MUSE GRIDS

MULTI UTILITIES SMART ENERGY GRIDS

Business Models for energy communities
The experience of MUSE GRIDS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824441.

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1. ¿ What is an Energy community?

Community energy refers to collective energy actions that foster citizens' participation across the energy system.

Energy communities can work in different angles such as:

i) **Electricity generation from RE**

ii) **Energy efficiency services (as building renovation)**

iii) **Supply, aggregation, energy storage and potentially distribution.**

iv) **Electric vehicle recharging services**

Community wind farm, Denmark
(Source: Amigos de la Tierra)

Source: energy.ec.europa.eu

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2. European regulatory framework

European Directives:

i) **Renewable Energy Directive**, RED (EU Directive 2018 / 2001, promotion of the use of energy from renewable sources, Art. 22)

ii) **Citizens' Energy Community**, CEC (EU Directive 2019/944 on common rules for the internal market in electricity, Art. 16)

It proposes the promotion by the member states of the energy communities but does not deepen what competences they have or how to carry them out.

Each Member State has provisions concerning the energy communities:

i) Shared self-consumption

ii) Geographical scope

iii) Grants

iv) Regulatory test benches

Source: energy.ec.europa.eu

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3. Introduction to the MUSE GRIDS project

The main objective of MUSE GRIDS is to **deliver a key contribution to the roll out of multi-energy management systems in the context of local energy communities**

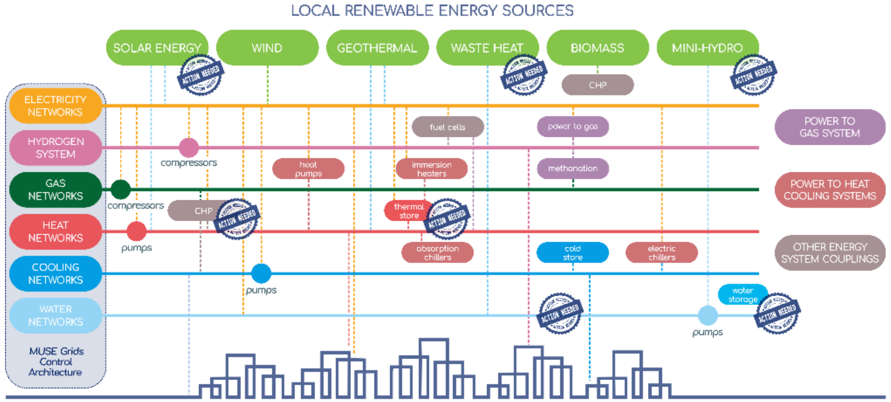
The project decisive objective is to demonstrate in two real test cases (Oud Heverlee and Osimo)

i) **how to interconnect local energy grids**

ii) **how to utilize synergies in the energy system to maximize efficiency, reduce cost, CO2 emissions and energy losses**

iii) **how to reach an affordable energy independency mainly maximizing local self-consumption based on RES.**

This interconnection will be achieved integrating **in two "real energy islands"** different flexible technologies (i.e. EVs, electro-thermal storage, large thermal storage, batteries etc.) and optimally managing them via proper **multi-energy demand side management (DSM)** driven by end-user habits.



Source: muse-grids.eu/

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4. Demosite Overview

City of Osimo

The demosite is the **whole town of Osimo** (~35,000 inhabitants), in Italy.

Indeed, since it has just one point of connection with the national grid/TSO, it configures itself as a **municipal microgrid**.

Most of the energy networks are **managed by the local utility** ASTEA or by its subsidiary companies (e.g., DEA, the local DSO).

Source: muse-grids.eu/

Osimo assets

Osimo's microgrid is characterized by several distributed generation technologies:

•A 1.2 MWe **CHP gas engine** serving a DH network of roughly 1250 users. It will be coupled from the 2018/2019 heating season with a high temperature Heat Pump to optimize the management of the CHP, making it more flexible and adaptable to Osimo's microgrid electric load.

•More than 30 MWp of **PV** and 400 kW of **mini-hydro**.

•A 200 kW **plant fed by liquid biomass.**

•Two **biogas plant** for a total power production of 2 MW.

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4. Demosite Overview

Rural street in Oud-Heverlee

The last dozen of houses in a rural street, which is at the end of local distribution line, in the **Belgian municipality of Oud-Heverlee**.

These houses in Oud-Heverlee will become **a microgrid at the end of the distribution line**.

