Energy Community

Smart Grid opportunities in the Energy Community Scoping Study

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13.05.2020

Electricity

This report was produced by the Energy Community.

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Scoping Study

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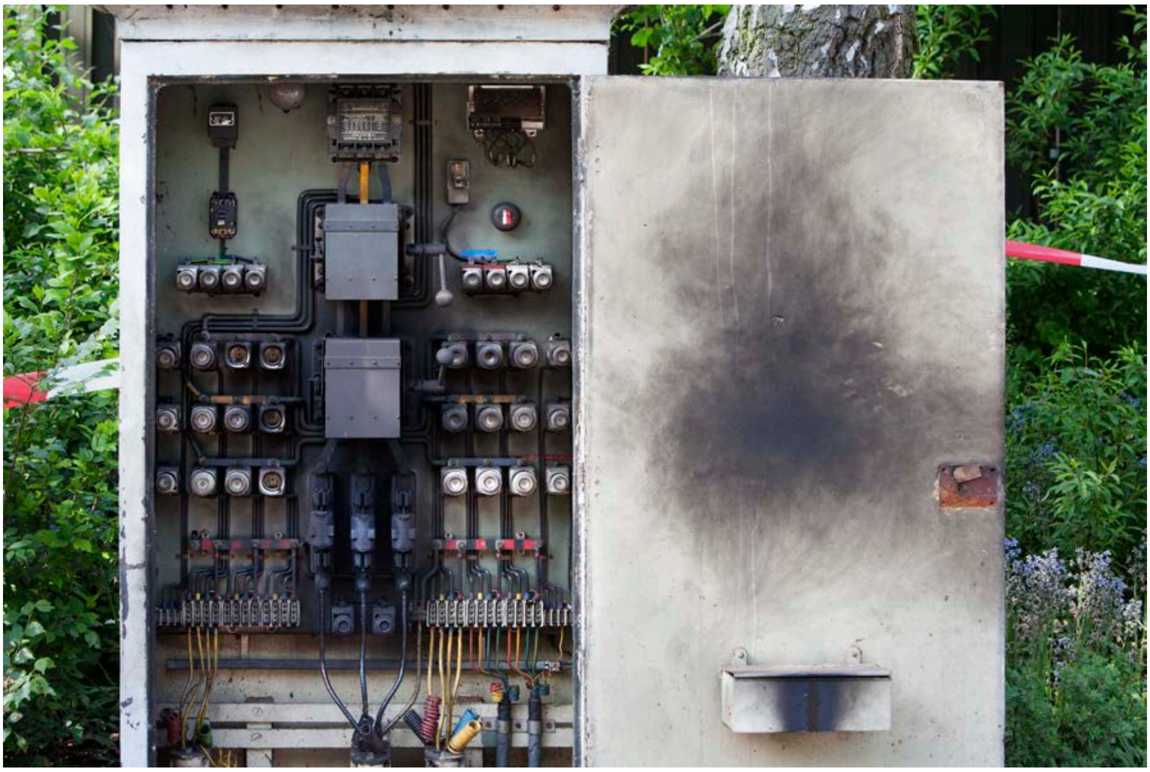
1. Definitions and abbreviations

Definition/Abbreviation	Description
TSO	Transmission System Operator
ISO	Independent System Operator
DSO	Distribution System Operator
EV	Electric Vehicles
EnC	Energy Community
ECS	Energy Community Secretariat
EC	European Commission
H2020	Horizon 2020
V2G	Vehicle to Grid
G2V	Grid to Vehicle
SCADA	Supervisory Control and Data Acquisition
WAMS	Wide Area Monitoring System
NDC	National Dispatching Centre
GUI	Graphical User trimi
RES	Renewable Energy Sources
DER	Distributed Energy Resources
TEN-E	Regulation (EU) No 347/2013 on guidelines for trans-European energy infrastructure
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSOG	European Network of Transmission System Operators for Gas
CSE RG	Continental South East Regional Group
ECDSO-E	Energy Community DSOs for Electricity Coordination Group
NOSBIH	ISO from Bosnia and Herzegovina
CGES	TSO from Montenegro
AD EMS	TSO from Serbia
GSE	TSO from Georgia
MEPSO	TSO from North Macedonia
OST	TSO from Albania
UKRENERGO	TSO from Ukraine
KOSTT	TSO from Kosovo*
EVN	DSO from North Macedonia
KEDS	DSO from Kosovo*
CEDIS	DSO from Montenegro
EPS	Electric Power System of Serbia (Serbian DSO is part of the group)
DTEK	DSO from Ukraine
OSHEE	DSO from Albania
DLR	Dynamic Line Rating
OHL	Overhead Line
EMS	Energy Management System
GMS	Generation Management System
AGC	Automatic Generation Control

