Smart Energy Systems ERA-Net | Policy Brief

Joint Programming Platform Smart Energy Systems

Policy Brief

2022 Edition – Summary

Introduction

The Joint Programming Platform (JPP) Smart Energy Systems (SES) initiative unites scientific experts in smart energy systems within its Knowledge Community. On the basis of their profound experience and expertise, these researchers develop an informed opinion of key aspects which – according to their perspective – should be considered by decision makers on different levels. With its Working Groups, the JPP SES initiative provides a platform for developing expert recommendations.

The presented rolling document is the condensed version of the Policy Briefs developed within the thematic Working Groups of the JPP SES initiative – resulting from work up until Spring 2022. The recommendations recently added or adapted within the 2021/2022 co-creation cycle are highlighted with an asterisk.

Particularly policy makers, managers of funding programmes and projects, regulators as well as representatives from business and science are invited to the platform expera for reviewing the respective Working Group Versions of the Policy Briefs. Please login or register to expera for access to the complete versions of the Policy Briefs.

The views expressed in this material are those of the authors and do not necessarily reflect the views of the JPP SES initiative. Any references included do not imply the endorsement by the JPP SES initiative.

Recommendations

Consumer and Citizen Involvement

Recommendation A: Include social sciences in Research, Development and Innovation programmes and projects

The (active) participation of users is prerequisite for the transformation of the energy system. When building smart energy solutions, tested approaches and knowledge from social sciences and humanities for engaging users should be deployed from the early phases of project development. Hence, interdisciplinary and transdisciplinary Research, Development and Innovation programmes and projects are of considerable importance to facilitate research on the motivations and needs regarding the (active) participation of citizens as well as of commercial and private consumers in the energy system.

Recommendation B: Involve potential user groups through agile, co-creative and user-centred technology design and development from the outset (*)

To ensure and enable acceptance and adoption of new technologies in the long term, the targeted involvement of potential user groups throughout the entire process of technology design and development is crucial. Firstly, this requires detailed assessment of potential user groups to be able to address their respective needs and to tailor engagement strategies in a suitable manner. A common framework and method for the assessment of user groups could facilitate the task and contribute to more comparable results. Secondly, this requires co-creative and user-centred approaches that actively involve potential user groups, such as during applying and testing prototype solutions in everyday life contexts. This requires professional innovation processes integrating many stakeholders and initiating dialogue among the latter through creative methods, such as design-thinking approaches.

Recommendation C: Integrate citizens and consumers targeted, consciously and smartly

Exploiting the flexibility potential of active storage, generation and consumption of energy carriers, such as electricity, cold and heat, requires smart technologies and mechanisms for data exchange. The latter must build on state-of-the-art knowledge on different and diverging user needs and requirements to ensure minimal bothering and maximum comfort as well as benefit for the user. Thereby, data privacy and personal rights must not be compromised.

Recommendation D: Shed light on the paths ahead with one voice and one direction (*)

The lack of concise information, changing or even contradicting messages and opposing actions from different policy levels create confusion among local stakeholders, including energy planners, citizens and consumers, in their endeavour and effort to design local energy systems. The overarching objectives regarding the principles on citizens' and consumers' participation need to be clearly defined and guidance provided for selecting optimal solutions for specific local settings. To motivate broad action, a clearly communicated common message and roadmap of actions are needed.

Recommendation E: Integrate Small and Medium Enterprises as key players in the energy system

Small and Medium Enterprises represent a special type of consumers that can considerably contribute to the efficient use of energy and stabilizing the system. The digitization of infrastructure, processes and procedures in Small and Medium Enterprises, including monitored data of consumption and generation measurement, enable responsive manufacturing control. Hence, mechanisms and market signals are necessary to activate their flexibility and foster provision of system services.

Recommendation F: Leverage Energy Communities to counteract energy poverty

People with low income lacking production and purchasing capacities can significantly benefit from local Energy Communities. To support sustainable development on the local level (e.g., reducing poverty and/or increasing equality by empowering under-represented groups), commercial and cooperation models need to be tailored and effectively communicated to the target group(s). Facilitating the active participation of local Small and Medium Enterprises provides further opportunities to strengthen the local community.

