The interplay between energy security and law and policy on green energy development: a socio-legal analysis

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ABSTRACT

This thesis examines the interplay between energy security and law and policies promoting green energy. Based on empirical work carried out in two very different country case studies – Great Britain and Brazil – this thesis attempts to foster a better understanding of the role played by energy security in constructing and deconstructing green energy policy initiatives. Understanding the diversity of views on and the complexities of the interplay between energy security and green energy development is at the heart of this thesis.

The diversity of views raised in national contexts leads to legal disputes in international forums when attempts are made to address the issues of this energy security-green energy interplay. As such, building on the findings of the case studies of Great Britain and Brazil, this thesis then analyses the interplay between energy security and green energy development in international trade law as encapsulated in the law of the World Trade Organisation (WTO), an international trade organisation which adjudicates between competing discursive claims surrounding energy security and green energy development and pronounces on their legal status.

This thesis shows the complexity of the relationship between energy security and law and policies on green energy development and how the existing discursive constructions are broadening, deepening and transforming this interplay. In summary, the findings demonstrate the discursive contests that lead to divergent constructions of energy security not only in the context of different countries, but also in different sectors of the economy within a country. It also shows that the links between energy security and national and international law and policies on green energy pose challenges to a transition to a green energy system.

In order to assist the energy transition, this thesis puts forward the adoption of the broader energy security concept in law and policies which includes environmental, climate and social considerations. It also argues for the incorporation of a dominant positive frame in relation to the interplay between energy security and law and policy on green energy development since a positive frame in relation to this link has the implication to significantly contribute to the promotion of an energy source. In addition, it advances the need to embrace emerging green energy technologies in energy systems and argues that an evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure green energy security in the context of the just energy transition. This thesis then proposes a way forward in creating the legal space in the law of the WTO for trade restrictive measures aimed at ensuring green energy security.

To my beloved husband and true friend, Dr Marcus William Rutherford.

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CHAPTER 1

INTRODUCTION

1. Introduction

Energy is a multi-disciplinary research theme of pressing social relevance. Energy is an essential enabler of human wellbeing. It enables us to fulfil our basic human needs and is an indispensable catalyst of economic activity. Energy exists in various forms, such as heat, light and electricity, and is an essential part of maintaining our current, post-industrial revolution era, modern lifestyle. By waking up with a smartphone alarm clock, which is left charging overnight, turning the lights on and then the kettle to make a cup of coffee or tea in the morning, by using computers, tablets, microwave, refrigerators, cookers, toasters, dishwashers and a variety of available appliances throughout the day, by driving a car or taking a bus, train or aeroplane, for example, one cannot fail to notice that most of the objects we rely on in modern life are driven by energy. Being fundamental to the smooth running of modern societies, it is, therefore, of no surprise that energy is often said to be the lifeblood of modern society.

The fast pace of the modern world involves the sizeable and continuous consumption of energy.[1] According to the International Energy Agency, in 2017 the world energy demand increased at twice the 2016 growth rate.[2] Energy demand has greatly increased with the rise of emerging economies which have become major energy consumers, with China, India and

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[1] Mogens Rüdiger, *The Culture of Energy* (Cambridge Scholars Publishing 2008), vii.
[2] International Energy Agency, 'Global Energy & CO2 Status Report 2017', March 2018, 2 <https://www.iea.org/publications/freepublications/publication/GECO2017.pdf> accessed 30 October 2018.

other Asian economies now accounting for around two-thirds of the growth in energy consumption.[3]

Population growth adds an additional stress on energy demand. According to the United Nations, the world population grows approximately by an additional 83 million people annually and is projected to increase by more than one billion people within the next 15 years, reaching 8.5 billion in 2030, and to increase further to 9.7 billion by 2050.[4] Furthermore, world GDP is forecasted to more than double by 2040, as more than 2.5 billion people are lifted from low incomes.[5] Access to modern technological equipment by billions of new users will increase energy demand. Access to low-cost smartphones which will probably require a charge daily serves as an illustration. According to recent research, smartphone users in Africa are expected to more than triple, rising from 226 million in 2015 to 720 million in 2020.[6] Thus, both population growth and increasing standards of living for many people in developing countries will substantially increase energy demand. BP's Energy Outlook reveals that energy demand will increase by around one third over the next 25 years,[7] which is the equivalent of taking all of today's demand and adding another China and European Union to it.[8] Although modern appliances, such as LED lights, TVs and refrigerators, have seen energy efficiency improvements of as much as 80%, energy efficiency improvements slowed down dramatically

[3] BP, '2018 BP Energy Outlook', 15 <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf> accessed 30 October 2018.
[4] United Nations, 'World Population Prospects, The 2015 Revision: Key Findings and Advance Tables', 2 <https://esa.un.org/unpd/wpp/publications/files/key_findings_wpp_2015.pdf> accessed 30 October 2018.
[5] BP, '2018 BP Energy Outlook', 6 < https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf> accessed 30 October 2018.
[6] GSMA, 'The Mobile Economy: Africa 2016' <https://www.gsmaintelligence.com/research/?file=3bc21ea879a5b217b64d62fa24c55bdf&download> accessed 30 October 2018.
[7] BP, '2018 BP Energy Outlook', 6 <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf> accessed 30 October 2018.
[8] Bob Dudley, 'Shaping the Future Energy Landscape', speech at the AIPN International Petroleum Summit, London, UK on 24 April 2018 < https://www.bp.com/en/global/corporate/media/speeches/shaping-the-future-energy-landscape.html> accessed 30 October 2018.

in 2017, because of weaker improvement in efficiency policy coverage and stringency as well as lower energy prices.[9]

While the world's energy needs continue to grow, almost one billion people – roughly one in seven, which represents more than the population of the whole of Europe – still live without electricity. The United Nations outlook for electrification shows that the world is not yet on track to achieve universal access by 2030,[10] making energy access a major topic for the 2018 United Nations Sustainable Development goals.

Against this background of an overpopulated world avidly consuming energy which, at the same time, leaves almost one billion in energy poverty, fossil fuels continue to exert a stranglehold on the global economy, despite two oil crises in 1973 and 1979. Fossil fuels are used to power machines and cars, to produce electricity, and to manufacture various chemicals which pervade humans' daily lives. The overall share of fossil fuels in the global energy demand in 2017 remained at 81%, a level that has remained constant for more than three decades despite growth in renewables.[11] Fossil fuels, nevertheless, are an exhaustible energy resource and the world is not in a position to maintain abundant fossil energy supplies. This means that sooner or later the world will face a global energy crisis, if non-fossil fuels energy sources are not widely deployed. All of these factors have amplified concerns about security of energy supply and have challenged the world's capacity to deal with the risks of global fuel shortages and interruptions in energy supply.

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[9] International Energy Agency, 'Global Energy & CO2 Status Report 2017', March 2018, <https://www.iea.org/publications/freepublications/publication/GECO2017.pdf> accessed 30 October 2018.

[10] United Nations, 'The Sustainable Development Goals Report 2018', 23 <https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf> accessed 30 October 2018.

[11] International Energy Agency, 'Global Energy & CO2 Status Report 2017', March 2018, 2 <https://www.iea.org/publications/freepublications/publication/GECO2017.pdf> accessed 30 October 2018.

In tandem with energy security challenges are climate change – driven by global warming – and environmental challenges. Global climate change as well as air pollution, water availability and quality, land-use change and biodiversity loss are strongly associated with energy security. For instance, water is used for energy and energy is used for water. Thermal power generation and hydropower generally require large quantities of water.[12] Hydroelectric power, for example, is a form of energy generated through the use of the gravitational force of falling or flowing water.[13] Shrinking water supplies, therefore, can cause serious energy security concerns. In 2015, drought in Brazil depleted reserves at its hydroelectric plants, leaving power generation at precariously low levels.[14] Conversely, energy is required for the collection, treatment and delivery of water.[15] In Texas, for instance, energy production consumes enough water to provide for the needs of approximately 3 million people, while the energy used for water treatment could provide enough power for about 100,000 people.[16] Energy is also the largest source of air pollution in many countries, especially in emerging countries, and this is the reason for several millions of deaths in developing countries.[17]

[12] United Nations World Water Assessment Programme, T*he United Nations World Water Development Report 2015: Water for a Sustainable World* (UNESCO 2015), 67.

[13] Monika Manglik and Mangey Ram, 'Behavioural Analysis of a Hydroelectric Production Power Plant under Reworking Scheme' (2015) 53(2) Int J Prod Res 648.

[14] Jonathan Watts, 'Brazil's Worst Drought in History Prompts Protests and Blackouts' *The Guardian* (23 January 2015).

[15] United Nations World Water Assessment Programme, T*he United Nations World Water Development Report 2015: Water for a Sustainable World* (Paris: UNESCO, 2015), 67.

[16] Ashlynn S Stillwell and others, 'The Energy-Water Nexus in Texas' (2011) 16(1) Ecology & Society 1.

[17] International Energy Agency, 'Energy and Air Pollution: World Energy Outlook Special Report', 2016 <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlookSpecialReport2016EnergyandAirPollution.pdf> accessed 30 October 2018. World Health Organization (WHO), '7 Million Premature Deaths Annually Linked to Air Pollution, 2014 <http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/> accessed 30 October 2018.

Climate change can itself disrupt energy systems[18] as in 2016, when interconnectors between France and Britain were partially severed during Storm Angus.[19] Moreover, climate change can have a negative effect on biofuel feeder crop production. For instance, the record storms and floods in the Midwest of the United States in June 2008 struck at the heart of America's grain belt at a time when the United States had become more reliant on corn-based ethanol for its fuel supply.[20]

Climate change is also likely to exacerbate resource scarcity, amplifying water scarcities and loss of agricultural production[21] whilst aggravating food insecurity as a result. The effects of climate change on crop and food production are already being felt in several regions of the world.[22] In 2008, 21 countries with a combined population of about 600 million were considered to be either cropland or freshwater scarce.[23] The combined effects of climate change and the increased demand for food production are likely to alter the productivity and distribution of the world's 'bread-basket' regions and accelerate soil degradation in previously fertile areas.[24] In this context, climate-induced weather patterns could play a greater role in food prices.[25] In 2018, the heatwave across Europe and considered the driest

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[18] Marcus King and Jay Gulledge, 'Climate Change and Energy Security: An Analysis of Policy Research' (2014) 132(1) Climate Change 57.

[19] Emily Gosden, 'Winter Power Crunch Fears as UK-France Cables Severed during Storm', *The Telegraph* (29 November 2016) < https://www.telegraph.co.uk/business/2016/11/29/winter-power-crunch-fears-uk-france-cables-severed-storm/> accessed 10 October 2018.

[20] Frank Umbach, 'The Intersection of Climate Protection Policies and Energy Security' (2012) 10(4) Journal of Transatlantic Studies 374, 377.

[21] National Intelligence Council (NIC), Global Trends 2025: A Transformed World (2008), viii <www.dni.gov/nic/NIC_2025_project.html> last accessed 22 March 2018.

[22] The Intergovernmental Panel on Climate Change (IPCC), 'Climate Change 2014: Impacts, Adaptation, and Vulnerability' (2014), 488-514 <https://www.ipcc.ch/report/ar5/wg2/> accessed 15 February 2019.

[23] National Intelligence Council (NIC), Global Trends 2025: A Transformed World (2008), 51 <www.dni.gov/nic/NIC_2025_project.html> last accessed 22 March 2018

[24] The Development, Concepts and Doctrine Centre (DCDC), 'Global Strategic Trends – Out to 2040' (Ministry of Defence 2010), 26.

[25] National Intelligence Council (NIC), Global Trends 2025: A Transformed World (2008), 52 <www.dni.gov/nic/NIC_2025_project.html> last accessed 22 March 2018; Donald J Wuebbles, Aman Chitkara, Clay Matheny, 'Potential Effects of Climate Change on Global Security' (2014) 34(4) Environment Systems and Decisions 564, 569.

summer in Britain, for example, pushed up food prices in the United Kingdom (UK), as a result of farmers struggling to raise crops.[26]

The current forecasts for rising sea levels due to climate change will severely impact territories, such as Tuvalu, Kiribati, and the Marshall Islands in which the current predicted sea level rise of 2 meters by 2100 would mean the submersion of these States by the Pacific Ocean.[27] Moreover, the spread of infectious disease, stimulation of mass migration and extreme weather events are all acknowledged as consequences of climate change. The potential for disaster is well recognised. According to scientists, in order to lower the risk of impacts on natural and human systems from global warming, current emissions of greenhouse gasses need to be reduced by 80% by the year 2050 and lowered to zero sometime after that. In recognition of this situation, 195 countries adopted the Paris Agreement in December 2015[28] with the aim of strengthening the global response to climate change by 'holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels'.[29]

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[26] Zoe Wood and Sarah Butler, 'Heatwave in Europe Set to Push up UK Food Prices', *The Guardian* (3 August 2018) < https://www.theguardian.com/business/2018/aug/03/heatwave-in-europe-set-to-push-up-uk-food-prices> accessed 31 October 2018. Terri-Ann Williams, 'Food Prices Are Set to Rise by £7.15 a Week as Heatwave Hits Britain's Struggling Farmers with Crops of Potatoes, Onions and Carrots Slumping by as Much as One-fifth', *Daily Mail* (4 September 2018) < https://www.dailymail.co.uk/news/article-6129469/Heatwave-hits-Britains-struggling-farmers-crops-potatoes-onions-carrots-slump.html> accessed 31 October 2018.

[27] John J Marra, Mark A Merrifield and William V Sweet, 'Sea Level and Coastal Inundation on Pacific Islands', in Victoria Keener and others*, Climate Change and Pacific Islands : Indicators and Impacts: Report for the 2012 Pacific Islands Regional Climate Assessment* (Island Press 2015), 79.

[28] United Nations Framework Convention on Climate Change, 'Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015, Addendum', 29 January 206 <https://unfccc.int/sites/default/files/resource/docs/2015/cop21/eng/10a01.pdf> accessed 30 October 2018.

[29] Article 2, paragraph 1 of the Paris Agreement <https://unfccc.int/sites/default/files/english_paris_agreement.pdf> accessed 30 October 2018.

Current energy systems are considered the largest single source of greenhouse gas emissions from human activities and the latest report from the Intergovernmental Panel on Climate Change (IPCC) now projects that by mid-century the majority of primary energy must come from non-fossil fuels if we are to keep warming below 1.5 or even 2 degrees.[30] The need for a fundamental transformation of the global energy system via the scaled-up deployment of non-fossil fuels technologies is widely accepted. However, how the decarbonisation of the energy system will take effect is uncertain. While some scholars advance studies of the feasibility of 100 per cent renewable technologies,[31] others argue that it is extremely difficult to achieve complete decarbonisation of the energy system, even when using every current technology and tool available, including energy efficiency, wind, hydroelectric, bioenergy, nuclear and solar energy as well as carbon capture and storage.[32] Also, competing with a scenario of high renewable energy share,[33] there are scholarly analyses proposing a large role for nuclear energy in the mitigation of greenhouse gas emissions.[34] Nonetheless, the global energy market at the moment is still monopolised to a great extent by the production, trade, and consumption of oil and gas[35] and the International Energy Agency estimates show that global energy-related CO2 emissions reached a historic high in 2017.[36]

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[30] Intergovernmental Panel on Climate Change, 'Global Warming of 1.5 °C', 2018, 51 <http://www.ipcc.ch/report/sr15/> accessed 30 October 2018.

[31] M Z Jacobson and others, '100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World' (2017) 1(1) Joule 108.

[32] Christopher T M Clack and others, 'Evaluation of a Proposal for Reliable Low-cost Grid Power with 100% Wind, Water, and Solar' 114(26) Proceedings of the National Academy of Sciences of the United States of America 6722.

[33] Felix Creutzig and others, 'The Underestimated Potential of Solar Energy to Mitigate Climate Change' (2017) 2(9) Nature Energy 17140.

[34] See, for example, A Berger and others, 'How Much Can Nuclear Energy Do about Global Warming?' (2017) 40 International Journal of Global Energy Issues 43.

[35] International Energy Agency, "World Energy Outlook," 2016, 5 <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlook2016ExecutiveSummaryEnglish.pdf> accessed 30 October 2018.

[36] International Energy Agency, 'Global Energy & CO2 Status Report 2017', March 2018, <https://www.iea.org/publications/freepublications/publication/GECO2017.pdf> accessed 30 October 2018.

Nonetheless, the mitigation of global warming produced by emissions from burning fossil fuels has become a significant issue in many parts of the world with a focus on limiting humanity's carbon footprint. Green energy promotion worldwide was driven in great part as a necessary measure to mitigate climate change, and formed part of countries broader strategies to cut carbon emissions. The Climate Change Act 2008 in the UK, for example, established a legally binding target to reduce the UK's greenhouse gases emissions to at least 80% lower than the 1990 baseline by 2050, and the increase of renewable energy consumption in electricity, transport, and heating sectors was proposed as one of the ways to help keep the UK on track to hit the targets.[37] Commitments were also adopted by Brazil with the enactment of the National Policy on Climate Change in 2009 when Brazil voluntarily committed to adopt actions to mitigate greenhouse gas emissions with the purpose of reducing between 36.1% and 38.9% of projected emissions by 2020. Increasing the share of green energy sources, such as wind, solar and biomass, in the power supply to 23% was one of the intended strategies to meet this target.[38] China committed to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030, including from wind, solar, geothermal energy, bio-energy and maritime energy.[39] By 2014, China had scaled up installed capacity of on-grid wind power and solar power.[40] Australia adopted the Renewable Energy Target's schemes to reduce emissions of greenhouse gases in the electricity sector and

[37] Department of Energy and Climate Change, 'UK Renewable Energy Roadmap', July 2011 <https://www.gov.uk/government/publications/renewable-energy-roadmap> accessed 7 October 2018.
[38] See Brazil, Brazil´s Intended Nationally Determined Contribution towards Achieving the Objective of the United Nations Framework Convention on Climate Change (28 September 2015) <www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx> accessed 25 January 2017; Eduardo Braga, *A Matriz Energética Brasileira e os Desafios do Setor em Decorrência das Mudanças Climáticas* (*Senado Federal, Comissão Mista Permanente Sobre Mudanças Climáticas* 2015).
[39] Department of Climate Change, National Development and Reform Commission of China, 'China's Intended Nationally Determined Contribution: Enhanced Actions on Climate Change', 30 June 2015, 5-7 <http://www4.unfccc.int/Submissions/INDC/Published%20Documents/China/1/China's%20INDC%20-%20on%2030%20June%202015.pdf> accessed 2 November 2018.
[40] Ibid 3.

deliver its 2020 target of having over 20 per cent of Australia's electricity coming from renewable energy sources.[41] The role of green energy in tackling climate change is, therefore, widely accepted.

1.1. A just energy transition

Effects of climate change and the necessary measures to mitigate it brought to the fore the need for transformative changes in the global energy sector and turned public policy and energy studies attention to the energy transition. In the energy transition, energy systems move away from fossil fuels and towards the adoption of energy technologies that leave a much smaller carbon footprint. Transitioning away from our current global energy system is considered 'of paramount importance'[42] and 'widely apparent'[43]. More energy efficiency and cleaner use of energy are considered central pre-requisites to the energy transition. These are not, however, the only issues in debate. The concept of a just energy transition has also emerged which promotes the transition to a low carbon economy with the inclusion of social justice, by bringing everyone in society along with that transition.[44]

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[41] Australian Government, 'About the Renewable Energy Target', 31 May 2018 <http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target> accessed 2 November 2018. Australian Government, 'How the Scheme Works", 31 May 2018 <http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works> accessed 2 November 2018. See also the Renewable Energy (Electricity) Amendment Bill 2015 and 'Australia's Intended Nationally Determined Contribution to a new Climate Change Agreement', August 2015 <http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Australia/1/Australias%20Intended%20Nationally%20Determined%20Contribution%20to%20a%20new%20Climate%20Change%20Agreement%20-%20August%202015.pdf> accessed 2 November 2018.

[42] Benjamin K Sovacool, 'How Long Will It Take? Conceptualizing the Temporal Dynamics of Energy Transitions' (2016) 13 Energy Research & Social Science 202.

[43] Grubler Arnulf, 'Energy Transitions Research Insights and Cautionary Tales' (2012) 50 Energy Policy 8.

[44] Raphael J Heffron, 'The Just Transition to a Low-Carbon Economy' (2018) 8(4) Renewable Energy Law & Policy Review 39.

The concept of a just transition was originally proposed by global trade unions in the 1980s, and one of the key aspects is related to the need to move workers in a high carbon economy into areas that will support the transition away from fossil fuels.[45] Just transition as a new framework of analysis is promoting the unification of climate, energy and environmental justice scholarships which all seek justice – albeit conceptualised in distinct ways – in the transition to a low carbon economy.[46] The just energy transition, therefore, does not involve only the shift from fossil fuels to forms of low carbon energy, but also the need to include strategies that promote social justice across the globe.

Against this background, one can observe that energy production and use today create a dilemma. On the one hand, energy brings economic growth and well-being to humankind which permanently requires more and more availability of energy supply to meet the needs of a growing world. On the other hand, energy is the largest source of greenhouse gas emissions, considered to be causing climate change and other environmental concerns, particularly air pollution, which can impede humanity's progress and appear to be leading the planet to the verge of collapse.

Humanity, therefore, needs to address this dilemma and the complicated situation it is rooted in: how can we ensure energy security without environmental and climate change imbalances and with social justice worldwide? These are competing priorities that need to be untangled across the energy sector. It is in attempting to contribute to the answer to this question that this PhD thesis has been written. Green energy's role in tackling climate change and environmental concerns is widely debated, but less so is its links with energy security.

[45] Darren McCauley and Raphael Heffron, 'Just Transition: Integrating Climate, Energy and Environmental Justice' (2018) 119 Energy Policy 1, 1.
[46] Raphael J Heffron and Darren McCauley, 'What is the 'Just Transition'?' (2018) 88 Geoforum 74, 74.

The objective of this thesis is, therefore, to address the interplay between energy security and green energy development.

2. The point of departure: thesis aim, research questions and contribution

2.1. Thesis aim and research questions

Simply put, the purpose of this study is to examine the interplay between energy security and law and policies promoting green energy. This thesis' central argument is that if we want to have a just energy transition we ought to pay closer attention to the relationship between energy security and law and policies on green energy development. The energy system is in a state of change, particularly as a result of the development, commercialisation and deployment of green energy technologies. Thus, in attempting to foster a better understanding of the role played by energy security in constructing and deconstructing green energy policy initiatives in the context of the just energy transition, this thesis initially seeks to answer the following three research questions:

1. How has energy security been discursively constructed?

2. What are the discursive links between energy security and law and policies promoting green energy?

3. What are the implications of energy security construction to law and policy on green energy development?

The answer to these three research questions are sought in the context of two countries case studies: Great Britain and Brazil. Previous studies have demonstrated that energy security concerns are shaped by contextual and national concerns.[47] Therefore, it made sense for the thesis to focus on specific country case studies. The multifaceted dimensions of energy security and its complex relationship with green energy initiatives worldwide as well as the global nature of green energy technologies deployment and energy system transformations mean that there would need to be variation in the case studies selected. Any focus on only one specific and localised area would not provide the multiplicity of perceptions and range of understandings required to answer the research questions. Thus, Great Britain and Brazil were selected as case studies because of their differences. Great Britain is a developed economy with an energy system dominated by fossil fuels,[48] but which is in a major period of transition.[49] Brazil is an emerging economy and considered to have the greenest energy mix worldwide.[50] Also, as will be demonstrated in this thesis, the issues surrounding energy security and law and policies on green energy development are demonstrably different in each country.

The just energy transition is also an opportunity to widen access to emerging green energy technologies globally. Today, there is disparity between different countries worldwide, with some getting ahead with green energy technologies while others are being

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[47] Bert Kruyt and others, 'Indicators for Energy Security' (2009) 37(6) Energy Policy 2166; Benjamin K Sovacool and others, 'Exploring Propositions about Perceptions of Energy Security: An International Survey' (2012) 16 Environmental Science & Policy 44; Janelle Knox-Hayes and others, 'Understanding Attitudes toward Energy Security: Results of a Cross-national Survey' (2013) 23(3) Global Environmental Change 609; Yann B Blumer and others, 'The Precarious Consensus on the Importance of Energy Security: Contrasting Views between Swiss Energy Users and Experts' (2015) 52 Renewable and Sustainable Energy Reviews 927; B W Ang, W L Choong and T S Ng, 'Energy Security: Definitions, Dimensions and Indexes' (2015) 42(1) Renewable and Sustainable Energy Reviews 1077.

[48] In 2017, the UK obtained 81.6 per cent of its primary energy from fossil fuels. See, Department for Business, Energy & Industrial Strategy, *UK Energy in Brief 2018* (Department for Business, Energy & Industrial Strategy 2018), 13.

[49] Frank W Geels and others, 'The Enactment of Socio-technical Transition Pathways: A Reformulated Typology and a Comparative Multi-level Analysis of the German and UK Low-carbon Electricity Transitions (1990–2014)' (2016) 45(4) Research Policy 896.

[50] Fatih Birol, 'Renewables 2018: Market Analysis and Forecast from 2018 to 2023' <https://www.iea.org/renewables2018/> accessed 6 November 2018.

left behind. It is also acknowledged that we must accelerate progress toward energy technologies and trading patterns to transition to a low carbon energy system.[51] In connection with that, the challenge of energy security is also impacted by trade relationships around the globe. With that in mind, understanding the law on energy security and international green energy trade is paramount. Developing a proper global response to energy security and green energy development concerns in the context of a just energy transition may require paying close attention to the global trade regime. As such, as a third case study, this thesis analyses the interplay between energy security and green energy development in the law of the World Trade Organisation (WTO).

The WTO is an international trade organisation, which sets international trade obligations through its agreements that Member States have to comply with and these influence their own national law and policies on energy security and green energy development. The WTO system also adjudicates between Member States competing claims via its dispute settlement body and has been acting as a forum for green energy trade-related disputes. Therefore, it is important to show the multiplicity of views on the case studies on Great Britain and Brazil, because these different perspectives will likely be at stake in legal disputes within the WTO dispute settlement body. As such, the findings of the country case studies on Great Britain and Brazil will inform the analyses on the intersection of trade, energy security and green energy.

The law of the WTO can offer opportunities for countries to transition to a green energy system and to ensure energy security. With a view of increasing the participation of

[51] Carlos Pascual and Jonathan Elkind, *Energy Security: Economics, Politics, Strategies, and Implications* (Brookings Institution Press 2010), 2.

green energy in the energy mix to ensure energy security, countries may adopt trade restrictive measures to support the development of the national green energy sector. However, these measures may be incompatible with the law of the WTO. Thus, the case study on the WTO explores whether there is any flexibility within the current WTO rules and the interpretations given to them that permit trade restrictive measures that support national green energy development with a view of ensuring energy security, i.e. green energy security. This third case study, therefore, aims at answering the fourth research question of this thesis:

4. Is there policy space for national green energy security in the law of the WTO?

Understanding the diversity of views on and the complexities of the interplay between energy security and green energy development not only in national laws and policies but also in international law is at the heart of this thesis.

2.2. Contribution

This thesis seeks to contribute to the literature on energy security and green energy within the sphere of national energy law and policy and the law of the WTO. Energy law and policy rests essentially on markets, security of supply and efficiency. It is about government policies aimed at securing energy sources at the least possible cost, including social cost.[52] Energy law, however, is a complex area of law, which demands that a scholar in the area engage with other disciplines like, for example, politics, economics, geography, environmental sciences and engineering.[53] Energy law is also derived from international,

[52] Raphael J Heffron and KimTalus, 'The Evolution of Energy Law and Energy Jurisprudence: Insights for Energy Analysts and Researchers' (2016) 19 Energy Research & Social Science 1, 1.
[53] Ibid 2.

national and local laws and thus across several levels.[54] Therefore, this thesis contributes not only to scholarship on national energy law with the case studies on Great Britain and Brazil, but also to international energy law within the analysis of the law of the WTO.

Notwithstanding the growing number of studies of energy security and green energy taken separately, there is seemingly no legal analysis into the link between these two phenomena. In particular, there are no comprehensive socio-legal studies that bring together the issues of the multifaceted concept of energy security and its connections and implications to national and international law and policies on green energy development.

Instead, the literature on the subject is fragmented and does not provide a coherent analysis and an overarching critique of the interplay between energy security concerns and green energy development. Traditionally, the debate on energy security has centred on conventional energy sources, while the debate on green energy has focused on climate change and environmental concerns. However, as we move from a fossil fuel dominated energy system to one that utilises more green energy, an analysis of these two isolated themes has to be unified. Therefore, the unification of these two separate themes is a central contribution of this thesis. By looking at green energy from the energy security angle, this thesis provides new knowledge and insights into critical global issues, thereby seeking to foster changes in the perceptions of the interlinked dimensions of energy security and green energy development. By doing so, it also seeks to influence the processes of creating new laws, regulations and policies.

[54] Raphael J Heffron, *Energy Law: An Introduction* (Springer 2015), 4.

3. The task being tackled: structure of the thesis

The structure of this thesis is as follows. Chapter 2 focuses on the methodological approach adopted in this thesis. As will be discussed, this research takes a socio-legal perspective and operates within a broadly constructionist frame to examine the interplay between energy security and law and policy on green energy development in the context of three case studies (i) Great Britain, (ii) Brazil and (iii) the World Trade organisation (WTO). The two country case studies employ discourse analysis as an additional methodological tool to examine the two national contexts. The third case study is based on a legal analysis of the law of the WTO. Each context required a different mode of engagement so each case study has its specific data collection technique, i.e. the first case study is based on semi-structured interviews, the second on archival research and the third on jurisprudence.

Chapter 3 contains the literature review and the concepts and definitions in play in the subsequent chapters of this thesis. It starts with the basic definitions of energy and green energy. It then proceeds to discuss the notions of energy security in the scholarly reviews, followed by an explanation of the processes of securitisation and politicisation around energy. The chapter finds that energy security is a complex and multifaceted phenomenon and the mainstream academic literature on energy security presents a pervasive lack of consensus in relation to its different concepts and dimensions. It also demonstrates that literature on securitisation and politicisation is not clear cut and entirely unproblematic and that these different processes imply different ways where energy security issues are acted on.

Chapter 4 contains the first case study. It examines the interplay between energy security and green energy in the context of Great Britain (GB) and focuses on the first three research questions of the thesis stated above. Based on semi-structured interviews with 24 leading energy experts, the chapter explores participants' views on green energy development. This is followed by an analysis of the core themes identified from the interviews with a focus on energy security definitions and on the interplay between energy security and law and policy on green energy development. The chapter demonstrates the multiple framings employed by leading energy experts in GB as part of discursive contests that lead to divergent constructions of energy security. In summary, energy security not only means different things to different people in different contexts, but also to different sectors of the economy. Based on participants' discursive constructions, this chapter shows challenges posed to a transition to a green energy system in GB and the emergence of novel themes in relation to green energy and energy security.

Chapter 5 contains the second case study. It examines the interplay between energy security and green energy in the context of Brazil and focuses on the first three research questions of the thesis stated above. Based on documents obtained from the Brazilian National Archive, the President of the Republic Archive and the Federal Senate Archive, the chapter traces the way that energy security is construed and given meaning and significance through the articulation and production of 'texts' of many kinds, from speeches to policy statements and laws, with emphasis on the role the discursive frames surrounding energy security play in constructing or deconstructing green energy initiatives over a period of fifteen years (January 2001-December 2015). It demonstrates that energy security is discursively framed differently in different green energy law and policies within different energy sectors. Due to its importance to economic and social stability in Brazil, when a positive frame in relation to the links between energy security and green energy development is made, it has the implication of promoting green energy. On the contrary, when a negative framing of the connections between energy security and green energy development is deployed, it has the implication of hindering green energy development. In particular, this chapter reveals two main findings: (i) that a positive frame for energy security and green energy connection is advanced in the context of the transport sector, which, as a result, supported biofuels development; and (ii) that a dominant negative frame is advanced in the context of deployment of green energy, solar and wind in particular, in the electricity system in Brazil, which, as a result, hindered solar and wind energy technologies and promoted fossil fuels development. This negative frame coupled with the absence in the official discourse of reference to emerging innovative technologies with the potential to minimise green energy intermittency issues, such as energy storage and smart grids, have had the result of contributing to Brazil moving in the opposite direction to a low carbon energy transition.

Chapter 6 builds on the findings of the case studies on Great Britain and Brazil and focuses on the fourth research question of the thesis: is there policy space for national green energy security in the law of the World Trade Organisation (WTO)? It reveals how energy security has been raised within the WTO green energy jurisprudence so far and explores whether there is any flexibility within the current WTO rules and the interpretations given to them that permit trade restrictive measures that support national green energy development with a view of ensuring energy security. The chapter argues that an evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure green energy security in the context of the just energy transition. It then proposes a way forward in creating the legal space in the law of the WTO for trade restrictive measures aimed at ensuring green energy security.

Finally, chapter 7 summarises the main conclusions and contributions of the thesis, discusses the main limitations of the study and makes recommendations for future research.

CHAPTER 2

METHODOLOGY

1. Introduction

The purpose of this chapter is to present the theoretical assumptions underpinning this research as well as to introduce the study's methodological bases and chosen method. As will be discussed, this research takes a socio-legal perspective and operates within a broadly constructionist frame to examine the interplay between energy security and law and policy on green energy development in the context of three case studies (i) Great Britain, (ii) Brazil and (iii) the World Trade organisation (WTO). The two country case studies employ discourse analysis as an additional methodological tool to examine two national contexts. The third case study is based on a legal analysis of the law of the WTO. Each context required a different mode of engagement so each case study has its specific data collection technique, i.e. the first case study is based on semi-structured interviews, the second on archival research and the third on jurisprudence.

This chapter is divided into four sections. In the first two sections, the broad methodological framework is set out. The third section describes discourse analysis as the chosen method for the two country case studies. Finally, section four deals with case studies as the research design for the thesis.

2. The project's socio-legal focus

The definition of socio-legal studies is not confined neatly within well-defined boundaries.[1] However, this thesis adopts a socio-legal perspective understood within the broad terms of the 'living law' which Ehrlich suggests gives primacy to 'living' sociality over the 'stagnant' official law.[2] The 'socio' in socio-legal studies represents 'an interface with a context within which law exists'.[3] Socio-legal research thus considers the law and the process of law (law-making, legal procedure) beyond legal texts, seeking to study law in its multiple and interconnected contexts.[4]

In this thesis, then, the socio-legal perspective offers a starting point for developing an understanding of the role played by energy security in constructing and deconstructing green energy policies in and through situated legal processes, procedures and practices.

3. The constructionist orientation

As well as adopting a socio-legal perspective, this thesis could also be characterised as broadly constructionist in orientation. Constructionism (or, as it is sometimes called, constructivism) has long been influential in the study of social problems, but it has also become prominent in legal studies.[5] Constructionism is often defined in philosophical terms as a commitment to the idea that participants actively make or construct the worlds of

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[1] Fiona Cownie and Anthony Bradney, 'Socio-legal Studies: A Challenge to the Doctrinal Approach' in Dawn Watkins and Mandy Burton (eds), *Research methods in law* (Routledge 2013), 35.
[2] Eugen Ehrlich, *Fundamental Principles of the Sociology of Law* (Harvard University Press 1936).
[3] S Wheeler and P A Thomas, 'Socio-Legal Studies' in D J Hayton (ed), Law's Future(s) (Hart Publishing 2002), 271.
[4] Alan Bradshaw, 'Sense and Sensibility: Debates and Developments in Socio-Legal Research Methods', in Philip A Thomas (ed), *Socio-Legal Studies* (Dartmouth 1997), 68.
[5] David Bogen and Michael Lynch, 'Do We Need a General Theory of Social Problems?' in Gale Miller and James A Holstein (eds), *Constructionist Controversies: Issues in Social Problems Theory* (Routledge 2017), 83.

everyday life and their constituent elements.[6] Rather than offering a metaphysical position as such (i.e., 'reality is a social construction'), constructionist studies are perhaps better thought of as fostering an open orientation to the kinds of activities and practices social actors engage in and seek to learn about them in their own terms. Thus, the main point in this thesis is to treat the law and the category of 'energy security' within it as a construction in this sense, i.e., as a product built up out of, and which gains relevance through, the activities and practices of people all working to shape it (often against one another) in various ways.

According to constructionists, one does not commit to any particular view of the nature of what is being studied prior to going out and studying it. Instead of operating with a pre-established theoretical view, a constructionist orientation analytically examines the work people themselves do and the resources they employ (including, for example, language, institutions and technologies) in order to shape things themselves. Given this, no grand theory was adopted before the study commenced. Instead, the point of the study was to explore how understandings of energy security and their relation to law and policies on green energy development were being shaped by people in real situations in the energy field, by letting them tell us how things are and show us how they seek to (re)shape reality according to that.

This thesis therefore proceeds on the basis that the law is actively constructed in and through people's efforts to define and apply categories like 'energy security' and 'green energy'.[7] For Hacking, the aim of an inquiry set out on these terms is to situate concepts in their sites – the rich fields of activity they operate within which can be described from many

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[6] Jaber F Gubrium and James A Holstein, 'The Constructionist Mosaic' in James A Holstein and Jaber F Gubrium (eds), *Handbook of Constructionist Research* (The Guilford Press 2008), 3.
[7] SS Strum and Bruno Latour, 'Redefining the Social Link: from Baboons to Humans' (1987) 26(4) Social Science Information 783, 784.

points of view and perspectives – and the work they do in them.[8] In the course of their activities, socio-legal actors forge links between the discursive and the social, political and material contexts or conditions within which concepts acquire their particular meaning or where their meanings are contested or fought over. As Hackings notes, concepts do not exist in a vacuum, they inhabit a social setting.[9] Following Hacking, this research focuses on the discursive construction of concepts of energy security and examines the category of 'energy security' in its sites. These are simultaneously political, legal and discursive, they vary across national boundaries and levels of governance and allow for processes of contestation in various ways as a result. Given this characterisation, the thesis investigates how the concept of energy security is being constructed and what the concept is being used to do. This thesis will demonstrate how the concept of energy security can be and is put to work for many ends and how it contributes in different ways to both the construction and deconstruction of green energy policies.

4. Discourse analysis

Alongside the socio-legal and constructionist elements, the additional methodological approach employed for the two country case studies is discourse analysis. Discourse analysis has increasingly been used across social science fields as an approach to understanding the social dimension of green energy policies.[10] Nonetheless, a review of the literature shows that discourse analyses of the links between energy security and law and policies on green energy

[8] Ian Hacking, 'Let's Not Talk about Objectivity', in Flavia Padovani, Alan Richardson and Jonathan Y Tsou (eds), *Objectivity in Science: New Perspectives from Science and Technology Studies* (Springer 2015), 19.
[9] Ian Hacking, *The Social Construction of What?* (Harvard University Press 1999), 11.
[10] See, for example, Sarah Mander, 'The Role of Discourse Coalitions in Planning for Renewable Energy: A Case Study of Wind-energy Deployment' (2008) 26(3) Environment and Planning C: Government and Policy 583; Brad Jessup, 'Plural and Hybrid Environmental Values: A Discourse Analysis of the Wind Energy Conflict in Australia and the United Kingdom' (2010) 19(1) Environmental Politics 21; Philipp Späth, 'Understanding the Social Dynamics of Energy Regions - The Importance of Discourse Analysis' (2012) 4(6) Sustainability 1256.

development remain rare. This thesis attempts to address this gap by examining how links between energy security and green energy are being established (or denied) in and through discursive practices.

There are a great variety of definitions of discourse. Following Parker, this work treats discourse as "an interrelated set of texts, and the practices of their production, dissemination, and reception, which bring an object into being".[11]Discourse analysis, then, investigates discourse in terms of the way phenomena like energy security are defined and given meaning and significance through the articulation and production of 'texts' of many kinds, from speeches to policy statements to legal rulings, and the practices those texts are part and parcel of. Particular emphasis is placed on discourse's practical role in constructing and reconstructing social, political and economic realities.[12] In the present case, that translates into an examination of the construction and reconstruction of energy security over time based on an investigation of specific kinds of discursive 'moves' in terms of their connection to law and policies on green energy development and implications for social, political and economic life.

In order to do this, this study analyses the discourses of particular texts in the wider contexts which they are presented and made sense of within. From a discourse analytic perspective, texts are seen as ´intertextual´ in that they are not produced or interpreted in isolation from one another.[13] The analysis seeks, therefore, to go 'beyond the text' in order to show the specific ways in which texts speak to other texts. By proceedings in this way, it is

[11]Ian Parker, *Discourse Dynamics* (Routledge 1992), 4.
[12] Nelson Phillips and Cynthia Hardy, *Discourse Analysis* (Sage 2002).
[13] Adam Hodges, 'Intertextuality in Discourse' in Deborah Tannen, Heidi E Hamilton, and Deborah Schiffrin (eds), *The Handbook of Discourse Analysis* (John Wiley & Sons, Inc 2015).

possible to arrive at a more nuanced understanding of the role that energy security discourse plays in law and policies on green energy development in those wider contexts.

This thesis attempts to identify the discursive complexes which define the contexts examined through the country case studies. More specifically, this study examines the discursive frames which dominate energy security discourse in different contexts. A discursive frame is a means of structuring understandings.[14] As a concept, it is closely related to the idea of a 'frame of reference', i.e. a set of understandings about the world and what it contains that makes it possible to make judgements, draw distinctions and establish connections. As Nelson Goodman puts it:[15]

> Frames of reference ... belong less to what is described than to systems of description ... [and competing] statements relate what is described to such a system [and a different one in each case]. If I ask about the world, you can offer to tell me how it is under one or more frames of reference; but if I insist that you tell me how it is apart from all frames, what can you say? We are confined to ways of describing whatever is described. Our universe, so to speak, consists of these ways rather than of a world or of worlds.

As such, for Goodman, competing interpretations present the world in different ways – within them actors do different things in different ways in a different order for different reasons at different times because they are driven by different reasons and different forces. If one interpretation wins out and others are rejected, things change and that process carries often serious implications. Understanding the discursive framing of energy security is,

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[14] Stephen D Reese, 'Prologue—Framing Public Life', in Stephen D Reese, Oscar H Gandy Jr and August E Grant (eds), *Framing Public Life: Perspectives on Media and our Understanding of the Social World* (Lawrence Erlbaum 2001), 11.
[15] Nelson Goodman, *Ways of World Making* (Hackett Publishing 1978), 2.

therefore, important, because when one frame is selected from among a range of competing frames that has consequences for how things are subsequently seen and acted on, particularly how green energy development is seen and acted on, as this thesis will demonstrate.

5. Case studies

5.1. Why case studies?

In order to unveil the contextual specificity of ways of discursively framing energy security as well as the different ways that energy security and green energy are discursively linked, this thesis adopts case studies as a research design. There is not a single definition of case study research. According to Hamel, Dufour and Fortin, a case study consists of an in-depth investigation of a case, which uses a variety of methods to investigate the phenomena in question.[16] Similarly, in Yin's view, a case study is an empirical inquiry that investigates a real life contemporary phenomenon in depth.[17] Miles and Huberman suggest that the 'case' is the unit of analysis, or in other words, the 'heart of the study'.[18]

The case study approach has become progressively popular among researchers,[19] including energy law and policy researchers.[20] Several arguments can be made in favour of a case study approach for this thesis. First, the research questions of this thesis focus mainly on exploratory 'how' and 'what' questions, and more explanatory questions are likely to lead to

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[16] Jacques Hamel, Stéphane Dufour & Dominic Fortin, *Case Study Methods* (Sage 1993).
[17] Robert K Yin, *Case Study Research: Design and Methods* (SAGE Publications 2018), 18.
[18] M Miles and A Huberman, *Qualitative Data Analysis* (Sage 1994).
[19] G Thomas, 'A Typology for the Case Study in Social Science following a Review of Definition, Discourse, and Structure' (2011) 17(6) Qualitative Inquiry 511; N Hyett, A Kenny and V Dickson-Swift, 'Methodology or Method? A Critical Review of Qualitative Case Study Reports' (2014) 9 International Journal of Qualitative Studies on Health and Well-being' 23606.
[20] See, for example, Heffron, R J, 'The Application of Contrast Explanation to Energy Policy Research: UK Nuclear Energy Policy 2002-2012' (2013) 55 Energy Policy 602; Richard L Ottinger (ed), *Renewable Energy Law and Development: Case Study Analysis* (Elgar 2013).

the use of case studies as one of the preferred research methods.[21] Second, a case study approach allows the particularities and complexities of local meanings associated with different cases to be more fully explored, without losing the meaningful characteristics of the wider context.[22] Third, case studies are ideal for exploring interactions between people and their understanding of a situation where the richness of the data obtained by multiple means from multiple perspectives provides a real insight into the main issues at play.[23] Fourth, the use of case studies enables a certain amount of analytical generalisation[24] by providing insights into recurring themes, issues and discursive practices across the cases analysed; thereby avoiding purely idiosyncratic conclusions and contributing to wider understandings of the role played by energy security discourse in constructing and deconstructing green energy policies.

Case studies, however, also have drawbacks. Case studies have been frequently criticised because they provide little basis for generalising conclusions.[25] Nonetheless, case studies do not represent 'samples' and the goal in the thesis is to provide analytic generalisation and not statistical generalisations.[26] As will be fully explained in the following subsection, this thesis adopts a multiple-case design where three case studies are presented that together form a body of evidence for the different ways of discursively framing energy security as well as its link with green energy development.

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[21] Robert K Yin, *Case Study Research: Design and Methods* (SAGE Publications 2018), 9-11.
[22] Robert E Stake, 'Qualitative Case Studies', in Norman K Denzin and Yvonna S Lincoln (eds), *Strategies of Qualitative Inquiry* (Sage Publications 2008), 119-149.
[23] Darren Dalcher, 'Stories and Histories: Case Study Research (and Beyond) in Information Systems Failures' in Michael E Whitman and Amy B Woszczynski (eds), *The Handbook of Information Systems Research* (Idea Group Publishing 2004), 314.
[24] Roger Gomm, Martyn Hammersley and Peter Foster, 'Case Study and Generalization', in Roger Gomm, Martyn Hammersley and Peter Foster, *Case Study Method: Key Issues, Key Texts* (Sage 2000).
[25] Robert K Yin, *Case Study Research: Design and Methods* (SAGE Publications 2018), 15.
[26] Ibid 15.

Another drawback is in relation to concerns over the lack of rigor of case study research, particularly in cases where the investigator has not followed systematic procedures or has allowed biased views to influence the direction of the findings and conclusions. As will be seen in the subsequent chapters, the method adopted for each case study has followed a systematic procedure and, as a strategy for interpreting the study's findings, the author has identified rival explanations or alternative perspectives for the findings in order to avoid bias.

5.2. Selection of case studies

This thesis examines the interplay between energy security and law and policy on green energy development in the context of three case studies (i) Great Britain, (ii) Brazil and (iii) the World Trade Organisation (WTO). This thesis' central argument is that if we want to have a just energy transition we ought to pay closer attention to the relationship between energy security and law and policies on green energy development. Understanding the diversity of views on and the complexities of the interplay between energy security and green energy development is at the heart of this thesis.

Great Britain and Brazil were then selected as country case studies to show this diversity in their national context rather than a direct replication.[27] The selection of these two cases is based on a desire to ensure the greatest difference or maximum variation between the cases. Given the differences in their economic and geography characteristics as well as energy policies, energy systems, energy governance and regulatory frameworks, areas where they diverge systematically provide a rich basis for analysing how the discursive frames

[27] Ibid 61.

surrounding energy security and law and policies on green energy development are being practically construed.

Great Britain is a developed economy with an energy system dominated by fossil fuels,[28] but which is in a major period of transition.[29] Brazil is an emerging economy with one of the highest shares of energy generated from renewable sources[30] and, according to the International Energy Agency, it has the greenest energy mix worldwide.[31] Energy policies are also demonstrably different in each country, i.e., GB has been active in grid modernisation efforts, including the shift to smart grid[32] with, for instance, the integration of green energy sources into the system, vehicle-to-grid and vehicle-to-home technologies[33] and it is pushing nuclear energy (which is a grey area for its categorisation of 'green' energy), while Brazil has focused on biofuels as a policy for its transport sector and has not included the shift to smart grid in its national energy policy yet.

In terms of legal systems/framework and energy governance, there are distinct differences here, too. England and Wales are common law countries and the UK has a more

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[28] In 2017, the UK obtained 81.6 per cent of its primary energy from fossil fuels. See, Department for Business, Energy & Industrial Strategy, *UK Energy in Brief 2018* (Department for Business, Energy & Industrial Strategy 2018), 13.

[29] Frank W Geels and others, 'The Enactment of Socio-technical Transition Pathways: A Reformulated Typology and a Comparative Multi-level Analysis of the German and UK Low-carbon Electricity Transitions (1990–2014)' (2016) 45(4) Research Policy 896.

[30] In the power sector, renewable sources account for 80.4% of the domestic supply of electricity in Brazil. See, Ministério de Minas e Energia (MME), *Balanço Energético Nacional 2018: Ano Base 2017* (Ministério de Minas e Energia, Empresa de Pesquisa Energética 2018), 16.

[31] Fatih Birol, 'Renewables 2018: Market Analysis and Forecast from 2018 to 2023' <https://www.iea.org/renewables2018/> accessed 6 November 2018.

[32] According to the European Commission, smart grid is an 'an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety'. See European Commission, 'Smart Grids' <http://s3platform.jrc.ec.europa.eu/smart-grids> accessed 7 October 2018.

[33] See, for example, João Crispim and others, 'Smart Grids in the EU with Smart Regulation: Experiences from the UK, Italy and Portugal' (2014) 31 Utilities Policy 85; Nick Jenkins, Chao Long, and Jianzhong Wu, 'An Overview of the Smart Grid in Great Britain' (2015) 4(1) Engineering 413; Dimitrios Xenias and others, 'UK Smart Grid Development: An Expert Assessment of the Benefits, Pitfalls and Functions' (2015) 81 Renewable Energy 89; P M Connor and others, 'Sources of Risk and Uncertainty in UK Smart Grid Deployment: An Expert Stakeholder Analysis' (2018) 161 Energy 1.

decentralised system for responsibility of the energy sector when compared to Brazil. The principle of devolution in the UK has transferred energy-related powers to be exercised by the Northern Ireland Executive, Scottish Government and Welsh Government.[34] The devolution, however, did not affect the fact that, formally, the UK central government retained overall responsibility for key energy policy agendas,[35] where the Department for Business, Energy & Industrial Strategy is the main ministry with energy responsibilities. In contrast, Brazil is a civil law country with a much more centralised system for responsibility in the energy sector centred in the hands of the President of the Republic who ultimately defines the country's energy policy,[36] as will be further explained in chapter 5.

There are also differences in the drive for their green energy policies. Green energy promotion in GB has risen to the forefront of energy policies mainly as a result of the transition to a low carbon energy system, where an increase of renewable energy consumption in electricity, transport, and the heating sectors was proposed as a way to help keep the UK on track to hit the targets set in the Climate Change Act 2008.[37] In Brazil, energy security initially appeared as a major force driving green energy policies, as will be shown in chapter 5 of this thesis. Demonstrating this diversity here contributes to the scholarly debate as legal academic literature on green energy development, in particular, focuses mainly on environmental and climate change concerns.[38] However, growing academic literature and

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[34] Richard Cowell, 'Rescaling the Governance of Renewable Energy: Lessons from the UK Devolution Experience' (2017) 19(5) Journal of Environmental Policy & Planning 480, 485

[35] Richard Cowell, 'Rescaling the Governance of Renewable Energy: Lessons from the UK Devolution Experience' (2017) 19(5) Journal of Environmental Policy & Planning 480, 485.

[36] Law 9,478 of 6 August 1997, article 2, and Provisional Measure N 870 of 1 January 2019, article 14.

[37] Department of Energy and Climate Change (DECC), 'UK Renewable Energy Roadmap', July 2011 <https://www.gov.uk/government/publications/renewable-energy-roadmap> accessed 7 October 2018.

[38] See, for example, Rafael Leal-Arcas, 'New Frontiers of International Economic Law: The Quest for Sustainable Development' (2018) 40(1) University of Pennsylvania Journal of International Law 83; Md Ershadul Karim and others, 'Energy Revolution for Our Common Future: An Evaluation of the Emerging International Renewable Energy Law' (2018) 11 Energies 7; Paolo Davide Farah and, Tivadar Ôtvös, 'Competition Law And Trade in Energy Vs. Sustainable Development: A Clash of Individualism and Cooperative Partnerships? (2018) 50(2) Arizona State

media worldwide are increasingly acknowledging the role of green energy in ensuring energy security.[39] The case of Brazil, therefore, contributes to the literature on energy security by bringing empirical data which supports the latter growing scholarly studies.

Revealing these differences in the country case studies is also relevant because this divergence of views and approaches, learnt in each country case study, may be at stake in legal disputes. In particular, legal disputes between countries concerning energy security and green energy development have already taken place within international trade law as encapsulated in the law of the World Trade Organisation (WTO), an international trade organisation which adjudicates between competing discursive claims and pronounces on their legal status. As previously stated, GB developed green energy as a result of climate change, while Brazil primarily developed it, particularly wind and biofuels, to ensure energy security. A legal dispute involving the driving force behind the promotion of national policies to develop green energy has recently been seen in the WTO Dispute Settlement Body on the case of *India – Solar Cells*[40] between India and the United States (US). As will be demonstrated in chapter 6, India raised energy security as the main argument for developing their domestic

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Law Journal 497; Kati Kulovesi, 'International Trade Disputes on Renewable Energy: Testing Ground for the Mutual Supportiveness of WTO Law and Climate Change Law' (2014) 23(3) Review of European Community & International Environmental Law 342.

[39] For academic journals, see, for example, Tareq Abu Hamed and Lindsey Bressler, 'Energy Security in Israel and Jordan: The Role of Renewable Energy Sources' (2019) 135 Renewable Energy 378; Pushpendra Kumar Singh Rathore, Durg Singh Chauhan and Rudra Pratap Singh, 'Decentralized Solar Rooftop Photovoltaic in India: On the Path of Sustainable Energy Security' (2019) 131 Renewable Energy 297; For media articles see, for example, World Bank, 'Improving Energy Security In Gaza Through Solar Energy' *World Bank* (10 October 2018) <https://www.worldbank.org/en/news/press-release/2018/10/10/improving-energy-security-in-gaza-through-solar-energy> accessed 10 May 2019; Peter Alagos, 'Solar Test Facility 'Key to Qatar's Energy Security' *Gulf Times* (8 June 2016) <https://www.gulf-times.com/story/497371/Solar-Test-Facility-key-to-Qatar-s-energy-security> accessed 11 May 2019; 'MIL-OSI Asia-Pacific: Promote New & Renewable Energy to Ensure Energy Security, to Protect Climate & to Reduce Pollution: Vice President' *ForeignAffairs.co.nz* (4 April 2019); International Renewable Energy Agency, 'Renewable Energy Can Build Prosperity and Improve Energy Security in Pakistan' *IRENA* (10 April 2018) < https://www.irena.org/newsroom/pressreleases/2018/Apr/Pakistan-RRA> accessed 10 May 2019.

[40] *India — Certain Measures Relating to Solar Cells and Solar Modules,* WT/DS456.

solar energy policies, while the US did not even acknowledge energy security as an argument and focused only on environmental issues.

The WTO, therefore, was selected as a third case study because it shows how this diversity of views raised in national contexts leads to legal disputes in international forums when attempts are made to address the issue of the interplay between energy security and green energy development. In particular, the WTO acts as the primary global trade governance body and plays a key role in settling interstate trade disputes through panels and the Appellate Body of its Dispute Settlement Body, which has come to act as a significant international forum to channel complaints related to international green energy trade. It is acknowledged that the world is currently going through a period of legal, economic and political quarrelling around the evolution of green energy technologies,[41] particularly with respect to trade. In the last nine years, for instance, fifteen cases involving green energy trade have been initiated under the WTO Dispute Settlement Body.[42] It is therefore relevant to explore the diversity of views being raised by countries in connection with the interplay between energy security and law and policies on green energy development in the WTO legal disputes.

Another reason as to the choice of the WTO as a case study lies in the fact that trade, green energy and energy security are intrinsically connected. The green energy sector of today is highly international with vast amounts of green energy technologies trade across the globe. In a study on trade analysis of technologies and goods relevant to the green energy supply sector, for instance, solar and wind figured quite prominently in terms of traded

[41] Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans, 'Setting the Horse Before the Cart to Preserve a Viable World', in Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans (eds), *The Law and Economics of a Sustainable Energy Trade Agreement* (Cambridge University Press 2016), 2.
[42] Please see appendix 3 for a list of green energy trade disputes under the WTO system.

technologies.[43] Green energy technologies are made up of packages of goods, services and embedded intangibles (such as software) that come together as a result of multiple transactions involving the providers of supply chains operating across several jurisdictions. There has also been an increasing number of examples internationally of green electricity grid transnationalisation and regionalisation via the installation of interconnectors, spurring green electricity trade amongst countries.[44] As will be seen in the case study on GB in chapter 4, participants highlighted this green electricity grid regionalisation in the context of the European Energy Community. Green energy, therefore, must be viewed through the lens of trade amongst countries.

International green energy trade interdependence then also raises energy security issues. On the one hand, some scholars propose enhancing openness to trade through liberalisation of the trade barriers to result in green energy technological diffusion.[45] In this sense, for countries with a high level of green energy in their energy mix, energy security is enhanced by having access to tradeable green energy technologies. On the other hand, it is acknowledged that public policies and government economic incentives are key drivers for the stimulation of national green energy markets[46] and relaxing trade barriers does not

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[43] Veena Jha, 'Trade flows, barriers and market drivers in renewable energy supply goods: The need to level the playing field' (2009) 3(3) BIORES 1.

[44] Natalie Ralph and Linda Hancock, 'Energy security, Transnational Politics, and Renewable Electricity Exports in Australia and Southeast Asia' (2019) 49 Energy Research & Social Science 233; Sharlissa Moore, 'Evaluating the Energy Security of Electricity Interdependence: Perspectives from Morocco' (2017) 24 Energy Research & Social Science 21; Mark T Nance and William A Boettcher, 'Conflict, Cooperation, and Change in the Politics of Energy Interdependence: An Introduction' (2017) 24 Energy Research & Social Science 1.

[45] See, for example, Rafael Leal-Arcas, 'New Frontiers of International Economic Law: The Quest for Sustainable Development' (2018) 40(1) University of Pennsylvania Journal of International Law 83; Muntasir Murshed, 'Does Improvement in Trade Openness Facilitate Renewable Energy Transition? Evidence from Selected South Asian Economies' (2018) 19(2) South Asia Economic Journal 151, 153.

[46] Veena Jha, 'Trade flows, barriers and market drivers in renewable energy supply goods: The need to level the playing field' (2009) 3(3) BIORES 1; Marianne Fay, Stephane Hallegatte, and Adrien Vogt-Schilb, *Decarbonizing Development: Three Steps to a Zero-Carbon Future* (World Bank 2015); Paolo Davide Farah and, Tivadar Ôtvös, 'Competition Law And Trade in Energy Vs. Sustainable Development: A Clash of Individualism and Cooperative Partnerships? (2018) 50(2) Arizona State Law Journal 497; A A Amrutha, P Balachandra and M Mathirajan,

effectively relieve the dependence of importing countries on green energy technologies. Asymmetric green energy trade interdependence may be a source of power to be used as an 'energy weapon'[47] and it may potentially cause major disruption in green energy supply. If, for example, a country is dependent on green energy equipment and most of its energy mix is based on green energy sources, a green energy technology embargo due to political considerations would negatively impact the importing country's energy security.

As will be seen in the country case studies in chapters 4 and 5, opposing arguments appeared in the data collected for analysis. In the case study of GB in chapter 4, for instance, on the one side, there were participants who stressed that energy security is ensured via the ability to manage energy supply from around the world, a view which exposes a reliance on global trade networks and nondomestic actors for provisioning of energy supply. In this sense, sourcing and distribution diversification is a chief component of energy security.[48] The literature on energy security, which is examined in chapter 3, also presents trade as an energy security indicator.[49] On the other side, there were participants who expressed concerns over the country's energy security due to import dependency, not only in relation to import dependency of green energy sources but also dependency on importation of green energy equipment, technology and energy expertise – particularly in the context of Brexit.

The relationship between the country case studies in chapters 4 and 5 and the case study on the WTO in chapter 6 lies in the fact that different arguments concerning the

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'Model-based Approach for Planning Renewable Energy Transition in a Resource-constrained Electricity System—A Case Study from India' (2018) 42(3) International Journal of Energy Research 1023.

[47] Johan Lilliestam and Saskia Ellenbeck, 'Energy security and renewable electricity trade — Will Desertec make Europe vulnerable to the ''energy weapon''?' 39 Energy Policy 3380, 3382.

[48] M Gruenig and B O'Donnell, 'Reshaping Equilibria: Renewable Energy Mega-Projects and Energy Security' in Patrizia Lombardi and Max Gruenig (eds), *Low-carbon Energy Security from a European Perspective* (Elsevier 2016), 116.

[49] See, for example, the 372 indicators proposed by Sovacool and Mukherjee in Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach' (2011) 36 Energy 5343.

interplay between energy security and green energy development may be raised by countries in international legal disputes under the WTO dispute settlement body. Two examples may illustrate this: (i) a dispute may arise between a country which promotes green energy to ensure energy security and a country which only links green energy with environmental/climate change concerns, such as the previously mentioned WTO case of *India – Solar Cells;* and (ii) a dispute may arise between two countries which promote green energy security, but in opposing ways, i.e. one country may adopt a national policy on green energy security based on managing energy supply from around the world and, therefore, will advocate trade liberalisation in the area; the other country may adopt a domestic policy on green energy security based on reducing import dependency and, thus, may seek the adoption of trade restrictive measures to develop its national green energy industry. Generally speaking, WTO rules are aimed at liberalising global trade. However, due to these different approaches to national energy policies on green energy security, it is relevant to examine how the WTO jurisprudence perceives the interplay between energy security and green energy, and how the law of the WTO applies to countries that want to reduce green energy import dependency on the grounds of energy security.

Developing a proper global response to energy security and green energy development concerns in the context of a just energy transition requires, therefore, paying close attention to the global trade regime. As such, building on the findings of the two very different country case studies in chapters 4 and 5, the third case study in chapter 6 of this thesis analyses the interplay between energy security and green energy development in the law of the World Trade Organisation (WTO).

5.3. Methods of data collection

For the case studies, this thesis adopts multiple methods of data collection – i.e. semi-structured interviews, archival data and jurisprudence – in order to assemble a richer, stronger and diverse array of evidence related to the discursive construction and deconstruction of green energy policies in a variety of contexts. Accordingly, (i) the case study of Great Britain is based on empirical data collected from face-to-face semi-structured interviews with 24 leading energy experts; (ii) the case study of Brazil is based on data collected from three major archives in Brazil: the Brazilian National Archive, the President of the Republic Archive and the Federal Senate Archive, and (iii) the case study of the WTO is based on the WTO jurisprudence. The particularities of each method is further explained in each respective chapter.[50] Both methods of data collection for the country case studies have the benefit of providing information not straightforwardly available in official published documents and, therefore, add novelty to this thesis. The findings of the country case studies then offer useful data that inform the legal analysis of the interplay between energy security and green energy in the law of the World Trade Organisation (WTO), which is largely unexplored.

6. Conclusion

In this chapter, the theoretical and methodological framework of the thesis and methods were set out and described. For the thesis, a socio-legal approach was taken based

[50] Due to time and resource constraints, it was not possible to carry out interviews and archival research in both country case studies. Thus, as the data collected are not alike, a comparative approach was not taken as it would lead to incorrect results. As such, a 'typical' case study research approach in which methods are replicated in each case was not adopted. For further discussion on this, see Robert K Yin, *Case Study Research: Design and Methods* (SAGE Publications 2018).

on a constructionist view. Discourse analysis was the method chosen for the two country case studies, which form materials for the legal analysis of the third case study on the WTO. Having set out the methodological approach and the detailed research methods which will be used for this thesis, the next chapter will explore the literature review and the concepts and definitions in play in the subsequent chapters of this thesis.

CHAPTER 3

LITERATURE REVIEW

1. Introduction

This chapter provides the literature review and outlines the concepts and definitions in play in the subsequent chapters of this thesis. It starts with the basic definitions of energy and green energy. It then proceeds to discuss the notions of energy security in the scholarly reviews. The debate on energy security is not only about conceptualisations, meanings and measures, it is also about the processes which understandings of energy security are embedded in and affect political practices. As will be demonstrated in this thesis, the processes of securitisation and politicisation around energy are particularly relevant for the analysis in subsequent chapters, and therefore an explanation on their concepts will also be elaborated here.

This chapter will demonstrate that there is a rich literature centred on the study of energy security. However, the existing scholarly debates on energy security present a pervasive lack of consensus in relation to its different concepts and dimensions. While some academic studies reduce energy security to the simple proxy of energy supply relative to demand, other commonly cited definitions stipulate that energy security is about uninterrupted availability at reasonable prices. There is also recent evidence in the scholarly debate of a broadening of the energy security concept with the inclusion of environmental, climate and social considerations. The subsequent chapters of this thesis will assess whether this broader approach in the existing literature feeds through into practice.

