



# The geopolitics of renewables; exploring the political implications of renewable energy systems<sup>☆</sup>



Daniel Scholten<sup>a,\*</sup>, Rick Bosman<sup>b</sup>

<sup>a</sup> Delft University of Technology, Faculty of Technology, Policy and Management, Section Economics of Technology and Innovation, room C3.060, Jaffalaan 5, P.O. Box 5015, 2600 GA Delft, The Netherlands

<sup>b</sup> Erasmus University Rotterdam, Dutch Research Institute for Transitions, Mandeville building, room T16-36, Burgemeester Oudlaan 50, 3062 PA Rotterdam, The Netherlands

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## ABSTRACT

This paper explores the potential political implications of the geographic and technical characteristics of renewable energy systems. This is done through a thought experiment that imagines a purely renewable based energy system, keeping all else equal. We start by noting that all countries have access to some form of renewable energy, though some are better endowed than others. We find two major implications for renewable energy based markets: a) countries face a make or buy decision, i.e. they have a choice to produce or import energy; b) electricity is the dominant energy carrier, implying a more physically integrated infrastructure with stringent managerial requirements. Two scenarios illustrate the strategic concerns arising from these implications: Continental, following a buy decision and more centralized network, and National, following a make decision and more decentralized network. Three observations stand out compared to the geopolitics of an energy system based on fossil fuels. First, a shift in considerations from getting access to resources to strategic positioning in infrastructure management. Second, a shift in strategic leverage from producers to consumers and those countries being able to render balancing and storage services. Finally, the possibility for most countries to become a 'prosumer country' may greatly reduce any form of geopolitical concern.

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## 1. Introduction

Rising fossil fuel tensions, increasing oil price volatility, deteriorating environmental conditions and looming climate change call for a transition towards a more sustainable energy system (Amineh and Guang, 2010; Nuttall and Manz, 2008; Dorian et al., 2006; Rifkin, 2002; Grübler and Nakićenović, 1996; Bosman and Loorbach, 2015; Loorbach and Verbong, 2013). Renewable energy sources and supporting technologies are to be the cornerstone of such a future. At the moment renewable energy is only a marginal contributor to global primary energy and electricity supply but is growing rapidly in installed capacity and investment (Renewable Energy Policy Network for the 21st Century (REN21), 2012; National Renewable Energy Laboratory (NREL), 2008, 43–45; Cowan and Daim, 2009; Schleicher-Tappeser, 2012; Bloomberg New Energy Finance (BNEF), 2013a; Bloomberg New Energy Finance (BNEF), 2013b). What is more, the potential of renewable energy sources

is huge and waiting to be exploited: “current technologies in renewable energy only capture a fraction of the available solar energy, wind energy, biomass, geothermal energy, ocean thermal energy, wave energy and hydropower” (Criekemans, 2011, 23).

The current academic debate on renewable energy systems is dominated by studies on economic modelling of their diffusion (cf. Cagnin et al., 2013; Duan et al., 2014; Kajikawa et al., 2008; Meade and Islam, 2015), scenarios on their role in possible future energy systems (cf. Fortes et al., 2015; International Energy Agency (IEA), 2014; Schaeffer et al., 2015; World Wildlife Fund (WWF) and Ecofys, 2011) and the policy implications they entail (Eom et al., 2015; Gouvea et al., 2013; Johnson et al., 2015; Riahi et al., 2013; Schwanitz et al., 2015). Although these studies are insightful for guiding the short and medium term transition processes (Grin et al., 2010), we feel that study of the (geo)political implications of widespread diffusion of renewable energy systems is lacking. We currently have hardly any academic research on how the geographic abundance of renewable sources will affect energy system topology and cross-border energy flows, or how intermittency, the possibility for decentralized generation and the generally electric nature of renewable energy transportation and storage will pose new challenges to energy trade and security. What strategic considerations and political tensions may be expected?

This matter is made worse by the fact that the other side of the medallion, the literature on energy geopolitics (mostly from the field of International Relations – Amineh, 2007; Amineh and Guang, 2010,

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\* Corresponding author.

