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Multilateral energy justice for managing multinational risks: A case study of multinational nuclear waste repositories

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Abstract:

This paper investigates the viability of Energy Justice as a framework to assist the governance of multilateral risk. Positioned between local and universal scales, it advocates for the approach of *multilateral energy justice* as a means of considering justice manifestations either between neighboring countries, or between countries that are geographically isolated but share common energy concerns or systems. More specifically, it focuses on the question of how to govern the risk of nuclear waste in a multinational fashion, and to what extent multinational/multilateral energy justice could offer a helpful account to help understand the fundamental justice issues such multinational repositories give rise to. We present a systematic content analysis of 10-years' worth of policy reports on nuclear waste repositories (between 2006 and 2016), including 25 full-length reports documents relating to the Government of South Australia's now abandoned repository proposal, to assess emergent references to multilateral energy justice. We then address three leading questions: how could we consider transboundary distributions and procedural issues of justice? How can we deal with intergenerational justice issues? And, could energy justice help us better understand and address conflicting justice demands across time and space, when international (multilateral) justice might demand different things than domestic justice?

Keywords: multilateral energy justice; energy justice; nuclear waste repositories; systematic content analysis; risk

1. Introduction

Energy justice challenges, like our energy system, are present at every scale, from local discourse over the siting of energy structures and access to energy services, to multinational considerations of whole systems energy and global externalities such as nuclear risk. To explain this scalar manifestation, Labelle (2017) and Sovacool *et al.* (2013) introduce 'particular' or 'local' energy justice, which emphasises local debate and choice (see also Heffron *et al.* 2015), and 'universal energy justice', which stretches across countries, is transboundary in nature, and emphasises moral and political responsibility. This universal approach shares commonalities with 'cosmopolitan' theories, arguing that (mainly distributive) justice approaches should be applied to the world as a whole. Radical cosmopolitanism (which is substantively different from distributive justice in its own right) claims firstly, that there are global principles of distributive justice and, secondly, that there are no state or nation-wide principles. A milder form simply says the former, retaining concern for fellow nationals or citizens (see Caney 2001).

Whilst the principles or tenets of energy justice can be effectively applied at a site, community, local or national level (see Forman 2017, Walker and Day 2012, Jenkins *et al.* 2017a,b as examples), universal justice is also necessary to consider global challenges such as climate change and the global distributed responsibilities for dealing with it; the mitigation of greenhouse gases could only be successful when tackled in a globally coordinated manner, for instance. As a real-world exemplar, the Kyoto Protocol forwards the notion of 'common but differentiated responsibility' emphasising this global challenge. Moreover, the Paris Agreement–as the continuation of Kyoto–is an acknowledgement of global responsibilities (although we acknowledge that these instruments differ in other aspects). Yet these large-scale, typically global approaches, present a very wide lens, restricting the fine-grained analysis of

transboundary, multinational issues. Moreover, some argue that their current formation is not proving effective and that universal claims do not help us identify who is responsible nor make tangible progress towards justice goals (see Maltais 2013; Ikeme 2003; Jenkins 2018). To illustrate this challenge with examples, what can universal justice say about the shipment of precious heavy metals for wind turbines from one country to another, or the transfer of chemical waste in the 1980s and 1990s? We argue that the failure to apply the energy justice concept at the multinational level could obscure potential justice challenges as well as potential solutions to remediate them. Indeed, understanding such multinational level potential challenges could be crucial for governing particular forms of energy (and specifically in this case, nuclear) risks.

Between the two approaches, this paper advocates for the approach of *multinational energy justice* as a means of considering justice manifestations either between neighbouring countries, or between countries that are geographically isolated but share common concerns or interests with regard to their energy systems and the risks they present. This reinforces the need for a combination of the social science account of energy (policy) with its natural science counterpart (energy systems and chains) (Jenkins *et al.* 2016; Heffron and McCauley 2014; Hoggett *et al*. 2014). Both employing and challenging the tripartite model of energy justice–distributional, procedural and recognition justice (McCauley *et al.* 2013; Jenkins *et al.* 2016)–we form our argument using the case study of multinational nuclear waste repositories, where geographically isolated countries are connected by a shared concern for governing risks emanating from nuclear waste, and where the fundamental question of justice such repositories could create are particularly pertinent considering their multinational and intergenerational hazards (Drottz-Sjöberg 2012; Ylönen and Litmanen 2015). Our aim is not only to present an incremental analysis that applies the tripartite model of energy

justice without question, but through a focus on currently neglected multinational and nuclear waste issues, to highlight the current shortcomings of it.

In the history of nuclear energy, there have been many examples of multinational collaborations in nuclear safety, security and safeguards, either between geographically proximate countries–e.g. regional approaches in the EU–or between geographically distant countries, such as the Franco-Indian collaborations (Sarkar 2015; Taebi and Mayer 2017). Ylönen and Litmanen (2015) provide a comprehensive overview of international nuclear safety collaborations, for example, including post-Fukushima crisis revisions of the International Atomic Energy Agency's (IAEA) Safety Standards and the Western European Nuclear Regulators' Associations' (WENRA) Reference Levels for nuclear reactors. Joint nuclear waste repositories, or the idea to dispose of nuclear waste collaboratively with a couple of countries, represent a further endeavor. Yet according to an analysis of 5,351 academic papers by Kuipers et al. (2019) the transportation of nuclear waste remains a comparatively neglected concern in nuclear research.