Recommendation G: Empower citizens and consumers through access to interoperable technologies and tools (*)

The prerequisite for an active and broad participation of citizens and consumers in (new) energy systems is low threshold access to technologies and tools. For citizens and consumers to consistently contribute to an efficient and effective utilization of renewable energy sources as well as to local grid stability, accessible and affordable user terminal appliances that provide accurate information for decision making need to be available.

The technologies and tools need to be conveniently controlled, understandable and user-friendly with intuitive user-interfaces and minimal user interaction. Moreover, wide interoperability among heterogenous systems from different sectors is of particular importance. Hence, to secure both, open access to and interoperability of technology and tools, appropriate legislation and regulation needs to be put in place.

Regional Matters

Recommendation A: Develop a common EU-dataset based on available information to properly design, smarten and upgrade the policy measures on energy efficiency and decarbonisation (*)

The promotion of an EU-dataset based on observable and reliable data is essential for properly modelling building stock energy metabolism maps and to design effective decarbonization support measures. The approach with a common database can bring decision-makers together. Categorizing techniques and scales is also important. Open data availability and use shall be subjected to the implementation of the EU directive on Information Freedom and the General Data Protection Regulation.

Recommendation B: Provide guidelines for local cooperation and interaction

As local stakeholders and energy planners are lacking tools to design local energy systems, guidelines on how to integrate different customers are required. Since the options are so manifold that restrictive specifications might be problematic, using case-specific integration profiles with involved actors, needed actions, transactions and technologies, optimal layouts, precautions, and conditions, could help. Comprehensive methodologies to come to such definitions, which can then be utilized across contexts should be developed.

Recommendation C: Adopt a consistent terminology for Energy Communities (including, but not limited to Citizen and Renewable Energy Communities)

The definitions of Citizen and Renewable Energy Communities as defined in EU directives are a good start. For practical use in the city and regional development processes they should be embedded in a broad, commonly used terminology covering any community of peers who cooperate in energy production and consumption. The scale at which Citizen and Renewable Energy Communities are deployed will depend upon (i) the attractiveness and coherence of the enabling framework and (ii) the flexibility of the underlying business model to allow for the participation of or cooperation with professional actors from the energy sector.

Recommendation D: Incentivize users' behaviour and better appreciation of demand flexibility

The integration of active customers and energy communities on a local and regional level will not happen without proper incentives. Individual response to signals from the Distribution System Operators and the market may be problematic if not well coordinated. Furthermore, participation mechanisms must ensure that users' behaviour is coordinated with the system requirements. Research showed that public engagement works better with intrinsic instead of extrinsic motivations.

Recommendation E: Foster exchange on Citizen and Renewable Energy Communities between researchers and local authorities

By exchanging with projects developing tools, plans and methodologies, local authorities can overcome difficulties when initiating and supporting the development of Citizen and Renewable Energy Communities. Policy makers should support local authorities to uptake research and development output in a situation where project timeframes are in the range of three years whereas local authorities plan in 30 years cycles. Policymakers should allow funding programmes to implement "series-of-projects" in the same city or region, providing mechanisms to follow up activities and provide continuous support.

Recommendation F: Provide clear EU policies and financing programmes to support efficient and standardised planning procedures (*)

By 2050 most existing residential buildings will be retrofitted to be zero-carbon buildings, and energy-related building codes will be introduced by 2030. This requires introducing or reinforcing the minimum energy performance standards and replacement schemes for low-efficiency appliances. Additionally, planning tools must be submitted, supported by financing programmes. For smartening the long-term planning procedures, harmonization work is needed. The role of funding agencies to meet the projects' goals is also crucial.

