Emerging business models for community batteries in the EU

Story Highlight
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Content

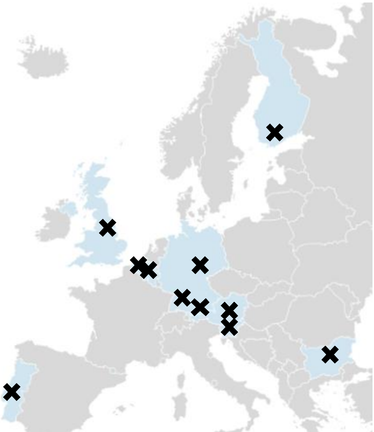
1 Introduction

Home batteries have started to occupy the market and a range of home storage providers have emerged in Europe. Community batteries (or “neighborhood batteries”) are however so far only in pilot stages as regulatory barriers prohibit their market roll out. The aim of this policy brief is to give an overview of selected examples including the ones of the STORY project, to discuss possible renevue streams as well as to compare community batteries with home battery systems regarding their user acceptance. The information we present is based on literature, but also on a set of interviews with market actors and other relevant stakeholders.

2 Multiuse of community batteries: Project examples, actors and revenue streams

2.1 Overview of pilot projects

This chapter provides an overview of pilot projects and their multiuse-applications. Several examples are presented in more detail in Chapter 6.



Community batteries are subject to analysis in various European and nationally funded projects, most of which are located in Germany. Often the following use cases are distinguished: self-consumption, market services, grid-supporting applications (voltage control, black start capability, or congestion management), peak shaving, deferred grid expansion and EV charging. Some use cases are easier to combine than others. Operating the storage for voltage control for example has only limited economic impacts (on other use cases) as such a service is only rarely needed[1].

Figure 1: Location of community battery storages in Europe

The planned STORY community battery in Belgium (in a village near Leuven) will be the nucleus of a Local Energy Community that will be further developed in the H2020 Musegrids project. The battery aims at improving the power quality of a neighbourhood with 40 houses at the end of the line and will balance energy generation and demand including a range of flexibilities from heat pumps, EVs, Demand Side Management etc. The battery also aims to provide services to the DSO.

[1] See DENA Netzstudie, 2016

The STORY community battery in the village of Suha, Slovenia (Li-Ion battery, 170kW, 450 kWh) aims to demonstrate peak demand control, reduction of line congestions, provision of tertiary reserve and a reduction of the total harmonic distortion. It will also test the integration in existing infrastructure of the community battery aiming to provide a high degree of self-sufficiency/reduce curtailment in the village arising from the locally generated solar power (7 PV power plants, 210 kW). For details see chapter 6.

The table below provides an overview of the main use cases in current and recently finalized demonstration projects. Some of them investigate additional use cases (than the ones indicated in the table) via simulations. The list has been made via a project screening in EU countries, it may however not be fully complete.

Table 1: Overview of (multi)-use cases of selected community battery projects

	Self-consumption	Services to the grid /peak shaving	Reserve or spot market	Island mode	E-Mobility
Weinsberg, DE					
Strombank, DE					
Solarsiedlung, DE					
Epplas, DE					
Kraftwerke Haag, DE					
Heimschuh, AT					
Evora, PT					
Haarlemmermeer, NL					
Suha, SI (EU STORY project)					
Eindhoven, NL (EU Interflex project)					
Nottingham, UK					
Simris,SE (EU Interflex project)					
Oud-Heverlee, BE (EU STORY project)					
Albena, BG (EU INVADE project)					

In many EU member states there are no pilots yet, most of the pilots are located in Germany.

Some insights from interviews with market actors are:

