

Understanding households' decision to become electricity producers and their role in the future energy landscape.

Case studies in France with photovoltaic electricity producers.

- Véronique BEILLAN (EDF R&D, France)
- Aurélie GOATER (Alphéeis, France)



Context, goals and methodology

Goal

- ◎ **Understand households' decision to become electricity producers;**
- ◎ **Get insight into their personal aspirations for the future, as producers, and into their willingness to take a more active role in balancing electricity production and consumption**
 - Why? : the key issue behind is how to achieve a successful integration of renewable but intermittent energy into the power grid and to what extent private producers could contribute to the electricity network supply-demand balance.

Methodology

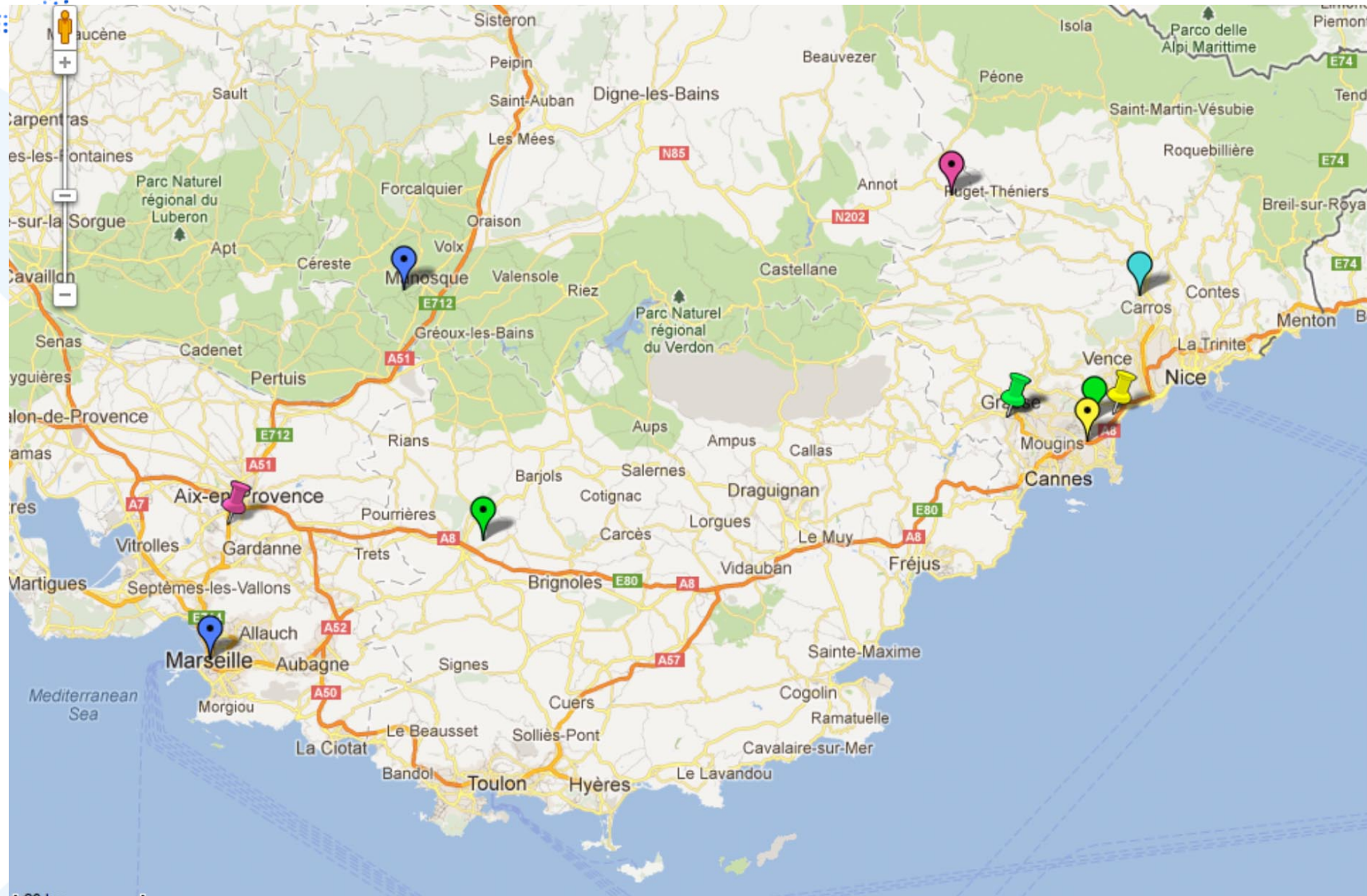
- ◎ **A qualitative study in South East France to investigate the profiles of households equipped with PV systems, their motivations, their attitudes towards energy and consumption practices** (PACA region):
 - preliminary interviews with 5 professionals in contact with households equipped with a PV system, to explore their perception (*which profiles of households have invested in PV so far and why?*)
 - In-depth interviews with 12 households equipped with PV systems.



