Energy Policy 106 (2017) 394–403

Contents lists available at ScienceDirect

Energy Policy

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

A comparative analysis of the costs of onshore wind energy: Is there a case for community-specific policy support?

Anna L. Berka[a,b,c], Jelte Harnmeijer[c,d], Deborah Roberts[d,e,*], Euan Phimister[e], Joshua Msika[d]

[a] University of Helsinki, Department of Forest Sciences, Finland
[b] The Energy Centre, University of Auckland Business School, New Zealand
[c] Scene Consulting, Edinburgh, United Kingdom
[d] Social, Economic and Geographical Sciences group, James Hutton Institute, United Kingdom
[e] Aberdeen Centre for Research in Energy Economics and Finance, Business School, University of Aberdeen, United Kingdom

ARTICLE INFO

Keywords:
Community energy
Onshore wind
Ownership
Economic costs
Risk

ABSTRACT

There is growing policy interest in increasing the share of community-owned renewable energy generation. This study explores why and how the costs of community-owned projects differ from commercially-owned projects by examining the case of onshore wind in the UK. Based on cross-sectoral literature on the challenges of community ownership, cost differences are attributed to six facets of an organisation or project: internal processes, internal knowledge and skills, perceived local legitimacy of the project, perceived external legitimacy of the organisation, investor motivation and expectations, and finally, project scale. These facets impact not only development costs but also project development times and the probability that projects pass certain critical stages in the development process. Using survey-based and secondary cost data on community and commercial projects in the UK, a model is developed to show the overall impact of cost, time and risk differences on the value of a hypothetical 500 kW onshore wind project. The results show that the main factors accounting for differences are higher pre-planning costs and additional risks born by community projects, and suggest that policy interventions may be required to place community- owned projects on a level playing field with commercial projects.

1. Introduction

In order to inform the debate over the desirability of different low-carbon energy scenarios in the UK, recent research has started comparing the relative costs and benefits of policies aimed at maximizing the cost-efficiency of national energy infrastructure on the one hand, versus decentralised, place-based socio-economic regeneration on the other (Bolton and Foxon, 2013; Catney et al., 2014; Foxon, 2013; Johnson and Hall, 2014). Community-owned renewable energy projects are thought to be able to generate a number of local economic, social and environmental benefits over and above those which arise from commercially-owned projects, although benefits incurred are context-specific (Berka and Creamer, 2016; Seyfang et al., 2013). These benefits may range from socio-economic regeneration (Callaghan and Williams, 2014; Entwistle, Roberts and Xu, 2014; Phimister and Roberts, 2012; Gubbins, 2010; Hain et al., 2005; Hinshelwood, 2001), to improved access to affordable energy (Callaghan and Williams, 2014; Gubbins, 2010; Chmiel and Bhattacharya, 2015; Yadoo and Cruickshank, 2010), knowledge and skills development (Armstrong, 2015; Hicks and Ison, 2011; Martiskainen, 2016;), social capital (Allen et al., 2012; Armstrong, 2015; Gubbins, 2010; van der Horst, 2008), empowerment (Callaghan and Williams, 2014; Hicks and Ison, 2011; Radtke, 2014) as well as improved energy literacy, environmentally benign lifestyles (Cox et al., 2009; Hamilton, 2011; Hauxwell-Baldwin, 2013; Letcher et al., 2007; Middlemiss, 2011; Rogers et al., 2012) and increased local support for renewable energy (Warren and McFadyen, 2010; Musall and Kuik, 2011; McLaren-Loring, 2007).

Discourse around community benefits has generated varying degrees of policy support for community energy across the UK (Walker et al., 2007; Slee and Harnmeijer, 2017). Unlike in Germany or Denmark, where community energy was more integral to national renewable energy strategy from the onset, community energy in the UK emerged at the periphery through replication of demonstrator projects, a gradual emergence of regional intermediaries that worked to lobby and adjust market support mechanisms designed primarily to facilitate large-scale commercial development and, eventually, the more systematic adoption and expansion of support frameworks pioneered by a

* Corresponding author at: Social, Economic and Geographical Sciences group, James Hutton Institute, United Kingdom.
E-mail address: deb.roberts@hutton.ac.uk (D. Roberts).

http://dx.doi.org/10.1016/j.enpol.2017.03.070
Received 11 September 2016; Received in revised form 20 February 2017; Accepted 31 March 2017
0301-4215/

pro-active devolved Scottish Government (Berka, 2017; Mitchell and Connor, 2004; Nolden, 2013; Smith et al., 2014). Because of this ad-hoc and bottom-up pattern of emergence, UK community energy today encompasses an array of motivations, ownership and organisational structures, and financial arrangements (see Berka and Creamer (2016) for a characterisation of different types of community energy projects and their relative size and distribution). However, despite the introduction of Feed-In-Tariffs and various grant and public loan programmes to date, the total share of community-owned renewable energy in the UK remains limited (DECC, 2014).

In order to support further growth in community ownership, policy makers require evidence of not only the benefits but also how the costs of community owned renewable energy (CRE) projects compare to their commercial counterparts. If there are additional costs associated with CRE projects, further support may be required in order to realise increased community-owned energy capacity and level the playing field vis-à-vis other ownership models.

