Matúš Mišík
Nada Kujundžić *Editors*

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For Matilda… Welcome!

Preface

The idea for this book first appeared during a workshop we organised at the Comenius University in Bratislava (Slovakia) in May 2018, entitled 'Energy Humanities: What We Know and Where We Are Going'. The 2-day event was filled with stimulating discussions about the emerging field of energy humanities and the possibilities it provides for better understanding energy policy and its main challenges. Approaching the issues discussed in the workshop from our different disciplinary angles—the social sciences (Mišík) and the humanities (Kujundžić)—we recognised the great potential of the new research agenda of energy humanities, as well as many stimulating, as of yet unanswered questions connected to its foundations and future development. This inspired us to develop a book project that would not only illustrate the wide scope of approaches that can be included under the umbrella of energy humanities, but also help define the nascent interdisciplinary research area and its possible contributions to answering the most pressing energy policy questions of today, most notably energy transition towards a post-carbon society. The resulting edited volume encompasses 12 chapters which discuss the energy humanities from different disciplinary and theoretical angles, written by both seasoned and early-career scholars.

Among the many people who helped us make this volume happen, we would first and foremost like to thank our contributors for sharing their knowledge and expertise with us, and investing a lot of time and hard work into this project. Our gratitude also goes out to colleagues from the Department of Political Science at Comenius University in Bratislava, especially Veronika Oravcová and Kateryna Yakovenko, for their assistance with organising the workshop, as well as the workshop participants, for enhancing our understanding of the potential of energy humanities through their expertise and experience. We are also indebted to the Springer team—Laura Burgess, Charlotte Cross, Anthony Doyle, Madanagopal Deenadayalan, and Rajan Muthu—whose friendly approach and professionalism helped us successfully conclude this project. This edited volume has been fully supported by the Slovak Research and Development Agency under the project 'Priorities of the Central and Eastern

European Countries in the context of Energy Union' (APVV-16-0062). We would like to thank the Agency for its generous support of innovative approaches in energy policy research.

Smokvica Krmpotska, Croatia — Matúš Mišík
May 2020 — Nada Kujundžić

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Editors and Contributors

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Chapter 1
Introduction

Matúš Mišík and Nada Kujundžić

Abstract This chapter presents the main ideas behind this edited volume and provides a background for the individual chapters encompassed therein. The chapter examines energy transition as one of the main components connected to climate change and highlights the potential contribution of the humanities and social sciences (previously largely excluded from the conversation) to the process of developing possible post-carbon economies, societies, and energy systems. It points to the energy humanities as a key means of providing insight into the various social, political, cultural, economic, and ideological aspects of energy transition, thus not only contributing to the mitigation of the consequences of climate change but also helping prevent climate change from reaching the point of no return.

Keywords Climate change · Global warming · Energy transition · Post-carbon society

1.1 Introduction

One of the main challenges humankind currently faces is connected to climate change causing irreversible transformation of our environment, which threatens the survival of both humans and other species that inhabit the Earth (Fitch-Roy and Fairbrass 2018). This change is instigated by (among other factors) the rising average global temperature, which, if not prevented, will initiate processes with devastating consequences for the environment, including rising oceans level caused by the melting of continental icebergs, severe weather conditions encompassing both frequent droughts and floods, the spread of deserts, etc. The World Bank estimates that, by 2050, climate

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changes will force more than 140 million people to move within their own countries (Rigaud et al. 2018). There are also expectations of intense international climate migration (Black et al. 2011; Laczko and Aghazarm 2009) that will have severe negative consequences for international relations and the existing international regime, causing new types of climate change-related conflicts.

To prevent such a development or at least mitigate its negative consequences, there has been an increased understanding at the global level about the need to change our attitudes towards the climate, environment, and consumption of natural resources, and adapt most (if not all) sectors of industry to the new situation. Most importantly, the 2016 Paris Agreement (which follows in the footsteps of the famous, but rather unsuccessful 1997 Kyoto Protocol) aims to limit the rise of global temperature below 2 °C above pre-industrial levels (UN 2020),[1] considered to be the threshold crossing that would mean irreversible changes to the Earth's climate. The Agreement proceeds to define an even more ambitious goal of limiting the temperature rise to 1.5 °C, which would be much better for the climate and humankind. The latest analyses show that, while keeping the global temperature rise under 1.5 °C will involve huge costs, its benefits will surely outweigh its downsides (Hoegh-Guldberg et al. 2019).

The Paris Agreement entered into force in November 2016, after being ratified by 55 countries responsible for at least 55% of the total greenhouse gas (GHG) emissions. In early 2020, 189 out of the 197 parties to the Paris Convention ratified the Agreement (UN 2020). The European Union (EU) developed a similarly ambitious plan to create an almost climate-neutral economy by 2050, proposing to cut CO_2 emissions between 80% and 95% (European Commission 2018). CO_2 and other GHG are considered to be the main cause of the temperature rise, which is why much of the efforts invested by the EU and other actors concentrate on their reduction. Several national governments, along with numerous cities and municipalities, went even further; inspired by the 'Fridays for Future' movement initiated by Swedish activist Greta Thunberg, they started declaring climate emergencies in early 2019, thus emphasising their dedication to climate and environmental issues. For example, in June 2019, the state of New York passed a plan to reduce GHG to zero by 2050 (Goldberg 2019).

However, some of these declarations could be seen more as lip service than the basis for new climate and environment policies. Most famously, the Canadian Federal Government declared a climate emergency only a few days before approving the expansion of the Trans Mountain Pipeline that will enable the country to export more of its oil produced from oil sands, a process of oil recovery which generates significant pollution (Ljunggren and Williams 2019). Similarly, in November 2019, President Donald Trump announced the U.S.'s withdrawal from the Paris Agreement (which, following the Agreement provisions, would come into effect a year later, in November 2020) thus providing severe pushback to the document as a whole (Duke 2019). The 2050 deadline for developing a carbon-neutral economy within the EU also encountered problems. Namely, in June 2019, the European Council

[1] According to NASA, the current temperature level has risen about 0.9 °C since the late 19th century (NASA 2019).

managed to reach an agreement among the member states only on the "transition to a climate-neutral EU in line with the Paris Agreement" (European Council 2019a, p. 1) without setting a deadline, due to opposition from four Central and Eastern European countries—the Czech Republic, Estonia, Hungary, and Poland. The second attempt in December 2019 was more successful as the European Council "endorse[d] the objective of achieving a climate-neutral EU by 2050", although "one member state, at [that] stage, [could not] commit to implementing" that objective (European Council 2019b, p. 1). Poland, the member state in question, was not identified in the document.

Although the attitude towards climate change does not follow a linear trend, and there are visible and significant ups and downs in the way our global society approaches this issue, we can observe a general trajectory of changing attitudes towards climate change, manifested especially as an understanding of the need to significantly reduce GHG emissions (Hewitt et al. 2017). This process has several dimensions, from changed personal preferences (well-illustrated by the *flygskam* concept—literally, flight shame—which stresses the need to use modes of transportation other than the carbon-intensive flying; Wolrath Söderberg and Wormbs 2019) to adaptations of industry and everything between. The 2020 Covid-19 pandemic has significantly impacted this process as, on the one hand, travel limitations and reduced industrial production have decreased GHG production, with many calling for a 'green' post-pandemic recovery; on the other hand, the industry has been requesting to be excused from existing climate and environmental commitments in order to facilitate its recovery without the need to invest heavily in climate-friendly solutions.

As the source of a significant share of GHG production and one of the main pollutants, the energy sector plays a crucial role in this process. Transition from the existing energy system based predominantly on burning fossil fuels towards a post-carbon one, based on renewable sources of energy, is therefore considered to be one of the main ways to achieve carbon-neutral economies that will produce at maximum as much CO_2 (and other GHG) as the environment will be able to naturally absorb (so-called carbon sink), without an increase in the GHG released in the atmosphere in absolute terms. Many disciplines aim to contribute to this goal as the transition towards renewable energy sources is a complex task which demands all available assistance and support. While the natural sciences are generating the data explaining the causes of climate changes and rising global temperatures, this is often not enough to stimulate "an appropriately strong and rapid societal response" (Nisbet et al. 2010, p. 329) that would translate into concrete action (see Conclusion).

The present volume builds on the notion that natural sciences are not the only ones able to contribute to solving climate change issues, including energy transition. Rather, other disciplines, particularly those within the humanities and social sciences (heretofore largely excluded from the conversation) can assist with this mammoth task by providing support and utilising their knowledge and expertise. Furthermore, the volume argues that only a combination of different points of view and types of knowledge can help us successfully deal with climate change and energy transition, complex problems with profound social, political, legal, cultural, economic, and ideological implications.

1.2 Energy Transition

The energy sector, one of the main pollutants and contributors to climate change, is being gradually transformed in order to decrease its environmental footprint, especially (but not exclusively) connected to the high levels of its GHG emissions. This transformation is better known as energy transition, a concept here defined as the shift from an over-dependency on our rapidly depleting supplies of fossil fuels, such as coal, oil, and natural gas—the burning of which produces carbon dioxide and other GHG emissions that contribute to climate change—to a carbon-free system of energy production and consumption that would not produce harmful emissions (see, for example, Stokes and Breetz 2018). The main goal of the transition is to decrease the energy sector's impact on climate change and halt the documented rise of global temperature caused by increased GHG concentration in the atmosphere.

Carbon dioxide (CO_2) has been identified as the main 'culprit' for climate change, which is why energy transition is aimed at developing and utilising carbon-free modes of energy production and consumption. While fossil fuels are finite and expected to last from the next several decades to a century or more,[2] most carbon-free energy sources are renewable (hence the name renewables, RES) or exist in supplies that are expected to last several centuries (the proposed fourth generation of nuclear power plants). Although the carbon-free nature of non-fossil fuels has dominated the current discussion, the need to replace existing energy systems also stems from the need to provide long-term energy supplies vis-à-vis the depletion of existing fields, rising costs of extracting new ones, geopolitical ramifications of the new situation brought about by these changes, technological development, etc.

While, as energy scholar Vaclav Smil notes, "[a] non-fossil world may be highly desirable, […] getting there will demand great determination, cost and patience" (2006a, [n.p.]). Namely, the transition from unsustainable and environmentally damaging fossil fuels to a world 'after oil'[3] (Petrocultures Research Group 2016), reliant on a mix of different carbon-free technologies, including renewables (biomass, water, wind, solar energy), nuclear, hydrogen, etc., is a challenging, long-term process which requires not only considerable technological advances, but also changes in the way we consume and think about energy. Smil lists five factors hindering the transition: "the scale of the shift; the lower energy density of the replacement fuels; the substantially lower power density of renewable energy extraction; intermittency of renewable flows; and uneven distribution of renewable energy resources" (2006a, [n.p.]). A good explanation for the longevity of energy transition is provided by

[2] The limits of our fossil fuel resources have given rise to a lot of discussion: while many studies highlight the bleak prognoses in their titles (e.g. David Goodstein's [2004] *Out of Gas: The End of the Age of Oil*, Richard Heinberg's [2005] *The Party's Over*, Paul Roberts' [2005] *The End of Oil: On the Edge of a Perilous New World*), others insist that fossil fuels are neither as depleted (some even going so far as to claim that oil is virtually inexhaustible; Adelman 1995, 2004) nor as dirty as is often claimed (Etam 2019; Mills 2008; Odell 2004). Furthermore, they are presented as preferable to trying (with uncertain results) to shift to expensive alternatives (Jaccard 2005).

[3] Although this concept highlights only one type of fossil fuel in its name, we use it to refer to all fossil fuels.

the lock-in concept (Unruh 2000), which shows how the combination of technological structures and institutions (the so-called techno-institutional complex) creates macro-level barriers to the diffusion of carbon-free technologies. Existing carbon technologies are so interwoven with the overall functioning of society and energy systems that they create path-dependency, resulting in series of decisions supporting these technologies over carbon-free ones (see Chap. 5 in this volume). In other words, technologies utilising fossil fuels play an important role and are difficult to replace, because the existing system is based on or connected to them (electricity grids, mobility, employment, technologies, etc.). Thus, a strong push is needed to create a window of opportunity for changing the existing energy systems.

While there is an overall consensus on the fact that energy transition is imperative, "[t]he difficult question of *how* such a complete transformation of social life is to be brought about remains open" (Szeman 2007, p. 816; original emphasis). What are the realities of an energy transition? What does it mean for everyday life? How exactly can the shift to a carbon-free future be realised and what kind of technological and infrastructural changes will it entail? And what should take the place of fossil fuels? The last two questions in particular have generated a lot of discussion, as well as a lot of disagreement. For example, while some believe that nuclear energy should play a key role in the energy transition, others argue against this technology, pointing to the carbon footprint of nuclear power plants created during the entire life cycle of a nuclear facility (Vaillancourt et al. 2008). Moreover, the aftermath of the 2011 Fukushima nuclear accident has dealt a significant blow to the nuclear industry, manifested in, for example, the phasing out of nuclear power plants in Germany (so-called *Atomausstieg*), negative result of the referendum on nuclear energy utilisation in Italy, and the overall decrease of interest in this technology in the Global North. However, many continue to embrace the nuclear: for instance, some of the Central and Eastern European EU members are still interested in the technology needed for developing new nuclear power stations (Mišík 2019), while many countries of the Global South see nuclear as a suitable way to accommodate the increasing energy demands of their growing economies (Andrews-Speed and Tromans 2019).

However, energy transition is not only about the ultimate goal (i.e. the substitution of 'dirty' energy sources with 'clean' ones), but also about the path leading to that end goal and the expected gradual changes it entails. According to some researchers and institutions, the prevention of climate change will not be achievable without the carbon capture and storage (CCS) technology that will ease the transition from fossil fuels to carbon-free sources by addressing the former's emission problem. CCS would enable the continued utilisation of fossil fuels such as coal, as CO_2 emissions created in the burning process would be separated and stored, thus helping develop a carbon-neutral economy. In Poland, this technology is seen as simultaneously enabling the utilisation of 'clean coal' and the fulfilment of EU climate requirements (Kuchler and Bridge 2018). However, the CCS technology is currently underdeveloped and, at the time of this writing, no large-scale CCS instalments that would demonstrate the feasibility of this solution have been built. Other proposed changes such as negative emission technologies (NETs) are similarly often dismissed as expensive, unviable

options, with only "limited realistic potential", which lack viable business models and economic initiatives needed for their implementation (EASAC 2018, p. 1).

The role of natural gas (discussed in Chaps. 4 and 5) is another important part of the discussion on energy transition, as its burning releases much less CO_2 compared to other fossil fuels, earning it the reputation of ideal bridge or transition fuel to a carbon-free future (Aguilera and Aguilera 2012). It therefore seems that natural gas could ease the process of transition, especially since it enables rapid fuel switching (for example, ships can be refurbished to use liquefied natural gas), and relies on existing infrastructure and technologies. However, it is nevertheless a CO_2-producing fossil fuel, which means it can at best be considered a mid-term solution to energy transition. A lot of discussion focuses on the role of renewables in the energy mix, especially in connection to their intermittent nature (particularly wind and solar energy), which raises questions about their compatibility with current energy systems (see, for example, Janda et al.'s [2017] analysis of the consequences of *Energiewende* on transmission networks in Central and Eastern Europe). In its attempt to remain technologically neutral and consider different types of energy and technologies on which there is little consensus, this volume does not discuss the role of the different technologies in the energy transition.

1.3 Energy Humanities

This chapter—and the edited volume as a whole—argues that the interdisciplinary combination of energy-oriented research within the humanities and social sciences—here referred to as the energy humanities—can provide insights into the different (social, cultural, political, ideological, etc.) factors hindering/supporting an energy transition, thus promoting our understanding of the transition towards a future carbon-free energy system necessary to mitigate climate change. Traditionally, research on energy—its resources and (chemical, physical, etc.) properties, conversion, exploitation, and utilisation—has been conducted within the natural sciences and engineering, and the knowledge produced within those disciplinary framework has greatly contributed to our understanding of the energy transition. Studies assuming a more technical approach have examined topics such as the different ways of increasing the efficiency of new technologies (Irandoust 2018), lower costs of technology that would make it competitive in the context of current carbon-based methods of energy generation (Shahnazari et al. 2017), or the (not always positive) effects of renewables on existing energy systems (Málek et al. 2017). However, the restriction of energy research to the previously mentioned disciplines results in a limited and fairly one-sided definition of the central issue (cf. Hulme 2011), one that typically overlooks the social, political, and cultural aspects of energy systems and energy transition. In response, much of the current research within the social sciences started focusing on the social and political dimensions of energy transition and their various implications (Sarrica et al. 2016, and many other articles, especially those published in the *Energy Research & Social Science* journal) including (among other topics) the

changing modes of energy governance and their impact on EU member states (Knodt and Ringel 2019); consumer behaviour (Stephenson et al. 2010); political, regulatory, and other barriers to carbon-free technologies (Bae and Yu 2018); energy democracy (Szulecki 2018); and energy poverty (González-Eguino 2015).

However, the inclusion of the social sciences alone in discussions on energy transition does not provide a thorough enough view of the process, leaving room for further inquiries. For example, the majority of social science inquiries on the consequences of the energy transition consider the experiences of past energy transitions only to a limited degree. However, the current transition is only the latest in a long history of energy shifts (e.g. from biomass to coal, or from coal to hydrocarbons; Smil 2006b), so examining these historical cases can offer insight into the mechanisms of energy systems change, as well as lessons for the future and examples of best practices. Social (and natural) scientists have also been hesitant to address the broader implications of the energy transition and reimagine our energy future. However, it has been argued that in order to introduce change, one must first imagine it (Sovacool and Brossmann 2013), a notion inscribed in the broader concept of sociotechnical imaginaries (Jasanoff and Kim 2013; see also Chap. 9).

This is where the humanities come in. With their focus on the "problems of ethics, habits, values, institutions, belief, and power" (Boyer and Szeman 2014, [n.p.]), the humanities and humanistic social sciences are ideally positioned to expand our understanding of the energy transition—its causes, pathways, possible shapes, and outcomes—and help communicate scientific knowledge on climate change in more effective and engaging ways. For example, exploring history offers examples of past energy transitions and societies that were not growth-oriented (see Chap. 3), while literature (especially speculative fiction) provides a platform for developing new ideas and testing future scenarios (see Chap. 9). Even such an unexpected discipline as archaeology can shed new light on various energy policy issues, such as the long-term depository of nuclear waste. As nuclear technology is likely to play an important role on our way to a carbon-free future, the issue of labelling permanent depositories of nuclear waste in a way that will warn future generations about their potential risks will become an important issue[4]. With its long tradition of examining marking systems of taboo and forbidden places (David and Wilson 2002; Olsen and Pétrusdóttir 2014), archaeology can therefore contribute valuable knowledge to the discussion on energy transition.

The fact that our world is being radically altered and the traditional tools we use to make sense of it, such as storytelling, no longer adequately represent or interpret the immense scope and far-reaching consequences of the current crisis (Ghosh 2016; Heise 2008), forces us to question our knowledge about that world, and our current and future place in it. As Tobias Boes points out (2014, p. 166),

[4] Although one could argue that the fourth generation of so-called fast reactors—able to use what is currently considered waste—would solve most of the problems connected to nuclear waste, there would still be a lot of radioactive materials (e.g. different parts of decommissioned nuclear power plants) that would have to be stored in the long term.

> [a]s we hurl forward into the Anthropocene, our continued survival will hinge in part on our ability to conceive of new ways of imagining the Earth (and by extension also the human species) in both the statistical and the autopoetic fashion necessitated by modern climate science.

Likening our planet to "a book in which we write our own destiny", Boes highlights the urgent need for "a hermeneutics and a poetics (a theory of understanding and a theory of expression) that might accompany the scientific study of the changing Earth system. The challenge that our present situation poses to the humanities has never been graver" (ibid., p. 168). The emergence of the concept of the Anthropocene[5] (Crutzen and Stoermer 2000), which identifies humans as the new geological force, highlighting the unprecedented impact humankind has had on the nonhuman, has blurred the distinction between natural history and human history, which, in turn, demands a reconsideration of the very nature of human identity, activities, ethics, values, and responsibilities (Chakrabarty 2009), all of which have traditionally been studied within the auspices of the humanities.

In addition to helping us make sense of the world, the humanities also play an important role in challenging, subverting, and unsettling dominant narratives, a task which appears particularly significant at a time when carbon-free energy resources are often negatively framed as overly expensive or insufficient for meeting our energy demands (see previous section), and so-called climate change deniers continue to publicly challenge scientific evidence. By examining the roots of fossil fuel capitalism and the degree to which our dependency on oil (reflected in terms such as *petrocultures*[6]) has shaped our contemporary modes of existence, the humanities also allow us to imagine an alternative to these systems and the concrete steps that will lead to its realisation. Furthermore, they emphasise "the way in which all knowledges are rooted in cultural and historical positioning, and often grounded in the erasure of alternative understandings, in particular those of non-Western and Indigenous peoples" (O'Gorman et al. 2019, p. 450; see also Chap. 8).

This volume aims to bring these and similar issues into the discussion on energy transition, and highlight the added value of the energy humanities to our understanding of the changes that this process will bring about. If there is one basic premise this research area is built upon, it is the one voiced in Imre Szeman's contribution to this volume (Chap. 2): energy *matters*. This is especially evident in the degree to which it permeates our contemporary world, shaping virtually all aspects of both our individual, everyday lives (in the sense that we are dependent on energy to run our households, prepare food, get to work, or relax with a good movie), and our collective social, cultural, and political existence. The energy humanities highlights

[5]While the term has been widely accepted, it also has its critics (Crist 2013), who argue for the adoption of the previously used Holocene or propose alternatives, such as the Capitalocene (Moore 2017), Ecozic (Berry 1991), Plantationocene, or even Chthulucene (Haraway 2015).

[6]The term 'petrocultures' is used to highlight "the ways in which post-industrial society today is an oil society through and through", and the degree to which dependency on fossil fuels shapes not only our material and physical reality, but also our "values, practices, habits, beliefs, and feelings" (Petrocultures Research Group 2016, p. 9).

the "critical role" of energy in "determining the shape, form, and character of our daily existence" (Petrocultures Research Group 2016, p. 9), reminding us that the transition from fossil fuels to 'clean' energy (Szeman 2016, p. 1)

> necessitates a wholesale transformation in contemporary petroculture: the political structures, built environments, social dynamics, gendered realities, educational systems, discursive modes, and everyday values, practices, habits, feelings, and beliefs that have developed in relation to and as a result of the shaping force of fossil fuels.

As such, it underscores the need to reconsider energy not just as a material, economic, and technological phenomenon, but also (and, perhaps, even more so) a social and cultural one.

To be sure, explorations of the different social (e.g. social acceptance of renewables[7] or nuclear energy and development of supporting schemes aimed at improving the competitiveness of renewable—and therefore carbon-free—technologies; Arent et al. 2017; Beck et al. 2017; Osička and Černoch 2017) and historical aspects of energy systems, including energy transitions (Mitchell 2011; Smil 2017), have been conducted before Dominic Boyer and Imre Szeman coined the term 'energy humanities' to designate "a rapidly emerging field of scholarship that […] highlights the essential contribution that the insights and methods of the human sciences" can make to the study of energy (2014, [n.p.]). For example, as early as 1934, historian and philosopher of technology Lewis Mumford discussed the impact of energy transitions happening at that time (especially from coal-based steam to electric motors) on society at large. Anthropologist Leslie White examined similar developments in the 1943 paper 'Energy and the Evolution of Culture', which identifies energy as a significant factor in shaping human society and culture.[8] Similarly, the need to overcome rigid boundaries between the (natural) sciences on the one hand, and the humanities and social sciences on the other, as well as those between academic research and its practical application, which lies at the core of the energy humanities, has been repeatedly voiced by both sides of the disciplinary divide (Gottschall 2008; Hulme 2011; Nisbet et al. 2010; Snow 1960; Sovacool et al. 2015). These calls have led to lively discussions bridging traditional disciplinary divides. The humanities in particular have been engaged in multidisciplinary and cross-disciplinary collaborations—partly in response to its ongoing crisis (see Chap. 3) and criticism voiced by other disciplines (Gottschall 2008; Kernan 1997; Perloff 2005; Stover 2018)—which have resulted in the development of a number of stimulating interdisciplinary research areas, such as digital, cognitive, medical, and environmental humanities.

While the field of energy humanities has been rapidly developing in recent years to the extent that developing a single definition that would encompass all its different

[7] A prominent place within the discussion on renewables (especially wind farms) belongs to the concept of NIMBY (Not in My Back Yard), the opposition to various forms of development or implementation of renewables, based on financial, environmental, aesthetic, and similar issues they entail (see, for example, Schwenkenbecher 2017).

[8] For a more extensive overview of literature, see Szeman and Boyer (2017a, b) or the extensive, thematically organised bibliography included in the final report on the "On the Energy Humanities" project (Szeman 2016, pp. 32–73).

facets would be almost impossible (see Chap. 2), several key objectives can be identified as being central to the research area. Firstly, the energy humanities aims to trace the roots of what Stephanie LeMenager has described as our "destructive attachment" to oil and other fossil fuels (2014, p. 11) by exploring the history of energy use and energy transitions, and using the lessons learned from them to prepare an outline and possible blueprint for the future transition to a carbon-free economy (Crosby 2006; Fouquet and Pearson 2012; Herring 2005; Podobnik 2005). Secondly, it studies the degree to which energy permeates our daily lives and shapes our current culture, society, political systems, and even interpersonal relations (Huber 2013; LeMenager 2014; Luong and Weintal 2010; Noreng 2002; Ross 2012; Wilson et al. 2017). While the first objective is largely concerned with the past and the path that led us to the present moment, the second focuses on our current existence within fossil fuel—specifically oil—capitalism (Szeman 2007).

Thirdly, the energy humanities seeks to identify the social, cultural, and political changes necessary to facilitate a full-scale energy transition, anticipate their consequences, and imagine possible scenarios for a future 'after oil' (cf. Sovacool and Brossmann 2013). Intertwined with this goal are creative responses to past and current energy-related issues, such as photographs, art installations, performances, films, plays, and poems (for a selection of these, see Szeman 2016, pp. 65–72; Szeman and Boyer 2017a), and explorations of the role and representation of energy in different art forms and media (Anca Farca 2015; Bellamy 2016; Ghosh 1992; Macdonald 2012, 2016; Szeman 2011; Wenzel 2006; Wilson et al. 2017; Yaeger 2011). Energy humanities thus examine the past, present, and future of energy systems, and therefore have much to offer to a discussion on the energy transition.

1.4 The Present Volume

The edited volume consists of twelve contributions, some of which originated at the 'Energy Humanities: What We Know and Where We Are Going' workshop (see Preface to this volume), while others were written specifically for this book project, in order to expand its thematic, disciplinary, and methodological scope. The selection of diverse energy-oriented research included in the volume provides a variety of topics, angles, critical approaches and practices, methods, interpretations, and voices, which, when taken together, illustrate the diversity and complexity of the energy humanities, as well as the heightened attention to energy issues and the proliferation of energy-oriented scholarship within the humanities and social sciences.

Penned by both seasoned researchers and early-career scholars, the individual contributions in the volume critically investigate the current state of the energy humanities and provide outlines for its future development. Furthermore, they offer novel insights on issues that have dominated scholarly discussions (climate protection, energy policy) and open up new avenues of thought (energy history of the humanities, critical theory of energy) connected to energy transition. In this way, the volume aims to avoid some of the pitfalls of existing research within the energy

humanities, primarily its 'petromyopia' or excessive focus on oil, which, according to Christopher F. Jones, "can distort our understanding of energy systems and distract scholars from giving proper weight to other energy sources", be they non-renewables or alternative resources (2016, p. 1). While boasting a variety of voices and approaches, the volume also acknowledges its inherent limitations, as some topics, approaches, and disciplines have inevitably been omitted (see Conclusion).

The role of the energy humanities has so far largely been exhausted in bringing together the different strands of energy research within the humanities and social sciences, prompting a conversation and collaboration between them; however, the present volume argues that, in order to reach its full potential, the research area must also challenge and transform those disciplines. In other words, as the following chapters demonstrate, energy is more than just a new topic of research for the humanities and social sciences; rather, it profoundly affects those disciplines, prompting them to develop new theories, methods, and vocabularies better suited to energy-oriented research (see Chap. 2). Furthermore, it prompts us to reconsider the relationship of those very disciplines with energy, for they—like everything else—also depend on energy for their very existence (see Chap. 3). Finally, it invites us to reconsider the way we produce, consume, and think about art (also a product of energy; see the chapters in Part III).

Energy Humanities. Current State and Future Directions aims to contribute to the pertinent ongoing discussion on the various energy challenges humanity is currently facing, with a primary focus on energy transition. As indicated in its title, it proposes to provide an overview of some of the key issues the energy humanities is currently preoccupied with and outline possible directions for its future development. Finally, it underscores the need for developing an interdisciplinary critical theory of energy and reconsider not only the social, political, and cultural aspects of energy, but also the tools used to study them.

1.5 Structure of the Edited Volume

The edited volume consists of ten original contributions—framed by this Introduction and the Conclusion—divided into three thematic sections. Entitled 'Energy and the Humanities', the first section is theoretical and programmatic in nature. It encompasses two contributions which contemplate the nature and history of the energy humanities, its theoretical foundations and future directions, as well as the different ways in which the humanities approach energy issues and how they, in turn, are challenged and transformed via this new field of inquiry. The section opens with a contribution by Imre Szeman (Chap. 2), one of the pioneers and leading experts in the field, who proposes that energy humanities may be understood as an attempt to develop a critical theory of energy. Crucial for Szeman's argument (and the present volume) is the notion that energy should not be seen merely as a new topic for the different disciplines within the humanities, one which can be described using existing vocabulary and studied with existing theoretical and methodological apparatuses.

Rather, the newly emerged focus on energy demands a transformation of the disciplines, which require wholly refashioned, energy-oriented vocabularies and theories to investigate this burgeoning and highly relevant area. Furthermore, the notion of critical theory demands interdisciplinary research and collaboration, thus challenging traditional disciplinary divisions. The chapter also provides a brief overview of the energy humanities, highlighting some of the most significant contributions made across the disciplines, while also drawing attention to under-researched areas and topics, such as the role of energy in the different operations of politics, governance, power, and freedom.

Chapter 3 by Dan Tamïr looks at what is commonly described as a crisis within the humanities, focusing especially on its energy aspects. The latter are often overlooked as the humanities have traditionally been viewed as almost immaterial and dissociated from their physical environment, especially when compared to the natural sciences which rely on complex infrastructures. Despite their reputation, the humanities, like any other human pursuit, are energy dependent and therefore do have an energetic history of their own. The chapter discusses this history in terms of two regimes: the old, sun radiation-dependent regime, and the new regime, which also includes fossil fuels. The chapter also considers concrete steps that might be taken to deal with climate change (also explored in Chap. 6) and the energy crisis, highlighting the crucial role of the humanities in this process.

The three chapters that constitute the second section, entitled 'Social and Political Implications of Energy', examine individual countries and international organisations to better understand the role of public discourse in shaping the perception of different energy resources, explore the role of energy within international relations, and identify examples of best practices regarding climate change policy. The section opens with a contribution by Justin Tomczyk (Chap. 4), which focuses on the Eurasian Economic Union (EAEU). The chapter examines the role of natural gas in the process of Eurasian integration and highlights the importance of including energy integration and common energy markets among the EAEU's founding principles. Special focus is on the highly energy-dependent Armenia. The existence of a common gas market allows EAEU members to keep Russia in line by preventing it from shutting off gas delivery to individual countries or raising prices. This enables smaller states like Armenia to exert pressure on Russia, forcing it to abide by a rules-based order. However, despite these provisions, Armenia's position continues to be precarious because it imports energy via Georgia, a country at odds with Russia. Through its examination of the EAEU, the chapter highlights the various political dimensions of energy, especially its use as a means of exerting pressure on energy-importing countries (often described using the concept of energy weapon, explored in more detail in Chap. 9) and its role in regional integration processes.

Written by John Szabo, Chap. 5 also focuses on natural gas, specifically, the political public discourse shaped by various key actors (EU-level institutions, private corporations, policy makers, etc.), which promotes it as the cleanest fossil fuel. By using a critical discourse analysis of policy documents and statements of key stakeholders in the EU's natural gas scene, the chapter traces the development of the

discourse on natural gas as a bridge fuel, which overemphasises its positive, climate-friendly qualities, as well as its impact on the role of this resource in the EU. In this way, it examines the ideological inscription of energy and its permeation of social and political relations, i.e. the connection between energy, its material practices and production (the structure), and its political and ideological inscription (the superstructure) which supports wider power relations. Ultimately, the research shows that support for natural gas stems less from its status as a climate-friendly energy source, and more from the economic and other interests of key actors inscribing it with ideas which contribute to the preservation and perpetuation of existing power relations, relations of production, and structures of fossil capitalism. As Szabo points out, this insistence on maintaining and perpetuating fossil capitalism is at odds with the process of energy transition, substituting the goal of sustainability with carbon neutrality and prolonging our dependency on fossil fuels.

The final chapter in the second section, written by Mishka Lysack (Chap. 6), starts from the notion that the abundance of scientific evidence pointing to the devastating and accelerating consequences of climate change does not prompt sufficient and/or sufficiently efficient action on the national and international levels. The author sees this as a direct result of a lack of effective climate policy implementation, accountability, and transparency. While many countries are struggling to meet their international climate commitments, some are making considerable progress and should therefore be studied as examples of good practices. The chapter does precisely that by analysing the UK and its Committee on Climate Change, which are compared to less successful cases (specifically, Canada). It examines the key building blocks and operating principles of the Committee, with special emphasis on its foundational legislation, the 2008 Climate Change Act, and considers its limitations and shortcomings, as well as opportunities for its modification. As Lysack demonstrates, analysing such examples of best practices and asking what makes them so successful offers valuable lessons which countries struggling to meet their climate commitments can implement in order to enhance their climate policies.

The volume's third section—'Representations of Energy'—encompasses five chapters, which study the depiction of select energy sources (oil and nuclear energy) in different media, from film and television series, through literature and photography, to art installations. All the chapters consider these representations within wider social, cultural, ideological, and political frameworks, asking how they shape our perception of the past and our visions of the future. Using the concepts of eco-guilt and eco-shame, reinforced with the concept of toxicity, the contribution by Tatiana Prorokova-Konrad (Chap. 7) examines how two examples from recent Norwegian visual media—the thriller *Pionér* (2013) and the TV series *Okkupert* (2015–)—depict the country's dependence on fossil fuels. Spanning nearly half a century, the analysed examples illustrate the transformations of Norwegian society, enabled by its access to oil. Furthermore, they reflect on the devastating human impact on the environment by staging the conflict between humans and nature through various acts of violence (criminal activity, war), which are ultimately linked to climate change. *Pionér* in particular reflects on the dangerous (toxic) aspects of our current oil dependency by depicting the various criminal deeds it drives the characters to. Viewing the

film and series as examples of eco-narratives, the chapter highlights the importance of visual media in raising public awareness of the pressing issue of climate change.

Chapter 8 by Samantha Spady and Siobhan Angus further explores the violence that underscores our dependency on fossil fuels by addressing the important issue of colonialism and its legacy, and exploring how it has shaped our contemporary society, including our understanding of climate change and energy transition. Using photographs of the Athabasca Tar Sands in Western Canada as their case study, Spady and Angus explore how settler colonialism and extractionism led to the expropriation of Indigenous lands and their appropriation for oil extraction. The authors argue that various means of cultural production—specifically photography—reflect the extractive view and the colonial gaze, and therefore played an important role in these processes by promoting the image of the Tar Sands as wild territory which belongs to no one (*terra nullius*). Such dispossessed land could easily be appropriated for the various 'civilising' projects which used the land for resource extraction, agriculture, etc., paving the way for its capitalist-colonial appropriation. The chapter vividly illustrates the importance of understanding energy transition not merely as a substitution of one energy source with another, but as a complex process with deep social, cultural, ideological, and political consequences and implications.

The contribution by Matúš Mišík and Nada Kujundžić (Chap. 9) explores the possibilities of the energy humanities by demonstrating how an interdisciplinary approach wherein a literary text is analysed with the tools of the social sciences can lead to a better understanding of both the text and the tools, while also yielding new concepts with extra-literary application. Specifically, it analyses Isaac Asimov's science fiction novel *Foundation* by relying on the energy weapon, a concept used within international relations to describe situations in which energy-exporting countries use energy to promote their own agenda and modify the behaviour of energy-importing countries. The chapter first examines whether the use of nuclear energy in the novel meets the criteria for energy weapon and then identifies three types of energy weapon use: deterrence, ideology, and trade. To demonstrate that the usefulness of this classification goes beyond the literary text, it applies it to the case of the Russian Federation. Building on existing research on energy in science fiction, the chapter highlights the potential of the future-oriented genre (and fiction in general) as a fictional laboratory of sorts, which can be used to test different scenarios for an energy transition and life 'after oil', and develop strategies that will allow us to realise the most suitable ones.

In Chap. 10, Inna Sukhenko examines three U.S. examples of Chernobyl fiction—fictional narratives depicting the accident at Chernobyl Nuclear Power Plant (1986), its causes, and aftermath. Situated within the proliferating research niche of nuclear criticism, the chapter uses Jacques Derrida's notion of the 'fabulously textual' to analyse the literary dimensions of the Chernobyl accident and its impact on nuclear narrative, which initially largely subscribed to Derrida's rhetoric of the nuclear as 'an imagined event'. Chernobyl marked a significant movement away from the fictional to the factual, as narratives sought to provide authentic accounts of events, often based on eyewitness accounts and memoirs. To illustrate this insistence on the factual, the analyses of the three novels (Frederik Pohl's *Chernobyl*, Andrea White's *Radiant*

Girl, and James Reich's *Bombshell*) focus on their spatio-temporal settings, created through references to real locations, historical dates and persons, and elements of popular culture of the time.

The section closes with Chap. 11, in which Laura Pannekoek considers the aesthetics of and discourse on nuclear risk management. Her contribution analyses Trevor Paglen's and Taryn Simon's radioactive cubes, *Into Eternity*—Michael Madsen's documentary about the Finnish deep geological nuclear waste repository Onkalo, and the GEOSAF project of the International Energy Agency. Through their sheer materiality, the two artworks make the threat of radiation, often described as intangible and even unthinkable due to its extreme temporal displacement, concrete, material, and tangible. In this way, they contribute to developing a new vocabulary, temporality, and epistemology, necessary to address the unique, unthinkable, and unknowable nature of nuclear demands. The cubes can also be seen as a means of communicating with the future, since they will not be available to the public until their (or the sites') radioactivity levels drops, which will not happen for at least 1,000 years. The issue of communicating with the future is also raised in Madsen's documentary, which discusses the problem of labelling nuclear waste sites, asking how future generations will interpret the signs and symbols used to mark them. Building on Frances Ferguson's notion of the nuclear sublime, the chapter develops the concept of the nuclear mundane, which seeks to give the nuclear shape in order to stabilise its energy future (rather than highlight its instability and unpredictability).

The Conclusion summarises the main findings of the assembled chapters and their contribution to the energy humanities, reflects on some of the volume's limitations, and proposes guidelines for future research. It highlights the role of the humanities and social sciences in enabling a more efficient communication of scientific knowledge related to climate change to relevant actors (e.g. decision makers) and the general public.

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Part I
Energy and the Humanities

Chapter 2
Towards a Critical Theory of Energy

Imre Szeman

Abstract In what ways might the energy humanities be understood as an attempt to develop a *critical theory of energy*? As surely as all of the other systems and practices interrogated by a critical theory of society, the processes associated with and generated by our use of energy produce social possibilities and limits that need to be thoroughly explored. Energy needs to be taken not just as a new *topic* of study for the human sciences. Rather, the new attention to energy that has been promulgated by the energy humanities is intended to unnerve the continuing legibility of the study of history, politics, philosophy, and literary and cultural studies as presently practiced. What the emergence of energy in the field of the human sciences demands is a wholesale refashioning of these vocabularies and their presumed objects of study. A critical theory of energy insists that adding energy to the mix of our analyses on any subject whatsoever forces a refashioning of the theories of the forces that animate the socio-political and the subjects within it.

Keywords Energy humanities · Critical theory · Environmental studies · Frankfurt school · Emancipation · Energy

2.1 Introduction

In just over a decade, the energy humanities has established itself as an important field of study in the contemporary human sciences (Jones 2019). With the rapid proliferation of work in the field, it has become challenging to offer a single, all-encompassing definition of its aims and intentions. Nevertheless, at its core, it is possible to assert without much argument that research in the energy humanities is animated by a single principle: energy *matters*. Energy matters to how human beings organise social, cultural, and political life (Szeman 2019; Szeman and Petrocultures 2016); it matters to the shape and form of their economies (Mitchell 2014; Wellum 2020); and, perhaps especially, a point made across almost all of the research in

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the field, it matters to our understanding of the relationship of human beings to the environment, in the broadest and most general sense of the latter term.

This core principle—energy matters—can be explored in any number of ways. At this moment of climate crisis, the theme of energy has been taken up by disciplines across the human sciences and analysed by means of a diverse range of methodologies. The energy humanities is a new and (forgive me) energetic field of inquiry. I worry, however, that its most radical impulses are becoming lost as energy emerges as a topic or theme of inquiry. The demand of the energy humanities is not that the study of energy become a subfield of history or anthropology. Its demand is sharper and deeper than this. The energy humanities articulates a demand that we reimagine the vocabularies, methodologies, and presumed objects of study of the disciplines as they currently exist, largely because they were constituted in the absence of an essential component of human experience: energy. The energy humanities thus necessitates the development of a *critical theory of energy*. But in order to understand what is at stake in the production of such a theory, we need to first remind ourselves of just what was at stake in the emergence of critical theory in the first place.

2.2 Critical Theory, in Brief

It is a story that has been told repeatedly—a narrative about how something once promising goes awry, or perhaps an equally familiar story about how age and maturity dulls once radical impulses. Theodor Adorno, one of the founding members of the Frankfurt School—an influential mid-20th-century group of social and political theorists and philosophers connected to the Institute for Social Research in Frankfurt—finds his lectures being disrupted by protestors in the wake of the student revolutions of the late 1960s. The students want action on the streets instead of theory in the classroom. "If Adorno is left in peace, capitalism will never cease", writes one protestor on the blackboard (Müller-Doohm 2014, p. 475). A sharper criticism is scrawled on the wall: "Whoever occupies himself with theory without acting practically is a traitor to socialism" (Jeffries 2016, p. 3).

This opposition between theory and practice has haunted left-wing politics over much of its life, and has led some commentators to describe the whole of post-WWII left philosophy as empty of any real politics [Perry Anderson's *Considerations on Western Marxism* (1976) remains the iconic text in this respect]. The moral of Adorno's story is usually taken to be the need to avoid drifting into residency in what György Lukács (1974) named the "Grand Hotel Abyss", a place where one messed about with ideas in an effort to make sense of the world, but where one also had no ability or interest in making these insights bring about substantive socio-political change.

There is much that could be (and has been) said about whether the opposition between theory and practice actually creates and affirms a division, rather than identifying any real, existing fracture. Action is easy to point to once the work of theory has already been done to map the landscape on which it takes place (in the example

above, all that constitutes 'capitalism', 'socialism', and even what constitutes 'practical action' has to first be theorised); and calls to action tend to presume exactly what theory wants to challenge—that the social is directly given, as opposed to being produced in a complicated process of nomination and ex-nomination. In the increasingly complex cultural and social landscape of the 20th (and now 21st) century, there is absolutely nothing obvious about the character or quality of the political that would allow one to act upon it in some direct and easy way in order to produce the long-desired result of political action: more freedom for more people.

One of the major contributions made by members of the Frankfurt School was an analysis of the redefinition and reimagining of freedom within advanced capitalist societies. Max Horkheimer and Theodor Adorno's *Dialectic of Enlightenment* (1972) offers the most well-known of the Frankfurt School's assessments of the manner in which true freedom and autonomy—i.e., freedom from having one's life activity completely determined by capitalism—were closed down, even as apparent freedom was expanded dramatically. 20th-century cultural *and* political life was organised around "the freedom to choose what was always the same" (Horkheimer and Adorno 1972, pp. 166–167), whether these choices were around what music to listen or which political parties were vying for power. The experience of "pseudo-individualization", which works to keep people "in line by making them forget that what they listen to is already listened to for them, or 'pre-digested'" (ibid., p. 217), has continued in this century, if on new terms. A Netflix menu might give one an enormous amount of options, much of it the same (in terms of plot and genre); now algorithms ensure that we stay within the small range of choices already identified as fitting our specific likes and dislikes. In the introduction to *Dialectic of Enlightenment*, Horkheimer and Adorno describe their critical task as "nothing less than the discovery of why mankind, instead of entering into a truly human condition, is sinking into a new kind of barbarism" (ibid., p. xi). There is nothing to suggest that the quicksand of barbarism is not the condition in which we continue to find ourselves. Nor is there anything to suggest that the barricades occupied by Adorno's students have generated the kinds of emancipation for which they had hoped.

"If critical theory means anything", Stuart Jeffries writes, "it means the kind of radical re-thinking that challenges what it considers to be the official versions of history and intellectual endeavor" (2016, p. 21). This radical confrontation with existing *doxa*, with the power of what Roland Barthes in *Mythologies* (1973) identified as the key narratives governing the social, has a singular impulse at its heart. In the words of Horkheimer, "Its goal is man's emancipation from slavery" (1975, p. 246). The achievement of genuine emancipation, real autonomy, vibrant democratic self-rule, active civic participation, and true social justice—these tasks, among many others central to the activity of politics, remain incomplete. What was unique about critical theory was that it undertook the effort to identify the new and developing conditions of the political in the 20th century by bringing together a range of concepts and theories: Marxism and psychoanalysis most notably, but also tenets from sociology, political theory, and philosophy, intellectual fields to which the Frankfurt School gave a vibrancy that by mid-century they had begun to lack, largely because they had begun to be codified and institutionalised. If critical theory means anything,

it means the activity of engaging in an ongoing challenge to the division of labour that has created distinct fields of knowledge, in order to see what gets missed or left out of the self-certainty of the ideas and concepts that govern each of them. It is why critical theory is a practice rather than a field, an approach to knowledge rather than the name of a discipline. It is also why critical theory welcomes engagements with what it itself might have misunderstood or misread about the forces involved in producing the (faux) freedoms of (for example) consumer choice and electoral decision-making that have served to so severely undercut the likelihood of true emancipation.

Dialectic of Enlightenment was prescient in identifying the rapidly unfolding development of the cultural industries and exploring fully their socio-political implications. It missed, however, another development taking place in the period following World War II: the massive expansion in population, water use, food production and consumption, transportation networks, resource extraction, and almost everything else. The expansion of production and consumption of every kind during this period was almost exponential—a stunning explosion of the human footprint on the planet. Amongst the things that increased was the use of energy, and of fossil fuels specifically, with a *nine*-fold increase in the amount of such energy used between 1940 and 2016: in 1940, the total use of fossil fuels was 15,113.90 terawatt hours; in 2016, it was 132,051.53 (Ritchie and Roser 2017).

With the exception of the work of Herbert Marcuse (2007), critical theory was largely blind to the impact of the aggressive expansionary logic of post-WWII capitalism on the environment. It failed to consider the consequences of what McNeill and Engelke (2014) have termed "The Great Acceleration". The largesse and excesses of capitalism bothered the Frankfurt School far less than the modes of political organisation that ensured vast inequalities of wealth and power across the world of the 20th century, including within China and the countries making up the Eastern Bloc. Like many other socialists, they imagined the expansion of technology and productivity to be central to the possibility of both political change and wealth for all. They certainly did not consider the ways in which ideas of freedom, both real and invented, were linked to access to energy, and ever greater levels of it. We are only now beginning to tell the story of the role played by energy in giving shape and form to history since the Enlightenment, especially to the period known as modernity. While we are all subjects of energy, we have to date struggled with the task of connecting freedom and emancipation not just to the development of political ideals, but also to the material resources we have added to the societies we inhabit, and which we use at a rate and on a scale that threatens the continued existence of humans on the planet.

Understanding ourselves as subjects of energy—that is, as subjects produced by and in conjunction with the post-war expansion of resources—changes the task of bringing about socio-political change. We need energy for our freedoms; the energies around which we have developed our ideas of freedom are toxic to the planet and (ultimately) in limited supply. The political challenge posed by energy is a significant one that we are only beginning to take seriously. What if Adorno's students had been presciently alert about the need to forcefully protest the petro-political energy regime already solidly entrenched by 1968? They would not have wasted their time opposing theory and action, in part because occupying the barricades

would not have interrupted the tenets and tendrils of fossil fuel capitalism (though it might have helped prevent it from growing larger, as the Dakota Access [US] and Northern Gateway [Canada] pipeline protests show us), and in part because they would recognise the need for theory to grapple with the range and depth of the commitments we have made to fossil fuels in all of our practices and actions. The students might have also been aware of the history of protest and the forms that it has taken, and might have wondered whether the politics of barricades—born, according to Timothy Mitchell (2011), in relation to coal extraction—were the right mechanism of protest for a petro-auto-era. What they might have done is insist that Adorno return to the lectures on history and freedom he offered just a few years earlier (1964–1965; collected in Adorno 2006) and, with his help and input, try to figure out how to talk about both topics in recognition of the impact fossil fuels were already beginning to have on individuals and societies around the world.

In this classroom, critical theory would not be coming to an end. It would be finding important new directions in which to turn its attention.

2.3 A Critical Theory of Energy

The area of research now known as the "energy humanities" has, over the past decade or so, begun to fill in some of the missing pieces of the puzzle of energy in contemporary culture (Bellamy and Diamanti 2018; Szeman and Boyer 2017; Wilson et al. 2017). My own work (2007, 2010, 2012) has tried, in part, to make sense of whether there is something about fossil fuels that has made them difficult to represent, which might explain why an element of such importance to the shape and form of modernity has been missing from characterisations of the modern, just as it was in the work of the Frankfurt School.

