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SMILE

Smart Island Energy Systems

Deliverable D3.5

Development Plan for the SMILE Case in Ballen

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1 Introduction

The overall scope of SMILE project is to demonstrate, in real-life operational conditions, a set of both technological and non-technological solutions adapted to local circumstances targeting distribution grids to enable demand response schemes, smart grid functionalities, storage and energy system integration with the final objective of paving the way for the introduction of the innovative solutions in the market in the near future. To this end, three large-scale pilot projects are under implementation in three European islands: Orkneys (UK), Samsø (DK) and Madeira (PT). This report deals with Samso pilot and in particular with the development plan for the SMILE Case in Ballen.

Actually, the main components of the SMILE pilot are on the southern pier of the Ballen marina. The marina is part of Ballen; therefore, the SMILE pilot is part of the urban development in Ballen. Figure 1 shows how the marina integrates with the Ballen village. SMILE concerns three existing buildings, marked on the photo: the *harbour master's office*, the *service building*, and *The Warehouse*. These names of the buildings will be used in this report and other future reports.

This report addresses the development of the plan for the Ballen area, where the SMILE pilot is placed in the larger context of a development plan for the area. The Samsø Municipal staff, including an anthropologist, are elaborating a proposal for an urban development plan. The eleven elected politicians in Samso's municipal council ordered the work, financed by the municipality.

The current public report (D3.5) is an account of the citizens engagement, including the political process, and the anthropological work (Askholm 2019). Two related deliverables preceded the current report: the first one (D3.1¹) is the report on specifications for the SMILE pilot whereas the second one (D3.4²) specifies the components of the SMILE pilot. Those reports concern technical matters, while the current report concerns the human side represented by the stakeholders. Table 1 is a matrix of stakeholders, grouped according to their influence and interest. The current report concerns almost all of them. To simplify the report, the headings refer to just the following three main groups of stakeholders with a high influence: the politicians, the citizens, and the sailors in the marina.



Figure 1. SMILE uses existing buildings on the Ballen marina. North is to the right, and the Southern Pier is the L-shaped concrete pier on the left side of the harbour.

¹ D3.1 "Specifications and Data Report for the Samsø Demonstrator" (Jantzen and Bak-Jensen 2017)

² D3.4 Requirements Specification(Jantzen 2019)

Table 1. Project stakeholders grouped according to influence and interest.

	Medium interest	High interest
Medium influence	Journalists Visiting politicians Students and professionals Tourists	Business owners Users of the service building Electric vehicle owners
High influence	The district heating company The municipal politicians The electricity company	Citizens and residents The harbour master The municipality Boat owners

2 The Smart Energy Site on the Southern Pier

The following list summarizes the main components of the Ballen marina pilot:

- Battery system
- Photovoltaic panels
- Heat pump in the harbour master's office
- Connection points for the boats

Figure 2 shows the components of the smart energy system marked on a photograph of the area. The battery energy storage system (BESS) is inside The Warehouse. The photovoltaic panels are distributed over three sites within the marina, namely: the roofs of The Warehouse and the service building taken together, the outer side of the board fence, and the two roof faces of the harbour master's office. The board fence is a barrier facing southeast toward the sea, and the PV panels are mounted vertically on the seaward side.

The technical goal is to exploit the available solar energy as much as possible (maximize self-supply). A related goal is to cover as much as possible of the marina's demand by solar energy (maximize self-sufficiency). On the nontechnical side, the goal is to attract more sailors to the marina and ultimately to increase Samsø's population.

The PV panels are the only visible among new components that SMILE added to the marina. Two outer units for heat pumps are hardly visible (on the harbour master's office and the service building). Figure 3 shows the service building with its PV panels. The surface is designed to prevent glare from the sun. The roof faces away from the marina, out of the sailors' view.

Because of the SMILE project, the harbour master decided to renew The Warehouse. Figure 4 shows the building before renovation, and Figure 5 shows the building after renovation (some painting is pending). He managed to fit the battery inside a separate room in the building. The rest of the building is a new information room for smart energy. It contains furniture and two large computer displays. The municipal anthropologist is designing more didactic material for the room. In the first month after the official opening of the smart marina, there were already five requests to see the battery. The information room will also serve as a stop on a guided tour of the renewable energy sites on Samsø for visitors.

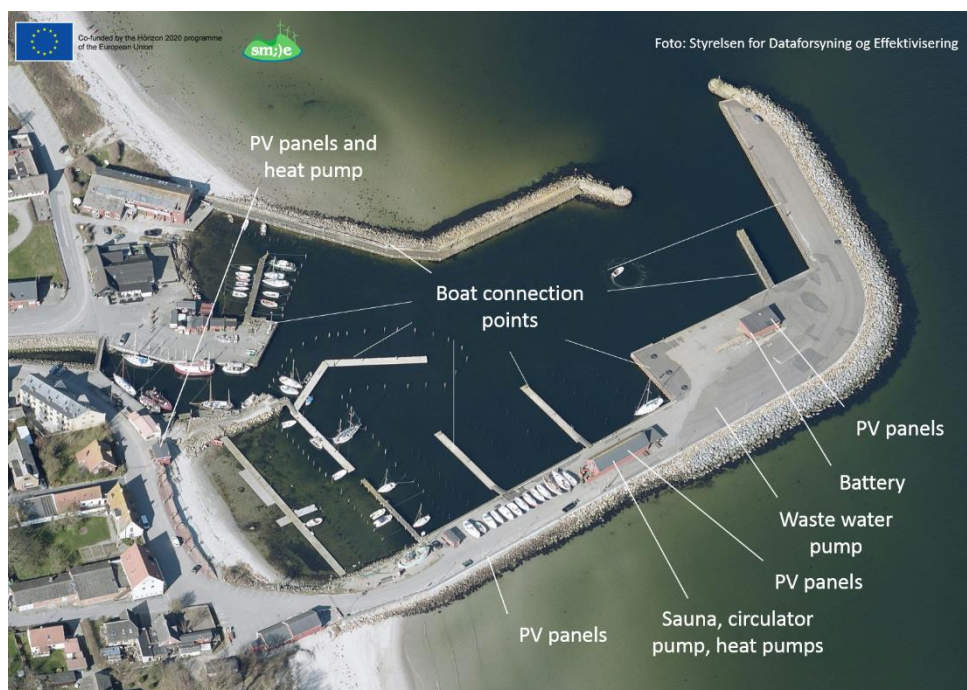


Figure 2. Overview of the Ballen marina and its smart energy components.



Figure 3. The service building. It contains showers, toilets, sauna, laundry, and a technology room. There are new PV panels on the roof and on a small roof at the end of the building in the background.



Figure 4. The Warehouse building before renovation.



Figure 5. The Warehouse building after renovation. The roof carries new PV panels.