Many countries possess nuclear waste but only in fairly limited amounts; therefore, nuclear waste repositories are increasingly popular as a solution for the long-term nuclear waste issue among small nuclear energy producing countries (Taebi 2012a). Collaborations and disposing of this waste multinationally would have many safety, security and economic benefits that we will elaborate in Sections 3 and 4, yet they carry the environmental and social benefits *and* ills. We propose that through applications in this context, the multinational energy justice concept could facilitate a better understanding of transboundary cooperation on energy governance issues and risks than universal energy justice. Further, by better recognising the role and transboundary nature of the energy system, we argue that such an approach serves as a

means of identifying both instances of injustice *and* the actors affected by and responsible for them (Jenkins *et al.* 2014, 2017a).

To explore this case empirically, our paper presents a systematic content analysis of 10-years' worth of policy reports on nuclear waste repositories (between 2006 and 2016), including 25 full-length reports documents relating to the Government of South Australia's now abandoned repository proposal. These include formal summary reports, issue papers to stimulate debates around challenges and opportunities, replies to these issue papers, and the results of public engagement exercises. Using the tripartite analytical lens of energy justice, we assess if and in what form references to multinational energy justice notions emerge. Our purpose here is to inform our later conceptual reflections.

Following this empirical investigation, we then present conceptual reflections on the nature of the emergent challenges as we address three leading questions: how could we consider transboundary distributions and procedural issues? How can we deal with intergenerational justice issues of risk? And, could energy justice help us better understand and address conflicting justice demands across time and space, when multinational justice might demand different things than domestic justice? This reflection allows us to engage with which justice notions play a dominant role at different systems stages, and explore the formation of transboundary and intergenerational risks.

In conclusion, we then introduce three emergent areas of importance for the multinational energy justice approach and energy justice more widely, both in academic scholarship and in policy-oriented practice. We call for (1) greater and geographically wider and better fine-grained attention to issues of spatial conflicts, (2) further reflections on temporal justice conflicts and how these might be embedded in energy

justice frameworks, and (3) reflection on ideas of multinational responsibility for energy justice.

1. Multinational energy justice

To begin, it is necessary to discuss what we understand by energy justice – a term that is rapidly increasing in popularity and because of that, is beginning to be applied in new contexts and take on new meanings. It is also necessary to describe how we use it. We ascribe to the definition provided by McCauley *et al.* (2013: 1) that energy justice "aims to provide all individuals, across all areas, with safe, affordable and sustainable energy". We also use the three-tenet model of McCauley *et al.* (2013), which sees energy justice as consisting of distributional justice, procedural justice and justice as recognition pillars. As identified by Sovacool and Dworkin (2015), this means that energy justice exists as a *conceptual* tool for uniting usually distinct justice concerns, an *analytical* tool for energy researchers seeking to understand how values are embedded in energy systems or resolve their neglect and, importantly, a *decision-making* tool that can help energy planners make more considered energy choices. More importantly, we understand from the offset that "justice" (as part of an overarching field of ethics) is a subjective concept, implying multilaterality in both time and space. This is to say that we acknowledge the temporal and spatial dimensions of energy justice, and that with this as our ontological foundation, have developed a study and review of the literature that aims to contribute to the understanding of these.

Within the academic literature, (at least) two competing strands of energy justice scholarship have emerged, each of which imply a different geographical scale of application: universal and particular justice. Labelle (2017: 615) introduces their two

definitions particularly effectively. Whilst synthesising and referencing the work of others he states:

> 'The definition for a universal energy justice stretches across countries, there is a "transboundary nature of energy injustice [which] requires a similar conception of the reach of moral and political responsibility" (Sovacool *et al.* 2013: 29). Universal applications of the eight aspects of energy justice (such as affordability, good governance and sustainability)[1] assist in building just universal energy systems (Sovacool and Dworkin 2015). The definition of particular energy justice embraces local debate and choices by understanding justification for local decisions, actions (Heffron and McCauley 2014) and even resistance to global economic policies (see Heffron *et al.* 2015). Examining the local is even more salient in an age of rising populism, which places a country's citizenry first, over global cooperative efforts.'

Yet despite the mention of "transboundary" above, and with applications of the energy justice approach to a number of different scales from local to global, it has not explicitly been considered as a tool for examining *multinational* interactions (Goldthau and Sovacool 2012) (see Table 1 for distinction). To make this core advancement within this piece, we focus on a specific type of energy risk, namely nuclear risk, which very much requires multinational approaches as it interacts with the challenges of uncertainty through time, the complexity of nuclear governance, political friction, links to nuclear weapons and rule ambiguity; see for instance (Fiorentini 2019; this special issue and Herron and Jenkins-Smith 2014).

