

Investing in smart grids: assessing the influence of regulatory and market factors on investment level by key European stakeholders

*Yvonne Vogt Gwerder*¹, *Nuno Carvalho Figueiredo*^{* 23}, and *Patricía Pereira da Silva*^{*‡45}

Executive summary

As reforming the electricity sector has become a key part of the European Union's transition to a clean energy future, it is important to determine what solutions can facilitate this transformation. Smart grids allow for an increased flexibility of distribution grids so that they are able to handle the influx of renewable energy sources, along with their variable loads. While this technology addresses many challenges that come with the clean energy transition, cost is a major barrier, and heavy investment is needed.

The motivation of this study is to understand the role that regulatory and market factors play on encouraging investments by the largest investors in smart grid projects in Europe: Distribution System Operators (DSOs), technology manufacturers, and universities. Statistical tests were conducted on these groups' investments in smart grid projects in the EU-28, Norway, and Switzerland from 2008-2015, to evaluate the influence of the following factors on investment: the level of distribution sector concentration, the regulatory mechanism in place, and the existence of innovation stimulus mechanisms.

We found that the level of distribution sector concentration did not significantly affect smart grid investments by the three stakeholders. Market-minded stakeholders, such as DSOs and technology manufacturers, invested more in countries with hybrid or incentive-based regulatory schemes, than those with cost-based models. Furthermore, countries that adopted innovation-stimulus mechanisms were seen to encourage more investments by these two groups. Meanwhile,

1 Energy for Sustainability Initiative, University of Coimbra, Rua Luís Reis dos Santos, 3030-788 Coimbra, Portugal

2 Corresponding author. Email: nuno.c.figueiredo@uc.pt

3 INESC Coimbra, Institute for Systems Engineering and Computers at Coimbra, Rua Sílvio Lima Pólo II, 3030-290 Coimbra, Portugal

4 Faculty of Economics, University of Coimbra, Av. Dias da Silva, 165, 3004-512 Coimbra, Portugal

5 CeBER, Centre for Business and Economics Research, Faculty of Economics, University of Coimbra, Av. Dias da Silva, 165, 3004-512 Coimbra, Portugal

the level of investments by collaborative knowledge-seeking institutions, such as universities, were not influenced by any of the evaluated factors.

These findings help policy makers design adequate incentives for stakeholders involved in smart grid Research & Development or project deployment. Smart grids are a key technology in the clean energy transition, and therefore further development of mechanisms fostering investment should be supported.

Keywords Smart grids; Smart grid regulation; Smart grid investment