3 The Political Council Supported a Low Impact Construction

During the first half year of the SMILE project in 2017, the project team on Samsø considered wind and solar power generators to be installed. The technical dimensioning criterion was to fit the power generation to the given battery size (240 kWh). Toward the end of 2017, the analysis suggested a solar power plant on the Ballen Marina, size between 30 kW and 120 kW. A cash flow analysis indicated the larger the better, up to 120 kW¹. The final size would have depended on a political decision involving new buildings on the marina, which would provide extra roof space for PV panels. The existing roof space is allowed for 30 kW.

The initial proposal to also install a wind turbine was abandoned due to foreseeable opposition from citizens and sailors. Moreover, the price of connecting a wind turbine on the traffic harbour to the marina via an undersea cable was too expensive — the payback period is 70 years for a 6-kW wind turbine — and it is uncertain whether such a connection is allowed under the current Danish regulatory framework.

3.1 The Political Process

The SMILE activities had to be approved by the municipal council, because the activities required an investment and because of the ongoing urban planning process. The political process was lengthy, stretching from January to September 2018. During that period, the local newspaper followed the events closely, exposing SMILE to the readers. Table 2 chronologically lists the political decisions in detail.

In brief, the municipal council's initial standpoint was to integrate the SMILE plan with the urban planning process for the Ballen village – the marina is a natural subset of the village; therefore, they must be coordinated. As a result, many citizens believed that SMILE would have dominated the urban plan – for the benefit of technology, and not for the citizens. The municipal council then decided to decouple SMILE from the urban planning process; otherwise SMILE would be delayed or perhaps abandoned. The harbour master then adjusted the size and location of the PV plant to fit *all* the existing surface area, ending at a final size of 60 kW. The tender and installation process started toward the end of 2018.

Political decisions are made by the municipal council, which consists of 11 elected politicians from a variety of political parties. The election period is four years. In the case of SMILE, the decision process has three stages: (1) the technical committee, (2) the financial committee, and (3) the council. That is, a proposal is first sent to (1), which may decide to forward it to (2) or send it back for further clarifications. The financial committee (2) can in its turn forward to the council (3) or send it back. After the necessary number of iterations, the council considers the case.

The harbour master initially submitted a plan with several scenarios for the southern pier. An architect made the plan, and it concerned the use of the spare land area on the pier. The technical committee selected, and recommended, the so-called Twins scenario. It consisted of two buildings with the battery in between, see Figure 6. The scenario would renew the existing Warehouse building and add a new similar building for small shops, cultural activities, and the like. That would provide some extra roof space for PV panels as well.

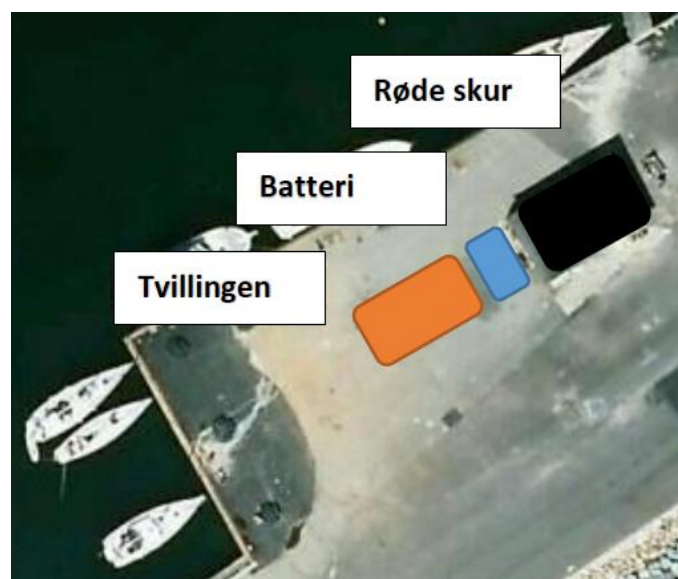


Figure 6. Layout of the “Twin” scenario. Translation of the Danish annotations: ‘Røde skur’ means ‘red cabin’, ‘Batteri’ means ‘battery’, and ‘Tvillingen’ means ‘the Twin’.

The Twin scenario passed the financial committee. But then, the council agreed to not make a decision, and instead call for a public meeting to hear the citizens. The meeting was in June 2018, and 70 citizens and politicians participated. The topic was the urban development of Ballen. Essentially the development concerns a change of land use considering the tourists, the business owners, and the citizens. There were many diverging opinions, and the municipality concluded that consensus was beyond reach. A municipal anthropologist then started a one-year-long analysis of wishes, worries, and proposals for the future land use. She went door to door, created workshops, and held common meetings. The result is a collection of statements, which organizes the opinions, all in a democratic manner.

The SMILE project team decided to aim for a minimal solution, within the constraints of the existing buildings on the southern pier. This was eventually accepted, and the council agreed to take out an investment loan for 3 million DKK (400 000 EUR). The municipal investment will be paid back over time from savings, thanks to solar energy, and from the sailors paying for their actual energy consumption. The SMILE project is thus cost-free for the taxpayers, as required by the politicians. The eleven politicians approved the investment unanimously, because the work is in harmony with the municipal plan to become a fossil fuel free island by 2030.

Table 2. Timeline of the political decision process.

Date	Event	Note
1/5/2017	SMILE begins	
30/11/2017	Specifications report	Deliverable D3.1 ¹
11/1/2018	Technical committee meeting	Orientation about SMILE and the development plan for the southern pier.
16/1/2018	Financial committee meeting	The committee sends the plan for the pier back to the municipal staff to improve the business case description.
23/1/2018	Municipal council meeting	Orientation about SMILE. Decision: Orientation approved.
9/2/2018	Technical committee meeting	Recommendation: the two buildings ("Twins") scenario out of five scenarios. Recommendation: to release a grant for 2.7 mill DKK (360 000 EUR). Recommendation: to offer the southern pier area on a 25-year lease
20/2/2018	Financial committee meeting	Recommendation: to call for a citizen meeting, and to send all five scenarios to a public hearing.
27/2/2018	Municipal council meeting	Decision: to have a citizen meeting and a hearing phase.
4/6/2018	Citizen meeting	Development plan for Ballen, including the southern pier. No consensus, 70 participants.
15/8/2018	Technical committee meeting	Recommendation: to draft a plan for the southern pier as part of the urban plan for Ballen, to establish a temporary wooden clad container for the SMILE battery, to install PV panels on the existing buildings, and to abandon sending the scenarios to a public hearing since they are not relevant anymore.
21/8/2018	Financial committee meeting	Recommendation: to approve the recommendation from the technical committee
28/8/2018	Municipal council meeting	Decision: the recommendation from the financial committee is approved.
5/9/2018	Technical committee meeting	Recommendation: to take out an investment loan for 3 mill DKK for PV panels and electricity sockets.
11/9/2018	Financial committee meeting	Recommendation: to approve the grant for 3 mill DKK
18/9/2018	Municipal council meeting	Decision: the 3 mill DKK grant is approved.
1/11/2018	Technical committee meeting	Orientation about the urban development plan for Ballen.
Thereafter	Municipal technical department	Tender process for battery cabin, PV panels, and boat sockets.

