BRIDGE Regulations Working Group

Recommendations on Selected Regulatory Issues

August 2018

Introductory Statement

BRIDGE is a cooperation group involving Smart-Grid and Energy Storage projects funded under the Horizon 2020 program since 2014. More information about BRIDGE is provided in **Annex 1**.

BRIDGE involves four different Working Groups (WGs). One of them, the WG on Regulations, is addressing cross-cutting regulatory issues about smart grids and energy storage. The projects participating in the Working Group on Regulations are listed in **Annex 2**.

The WG on Regulations has delivered a range of regulatory analyses and recommendations to the European Commission, including some feedback on the Clean Energy Package proposals.

In 2018, the WG on Regulations has adopted an issue-oriented approach in order to deliver targeted recommendations addressing specific regulatory issues. The present report presents five key issues, which are illustrative of the Working Group's activities.

For each of the five key issues discussed in this report, recommendations have been formulated by ad-hoc subgroups of the WG on Regulations, coordinated by one or several members of the WG. The full list of authors and contributors is presented in **Annex 3**.

This report has been elaborated with the support of TECHNOFI / DOWEL MANAGEMENT within the INTENSYS4EU Coordination and Support Action. The INTENSYS4EU Project supports the BRIDGE activities and has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731220.

Executive summary

Storage ownership and procurement of storage services

Energy storage is not explicitly addressed under the unbundling rules of the current European legal framework (Third Energy Package). As a result, Member States' approaches to the unbundling of energy storage differ.

A first issue is, therefore, to define a clear ownership regime for storage which provides sufficient legal certainty and, where necessary, flexibility. Regulatory flexibility is recommended to enable different parties to temporarily and conditionally experiment with the deployment and development of storage (possibly combined with a sunset clause[1]). Dutch experience with regulatory exemptions to facilitate innovation as well as relevant upcoming Flemish rules may provide useful insights.

Independent of the precise wording of the final text of the recast of the Electricity Market Directive in the Clean Energy Package (CEP) to be adopted by the Council and the Parliament shortly, flexible interpretation in the above respect would be desirable.

A second important issue is that network operators should be sufficiently incentivised to buy storage services from third parties, for example to solve congestion. Given the benefits of storage for grid operation, especially in an environment with high shares of intermittent RES, the legal framework should specify that network operators should be incentivised to procure services required for optimum operation of electricity systems, including storage services. Member States are therefore called upon to ensure ambitious implementation of provisions proposed in the recast of the Electricity Market Directive.

Storage valorisation

For the moment, there exist some regulatory limitations blocking the potential of storage to provide new flexibility services:

Self-consumption: The aim of storage for self-consumption is to maximize the usage of self-produced energy. That means to store energy production during periods of low electricity consumption at building level. Some detected barriers are economic fees in case of installing photovoltaic systems with batteries in some countries (e.g. sun tax in Spain, which is currently being reviewed). Technical and regulatory provisions are lacking when it comes to prosumers creating electric islands during black-outs.

Multi-building storage sharing: It applies when using the main grid or not. In a few EU/EEA countries, multi-building storage sharing is already allowed, e.g. in Switzerland and Germany and business models are emerging. BRIDGE community recommends other countries to follow fast, building on the lessons learned so far. Multi-building storage sharing will be an important first step towards wider behind-the-meter models that will emerge in the next years.

Balancing and ancillary services: Energy storage can support electricity networks by ensuring security and quality of supply through provision of balancing and ancillary services. However, access to ancillary service markets is variable across European countries. In some markets, e.g. Italy, providing frequency response is mandatory for generators, and so not separately valued. A more common approach across the EU proposed under the Clean Energy Package will open up the market opportunity for energy storage technologies and increase the deployment potential.

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[1] A sunset clause is a measure that provides that the law shall cease to have effect after a specific date, unless further legislative action is taken to extend the law.

RES and storage complementary: BRIDGE community recommends that Member States, in collaboration with the Commission[2] where appropriate, clarify to what extent facilities that benefit(ed) from RES incentive schemes can be combined with storage and on which conditions.

Safety and environment

Safety regulations are defined as regulations that deal with the safety of humans, either personnel involved in the installation, maintenance, operation etc. of the storage installation or the public (e.g. people living in the neighbourhood) as well as environmental safety.

Most projects are using existing, mature storage technologies. Thus, regulation is ‘aware’ of these technologies and hence integration of these storage systems is not blocked by safety regulations.

Still, a safety guideline could be developed and should relate to well-known systems (e.g. compare a battery system to a transformer) to facilitate practical implementation and trust. This guideline should contain practical information, e.g. how to fight a fire.

With regards to less mature technologies as Power-to-gas, Compressed Air Energy Storage (CAES) and Second-life EV batteries, regulatory adaptations would be welcome in order to facilitate the deployment of such promising storage technologies.

Second-life batteries: when taken out of the car, lithium-on batteries are currently classified as “dangerous waste”, making transport and logistics complex and costly. Furthermore, the battery producer remains officially responsible for the battery although it has not necessarily track where and how it is used in a second-life application. There should be an option to shift the responsibility from the initial producer to the professional “second-life operator”. Standardization must focus on ways and methods to evaluate the ageing of batteries, which is relevant both in the context of 1st and 2nd life batteries.

Other issues, like the issues arising in the context of use of single-phase batteries in a 3-phase set up are also to be addressed in one or the other way.

For new energy storage products such as CAES, it may be prudent to subject the completed assembly to a process of type approval.

Under current EU environmental legislation, a power-to-gas plant is treated as “chemical industry” instead of “energy industry” which leads to overly burdensome authorization procedures. A pragmatic approach to solve this issue is to be explored.

New market design options, leading to new services, business models and roles for system operators

Changes in the energy landscape (i.e. increase of RES at the distribution grid, bi-directional flows, increased variability, increased participation of smaller companies and end consumers to the energy market, electric vehicles…) have created a new market context. In particular, the participation of resources, connected to the distribution grid, is driving innovations in the energy system. Future market design and regulatory framework should:

- take into account local grid constraints and energy transfer costs (losses),
- allow resources connected to the distribution grid to participate to the market, directly or via an aggregator,
- support the development of local concepts such as microgrids, local energy communities and renewable energy communities,
- facilitate acquisition of the flexibility coming from active grid users. In this context the roll-out of smart meters and dynamic pricing are important requirements.

[2] DG Competition

Within this new market context, new services are developed and offered to or by system operators. In order to guarantee an efficient provision of new services, roles of system operators should be enlarged. In particular, the evolving role of the DSO is relevant for the emergence of certain services and related business models:

- The DSO could support the TSO during the *prequalification* process,
- The DSO could play a role in the *balancing* of the system by ensuring the balancing of the distribution grid; it could also support the TSO in the organization of an overarching central flexibility market (for example for regional balancing).
- DSO may provide new services to other market players (e.g. aggregators, microgrids or local energy communities) - operation and maintenance of the grid, balancing of the grid, back-up power, administrative support, etc.
- The DSO could provide *metering data to third parties* (e.g. aggregators) subject to agreement of consumers,
- The *improved observability of the distribution grid* will also lead to new services for market players.
- DSO should be allowed to contract flexibility via market-based mechanisms. Network remuneration fees should treat the procurement of energy flexibility at the same level as alternative solutions such as network reinforcements. The principle should be the avoided costs (e.g. the cost of avoided network reinforcements).