- Market actors mentioned that centralized storages are not yet economical due to the current regulative framework (grid fees for charging/discharging, limitation at reserve markets, eg minimum offers of 1MW in Germany and other countries).
- The focus of German projects is mostly on **self-supply optimization and services to the grid**. Demo project representatives emphasize the need to integrate heat pumps and thermal storage systems in the overall system in order to be cost-effective. Stakeholder mentioned the risk of basing business models too much on the reserve markets due to the unclear future price development. Grid stabilization and self-suciency are synergetic as high solar production at same time may result in the de-stabilization of the grid, which may results in curtailing access generation thereby reducing self suficiency. With storage such this can be avoided and at the same time grid can be stabilized.
- In the other demo projects, the main aim **was to provide services to the grid and avoidance of grid expansion.** However, in these projects market profits, such as the provision of reserve energy contributed to the economic feasibility of the overall system. According to interviews, storage solutions to avoid grid expansions are still up to 5 times more expensive than a conventional expansion and therefore need to be combined with other means of income. This is however very site-specific and there are areas where grid expansion can be also very expensive.
- In a few demo projects, residents also have home batteries apart from the centralized storage. In these cases, **community batteries often are used to connect several decentralized components** (e.g. home batteries, heat pumps or EVs to a broader virtual power plant).
- The focus of grid services is on peak shaving. Other goals are frequency control, reactive power compensation, and voltage control. A **cascading benefit to higher network levels can be created**, and be amplified if large storage is also present at the MV level, leading to benefits to the overall system such as in the case of the demo in Évora (see chapter 6.4).
- The **use of community batteries for EV charging stations** (eg peak shifting in case of congestions, fast charging) **is not yet well-developed**; The possibility to use community batteries simultaneously for charging stations and for self-supply optimization could pose issues (relation power vs. energy) as stated by interviewees. Several community storage solutions are designed only for the utilization as charging stations.

Coupling electricity and heat

Coupling electricity and heat enables additional flexibility to the system. The integration of electricity in the heat generation can also substitute other energy carriers such as natural gas. Moreover, as shown in the example of Weinsberg (see Chapter 6.1), the coupling of electricity and heat, especially in a newly built neighborhood where oversizing of the infrastructure can be prevented, is critical to enable business cases.

2.2 Actors

Network operators

According to the new EU electricity market directive, a network operator should not own, develop, manage or operate energy storage facilities. DSOs however could pave the way for the installation of the storage system (permission, connection, etc.). Community batteries also could provide local flexibilities, which the network operator could use. This is currently under investigation in several demo projects[2].

Municipal utilities and local electricity retailers

In Germany, community batteries are already considered by municipal utilities and first pilot projects have been implemented. The aim of the projects is to integrate different technologies and maintain customer relationships by offering new products, while home storage systems may pose a risk for municipal utilities as customers may become completely self-sufficient and independent. Due to the phase-out of the German feed-in tariffs (>100 kW PV) producers are obliged to sell their electricity themselves. Public utilities are often the first party to look for support. To valorize services on markets some municipal utilities already cooperate with aggregators while others act on their own or in the name of smaller municipal utilities. For municipal utilities as well as other local electricity retailers, community storages offer the possibility to provide a range of different services, possibly including EV charging.

Energy cooperatives/local communities

Energy cooperatives often do not act on the market, with a few exceptions, such as the Belgium cooperative Ecopower. In Belgium and the Netherlands, energy cooperatives have proven to be important partners for implementing community batteries as they facilitate acceptance by the population, having already well established contacts to consumers. In case neighbourhoods identify needs that can be satisfied by such storage systems and promote the set-up of these assets additional means are needed to reduce investment risks, as there currently are no clear and stable revenue streams and communities may have less means to diversify risks than market actors.

Housing associations

Housing associations were stated by interviewees to be important partners in the context of community batteries due to their access to consumers. Real estate agencies could improve their rental offers through community batteries in the context of electricity supply models.

2.3 Revenue streams and business models

The optimal capacity of a community battery that aims at maximizing self-consumption rates of renewables electricity for households (or companies) is smaller than the aggregated capacities of all individual storage systems it replaces (Scheller, 2017). This is because load profiles vary between households (or companies) and can partly balance themselves. Nonetheless, to find viable business models more than one use case has to be combined. The combination of use cases, however, may be challenging, as there is a need that different

[2] E.g. German project : FLEX4ENERGY (https://www.flex4energy.de/)

usages can be clearly separated. The capacity designated for reserve energy for example has to be available at any time.

The calculations below aim to illustrate selected revenue streams that could be the basis for business models. We take as an example a 100kW/150kWh Li-Ion battery. For self-consumption, the maximum price that an operator can charge is calculated based on the cost and revenues without storage. This includes 1) the revenues from feeding excess PV electricity into the public grid and 2) the costs for the purchase of electricity from the public grid. The difference between these two values is the maximum price for the alternative, the storage service. It however has to include potential costs such as grid fees and taxes just as the alternatively purchased electricity from the public grid, reducing the revenues for the storage operator. Under current regulatory frameworks, these elements pose an important cost factor limiting the rollout of community batteries.

