



local Electricity retail Markets for Prosumer smart grid pOWER services

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Abbreviations and Acronyms

| Acronym | Description |
|---------|-----------------|
| GA | Grant Agreement |
| WP | Work Package |

Executive summary

This document reflects the dissemination and communication actions performed during the three years duration of EMPOWER project for creating impact by spreading the project objectives, evolution and results.

The main goals of “WP9 Dissemination and communication” are to disseminate the project insights, while capturing and maintaining the attention of stakeholders, including authorities, citizens, potential partners so as to maximise the project impact.

Being aware of the large influence Internet has nowadays, a big effort has been put to update the webpage of the project with news and connecting it to the social networks. In addition, several events have been organized and other communication channels like conferences, workshops, magazines, newsletters and journals have been used to publish EMPOWER vision, objectives and results. For encouraging the dissemination of EMPOWER and reaching potential stakeholders, the project has been presented at several events and flyers have been distributed. Additionally, the Technical Advisory Group (TAG), which was created during the first year of the project, has been expanded. All these communication and dissemination activities have been complemented with the release of videos explaining the project insights. Furthermore, a book to be published by Wiley during 2018 with focus on local electricity markets is under development.

Using all these tools, the messages spread through the communication and dissemination actions during the 3 years of the project have promoted:

- The creation of innovative, sustainability-focused market solutions that increase prosumer engagement and offer more freedom of choice to electricity consumers.
- The improvement of investments and assimilation of micro-generation in the distribution net among consumers and others by means of the insight established in EMPOWER.
- The SESP role and the micro-market for inclusion in regular business operations.
- The development of functions of the ICT to trigger further exploitation.
- The stimulation of social and environmental mind-shifts and trigger practical initiatives among based on the EMPOWER experience.

1 Introduction

The present report is an outcome of Task 9.5, “Dissemination and Communication activities”. To contextualise the focus of communication and dissemination activities, a brief description of EMPOWER objectives is presented. Due to the distributed installation of renewable and therefore intermittent generation, the role of distribution system operators (DSO) has become much more important than before the electricity market liberalization carried out in the European Union. To maintain a high level of quality of customer services and electricity supply, new information and communication technologies are needed and new roles will evolve at the interface between DSO’s, local consumers/prosumers, decentralised electricity suppliers and the transmission operator. Small to medium-scale distributed storage systems on medium and low voltage supply systems level will have to be managed in the future. In this scenario, the EMPOWER project is designing a new market for local trading and involvement of prosumers through a cloud based ICT.

The present document is structured as follows. First, the project vision and mission are presented. Then, a brief reference to dissemination and communication in EMPOWER project is shown. Afterwards, the main dissemination and communication channels are described, with special emphasis on the webpage and twitter account, showing the obtained statistics after 3 years monitoring through Google Analytics. The Technical Advisory Group (TAG) evolution and its meetings are summarised. Then, the specific business awareness creation strategy and results are explained. Finally, the presentations, publications, videos and events performed during all the project are reviewed. Special importance is given to the book on local electricity markets that is under development, co-authored by EMPOWER project partners. Last, but not least, the Dissemination and communication plan are reviewed.

2 Empower vision and mission

The EMPOWER vision and mission were presented in the Grant Agreement, before starting the project.

Nowadays, political goals, consumer engagement and technology developments are leading to a lot of changes at the retail/medium and low voltage side of the electricity market. New technologies are under deployment including appliances for smart metering, distributed electricity generation, home automation/smart appliances/load control, distributed storage and electric vehicles. Such technologies create new challenges for the operation of the distribution networks, due to higher peaks, more dynamics and less predictability. Balancing supply and demand and maintaining power quality in the grid are some of the challenges. These challenges are local and must be solved at the local level.

At the same time we observe a growing engagement from the consumers, who want to take a larger responsibility for a sustainable future regarding energy use. Some places groups of consumers self-organize to create co-operatives in order to be able to take such responsibility.

As described above, deployment of new technologies at retail side creates new challenges for the electricity system. On the other hand the same technologies can also be a main contributor to solving these challenges. However, technological possibilities and consumer awareness are not enough to make this happen.

The consumers and prosumers must be provided with incentives (economic and other) to invest in new technology and to participate in self-generation, demand response programs and other programs that put a value at flexibility. This should be done by development of innovative business models. The contribution from each single consumer and prosumer might be small, so aggregation and coordination must be established efficiently. Such collective/coordinated regimes must ensure confidence for the consumers/prosumers as well as for the DSO in order to maximize potential and hence realize the benefits for the local electricity system, the local community and each participant.

Local market place(s) must be established to exchange the local resources aiming for solution of local challenges and ensuring local cost efficiency. EMPOWER proposes the definition of a new role in the local electricity market, the Smart Energy Service Provider (SESP), with the task to handle the operation of the market place, the coordination

between the participants, economic settlement and offering of services for the market participants. The SESP role can be taken by incumbent roles (like the DSO) or by newcomers (like ESCOS, co-operatives, municipalities, or others). In any case the tasks and responsibilities for the different roles must be defined and the technical and economic interaction between them must be outlined.

Taking into account this vision, EMPOWER aims to “develop and verify a local market place and innovative business models including operational methods to encourage micro-generation and active participation of prosumers to exploit the flexibility that this creates for the benefit of all connected to the local grid.”

3 Dissemination and communication guidelines

Dissemination and Communication are proven to be extremely important in a European funded project. An internal document entitled “*Dissemination & Communication. A guide for project participants*” was written during the first year for setting the principles and guidelines mandatory for all the partners, in order to give the Dissemination & Communication activities a common shape and avoid any possible error. This guide has been used for the dissemination and communication activities of the three years [1-4].

4 Channels for dissemination and communication

4.1 Webpage

The internet was identified from the beginning of the project as a key element for disseminating the EMPOWER among end users, prosumers or anyone interested in it (<http://empowerh2020.eu>). So the language style used in it, although being technical when required, is carefully selected to allow a general comprehension of the project insights for non-technical people. The webpage development has been taking into consideration that it enables:

- Presenting the project to a broad audience
- A way to reach possible stakeholders
- Promoting the project insights and the team
- Spreading press/events/deliverables

Taking into account the before-mentioned, it was concluded that what we needed should be:

- Graphical webpage
- Catchy design
- Easy-to-understand language

The link for accessing the EMPOWER project webpage is:

<http://empowerh2020.eu/>

The structure of the webpage developed during the first year has been kept and the contents of the menus created during the first year have been updated and expanded, specifically with publications, news and events of the second year.

- Home
- The project
- Partners
- Technical publications
- Press & News
- Events
- Friends of EMPOWER
- Contact

To show some of the updates of the webpage a caption for each page menu has been included (Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8). It is worth mentioning that when doing a google search of the words “local electricity markets”, the EMPOWER webpage appears in the 6th position.

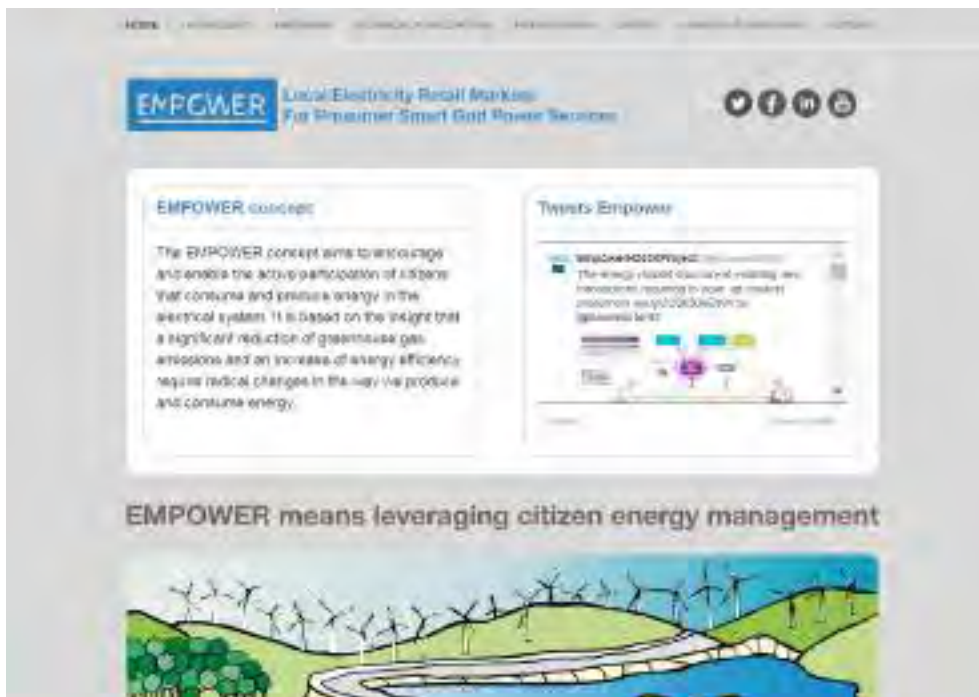


Figure 1: Home page caption



Figure 2: The project page caption



Figure 3: Partners page caption



Figure 4: Technical publications page caption (submenu Deliverables)



Figure 5: Press and news page caption

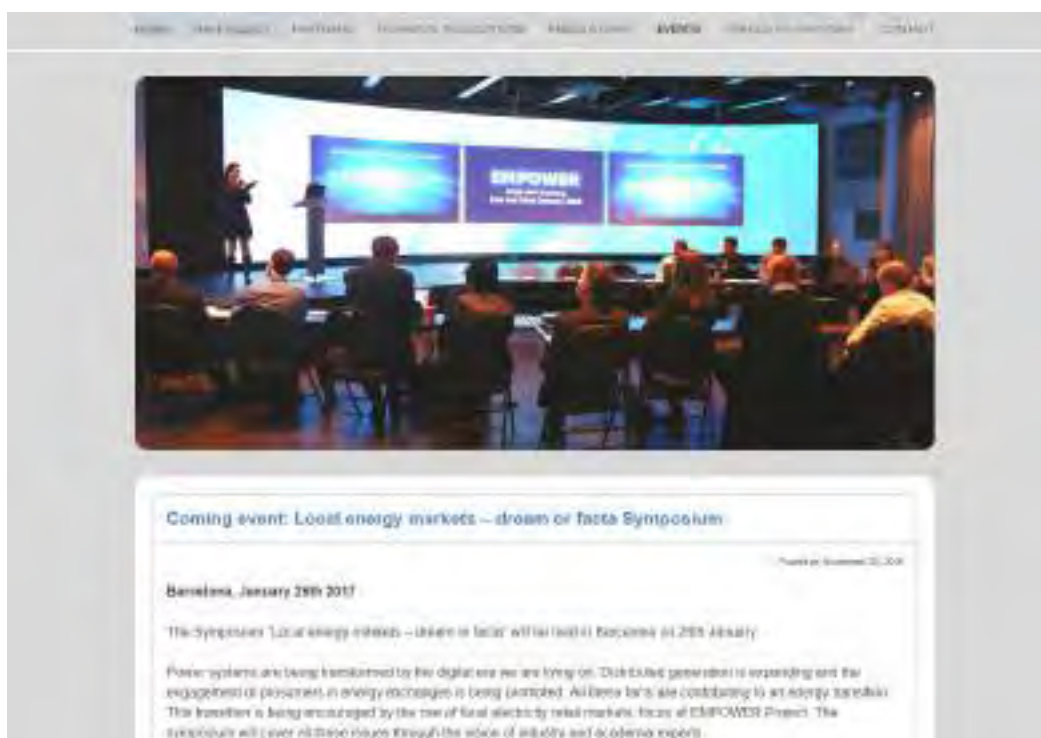


Figure 6: Events page caption

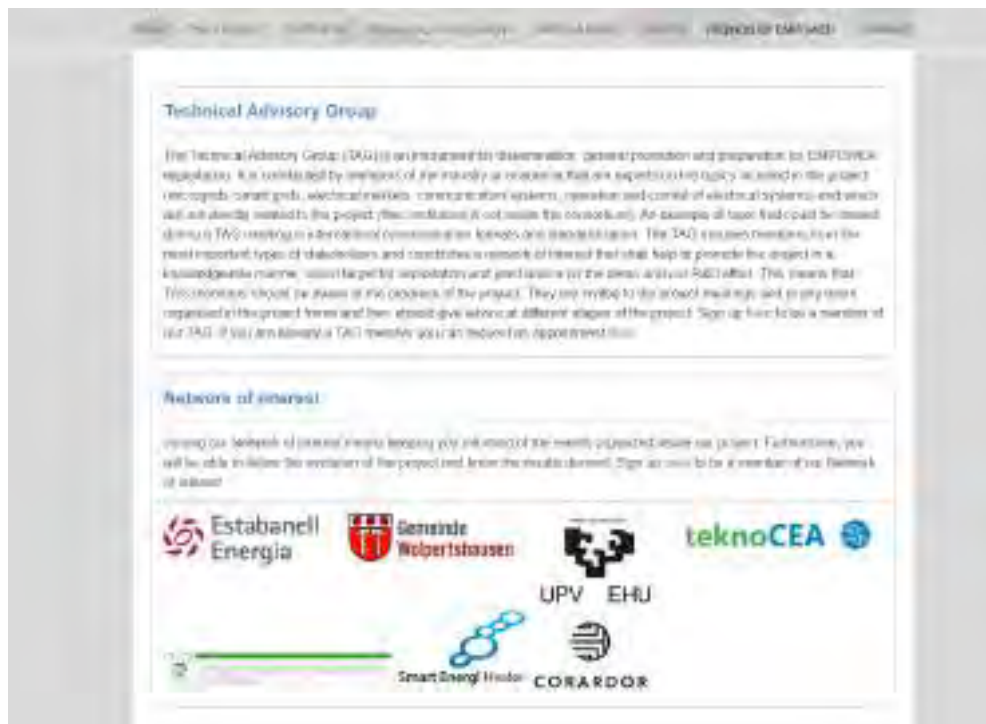


Figure 7: Friends of EMPOWER page caption



Figure 8: Contact page caption

In order to reflect the webpage interest and impact, some statistics have been generated through Google Analytics for the 3 years of the project. They are reflected in Figure 9 for the first year, in Figure 10 for the second year and in Figure 11 for the third year. It can be seen that both during 2015 and 2016, the webpage registered more than 7000 views. The users were in its majority new. In 2015, 15 % of the total number of visitors were returning ones, while in 2016, 30 % were returning ones. During 2017, the number of users and page visits have continued the increasing tendency.



Figure 9: Statistics of EMPOWER webpage during the first year, from Google Analytics



Figure 11: Statistics of EMPOWER webpage during the third year project (January-December 2017), from Google Analytics

4.2 Social networks

EMPOWER is available in different social networks: Twitter, LinkedIn, Facebook and Youtube. All the social networks are accessible from the home menu of the webpage of the project. On the other hand, the Youtube channel has been used for uploading videos explaining the project and the business models developed.