Table 1: Comparison of universal, particular and multinational justice approaches

	Conceptual approach	Scalar application
Universal justice	Cosmopolitanism Multinational trade-offs	Global
Particular justice	Distributional, procedural and justice as recognition Local debate and choice	Local
Multinational justice	Bilateral and multinational negotiations Systems of impact and responsibility	Transnational systems

We see *multinational energy justice* primarily as a strategically impactful spatial development, yet it also has implications for how we think of energy justice *temporally.* The latter is significant not only because there are important distributive impacts of energy decisions that will manifest over (short and long-term) time frames, but also because spatial *injustices* could easily be perpetuated temporally; e.g. the siting of disposal places for nuclear waste that create spatial injustices among the present generations will continue to create some kind of spatial injustice emanating from nuclear risk for future people living close to those sites (e.g.Vilhunen et al. Forthcoming).

The treatment of time or temporality within current energy justice research is inconsistent, however. This is despite a lengthy history of consideration by parallel disciplines including environmental and climate justice (e.g. Kyne 2016; Page 2007). As an illustration, Sidortsov and Sovacool (2015: 306) state that "energy justice is best understood by examining instances of injustice" and that "it is unlikely that one would take note of how just and fair things are unless something disturbs the status quo". In

this regard they highlight a tendency to look back in time, take an evaluative approach, and focus on the remediation of past injustice. In a separate piece, however, Sovacool (2013a: 959) observes that energy justice raises the issue of fairness for "future generations, as we will leave them with the legacy of polluted atmosphere and a potentially unstable climate". In keeping with this statement, Heffron *et al.* (2015: 171) introduce the concept of thinking in the "future tense", whereby specific attention is given to future generations, and to ensuring that they are treated as equally significant to the present populations. They neglect, however, potentially conflicting situations that could arise from an 'equal treatment' of future generations, an idea we return to this issue in the discussion section of this paper.

In short, by (typically) focusing on the mitigation of potential injustices in the future and at "local" or "universal" scales, current approaches to energy justice present several shortcomings. In an attempt to present a coherent account, and alongside obvious gains in exploring the spatial nature of energy justice concerns, our *multinational* approach allows for the consideration of past, present *and* future impacts on social justice outcomes, thereby raising normative questions around intra-generational equity, for example. It does so by considering, in this case, the past, present and potential transfers of nuclear wastes. The consideration of the *ex ante* (i.e. before implementation of energy systems or waste hosting sites) is especially important for the question of the nuclear waste legacy and how to govern its risks.

1.1. Multinational energy justice failings

Of course, multinational energy negotiations with inter and intra-generational elements already occur for a range of reasons, be it security and proliferation, resource trading or skill share (see Herron and Jenkins-Smith 2014; Fischhendler *et al.* 2016;

Liping 2011; Finlay 2011; Wieczorek *et al.* 2015; Kyne 2016; Taebi and Mayer 2017). Kuipers et al. (2019) highlight plentiful scholarship in the crisis and disaster literatures that engage with nuclear risk (and more specifically with citizen engagement, communication and regulation) (see also Chien 2014; Kuipers and Welsh 2017), but this scholarship does not explicitly address the multinational aspects of nuclear risks and, thereby, also does not engage with the questions of multinational justice (Goldthau and Sovacool 2012,[2]

With regards to the case of multinational waste repositories multinational exchanges have often been seen as purely economic transactions–a discussion of imports and exports and the economic value that will be offered in exchange. Approaching such problems as purely economic transactions is problematic for many reasons. We list two. First, such an approach neglects the different starting position of different countries, both economically and politically, leaving the potential for maldistributed winners and losers. When economically diverse countries engage in an economic interaction to share burdens transnationally, it will very much matter to what level each of those countries would depend on the revenues and the employment that come with such proposal. Looking critically, it seems to be an implicit assumption in economically wealthy countries that when they engage in such approaches, they would be able to find a sum *acceptable* to (presumably) less wealthy countries for accepting the responsibilities of such burdens. Secondly, the financial nature of the process stalls progress.

Despite the obvious challenges and stumbling blocks, in some places in the world, there is already legislation in place to regulate such multinational activity. As an example, the EU waste directive requires members states to, first, have their own national plan ready before engaging in any multinational collaborations and, second, to

only collaborate with and export to countries that are technically capable of dealing with this waste (Directive 2008/98/EC). The requirement to have a national plan does not, however, demand a specific time frame for the actual disposal of the waste. This means that some countries possessing small amounts of nuclear waste have proposed very long timeframes for the realisation of underground nuclear storage; e.g. the Dutch National Plan requires the Dutch nuclear waste is disposed of underground by 2130 only (MIE 2006; ANVES 2017). An implicit assumption underlying this long period is presumably, that small counties are counting on the realisation of multinational disposal in the next few decades. Indeed, the issue of nuclear waste disposal has always been and will likely continue to be a controversial issue at a national and global level (Jenkins-Smith et al. 2012); the multinational disposal has no guarantee of being successful.