LFC	Load Frequency Control
LDS	Load Dispatch System
STLF	Short Term Load Forecast
CF	Congestion Forecast
ICT	Information and communications technology



2. Why we need a smarter grid in the Energy Community

As defined by the International Energy Agency, "a smart grid is an energy network that uses digital and other advanced technologies to monitor and manage the transport of energy from all generation sources to meet the varying energy demands of end-users". The aim of smart grids is to maximize system reliability, resilience and stability and minimize costs and environmental impacts by coordinating the needs and resources of end-users and generation, grid and market operators. Since smart grids are mainly based on information sharing, the new information and communication technologies are their vital enabler. The first level of smartness is ensured by smart meters and standardised communication protocols.

This study is intended to give a snapshot of the current situation of smart grids and smart meter penetration in the Energy Community, based on responses to questionnaires prepared by the Secretariat in consultation with members of the ECDSO-E coordination group. The questionnaires aimed to identify projects that were either completed or under development in the Energy Community, focussing on smart grid benefits and services, such as: system flexibility, large use of renewable energy sources, transmission and distribution system optimisation, demand side management, improvement of TSO/DSO system operation and the future active roles of prosumers, as well as their possible interactions with markets, and last but not least the introduction of smart meters.

Having in view the current level of technological development in the Contracting Parties, the study pinpoints energy digitalization areas of most relevance and proposes concrete regional projects that could be eligible for technical and financial assistance.

2.1 Rationale of the study

The Energy Community Contracting Parties are lagging behind in most areas of the digital transformation, not only in the use of the internet and broadband technology, but also in the area of digital readiness of the public sector, including energy.

Given that the Energy Community's ultimate goal is to be aligned with the policy and technology developments in the EU, the Secretariat's intention with this study is to bring forward the message to energy utilities to invest as soon as possible in digitalized energy systems in order to keep up with these developments and ensure a secure and reliable power system. The study also aims to raise awareness of the support and assistance offered by International Financial Institutions and donors, which remain underutilised.

2.2 Legal background[1]

The Second and Third Energy Package, which is also transposed in the Energy Community Contracting Parties, introduced smart grids and smart meters. It emphasized that national systems should encourage the modernization of transmission and distribution networks, such as through the introduction of smart grids, which should be built in a way that encourages decentralized generation and energy efficiency, which facilitates the implementation of active transmission and distribution networks.

A 'smart grid' is defined in the TEN-E Regulation (Regulation (EU) 347/2013 as adapted and adopted by EnC) as an electricity network that can integrate in a cost-efficient manner the

[1] For a complete overview of legislation applicable in the Energy Community, please visit https://www.energy-community.org/legal/acquis.html.

behaviour and actions of all users connected to it, including generators, consumers and those that both generate and consume, in order to ensure an economically efficient and sustainable power system with low losses and high levels of quality, security of supply and safety. The TEN-E Regulation has identified smart grid deployment as one of the 12 trans-European energy infrastructure priority corridors and areas.

Moreover, the 2019 Clean Energy Package goes beyond the Third Energy Package and states that all consumers should be entitled to request a smart meter from their suppliers, thus fostering decarbonisation and achievement of the overall goals of the EU's energy sector, wherever their benefits outweigh the costs.

Article 15 of the Energy Efficiency Directive (EED 2012/27/EU of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC as adapted and adopted by EnC), and the related Annexes XI and XII aim to maximize grid and infrastructure efficiency to promote demand response and enhance overall energy security.

2.3 Smarter grids for energy digitalization

The electricity system relies on an interconnected grid to deliver secure, stable, economic and sustainable supply of sufficient quantities of high quality electrical energy to suppliers. Smart grids facilitate the integration of distributed, clean energy resources in the system and contribute to the empowerment of energy consumers. The development of smart energy infrastructure should follow, at the same pace, in order to underpin this transformation.

Given the interaction between transmission and distribution grids under the new decarbonisation of energy sector paths, there is a strong need for revision of operational and planning practices of both TSOs and DSOs in order to support the desired market framework that enables to harness the optimal use of the entire potential of distributed energy resources and demand side response.

