Final report

1.1 Project details

Project title	Solcelleejeres motivation og adfærd som prosumers
Project identification (program abbrev. and file)	
Name of the programme which has funded the project	ForskEL- Indsatsområde Marked og Samfund
Project managing company/institution (name and address)	Aalborg University A.C. Meyers Vænge 15, 2450 Copenhagen SV
Project partners	Seas-NVE Norlys (formerly Eniig)
CVR (central business register)	29102384
Date for submission	26 April 2020

1.2 Short description of project objective and results

The project has set out to investigate what types of households that have bought solar PVs in Denmark, what motivated them to buy, and finally, how the PVs have affected their everday life and electricity consumption patterns. We find that PV owners are different from other households regarding socio-economic characteristics and that the PV system affect the prosumer households in different ways, for example by being more engaged in energy consumption (practices).

1.3 Executive summary

The project has provided new evidence on why households buy PVs and how such PVs affect the everyday lives of these so-called prosumers. Thereby, the project contributes to existing research in several ways. First, by providing new evidence on unexplored aspects of 'prosumption', for example in relation to time-shifting of practices and the link to household practices such as hobbies and DIY work. Second, by utilizing much more extensive datasets than previous studies, for example based on a full population of PV owners, and by applying mixed method analysis based on survey data as well as qualitative interviews.

1.4 Project objectives

A future energy system based on renewable energy rely on expanding the electricity generation from solar photovoltaics (PV). Small-scale PVs on private houses might contribute in two ways to a sustainable transition. First, by contributing to producing more renewable energy to specific households and the energy system, and second, by 'engaging' prosumer households in energy consumption and production, which might indirectly support the success of a new energy system based on more intermittent energy sources. Therefore, we need more knowledge about the process of acquisition of PVs, for example motivation and context, as well as how these PVs influence the everyday lives of prosumer households, for example time-shifting of energy consumption and increased engagement.

1.5 Project results and dissemination of results

The project has six main results. First, Danish PV owners seem generally satisfied with their PV system. Second, Danish PV owner households are significantly different from other households, especially by tending to have higher income and more often a technical educa-

tion. Third, three primary forms of motivation for buying PVs seem to have driven acquisition of PVs. These were motivated by becoming self-sufficient, showing a good example to others and by economic gain. Fourth, PV households, especially those on hourly or immediate net metering scheme, tend to time-shift their consumption to when the sun is shining. Fifth, PV owners tend to state that they become more engaged and interested in energy production and consumption. Sixth, some PV owners develop specific energy-production practices, for example, where reading and optimization of production becomes a hobby.

These results were published in six publications, where two are in press. However, in addition, the results are presented in working papers, one under review and two underway, which are going to be sent to international peer-reviewed journals. This is much more than we promised in the application.

Publications

1. ”Hverdag med solceller: Hvem har købt? Hvorfor har de købt? Og hvordan påvirker det deres hverdag og elforbrug?” (2020). Policy brief (in press).
2. ”Hjemme med solceller på taget: Hverdagsliv, energiforbrug og teknologinørderi” (2020). Peer-reviewed report by Mette Mechlenborg, Anders Rhiger Hansen og Kirsten Gram-Hanssen, Eva Sass Lauritsen og Gitte Wad Thybo. Polyteknisk Forlag (in press).
3. ”Three forms of energy prosumer engagement and their impact on time-shifting electricity consumption” (2019) Conference paper in proceedings by Anders Rhiger Hansen, Freja Friis, Mette Hove Jacobsen og Kirsten Gram-Hanssen i: ECEEE 2019 Summer Study Proceedings. https://vbn.aau.dk/da/publications/three-forms-of-energy-prosumerengagement-and-their-impact-on-tim
4. ”Hverdagsliv med solceller og motivation for køb: Spørgeskemaundersøgelse blandt private solcelleejere i Danmark” (2019). Report by Mette Hove Jacobsen, Anders Rhiger Hansen og Kirsten Gram-Hanssen, Statens Byggeforskningsinstitut, Aalborg Universitet, København. https://vbn.aau.dk/ws/portalfiles/portal/312630204/SBi_2019_05.pdf
5. ”Solcelleejeres motivation of adfærd som prosumers” (2018) Report by Eva Sass Lauritsen (Cerius).
6. ”Private solcelleanlæg i Danmark: Hvem har købt? Og under hvilke forhold?” (2018). Peer-reviewed report by Anders Rhiger Hansen, Kirsten Gram-Hanssen, Gitte Wad Thybo, Jacob Vestersager Engdal og Eva Sass Lauritsen.Polyteknisk Forlag. https://sbi.dk/Pages/Private-solcelleanlaeg-i-Danmark-Hvem-har-koebt-Og-under-hvilke-forhold.aspx

