ETIP SNET

EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM

SMART NETWORKS FOR ENERGY TRANSITION

D3.3 Minutes of the regional workshops

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1. INTRODUCTION

1.1 OBJECTIVES OF THE REGIONAL WORKSHOPS

The Regional Workshops aim at:

- Presenting national and regional RD&I projects of significant added value addressing energy system integration issues, in line with the thematic priorities of the ETIP SNET Working Groups;
- Identifying unsolved RD&I topics and monitoring the implementation of RD&I activities at national and regional levels in Europe;
- Ensuring consistency between national and European views;
- Stimulating knowledge-sharing between stakeholders and among Member States and associated countries, so as to foster the efficient implementation of RD&I projects all over Europe.

1.2 ORGANISATION OF THE REGIONAL WORKSHOPS

1.2.1 REGIONAL APPROACH

Based on the experience gained during the Grid+Storage workshops organised in 2016 (see http://www.gridplusstorage.eu/workshops), and on the will to stimulate exchanges between stakeholders within different countries, it was proposed to adjust the scope of the different regions and to divide Europe into four parts, as illustrated below.

- Region 1: PT, ES, FR, UK, EI
- Region 2: DK, SE, FI, NO, LT, LV, EE
- Region 3: IT, SL, KR, MT, HU, RO, BG, GR, CY
- Region 4: BE, NL, LU, DE, PL, CH, AT, CZ, SK, HU

The workshops were organised for 2017 according to the schedule presented in the table below.

Table 1 – Planning for the 4 regional first knowledge sharing workshops

Workshop nr.	Member States	Location	Date
1	Belgium, Netherlands, Luxembourg, Poland, Austria, Germany, Switzerland, Czech Republic and Slovakia	Aachen (Germany)	18-19 September 2017
2	Spain, France, Portugal, Ireland and the UK	Lisbon (Portugal)	28-29 September 2017

3	Italy, Slovenia, Malta, Hungary, Romania, Bulgaria, Croatia, Greece and Cyprus	Nicosia (Cyprus)	23-24 November 2017
4	Denmark, Sweden, Norway, Finland, Latvia, Lithuania and Estonia	Riga (Latvia)	7-8 December 2017

In Cyprus, the ETIP-SNET workshops was organised in cooperation with the JRC in order to stimulate the participation of local stakeholders.

1.2.2 PROGRAMME OF THE KNOWLEDGE SHARING WORKSHOPS

The 4 workshops are held over two days according to the agenda below (adjusted depending on logistical constraints and number of projects presented):

Slot duration	Speaker	Purpose
5 min	Workshop host representative	Welcome words
15 min	**ETIP SNET support team**	Introduction to R&I activities in the scope of the ETIP SNET; presentation of the R&I roadmap 2016-2025 – focus on the topics of the concerned WG(s); presentation of the other workshops (past and future)
Project session 1 (group of projects addressing topics within the scope of ETIP SNET WG1)		
15 min	**ETIP WG1 representative**	High-level vision (overarching goals and constraints) for the European energy system and respectively of the contribution of various technologies to this system – in relation with the concerned WG(s)
30 min per project	Projects' representatives	Presentation of the findings of the project. Focus on: • the new knowledge gained so far; • the main lessons learnt; • the next projects steps; • the needs for future R&I coming out of the project; • deployment prospects. Each presentation is followed by Q&A.
30 min	Roundtable to conclude session N (animated by **ETIP SNET support team**)	Presence of all speakers in the session + **ETIP WG1 representative** + **ENTSO-E**, **EDSO**, **EASE** and **EERA** representatives
Project session 2 (group of projects addressing topics within the scope of ETIP SNET WG2)		
Similar structure than first session		
Project session 3 (group of projects addressing topics within the scope of ETIP SNET WG3)		
Similar structure than first session		
Project session 4 (group of projects addressing topics within the scope of ETIP SNET WG4)		
Similar structure than first session		
Concluding session		
20 min	**ETIP SNET support**	Wrap-up of the recommendations from the projects

	team	presented and of the conclusions from the roundtables
10 min	**ETIP SNET support team**	Closing words, invitation to participate in upcoming consultation processes