Against this background, we proceed with two dilemmas in mind. Firstly, that particular and universal approaches to energy justice do not adequately capture multinational justice relations across time and space, and, secondly, that these multinational dynamics raise fundamental normative and empirical questions about how we ought to proceed: how do we consider transboundary justice issues, how do we tackle intergenerational issues, and how can energy justice help make domestic versus multinational justice trade-offs? Our paper provides early reflections on these questions.

2. Research methods: A systematic review and content analysis

The following sections outline the process of data collection and data analysis for our systematic review. We begin by giving information on our case study for this paper, the Government of South Australia's proposal for a nuclear waste repository. It

is worth stating that whilst our case study is based on a single country case study, this is for the purposes of coherent data collection only. The case study in question – nuclear waste repositories - are by nature, multinational.

2.1. History of Australian nuclear waste repository development

To date, there are no operative multinational nuclear waste repositories, only proposals to develop them. As of August 2017, the World Nuclear Association reported that there are over 440 commercially operative nuclear power stations across 31 countries, with a further 60 currently undergoing construction. Together, these produce over 11% of the world's base-load electricity production, and large quantities of nuclear waste (WNA 2017a)[3]. Many countries possess nuclear waste but only in fairly limited amounts. Therefore, despite the recognition that each producing country remains ultimately responsible for its own output, there is growing interest to consider the possibility of regional or multinational repositories, especially among small members of nuclear energy countries (Taebi 2012a).

Multinational collaborations on disposing of this waste would have many safety, security and economic benefits. Most fundamentally, they are beneficial for regions or countries that do not have the necessary geological conditions for geological disposal. The International Atomic Energy Agency (IAEA 2005: 2) indicates the added incentive of "the assurance of non-proliferation". Moreover, Taebi (2012a) identifies that they have considerable economic and safety advantages, particularly for small nuclear club members with no more than two energy reactors (see also El-Baradei 2003; IAEA 1998, 2004 and McCombie & Chapman 2002). This also includes the 20 new countries for which nuclear power is under some degree of consideration, including, as a sample, Italy, Norway, Poland, Saudi Arabia, Tanzania and Ecuador (WNA 2017b).

Despite the listed benefits, however, proposals for multinational repositories also create many legal, financial, political and ethical issues (Taebi 2017), which, due to the recent nature of such discussions, have not been fully or systematically explored. Most apparently, they raise concerns over the shipment of nuclear waste by water, rail and road over what can be great distances. As a pre-existing example, the Sellafield nuclear complex in the UK reprocessed waste for Japan, Germany and Switzerland– extracting uranium and plutonium-before all was shipped back (Blowers 2016); the development of multinational repositories would increase this flow markedly, with risk implications. Reported risks include the danger of accidents with human and environmental health implications and proliferation, mandating a need for multi-lateral and global governance for nuclear safety (Taebi and Mayer 2017).

The idea of a multinational nuclear waste repository is being considered in depth by the EU countries that poses nuclear waste and formerly, by the Government of South Australia, who, in an initial report, outlined that using the region to host fuel from other countries is considered viable (NFCRC 2016). The Australian case is explained in more depth in the following sections and throughout our results.

2.2. Government of South Australia

Australia has no operative nuclear power plants and as of 2017, the construction of them has been prohibited. As a result, Reznikov (2016) writes that most Australians have not been exposed to the nuclear industry and its safety and environmental risks. This is accompanied by a long history of anti-repository campaigns from Aboriginal peoples (Green 2017; Nagtzaam 2014). Australia does, however, have around 33% of the world's uranium mining deposits, which, behind Kazakhstan and Canada, make it the third largest uranium producer globally (WNA 2017b). This secures the country's

role in the global nuclear lifecycle. Moreover, low and intermediate level wastes from Australia's research reactors and medical facilities as well as uranium tailings (remaining of the uranium mining process) are stored throughout the country (NFCRC 2016; Nagtzaam 2014).

Despite not producing nuclear energy for commercial use, Australia has been positioned as one potential location for a nuclear waste repository, with initial support from the South Australian Government (SAG). In 2015, the SAG established the Nuclear Fuel Cycle Royal Commission (NFCRC) to independently investigate the potential to increase Australia's role in the nuclear fuel cycle (Reznikov 2016). They collected evidence from written submissions, oral evidence in public sessions, their own research including overseas visits, and commissioned studies (NFCRC 2017). On the back of the evidence gathered, one of their findings was that "the disposal of multinational used fuel and intermediate level waste could provide significant and enduring economic benefits to the South Australian community" (NRCRC 2016: xiii). Thus, the commission recommended that the South Australian Government proceed with the opportunity following the processes and principles set out in the report.

The South Australian proposal seems to be put on hold (at least temporarily), because a citizens' jury has voted against it. Indeed, the Prime Minister (PM) agreed only to support the project if there was bipartisan support, which has not been achieved. The PM did, however, say that the case is not closed (ABC News 2016). Despite this temporary halt in developments, as one of the most advanced proposals for a multinational repository globally, this case study provides plentiful opportunities to both explore empirical experiences of negotiations and plans, and to conceptually reflect on their challenges. It is for this reason that it was chosen for this research.