What do previous studies tell us on power producing households profiles and motivations?

- Many analysis and debates on the role of Decentralized Power Generation (DPG) in energy policy and on energy behavior change,
 - microgeneration might raise consumer awareness and encourage changes in consumption patterns.
- but there is still a lack of knowledge concerning the profiles and the motivations of PV power producers and their willingness to take an active role as power producer.

Main sites where we have conducted interviews





Profiles of the interviewed households

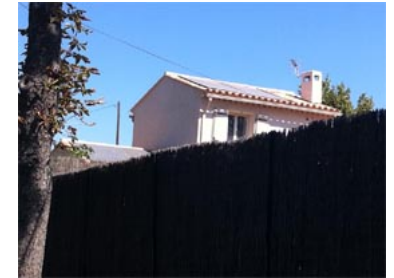
◎ Presentation of the interviewed households & characteristics of their project:

- Owners of detached houses in urban / peri-urban zones - houses built between 1950 and 2000
- Working adults in their fifties or sixties, including a few retirees
- A broad range of professional backgrounds:

healthcare, company managers, employees, teachers ; two people with jobs in the field of construction and energy (building inspector & work supervisor in a school)

- PV installed 1-4 years before (<3kWp PV system). The electricity produced was systematically sold and exported back into the grid.
- The PV project was not the single and only energy-related project in most cases:

thermal insulation work on the house, change of the heating system, installation of a thermal solar water heater, re-roofing...





Motivations to become electricity producers (1/2)

◎ 5 types of motivations identified on the panel:

- Financial motivation:

- a profitable investment thanks to incentive policy (tax deduction, advantageous feed-in-tariff);
- a way to reduce the electricity bill, indirectly;
- a way to protect oneself against future energy price increases (anticipation);

(importance of economic motivations highlighted in Beslay 2011 for technologies in the normalization phase)

- Desire to take actions that help protect the environment:

- a way to promote “green energies” and reduce greenhouse gases;
- to develop an alternative to nuclear power ;
- to help avoid the construction of new power lines (costly for the community and the environment);

(presence of environmentalist profiles also shown in Tengvard 2009 among small scale producers)

- Wish to gain more autonomy in energy production / and independence from the grid:

- a way to protest against the system in place and its key players; *(as seen in Tengvard 2009)*
- satisfaction to produce on-site and gain in autonomy: “Realizing that you produce your own electricity, it’s great.”;
“I like being self-sufficient”
- a way to minimize one’s own vulnerability to power cuts;

- Desire to take an active role in the energy transition process:

- search for alternative ways to produce energy, using local, “free” & cleaner energy;
- wish to consume differently, by reducing energy needs;

- Professional interest:

- demonstration or trial purposes.



Motivations to become electricity producers (2/2)

- ◎ These motivations were often combined with one another:
 - in most cases: financial & environmental motivations were combined
 - environmental aspects did play a role (even though the financial motivation was a key driver)
(similarities with the motivations profiles encountered in previous studies: Tengvard, 2009; Ademe, 2011)
 - desire to contribute to the energy transition + professional interest
 - environmental motivations (energy sobriety and a desire for alternative ways to produce energy) + desire to gain more autonomy
 - financial motivations only for 2 households.

☞ even though the financial motivation was quite often decisive, it acted more as an “enabler” than a “key driver” in some projects : *[“It was for us an alternative to nuclear production; The incentives measures allowed us to act. We couldn’t have afforded to install PV panels without subsidies”]*

☞ deliberations about the role of the customer in the future energy landscape - with decentralized power generation - should take into account the various rationales of the individuals



Energy approaches of the interviewed households (1/2)

- ◎ The decision to become an electricity producer was influenced by households' energy representations and practices.
- ◎ 4 types of “energy approaches” were observed in the sample:
 - the « efficiency » approach to energy
 - *hate to waste energy, have upgraded the thermal insulation of their house...*
 - *consider renewable energies as “natural” and “efficient” because they are “free”, “largely available”*
 - the « financial » approach to energy
 - *cost is the main criteria when making a decision (on the type of equipment...)*
 - the « sobriety » approach
 - *efforts to decrease the energy needs : desire to become a player in the energy transition ;*
 - the « comfort » approach to energy
 - *comfort is first (don't like to waste energy but not ready to sacrifice comfort to save energy / money).*



Energy approaches of the interviewed households (2/2)

=> For most projects, a link could be established between the energy approach and the decision to become an electricity producer.

