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## The Awareness of Renewable Energy efficiency for Supply Chain Management

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**Abstract:** The aim of this paper is to explore the factors related to applications for innovative energy efficiency in supply chain management and provide understanding of community project awareness in relation to barriers for sustainable use of different energy types. This research employs exploratory interviews with experts to understand the applications of energy efficiency and to indicate factors that are considered important barriers to indicate community perceptions of awareness. The paper provides an overview of the field of energy supply chain and therefore will be of high value to top managers, policy makers and academics. It also shows how to understand factors of community awareness for efficient energy supply chain that results in cost savings and innovative effective supply operations.

**Keywords:** *Supply Chain Management; Innovative Energy efficiency; Community Awareness Factors.*

### Introduction

Since those “early days” attention to the whole gamut of issues relating to sustainability have encouraged the development of far more comprehensive models of energy use and consumption (Wong et al., 2012). However, the accuracies of such models, especially in respect of energy efficiency in supply chain management for different domains (e.g. buildings, transport, and factories), remain problematic. The growing energy demand in both developed and developing countries due to high pace of economic growth has increased their import requirements. There is a substantial potential for increasing efficiency of energy use. Estimates of the quantity of possible cost-effective energy savings vary but all studies indicate a large potential for community projects (Painuly, 2009; Thapar et al., 2017). The potential ranges from 10 to 30 per cent over the next two to three decades in industrialized countries (IEA, 2002) to 50-90 per cent in the case of new installations in developing countries and 20-50 per cent in existing installations.

Despite the fact that improving energy efficiency is one of the most desirable and effective short-term measures to address the issue of energy security. The question therefore arises – what is holding the energy efficiency back? What holds energy efficiency back is a combination of various market failures and imperfections, including imperfect competition, externalities, imperfect information, high transaction costs, and organizational failure and barriers. The barriers to energy efficiency are well known and various governments have tried to address them through specific regulations. Main factors that cause market failures and create market barriers for energy efficiency include: financial – a lack of access to finance; technical – a lack of access to efficient technologies; information – a lack of knowledge at main supplier and/or end customer level along with the different functions of supply chain about efficient technologies/products; managerial – a lack of synergy with managerial goals and incentives in businesses; and institutional – a lack of competent

regulatory body. Inadequate or inefficient policies themselves often in turn create more barriers rather than ease them. For consumers, market barriers may also include energy price distortions, high transaction costs, high discount rates, low share of energy costs in overall costs in the supply chain, disconnect between energy use and equipment purchase, etc. Despite huge scope for energy efficiency improvement, the progress in realizing the potential has been very slow due to these barriers in several countries. Therefore, this research paper aims to explore the factors related to applications for innovative energy efficiency in supply chain and provide understanding of community project awareness in relation to efficient use of different energy types. The authors structure this paper as follows: a review of innovative energy efficiency and community project literature is undertaken, the research methodology, findings and discussions, conclusion.

## **Literature Review**

This study strives to contribute to literature on the related topics of innovative strategic choices and performance in community-based enterprises for the renewable energy sector. In the renewable energy sector, the innovation motivators are different than the classical innovation for an entrepreneur, particularly the growth of wealth and market power since they are not possible outcomes in this sector, specifically in a framework of “decentralized energy”, which a sustainable energy market requires (Greenpeace, 2005). Cato et al. argued that the utmost essential innovation in the renewable energy sector is the “social invention” of the mutual model of organization: “The form itself, in a Co-operative and Mutual Enterprise, is the product, rather than a list of separate commodities” (Yeo, 2002). Nonetheless, it has been argued that entrepreneurs’ most significant innovations may be in the nature of the organizational form they choose and the way they choose to measure and distribute the returns from their activities. For many renewable energy entrepreneurs the wellbeing of the local community and the planet is the main motivation, instead of financial or individual gain (Cato et al., 2007).

The renewable energy production at the community level is very promising. It involves people in a neighborhood, who invest in renewable energy technologies jointly and generate the energy they consume, known as renewable energy communities (Docia and Vasileiadoub, 2015). The growing importance of community-based energy production is well illustrated in many countries such as Germany, Netherlands, UK, etc. Gaining a better insight on the motivations of renewable investors at the community level (Marques et al., 2010; Palm and Tengvard, 2011; Paladino and Pandit, 2012) can help policy makers to develop more effective supporting mechanisms to address these communities (Docia and Vasileiadoub, 2015).