4 Dialogue with the Citizens about Nontechnical Barriers

4.1 Public Citizens Meeting

The citizens of the Ballen village participated in a public meeting with the mayor, members of the municipal council, members of the municipal staff, and representatives of the SMILE project (June 2018). The meeting included 20 minutes of group work followed by a presentation from each group (*charrette* style).

Many participants wished for more recreational areas and activities. The participants were divided regarding the location of extra parking areas. There was no consensus at the meeting, and the municipal council afterwards decided to leave the urban development plan open, as mentioned earlier.

4.2 Newspaper Articles and Online Forum

The local newspaper (Samsø Posten) is published every Thursday. On average, SMILE appeared in articles more than once per month between January 2018 and April 2019. Appendix A lists all the dissemination activities on Samsø and outside.

The newspaper also operates an online forum, where subscribers can comment on articles. In fact, almost every news article about SMILE spurred a critical debate concerning the SMILE project. Samsø Energy Academy participated in the debate and compiled later a question-answer type of document containing 49 questions and answers. The main headings are as follows: the project management, the financing, and the technology. The Samsø Energy Academy presented the document to the public at the annual Samsø energy fair in October 2018. Appendix B lists all the questions and their answers (in Danish).

The local press coverage has been neutral, reporting events and a few facts the best they could. However, a group of people, always active online, have been very critical to the project. The criticism concerns the project relevance, the technology, and the financing.

Sample questions about the project relevance. Is the project necessary? What does Samsø gain from it? Is there a conflict of interest between the Energy Academy and the Samsø municipality? What kind of work do the project workers do? Is it more about getting funding than doing real work?

Sample questions about the economy. What does it cost? Who pays? How much do the partners get? Does the project have any value, considering the small size of the plant? Did you forget to include costs for maintenance and a risk premium? How much does the municipality pay?

Sample questions about the technology. How big is the battery? How big is the PV plant? Did you consider the salty ambience? Why not just buy a bigger cable? Why make more renewable electricity; we already have more than we can spend? Why not just place the battery in a transformer station instead?

Although the online language is sometimes hostile, there seems to be a legitimate need to know what is going on. The Samsø Energy Academy tried to rebut the criticism by supplying facts and information in the same place.

Whether this satisfied the writers is difficult to know, but the debate disappeared. The questions arise out of statements of the type 'I am afraid that...'. For example, they fear that the municipality is spending the taxpayers' money on useless projects. Or they fear that the project will spoil the quality of life for some, while others gain.

4.3 The Official Opening of the Smart Marina

The deputy mayor of Samsø officially opened the battery driven marina on 10 April 2019 (Figure 7), after an advertisement in the local newspaper. Thirty people turned up to hear about the technology and made questions to the suppliers of hardware. The event lasted two hours, and it was a clear public statement.

Before the event, the SMILE project group managed to contact two journalists who independently sent out press releases. That resulted in a surge of interest from national media, including nationwide TV and radio. A list of 15 articles and appearances resulted after the event.

The media generated further interest after the opening, and there were five requests to visit in one month. Two of these were from politicians: one running for the European parliament election, and the other the Minister of environment and food of Denmark.

A Facebook page³ holds facts and pictures, so that journalists and other readers can acquire the correct numbers and the correct arguments. The Facebook page is in Danish, and it is for Samsø citizens, visitors, journalists, and other stakeholders.



Figure 7. The deputy mayor, Helle Hansen, starts the hardware on 10 April 2019.

³ <https://www.facebook.com/smilesamso/>

5 The Sailors Gain More Sockets with More Power

Before SMILE, the visiting boats had access to sockets, which were limited in power due to weak wiring on the marina. Now, the boats have access to more sockets (340 in total), and each socket delivers more power than before (up to 16 amp). This improvement is particularly welcome during the peak period in July. The photo in Figure 8 shows one of the new socket-stands.

The sailors have a new payment system, and they pay according to their actual energy consumption instead of a fixed lump sum for everybody. Some sailboats consume very little energy, and some large motorboats consume large amounts owing to hot water heaters, cookers, heaters, and communication equipment. Since there is a large difference in energy use, it is fair to bill the boats according to their individual consumption.

When the boat arrives at the pier, the boat must subscribe to the socket number that it wishes to use. This can be done on the spot with a smart phone, or with a machine at the harbour master's office. Once the boat sends its credit card details, the socket opens for the electricity. There may be a tariff system, later, which favours consumption late in the evening and during the night instead of in the afternoon. It is of course important to know whether the sailors like this kind of system, or not.

Two anthropologists from the Danish Technological Institute (partner DTI) visited Samsø for some days in August 2018, and they had meetings with staff from the Samsø municipality (partner SK) and the Samsø Energy Academy. Afterwards, they managed to interview a few boat owners that they found in the marina. The outcome was a work plan for their interviews in 2019 and 2020.

Although some boat owners leave their boats in the marina all year round, the bulk of the sailors turn up during summertime. Therefore, the anthropologists prepare for a larger effort during the summer of 2019. One task is to anthropologically analyze the sailors' viewpoints regarding the smart system based on renewable energy, is that attractive? Another task is to advise the harbour master how to inform the sailors about the smart system.

The harbour master initiated a collaboration with the association of Danish yacht harbours (FLID). The association publishes a magazine to its members representing 266 yacht harbours. The collaboration resulted in an article in their magazine. It is available from the SMILE website in Danish and in English (Larsen 2019).

It is important, from a commercial viewpoint, to reach the sailors and analyze whether it makes a difference that the Ballen marina is more climate friendly than other marinas.



Figure 8. New socket stand. Each of the six blue sockets has a remote switch and an electricity meter. The tower contains a radio transmitter, which forms a wireless network together with the other towers.

6 SMILE in the Larger Context of Ballen's Urban Development

Citizens and business owners have discussed for years how to create activities and new buildings around the marina in Ballen. The municipal council established a vision and a catalogue of ideas in the municipal plan. In 2014 the municipal council granted an extension of the southern pier, which created more space. In 2016 the municipal council decided to build a board walk along the land side of the marina and extend the number of long-term parking spaces.

The idea is that more urban life on the southern pier will offer more space for local communities, the youth, shop owners, and create new recreational areas for tourists. At the same time, these activities should be kept at a level, which preserves the quality of life for the people who live there.

At least three out of four SMILE scenarios concern Ballen and the area around it, see Figure 9. The inner town is rather dense, and traffic is becoming a problem, especially space for parking. The southern pier represents an 'idle' space, which could be used to resolve some of the topics of contention.

In summary, owing to the contention with the citizens, SMILE can only occupy area, which is going to be used for another purpose also, such as shops, recreation, culture, or parking.

