Journal of Cleaner Production 195 (2018) 1032–1046

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The typologies of power: Energy utility business models in an increasingly renewable sector

Scott T. Bryant [a, b, *], Karla Straker [a], Cara Wrigley [a, b]

[a] Sydney School of Architecture, Design and Planning, The University of Sydney, 148 City Road, Darlington, Australia
[b] Sydney Nano Institute, The University of Sydney, Physics Rd, Camperdown, Australia

ARTICLE INFO

Article history:
Received 4 October 2017
Received in revised form
17 April 2018
Accepted 27 May 2018
Available online 30 May 2018

Keywords:
Energy utility
Variable renewable energy (VRE)
Business models
Emerging utility models
Content analysis

ABSTRACT

In the last decade energy utilities have been confronted with the challenge of maintaining business-as-usual energy production in a world seeking to dramatically increase levels of variable renewable energy (VRE) in the energy sector. To understand the state of business models in this changing sector, 50 Australasian and European energy utilities were analysed. Findings identified 4 emerging energy utility and utility equivalent business model typologies, in addition to the existing Traditional Energy Utility typology: the Green Energy Utility, the Cooperative Energy Utility, the Prosumer Energy Utility, and the Prosumer Facilitator. The study revealed that whilst energy utilities and energy equivalent utilities are aware of the need for innovation and new value propositions to deal with the changing energy market landscape, there is a gap regarding how they will financially adapt to the impact of increased VRE. All typologies were found to be financially vulnerable to increasing levels of VRE capacity present in the energy sector. More specifically, the business models and support business strategies rarely considered the potential future impact that VRE would have on their viability. This paper highlights proposed future routes of business model adaptation for the five typologies, and provides insights for VRE uptake in practice and policy.

1. Introduction

In recent decades, the threat of climate change has led to in an increasing push for companies operating in the energy sector to develop sustainable means of meeting energy demand (Bierbaum and Matson, 2013). This push has led to an ongoing increase in the uptake of variable renewable energy (VRE) capacity (e.g. wind and solar PV) in energy markets, and has resulted in an influx of businesses (and technology) attempting to compete in the traditionally slow-moving and highly-vertically-integrated energy utility market (Nillessen and Pollitt, 2016). These new entrants bring with them new business models for how businesses create, deliver and capture value (Osterwalder and Pigneur, 2010), that seek to somewhat bridge the gap between business-as-usual in the energy sector and a fully-renewables-based energy sector. More specifically, these entrants seek to develop new value propositions as an alternative to the shrinking margins of the traditional energy utility approach (Duncan, 2010). Given this increase in new energy utility business models available in global energy markets, it is interesting to note that little research has been done to-date on comparing traditional and new energy utility business models (Hannon et al., 2013; Hall and Roelich, 2016; Duncan, 2010).

Furthermore, national strategic energy plans for the uptake of renewables (European Commission, 2017; Australian Government, 2017; New Zealand Government, 2017) do not typically address the potentially drastic shifts required of energy utilities and providers to adopt VRE to meet government renewable targets, nor the impact this will have on the economic viability of their business models (Sioshansi, 2017; Ruggiero and Lehkonen, 2017). Similarly, although many traditional energy utilities have developed strategic company visions around increasing levels of VRE (Dallos, 2016; Neslen, 2017; Clark, 2017), few provide concrete steps as to the required adaptations to their business models to future-proof their businesses against a sustainable energy future, let alone thrive. This lack of detailed business model vision from utilities has coincided with a time during which profitability from energy markets is proving increasingly difficult using the traditional energy utility approach (i.e. sale of units of electricity, gas, and heat) (Castaneda

* Corresponding author. Sydney School of Architecture, Design and Planning, The University of Sydney, 148 City Road, Darlington, Australia.
E-mail addresses: sbry9140@uni.sydney.edu.au (S.T. Bryant), karla.straker@sydney.edu.au (K. Straker), cara.wrigley@sydney.edu.au (C. Wrigley).

https://doi.org/10.1016/j.jclepro.2018.05.233
0959-6526/

et al., 2017; Laws et al., 2017; Muaafa et al., 2017). That is, an ever-increasing level of variable renewable energy (VRE) generation capacity, both consumer- and commercially-owned, has been impacting energy market prices (Zipp, 2017; Paraschiv et al., 2014; Bell et al., 2017), making market pricing payments more volatile and wreaking havoc with the traditional energy utility business model.

