

Title: Value creation and value capture in smart grid services – A literature review and an analysis of smart grid pilot projects.

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This paper addresses the creation and capture of value in smart electricity grids. The transition to smart electricity grids in energy sectors around the world is an important facilitator of low carbon cities that are resilient to climate change. A smart grid enables the integration of locally produced renewable energy, energy-efficient behavior, and the consumption of green electricity (e.g. Curtius et al., 2012). It is an upgraded electricity network that enables two-way information and power exchange between producers and consumers. While many of the enabling technologies, such as smart meters, vehicle-to-grid (V2G) and demand-side management (DSM) applications, are currently being introduced into the market, one factor that is of pivotal importance to turn these inventions into innovations has received less attention: the ability of businesses to create and capture value on a large scale by offering smart grid products and services to consumers.

This paper contributes to building up a knowledge base on value creation and value capture for smart grid products and services in two ways. First, we offer a systematic review of 40 articles on smart grids published in international, peer-reviewed journals. We classify smart grid services with respect to their ‘consumer value orientation’ (services create value for consumers with a self-transcendent orientation or a self-enhancement orientation) and with respect to their ‘value capture strategies’ (low-cost strategy or differentiation strategy of companies) (De Groot and Steg, 2007, 2008). These services are offered to consumers in three domains: the energy supply domain, the communication domain, and the prosumer domain. Second, we complement this literature review with an analysis of value creation and value capture in actual smart grid projects. To this end, we have created and analysed a

database of 434 smart grid projects, comprising European smart grid projects described by the Joint Research Centre of the European Commission, and US-based projects (www.sgiclearinghouse.org). We classified each project as belonging to the energy supply domain, the communication domain or the prosumer domain, and, on the basis of the project descriptions, we offer an overview of the different ways of value creation and value capture in these projects.

By classifying different ways of value creation and value capture for a variety of smart grid services, our literature review and analysis of smart grid pilot projects offer a comprehensive overview of business opportunities in the future smart grid. The results show that many services that provide environmental benefits can also be economically attractive to energy suppliers. The paper contributes to literature on business models by emphasizing how sustainability considerations can be combined with making money (Johnson and Suskewicz, 2009; Zott et al., 2011). By analyzing different types of value creation for consumers in a smart grid setting, the paper also contributes to literature that addresses adoption decisions by consumers of environmentally friendly products and services (De Groot and Steg, 2007, 2008). Based on the new classification, several topics for further research are proposed.

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