

# Identifying innovative actors in the Electricity Supply Industry using machine learning: an application to UK patent data

EPRG Working Paper 2004

Cambridge Working Paper in Economics 2013

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Over the course of the last thirty years, the Electricity Supply Industry (ESI) of several OECD economies experienced significant structural changes. These changes occurred against the backdrop – and under the impulse – of two pivotal policy developments: a transition toward liberalised electricity markets and a policy-led push to decarbonise the electricity generation portfolio.

These changes not only affected the pace and nature of innovation activity in the sector but also altered the set of innovative actors. The present paper provides a methodology to identify these actors, which we apply to priority patents filed at the UK Intellectual Property Office over the period 1955-2016. We then proceed to analyse the patent filing activity.

The approach taken in this paper provides us with important insights. First, the innovation activity shifted away from large (integrated) generation, transmission and distribution utilities to (smaller) equipment manufacturers or R&D firms. Patent filings by universities, although increasing as a share of total patent filings over time, remain marginal. Second, the distribution of patent filings over the sample period is heavily skewed, with a small number of actors constituting a large proportion of filings. This is particularly true for OEMs. Third, on a related note, we uncovered the predominant role played by lateral innovation in the development of fossil fuel electricity generation technologies (FF). Fourth, innovation in these technologies still represents a large proportion of yearly filings. Finally, with regard to UK-based OEMs specifically, the paper highlights a number of firm-level (technological) dynamics: (a) a majority of patents are filed by firms that are active in both fossil fuel and renewable electricity generation technologies (REN), (b) but ‘mixed’ firms have filed significantly more FF patents than REN patents; and only during the period 2007-2013 have these firms filed more REN than FF patents, (c) the increase in REN patent filings observed between 2005 and 2011 went hand in hand with an increase in the number of (small) technological entrants (i.e. firms patenting for the first time).

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Publication March 2020  
Financial Support UK Economic and Social Research Council