HOW TO REDESIGN THE ROLE OF THE ELECTRICITY DISTRIBUTION SYSTEM OPERATORS?

Guillermo Ivan Pereira, EfS -UC, MIT-P-SES, INESC-Coimbra, gpereira@student.dem.uc.pt
Patrícia Pereira da Silva, INESC-Coimbra, FEUC, CeBER, MIT-P, patsilva@fe.uc.pt
Deborah Soule, MIT Sloan, MIT IDE, dsoule@mit.edu

Overview

The European Union (EU) electricity sector can be seen as in a second stage of restructuring underpinned by the transition toward a smarter and more sustainable scenario motivated by ambitious Digital Single Market and Low Carbon Economy policies (European Commission, 2015a, 2015b). This transition calls for the implementation of a market design that facilitates new roles and services, whilst ensuring a competitive, secure, and sustainable electricity supply for European citizens. This ambition is visible in the recent Clean Energy for All Europeans policy package, with specific proposals for electricity sector market design and the role of DSOs considering the diffusion of new technologies and policies toward sustainability (European Commission, 2016). This context has contributed to the need to redesign the role of the electricity distribution system operators (DSOs). These operate the distribution network infrastructure at the interface of electricity demand and supply, for which recent changes are noteworthy, considering: the diffusion of distributed generation installed on the customer side and connected to the distribution grid; the proliferation of smart metering; and the growth of the electric vehicle fleet and charging infrastructure. These aspects represent opportunities for providing new services such as data services for third parties and suppliers, energy efficiency services through demand-side management or demand response actions, smart meter deployment, and the deployment of electric vehicle charging infrastructure (Oosterkamp et al., 2014). However, adapting the DSOs operations to these opportunities is an intricate topic, considering their natural monopoly characteristics and neutral market facilitation role, which lead to uncertainty regarding what new activities should be performed at the distribution-level, whilst ensuring access and fair prices (Mallet et al., 2014). To contribute to reducing this uncertainty, this article presents a foresight analysis study on challenges, policy alternatives, priorities, and evolution trajectories for DSOs.

Methods

To develop this research, we apply a Policy Delphi technique, adequate for circumstances in which policy uncertainty is perceived and when expert's knowledge is accessible (Loe et al., 2016). The Policy Delphi method applied is based in four phases. Firstly, an extensive literature review was conducted focusing on obtaining an up-to-date inventory of aspects impacting DSOs through the energy transition, which resulted in an initial questionnaire. Secondly, the questionnaire developed was subject to testing and validation by a group of external academics and DSO industry representatives, to ensure the validity and relevance of the study design. Thirdly, a group of EU-based experts was identified to participate in the analysis, selected based on their: (i) affiliation to entities working at the intersection of smart grids development and EU electricity market design; (ii) interest in collaborating toward the development of future policies for the EU electricity sector; and (iii) willingness to collaborate in a foresight study for analysing policy issues at the DSO level. Lastly, the questionnaire was sent to the group of experts, following the iterative rounds approach, with inter-round feedback to experts. Two consecutive survey rounds were used for this study. The first-round results were obtained from 207 experts, representing 25 European countries, which evaluated 57 policy alternatives. The second-round results were obtained from 103 experts, representing 20 European countries, which evaluated 21 policy alternatives. The second round of participating experts were recurring from the first round.

Results

The results obtained shed light on topics covering business model innovation, technological adaptation, and market design, these expert-derived foresight-based indicators were categorised as: weak policy alternatives, uncertain policy alternatives, and strong policy alternatives.

Statements rated as strong policy alternatives include:

- Grid planning
- Grid management

- DSOs should explore technological innovation in partnership with external entities such as universities, ICT firms, and other DSOs.
- DSOs regulation should be designed to facilitate innovation and investments in smart grid technologies.
- DSOs should focus on adapting their organisational structure to be ready for the opportunities resulting from a fully deployed smart grid.

Statements rated as uncertain policy alternatives include:

- The unbundling threshold, currently set to DSOs with 100 000 connected consumers should be re-considered as it can challenge the adaptation and innovation potential of DSOs.
- DSOs will be able to adapt to a changing electricity sector only with adapted regulation.

Statements rated as weak policy alternatives include:

- DSOs should limit their business strategy to the possibilities allowed by existing regulations.
- Electricity retail.
- DSOs will continue with their traditional activities, solving most of the grid related issues at the planning stage, operating as passive network managers.
- DSOs should focus only on grid operation and maintenance, planning and expansion, and quality of service.
- DSOs will be able to integrate new technologies to support the transition to smarter distribution grids.

Conclusions

The results provide foresight indicators regarding business model innovation, technological adaptation, and market design. The importance of facilitating the adaptation of organisational structures is highlighted. And also, the need for DSOs to balance their traditional distribution activities with those related to the integration of distributed energy resources technologies. As for market design, the importance of innovation-friendly regulation is emphasized, in parallel with the need for a shared EU-level vision regarding DSO responsibilities. The results obtained indicate the importance of the following policy actions. Firstly, the development of a vision for DSOs transition to a smarter and more sustainable electricity sector across the EU. This can be developed through a more detailed understanding of the existing technologies, processes, and practices, as indicators of existing capabilities and potential for adaptation to a changing electricity sector. Secondly, the development of a smart grid governance model. This could contribute for a detailed understanding of the electricity sector structure, existing challenges, institutional and technological structures, all of which could provide guidance for incumbent DSOs as well as new entrants on roles and opportunities to be explored. Lastly, the development of Smart Grid Action Plans at the Member State level. These can support Member State's commitment to deploy smart grids, by focusing on available technologies, expected costs and benefits, and necessary actions across sectors. These plans could further guide national efforts for deploying cost-effective smart grid innovations and services that benefit consumers. The suggested policy actions can support the development of a framework in which new alternatives can be tested to understand resulting benefits and costs from evolving towards a smarter electricity sector in the EU. These gain further relevance considering the recent Clean Energy for All Europeans policy package proposals, concerning the role of DSOs in the electricity sector.

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