All the social media (and webpage) have been monitored since their creation through Google analytics, so as to know how their successfulness and take actions based on the publications having more impact.

The list of performance indicators considered for evaluating the effect of Twitter, Facebook and LinkedIn. All this data has been obtained with Google Analytics. The parameters corresponding to the Twitter account (see its caption in Figure 12 Figure 11), which was the most successful one, are reflected in Table 1 for the first year, in Table 2 for the second year and in Table 3 for the third year. They show the number of tweets, of profile visits, of new followers, of tweet impressions and of mentions, which in general are increasing in time, as represented in Figure 13a, Figure 13b, Figure 13c and Figure 13d.



Figure 12: Caption of the twitter account on 1st December 2017

| MONTH | TWEETS | PROFILE VISITS | NEW FOLLOWERS | TWEET IMPRESSIONS | MENTIONS |
|--------------|-----------|----------------|---------------|-------------------|-----------|
| 1 | 9 | 333 | 19 | 1160 | 3 |
| 2 | 0 | 77 | 7 | 1208 | 3 |
| 3 | 1 | 167 | 6 | 788 | 1 |
| 4 | 0 | 54 | 4 | 75 | 4 |
| 5 | 5 | 134 | 2 | 379 | 5 |
| 6 | 4 | 90 | 12 | 617 | 5 |
| 7 | 1 | 125 | 5 | 634 | 4 |
| 8 | 0 | 66 | 4 | 286 | 0 |
| 9 | 1 | 35 | 4 | 454 | 1 |
| 10 | 0 | 253 | 6 | 253 | 5 |
| 11 | 1 | 69 | 5 | 122 | 5 |
| 12 | 5 | 177 | 8 | 1168 | 2 |
| TOTAL | 27 | 1580 | 82 | 7144 | 38 |

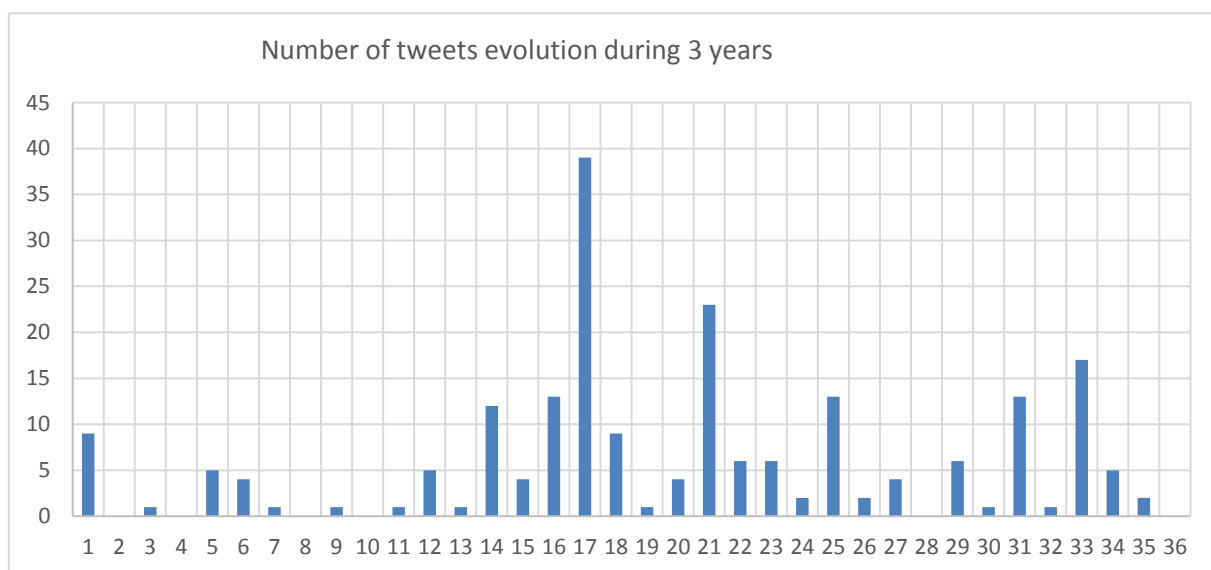
Table 1. Twitter statistics during the first year of the project, obtained from Google Analytics

| MONTH | TWEETS | PROFILE VISITS | NEW FOLLOWERS | TWEET IMPRESSIONS | MENTIONS |
|--------------|------------|----------------|---------------|-------------------|------------|
| 13 | 1 | 124 | 0 | 981 | 0 |
| 14 | 12 | 380 | 0 | 3547 | 11 |
| 15 | 4 | 165 | 0 | 3499 | 11 |
| 16 | 13 | 320 | 0 | 5811 | 19 |
| 17 | 39 | 357 | 0 | 26200 | 18 |
| 18 | 9 | 338 | 0 | 7455 | 8 |
| 19 | 1 | 170 | 10 | 5536 | 0 |
| 20 | 4 | 184 | 5 | 3358 | 3 |
| 21 | 23 | 407 | 14 | 4749 | 29 |
| 22 | 6 | 368 | 10 | 4691 | 4 |
| 23 | 6 | 174 | 10 | 3584 | 8 |
| 24 | 2 | 273 | 10 | 2883 | 4 |
| TOTAL | 120 | 3260 | 59 | 72294 | 115 |

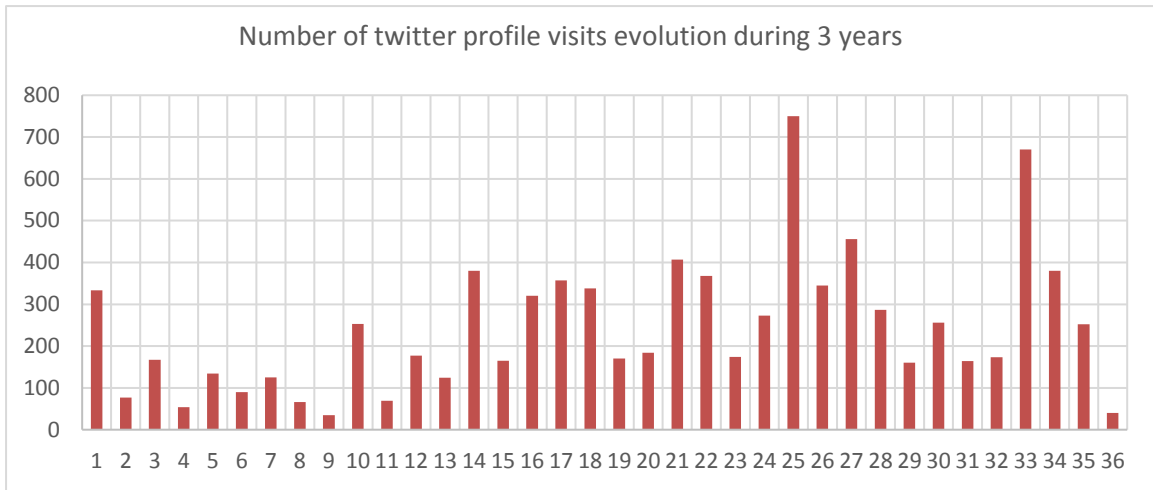
Table 2. Twitter statistics during the second year of the project, obtained from Google Analytics

| MONTH | TWEETS | PROFILE VISITS | NEW FOLLOWERS | TWEET IMPRESSIONS | MENTIONS |
|--------------|-----------|----------------|---------------|-------------------|------------|
| 25 | 13 | 750 | 20 | 8042 | 45 |
| 26 | 2 | 345 | 17 | 2662 | 21 |
| 27 | 4 | 456 | 21 | 2945 | 8 |
| 28 | 0 | 287 | 9 | 2066 | 10 |
| 29 | 6 | 160 | 14 | 2014 | 21 |
| 30 | 1 | 256 | 13 | 1256 | 22 |
| 31 | 13 | 164 | 11 | 2266 | 13 |
| 32 | 1 | 173 | 12 | 2493 | 1 |
| 33 | 17 | 670 | 20 | 8799 | 24 |
| 34 | 5 | 380 | 22 | 9503 | 28 |
| 35 | 2 | 252 | 10 | 1575 | 11 |
| 36 (12 days) | 0 | 40 | 8 | 355 | 0 |
| TOTAL | 64 | 3993 | 177 | 43976 | 204 |

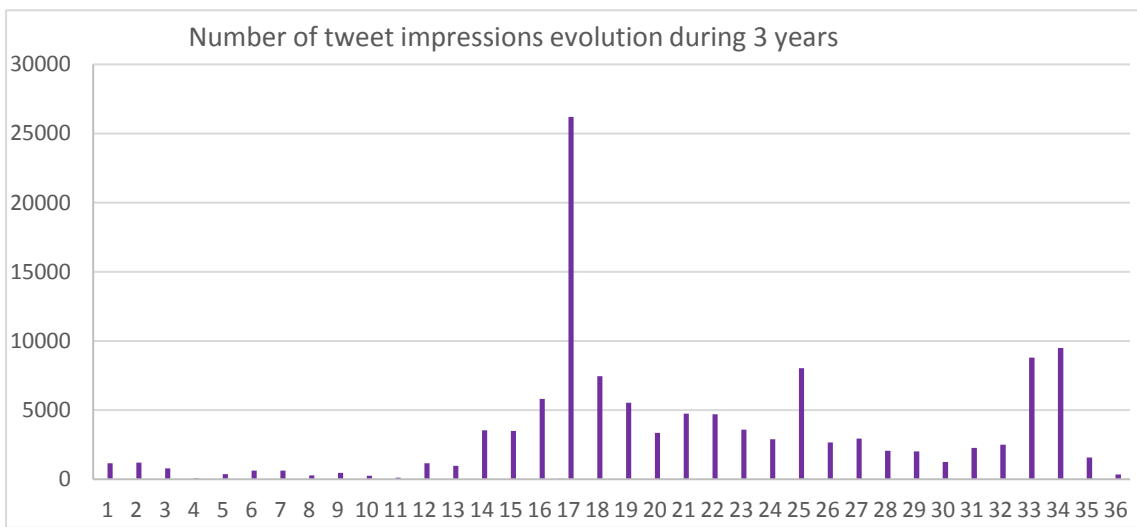
Table 3. Twitter statistics during the third year of the project, obtained from Google Analytics



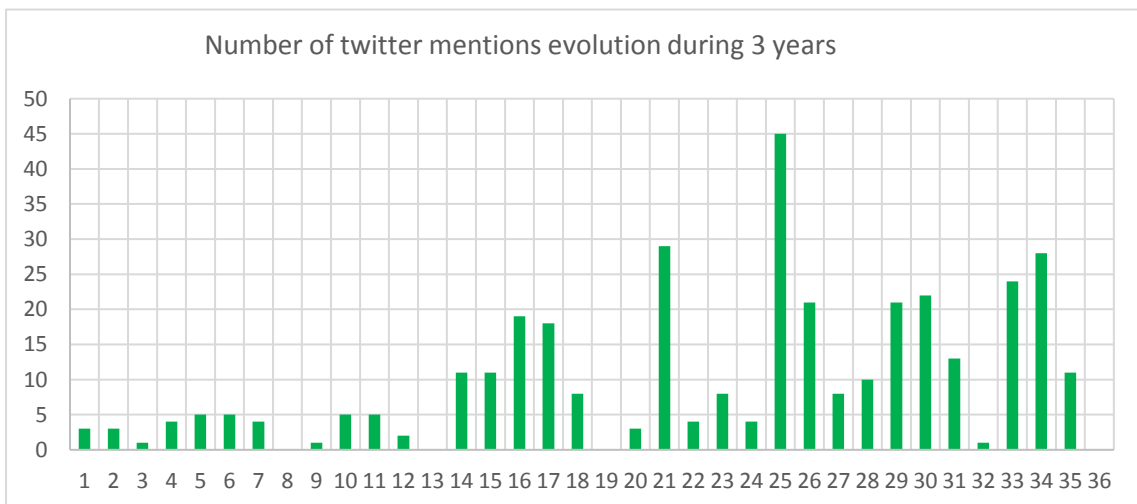
a) Number of tweets evolution



b) Number of twitter profile visits evolution



c) Number of tweet impressions evolution



d) Number of tweet mentions evolution

Figure 13: Twitter statistics

The global figures during the three years indicate a success of the dissemination through the Twitter account: 211 tweets, 8773 profile visits, 318 followers, 123414 tweet impressions and 357 mentions (taking into consideration the first two weeks of December 2017).

4.3 Newsletters

Three newsletters have been released since the Project started: one during the first year, to disseminate the project progress, announce coming events and capture the interest of stakeholders.



Figure 14: EMPOWER Newsletters 1, 2 and 3

The first newsletter was published on 2016 and focused on explaining the Project concept and objectives. The second newsletter was published at the beginning of 2017 and put emphasis on the ICT platform under development. The third newsletter was also published on 2017 and showed the pilot sites deployment status.

4.4 Poster and flyers

A poster and two flyers were designed and printed in order to distribute them in workshops, conferences and other events to capture the attention of stakeholders. The poster is depicted in Figure 15 and the two flyers in Figure 16 and Figure 17, respectively. The first flyer was focused on the project objectives and the second flyer was focused on the ICT platform and pilot site implementation.