Moving on to the examination of the processes of securitisation and politicisation around energy, this chapter will show that literature on securitisation and politicisation is not clear cut and entirely unproblematic. The boundaries of these processes around energy are not sharply defined and are contentious among scholars. What the conceptual analysis of these energy processes will show is that different processes imply different ways in which energy security issues are acted on.

2. The definition of energy

The Nobel Prize winning physicist, Richard Feynman, defined energy as follows:

> There is a fact, or if you wish, a law, governing all natural phenomena that are known to date. There is no known exception to this law—it is exact so far as we know. The law is called the conservation of energy. It states that there is a certain quantity, which we call energy that does not change in the manifold changes which nature undergoes. That is a most abstract idea, because it is a mathematical principle; it says that there is a numerical quantity which does not change when something happens. It is not a description of a mechanism, or anything concrete; it is just a strange fact that we can calculate some number and when we finish watching nature go through her tricks and calculate the number again, it is the same.[1]

Scientifically, energy is an abstract mathematical concept,[2] and, as such, it is a difficult concept to comprehend.[3] However, energy is classically defined as the capacity to do work.[4]

[1] Richard Phillips Feynman, *The Feynman Lectures on Physics.* Volume 1 (Basic Books 2013), 4-1.
[2] John William Warren, 'The Teaching of Energy' (1991) 26(1) Physics Education 8, 8-9.
[3] Evelyn Chrystalla Pielou, *The Nature of Energy* (University of Chicago Press 2001), 5; Manuel Bächtold, 'How Should Energy Be Defined Throughout Schooling?' (2018) 48(2) Research in Science Education 345, 345.
[4] Cutler J Cleveland and Christopher Morris (eds), *Dictionary of Energy* (Elsevier 2015), 196.

Here 'work' means the application of effort to accomplish a task, and the rate at which work is performed is called 'power'. Thus, machines consume energy, perform work, and provide power.[5] The Oxford English Dictionary provides us with an additional meaning, which is used in everyday contexts, i.e., the power or force used to operate machines and devices, to provide light and heat, etc. This is what is meant by energy in non-scientific literature and governmental reports. Against this background, Slesser has remarked that energy is 'a generic term used to cover sources of heat and power without specifying what sort and without regard to quality.'[6]

There are also different sources of energy generation. Some energy sources are stores (repositories) of energy that can be liberated for useful purposes, such as coal, oil, or uranium. Other energy sources are flows of energy through the natural environment that are present in varying degrees at particular times and places, such as wind and solar energy.[7] Energy sources are commonly categorised into renewable and non-renewable sources, or conventional and unconventional (or alternative) energy sources.[8] Non-renewable energy sources include energy resources which are available in limited quantities, such as fossil fuels (oil, gas and coal) and uranium.[9] Renewable energy sources are sources that are continuously replenished by natural processes and include, for example, solar, wind, tidal, wave, hydro, geothermal, ocean thermal and biomass.[10] Conventional or traditional energy sources are typically oil, natural gas, coal, large scale hydro and nuclear power. Unconventional or alternative energy sources can provide either an alternative or a supplement to conventional

[5] James H Clark, R M Dell, and D A J Rand, *Clean Energy* (Royal Society of Chemistry 2004), 1.
[6] Malcolm Slesser, *Dictionary of Energy* (The Macmillan Press Ltd 1982), 88.
[7] Robert Ehrlich, *Renewable Energy: A First Course* (CRC Press 2013), 8.
[8] Lisa C Klein, 'Conventional Energy Sources and Alternative Energy Sources and the Role of Sol-Gel Processing' (2012) Sol-Gel Processing for Conventional & Alternative Energy 1; Balasubramanian Viswanathan, *Energy Sources: Fundamentals of Chemical Conversion Processes and Applications* (Elsevier 2016), 3.
[9] Marc A Rosen, 'Energy Sustainability: A Pragmatic Approach and Illustrations' (2009) 1 Sustainability 55.
[10] Michael A Laughton (ed), *Renewable Energy Sources* (Elsevier Science Pub Co 1990).

energy sources,[11] such as solar, wind, ocean thermal, wave, tidal, small scale hydro, geothermal, biomass, energy from waste and hydrogen. This thesis will focus on green energy which will be discussed in the following section.

3. The definition of green energy

There is currently no accepted or adopted definition of 'green energy' and it is not the purpose of this thesis to analyse the debate surrounding what types of energy sources fall within the 'green' category. In the case studies in the subsequent chapters, the scope of green energy will be limited to emerging non-conventional energy sources. As a general overview, the Oxford English Dictionary defines green energy as 'energy produced or harnessed in an environmentally responsible manner.'

Green energy does not imply the absence of environmental impacts. All sources of energy have some environmental impact, but the impacts of different sources vary considerably. Fossil fuels have very harmful environmental impacts in terms of air, water, and land pollution, particularly in event of accidents and disasters, like oil spills and coal mine disasters.[12] Nuclear power is carbon-free unlike fossil fuels, and, given this, some scientists are of the opinion that nuclear power is the greenest option even though this source of energy has received considerable criticism and public opinion on the possible dangers associated with nuclear reactors, especially after disasters such as the Japanese Fukushima-Daiichi, Russia's Chernobyl, and Three Mile Island.[13] There are, additionally, environmental concerns over radioactive waste and new nuclear power plants have also been controversial because

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[11] Gary M Zatzman, *Sustainable Resource Development* (Wiley-Blackwell 2012), 60.

[12] Richard L Ottinger and Mindy Jayne, 'Global Climate Change Kyoto Protocol Implementation: Legal Frameworks for Implementing Clean Energy Solutions' (2000) 18 Pace Environmental Law Review 19, 22.

[13] Balasubramanian Viswanathan*, Energy Sources: Fundamentals of Chemical Conversion Processes and Applications* (Elsevier 2016), 113.

of costs as well as risks. There has been a recent move towards the development of small nuclear power reactors, but this is not a wholly new technology, simply a different way to package nuclear energy to produce heat or electricity for commercial energy markets.[14] There are, moreover, few differences in terms of environmental impacts between large and small nuclear power reactors. The main differences between small and large nuclear power reactors in terms of environmental impacts are their enhanced ability to withstand earthquakes, and a reduction in water usage as, contrary to conventional nuclear power reactors which are usually cooled by water, small nuclear power reactors can be cooled by air, gas, low-melting point metals or salt.[15]

Beyond fossil fuels and nuclear power, there is also hydroelectric power which is also controversial. New large-scale hydroelectric dams involve flooding of large areas of land and this typically creates problems due to the displacement of people or agriculture to make way for them. Dams themselves create some methane (another greenhouse gas) emissions from decaying vegetation.[16] In terms of problem-free energy sources, then, the search continues.

In many respects, hydrogen might be considered the ideal fuel from an ecological viewpoint.[17] It may, in principle, be derived from water using a non-fossil energy source (e.g. solar, geothermal) and combusted back to water in a closed chemical cycle involving no release of carbonaceous pollutants.[18] However, today, most hydrogen is produced by the

[14] Daniel T Ingersoll, *Small Modular Reactors: Nuclear Power Fad or Future?* (Woodhead Publishing 2016), 3.
[15] Jorge Morales Pedraza, *Small Modular Reactors for Electricity Generation: An Economic and Technologically Sound Alternative* (Springer 2017), 12-15.
[16] N Barros and others, 'Carbon Emission from Hydroelectric Reservoirs Linked to Reservoir Age and Latitude' (2011) 4 Nature Geoscience 593; Benjamin L Miller and others, 'Methane Ebullition in Temperate Hydropower Reservoirs and Implications for US Policy on Greenhouse Gas Emissions' (2017) 60 Environmental Management 615.
[17] James H Clark, R M Dell, and D A J Rand, *Clean Energy* (Royal Society of Chemistry 2004), 51.
[18] Ibid.

steam reforming of natural gas, coal or naphtha, and by the partial oxidation of heavy oils to produce synthesis gas, a process that contributes to large emissions of carbon dioxide.[19]

Non-conventional renewable energy sources are considered more environmentally benign, even though they too have some harmful impacts. As an illustration, in the case of wind energy, concerns have been raised over the noise produced by the rotor blades, visual impacts, deaths of birds and bats that fly into the rotors as well as loss of habitat for some species.[20] When it comes to solar energy, concerns have been raised over photovoltaic solar panels as most of the solar cell technologies are using hazardous chemicals to achieve higher conversion efficiency.[21] Geothermal, the available stored thermal energy in the Earth's interior, has the issue of emission of noxious gases, although in relatively low concentrations, as well as the inducement of earthquakes during the hydrofraction process.[22] In the case of tidal energy, there are concerns over the installation of tidal current turbines as they intrude upon ecological region and local species communities and can cause potential injury to marine wildlife such as fish, diving birds, and marine mammals that may come into contact with the moving components of turbines.[23]

Brief mention ought to be made to a not yet commercially viable though scientifically feasible form of energy, nuclear fusion.[24] Nuclear fusion is the process of combining atoms. It

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[19] Ibid.

[20] Committee on Environmental Impacts of Wind Energy Projects, National Research Council, Division on Earth and Life Studies, and National Research Council, *Environmental Impacts of Wind-Energy Projects* (National Academies Press 2007).

[21] Senthilarasu Sundaram, David Benson and Tapas Kumar Mallick, *Solar Photovoltaic Technology Production: Potential Environmental Impacts and Implications for Governance* (Elsevier 2016), 23.

[22] Robert Ehrlich, *Renewable Energy: A First Course* (CRC Press 2013), 173.

[23] Stephen Sangiuliano, 'Turning of the Tides: Assessing the International Implementation of Tidal Current Turbines' (2017) 80(1) Renewable and Sustainable Energy Reviews 971; Miriam Garcia-Oliva, 'Exploring the Implications of Tidal Farms Deployment for Wetland-birds Habitats in a highly Protected Estuary' (2017) 81(1) Marine Policy 359.

[24] Garry McCracken and Peter Stott, *Fusion: The Energy of the Universe* (Elsevier 2012), 189. Bahman Zohuri, *Magnetic Confinement Fusion Driven Thermonuclear Energy* (Springer 2017), 103.

differs from nuclear fission which is the process of splitting atoms. Nuclear fusion, the process by which the Sun and other stars generate their energy, is being developed for the production of electrical power on Earth.[25] The fusion reaction between deuterium and tritium has been considered the best candidate for a fusion power plant useful to mankind.[26] A kilogram of fusion fuel can produce as much energy as 10,000 tons of coal, oil, or natural gas.[27] Contrary to nuclear fission, the fusion fuel cycle produces no long-term radioactive waste products for future generations.[28] However, there are still considerable scientific and technical difficulties encountered with regard to its feasibility and the construction of commercial-scale fusion power plants,[29] as well as uncertainties concerning the cost to the environment.[30]

4. Understanding the concept of energy security: scholarly views

There is wide consensus among scholars that ensuring energy security is of key importance for society. The notion of "energy security" is widely discussed within academic literature and debates around the concept have given rise to a multitude of definitions and interpretations. One review, for instance, identified 83 specific definitions of energy security.[31] However, an agreed definition has not yet been reached, apart from the recognition that the concept of energy security is polysemic, multi-dimensional, contextual

[25] Bahman Zohuri, *Magnetic Confinement Fusion Driven Thermonuclear Energy* (Springer 2017), 103.
[26] Garry McCracken and Peter Stott, *Fusion: The Energy of the Universe* (Elsevier 2012), 31.
[27] Ibid 201.
[28] Massimo Zucchetti and others, 'Fusion Power Plants, Fission and Conventional Power Plants. Radioactivity, Radiotoxicity, Radioactive Waste' (2018) 136 Fusion Engineering and Design 1529, 1529.
[29] Garry McCracken and Peter Stott, *Fusion: The Energy of the Universe* (Elsevier 2012), 5.
[30] Ibid 200.
[31] B W Ang, W L Choong and T S Ng, 'Energy Security: Definitions, Dimensions and Indexes' (2015) 42(1) Renewable and Sustainable Energy Reviews 1077. In 2011, Sovacool had identified 45 distinct definitions of the concept of energy security in practice, see Benjamin K Sovacool (ed), *The Routledge Handbook of Energy Security* (Routledge 2011).

and dynamic in nature.[32] Although there has been debate surrounding security of demand,[33] most of the literature uses energy security, security of energy supply or security of supply as synonyms. This thesis proceeds in similar fashion, focusing on energy security in the sense of security of energy supply.

Ciută has already highlighted the terminological profusion and ambiguity of the concept of energy security.[34] While some scholars advocate that a broader array of criteria needs to be considered as a key component of energy security concepts,[35] others argue for a narrow notion of energy security and a clear separation between energy security and other policy objectives, leading to the definition of energy security as the continuity of energy supplies relative to demand.[36]

Against this backdrop of disagreement, however, the International Energy Agency (IEA)'s mainstream definition of energy security as "the uninterrupted availability of energy sources at an affordable price"[37] has been generally repeated in the literature. Bielecki defines energy security as the "reliable and adequate supply of energy at reasonable prices".[38] Barton defines energy security as "a condition in which a nation and all, or most, of its citizens

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[32] L Chester, 'Conceptualising Energy Security and Making Explicit its Polysemic Nature' (2010) 38 Energy Policy 887; Vlado Vivoda, 'Evaluating Energy Security in the Asia-Pacific Region: a Novel Methodological Approach' (2010) 38(9) Energy Policy 5258; B W Ang, W L Choong and T S Ng, 'Energy Security: Definitions, Dimensions and Indexes' (2015) 42(1) Renewable and Sustainable Energy Reviews 1077, 1077.

[33] Gawdat Bahgat, 'Oil Producers' Perspectives on Energy Security' in Hugh Dyer and Maria Julia Trombetta (eds), *International Handbook of Energy Security* (Edward Elgar Publishing 2013).

[34] Felix Ciută. 'Conceptual Notes on Energy Security: Total or Banal Security?' (2010) 41(2) Security Dialogue 123, 127.

[35] See, for instance, Vlado Vivoda, 'Evaluating Energy Security in the Asia-Pacific Region: a Novel Methodological Approach' (2010) 38(9) Energy Policy 5258; David F von Hippel and others, 'Evaluating the Energy Security Impacts of Energy Policies', in Benjamin K Sovacool (ed), *The Routledge Handbook of Energy Security* (Routledge 2011).

[36] Christian Winzer, 'Conceptualizing Energy Security' (2012) 46 Energy Policy 36.

[37] IEA, "Energy Security"(2014) <http://www.iea.org/topics/energysecurity/> last accessed 26 March 2015. This is similar to Daniel Yergin definition of 1988, "adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives". See Daniel Yergin, 'Energy Security in the 1990s'' (Fall 1988) 67(1) Foreign Affairs 110, 111.

[38] Janusz Bielecki, 'Energy Security: Is the Wolf at the Door?' (2002) 42(2) Quarterly Review of Economics and Finance 235, 237.

and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service”.[39] In Asif and Muneer’s words, energy security means “consistent availability of sufficient energy in various forms at affordable prices.”[40] In line with these definitions, the common elements for energy security are availability, reliability and affordability.

However, availability, reliability and affordability are only part of the story. In the later decades of the 20th century, energy security came to be discursively reconfigured to include the environment. Cherp and Jewell describe this change in the framing of energy security as ‘robustness perspective’ which was influenced by the idea of globally limited resources.[41] Thus, by 1999, energy security became associated with efforts to “minimize vulnerability to resource supply disruptions, access reliable energy at reasonable or market driven prices, and consume resources that least damage the environment and promote sustainable development.”[42]

A similar emphasis on the environmental dimension can be discerned in definitions adopted in academic research on energy security. For instance, Yinka Omorogbe adopts the concept of energy security as “the provision of adequate, affordable, efficient, and reliable energy services with minimal adverse impacts on the environment”.[43] Sascha Müller-Kraenner refers to “the provision of reasonably priced, reliable and environmentally friendly

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[39] Barry Barton, *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press, 2004), 5.
[40] M Asif and T Muneer. 'Energy Supply, its Demand and Security Issues for Developed and Emerging Economies' (2007) 11 Renewable and Sustainable Energy Reviews 1388, 1401.
[41] Aleh Cherp and Jessica Jewell, ‘The Three Perspectives on Energy Security: Intellectual History, Disciplinary Roots and the Potential for Integration’ (2011) 3(4) Current Opinion in Environmental Sustainability 202, 204, 207.
[42] Jin Song, ‘Energy Security in the Asia-Pacific: Competition or Cooperation?’ (1999) Asia-Pacific Center for Security Studies <http://www.apcss.org/Publications/Report_Energy_Security_99.html> last accessed 26 March 2018.
[43] Yinka Omorogbe, 'Regional and National Frameworks for Energy Security in Africa' in Barry Barton (ed), *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press 2004), 124.

energy".[44] Carolina Hernandez defines energy security as "access to reliable, affordable and environmentally sustainable energy supplies".[45] According to the UNDP (United Nations Development Programme),[46] energy security is "the availability of energy at all times in various forms, in sufficient quantities and at reasonable and/or affordable prices, without an unacceptable or irreversible impact on the environment."[47] In the view of Constantini and others, energy security has physical, economic, social, and environmental dimensions, as well as long and short-term dimensions.[48] For Elkind, a contemporary understanding of energy security must include not only availability, reliability, and affordability, but also environmental sustainability.[49] The 4 A's of energy security – availability (geological), accessibility (geopolitical), acceptability (environmental and social) and affordability (economic) introduced by the Asia Pacific Energy Research Centre (APERC) – has also gained traction in recent literature.[50] Therefore, scholarly definitions also encompass social and environmental sustainability as core components of energy security, making these aspects a condition for energy security to be met. This approach endorses, as such, the idea that energy security and social and environmental sustainability are inseparable and indivisible and thus cannot be treated as distinct.

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[44] Sascha Müller-Kraenner, *Energy Security: Re-measuring the World* (Earthscan 2008), xi.

[45] Carolina Hernandez. 'Philippine Energy Policy: Implications for Human Security and Regional Cooperation' in Antonio Marquina (ed), *Energy Security: Visions from Asia and Europe* (New York: Palgrave MacMillan, 2008), 218.

[46] UNDP World Energy Assessment Overview: 2004, <http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/world_energy_assessmentoverview2004update.html> accessed 10 March 2018.

[47] Other concepts of energy security can be found in Benjamin K Sovacool (ed), *The Routledge Handbook of Energy Security* (Routledge 2011), 3-6.

[48] Valeria Costantini and others, 'Security of Energy Supply: Comparing Scenarios from a European Perspective' 2007 35(1) Energy Policy 210.

[49] Jonathan Elkind, 'Energy Security: Call for a Broader Agenda' in Carlos Pascual and Jonathan Elkind (eds), *Energy Security: Economics, Politics, Strategies, and Implications* (Brookings Institution Press 2010), 121.

[50] Aleh Cherpa and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As' (2014) 75 Energy Policy 415; Sandu-Daniel Kopp, *Politics, Markets and EU Gas Supply Security: Case Studies of the UK and Germany* (Springer VS 2015).

Various factors contributed to this discursive shift. Environmental disasters demonstrated that energy and the environment impact one another with real-world consequences, with the pursuit of energy security causing growing threats to the environment and disaster disrupting access to energy. For instance, the unprecedented Gulf War oil spill in 1991 caused extensive contamination of the natural habitat and long-term effects on aquatic ecosystems.[51] In August and September 2005, the hurricanes Katrina and Rita shut down 27% of US oil production and 21% of US refining capacity in the Gulf of Mexico with worldwide implications for global oil prices, climate change, strategic oil stocks and perceptions of supply security.[52] The oil spill in the Gulf of Mexico in May 2010, to take another example, brought to the fore the negative impact on the environment as a result of pursuit of energy security.

Beyond disasters and increased understanding of the risk of disasters, the problem of greenhouse gas emissions and the international commitments of governments under the Kyoto Protocol also prompted some countries to emphasise the environmental aspects of their energy policies.[53] I also brought about the Post-Kyoto emission targets as well as actions and debates regarding low carbon energy transition and geopolitics of climate change. This latter factor, in turn, helped drive a further reframing of the concept of energy security to include climate change. The European Commission, for example, substituted references to

[51] Saleh Al-Muzaini, Mirza U Beg and Alan Moghissi, 'The Long-term Environmental Effects of the Gulf War' (1998) 24(1-2) Environment International 1; Nasser Mostafawi, 'How Severely Was the Persian Gulf Affected by Oil Spills following the 1991 Gulf War?' (2001) 40(10) Environmental Geology 1185; A Mukhopadhyay and others, 'Ground Water Contamination in Kuwait Resulting from the 1991 Gulf War; A Preliminary Assessment' (2008) 28(2) Ground Water Monitoring & Remediation 81; Adriana C Bejarano and Jacqueline Michel, 'Large-scale Risk Assessment of Polycyclic Aromatic Hydrocarbons in Shoreline Sediments from Saudi Arabia: Environmental Legacy after Twelve Years of the Gulf War Oil Spill' (2010) 158(5) Environmental Pollution 1561.
[52] Frank Umbach, 'Global Energy Security and the Implications for the EU' (2010) 38 Energy Policy 1229, 1234.
[53] Luise Röpke, 'The Development of Renewable Energies and Supply Security: A Trade-off Analysis' (2013) 61 Energy Policy 1011, 1011.

"environmental concerns" in its energy security definition in the year 2000[54] with references to climate change: "the uninterrupted physical availability of energy products and services on the market, at a price which is affordable for all consumers (private and industrial), while contributing to the EU's wider social and climate goals."[55]

Nevertheless, the global energy landscape changes over time. As a result, changes in the emphasis of energy security dimensions are also seen. As such, although some scholars have included the environment and climate change within the concept of energy security, this is not uniform. Just as pronounced is the tendency to frame the environment, climate change and energy as independent issues, a process which generates tension and conflict around the concept of energy security and its implications for environmental protection and/or climate change policies. Many energy developments that negatively impact the environment have been controversially promoted in the name of energy security, such as the drill for oil in the Arctic National Wildlife Refuge,[56] the exploration of oil sands in Alberta, Canada,[57] and the recent grating of licences for shale gas exploration in the UK.[58]

The competing dimensions of energy security have been a focus in the literature with one recent literature review, for instance, identifying 15 dimensions.[59] Due to its multidimensional characteristics, a growing number of studies present a set of metrics for

[54] "[E]nergy supply security must be geared to ensuring, for the well-being of its citizens and the proper functioning of the economy, the uninterrupted physical availability of energy products on the market, at a price which is affordable for all consumers (private and industrial), while respecting environmental concerns and looking towards sustainable development. See European Commission, Green Paper - Towards a European Strategy for the Security of Energy Supply, COM(2000) 769 final.

[55] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Energy 2020: A Strategy For Competitive, Sustainable And Secure Energy, COM(2010) 639 final.

[56] Michael Collins, 'Interior Department Takes Step toward Drilling in Alaska's Arctic National Wildlife Refuge', *USA Today* (19 April 2018).

[57] John Vidal, 'Canadians Ponder Cost of Rush for Dirty Oil', *The Guardian* (11 July 2008).

[58] Ken Cronin, 'Shale gas will boost UK energy security', *Financial Times* (26 May 2016).

[59] Abdelrahman Azzuni and Christian Breyer, 'Definitions and Dimensions of Energy Security: A Literature Review' (2018) 7 Wiley Interdisciplinary Reviews-Energy and Environment 1.

energy security in order to measure and track progress on energy security, including future energy security performance.[60] These studies present large variations in the choice of indicators and in the way energy security indexes are framed and constructed. The logic of measurement and quantification of energy security seek to transform a vague and weakly defined notion into a "practical decision space" and so bring energy security into the domain of management, modelling and scenario analysis,[61] making it commensurable with other concerns for decision makers.[62]

According to another recent literature review, 53 studies have dealt with energy security indicators.[63] As an illustration, Sovacool and Brown, recognising each dimension – availability, affordability, energy and economic efficiency, environmental stewardship – to be of comparable importance, developed 10 indicators that constitute an Energy Security Index. Their index included oil import dependency, natural gas import dependency, dependence on petroleum transport fuels, retail electricity prices, retail gasoline/petrol prices, energy intensity, per capita electricity use, on-road fuel intensity of passenger vehicles, SO2 and CO2 emissions.[64] The higher the value of each indicator, the lower energy security is.[65] However, a pitfall of this index is that, for the environmental criteria, only gases emissions are relevant in the equation, not including, as such, other environmental impacts.

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[60] Mayurachat Watcharejyothin and Ram M Shrestha, 'Regional Energy Resource Development and Energy Security under CO2 Emission Constraint in the Greater Mekong Sub-region Countries (GMS)' (2009) 37 Energy Policy 4428; Aumnad Phdungsilp, 'Assessing Energy Security Performance in Thailand under Different Scenarios and Policy Implications' (2015) 79 Energy Procedia 982.
[61] Bert Kruyt and others, 'Indicators for Energy Security' in Benjamin Sovacool (ed), *The Routledge handbook of energy security* (Routledge 2011), 291.
[62] Gavin Bridge, 'Energy (in)security: World-making in an Age of Scarcity', (2015) 181 The Geographical Journal 328, 334.
[63] B W Ang, W L Choong and T S Ng, 'Energy Security: Definitions, Dimensions and Indexes' (2015) 42(1) Renewable and Sustainable Energy Reviews 1077, 1090.
[64] Benjamin K Sovacool and Marilyn A Brown, 'Competing Dimensions of Energy Security: An International Perspective' (2010) 3(1) Annual Review of Environment and Resources 77.
[65] Ibid 85.

Sovacool and Mukherjee provide a broader framework for analysing national energy security policies and performance, demonstrating its complexity by suggesting a total of 372 indicators. They have proposed five dimensions for energy security: availability, affordability, technology development, sustainability, and regulation. These five dimensions are broken down into 20 components related to security of supply and production, dependency, and diversification for availability; price stability, access and equity, decentralization, and low prices for affordability; innovation and research, safety and reliability, resilience, energy efficiency, and investment for technology development; land use, water, climate change, and air pollution for sustainability; and governance, trade, competition, and knowledge for sound regulation. These 20 components then corresponded to 320 simple and 52 complex indicators that can be used to measure and track performance on energy security.[66]

Heffron, McCauley and Sovacool put forward the Energy Justice Metric as a way to try to achieve a just and equitable balance between the competing demands of the energy trilemma (economics, politics and the environment).[67] Economics, politics and the environment are used as parameters of the Energy Justice Metric with energy security being included within politics, in which the cost of fluctuation and instability in energy supplies and the cost (benefit) of import/export of energy supplies are measured.[68] In this way, energy security is a concept independent from the environment and economics.

The existing literature, therefore, presents a wide variety of conceptualisations, interpretations and measurements of energy security, adding to the uncertainty surrounding its definition. They either advance a narrow interpretation of energy security in the sense of

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[66] Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach' (2011) 36 Energy 5343.
[67] Raphael J Heffron, Darren McCauley and Benjamin K Sovacool, 'Resolving Society's Energy Trilemma through the Energy Justice Metric' (2015) 87 Energy Policy 168.
[68] Ibid 172.

energy supply only or they advance an understanding based on a mixture of economic, social, political, technological and environmental indicators.

For Winzer, this lack of clarity makes energy security 'hard to measure and difficult to balance against other policy objectives'.[69] Despite this variety of energy security definitions, Cherp and Jewell suggest that attempts should still be made to find a useful universal definition.[70] Meanwhile, others have argued that the complex and contested nature of energy security means that a universal definition is probably not a practical goal.[71] This thesis does not aim to generate an agreed-upon definition of energy security, but rather to shed more light on the diversity of perspectives around it, something which will be shown in the following chapters.

Within the context of energy security, there are also the dynamics that arise from an understanding of processes around energy. The processes of securitisation and politicisation around energy are particularly relevant for the subsequent chapters, and, therefore, an explanation on them will also be elaborated in the following sections.

5. Securitisation of energy

The securitisation of energy – the connection between energy and national security – was established more than a century ago. Americans, for example, began to think about energy in terms of national security in the nineteenth century with coal and the fuelling of steamships.[72] Until World War II, the notion of energy security was closely tied to the supply

[69] Christian Winzer, 'Conceptualizing Energy Security' (2012) 46 Energy Policy 36, 36.
[70] Aleh Cherpa and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As' (2014) 75 Energy Policy 415, 420.
[71] L Chester, 'Conceptualising Energy Security and Making Explicit its Polysemic Nature' (2010) 38 Energy Policy 887; B Sovacool (ed), *The Routledge Handbook of Energy Security* (Routledge 2011).
[72] Peter A Shulman, *Coal and Empire: The Birth of Energy Security in Industrial America* (Johns Hopkins University Press 2015).

of fuels for the military. Energy resources, firstly in the form of coal in the nineteenth century, and later in the form of petroleum products, allowed the generation of electricity, power for vehicles, aircraft and ships essential to warfare, and provided power to the large manufacturing base required.[73] Energy has also been considered to be a question of national security during times of war due to the significant impact of conflict on energy infrastructure, through its destruction and prioritisation as a target.[74]

The importance of oil for armies did not decrease in the post-war period, but oil also became essential for the functioning of industrialised societies in many other ways too. Developed nations became dependent on oil products for motorised vehicles for passenger transport, food production, health care, manufacturing, heating, and electricity generation. At the same time, most industrialized countries did not produce enough oil to satisfy their needs and became dependent on oil imports. The vulnerability of this system came to light in 1973 with the first oil crisis when oil was used as an instrument of coercion. Most Arab members of OPEC along with several non-OPEC Arab countries cut oil supplies to the USA, the Netherlands and later to several other countries in protest of the US support for Israel. The price of oil quadrupled triggering an economic crisis and exposing the fragility of the global oil supply system. [75] In the 1970s and 1980s, the world economy struggled to overcome the damaging effects of the oil crises of 1973–74 and 1979–80 and their knock-on effects, including economic recessions and high unemployment.[76] In this context, the term energy security came to denote concerns relating to oil and potential costs of supply disruption,

[73] Ben Short, Moniek de Jong and Larry Hughes (eds), *Energy in Conventional Warfare* (NATO Energy Security 2016), 8.
[74] Ibid.
[75] Aleh Cherp and Jessica Jewell, 'The Three Perspectives on Energy Security: Intellectual History, Disciplinary Roots and the Potential for Integration' (2011) 3(4) Current Opinion in Environmental Sustainability 202, 202.
[76] Janusz Bielecki, 'Energy Security: Is the Wolf at the Door?' (2002) 42(2) The Quarterly Review of Economics and Finance 235, 236.

associated with an over-dependence on oil imports.[77] There is, as such, a close association between energy security and crude oil imports and the concept of energy security continues to be shaped in significant ways by the historical anxieties experienced by oil importing States.[78]

Since the rise of coal in the industrial revolution, and later through petroleum-based products, energy has recurrently become entangled with questions of national security. Initially, energy was an essential aspect of national security due to societies' dependence on energy for war fighting capabilities. Later, energy also became associated with national security as a result of societies' dependence on fossil fuels.

Adding to this, and particularly after the oil crisis, the security dimensions of energy have largely been shaped by perceptions of scarcity, based on the presumption that global reserves of fossil fuels are insufficient to meet the anticipated needs of a State due to the finite nature of fossil fuel reserves and their location in areas of recurring turmoil and conflict. As a recent example, disruptions in gas supply as a result of Russia's annexation of Crimea and its actions in Ukraine have evoked the spectre of the use of energy as a weapon. In this, EU Member States' reliance on and exposure to Russia on energy supplies said to have "critical national security implications".[79]

A series of other developments have also shaped concerns around scarcity. These include the rapid growth in energy demand outside of the OECD, notably in China,[80] but also

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[77] Frank Umbach, 'Global Energy Security and the Implications for the EU' (2010) 38(3) Energy Policy 1229, 1230. Sandu-Daniel Kopp, *Politics, Markets and EU Gas Supply Security: Case Studies of the UK and Germany* (Springer VS, 2015), 41-47.

[78] Gavin Bridge, 'Energy (in)security: World-making in an Age of Scarcity', (2015) 181 The Geographical Journal 328, 328.

[79] David Koranyi, 'Transatlantic Energy Security and the Ukraine-crisis: A Blessing in Disguise?', *NATO Review*, May 2014 < https://www.nato.int/docu/review/2014/nato-energy-security-running-on-empty/Transatlantic-energy-security-Ukraine-crisis/EN/index.htm> accessed 9 July 2018.

[80] Eugene Gholz, Umul Awan and Ehud Ronn, ´Financial and Energy Security Analysis of China's Loan-for-oil Deals' (2017) 24 Energy Research & Social Science 42.

in a number of major oil and gas exporting countries. This expansion of domestic demand means that their 'exportable surplus' is reduced.[81] It also includes, however, the increasing prevalence of bilateral deals (particularly those associated with Chinese oil investment) that effectively remove oil from market channels.[82]

There is also the presumption that energy-poor States must engage in whatever means possible and necessary — economic, diplomatic, and military — to ensure access to adequate energy supplies.[83] To this day, perceptions of scarcity and a willingness to safeguard vital energy supplies through military means continue to shape government policy in many parts of the world and make energy security an essential component of national security.[84] Due to concerns over the energy security implications of developments in Ukraine, as a consequence of Russia's violation of Ukraine's sovereignty and territorial integrity, the G7[85] leaders, for instance, associated energy security with national security by stating that '[e]nergy security is a collective responsibility, a core component of our economic and national security'.[86] In another example, the 2009 Wicks Report warned of 'a global grab for energy' following the coming out of the 2008 global recession, in which 'nations will flex their muscles in the pursuit of energy resources.'[87]

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[81] Gavin Bridge, 'Energy (in)security: World-making in an Age of Scarcity', (2015) 181 The Geographical Journal 328, 331.

[82] John V Mitchell and Beth Mitchell, 'Structural Crisis in the Oil and Gas Industry' (2014) 64 Energy Policy 36, 40.

[83] Joshua Olaniyi Alabi, 'Resource conflicts: energy worth fighting for?', in Hugh Dyer and Maria Julia Trombetta (eds), *International Handbook of Energy Security* (Edward Elgar Publishing 2013); Michael T Klare, 'No Blood for Oil? Hydrocarbon Abundance and International Security', in Thijs Van de Graaf and others (eds), *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave 2016), 419.

[84] Michael T Klare, 'No Blood for Oil? Hydrocarbon Abundance and International Security', in Thijs Van de Graaf and others (eds), *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave 2016), 420.

[85] G7 is the Group of 7 major industrialized economies, consisting of Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

[86] G7, 'G7 Rome Energy Ministerial Meeting Rome G7 Energy Initiative for Energy Security Joint Statement', 6 May 2014 <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/308669/Final_Joint_Declaration_may_6th_2014_DEFINITIVO.pdf> accessed 1 January 2019.

[87] Malcolm Wicks MP, *Energy Security: A National Challenge in a Changing World* (Department of Energy & Climate Change 2009), 1.

The global security landscape has changed as well, with growing concerns about threats from non-State actors, which include piracy and terrorist attacks, including cyber ones, on critical energy infrastructure with the aim of disrupting the energy supply chain.[88] This also contributes to the configuration of energy security as a national security issue. In the words of NATO's Assistant Secretary General:

> Given its critical role in the functioning of modern economy as well as in supporting collective defence efforts, energy infrastructure remains among the most critical components that determine a nation´s security. Increasing digitisation (e.g. smart grids, smart meters and the internet) has made the energy sector more efficient, yet at the same time more vulnerable. For example, attacks on Industrial Control Systems can result in massive physical damage such as the breakdown of critical machinery, which cannot be replaced quickly. A well orchestrated cyberattack could thus bring down crucial components of a country's energy infrastructure, resulting in massive economic and financial disruption and arguably even loss of life.[89]

However, it is important not to take the meaning of the concept of security at face value. Approaching security as a concept embedded in discursive and political practices,[90] the

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[88] United States, Government Accountability Office*, Maritime Security: Federal Efforts Needed to Address Challenges in Preventing and Responding to Terrorist Attacks on Energy Commodity Tankers: Report to Congressional Requesters* (US Government Accountability Office 2007).
[89] Sorin Dumitru Ducaru, 'The Security of Critical Energy Infrastructure in the Age of Multiple Attack Vectors: NATO's Multi-Faceted Approach' (2017) 11(1) Europolity - Continuity and Change in European Governance 5, 7.
[90] David A Baldwin, 'The Concept of Security' (1997) 23(1) Review of International Studies 5.

theory developed by the Copenhagen School of security analysts and represented by the work of Barry Buzan and Ole Waever[91] best epitomise this approach. In the words of Waever:[92]

> 'Security is a practice, a specific way to frame an issue. Security discourse is characterised by dramatising an issue as having absolute priority. By labelling this as a security issue, the actor has claimed the right to handle it with extraordinary means, to break the normal rules of the game (e.g. in the form of secrecy, levying taxes or conscripts, limitations on otherwise inviolable rights).'

Thus, linking a specific matter to security can create a sense of importance and urgency required to resolve the problem. As Barry Buzan and others note, 'issues acknowledged to be inside the security box—by virtue of their seriousness—warrant priority and may allow decision makers to pursue emergency measures outside the realm of normal politics.'[93] Consequently, by securitising energy, energy is moved to the field of emergency politics, 'where it can be dealt with swiftly and without the normal (democratic) rules and regulations of policy-making.'[94] Thus, a security issue is characterised by urgency, secrecy and the employment of extraordinary measures.

Framing the energy debate in security terms is consequential in several ways.

First, as a component of national security, energy security can become the justification for using military force or other instruments of coercion. For example, this stance was articulated by several US presidents when authorising military action in the Persian Gulf

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[91] See Ole Waever, 'Securitization and Desecuritization', in Ronnie D Lipschutz (ed), *On Security* (Columbia University Press 1995); Barry Buzan, Ole Waever and Jaap de Wilde, *Security: A New Framework for Analysis* (Lynne Rienner 1998).

[92] Ole Waever, 'Insecurity, Security and Asecurity in the West European Non-war Community', in Emanuel Adler and Michael Barnett (eds), *Security Communities* (Cambridge University Press 1998), 80.

[93] Barry Buzan, Ole Wæver, and Jaap de Wilde, *Security: A New Framework for Analysis* (Lynne Rienner 1998), 3.

[94] Rita Taureck, 'Securitization Theory and Securitization Studies' (2006) 9 Journal of International Relations and Development 53, 55.

area.[95] Tying energy to militarised solutions may be an inappropriate way of resolving underlying issues, such as oil dependency, and divert attention from seeking a less drastic alternative.

Second, associating energy with national security can override access to information. The UK Freedom of Information Act 2000, under section 24, for example, allows a public authority not to disclose information if it considers releasing the information would make the UK or its citizens more vulnerable to a national security threat.

Third, it reinforces the discourses of control and can restrict public participation. Under article 6 of the Aarhus Convention, for instance, public authorities can limit public participation in decisions to proposed activities serving national defence purposes.[96] According to Copenhagen School scholars, the securitisation process results in a lack of open or collective political deliberation as decision making takes place behind closed doors. As a result, if public decision cannot be analysed in detail and discussed in public, it affects transparency of practice in public administrations and also erodes democratic accountability. Recent critical security literature, however, has suggested that securitising moves do not always have to result in secret decision making.[97]

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[95] Michael T Klare, 'No Blood for Oil? Hydrocarbon Abundance and International Security', in Thijs Van de Graaf and others (eds), *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave 2016), 419.

[96] Aarhus Convention does not use the term 'security'. However, as per the current US Department of Defense's definition, national security is 'a collective term encompassing both national defense and foreign relations…'. See, US Department of Defense, *Dictionary of Military and Associated Terms (as amended through 15 March 2015)* (US Department of Defense 2010).

[97] Christopher S Browning and Matt McDonald, 'The Future of Critical Security Studies: Ethics and the Politics of Security' (2013) 19(2) European Journal of International Relations 235.

Fourth, discourses of security are frequently exclusionary and violent, limiting individual freedom.[98] Thus, they can allow a broad range of actions from curtailing public access and rights of way to withholding the right to protest/strike.[99]

Fifth, security concerns can be devised in order to achieve certain policy aims. Policy makers can place a specific matter of interest under the security umbrella to prioritise and push forward the approval of preferred policies. Leese and Meisch argue, for example, that issues of energy have often been placed under the general framework of security to push forward and foster a new 'green' economy.[100] According to Bridge, by conjoining energy with security a broad range of actions and clusters of technologies may be licensed by appealing to the term, from wind farms to nuclear power.[101]

Sixth, securitisation of energy – the claim that energy is a matter of security – can be used by governments to derogate from other obligations. The State may invoke exceptional security clauses in national, regional or international agreements to resist challenges to regulatory or other measures adopted by the State to implement its policy or to avoid other obligations embedded in agreements constraining its chosen policy. If a measure is taken that adversely affects a national security interest, the government can take appropriate measure to address the threat, including breaching other interests protected by law which do not fall under the security umbrella. Thus, some countries have been restricting foreign investments to protect their energy security interest. In May 2008, Japan, for example, ordered the Children's Investment Master Fund (TCI), a British hedge fund, to drop a bid to raise its stake

[98] Mark Neocleous, *Critique of Security* (Edinburgh University Press 2008), 5.
[99] Gavin Bridge, 'Energy (in)security: World-making in an Age of Scarcity', (2015) 181 The Geographical Journal 328, 330.
[100] Matthias Leese and Simon Meisch, 'Securitising Sustainability? Questioning the 'Water, Energy and Food-Security Nexus' (2015) 8(1) Water Alternatives 695, 703.
[101] Gavin Bridge, 'Energy (in)security: World-making in an Age of Scarcity', (2015) 181 The Geographical Journal 328, 330.

in J-Power, the biggest wholesale electric company in Japan on the grounds that foreign ownership holdings in strategic energy companies like J-Power would threaten Japan´s maintenance of public order and national security.[102] The same applies to the restrictions placed by Venezuela (2001), Bolivia (2006), Kazakhstan (2007) and Russia (2008) on foreign investment in national oil and gas industries based on energy security.[103]

Seventh, the securitisation of energy can be used as a rationale for justifying State intervention in energy markets in order to, for example, increase or reduce the pace of renewable energy deployment.[104]

Eighth, it can be used to justify energy developments which cause environmental degradation. Redgwell highlighted the fact that substantive treaty obligations such as the obligation to protect and preserve the marine environment and to conserve biological diversity generally are not subject to express treaty exceptions permitting derogation for energy purposes.[105] Nonetheless, placing energy within the national security exception in treaties leaves scope for environmental derogation for unsustainable energy purposes.

Traditionally, security has largely been thought of as encompassing military or war-related threats or concerns. Of late, however, the boundaries of such an understanding of the term have been challenged, which has led to a broadening and deepening in understandings

[102] Kazuhiro Nakatani, 'Restrictions on Foreign Investment in the Energy Sector for National Security Reasons: The Case of Japan' in Aillen McHarg and others (eds), *Property and the Law in Energy and Natural Resources* (Oxford University Press 2010) 311.
[103] A Goldthau, 'From the State to the Market and Back: Policy Implications of Changing Energy Paradigms' (2012) 3(2) Global Policy 198, 203.
[104] Javier Valdés, 'Arbitrariness in Multidimensional Energy Security Indicators' (2018) 145 Ecological Economics 263, 263.
[105] Catherine Redgwell, 'International Regulation of Energy Activities' in Martha Roggenkamp and others (ed), *Energy Law in Europe: National, EU and International Regulation* (Oxford University Press 2007) 13, 112.

of what security comprises.[106] For instance, the environment,[107] climate,[108] food[109] and water[110] – elements closely linked to energy – have been included within the security domain. This emerged within the context of non-military threats to national security under the assumption that threats to security arise less from the relationship of nation to nation and more from the relationship of human beings to nature based on the fact that pressures on the earth's principal biological systems, namely oceanic fisheries, grasslands, forests and croplands, on which humanity depends for food and industrial raw materials, are mounting rapidly as population expands and global consumption climbs.[111]

Increasing securitisation of energy and related policies – and the rise of different notions of security – bring about the problem of different security interests competing with each other. Placing energy, the environment, climate, food and water under the security

[106] Lester Russell Brown, *Redefining National Security* (Worldwatch Institute 1977); Richard Ullman, 'Redefining Security' (Summer 1983) 8(1) International Security 129; Jessica Tuchman Mathews, 'Redefining Security', (Spring 1989) 68(2) Foreign Affairs 162; Helga Haftendorn, 'The Security Puzzle: Theory-Building and Discipline-Building in International Security' (1991) 35(1) International Studies Quarterly 3; Keith Krause and Michael C Williams, 'Broadening the Agenda of Security Studies: Politics and Methods' (1996) 40(2) Mershon International Studies Review 229.

[107] Norman Myers, 'Environment and Security', (Spring 1989) 74 Foreign Policy 23; Ronnie D Lipschutz and John P Holdren. 'Crossing Borders: Resource Flows, the Global Environment, and International Security' (1990) 21(2) Security Dialogue 121; Hans Günter Brauch and others (ed), *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts* (Springer 2009); Peter Liotta, *Achieving Environmental Security: Ecosystem Services and Human Welfare* (IOS Press 2010); Simon Dalby, *Security and Environmental Change* (Wiley 2013). For a sceptical perspective, see Daniel Deudney, 'The Case against Linking Environmental Degradation and National Security' (1990) 19(3) Millennium 461.

[108] Nigel Purvis and Joshua Busby, 'The Security Implications of Climate Change for the UN System' in Geoffrey D Dabelko (ed), *Environmental Change and Security Project Report* (Woodrow Wilson International Center for Scholars 2004); Joshua W Busby, *Climate Change and National Security: An Agenda for Action* (Council on Foreign Relations Press 2007); Jürgen Scheffran and Antonella Battaglini, 'Climate and Conflicts: The Security Risks of Global Warming' (2011) 11 Regional Environmental Change 27.

[109] See, for example, Food and Agriculture Organization (FAO), 'Rome Declaration on World Food Security and World Food Summit Plan of Action' (2006); Basudeb Guha-Khasnobis, Shabd S Acharya, and Benjamin Davis (eds), *Food Security: Indicators, Measurement, and the Impact of Trade Openness* (Oxford University Press 2007); Rudiger P Tscherning, 'Renewable Energy for Food and Water security projects in Dry-land Countries: Towards a Model Legal Framework for the Qatar National Food Security Programme' in Kim Talus (ed), *Research Handbook on International Energy Law* (Edward Elgar Publishing 2014).

[110] Peter H Gleick, 'Water and Conflict: Fresh Water Resources and International Security' (1993) 18(1) International Security 79; Claudia Ringler, Asit K. Biswas and Sarah A. Cline (eds), *Global Change: Impacts on Water and Food Security* (Springer-Verlag 2010); United Nations World Water Assessment Programme, T*he United Nations World Water Development Report 2015: Water for a Sustainable World* (UNESCO 2015).

[111] Lester Russell Brown, *Redefining National Security* (Worldwatch Institute 1977).

umbrella raises the problem of determining which security issue prevails when there are two or more security issues at stake.

A good example of the tensions that can arise around the pursuit of energy security is the development of unconventional reserves and the use of hydraulic fracking, commonly referred to simply as fracking, and its impact on climate, environmental and water securities. The development of any non-low carbon energy conflicts with climate security. Fracking, a technique used to unlock oil and gas from deposits of shale via the injection of high-pressure streams of sand, water, and chemicals into underground shale,[112]is generally associated with spills, risk of air pollution, contamination of surface and groundwater by chemical constituents, and harm to people's health and welfare.[113] Fracking has raised significant concerns around its impact on water security, including: (i) concerns over water withdrawals associated with shale gas development, and the extent to which it may deplete local water supplies or adversely impact local watersheds; (ii) concerns over managing wastewater as wastewater treatment facilities are not equipped to process such wastewater; and (iii) concerns over water contamination.[114]

Another instance of competing securities is the development of biofuels and the food versus energy debate it brings to the fore. Biofuels have been criticised for their

[112] Jason Schumacher and Jennifer Morrissey, 'The Legal Landscape of "Fracking": the Oil and Gas Industry's Game-Changing Technique is its Biggest Hurdle' (2013) 17(2) Texas Review of Law & Politics 239, 241.

[113] International Energy Agency, *World Energy Outlook 2012* (IEA 2012) 1, 506. Fred Krupp, 'Don't Just Drill, Baby--Drill Carefully: How to Make Fracking Safer for the Environment' (2014) 93(3) Foreign Affairs 15. Daniel F Twomey and others, 'Fracking: Blasting the Bedrock of Business' (2014) 12(1) Competition Forum 204.

[114] LeRoy C Paddock and Jessica Anne Wentz, 'Emerging Regulatory Frameworks for Hydraulic Fracturing and Shale Gas Development in the United States' in Donald N Zillman and others (eds), *The Law of Energy Underground: Understanding New Developments in Subsurface Production, Transmission, and Storage* (Oxford University Press, 2014) 147, 153.

unsustainability, particularly in relation to land-use change, and their competition with agriculture for land resources.[115]

As such, different logics of security interact and shape energy security discourses, challenging disciplinary boundaries and security practices.

6. Politicisation of energy

Politicisation can be understood as placing a subject into the realm of deliberation, decision making and human agency when previously they were not.[116] Accordingly, politicisation of energy security occurs when it becomes subject to political scrutiny, generating debate and usually multiple policy approaches. This demonstrates public and political interest in the matter, requiring government decision and resource allocations, while not imposing the threat-urgency modality of securitisation.

The oil crises of the 1970s made people aware of energy, and energy issues, previously only discussed mainly by experts, began to be reported massively by the media. This in turn led to demands for new governmental responses, resulting in a political transformation of energy security issues. While some scholars argue that energy security as a national security issue has promoted depoliticisation, others suggest links between politicisation and securitisation in energy. Kuzemko, for example, argues that the framing of energy supply as a security issue influenced an opening up of UK energy, which had been subject to processes of depoliticisation since the late 1980s, to greater political interest and deliberation.[117]

[115] Petrobras, *The Impact of Pre-Salt: A Long-Term Perspective* (Oxford Analytica 2010), 12. Tatsuji Koizumi, *Biofuels and Food Security: Biofuel Impact on Food Security in Brazil, Asia and Major Producing Countries* (Springer 2014).
[116] Colin Hay, *Why We Hate Politics* (Polity Press 2013), 81.
[117] Caroline Kuzemko, 'Politicising UK Energy: What 'Speaking Energy Security' Can Do' (2014) 42(2) Policy and Politics 259.

According to Kuzemko, energy in the UK was politicised partly through the impact of narratives of national energy supply (in-)security in the context of mounting political support for climate change mitigation, Russian energy policy restructurings, the emergence of China as a powerful energy actor, of rising oil and gas prices, and of the Russia–Ukraine gas transit disputes, and on the brink of the UK becoming an importer of oil and gas after decades as a net exporter.[118]

Energy security is considered both a strategic issue and public policy issue.[119] Superimposed on all the strategic considerations is a political issue, as there is the core assumption that satisfying national energy requirements is a critical government responsibility.[120] Scholars argue that the public is increasingly demanding participation in energy policy,[121] although meaningful interactions between energy experts and lay-people remains difficult, and existing energy policy processes, from power plant siting planning decisions to the design of energy legislation, tend to limit rather than expand public participation and engagement.[122]

Many factors can promote the politicisation of energy.

First, when there is some risk to energy supply. Rand, for instance, suggests that politicians and the general public are concerned more with the affairs of the moment. Politicians focus on immediate threats, general political discontent and the prospects for

[118] Ibid 260.
[119] Andreas Goldthau, 'A Public Policy Perspective on Global Energy Security' (2011) 13(1) International Studies Perspectives 65, 65.
[120] Michael T Klare, 'No Blood for Oil? Hydrocarbon Abundance and International Security', in Thijs Van de Graaf and others (eds), *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave 2016), 419.
[121] Kolya Abramsky, *Sparking a Worldwide Energy Revolution: Social Struggles in the Transition to a Post-Petrol World* (AK Press 2010); Clark A Miller, Jennifer Richter and Jason O'Leary, 'Socio-energy Systems Design: A Policy Framework for Energy Transitions' (2015) 6 Energy Research & Social Science 29, 37; Noel Healy and John Barry, 'Politicizing Energy Justice and Energy System Transitions: Fossil Fuel Divestment and a "Just Transition"' (2017) 108 Energy Policy 451, 453.
[122] Clark A Miller, Jennifer Richter and Jason O'Leary, 'Socio-energy Systems Design: A Policy Framework for Energy Transitions' (2015) 6 Energy Research & Social Science 29, 37.

winning the next election as opposed to more distant issues. The 'man in the street', by contrast, is said to be occupied with short-term matters that involve family, food, job, housing, finance, recreational activities. Whether true or not, it is when supplies of energy show signs of becoming inadequate that politicians and the general public jointly turn their attention to energy.[123] In the UK, for example, it is said that a debate about energy security started to appear in the public realm in the most loud and persistent way since the 1970s oil crises.[124] However, when the stability of energy supplies is recognisably at risk, it is most likely that the militarisation of energy-resource management will occur,[125] and the securitisation discourse takes over as a result.

Second, politicisation occurs when there are safety issues. For instance, during the second half of the 1990s, several accidents in nuclear-related factories in Japan – a liquid sodium leak at the Monju fast breeder reactor in December 1995; a fire at the Tokaimura reprocessing plant in March 1997; and an accident at the Japan Nuclear Fuel Conversion Co. in September 1999 – began to draw public attention, and the Fukushima incident on 11 March 2011 triggered the politicisation of the nuclear power issue at the national level in Japan.[126]

Third, when there is contention about which energy source should be developed. The politicisation of renewable energy – where proponents and opponents have engaged in fierce debates about the merits of renewable sources of energy which have brought about intense political debates in many countries – serves as an example. On the pro-renewables front, thousands of people joined a protest rally in Germany when the government tried to cut

[123] D A J Rand, *Hydrogen Energy: Challenges and Prospects* (Royal Society of Chemistry 2007), 14.
[124] Caroline Kuzemko, *The Energy Security-Climate Nexus: Institutional Change in the UK and Beyond* (Palgrave Macmillan 2013), 125.
[125] Daniel Moran and James A Russell, 'The Militarization of Energy Security', in Daniel Moran and James A Russell (eds), *Energy Security and Global Politics: The militarization of Resource Management* (Routledge 2009), 6.
[126] Sung Chull Kim and Yousun Chung, 'Dynamics of Nuclear Power Policy in the Post-Fukushima Era: Interest Structure and Politicisation in Japan, Taiwan and Korea' (2018) 42(1) Asian Studies Review 107, 112.

support for solar photovoltaics (PV).[127] On the opposite side, there has been immense opposition to renewable energy development.[128] The Koch brothers in the United States, for instance, have invested significant sums in antirenewable lobbying.[129] Entwined with contentiousness about choice of energy source promotion is the growing political pressure to address climate change.

Fourth, when there is rising energy prices. According to Moran and Russell, high energy prices would probably not be a sufficient motivation for a well-grounded calculation that war for energy pays off.[130] However, the affordability element of energy security as a cause for politicisation and as a justification for State action is widely accepted[131] as increasing energy prices brings about pressure from the public. Rising energy prices are even capable of causing a 'political panic'.[132]

The above-mentioned examples are merely illustrative. They do not constitute an exhaustive list. Some energy matters may remain local and specific, but they may be elevated to the national agenda, and may also become entangled in electoral politics.

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[127] Sofia Mitra-Thakur, 'Thousands Protest Germany's Solar Cuts', *Engineering and Technology* (5 March 2012); Stephen Evans, 'Will Sun Still Shine on Germany Solar Power Industry?', *BBC News* (12 March 2012).

[128] Kolya Abramsky, *Sparking a Worldwide Energy Revolution: Social Struggles in the Transition to a Post-Petrol World* (AK Press 2010), 282.

[129] Nick Gass, 'White House hits back at Charles Koch', *Politico* (26 August 2015). Michaël Aklin and Johannes Urpelainen, *Renewables: The Politics of a Global Energy Transition* (The MIT Press 2018), 129.

[130] Daniel Moran and James A Russell, 'The Militarization of Energy Security', in Daniel Moran and James A Russell (eds), *Energy Security and Global Politics: The Militarization of Resource Management* (Routledge 2009), 5.

[131] Andreas Goldthau,'A Public Policy Perspective on Global Energy Security' (2011) 13(1) International Studies Perspectives 65, 67.

[132] Michael Grubb and others, *UK Energy Policy: Politicisation or Rationalisation?* (UCL Institute for Sustainable Resources 2015), 8.

7. Conclusion

This chapter has introduced and discussed the concepts and definitions in play in the subsequent chapters of this thesis. The chapter explored the variety of definitions in the existing literature of energy security, its multidimensional character as well as the processes of securitisation and politicisation surrounding energy policymaking. The purpose of this chapter was not to add a new notion of energy security to the already existing literature. The aim was instead to look at key concepts, whose discursive framing and reframing will be returned to throughout the thesis.

The scholarly debate on energy security has demonstrated that the concept of energy security is not static, but dynamic, changing over time. The processes of energy securitisation and politicisation are not black or white either, establishing states of affairs in which energy issues fall on one side of the divide or the other clearly at any given moment. They are, instead, complex and contested with disagreements among scholars. The concept of and phenomena surrounding energy security cannot, therefore, be oversimplified. The different shifts in understandings of energy security thus point to the primacy of discursive practices at different times and in different places.[133]

With discourse analysis as the particular analytical approach adopted in the case studies under chapters 4 and 5, the main objective of these chapters is to investigate, via a bottom-up approach, how discourses of energy security have been framed in the specific case studies chosen for this research and the impact of those frames on green energy development. The case studies of Great Britain and Brazil will highlight the diversity of discursive practices in play around energy security, and how they contribute to the

[133] Nils Bubandt, 'Vernacular Security: The Politics of Feeling Safe in Global, National and Local Worlds' (2005) 36(3) Security Dialogue 275, 291.

construction, but also the dismantling or de-construction of green energy policies. They will also explore what the stakes are in these discursive contests. The findings of these case studies provide valuable data which will inform the examination of the law of the World Trade Organisation (WTO) in chapter 6, focusing on policy space for trade restrictive measures which support green energy development with a view of ensuring energy security.

CHAPTER 4

ENERGY SECURITY AND GREEN ENERGY IN GREAT BRITAIN: THE DISCOURSE OF THE LIGHTS GOING OUT

1. Introduction

1.1. Aim and contribution of the chapter

This chapter delves into energy security and green energy in the context of Great Britain (GB)[1] and focuses on the thesis key research questions: (i) how has energy security been discursively constructed? (ii) what are the discursive links between energy security and law and policies promoting green energy? And (iii) what are the implications of energy security construction to law and policy on green energy development?

The interplay between energy security and law and policies on green energy fits within the debate surrounding a just transition[2] to a more sustainable, affordable, secure and inclusive energy system. Great Britain was chosen as a case study because although its energy system is dominated by fossil fuels,[3] it is currently undergoing a major transition.[4] It is also a country where issues of energy security and climate change have come to the fore prominently. Green energy development in GB, in particular, has risen to the forefront of energy policies mainly as a result of the transition to a low carbon energy system. The Climate Change Act 2008 established a legally binding target to reduce the UK's greenhouse gases

[1] As a note to the reader, the electricity systems in Great Britain and Northern Ireland are governed and regulated independently of one another. This chapter focuses on Great Britain, although some data is used which is reported at the level of the whole of the United Kingdom (UK).
[2] Raphael J Heffron, 'The Just Transition to a Low-Carbon Economy' (2018) 8(4) Renewable Energy Law & Policy Review 39.
[3] In 2017, the UK obtained 81.6 per cent of its primary energy from fossil fuels. See, Department for Business, Energy & Industrial Strategy, *UK Energy in Brief 2018* (Department for Business, Energy & Industrial Strategy 2018), 13.
[4] Frank W Geels and others, 'The Enactment of Socio-technical Transition Pathways: A Reformulated Typology and a Comparative Multi-level Analysis of the German and UK Low-carbon Electricity Transitions (1990–2014)' (2016) 45(4) Research Policy 896.

emissions to at least 80% lower than the 1990 baseline by 2050, and an increase of renewable energy consumption in electricity, transport, and heating sectors was proposed as a way to help keep the UK on track to hit the targets.[5]

At the same time, the closure of a number of coal- and oil-fired plants due to high pollution levels as well as the closure of nuclear plants which are coming to the end of their working lives have decreased the electricity capacity margin between supply and demand, which increases the risks to the security of energy supply.[6] In addition, due to the decline of supplies from the UK Continental Shelf,[7] GB has increasingly become dependent on energy imports, being an energy importer since 2004.[8] These factors have all contributed to take energy security to the top of the political agenda in GB. Concomitantly, GB has been active in grid modernisation efforts, including the shift to smart grid[9] with, for instance, the integration of green energy sources to the system, vehicle-to-grid and vehicle-to-home technologies.[10] The expansion of electric vehicle markets in GB has also raised security of energy supply

[5] Department of Energy and Climate Change (DECC), 'UK Renewable Energy Roadmap', July 2011 <https://www.gov.uk/government/publications/renewable-energy-roadmap> accessed 7 October 2018.
[6] DECC, 'Energy Security Strategy' (November 2012) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65643/7101-energy-security-strategy.pdf> accessed 10 October 2018.
[7] OFGEM, 'Wholesale Energy Markets in 2015' <https://www.ofgem.gov.uk/sites/default/files/docs/2015/09/wholesale_energy_markets_in_2015_final_0.pdf> accessed 10 October 2018.
[8] Department for Business, Energy and Industrial Strategy, 'UK Energy in Brief 2018', July 2018 <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728374/UK_Energy_in_Brief_2018.pdf> accessed 20 December 2018, 11.
[9] According to the European Commission, smart grid is an 'an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety'. See European Commission, 'Smart Grids' <http://s3platform.jrc.ec.europa.eu/smart-grids> accessed 7 October 2018.
[10] See, for example, João Crispim and others, 'Smart Grids in the EU with Smart Regulation: Experiences from the UK, Italy and Portugal' (2014) 31 Utilities Policy 85; Nick Jenkins, Chao Long, and Jianzhong Wu, 'An Overview of the Smart Grid in Great Britain' (2015) 4(1) Engineering 413; Dimitrios Xenias and others, 'UK Smart Grid Development: An Expert Assessment of the Benefits, Pitfalls and Functions' (2015) 81 Renewable Energy 89; P M Connor and others, 'Sources of Risk and Uncertainty in UK Smart Grid Deployment: An Expert Stakeholder Analysis' (2018) 161 Energy 1.

concerns due to the potential to substantially increase load across distribution networks and significantly change patterns of electricity demand.[11]

Within this overall context, this chapter carries out an empirical exploration of the discursive construction of energy security and its link with law and policies promoting green energy amongst key energy experts from different sectors of the economy in GB. Although there are existing case studies of the UK in energy studies,[12] as well as empirical studies exploring public and expert meanings of energy security in the UK,[13] there is no empirical data examining the views of energy experts from different sectors of the economy in GB on the interplay between energy security and law and policy on green energy development. The overarching objective of this chapter, therefore, is to reveal some of the on-the-ground perceptions of key energy experts in GB on this interplay that so far have remained unseen in scholarly analysis. By doing so, this chapter presents original research that has never been published before and makes a novel contribution to the legal and socio-legal scholarship on energy security, green energy development and the just energy transition.

As energy security is used as an argument in debates which inform law and policies on the transition to an energy system with increased share of green energy deployment, a contribution of the kind this chapter makes is important because it helps us understand how the concept is construed by different actors in the economy in GB and its impact on green

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[11] See, for example, Cedric Clastres, 'Smart Grids: Another Step towards Competition, Energy Security and Climate Change Objectives' (2011) 39 Energy Policy 5399, 5406; Ernst & Young, 'Smart Grid: A Race Worth Winning? A Report on the Economic Benefits of Smart Grid', April 2012 <https://www.smartgrid.gov/files/Smart_Grid_Race_Worth_Winning_Report_on_Economic_Benefits_201209.pdf> accessed 7 October 2018; National Grid, *Future Energy Scenario* (National Grid 2017); Joseph Archer, 'Centrica, Uber Launch Electric Vehicle Trial to Monitor Impact on UK Energy Grid', *The Telegraph* (30 November 2018).

[12] See, for example, Raphael J Heffron, 'The Application of Contrast Explanation to Energy Policy Research: UK Nuclear Energy Policy 2002-2012' (2013) 55 Energy Policy 602.

[13] Christina Demski, Wouter Poortinga and Nick Pidgeon, 'Exploring Public Perceptions of Energy Security Risks in the UK' (2014) 66 Energy Policy 369; Emily Cox, 'Opening the Black Box of Energy Security: A Study of Conceptions of Electricity Security in the United Kingdom' (2016) 21 Energy Research & Social Science 1.

energy law and policies. Rather than speak for them, therefore, the aim is to present the discursive realities according to participants themselves by letting them set out their accounts in their own words and in their own terms. This chapter, thus, seeks to go beyond assumptions and speculation to focus on discourses directly. This is in line with the methodological approach adopted in this study which is based on the assumption that discourses not only represent reality, but also help shape it in consequential ways.

