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Business model innovation in electricity supply markets: The role of complex value in the United Kingdom

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HIGHLIGHTS

- Business models of energy supply markets shape energy transitions.
- The British system misses four opportunities of local electricity supply.
- Nine new business model archetypes of local supply are analysed.
- New electricity business models have complex value propositions.
- A process for policy response to business model innovation is presented.

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ABSTRACT

This research investigates the new opportunities that business model innovations are creating in electricity supply markets at the sub-national scale. These local supply business models can offer significant benefits to the electricity system, but also generate economic, social, and environmental values that are not well accounted for in current policy or regulation. This paper uses the UK electricity supply market to investigate new business models which rely on more complex value propositions than the incumbent utility model. Nine archetypal local supply business models are identified and their value propositions, value capture methods, and barriers to market entry are analysed. This analysis defines 'complex value' as a key concept in understanding business model innovation in the energy sector. The process of complex value identification poses a challenge to energy researchers, commercial firms and policymakers in liberalised markets; to investigate the opportunities for system efficiency and diverse outcomes that new supplier business models can offer to the electricity system.

1. Introduction

To achieve energy transitions, technological and business model innovation must co-evolve with policy and system regulation (Foxon, 2011). However, much of the literature on technical and business model innovation neglects the retail or 'supply' element of the energy value chain. In liberalised markets the dominant supply business model has been the corporate utility, selling units of energy to consumers in national markets (Hannon et al., 2013). Very little has been done by the energy research community to examine challenges to this dominant supply model, or the national scale at which it operates. Supply business models on smaller scales (from city-region to neighbourhood) have the potential to: expand the penetration of renewable energy, accelerate demand management, drive energy efficiency, and re-localise energy value. However, there has been no systematic analysis of the business models that can realise these opportunities, or understanding of why they remain uncommon in liberalised markets. Electricity supply business models that are designed to operate sub-nationally, pose a number of challenges to policymakers, regulators, and mainstream utilities.

This paper is structured as follows: Section 2 describes the literatures on business model innovation in the energy sector, focussing on the *value proposition* and *value capture* elements of the business model concept to frame four research questions. Section 3 describes the study methodology. Section 4 presents our results. Section 5 considers how the notion of 'complex value' is useful in understanding these business model innovations and describes how a complex value framing poses new questions for energy policy. Section 6 concludes with recommendations for policymakers across liberalised markets.

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We define 'Local Supply' as:

> Local supply is the operation of an organisational form with either the legal ability, or in partnership with another agency with that ability, to supply electricity to commercial and domestic consumers predominantly within a single distribution network region or group of regions at the sub-national scale.

2. Literature review

This review is split into two parts. The first reviews the literatures on business model innovation in energy systems. The second identifies how the incumbent utility business model often misses opportunities to solve the energy trilemma; the provision of secure, affordable, low-carbon energy.

2.1. Business models and energy systems

A business model describes the benefit an enterprise will deliver to customers, how it will do so, and how it will capture a portion of the value it delivers (Teece, 2010; Chesbrough and Rosenbloom, 2002). Determining how to deliver benefits *and* capture value is key to designing business models (Teece, 2010; Boons and Lüdeke-Freund, 2013). Osterwalder and Pigneur (2010) describe nine 'building blocks' of a business model: key partners, key activities, key resources, customer **value proposition**, customer relationships, channels, customer segments, cost structure and revenue stream (equivalent to **value capture**).

Business model innovation is often broken into technological, organisational, and strategically driven categories (Boons and Lüdeke-Freund, 2013). Bocken et al. (2014) use these categories to further refine eight *generic* sustainability **value propositions**[1]. Of these eight, the most relevant to this research are those which: maximise material and energy efficiency; Substitute [fossil fuels] with renewables and natural processes; Encourage sufficiency (including demand management); and Re-purpose the business for society/ environment. To understand the policy implications of business model innovation in energy markets, system specific accounts are needed, which link the sustainable business model innovation literature to empirical cases. Business model innovation research in the energy field has focused on the deployment of specific *technologies* in the energy value chain such as: storage (He et al., 2011; Taylor et al. 2013), solar generation (Huijben and Verbong, 2013) and electric vehicle charging (San Román et al., 2011). These are useful contributions to our understanding of how new technologies can enable new entrants to compete with incumbent firms. Other research analyses how technology choice and business model design are iterative, and how revenue capture methods and business model design are interdependent (Kley et al., 2011; Okkonen and Suhonen, 2010). These contributions also demonstrate the relevance of business model research to the energy policy community, as they analyse where business model innovations can have both productive and disruptive effects across energy markets (Channell et al., 2013; Richter, 2011,2013).