I have approached this question in two distinct, if related ways. The first has been to assess the socio-political and cultural reasons for the under-representation of energy in general, and fossil fuels more specifically, in literature, film, and other forms of cultural representation. This mode of analysis draws attention to the character of oil's presence or absence in the political imaginaries of modernity, and tries to offer reasons for why (and how) energy manages to hide in plain sight. My second approach has been to ask deeper questions about the ontology of oil and energy, and consider what this ontology implies for how we have characterised oil capitalism and constituted challenges to it. In both cases, I wanted to understand if there is something about the nature of fossil fuels (oil *qua* oil) that makes them resistant to fully naming and explaining their essence and their essential role in shaping modernity. Do representations of fossil fuels—those narratives and images that do in fact exist—miss the mark when they fail to capture how and why this is a substance that *cannot* be represented, i.e., in their eagerness to deal with a missing element, do they show it off too quickly, too didactically, and so fail to actually address the reasons for its absence in the first place? How, then, might one make sense of such

a substance, and bring to light the political and environmental consequences of our having shaped every aspect of civilisation around it?

The process of coming to grips with the unique character of fossil fuels, epistemologically as well as ontologically, has been a difficult one, with at times an unclear trajectory. While there is a large and rich body of research that explores fossil fuels and society, especially in the fields of anthropology (Appel et al. 2015; Boyer 2019; Boyer and Howe 2019; Strauss et al. 2013), history (Johnson 2014, 2019; Jones 2019; Mitchell 2011), and (more recently) literary criticism (Balkan and Nandi 2020; LeMenager 2014; Wenzel 2019), when I began my reflections I found only a few essays and books that spoke directly to my particular concerns. This small cluster of work is bookended by Amitav Ghosh's insightful critical writing—beginning with "Petrofiction: The Oil Encounter and the Novel" (2007; originally published in 1992) and ending with *The Great Derangement: Climate Change and the Unthinkable* (2016)—which asks big-picture questions about the incapacities of fiction to name ourselves in relation to our fossil fuel cultures, and challenges us to develop modes of representation that might yet help us more fully grapple with the substance animating modernity.

A handful of other texts have been critically important as well. No other book better articulates the implications of the power unleashed by fossil fuels for human ontologies, epistemologies, and ethics, than Allan Stoekl's *Bataille's Peak: Energy, Religion, and Postsustainability* (2007); in my opinion, this is a work that has yet to receive the full critical response it deserves, an engagement that would generate new explorations of the deep connection between subjectivity, community, and energy. The same might be said for the primary subject of Stoekl's book: philosopher Georges Bataille's foundational *The Accursed Share* (1991), which inverts accepted ideas about limits and restraints in relation to the expenditure of energy. Dipesh Chakrabarty's "The Climate of History: Four Theses" (2009) and Timothy Mitchell's *Carbon Democracy: Political Power in the Age of Oil* (2011) offer profound re-narrations of modernity by highlighting the element all too often missing from our histories: energy. As these thinkers have done with history in relation to energy, Jeff Diamanti has provocatively done with the built environment of modernity, which he describes as having been shaped by a process of "energy deepening" (2016, p. 15), an ever-expanding, recursive commitment to fossils fuels that might well have made it extraordinarily difficult to generate alternatives to petroculture. Stephanie LeMenager (2011) and Jennifer Wenzel (2017) have each helped me to see how foregrounding fossil fuels can generate profound new ways of understanding cultural narratives. LeMenager's essay "Petro-Melancholia: The BP Blowout and the Arts of Grief" (2011) alerts us to the affective dimensions of our relation to fossil fuels, including the genres, practices, and mechanisms we use to critique this relation; our critical texts, too, are marked by their emergence in a period in which energy was imagined as infinitely available, which means that critical thinking is also filled with and defined by the energies of petromodernity. Finally, in addition to her many other contributions to the field, Wenzel's introduction to *Fueling Culture* (2017) remains the single best overview of the questions and concerns animating energy humanities; anyone interested in this field would find this a great place to start.

I describe my work on oil and energy as an attempt to develop a *critical theory of energy*. As surely as all the other systems and practices interrogated by a critical theory of society, the processes associated with and generated by our use of energy produce social possibilities and limits that need to be thoroughly explored. From its origins, the aim of critical theory was to imbue social analysis with an explicitly political intent. Critical theory would profess not only to understand the forces and processes that shaped social forms and practices, but would do so for emancipatory purposes. It is hard not to hear the echo of Marx's 11th thesis from *Theses on Feuerbach* ["The philosophers have only *interpreted* the world, in various ways; the point, however, is to *change* it" (1969–72, p. 19; original emphasis)] in Horkheimer's description of the activity of the Frankfurt School critical theory cited earlier. In addition to its explicit political goal, the theory and analysis undertaken in critical theory is also alert to the limits of theory as such, by being permanently attentive and attuned to the positivisms and utilitarianisms to which social analyses are vulnerable. Critical theory determinately jettisons the political fiction that social science might be able to mirror the disinterest and objectivity of the natural sciences. When we speak today of critical theory in a more generic sense—that is, as not just the direct outgrowth of the work of the Frankfurt School, but as a practice that more commonly goes by the name "theory"—it is this that I think we have in mind: an alertness and awareness of the damage that concepts can do when heuristics are mistaken (whether accidentally or deliberately) for simple facts of nature.

Given this, exactly what might it mean to develop a critical theory of energy? Energy should *not* be taken as just a *topic* of study for the human sciences. It should not be seen as simply another field to add, for example, to the environmental humanities—that broad area of scholarly investigation of human activity in relation to the environment (and vice versa)—or a needed reminder of the resource politics that constitutes an essential component of colonialism and postcolonialism. Yet, this characterises a great deal of what has gone under the name of energy humanities to date: a new attention to novels or films that address energy and a greater attunement to the significance of energy for the environmental crisis. But the aim of the energy humanities was always greater than this. The new attention to energy that has been promulgated by the energy humanities is intended to unnerve the continuing legibility of the study of history, politics, philosophy, and literary and cultural studies, as presently practiced. The critical work involved in the energy humanities goes well beyond the "ta da!" of revealing a missing component of the various core elements of the narrative of the modern—of democracy, belonging and community, of colonialism and postcolonialism, and indeed, even of the constitution of subjectivity. If this was all that looking at energy accomplished, there would be little left to do once the initial reveal took place. Energy is not just another topic to animate the kind of critical paranoia challenged by Eve Kosofsky Sedgwick, which depends "on an infinite reservoir of naïveté in those who make up the audience for these unveilings" (2003, p. 141). In truth, what the emergence of energy in the field of the human sciences demands is not just a slight amelioration of critical vocabularies, a nip-and-tuck addition of energy to the discourses we already have, but a *wholesale refashioning of these vocabularies and their presumed objects of study.*

The modern subject, for example, has had her capacities radically redefined by cheap energy. The petrocultural subject's life is configured around the energies of millions of years of dead matter; what she understands as banal quotidian reality is in fact a bending and stretching of time to give the subject powers of movement, vision, and knowledge akin to that of the demigods found in ancient myth. To the powers of the unconscious mapped by Freud and the powers of political economy interrogated by Marx, we need to add the capacities of energy, which inhabit (and shape and form) both these spaces and still others we have yet to fully probe. In short, a critical theory of energy insists that *adding energy to the mix of our analyses on any subject whatsoever forces a refashioning of the theories of the forces that animate the social and the subjects within it*.

The fundamental challenge that energy poses to theory is one that scholars are slowly beginning to recognise (the present volume offers evidence of just this fact). What is perhaps less evident are the political and emancipatory forces that emerge from critical attention to energy. Remember Horkheimer's words: the goal of critical theory "is man's emancipation from slavery" (1975, p. 246). One way in which some writers on energy have tried to insist on its social import and significance is by linking it *directly* to the practice of slavery. As a way of changing attitudes towards our current levels of energy use, "emotionally as well as intellectually", Jean-François Mouhot points out, "if we all wanted to benefit from our current lifestyles without any fossil fuels, we would need to employ several dozen people working full time for us" (2011, pp. 339–340). The energy of fossil fuels allows us to do things we could not otherwise do; only by drawing on the energies of other bodies in servitude to us could we approximate the now taken-for-granted powers of the modern subject (see chapter by Spady & Angus in this volume). The link made to slavery suggests that one of the critical aims of the energy humanities is to get us to abandon fossil fuels in favour of other, greener forms of energy, and so interrupt the operations of modernity as a formation in which we live way beyond the limits of our physical bodies and collective means.

Mouhot (2011) has still other reasons for drawing the connection between energy and slaves. He worries that there is a real risk of a return to slavery in the future if dependence on fossil fuels is not addressed in the present, as elites try to maintain fossil fuel comforts and lifestyles even in a post-fossil fuel world. However powerful such analyses of our fossil fuel servitude might be, using oil is *not* the same as using slaves; the appeal by Mouhot and others to the notion of "energy slaves" is, at best, an attempt to gesture towards an ethics via a somewhat offensive allegory. One of the side effects of this view of fossil fuels is that it has inadvertently helped shape a strongly held belief that a shift to wind and solar power occasions (all on its own) a more general expansion of social justice—a completely unsubstantiated view of how energy and social possibility are linked. Simon Pirani notes that while cheap and abundant energy changed labour processes in industry and in the home, it "has made little difference to the hours worked, whether by employed or domestic labour" (2018, p. 194). The real political and emancipatory force of the energy humanities lies not in the possibility of clean energy, but elsewhere, in fundamental changes to

how and why we work, and the systems through which labour is assigned to some and not to other.

Our use of fossil fuels is the single biggest source of human-produced carbon dioxide (CO_2). In other words, it is in large part our commitment to our petrocultures, both conscious and unconscious, that has reshaped the global environment, and in a very short period of time. Fossil fuel use and CO_2 production have expanded precipitously since World War II. During this period, expanded uses of fossil fuels enabled increases in population (through, for example, industrial agriculture and the wide-spread use of fertilisers), which, in turn, increased the demand for fossil fuels, and so on, generating a human footprint of astonishing proportions on the planet. In order to address the impact of fossil fuels on the environment, it is clear that we will need to undergo an energy transition this century—a shift from dirty energy to clean, renewable, and sustainable forms of energy. The consensus among scientists on the need for energy transition is matched today by the majority of the world's policy makers: documents such as the Paris Agreement (2016) are not only about limiting CO_2 output, but also about enabling energy transition.

To date, very few countries have actually engaged in the full set of changes needed to undergo energy transition. Almost without exception, discussions of energy transition make a presumption that needs to be challenged. Fossil fuels have played an essential role in activating and enabling the operations of capitalism, and all that comes with it: profit over people, ferocious extractivist practices, and social and political injustice. For the most part, both existing and planned practices of energy transition presume the persistence of contemporary capitalism and the forms of neoliberal governance that have accompanied it (even if there are moves in some cases to develop forms of energy democracy to accompany energy transition, i.e., the transfer of decision-making away from industry to local communities; see Morris and Jungjohann 2016). Current models of energy transition *do not* imagine that, in order for it to be successful, there must also be major, significant and even revolutionary transitions in culture, society, and politics (this is an unfortunate feature of the various Green New Deals that have been proposed as well; see Riofrancos 2019). This should come as little surprise. It is not only the self-interest of the status quo that is at work in imagining that a capitalism developed in conjunction with the easy-to-access (until recently) and cheap energy of fossil fuels could (and should) continue long into the future, with nary a hiccup or misstep, but now energised by solar panels and wind farms (with an added benefit of a desperately sought after injection of value through the introduction of new forms of energy). The gaps and absences that the energy humanities have noted in conceptions of our social and cultural past remain alive in most articulations of our political futures, too. From the perspective of the status quo, energy does not seem to be anything other than the input we need to make things run. So why could not there thus be a renewable energy capitalism, one that would continue to make profit without harming the planet?

I believe the period of energy transition offers a political opening—an unexpected one. The energy of fossil fuels has given rise to a specific way of life. Oil has shaped our communities in ways that have produced an abiding loyalty to the substance; it has generated a violent geopolitics organised around access to and control over the 'black

gold' that fuels the planet. This way of life is one that is neither especially well-loved nor actively defended by the planet's human inhabitants. The majority of us have no real commitment to the inequalities and injustices that oil capitalism and its political mechanisms have promulgated, and certainly do not wish to destroy the environment. As fossil fuel capitalism begins to shift to other forms of energy—reluctantly and haphazardly, as evidenced by the last stand of fossil fuel capitalism in the Trump administration—it seems to me that the possibility of other transitions opens up. One of the key political struggles of this century will be whether an energy transition can be achieved without other forms of transition (thus maintaining the status quo), or whether the profound dislocation of moving away from fossil fuels, in the context of a growing awareness of global warming, will generate social and cultural transitions, and political ones, too. Chakrabarty writes: "The mansion of modern freedoms stands on an ever-expanding base of fossil-fuel use. Most of our freedoms so far have been energy-intensive" (2009, p. 208). Mitchell puts it just as directly: "Fossil fuels helped create both the possibility of twentieth-century democracy and its limits" (2011, p. 399). The emancipatory struggle announced by a critical theory of energy is to develop a world not only beyond the dictates of oil capitalism, but also one whose freedoms are not the outcome of the use of massive amounts of energy. The "carbon democracy" whose development Mitchell outlines is a democracy in name only; and many of our freedoms to date have been little more than a fantastical deification of the human, giving some of us powers and capacities, but operating on the borrowed time of fossilised bodies, at the expense of the world we inhabit.

A critical theory of energy would accomplish a number of tasks that are important for whatever understanding of emancipation we might want to advance in the 21st century. Reading energy not only into the apparatus of freedom—in the liberal tradition, the operation of law to secure freedoms for and against—but also into our conceptual understanding of it would generate new insights into the character and materiality of political freedom. Re-narrating post-Enlightenment practices and verities in relation to energy would draw attention to the environmental implications of the political as such, and do so in a manner that pushes past the meek gestures that have constituted the majority of responses to global warming to date (e.g., carbon taxes, a continuation of the use of tax as a mechanism of liberty that dates back to Adam Smith). It might also tell us something about the threats to freedoms that lie just over the horizon, as access to abundant and cheap fossil fuels begins to wane, either as a result of the gross depletion of supplies or due to the environmental necessity of moving away from their use.

In addition to the lack of focus on the role of energy in liberal understandings of freedom, virtually no attention has been paid to the role played by energy in the operations of contemporary power, politics, and governance, whether these operations are figured in the language of standard political science (e.g., the geopolitical 'realism' that dominates the field of international relations) or understood through the lens of the work of thinkers such as Michel Foucault. The careful elaboration of the rationale and mechanics of governmentality that Foucault outlines in his later lectures (1997, 2004a, b) *never* describes the import of energy to the management of modern populations. It is not just that the operations of governmentality require

energy and that access to more and more energy in turn animates new modes of governmentality, but that 'population' is itself a phenomenon linked to energy. The expansion of modern populations that accompanied the increasing scale and intensity of energy use is deeply conjoined with greater and greater levels of energy use [which is not the same as suggesting that fossil fuel use is directly conjoined with population, a neo-Malthusian error that Pirani (2018) is right to warn us about]; and the capacity of states to intervene at the scale of the population to enact practices and processes of governmentality also depends on access to ever greater-levels of energy. In his later lectures, Foucault also attended to the development of neoliberalism as an aspect of modern governmentality. As we described earlier, one dimension of neoliberalism that is commonly stressed is the downloading of state responsibilities onto the market. Here, too, there are practices in the flow of modern energy that can be seen as complicating this accepted narrative of neoliberalism. The externalisation of the costs of the ever-expanding car culture and suburban infrastructure onto governments (a now global phenomenon) have helped markets stung by stalled or slow growth post-1973 to continue to believe in the growth of capitalist markets.

Despite the obvious import of fossil fuel energy to the shape of contemporary politics and society, to date very few theorists have attempted to make certain that energy is part of the larger story of the operations of power. This is as true of Marxist theory as it of other modes of political theory (the work of Bellamy and Diamanti is a notable exception). Marx's "Fragment on Machines" from the *Grundrisse* (1993), which has played an important role in the reimagining of contemporary left political theory [most notably within the Italian leftist movement Autonomia, as well as the related work of Hardt and Antonio Negri (2009)], describes a world in which advanced technology frees labour from production. Even were technology to have the capacity to set individuals free from work so that they might engage in self-development, these machines would still require energy to function.

It is essential to understand the energetic and environmental implications of the manner in which we frame political transformation. It is not only our understanding of capitalism that is impeded when we do not factor energy into social theory, but our imaginings of the character of social and political emancipation.

2.4 Critical Theory, Critical Action

In contemporary political analysis, the historical and conceptual import of energy for politics remains as hidden as the subject of the environment, despite expanded interest in and attention to the latter. A recent study of the status of environmental politics within the field of international relations (IR) points to this gap or absence. Despite the fact that 51% of U.S.-based IR scholars picked global climate change as one of the top three policy issues faced by the U.S. today, only 3.2% of them identified the environment as their main area of study; further, only 65 (1.23%) of 5,306 articles published in the 12 most important IR journals between 1980 and 2012 focused on environmental issues (Green and Hale 2017).

One might be forgiven for expecting that the environment might occupy a larger space in the elaboration of more radical politics. But it appears that discussions of the common have proceeded with as large a blind spot about the environment as in status quo IR scholarship. The general absence of the consideration of material resources and the environment in Autonomist political theory has been noted by Sara Nelson and Bruce Braun in "Autonomia in the Anthropocene: New Challenges to Radical Politics" (2017). They are one of the few critics to recognise that the 'immaterial' production of cognitive and communicative capitalism is only made possible by the all-too-real materiality of global economies of extractivism. They also point to the fact that the birth of Autonomia in Italy is linked ineffably to Italy's post-war oil and gas boom, to its relative proximity to refinery complexes, and to one of the key sites of the production of the reality and imaginary of petroculture: the automotive factory where the autonomy of workers first began to be asserted. "We cannot simply assume that capitalism *increases* the potentiality of the common", Nelson and Braun write, "these capacities may be irredeemably diminished in a world of social and ecological devastation" (2017, p. 233; original emphasis). As it has been developed recently by thinkers including Cesare Casarino, Michael Hardt and Antonio Negri, and Paolo Virno, the basis of the common is to be found in "knowledges, information, images, affects and social relationships" of the human *qua* human; as such, the common "does not lend itself to the logic of scarcity" (Hardt and Negri 2009, p. 139) that one might articulated with respect to environmental resources, including energy. Nelson and Braun offer one of the few arguments to date about the need for the common to conceptually refashion itself in a manner attuned to the significance of an era in which "colonial and capitalist appropriation and exploitation have left a differentiated world unevenly threatened by rising seas, climate volatility, and toxic natures" (2017, p. 234).

A critical theory of energy points to the need for all theory to attend more deeply and concertedly to the social and political function of energy. As Jean-Claude Debeir, Jean-Paul Deléage, and Daniel Hémery argue in their iconic *In the Servitude of Power: Energy and Civilization Through the Ages* (1991, p. 13),

> while there is no energy determinism there is a powerful energy determination at work in all societies […] the energy determination is itself determined: it is the result of the interplay of economic, demographic, psychological, intellectual, social and political parameters operating in the various human societies.

It is this energy determination that a critical theory of energy would not only seek to unravel, but also put into practice in a politics that might allow us to undertake a revolution in society and a revolution in energy at the same time.

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Chapter 3
Fats and Spirits: A Story of Modern Humanities' Energy Dependence

Dan Tamïr

Abstract While warnings about a crisis in the humanities have often been heard in the past two decades, little attention was hitherto given to the connection between the current situation in the humanities and the energetic regime allowing their pursuit. This chapter examines the relation between the social ability to dedicate time and resources to scholarship in the humanities, and the availability of energy. Its main argument is that the blooming of the humanities during the 19th and 20th centuries was tightly related to the great abundance of cheap fossil fuels – coal, gas, and, most significantly, petroleum—which sparked 'growth' in many aspects of human life, the humanities included. The humanities represent a human occupation which is not aimed at immediate gains or the satisfaction of the most basic needs; therefore, they have been among the first to suffer due to the declining availability of cheap and easy-to-get energy during the past decades. Dwindling resources and threats brought upon by greenhouse gas emissions are now putting an end to the modern flourishing of the humanities, which will need social, economic, and political supporting mechanisms different from those which have been supporting them for the past two centuries.

Keywords Economic growth · Scholarship · Industrial revolution · Fossil fuels · Petroleum · Peak oil · Dependence

3.1 Introduction

The widespread idea of a crisis in the humanities—and in scholarship and non-technical knowledge in general—is hardly secret. A feeling of a deterioration of the humanities (and, to a lesser extent, the 'soft' social sciences) has been around for decades (see, e.g., Bloom 1987). More recently, declarations about a "Silent Crisis" in the study of the humanities, damaging the fundaments of liberal democratic modern societies are loud and clear (Nussbaum 2016, p. 2). Some, however, characterise the current situation in the humanities not as a crisis but rather as "an

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ongoing set of problems", perceiving it less as an immediate threat and more as a structural phenomenon (Donoghue 2010, p. 1). Either way, a notion of decline and deterioration–culturally and politically–has accompanied those working in and with the humanities for quite a while; while the loudest voices surrounding it seem to stem from that part of North America between Canada and Mexico, the trend-differing in its intensity and form-is not limited to that region. This chapter argues that the current situation in the humanities has an energy aspect, which should not be overlooked.

What are the 'humanities'? The exact definition of the term in its scholarly context is not an easy one, as some small differences exist between its usage in various academic traditions. In English, the *Oxford Dictionary* defines the humanities as "the subjects of study that are about the way people think and behave, for example literature, language, history and philosophy" (Humanity 2020b). *Merriam-Webster* reiterates this definition as "the branches of learning-such as philosophy, arts, or languages-that investigate human constructs and concerns", as opposed to "natural processes (as in physics or chemistry) and social relations (as in anthropology or economics)" (Humanity 2020a). In French, the *Larousse* describes "human sciences" as "disciplines whose object [of research] is the human being and his individual and collective behaviours, in the past and in the present" (Sciences 2020). Accordingly, in the French-speaking sphere, the differentiation between "natural sciences", "life sciences", "social sciences", and "human sciences" is a common one, even though the borders between the human and the social may be blurred. A similar definition prevails in German, where the *Duden* defines "Geisteswissenschaft" (literally: the sciences of the spirit) as "the entirety of the sciences whose object is the various fields of [human] culture and intellectual life" (2020); the German academy, though, has traditionally merged under this definition also what we today call 'social sciences'.

Altogether, under 'humanities' we can understand the research and the investigation of phenomena conducted, construed, or contrived by humans, as opposed to other animals or forces of nature. It is a human endeavour focused on the inner individual or social self, not the practical production of anything for immediate gain. These definitions of the humanities, however, have a contemporary twist: in an era when humans influence the fundamentals of an entire planet to the degree of modifying entire ecosystems, changing the Earth's atmosphere and climate, is not everything on our planet an object of human agency? Indeed, our era of all-encompassing human influence, named the Anthropocene (Crutzen and Stoermer 2000), might be changing the essence of the humanities, or at least the way we perceive them: if everything in our world is influenced by human action, then everything may be considered to be part of the humanities. It is not surprising, therefore, that the field of *environmental humanities* is gaining ground, encouraging humanists to look at the entire world as relevant to the human experience, and seek the human experience in all parts and aspects of our environment (Holm et al. 2015). As we shall see, however, even the most theoretical and non-material pursuit of the humanities has energetic dependencies; the humanities, in other words, have an energetic history of their own.

However, 'history of the humanities' is not a common token and its study is not as established a field as the history of the natural sciences to the degree that some assert that the humanities completely "lack a general history" (Bod 2013, p. 1). Such

a decisive assertion might sound as a bit of an over-exclamation, but it is true that a 'mainstream', general and agreed upon history of the humanities is not common knowledge. The lack of a general history of the humanities stands in clear contrast with the abundance of modern natural science histories (see, e.g., Bynum 2012; DeWitt 2010; Gribbin 2010): whereas a 'history of science' is a common thing, a 'history of the humanities' is hardly existent.

One appealing explanation for the lack in humanities history is the increased fragmentation which has gradually been taking place within the humanities during the past 200 years, a fragmentation which seems as an opposite move to the search for unifying theories guiding the natural sciences, at least as their desired outcome, if not their daily practice (Bod 2013, p. 4). A second explanation or a general reason for this lack may be that hitherto very little research has been conducted on the relationship between the humanities-which are usually associated with intellect and spirit—and their physical environment. While the connection between the natural sciences and the surrounding physical environment seems to go without saying, the connection between the humanities and the environment seems less obvious.

This historiographical lack has multiple faces, but a part of it is the lack of a history of the connection between the humans' occupation with the humanities and the physical resources available to them, which enable the mere existence of that pursuit of knowledge. Energy—the basis of our physical existence and activity—is a good place to start filling this gap between spiritual contemplation and physical existence: the 'energy humanities' can be perceived as a field of scholarship that overcomes the boundaries between disciplines, and between academic and applied research, highlighting the essential contribution that the insights and methods of the human sciences can make to areas of study and analysis that were once thought best left to the natural sciences (Boyer and Szeman 2014).

The aim of this chapter is to draw a very brief description of the relations between energy and the study of the humanities during the past few centuries (a time period marked by a deep schism with its energetic past), sketch an outline for our contemporary humanities-energy nexus and crisis—a crisis made up of a combination of the unwanted consequences of the use of fossil fuels and the dwindling of some of them—and finally suggest some foundations for a future agenda for the humanities, based on the threats our current energetic situation poses and the opportunities it creates. This chapter takes a point of view not from the humanities towards energy, but rather from energy towards the humanities: it first provides a short review of humanity's *longue durée* energetic history, focusing on the shift from the old regime to the new one. After defining and analysing the significance of the different phases in the development of the new energy regime, it shows how that material energetic development enabled and shaped the development of the humanities in academia during the past two decades. It then suggests that the current crisis in the exploitation of fossil fuels is now once again reshaping academia in general and the humanities in particular (partially taking these back to the place they had before the era of fossils). Finally, the chapter portrays a possible vision of a future for the humanities, based on the current global energy situation and the world's predicted energetic future.

3.2 Energy and Human Endeavour

Like any human activity, research and teaching are bound to various forces influencing and shaping human societies. These forces are social, political, ideological—and material. Thus, depending and relying on ideas, innovation, cognition, and spiritual and mental efforts as she may be, academia still requires material infrastructure and resources in order to sustain herself. While the joke about the history professor who needs nothing but books and a computer, and the philosophy professor who does not even need a computer is an exaggeration, it is true that the material demands of the humanities are considerably lower compared with those of the natural sciences, which require laboratories, consumable materials, large spaces, machinery, and further infrastructure. However, pursuing the humanities still requires a certain amount of real, tangible matter. This includes not only books, journal subscriptions, access to archives, computers, pencils, desks, and travel mechanisms, but the entire complex system which allows people to engage in and devote themselves to scholarly work which does not yield immediate results or gains. Even ascetic philosophers and extreme theoreticians must eat something every now and then, and keep their studios, rooms, and offices warm during cold winter nights. In short: they are humans and everything they do requires energy.

Like all other living creatures, humans rely on external energy sources in order to exist and act. Furthermore, as social animals, humans do not act only as individuals: this means that all human societies can therefore be seen as systems aimed at collecting energy available from various sources, processing and re-distributing it through various social mechanisms which may describe society. The amount and kind of energy available to a society are two factors which define the framework within which social processes can take place. Therefore, the analysis of historical energy flows provides an explanation—not a unique or single explanation, but still a valid one—for the basic patterns of different social formations and actions (Crosby 2006).

3.3 Different ‘Energy Regimes’

The energy history of humanity may be divided roughly into two eras, based on two energetic regimes: the ‘old regime’ and the ‘new regime’. The ‘old regime’ is based on the annually renewable energy deriving from the sun, from direct radiation to subsidiary kinds of energy, such as wind, the flow of rivers, and the organic material accumulated in plants during the process of photosynthesis, which is possible thanks to sunlight. The ‘old’ regime was—and still is-based on the annual radiation of the sun, giving modest energetic gains for every action made by humans and allowing only little accumulation of energy and wealth in both time and space.

The ‘new regime’ also involves fossil fuels (Burke 2009; Sieferle 2001, pp. 4–34). While the temporal distinction between the two regimes is not clear-cut (they

still co-exist in various parts of the world), the 'new regime' is actually defining the modern world as the basis for our contemporary industrial civilization. Nuclear energy is another feature of the new regime, whereas energy from renewable sources is additional to the fossils, not their replacement (a total replacement of fossils by renewable sources in the future may signal the beginning of a new era). The new regime can be further subdivided in accordance with the three main fossil fuels humans use: coal, gas, and petroleum.

Energy is absolutely necessary not only to modern societies (Szeman and Boyer 2017), but to any society, be it modern or not. However, without the forms and quantities of energy to which we have access and which we now take for granted, industrialisation and modernity probably would never had existed: the modern (and Northern-dominated) world came to be what it is today thanks to the broad and intensive use of fossil energy. As part of the entire human endeavour, the development of the humanities during the past two centuries is tightly bound with the technical achievements of the new energy regime during that same period. In the 19th century, modern societies moved from using human and animal labour to using fossil fuels. This transition was what made them industrial and modern.

This energetic development was not straightforward, and included several phases, generally parallel to the finding, adoption, and implementation of new fossil fuels: from the beginning of the use of coal during the early 19th century, through the switch from coal to petroleum, and to the great acceleration of the 1950s—the rapid increase in the growth of every material aspect of human life, from food to transportation and from textile manufacture to radio programmes, also known as the '1950s Syndrome'—due to new oil discoveries and improved extraction and combustion technologies (Crosby 2006; Pfister 1996; Steffen et al. 2015). Like other intellectual occupations, the humanities were also part of this, as these phases are parallel to the blooming of new universities and faculties, the establishment of the *Geisteswissenschaften*, and then the 'boom' in higher education in the industrialised world—as well as the crisis we are witnessing today.

3.3.1 Modern Times: Coal Makes the 'New Regime'

Three main fossil fuels are used today. Whereas the broad commercial use of gas began (in historical terms) just recently, petroleum was available from the late 19th century (Heinberg 2003; Smil 2006). However, it was coal, in broad use from the 18th century, which enabled the "Great Departure" from an old world order to a new one (Marks 2007, pp. 189–194). That shift from renewable solar-cycle energy to fossil energy accumulated in coal had a deep and wide influence on all parts and aspects of human life, from the micro daily schedule and habits of individuals to the macro political history of the world in the modern era.

The introduction of coal into human economies had both an immediate, practical, and quantitative effect and a qualitative, conceptual one. Quantitatively, the past two centuries stood in the sign of plenty, richness, and an ongoing expectation for

material abundance. It is worthwhile pausing for a moment to grasp and comprehend the huge difference between the amount of energy currently available to the average woman or man in modern industrialised society and the amount of energy that was available to his/her ancestors about eight generations ago, in the early 19th century. The amount of energy available to the average human today is twice as big as the amount of energy that was available to his/her grandparents 60 years ago and about four times the amount of energy available to their grandparents (Smil 2017). One outcome of the substitution of human labour with machines was the liberation of a constantly growing percent of the population in industrial societies from their age-old work in the production of food and goods, allowing a growing part of the population to take part in activities other than supplying basic needs—such as reading, writing, and studying. Qualitatively, the main conceptual effect induced by that energetic transition was 'growth': the notion that individuals, societies, and even humanity in general are bound to have more and more available material and energy with every passing period of time.

Altogether, the essence of the coal-based Industrial Revolution was equipping each worker with more energy and capital, thus increasing production and the average income of the entire population. Soon, people began to expect to be better paid and enjoy the benefits of leisure and consumption allowed by the new energy regime (Kander et al. 2013, p. 158). It is exactly this leisure that made the widening of the humanities possible; this widening became even greater with the mass usage of petroleum.

3.3.2 The 20th Century: Oil Makes the World Go Round

Although their chemical and natural origins are similar, oil has several operational advantages over coal and gas. First, unlike coal, which needs to be lifted and shovelled, oil is less bulky, and can be transported and delivered by tanks, barrels, or small pipelines. It therefore requires less manpower for extraction, shipping, distribution, and delivery. Oil used to be relatively easily extracted: during the booming years of cheap, accessible oil, the drilling of oil wells, the shipping of crude oil, and its final refining demanded a very small investment of energy and a few workers compared to the inputs required to operate coal mines. Second, it is relatively stable: unlike gas, which has to be well sealed in closed containers, cooled down or liquified, oil is not likely to diffuse or evaporate when kept in a wide range of temperatures. Last but not least, oil can be quite easily processed into a variety of different products: from gasoline to plastic toys, from lubricants to fertilizers. Cheap, flexible, and abundant, it endowed modern industrial societies with an immense quantity of readily available energy.

With these features well established, no wonder that engines fuelled by petroleum products became the movers of the 20th century's global society (Smil 2010, p. 216). Of course, oil is only one energy source out of many and should not be the only prism of our energy research (Jones 2016). Yet today, oil presents society with a

large portfolio of problems: rapid global warming; serious, world-altering globalised environmental crises related to its extraction; increasing geopolitical instability and armed conflicts related to control of oil supplies; and, finally, a possibly imminent failure of supply that would deeply affect the world's economic and social systems. Oil has become essential to all aspects of humans' way of life, from agriculture and healthcare to transportation and consumer goods (Buell 2012; Heinberg 2003): and these are the social systems and infrastructures which support the pursuit of all scholarship—including the humanities.

And how cheap oil was and still is! A common way of pricing energy—and many other things—is in invented money: GBP per unit of gas or USD per barrel of oil. Modern currencies, however, are a human imaginary invention; the *real* price of energy is the *energetic* cost of extracting it: how many units of energy one has to invest in order to extract another unit of energy. This is referred to as the Energy Return on Investment, or EROI. For example, investing 10 calories in a process which grants us 20 calories reflects an EROI of 1:2; investing the energy equivalent of 100 apples in order to get the energy equivalent of 1,000 apples gives an EROI rate of 1:10.

Measured in EROI, petroleum was an energetic bonanza: at the beginning of the 20th century, the estimated EROI for petroleum was around 1:100. This ratio declined with time but was still very profitable during most of that century: in some oil fields during the 1960s, the energetic return rate was still around 40. This means that for every unit of energy invested in drilling, pumping, distilling, and shipping, 40 units of energy were delivered (Murphy and Hall 2010). From the end of the 19th to the beginning of the 21st century, thanks to discoveries of new oil fields and improving drilling techniques, petroleum was available in ever-growing quantities. Even if the net return on investment was steadily decreasing, the total amount of oil extracted continued to grow. This steady growth in energetic inputs easily inspired two economic thoughts: first, that 'growth' is and should be an integral part of modern economy; second, that this growth can continue on and on (Heinberg 2003).

3.3.3 Growth and Its Limits

The sudden availability of fossil fuels—with oil being of central importance among them—and their *growing* annual rates of extraction during the 20th century have laid the ground for a new social and economic order which has—as far as we can tell—no historical precedence. That order is based on and aimed at 'growth'; although it is usually referred to as *economic* growth, it actually encompasses all parts of life. Supported by the increasing availability of energy inputs during the 20th century, growth became *the* political belief of the late 20th century. Although in different facets and within different political contexts, the belief that human consumption, population size, and available services can 'grow' was shared by both capitalist and communist societies, liberals and social-democrats—to the degree that some scholars claim that within the Anthropocene, our era is the era of growth or the Auxocene

(Reichel and Perey 2018). Most of the disputes between different political parties and factions were—and to a large extent, as long as mainstream political camps stay bound to anachronistic paradigms, still are—merely about the distribution of accumulated wealth and the way the pieces of the growing pie should be divided. All believed that the pie was growing and would continue to grow.

When viewed through the narrow prism of the second half of the 20th century, the global economy indeed seemed to be growing: every year more oil was extracted and more energy was available to humanity. The availability of cheap, abundant fossil fuels was the main force driving the economic growth since the beginning of the 20th century, especially from the 1950s onwards (Pfister 1996): more available energy meant more food, more people, more commodities, more mobility, more of everything manufactured or invented by people, as a matter of fact (and less of everything else, from rainforests to fish in the sea). However, like coal and gas, petroleum is a limited, non-renewable resource, which is about to be depleted after reaching a 'peak' in its extraction (Campbell and Laherrère 1998; Heinberg 2006; Hirsch 2005). And indeed, it is depleting (Chapman 2014; Murray and King 2012).

Meanwhile, this increased economic activity caused by the growing availability of energy raised considerable criticism and scepticism. During the early 1970s, Nicholas Georgescu-Roegen (1971, 1977) already pointed out that the material limits of the world in which humans live do hinder, by definition, future economic growth: infinite consumption and growth are impossible in a finite world, without external inputs. Therefore, he concluded, growth will have to end, sooner or later. The best publicly known expression of the initial fear of exhausting that 'growth' was probably the one articulated by the 'Club of Rome'—a group of natural and social scientists, named after the city in which it first congregated—which doubted the entire ability of humanity to sustain its economic growth, due to employment insecurity, environmental degradation, monetary disruptions, rapid changes in traditions, and the breaking of social institutions (Meadows et al. 1972). All of these reports and critics of the ruling financial order emphasised our inability to continue growing infinitely in a finite world. The mainstream media and most of the world's governments will not admit it, because it is 'bad news' for our consumer society; but by the beginning of the 21st century, the futility of the attempts to sustain the unsustainable has become clear (Seidl and Zahrnt 2010).

3.4 Humanities and Energy Shifts

Doubtful by their nature as they are and disliked as they ought to be, generalisations are not always bad; in the case of the old energetic regime and its influence on the humanities, they may even be useful. The humanities have their history of continuity and change, through which they neither stood still nor stayed frozen in any way: from their beginnings in the ancient world, through classical and medieval eras, in

various places and various social, religious, and political constellations, the humanities changed deeply in their methods, foci, and social acceptance, to name just a few characteristics of their place in the history of knowledge and ideas (Bod 2013).

That being said, the humanities were also part of the energetic surroundings of humanity, as mentioned above: societies' ability to allow their members to engage in activities that are not related to immediate needs is dependent on the amount of 'spare' energy available to them. The division between an old and a new energy regime is valid here as well. For the purpose of our discussion, here we can assume that the ancient and medieval history of the humanities saw relatively small and very slow changes until the early modern era: enriching humans' knowledge about the world and themselves had to do more with preserving old knowledge than creating new knowledge. In societies which relied on human labour and muscle energy for catering to basic needs (mostly food supply), only a tiny percentage of the population could engage itself fully with occupations which were not directly related to physical work and labour. In the times before the usage of fossil fuels, farmers, masons, herders, foresters, and artisans were all needed in large numbers. Only a small percentage of the population could evade the physical toil and engage in the work of the brain and not of the body. The Roman admiration for *vita contemplativa*—as opposed to *vita activa*—was all but an expression of that desire: probably shared by many but accomplished only by few. Accordingly, the engagement with the humanities was limited and small in numbers. This is, of course, not to say that past cultures were less developed or lacked some qualities that modern societies have, or that ancient and medieval humanities were of lower grade, but that the social reach of the humanities, as a distinct faculty of human life, was limited.

The new energy regime brought a deep change to the history of the humanities. With their qualitative essence and role in human societies well established, changes in the humanities at the early stages of the new regime, during the 19th century, were structural and institutional rather than essential or qualitative. They included specialisation and professionalisation, the creation of local and national—rather than universal—foundations for research in the humanities, and finally the separation from the natural sciences. Most distinctively, new in the 19th century was the academic institutionalisation of disciplines, not so much the nature of humanistic knowledge as a whole (Bod et al. 2014).

While the early roots of the aforementioned processes may be traced to the 18th century, the later rise of modern industrial civilization accelerated them considerably. One of the earliest and most commonly cited expressions portraying the specialisation of the humanities is the one coined by Charles P. Snow, who refers to the humanities and the natural sciences as 'two cultures', with a substantial gap between them (1956, 1959). Another chasm portrayed in Snow's book (1959) received less attention during the past decades. This is the gap which developed between the humanities (and theoretical scientists to some degree) and modern technology. "If we forget the scientific culture", Snow opines, "then the rest of western intellectuals have never tried, wanted or been able to understand the industrial revolution, much less accept it" (1959, p. 23). As a matter of fact, Snow argues, academics had nothing to do

with the Industrial Revolution, for "so far as there was any thinking in nineteenth-century industry, it was left to cranks and clever workmen"—not to academics and certainly not to humanists (ibid., p. 25). The latter practically 'survived' through one of the greatest transformations humanity had ever seen (second maybe only to the agricultural revolutions millennia earlier), while benefiting from its amenities.

Today, when the decreasing returns on energy investments bring the age of expansion and prosperity to its end, the humanities will no longer be able to join the ride and enjoy the plenitude as it used to during the past century. The evidence is already clear: during the past several decades, and increasingly since the 1980s, higher education became an industry for itself, as academic degrees and publications became a commodity or consumer goods, produced in growing quantities with no direct purpose except the continued operation of the institutions and mechanisms producing them. Now, with global growth decreasing or disappearing altogether, humanities cannot continue growing and expanding. The production of education in masses unknown before—a large part thereof in the humanities—cannot be sustained as it is based on borrowing and debts meant to be 'paid off' sometime in the future.

The sheer joy of the humanities is a great thing; alas, it does not pay off in any practical way in the material world, whose margins are once again becoming narrower. The United States of America provide an extreme yet telling example with regard to the phenomenon in general. During the first half of 2019, the debts of 44 million current and former students in the U.S. alone were estimated around 1.5 trillion USD, making every U.S. university graduate begin his/her early-career life with a debt of around 35,000 USD on average (Friedman 2019). Students with a strong economic background probably owe much less; one may therefore assume that many former students carry much bigger loans they have to pay. Indeed, about 11% (around 166 billion USD) of these debts are in some kind of service failure (Tanzi 2019). Nowadays, some college students actually go hungry in order to pay their tuition fees and other living expenses (Laterman 2019). Other countries may be presenting less staggering figures, but the tendency is similar worldwide; in the European Union, student debt may be public rather than private but is debt all the same. Can this situation continue as it is, given the fact that the resources available to sustain our modern society are dwindling?

3.5 Discussion and Conclusion: What Next?

Humanity has entered an age of crisis, and our only way out is by thinking more deeply about the global connections between politics and ecology. Human history has always been part of all the other lives on Earth and there is no way for us to escape from that common fate (Hou 2018). The humanities are not dissociated from human lives, so this applies to the humanities as well: engaging in the humanities means freedom from catering for one's basic needs and most of our freedoms so far have been energy-intensive, from the time of the early civilisations on Earth (Chakrabarty 2009). The more energy provided, the more freedom humans enjoyed; in our case,

the free scholar who has someone or something else take care of his/her supply of material. What should we expect now, when the amount of energy available to us is not growing anymore? Should we expect less freedom and hence a lower ability to engage ourselves in the humanities, now that the 'new' energy regime is about to go into a deep change?

Problematically, the current public discourse and debates on energy tend to approach fossil fuels as a problem of greenhouse gas (GHG) emissions, with its direct impact on climate change and all the calamities that derive from it. Indeed, GHG emissions are a dire problem and an immediate threat to us all. However, 'the problem' of fossil fuels is much more than climate change and should not be limited to emissions or pollution. When we look at it on a wide scope, climate change is but one symptom of a larger systemic problem of the global political economy of extraction and combustion (Princen et al. 2015, pp. 5–6). Fossil fuels have deeply changed human society in every possible aspect and in every field of life: our food, our mobility, our ability to produce and consume goods, our time management, our spatial perception, our health and life expectancy, our social interactions and family relations, our education systems and political structures, our communication, our span of attention, and even our imagination. In short: it changed our life. And it is not sustainable—or even durable—in any way. It will have to come to an end.

What can we do with this? Where can we take the humanities to now, from the dire energy straits in which they are, together with the rest of humanity's modern endeavour? In order to find some reasonable answers to these questions, we first have to distinguish between four related yet distinct issues. It may well be that at least part of the confusion we are experiencing and the feeling of anxiety and lack of orientation prevalent among humanists (as well as others) is due to the confusion between these issues. The first issue is defining and acknowledging the problem of modern scholarship—the humanities included—in relation to energy resources. The second issue is admitting what is *not* likely to happen and what is *not* reasonable to expect. The third issue—standing in contradiction to the second—is what may be possible to achieve. The fourth issue is what is desired and what we wish for, under the given conditions. While the first three issues are positivist by nature—even if not precise, and subject to different assessments and interpretations—the last one is normative.

First, the root of the problem of modern scholarship in general and the humanities in particular in relation to energy resources is basically the problem facing the entire modern civilisation: the declining availability of easy-to-get, accessible energy. The combination of a growing population and diminishing returns on energetic investments led us all to a situation in which more and more people have to share a pie which is not growing anymore and may soon be shrinking. This is even before we begin to deal with the environmental damages caused by the burning of fossil fuels and the socio-political havoc these are already causing through climate change and the mass destruction of habitats and livelihoods (Princen 2014; Tollefson 2016). One more thing we must remember in this context is that clean energy from renewable sources is not likely to fill the gap between current energy demand and future energy

supply. We currently have no technology that would sufficiently substitute fossil fuels in all their usages and in the quantities currently combusted.

Therefore, some things are *not* likely to happen and are *not* reasonable to expect. Foremost among these is the flawless continuation of the 20th century's norm of drilling, pumping, and burning, while creating an imagined and unsustainable 'growth' on the one hand and turning the Earth's atmosphere into a huge greenhouse on the other. This 'business as usual' situation is likely to stop sooner or later both because of the environmental damages it causes and because of the exhaustion of the reserves of petroleum, the main resource enabling it (although one should not hope for the latter to stop the former, as there are still enough fossils to be burned in order to destroy our biosphere three times over; Princen 2014). As a consequence, we may suspect that processes which have become a norm during the fossil fuel era—growth, specialisation, centralisation—will also come to a halt. Nonetheless, given the scientific and technological knowledge accumulated, tested, and implemented during the past centuries, we may well assume that we are not going back to the Stone Age or the 'Olduvai Gorge' (Duncan 2007): humanity has made enough technological progress from the Stone Age to early modern times and complex societies have existed for millennia without fossil fuels. Dystopian visions of our modern global human society dismembering into thousands of detached, naked cave-dwelling tribes of nomads provide the base for an interesting literary experience but will probably prove to be exaggerated in reality.

What might be possible to achieve, then, is a new social, political, and economic order (in this case these three words are synonyms), which will not be based on growth and will not take growth as one of its components. The transition to such a new order will require rearrangement of all aspects of our lives, re-planning, descaling, and probably decentralising of our current institutions. History does not repeat itself, but it may rhyme: we do have historical precedents and examples of societies which survived, thrived, and even flourished without economic growth. Growth is a new phenomenon, and although the forces that try to make us forget the past (or at least blur it) are considerably strong, it is not beyond our capacity to look back into history and find plenty of examples and lessons. As a matter of fact, all pre-industrial economies lived in a relatively steady situation, with only negligible growth. To achieve this, we shall definitely need the humanities (history, literature, linguistics, archaeology): to look into our pre-industrial history as humans and imagine a post-industrial society. Looking at our human ancestors may teach us how can we live without fossil fuels, while using our imagination and language skills may assist us in inventing new, updated, and suitable systems and tools for living like that anew in the future.

What future exactly? The answer to this question is not positivist but rather normative. It is not the question of what we can, but of what we want and desire. After finding and learning a set (or a spectrum) of possibilities, we shall have to redraw the outlines of a new global human society, based on renewable energy sources. The reorganisation of our lives will demand a deep and thorough redistribution of wealth and labour, as well as changes in occupations, family ties, and political regimes. Do we want higher or lower inequality? Do we want more openness or more seclusion? Do we wish for more connections or would we prefer breaking into more isolated

social units? Whether we define the current situation within the humanities as a crisis or as a set of problems (Donoghue 2010; Nussbaum 2016), the humanities themselves—like all other parts of life and society—will have to break from the frames and the institutions to which they were bound during the industrial era.

The good news, however, is that the humanities—while having to reorganize and adapt to an era of relative scarcity and decrease—may help us make wise decisions. The current energetic predicament of modern society is made of natural factors—resources and emissions—but is entirely human-made. Both at its extraction end, with declining returns from our current energy sources, and at its emission end, with pollution and climate change threatening billions of people around the world, our modern energy economy was and still is planned, built, and maintained by humans. Like our entire economy, our current energy regime is based neither on divine ruling nor some natural law; it is a social construct. Therefore, it is up to us, humans, to change and improve it, or—as seems to be the case here—abandon it and develop a new one to replace it. A primary precondition for good decision making is a clear view of reality. Studying, mapping, and analysing human ideas, thoughts and actions is exactly the mandate of the humanities. Energy humanities, then, can and should play a central role in learning from our past human experience, analysing our present human situation, and envisioning a novel energy regime in which humans may think and act in the future.

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Part II
Social and Political Implications of Energy

Chapter 4
Natural Gas in the Process of Eurasian Integration

Justin Tomczyk

Abstract From the construction of LNG terminals in the Baltic Sea to the development of pipeline networks across Central Asia, the former Soviet Union remains a dynamic space for the production, transit, and delivery of energy. At the core of this space lays the Russian Federation, a country whose vast resources and energy supplies have evolved from a commodity of trade and commerce to a tool for influence and political gain in the surrounding region. As the latest Russian-led regional integration project takes shape, a curious detail is visible—the development of a common market for natural gas is explicitly outlined in the founding treaty of the Eurasian Economic Union (EAEU). This chapter explores what role the creation of a common natural gas market plays in the process of Eurasian integration, how this compares to similar energy integration efforts in the European Union, and what these developments mean for the smallest member of the EAEU, Armenia.

Keywords Armenia · EAEU · Natural gas · Pipeline · Russia

4.1 Introduction

With its formal establishment in 2015, the Eurasian Economic Union (EAEU) presents one of the most comprehensive Russian-led integration projects in the former Soviet Union. Totalling just over 180 million people and covering 20 million square miles, the regional organisation emulates many of the functions of the European Union (EU) by establishing legal approximation between its members and facilitating the movement of goods, persons, and capital across its members. While comparable in structure and purpose to the EU, the geography of the EAEU has provided it with a major distinguishing factor: access to energy, particularly through the massive reserves of oil and gas in the Russian Federation, and deposits of uranium throughout Kazakhstan. In addition to containing no deposits of fossil fuels, the Republic of Armenia—the smallest EAEU member—is geographically disconnected from the

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rest of the Union, leaving it dependent on the transit of Russian natural gas through neighbouring Georgia.