Understanding how participants discursively frame energy security and its links with law and policy on green energy development is crucial here because when one frame is selected from amongst a range of competing frames it can be incorporated into law and policies and it has consequences for how green energy development is subsequently seen and acted on. Gathering participants' accounts is, therefore, relevant because their ways of framing the interplay between energy security and law and policy on green energy development provides on-the-ground insights into the discourses which inform and shape the creation of law and policies on green energy development.

1.2. Structure of the chapter

To set the stage for this empirical exploration of energy security and law and policies promoting green energy in GB, this chapter starts by outlining the investigative method used. It then explores participants' views on green energy, followed by an analysis of the core themes identified from the interviews. The focus throughout is on energy security definitions and on the interplay between energy security and law and policy on green energy development.

1.3. Summary of findings

This chapter will demonstrate the multiple framing employed by leading energy experts in GB as part of discursive contests that lead to divergent constructions of energy security. In summary, energy security not only means different things to different people in different contexts, but also to different sectors of the economy. Based on participants' discursive constructions, this chapter will highlight the challenges posed to the transition to a green energy system in GB.

First, this chapter will show that energy security in GB is first and foremost a political issue, particularly as a result of risks associated with governments toppling in cases of energy interruption in the country. Second, this chapter will demonstrate that energy politicisation in GB was framed as having negative impacts on green energy development due to vested interests, unequal lobbying power and association of green energy with left-wing politics. Third, the analysis also reveals a discursive struggle over energy security and green energy links with positive and negative frames identified. In particular, the analysis shows the emergence of two novel themes in relation to green energy and energy security: (i) the potential shift in the debate surrounding green energy intermittency as a result of large-scale commercial energy storage; and (ii) the emergence of 'prosumers', a new actor in the energy market which challenges the current energy system.

By presenting the multiple voices of participants, this chapter will call for integration and dialogue among experts from different sectors of the economy in GB and suggests that green energy technological advancements should be embraced in the context of the transition to a green energy system. Further research should also be carried out to address the challenges and uncertainties posed by the increasing integration of green energy sources into the system, particularly in how the legal and regulatory framework can assist in tacking those issues and support the transition to a green energy system.

2. Method

2.1. Sampling, access and recruitment of participants

A representative sample "reflects the population accurately so that it is a microcosm of the population."[14] In trying to ensure the correct proportion of participants from different sectors of the economy which deal with energy, it was a priori determined that participants from the public, private and third sectors of the economy would be invited to participate. The range of interviewees was also determined on the basis of an assumption that different sectors will ex ante adhere to different viewpoints, and hence greater diversity among participants would provide the research with a range of competing constructions.

Participants were identified initially through the literature review, an internet search of energy organisations and some personal contact made via attendance at workshops, conferences and energy events. A snowball sampling process – a process of reference from one person to the next[15] – was then followed. Participants were approached in writing via letter or email. The main inclusion criteria were expertise, direct relevance (people directly involved and active in the energy and climate/environmental field) and experience.

A total of 24 participants took part in the research. To adhere to the process outlined in the ethics application approved by the University of Liverpool Research Ethics Committee,

[14] A Bryman, *Social Research Methods* (Oxford University Press 2004), 87.

[15] M Denscombe, *The Good Research Guide: for Small-Scale Social Research Projects* (Open University Press 2003), 16.

responses and institutions visited were listed anonymously to protect confidentiality. Participants were placed into three categories according to who they worked for: (i) government/governmental organisations, (ii) private sector and (iii) not-for-profit organisations. From the total of 24 participants, 6 belonged to government/governmental organisations, 12 came from the private sector and 6 from not-for-profit organisations. In terms of positions of leadership, 15 were head of departments, directors or chairmen; the other 9 were managers, engineers, solicitors, senior policy analysts, policy analysts, energy analysts or researchers.

Table 1: Summary of participants' job positions

SECTORS → / POSITIONS ↓	Private	Government	Not-for-profit
Director	2	3	-
Head of Department	4	1	1
Chairman	-	2	2
Manager	1	-	-
Engineer	1	-	-
Solicitor	1	-	-
Senior Policy Analyst	1	-	1
Policy Analyst	-	-	1
Energy Analyst	2	-	-
Researcher	-	-	1
TOTAL	12	6	6

2.2. Data collection

Semi-structured interviews were conducted by the author with 24 participants from June 2016 to November 2016.

Table 2: Summary of interviews (sector/position/dates)

Sector	Position	Date
Government/Governmental organisation	Managing Director	22 July 2016
Private	Head of Department	27 July 2016
Private	Engineer	3 August 2016
Not-for-profit sector	Policy Analyst	8 August 2016(a)
Not-for-profit sector	Senior Policy Analyst	8 August 2016(b)
Private	Energy Analyst	9 August 2016
Government/Governmental organisation	Head of Department	9 August 2016
Private	Director	11 August 2016
Private	Head of Department	17 August 2016(a)
Private	Solicitor	17 August 2016(b)
Private	Head of Department	18 August 2016
Not-for-profit organisation	Researcher	19 August 2016
Not-for-profit organisation	Chairman	23 August 2016
Private	Head of Department	24 August 2016
Private	Energy Analyst	25 August 2016
Not-for-profit organisation	Chairman	14 September 2016
Government/Governmental organisation	Director	14 September 2016
Private	Managing Director	28 September 2016
Not-for-profit organisation	Head of Department	29 September 2016
Private	Senior Policy Analyst	7 October 2016
Government/Governmental organisation	Director	11 October 2016
Private	Manager	17 October 2016
Government/Governmental organisation	Chairman	19 October 2016
Government/Governmental organisation	Chairman	20 October 2016

The semi-structured research interview format meant it was possible to ask the experts involved a set of standard questions while also allowing the conversation to build and deviate to explore new ideas brought up by the interviewees during the interview. Interviews were face-to-face and took place in London, Leeds, Liverpool, Peterborough, Chester and Kings Langley. Interviewing time ranged from 15 minutes to 90 minutes. 90% of the interviews lasted between 45-60 minutes.

Participants were asked broad questions outlined in the interview guide under appendix 1. All participants answered all the questions outlined in the interview guide. Responses from 23 participants were captured with a digital audio recorder. One participant from the private sector did not wish to have the interview recorded, but note-taking was allowed and, therefore, notes were taken.

All interviews were transcribed verbatim by the author. Transcripts were checked for errors against the taped version of each interview to ensure accurate and authentic reproductions of participants' accounts. Participants received a copy of the interview transcript with the exception of three participants who verbally expressed that submission of the transcript to them was not necessary. Upon submission of the transcript, participants had the opportunity to carry out any amendments that they deemed necessary. In all cases, no amendments in relation to change of views were made. In addition, information was not omitted as participants did not remove any substantial part of the comments.

2.3. Data analysis

The transcripts were analysed thematically. Thematic analysis is a search for themes that emerge as important to the description of the phenomenon.[16] It is a flexible method that can be applied across a range of theoretical perspectives.[17] According to the constructionist paradigm adopted in the thesis, meaning and experience are treated as socially produced and reproduced, rather than inhering within individuals.[18] In addition, within discourse analysis,

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[16] Jeanne Daly, Allan Kellehear and Michael Gliksman, *The Public Health Researcher: A Methodological Approach* (Oxford University Press 1997), 3.
[17] Virginia Braun and Victoria Clarke, 'Using Thematic Analysis in Psychology' (2006) 3(2) Qualitative Research in Psychology 77, 78.
[18] Vivien Burr, *An Introduction to Social Constructionism* (Routledge 1995).

discourses are orientated towards action and aim to establish a particular prevailing view or social reality. Therefore, following the constructionist paradigm and the discourse analytic approach, the analysis of the interviews did not seek to focus on motivation or individual psychologies of the participants, but instead sought to examine the underlying ideas, assumptions, conceptualisations and ideologies that were given voice within the participants' accounts. A data-driven inductive or 'bottom up' approach focused on the lines of similarity and difference emerging from the interviews was followed and the 6-phase guide to performing thematic analysis of Braun and Clarke[19] provided recursive and iterative tools for the analysis of the data.

Firstly, transcripts were carefully read and re-read to familiarise myself with the depth and breadth of the content. Secondly, due to the narrowing of the research topic to be analysed for the purpose of this thesis, the data suitable for analysis was determined with a focus on energy security. Thirdly, codes were generated inductively, which means that the themes identified were strongly linked to the data themselves and not driven by the author's theoretical interest in the topic. The process of coding the data was therefore carried out without an attempt to fit it into a pre-existing coding frame, or the author´s analytic preconceptions. Interviews were coded manually. Although Nvivo is a useful software package for managing data and coding, the limitation of seeing only sections of material on screen made it difficult for the author to visualise and contextualise all of the data. As the transcripts were also examined as a whole, with a view of identifying the overarching discursive frames deployed by the participants, the author felt that manual coding was better suited to the task.

[19] Virginia Braun and Victoria Clarke, 'Using Thematic Analysis in Psychology' (2006) 3(2) Qualitative Research in Psychology 77.

Fourthly, once the data was coded, the codes were consolidated into broader themes. The development of the themes themselves involved the observation of patterns across accounts and issues of potential interest in the data. There is no universally accepted standard for establishing the relevance of a pattern in thematic analysis. In qualitative data analysis, the researcher is the instrument for analysis, making judgments about coding, theming, decontextualizing, and recontextualising the data.[20] The author, therefore, used her own judgment to determine whether themes were present in the data, based on whether a concept captured something important to the research aims. Fifthly, those themes were reviewed to ensure that they were adequately supported by the extracts relating to that theme. This involved a constant moving back and forth between the entire data set, the coded extracts of data and the themes. Sixthly, each theme was given a name designed to give an immediate sense of its meaning and the specifics of each theme. Lastly, extracts were selected to best illustrate each theme. Participants' quotes presented in this work are unedited to minimise the chances of any possible misinterpretation and distortion. The core themes identified from the interviews are presented in this chapter. Interview data was supplemented by literature review.

2.4. Limitations and caveats

The current study has some limitations. Primary among these is its small sample size relative to the entire pool of energy experts in GB and views are restricted to those participants. However, given that, at times, participants were recurrently returning to similar

[20] Helene Starks and Susan Brown Trinidad, 'Choose Your Method: A Comparison of Phenomenology, Discourse Analysis, and Grounded Theory' (2007) 17(10) Qualitative health research 1372, 1376.

themes, sample size issues are not a significant concern with this data set given this study's aims. Larger sampling would be needed if someone were to seek to replicate or re-enforce these findings but in terms of identifying recurrent themes and the discursive practices which underpin them, this sample provides clear insights into the discursive construction of the issues.

Another limitation is regional representativeness, the sample being restricted to England. However, although all interviews were carried out in England, participants were familiar with the energy market in Great Britain and pointed out appropriate differences in energy markets in England, Wales and Scotland where pertinent. Therefore, regional representativeness does not significantly affect the analysis either.

In terms of consistency of questioning, the same interview style was used for all participants and all questions on the form were posed to all participants. However, since a semi-structured interview protocol was employed, a few additional questions were addressed to each interviewee. Nonetheless, at the end of each of the interviews all participants were asked if they would like to add any additional comments in relation to the topic, offering participants, therefore, the opportunity to express their views in any aspect of the topic which they deemed important to mention. Given the aim of the exercise was to identify what participants saw as relevant, and to analyse how that was discursively constructed, that the questions asked were not identical in each case is not, again, a significant limit on the analysis offered.

Finally, in this chapter, verbatim extracts are used as evidence of the frames discursively constructed by participants. This approach also helps towards the reduction of subjectivity in writing and presenting data[21] – as the author presents more than one account of the same event as advanced by participants, making sure that data which do not necessarily support the author's view are also offered to readers.[22] Therefore, due to the importance of verbatim extracts for evidencing participants' use of discursive frames and for reducing subjectivity, the author disagrees with the view that interview extracts should be used sparingly since 'overuse of quotes can become tedious and the point being made can get lost in the words'.[23] While that means more space is given to participants' responses, it also means their discursive work can be more closely evaluated.

2.5. Ethical considerations

Before commencing data collection, ethical approval for the study was obtained from the University of Liverpool Research Ethics Committee. Transparency was at the heart of the study and was observed throughout the empirical work. Participants were given an information sheet containing information about the author, the nature of the research (in non-academic jargon), the sponsor, the duration of the interview, how the data would be used, where the results would be disseminated and the anonymity of the information. All individual participants included in the study provided informed written consent on the day of the interview and were fully briefed about the project and the voluntary nature of their participation as well as anonymity.

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[21] For texts that address the issues of subjectivity in writing and presenting, see, for example, Marlene de Laine, *Fieldwork, Participation and Practice : Ethics and Dilemmas in Qualitative Research* (SAGE Publications 2000).
[22] Angela Thody, *Writing and Presenting Research* (Sage 2006), 19.
[23] Yvonne Darlington and Dorothy Scott, *Qualitative Research in Practice: Stories from the Field* (Allen & Unwin 2002), 161.

3. “There are all sorts of scales as to how we define green energy”[24]: Conceptualising green energy

Participants defined green energy in a variety of ways: from specific views such as “anything that is renewable, excluding large scale hydro”,[25] “energy that is substantially better for the environment than traditional forms of energy production”[26], “energy that is produced essentially from natural resources that are not being dug up or can be replaced”[27] to broader views such as “low carbon forms of energy generation, such as renewables and nuclear”[28], “energy that is from other than a carbon source”[29] and “low or zero carbon energy, including technologies that can support low or zero carbon output, such as carbon capture and storage being something that can help to make fossil fuels green energy”,[30] and further to broader, more epistemically focused views, such as “there isn’t an accepted definition”[31] or “the definition of green energy depends on the discussion we are having and in what context you are talking”.[32]

Participants, nevertheless, generally agreed that non-conventional renewable energy fits within the scope of green energy. Therefore, for clarity, in this chapter, the author uses the term green energy as a synonym for non-conventional renewable energy sources, such as wind, solar, wave and tidal.

[24] Interview with participant from the not-for-profit sector on 8 August 2016(a).
[25] Interview with participant from the private sector on 9 August 2016.
[26] Interview with participant from the private sector on 17 August 2016(a).
[27] Interview with participant from the private sector on 24 August 2016.
[28] Interview with participants from the private sector on 28 September 2016 and 7 October 2016.
[29] Interview with participant from the private sector on 3 August 2016.
[30] Interview with participant from the private sector on 11 August 2016.
[31] Interview with participant from the government on 20 October 2016.
[32] Interview with participant from the private sector on 25 August 2016.

4. "We can get to a lot of places with your energy security":[33] the empirical definition of energy security in GB

How energy security has been discursively constructed is one of this thesis' key research questions. As explained in chapter 3, although the term 'energy security' has become commonplace in both academic and policy discussions, literature on energy security continues to resist a commonly-accepted definition. In view of the lack of clear understanding of what energy security actually means, this section presents an empirical view of energy security definition in the context of GB.

During the interviews, all participants answered the question "what do you understand by the term 'energy security'?" The interviews with these leading energy experts enable us to find out more about the diversity of views on energy security as it is elaborated on-the-ground. By proceeding in this way, the study brings more clarity to the public debate by highlighting where the disagreements are and with respect to what in different sectors of the economy in GB. By bringing together the multiplicity of views of participants in one document, this study can also feed into energy decision-making processes and inform law and policies. This is not because the interviews generated an agreed-upon definition on energy security, they did not seek to. Instead, the interviews clarify the priorities of different energy actors from different sectors of the economy, how those priorities inform perceptions of the interplay between energy security and law and policies promoting green energy in GB and how both translate into action on these issues.

[33] Interview with participant from the government sector on 22 July 2016.

4.1. Empirical view on energy security definition

The polysemic, multi-dimensional, contextual and dynamic nature of energy security, as explained in chapter 3, can be observed in the variety of definitions of energy security given by interviewees. On the one hand, energy security was discursively constructed in an alarmist and fearful manner by focusing on "lights going out" which will be discussed at length later, and, on the other, in a broader and holistic manner emphasising sustainability and human welfare, in which, for example, "environment and energy security are the same things; they are two sides of the same coin"[34] or "energy security is also a personal issue about poverty and inclusion"[35]. In line with this latter view, an energy system is not considered secure if it causes severe environmental and social externalities.

Energy security was recurrently discursively constructed via the energy trilemma – security of supply, affordability and sustainability[36] – albeit in different ways. Some participants presented them as conflicting aspects of energy production in which one goal of the trilemma – energy security in particular – is selected as most important and privileged over the other two. For instance, one participant claimed that "that is not a true trilemma. There is a hierarchy of the three and energy security comes first. Still the trilemma would need to be resolved, but if you had to choose, security always comes first".[37] In other participants' words, "it has never been an evenly balanced trilemma. At various stages environmental policy or costs have been the most important of the three points and now I

[34] Interview with participant from the not-for-profit sector on 8 August 2016(b).
[35] Interview with participant from the not-for-profit sector on 29 September 2016.
[36] World Energy Council and Oliver Wyman, *World Energy Trilemma Index* (World Energy Council 2016), 6. This is also the terminology used by National Grid, see National Grid, UK Future Energy Scenarios (July 2014) <http://www2.nationalgrid.com/uk/industryinformation/future-of-energy/future-energy-scenarios/> accessed 10 October 2018.
[37] Interview with participant from the private sector on 11 August 2016.

would say that security of supply is clearly the most important to government";[38] "the real tension is between the affordability and the environmental and climate change aspects. The security of energy supply is a given";[39] or "energy security is a Minister's top priority for energy policy. I think that you have heard of the trilemma. The requirements blend decarbonisation with security and affordability, and they [the government] put energy security on top amongst those. Even if you think about how you can maintain public support for decarbonisation, clearly if security is ever questioned, as a trade-off, then that really undermines support for energy decarbonisation".[40] Other discursive constructions, nevertheless, sought to establish a balanced view of the trilemma in which one or two goals did not need to be pursued at the expense of the other(s).

The need for Britain to have a much broader and more flexible way of thinking about energy security and develop policies for energy security and climate change mitigation in the same silos is advanced in the academic literature.[41] However, a summary of the elements of energy security raised by participants (table 3 below) demonstrates that climate change, environment and social inclusion were only part of energy security definitions of participants from the not-for-profit sector. It is important to point out here that one participant from the government sector showed awareness that energy security definition could include climate change considerations, but s/he 'doesn't think that at the moment people in the industry and politicians think of it in those terms'.[42] Thus, this study finds that participants from the government and private sectors do not seem to consider climate change, environment and

[38] Interview with participant from the Government sector on 20 October 2016.
[39] Interview with participant from the Government sector on 14 September 2016.
[40] Interview with participant from the Government sector on 9 August 2016.
[41] Catherine Mitchell and Jim Watson, 'Conceptualising Energy Security' in Catherine Mitchell, Jim Watson and Jessica Whiting (eds), *New Challenges in Energy Security: The UK in a Multipolar World* (Palgrave Macmillan 2013), 1.
[42] Interview with participant from the government sector on 20 October 2016.

social inclusion to be a part of the current energy security concept in GB. This does not necessarily mean that climate change, environmental and social issues were fully excluded from the views of these participants in the debate on energy. Instead it means that they were not presented by participants within the energy security concept and, therefore, were each seen as independent concepts. By not presenting climate change, environmental and social considerations within the definition of energy security, the implication is that law and policies pursuing energy security can be created which negatively impact the climate, the environment and social inclusion.

The dominant energy security frame deployed by most participants from the government sector was based on "the lights going out". The focus here was on capacity adequacy – including whether capacity was of the right type to respond in a timely way, but also whether the relationship between peak demand and the amount of generation capacity was well balanced – and resilience – whether the energy system could be made robust enough to cope with external events and continue to deliver energy services and whether it could recover from those events.[43] Thus, the primary energy security concern of government experts who took part in this study was with respect to availability and reliability.[44] Costs were also considered important by participants from the government sector, but, with the exception of one participant,[45] affordability was not presented as part of the concept of energy security. This emphasis on availability and reliability is in line with the government definition of energy security in the 2017 Clean Growth Strategy:[46]

[43] Modassar Chaudry and others, 'Building a Resilient UK Energy System', UK Energy Research Centre Working Paper REF UKERC/WP/ES/2009/023, 2009 <http://www.ukerc.ac.uk/publications/building-a-resilient-uk-energy-system-working-paper.html> accessed 2 October 2018.

[44] 5 out of 6 participants of the government sector (83.3%) framed energy security in the sense of availability and reliability or capacity and resilience / Keeping the lights on.

[45] Interview with participant from the government sector on 22 July 2016.

[46] HM Government, *The Clean Growth Strategy: Leading the way to a low carbon future* (HM Government 2017), 156.

> Energy security is about ensuring secure, reliable, uninterrupted supplies to consumers, and having a system that can effectively and efficiently respond and adapt to changes and shocks. It is made up of three characteristics: flexibility, adequacy and resilience.

Surprisingly, all participants from the private sector also framed the concept of energy security in relation to availability and reliability alone.[47] A summary of energy security definitions in table 3 below shows that a focus on availability and reliability was common to definitions of energy security offered by experts from all three sectors.

Affordability was an important element in the discussion, but no participant from the private sector included affordability within the definition of energy security. It is also interesting to note that only one participant from the not-for-profit sector included affordability within the concept of energy security. What the analysis shows, therefore, is that a divergent construction of energy security is being advanced by participants from different sectors. Also, the broader concepts of energy security presented in the literature have not been fully incorporated into practice yet, particularly by the government and industry, as the majority of the on-the-ground views focused on narrow energy security definitions related to availability and reliability.

[47] Participants' references to capacity and resilience/ keeping the lights on can also be interpreted as availability and reliability of energy supply.

Table 3: Summary of energy security definitions from participants per sector

Government	Private	Not-for-profit
Availability and reliability	Availability and reliability	Availability and reliability
Availability, affordability and reliability	-	-
-	-	Availability and environmental sustainability
-	-	Availability, affordability, reliability, climate change, social and environmental sustainability
Capacity and resilience / Keeping the lights on	Capacity and resilience / Keeping the lights on	Keeping the lights on in the context of climate change

The changing nature of energy security also resonated in interviewees' accounts. According to a participant, "energy security now means something quite different from when I first started looking into renewables."[48] These changes in definitions of energy security and the different priorities attached to their elements were presented as being driven by political, economic and social factors. They were also seen as a result of its correlation to local, national and global events, being intrinsically linked to externalities of the globalised economy. As pointed out by a participant:

> Energy security is driven heavily by what is happening in the world and the local situation as well, which is why it changes so much. So it's very complicated and what you call security of supply today will be different to say ten years ago, twenty years ago and to ten years hence as well.
>
> […] [Energy security] is driven by how the government strategically feels at the time about what is going on, which is interesting, because energy policy should be good in long-term, about generating electricity, but actually, if you look at

[48] Interview with participant from the government sector on 22 July 2016.

> it, it changes according to the social, economic and political kind of things that are going on in the world at the time.[49]

These contexts and external influences are well exemplified by the narrative of a participant explaining energy supply in Britain:

> In 2005, we had fairly cheap energy. We were still enjoying the tail end of that period of energy security. Until the early 2000´s, we had gas prices that were lower than the rest of the world as we had an oversupply. Then we became an importer just at a time that the international gas price started going up a lot, so our gas price went up even further because we had to catch up with the rising target, but before that happened we had relatively low energy costs, we had a high degree of security of supply, and therefore the focus was all about green energy. Then between about 2006 and 2010, energy prices went up a lot and the focus changed almost exclusively to consumer cost and how you achieve environmental objectives and security of supply at acceptable costs to the consumer. More recently, because we have been running down, in particular, coal-fired generation, the margin of supply over demand is narrower than it has been. That narrowness is often exaggerated, but it is narrower than it has been historically. Politicians are therefore focused on what they see as the real risk to them, which is the lights going out one day and something going horribly wrong.[50]

The "lights going out" frame was heavily influenced by a political memory of the energy supply interruption in the 1970's, an outcome typically linked by participants to

[49] Interview with participant from the government sector on 11 October 2016.
[50] Interview with participant from the government sector on 20 October 2016.

industrial action in the mining sector, during which coal miners went on strike and, as a consequence, the country experienced rolling power cuts. This event was framed as having "a huge amount of resonance and symbolism"[51] in the national psyche and impacting on how people perceive energy security in the country as "it colours attitudes"[52] to the conversations related to energy security today. As such, the construction of energy security was based on a 'fear factor' which came as a result of the 1970's strike and energy supply interruption and this was used as a recurrent reminder to politicians to take action for the lights not to go out. As mentioned by a participant:

> Now, when people whisper 'Minister, do you really want the lights to go out?' that is what they are insinuating, that is how this is going to be received. There will be no worse thing for a Minister than seeing this thing happen, because of this resonance, because the tabloid newspapers would just come out with that line. Energy security is imbued with that image of the lights going out.[53]

This section revealed the underlying concepts which were used by leading energy experts in relation to energy security. The fact that the majority of energy security definitions focused on the elements of availability and reliability does not question the construction of the broader energy security concepts also advanced by some participants. This empirical evidence on energy security definition demonstrates, therefore, that there is no uniform understanding of energy security among different sectors of the economy in GB. While some participants from the not-for-profit sector advanced a definition in line with broader scholarly concepts of energy security which include climate change and social and environmental

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[51] Interview with participant from the government sector on 14 September 2016.
[52] Interview with participant from the government sector on 20 October 2016.
[53] Interview with participant from the government sector on 14 September 2016.

sustainability considerations, participants from the private and government sectors presented a narrower view on energy security, focusing mainly on availability and reliability. Another divergence is that, while the element of affordability can be found in the energy security concepts of one participant from the government and one participant from the not-for-profit sector, affordability is absent from definitions of participants from the private sector.

4.2. Contending energy security indicators

In connection with participants' competing energy security definitions related to the elements of availability, reliability, affordability, climate change, environmental and social considerations, analysis of the interview data revealed a number of contending energy security indicators offered by participants. As pointed out under chapter 3, a number of energy security indicators have been developed in the academic literature. Sovacool and Mukherjee, for example, identified 372 indicators that can be used to measure and track performance on energy security.[54] In this empirical study in GB, the elements of availability and reliability in particular were presented in a variety of ways by participants in relation to the following indicators: control over energy sources, import dependency, securing adequate investments and energy infrastructure.

[54] Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach'(2011) 36 Energy 5343.

4.2.1. Control over energy sources

Control over energy sources was raised by participants from all sectors as an important energy security dimension. There were, however, different views here. On the one side, there were those who stressed control via the ability to manage energy supply from around the world, a view which exposes a reliance on global trade networks and nondomestic actors for provisioning of energy supply. For those who framed control in this way, energy security is ensured via the diversification of foreign sources of energy supply[55] and by sourcing energy from places where there is minimal risk of interruption.[56] This view is also rooted in scholarship via the association of energy security in the UK with promoting open and competitive energy markets.[57] In fact, the UK relies in part on international energy trade to ensure adequate supplies of energy in the country.[58] On the other, there were those which stressed control through reliance on (totally or mainly) indigenous sources of energy supply.[59] This narrative was presented by some participants from all sectors and is also found in scholarly work claiming an end to 'market fundamentalism' in UK energy governance.[60] The empirical work, therefore, presented narratives that stand in direct contrast to each other.

[55] Interview with participants from the government sector on 9 August 2016 and 20 October 2016.

[56] Interview with participant from the private sector on 9 August 2016.

[57] William J Nuttall and Devon L Manz, 'A New Energy Security Paradigm for the Twenty-first Century' (2008) 75(8) Technological Forecasting and Social Change 1247, 1249; Y Chang and JL Lee, 'Electricity Market Deregulation and Energy Security: A Study of the UK and Singapore Electricity Markets' (2008) 29 International Journal of Global Energy Issues 109; Marilyn A Brown and Benjamin K Sovacool*, Climate Change and Global Energy Security: Technology and Policy Options* (MIT Press 2011), 5.

[58] In 2017, 36% of energy used in the UK was imported. See, Department for Business, Energy and Industrial Strategy, 'UK Energy in Brief 2018', July 2018 <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728374/UK_Energy_in_Brief_2018.pdf> accessed 28 December 2018, 11.

[59] Interview with participant from the government sector on 22 July 2016, from the private sector on 27 July 2016 and 28 September 2016, and from the not-for-profit sector on 19 August 2016.

[60] Ian Rutledge and Philip Wright, 'The Content and Delivery of Future UK Energy Policy' in Ian Rutledge and Philip Wright (eds), *UK Energy Policy and the End of Market Fundamentalism* (Oxford Institute for Energy Studies 2010).

4.2.2. Import dependency

Import dependency was another significant frame raised as an energy security issue. This was not only in terms of fossil fuel imports but also in terms of imports of low carbon electricity from Europe via the use of interconnectors, particularly in the context of uncertainty in connection with Brexit[61] and the internal European energy market. As pointed out by a participant "it is an energy security aspect if you are importing all of your electricity from the Continent, if we don't generate it ourselves, because you are so reliant on another country supplying your power".[62] In terms of fossil fuel imports, a participant framed reliance on imported fossil fuel sources as "heavily overplayed in the UK context" based on the existence of sufficient global diversified supply and fairly well established resilience to pricing changes that there are in global supplies of fossil fuels.[63]

Additional themes related to import dependency concern the importation of energy equipment and technology and energy expertise, which was framed as "really a point of energy security",[64] and maintaining human resources in the country and their energy skills capabilities was advanced as "essential for energy security".[65] As exemplified by participants:

> There is the wider energy security aspect if you are importing a lot of your equipment and your expertise in certain technologies. Is that actually secure? So, for example, in oil, gas and nuclear where most of the technologies and

[61] In May 2015, the UK held a general election to elect members to the House of Commons. The Conservative Party won and took over the Conservative and Liberal Democrat coalition government (2010-2015). The victory of the Conservative Party was followed by a referendum concerning future UK membership of the European Union in June 2016, which resulted in the UK electorate voting to withdraw from the European Union (Brexit) by 51.9% to 48.1%. See EU Referendum Results: UK Votes to Leave the EU, *BBC News* <https://www.bbc.co.uk/news/politics/eu_referendum/results> accessed 30 October 2018.
[62] Interview with participant from the not-for-profit sector on 8 August 2016(b).
[63] Interview with participant from the government sector on 14 September 2016.
[64] Interview with participant from the government sector on 22 July 2016.
[65] Interview with participant from the private sector on 9 August 2016.

equipment are not British, they are essentially imported, there is an energy security risk. […] Where the technology comes from and the benefits which can be accrued from that are almost as important as where the fuel is coming from.[66]

The wind industry is based mostly on German and Scandinavian technology, particularly offshore wind, so now [post-Brexit] you have the challenge for the UK in attracting that technology into the UK, whether being manufactured in the UK under a licence or being exported into the UK. It is a security issue, the ability to source wind turbines. That is part of the economics of energy security. It is not only people, it is also equipment, markets supplying renewable energy equipment.[67]

Therefore, participants also gave examples of dependence on foreign energy expertise, equipment and technology as energy security issues not only in the context of nuclear, oil and gas, but also green energy.

4.2.3. Securing adequate investments

Energy security in GB was also correlated by participants with the origin of foreign investment and the need to secure adequate investment. If foreign investment stopped, it was felt that this would negatively affect the steady supply of energy in the country. Securing adequate investment has already been highlighted in an empirical study as one of the most

[66] Interview with participant from the not-for-profit sector on 8 August 2016(b).
[67] Interview with participant from the government sector on 22 July 2016.

critical aspects of ensuring energy security in the UK on all timescales.[68] The study also found that there were concerns that the UK is currently at risk from a lack of investment in energy infrastructure.[69] It is estimated that over the next decade, GB will need around £100 billion of capital investment in its electricity infrastructure to accommodate projected future increases in electricity demand and to replace ageing power stations.[70]

According to Sir Philip Lowe, the post-Brexit framework, for instance, will certainly have an impact on the readiness of EU-27 companies to invest in the UK energy sector and Brexit will reduce the number of investors and suppliers operating in the UK.[71] One participant exemplified dependence on foreign investment and energy security in the following way:

> If the Japanese banks are not going to invest in the UK anymore, for example, that is a big energy security issue. That is another strand or facet of energy security, where the investments in energy are coming from and they are not coming from the UK. Very little comes from the UK.[72]

From another angle, some countries take the view that allowing foreign investment in energy industries endangers energy security[73] or national security in the case of nuclear energy.[74] The go-ahead for Hinkley Point C, for instance, was publicly controversial with media

[68] Emily Cox, 'Opening the Black Box of Energy Security: A Study of Conceptions of Electricity Security in the United Kingdom' (2016) 21 Energy Research & Social Science 1.
[69] Ibid 3.
[70] OFGEM, 'Electricity Market Reform (EMR)' < https://www.ofgem.gov.uk/electricity/wholesale-market/market-efficiency-review-and-reform/electricity-market-reform-emr> accessed 28 December 2018.
[71] Philip Lowe, 'Brexit and Energy: Time to Make Some Hard Choices' (2018) 7 European Energy Journal 38, 45.
[72] Interview with participant from the government sector on 22 July 2016.
[73] A Goldthau, 'From the State to the Market and Back: Policy Implications of Changing Energy Paradigms' (2012) 3(2) Global Policy 198, 203.
[74] Kazuhiro Nakatani, 'Restrictions on Foreign Investment in the Energy Sector for National Security Reasons: The Case of Japan' in Aillen McHarg and others (eds), *Property and the Law in Energy and Natural Resources* (Oxford University Press 2010).

coverage on speculation about Britain's national security concerns.[75] However, one participant, giving Hinkley Point C as an example, discarded national security concerns grounded on Chinese and French Governments investments in nuclear energy in GB, on the basis that this is how investments in the energy industry currently works as "we are living in a global age where that happens everywhere".[76]

From another perspective, one participant pointed out the importance of energy security for ensuring investment and put energy security in a comparative perspective, where investment was presented as a zero-sum game, i.e. where if GB gets investment, someone else loses it:

> […] if energy security isn't there, the production, or consumption, of whatever the end goal is, isn't reliable, you can't guarantee production and in this fast paced changing business world guarantees are very valuable. […]
>
> It is the short-term production that you want your energy security for and that security will also inform investment decisions in the long-term. […]For the long-term, incentive is to keep investment flowing and confidence in your system, your network, your ability to produce and guarantee payments for the investment. These are all down to energy security. Energy security will actually impact that. If you don't have energy security, then you won't have investment

[75] See, for example, Carrie Gracie, 'Is China the Hitch for the Hinkley Point Deal?', *BBC News* (29 July 2016) <https://www.bbc.co.uk/news/world-36922898> accessed 10 October 2018; Andrew Ward, Jim Pickard and Michael Stothard, 'Hinkley Go-ahead after 'National Security' Safeguards', *Financial Times* (15 September 2016) < https://www.ft.com/content/0cde26b6-7b66-11e6-b837-eb4b4333ee43> accessed 10 October 2018.
[76] Interview with participant from the not-for-profit sector on 8 August 2016(a).

in the long-term to an extent. As long as you have more energy security than other countries you will do better, so I guess it is a rat race.[77]

Therefore, participants in GB highlighted the importance of securing adequate investments as a critical aspect of ensuring energy security. On an interrelated angle, one participant pointed out the importance of energy security for ensuring investment. This demonstrates, therefore, a vicious circle where investments are necessary to ensure energy security and energy security is necessary to ensure investments, making it difficult to recover should either decrease.

4.2.4. Energy Infrastructure

The need to have a robust secure energy Infrastructure was also raised by participants as part of energy security concerns. This was characterised by four frames which are explained here in no particular order of importance. First, security of the energy infrastructure from bombing and terrorist attacks, including cyber-attacks in which the energy sector has become prime target.[78] Only two participants, both from the private sector,[79] mentioned this aspect of the physical security of the energy infrastructure. However, one of them clearly stated that this was not what s/he had in mind when talking about energy security.[80] Some energy security scholarship, nevertheless, refers to this aspect of energy security.[81]

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[77] Interview with participant from the private sector on 25 August 2016.

[78] World Energy Council, 'Managing Cyber Risks', September 2016 <https://www.worldenergy.org/publications/2016/the-road-to-resilience-managing-cyber-risks/> accessed 10 October 2018.

[79] Interview with participant from the private sector on 3 August 2016 and 28 September 2016.

[80] Interview with participant from the private sector on 28 September 2016.

[81] See, for example, Catherine Redgwell, 'International Energy Security', in Barry Barton and others, *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press 2004); Donald N Zillman and Michael T Bigos, 'Security of Supply and Control of Terrorism: Energy Security in the United States

Second, security of the energy infrastructure from deterioration in which networks must be kept healthy in order to avoid power failures.[82] This is correlated to ensuring adequate investment in energy infrastructure, as pointed out in subsection 4.2.3. Third, security of the energy infrastructure from natural disasters or accidents, such as fires at power stations,[83] which can cut people off from the electricity or gas supply.[84] Fourth, security of the energy infrastructure from the impacts caused by climate change, particularly as a result of extreme weather events,[85] such as damage to interconnectors during a storm,[86] to the electricity transmission line network[87] or to other aspects of the electricity power infrastructure.[88] Following this line of thought, Paskal constructed climate change as a fundamental facet of energy security due to the fact that energy infrastructure tends to have a long lifespan and lies in areas that may become increasingly physically unstable owing to changes in the environment.[89] One participant raised concerns surrounding the development

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in the Early Twenty-First Century', in Barry Barton and others, *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press 2004); Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach'(2011) 36 Energy 5343, 5352.

[82] Interview with participant from the private sector on 3 August 2016.

[83] See, for example, fires at the Ferrybridge and Didcot B power stations. Hatty Collier, 'Fire Hits Ferrybridge Power Station', *The Guardian* (31 July 2014) <https://www.theguardian.com/uk-news/2014/jul/31/fire-ferrybridge-power-station-west-yorkshire> accessed 10 October 2018; Alice Philipson, 'Didcot Power Station Fire: As It Happened', *The Telegraph* (20 October 2014) <https://www.telegraph.co.uk/news/earth/energy/11173594/Didcot-Power-Station-fire-as-it-happened.html> accessed 10 October 2018.

[84] Interview with participant from the private sector on 3 August 2016 and from the government sector on 14 September 2016.

[85] Interview with participant from the not-for-profit sector on 29 September 2016.

[86] In 2016, for example, interconnectors during France and Britain were partially severed during Storm Angus. See, Emily Gosden, 'Winter Power Crunch Fears as UK-France Cables Severed during Storm', *The Telegraph* (29 November 2016) < https://www.telegraph.co.uk/business/2016/11/29/winter-power-crunch-fears-uk-france-cables-severed-storm/> accessed 10 October 2018.

[87] Panagiotis Manis, 'Climate Change and Extreme Wind Effects on Transmission Towers' (2017) 170(2) Proceedings of the Institution of Civil Engineers: Structures and Buildings 81.

[88] Lynsey McColl and others, 'Assessing the Potential Impact of Climate Change on the UK's Electricity Network' (2012) 115 Climatic Change 821; Dana Abi Ghanem, Sarah Mander and Clair Gough, '"I think We Need to Get a Better Generator": Household Resilience to Disruption to Power Supply during Storm Events' (2016) 92 Energy Policy 171.

[89] Cleo Paskal, *The Vulnerability of Energy Infrastructure to Environmental Change* (Chatham House and Global EESE 2009), 2.

of Hinkley C nuclear power station in those terms in the context of the site being located near the coast line and uncertainties about sea level rises. According to the participant:

> If they build another nuclear power station on that site, it will operate for forty or fifty years and it will take 200 years to decommission. The sea level will rise by a metre by 2100 but then will go on rising even with the carbon in the atmosphere at the moment for a very long time. In 250 years, we might have two to four meters of sea level rise and a very impoverished world trying to deal with an incredibly toxic nuclear power station clear up.[90]

Publicly, nuclear developer, EDF, however, acknowledged assessing sea level rise as a result of climate change and was taking preventive measures to protect the nuclear station from tides, storm surges and tsunamis.[91] No participant from the private sector, however, considered security of energy infrastructure due to climate change as an indicator for energy security. It is worth noting that in the literature, climate change has increasingly been considered as having an effect on energy security not only related to impacts on the energy infrastructure as raised in this empirical study, but also due to impacts on energy demand and supply patterns.[92] However, no participant in this empirical study framed energy security in these latter terms.

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[90] Interview with participant from the not-for-profit sector on 29 September 2016.

[91] 'EDF Rejects Fears that Hinkley C will be Vulnerable to Rising Sea Levels', *Burnham-on-sea.com* (1 August 2018) < http://www.burnham-on-sea.com/news/2018/hinkley-c-rising-sea-levels-01-08-18.php> accessed 10 October 2018.

[92] See, for example, Michael T Klare, 'Climate Change Blowback: The Threats to Energy Security' (2015) 35(1) SAIS Review of International Affairs 61; Jim Watson and others, *The Security of UK Energy Futures* (UK Energy Research Centre 2018), 3.

Table 4: Summary of energy security indicators from participants per sector

Government	Private	Not-for-profit
Control over energy sources through reliance on (totally or mainly) indigenous energy sources	Control over energy sources through reliance on (totally or mainly) indigenous energy sources	Control over energy sources through reliance on (totally or mainly) indigenous energy sources
Control over energy sources via the ability to manage energy supply from around the world	Control over energy sources via the ability to manage energy supply from around the world	-
Energy import dependency	Energy import dependency	Energy import dependency
Ability to source energy technology (equipment)	-	Ability to source energy technology (equipment)
Ability to source human expertise	Ability to source human expertise	Ability to source human expertise
Securing adequate investment	Securing adequate investment	-
Security of energy infrastructure (from natural disasters or accidents)	Security of energy infrastructure (from natural disasters or accidents)	-
-	-	Security of energy infrastructure (due to climate change)
-	Security of energy infrastructure (from bombing, attacks)	-
-	Security of energy infrastructure (network maintenance, security from deterioration)	-

4.3. The emotive and dynamic nature of energy security

Participants from all sectors agreed on the use of emotive language surrounding energy security in GB and the use of this type of language for serving one's own interest. It was said that the media, in particular, blows energy security matters out of proportion and uses emotional and inflammatory language.[93] This emotional language along with energy

[93] Interview with participant from the government sector on 19 October 2016, from the not-for-profit sector on 8 August 2016(a) and from the private sector on 11 August 2016.

security’s broad spectrum of definitions and dimensions, as shown above, were constructed as being used to lobby a particular point of view, be it pro-green energy or against green energy. As participants pointed out, “people will play the energy security card for their own interests”,[94] and it is “often used as a buzz word”.[95] This is something which is generally acknowledged by scholars that the language of energy security is “politically potent”[96] and the lack of a commonly agreed definition affords energy security a wide range of political possibilities, including its capacity as a political “trump card”,[97] in which protagonists use energy security to add more weight to their arguments.

In line with this, a participant from the renewable energy private sector pointed out the use of the language of energy security for pro-green lobbying purposes:

> When I am lobbying government, or when I am talking to someone and trying to influence them, I mention energy security. I just don´t think it is on top of the list, but sometimes I think that it is one of those sound bites that you see that does sort of hit the mark with some people, especially if you say ‘of course we need to make sure that Russia isn’t in control of our energy supplies’ […].[98]

In another way which shows how the language of energy security can be used for very different purposes, a participant mentioned the use of the language energy security by the government in support of conventional forms of energy, particularly exploration of natural gas via the use of fracking.[99] This also resonates with a view presented by Noé and Pring, in

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[94] Interview with participant from the government sector on 14 September 2016.
[95] Interview with participant from the not-for-profit sector on 8 August 2016(b).
[96] Caroline Kuzemko, ‘Politicising UK Energy: What ‘Speaking Energy Security’ Can Do’ (2014) 42(2) Policy and Politics 259, 270.
[97] Gavin Bridge, ‘Energy (in)security: World-making in an Age of Scarcity’, (2015) 181 The Geographical Journal 328, 329.
[98] Interview with participant from the private sector on 28 September 2016.
[99] Interview with participant from the private sector on 27 July 2016.

which energy security is misused as a justification to push forward energy development projects that ignore social and environmental sustainability.[100]

Still in relation to this manipulation of energy security language for one's own interest, a leading energy expert from the government sector indicated that stakeholders use the language of energy security in order to have financial resources allocated to them. As s/he put it, energy security "is the mechanism whereby, if you look at the big utility companies, they are always using this to get more money out of the government, always, that's their mechanism, so is National Grid."[101]

What is observed in the empirical data, therefore, is the dynamic nature of energy security, one that can be continually taken up in new and different ways, where different players can break the concept up and reform it along lines which suit their own particular and sectoral interests.

4.4. Complexity of energy security construction: summary and importance of findings

The analysis under section 4 demonstrated the complexity of the discussion encapsulated in the concept of energy security and its dimensions. The examination of the interviews highlighted that energy security concepts are raised differently relative to different sectors of the economy. The fact that energy security "means a number of different things to

[100] Susan Y Noé and George (Rock) Pring, 'The 'Fear Factor': Why We Should Not Allow Energy Security Rhetoric to Trump Sustainable Development' in Barry Barton and others (ed), *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press 2004), 431.
[101] Interview with participant from the government sector on 19 October 2016.

different people"[102] or that "everyone has their own idea on energy security"[103] has been discursively constructed as the "biggest problem".[104]

There is no consensus amongst participants from different sectors about whether climate change, and social and environmental concerns, in particular, should be a part of the energy security concept. Somewhat missing are attempts from industry and government to open up the energy security definition to broader issues of environmental protection, climate change and social inclusion. Interestingly, there is no consensus amongst interviewees from different sectors in relation to the inclusion of affordability within the meaning of energy security either, as affordability was absent from definitions of participants from the private sector. Non-inclusion of these elements within the concept of energy security means that energy law and policies pursuing energy security can be created which negatively impact affordability, the climate, the environment and social inclusion. Encapsulating these elements within the concept of energy security would, therefore, assist the move towards a just energy transition, as law and policies on energy security would need to be justified under this broader scope.

Different indicators of energy security are also seen differently from different sectors with narratives standing in direct contrast to each other. For instance, although control over energy sources was advanced by participants from all sectors, its meaning was cast in opposing terms from having control via reliance on indigenous sources of energy supply, on the one hand, to having control via the ability to effectively manage energy supply from around the world, on the other. This study, therefore, presents divergent constructions of

[102] Interview with participant from the government sector on 14 September 2016.
[103] Interview with participant from the government sector on 20 October 2016.
[104] Interview with participant from the government sector on 17 September 2016.

energy security by leading energy experts from different sectors of the economy in GB. These differences do not promote efficient communication amongst the sectors, but instead create more distance and misunderstanding.

The summary of energy security definitions and indicators advanced by participants per sector also reveals a partitioning of views across different sectors of the economy with regards to the different elements of energy security, where participants did not deliver a full picture in their discursive construction of the energy security complexity. This could be a result of the complexity involved in the concept of energy security or due to individual or sectoral bias, if participants just wanted to put forward their preferred energy security concept based on their own or their own sector's interests.

Having different energy security definitions amongst participants from different sectors of the economy means that efforts to improve energy security in the country will have to attenuate themselves to different audiences. This diversity of ways in which energy security was constructed by participants also shows that energy security, as stated by a participant, "isn't one size fits all, at all",[105] and, therefore, there is not a single or common solution. This broad spectrum of energy security definitions and dimensions, along with a general acknowledgement of an emotional language associated with energy security, also showed that the language of energy security can be manipulated for one's own individual/sectoral interest and used to advance a particular point of view.

This variety of concepts amongst different sectors of the economy in GB can also be an obstacle to a meaningful debate surrounding energy security. Participants, for instance, may be referring to energy security from very different perspectives or may be selecting

[105] Interview with participant from the government sector on 11 October 2016.

particular aspects of energy security to suit their agenda. One, therefore, needs to distinguish the different elements and dimensions of energy security upfront in order to have any meaningful debate surrounding the topic. Demonstrating the variety of arguments constructed by the protagonists in the energy field in GB is, therefore, relevant; not only because it brings more clarity to the public debate by highlighting where the disagreements are and with respect to what, but also because it might assist in decision-making processes and inform law and policies. Thus, awareness of this conceptual diversity in GB assists in creating clear law and policies on the transition to a low carbon energy system.

The definition of energy security by participants, however, is only one piece of the puzzle which will inform the following sections. The subsequent sections will focus on answering the remaining two key research questions of this thesis: what are the discursive links between energy security and law and policies promoting green energy? And what are the implications of energy security construction to law and policy on green energy development?

5. Energy security and energy politicisation in GB

This section examines energy security in the context of energy politicisation in GB as raised by participants in the interviews. It shows that energy security in GB is first and foremost a political issue and that governments are critical actors, in that is they who will be held responsible and accountable for energy supply interruption in the country. In connection with this debate, this section also demonstrates the implications of energy politicisation in GB to green energy development. The analysis of the empirical data showed that, according to participants' narratives, energy politicisation in GB is hindering green energy development as a result of three factors: vested interests, unequal lobbying power and association of green energy with left-wing politics.

5.1. "It is a political suicide for the lights to go out"[106]: Energy politicisation in GB

As demonstrated in the previous section, apart from the very brief association of energy infrastructure with terrorist attacks, no participant associated energy security with national security, showing an absence of energy securitisation in the discursive terrain of this empirical work in GB. Energy politicisation, on the other hand, within the meaning explained under chapter 3, where there is public and political interest in the matter which is subject to contestation and political deliberation, was a remarkably dominant frame in the empirical data.

As explained by participants, "governments fall if they don't provide people with electricity, so there is an important political reason why people and Ministers take it seriously",[107] "if you are in government, you would never like to be the government that stands over a bunch of blackouts in the country, would you? It's pretty terminal from a political perspective"[108] or "for democratically elected governments it [energy supply interruption] means that those who are in power are likely to be out of power very quickly."[109]

As relevant as having a political party removed from government as a result of energy supply interruptions is the impact on the chances of getting re-elected, as explained by a participant in a mixed metaphor "you have got to keep governments with their feet to the

[106] Interview with participant from the government sector on 22 July 2016.
[107] Interview with participant from the government sector on 19 October 2016.
[108] Interview with participant from the government sector on 11 October 2016.
[109] Interview with participant from the private sector on 17 August 2016(a).

fire and they are not going to keep their feet to the fire if the lights aren't on".[110] Energy security in GB, therefore, was recurrently construed as a matter of priority because of its direct consequences of governments toppling and its negative impact on the chances of a political party getting re-elected in cases of energy interruption in the country.

Energy security and energy politicisation in GB were, however, framed in apparently contradictory ways by participants. On the one hand, it was framed as a priority due to governments falling due to energy supply interruption. On the other hand, energy security issues were framed as policy concerns which "tend to be the football that is kicked around",[111] and, as a result, were not high on the political agenda. In the words of a participant: "You can see that energy security is not top of the political pile, because it has become a political football, which means that people have been able to use it for politics."[112]

Some light is shed on this apparent contradiction when one observes that energy security is not only defined differently but also categorised into short-term and long-term.[113] What participants meant was that energy security in the sense of "the lights going out" was a government priority treated as a day-to-day threat, where interruptions to the energy system were known to foster political and social unrest, disrupt economic growth and topple governments.[114] As exemplified by participants, "the lack of supply can lead to competition, and even social and political unrest. The ripple effect can be endless"[115] or, with reference to GB, "people will riot if they arrive at home and can't turn their TV on."[116] The association of

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[110] Interview with participant from the government sector on 19 October 2016.
[111] Interview with participant from the not-for-profit sector on 14 September 2016.
[112] Interview with participant from the private sector on 24 August 2016.
[113] A participant from the private sector interviewed on 17 August 2016(b) also made this distinction between short-term and long-term energy security.
[114] Various participants put forward this view.
[115] Interview with participant from the private sector on 3 August 2016.
[116] Interview with participant from the private sector on 17 October 2016.

public dissatisfaction as a result of energy interruption in GB and its direct impact on the collapse of a government was clear in the data.

Conversely, long-term energy security was framed as not being taken seriously by governments in GB. As participants highlighted “everybody knows that in the long-term it [energy security] is really important, but in the immediate short-term, nobody is going to lose their political career over it”,[117] “[energy] policy is being driven by today’s headlines and not on the long-term view that it needs”[118] or “the problem about energy is that it is absolutely essential, but at the same time, when things are going well, not many people take much interest in it”.[119] The challenge is that government tends to operate on a short timescale, based on electoral cycles, and this timescale is inappropriate for developing the policies needed to manage long-term energy security.

Be it short-term or long-term energy security, however, there is the assumption presented in participants’ narratives that satisfying national energy requirements is a critical government responsibility in which the GB government will be held accountable for any energy supply interruption. This is seen particularly in relation to criticisms of government choices of energy policy or absence of clear long-term energy policies and the certainty advanced by participants of governments toppling as a result of energy outage in GB. In fact, the Secretary of State and the Gas and Electricity Markets Authority do have a legal responsibility for energy security in GB set out in the Electricity Act 1989. They have ‘the need to secure that all reasonable demands for electricity are met’.[120] However, the language used in the Act implies that the responsibility is for security of the supply of electricity relative to

[117] Interview with participant from the private sector on 24 August 2016.
[118] Interview with participant from the private sector on 17 August 2016(a).
[119] Interview with participant from the government sector on 19 October 2016.
[120] Electricity Act 1989, 3(A)(2)(a).

demand, not the broader definition of energy security examined under chapter 3 and section 4 of this chapter.

In addition to being political, two participants placed energy security on an equal footing with economics. For one participant, interest in energy matters reflects phases in economic cycles, i.e. during times of economic depression there is an interest in energy, which is driven by price and security; conversely, during times of economic prosperity energy matters have less importance, because “people feel less worried about price and security, because it is all free and it is all there and we can afford it, it is all jolly because we are trading with everybody.”[121] For another participant, as previously mentioned under section 4.2.3, interest in energy security is related to its importance for ensuring investment in the country.[122] These associations of energy security with economics as a primary factor were only raised by two participants, demonstrating that this is not the majority of views in this empirical work in GB.

This section, therefore, demonstrated that short-term energy security in GB is first and foremost a political issue, as a result of its direct consequences of governments toppling and its negative impact on the chances of a political party getting re-elected in cases of energy interruption in the country. Participants also pointed out that energy security is also a priority because, in addition to political disruption, lack of energy supply can lead to economic and social disruption if measures are not taken to change the energy supply scenario. Energy security, nonetheless, was not associated with national security by participants.

[121] Interview with participant from the government sector on 11 October 2016.
[122] Interview with participant from the private sector on 25 August 2016.

5.2. Political factors as barriers for the transition to a green energy system in GB

As shown above, the interplay between energy security and law and policies on green energy development was framed by participants in the context of energy politicisation in GB. It demonstrated that energy security in GB is first and foremost a political issue and that governments will be held responsible and accountable for energy supply interruption in the country. In connection with this debate, this section reveals the implications of energy politicisation in GB to green energy development as raised by participants. The analysis of the empirical data showed that, according to participants' accounts, energy politicisation in GB is hindering green energy development as a result of three factors: vested interests, unequal lobbying power and association of green energy with left-wing politics.

5.2.1. Vested interests

Vested interests were constructed as connected to the close personal relationships between the government and the nuclear, oil and gas industries,[123] and their unwillingness to see the energy system changed. The rationale provided for this reluctance towards changes to a green energy system was not only due to their familiarity with conventional energy sources,[124] but also because the conventional energy industries do not want to lose revenue streams or have their business models negatively affected.[125]

Aspects of this are perhaps unsurprising as a fully-fledged policy drive to a green energy system will certainly have important consequences for future revenues of

[123] Interview with a participant from the private sector on 27 July 2016 and interview with a participant from the not-for-profit sector on 23 August 2016.
[124] Interview with a participant from the not-for-profit sector on 19 August 2016.
[125] Interview with a participant from the government sector on 14 September 2016.

conventional energy industries. According to Petit, for instance, as the volume of renewable energies grows and becomes naturally competitive with conventional generation, many conventional power plants now face situations where their profitability is threatened.[126] However, a review of the three great energy transitions of modern times—the rise of steam during the first Industrial Revolution in the 18th century, electrification in the 19th century, and the advent of oil-fuelled cars in the 20th century—finds that where vested interests were overly protected, transitions were delayed at a high cost.[127] A successful transition to a low carbon energy system will, therefore, require managing vested interests.

5.2.2. Unequal lobbying power

Unequal lobbying power was advanced by participants as a key issue. According to Barbier, vested interests and political lobbying help delay the transition to sustainable development because powerful interest groups influence governments to block policy reforms that redistribute costs and benefits against their interest.[128] The nuclear, oil and gas industries in GB are made up of large, multinational and multibillion pound organisations and these were seen as having far more lobbying power over the government than wind, solar and biomass, because the renewable energy sector was framed as not wanting to speak with a single voice and not being as large.[129] Valentine agrees with the existence of a fragmented structure of the renewable energy technology sector and argues that it places the sector at a

[126] Vincent Petit, *The Energy Transition: An Overview of the True Challenge of the 21st Century* (Springer 2017), 88.
[127] Clive Trebilcock, *The Industrialization of the Continental Powers, 1780-1914* (Longmans 1981); Marianne Fay, Stephane Hallegatte and Adrien Vogt-Schilb, *Decarbonizing Development: Three Steps to a Zero-Carbon Future* (World Bank Publications 2015), 153.
[128] Edward B Barbier, 'Transaction Costs and the Transition to Environmentally Sustainable Development' (2011) 1(1) Environmental Innovation and Societal Transitions 58, 62.
[129] Interview with a participant from the private sector on 27 July 2016.

financial disadvantage when compared to fossil fuels, a sector which does unite to engage in collective lobbying.[130]

Publicly, fossil fuel companies were claimed to enjoy far greater access to UK government ministers than renewable energy companies or climate campaigns.[131] In the literature, it has also been argued that a strong nuclear lobby in Britain orchestrated the UK plan to build two nuclear reactors at the Hinkley Point C site, although it is not readily apparent who that lobby might contain.[132] Unequal lobbying power is, therefore, another issue which needs to be tackled to increase green energy deployment in the energy system in GB.

5.2.3. Green energy as tied to left-wing politics

Participants also advanced a construction of public perception based on people associating “wind turbines or solar energy as hippy”[133], “totemic for the left”[134] or that “green energy equals left wing”.[135] This equation of green energy with left-wing politics then makes it difficult for a right wing government to support green energy development as a strategic energy policy choice. However, a participant mentioned that attempts have been made to move on from that discussion and associate green energy with business opportunity.[136]

[130] Scott Victor Valentine, ‘Emerging Symbiosis: Renewable Energy and Energy Security’ (2011) 15(9) Renewable and Sustainable Energy Review 4572.
[131] Rob Evans and others, ‘Shell and BP Alone Eclipse Renewable Energy Sector on Access to Ministers’, *The Guardian* (28 April 2015).
[132] Stephen Thomas, ‘The Hinkley Point Decision: An Analysis of the Policy Process’ (2016) 96 Energy Policy 421, 430.
[133] Interview with a participant from the private sector on 27 July 2016.
[134] Interview with a participant from the private sector on 28 September 2016.
[135] Interview with participant from the government sector on 22 July 2016.
[136] Interview with participant from the government sector on 22 July 2016.

In summary, vested interests, unequal lobbying power and association of green energy with left-wing politics were issues advanced by participants which need to be managed to increase the deployment of green energy in the energy system in GB. Law and policies in this area may, therefore, be useful in tackling these issues if the goal is to increase the share of green energy deployment in the energy system.

6. Analysing the links between energy security and law and policies on green energy development

As shown under section 4 above, energy security was recurrently discursively constructed as part of the energy trilemma – security of supply, affordability and sustainability. The majority of participants' views advanced these three components – energy security, affordability and sustainability – as three independent concepts. One of the findings of the analysis of the empirical view on energy security definitions under section 4 above was that elements of climate, environmental and social considerations as part of the energy security concept were only part of energy security definitions advanced by participants from the not-for-profit sector. In this regard, only three participants in total, out of the 24 participants which took part in this research, included those elements in the concept of energy security, representing just 12.5 per cent of the sample for this study. In terms of the element of affordability, it was interesting to find that no participant from the private sector included affordability within the concept of energy security. Only two participants in total – one participant from the government sector and one participant from the not-for-profit sector – included affordability within the definition of energy security, representing only 8.3 per cent of the sample. As previously stated, this shows that the broader concepts of energy security presented in the literature review under chapter 3 have not been fully incorporated into practice yet. The majority of on-the-ground views in GB focused instead on a narrow energy security definition, relating it primarily to availability and reliability.

Law and policies on green energy development were debated by participants not only in the context of energy security, but also within the affordability and sustainability aspects of the energy trilemma. This thesis, however, is centred on the interplay between energy security and law and policies on green energy development. Therefore, since the narrow view of availability and reliability of energy supply was the prevalent energy security definition presented by participants in this study, this section will focus on energy security based on this definition. This narrow energy security construction will serve as the basis for the subsequent examination of the interplay between energy security and law and policies on green energy development in GB as framed by participants.

As a first step in that analysis, it is worth noting that there has been an increasing recognition in the literature of energy security factors behind the support for green energy deployment, particularly in the context of energy security strategies with a view to diversification of energy sources and/or energy import dependency reduction,[137] including in the context of GB.[138] In fact, Lucas, Francés and González identified energy security strategies, and not environmental concerns, as the main driver in current green energy deployment in

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[137] See, for example, Samantha Ölz, Ralph Sims and Nicolai Kirchner, 'Contribution of Renewables to Energy Security', International Energy Agency, April 2007 <https://www.iea.org/publications/freepublications/publication/so_contribution.pdf> accessed 10 October 2018; A C Marques, J A Fuinhas and JR Pires Manso, 'Motivations Driving Renewable Energy in European Countries: A Panel Data Approach' (2010) 38 Energy Policy 6877; Scott Victor Valentine, 'Emerging Symbiosis: Renewable Energy and Energy Security' (2011) 15(9) Renewable and Sustainable Energy Review 4572; M Aguirre and G Ibikunle, 'Determinants of Renewable Energy Growth: A Global Sample Analysis' (2014) 69 Energy Policy 374; Javier Noel Valdés Lucas, Gonzalo Escribano Francés and Enrique San Martín González, 'Energy Security and Renewable Energy Deployment in the EU: Liaisons Dangereuses or Virtuous Circle?' (2016) 62 Renewable and Sustainable Energy Review 1032.

[138] M Grubb, L Butlerb and P Twomey, 'Diversity and Security in UK Electricity Generation: The Influence of Low-Carbon Objectives' (2006) 34 Energy Policy 4050.

the European Union (EU)[139] and a Renewable Energy Security Index has even been developed as a quantifiable energy security index of national power generation sectors.[140] In addition to these EU-wide moves, political leaders in the UK have recognised the role played by green energy in ensuring energy security. As stated by the UK Secretary of State for Energy in 2014, '[i]nvesting in homegrown clean energy and energy efficiency across our economies is fundamental to greater energy security, just as it is to fighting climate change.'[141]

This section, therefore, investigates how participants discursively constructed the links between energy security and law and policies on green energy development in GB at a time when the government approach appeared to be shifting.[142] As previously stated, understanding participants' discursive framing of energy security and its links with law and policies on green energy development is important because when one frame is selected from amongst a range of competing frames it can be incorporated into law and policies and it has consequences for how green energy development is subsequently seen and acted on.

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[139] Javier Noel Valdés Lucas, Gonzalo Escribano Francés and Enrique San Martín González, 'Energy Security and Renewable Energy Deployment in the EU: Liaisons Dangereuses or Virtuous Circle?' (2016) 62 Renewable and Sustainable Energy Review 1032.

[140] Diego García-Gusano, Diego Iribarrena and Daniel Garraín, 'Prospective Analysis of Energy Security: A Practical Life-cycle Approach Focused on Renewable Power Generation and Oriented towards Policy-makers' (2017) 190 Applied Energy 891.

[141] Department of Energy & Climate Change and the Rt Hon Edward Davey, 'Statement by Edward Davey, Secretary of State for Energy, Following His Meeting with G7 Ministers in Rome', 6 May 2014 <https://www.gov.uk/government/news/g7-energy-ministers-meeting-in-rome> accessed 1 January 2019.

[142] The interviews were carried out from June 2016 to November 2016. In May 2015, the UK held a general election to elect members to the House of Commons. The Conservative Party won and took over from the Conservative and Liberal Democrat coalition government (2010-2015). In terms of energy policy, the new Conservative Party pushed forward the exploitation of domestic sources of oil and gas, including from fracking, the construction of Hinkley Point nuclear power station and reduced the amount of financial support towards some renewable technologies, particularly onshore wind and solar. These approaches to energy policy were subject to media attention during the time of the interviews. See, for example, the Conservative Party Manifesto 2015, 56 <https://www.bond.org.uk/data/files/Blog/ConservativeManifesto2015.pdf> accessed 1 October 2018; Roger Harrabin, 'Renewables subsidy cuts could increase energy bills', BBC News (3 March 2016) <https://www.bbc.co.uk/news/business-35706645> accessed 1 October 2018; Andrew Ward, 'Hinkley Point: Is the UK getting a good deal?', Financial Times (15 September 2016) <https://www.ft.com/content/9037d7c4-7ade-11e6-b837-eb4b4333ee43> accessed 1 October 2018; Adam Vaughan, 'Fracking given UK go-ahead as Lancashire council rejection overturned', The Guardian (6 October 2016) < https://www.theguardian.com/environment/2016/oct/06/uk-fracking-given-go-ahead-as-lancashire-council-rejection-is-overturned> accessed 1 October 2018.