Working papers

1. ”PV-prosumers and their time shifting of energy consuming everyday practices” by Kirsten Gram-Hanssen, Anders Rhiger Hansen and Mette Mechlenborg. Under review in *Sustainability*
2. ”Motivated by values, economics, or independency? New insights on why households buy PVs” by Anders Rhiger Hansen, Mette Hove Jacobsen and Kirsten Gram-Hanssen.
3. ”Prosumption in the dark: Are prosumers more likely to time-shift everyday practices to reduce peak electricity demand?” by Anders Rhiger Hansen.

1.6 Utilization of project results

We have summarized the main messages from the project:

1. If the purpose is to diffuse PVs, then…
   ...net settlement scheme may be important to which type of households that buy.
   ...motivations like being self-sufficient and setting a good example for others should be emphazised.
   ...motivations for buying need to be understood in context, for example if there are other PV in the neighborhood or if the household has technical competences and interest.

2. If the purpose is to make energy consumers more engaged and interested in energy consumption and production, then this project shows that when production ”moves in”, production and consumption of energy becomes more visible in everyday practices and thereby more prevalent for the prosumer households.

1.7 Project conclusion and perspective

Households buying PVs are distinct from others, especially by tending to have higher income and be technical educated. When households get PVs, it affects them in different ways. First, they tend to be more engaged in electricity matters. Second, those on hourly or immediate net settlement schemes tend to time-shift consumption to utilize their own production. Finally, some PV households has a ‘nerdy’ approach to their PVs, where reading meters, optimizing production and reducing consumption become a hobby to them.
These results are important for further research on how to get households to reduce or time-shift their electricity consumption practices. Moreover, the project provide important insights into why households buy PVs and how such technologies affect their everyday lives in different ways.

Annex

https://vbn.aau.dk/da/projects/solcelleejeres-motivation-og-adf%C3%A6rd-som-prosumers
https://www.researchgate.net/project/PV-owners-motivation-and-practices-as-prosumers

(the guidelines should be deleted – they should NOT be included in the final report)

GUIDELINES FOR FINAL REPORT

General

Depending of project type, project size and project complexity the **number of pages** in the final report may vary. For smaller **demonstration** projects the final report normally should not be more than 20 pages plus possible relevant appendices. For **research and development** projects the final report should not be more tha 50 pages.

The final report will be used for dissemination purposes and the information given in the final report should be suitable for dissemination, cf. point 1.4.

1.2 Short description of project objective and results

The short description should be in two versions:

- an *English version* and
- a *Danish version.*

Each version should be brief, not more than 600 to 800 characters.

1.3 Executive summary

Brief summary of the project and its results and expected utilisation of project results.

1.4 Project objectives

Description of the project objectives and the implementation of the project. How did the project evolve? Describe the risks associated with the project. Did the project implementation develop as foreseen and according to milestones agreed upon? Did the project experience problems not expected?)

1.5 Project results and dissemination of results

Description of main activities and technical results in the project as well as description of commercial results and expectations of the project.

Did the project succeed in realising its objectives? If not, why? Did the project give answer to the problem stated in the project proposal which the funding has been based on. Did the project produce results not expected?

Did the project so far result in increased turnover, exports, employment? Do the project partners expect that the project result in increased turnover, exports, employment?

How has project results been disseminated?

1.6 Utilization of project results

How do the project participants expect to utilize the results obtained in the project? Do any of the project participants expect to utilize the project results - commercially or otherwise? Which commercial activities and marketing results do you plan for? Has your business plan been updated? Or a new business plan produced? What future context is the end results expected to be part of, e.g. as part of another prod-

uct, as the main product or as part of further development and demonstration? What is the market potential? Competition?

Do project participants expect to take out patents?

How do project results contribute to realize energy policy objectives?

Have results been transferred to other institutions after project completion? If Ph.D.s have been part of the project, it must be described how the results from the project are used in teaching and other dissemination activities

1.7 Project conclusion and perspective

State the conclusions made in the project. Try to put into perspective how the project results may influence future development.

Annex

Add links to relevant documents, publications, home pages etc.