This chapter explores how exactly regional organisations such as the EAEU and the EU theorise the concept of 'energy unity', and how their different approaches may reflect that of an energy importer and an energy exporter. It explains how the founding treaty of the EAEU lays the foundation for a unified energy policy, and how such a policy would differ from previous interactions between the Russian Federation and former Soviet Republics in the sale and transit of energy. The present analysis is primarily focused on natural gas—specifically, the formation of a common natural gas market. Furthermore, the chapter examines how the potential emergence of an EAEU energy policy would impact the delivery of natural gas to the Republic of Armenia and how this process would compare to energy delivery among smaller states of the EU. In its analysis, the chapter draws upon existing literature on the topic of energy integration in the EU, including *Energy Security in Europe* (Szulecki 2018), which provides a broad overview of the securitisation of energy policies among EU members and the political dimensions of energy delivery among the EU member states. Additionally, *External Energy Security in the European Union* (Mišík 2019) was used extensively in developing a comparative perspective between energy delivery in the EU and the emerging energy policies of the EAEU. With regards to studying the EAEU, the founding treaty of the organisation is used as the basis for conceptualising Eurasian energy integration (Supreme Council of the Eurasian Economic Union 2014).

4.2 The Eurasian Economic Union

The Eurasian Economic Union is a regional organisation made up of five former Soviet Republics: Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia. The concept of an 'Eurasian Union' was first mentioned by Kazakh President Nursultan Nazarbayev in a 1994 speech at Chatham House and later in an address at Moscow State University (Raikhan 2013). The project is an elaboration of earlier Russian-led integration projects in the post-Soviet space, such as the Customs Union of Belarus, Kazakhstan, and Russia, and the CIS Free Trade Area. What sets the EAEU apart from these earlier integration projects is the creation and usage of super-state institutions in its decision-making process, such as the Eurasian Economic Commission and the Court of the Eurasian Economic Union. In this sense, the EAEU emulates much of the structure of the EU and is also committed to upholding the freedom of movement for goods, capital, labour, and persons between its five members. What sets the EAEU apart from the EU is the lack of financial integration between its members and its exclusive emphasis on economics, as organs such as the European Parliament have no equivalent in the EAEU.

Decisions regarding the development of EAEU energy policies are made by two bodies: the first is the Supreme Eurasian Economic Council, a gathering of heads of state analogous to the European Council, which develops the direction of the Union;

the second is the Eurasian Economic Commission, which handles the regulatory aspects of policy and acts as the organisation's chief collector of statistics and data. The Commission's decision-making branch features two subgroups: the Council of the Eurasian Economic Union, made up of vice prime ministers from each member state, and the Board of the Eurasian Economic Union, made up of two representatives from each member state and a chairman (Supreme Council of the Eurasian Economic Union 2014). While political will and support for European integration expanded the initial free-trade agreements, from the Treaty of Rome (1957) to the establishment of a super-state structure reminiscent of a federal model, there has been little enthusiasm for expanding the EAEU's structure or developing a wider focus beyond economics. The organisation's narrow scope and relatively small decision-making process make the EAEU an effective regulatory body, but it lacks the initiative to dictate and coordinate polices or create programs as wide spanning as the EU's Common Security and Defence Policy.

The EAEU is a net exporter of energy. This energy export is primarily made up of oil and natural gas, with radioactive materials like uranium representing a portion of Kazakhstan's external energy trade. The sale of electricity is also part of the EAEU's energy portfolio, due to the continued usage of Soviet-era power grids between member states (Pastukhova and Westphal 2018). In 2017, the Union produced 18.4% of the world's natural gas; 98.1% of this figure is the product of Russia, while the remaining 1.9% comes from Kazakhstan (Zemskova 2018). Belarus is part of Russia's wider network for the transit of natural gas and oil to Europe, while Armenia and Kyrgyzstan are dependent on the import of natural gas to meet their energy demands (ibid.). Energy delivery between the EAEU members is largely dependent on earlier Soviet-era infrastructure.

4.3 Energy Unity as a Core Principle: A Close Reading of the EAEU Founding Treaty

The development of an 'Energy Union' or common set of energy policies is an ongoing process within the EU. The disruption of natural gas and oil supplies during a series of disputes between the Russian and Ukrainian governments in the early 2000s was a catalyst for this process and wider discussions on energy security (Siddi 2018), which saw a renewed interest in the wake of the 2014 annexation of Crimea (De Micco 2014). The European Commission has drafted sets of policies known as 'energy packages' to approach this topic. The first of these policies, known as the First Energy Package (1996), provided a legal groundwork for the liberalisation of gas and electricity markets (European Parliament 2020). Since the crafting of the First Energy Package, several similar policy collections have been developed, with the most recent Winter Energy Package (2016) covering the development of clean energy sources as part of the EU's energy policies.

Unlike the EU, the EAEU has explicitly incorporated the concept of an energy union in its founding treaty, in the form of a proposed common market for gas, oil, and petroleum products, as outlined in Section XX of the *Treaty on the Eurasian Economic Union* titled "Energy Industry" (Supreme Council of the Eurasian Economic Union 2014, p. 85). Article 79 of the same Section, "Cooperation of the Member States in the Energy Sphere", outlines the core principles of the EAEU's energy policy, which include "ensuring market pricing for energy resources" and "the development of competition in the common markets of energy resources" (ibid., p. 86). This Section also includes clauses specifying that member states will remove any physical and legal barriers to energy trade between one another, as well as a clause stating that member states will harmonise "national rules and regulations for the functioning of the process and business infrastructure of the common markets of energy resources" (ibid.).

This Article is followed by provisions for tracking the EAEU's balances in natural gas, oil, and petroleum products. Access to these three areas of energy are elaborated upon, with natural gas being covered in Article 83: "Establishment of a Common Gas Market and Ensuring Access to Services of Natural Monopoly Entities in Gas Transportation" (Supreme Council of the Eurasian Economic Union 2014, p. 89). While the previously mentioned Article 79 outlines the broader elements of cooperation between the EAEU members in the field of energy trade, Article 83 provides a substantive base for what would become the EAEU's common gas market. In addition to explicitly specifying that member states must establish a common gas market with the approval of the EAEU's Supreme Council, the Article also states that the EAEU members must allow "unhindered access for economic entities of other Member States to gas transportation systems located on the territories of the Member States to enable gas transportation on the basis of common principles, conditions and rules provided for by Annex 22 to this Treaty" (ibid.). Annex 22 categorizes gas delivery infrastructure as a natural monopoly and therefore subject to a standard of access for other EAEU members. This means that the gas delivery infrastructure located in an EAEU member state may be used by firms and other legal entities registered with an EAEU member and access cannot be reserved for a single nationality within the EAEU. Annex 20 of the EAEU Treaty, "Protocol on Common Principles and Rules for Activities of Natural Monopoly Entities", lists natural gas pipelines and other elements of energy delivery belonging to Belarus, Kazakhstan, and the Russian Federation as being part of a "natural monopoly", carried over from the three countries' previous customs union in the early 2000s. The window of time for the transition to a common energy market is listed in Section XX, Article 104, with the concept of a common gas market being approved by 1 January 2016, the programme for its creation being finalised by 1 January 2018, and the entry into force for this common gas market occurring before 1 January 2024. By 2025, the EAEU members must finalise the Treaty, "including the common rules of access to gas transportation systems located on the territories of the Member States" (ibid., p. 127). Section XX closes with the Eurasian Economic Commission being tasked with monitoring the implementation of these clauses.

While the EAEU is a relatively underdeveloped integration regime compared to the EU, it is considerably more explicit in outlining what a common market for natural gas between its members would look like. This may be due to the EAEU's status as a net exporter of energy, with its largest economy, the Russian Federation, being dependent on both the sale of energy and the use of the EAEU members (such as Belarus) as a conduit. With this in mind, the creation of a common market for natural gas can be interpreted as partially an effort by Moscow to cement Russia's role as an energy provider among the four other EAEU members for a greater political gain. Considering that changes in gas tariffs have previously been used as a means of exerting pressure on states of the former Soviet Union in order to dissuade their engagement with the EU (European Parliament Policy Department 2018), it is unlikely that Russian authorities would surrender this policy option and allow for uniform gas pricing and continued access unless they were confident in the EAEU members' long-term commitments to Russian interests. Additionally, the development of a common market for natural gas signals Russia's potential movement towards bureaucracy and legal systems as a means of maintaining its status as an energy supplier, and away from energy supremacy asserted solely through the operation of pipelines and other legacy equipment of the Soviet Union.

Compared to the EAEU, much of the EU's posturing towards the development of a unified energy policy seems to be reactive and focused on ensuring continued delivery through a crisis. One effort to generate such a unified energy policy towards natural gas is Council Directive 2004/67/EC, "Concerning measures to safeguard security of natural gas supply" (Council of the European Union 2004). The Directive frames the delivery of natural gas largely as a security concern, emphasising the necessity of the EU members to assist one another in ensuring the minimum required delivery of natural gas. This includes the addition of a "Community Mechanism", which states that in the event of a major disruption of natural gas delivery, a member state may initiate a meeting of all the EU members in order to ensure that short-term energy needs will be met and a long-term solution will be developed (ibid.). Additionally, while the Treaty of Lisbon (2007) mentions the development of a Union-wide approach to energy and the EU took comprehensive steps towards the development of an energy union through the aforementioned energy packages, these policies are again framed as a reactive response and grounded in the EU's status as an energy importer (Eikeland 2011). While there have been efforts to establish a common market for the sale of natural gas in the Union, progress has been largely limited to the theoretical stages, with the approach to the sale of natural gas being a mix of security concerns and already existing provisions for free trade.

The EU represents a considerably more mature integration regime, but its status as an energy importer has led to a more reactive energy policy built around crisis management and maintaining current flows of natural gas. While the overall scope of the EAEU's integration policies seems to be less than that of the EU, the detailed implementation plan towards the creation of a single gas market likely reflects on the stability brought about by its status as an energy exporter, as well as the large economic interest in the export of natural gas.

Since the drafting of the founding treaty of the EAEU, we have seen EAEU members make progress in actualising the creation of a common gas market. Decision No. 18 of the Supreme Council of the Eurasian Economic Union entitled "On the Formation of a Natural Gas Market for the Eurasian Economic Union" (2018) elaborates on the specific steps that should be taken in the implementation of a common gas market. This includes the establishment of a common pricing and tariff regime among EAEU members by the Eurasian Economic Commission. In broader terms, Decision No. 18 requires that all EAEU members undergo legal harmonisation to ensure compatibility between national legislature on gas delivery, the creation of a separate treaty for unified gas trade with third parties outside the Union, and provisions to prevent the resale of natural gas by third-party trading partners (ibid.).

The emergence of a unified policy within the EAEU holds many potential implications for energy trade with external partners. The import of Russian gas to the EU via Belarus would no longer be a matter between the EU and two third parties, but rather a transaction between two regional blocks, each liable to their supranational terms of trade at the Belarussian-Polish border. This could be particularly difficult should the establishment of an agreement on external trade of natural gas among the EAEU members differ greatly from the EU's current bilateral agreements with Belarus and Russia. However, given the ongoing disputes between the EAEU members on what criteria will be used in the pricing of oil, it is possible that the trade of natural gas with the EU will be most impacted by internal divisions.

4.4 Armenia as a 'Small State' in Eurasian Energy Policy and the 'Kaliningrad' of the EAEU

Although the EAEU and the EU differ in their approach towards a unified energy policy, there are certain trends that are visible in both regional blocks. Armenia's position within the EAEU could be considered analogous to that of a 'small state' of the EU (see Mišík 2019). It is the smallest member of the EAEU with regards to population and the second smallest with regards to economy. Through trade and an extensive flow of remittances, Armenia is closely tethered to the Russian economy. However, this dynamic is far from mutual, as Armenia is the destination for only 0.33% of Russian exports and the origin for only 0.26% of Russian imports trade, suggesting that Russia would have considerably larger leverage over the Armenian economy (Observatory of Economic Complexity 2017). Of the $1.14 billion worth of exports from the Russian Federation to Armenia, petroleum gas makes up 24% of this sum (ibid.). Natural gas-fuelled thermoelectric plants generate 59% of Armenia's electricity (IEA 2016). Beyond its use in thermal power plants, natural gas has a variety of consumer uses in the country, with almost 80% of vehicles using liquified natural gas (LNG) as fuel (EU4Energy 2018). Armenia's natural gas market is controlled by Gazprom Armenia, a subsidiary of Gazprom Russia.

While four of the EAEU members form a continuous, single geographic space, Armenia is separated from the other members of the organisation. Georgia lays between Armenia and Russia, the nearest EAEU member. Armenia's eastern border is closed due to the conflict with the neighbouring Azerbaijan over the status of the territory of Nagorno-Karabakh. Known as the Nagorno-Karabakh War, this unresolved dispute began in 1988 and is considered to be a frozen conflict. In 1993, Turkey enacted an economic blockade of its border with Armenia as a symbol of solidarity with Azerbaijan. This led to the closure of Armenia's western border with Turkey. This leaves two viable borders for trade and the movement of persons with neighbouring countries: the small southern border with Iran and the northern border with Georgia. Georgia-Russian relations can be categorised as poor due to Georgia's EU and NATO membership aspirations and the 2008 Russo-Georgian War. This has complicated Armenia's relationship with both countries, as conflict between Moscow and Tbilisi has impacted trade flows in the Armenian economy (Nichol 2014), while some perceive Armenia's relationship with Georgia as a potential part of a wider fault line between Russia and the West (Shirinyan 2019).

With regards to energy transit, Armenia is largely dependent on the continual flow of natural gas from Russia through Georgia via the Tbilisi-Mozdok Pipeline and the North Caucasus Pipeline. The dynamics of natural gas delivery from Armenia to Russia via Georgia is similar to the delivery of natural gas from Russia to the exclave of Kaliningrad via Lithuania. Similar to how Russia is dependent on Lithuania for energy delivery to Kaliningrad through legacy Soviet infrastructure, Russia uses the Mozdok-Tbilisi Pipeline to deliver most of its gas to Armenia via Georgia (Badalyan 2011).

What sets these two cases apart, however, is the way in which both states' bilateral relationship with Russia impacted their associated costs of dependency on Russian energy. Although this relationship featured a high amount of political risk, the usage of legacy infrastructure from the Soviet Union provided a low cost of operation for Lithuania, and many of the smaller states of Central and Eastern Europe (Mišík and Prachárová 2016). While Lithuania's membership in the EU and NATO was a source of friction with Russia, these organisations also provided a guarantee of security that dissuaded any major escalations between the two countries. Kaliningrad's dependency on the transfer of natural gas via Lithuania was also an assurance that shut-offs and other coercive tactics directed at Lithuania would be unlikely, as it would impact the flow of natural gas to an exclave of the Russian Federation. This arrangement proved adequate for both Lithuania and Russia, and it was not until the aftermath of the 2014 annexation of Crimea and the subsequent War in Donbass that Lithuania pushed for the construction of an LNG terminal in the Baltic Sea as an alternative source of energy (Mišík 2016).

In comparison to Lithuania, Georgia's role as a transit partner was not nearly as stable. While Soviet infrastructure was available for the delivery of natural gas, pipelines in the North Caucasus and Georgia were popular targets for sabotage by terrorists or sappers, often intent on disrupting the flow of natural gas to Armenia during the Karabakh War (Baker 1996). Additionally, Russia's support of Abkhazian and South Ossetian militants during the Georgian Civil War and later Russo-Georgian

War (2008) put a strain on relations between Tbilisi and Moscow. This relationship extends beyond the idea of 'political risk' and could be considered openly hostile, particularly after Georgia's severing of diplomatic relations with Russia and formal exit from the Commonwealth of Independent States (O'Rourke 2009). Another degree of separation between Georgia and Lithuania is the viability of energy partners outside of Russia. Lithuania was a sort of 'energy island', largely cut off from pipelines in Europe. In comparison, Georgia borders Azerbaijan, a major exporter of oil and natural gas. Georgia's borders with Azerbaijan, Turkey, and the Black Sea shoreline opened the possibility of access to energy networks in the surrounding region.

This possibility was manifest in the creation of the Baku-Tbilisi-Ceyhan Pipeline in 2005, which allowed for the delivery of oil from Azerbaijan through an East-West pipeline network. This was accompanied by theSouth Caucasus Pipeline, a natural gas network that largely ran parallel to the Baku-Tbilisi-Ceyhan route (Southern Gas Corridor 2020). Between these two networks, Georgia was poised to potentially wean itself off its dependency on Russian gas energy imports altogether. This led to the negotiation of an agreement between Georgia and Russia, whereby 2.02 billion cubic meters of gas would be transited to Armenia over the course of two years. In exchange for delivering the gas, Georgia would be entitled to 10% of the total gas delivered over one year, and later be able to purchase gas at $185 per thousand cubic meters—below the previous market value of $215 per thousand cubic meters (Rukhadze 2017).

In an effort to ease the energy bottleneck in Georgia, Armenia turned to Iran as a partner for the import of natural gas. The Armenia-Iran gas pipeline was inaugurated in 2006 and connects Armenia to a supply of Iranian gas via Tabriz. However, while this project was an effort to diversify the import of natural gas, Armenia was still bound by its energy relationship with Russia. The creation of the pipeline was a venture between the National Iranian Oil Company and ArmRosGazprom. The ownership of ArmRosGazprom was divided among Gazprom (45%), the Armenian Ministry of Energy (45%), and the Itera Group (10%; Kramer 2016). While separate from existing natural gas projects, the project contained a major concession to Gazprom in that the diameter of the pipeline was shrunk from 1,420 to 700 mm. In addition to limiting the total flow of natural gas, this new diameter prevents the potential future routing of Iranian gas to Europe (Socor 2007). By 2014, ArmRosGazprom had fallen under the complete ownership of Gazprom and transitioned to Gazprom Armenia. Although originating from a separate partner, Iranian natural gas would be subject to the same pricing and tariffs as gas from Georgia, due to Gazprom's ownership of its delivery infrastructure. Additionally, the ownership of the pipeline by Gazprom means that Armenia would be unable to individually negotiate a tariff with Iran, as it would be dependent on final approval by Gazprom.

While Armenia's interactions with Russia in the field of natural gas delivery would suggest that there is little to be gained, there is one major advantage that membership in the EAEU grants. Given the emphasis on the role of the Eurasian Economic Commission and Supreme Council of the Eurasian Union in the establishment of a common market and common pricing regime for natural gas, it would be difficult for

the Russian Federation to unilaterally threaten to shut off and disrupt gas delivery to specific members of the Union. Additionally, the establishment of a common gas tariff would prevent any predatory pricing manoeuvres, albeit at the cost of potentially undoing favourable tariffs. This has led to a series of contentious negotiations between Russia and other EAEU members on the tariff policy for natural gas, including a lack of effective tax and budgeting legislation which may be considered one of the first major hurdles to the development of a common gas market (TASS 2020). Although the Russian Federation still exerts a disproportionately large amount of influence and power in the EAEU, smaller states like Armenia can use the organisation as a means of containing Moscow in a rules-based order.

4.5 Conclusion

When we consider the ongoing struggle to develop a cohesive and comprehensive energy policy in the EU, the provisions to establish a common market for natural gas, petrol, and electricity in the founding treaty of the EAEU may signify an evolution in regional integration processes. Rather than approach energy trade as just another aspect of economic integration or a process that can be achieved through ad hoc policy planning, we now see a contemporary integration project that includes energy integration and common energy markets as a founding principle. While this was largely due to pre-existing infrastructure between the EAEU members and a surplus of energy, this aspect of Eurasian integration is heavily dependent on the Russian Federation abiding by a rules-based order and, in doing so, conceding its flexibility in setting gas prices and its ability to unilaterally affect the flow of natural gas. With this, Moscow has forfeited one of its major tools of enacting pressure on the near abroad. However, through the process of energy integration and the creation of a single gas market, Russia has effectively secured the territories of Belarus, Kyrgyzstan, and Kazakhstan to act as conduits for natural gas exports to partners such as the EU. By preventing the EAEU members from unilaterally entering into agreements related to energy trade with third parties, Russia has also solidified its role as an energy provider among the members of the Union. These factors imply that Russia placed a high degree of trust in the process of Eurasian integration as a means of securing influence in the near abroad—especially when smaller EAEU members such as Kyrgyzstan and Armenia hold equal say in the development of policies.

However, for Armenia, membership in the EAEU has not necessarily led to a greater sense of energy security, since energy imports must be delivered through a transit country that is increasingly at odds with the Russian Federation. If anything, participation in the EAEU may be interpreted as an alignment towards Russian interests and a limit on Armenia's engagement with Georgia. When considering the potential political limitation of southbound gas delivery through Georgia and the flow limitations placed on the northbound pipeline from Iran, Eurasian integration may have provided Armenia with a greater sense of energy insecurity. For the field of

energy humanities, this ongoing process shows how access to energy may transform from being a tool for enacting pressuring on small states to achieve small policy goals to a crucial element of regional integration.

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Chapter 5
Natural Gas' Changing Discourse in European Decarbonisation

John Szabo

Abstract Natural gas plays a key role in the European Union's energy system, which is partially predicated on its favourable environmental characteristics. These qualities have allowed key stakeholders to facilitate a positive discursive and ideological inscription of the fuel to ensure their continued ability to capitalise on it. European Commission-led climate action poses a significant challenge to the status quo, which industry incumbents first sought to address by promulgating the message that natural gas is the *transition* or *bridge fuel* to a renewable society. As it became clear that this would not be sufficient to maintain the fuel's role in EU's future energy mix, producers and infrastructure owners devised energy futures in which they would complement and gradually substitute natural gas with sustainable (biomethane) and decarbonised (hydrogen) forms of gas. Discourse on the role low carbon gases can play in EU's decarbonisation proliferated, partly due to the limitations of electrification and renewables, but also reflecting the deep entrenchment of ideas society pairs with the (fossil) fuels it relies on.

Keywords Natural gas · Discourse · Transition fuel · Climate change · Inscription

5.1 Introduction

Natural gas has a well-established role in the European Union's (EU) energy mix, but its continued consumption poses a growing threat to the bloc's climate action commitments. The fuel constituted 23% of the EU's total energy supply in 2018, the second largest share behind oil and petroleum products (Eurostat 2020). Natural gas may be the *cleanest* fossil fuel, but it is nonetheless a greenhouse-gas-emitting non-renewable source of energy. Members of the EU urgently need to phase it out of their energy mixes to meet decarbonisation targets (Anderson and Broderick 2017).

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This vast undertaking is impeded by its lock-in (Seto et al. 2016; Unruh 2000), given the deeply entrenched energy consumption practices developed over the past decades. It is a prominent, infrastructure-intensive, convenient energy carrier with well-established interests supporting its sustained consumption. Its lock-in is further consolidated by EU-level institutions and private corporations promulgating the discourse that substituting the consumption of other fossil fuels with natural gas is desirable, since it is a *transition* or *bridge fuel*. This chapter looks at how this dimension of the discourse on natural gas has evolved alongside the EU's rising climate commitments. It assesses how the narratives framing natural gas' relative cleanliness have impacted its role in the EU, driven by an understanding that these can codify its appeal and unnecessarily prolong society's reliance on it.

The climate-friendly qualities of natural gas tend to be overemphasised, *greenwashing* the resource (Stephenson et al. 2012). Statements hailing the *golden age of gas* (IEA 2011), or its *transition* and *bridge* qualities (Cañete 2017; MITEI 2011) are not squared with the EU's climate agenda, since it is unclear how the fuel will be phased out and what sort of pushback the hydrocarbon industry will initiate to prolong its consumption. This chapter assesses the European case because the European Commission has long been touted a leader in climate policy, in addition to which the region is highly natural gas-dependent (Oberthür and Kelly 2008). It offers a terrain to test how the natural gas industry has responded, and how the contradictions in narrative and material qualities of the fuel clash. The findings offer a more rigorous understanding of how the discursive inscription of a fossil fuel can perpetuate its consumption and vice versa. This informs our understanding of the dialectics between ideology and fossil fuel-based relations of production. Even if the Europeans consume natural gas in a manner compatible with climate change goals (e.g. in a decarbonised form), ambitions to attain sustainability are swapped for carbon neutrality, while existing power relations are sustained, leaving issues such as resource depletion or supply security unresolved.

This chapter builds on the critical discourse analysis of policy documents and statements of key stakeholders in the EU's natural gas scene, issued in the period between the Paris Climate Agreement (adopted in 2015) and 2019. Secondary literature and probing interviews led the author to select the time interval, which is based on the understanding that the Paris Agreement was a significant turning point in the EU's determination to decarbonise. In ensuing years, energy sectors and their respective incumbents undertook vast action to maintain their relevance in the bloc's future energy plans. A key element of this undertaking was their promulgation of key discourses in a number of reports, policy papers, position papers, public statements, etc. This chapter focuses on such texts published by key actors in the EU's natural gas scene, most prominently, the European Commission, Gazprom, Equinor, natural gas advocacy groups, and the work of prominent research institutions (e.g. the International Energy Agency [IEA]). The chapter is structured as follows: it first discusses the role ideology and discourse play in entrenching energy systems. To do this, it draws on energy humanities, which offers insights into how these modes of narrative creation and ideological inscription can sustain certain ideas, which, in turn, maintain prevalent relations of production and social power structures. To illustrate these

points, the chapter then turns to the early days of natural gas in the EU to untangle ideological drivers of its consumption, which leads to the exploration of the dominant transition and bridge fuel narratives a wide array of actors adopted in the late 1990s and early 2000s. The chapter subsequently traces the EU's unfolding climate agenda and the response that the natural gas industry and policymakers offered to the need to decarbonise their fuel.

5.2 The Role of Discourse and Ideology in Conserving Energy Systems

Discourses play formative roles in reifying or disintegrating the institutionalised social practices actors have adopted in relation to energy systems. Critical discourse analysis (CDA) delineates three analytical categories to trace these dynamics: text, discourse practice, and sociocultural practice (Fairclough 2013). The approach understands texts as multi-semiotic artefacts, as they combine language with other semiotic forms—think about a presentation which combines speech, written text, pictures, and so on. Texts manifest two fundamental social processes: cognition/representation and social interaction, leading them to form systems of knowledge and belief, social subjects, and social relations between subjects (Foucault 2012). These properties are also essential for actors' ability to promulgate ideology and inculcate subjects by diffusing meaning and connotation via discursive means mediated through language. Discourse practice is by-and-large constituted of the production, distribution, and interpretation of a text. Tracing this builds our understanding of the institutional and discoursal practices within which texts are embedded. Discourse practices mediate links between text and sociocultural practice, reflecting, reproducing, and transforming an imprint of the latter. These three analytical categories allow us to assess how texts and social practices form a dialectic, shaping one another.

Discourse is an articulatory practice dialectically constituting and organising social relations, which social relations recursively reify and transform (Howarth 2010). It is a manifestation of power and a vehicle of ideology that interpellates subjects through apparatuses and their practice(s) (Althusser 1971; Purvis and Hunt 1993). A material existence of ideology in practices enables powerful coalitions of actors to shape ideology through discourses per their normative and ethical positions, according to their broader strategies (Jessop 1991; Jørgensen and Phillips 2002). Currently, the structural setting underpins an ideology of fossil fuel-based capital accumulation (Boyer 2014). This is also reflected in the actions of the state, the outcomes of which are imprinted on the discourses emanating from the state's executive arm, the government (Barrow 1993; Johnstone and Newell 2018). The EU may not be a state per se, but the actions of its executive body, the European Commission, also reflect the broader structural setting of fossil capitalism and are susceptible to the interests of the fossil fuel industry (Szabo and Fabok 2020). Policymakers are ideologically interpellated and the discourses they emanate reflect this,

despite their (self-proclaimed) aim for neutrality. Policy language is a key form of discourse encoding dominant ideologies, as well as structural and strategic objectives or accomplishments of certain political coalitions (Hajer 1995). By deciphering policy discourse, we can trace the power relations it embodies.

Existing literature has typically focused on the socio-technical, economic, and political domains of energy, but it "is dialectical, operating at once on the level of infrastructure *and* on the level of superstructure" (Kinder 2016, p. 8; original emphasis). The energy humanities introduces an impetus for the need to focus on the ideological inscription of fossil fuels, thereby comprehending their deep permeation of social relations (Szeman 2016; Szeman and Boyer 2017; Wilson et al. 2017). Assuming a dialectic between the structure/infrastructure/base (relations of production) and superstructure (the political and the ideological) allows for a much richer understanding of the deeply embedded nature of our energy consumption practices. The energy humanities urges for the need to trace the ideological inscription of energy in the superstructure to map its deep-seated role in organising relations of production. Accordingly, this stream of academic work emphasises the need to unpack how fossil fuel-based capitalism has permeated all facets of our lives, from the economic to the cultural. Critical discourse analysis allows us to trace the discourses pertaining to energy consumption, and the intimate linkages they have formed with material practices and their embodiment of power relations (Fairclough and Graham 2002; Scrase and Ockwell 2010). This is especially pertinent given the urgent need to decarbonise our energy systems with the looming threat of climate change (Petrocultures Research Group 2016). The energy humanities has been heavily preoccupied with the role of oil and the *petrocultures* that it warrants, but this chapter argues and demonstrates that this focus should also be expanded to natural gas and possibly other fossil fuels as well.

Natural gas is a convenient, infrastructure-intensive source of energy that is the least emitting fossil fuel. These qualities have been fundamental in shaping its political economy and lock-in (Balmaceda 2018; Smil 2015; Unruh 2000). This has become evident in Europe, where decades of investment into the infrastructure and the political-legal apparatus governing the trade of the fuel have paved the way for its crucial role in the region's economy. The European Commission (1998, 2003a, 2009, 2015) has developed policy packages facilitating the creation of a competitive market for natural gas and has systematically included it into its visions for the bloc's energy future. There has been a widely accepted crucial prerequisite for this: natural gas is a clean (fossil) fuel. The statement may be based on the physical characteristics of the fuel, since it yields the least amount of greenhouse gas emissions upon combustion (IPCC 2006), but this idea has become an element of discourse that actors in the structural setting of fossil capitalism have welcomed, adopted, and reified to legitimise its heightened uptake. This leads to its imprint in the discursive events of the European Commission, which are subjugated to the ideological domination of the vast entrenched interests of the sector. In its discourses, the Commission codifies the positive connotation of the fuel, further inscribing this idea and fortifying its lock-in.

Fossil fuels underpin the operation of capitalism, but climate change and the ensuing global climate action are threatening these relations. Natural gas stakeholders

have long built on an understanding that their fuel's favourable characteristics will allow it to become a transition or bridge fuel to a renewable-based society. This has been a focal element of natural gas' ideological inscription manifest in the discourse pertaining to the fuel. Sectoral incumbents have actively backed this narrative to shape the fuel's future trajectory, which the Commission has also adopted, reflecting and reifying this ideology. Policy papers also reflect these power relations at play, suggesting their non-neutrality with regards to ideologies linked to certain fuels. A shift has occurred in this field since the bridge fuel narrative was increasingly questioned by policymakers en route to taking more drastic climate action. Fossil capital's relations of production remain intact, as natural gas sectoral incumbents have pushed to shift the discourse from one that favours natural gas as a bridge fuel, to one that emphasises the need to incorporate *gases* into the EU's energy future, shifting emphasis away from *bridge fuel* to an *end fuel*. In response to the crisis posed by climate change, the political coalition that the European natural gas industry constitutes has begun to alter the superstructure in order to sustain the structure of fossil capitalism.

5.3 The Early Days of the Cleanest Fossil Fuel

Since it became an important source fuel in the 1960s, natural gas has established a tremendous lock-in in the EU. It was initially locally consumed in gas-producing regions (e.g. northern Italy or parts of Austria) until the middle of the 20th century (Högselius 2012). Western Europe began to widely utilise it during the 1960s, when the Dutch developed the Groningen field and the United Kingdom began to exploit its offshore resources. An expanding energy-hungry European economy underpinned the fuel's uptake. The UK also viewed it favourably since it alleviated urban air pollution. Its acceptance amongst politicians and the broader public was predicated on their pre-existing favourable perception of town gas, which they had consumed since the early 1900s (Thomas 2018). Natural gas drew on the favourable perception Western European society had linked to town gas to establish its appeal, since it also offered a cleaner alternative to burning other fossil fuels—it yields lower levels of emissions during combustion, as well as low levels of sulphur and particulate matter (Smil 2015). These considerations became pertinent during the aftermath of the Great Smog of London in 1952, with ongoing air pollution crises sustaining through 1962 in the UK. The introduction of the Clean Air Act in 1956 and a push from urban areas to switch to cleaner sources of energy from polluting coal also favoured various forms of gas. The fuel's momentum continued during the 1970s, driven by rising environmentalism and a bid from countries to diversify away from oil to natural gas (Högselius 2013). The generally accepted favourable environmental characteristics of natural gas encoded in energy discourses boosted its uptake in Western Europe during the 20th century.

Countries in the eastern areas of the European continent also shifted to natural gas consumption during the 1960s and 1970s. This was supported by multiple dynamics.

On the supply side, Soviet leadership sought to diversify away from the lopsided oil reliance that the Eastern bloc had developed (Szabo and Deak forthcoming). Oil production in the Soviet Union was unable to meet the rapidly climbing energy demands of industrialising Warsaw Pact signatories, requiring leaders in Moscow to push for a diversification of fuels. Soviet and national governments framed natural gas as a modern, clean, and convenient source of energy. Additionally, they could draw on the existing popularity of town gas, as was the case in Western Europe. "By the early 1970s, Europe was seen to have 'fallen in love with natural gas'" (Högselius 2012, p. 167), which continued into the 1980s. The Commission of the European Communities noted that (1981, p. 5):

> [t]he considerable existing infrastructure this network represents is one of the advantages of natural gas. It is also transported unobtrusively and is environmentally attractive because of its cleanliness during use. It is a flexible and convenient fuel to use which also helps to explain its popularity in the domestic sector and in certain specialised industrial uses.

The fuel ticked all the boxes, allowing a discourse emphasising its favourable characteristics to proliferate, establishing a bedrock for its positive appeal.

5.4 Natural Gas as the Transition Fuel

Consumers have understood natural gas as a *smokeless* source of energy since the onset of its uptake, capable of alleviating air pollution and warranting its descriptor of the cleanest fossil fuel. Its appeal has expanded in recent decades since its physical characteristics allow the mitigation of air pollution *and* greenhouse gases (GHG) during combustion. The latter has become pertinent as the need for global society to take concerted action to tackle climate change rose on the global agenda. The Intergovernmental Panel on Climate Change (IPCC) was focal in compiling scientific work on climate change, since it published its *First Assessment Report* in 1990 (IPCC 1990). This publication continued the positive discursive coding of natural gas, emphasising the relative climate benefits that fuel switching from coal to natural gas would yield, while allowing countries to maintain economic competitiveness. Discourse on climate change proliferated following nation states' decision to launch the United Nations Framework Convention on Climate Change in 1992, expanding the number and scope of actors involved in climate governance (Paterson and Grubb 1992; Pettenger 2016). By this time, those with an interest in the fossil fuel industry understood that the objectives of fossil capitalism and avoiding a climate catastrophe were set to collide. Natural gas interests were isolated from these discussions, since expert opinions that countries should switch *to* the fuel and that it was the cleanest fossil fuel were set to provide it a buffer from climate action. Authoritative IPCC reports (1995, 2007, 2014) reiterated this position, emphasising the relative gains substituting more polluting fuels for natural gas could yield, but noting that methane emissions remained a hazard.

Experts established a discourse, later reified by the hydrocarbon industry and policymakers, that natural gas is a transition fuel leading society away from more polluting fossil fuels to renewables. Nebojša Nakićenović was amongst the first to use the *transitional* and *bridge fuel* descriptor for natural gas in a paper published by the authoritative U.S. Geological Survey in 1993 and subsequently reprinted by the International Institute for Applied Systems Analysis in 1994. He argues that the evolutionary dynamics of the global energy system suggest a move away from coal to less polluting fossil fuels. This hypothesis is supported by three factors: (1) a trend of fuel substitution favouring natural gas has begun; (2) it is the most environmentally and climate-friendly fossil fuel; and (3) it is available in abundant quantities. These led natural gas to become an optimal choice as a fuel en route to decarbonisation. Nakićenović's paper echoes the messages of the IPCC report, and concludes by claiming that "methane is the transitional hydrocarbon" and positing the "methane economy as a bridge to hydrogen" (1994, pp. 674, 672). The scientific and expert community established the descriptor that natural gas could be a bridge or transition fuel, but the hydrocarbon industry did not draw on it yet. Instead, it was preoccupied with a misinformation campaign to protect coal and oil assets (Banerjee et al. 2015), while industry incumbents perceived natural gas to be insulated from significant threats.

The material conditions warranting the active diffusion of a discourse emphasising the bridge fuel qualities of natural gas only came to the fore following the European Commission's (2008, 2011) decisions to launch its 2020 agenda and plans to decarbonise by 2050. Climate action remained subdued in the 1990s and early 2000s. The EU natural gas industry was preoccupied with energy security considerations: imports were increasing and tension between the Russian and Ukrainian governments rose—the latter culminating in the supply disruptions of 2006 and 2009 (Balmaceda 2013). These crises tarnished the image of Russian natural gas, but also weighed on the positive perception of the fuel in general, since the EU sourced a large portion of it from Russia. It took years of efforts to re-establish the positive standing of the fuel, to which its favourable environmental and climate qualities were able to contribute. Following the Commission's (2009) launch of the Third Energy Package and the resolution of the 2009 natural gas crisis, policymakers turned to the implementation of climate policy, backed by Germany's *Energiewende* (BMWI and BMU 2010). The hydrocarbon industry sought to reify the transition fuel narrative that had been paired with natural gas. The material conditions were ripe for the consolidation of a favourable discourse, since it became clear that the European Commission and its member states were going to take climate action. GasTerra—owned by Royal Dutch Shell, ExxonMobil, and the Dutch Government—was amongst the first to take action. It published an influential report titled *Natural gas as a transitional fuel: For a sustainable energy future* (GasTerra 2009), which sketched a natural gas-dependent energy transition through 2050 and beyond.

The natural gas industry took small steps to entrench a positive narrative paired with its fuel, but research institutions were the prime sources of impetus in the early 2010s. Again, material factors played a key role in development since the shale revolution in the U.S. kicked into full swing. Researchers and experts all over the

world began to heed more attention to the fuel's favourable qualities, given that its rising availability could allow it to play a focal role in the global energy transition, as envisioned by Nakićenović (1994). How the world was going to phase out the fuel was a question that very few raised, allowing fossil capitalism to *greenwash* its inherent unsustainability by relying on less emission-intensive fossil fuels (Byrne et al. 2006). MIT's Energy Initiative's prominent report *The Future of Natural Gas* (MITEI 2011) discussed natural gas as a bridge fuel, further codifying this descriptor. The message was amplified by the International Energy Agency's authoritative World Energy Outlook report proclaiming the forthcoming "golden age of gas" (IEA 2011). The IEA's position reflected the potential of U.S. non-conventional production and the boom it expected for global natural gas markets, but its position on prospects in Europe was slightly gloomier, although still upbeat. These positive discourses and the lack of imminent threats from the climate action of policymakers allowed the natural gas industry to believe that it was in a comfortable position with a bright future.

As soon as it became clear that the EU was serious about climate action, its largest natural gas suppliers began to take action: they emphasised the fuel's climate-friendliness. EU's largest natural gas supplier, the Russian Gazprom, first emphasised that natural gas could and should substitute coal to reduce emissions in its *2007 Environmental Report* (Gazprom 2007). It also expanded its regularly published reports with a *Sustainability Report*, launched with the 2008–2009 issue, emphasising the company's commitments to sustainability (Gazprom 2009). In the inaugural edition, it highlighted the beneficial qualities of natural gas in reducing emissions. The report emphasised that natural gas is the most "preferable component of the 'energy basket'" (ibid., p. 17) and incorporated, inter alia, Günther Oettinger's (Energy Commissioner at the time) viewpoint that "[a]s a relatively clean fuel, gas can contribute in a significant way to the sustainable development of our economies" (ibid., p. 44). Statoil—now known as Equinor—was also quick to discursively emphasise the need for natural gas in energy futures, with the "Fuelling the UK with The Telegraph and Statoil" op-ed campaign launched in 2012 (Statoil 2012). The move could be read as a campaign to capture Gazprom's markets, as the Russian supplier was deemed unreliable in the wake of the 2006 and 2009 supply disruptions. However, Statoil not only emphasised the benefits of Norwegian natural gas in these pieces but attempted to contextualise the fuel's beneficial qualities more broadly. These narratives were further backed by the European Gas Advocacy Forum (2011), which emphasised that natural gas is an integral part of the EU's *green* journey.

5.5 The Natural Gas Sector Responds to Climate Action

The EU upheld its leading role in global climate action by signing the Paris Agreement in 2015 and committing to *green* its energy mix, but the role natural gas would play came into question in 2015. The Paris Agreement provided supranational and national policymakers with an impetus to decarbonise their societies. The European

Commission translated broad commitments to reduce greenhouse gases into policy when it introduced the Clean energy for all Europeans package (2016). This proposed a framework for providing low-carbon electricity to consumers, predicated on extensive electrification and the diffusion or renewables. The Commission's plan offered a blueprint for the electricity and renewable sectors in the EU's future, but did not elaborate on the role of natural gas. This was a jolt for the natural gas industry, since incumbents realised that the EU was moving ahead with decarbonisation and, despite the positive inscription of their fuel, they may be left off the bandwagon. The natural gas industry deemed that it was in a secure position and engagement with decarbonisation policies could wait.

Following the release of Clean energy package, the Commission had to adjust its electrification- and renewable-dominated discourse to include other fuels as well. This shift was spurred by a push from technocrats, who emphasised that not everything can be electrified. Eurelectric (2018), the influential advocacy group of electricity producers, calculated that only 60% of the EU's economy can be electrified—anything beyond that would be extremely costly or technologically impossible. These forecasts maintained assumptions that the underlying disposition of capitalism would not be radically altered, but greened. Natural gas industry incumbents also mobilised their power by emphasising the beneficial qualities of natural gas in the short term *and* the ability to decarbonise the resource in the long run. Industry incumbents began to actively participate and propose energy futures for the EU, in which natural gas or its decarbonised variants would play a crucial role. They sought to shape policy by using their power to diffuse an ideology that responded to the irreconcilability of fossil capitalism and the threat of climate change. The industry followed a two-pronged strategy, first emphasising the bridge fuel qualities of natural gas, including its ability to complement renewables. Second, it turned to articulating that the fuel was decarbonisable and a valuable component of any energy future. The common thread between these strategies is their use of discourse to draw on the physical characteristics of the fuel in response to the material characteristics threatening their exploitation—climate action.

Experts reinvigorated arguments that natural gas is an optimal bridge fuel, given its ability to curb emissions and complement renewables (IEA 2017). Eurogas, the prime advocacy group for natural gas producers, claimed that coal-to-gas switching can curtail emissions by up to five percentage points (Braaksma 2018), while Statoil (2017) argued that such fuel switching was focal in underpinning the credibility of the EU's climate strategy. Commissioner Miguel Arias Cañete clearly articulates these points when noting that (2016, [n.p.]):

> [g]as will therefore play an important role in Europe's energy transition towards clean and more sustainable societies and economies because: natural gas pollutes half as much as coal, and will therefore serve as a bridge between more polluting fossil fuels and cleaner sources of energy; gas serves as a back-up to renewable energy sources; finally, it plays an important role in the decarbonisation of the transport sector as an alternative to fuel for trucks and ships.

The messages of experts that the natural gas industry had picked up began to surface in the positions of policymakers. Their statements heavily reflected the deeply entrenched ideology of fossil capitalism, given their backing of a fuel that would introduce a temporary technological fix to a deep societal crisis predicated on unsustainable modes of living. Policy discourse was not neutral; rather, it took a normative stance predicated on the ideological inscription of fossil capitalism that emphasised the relative benefits of natural gas amidst a climate crisis.

Fuel switching to natural gas may reduce emissions, but it also extends fossil capitalism as a primary mode of social organisation. Fuel switching carries numerous benefits, as has been clear from the onset of town gas consumption that alleviated air pollution. It could bring significant short-term air pollution and GHG improvements in coal-dependent countries such as Poland or Germany, a point that the U.S. shift away from coal to natural gas (on economic grounds) has underscored. However, the EU has not been able to replicate this, with the low prices of coal and CO_2 allowances inhibiting any significant switch (Stern 2017). This may be changing as allowance prices increase (Sandbag 2019), but simultaneously, the expansion of natural gas can be to the detriment of renewables. Natural gas can also reduce emissions in non-EU Emission Trading System (ETS) sectors such as transport or industry. Gazprom claims that "[n]atural gas is the most economical, eco-friendly and safe type of fuel available today [for vehicles]" (2018, [n.p.]), while shifting industrial coal consumption to natural gas also yields significant benefits (Smil 2015). Despite these benefits, it is crucial that actors pushing for the uptake of natural gas have presented few feasible scenarios for its phase-out in the future. Discursive acts emphasising the benefits of the fuel carry the risk of further entrenching unsustainable fossil fuel-based practices, even if they alleviate some emissions.

A further consideration when society opts to switch to natural gas is the risk of methane leakage. Natural gas may alleviate GHG emissions upon combustion in comparison to other fossil fuels, but methane leaks throughout its entire supply chain. Rising methane levels in the atmosphere accelerate climate change since the compound has a stronger greenhouse effect than CO_2. This is paired with a shorter atmospheric lifetime—decades as opposed to carbon dioxide's centuries—but it poses a significant risk in accelerating global society's nearing of climatic tipping points, ushering in the collapse of vast ecological systems. Total atmospheric methane levels are disputed, but generally increasing concentrations have been measured (Hausmann et al. 2016). The causes of this rise are contested amongst the scientific community but are—at least partially—linked to heightened oil and gas production. Approximately 2% of the natural gas-related methane produced slips into the atmosphere, exacerbating the climate problem (Balcombe et al. 2017). Slippage rates vary based on the form and location of production, but the IEA's (2018) findings suggest that higher global natural gas production leads to the exploitation of reserves that leak more methane into the atmosphere. These can be exacerbated with lifecycle methane emissions, which scientists have not yet quantified. For instance, methane slippage from shale gas production or the slips from carriers of liquefied natural gas (LNG) and LNG-fuelled ships are little understood (Anderson and Broderick 2017). The relative benefits of switching to natural gas consumption from other fossil fuels

are not trivial, since heightened methane emissions can exacerbate GHG emission concentrations in the atmosphere.

5.6 From Gas to Gases

The European Commission's post-Paris Agreement policies focused on the roll-out of renewables and a sweeping push to electrify the bloc's economy. This agenda pushed the natural gas industry to contemplate, formulate, and discursively articulate its own role in the EU's future energy mix. The transition fuel narrative provided some lift for the industry, following the realisation that the entire economy cannot be electrified. However, it increasingly became clear that the European Commission (2011) would uphold its earlier decarbonisation commitments, entailing an 80% or higher reduction of GHG emissions by 2050. The Paris Agreement and subsequent actions were an affirmation of this, indicating that the EU would phase out fossil fuels from its energy mix in their current form. The bridge or transition fuel discourse was not sufficient to ensure the future of natural gas, since now policymakers began to focus on what is at the end of the bridge, i.e. how a carbon-neutral Europe would look. In its current form, natural gas could not play a role in this, given its emissions. This position was underscored by a report commissioned by Friends of the Earth, unequivocally concluding that "[f]ossil fuels (including natural gas) have no substantial role in an EU 2 °C energy system beyond 2035" (Anderson and Broderick 2017, p. 5). Policy discussions turned to renewables and other low-carbon technologies, but (reflective of the entrenchment of fossil capitalism) it was not the phase-out of natural gas that came to dominate the EU's energy policy agenda, but rather what role it will play in the bloc's energy future.

The natural gas industry had to shift the bridge fuel discourse to an end fuel narrative to establish its inclusion in the policy-making process and thereby the EU's energy future. It linked two crucial caveats of decarbonisation to argue for its sustained role: (1) the EU's economy cannot be fully electrified; and (2) Europe has already invested billions, if not trillions, into natural gas infrastructure. The first point was made clear by Eurelectric's *Decarbonisation Pathways* report (2018), which allocated ample room for decarbonised sources of energy in difficult to electrify areas. Natural gas infrastructure owners also became aware that the shift towards an all-electric society would render their services redundant. They realised the need to convey their infrastructure as a component of a decarbonised energy sector, by emphasising that electricity should be complemented with (decarbonised) gas to meet energy demand. Limitations in electrification and arguments emphasising the efficiency gains of utilising existing gas infrastructure anchored the natural gas industry's concerted response to decarbonisation, by concluding that gas will be a part of the process. First natural gas can play the role of a bridge fuel, by offering a low-carbon substitute for more polluting fuels; then, producers can provide consumers with decarbonised gases. Sectoral incumbents shifted the bridge fuel of natural gas

to an end fuel by introducing decarbonised or carbon-neutral alternatives, such as biomethane or hydrogen.

The natural gas industry and policymakers began to plan the role of natural gas in the EU's energy transition, predicated on the role the fuel plays in mediating relations of production and the vast infrastructure that underpinned the industry's prominence. The discourse on the fuel was deeply rooted in the base of fossil capitalism. The pro-gas energy transition argument was clearly reflected in, for example, the positions of Gas Infrastructure Europe, an advocacy group for natural gas infrastructure owners. It claimed that (GIE 2019, p. [1]; original emphasis):

> [g]as infrastructure operators will continue to supply *reliable, clean, affordable energy* throughout the EU to 2050 and beyond […] [u]sing the existing gas infrastructure to deliver and store increased quantities of renewable and decarbonised energy, rather than build new electricity networks, will result in *significant cost savings*.

These sentiments surfaced in the positions of the European Commission as well (Borchardt 2019; Cañete 2017; Simson 2019). Most prominently, the European Commission-ordered study on *The role of Trans-European gas infrastructure in the light of the 2050 decarbonisation targets* developed storylines of how the EU's gas infrastructure can be utilised and transit various forms of gas, including natural gas, biomethane, and various forms of hydrogen (Trinomics 2018). These discourses bundle various forms of gases together and introduce them into the EU's energy future.