Against that background, the analysis presented in this chapter shows, in summary, that the construction of energy security and green energy links involves three competing ways of framing how energy security impacts on green energy development. These frames are not entirely clear cut and uniform amongst participants: (i) the positive frame, (ii) the negative frame and (iii) the emerging frame. Generally speaking, the positive frame, which associates energy security and green energy in a positive way, has the implication of promoting green energy development. The negative frame, which associates energy security and green energy in a negative way, has the implication of hindering green energy development; however, there is the potential shift in the debate surrounding the negative frame as a result of large-scale commercial energy storage. Finally, the emerging frame, centred on 'prosumers' as a new actor in the GB energy market, is challenging the current energy system and threatening the maintenance of the existing energy infrastructure.

6.1. Analysing the positive frame

Data analysis produced four themes associated with the interplay between energy security and law and policies on green energy development in a positive way: energy availability, energy diversification, energy independence and energy decentralisation. Participants deployed this positive frame to point out the importance of developing green energy to ensure energy security. In the analysis which follows, there has been no attempt to rank these themes in order of importance.

First, participants praised green energy for its wide availability, for not being subject to depletion like fossil fuel resources, and for delivering energy security as a result of its contribution to meeting energy demands and contribution, second, to the diversification of the energy matrix.[143]

Third, energy independence, in the sense of green energy being a domestic source and in the sense of less or no imported fossil fuels, was also mentioned in a positive way in relation to green energy, albeit raising some controversy. Participants pointed out that the emphasis on energy independence does not favour green energy exclusively as this argument has also been used extensively for fracking in the UK.[144]

Moreover, the debate about energy independence was criticised from two different perspectives: (i) less imported fossil fuel was seen as not completely shielding the energy sector from the price effects of a global constraint on oil and gas, and it was recognised that reducing high priced imports would not mean that everybody would be better off because of the way that energy markets work and because of customers contractual structures in place;[145]and (ii) energy independence was constructed as an outdated debate in the context of the current energy interdependence in GB, particularly as a result of installation of interconnectors with neighbouring European countries which allows for energy exportation when there is over-supply or energy importation when there is under-supply,[146] providing, of

[143] For example, interview with participant from the government sector on 11 October 2016, from the not-for-profit sector on 8 August 2016(b), from the not-for-profit sector on 19 August 2016.

[144] Interview with participant from the government sector on14 September 2016 and from the not-for-profit sector on 19 August 2016. See also, for example, Harry Cockburn, 'More than 6,000 Fracking Wells Needed in UK to Halve Gas Imports, Study Says', *Independent* (25 April 2018) <https://www.independent.co.uk/environment/fracking-uk-gas-imports-energy-environment-renewable-a8320661.html> accessed 6 October 2018.

[145] Interview with participant from the government sector on 14 September 2016.

[146] Interview with participant from the not-for-profit sector on 8 August 2016(a). Britain´s electricity market is currently interconnected with France, Netherlands, Northern Ireland and the Republic of Ireland. There are additional interconnector projects in place with France, Belgium, Norway, Denmark and Ireland with estimated delivery date from 2019 to 2021. See OFGEM, 'Electricity Interconnectors' <https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors> accessed 6 October 2018. There were discussions to build a power interconnector from Iceland to Britain, but this has been delayed due to Brexit. See Jemima Kelly and Nerijus Adomaitis, 'Giant Iceland-UK Power Cable Plan Seen Facing Brexit Delay', *Reuters* (21 October 2016) <https://uk.reuters.com/article/uk-britain-iceland-power-idUKKCN12L1O5> accessed 6 October 2016.

course, that the continental energy producers themselves are not under stress to produce more for their own local markets. Lindquist has argued that cross-border interconnectors have been seen as key to improving the reliability of the energy system and reducing power interruptions.[147] This position reveals a preference for an integrated energy system that is based on high quality infrastructure. Nevertheless, Brexit and the future uncertainty over the internal energy market was constructed as being capable of influencing the rhetoric around energy independence and energy security as Brexit could potentially make it harder to secure energy supplies from the Continent.[148]

Fourth, energy decentralisation – where a generation plant can be connected to the distribution network or off grid, at a location close to the point of use – as a characteristic of green energy deployment was constructed as contributing to energy security. By being able to supply energy in a decentralised manner, green energy was framed as contributing to the flexibility of the energy system and its resistance to central shocks or system-level failures.[149] Similar views can be found in the literature where decentralised energy systems are considered to have positive impacts in the operation of electric grids, as they increase system reliability and power quality, minimize land use effects, reduce grid congestion costs and the need of peak power supply, and allow savings in transmission and distribution losses whilst offering greater levels of energy security.[150] The literature on energy decentralisation,

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[147] Helena Lindquist, 'The Journey of Reinventing the European Electricity Landscape' in Lawrence E Jones (ed), *Renewable Energy Integration: Practical Management of Variability, Uncertainty, and Flexibility in Power Grids* (Elsevier 2017), 8.

[148] Interview with participant from the not-for-profit sector on 8 August 2016(b).

[149] Interview with participant from the not-for-profit sector on 14 September 2016.

[150] See, for example, Jon Coaffee, 'Risk, Resilience, and Environmentally Sustainable Cities' (2008) 36(12) Energy Policy 4633; K N Finney, V N Sharifi and J Swithenbank, 'The Negative Impacts of the Global Economic Downturn on Funding Decentralised Energy in the UK' 51(2012) Energy Policy 290; B Römer and others, 'The Role of Smart Metering and Decentralized Electricity Storage for Smart Grids: The Importance of Positive Externalities' (2012) 50 Energy Policy 486; M B Blarke and B M Jenkins, 'SuperGrid or SmartGrid: Competing Strategies for Large-scale Integration of Intermittent Renewables?' (2013) 58 Energy Policy 381; K Chmutina and CI Goodier, 'Alternative Future Energy Pathways: Assessment of the Potential of Innovative Decentralized Energy Systems in the UK'

however, also point to factors that can negatively impact energy security, such as increased need for load balancing[151] and the possibility of lack of coordination between different network operators.[152]

Thus, energy security concerns framed around energy availability, energy diversification, energy independence and energy decentralisation were generally advanced by participants as a positive frame which pushed forward the promotion of green energy development in the discourse.

6.2. "Energy security is being used as a stick to beat green energy with"[153]: Analysing the negative frame

Data analysis produced two themes associated with energy security and green energy development when framed negatively: grid upgrading issues and unreliability due to intermittency. This negative frame in the discourse had the implication of hindering green energy development. The allegation that some green energy projects in GB could generate energy but could not have the energy gridded due to grid upgrading issues[154] was constructed within the negative frame. In fact, there are large parts of the GB energy network which are in need of replacing or upgrading.[155] This shows that, although green energy can provide energy availability, modernisation of the electricity grid is a critical element to ensure energy

(2014) 66 Energy Policy 62; R Hoggett, 'Technology Scale and Supply Chains in a Secure, Affordable and Low Carbon Energy Transition' (2014) 123 Applied Energy 296.

[151] J Barton and others, *Distributing Power, a Transition to a Civic Energy Future* (Realising Transition Pathways Research Consortium 2015).

[152] Alfredo Vaccaro and others, 'An Integrated Framework for Smart Microgrids Modeling, Monitoring, Control, Communication, and Verification' (2011) 99(1) IEEE Proceedings 119; Eng Tseng Lau and others, 'Efficient Economic and Resilience-Based Optimization for Disaster Recovery Management of Critical Infrastructures' (2018) 11(12) Energies 3418.

[153] Interview with participant from the private sector on 17 August 2016.

[154] Interview with participant from the government sector on 22 July 2016.

[155] Department of Energy and Climate Change, *Delivering UK Energy Investment: Networks* (Department of Energy and Climate Change 2015).

security and has been used as an argument which negatively impacts green energy development.

Green energy's intermittent nature was also recurrently presented as negatively affecting the energy security element of reliability. An acknowledged issue with green energy sources, such as solar and wind energy, is the variability in its output. The period during which wind or solar power is produced is not controllable or even always predictable. These sources, therefore, do not produce power in synchrony with demand. In order to ensure energy security, it is, nonetheless, mandatory to permanently balance electricity production and consumption. The lack of balance has devastating consequences for the electrical network, including frequency and voltage variations. Beyond certain limits, these variations can result in damage to connected equipment as well as blackouts.[156] This, therefore, created a general indisposition among some participants to associate green energy sources with energy security in a positive way.

This negative frame was mainly constructed in connection with green energy's impact on the security of the electricity system, particularly the transmission system, due to challenges for the energy system operator to keep the system stable as a result of the intermittent character of green energy. As explained by one participant:

> […] the characteristics of green energy sources are such that they tend to mess up the smooth operation of the system and so they bring short-term energy security problems. Partly because they are normally intermittent, they don't run all the time or exactly when you need them, so you need back up sources

[156]Anthony Price, 'The Exploitation of Renewable Sources of Energy for Power Generation' in Jürgen Garche and Patrick T Moseley (eds), *Electrochemical Energy Storage for Renewable Sources and Grid Balancing* (Elsevier 2014), 5.

of supply to fill in the gaps which is expensive, because those sources are sitting around doing nothing for some time.[157]

As a result of the negative impact on the functionality of current electricity systems, green energy was framed as causing “genuine risks to energy security in the sense literally of the lights going out”.[158] In Japan, for example, a utility curbed the use of solar power supplies in order to maintain grid stability and avoid the threat of sudden blackouts.[159] The International Energy Agency (IEA) has underlined the point that the sweeping green energy generation revolution has propelled a new debate over the design of the evolving power market and electricity security.[160] Therefore, as shown under section 5, taking into account the political nature of interruption of energy supply in GB, capable of toppling governments, some participants have placed heavy weight on this negative frame surrounding the interplay between energy security and green energy in GB. That negativity is exemplified by a participant labelling green energy as a “threat” to the energy system’s operation.[161]

Those who contested this negative framing sought to refocus the debate on the role of technological advancement. Indeed, in regard to the operational aspects of green energy integration by transmission system operators (TSOs) and distribution system operators (DSOs), the variability of electricity generation from green energy has led many not to rule it out but to call for the use of new technologies to make better production forecasts and

[157] Interview with participant from the government sector on 20 October 2016.
[158] Interview with participant from the government sector on 20 October 2016.
[159] Reuters, ‘Japan's Kyushu Elec Restricts Renewable Energy Supplies for First Time’, *Reuters* (15 October 2018) <https://www.reuters.com/article/japan-nuclear-renewables-restrictions/japans-kyushu-elec-restricts-renewable-energy-supplies-for-first-time-idUSL4N1WS390> accessed 15 October 2018.
[160] The International Energy Agency, ‘World Energy Outlook, OECD/IEA 2016, 1 <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlook2016ExecutiveSummaryEnglish.pdf> accessed 16 October 2018.
[161] Interview with participant from the government sector on 14 September 2016.

increase grid flexibility.[162] In an attempt to reverse key aspects of the negative frame, these short-term energy security challenges, particularly grid balancing, were framed positively as stimulating innovation via the development of new energy technologies, such as energy storage.[163] Large scale commercial energy storage was also advanced as one of the answers to the short-term energy security challenges that come with green energy deployment in the system,[164] where energy storage would constitute a "game changer"[165] or, as Winfield, Shokrzadeh and Jones have put it, a "technology which may disrupt conventional utility models".[166] According to one participant:

> They say that energy will be too cheap to bill because it will be everywhere. I am sure you have seen how much energy is hitting the earth at any given time and how much of that energy we are capturing and using, it is very small. If we are able to harness a percentage of the solar power and store it in batteries, then you wouldn't need anything else.[167]

While the addition of energy storage technologies to the energy system addresses some problems, however, it also raises legal, regulatory and social issues, such as lack of agreed legal definition of energy storage,[168] jurisdictional uncertainty to regulate energy

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[162] Helena Lindquist, 'The Journey of Reinventing the European Electricity Landscape' in Lawrence E Jones (ed), *Renewable Energy Integration: Practical Management of Variability, Uncertainty, and Flexibility in Power Grids* (Elsevier 2017), 7.

[163] Interview with participants from the private sector on 17 August 2016(a) and (b). Energy battery and solar technology, for instance, are being installed at 100 homes in Cornwall, UK as a trial. See Michael Holder, 'Clean energy technologies could save UK industry £540m on bills', *Business Green* (24 September 2018) < https://www.businessgreen.com/bg/news/3063237/report-clean-energy-technologies-could-save-uk-industry-gbp540m-on-bills> accessed 6 October 2018.

[164] Interview with participants from the government sector on 20 October 2016.

[165] Interview with participants from the private sector on 25 August 2016 and from the government sector on 20 October 2016.

[166] Mark Winfield, Shahab Shokrzadeh and Adam Jones, 'Energy Policy Regime Change and Advanced Energy Storage: A Comparative Analysis' (2018) 115 Energy Policy 572, 572.

[167] Interview with participants from the private sector on 25 August 2016.

[168] Penelope Crossley, 'Defining the Greatest Legal and Policy Obstacle to Energy Storage' (2013) 4 Renewable Energy Law and Policy Review 268.

storage facilities and the services they provide as well as costs recovery uncertainty,[169] contractual issues in the context of energy storage services[170] and issues of social acceptance of and resistance to energy storage as a technological change to the energy system.[171]

It is acknowledged that low-cost, reliable, and efficient methods to store energy would constitute a valuable addition to a network with a high penetration of green energy generation.[172] Nevertheless, energy storage is not yet a technology that has been commercially proven at large scale and readily available at low cost, although we can see widespread energy storage projects worldwide[173] and in GB.[174] An analysis of participants' narratives shows large-scale commercial energy storage to be an essential factor to shift the negative frame to a positive frame surrounding the interplay between energy security and law and policies on green energy development. Thus, in order to increase the share of green energy in the energy system in GB and move towards a low carbon energy system, further investment and research in this area are necessary to lower the cost, increase scalability of energy storage technologies as well as understand legal, regulatory and social issues around the addition of energy storage technologies to the energy system.

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[169] Amy L Stein, 'Reconsidering Regulatory Uncertainty: Making a Case for Energy Storage' (2014) 41 Florida State University Law Review 697.
[170] Andrew Burlinson and Monica Giulietti, 'Non-traditional Business Models for City-scale Energy Storage: Evidence from UK Case Studies' (2018) 45(2) Economia e Politica Industriale 215.
[171] Patrick Devine-Wright and others, 'A Conceptual Framework for Understanding the Social Acceptance of Energy Infrastructure: Insights from Energy Storage' (2017) 107 Energy Policy 27.
[172] Anthony Price, 'The Exploitation of Renewable Sources of Energy for Power Generation' in Jürgen Garche and Patrick T Moseley (eds), *Electrochemical Energy Storage for Renewable Sources and Grid Balancing* (Elsevier 2014), 7.
[173] There are more than 800 energy storage projects worldwide. See US Department of Energy, 'Global Energy Storage Database: Projects', 2016. <http://www.energystorageexchange.org> accessed 10 January 2019.
[174] So far a total of 40 energy storage projects are currently operational in the UK, according to the United States' Department of Energy. See US Department of Energy, 'Global Energy Storage Database: Projects', 2016. <http://www.energystorageexchange.org> accessed 10 January 2019.

6.3. Analysing the emerging frame: 'Prosumers' and energy security

Adding green energy to the power sector has given rise to a new actor in the energy debate called the "prosumer", defined as "an energy user who generates renewable energy in his/her domestic environment and either stores the surplus energy for future use or trades to interested energy customers in smart grid.[175] Other definitions of prosumers are found in the literature.[176] However, in general, prosumers are both producers and consumers of energy and they can also trade energy surpluses. Nowadays, the concept of 'energy prosumer' is gaining more ground within the energy market as multiple consumers produce domestically electricity.[177] A recent study, for instance, speculated that by 2050, 44% of UK energy could be generated by prosumers.[178] It has also been predicted that the number of British energy 'prosumers' could grow from one million in 2015 to 24 million by 2050.[179]

Prosumers are an illustration of how the deployment of emerging green energy technologies has disrupted the manner in which the existing network and energy sector operate, by creating a shift in the value chain from transmission through distribution. Electrical power systems are usually broken down into 3 element types: generation, transmission, and distribution. The current energy system structures in GB revolve around

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[175] A D Rathnayaka and others, 'Framework to Manage Multiple Goals in Community-based Energy Sharing Network in Smart Grid' (2015) 73 International Journal of Electrical Power & Energy Systems 615.
[176] Y Parag and B K Sovacool, 'Electricity Market Design for the Prosumer Era' (2016) 1 Nature Energy 1; R Zafar and others, 'Prosumer Based Energy Management and Sharing in Smart Grid' (2018) 82 Renewable and Sustainable Energy Reviews 1675.
[177] Junyeon Hwang and others, 'Energy Prosumer Business Model Using Blockchain System to Ensure Transparency and Safety' (2017) 141 Energy Procedia 194, 194.
[178] Bettina Kampman, Jaco Blommerde and Maarten Afman, *The Potential of Energy Citizens in the European Union* (CE Delft 2016), 23. Good Energy, 'Community Energy", October 2016, 4 <https://www.goodenergy.co.uk/media/3538/good-energy_community-energy-report_oct-16.pdf> accessed 10 October 2016.
[179] Ian Clover, 'UK Could Be Home to 24 Million Clean Energy Prosumers by 2050, Says Report', *PV Magazine* (27 September 2016) <https://www.pv-magazine.com/2016/09/27/uk-could-be-home-to-24-million-clean-energy-prosumers-by-2050-says-report_100026268/> accessed 10 October 2018.

large-scale centralised generation to deliver energy security. The electricity transmission system operator in Britain is a monopoly, performed by National Grid Electricity Transmission plc (National Grid),[180] which is responsible for ensuring the stable and secure operation of the whole transmission system,[181] and the distribution network is run (and owned) by the UK's Distribution Network Operators (DNOs). There are now 6 DNOs running the 14 distribution networks in England, Scotland and Wales,[182] and the dominant supply business model has been the corporate utility (commonly known as 'the big six' in the UK), selling units of energy to consumers in national markets.[183]

However, the installation of photovoltaic (PV) panels in properties, for example, along with storage technologies is changing the roles played by the participants in the energy system. For instance, solar energy is directly transmitted to the property via installed solar panels and can be stored via the use of domestic energy storage.[184] As a result, consumers can generate, store and consume energy independently from the grid, reducing, as such, revenues for the utilities sector, and replacing the traditional role of an energy supplier. Thus, prosumers are altering the fundamental geography of energy networks, blurring previously fixed distinctions between consumers and producers, sites of energy

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[180] For an overview about the National Grid, see Pierre Bernard, Marta Navarrete Moreno and Aurore Vanhay, 'An Overview of the Evolution of the European Unbundling Process in the Electricity Sector: The Cases of France, the UK and Belgium' (2013) 3 European Energy Journal 24.

[181] OFGEM, 'The GB Electricity Transmission Network' < https://www.ofgem.gov.uk/electricity/transmission-networks/gb-electricity-transmission-network> accessed 6 October 2018.

[182] OFGEM, 'The GB Electricity Distribution Network < https://www.ofgem.gov.uk/electricity/distribution-networks/gb-electricity-distribution-network> accessed 10 October 2018.

[183] M J Hannon, T J Foxon and W F Gale, 'The Co-evolutionary Relationship between Energy Service Companies and the UK Energy System: Implications for a Low-carbon Transition' (2013) 61 Energy Policy 1031.

[184] See, for example, Andy Colthorpe, 'Duracell to Launch AI-enabled Home Battery System Next Month for UK Market', *Solar Power Portal* (4 October 2018) <https://www.solarpowerportal.co.uk/news/duracell_to_launch_ai_enabled_home_battery_system_next_month_for_uk_market> accessed 6 October 2018.

production and of use, and the relationship between supply and demand in general.[185] This transformation in the energy system structure has recently been acknowledged by the Secretary of State for Business, Energy and Industrial Strategy in his statement that '[t]he distinction between [energy] supplier and distributor may no longer hold in this new world'.[186]

The appearance of prosumers has been claimed to have both positive and negative implications for energy security. According to Staffell, prosumers add to energy security by, for instance, reducing the need for new generation and infrastructures by generating energy where it is used and by adding to the diversity of the energy supply.[187] However, in an opposite vein, one participant pointed out how prosumers can have a negative impact on energy security. This participant advanced issues related to undermining the integrity of the national energy networks, ownership of the assets and consumer law issues as prosumers impact the perceived fairness of who pays for the physical maintenance and operation of the energy network infrastructure.[188]

Those engaged in producing and consuming their own energy do not want to pay for the maintenance of the energy infrastructure, but if the energy network costs are shifted onto a smaller group of energy consumers, their electricity costs can become very high. This means that prosumers have important consequences for future revenues related to the energy infrastructure. As seen under section 5, the physical maintenance of the energy infrastructure

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[185] Katherine Ellsworth-Krebs and Louise Reid, 'Conceptualising Energy Prosumption: Exploring Energy Production, Consumption and Microgeneration in Scotland, UK' (2016) 48(10) Environment and Planning 1988, 1989.
[186] The Rt Hon Greg Clark MP, 'After the Trilemma - 4 Principles for the Power Sector', Speech on the future of the energy market on 15 November 2018 <https://www.gov.uk/government/speeches/after-the-trilemma-4-principles-for-the-power-sector> accessed 9 January 2019.
[187] Iain Staffell and others, *Domestic Microgeneration: Renewable and Distributed Energy Technologies, Policies and Economics* (Routledge 2015).
[188] Interview with participants from the government sector on 20 October 2016.

from deterioration was advanced as one of the elements of energy security and, with the introduction of green energy to the system, grid modernisation is also needed. Maintenance and upgrading of the energy infrastructure are, however, costly processes[189] which can be jeopardised if funding is not available.

Diesendorf and Elliston also add that the increase in local energy self-reliance may reduce the political power of the large energy utilities and the fossil and nuclear power industries.[190] This, therefore, may also cause resistance to further deployment of green energy via prosumers. In any case, the appearance of prosumers is evidence that the energy system is evolving into a more decentralised, distributed and multi-directional energy grid. With an increasing share of green energy in GB and with the introduction of home energy storage to the market,[191] the role of consumers as active participants in the energy system, as energy producers and/or suppliers is bound to increase. Further research on the implications of prosumers for the energy system is, therefore, needed.

One can observe that technological advances, such as energy storage, and the appearance of prosumers are bringing a shift in the frame of the debate. Where green energy was presented as being an energy security concern mainly as a result of supply interruption in the electricity system due to its intermittent nature, as new technologies come on-stream now it is increasingly being presented as a concern because it undermines the integrity of national energy networks, disrupting the traditional way of doing things, disturbing the

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[189] In March 2018, around £250 of a typical household's dual fuel energy bill went towards running and maintaining the network - around a fifth of an overall bill of £1,100, see OFGEM, 'How the Energy Networks Work for You' <https://www.ofgem.gov.uk/network-regulation-riio-model/how-energy-networks-work-you> accessed 16 October 2018.

[190] Mark Diesendorf and Ben Elliston, 'The Feasibility of 100% Renewable Electricity Systems: A Response to Critics' (2018) 93 Renewable and Sustainable Energy Reviews 318, 319.

[191] Emma Woollacott, 'How Your Home Could Generate, Store and Sell Energy' *BBC News* (26 June 2018) <https://www.bbc.co.uk/news/business-44540726> accessed 10 October 2018.

'business as usual' scenario, driving changes in old monopoly industries and "forcing big monopoly industries to start thinking differently".[192] How monopolies, such as the electricity transmission system operator, adapt to these changes has been raised as a current challenge. As a participant put it, "how do you transform a massive business like the National Grid to go from being quite rules based, loving the process and doing the same old thing, quite stagnant, quite stale and not very agile to start being more like a Google or a Tesla?"[193]

Indeed, policies favouring more distributed or decentralised electricity generation have led to concerns in some circles about a 'death spiral' for traditional monopoly electric utilities.[194] This demonstrates the need for energy players to learn how to effectively manage the uncertainties associated with the technological advancements which play a critical role in offsetting the inherently variable nature of green energy sources and can fundamentally change electricity market dynamics. As pointed out by a participant, "any business that has tried to be defensive has just died, it is just death by a thousand cuts".[195] It cannot be denied that changes to adapt and improve the energy system in GB are greatly needed in the just energy transition. The solution then may be to embrace the changes rather than fight them.

In light of the above, then, it becomes clear that the relationship between energy security and green energy is being constructed as a dilemma. On the one hand, green energy is constructed as offering solutions to many energy supply challenges by being able to provide environmentally-friendly availability of energy, energy independence and diversification. On the other, it is constructed as a threat to the current energy system in two different ways: (i) as a threat to short-term energy security as a result of grid balancing and intermittency issues;

[192] Interview with participant from the private sector on 11 August 2016.
[193] Interview with participant from the private sector on 11 August 2016.
[194] Robert C Armstrong and others, 'The Frontiers of Energy' (2016) 1 Nature Energy 1, 2.
[195] Interview with participant from the private sector on 11 August 2016.

and (ii) as a threat to the maintenance of the current energy infrastructure as well as to the current electricity market dynamics and its dominant players as a result of technological development and challenges associated with consumers seeking independence from utilities through energy self-sufficiency. One can observe, therefore, that green energy is framed as tackling energy security issues, but also being the cause for the upsurge of emerging energy security problems.

This section has demonstrated that the links between energy security and green energy are far from straightforward. It has also revealed how existing discursive constructions are broadening, deepening and transforming the relationship between energy security and law and policies on green energy as well as showing its complexity, particularly as a result of technological innovation and the introduction of new challenges to energy infrastructure and market operators following the increasing integration of green energy sources into the system. These challenges will certainly benefit from further research for a deep and thorough analysis in terms of solutions, particularly in how legal and regulatory frameworks can assist in tacking those issues.

7. Conclusion

This chapter delved into the interplay between energy security and law and policies on green energy in the context of Great Britain. It sought to examine empirical perceptions of leading energy experts in GB, by presenting the discursive realities according to participants. The analysis revealed a contested terrain around the topic. In terms of how participants construed energy security, although the majority of the on-the-ground views on energy security definitions focused on the elements of availability and reliability, there was a multiple framing employed by leading energy experts as part of discursive contests that led to divergent constructions of energy security. While some participants from the not-for-profit sector advanced a definition in line with broader scholarly concepts of energy security with the inclusion of climate change, environmental and social considerations, participants from the private and government sectors presented a narrower view on energy security, focusing mainly on availability and reliability alone. Interestingly, there was no consensus amongst interviewees from different sectors in relation to the inclusion of affordability within the meaning of energy security either, as affordability was absent from definitions of participants from the private sector and could only be found in the energy security concepts of one participant from the government and one participant from the not-for-profit sector.

Thus, this study has found that somewhat missing are attempts in industry and government to open up the energy security definition to broader issues of environmental protection, climate change and social inclusion and only a minority of definitions included affordability within the concept of energy security. What this shows, therefore, is that the broader concepts of energy security presented in the literature have not been fully incorporated into practice yet. One of the consequences of the non-inclusion of these elements within the concept of energy security is that energy law and policies pursuing energy security can be created which negatively impact affordability, the climate, the environment and social inclusion. Encapsulating these elements within the concept of energy security would, therefore, assist the move towards a just energy transition, as law and policies pursuing energy security would need to be justified under this broader frame, with much present law and policy falling short of that standard.

Different indicators of energy security were also seen differently by different sectors with participants' accounts standing in direct contrast to each other. For instance, although control over energy sources was treated as important by participants from all sectors, it was cast in opposing terms from, on the one hand, having control via reliance on indigenous sources of energy supply to, on the other, having control via the ability to effectively manage energy supply from around the world. This broad spectrum of energy security definitions and indicators along with a general acknowledgement of the emotional language associated with discussions of energy security also showed that the language of energy security can be manipulated for one's own interest and used to advance a particular point of view. The analysis, therefore, reminds us that energy security meanings reflect contradiction and contestation, and that the concept possesses interpretive flexibility exploited by different protagonists to advance their own positions.

These divergent constructions of energy security by leading energy experts from different sectors of the economy in GB do not promote effective communication amongst the sectors, but instead create more distance and misunderstanding. Participants, for instance, may be referring to energy security from very different perspectives or may be selecting particular aspects of energy security to suit their agenda when making it an issue. It is critical, therefore, to distinguish the different elements of energy security upfront in order to have any meaningful debate surrounding the topic. This diversity of ways in which energy security was constructed by participants also shows that there is not a single or common solution for achieving energy security and efforts to improve energy security in the country will have to attenuate themselves to different audiences.

Another principal finding in this chapter was that energy security in GB is first and foremost a political issue and governments will be held responsible and accountable for energy supply interruption in the country. The analysis of the empirical data showed that, according to participants' narratives, energy politicisation in GB is hindering green energy development as a result of three factors: vested interests, unequal lobbying power and association of green energy with left-wing politics. Therefore, these issues need to be managed to increase the deployment of green energy in the energy system in GB, and law and policies in this area may be useful to tackle these issues.

The analysis also found that the construction of energy security and green energy links have been characterised by competing perspectives on how energy security construction is impacting green energy development. Three frames were found which were not entirely clear cut and uniform amongst participants: (i) the positive frame, where energy availability, energy diversification, energy independence and energy decentralisation were generally advanced by participants as a positive frame which pushed forward the promotion of green energy development in the discourse; (ii) the negative frame, where grid upgrading issues and unreliability of green energy due to grid balancing challenges and its intermittent nature were construed as hindering green energy development. However, there is the potential shift in the debate surrounding the negative frame as a result of large-scale commercial energy storage; and (iii) the emerging frame, focused on 'prosumer' as a new actor in the energy market which is challenging the current energy system and threatening the maintenance of the current energy infrastructure.

The interplay between energy security and law and policies on green energy development is, therefore, far from being straightforward. On the one hand, green energy was constructed as offering solutions to core energy security challenges by being able to provide environmentally-friendly availability of energy, energy independence, decentralisation and diversification. On the other, it was constructed as a threat to the current energy system in two different ways: (i) as a threat to short-term energy security as a result of grid upgrading issues, grid balancing and intermittency issues; and (ii) as a threat to the maintenance of the energy infrastructure as well as to the current electricity market dynamics and its dominant players as a result of technological development and challenges associated with consumers seeking independence from utilities and desiring energy self-sufficiency. One can observe, therefore, that green energy was framed as a means to tackle energy security issues, but also a cause for the upsurge of emerging energy security problems.

These findings reveal how existing discursive constructions are broadening, deepening and transforming the relationship between energy security and law and policies on green energy as well as showing its complexity, particularly as a result of technological innovation and the emergence of new challenges to energy infrastructure and market operators following the increasing integration of green energy sources into the system. These challenges will certainly benefit from further research and analysis in terms of solutions, particularly in terms of how the legal and regulatory framework can assist in tackling those issues and supporting the transition to a green energy system in GB.

By presenting the multiple voices of participants from different sectors of the economy in GB, this chapter calls for integration and dialogue so to contribute to a more sophisticated debate amongst energy players. This, in turn, would help achieve a better understanding of the current challenges posed to the energy transition. It was not possible to explore in depth all the concerns advanced by participants in this chapter. However, the discussion and findings are valuable in pointing to areas for future research as well as informing the analysis of the interplay between energy security and green energy in the law of the WTO under chapter 6.

In line with the approach adopted in this thesis, one which aims to capture a plurality of views and the discursive frames that arise from them, the next chapter examines the official discourse surrounding energy security and law and policy on green energy development in Brazil, an example of a perspective from an emerging economy with a dominant low carbon energy system. The contextual variations provided by the case study on Brazil in the next chapter cast further light on the nexus of interests at work across this contested field.

CHAPTER 5

ENERGY SECURITY AND GREEN ENERGY IN BRAZIL: THE DISCOURSE OF ECONOMIC DEVELOPMENT

1. Introduction

1.1. Aim and contribution of the chapter

As in the case study on Great Britain, this chapter aims to answer the research questions at the centre of this thesis in the context of Brazil: (i) how has energy security been discursively constructed? (ii) what are the discursive links between energy security and law and policies promoting green energy? (iii) what are the implications of energy security construction to law and policy on green energy development? As yet, there is no definitive, agreed-upon understanding of the meaning of the term 'green energy', and it is not the objective of this work to analyse the debate surrounding what types of energy sources fall within the 'green' category. For the purpose of this chapter, green energy is referred to as alternative energy sources, a term that is prevalent in the Brazilian discourse, and includes wind, solar, bioenergy and small-scale hydropower[1] energy resources.

The discussion which follows attempts to contribute to the need to overcome the complicated situation which humankind currently faces in ensuring energy security without environmental and climate change imbalances and with social justice globally. It is widely acknowledged that the energy transition of the 21st century will need to be rapid.[2] In order

[1] The concept of small hydropower under Brazilian regulation includes installed capacity of 30,000 KW and a maximum inundated area of reservoir of 3 km². See ANEEL Resolution 394 of 4 December 1998.

[2] See, for example, Barry D Solomon and Karthik Krishna, 'The Coming Sustainable Energy Transition: History, Strategies, and Outlook' (2011) 39(1) Energy Policy 7422; Benjamin K Sovacool, 'How Long Will It Take? Conceptualizing the Temporal Dynamics of Energy Transitions' (2016) 13 Energy Research & Social Science 202.

to assist moves towards the goal of a just low-carbon energy transition taking place as well as to ensure that the share of green energy deployment to energy systems is increased worldwide, it is crucial to understand the connections between energy security and green energy in diverse contexts. The fact that Brazil has a very different energy system and energy law and policies from Great Britain makes Brazil a relevant case study to add variety and complexity to the analyses presented in the thesis and, as a result, bring additional understanding. As with the case study of GB, the findings of the case study of Brazil will also serve to inform the legal analyses surrounding room for green energy security in the law of the World Trade Organisation (WTO) under chapter 6.

Brazil is an emerging economy which has and will have to cope with a strong increase in energy demand in the future. The country currently ranks 10th in the world in terms of energy consumption[3] and has a population of more than 208.5 million inhabitants,[4] which grew 21 per cent when compared to 2001[5] and is predicted to grow almost another 30 million by 2047.[6] This, combined with efforts to climb the ladder of socioeconomic development, mean that energy demand in Brazil is likely to rise sharply. The latest BP Energy Outlook report, for instance, foresaw a growth of 60 per cent in Brazil's energy consumption by 2040.[7]

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[3] Central Intelligence Agency, 'The World Factbook', <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2233rank.html> accessed 6 November 2018.

[4] Estimate provided by Resolution 2 of 28 August 2018 of the Brazilian Institute of Geography and Statistics, available at http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=515&pagina=55&data=29/08/2018.

[5] Daniel Silveira, 'Brasil Tem Mais de 208,5 Milhões de Habitantes, segundo o IBGE', *Economia* (29 August 2018) <https://g1.globo.com/economia/noticia/2018/08/29/brasil-tem-mais-de-208-milhoes-de-habitantes-segundo-o-ibge.ghtml> accessed 6 November 2018.

[6] Carlos Brito and Darlan Alvarenga, 'População Brasileira Chegará a 233 Milhões em 2047 e Começará a Encolher, Aponta IBGE', *Economia* (25 July 2018) <https://g1.globo.com/economia/noticia/2018/07/25/populacao-brasileira-chegara-a-233-milhoes-em-2047-e-comecara-a-encolher-aponta-ibge.ghtml> accessed 6 November 2018.

[7] BP, 'BP Energy Outlook 2018 – Brazil' <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018-country-insight-brazil.pdf> accessed 6 November 2018.

Globally, Brazil has one of the highest shares of energy generated from renewable sources[8] and, according to the International Energy Agency, it has the greenest energy mix worldwide.[9] The Brazilian power sector, however, is dominated by large-scale hydropower, an energy source which has become controversial as a result of its environmental and social impacts,[10] as well as due to studies demonstrating that large-scale hydropower plants have the potential to produce high amounts of methane – a greenhouse gas – owing to methane leakage that can take place when areas are flooded to create reservoirs.[11] Brazil is also a leading producer and consumer of bioenergy and has been a pioneer in the worldwide promotion of and support to biofuels, discursively emphasising, in particular, the right to social and economic development and the needs of poorer communities.

Against this background, the case of Brazil brings value and novelty to this work because of two main reasons: (i) there is a lack of comprehensive socio-legal energy studies research in developing countries[12] – which, as pointed out by Sovacool, "are the very places

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[8] In the power sector, renewable sources account for 80.4% of the domestic supply of electricity in Brazil. See, Ministério de Minas e Energia (MME), *Balanço Energético Nacional 2018: Ano Base 2017* (Ministério de Minas e Energia, Empresa de Pesquisa Energética 2018), 16.

[9] Fatih Birol, 'Renewables 2018: Market Analysis and Forecast from 2018 to 2023' <https://www.iea.org/renewables2018/> accessed 6 November 2018.

[10] See, for example, D M Rosenberg, R A Bodaly and P J Usher, 'Environmental and Social Impacts of Large Scale Hydroelectric Development: Who Is Listening?' (1995) 5(2) Global Environmental Change 127; Michael M Cernea, 'Hydropower Dams and Social Impacts: A Sociological Perspective', The World Bank Paper No. 16 January 1997 <http://documents.worldbank.org/curated/en/446311468761673943/585559324_20040283053533/additional/multi-page.pdf> accessed 6 November 2018; André Marconato Ramos and Humberto Prates da Fonseca Alves, 'Conflito Socioeconômico e Ambiental ao Redor da Construção da Usina Hidrelétrica Belo Monte' (2018) 46 Desenvolvimento e Meio Ambiente 174; Philip Martin Fearnside, 'Belo Monte: Atores e Argumentos na Luta sobre a Barragem Amazônica mais Controversa do Brasil' (2018) 1(42) Revista NERA 1; Antti P Eloranta and others, 'Hydropower Impacts on Reservoir Fish Populations Are Modified by Environmental Variation' (2018) 618(5) Science of The Total Environment 313.

[11] N Barros and others, 'Carbon Emission from Hydroelectric Reservoirs Linked to Reservoir Age and Latitude' (2011) 4 Nature Geoscience 593; Benjamin L Miller and others, 'Methane Ebullition in Temperate Hydropower Reservoirs and Implications for US Policy on Greenhouse Gas Emissions' (2017) 60 Environmental Management 615.

[12] Benjamin K Sovacool, 'What Are We Doing Here? Analysing Fifteen Years of Energy Scholarship and Proposing a Social Science Research Agenda', (2014) 1 Energy Research and Social Science 1, 8.

in the world where future growth in energy demand will likely be the greatest, [but] where capacity to acquire capital and technology will be the most limited"[13] – and (ii) although there are case studies of Brazil in the area of energy law,[14] there is absence of studies on the construction of energy security in Brazil in particular.[15]

1.2. Structure of the chapter

To set the stage for this analysis of energy security and green energy in Brazil, this chapter starts with a brief background to the energy governance in Brazil. It then outlines the investigative method used to gather and analyse the data it is based around. In line with the methodological approach adopted in this thesis and explained in chapter 2, socio-legal discourse analysis, this chapter traces the way that energy security is construed and given meaning and significance through the articulation and production of 'texts' of many kinds, from speeches to policy statements and laws, with emphasis on the energy security discursive frames' role in constructing or deconstructing green energy initiatives. As underscored several times already, understanding the discursive framing of energy security and its links with law and policies on green energy development is important because when one frame is selected from amongst a range of competing frames it has consequences for how green energy development is subsequently seen and acted on.

[13] Benjamin K Sovacool, 'What Are We Doing Here? Analysing Fifteen Years of Energy Scholarship and Proposing a Social Science Research Agenda', (2014) 1 Energy Research and Social Science 1, 22.
[14] See, for example, Maria-Augusta Paim and others, 'Evaluating regulatory strategies for mitigating hydrological risk in Brazil through diversification of its electricity mix' (2019) 128 Energy Policy 393.
[15] A recent literature survey covering 104 energy security studies, identified 68 country-specific energy security studies and none of them referred to Brazil, see B W Ang, W L Choong and T S Ng, 'Energy security: Definitions, Dimensions and Indexes' (2015) 42(1) Renewable and Sustainable Energy Reviews 1077, 1082.

The first product of this approach is an initial analysis of the socio-legal factors underpinning the emergence of national rules that have encouraged the promotion of green energy initiatives through national policymaking. This examination of socio-legal factors provides the groundwork for an analysis of the interplay between energy security and green energy law and policies in Brazil. The purpose of this deeper level of analysis is to reveal how the concept of energy security is conceptualised and contextualised in Brazil within the period of analysis (January 2001-December 2015). This is useful as energy security constructions are analysed not at a static point in time, but over a period of years. Such enhanced analysis better captures the heterogeneity of perspectives advanced in a national context, the findings of which may require policymakers, planners and analysts to re-examine their own assumptions about what energy security is, and how it can be best improved. Following this, this chapter then moves on to analyse and reflect upon the ways in which the discursive links between energy security and green energy law and policies have been forged in practice.

1.3. Summary of findings

This chapter will demonstrate that energy security is discursively framed differently in different green energy law and policies within different energy sectors. Due to its importance to economic and social stability in Brazil, when a positive frame in relation to the links between energy security and green energy development is made, it has the implication of promoting green energy. On the contrary, when a negative frame on the connections between energy security and green energy development is formed, it has the implication of hindering green energy development. In particular, this chapter will reveal two main findings: (i) that a positive frame for energy security and green energy connection is advanced in the context of the transport sector, which, as a result, supported biofuels development; and (ii) that a dominant negative frame is advanced in the context of deployment of green energy, solar and wind in particular, in the electricity system in Brazil, which, as a result, hindered solar and wind energy technologies and promoted fossil fuels development. This negative frame coupled with the absence in the official discourse of reference to emerging innovative technologies with the potential to minimise green energy intermittency issues, such as energy storage and smart grid, have had the result of contributing to Brazil moving in an opposite direction to a low carbon energy transition.

This chapter argues that Brazil should be seeking further diversification of its energy matrix by increasing the share of green energy sources and creating supportive laws and policies for the development, commercialisation and deployment of emerging green energy technologies to unlock their potential for the country. In order to assist with this task, a dominant positive frame should be forged in relation to the interplay between energy security and wind and solar energy development, and a broader concept of energy security should be incorporated in law and policies. This chapter also points out that further research is needed to identify the legal, regulatory and social challenges in order to enable the development, commercialisation and deployment of emerging green energy technologies in Brazil, particularly around energy storage and smart grid.

2. Background to energy governance in Brazil

The President of the Republic of Brazil (President) is both the head of State and the head of government.[16] A number of government institutions are involved in the development

[16] Constitution of the Federative Republic of Brazil, article 84.

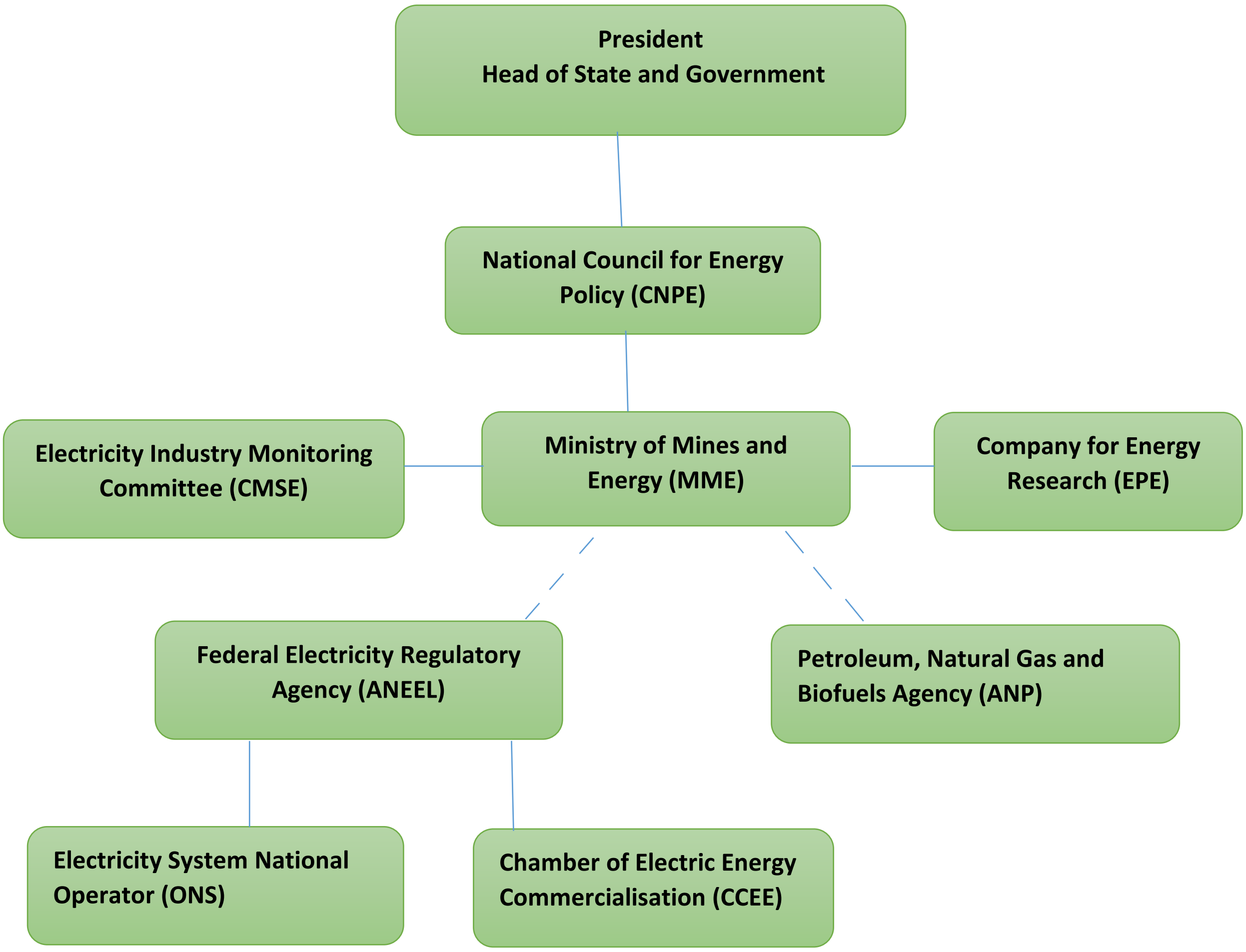
of energy policies in Brazil, as shown in figure 1 below. In terms of institutions, at the top of the organogram is the National Council for Energy Policy (CNPE). The CNPE is directly linked to the Presidency of the Republic with the attribution of proposing to the President national energy policies.[17] The final decision of the proposed energy policies by the CNPE lies with the President who then ultimately defines the national energy policy of the country.[18]

The Ministry of Mines and Energy (MME) is another key agency directly related to the Brazilian energy policymaking process. The MME is responsible for the planning, supervision and implementation of national energy policies.[19] The President has the exclusive power to appoint and dismiss the Minister of the MME without participation of the National Congress.[20] The planning of the energy sector by the MME is supported by research carried out by the Company for Energy Research (EPE).[21] The Electricity Industry Monitoring Committee (CMSE) supervises the continuity and security of electricity supply in the country.[22] The Federal Electricity Regulatory Agency (ANEEL) is responsible for regulating and controlling the generation, transmission, distribution and commercialisation of electricity in compliance with national policies and existing legislation.[23] The Electricity System National Operator (ONS) coordinates and controls the generation and transmission of electricity in the National Interconnected System (Sistema Interligado Nacional – SIN) under the regulation and control of ANEEL.[24] The Chamber of Electric Energy Commercialisation (CCEE) manages the operation of the Brazilian power market and, by delegation of ANEEL, execute the regulated

[17] Law 9,478 of 6 August 1997, article 2, and Provisional Measure N 870 of 1 January 2019, article 14.
[18] Law 9,478 of 6 August 1997, article 2, and Provisional Measure N 870 of 1 January 2019, article 14.
[19] Ministério de Minas e Energia, 'Competências' <http://www.mme.gov.br/web/guest/acesso-a-informacao/institucional/competencias> accessed 11 May 2019.
[20] Constitution of the Federative Republic of Brazil, article 84.
[21] Law 10,847 of 15 March 2004.
[22] Law 10848 of 15 March 2004, article 14.
[23] Law 9,427 of 26 December 1996.
[24] Law 9648 of 27 May 1998, article 13.

power auctions.[25] The Petroleum, Natural Gas and Biofuels Agency (ANP) is responsible for regulating the petroleum, natural gas and biofuels industry in Brazil.[26]

Figure 1: Institutional structure of the energy sector in Brazil



Source: Author's own.

[25] Law 10848 of 15 March 2004, article 4.
[26] Law 9,478 of 6 August 1997, as amended by Law 11,097 of 13 January 2005 and by Law 12,490 of 16 September 2011.

3. Method

3.1 Data selection

The method of data selection adopted in this chapter follows the principle of a top-down approach, starting from a 'universe of possible texts'[27] and progressively narrowing the choices. All of the texts taken into consideration refer to energy matters. The initial set of texts identified according to that criterion were then sampled according to the Relevance Sampling Method, also known as 'purposive sampling'.[28] They were sampled according to the timeframe (only texts from January 2001 to December 2015 are included), theme (energy supply) and additional relevance criteria (e.g. via a focus on documents from relevant energy bodies). This method of data selection yielded 162 texts. These are not meant to be taken as representative of a population of texts; rather, they are the population of relevant texts, excluding the textual units that do not possess relevant information.[29] The documents were obtained from the Brazilian National Archive, the President of the Republic Archive and the Federal Senate Archive during the author's stay in Brazil from December 2015 to February 2016. All the official documents selected for analysis are outlined in chronological order in Annex 1.

In terms of identifying relevant official texts, the analysis revealed that several government bodies are involved in the development of green energy in Brazil. However, for the purpose of analysis only the main regulatory instruments and documents of the main bodies with direct responsibility for the development of energy in the country were selected

[27] Stefan Titscher and others, *Methods of Text and Discourse Analysis* (Sage 2000), 33.
[28] K Krippendorf, *Content Analysis: An Introduction to its Methodology* (Sage Publications, Inc 2004), 119.
[29] Ibid.

– the Ministry of Mines and Energy (MME), the Brazilian Federal Electricity Regulatory Agency (ANEEL) and the National Council for Energy Policy (CNPE).

In terms of their roles, the MME is responsible for the planning, supervision and implementation of national energy policies.[30] ANEEL is responsible for regulating and controlling the generation, transmission, distribution and commercialisation of electricity in compliance with national policies and existing legislation.[31] The CNPE acts as an aid to the President of Brazil in the formulation of energy policies.[32] Statements and speeches of the President of Brazil (President) that referred to the supply of energy were also selected because the words of the leader of the Executive as the head of the State and Government carry particular weight and set out directions around energy policy. In terms of legislation, the main legislative acts applicable to the development of energy, particularly green energy, at the federal level were selected. The documents that preceded the enactment of the legislative acts, such as reports, technical notes and meeting records, were also analysed.

The Petroleum, Natural Gas and Biofuels Agency (ANP) also plays an important role in the development of green energy in the country, particularly biofuels, as it is the federal governmental agency responsible for the regulation of the biofuels sector.[33] However, as the key elements regarding biofuels development were enacted via federal legislation, the regulatory instruments issued by ANP were not included in this analysis.

The time frame for the analysis is from January 2001 to December 2015. The reason for starting the analysis in 2001 is because until 2001 green energy had a minor presence in

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[30] Ministério de Minas e Energia, 'Competências' <http://www.mme.gov.br/web/guest/acesso-a-informacao/institucional/competencias> accessed 1 May 2018.
[31] Law 9,427 of 26 December 1996.
[32] Law 9,478 of 6 August 1997.
[33] Law 9,478 of 6 August 1997, as amended by Law 11,097 of 13 January 2005 and by Law 12,490 of 16 September 2011.

the Brazilian electricity sector, contributing less than three per cent of the total energy mix.[34] However, as it will be further explained, Brazil suffered a crisis in the electricity sector in 2001 and this provided a new discursive context in which green energy initiatives were framed and re-framed. The period for the analysis ended in December 2015, because, as previously mentioned, documents were obtained from archives during the author's stay in Brazil from December 2015 to February 2016.

3.2 Data analysis

Following the methodology of this thesis explained in chapter 2, this chapter adopts a data-driven inductive or 'bottom up' approach to data analysis, focusing on the overall messages emerging from the evidence as opposed to adopting a grand theory before study commenced.

Therefore, in view of determining how specific kinds of discourses emerge out of the text in a dialogue with the reader or recipient to whom the text addresses itself, the documents were analysed through the method of interrogative insertion, where by formulating and inserting questions into a text, the analyst attempts to uncover the logic of the discourse and the direction and emphasis of the argument made in the texts.[35] It involved a careful reading of the texts of the documents and then proceeded with an interrogation of the texts organised around the thesis principal research questions: (i) how has energy security been discursively constructed? (ii) what are the discursive links between energy security and

[34] Congresso Nacional (Brazil), Comissão Mista Especial Destinada a Estudar as Causas a Crise de Abastecimento de Energia no País, bem como Propor Alternativas ao seu Equacionamento, A *Crise de Abastecimento de Energia Elétrica: Relatório* (Senado Federal, Secretaria Especial de Editoração e Publicações 2002), 5.
[35] Nicholas Walliman, *Social Research Method: The Essentials* (SAGE Publications Ltd 2006), 140.

green energy law and policies? (iii) what are the implications of energy security construction to law and policy on green energy development?

3.3 Translation

Unless otherwise stated, the author has carried out all translations from the original Portuguese text.

4. National forces influencing green energy development

By way of background, this section aims to analyse the socio-legal factors that influenced the emergence of national rules which have promoted green energy development in Brazil. This section focuses on the relevant legislative acts from January 2001 to December 2015 and attempts to draw out the socio-legal factors foregrounded by the legal texts themselves as well as their stated implications for current practices. Table 1 below, which is subsequently analysed, provides a summary of the drivers as specifically mentioned in legislative instruments that promoted green energy development in Brazil. In summary, the drivers found are: energy access, economic development, environmental protection, climate change, social development and energy security. The role played by energy security in green energy development is at the core of this thesis and will be examined under section 4.

Table 1

LEGISLATION/ REGULATIONS	DATE	ENERGY TYPE	OBJECTIVE	DRIVERS
Resolution 24	05/07/2001	Wind	Created the PROEOLICA	▪ Foreseen energy deficit; ▪ Security of supply;

			programme to promote wind energy.	▪ Economic, social and environmental development.
Law 10,438 (Provisional Measure 14 of 21/12/2001)	26/04/2002	Wind Biomass Small hydro	Created the Programme for Incentive of Alternative Electric Energy Sources (PROINFA).	▪ Foreseen energy deficit; ▪ Security of supply; ▪ Reduction of hydropower dependency; ▪ Use of local resources instead of fuel importation; ▪ Access to energy/ support to rural electrification; ▪ Reduction of greenhouse gases emissions.
Decree 4,873	11/11/2003	Mainly solar	Created the programme 'Light for All'.	▪ Access to energy; ▪ Social goal; ▪ Economic development of rural areas.
ANEEL Normative Resolution 83	20/09/2004	Solar	Regulated the use of household photovoltaic systems for the electrification of isolated areas.	▪ Access to energy; ▪ Social goal; ▪ Economic development of rural areas.
Law 11,097 (Provisional Measure 214 of 13/09/2004)	13/01/2005	Biodiesel	Introduced biodiesel to the Brazilian energy matrix	▪ Social inclusion; ▪ Economic development; ▪ Environment protection; ▪ Pollution reduction ▪ Improvement of quality of life of urban centres;

				▪ Technology development; ▪ Security of supply.
Law 11,116 (Provisional Measure 227 of 06/12/2004)	18/05/2005	Biodiesel	Created a registry of biodiesel producers and importers and provided for the tax regime for biodiesel producers and importers.	▪ Economic development; ▪ Improvement of quality of life of urban centres; ▪ Greenhouse gases emissions reduction; ▪ Technology development; ▪ Social inclusion.
Decree 5,882	31/08/2006	Wind Biomass Small hydro	Regulated PROINFA	▪ Reduction of greenhouse gases emissions; ▪ The use of financial resources from Clean Development Mechanisms to reduce PROINFA costs.
CNPE Resolution 7	05/12/2007	Biodiesel	Established guidelines for the formation of biodiesel stocks.	▪ Security of supply; ▪ Ensure the protection of the interests of consumers with regard to price, quality and supply of biodiesel;
CNPE Resolution 2	13/03/2008	Biodiesel	Set the minimum percentage of biodiesel to be added to diesel oil at 3%.	▪ Increase in employment and income; ▪ Social development; ▪ Development of national industry of goods and services;

				▪ Reduction in oil imports, with gains in the commercial balance; ▪ Decrease of vehicle pollutants emissions.
CNPE Resolution 2	27/04/2009	Biodiesel	Increased the biodiesel blending mandate to 4% from July 2009.	▪ Increase in employment and income; ▪ Development of national industry of goods and services; ▪ Social development; ▪ Reduction in oil imports with gains in the commercial balance; ▪ Decrease of vehicle pollutants emissions.
CNPE Resolution 6	16/09/2009	Biodiesel	Increased the biodiesel blending mandate to 5%.	▪ Development of national industry of goods and services; ▪ Increase in employment and income; ▪ Reductions of greenhouse gases emission; ▪ Reduction in oil imports with gains in the commercial balance.

Law 12,187	29/12/2009	Low carbon emission energy sources	Established the National Policy on Climate Change.	▪ Reduction of greenhouse gases emissions; ▪ Socio-economic development; ▪ Poverty eradication; ▪ Reduction of socio inequalities.
Law 12,490 (Provisional Measure 532 of 28/04/2011)	16/09/2011	Biofuels	Biofuels were included expressly in the Brazilian legislation as a key energy resource for the country, as well as the security of supply of biofuels throughout the country as being one of the objectives of the National Energy Policy.	▪ Security of supply; ▪ Price regulation; ▪ Protection of consumers in relation to price, quality and supply; ▪ Economic and technological development; ▪ Promotion of Brazil´s competitiveness in the international market of biofuels; ▪ Reduction of greenhouse gases emissions.
Law 12,783 (Provisional Measure 579 of 11/09/2012)	11/01/2013	Wind Small hydro Biomass Solar	Promoted the competitiveness of energy produced from wind power, thermosolar, photovoltaic, small hydro, biomass, other	▪ Reduction of energy costs; ▪ Energy security (availability and affordability of electricity);

			renewables and natural gas.	
Law 12,859 (Provisional Measure 613 of 07/05/2013)	10/09/2013	Bioethanol	Reduced the tax for bioethanol.	▪ Reduction of ethanol costs; ▪ Reduction of oil consumption and importation with gains in the commercial balance; ▪ Reduction of greenhouse gases emissions.
Law 13,033 (Provisional Measure 647 of 28/05/2014)	24/09/2014	Biofuels	Increased the biodiesel blending mandate to 5%.	▪ Balanced environment; ▪ Reduction of greenhouse gases emissions; ▪ Increase in employment, income and high value-added products; ▪ Reduction in oil imports with gains in the commercial balance; ▪ Energy security (protect the national supply in atypical situations).
Law 13,097 (Provisional Measure 656 of 07/10/2014)	15/01/2015	Wind	Provided import tax exemptions for wind turbine components.	▪ Increase in competitiveness of national industry in the face of international industry; ▪ Reduction of energy price.
CNPE Resolution 3	21/09/2015	Biodiesel	Authorised and set guidelines for the	▪ Economic, social and environmental basis;

			commercialisation and the voluntary use of biodiesel.	▪ Consumers´ protection.

4.1 Energy access

Lack of modern energy access remains an enduring global problem, limiting opportunities for income generation and the ability to tackle extreme poverty.[36] Conversely, ensuring access to energy supplies serves as a means to promote economic development by increasing productivity and growth. In Brazil, the benefits brought by improving access to energy were a theme in speeches of the President across the period chosen for analysis. For instance:

> Those who participate in these projects [rural electrification], particularly in the poorest regions of the country, know the benefit a pole, a wire and a light brings. They know what the possibility of making a flour mill means, the possibility of placing a pump to draw water means, what the possibility of making a machine to make bran, to grind corn, means. It is something of great magnitude, and possibly many people from the city are not entirely clear about the importance of light.[37]

Energy access was also a recurrent theme in the legal framework. Law 10,438 of 26 April 2002, which created the Alternative Energy Sources Incentive Programme (PROINFA),[38]

[36] Benjamin K Sovacool and Ira M Drupady, *Energy Access, Poverty, and Development: The Governance of Small-scale Renewable Energy in Developing Asia* (Routledge 2016), 1.
[37] Luiz Inácio Lula da Silva, 'Speech at the Launching Ceremony of the Universal National Programme for Access and Use of Electric Power', Brasília-DF, 11 November 2003.
[38] Only wind, biomass and small-scale hydro energy sources were included in PROINFA.

under article 13, marks the universalisation of energy access in Brazil, announcing the promotion of universal electricity services across all of the national territory with the aim of combating energy poverty in Brazil. As explained by the President:

> (…) there are 12 million families in Brazil that still lack electricity (…); we have in Brazil nearly three countries the size of Paraguay without electricity, in a country that has the possibility to produce as much energy as is needed.[39]

In Brazil, solar energy has played an important role in achieving the social aim of universal energy access and tackling energy poverty. In terms of its framing, it is a poverty-alleviating energy resource. However, the incentive programmes targeting alternative energy sources in Brazil did not initially include solar. The situation changed following various public energy access programmes from the 1990´s, such as ‘Luz da Terra’ (Light of the Land),[40] ‘Luz no Campo’ (Light in the Countryside),[41] and ‘Luz para Todos’ (Light for All),[42] which involved government as well as businesses and non-profit organisations. These programmes envisaged the provision of energy services through renewable energy, particularly via the use of solar panels.

These programmes were aimed at providing electricity to isolated poor communities, which did not have access to electricity supply through the conventional network. They prioritised the provision of electricity to government funded schools, health centres and water supply wells, and projects aimed at local and family agricultural development. Thus, solar energy served as a means of rescuing the poor, isolated and distant rural communities

[39] Luiz Inácio Lula da Silva, ‘Speech at the Opening Ceremony of the Electrification Network in 53 Settlements’, Sidrolândia-MS, 22 February 2005.
[40] Decree n. 41,187 of 25 September 1996.
[41] Presidential Decree of 2 December 1999.
[42] Decree 4,873 of 11 November 2003.

by providing energy services, improving their living standards as well as ensuring environmental sustainability. In this way, solar was positioned within the wider discourse of energy policy in Brazil.

4.2 Economic development

What emerges very powerfully through the texts is the stress on the importance of energy supply to economic development. As the President put it in 2004: 'The truth is that no country develops without energy.'[43] The role that green energy promotion has played in the drive to achieve economic development is multi-fold.

Firstly, as explained in the previous section, green energy promotion was discursively positioned as a means to pursue the economic development of rural areas, through public energy access programmes.

Secondly, the texts work to mutually elaborate a rationale for green energy development in terms of increasing employment and income as well as the acquisition and development of technology and development of a national industry of goods and services. As stated by the President using PROINFA as the example:

> PROINFA was a model (…), our first successful experience of wind power and biomass, one that shows we can be acquiring new technology (…).[44]

Thirdly, the pursuit of green energy, specifically biofuels, is discursively tied to an economic strategy centred on maintaining the continuity of energy supply as well as bringing

[43] Luiz Inácio Lula da Silva,' Speech at the Official Ceremony of the Construction and Installation of Turbines of the Tucuruí Hydroelectric Plant', Tucuruí – Pará, 25 November 2004.
[44] Luiz Inácio Lula da Silva, 'Speech at the Opening of the Brazilian Forum on Climate Change Meeting', Brasília-DF, 30 November 2004.

gains in the national balance of payments through the reduction of oil imports. As explained by the Minister of Mines and Energy in relation to the use of biodiesel:

> Biodiesel, as a vegetable oil, will be an alternative energy source, and at the same time a strategic energy resource from an economic point of view, if we take into account the fact that global oil reserves are not renewable and they will deplete if their exploration keeps on increasing.[45]

Conversely, wind and solar energy sources also appear in presidential speeches as insufficient to provide economic development in the country, as exemplified in a presidential speech:

> […] solar energy and wind power are still complementary energies. They do not guarantee the country's development, social inclusion and sustainability, they do not support the production of energy, they are complementary.[46]

This demonstrates, therefore, that the country’s economic, social and sustainable development has also been discursively used to downplay the importance of wind and solar energy sources.

4.3 Environmental matters

Some regulatory instruments discursively present green energy development as a way forward in achieving a balanced environment. The PROEOLICA programme which promoted wind energy, for instance, was supported by the argument that it would attract

[45] Exposure of Motives 44/MME of 9 September 2004.