2.3. Data collection

To collect data for our study, a systematic search was conducted for policy reports on the Government of South Australia's proposed nuclear waste repositories published between January 1st 2006 and December 31st 2016. Reports were gathered from the Government of South Australia 'Get to Know Nuclear' website (GSA 2017), which hosts all material from the initial scoping and consultation process around the repository proposal.

To ensure that only relevant material was captured in the samples, the authors searched report titles for a series of key terms: the word “nuclear” and any of the following: “multilateral”, “fuel cycle”, “storage”, “fuel”, “international”, “multinational”, “disposal”, “waste” and “spent fuel. Where appropriate, we duplicated the searches to include a hyphenated spelling e.g. “multinational” and “multi-national”. These categories were inclusive, meaning that a single report could not be counted multiple times in different categories i.e. it they appeared in “multilateral” *and* “international” they would only be coded once. All reports on the website were fully available and written in English and therefore, none were excluded.

2.4. Data analysis

To analyse the relevant reports, we used a content analysis methodology similar to Sovacool (2014). Content analysis allows both quantitative and qualitative assessments of texts, delivering, in each instance, a systematic description of the material. To determine emergent themes from the data, coders searching the article for key terms and phrases including “justice”, “ethics”, “moral”, “equality”, “acceptance”, “risk” and “burdens”. We also looked for statements concerning multinational relationships, using terms such as “multilateral”, “transboundary”, “multinational”,

“overseas”, and “shipment” (plus hyphenated alternatives). This allowed us to investigate perceptions of cross-country relationships and the justice challenges they raised.

In the presence of statements on multinational nuclear waste issues, we inductively coded the contents of articles to capture the meaning of the text. This meant that no initial assumptions were made about contents, and allowed a more accurate portrayal of the material. This approach also fitted our aim to not only present an incremental analysis that applied the tripartite model of energy justice without question, but to develop one that illustrated conceptual additionality and novelty.

3. Results

This section of the paper presents the results of the content analysis where we assess if and in what form references to multinational energy justice notions emerged within the research sample. Not all analysed documents are cited – only those from which we have taken direct quotes. The results from other documents are grouped into themes and reported on collectively. These results inform the conceptual reflections presented in section 5.

3.1. Framings of justice

Excluding one reference to "financial equity", the terms "justice", "equity", "fairness" and "equality" do not appear in the Nuclear Fuel Cycle Royal Commission Report (NFCRC 2016). Instead, the term "acceptance" appeared 11 times, and "moral" once as it stated:

"There is also a moral basis for communities that derive a benefit from the use of radioactive materials in science and industry to manage the waste that has been

created. This ensures an unfair burden is not placed on future generations. It is recognised that there may be circumstances in which the management of a country's waste is contracted to another country" (p. 79).

This suggests that from the Commission's perspective, there is a reluctance to engage with the direct use of normative terms – terms that are often missing from multinational agreements. This is, however, at odds with many of the other analysed documents, which show widespread use of normative language. Safety from accidents, the effects on human health, environmental damage (including the contamination of aquifers), links to nuclear weaponry and potential proliferation, and the costs of the Government of South Australia repository project all emerged as distributional justice themes from sample documents, with surrounding use of the statements "ethical", "just", "justice", "moral and fair". As one example reads:

“The whole issue is wrong ethically, morally and does not consider the safety of all citizens. It should NOT even be considered to have South Australia as a nuclear dump. No amount of money will fix any damaged caused by the dump breaking down. Nothing is 100% safe!!!!!!” (Colmar Brunton 2016a).

Such statements sat alongside procedural justice and justice as recognition concerns as the documents (some of which gave the results of public engagement exercises including questionnaires and telephone surveys) reported on the importance of trust, accountability, transparency, regular and appropriate stakeholder engagement and with particular emphasis, the need to recognise and procedurally engage with the challenge of future generations. These challenges were primarily discussed on a national scale, reflecting procedural concerns for Australian citizens. As an exemplar, a respondent in one document stated that:

"I don't believe that government always works in the best interest of the people. Certain representatives try but often policy (political ideas) overrides the needs of the community and what is ethical and moral." (Colmar Brunton 2016b).

In this regard, the multinational nuclear waste repository was clearly seen as an energy justice concern. The question that follows is *how* was it considered multinationally or across boundaries.

3.2. Multinational links

Documents analysed through the tripartite lens of justice as recognition showed most clearly where national *and* multinational considerations arose. The opening acknowledgement was that multinational arrangements are not simple, and that they would need to address the exploitation of past vulnerabilities, without imposing undue burdens on future generations. Nationally, the documents showed that attention was given to communities close to the proposed facility, aboriginal populations and future generations (often without geographical boundaries) as particular stakeholder groups. *Multinationally*, justice as recognition concerns frequently focused on the responsibility for nuclear waste given the ongoing role of Australia as a uranium ore exporter, recognising an obligation to those overseas that used an Australian product. To this end, the appropriate handling of nuclear waste was seen to be intimately related to uranium mining operations, both positively and negatively:

"Someone has to make a decision - there is the moral question that if we are going to export uranium we need to be responsible for safe waste disposal" (Colmar Brunton 2016b).