Below we give examples to illustrate the magnitude of possible revenue streams for the storage operator (excluding grid fees and taxes[3]). As an example for Austria, we assume a feed-in tariff of 0,0767€/kWh for PV electricity (2019 value). When we deduct this from a typical household electricity price of 0,195€/kWh in Austria, the storage owner can charge a maximum of 0,118€/kWh for its service to the storage user. (In order to be economically attractive, the charged price should be below this threshold). Lower feed-in tariffs and higher consumer electricity prices increase the potential fee that can be charged for the storage service.

Table 2: Economic parameters for the calculation of the revenue streams

Economic parameters	
CAPEX	200-500 €/kWh
O&M costs	2,5% of CAPEX
Insurance	0,2% of CAPEX
Discount rate	0,08
Inflation rate	0,02
Peak shaving revenues	100€/kW/year[4]
Frequency control revenues	120€/year[5]
Self-sufficiency average discharged power	5 kW
Max. price that can charged for self-consumption in a community storage in case of a feed-in of 0,076€/KWh	0,118€/kWh (example Austria)

Figure 2 below shows that only at a CAPEX below 500€/kWh a part of the storage can be possibly allocated to self-consumption in order to meet a break-even of the battery system after 10 years. Naturally, if there is a lower remuneration for the electricity injected into the grid the storage operator can charge more for the storage and less revenues from the reserve markets are needed to cover the storage costs. Figure 3 shows a combination of peak shaving and a maximum of self-consumption. This combination leads to a break-even after 10 years only at a low CAPEX (<400 €/kWh).

[3] that are in the range of about 0,04-0,07€/KWh in Austria in 2018
[4] Based on recent estimations such as Schäffer, 2016 or Simon, 2018
[5] https://3pkem226sk6p252wx4117ivb-wpengine.netdna-ssl.com/wp-content/uploads/sites/4/2017/04/Webinar-mit-Fenecon-28_04_2017.pdf