[46] Dilma Rouseff, ‘Speech during the Start Ceremony of the Deviation of the Madeira River for the Santo Antônio Hydroelectric Power Plant’, Porto Velho-RO, 5 July 2011.

environmental development.[47] Environmental matters have also been discursively implicated in the debates within high ranking meetings regarding energy development. As stated in a CNPE meeting, for instance: 'ecological and socio-economic issues should be considered strategically on [energy] projects before any signalling to the market for eligible exploitations.'[48]

However, these discursive attempts to knit together green energy projects and environmental protection have also met resistance. Green energy projects have been characterised as facing difficulties in meeting the demands of environmental agencies. Taking one example, environmental licencing has gradually come to be portrayed as a villain in relation to green energy projects. Reports by the Federal Senate[49] and the Federal Court of Accounts[50] have shown concerns over the lack of clear and objective definitions of the necessary criteria for the granting of licences as well as uncertainties in relation to timescale and the length of the process, delays due to judicial decisions and lack of technicians to analyse environmental studies and the general complexity of the environmental licencing process as a whole. As an illustration of the success of this counter-discourse in problematising the practical implementation of green energy initiatives, a new legal framework is currently under debate which would speed up the environmental licencing process for energy projects while taking into account concerns over the environmental impacts of the activity and any compensatory measures due.[51]

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[47] Resolution 24 of 5 July 2001.
[48] Records of the 27th Ordinary CNPE Meeting of 17 December 2013.
[49] Comissão de Serviços de Infraestrutura, *Política Nacional de Recursos Hídricos: Abastecimento, Energia e Saneamento Básico* (Senado Federal 2015).
[50] See the 2014 Federal Court of Accounts report on the auditing of processes and contracts of implementation of wind parks in Bahia, Rio Grande do Norte, Ceará and Rio Grande do Sul, in Tribunal de Contas da União (TCU), Relatório TC 017.421/2013-6 of 18 June 2014.
[51] Project of Law of the Federal Senate 654 of 2015.

By way of another example, environmental conflicts in relation to how green energy development projects have been implemented have also been brought to the discursive surface. In this rather different form of counter-discourse, such things as, for instance, the devastation of sand dunes, interference with aquifers, visual and noise pollution in the case of wind energy[52] have all come to be discursively juxtaposed against the claims of environmental protection.

In relation to interference with aquifers used by indigenous populations in the case of small-scale hydropower, for instance, statements like this one from the Federal Public Ministry in Rondonia do a particular kind of discursive work:[53]

> …[S]mall-scale hydropower plants are considered "clean energy" because they do not have an environmental impact on the rivers where they are installed. However, over the years, several small-scale hydropower plants have been installed in the bed of the Branco River, which have caused serious environmental and social impacts to the indigenous population who inhabit the region. This was because environmental impact studies only took dams into account individually – one by one – and disregarded the fact that, from an environmental point of view, a group of small-scale hydropower plants is equivalent to a large enterprise.

In this statement, doubt is discursively introduced along a new plane. Rather than treating the issuing of environmental licenses for green energy projects as too inflexible, they

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52 See Antonio Jeovah Meireles, 'Danos Socioambientais Originados pelas Usinas Eólicas nos Campos de Dunas do Nordeste Brasileiro e Critérios para Definição de Alternativas Locacionais' (2011) 11 Confins [Online].

53 'Conjunto de Pequenas Centrais Hidrelétricas Prejudica Índios e Meio Ambiente em Rondônia' (*Procuradoria da República em Rondônia*, 28 June 2011) < http://www.mpf.mp.br/ro/sala-de-imprensa/noticias-ro/conjunto-de-pequenas-centrais-hidreletricas-prejudica-indios-e-meio-ambiente-em-rondonia> accessed 29 March 2016.

instead emerge as flexible enough to allow green energy projects which cause environmental and social impacts.

The process of facilitating the issue of environmental licenses to speed up energy projects has also been criticised by scholars.[54] Environmental conflicts have been invoked in academic studies[55] and complaints have been registered in the Map of Conflict, Environmental Injustice and Health[56] from social movements and affected population groups. In addition, civil lawsuits have been filed by the Federal Public Ministry due to environmental protection concerns, particularly in relation to wind power[57] and small-scale hydropower projects,[58] with the allegation that appropriate environmental studies are not being carried out in relation to energy projects. This demonstrates a growing opposition movement against the green energy industry due to conflicts over environmental impacts. As the above suggests, environmental conflict is both expressed through and given shape by discursive practices, with one side finding its statements repositioned, modified and made to serve quite different ends to the ones they were initially meant to serve – one person's inexcusable delay in

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[54] Marcelo Firpo de Souza Porto, Renan Finamore and Hugo Ferreira, 'Injustiças da Sustentabilidade: Conflitos Ambientais Relacionados à Produção de Energia "Limpa" no Brasil' (2013) 100 Revista Crítica de Ciências Sociais 37, 40.

[55] See Antonio Jeovah Meireles, 'Danos Socioambientais Originados pelas Usinas Eólicas nos Campos de Dunas do Nordeste Brasileiro e Critérios para Definição de Alternativas Locacionais' (2011) 11 Confins [Online]; Keith Brower Brown, 'Wind Power in Northeastern Brazil: Local Burdens, Regional Benefits and Growing Opposition' (2011) 3(4) Climate and Development 344; Alice Nataraja Santos, *A Energia Eólica no Litoral do NE no Brasil: Desconstruindo a "Sustentabilidade" para Promover "Justiça Ambiental"* (Heinrich-Böll-Stiftung 2014).

[56] The Map of Conflicts, Environmental Injustice and Health is the result of a project developed jointly by the Oswaldo Cruz Foundation and the NGO Fase with the support of the Department of Environmental and Workers Health and of the Ministry of Health. The map was launched in 2010 and currently has over 500 environmental conflicts spread throughout Brazil. See <http://www.conflitoambiental.icict.fiocruz.br/index.php> accessed 30 December 2018.

[57] See, for example, civil lawsuit JFCE/LN-0000396-30.2009.4.05.8101-ACP, filed on 21 September 2009 against the construction of Aracati Eolic Park.

[58] See, for example, civil lawsuit JF-RO-0012760-49.2011.4.01.4100-ACP, filed on 27 September 2011 against the construction of small hydropower plants Santa Cruz de Monte Negro, Jamari and Canaã; and civil lawsuit 0000736-29.2015.403.6125, filed on 1 June 2015 by Sao Paulo Federal Public Ministry against the construction of small hydropower plants in Pardo river.

environmental licencing for much needed energy is another person's healthy governmental and judicial oversight.

4.4 Climate change

The fact that explicit major forces driving green energy policies in Brazil have motivations other than climate change has been echoed in the literature.[59] An analysis of the Brazilian legal framework on green energy development within the period of study (2001-2015) corroborates the finding that curbing energy's contribution to climate change did not initially surface as an important priority. For instance, in the aforementioned 2001 wind energy development programme PROEOLICA and 2003 energy access programme 'Light for all', which promoted solar energy, climate change issues were not even mentioned. The impact of reducing greenhouse gas emissions was raised as one of the benefits for the implementation of the main programme for incentivising alternative energy sources, PROINFA.[60] However, the reduction of greenhouse gas emissions as an aim of PROINFA was not included in the wording of the original legislation in 2002. It was in 2006 that new legislation was enacted to expressly include the reduction of greenhouse gas emissions in the legal discourse itself so as to explicitly allow the use of the financial resources from Clean Development Mechanisms[61] to offset costs of the PROINFA programme.[62]

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[59] Roberto Schaeffer and others, *Who Drives Climate-relevant Policies in Brazil?* (Institute of Development Studies/Universidade Federal do Rio de Janeiro 2015), 22.

[60] Exposure of Motives 00376-A-CCIVIL/MF/MME/MDIC of 21 December 2001.

[61] This allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, which can be traded and sold, and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. See UNFCCC, 'What is the CDM' <https://cdm.unfccc.int/about/index.html> accessed 7 November 2018.

[62] Decree 5,882 of 31 August 2006.

Similarly to PROINFA, reducing greenhouse gas emissions was discursively construed as a factor surrounding the initial discussions of biodiesel promotion,[63] but it was not specifically included in the biodiesel legislation. Law 11,097 of 13 January 2005 (the Biodiesel Law), for example, expressly introduced biodiesel as a key fuel in the Brazilian energy matrix. It also set the objective to increase the share of biofuels in the national energy matrix on economic, social and environmental grounds. Climate change concerns, therefore, were articulated in the discussions of Brazilian regulatory instruments for biodiesel, but not expressly included in legislation. It was only in 2011, via the enactment of Law 12,490 of 16 September 2011[64] that the reduction of greenhouse gas emissions was included as an aim in official legal discourse and directly connected with biofuels.[65] The absence of express references to the reduction of greenhouse gas emissions in the original official legislation shows, therefore, that, although climate change concerns were taken into account as a factor for the initial creation and implementation of some forms of green energy, they were not considered the primary driver.

Today, green energy and climate change are directly and expressly linked in Brazil's official legal discourse nationally and internationally. In its climate action plan submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in the context of the negotiations to the 2015 Paris Agreement,[66] Brazil committed to reduce greenhouse gas

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[63] See, for example, reasons given for the enactment of Provisional Measure 227 of 6 December 2004, EM Interministerial nº 00166/2004 - MF/MDA/MME <http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2004/Exm/EM-166-04.htm> accessed 19 November 2018.

[64] Law 12,490/2011 changed Law 9,478 of 6 August 1997 which provides for the national energy policy.

[65] See article 1 of Law 12,490/2011 which included the reduction of greenhouse gas emissions and pollutants in the energy and transport sector, including via the use of biofuels, as an aim of the Brazilian national energy policy.

[66] See Brazil´s Intended Nationally Determined Contribution towards Achieving the Objective of the United Nations Framework Convention on Climate Change (28 September 2015) <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf > accessed 25 November 2018.

emissions by 37% below 2005 levels in 2025. In addition to measures focusing on deforestation and land use, the country has sought to promote the role played by green energy in meeting this target in the international arena. It has done this by, for example, committing to the adopting of measures which will increase the share of green energy in the power supply to 23% by 2030 by focusing on wind, solar and biomass[67] and to increasing the share of sustainable biofuels in its energy mix to approximately 18% by 2030, by expanding biofuel consumption, increasing ethanol supply, including by increasing the share of advanced biofuels (second generation), and increasing the share of biodiesel in the diesel mix.[68] Therefore, Brazil´s commitments in the international arena have discursively elevated climate change as an important driver for green energy development.

4.5 Social issues

The regulatory framework for green energy development discursively presents social development and social inclusion as one of its goals. The biodiesel programme, for example, created the Social Fuel Seal (SFS), Selo Combustível Social,[69] which promotes the inclusion of small agriculture in the biodiesel production chain, particularly from the poorest and most disadvantaged regions in Brazil. Biodiesel producers must purchase a certain percentage of feedstock from family-based farmers, enter into contracts with them to establish specific income levels, and guarantee technical assistance and training.[70] As such, this procedure

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[67] Ibid 3. See also, Eduardo Braga, 'A Matriz Energética Brasileira e os Desafios do Setor em Decorrência das Mudanças Climáticas' (*Senado Federal, Comissão Mista Permanente Sobre Mudanças Climáticas* 2015).
[68] *Ibid.*
[69] Decree 5,297 of 6 December 2004.
[70] Decree 5,297 of 6 December 2004, article 2, paragraph 1.

allows small communities to generate an income from the plantation and harvest of feedstock.

However, social conflicts have not been absent from green energy development. In fact, social issues have become discursively relevant in high ranking debates. In the CNPE's meeting of 17 December 2013, for example, it was acknowledged that 'social issues have been overtaking environmental issues in regard to conflicts over the development of energy projects'.[71]

Social conflicts in the development of green energy projects are mainly framed as a result of their negative impacts on small farmers, local and indigenous communities and riverine populations by lowering their quality of life, for instance, due to the displacement of communities, blocking access to fishing areas and damage to homes from construction equipment.[72] Two cases can serve as illustration. First, there have been land conflicts and displacement of traditional populations in Caetité-BA, where wind parks were constructed.[73] Second, indigenous populations and energy companies have been in conflict in relation to the construction of Juruena small hydropower plant in the state of Mato Grosso due to a drastic reduction in fish population numbers in the river which are essential for food and for the maintenance of the indigenous cultural practices.[74] The conflict was intensified when about

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[71] Records of CNPE meeting of 17 December 2013.

[72] For a research based on qualitative interviews with local and regional stakeholders in a wind energy state in Brazil, see Keith Brower Brown, 'Wind Power in Northeastern Brazil: Local Burdens, Regional Benefits and Growing Opposition' (2011) 3(4) Climate and Development 344.

[73] Comissão Pastoral da Terra, 'O Avanço do Capital e sua Influência nos Modos de Vida das Populações Tradicionais no Município de Caetité (BA)' (13 August 2013) <http://www.cptnacional.org.br/index.php/publicacoes/noticias/artigos/1676-o-avanco-do-capital-e-sua-influencia-nos-modos-de-vida-das-populacoes-tradicionais-no-municipio-de-caetite-ba> accessed 29 March 2016; Iasmin Santana and Allan Lustosa, 'Na Bahia, Energia Eólica Impacta Comunidade' (2 September 2014) <http://www.canalibase.org.br/na-bahia-energia-eolica-impacta-comunidade> accessed 25 January 2017.

[74] Ministério Público Federal, 'MPF Recebe Relatório contra a Construção de Hidrelétricas no Vale do Juruena (MT)' (1 August 2016) < http://www.mpf.mp.br/mt/sala-de-imprensa/noticias-mt/mpf-recebe-relatorio-contra-a-construcao-de-hidreletricas-no-vale-do-juruena-mt> accessed 25 January 2017.

120 native Indians invaded and set fire to a small hydropower construction site.[75] Therefore, just as was the case with environmental conflicts, although green energy development has social inclusion as one of its key goals, concrete green energy projects have raised concerns about their negative social impacts.

5. The role played by energy security in green energy development

In the previous section, the socio-legal factors that influenced the emergence of national rules which have promoted green energy development in Brazil were explained as a background to understand what kind of forces were at play in Brazil at the time of enactment of green energy law during the period of analysis. Energy security was also one of the factors that influenced law and policies on green energy development and is at the centre of this thesis. This section, therefore, aims to unveil the interplay between energy security and green energy and focuses on the thesis key research questions: (i) how has energy security been discursively constructed? (ii) what are the discursive links between energy security and law and policies promoting green energy? (iii) what are the implications of energy security construction to law and policy on green energy development?

As explained in chapter 3, this thesis focuses on energy security in the sense of security of energy supply, and although the notion of "energy security" is widely debated within academic literature, an agreed definition has not yet been reached. While some scholars argue that a broader array of criteria needs to be considered as a key component of energy security concepts – such as availability, reliability, affordability as well as environmental,

[75] Beto Ricardo and Fany Ricardo (ed), *Povos Indígenas no Brasil: 2006/2010* (Instituto Socioambental 2011), 580.

climate and social considerations – others argue for a narrow notion of energy security and a clear separation between energy security and other policy objectives, leading to the definition of energy security as the continuity of energy supplies relative to demand. At the same time as these debates have unfolded, governments around the world, and Brazil is no exception, have been enacting new legislation, introducing new policies and, through both, weaving understandings of energy security into the discursive fabric of their societies' laws and policies. Against this background, this section aims to examine how energy security has been configured as a concern in green energy law and policies in Brazil between January 2001 and December 2015.

The analysis is split into two discernible discursive periods; the period of the 2001 energy crisis (2001-2002) and the post-crisis period (2003-2015), respectively. This distinction is drawn in clear-cut ways for analytical purposes; in reality, the boundaries of each of the periods identified are fluid (that is, to a certain extent they overlap). The reason for distinguishing them is to identify the main discursive strands that have been central to the construction of the links between energy security and green energy law and policies in Brazil, establishing, in particular, continuities and changes in the ways in which it has been framed.

5.1 Energy security and green energy during the 2001 energy crisis (2001-2002)

5.1.1 Constructing energy security

This section will demonstrate that, during the 2001 energy crisis in Brazil, energy security was conceptualised narrowly as uninterrupted availability of energy supply and was treated as intrinsically linked to the country's economic development. There was no expressly stated association of energy security with national security in any of the documents analysed and there was no reference in the legal and political official discourse to any form of military action as a result of energy shortage. The creation of a sense of urgency around the provision of energy supply was pursued mainly as a result of energy being framed as an essential element to support the growth of the economy. Additionally, in the official legal and political discourses, there is no reference to social unrest as one of the main reasons for adopting measures to ensure energy supply. Some street protests, however, did take place and were framed by the media at the time as being responses to electricity rationing and its negative impact on labour markets and jobs, not directly correlated to limitations on the use of modern appliances, focusing, as such, on the argument of economic development. What the 2001 energy crisis reveals, therefore, is that energy interruption in Brazil can cause economic instability and, as a result, lead to social instability. If necessary measures are not taken to correct imbalances in the energy supply, it might ultimately lead to economic collapse and chaos that disrupt the typical social order of society in Brazil.

2001 is significant in this context as it was in that year that Brazil went through what became generally known as the 2001 energy crisis, when the country had to ration electricity usage for several months to prevent large-scale blackouts. This situation was characterised by low water levels in the many reservoirs that are used to power Brazil´s major hydroelectric generation facilities as a result of low amounts of rainfall in 2000 and early 2001, as well as by Brazil’s significant dependence on electricity generated from hydrological resources. At that time, more than 80% of energy generation in Brazil came from hydroelectric power. The energy capacity of Brazil in 2001 is summarised in the table below.[76]

[76] Congresso Nacional (Brazil), Comissão Mista Especial Destinada a Estudar as Causas a Crise de Abastecimento de Energia no País, bem como Propor Alternativas ao seu Equacionamento, A *Crise de Abastecimento de Energia Elétrica: Relatório* (Senado Federal, Secretaria Especial de Editoração e Publicações 2002), 5.

Table 2: Utilities in operation (December 2001)

Type	Quantity	Power (MW)	% of total
Wind	6	18.8	0.03
Biomass	151	8791	1.18
Small scale hydro	309	1,002.3	1.35
Large scale hydro	123	61,018.8	82.06
Thermal	434	9,470.8	12.74
Nuclear	2	1,966.0	2.64
Total	1,025	74,355.8	100.00

The lack of financial investment in the energy sector came to be discursively framed as one of the reasons for the energy crisis.[77] As pointed out by the President:

> It is true that the reservoirs were being depleted. But they were being depleted because there was effectively a lack of generation and distribution in the past. We are paying the price for the improvidence or impossibility, due to economic reasons, of investment in the past.[78]

This period was characterised by language that emphasised tension and uncertainty, with frequent invocations of 'risk', 'vulnerability', 'emergency' and 'crisis', as well as the emergence of an alarmist discourse framed in terms of urgency and deployed to convey the sense that Brazilian society was at risk from interruption of its energy supply. In the President's own terms:

> We think it is very important right now that whatever is decided in terms of energy has priority. And when I say 'everything that is decided in terms of

[77] See Congresso Nacional (Brazil), Comissão Mista Especial Destinada a Estudar as Causas da Crise de Abastecimento de Energia no País, bem como Propor Alternativas ao seu Equacionamento, A *crise de Abastecimento de Energia Elétrica: Relatório* (Senado Federal, Secretaria Especial de Editoração e Publicações 2002), 19. Tribunal de Contas da União (Brazil), *Relatório de Auditoria: Crise de Energia Elétrica* (Tribunal de Contas da União 2001), 4. See also João Lizardo R Hermes de Araújo, *The Case of Brazil: Reform by Trial and Error?* (Elsevier 2006).

[78] Fernando Henrique Cardoso, 'Statement in National Radio and Television', Brasília-DF, 7 May 2001.

energy,' I am not referring only to rationalised energy usage. I am referring especially to measures necessary to increase energy supply, under the coordination of Minister José Jorge.[79]

In addition to framing energy as an issue of absolute priority and creating a sense of importance and urgency required to resolve the problem, other elements of securitisation can also be found in the manner which government sought to bypass the legislative process, by taking exceptional measures without the normal democratic scrutiny. As an illustration, during the 2001 energy crisis, the government enacted energy law via the use of provisional measures, a constitutional mechanism that has the force of law and may be adopted by the President of the Republic in relevant and urgent cases without first being submitted to the National Congress for deliberation.[80]

However, it is widely acknowledged that provisional measures in Brazil are not used just in extraordinary moments. On the contrary, they are frequently issued as an instrument of governance to promote the governmental agenda and to implement public policies.[81] Nevertheless, on the one hand, use of such instruments results in a lack of open or collective political deliberation as public decisions cannot be analysed in detail and discussed in public – they are, therefore, characteristic of a shift towards securitisation. On the other hand, energy was not expressly associated with national security in any of the documents analysed and there was no reference to any form of military action as a result of energy shortage.

[79] Fernando Henrique Cardoso, 'Statement after the Energy Crisis Committee Meeting', Brasilia-DF, 14 May 2001.
[80] Federal Constitution of 1988, article 62.
[81] See, for example, Carmem Arias, 'Um Estudo sobre as Medidas Provisórias no Brasil' (20010 6(2) Mediações: Revista de Ciências Sociais 29; Luciano Da Ros, 'Poder de Decreto e Accountability Horizontal: Dinâmica Institucional dos Três Poderes e Medidas Provisórias no Brasil pós-1988' (2008) 16(31) Revista de Sociologia e Política 143; Felipe de Paula, 'Does Brazil have a Legislative Policy?' (2016) 4(3) The Theory and Practice of Legislation 329.

Therefore, some elements of securitisation within the concept explained under chapter 3 are found in the energy discourse in Brazil, but it still lacks the express connection between energy and national security.

The creation of a sense of urgency to provide energy supply was pursued mainly as a result of energy being framed as an essential element to support the growth of the economy. This demonstrates that, at the time of the 2001 energy crisis, economic development was being presented as the crucial and priority driver for undertaking measures to ensure continuity of energy supply in Brazil. Energy consumption associated with economic growth and the argument that imbalances in energy supply and demand would negatively impact the country's economic development can be found in the majority of the texts of this period. The lack of energy supply as one of the most important impediments for economic growth in Brazil is also echoed in the literature.[82] As stated by the President: 'The development of the country demands energy';[83] 'The growth rates in Brazil are consistent today. (…) today we see the output of Brazilian industry as very significant, this means we have to increase the supply of energy a lot.'[84]

The document justifying the enactment of provisional measure 2,147 of 15 May 2001, which created the Energy Crisis Committee (Câmara de Gestão da Crise de Energia Elétrica – GCE), recognised that energy shortage can substantially impact social relations.[85] Indeed,

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[82] Alexandre Macchione Saes and Felipe Pereira Loureiro, 'What Developing Countries' Past Energy Policies Can Tell Us about Energy Issues Today? Lessons from the Expropriation of American Foreign and Power in Brazil (1959–1965)' (2014) 29 Utilities Policy 36, 36.
[83] Fernando Henrique Cardoso, 'Speech at the ceremony to sign agreements relating to the public service concession of electric power transmission between the Union and Amazon Company of Power Transmission and Para Company of Power Transmission', Brasilia-DF, 12 June 2001.
[84] Fernando Henrique Cardoso, 'Speech at the Ceremony Introducing the Ministers of Social Security and Mines and Energy', Brasilia-DF, 13 March 2001.
[85] Exposure of Motives 00203 of 15 May 2001, justifying the enactment of provisional measure 2,147 which created the Energy Crisis Committee, see Congresso Nacional (Brazil), *Diário do Congresso Nacional* (n 29, Congresso Nacional, 2 August 2001), 13402.

street protests took place and were framed by the media as being responses to electricity rationing and its negative impact on labour markets and jobs, not correlated to limitations on the use of modern appliances.[86] The focus, therefore, was on the argument of economic development. However, in the official legal and political discourses, there was no reference to social unrest as one of the main reasons for adopting measures to ensure energy supply. The political discourse was framed in a positive way by thanking and praising the population for the cooperation and support.

An additional analysis, conducted as part of the present study, of articles published in 2001 in one of the main newspapers in Brazil, Folha de S. Paulo, identified no reference to protests sparked by a lack of energy supply correlated to limitations on the use of modern appliances. While a thorough analysis of all the media discourse at the time of the 2001 energy crisis would be needed to confirm the veracity of this statement, it is worth noting that no academic studies associate the electricity rationing episode in Brazil in 2001 with social unrest due to customers' inability to use electric appliances. What the 2001 energy crisis reveals, therefore, is that energy interruption in Brazil can cause economic instability and, as a result, social instability and might ultimately lead to economic collapse and chaos that disrupt the typical social order of society if necessary measures are not taken to correct the scenario.

Provisional Measure 2,147, under article 1, also framed energy security narrowly in the sense of 'uninterrupted availability of energy supply', a concern that appeared in all documents in this analysis. In fact, the terms 'energy security' or ´security of energy supply'

[86] See, for example, Rafael Garcia, 'Protesto na Paulista Critica Racionamento de Energia e Pede CPI', *Folha de S. Paulo* (18 May 2001); 'Crise de Energia Traz Ameaça de 'Apagão'', Memorial da Democracia (1 June 2001) < http://memorialdademocracia.com.br/card/crise-de-energia-traz-ameaca-de-apagao> accessed 1 November 2018.

were not widely used. The term 'security of supply' was only deployed once in the official discourse during this period in connection with electricity and natural gas importation.[87] However, while not formulated in precisely those terms, the legal provision of Provisional Measure 2,147, in which the Energy Crisis Committee was created to 'propose and implement emergency measures to match the demand and supply of electricity in order to avoid unfortunate or unexpected interruptions in electricity supply' significantly characterises energy security narrowly as 'uninterrupted availability of energy supply'.

Taking front stage at a time when Brazil was struggling to meet its energy requirements, the focus on energy security was distinctly framed in terms of energy availability and on its correlation to economic development. Other elements of the broader concept of energy security, such as environmental protection, also appeared in the discourse as concerns, albeit not as core priorities. Rules were thus created to speed up the analysis of environmental impact reports and for the procedures concerning environmental licenses in relation to energy projects, as well as to simplify the procedures for obtaining environmental licences in energy projects of small environmental impact.[88] The introduction of these measures followed on from the President´s statement:

> There must be greater speed in project evaluation. This will require special measures in the Ministry of the Environment, which is directly linked to the granting of authorisations. Of course, we must always take into account environmental issues. But also, given the nature of the emergency we face, those decisions can be faster.[89]

[87] CNPE Resolution 1 of 17 September 2001.
[88] Provisional Measure 2,147, article 8.
[89] Fernando Henrique Cardoso, "Statement after the Energy Crisis Committee Meeting', Brasilia, 14 May 2001.

In another example, the official discourse presents a conflict between energy supply and socio-economic development on the one hand, and environmental protection on the other. This is clearly seen in discussions surrounding the delay of works related to the generation and transmission of energy due to environmental issues. The official discourse presents a position where, if there is tension between energy supply, socio-economic development and environmental protection, as a priority, energy supply and socio-economic development should come first. According to the President:

> It makes no sense at all, even in the name of environmental protection as a valid principle, to forbid the population from having the minimum welfare needed and getting a job to survive. These things must be reconciled. We must converge, respect the environment, but respect above all the hunger for energy and the desire of the Brazilian people to grow.[90]

At this time, climate change concerns were also acknowledged in the official energy discourse. The President, for instance, stated his certainty that “all of us, who are aware of such things [climate change], know that climate change is a challenge. If we today are suffering from these rain changes, God only knows, when one looks over a period of 100 years, one sees that the average rainfall for every 20 years has decreased.”[91] At the time of the energy crisis, in March 2002, the Kyoto Protocol was sent for ratification to the National Congress in Brazil,[92] which would give it force of national law. However, Brazil was not part of Annex 1 of the Kyoto Protocol and, as such, had no mandatory emissions reduction targets.

[90] Fernando Henrique Cardoso, ‘Speech at the Inauguration Ceremony of William Arjona Thermoelectric Plant’, 28 June 2001, Campo Grande.
[91] Fernando Henrique Cardoso, ‘Speech at the inauguration ceremony of William Arjona thermoelectric plant’, 28 June 2001, Campo Grande.
[92] The Kyoto Protocol was ratified by the Legislative Decree 144 of 20 June 2002.

Therefore, apart from including the reduction of greenhouse gas emissions as one of the impacts of the implementation of the main programme for incentive of green energy sources, PROINFA,[93] climate change concerns had little influence on energy law and policies during this period, and were certainly not included within energy security definition.

5.1.2 Energy security and the push for fossil fuel promotion

It is generally acknowledged by scholars[94] and demonstrated in the laws enacted at the time that the period of the 2001 energy crisis in Brazil clearly advances one main energy strategy: to diversify away from hydropower. In the previous section it was shown that, during this period, energy security was narrowly construed as 'uninterrupted availability of energy supply' and intrinsically linked to the country's economic development. In this context, two interrelated frames for the connection between energy security and green energy promotion are developed, frames whose principal features can be summarised as follows: a positive frame within which green energy is important for energy diversification; however, at the same time, alongside it, a negative frame, where green energy is treated as a complementary energy source due to its costs, intermittent nature and insufficiency for supporting economic development.

As explained in the introduction of this chapter, understanding the discursive framing of energy security and its links with law and policies on green energy development is important because when one frame is selected from amongst a range of competing frames it

[93] Exposure of Motives 00376-A-CCIVIL/MF/MME/MDIC of 21 December 2001. However, reduction of greenhouse gas emissions were not included as an aim in the wording of the original legislation in 2002.

[94] See, for example, Carla Kazue Nakao Cavaliero and Ennio Peres Da Silva, 'Electricity Generation: Regulatory Mechanisms to Incentive Renewable Alternative Energy Sources in Brazil' (2005) 33 Energy Policy 1745; Richard L Ottinger, Douglas S de Figueiredo and Lia Helena M L Demange, 'Case Study of Renewable Energy in Brazil', in Richard L Ottinger (ed), *Renewable Energy Law and Development: Case Study Analysis* (Elgar 2013), 108.

has consequences for how green energy development is subsequently seen and acted on. Thus, the positive frame in relation to the links between energy security and green energy had the implication of contributing to the development of green energy for the purpose of diversifying the energy matrix. However, simultaneously framing green energy as a complementary source had the implication of promoting it only for small-scale projects. Thus, although green energy was framed as playing a role in ensuring energy security via the diversification of the Brazilian energy matrix, the construction of energy security at this time as uninterrupted availability of energy supply served mainly to promote fossil fuels development as essential for energy security. This argument is evidenced by the following analysis.

The role played by green energy in the strategy to diversify the Brazilian energy matrix away from hydropower is evidenced, for instance, in the legal statement which constructs the main programme for incentive of green energy sources, PROINFA, as 'an effort to guarantee the diversification of the Brazilian energy matrix, searching for solutions using alternative energy sources, independent from hydrological conditions (…)'.[95]

This position is the culmination of a series of prior moves. The first stage in the promotion of green energy to diversify the energy matrix in Brazil during the period in analysis was the creation of the Emergency Programme for Wind Energy, PROEOLICA, via Resolution 24 of 5 July 2001, which promoted 1,050 MW generated from wind energy by December

[95] Office of the Chief of Staff, Ministry of Mines and Energy, Ministry of the Economy and Ministry of Development, Industry and Foreign Trade, 'Exposição de Motivos Interministerial 00376-A-CCIVIL/MF/MME/MDIC', 21 December 2001.

2003.[96] This programme had a short-term design that did not promote the long-term establishment of a wind industry in Brazil.[97]

The development of the wind energy sector in Brazil at this time in a short-term period was promoted via agreements and partnership between public and private institutions, but was said to face challenges as a result of the currency exchange rate due to two reasons: (i) there was only one national manufacturer of complete equipment for wind turbines and few manufacturers for parts of wind turbines. In terms of viability for wind energy projects in Brazil in the short-term, the industry could not be dependent on few suppliers, so it was expected that the majority of wind equipment would be imported; and (ii) wind energy projects were considered capital intensive, requiring, therefore, long-term finance (15-20 years). However, foreign investments would not be available for wind energy projects due to the devalued currency exchange. The price set for purchase of wind energy was low when converted to US dollars as a result of the devalued currency exchange, which, therefore, would not recompense the investment.[98] Other factors, such as options for purchase/rental of adequate land to develop wind projects, connection to the grid, acquisition/confirmation of wind resources data in different places and cancellation of requests for wind parks due to a variety of reasons, such as restrictions from the Civil Aviation Department, also contributed to the delay of implementation of wind projects in Brazil at this time.[99] Although promoted

[96] Energy Crisis Committee Resolution 24 of 5 July 2001, article 1.
[97] U Wachsmann and MT Tolmasquim, 'Wind Power in Brazil—Transition Using German Experience' (2003) 28(7) Renewable Energy 1029, 1037.
[98] Electronic correspondence from Mr Andre Leal, Executive Director of SeaWest Windpower do Brasil, to the Minister of Mines and Energy, Mr Jose Jorge de Vasconcelos Lima, and the Minister Chief of Staff of the Presidency of the Republic, Mr Pedro Parente, on 29 October 2001.
[99] Letter EN-ANEEL-20/11/01-001 from Mr Alberto Seisdedos Fernandez del Pino, Director of Enerbrasil, to the Brazilian Federal Electricity Agency (Agência Nacional de Energia Elétrica – ANEEL) on 20 November 2001, in reply to ANEEL document Offício n. 400/2001 – SCG/ANEEL of 12 November 2001.

via PROELICA, wind energy was also presented in the discourse ‘as expensive and insufficient for maintaining continuity of energy supply’.[100]

A few months later, the President passed Provisional Measure 14 of 21 December 2001, which created the Alternative Energy Sources Incentive Programme (PROINFA)[101] designed to stimulate electricity generation from three green energy sources (wind, biomass and small-scale hydro) and a long-term basis to develop these energy sources was thus created. PROINFA was then enacted by Law 10,438 on 26 April 2002 (converted from the Provisional Measure 14/2001), and was later revised and amended by Decree 4541 of 23 December 2002, Law 10,762 of 11 November 2003 and Decree 5,025 of 30 March 2004, as well as regulated by MME Norm 45 of 30 March 2004. Two distinct phases were set up. In its first phase, to be met by December 2006,[102] the programme was to establish fifteen-year contracts for generating 3300 MW, equally distributed amongst wind energy, biomass and small hydro resources.[103] The second phase originally established a target share of 10% for green energy sources in Brazil's electricity consumption within twenty years.[104] Accompanying PROINFA’s legislation was a discursive assertion that the promotion of green energy was essential to guarantee the diversification of the energy matrix, as exemplified in the legal reasons given to justify the creation of PROINFA:

> Due to the critical situation of the power sector during this year which is spreading throughout the country to the detriment of all Brazilian citizens,

[100] Fernando Henrique Cardoso, ‘Speech to Celebrate the World Environment Day’, Brasilia-DF, 5 June 2001.
[101] The first study about PROINFA was presented to the Executive members of the Energy Crisis Committee in a meeting on 29 October 2001. See Núcleo Executivo da Câmara de Gestão da Crise de Energia Elétrica – GCE, ‘Ata N. 22/01, Reunião realizada em 29 de Outubro de 2001’.
[102] This date was later extended to December 2008 by Law 11,075 of 30 December 2004; to December 2010 by Law 11,943 of 28 May 2009; to December 2011 by Law 12,431 of 24 June 2011.
[103] Law 10,438 of 26 April 2002, article 3.
[104] Law 10,438 of 26 April 2002, article 3.

there was an urgent need to promote investments and incentives for electricity production which are independent from weather issues that as factors are difficult to predict. In this sense, the creation of PROINFA was envisioned (…). This proposal represents an effort to guarantee the diversification of the Brazilian energy matrix, searching for solutions with the use of alternative energy sources, independent from hydrological conditions (…).[105]

However, this period presented the promotion of fossil fuels as critical to ensuring energy security within its narrow concept of uninterrupted availability of energy supply and with the aim of diversifying away from large-scale hydropower. When compared with fossil fuel promotion, green energy development played only a minor role. The Strategic Programme for Increase of Electricity Supply (2001-2003)[106] predicted the increase of electricity supply from the following energy sources:[107]

Table 3

Energy source (units)	Increase of supply			
	2001	2002	2003	Total
Thermoelectricity (26)	1,517	3,599	5,100	10,216
Hydroelectricity (21)	1,237	3,513	3,053	7,803
Energy import	548	1,488	800	2,836
Wind power	50	500	500	1,050
Cogeneration (natural gas and biomass)	160	300	500	960
Small-scale hydropower	46,6	400	400	846,9
Total (MW)	3,558.9	9,800	10,353	23,711.9

105 Office of the Chief of Staff, Ministry of Mines and Energy, Ministry of the Economy and Ministry of Development, Industry and Foreign Trade, 'Exposição de Motivos Interministerial 00376-A-CCIVIL/MF/MME/MDIC', 21 December 2001.

106 Ministry of Mines and Energy, 'Strategic Programme for Increase of Electricity Supply (2001-2003)', approved by the Energy Crisis Committee during meeting of 5 July 2001, see Energy Crisis Committee, 'Meeting of 5 July 2001, ATA n. 02/2001'.

107 Ministry of Mines and Energy, 'Strategic Programme for Increase of Electricity Supply (2001-2003)' obtained from the Brazilian National Archive.

This push for fossil fuels in Brazil was framed in a unique kind of context. While many countries power generation was and remains dominated by fossil fuels and the deployment of green energy was and is needed to reduce greenhouse gas emissions, the Brazilian power sector did not need to decarbonise; instead it needed to add fossil fuels to ensure energy security.[108] The increase of fossil fuels, particularly natural gas, in the Brazilian energy matrix to ensure energy security regularly appeared in presidential speeches[109] and in discussions at the Energy Crisis Committee's[110] and CNPE's meetings.[111] Thermoelectric power plants, using natural gas mostly imported from Bolivia, were considered the main short-term alternative for reducing the dependency on the hydrological power regime.[112] As the President stated:

> (…) there must be an energy supply process that is independent of rainfall. Brazil has lived a lifetime dependent on the rain, and a country that has the Brazilian industrial capacity cannot settle for this. We must have the complementarity of hydroelectricity and thermoelectricity.[113]

The focus on thermoelectric power stations is exemplified in the following statement:

> There will be more than 11,000 megawatts by 2002. This entails the construction and the beginning of thermoelectric operation. Although the

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[108] Fernando Henrique Cardoso, 'Speech at the Opening Ceremony of Thermoelectric Power Plant of Nova Piratininga', Santo Amaro-SP, 4 July 2002.
[109] See, for example, Fernando Henrique Cardoso, 'Speech at the Ceremony to Sign Agreements relating to the Public Service Concession of Electric Power Transmission between the Union and Amazon Company of Power Transmission and Para Company of Power Transmission', Brasilia, 12 June 2001; Fernando Henrique Cardoso, 'Speech at the meeting of the Energy Crisis Committee', Brasilia, 5 July 2001; Fernando Henrique Cardoso, 'Speech at the Opening Ceremony of Thermoelectric Power Plant of Nova Piratininga', Santo Amaro-SP, 4 July 2002.
[110] See, for example, meetings of 5 July 2001 and 29 October 2001.
[111] See, for example, CNPE Resolution 1 of 17 September 2001; CNPE Resolution 3 of 6 August 2002;
[112] Ministry of Mines and Energy, 'Strategic Programme for Increase of Electricity Supply (2001-2003)', approved by the Energy Crisis Committee during meeting of 5 July 2001, see Energy Crisis Committee, 'Meeting of 5 July 2001, ATA n. 02/2001'.
[113] Fernando Henrique Cardoso, 'Speech at the Ceremony Introducing the Ministers of Social Security and Mines and Energy', Brasilia, 13 March 2001.

original plan was 49 thermoelectric plants, in the revisions made by the Minister José Jorge it is going to be possible to recover the time lost with the regulatory as well as financial and economic difficulties, to recover energy and build 30 thermoelectric power stations by 2003, in the next three years, which will give Brazil a more secure energy matrix and consequently reduce the vulnerability of our system in relation to rainfall.[114]

The push for thermoelectricity presented in the energy discourse was accompanied by change in practice. In January 2002, there was 2,753MW of generation capacity from thermoelectric using gas, and 14 other large-scale thermoelectric plants were in construction totalling an installed power generation capacity of 6,857 MW.[115] This, therefore, shows that the positive association between energy security and fossil fuels meant promoting it in large-scale.

5.2 Energy security and green energy in the post-crisis period(2003-2015)

5.2.1 Constructing energy security

This section will demonstrate that, during the post-crisis period, the concept of energy security was expanded. Although environmental, climate change and social inclusion concerns within the energy debate started coming to the fore more prominently, uninterrupted availability, affordability and reliability appeared as the key elements for the construction of energy security. The official legal concept of energy security in Brazil thus

[114] Fernando Henrique Cardoso, 'Speech at the Ceremony to Sign Agreements relating to the Public Service Concession of Electric Power Transmission between the Union and Amazon Company of Power Transmission and Para Company of Power Transmission', Brasilia, 12 June 2001.
[115] Agência Nacional de Energia Elétrica (Brazil), *Atlas de Energia Elétrica do Brasil* (ANEEL 2002), 92.

remains notably narrower than the broader scholarly definitions presented in chapter 3. This section will also point out that, as was the case around the 2001 energy crisis, national security was not linked to energy security in any of the documents analysed. In addition to the continued construction of energy security in the context of economic development, security of energy supply was recurrently emphasised as an essential element to attract investments.

Although Brazil had overcome the 2001 energy crisis by the end of 2002, the fear of a recurrence has appeared frequently in texts. The government and commentators have been continually on the lookout for warning sign of a repeat of the 2001 episode and continue to introduce measures discursively justified by the need to avoid it. As stated in a Federal Senate report, '[t]he effects of the blackout at the beginning of the last decade are still latent in the Brazilian people's memory. At that time, it was possible to realise just how important the security of energy supply was in the country.'[116] The blackout was, therefore, discursively presented as a clear indicator of the reliance of Brazilian society on uninterrupted energy supply.

The effects of the energy crisis were felt deeply. It wiped out expected Gross Domestic Product (GDP) growth of 4 per cent[117] and cost the country 10 billion US dollars.[118] In addition to the continued construction of energy security as a vehicle of economic development, security of energy supply was recurrently emphasised as an essential element to attract investments during this period since 'everyone knows that any businessperson in the world,

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[116] Comissão de Serviços de Infraestrutura, *Política Nacional de Recursos Hídricos: Abastecimento, Energia e Saneamento Básico* (Senado Federal 2015), 19.
[117] Brazil's growth in 2001 was 1.3 per cent, a drop from 4.1 per cent in 2000. See The World Bank, 'GDP Growth (annual %)' < https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG> accessed 27 November 2018.
[118] Peter Kingstone, *Critical Issues in Brazil's Energy Sector: The Long (And Uncertain) March to Energy Privatization in Brazil* (The James A Baker III Institute for Public Policy of Rice University 2004), 1.

who wants to use his money for investment somewhere, requires a guarantee of energy supply'.[119] As a result, concerns that the 2001 energy crisis would hinder investment in Brazil were also raised. As the President put it:

> After the blackout, I thought that Brazil could not win the trust of any investor, Brazilian or foreign, if we could not give an objective answer to the question of energy security to be offered to all Brazilians.[120]

> After all, energy is the basis for the industrialization of a country. If you do not have energy to sell, be it gas, be it biomass, be it hydroelectric , be it any form, even diesel oil, if we do not have this to offer, we will have little chance of bringing investors here.[121]

The post-energy crisis phase, therefore, presents itself as an all-embracing policy direction predicated on guaranteeing energy supply to attract internal and international investment, bring about economic development and avoid another energy crisis. Similarly to the 2001 energy crisis period, national security was not linked to energy security in any of the documents analysed. There was, however, an acknowledged association of energy interruption with conflicts, as evidenced in a presidential speech:

> Incidentally, it is worth remembering that in many cases, history shows that due to interruptions in [energy] supply, even wars were made.[122]

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[119] Luiz Inácio Lula da Silva, 'Speech at the Visit of Ceremony to the Works of the Wind Farm Osorio', Osório-RS', 19 April 2006.
[120] Luiz Inácio Lula da Silva, 'Speech at the Opening Ceremony of Viana Electric Power Substation', Viana-ES, 30 January 2006.
[121] Luiz Inácio Lula da Silva, 'Speech at the Signing Ceremony of the Concession Contracts of Hydroelectric Plants with Entrepreneurs', Brasília-DF, 15 August 2006.
[122] Dilma Rousseff, 'Speech during the Introduction of Magda Chambriard, General Director of the National Petroleum Agency (ANP)', Rio de Janeiro-RJ, 21 March 2012.

The concept of energy security in official texts during this phase was expanded. In addition to the continuous focus on uninterrupted availability of energy supply, references to affordability and reliability were introduced expressly in legislation. For instance, Law 10,848 of 15 March 2004, enacting on the commercialisation of electricity, embodied the term energy security[123] and stated that the sale of electricity 'should provide general criteria for the guarantee of electricity supply to ensure the proper balance between supply reliability and reasonableness of rates and prices (…)'.[124] Availability, affordability and reliability in support of economic development appeared as the most recurrent criteria during this period:

> We know that one of the great challenges of a country is to have affordable and secure energy. The lack of electricity constrains the growth of a country under any circumstances. And this growth has its assurance given by the availability of this energy both in terms of its security as of low tariffs.[125]

The focus on affordability was due to the increase in energy price as a result of the measures taken during the 2001 energy crisis period.[126] Electricity tariffs increased by 31.1 per cent for industrial consumers and 64.1 percent for residential consumers.[127] As such, affordability repeatedly appeared in documents of this period as an important aspect in the development of energy:

> It is good and necessary to have plenty of energy, but it is also necessary that people can pay the tariff and industries do not lose competitiveness due to the

[123] Law 10,848 of 15 March 2004, article 1, paragraph 10.
[124] Law 10,848 of 15 March 2004, article 1, X.
[125] Dilma Rousseff, 'Speech during the Announcement Ceremony of the Investment Programme in Energy', Brasília-DF, 11 August 2015.
[126] Ibid.
[127] José Goldenberg and Luiz Tadeu Siqueira Prado, 'Reforma e Crise do Setor Elétrico no Período FHC' (2003) 15(2) Tempo Social 219, 235.

> cost of electricity. The price of energy cannot be a barrier to the well- being of families, nor an obstacle to the growth of the Brazilian productive sector.[128]

Furthermore, with the development of the Light for All programme in 2003,[129] as pointed out in section 3.1 above, access to energy also discursively entered the energy debate. Energy access is far from an official concern alone, however, with recent scholarship noting that survey respondents from Brazil rated affordability and equitable access to energy services to be of higher importance to the national energy culture than respondents from Denmark, Germany, Japan, Singapore, and the USA.[130]

Environmental concerns also began to surface more regularly in the energy discourse after the 2001 energy crisis. A presidential speech of the time serves as an example of the increased focus on environmental matters:

> Today it is not so easy to build a hydroelectric power plant like we built Itaipu in the 70s. Today the legislation is tougher, environmentalists are overseeing more, demanding more. And today, too, governments have more responsibility and are doing things more carefully, because we are not thinking only of our generation, we are not thinking only of our children or our grandchildren.[131]

The official discourse attempted to place environmental protection on an equal footing with energy security, in which fossil fuel exploration in Brazil, for example, should

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128 Luiz Inácio Lula da Silva,' Speech at the Official Ceremony of the Construction and Installation of Turbines of the Tucuruí Hydroelectric Plant', Tucuruí – Pará, 25 November 2004.
129 Decree 4,873 of 11 November 2003.
130 Benjamin K Sovacool, 'Differing Cultures of Energy Security: An International Comparison of Public Perceptions' (2016) 55 Renewable and Sustainable Energy Reviews 811, 819.
131 Luiz Inácio Lula da Silva, 'Speech at the Opening Ceremony of Generating Units of Itaipu Hydroelectric Power Plant', Foz do Iguaçu-PR, 21 May 2007.

“safeguard the environment and security”.[132] However, environmental concerns and energy security were still seen as separate and independent concepts, not unified within the definition of energy security. This was also a period which saw the judicialisation of energy projects over environmental and social matters, as there was a growing reliance on courts and judicial means for addressing environmental and social concerns and halting energy projects which were advanced in the official discourse as essential to ensure energy security in Brazil. The construction of Belo Monte dam, for instance, was subject to considerable controversy[133] and gave rise to lawsuits[134] due to its impacts on the environment, indigenous communities and nearby populations.

As a result of this judicialisation of energy projects, the official discourse promoted communication between environmental and energy departments in order to avoid lawsuits[135] and the need for a joint effort between institutions such as the Public Ministry, NGOs, environmental institutions, the judiciary power.[136] In addition, as explained under section 3.3 above, partially as a result of delays in energy projects due to judicial decisions, proposals were also put forward to enact law that would accelerate the environmental licencing process. Currently under debate is a project that would see news laws designed to speed up

[132] Dilma Rousseff, ‘Speech during the Introduction of Magda Chambriard, General Director of the National Petroleum Agency (ANP)’, Rio de Janeiro-RJ, 21 March 2012.
[133] See, for example, Ed Atkins, ‘Dams, Political Framing and Sustainability as an Empty Signifier: The Case of Belo Monte’ (2018) 50(2) Area 232; André Marconato Ramos and Humberto Prates da Fonseca Alves, ‘Conflito Socioeconômico e Ambiental ao Redor da Construção da Usina Hidrelétrica Belo Monte’ (2018) 46 Desenvolvimento e Meio Ambiente 174; Philip Martin Fearnside, ‘Belo Monte: Atores e Argumentos na Luta sobre a Barragem Amazônica Mais Controversa do Brasil’ (2018) 1(42) Revista NERA 1.
[134] See civil lawsuit n 2006.39.03.000711-8/PA. In 2011, a complaint was also filed before the Inter-American Commission of Human Rights, see, for example, precautionary measure 382/10 - Indigenous Communities of the Xingu River Basin, Pará, Brazil < http://www.oas.org/en/iachr/decisions/precautionary.asp> accessed 20 November 2018.
[135] Luiz Inácio Lula da Silva, ‘Speech during a Visit to the Works of the Jirau Hydroelectric Plant’, Porto Velho-RO, 12 March 2009.
[136] Luiz Inácio Lula da Silva, ‘Speech at the Signing Ceremony of the Concession Contracts of Hydroelectric Plants with Entrepreneurs’, Brasília-DF, 15 August 2006.

the environmental licencing process for energy projects while taking into account concerns over the environmental impacts of the activity and initiating any compensatory measures due.[137] These proposals were advocated in a presidential speech:

> […] there is no doubt that the [energy] bills have increased and we deplore it. But they increased precisely because, given the lack of water to keep the lights on, we had to use thermoelectric power and therefore pay far more than we would have paid if there was only hydroelectric power in our system. Hence I welcome all this effort to establish a joint relationship with the National Congress to create a "fast track", i.e. a fast and secure way for dealing with licenses that are strategic for the country's growth in the medium to long-term.[138]

Therefore, these proposals to speed up the environmental licencing process in relation to energy projects were advanced in the discourse with a view of ensuring energy availability, affordability and the country's growth.

At the same time, climate change concerns within the energy debate started coming to the fore more prominently, not only in presidential speeches, but also in the legal discourse. In presidential speeches, policies promoting biodiesel were particularly linked with climate change. In 2005, for example, the President stated that the National Programme on Biodiesel "was not only about an answer to the depletion of world oil reserves, but also an imperative of planetary survival that the Kyoto Protocol enshrined in the form of a new

[137] Project of Law of the Federal Senate 654 of 2015.
[138] Dilma Rousseff, 'Speech during the Announcement Ceremony of the Investment Programme in Energy', Brasília-DF, 11 August 2015.

consensus amongst nations."[139] In addition, as mentioned under section 3.4 above, in 2006 new legislation was enacted to expressly include the reduction of greenhouse gas emissions as an aim for PROINFA.[140] In 2011, the reduction of greenhouse gas emissions was included as an aim of national energy policy in the official legal discourse.[141] Furthermore, Brazil included energy in its climate action plan submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in the context of the negotiations around the 2015 Paris Agreement.[142]

The concept of energy security in legal documents during this time in Brazil, however, did not include the broader elements of environmental protection, climate change and social inclusion. This can be evidenced in Law 10,848 of 15 March 2004 which is the law in force today and its focus on availability, reliability and affordability as criteria for security of electricity supply. The legal official concept of energy security in Brazil thus remains notably narrower than the broader scholarly definitions presented in chapter 3.

5.2.2 The multiple frames around the interplay between energy security and green energy

The period of 2003-2015 continues advancing the frames from the 2001 energy crisis period in which, as a positive framing, green energy is treated as important for energy diversification; while, at the same time, as a negative framing, it is downgraded as a

[139] Luiz Inacio Lula da Silva, 'Speech at the Opening Ceremony of Biodiesel Plant Agropalma', Belem-PA, 27 April 2005.
[140] Decree 5,882 of 31 August 2006, article 1, paragraph 1.
[141] Law 12,490 of 16 September 2011.
[142] See Brazil´s Intended Nationally Determined Contribution towards Achieving the Objective of the United Nations Framework Convention on Climate Change (28 September 2015) <www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx> accessed 25 January 2017.

complementary energy source and insufficient to meet the energy demand required to support economic growth. The novelty in this period is the emergence of an additional positive frame in connection with biofuels development. All frames for this period are analysed below.

A. Biofuels and the emergence of a new positive frame

This section will show that, in the context of biofuels, energy security concerns were framed in terms of energy use from exhaustible energy sources, dependency on imported energy sources, the oligopoly of oil producers and the uneven distribution of fossil fuels around the world as well as the risk of war associated with oil exploration. In law and policies, biofuels were construed as playing a key role in tackling these energy security concerns. This construction of a positive frame around the interplay between energy security and biofuels pushed forward the promotion of biofuels.

Biofuels policies in Brazil revolve around two main categories: first, sugarcane ethanol, and secondly, biodiesel made from vegetable oils or animal fats. The first official national policy in Brazil for the use of ethanol[143] was set out in 1931[144] and took off in 1975 with the launch of the National Alcohol Programme (PROALCOOL) which aimed to progressively add alcohol to gasoline so as to ultimately reach 20 per cent of the mixture.[145] As a result of the oil shocks and aiming to replace fossil fuel imports, another two biodiesel programmes were

[143] The term sugarcane alcohol (álcool) was initially used. The term ethanol (etanol) was only introduced by ANP Resolution 39 of 10 December 2009, article 1, paragraph 3.
[144] Jose Moreira and Jose Goldemberg, 'The Alcohol Program' (1999) 27 Energy Policy 229, 231. Antônio José Ferreira Simões, 'Biocombustíveis: A Experiência Brasileira e o Desafio da Consolidação do Mercado Internacional' (2008) 17 <http://sistemas.mre.gov.br/kitweb/datafiles/NovaDelhi/pt-br/file/Biocombustiveis_02-experienciabrasileira.pdf> accessed 10 November 2018.
[145] Decree N 76,593, of 14 November 1975.

created in 1980 and 1983 respectively: PROOLEO, the National Programme for the Production of Vegetable Oils for Energy Use, which enabled blending in natura raw vegetable oils into diesel and ultimately aimed at the complete substitution of diesel as fuel; and the Programme of Vegetable Oils – OVEG, which aimed to test different proportions of biodiesel in partnership with the automobile industry. As oil prices became stable, PROOLEO was never implemented and although the test results had been positive for biodiesel, the high costs of the product, at that time, prohibited its commercial use.[146] In early 2000s the biodiesel policy returned to the Brazilian agenda with the launch of the National Programme for the Production and Use of Biodiesel (Programa Nacional de Produção e Uso do Biodiesel – PNPB) in 2004.[147] In 2006, the dissemination of the use of biofuels worldwide became a priority for the Brazilian Government.[148]

The Brazilian biofuels programmes have generated considerable controversy for many reasons, including their impact on food prices, deforestation and impact on sensitive ecosystems, the undermining of rural livelihoods, concentration of land into the hands of large corporations, displacement of smallholders as well as labour-related and human rights issues.[149] However, as previously stated in chapter 3, green energy development does not preclude environmental impacts and this work analyses non-conventional energy sources which are considered 'green' in the country's official discourse.

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[146] A P Rutherford, 'Regulatory Framework for Biofuels in Brazil: History and Challenges under the Law of the WTO' (2016) 34(2) Journal of Energy & Natural Resources Law 213.
[147] Decree No 5,297 of 6 December 2004.
[148] Sybille Roehrkasten, *Global Governance on Renewable Energy: Contrasting the Ideas of the German and the Brazilian Governments* (Springer 2014), 174.
[149] See, for example, Bernardo Mançano Fernandes, Clifford Andrew Welch and Elienaí Constantino Gonçalves, 'Agrofuel Policies in Brazil: Paradigmatic and Territorial Disputes' (2010) 37 Journal of Peasant Studies 793; Renata Marson Teixeira de Andrade and Andrew Miccolis, 'Policies and Institutional and Legal Frameworks in the Expansion of Brazilian Biofuels' (2011) Center for International Forestry Research Working Paper 71, 27–32.

As mentioned above, in the context of biofuels, energy security concerns were framed in terms of energy use from exhaustible energy sources, dependency on imported energy sources, the oligopoly of oil producers and the uneven distribution of fossil fuels around the world as well as the risk of war associated with oil exploration. This construction of a positive frame around the interplay between energy security and biofuels pushed forward the promotion of biofuels in a number of ways:

(i) Concerns surrounding energy use from exhaustible energy sources supported the narrative of biofuels as a preferred substitute for finite oil not only from an energy strategic point of view, but also from an economic angle. As an illustration, upon discussion of Provisional Measure 214 of 13 September 2004, which was later converted to the Biodiesel Law,[150] the Minister of Mines and Energy stated, as one of the reasons for the production of biodiesel at commercial scales, that biodiesel, as an oil from vegetable origin, constitutes 'not only an alternative energy source, but also a strategic energy source from an economic point of view if we take into account that global oil reserves are not renewable and will deplete if oil exploration keeps on increasing'.[151] Biodiesel as a preferred substitute for finite oil sources was also promoted in a presidential speech:

> (…) oil will end one day because we get it out of the deep sea or earth. Now our oil, the green castor, babassu, soybeans, sunflower, cottonseed oil never

[150] Law 11,097 of 13 January 2005.
[151] Ministério de Minas e Energia, 'Exposição de Motivo n° 44/2004, do Ministro de Estado de Minas e Energia' (9 September 2004), 15.

ends, because if a tree stops producing, we plant another, and we will have a renewable energy matrix.[152]

(ii) The co-relation between concerns over dependency on imported energy sources and its impact on the balance of payments supported the narrative which gave biofuels a key role in reducing the use of diesel oil, something which would enable Brazil to save on foreign exchange. As explained by the President:

> Brazil consumes 36 billion litres of diesel and imports 17 % of a total expenditure of about USD 800 million per year just for diesel. With the mandatory blending of 2% biodiesel to petroleum derivative, we will save USD 160 million, and about USD 400 million with the addition of 5 % to the mix.[153]

(iii) Concerns surrounding the oligopoly of oil producers and the uneven distribution of fossil fuels around the world[154] advanced the narrative of biofuels as a way to democratise access to energy and energy production, as well as to achieve economic development and fair income distribution globally. As the President put it:

> Biofuels can create a supply that is more predictable and democratise access to reliable sources of energy. Whilst oil production is concentrated in only 15 countries, it is estimated that over 120 countries have the potential to produce biofuels. After all, not everyone has the resources or technology to drill

[152] Luiz Inácio Lula da Silva, 'Speech at the Ceremony relating to Castor Crop for the Production of Biodiesel', Canto do Buriti/Eliseu Martins-PI, 4 August 2005.
[153] Luiz Inácio Lula da Silva, 'Speech at the Opening Ceremony of Biodiesel Plant Agropalma', Belém-PA, 27 April 2005.
[154] Luiz Inácio Lula da Silva, 'Speech at the International Conference on Biofuels', Brussels- Belgium, 5 July 2007. The 12 largest oil companies control roughly 80% of petroleum reserves and oil and gas trade are controlled by a handful of government-dominated firms and major oil companies, see Marilyn A Brown and Benjamin K Sovacool, *Climate Change and Global Energy Security: Technology and Policy Options* (MIT Press 2011).

thousands of meters in search of oil but they can dig a hole a few centimetres to plant a cane or castor oil.[155]

(iv) The risk of war associated with oil exploration was also construed as having a positive impact on biofuels promotion which was advanced as being able to de-securitise energy by avoiding military conflict around competition for finite energy resources. As evidenced in presidential speeches:

> In fact, we're doing more than creating a biodiesel programme, we are doing much more than just producing a new energy matrix. We are doing much more than just helping build workers' organisations in cooperatives, helping family farmers and helping small and medium entrepreneurs in the field. A lot more. We are giving a signal to the world that in the near future oil will not be a reason for war in the world, or for a consumer country to invade a producer country.[156]

> The inclusion of biofuels in the international energy matrix will also help to eliminate another disturbing imbalance: 20 countries produce energy for approximately 200 countries. With the adoption of biofuels, more than 100 countries can produce energy, democratizing its access. We will be reducing the asymmetries and inequalities between countries, consumers and producers of energy and preventing potential conflicts arising from competition for finite energy resources.[157]

[155] Luiz Inácio Lula da Silva, 'Speech at the Opening of the Seminar on Biofuels', Stockholm-Sweden, 12 September 2007.
[156] Luiz Inácio Lula da Silva, 'Speech at the Opening Ceremony of the Biodiesel Plant Soyminas', Cássia-MG, 24 March 2005.
[157] Luiz Inácio Lula da Silva, 'Speech at the International Conference on Biofuels', Brussels- Belgium, 5 July 2007.

Therefore, biofuels were positioned as helping to ensure energy security in the country by playing a key role in the reduction and substitution of exhaustible energy sources, by democratising access to energy and energy production worldwide, as well as by achieving economic development and fair income distribution globally, and being able to de-securitise energy and avoid military conflict. This positive frame around energy security and biofuels had the implication of promoting biofuels in law and policies in Brazil.

B. Green energy and diversification of the energy matrix

As previously stated, the period of 2003-2015 continued advancing the frames from the 2001 energy crisis period in which, as a positive frame, green energy was treated as important for energy diversification; however, at the same time, as a negative frame, it was discursively downgraded to being only a complementary energy source and insufficient to meet the energy demands of a growing economy. Unlike the 2001 energy crisis which saw the promotion of green energy for small-scale projects, the dominant negative frame in relation to the links between energy security and green energy prevented the adoption of new specific policies and stimulus for green energy development in the electricity system. As will be demonstrated in the following section C, this negative frame contributed to the further promotion of fossil fuels.

Mostly as a result of climatic conditions and Brazil's dependency on hydropower, scholars have highlighted that Brazil has been suffering from an energy crisis with a frequency of 10-15 years, i.e. the years 1924, 1944, 1955, 1964, 1986, 2001 and 2015.[158] In 2015, Brazil

[158] Julian David Hunt, Daniel Stilpen and Marcos Aurélio Vasconcelos de Freitas, 'A Review of the Causes, Impacts and Solutions for Electricity Supply Crises in Brazil' (2018) 88 Renewable and Sustainable Energy Reviews 208, 208.

went through another water related episode, which became known generally as the 'water crisis' due to drought. The rhetoric of crisis is discernible in the speeches of the President at the time. For instance:

> We are now facing the challenge, perhaps the greatest challenge of the hydrologic history, the history of the waters of our country. It is the largest drought in the Northeast in the last 100 years (…). And what is unprecedented, it is the largest drought in the Southeast as well.

In contrast with the 2001 energy crisis, there was no need to ration electricity. Scholars argued that rationing had been partially avoided because new transmission lines were built to interconnect the electricity grid from different regions.[159] In addition to energy interconnection, the diversification of the Brazilian energy matrix was seized upon as a key factor in the official discourse. The role played by wind energy and biomass, for example, in ensuring energy security was discursively acknowledged, as exemplified in a presidential speech:

> Brazil is in the following situation: it has put a very important part of its eggs in the basket of hydroelectric power, which is very important and very good because it is the cheapest energy it has. But also it has put its remaining eggs in other baskets and this is what guarantees the energy security of the country. We have put our eggs in the baskets of thermal, wind and biomass.[160]

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[159] Rodrigo Corrêa da Silva, Ismael de Marchi Neto and Stephan Silva Seifert, 'Electricity Supply Security and the Future Role of Renewable Energy Sources in Brazil' (2016) 59 Renewable and Sustainable Energy Reviews 328, 335.

[160] Dilma Rousseff, 'Speech at the Opening Ceremony of Geribatu Wind Farm and the Associated Transmission System in Santa Vitória do Palmar/RS', Santa Vitória do Palmar-RS, 27 February 2015.

In 2015, Brazilian electricity supply had indeed diversified when compared to 2001, although hydropower remained the main source, accounting for 64 per cent of the national total electricity supply. According to the Ministry of Mines and Energy, in 2015, domestic electricity supply was generated by the following sources:[161]

Table 4

Energy source	Percentage
Hydropower	64%
Natural gas	12.9%
Biomass	8%
Oil	4.8%
Coal	4.5%
Wind	3.5%
Nuclear	2.4%
Solar	0.01%

A combination of concerns about over-reliance on hydropower, risk of drought as well as problems with lawsuits halting energy projects – particularly new large-scale dams – due to environmental and social concerns, such as the construction of Belo Monte dam referred to under section 4.2.1 above and the fact that Brazil faces a near exhaustion of its environmentally feasible hydropower potential,[162] contributed to efforts to diversify the Brazilian energy matrix away from large-scale hydropower with the inclusion of green energy sources, particularly wind and biomass. However, with the exception of biomass, despite contributing to diversification, green energy sources, such as wind and solar, played only a small role in the diversification of energy sources for the electricity system in Brazil.