This clearly shows that even though past (and ongoing) uranium exports are a separate issue from the recent proposal for multinational nuclear waste repository, the

two issues have been connected in at least two ways; first, by earlier experiences that people have with the issue of radioactive materials and export to other countries (hence multinational justice concerns) and, second, because of the implicit responsibility that such export implies to also receive the emanating waste coming from those uranium ores. What is not clear from this statement, however, is the exact location of the right holders that are being recognised, leading us not to a statement on the protection of particular groups, but a consideration of the distribution of risks and benefits. Further work would be certainly required to "map" the stakeholder impacts of such facilities, leading to nuanced justice as recognition and procedural justice outcomes.

Whilst universal justice approaches assume that we have equal moral right to access to energy, it does not adequately consider the burdens or responsibilities for them. Nor it deals with the issue of waste generated by energy production. The analysis shows that as uranium producers, Australian citizens feel a moral burden to host waste giving a lifecycle lens that reveals key multinational, stakeholders in these justice concerns. Proliferation was also a specifically identified apprehension, with regulation to protect against it. One example in the context of nuclear waste reads:

"The diplomatic problems in this are mind-blowing - would you trust e.g. North Korea to abide by any multinational guidelines or quality control?!" (Colmar Brunton 2016a)

There was recognition too, however, that multinational arrangements may manage proliferation risks more effectively than domestic arrangements. Indeed, extending this notion and despite referencing challenges, the NFCRC (2016) reported a series of (transnational) benefits of the multinational approach including: (1) mimising the spread of enrichment technology to facilities in multiple countries, (2) making the potential for any one participating country to withdraw from the 'Non-

proliferation of Nuclear Weapons' and other multinational agreements for ensuring nuclear safety and security more challenging, particularly if that country seeks to do so without arousing suspicion at an early stage, (3) reducing the potential for highly enriched uranium to be produced or diverted in secret, (4) allowing for the efficient application of safeguards to a centralised facility by the Multinational Atomic Energy Authority (IAEA), especially if the multinational arrangement incorporates IAEA oversight, and (5) reassuring the multinational community that the development of enrichment capabilities is for exclusively peaceful purposes. Indeed, there are also serious (transnational) burdens associated with multinational repositories, as the one that Australia has proposed.

In summary, beyond the statement that multinational justice proposals raise challenging justice questions, the results show the need to include multinational energy justice explicitly as one of the key frameworks for their assessment.

4. Discussion and conceptual reflections

Most fundamentally, we identify that not considering the ethical issues associated with multinational proposals could either lead to ethically problematic "solutions" or to the total failure of any multinational proposal. Thus, we seek to extend the consideration of multinational transactions to economic, environmental *and* social justice transactions. In doing so, it seems possible to establish notions of responsibility that may, in turn, increase the likelihood of positive progress on multinational issues. In this context, the application of energy justice concepts and decision-making tools is as useful as it is necessary.

We recognise, however, that the statement that "we should engage with multinational social justice patterns" is easy to make, but not necessarily easy to tackle.

Indeed, governance and policy structures on the whole are not well equipped to engage with transboundary justice disputes (Okereke 2006; Lange *et al.* 2018). For this reason, we now present conceptual reflections on the nature of the emergent challenges. We address three leading questions: how could we consider transboundary distributions and procedural issues? How can we deal with intergenerational justice issues? And, could energy justice say something about conflicting justice demands across time and space, when multinational (multinational) justice might demand different things than domestic justice? This reflection allows us to engage with which justice notions play a dominant role at different systems stages, and explore the formation of transboundary and intergenerational risk.

4.1. How could we consider transboundary distributions and procedural issues?

Positively, there already frameworks in place which are concerned with the maldistribution of environmental ills–an element of distributional justice. One example is the Basel Convention, a response to chemical waste exports in the 1970s and 1980s that serves to highlight the significance of the justice discourses around global environmental management (Okereke 2006). The emergence of the Basel Convention, which sets parameters on the multinational export of toxic wastes, is seen by many as an outcome of campaigns against the practice of richer countries dumping hazardous waste on the poorer and less industrialised (Okereke 2006; Wynne 1989; Puckett 1992, Clapp 1994, 2001). This was seen as being morally reprehensible and a "poisoning by pollution of moral principles" (Puckett 1992: 94). Thus, it manifested as a concern for not just the environment, but also for long-term justice and economic development prospects. The convention sought to ban the export of toxic wastes from industrialised countries, as well to achieve the transference of expertise in waste management to

developing countries handling their own material (Clapp 2001). It does not, however, apply to nuclear waste exports. It seems a logical extension that it should, or at least that a similar framework should be constructed.