In addition, coordination and cooperation between system operators should be increased in the in the context of network planning and network operation to make use of new services in an efficient way:

- Network remuneration fees for system operation should be designed to foster a coordinated procurement of ancillary services which would be based on the principle of system-wide cost optimization,
- TSOs and DSOs should implement functionalities and provide information on the state of the grid to remove inefficiencies in network operation. The sharing of relevant data with each other and with other market players should be done according to a transparent framework and should be supported by infrastructure and standards. This implies also a revision of privacy and cybersecurity aspects, back-up systems for communication and new procedures for remote monitoring and control.

This coordination and cooperation should be further strengthened also in the context of emergency situations and restoration.

Member States are called upon to ensure quick transposition of new market design rules which will be adopted in the coming months and to do it in ambitious way (on a number of issues only general principles will be laid down by the Clean Energy Package).

Specific regulatory aspects for island cases

An energy island is an area in which the local community benefits environmentally, socially and economically from the operation of largely autonomous smart energy and transport systems. An energy island's energy system tends to include local renewable energy generation, smart distribution network assets and energy storage.

From a regulatory point of view, the definition of 'small isolated systems' in the 2009 Electricity Directive deserves to be clarified in order to maximise the potential for the development of energy islands. Therefore, it would be beneficial to take advantage of the current Clean Energy Package (CEP) discussions and future transpositions into national laws to provide clarity on the legal framework concerning small isolated systems.

More recommendations are still to follow in the coming months from the relevant sub-working group.

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1. Storage ownership and procurement of storage services

Section written under the coordination of ***Gijs Kreeft*** *(University of Groningen, STORE&GO project)*

1.1. Definition

Energy storage is not explicitly addressed under the unbundling rules under the current legal framework (Third Energy Package). As a result, Member States' approaches to the unbundling of energy storage differ.

A first issue is, therefore, to define a clear ownership regime for storage which provides sufficient legal certainty and, where necessary, flexibility.

At the same time, network operators are currently not (sufficiently) incentivised by Member States to buy storage services from third parties, for example to solve congestion. Given the benefits that storage has on grid operation, especially in an environment with high shares of intermittent RES, system operators should be encouraged to procure services from storage facilities.

1.2. Main points

Several project demos are currently testing various storage technologies in Europe. There is, however, no consensus about who should own and manage such facilities. The role of the network operator with respect to storage services must, thus, be clarified in the future.

Some consider that the EU legal framework should provide that network operators should not own storage in order to avoid competition distortions between regulated and liberalised sectors, and to ensure that private operators can benefit as much as possible from revenue stacking, thus contributing to economic viability of storage. At the same time, the framework should allow for exceptions in case of market failure and should provide sufficient flexibility for experimentation and innovation.

The Ten-Year Development Plan of ENTSO-E clearly foresees storage as alternative for cross-border transmission lines after a dedicated cost-benefit analysis.

Furthermore, a legal framework is required in order for all network operators to take the deployment of commercial storage into account in their network planning and provide these with appropriate remuneration.

It is crucial that the way how network operators are remunerated is aligned with the overall system interests so that storage services are always procured when it is the best option for the system (as opposed to network reinforcements).

1.3. Recommendations

Unbundling of Energy Storage Facilities

A preliminary inquiry into the experiences with unbundling by the BRIDGE projects revealed that there exists a plurality of opinions with regard to regulated ownership. This outcome is not surprising as some projects focus on deployment by market parties (including congestion relieve services), while others focus on storage in system operation. The following responses reflect the diversity in opinions among BRIDGE projects:

- SMARTNET favours the market model. They remarked that even congestion management can be a commercial service by third parties.

- INTEGRIDY states that system operators should be allowed to invest in storage when it is targeted to support system needs and ancillary services.

For now, it is recommended that legal certainty is required with regard to the issue of storage ownership, especially with regard to possible derogations for regulated operation of storage. It is important to monitor to what extent the Member States implement the relevant provisions proposed under the Clean Energy Package in an appropriate way.

We recommend that the legislative framework allows for sufficient flexibility for experimentation with storage technologies by *all* actors, including system operators. Innovation requires regulatory flexibility and pragmatism. Rigid regulation may limit innovation. Regulatory flexibility is thereof recommended to allow different parties to, temporarily and conditionally, experiment with the deployment and development of storage (possibly combined with a sunset clause).

Dutch experience with regulatory exemptions to facilitate innovation as well as relevant upcoming Flemish rules may provide useful insights.

Whatever the wording of the final text to be shortly adopted by the Council and the Parliament, any possibility of flexible interpretation in the above respect would be desirable.

Remuneration of Storage Services

As deployment of storage by market parties will be the default rule, the legal framework should specify that network operators should be incentivised to procure services required for optimum operation of electricity systems, including storage services. For example, the STORY project remarked that remuneration for storage services is often lacking, which affects the return on investment. The project has data on the value of storage in local grid management and investment deferral but points to the lack of a legal framework which incentivises system operators to acquire such on conditions reflecting the benefits to system operation.

2. Storage valorisation

*Section written under the coordination of **Pol Olivella** (Universitat Politècnica de Catalunya, INVADE project) and **Andreas Tuerk** (Joanneum Research, STORY project)*

2.1. Definition

For the moment, in many Member States there exist some regulatory limitations blocking the access of storage to provide new flexibility services at the level of self-consumption, multi-building storage sharing/renting, back-up and finally RES and storage complementarity (see main points below).

2.2. Main points

Self-consumption

The aim of storage for self-consumption is to maximize the usage of self-produced energy. That means to store energy production during periods of low electricity consumption at house level. Additionally, storage can be used as well to reduce electricity cost in case of dynamic price tariffs. This topic also covers the capability of consumers to disconnect from the main grid and operate in island mode during black-out situations or similar. Energy storage can come from stationary batteries, from electric vehicle batteries using vehicle-to-grid chargers, or from conversion from other energy carriers (e.g. thermal storage).

Some detected barriers are economic fees in case of installing photovoltaic systems with batteries in some countries (e.g. sun tax in Spain, which is currently being reviewed). There are no technical and regulatory indications about prosumers creating electric islands during black-outs.

Multi-building storage sharing

Multi-building storage sharing applies either when using the main grid or not. In case storage is directly connected with the public grid (Community electricity storage), a double grid fee (for production and for consumption) may be applied, impacting the valorisation of storage. In a few European countries storage sharing behind the meter is already allowed based on recent legal changes such as in Switzerland and Germany that even allows linking neighbouring buildings by autonomous cables. These emerging models are being observed and insights shared within the working group.

Balancing and ancillary services

Energy storage can support electricity networks by ensuring security and quality of supply through provision of several services:

- Reserve, e.g. to provide active power (upward and downward)
- Response, to maintain frequency within predefined limits
- Black start, to restore the grid from a shut-down

Different energy storage technologies have the potential to meet these services. However, the extent to which storage is able to do this, is partly dependent on how storage is treated by the regulatory regime/market instruments, and how these services are valued. In some markets, e.g. Italy, providing frequency response is mandatory for generators, and so not separately valued. More generally, the regulated contract length that can be awarded for providing response/reserve may not be sufficient to invest in new technologies, though they would have a positive longer term economic and environmental impact.