Recommendation G: Build a climate of multilevel trust and cooperation among different actors in the energy sector (*)

Load control solutions can cover a wide range of energy users. Promoting a multilevel transition by providing tools and services at all scales for energy savings and reducing carbon emissions is relevant. To realize the multiloop/multilevel vision, a climate of trust and cooperation among different actors in the energy market is desirable.

Regulatory and Market Development

Recommendation A: Assess and test support schemes to enable deployment of Citizen and Renewable Energy Communities (*)

In order to prompt citizens' engagement in both, Citizen and Renewable Energy Communities, it is valuable to provide financial support. However, this cannot involve reducing network charges if the contribution of the Energy Community in supporting the grid is not proven. As the business case varies with the use case and with the size and features of the community, different models can be adequate for different situations. Demonstration projects should elaborate recommendations for action for policy makers aiming at equalising support schemes around Europe as much as possible.

Recommendation B: Enable context-based roles and regulation of energy sharing practices in Energy Communities (*)

It is still early to narrow down to single types for energy sharing and self-consumption in Energy Communities. Regulation of energy sharing needs to be dynamic and flexible, adapting to country-specific developments, without endangering the grid stability, but at the same time not causing economic disadvantages related to the use of the public grid. Multiple configurations of Energy Communities should be allowed (also beyond the definitions of respective directives). Market developments should be monitored and legal adjustments made in case that there is no uptake or negative side effects emerge.

Recommendation C: Consider regional requirements to ensure local quality and security of supply of electricity as well as heating in Energy Communities (*)

For Energy Communities to have a positive effect on overall grid stability, the focus of attention needs to be broadened, taking into account not only local, but also regional requirements. The different geographical constraints must be considered to adapt the concept of quality and security of supply at various grid levels (local, regional, etc.), and possibly extend beyond the electricity sector, and in particular to heating. Adapting successful schemes to local peculiarities needs to be supported.

Recommendation D: Implement open-access regulatory sandbox programmes for Energy Communities based on innovative concepts (*)

Open-access regulatory sandbox programmes should be defined to allow new concepts for Energy Communities to be tested, thus valuing and promoting the extensive application of experimental results. Mechanisms for accessing regulatory sandbox programmes must be transparent and open, requiring that utilities are willing to provide more than business-as-usual engagement. Innovative concepts need to be investigated, involving both project participants and regulatory authorities, in order to decrease the considerable efforts in engagement, testing, feedback, knowledge sharing and education.

Recommendation E: Designate a single National Regulatory Authority for electricity and gas (and possibly heat) to take better account of the evolution of sector coupling (*)

With increasing importance of sector coupling, coordination of regulatory measures in the electricity and gas fields becomes crucial. In the field of renewable gas, a multitude of regulations – as seen in the past – can cap the cross-border trade significantly. Therefore, as a step for a more unified and coherent regulatory environment, especially in regard to renewable energy, decreasing the number of stakeholders by limiting responsible bodies to one per Member State is welcome. It is recommended to also place heat (and particularly District Heating) in the power of a unified National Regulatory Authority.

Recommendation F: Clearly define and regulate new actors and their relationship in the establishment of local electricity and flexibility markets (*)

Technological interoperability (in terms of information and role models) should be promoted and new actors should be defined for distributed systems. The relationship between market participants and their responsibilities should be clarified, keeping in mind that an even level playing field should be achieved for all. Considering the specific characteristics of Energy Communities, the JPP SES appreciates the development of a “Harmonized Electricity Market Role Model” (HEMRM) and recommends to support a qualified discussion in the framework of the respective European Commission H2020 Bridge action. It should be monitored in which markets decarbonisation is advancing fastest and the corresponding market models should be supported by regulations.

Recommendation G: Adjust economic regulation to support grid owners and service providers in procuring optimised storage services (*)

Traditional grid development strategies need to be adapted to meet requirements from society and novel solutions, including alternative grid development strategies, are needed. This includes enabling storage deployment and storage networking with demand responsive consumers. Development of the regulatory framework, supporting TOTEX based investments, together with alignment on ownership of enabling technologies, will support a sustainable grid development in the long-term. In order to create an even level playing field for storage procurement from other kinds of actors, different valid business models and business cases should be enabled by policy incentives as well as by transparent exchange of information by Distribution System Operators. Attention should be given to virtual storage.