E-mail addresses: [d.j.scholten@tudelft.nl](mailto:d.j.scholten@tudelft.nl) (D. Scholten), [bosman@drift.eur.nl](mailto:bosman@drift.eur.nl) (R. Bosman).

Amineh and Guang, 2012; Dannreuther, 2010; Correlje and van der Linde, 2006; Umbach, 2010; Klare, 2008; Akiner, 2004; Friedman, 2006; Andrews-Speed, 2008; Ölz et al., 2007; Eisen, 2011), has thus far focused on oil and gas security, barely scratching “the surface with regard to exploring the potential geopolitical effects of the transition towards more renewable energy sources” (Criekemans, 2011, 4). Only a few works in this area exist, predominantly focussing on the conflict potential of rare earth materials in international energy dependencies (De Ridder et al., 2012; De Ridder, 2013; Buijs and Sievers, 2011). Consequently, whereas the strategic implications of the increasingly scarce and geographically concentrated nature of oil and natural gas are well-documented, there still exists a great deal of uncertainty regarding the economic and political implications of renewable energy systems. Considering the still marginal role such systems play in the current energy system this is not surprising. However, the mounting societal and political pressure to increase their contribution, makes studying those implications a pressing topic.

These considerations lead to an intriguing question: what are the potential political implications of the geographic and technical characteristics of renewable energy systems? Put differently, what might renewable energy sources and supporting technologies imply for energy-related patterns of cooperation and conflict between states? Moreover, will a transition to renewables provide solutions to the geopolitical challenges associated with the use of fossil fuels or merely replace old challenges by new ones?

This paper aims to provide food for thought through a structured thought experiment in which we explore what political concerns may be expected to arise between energy producer, consumer, and transit countries from the geographical characteristics of renewable energy sources and the technological specificities of the accompanying infrastructure systems. Our intention is specifically to deduce general principles that shape the nature of interstate renewable energy relations. In follow up research more detailed case studies on specific regions and countries could further refine and specify these principles. We utilize a thought experiment because the technique is suitable for discussing hypothetical cases and their possible consequences in order to provoke the imagination of the reader (Hacking, 1992). In this paper, the hypothetical case comprises that we exchange the existing fossil fuel based energy systems with renewable sources based counterparts, keeping all else equal.<sup>1</sup> Put differently, we imagine an energy system that is purely based on renewable sources. We then ask what this implies for the energy market structure and subsequently where sources for geopolitical tensions would lie. On several occasions a comparison with fossil fuels is made in order to contrast important differences.<sup>2</sup>

Carrying out this thought experiment is relevant for both science and policy. First, it spurs us to further develop our understanding of the relationship between the geographic and technical characteristics of energy sources, production, and transport on the one hand, and market formation and countries' strategic realities and policy responses on the other. Second, such an understanding may be able to assist decision makers to oversee the geopolitical implications of large-scale use of renewables, allowing them to make informed decisions on securing an affordable renewable energy supply in the future.

We proceed with a literature review on the geopolitics of renewables in Section 2, then detailing the structure of our thought experiment in Section 3. Afterwards, Section 4 explores the geopolitics of renewables. We round up with a discussion in Section 5 and a brief conclusion in Section 6.

<sup>1</sup> This implies assuming today's technology, political-economic environment, and socio-cultural values. We hence rather explore an alternate reality and not necessarily a possible future.

<sup>2</sup> For a more detailed comparison between the geopolitics of fossil fuels and renewables we refer to an earlier version of this article, the conference paper for the 'Politicoogenetmaal' 2013 in Ghent, where the geopolitics of fossil fuels served as an explicit reference point for the geopolitics of renewables and the application of the thought-experiment.

## 2. Theories on geopolitics and renewables

The geopolitics of renewables is a rather novel topic, despite the abundant literature on energy geopolitics, renewable energy technologies and energy transitions.