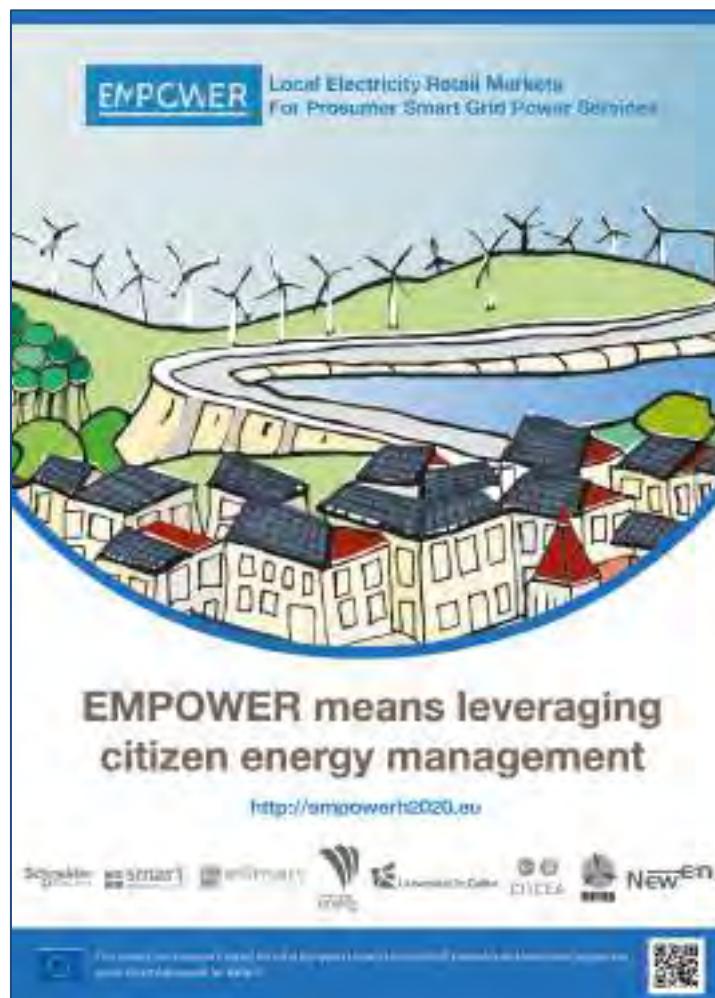


Figure 15: EMPOWER poster



| | | |
|--|--|---|
| <p>EMPOWER CONCEPT & GOALS</p> <p>The EMPOWER project aims to encourage and enable the citizen participation in their energy economy. To do so, the project is developing an ICT platform for facilitating local electricity trading. EMPOWER creates a local community of consumers, producers or processors who seek opportunities in an energy market situated in their own neighbourhood. This energy flexibility and other energy related services are traded. Community members can negotiate and trade contracts through a community controlled Smart Energy Local Market (SELM) with the DSO, with their neighbours and other consumers. Community self-trading flexibility will be strongly and continuously enabled together with energy yield and output. Choice and trading in the community will lead to economically incentivised to invest in energy and storage and this part which will allow to increase generation capacity and lead to increase the energy efficiency.</p> <p>LEVERAGING THE LOCAL CITIZEN The SELM-ONEP project...</p> <ul style="list-style-type: none"> - Defines a community for local trade of energy, flexibility and energy related services. - Enables a trading system in continuous energy storage flexibility and services, contracts and are combinations of them. - Designs an ICT platform for enabling local markets. - Implements and tests the ICT platform in three pilot sites. - Other representative partners, city public services and nearby actors participate in support their engagement in the ICT platform. <p>The ICT platform coupled with the trading system will allow neighbours to participate in the local market trading and making offers for their energy resources for physical and virtual flexible demand and storage units.</p> | <p>WHAT IS A LOCAL MARKET?</p> <p>A local market is a new mode of ideas for electricity trade between producers and a small community. The local market will be very resilient in terms of high flexibility due to distributed energy resources and for integrating flexible loads like water heaters and heat pumps including others. Furthermore, they can be adapted to the different regulatory regimes used in the participating regions.</p> <p>WHO IS GOING TO MANAGE THE LOCAL MARKET?</p> <p>The local market shall be established on basis for a new business model. The SELM shall coordinate the legal link with the local central distribution system with respect to local market operation. Its main role is the organization of the local market. Subsequently the SELM offers services like market development, energy efficiency, storage, maintenance, value creation and technical support. The SELM offers services to all potential participants: consumers, producers, processors, community storage with participating system operators.</p> <p>HOW TO ENABLE PARTICIPATION IN THE LOCAL MARKET?</p> <p>The SELM ICT platform enables the integration between all the market players as producers and as participants. Producers, distributed consumers, distribution system operators and distribution networks DSO with the SELM to optimally identify the value created in new local market rules.</p> | <p>PROJECT ORGANIZATION</p> <p>The project is organized in two work packages (WP). WP1 Project Management is dedicated to lead the project, coordinate the WP, ensure the quality of the outcomes and organize general activities.</p> <p>WP2 Strategies, business models, regulations and policies that define the context where the Local Smart Grid platform can be implemented as they take place in the guidelines and the topics for the specifications to be developed in WP3.</p> <p>WP3 Local Smart Grids (LSG) architecture and processes for implementation of both the ICT platform and of the possible market models.</p> <p>WP4 LSG Communication and user interface for the platform components for the administration implementation.</p> <p>WP5 LSG Control cloud development of the platform components for the control local market.</p> <p>WP6 LSG Market design evaluation the basis for the relationship between the distribution system, their partners in community energy distribution and SELM.</p> <p>WP7 Integration, quality Deployment and Subscribers, where all the different elements and concepts will be integrated, tested and validated.</p> <p>WP8 Evaluation and final policy after testing system integration to help for the establishment of the Local Smart Grid and SELM concepts in the markets. These work packages will be together a fundamental topologies for the achievement of the objectives.</p> <p>WP9 Communication and Dissemination is a range of campaigns and activities that communicate activities that will help in disseminating the project's impacts and, as a result, building the replication potential.</p> |
|--|--|---|

Figure 16: EMPOWER Flyer 1



EMPOWER CONCEPT & GOALS

The EMPOWER project aims to encourage and enable the active participation in local energy exchange. To do so, the project is developing an ICT platform for facilitating local electricity trading.

LEVERAGING THE LOCAL CITIZEN

The EMPOWER project:

- Defines a roadmap for local tasks of energy, flexibility and energy related services
- Creates a needed system for continuous trading of energy, flexibility and service contracts and new business models in these
- Designs an ICT platform for operating local markets
- Implements and tests the ICT platform in two pilot sites
- Offers symmetrical services, like web services and mobile apps for participants to support their engagement in the ICT platform

WHAT IS A LOCAL MARKET?

A local market is a new market place for electricity transactions, based on a small community. The local market will be implemented in places with high potential due to distributed energy resources and for increasing flexibility like solar farms and local storage including others.

WHO IS GOING TO MANAGE THE LOCAL MARKET?

The local market place needs to be in place for a new business model. The smart energy service provider (SESP) is the responsible for legal entity with the most central functionality will consist of local market operators. Its expertise is the operation of the local market. Additionally, the SESP offers services like market management, energy efficiency analysis, measurement, value estimation and technical issue support. The SESP offers services for all potential participants: consumers, producers, prosumers, community energy, and distribution system operators.

The SESP ICT platform enables the standard language of the market places on individual level as part of a collective Prosumer, distributed generation, distributed system operators and system operators data with the SESP to centrally access the system based on one local market sites.

The ICT platform developed will be tested in different pilot sites, located in Münsterlagersheim and San-Bonaventura (Munich), Walsertal (near Garmisch) and in Gießen (Hesse).



The solar panels with a battery (SESP) system will connected to local energy in Garmisch.

SMARTFLEX APP AN INTERFACE WITH THE SESP PLATFORM

The EMPOWER platform is designed to offer energy contracts, flexibility contracts and service contracts to consumers through the SESP.

- Energy contracts regulate conditions related to users and conditions of electricity between the consumer and the SESP
- Flexibility contracts regulate conditions related to users of flexibility that is provided to the SESP and from the SESP to a DSO
- Service contracts regulate conditions related to users of different services from the SESP to a prosumer.

The SESP can handle these contracts, ensuring all attention about the resources, offers and prosumers. Market rules, price and fees and conditions are stored in the cloud and are processed automatically that the prosumer can check through the application SmartFlex or a web interface with the SESP through the so-called EMS system.



SmartFlex app, SmartFlex/Edge and Web-Interface


Figure 17: EMPOWER Flyer 2

5 Technical Advisory Group

During the first year of a Technical Advisory Group, the so-called TAG, was created. During the second and third years, more contacts were reached and the number of TAG members increased. The persons contacted that agreed to become TAG members are: Carmen Gimeno (GEODE Secretary General), Johannes Vollmer (GEODE Policy Manager), Mark Buckner (Group Leader of Power & Energy Systems at Oak Ridge National Laboratory) and Xavier Farriols (Head of the Energy Business of Factor Energia), Rikiya ABE (CEO of Digital Grid Consortium and Professor at Univ. Of Tokyo), Christian Kunze (Swissgrid), Øivind Berg (Institute for energy technology, Norway), John Hodemaekers (USEF, Universal Smart Energy Framework), Jaume Gratacós (ICAEN, Catalan Institute on Energy), Josep Maria Peiró (COEIC, Industrial Engineers Association of Catalonia) and Amin Shokri (BISITE Research Group)

The first TAG meeting successfully took place in St. Gallen University during the “Forum for Management of Renewable Energies”, on 27th May 2016. The second TAG meeting successfully took place in Barcelona on 26th January 2017. A caption of the programme of each meeting is depicted in Figure 18 and Figure 19. Then, a summary of the minutes of each meeting is presented. A third TAG meeting was planned during a showroom event in Norway at the end of the project, but has not taken place yet.

EMPOWER TAG Workshop H2020 project – Grant agreement n° 646476

EMPOWER TAG Workshop at the St. Gallen Forum for Management of Renewable Energies 

Friday 27th May at 13:45 h

Workshop 7
EMPOWER to the people! (organized by EMPOWER)

Moderation ■ Prof. Bernt A. Bremdal, Norwegian Centre of Expertise Smart Energy Markets
Speakers ■ Knut H. Johansen, CEO eSmart Systems AS
■ Prof. Andreas Sumper, CITCEA - Universitat Politècnica de Catalunya
Venue ■ Room 9.2 C, second floor



This workshop will address the following topics: What is EMPOWER H2020? State-of-the-art local energy markets research, Microgrids and local energy markets, EMPOWER Local Market Design, EMPOWER Architecture and ICT core of the EMPOWER Project. Finally there will be a discussion including Exploitation – how will EMPOWER commercialize.

Agenda

1. What is Empower H2020? (Andreas Sumper) 15 min. Overall explanation of the project.
2. State-of-the-art local energy markets research, Microgrids and local energy markets – pioneers (Bernt Bremdal), 15 min
3. EMPOWER Local Market Design (Bernt Bremdal), 15 min.
4. Presenting the Empower Architecture (Andreas Sumper) 15 min.
5. ICT core of the Empower Project (Knut Johansen), 15 min.
6. Discussion including Exploitation – how will EMPOWER commercialize (Bernt Bremdal, Andreas Sumper, Knut Johansen & all) 45 min.


 This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 646476

Figure 18: TAG meeting in St. Gallen University (May 2016)

EMPOWER

Thursday, 26th January 2017
 Barcelona, ETSEIB
 Universitat Politècnica de Catalunya, UPC BarcelonaTech.




EMPOWER H2020: 2nd TAG meeting



- Introduction to EMPOWER H2020 project (Dieter Hirdes, SmartID)
- Business models description (Emmanuelle, St Gallen University and Bernd Brendel, SmartID)
- Implementation through an ICT platform (Stig Ødegaard, eSmart)
- Deployment in 3 pilots (Per Gjerløw, Schneider Electric)
- Open discussion (30 min)





This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 646476.

Figure 19: TAG meeting in Barcelona (January 2017)

5.1 TAG Workshop at the St. Gallen Forum for Management of Renewable Energies

Friday 27th May at 13:45 h -16:00 h This event was moderated by Bernt Bremdal. Notes were taken by Andreas Sumper.

First, an introduction round has been done.

1. What is Empower H2020? (Andreas Sumper, Presentation)

WP9 leader Andreas Sumper explained the overall goals and other key data of the Project to the TAG. The project is designing an ICT platform for facilitating local electricity trading

2. State-of-the-art local energy markets research, Microgrids and local energy markets – pioneers

3. EMPOWER Local Market Design (Bernt Bremdal, joint presentation)

Bernt Bremdal is defining the concept local market. Multitagent systems are dominating the actual research. The first initiatives on microgrids are coming from the US Army for reliability reasons. Community initiatives and cooperates are present. It's all about how easy it is to participate for normal people. Value is not equal to price.

In the second part of the presentation Bernt Bremdal introduces de SESP. The local market function of the SESP is explained in detail. The SESP is operating an inner and the outer market. Local prosumer and the SESP have flexibility.

Question: How is the market participation done: manually or automatically.

Answer: Automatically

Question: Where should be the SESP? DSO, community etc.?

Answer: Ownership is important.

4. Presenting the Empower Architecture (Andreas Sumper, presentation)

Andreas Sumper present the SGAM Methodology in order to design the SESP. This pres

Questions: How is this implemented?

Answer: The next presentation shows the results of the implementation. It is based on modules that is laying on an existing platform.

Comments on Standards: SGAM has be implemented to enable standardization of the information and communication system. Further works on standardization in general has to be done.

5. ICT core of the Empower Project (Knut Johansen, presentation)

Knut Johansen is presenting the ICT platform for the SESP. It is based on Microsoft Azure. Knut is showing some examples of the ICT platform.

6. Discussion including Exploitation – how will EMPOWER commercialize (Bernt Bremdal, Andreas Sumper, Knut Johansen & all)

Question: In Norway the meterdata is collected by the DSO. How is this implemented in the Empower model.

Answer: The Empower platform is flexible in this sense. The roles can be changed.

Question: From the German point of view: There is the DSO, SESP and supplier. The supplier has to authorize the SESP. Did you analyse these legal issues?

Answer: We have analysed the legal issues, but there is also a change in legislation and regulation. It is difficult area, there are a lot of different legislation. But the experience form other sectors such barriers can be overcome.

Question: How are the Pilot regions prepared to be active in the project?

Answer: In Norway, the FEN is very active and part of the pilots are in place. Public Buildings are integrated and about 100 customers will be integrated in the system.

Question: As prosumer, do I have a choice of the device to be integrated?

Answer: Yes, it is possible.

Comment: The local market will be only on lower and medium voltage grid, never transmission system.

Comment: The TSO should go to the real time pricing

Question (from remote): SESP is a good idea. How is the business model for the SESP?

Answer: The basic idea is to establish a shopping club. Services will be sold as well.

Question: Is it possible to have the SESP in the traditional utility model?

Answer: The SESP could be a traditional player adding these services.

5.2 TAG Workshop at the EMPOWER Symposium “Local energy markets: dream or facta” in Barcelona

Thursday 26th January 2017 at 16:00 h -17:30 h

This event was moderated by Mònica Aragüés.

Notes were taken by Andreas Sumper and Mònica Aragüés.

ABSTRACT

First, an introduction round has been done.

Then, the status of the work packages related to Business models, the ICT platform and the Pilot sites deployment has been summarised.

Next, a debate based on the feedback of TAG members started

- John Hodemaekers (USEF, Universal Smart Energy Framework)
- Jaume Gratacós (ICAEN, Catalan Institute on Energy)
- Josep Maria Peiró (COEIC, Industrial Engineers Association of Catalonia)
- Amin Shokri (BISITE Research Group)

Finally, the UPC Prosumer Lab has been visited and a test was performed.

Business models description (Emmanuelle Reuter, St Gallen University)

The business models for the project have already been developed in WP2. The important step now is its implementation in the pilots sites. If needed, some business models can be refined.