Although somewhat abstractly, our analysis shows that the application of an energy justice approach allows us to identify systems chains and dependencies *and* responsibilities across them. Why is the energy justice concept capable of these considerations? Bickerstaff *et al.* (2013: 2), identify that energy justice "provides a way of 'bounding' and separating out energy concerns from the wider range of topics addressed within both environmental and climate justice campaigning". Energy justice does this by focusing on each stage of the whole energy system, encompassing resource mining through to waste management and energy consumption (Jenkins *et al.* 2014, 2016), thereby making justice and equity questions understandable to people by breaking them into smaller chunks (Jenkins 2018). At each stage of the energy system– resource mining or energy production, for example – energy justice can engage with local, regional and national justice questions. Indeed, many steps of the nuclear cycle have a clear international/multilateral aspect that-if not explicitly addressed–could easily be overlooked.

Multinational energy justice could therefore provide an important lens through which to assess our energy infrastructure. It is this element that is particularly key. The material infrastructure of the energy system allows us to chart distributive and procedural justice issues, not only at the local level but – whenever needed - as a matter of multinational justice in terms of benefits and ills of energy provision and use between countries. Once identified, transboundary issues become a discussion of more than economics, *and* of social justice. Further, this has procedural justice knock-ons as we identify the representative bodies, different stakeholders and appropriate processes

needed in different countries involved in the 'social justice transaction'.

4.2. How can we deal with intergenerational justice issues?

Nuclear waste and intergenerational justice are two terms that classically follow another, with a scholarship covering decades of research and lived experience (e.g. Sharder-Frechette 1994, 2000; Taebi and Roeser 2015). Taebi (2012a) summarises the challenge from a multinational repository perspective as being a trade-off between the idea that (a) the number of facilities posing a risk to future generations will be reduced– if there are 5 facilities that need managing and recording instead of 15, for example– and (b) the idea that they can only be successful if one nation accepts another nation's waste, meaning that potential multinational injustices become intragenerational as they extend into the distant future. At the same time, multinational nuclear waste repositories are arguably very dangerous in terms of their intergenerational justice impact. If waste is shipped from one nuclear energy producing country to another waste host country, it may increase the "unconsciousness" of the nuclear waste legacy. Put another way, it may make it even easier to forget following the logic of “out of sight” means “out of mind”. Therefore, alongside negotiating the justice realities of multinational negotiations, we also need to consider temporal ones.

As with large-scale governance issues and externalities, the issue of temporal justice can sometimes be too intangible to tackle. This may be behind the fact that in national legislations, the issues is often merely mentioned rather than extensively discussed and included in the regulatory process and the final outcome. Moreover, it may reflect the necessarily large degree of unpredictability regarding the timing and nature of events – a factor that Fiorentini (2019, this special issue) labels “time uncertainty”. Yet, there are several important examples that have tried to include

intergenerational justice issues as an explicit concern in governance decisions at the national level. The American Environmental Protection Agency (EPA) has, for instance, proposed certain radiation protection standards for licensing the Yucca Mountain Repository. Even though the repository is not being further developed because the huge controversies it engendered in the State of Nevada and President Obama's promise to stop further development (a decision that could, of course, be undone), the licensing procedure was advanced. In this proposal, the EPA proposed a cut off line to distinguish between the next 10,000 years and beyond (up to one million years the period of radiotoxicity of American nuclear waste); the former period is entitled as the same level of protection as we deem acceptable today, and the latter must be protected against a level of radiation that could be more than six times higher than the current level (EPA 2008). While this distinction seems to lack any serious moral justification, it seems needed from a pragmatic point of view; that is, to make it possible that we facilitate the building of such repositories deep underground (Taebi 2012b). Another important example is the ongoing developments in Sweden in which, from the very early days of development, multinational justice seemed to be one of the key reasons behind their proposal for the development of underground repositories, and part of the process of public participation (KASAM 1998).

In sum, regardless of whether we mention and include the issues of intergenerational justice as an explicit issue, current policy has an undeniable impact on future generations' interest. What exacerbates this problem in the case of multinational repositories is that the current instances of intragenerational injustice could easily be perpetuated into the future. Perhaps spatial multinational justice could be the best placeholder to also include the concerns associated with intergenerational justice for decision-making on such repositories.

4.3. Could energy justice say something about conflicting justice demands across time and space, when multinational justice might demand different things than domestic justice?

The shift away from concerns of energy resource self-sufficiency towards diversification and a growing role of energy networks and multinational cooperation (Hoggett *et al.* 2017) brings with it potentially conflicting justice demands, as this paper has illustrated. We propose that through applications in this context, the multinational energy justice concept could facilitate a better understanding of transboundary cooperation on energy governance issues than universal energy justice.

In this respect, energy justice (and multinational energy justice) could be a core pillar to understand and—to the extent possible—to address issues of fair procedure, recognition and distribution, as well as potential trade-offs that could follow, both as a conflict between the demand of spatial and temporal justice, and as a conflict between local/national versus international/multilateral justice demands—political economy dimensions. Energy justice is then a *decision-making* tool that can help energy planners make more considered energy choices.

It has to be quickly conceded that the strength of justice as a moral concept or a tool for political decision-making does not derive from the precision of its meaning. We concur with Okereke (2006) in that energy justice itself cannot consider and prioritise competing demands, but as a framework, it will reveal the conflicting demands, and help decision-makers, as well as other stakeholders to make informed choices. This is particularly relevant in energy decisions with multinational consequences.