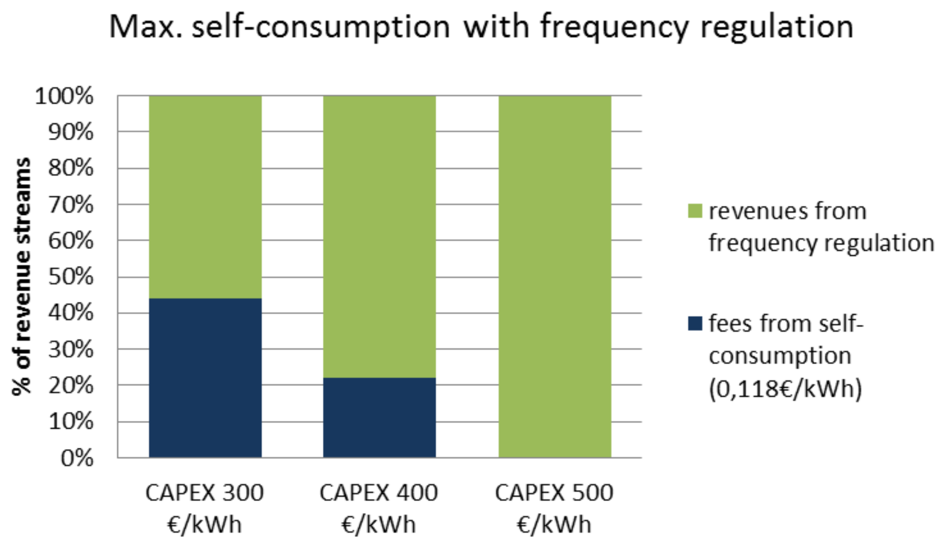


Figure 2: Max. revenues of self-consumption combined with frequency regulation

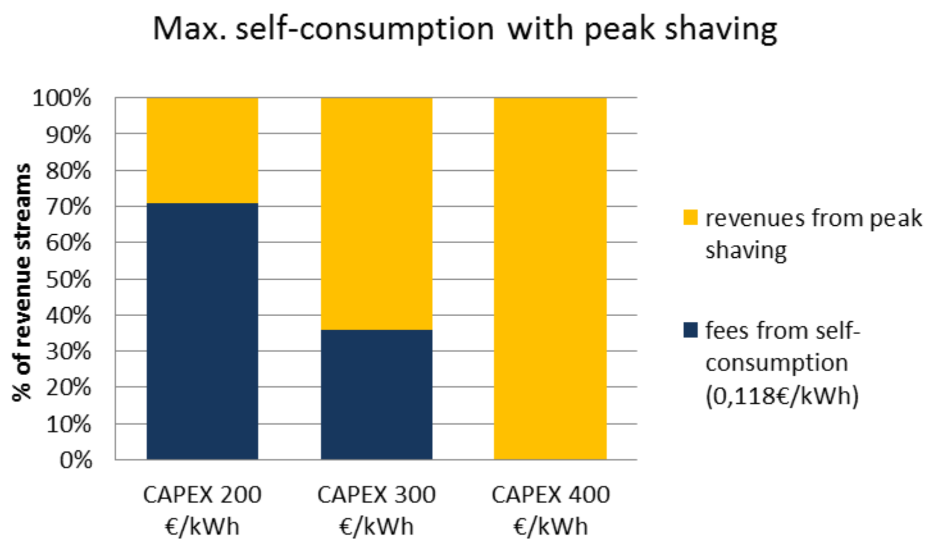


Figure 3: Max. revenues of self-consumption combined with peak shaving

While self-consumption via community storages seems to be feasible only at low CAPEX values and without grid fees and taxes in our illustrative calculations above, additional elements can importantly improve the business case. Community batteries are not limited to the maximization of renewable self-consumption rates in households but can also include diverse user groups (commercial customers, households without own PV systems), and a complementary mixture of PV- and CHP systems which enable further beneficial characteristics for the business case (see Scheller, 2017). Generally, developing viable business models for community storages requires modeling including a scenario-based quantitative evaluation of costs and earnings from an actors perspective (see Scheller, 2017).

3 Acceptance of community storage

Based on literature and interviews we compared acceptance of community storage versus home batteries[6].

Arguments which have a clear USP for community batteries are self-sufficiency and therefore independence of the (perceived) market power of big energy companies. This is where community batteries are positioned superior to other competing products.

Example: Alpstore Energy Storage

The goal of the "Alpstore Energy Storage for the Alpine Space" project (2007-2013) was the development of an optimized use of stationary and mobile electricity storage in Alpine Region to buffer fluctuating decentralized renewable energy generation. The project also included a survey among residents on acceptance of battery systems. On the question: "What in your opinion would be the main argument in favour of a community energy storage" 108 participants answered. Support of local energy generation was the most popular argument (70 respondents), with perceived environmental benefits (decrease of CO2 emissions) and decrease of nuclear power share on the second place. Financial benefits were noted by 36% of the respondents. 12% did not have an opinion on the issue.

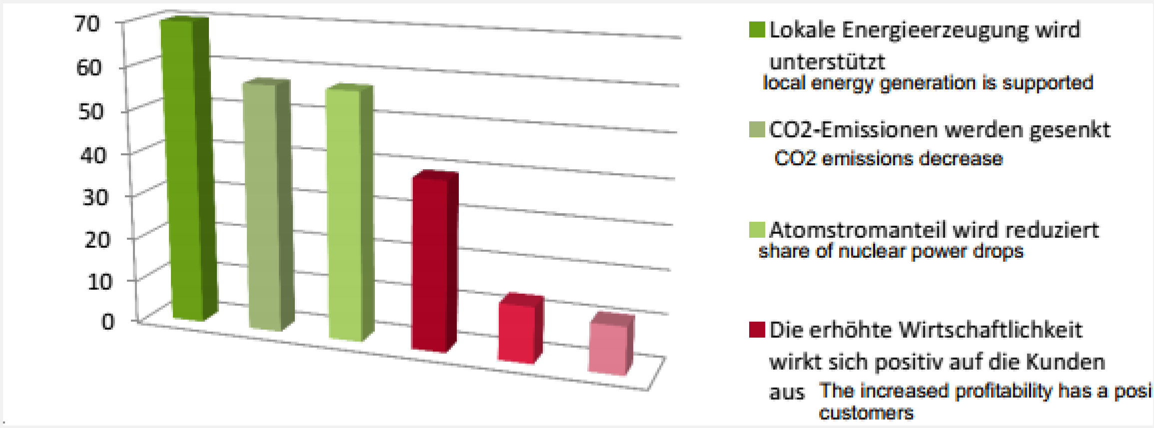


Figure 4: Responses distribution for the question "What in your opinion would be the main argument in favour of a community energy storage" (Samweber et al, n.d.)

Community batteries can be even better distinguished from home batteries by the community aspect: In almost all pilot projects the interactions between participants is of importance. Since community batteries are physically present in a local social structure, neighborhood relations can be tied and strengthened. This notion needs to be further developed and realized as selling point on the market.