The cost structure and factors influencing the cost of commercial renewable energy projects are well established (International Renewable Energy Agency (IRENA), 2012b; Kobos et al., 2006). However, very little research has explicitly analysed cost differences across different ownership models within the renewable energy industry. There has been some research on the costs of CRE in the context of studies comparing the financial viability or local economic impacts of different types of local ownership models (Entwistle et al., 2014; Lantz and Tegen, 2009). Most relevant to the study at hand, Wiser (1997) uses a standard financial cashflow model to compare the project costs of (vertically integrated) utility-owned wind projects with non-utility privately-owned projects (Wiser, 1997). While these approaches have demonstrated that the nature and terms of finance and tax incentives associated with different ownership models can have a substantial influence on overall development costs, they fail to account for a number of factors that may contribute to cost discrepancies between commercial and community-owned schemes. These include the reliance of community schemes on voluntary labour and outsourced expertise, and differences in the perceived risks associated with the two different ownership models.

Against this background, this paper explores the origin and magnitude of cost differences in community-owned and commercial-owned renewable projects, asking: how might social, economic and political risks described in community energy literature translate into probabilities of success at key stages of the project development process? In addition, how do these risks influence actual project costs and viability, compared to commercially owned projects? Based on the findings, the paper explores whether there is there a case for CRE-specific policy support in the UK. Following established definitions of CRE in the UK, we limit our analysis to renewable energy projects that are owned and managed by constituted for- and not-for-profit distribution community organisations established and operating across a geographically defined community (including Community Benefit Societies or Bencoms), and commercial projects as owned and managed by professional private entities (Dóci et al., 2015; Kobos et al., 2006; Ruggiero et al., 2014; Walker and Cass, 2007; Walker and Devine-Wright, 2008).

The analysis is based on an economic model of a hypothetical 500 kW onshore wind project, parameterised using data collected from a survey of community and commercial renewable energy projects in combination with information from secondary sources. Both the Net Present Value (NPV) and Levelised Cost of Energy (LCOE)[1] of a commercial and community-owned project are calculated in a manner that allows for differences in costs, development times and risks at different phases of project development. The financial viability of commercial and community projects are compared at different stages of the development process and the sensitivity of the results tested through a Tornado analysis.

The results show that not all of the cost differences are biased against CRE and not all give rise to substantial differences in project financial viability. However, CRE projects exhibit a number of characteristics that negatively influence financial viability as compared to an equivalent commercially-owned project, particularly when valued at point of project inception.

The paper is structured as follows. Section 2 reviews literature on the challenges and constraints of community-led projects to identify reasons why the costs faced by CRE organisations may differ from those of commercial developers, where possible drawing on relevant theoretical concepts in transaction cost economics, organisational ecology, and technology innovation systems. Section 3 describes the economic model used in the comparative analysis and the data collection process. Results are presented and discussed in Section 4 while Section 5 considers the implications of the findings for community renewable energy policy in the UK and beyond.

2. The influence of community ownership on the cost of renewable energy projects

Table 1 provides an overview of categories of capital expenditures and operating costs of onshore wind energy projects at key stages of the development process, along with the associated risks. Costs that enter directly into project financial evaluations are technology choice, size of the project, the cost of finance, tax and support incentives, grid access and capacity, as well as site location. Economic risks influencing project costs are factors such as interest and exchange rates (influenced by the general economic environment and market context), the ability to find viable project sites, and the nature of contracts associated with the particular project. Non-financial risks inherent to the development process do not typically enter project evaluations but can nevertheless be decisive by increasing costs and uncertainty (Lüthi and Prässler, 2011; Valentine, 2010). These include social risks, such as levels of civic activism and anti-big-wind sentiment, as well as political and technical risks, such as levels of political support for diffused alternative energy and thermal headroom at the nearest grid connection point. These factors affect the perceived risk, bankability and cost of capital, but can also increase scoping and planning costs for instance through the need for planning appeals or alternative development sites (Klessmann et al., 2013; Wiser, 1997).

While community and commercial renewable energy projects share common generic cost categories, literature on community ownership across a range of industries (forestry, water and urban sanitation) suggests that community projects in both the developed and developing world face common challenges that can influence both project costs and the risks to which projects are exposed. These challenges can be categorised as internal process costs, transaction costs, legitimacy costs, and internal diseconomies of scale. These are discussed in turn.

First, communities face higher internal process costs arising from the need to manage their activities to the satisfaction of all members (Aggarwal, 2000; Bank, 2006). Wellens and Jegers (2014) call this challenge a multiple principles situation in which various stakeholders may not only have different expectations of what should be done but also of how decisions should be made. Internal process costs are likely to be particularly high for new organisations, or organisations that have no prior experience in managing complex projects and have not developed decision-making processes and internal conflict resolution strategies. This may make community organisations less able to respond effectively to windows of opportunity and is likely to translate into increased project management and consultancy costs. It is also likely to lead to longer development times, for early project stages in particular (Adhikari and Lovett, 2006; Meshack et al., 2006). Overall,

[1] Expected LCOE is the total discounted cost per unit electricity over the lifetime of the generating asset (in £/MWh), and can be interpreted as the break-even value required by a producer for the project to be financially viable.