5. Conclusion

Throughout our exploration, this paper has highlighted a comparatively neglected area in the energy justice literature – the importance of multinational perspectives – as well as presented novel findings from a systematic analysis of literature related to multinational nuclear waste facilities. Now, in the light of discussions around the merit of energy justice approaches in relation of multinational issues of justice, intergenerational justice, and the role conflicting justice demands across time and space, we introduce three emergent areas of importance for multinational energy justice scholarship and their relevance to governance decisions regarding multinational risk.

Firstly, we must consider how to engage with issues of *spatial conflict*. McCauley *et al.* (2013: 1) identify that energy justice "aims to provide all individuals, across all areas, with safe, affordable and sustainable energy". Yet the globalised "energy for all" concept is at odds with our governance structures. There is a tendency to split our energy systems into small, understandable pieces, leading to ad-hoc, detrimental policy, as some of our 'solutions' both cause and fail to recognise widespread externalities (Gagnon *et al.* 2002; Meadows 2009; Sovacool *et al.* 2014), including issues of social justice. This includes a continued focus on national strategies for energy provision and use, detached from the often multinational systems-wide upstream and downstream implications of these policies. Most fundamentally, this paper adds to a growing body of work which identifies that it is necessary to extend the national context, considering structures for energy justice at the multinational systems level, but to increase dialogue between these national contexts as we consider how one country might learn from another and how we may multinationally collaborate. This is necessary to tackle what Michel (2009: 262) calls "the problem of hydra-headed

complexities", where in an multinational policy arena and interconnected world, the policies undertaken by some almost inevitably affect the outcomes obtained by others. Our account of multinational justice helps appreciate some of these complexities regarding governance of energy systems that create multinational risk or whose governance requires multinational efforts. The case of multinational nuclear waste disposal is discussed elaborately to show such risk.

Secondly, we must further reflect on, engage with, and proactively tackle *temporal justice conflicts*, because they are often neglected, particularly when they have also multinational aspects. The drivers of energy systems transformation inevitably change, with different energy sources and usages being selected based on their ability to fulfil evolving political priorities. This includes a shift in concern for the cheap, plentiful supply of energy, to the provision of safe and secure electricity generation, resource efficiency, or the desire to transition to low-carbon production. Variations also include post-crisis policy-making decisions, such as those made after the Fukushima nuclear accidents in 2011 (Chien, 2014). Yet despite these dynamics, research is typically driven by spatial explanations of change. We identify that explicit engagement with temporality is largely neglected in current research, and that where it does appear it does so in very contrasting ways. Yet, governance decisions about such energy systems often create a temporal conflicts and not only between the present and future generations, but also between different people belonging to different future generations. Whether we make nuclear waste disposal retrievable or not will have, for instance, different implications for short-term and long-term future generations (Kermisch and Taebi 2017), and that these future generations could belong to different countries in case of multinational repositories. One might argue that the multinational energy justice will then been perpetuated temporally. These temporal multinational justice conflicts

are often overlooked in the literature. Our account of multinational energy justice will help facilitate informed governance decisions with regard to long-term multinational nuclear risks by making such conflict explicit and tangible.

Thirdly, and to reiterate, through better recognising the role and transboundary nature of the energy system, we suggest that multinational justice also serves as a means of identifying both instances of injustice *and* the actors affected by and responsible for them (Jenkins *et al.* 2014, 2017a); this could best be done for spatial *and* temporal injustice challenges, and perhaps best in conjunction. Looking forward, the challenge then becomes one of ensuring that 'ownership' of this responsibility is accompanied by responsible action.

On the basis of these reflections, our review challenges and extends the application of the energy justice concept. The result is reflections that go beyond the specific case of multinational nuclear waste repositories. Such conflict could also occur when combating climate change: for example, biofuel produced from food crops potentially exacerbates the problem of hunger in the producing countries (causing a problem of multinational injustice between the producers and consumers); and the geological disposal of CO_2 creates burdens for local communities, while the benefits are mostly global and for climate change mitigations. Further, our contribution is policy-relevant as we argue that the notion of multinational energy justice also enables policy-makers in different countries to focus on issues that might otherwise have been overlooked, thereby increasing the potential success of multinational projects.

Notes

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[1] A separate definition of energy justice which instead of the three tenets of distributional justice, procedural justice and justice as recognition focuses on eight key values: availability, affordability, due process, transparency and accountability, sustainability, intragenerational equity, intergenerational equity, and responsibility (Sovacool et al. 2017).

[2] The international relations scholarship does deal with the multinational aspects of nuclear risk, particularly with respect to nuclear security and nuclear non-proliferation (e.g. Florentini 2019; this special issue), but this does not fully fit in the energy scholarship.

[3] We note that there are only 4 or 5 Japanese reactors connected to the grid. The WNA counts all Japanese reactors, regardless of whether they are operative or not. In this sense, their figure is an overestimate.

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