1.3 STRUCTURE OF THIS REPORT

For each of the regional workshops, this report gathers the following information:

- List of projects presented, including the link to the slides displayed at the workshop;
- Participants in the different roundtables and statistical analysis of the attendees per country and organisation of origin;
- Main questions raised during the projects' Q&A sessions;
- Summary of the main recommendations from the projects and conclusions from the roundtables.

2. REGIONAL WORKSHOP 1 (BELGIUM, NETHERLANDS, LUXEMBOURG, POLAND, AUSTRIA, GERMANY, SWITZERLAND, CZECH REPUBLIC AND SLOVAKIA)

The first workshop was held in Aachen (Germany) on the 18th and 19th of September, 2017. The workshop agenda is available on the ETIP-SNET website.

2.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

2.1.1 R&I PROJECTS PRESENTED

Fourteen R&I projects were presented during the first workshop, as displayed in the table below:

Table 2 – Projects presented at the workshop 1

Project	Country	Purpose	Speaker	Link to presentation
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system")				
Hybrid AC/DC overhead lines in Switzerland	Switzerland	Swissgrid together with electric utilities, manufacturer and universities is testing the concept of hybrid AC/DC lines on existing AC towers: increasing the transfer capacity without the need for new transmission corridors.	**Joshu JULLIER** (Swissgrid)	Link
Proaktives Verteilnetz Project	Germany	The project shows synergies between market- and grid-driven usages of flexibility. The traffic light system indicates the actual status of the interaction of the grid with the market. Flexibility in this project means adapting generation and/or demand behaviour by external signals.	**Thomas WIEDEMANN** (Innogy)	Link
Automatic voltage regulation and reactive power system (SAVR) Project	Czech Republic	The project deals with controls of power systems including the reactive power. The SAVR controls voltage in pilot nodes by reactive power of the connected generators. Demanded voltage is defined by dispatcher or by the OPF. Producers with the SAVR installations support the distribution grid instead of neutral behaviour only.	**Jaromír BERAN** (EGÚ Praha Engineering, a.s.)	Link
Ampacity- 10-kV-Superconducting medium-voltage	Germany	Development, manufacturing and field testing of a 10 kV superconducting cable system in the city centre of Essen. Proof of the technical and economic feasibility of a high-temperature superconducting cable system in a distribution network under real operating conditions.	**Thomas WIEDEMANN** (Innogy)	Link

