Smart Energy Systems ERA-Net | Spotlight

WG RegioM 2021

AISTOR, CLUE, DISTRHEAT, EPC4SES, EVA, EVCHIP, Flexi-Sync, PIGergy, REgions, SONDER, SuperP2G

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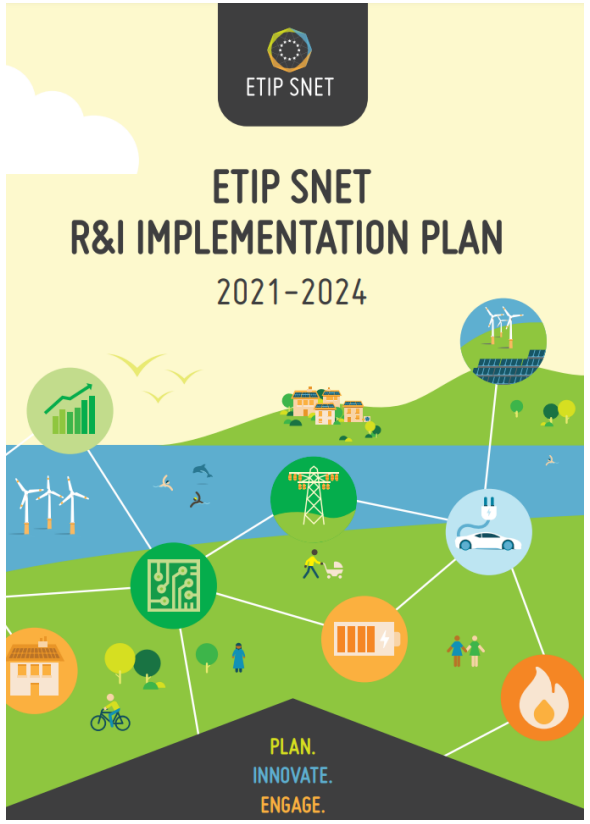
ERA-Net SES has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements no. 646039, 775970 and 883973.

ERA-Net SES Projects´ Perspectives on

- Tools enabling connectivity
- Decarbonisation for vRES integration
- Tools and methods for system flexibility planning, monitoring and advanced modelling
- Early detection of critical situations
- Solutions for operational planning

ERA-Net SES Spotlights showcase intermediate results of the Joint Programming Platform´s RDD projects and the Knowledge Community to researchers and experts. Each Working Group selects reference documents of high relevance to put their results into context. All Knowledge Community experts are invited to comment the current edition's Living Document on expera.

Building on „ETIP SNET R&I Implementation Plan 2021-2024" by ETIP SNET



Tools enabling connectivity among stakeholders

"Tools […] putting the end-user in direct contact with […] other involved market stakeholders […]. […] demonstrations will show real-time optimisation […] and increase the understanding of consumer behaviour providing direct action […] through dynamic energy management mechanisms." *(ETIP SNET R&I Implementation Plan 2021-2024 , page 36)*

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CLUE

Agree, LEC planners have lacked tools to design LEC energy system with sector coupling and flex integration. CLUE tool-sets for planning and operation of ECs are based on simulation, stakeholder and regulatory analysis to derive interactions between con-/ prosumer, EC and energy system.

Further resources
www.project-clue.eu

EVA

Agree: To integrate EV electricity, we need demand flexibility, network digitalization and supervisory control for effective network management. Open Data access is required to develop methodological tools for urban networks, deterministic flex load management and optimization.

Further resources
www.evaproject.eu

PIGergy

Strongly supports the statement. It is key that demonstrations are carried out in order to "increase understanding of consumer's behaviour..." and to achieve "real-time optimisation of DER". PIGergy is showcasing its novel treatment for pig manure to generate heat, electricity and biochar.

Further resources
www.glasportbio.com/era-net-ses

SONDER

Disagree: In an EC, end-customers remain connected by contract with supplier and by regulation with DSO. For active customers, there can be direct links with supplier and / or grid operator. The common smart meters don't enable that. Meanwhile, ECs can serve as indirect interface.

Further resources
www.project-sonder.eu

Joint Conclusions

Smart Energy Systems ERA-Net

It is out forward that data will be available and transparent for all stakeholders to facilitate end-user-supplier engagement. In case of EC, SONDER assumes, only active customers may have direct communication and control links with supplier/ grid operator and their appliances. ECs are seen as indirect interface to better integrate customers with different energy markets.

Decarbonisation is based on variable renewable source integration

"Progressive decarbonisation of the energy system relies on the deep integration of variable renewable energy sources." *(ETIP SNET R&I Implementation Plan 2021-2024 , page 89)*

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CLUE

Agree, the growing mismatch of energy generation and consumption requires properly planned integration of flexibilities. In CLUE all demo sites allow for and will enhance further activation of local flexibility.