Storage and Cross Energy Carrier Synergies

Recommendation A: Plan energy systems holistically across energy carriers and sectors (*)

Currently, energy systems are in most cases regulated and managed in silos, ignoring possible synergies related to flexibility, system stability and decarbonization. District heating systems with heat storages would help balancing the electric power system, and they also would enable the utilization of the surplus heat from data centres and electrolysers. Policy makers should prioritize the establishment of a level playing field with equal rights for market participants across different technology and business sectors, adding new resources to the flexibility portfolio.

Recommendation B: Exploit flexibility to stabilize low-carbon integrated systems (*)

Energy efficiency and flexibility together with different kinds of energy storage capacities are key factors helping us to manage the transition to a carbon neutral system. Special attention needs to be given to cross-sectoral storages that enable converting clean electrical energy to other energy vectors and in some cases back to electricity (Power-to-X-to-Power). Several fees and taxes should be reviewed and transformed to encourage rather than detain the needed sector coupling.

Recommendation C: Plan storage for local energy production

Distributed renewable energy production needs to be accompanied from the beginning by planning the energy storages needed for balancing. Distributed storages would diminish the pressure and costs for grid refurbishment. Storages may also bring benefits or cost savings to prosumers, also enabling installation of larger production units. Planning tools would help introducing storages in an open and transparent way, which is key in creating the regulation still needed to enable even more business cases for storages.

Recommendation D: Enable low-temperature district heating networks

Adjusting district heating networks to lower temperatures creates great opportunities to utilize waste heat and integrate storages, which can help stabilize other energy systems such as electricity and gas.

Recommendation E: Certify and validate low-carbon fuels for future energy systems (*)

The emissions during the whole lifecycle of the fuel should be assessed when options for low-carbon fuels/green fuels are compared, paying attention to data validity and accuracy (updated) for each fuel's total emissions during the life cycle. Comprehensive terminology for all renewable and low-carbon fuels and a European system of certification of such fuels should be proposed.

Recommendation F: Promote digitalisation of energy systems / district heating to maximize energy efficiency and utilisation of waste heat (*)

Digitalization of the district heating network is needed to maximize energy efficiency, yield from waste heat and use of renewable energy. Sector integration requires smart management of data from different systems. Integration of data networks of electricity grid and heating network should be promoted. Effective data collection and communication, standardization, and data security must be assured.

Recommendation G: Promote utilisation of waste heat and thermal storages (*)

Further exploitation of excess heat should be one of the main focuses for EU strategy, along with RES integration and further efficiency improvements, to attain a decarbonized energy system. Waste heat must be considered as an asset in circular energy system. The exploitation of excess heat from industrial sites, data centres and electrolysers are strongly recommended. Since the utilisation of waste heat sometimes requires heat pumps to increase the temperature to sufficient levels, rules for taxing energy products and electricity should be reviewed.

System Architecture and Implementation Modelling

Recommendation A: View energy transition and climate neutrality holistically (*)

Energy Transition and action toward climate neutrality should be an integral part of regional development. Both can support the overall welfare of the region. Therefore, regional development institutions for business and infrastructure need to be involved in the discussion. Energy related organisations and institutions need to interoperate with sectors beyond energy. In order to get integrated systems for cities, towns and regions, interoperability, effectiveness and efficiency should be considered across multiple sectors: manufacturing, agriculture, energy, healthcare, etc.

Recommendation B: Develop a clear terminology for Distributed Energy Systems (*)

To constructively discuss integrated regional energy systems in relation to the overall energy system, terms such as "integrated", "regional" and "local" need to be clearly defined. The entire Research, Development and Innovation community could benefit more if all projects would use defined terms to describe their activities and results or at least define them clearly for their documents. JPP SES programme designers and projects should use the proposed terminology (as described in the JPP SES Glossary). Projects should refer to roles and actors in the energy system as outlined in the "Harmonized Electricity Market Role Model" (HEMRM), which is being revised under the lead of EU Bridge Working Groups.

