

# BUSINESS MODELS FOR THE DECARBONATION OF DISTRICTS

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## SUMMARY

In order to be able to holistically evaluate the expected energy and CO<sub>2</sub> performance of the site and to identify optimized infrastructure investment pathways, the master plan will become a dynamic guidepost for the involved stakeholders, a basis for data-supported, collaborative decision making to preserve alignment of the site's infrastructure with shared energy, CO<sub>2</sub> and other performance objectives. A promising initiative is to establish Innovation clusters that are user centred initiatives where knowledge production involves user groups affected by sustainable transitions. Those Innovation clusters are ideally formed on well-established business models to secure user engagement and as a framework for the organisation of user involvement in demonstration projects. Typically, there are three important elements that ensure a maximum of impact. We propose to set up (or use existing) innovation clusters, to establish Innovative business environments (innovation clusters) that have the potential for upscaling and replication of District Decarbonization Solutions.

## INTRODUCTION

Renovation strategies on building level need to be derived as a combination of energy efficiency upgrades for buildings and the use of renewable energy to decarbonise the energy supply, on district or city scale. To this end, (IEA Annex 75, 2017) sets off to define a methodology to identify which strategies are most energy saving and cost-effective when applying both energy efficiency and renewable energy measures. By combining energy efficiency and renewable energy sources, the approach addresses both energy supply and demand in the built environment. In this sense, building retrofitting is an appropriate strategy to reduce demand, while the use of renewable energy aims at decarbonizing the energy supply system.

Nevertheless, to apply the large-scale renovation strategies and achieve the projected building stock decarbonisation, identifying the technical solutions is not enough. The renovation rate in Europe remains well below the targeted annual 3% (Artola et al. 2016; Laffont-Eloire et al., 2019). Some of the main barriers to renovation have to do with the renovation cost and access to finance, as well as complexity, awareness, stakeholders' management and fragmentation of the supply chain (BPIE (2011)). As a result, business models are relevant to implementation and acceleration of renovations. Seddon et al. (2004) defines "business model" as the outline of essential details of a firm's value proposition for its various stakeholders, and the activity system the firm uses to create and deliver this value proposition. In other words, a business model is the abstraction of a strategy, focused on the system of activities through which a firm creates economic value (Seddon et al., 2004).

Innovation clusters acts as ecosystems that create an active flow of information and resources for ideas to transform into reality. Through these ecosystems, a process is started by which more innovators and entrepreneurs can develop and launch solutions to solve real-world problems, faster. This process creates expertise in new areas, helps to diversify the economy, and allows businesses to meet their customers where they are. Additionally, an innovation ecosystem provides the means to create economic stability and

resource sharing (Mas Verdú & Tierno, 2019)].

The value of an innovation ecosystem lies in the access to resources and the flow of information for the ecosystem’s stakeholders. This information flow creates more investment opportunities for the right institutions to connect with the right ideas for their businesses and portfolios, at the right time, for the right reasons.

## RESULTS

Table 1 summarizes the types of business models that these Innovation clusters can follow. There were basically four different business model archetypes identified which can be split in several types and even sub-types.

There is a large variety of business models for the energy supply. For the energy supply, three kinds of scope of the business models can be defined:

1. demand response (DR) and energy management systems (EMS), electrical and thermal storage (ETS)
2. solar PV businesses (PV)
3. However, there are other objectives that are to be fulfilled as well. Buildings are more commonly seen as micro-energy hubs with energy generated, stored, used and saved in buildings and districts, aiming at (BPIE 2016):
  - Maximise energy efficiency of the buildings
  - Increased on-site or nearby RE production and self-consumption
  - Encourage energy storage capacities in buildings (or nearby)
  - Incorporate demand-response capacity in the building stock
  - Decarbonise the heating and cooling energy for buildings
  - Empower end users via smart meters and controls
  - Make dynamic price signals available for all consumers
  - Foster business models aggregating micro-energy hubs
  - (Re)Build smart and interconnected districts (renovate/retrofit)
  - Build infrastructure for further market uptake of electric vehicles

**TABLE 1: SUMMARY OF BUSINESS MODELS**

archetype	type
Going green business models	Utility-side renewable energy model
	Prosumer model
Building energy communities business models	Utility-Sponsored Community (USC) model
	Special Purpose Entity (SPE) model
	Energy cooperative model
	Local white label model
Lock-in oriented business models	BM that offer energy functionalities

	Energy service agreement
	Third-party model
Complementarities-oriented energy supply business models	Optimizing grid operations
	Combining value propositions
	Acting locally
Efficiency-oriented energy business models	Scaling-up
	Running platforms

In accordance to the characteristics defined in the previous section the most predominant archetypes of business models for the energy supply are presented and discussed below. Four distinct themes that outline the value creation drivers for the energy supply business models (BM) have been identified:

- **Going Green** BMs are the ones where new ways of performing the economic transactions have been adopted. Accounting for the content element, the fossil fuel energy is replaced in these BMs with renewable energy resources, thus they are mostly technology driven BMs, nowadays with a strong predominance in the solar PV businesses, resulting in a pattern category named “Going Green”.
- **“Building energy communities”** is the second pattern category where new organizations based on the co-participation form are addressed in the structure element, while the governance element is based on shared resources and governance.
- **lock-in** centered business models refer to the ability of the firm to attract, maintain and improve customer and partner association with the BM.
- **Complementarities**-centered BMs refer to the BM having a bundle of goods together instead of providing each of the goods separately and finally
- **efficiency**-centered BM are the ones where measures are taken in order to achieve increased transaction efficiencies.

**CONCLUSIONS**

The energy sector is undergoing a continuous process of transformation where a fundamental shift of energy supply towards renewable, CO2 neutral energies is taking place, together with a decentralization and digitalization. The classical structure of the electrical energy industry that emerged after the liberalization of the electricity and gas markets in Europe including established business models, is subject to disruptive and massive changes.

Business models in the electric power sector are embedded in the regulatory and policy frameworks that characterize the sector. State- or national government-appointed regulatory commissions regulate the revenues of electricity distribution companies. The revenues – and thus the viability – of distributed renewable energy businesses (DER) in distribution networks are therefore exposed in part to these regulatory frameworks. Similarly, in wholesale electricity markets, market rules are established by a central authority, Independent System Operators [ISOs] or Regional Transmission Operators [RTOs], all entities monitored and regulated by an Energy Regulatory Commission [FERC]). New DER business models selling services in wholesale electricity markets must conform to the market rules and regulations established by these authorities. In addition, the electric power sector is subject of significant national and EU policy support, taking the form of subsidies or favorable rules for a variety of technologies. Understanding these policy and regulatory interdependencies is critical to ensuring the sustainable

development of these businesses.

- Five different archetypes of BM were identified that ensure a maximum of impact.
- We propose to set up (or use existing) innovation clusters, based on these promising BM to ensure that innovative business environments (innovation clusters) will grow that have the potential for upscaling and replication of District Decarbonization Solutions. ...
- There are no specific business models for energy supply applied to renovation of districts.
- Uncertainties in the supportive measures for the application of DER makes it difficult to develop new business models for the utilities.

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