Implementation through an ICT platform (Stig Ødegaard, eSmart)

The market operation is based on forecasting information and optimization techniques. For this purpose, machine learning and artificial intelligence have been used. The market operation requires data of the generating, consumption and storage units from the metering infrastructure. This data is obtained through the ICT platform being developed, which will also allow to send the appropriate signals to these units based on the SESP orders.

This ICT platform will handle neighbourhoods engagements, it will deal with the contracts with the different prosumers and it will enable the flexibility management.

Deployment in 3 pilots (Per Gjerløw, Schneider Electric)

The pilots for testing the ICT platform with the business models designed are located in Norderhaugveien (Norway), Sandbakken (Germany) and Gozo (Malta). The pilot specificities in terms of elements installed, technologies used, functionalities and regulatory market constraints have been shown and the use cases defined to be tested have been presented. There is interest in installing an IDPR in Norway, for dealing with island mode transition.

Debate

After John Hodeamakers (USEF) comments

- *Sandbakken test site is impressive. USEF would wish such a pilot site in the Netherlands.*
- *Is the grid operator involved? Answer Yes.*
- *Is the DSO involved in the use cases? Yes.*
- *Offer to explore possible collaboration*

Question to USEF: How are data collected. Data every 15 min

Question to USEF: How to measure flexibility? What if situation. This is an open issue.

The use cases will guide the field tests. Who is involved in the use cases definition? Mainly, the EMPOWER partners and the grid operator. With which frequency is the data from Smart meters collected? Every 15 minutes. USEF also collects measures every 15 minutes, receiving them from the DSO, after 24 hours of the measurement. How is flexibility measured? This topic could lead to a whole new project.

After Josep Maria Peiró (COEIC, Industrial Engineers Association of Catalonia) comments:

- *Are added values for new actors identified?*
- *Is the proposal technically convincing?*
- *How to convince the utility?*

How to engage prosumers? Added values for new actors in local markets operation need to be clearly identified. Technical feasibility seems ready. However, it is not straight how

to involve new actors, as some utilities. The experience gained in biomass projects for public buildings and municipalities could be used as first steps.

From EMPOWER, we are proposing a new retailer. Wholesale and local markets can live combined. One of the key issues is how to operate them.

After Jaume Gratacós (ICAEN, Catalan Institute on Energy) comments

- Question to him: Is the business model suitable for the actual system in Spain?
- Regulatory issues are needed to be addressed for implementing such a system?
- Is Market splitting possible in Empower? Yes, but is a complementary service. This is impacting the DSO investment scheme.

TSOs need to invest in the grid, but the volume of electricity transmitted appears to be going down. An increasing flexibility at distribution level can slow down the grid expansion investments. Based on this assumption, consumers could be rewarded for providing flexibility.

After Amin Shokri comments (BISITE Research Group)

- What is the relationship between the local and global market, which will be the market coupling mechanism?
- Peer-to-peer: Agent or services oriented. Answer: SESP is peer to platform.

The model being developed in EMPOWER is a peer-to-platform: everything goes through the SESP.

To close the TAG meeting, a demo of the CITCEA Prosumer Lab at the UPC was performed. There was Showcase of the emulated SESP-Household interaction.

6 Business awareness creation

In this section we provide an overview of the intensive business awareness creation activities which have been conducted in the EMPOWER project.

The business awareness creation activities have been award winning (winning 1 prize of a competitive start-up competition and winning 1 prize of a competitive poster competition, details below, publications have been accepted in the leading Energy journal or are under way towards final acceptance). Throughout the project (1.1.2014-31.12.2017) EMPOWER has been integrated in the communication and out-reach activities of IWOE-HSG. Over 500 participants at the annual conferences for Renewable Energy Management (<https://www.remforum.ch>) have been informed about EMPOWER, with over 100 people participating in a total of three specific EMPOWER dedicated workshops (workshops in the main programme in 2016 and 2017 and a one day pre-conference workshop in 2016 see below).

More than 110 executives in the energy sector coming from Europe and the rest of the world and different organizations have been informed about EMPOWER during intense case studies on EMPOWER based business models. Over the course of the project The executive students have been developed 16 business models for EMPOWER.

EMPOWER has been further communicated throughout the standard communication channels at IWOE-HSG (e.g. homepage, newsletter and annual reports). Within the teaching activities EMPOWER has been subject to courses and case study teaching and 33 student theses have been written in relation to the EMPOWER project on the Bachelor- and Master-Level. In additional research and outreach seminars we have been reaching approx. 200 individuals from around the world

In the following we provide an overview of the single activities for business awareness creation.



Figure 20: James Johnston of open utility presenting opportunities for decentral business models business models at the EMPOWER workshop within the REM forum 2016

Make business leaders and future business leaders aware of the EMPOWER project and the opportunities that arise from EMPOWER is of central concern for the project. While the different actions have been listed in the list of communication activities, the EMPOWER activities of business awareness creation concern different levels. In the following we provide a systematic overview over how EMPOWER creates business awareness:

Workshops and personal interaction with the business community

An important part of the business awareness creation actions in EMPOWER is the organization of interactive workshops with practitioners. An important pillar for this type of business awareness creation are for instance the various annual EMPOWER workshops at the St. Gallen Forum for Management of Renewable Energies. These workshops attract international business leaders and make them aware of the business opportunities that arise from EMPOWER (for more **details** see the list of communication activities). Furthermore, we regularly engage with companies at the local and regional level. For instance, we presented the EMPOWER concept to utility companies, to trade and service companies in Switzerland. We further regularly participate in industry events, as for instance, the national conference for renewable energies in Switzerland (e.g. the AEE conference).

Business awareness creation research talks

Research talks by invitation of leading business schools in Europe had been organized, attracting 90 participants within the seminars. Additionally, the research seminars have been integrated in the communication activities of the inviting institutions. Below an overview of the seminars and an example of how the seminars have been communicated, the ppt presentations are available on request from moritz.loock@unisq.ch. The seminars had in average 35 participants.

What else do business models do? Configuring of heuristics in sustainability transitions

1. September 2017, 13:30 Uhr - 14:30 Uhr, Eawag Dübendorf, Referent: Prof. Dr. Moritz Loock, Ort: Forum Chriesbach, FC-C24, Sprache: Englisch

Abstract: This paper provides novel opportunity to link the dynamics on economic change that Nelson and Winter describe to the regime-niche struggles in transitions research. So far, it has been unclear how – other than through strategic niche management – rule dynamics in niches can emancipate themselves from regime-level ecology. How does regime-independent innovation come about? The configuring of heuristics provides novel explanation. Heuristics are micro-foundational, simple cognitive rules that govern innovation. Business modelling is the process of retaining heuristics for value creation and capture into a configuration and establishing a cognitive niche. Based on observations of digital business model innovation in the power sector and the EMPOWER data-base, this paper explains how configurations of heuristics empower idiosyncratic single heuristics to withstand the selection forces of regimes, facilitate regime-independent innovation and ultimately also enable regime change. Implications apply for the fundamental role heuristics have in innovation studies, and for justification mechanisms that business models provide to technological innovation systems.

For more information on the EMPOWER project please see here <http://empowerh2020.eu>

Link:

http://www.eawag.ch/de/news-agenda/agenda/detail/?tx_sfpevents_sfpevents%5Bevent%5D=1085&tx_sfpevents_sfp_events%5Bcontroller%5D=Events&cHash=55350808a8c073dcd9f3d9be5ce0406

List of EMPOWER research talks for business awareness creation:

- EPFL (May 2017): Digitalization-based business models for sustainable energy

- GEM Grenoble (November, 2017): The flexible prosumer: The flexible prosumer: Measuring the willingness to co-create distributed ancillary service.
- GEM Grenoble (May, 2017): How business models are spinning innovation in sustainability transitions
- EAWAG (September 2017): The role of business models in sustainability transitions
- WWF 2017: approx. 60 people; ppl with different backgrounds from the Swiss energy industry
- EPFL (May 2015): Digitalization-based business models for sustainable energy
- Business models for local flexibility co-creation (workshop at St Gallen Forum for REM 2017)
- «Strategies, business models, regulation & policies»; Review Meeting Fredrikstad, Norway, 29.09.2016
- Disrupt yourself, or be disrupted! (EMPOWER pre-conference workshop at St Gallen Forum for REM 2016)
- “Utilizing cognition for business model innovation”, keynote speech at the conference Disrupt your-self or be disrupted, EMPOWER/St. Gallen 26.05.2016
- Strategic innovation in the energy industry (workshop at St Gallen Forum for REM 2016)
- Promising Smart Grid business models (workshop at St Gallen Forum for REM 2015)

In addition, intensive individual meetings with approx. 40 individuals; with different backgrounds (public, private sector) from the German, Swiss and Luxembourgish energy industry has been conducted to create business awareness in regard to EMPOWER.



Figure 21: Moritz Looch presenting opportunities for EMPOWER based business models at the EMPOWER workshop within the REM forum 2015 and in discussion with industry representatives

Outreach to the business and academic community

The activities also contain broader outreach, as through the writing, publication and diffusion of EMPOWER-related findings. In this respect, we also participate in academic conferences and workshops, as for instance, the annual Strategic Management Society. At these conferences, we also organized panel discussions with leading executives (e.g. Strategic Transformation in the German Energy Industry at the Strategic Management Society 2016 with approx. 30 people; mostly academics in the management field from around the world mainly US and Europe and leading industry experts from companies

like RWE). These endeavors helped to ensure knowledge transfer between academia and the industry. Business awareness creation through broader communication contains publications, as well as videos, interviews and also individual consulting and meetings with business leaders that want to know more about EMPOWER (for more details see the list of communication activities).

Award winning publications for business awareness creation

The largest business awareness creation activity has been the development and publication of academic papers for demanding and high-quality peer-reviewed journals. While the published papers are the final result, the publication activities also include many rewrites within the publication processes, and responses to reviews and respective revisions. Below we provide a list of important publications out of EMPOWER. All papers are available upon request from moritz.loock@unisg.ch

Helms, T, Loock, M, Bohnsack R (2016): Timing-based business models for flexibility creation in the electric power sector, *Energy Policy* (92): 348-358.

Abstract: Energy policies in many countries push for an increase in the generation of wind and solar power. Along these developments, the balance between supply and demand becomes more challenging as the generation of wind and solar power is volatile, and flexibility of supply and demand becomes valuable. As a consequence, companies in the electric power sector develop new business models that create flexibility through activities of timing supply and demand. Based on an extensive qualitative analysis of interviews and industry research in the energy industry, the paper at hand explores the role of timing-based business models in the power sector and sheds light on the mechanisms of flexibility creation through timing. In particular we distil four ideal-type business models of flexibility creation with timing and reveal how they can be classified along two dimensions, namely costs of multiplicity and intervention costs. We put forward that these business models offer 'coupled services', combining resource-centered and service-centered perspectives. This complementary character has important implications for energy policy.

Kubli, M, Loock, M and Wuestenhagen, R (2017, revise & resubmit in *Energy Policy*): Co-Creation innovation with flexible prosumers: Exploring willingness to provide flexibility in power markets

Abstract: Rising shares of fluctuating renewables increase the need for flexibility in the power market. While the potential of decentralized technologies to provide flexibility has been extensively documented, there is surprisingly little empirical analysis in terms of whether individuals are actually ready to contribute flexibility, and if so, under which conditions these resources can be mobilized. We address this gap in the energy economics literature with an analysis of 7'216 individual decisions in a series of choice experiments with 902 study participants in three main domains of residential energy prosumption: (a) solar PV plus storage, (b) heat pumps, (c) electric mobility. Our results indicate that electric car and solar PV users exhibit a higher willingness to co-create flexibility than heat pump users. Reaping the potential in those two domains requires removing regulatory barriers and designing adequate business models.

Based on this research, the paper won first price at a competitive poster competition at the SCCER Mobility conference: “The SCCER Mobility 4th Annual Conference took place on 15 September at ETH Zurich. With over 120 participants including about 40 guests from public offices and industry, this event provided an opportunity to discuss relevant research topics and projects, exchange with academic and external experts as well as find new cooperation partners.”



http://www.sccer-mobility.ch/p_supporting_measures/Annual-Conferences/AC2017/

Loock, M: The role of digitalization in Energy Entrepreneurship: Evidence from the EMPOWER Project

Abstract: This paper looks at thirty-one digitalization-based business model innovations of entrepreneurial companies in the power sector. It appears that digitalization-based business model innovations evolve towards two types: business model innovations that enable digitalization based integration of incumbent energy markets and business model innovations that enable digitalization based independence of incumbent energy markets. The data shows how digitalization-based business model innovations link topics from other industries, such as self-production and self-consumption, sharing, aggregation, control and platform formation to the energy industry. More broadly the study of digitalization-based business model innovations shows how entrepreneurial ventures in the power sector utilize knowledge from other industries in order to build solutions for salient challenges in the power sector. This has important implications for energy policy to enable and optimize cross-industry learning.

Loock, M, Reuter, E; (forthcoming): Ideal-type digitalization based business models for establishing local power markets: the potential of platforms (EMPOWER textbook).

Loock, M (under review in Organizations & Environment): How good are sustainable business models? A heuristic perspective

Abstract: This paper provides a novel view on sustainable business models as heuristics. This novel view allows to remedy an important gap in the current research and practice of sustainable business models: Earlier research has been surprisingly vague on business model quality. This is an urgent practical problem, because both start-ups and established firms often find themselves in positions that require designing or redesigning high-quality sustainable business models. Grounded in the study of business models the paper suggests a novel research agenda on how the quality of sustainable business models emerges from three pillars: (1) how the business model aligns different and even conflicting environmental, social and economic interests; (2) what kind of information and established power the business model ignores and considers; and (3) what goals and performances the business model aspires and actually achieves.