They will **act as a real energy island**, being more autonomous and independent in weak connection situations

Source: muse-grids.eu/

Oud-Heverlee assets

Ous-Heverlee's microgrid is characterized by several distributed generation technologies:

- 65 kW **PV installed**
- 5 full **EVs** and 3 **hybrid cars**
- Seven buildings have **heat pumps**
- One building has a **fuel cell** (750 W electrical power) and another one of the buildings has **seasonal storage** (24 000 litres hot water), **hybrid PV**, **heat pump**, 2 **EVs** and **static batteries**

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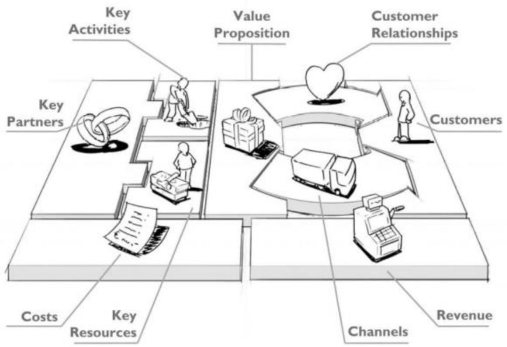
5. Business model definition and methodology

Definition

A business model can be defined as the steps required for a company to succeed in capturing value from a specific activity. .

The energy community framework created by the before-mentioned directives is expected to **boost innovative business models and attract private and public investment**.

This will allow energy communities to **become more commercial** and **diversify their revenue streams** by offering novel energy services in addition to local energy generation



Methodology

One of the most applied frameworks is the content-oriented **business model canvas** from Alexander Osterwalder.

It is a trend-setting concept for business model generation covering the main areas**: customers, offer, infrastructure and financial viability.**

The author of this methodology proposes a **9-block approach** that helps to identify, cluster and value business model:

1. Infrastructure
   a. Key activities
   b. Key resources
   c. Key partners
2. Offering
   a. Value proposition
3. Customers
   a. Customer segments
   b. Channels
   c. Customer relationships
4. Finances
   a. Cost structure
   b. Revenue Stream

Source: Alexander Osterwalder, Yves Pigneur (2011

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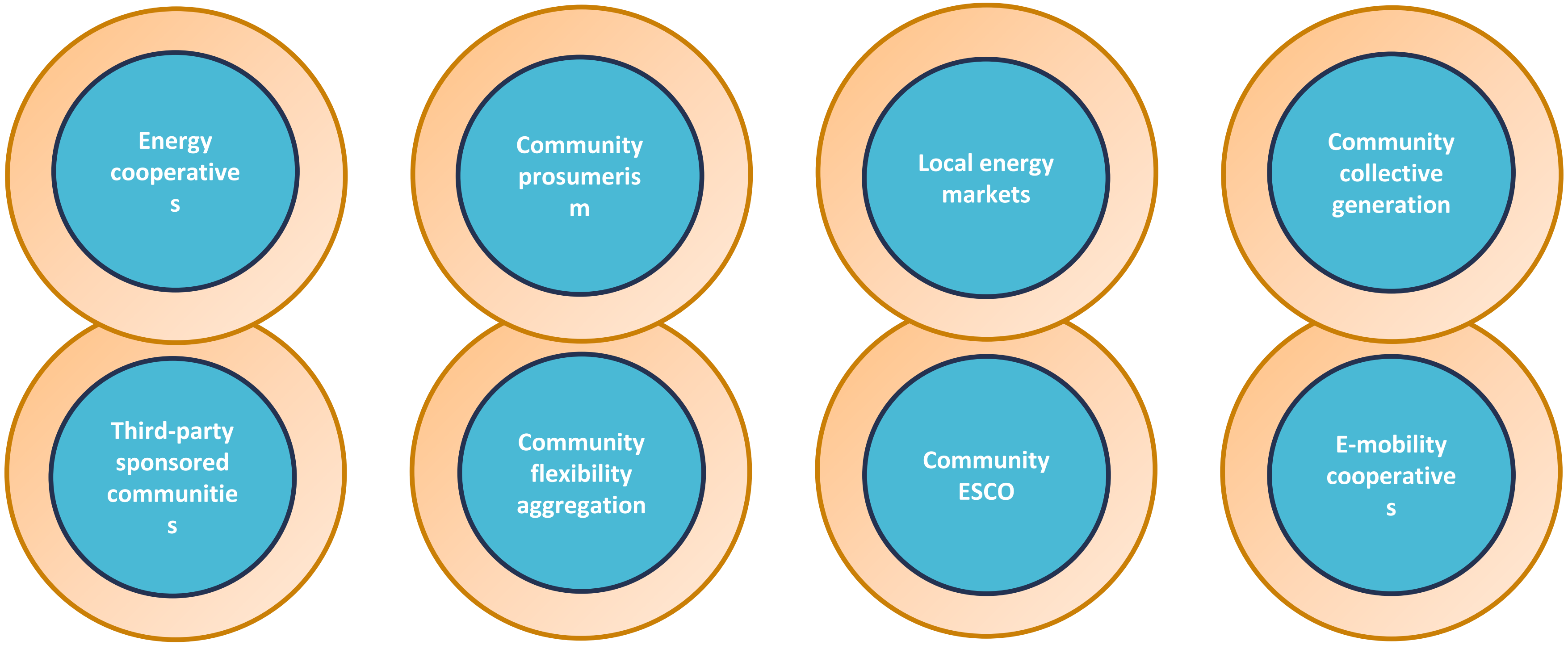
6. Business models archetypes