RES and storage complementary

Storage that is dedicated to achieving increased RES penetration is not presently handled by regulations. Although RES support schemes may also apply to electricity injected after storage, these schemes or the overall existing market design do not compensate storage for their specific added value (e.g. replacing fossil-fueled reserve/peak capacity or provided load-shedding services).

2.3. Recommendations

Multi-building storage sharing/renting

In a few European countries (e.g. Switzerland, Germany) multi-building storage sharing is already allowed, and business models are emerging.

We recommend other Member States to follow fast, building on the experience made so far. Multi-building storage sharing can be an important first step towards wider behind-the-meter models that will emerge in the next years.

Balancing and ancillary services

Energy storage is well suited to provide balancing services that support the operation of electricity networks. These include ‘reserve’ to provide active power (upward and downward); and ‘response’, to maintain frequency within predefined limits. There are examples where energy storage has successfully competed against other technologies in these markets. However, our survey showed that access to ancillary service markets is variable across European countries. In some cases, system operators allow third parties to bid to provide such services, elsewhere they may be provided by a single company, or storage is excluded from participating.

A more detailed analysis is being undertaken, but we consider that a more common approach across the EU could open up the market opportunity for energy storage technologies and increase the deployment potential.

RES and Storage complementarity

The outcome of a preliminary survey among BRIDGE projects revealed that except for Germany, Member States have not yet awarded explicit attention to the eligibility of RES operators to receive a feed-in tariff or market premium after storage.

We recommend that Member States clarify to what extent facilities that benefit(ed) from RES incentive schemes can be combined with storage and on which conditions. This should be done in co-operation with the European Commission where appropriate (DG Competition).

3. Safety and environment

Section written under the coordination of ***Odile Garçon*** *(Renault, ELSA project) and* ***Andreas Tuerk*** *(Joanneum Research, STORY project)*

3.1. Definition

Safety regulations are defined as regulations that deal with the safety of humans, either personnel involved in the installation, maintenance, operation etc. of the storage installation or the public (e.g. people living in the neighbourhood) as well as environmental safety.

3.2. Main points

Most projects are using existing, mature storage technologies. Thus, regulation is 'aware' of these technologies and hence integration of these storage systems is not blocked by safety regulations. Nevertheless, in some cases significant expenses must be made to comply to existing regulation (e.g. explosion, chemical and temperature hazards in the STORY-Beneens demonstrator). However, we assume these regulations remain correct and applicable in their current shape. Some regulations are related to the local level, other actions may need supra-national effort/intervention.

Some projects use less mature storage technologies (e.g. Na-ion battery, CAES…). In some of these projects, the investigation of existing safety regulations and the development of the respective safety measures are an inherent part of the development. Safety of these technologies must be evaluated using regulations that were meant for different technologies and these regulations must be interpreted in the scope of the newly developed technology.

Moreover, more general overarching safety regulations (e.g. UK Health and Safety at Work Act) are used to ensure safety. Also, every project & product has to start with a risk study. Here standards may help to limit risks. The risk study is primordial in avoiding safety issues. Accidents have to be avoided in the design phase.

There is no explicit regulation for battery systems apart from the Battery directive that focusses mainly on the collection and recycling of batteries. National codes can have clauses on batteries like safety distances, ventilation need and barriers. Learning from use cases is of course worthwhile and a meta-analysis may create a new recommendation for a standard or regulation (national or EU directive – e.g. in the context of revision of Battery directive).

Main issues related to safety for demonstration projects but also initial commercial projects include for example:

- The problem that local authorities and fire brigades have very little experience with storage systems e.g. at district or residential level. Thus, these projects often spend considerable time and effort to convince these authorities with respect to the safety of the installed system.
- A number of regulatory uncertainties and issues have been identified that could hinder the development of the re-use (second-life) of electrical vehicle batteries. For instance, when taken out of the car, lithium-on batteries are classified as “dangerous waste”, making transport and logistics complex and costly. Furthermore, the battery producer remains officially responsible for the battery although it has not necessarily track where and how it is used in a second-life application.
- STORY project looks into different issues of the connection of storage to the electrical system, including issues related to the use of single-phase batteries in a 3-phase set up.
- For new energy storage products such as CAES, which are carefully designed systems comprised of certified components working within their manufacturers recommended limits, it may be prudent to subject the completed assembly to a process of type approval. This allows an approved third part certification body to demonstrate fitness for purpose at the extremes of the operational envelope and thereby foster confidence from owners, investors, underwriters and regulatory health and safety bodies.
- Under current EU environmental legislation, a power-to-gas plant is treated as “chemical industry” instead of “energy industry”. This leads to overly burdensome authorization procedures under the Environmental Impact Assessment Directive, the Industrial Emissions Directive, and REACH. It needs to be evaluated which category/classification is appropriate under these pieces of legislation (STORE&GO).

3.3. Recommendations

Guidelines & practical rules

Guidelines could complement regulations. A safety guideline for example could be developed on top of the existing regulations (e.g. safety testing for batteries). This guideline should contain practical information (e.g. how to fight a fire) and should relate to known systems (e.g. compare a battery system to a transformer) to overcome the doubts of local authorities. Such guidelines are not an issue at the local level only, also international standardisation organisations would have to contribute. An on-set for this was made in the European STALLION project with an explanation on battery safety assessment for stakeholders around stationary battery systems.[3]

Furthermore, safety aspects of batteries should include practical integration rules. This should include the aspect related to the above-mentioned single phase – 3-phase issues, reconnection (including certified devices for frequency checking), aspects related to safety of personnel working on the public grid.

Power-to-gas

Power-to-gas installations are currently classified as “chemical installation” (in the case of power-to-hydrogen) or “integrated chemical installation” (in case of power-to-synthetic methane) under EU environmental legislation, such as the Environmental Impact Assessment Directive and the Industrial

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[3] See https://www.batterystandards.info/sites/batterystandards.info/files/d8_4_stallion_handbook_on_li-ion_safety_assessment_final.pdf.

Emissions Directive. We recommend that the classification of power-to-gas installations under EU environmental legislation is reviewed.

Compressed Air Energy Storage (CAES)

Since CAES falls under the pressure equipment directive and the machine directive, type approval would be possible if a specific standard is written out that is in line with the directives: a harmonized standard.

Second-life EV batteries

It is urgent to clarify regulations to optimize EV battery usage through its full life cycle (from the car-smart charge and vehicle-to-grid to stationary storage services).

Second-life EV batteries should fall under the regulatory definition of re-use, and not be considered as waste. Since EV batteries represent significant economic costs, regulation should promote second-life use of batteries, in line with circular economy objectives.

Standardization must focus on ways and methods to evaluate the ageing of batteries. This will help for the second-life application for the trading of these batteries with a proper estimation of state of health. It will also induce a better customer satisfaction for electric vehicle as it may predict performance decrease.

A regulation framework for lithium-ion battery recycling should promote alternative solutions to recycling of EV batteries. In order to enhance re-use activities, the regulatory framework should allow to shift the responsibility (financial, but also organizational and administrative) from the initial producer to the professional “second-life operator”.