cables for urban power supply				
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"				
StEnSEA Project	Germany	The development and research project "StEnSEA" (Stored Energy in the Sea) is investigating the installation of large storage facilities on the sea floor, in combination with offshore wind farms. The physical principle on which the energy storage facility operates is similar to that of conventional pumped storage power plants, but based not on two reservoirs, but a hollow sphere.	**Matthias PUCHTA** (Fraunhofer IWES)	Link
WESpe Project	Germany	How can surplus wind energy be stored efficiently in the form of hydrogen at large scale? Scientists consider the value chain from a technical and economic point of view. The Analysis includes electrolysis, underground storage facilities and the connection to gas grids.	**Ulrich FISCHER** (Brandenburgische Technische Universität)	Link
Underground Sun Storage Project	Austria	The project attempts to demonstrate the ability of underground natural gas storage facilities to reach hydrogen content of up to 10%, in order to extend the storage potential of the gas network as a whole. To achieve this aim, the project comprises laboratory experiments, simulations and a field trial conducted on an industrial scale at an existing storage reservoir with similar characteristics to Austria's large storage facilities.	**Stephan BAUER** (RAG)	Link
SAVE Project	Belgium	The project looks for practical solutions for the smart use of renewable energy at SME level (with a focus on energy storage and demand side management in agriculture). The target groups are end users as well as providers of energy technology. The main results are: simulation tools (offline and online) to define the potential of demand side management and/or energy storage, 3 demonstration sites, a guideline with economic analyses for representative cases and knowledge dissemination.	**Jeroen BÜSCHER** (VITO)	Link
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"				
Dynamo Project	Netherlands	The DYNAMO project develops a well-functioning and open market for flexibility and ensures that the DSO is capable of procuring flexibility for grid management. It is applying the open-source Universal Smart Energy Framework (USEF), which defines what roles contain what responsibilities and what information exchange is necessary for optimal use of flexibility of consumers.	**Bram SIEBEN** (Alliander)	Link
Kryolens Project	Germany	This project focuses on the technical development and assessment of of liquid air energy storage (LAES). The LAES technology combines flexible generation and energy storage as it can be integrated in conventional generation facilities as well as designed as stand-alone energy storage system. Process analysis as well as component analysis are performed.	**Dr. Christian BERGINS** (Mitsubishi Hitachi Power Systems Europe)	Link
PV Forecast project	Luxemburg	The project developed a forecasting scheme for timely resolved (hourly resolution), spatial PV power forecast, up to 72 hours ahead, for whole Luxembourg. Beside the irradiance forecasts, the algorithm uses a feedback loop of online measured PV reference systems, distributed all over Luxemburg.	**Daniel KOSTER** (LIST)	Link

Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"				
Planning the future electricity grid by using 3D Decision Support System	Switzerland	The project developed a 3D Decision Support System that supports finding the optimal path between two points for a new overhead line. The developed system allows stakeholders to assess various spatially-explicit factors concerning social, environmental and economic impact in order to compute corridors, path alternatives, and corresponding costs.	**Joshu JULLIER** (Swissgrid)	Link
HelloData	Netherlands	HelloData authorizes consumers to share real-time data from the commercial exit point of their smart meter in a secure way. The project creates an equal level playing field which facilitates the development of innovative data-based products and services by introducing an open standard for energy data handling.	**Bart JANSSEN** (Hellodata)	Link
SHAR-Q Project	Slovak Republic	The SHAR-Q project aims at establishing an interoperability network that connects the capacities of the neighbourhood and wide regional RES+EES ecosystems into a collaboration framework that mitigates the requirement on the overall EES capacities thanks to the shared capacities among the participating actors.	**Stefan VANYA** (Bavenir)	Link

Poland was not represented during this workshop but several projects being at an early stage of development have already been identified. Those projects would be involved in the next years' workshops.

2.1.2 ROUNDTABLES

Four roundtables were held during the workshop, all moderatedby Eric PEIRANO and Rainer BACHER. They were mainly devoted to questions for the speakers of the projects presented. Representatives from EASE, EDSO for Smart Grids and ENTSO-E, were also attending in the audience. Table 3 below shows the participants in each roundtable.

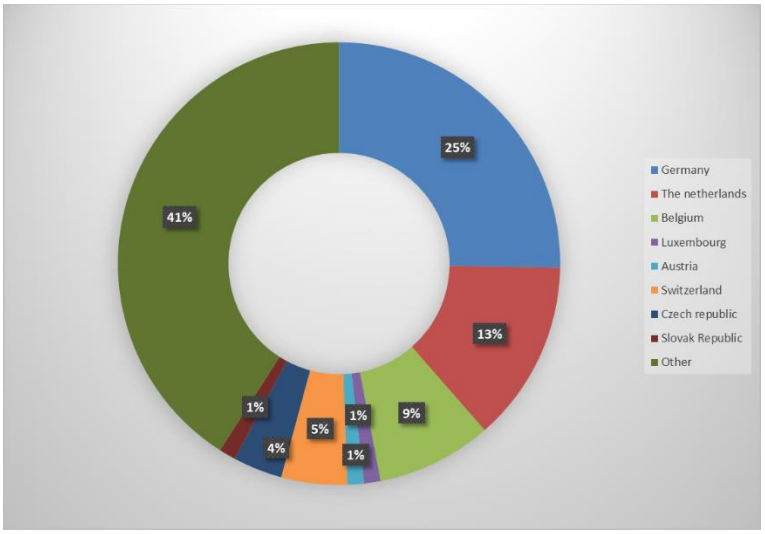
Table 3 – Participants in roundtables at the first regional workshop

