

MAPPING INNOVATION IN THE ELECTRICITY SECTOR: A STARTUPS APPROACH

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Overview

Technology innovation is widely recognized as one of the main engines behind economic growth. Anticipating innovation trajectories could help decision makers develop new capabilities to take advantage of incremental and disruptive effects. The objective of this paper is to map innovations in the electricity sector using a bottom-up approach.

Many studies have tried to identify technological trends with patent information using citation and abstracts. Although businesses, entrepreneurs and investors are well suited to identify, evaluate and support the most promising ideas and to turn them into products and services, few studies have focused on the business value proposition. We try to fill that void by analyzing actual innovations pursued by startups worldwide in the electricity sector.

A startup is a newly created firm that has great growth potential. Through the startup phase, new ideas are brought into the market and are transformed into economically sustainable enterprises. Start-ups have typically been most suitable for disruptive ideas for digital, small-scale and consumer products. Also, many start-ups increasingly are focusing on promising clean energy technologies as there is a rising appetite for allocating risk capital to early-stage, high-potential innovations for tackling climate change.

Methods

We compiled a database of 320 startups whose focus is centered in the electricity sector. We classified these startups according to their business proposition in the context of megatrends disrupting the electricity sector. The megatrends that we identified are decarbonization, digitalization, decentralization and electrification. We also classified these startups based on their specific technological domain. Then we anticipate the impact on the electricity sector should their business succeed. The collection of startups was also linked to a conceptually focused review of the relevant literature on innovation.

Results

From analyzing this dataset, we put forward the following propositions:

- The future of electricity will be decarbonized and digitalized. PV solar, Artificial Intelligence (AI) and storage deployment will be the dominant new technologies.
- PV is the key technology for decarbonization. Innovation within PV focuses on product innovation such as sustained innovation, more resistant materials, easier to install, more output, and easier to maintain, within the same business model without the need to update regulation.
- Digitalization is the key disruptive/breakthrough innovation. This is a new technology in search of applications in the electricity sector. As such it has the potential to reshape businesses and the regulatory-market structure. Digitalization tends to animate markets, reduce market barriers for participation, connect buyers and sellers through

platforms, and reduce inefficiencies. For the sector to successfully utilize this innovation, regulations need to be updated to accommodate it.

- Storage technologies can be very disruptive for the power sector, but the innovations that we observe in the technology itself are incremental (problem well defined, domain mostly defined), e.g., batteries that last longer, that charge in shorter periods of time, or that use other less expensive raw materials.

- Many innovations assume a more distributed power system and associated regulatory framework.

- Although fewer in number, there are multiple innovations not involving solar, batteries, and AI, e.g., EV and at home (heating/ cooling) including using geothermal.

Conclusions

This paper offers a systematic approach to map future technology trends in the electricity industry based on analyzing the business proposition of 320 startups worldwide. We find that innovations in the electricity sector focus on decarbonization and digitalization. More specifically, dominant technologies developed by start-ups are solar, AI and storage.

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