What is an energy community? A taxonomy for investment evaluation applied to four pilots

Work in progress

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Background (1/2)

- This study starts form the work done during the EU project **NEON - Next-Generation Integrated Energy Services fOr Citizen Energy CommuNities**

NEON is committed to conduct coordination and support activities aimed at advancing **cutting-edge technologies and concepts to deliver innovative integrated energy services for Citizen Energy Communities (CECs).**

To achieve this goal, the project's primary focus is on *enhancing the energy efficiency of buildings*, promoting the production and storage of renewable energy, and fostering demand flexibility and *reduce CO2 emissions.*

Background

(As we all know at this point)

- EU policy wants to increase the integration of **small producers** in the network
- Integration shall involve also **consumers/*prosumers*** in the network, often in aggregated forms (new agents, like *aggregators* or *energy communities*)

- **Challenges** for the network => increased operation costs due to the presence of new peripheral energy sources => need to manage the integration involving consumers and prosumers

EU definition for Energy Communities

Energy communities are (from https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en)

“Citizen-driven energy actions that contribute to the clean energy transition, advancing energy efficiency within local communities”

- **Energy efficiency**
- **Provision of flexibility**
- **Stimulus for investments (?) in the Energy Transition**

Our questions

PROJECT QUESTION

- Is it **profitable** (or at least financially sustainable) to invest in an energy community project?
- How to design *advanced* energy performance contracts (**EPC**) to manage the participation of new agents?

RESEARCH QUESTION

- What does it mean investing in a Energy Community project? What am I investing in?
- EPC* are based on energy savings: **what** are we saving?

Pilot communities: overview

The project analyses four potential energy communities. These four realities already show different levels of endowments and different characteristics (little sample, many cases)

1) Italian village in the Sardinian montains. Only residential loads

2) 3 residential buildings in the French Alps

3) Residential + industrial buildings in Spain

4) Offices and commercial + residential in France

Challenges in investment evaluation

PRIVATE SIDE

- Each project shall be evaluated per se (avoid cross subsidizing)
- EC project are composed, but still there are some differences and we need to know whether we are investing in “simple” RES or in community projects

PUBLIC SIDE

- Avoid double counting
- Give value to externalities (both positive and negative)

Traditional approaches to foster private investment lack in a proper evaluation of externalities. They are somehow managed through incentives, but lack in clarity of purposes and frameworks lead to underperforming schemes.

Pilot 1

EXISTING BUILDINGS
Information about consumption

EXISTING (SUNK) AND POTENTIAL INVESTMENTS
For RES production

ASSUMPTIONS (AND SENSITIVITY) ON SELF-CONSUMPTION RATES
Wtp to the EC

Revenue from REC		
Energy shared	5.408	€/year
Injected into grid	413	€/year
Dispatchment	442	€/year
TOTAL	**6.263**	**€/year**

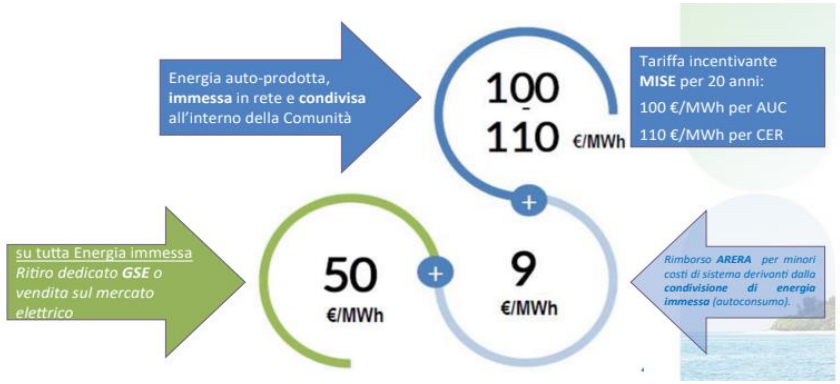
Non-disbursement for energy selfconsumed for prosumers		
TOTAL	**26.277**	**€/year**

Non-disbursement for energy in F3 thanks to energy stored i n BESS		
TOTAL	**10.392**	**€/year**

Benefit for single prosumer	
Prosumer	
1.085	**€/year/user**

Proportional benefit		
Prosumers	Consumers	
31.684	**6.263**	**€/year**

Approximate investment costs		
Technology	Unit Price	Unit
PV system	2000	€/kWp
Smart Meter	250	€/pod
Platform	200	one-off 200 €/user
Battery Energy Storage System	1100	€/kWh



From GSE.it

What emerges

- Pilots are supposed to provide first examples of energy communities, but:
  - The presence of country incentives affect the structure of the community. More attention to reach the score for incentives rather than to reach the scopes (e.g. optimal sharing, services to the grid, flexibilities…)
  - Investments are mixed and evaluate all together
  - Rules for contracts are not clear/not ready enough

⇒ **These problems are pretty well known among practitioners**

⇒ **We need to fill the gap going to the basis: this should avoid great uncontrolled expenses (differently from initial RES, technology is mature; it's a matter of policies)**

Long story short

COSTS

- EC projects are quite similar to RES projects

BUT

They need to include high tecnological effort to manage data that allow for all the **active measures** to collaborate with the network
(Note: marginal contributions?)
(Note 2: Building envelopes are not EC investments)

BENEFITS

- Externalities are big players in the EC projects, and this justifies the presence of incentive schemes

BUT

Are incentives working for the correct EC targets?

- Impacts on the network
- Social (?) impacts

(Note: negative externalities not included here, but still they do exist)

Special surveillance

- **Impacts on the network**

Increased self-consumption is not sufficient
More **discussion with operators needed**
Too passive
(where is the *smartness*?)

- **Social impacts**

Too vague
Policy targets shall be defined
Redistribution policies shall be defined
(otherwise: be aware of possible distortions)

(Preliminary) Concluding remarks

Our work started from a **very practical issue**:

$\Rightarrow$ Are investments in Energy Community projects financially sustainable?

$\Rightarrow$ Which are the EC related investments?

$\Rightarrow$ Which costs and which revenues are strictly related to the EC?

Nowadays, the definition of EC is too wide.

Similarities

Do you remember the smart grid?

"After this overview, we identified the final outcome of investments in SGs in the reduction of market risks faced by market players, such as production firms, consumers, and distribution system operators (DSOs) who manage local grids. The latter also play a crucial role in undertaking investments that may improve the smartness of the local distribution grids."

Bertolini M., Buso M., Greco L., 2020. "Competition in Smart Distribution Grids", Energy Policy, vol. 145 October 2020, 111729.

EC can't be defined only «technically», because the *social* component shall be exploited

Concluding remarks 2

- Wide definition => less investments, due to higher risk perceived
- Political vacuum => better for incumbents, unbalanced market power

=> Low or undesired effects of incentives and policies

=> Need to invest in what is missing (dialogue with operators, for sure)

Energy transition is a real need, no time for procrastination

Far more open issues

- Contribution to balancing markets, network stability, renewable integration:
  => **Are EC correctly sized?**

- Frequent data exchange, effort from consumers and prosumers:
  =>**Hidden costs/ negative externalities**

Bergemann D., Bertolini M., Castellini M., Moretto M., Vergalli S.
«Renewable energy communities, digitalization and information»
Nota di Lavoro **037.2022**, Milano, Italy: Fondazione Eni Enrico Mattei

Thank you for your attention!

With the support of the projects

“The future of energy: institutions, regulation and enabling factors” by Levi Cases Centre of Energy Economics and Technology

&

GRINS – “Growing Resilient, Inclusive and Sustainable”, Spoke 6

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