Ease of use and technophilia are also relevant arguments but are ranked lower than for home batteries. Ease of use is necessary, but not a sufficient premise, for participants to quit the projects early. The German project Strombank in which consumers had different types of accounts in the community storage with different risk profiles and financial benefits to choose

[6] Eg we looked at the documentation of the projects Strombank, Alpstore and carried out 8 interviews with demo site responsibles

from (in analogy to a bank account), however showed that the core motivation behind the preferred model for the consumer was perceived ease of usage and familiarity with the approach.

Safety concerns are equally present for community batteries than for home batteries. The percentage of participants with interest and fascination in modern technology in current pilot projects was rather low for community batteries, while it is higher for devices installed in households. For these participants technical gadgets could be attractive, however, it is not expected that a large expenditure for the development of these gadgets will be in relation to a comparable increase in participants.

Table 3 represents the main findings regarding the motivation to choose between community and home batteries:

Table 3: Motivation for participation in community batteries and home batteries

Motivation	Community batteries	Home batteries
Financial performance	++	+++
Self-sufficiency	+++	+++
Environmental value creation	+++	++
Social value creation	++	
Technophilia	+	++
Ease of use	++	+
Communication, transparency, participation	+++	
Safety	++	++

Analysing the motivations for the community battery model, it can be concluded that energy self-sufficiency and autarky and environmental value creation are the main motivations to address for participation in community storage. Financial motivation, although strong for competitive models, is less stimulating for community storage, however there are concerns that every consumer gets a fair benefit out of the joint storage. At the same time, social structures, inclusion, effective communication, and transparency are the strategic points for structuring customer participation.

4 Conclusions

Community batteries stand out compared to home batteries due to the possibility to integrate various technologies. For this reason, it is especially interesting for energy suppliers with a (planned) wide technology portfolio to provide new services. Community batteries allow energy companies with a similar structure as municipal utilities to operate on a regional level and establish/maintain consumer relationships. While there are no clear business cases yet, in the case of new buillt neighborhoods promising business cases could already be implemented in the next few years due to the possibility to link electricity and heat demand and possibly electric vehicles, however only if regulatory barriers are reduced (such as introducing low local grid fees). “Behind the meter” solutions with lower grid feeds however will gain greater significance in the next years due to the implementation of the Clean Energy for All Europeans package, creating new opportunities for community batteries, for example, as part of Local Energy Communities.

5 References

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6 Selected examples

6.1 Weinsberg, Germany

Short description	Within this project, a newly conceptualized settlement supplying electric and thermal energy from solar electricity to the neighborhood, (23 households) was realized. Next, to a centralized electric storage, a centralized thermal storage, a centralized heat pump, and several decentralized storages were implemented. The local heat grid is operated with intelligent use of excess electricity for heating and warm water heating in summer. A cogeneration unit is used to cover electricity and heat gaps.
Economics	The project turned out to be cost effective due to the almost ideal surrounding conditions: i.) the property, where the settlement was built, belonged to the operating enterprise, ii.) a centrally positioned electricity and heat storage, ii.) the possibility to offer a tariff cheaper than the market one and iv.) the administration and operation of the energy concept were taken over internally by the operating enterprise.
Technical	145 kW PV, a 150 kWh centralized electric Li-Ion storage, a 35 kWel heat pump, a centralized buffer tank (20 000l), a bidirectional battery

specifications	inverter, 18 decentralized smaller thermal storages, a 240 kW gas boiler for peak loads and a 27kWth CHP unit. Excess power, which cannot be stored electrically, goes to the thermal storage, where either the centralized heat pump is powered or smaller decentralized heat storages are heated.
Multiuse of the electric storage	The possibility to participate in the balancing market exists; nonetheless, self-sufficiency was the main aim. The storage was also profitable without market revenues. Here the link to the heat supply was of major importance.
Highlights	97% electric and 50% thermal self-sufficiency
Partners	Kaco new energy, Kruck + Partner GmbH & Co. KG (Partners: Fraunhofer ISE, Ingeneubüro Bunse Gmbh, SIB Ingenieurbüro für Electrotechnik)
Location	Weinsberg, Baden Württemberg, Germany
Timescale	2013/14
Link	http://kaco-newenergy.com/de/lounge/modellprojekt-weinsberg/