Key interests and policymakers reify the positive perception of gas, which has become a bundle of fuels, including decarbonised and emitting forms of methane. Strategic interests per the logic of fossil capitalism dictate that sectoral incumbents find ways to sustain the role of natural gas in the energy mix. A shift from a sole focus on natural gas towards gases achieves precisely this by expanding the discursive inscription of the fuel. Actors have expanded the term *gas* to include its decarbonised forms, essentially lumping its variants together under a single descriptor. However, the materialities of fossil capitalism suggest that these will still be dominated by the continued exploitation of natural resources. This has trickled into policy language as well. The European Commission states in its influential *A Clean Planet for All* communication (2018, p. 8):

> [s]ustainable renewable heating will continue to play a major role and gas, including liquefied natural gas, mixed with hydrogen, or e-methane produced from renewable electricity and biogas mixtures could all play a key role in existing buildings as well as in many industrial applications.

Here, the Commission discusses and includes LNG into the admixture of sustainable or decarbonised gases expected to play a key role in the EU's energy future. The discursive coding in policy language reflects the broader power relations at play, and the result of the systematic lumping together of gases undertaken by researchers, the industry, and policymakers.

To make matters more convoluted and thereby opaque, sustainable or renewable gases lack a comprehensive definition in the EU policy, and stakeholders are only

beginning to address the limitations of their production. Sustainable gases generally include biogas, biomethane, biomass fuels (gaseous and solid fuels produced from biomass), renewable liquid, and gaseous transport fuels of non-biological origin (e.g. renewable-based hydrogen used for transportation). While biogases are much discussed, the costliness of processing biogas into biomethane has generally led biogas to be consumed on location instead of being fed into the natural gas distribution network. This may change with the advent of sustainable gases, but biogas' potential upper production limit in the EU is expected to reach 98 billion cubic meters by 2050—less than a quarter of the EU's current natural gas demand—in a scenario favourable for the resource's expansion (Ecofys 2018). Thus, the fuel cannot be scaled up sufficiently to become the silver bullet of the energy transition. This suggests the need for renewable-based hydrogen production to become a key component of the gas admixture in order to legitimise its sustainable connotation. Otherwise, natural gas and decarbonised natural gas are set to appropriate the *sustainable* or *green* descriptor while maintaining the role of non-renewable gases in the EU's energy mix. Policy language accepts and encodes the substitution of carbon-neutral for sustainability.

A double dynamic is unfolding in EU policy language and the positions of sectoral incumbents, whereby gases are formally distinguished from one another, but their discourses with regard to their role in the energy transition are fused. Gas needs to be decarbonised for it to be consumed in the long run, but currently, *green gas* or *sustainable gas* is only applicable to a marginal fraction of the total gas currently produced. Despite this negligible role, sustainable gases legitimise the inclusion of gas (in a broad sense) into the EU's energy future. Non-renewable gases can draw on this form of discursive and ideological inclusion into the region's policy planning, fortifying their role based on the apparatuses linked to the superstructure of relations of production. Ultimately, fossil capital interests can leverage this additional source of power to maintain pre-existing fossil fuel-based relations of production and maintain a (decarbonised) fossil capitalism. This sort of narrative creation and ideological inscription is essential to untangle, given the material impact it carries on the future developments of the EU's energy transition. Policy language is not a neutral tool reflecting the decisions of the executive arm of the state, but much rather a medium susceptible to the influence of interests that wield structural power in society. It is a crucial medium that readily translates the narratives offered in a plethora of discourses backed by powerful interests into EU-led action.

5.7 Role of Sustainable Hydrogen Discourse in Legitimising Natural Gas Production

Society's ability to consume natural gas in the long term hinges on producers decarbonising the fuel, which is set to lead to their appropriation of a hydrogen utopia. Hydrogen has a lengthy history in which science fiction writers and various energy experts have understood it to play a foundational role in fuelling a sustainable society

(Zubrin 2007). Visionaries saw this high-density energy carrier as the silver bullet for meeting the global energy demand, given its lack of emissions and general convenience (IEA 2019). A hydrogen utopia is, however, reliant on the mode of the fuel's production. This can be based on the electrolysis of abundantly available water, with necessary electricity generated from renewables (green hydrogen) or fusion nuclear reactors. Such a positive narrative dates back to Jules Verne's *The Mysterious Island* (1874) and Max Pemberton's *The Iron Pirate* novels (2008), and has been a recurring theme in science fiction[1] (Cassedy 2000; Romm 2004). Scientists and other experts have also dwelled on a hydrogen utopia and proposed a multitude of grandiose schemes, in which renewable or nuclear fusion-based energy is stored and carried in the form of hydrogen (Hoffmann 1981). This long-standing history has been essential in establishing hydrogen as the *ultimate fuel* (Dell and Bridger 1975). However, society has made little progress in widely adopting hydrogen, given the unfettered fossil fuel consumption that recent centuries have been interlaced with.

Policymakers of the European Union have also been strong proponents of hydrogen, dating back to the early 2000s. During the inauguration of the High Level Group on Hydrogen and Fuel Cell Technologies, Research Commissioner Philippe Busquin claimed that (European Commission 2002, [n.p.])

> [u]p until now in the 'fossil fuel civilisation', we have been trying to strike a balance between the need to foster economic growth and at the same time to ensure this has a minimum impact on the environment. With an extensive use of hydrogen as an energy carrier, this conflict will be resolved.

The Group was launched as an informal advisory body to the European Commission and argued that hydrogen is an ideal energy carrier that should be paired with renewable electricity generation, nuclear-based energy, and carbon capture and storage (CCS)-equipped fossil fuel combustion to meet the energy demand of EU member states (European Commission 2003b). This yields an energy system that ensures energy security, underpins economic competitiveness, improves air quality and health, and reduces greenhouse gases. Policymakers followed this initiative by establishing the Fuel Cells and Hydrogen Joint Undertaking in 2008, which they extended in 2014 (Council of the European Union 2008, 2014). Most recently, they reconfirmed their commitment to hydrogen by launching the non-binding Hydrogen Initiative (EU Energy Ministers 2018). These attempts underpin the EU's continued positive framing of a (sustainable) hydrogen society which has become entrenched in the superstructures of the bloc's energy future but offers little indication of the source of hydrogen.

In contrast to the hydrogen utopia envisioned by many, hydrogen is already a key element of industrial production and is primarily linked to the oil and natural gas sector. Dedicated pure hydrogen production amounted to 73.9 million tonnes in 2018 and was consumed by the oil refining (52%), ammonia production (43%), and other (5%) sectors (IEA 2019). Producers overwhelmingly rely on steam methane reforming to produce hydrogen. This yields H_2 and CO_2, where CO_2 can either be

[1] See, for example, Ben Bova's *Return to Mars* (2010).

released (grey hydrogen) or captured and stored (blue hydrogen). CCS is a technology that has been very slow to materialise, due to its shaky economic foundations, relatively low levels of investment, and social unacceptability of storing CO_2 in geological formations (Herzog 2018). The impediments sustain despite CCS being a mature technology, first applied in natural gas and oil production, with the CO_2 from burning (associated gas) during natural gas processing being used for enhanced oil recovery already in 1972. Nonetheless, "the global portfolio of CCS projects is not expanding at anything like the rate that would be needed to meet long-term climate goals" (IEA 2017, p. 61). There is a discrepancy between the actual development and deployment of CCS, and the proliferating discourse placing an emphasis on the need to deploy the technology to meet climate agreements, which also limits the ability of companies to deploy the technology and produce carbon-neutral blue hydrogen.

Oil and natural gas companies have nonetheless deployed strategies to capture the notion of a sustainable hydrogen utopia. This is a crucial component of their discursive switch from gas to gases, whereby their products (natural gas and blue hydrogen) are still set to dominate the bundle of gases that customers consume in forthcoming decades. Europe's second largest natural gas supplier, Norway's Equinor, has placed strong emphasis on the narrative that hydrogen is a long-term solution to the EU's energy needs (Eikaas 2017; Equinor 2020; Szalai 2017), which it can readily capture given its vast natural gas deposits and infrastructure, experience with CCS, and ventures in steam methane reforming. The firm currently leads multiple hydrogen projects in Europe (e.g. H21, H-vision, Magnum, and the Net Zero UK partnership) that it claims will help the EU in executing its energy transition (Equinor 2020; European Commission 2017). Equinor's largest competitor, Gazprom, has sought to eliminate the need for CCS by developing methane pyrolysis (methane cracking), a nascent technology that splits methane into carbon and hydrogen without combustion (Weger et al. 2017). Pyrolysis is becoming a hedge for Gazprom's strategy, as it allows the Russian firm to further exploit its natural gas reserves and utilise its infrastructure in a decarbonised era (Shiryaevskaya 2018). Accordingly, it has begun to discursively back the narrative of a blue hydrogen economy by underlining its ability to utilise current infrastructure, maintain a cost-competitive energy source for the EU's economy, and help the bloc meet its climate targets (Burmistrova 2018).

5.8 Conclusion

The European Commission and the national governments of the European Union have positioned themselves as frontrunners of climate action, but this has been paired with them consistently framing natural gas in a favourable light. They have linked a bridge fuel narrative with natural gas and emphasised that it is the cleanest fossil fuel. By assessing the texts produced by key sectoral incumbents (e.g. European Commission, Gazprom, Equinor, and advocacy groups), the discourse and sociocultural practices shaping these discourses, we see that they embody the core ideological tenets of

fossil capitalism. The discourses emanating from the EU's executive arm are reflective of the power struggle taking place in society, whereby fossil fuel interests seek to respond to the climate crisis, posing an existential crisis to their operations. Expert opinions and inputs of the fossil fuel industry are discourse-constituting, and capable of shaping the specific positions and texts that the executive arm of the EU conveys in its discourses. The subjugations of the Commission to these positions reflects the broader structural setting, where the fossil fuel capitalist relations of production seek to shape the superstructure through a medium that many understand as neutral—policy language. In turn, the discursive events pave the way for a structural sustainment of fossil capitalism by creating and consolidating a narrative that enables the continued exploitation and consumption of fossil fuels. It is crucial to unpack the ideological inscription of these fossil fuels in order to identify the constituents that potentially hinder an energy transition. The presumption that natural gas is a bridge fuel poses such a risk. It is a "bridge to nowhere" (Howarth 2014).

The EU's ambitions to decarbonise its society have rendered the bridge fuel narrative problematic, leading stakeholders to alter this discourse. We see that fossil capitalism's relations of production are left intact or subject to slight change, predicated on actors and political factions altering constitutive elements of the superstructure. They have shifted the prevalent ideology from the discursive inscription of emphasising the cleanliness of natural gas to one that bundles natural gas with other gases. Biogas, various forms of hydrogen, and natural gas are conflated into a category which maintains the favourable perception of gas as a fuel. This is essential for policymakers to include natural gas in the region's energy future since they lump it together with sustainable or decarbonised gases. They can formally distinguish between these fuels, but this prolongs the lock-in since they continue to presume the availability of the fuel and its infrastructure, both of which further its lock-in. Stakeholders have also begun to develop technologies and proliferate discourses that emphasise that they can decarbonise their fuel to ensure markets for it in the forthcoming decades. This maintains fossil capitalism's structure, while, once again, slightly altering the infrastructure by shaping ideology and politics. Entrenched power relations of fossil capitalism have now begun to appropriate the narrative of a sustainable hydrogen society, enabling their continued operations with relatively little change. The ideological inscription of the discourse embodied in the gas-dependent energy future of the EU creates a narrow path for change, leaving power relations essentially unmodified. By shaping the EU's energy future, these sectoral incumbents are able to secure their sustained existence.

This chapter set out to explore natural gas' changing discourse in the EU at a historical juncture when the contradiction of fossil capitalism and climate change began to unfold. By tracing the ideological and discursive inscription of descriptors society has linked to fuels, this research to convey just how deeply entrenched certain fossil fuel systems are. Their lock-ins are not only limited to the sociotechnical or political economic realms, but, as the energy humanities have consistently pointed out, go much deeper: they form a dialectic with ideology and culture. A fuel's role in a specific mode of social organisation is manifested in a plethora of forms, ranging from artistic endeavours, through media products, to what is frequently perceived

as a neutral medium—policy language. Unpicking how powerful actors frame and discuss various fuels in policy language can enrich our understanding of how their actions are subjugated to specific ideologies and how they reify these positions. While oil has typically been the object of the energy humanities, the analytical insights researchers have derived from inquiries can be applied to enrich our understanding of other (fossil) fuels as well.

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Chapter 6
Best Practices in Effective Climate Policy Implementation, Governance, and Accountability: The UK Committee on Climate Change

Michael (Mishka) Lysack

Abstract The chapter examines the best practices in effective climate change policy implementation, governance, and accountability, using the UK Committee on Climate Change (CCC) as a template. While some countries (e.g. Canada) are struggling to meet their international climate change commitments for reducing emissions and transitioning to a renewable energy economy, the UK—thanks to its Climate Change Act 2008 and the CCC—has made significant progress in implementing effective climate policies with mechanisms for policy accountability and transparency. The chapter starts by emphasising that effective climate policy must move from a quantitative density of policy fragments to a combined quantitative and qualitative intensity of policies via integrated policy design and implementation. It then analyses the advances made in the UK over the last decade, including the decarbonisation of its electricity sector with a significant increase in the GDP. It also examines the key building blocks and structural elements of the UK CCC which constitute the best practices in effective climate policy and governance, evident in GHG emissions reduction in some sectors, especially offshore wind energy and waste. The chapter also considers the past shortcomings and future challenges of UK's climate progress in reducing GHG emissions, as well as emerging opportunities for moving forward in meeting the country's climate targets. Finally, it underlines the increasing threats of climate change and explores the pathways and policies that would accelerate climate adaptation and enhance climate resilience.

Keywords Effective climate policy · Accountability · Transparency · Energy transition · UK committee on climate change · Climate change act 2008

6.1 Introduction

In their influential article calling for the rise of energy humanities, Boyer and Szeman write (2014, [n.p.]):

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> As the fact that humanity has entered a new geological era, the Anthropocene sinks in, experts and public across the world are wondering: how can we cope with a rising demand for energy when our current portfolio of energy sources is already inducing global warming, ocean acidification and climate change?

The two lead thinkers in the field of energy humanities thus provide us with an excellent and thought-provoking question: how will we be able to address climate change effectively when we continue to use the fossil fuel energy sources that created the problem in the first place? These forms of energy are woven into the fabric of our daily life not just as fuel sources, but also as material for our contemporary societies.

Along with other disciplines, climate science has provided a clear and detailed series of insights into and a deeper understanding of how the accelerating impacts of climate change are dangerously approaching their irreversible tipping points (Lenton et al. 2019), significantly impacting not only our lives as human beings, but also the web of life on Earth, which also includes environmental communities of plants and animals that populate the planet alongside us. This reality necessitates deep changes in our energy systems, economies, and societies, which are dependent on energy to continue functioning. However, as we shall see from our explorations of two countries (Canada and the UK) seeking to meet their own climate change commitments and whose political leaders have publicly expressed concern about climate change, this knowledge does not always translate into action.

Clearly, this inaction is not due to a lack of scientific data; rather, this chapter argues that it stems from a lack of effective climate policy implementation, accountability, and transparency, all of which locate the present discussion in the realm of both the social sciences and the humanities. While the chapter opens with an account of the difficulties and challenges of implementing an effective climate policy in Canada, its primary goal is to explore the key building blocks and operating principles of the UK Committee on Climate Change (CCC), as implemented by the passing of a ground-breaking legislation—the Climate Change Act (CCA) 2008.

In this context, the energy humanities—an area of research increasingly "being recognized by the sciences, by government, indeed by industry" (Boyer and Szeman 2014, [n.p.])—and the humanistic social sciences can help highlight the crucial role that politics and policy studies can play in addressing effective policy development and implementation, and political decision-making for countries, states, and cities. Could the energy humanities and humanistic social sciences be of assistance in making sense of the challenges, and offering pathways and resources for addressing the climate change inaction? Boyer and Szeman offer an intriguing proposal: "What we energy humanists contend is that today's energy and environmental dilemmas are fundamentally problems of ethics, habits, values, institutions, belief, and power—all traditional areas of expertise of the humanities and humanistic social sciences" (ibid.). Several of the areas identified by Boyer and Szeman provide substance for the exploration of public policy addressing climate change, which should assist governments taking action to transition to a sustainable renewable energy economy. This chapter therefore addresses the challenges faced by governments when taking decisive and necessary action to implement effective climate policy, including governance practices of accountability and transparency.

The chapter aims to provide an overview of the key goals, operating principles, and building blocks of the UK CCC and its foundational legislation, the CCA 2008. It discusses the acknowledged strengths of the CCC's approach, its limitations and shortcomings, and opportunities/needs for modifying the Committee. Furthermore, it argues that climate policy in countries and states addressing climate change and transitioning to a sustainable, renewable, 'net-zero' energy economy is unlikely to be effective and succeed in meeting the set targets, unless the key elements of the UK CCC, with its stress on accountability and transparency, are replicated. Indeed, it is clear that the UK CCC is now regarded as an international standard for effective climate policy enactment and implementation (cf. Averchenkova 2019; Averchenkova et al. 2018; Fankhauser 2018; Muinzer 2019). Finally, the chapter examines the need for effective climate policy to move from a mere quantitative density of policy fragments to a qualitative intensity in climate policy design and implementation (Goertz et al. 2016; Schaffrin et al. 2015).

The research question that traverses the chapter is: what are the key constituents of the UK CCC and in what ways do they enhance policy enactment? Furthermore, are they necessary for the effective implementation of a climate change policy, along with the key governance principles of ongoing and sufficient accountability and transparency of effective climate policy enactment? In its approach, it draws more from the humanities and literary studies than the social sciences. As such, it aims to contribute to the energy humanities and humanistic social sciences by enhancing our understanding of the necessity of effective climate policy implementation with accountability and transparency, and how this has been accomplished by the UK CCC. In this way, this research "shows that the humanities are contributing directly to the solution of an immense 'real world' social problem: how to find our way to a sustainable energy future" (Boyer and Szeman 2014, [n.p.]).

6.2 Challenges of Effective Climate Policy Implementation in Canada: Need for Policy Accountability and Transparency

It was the convergence of two events—the first on 1 April 2019, the second on the following day—that, when viewed together, formed an intersection or, perhaps collision that possessed an almost Shakespearean texture of tragedy and irony. First, on 1 April, a report from 43 university researchers and government scientists in the Canadian Federal Government Ministry of Environment and Climate Change Canada (ECCC) warned that Canada's climate has warmed twice as quickly as that of the rest of the world. The warming, the report claimed, was driven by greenhouse gas (GHG) emissions, especially in Canada's North, and would continue. The prospects are both disturbing and sobering, indicating a serious concern on the part of government scientists who researched and wrote the report. With a continued increase of emissions in the future, scientists predict that climate change in Canada

will continue to get worse with accelerating impacts on the entire country, including increased annual and winter rainfall with greater flooding, a new normal of greater fires and heat waves, continuing loss of ice and snow, rising ocean levels and greater coastal flooding, increased risk of water shortage, and increased negative impacts on marine life and ecosystems (Meyer 2019). The report concludes that scenarios with limited warming will only be possible in case of serious and sustained reduction of GHG emissions.

Fast forward to the next day: on 2 April 2019, the Federal Commissioner for the Environment and Sustainable Development in the Auditor General's Office Julie Gelfand and three of her Principals (audit team leaders) presented their reports to the Canadian public. Commissioner Gelfand's comments on the inadequate development and implementation of effective public policy in reducing Canada's GHG emissions and transitioning to a sustainable renewable energy economy were as clear as the scientists' comments in their report on the preceding day. The Commissioner also "criticized successive federal governments, saying their failure to cut emissions is 'disturbing', and urged greater action to tackle what she called one of the biggest challenges facing humanity" (Lewis 2019, [n.p.]). Despite the reassurances of political leaders, such as Environment and Climate Change Minister Catherine McKenna and Prime Minister Justin Trudeau, that Canada is making progress as an international climate-change leader in reducing GHG emissions, Gelfand pointed out the country was not on track to meet its climate goals. Namely, "Canada has committed to slash carbon emissions 30% below 2005 levels by 2030, but the most recent federal projections show emissions will be only 19 per cent lower by then under the most optimistic scenarios" (ibid.).

Following each other in quick succession, the two events pose a key question for climate action policies and the effectiveness of climate governance structures in Canada, including their transparency and accountability. To be sure, the country is not alone in its struggle with the challenge of effective climate governance, and the implementation of an efficacious and impactful climate policy. Indeed, a recent study indicates that Canada's Nationally Determined Contributions (NDC) place Canada in the same group as China and Russia, with a projected global emissions scenario of 5.1 °C of warming by 2100 (Robiou du Pont and Meinshausen 2018). Reflecting on the significance of this research, Jonathan Watts, the global environment editor for the *Guardian*, points to the (2018, [n.p.]):

> major energy exporters who are doing almost nothing to limit carbon dioxide emissions. These include Saudi Arabia (oil), Russia (gas) and Canada, which is drawing vast quantities of dirty oil from tar sands. Fossil fuel lobbies in these countries are so powerful that government climate pledges are very weak, setting the world on course for more than 5C of heating by the end of the century.

All this research suggests that, at present, Canada does not possess a sufficiently robust climate action strategy. Moreover, it is characterised by a vacuum of effective public climate leadership in the political/governmental sphere, especially if the oil sands in Alberta (see the chapter by Spady and Angus in this volume), which constitute a significant portion of the country's total emissions, are permitted to continue generating significant amounts of GHG emissions.

After examining the Government of Canada's 2018 report on GHG and air pollutant emissions projections, investigative journalist Barry Saxifrage noted that (2019, [n.p.]; emphasis added):

> The gap between Canada's proposed climate efforts and its 2030 Paris Agreement target has grown even wider in the last year. The federal government is now predicting a gap larger than all emissions from the province of Quebec. […] Canada's actual emissions are projected to be even higher than that: 115 Mt CO_2 above their 2030 Paris target, or *less than halfway to the target*. […] [T]he latest report shows that Canada is on track to miss its 2030 climate target by a large and growing amount.

Canada's climate goal is to reduce CO_2 emissions to 30% below 2005 levels by 2030 or achieve an annual emissions reduction of 220 million tons (Mt) of CO_2. Not only is the country on track to miss its target, but its 2030 emissions reduction objective is not in accordance with the recent and more stringent climate emissions target currently recommended by UN climate scientists, which holds the average global temperature rise at no more than 1.5 °C.

Taken together, all these events highlight the inadequacy of existing climate policy infrastructure and pose a key question: what changes does a country like Canada (and many others) need to implement in order to achieve both its own target for 2030 and the important UN target of reducing GHG emissions by 45% below 2010 levels by 2030 (IPCC 2018)? What institutional changes in the current government policy regime would be necessary to restructure and reconfigure climate governance in order to enhance its efficacy and effectiveness in addressing climate change? If Canada or any other country decided to meet or exceed it GHG emissions goals, thus becoming a climate-change leader, what changes would be needed in its climate policy structure, processes of setting science-based targets, and the implementation of legal and regulatory changes and infrastructure? What additional climate policy, governmental structures, and legislation would be for its climate change policy implementation to possess accountability and transparency?

This prompts another question: which countries currently possess the highest quality of climate policy implementation and could therefore serve as role models for countries such as Canada? Research indicates that the UK currently has the best climate policy legislation to achieve these goals globally. In fact, researchers at key climate policy institutes, such as the Grantham Research Institute on Climate Change and the Environment at the London School of Economics, have documented how these practices are now used internationally as a key heuristic tool to assess the climate policy and governance capacity of other countries (Averchenkova 2019). This chapter will therefore examine the key features of the UK CCC and its foundational CCA 2008. It asks how these elements have provided a foundation for not only effective climate policy, but also the critical elements of transparency and accountability. But first, the chapter explores another helpful measurement of effective public policy on climate change which includes both *density* or quantity of policy measures, and policy *intensity*, which centres on integrated and coordinated policy building blocks and a monitoring structure. As such, it provides a useful tool for strengthening the effectiveness and efficacy of governmental climate policy in achieving its goals.

6.3 Effective Climate Policy: Moving from Quantitative Density to Qualitative Intensity

Public policy in any area, including climate change, frequently involves purely numerical and quantitative random collection of unrelated and fragmented polices with little to no focus or integrating framework. It is this feature of *policy density* that often prevails as the dominant policy approach, and is perceived to be the norm for public policy development and operationalisation. Colten Goertz, Kelechi Nwanekezie, Martin Boucher, Miranda Gouchie, and Tyler Koebel insist that such a "measure can be misleading. For example, it would suggest that a large number of weak instruments—such as education campaigns and voluntary agreements—are superior to a small number of far more effective instruments, such as strict regulations and binding agreements" (2016, [n.p.]). Instead, public policy researchers and developers need to include both *policy density* (the number of measures) and *policy intensity*. In their research aimed at developing a methodology for assessing policy output, André Schaffrin, Sebastian Sewerin, and Sibylle Seubert identified "six policy-intensity measures (objectives, scope, integration, budget, implementation, and monitoring), which are used for weighting national policy instruments on an Index of Climate Policy Activity" (2015, p. 257). Through a comparative analysis, they determined that these findings provide "a reliable and valid measurement for national policy output that can be applied for comparative analyses of policy output" (ibid.).

In examining the role and contribution of policy innovation in the initial development of public policy centred on climate mitigation, Schaffrin et al. (2014) analyse the role of policy innovation in the development and effectiveness of national climate and energy policy portfolios in Austria, Germany, and the UK. Unlike Austria, "German and UK policy portfolios remained highly innovative over a longer time period", expanded via policy innovations which introduced "new types of policy instruments" (Schaffrin et al. 2014, p. 875). Furthermore, the climate policy innovations in both countries gathered in larger policy packages. In contrast, the innovations in Britain "seemed to be more symbolic and experimental but contribute a larger scope and more resources to the policy portfolio" (ibid.).

More recently, Goertz et al. (2016) utilised a similar methodology of combining policy density and policy intensity to compare the effectiveness of climate policy in Germany, Australia, and Canada. Their research reveals that both Canada and Australia had a higher qualitative number of active climate policy instruments (policy density) than Germany. Despite this, Germany has been perceived as a climate leader, whereas both Canada and Australia have been criticised internationally for their lack of effective climate policy and mitigation, as well as their consistent pattern and history of missing their climate mitigation targets. Germany possesses a lower policy density, but higher policy intensity and more ambitious (while also quite feasible) policy initiatives when compared to both Canada and Australia, and has received more international praise for its track record in climate protection. In 2000, Germany's Federal Government (*Bundestag*) introduced an innovative market redesign through

its Renewable Energy Act (*Erneuerbare Energien Gesetz*), which encouraged ordinary Germany citizens and communities to become new and empowered direct stakeholders (and shareholders) in the emerging renewable energy economy. The Government also implemented climate targets and timelines, while providing organisation on the federal level by coordinating climate action with the 16 German federal states (*Länder*), numerous cities, and municipalities, as well as ensuring those states and cities receive financial resources and personnel. Goertz et al. (2016) consider this coordination key for achieving high policy intensity. What is more, the country's "national strategy uses policy instruments with clear objectives, emissions targets, budgets and monitoring. In short, central oversight by the German federal government has been vital to the success of the country's climate change policy outcomes" (Goertz et al. 2016, [n.p.]).[1]

Countries such as Germany, Denmark, and the UK possess effective climate mitigation policy frameworks. While they share certain common characteristics such as a balance between policy intensity and policy density, Germany, Denmark, and the UK have also developed unique approaches and distinctive features in their climate action policy constellations and their implementation, worthy of further examination. This chapter focuses on the features of the UK approach and examines the building blocks, key structures, and processes of the UK CCC, as well as its legislation, the Climate Change Act 2008 (CCA 2008), structure, emission targets, and five-year carbon budget. Finally, it considers the tools of an effective climate change policy framework that enhances climate policy development and implementation, as well as climate governance accountability and transparency.

6.4 UK Climate Change Committee, Climate Policy and Climate Governance: Key Building Blocks and Structural Elements as Best Practices

In November 2008, the UK Parliament at the time of Prime Minister David Cameron's Conservative Government passed what would prove to be a highly influential piece of climate change legislation with strong cross-party support—the Climate Change Act. With this, the UK became the first country in the world to introduce long-term, legally binding targets to address climate change. Since its implementation in 2008, many other countries have modelled their national climate change legislation on the UK's CCA, including Sweden, Finland, Denmark, Mexico and, most recently, New Zealand (Averchenkova 2019; Muinzer 2019, pp. 97–98), highlighting its influence on international climate change policy and governance. The CCA 2008 also reflected the growing awareness that effective climate legislation requires *cross-disciplinary* and *cross-ministry* collaboration, as well as long-term commitment that would span

[1] For an overview of Germany's approach to effective climate change policy and opportunities for Canada and other countries to move in that direction, see Lysack (2019a, b).

decades—no mean challenge given the tendency of governments to be more oriented towards short-term action.

The innovative nature of the CCA 2008 and the UK CCC is evident in nine key building blocks, all of which are needed to enable the structure as a whole to function effectively. First, the UK was the first country to place a legally binding and scientifically grounded long-term commitment on the Government to oversee the country's GHG emissions reduction by a minimum of 80% by 2050. The priority of this part of the CCA 2008 and the CCC infrastructure is to increase climate ambition and ensure that ambition was met or even surpassed (to decrease the probability of a climate catastrophe).

Second, the CCA 2008 has also created a policy framework for the long-term objective of reducing GHG emissions, committing the UK to a sequence of legally binding five-year carbon budgets, which function as a clear reference point by which the ongoing emissions reduction efforts may be compared, measured, monitored, and tracked. The carbon budgets not only contribute to the effective monitoring, reporting, and verification (MRV) of the climate change mitigation policy implementation for the country, but they also provide certainty and stability for the business sector/investors and the community-at-large, as well as subnational governments (states/provinces, cities) to encourage certainty regarding climate governance and regulation. Moreover, they help generate a climate of stability for economic investment and innovation.

In order to facilitate this short- and mid-term certainty, the legislation stipulates that the five-year carbon budgets must be established and made public a minimum of 12 years in advance of their actual implementation. This not only enables more effective government planning and implementation, but also enhances investor certainty and confidence, while encouraging innovation. The five-year carbon budgets of reducing GHG emissions are as follows: 2008–2012: −25% Mt of CO_2 equivalent; 2013–2017: −31%; 2018–2022: −37%; 2023–2027: −51%; 2028–2032: −57%; and 2050: −80% (Averchenkova et al. 2018, p. 5). It should be noted that climate leaders, scientists, and researchers (including those in the UK CCC; see Stark 2019b) around the world are re-examining and re-formulating the 2050 target in light of recent findings regarding the accelerated pace of climate change, and the increasingly imminent likelihood of the irreversible and catastrophic crossing of key planetary climate tipping points (Lenton et al. 2019).

Third, the CCA 2008 established the CCA as an independent agency which has three main tasks. First, it provides the Government with evidence-based advice and information on how the scientific, societal, and economic targets of the carbon budgets may be successfully achieved. Second, it monitors and annually reports to the Parliament and the public on the progress being made (or not being made) towards meeting those targets and carbon budgets. It works towards dealing with barriers and obstacles, and offers solutions for meeting the GHG emissions objectives and carbon budgets. Third, it demands discussions of CCC reports and their assessments in the Parliament and the public domain. Not only do these features of the UK CCC serve to increase the transparency and accountability of the Government in successfully realising climate change objectives, but they also support and

increase the ambition of Government and other sector leaders to achieve their goals, and enhance the effectiveness of their climate mitigation and adaptation strategies.

The fourth key building block of the CCA 2008 stems from its amendment, so that the GHG emissions targets for the UK would not consist of CO_2 alone, but would include all the GHG emissions originally identified in the Kyoto Protocol (1997): CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. Fifth, the climate mitigation objectives apply to all sectors of the UK economy and do not exclude any specific sector. In the UK, the monitored sectors include energy, waste, transport, industry, the heating/cooling of buildings, agriculture and land use, and fluorinated or F-gases.[2] This cross-sector approach, combined with the five-year carbon budgets, provides the flexibility for some sectors to rise above the mitigation goals, but only as long as other sectors make GHG reductions above the target to compensate for the excessive emissions in a particular sector or subsector. Since the original setting of sector targets, the UK Government also extended transport emission targets to include emissions from international transport, such as aviation and shipping.

Sixth, the UK CCC also endorsed certain objectives regarding the amendment of GHG and climate mitigation objectives, in light of scientific evidence that the Earth is getting warmer and GHG levels are rapidly increasing. At the time of launching the CCA 2008 and the CCC, two priorities were endorsed: keeping global warming as close as possible to an increase of no more than a 2 °C over 1990 levels and minimising the risk of a possible climate catastrophe, i.e. reaching <1% probability of moving beyond a 4 °C temperature rise, all of which were consistent with the scientific evidence available at the time (see, e.g., Meinshausen et al. 2009). These climate mitigation targets are now being reviewed by the CCC and the public in light of more recent scientific data of an accelerated rate of climate change and global warming, as well as the recommendations from both UN Intergovernmental Panel on Climate Change (IPCC) scientists and the scientific community as a whole (see, e.g., Robiou du Pont and Meinshausen 2018) to make 1.5 °C rise the maximum limit with an accelerated time line for stabilising and reducing GHG emissions prior to 2030 (reducing GHG emissions by 45% relative to 2010 levels by 2030).

Seventh, since the establishment of the structure of the five-year carbon budgets, it appears they have addressed and diminished the initial fears and concerns that effective climate mitigation would be delayed until later in the time span leading up 2050. The structure of the carbon budgets has therefore served to increase the accountability and transparency of the actual implementation of climate mitigation, and enhanced the probability of a steady progress towards overall climate mitigation objectives by clarifying that the five-year carbon budgets targets are both technically and economically feasible (Fankhauser et al. 2009, p. 205).

Eighth, the CCC and other researchers continue to examine the potential broader social and economic impacts and ramifications of the UK climate mitigation strategy. At the inception of the implementation of the climate mitigation strategy, they

[2] 'F-gases' are a group of powerful human-made gases/GHGs used in a diversity of household and industrial applications, including refrigeration, with a global warming impact up to 23,000 times stronger than CO_2 (their emissions are rising quickly).

concluded that "the UK could meet the proposed carbon budgets at a cost of less than 1% of GDP" (Fankhauser et al. 2009, p. 206). Ninth and last (but certainly not least), the UK has achieved the striking goal of significantly reducing its GHG emissions while also substantially increasing economic wealth and development, thereby decoupling the rise in GHG emissions and other pollution from economic development. "Measured from 1990, emissions have now fallen by 43%, over a period when the economy grew by over 70%. This is the most substantial emissions reduction in the G7, over a period when economic growth was above the G7 average" (Committee on Climate Change 2018, p. 14), and is in itself quite a significant accomplishment.

6.5 Ten-Year Progress in Reducing GHG Emissions Across Sectors in the UK

6.5.1 A Retrospective Analysis of Advances in the Last Ten Years

Building on the establishment of the CCC and the legislation of long-term GHG emissions targets in the CCA 2008, the UK Government proceeded to legislate the first five carbon budgets (2008–2032), which necessitate the reduction of GHG emissions by 57% by 2030. To date, the UK has successfully met and even exceeded the first two carbon budgets (2008–2012 and 2013–2017) and is well positioned to meet the third one (2018–2022). Since the country initiated its emissions reductions under the CCA 2008, it has succeeded in lowering its GHG emissions by 42% below 1990 levels by 2016 (see Committee on Climate Change 2018). In that same period, the country's economy grew by 2/3.

Since the passing of the CCA in 2008, emissions reduction in the power sector has been a priority in order to make rapid progress in GHG emissions reduction in the early stages, as well as to prepare for using the power sector as an energy platform for the subsequent decarbonisation of other sectors, such as the heating/cooling of buildings and transportation. GHG emissions in the power sector were therefore reduced by 55% between 2008 and 2016, as a result of a basic market reform in the electricity sector, completed by the UK Government acting on CCA recommendations. This market reform of the electricity sector started by introducing long-term contractual agreements on generating low-carbon electricity and introducing competition in the allocation of contracts. These market reforms have resulted in significant reductions in the cost of renewable electricity; for instance, from 2015 to 2017, the cost of new offshore wind power diminished by over 50%, while the amount of renewable electricity increased from 12% in 2012 to 30% in 2017 (Committee on Climate Change 2018).

In the overall power sector, two priorities have emerged: reducing emissions by phasing out coal plant use and building out large amounts of zero-emission electricity generation by expanding low-cost offshore wind energy. Since the passing of the CCA

as legislation, no additional coal plants have been built in the UK. Furthermore, the development of a baseline for 'carbon price floor' by implementing a minimum price for GHG emissions from the power sector discouraged new investment in further expansions of coal-based electricity. In addition, existing coal plants have been retrofitted for biomass, while the Government also increased the sustainability limits of biomass by reducing its GHG emission intensity as a fuel.

Through this energy market redesign, the UK not only reduced GHG emissions from coal in the energy sector, but also expanded its zero-emissions energy generation through the rapid expansion of low-cost offshore wind energy. In order to encourage investment and innovation in the development of offshore wind energy, the Government has financially supported advancements in energy technologies to aid in project development and reduce costs. The CCA prioritised offshore wind as a key strategic priority in its 2011 Renewable Energy Review, in large part due to opportunities for major cost reduction and contribution to UK's progress towards a low-carbon future. Renewable offshore wind energy is predicted to provide over 10% of electricity generation in the UK by 2020, making it the country with the largest installed capacity in wind energy on an expanding global market with diminishing costs (Committee on Climate Change 2018). Between 2012 and 2017, UK emissions in the power sector dropped significantly by about 54%, due to both diminished coal use and especially bringing large amounts of offshore wind energy on line (Stark 2019a). In addition, the costs of low-carbon technologies, including onshore wind, offshore wind, and solar energy, have been dropping precipitously and are expected to continue to do so at an accelerated rate through the 2020s and for the foreseeable future. This will significantly contribute to the expansion of UK's renewable energy power sector.

The waste sector showed the next largest drop in GHG emissions in 2012–2017 of about −23%, which was guided by EU regulations and protocols regarding GHG emissions reduction in the waste sector (Stark 2019a). Another sector in which emissions dropped by about 10% is the high-energy demand industrial sector (ibid.), for which the Government developed decarbonisation roadmaps in its 2017 Clean Growth Strategy, aiming for a 20% improvement in energy efficiency (Committee on Climate Change 2018). The heating/cooling of buildings, transportation, and F-gases are three sectors which did not show any significant mitigation of GHG emissions in the period between 2012 and 2017. In fact, GHG emissions actually increased about 3% in the transportation sector (Stark 2019a), which presents an ongoing challenge in meeting future UK carbon budgets.

6.5.2 Prospective Look into the Future: Challenges for Progress in Reducing GHG Emissions

Looking into the near future, the UK CCC has developed scenarios which anticipate that the GHG emissions intensity of the country's energy grid will continue, with coal

projected to disappear completely from the grid by 2026 and natural gas/methane (CH_4) use projected to continue to drop to about 20% by 2032. The use of low-/zero-carbon electricity sources such as wind and solar energy is expected to increase to 80% by 2032 (Stark 2019b). However, as the Chair of the Committee on Climate Change Lord Deben explains in his foreword to the CCC's progress report (2018), the advancement made in reducing GHG emissions in the energy and waste sectors obscures the reality of the lack of progress in other sectors. In this respect, the UK faces a crossroads in the short term. The CCC has therefore (Lord Deben 2018, p. 4):

> chosen this moment to give a strong message to Government: Act now, climate change will not pause while we consider our options. And act in the consumer interest: pursue the low-cost, low-risk options, like onshore wind, and enforce the standards that will reduce emissions from vehicles and buildings, where consumers have been cheated by misleading industry claims.

Entitled *Reducing UK Emissions* (Committee on Climate Change 2018), the aforementioned report provides a detailed assessment of the progress as well as the gaps and omissions in how the UK has addressed the decarbonisation of different sectors. It also underlines the need to address four clusters of initiatives and identifies the specific responses needed to effectively implement climate policy in the future. First, the UK can support and move forward with simple and low-cost options such as investing in innovation and completing a market redesign. These would encourage and accelerate the development of and investment in lower cost, zero-/low-carbon energy, such as solar and offshore/ onshore wind energy, as well as investment in energy efficiency in buildings and homes. In addition, the UK could expand its program of naturally sequestering carbon by increasing woodlands by 2/3 and developing a nation-wide food waste recycling program that would be operational by 2025 (ibid., pp. 12–13).

Second, the UK CCC advocates that the Government refrain from stopping the 'chopping' and changing of policies such as the programs in supporting zero-carbon homes. Modifying or eliminating such programs not only lowers standards for homes, but also risks making building/retrofitting homes more costly later. The Government is also encouraged to invest in carbon capture and storage (CCS), which will decrease its costs in later deployment, and implement a market redesign by applying feed-in tariffs to increase investment by ordinary British citizens, communities, and businesses, while also reversing the 56% drop in investment in renewable (solar and onshore wind) energy between 2016–2017. The Government could also mandate and support energy efficiency in buildings, rather than risk losing 30,000 jobs in energy efficiency and the building retrofitting sector alone (Committee on Climate Change 2018, pp. 12–13).

Third, the UK Government needs to make a public commitment and legislate their obligation to effective regulation and strict enforcement in two strategic areas: (a) energy efficiency in buildings, and (b) sustainable transportation. In doing so, the Government could avoid further wasting energy, higher fuel and energy bills, higher GHG emissions in buildings, long waiting lists for electric vehicles (EV), and deteriorating air quality that impacts human health (Committee on Climate Change

2018, pp. 12–13). Finally, the Government has the opportunity to make more intensive long-term investment in infrastructure for effective climate protection (such as heat pumps or a decarbonised heating system), offshore wind energy, and carbon capture and sequestration, to decrease costs and increase options and availability in the future (ibid.). Other countries, such as Canada, could benefit from a detailed assessment of the key limitations and gaps of its own climate policies, and learn from the roadmaps for decarbonisation being implemented in the UK by exploring how they themselves might enact such strategies.

6.6 Adaptation and Climate Change

The second major critical area of the UK CCC's that would be very relevant for other countries centres on assessing the accelerating risks and threats that climate change poses to UK society and its natural environment, as well as recommending adaptation responses and ways to enhance climate resilience. In 2009, the Adaptation Sub-Committee (ASC) of the CCC was formed to focus on the impacts of climate change and offer biannual research-based reports and guidance to the UK Parliament regarding the Government's progress in assisting the country to develop resilience against climate change impacts through the National Adaptation Programme (NAP).

The ASC of the UK CCC has highlighted key impacts of climate change in the UK and areas in which climate adaptation and resilience need to be developed. Two problems in particular have been identified as being high-risk: (a) flooding, coastal erosion, and increasing rainfall which will require flooding mitigation measures on vulnerable coastlines and other locations; and (b) the growing impacts on health from increasing temperatures on the population (Committee on Climate Change 2017, p. 6). The CCC report states that sea levels "have risen by 15–20 cm since 1900. Whilst natural variability in the climate will continue to have a large influence on individual weather events, the recent episodes of severe and sustained rainfall are consistent with projections of climate change" (ibid.). Moreover, heatwaves are becoming a serious problem, which requires retrofitting homes, senior residences, and hospitals to protect vulnerable ageing population from the health impacts of increasing temperatures (ibid., p. 8):

> The average number of hot days per year has been increasing since the 1960 s, and currently 2,000 people die prematurely each year in the UK from heat-related conditions. The growing, ageing population means the number of vulnerable people at risk is increasing. In combination this means the number of premature heat-related deaths is expected to more than triple by the 2050s.

The ASC of the CCC has also highlighted the importance of addressing growing water scarcity, as climate change impacts will include high risk of shortages in the public water supply, as well as agriculture, energy generation, and industry. This will require implementing certain measures, such as increasing water storage, treatment, and supply infrastructure. The UK also needs to respond to the growing risks

threatening key environmental capital or goods and services, such as natural carbon sequestration (by expanding woodlands, protecting peat bogs to sequester methane etc.), clean air, clean water (including terrestrial, coastal, marine, and freshwater ecosystems), soils, and environmental biodiversity. The degradation of these essential ecosystem services heightens risks to both domestic and international food production and trade. Finally, the ASC of the UK CCC identifies the research priority of investigating the growing threat of new and emerging pests and diseases, and invasive non-native species, which affect people, plants, and animals (Committee on Climate Change 2017, p. 6).

Given the rising incidence and severity of climate change impacts, in July 2018, the British Government requested the CCC to prepare an independent evidence report supporting the UK's third comprehensive assessment of climate risks and opportunities (Committee on Climate Change 2018). Based on this report, the Secretary of State was required to develop an adaptation plan and strategy that will enhance the resilience of the people and ecosystems in the UK in response to the accelerating impacts of climate change. While it seems that devoting more attention to climate mitigation than climate adaptation was a missed opportunity (Muinzer 2019, p. 66), increasing emphasis is currently being placed on providing research and advice to the UK Parliament on how to best address the impacts of climate change, and increase the climate resilience of both the people and ecosystems through extensive climate adaptation programs. Other countries could also learn much from proposed UK climate adaptation initiatives developed by the Committee, especially how to address the multiple impacts of climate change and enhance climate resilience.

6.7 Major Achievements of the Last Decade: Lessons Learned from UK CCC

As the CCA 2008 was being developed, a number of options and potential directions needed to be considered (Fankhauser et al. 2018). For instance, its architects opted to focus the CCA on climate change via emissions reduction, rather than link climate mitigation with the advancement of broader sustainable development priorities. Other jurisdictions might therefore instead choose to follow the UN's lead by linking climate mitigation/adaptation with UN's Sustainable Development Goals and the IPCC's interest in connecting climate mitigation with Shared Socio-Economic Pathways (SSP). Although the CCA chose a primarily national focus, rather than connect domestic climate mitigation to the international climate governance context, current legislators in other countries could instead choose an international frame, using the IPCC emissions reductions targets focused on staying below a 1.5 °C temperature rise (IPCC 2018). Moreover, the designers of the CCA elected to develop a both/and approach with a strong target-centred policy, while also allowing markets to contribute to emissions reductions, including a market redesign. Finally, they opted to include the responsibilities of subnational or devolved governments in the CCA,

thus creating an opportunity for subnational actors such as Scotland to be the UK leader in mitigating GHG emissions.

What other contributions may the UK CCC offer to countries seeking to develop or improve their climate change policy and effectiveness of implementation? For Fankhauser et al. (2018), the CCA's most successful social achievement has been enhancing the discussion on addressing climate change in the UK through its sequence of establishing carbon budget targets, annual reporting, and detailed evidence-based recommendations for emissions reductions, followed by Parliamentary reporting on decisions to pursue the recommended strategies. In historically improving the political debate on climate change, a climate consensus within the UK has emerged. Certainly, there have been significant and tangible outcomes in the decarbonisation of the energy sector by embarking on phasing out coal and significantly increasing the production of renewable energy (e.g. offshore wind energy), all of which have enable the UK to meet its first two carbon budgets and decouple economic development (GDP) from GHG emissions. Finally, the development of the CCA and the CCC has enabled the country to develop a well-deserved international reputation in climate leadership, which it displayed both by contributing to the development of the Paris Climate Agreement (2015) and assuming leadership in more recent international climate initiatives, such as the 'Powering Past Coal' alliance (2017).

6.8 Challenges and Shortcomings: Opportunities for Enhancing Climate Policy Effectiveness

Achieving effective climate policy implementation with accountability and strategic action in the current context, and moving into the future will be a growing and increasingly difficult challenge. Sam Fankhauser states that the UK Government's "own analysis shows we are not on the right path to meet the 4th or 5th [carbon budgets]. To get back on track, attention will need to shift to sectors like heat, transport and land use, where emissions remain stubbornly high" (2018, [n.p.]). He also highlights how the context has changed with the rise of "political short-termism", and the growing gaps between the advice provided by the UK CCC and the Government's actual implementation strategies. This growing challenge stresses the importance of allying the achievement of analytical credibility with a greater political awareness, in part provided by Lord Deben, an experienced politician and former Conservative Environment Secretary, who also chairs the Mitigation Committee of the UK CCC. For Fankhauser, just "being analytically right is no longer enough. The political argument also needs to be won" (ibid.).

While there is much to be commended in the CCA 2008 as well as the operation and research of the UK CCC, Lord Deben's previously cited criticism highlights how the limitations of the UK approach are embedded in the political side of the process. For Fankhauser et al. (2018), the limitations and challenges of UK's approach to

climate change are not primarily centred on the CCA as a legislation or the CCC, but rather on the decisions and actions of the Parliamentarians and policy developers. In the absence of adequate accountability and enforcement, protection from climate policy back-tracking is inadequate, as evidenced by the growing distance between the emission targets and carbon budgets stipulated through the CCA and communicated by the CCC, and the actual public policy enacted by the Parliamentarians to address those targets and budgets, resulting in policy 'backsliding'.

Another opportunity for improving the CCA is through its objective to provide greater economic investor certainty and clarity of direction in the implementation of the carbon budgets. On occasion, it is often visible in the gap between clarity/certainty of legislated carbon budgets on the one hand, and the actual and sometimes less ambitious climate policy that is actually implemented on the other. Moreover, the buy-in of specific government ministries and departments is often uneven, sometimes inhibiting the robust implementation of climate policy that is more fully in line with the CCA's long-term climate objectives. Finally, until recently, the UK Government's climate adaptation initiatives have consisted of an abundance of adaptation discussion and planning, but have been missing the actual and robust implementation of climate adaptation and resilience initiatives.

As might be expected, the previously described challenges and gaps highlight both the opportunity and need to reconfigure and reform the CCA in order to enhance its perceived overall effectiveness as climate legislation and governance (Fankhauser et al. 2018). The first among several opportunities for strengthening the CCA is the realignment of the statutory long-term emissions reduction goal of a minimum of 80% below 1990 levels by 2050, so that it is consistent with the most recent IPCC scientific report regarding a 1.5 °C limit on the global temperature rise (IPCC 2018). In a speech entitled "Towards Net Zero", CCC Chief Executive Chris Stark echoes this recommendation for changing the statutory carbon emission reduction target, pointing out that the UK was "on track for 3 °C—still a destructive level of warming. And we are nowhere near—yet—the emission trajectories for 1.5 °C and 2.0 °C goals in the Paris Agreement" (2019b, [n.p.]).