4. New market design options, leading to new services, business models and roles for system operators

*Section written under the coordination of **Helena Gerard** (VITO, SMARTNET project), **Zoran Marinsek** (INEA, GOFLEX project) and **Gregory Jarry** (ACCENTURE, INTERFLEX project)*

The present section combines the discussion of three distinct issues:

1. New market design concepts,
2. New services and business models,
3. Coordination between TSOs and DSOs.

Due to the important interdependencies between the three issues listed above, the issues are discussed in an integrated way. On the one hand, this approach will allow to better understand the complexity of the individual issues and on the other hand, the link with the other issues is more visible. The recommendations provided at the end of the section are split according to the three original issues.

4.1. Definition

The **design of the market** should serve the needs of different stakeholders in a secure and efficient way, by providing a clear, transparent and standardized framework on how existing and new services could be procured, while at the same time expanding the market to include prosumers (active consumers and producers) as active players on the market. Consequently, new market design options (e.g. local markets) will progressively increase the use of flexible resources (mostly connected at the distribution grid) and increase the added value for the entire energy system.

Within this new market context, **new services** are developed and offered **to or by system operators**. On the one hand, the DSO can provide new services to the TSO or to other market players. On the other hand, market players provide new services to the DSO. In the context of the provision of new services by the DSO and new services for the DSO (provided by market players), new roles and responsibilities for system operators are in particular relevant. The provision of new services will lead to new business models and might provide benefits for the entire energy system.

In order to foster the emergence of new services and business models that will serve a stable and secure grid, a close **coordination and collaboration between system operators (TSOs and DSOs)** is necessary in the field of network planning, network operation, balancing and emergency situations and restoration, facilitated by efficient data exchange. Consequently, regulation should support coordination between system operators by clarifying roles and responsibilities, providing guidelines that stimulate coordination and removing barriers that hinder efficient cooperation.

4.2. Main points

The following section describes the main regulatory barriers related to **new market design concepts**, **new services and business models** and the **coordination between TSOs and DSOs.**

New market design concepts

Changes in the energy landscape (i.e. increase of RES at the distribution grid, bi-directional flows, increased variability, increased participation of smaller companies and end consumers to the energy market, electric vehicles…) have led to a new market context.

The increased participation of resources connected to the distribution grid in the provision of system services (to both TSO and DSO) has consequences for the market design. In particular, new business concepts such as *local energy communities* and *local microgrids* emphasize the importance of **locational aspects** in future market design concepts.

Several European projects propose new frameworks that introduce new options for market design. In general, distinction can be made between centralised and decentralised concepts. However, even within one category, several different design options exist. Below some illustrations of concepts developed within the projects.

PROJECT ILLUSTRATIONS

- **GOFLEX**

In GOFLEX, the electricity market and grid system is structured into vertically nested systems with similar functions to the functions of parental system (cellular subsystems).

Thus in the segment of electricity grid, DSO system is considered a cellular subsystem of TSO territory; this means that the DSO holds the same responsibility and functions on the level of its territory as TSO does on the level of the overarching system. The cellular approach to grid system structuring entails several changes for the business model of DSOs as the DSO is responsible for local balancing of energy flows on the distribution grid.

The DSO business model that enables this is based on avoided costs of TSO.

Similarly, in the segment of market processes of supply and demand (energy consumption, production, storage, transfer and trading), the cellular structure that is already introduced to the Balance group level, is carried downwards to the local enery community and local microgrid systems.

The structuring in both segments of the electricity market system has to be done 'coherently' so as to provide cross-sections between them that enable engaging the flexibilities locally and provisioning all types of services for and by DSO. The objective is to maximize local problem solving on each cellular level.

To maximize the offer of energy flexibilities by prosumers, dynamic pricing based on local conditions on the grid are used; these are driven by the avoided costs model.

- **SMARTNET**

Five models for TSO-DSO cooperation are developed for the provision of ancillary services. Each model implies a different market design of the ancillary service (AS) market.

Three models rely on a centralised concept where one centralised market exists that incorporates all flexible resources (the Centralised AS market model, the Common TSO-DSO AS market model and the Integrated Flexibility market model). The models differ in terms of who participates in the market. The TSO could be the only buyer, both TSO and DSO could be buyers in the market or, at least theoretically, a market could exist where system operators compete with commercial market parties.

Two models (the Local AS market model and the Shared balancing responsibility model) rely on a decentralised concept where the DSO organises a local market for all the flexible resources connected to the distribution grid. In one model, the DSO uses the local resources first for local congestion management, before allowing the TSO to use the non-used remaining flexible resources. In another model, the DSO organizes a local market for local balancing and local congestion management. In this model the TSO has no access to resources connected to the distribution grid.

- **INTERFLEX**

Several commercial models and market mechanisms are being investigated for the provision of flexibility to the DSO:

  - In Germany, Avacon is discussing a DSO-Flex-Market for the provision of flexibility by household customers. The mechanism – similar to the established balancing power products on a TSO-level – allows customers to offer their flexibility to the DSO on a weekly / monthly / annual basis in return for a flat rate compensation. This model would inter alia adress the double grid tariff issue.
  - In the Netherlands, Enexis is testing an integrated flexibility market for grid supporting services (e.g. congestion management). The DSO can procure flexibility from multiple aggregators and from different flexibility sources (Smart Storage Unit, EV chargers).
  - Within the French demonstrator 'Nice Smart Valley', aggregators can offer flexibilities via a dedicated platform to the DSO (Enedis) for local grid congestion management, or alternatively offer them on the national balancing market. In a second step it shall be explored in which way market players may take advantage of local offers and give raise to a broader exchange of local flexibilities. A wide variety of flexibilities will be used, from battery storage to cross energy carrier management (gas / thermal / electric).

- **INVADE**

A centralised local flexibility trading platform is defined to sell and buy flexibility within a specific area. By means of this platform, the aggregator or the so-called Flexibility Operator (FO) is the main actor in this platform. It acts as the combination of an aggregator and an Energy Services Company (ESCO). It is in charge of managing the flexible resources from the prosumers located within a local energy community (LEC); and hence, is able to provide new services to two main actors: BRPs and DSOs (aggregator role). DSOs could then use flexibility for congestion management purposes and controlled islanding. On the other hand, BRPs could take advantage of flexibility services for portfolio optimization and, as a result, for deviation penalties reduction.

In addition to these services, the FO optimizes the prosumer consumption / generation profile (ESCO role), especially when there are no external flexibility requests from DSO/BRP.

In that sense, this platform not only deals with flexibility services scheduling but also with who should receive the flexibility service. The services offered to BRP and DSO can be requested at the same time and could be contradictory. Hence, flexibility requests should be prioritized according to the grid status.

Furthermore, in current markets, aspects such as **distribution grid constraints** (i.e. congestion) or grid losses are not taken into account.

Within SMARTNET, an integrated market solution is proposed, where different services (balancing and congestion management), by different system operators (both TSO and DSO) are procured simultaneously, taking into account local grid constraints. In GOFLEX, the approach is to add to the cost of energy flexibilities the costs of energy transfer from the place where it is supplied to the grid to the point of forecasted congestion or energy disbalance. The focus of INTERFLEX is to ensure a minimum of transaction costs and high customer engagement. In INVADE, the local flexibility platform allows the DSO to use flexibility services for congestion management.

In general, the introduction of locational incentives could lead to a more efficient procurement of multiple services and could steer investments in the proper direction. This will also maximize local problem solving.