6.2 Strombank, Germany

Short description	In the “Strombank” project, a 15 months field test with 18 participating PV and CHP owners was conducted. The model works similar to a conventional bank: Participants obtained a specific share of the storage capacity of the battery and could deposit and withdraw electricity within their share. This led to a considerable increase in self-sufficiency. Moreover, participants had the possibility to trade excessive electricity in the community. The managing of their share was done over an app.
Economics	The project was financed in the context of a research project. Another contemplated option is a contracting model, where the battery is provided, installed and run by an external provider. This results in a cross-selling potential due to the possibility to sell needed residual current and the addition of supplementary products such as heat pumps. House owners, on the other hand, have the opportunity to store energy and optimize their self-supply without having to bear technical or economic risks. In the case of the rental model, households have to pay a monthly fee for the utilization of their share. As for a co-operation model, PV and CHP owners invest together in the battery and the software and are responsible for the operation. Due to the current legal framework (fees on feed in and discharging), the “Strombankmodell” is, independent of the business model, not profitable. The Strombankmodell price is approx. 23c/kWh and the conventional electricity price is at 18ct/kWh.

Technical specifications	100 kW Li-Ion battery, 116 kWh storage capacity The operation of the system works by the means of an energy cloud connecting participants and storage. Energy flows of the single participants were measured by smart meters and transferred to the system for accounting. Moreover, a peak shaving algorithm has been developed, which distorted the charging temporarily based on supply and demand projections in order to reduce critical peaks. Excess electricity wasn't directly temporarily stored in order to have storage capacity available at noon. Projections regarding the supply were based on an available PV projection of a reference system. Demand projections were based on the average weekday profile of the participants.
Multiuse of the electric storage	Self-sufficiency optimization (storing and trading of electricity) was the main goal of the project. The "Strombankmodell" is pre-qualified for the provision of secondary balancing power, however, this couldn't be realized due to complex requirements.
Acceptance	The acceptance was in principal high, however, the range of options to participate in the storage was a possible obstacle.
Highlights	Reduction of feed-in of excess solar electricity by about 75%, Reduction of grid electricity by 40%, Self-supply at an average of 60-80%, Ideal complementation of PV and CHP facilities (CHP generate excess energy mostly at night and in winter), Seasonal varying account sizes to consider seasonal fluctuation in the generation of renewable energy sources, Peak shaving algorithm
Partners	MVV Energie, Netrion Gmbh (grid operator), ads-tec Gmbh (Battery provider), University of Stuttgart, 14 households and 4 industrial partners (PV, CHP operators)
Location	Rheinau, Mannheim, Germany
Timescale	November 2013-March 2016
Link	https://www.mvv.de/de/mvv_energie_gruppe/nachhaltigkeit_2/nachhaltig_wirtschaften_1/innovationen_1/strombank/strombank_1.jsp

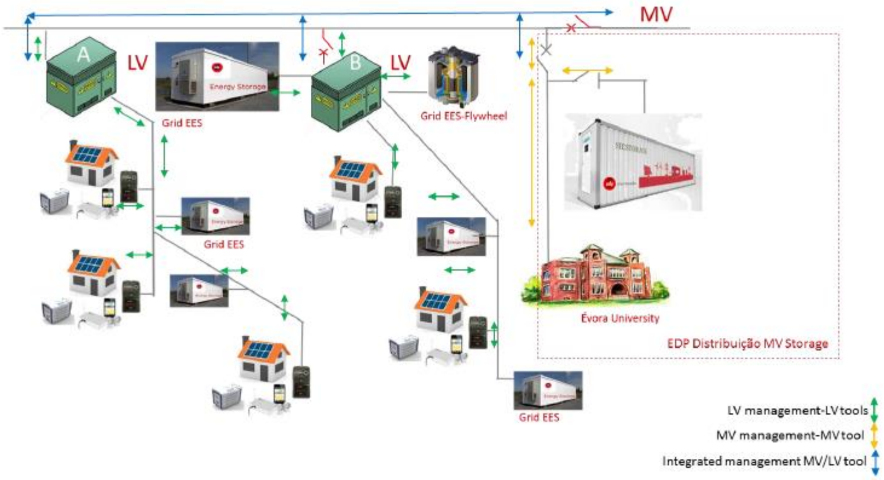
6.3 Solar Neighborhood, Germany

Short description	In a newly built settlement, the so-called "Solar neighborhood" (each house is obliged to install a solar collector on their roof) a community battery was implemented to increase self-sufficiency. The storage is operatd by ENTEGA Energie. Community storage plays an important part in the regional flexibility management plan (Flex4Energy). The aim of this concept is to introduce a flexibility manager as a new market actor, who takes over the integration and aggregation of different flexibility products, balances offers and therefore creates a market on the distribution level. Community batteries offer better flexibility than