[161] Ministry of Mines and Energy, 'Brazilian Energy Matrix Year 2015', 16 <https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_2016.pdf> accessed 20 November 2018.

[162] Most of Brazil's untapped hydropower potential lies in the Amazon region, and therefore faces severe local environmental constraints. See, Roberto Schaeffer and others, *Who Drives Climate-relevant Policies in Brazil?* (Institute of Development Studies/Universidade Federal do Rio de Janeiro 2015); André F P Lucena and others, 'Climate Policy Scenarios in Brazil: A Multi-model Comparison for Energy' (2016) 56 Energy Economics 564.

Although Brazil has impressive solar power potential,[163] there have been no policies focusing on its promotion on a large scale during this period. From 2003 to 2015, PROINFA and 'Light for All'[164] remained the programmes which promoted green energy sources for the electricity system. Law 12,783 of 11 January 2013 amended Law 10,438 of 26 April 2002, which created PROINFA, to include that funds from the Energy Development Fund (Conta de Desenvolvimento Energético – CDE) should be used to promote the competitiveness of energy produced from wind power, thermosolar, photovoltaic, small hydropower, biomass, other renewables and natural gas. However, apart from the inclusion of this aim in the legal framework, there were no new specific policies and stimulus for green energy development in the electricity system for a period of circa 13 years.

C. The continuation of the negative frame and the promotion of fossil fuels

As noted above, compared to 2001, green energy technologies, such as biomass, wind and solar energy, saw increasing use in the electricity sector[165] with a view to diversification, as a result of programmes started during the 2001 energy crisis. However, this section will show that the negative framing of green energy, particularly wind and solar energy, as insufficient to meet the energy demand required to support economic growth has contributed to preventing the promotion of these energy sources for large scale use. It will also be demonstrated that positive links in relation to energy security and fossil fuels had the implication of promoting fossil fuels development in the country. During this period, the

[163] F Martins and E Pereira, 'Enhancing Information for Solar and Wind Energy Technology Deployment in Brazil' (2011) 39 Energy Policy 4378; T Viana and others, 'Assessing the Potential of Concentrating Solar Photovoltaic Generation in Brazil with Satellite-derived Direct Normal Irradiation' (2011) 85 Solar Energy 486.
[164] Light for All was created in 2003 via Decree 4,873 of 11 November 2003 with the aim of providing energy access. Please see section 3.1 above.
[165] Please see tables 2 and 3.

concept of energy security as availability, affordability and reliability of energy supply coupled with challenges over dependency on one energy source and on foreign energy resource advance a predominant paradigm of energy independence based on national fossil fuel exploration, where wind and solar energy sources played no role.

The negative discursive construction in relation to green energy is evidenced in presidential speeches:

> Some people think that wind energy is the solution. It is not. Wind energy is a complementary and auxiliary thing. You can never think that wind energy will be the basis of the energy matrix of a country that wants to grow 5% per year. It's not possible.[166]
>
> No country in the world can provide power without dams in a system like ours, or thermal power plants, either thermal oil or thermal of fissile origin, as is the case with nuclear, because solar energy and wind power are still complementary energies. They do not guarantee the country's development, social inclusion and sustainability, they do not support energy production, they are complementary.[167]

Brazil promoted fossil fuels, particularly oil and gas, as a way of making the country's electricity sector more resilient to extreme weather events and guarantee energy security. In 2001, a maximum of 12.74 per cent of electricity was generated from fossil fuels, as per table 2. By 2015, this amount had increased to almost 23 per cent, as per table 3. The sharp increase

[166] Luiz Inácio Lula da Silva, 'Speech at the Start-up Ceremony of Ethanol Usage in the Juiz de Fora Thermoelectric Power Plant', Juiz de Fora – MG, 19 January 2010.
[167] Dilma Rouseff, 'Speech during the Start Ceremony of the Deviation of the Madeira River for the Santo Antônio Hydroelectric Power Plant', Porto Velho-RO, 5 July 2011.

of oil and gas consumption in Brazil is also clear. From 2004 to 2014 oil consumption increased 54.9 per cent while natural gas consumption increased 100.6 per cent.[168] During this period, in addition to dependency on one energy source and the need to diversify,[169] energy security was framed in terms of dependency on foreign energy resource – gas from Bolivia in particular.

In 2006, the Bolivian President, Evo Morales, nationalised the hydrocarbons industry in Bolivia and increased royalties from 50 per cent to 82 per cent in their two largest fields.[170] This had a negative impact on the security of energy supply in Brazil because, as stated above, during the 2001 energy crisis, thermoelectric power plants using natural gas mostly imported from Bolivia were developed as the main alternative to reduce the dependency on hydropower. The nationalisation of the hydrocarbons industry in Bolivia resulted in the appearance of alarmist language, such as the 'gas crisis'.[171] However, as previously stated, no explicit links were made between energy security and national security in the official discourse. This dependency on foreign energy resources was explained in a different way, as is clear in these excerpts from presidential speeches:

> And now a part of the Brazilian industrial production, particularly in the state of São Paulo, taxis in São Paulo and Rio de Janeiro, are dependent on gas. But some people have forgotten that this gas was not ours, they forgot that this

[168] Conrado Augustus de Melo, Gilberto de Martino Jannuzzi and Sergio Valdir Bajay, 'Nonconventional Renewable Energy Governance in Brazil: Lessons to Learn from the German Experience' (2016) 61 Renewable and Sustainable Energy Reviews 222, 225.
[169] See, for example, Dilma Rousseff, 'Speech at the Opening Ceremony of Geribatu Wind Farm and the Associated Transmission System in Santa Vitória do Palmar/RS', Santa Vitória do Palmar-RS, 27 February 2015.
[170] 'Now it's the People's Gas', *The Economist* (Caracas, La Paz and São Paulo, 4 May 2006). See also Giselle de Castro de Carvalho, 'A Indústria dos Hidrocarbonetos no Brasil: O Problema com o Caso Gasoduto Bolívia- Brasil e a Solução com os Combustíveis Renováveis' (2006) 11(2) Papel Político 739.
[171] Luiz Inácio Lula da Silva, 'Speech during a Visit to Platform Facilities and Collection of First Oil Production of the Well in the Pre-salt Campo Baleia Franca', Vitória-ES, 15 July 2010.

gas belonged to another country. And as a sovereign country it has the right to make the decision based on its assessment of the richness of its soil and subsoil. And it is no surprise what happened in Bolivia.[172]

> You see, for example, what happened with Brazil and Bolivia. Brazil suddenly prioritised an energy matrix which was not independent, where we did not have self-sufficiency. When we do not have self-sufficiency and the owner decides to say 'I will not sell to you' we are in trouble. [173]

As a result of the nationalisation of Bolivian gas, Brazil promoted the exploration of its natural gas to achieve self-sufficiency. The discourse, as such, reveals a predominant paradigm of energy independence based on fossil fuel exploration. Wind and solar energy sources were not discursively framed as playing a role in minimising any impact related to dependency on foreign energy resources. As indicated in presidential speeches:

> […] it has been about three or four years since we had the first gas crisis. We held a meeting of the National Energy Policy Council at the time and decided that we would not be left with a sword to our head because of the gas bill, we were going to search for our own gas. We created the Plangás and today Petrobras already has a number of [its own sites]... How much gas are we exploring there? We are selling over 60 million cubic meters of gas.[174]

[172] Luiz Inácio Lula da Sila, 'Speech at the Opening Ceremony of the Hydroelectric Plant Eliezer Batista', Aimorés-MG, 5 May 2006.
[173] Luiz Inácio Lula da Silva, 'Speech at the Opening Ceremony of the Biodiesel Plant Barralcool', Barra do Bugres-MT, 21 November 2006.
[174] Luiz Inácio Lula da Silva, 'Speech during a Visit to Platform Facilities and Collection of First Oil Production of the Well in the Pre-salt Campo Baleia Franca', Vitória-ES, 15 July 2010.

> In 2006, President Lula called us all and created the Plangás. The Plangás was the anticipation of gas production in order for Brazil to reach self-sufficiency.[175]

However, even though gas self-sufficiency was presented as a priority in the discourse, in 2013 Brazil was still dependent on Bolivian gas. In 2013 Brazil imported 59% of its natural gas with Bolivia accounting for 67% of the total Brazilian gas imports.[176] The claim that this dependency on gas from Bolivia constituted a threat to Brazilian energy security is also found in the literature.[177] As a result of dependency on Bolivian gas, Brazil promoted the national exploration and production of oil and natural gas from conventional and unconventional petroleum resources.[178] The approval of oil and gas exploration which requires the use of hydraulic fracturing (fracking) in 2013 caused controversy in Brazil and was challenged, among others, by politicians,[179] the Federal Public Ministry, NGOs[180] and the public in general.[181] Civil

[175] Dilma Rousseff, 'Speech during the Announcement Ceremony of the Implementation of the Regasification Terminal of Liquefied Natural Gas (LNG) in Bahia', Salvador-BA, 1 March 2011.

[176] Ministério de Minas e Energia (Brazil), *Boletim Anual de Exploração e Produção de Petróleo e Gás Natural – 2014* (MME 2014).

[177] Tiago Tasca, 'De Roboré aos anos 2000: A Bolívia como Vértice de (In)Segurança Energética Brasileira?' (2017) 14(1) Conjuntura Internacional 12, 21.

[178] CNPE Resolution 6 of 25 June 2013.

[179] The use of fracking was challenged in the public audience by the Environmental, Consumer Protection and Surveillance and Control Commission (CMA) of the Federal Senate on 27 August 2013. On 27 November 2013, two Deputies also proposed a Project of Law to suspend the CNPE Resolution 6, ANP resolution 181 and the tender which was rejected by the Mines and Energy Commission. See Project of Law 1409/2013 (Projeto de Decreto Legislativo n. 1409/2013).

[180] For example, the Landless Workers' Movement (Movimento dos Trabalhadores Sem Terra), the Land Pastoral Commission (Comissão da Pastoral da Terra), the National Conference of Bishops of Brazil (Conferência Nacional dos Bispos do Brasil) and Greenpeace.

[181] The Brazilian Society for the Progress of Science (Sociedade Brasileira para o Progresso da Ciência) and the Brazilian Academy of Science (Academia Brasileira de Ciências), for example, sent a letter to the president Dilma Rousseff in the beginning of August 2013 requesting the suspension of the shale gas auction by the ANP. See <http://www12.senado.gov.br/noticias/materias/2013/08/23/cma-discute-impactos-economicos-e-ambientais-da-exploracao-de-gas-de-xisto)> last accessed 10 March 2015. Indigenous population were also against the exploration of shale gas in the Amazon area. See Sílvia Mugnatto, 'Indígenas do Amazonas ameaçam entrar em guerra com empresas para evitar exploração de gás na região' *Rádio Câmara* (28 November 2013).

lawsuits were filed by the Federal Public Ministry on the basis that fracking causes irreversible harms to the environment, human health and regional economic activity.[182]

Affordability, as part of the energy security concept adopted during this period, was, however, presented as an important driver in the official discourse when it came to pushing forward the exploration of fossil fuels in the country. For example, when rejecting the Project of Law 1409/13 which sought the suspension of CNPE Resolution 6, the Brazilian Mines and Energy Commission expressly advocated the exploration of shale gas as in the public interest. Presenting shale gas as a cheap and clean energy source, the Commission supported the view that shale gas had the potential to supply a great part of the Brazilian energy demand for decades and its exploration would positively impact gas for cooking and electric energy. This is because access to it would reduce the gas price as well as the operational costs of thermoelectric power plants thus benefiting, as such, society, in particular those on low income.[183] Thus, the notion of energy security – framed in terms of concerns related to external energy dependency and affordable prices – was used to push forward the approval of a fossil fuel policy.

The promotion of oil and natural gas in Brazil was also favoured by the discovery of significant offshore oil and natural gas reserves under extensive layers of salt and rocks (‘pre-salt’) in 2007 with its exploration regulated by Law 12,351 of 22 December 2010. The daily oil output from pre-salt extraction rose from an average of approximately 41,000 barrels per day

[182] Public Civil Action n. 5005509-18.2014.404.7005 filed by Parana Federal Public Ministry on 22 May 2014; Lawsuit n. 0006519.75.2014.403.6112 filed by Sao Paulo Federal Public Ministry on 17 December 2014. As of January 2019, the approval for unconventional oil and gas was suspended and both lawsuits were under appeal.
[183] Rapporteur Opinion of the Mines and Energy Commission on the Project of Law 1409/13 on 22 April 2014. See also Tiago Miranda, 'Minas e Energia rejeita suspensão de leilão para explorar gás natural e de xisto' *Câmara Notícias* (9 May 2014).

in 2010 to 1 million barrels per day by mid-2016.[184] In 2030 it is predicted that daily oil output will be around 31 million barrels.[185] However, technical challenges surround the extraction of these reserves, given the depth and pressures involved, associated freezing temperatures, and distance offshore. In addition, the fields have the potential to include large volumes of associated natural gas for which major infrastructure would be required to either transport it to markets via pipelines or liquefy it at sea, both of which introduce additional technical, logistical, economic, and safety considerations.[186] In this context, Brazil is now ranked 15th among the world's biggest proven oil reserves[187] and 9th among the world's biggest oil producers.[188] In the last decade, Brazil has, therefore, emerged as a significant fossil fuel player.

As a result of pre-salt and Brazil's rise to become one of the largest oil producers in the world, researchers have argued that renewable energy policies have been marginalised,[189] that pre-salt might cause major changes to the national patterns of electricity generation[190] and that the government's disproportionate investment in exploration for fossil fuels is clearly at odds with its claims that Brazil is fully committed to a 'clean' energy

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184 Petrobras, 'Pre-salt' <http://www.petrobras.com.br/en/our-activities/performance-areas/oil-and-gas-exploration-and-production/pre-salt/> accessed 26 November 2018.
185 Ildo L Sauer and Larissa Araújo Rodrigues, 'Pré-sal e Petrobras além dos Discursos e Mitos: Disputas, Riscos e Desafios' (2016) 30(88) Estudos Avançados 185, 191.
186 Eugene D Coyle and Richard A Simmons, *Understanding the Global Energy Crisis* (Purdue University Press 2014), 56.
187 Worldatlas, 'The World's Largest Oil Reserves By Country' <https://www.worldatlas.com/articles/the-world-s-largest-oil-reserves-by-country.html> accessed 26 November 2018.
188 US Energy Information Administration, 'What Countries Are the Top Producers and Consumers of Oil? The 10 largest oil producers and share of total world oil production in 2017' <https://www.eia.gov/tools/faqs/faq.php?id=709&t=6> accessed 26 November 2018.
189 Paulo Henrique Martinez and Roger Domenech Colacios, 'Pré-Sal: Petróleo e Políticas Públicas no Brasil (2007-2016)' (2016) 1(5) Journal of Social, Technological and Environmental Science 145, 147.
190 Richard L Ottinger, Douglas S de Figueiredo and Lia Helena M L Demange, 'Case Study of Renewable Energy in Brazil', in Richard L Ottinger (ed), *Renewable Energy law and Development: Case Study Analysis* (Elgar 2013), 107.

matrix.[191] It has been pointed out in the literature that the low-carbon energy system in Brazil could change in the future if the Brazilian system fails in boosting the large economic development while at the same time keeping its energy sector eco-friendly.[192] Some researchers highlight the potential of Brazil to improve electricity supply security by increasing the share of green energy sources and increasing the energy storage potential of the country.[193] Other researchers propose the use of a fraction of the pre-salt petroleum revenue to invest in the promotion and deployment of renewables in Brazil, including developing those energy sources not yet technologically mature, such as solar energy.[194] The evidence presented here suggests a rather different picture. The analysis of official documents in Brazil for the post-energy crisis period (2003-2015) demonstrates that, with the exception of bioenergy, green energy law and policies were not further developed, particularly in relation to the electricity sector.

An analysis of the official discourse in Brazil during the post-crisis period demonstrates two important points. First, it reveals that fossil fuels development has been advanced as essential for energy security in Brazil with regards to the electricity sector while green energy is construed as complementary energy and insufficient to meet the energy demands required for economic growth. Second, it shows a lack of debate in the official discourse surrounding emerging technological developments that can minimise the intermittency of green energy,

[191] Marco Antonio Vieira and Klaus Guimarães Dalgaard, 'The Energy-Security–Climate-Change Nexus in Brazil' (2013) 22(4) Environmental Politics 610, 614.
[192] Fabio Farinosi, 'Energy Transitions and Climate Security in Brazil', in Robert E Looney (ed), *Handbook of Transitions to Energy and Climate Security* (Routledg 2017), 239.
[193] Julian David Hunt, Daniel Stilpen and Marcos Aurélio Vasconcelos de Freitas, 'A Review of the Causes, Impacts and Solutions for Electricity Supply Crises in Brazil' (2018) 88 Renewable and Sustainable Energy Reviews 208.
[194] José Goldemberg and others, 'Oil and Natural Gas Prospects in South America: Can the Petroleum Industry Pave the Way for Renewables in Brazil?' (2014) 64 Energy Policy 58.

such as around energy storage and smart grid. There was no mention of energy storage or smart grid in any of the documents analysed.

What this section demonstrates, therefore, is that the dominant positive frame on the interplay between energy security and fossil fuel, coupled with the prevalence of a negative discursive frame in relation to green energy technologies for the electricity sector and the absence of a debate in the official discourse surrounding emerging technological advances which support the deployment of green energy technologies are contributing to Brazil moving in an opposite direction to a low carbon energy transition.

It seems clear that, in order to transition to a low carbon energy system, Brazil should be seeking further diversification of its energy matrix by increasing the share of green energy sources. Here, three actions would be of assistance. First, as demonstrated in this chapter, when a positive frame in relation to the links between energy security and an energy source is advanced, it has the implication of promoting such energy source. Therefore, a dominant positive frame should be forged in law and policies in relation to the interplay between energy security and green energy, particularly wind and solar energy. Second, the broader energy security concept should be incorporated in law and policies which includes environmental, climate and social considerations. As demonstrated in section 3, although there are social and environmental conflicts in relation to some green energy projects, nowadays green energy is directly linked with climate change in law and policies and solar energy has played an important role in achieving the social aim of universal energy access. Adopting this broader concept, therefore, would more clearly associate the role played by green energy in ensuring energy security. Third, Brazil should create law and policies which support the development, commercialisation and deployment of emerging green energy technologies. In order to assist with this task, further research is needed to identify the legal, regulatory and social challenges to enable the development, commercialisation and deployment of emerging green energy technologies in Brazil, particularly around energy storage and smart grid.

6. Conclusions

This chapter analysed the interplay between energy security and green energy law and policies in Brazil. It uncovered the socio-legal factors underpinning the emergence of the national rules that encouraged the promotion of green energy initiatives in Brazil through national policymaking, a policy domain which included energy access, economic development, environmental protection, climate change, social development and energy security. After examining the forces that were at play in Brazil at the time of the enactment of green energy law and policies during the period of analysis (January 2001- December 2015), the chapter then moved on to investigate the interplay between energy security and law and policies on green energy development, a subject which is at the centre of this thesis. Based on the key research questions, the focus here was on the discursive construction of energy security and its law and policy on green energy development, as well as the discursive links between energy security and law and policies promoting green energy. In this process, the chapter established a number of important findings.

By examining how the concept of energy security was conceptualised and contextualised in Brazil within the period of analysis, it revealed that, during the 2001 energy crisis, energy security concerns were distinctly focused on energy availability and reliability, while the concept adopted in the post-2001 energy crisis period was expanded to include affordability, confirming, as such, the evolving and multifaceted nature of the meaning of energy security. However, it is clear that broader concepts of energy security found in the literature which include environmental, climate and social considerations have not reached the official discursive terrain of green energy law and policies in Brazil as yet.

What emerged as a common feature from 2001 to 2015 is the absence of explicit links between energy security and national security/military action in the official discourse. The framing of energy security was in the context of economic development, demonstrating that energy security in Brazil is first and foremost an economic issue. This finding is relevant, because, although absent from the official discourse, street protests took place during the 2001 energy crisis and were framed by the media at the time as being responses to electricity rationing and its negative impact on labour markets and jobs. What this reveals, therefore, is that energy interruption in Brazil can cause economic instability and, as a result, lead to social instability. If necessary measures are not taken to correct the imbalance in energy supply, the evidence suggests this can lead to economic crises and chaos that disrupts Brazil's social order.

The analysis of the links between energy security and green energy law and policies was further contextualised in relation to Brazil's high dependence on large-scale hydropower and its pursuit of diversification in its energy matrix. This chapter demonstrated that energy security was discursively framed differently in different green energy law and policies within different energy sectors. Due to its importance to economic and social stability in Brazil, when the connections between energy security and an energy source were positively framed, it had the implication of promoting that energy source. On the contrary, when the connections between energy security and an energy source were negatively framed, it had the implication of hindering the development of such energy source.

Attention, therefore, should be paid to how the discourse of energy security has been framed in green energy law and policies and how it has affected green energy development. In this respect, this chapter showed that in the context of the transport sector, a positive frame in law and policies for energy security and biofuels connections was advanced in terms of biofuels' key role in tackling energy security concerns over energy use from exhaustible energy sources, dependency on imported energy sources, the oligopoly of oil producers and the uneven distribution of fossil fuels around the world as well as the risk of war associated with oil exploration. This positive construction, as a result, has supported biofuels development.

In the electricity sector, the dominant positive frame linked energy security and fossil fuel, with a particular emphasis on fossil fuel's essential role in ensuring energy security via the diversification away from large scale hydropower and achievement of energy self-sufficiency based on national fossil fuel exploration. Although there was a positive frame within which green energy was cast as important for energy diversification and which, therefore, saw its promotion for small-scale projects, a dominant negative frame was advanced in the context of the deployment of green energy, solar and wind in particular, in which it was treated as a complementary energy source due to its costs, intermittent nature and insufficiency for supporting economic development. This positive frame for fossil fuel and negative frame for wind and solar energy in law and policies coupled with the absence of any reference in the official discourse to emerging innovative technologies with the potential to minimise green energy intermittency issues have had the result of contributing to the hindrance of these green energy technologies and the promotion of fossil fuels development in Brazil. Consequently, Brazil is moving in an opposite direction to a low carbon energy transition.

It seems clear that, in order to move towards a low carbon energy transition, Brazil should be seeking further diversification of its energy matrix by increasing the share of green energy sources. Here, three actions would be of assistance. First, a dominant positive frame should be forged in law and policies in relation to the interplay between energy security and green energy, particularly wind and solar energy, since a positive frame in relation to this link has the implication of significantly contributing to the promotion of an energy source. Second, the broader energy security concept should be incorporated in law and policies which includes environmental, climate and social considerations. As demonstrated in this chapter, although there are environmental and social conflicts in relation to some green energy projects, nowadays green energy is directly linked with climate change in law and policies and solar energy has played an important role in achieving the social aim of universal energy access. Adopting this broader concept, therefore, would facilitate understanding on the role played by green energy in ensuring energy security. Third, Brazil should create law and policies which support the development, commercialisation and deployment of emerging green energy technologies to unlock their potential to the country, particularly around energy storage and smart grid – something research could contribute to by identifying, for example, the legal, regulatory and social challenges to enable the development and diffusion of such technologies.

In line with the approach adopted in this thesis, the following chapter will examine the interplay between energy security and green energy in the law of the World Trade Organisation (WTO), building on the findings of the case studies of GB and Brazil.

CHAPTER 6

THE APPLICABILITY OF THE LAW OF THE WTO TO GREEN ENERGY SECURITY

1. Introduction

1.1. Aim and contribution of the chapter

This chapter builds on the findings of the case studies on Great Britain (GB) and Brazil under chapters 4 and 5 respectively. These country case studies have shown that two main discursive frames can be found in relation to the interplay between energy security and national law and policies on green energy development: (i) the positive frame, which points out the importance of developing green energy to ensure energy security, i.e. green energy security; and (ii) the negative frame, where green energy is seen as negatively affecting energy security, particularly as a result of its intermittent nature, costs and insufficiency to meet the energy demands of a growing economy.

Revealing these differences of approaches in relation to the interplay between energy security and green energy in the country case studies is relevant because this divergence of views, learnt in each country case study, may be at stake in legal disputes. In particular, legal disputes between countries concerning energy security and green energy development have already taken place within international trade law as encapsulated in the law of the World Trade Organisation (WTO), an international trade organisation which adjudicates between competing discursive claims and pronounces on their legal status.

The WTO, therefore, was selected as a third case study because it shows how this diversity of views raised in national contexts leads to legal disputes in international forums when attempts are made to address the issue of the interplay between energy security and green energy development. Literature on international green energy trade disputes in the WTO, however, have predominantly focused on the consistency of green energy policies with WTO law and the balance between WTO obligations and domestic public policy space as a way to address environmental and climate change objectives.[1] Energy security as a justification under WTO rules for trade restrictive measures to support green energy development is largely unexplored. Thus, the key contribution of this study to the existing academic literature on green energy and the law of the WTO lies in the fact that it analyses the WTO rules on green energy through the prism of energy security.

As countries transition to a low carbon energy system, the participation of green energy in the energy mix will increase worldwide. Thus, countries' dependence on green energy as a dominant energy source may be greater in the future. In this sense, green energy will also increasingly play a larger role in ensuring energy security globally. It is therefore important to analyse green energy security in the law of the WTO for a number of reasons. First, the WTO acts as the primary global trade governance body and plays a key role in settling interstate trade disputes through panels and the Appellate Body of its Dispute

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[1] Luca Rubini, 'Ain't Wastin' Time No More: Subsidies for Renewable Energy, the SCM Agreement, Policy Space, and Law Reform' (2012) 15(2) Journal of International Economic Law 525; Aaron Cosbey and Petroc C Mavroidis, 'A Turquoise Mess: Green Subsidies, Blue Industrial Policy and Renewable Energy: The Case for Redrafting the Subsidies Agreement of the WTO' (2014) 17(1) Journal of International Economic Law 11; Joanna I Lewis, 'The Rise of Renewable Energy Protectionism: Emerging Trade Conflicts and Implications for Low Carbon Development' (2014) 14(4) Global Environmental Politics 10; Thomas Cottier, 'Renewable Energy and WTO Law: More Policy Space or Enhanced Disciplines?' (2014) Renewable Energy Law and Policy Review 40; Avidan Kent and Vyoma Jha, 'Keeping Up with the Changing Climate: The WTO's Evolutive Approach in Response to the Trade and Climate Conundrum' (2014) 15 Journal of World Investment & Trade 245; Kati Kulovesi, 'International Trade Disputes on Renewable Energy: Testing Ground for the Mutual Supportiveness of WTO Law and Climate Change Law' (2014) 23(3) Review of European Community & International Environmental Law 342; Jaemin Lee, 'SCM Agreement Revisited: Climate Change, Renewable Energy, and the SCM Agreement' (2016) 15(4) World Trade Review 613. Huaxia Lai, 'The Climate-Trade Conundrum: A Critical Analysis of the WTO's Jurisprudence on Subsidies to Renewable Energy', in Mitsuo Matsushita and Thomas J Schoenbaum (eds), *Emerging Issues in Sustainable Development: International Trade Law and Policy relating to Natural Resources, Energy, and the Environment* (Springer 2016).

Settlement Body (DSB). Since the WTO DSB has come to act as a significant international forum to channel complaints related to trade restrictive measures supporting green energy development, it is therefore relevant to explore trends in energy security put forward to this specialised tribunal. Second, as the WTO DSB makes crucial jurisprudential moves that impact domestic law and policies, WTO Member States need to take WTO rules into account when shaping their domestic green energy law and policies. Therefore, a legal analysis of energy security in the green energy context within the WTO rules is needed, in particular, how a well-designed energy security policy promoting green energy could fail or succeed the various public policy exceptions provided in the law of the WTO. Third, with increasing green energy trade disputes under the WTO DSB over the years,[2] more trade disputes might be heard at the WTO on the subject of green energy security as to the purpose of government support for green energy. This chapter, then, aims to answer the fourth key research question of this thesis: is there policy space for national green energy security in the law of the World Trade Organisation (WTO)? It, therefore, explores whether there is any flexibility within the current WTO rules and the interpretations given to them that permit trade restrictive measures that support national green energy development with a view of ensuring energy security, i.e. green energy security

It is generally acknowledged in the literature that a successful transition to a low carbon energy system will require government support to develop new green energy sectors and technologies.[3] Countries, therefore, have adopted trade restrictive measures, particularly

[2] Since its creation in 1995, 15 cases involving green energy have been initiated under the WTO DSB as of January 2019. In 2018, 4 green energy cases were initiated under the WTO. Please see appendix 3.
[3] See, for example, Marianne Fay, Stephane Hallegatte, and Adrien Vogt-Schilb, *Decarbonizing Development: Three Steps to a Zero-Carbon Future* (World Bank 2015); A A Amrutha, P Balachandra and M Mathirajan, 'Model-based Approach for Planning Renewable Energy Transition in a Resource-constrained Electricity System—A Case Study from India' (2018) 42(3) International Journal of Energy Research 1023.

local content requirements and subsidies, as instruments to develop a national green energy industry. Local content requirements are often expressed as a percentage of a project that must be supplied by local firms (akin to a quota). They are used to support infant industry – especially in developing countries entering high-tech sectors such as green energy[4] – to achieve economies of scale, as access to a growing domestic market shielded from international competition may in time enable domestic firms to develop economies of scale and technological capacity.[5] The technology needed for green energy tends to be more expensive than traditional fuel sources,[6] and investors also prefer low-risk, conventional technologies that can be built quickly instead of long-term, innovative technologies that make for riskier investment options. Therefore, government assistance is often considered key to encourage investment in innovative technologies like green energy.[7]

In terms of subsidies, generally speaking, they are defined as a 'financial contribution' that confers a benefit. In the context of the WTO, a subsidy may exist in cases which involve 'any form of income or price support, which operates directly or indirectly to increase exports of any product from, or to reduce imports of any product into the territory of a Member State'.[8] Not all subsidies violate WTO law, only the ones that distort trade.[9] These trade restrictive measures do not prevent foreign direct investment or participation of the private sector. In fact, governments have tried to design green energy programmes in a way that

[4] Gary Hufbauer and others, *Local Content Requirements: A Global Problem* (Peterson Institute for International Economics 2013), 2.
[5] Ibid 96-99.
[6] David Popp, Ivan Hascic and Neelakshi Medhi, 'Technology and the Diffusion of Renewable Energy' (2011) 33(4) Energy Economics 648, 648.
[7] Virginia R Hildreth, 'Renewable Energy Subsidies and the GATT' (2014) 14(2) Chicago Journal of International Law 702, 707.
[8] Article 1.1 of the Agreement on Subsidies and Countervailing Measures (ASCM) and Article XVI:1 of the General Agreement on Tariffs and Trade (GATT) 1994.
[9] The Agreement on Subsidies and Countervailing Measures (ASCM) establishes two categories of subsidy: (1) prohibited subsidies that are outright WTO unlawful under Article 3; and (2) actionable subsidies that may be illegal, depending on their impact under Article 5.

ensures the support is provided through private entities. However, the argument that the government does not provide support itself and the programme does not constitute a subsidy does not find support in the WTO rules.[10]

A thorough economic analysis is necessary to evaluate which policy instruments best promote the development of a green energy industry. This is, however, outside the scope of this thesis. What is happening in practice is that local content requirements and subsidies are being used by Member States to support the development of green energy. These trade restrictive measures, however, have been challenged in green energy legal disputes under the WTO DSB. *Canada — Renewable Energy,*[11] *Canada — Feed-In Tariff Programme*[12] and *India — Solar Cells*[13] are examples here. The analysis of these cases in the literature focuses on justifying these trade restrictive measures on environmental and climate change grounds.[14] However, these cases also raise issues surrounding energy security as a justification under WTO rules for trade restrictive measures to support green energy development, but this has been largely unexplored.

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[10] Yulia Selivanova, 'The WTO Agreements and Energy', in Kim Talus (ed), *Research Handbook on International Energy Law* (Elgar Law 2014), 302.

[11] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector* – Report of the Appellate Body (6 May 2013) WT/DS412.

[12] WTO – *Canada — Measures Relating to the Feed-in Tariff Programme* – Report of the Appellate Body (6 May 2013) WT/DS426.

[13] WTO, *India — Certain Measures Relating to Solar Cells and Solar Modules* – Report of the Appellate Body (16 September 2016) WT/DS456.

[14] For *Canada – Renewable Energy/FIT,* see, for example, Luca Rubini, 'Ain't Wastin' Time No More: Subsidies for Renewable Energy, the SCM Agreement, Policy Space, and Law Reform' (2012) 15(2) Journal of International Economic Law 525; Aaron Cosbey and Petroc C Mavroidis, 'A Turquoise Mess: Green Subsidies, Blue Industrial Policy and Renewable Energy: The Case for Redrafting the Subsidies Agreement of the WTO' (2014) 17(1) Journal of International Economic Law 11; Jaemin Lee, 'SCM Agreement Revisited: Climate Change, Renewable Energy, and the SCM Agreement' (2016) 15(4) World Trade Review 613. For *India — Solar Cells*, see, for example, Sherzod Shadikhodjaev, 'India – Certain Measures Relating to Solar Cells and Solar Modules´ (2017) 111 (1) American Journal of International Law 139; Vivasvan Bansal and Chaitanya Deshpande, 'The India-Solar Cells Dispute: Renewable Energy Subsidies under World Trade Law and the Need for Environmental Exceptions' (2017) 10(2) NUJS Law Review 209; Umair Hafeez Ghori, '"Reverse Permissibility" in the Renewable Energy Sector: Going Beyond the US-India Solar Cells Dispute' (2018) 8(2) Asian Journal of International Law 322; Marianna Karttunen and Michael O Moore, 'India-Solar Cells: Trade Rules, Climate Policy, and Sustainable Development Goals' (2018) 17(2) World Trade Review 215.

Although some scholars have examined energy security within the WTO,[15] only a few studies have analysed the lines of argument which have focused on the role played by green energy in configuring energy security as a facet of public policy in the WTO.[16] These few studies mention the significance of green energy to energy security, for example, 'the use of renewable energy will help towards energy security regionally',[17] 'countries [are] aiming to improve their domestic capacity for renewable energy to facilitate energy security',[18] and the importance of green energy regulation in the WTO to energy security. As illustrated in one scholar's words: '[l]ack of appropriate disciplines in the WTO in areas such as renewable energy constrain the development of this sector and impair energy security'.[19] The role of green energy in ensuring 'a more secure energy path' has been recognised by the former WTO Director-General Pascal Lamy. As he put it, "[g]reater energy efficiency and clean energy will play a central role in moving the world onto a more secure and sustainable energy path."[20] In light of these markers both in academic work and statements by key figures in the WTO itself,

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[15] See, for example, Shiv Kumar Verma, 'Energy Geopolitics and Iran–Pakistan–India Gas Pipeline' (2007) 35(6) Energy policy 3280; Wen-Chen Shih, 'Energy Security, GATT/WTO, and Regional Agreements', (2009) 49(2) Natural Resources Journal 433; Tang Qi, 'The Implications of Reshaping Energy Trade Discipline on China's Energy Security (2011) 5 Energy Procedia 562; Sajal Mathur, *Trade, the WTO and Energy Security: Mapping the Linkages for India* (Springer 2014); Sherzod Shadikhodjaev, 'Russia and Energy Issues under the WTO System' (2016) 50(4) Journal of World Trade 705.

[16] See, for example, Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh, 'Renewable Energy in the World Trade Organization' in Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh (eds), *International Energy Governance: Selected Legal Issues* (Edward Elgar Pub Ltd 2014); Angelica P Rutherford, 'Regulatory Framework for Biofuels in Brazil: History and Challenges under the Law of the WTO' (2016) 34(2) Journal of Energy & Natural Resources Law 213; A Jayagovind, 'Missing the Wood for the Trees: A Critique of the WTO Ruling in *India: Solar Cells and Modules*' (2016) 56(2) Indian Journal of International Law 201.

[17] Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh, 'Renewable Energy in the World Trade Organization' in Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh (eds), *International Energy Governance: Selected Legal Issues* (Edward Elgar Pub Ltd 2014), 383.

[18] Aditya Sarmah, 'Renewable Energy and Article III:8(A) of the GATT: Reassessing the Environment-Trade Conflict in Light of the Next Generation Cases' (2017) 9(2) Trade, Law and Development 197, 219.

[19] James J Nedumpara, 'Energy Security and the WTO Agreements', in Sajal Mathur (ed), *Trade, the WTO and Energy Security: Mapping the Linkages for India* (Springer 2014), 71;

[20] Pascal Lamy, 'Speech to the Workshop on the Role of Intergovernmental Agreements in Energy Policy organized by the Energy Charter Secretariat on 29 April 2013 at the WTO' <https://www.wto.org/english/news_e/sppl_e/sppl279_e.htm> accessed 20 June 2018.

the following sections will expand on the interaction between green energy and energy security in the WTO.

1.2. Structure of the chapter

In an attempt to answer the question of whether there is policy space for national green energy security in the law of the WTO and fill the gap in the literature, this chapter will have the following structure. The chapter begins with an overview of the nature of international trade in green energy, followed by an examination of green energy trade law under the WTO as a background for contextual purposes. The following section focuses on energy security in the law of the WTO. It reveals how energy security has been raised within the WTO green energy jurisprudence so far. Based on the findings of the case studies on GB and Brazil, it also analyses whether there is room for green energy security as a justification for trade restrictive measures. The final section elaborates on a proposal for policy space for green energy security in the law of the WTO.

1.3. Summary of findings

Overall, this chapter will demonstrate that green energy development has increasingly come to be associated with energy security in the WTO jurisprudence. An analysis of the WTO green energy disputes involving energy security will also reveal that energy security concepts have been raised differently by respondents, and broader concepts of energy security found in the literature which include environmental, climate and social considerations have not reached the jurisprudence in the WTO system yet. The analyses of room for green energy security as a justification for trade restrictive measures will demonstrate that there might be some room for green energy security within the defences under Articles III:8(a), XX(a) and (j) and Article XXI. However, these defences have limited applicability and may also have undesirable outcomes. Finally, this chapter will argue that an evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure green energy security in the context of the just energy transition and propose a way forward to create the legal space in the WTO for trade restrictive measures aimed at ensuring green energy security.

2. The nature of international trade in green energy

Scaling-up the supply and use of green energy worldwide has mainly been associated with global efforts to curb climate change. For instance, agendas of multilateral leaders' meetings, such as the Group of 7 major industrialized economies (G7), called for 'accelerat[ing] access to renewable energy in Africa and developing countries in other regions' in the context of climate change.[21] Many countries have embarked on proactive policies to expand the deployment of green energy. According to REN21, renewable power, for example, accounted for 70% of net additions to global power generating capacity in 2017.[22] Governments worldwide have passed a raft of national regulations to encourage or mandate increased use of green energy sources as a substitute for traditional energy sources. With growing green energy markets, international trade is also increasing.[23] For example, the potential for biofuels to provide a major source of fuel for transportation has generated commitments of resources to that effort worldwide. This is especially true for the United

[21] G7 Germany, 'Leaders' Declaration, G7 Summit, 7–8 June 2015', 16 <https://www.g7 germany.de/Content/EN/_Anlagen/G7/2015–06–08-g7-abschluss-eng_en.html> accessed 12 January 2019.
[22] Renewable Energy Policy and Network for the 21st Century (REN21), 'Renewables 2018 Global Status Report' <http://www.ren21.net/status-of-renewables/global-status-report/> accessed 20 June 2018.
[23] See, for example, Amy Myers Jaffe, 'Green Giant: Renewable Energy and Chinese Power', *Foreign Affairs* (Mar/Apr 2018); Pilita Clark, 'The Big Green Bang: How Renewable Energy Became Unstoppable', *Financial Times* (18 May 2017), <https://www.ft.com/content/44ed7e90-3960-11e7-ac89-b01cc67cfeec> accessed 20 June 2018.

States, the European Union (EU) and Brazil, with total biofuel production in these countries increasing 462 per cent from 2001 to 2013.[24]

Green energy technologies are made up of packages of goods, services and embedded intangibles (such as software) that come together as a result of multiple transactions involving the providers of supply chains operating across several jurisdictions. In this manner, the goods, services and intellectual property (IP) involved in any particular wind energy park or a solar photovoltaics (PV) installation, for example, have usually crossed several borders to get there. Any such equipment would generally also include locally produced components and services.[25] For instance, solar firms in the US and the EU are linked with Chinese firms through global supply chains.[26] The emergence of global supply chains has enabled solar photovoltaics companies to specialise in specific stages of manufacturing, and to scale up global solar photovoltaics production capacity.[27] The photovoltaics industry consists of a long value chain from raw materials to photovoltaics system installation and maintenance. In general, when people talk about the PV industry, the main focus is on the solar-cell and module manufacturers. However, there is also the upstream industry (e.g. materials, polysilicon production, wafer production and equipment manufacturing) as well as the downstream industry (e.g. inverters, balance of system (BOS) components, system development, project development, financing, installations and integration into existing or future electricity infrastructure, plant operators, operation and maintenance).[28] As a result of these

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[24] Jayson Beckman, 'Biofuel Use in International Markets: The Importance of Trade' (2015), <https://www.ers.usda.gov/webdocs/publications/44009/53707_eib144.pdf?v=42248> accessed 20 June 2018.
[25] Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans, 'Setting the Horse Before the Cart to Preserve a Viable World', in Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans (eds), *The Law and Economics of a Sustainable Energy Trade Agreement* (Cambridge University Press 2016), 3.
[26] Jonas Nahm, 'Renewable Futures and Industrial Legacies: Wind and Solar Sectors in China, Germany, and the U.S', (2017) 19(1) Business and Politics 68.
[27] Jonas Nahm and Edward S Steinfeld, 'Scale-up Nation: China's Specialization in Innovative Manufacturing' (2014) 54 World Development 288, 298.
[28] Arnulf Jäger-Waldau, *PV Status Report 2017* (Publications Office of the European Union 2017), 52.

developments, the nature of the green energy sector has resulted in increasing tradability of green energy goods and services, and internationalisation of green energy activities.

The trend towards privatisation and liberalisation of the energy sector has also accelerated green energy trade. Until the 1980s, it was a conventional wisdom of the post-war years that markets are hopelessly inadequate in providing appropriate energy supplies,[29] and governments worldwide have considered the energy sector too crucial to be left to market forces. Accordingly, monopoly was the norm.[30] However, with the deregulation movement, there was a paradigm shift in the electricity industry across the world from a system of State ownership and centralised management to one that favours decentralised structures, competition, independent regulatory oversight, and private ownership.[31] As a result, trade in electricity is a new dimension of trade in energy, in which the green energy sector plays an important role. As such, industries in the green energy sector have not been dominated by State-owned vertically integrated utilities, who would typically have engaged in the production, transport and distribution of energy products. As a result, this has left ample margins for trade and competition.

3. Green energy trade and the law of the WTO: an overview

This section introduces some of the key rules of WTO law as well as examines how green energy has been addressed in the law of the WTO.

[29] D Helm, *Energy, the State and the Market* (Oxford University Press 2004), 1.
[30] Daniel Kirschen and Goran Strbac, *Fundamentals of Power System Economics* (John Wiley & Sons 2004), 1.
[31] OECD, *Regulatory Reform in Network Industries: Past Experience and Current Issues* (OECD Economic Outlook 67, Organisation for Economic Co-operation and Development 2000).

3.1. WTO main trade obligations

The WTO was created in 1995 as the successor to, and incorporates within it, the General Agreement on Tariffs and Trade (GATT). As a forum for negotiation to reduce trade barriers, the GATT oversaw eight rounds of multilateral trade negotiations, culminating in the Uruguay Round that created the WTO[32] with the WTO taking responsibility for establishing the rules governing the international trading system within a multilateral framework. Generally speaking, WTO rules are aimed at liberalising global trade and are based on agreements negotiated by Member States.[33] As part of that, the GATT/WTO system provides a framework for conflict resolution in international trade relations.

The principle of non-discrimination constitutes a cornerstone in international trade relations.[34] WTO law requires States to abide by the non-discrimination obligations of most-favoured nation and national treatment. The Most Favoured Nation (MFN) obligation is reflected in several WTO Agreements,[35] including GATT Article I. The MFN obligation under GATT Article I requires WTO Members to grant any 'advantage, favour, privilege or immunity' given to one WTO Member to 'like products' originating from all other WTO Members. The WTO members are obliged to grant MFN treatment immediately and unconditionally. Thus, according to the MFN obligation, discrimination between trading partners is prohibited under WTO law. The National Treatment obligation under GATT Article III:4 implies non-discrimination between domestic and imported goods. The basic concept is that imported products shall be accorded treatment 'no less favourable' than that accorded to domestic

[32] Robert M Stern, 'The Multilateral Trading System', in Arvid Lukauskas, Robert M Stern, and Gianni Zanini (eds), *Handbook of Trade Policy for Development* (OUP 2013), 43.
[33] For an overview of WTO agreements, see WTO, 'Understanding the WTO: The Agreements' <https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm> accessed 1 January 2019.
[34] Nicolas F Diebold, 'Standards of Non-Discrimination in International Economic Law' (2011) 60 International & Comparative Law Quarterly 831, 831.
[35] See also General Agreement on Trade in Services (GATS), Article 2; and Agreement on Trade-related Aspects of Intellectual Property (TRIPS), Article 4.

products. While MFN applies to both imports and exports, the national treatment is applicable only to non-discrimination of imports, and not exports.[36]

The GATT recognises that derogations from international trade obligations are sometimes necessary to protect legitimate non-trade policy interests. This is possible, for example, by virtue of GATT Article XX entitled 'general exceptions' and Article XXI entitled 'security exceptions'. In section 4 below, these exceptions will be analysed in the context of green energy security.

3.2. Green energy trade and the law of the WTO

The world is currently going through a period of legal, economic and political quarrelling around the evolution of green energy technologies,[37] particularly with respect to trade.[38] As governments put in place policies to stimulate the green energy sector, trade tensions arise that test the limits of existing trade rules. Several disputes on related policies have been brought to the dispute settlement system of the WTO.

Given the ongoing disputes at an international level, there is increased acknowledgement of the interaction between trade and energy, and regulating green energy trade has been recognised as one of the WTO's key challenges.[39] The former Director General of the WTO, Pascal Lamy, stated in 2013 that 'what is sorely lacking in the current WTO

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[36] Yulia Selivanova, 'The WTO Agreements and Energy', in Kim Talus (ed), *Research Handbook on International Energy Law* (Elgar Law 2014), 282.
[37] Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans, 'Setting the Horse Before the Cart to Preserve a Viable World', in Gary C Hufbauer, Ricardo Meléndez-Ortiz and Richard Samans (eds), *The Law and Economics of a Sustainable Energy Trade Agreement* (Cambridge University Press 2016), 2.
[38] Please see appendix 3 for a list of green energy trade disputes under the WTO system.
[39] WTO, 'World Trade Report 2007: Six Decades of Multilateral Trade Cooperation: What Have We Learnt?', v. <https://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report07_e.pdf> accessed 16 June 2018.

context is a constructive and forward-looking discussion among members on the rapidly expanding trade and energy interface'.[40]

Energy is not specifically addressed in the law of the WTO and has not been singled out as a specific sector of trade under the WTO system.[41] When the original GATT was drafted in 1947, energy was not contemplated. The former WTO Director-General Pascal Lamy explained the absence of energy as a distinct sector by stating that '[w]hen the rules of the GATT — which preceded the WTO – were negotiated 60 years ago, opening trade in energy was not a political priority. World energy demand was a fraction of today's and you could buy a barrel of crude oil for USD20 at current prices.'[42] Cross-border trade for grid-linked energy was not very developed at the time of the GATT negotiations either.[43] In addition, at that time, green energy was neither on the agenda of the institutions of global governance nor the domestic policy agenda of member countries. Thus, interest in green energy was not a major concern. The emphasis was on economic reconstruction following the destruction of World War II, and avoiding a depression like that which took place after World War I.

Nevertheless, although the rules of the WTO were not directly negotiated with energy in mind, many scholars have argued that WTO rules are applicable to trade in energy and

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[40] Pascal Lamy, 'Speech to the Workshop on the Role of Intergovernmental Agreements in Energy Policy organized by the Energy Charter Secretariat on 29 April 2013 at the WTO' <https://www.wto.org/english/news_e/sppl_e/sppl279_e.htm> accessed 20 June 2018.

[41] See, for example, Ricardo Meléndez-Ortiz and Mahesh Sugathan, 'Enabling the Energy Transition and Scale-Up of Clean Energy Technologies: Options for the Global Trade System – Synthesis of the Policy Options', (2017) 51(6) Journal of World Trade 933, 936. Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh, 'Energy as a Special Sector in the World Trade Organization' in Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh (eds), *International Energy Governance: Selected Legal Issues* (Edward Elgar Pub Ltd 2014). Timothy J Richards and Lawrence Herman, 'Relationship between International Trade and Energy' <https://www.wto.org/english/res_e/publications_e/wtr10_richards_herman_e.htm> accessed 20 June 2018.

[42] Pascal Lamy, 'Doha Round Will Benefit Energy Trade', in his speech at the 20th World Energy Congress on 15 November 2007 in Rome < https://www.wto.org/english/news_e/sppl_e/sppl80_e.htm> last accessed 31 May 2017.

[43] Yulia Selivanova, 'The WTO Agreements and Energy', in Kim Talus (ed), *Research Handbook on International Energy Law* (Elgar Law 2014), 275.

energy products.[44] This implies that the non-discrimination principles of WTO law form an integral part of the legal framework that applies to international trade in energy. In practice, WTO rules have been treated as applicable to green energy trade disputes and the first cases on green energy decided by the WTO DSB made it clear that green energy falls under the disciplines of the GATT and its related agreements. The fact that many of the main green energy producing and exporting countries as well as suppliers and importers of green energy generation equipment in the world, such as China, the US and the EU,[45] are WTO members who have subscribed to its robust dispute settlement system,[46] may have contributed to the emergence of the WTO as a forum for green energy trade-related disputes.

Due to the multifaceted character of green energy trade, which encompasses a wide range of matters ranging from, for instance, trade in goods to trade in services, various agreements covered under the WTO system are relevant to green energy matters. As demonstrated by Thomas Cottier,[47] tariffs on hardware, such as photovoltaic equipment, fall under Articles II and XXVIII GATT. Import and export restrictions on green energy are dealt

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[44] See, for example, Gabrielle Marceau, 'The WTO in the Emerging Energy Governance Debate', in Joost Pauwelyn (ed), *Global Challenges at the Intersection of Trade, Energy and the Environment* (Centre for Trade and Economic Integration 2010), 26; Alan Yanovich,'WTO Rules and the Energy Sector', in Yulia Selivanova (ed) *Regulation of Energy in International Trade Law: WTO, NAFTA, and Energy Charter Treaty* (Kluwer 2011), 2; Timothy Meyer, 'The World Trade Organization's Role in Global Energy Governance', in Thijs Van de Graaf and others (eds), *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave 2016), 144. Timothy J Richards and Lawrence Herman, 'Relationship between International Trade and Energy' <https://www.wto.org/english/res_e/publications_e/wtr10_richards_herman_e.htm> accessed 20 June 2018.

[45] See Mahesh Sugathan, 'Winds of Change and Rays of Hope: How Can the Multilateral Trading System Facilitate Trade in Clean Energy Technologies and Services?' in: *The El 5 Initiative Strengthening the Multilateral Trading System: Clean Energy and the Trade System Group: Proposals and Analysis*, ICTSD Paper, Geneva 2013 <http://www.ictsd.org/downloads/2014/01/el 5-clean-energy-compilation.pdf> last accessed 27 April 2017.

[46] See, for example, Isabelle Van Damme, *Treaty Interpretation by the WTO Appellate Body* (OUP 2009); Alberto Álvarez-Jiménez, 'The WTO Appellate Body Decision-making Process: A Perfect Model for International Adjudication?' (2009) 12(2) Journal of International Economic Law 289; Rafael Leal-Arcas, 'Comparative Analysis between NAFTA's Chapter 20 and the WTO's Dispute Settlement Understanding' (2011) 8(3) Transnational Dispute Management 1; Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh, 'Energy as a Special Sector in the World Trade Organization' in Rafael Leal-Arcas, Andrew Filis and Ehab S Abu Gosh (eds), *International Energy Governance: Selected Legal Issues* (Edward Elgar Pub Ltd 2014); Timothy Meyer, 'Explaining Energy Disputes at the World Trade Organization' (2017) International Environmental Agreements: Politics, Law and Economics 1.

[47] Thomas Cottier, 'Renewable Energy and WTO Law: More Policy Space or Enhanced Disciplines?' (2014) Renewable Energy Law and Policy Review 40, 42.

with under Articles XI and XX GATT. Local content rules and government procurement are addressed by Article III GATT, the Agreement on Trade-Related Investment Measures (TRIMs), and the Government Procurement Agreement (GPA). Trade remedies (safeguards, anti-dumping, subsidies and countervailing measures) extend to energy and are subject to the disciplines of Articles VI, XVI, XIX GATT, as well as to the Anti-Dumping Agreement (ADA), the Agreement on Subsidies and Countervailing Measures (ASCM) and the Agreement on Safeguards (SG). Biofuels partially fall under the Agreement on Agriculture (AoA), with the application of its regime to bioethanol. Furthermore, the green energy sector is strongly based upon services, such as metering, scoping, scouting, engineering and maintenance of installations and finance, and thus fall under the General Agreement on Trade in Services (GATS). Technical standards, which are of crucial importance for safety as well as for achieving high productivity, fall under the Agreement on Technical Barriers to Trade (TBT). Finally, green energy may touch upon intellectual property rights, transfer of technology and competition under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs).

An important issue in ongoing international debates on energy is how it should be defined for WTO purposes. For instance, should energy be defined in terms of products or in terms of their use? Marceau suggests that energy should be defined as the action (product and process) through which energy-containing natural resources are transformed and consumed in response to a series of societal and individual human requirements for heat and power. However, the author notes that such a definition is not sufficient for WTO purposes as it does not fall neatly within the goods/services parameters of the WTO.[48] There is no agreement, for instance, on whether electricity qualifies as a good or a service under WTO

[48] Gabrielle Marceau, 'The WTO in the Emerging Energy Governance Debate', in Joost Pauwelyn (ed), *Global Challenges at the Intersection of Trade, Energy and the Environment* (Centre for Trade and Economic Integration 2010), 26.

rules.[49] This impacts upon electricity produced from green energy sources because WTO rules are based on a distinction between goods and services and, depending on the classification, different WTO rules apply. However, whilst classificatory ambiguities should certainly be noted in terms of their legal relevance, it is not the purpose of this chapter to provide a detailed analysis with regards to this matter. Rather, the emphasis is on the policy space for green energy security in the law of the WTO, an issue that will, in all likelihood, have to be addressed as a result of increasing links between energy security and green energy development, and as this body of law continues to be elaborated.

When it comes to the development of case law, environmental and climate change concerns have been the central issue with regards to green energy in the context of WTO law. Many of the main contemporary green energy goods and services, such as wind turbines, solar panels and solar water heaters, geothermal energy sensors and storage technologies like batteries, have been negotiated as environmental goods and services in the Doha Round, the latest round of trade negotiations among the WTO's membership.[50] While there is a lack of specific rules on green energy and related products under the WTO system, there is reference to sustainable development in the 1994 WTO agreement's preamble. The preamble covers the need for the Contracting Parties to make 'optimal use of the world's resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment', and this element has been widely associated with green energy in the literature as well as in WTO case law. What is lacking is an analysis of green energy security within the WTO, an issue which will be examined in the following section.

[49] See, for example, Henok Birhanu Asmelash, 'Energy Subsidies and WTO Dispute Settlement: Why Only Renewable Energy Subsidies Are Challenged' (2015) 18(2) Journal of International Economic Law 261.
[50] WTO, 'Negotiations on Trade and the Environment' <https://www.wto.org/english/tratop_e/envir_e/envir_negotiations_e.htm> accessed 16 June 2018.

4. Energy security and green energy in the WTO jurisprudence

An examination of room for national policy space for green energy security in the law of the WTO only makes sense if it is first acknowledged that green energy plays a role in ensuring energy security. Evidence from the case studies of GB and Brazil highlight the importance of green energy to energy security in a variety of ways. As green energy deployment in countries' energy mixes increases and may become the dominant energy source, it is likely that national law and policies on green energy development will come to be associated with energy security more widely. This section, therefore, will investigate how energy security has been construed within the WTO green energy jurisprudence so far.

The multifaceted concept of energy security has been extensively discussed in chapter 3. The case study on Brazil demonstrated the evolving concept of energy security within a specific country, while the case study on GB showed the dynamic and controversial concept of energy security within different sectors of the economy in a specific country. The WTO deals with different Member States, which will have different contexts and will, therefore, have a multiplicity of ways of understanding what energy security is.

The differences in concepts of energy security and their uses have already come to be seen as a cause of controversy and debate, generating significant deadlock in international negotiations. As one participant to the G8 Summit in St Petersburg put it: '[i]n preparing the St. Petersburg Summit´s final documents, the most stubborn arguments up to the last day concerned the interpretation of the very idea of "energy security"'.[51] The recent WTO case

[51] Nodari A Simonia, 'Energy Security: Russia, the European Union and the G8' in John Kirton, Marina Larionova and Paolo Savona (eds*), Making Global Economic Governance Effective: Hard and Soft Law Institutions in a Crowded World* (Ashgate 2010), 140.

on conventional energy between Russia and the European Union (EU), *EU – Energy Package,*[52] is another example of how a lack of agreed definition on security of energy supply can create controversy. In this case, Russia submitted that "neither the Directive nor any other EU authority on the record identifies a clear and consistent definition of security of supply"[53] and in Russia's view, this was "deliberate" and meant to "maximize [the European Union's] discretion to define security of supply in the manner most advantageous to its overall objectives, to include reducing reliance on Russian pipeline transport services and natural gas imports."[54] Therefore, an analysis of how energy security has been configured through WTO case law is important and timely. The definitions and interpretations of energy security in the WTO shape the term's role in legal texts and negotiations. Its interpretation can not only shape the outcome of individual disputes but also determine future trends in national policymaking.

WTO law does not provide a definition of energy security. Strictly speaking, there is no official definition of energy security in existing, legally binding instruments of international law. This complicates the process of clarifying the 'ordinary meaning' with reference to the term's context. The WTO has been acting as a forum for energy disputes, particularly green energy, for some time. Since its creation in 1995, 17 cases[55] involving energy have been initiated under the WTO DSB and, among those cases, 15 cases involved green energy as of 23 January 2019. In total, three green energy cases make reference to energy security matters: *Canada — Renewable Energy,*[56] *Canada — Feed-In Tariff Programme,*[57] *and India —*

[52] WTO, *European Union and its member States – Certain Measures relating to the Energy Sector* – Report of the Panel (10 August 2018) WT/DS476/R.
[53] Ibid [7.1147].
[54] Ibid.
[55] See appendix 3.
[56] *Canada — Certain Measures Affecting the Renewable Energy Generation Sector,* WT/DS412.
[57] *Canada — Measures Relating to the Feed-in Tariff Programme,* WT/DS426.

Solar Cells.[58] These cases, which will be subsequently analysed, provide an indication of how energy security has been raised and dealt with in the WTO green energy jurisprudence so far.

4.1. *Canada — Renewable Energy and Canada — Feed-In Tariff Programme*

4.1.1. Facts

In *Canada — Renewable Energy and Canada — Feed-In Tariff Programme*, the terms 'energy security' or 'security of energy supply' were not expressly used. However, concerns around energy availability and reliability – constitutive elements that form part of the energy security concept as shown in the previous chapters – were expressly raised. The case *Canada — Renewable Energy* initiated by Japan in 2010,[59] and prompted the WTO Dispute Settlement Body to decide, for the first time, on matters relating to trade in green energy, specifically the legal status of renewable energy and measures of support to enhance its contribution to a specific nation's energy matrix. Almost a year later, the EU also started a dispute under *Canada — Feed-In Tariff Programme* with regards to the same issue.[60]

The central complaint in these two cases related to the domestic content requirements for certain wind and solar photovoltaic electricity generation projects in the feed-in tariff programme (the 'FIT Programme'), established by the Canadian Province of Ontario, and the discriminatory treatment affecting imports of renewable energy generation equipment this led to. Generally, a feed-in tariff (FIT) scheme is designed to promote investment in the development of the green energy industry. A FIT typically provides for a fixed price for green electricity per kilowatt-hour fed into the grid on a common basis via long-

[58] *India — Certain Measures Relating to Solar Cells and Solar Modules,* WT/DS456.
[59] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector* – Request for Consultations by Japan (13 September 2010) WT/DS412/1.
[60] WTO, *Canada — Measures Relating to the Feed-in Tariff Programme* – Request for Consultations by the European Union (11 August 2011) WT/DS426/1.

term contracts.[61] Ontario linked eligibility for its FIT to a local content requirement, as an instrument to promote green industries.[62]

Under the Government of Ontario's FIT Programme, generators of electricity, producing from certain forms of renewable energy (wind, solar PV, renewable biomass, biogas, landfill gas, and waterpower), were paid a guaranteed price per kilowatt hour of electricity delivered into the Ontario electricity system under 20-year or 40-year contracts. In the case of wind power projects having a capacity to produce electricity greater than 10 kW, and solar projects with a capacity of up to 10MW, some minimum level of domestic content had to be satisfied in the development and construction of the qualifying electricity generation facility.[63]

Japan and the EU argued that Ontario's FIT Programme granted and maintained prohibited subsidies that were contingent upon the use of domestic over imported renewable energy equipment from other WTO Members and accorded less favourable treatment to like products of Japanese and EU origin, contrary to the national treatment principle. On this basis, Japan and the EU submitted that the FIT programme was not compatible with Canada's obligations under: (i) Articles 3.1(b) and 3.2 of the ASCM; (ii) Article III:4 of the GATT 1994; and (iii) Article 2.1 of the TRIMS Agreement.[64] Thus, the complainants requested the elimination of the domestic content requirement.

[61] Miguel Mendonça, David Jacobs and Benjamin K Sovacool, *Powering the Green Economy: The Feed-in Tariff Handbook* (Earthscan 2010), 15.
[62] Steve Charnovitz and Carolyn Fischer, 'Canada–Renewable Energy: Implications for WTO Law on Green and Not-So-Green Subsidies' (2015) 14(2) World Trade Review 177, 180.
[63] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector/ Canada — Measures relating to the Feed-in Tariff Programme* – Reports of the Panels (19 December 2012) WT/DS412/R and WT/DS426/R, [7.64].
[64] Ibid [3.1]-[3.4].

In response, Canada argued that the procurement of electricity through the FIT Programme fell within the scope of the government procurement exception under Article III:8(a) of GATT and as a consequence, was not subject to Article III of GATT and could not be inconsistent with Article 2.1 of the TRIMS Agreement as a result.[65] Both the Panel and the Appellate Body found that the domestic content requirements under the FIT Programme were inconsistent with Article III:4 of GATT and Article 2.1 of the TRIMs Agreement.[66] In relation to the subsidy claim, the question of whether FITs qualify as a subsidy under the ASCM remained unanswered because neither the Panel nor the Appellate Body reached a final conclusion as to whether FIT confers a benefit within the meaning of Article 1.1(b).

4.1.2. Energy security concepts

Canada made it clear that the FIT programme had two important contributions to make: (i) in helping secure the supply of electricity, and (ii) in helping protect the environment as it reduced Ontario's reliance on electricity from coal, thus reducing the production of greenhouse gases.[67] Throughout its arguments, Canada emphasised that 'FIT Programmes play an important role in securing clean electricity supply'.[68] Although the wording 'energy security' or 'security of energy supply' was not explicitly used, the role played by the Government of Ontario in ensuring an adequate, reliable and secure supply of electricity,

[65] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector, Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels, Addendum, Annex A-3 (19 December 20012) WT/DS412/R/Add.1 and WT/DS426/R/Add.1, [3].
[66] WTO, *Canada - Certain Measures affecting the Renewable Energy Generation Sector, Canada - Measures relating to the Feed-in Tariff Program* – Reports of the Panels (19 December 2012) WT/DS412/R and WT/DS426/R, [7.152]; Reports of the Appellate Body (6 May 2013) WT/DS 412/AB/R and WT/DS426/AB/R, [5.75]-[5.90].
[67] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector/ Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels, Addendum, Annex A-3 (19 December 2012) WT/DS412/R/Add.1 and WT/DS426/R/Add.1, [2].
[68] Ibid [17].

including from green sources, was highlighted throughout Canada's arguments.[69] Canada, therefore, focused on energy security in the sense of availability and reliability of energy supply. These are similar elements to those raised by the majority of participants in the case study on GB under chapter 4. The temporary shutdown of several nuclear facilities for maintenance, phasing out of coal-fired generation by 2014 and subsequent reduction in generation capacity, as well as the increase of Ontario's population by 28% by 2030 and the subsequent increases in energy demand were all invoked to express concerns about energy security.[70]

What is interesting in these cases is also how the Panel and the Appellate Body presented the link between energy security and green energy. While the Panel presented only a negative frame where green energy does not support energy security because of the intermittency of wind and solar energy sources,[71] the Appellate Body advanced a positive frame where green energy does play a role in ensuring energy security in the long-term by reducing reliance on fossil energy resources.[72] Therefore, in these cases, the Panel and the Appellate Body presented two different approaches in regard to framing green energy and energy security. From a legal perspective, this divergence in frames has implications for the interplay between energy security and green energy under WTO law, because the frame adopted can impact the applicability and interpretation of WTO provisions. The negative frame, for instance, reduces the room for energy security as a legal justification for trade restrictive measures adopted to promote green energy.