6.1 Analysis of the Citizens' Wishes, Worries, and Ideas

A municipal anthropologist conducted 100 qualitative interviews, seven workshops, and one final public meeting, where she presented the findings (Askholm 2019). The purpose was to collect and report the *pros and cons* on behalf of the stakeholders. A group of municipal planners will later publish their proposals for an urban development plan. After a hearing phase, the municipal council will hopefully be able to decide on a plan for the Ballen area.

The anthropological analysis concerned some upper level themes, as follows: conservation of the built environment; year-round living; style of new buildings; the commercial life; the balance between activities and tranquillity; as well as values like diversity, public access, and quality of life. The population consists of citizens, residents with recreational housing, and business owners. They have diverging ideas, but everybody wishes to preserve the casual atmosphere. During the peak of the summer, however, the number of tourists cause traffic congestion.

The analysis also treats specific stakeholder ideas around the following topics: traffic congestion, parking, the marina, commercial activities, the beaches, the layout of the town, activities, nature, walking trails, and tourism. The proposed actions are sometimes conflicting, but the overall goals are often in agreement. Ballen's layout is circular with narrow roads (see Figure 1), as opposed to rectangular with right-angled roads. Consequently, modern tourist busses are too large to navigate the parts of the town near the marina.

6.2 Opinions About the Southern Pier

The southern pier exhibits a potential for extra space, and that is a source of conflict. The conflict especially concerns whether to use the space for parking or not. Those who favour parking lots on the pier, argue that they would ensure a flow of traffic to support the little supermarket on the marina. Oppositely, if it turns out that the parking space is limited, vehicles will turn around on the narrow pier

in search for a free space, creating greater problems. Some stakeholders propose to separate traffic and pedestrians on the pier, while others wish neither traffic nor parking at all. They prefer activities, such as meeting places, cultural activities, recreational areas, and small shops. Some stakeholders suggest small cabins or houses. A group of citizens oppose any buildings on the pier, because that would destroy the delightful sea view; for them the wide-open space is important.

Clearly, it is difficult to reach consensus, which was also the conclusion at the public meeting held in Ballen.

6.3 SMILE's Role in Ballen

The politicians agreed to separate SMILE from the formal process of urban development (Section 3.1). SMILE then continued with a solution, which had a minimal visual impact and minimal space requirements. That is, the PV panels are visible, but they are on existing roofs, and the BESS is hidden inside The Warehouse. The harbour master even renovated The Warehouse, which improved the pier aesthetically.

SMILE proposed four scenarios in deliverable D3.1⁴. Figure 9 shows three out of the four scenarios on a map. Scenario 2 includes the traffic harbour, but construction work there is unlikely. Scenarios 3 and 4 include larger areas, but only in simulation. It is therefore only Scenario 1, which has a visual impact.

The SMILE project has defined evaluation criteria in order to define a set of *key performance indicators*⁴ (CERTH 2018). Table 3 lists those key performance indicators that are relevant for the present report. The table provides a preliminary evaluation in order to measure the impact of the SMILE pilot. It is impossible to say anything about *overall satisfaction* at this point, only halfway into the project, but the table does not reveal any negative issues.

Should the urban development in Ballen result in more buildings on the southern pier, SMILE would of course be interested in using the roof space for more PV panels. But of course, such a development must go through an equally careful process with the politicians and the local population.

The SMILE pilot plant in Ballen is too small to influence the island's energy balance; after all, it is only a demonstrator. However, on a short-term horizon, the SMILE installation will play an educational role. As prices of PV panels and batteries decrease, such an installation may be economically viable for house owners, and they will want to know more about the technology, the economy, and how to organize a project. Boat owners may show an interest for the same reasons, especially the self-sufficiency aspect. The SMILE anthropologist will investigate whether visiting sailors find the Ballen marina more attractive than alternative marinas — because of the climate friendly installation.

On a medium-term horizon, the municipality may wish to replicate the plant to the two other marinas on Samsø, and even to the two traffic harbours.

On a long-term horizon, the goal is to increase the population. The new technology could create more jobs. If there is also enough housing available — perhaps houses with a high degree of self-sufficiency themselves — there will likely be an in-migration of settlers to the island.

⁴ D6.1 Report on selected evaluation indicators (CERTH 2018)

The SMILE project is part of a larger sociotechnical transition on Samsø⁵. The goal is to become a fossil fuel-free island by the year 2030. The island already went through a transition to become a renewable energy island, and the next step is to reform the transportation sector, including busses, tractors, cars, and ferries. Biofuels and electric vehicles are necessary means to reach the goal. Electricity can save some of the limited biomass, which is now burnt in the district heating plants, and the biomass can be used in a bioreactor to produce biogas instead. Although the island exports as much as 70% of the electricity it produces, the future will bring a larger demand for electricity, especially for district heating by means of heat pumps.

Table 3. Preliminary fulfilment of key performance indicators.

Key Performance Indicator	Preliminary evaluation
CO2 tonnes saved	The marina saves buying 50 000 kWh electricity, and the CO2 declaration is 469 g/kWh. Thus, saved: 23 tonnes CO2 per year.
Noise pollution exposure	None
Flora-fauna influence	None
Improved access to online services	Sailors pay via smart phone. They will see their electricity consumption online. They will see the marina's instantaneous renewable energy percentage online.
Increased education	Guided tours can be booked. Posters in the windows and a take-home brochure.
Demand response scheme sensibility	Anthropologists will investigate whether sailors find the smart energy system attractive.
Electric vehicle scheme	It may be possible to charge a vehicle from the same sockets that boats use (240 V AC).
Thermal comfort	A heat pump replaced an electric heater in the harbour master's office. This is an improvement. A heat pump supplies heating in the information room; none previously.
Landscape impact	None
People reached	All Samsø citizens (3700). All paying sailors (10 000 boats per year). TV viewers and radio listeners in Denmark in connection with the official opening (4 million).
Green jobs	Local enterprises installed the equipment. Future installations in more marinas will create new jobs.
Easy access to information	There is a new information room in connection with the BESS. It will be equipped with didactic material.
Citizen participation	High: Newspaper, online forum, citizen meetings, interviews
Overall degree of satisfaction	Satisfactory, so far.