	individual decentralized home batteries and are therefore an important part in the flexibility management plan.
Economics	Consumers feed-in electricity from their PV panels according to the EEG – the community battery is used in parallel without a contract between storage operator and consumer. The community battery plays an important role in the set-up of a trading platform for regional flexibility products by facilitating grid stabilization. Benefits of the trading platform are: cost savings for consumers as a certain flexibility potential is already available/consumers can address local challenges directly and do not have to invest in order to come to an off-set; additional revenues to re-finance installations for flexibility providers. Currently, this model is not profitable due to disadvantageous statues such as grid fees for the utilization of the public grid between the storage and the consumers.
Technical specifications	250 kWh Li-Ion storage (expansion to 800kWh), currently 24 households are connected (82 are indented), each house is bound to have at least 5KW PV on the roof, air-heating pumps in each house.
Multiuse of the electric storage	Primary self-sufficiency optimization, grid stabilization through regional flexibility products and integration of heat pumps.
Acceptance	Community batteries are viable components for ENTECA to establish new business areas such as e-mobility. Community batteries also come with lower safety concerns by consumers than home batteries.
Highlights	Local flexibility management – flexibilities of the community storage can be offered/used via a regional trading platform.
Partners	ENTEGA (local energy supplier), ads-tec Gmbh (Battery producer), local administration/municipality (concept of solar settlement)
Location	Groß-Umstadt, Germany
Timescale	Project start: September 2016
Link	https://www.entega.ag/flex4energy/aktuelles.html

6.4 Évora, Portugal

Short description	The aim of the demonstration project as part of the EU project SENSIBLE is to improve the stabilization of the local low/medium voltage network in the municipality Valverde (450 inhabitants) by the means of storage and intelligent energy management solutions and to ensure a flawless integration of decentralized renewable energy into the local electricity grid. The aim is not only to guarantee an ideal standard operation of the grid but also to test the possibility to operate the village in an island mode. The combination of storage and energy management solutions should allow overcoming technical challenges of the grid as a result of increasing decentralized electricity generation. Next to the 360kWh battery at the University of Évora, an additional

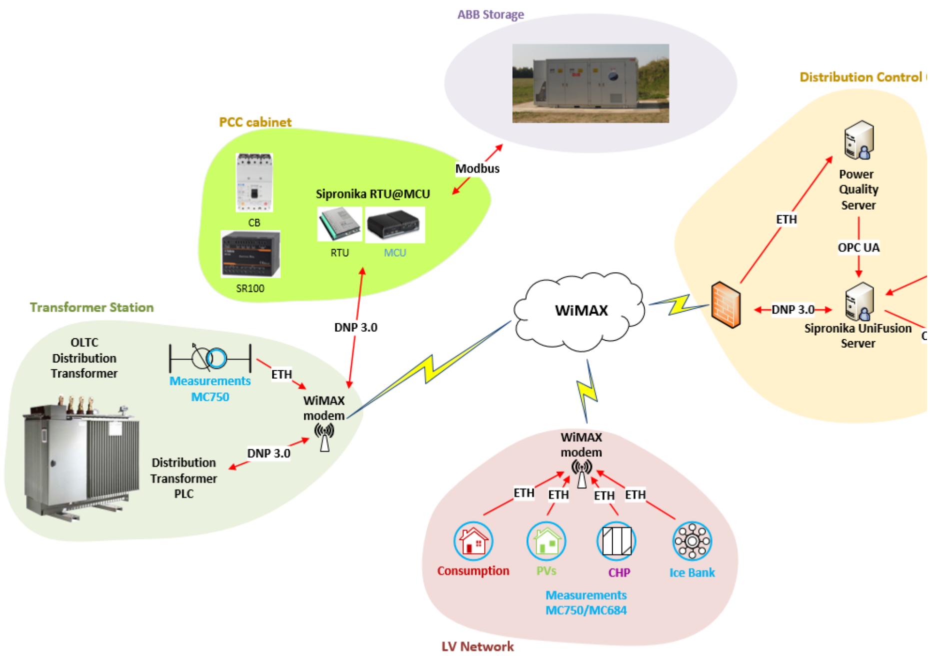
	battery at the intersection of low and medium voltage network and several smaller storage solutions at different locations of the low-voltage grid were implemented. Combined with the already implemented home storage a cascading storage system over several network levels is created. Data collected by smart meters allow the ideal management of the system.
Economics	The focus of the demonstration is grid stabilization but also the generation of market revenues. The aim is to ensure ideal management of the high and medium voltage grid. Due to the integration of different storage solutions in the low and medium voltage network, a cascading benefit is created for superior grid levels, which could reduce costs.
Technical specifications	 Évora Demonstrator Site Powerpoint Presentation: http://www.h2020-project-sensible.eu/demonstrator-sites/evora-demonstrator-site.aspx
Multiuse of the electric storage	Services so the grid and generation of market revenues.
Acceptance	In the beginning, EDP encountered difficulties as a big utility company to gain trust in the small regional area, however, later there was a good acceptance of the DMS system.
Highlights	Cascading storage system over several grid levels.
Partners	EDP, Siemens AG, INSEC TEC
Location	Valverde, Évora, Portugal
Timescale	2015-1018
Link	http://www.h2020-project-sensible.eu/demonstrator-sites/evora-demonstrator-site.aspx