Recommendation C: Make system and market architecture models comprehensive and easy to use (*)

More attention should be given to describe (the parts of) the complex system in an easy to grasp manner. There is still a need to overcome incompatibilities in terminology of sectors (ICT, energy, governance etc.). Glossaries may not be enough and need to be accompanied by excellent depictions and more opportunities for oral exchange. The definitions of roles and actors as outlined in the revised "Harmonized Electricity Market Role Model" (HEMRM) should be supported. Supportive visualisation and tracking tools are needed to describe complex and interrelated requirements and to assess interoperability needs and solutions (such as the validation network with living labs and testbeds that is being set-up for projects in the framework of JPP SES or by the newly awarded H2020 project IntNet).

Recommendation D: Develop a holistic perspective on interoperability in energy systems (*)

Regulatory bodies should foster interoperable solutions unleashing possibilities for machine learning and artificial intelligence-based controls and linking them to the existing frameworks. Research, Development and Innovation support programmes shall transfer background knowledge, practical skills, and experience diversity for the development of integration profiles for interoperability (often called interoperability profiles) instead of proprietary solutions. Such communities should rely on existing best practice, e.g., the Austrian IES initiative (Integrating the Energy System) which suggested and tested a common understanding and framework to develop and reuse use-case specific solutions for data exchange.

All stakeholders of the energy system (academia, practitioners, need owners, legal and regulatory entities) should put interoperability on a checklist for every action programme and regulation. Research, Development and Innovation programmes should call for formal integration of interoperability profiles whenever funded projects develop interfaces that shall connect independent (non-proprietary) components. At the same time tenders and applications should be obliged to outline references to test labs and their requirements to testing systems.

Project and product developers should take into account well established frameworks for that purpose, e.g., The Open Group Architecture Framework (TOGAF), the European Interoperability Framework (EIF) and the European Interoperability Reference Architecture (EIRA). These are focused on general and sector independent governance.

Recommendation E: Strengthen the use of open resources for interoperability testing (*)

First, open-access relates to the availability of data. Testing functionality and interoperability relies on practical cases. Whether it be historical or near real-time data, network or meter operators should be obliged to provide anonymised data for validation purposes. Additionally, a set of relevant use cases should be described (together with tangible information or data on topology, type of customer, geographical location, etc.) that are suitable for validation purposes. With respect to opening and jointly recognizing data and protocol resources, results of the OPEN DEI project are highly relevant. It has developed an open database and a very practical approach to cover cross domain interoperability and – for the energy sector – described a seamless exchange of data across domains and zones, i.e., from individual consumers or prosumers to bulk generation and global markets.

Second, open-source simulation software is ideal to improve the interoperability testing processes without vendor and operator lock-in. License fees should not hinder the access to standards, testing and simulation software. Interoperability profiles and standards should be open-access and existing testbeds be openly accessible for a fair fee.

Recommendation F: Allow for defined and protected local access to system data (*)

Existing data models are oriented towards optimizing system control and billing. In addition, consumers, prosumers and prostormers need reliable, near real time data to control their local system and optimize their behaviour. Data about local generation and consumption should be made available just-in-time to local energy management systems – whether it be accessible from smart meters via local interfaces or via protected gateways that connect the energy management systems to datahubs. To that end, the sensitive data collection mechanisms and processes of metering systems need to be revisited.

In addition to local system data, relevant data about the overall system status should be accessible for the participants at the edge of the system. Only if local control systems have access to market-prices, CO_2 intensity in the energy mix or grid congestion state, they can contribute to the sanity of the energy system and support the carbon reduction goals with their own valid control and business models. Such advanced data access protocol models should be covered by legislation and regulation after testing them in sandbox projects. The revision of the “Harmonized Electricity Market Role Model” (HEMRM) should take that into account.