The Energy Community is lagging behind the EU in terms of the digital and energy transformation. This could jeopardize the overall regional economy and slow down economic growth. In this context, the digitalization of the energy sector is and will continue to be a key driver of future change. The energy world in the EU, as well as in the EnC, is changing at unprecedented speed with the following challenges to be tackled:

- Higher level of intermittent renewables connected to the grid,
- Integration of storages,
- Phase-out of nuclear and fossil fuelled generation units,
- Introduction of the smarter transmission and distribution grids,
- Introduction of demand side management and customer engagement as prosumers, and
- Emergence of many decentralized new players in a free trading market.

All of the above impose a vast increase of collection, flows and exchanges of digital data which are necessary to run the whole system efficiently. Therefore, the energy sector is becoming one big and highly complex cyber-physical system.

A secure and reliable digitalized power system in the Energy Community will enable uninterrupted power supplies from various domestic and regional sources to industry and consumers.

The smart grid concept is already well known to the electricity generation, transmission and distribution subsystems. Systems such as SCADA – Supervisory Control and Data Acquisition, EMS – Energy Management System, MMS – Market Management System for TSOs and DSOs, as well as AGC – Automatic Generation Control, Secondary Control, different automation systems for generation units, are in use for the last decade, or for some of the listed systems even decades. The smart grid is a new name for the concept, already partially being utilised on TSO, DSO and electricity generation levels, with the intention to introduce new players, new practices and new technologies into the overall 'smart' picture.

The potential for savings in energy networks is huge. Technical and non-technical losses range from 4% to 17% for electricity and from 0.2% to 3.9% for gas in the Energy Community. Keeping these statistics in mind, a key way to improve energy efficiency in network infrastructures is by reducing energy waste.

Figure 1 - Typical smart grid topology: Courtesy of KfW

3. Scope of analysis

The research underpinning this study consisted of four tasks which were executed by the Energy Community Secretariat in consultation with the main stakeholders - system operators in the Energy Community.

The geographic coverage of the study constitutes the nine Contracting Parties of the Energy Community. The study is structured around four key tasks:

Task 1 – Overview of current technological elements of smart grids

To review the current technological elements of smart grids in Europe.

Task 2 - Review of Energy Community initiatives and identification of potential project needs

To review existing initiatives/projects in the field and identify additional initiatives/projects that may be required, in order to achieve an appropriate level of smart grid development in the Contracting Parties and assess the maturity of each initiative. This was implemented through a questionnaire discussed at the Electricity DSO Platform meeting in Vienna on 29.11.2019, as well as at the ENTSO-E CSE RG meeting in Kiev (November 2019) and Rome (December 2019).

Task 3 – Potential for smart grid development in the Energy Community

To identify the technological approaches, appropriate for EnC Contracting Parties, given their current TSO/DSO network topologies and operational processes, and propose potential regional consortia on smart grid related issues and outline funding possibilities.

Task 4 – Key components of a cost benefit analysis for smart meter roll-out methodology

This section is intended to bring some light into the cost benefit analysis methodology that could be further used as a basis for the smart meter roll-out assessment in the Contracting Parties and in the Energy Community under the next PECI/PMI selection process.[2]

[2] For more information about the PECI/PMI process, please visit https://www.energy-community.org/regionalinitiatives/infrastructure/selection.html.

4. Main stakeholders

The main stakeholders that were identified and involved in the study from the very outset were the transmission and distribution system operators of the Energy Community Contracting Parties, as listed below. They are also the main beneficiaries of the study.

TSOs:

1. NOSBIH, Independent System Operator, Bosnia and Herzegovina
2. CGES, Crnogorski Elektroprenosni Sistem AD, Montenegro
3. EMS, Elektromreža Srbija AD, Serbia
4. GSE, SC Georgian State Electrosystem, Georgia
5. MEPSO, North Macedonia
6. OST, Albania
7. UKRENERGO, Ukraine
8. KOSTT, Kosovo*[3]
9. MOLDELECTRICA, Moldova

DSOs:

1. JP Komunalno Brčko, Bosnia and Herzegovina
2. MH Elektroprivreda Republike Srpske, Bosnia and Herzegovina
3. EVN Electricity Distribution, North Macedonia
4. KEDS Kosovo Energy Distribution Services, Kosovo*
5. CEDIS a.d., Montenegro
6. EPS Distribucija, Serbia
7. DTEK Grid, Ukraine
8. DSO Association, Ukraine
9. Pro Energo, Georgia
10. OSHEE, Albania