Due to the different ways the term community is understood in different projects, Walker and Devine-Wright (2008) established two dimensions to classify community energy projects. The two dimensions are process and outcome. The process dimension considers who is involved in the project, who it is run by, with who the project is developed and their influences. While the outcome dimension refers to the social and spatial distribution in the outcomes of a project, i.e. the project is for who, who economically or socially benefits from the project. Walker and Devine-Wright (2008) classify several observations related to community energy projects. They stated that the notion community should not be taken for granted. Barton (2000) defines community as “a network of people with common interests and the expectation of mutual recognition, support and friendship” (Barton, 2000). Additionally, communities usually have little to do with locality (Barton, 2000) and energy projects can be notable as community “based”, “led”, “set up” or “operated” (Coles et al., 2016). It is presumed that the public likes to be involved in urban community energy projects. It was found that individuals of the public saw the benefits of community based renewable energy in encouraging ways, associated with establishing community spirit and conserving natural resources (Rogers et al., 2008, 2012).

In many countries renewable energy communities have multiplied the last years, even in contexts that the structural conditions are not favorable (Docia and Vasileiadoub, 2015). As a strategy for

accomplishing energy and environmental targets governments in the developed world have encouraged the creation of sustainable energy communities (Romero-Rubio and de Andrés Díaz, 2015). In the German renewable industry, community based renewable energy projects have been the essence of success, which has perceived one of the biggest installations in relations of renewable energy capacity (Docia and Vasileiadoub, 2015). In the United States of America, community-owned wind power development is also becoming a reality (Bolinger and Wiser, 2006).

### **Methodology**

The method is based on exploratory approach. The empirical context of the study is UK. The first step is a review of existing literature on renewable energy supply chain and community awareness. The study can indicate various themes related to applications for innovative energy efficiency in supply chain management and also provide sub-themes of applications based on project awareness in relation to barriers and their dimensions for sustainable use of different energy types. It is obvious that renewable energy applications that have significant potential for contribution in a country will be the candidates for the study of barriers and ways to overcome them. Then, 10 expert interviews along the supply chain of renewable energy applications are conducted to examine the various types of applications and their barriers. A thematic analysis approach is used to analyse the data collected from the expert interviews. Applications and their barriers is explored and analysed at several levels of themes. The first level is application types, the second level is barriers within a category, and the third is barriers' dimensions.

### **Finding and Discussion**

The various applications for efficient renewable energy in the supply chain are the following technologies: pollution prevention measures in existing processes, cleaning technology e.g. bioremediation of polluted soils, cleaner technology, process internal recycling i.e. re-use of material waste, heat and water, measurement technologies of pollution and processes.

At present these are just suggestions based on our preliminary investigation of the examples of community renewable energy schemes in the UK. Further research might also compare these examples with other businesses in the same sector organised according to more traditional business models. We found that all the applications demonstrated independence in the sense of wishing to provide energy to their local community that was independent. In most applications the supply chain operators were concerned to achieve sustainability, although in many examples financial achievements were more important. In the context of associative entrepreneurship profitability needs to be interpreted as sufficient surplus to allow the business to continue: the satisfaction of this criterion was unclear in many cases, which are either nascent or publicly.

There are two types of barriers which are: internal and external. External barriers are concerns outside the firm while internal barriers are concerns within the firm that will delay a firm from doing its innovation initiatives. Barriers as follows: financial barriers (lack of finance from sources outside your enterprise), skill barriers (lack of qualified personnel), lack of information on technology, lack of information on markets, and lack of innovation partners (difficulty in finding cooperation partners for innovation). In a different way, renewable energy barriers were grouped as follows: infrastructural, connected with the form of innovation activity support, in the sphere of education and management, determined by actions of the state, and informational.

### **Conclusion**

With this research, we hope to contribute to the literature. To provide a conceptual framework of renewable energy community in supply chain management. The main focus is on a possible association among the themes of innovative strategic choices; community network; and supply chain performance. This is in community-based enterprises for the renewable energy sector in the UK. This research will also identify an instrument or analytical approach for assessing the

renewable energy entrepreneurial/commercial component of firms. Second, managerial implications: research on renewable energy has the potential to benefit green firms, industries and sectors in countries. This research will advance the knowledge and practices of renewable energy entrepreneurial firms.

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