Important to mention is that, in order to fully benefit from the new services and business models, resources connected to the distribution grid (i.e. prosumers) should be allowed to participate to the market, directly or via another market party responsible for the aggregation of resources[4].

New services and business models

The roles of system operators are evolving, driven by the changing market environment. In particular the role of the DSO has been subject to changes. The evolving or new roles for the DSO are leading to the emergence of new services and business models.

For the DSO to fully benefit from the new services on the one hand and to be able to play an active role itself in the provision of new services, a set of roles that foster this cooperation should be adopted. The need for the adoption of certain roles is country dependent.

To note that the lack of adoption of certain roles by system operators could hinder the development of certain (local) services. Moreover, the exemption rule for unbundling of small DSOs (applicable to DSOs with less than 100.000 connected customers) is a possible barrier for the provision of new services by and for the DSO via local markets as there is a risk of having illiquid, less competitive markets that do not benefit sufficiently from possible economies of scale.

New services provided by the DSO

The changing role of the DSO will allow the **DSO to provide new services to the TSO and to other (commercial) market players**.

- **New services provided by the DSO to the TSO**

Existing ancillary services are mostly provided by resources connected at the transmission grid. Today, more and more resources connected at the distribution grid are used to provide services to the TSO. Below some examples of potential new services that could be provided by the DSO to the TSO are given:

1. *Prequalification*: the DSO could for example play a more active role in the prequalification of resources to allow their participation to the market for ancillary services or other local system services. In particular, the DSO must verify that local grid constraints are respected.
2. Next, the DSO could support the procurement process of the TSO by *facilitating a local flexibility market*. This could mean defining a regulatory framework in a transparent way that

[4] E.g. In INVADE, prosumers flexibility is aggregated by means of the flexibility operator (FO), and so the FO is responsible for participating in the market. The aim of the FO is to maximize the profits for its prosumers portfolio.

would allow other commercial parties to organize a local market in an efficient way or could in certain cases also mean the practical organization of the local flexibility market.

3. The DSO could play a role in the *balancing* of the system by ensuring the balancing of the distribution grid.
4. The DSO could also support the TSO in the organization of an overarching central flexibility market (for example for regional balancing).
5. An improved observability and controllability of the distribution grid will allow the DSO to optimize the operation of the distribution grid and as a result, provide support to the TSO to keep the system stable and secure (e.g. by improved frequency control, voltage control and overall power quality improvement).

- **<u>New services provided by the DSO to other market players</u>**

Below some examples of new services provided by the DSO to other market players are given:

1. The DSO will be able to provide services to new business concepts such as *microgrids* or *local energy communities*. Microgrids and local energy communities (LEC) operate as subsystems of a larger system. The terminology “microgrid” refers to both isolated grids and local distribution grids connected to and synchronous with a larger grid. It acts as a single controllable entity with respect to the grid. The DSO could provide multiple services: operation and maintenance of the grid, balancing of the grid, back-up power, administrative support, support in sustainable investments, settlement… The type of service needed by a microgrid or LEC will depend on the country or region.
2. The DSO could provide *metering data to third parties* (e.g. aggregators) that could be used to optimize new business models or business concepts. To note that the provision of data to third parties is only allowed in case the end consumer agrees.
3. The *improved observability of the distribution grid* will also lead to new services for market players. It will be possible to forecast the operational state of the local grid, calculate the energy transfer costs between two points on the distribution grid (for implicit capacity trading), define energy products based on operational state of the local grid, thus steering incentives for market participants to optimize energy flexibility offers (volume, price, timing) based on the needs of the grid. This will, in return, provide benefits to both DSO and TSO.
4. Under certain market and grid assumptions, the DSO could be responsible to aggregate energy flexibility offers of the prosumers within a local market and transfer them to the TSO market for ancillary services (reverse energy flow on the grid). To note that competition between regulated players (DSOs and TSOs) and commercial market agents should be avoided.

New services provided for the DSO

On the other hand, the changing role of the DSO will require the **provision of new services by market players to the DSO**.

1. The DSO could for example become a buyer of energy flexibilities of resources (i.e. prosumers) for local system services. These flexible resources could be used for *local congestion management* and *local energy balancing* by the DSO.
2. Local energy communities, microgrids and virtual power plants (VPP) could also provide services to the DSO. They could aggregate and trade the energy flexibility of resources (i.e. prosumers) or they could optimise *the operation of the microgrid,* for example by supporting the DSO in restoring imbalances or local constraints in the grid. In case of system-wide

problems, the islanding operation of the microgrid or local energy community could avoid a complete black-out and could guarantee that customers still receive the necessary power.

3. New services could even be provided at the level of the active consumers[5], prosumers and producers. Examples are:
   - Short term virtual energy storage (negative or positive) in processes, accessible by dynamic pricing of energy flexibilities,
   - Innovative energy storage systems accessible through coupling of different energy carriers at prosumer level, e.g. thermal energy system;
   - New types of consumers or prosumers on the grid, e.g. battery prosumer, hydrogen prosumer.

Coordination and collaboration between TSOs and DSOs

In order to allow new services and new business models to emerge, an efficient and increased **coordination and collaboration between system operators** (TSOs and DSOs) is needed. The need for coordination is important in the context of activities related to planning, network operation and the provision of new (system) services.

The roles of system operators (TSOs and DSOs) will determine the way they coordinate the different activities related to planning and network operation. Dependent on the adopted roles, the DSO can have different responsibilities. Today, certain roles are not always allowed yet, excluding certain models of cooperation between system operators. Moreover, the network remuneration fees for system operation are not always designed to foster a coordinated procurement of ancillary services which would be based on the principle of system-wide cost optimization and as a result, would maximize social welfare.

Increased coordination and collaboration should be supported by an efficient use of data. Recently, there is an increased need for both system operators (TSOs and DSOs) to provide information related to the forecasted and actual state-of-the grid to each other on the one hand, and to share relevant data on the other hand, with each other or with specific market players to allow the creation of new services and business models.

The common use or sharing of data should be done in a secure and efficient way, requiring additional investments in shared platforms or common interfaces. In addition, a revision of cyber security aspects, privacy aspects and back-up systems to guarantee a reliable system is needed.

The sharing of data between system operators is also relevant in the context of minimizing the overall cost of system planning (e.g. investment deferral, and a least cost integration of renewable energy resources).

4.3. Conclusions and recommendations

The main regulatory barriers observed in the context of new market evolutions, the provision of new services by and for system operators and the interaction between system operators are summarized below.

The recommendations are split in three categories:

- recommendations related to market evolutions,
- recommendations related to new services for and by DSOs,
- recommendations related to the coordination between the TSO and the DSO.

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[5] To enable active residential consumers, house appliances have to become interoperable. See recommendations from the Preparatory study on Smart Appliances at http://www.eco-smartappliances.eu/Documents/Task_7_draft_20170914.pdf.

Recommended market evolutions

A. The increased use of resources from the distribution grid requires the introduction of 'local' aspects in the organisation of the market. For instance, local grid constraints and energy transfer costs (losses) could be integrated in relevant market clearing algorithms (*ex ante*, in real-time or *ex post*), e.g. to prevent congestion.