[3] * This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

5. Task 1 – Overview of current technological elements of smart grids

5.1 Energy digitalisation areas

In order to better understand the highly technical features of smart grids, a short description of the key elements is provided, as follows:

5.1.1 Power system control

The following technologies and operations are considered to be part of the power system control smart grid cluster: SCADA - upgrades, WAMS - Wide Area Monitoring System, OHL DLR – Over Head Line Dynamic Line Rating, power system regulation, power system balancing, reactive power management and voltage control, Energy Management System (EMS) - upgrades, Generation Management System (GMS) (at least Automatic Generation Control (AGC) with Load Frequency Control (LFC)) - upgrades, Frequency management and provision of system services, Load Dispatch System (LDS), Load Shedding, Short Term Load Forecast (SLTF) and Congestion Forecast (CF), Congestion management - upgrades and improvements, Weather and generation predictions, forecast, Energy system flexibility (regional approach preferred), Local Supervisory Control and data Acquisition - SCADA systems and Remote Terminal Units - RTUs, Backup dispatch room and backup ICT systems, Power system restoration and DSOs' provision of remedial actions.

The extension of the current supervisory control and data acquisition system (SCADA) across the transmission grid network. Improved management and monitoring through a network wide SCADA system will increase the availability and reliability of the entire 400 kV transmission network. This will lead to improvements in load factors, lower system losses and improved outage management performance with a significant reduction in operational and maintenance costs. It will also lead to improved levels of communication with the National Dispatch Centre (NDC) and the Back Up Dispatch Centre.

Implementation of a wide area monitoring system (WAMS). Interconnected power systems worldwide are now operated closer to their limits with a strong interdependence between different national systems. In order to obtain real time and precise information about possible wide area disturbance and allow the implementation of suitable remedial actions, a wide area monitoring system which includes synchrophasor measurement technology enables the timely detection of operational security margin violations. A WAMS typically comprises a central graphic user interface (GUI), phasor data concentrator (PDC) installed in a national dispatching centre together with phasor measurement units (PMU) distributed across the transmission network. The objectives of this activity will be to determine the optimal locations for the installation of PMUs to deal with stability issues in the grid and ensure high quality real time monitoring, to install PMUs with the required technical characteristics and a central PDC unit in the National Dispatch Centre with dynamic stability monitoring functions.

5.1.2 Demand side management

Demand response represents the possibility to change electricity usage by end-users from their normal consumption patterns in response to market signals. Demand side management enhances network security, increases competition in markets and minimizes the need for investment in the grid. The smart grid facilitates more sophisticated demand side response mechanisms through the availability of additional grid "smartness" which also enables active participation by customers.

Demand response facilities, depending on the load characteristics, are classified into:

- Shiftable loads
- Curtailable loads
- Thermostatically controlled loads

5.1.3 Smart meter roll-out

Coupled with smart metering systems, smart grids reach consumers and suppliers by providing information on real-time consumption, giving them the opportunity to adapt – in time and volume - their energy usage to different energy prices throughout the day. Smart grid metering, or smart meters, can also help to better integrate renewable energy and distributed energy sources, combining information on energy demand with weather forecasts. Also, together with the proposed improvements in DSO/TSO interoperability and coordination, operators will be able to better plan the integration of renewable energy into the grid and balance their systems. Smart grids also give the possibility for consumers who produce their own energy, so-called prosumers, to respond to prices and sell excess to the grid. Smart meters should allow consumers/prosumers to reap the benefits of the progressive digitalisation of the energy market via several different functions.

5.1.4 Asset management

Transmission System Operators (TSOs) consist of substation equipment and transmission line assets that are spread across entire countries. Within the substations lies equipment such as power transformers, circuit breakers (CBs), load tape changers (LTC), relays and switches. To meet business objectives, TSOs must effectively monitor these assets, with millions of potential data points spread across these numerous assets, and this is incredibly challenging. Previously, asset management processes relied heavily on labour-intensive human inspections and manual collection of operational data. Today, TSOs can transform asset management processes through readily available, real-time data from across the entire electricity supply chain.

5.1.5 Digital markets

The move to a low-carbon economy, deregulated market structures and increasing necessity for deeper customer involvement are driving utilities to embrace new digitally-enabled business models and place consumers at the heart of their business. Electricity market solutions, which are primarily data platforms to facilitate the exchange of all types of data and support integrated electricity market facilitation play a key role in this new energy system.