Closely related to this target reformulation is another reformulation of the norms for carbon emissions accounting by shifting from net emissions accounting (aligned with the EU carbon emissions trade system in certificates) to gross emissions accounting (which measures the UK's actual total or gross emissions). The CCA needs to be further amended in order to clarify the specific criteria for assessing compliance by instituting a judicial review by the courts of government con-compliance or compliance. Amendments to the CCA need to legislate a specific statutory response time for the Government to develop and implement a carbon budget plan for achieving GHG emissions reductions. Such amendments would address an oversight in the original drafting of the CCA by closing a loophole in the Act which currently permits the Government to delay its emission reduction strategy and policy, even when a carbon budget has been legislated by the Parliament. Two other structural changes would also be important for the CCC's infrastructure and mandate: developing a proactive communications strategy for engaging the general public in order to increase and strengthen public consensus on the importance and urgency for

action on addressing climate change, and modifying the CCC infrastructure so that it is supported by an independent financial budget in accordance with best international practices.

Looking ahead, there are other issues that the CCA faces which are less structural (such as the previously discussed areas) and more political, strategic, and ambitious in light of recent scientific findings combined with our growing experience of actual climate impacts. Stark draws attention to the increasing ambition of other countries around the world which have begun "to set tougher emissions targets. Sweden became the first country to legislate a net zero target—with a 2045 date, albeit excluding aviation and shipping and using international credits. France is working on a net zero bill to come before parliament this spring" (2019b, [n.p.]). While highlighting the urgency of increasing the pace of deep decarbonisation across all sectors in the face of accelerating and more destructive climate change, the author argues that "we will need to move quickly to decarbonise every sector in unison" (ibid.). Given the urgency, carbon pricing by itself is no longer sufficient to reduce emissions at the pace required; rather, speed is of the essence (ibid.):

> Twenty years ago, we might have had the luxury of allowing prices and carbon pricing to do the heavy lifting required, but we have been too slow globally to respond to climate change – and we are now up against hard, scientific deadlines. So, it is vital to consider how regulation can be deployed to drive more rapid change – often by providing a firm backstop date for a transition for example, to encourage a swifter market response.

Fankhauser et al. (2018) identify three additional challenges for the UK's immediate future in continuing to provide leadership in climate mitigation. First, at the present rate of decarbonisation, research analysis shows that the country is not on track to meet either its fourth (mid-2020s) or fifth (early 2030s) legislated carbon budget. Given the need to accelerate the pace of decarbonisation and "clos[ing] the gap between emissions targets and policy delivery" (Fankhauser et al. 2018, p. 5) will be a litmus test of the Government's commitment to addressing climate change. Second, as the demand for quickening the pace of climate action increases, it will be imperative to encourage and support assertive and determined climate leadership that meets the demands of the Paris Agreement, especially the 1.5 °C global temperature rise limit. Third, given the critical role that the CCC and the CCA will play in the successful decarbonisation of the UK, the Committee will need to be supported by the public and enhanced by strong climate leadership in the Government, Parliament, and the public at large.

6.9 Concluding Remarks

According to Stark, in the CCA, the UK has a strong statutory framework, which mixes "long-term goals with the medium-term requirement to plan and the short-term requirement to act" (2019b, [n.p.]). This integration of the three dimensions of long-term objectives with the imperative to plan in the medium term, as well as the

urgency to integrate them with the necessity to meet objectives, is the strength of both the UK CCC and the CCA 2008. It also presents a helpful focus for all countries as they endeavour to both raise their climate ambition in accordance with the most recent scientific findings and successfully implement their enhanced climate targets.

By examining the best existing practices of effective climate policy implementation with accountability and transparency as enacted by the UK CCC, this chapter aims to enable those interested in more effective climate policy implementation in their own countries and jurisdictions to become better equipped to utilise the insights of key researchers in this area in their own jurisdictions. At this point, the UK CCC and the CCA 2008 have come to be regarded as a template for best existing practices in national effective climate policy implementation, accountability, and transparency (Averchenkova 2019), providing a reservoir of policy resources for other countries contemplating developing their own effective climate policy infrastructure with accountability and transparency. At the time of this writing, this includes both New Zealand, under the leadership of Prime Minister Jacinda Ardern, and Canada, led by Prime Minister Trudeau.

Drawing lessons from UK's experience of innovative approach and legislation embodies the spirit of the energy humanities. This brings together and highlights the pathways for countries to improve the effectiveness of their climate policy, so that they can meet what Boyer and Szeman describe as the daunting challenges of addressing climate change (2014, [n.p.]):

> Those who are closest to the blunt necessity of energy for our complex, modern societies are aware of the enormous challenges of mitigating the environmental effects of energy use. They are looking for change. But when it comes to how they might participate in change, or how the public would react to policies that might necessitate significant transformations in their daily lives, they realize they need insight and guidance from humanists and social scientists.

While responding to the demands and challenges of climate change is daunting and requires high levels of engagement and the effective design, implementation, monitoring, and enhancement of climate policy, the UK CCC offers invaluable resources for policy developers in all countries to build on the insights and successes of the UK approach, while also learning from its mistakes and shortcomings. However, as suggested by researchers cited in this chapter and conscientious politicians such as Lord Deben and Prime Minister Ardern, effective political leadership is also essential for the efficient functioning of climate policy in addressing the challenges of climate change. Indeed, effective climate leadership in the political realm of government still seems to be a rare quality.

And yet, much has been gained through the efforts of the developers of the CCA 2008 and the UK CCC that can be passed on to many other countries. It is increasingly clear that much more remains to be done and if recent findings in climate science are any indication, it needs to be done quickly and effectively. Because of the efforts and contributions of others, we now have the pathway of deep decarbonisation available to us. What remains is for us to do the work.

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Part III
Representations of Energy

Chapter 7
Toxicity, Fossil Fuels, and Climate Change in *Pionér* and *Okkupert*

Tatiana Prorokova-Konrad

Abstract This chapter analyses the thriller *Pionér* (*Pioneer* 2013) and the TV series *Okkupert* (*The Occupied*, 2015–) to show how the two examples depict Norway's dependence on fossil fuels. The analysis starts with the events presented in *Pionér*, when Norway laid the first oil pipeline in the North Sea in the 1980s and prepared for the installation of a gas pipeline. It then moves to the images of gas and oil production from the nearest future depicted in *Okkupert*. Through these two examples, the chapter investigates the intricate connection between the use of fossil fuels and climate change. It claims that humanity's dependence on oil and natural gas not only defines the era of modernity but has also formulated the toxic politics of today's world. This politics manifests itself in the toxicity of burning fossil fuels on the one hand, and the toxicity of human nature on the other, for human avarice continues to be one of the major obstacles on the way to a greener and healthier environment. To illustrate the complexity of capitalist petrodependency, the chapter utilises the concepts of eco-guilt and eco-shame.

Keywords Fossil fuels · Climate change · Toxicity · Eco-guilt · Eco-shame · *Pionér* · *Okkupert*

7.1 Introduction

Climate change is one of the most urgent problems that humanity faces today (Poushter and Huang 2019, [n.p.]). While scientific comments on climate change overtly underscore the grave peril of this environmental phenomenon, there are also various speculations and actions that are meant to interpret climate change as a myth. The latter are not only misleading but also extremely dangerous, for they undermine the existing problem and prevent certain people from necessary action. To give just a few examples: in 2012, Donald Trump claimed that "[t]he concept of

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global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive" ([n.p.]), and recently, in 2019, banned the use of "climate change in press releases" (Waldman 2019). Therefore, the importance of spreading eco-awareness among the world population, drawing everyone's attention to ecological decline and global warming is one of the key steps in addressing climate change and minimising its effects.

Film and television have proved effective in communicating various issues, including climate change, to wider audiences. Turning the "invisible crisis" (Duvall 2017, p. 1) into a visible one, environmental documentaries such as Davis Guggenheim's *An Inconvenient Truth* (2006), make the problems related to ecology and the environment more accessible to the general viewer, frequently provoking "an activist stance in response to them" (ibid., p. 3). However, the documentary is not the only genre that attempts to convey the serious nature of climate change to its viewers. Fiction eco-films vehemently comment on this problem, too. For example, Hollywood disaster movies—films "that ha[ve] an impending or ongoing disaster as the central feature of […] [their] plot" (Kuhn and Westwell 2012, p. 123) yet "operate […] within the realm of the possible," making the viewers "believe" that the scenario can repeat itself in real life (Keane 2006, p. 13)—such as Roland Emmerich's *The Day After Tomorrow* (2004) and *2012* (2009), or Dean Devlin's *Geostorm* (2017), offer audiences scenarios in which natural disasters and severe weather fluctuations lead to an apocalypse in the form of an environmental catastrophe.

While Hollywood has indeed been the most prolific with cinematic examples of this kind, films and series about the perils of climate change have also been created outside the U.S. Examples from the Arctic region (i.e., the polar region that includes Scandinavia, Greenland, parts of Russia, the U.S., and Canada, and the Arctic Ocean) also energetically engage with the problem of climate change, tackling it from multiple angles and frequently foregrounding humanity's dependence on cheap energy. Cheap energy is identified as the key reason for the emergence of climate change, and our inability to deal with the matter in an adequate and sufficient manner. Raising the issue of energy in their plots and visuals, cultural narratives closely engage with what Imre Szeman terms "the probable future of oil—and, to a lesser degree, of oil capitalism" (2017b, p. 57). Recreating culture on the screen through images of fossil fuels, these visual media sketch out the horror of the means used to create the world as we know it. Szeman emphasises that oil is "not just energy"—it is "history"; therefore (2010, p. 34),

> [w]hen one discusses the end of oil and imagines the main issue to be the possibility of replacement fuels […] one fails to grasp that we are not dealing with an input that can easily take other forms, but with a substance that has given shape to capitalist social reality, perhaps as much as the division of labor or the dance of commodity reification.

In this chapter, I focus on Norwegian eco-film and eco-TV to investigate lesser known (especially when compared to Hollywood) yet powerful images of climate change and cheap energy. Closely examining the thriller *Pionér* [*Pioneer*] and the TV series *Okkupert* [*Occupied*], released in 2013 and 2015 respectively, I discuss Norway's dependence on fossil fuels, as portrayed in the two examples. Beginning

with the events presented in *Pionér*, when Norway laid the first oil pipeline in the North Sea in the 1980s in preparation for the installation of a gas pipeline, and finishing with the images of gas and oil production from the nearest future depicted in *Okkupert*, I address the intricate connection between the use of fossil fuels and climate change. I argue that humanity's dependence on oil and natural gas not only defines the era of modernity, but has also formulated the toxic politics of today's world, which manifests itself in the toxicity of burning fossil fuels on the one hand, and the toxicity of human nature on the other, for human avarice continues to be one of the major obstacles on the way to a greener and healthier environment.

I begin with a brief history of humanity's use of fossil fuels since the Industrial Revolution. I then move on to discuss the relationship between climate change and the use of fossil fuel energy, revealing that the former cannot be solved without addressing the latter. I refer to *Pionér* and *Okkupert* to demonstrate how complex the problem of using fossil fuel energy is. While both examples were released nationally as well as internationally, *Pionér* is less known, whereas *Okkupert* (which, as of 2020, includes three seasons) has been more widely recognised as a "typical product in the success story of Scandinavian quality TV" (Bruhn 2018, p. 68). I examine the film and the series as powerful eco-narratives that explicitly narrate Norwegian energy history, unveiling the true environmental costs of the energy problem. In my analysis, I use the concepts of *eco-guilt* and *eco-shame* (ibid., p. 66; Mallett 2012, p. 223), introduce the term *toxicity* to reinforce the environmental meanings of the two notions, and address the deadly nature of humanity's use of fossil fuels. The latter includes the process of burning that leads to environmental and ecological destruction, as well as actual political and economic power that possessing natural resources can guarantee individuals. The aim of this chapter is thus to examine the toxicity of the energy issue through the visual aesthetics of fossil fuels and the culture we have built through our dependence on them, as portrayed in *Pionér* and *Okkupert*. Analysing the complex nature of energy issues through the concepts of toxicity, eco-guilt, and eco-shame, this chapter contributes to the ongoing research within energy humanities.

7.2 Fossil Fuels and Climate Change

In the course of history, climate change has proved to be a force that either facilitates life or kills everything at once. As Leigh Glover points out, "[b]rief or extended periods of extreme climatic conditions have wrecked havoc on many civilizations throughout history and pre-history. Conversely, there appear to be strong associations in the pre-modern era between human development and benign, stable climate" (2006, p. 10). Prior to the Industrial Revolution—the turning point in history when humanity's heavy dependence on fossil fuels began—any climatic transformations were viewed as normal natural phenomena. In the course of the 19th and 20th centuries, "climate was considered as entirely independent of human activity" (ibid., p. 11); only recently has humanity understood that industrialisation and the use of

fossil fuels have directly influenced and continue to alter the Earth's climate. Indeed, the main reason for the temperature rise—one of the main characteristics of global warming—is "the increase in CO_2 levels", which primarily happens due to various human activities and is therefore defined as "anthropogenic" (Chen 2011, p. 3). It is also known that burning fossil fuels produces large amounts of CO_2. As Roberta Goldberg argues (2014, p. 54),

> [s]ince the Industrial Revolution, there has been tremendous growth in the use of fossil fuels – specifically coal, oil, and natural gas – to develop and sustain industrial production, transportation, and electrical power, the most common forms of fossil-fuel consumption.

Although it is true that the need for fossil fuels has grown exceedingly since the 19th century, humanity had also polluted the environment prior to that time. William M. Cavert, for example, draws attention to Britain's use of coal already since the end of the 16th century, which not only led to the deterioration of human health but also visibly affected the environment, turning London into "*the* city […] of smoke" (2016, p. xv; original emphasis). Pollution and various other ecological problems have been ruining our environment for centuries.

Climate change did not emerge in the 21st century. Humanity has been largely transforming the environment, causing ecological decline in general and climate change in particular for a considerable time, particularly since 1784, when the steam engine gained special significance, "enabl[ing] the industrial *turn*" (Morton 2016, p. 8; original emphasis). Human dependence on fossil fuels has continued to grow since that time and we have built a culture that is better defined as "petroculture" (Wilson et al. 2017). It is, however, today's task to minimise the effects of climate change by finding new ways and rules to exist on this planet. Geoffrey Parker skilfully demonstrates how climate change, although obviously not "the only plausible common denominator", was the reason for numerous calamities that took place in the course of the 17th century (2017, p. xvii). Despite his exclusive focus on the 17th century, Parker admits that "[c]limate change has frequently caused or contributed to widespread destruction and dislocation on Earth" (ibid., p. xiii). His historical approach is particularly valuable today for examining the problems that climate change caused hundreds of years ago. Yet, one might wonder how different the consequences of climate change will be this time, and whether humanity will be able to survive and deal with them. We have to face the fact that with our current modes of existing we are not ready to face climate change; that the current climate change differs dramatically from the climate changes that occurred earlier in history; that our current environmental crisis is to a larger degree shaped by the idea that it is indeed humans who have caused climate change, yet refuse to recognise the problem as an existential threat.

The transformations that must take place if we want to preserve life on the planet are considerable and largely involve fossil fuels, or rather, finding alternative ways to fuel our modern way of existence and abandoning the use oil, gas, and coal (so-called energy transition). Fossil fuels have indeed become inseparable from the world that humanity has been creating since the Industrial Revolution. They not only define modernity, which, according to Stephanie LeMenager, can be directly

perceived through "the human capacity to harness cheap energy" (2014, p. 104), but have literally become the world around us. Sheena Wilson, Imre Szeman, and Adam Carlson lament that "[o]il and its outcomes—speed, plastics, and the luxuries of capitalism, to name a few—have lubricated our relationship to one another and the environment for the duration of the twentieth century" (2017, p. 15). Getting rid of fossil fuels and the products and comforts they have guaranteed means transforming our reality in the most radical way possible. This has already provoked a special "feeling" among many, which LeMenager terms *petromelancholia*, "[t]he feeling of losing cheap energy that came relatively easily, without tar sands extraction, ultradeep ocean drilling, and fracking" (2014, p. 102). Yet, such a transformation is inevitable. As Szeman writes (2017a, p. 46):

> It's impossible to address global warming without significant changes in our use of fossil fuels. This is widely known. Making these changes means becoming different subjects who embrace a different collectivity and sociality – subjects who decide to no longer be creatures of petroculture. This is less well known. We don't just need to find new sources of energy and cut down on our use of fossil fuels. We need to invent new ways of being, belonging, and behaving – and to do so quickly.

By refusing to welcome a new fossil-fuel-free reality and become a new humanity, with new priorities, values, and tasks, we continue to commit what Rob Nixon effectively terms "slow violence"—"a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all" (2011, p. 2)—toward nature and our fellow human beings. Independence from fossil fuel energy would end discussions on the "limit of the Earth's environment, of which [fossil fuels are] simultaneously a part (limit) and an other (catastrophe) that the future would be better off without" (Szeman 2012, p. 438).

Once we become aware of the danger of CO_2 omissions, the solution to global warming indeed seems rather easy in theory: stop extracting and burning fossil fuels. Yet in practice, following this plan can be very problematic. Michael S. Northcott makes an important observation (2013, p. 12):

> Mitigating climate change requires dramatic, large-scale political interventions in fossil fuel extraction and marketing, and hence in the energy systems and behaviours that these fuels sustain. But these systems and behaviours are so intrinsic to industrial civilisation and modern consumerism that radical reform without a real and present climate catastrophe lacks popular support, and hence influential advocacy, in most political domains.

That, in principle, means that the real danger of climate change is not noticed by many or ignored by some, simply because the ramifications of global warming are not sudden enough, or immediate enough, or visible enough to make everyone realise the necessity to act right now. The ability of disaster films to portray immediate consequences on a large scale helps audiences imagine possible scenarios of what might happen if we continue to ignore global warming. However, the films and TV series that employ fossil fuel narratives are also effective tools with which to communicate the current crisis. They are essentially examples of eco-cinema that "actively seek to inform viewers about, as well as engage their participation in,

addressing issues of ecological import" (Willoquet-Maricondi 2010, p. 10; qtd. in Murray and Heumann 2014, pp. xii–xiii). Such films and TV series not only spread eco-awareness but, perhaps even more importantly, "overtly strive[…] to inspire personal and political action on the part of viewers, stimulating our thinking so as to bring about concrete changes in the choices we make, daily and in the long run, as individuals and as societies, locally and globally" (Willoquet-Maricondi 2010, p. 45; qtd. in Duvall 2017, p. 26). Through their discussions of oil and natural gas, both *Pionér* and *Okkupert* raise the issues of energy and the environment, offering a powerful commentary on the current world, which is largely characterised by political, ecological, and cultural toxicity.

7.3 Toxicity, Ecology, and Fossil Fuels in *Pionér* and *Okkupert*

While both *Pionér* and *Okkupert* were released in the 2010s, they address different time periods, portraying Norway as one of the nations that became rich thanks to oil. *Pionér* focuses on the 1980s, whereas *Okkupert* is set in the near future, thus emphasising the complex nature of the energy crisis today, and foregrounding the fact that humanity does not have easy and immediate solutions to this intricate issue. The two examples hence cover roughly half a century and, when analysed together, effectively demonstrate the significant transformations that the country has undergone because of its access to oil. I examine *Pionér* and *Okkupert* from the perspectives of "eco-guilt" and "eco-shame", concepts I borrow from Jørgen Bruhn's reading of *Okkupert*, which he introduces to reinforce the narratives of shame and guilt imposed on "[t]he Scandinavian middle classes" (2018, p. 66). In doing so, I expand the existing analysis of *Okkupert* and the cultural meanings of the two concepts, essentially demonstrating that while they are crucial to the cultural narratives of Scandinavia, they can and should be applied to existing oil cultures and capitalist petrodependency globally. I also demonstrate how, taken together, *Pionér* and *Okkupert* narrate the problematic, provocative, and toxic history of Norway's relationship with fossil fuels. I use the term toxicity to underscore the deadly influence of burning fossil fuels on the environment and unveil the complex eco-political meaning of humanity's reliance on fossil fuel energy.

The notion of eco-guilt has been defined by Robyn K. Mallett as "guilt that arises when people think about times they have not met personal or societal standards for environmental behavior" (2012, p. 223). Bruhn specifies that eco-guilt is "guilt related to actions that have either already contributed to or will in the future accelerate climate change", whereas eco-shame is "the feeling of shame related to the mere existence as a rich […] citizen with huge ecological footprints, being at least partly responsible for climate change and the Anthropocene condition" (2018, p. 66). Keeping the two concepts in mind, I claim that, through their explorations of toxicity that is characteristic of both oil (due to its poisoning effects) and the pro-fossil fuel politics

that is toxic to the environment, *Pionér* and *Okkupert* offer a powerful reflection on human responsibility for environmental degradation.

Although neither of the two examples I analyse here has gained global success, they are important contributions to eco-cinema and eco-TV. Zeroing in on a country that is today recognised as one of the wealthiest and most secure states, both the film and the TV series dramatically visualise the actual profit that fossil fuels can bring to humanity. The example of a rich and flourishing country can be effectively juxtaposed to the image of a fading planet, thus uncovering the true price of humanity's dependence on coal, oil, and natural gas. Reimagining this very striking difference between happy humanity and a dying planet, *Pionér* and *Okkupert* not only reconstruct the narrative of eco-guilt and eco-shame, making viewers see the cost at which our civilisation has been built, but also foreground toxicity as the key element in fossil fuel discourses: our politics, economy, and culture have become profoundly toxic; our environment is unhealthy and essentially toxic; humanity is made toxic by its greed for more wealth and comfort that fossil fuels can guarantee, but also by the pollution that emerges as a result of anthropogenic activity. We are toxic objects in a toxic world, defined by toxic wishes.

7.3.1 Pionér

The thriller *Pionér* is set in the 1980s and tells the story of an ambitious Norwegian diver Petter (Aksel Hennie), who wants to reach the bottom of the North Sea. As deposits of oil and natural gas are discovered there, Petter considers it an excellent chance to fulfil his professional dream and dive as deep as 500 m. The film opens with scenes of training, in which a group of divers (including Petter) are placed into a special machine that simulates the diving mission to the bottom of the North Sea. The viewer can witness the difficulty of the mission through close-ups of the divers' faces, which show that the men are evidently experiencing discomfort and pain, yet are unwilling to give up and ready to go on this dangerous mission for the economic well-being of their homeland. However, the mission ends tragically: Petter's brother Knut (André Eriksen), who dives with him, dies, as it is explained, due to a technical mistake. Petter soon realises that he is involved in a dangerous game the rules of which are largely determined by those interested in the natural resources discovered in the North Sea.

Although oil and natural gas are not foregrounded in the film—indeed, it is the mysterious murders that seem to drive the plot—the film is set at the time of the so-called Norwegian oil boom, when particularly large amounts of oil were discovered in the North Sea. It is thus apparent that oil, although visually absent from the screen, is one of the defining factors in the film. *Pionér* opens and closes with references to natural resources, while the major part of the film is devoted to the missions that are potentially aimed at reaching, extracting, and possessing those resources. Although that, in a sense, considerably slows down the plot, it establishes a powerful commentary on the history of environmental degradation enabled through the use

of fossil fuels. *Pionér* shows how difficult it was to get access to fossil fuels in the first place, constructing the narrative of guilt/shame. It does not necessarily accuse Norway of building its economy on oil (although this is part of the story), but rather, I would argue, demonstrates how humanity's interest in fossil fuels can be read as a crime story depicting crime against nature and humanity itself. Namely, the use of cheap energy generated with the help of fossil fuels transforms and destroys the environment, reinforcing the capitalist model of a "good" life essentially built on endless production and consumption.

Crucially, the deadly effects of CO_2 emissions on the planet were already known at the time the film focuses on. The images of discovery and extraction of natural resources forebode substantial changes and, I claim, are included in the film to make the country, its citizens, but also the viewers of the film, experience feelings of eco-guilt by realising the deadly effects of the use of the found fossil fuels on the environment. On the other hand, these images also evoke feelings of eco-shame, suggesting that this valuable discovery will contribute to ecological degradation and climate change. In doing so, the film dramatically emphasises the complexity of the human-nature relationship. Indeed, *Pionér* essentially demonstrates the confrontation between nature and humanity. Nature—powerful, majestic, dark, rich, and deadly—is effectively portrayed through the North Sea which humanity needs to conquer in order to use its wealth. It is crucial that diving as deep as 500 m is a task that can be performed only by select individuals, which helps reinforce the power of nature, and the inferiority and weakness of humans; moreover, even those who are trained to dive so deep are in danger. The major threat comes from nature itself—the sea being a dangerous place—but also from other humans who are interested in the financial profit that the mission can guarantee them.

The invisibility of oil in *Pionér* (the film only hints at the opportunities that oil might create, thus allowing the viewer to also imagine an oil-less future) helps intensify its constructed importance of oil to humanity, which stems from its deep entwinement with our culture, and, in a way, echoes LeMenager's concept of "petromelancholia" (2014, p. 102) by posing the question, how can humanity exist without oil? According to *Pionér*, this is impossible, for oil drives economy, politics, and other domains of human life. Due to its phantom-like nature (for it is only the potential of having access to it that is discussed in the film), oil is the reason behind misfortunes, bribes, and deaths that the audience can witness in *Pionér*. It is thus portrayed as a deadly resource which, while guaranteeing certain comforts (to the select individuals who directly profit from it), is, in principle, fatal. The deaths that the viewer observes in the film charge the image of oil with negative connotations.

In the end, *Pionér* meditates on the role that oil plays or will potentially play in the development of Norway. Petter is ultimately financially compensated for the hard job he performed, as well as the death of his brother. As a politician offers Petter a bribe (which Petter accepts), the former comments on the prospects that the success of the North Sea mission has opened, skilfully foregrounding the toxic nature of the mission itself and those involved in it: "In twenty years, when [Knut's] son grows up… He'll grow up in one of the world's richest countries" (*Pionér*). Although made in 2013, the film successfully "predicts" the future and—even more

importantly—vehemently foregrounds the cost of that future. The deaths of some of the divers and the exploitation of others, as well as the exploitation of nature itself—these are the deadly effects that are singled out as part of a larger environmental catastrophe that the use of oil will contribute to, reinforcing the toxicity of a fossil fuel world, and provoking (or intending to provoke) feelings of eco-guilt and eco-shame in every witness and participant. *Pionér* thus carefully outlines Norway's dependence on oil, commenting on its criminal and dangerous aspects, which largely contributes to the current climate change and energy debates. Through the absence of oil's visual aesthetics, the film conveys the meaning of "petroculture" (Wilson et al. 2017) as being so deeply informed and enabled by fossil fuels that the very images of energy become invisible, yet their toxicity is preserved to stimulate eco-responses instrumented by eco-guilt and eco-shame.

7.3.2 Okkupert

The TV series *Okkupert* continues the discussion on energy, fossil fuels, and environmental degradation, informing the viewer about the role of politics and economics in the emergence of climate change. Chris J. Cuomo interprets climate change as, on the one hand, "an ethical issue of epic proportions," due to its global nature, and, on the other, a "set of practical problems, for climate change has emerged from powerful and deeply entrenched economic and social norms and practices" (2011, p. 692). As such, climate change, its ethical and very practical aspects alike, is, to a large degree, the result of the actions and policies of those who were/are in power. When one talks about climate change, one can, of course, discuss it in relation to specific countries and nations; yet, it is certainly more helpful to be more specific and focus precisely on those decisions and/or actions that contribute to the greenhouse effect, and thus emphasise the role of various powerful agents in the current environmental crisis. Cuomo continues: "Particular people and particular cultures, nations, industries, and economic systems have caused and contributed to the pollution that created the industrial greenhouse effect, and we need not take those actors to be representative of the entire human species" (ibid., p. 697). The scholar's observation is shrewd, for it underscores the significance of *localising* the problem of *global* warming. Only through geographic and national localisations can one deal with the problem of climate change in a more precise manner. To borrow from Cuomo (ibid.):

> Attributing blame to humans *simpliciter* diverts attention from the real sources of the problem and reproduces the narrow view that there is a universal greedy human nature that inevitably leads toward planetary destruction, and the mistaken assumption that everyone naturally desires the lifestyles enabled by modern Western colonial development.

In this regard, *Okkupert* is an interesting example that deals with specific countries, regions, and nations, addressing the questions of power and collective-versus-individual responsibility of humans in causing and refusing to solve the problem of climate change.

The story of *Okkupert* is set in the near future, which finds Europe amidst an energy crisis. With the rise of the Norwegian Green Party, the Prime Minister, in search of independence from fossil fuels, announces his plan to use thorium-based nuclear power. Clearly dissatisfied with that decision, the European Union (EU) asks Russia to invade Norway and force it to turn back to oil and gas production. No one provides any military support to free Norway from the occupation. In the course of the series, the viewer witnesses Norway's attempts to come to an agreement with Russia; ultimately unsuccessful, the country is obviously left alone in this energy/military crisis.

Although some critics saw the series as "disturbingly relevant in light of the Ukraine crisis […] and the reappearance of larger-scale East-West tensions over Moscow's new-found assertiveness in Europe" (Kirchick 2017, [n.p.]), *Okkupert*'s message concerning climate change and reckless energy policy is also rather straightforward. The focus on Norway and Russia is not random and allows the creators of the series to vividly illustrate the existing dependence on fossil fuels of the world in general and of specific nations in particular. Russia used to be known as the largest exporter of oil and gas in the world; in 2011, the country "produce[d] 11.8% of the world's oil, compared with 9.9% for Saudi Arabia and 12.4% for Iran, United Arab Emirates, Kuwait, and Iraq combined" (Chen 2011, p. 64). Today, it is recognised as "the second-largest producer of oil in the world" after the United States (Ali 2019, [n.p.]), and the second largest exporter of crude oil after Saudi Arabia (Workman 2019, [n.p.]). Despite this shift, it is evident that Russia remains an important player in the game. Norway has also been "relying heavily on development of Arctic energy reserves to continue the flow of cash that has made Norway one of the richest countries in the world, with a petroleum pension fund that totaled US$443 billion as of March 2010" (Marsden 2011, p. 168). While Norway is recognised as "a small player in the global crude market", it is an important exporter (being forestalled only by Russia in exporting gas), exporting practically all oil and natural gas produced on the Norwegian shelf (Exports of oil and gas 2019, [n.p.]). Moreover, the complex relationship between Russia and Norway regarding the access to energy resources has been known for decades (Marsden 2011, pp. 165–166):

> For forty years the two countries had tussled over ownership of the potentially oil-rich continental shelf covering 176,000 square kilometers under the Barents Sea. […] Both countries are eager to tap into these gas and oil fields. Russia is already constructing four 70-megawatt nuclear power plants on barges, each containing two reactors, to power oil and gas rigs in the Barents and Kara seas as well as service an estimated thirty-three remote communities along the full breadth of the Arctic coastline. The first was completed in 2011. Russia plans to build as many as fifteen floating nuclear reactors a year.

In 2019, Russia pulled the Akademik Lomonosov floating nuclear power plant that took almost 20 years to construct (Ilyushina 2019, [n.p.]). Both Russia and Norway have therefore been willing to financially profit from energy resources. How do the examples of the two countries, as shown in *Okkupert*, help one understand the politics of climate change, and is there a way out of the environmental crisis that the use of coal, oil, and natural gas has caused?

Already in the first episode of the series, the Prime Minister of Norway suggests a new energy policy for the country—to use thorium. He claims that "fossil fuel no longer supplies us with hope. Because fossil fuel is the cause of our climate crisis. The time for fossil fuel has passed. In Norway's case, that means the era of oil is over" (*Okkupert* 2015, S1, E1). The strong opposition the politician faces comes from the EU, which asks Russia to help change the plans of the Norwegian Government. Zeroing in on the occupation throughout the rest of the series, *Okkupert* skilfully brings together war and climate change, apparently to intensify the insignificance of global warming for some political leaders today. Climate change becomes an invisible obstacle on the way to wealth and economic prosperity. Significantly, not posing a direct threat to people at that specific moment of time but rather being represented as a danger for future generations, climate change is easily interpreted as a potential threat, but not a real-time one. *Okkupert* thus touches upon one of the most serious aspects of climate change that prevent many from viewing it as a real danger: its non-suddenness.

Okkupert promotes the idea of human blindness toward the environmental crisis; but the series is even more interested in the idea of anthropogenic climate change, which it explores aesthetically. In the first season, the opening credits include the image of Arctic ice melting quickly and changing colour from clear shades of white and blue, to grey and black. The opening credits continue, introducing the main characters of the series, but also teasing the viewer by hinting at the main issues that *Okkupert* deals with. Thus, the images of oil drilling platforms, thick black oil, and gas pipelines intermingle with those of the military, protesting crowds, and politicians. The credits end with a full-screen image of a stormy ocean that is of the same dark grey colour as the sky above it, which stands for the waters that surround Norway; on the other hand, it is a metaphorical reference to the devastating force of nature that humanity will inevitably face because of climate change. In the second season, the imagery in the opening credits is visually much colder and the focus on Arctic ice is even stronger. It is a clear reference to Norway as a cold northern country with longer nights and winters. The final image in the credits—the mesmerising scenery of dark blue snow—accentuates that once again. However, the ice also creates strong associations to climate change and the danger of melting glaciers.

The aesthetics of climate change that the series so skilfully constructs through the images of Scandinavian nature, wilderness, and sublimity, on the one hand, and oil drilling, gas pipelines, humans working in the energy sector, and politicians responsible for specific energy policies, on the other, is toxic in many ways. It is surely the chemical toxicity of burning fossil fuels that causes climate change, endangering the life on our planet. But it is also anthropogenic toxicity, which *Okkupert* portrays as even more disgusting, if not embarrassing. Through the series' overt focus on political intrigues that involve countries and nations, *Okkupert* intensifies the factor of human recklessness and indifference to the environment. Greediness, which seems to be the main reason behind the tragic turns in the series—including the Russian occupation of Norway—is viewed as the driving force for literally every character, but is most vividly illustrated with the examples of high-standing political figures involved in the energy crisis. It is exactly through these images that the series stirs

feelings of eco-guilt and eco-shame in the viewers and characters, making one care for the environment and reconsider the current energy politics. Bruhn accentuates the power of these images to formulate one's eco-consciousness, claiming that the series transforms eco-guilt into "eco-responsibility which results in direct activist decisions: the administration opts to end all fossil fuel production" (2018, p. 71). Although it might seem that *Okkupert* gradually backgrounds climate change while foregrounding war as the key problem central to the plot, it nevertheless continues to reinforce the toxicity of the energy issue. It does so through the involvement of war which—in combination with the problem of climate change which humanity faces due to our faulty energy politics—effectively and powerfully communicates the issues of precarious existence, destruction, and death. In doing so, the series illustrates the problem of "slow violence" (Nixon 2011, p. 2) through the images of crime and violence against nature and humanity.

The series' focus on military occupation is overt: Russia is depicted as both a military and environmental aggressor. Its decision to sustain oil and gas production is scary but crucial, for it not only literally reveals the economic dependence of certain individuals on fossil fuels, but also establishes an intricate connection between climate change and war. The images of war and the military dominate the series. While through them the creators of *Okkupert* might attempt to comment on certain actions of the Russian Government which construct the image of Russia as a military aggressor, these images can also be directly linked to the problem of climate change. *Okkupert* works as an apt example that reveals an explicit connection between climate change and war. The series accentuates the readiness of humanity to protect what it considers important for its economic stability (fossil fuels) with the help of military power. In making this point, *Okkupert* hardly narrows the focus to Russia and Norway, but rather invites the audience to ponder the problem of humanity's dependence on fossil fuels in general, with a specific focus on the EU and Russia. The war in *Okkupert* is not just a conflict between two states—Russia and Norway—but also a metaphorical conflict between humanity and its petroaddiction, and nature as such.

It is also through the occupation that the series explores the issue of violence in greater depth. Displaying military violence that one nation directs against another, *Okkupert* starts a more profound discussion on human violence against all living things, especially nature. Despite their visual grandiosity and majesty, the Scandinavian landscapes and wild nature which are truly transcendental in the series turn fragile in the hands of humanity. Nature is not only fully exploited by those who extract energy resources but is depicted as being enslaved by humanity and destined to become extinct—the result of the actions of certain individuals and the mute support or weak protests of others. Thus, the idea of war between humanity and nature is largely intensified through the visuals. While humanity appears to be stronger than the voiceless nature, the power of nature is yet to be seen. Climate change is the primary and most dangerous response of nature, which, according to *Okkupert*, is inevitable. The fact that Norway is portrayed as unable to win the war can be interpreted in two ways. On the one hand, the oppressed Norway stands for those who are willing to stop harming the environment but are evidently less powerful, whereas Russia

represents those who live from the money they earn adhering to non-eco-friendly policies. The unequal relationship between the two countries metaphorically stands for the unequal relationship between humanity and nature, as humanity seems to be more powerful. On the other hand, Norway, with its eco-friendly policies and care for future generations, might represent humanity in general; therefore, Norway's weakness and inability to win the war can be figuratively interpreted as the inability of humanity to withstand the power of nature and its most dangerous weapon—climate change.

7.4 Conclusion

The message of *Okkupert* is strong, for it persuasively reveals the reality and peril of climate change. It is also effectively complements the oil narrative presented in *Pionér*, which invites viewers to think about the consequences of oil use, instead of immediately plunging them into the reality of an energy crisis, like *Okkupert* does. Neither *Pionér* nor Okkupert provide answers to how to solve the environmental and energy crises. However, this is not their aim. Their aim is to construct the recent history of Norway's relationship with fossil fuels, from the times of the Norwegian oil boom to the current energy crisis and the turn to greener politics. Because of the close connection between economy and energy that *Okkupert* meticulously explores, one hardly finds an unambiguous answer to how to save the environment without setting humans against each other and starting war, thus recognising toxicity as the defining and driving characteristic of the current era.

Just as *Pionér* is aware of the dramatic consequences that the use of oil will have, *Okkupert* understands the scale of the problem but does not see an easy solution to it. The series' hard-boiled politicians, their cynical policies, and openly extremist views of their opponents reveal great political turmoil over the environment, thus to a large degree illustrating Cuomo's (2011) notion that, when thinking about climate change and its causes, we should think about specific agents and agencies. Yet, *Okkupert* also provides an opportunity to look at the wrongdoings that humans commit against themselves and nature in general, making the viewer realise that perhaps a more effective way to approach the problem is to acknowledge that everyone is to be blamed for the ecological decline that we are facing today. This intensifies the problem of toxicity which does not end with individual people or organisations, but has indeed invaded our world, making everyone responsible for the process of environmental ruination. In doing so, the series contributes to a cultural reconstruction of energy history on screen. Whether humanity will be able to mitigate climate change and become eco-friendlier is yet to be seen; however, cultural examples such as *Pionér* and *Okkupert* foreground the complexity of current environmental issues and help us understand the nature of the ecological collapse that is threatening our planet because of our own actions.

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Chapter 8
Histories of the Present: Tar Sands Photography and Colonial Cultural Production

Samantha Spady and Siobhan Angus

> *[T]o make a new world is to run the risk of forgetting the problem or believing it solved.*
> —Spivak (1974, p. xv)

Abstract This chapter examines photographs of the Alberta Tar Sands through the lens of settler colonialism and extractive capitalism. We argue that current conversations about energy transition must consider how colonialism has shaped our perceptions of, and relations to land, water, and resources. We seek to investigate how extractive relationships to land emerge through cultural production. We use landscape and survey photography in our case study, analysing both historical representations of the Tar Sands and more contemporary activist images. This chapter asks what cultural and political work do images of the Athabasca Tar Sands play in shaping how oil extraction is understood? Furthermore, it also asks what is assumed about land, resources, and extraction that conditions what alternatives, and what kinds of energy transition are possible? This paper poses questions about how the pursuit of sustainable futures may reproduce colonial relations, how coloniality shapes perception, and how cultural production determines what forms of extractions come to be considered possible and necessary.

Keywords Photography · Energy transition · Extraction · Oil · Settler colonialism · Athabasca tar sands

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8.1 Introduction

This chapter argues that conversations about energy transition must consider how colonialism has profoundly influenced the cultural and political imaginaries of our current moment. It describes how the enduring forms of colonial perception deeply shape how we understand both climate change and energy transition. In order to understand energy transition and do the work of imagining sustainable futures, we must analyse how colonialism continues to influence the way we understand the world around us, particularly the ontological assumptions that typically frame ways of knowing lands, waters, and nonhuman species in Western society and culture. Without addressing the ontological underpinnings that are rooted in colonial logics, we risk reproducing and further entrenching colonial relations of extraction and exploitation by continuing to treat the earth as simply a resource, a commodity, or backdrop for human activity.[1] Worse, we risk erasing the recognition that our current relationships to land require the violent dispossession of Indigenous peoples and the destruction of lands, waters, and nonhuman species. Discussions of transition that do not account for colonial cultural and knowledge production have the effect of leaving many of the same structures in place, even if they are carbon neutral.

To demonstrate how extractive relationships to land emerge through cultural production, the chapter focuses on photography of the Athabasca Tar Sands, a site of large-scale oil extraction in Western Canada. As a case study, this chapter foregrounds the conditions of ongoing settler colonialism and the expropriation of Indigenous lands for resource extraction in Canada. It argues that settlers were/are taught to see the Tar Sands through the lens of wilderness and *terra nullius* [nobody's land]. The cultural imaginary of wilderness emptied the land of Indigenous presence and possession in order to make way for the 'civilising' projects of European settlement, agriculture, and resource extraction, which sought to use land in 'productive' ways. In demonstrating the effects of *terra nullius*, we want readers both within and outside of the Canadian context to reckon with the ways that colonialism has also shaped knowledge and cultural production in the metropole.[2] This chapter asks what cultural and political work do images of the Athabasca Tar Sands play in shaping how oil extraction is understood? Furthermore, it also asks what is assumed about

[1] Our argument about ontology and colonial relationships to land builds on the important work of Indigenous scholars who have described the ways in which colonialism operates from human-centric and capitalist Western ontologies that are incommensurate with the ethics and responsibilities that are a part of relational Indigenous ontologies (Kimmerer 2013; Murphy 2017; TallBear 2017; Todd 2016, 2017).

[2] This includes the center-periphery as defined by Innis (1970) in his description of Canadian political economies. Innis argues that Central Canada relies on the raw materials of the Hinterland. We see this argument also reverberating through how legacies of colonial encounters deeply influenced the metropole and echoed throughout nation-building projects in Europe (Cooper and Stoler 1997; Stoler 1995). We position the circulation between the metropole and colony as an important lesson for understanding contemporary energy debates both in terms of the circulation of global commodity markets and cultural production, as well as the continued reliance on raw materials taken from former or currently colonized places to meet the energy needs of the rest of the world.

land, resources, and extraction that conditions what alternatives, and what kinds of energy transition are possible?

The chapter argues that a discussion of energy transition that does not challenge the colonial relationships to land, including conceptions of property and the prioritisation of corporate wealth, cannot address the environmental challenges of the present. Other epistemologies, ontologies, and ways of relating to land are lost when the colonial gaze is reproduced in debates about energy transition. An energy transition that reproduces a colonial transition cannot envision a more ethical relationship to places of extraction and fails to address the structural causes of climate crisis. While this chapter focuses only on settler colonialism, we are encouraged by the proliferation of work linking environmental racism, climate change, and land dispossession (Gergan et al. 2018; Gómez-Barris 2017; Murphy 2017). Furthermore, we see this work contributing to the diverse literature on the energy humanities. While still emerging and developing, the energy humanities is concerned with energy transition, including the attachments, ubiquity, and saturation of energy use in our day-to-day lives (see the chapter by Szeman in this volume). Our contribution to this emerging field, and to conversations on transition more largely, is to consider how the histories of colonialism have deeply shaped how we perceive, how we see, and how we know. These processes are crucial to understanding what the problems are and how we might transition away from them.

This chapter begins with an overview of the Athabasca Tar Sands, and then describes what we mean by perception and the political stakes of understanding perception as a historical and social process. Next, it examines how the Athabasca region came under the purview of the Canadian state through Treaty 8, and the types of colonial visual culture that went hand in hand with expansion and dispossession. These forms of visual culture worked to produce and proliferate an understanding of Indigenous land as *terra nullius*. We define and expand on the history of this term as it relates to the ways of seeing and knowing this place through landscape painting, the geological survey, and early Tar Sands photography. The chapter then traces the historical role of the state in developing oil extraction in the region. It concludes by analysing how the colonial visual forms that reproduce *terra nullius* continue to be reproduced in the present. Using visual representations of the Tar Sands as an empirical case study, the chapter argues that the reproduction of colonial ways of seeing demonstrates the ubiquity of colonial perception. An implication of this insight is that it can inform how we might think about issues of oil extraction, consumption, and energy transition more largely.

8.1.1 The Athabasca Tar Sands

The Athabasca Tar Sands oil deposit, located in the province of Alberta in North Western Canada, is the largest industrial project in the world and the third largest proven oil reserve (Nikiforuk 2010). Due to the scale of extraction and its history as a settler-colonising nation, Canada is a crucial place for studying energy transition and

settler colonialism. The Tar Sands oil deposit is also on Indigenous territory subject to Treaty 8, which was signed in 1899 and 1900 between the Canadian state and the Cree, Dene, and Metis nations of the Athabasca region (Maher 2011; Madill 1986).

While settlers and speculators were exploring the region throughout the 19th century, the early Canadian state conducted a decades-long search for commercial uses of bitumen. When the oil found in Northern Alberta was determined to be an 'unconventional' oil deposit, i.e. not an easily drillable deposit, the government became invested in finding other uses for bitumen. Provincial and federal funding was provided for research to develop asphalt, roof tiling products, and, eventually, the extraction techniques to turn bitumen into a shippable form of oil crude, though this research was, at times, fraught and abandoned.[3] The 1947 discovery of oil at Leduc, outside of Edmonton, however, brought about significant changes to Albertan economy. In 1948, the provincial government took over a failing private experimental processing plant called Bitumount and rebranded the site the Alberta Government Oil Sands Project. After confirming the commercial viability of the oil sands, the provincial government began to solicit investors. By 1953, the Great Canadian Oil Sands (GCOS) consortium was constituted from various former private mines such as Abasand Oils, Canadian Oils Ltd., Champion's Oil Sands Ltd., American Oil Company, and Sun Oil Company. The GCOS began their commercial scale mining activities in 1967 (Longley and Joly 2018).

The oil crisis of 1973 further transformed the Tar Sands. Securing energy became an important objective. When a private American oil company pulled its investment from Syncrude Canada Ltd., which was working to build a new oil plant in the region, the Alberta, Ontario, and Canadian federal governments stepped into purchase the private company's share, acquiring 10, 5, and 15% of the share, respectively. Along with this ownership scheme, the Alberta provincial government also made several other loans and investments with Syncrude (Longley and Joly 2018, pp. 6–7). The Crown Corporation, PetroCanada was formed, solidifying the state's interests to secure part of the market share, and facilitate private ownership and profit in this region (Preston 2017, p. 116). However, during the 1990s neoliberal restructuring, PetroCanada's nationalisation goals were marginalised as the company went public and all state-owned shares were sold off by 2004 (ibid., p. 121).

The absence of direct state ownership in the Tar Sands operations has not meant that the state has become uninvested in getting this oil to market. According to the recent International Monetary Fund (IMF) report, the Canadian Government subsidises the energy sector an extraordinary $46.4 billion. These subsidies are made through either direct investment or uncollected taxes on externalised costs (Anderson

[3]It was not until 1913 that engineer Sidney Ells from the Department of Mines in Ottawa began a research expedition with government funding to conduct a study on the commercial potential for bitumen. Ells developed early techniques of separating the oil from the sand, producing asphalt (Turner 2017, p. 37). A rivalry developed between the provincial and federal governments to determine which scientists could discover a commercial use for bitumen, and the hot water/steam process to separate oil from bitumen. The Government of Alberta and the University of Alberta sponsored Dr. Karl Clark in his research throughout the 1920s but had to suspend financial support through the Great Depression and World War II (Turner 2017).

2016). IMF economists have calculated that $3.5 billion of that is from uncollected value-added taxes and $1.4 billion in direct subsidies alone. In addition to financial investments, the state has also devoted resources to the surveillance and policing of this resource (ibid.).

Finally, as this oil deposit is far from oceans in the landlocked Canadian west, it requires pipelines to get it to market. Controversial pipeline projects such as Keystone XL, Transmountain, and the Line 9 reversal are all needed to get Tar Sands to refineries and markets. In 2018, the Canadian Government under Prime Minister Justin Trudeau spent U.S. $3.4 billion (C $4.5 billion) to buy the Trans Mountain oil pipeline, which spans a 715-mile route from Alberta to British Columbia. These pipelines have all been subject to fierce resistance from Indigenous land and water protectors, as they refuse to have pipelines cross their territories. For this reason, this oil then sits at the intersection of climate change, colonialism, and extractive capitalism. The lessons we can learn from how this place is understood and made normal are lessons that are globally significant.

8.2 Tar Sands Photography

The Tar Sands are a complex site of interaction between nature and industry, the state and corporate interests, and settler and Indigenous societies. However, despite the extractive labour that occurs on a massive scale, Northern Alberta's Tar Sands are spatially removed for most people, and therefore, out of sight. As a result, most people's experience of this place is mediated through photographs, film, or news media. The visual thus forms an important way of knowing and understanding extractivism in Canada. In an increasingly visual world, the visual is a critical site of knowledge production. For instance, it is estimated that, in 2017, 1.2 trillion photos were taken (Cakebread 2017), while every minute, Instagram users shared 46,740 photos and Snapchat users uploaded 27,760 images (Domo 2017). In our study case, we focus on how people learn about extraction through the visual evidence of photographs. Photography is a representation of the world around us. As a result, photographs mediate our relationship to the external world.