B. Resources connected to the distribution grid (i.e. active consumers, producers and prosumers) should be allowed to participate to the market, directly or via an aggregator, allowing them to provide all types of services to the DSO.

C. The possibility of exemption from unbundling rule (cf. DSO with < 100.000 customers) should be used carefully to avoid possible abuse of power in case conflict of interests would arise in emergent local markets.

D. The electricity market system in Europe should be further harmonized and integrated and should support the development of local concepts such as microgrids, local energy communities and renewable energy communities. Network codes should allow a more decentralised design of the market in case economically optimal and without endangering the security or stability of the grid.

E. The regulatory framework should facilitate the flexibility, coming from active grid users (consumers, producers, prosumers, storage, etc.), to participate to future (local, central and cross-border) markets in order to be used by system operators for the management of both transmission and distribution grid, taking into account the local conditions of the grid. The roll-out of smart meters, dynamic pricing are important requirements in this discussion.

New services recommended for and by DSOs

A. The role of the DSO should be extended in order to allow the DSO to take up additional responsibilities in the provision of new services to the TSO. In particular, the DSO could support the TSO during the prequalification process; by being responsible for the balancing of the distribution grid; and with the organization of a local balancing market for energy flexibilities. In the Clean Energy Package, the scope of DSO activities is complemented with new responsibilities. It is important that this extension of roles will be integrated in the relevant national regulatory frameworks and network codes.

B. The role of the DSO should be extended in order to allow the DSO to take up additional responsibilities in the provision of new services to other market players (e.g. aggregators, microgrids or local energy communities). In the Clean Energy Package, new concepts such as local energy communities are introduced. It is important that the services that could be provided by the DSO are formalized and integrated in the relevant regulatory framework.

C. The role of the DSO should be extended in order to allow the DSO to make use of new services provided by other market players (e.g. aggregators, microgrids or local energy communities). In particular, the DSO should be allowed to contract flexibility, offered by other market players, via market-based mechanisms.

Recommendations regarding TSO-DSO coordination

A. TSOs and DSOs should have common objectives in the network remuneration fee related to the procurement of flexibility. This should support the optimization of operational expenses by both TSO and DSO in the context of the procurement of system services.

B. Network remuneration fees should be allocated for the procurement of energy flexibility by either TSO or DSO as for alternative solutions such as network reinforcements. The principle should be the avoided costs (e.g. the cost of network reinforcements).

C. TSOs and DSOs should implement functionalities and provide the relevant information of the forecasted and actual state of the grid in such a way that possible inefficiencies in network operation are removed. The operational procedures to do so, should be formalized.

D. The increased coordination between system operators and the sharing of relevant data with each other and with other market players should be done according to a transparent framework and should be supported by infrastructure and standards (common communication interfaces and data formats, shared platform…), allowing a common use of specific data in an efficient way. This implies also a revision of privacy and cybersecurity aspects, back-up systems for communication and new procedures for remote monitoring and control.

5. Specific regulatory aspects for island cases

*Section written under the coordination of **Tracey Crosbie** (Teesside University, INTEGRIDY project) and **Romain Mauger** (University of Groningen, SMILE project)*

5.1. Definition

An energy island is an area in which the local community benefits environmentally, socially and economically from the operation of largely autonomous smart energy and transport systems. It may be situated on a geographical island, or it may be a district or neighbourhood that is part of the mainland.

An energy island's energy system tends to include local renewable energy generation, smart distribution network assets and energy storage. Additionally, an energy island's transport system tends to promote the use of clean technologies (electric vehicles and hydrogen fuelled vehicles etc.) and public transport and is integrated with the island's energy network.

An energy island's energy network can be connected to the national (mainland) network. It may supply flexibility and/or other ancillary services to the mainland network. In addition, short-term imbalances in energy supply and demand on energy islands can be corrected with mainland energy supplies. Or an energy island can operate as a totally islanded grid.

5.2. Main points

According to article 2, paragraph 26 of the 2009 Electricity Directive, a 'small isolated system' means any system with consumption of less than 3,000 GWh in the year 1996, where less than 5 % of annual consumption is obtained through interconnection with other systems.

Interpretation of 5% criterion doesn't seem crystal-clear.

Paragraph 27 of article 2 of the 2009 Electricity Directive, in turn, refers to 'micro isolated system.' This is defined as a system with consumption levels below 500 GWh in the year 1996 and without a connection with other systems. This qualification opens the door for an exemption to liberalisation rules (unbundling, third-party access…). For example, this type of exemption has been granted in the case of the archipelago of Madeira (Commission decision 2006/375/EC of 23 May 2006: derogation from certain provisions of directive 2003/54/EC concerning the archipelago of Madeira).

If an electricity system can be labelled as a small isolated system, Member States (MS) are entitled to deviate from the unbundling rules for DSOs (article 26 paragraph 4 of 2009 Electricity Directive). Additionally, MS can request an exemption from the directive's chapters related to TSOs, DSOs, unbundling and transparency of accounts, and organisation of access to the systems (art. 44 § 1) if the MS can prove that it will be facing "substantial problems for the operation of [its] small isolated systems." This exemption can apply to micro or small isolated systems. The isolated system can then continue with a regime of exception avoiding most of the liberalised market rules.

In the Clean Energy Package (CEP) proposal (RECAST for the 2009 Electricity Directive), the definition of a ‘small isolated system’ remains exactly the same (art. 2, §36). However, the category of ‘micro isolated system’ simply disappears. Current micro isolated systems will then fall under the definition of a small isolated system, with higher thresholds.

According to article 32 of the Electricity Directive of the CEP proposal, DSOs are supposed to establish a network development plan to be submitted to their NRA. However, paragraph 2 of this article allows MS “not to apply this obligation to integrated undertakings serving […] isolated systems”.

5.3. Recommendations

Unless the final text of the recast of the Electricity Market Directive to be adopted this Autumn includes clear indications on 5% import criterion the BRIDGE subgroup on Islands provides the following recommendation on the interpretation of this criterion:

1. This criterion should **not** be assessed by reference to the year 1996, just as in case of the 3,000 GWh of annual consumption criterion. This option will not take into account the ongoing energy transition which already led some islands such as Samsø (DK) and the Orkneys (UK) to produce excess electricity and export it to mainland.
2. In principle, the 5% could explicitly refer to the year an island’s energy system is assessed. So, 2017 annual consumption through interconnection for a 2017 assessment, etc. But as annual electricity production and consumption varies, especially with variable renewable energy generation, this approach will not be ideal either.
3. **Therefore, the 5% could be explicitly defined as calculated over a sensible period of assessment, such as 5 years. In this way, the criterion is met if the island did not import through its interconnection a total of 5% of its electricity consumption over a 5-year period. Or a more stringent approach could be taken and the criterion is met if the island did not import through its interconnection a total of 5% annually during a continuous period of 5 years. *Either of these two options is our preferred approach.***
4. In the long run, the relevant criterion could be changed and the notion of peak demand used instead. In this case, the island would have to limit its import of electricity during periods of peak demand, when the grid is highly congested. The island would also have to comply with this criterion during a period of time. *However, it is not currently the preferred option because more efforts are required to sensibly define peak-demand-import thresholds.*

Annex 1 – About the BRIDGE initiative

BRIDGE is a European Commission initiative which unites Horizon 2020 Smart Grid and Energy Storage Projects to create a structured view of cross-cutting issues which are encountered in the demonstration projects and may constitute an obstacle to innovation.