The need to exchange and utilize data and the increasing complexity of market structures is needed to enable market participants to operate efficiently. This removes much of the cost in managing these processes, minimizing barriers and stimulating innovation and development of new products and services. In addition, consumer choice is enhanced.

5.1.6 Distributed renewable energy sources and storages

The aim of the actions described in this section is to examine MicroGrid interactions with regard to the most relevant operational processes in a changed environment with growing penetration levels of distributed energy resources (DER), and certify the improvements brought by the deep, aggregated, high resolution modelling. Processes which can be improved are as follows:

- Long-term and operational network planning
- Grid connections (rfg network code)

- Frequency management and provision of system services
- Congestion management
- DER flexibility activation and imbalance settlement
- Reactive power management and voltage control
- Grid losses forecasting, procurement and imbalance settlement
- Demand side response with involvement of aggregators
- Power system restoration and DSOs provision of remedial actions.

Integration of the DER devices can have significant impact on the TSO and DSO interaction, particularly when high levels of penetration are achieved.

The main categories of DER resources are:

- Distributed generation
- Distributed storage
- Demand response
- Power to heat installations
- Electric vehicles

Distributed generation can be classified according to the generator's capabilities to provide flexibility services:

- Biogas and biomass power plants
- Combined heat and power plants
- Wind and PV power plants
- Small hydro power plants
- Back-up generators

Biogas and biomass power plants and combined heat and power plants can be declared as the inflexible sources, due to their inherent characteristics. Wind and PV power plants, on the other side, are normally used for the active power control via power curtailment.

Distributed storage can be put into the following categories:

- Pumped hydro storage
- Compressed air storage
- Batteries
- Flywheels
- Power to gas storage

5.1.7 Communication and data management

Proper telecommunication equipment is crucial for all other smart grid subsystems and functionalities to become operational and useful. ICT departments are becoming the backbone of TSO/DSO everyday operations and it is the up to date equipment and trained staff that are of most importance for secure and uninterrupted system operation.

5.1.8 Improved DSO2TSO communication, forecast and system operation

Getting the DSOs and TSOs at the same level of "digitalization" is crucial for the flow of information and data between the two operators, the way it used to be when they were vertically integrated (one single company); this is called the interface TSO/DSO that needs to be re-established and for this you need smart grids on both voltage levels: high – TSO, medium and low – DSO.

Improved system operation forecasting on the TSO/DSO level is based on the optimal inclusion of distributed generation and demand, enhancing the TSO/DSO interoperability and grid connections of the generating installations, including access possibilities for micro energy generators and distributed energy sources.

This new communication level would bring:

- Improved production and load analysis algorithms in order to minimize the impact of DERs on the network, deliver better network security margins (i.e., more reliable determination of reserve requirements in a timely and secure manner) and increase the level of the observation abilities;
- Improved short-term (15', 1h, 3h) and long-term (5-day) forecast engines for both distributed generators (PV, wind, CHP…) and loads;
- New integrated functions (scaling-up techniques) and solutions for technical aggregation of DG data acquisition capabilities for improved DG production observability;
- Active customer involvement with "indirect" feedback (provided post-consumption) and "direct" feedback (real-time) and suitable operations designed to achieve a reduction in the peak demand (10-15 %);
- Novel ways of providing ancillary services through loads and their impact on transmission networks, since the highly variable and unpredictable nature of DGs and RESs places new constraints on these ancillary services;
- New simulation environments to demonstrate the viability and options of ancillary services provision by aggregated loads at the DSO level;
- New methods and tools for planning new DG connections at the TSO/DSO boundary (response to new connection requirements);
- New architecture, control systems and communications (incorporated in the GIS system) that allow multiple new generators to be connected and share information with TSOs;
- A new model customer/load behaviour and segmentation, and quantify the degree of flexibility provided by distribution networks (through reconfiguration or other methods);
- New market models that enable DGs (RES) to provide ancillary services;
- New simulation framework that detects weaknesses in reconnection scenarios involving DG units;
- Assess the potential contributions of RESs, DGs and micro-grids to defence plans (black-start capabilities, islanding capabilities), as well as possibility of a joint TSO/DSO approach for defence plans involving DGs and micro-grids.