⁵ "Sociotechnical Transition to Smart Energy: The Case of Samsø 1997-2030." (Jantzen, Kristensen and Christensen 2018)

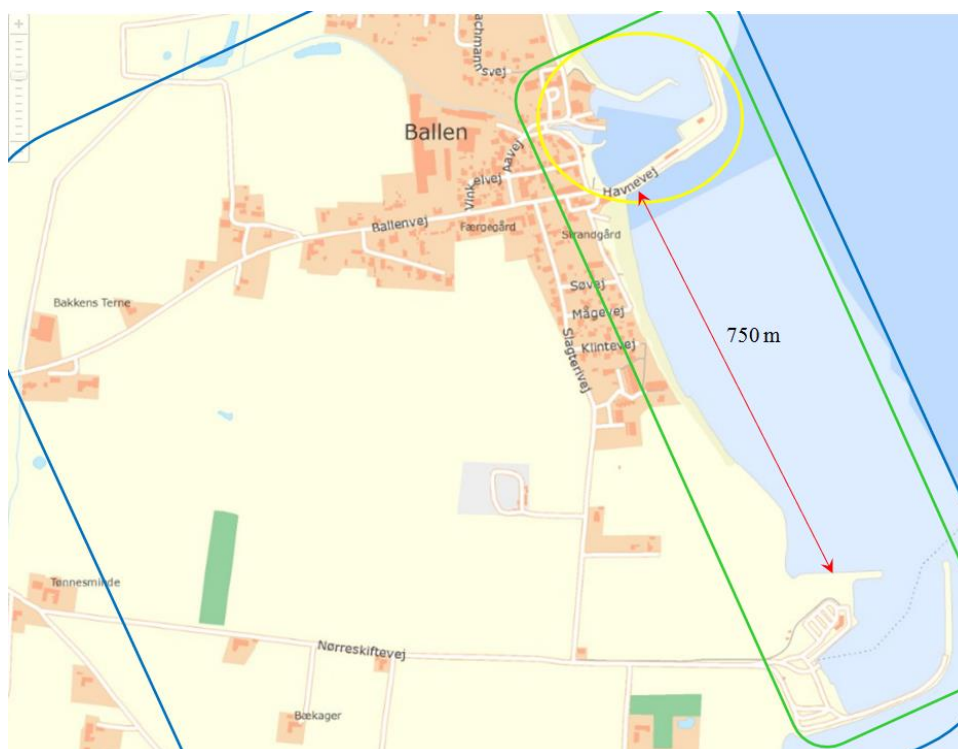


Figure 9. The four SMILE scenarios: (1) Ballen marina (innermost curve), (2) to include the traffic harbour (next curve out), (3) to include all Ballen (outermost curve), and (4) to include the whole island (not shown).

7 Conclusions

This report presented the Development Plan for the SMILE Case in Ballen. After some opposition from some stakeholders during the first 16 months of the SMILE project, the pilot on the Ballen marina was adjusted and installed. The municipal politicians unanimously agreed to invest in the plant. The investment is paid back by savings, thanks to solar energy, and the income from selling electricity to the visiting boats. The project is financially sustainable, at no cost for the taxpayers. The visual impact is low, and the renovation of The Warehouse has improved the atmosphere on the southern pier.

Should new opportunities appear on the southern pier, the PV plant can be scaled up to twice its size with the current battery capacity. The battery can, in principle, also be scaled to a larger size, although at some size it may require another cabin.

The plant can be replicated to the two other marinas on Samso. That includes the PV plant, the BESS, the power sockets, the communication system, and the payment system. A similar plant could be installed in the traffic harbours, and the sockets could be used for charging electric vehicles.

The pilot benefits primarily the sailors, because they gain more sockets and more power in each socket. In addition, the power is climate friendly. Second, the pilot benefits the local population, if it attracts more sailors. The more visiting sailors, the more livelihood, and the more local trade. This may in turn attract more settlers. Third, the pilot benefits the municipality, because the PV panels generate savings, and there is an income from the sale of electricity. Profit can be reinvested in new energy projects.

The potential for scaling and replication motivates the work, which is aligned with Samso's energy plan and vision. That vision is in turn aligned with the vision for Denmark, and in turn with the energy vision for the EU.



8 Acknowledgement

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APPENDIX A – List of Communication and Dissemination Activities

Date	who	Means / Media	Title of the Publication	Target Audience
18/01/2018	SE	SamsøPosten (local newspaper)	Stort EU-projekt sikrer job, ny viden og SMART GRID på Ballen Havn (Large EU project ensures jobs, new knowledge, and SMART GRID on the Ballen Marina)	Citizens of Samsø and visitors
25/01/2018	SK	SamsøPosten (local newspaper)	Sag om sydmolen sendt retur (File concerning the south pier returned to sender)	Citizens of Samsø and visitors
25/01/2018	TI	SamsøPosten (local newspaper)	Endnu et Samsk projekt trækker overskrifter (Another Samsø project pulls headlines)	Citizens of Samsø and visitors
09/02/2018	SE	SamsøPosten (local newspaper)	Omkring udviklingen på Sydmoen i Ballen (About the development of the south pier in Ballen)	Subscribers to SamsøPosten
13/02/2018	SE	SamsøPosten (local newspaper)	Kommentarer til byggeri på molen i Ballen (Comments to the construction on the pier in Ballen)	Subscribers to SamsøPosten
15/02/2018	SK	SamsøPosten (local newspaper)	Fem scenarier for udnyttelse af sydmoen (Five scenarios for utilising the south pier)	Citizens of Samsø and visitors
21/02/2018	SE	SamsøPosten (local newspaper)	Debatten om Ballen havn byggeri fortsætter (The debate concerning the construction on Ballen marina continues)	Subscribers to SamsøPosten
22/02/2018	SK	SamsøPosten (local newspaper)	Ballen er igen i fokus (Ballen is in focus again)	Citizens of Samsø and visitors
01/03/2018	SK	SamsøPosten (local newspaper)	Solcelleprojekterne på Sydmoen i høring (The photovoltaic plant on the south pier goes to a hearing)	Citizens of Samsø and visitors
01/03/2018	SK	SamsøPosten (local newspaper)	Sæson handelspladser på Sydmoen i 2018 (Seasonal trade booths on the south pier in 2018)	Citizens of Samsø and visitors
31/05/2018	SK	SamsøPosten (local newspaper)	Borgermøde om udviklingen af sydmoen i Ballen (Citizens' meeting about the development of the southern pier in Ballen)	Citizens of Samsø and visitors
04/06/2018	SK	Announcement in SamsøPosten (local newspaper)	Borgermøde om udviklingen af sydmoen i Ballen (Citizens' meeting about the development of the southern pier in Ballen)	Citizens of Samsø and visitors
07/06/2018	SK	SamsøPosten (local newspaper)	Rekreativt område på Sydmoen (Recreational area on the southern pier)	Citizens of Samsø and visitors