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[69] Ibid [1], [12], [17], [20], [41], [47], [51], [74], [77], [100], [112].

[70] Ibid [13].

[71] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector, Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels (19 December 2019) WT/DS412/R and WT/DS426/R, [7.19].

[72] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector, Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Appellate Body (6 May 2013) WT/DS412/AB/R and WT/DS426/AB/R, [5.186].

4.2. *India – Solar Cells*

4.2.1. Facts

India – Solar Cells is the first case in the history of the WTO case law where the wording 'energy security' and 'security of energy supply' have been expressly used in connection with green energy development. This case was brought by the United States (US) against India concerning local content requirements imposed under the Jawaharlal Nehru National Solar Mission (National Solar Mission) for solar cells[73] and solar modules. According to India, the National Solar Mission was a major initiative of the Government of India to promote ecologically sustainable growth while addressing India's energy security challenge, as well as to contribute to the global effort to meet the challenges of climate change.[74] It was launched by the Government of India in 2010, with the aim of generating 20,000 megawatts (MW) of grid-connected solar power capacity by 2022. India subsequently increased that target to 100,000 MW of grid-connected solar power capacity by 2022.[75] In order to meet this target, the scheme provided that the Government of India would enter into long-term Power Purchase Agreements (PPAs) with private solar power developers (SPDs).[76]

The US alleged that India required SPDs to purchase and use solar cells and solar modules of domestic origin to enter into and maintain PPAs with the Government of India. In addition, SPDs received certain benefits and advantages, such as long-term tariffs for electricity, contingent on the purchase and use of solar cells and solar modules of domestic

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[73] Solar cells are photovoltaic devices that are components of solar modules, also known as solar panels. See WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel (24 February 2016) WT/DS456/R, [2.1].
[74] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-3 (24 February 2016) WT/DS456/R/Add.1, [3].
[75] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel (24 February 2016) WT/DS456/R, [7.1].
[76] Ibid [7.2].

origin.[77] The US claimed violations of the National Treatment obligation under GATT Article III:4 and Article 2.1 of the TRIMs Agreement. India used the government procurement derogation under Article III:8(a) of GATT 1994, the 'general or local short supply' exception under GATT article XX(j) and the need to 'secure compliance' exception under GATT article XX(d).

4.2.2. Energy security concepts

Although ecological sustainability and climate change were also presented as driving forces for the National Solar Mission, India not only directly and explicitly associated green energy development with energy security, but also presented energy security as one of the priority drivers for the promotion of green energy. India asserted that its procurement of solar power was an act pursuant to the government purpose of promoting ecologically sustainable growth while addressing India's energy security challenge.[78] India's focus on energy security is clearly discernible in its repeated invocation of 'energy security' or 'security of supply' 23 times in its summaries of the arguments included in the Panel Report.[79]

In elucidating the meaning of energy security, India referred to definitions in which availability, reliability and affordability were emphasised as the main aspects of energy security. For instance, India mentioned the International Energy Agency (IAE) definition of 'the uninterrupted availability of energy sources at an affordable price', a report by the United Nations Development Programme, which similarly defines energy security as 'the continuous

[77] WTO, *India—Certain Measures Relating to Solar Cells and Solar Modules* – Request for Consultations and Supplementary Consultations by the United States (6 February 2013) WT/DS456/1 and WT/DS456/5.
[78] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annexe B-3 (24 February 2016) WT/DS456/R/Add.1, [3].
[79] Ibid [2], [3], [29], [34], [35], [36], [37], [43], [46], [49], [52], [53], [55] and [59]; WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annexes B-4 (24 February 2016) WT/DS456/R/Add.1, [21], [25] and [43].

availability of energy in varied forms in sufficient quantities at reasonable prices', and its own *Integrated Energy Policy*, which affirms the need to 'supply lifeline energy to all our citizens irrespective of their ability to pay for it as well as meet their effective demand for safe and convenient energy to satisfy their various needs at competitive prices, at all times and with a prescribed confidence level considering shocks and disruptions that can be reasonably expected'.[80] Availability, reliability and affordability are similar energy security elements to those found in the current legal framework in Brazil, as shown in chapter 5.

India pointed out that the Government of India was currently being challenged by crippling electricity shortages, the rising price of electricity, and the gradual shift towards imported coal to meet its energy demand, which India stated that in turn would only lead to further increase in electricity prices.[81] In India's arguments, energy security issues were triggered by energy deficit, increasing demands for energy, and India's dependence on fossil fuels and imported materials for its energy requirements.[82] Solar energy development would lead to energy security through displacement of coal and petroleum.[83] Here, India can be seen associating energy security and solar energy through a positive frame highlighting the reduction of fossil fuel dependency, just like the official discourse in Brazil positively associated energy security and biofuels, as shown in chapter 5. By associating energy security with solar energy, India aimed to justify the adoption of national law and policies supporting solar energy, whilst having a restrictive effect on international trade.

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[80] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel (24 February 2016) WT/DS456/R, [7.16].

[81] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-3 (24 February 2016) WT/DS456/R/Add.1, footnote 23.

[82] Ibid [33].

[83] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel (24 February 2016) WT/DS456/R, [7.283].

According to India, an essential corollary to the energy security objective was the need to ensure control over the country's energy destiny. This would require security of supply of energy products, such as solar cells and modules. These were, from India's point of view, critical components intrinsic to solar power development and were currently being heavily imported, and, as a result, exposed India to the risks of market fluctuations in international supply.[84] Thus, in pursuance of energy security, government intervention was necessary in order to ensure domestic resilience in addressing any supply side disruptions since any dependence on imports brought with it risks associated with supply side vulnerabilities and fluctuations.[85] As such, from India's perspective, the domestic content requirement measures disputed by the US did not seek to maximise self-sufficiency by reducing imports of solar cells and modules; instead they aimed to ensure the existence of an adequate domestic manufacturing capacity and human skills in order to reduce the risks linked to dependence solely on imports of solar cells and modules which were intrinsic to solar power generation.[86] Interestingly, some participants in the case study on GB in chapter 4 also highlighted the link between energy security and the importation of energy equipment, technology and expertise as well as maintenance of human resources in the country and their energy skills and capabilities. The question here then – which will be subsequently examined – is whether green energy equipment import dependence is a green energy security issue.

[84] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-3 (24 February 2016) WT/DS456/R/Add.1, [35].
[85] Ibid [33].
[86] Ibid [4]; WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-4 (24 February 2016) WT/DS456/R/Add.1, [41].

4.2.3. Is green energy equipment import dependence a green energy security issue?

In the literature, trade appears as an indicator for energy security.[87] In this approach, reducing barriers to trade fosters energy security, so the goal is to keep energy markets open and fight protectionism. Liberalisation of international trade is advanced by complainants in the WTO green energy disputes as a way to have access to the best available technology from the global marketplace at competitive prices.[88] Countries which depend profoundly on energy equipment and technology imports have to rely on the secure and smooth-functioning of international trade in energy in order to ensure security of energy supply. Participants in the case study on GB also presented the argument that restrictions in access to green energy technology markets would affect energy security as some green energy equipment is not produced in the country. One can, therefore, conclude that green energy technology and equipment import dependence can entail green energy security issues, particularly for green energy import dependent countries, if trade is not available.

Although green energy equipment can be easily traded or transported short and long distances, situations of supply constraints, such as political unrest, conflict and trade embargoes, can occur. These trade disruptions usually happen without much warning and do not allow time for countries to plan different energy strategies to ensure green energy security. One of the goals of the transition to a low carbon energy system is to increase the participation of green energy in the energy mix. As a consequence, countries dependent on

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[87] See, for example, Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach'(2011) 36 Energy 5343, 5352.

[88] See, for example, Japan's position in WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector/ Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels, Addendum, Annex A-1 (19 December 2012) WT/DS412/R/Add.1 and WT/DS426/R/Add.1, [3]. See also EU's position in WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector/ Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels, Addendum, Annex A-2 (19 December 2012) WT/DS412/R/Add.1 and WT/DS426/R/Add.1, [2].

solar and wind energy as a dominant energy source, for example, may be more common in the future. In these cases, if a country's energy mix is designed to be dependent on solar and wind energies, trade restrictions on equipment in this area without advance warning would not realistically allow countries to plan their energy supply from other energy sources and produce the necessary green energy equipment while the trade restrictions issues are solved.

While a globally integrated and liberalised trade environment is presented as a solution for energy security issues, realistically, we currently do not live in a world where international trade is one hundred per cent guaranteed. Political unrest, conflict and trade embargoes, for example, can happen and cause supply constraints. It is wise, therefore, that countries ensure domestic resilience against disruptions in supplies of green energy technologies and equipment, by developing a local green energy technology manufacturing industry.

The debate here, then, is about importing countries choosing to adopt some temporary trade restrictive measures non-compliant with WTO law in order to develop their national green energy industry and ensure long-term green energy security in the event of supply side disruption. One can argue that temporarily restricting trade imports could cause energy insecurity in importing countries. For example, if an importing country restricted the importation of non-locally produced green energy technology, it would negatively impact the security of green energy supply, because the country would not have this product available nationally and would not have access to the product internationally. Each country, however, is best situated to assess its own energy security interests and to decide whether essential energy security interests are at stake relative to certain types of trade measures. Energy security is context dependent and countries could plan their energy strategies to ensure that energy would still be available if they chose to temporarily restrict the trade. For instance, if solar energy equipment importing countries wanted to develop their national solar energy industry, they could temporarily plan to ensure energy security from other energy sources while a percentage of its solar energy domestic market is developed. Strategic plans, therefore, could prevent any general energy supply interruption.

Developing green energy technologies nationally is not an easy and straightforward task. The case of Brazil in chapter 5 serves as an example that green energy manufacturing facilities do not just spring up overnight. As seen in chapter 5, during the 2001 energy crisis, Brazil acted to develop wind energy via its Emergency Programme for Wind Energy, PROEOLICA, to ensure energy security. Evidence showed that a domestic manufacturing base could not be developed in the short-term, because the industry could not be dependent on very few national suppliers for the viability of wind energy projects in Brazil in that initial development period. At the time, there was only one national manufacturer of complete equipment for wind turbines and only a few manufacturers of parts for wind turbines. Therefore, it was expected that the majority of wind equipment would be imported. However, in cases where this international trade is restricted, the country would not be able to ensure its green energy security.

Supply constraints on green energy equipment can result not only in physical supply interruptions, but can also have negative consequences for prices in green energy markets, which, as such, affect, in particular, energy security in the sense of availability and affordability. The concentration of green energy equipment producers in a small number of countries heightens the impact of these issues on energy market volatility, and periods of wildly fluctuating green energy equipment prices will have an impact on the green energy security of country importers, particularly on the element of affordability.

The question then is how likely is international trade on green energy equipment to be disrupted? So far there has not been any political unrest, conflict or trade embargoes with regards to green energy equipment. However, today there is concentration of some green energy equipment in the hands of a few. In 2016, for instance, of the 20 largest solar cells production companies, in terms of actual production/shipments, 11 were 100% Chinese and an additional five had Chinese participation.[89] In the same year, China and Taiwan held a share of 68% of PV module production in the world.[90] This market share dominance, on the one hand, may not have any negative impact on the energy security of an importer country if access to the supply of the product is stable, accessible and reliable. On the other hand, if this market share dominance makes international trade unreliable, then it is a factor which should be considered when examining energy security concerns.

It seems an open matter as to whether the concentration of some green energy equipment production in the hands of a few is or is not a problem. However, one can safely conclude that market share dominance is not the ideal position for the world to be in. An evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure energy security in the context of the just energy transition. No country should depend totally on a few suppliers. The diversification of green energy players in the market is essential and the WTO has an important role to play in achieving this goal. In view of this, the next section will examine whether there is policy space within WTO law for Member States to adopt trade restrictive measures to develop their national green energy industry with a view of ensuring green energy security.

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[89] Arnulf Jäger-Waldau, *PV Status Report 2017* (Publications Office of the European Union 2017), 59-64.

[90] Fraunhofer Institute for Solar Energy Systems, 'Photovoltaics Report' (26 February 2018), 5 <https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf> accessed 20 June 2018.

5. Green energy security as a justification for trade restrictive measures

The previous section shows evidence that WTO Member States are increasingly associating energy security with green energy in their legal disputes under the WTO DSB. Member States which have adopted or intend to adopt trade restrictive measures to support national green energy development with a view of ensuring energy security should familiarise themselves with the following question: Does WTO law provide room for national public policy on green energy security grounds? This section aims at answering this question in the context of the WTO agreement on trade in goods, GATT, an agreement that has been raised in all green energy disputes in the WTO system so far.[91] As such, this section is not intended to be either definitive or exhaustive of the legal defences around green energy security within all agreements of the WTO framework. Instead, it focuses on room for green energy security within the current exceptions under GATT.

As a rule, WTO Member States are required to design their internal legislation and regulations in a way that is compatible with WTO law.[92] However, if a WTO Member State wishes to pursue some legitimate non-trade policy objectives, it may enact certain measures that, although inconsistent with WTO rules, may still be justified under GATT. Literature on green energy development and the GATT exceptions focuses mainly on environmental and climate change grounds within the scope of GATT Article XX(b) relating to measures 'necessary to protect human, animal or plant life or health' and GATT Article XX(g) relating to 'the conservation of exhaustible natural resources'.[93] In the context of green energy security,

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[91] Please see appendix 3.

[92] Daniel Peat, 'The Perfect FIT: Lessons for Renewable Energy Subsidies in the World Trade Organization' (2012) LSU Journal of Energy Law and Resources 1, 24; Kati Kulovesi, 'International trade: Natural resources and the World Trade Organization', in Elisa Morgera and Kati Kulovesi (eds), *Research Handbook on International Law and Natural Resources* (Elgar 2016), 54.

[93] See, for example, Luca Rubini, 'Ain't Wastin' Time No More: Subsidies for Renewable Energy, The SCM Agreement, Policy Space, and Law Reform' (2012) 15(2) Journal of International Economic Law 525; Peter Kayode Oniemola, 'International Law on Renewable Energy: The Need for a Worldwide Treaty' (2013) 56 German

the examination of four legal defences under GATT is pertinent: Article III:8(a), Article XX(a), Article XX(j) and Article XXI.

5.1. GATT Article III:8(a)

Article III:8(a) of GATT provides:

> *The provisions of this Article [National Treatment on Internal Taxation and Regulation] shall not apply to laws, regulations or requirements governing the procurement by governmental agencies of products purchased for governmental purposes and not with a view to commercial resale or with a view to use in the production of goods for commercial sale.*

Article III:8(a) of GATT exempts government procurement programmes from the national treatment obligation, leaving, as such, room for discrimination concerning the exercise of government actions relating to the procurement of 'products purchased for governmental purposes, and not with a view to commercial resale or with a view to use in the production of goods for commercial sale'. Article III:8(a), therefore, establishes a derogation from the national treatment obligation under Article III for government procurement activities falling within its scope.

In all three green energy security cases so far, *Canada — Renewable Energy, Canada — Feed-In Tariff Programme and India – Solar Cells,* this exception was raised in an attempt to justify the discriminatory measure adopted to support domestic green energy development. Canada's and India's argument was that the purchase of electricity from green energy was for government purposes not with a view to commercial resale or with a view to

Yearbook of International Law 281; Amber Rose Maggio, *Environmental Policy, Non-Product Related Process and Production Methods and the Law of the World Trade Organization* (Springer 2017).

use in the production of goods for commercial sale, as a result of government's role in ensuring energy security. Although energy security as a legal defence per se is not part of Article III:8(a) of GATT, this is still an important case for green energy security, as green energy security can be raised as a rhetorical defence of the disputed procurement measures. It is has also been echoed in the literature that the decision on *Canada — Renewable Energy, Canada — Feed-In Tariff Programme and India – Solar Cells* in relation to GATT Article III:8(a) will have far reaching implications for the energy security debate.[94]

The Panel and the Appellate Body interpreted Article III:8(a) of GATT differently in *Canada — Renewable Energy/Feed-In Tariff Programme.* The Panel found that the Government of Ontario's purchases of electricity generated from green energy sources under the FIT programme were 'with a view to commercial resale', because whether an electricity system is highly regulated or made up entirely of competitive markets at the different levels of trade, the electricity purchased by the government and sold to retail consumers were in competition with private sector electricity retailers.[95]

What can be concluded from the Panel's reasoning is that, if countries with a competitive electricity market with private sector electricity retailers adopt trade restrictive measures to promote green energy development, these measures cannot be justified under GATT Article III:8(a) and will be considered in conflict with WTO law. As such, based on the Panel's decision, to satisfy the 'not with a view to commercial resale' criteria and justify their trade restrictive measure to support green energy development under GATT Article III:8(a), it seems that countries would basically need to be in two positions: (i) have a nationalised

[94] Aditya Sarmah, 'Renewable Energy and Article III:8(A) of the GATT: Reassessing the Environment-Trade Conflict in Light of the Next Generation Cases' (2017) 9(2) Trade, Law and Development 197, 212.

[95] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector, Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Panels (19 December 2012) WT/DS412/R and WT/DS426/R, [7.148].

electricity system, where the government is the only supplier of electricity; or (ii) have government agencies acting on behalf of the government under the express authority conferred by it and be performing activities exclusively performed by the government. Sarmah argues that this appears to cover several public-private partnerships, especially those secured through a tendering process.[96] However, there is no express confirmation of this by the Panel or Appellate Body in the cases. What seems certain is that companies cannot be involved in a competitive and commercial setup.

The Appellate Body did not elaborate on 'with a view to commercial resale', so its position is unknown. The Appellate Body legal reasoning, applied in *Canada — Renewable Energy/FIT Programme* and followed in *India – Solar Cells,* was on the finding that the product of foreign origin allegedly being discriminated against must be in a competitive relationship with the product purchased by the government. In the given cases, the foreign product was the green energy generation equipment (manufactured/purchased by the private sector to generate electricity) while the product purchased by the Ontario and India governments was electricity. Therefore, the discrimination relating to generation equipment contained in the FIT Programme was not covered by the derogation of Article III:8(a) of the GATT 1994.[97] The Appellate Body's approach has been criticised in the literature in favour of the Panels' approach.[98]

What is crucial in the Appellate Body's decision is that it is irrelevant that the products (i.e. solar panels) might be in a close relationship, in the sense that electricity cannot be

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[96] Aditya Sarmah, 'Renewable Energy and Article III:8(A) of the GATT: Reassessing the Environment-Trade Conflict in Light of the Next Generation Cases' (2017) 9(2) Trade, Law and Development 197, 213.
[97] WTO, *Canada — Certain Measures Affecting the Renewable Energy Generation Sector, Canada — Measures relating to the Feed-in Tariff Program* – Reports of the Appellate Body (6 May 2013) WT/DS412/AB/R and WT/DS426/AB/R, [5.79].
[98] Arwel Davies, 'The GATT Article III:8(a) Procurement Derogation and Canada – Renewable Energy' (2015) 18(3) Journal of International Economic Law 543.

generated and then procured without electricity generating equipment (i.e. solar panels). Under the current technological stage, without solar cells and modules there is no solar generated electricity. Therefore, solar cells are a central aspect of solar electrical power generation. If the Appellate Body's position is followed in future disputes, one of the primary conditions for Article III:8(a) of the GATT to be applied is that the trade restrictive measures should be in relation to the product purchased by the government. Therefore, if the trade restrictive measures are directed to green energy equipment, then the government itself should purchase the equipment and generate green electricity. This would, as a result, amount to a situation where the government could only directly acquire the green energy equipment and generate electricity from it. This implies the existence of an electricity market structure with more government interference and participation in the electricity sector, as the role of electricity generation would be carried out by the government.

If governments want electricity to be generated by the private sector, and then be purchased by governments, in order to apply Article III:8(a) of the GATT, the trade restrictive measure would need to be in relation to green electricity not green energy generation equipment (i.e solar panels). However, in these circumstances, there would be no direct incentive to develop a national green energy manufacturing industry, as the electricity producers could import all equipment to generate green electricity. Therefore, what can be concluded here is that the panel and Appellate Body may have wanted to prevent protectionist measures, but their limited approach may have had the opposite effect. As shown in the case study in GB, for example, participants pointed out that the government would be held responsible and accountable for energy interruption in the country. This may also apply to many other countries. As such, in attempting to prevent trade litigation and be compliant with WTO law, Member States, particularly countries facing energy security issues, may decide to take control of their national electricity system and exclude the participation of the private sector so as to enable them to adopt policies necessary to ensure their green energy security.

5.2. GATT Article XX

GATT Article XX provide exceptions to its main substantive obligations. The adequacy and sufficiency of Article XX exceptions to enable Member States to meet contemporary challenges have been questioned in the literature.[99] With respect to green energy security, Article XX(a) and (j) are most relevant. Article XX(a) and (j) states:

> *Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:*
>
> *(a) necessary to protect public morals;*
>
> *(j) essential to the acquisition or distribution of products in general or local short supply; Provided that any such measures shall be consistent with the principle that all contracting parties are entitled to an equitable share of the international supply of such products, and that any such measures, which are inconsistent with the other provisions of the Agreement shall be discontinued as soon as the conditions giving rise to them have ceased to exist. The CONTRACTING PARTIES shall review the need for this sub-paragraph not later than 30 June 1960.*

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[99] Christiane Conrad, *Processes and Production Methods (PPMs) in WTO Law: Interfacing Trade and Social Goals* (Cambridge University Press 2011), 248.

According to the interpretation by the Appellate Body of the introductory paragraph to Article XX, known as the "chapeau", exceptions under Article XX have to observe the requirements in the chapeau of Article XX: the measures must not be applied in a manner which involves 'arbitrary or unjustifiable discrimination' and they must not be used as a 'disguised restriction on international trade'.[100] The application of GATT Article XX involves a two-tier test: (i) justification under one of the exceptions – (a) and (j) for green energy security – and (ii) examination of the chapeau. The chapeau is examined after a disputed measure is found to fall provisionally under one of the specific exceptions.[101] A panel adjudicating Article XX should first consider the threshold question to see if the governmental measure being litigated fits within the range of policies covered by the exceptions in the paragraphs of Article XX. If so, then the chapeau would be examined. The burden of proof lies on the party invoking these exceptions.[102]

There is controversy over whether Article XX can be invoked to justify breaches of WTO Agreements other than GATT. Subsidies, for example, are enacted under the ASCM which does not integrate the provisions of GATT Article XX. In *China – Raw Materials*, the Panel held that GATT exceptions could only be applied to violations of the GATT unless specifically incorporated into a non-GATT instrument.[103] For Rubini, the need to include 'express language' referring to GATT Article XX is 'unduly restrictive' and 'clearly wrong under general principles of interpretation'.[104] However, in *China – Publications and Audiovisual*

[100] See WTO, *United States – Import Prohibition on Certain Shrimp and Shrimp Products* – Appellate Body Report (6 November 1998) WT/DS58/AB/R, [150].
[101] Ibid [119].
[102] Steve Charnovitz, 'Trade and Environment', in Arvid Lukauskas, Robert M. Stern and Gianni Zanini (eds), *Handbook of Trade Policy for Development* (Oxford Scholarship Online 2014), 900.
[103] WTO, *China — Measures Related to the Exportation of Various Raw Materials* – Panel Report (5 July 2011) WT/DS394/R, WT/DS395/R, WT/DS398/R.
[104] Luca Rubini, 'Ain't Wastin' Time No More: Subsidies for Renewable Energy, The SCM Agreement, Policy Space, and Law Reform' (2012) 15(2) Journal of International Economic Law 525, 565.

Products dispute, the Appellate Body held that Article XX of the GATT could apply to China's Protocol of Accession,[105] and for the first time it showed a positive attitude towards the idea that Article XX might be applicable beyond the scope of the agreement.[106] This topic, nonetheless, is still being debated and, therefore, it is uncertain whether Article XX can be used to justify green energy subsidies under the ASCM.

Article XX(a) and (j) will be analysed in the following sections.

5.2.1 Article XX(a) – Social disruption within public morals exception?

As shown in the case study of Brazil, and acknowledged by participants in the case study of GB, lack of energy supply can lead to social disruption. In this context, the maintenance of public order as an exception may be applicable to green energy security, i.e. as a defence for trade restrictive measures to promote green energy development with a view of ensuring energy security.

However, unlike Article XIV(a) of the GATS which expressly includes as defence measures necessary to "protect public morals" or to "maintain public order", the exception IN Article XX(a) of the GATT does not expressly include the wording "to maintain public order". Article XX(a) of the GATT applies to measures "necessary to protect public morals" only. Nonetheless, difficulty remains in determining whether policy objectives invoked in a specific case would actually fall within the scope of public morals or order.[107] In this case, could social

[105] WTO, *China – Measures Affecting Trading Rights and Distribution Services for Certain Publications and Audiovisual Entertainment Products* – Appellate Body Report (21 December 2009) WT/DS363/AB/R.
[106] Joost Pauwelyn, 'Squaring Free Trade in Culture with Chinese Censorship: The WTO Appellate Body Report on "China - Audiovisuals"' (2010) 11(1) Melbourne Journal of International Law 119, 119; Paolo D Farah and Elena Cima, 'Energy Trade and the WTO: Implications for Renewable Energy and the OPEC Cartel' (2013) 16(3) Journal of International Economic Law 707.
[107] Nicolas F Diebold, 'The Morals and Order Exceptions in WTO Law: Balancing the Toothless Tiger and the Undermining Mole' (2008) 11(1) Journal of International Economic Law 43, 49.

disruption as a result of lack of energy supply be included within the public morals exception under GATT Article XX(a)?

The interpretation of "public morals" was developed by the Panel in *US – Gambling*[108] and adopted by the Panel in *China – Publications and Audiovisual Products*. In particular, it was held that "the term 'public morals' denotes standards of right and wrong conduct maintained by or on behalf of a community or nation"[109] and that "the content of these concepts for Members can vary in time and space, depending upon a range of factors, including prevailing social, cultural, ethical and religious values."[110] The panel also acknowledged that in applying this and other similar societal concepts, Member States "should be given some scope to define and apply for themselves the concepts of 'public morals' ... in their respective territories, according to their own systems and scales of values".[111]

It can be argued that cases of social unrest as a result of lack of energy supply are likely to affect the standards of right and wrong maintained by a country. Thus, following *Brazil – Taxation*,[112] the responding party would have had to establish that green energy development was very important to the country, as a means of maintaining its standards of right and wrong, and that green energy security as a public policy objective at issue was indeed a public moral objective according to its value system.[113] As such, the discriminatory aspects of the trade restrictive measure would need to be necessary in order to ensure continuity of green energy supply.

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[108] WTO, *United States – Measures Affecting the Cross-Border Supply of Gambling and Betting Services* – Report of the Panel (20 April 2005) WT/DS285/R.
[109] Ibid [6.465].
[110] Ibid [6.461].
[111] Ibid [6.461].
[112] WTO, *Brazil – Certain Measures Concerning Taxation and Charges* – Report of the Panel (30 August 2017) WT/DS472/R – WT/DS497/R.
[113] Ibid [7.558].

However, in *Brazil – Taxation*, the Panel also ruled that imports must be taken into account when assessing continuity of supply in a WTO Member State.[114] Thus, the exception under Article XX(a) would probably not succeed for green energy security if green energy technologies were available to be imported. Also, the complaining parties would probably suggest WTO-consistent alternative approaches, such as the lowering of trade barriers to green energy technologies, as a more effective approach of achieving green energy security objectives. WTO-consistent alternative approaches could be valid for ensuring short-term energy security, but not for long-term energy security in circumstances where countries are adopting strategies to have domestic green energy technologies available in cases of trade supply disruptions. Thus, the exception under Article XX(a) is only likely to succeed in situations where there is no green energy technologies available in the international market to be imported. However, as previously stated, the development of a green energy technology industry is not straightforward, so countries would be in a position where they would need to cope with social disruption for some time until their domestic industry is developed to ensure green energy security.

Although not available under GATT Article XX(a), the public order exception is available under the WTO agreement on services set out at GATS Article XIV(a), which establish under footnote 5 that '[t]he public order exception may be invoked only where a genuine and sufficiently serious threat is posed to one of the fundamental interests of society'. An analysis of the defences under GATS is outside the scope of this chapter. However, the recent Panel's decision in *EU – Energy Package*[115] on the public order exception under GATS Article XIV(a) provides insights into how future disputes on green energy security may unfold in the WTO

[114] Ibid [7.598].

[115] WTO, *European Union and its Member States – Certain Measures relating to the Energy Sector* – Report of the Panel (10 August 2018) WT/DS476/R.

DSB, as the Panel concluded that security of energy supply is a fundamental interest of society within the meaning of footnote 5 to Article XIV(a) of the GATS.[116]

EU – Energy Package is a recent and the only WTO case so far where security of energy supply was directly related to maintenance of public order. In *EU – Energy Package*, the European Union (EU) raised the public order exception under GATS Article XIV(a), arguing that the trade restrictive measure was necessary to ensure the EU's security of energy supply and hence to maintain public order on the basis that security of energy supply is a fundamental interest of society.[117] Although dealing with the interpretation of the public order exception rather than the public morals exception, and with conventional energy rather than green energy, the recent Panel's decision in *EU – Energy Package* made important remarks relating to the concept of security of energy supply.

According to the Panel, the lack of a definition of security of energy supply in a Member State's legal documents are no basis for concluding that Article XIV(a) covers only fundamental interests which are defined in the challenged measure or elsewhere in the legislation of the responding party. However, a certain minimum level of clarity is required in order to assess, in a meaningful manner, whether a stated interest can be considered a fundamental interest of society within the meaning of footnote 5. Also, as the responding party bears the burden of making a *prima facie* case when advancing a defence, it is then for the responding party to provide sufficient clarity concerning the meaning of the concept of security of energy supply during the proceedings.[118]

Thus, there is no reason as to why the same conclusions should not be applied to the public morals exception. This, therefore, means that, if energy security is invoked as an

[116] Ibid [7.1156].
[117] Ibid [7.1143].
[118] Ibid [7.1149] – [7.1153].

element of public morals, legal documents do not necessarily need to define what energy security is as long as the concept is defined with clarity during proceedings. Given the multiplicity of energy security concepts shown in previous chapters, and the manipulation of energy security language for one's own interest as shown in the case study on GB in chapter 4, this approach leaves broad discretion for energy security to be defined in proceedings in a way which is most advantageous for the responding party. It is unfortunate that the Panel took this approach as, based on this, it would be wise for Member States not to define energy security in their laws and policies, as this would limit the range of interpretative possibilities relating to the concept that a respondent party could raise as defence. However, such an approach will not bring clarity or stability to the green energy security debate.

Another important finding of *EU – Energy Package* is that the Panel did not require imminent or actual social unrest to grant the defence. Therefore, that social disruption has materialised is not a prerequisite for the public order exception.[119] What is needed is the existence of a real and true possibility of security of supply being undermined.[120] As this was the standard applied to public order, there is no reason as to why a Panel would apply a higher standard to the public morals exception. Therefore, it seems that it is sufficient for a Member State to show evidence that social unrest as a result of lack of security of green energy supply would undermine the protection of public morals. The materialisation of social unrest is not necessary. However, this exception for green energy security is still likely to fail if there is international green energy technologies trade. This exception, therefore, does not allow for countries to strategically prepare in advance for long-term green energy security in circumstances where international trade is not available.

[119] Ibid [7.1190].
[120] Ibid [7.1194].

5.2.2 Article XX(j) – Short supply exception

Article XX(j) was interpreted for the first time by the WTO DSB in *India – Solar Cells.* When raising Article XX(j) exception as a defence, India advocated a holistic approach by arguing that the domestic content requirement measures and the basis for invoking Article XX(j) needed to be seen in the context of the overall objectives of energy security and ecologically sustainable growth for which acquisition or distribution of indigenously manufactured solar cells and modules was essential,[121] as well as being seen in the context of India's overall energy scenario and the challenges it was currently facing, which were characterised by India's rising energy deficit, and its dependence on fossil fuels and imported materials for its energy requirements.[122]

The US, as complainant and appellee, made no categorical comments in relation to India’s public policy regarding energy security. The US advocated the narrow approach of taking into account the language of the WTO provisions only and not considerations regarding the achievement of policy objectives.[123] For the US, the policy rationale behind the measure should not be considered a valid ground. In the US’s written submissions to the Panel and to the Appellate Body, the wording ‘energy security’ or ‘security of supply’ was never used in the US’s own arguments. The US acknowledged the environmental underpinnings of the National Solar Mission by noting that the promotion of solar energy was ‘a laudable goal that the

[121] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-3 (24 February 2016) WT/DS456/R/Add.1, [21] and [43].
[122] Ibid [33].
[123] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-2 (24 February 2016) WT/DS456/R/Add.1, [14].

United States and many other WTO Members share, and it is not this environmental objective that the United States challenges in this dispute.'[124]

The US gave no explanation about the lack of debate on their part concerning energy security as a public policy and the reason as to why this was not advanced remains unknown. Two hypothetical reasons for this can only be briefly surmised here. It could be that the US decided not to draw attention to energy security as an important factor as a diversionary tactic to actually prevent the Panel and Appellate Body from having to acknowledge energy security as an important ground for derogation, or that the US genuinely thought that energy security played no explicit role in the configuration of the issues at stake in this case. However, there is no certainty in these arguments. Whatever the reason might be, the US decision not to engage with the energy security argument reveals a tension surrounding this issue and the potential for energy security to be deployed in various strategic ways to suit certain policy needs.

The Panel did not endorse India's argument, but limited and centred its legal reasoning on the interpretation of the terms of the provisions pursuant to the ordinary meaning of the terms,[125] as well as in light of the interpretation related to the history of Article XX(j) as a way of confirming its interpretation.[126]

India's policy objectives were dismissed as 'legally irrelevant' by the Panel:

> '[…] we do not consider that these wider objectives of energy security and sustainable development would be legally relevant to the question of whether the DCR measures are "essential to the acquisition" of products in short supply

[124] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel, Addendum, Annex B-1 (24 February 2016) WT/DS456/R/Add.1, [1].
[125] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Panel (24 February 2016) WT/DS456/R, [7.202].
[126] Ibid [7.235].

> under Article XX(j). We therefore disagree with India's statement that, in the context of Article XX(j), the DCR measures must "be examined in the context of the overall objectives of energy security and ecologically sustainable growth for which acquisition or distribution of domestically manufactured solar cells and modules is essential".[127]

Similarly to the Panel, the Appellate Body's analysis was limited to the interpretation of the language in the articles raised by the parties. The Appellate Body confirmed the Panel's finding that India's lack of domestic manufacturing capacity was not sufficient to constitute product shortage and agreed that India merely identified potential disruptions to imports and failed to demonstrate any actual disruptions. Energy security as a public policy played no role in the legal reasoning of the Panel or the Appellate Body. For the Panel, policy objectives are legally irrelevant under article XX(j). For the Appellate Body, policy considerations may inform the nature and extent of the provisions under Article XX(j), but the party invoking the exception must demonstrate the applicability of the ordinary meaning of the terms of the WTO provisions.[128] Therefore, the focus has been primarily on the need for the invoking party to meet the substantive requirements of the relevant provision of WTO law.

Turning to the interpretation of the language under Article XX(j), the argument that import dependency amounts to energy security concerns will most likely fail in any dispute. Based on the Panel and Appellate Body's decision, it can be understood that the following criteria must apply concomitantly:

(i) Members are not entitled to an equitable share in the international *production* of green energy products but instead are entitled to an equitable share of the international

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[127] Ibid [7.340].
[128] WTO, *India- Certain Measures relating to Solar Cells and Solar Modules* – Report of the Appellate Body (16 September 2016) WT/DS456/AB/R, [5.79].

supply of green energy products. Therefore, a Member State cannot raise the argument that it needs its own domestic production of green energy equipment when there is access to the international supply of the product. Thus, if there is supply availability of the product in the international market, Article XX(j) cannot be raised;

(ii) There must be *imminent* risks of supply shortage or *actual* supply shortage of green energy equipment, not *potential* risks. The simple existence of low domestic manufacturing capacity does not qualify as an imminent risk. Thus, evidence of the lack of supply or evidence of imminent risks of supply shortage is key for the applicability of Article XX(j). Arguments about possible shortages in the future do not fall within Article XX(j). The level of domestic production, the relevant product and geographic market, potential price fluctuations, and accessibility of international supplies, for instance, will be taken into account to demonstrate the availability and sufficiency of the product.[129] Also, in assessing whether a product is in general or local short supply, the stage of development of a Member State should be taken into account in determining exposure to supply disruption. As noted by the Appellate Body, 'different levels of economic development of Members may, depending on the circumstances, impact the availability of supply of a product in a given market. Developing countries may, for example, have less domestic production, and may be more vulnerable to disruptions in supply than developed countries.'[130] Although the Appellate Body leaves more room to apply the short supply exception under Article XX(j) to developing countries, only allowing imminent or actual risks of supply shortage may still cause greater adverse impact on developing countries that are dependent on imported green energy technological products. These products require a certain level of human and technological expertise and

[129] Ibid [5.71].
[130] Ibid [5.72].

time in order to develop an adequate domestic manufacturing capacity, and if there is a significant imminent or actual supply shortage it may be too late to adopt measures that avoid green energy supply disruption.

(iii) The trade restrictive measures must be *essential* to address the situation of short supply. The meaning of essential was not clarified by the Appellate Body. However, the Appellate Body points out that the same process of weighing and balancing a series of factors for a "necessity" analysis under Article XX(d) is relevant in assessing "essential" under Article XX(j).[131]

Therefore, for trade restrictive measures with a view to developing green energy to be justified under GATT Article XX(j), there must be an imminent or actual supply shortage and the measures must be essential to addressing the supply shortage. The position is, therefore, based on short-termism, which can cause great adverse impact on countries dependent on imported green energy technological products in an event of unavailability of the products in the market. These products require a certain level of human and technological expertise and time in order to develop an adequate domestic manufacturing capacity and if there is a significant imminent or actual supply shortage it may be too late to adopt measures that avoid green energy supply disruption. Also, based on the interpretation given to GATT Article XX(j), the argument of developing a green energy domestic manufacturing capacity in order to ensure long-term green energy security has no chance to succeed.

5.3 GATT Article XXI: national security

GATT Article XXI provides:

[131] Ibid [5.63].

Nothing in this Agreement shall be construed

(a) to require any contracting party to furnish any information the disclosure of which it considers contrary to its essential security interests; or

(b) to prevent any contracting party from taking any action which it considers necessary for the protection of its essential security interests

(i) relating to fissionable materials or the materials from which they are derived;

(ii) relating to the traffic in arms, ammunition and implements of war and to such traffic in other goods and materials as is carried on directly or indirectly for the purpose of supplying a military establishment;

(iii) taken in time of war or other emergency in international relations; or

(c) to prevent any contracting party from taking any action in pursuance of its obligations under the United Nations Charter for the maintenance of international peace and security.

Article XXI permits derogation from otherwise applicable trade obligations, such as the WTO provisions of national treatment and MFN, in cases of 'essential security interest'. Unlike the general exceptions under Article XX, the security exception encompasses a non-conditional provision. As one scholar has argued, for WTO members, security exceptions represent 'an indispensable escape mechanism or safety valve'[132] when their very existence is under threat. In the literature, the view is also advanced that, with Article XXI, Members have sought to retain a degree of autonomy over decisions in 'sensitive' policy areas, while

[132] Wesley A Cann Jr, 'Creating Standards of Accountability for the Use of the WTO Security Exception: Reducing the Role of Power Based Relations and Establishing a New Balance Between Sovereignty and Multilaterialism' (2001) 26 Yale Journal of International Law 413, 417.

balancing the tension between their national security and free trade.[133] Scholars agree that the language of Article XXI is broad and ambiguous,[134] giving Member States an open-ended discretion and a potential power to abuse it.[135] One researcher has even claimed that leaving national security exceptions vague was necessary from a practical standpoint for Members to reserve the space to argue for positions of law when the actual security dispute occurs.[136] The question then is whether green energy security falls within the security exception under GATT Article XXI.

5.3.1. Invoking GATT Article XXI: the self-judging character of essential security provisions?

Before the analysis of the applicability of GATT Article XXI to green energy security, an important issue is the invocation of GATT Article XXI. A number of authors have debated the self-judging character of essential security provisions. As a brief analysis, at invocation, a contest exists between security exceptions as self-judging 'release valves' on the one hand, where only WTO Member States have the authority to define their 'essential security interests',[137] and as a justiciable and limited means of escaping trade obligations on the other

[133] Dapo Akande and Sope Williams, 'International Adjudication on National Security Issues: What Role for the WTO' (2003) 43(2) Virginia Journal of International Law 365, 372.
[134] See, for example, John Jackson, *The World Trading System: Law and Policy of International Economic Relations* (MIT Press 1997); Wesley A Jr Cann, 'Creating Standards and Accountability for the Use of the WTO Security Exception: Reducing the Role of Power-Based Relations and Establishing a New Balance between Sovereignty and Multilateralism' (2001) 26 Yale Journal of International Law 413; Peter Lindsay, 'The Ambiguity of GATT Article XXI: Subtle Success or Rampant Failure?' (2003) 52 Duke Law Journal 1277; Rostam J Neuwirth and Alexandr Svetlicinii, 'The Economic Sanctions over the Ukraine Conflict and the WTO: 'Catch-XXI' and the Revival of the Debate on Security Exceptions' (2015) 49(5) Journal of World Trade 891.
[135] Ji Yeong Yoo and Dukgeun Ahn, 'Security Exceptions in the WTO System: Bridge or Bottle-Neck for Trade and Security?' (2016) 19(2) Journal of International Economic Law 417, 423.
[136] Shin-yi Pen, 'Cybersecurity Threats and the WTO National Security Exceptions' (2015) 18(2) Journal of International Economic Law 449.
[137] See, for example, Donald N Zillman, 'Energy Trade and the National Security Exception to the GATT' (1994) 12 Journal of Energy & Natural Resources Law 117; Raj Bhala, 'National Security and International Trade Law: What the GATT Says, and what the United States Does' (1998) 19(2) University of Pennsylvania Journal of International Economic Law 263; C Todd Piczak, 'The Helms Burton Act: US Foreign Policy Toward Cuba, The

hand, where security exceptions allow members restricted, but lawful, derogation from their trade obligations subject to review by a dispute settlement body.[138] The central question therefore is who must decide whether the essential security interests of a State are at stake: only the State adopting the measures or is that invocation subject to some form of judicial review?

Some scholars argue that the strand of thinking which emerged during the drafters' discussions was that the security exception is subject to reviewable limitations.[139] However, the *US — Helms Burton*[140] case raised fundamental concerns about whether the WTO Dispute Settlement Body had the authority to determine a member's invocation of the security exceptions. In *US — Helms Burton*, the US argued that WTO panels were not competent to determine politically intense concerns relating to State survival and national security,[141]

National Security Exception to the GATT and the Political Question Doctrine', (1999) 61 University of Pittsburgh Law Review 287; Andrew Emmerson, 'Conceptualizing Security Exceptions: Legal doctrine Or Political Excuse?' (2008) 11(1) Journal of International Economic Law 135; Roger P Alford, 'The Self-Judging WTO Security Exception' (2011) 3 Utah Law Review 697.

[138] See, for example, Michael J Hahn, 'Vital Interests and the Law of the GATT – an Analysis of GATT's Security Exception' (1991) 12 Michigan Journal of International Law 558; Antonio F Perez, 'WTO and UN Law: Institutional Comity in National Security' (1998) 23 Yale Journal of International Law 301; Hannes L Schloemann and Stefan Ohlhoff, '''Constitutionalization'' and Dispute Settlement in the WTO: National Security as an Issue of Competence' (1999) 93 American Journal of International Law 424; Wesley A Cann Jr, 'Creating Standards and Accountability for the Use of the WTO Security Exception: Reducing the Role of Power-Based Relations and Establishing a New Balance Between Sovereignty and Multilateralism' (2001) 26 Yale Journal of International Law 413; Dapo Akande and Sope Williams, 'International Adjudication on National Security Issues: What Role for the WTO' (2003) 43(2) Virginia Journal of International Law 365; Thomas Cottier and Panagiotis Delimatsis, 'Article XIV^{bis} GATS. Security Exceptions' in Rüdiger Wolfrum, Peter-Tobias Stoll and Clemens Feinäugle (eds), *WTO - Trade in Services* (Leiden 2008).

[139] Michael J Hahn, 'Vital Interests and the Law of the GATT – an Analysis of GATT's Security Exception' (1991) 12 Michigan Journal of International Law 558, 568; WTO, 'GATT Analytical Index — Guide to GATT Law and Practice (1995)', 608-609 <https://www.wto.org/english/res_e/booksp_e/gatt_ai_e/art21_e.pdf> accessed 1 July 2017; Olivia Q Swaak-Goldman, 'Who Defines Members' Security Interest in the WTO?' (1996) 9(2) Leiden Journal of International Law 361, 366.

[140] WTO, *United States — The Cuban Liberty and Democratic Solidarity Act* – Request for Consultations by the European Communities (13 May 1996) WT/DS38/1.

[141] See Rene E Browne, 'Revisiting ''National Security'' in an Interdependent World: The GATT Article XXI Defense after Helms-Burton' (1997) 86 The Georgetown Law Journal 405, 413; C Todd Piczak, 'The Helms Burton Act: US Foreign Policy Toward Cuba, The National Security Exception to the GATT and the Political Question Doctrine' (1999) 61 University of Pittsburgh Law Review 287, 320; Jeffrey L Dunoff, 'The WTO's Legitimacy Crisis: Reflections on the Law and Politics of WTO Dispute Resolution' (2002) 12 American Review of International Arbitration 197, 206–207.

irrespective of the potential for abuse of the system.[142] However, the practice of the WTO on this issue is inconclusive.[143]

The ones who adopt the self-judging view mostly argue that a textual interpretation of Article XXI leads to this approach[144] or that the matters raised by Article XXI are political questions, and, as such, are not capable of judicial determination.[145] From the other perspective, some authors argue that the WTO system is rule-oriented and that one should take into account the centrality of the dispute settlement system to the whole system.[146] As such, the perception of unfettered discretion could not be sustained in connection with the security provisions of WTO law as this school of thought leads to the result that a Member State could invariably circumvent its WTO obligations by simply invoking security reasons, and, as a result, negatively impact a rules-based system that seeks to ensure stability and predictability in the international trade order.[147] According to Akande and Williams, the WTO system must be 'faithful' to the terms of the security exception, but 'at the same time seeks to prevent abuse of the system'.[148] What is clear is that to accept Article XXI to be interpreted exclusively by the country invoking it could lead to abuse of this exception. However, as the

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[142] Andrew Emmerson, 'Conceptualizing Security Exceptions: Legal doctrine Or Political Excuse?' (2008) 11(1) Journal of International Economic Law 135, 141.

[143] Dapo Akande and Sope Williams, 'International Adjudication on National Security Issues: What Role for the WTO' (2003) 43(2) Virginia Journal of International Law 365, 378.

[144] Raj Bhala, 'National Security and International Trade Law: What the GATT Says, and what the United States Does' (1998) 19(2) University of Pennsylvania Journal of International Economic Law 263, 266-276.

[145] C Todd Piczak, 'The Helms Burton Act: US Foreign Policy Toward Cuba, The National Security Exception to the GATT and the Political Question Doctrine' (1999) 61 University of Pittsburgh Law Review 287, 318-326.

[146] Antonio F Perez, 'WTO and UN Law: Institutional Comity in National Security' (1998) 23 Yale Journal of International Law 301, 330; Hannes L Schloemann and Stefan Ohlhoff, '''Constitutionalization'' and Dispute Settlement in the WTO: National Security as an Issue of Competence' (1999) 93 American Journal of International Law 424, 450; Wesley A Cann Jr, 'Creating Standards and Accountability for the Use of the WTO Security Exception: Reducing the Role of Power-Based Relations and Establishing a New Balance Between Sovereignty and Multilateralism' (2001) 26 Yale Journal of International Law 413, 435.

[147] Thomas Cottier and Panagiotis Delimatsis, 'Article XIV^{bis} GATS. Security Exceptions' in Rüdiger Wolfrum, Peter-Tobias Stoll and Clemens Feinäugle (eds), *WTO - Trade in Services* (Leiden 2008), 334.

[148] Dapo Akande and Sope Williams, 'International Adjudication on National Security Issues: What Role for the WTO' (2003) 43(2) Virginia Journal of International Law 365, 378.

self-judging nature of the security exception has never been expressly confirmed by a panel or an Appellate Body's ruling in the context of the WTO dispute settlement, this topic remains uncertain.

5.3.2. Applicability of Article XXI to green energy security

So far, Article XXI has not been determined by any GATT/WTO dispute resolution panel.[149] Article XXI is divided into three paragraphs, but, generally speaking, the security exception embraces five categories: (1) national security information (Article XXI(a)); (2) fissionable materials (Article XXI(b) (i)); (3) military goods and services (Article XXI(b)(ii)); (4) war or international emergencies (Article XXI(b)(3)); and (5) UN obligations (Article XXI(c)).[150]

Common to the first two paragraphs of Article XXI is that both provide that the essential security interest of the WTO Members is protected under the security exception. However, the difference between them lies in the fact that paragraph (a) allows for abstention from actions in order to protect these interests, whereas paragraph (b) provides that a Member State could, for the interest of its essential security interests, take certain actions, even though they might be infringing. Paragraph (c) requires prior decision under the UN Charter in order to become applicable. Thereby, this provision expressly gives priority to the obligations under the UN and specifically the Security Council, when clashing with the GATT.[151]

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[149] There were a total of seven disputes in the GATT era where Article XXI was invoked as a defence. For a summary of the GATT/WTO disputes involving Article XXI, see Donald N Zillman, 'Energy Trade and the National Security Exception to the GATT' (1994) 12 Journal of Energy & Natural Resources Law 117; Andreas F Lowenfeld, *International Economic Law* (Oxford University Press 2002); Regis Bonnan, 'The GATT Security Exception in a Dispute Resolution Context: Necessity or Incompatibility' (2010) 19(1) International Trade Law Journal 3; Raj Bhala, *Modern GATT Law: A Treatise on the General Agreement on Tariffs and Trade, vol. II* (Sweet & Maxwell 2013).

[150] See generally Antonio F Perez, 'WTO and U.N. Law: Institutional Comity in National Security' (1998) 23 Yale Journal of International Law 301, 325–43.

[151] See R Bhala, Modern GATT Law: a Treatise on the General Agreement on Tariffs and Trade (2005), at 563-

That the term 'essential security interests' includes matters beyond purely military threats can be safely concluded from the expansive reference to 'other emergency in international relations' which has been suggested to mean 'serious international tension'.[152] As explained in chapter 3, energy security can be closely tied up with national security. Although GATT Article XXI was not drafted with energy trade in mind,[153] the fact that traditional energy goods could rely on the national security exception under Article XXI has already been accepted by the WTO.[154] Nonetheless, the reference to 'traditional energy goods' can be precisely interpreted as fossil fuels and nuclear energy. Scholars have also already suggested the use of energy security as a ground on which national measures can be insulated from trade under the national security exception of GATT Article XXI on the basis that energy products and services are absolutely essential for society to function.[155] However, their analysis points towards reference to fossil fuels and nuclear energy only. There are no studies which examine whether green energy security can fall within the national security exception under GATT Article XXI. What can be safely inferred is that including green energy security as a ground under Article XXI would require the terms of this provision to be interpreted in light of contemporaneous circumstances.

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[152] Felicity Deane, 'The WTO, the National Security Exception and Climate Change' (2012) 6 Carbon & Climate Law Review 149, 156.

[153] Wen-Chen Shih, 'Energy Security, GATT/WTO, and Regional Agreements' (2009) 49 Natural Resources Journal 433, 463.

[154] WTO, 'Energy Services: Background Note by the Secretariat' (1998), S/C/W/52, [31], <www.wto.org/english/tratop_e/serv_e/w52.doc> accessed 9 January 2019.

[155] See, for example, Donald N Zillman, 'Energy Trade and the National Security Exception to the GATT' (1994) 12 Journal of Energy & Natural Resources Law 117; Wen-Chen Shih, 'Energy Security, GATT/WTO, and Regional Agreements', (2009) 49(2) Natural Resources Journal 433; Dennis J Jr James Hough, 'World Trade Organization Agreements and Principles as a Vehicle for the Attainment of Energy Security' (2010) 9(2) Richmond Journal of Global Law and Business 199; J Nedumpara, 'Energy Security and the WTO Agreements' in Sajal Mathur, *Trade, the WTO and Energy Security: Mapping the Linkages for India* (Springer 2014) 15–71.

As shown in the case study of Brazil, there was no express association of energy security with national security in law and policies in any of the 162 documents analysed. In the case study of GB, interviews with leading energy experts did not present express evidence of an association of energy security with national security either. If Brazil or GB, for example, wanted to raise green energy security within the scope of Article XXI, evidence in laws and policy documents of green energy security being defined as essential security interests would be necessary if the approach taken is that the panel and the Appellate Body should examine whether a Member's explanation is reasonable or whether the measure constitutes an apparent abuse. Therefore, national security as the fundamental component of green energy security being reflected in laws and policies would be important for an Article XXI defence to have any chances of succeeding. However, if Article XXI is interpreted as allowing Members States to invoke the provision free from any judicial review, Brazil, GB or any State's arbitrary declaration on the need to protect security interests would need to be accepted and no evidence would be necessary. On this latter view, Member States could easily raise Article XXI, particularly paragraph (b)(iii), on the grounds of green energy security as an essential security interest.

However, would the association of green energy security with national security be beneficial? In a positive vein, it would promote the national development of green energy. However, in a negative vein, Member States would be securitising the promotion of green energy. As explained under chapter 3, securitising green energy can, for instance, make the development of green energy a justification for using military force or other instruments of coercion, override access to information, reinforce the discourses of control, restrict public participation and limit individual freedom. These consequences would certainly not be desirable. In any case, given the rarity of invocations of Article XXI, Member States do not seem to be willing to defend their measures by an invocation of the security exception in formal dispute resolution proceedings. It is, therefore, unlikely that Article XXI would be raised on the grounds of green energy security. Another way of attempting to include green energy security within the scope of Article XXI is to ask whether economic security can amount to national security interest. This will be analysed below.

5.3.3. Is economic security a national security interest under Article XXI?

It is widely acknowledged that energy is an essential enabler of economic prosperity. As demonstrated in the case studies of GB and Brazil, energy supply interruption not only negatively impact the economy in terms of production and job availability, for instance, but also in terms of attracting investments. Energy security is, therefore, essential for the well-functioning of an economy. In the case study of Brazil, in particular, the framing of energy security was in the context of economic development, demonstrating that energy security in Brazil is first and foremost an economic issue. In this sense, green energy supply interruption, particularly supply of biofuels in the context of Brazil, could negatively impact the economy not only as a result of lack of energy, but also as a result of reduction of the economic output for the country from biofuels. Therefore, associating green energy with economic security is not a difficult task. In these circumstances, could Brazil raise the argument of economic security under Article XXI in order to adopt trade restrictive measures to promote green energy development?

So far, economic security has not been invoked under GATT Article XXI in a WTO dispute. However, in the literature, economic security has been argued to be a dimension of national security,[156] particularly as a result of increased interdependence in global markets where one nation's default may trigger a worldwide chain reaction, cascade failures and may cause a calamity.[157] Economic security has been broadly defined to include securing a nation's industrial and technological base, access to critical materials and resources and the functioning of critical infrastructures and services that are required for critical societal functions[158] as well as with reference to global capital and commodities markets flows.[159]

In terms of the inclusion of economic security within the national security exception under GATT Article XXI, according to Broome, the few disputes in the GATT invoking Article XXI, as well as the negotiating history of Article XXI do not seem to support economic security within the meaning of "essential security interests."[160] In his view, equating economic security with national security in the context of Article XXI would likely constitute an unacceptably broad interpretation of Article XXI.[161]

However, the broader concept of economic security would not be difficult to be included within the dimension of essential security interests under Article XXI if a contemporary interpretation was adopted. It would be important for a Member State raising this point to show in its laws and policies that its society places a great importance on its economic security as a national security interest if Article XXI is not seen as self-judging.

[156] See, for example, Russell Dean Covey, 'Adventures in the Zone of Twilight: Separation of Powers and National Economic Security in the Mexican Bailout' (1996) 105(5) The Yale Law Journal 1311; Sheila R Ronis (ed), *Economic Security Neglected Dimension of National Security?* (National Defense University Press 2011); Tyler Valdron, 'Economic Security: An Analysis of the Strait of Malacca' in Anthony J Masys (ed), *Exploring the Security Landscape: Non-Traditional Security Challenges* (Springer 2016); A D Antonova and E V Ponomarenko, 'External Debt is a Threat To National Security?' (2016) 4 RUDN Journal of Economics 49;

[157] Joseph J Romm, *Defining National Security: The Nonmilitary Aspects* (Council on Foreign Relations 1993).

[158] Christian O Fjäder, 'National Security in a Hyper-connected World: Global Interdependence and National Security' in Anthony J Masys (ed), *Exploring the Security Landscape: Non-Traditional Security Challenges* (Springer 2016), 31.

[159] James G Rickards, 'Economic Security and National Security: Interaction and Synthesis' (fall 2009) 3(3) Strategic Studies Quarterly 8, 8.

[160] Stephen A Broome, 'Conflicting Obligations for Oil Exporting Nations?: Satisfying Membership Requirements of Both OPEC and the WTO' (2006) 38 George Washington International Law Review 409, 430.

[161] Ibid 431.

However, the fact that Article XXI has not been applied in a decided WTO case so far indicates that Member States seem to be reluctant to partake in the securitisation agenda. It also suggests that the security exception clause might be applicable only in rare circumstances.

As the textual content of the GATT was not fully developed regarding the situations where measures could be adopted for security reasons, the scope of Article XXI is still quite unsettled. As shown under chapter 3, one of the consequences of securitisation is that security concerns can be devised in order to achieve certain policy aims. Policy makers can place a specific matter of interest under the security umbrella to prioritise and push forward the approval of preferred policies. However, care should also be taken in its interpretation as, in the words of Professor Jackson, the national security exception 'can reopen the door to arbitrary abuse'.[162] GATT Article XXI should not be seen as a political instrument with the aim to enable the contracting parties to take actions or adopt measures with a view of achieving a particular public policy and protecting certain interests, such as green energy security. Its applicability should be as a last resort.

5.4 Final remarks on the section

This section has demonstrated that there might be some room for short-term green energy security within the defences under Articles III:8(a), XX(a) and (j) and Article XXI. However, under Article XX(a), this means that the defence only applies in circumstances where there is no international trade available, and the exception under Article XX(j) also requires actual or imminent short supply. These defences, therefore, are of no use to countries wishing to apply trade restrictive measures to develop their green national industry

[162] John H Jackson, *World Trade and the Law of GATT* (Bobbs-Merrill CO, Inc 1969), 752.

as a strategic way to prepare them for any circumstances where there is no international trade, such as political unrest, conflict and trade embargoes.

For long-term green energy security, i.e. countries seeking to develop their domestic green energy industry so that they do not become overly dependent on imports and international trade in cases of trade disruption, the only possible defences are under GATT Article III: 8(a) and GATT Article XXI. However, according to the Panel's and Appellate Body's decisions on green energy jurisprudence so far, it seems that trade restrictive measures under Article III(8) will only have chances to succeed in a scenario where the energy market structure is basically nationalised, that is, without the participation of the private sector in a competitive relationship. Invocation of the national security exception under Article XXI to defend trade restrictive green energy measures may also be possible, but will have the consequence of green energy being securitised. From the foregoing analysis, therefore, it is seems that room for long-term green energy security is only available under GATT if the government takes control over the energy market or if green energy is expressly associated with national security.

Future WTO Panels and the Appellate Body could follow a different approach, be it a wider and holistic one or even a more restrictive approach, as the Appellate Body has a significant amount of discretion in how they interpret WTO provisions.[163] Previous cases show, for example, that some adjudicators in the GATT/WTO have contributed to shifts in the meaning of the general exceptions enshrined in Article XX of the GATT.[164] Nevertheless, while in WTO jurisprudence previous decisions are not biding for all future cases, the Appellate

[163] J Scott, 'International Trade and Environmental Governance: Relating Rules (and Standards) in the EU and the WTO', (2007) 15(2) European Journal of International Law 311.

[164] Ingo Venzke, 'Making General Exceptions: The Spell of Precedents in Developing Article XX GATT into Standards for Domestic Regulatory Policy' (2011) 12(5) German Law Journal 1111, 1112.

Body strives to maintain consistency between a ruling in an appeal and of that in subsequent appeals involving the same issue.[165]

An option for reverting the limited defences available for long-term green energy security could be the adoption of a broader, holistic and contemporary interpretation of the provisions, involving weighing and balancing the importance of the interest being protected, the contribution of the measure to the protection of that interest, and the trade-restrictiveness of the measure, in light of any WTO-consistent less trade-restrictive reasonably-available alternatives that could achieve the same level of protection. As per Van Damme, '[t]reaties are incomplete. Nothing is decided comprehensively in advance. Treaties reflect a negotiated political compromise and will leave issues unanswered, unprovided for, or unclear.[166] Such is the case for green energy security when the texts of the WTO agreements were negotiated.

Nonetheless, how far can the WTO DBS adjudicators go beyond what could be considered 'ordinary interpretation'? The answer is controversial and brings criticisms of illegitimacy directed at the WTO system as a whole. The fine line between interpretation of factual circumstances of vague provisions and that which goes beyond is hard to draw. What is clear, nonetheless, is that the modern world faces challenges which were not in place when WTO law was enacted. Therefore, WTO rules are not well designed to address some issues. For example, transitioning to a greener energy supply whist having to cope with increasing population and rising energy demand is a key issue worldwide, and the terms of the WTO provisions were not negotiated with these problems in sight. A reductionist interpretation,

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[165] Mitsuo Matsushita, 'Reflections on the Functioning of the Appellate Body' in Gabrielle Marceau (ed), *A History of Law and Lawyers in the GATT/WTO: The Development of the Rule of Law in the Multilateral Trading System* (Cambridge University Press 2015), 552.
[166] Isabelle Van Damme, *Treaty Interpretation by the WTO Appellate Body* (Oxford University Press 2009), 110.

particularly if the interpretation of WTO law is by recourse to the history of the provision, may not be able to take into account the current challenges faced by society or prepare society for possible future challenges. The primary responsibility for achieving green energy security lies not with the WTO, but rather its Members: national governments.

Rule change through litigation strategies to alter the interpretation of existing WTO rules also has additional negative aspects, such as governments having to use taxpayers' money to resort to the lengthy and costly litigation process under the WTO. This would particularly affect developing and least developed countries as they often lack the resources to participate in the litigation.[167] Also, the decisions still would not bring legal certainty as decisions are not authoritative in all future cases. WTO rules, nonetheless, must address the concerns of Member States in ensuring green energy security without fearing WTO litigations. The next section will propose a possible solution.

6. Proposal for green energy security in the law of the WTO

The previous section demonstrated that policy space for green energy security within the GATT exceptions is limited, particularly for long-term green energy security strategies. However, green energy security solutions must be not only short-term, but also long-term. The benefits of trade do not necessarily imply that WTO membership has been doing an adequate and sufficient job of promoting green energy security worldwide. Green energy security should be a critical long-term domestic policy goal, and, as such, should not be

[167] Gary N Horlick and Katherine Fennell, 'WTO Dispute Settlement from the Perspective of Developing Countries' in Yong-Shik Lee and others (eds), *Law and Development Perspective on International Trade Law* (Cambridge University Press 2011), 163.

ignored in the WTO and should assume a high profile in this system due to the need to transition to a low carbon energy system.

The WTO seeks liberalised trade in a world where green energy technologies are still an emerging industry in most countries. The WTO, therefore, should support the creation of competitive and stable domestic industries that could supply the domestic and international markets. The proposal which follows is based on the assumption that where domestic producers could not compete with foreign imports absent government protection, WTO law should allow the protection afforded to domestic producers, so that such producers can develop their industry. Support for the development of domestic green energy industries worldwide could enable an otherwise uncompetitive domestic industry to become competitive to such an extent that it could supply the national and international markets, resulting in a more evenly distributed global green energy market and lower prices for consumers and, therefore, a net welfare benefit in terms of social development and inclusion worldwide.