Roundtable nr.	Participants
1	• Frank WIERSMA (TenneT, WG1 Representative) • Joshu JULLIER (Swissgrid) • Thomas WIEDEMANN (Innogy) • Jaromír BERAN (EGÚ Praha Engineering, a.s.) • Rainer BACHER (ETIP SNET Support Team, BACHER)
2	• Mathilde BIEBER (General Electric, WG2 Representative) • Matthias PUCHTA (Fraunhofer IWES) • Ulrich FISCHER (Brandenburgische Technische Universität) • Stephan BAUER (RAG) • Jeroen BÜSCHER (VITO) • Niels Leemput (TRACTEBEL) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
3	• Alexander WIEDERMANN (MAN Diesel & Turbo SE, WG3 representative) • Bram SIEBEN (Alliander) • Dr. Christian BERGINS (Mitsubishi Hitachi Power Systems Europe) • Daniel KOSTER (LIST) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
4	• Prof. Antonello MONTI (E.ON Energy Research Centre, RWTH Aachen University, WG4 representative) • Joshu JULLIER (Swissgrid) • Bart JANSSEN (Hellodata) • Stefan VANYA (Bavenir) • Rainer BACHER (ETIP SNET Support Team, BACHER)

2.1.3 LIST OF ATTENDEES

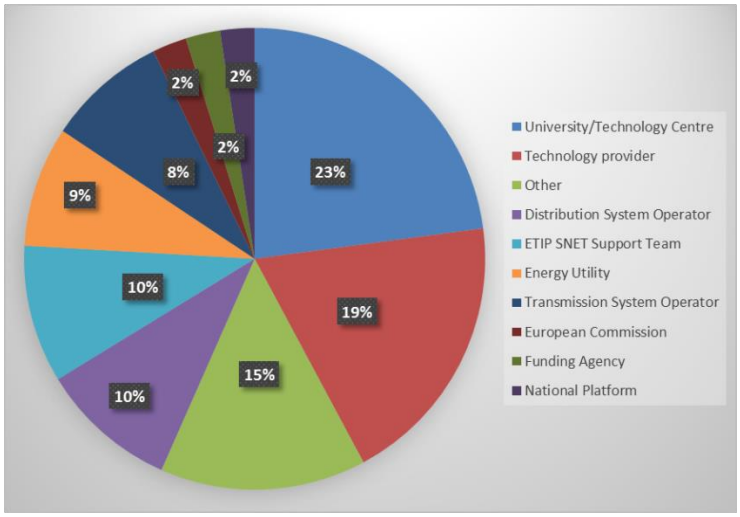
In total, the workshop was attended by 82 participants. The distribution of participants by country is provided in the figure below:

Figure 1– Distribution of participants by country



It can be noticed that the three main countries represented from the central region are Germany, The Netherlands and Belgium. It is also to highlight that 41% of the participants are coming from different countries outside of the central region.
Moreover, the following figure gives an indication of the distribution of participants by organization:

Figure 2– Distribution of participants by organization



It can be pointed out that more than 40% of the audience comes from University/Technology Centre as well as from Technology provider.