Source: Inês F.G. Reis (2021)

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7. Identified business models

Virtual Utility or Virtual Power Plant (VPP)

Decentralized management based on the aggregation of several DERs can potentially overcome the apparently inevitable increase in complexity of system operation, and here is where the concept of ***Virtual Power Plant*** **(VPP)** takes relevance

- Can be defined as a cluster of dispersed generating units, flexible loads, and storage systems that are grouped in order **to operate as a single entity.**
- The generating units in the VPP can **employ both fossil and renewable energy sources.**
- The primary purpose of a VPP is thus to **coordinate the production and consumption** of its constituent parts with a view to **maximizing their performance.**

Block	Result
Key Partners	Technology providers
Key Activities	**Aggregate energy generation, Balance supply and demand**
Key resources	IT infrastructure, technology, smart grids
Value Propositions	Aggregation of distributed energy sources Balance supply and demand to favor the low energy costs and the demand response
Cost Structure	Purchase energy technology costs, IT and Smart grid infrastructure
Revenue Streams	**Margin on purchasing and selling energy to consumers**
Customer relationships	Tailored services
Customer segments	**Energy producers and consumers**
Channels	On-line software platform

Relation with exploitable results

MUSE GRIDS DSM, Smart Electro-Thermal Storage, Large insulated outdoor TES, Smart Water Pumping system and Neighbourhood battery

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8. Identified business models

Automatic Energy Management and Monitoring

The automatic energy metering and monitoring business model is a service that includes the installation of smart meters and controls to enable the client to self-monitor energy consumption, discover, and quantify energy savings opportunities.

- Building automation can **optimize energy efficiency** in buildings.
- **Climate control, lighting, water saving, and power management** are all important considerations in this BM.
- This business strategy is typically **implemented by industry and the service sector.**

Block	Result
Key Partners	Service companies
Key Activities	**Installation systems for monitoring and metering the use of energy**
Key resources	Direct access to retail distribution products
Value Propositions	Provides service including self-monitoring systems
Cost Structure	Installation costs, commercial costs, energy consumption costs reduced
Revenue Streams	**Selling of smart meters and control systems**
Customer relationships	Direct relationship between company and customer
Customer segments	**Private citizens and public bodies**
Channels	Market where energy tech is increasingly used

Relation with exploitable results

MUSE GRIDS DSM

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9. Future business model developments

Platform model

A platform is a business model that provides value by allowing two or more interdependent parties, usually customers and producers, to exchange information.

This platform can be based in markets. There are two types of markets that are at the head of this kind of developments.

- **Local Flexibility Market** provide opportunities and trading environments for the DSO by encouraging the users to localized flexibility trading.
- **Energy trading P2P market** provide users the capability to exchange energy amid them to reduce costs and improve the EE.

Energy Performance Contracting (EPC)

Energy Performance Contracting (EPC) is a type of "creative financing" for capital improvement that allows energy upgrades to be funded through cost savings.

An external organization (Energy Service Company - ESCO) performs an **energy efficiency project** and uses the stream of income from the cost savings to repay the project's expenditures.

Essentially, the ESCO will not be paid unless the project achieves the promised energy savings.

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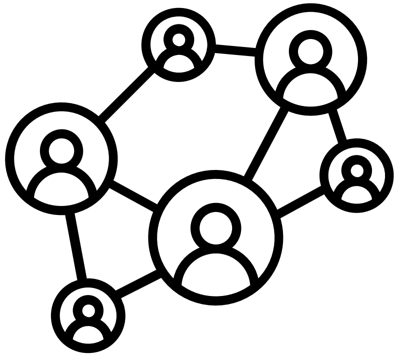
10. Conclusion

The three key insights to gather from this analysis would be:

- The development of business models in LEC is a key factor for their progression in the energy sector.
- A great number of business model can me proposed for LEC due to their adaptability and the increment of projects related with them.
- European and country regulations must step forward to improve the development and viability of business models related to LEC.



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¡Thank you!

If you have any doubt, send me an e-mail

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