Loock, M (in final preparation for submission to the Journal of Management Studies): Representation of organizations: A novel theory and tool based on topic modeling

Loock, M, Anne-Lorene Vernay & Cousse, J (under preparation for submission to Research Policy): Creative heuristics: Micro-foundations of business model co-innovation

Introduction: Business model innovation - the processes of developing novel ways of creating and capturing value - has become a central topic in innovation research (Foss

& Saebi, 2017). While business model innovation is a way for firms to commercialize new ideas and technologies (Chesbrough, 2010), recent publications have also stressed that developing new business models and new understandings of the values that are to be created and captured, is crucial to facilitate the transition towards sustainability (Boons & Lüdeke-Freund, 2013; Schaltegger, Hansen, & Lüdeke-Freund, 2016). Business model innovations facilitate the market acceptance of technological innovation and support their broader diffusion (Bohnsack & Pinkse, 2017; Chesbrough & Rosenbloom, 2002; Drury et al., 2012; Yu & Hang, 2010). They also help to create new industry recipes, thereby changing the perception of firms in an industry by enacting novel references for how to create and capture (Matthyssens, Vandembemt, & Berghman, 2006; Sabatier, Craig-Kennard, & Mangematin, 2012). Today, many heterogeneous groups, individuals and perspectives are involved in business model innovation processes, such as different managers within a firm or managers of various firms working within a common eco-system of investors, suppliers, customers, policy-makers and more. Earlier research shows that business models are “innovation devices” that facilitate coordination between diverse stakeholders in regard to value creation and value capture (Doganova & Eyquem-Renault, 2009). However, there exists little insights into how collaboration of different stakeholders, to co-create value and to co-capture value, comes about (Lüdeke-Freund et al., 2017). We have limited understanding of how business models are developed, who contributes to what, and how each stakeholder influences the mechanisms of value creation, delivery and capture. Researchers seem to metaphorically point out to the “key partner box”, in the Osterwarlder canvas, stating that it is important, without further questioning and investigating the micro-foundations of business model co-innovation. To address this gap, this paper aims to answer the following research question: what are the micro-foundations of BM co-innovation? Answering this research question is an important and timely task as business model innovation processes increasingly happen at the eco-system level and require to integrate heterogeneous stakeholders. Several developments drive this phenomenon: some industries are increasingly initiating novel collaborations with actors from other industries, such as between the transport and energy industries where alliances are made to offer novel products such as vehicle-to-grid solutions (Bohnsack & Pinkse, 2017; Kempton & Tomić, 2005). Furthermore, boundaries between different sectors and experts are becoming blurry. Actors with diverse knowledge and backgrounds are increasingly working together. A profound example is the emergence of business models where value creation is not solely done by firms but where customers become co-creators of value (Angeli & Jaiswal, 2016; Payne, Storbacka, & Frow, 2008). Recent

advancements in digital developments offers novel opportunities to coordinate business model innovation among different actors that have not commonly interacted in the past (Brynjolfsson, Hofmann, & Jordan, 2010; Agarwal, Gao, DesRoches, & Jha, 2010). Overall, we need to know more on how business model innovations deal with the increasing diversity among the stakeholders involved, and how business model co-innovation comes about. We proceed as follows. First, we ground our investigation on the recent advancements in business model theory that link heuristics as the cognitive foundations of business models (Loock & Hacklin, 2015). We then report from preliminary set of interviews, conducted by us, to capture the various stakeholders that are involved in five business model innovation processes in the energy sector. Applying established methods of extracting heuristics from interview data (Bingham & Eisenhardt, 2011), we find that business model innovation processes host different and interesting types of heuristics that have been unknown so far. Based on the data, we are able to explain how creative heuristics come about, where they appear and novel types of heuristics work as micro-foundations of business model co-innovation. Beyond contributing to novel understandings of the micro-foundations of business model co-innovation, we extend existing theories on social heuristics. The latter have explicated how heuristics facilitate coordination, but not – as we are able to show – how heuristics guide co-innovation and co-creation. We state fundamental implications for the micro-macro link in innovation studies and the specific role of heuristics for economic renewal and business model innovation process as an important mediator in the relations between heuristics and innovation.

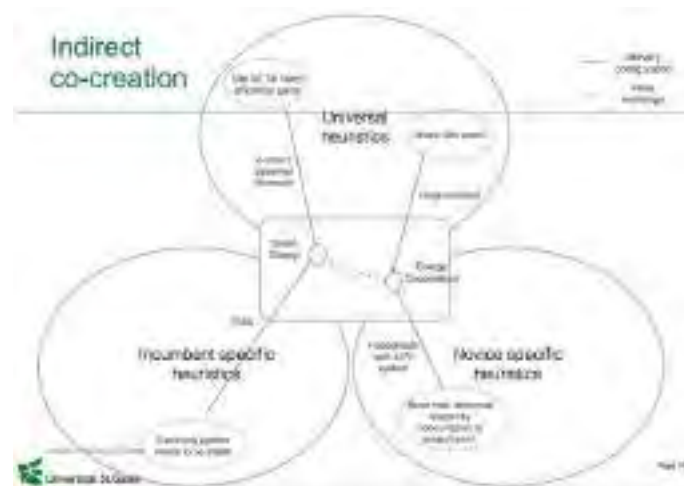


Figure 22: How EMPOWER business models configure novel bundles of simple rules for value creation and capture

| Heuristics | Representative quotes |
|---|---|
| Set up a spin-off company to capitalize on R&D projects | <p>'When we started Smart Energy, it was primarily to capitalize on all the unique research and development projects that we carried out in Smart Energy Hvaler with our partners such as NCE or the municipality of Hvaler because we thought that the research and development projects that were carried out in the Nabalog was giving us completely unique in decision making.'</p> |
| Start new business units after successful pilots have been conducted | |
| To develop a successful and sustainable business model, start lean to be able to adapt to customers' needs quickly and proceed stepwise | <p>'When we started Smart Energy we had a very lean start-up. We did not have very fancy and complete business plans and a very long strategic line.'</p> |
| | <p>'There were so many more needs and we could very quickly adopt because we didn't have like very expensive systems to deal with and there were not very much products to choose from. So, we had to make everything from scratch.'</p> |
| | <p>'But I think it's very important for us to keep the company light weight. So, we also can always interact with our customers much better than other companies can do. I think it's fairly unique in Norway to interact with the customers the way that we do.'</p> |
| | <p>'For Smart Energy that I think it's important to say that even though today we have far more long term and concrete business plan, it's very important for us to keep the company very a lightweight in a way. So, it could be a short way from idea to implementation.'</p> |
| | <p>'So, we just kind of had an idea but and as we and the customers were moving forward, both parties saw that there were so many more needs and we could very quickly adapt to those needs because we didn't have like very expensive systems to deal with and there were not very much products to choose from. So, we had to make everything from scratch.'</p> |
| | <p>'What the customers needed was extremely important for us and when we build these projects so it was quite easy actually to involve the customers and enroll their wishes.'</p> |
| To support innovation, work on changing the regulatory | <p>'We also think that it's important to challenge the regulations and try to make it more customer friendly. So, I think it is important to have a very nice cooperation with the regulator in Norway. But of course, there will always be</p> |

| | |
|---|--|
| environment and regulated based heuristics | regulation and especially when there is such critical infrastructure such as the grids. You will always have regulations.' |
| | 'Then in the space of research and development projects there are more room for trying out new stuff that might bend the regulation a little bit I think.' |
| To develop a successful business model, at some point you have to earn money | 'We have done this for a couple of years now and at some point, you have to earn money.' |
| To develop a successful business model, it is crucial to make the customers feel appreciated and involved | 'I think it's important for many CEOs and other who works in companies to remember the way you make the customers feel you can't get it for commercial money. If you make the customers feel happy, involved, important for the business, I'm sure as hell that the customers are going to forgive you for having crappy websites or something else that goes wrong because when you work with research and development projects there's a lot of things that can go wrong. But if you make the customers feel appreciated and involved, I think that's the most important thing that we can do to our customers.' |
| To make customers feel appreciated, invite them to physical meetings | 'All our customers are offered to participate in research and development projects. And also, we invite them to physical meetings, where our offices are. So, we invite them.' |
| Making customers feel appreciated and involved, becomes more challenging the more customers a business model serves | 'And of course, it's a very demanding job because like now we have I think 4,300 customers in Smart Energy. It was a lot easier when we had like 10 devoted customers. But now we have like perhaps 2000 of them that want to shape our business.' |
| Business leaders need to be available for customers | 'And also, of course, I'm a very available CEO. Some customers actually call me and meet directly. And I always take the time to talk to them. It's important for me that every one of my leaders seeks customer contact. I don't want to have leadership that doesn't want to talk to customers.' |
| Go for it wholeheartedly | 'So, what I learned from the Smart Energy product was most of all, go for it.' |

Table 4. Exemplar quotes of EMPOWER based business modeling

Teaching regular students and future business leaders

An important tool that accompanies our awareness creation efforts for future managers, and which we have developed, is the EMPOWER case study. Within the case study, students learn about the EMPOWER concept, and develop business models for the EMPOWER market design. The case study is applied in various teaching activities at the Bachelor and Master-level. To illustrate, we have used the case study in this year's CEMS program, which is among the top ten pre-experience Master programs in management in the global Financial Times ranking. Besides the EMPOWER case study also the Business Model Composer is used for this type of business awareness creation. Further the EMPOWER project contains the frame for different BA and MA theses (for more details see the list of communication activities).

EMPOWER based business modeling based on the EMPOWER case study has been subject to the CEMS block-seminar "Meeting the Energy and Climate Challenge" in St. Gallen. Over 160 international students from the CEMS partner universities and future industry leaders have been developed and tested novel business models for EMPOWER (2017: 53 students within 9 teams, 2016: 48 students within 10 teams, and 2015: 56 students within 9 teams). In additions EMPOWER has been subject to summer schools (e.g. in 2015 Helmholtz Summer School in Falera 80 from around the world and at the ECE Summer school at ETH (2017) with approx. 40 master students from different universities in the world.

Within the EMPOWER project 33 Master and BA-theses have been supervised in relation to the EMPOWER project. The theses have been mostly written in co-operation with external parties, which lead to an additional awareness creation of EMPOWER.

Theses in relation to EMPOWER under supervision of Moritz Look:

- Engler (2017): Eine Erarbeitung von Softwareansätzen für die Unterstützung von energieautonomen Landgemeinden anhand des Beispiels von Bioenergiedörfern in der Region Baden-Württemberg
- Kaufmann (2017): Vehicle-to-Grid Business Model - Entering the Swiss Energy Market
- Boger (2016): Idealtypische Architekturen von Online Trading Plattformen im Energiebereich
- Adank(2016): Facilitating Value Co-Creation between Experts and Customers: Antecedents of efficient Platform Design in the Energy Sector

- Theiler (2016): Kapazitätsmanagement im virtuellen Kraftwerk - Entwicklung eines Geschäftsmodells zur effizienten Integration von dezentralen Batteriespeichern am Beispiel der Photovoltaik
- Roth (2016): A business model analysis within the Energy Sector - How do stakeholder preferences guide service-based business models for the EMPOWER project?
- Attlmayr (2016): Die Bedeutung von Framing-Dynamiken für die Entwicklung des Smart Grid - Ein Vergleich der Akteurkonstellationen in Großbritannien und der Schweiz zur Untersuchung abweichender Evolutionspfade von Smart Grid-Feldern
- Wang (2017): Smart Grid Business Models in North Sea Region and their Chinese Counterparts
- Bauer (2015): Typen und erfolgreiche Konfigurationen von Smart-Grid-Projekten mit Demand Response in der EU: Eine QCA-Methode
- Pirovino (2014): Strategic insights regarding the integration of eMobility in the fleet business sector : Case study analysis of the fleet business structure & development of innovative financial services products
- Bauer(2014):Nutzen und Vermarktungsstrategie Evite : Öffentliche Ladesäulen für E-Mobility
- Wetter (2014): Rentabilität und Investitionskriterien von Kleinwindkraftanlagen
- Isler (2014): Photovoltaic-coupled battery storage for residential applications : analysis of current and future business models
- Widmer (2017): Alternative financial analysis methods for wind energy projects – a heuristic based approach
- Gleichauf (2015): Simple or Complex Models: A General Approach to the Performance of Heuristics versus Complex Models in the CleanTech Field
- Siebenthal (2015): Prevalent Simple-Rule Heuristics in Entrepreneurship
- Schöllhorn (2014): Heuristiken im Cleantech Management
- Worth (2016): Ideal-type strategic responses to external shocks in the European Energy Industry

- Elia (2016): The evolution of the strategic agendas in the local retail electricity market in Switzerland
- Ziegler (2015): Technology implementation strategies of Swiss energy companies: organizational learning in a dynamic environment
- Burckhardt (2015): The Effect of CEO Characteristics and the Institutional Environment on the Executive's Time to Attention of a New Major Industry Trend
- Bürgi (2017): Market acceptance and willingness to pay for fixed price renewable energy tariffs in Finland - A choice based conjoint analysis examining private Finnish household's preference of renewable energy
- Grob (2014): Customers as Sources of Flexibility - opportunities and threats of demand response business models for small and medium utilities
- Wiesmann (2014): Social acceptance of smart grids : an explorative investigation of factors driving social acceptance of distributed generation in smart grids

Theses in relation to EMPOWER under supervision of Emmanuell Reuter:

- Ruetz, Benedikt, 2015: Explaining CEOs' conceptual complexity - The role of performance feedback and multi-level antecedents
- Attlmayr, David, 2016: Die Bedeutung von Framing-Dynamiken für die Entwicklung des Smart Grid
- Freiermuth, Diego, 2016: Integration of market and political strategies: a multiple-case study of Swiss incumbent electric utilities
- Biedermann, Dominik, 2016: A model of cognitive business model configuration
- Lampart, Michael, 2016: The settlement of field frames: An analysis of framing contests in the field of smart grid policies in Switzerland
- Elia, Sabri, 2017: The evolution of the strategic agendas in the local retail electricity market in Switzerland
- Krauspe, Tao, 2016: Die Entstehung von neuen Geschäftsmodellen
- Julia Cousse, 2017: Antecedents to CEOs' attention to innovation: A study of the European electricity market
- Julian Winsauer, 2016: Uncovering Value Creation Logics in Decentralized Energy Markets

Gander, Samuel, 2017: Swiss power suppliers' responses to Fukushima: A cognitive causal map Analysis

Teaching executive students and current business leaders

Developing EMPOWER business models has been a core element of the business model development module in a leading executive education programme for REM. <https://www.renewable-energy-management.ch>.

Below is an overview of the conceptual structure how WP and EMPOWER based business modeling is core to this business awareness creation activity. Further below are exemplaric pictures of the business modeling based on EMPOWER.