2.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions. The important questions and comments are collected in the table below:

Table 4 – Main questions and comments by project

Project	Country	Main Questions & comments
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system")		
Hybrid AC/DC overhead lines in Switzerland	Switzerland	Measures to increase the transmission capacity of an existing line were discussed. It was explained that the first step to increase the capacity of a line is to increase the voltage from 220 to 380 kV . If the line has already 380 kV, an increase of capacity is just possible with a new line or with the conversion into a hybrid line. Moreover, it was highlighted the importance of communication campaigns for the acceptance of new technologies.
Proaktives Verteilnetz Project	Germany	The size, the role and the feedback from market players in the congestion management issues have been discussed. Again, the transparency between the different actors has been emphasized.
Automatic voltage regulation and reactive power system (SAVR) Project	Czech Republic	The presentation raised some questions about how central and distributed new control systems would need to be. This project showed that country-specific regulations/laws would require the adaption of existing central control mechanisms leading new questions such as: How to handle the need for much more automation?
Ampacity- 10-kV-Superconducting medium-voltage cables for urban power supply	Germany	The question related to the investments expected with the development of the technology presented by the project was raised. It was specified that different investment scenarios are foreseen. Moreover, it was reminded that social acceptance was the key to support the use of new technologies. Once more, communication campaigns must be done at an early phase of the project and involve the different parties affected.
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"		
StEnSEA Project	Germany	The questions were linked to the specific investment costs of the storage facilities developed within the project which were indicated to be around 1500 to 2000 euros/kW. Moreover, environmental aspects were tackled in order to point out the potential impact of the technology: the project indicated that it was working, among others, on bio films to protect the environment.

WESpe Project	Germany	Legal aspects related to storage in Europe and specifically, to underground's storage permits were highlighted during this presentation. It was reminded that, in Germany, where the next R&D projects will be set, the legal framework authorizes such activities.
Underground Sun Storage Project	Austria	The process described within the project highlighted the presence of micro-organisms being able to convert Hxdrogen and CO2 to Methane in depleted gas reservoirs and questions related to their speed of development, the repetition cycle of the process, etc. fed the discussions. A follow up project called "Underground Sun Conversion" plans to study further those micro-organisms and their behaviour within its next step of development. It was stressed that, those microbial processes could be a sustainable way to convert renewable energy in an energy carrier which is seasonally storable and completely compatible with the existing gas infrastructure. A sustainable closed carbon loop can be established.
SAVE Project	Belgium	The project indicated that the smart use of own produced electricity does not have a generic solution. Each situation can be different (location, power needed, activities of the facilities,…) and for this reason it was reminded that case by case solutions would be more relevant. It was also highlighted that, the project was able to develop a profitable business model for the battery in niche markets (such as agriculture, etc.).
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"		
Dynamo Project	Netherlands	During the discussion, it was stressed that the DSO is not the only customer of flexibility, all interactions between market roles (especially emerging market players) should be defined. As such it is very important that these (new) players fully the DSO requirements versus flexibility product characteristics of different flexibility sources. Also, it is pointed out that the open platform introduced in the project is of high value (standardized information exchange is essential) and that it would make a relevant link with topics encountered within WG4.
Kryolens Project	Germany	The comments following the project presentation were mainly related to the size of the land needed for the Cryogenic air energy storage infrastructures introduced. It was reminded that the energy density for the liquefied air is in the range of the one for CAES (Compressed Air Energy Storage) and LNG (Liquefied Natural Gas). Also, it was indicated that 1600 m^3 of storage capacity are enough for a facility of 100 MWh. This would enable to locate a pilot plant next to a city.
PV Forecast project	Luxemburg	Possible optimisations for the PV Forecast tool presented were focused on: - Incorporation of a hybrid method (e.g. using machine learning) to reach higher accuracy – which is intended to be done in a further development step, - Consideration of the underline grid - planed as soon as the necessary degree of detail on the grid is available,