The BRIDGE process fosters continuous knowledge sharing amongst projects thus allowing them to deliver conclusions and recommendations about the future exploitation of the project results, with a single voice, through four different Working Groups representing the main areas of interest: **Business Models**, **Data Management**, **Customer Engagement**, and **Regulations**.

So far, the following 36 projects have participated in BRIDGE:

More information can be found at https://www.h2020-bridge.eu/.

Annex 2 – Projects participating in the Working Group on Regulations

The projects participating in the Working Group on Regulations are listed here. More details about each of these projects can be found in the "BRIDGE initiative and project fact sheets" available on the BRIDGE website at https://www.h2020-bridge.eu/download/.

Project	Objective of the project	Period
Call LCE-07-2014 - Distribution grid and retail market		
AnyPLACE	AnyPLACE is developing a modular energy management system capable monitoring and controlling local devices according to the preferences of end-users.	2015-2017
EMPOWER	EMPOWER encourages micro-generation and the active participation of prosumers to exploit the flexibility created for the benefit of all connected to the local grid.	2015-2017
FLEXICIENCY	On the basis of a technical model reflecting a common framework for data exchange at EU level, FLEXICIENCY will demonstrate novel energy services in the electricity retail markets, accelerated via an open EU Market Place for B2B interactions developed in the project.	2015-2019
Nobel Grid Smart energy for people	NOBEL GRID will provide advanced tools and Information and Communication Technologies (ICT) services to all actors in the Smart Grid and retail electricity market in order to ensure benefits from cheaper prices, more secure and stable grids and clean electricity.	2015-2018
P2P-smartTest	P2P-SmartTest project investigates and demonstrates a smarter electricity distribution system integrated with advanced ICT, regional markets and innovative business models. It will employ Peer-to-Peer (P2P) approaches to ensure the integration of demand side flexibility and the optimum operation of DER and other resources within the network while maintaining second-to-second power balance and the quality and security of the supply.	2015-2017
SmarterEMC2	SmarterEMC2 implements ICT tools that support the integration of consumers through Demand Response services and the integration of Distributed Generation (DG)/RES through Virtual Power Plants.	2015-2017
UPGRID	UPGRID focuses on addressing the constraints and needs arisen from poor observability of Low Voltage (LV) grid, local accumulation of distributed generation, risks and difficulties in managing the distribution network, aging infrastructure and social and environmental restrictions that inhibit the grid development. To be successful, UPGRID proposes an open, standardised and integral improvement of the LV grid.	2015-2017
Call LCE-08-2014 - Local / small-scale storage		
Elsa	ELSA will adapt, build upon, and integrate close-to-mature storage technologies (including low-cost second-life Li-ion batteries) and related ICT-based energy management systems for the management and control of local loads, generation and single or aggregated real or virtual storage resources, including demand response, in buildings, districts and distribution grids.	2015-2018
NETfficient	The NETfficient project will deploy and demonstrate local energy storage technologies and develop information and communication tools, to exploit the synergies between energy storage, the smart grid and the citizens.	2015-2018
RealValue	RealValue will demonstrate, through the deployment of Smart Electric Thermal Storage (SETS) technology in 1,250 properties in Ireland, Germany and Latvia how it can provide value and benefits to the whole electricity supply chain.	2015-2018

Project	Objective of the project	Period
SENSIBLE	SENSIBLE aims at developing, demonstrating and evaluating a storage-enabled sustainable energy supply for buildings and communities	2015-2018
STORY	STORY is researching new energy storage technologies and their benefits in distribution systems and involves 18 Partner Institutions in 8 different European countries.	2015-2020
TILOS	TILOS' main goal is to demonstrate the potential of local / small-scale battery storage to serve a multipurpose role within a smart island microgrid that features high shares of renewable energy and trades electricity with the main electricity network.	2015-2019
Call LCE-10-2014 - Next generation technologies for energy storage		
NAIADES	The NAIADES project aims to develop and demonstrate the ambient Na-ion battery under realistic conditions as an effective alternative to the Li-ion battery for stationary Electric Energy Storage (EES) application.	2015-2018
Call LCE-06-2015 - Transmission grid and wholesale market		
MIGRATE	The aim of MIGRATE is to develop and validate innovative, technology-based solutions in view of managing the pan-European electricity system experiencing a proliferation of Power Electronics (PE) devices involved in connecting generation and consumption sites.	2016-2019
SmartNet	The SmartNet project arises from the need to find answers and propose new practical solutions to the increasing integration of Renewable Energy Sources in the existing electricity transmission network.	2016-2018
Call LCE-09-2015 - Large scale energy storage		
CryoHub	The CryoHub innovation project will investigate and extend the potential of large-scale Cryogenic Energy Storage (CES) and will apply the stored energy for both cooling and energy generation.	2016-2019
STORE&GO	STORE&GO focuses on the integration of power-to-gas (PtG) technology into the daily operation of European energy grids to demonstrate the maturity of the technology. Additionally, STORE&GO identifies current and future PtG business cases and regulatory barriers to develop a European power-to-gas roadmap.	2016-2020
Call LCE-02-2016 - Demonstration of smart grid, storage and system integration technologies with increasing share of renewables: distribution system		
GOFLEX	The GOFLEX project innovates, integrates, and demonstrates a group of electricity smart-grid technologies for managing flexibility in energy production and consumption.	2016-2019
integrid	InteGrid's vision is to bridge the gap between citizens and technology/solution providers such as utilities, aggregators, manufacturers and all other agents providing energy services.	2017-2020
inteGRIDy	inteGRIDy pursues facilitating the optimal and dynamic operation of the Distribution Grid, fostering the stability of the electricity grid and coordination of distributed energy resources, Virtual Power Plants and innovative collaborative storage schemes within a continuously increased share of renewable energy.	2017-2020
InterFLEX	InterFlex investigates during 36 months the INTERactions between FLEXibilities provided by energy market players and the distribution grid. This project focuses particularly on energy storage, smart charging of electric vehicles, demand response, islanding, grid automation and integration of different energy carriers (gas, heat, electricity).	2017-2019

Project	Objective of the project	Period
INVADE	INVADE proposes to deliver a cloud-based flexibility management system integrated with Electric Vehicles (EV) and batteries empowering energy storage at mobile, distributed and centralised levels to increase renewables share in the smart distribution grid. The project integrates different components: flexibility management system, energy storage technologies, electric vehicles and novel business models.	2017-2019
sm;)e	The SMILE project aims at demonstrating different innovative technological and non-technological solutions in large-scale smart grid demonstration projects in islands, paving the way for their introduction in the market in the near future	2017-2021
wiseGrid	WiseGRID will provide a set of solutions and technologies to increase the smartness, stability and security of an open, consumer-centric European energy grid.	2016-2020
Call LCE-07-2016-2017 - Developing the next generation technologies of renewable electricity and heating/cooling		
RESERVE	RESERVE is researching new energy system concepts, implemented as new system support services enabling distributed, multi-level control of the energy system using pan-European unified network connection codes.	2016-2018
Call LCE-04-2016-2017 - Demonstration of system integration with smart transmission grid and storage technologies with increasing share of renewables		
crossbow	CROSSBOW will propose the shared use of resources to foster cross-border management of variable renewable energies and storage units, enabling a higher penetration of clean energies whilst reducing network operational costs and improving economic benefits of RES and storage units	2017-2021
flexitranstore	FLEXITRANSTORE project will develop the next generation Flexible Energy Grid (FEG), which will provide the technical basis supporting the valorisation of flexibility services and enhancing the existing European Internal Energy Market (IEM).	2017-2021
OSMOSE	OSMOSE addresses flexibility for the integration of renewable energy sources, through a holistic approach in order to capture "silo-breaking" synergies across needs and sources flexibilities.	2018-2021