To consider how photographs mediate our understanding of the Tar Sands, we root our analysis of energy transition in *perception*, a crucial process of making sense of the world (Gómez-Barris 2017; Merleau-Ponty 2005). We explore perception as it is broadly defined: a process of learning about the world through visual or sensory impressions (Perception 2020). The photo theorist John Berger articulates the importance of perception, observing that "[i]t is seeing which establishes our place in the surrounding world; we explain it with words, but words can never undo the fact that we are surrounded by it. The relation between what we see and what we know is never settled" (1972, p. 7).[4] As Berger describes, images are an important

[4]Classic texts on perception include Maurice Merleau-Ponty's *Phenomenology of Perception* (2005; first published in 1945) and John Berger's *Ways of Seeing* (1972).

way in which we gain knowledge of the world. It is particularly significant because the circulation of images helps shape the often unquestioned ways of knowing and experiencing place.

The visual culture of the Athabasca Tar Sands has been largely shaped by state interest in the mineral resources in the region. In this way, the Athabasca region forms a contrast to the nearby national parks of Banff and Jasper, which were extensively documented for their dramatic natural scenery and sweeping mountain vistas. Rather than aesthetic landscape photography, the Tar Sands visual culture is rooted in survey photography. The survey was, of course, a critical tool for both enclosing commonly held lands, and for colonising and settling North America (Blomley 2003).

Perception is not a neutral process. In this chapter, we consider how it relates to processes of world-making. In its most literal definition, perception is a way of learning about the world through sensory observation. However, it is also defined as a way of understanding or interpreting something, a process through which sensory information becomes knowledge. Seeing becomes linked to the production of meaning, knowledge, and ideology. Visual culture plays a significant role in creating, mediating, and contesting structures of power. Rancière (2006) has compellingly argued that the aesthetic dimension is integral to politics. The "distribution of the sensible" governs what is possible to see and hear, to say and think, to do and make within particular social contexts, establishing the centrality of perception in the maintenance of the political order (Rancière 2006, p. 26). In this framework, politics is understood as a struggle between the established social order and its excluded parts. Politics emerges when those removed from the political order assert their sovereignty. In this framework, perception is understood as both culturally situated and historically produced. What cultural and political work do images of the Athabasca Tar Sands play in shaping the "distribution of the sensible", or, to put it more simply, the perception of reality and its possibilities for change? In the following sections, we consider what social imaginaries mediate our understanding of fossil fuels, and the implications these imaginaries have for energy transitions.

8.3 Settler Colonialism

The Athabasca Tar Sands are on the traditional territories of the Metis, Dene, and Cree people. Since the turn of the 20th century, Treaty 8 has governed relationships between Indigenous communities, the state, and settlers on this territory. The Treaty was the result of a demand by the Dene people who sought to formalise how the land would be shared with settlers, who were sweeping through their territories on route to the Klondike gold rush (Madill 1986). However, the Canadian state was also interested in securing a treaty in order to 'extinguish' the Indigenous title to these lands and secure their own sovereignty over possible mineral and oil deposits (ibid.). Canadian and Indigenous understandings of the Treaty—and of land itself—were incommensurate. Rather than the co-existence and land-sharing covenants that treaties typically spelled out in Indigenous treaty-making practice, the state used

treaties to take ownership over collectively held and spiritually resonate lands and waters (Lindberg 2010). Today, Treaty 8 lands continue to be a space of contestation between Indigenous communities, petrochemical companies, and the government, as oil exploration and extraction dominates the landscape. The relations of settler colonialism and the transformations this form of colonialism has brought to this place are undeniable.

Settler colonialism is a form of colonialism in which the invader-coloniser attempts to create a new society in place of and through the erasure of the Indigenous ones (Wolfe 2006). As Eve Tuck and K. Wayne Yang argue, "[t]he horizons of the settler colonial nation-state are total and require a mode of total appropriation of Indigenous life and land, rather than the selective expropriation of profit-producing fragments" (2012, p. 5). In this way, settler colonialism is primarily about settler replacement of Indigenous people, and while it may also include the extraction and appropriation of resources, this is not its central organising principle.[5] Settler nations are distinct from immigrant nations as "[i]mmigrants are beholden to the Indigenous laws and epistemologies of the lands they migrate to. Settlers become the law, supplanting Indigenous laws and epistemologies" (ibid., pp. 6–7).

Settlement is about making a home on Indigenous lands. This process involved the implantation of European legal practices that transformed land into private property. Consequently, white settler entitlement to this property required Indigenous dispossession (Blomley 2003, p. 129). Patrick Wolfe (2006) describes the "logic of elimination" that permeates all institutions, spaces, and laws in the setter colony, which strives for the continuous removal of Indigenous peoples to make way for the settler state and its control of territory. Access to land is thus "settler colonialism's specific, irreducible element" (Wolfe 2006, p. 388). This access to land is not simply a historical event, but a structure that carries on into contemporary conflicts over appropriation of land for oil and gas development, and the pipelines needed to transport this energy to market (ibid.; see also Cowen 2017; Estes 2019; Spice 2018). Given the intimate relationships between the state and industry to secure access to land for energy development, we see settler colonialism as a crucial logic at the heart of the "energy impasse" described by Boyer and Szeman (2014). For this reason, we argue that settler colonialism is a fruitful analysis for furthering the energy humanities. At the crux of this is what Michi Saagiig Nishnaabeg writer Leanne Betasamosake Simpson has described as the impossibility of colonial-capitalism having the tools to achieve the transitions we need. She argues (qtd. in Harris 2019, [n.p.]):

> The issue is that accumulation-based societies don't like the answers we come up with because they are not quick technological fixes, they are not easy. Real solutions require a

[5] Settler colonialism is distinct from conceptualisations of external and internal colonialism, because these modes are employed in the operation of settler colonialism; at the same time, "there is no spatial separation between metropole and colony" (Tuck and Yang 2012, p. 5). They give examples of internal colonialism through forced removal of Indigenous people from homelands to reserves and U.S. boarding schools (and residential schools in Canada), and forms of external colonialism through resource extraction on Indigenous lands in the U.S. South West and Alaska (and, in this case, on both treaty and unceded lands throughout Canada).

> rethinking of our global relationship to the land, water, and to each other. They require critical thinking about our economic and political systems. They require radical systemic change.

The radical change Simpson articulates is one of decolonisation, a future that includes the rematriation of Indigenous lands and waters, and the transformation of entire societies, including those that may not be the site of settler colonies, but that benefit nonetheless from the wealth created there.

8.3.1 Labour and Land

In addition to social transformations, settler colonialism also seeks to transform the land itself. This 'terraforming' includes importing plants and animals, damming rivers, removing forests and other Indigenous land features to build cities, farms, and other types of extractive industries. As Kyle Whyte puts it, "industrial settler campaigns erase what makes a place ecologically unique in terms of human and nonhuman relations, the ecological history of a place, and the sharing of the environment by different human societies" (2016, p. 88).

This extends to the relations of capitalism that are pursued by the state, which can be understood as part of a colonial-capitalist project. Glen Coulthard argues that in Canada, this colonial domination is maintained structurally to secure access to the resources and land base that the state builds capitalist development and settlement, and derives its state-formation from (2014, p. 7). Coulthard's re-working of Marx's Primitive Accumulation theory helps us to attend to the ways in which dispossession looked and functioned differently in North America than it did in Europe.[6] He claims that (ibid., p. 14)

> re-establishing the colonial relation of dispossession as a co-foundational feature of our understanding of and critical engagement with capitalism opens up the possibility of developing a more ecologically attentive critique of colonial-capitalist accumulation, especially if this engagement takes its cues from the grounded normativity of Indigenous modalities of place-based resistance and criticism.

Instead of dispossessing people in a process of proletarianization, Coulthard argues that after the fur trade period, "Canadian state-formation and colonial-capitalist development required first and foremost land, and only secondarily the surplus value afforded by cheap, Indigenous labor" (ibid., pp. 12–13). The transformation of Indigenous land into Treaty-Crown land was not just about privatising the commons for the use of the state, but also a transformation of the value of land.[7]

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[6]Coulthard argues that the capital relation "tends to concern itself most with the adverse structural and ideological effects stemming from expropriated labor", and takes for granted the idea that "land is not exploitable, people are" (2014, p. 14).

[7]Locke and Marx (and much of Western philosophy and political economy) both share this understanding of land's value—that it comes from the work that is invested into it (Engle 2011, p. 31). Whether communally or privately held, the labour with the object adds value and subsequently ownership and extractive relations to land. In this way, both capitalist and socialist/communist

Centring the colonial relation in this analysis attends to how colonialism transformed relations to this place in particular ways that have resulted in significant efforts by the state to make Tar Sands extraction possible and profitable. Furthermore, this orientation shifts how we might understand questions of transition, and, as we describe next, how we perceive the questions, problems, and possible solutions related to extractive industries, energy, and transition.

While this case study centres on settler colonialism, we argue that the issues surrounding land and energy extraction do not only concern settler nations. Lowe (2015) has traced the convergent and overlapping processes of and linkages between Indigenous expropriation, African enslavement, indentured migration, and other racial dispossessions of colonial capitalist expansion. She offers a way to account for what she terms the 'intimacies' between the Americas, Asia, Africa, and Europe. In this way, racial formation circulates between these continents and is contingent on particular histories that overlap and inform each other, while not attempting to make these different processes and violences equivalent. According to Lowe, "it is necessary to conceive settler colonialism, slavery, indenture, imperial war, and trade together, as braided parts of a world process" (2015, p. 76). This "braided world process" is instructive to how we understand current debates and scholarship about the climate crisis, extraction, and energy transition. Tracing how the histories of settler colonialism, slavery, indenture, imperial war, and trade are outcomes of a particular worldview, and ontological assumptions about social and economic relations, shape how we can understand them as co-constitutive of each other. We see these histories as deeply entangled with and structuring the types of relations that have led us to the simultaneous crises of capitalism, climate change, and mass extinction. In order to fully grasp what might be possible in energy transitions, we argue it is important to reckon with these global capitalist-colonial processes. The global reach of both colonisation and capitalism makes it crucial to understand how the flows of knowledge that transformed economic and social relations in Europe were implanted in other places through dispossession and conquest.

8.4 The Colonial-Extractive Gaze: *Terra Nullius*

In our case study, we argue that the logics and practices that have created and sustained Tar Sands extraction in this place can be understood as *extractivism*. Extractive capitalism is a process that attempts to assimilate or eradicate other ways of living, knowing, and relating to resources, lands, and waters. Through this, it asserts the primacy of the extractive gaze as a way of seeing, understanding, and relating to land. Writing from the South American context, Macarena Gómez-Barris defines

projects still understand land to be primarily a resource to/from which value can be added or extracted; not as something that is alive, or agentic. Sandy Grande clarifies that "both Marxists and capitalists view land and natural resources as commodities to be exploited, in the first instance, by capitalists for personal gain, and in the second by Marxists for the good of all" (2004, p. 27).

extractivism as "an economic system that engages in thefts, borrowings, and forced removals, violently reorganizing social life as well as the land by thieving resources from Indigenous and Afro-descendent territories" (2017, p. xvii). Natural resource extraction must be understood within existing practices of settler colonialism, as rich natural resources found on Indigenous territories require legal or extra-legal dispossession and expropriation (ibid.). This necessitates an analysis of "how Native peoples are both constructed by the state and corporate entities as obstructions to the expansion of extractive capitalism and literally block its reach" (ibid., p. xvii). This process results in a way of seeing or perceiving land which Gómez-Barris terms the *extractive view*: a way of seeing that was enforced by European colonisation that "cast nature as other and, through the gaze of terra nullius, represented Indigenous peoples as non-existent", which facilitated both settlement and the extraction of those territories' resources (ibid., p. 6).

The extractive view is rooted in *terra nullius*, the perception that land is empty, not being used, and therefore can be taken. The concept emerged from a similar one in Roman law, where something defined as *res nullius*, nobody's thing—including wild animals, slaves, or abandoned structures—could be seized and taken as property (Lindberg 2010, p. 92). There was a widespread perception by European settlers in the Americas that Indigenous people did not have practices of claim or entitlement to land. As Zapotec scholar Isabel Altamirano-Jiménez explains (2013, p. 32),

> [a]lthough Indigenous territories were imprinted by human actions and inhabitants were governed by complex systems of land use and ownership, disavowing Indigenous peoples and constructing them as 'hunter-gatherers' and their lands as being waste or 'wilderness' corresponded to a practice of eliminating Indigenous peoples. Moreover, these constructions justified the civilizing action of English settlers and the rejections of Indigenous land ownership.

This belief was used as a justification for white settlement and the appropriation of lands for resource extraction. As Mario Blaser and Marisol de la Cadena argue, "[e]xtractivism continues the practice of terra nullius: it actively creates space for the tangible expansion of the one world by rendering empty the places it occupies and making absent the worlds that make those places" (2018, p. 3). *Terra nullius* is also rooted in conceptions of land use: if no one had shown the initiative to develop the land, it was considered empty regardless of settlement. In the summer of 1900, treaty commissioners travelled through Treaty 8 territory, describing how "the forest appeared empty as seen from a passing boat moving slowly along the Athabasca River. There was an 'absence of life of any kind along the river'" (Maher 2011, p. 67). Travelogues and correspondences from this period emphasise depopulated territory and depict Indigenous populations as dying out (ibid., p. 68).[8] Secretary Mair of the Treaty 8 Commission estimated that there was room to settle over a million people as the territory was "enormous in extent and rich in economic resources" (ibid., p. 71). Importantly, these resources "should now be placed by treaty at the disposal of the Canadian people" (ibid.). The analysis of extractivism that has emerged from South

[8]For a more in-depth analysis of this, see Maher's (2011) historical account of the Treaty 8 Commission.

America also describes the resistance that has emerged in response to resource theft and the important efforts to regain resource sovereignty locally.

Visually, *terra nullius* found its expression in landscape painting and photography. Throughout the 19th and 20th century, artists, writers, journalists, and promoters reimagined the homeland of the Metis, Cree, and Dene peoples as an untouched wilderness. Within Canadian art history, empty, depopulated landscapes confirmed to white settlers that the traditional territory of Indigenous nations was *terra nullius*.[9] By rendering landscapes empty and wild, the presence of Indigenous communities was symbolically erased. Canada's cultural imaginary has long been defined by 'wilderness'. The abundance of natural resources replicated in paint or photography signalled Canada's future as a resource economy in an aesthetics of abundance.

Tuscarora art historian Jolene Rickard (2015) argues that differences in perceiving and representing territory reveal contrasting ways of relating to and valuing land. She describes how "from an Indigenous perspective, the genre of landscape painting is one of the conceptual and visceral tools of colonization" (Rickard 2015, p. 115). In contrast to the empty vistas of landscape painting, the material culture produced by Indigenous communities, "molded in clay, carved in stone, stitched in animal skins, woven in fibers, etched on our bodies, and embedded in the environment as mounds or medicine wheels", reflects an ongoing visualisation of thought and relationship to the universe (ibid.).

The intimate nature of the artistic labour that Rickard describes between the artist and these materials also prompts a consideration of relationality to natural materials and the natural world. She articulates the stakes in representations of land by noting that Haudenosaunee artistry is "not only the visual, but also the overt integration of the responsibility Indigenous peoples have as ongoing stewards or guardians of the land" (Rickard 2015, p. 119). Indigenous practices of treaty-making and definitions of sovereignty completely contest the state's practice of capture and extinguishment. In Treaty 8 territories, this includes Cree, Dene, and Metis cosmologies, and legal reciprocal practices towards lands, waters, and more-than-human life. Cree elders have described the possibility of extinguishing title to land as impossible, as the responsibility for and, as a result, sovereignty for the land is a spiritual right that is inviolable (Cardinal and Hildebrandt 2000). As Cree and Blood scholar Sharon Verne describes (1998, p. 23),

> [o]ur spirituality and our responsibilities define our duties. We understand the concept of sovereignty as woven through a fabric that encompasses our spirituality and responsibility. This is a cyclical view of sovereignty, incorporating it into our traditional philosophy and view of our responsibilities. There it differs greatly from the concept of western sovereignty which is based upon absolute power. For us absolute power is in the Creator and the natural order of all living things; not only in human beings… Our sovereignty is related to our connections to the earth and is inherent. The idea of a nation did not simply apply to human beings. We call the buffalo or, the wolves, the fish, the trees, and all are nations. Each is sovereign, an equal part of the creation, interdependent, interwoven, and all related.

This conception of *responsibility* to land is a central difference between how land was understood by settlers and by many Indigenous nations. Through the "rupture

[9] For an analysis of wilderness in Canadian art history, see, for example, O'Brian and White (2018).

of Indigenous cosmological relationships to land, the state and corporations expand their control and purview over nature in new forms of settler colonialism", and in doing so "colonial visual regimes normalize an extractive planetary view" (Gómez-Barris 2017, p. 6). The extractive gaze and the images that are produced from it frame our understanding of possibilities and solutions, often unconsciously. In the following sections, we analyse how photography reproduces ways of seeing and relating to the world that helped bolster the project of colonial extraction.

8.5 The Role of State in Extractive Capitalism and Survey Photography

Like Canadian landscape painting, we place survey photography in a similar category of early Canadian visual cultural production. Though used and consumed in very different ways, the ways of 'seeing' reflect the aims of capturing empty lands for settlement, extraction, and industrial development. Survey photography was an important technique of colonial administrators to impose private property while erasing Indigenous presence and land use.[10] As a practice of abstraction, surveyors constructed land as an objective, ownable thing that facilitated not only new legal relations to land through private property, but also the social relations that could exist in those newly ordered spaces (Blomley 2003). This process abstracted land into a commodity: a thing that can be bought and sold. In the context of settler colonialism, this abstraction was formalised in laws that required Indigenous dispossession and subsequent racialisation of property regimes. An important institution for place-making by the Canadian state was The Geological Survey of Canada.

The earliest significant photographs of the Athabasca Tar Sands were survey photographs produced by G.B. Dowling for The Geological Survey of Canada. Dowling's photographs document the existence of oil in the region, forming visual evidence to accompany reports by Dr. Robert Bell, a field geologist who would become acting director of The Geological Survey of Canada. Bell's reports describe the "tar and pitch" forming "pools of oil" (1884, p. 21). The photographs by Dowling acted as evidence of the existence of oil in the region. The Geological Survey of Canada celebrates how "geologists became among the first to recognize the importance of photography in scientific work", producing photographs as early as 1860 to record interesting geological features (Hall 1967, p. 6). Survey photography was an important visual form in establishing relationships to the natural world and shaping the extractive gaze in Canada. Within the use of photography by The Geological Survey of Canada, "the images produced created an ordered, cataloged, and labeled environment" (Cronin 2007, p. 309). As Gismondi and Davidson argue,

[10] Writing of these vast changes made to land tenure in England during the 16th century enclosures, Blomley (2003) argues that the survey was a tool in abstracting land into private property. Blomley, among other scholars, shows how the transformation of private property in the metropole made way for systematic colonial expansion abroad (see, also, for example, Slotkin 1985).

Fig. 8.1 Tar sands at the Athabasca River, Alberta 1892 (Reproduced from the geological survey of Canada, G. B. Dowling, 1892, Library and Archives Canada)

"[i]nventories, maps, and reports by surveyors and engineers were both practical tools and symbols of state power", linking extraction and the emerging power of the settler colonial state (2012, p. 70). Through the lens of geologists and surveyors, the Athabasca Tar Sands were transformed into an extractive zone.

In an 1892 photograph, Dowling captures the Tar Sands along the Athabasca River (see Fig. 8.1). Divided in half on a diagonal, the framing emphasises the dramatic forms of the Tar Sands, which rise from river on the far-left side, filling the frame on the right. On the left of the image, the smooth, bright water provides a tonal contrast to the dark earth of the Tar Sands. A rich boreal forest spans the horizon line in the background of the image. Two lone trees jut out from the sands. On the left-hand sand, two human figures stand with their hands on their hips. Beside them is a small boat. Within the photograph, the focus is on the Tar Sands. The men provide scale, but they are out of focus and in the background. While their smallness emphasises the vastness of the resources available, the camera's lens focuses on the tonal and textural shifts within the riverbank. In this shot, the evidentiary function of photography is employed, a process of 'seeing is believing'. However, while surveyors were exploring and documenting the territory to highlight potential extractive resources, the photograph does not immediately reveal this.

Without contextualisation within the survey, the photograph has the hallmarks of traditional wilderness landscape photography: water, rock, trees. The inclusion

of the two figures and a small boat invites associations of wilderness travel. In the emphasis on natural scenery, there are affinities between survey photography, which catalogued resources, and wilderness, which aestheticized wildness. In both forms, however, the effect of demonstrating 'empty' lands without Indigenous presence reproduces the same colonial gaze of *terra nullius*. Whether the end effect was to preserve the image of untouched wilderness and create economies of settler adventure in these 'wild spaces' (Thorpe 2011), or to evaluate and demonstrate the mineral and oil resources that could be developed (Bell 1884), the visual forms represent these places as wild, untouched, and, importantly, empty.

8.5.1 The Extractive View

In 1908, Agnes Deans Cameron, a schoolteacher from Victoria, British Columbia, travelled through Canada's North-Western expanses on behalf of the Western Canada Immigration Association. Her travels were published in a heavily illustrated book, *The New North: Being Some Account of a Woman's Journey through Canada to the Arctic* (1910). While travelling through Northern Alberta, Cameron became fascinated by the Athabasca Tar Sands.

In Cameron's book and lectures, photographs are enlisted as tools to promote both settler colonialism and resource extraction in the Athabasca Tar Sands region. Cameron lectured with magic lantern slides of her "Journeys through Unknown Canada" across Canada and the U.S., as well as at Oxford, Cambridge, St. Andrew's University, and The Royal Geographical Society. The language of *terra nullius* is reinforced in Cameron's work, as she refers to Canada as "the last unstaked Empire under a white man's sky" (1910, p. 385). In the published book, a wide range of photographs illustrate her travel narrative, including landscapes, portraits (often of Indigenous people), and scenes of industry. Her section on the Athabasca River is illustrated with a landscape titled "Grand Rapids on the Athabasca River" (see Fig. 8.2). The photograph has the traditional hallmarks of landscape photography. A closely framed shot, the camera lens is placed near the river to focus on the choppy water that splashes onto rocks. In the background, trees span the horizon line. Behind the rocks, a boat introduces human activity into the natural landscape, though upon first glance, it mimics the rocks. Cameron describes the "sense of majesty and power" (ibid., p. 538). She describes how men "talk of the water-power furnished by the great falls, and hazard guesses about the future economic purposes to which it will be put" (ibid.). Immediately before this reference to the falls, she describes the incredible quietness of the region, emphasising how the land along the Peace River that "echo now only the quiet foot of the Cree is so unmistakably a White Man's Country" (ibid., p. 332). As this linking indicates, the narrative of the necessity and rightness of settler colonialism is tied to a celebration of capitalist development of natural resources. For Cameron, the settlement of the region by white settlers and the exploitation of oil in the region were twin pillars of development, linking extraction with nation building.

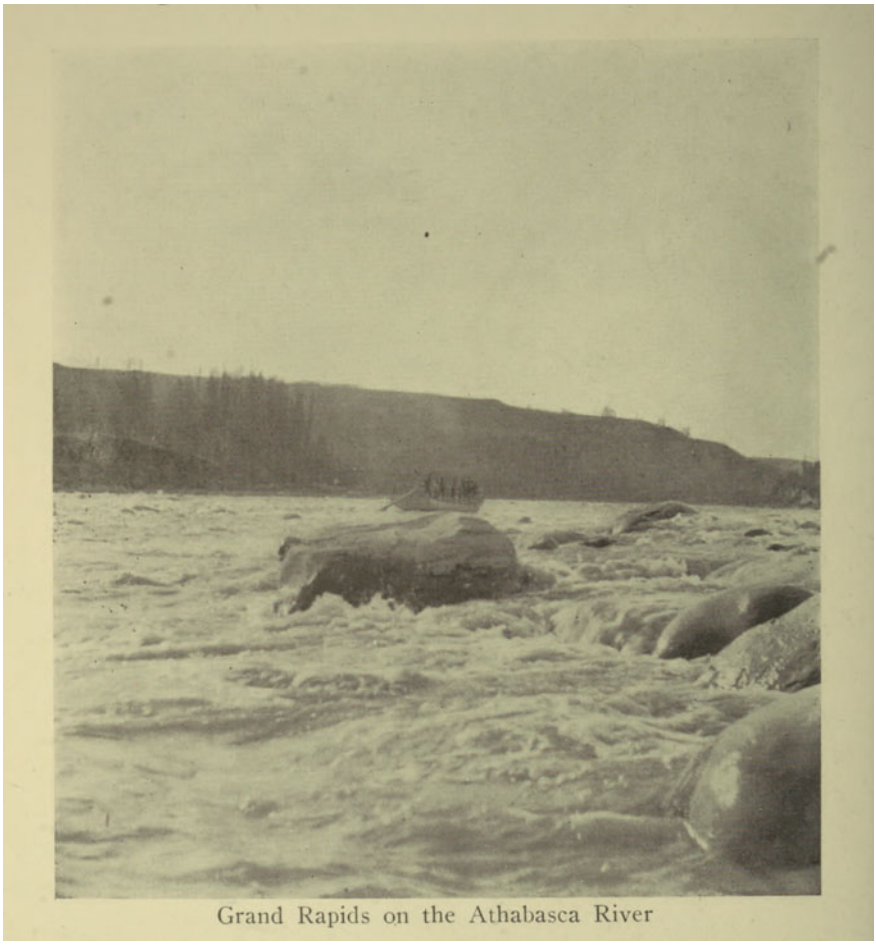

Fig. 8.2 Grand rapids on the Athabasca River (Reproduced from Cameron 1910)

The more traditional association of *terra nullius* with natural landscapes is supplemented by a focus on labour and the built structures of industry, connecting the association of *terra nullius* with land use. In one photograph typical of the collection, Cameron captures an oil derrick on the Athabasca (see Fig. 8.3). The rudimentary structure is shown with two figures standing alongside the derrick. The photograph captures an early attempt at finding an oil deposit along the Athabasca River. The framing of the photograph cuts off the top part of the oil extracting structure in favour of an extended foreground of the landscape. The unusual cropping of the photograph hides the distinctive architecture of the oil derrick. To the left of the derrick is a lone tree, which is visually mimicked by a small smokestack to the right.

In the text accompanying the image, Cameron describes how "[i]n all Canada there is no more interesting stretch of waterway than that upon which we are entering.

Fig. 8.3 An Oil Derrick on the Athabasca (Reproduced from Cameron 1910)

An earth-movement here has created a line of fault clearly visible for seventy or eighty miles along the riverbank, out of which oil oozes at frequent intervals" (1910, p. 90). She goes on to express her respect for "labor and determination which in this wilderness has erected these giant derricks. Looking at them, we waft a wish that the plucky prospector may reap his reward and abundantly strike oil" (ibid., p. 90–91). The extractive potential of the region was made clear, described as a resource that "oozes from every fissure, and into some bituminous tar well we can poke a twenty foot pole and find no resistance" (ibid., p. 93). The derrick was installed by Count Alfred von Hammerstein, a private speculator who arrived in the region in 1896. While his claims were ultimately not productive, Hammerstein was the first to extract oil commercially from the sands and raise significant investment to do so. By 1909, he had drilled 14 wells, erected five derricks, and invested in over 100 tons of equipment (Government of Alberta 2020).

Cameron's framing of the area as being developed through labour aligned with the ways in which the Treaty commissioners sought to incorporate this region into the Canadian settler colonial project predicated on European settlement and agriculture.

Uplifting, or improving the land through labour, works as a form of 'original appropriation', i.e. Locke's (2015) theory that labour, mixed with land, or work on the land, earned the settler his place on this land. Labour functions as a form of emplacement or place-making for the settler (Blomley 2003), creating relationships to land through work that become "techniques of settler belonging" (Jackson 2012, p. 74). When combined with the narrative that settlers could 'use' the land more efficiently or effectively than Indigenous peoples, or that Indigenous people did not use the land at all in the first place, 'original appropriation' offers a powerful narrative for legitimising both settler belonging, and violent dispossession and Indigenous erasure. Capitalism and colonialism's entangled structures co-create these discourses of the settler working to earn a place on the land and in the nation. This is often narrated as the impulse to 'improve' or 'uplift' the land into a higher purpose (Veracini 2010), while civilising what was considered wild frontier.

When Deans Cameron visited the region as a white settler woman traversing a remote frontier, she framed the region through two lenses: that of oil and that of nation-building. Deans Cameron's photography demonstrates how ways of seeing land in this area were greatly shaped by the interest of the state in developing oil production in the region, highlighting the links between seeing territory, and the ways these perceptions end up shaping how places are understood, valued, and ultimately transformed; what W. J. T. Mitchell describes as the making of history "in both the real and represented environment" (2002, p. 2).

8.5.2 Present

By 1967, when the Great Canadian Oil Sands Company was founded, this way of understanding land in the region had been largely defined. *Terra nullius* as a way of seeing or perceiving land—something to be owned—had tangible, material consequences. While recent Indigenous land actions and legal judgements on land claims have complicated this framework, the visual trope of the vast *empty* Canadian wilderness continues to circulate.

In contemporary visual culture, the Tar Sands are most commonly pictured through aerial photography. Famous examples include works by Edward Burtynsky, but the consistency in how the territory is perceived is evidenced in the circulation of images. For example, a Google Image Search of the 'Athabasca oil sands' and the 'Athabasca Tar Sands' returns a series of images with repetitive visual forms. They are all shot with aerial photography, showing the vast scale of the Tar Sands, and, often, the forests surrounding them. The uniformity of the images reflects how visual patterns are repeated in the representation of the Tar Sands. While they are not necessarily typical landscapes, these photographs fall into the category of landscape as it is broadly defined. Some of the images show industry, often through smokestacks that signal production. Because of the abstraction of the aerial view, workers are not the focus of the images. The scale also hides other land use patterns in the region. The images are used to illustrate a wide variety of articles, from both

pro- and anti-extraction perspectives. Critically, there are no markers of Indigenous presence, culture, or land-use in any of the images.

To focus on one the images, we look specifically to a 2009 Greenpeace advertisement by Jiri Rezac.[11] The photograph captures a 'line in the Tar Sands' which separates a Tar Sands mine from a lush forest divided by seismic lines. The ad puts forward a critique: "This is what unconstrained fossil fuel development and unchecked emissions looks like" (Greenpeace International 2009). Yet visually, the aerial view undermines the stated purpose as the decay of the Tar Sands mine becomes beautiful. Even with the knowledge that the painterly organic forms of the Tar Sands are not benign, the image undermines its own aim as the hyper saturated green sets up an aesthetics of abundance: an endless, untouched nature that surrounds the dark blue and white forms, echoing colours found in the natural world. The Tar Sands sit alongside 'nature' (indicated by its green-ness, though a nature that has been marked by development) and the photograph gives them equal space, initiating a visual equivalence.

While there is widespread acceptance that the environmental impacts of the Tar Sands have massively altered our global climate (Hatch and Price 2008), the image is oddly reassuring. The photograph offers visual proof through the ostensibly objective lens of the camera of the overwhelming abundance of nature that is endlessly able to absorb the trauma of development. The image, while well-intentioned, does not tell the viewer anything useful about the more damaging realities of extraction.

Furthermore, these types of images reproduce the idea of *terra nullius*. Like Deans Cameron's photographs and the gaze of the surveyor before them, these images empty out Indigenous presence, rendering the land empty but for the large holes and massive tailings ponds seen from the air. Not only do these images reproduce colonial frames of perception and seeing, they also obscure who exactly is responsible for this transformation of land. We suggest that while these images (often unconsciously) frame our understanding of possibilities and solutions, it is important to include a deeper analysis of how these processes of perception and understanding are historically produced through colonial-capitalist dispossession.

In contrast to the extractive zone, Gomez-Barris, theorizing with Glissant's conception of "renewed perception" offers the possibility of percieving otherwise (as cited in 2017, p. 9). She describes a "submerged viewpoint" that is attuned to the ecologies surrounding us that may not be visible to the naked eye (ibid., xv). If photography tends to obscure the more complex realities of the territory and the effects of colonial occupation, the task becomes "to question what lies beneath the visible world of *the extractive zone* and to seek out less perceivable worlds, life forms, and the organization of relations within them, while creating new methods that allow for this tracking" (ibid.; original emphasis). We see the continuation of abstracted visual production as part of this trajectory, and the social relations of settler colonialism and state investment in oil extraction that it orders. Tracing the histories and consequences of these perceptive frameworks allows us to understand

[11] This image can be viewed on Greenpeace's Flickr page as well as the Greenpeace website. See Greenpeace International (2009).

how the visual reproduces certain ontological assumptions, including that of colonial projects of dispossession, settlement, and extraction.

8.6 Conclusion

This chapter has traced the histories of visual cultural production alongside the settlement and creation of oil extraction in the Athabasca region of North-Eastern Alberta, Canada. In doing so, we argue that settler colonialism in this place has significantly shaped the ways of seeing land, which has, in turn, facilitated the capitalist-colonial appropriation of land to make way for Treaty, natural resource extraction, and nation building. We have traced several moments of 'seeing' the Athabasca Tar Sands from the 'extractive view' and through the colonial gaze. Emptying lands of the ways in which Indigenous occupancy was present, these practices of visual cultural production have deeply transformed the relations that exist here, seeking to replace Indigenous forms of place-making with Euro-Canadian ones. In Deans Cameron's photographs, and, more recently, activist anti-Tar Sands aerial photography, there exist similar forms of abstraction. The abstraction of land as seen in survey photography is repeated in these other forms of visual culture.

These photographs repeat the aesthetic and visual forms of landscape that have gone hand in hand with creating nationalist myths of wild frontiers and empty lands for the taking. Furthermore, these visual forms matter to how we perceive the social, political, and economic relations that make oil extraction possible in the present. Oil extraction in this place is not an inevitable outcome of commodity markets and demand for oil, but part of a longer history of land dispossession, investment in the technologies to extract and refine this oil, and the present commitments to continue to pursue extractive and carbon-based futures. As a result, we have argued that conversations about energy transition must consider how colonialism has profoundly influenced the cultural and political imaginaries of our current moment.

Ways of seeing and perceiving land have dramatic consequences for how land is understood, valued, and used. The logics of colonial-capitalism that structure ways of perceiving places like the Tar Sands make it possible to imagine this place as an inevitable site of oil production and industrial damage. To trace how this was not an inevitability, but the consequence of particular relationships to land, and particular practices of viewing and understanding this place, makes it possible to choose other ways forward. We see this argument as offering a type of way forward, a way to consider what is shaping what we know, how we understand, and even what we perceive. Examining these ontological assumptions offers ways to think about energy transition in new ways. More than just a relation of capital or the petrostate, we argue that examining the questions of energy transition through the analytic of settler colonialism offers a crucial approach to furthering scholarship in the emerging energy humanities.

Examining the ways that the visual forms of photography in the present replicate the types of practices and visual culture that made colonisation, land dispossession,

and extractive economies possible in the past, offers a method for understanding how relations of capital-colonialism become reproduced through visual tropes and conventions. Understanding the genealogies of these visual forms opens up new ways to trace the cultural and historical processes that condition how we perceive places like the Tar Sands, and the social relations that get created and sustained around oil economies and the practices of extraction that feed them. Furthermore, understanding that the types of relations towards land and resources in Northern Alberta are sustained and circulated world-wide helps connect this particular site to more global questions about energy creation, consumption, and, ultimately, transition.

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Chapter 9
The Future Is Nuclear: Energy Weapon in Isaac Asimov's *Foundation*

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Abstract Combining concepts, theories, and methods from literary studies, international relations, and energy humanities, the chapter examines the role and uses of nuclear energy in Isaac Asimov's science-fiction novel *Foundation* (1951). While offering a textual analysis of the novel, the chapter uses the concept of *energy weapon* to explore the different ways in which nuclear energy is used in the narrative as a foreign policy tool. It relies on a two-part textual analysis of *Foundation*, which first discusses the applicability of the energy weapon concept to the novel by examining whether it meets the four preconditions identified by Smith Stegen (2011). It then identifies three uses of nuclear as energy weapon in the novel: deterrence, ideology, and trade. Finally, the chapter applies this typology to current energy policy relations, using Russia as a case study. By drawing links between the fictional world of Asimov's novel and the current situation within the international arena, the chapter highlights the potential of literature in general and science fiction in particular to help us (re)consider our present and imagine our (energy) futures.

Keywords Energy weapon · *Foundation* · Isaac Asimov · Nuclear energy · Science fiction

9.1 Introduction

Energy in its many forms has always been an important part of human development and progress. The dawn of humankind (fire), the Industrial Revolution (coal-powered steam engine), World War I (oil), even European integration (cooperation in the coal and nuclear sector) and the post-economic crisis recovery (shale gas revolution) are all, at least partly, connected to different types of energy (Dinan 2004; Smil 1994;

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Wang et al. 2014). In the wake of World War II, nuclear energy gained increasing importance and its development sparked ideas about electricity so cheap that it would no longer be metered (Sovacool and Brossmann 2013). Belief in the key role of nuclear energy in the future development of humankind was mirrored not only in the imagination of decision makers, but in popular culture as well (Jasper 1990). While by no means disregarding its potentially negative consequences—especially the possibility of nuclear war (Berger 1976; Brians 1984)—science fiction in particular celebrated nuclear energy as a means of changing the world, even largely anticipating the advent of atomic power (Stableford 1995). This should, perhaps, come as no surprise since, as Graeme Macdonald points out, "[o]f all the genres of modern cultural production", science fiction has been "the most reflexively and *consciously* aware of energy as literary *and* material necessity, politico-environmental issue and techno-social system" (2016, [n.p.]; original emphasis).

One science fiction writer whose work shows particular interest in and enthusiasm for nuclear energy is Isaac Asimov (1920–1992). Unlike many of his colleagues, Asimov remained a vocal and "enormously influential apologist" of technological and scientific progress at a time when many raised concerns about its possible dehumanising effects (Stableford and Nicholls 1995, p. 1202). He was an especially ardent supporter of the development of nuclear energy, which he saw "as an inevitable step toward the eventual practical establishment of nuclear fusion as a resource" (White 2005, p. 254), and "a possible 'real life' salvation" and solution to humankind's various problems (ibid., p. 255). This attitude is clearly expressed in one of his most famous works, the 'Foundation' trilogy,[1] which is the main object of the research presented in this chapter. Specifically, the chapter focuses on *Foundation* (1951), the first book in the series, and explores the ways in which it depicts the role and use of nuclear energy, particularly its utilisation as a foreign policy tool. Since nuclear energy is less central to the other two other books in Asimov's trilogy (*Foundation and Empire* and *Second Foundation*), they remain outside the scope of this research.

Adopting an interdisciplinary approach, the chapter proposes a two-part textual analysis of Asimov's *Foundation*, wherein the role and portrayal of nuclear energy in the novel are interpreted using a concept borrowed from political science and international relations—*energy weapon*. The concept is used to explain the behaviour

[1] For the sake of simplicity, the present paper uses the term trilogy to refer to the first three books in what would decades later become a lengthy series encompassing numerous novels and short stories. However, it should be noted that, as Joseph Patrouch points out, its implication of "a completed unit composed of three novels" is somewhat misleading since the three books consist of stories—eight of them previously published, plus one new—which, taken together, "do not form a unified, completed work" (1974, p. 61). As such, the 'trilogy' is primarily "an open-ended series of stories that just happened to get printed all together in three books" (ibid.), rather than a three-part whole. The trilogy, which consists of *Foundation* (1951), *Foundation and Empire* (1952), and *Second Foundation* (1953), is only one part of a more extensive 'Foundation' series (the title of the series is given within quotation marks to distinguish it from the title of its first instalment), which also includes two sequels (*Foundation's Edge*, 1982; *Foundation and Earth*, 1986) and two prequels (*Prelude to Foundation*, 1988; *Forward the Foundation*, 1993), and was gradually expanded into a metaseries encompassing around 20 of Asimov's robot stories, four robot, and three Empire novels (Palumbo 2002).

of energy-rich countries and the way they use their natural resources for non-commercial purposes (Smith Stegen 2011). Seen from this perspective, energy is not only a commodity sold at a market with existing competition, but also a potential means of exercising political influence, especially under monopolistic conditions or in cases when different (mostly technical, but also legal and other) reasons prevent the establishment of a demand/supply equilibrium.

Through its focus on the literary representations and "narratological qualities of energy" (Bellamy 2016, p. 10), the chapter proposes to contribute to energy humanities (Boyer and Szeman 2014; Szeman and Boyer 2017), a research niche focused on the interplay between energy and the social, cultural, and political reality of its production and use (Szeman 2015, 2019; Petrocultures Research Group 2016). By adding energy humanities to the conversation, the chapter aims to create a bridge between the fictional portrayal of nuclear energy and its use as energy weapon on the one hand, and their extra-literary (specifically, policy) implications on the other (Lord 2014; Bellamy 2016; Szeman and Boyer 2017).

The approach presented in this chapter differs from similar interdisciplinary explorations of popular culture, which often use examples from popular genres and media (literature, film, TV series, etc.) to illustrate various concepts from social sciences or other disciplines, making them more comprehensible and accessible to a wider audience (Drezner 2011; Foy 2013; Ruane and James 2012). In contrast, the present analysis combines literary and international relations scholarship by applying a concept from social sciences to a work of fiction in order to explore in more detail both that concept and the work of fiction (cf. Beuret and Brown 2017; Thorogood 2016). Furthermore, it poses questions about the 'real-world' application and policy lessons that may be derived from these detailed explorations. In other words, what (if anything) can observations about the use of nuclear energy as energy weapon in a science-fiction novel written several decades ago and set in the distant future tell us about the present state of energy policy at the international level?

The chapter is organised as follows: the first, theoretical section discusses the concept of energy weapon, its use, and present operationalisation. It is followed by a summary of Asimov's *Foundation* and a two-part analysis which examines the applicability of the energy weapon concept to the novel, and the different uses of energy weapon it depicts. The penultimate part discusses the implications of the research results for the current conversation on international energy policy and situates them within the broader framework of energy humanities. The conclusion summarises the main findings and highlights the contribution of the chapter.

9.2 Operationalisation of Energy Weapon

The concept of energy weapon (see, for example, Henderson 2016; Lilliestam and Ellenbeck 2011) was developed within international relations scholarship to describe a situation in which energy-rich and exporting countries use their natural resources not only as a source of income (i.e. for commercial purposes), but also as a political

instrument for gaining influence (Casier 2011), usually concerning various foreign policy goals (Shaffer 2013). Energy weapon can therefore be defined as a "prospective source of significant political leverage […] used to threaten or exert pressure on consuming countries" (Henderson 2016, p. 461). Given the fact that its establishment is linked to the 1973 oil embargo, the term has long been predominantly associated with (crude) oil (Mabro 2008; Morgenthau 2006). Currently, however, it is primarily used in reference to Russia's natural gas conflicts with its neighbours (Lilliestam and Ellenbeck 2011). In fact, several analyses have identified the Russian Federation as the most conspicuous country utilising the energy weapon; the present section will therefore use the Russian example to illustrate individual parts of the operationalisation of the concept under discussion (Casier 2011; Henderson 2016; Smith Stegen 2011; for an opposing view, see Goldthau 2008).

According to Karen Smith Stegen, there are four conditions or stages "that must be accomplished before a state can be considered to have transformed energy resources into political capital", i.e. energy weapon (2011, p. 6506). Specifically, a state can be said to use energy as a weapon if: (1) it owns and/or has control over energy resources and (2) supply routes, and (3) uses energy—either implicitly or explicitly—to threaten, punish, or reward an importing state, which (4) responds to this (threat of) disruption or incentive by modifying its behaviour.

The first condition for energy weapon requires a state to have ownership and/or direct control of resources. For example, the Russian Federation gained control over almost all of its energy sources, with its biggest energy companies (i.e. Gazprom) firmly in the Government's hands (Judge et al. 2016). Independent actors or private firms have only very limited access to energy sources, while foreign influences (shareholders, foreign companies) face increasing restrictions. The second condition requires the exporting state to assert control over transit routes that grant the importing state access to energy; simply put, "the supplier state controls delivery to the customer" (Smith Stegen 2011, p. 6508). Transit assets thus have to be in the hands or under the direct control of the supplying country. Gazprom Export, a company fully controlled by the Russian Government, has a monopoly on natural gas export and (in)direct control over different transit routes (Mišík 2019). Moreover, it has developed surplus capacity (i.e. alternative supply routes) to limit the impact of transfer countries and improve its manoeuvrability (Vatansever 2017).

The third condition identified by Smith Stegen (2011) concerns the exporting country's willingness to convert its supplies into political goals. This can be done in several ways: for instance, the exporting country can threaten to shorten or interrupt energy supplies, hike the price of the commodity, or disrupt energy supplies (partly or in full). It should be noted that the exporting country can do this only if the previous conditions are met, i.e. if its government has control over energy sources and supply routes. The Russian Federation has interrupted its energy (oil as well as natural gas) supplies several times, with the most serious instance resulting in the 2009 energy crisis (Krickovic 2015; Siddi 2017). The Baltic States in particular have considerable experience with these interruptions (Mišík and Prachárová 2016; Zeng et al. 2017).

The final condition for energy weapon is the modification of the importing state's behaviour based on the exporting country's threats or actual interruption of energy

supplies. It is difficult to identify the causal influence of energy weapon on a given state's behaviour, especially since countries are often able to resist such pressure (Smith Stegen 2011). However, it may be argued that Ukraine changed its energy policy after the 2009 gas crisis, when it began importing gas from European countries and decreased its import from the Russian Federation (it no longer imports gas directly from Russia; Lee 2017; Stulberg 2017).

This chapter proposes to integrate the four-stage operationalisation described above into a two-step textual analysis of Asimov's *Foundation*. The first step aims to determine the presence of energy weapon in the novel, while the second explores the specific types of its usage. We argue that these types—i.e. concrete uses of the energy weapon—change throughout the novel, depending on the specific period that is portrayed. Before delving into the analysis, the chapter will first briefly introduce Asimov's *Foundation* and its main plot line, thus providing an empirical basis for the two analytical parts.

9.3 Asimov's *Foundation*

Hailed as "one of the founding fathers of modern science fiction" and—with around 500 fiction and non-fiction books to his name—"the third most prolific writer of all time" (White 2005, p. 1), Isaac Asimov is perhaps best known for his 'Robot' and 'Foundation' series (Clute and Edwards 1995; Patrouch 1974). The latter is especially notable as one of the most popular science-fiction series (Asimov himself considered it to be "the most popular and successful of all [his] writings"; 1994, p. 117) and recipient of the prestigious Hugo Award for Best All-Time Series in 1965 (Clute and Edwards 1995).

The story of *Foundation* depicts the decay of the 12,000-year-old Galactic Empire, "an interstellar version of the collapsing Roman Empire" (Palumbo 2002, p. 14), and the efforts of Hari Seldon, a mathematician and founder of *psychohistory*—a mathematics-based discipline able to predict the future (which Palumbo sees as "an extrapolation of chaos theory"; ibid., p. 24)—to shorten the period of anarchy and chaos between the inevitable fall of the old and rise of a new Empire. Under the guise of preparing a *Galactic Encyclopaedia* that would preserve "the science and culture of the dying Empire" (Asimov 2004, p. 119), Seldon establishes a research colony called Foundation on the planet Terminus, situated on the outer rims of the Empire (the so-called Periphery). Following Seldon's predictions about the future, the goal of the Foundation is to steer the development of the Galaxy in a way that would significantly reduce the anarchic interregnum—from 30,000 to 1,000 years—and create the basis for the Second Galactic Empire.

In the course of the novel which covers 155 years of its history, the Foundation faces several challenges (so-called Seldon crises) which are brought about by different types of power imbalance between Terminus and its neighbours, and invariably solved with the help of nuclear energy (Wilcox 1990). The first Seldon crisis occurs as the planets surrounding Terminus gradually become more independent

due to the waning power of the Empire. However, the Foundation's cutting-edge, nuclear energy-based technology gives it a distinct advantage over its neighbours, who have gradually reverted to feudalism and technological primitivism, allowing the Foundation to ward off attacks and create balance within the region. The second crisis is also defused with the help of nuclear energy—specifically, an entire religion built around it. However, over time, the neighbouring planets learn to recognise and resist the Foundation's foreign policy based on religious control, which prompts the Foundation leaders to develop a new approach, this time based on trade in advanced nuclear technology.

Though not previously described in terms of energy weapon, power (im)balance has been recognised as an important theme in the 'Foundation' series. Clyde Wilcox in particular discusses the "galactic balance of power" as central for the novels, noting that victory in conflicts does not necessarily entail physical defeat of the enemy, but may also consist of "maintaining independence by playing one galactic power off against the other" (1990, p. 58). Indeed, the conflicts in *Foundation* are not resolved by resorting to "spectacular battles featuring all sorts of fantastic weapons and super-weapons of the future", which were a staple of the science fiction of the time (Patrouch 1974, p. 74). On the contrary, the novel (and the series as a whole) is more focused on politics and the use of various non-violent forms of pressure (manifested, as this chapter argues, as energy weapon) to resolve conflict and assert (political) dominance. While, as the Major of Terminus Salvor Hardin points out, "put[ing] up a fight" appears to be "the most satisfactory" and "easiest way out", it is ultimately rejected as "the stupidest" option (Asimov 2004, p. 106); or, as summarised in an oft-repeated maxim, "Violence is the last refuge of the incompetent" (ibid., p. 105). Moreover, during the second Seldon crisis, violence is described as "an uneconomical way of attaining an end. There are always better substitutes, though they may sometimes be a little less direct" (ibid., p. 148). These alternatives to a violent conflict will be discussed in the two-step analysis that follows.

9.4 Step One: Does the Foundation Use Energy as Weapon?

Following the operationalisation of energy weapon presented above, the chapter now turns to the analysis of the use of nuclear energy in Asimov's *Foundation*. Specifically, the analysis first aims to determine whether the novel depicts the utilisation of energy as a weapon by considering the four conditions identified by Smith Stegen (2011).