6.5 Harlemermeer, Netherlands

Short description	The community battery project in Haarlemmermeer was initiated by the grid operator Liander, who approached the local supplier Tegenstroom. Tegenstroom is part of an energy cooperative. Liander is the owner

	and operator of the community battery. If this will be outlawed on account of the Clean Energy Packet a service operator will take over the operation. The participation of the households on the project is free of charge, households, however, have to install PV panels of Tegenstroom for rent on their roof. A discount was granted for the rent of these PV panels. Currently, there are 35 households involved. The installation of the panels was realized in co-operation with a social housing company. Moreover, participating households are equipped with the energy management software "Lyv Dash", which allows monitoring of the energy flows and optimization of the energy use.
Economics	The focus of the demonstration is grid stabilization but also concepts for other market revenues are sought (e.g. co-operation with an aggregator offering electricity/balancing power). The optimization of self-sufficiency is currently, due to the legal framework (net-metering system), not reasonable but is pursued. Participants profit by a reduction of the PV panel rent (reduction of 180€/year) and provision of the energy management software "Lyv Dash". In the future, households will be equipped with additional home storage. The benefits of the community battery should, in the long run, be on the provision of residual current.
Technical specifications	Li-Ion Battery storage, 400 kV-grid
Multiuse of the electric storage	Services so the grid and in addition market revenues
Acceptance	Through the local supplier, Tegenstroom, a high interest of the inhabitants in the community battery could be drawn, since a high level of trust between the population and Tegenstroom was already established. Several other villages and cities in the Netherlands have expressed interest in community batteries. One big advantage of community storage is that houses in the Netherlands are typically quite small and therefore lack room for home batteries.
Highlights	High acceptance through the co-operation with a local utility company.
Partners	Liander (Grid operator), Tegenstroom (local utility company) Lyv Smart Living (Energy management software) and ATEPS (battery provider)
Location	Rijsenhout, Haarlemmermeer, The Netherlands
Timescale	2017
Link	https://tegenstroom.nl/zonnepanelen/buurtbatterij-rijsenhout https://www.liander.nl/buurtbatterij

6.6 Suha, Slovenia

Short description	As part of the EU STORY project, the first community battery in Slovenia has been implemented in Suha pri Kranju at the end of August 2018. The Slovenian DSO Elektro Gorenjska (EG) aims to demonstrate the management (integration in existing infrastructure, control and battery management system, peak demand control within the daily load diagram, reduction of line congestions, provision of tertiary reserve and TDH reduction) of a medium-sized battery and provide a high degree of self-sufficiency to the village from the locally generated solar power (7 PV power plants). After a year of operation in Suha (rural load), the battery will be de-installed and re-connected in EG HQ representing a typical industrial load.
Economics	Currently, no analysis has been conducted, but it is expected, that the utilization of the battery only for DSO service support will most likely not be profitable.
Technical specifications	Li-Ion battery (170kW, 450 kWh) connected directly to a 400 kVA OLTC MV/LV transformer station, supplying 90 households with 7 PV plants (total 210 kW power). A day ahead weather forecast, implemented within the control algorithm, additionally optimizes the battery operation. 
Multiuse of the electric storage	In line with the project goals, storage primarily supports DSO operations, with tertiary reserve provision only being implemented as trial service. The cooperation with an aggregator is planned. In order to

	fully exploit storage potential, integration in a VPP is mandatory.
Acceptance	High acceptance due to a good relationship between the DSO and the customers in the region.
Highlights	Demonstration of flexible and robust use of a medium-sized battery in a rural and industrial network.
Partners	Elektro Gorenjska, ABB, VTT, University of Ljubljana
Location	Suha pri Kranju, Slovenia
Timescale	2018-2019
Link	http://horizon2020-story.eu/story_case_study/case-study-5/