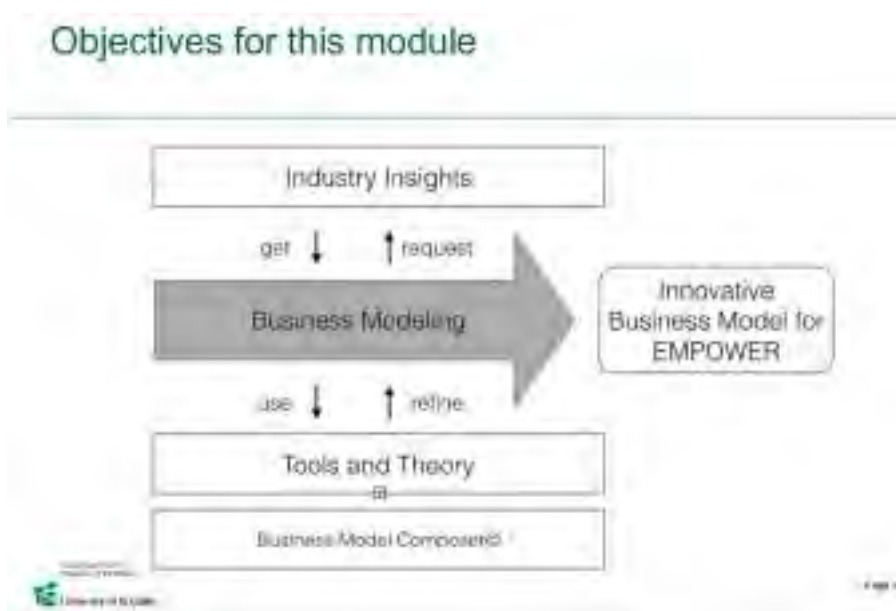


Figure 23: Structure of the executive education core module business model development based on EMPOWER



Figure 24: 26 Executive students of REM developing EMPOWER business models



Figure 25: Project partners of EMPOWER (Christian Kunze of Smart IO and Arne Henn of NewEn) providing inputs for developing EMPOWER business models

Business awareness creation based on the EMPOWER case study

To support business awareness creation a specific EMPOWER case study has been developed. The Case study can be downloaded for use at: www.thecasecentre.org



Videos for business awareness creation

A number of videos have produced to support business awareness creation. While the full list of videos can be found under the EMPOWER youtube channel a selection is provided here:



https://www.youtube.com/watch?list=PLqYCCUDc43YkolUoXZrdBE1DYQ1KOcbj7&v=IIN7_zOX2wk

<https://www.youtube.com/watch?v=XhLFgJWnB7c&list=PLqYCCUDc43YkolUoXZrdBE1DYQ1KOcbj7&index=3>

Moritz Loock about the role of novel business models in EMPOWER:

<https://www.youtube.com/watch?v=So1pQtxZFI4>

Moritz Loock about energy innovation at local energy markets (the EMPOWER project):

https://www.youtube.com/watch?v=IIN7_zOX2wk&list=PLqYCCUDc43YkolUoXZrdBE1DYQ1KOcbj7

Business models for empower: <https://www.youtube.com/watch?v=XhLFgJWnB7c>

The business model composer a novel tool for business model innovation:

<http://businessmodelcomposer.com>

Award winning business awareness creation based on Newtility

One of the most important business creation activities have been the participation at start-up competition <http://disruptme.stadtwerke-westmuensterland.de>. For that Moritz Loock (UNISG) and Christian Kunze (SmartIO) developed an entrepreneurial ambition and formed a venture.

It was important to develop a competitive name, for which Loock and Kunze developed Newtility, a new utility. The business awareness creation action involved an in-depth analysis of the German speaking market, the respective needs of the local utility companies (Stadtwerke Westmünsterland, a cooperation of eight local utility companies) and a fundamental adoption of the EMPOWER concept to fit the specific needs.

Based on this work, Kunze & Loock submitted an application to the competition and have been selected as one of four out of 20 participating companies that have been invited to a two-day workshop with the CEOs of the utility companies in Düsseldorf, Germany.

Within the two-day workshop and close interactions within the CEOs Loock and Kunze were able to present and further develop Newtility. As a result they have won the first prize in the start-up competition and the Stadtwerke Westmünsterland expressed detailed interest to establish a cooperation with Newtility to utilize the learnings of the EMPOWER concept.



Figure 26: Chriatian Kunze (Smart I)O and Moritz Looock (UNISG) during the start-up competition in which the have won the first price with EMPOWER based venture Newtility

In the follow-up processes after the start-up competition the business awareness creation activities and preparations for market exploitation beyond the EMPOWER project have been intensified. In follow-meetings and work further requirements have been identified and the venture creation process has been intensified (e.g. specifying legal structures, securing brand names, developing distinct models of cooperation, identifying further need for adoption towards the regulatory and strategic environment of the local utilities. Below are screenshots that show the current version of Newtility on www.newtility.de



Cross-H2020 project cooperation for shared business model

Development: The business model composer as A joined platform (Loock & Bohnsack)

This paper suggests a cross H2020 project collaboration in relation to the Business Model Composer (BMC): www.businessmodelcomposer.com. The business model composer has been initially developed in the H2020 project EMPOWER by Moritz Loock and Rene Bohnsack. We suggest to further develop the BMC as a cross-H2020 project cooperation.

The BMC offers a platform for the shared development of sustainability business models, which consists of a business model development process and an integrated IT-platform to support the business model development process. As exploitation based on the development of novel, sustainability business models is a central element of many H2020 projects, the business model composer offers opportunities also for the business model development in other H2020 projects. This paper provides an overview of the foundations of the Business Model Composer and suggests a further development, which might even result in a distinct Horizon2020 framework for the development of business models for the good of the citizens and economy within the European Union.



Figure 27: The EMPOWER business model composer

7 Publications, presentations, videos and events

The dissemination actions cover an extensive list of written publications (Table 5), presentations in workshops, conferences, meetings and other dissemination activities (Table 6), as well as video releases (Table 7). It is worth mentioning that 6 of the written publications correspond to journal papers (3 have already been published in leading peer-review journals like Applied Energy, Energy Policy and Energies and 3 are under review process). The total number of video views in Youtube exceeds 1000, which is indicative of the high interest the project has risen.

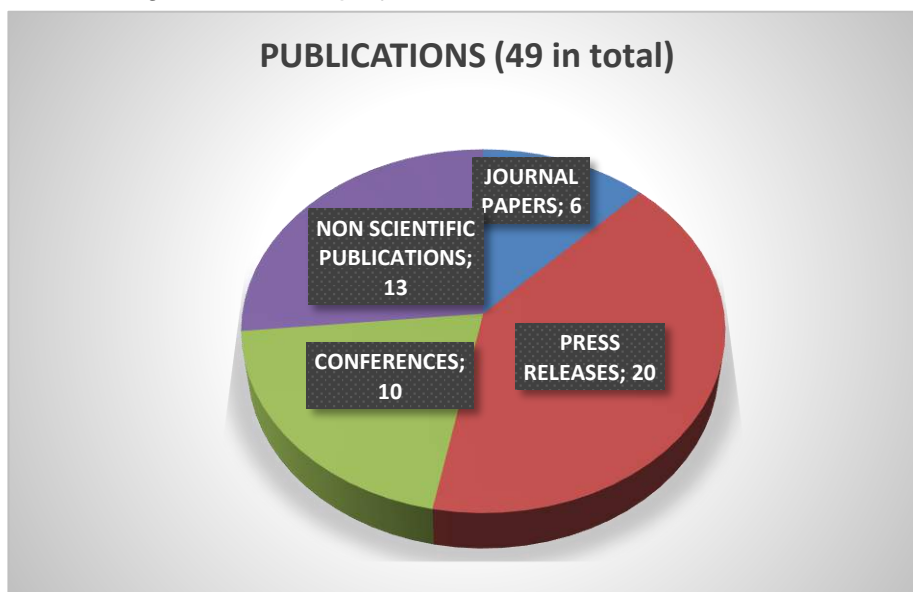


Figure 28: Classification and number of written publications

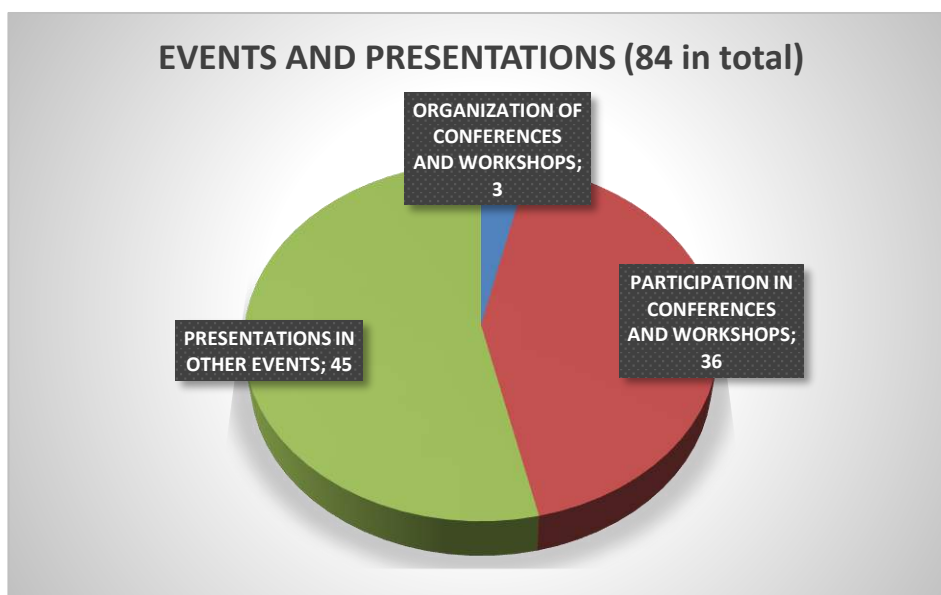


Figure 29: Classification and number of events and presentations

| TITLE | TYPE OF PUBLICATION | AUTHORS | DATE OF PUBLICATION | PUBLISHED IN |
|---|--|---|---------------------|--|
| Choose your partners wisely | Press release | Claude R. Olsen | January 2015 | Forskningsradet webpage |
| The real value of Smart Grids and Microgrids | Press release | Andreas Sumper | January 2015 | Automática e Instrumentación, num. 469 |
| New concepts in microgrids for the distribution of electrical energy | Non-scientific and non-peer-reviewed publication (popularised publication) | Francesc Girbau, Mónica Aragüés, Andreas Sumper | January 2015 | Automática e Instrumentación, num. 469 |
| NCE Smart leads new 50 million EU project which will revolutionize the energy market | Press release | Dieter Hirdes, Bernt A. Bremdal, Knut H. Johansen | October 2014 | NCE Smart Energy Markets webpage |
| Vil flytte markedsmakt | Non-scientific and non-peer-reviewed publication (popularised publication) | Atle Albensen | December 2014 | Energiteknikk (Norwegian Energy Technology Magazine) page 42 |
| Facilitating homeowners to be able to create their own energy | Non-scientific and non-peer-reviewed publication (popularised publication) | NRK- Østfold (Hilde Erlingsen and Odd Skjerdal) | February 2015 | NRK - Østfold |
| Solar cells and wind turbines will provide power at the eastern Hvaler | Non-scientific and non-peer-reviewed publication (popularised publication) | John Johansen | February 2015 | Fredrikstad Blad |
| Fredrikstad Energi preparing for the future | Press release | Fredrikstad Energi | March 2015 | Energibransjen.no |
| Unique environmental project in Southern Sandøya will make cabins self-powered. Receiving 16 environmental millions | Non-scientific and non-peer-reviewed publication (popularised publication) | John Johansen | February 2015 | Fredrikstad Blad |
| The concept of prosumer | Press release | Mònica Aragüés | May 2015 | CIT UPC |

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|---|--|--|---------------|--------------------------------------|
| Getting smarter and smarter | Non-scientific and non-peer-reviewed publication (popularised publication) | Estabanell Energia | April 2015 | Blog of Estabanell Energia |
| Scaling novel business models | Participation to a Conference | Loock, Bartl and Reuter | June 2015 | EGOS conference, Athens |
| Energy solutions for the future | Press release | EGI-HSG | August 2015 | UNISG webpage |
| Local Electricity Retail Markets for Prosumer Smart Grid Power Services | Press release | Moritz Loock | April 2015 | UNISG webpage |
| Promising Smart Grid Business Models | Press release | Moritz Loock | March 2015 | UNISG webpage, conference brochure |
| Empowering local electricity retail markets through business modelling | Press release | Loock, Bohnsack, Reuter and Kunze | December 2015 | ECCH |
| Day-ahead micro-market design for distributed energy resources | Participation to a Conference | Pol Olivella | April 2016 | IEEE |
| For energy conversion | Non-scientific and non-peer-reviewed publication (popularised publication) | Dieter Hirdes | 2015 | |
| Europe's electricity becomes intelligent! Also in Wolpertshausen | Press release | Henrik Steinert | 22.01.2016 | Bürgermeisteramt Wolpertshausen |
| New markets and business models in microgrids: EMPOWER project | Participation to a Conference | Pol Olivella Rosell, Rafael Pacheco Bubi, Roberto Villafáfila Robles, Andreas Sumper Antoni, Sudrià-Andreu | 1-2/12/2015 | Programa Iberoamericano de Ciencia y |

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|--|-------------------------------|--|---------------|---|
| | | | | Tecnología para el Desarrollo (CYTED). |
| Local Electricity Retail Markets for Prosumer Smart Grid Power Services | Website | Henriette Forsetlund | March 2015 | eSmart webpage |
| eSmart Systems partner in a new EU project that will revolutionize the energy market | Press release | Henriette Forsetlund | March 2015 | eSmart webpage |
| Timing-based business models for flexibility creation in the electric power sector | published article | Thorsten Helms, Moritz Loock, Rene Bohnsack | May 2016 | Energy Policy, Elsevier |
| Business model quality: towards an ecological rationality view | article | Moritz Loock | July 2016 | working paper in preparation for review |
| Frame sequences and rule dynamics: Evidence from corporate venture processes in the power sector | working paper | Moritz Loock, Emma Reuter, Daniel Bartl | June 2016 | working paper in preparation for review |
| How to use the business model composer for EMPOWER business modeling | brochure | Moritz Loock, Rene Bohnsack | December 2015 | |
| Strategic Innovation in the Energy Industry | Workshop description | Emma Reuter, Moritz Loock | January 2016 | |
| Strategic Transformation in the German Energy Industry | Workshop description | Emma Reuter, Moritz Loock | February 2016 | |
| Norway is pushing the development of innovative smart grid solutions | article | Dieter Hirdes | December 2016 | GTAI, Germany Trade & Invest |
| Creating a local energy market | Participation to a Conference | Bernt Bremdal, Pol Olivella, Jayaprakash Rajasekharan, Iliana Ilieva | June 2017 | CIREN 2017 |