23/08/2018	SK	SamsøPosten (local newspaper)	Klokkeklar forvirring (Evident confusion)	Citizens of Samsø and visitors
30/09/2018	AAU +SE	Proceedings	Business and Socioeconomic Assessment of Introducing Heat Pumps with Heat Storage in Small-scale District Heating Systems	International scientific community, energy planners
13/10/2018	SE	SamsøPosten (local newspaper)	PV panels and battery	Citizens of Samsø and visitors
18/10/2018	SE	SamsøPosten (local newspaper)	Stor spørgelyst (Great inquisition)	Citizens of Samsø and visitors
10/01/2019	SK+ SEL +SE	SamsøPosten (local newspaper)	SMILE projekt i gang (SMILE project has started)	Citizens of Samsø and visitors
24/01/2019	SK	SamsøPosten (local newspaper)	Workshops om ideudvikling til udviklingsplan for Ballen (Workshops around ideas for the Ballen development plan)	Citizens of Samsø and visitors
31/01/2019	SK+ SEL +LIB AL	SamsøPosten (local newspaper)	Batterierne er på plads -- Turen går til Madeira (Batteries in place -- Off to Madeira)	Citizens of Samsø and visitors
31/01/2019	SE	Facebook	New Facebook page in Danish called SMILESamsø	Citizens of Samsø and visitors
12/02/2019	SE	Announcement in SamsøPosten (local newspaper)	New Year's Nap (Nytårsluren)	Citizens of Samsø and visitors
28/02/2019	SE	SamsøPosten (local newspaper)	Processer for fremtiden (Processes for the future)	Citizens of Samsø and visitors
10/04/2019	SK+ SEL +SE +LIB AL	Announcement in SamsøPosten (local newspaper)	Inauguration of the Ballen battery marina	Citizens of Samsø and visitors
10/04/2019	SK+ SE+ LIBA L	At least 11 national newspapers and magazines	(in connection with the inauguration 10/4/2019)	Citizens of Denmark (boat owners, engineers, energy specialists, newspaper readers)
10/04/2019	SK+ SE+ LIBA L	Two interviews to news channels on national TV (DR)	(in connection with the inauguration 10/4/2019)	Citizens of Denmark
10/04/2019	SE+ LIBA L	Two radio interviews to national radio (DR P4)	(in connection with the inauguration 10/4/2019)	Citizens of Central Denmark Region

APPENDIX B – Questions and Answers (in Danish)



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Spørgsmål og svar til solceller og batteri i Ballen (SMILE)

18. april 2019

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Om projektet

1. Hvad handler SMILE om?

SMILE projektet vil installere solceller og et batteri på Ballen havn. Batteriet gemmer strømmen fra solcellerne til senere, når solen ikke skinner. Vi har fået timeafregning, og så kan batteriet levere strøm, når prisen fra nettet er høj. Desuden undersøger SMILE hele Ballens energisystem, inklusive fjernvarmen, og hele Samsøs energisystem (i simulering).

2. Hvad er formålet med SMILE?

Projektet skal demonstrere ni forskellige teknologier til det intelligente elnet (smart grid). Formålet er at fremme indførelsen af disse teknologier. I Ballen skal anlægget levere vedvarende energi til sejlerne. Projektets resultater er offentlige.

3. Hvad får Samsø ud af det?

Ballen havn får et tilskud af vedvarende energi, som er en besparelse — besparelser kommer alle havnene til gode, eftersom det er samme kasse. Bådene bliver afregnet for deres faktiske elforbrug, således at store og små både opkræves retfærdigt. Erfaringerne kan bruges i Samsøs andre havne. Projektet skulle gerne tiltrække flere sejlere, som en fremtidssikring af havnene. Elselskabet har indført timeafregning, og så bliver solceller med batteri relevant for alle husstande, der ønsker at trække på et batteri når elprisen er høj; det kunne være i forbindelse med en elbil. Der kommer en udstilling, så borgere, sejlere, turister og faggrupper kan orientere sig om mulighederne i det intelligente energinet.

4. Ødelægger SMILE projektet miljøet på havnemolen?

Nej, SMILE's minimumsløsning gør kun brug af eksisterende tagflader. Hvis byudviklingen resulterer i mere tagareal, så er SMILE projektet interesseret i at udnytte det, hvis det ellers er acceptabelt.

5. Kører projektet i Energiakademiets regi?

Samsø kommune, Samsø Energiakademi og Samsø Elektro er ligeværdige partnere på Samsø. Desuden deltager Teknologisk Institut og Aalborg Universitet. Alle partnere har hver især bidraget til ansøgningen, og hver partner har sit eget budget og regnskab. Projektet indeholder ti arbejdsplaner, hvor Samsø Energiakademi er projektleder på den ene arbejdsplan, der vedrører Samsø. Der er tilsvarende arbejdsplaner på Orkney og Madeira.

6. Hvad er kommunens, og hvad er Energiakademiets?

Energiakademiet har beregnet økonomien, men investeringen er kommunens. Alle økonomiske tal vedrører kommunens budget, og projektet må ikke koste kommunen noget.

7. Hvorfor er der ingen private investorer i SMILE projektet?

Et netopkoblet batteri er relativt nyt. Hvis det viser sig, at solceller med batterier er et godt investeringsobjekt, så kan det næste projekt måske blive med private investorer.

8. Var det ikke mere relevant at etablere anlægget på Sælvig havn?

Det kan sagtens være relevant i Sælvig også, og i alle havnene. Hvis erfaringerne med SMILE er gode, så er det oplagt at se på de andre havne.



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9. Hvor mange mennesker beskæftiger SMILE?

På Samsø svarer budgettet til godt seks årsværk, og projektet varer fire år (altså 1.5 stilling). Partnerne er Samsø Kommune, Samsø Elektro og Samsø Energiakademi. Desuden deltager Teknologisk Institut, to afdelinger på Aalborg Universitet og firmaet Lithium Balance, som leverer batterisystemet. Orkney øerne og Madeira deltager på lige fod med Samsø, og der er i alt 19 partnere i projektet.

10. Hvad laver de mennesker i SMILE?

Analyse, kravspecifikation, installation af solceller og batteri, konstruktion af programmel til forbrugsudjævning, et system til styring og regulering af batteriets ladestand, en betalingsordning for bådene, rejser, projektstyring, rapportskrivning og revision. Der er en særlig aktivitet til samarbejde med borgerne. Desuden leverer Samsø oplysninger til de øvrige projektdeltagere angående teknisk modellering, livscyklus beregninger, juridiske aspekter, modeller af energisystemet på Samsø, og formidling. Projektet varer i fire år (fra 1/5 2017).

11. Er der behov for solceller på en VEØ?

Ja, for det første for at forbedre havnens økonomi. For det andet, fordi vindmøllerne bliver slidt op inden længe, og vi ved ikke om de bliver fornyet. For det tredje, fordi Samsø's CO2 udledning pr indbygger er blevet positiv (2017).

12. Handler det mere om 6 årsværk end om vedvarende energi?

Det handler om begge dele. Vedvarende energi giver arbejdspladser, og Samsø har brug for arbejdspladser til at øge folketallet.

13. Skal sådan et projekt ikke i udbud?

Nej, ikke SMILE projektet. De 19 partnere har formuleret projektet og skrevet en ansøgning til EU's Horizon 2020 program i konkurrence med mange andre ansøgere. Ansøgningen er blevet vurderet af EU's bedømmere, og EU har bevilget det ansøgte beløb til SMILE konsortiet gennem en kontrakt. Men solcelleanlægget og batterihuset har været i udbud.