There might be WTO compliant incentives available to promote green energy development domestically. However, if countries are using local content requirements and subsidies non-compliant with WTO law, one could expect that this would be based on an economic and technical analysis of the most viable and efficient manner to develop a green energy industry nationally in accordance with a country's circumstances. Therefore, as long as there is evidence of this economic and technical analysis, i.e. an analysis of absence of viable and efficient non-trade restrictive measures to foster the development of a domestic green energy industry, Member States should be allowed some policy space to develop their green energy industry with a view of ensuring short-term and long-term green energy security. The proposal below will elaborate on how to create such policy space.

The WTO multilateral trading system could and should become a relevant tool for supporting green energy security in a world where green energy security concerns are becoming increasingly more widespread and attempts are made to carry out a just energy transition. However, how do we create the legal space in the WTO for trade restrictive measures aiming to ensure green energy security? A proposal will be discussed in the following subsection.

6.1. Proposal – The way forward

While the multilateral trade rules are oriented towards ensuring market access, WTO law should also be supporting green energy scale-up. Thus, the proposal is to allow temporary trade restrictive measures subject to an economic and technical analysis of the most viable and efficient manner to develop green energy technologies domestically in accordance with a country's circumstances, so that Member States can develop a percentage – ten per cent, for example, to be agreed amongst Member States – of their national green energy industry. This would temporarily bring the world to a scenario in which there would be two basic groups of main players: (i) countries with national green energy industry developed and (ii) countries with no or emerging green energy industry.

These two groups would have differing sets of trade obligations. Countries with no or emerging green energy industry would enjoy "special and differential treatment," to allow them to develop a percentage of their domestic industry. Although this approach means that the trade regime would be asymmetrical, this asymmetry would be temporary, as when countries achieved, for example, ten per cent of domestic market share, they would graduate to taking on full trade obligations. One may criticise this proposal as inadequate for a sustainable non-discriminatory multilateral trading system. However, this type of measures would be transitional and would assist in bringing a plurality of green energy players into the national and global green energy markets. By increasing the number of market participants, it would boost reliability of green energy technologies supply. With a plurality of green energy players worldwide, unpredicted trade restrictions scenarios would also be less likely to cause green energy interruption, as this proposal would support the opening of new routes to supply of green energy technologies. How the proposal could be implemented is discussed as follows.

6.2. How to implement the proposal?

Member States need to use a pragmatic approach to address green energy security. Thus, Member States could consider two options: (i) add a permanent green energy security exception; or (ii) agree on a temporary implementation of a waiver.

Amendment of existing WTO rules and the formulation of new rules in order to strengthen policy space for green energy security purposes could be an option via the inclusion of a green energy security exception under GATT. Attempting to amend agreements under the WTO is, nonetheless, quite complicated, not only because of the nature of the negotiations, but also because of the body's decision-making processes.[168] Realistically, negotiations on this process would be complex, time consuming and subject to political will. Given the unsuccessful Doha Round trade talks, the latest round of trade negotiations among

[168] Beatriz Leycegui Gardoqui and Imanol Ramírez, 'Identifying a WTO Exception to Incorporate Climate Clubs' (2015) 9(7) BioRes 22, 24.

the WTO membership,[169] this option seems unfeasible at the moment. It would, nonetheless, serve to demonstrate the functionality of the global trade body's negotiating arm.

Waivers may also be an option. The WTO's waiver power is found in Article IX:3 of the Agreement Establishing the WTO (WTO Agreement). It allows the Ministerial Conference '[i]n exceptional circumstances. . . to waive an obligation imposed on a Member by this Agreement or any of the Multilateral Trade Agreements, provided that any such decision shall be taken by three-fourths of the Members'. Thus, the WTO waiver is the power of the WTO Ministerial Conference to suspend any legal obligation of the WTO Agreement or the annexed Multilateral Trade Agreements[170] to address tensions, such as the tension between international governance and domestic government, and the tension between societies at different stages of economic development and with different forms of government.[171] The waiver is a binding legal act which formally suspends legal obligations and thus allows for non-compliance without putting into question the validity of WTO law.[172] The waiver, therefore, can allow Member States to take measures in violation of WTO obligations in respect of green energy development. Thus, Member States should consider the waiver as an option for policy space for green energy security as its use would flexibilise WTO law and thus address the tensions identified above.

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[169] Susan Schwab, 'Acknowledge Doha's Demise and Move on to Save the WTO' in Richard Baldwin and Simon Evenett (eds) *Next Steps: Getting Past the Doha Round Crisis* (VoxEU Publication 2011); Luis Pedro Cunha, 'The Failure of the Doha Round and the Development Issue' (2014) 57 Boletim Ciencias Economicas 1267.

[170] The Multilateral Trade Agreements are the agreements and associated legal instruments included in Annexes 1, 2 and 3 of the WTO Agreement (Art. II:2 WTO Agreement); these are the Multilateral Agreements on Trade in Goods (Annex 1A), the General Agreement on Trade in Services (Annex 1B), the Agreement on Trade-Related Aspects of Intellectual Property Rights (Annex 1C), the Understanding on Rules and Procedures Governing the Settlement of Disputes (Annex 2) and the Trade Policy Review Mechanism (Annex 3).

[171] Isabel Feichtner, *The Law and Politics of WTO Waivers: Stability and Flexibility in Public International Law* (Cambridge University Press 2011), 1.

[172] Henry G Schermers and Niels M Blokker, *International Institutional Law* (Nijhoff 2003), § 811.

The terms and conditions governing the applicability of the waiver for the development of a minimal percentage of a national green energy industry in line with the aforementioned proposal should provide for specific time limits to be set when a waiver is granted, an annual review and its termination.

A waiver decision, according to Article IX:3 of the WTO Agreement, needs to be adopted by three-fourths of the members. Although this is a strict voting requirement, it is less challenging than attempts to modify WTO texts. However, waivers are not granted to developed Member States to allow them to adopt protectionist measures.[173] Therefore, waiver to allow green energy development could only be granted to developing and least-developed country members. This limitation, nonetheless, should not prevent the use of a waiver as, in practice, developing and least-developed country members have far greater difficulties in developing their national green energy industry.

The waiver would, therefore, allow developing and least-developed Member States to maintain trade restrictive measures in violation of WTO law for green energy security reasons to allow a minimal percentage of a national green energy industry to be developed. An exception in this direction could provide the right incentives for countries to acquire serious commitments on long-term green energy security and at the same time promote the stability of the multilateral trading system with the existence of a plurality of green energy players widespread around the world.

The international community needs to respond realistically to countries wanting to develop their green energy industry on the basis of ensuring green energy security. With this

[173] Isabel Feichtner, *The Law and Politics of WTO Waivers: Stability and Flexibility in Public International Law* (Cambridge University Press 2011), 62.

proposal, domestic policies supporting the development and scale-up of green energy for energy security purposes would be more explicitly permissible and thus sheltered from challenge. This proposal is intended to open the debate in this direction.

7. Conclusions

This chapter examined whether there is any flexibility within the current GATT/WTO rules and the interpretation given to them that permit trade restrictive measures which support green energy security. It showed that green energy development has increasingly come to be associated with energy security in the WTO jurisprudence. An analysis of the WTO green energy disputes involving energy security revealed that broader concepts of energy security found in the literature which include environmental, climate and social considerations have not reached the jurisprudence in the WTO system yet.

Energy security concepts have been raised differently by respondents. While in *Canada — Renewable Energy and Canada — Feed-In Tariff Programme* the concept focused on availability and reliability, in *India – Solar Cells*, in addition to availability and reliability, affordability is also placed as part of the energy security concept. Interestingly, the energy security concept as raised by Canada is the same concept raised by the majority of participants in the case study of GB, which is correlated to the view adopted by the UK government in recent policy documents. The concept raised by India which include the elements of availability, reliability and affordability is the same concept in the current legal framework in Brazil as shown in chapter 5. However, energy security concept is dynamic and evolves, so it may be just a coincidence that developed countries, i.e. Canada and UK, currently use the same concept, while emerging economies, i.e. India and Brazil, currently use the same concepts. Further comparative studies on the topic would be necessary to draw any further conclusions here.

What was also an interesting finding in the analyses of *Canada — Renewable Energy and Canada — Feed-In Tariff Programme* was the fact that the panel and Appellate Body presented a different framing for green energy and energy security links. While the panel focused on green energy not supporting energy security due to green energy intermittent nature, the Appellate Body advanced the role played by green energy in ensuring energy security in the long-term. From a legal perspective this divergence in frames has implications for the interplay between energy security and green energy under WTO law, because the frame adopted can impact the applicability and interpretation of WTO provisions. The negative frame, for instance, cuts down the room for energy security to be raised as a legal defence for trade restrictive measures adopted to promote green energy. Such negative frame might signal about the inability of WTO to adapt to a changing global landscape and add to the discontent among its membership.

The analyses of room for green energy security as a justification for trade restrictive measures concluded that there might be some room for short-term green energy security within the defences under Articles III:8(a), XX(a) and (j) and Article XXI. However, under Article XX(a), this means that the defence only applies in circumstances where there is no international trade available, and the exception under Article XX(j) also requires actual or imminent short supply. These two exceptions under GATT Article XX are only likely to succeed in situations where there are no green energy technologies available in the international market to be imported. However, the development of a green energy technology industry is not straightforward, so countries would be left in a position where they would need to cope with the negative consequences of imminent or actual green energy supply disruption for some time until their domestic industry is developed to ensure green energy security. These defences are also inapplicable to countries wishing to adopt trade restrictive measures to develop their national green energy industry as a strategic way to prepare them for any circumstances where there is no international trade, such as political unrest, conflict and trade embargoes.

For long-term green energy security, i.e. countries wanting to develop their domestic green energy industry so that they do not become overly dependent on imports and international trade in cases of trade disruption, the only possible defences are under GATT Article III: 8(a) and GATT Article XXI. However, according to the Panel's and Appellate Body's decisions on green energy jurisprudence so far, it seems that trade restrictive measures under Article III:8(a) will only have chances to succeed in a scenario where the energy market structure is basically nationalised, that is, without the participation of the private sector in a competitive relationship. The panel and Appellate Body may have wanted to prevent protectionist measures, but their limited approach may have the opposite effect. In attempting to prevent trade litigation and be compliant with WTO law, State Members, particularly countries facing energy security issues, may decide to take control of their national electricity systems and exclude the participation of the private sector to adopt policies necessary to ensure their green energy security.

Trade restrictive measures within the national security exception under Article XXI may also be possible, but will have the consequence of securitising green energy, which is not desirable. However, given how rarely GATT Article XXI is invoked, Member States do not seem to be willing to defend their measures via the invocation of the security exception in formal dispute resolution proceedings. In any case, given the negative consequences of securitisation, such as justification for using military force or other instruments of coercion, overriding access to information, reinforcing discourses of control, restricting public participation and limiting individual freedom.

An option for reverting the limited defences available for green energy security could be the adoption of a broader, holistic and contemporary interpretation of the terms of the provisions, involving weighing and balancing the importance of the interest being protected, the contribution of the measure to the protection of that interest, and the trade-restrictiveness of the measure, in light of any WTO-consistent less trade-restrictive reasonably-available alternatives that could achieve the same level of protection. However, rule change through litigation strategies to alter the interpretation of existing WTO rules has negative aspects, such as governments having to use taxpayers' money to resort to the lengthy and costly litigation process under the WTO. This would particularly affect developing and least developed countries as they often lack the resources to participate in the litigation.[174] Also, the decisions still would not bring legal certainty as decisions are not authoritative in all future cases.

This chapter argued that an evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure green energy security in the context of the just energy transition. The WTO multilateral trading system could and should become a relevant tool for supporting green energy security in a world where green energy security concerns are becoming increasingly more widespread and attempts are made to carry out a just energy transition. This work, therefore, proposed a way forward to create the legal space in the WTO for trade restrictive measures aimed at ensuring green energy security. The proposal involved allowing temporary trade restrictive measures

[174] Gary N Horlick and Katherine Fennell, 'WTO Dispute Settlement from the Perspective of Developing Countries' in Yong-Shik Lee and others (eds), *Law and Development Perspective on International Trade Law* (Cambridge University Press 2011), 163.

subject to an economic and technical analysis of the most viable and efficient manner to develop green energy technologies domestically in accordance with a country's circumstances, so that Member States could develop a percentage of their national green energy industry. With this proposal, domestic policies supporting the development and scale-up of green energy for energy security purposes would be more explicitly permissible and thus sheltered from legal challenge. This proposal is intended to open the debate in this direction.

CHAPTER 7

CONCLUSION

1. Introduction

This concluding chapter will look into some of the implications of the findings of this thesis for the ways in which we can understand the interplay between energy security and law and policies on green energy development as well as for the literature review in chapter 3.

In addition to pulling together the main insights and conclusions from the previous chapters, this final chapter will draw out the key lessons of the study and will eke out further implications for the disagreement on energy security concepts and for the plurality of views on the interplay between energy security and law and policies on green energy development.

This chapter has three sections. The first section summarises the methodology and research questions. It then elaborates on the main research findings, how each chapter relates to each another and contributes to the literature. The final section explains the imitations of the thesis and sets out future avenues for expanding this research.

2. Methodology and research questions

The overarching aim of this thesis was to capture the plurality of views and the discursive frames that arise in relation to the interplay between energy security and national and international law and policies on green energy development, based on the argument that, if we want to have a just energy transition, we ought to pay closer attention to this relationship.

In order to achieve the thesis' goal, this research took a socio-legal perspective, as it sought to study the law in its multiple and interconnected contexts. As well as adopting a socio-legal perspective, this thesis operated within a broadly constructionist frame, where there was a commitment to the idea that participants actively make or construct the world of everyday life and its constituent elements. Thus, the main point of this thesis was to treat the law and the category of 'energy security' within it as a construction which gains relevance through the activities and practices of people all working to shape it in various ways.

In order to highlight the contextual specificity of the diversity of ways of discursively framing energy security as well as the different ways that energy security and green energy were discursively linked, this thesis adopted case studies as a research design. Aimed at ensuring the greatest difference or maximum variation between the cases, this thesis examined the interplay between energy security and law and policy on green energy development in the context of three very different case studies (i) Great Britain (GB), (ii) Brazil and (iii) the World Trade Organisation (WTO).

This study initially carried out an empirical assessment of national law and policies on green energy development in the two country case studies: GB and Brazil. In order to establish the parameters within which to conduct this research, three initial research questions were posed, as follows:

1. How has energy security been discursively constructed?

2. What are the discursive links between energy security and law and policies promoting green energy?

3. What are the implications of energy security construction to law and policy on green energy development?

In attempting to address these questions, the research adopted discourse analysis as a methodological approach for the country cases studies, something which is rare in the socio-legal literature on energy security and green energy. It investigated discourses surrounding energy security as defined and given meaning and significance through the articulation and production of 'texts' of many kinds, from speeches to policy statements to legal rulings, and the practices those texts were part and parcel of. More specifically, this study examined the discursive frames which dominated the energy security discourse in different contexts. This thesis has shown that understanding the discursive framing of energy security was important, because when one frame was selected from among a range of competing frames it had consequences for how green energy development was seen and acted upon.

Revealing these differences in the country case studies in chapters 4 and 5 was relevant because this divergence of views and approaches, learnt in each country case study, was at stake in legal disputes. In particular, legal disputes between countries concerning energy security and green energy development have already taken place within international trade law as encapsulated in the law of the World Trade Organisation (WTO), an international trade organisation which adjudicates between competing discursive claims and pronounces on their legal status. The WTO, therefore, was an important third case study because it showed how this diversity of views raised in national contexts could lead to legal disputes in international forums when attempts were made to address the issue of the interplay between energy security and green energy development.

Due to these different approaches to national energy policies on the interplay between energy security and green energy development, which could be at stake in legal disputes, it was relevant to examine how the WTO jurisprudence perceived this interplay and how the law of the WTO applied to countries that wanted to reduce green energy import dependency on the grounds of energy security. Therefore, the investigation of energy security and green energy in the law of the WTO was based on the thesis' fourth research question:

4. Is there policy space for national green energy security in the law of the WTO?

The main research findings and contributions of this thesis are explained in the following section.

3. Main research findings and contributions

Running throughout this thesis is the examination of two main topics: (i) the question of the proper definition of the term "energy security", and (ii) the implications of the links between energy security and law and policies on green energy development. These are no simple issues, as will be subsequently summarised.

3.1. Lessons from the energy security definitions

As seen in the literature review in chapter 3, existing scholarly debates on energy security demonstrate that energy security is a complex and multifaceted topic[1] and the mainstream academic literature on energy security is characterised by a pervasive lack of consensus in relation to its different concepts and dimensions. While Winzer reduces energy security to the simple proxy of energy supply relative to demand,[2] the International Energy Agency (IEA)'s mainstream definition stipulates that energy security is about uninterrupted availability at reasonable prices.[3] There is, however, evidence in the scholarly debate of a

[1] Felix Ciută. 'Conceptual Notes on Energy Security: Total or Banal Security?' (2010) 41(2) Security Dialogue 123, 127.
[2] Christian Winzer, 'Conceptualizing Energy Security' (2012) 46 Energy Policy 36.
[3] [3] IEA, "Energy Security"(2014) <http://www.iea.org/topics/energysecurity/> last accessed 14 May 2019.

recent broadening of the energy security concept with the inclusion of environmental, climate and social considerations.[4]

The diversity of accounts provided by the case studies shows that there is no unanimity here. The findings of the case studies of GB and Brazil in chapters 4 and 5 and legal analysis of the WTO green energy jurisprudence in chapter 6 demonstrate the discursive contests that lead to divergent constructions of energy security not only in the context of different countries, but also in different sectors of the economy within a country. The polysemic, multi-dimensional, contextual and dynamic nature of energy security, advanced by Chester,[5] can, therefore, be observed in the variety of definitions of energy security given in the case studies examined in this thesis.

The empirical work in GB shows that, on the one hand, energy security is discursively constructed in an alarmist and fearful manner by focusing on “lights going out” and, on the other, in a broader and holistic manner emphasising affordability, sustainability and human welfare. However, the majority of energy security definitions given by energy experts in GB focused on the elements of availability and reliability, advancing, therefore, a narrow definition of energy security found in the mainstream academic literature. This, nonetheless, does not question the construction of the broader energy security concepts also advanced by some participants in GB and, therefore, shows that there is no uniform understanding of energy security here.

The case study of Brazil uncovers the evolving and multifaceted nature of the meaning of energy security. By examining how the concept of energy security was conceptualised and

[4] See, for example, Aleh Cherpa and Jessica Jewell, ‘The Concept of Energy Security: Beyond the Four As’ (2014) 75 Energy Policy 415.
[5] L Chester, ‘Conceptualising Energy Security and Making Explicit its Polysemic Nature’ (2010) 38 Energy Policy 887;

contextualised in Brazil within the period of analysis (2001-2015), it reveals that, during the 2001 energy crisis, energy security concerns were distinctly focused on energy availability and reliability, while the concept adopted in the post-2001 energy crisis period was expanded to include affordability.

These divergent constructions of energy security definitions are also found in legal disputes under the WTO Dispute Settlement Body. While in *Canada — Renewable Energy and Canada — Feed-In Tariff Programme* the concept raised by Canada focuses on availability and reliability, in *India – Solar Cells*, in addition to availability and reliability, affordability is also placed by India as part of the energy security concept. Interestingly, the energy security concept as raised by Canada is the same concept raised by the majority of participants in the case study of GB, which is correlated to the view adopted by the UK government in recent policy documents, as demonstrated in chapter 4. The concept raised by India which includes the elements of availability, reliability and affordability is the same concept found in the current legal framework in Brazil as shown in chapter 5. However, the concept of energy security is dynamic and evolves, so it may be just a coincidence that developed countries, i.e. Canada and the UK, currently use the same concept, while emerging economies, i.e. India and Brazil, currently use the same concept. Further comparative studies on the topic would be necessary to draw any further conclusions here.

Overall, what the results demonstrate is that broader concepts of energy security found in the academic literature which include environmental, climate and social considerations have not reached the discursive terrain of green energy law and policies in the official discourse in Brazil, in the majority of views of participants in GB - particularly by the government and industry – or in legal green energy disputes in the WTO system.

In order to assist the just energy transition, as defined in chapter 1, this thesis puts forward the adoption of the broader energy security concept in law and policies which includes affordability, environmental, climate and social considerations. However, as it was shown, although the adoption of and elaboration on energy security concepts would bring clarity to the debate, it might disadvantage countries in legal disputes in the WTO system where recent jurisprudence in the case of *EU – Energy Package,* between Russia and the European Union (EU), required only certain minimum level of clarity on the concept of energy security. Adopting a specific concept would limit a country's capacity to break the concept up and reform it along lines which suit their own interests in the context of winning a legal dispute. It is unfortunate, therefore, that the WTO jurisprudence has taken this approach as this will serve as an obstacle for countries to engage in a more meaningful debate.

Another consequence of the non-inclusion of these elements within the concept of energy security is that energy law and policies pursuing energy security can be created which negatively impact affordability, the climate, the environment and social inclusion. Encapsulating these elements within the concept of energy security would, therefore, assist the move towards a just energy transition, as law and policies pursuing energy security would need to be justified under this broader frame, with much present law and policy falling short of that standard. Political will would be necessary to adopt this broader energy security concept, as countries may be at a disadvantage if the broader definition of energy security is set up as this would limit their ability to play with the concept to suit their own interests.

The academic literature examined in chapter 3 also focuses on the competing dimensions of energy security. The variety of indicators put forward by scholars shows the complexity in analysing national energy security policies and performance. There is no agreement here either. Academic studies present large variations in the choice of indicators and in the way energy security indexes are framed and constructed, including an Energy Justice Metric as a way to try to achieve a just and equitable balance between the competing demands of the energy trilemma.[6] The interview data from the empirical studies in GB reveals a number of contending energy security indicators offered by participants. For instance, although control over energy sources is advanced by participants from all sectors, its meaning is cast in opposing terms from having control via reliance on indigenous sources of energy supply, on the one hand, to having control via the ability to effectively manage energy supply from trade around the world, on the other.

In Sovacool and Mukherjee's study, for instance, trade in energy sources appears as an indicator for energy security.[7] In this approach, reducing barriers to trade fosters energy security, so the goal is to keep energy markets open and fight protectionism. However, a contribution of this thesis to the literature lies in the fact that import dependency of energy equipment, technology and energy expertise is also seen as essential for energy security by some participants in the empirical work in GB, indicators that are absent from the present academic literature.

This thesis shows that these contending energy security indicators, which lead countries to adopt opposing national energy policies, are found in legal disputes in the WTO system. On the one hand, liberalisation of international trade is advanced by complainants in the WTO green energy disputes as a way to have access to the best available technology from the global marketplace at competitive prices, as seen in Japan's position in *Canada — Renewable Energy/ Feed-in Tariff.* On the other hand, countries which depend profoundly on

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[6] Raphael J Heffron, Darren McCauley and Benjamin K Sovacool, 'Resolving Society's Energy Trilemma through the Energy Justice Metric' (2015) 87 Energy Policy 168.
[7] See, for example, Benjamin K Sovacool and Ishani Mukherjee, 'Conceptualizing and Measuring Energy Security: A Synthesized Approach'(2011) 36 Energy 5343, 5352.

green energy equipment and technology imports have to rely on the secure and smooth-functioning of international trade in energy in order to ensure security of energy supply, and shows concern over their energy security as a result of this import dependency, as raised by India in *India – Solar Cells.* These different views on energy security, therefore, contribute to the literature on energy law, particularly by adding ways in which the energy security and reliability principle of energy law[8] can be understood.

3.2. Lessons from the implications of energy security – green energy links

Another difference present in the country case studies examined in this thesis, which is also found in legal disputes in the WTO system, is in relation to the links between energy security and green energy development. The case studies of GB and Brazil show that positive and negative links are forged concerning the interplay between energy security and law and policies on green energy development. In GB, participants deployed a positive frame to point out the importance of developing green energy to ensure energy security as a result of energy availability, energy diversification, energy independence and energy decentralisation. In Brazil, law and policies on biofuels in particular were constructed in a positive frame around the energy security-green energy links as a result of their role in tackling energy security concerns framed in terms of energy use from exhaustible energy sources, dependency on imported energy sources, the oligopoly of oil producers and the uneven distribution of fossil fuels around the world as well as the risk of war associated with oil exploration. Wind energy was also framed as playing a role in ensuring energy diversification.

[8] Raphael J Heffron and others, 'A Treatise for Energy Law', (2018) 11(1) Journal of World Energy Law & Business' 34.

In relation to the negative frame, in GB, energy security and green energy development links were framed negatively as a result of grid upgrading issues and unreliability due to intermittency, and this created a general indisposition among some participants to associate green energy sources with energy security in a positive way. In Brazil, green energy, particularly wind and solar, was framed negatively as being insufficient to meet the energy demand required to support economic growth.

These positive and negative frames are found in legal disputes in the WTO system. In terms of positive frames, in India's arguments in the case of *India – Solar Cells,* for instance, solar energy development would lead to energy security through displacement of coal and petroleum. Here, India can be seen associating energy security and solar energy through a positive frame highlighting the reduction of fossil fuel dependency, just like the official discourse in Brazil positively associate energy security and biofuels, as shown in chapter 5. In the disputes of *Canada — Renewable Energy and Canada — Feed-In Tariff Programme*, Canada put forward the role played by green energy in helping secure the supply of electricity which was needed as a result of the temporary shutdown of several nuclear facilities for maintenance, phasing out of coal-fired generation and subsequent reduction in generation capacity, as well as the increase of Ontario's population by 28% by 2030 and the subsequent increases in energy demand.

What is also interesting in the WTO cases is how the Panel and the Appellate Body presented the link between energy security and green energy differently in *Canada — Renewable Energy and Canada — Feed-In Tariff Programme* . As was demonstrated in chapter 6, while the Panel presented only a negative frame where green energy does not support energy security because of the intermittency of wind and solar energy sources, the Appellate Body advanced a positive frame where green energy plays a role in ensuring energy security in the long-term by reducing reliance on fossil energy resources. Therefore, in these cases, the Panel and the Appellate Body presented two different approaches in regard to framing green energy and energy security. From a legal perspective, this divergence in frames has implications for the interplay between energy security and green energy under WTO law, because the frame adopted can impact the applicability and interpretation of WTO provisions. The negative frame, for instance, reduces the room for energy security as a legal justification for trade restrictive measures adopted to promote green energy.

The analysis in chapter 6 shows evidence that WTO Member States are increasingly associating energy security with green energy in a positive frame in their legal disputes under the WTO DSB. These countries are adopting trade restrictive measures to support national green energy development with a view of ensuring energy security. As explained in chapter 6, literature around green energy trade disputes in the WTO DSB focuses its analysis on environmental/climate change grounds.[9] However, this thesis adds to the literature in international trade law as it shows a new perspective that these cases also raise issues surrounding energy security as a justification under WTO rules for trade restrictive measures to support green energy development. The significance of the divergences revealed in this thesis is also to draw the attention of policymakers and legal practitioners to the potential differences in national energy policies that pursue different objectives of trade liberalisation, energy security and green energy development.

[9] See, for example, Luca Rubini, 'Ain't Wastin' Time No More: Subsidies for Renewable Energy, the SCM Agreement, Policy Space, and Law Reform' (2012) 15(2) Journal of International Economic Law 525; Aaron Cosbey and Petroc C Mavroidis, 'A Turquoise Mess: Green Subsidies, Blue Industrial Policy and Renewable Energy: The Case for Redrafting the Subsidies Agreement of the WTO' (2014) 17(1) Journal of International Economic Law 11; Thomas Cottier, 'Renewable Energy and WTO Law: More Policy Space or Enhanced Disciplines?' (2014) Renewable Energy Law and Policy Review 40.

This thesis shows that countries that are taking trade restrictive measures to promote green energy development on energy security grounds should then familiarise themselves with the question of whether WTO law provides room for national public policy on green energy security grounds. The legal analyses of room for green energy security as a justification for trade restrictive measures concluded that there might be some room for short-term green energy security within the defences under Articles III:8(a), XX(a) and (j) and Article XXI. However, under Article XX(a), this means that the defence only applies in circumstances where there is no international trade available, and the exception under Article XX(j) also requires actual or imminent short supply. These defences, therefore, are inapplicable to countries wishing to adopt trade restrictive measures to develop their national green energy industry as a strategic way to prepare them for any future circumstances where there is no international trade, such as political unrest, conflict and trade embargoes.

For long-term green energy security, i.e. countries wanting to develop their domestic green energy industry so that they do not become overly dependent on imports and international trade in cases of future trade disruption, the only possible defences are under GATT Article III: 8(a) and GATT Article XXI. However, according to the Panel's and Appellate Body's decisions on green energy jurisprudence so far, it seems that trade restrictive measures under Article III:8(a) will only have chances to succeed in a scenario where the energy market structure is basically nationalised, that is, without the participation of the private sector in a competitive relationship. The Panel and Appellate Body may have wanted to prevent protectionist measures, but their limited approach may have the opposite effect, as countries may decide to take control of their national electricity systems and exclude the participation of the private sector to adopt policies necessary to ensure their green energy security.

Literature review in chapter 3 also showed that countries may make connections between energy security and national security, although these connections were not found in the case studies of GB and Brazil. In terms of international trade law, trade restrictive measures within the national security exception under Article XXI may be possible, but will have the consequence of securitising green energy, which, as shown in chapter 3, has undesirable consequences. This thesis also elaborates on economic security within the scope of the national security exception under Article XXI. Taking the case study of Brazil as example, where the framing of energy security is in the context of economic development, this thesis finds that associating green energy with economic security is not a difficult task if a contemporary interpretation of Article XXI is adopted. However, given how rarely GATT Article XXI is invoked, Member States do not seem to be willing to defend their measures via the invocation of the security exception in formal dispute resolution proceedings.

An option for reverting the limited defences available for green energy security could be the adoption of a broader, holistic and contemporary interpretation of the terms of the provisions, involving weighing and balancing the importance of the interest being protected, the contribution of the measure to the protection of that interest, and the trade-restrictiveness of the measure, in light of any WTO-consistent less trade-restrictive reasonably-available alternatives that could achieve the same level of protection. However, rule change through litigation strategies to alter the interpretation of existing WTO rules has negative aspects, such as governments having to use taxpayers' money to resort to the lengthy and costly litigation process under the WTO. This would particularly affect developing and the least developed countries as they often lack the resources to participate in the litigation.[10] Also, the decisions still would not bring legal certainty as decisions are not authoritative in all future cases.

This thesis argues that an evenly distributed market share of green energy technologies and equipment around the world is the best solution to ensure green energy security in the context of the just energy transition. In this regard, it demonstrates that the law of GATT/WTO presents limited room for green energy security as a justification for trade restrictive measures, and the limited applicability of defences available may have undesirable outcomes. It then proposes a way forward to create the legal space in the WTO for trade restrictive measures aimed at ensuring green energy security. The proposal involves allowing temporary trade restrictive measures subject to an economic and technical analysis of the most viable and efficient manner to develop green energy technologies domestically in accordance with a country's circumstances, so that Member States can develop a percentage of their national green energy industry. With this proposal, domestic policies supporting the development and scale-up of green energy for energy security purposes would be more explicitly permissible and thus sheltered from legal challenge. This proposal is intended to open the debate in this direction. What also emerge from the analysis in the case studies is that the interplay between energy security and green energy poses challenges to a transition to a green energy system. For instance, when the connections between energy security and green energy development are negatively framed, it has the implication of hindering green energy development. Another challenge can be seen in the process of energy politicisation in GB, which is framed as having negative impacts on green energy development due to vested interests, unequal lobbying power and association of green energy with left-wing politics.

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[10] Gary N Horlick and Katherine Fennell, 'WTO Dispute Settlement from the Perspective of Developing Countries' in Yong-Shik Lee and others (eds), *Law and Development Perspective on International Trade Law* (Cambridge University Press 2011), 163.

In order to assist the just energy transition, this thesis argues for the incorporation of a dominant positive frame in relation to the interplay between energy security and law and policies on green energy development since a positive frame in relation to this link has the implication of significantly contributing to the promotion of an energy source. It also advances the need to embrace emerging green energy technologies in energy systems and the need for further research in the area to unlock its potential were also advanced.

Finally, this thesis highlights that the interplay between energy security and green energy development is far from straightforward, as existing discursive constructions are broadening, deepening and transforming the relationship between energy security and law and policies on green energy as well as showing its complexity. This thesis does not seek to close down the diversity of views on the topic. Instead, the analysis in this thesis and its proposals are intended to stress the importance of this under analysed topic and open the debate in this direction.

4. Limitations of the thesis and future avenues for expanding this research

Due to the multi-disciplinary nature of energy research, its complexity and the global challenge where it is inserted, it was not possible to explore in depth all the various aspects on the interplay between energy security and law and policies on green energy development. The case study of Brazil, for instance, would benefit from interviews with players in the energy sector in this country to highlight the plurality of views and perspectives on the subject as well as improve the understanding of problems associated with energy security and green energy development. Undertaking research of that kind was not possible in this case due to delays concerning the approval of the ethics application by the Brazilian National Ethics Committee as well as the extreme politicisation of energy politics in Brazil at the time the study was conducted. However, while this necessitated a shift of research strategy, that was ultimately to the benefit of the thesis in two ways. First, it allowed the different empirical sections of this thesis to focus on three different though related things: the contestation of green energy security definitions across different sectors of an economy (GB); the incorporation of green energy security into law and policy (Brazil); and the adjudication of disputes around law and policy in relation to green energy security (WTO). Second, it underscored the point that green energy security is political and its politicisation is something that countries must find ways of managing if they are to move towards a just energy transition.

Also, many very interesting topics associated with the theme of this thesis fell outside of this work. To give two examples, it can be mentioned (i) the role of governments and the market in ensuring energy security, and (ii) the interplay of energy security and green energy in all of the WTO agreements.

Results of this study point towards the emergence of novel themes which would benefit from further research, particularly relating to legal and societal challenges as a result of the development, commercialisation and deployment of green energy technologies, such as the emergence of 'prosumers' and energy storage.

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UNIVERSITY OF LIVERPOOL

<u>**Interview Guide**</u>

My research project aims to analyse the relationship between global security concerns and the law/policies surrounding green energy development from a socio-legal and empirical perspective. The interview will be based on the broad questions outlined below and followed up with secondary questions based on your responses:

- What do you understand by the term 'energy security'?
- How important is energy security for energy policies in your country?
- How important is climate change/ the environment for energy policies in your country? Do you see them as 'security' issues?
- What are your views on the growing argument of nuclear as green energy?
- From your point of view what is the impact that security has had on the expression, shape, scope and character of policy, investment and legislation in the field of green energy?
- From your point of view what are the short and long term implications of the use of 'security' to the decision making process in relation to green energy development?
- What are your views on the relationship between energy security, public participation and access to information concerning green energy policies?
- From your point of view, what role do security concerns play in finding a balance between energy supply and environmental and climate change concerns?

APPENDIX 2

SUMMARY OF DOCUMENTS SELECTED FOR ANALYSIS FOR CHAPTER 5

Type	Date	Name	Authority	Main objective
Speech	13/03/2001	Speech at the ceremony introducing the Ministers of Social Security and Mines and Energy	President	Introduced the new Minister of Mines and Energy and highlighted the energy challenges ahead.
Statement	07/05/2001	Statement on national radio and television	President	Informed the public of the need for energy rationing.
Statement	14/05/2001	Statement after the Energy Crisis Committee Meeting	President	Informed the public of the initial decisions made to overcome the energy crisis.
Legislation	15/05/2001	Provisional measure 2,147	Executive Power	Created the Energy Crisis Committee and established guidelines for programmes to cope with the energy crisis.
Note	15/05/2001	Exposure of motives 00203	Executive Power	Gave reasons to enact Provisional Measure 2,147.
Statement	18/05/2001	Statement on national radio and TV on the day of the implementation of the emergency programme of electricity consumption reduction	President	Informed the public of the need to reduce energy consumption.
Statement	25/05/2001	Statement	President	Discussed measures that affected consumers´ rights.
Speech	5/06/2001	Speech in the ceremony to celebrate	President	Speech to celebrate the

		the World Environment Day		World Environment Day
Speech	12/06/2001	Speech at the ceremony to sign agreements relating to the public service concession of electric power transmission between the Union and Amazon Company of Power Transmission and Para Company of Power Transmission.	President	Discussed the energy crisis and solutions.
Speech	27/06/2001	Speech on a visit to the San Alberto field of natural gas processing	President	Discussed the new plant of natural gas processing done by Petrobras in San Alberto – Bolivia.
Speech	28/06/2001	Speech at the inauguration ceremony of the William Arjona thermoelectric plant	President	Inaugurated the first thermoelectric plant which uses gas from Bolivia.
Speech	04/07/2001	Opening speech at the meeting of the Brazilian Forum of Climate Change	President	Discussed climate change.
Meeting record	05/07/2001	Meeting N. 02/2001	Energy Crisis Committee	Discussed measures to overcome the energy crisis.
Speech	05/07/2001	Speech at the meeting of the Energy Crisis Committee	President	Informed the decisions taken at the Energy Crisis Committee meeting.
Regulation	05/07/2001	Resolution 24	Executive Power	Created the PROEOLICA programme to promote wind energy.
Speech	06/07/2001	Speech on a visit to the Luis Eduardo Magalhaes hydroelectric plant	President	Informed society of the actions to overcome the energy crisis.

Speech	20/07/2001	Speech on a visit to the Sergio Motta hydroelectric plant	President	Discussed the Brazilian energy matrix.
Speech	24/07/2001	Speech at the launching ceremony of the business call notice to integrate the share capital of the Amazon Gas Company	President	Discussed the energy problem in the Amazon area.
Speech	13/08/2001	Speech at the opening ceremony of Boa Vista substation with Brazil-Venezuela energy transmission line	President	Discussed grid interconnection between Brazil and Venezuela.
Speech	03/09/2001	Speech at the presentation ceremony of the installation project of wind turbines from the Wobben factory in the Port of Pecem industrial complex	President	Discussed wind energy.
Regulation	17/09/2001	CNPE Resolution 1	CNPE	Enacted about energy integration policy, electricity and natural gas imports.
Speech	05/10/2001	Speech at the inauguration ceremony of Luis Eduardo Magalhaes hydroelectric plant	President	Discussed energy production.
Speech	17/10/2001	Speech at the sanctioning ceremony of the project of law which provides for the National Policy Conservation and Rational Use of Energy	President	Discussed the National Policy Conservation and Rational Use of Energy.
Meeting record	29/10/2001	Meeting N. 22/01	Energy Crisis Committee	Discussed measures to overcome the energy crisis.

Electronic correspondence	29/10/2001	Electronic correspondence from Mr Andre Leal, Executive Director of SeaWest Windpower do Brasil, to the Minister of Mines and Energy	SeaWest Windpower do Brasil / MME	Stated challenges for the development of the wind energy sector in Brazil.
Letter	20/11/2001	Letter EN-ANEEL-20/11/01-001 from Mr Alberto Seisdedos Fernandez del Pino, Director of Enerbrasil, to the Brazilian Federal Electricity Agency	Director of Enerbrasil / ANEEL	Stated reasons for the delay of implementation of wind projects in Brazil
Legislation	21/12/2001	Provisional measure 14	Executive Power	Created the Program for Incentive of Alternative Electric Energy Sources (PROINFA).
Note	21/12/2001	Exposure of motives 00376-A-CCIVIL/MF/MME/MDIC	Executive Power	Gave reasons to enact Provisional Measure 14.
Speech	06/02/2002	Speech at the ministerial meeting – Work Program for 2002	President	Discussed the Work Program for 2002.
Speech	13/03/2002	Speech at the ceremony which signs the message forwarding the Kyoto protocol to the national congress for ratification	President	Forwarded the Kyoto Protocol to the National Congress for Ratification.
Meeting record	16/04/2002	Debate and Voting	Federal Senate	Debate and voting for the conversion of Provisional Measure 14 into Law 10,438/02 in the plenary of the Federal Senate.
Speech	23/04/2002	Speech at the signing ceremony of the concession contracts for the construction	President	Discussed changes in the energy system regulation.

		and exploitation of new hydroelectric power plants		
Legislation	26/4/2002	Law 10,438	Legislative Power	Created the Program for Incentive of Alternative Electric Energy Sources (PROINFA).
Speech	24/05/2002	Speech at the opening ceremony of Cana Brava hydroelectric power plant	President	Discussed the increase in energy production.
Speech	28/06/2002	Speech in the rotor installation ceremony in the hydroelectric plant of Tucuruí	President	Discussed the increase in energy production.
Speech	04/07/2002	Speech at the opening ceremony of the thermoelectric power plant of Nova Piratininga	President	Discussed energy development.
Report	28/08/2002	The electricity supply crisis: final report	National Congress – Special Mixed Commission to study the energy crisis.	Studied the causes of the energy supply crisis and proposed alternatives to address the issue.
Legislation	23/12/2002	Decree 4,541	Executive Power	Regulated PROINFA
Speech	02/05/2003	Speech at the opening ceremony of companhia energética Santa Elisa thermoelectric power plant	President	Discussed the alternative energy matrix.
Speech	06/05/2003	Speech at a meeting with representatives of the sugar and alcohol sector	President	Discussed the development of alcohol as fuel.
Speech	25/06/2003	Speech at the first infrastructure seminar for sustainable development	President	Discussed Brazil´s development

Legislation	11/11/2003	Law 10,762	Legislative Power	Amended PROINFA
Speech	11/11/2003	Speech at the launching ceremony of the national program for universal access and use of electricity	President	Discussed rural electrification.
Legislation	11/11/2003	Decree 4,873	Executive Power	Created the program 'Light for All'.
Legislation	11/12/2003	Provisional measure 144	President	Established the principles for the energy sector.
Note	11/12/2003	Exposure of motives EM 00095/MME	Executive Power	Gave reasons to enact Provisional Measure 144.
Speech	16/01/2004	Speech at the official opening ceremony of the Padre Carlos plant (Poço de Caldas-MG)	President	Discussed the electricity sector.
Speech	16/01/2004	Speech at the launching ceremony of biofuels pole	President	Discussed biodiesel production.
Legislation	15/03/2004	Law 10,848	Legislative Power	Established the principles for the energy sector.
Legislation	30/03/2004	Decree 5,025	Executive Power	Regulated PROINFA.
Regulation	30/03/2004	MME norm 45	MME	Regulated PROINFA.
Speech	02/04/2004	Speech at the opening ceremony of Três Lagoas thermoelectric	President	Discussed unfinished energy projects.
Speech	09/06/2004	Speech at the contract signing ceremony of the Light for All program	President	Discussed the Light for All program.
Speech	30/07/2004	Speech at the decree signing ceremony that regulates Law 10,848, which provides for the sale of electricity	President	Discussed the decree which regulates Law 10,848.
Legislation	30/07/2004	Decree 5,163	Executive Power	Regulated the sale of electricity.
Note	09/09/2004	Exposure of Motives 44/MME	Executive Power	Gave reasons to enact Provisional Measure 214.

Legislation	13/09/2004	Provisional Measure 214	President	Introduced biodiesel into the Brazilian energy matrix.
Report	14/09/2004	ANEEL report regarding normative resolution 83	ANEEL	Reasons for regulation of electricity supply to isolated communities through individual systems of electricity generation via the use of renewable energy.
Regulation	20/09/2004	Normative resolution 83	ANEEL	Regulated the use of household photovoltaic systems for the electrification of isolated areas.
Speech	25/11/2004	Speech at the official ceremony of the construction and installation of turbines of the Tucuruí Hydroelectric Plant	President	Discussed electricity generation.
Speech	30/11/2004	Speech at the opening of the Brazilian Forum on Climate Change meeting	President	Discussed biodiesel development.
Legislation	06/12/2004	Provisional measure 224	President	Created a registry of biodiesel producers and importers and provided for the tax regime for biodiesel producers and importers.
Note	06/12/2004	Exposure of motives EM Interministerial 00166/2004-MF/MDA/MME	Executive Power	Gave reasons to enact Provisional Measure 224.
Speech	06/12/2004	Speech at the launching ceremony of	President	Discussed the biodiesel program.

		the National Biodiesel Program		
Debate	16/12/2004	Plenary debate for the enactment of law 11,097/2005.	Federal Senate	Debated the enactment of Law 11,097.
Speech	20/12/2004	Speech at the launching ceremony of the investment fund holdings Brazil Energy	President	Discussed energy investment.
Speech	11/01/2005	Speech at the opening ceremony of the hydroelectric power plant Monte Claro	President	Discussed energy production.
Legislation	13/01/2005	Law 11,097	Legislative Power	Introduced biodiesel into the Brazilian energy matrix.
Speech	22/02/2005	Speech at the opening ceremony of the electrification network in 53 settlements	President	Discussed energy access.
Speech	24/03/2005	Speech at the opening ceremony of the biodiesel plant Soyminas	President	Discussed biodiesel production.
Speech	27/04/2005	Speech at the opening ceremony of biodiesel plant Agropalma	President	Discussed biodiesel production.
Legislation	18/05/2005	Law 11,116	Legislative Power	Created a registry of biodiesel producers and importers and provided for the tax regime for biodiesel producers and importers.
Speech	04/08/2005	Speech at the ceremony relating to castor crop for the production of biodiesel	President	Discussed biodiesel production.
Speech	04/08/2005	Speech at the opening ceremony of the biodiesel plant Brasil Ecodiesel S/A	President	Discussed biodiesel production.

Speech	10/08/2005	Speech at the visit to the works of the hydroelectric plant Peixe Angical	President	Discussed energy development.
Speech	17/11/2005	Speech at the ceremony of the social fuel seal	President	Discussed the biodiesel program.
Speech	30/01/2006	Speech at the opening ceremony of the Electric Power Substation Viana	President	Discussed energy supply.
Speech	03/02/2006	Speech at the signing ceremony of biodiesel purchase agreements of the ANP auction	President	Discussed biodiesel production.
Speech	19/04/2006	Speech at the visit to the works of the wind farm Osorio	President	Discussed energy supply.
Speech	05/05/2006	Speech at the opening ceremony of the hydroelectric plant Eliezer Batista	President	Discussed the nationalisation of Petrobras in Bolivia.
Speech	20/06/2006	Speech at the launching ceremony of cornerstone of biodiesel plant BSBios	President	Discussed biodiesel.
Speech	20/06/2006	Speech at the ceremony of the industrial test of H-Bio	President	Discussed biodiesel.
Speech	25/07/2006	Speech at the signing ceremony of the contracts of the 2nd public auction of biodiesel	President	Discussed biodiesel.
Speech	31/07/2006	Speech at the opening of the meeting on biodiesel	President	Discussed biodiesel.
Speech	15/08/2006	Speech at the signing ceremony of the concession contracts of hydroelectric plants with entrepreneurs	President	Discussed energy production.
Speech	31/08/2006	Speech at the first national meeting on biofuels	President	Discussed biofuels.
Legislation	31/08/2006	Decree 5,882	Executive Power	Amended Decree 5,025/2004.

				Added the reduction of greenhouse gases emissions as an aim of PROINFA.
Speech	21/11/2006	Speech at the opening ceremony of the biodiesel plant Barralcool	President	Discussed biodiesel.
Policy document	2007	The National Energy Plan 2030 (PNE)	MME	Provides a long-term integrated energy strategy.
Speech	31/01/2007	Speech at the opening ceremony of biodiesel plant Ecodiesel	President	Discussed biodiesel.
Speech	10/02/2007	Speech at the opening ceremony of the biodiesel plant Ecodiesel	President	Discussed biodiesel.
Legislation	27/02/2007	Decree 6,048	Executive Power	Allowed A1 to A5 auctions exclusively for renewables.
Speech	18/05/2007	Speech at the opening ceremony of biodiesel plant Ecodiesel	President	Discussed biodiesel.
Speech	21/05/2007	Speech at the opening of the seminar on Biofuels	President	Discussed biodiesel.
Speech	21/05/2007	Speech at the opening ceremony of generating units of Itaipu hydroelectric power plant	President	Discussed Itaipu hydroelectric power plant.
Legislation	15/06/2007	Law 11,488	Legislative Power	Created a fiscal incentive regime for infrastructure development, known as REIDI, which energy projects could benefit from.
Speech	05/07/2007	Speech at the International Conference on Biofuels	President	Discussed biofuels.
Speech	09/08/2007	Speech at the opening ceremony of the	President	Discussed biofuels.

		Jamaica Broilers Group´s Ethanol Plant		
Speech	21/08/2007	Speech in the opening ceremony of the biodiesel plant Bertin	President	Discussed biodiesel.
Speech	12/09/2007	Speech at the opening of the seminar on biofuels	President	Discussed biofuels.
Regulation	05/12/2007	CNPE resolution 7	CNPE	Established guidelines for the formation of biodiesel stocks.
Speech	21/01/2008	Speech at the introduction of the Mines and Energy Minister Edison Lobão	President	Discussed energy shortage in Brazil.
Regulation	13/03/2008	CNPE resolution 2	CNPE	Set the minimum percentage of biodiesel to be added to diesel oil at 3%.
Speech	03/06/2008	Speech at the meeting of the high level of FAO on food security, climate change and bioenergy	President	Discussed food security, climate change and biofuels.
Speech	20/08/2008	Speech at the opening ceremony of the second commercial biodiesel plant of Petrobras	President	Discussed biodiesel.
Speech	20/08/2008	Speech at the opening ceremony of the terminal of liquefied natural gas regasification	President	Discussed energy supply.
Speech	21/11/2008	Speech at the closing of the plenary session of the International Conference on Biofuels	President	Discussed biofuels, food security and climate change.
Regulation	12/02/2009	MME norm 60	MME	Approved the manual for special projects in the context of the Universal National Program for

				Access and Use of electricity - "Light for All".
Speech	12/03/2009	Speech during a visit to the works of the Jirau hydroelectric plant	President	Discussed energy development and the world economic crisis.
Speech	06/04/2009	Speech during the opening ceremony of the Darcy Ribeiro biodiesel plant	President	Discussed biofuels and the world economic crisis.
Regulation	27/04/2009	CNPE resolution 2	CNPE	Increased the biodiesel blending mandate to 4% from July 2009.
Speech	12/05/2009	Speech during a visit to the works of Euzébio Rock thermoelectric plant	President	Discussed the world economic crisis.
Legislation	28/05/2009	Law 11,943	Legislative Power	Extended the date for PROINFA projects to start commercial operations to December 2010.
Regulation	16/09/2009	CNPE resolution 6	CNPE	Increased the biodiesel blending mandate to 5%.
Speech	23/10/2009	Speech during the announcement of the mandatory blend of 5% biodiesel to diesel	President	Discussed biodiesel.
Legislation	29/12/2009	Law 12,187	Legislative Power	Established the National Policy on Climate Change.
Speech	19/01/2010	Speech at the start-up ceremony of ethanol usage in the Juiz de Fora thermoelectric power plant	President	Discussed thermoelectric with ethanol usage and climate change.
Speech	15/07/2010	Speech during a visit to platform facilities and collection of first oil production at the well in the pre-salt Campo Baleia Franca	President	Discussed pre-salt.

Speech	13/08/2010	Speech during a visit to the works of turbines of hydropower plant	President	Discussed the Brazilian energy matrix.
Speech	26/08/2010	Speech at the signing ceremony of the concession contract for the Belo Monte hydroelectric plant	President	Discussed the construction of Belo Monte and environmental issues.
Speech	19/10/2010	Speech during the opening ceremony of two hydroelectric plants in Goiás	President	Discussed energy investment.
Speech	26/11/2010	Speech during the opening ceremony of the gas thermoelectric park in the North	President	Discussed gas development.
Meeting record	13/12/2010	21st CNPE ordinary meeting	CNPE	Discussed the situation of the National Energy Policy.
Legislation	22/12/2010	Law 12,351	Legislative Power	Established the framework for the exploration of oil and gas in the pre-salt area.
Speech	01/03/2011	Speech during the announcement ceremony of the implementation of the Regasification Terminal of Liquefied Natural Gas (LNG) in Bahia’	President	Discussed gas development.
Legislation	28/04/2011	Provisional measure 532	Executive Power	Biofuels were included expressly in the Brazilian legislation as a key energy resource for the country, as well as the security of supply of biofuels throughout the country as one of the objectives of the National Energy Policy.

Note	28/04/2011	Exposure of motives EM INTERMINISTERIAL N 00013 / MME / MF / MDIC/ MAPA/ MC/MP	Executive Power	Gave reasons to enact Provisional Measure 532
Speech	05/07/2011	Speech during the start ceremony of the deviation of the Madeira River for the Santo Antônio hydroelectric power plant	President	Discussed hydroelectricity generation.
Legislation	16/09/2011	Law 12,490	Legislative Power	Biofuels were included expressly in the Brazilian legislation as a key energy resource for the country, as well as the security of supply of biofuels throughout the country as one of the objectives of the National Energy Policy.
Speech	22/09/2011	Speech at the high-level meeting on nuclear safety	President	Discussed nuclear safety.
Meeting record	05/12/2011	23rd CNPE ordinary meeting	CNPE	Discussed energy policies.
Legislation	23/12/2011	Decree 7,660	Executive Power	Provided import tax exemptions for wind power equipment, and set those for solar PV equipment in the 2% to 10% range.
Speech	21/03/2012	Speech during the introduction of Magda Chambriard, general director of the National Petroleum Agency (ANP)	President	Discussed energy supply.
Regulation	05/06/2012	Normative resolution 493	ANEEL	Regulated electricity supply

				through individual systems of electricity generation via the use of renewable energy.
Meeting record	26/06/2012	24th CNPE ordinary meeting	CNPE	Discussed energy supply.
Legislation	11/09/2012	Provisional measure 579	Executive Power	Promoted the competitiveness of energy produced from wind power, thermosolar, photovoltaic, small hydro, biomass, other renewables and natural gas.
Note	11/09/2012	Exposure of motives EM Interministerial nº 37/MME/MF/AGU	Executive Power	Gave reasons to enact Provisional Measure 579.
Speech	11/09/2012	Speech during the announcement ceremony of the reduction of energy cost	President	Discussed the energy sector.
Speech	17/10/2012	Speech at the opening ceremony of the Estreito hydroelectric power plant	President	Discussed hydroelectricity.
Legislation	11/01/2013	Law 12,783	Legislative Power	Promoted the competitiveness of energy produced from wind power, thermosolar, photovoltaic, small hydro, biomass, other renewables and natural gas.
Statement	23/01/2013	Statement on lower electric power rates	President	Discussed lower electric power rates.

Note	30/04/2013	Exposure of motives EM nº 00090/2013 MF	Executive Power	Gave reasons to enact Provisional Measure 613.
Legislation	07/05/2013	Provisional measure 613	President	Reduced the tax for bioethanol.
Regulation	25/06/2013	CNPE Resolution 6	CNPE	Authorised the exploration and production of petroleum and natural gas.
Legislation	10/09/2013	Law 12,859	Legislative Power	Reduced the tax for bioethanol.
Speech	29/10/2013	Speech during the opening ceremony of the 500 kV electrified line between Villa Hayes and the power substation on the right bank of Itaipu	President	Discussed energy interconnection and infrastructure.
Speech	08/11/2013	Speech during the completion ceremony of Platform P-58 in Rio Grande / RS	President	Discussed oil exploration in Brazil.
Meeting record	17/12/2013	27th CNPE ordinary meeting	CNPE	Discussed the national energy policy.
Note	09/05/2014	Exposure of motives EMI nº 00015/2014 MME MAPA MF MDA MDIC	Executive Power	Gave reasons to enact Provisional Measure 647.
Legislation	28/05/2014	Provisional measure 647	President	Set the minimal biodiesel blending mandate at 7%.
Speech	28/05/2014	Speech during the announcement ceremony of measures for promotion of the production and consumption of biodiesel	President	Discussed biodiesel.
Speech	01/07/2014	Speech during the commemoration ceremony of 500,000 barrels of oil from the pre-salt in Rio de Janeiro / RJ	President	Discussed pre-salt area.

Note	12/09/2014	Exposure of motives EMI nº 00144/2014 MF MJ MTE MDIC BACEN	Executive Power	Gave reasons to enact Provisional Measure 656.
Legislation	24/09/2014	Law 13,033	Legislative Power	Set the minimal biodiesel blending mandate at 7%.
Legislation	07/10/2014	Provisional measure 656	President	Provided import tax exemptions for wind turbine components.
Meeting record	09/12/2014	29th CNPE ordinary meeting	CNPE	Discussed the national energy sector.
Legislation	19/01/2015	Law 13,097	Legislative Power	Provided import tax exemptions for wind turbine components.
Speech	27/02/2015	Speech at the opening ceremony of Geribatu Wind Farm and the associated transmission system in Santa Vitória do Palmar/RS	President	Discussed wind energy.
Speech	28/02/2015	Speech at the inauguration ceremony of the wind farm Artilleros	President	Discussed wind energy.
Meeting record	30/06/2015	30th CNPE ordinary meeting	CNPE	Discussed the national energy sector.
Speech	11/08/2015	Speech during the announcement ceremony of the Investment Program in Energy	President	Discussed energy investment.
Legislation	18/08/2015	Provisional measure 688	President	Provided for the renegotiation of the hydrological risk of electricity generation.
Note	18/08/2015	Exposure of motives EMI 00023/2015 MME AGU MF	Executive Power	Gave reasons to enact Provisional Measure 688.
Regulation	21/09/2015	CNPE resolution 3	CNPE	Authorised and set guidelines for the

				commercialisation and the voluntary use of biodiesel.
Meeting record	08/12/2015	31st CNPE ordinary meeting	CNPE	Discussed the national energy sector.
Legislation	08/12/2015	Law 13,203	Legislative Power	Provided for the renegotiation of the hydrological risk of electricity generation.
Report	2015	National Policy of Water Resources: Supply, Energy and Basic Sanitation	Federal Senate	Evaluated the National Water Resources Policy, with emphasis on supply issues, energy and sanitation.

APPENDIX 3

CHRONOLOGICAL LIST OF WTO ENERGY DISPUTE CASES

Full case title	Measure at issue	Agreements cited	Dispute status
United States — Standards for Reformulated and Conventional Gasoline, WT/DS2	The "Gasoline Rule" under the US Clean Air Act set different methods for domestic and imported gasoline.	GATT 1994: Art. I, III, XXII:1 Technical Barriers to Trade (TBT): Art. 2, 14.1	Final decision in 1996
Canada — Certain Measures Affecting the Renewable Energy Generation Sector, WT/DS412	Local content requirements in Ontario's Feed in Tariff programme for wind and solar PV.	GATT: Art. III:4, III:5, XXIII:1 ASCM: Art. 1.1, 3.1(b), 3.2 TRIMS: Art. 2.1	Final decision in 2013
China - Measures concerning Wind Power Equipment, WT/DS419	Grants, funds, or awards to enterprises manufacturing wind power equipment in China.	GATT 1994: Art. XVI:1 ASCM: Art. 3, 25.1, 25.2, 25.3, 25.4	In consultations
Canada — Measures Relating to the Feed-in Tariff Programme, WT/DS426	Local content requirements in Ontario's Feed in Tariff programme for wind and solar PV.	GATT 1994: Art. III:4 ASCM: Art. 1.1, 3.1(b), 3.2 TRIMS: Art. 2.1	Final decision in 2013

United States — Countervailing Duty Measures on Certain Products from China, WT/DS437	Imposition of countervailing duty measures by the United States on certain products from China (including solar panels and wind towers).	GATT: Art. VI ASCM: Art. 1.1, 2, 11.1, 11.2, 11.3, 12.7 and 14(d)	Final decision in 2014
European Union and a Member State — Certain Measures Concerning the Importation of Biodiesels, WT/DS443	EU and Spain's measures affecting the importation of biodiesels for accounting purposes with regard to the compliance with the mandatory targets for biofuels.	GATT: Art. III:1, III:4, III:5 and XI:1 TRIMS: Art. 2.1 and 2.2	Establishment of a panel deferred
European Union and Certain Member States — Certain Measures Affecting the Renewable Energy Generation Sector, WT/DS452	Domestic content restrictions that affect the renewable energy generation sector relating to the feed-in tariff programmes of EU member States.	GATT: Art. I, III:1, III:4, III:5 ASCM: Art. 1.1, 3.1(b), 3.2 TRIMS: Art. 2.1, 2.2	In consultations

India — Certain Measures Relating to Solar Cells and Solar Modules, WT/DS456	Domestic content requirements under the India's Jawaharlal Nehru National Solar Mission ("NSM") for solar cells and solar modules.	GATT: Art. III:4 TRIMS: Art. 2.1 ASCM: Art. 3.1(b), 3.2, 5(c), 6.3(a) and (c), and 25	Final decision in 2016
European Union — Certain Measures on the Importation and Marketing of Biodiesel and Measures Supporting the Biodiesel Industry, WT/DS459	Two types of measures adopted by the European Union and certain member States: (a) measures to promote the use of energy from renewable sources and to introduce a mechanism to control and reduce greenhouse emissions; and (b) measures to establish support schemes for the biodiesel sector.	GATT: Art. I:1, III, III:1, III:2, III:4, III:5 TBT: Art. 2.1, 2.2, 5.1, 5.2 TRIMS: Art. 2.1, 2.2 ASCM: Art. 3.1(b), 3.2, 5(b), 5(c), 2.3, 1.1, 6.3(a)	In consultations
European Union — Anti-Dumping Measures on	Two claims against the EU: (a) provisional and definitive anti-dumping	The Anti-Dumping Agreement: Art. 1, 2.1, 2.2, 2.2.1.1, 2.2.2,	Final decision in 2016

Biodiesel from Argentina, WT/DS473	measures imposed on biodiesel originating in Argentina; and, (b) a provision in Council Regulation (EC) 1225/2009 of November 2009, which refers to the adjustment or establishment of costs associated with the production and sale of products under investigation in the determination of dumping margins.	2.4, 3.1, 3.2, 3.4, 3.5, 6.2, 6.4, 6.5, 6.5.1, 9.3, 18 and 18.4. GATT: Art. VI	
European Union and its Member States — Certain Measures Relating to the Energy Sector, WT/DS476	Measures which regulated the natural gas sector and sought to facilitate the development of natural gas infrastructure within the European Union.	GATS: Articles II, VI, XVI and XVII; GATT: Articles I, III, X and XI; ASCM: Article 3; TRIMS: Article 2.	Panel report circulated on 10 August 2018

European Union — Anti-Dumping Measures on Biodiesel from Indonesia, WT/DS480	Two claims against the EU: (a) provisions of Council Regulation (EC) No 1225/2009 on protection against dumped imports from countries not members of the European Community; and (b) anti-dumping measures imposed in 2013 by the European Union on imports of biodiesel originating in, inter alia, Indonesia.	The Anti-Dumping Agreement: Art. 1, 2, 2.1, 2.2, 2.2.1.1, 2.2.2, 2.3, 2.4, 3.1, 3.2, 3.4, 3.5, 6.5, 6.5.1, 7.1, 7.2, 9.2, 9.3, 15 and 18.4 GATT: Art. VI, VI:1 and VI:2	Panel report circulated on 25 January 2018
United States — Certain Measures Relating to the Renewable Energy Sector, WT/DS510	Domestic content requirements and subsidies instituted by the governments of the states of Washington, California, Montana, Massachusetts, Connecticut, Michigan,	GATT: Art. III:4, XVI:1 ASCM: Art. 3.1(b), 3.2, 5(a), 5(c), 6.3(a), 25 TRIMS: Art. 2.1	Panel composed on 24 April 2018

	Delaware and Minnesota, in the energy sector.		
United States — Safeguard measure on imports of crystalline silicon photovoltaic products, WT/DS545	Definitive safeguard measures imposed by the United States on imports of certain crystalline silicon photovoltaic products.	the Agreement on Safeguards: Articles 1, 2.1, 3.1, 3.2, 4.1, 4.2, 5.1, 5.2, 7.1, 7.4, 8.1, 12.1, 12.2 and 12.3; GATT: Article X:3, XIII and XIX:1(a).	In consultations
United States — Safeguard Measure on Imports of Crystalline Silicon Photovoltaic Products, WT/DS562	Definitive safeguard measure imposed by the United States on Chinese imports of certain crystalline silicon photovoltaic products.	the Agreement on Safeguards: Articles 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 5.1, 7.1, 7.4, 8.1, 12.1, 12.2 and 12.3; GATT: Articles X:3, XIII, XIX:1(a) and XIX:2.	In consultations
United States — Certain Measures Related to Renewable Energy, WT/DS563	Domestic content requirements and subsidies instituted by the governments of	SCM Agreement: Articles 3.1(b) and 3.2; TRIMS Agreement: Articles 2.1 and 2.2;	In consultations

	certain US states and municipalities.	GATT: Article III:4.	
Peru — Anti-dumping and countervailing measures on biodiesel from Argentina, WT/DS572	Anti-dumping and countervailing measures imposed by Peru on biodiesel from Argentina.	Anti-dumping (Article VI of GATT 1994): Art. 2.2, 2.2.1.1, 2.2.2(iii), 3.1, 3.4, 3.5, 5.2, 5.3, 5.8, 6.5, 9.3, 18.1, 18.4 Subsidies and Countervailing Measures: Art. 1.1(a), 1.1(a)(1)(iii), 1.1(b), 10, 12.4, 14(d), 15.1, 15.4, 15.5, 19.1, 19.4, 32.1, 32.5 GATT 1994: Art. VI:1, VI:2, VI:3, VI:5(a)	In consultations