Further resources: www.project-clue.eu

PIGergy

Agree, this is key to PIGergy in terms of energy, heat and biochar production from an agricultural 'waste' material. Increasing fuel flexibility of thermal generation and RHC is relevant to our project.

Further resources: www.glasportbio.com/era-net-ses

Joint Conclusions

PIGergy and CLUE agree with the statement as it relates to the management of local energy communities, and attempts to better match energy generation and consumption through the integration of flexibilities in the energy system.

Tools and methods for system flexibility planning, monitoring and advanced modelling (I)

"Tools and methods for system planning, considering the new types of flexibility services, as in case of a low inertia network" & "Novel monitoring and control tools and advanced modelling tools for better operation management and decisional support." *(ETIP SNET R&I Implementation Plan 2021-2024 , page 90)*

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CLUE

Agree, we develop tools for LEC planning with integration of customers, RES, storage, e-mobility, and power-to-heat. Providing capabilities for real-time overview about energy flows within the community for an automated and optimized LEC operation.

Further resources
www.project-clue.eu

REgions

We develop flex service tools to show variable RES can provide ancillary services. Interaction of data acquisition and measurement with data evaluation and operation prediction is key. Uncertainty calculation and risk reduction are critical for investments and operation options.

Further resources
www.regions-project.info

SuperP2G

Open access of data is crucial. We strongly believe development of tools and methods is important for future decision making, giving operators the chance to optimize existing processes as well as planning for their future transformation into a green industry.

Further resources
www.superp2g.eu

Tools and methods for system flexibility planning, monitoring and advanced modelling (II)

"Tools and methods for system planning, considering the new types of flexibility services, as in case of a low inertia network" & "Novel monitoring and control tools and advanced modelling tools for better operation management and decisional support." *(ETIP SNET R&I Implementation Plan 2021-2024 , page 90)*

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Flexi-Sync

Agree, system modeling and price forecasts are essential to see sector coupling impacts. Tools are necessary to control components. Demonstrations provide validation and replicability. We investigate flexibility potentials in DHC networks with power system integration.

Further resources: www.flexisync.eu

DISTRHEAT

Agree, physical modeling leads to system optimization and control. Efficient real-time control strategies should include heating and cooling due to its high energy consumption. Our MPC tools for DHC can be applied for other energy vectors as well.

Further resources: www.distrheat.eu

Joint Conclusions

Tools and methods are seen as a key element for flexibility planning, system optimization and operation of an integrated energy system by all projects. DISTRHEAT points at DHC to consider and Super P2G at open access to sufficient data.

Early detection of critical situations or nodes

"Early detection of critical situations or nodes will be made possible. […] ICT infrastructures needed to enable the state estimation and visualisation, […] protocols for the adequate cooperation of network operators at all levels."
(ETIP SNET R&I Implementation Plan 2021-2024 , page 102)

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AISTOR

Agree, we approach this challenge by creating AI-controlled tools for managing the variability and uncertainty of power supply. AISTOR is an AI energy storage and management system for emergency situations such as a power outages after natural disasters.

Further resources
www.be-aistor.com

EVCHIP

Agree, however classical observation requires access to monitoring and communication infrastructure that is non-existent at the (low voltage) distribution grid or avoided due to cost. From a regional perspective, not all operators/countries will have the same level or resources. Solutions may be adapted accordingly.

Further resources
www.evchip.ucd.ie

REgions

Agree. REgions is concerned with ancillary service from vRES. Hence we particularly support the need for "protocols for the adequate cooperation of network cooperation at all levels". In future systems, with intensified bidirectional exchange, ICT infrastructure for TSO-DSO communication is crucial.

Further resources
www.regions-project.info

SONDER

Agree, even go beyond on an EC scale: In SONDER we intend to predict critical situations and prepare according responses ahead of time based on machine learning to minimise the impact of expectable grid issues on the community members, achieving a win-win situation.

Further resources
www.project-sonder.eu

Joint Conclusions

The projects agree with this statement. EVCHIP states adequate monitoring ICT is often nonexistent, so early detection has to be made possible. Until then, it is a challenge for the protocols for cooperation of network operators. SONDER stresses that prediction can be used to prepare adequate customer responses ahead of time minimize the impact on EC members.

Reliable solutions for operational planning

"Forecasting, secondary and tertiary control. […] Solutions for operational planning of the energy systems with special reference to resource scheduling and optimisation of active/reactive power and voltage control. […] Validated close to real-time tools for improved security analysis and decision making […]."
(ETIP SNET R&I Implementation Plan 2021-2024 , page 109-110)

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CLUE

Agree, SONDER is attempting to do so within the scope of industry customers that cooperate in an Renewables Energy Community (REC) setting. To optimally utilise the RES contributed by REC members, SONDER intends to use prediction and load shifting to optimise the energy balancing among members to minimise the energy drawn from the grid.