Recommendation G: Fight vender lock-in effects in the system (*)

With respect to interoperability and deployment of standards, the European Commission should be more specific in the Building Directive. Principles such as “smart control readiness” and “open bidirectional communication” should be mandatory for buildings that receive public funds. This would avoid vendor lock-in and open the doors for a quick and broad digitalization of the entire energy system (including also gas and district heating). In addition, regulatory bodies shall assure interoperable solutions unleashing possibilities for the integration of model predictive control or other artificial intelligence and machine learning models. They should require providers to link their solutions to the existing frameworks of building automation.

Contributing JPP SES Funded Projects

Please find more information on the funded projects by clicking on the project acronym or on the "Project Factsheet".

	AGRO-SOFC **Sector coupling with SOFC technology in the agro-industry** Joint Call 2018 | Project Factsheet
	AISTOR **Smart AI Based Storage System** Joint Call 2019 | Project Factsheet
	ANM4L **Active Network Management for All** Joint Call 2018 | Project Factsheet
	CLUE **Concepts, Planning, Demonstration and Replication of Local User-friendly Energy Communities** Joint Call 2018 | Project Factsheet
	DISTRHEAT **Digital Intelligent and Scalable conTrol for Renewables in HEAting neTworks** Joint Call 2018 | Project Factsheet
	EPC4SES **EPC based Digital Building Twins for Smart Energy Systems SES** Joint Call 2018 | Project Factsheet
	EVCHIP **Electric Vehicles Charging Platform for Community Demand Response Aggregators** Joint Call 2018 | Project Factsheet
	Flexi-Sync **Flexible energy system integration using concept development, demonstration and replication** Joint Call 2018 | Project Factsheet

	**FlexSUS** **Flexibility for Smart Urban Systems** Joint Call 2018 | Project Factsheet
	**GAMES** **Grid Aware Mobility and Energy Sharing** Joint Call 2020
	**HEATflex** Joint Call 2018 | Project Factsheet
	**IFAISTOS** **Intelligent electroFuel production for An Integrated STOrage System** Joint Call 2018 | Project Factsheet
	**NewSETS** **New energy storages promoting sustainable energy transition in so** Joint Call 2019 | Project Factsheet
	**MatchIT** **Efficient demand and supply matching by incentivizing end-users in buildings** Joint Call 2016 | Project Factsheet
	**PIGergy** **A novel means of unleashing the energy potential of pig waste** Joint Call 2018 | Project Factsheet
	**R2EC** **Regional Renewable Energy Cells** Joint Call 2018 | Project Factsheet
	**REDAP** **Regional Energy Demand Analysis Portal** Joint Call 2018 | Project Factsheet
	**RELflex** **Renewable Energy and Load Flexibility in Industry** Joint Call 2017 | Project Factsheet

	REgions Ancillary services of regions with high shares of renewable energies for regional, interregional and European markets **Joint Call 2018** | Project Factsheet
	SONDER **Service Optimization of Novel Distributed Energy Regions** Joint Call 2018 | Project Factsheet
	TOP-UP **TOP-down energy projects as catalysts for bottom-UP local energy initiatives** Joint Call 2018 | Project Factsheet
	USC-Flexstore **Underground Sun Conversion – Flexible Storage** Joint Call 2019 | Project Factsheet
	ZEHTC **Zero Emission Hydrogen Turbine Center** Joint Call 2018 | Project Factsheet

Contributing Projects Outside of JPP SES

Please find more information on the contributing projects by clicking on the name.

	RegEnergy **Renewable Energy Regions** Interreg North-West Europe
	Tallaght Smart Grid Test Bed **JPP SES Living Lab**
	Task Force Local Energy Communities **BRIDGE Initiative** H2020
	SCORE **Supporting Consumer Ownership in Renewable Energies** **JPP SES Living Lab** H2020
	Smart M Power Ltd **JPP SES Digital Platform Provider**

JPP SES Funding Partners

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