		- Prediction of the wind and of the clouding effect -which is incorporated in the used irradiance forecast and additionally the feedback loop of connected PV systems delivers data to correct for prediction errors - Consideration of the eclipse – which is comparably straight forward, from a forecasting perspective but not yet included in the ECMWF solar irradiance forecast model All these aspects could be taken into account or are already considered by the project.
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"		
Planning the future electricity grid by using 3D Decision Support System	Switzerland	The demonstration tool introduced by the project was appreciated and leads to different discussions: - Some alternative scenarios were presented in order to plan future electricity grids - The tool is a good approach to communicate with the public but the real influence of such tool in the decision process is not yet known. One of the next step of the project is to compare the tool's results with the solutions of the experts so as to identify significant discrepancies in order to improve the underlying decision making algorithm.
HelloData	Netherlands	Different topics related to the secure sharing of energy data have been raised: who is controlling? Does it have to be anonymous? What about the connectivity and freedom of choice? Etc. The main challenge of the project would be to develop an ecosystem/ platform enabling to prepare the future management of consumers' energy data.
SHAR-Q Project	Slovak Republic	The projects introduces several challenges: data privacy, tracking of the data ownership,etc. It was indicated that most of the challenges to be faced could be solved with the blockchain technology. Today, because of the lack of regulatory framework, the project works as if the regulation were available so as to provide relevant recommendations to the commission.

2.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES

These recommendations and conclusions have been discussed and agreed upon during the Final Wrap-up session of the workshop.

2.3.1 SESSION 1: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"

- Public acceptance for innovative solutions is key for future grid developments.
- AC/DC hybridisation is a promising technology to increase transmission and distribution grid capacity without building new lines. HVDC converters will bring additional degree of freedom.
- Superconducting cables are a promising solution for reinforcements in densely populated areas.
- Interactions between regulated players (grid operators) and market players should be performed on the basis of user-friendly and efficient signals, especially for the "yellow light" state.
- The full monitoring, automation and control of the flexible electricity grid (all voltage levels) calls for new approaches (governance and technical solutions) so as to be able to handle at different time scale the huge amount of data.
- Enhanced TSO/DSO (market makers) coordination is needed so as to be able to have, at the same time, efficient markets at all spatial scale (wholesale and retail) within an open, adaptive regulatory framework.

2.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES"

- Deep water off-shore PHS (StEnSEA concept) seems to be a promising solution (in terms of costs) provided that key maintenance issues are solved at affordable costs (e.g. fouling).
- Direct electrolyser H2 use for transport application (H2-powered passenger vehicles) is nearly cost competitive provided that regulatory issues can be addressed (storage of H2).
- Storage of energy (H2) is technically feasible with available know-how and provides solutions for large-scale (including seasonal) storage of renewable electricity.
- Microbiological applications can be a way to establishing a sustainable carbon cycle (CH4 and CCU): more R&I needs.

- Small-scale BESS can provide cost competitive solutions in niche markets (e.g. agriculture).

- Need for system optimisation to find the most efficient coupling between electricity and gas (including large-scale storage of electricity).

2.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 3 ""FLEXIBLE GENERATION"

- R&I activities are needed for the development of adaptive solutions so as to quickly set up a 100% RES based energy system at affordable costs.

- There is a need to study the overall coherence between the different aspects of the Energy Union, for instance mechanisms to foster the penetration of renewables and CO2 prices (ETS).

- Open source environment are needed (e.g. the USEF framework) so as to define the interactions between the different market players at local level (ancillary services for DSOs), stressing on the essential need for standardized information exchange.

- LAES could be an alternative solving some of the drawbacks of CAES: more research is needed to prove the commercial soundness provided that the ancillary services brought by this technology are fairly valued and remunerated on electricity markets.

- Efficient PV forecasting tools at local level (small cells) could help local system players (DSO level) to better handle decentralized PV generation.

2.3.4 SESSION 4: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 4 ""DIGITISATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION"

- GIS-based solutions can provide a practical framework to quantify and visualize the possible impact and costs of new OH lines and cables and to support public acceptance processes.

- Customer (end-users) should keep control over their data and give access permissions through dedicated platforms (who has the right to use the data? To what end?).

- Peer-to-peer interoperability of smart energy components might provide further local flexibilities supported by blockchain technology.

- Smart meters should be used for network management and billing services; service provisions should be performed through other channels (energy box?).

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