9.4.1 Possession and/or Control of Nuclear Energy

Although devoid of metal and fossil fuels, "poor in resources and negligible in economic value" (Asimov 2004, p. 49), the Foundation's home planet Terminus has

access to nuclear energy sources,[2] thus meeting the first criteria for energy weapon: the possession and/or control of energy resources. The fact that nuclear energy is a rare and therefore highly valuable commodity within the Galaxy gives the Foundation a distinct advantage over other planets, especially its neighbours, which pose an immediate threat to it.

At the time when the Foundation is first established, nuclear energy-based technology is standard fare throughout the Galaxy. However, due to bad maintenance and lack of knowledge necessary to properly run power plants and other nuclear facilities, the planets surrounding Terminus gradually loose this technology and revert back "to barbarous techniques of chemical power" (Asimov 2004, p. 69)—i.e. fossil fuels. Significantly, it is the absence of oil that marks human progress, while the return to fossil fuels is seen as the first sign of a "slide into barbarism" (Canavan 2014, p. 338). The surviving nuclear technology of the Galactic Empire found on planets closer to the centre of the Galaxy becomes outdated and falls into decay due to a lack of proper maintenance. Thus, even planets with access to the (aging) nuclear technology of the Galactic Empire (for instance, Askone), such as nuclear weapons and spaceships, gradually develop an "entirely non-nuclear" internal economy (Asimov 2004, p. 185).

In this context, the possession of the scarce and valuable nuclear energy places the Foundation in a most advantageous position, especially in relation to other planets of the Periphery. This privileged position is predicated on its ability to not only properly maintain nuclear technology (used primarily for generating electricity and other non-military purposes), but also further develop it. For example, the research colony succeeds in miniaturising nuclear technology (energy generators and other gadgets) into a more compact form. This ultimately confirms its scientific superiority and leading role within the Periphery.

9.4.2 Control over Transit Routes

As a result of the degradation of knowledge and return to feudalism on the neighbouring planets, the Foundation is able to create an entire religion surrounding nuclear energy, presenting it as something supernatural. Thus, nuclear energy is shared under the guise of religious truth. Furthermore, the priests—in reality, technicians responsible for maintaining and supervising nuclear facilities (temples)—take direct orders from the Foundation leaders, who withhold scientific explanations regarding nuclear technology and its sources, even going so far as to situate science within the realm of magic. Trained only to operate power stations, the priests possess purely empirical knowledge of the energy they depend on.

To overcome the third crisis, the Foundation abandons the nuclear energy religion, developing instead a free trade system with the planets of the Periphery. Unlike

[2]The novel discusses only fossil fuels (coal, oil) and nuclear energy; renewable sources of energy are not presented as an option.

the priests who came before them, the traders are not responsible for running and maintaining nuclear energy-based tools; rather, their only goal is to exchange these tools and gadgets for raw metals. While they are initially tasked with promoting religious ideology, the traders gradually develop an agenda-free model of commerce which proves to be more efficient. All trade is conducted under the auspices of the Foundation: the fact that all traders require a licence and membership in the Foundation-controlled guild enables the research colony to maintain a monopoly on the supply of nuclear gadgets.

As the examples presented above indicate, the Foundation continuously maintains control over energy routes, thus meeting the second criteria for energy weapon. More specifically, it develops different strategies for controlling access to nuclear technology, either directly or via intermediaries (the clergy, traders). Firmly under the Foundation's control, the intermediaries do not have direct access to nuclear technology, and are only tasked with its maintenance (priests) and distribution (traders). In this way, the Foundation retains a monopoly on both the physical supply of nuclear technology and its upkeep, which can be seen as an effective form of control over transit routes. Ultimately, planets of the Periphery can get nuclear energy only from the Foundation or intermediaries with strong ties to it via controlled channels; or, as Mayor of Terminus Hober Mallow aptly puts it, "there isn't a factory, not a trading center, not a shipping line that isn't under [Foundation's] control" (Asimov 2004, p. 295).

9.4.3 Use of Energy to Threaten, Punish, or Reward

As the previous sections demonstrate, the Foundation has ownership and control of both nuclear energy and supply routes, thus meeting the first two criteria for energy weapon. Furthermore, during all three Seldon crises, the colony uses the said ownership and control to threaten, punish, or reward importing states, thus meeting the third criteria identified by Smith Stegen (2011). The Foundation rewards planets that cooperate with it in a peaceful way by providing them with nuclear energy and technology. It spreads "science, trade, education, scientific medicine", and helps rebuild power plants on neighbouring planets (Asimov 2004, p. 107). Replacing old, coal- and oil-based systems with nuclear power helps boost the importing planets' economies and wealth.

However, nuclear energy is most often used to threaten and/or punish planets that challenge the Foundation. During the first Seldon crisis, the colony uses its status of "an island of nuclear power in a growing ocean of more primitive energy" to counter the territorial claims of the planet Anacreon (Asimov 2004, p. 95). Mayor Hardin visits the other neighbouring kingdoms, warning their leaders that "to allow the secret of nuclear power to fall into the hands of Anacreon [is] the quickest way of cutting their own throats" (ibid., p. 106). In other words, if the Foundation's nuclear energy were to fall in the hands of the Anacreonians, they are more than likely to use it against the other members of the so-called Four Kingdoms. The concerned leaders

agree to form a coalition which pressures Anacreon into leaving Terminus and helps maintain a precarious balance among the Four Kingdoms.

As time goes by, Anacreon grows in power to such an extent that the united forces of the other kingdoms are no longer sufficient to prevent its violent expansion. Its ruler, Prince Regent Wienis, launches an attack against the research colony by using a derelict Empire spaceship repaired and upgraded by Foundation experts, thus marking the onset of the second Seldon crisis. However, thanks to an 'ultra-wave' relay installed during the repairs, the Mayor of Terminus remotely switches off the ship. This serves to validate a curse placed on the spacecraft by a priest and (more generally) the authority of the nuclear energy-based "religion of science" (Asimov 2004, p. 114). The nuclear-powered spaceship is later relaunched and turned against Anacreon. As priests on the assailant planet shut down nuclear energy supplies, the High Priest's claims that an attack on the religious capital Terminus is blasphemous provoke an uprising against Wienis. Thus, nuclear energy is used to punish the assailant planet, and force its leaders to surrender and unconditionally accept the Foundation-controlled religion of science.

Nuclear energy is also used to punish the planets challenging the Foundation's technological and commercial dominance during the third Seldon crisis; specifically, the Foundation interrupts its nuclear technology supply in order to alter the behaviour of its aggressors, the planets of the Republic of Korell. Korell displays traces of independent technological development and uses nuclear technology (e.g. atomic handguns) of the Galactic Empire. However, both its industry and common households are sustained by nuclear energy-based tools and technologies "which [the Foundation] introduced and which only [the Foundation] can continue to supply" (Asimov 2004, p. 290). The Foundation uses Korell's dependence on its civil technology to its advantage, pressuring the Republic into withdrawing its declaration of war by imposing an embargo on it. The Foundation's monopoly on specialised nuclear technology (miniaturised tools and energy sources) leaves the aggressor with no alternative source of supply, ultimately forcing it to concede defeat and agree to the supplier's demands. This brings us to the last condition, modification of the importing countries' behaviour.

9.4.4 Modification of Other Actors' Behaviour

The final condition for energy weapon utilisation concerns the modification of other actors' behaviour, based on pressure exerted by the supplying country. The Foundation meets this criterion as its nuclear energy-based rewards, threats, and punishments (utilising nuclear energy, providing tools, instalments, technologies, etc.) ultimately force other planets to alter their actions. Such modifications of originally hostile behaviour are at the core of the solutions to all three Seldon crises.

During the first two crises, the possession of nuclear energy (in)directly helps the Foundation to reverse attacks launched by its neighbours. The third crisis is overcome thanks to Korell's overdependence on the Foundation's nuclear supplies,

which makes it unable to endure a long-term state of frozen conflict (Welt 2010). In all three cases, the Foundation successfully uses (the threat/promise of) nuclear energy to alter the behaviour of its opponents in a way that best suits its own interests. Thus, Anacreon is twice forced to abandon its plans to take over Terminus and use it to establish "scientific superiority over the rest of the Periphery", while Korell is pressured into cancelling its military campaign (Asimov 2004, p. 147).

Despite initial resistance of some planets to the Foundation's efforts to turn their societies and/or economies into nuclear ones, the research colony ultimately succeeds in achieving this goal. The religion of science—first its establishment and then its gradual merging with commerce—plays an especially prominent role in overcoming resistance to nuclear technology, which some planets still associate "with the old imperial regime [remembered] with horror" (Asimov 2004, p. 184). The Foundation consciously invests these efforts, well aware that creating a dependence on "nuclear gadgets" among other planets is a key prerequisite for establishing control (ibid.). One planet which is particularly firm in its rejection of nuclear energy is Askone, where Foundation agents attempt to start trade by any means necessary. The creation of "a religion-controlled commercial empire" proves especially effective here (ibid.): namely, the establishment of trade relations is followed by missionary activity on the importing planet, since priests (in their role of nuclear energy technicians) have to ensure that the purchased goods (fuelled by nuclear energy) will run properly. Ultimately, the Foundation successfully uses nuclear technology to alter the behaviour of the targeted planets, overcoming their initial resistance and forcing them to comply with its rules by utilising its nuclear technology, thus meeting the fourth and final criterion for energy weapon.

9.5 Step Two: How Does the Foundation Utilise Energy Weapon?

The previous section indicates that the Foundation uses energy weapon as a foreign policy tool in its interaction with other actors. Indeed, all three Seldon crises provide support for all four conditions of energy weapon utilisation. However, the Foundation does not solve every crisis in the same way; rather, it utilises energy weapon in different ways, depending on the specifics of a given situation. The present section distinguishes between three different types of energy weapon use: *deterrence*, *ideology*, and *trade*. Each type is analysed separately and discussed within the wider frame of the energy weapon concept (Lee 2017; Smith Stegen 2011). The section further proposes that the pertinence and usefulness of these theoretical concepts go beyond the boundaries of Asimov's narrative universe; in other words, it argues for an extra-literary, 'real-world' applicability of this literature-based typology, which can be used to describe how individual countries use energy sources to achieve their own various (often foreign policy) goals. To illustrate this, the chapter applies the typology of the energy weapon use to the previously mentioned case of the Russian Federation.

9.5.1 Deterrence

During the first Seldon crisis, nuclear technology is used as deterrence in two ways: direct and indirect. It is used directly when the Foundation is implicitly presented to the representative of Anacreon as a nuclear power—i.e. a planet that possesses nuclear technology, including nuclear weapons and other military technology (spaceships, etc.). In reality, however, the Foundation only has nuclear power "for commercial uses, and darn little at that" (Asimov 2004, p. 67). Due to the lack of metal on its home planet (also its main disadvantage), the Foundation is forced to develop nuclear technology in a way that minimises its size. This later helps the colony radically change its position within the Periphery and overcome its limitations.

The above-mentioned act of direct deterrence wins the Foundation some time to rethink its strategy vis-à-vis its expansion-oriented neighbour and ultimately come up with a new strategy, one that relies on a more indirect use of nuclear technology as deterrence. Thus, when Mayor Hardin visits the leaders of the other neighbouring kingdoms and explains to them the dangers of allowing the Foundation's nuclear energy to fall into the hands of Anacreon, they all join forces, creating a balance of threat (Shimko 2010) and pressuring Anacreon to retreat.

9.5.2 Ideology

The Foundation is able to further tighten its grip on the neighbouring kingdoms and promote its own foreign policy goals by using energy weapon in a considerably different way—as ideology. Clouding it in mystery (the complex nature and intricate mechanisms of nuclear energy are known only to the Foundation leaders) and giving it an air of the supernatural, the Foundation turns nuclear energy into a religion, complete with temples (nuclear power plants), rituals, priests (technicians), and high priests (ambassadors of the Foundation). In this new ideology, nuclear energy is placed within the realm of the supernatural, and used in religious rituals to power the floating throne of the divinely anointed kings and add light effects or a magical aura to various ceremonies. Thus conceived, the religion of science keeps other, more powerful planets at a distance, since the priests dutifully spread the message that "an attack on the Foundation [would be] nothing short of sacrilege of the highest order" (Asimov 2004, p. 151).

The rulers of the Four Kingdoms readily accept a religion that makes them divine, thus confirming and "cement[ing] forever [their] domination over their own people" (Asimov 2004, p. 163). However, this is a double-edged sword: since the Foundation uses this religion to promote its own interests, it inevitably becomes the "bridle and saddle" (ibid.) of the rulers who embrace and impose it on their people. In other words, to accept the religion of science inevitably means to accept (and become dependent on) the Foundation since nuclear energy is in the hands of the priests, who, in turn, are controlled by the Foundation. This state of extreme dependency

is well illustrated by Prince Wienis' complaints: "All the greatness of Anacreon; all its ships and its cities and its people and its commerce depend on the dribbles and leavings of power that the Foundation have given us grudgingly" (ibid., p. 127).

9.5.3 Trade

Although the religion of science enables the Foundation to increase its influence within the region, this approach has its limits. Following the successful solution of the second crisis, Seldon's hologram warns the leaders of the Foundation that their nuclear energy-based religion will eventually lose its appeal. His words inevitably prove to be prophetic: with each passing decade, as stories of how the Foundation "used the priesthood and the superstition of the people to overthrow the independence and power of the secular monarchs" spreads, the influence of religion wanes (Asimov 2004, p. 266). This new attitude is clearly expressed by Master Trader (later Mayor of Terminus City) Hobert Mallow, who openly rejects "the mysticism and hocus-pocus of the missionaries", proclaiming money to be his only religion (ibid., p. 230).

Like Mallow, the Foundation soon realises that its continued influence and dominance lie in the nuclear tools themselves, not the religion that developed around them. Ideology is therefore replaced with a different type of energy weapon—trade. More specifically, the Foundation establishes religion-free commercial relations with numerous planets ("Trade without priests! Trade alone!"; Asimov 2004, p. 290), selling them industrial technology in the form of everyday appliances and gadgets. This enables the colony to gradually regain its "reputation of power" and become a key player in the Periphery (ibid., p. 206).

However, to be used as an energy weapon, the purpose of trade must go beyond the economic interests of the exporting country and be connected to its foreign policy goals. This becomes evident during the third Seldon crisis, when the Foundation places an embargo on import to Korell to force the assailant Republic to abandon its military campaign. Without the Foundation's high-end tools and equipment, Korell is no longer able to meet the demands of its businesses and inhabitants, which ultimately forces it to surrender unconditionally.

9.5.4 Uses of Energy Weapon on the Current Geopolitical Stage: The Case of Russia

Having examined the literary representation of imagined uses of energy for political ends and identified three possible types of energy weapon use, the chapter argues that this literature-based typology also has extra-literary, 'real-world' applicability. To illustrate this, it applies the typology of the energy weapon use to the previously mentioned case of the Russian Federation, as numerous parallels can be drawn

between Russia's behaviour in the energy policy area since the late 2000s and the events described in *Foundation*, such as creating intermediaries (i.e. traders). The following paragraphs build on existing analyses which argue that the Russian Federation uses energy weapon to meet its foreign policy goals (e.g. Smith Stegen 2011) and expands them via the typology based on the examination of Asimov's novel.

Using energy weapon as deterrence refers to situations in which an energy-exporting country attempts to modify an importing country's behaviour by striking a deal with the importing country's neighbours or offering them better conditions in order to create imbalance in the region, and decrease homogeneity and mutual solidarity. For example, after 2009, the Russian Federation treated individual Baltic States differently based on the unbundling option each country had chosen within the Third EU Energy Liberalisation Package. Opting for the most liberal version of unbundling, Lithuania created very unfavourable conditions for Russia, which responded by increasing the price of natural gas. Having witnessed the fate of Lithuanian, Latvia and Estonia ultimately decided on an unbundling option that was more favourable for its main energy provider (Grigas 2013).

Ideology, the second type of energy weapon identified in this chapter, can be defined as the use of ideas (e.g. perception, beliefs) to support the exporting country's interests in the energy area, which ultimately enables it to use energy as a foreign policy tool. This type of energy weapon use can currently be seen in the argumentation concerning the development of the Nord Stream 2 Pipeline or similar projects (Goldthau 2016; Mišík and Nosko 2017). The Russian Federation has become quite skilful in turning the EU's legal arguments (which can be understood as ideas) against the EU and its energy policy priorities. For example, unclear rules of the Third EU Energy Liberalisation Package concerning unbundling and third-party access in international waters enabled the Russian company Gazprom to argue that the EU laws supported its objectives and activities connected to the development of Nord Stream 2. In reality, some of the provisions (especially the so-called Gazprom clause) were designed with opposite goals in mind.

Trade, the third and most common type of energy weapon use identified in this chapter, refers to the exporting country's attempts to influence the importing country's behaviour via various market tools. While prices are the most visible tool, other limitations such as prohibition of re-export can also have a highly negative impact on the importing country (Jirušek and Kuchyňková 2018). Gazprom pricing policies in the EU are a prime example of such behaviour, as there is no obvious link between the costs connected to supplying individual European countries and the price of gas. Thus, countries further away from the Russian Federation do not (as might be expected due to higher transit costs) pay higher prices for natural gas.

9.6 Discussion

As a genre which addresses a variety of contemporary social, political, and cultural concerns through explorations of worlds distinctly different from our own and seemingly impossible futuristic advancements in science and technology (Roberts 2006; see also Suvin 2010), science fiction is perhaps uniquely positioned as a narrative platform for examining new technologies, energy resources, and social systems, as well as the changes they could bring. As such, it provides us with a "space for individual and collective reflection" (Petrocultures Research Group 2016, p. 42) on future scenarios we wish to achieve/avoid, and the possible pathways that lead to/away from them. Even though, as Steven Shaviro points out, many of the scenarios envisioned in numerous science fiction novels are "neither inevitable, nor even likely to happen", they nevertheless "point us to certain potentialities […] that are already astir within our present moment" (2011, p. 15).

The potential of science fiction as a fictional laboratory of sorts has long been recognised (oft-cited examples of the genre's prophetic capacity include Jules Verne's *From the Earth to the Moon* [1865], which predates the Moon landing by almost a century, and H. G. Wells' *The World Set Free* [1914], which is said to have inspired the discovery of nuclear reaction [Canavan 2014, p. 337]) and utilised. For example, in 2009, the U.S. Homeland Security reached out to science fiction authors for creative input on future technologies and possible safety issues (Sci-fi writers 2009). Similarly, in 2019, the French army assembled a team of writers, chosen for their ability to "think more creatively than more traditional elements of the army", and asked them to develop "'scenarios of disruption' that military strategists may not think of" (French sci-fi team 2019, [n.p.]). Boasting "a unique set of talents for advising on new technologies, future developments and disruptive events", an entire organisation of science fiction writers—SIGMA—is dedicated to "offer[ing] futurism consulting to the United States government and appropriate NGOs" by exploring the future and its various challenges (What is SIGMA? 2020, [n.p.]).

The ability of science (and other speculative) fiction to give concrete shape to abstract ideas is especially relevant when it comes to what Timothy Morton terms hyperobjects—phenomena and entities such as global warming or energy transition, which are real but exist on such an immense scale and have such far-reaching consequences that we cannot fully grasp or experience them (2010, pp. 130–135; see also Morton 2013). According to Shaviro, science fiction concretises such concepts which initially appear abstract and overwhelming, allowing readers to experience their effects "intimately and viscerally, on a human and personal scale, contained within the boundaries of a finite narrative" (2011, p. 4). Since we tend to determine the likelihood of an event based on our ability to imagine its occurrence (Kahneman and Tversky 1981), making future scenarios (especially very bleak ones) more concrete makes their impact appear more immediate, relevant, and powerful.

As the analysis presented in this chapter has demonstrated, Asimov's *Foundation* offers one such imaginary terrain for reflecting on our present moment and imagining future scenarios. By examining this technological fantasy with the help of an

extra-literary concept and demonstrating the possible extra-literary applications of its analysis, this chapter both adds to our understanding of the concept of energy weapon and its uses, and highlights the importance of (science) fiction as a platform for considering various pressing (especially energy-related) issues faced by humankind and testing different ideas in an imagined (and therefore safe) environment, commonly described by the concept of sociotechnical imaginaries (Jasanoff and Kim 2013; Levenda et al. 2019). Reading Asimov's novel through the combined lenses of literary and international relations scholarship, this chapter has demonstrated that such fictional platforms can be used not only to envision possible new energy sources (no matter how fantastical they may appear) but also to explore possible changes in the social and geopolitical landscape that will inevitably appear in the wake of an energy transition. What is more, as the second part of the present analysis has argued, the lessons drawn from such literary and sociotechnical imaginaries are also applicable to and relevant for our present moment.

As "the genre best placed to advance our understanding not only about the present and future energy crises we face, but also the manner in which we (fail to) envisage and conceive energy as a matter for culture as much as it is cultural matter" (Macdonald 2016, [n.p.]), science fiction has proven especially interesting for energy-focused research (cf. Badia 2019; Bellamy 2019; Canavan 2014; Diamanti 2019; Gross 2013; Lubek 2019; Williams 2019). While indebted to existing studies, the present research also differs from them in its attempt to bridge the literary/extra-literary divide by using extra-literary concepts to explore a work of fiction and applying the knowledge gained from analysing that work of fiction to extra-literary scenarios. Its findings about the usefulness of literature for developing analytical tools that can be used to discuss extra-literary scenarios support Bellamy's claim that "the tools of science fiction studies, and literary analysis more generally, are profoundly suited to detecting and addressing the entangled relationship of the mode of production, energy regimes, and cultural texts" (2019, pp. 6–7). Moreover, this research is less focused on futuristic energy sources and more on their political and (to a lesser extent) economic aspects. Its focus on the political aspects of energy highlights the fact that energy is not just a resource needed to fuel our everyday existence, but also an important bargaining chip in political and economic negotiations (see chapter by Tomczyk in this volume). As such, the chapter contributes to the discussion within energy humanities, which stresses the omnipresence of energy (especially fossil fuels) in our daily lives and the high degree to which it permeates every aspect of our contemporary world, from arts and culture, to social structure and international relations.

9.7 Conclusion

In its interdisciplinary analysis of Isaac Asimov's *Foundation*, this chapter has examined the use of nuclear energy in the novel within the framework of energy weapon. Using nuclear as an energy weapon allows the Foundation to establish itself as a powerful and influential player within a decaying region that is reverting to feudalism,

and successfully thwart threats from larger and militarily more advanced neighbouring planets. The chapter has identified three distinct types of energy weapon use—deterrence, ideology, and trade—which proved to have extra-literary application as well. As the key added value of the chapter, this typology may serve as a starting point for future research on the behaviour of energy-exporting countries, which, in turn, can have direct policy implications.

By moving beyond the mere identification of a given concept in a literary text or use of examples from popular culture to explain various notions from different disciplines, this interdisciplinary research has combined literary analysis with concepts from social sciences to create a typology that can be used to both interpret a given text and examine the current state of affairs in international energy policy. These possibilities point to the rich potential of literature in general and science fiction in particular to provide us not only with a space for imagining what the future might be like, but also with the tools needed to analyse and better understand our current reality.

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Chapter 10
Implicating the 'Factual' in U.S. Nuclear Fiction: Nuclear Criticism's Perspective

Inna Sukhenko

Abstract Situated within the framework of nuclear criticism and energy humanities, the chapter focuses on the factual component of nuclear narrative, which is studied as a part of the transformation of what Derrida calls the 'fabulously textual' (1984) into the factual setting of nuclear fiction. The chapter contributes to an understanding of the literary dimensions of the Chernobyl nuclear accident (1986) and its impact on the nuclear narrative, which has since shown a tendency towards stressing true facts and shared experience, rather than subscribe to the late-/post-Cold War-rhetoric of 'an imagined event'. The chapter analyses U.S. nuclear fiction on the events at Chernobyl—specifically, Frederik Pohl's *Chernobyl* (1987), Andrea White's *Radiant Girl* (2008), and James Reich's *Bombshell* (2013)—with a special focus on the importance of the spatio-temporal setting for framing the parameters of Chernobyl nuclear fiction. The discussion on the relationship between the 'fabulously textual' and the 'factual' in nuclear fiction contributes to a reconsideration of the ecological and political aspects of nuclear narrative, and frames the writers' reflections on the literary dimensions of nuclear energy as a concept in an energy-dependent society.

Keywords Nuclear fiction · Nuclear narrative · Nuclear criticism · Chernobyl · Factual · Fictional · Energy humanities

10.1 Introduction

The current need for reconceptualising nuclear energy and nuclear energy-related issues within the climate change and environmental crises agendas has prompted the launch of the multidisciplinary energy humanities and energy transition studies. According to Julie Williams (2014), the perpetual desire to forge plots from scientific and literary dimensions reaches far beyond the confines of reactionary coping mechanisms; it speaks to something deeper within our shared humanity (Blouin et al.

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2014, p. 7), which unites our nuclear past, present, and future in terms of shaping the shared values and behaviours within an energy-dependent society, and remapping the literary and cultural dimensions of nuclear energy discourse.

The aim of this chapter is to examine the literary implications of 'the factual'—here regarded as the factual setting of nuclear fiction—as one of the components of nuclear narrative which encourages the transformations of what Jacques Derrida terms the "fabulously textual" (1984, p. 23) in post-Chernobyl nuclear fiction. The chapter aims to contribute to the comprehension of implementing the fictional/factual in nuclear narrative by exploring the literary dimensions of the Chernobyl nuclear accident (1986), which stress the assembled knowledge on the history of nuclear technology and lessons learned from nuclear disasters, rather than dramatize such an imagined event—"a speculation, an invention in the sense of a fable" (ibid., p. 28)—within apocalyptic rhetoric. In this way, the research highlights the role of nuclear fiction in raising nuclear awareness (Barash 2014) as a critical social assessment skill which contributes to the development of a critical perception of nuclear energy-related issues. The theoretical basis of the chapter is nuclear criticism, a field of literary theory which studies nuclear energy issues in literature and the narrative tools used to situate nuclear energy and nuclear energy-related issues in the text (William 2009, pp. 246–250; see also Cordle 2006; Derrida 1984; Ruthven 1993; Schell 2007; Williams 2014).

This chapter gives an overview of the launching period of nuclear criticism and discusses the 'fabulously textual', focusing on 'factual' implications in nuclear fiction as a narrative tool of critical thinking and developing nuclear awareness. It also examines how these elements shape the literary imaginaries of one of the most devastating and frequently dramatised nuclear disasters in history—the Chernobyl nuclear accident, which occurred on Saturday, 26 April 1986, at reactor four of the Chernobyl Nuclear Power Plant (NPP), near the city of Pripyat in the north of the Ukrainian Soviet Republic. The Chernobyl disaster led to reconsiderations of geopolitical, ecological, and social landmarks of the late Cold War, as well as the emergence of the so-called Chernobyl Syndrome—a set of disorders related to the fear of radiation and further consequences of the Chernobyl accident (see Ing 1988; Sukhenko 2019). The Chernobyl Syndrome is not only a medical diagnosis, but also a social phenomenon, which initially stemmed from the lack of information about the nuclear disaster and potential health risks of radiation exposure. This largely refers to the details of the lives of forcefully displaced residents, from the time of evacuation to the moment of getting used to living in a new surrounding. Later, the Chernobyl Syndrome has become to include nuclear phobia, distrust, deprivation, and uncertainty related to nuclear technology and nuclear policy of the state (Sukhenko 2019, p. 176).

This chapter analyses three U.S. novels about the Chernobyl nuclear disaster, which cover the causes, stages, and aftermath of the Chernobyl NPP explosion: Frederik Pohl's *Chernobyl* (1988; first published in 1987), Andrea White's *Radiant Girl* (2008), and James Reich's *Bombshell* (2013). These novels are representative of U.S. Chernobyl nuclear writing practices as they cover the historical range of

U.S. post-Chernobyl nuclear fiction, from the early fictional response to the Chernobyl disaster in 1987 to later attempts to address intergenerational trauma memory, represented in fictional writings on nuclear terrorism. Moreover, the authors provide various time perspectives on the Chernobyl disaster and utilise the factual component by drawing from eyewitness evidence and archival materials, thus filling the information gap on the nuclear accident for Anglophone readers.

Building on nuclear criticism, the chapter contributes to a re-reading of U.S. nuclear fiction on the Chernobyl events by focusing on the importance of the spatio-temporal setting of nuclear narratives for framing the specifics of nuclear—especially Chernobyl—fiction. The discussion about the relationship between the fictional and the factual in the context of the 'fabulously textual' in nuclear fiction prompts a reconsideration of the references to the ecological and political levels of nuclear narrative, and the framing of reflections on the literary dimensions of nuclear energy as a value-/priority-/behaviour-shaping concept in an energy-dependent society. Seen from this perspective, nuclear narrative can be further linked to concepts such as sustainable development and energy distribution of environmental hazards, thus prompting further interdisciplinary research within the framework of (among other disciplines) energy humanities and eco-narratology studies.

By overcoming the gap between science and the humanities, nuclear narrative is shaped by geopolitical developments and ecological situations, which have jointly determined the approaches to how nuclear energy-related issues are considered, estimated, and represented in a fictional text. Furthermore, they contribute to a further remapping of the cooperation between fiction and nuclear issues, which not only clarifies the range of multileveled perceptions of nuclearity within various spatio-temporal frames, but also highlights the circumstances of the relationship between society and nuclear energy production/consumption. The shifting paradigms of the contemporary academic landscape in which science and the humanities meet, encourage the re-conceptualisation of 'energy' (especially 'nuclear energy') at the various levels of its reception, as influenced by social and political events. Such multidisciplinary ways of studying energy-society relationships within the framework of energy humanities help expand our knowledge of how cultural forms impact the public perception of energy transitions and contribute to a renewed realisation of the cultural and social significance of energy. Such an approach encourages us to revisit (nuclear) energy-related issues, explore the field of energy culture, and critically consider our energy futures.

10.2 Nuclear Criticism on the 'Fabulously Textual'

Focusing on the so-called Nuclear Age, which started on 16 July 1945 with the detonation of the first nuclear device at the Trinity Test Site under the Manhattan Project (Kramer 2020), nuclear criticism builds its own agenda around the literary parameters of nuclear energy as a social and cultural phenomenon (Daw 2016, p. 120), thus

attempting to bridge the gap between social values and nuclear industry achievements. Nuclear energy as a cultural phenomenon went through some reframing with the 'Atom for Peace' initiative, described by U.S. President Dwight D. Eisenhower in his address at the UN General Assembly on 8 December 1953. In it, he invited global powers to stockpile uranium for power generation rather than weaponisation purposes and emphasised atomic energy's ability to be used for good by powering our homes and businesses (Eisenhower 1953).

Williams highlights the importance of studying narratives and storytelling about "our nuclear past and possible nuclear futures", which can reveal how "we as a society deal with the use of nuclear weapons" (2014, p. 163). Although she only mentions nuclear weapons, Williams' statement can be related to 'the nuclear' in all its implications, which jointly contribute to shaping the nuclear discourse. While nuclear narratives were the focus of many literary scholars during the Cold War, only nuclear criticism became a specific response to society's need for understanding the multisided cultural and literary parameters of nuclear energy discourse and developed the approaches, methods, and tools for researching nuclear fiction (Blouin et al. 2014; Cordle 2006, 2017; William 2009). The latter is defined as fictional storytelling on nuclear issues through literary conceptualisations of nuclear energy and related issues, including nuclear weapons, nuclear energy plant explosions, nuclear tests, nuclear waste management, etc., which contribute to shaping the nuclear narrative (Brians 1988; Doherty 2009).

The development of nuclear criticism closely follows the stages of forming the 'nuclear' landscape at the global level, framed by the Nuclear (or Atomic) Age and marked by the stages of proliferation and mitigation (Bracken 2003; Garrity 2015). Ele Carpenter characterises the current nuclear epoch as the Nuclear Anthropocene, a concept which "refers to the way in which nuclear fission released man-made radionuclides into the environment through fallout, providing a radiological time-stamp of the start of the nuclear age in the 1940s" (2016, [n.p.]). Susan Schuppli stresses that the Nuclear Anthropocene describes how human-made radiation contaminates the Earth while forming a mark of human activity that will last for hundreds of thousands of years (2020, p. 75). While the 20th century, with its traces of nuclear weapons testing, bears the stamp of the first Nuclear Age, the 21st century is characterised by high-level radioactive waste reservoirs. The latter physically create new geological layers in the Earth's fossil record, regarded as the markers and archives of the Nuclear Anthropocene (Schuppli 2016, p. 110).

Cornell University's 1984 conference on poststructuralism studies launched the debates on the literary parameters of nuclear energy implementations, which became defined as a single field of literary scholarship (Blouin et al. 2014). The conference brought together contributors who discussed the issue of linguistic or metaphysical 'meanings', and debated the literary and critical dimensions of nuclear energy issues. The presentations and round-table discussions were published in a special issue of *Diacritics* (Klein 1984). The introduction to the special issue notes that nuclear criticism (Proposal 1984, p. 2):

> [A]rises, on the one hand, out of reading a certain amount of recent criticism and critical theory and feeling that without exception it recounts an allegory of nuclear survival; and, on the other, out of the sense that critical theory ought to be making a more important contribution to the public discussion of nuclear issues.

The field also includes the kind of criticism "that reads other critical or canonical texts for the purpose of uncovering the unknown shapes of our conscious nuclear fears", and addresses "[t]he use value, as well as the profit, that can be derived from predicting the end of things" (ibid.). That issue of *Diacritics* first launched the discussion on establishing a literary-theory bridge between academia and nuclear energy agenda in the early 1980s.

Possibly the most influential submission to that issue of *Diacritics* which sparked the most debate is the paper by Jacques Derrida, "No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives)" (1984). In it, the scholar makes a statement on nuclear criticism, which highlights the idea that what he calls an imagined event, such as a nuclear war, only summarizes the necessity to break down the connection between the event and its literary (imagined) presentation. The key message of the paper is the fabulous content of any nuclear event. According to Derrida, a nuclear event is (1984, p. 23, original emphasis):

> [A] phenomenon whose essential feature is that of being *fabulously textual*, through and through. Nuclear weaponry depends, more than any weaponry in the past, it seems, upon structures of information and communication, structures of language, including non-vocalizable language, structures of codes and graphic decoding. But the phenomenon is fabulously textual also to the extent that, for the moment, a nuclear war has not taken place: one can only talk and write about it. […] It has never occurred, itself; it is a non-event.

This statement was considered to be the key idea of nuclear criticism at its launching point as a field of literary scholarship.

Derrida's words are based on the notion that "any attempt to 'ground' the discussion would be folly; words are based on nothing but pure fantasy" (Blouin et al. 2014, p. 3). Thus, Derrida emphasises the words of a language, which is always in the process of "stockpiling, of building up an objective archive over and above any traditional oral base" (1984, p. 26). According to Derrida's deconstructive model, it is the word, not an event, that creates an imagined event, and formulates the real threats and potential victims of a nuclear war. The crucial issue of the 'impracticality' of his perspective on the main principle of nuclear criticism encouraged opposing views, which point out that Derrida does not regard U.S. nuclear bombings of Hiroshima and Nagasaki as nuclear events (Norris 1994, p. 132; Ruthven 1993, p. 73). Peter Schwenger (1992) emphasises that nuclear criticism also looks into the role of language, which, while being deconstructive, also but also concomitantly conceives of an ethical position towards nuclear relationships. According to Bradley Fest, nuclear criticism highlights the connection between words for narrative formation and imagined event; at the same time (2014, p. 83):

> Nuclear Criticism following the Cold War cannot ignore the imaginative and historical forces produced by the continued dialogue between information and military technologies, between the archive and the Bomb, between the decentralization of the first nuclear age and the networked distribution of the second age in which the nuclear referent has dispersed in a variety of ways.

Ten years after Derrida's presentation about the nuclear, Ken Ruthven (1993) partially supported his 'fabulously textual' as a key statement of nuclear criticism, extending it beyond a nuclear war discourse so that it applies to all nuclear discourse. While emphasising that "[i]t" becomes more important than ever to preserve the nuclear referent and to resist efforts to textualize it out of existence (1993, p. 74), Ruthven stresses the question of value in nuclear criticism. Arguing against Derrida's critical 'word' acceleration as the shaping force of nuclear criticism, Ruthven states that the nuclear criticism of his time is closely linked to the moment of historicising the narrative due to local/national/global priorities and shaped by the nuclear agent's contribution to the global nuclear narrative.

Two decades later, the prominent nuclear criticism scholar analysed Derrida's statement on the textual content of nuclear weapons (2006, p. 1188; original emphasis):

> First, they [nuclear weapons] are, as Derrida hints, not only missiles but missiles that are held in suspension, ready to be launched from, and by, vast interconnected informational networks. They are part of cybernetic systems, comprised of humans and machines that 'talk' to each other, that sift information about potential threats, and which, during the Cold War, had to strike a precarious balance between performing the safety checks and fail-safe procedures that would prevent the accidental triggering of global war, and launching a swift and devastating attack, on a hair-trigger response to an outside threat. Perhaps more importantly, though, they are textual to the extent that global nuclear war is itself an entirely virtual construction that is accessible *only* through fictions of various kinds. Once it happens then the possibility of a fiction or art with which it might be rendered accurately is itself erased because such a nuclear war has been presumed, from as early as the 1950s, to be world-, or at least civilization-, ending.

Cordle comments on Derrida's focus on nuclear weapons as well as nuclear war but widens his concern beyond nuclear wars, covering instead the nuclear itself by emphasising the nuclear apocalypse as an imagined event which can result in the total end of humanity. In 2014, literary critics defined nuclear criticism as "a tool of the humanities [which] can and should target the 'real world' as its site of interrogation", while underlining the cancerous proliferation of nuclear capacities, exacerbated by political rhetoric (Blouin et al. 2014, p. 10).

10.3 Rereading Chernobyl Fiction

Since Derrida's writing on the 'fabulous' nature of nuclear events which characterises the nuclear discourse, several nuclear events took place, which defined the political and ecological rhetoric of the nuclear. Among such nuclear events which influenced the global nuclear narrative were the Chernobyl nuclear plant explosion, the collapse

of the Soviet Union, and the fall of the Iron Curtain. According to Jean Baudrillard, "the Berlin Wall disappeared after Chernobyl" (1994, p. 45), which highlights the role of the Chernobyl nuclear disaster in mapping a new geopolitical world picture. Chernobyl launched a new period of narrating nuclear events, one which connected the local mapping of nuclear events to the global nuclear discourse. Chernobyl shifted the focus of nuclear literary critics beyond the literary imaginaries of the atomic bomb and the Cold War rhetoric. Thus, the challenge for nuclear criticism was "to mature beyond its Cold War adolescence and find a way to speak to long-term and more subtle manifestations of nuclear culture" (Cordle 2014, p. 232). During the late Cold War, nuclear criticism became regarded as a factor of global nuclear culture formation, which tried to loosen the local (mainly political) content of the nuclear and become universal, regardless of its national application.

As for the global nuclear narrative, Chernobyl gave nuclear criticism a real impulse to check how the 'fabulously textual' image of the nuclear correlates with a real event and the real area of its implementation. Writers of the post-Chernobyl Age mainly try to confirm the factual nature of nuclear events while weakening the 'fabulously textual' nature (with its language coding and decoding) of nuclear narrative. They manage to stress the commonly evident comprehension of the aftermath of the tragedy, while focusing on humanity's and society's transformations caused by the nuclear plant explosion, and depicting the ecological problems of the region which suffered the nuclear disaster.

Nuclear fiction which addresses issues related to the Chernobyl accident uses memoirs—including eyewitness memoirs, reconsidered eyewitness memoirs, and intergenerational trauma memory of the events—to various degrees (Lindsay 2014). As the number of real participants of the disaster at the Chernobyl NPP was rather limited, narrating Chernobyl (especially the 'literary Chernobyl') is largely based on memoirs and archival material (Hundorova 2017). Using memoirs is one way in which writers can reconsider past events (in this case, the Chernobyl explosion and its aftermath) through the perspective of their present feelings and thoughts about the past, while attempting to digest the present-day situation concerning the political, social, and ecological dimensions of such a traumatic experience. Used as a component of fiction, the included memoirs are presented as eyewitness memories, notes, or written evidence about the Chernobyl NPP disaster and its short-/long-term aftermath, disclosed by the writers themselves or disclosed from eyewitness evidence. This is especially relevant to U.S. nuclear fiction on Chernobyl, which is the focus of this chapter (Pohl 1988; Reich 2013; White 2008). Namely, U.S. writers use eyewitness evidence and memoirs as a factual component to factualise their storylines and claim the authenticity of narrating the nuclear past for Anglophone readers.

In his recent book *Chernobyl: The History of a Nuclear Catastrophe*, Serhii Plokhy stresses the role of eyewitness evidence for revealing the truth about the nuclear event (2018, p. 13):

> The further we move in time from the disaster, the more it seems like a myth – and the more difficult it becomes to grasp its real-life roots and consequences. […] My use of newly available archival materials and recently published government documents, as well

as interviews with eyewitnesses and accounts of other writers, such as Svetlana Alexievich and Yurii Shcherbak, has allowed me to present a long-term perspective on the disaster and its political, social, and cultural effects.

That is why eyewitness memories are a key source for reflecting on the causes and consequences of the Chernobyl nuclear accident, which gradually helped create awareness of what happened at the Chernobyl NPP.

10.4 On the 'Fictional/Factual' Within Nuclear Fiction

Represented by fictional writings on nuclear-related events, nuclear fiction tends to function as an "encyclopedic" archiving of life (Saint-Amour 2015), a piece of the Anthropocene's cultural heritage and a historical/geographical/social database. It depicts nuclear energy-related issues such as nuclear power plants, urban nuclear landscapes, nuclear explosions, nuclear waste management, nuclear energy policy, or nuclear/atomic war, by creating the literary imaginaries of a nuclear event. The references to historical/geographical/social data result in the reframing of Derrida's 'fabulously textual', encouraging us to study the literary tools used to create the 'factual/fictional' balance of nuclear narrative. Taking into account the semantic definition of this factual/fictional balance in any narrative (as Schaeffer points out, "factual narrative *is* referential whereas fictional narrative has no reference"; 2014, p. 179, original emphasis), nuclear fiction obtains its distinguishing feature by further amalgamating the factual and the fictional, while maintaining the reference to a real event, which is easily recognised because of the unique nature of each nuclear event (Rojavin et al. 2011, p. 261). Furthermore, storytelling often includes memoirs, witness evidence, or other information provided from various sources, which have become a distinguishing feature of nuclear fiction. This approach of combining factual and fictional components blurs the boundary between 'the fact' and 'the imagined event' (Derrida 1984) by factualising nuclear fiction, which results in mistaking fiction on nuclear energy and nuclear-related issues for factual narratives. Here it is necessary to clarify that Derrida's statement on the 'fabulously textual' nature of nuclear narrative refers to a nuclear war as 'the imagined event' which has no factual. However, nuclear discourse—at least in its initial phases—has gone through transformations, consequently reframing its boundaries by including nuclear energy-related narratives. This encourages explorations of possible factual/fictional correlations in a nuclear narrative with its nuclear energy-themed component.

Within poststructuralism's perspective on the fact/fiction dichotomy, "every (narrative) representation is a human construction" (Schaeffer 2014, p. 180)—more precisely, a model projected onto reality. Based on ontological realism, nuclear energy discourse encourages the process of fictionalising facts: thus, the factual component, which represents the nuclear discourse, becomes the basis for making narrative fictional. Nuclear fiction is a good example of amalgamating the fictional and factual, which allows us to study the relationships between narrative techniques

and the fictionality/factuality distinction (for example, Cohn 1999; Genette 1993; Schaeffer 2014). Due to way in which it depicts nuclear issues (nuclear energy fission, nuclear power plant structure and its explosion, nuclear energy policy, etc.), nuclear fiction is regarded as both a factual narrative, based on referential representation (of available information), and a fictional narrative, based on non-factual, imagined representation (which partially stems from the secrecy of nuclear energy studies and emphasis on supposition, illusion, pretence, and probability).

Nuclear fiction demonstrates how the use of the real-world background and the lack of factual information can result in the process of imaginative steps (including prediction and simulation of uncovering informational gaps). Such an amalgamation of fictional and factual components transforms nuclear energy writing into nuclear fiction related to life-writing (mainly thanks to its spatial and temporal features), which ultimately contributes to enhancing the reliability of nuclear fiction, producing priorities, beliefs, and values, and further constructing the past and predicting the future within humanity's energy history.

10.5 The 'Factual' Component of U.S. Nuclear Fiction on Chernobyl

Highlighting the role of information as a traumatic stressor, Anne Speckhard claims that (2006, p. 201; original emphasis):

> [T]echnological disasters often lack this sharply delineated destructive phase and whatever dangerous forces they produce are often unseen. Their traumatic aspects are frequently the result of frightening information (rather than the actual sight of the dangerous event), with this information usually being received over an extended time period, often with substantial delays. Hence, many authors note the crucial role played by *information* as the central stressor rather than a sensory experience of threat to life.

Only a few people witnessed the Chernobyl disaster, which later affected the thousands living nearby; furthermore, access to official information provided by the authorities is very limited. Against the background of disappointment, distrust, lies, or delays in their revelation, contradictory and confusing information about the nuclear disaster were received from unofficial channels, creating confusion and alarm. Under such circumstances, the use of factual information (or even memoirs, accompanied by writers' subjective personal experiences) in fictional literary works erases the border between the factual and the fictional. It is this factual component which made nuclear fiction on the Chernobyl nuclear disaster trustworthy and even documentary.

This research analyses three examples of U.S. nuclear fiction about the Chernobyl disaster: Frederik Pohl's *Chernobyl*, Andrea White's *Radiant Girl*, and James Reich's *Bombshell*. In the novel *Chernobyl*, written within months after the nuclear explosion, Frederik Pohl, best known as a science fiction writer, creates the details of the Chernobyl nuclear accident by telling the story as it was documented in the Soviet

press and Moscow's report to the International Atomic Energy Agency (IAEA) delivered in September 1986. He uses fictional characters, mainly officials and workers at the nuclear plant (with Slim as a main protogonost), who followed the real participants of the events (Eaton 1987) to emphasise what went wrong and caused the tragedy, and what was done right through heroic efforts to control the consequences of the disaster. In the afterword to his novel, Pohl notes that he received assistance from leaders of the Union of Soviet Writers and was allowed to interview scores of people with knowledge about Chernobyl (1988, p. 168).

In *Radiant Girl* (2008), Andrea White, a journalist and juvinale fiction writer, tells the personal story of an 11-year-old Ukrainian girl named Katya Dubko, set against the technological disaster at the Chernobyl NPP, where her father works. The author does not emphasise the nature of the disaster or the authoritarian regime; rather, she focuses on the shifts in a young girl's value system in the context of the political, ecological, and social features of a society in transition. White directs the readers' attention to the cultural component of the transformations, amalgamating Ukrainian folklore and Soviet patriotism against a historical context—from the Cold War rhetoric, through the time of Perestroika (political and economic reforms in the second half of the 1980s), to the final moments of the Chernobyl NPP's functioning (2000). The variety of details of everyday life helps readers follow a single person's life which unfolds against the backdrop of the Ukrainian society and its transformation from a Soviet Republic to the independent state (1991). Before writing the novel, White visited the Chernobyl Exclusion Zone and became acquainted with the life stories of those who suffered in the aftermath of the nuclear disaster.

Bombshell (2013), by novelist and ecopsychologist James Reich is a feminist nuclear thriller (Kristen 2013) depicting Varyushka Cash, a 24-year-old feminist activist and nuclear terrorist, who is waging a personal war against America's nuclear industry. Born in Pripyat, Ukraine, at the moment of the Chernobyl meltdown, Varyushka lost her parents who smuggled her into the U.S., where she grew up in a family of feminists and musicians. Influenced by assassin Valerie Solanas' activities, Varyushka initiates a series of systematic strikes against the U.S. nuclear industry by destroying its objects. CIA officers chase her to New York, where she plans to blow up the Indian Point nuclear plant on the bank of the Hudson River. Varyushka, whom Reich describes in an interview as an iteration of "the philosophical psychopath" (Hurley 2016, [n.p.]), tries to reconsider her past after the Chernobyl disaster by destroying everything relevant to nuclear industry; however, she ends up launching new waves of violence and destruction. By referring to the Chernobyl disaster via fading memories about her parents and their life in the vicinity of the nuclear power plant, the protagonist shapes her own aggressive anti-nuclear position concerning the U.S. nuclear policy and the nuclear energy production sector, which leads to her nuclear terrorist activities.

To avoid any errors in interpreting the true facts about the nuclear disaster in Ukraine, and confirm the attempt to represent their personal and subjective vision of the nuclear event and its aftermath, the three writers draw the readers' attention to the fictional nature of their works by making the following statements in the prefaces to their novels:

> This is a *fictional* story based on the true events of the 1986 Chernobyl accident. Any resemblance to any person living or dead is entirely coincidental (White 2008, p. 5; emphasis added).

> *Chernobyl* is a work of *fiction.* A number of actual Soviet and other persons are referred to in the work; information about these persons is taken from the public record, and none of them appear as active characters in the novel. All those who do appear are *fictitious* characters. They do not represent real persons (Pohl 1988, p. 1; emphases added).

> This book is a work of *fiction.* Names, characters, places, and incidents either are products of the author's imagination or are used fictitiously. Any resemblance to actual events or locales or persons, living or dead, is entirely coincidental (Reich 2013, p. 3; emphasis added)

Nevertheless, the writers find it impossible to avoid mentioning real names, places, and objects, while writing about a true event and using documentary evidence, archival material, and memoirs. The use of factual information (real localities, dates, names) in the nuclear fiction shapes "the spatio-temporal setting, the compositional frame, which provides the preliminary key parameters of the original situation and surroundings depicting by the text" (Pitkänen 2003, p. iii). This way of narrowing the factual component to real places, dates, and organisations not only shapes the emotional and cognitive aspects of a nuclear narrative, but also positions the narrative between fiction and nonfiction. At the same time, it erases the boundary between fiction and nonfiction by highlighting some of the factual information used by the writers as evidence of creating the spatio-temporal setting of nuclear fiction.