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|---|--|---|---------------|---|
| EMPOWER - Designing a local power market | Participation to a Conference | Bernt Bremdal, Pol Olivella, Jayaprakash Rajasekharan | June 2017 | IEEE PowerTech 2017 |
| Empower 2020: towards a collaborative electric business model | Non-scientific and non-peer-reviewed publication (popularised publication) | Cristina Bernabeu | February 2017 | Info PLC++ |
| Design and Operational Characteristics of Local Energy and Flexibility Markets in the Distribution Grid | Participation to a Conference | Pol Olivella, Jayaprakash Rajasekharan, Bernt Bremdal | December 2016 | SET PLAN 2016 - CEEC X |
| EMPOWER H2020 | Non-scientific and non-peer-reviewed publication (popularised publication) | Mònica Aragüés , Emmanuelle Reuterand Dieter Hirdes | April 2017 | BRIDGE |
| EMPOWER H2020 | Conference | Emmanuelle Reuter | January 2017 | BRIDGE |
| Multi market bidding strategies for demand side flexibility aggregators in electricity markets | published article | Stig Ødegaard Ottesen | March 2017 | NTNU, Doctoral Thesis ISBN 978-82-326-216-3 |
| A green electricity tariff for Wolpertshausen | Press release | Henrik Steinert | July 2017 | Bürgermeisteramt Wolpertshausen |
| Optimization problem for meeting distribution system operator requests in local flexibility markets with distributed energy resources | published article | Pol Olivella-Rosell; Eduard Bullich-Massagué; Mònica Aragüés-Peñalba; Andreas Sumper; Stig Ottesen; Josep-Andreu Vidal-Clos; Roberto Villafafila-Robles | August 2017 | Applied Energy |
| <u>Methodology for the Evaluation of Resilience of ICT Systems for Smart Distribution Grids</u> | published article | Pau Lloret-Gallego, Mònica Aragüés-Peñalba, Lien Van Schepdael, Eduard Bullich-Massagué, Pol Olivella-Rosell and Andreas Sumper | August 2017 | Energies |
| Empowering Local Electricity Markets: A survey study from | Published report | Reuter, Emma; Loock, Moritz | October 2017 | HSG |

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|---|-------------------|--|------|---|
| Switzerland, Norway, Spain and Germany | | | | |
| The flexible prosumer: Customer co-creation of ancillary services in smart grids | conference paper | Kubli, Loock & Wüstenhagen | 2017 | IAEE Vienna |
| V2G: Measuring electric vehicle drivers' willingness to co-create flexibility for smart grids | best poster award | Kubli, Loock & Wüstenhagen | 2017 | |
| The flexible prosumer: Customer co-creation of ancillary services in smart grids | research paper | Kubli, Loock & Wüstenhagen | 2017 | Energy Policy (under review) |
| Multi-Period Power Management Optimization for Operating Isolated Hybrid Microgrids | Conference paper | Marc Galceran, Mònica Aragüés, Eduard Bulich, Oriol Gomis | 2017 | 7th IEEE International Conference on Innovative Smart Grid Technologies (IEEE PES ISGT Europe 2017) |
| Architecture definition and operation testing of local electricity markets. The EMPOWER project | Conference paper | E. Bullich-Massagué, M. Aragüés-Peñalba, P. Olivella-Rosell, P. Lloret-Gallego, J. A. Vidal-Clos and A. Sumper | 2017 | Conference on Modern Power Systems (MPS), Cluj-Napoca, 2017, pp. 1-5. |

Table 5. List of written publications

| ENGLISH TITLE | TYPE OF PUBLICATION | AUTHORS | DATE OF PUBLICATION/PRESENTATION |
|---|---------------------|---------------|---|
| Local Electricity Retail Markets for Prosumer Smart Grid Power Services | Presentation | Dieter Hirdes | 21-22.05.2015 |
| Promising Smart Grid Business Models | Presentation | Dieter Hirdes | 22/05/2015 |
| Business Modeling in the Energy Sector | Presentation | Dieter Hirdes | 18-21-05.2015 |
| Novel grid developments, novel business models | Presentation | Dieter Hirdes | 30/05/2015 |
| New energy business models | Presentation | Dieter Hirdes | 01/09/2015 |
| New energy business models | Presentation | Dieter Hirdes | 2015-05-21 1st workshop SmartGrids Brussels |
| New energy business models | Presentation | Dieter Hirdes | 2015-06-16 Malta demo site visit |
| New energy business models | Presentation | Dieter Hirdes | 2015-06-17 Statsbygg 17.6.15 |
| New energy business models | Presentation | Dieter Hirdes | 2015-06-18 Verdiskapingsforum Østfold |
| New energy business models | Presentation | Dieter Hirdes | 2015-08-13 TrønderEnergi 12.-13.8.15 |
| New energy business models | Presentation | Dieter Hirdes | 2015-08-14 Stavanger FME 14.8.15 |
| New energy business models | Presentation | Dieter Hirdes | 2015-08-28 OE Minister visit to Hvaler |

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|---|--------------------|------------------|--|
| New energy business models | Presentation | Dieter Hirdes | 2015-08-28 Ringeriks-Kraft Halden |
| New energy business models | Presentation | Dieter Hirdes | Lyse |
| New energy business models | Presentation | Dieter Hirdes | 2015-09-10 Wolpertshausen |
| New energy business models | Presentation | Dieter Hirdes | 2015-09-22 SRG meeting Dublin |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-01 FlexNett project meeting |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-08 BANCAGE Bulgaria |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-09 Østfold fylkeskommunes Internasjonale Forum |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-13 TrønderEnergi 13.10.15 |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-14 Haugaland Kraft |
| New energy business models | Presentation | Dieter Hirdes | 2015-10-22 German-Norwegian Energy Forum Berlin |
| New energy business models | Presentation | Dieter Hirdes | 2015-11-03 FME CEI Halden |
| New energy business models | Presentation | Dieter Hirdes | 2015-11-04 Nettalliansen |
| New energy business models | Presentation | Dieter Hirdes | 2015-11-06 Energi Norge |
| Motivated Learning and the Origins of Experience: How New Ventures Develop Heuristic Portfolios | paper presentation | Reuter and Loock | 03-10-2015 |

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|--|---|---------------------------|---------------|
| Research project presentation | research project presentation | Reuter | 03-03-2016 |
| TAG Workshop in “7th St. Gallen Forum for Management of Renewable Energies” | panel discussion | Reuter and Loock | 27-05-2016 |
| 7th St.Gallen Forum for Management of Renewable Energies | Not applicable | Not applicable | 26-27,05,2016 |
| Reinventing the Utility: Successful Strategic Renewal in the Energy Industry | panel discussion | Reuter and Loock | 27-05-2016 |
| Electricity micromarkets with community electricity storage | Presentation | Pol Olivella | 09-02-2016 |
| The vision of EMPOWER H2020 project: Storage needs of Smart Energy Service Providers | Presentation | Pol Olivella | 02-05-2016 |
| Day-ahead micro-market design for distributed energy resources | Presentation | Pol Olivella | April 2016 |
| Performance of micro-markets for distributed energy resources | Presentation | Pol Olivella | December 2015 |
| Preconference St. Gallen Forum for Management of Renewable Energies | Presentation | Knut H. Johansen | 26.05.16 |
| TAG Workshop in “7th St. Gallen Forum for Management of Renewable Energies” | Speaker at Workshop 7 EMPOWER to the people | Knut H. Johansen | 27-05-2016 |
| Strategic Innovation in the Energy Industry | presentations/ workshop | Emma Reuter, Moritz Loock | May 2016 |

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|--|-------------------------|--|-----------------------|
| Strategic Transformation in the German Energy Industry | presentations/ workshop | Emma Reuter, Moritz Looch | September 2016 |
| Total upheaval in the energy industry? | Speaker/Presentation | Knut H. Johansen | 31.05-01.06.2016 |
| A journey with new business models, big data, disruption and artificial intelligence | Speaker/Presentation | Knut H. Johansen | 02.06.2016 |
| Smart City Workshop | Presentation | Knut H. Johansen | 18/11/2015 |
| Local market design workshop | Panel discussion | Bernt, Jay and Pol | 15/09/2016 |
| Micro-markets and EMPOWER project | Webinar | Pol | 02.11.2016 |
| EMPOWER project | Panel discussion | Mònica Aragüés, Pau Lloret, Andreas | 15.11.2016-17.11.2016 |
| EMPOWER project | Panel discussion | Mònica Aragüés, Pau Lloret, Andreas | 15.11.2016-17.11.2016 |
| EMPOWER project | Panel discussion | eSmart | 15.11.2016-17.11.2016 |
| EMPOWER project explained to Smart Grids Working Group of COEIC | Presentation | Roberto Villafàfila, CITCEA UPC | 07.02.2017 |
| EMPOWER project explained in the Energy Congress of Catalonia | Presentation | Roberto Villafàfila, CITCEA UPC | 15.02.2017 |
| EMPOWER project explained in COEIC | Presentation | Roberto Villafàfila, CITCEA UPC | 04.04.2017 |
| EMPOWER project | BRIDGE Meeting | Emmanuelle Reuter | 17.-18.01.2017 |

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|---|--|-------------------------|-------------|
| EMPOWER project | Presentation: Power to the People: Generating Cleaner Energy from Smart Grids - Trends, developments and new | | 07.06.2017 |
| EMPOWER project | University-level seminar | Emmanuelle Reuter | 25.09.2017 |
| EMPOWER case study | University-level seminar | Emmanuelle Reuter | 4.-8.9.2017 |
| EMPOWER project | University-level seminar | Emmanuelle Reuter | 27.06.2017 |
| EMPOWER project | Presentation in a meeting | Emmanuelle Reuter | 26/06/2017 |
| EMPOWER project | Presentation in a meeting | Emmanuelle Reuter | 30.05.2017 |
| EMPOWER project | Presentation in a meeting | Emmanuelle Reuter | 31/05/2017 |
| EMPOWER project | Presentation in a meeting | Mònica Aragüés | 16/05/2017 |
| Local flexibility markets: From EMPOWER to INVADE | Participation to a Workshop | Pol Olivella | 11/07/2017 |
| Machine Learning in the Energy Sector | Participation to a Workshop | Davide Roverso (eSmart) | 25/10/2017 |
| Machine Learning in the Energy Sector | Participation to a Workshop | Davide Roverso (eSmart) | 06/11/2017 |
| Machine Learning in the Energy Sector | Participation to a Conference | Davide Roverso (eSmart) | 26/09/2017 |
| Machine Learning in the Energy Sector | Participation to a Conference | Davide Roverso (eSmart) | 09/11/2017 |
| Machine Learning in the Energy Sector | Participation to a Conference | Davide Roverso (eSmart) | 12/09/2017 |

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|---|-------------------------------|-------------------------|------------|
| Machine Learning in the Energy Sector | Participation to a Conference | Davide Roverso (eSmart) | 26/10/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 02/11/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 21/09/2017 |
| Machine Learning in the Energy Sector | Participation to a Conference | Davide Roverso (eSmart) | 07/09/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 30/08/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 12/06/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 02/06/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 20/02/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 23/01/2017 |
| Machine Learning in the Energy Sector | Presentation in a meeting | Davide Roverso (eSmart) | 15/01/2017 |
| Empower Project | Presentation | Diane Cassar (MIEMA) | 15/07/2017 |
| Empower Project | Presentation | Diane Cassar (MIEMA) | 11/09/2017 |
| Smart Meters and Smart Grid - learning from piloting | Presentation | Vidar Kristoffersen | 29/01/2015 |
| DSO trade with flexibility - a substitute for grid investments? | Presentation | Vidar Kristoffersen | 19/10/2017 |
| Innovation spinning with EMPOWER based business models | Presentation | Moritz Look | 04/05/2017 |

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|---|--------------|-----------------------|------------|
| The role of EMPOWER based business modeling in sustainability transitions | Presentation | Moritz Loock | 01/09/2017 |
| Preferences of flexibility prosumers in EMPOWER market places | Presentation | Moritz Loock | 10/11/2017 |
| Efficient digital prosumer | Presentation | Stig Ødegaard Ottesen | 2017 |
| EMPOWER - an example of an alternate DER marketplace | Presentation | Tina M. Skagen | 2017 |
| The connection between smart charging stations and energy demand in neighbourhoods | Presentation | Stig Ødegaard Ottesen | 2017 |
| Smart Grids and Business Models | Presentation | Stig Ødegaard Ottesen | 2017 |
| Energy Markets and Demand Side Flexibility | Presentation | Stig Ødegaard Ottesen | 2017 |
| Demand side flexibility and its role for DSOs and TSOs | Presentation | Stig Ødegaard Ottesen | 2017 |
| EMPOWER, Smart Energy Hvaler and Statkraft | Presentation | Stig Ødegaard Ottesen | 2017 |
| Aggregation of prosumer flexibility as a service to the DSOs | Presentation | Stig Ødegaard Ottesen | 2017 |
| Demand side flexibility | Presentation | Stig Ødegaard Ottesen | 2017 |
| Demand side flexibility and activities in eSmart | Presentation | Stig Ødegaard Ottesen | 2017 |
| Smart Grids – on how energy and it technology together with market models can contribute to a more efficient power system | Presentation | Stig Ødegaard Ottesen | 2017 |
| How innovative business models can contribute to solving power challenges in distribution grids | Presentation | Stig Ødegaard Ottesen | 2017 |

Table 6. List of presentations in workshops, conferences, meetings and other dissemination activities

| ENGLISH TITLE | LINK | PUBLISHED IN | ANNOUNCED IN | Number of views in Youtube |
|--|---|----------------|---|----------------------------|
| EMPOWER concept explained | https://www.youtube.com/watch?v=zO07tNSh6Tw | Youtube cannel | EMPOWER webpage Newsletter Twitter Linkedin Facebook | 607 |
| EMPOWER business model composer explanation | https://www.youtube.com/watch?v=T_9cX8N4jwg&t=2s | | | 106 |
| EMPOWER business models through a whiteboard animation | https://www.youtube.com/watch?v=XhLFgJWnB7c&t=5s | | | 373 |
| Euresearch services: EMPOWER | https://www.youtube.com/watch?v=IIN7_zOX2wk&list=PLqYCCUDc43YkolUoXZrdBE1DYQ1KOcbj7 | | | 222 |
| Local flexibility markets: From EMPOWER to INVADE (CITCEA-UPC) | https://www.youtube.com/watch?v=cGCijWfvIVY | | | 68 |
| Deuwatts. Renewable energy sources (Barcelona Local TV) | http://beteve.cat/clip/deuwatts-energies-renovables/ | | | - |

Table 7. List of released videos

8 Book “Micro and Local Power Markets”

One of the dissemination actions performed is to publish a Textbook “Micro and Local Power Markets” which is on-going and will be published in Wiley in 2018. This Textbook has not been planned initially and it complements perfectly the academic activity of this project. The abstract of the book:

Today there is an obvious shift in the European electricity system from thermal and centralized generation towards renewable and distributed generation. However, this shift is not yet reflected in the trading structures of wholesale electricity markets. Household consumers are excluded from trading activities, trading entities aggregate supply and demand from lower voltage levels and conduct centralized trading activities on the highest voltage level. Antiquated market design leads to the fact that trading decisions on the most advanced wholesale electricity markets are slow and cannot address the increasing need of flexibility that micro power markets can offer.