However, the potential for business model innovation in electricity supply markets, the retail end of the value chain, is less well understood. The traditional energy supply business model operates a relatively simple value proposition; national utilities rely on increasing kWh units sold (relative to costs) to remain profitable (Blyth et al., 2014a, 2014b; Hannon et al., 2013). Both the national focus and the reliance on increasing unit sales affect the ability of new entrants to compete in or join the market (Hall and Roelich, 2015). The business model built on unit volume drives the whole energy value chain to increase throughput, locking system users into unsustainable practices (Unruh, 2002; Apajalahti et al., 2015; Roelich et al., 2015).

Despite the importance of business models in shaping the system, research into energy retail/supply markets tends to be limited to three categories: the drivers for consumer switching (Yang, 2014; Annala et al., 2013), the barriers to market entry (Littlechild, 2005), or the effect of market competition on final prices (Lehto, 2011; Defeuilley, 2009). The business models of these supply entities have received little attention, even as the notion of the business model as a critical element of system innovation is becoming an established concept (Zott et al., 2011; Chesbrough, 2010). There is a small but growing literature on the effect of supplier business models on whole energy systems (see: Hannon et al., 2013; Richter, 2011, 2013; Sousa et al., 2013; Apajalahti et al., 2015; and Littlechild, 2005). These contributions question the compatibility of current throughput-based models with solving the trilemma of secure, low carbon, and affordable energy (Sousa et al., 2013; Hannon et al., 2013). For the throughput-based utility model, reduction in final demand undermines revenues. Many tariffs also encourage higher usage by charging less for consumption over a certain threshold. As such, the mainstream utility model cannot reasonably pursue transformative energy efficiency without undermining its core value proposition. Furthermore, many of the value propositions from demand reduction accrue to those outside the energy system. This adds to business model complexity because in order to monetise these values revenue sharing across sectors becomes necessary.Energy Service Companies, or 'ESCos' are more likely to incentivise substantive efficiency (Fang et al., 2012; Roelich et al. 2015; Hannon et al., 2013). ESCos provide energy services (e.g. a warm home, efficient appliances/illumination) rather than supply energy by the unit. Revenues are drawn from providing these services for the fewest units possible, thus incentivising energy efficiency. However ESCos are only one possible business model innovation. This research contributes to the business model innovation field by analysing a suite of new business model archetypes in electricity supply markets. These archetypes transcend the national focus of the traditional utility, and create space for more geographically bound supplier models.

What is clear from the business model innovation literature is the need to be clear about **value proposition** and **value capture**. This is important to energy business models because they can deliver multiple benefits beyond the energy customer; to the energy system itself, such a demand-side management reducing the need to reinforce networks (Hall and Foxon, 2014), and to the wider economy, such as public health benefits associated with fuel poverty alleviation (International Energy Agency, 2014). This makes business model development more challenging; monitoring benefits accrued to different actors, and capturing value from these different actors to compensate the enterprise can be difficult.

Recent advances in technology, such as smart meters and energy management systems, help to overcome the problems associated with capturing complex values. Technological and business model innovations are iterative, smarter systems pave the way for innovation in 'complex value business models'. Complex value being defined by the authors as: the production of financial, developmental, social and environmental benefits which accrue to different parties, across multiple spaces and times, and through several systems. Business models with complex value propositions

[1] Maximise material and energy efficiency; Create value from 'waste'; Substitute with renewables and natural processes; Deliver functionality rather than ownership; Adopt a stewardship role; Encourage sufficiency; Re-purpose the business for society/ environment; and develop scale-up solutions. (Bocken et al., 2014 p.48).