Most works on energy geopolitics stem from the field of International Relations. Considering the physical-geographic nature of energy sources and the economic and strategic importance of energy for the wealth and power of states, international relations scholars have always had a great interest in energy security questions. A multitude of studies reveal ample examples of how the topology of oil and gas reserves affect political decision making in both consumer and producer countries and the nature of interstate energy relations (Amineh, 2007; Amineh and Guang, 2010; Amineh and Guang, 2012; Dannreuther, 2010; Correlje and van der Linde, 2006; Umbach, 2010; Klare, 2008; Akiner, 2004; Friedman, 2006; Andrews-Speed, 2008; Ölz et al., 2007; Eisen, 2011). A famous example is the EU's efforts to secure energy supply<sup>3</sup> in the wake of the Ukrainian crises in 2005–2006 and the pipeline politics that followed it or the more recent energy union. The concept of geopolitics implied in these studies tends to be of the most basic nature; it usually equates to “politics, especially international relations, as influenced by geographical factors”, usually through politicians that act upon geographic considerations (Oxford dictionary, 2012). Foregoing a lengthy discussion on what geopolitics is,<sup>4</sup> we also follow this simple definition in this paper. Considering this attention, it is remarkable that present-day geopolitical and international relations literature has “only barely scratched the surface with regard to exploring the potential geopolitical effects of the transition towards more renewable energy sources” (Criekemans, 2011, 4). Another issue is that these studies tend to focus on the conflictuous nature of energy, ignoring often their presence as an everyday commodity that can stimulate growth. Nevertheless, the literature harbours a rich set of operationalized notions with which to discuss the strategic realities of producer, transit, and consumer countries: energy scarcity, dependence and vulnerability,<sup>5</sup> stability of energy prices in global markets, and possibilities for diversification (country, source or route). These notions seem just as relevant for renewables

<sup>3</sup> According to the European Commission “[e]nergy supply security must be geared to ensuring [...] the proper functioning of the economy, the uninterrupted physical availability [...] at a price which is affordable [...] while respecting environmental concerns” (European Commission (EC), 2001, 2). The policy framework, with which security of supply should be assured, however, is controversial. While some decision makers trust in market instruments for optimizing the energy supply mix, others urge for more government intervention arguing that markets fail to ensure adequate and sustained levels of energy supply security (Percebois, 2003; Constantini et al., 2007; Egenhofer and Legge, 2001).

<sup>4</sup> The notion of geopolitics, belonging to both Political Geography and International Relations harbours a great many different interpretations. To Criekemans (2011, 4), for example, geopolitics “investigates the interaction between [political actors] and their surrounding territoriality in its three dimensions: physical-geographical, human-geographical and spatial.” Energy would mostly/only fall in the first category. A different classification can be made between the more classical or orthodox geopolitics and that of neo-geopolitics (Mahan, 1890; Ratzel, 1897; Mackinder, 1904; Amineh, 2003; Agnew, 1998; Tuathail and Dalby, 1998). The former relates mostly to the ‘rivalry between great powers in its geographic dimension’ (akin to the realist school of international relations). In this struggle for power land and resources are imperative for the survival of the nation. Famous examples in this light are the ‘scramble for Africa’, Mackinder's heartland notion, or Soviet containment policy during the Cold War. The latter perceives “Geographic arrangements [as] social constructions that are changeable over time depending on political, economic and technological changes” (Amineh, 2003, 24) (akin to liberal and critical theories in IR). Next to the traditional focus on hierarchies of power and the access to natural resources, explanatory factors are also found in the global economy (control of trade, production and finance), political discourse, and the legitimacy of power.

<sup>5</sup> Fossil fuel energy security is tightly linked to the concepts of dependence and vulnerability, especially for net-importing or consumer countries. Dependency refers to “the share of national energy consumption which is produced domestically vis-à-vis energy imports” (Gnansounou, 2008, 3735). It is closely related to the concept of risk. “The vulnerability of a system is the degree to which that system is unable to cope with selected adverse events.” Vulnerability expresses the consequences of energy supply interruptions (Gnansounou, 2008, 3735).

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