The aim of the book is to provide the basis for understanding of micro power markets, emphasizing in its application for local initiatives, the grid integration of renewable-based generation and facilitating the decarbonization of the future electrical networks.

The book is addressed to early researchers both in university and industry, last course Master Students. Accordingly, the topics it will cover include:

- *The basic principle of power markets. Fundamentals of the power trading, valid for both wholesale and local markets will be described.*
- *Definition of micro (technical aspects) and local (economic aspects) power markets. Basic organisation of such markets.*
- *Design of Micro power markets, isolated from the wholesale markets. Design principles, trading schemes with energy, flexibility and services in a small market, taking into account also the economic and social dimensions.*
- *Methodologies of the interaction between micro power markets and wholesale markets*
- *Business Models for micro and local power markets.*
- *Regulatory issues of micro and local power markets.*

Table of content and author information:

- Chapter 1: Power Market Fundamentals
 - Authors: Andreas Sumper/ Ingrid Munne-Collado/ Pol Olivella-Rosell
- Chapter 2: Micro and Local Power Markets
 - Authors: Ingrid Munne-Collado/ Pol Olivella-Rosell
- Chapter 3: Decoupled (islanded) Micro Power Markets
 - Authors: Bernt Bremdal and Iliana Ilieva
- Chapter 4: Coupled (main grid connected) Micro Power Markets
 - Authors: Pol Olivella-Rosell/ Madeleine Gibescu/ Shahab Shariat Torbaghan
- Chapter 5: Business models for Micro and Local Power Markets
 - Authors: Emmanuelle Reuter/Moritz Loock/Julia Cousse
- Chapter 6: Regulatory issues of Micro and Local Power Markets
 - Author: Dirk Kuiken

This Textbook will have a Foreword explaining the EMPOWER H2020 Project.

9 Project deliverables

In addition to the technical publications that have been published, the project has its specific deliverables for reporting the work done in each work package. They are listed next. Those deliverables that are public are accessible through the webpage.

WP2 Strategies, business models, regulation and policies

- D2.1 Timing-based business models
- D2.2 Ideal-type business models in local smart grids
- D2.3 Models of prosumer acceptance
- D2.4 Policy implications

WP3 Local Smart Grids architecture

- D3.1 Control cloud technical architecture
- D3.2 Market cloud technical architecture
- D3.3 Communications system
- D3.4 Index of Resilience and Security
- D3.5 Life-Cycle Analysis
- D3.6 Rate of Resilience and Security

WP4 Communications platform

- D4.1 Communications Specification Plan
- D4.2 Functional and technical documentation of relevant API-functions
- D4.3 Communications Test Plan
- D4.4 Feasibility Report
- D4.5 Communications Test Report
- D4.6 API-functions implemented, tested and verified

WP5 Local Smart Grids Control Cloud

- D5.1 Cloud based control system for SESP, phase 1
- D5.2 Cloud based control system for SESP, phase 2
- D5.3 Cloud based control system for SESP, phase 3

- D5.4 Cloud based control system for SESP, phase 4
- D5.5 System Documentation

WP6 Market design

- D6.1 Market design
- D6.2 Prosumer oriented trade
- D6.3 Trading concept development
- D6.4 Technical specifications for software development

WP7 Integration, pilot deployment and validation

- D7.1 Pilot Sites Specification Report
- D7.2 Deployment Report
- D7.3 Validation and Testing Report
- D7.4 Report on user behaviour, user acceptance and user involvement

WP8 Exploitation and local policy strategies

- D8.1 Technological Exploitation Plan
- D8.2 Partner Exploitation Plan
- D8.3 Final Exploitation and Market Plan
- D8.4 Business model development

WP9 Communication and dissemination

- D9.1 Dissemination Plan
- D9.2 Project website and social networks profiles
- D9.3 Dissemination and communication report, year 1
- D9.4 Dissemination and communication report, year 2 and revised plan
- D9.5 Dissemination and communication report, final

10 Dissemination and communication plan review

The dissemination and communication actions to be developed during the three years of the project were specified and planned in the Document of Agreement. This section reviews all these actions and evaluates if they have been done. Actions that are unique to the dissemination part of the overall process and not part of the general communication actions are detailed in Table 8. Communication actions are depicted in Table 9. All the planned actions have been performed, although a few have required a change in the place or event where they were initially programmed. This has been reflected in the column “ACTION” where the initial title has been crossed out and the new one has been detailed.

| ACTION | WHY | TO WHOM | WHEN | HOW | PARTNER IN CHARGE | EVALUATION METHOD | CHECK IF DONE |
|--|--|--|-------------------|----------------|-------------------|----------------------------|---------------|
| Prepare papers to be presented at IEEE PES Innovative Smart Grid Technologies Conference Europe ENERGYCON | To spread information regarding the project and technology approach, the conceptual view | People around the world of the Smart Grids | M18 M24 M36 | Paper proposal | UPC/ SmartIO | Acceptance for publication | ✓ |
| Publish article in ew-Energiewirtschaft (DE) | To spread information regarding the project and technology approach | DSO | 2015 | Paper proposal | UPC/ NEWEN | Acceptance for publication | ✓ |

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|---|---|--|----------------------|---|----------------------------|---|---|
| Participation to H2020 Programme meetings, to be organized by the DG Connect | To share information regarding the project and technology approach between the participants | H2020 Programme participants | 2015 2016 2017 | Presentation | UPC/ SMARTIO / UNISG | Oral presentation / workshop | ✓ |
| Preparation of a one-day Symposium/ conference on Active distribution systems | To spread information regarding the project and technology approach | TSO / DSO / ESCO / Producers / Prosumers | M15 M22 | Presentation | UPC | > 150 assistance | ✓ |
| Preparation of a Business Day attached to the One Day Symposium | To spread out the prosumer concept for managers | Managers/Decision makers | M15 | Presentation | UNISG | >100 assistance | ✓ |
| Prepare presentation at Smart Grid Conference | To spread information to highlight the exploitable aspects of the project | DSO / TSO | M18 | Paper proposal, Presentation | SMARTIO | Acceptance for publication | ✓ |
| Prepare presentation at VDE Congress, Germany session or paper) | To spread information to DSO and ESCO and discuss the project | DSO / ESCO | M22 | Participating in one of their internal meetings about RES. In Oct 2013 will be invited to join the TAG. | SMARTIO /NEWEN | Acceptance for publication and / or oral speech at conference | ✓ |

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|--|---|---|-----|--|----------------------------|--|---|
| Prepare 2 papers to be presented at IEEE-Powertech conferences in Europe | To spread information regarding the project and technology approach, especially on power electronic findings | DSO / ESCO | M24 | Presentation | UPC | Acceptance for publication | ✓ |
| Generate presentation to the members of EDSOs for Smart Grids | The bigger DSO's are members of EDSO rather than GEODE. The presentation will show the project status. | To the participants in the summit | M21 | Presentation | UPC | To succeed means to be accepted for making the presentation | ✓ |
| Prepare presentation at CIRED (International Council on Large electric Systems) Conference | Yearly event for scientific progress in the field of communications for electricity utilities | DSO / TSO | M21 | Presentation of the project by means of the Video and Distribution of the newsletter | UPC | Acceptance for publication and / or oral speech at conference | ✓ |
| Generate presentation of the project status to the members of GEODE General presentation for utilities | DSO's are the potential customers | To the General Assembly and to the individual members | M34 | Paper proposal | UPC | Number of presentations and number of requests for information after the mailing | ✓ |
| To present the project to engineers of different specialties having relation with the local markets | The engineers working in the rural areas can be interested in developing the new business models, or supporting the local entrepreneurs for its development | Engineers already involved in rural activities | M32 | Paper proposal | UPC/ SMARTIO / UNISG | Participation in the blog and visits to the website | ✓ |

| | | | | | | | |
|--|--|--|-----|--|--------------|--|---|
| Prepare presentation and 2 papers at IEEE conferences PES General Meeting. | To spread information on the findings during the whole project from the power system and power delivery point of view, | DSO / ESCO | M22 | Presentation of the project by means of the Video and Distribution of the newsletter, not only within the session but also via GEODE mailing | SMARTIO /UPC | Acceptance for publication | ✓ |
| Prepare presentation at Barcelona Smart City EXPO | Knowledge must be spread for the success of the project | People around the world of the Smart Grids | M34 | Presentation of the project by means of the Video and Distribution of the newsletter | UPC | Number of contacts amount the public of the presentation | ✓ |
| Prepare presentation at IEEE AMPS Conference | To spread information regarding the project and technology approach | TSO | M22 | Technical presentation of the project and diffusion of the website. | UPC | Acceptance for publication | ✓ |
| Publish article in ew-Energiewirtschaft, Germany | To spread information regarding the project and technology approach | DSO | M34 | | UPC/NEWEN | Acceptance for publication | ✓ |
| Organization of demonstration in the field | To show the project results, under actual situation and working environment, to interested parties | DSO / TSO / ESCO / All | M23 | Paper proposal | UPC | Number of demos, number of attendees. | ✓ |

| | | | | | | | |
|--|--|--|-------------------|---|-----|----------------------------|---|
| Generate a paper to be published in "Automática e Instrumentación" magazine or IEEE PES Magazine | To spread out general results and findings of the project, | TSO / DSO / ESCO / Citizen | M23 | Presentation and proposal for 2 conference papers | UPC | Acceptance for publication | ✓ |
| Publish in different Journals and magazines | To spread findings of the project that could not be published during the project | All | M31 | Poster in 2015 Presentation in 2016 | All | Acceptance for publication | ✓ |
| Scientific Papers in Journals | To spread findings from the power system and power delivery point of view | People around the world of the Smart Grids | M18 M24 M36 | Paper proposal | All | Acceptance for publication | ✓ |

Table 8. Dissemination actions review

| ACTION | WHY | TO WHOM | WHEN | HOW | PARTNER IN CHARGE | EVALUATION METHOD | CHECK IF DONE |
|---|--|---------------|-------------------|--|--|-------------------|---------------|
| Press releases | To spread information regarding the project, the consortium, the approach, enabling interactions and feedbacks | All | M2 | Press release to major newspapers specialized magazines and Journals | Publication of the article | UPC | ✓ |
| | | | M12 | | | | |
| | M24 | | | | | | |
| | M36 | | | | | | |
| Activate the project website and the social networks profiles | | All | M3 | Ongoing report concerning the aims and results of the project | Release of the website, social network profiles opened | UPC | ✓ |
| Generate and release the Project Video | To spread information regarding the project and technology approach, enabling interactions and feedbacks | All | M3 | Present the project aims, expected results and outcomes | Release of the video | UPC | ✓ |
| Generate the Project Flyer and Project Poster | | All | M3 | | Release of the Project Flyer and Poster | UPC | ✓ |
| Prepare and hold Project workshops in Brussels-St. Gallen | | GEODE members | M6 | | Number of attendees, number of contributions | UPC | ✓ |
| Generate the Project newsletter | To spread information regarding the project | All | M12 M24 M36 | Newsletter | Publication and distribution | UPC | ✓ |

| | | | | | | | |
|--|--|-----------------------------------|------------|---|--|--|---|
| Include reference to the project in partners' websites | Inform customers, providers and partners of the projects, expected results and outcomes | All | M3 | Information and links in partners' websites | Publication | all | ✓ |
| 10 minutes of project diffusion in TV news coverage in a Local TV | To reach notoriety and gain audience | Citizens | M24 M36 | Present the project aims, results and outcomes | 10 min in local tv | UPC SmartIO Newen MIEMA | ✓ |
| 5 minutes of project diffusion in TV news coverage in a Regional/National TV | | | | Present the project aims, results and outcomes | 5 min in local tv | UPC SmartIO Newen MIEMA | ✓ |
| Prepare and hold Project workshops in Norway | To spread information regarding the project and technology approach, enabling interactions and feedbacks | Norwegian Smart Grid Centre | M19 | Present and discuss concept of SESP and the project | Number of attendees, number of contributions | SmartIO | ✓ |
| Present project results in at least 10 international conferences | To spread information regarding the project and results | Industry and Scientific community | | Presentations and publications | All | All | ✓ |
| Conference and Innovation Days on Local Smart Grids | To spread information regarding the project and technology approach to a big audience | All | M30 | Present the concept and results of the project newsletter | UPC | Number of attendees, number of contributions | ✓ |

Table 9. Communication actions review

11 Conclusions

Dissemination and communication are key in H2020 projects. Dissemination is needed to broadcast the results of the project while communication focuses on divulging the project (not necessarily its results) so as to reach a specific audience. The main goal of communication and dissemination is to strategically inform/at all project stages, always keeping or widening the attention of the public and stakeholders (governments, authorities, public & private funding entities, students, etc.).

In order to prepare any activity implying communication or dissemination inside EMPOWER project, 5 guidelines have been taken into consideration. First, the statement of clear objectives of the communication and dissemination as well as the target audience. Second, the appropriate message and medium to transmit the information (according to audience's interests and project objectives). Last, but not least, the management that ensures the sufficient time and resources investment to reach the dissemination and communication goals.

This report has presented the dissemination and communication actions performed in EMPOWER project from January 2015 until December 2017, detailing the steps taken during the three years for spreading the project objectives, evolution and achievements. The actions promoted include webpage updates, the TAG expansion, video releases, organisation and attendance to events, scientific publications and publications through social networks, newsletters, workshops and conferences.

All these instruments have had a significant impact in the awareness creation and results exploitation. A total number of 6 video releases, 47 publications and 84 events (including conferences and workshops in which the project partners have either participated or organized) have been reached.

The “EMPOWER concept” video has accumulated 607 views in Youtube. The “EMPOWER whiteboard animation” video has received 373 views. The “Business model composer” video has been watched 106 and “The central role of business models video has gathered” 74 views. Therefore, all the released videos have led to more than 1000 views. Furthermore, it is worth mentioning that when doing a google search of the words “local electricity markets”, the EMPOWER webpage appears in the 6th position.

Additionally, regarding publications, 6 high-level articles in leading peer-review journals (3 published and 3 under review) and 10 conference papers have been written, as well

as 20 press releases and 13 non-scientific publications. Furthermore, EMPOWER has involved in 84 events.

All this data permit to conclude that the dissemination and communication actions have been successful during all the project stages, leading to a significant increase of the interest and engagement of citizens for participating in the local energy markets being shaped.

References

- [1] Wikipedia, <http://en.wikipedia.org/wiki/Dissemination>
- [2] Wikipedia, <http://en.wikipedia.org/wiki/Communication>
- [3] European Commission, Communicating EU Research & Innovation. A guide for Project participants, 2012
- [4] European Commission, Communicating EU research & innovation guidance for project participants, 2014