TSOs and DSOs are generally responsible for secure operation of their respective networks, what also involves mutual interaction and data exchange in numerous processes. The way network operators interact and exchange data might be different, depending on the respective roles assignment by the specific regulatory framework in force. As a general principle of data accessibility, each market operator should have access to the data and information which are necessary to perform their respective regulated tasks. If commercial data are to be accessed for other than regulated tasks, permission of the data owner is necessary.

To highlight the importance of TSO-DSO coordination, it is worth to note that five out of the nine network codes are relevant to the TSO-DSO cooperation:

- Requirements for Generators
- Demand Connection
- System Operation
- Emergency and Restoration
- Electricity Balancing

5.1.9 Electric vehicles

The electric power grid and an electric vehicle fleet are completely complementary as systems for converting and managing electrical power. Plug-in vehicles can serve, in discharge mode, as a distributed energy resource, providing electricity to the grid when required to meet peak load demand and can then be recharged during off-peak hours at cheaper rates helping to absorb excess night time generation. Studies have shown that smart charging minimizes the impact of plug-in electric vehicles on the grid provided that suitable choices are made for intelligent controls.

Electric vehicle fleets can be applied to provide flexibility services in two operational modes:

- Grid-to-vehicle G2V
- Vehicle-to-grid V2G

6. Task 2 – Review of Energy Community initiatives and identification of potential project needs

6.1 The approach

As part of the study, the Secretariat distributed a questionnaire to all stakeholders listed above in order to identify and assess smart grid activities in the Energy Community. The following survey headings were used for both TSOs and DSOs to list their needs and provide information on ongoing initiatives:

1. Power system control
2. Demand side management
3. Smart metering
4. Asset management
5. Digital markets
6. Distributed renewable energy sources and storages
7. Communication and data management
8. DSO/TSO cooperation
9. Electric vehicles

In total, 13 feedback surveys by 8 DSOs and 5 TSOs were received, as shown in Table 1:

Table 1 – Stakeholders involvement

Contracting Party	TSO/ISO	DSO/DSOs
Albania		
Bosnia and Herzegovina		
Georgia		
Kosovo*		
Moldova		
Montenegro		
North Macedonia		
Serbia		
Ukraine		

survey filled out and sent back to ECS

no information provided

6.2 Overview of smart grid projects in the Energy Community

Based on the submitted questionnaires, the ECS compiled the data received on projects in EnC Contracting Parties into short summary tables. Table 2 shows the overview related to the number of projects submitted per company and topic. Tables 3-11, categorized per topic, provide additional details on each project. In total, the ECS received 75 projects, some of them are ongoing projects, some in preparation/study phase and some show a current need with no activities ongoing at present.

Table 2: Summary table on the number of projects submitted per company and per topic

Topic name		Power system control	Demand side manage-ment	Smart metering	Asset manage-ment	Digital markets	Distributed RES and storages	Communi-cation and data manage-ment	DSO/ TSO coope-ration	EVs	Total number of projects
A	TSO	0	0	0	0	0	0	0	0	0	**0**
	DSO	0	0	0	0	0	0	0	0	0	**0**
BA	TSO	3	0	0	0	0	0	0	0	0	**3**
	DSO	0	0	1	1	0	1	1	0	0	**4**
GE	TSO	3	0	0	0	0	3	2	0	0	**8**
	DSO	0	0	1	0	0	0	0	0	0	**1**
K*	TSO	0	0	0	0	0	0	0	0	0	**0**
	DSO	2	1	1	0	0	0	0	0	0	**4**
MD	TSO	0	0	0	0	0	0	0	0	0	**0**
	DSO	3	0	1	1	0	0	0	0	0	**5**
ME	TSO	4	1	1	4	0	0	1	0	0	**11**
	DSO	1	1	1	1	0	1	1	1	1	**8**
NM	TSO	1	1	0	1	0	1	1	1	1	**7**
	DSO	0	0	1	0	0	0	0	0	0	**1**
RS	TSO	4	1	0	0	6	0	0	0	0	**11**
	DSO	1	0	1	0	0	0	1	0	0	**3**
UA	TSO	0	0	0	0	0	0	0	0	0	**0**
	DSO	1	1	2	1	1	1	1	0	1	**9**
Tot		**23**	**6**	**10**	**9**	**7**	**6**	**8**	**2**	**3**	**75**

