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The politics and economics of cross-border electricity infrastructure: A framework for analysis

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ABSTRACT

A common European electricity market requires both market integration and transmission grid expansion, including cross-border interconnectors. Although the benefits of increased interconnectivity are widely acknowledged, expansion of interconnectors is often very slow. What are the reasons behind this "grid-lock"? To date, the issue remains discussed largely from the perspective of practitioners. Academic research on interconnectors comes mostly from the discipline of energy economics, offering models that do not necessarily help us explain the dynamic situation in the EU. This paper sketches the problem and its scale, reviews existing approaches and proposes a framework for analysis of interconnector projects, including a set of hypotheses that could account for the stall in interconnector development. The hypotheses relate to inadequate financing, diverging interests, governance and administration problems, as well as political discourses and perceptions. As empirical illustration we use the case of the German–Polish border. Drawing on document analysis and stakeholder interviews, we evaluate the hypotheses. Evidence suggests that at this stage, political and governance-related issues rather than economics and finances might explain the "grid-lock" we are facing. The concluding section sums up the findings, highlights methodological difficulties and gaps, and proposes directions for further social scientific research in this issue area.

1. Introduction

One of the cornerstones of the European Union's (EU) energy policy is the creation of an Internal Energy Market (IEM). Market integration is to enhance EU economic performance, increase security of supply, and facilitate the transfer to a low carbon economy. Although the idea dates back to the end of the 1980s, only in March 2011 the European Council finally envisaged a common energy market for power and gas by 2014. This means both the alignment of rules and development of physical grid interconnections between the EU member states. The former is being developed with framework guidelines and grid codes, and most of the attention so far is on the alignment of trading rules and system operations [1]. This approach is necessary albeit not sufficient, as for a functioning common market we also need a robust electricity grid with more interconnectors and thus – an increased exchange capacity between the member states.

Grid development has been recognized to bring various benefits such as increased system stability and enhanced security of supply [2]. Furthermore, transmission grid expansion is the cheapest way to integrate high shares of renewables and makes the power system more resilient [3]. In the light of the growing generation from scattered and intermittent renewable energy sources (RES), grid management faces new challenges such as unplanned energy flows [4], and interconnectors are one of the necessary components of achieving efficiency [5]. Finally, case studies of existing interconnectors reveal significant cost-effectiveness of interconnection and increased efficiency of the regional decarbonisation strategies compared to individual efforts [6].

Most recently in June 2014, in the light of the Ukrainian-Russian crisis, based on the Polish proposal [7], the EU recognized development of interconnectors as an inevitable element of the closer EU energy integration, towards an "Energy Union" [8]. In

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addition, the EU offers both financial and regulatory support for grid development.[1]

At the same time, the level of exchange capacity of most of the member states is below 10% of national generation capacity – a benchmark acknowledged by the EU already in 2002 [58]. While that level is still far from optimizing the synergies between national systems, it is already difficult to achieve for many member states. On the borders between many EU states, for example between Belgium and the United Kingdom (UK) or Germany and Poland, projects are effectively stalled, while other important projects are delayed.

What are the reasons behind this “grid-lock”? Do states lack financial resources or are the interconnector projects simply economically inefficient? Or is this part of a general problem with large scale infrastructure development that we see in different issue areas where the society and technology meet? This paper is an attempt to map this important problem and propose pathways for further research coming from the social sciences. To date, electricity interconnectors have remained largely a topic for engineers and practitioners. On rare occasions and only in some countries a wider public debate around the issue was sparked. As a result, the lay understanding of the issue area is limited – not only because of its inherent technical complexity – and despite the importance of interconnectors for social welfare, public policy and the potential energy transformation, it remains visibly under-researched. Broader analyses and academic research on interconnectors is either limited to single cases, or comes from the discipline of energy economics, offering models that do not necessarily help us explain and understand the current situation in the EU with its complex dynamics. We thus aim to propose a framework for comparative social scientific research on electricity interconnectors, underlining the question of *politics* that makes energy *policies* achievable, in line with the suggestion made by Benjamin Sovacool in the journal’s flagship article ([63]: 21).