In light of the emergence of new energy utility business models, this paper seeks to explore the different business models currently employed by businesses operating in the energy utility space, both traditional models and those emerging via companies attempting to fulfil the role of energy utility. The geographic focus of this paper will be on Europe and Australasia, due to the authors' interest in and familiarity with the energy sectors of these particular regions, in addition to their similar energy market principles since liberalisation in the 1990s (European Parliament, 2017; Australian Energy Market Regulator, 2017; New Zealand Government, 2015). The paper will explore the typologies of energy utility business models that exist, seeking to answer the following research questions:

- What energy utility, and energy utility equivalent business models are now present in European and Australasian energy markets?
- To what extent do these business models appear to consider the impact of increasing levels of variable renewable energy (VRE)?

The following section of the paper details the existing literature on business models, energy utilities, and the limited research conducted on the rise of new energy business models as a result of increasing prevalence of renewable energy technologies. The research design is subsequently introduced, including the approach to data collection and analysis. The organisations used as part of the analysis are presented, along with the energy utility business model typologies that have been identified. These findings are then discussed, developing a model of the current role of the different energy utility business models with respect to the end-consumer. The current "business model gap" in the energy sector is also discussed in the context of the challenges facing energy utility, and utility equivalent business models in-light of increase renewable energy uptake. Finally, the research outlines proposals for each of the 5 typologies to for adapt their business models to leverage existing value propositions whilst mitigating the impact of increasing VRE, and the future work required to test these models.

2. Literature review

2.1. Energy utility business models

In seeking to operate successfully, businesses such as energy utilities look to create, deliver and capture value for and from their customers, and undertake innovative activities and redesign themselves to gain a competitive advantage in the market (Zott and Amit, 2010). Understanding the approach to the creation, delivery and capturing of this value by businesses has been the focus of much research under the theme 'business models' (Zott et al., 2011; Teece, 2010; Gunzel and Holm, 2013; Rodet-Kroichvili et al., 2014; Porter and Kramer, 2011). Despite lacking a generally accepted definition (Lima and Baudier, 2017) business models have been proposed as frameworks to understand, evaluate and compare how businesses create, deliver and capture value (Osterwalder et al., 2005), and it is this definition that the authors will be using within this paper. Within the context of company value creation and delivery, this field has been underpinned, or at least focused, by formative and analytical methodologies that have provided a common language for describing these actions i.e. business models (Zott et al., 2011; Teece, 2010; Gunzel and Holm, 2013; Rodet-Kroichvili et al., 2014; Porter and Kramer, 2011). It should be noted that in the context of this paper, value creation for the firm refers to economic gain, whilst for the customer this refers to the receipt of products or services. More specifically, the 'business model canvas' (Osterwalder and Pigneur, 2010) provides a clear articulation of this approach. The advent of the business model canvas has allowed for the unpacking and comparison of new and existing approaches by businesses to value creation, delivery and capture by many researchers in the energy field (Hall and Roelich, 2016; Hannon et al., 2013; Richter, 2013). It is important to note that the business model canvas has both strengths and limitations, as highlighted by Lima and Baudier (2017), Coen (2014) and Ching and Fauvel (2013). However, despite the limitations of the business model canvas, its simplification of external impacts on businesses enables the underlying logic of a business to be easily identified and compared consistently between organisations (Osterwalder and Pigneur, 2010).

2.2. Traditional energy utility value chain

An energy utility, defined by Stephens et al. (2017) is a generator and supplier of energy (electricity, gas and heat) to households, communities, businesses and other organisations that recovers its costs through the charging of rates. These rates are a reflection of the areas of the energy 'value chain' (see Fig. 1 below) across which the energy utility operates (shaded), and traditionally have involved recovering the cost for generating, transmitting, distributing and selling electricity, gas and heat to end-consumers (Wilson et al., 2008).

Whilst energy utilities originally operated across this entire value chain (Hall and Roelich, 2016), liberalisation of modern energy markets, such as those in Europe and Australasia, has focused the majority of energy utilities' operations on the generation, trading and retail of energy (Richter, 2013). This results in a straightforward energy utility business model, used as the definition of an energy utility business model for the purposes of this paper: businesses focusing on profit generation through the sale of (increasingly more) units of energy to an end-customer via energy (typically electricity) generation from large-scale energy plants that are often using non-renewable fuels (Blyth et al., 2014a,b; Hannon et al., 2013). This business model is visualised in Fig. 2 below, and is built around the provision of a low-cost, reliable supply of energy to the consumer (Hall and Roelich, 2016).

The traditional energy utility business model focuses on generating energy via (or sourcing energy from) large-scale projects, typically at the scale of 100s-1000s of megawatts (MW), using a variety of technologies: wind, solar PV, solar thermal, biomass, nuclear, coal, gas (Hall and Roelich, 2016). The value proposition at the centre of this business model (see Table 1 below) is the bulk generation of electricity (and in some cases heat) (Nimmons and

Fig. 1. The traditional energy utility value chain (adapted from Richter (2012)).