14. Turen til Madeira belaster klimaet?

Ja, en rejse for tre personer Samsø-Madeira belaster klimaet. Vi ser det som en nødvendig investering, der tjener sig ind i det lange løb. Projektets 19 partnere mødes hver niende måned. På Madeira fremlagde vi projektets status for EU's repræsentant, så hun kan kontrollere, at tidsplanen holder. Eller komme med råd.

15. Hvor kan man få mere at vide?

Skriv til Jan Jantzen (jj@energiakademiet.dk) på Samsø Energiakademi. Projektet har en hjemmeside med oplysninger på <http://www.h2020smile.eu/> og en Facebook side på <https://www.facebook.com/smileamsos/>

Økonomi

16. Hvor stort er overskuddet?

Med et solcelleanlæg på 60 kilowatt giver et overskud på knap 1 million kroner efter 25 år.

17. Hvor store er vedligeholdelsesomkostningerne?

Med udgangspunkt i et 60 kilowatt solcelleanlæg er der afsat 5600 kroner om året til drift og vedligehold af solcellerne (Energistyrelsens teknologikatalog) og 5600 kroner til drift og vedligehold af batteriet (skønnet).



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Omkostningerne stiger til det dobbelte, hvis solcelleanlægget bliver dobbelt så stort. Vedligeholdelsen betales af besparelsen ved at bruge vedvarende energi.

18. Er der regnet med et risikotillæg?

Nej. Der er til gengæld tre scenarier: Et bedste fald, et grundscenari, og et værste fald. I grundscenariet er tilbagebetalingstiden ni år (40 kW anlæg). I værste fald er tilbagebetalingstiden tyve år (40 kW).

19. Hvad koster finansieringen?

Et lån på 420 000 kroner, der løber over 25 år, koster 1.61 % i rente (Kommunekredit). Den årlige ydelse er 20 540 kroner. Dette er kun et eksempel.

20. Har projektet overhovedet nogen værdi med så lille et anlæg?

Det er et lille anlæg, men det giver overskud, og hver en krone sparet tæller i vedligeholdelsen af alle havnene. Vi vil gerne have så stort et solcelleanlæg som muligt, for det giver større overskud. I anden række får Samsø erfaringer med en teknologi, som kan bruges i de andre havne på Samsø. I tredje række får EU erfaringer med teknologien og dens forhold til borgere og sejlere. Teknisk får vi erfaringer med at styre forsyning og forbrug, så de passer sammen så vidt det nu er muligt. Projektet giver mulighed for at opkræve betaling for hver båds faktiske elforbrug. Alt i alt skulle projektet gerne trække flere sejlere til Samsø.

21. Hvad er tilbagebetalingstiden?

I grundscenariet er tilbagebetalingstiden 5 år (60 kW solcelleanlæg).

22. Hvad med udgifter til husleje?

Der er ingen udgifter til husleje, da solcellerne kommer til at sidde på kommunens egne bygninger. Bygningerne kan eventuelt lejes ud, så der er ikke tale om mistet huslejeindtægt.

23. Der kan være strømsalg til nettet, har I glemt den indtægt?

Nej. Strømsalget er simuleret af Aalborg Universitet og medtaget i beregningen af økonomien (pengestrømsanalysen).

24. Er der andre omkostninger?

Der er udgifter til et batterihus, og hvad dertil hører af kabler og brandsikring. EU dækker disse.

25. Projektets økonomi hænger vel kun sammen på grund af tilskud fra EU?

Ja. Med tilskud giver solcellerne overskud efter fem år (60 kW solceller). EU dækker omformere, battericeller, overvågning og styring af batteripakken, hus, klima-anlæg, brandsikring og mindre måleudstyr. Uden tilskud ville tilbagebetalingstiden være 20 år, hvilket grænser til det acceptable. Danmark betaler til EU, og dette projekt trækker lidt af beløbet tilbage. Resultaterne er offentlige.

26. Hvad er prisen?

SMILE budgettet indeholder 250 000 EUR til battericeller, omformere, og et specialbygget batterihus. Desuden indeholder budgettet 170 000 EUR til 200 elstik og kommunikationsudstyr. Totalbudgettet er 14 mill EUR for alle 19 partnere, hvor EU bidrager med 12 millioner EUR.



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27. Hvad koster SMILE kommunen?

Projektet er "udgiftsneutralt", det var en betingelse fra starten. Samsø Kommune har investeret i solceller, men investeringen bliver betalt af besparelsen i strømindkøb.

Teknik

28. Hvor stort er solcelleanlægget?

Anlægget er 60 kilowatt. Det er halvt så stort som kommunens anlæg ved fodboldbanerne i Tranebjerg. Økonomien sætter en grænse ved 120 kilowatt med den valgte batteristørrelse.

29. Hvad yder solcellerne?

Ydelsen er beregnet til 935 kilowatt-timer for hver installeret kilowatt (Better Energy), og den årlige produktion er 56 000 kWh. Produktionen aftager med alderen. Havnens elforbrug er 100 000 kilowatt-timer.

30. Hvad hvis solcellerne går i stykker?

Udbuddet foreskriver at leverandøren skal give en produktgaranti på ti år, så moduler, der går i stykker inden garantiperioden erstattes med nye.

31. Er der taget højde for det saltholdige miljø?

Et af kravene i udbuddet er robusthed overfor salt. Batterihuset indrettes med temperaturstyring, luftfilter og tørring. Batterihuset har også været i udbud.

32. Hvorfor ikke bruge ALLE tagene på havnen?

Solceller, batteri og forbrugere skal være inden for samme matrikel. Bygningen med sejlerstuen er derfor udelukket, desværre. Desuden skal tagene helst vende mod syd.

33. Hvor stort er batteriet?

Nominelt er batteriet 240 kilowatt-timer. For at beskytte det, har vi kun adgang til 80% eller 192 kilowatt-timer. Et 60 kW solcelleanlæg kan lade batteriet op på 6-8 timer på en god sommerdag.

34. Hvor stort er batterihuset?

Batterihuset fylder 9 kvadratmeter. Højden er 2,80 meter på det højeste sted. Batterihuset står inde i det forhenværende pakhús, hvor resten af pakhúset bliver en udstillingspost. Batterihuset har været i udbud, og EU finansierede det. Batterihuset indeholder temperaturstyring og affugtning.

35. Hvad er batteriets levetid?

Leverandøren opgiver 15 år. Der er ikke regnet med udskiftning af batteriet, fordi økonomien kan bære uden udskiftning. Anlægget kan godt køre uden batteri. Det er muligt batteriprisen falder til 1/8 til den tid, og så kan det måske godt betale sig at købe et nyt batteri.

36. Ødelægger I ikke batteriet ved at lade op og ned dagligt?

Et lithium batteri tåler delvis afladning udmærket, ligesom i elbiler. Batteriet tåler hverken fuldstændig afladning eller fuldstændig opladning; derfor har det en styring, der beskytter mod det. Der er en stødpude på 20% af kapaciteten, som vi ikke får lov at bruge.