- The decision to install a PV system is the expression of individual perceptions of energy / and feeling that the energy context is changing :
 - scarcity of energy resources, rising energy prices, climate change and necessity to develop low carbon energy generation.
- The PV project is an answer to this energy context. It is a way to:
 - potentially access free electricity in the future,
 - gain more autonomy / and independence from the grid (according to them),
 - use energy sources available locally,
 - become a “driving force” for change, by developing more sustainable lifestyles.



Impact of the project on energy consumption practices

- ◎ Our hypothesis - following many previous analysts (Keirstead, Sauter & al., Bergman & al., Pehnt & al., Beslay):
 - on-site energy production can raise households' awareness about their energy consumption and encourage energy saving practices.
- ◎ Our study showed:
 - no apparent impact on households energy consumption practices.
- ◎ Barriers: households were generally not aware of the quantity of electricity they were producing compared to the quantity they were consuming:
 - the production was sold/ not consumed on-site => lack of appropriation
 - consumption and production reported on two separate bills
- ◎ Some would have been interested in consuming on-site but were not encouraged to do so.

☒ The social technical configuration (*policies, incentives, infrastructures and technologies: lack of storage technologies relevant from a technical and economic point of view*), shapes the scope of action available to the user.

☒ In France, the current configuration tends to limit the choice of the household (*electricity produced not consumed on-site*)



Relationship to the power grid and perception of flexibility – *from the consumer point of view*

- ◎ The interviewed households were aware of the local issues on electricity supply, but were more or less sensitive to it - depending on their own previous experience of power cuts.
- ◎ Most of them claimed to be ready to take actions for maintaining the stability of the grid:
 - reducing consumption during peak hours was considered a “citizen gesture”: people were ready to slow down their energy consumption:

“There are changes to be made. Trying to reduce our electricity consumption during critical periods is a minimum”.

“If I was told tomorrow that the PACA region had reached the maximum of production and that I should accept having a system installed that does micro cuts, well I would do it. I wouldn’t be very happy, but I would do it for the general interest”
 - ...but they expressed reservations regarding the associated potential constraints for their everyday life;
 - dynamic pricing schemes: considered with some mistrust by more than half of the interviewees.
- ◎ Their participation would occur only under certain conditions:
 - involvement of all social stakeholders (*communities, companies, not only the inhabitants*);
 - anticipation and minimization of the potential drawbacks (*impact on comfort, cost, social equity*);
 - transparency of the process with issues and benefits clearly defined for the various stakeholders;
 - based on volunteering.



Relationship to the power grid and perception of flexibility - *from the producer point of view*

- ◎ The households perceived local decentralized generation as a tool to complement the grid and/or as an alternative to the grid:
 - a substitute for the construction of new power lines / or simply a back up for the power grid:
 - 7 out of 12 made a link between the tense regional context and their PV project (it gave a meaning to their project)... even though supporting the network was definitely not a driver;
 - a way to be active in the energy transition / to help develop other ways to produce electricity;
 - a way to distance themselves from the grid.
- ◎ The stability and reliability issues raised by the integration of renewable energies on the electricity network were not perceived as key issues yet.



Conclusion (1/2)

◎ Households in France invested hugely in PV installations between 2006-2011. Two interplaying types of factors have played a role :

- the favorable context created an opportunity:

- financial incentives, positive image in the media, maturity of the technology...

- this opportunity materialized under the influence of more “personal” factors:

- approach to energy, perception of the energy context, relationship to the grid,
- personal values (protection of the environment...), knowledge, abilities (influenced by peer discussion ...)

◎ Motivations:

- In most cases, investing in PV was not solely a financial investment :

- environmental aspects did play a role, as well as the desire to support the energy transition process;
- there is a link between the energy approach of the households and their decision to invest in PV;

- On-site consumption of the electricity produced may become an important driver for DPG in the future, when the context becomes more favorable, given that households have expressed a desire for it.

- Some interviewees made a link between the tense electric regional context and their PV project, but providing support to the grid was clearly not a driver yet.

☞ the rationales of the households are diverse (this should be considered for the design of public policies)



Conclusion (2/2)

- ◎ PV producers may take a more active role in supporting the electricity grid but their participation depends on clear conditions:
 - Interviewees have in particular stressed the importance of norm activation for a better acceptance of demand response solutions (involvement of all as stakeholders required);
 - they express concerns about comfort;
- ◎ The stability and reliability issues raised by the integration of renewable energies on the electricity network are not perceived as key issues yet (*“as long as electricity works, people do not worry”*) .



Thank you for your attention

Questions?

- Véronique BEILLAN (EDF R&D, France) : veronique.beillan@edf.fr
- Aurélie GOATER (Alphéeis, France): aurelie.goater@alpheeis.com