Annex 3 – List of authors and contributors

Authors of the present report

Section 1 "STORAGE OWNERSHIP AND PROCUREMENT OF STORAGE SERVICES"

Coordinator

Name	Organisation	E-mail	Project
Gijs Kreeft	University of Groningen	g.j.kreeft@rug.nl	STORE&GO

Other contributors

Name	Organisation	E-mail	Project
Jonathan Radcliffe	Birmingham University	J.Radcliffe@bham.ac.uk	CRYOHUB
Tracey Crosbie	Teesside University	T.Crosbie@tees.ac.uk	INTEGRIDY
Grietus Mulder	VITO	grietus.mulder@vito.be	NAIADES
Alfonso Damiano	Cagliari University	alfio@diee.unica.it	NETFFICIENT
Evangelos Karf	NTUA	ekarf@power.ece.ntua.gr	NOBEL GRID
Romain Mauger	University of Groningen	r.j.g.mauger@rug.nl	SMILE
Andreas Tuerk	JOANNEUM RESEARCH	andreas.tuerk@joanneum.at	STORY
Egon Troch	Think-e	egon@think-e.be	STORY
Takis Ktenidis	TEIP	takisktnds@gmail.com	TILOS

Section 2 "STORAGE VALORISATION"

Coordinators

Name	Organisation	E-mail	Project
Pol Olivella-Rosell	CITCEA-UPC	pol.olivella@citcea.upc.edu	INVADE
Andreas Tuerk	Joanneum Research	andreas.tuerk@joanneum.at	STORY

Other contributors

Name	Organisation	E-mail	Project
Jonathan Radcliffe	Birmingham University	J.Radcliffe@bham.ac.uk	CRYOHUB
Odile Garcon	Renault	odile.garcon@renault.com	ELSA
Tracey Crosbie	Teesside University	T.Crosbie@tees.ac.uk	INTEGRIDY
Grietus Mulder	VITO	grietus.mulder@vito.be	NAIADES
Evangelos Karf	NTUA	ekarf@power.ece.ntua.gr	NOBEL GRID
Romain Mauger	University of Groningen	r.j.g.mauger@rug.nl	SMILE
Gijs Kreeft	University of Groningen	g.j.kreeft@rug.nl	STORE&GO
Egon Troch	Think-e	egon@think-e.be	STORY
Takis Ktenidis	TEIP	takisktnds@gmail.com	TILOS
Aris Dimeas	NTUA	adimeas@power.ece.ntua.gr	WISEGRID

Section 3 "SAFETY AND ENVIRONMENT"

Coordinators

Name	Organisation	E-mail	Project
Odile Garcon	Renault	odile.garcon@renault.com	ELSA
Andreas Tuerk	Joanneum Research	andreas.tuerk@joanneum.at	STORY

Other contributors

Name	Organisation	E-mail	Project
Jonathan Radcliffe	Birmingham University	J.Radcliffe@bham.ac.uk	CRYOHUB
Pol Olivella-Rosell	CITCEA-UPC	pol.olivella@citcea.upc.edu	INVADE
Grietus Mulder	VITO	grietus.mulder@vito.be	NAIADES
Gijs Kreeft	University of Groningen	g.j.kreeft@rug.nl	STORE&GO
Leen Peters	Think-e	leen@think-e.be	STORY
Egon Troch	Think-e	egon@think-e.be	STORY
Takis Ktenidis	TEIP	takisktnds@gmail.com	TILOS

Section 4 "NEW MARKET DESIGN OPTIONS, LEADING TO NEW SERVICES, BUSINESS MODELS AND ROLES FOR SYSTEM OPERATORS, REQUIRING INCREASED COORDINATION BETWEEN SYSTEM OPERATORS"

Coordinators

Name	Organisation	E-mail	Project
Zoran Marinsek	INEA	Zoran.Marinsek@inea.si	GOFLEX
Gregory Jarry	ACCENTURE	g.jarry@accenture.com	INTERFLEX
Helena Gerard	VITO	helena.gerard@vito.be	SMARTNET

Other contributors

Name	Organisation	E-mail	Project
Manuel Serrano	Grupo ETRA	mserrano.etraid@grupoetra.com	CROSSBOW
Ricardo Prata	EDP Distribuição	ricardo.prata@edp.pt	INTEGRID
Tracey Crosbie	Teesside University	T.Crosbie@tees.ac.uk	INTEGRIDY
Thorsten Gross	Avacon	Thorsten.Gross@avacon.de	INTERFLEX
Íngrid Munné-Collado	CITCEA-UPC	ingrid.munne@citcea.upc.edu	INVADE
Pol Olivella-Rosell	CITCEA-UPC	pol.olivella@citcea.upc.edu	INVADE
Hannes Munzel	TenneT	hannes.munzel@tennet.eu	MIGRATE
Torsten Rendel	TenneT	torsten.rendel@tennet.eu	MIGRATE
Alfonso Damiano	Università di Cagliari	alfio@diee.unica.it	NETFFICIENT
Mihai Paun	Romanian Energy Center	mihai.paun@crenerg.org	RESERVE
Catalin Chimirel	Romanian Energy Center	Catalin.Chimirel@crenerg.org	RESERVE
Ricardo André	EDP	Ricardo.Andre@edp.pt	SENSIBLE

Section 5 “SPECIFIC REGULATORY ASPECTS FOR ISLAND CASES”

Coordinator

Name	Organisation	E-mail	Project
Tracey Crosbie	Teesside University	T.Crosbie@tees.ac.uk	INTEGRIDY
Romain Mauger	University of Groningen	r.j.g.mauger@rug.nl	SMILE

Other contributors

Name	Organisation	E-mail	Project
Takis Ktenidis	TEIP	takisktnds@gmail.com	TILOS
Christina Papadimitriou	NTUA	chpapadi@mail.ntua.gr	WISEGRID

Leading team of the BRIDGE Working Group on Regulations, quality check of the present report

Chairman of the Working Group

Name	Organisation	E-mail	Project
Takis Ktenidis	TEIP	takisktnds@gmail.com	TILOS

Rapporteurs

Name	Organisation	E-mail	Project
Aris Dimeas	NTUA	adimeas@power.ece.ntua.gr	WISEGRID
Mihai Paun	Romanian Energy Center	mihai.paun@crenerg.org	RESERVE

Guidance from European Commission

Name	Organisation	E-mail
Aleksandra Kronberga	DG ENER	Aleksandra.KRONBERGA@ec.europa.eu

Editor

Name	Organisation	E-mail	Project
Sophie Dourlens-Quaranta	DOWEL MANAGEMENT	sophie.dourlens@dowel.eu	INTENSYS4EU

http://www.h2020-bridge.eu/