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37. Hvordan vil man styre forbruget på bådene?

Det skal foregå ad frivillig vej ved hjælp af to forskellige abonnementer. Køber bådejeren et "gult" abonnement, så får båden strøm som normalt. Køber bådejeren et "grønt" abonnement, så bliver bådens batteri ladet op inden solopgang, men opladningen starter først om aftenen. Det grønne er billigere end det gule abonnement.

38. Hvad er solcellernes levetid?

Udbuddet specificerer mindst 25 år (80% ydelse).

39. Skal der ikke være en alternativ, backup forsyning?

Det er der. Anlægget er forbundet til nettet. Skulle solcellerne og batteriet falde ud, så er der forsyning fra nettet. Der er ikke behov for en særlig backup forsyning.

40. Hvorfor lave energiproduktion i fordelingsnettet?

Det ville give mere, hvis batteriet sad på mellemspændingsniveau (Vadstrup eller Mårup transformerne). SMILE prøver med en mindre løsning, som er nærmere forbrugerne.

41. Energiakademiet har manipuleret med tallene!

Nej! Beregningerne står i en rapport, som blev udgivet på projektets hjemmeside 30/11 2017; disse tal kan ikke ændres, og manipulation er derfor udelukket. Vi kendte dog ikke den endelige størrelse af anlægget på det tidspunkt, derfor gav et lille og et stort anlæg -- fra 30 kW op til 120 kW -- forskelligt overskud. Desuden er der usikkerheder såsom elprisen for køb og salg til elnettet. Regnearket indeholder et grundscenarie, samt et værste og et bedste fald.

42. Hvad kan machine learning bruges til her?

Vi har tænkt at bruge det til fremskrivninger. På forsyningssiden kan vejruddsigten hjælpe til at forudsige solcellernes produktion. På forbrugssiden er der muligvis et mønster i sejlernes forbrug. Det kan være svært at forudsige bådernes ankomster, men der kan være et mønster hen over dagen og hen over ugen. Det afhænger også af vejruddsigten. Fremskrivningerne skal være 24 timer frem i tiden. Vi afprøver det i 2020.

43. Skal havnen have specielle stik til bådene?

Stikkene er standard, men elstanderne er lavet om, så hvert stik har fået en elmåler og en afbryder. Når båden ankommer betaler den for strøm ved hjælp af en APP på mobiltelefon (eller en automat i havnekontoret). Når betalingen er registreret åbner stikket for strøm. Betalingssystemet er udviklet af CompuSoft, <http://www.compusoft.dk>

44. Er batteriet dansk produceret?

Ikke battericellerne, men batterisystemet. Det danske firma Lithium Balance har indkøbt battericellerne og samlet dem i brandsikre moduler. Firmaet har udviklet et styringssystem, som håndterer strømme og temperaturer. Desuden er der adgang til at styre systemet udefra, fra "skyen". Se også, <http://www.lithiumbalance.com>

Pressens spørgsmål og svar

45. Hvad er perspektivet ved at få sådan nogle kæmpebatterier?

Teknikerens perspektiv er at gemme strømmen til der er brug for den. Sejlerens perspektiv er billigere strøm, som er lidt mere klimavenlig. Borgerens perspektiv er at bo et klimavenligt sted. Kommunens



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perspektiv er lignende anlæg til de andre havne. Danmarks perspektiv er at se Samsø tumle med opgaven, inden andre kaster sig ud i det. EU's perspektiv er at se ny teknologi, som kan komme mange til gode.

46. Har Samsø prøvet andre batterier før?

Nej, det er første gang. Det er i det hele taget nyt, det med at slutte et batteri til elnettet. Det bliver nok mere almindeligt i fremtiden, især når elbiler kommer til at sende og modtage strøm fra elnettet.

47. Kommer det til at løse Samsøs elproblem under sommer-turismen?

Batteriet forsyner Ballen lystbådehavn, og det er sejlerne, som får glæde af batteriet. De får flere stik og mere strøm i stikkene. Havnen har haft svært ved at forsyne alle bådene i højsæsonen i juli måned. Resten af Samsøs elforsyning har ikke haft problemer i den retning.

48. Kan det kopieres med succes til andre steder?

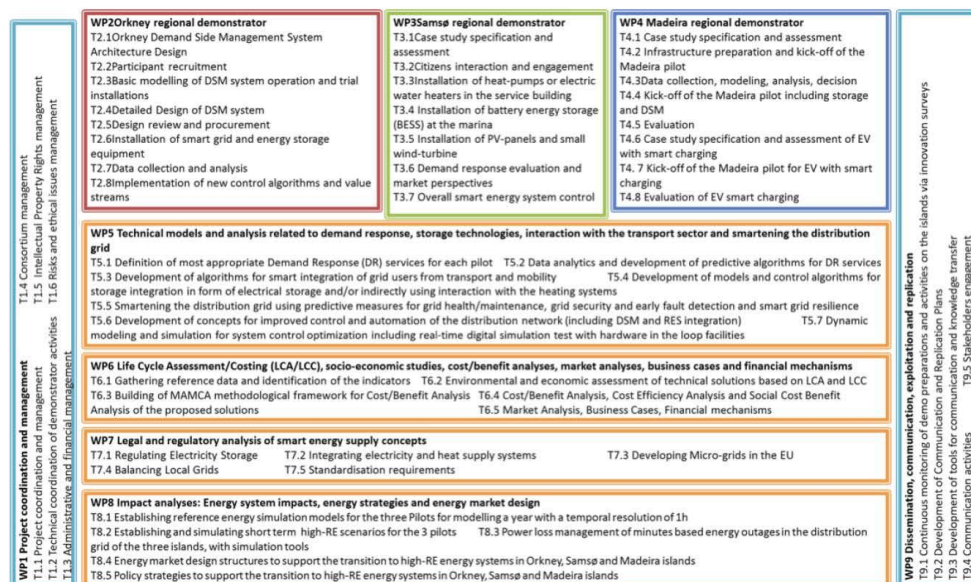
Hvis det går godt, er det oplagt at prøve i Samsøs andre lystbådehavne i Langør og Mårup. Det er også relevant for trafikhavnene på Samsø. Projektet er offentligt, og alle kan frit bruge vores erfaringer og data; også udenlandske havne.

49. Andre perspektiver?

Når priserne på solceller og batterier falder yderligere, så bliver det relevant for husejere også. Især hvis man indretter sig med lidt automatisk styring, så apparaterne tænder og slukker på tidspunkter, som er gode for batteriet. Samsøs færger kunne også få glæde af store batterier. I det hele taget er det en ny teknologi, som kan skabe jobs til håndværkere og fagfolk på Samsø, samtidig med at den er klimavenlig.



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Figur 1. Oversigt over arbejdsplanerne i SMILE.