Further resources
www.project-clue.eu

SONDER

In project SONDER we explore the potential of collaborative energy management by coordinated demand response in energy communities.
We focus on:

- EV charging
- data center operation
- residential & industrial demand response
- integration and operation of community energy storage

Further resources
www.project-sonder.eu

EPC4SES

Agrees with the statement although the EPC4SES provide an holistic approach. In order to forecast the amount of energy needed in certain nodes the coupling of electricity needs and H&C needs must be addressed. EPC4SES aims at decarbonizing h&c demand connecting processes of domestic energy demand, adding sector spanning potential to smart grids and simulation based planning and control.

Further resources
www.smartenergy.nu

Joint Conclusions

All projects agree with the statement and include forecasting and control mechanisms in their own approach. SONDER is working on prediction and load shifting for industry customers in a REC, CLUE has several demo sites where forecasting and optimization come into play. EPC4SES will combine model-based simulation of demand, using thermal capacity of buildings with models for consumer attitudes and behaviour models to predict demand and allow realistic interventions.

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DISTRHEAT | EVCHIP

DISTRHEAT
EVCHIP

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ERA-Net SES Projects´ Perspectives on

Heating and Cooling short term forecasting algorithms

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Building on „Strategic Research and Innovation Agenda for Climate-Neutral Heating and Cooling in Europe" by ETIP RHC

Heating and Cooling short term forecasting algorithms

"Development of algorithm for short term forecasting of heating (and cooling) demand as well as electricity demand & prices, using innovative approaches (e.g. AI Model Predictive Control algorithm for effective control of non-programmable RE sources." *(Strategic Research and Innovation Agenda for Climate-Neutral Heating and Cooling in Europe, page 21)*

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DISTRHEAT

They agree, but AI-based methods may lose the ability to represent unexpected and unpredictable future conditions -> e.g. for example during COVID-19 times databases are not representative.

Further resources: www.distrheat.eu

EVCHIP

The forecasting (day-ahead) of heat and electricity demand is key for scheduling all RES operation in an effective manner. Synergy is required among RES.

Further resources: www.evchip.ucd.ie

Joint Conclusions

DISTRHEAT and EVCHIP agree that efficient algorithms for short term forecasting of heating (and cooling) demand are needed. Both projects perform studies on response algorithms to predict heating and cooling demand. Synergy is required among RES and customer satisfaction must be achieved. Hybrid forecasting methods based on both the main physical conservation equations and available databases, could be proposed.

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ERA-Net SES Projects´ Perspectives on

Energy Communities: how to achieve energy sharing?

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Building on „Energy Communities under the Clean Energy Package" by REScoop and ClientEarth

REScoop.eu ClientEarth

Energy Communities under the Clean Energy Package

Transposition Guidance

Energy Communities: how to achieve energy sharing?

"It is recommend that Member States take an open and innovative approach and allow different models of energy sharing. Consider to include community-owned peer-to-peer trading platforms in the energy sharing frameworks, which also allow for individual renewables self consumers and generators to participate." *(Energy Communities under the Clean Energy Package, page 75)*

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CLUE

CLUE strongly supports this statement. The project CLUE mission is to localize, as much as possible, the production and consumption of energy using renewable energy resources. CLUE will emphasize on capacity and energy sharing with the utilization of community battery and hydrogen storage to increase self-consumption.

Further resources
www.project-clue.eu

RegEnergy

Peer to Peer (P2P) sharing mechanisms can be the vehicle to facilitate prosumers to engage with the market and integrate renewable energy technologies locally to suit their communities aggregated demand. They would have a legal standing with the market such that the frameworks, consumption and spill of these communities with the grid can be regulated.

Further resources
www.nweurope.eu/projects/regenergy

REDAP

In GIS terminology, REDAP project is about developing a standardised base-layer (backdrop) of information which represents energy demand within and across regions. This base-layer can be used for a range of different analysis purposes which combines techniques from data management, plan and policy-making, and visualisation.

Further resources
www.redap.eu

SONDER

We support enabling of different models of energy sharing. To our knowledge there is no single sharing approach that fits all and every situation.
However, we clearly separate sharing from trading. Sharing should exclude any involvement of the energy market.

Further resources
www.project-sonder.eu

Joint Conclusions

Projects generally agree with the need for electricity sharing to enable an open and innovative approach.
There is no single sharing approach that fits all the LEC situations, and instead, a diverse set of techniques are needed. However, clarification between trading and sharing of energy is required.

Funding Partners

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The Joint Programming Platform Smart Energy Systems receives funding from the European Union´s Horizon 2021 research and innovation program under the grant agreements no. 646039, 775970 and 883973.