This piece thus begins by sketching the problem and its scale, building an argument for the benefits of interconnectors contrasted with their visibly inadequate expansion. We then review the existing approaches that seek to explain different elements of the interconnector development problem, and based on these, propose a framework for analysis of interconnector projects, including a set of hypotheses that could account for the stall in interconnector development. The hypotheses relate to financing; stakeholder interests; governance and administration problems; and finally political discourses and perceptions.

As empirical illustration we use the case of the German–Polish border. Increased interconnectivity between the two countries has been recognized as an element of the cost-effective way to transform into low-emission economy in Europe by 2050 [9], nevertheless the progress is slow. Drawing on a document analysis and stakeholder interviews, we try to evaluate the four hypotheses introduced earlier. The case of the grid-lock in the project of the German–Polish interconnector thus becomes a case study of the opportunities and limitations to the European energy integration, as well as the challenges of social science research on the topic.

Evidence drawn from the case-study seems to suggest that political and governance-related issues rather than economics and finances might explain the “grid-lock” we are facing, although changes in the regulatory framework and EU support can also unlock much investment. The concluding section sums up the findings, points to existing gaps, discusses methodological issues, again relating to the broader themes of energy research within the social sciences [64], and proposes some further directions for social scientific research in this issue area, emphasizing the need for comparative studies of different cases.

[1] I.e. the European Energy Infrastructure Package, European Energy Programme for Recovery, selection of the Projects of Common Interests, and the recent Connecting Europe Facility.

2. Explaining the grid-lock: an analytical framework

Cross-border electricity interconnectors play many roles and are acknowledged to bring various benefits for different stakeholders. Initially, interconnectors were constructed mostly as an emergency backup option for national energy systems. Their positive impact on the *security of supply* has later been reinforced by *economic* and *social welfare* arguments. Literature on energy economics is in agreement that “interconnectors bring major benefits to electricity systems [. . .], improve reliability and allow for more economical system operation. They reduce the need for reserve and peaking generation capacity and allow more efficient dispatch” ([68]: 89). Welfare provision is a more complex issue, as interconnectors (or in fact any means of international trade) benefits some while others are forced to carry the burden, i.e. of energy price convergence ([66]: 122). From a wider perspective, however, it is visible that interconnectivity provides net welfare gains, and that is the argument that the European Commission uses to promote interconnectors as part of the Internal Energy Market ([58]: 4). In early 2014, Britain’s Secretary of State for Energy and Climate Change claimed that a rapid and large-scale expansion of interconnectors was the only way to make European energy prices competitive with that of the U.S., and that such a network could “knock more than 10 per cent off electricity bills” Europe-wide [10]. Last but not least, interconnectors are seen as a vital part of the European *energy transformation* towards a system with large scale intermittent renewable generation [69]. It is widely recognized that to benefit from different geographical and weather conditions as well as connecting the efficient generation sites with urban and industrial demand, an expanded electricity network will be required. Under the emerging new characteristics of energy systems with high renewable penetration, interconnectors again help increase energy security, since the resilience of interconnected systems is dependent on the difference in the plant mix across regions ([54]: 580). Interconnector expansion in macro-scale can either take the form of a pan-European super-grid, like in the case of the Desertec project idea, combining large solar generation in North Africa with other renewables, such as North Sea and Baltic offshore wind; or slightly less ambitious, but still large-scale ideas like connecting different types of renewables with different qualities to achieve synergistic effects (cf. [57]). This type of a “complementary system” is expected to “play an increasing role in the years to come” ([58]: 11; [51]), while interconnectors have an important role to play also by reducing the need for flexible conventional capacity ([66]: 120).

It is thus clear that the expansion of cross-border exchange capacity combines all three elements of the “energy trilemma” – delivering increased security, enhanced economic performance and allowing for a transformation towards environmental stability. Brancucci Martínez-Anido and colleagues [51] show that under a minimum cost dispatch model, planned additional cross border capacity will reduce dispatch costs, and with a growing demand and increasing renewable generation will also help maintain security of supply and reduce RES curtailment needs. Taking only efficiency and sustainability into account, the Pathways project modelled two alternative scenarios, suggesting that the existing