First of all, the storylines of all three novels are set in real localities, with Chernobyl (or the Chernobyl NPP) as the central location which provides the background for all the events and even functions as a separate character. In this way, the novels map out nuclear geographies, which also include Pripyat, nowadays a 'ghost' town in Northern Ukraine (near the Ukraine-Belarus border), and Kiev, the capital of Ukraine, which hosted the first evacuated refugees. Other notable locations which constitute the factual component of the narratives include Yaniv, an abandoned Ukrainian train station located in the Chernobyl Exclusion Zone, and Slavutich, a city in northern Ukraine purposely built for the evacuated personnel of the Chernobyl NPP. White, for instance, describes the construction of Slavutich (2008, p. 99):

> The name Slavutich means 'glory' in Russian, and the nation's best builders were tapped to construct this model city. Crews from eight Soviet Republics worked overtime to complete high-rise office buildings and concrete-block apartment houses in the styles of their homelands. When the town was finished in 1987, almost 25,000 people moved there. Virtually every adult resident worked at the station.

To situate the Chernobyl disaster in the context of the global nuclear discourse, the writers also introduce well-known locations in the former Soviet Union and the U.S., such as Moscow and Leningrad (Pohl 1988). Reich provides a long list of U.S. locations (2013, p. 24):

> Many of you in Washington, California, Arizona, Nebraska, Kansas, Texas, Louisiana, Minnesota, Iowa, Montana, Arkansas, Mississippi, Wisconsin, Illinois, Michigan, Ohio, Tennessee, Alabama, Georgia, Florida, South Carolina, North Carolina, Virginia, Pennsylvania, New York, New Hampshire, Massachusetts, Vermont, Maryland, New Jersey, and

> Connecticut are oblivious to the fact that you are playing the same game of Russian roulette with 104 aging nuclear reactors.

The spatio-temporal setting of nuclear fiction about the Chernobyl nuclear explosion is also shaped through the dates (April and May of 1986) marking the nuclear events and their aftermath, and factual information which contributes to understanding the spatio-temporal frames of the nuclear epoch. Such a way of introducing the dates of actual events not only presents the reader with the stages of the Chernobyl nuclear explosion and its aftermath by historicising the fabulous narrative, but also situates fictional events in the context of post-Cold War rhetoric, all of which works toward blurring the fictional/factual boundary. Furthermore, the factual component of nuclear fiction is represented by references to well-known historical figures, such as Robert Oppenheimer (Reich 2013, p. 19), Bill Clinton, or President of Ukraine Leonid Kuchma (White 2008, p. 177). Inserted into nuclear fiction, well-known information and details about the period, such as names of organisations ("the kids' patriotism-Communism-scouting organization, the Pioneers"; Pohl 1987, p. 41), media (magazines such as *Working Woman* or *Krestjanka*; White 2008, 59), or movies (*The Man Who Fell to Earth* or *The China Syndrome*; Reich 2013, pp. 21, 32) that define the lifestyle realia of the Chernobyl time, enforce the factual component of the analysed novels.

These examples of spatio-temporal components of the three novels suggest that the inclusion of encyclopaedic data and shared knowledge about the represented epoch shapes the factual—in this case, nuclear—setting of the narrative. Accompanied by a biased narrative of memories about the nuclear event, coloured by strong emotions such as fear of radiation and depression (White 2008, p. 72), uncertainty (Pohl 1988, p. 133; White 2008, p. 21), traumatic memories of the past (Pohl 1988, p. 90; White 2008, p. 89), aggression towards external enemies as a product of Cold War propaganda (Pohl 1988, p. 27; White 2008, p. 67), and mistrust of government authorities (Pohl 1988, p. 95; White 2008, p. 108), the factual component makes readers believe in the factual nature of the fictional text by creating a shared experience of the nuclear events.

These 'factual' parts of the analysed novels are part of the depictions of protagonists' fears, dreams, disappointments, uncertainties, and hopes, based on the personal experiences of eyewitnesses. In the writers' amalgamations, such components of emotionally-coloured 'factual parts' at the personal (even individual) level represent not only the historical and material context of the events, but also provide the coverage of social and cultural components, and clarify the public opinion on the nuclear accident, while offering a full picture of the event. At the same time, the uncritical approach to using the factual components of memoirs is quite dangerous because of their personal, even biased, attitudes. However, such personalised and biased notes and comments of eyewitnesses can serve as a valuable source of information, revealing the causes of nuclear events, showing how the false image of a nuclear event is shaped, and revealing the truth. In the case of the analysed novels, such personal writing practices help reveal the stages of what was happening before, during, and after the accident at the Chernobyl NPP. This is especially importance

since, due to the total ban on the dissemination of information related to the accident at the Chernobyl NPP, the Soviet Government's version of the explosion as a technical mistake was the only official point of view on the events during the first year after the explosion. Eyewitness notes, experiences, and memoirs provided not only a vivid background to the governmental version of the nuclear explosion, but also an alternative view of the range of events leading to the nuclear accident. These would later generate the opinion that the Chernobyl explosion cannot be regarded simply as a technical mistake, but as a nuclear disaster which should be regarded within the context of social and human factors.

Such an amalgamation of the fictional and factual components of nuclear narrative shapes a situation in which the narrative framed by a factual setting needs less fictional details about the spatio-temporal frame, which is already presented by the factual component. At the same time, by creating a narrative in which the fictional and factual components are closely combined, nuclear fiction blurs the boundary between the fictional and the factual, creating a form of fabulous storytelling that unfolds against a background of real details. The gradual combination of factual and fictional components about nuclear events presents a distinct feature of nuclear fiction.

10.6 Discussion and Conclusion

Appearing both as a literary response and fictional reconsideration of the Chernobyl NPP explosion, Chernobyl nuclear fiction demonstrates that the 'fabulously textual' image of the nuclear refers not only to the past (fictional references to nuclear explosions and bomb testing) and the future (fictional references to apocalyptic events, stemming from a possible nuclear war); rather, it also refers the nuclear to the present. Occurring against the political and ecological background of the Cold War, the Chernobyl nuclear explosion, according to Jonathan Schell, marked a shift of focus of nuclear narratives: from "nuclear anarchy" to "an operational norm" (2007, p. 14). What is more (Blouin et al. 2014, p. 8):

> By making the nuclear – in all its guises, from weaponry to energy – an accepted practice (at least, for the nations deemed "responsible enough"), proliferation dictates a geopolitical landscape trapped between the potentials of nuclear energy and the apocalyptic tropes that continue to constitute it in the public imagination.

Studying nuclear narrative during the late Cold War (or the post-Chernobyl Age) within energy humanities allows for a precise reconsideration of its 'fabulously textual' component. The nuclear past or the 'imagined' nuclear future was made present by Chernobyl and implemented in Chernobyl narrative studies. This aspect of the present research addresses issues situated on the border between the humanities and sciences, while considering the Chernobyl NPP explosion from the perspective of social, political, and ethical representations within the nuclear criticism agenda. Post-Chernobyl nuclear fiction launched a shift within the nuclear narrative by transferring a nuclear "non-event", considered to be "fabulously textual" (Derrida 1984,

p. 23), into the real present, which is further correlated with the acute issues of literary energy narratives (Goodbody 2018, p. 15). The latter are of special interest to the energy humanities, which reflects on the changing uses of energy and highlights the role of (non)fiction in shaping the values and priorities of an energy-dependent society.

Energy humanities' perspective on nuclear fiction in the post-Chernobyl Age points to the literary dimensions of nuclear issues, which are characterised by a sudden shift: a shift from trust, collective responsibility, and confidence (as seen in the 'Atom for Peace' initiative) to total distrust, uncertainty, and despair. This not only changes the public reception of nuclear energy, but also emphasises the local implications of a 'literary Chernobyl' or any nuclear disaster in fiction. This type of 'factual' implication of a 'literary Chernobyl' shifts the nuclear rhetoric from the global to a local—even peripheral—level, which marks the transition from nuclear imperialism/nuclear anarchy to domestic nuclear peril (Schell 2007) and 'nuclear geographies' (Alexis-Martin & Thom 2017).

Through its 'factual' component, nuclear fiction helps reveal the geopolitical and ecological factors of energy policy at various levels as a step towards a further rereading of the energy history of humanity. By providing factual information, nuclear fiction on the Chernobyl NPP explosion not only frames the narrative tools used to depict one of the landmark technological catastrophes, but also allows humanity to reconsider the 'Atom for Peace' initiative against the various political, technological, ecological, and cultural agendas of its fictional implementation. This factual component transforms 'literary Chernobyl' into an intellectual, cultural, and international part of the world's energy history. The factual details of the analysed fictional texts depict the geopolitical landscape and causes of the nuclear disaster, while also providing balance through emotionally charged narration which reveals the details of the catastrophe and the ethical appeal of the novels' narratives. Such a combination of the fictional and factual provides an emotionally balanced, and reasonably critical reconsideration of the Chernobyl nuclear disaster in U.S. nuclear fiction. This allows readers not only to trace the history of the nuclear catastrophe in terms of moving the narrative from nuclear imperialism (Broinowski 2016) to a new nuclear order, but also to understand the political situation in Ukraine in terms of the contemporary geopolitical scale. The factual component of nuclear fiction does not change the 'fabulously textual' of the nuclear but prevents the erasure of the boundary between the true event and the myth, built around the Chernobyl disaster.

Situating the facts of the nuclear disaster within a wider historical context (from the Cold War rhetoric, through the time of President Mikhail Gorbachev and the Perestroika, to the shutting down of Chernobyl NPP) helps readers realise the causes and stages of the social transformations of the concept of nuclear energy in fiction against the USSR nuclear industry policy and the Cold War discourse. This 'factual/fictional' balance reveals the hidden truth about this technological disaster, which is regarded as a step towards drawing historical lessons from the consequences of a nuclear catastrophe. In other words, "[p]lacing the Chernobyl accident in the context of international history makes it possible to draw lessons of global significance" (Plokhy

2018, p. 13), which contributes to shaping nuclear awareness as a critical component of assessing nuclear energy history.

The fictional writings which provide a literary representation of the Chernobyl nuclear disaster produce literary imaginaries of the nuclear disaster—a 'literary Chernobyl'. The latter is created from amalgamations of fictional components on the one hand, and archival material, memoirs, and interviews (these cover the participants' names, pre-/post- explosion conversations, the death toll, the scale of the disaster's consequences, potential health risks of radiation exposure, and subsequent nuclear phobia, distrust and uncertainty, which culminated in the Chernobyl Syndrome), on the other. The use of facts, data, documents, and archival material makes nuclear fiction a source of information on the nuclear disaster and its aftermath, while its distinct amalgamation of facts and fictional storytelling works towards erasing the boundary between the factual and the fictional. The narration of nuclear events which draws readers' attention to both fictional and factional components also provides a way to reread the energy history of the humanity, by reshaping the values and priorities connected to promoting sustainable energy sources and energy transitions.

Going beyond the geopolitical and ecological aspects of a nuclear disaster, nuclear criticism focused on post-Chernobyl nuclear narratives contributes to multidisciplinary debates on nuclear energy issues and encourages the development of energy humanities by studying the narrative tools used to shape the perception of energy history in the past and the choice of energy sources in the future. Studying the literary and cultural dimensions of nuclear energy helps us imagine alternative scenarios of energy futures, based on changing narratives about the nuclear past and the nuclear present. This creates a platform for studying real historical events (or any other nuclear issue) in close connection with human, animal, and technological studies, while stressing the need for understanding nuclear identity, nuclear culture, and related issues of identification concerning real historical events, as represented in fiction. Incorporating ideas from different disciplines under a single umbrella not only provides opportunities for reshaping nuclear narrative within literary, cultural, social, and political parameters, but also fosters debates about the role of nuclear fiction in developing nuclear awareness within a sustainable development agenda.

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Chapter 11
The Nuclear Mundane: Geology and the Unthinkable

Laura Pannekoek

Abstract This chapter explores a set of conceptual tensions in aesthetic and discursive economies of nuclear risk management by analysing Trevor Paglen's *Trinity Cube* (2016), Taryn Simon's *Black Square XVII* (2015), Michael Madsen's *Into Eternity* (2010), and the International Energy Agency's GEOSAF project. It examines the tactical positioning of geology in waste management and the attempt to work through the figure of the unthinkable that persists in nuclear aesthetics. Building on Frances Ferguson's idea of the nuclear sublime, the chapter identifies a newly emerging analytic: the nuclear mundane, which describes contemporary techno-political mechanisms through which the unthinkable timescales of nuclear energy become banalised and figured as regular industrial risk. The chapter considers how this nuclear mundane gets played out on a geologic register and what this means for the way nuclearity gets figured into an energy future.

Keywords Nuclear energy · Nuclear aesthetics · Energy humanities · Geology

11.1 Introduction

Two radioactive cubes, recent artworks by two U.S. artists—Taryn Simon's *Black Square XVII* (2015) and Trevor Paglen's *Trinity Cube* (2016)—are currently suspended from public exhibition. One is placed in the Fukushima Nuclear Exclusion Zone, in the so-called Difficult-to-Return Zone to which entry, lodging, and commerce are prohibited indefinitely. The other is contained in the Radon Nuclear Waste Disposal Plant, 90 km from Moscow. Paglen's and Simon's cubes are both made out of what would be considered by most international regulations as radioactive materials. They are vitrified into solid cubes through an industry technique called GeoMelting, whereby nuclear waste is mixed with glass-forming elements to immobilise radionuclides and prepare them for long-term storage. Common to both cubes is that they will only be available for public viewing once either the site's or the object's

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radiation levels have diminished to a level safe enough for humans, a 1,000 years for Simon's cube and a still unknown amount of time for Paglen's. Encounters with these objects are deferred through the temporal pressures that radiation exerts on the bodies through which it moves. On the one hand, their prolonged absence presses against an imaginary that presents radiation as a threat consistently out of reach. On the other, the cubes' radioactivity puts pressure on what it is we might imagine an artwork's geological presence to license, invite, and promise.

Simon's and Paglen's cubes materialise the temporal and spatial pressures that align with some of the oppositions that have long defined nuclearity as an aesthetic economy: presence and absence, site and non-site, exclusion and inclusion, and visibility and invisibility. Thinking about nuclearity in these terms has a way of resisting concretisation. The cubes inherit the ongoing project of 'making tangible' the threat of radiation, which often turns out to be, paradoxically, not that different from the project of reasserting its intangibility. Simon's *Square* will inhabit its intended site (titled *Void for Artwork*) in the Garage Museum of Contemporary Art in Moscow in the year 3015. Its extreme displacement through time invades the viewers' temporal framework and stupefies their actual and imagined relation to time. Paglen's *Cube* similarly entertains the notion of spatial and temporal deferral, but also attempts to congeal the ahistorical and the historical. Made out of both Trinitite, the glass-like residue left after the Trinity nuclear bomb test on 16 July 1945 in Mexico, and Fukushima's melted glass, Paglen's *Cube* melts together the deep times of radioactive threat and the almost anachronistic historicism of the event of explosion.

These temporal and spatial tensions invited by the cubes play into the category of the unthinkable and reflect on what Frances Ferguson identified in 1984 as the nuclear sublime, in which nuclearity is presented as the ultimate and final threat. As the absolute totality of destruction, the nuclear sublime becomes the primary invocation of the unthinkable. Yet, as much as the cubes invoke this aesthetic mode of the nuclear sublime, they also mark a definite turning point in thinking about the unthinkable. The unthinkable is also presented as geologically condensed and contained, even if it must remain absent. Its volatility is subsumed in a predictably simple geometric shape. I argue that this manoeuvre that makes a nuclear threat that is thought of as unthinkable, volatile, and sublime into a concrete knowable substance is a new dynamic of 'making tangible' that persists in both artistic responses to radiotoxicity, as well as the nuclear industry's risk management discourse.

These artworks coincide not only with renewed aesthetic and cultural interest in nuclearity after the Fukushima Daiichi disaster in 2010, but also with a new imagination of a nuclear energy future in the Anthropocene. Decarbonisation plans that increasingly include larger shares of nuclear as a 'green' alternative to carbon, paired with a heightened awareness of humanity's geological presence, create a discursive and moral space in which a nuclear-fuelled culture that regularly operates on and manages nuclear timescales no longer seems that unthinkable. On the left, debates about energy transition also often include nuclear as a temporary solution, a 'stepping stone' in the transition to renewable energy, or even as a final goal. What often gets downplayed in these pragmatic accounts are the powerful cultural lives and

afterlives of nuclear power. Nuclear trauma and fear of contamination get presented as irrational responses that form barriers to a new nuclear-fuelled modernity.

Approaching nuclearity from an energy humanities perspective helps bring into view how nuclear energy *imaginaries* are not a separate force acting upon an energy industry, but deeply interwoven on the institutional, corporate, and infrastructural level. Perhaps more so than oil, nuclear power has had, and continues to have an intense cultural presence. This continues to impact legislation in ways that are radically different from fossil fuels, although pressure from the market increasingly erodes that legislation. Nuclearity signals a robust tradition of cultural work throughout the second half of the 20th century. It has become imperative to revisit and revise nuclearity now that it becomes, for better or worse, an element in the transition to a sustainable energy future. Heeding the call made by Imre Szeman and Dominic Boyer in 2014, the humanities should no longer be seen as an afterthought to technology and politics, but instead a forerunner in imagining the relationship between energy and society. When life on Earth is threatened not so much by natural forces but by a mix of capital, climate, and technology, interdisciplinary cultural work on energy is an essential step to imagine an otherwise.

When it comes to nuclearity, we might start by asking what are some of the discourses, analytical practices, and imaginaries surrounding the nuclear that emerge from the pressures of a warming world? Considering nuclearity's multiple traumatic lives and afterlives, how do we talk about nuclear power after oil? What is important to me in this chapter is how geology, as a modern science and material category, gets positioned as the stable discursive and material grounds to support nuclear energy safety discourse, and works to diminish the so-called radical uniqueness of nuclear materials and the nuclear sublime as the dominant form of nuclear aesthetics. Geology helps establish what I will call, building on Gabrielle Hecht's (2012, 2016) work, the *nuclear mundane*, which describes contemporary techno-political mechanisms through which the unthinkable timescales of nuclear energy become banalised and figured as regular industrial risk. Paglen's and Simon's cubes are not alone in invoking a geologic index to nuclearity; the 2010 documentary film *Into Eternity* (dir. Michael Madsen) shows similar tensions between the aesthetics of the sublime and the mundane in nuclear waste risk management, in which geology performs the mundane. In what follows, I track the nuclear mundane and the nuclear sublime as analytical categories as they surface in Simon's and Paglen's artworks, *Into Eternity*, and the official risk management discourse of the Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA).

11.2 Mistimed and Mislocated: The Nuclear Sublime

The genre of the unthinkable persists as the dominant response to the nuclear, even if in its contemporary form it is less about the moment of explosion than the perpetual management of excluded materials and sites. Correspondingly, a major aesthetic weight of both cubes hinges on the awe one feels faced with the 1,000-year suspension

of the artwork. For Ferguson's (1984) conception of the nuclear sublime, suspension catalyses the specific experience of nuclear threat. Thinking the unthinkable, she argues, while provoking "considerable difficulties", nevertheless, like other forms of the sublime, "imagines freedom to be threatened by a power that is consistently mislocated" (1984, p. 9). It is mislocated not only because of the spaces, bodies, and materials that the threat inhabits that are not our own—but are hopefully always contained and excluded—it is also mislocated through time. At least in so far as the threat these cubes induce operates on a timescale at variance with the human rationalisation of threat. The event of mislocation, both spatially and temporally, does not only indicate an unthinkable power that hides from understanding, but also makes it unthinkable as such. If the nuclear sublime continues to figure radiation as a threat that is consistently mislocated, both spatially and temporally, then, sure enough, thinking the unthinkable becomes a cognitive loop that maintains distance from the 'concept' of radioactivity, so we will be perpetually unable to pinpoint the times and places of nuclearity. Still, mislocated the cubes will be, for a 1,000 years, if they are left to remain as intended. In a nuclear-fuelled culture, art must now also take a long time.

Nuclearity messes with our thinking about time and space. The important point here is that a transition from fossil fuels to nuclear energy, even as a temporary, 'in-between stage', has unforeseeable social and cultural repercussions. A nuclear transition means a transition in what we deem thinkable and knowable, and how we come to acquire that knowledge. In other words, to manifest itself, nuclearity needs its own temporal and epistemological framework that can calculate and justify certain registers of risk. Of course, those frameworks are modulated on all sides by the nuclear industry's vested interests, which constitute a complicated web of geopolitics, finance, and geology. What is considered a nuclear risk practically is more about dexterous management discourse than about the absolute and ultimate threat of nuclearity we find in the nuclear sublime.

In the cubes, this risk management unfolds on a geological register. Taryn Simon's *Square* is made of medium-level radioactive waste from Russia's State Atomic Energy Corporation's (ROSATOM) Kursk Nuclear Power Plant formed into a solid cube through GeoMelting. She describes her project in an interview with *Aperture*: "I wanted to make a work not for my generation, nor my children's generation, but for a distant future to which I have no tangible relationship. The process of vitrification converts radioactive waste from a volatile liquid to a stable solid mass, which resembles polished black glass" (Fowle 2016, [n.p.]). The process of vitrification is introduced as a stabilizer for the spatio-temporal ambiguity of radioactivity. Making tangible here is thought less as an imagined emancipation from the abstract realms of the unthinkable, than through the concrete technique of GeoMelting, which is at once a process of materialisation—in the sense of converting the material from a "volatile liquid to a stable solid mass"—and one of rationalisation, in the conversion of the idea of radioactive waste qua hyperobject to a single geometric shape.

Similarly, Trevor Paglen's project is also a vitrified cube, made from irradiated glass from Fukushima on the outside and Trinitite on the inside. In an interview about his project, he explains: "For me it is a gesture that's thinking about geology,

thinking about man-made minerals, and thinking about that history of nuclear power slash nuclear weapons that began, perhaps, in New Mexico and continues to this day through places like Fukushima" (The Creators Project 2015, [n.p.]). Paglen, like Simon, puts forward geology both as an epistemic mode and measure to think through this mislocation and mistiming of the threat in the nuclear sublime. The mistimed is an ahistorical threat—just as geology was considered to be an event unfolding on ahistorical scales—that Paglen wants to concretise, make historical, by putting the geologic on the same plane as the materials produced by human events. By melting together the Trinitite mineral with the irradiated glass from the Fukushima Exclusion Zone, Paglen's *Cube* congeals history with what is the ahistorical quality of the perpetual mislocation and mistiming of nuclear threat. The process of vitrification is a mechanism to convert dangerous material output of a specific energy regime into an ahistorical materiality (Carpenter 2016; Yusoff 2019). This ahistorical materiality dislodges the radioactive waste from real historical systems of extraction and consumption, and the political mediations that sanction them. In other words, what Paglen calls a "man-made mineral" is put forward as the figure by which the tension between the intangibility of radiation and the actuality of nuclear materials is resolved through a turn to geology, as a relay between history and ahistory.

The mislocation and mistiming of nuclear threat that these cubes both address and attempt to condense through this transmutation from nowhere to somewhere is a mechanism that is part of the political project of making nuclearity tangible. As a scientific mode and material category, geology emerges as a stabiliser for radiation that is always already mislocated and mistimed, is volatile, and subject to a nuclear sublime that consistently pulls away from, if not an essence or truth, then a stable measure for decision-making. It comes perhaps as no surprise then that Simon worked in collaboration with ROSATOM on *Black Square XVII*, while Paglen's *Trinity Cube* is part of the *Don't Follow the Wind* project, which explicitly aims to provide a counter-narrative to the pro-nuclear agenda of the Tokyo Electric Power Company (TEPCO) and the Japanese Government. When the Garage Museum of Contemporary Art in Moscow, which exhibits the space Simon's *Square* will take 1,000 years from now, frames the cube as evidence of the process of stabilisation of volatile material, it effectively becomes a poster child for GeoMelting and waste 'neutralisation'.

Simon also included a personal letter to the distant future in the vitrified cube, as if radioactive waste is somehow supposed to safeguard our connection to the future, giving it positive value, associating nuclear timescale with permanence and stability in a volatile world. Andrew Moisey has suggested that permanent nuclear commemoration, such as the Waste Isolation Pilot Plant's marking designs from 1989 intended to cover the entire surface of the Plant with awe-inspiring spikes, spirals, and basalt, were not meant to be a hiding place or warning about nuclear danger for a thousand future generations, but a celebration of the moment in history when humans reinvented fire, the ultimate achievement of modernity (2017, p. 892). While celebrating nuclear waste as our ultimate permanent mark on the world seems too abstract for a direct motive, ROSATOM's interest in emphasising GeoMelting as a waste neutralisation process is not at all abstract in how it helps to demystify what continues to be perceived as an invisible and ungraspable threat. As I will argue next,

the banalisation of nuclear materials, both on the front- and back-end of the nuclear fuel cycle, and both in the public imagination and in international safety regulations, is the core mechanism by which the nuclear industry hedges against public criticism and keeps policy restrictions at bay.

11.3 Nuclear Banalisation

The attention of both cubes to human-made geology—their attempt to think about the future from a non-human perspective through the epistemic mode of geology—signals a re-contextualisation of nuclearity from the Cold-War atomic sublime to Anthropocene-inflected arts and humanities discourses. This shift is important to note because it is the discursive and ecological envelope through which the aesthetics of nuclear energy gets materialised in more recent artworks that turn radioactive materials into an artistic medium. Very different is this aesthetic gesture than the conceptual matrix through which nuclear criticism in the 1980 s oscillated between the unthinkable and unrepresentable ultimate destruction of nuclear war on the one hand, and the very specific image of explosion on the other. Thus, what is made available by attending to the presentation of geology in Paglen's and Simon's artworks are, among other things, the modes by which the geologic index of the human becomes both a problem for climate change and a solution to it.

The shift is just as visible in the industry's discourse about itself. Although the nuclear industry witnessed a plunge in reactor capacity since the early 2000s through the decommissioning of old reactors built in nuclear's 'golden age' (roughly between 1950 and 1970; Betts 1986–87), some are speaking of a second coming of the nuclear industry, in some parts fuelled by tech start-ups (Johnson 2018), or as international nuclear agencies and associations have been marketing it, "a nuclear renaissance" (Bird 2008; International Energy Agency 2007; Wang and Hansen 2007). The Nuclear Energy Agency (NEA) is calling for new policy frameworks that would allow for a growing share of nuclear in decarbonisation plans (2019). That means easing restrictions on trade, processing, and disposal of nuclear materials that currently obstruct the movement of nuclear materials out of safety considerations and subject them to the forces of the market instead. Elsewhere, ecomodernists, in a truly Promethean manifesto, argue that a 'good' (or even great) Anthropocene is possible if only humans would be willing to use their economic and technological powers to stabilise the climate (Asafu-Adjaye et al. 2015). Nuclear power is one of their proposed solutions in further "liberat[ing] humanity from nature" (ibid., 17). Human civilisation will be able to flourish for millennia on unlimited power generated by a closed uranium—or thorium-fuel cycle, as argued in the *Ecomodernist Manifesto* (ibid., p. 10). Indeed, in the U.S and across Europe, new grade 4 reactors are being built, 12 underground disposal sites are currently in the early stages of construction, and the current U.S. administration is adding large funds to private-public partnerships in advanced reactor developments to revitalise its domestic nuclear industry. It seems that the nuclear industry is making its way back into at least some official

imaginations of energy futures. The cubes, each in its own way, signal that, parallel to this, nuclearity is returning as an aesthetic problem, one that attempts to grasp the times and spaces of a nuclear energy future. This time around, not as the instigator of the end of the world, but as its solution.

This new nuclearity is then less about controversy over reactor safety and more about the struggle between energy future and the apparent geological capacity of the human that the Anthropocene has revealed. The Anthropocene signals new ways of thinking about time and matter because it imagines the temporal and material capabilities of the human to have stretched massively. While for many this triggers an uncomfortable image of humanity exceeding its boundaries, for nuclearity, this geological index of the human is figured as a stable ground to base a new nuclear literacy on, an epistemic framework that thinks possible the stretching of risk management to geological timescales. A major case in which this development becomes clear is the deep geologic disposal for spent nuclear material. Storing radioactive waste deep within geologic formations relies on a 'safety analysis' of the area, which means evaluating the geological and hydrological structure and its evolution. In these disposal projects, much like both Simon's and Paglen's cubes, geology, as a modern science concerned with deep time, is put forward as the measure against which the temporalities of radioactive waste can be thought, managed, or contained. This constitutes a form of geologic mediation that modulates the bureaucratic and conceptual stakes of the Anthropocene.

In these deep geologic waste storage projects, geology becomes the discursive and materials grounds for a contemporary iteration of the process of nuclear banalisation that, in different ways, has characterised the nuclear economy since the 1960s. Bureaucratic reforms, rephrasing, and re-characterisations of the 'nuclear' have been aimed at reinventing nuclear risk on an international policy level from a specifically nuclear risk to regular industrial risk. This started with the denuclearisation of uranium at the beginning of the 1960s, meant to strip the mineral from its nuclearity—that is, the particular conditions that make nuclear material subject to international regulations. The set of bureaucratic reforms, mainly in defining separate stages of uranium exploitation constitutes what Hecht (2012) calls mechanisms of banalisation. These interventions were employed by the IAEA since the mid-1960s, in response to an international desire for a uranium market and hinge on the definition of "source materials" to transform nuclear things into ordinary commodities (Hecht 2012, p. 55). This created the techno-political conditions of possibility through which the distinctiveness of the state of being nuclear could be diminished. For deep geological disposal, these terms of banalisation are set by the IAEA's GEOSAF project and are based on geological research. GEOSAF, or the International Project on Demonstrating the Safety of Geologic Disposal, pursues the IAEA's general statutory objective: to "seek to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world" (International Atomic Energy Agency 2015, [n.p.]) by making a safety case that "draw[s] together all of the safety arguments and demonstrate[s] and communicate[s] why the operator of the facility has confidence that safety in the long term will be ensured" (ibid., p. 0).

This five-year project (2012–2017) defines the terms and guidelines for what the IAEA calls "post-closure safety", the assessment of risk of leakage after final waste disposal as opposed to leakage during operation (International Atomic Energy Agency 2015). If the operator of the facility remains within the procedural guidelines set out by GEOSAF, post-closure safety is deemed assured. These guidelines prescribe a series of safety functions consisting of 'natural barriers', the 'host rock'—that is, the rock directly surrounding the waste containers and the geological formations overlying the underground facility—and 'engineered barriers', the waste packaging, buffer, and sealing materials. It is important to make a distinction here between ensuring the safety of geological repositories and GEOSAF's aims to provide the terms and parameters, the techno-political framework with which the safety of geological disposal can be argued for. The terms GEOSAF provides, such as post-closure safety, safety functions, and safety envelope (the set of boundary levels that must be maintained throughout the disposal facility's life cycle), to use geology to provide a way to talk about risk management on a 100,000-year scale, are mechanisms of banalisation that necessitate an analytics that is, in fact, the opposite of the nuclear sublime, it is a *nuclear mundane*.

The nuclear mundane is different from the nuclear sublime in that it gives a literal shape to the nuclear in order to stabilise a nuclear energy future, instead of foreground its unpredictability. What the mundane works on conceptually is the figure-ground relationship, where the environment as ground is turned into a passive stabiliser for the harmful actions of the human as figure. Rather than vice versa, where climate change becomes something that happens to the human, this nuclear mundane therefore works conceptually and aesthetically to distribute nuclearity as a distinctly human product back into the earth through geology. On the one hand, this is a facet of the Anthropocene that positions the human as possessing the ultimate and final agency; on the other, it allows the aesthetic of nuclearity to become banalised, unimportant, or insignificant. The nuclear mundane, needless to say, not only falls back into the idea of energy as fuel and its regimes as supportive—rather than constitutive of social and cultural worlds—but also obscures and diminishes the threats and violences specific to it. The nuclear mundane and the nuclear sublime are opposing analytics for nuclearity, yet, as I will argue in the next section, both economies bypass the idea of nuclearity as a unique energy regime.

11.4 Geology and the Mundane

Nuclearity manifests itself discursively, aesthetically, and ideologically either as the sublime or the mundane. This polarisation of the nuclear index, already signalled in Paglen's and Simon's cubes, returns more explicitly in the 2010 documentary film *Into Eternity*. It chronicles the early stages of the construction of Onkalo, Finland's deep geological repository for nuclear waste generated by the nearby Olkiluoto Nuclear Power Plant. This facility will be filled with spent nuclear fuel currently in interim storage and will continue to accept new waste before it is backfilled and

sealed around the year 2120. It is meant to stay sealed for as long as the waste remains radioactive, up to 100,000 years in the future.

In the film, we see the representatives of Onkalo arguing for its safety by storing the waste deep within the Finnish bedrock, which is, they state, "the most stable environment we know of", and where "time moves slower than on the surface" (*Into Eternity* 2010). Making this safety case relies on certain assumptions about the host rock, resonating with a view on geology going back to the so-called English Gentleman tradition of James Hutton and Charles Lyell, a time when gradual, uniform processes of change replaced previous ideas of the earth being changed only by spectacular sudden catastrophes. Lyell's most important work, *Principles of Geology* (1830–1833), is a polemic against the so-called catastrophists of his time and argues for a uniformitarianism: the idea that physical laws, and subsequently geologic processes, are stable and uniform, and thus the past can be studied through the present. James Hutton writes: "In examining things present, we have data from which to reason with regard to what has been; and from what has actually been, we have to conclude with regard to that which is to happen thereafter" (1788, p. 17). In these terms, a nuclear safety future can be constructed from the study of natural analogues—present-day geological formations as stand-ins for the distant future—and computational modelling based on these studies. It is no surprise then that the Onkalo representatives choose to adopt this language.

However, this study of natural analogues does not align with the safety parameters common to industrial risk, meant to guarantee safety by verification of future stability. For the IAEA, since post-closure safety cannot be "verified by direct methods", which means that because no IAEA member will be able to witness a successful radioactive containment for a 100,000 years, post-closure safety can instead be guaranteed by "indirect methods" of natural analogues (International Atomic Energy Agency 2015, p. 7). This tactical split in defining 'guaranteed safety' between indirect and direct verification makes it possible to argue for the complete safety of an open nuclear-fuel cycle. These indirect methods of verification move alongside the mechanisms of mistiming that gets associated with nuclear materials, because the Scottish uniformitarianist principle 'the present is key to the past is key to future' thinks all three on the same plane. Yet this time, GEOSAF's safety framework doubles down on the ahistoricality that gets associated with nuclear materials. This, again, is a mechanism of banalisation that attempts to diminish what Hecht (2012) calls the "radical uniqueness" of radioactive waste by creating a bureaucratically constituted, atemporal form of nuclear materiality that allows a nuclear risk to disengage from its time and place. This extraordinary move signals that there is nothing mundane about the nuclear mundane. Without this form of banalisation through the function of the ahistorical, nuclear energy and its 100,000-year legacy would become again about the current historical moment, and would endure a literally unthinkable and, as such, undefendable pressure on nuclearity.

To return some of this pressure suspended by banalisation to present-day energy policy, some forms of nuclear aesthetics, like *Into Eternity*, demand an intervention in the ways in which these mechanisms represent the stages of the nuclear-fuel cycle. The critical weight of *Into Eternity* then lies in the doubt it casts on these terms of

banalisation. In his interviews, filmmaker Michael Madsen asks repeatedly, how can we guarantee that no future civilisation or life form will enter the repository? When asked about human intrusion, Peter Wikberg, credited as Onkalo's research director, responds: "If someone in the future is able to dig down to the repository—it will probably be a civilisation of the same kind as we have presently. In such a case they would also be knowledgeable—to know that this is radioactive material" (*Into Eternity* 2010). The woman sitting next to him, Berit Lundqvist, for a short moment smiles and after an awkward pause and a short intake of breath phrases carefully: "I think that is the most… probable scenario, but I'm not so sure. It could be—another situation. They might interpret it as something religious, a burial ground, a treasure" (ibid.). This conspicuous doubt is the central jarring gesture of this film. Perhaps because Lundqvist recognises the disastrous consequences of being wrong, not only for the humans of the future, but of the Onkalo project and the international nuclear safety agreements more broadly. In this awkwardness lies the strength of *Into Eternity*'s intervention. It is this shimmer of doubt that can destabilise the carefully constructed bureaucratic grid through which the doubts, dangers, and uncertainties of long-term nuclear risk get banalised.

By pushing the limits of this fear-management discourse and leading the engineers to dead ends in their arguments, *Into Eternity* returns some of the panic of the nuclear sublime to us. Aside from the interviews with the representatives, the film employs a series of aesthetic and narrative strategies that caused film scholar Andrew Moisey to dismissively name the film a "middle-brow spook fest" (2012, p. 103). This is not surprising, as Madsen's match-lit monologues, the stylised shots of waste containers set against songs from Kraftwerk's album *Radio-Aktivität*, the footage of poorly lit underground tunnels, the markings for the blasters that look like prehistoric cave drawings, and extensive embellished footage of construction machinery, are all tactically presented stand-ins for the 'unrepresentable future' of nuclear waste. In *Into Eternity*, Onkalo becomes a mythical place, far removed from the mechanisms of banalisation. The waste is not presented as ahistorical materiality, but as existing in a science-fictional sphere that is forever occupied with thinking the unthinkable.

The film's two opposing narratives are structured around nuclear waste. The IAEA reflected in the Onkalo representatives and Madsen's "spook fest" mirror this ongoing polarisation of the sublime and the mundane in nuclear energy discourse: the movement towards banalisation, a radical mundane of nuclearity and its countermovement towards the 'radical uniqueness' of nuclearity. Both spheres construct opposite futures—one of absolute predictability and one of no predictability at all—but engage a similar process through which nuclear materiality is disengaged from its discursive surroundings.

11.5 Conclusion

The futures invoked, or rather not invoked, by *Into Eternity*'s "spook fest" generate a fear of darkness, of nothingness, of the unknown, more than they generate a fear of nuclear threat. The IAEA's tactics of banalisation through misplacement and mistiming creates matter disconnected from history. It is this type of nuclearity that has less and less to do with radiation. Radiation only really manifests itself when it comes into contact with matter. Instead, here nuclearity becomes an aesthetic economy that mistakes the discursive process of 'making tangible' for the material process of making tangible. It is here that the tensions at the heart of Paglen's and Simon's cubes come together. The important point here is that both sides of this polarisation work to bypass the violence of nuclear energy regimes. *Into Eternity* also inhabits that same polarisation of the mundane and the sublime that is so central to Paglen's and Simon's cubes, and might be precisely what continues the illiteracy of representation of nuclear energy regimes. This is not to say that they defy representation; rather, it is to say that nuclear energy safety discourse is caught up in a web of competing temporalities that cannot be figured in existing conceptions of nuclear risk in the present, risk in the future, and what we have come to know about risk in the past.

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Chapter 12
Conclusion: Where We Are and Where We Are Going

Nada Kujundžić and Matúš Mišík

Abstract The chapter provides an overview of the edited volume and summarises the main contributions of the individual chapters to the energy humanities. Based on this, it provides an overview of the issues that are currently at the forefront of energy humanities research and identifies possible venues for future inquiries. It also addresses some of the volume's limitations. The chapter underscores the importance of the energy humanities for examining the roots and extent of our dependency on fossil fuels, and the social, political, ideological, aesthetic, and cultural aspects of energy, as well as its role in bridging the gap between the natural sciences and the general public. Namely, while natural sciences continue to generate data regarding the devastating and fast-approaching consequences of climate change, they are not always successful in communicating their immediacy and importance to a wider audience. Many directly link this absence of effective communication with the lack of concrete action on the part of decision makers and the public. The chapter argues that the humanities and social sciences can greatly contribute to the transfer of knowledge between the scientific community and the general public, and the creation of a greater sense of immediacy and significance related to taking decisive action, necessary to prevent irreversible consequences of climate change.

Keywords Climate change · Energy transition · Public · Natural science · Policy change

The main idea behind this edited volume—and the energy humanities as a whole—is the notion that the humanities and social sciences have a lot to contribute to solving current global challenges related to climate change, especially energy transition. For a long time, climate change, global warming, and the role of humankind in these

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processes were viewed almost exclusively through the prism of natural sciences: for example, climatologists and mathematicians have modelled the development of the planet's climate; chemists and physicists have explained how different gases produced by humans create a layer in the atmosphere which prevents the excess heat to leave the planet, thus causing a temperature rise. Despite some discussion on whether the current climate crisis is entirely caused by humans (some see it as a result of the natural cycle of colder and warmer climate periods; Bertoldo et al. 2019), scientists agree that climate change (and other radical changes of our planet) is anthropocentric (Doran and Zimmerman 2009), a notion reflected in the use of the term 'Anthropocene' ('the epoch of humanity') to describe our current era and highlight the extent to which it has been shaped by humans (Crutzen 2002; Crutzen and Stoermer 2000; Zalasiewicz et al. 2012). Opposition to this claim (so-called climate change denial) comes from questionable sources that are regularly invalidated, but still manage to enter the public discourse thanks to their vocal supporters (Dunlap and McCright 2011; Washington and Cook 2011).

For decades, natural sciences have consistently been providing evidence about climate change and the seriousness of its consequences for the entire planet. Recent research has shown that even 50-year-old climate models were precise in predicting climate development, and that future expectations provided by those and the more precise current models will very likely be realised (Cornwall 2019). However, despite the plethora of scientific evidence highlighting the need to alter our way of life and use existing opportunities (such as the current post-pandemic recovery)[1] to decrease greenhouse gas (GHG) emissions, and public calls to heed their warning—voiced especially loudly by the young Swedish activist Greta Thunberg (2019), initiator of the 'Fridays for Future' movement—there is still a considerable lack of decisive action, both on the part of decision makers and the general public. Some researchers attribute this to the lack of effective communication on the part of natural sciences (Nisbet and Scheufele 2009; Whitmer et al. 2010), claiming that, in order "to motivate, enable, and sustain public action on climate change and other environmental issues", scientists need a better understanding of the processes of communication and learning, the conditions needed to improve the learning experience, as well as the different sources of information, from news broadcasts and online platforms, to museums, video games, and social media (Groffman et al. 2010, p. 286).

While their contribution to the discussion on climate change and energy transition is by no means exhausted in mere mediation, the humanities and social sciences play a key role in successfully communicating 'hard' scientific data in more comprehensible and engaging ways. Namely, effective communication is not just a matter of

[1] As the global economy slowed down and transport was almost fully halted for several months, the current Covid-19 pandemic (this Conclusion was written in May 2020) decreased the production of emissions, which raised questions about post-pandemic recovery. Many voices, especially within the European Union, support a 'green' recovery, viewing the pandemic as an opportunity to avoid reverting back to the 'old' system of emission and pollution, and instead exclusively invest in environment-friendly industry. In other geographic areas, however, GHG levels reached pre-pandemic heights even before the pandemic was fully over (Qi 2020), and are expected to continue increasing as many governments give precedence to a fast and steep economic recovery over climate concerns.

creating more accessible narratives, but also (and even more so) of understanding the importance of values, needs, and experiences for interpreting and responding to information (Einsiedel 2008; Nisbet 2009; Weber and Word 2001), as well as the processes wherein individuals make connections between broader issues such as environmental problems, and their everyday lives and value systems (Groffman et al. 2010). The key to getting scientific messages across therefore lies in a more thorough understanding of different audiences and their values, interests, and social networks (the focus of disciplines such as sociology, communication and media studies), as well as they ways in which individual issues should be framed so as to resonate with target audiences (e.g. folklore and literary studies). This is why the interdisciplinary collaboration between the natural sciences, humanities, and social sciences, as well as between academic and other institutions, is crucial for "bring[ing] many sources of specialized knowledge and experience to bear on societal engagement and solutions to climate change and other environmental problems" (Nisbet et al. 2010, p. 329).

In addition to facilitating the transference of scientific knowledge, the humanities and social sciences contribute to discussions on the current climate and energy crises—especially the transition to a carbon-free form of energy production—with their own unique knowledge and expertise. The energy humanities is especially well positioned to study both the minutiae of the energy transition, a complex process that impacts all aspects of human life, and the negative effects of a 'business-as-usual' approach to GHG emissions and climate change. As illustrated by the research presented in this volume, its unique combination of approaches from the humanities and social sciences brings the social, political, ideological, aesthetic, and cultural aspects of the energy transition to the forefront by examining how we reached the point at which an energy shift is necessary, how it might be realised, and how it will inevitably alter both our everyday lives and our societies. The edited volume's different chapters have argued that the energy humanities has an opportunity to assist in the energy transition by (among other things) seeking historical models of more sustainable societies and modes of living (Chap. 3), using literature and other art forms as fictional platforms for developing possible future scenarios (Chap. 9), and identifying and drawing lessons from best contemporary practices (Chap. 6). Furthermore, it has the important task of identifying and highlighting the role of energy in the different operations of politics, governance, power, and freedom. For, as Imre Szeman warns (Chap. 2), the failure to do so not only limits our understanding of energy and the possible manifestations of energy transition, but also (perhaps more importantly) results in a warped and incomplete comprehension of those processes, which, in turn, can lead to the reproduction of their more harmful aspects (Chap. 8).

The chapters assembled in this volume address a number of issues connected to the energy humanities from different disciplinary and theoretical angles. While the chapters in the first section focus on the broader picture and provide theoretical discussions on the critical theory of energy (Chap. 2) and an energy history of the humanities (Chap. 3), those in the second section demonstrate that existing best institutional practices are not always recognised and implemented (Chaps. 4 and 6), and that narratives about carbon–neutral fuels of the future are often used to mask the utilisation of the carbon-based fuels of today (Chap. 5). The chapters included in

the third section argue that fictional depictions of fossil fuels in Norwegian television and film represent not only modernity, but also the toxicity of politics and human nature (Chap. 7), trace the colonial legacy inscribed in the energy transition and fossil fuel extraction in Canada (Chap. 8), draw lessons for current energy relations from science fiction (Chap. 9), analyse representations of the Chernobyl nuclear disaster in contemporary U.S. fiction (Chap. 10), and study cultural artefacts that stress the longevity of nuclear waste (Chap. 11).

Taken together, the chapters underscore several key aspects of the current state of energy humanities, primarily its interdisciplinary potential and ability to bridge the gap between academic and applied research (Chaps. 2 and 3). The emphasis on interdisciplinarity stems from one of the key premises of this research field—the notion that energy permeates every aspect of our contemporary lives, from everyday activities and interpersonal relations, to larger social structures and modes of cultural production. Because energy (especially fossil fuels) is not limited to a single area of our existence, its study cannot be limited to a single discipline. Furthermore, this means that an energy transition (regardless of its concrete course and shape) is not merely a matter of substituting one (non-sustainable, 'dirty') energy source with another (sustainable, 'clean'); rather, it is a process with a wide range of implications, from political and social, to ideological and cultural (Chap. 8).

Secondly, the chapters illustrate the ability of the energy humanities to look into the past (Chap. 3), present (chapters in Part II), and future (Chap. 9) in search of the causes and solutions for our contemporary concerns. The volume's second section offers especially pertinent lessons for energy transition by seeking current examples of climate and renewable policy implementation that should (not) be followed. By discussing examples of best practices that are not always followed or include aspects which are not always climate-oriented, all three chapters in the section underscore the notion that discussions on energy (transition) are deeply rooted in political and social discourses, demanding that special attention be paid to the individual actors within those discussions, and their role in shaping the public perception of individual energy sources and solutions.

Finally, the chapters assembled here highlight the fact that energy is more than just a novel research topic for the humanities and social sciences. Rather, it challenges and alters individual disciplines, prompting them to develop theoretical and methodological apparatuses that are especially suited to the study of energy. Moreover, the increased awareness of the material aspects and requirements of the disciplines within the humanities and social sciences (Chap. 3), as well as the different forms of artistic expression, calls for a reconsideration of their own relationship to energy and inevitable transformations following an energy transition.

By focusing on resources other than oil—specifically, natural gas (Chaps. 4 and 5) and nuclear energy (Chaps. 9, 10 and 11)—the edited volume attempted to avoid the commonly criticised 'petromyopia' of the energy humanities (Jones 2016) and broaden the discussion to include energy sources that are being considered as possible alternatives to oil. For example, the conversation on nuclear energy as a possible substitute for fossil fuels necessitates a reconsideration of its traumatic (post-Chernobyl) legacy and reputation, connection to radiation, and potential role in

a new energy regime. The three chapters on nuclear energy included in the volume's third section trace the changing discourse on this energy source, from safe resource that can enable extremely cheap electricity generation (Chap. 9) to devastating threat the consequences of which can hardly be grasped (Chaps. 10 and 11). To be sure, many more energy sources remain outside the scope of the edited volume, including renewable sources such as hydro, wind, and solar energy.

In addition to what might be termed a thematic imbalance (almost exclusive focus on oil), the field of energy humanities has also been marked by a geographical unevenness. As in the case of the environmental humanities, the majority of teaching and research is conducted in Anglophone contexts (cf. O'Gorman et al. 2019), especially Canada, which is hardly surprising considering the pioneering role Canadian researchers and institutions have played in defining and developing the energy humanities. While this volume attempted to address this issue by expanding the discussion to include scholars from beyond Canada and the U.S., there is still considerable room for improvement. Of particular note is the absence of contributions from/about the Global South, as countries from that region play just as important role in the energy transition as those from the Global North, especially considering their requests for unrestricted development, similar to the one enjoyed by countries of the Global North which enabled them to aggregate wealth (at the expense of rising GHG emissions).

While we believe that this edited volume presents a wide variety of perspectives on the energy humanities, thus illustrating its possible contributions to the discussions on energy transition and climate change, many promising areas of inquiry inevitably remain beyond its scope. We present some of the more stimulating and pressing ones as recommendations for future studies. Additional research is needed on the material aspects and energy dependency of the different disciplines within the humanities and social sciences, in order to anticipate their transformations following the energy transition. A topic raised by some of the chapters in this volume which demands more attention is the role of energy in different types of power relations, from (post)colonial relations to the various forms of energy-based power play on the international stage. Future research should also consider the links between the energy humanities and sociotechnical imaginaries, which also address issues connected to energy transition. While representations of energy in literature, film, photography, and other forms of art have already proven to be a productive research field, more systematic efforts should be directed towards examining the role of energy in the production of art and the impact an energy transition would have on individual art forms. Finally, it is imperative to turn our attention to countries of the Global South and similar areas in which energy development has been hindered in some way, and/or which primarily rely on energy sources other than fossil fuels.

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