activities exist

no activities

feedback not provided

6.2.1 Table 3: Power system control

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Installation of WAMS in transmission network of Bosnia and Herzegovina	BA	TSO - NOS BiH	Ongoing tendering	0,16	Yes, from CROSSBOW project
2. Deployment of compensation devices in transmission network of Bosnia and Herzegovina (Reactive power management and voltage control)	BA	TSO - NOS BiH	Ongoing feasibility study	No estimation available yet	No
3. Installation of DLR system in transmission network of BA	BA	TSO - NOS BiH	Conceptual idea	1,155	No
4. SCADA/DMS/OMS in distribution system operator	BA	DSO - MH ERS Trebinje	Ongoing project	No estimation available yet	No
5. Emergency Control System (ECS)	GE	TSO - GSE	Ongoing project	2,0	Yes, GSE budget (767.000 EUR), USAID (1.233.000 EUR)
6. SCADA - upgrades, DLR, power system regulation, Energy Management System (EMS) - upgrades, Generation Management System (GMS)	GE	TSO - GSE	Installation of equipment ongoing	0,378	No
7. WAMS – Wide Area Monitoring System	GE	TSO - GSE	Installation of equipment ongoing	0,32	Yes, GSE budget
8. SCADA - upgrades (Extend Scada's scope), Remote Terminal Units – RTUs	KS*	DSO-KEDS	Ongoing project	0,95	No, the company will be able to implement the project only with additional budget/support/grant.
9. SCADA - upgrades	MD	DSO - Premier Energy Distribution	Financing negotiations	0,4	No
10. Energy Management System (EMS) – Prime Read upgrade and acquisition of EMS modules	MD	DSO - Premier Energy Distribution	Financing negotiations	0,156	No, additional funding sources are needed to fully implement this project.

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
11. Backup dispatch room	MD	DSO - Premier Energy Distribution	Financing negotiations	1,5	No, additional funding sources are needed to fully implement this project.
12. SCADA for new dispatching centre with EMS system (including real-time estimation for N-1 safety criteria in EES)	ME	TSO - CGES	Ongoing project	No estimation available yet	Yes
13. Dynamic Line Rating	ME	TSO - CGES	Financing negotiations	No estimation available yet	No
14. Procurement of network analysis software	ME	TSO - CGES	Financing negotiations	No estimation available yet	No
15. SCADA/ADMS for DSO	ME	DSO-CEDIS	Tendering in preparation	11	Yes, CEDIS investment budget
16. CROSSBOW and Trinity connected equipment	MK	TSO-MEPSO	No activity	1,38	Yes, WAMS: 80% WBIF grant, 20% national contribution; DLR: 98% national contribution, 2% grant.
17. Regional voltage control study	RS	TSO- AD EMS	Ongoing feasibility study	No estimation available yet	Yes, WBIF loan
18. RES Regional Coordination Centre (RES-CC)	RS	TSO- AD EMS	Feasibility study in preparation	No estimation available yet	No
19. Regional Storage Coordination Centre (STO-CC)	RS	TSO- AD EMS	Feasibility study in preparation	No estimation available yet	No
20. Wide Area Monitoring and Awareness System (WAMAS)	RS	TSO- AD EMS	No activity	No estimation available yet	No
21. Local Supervisory Control and Data Acquisition - SCADA systems and Remote Terminal Units - RTUs Automation of MV electric network for DSO	RS	DSO - JSC ODS EPS Distribucija d.o.o.	Ongoing installation of equipment	14,5	Yes, DSOs' own budgets
22. SCADA (ADMS) for DSO	UA	DSO - DTEK	Ongoing feasibility study	No estimation available yet	No

6.2.2 Table 4: Automated demand response software/hardware

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Demand side control and response with aggregators involvement	KS*	DSO - KEDS	Ongoing prefeasibility study	0,55	No
2. Demand side response for TSO	ME	TSO-CGES	Financing negotiations	No estimation available yet	No
3. Prefeasibility study for DSO	ME	DSO-CEDIS	No activity	No estimation available yet	No
4. A study for in-depth analysis of the legislative framework and implementation of Automated Demand Response in North Macedonia and developed countries	MK	TSO-MEPSO	Completed in 2017	No estimation available yet	No
5. Regional DSM integration platform (DSM-IP)	RS	TSO-AD EMS	In preparation	No estimation available yet	No
6. Demand side control and response with aggregators involvement	UA	DSO-DITEK	Feasibility study in preparation	No estimation available yet	No

6.2.3 Table 5: Smart meter roll-out

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Smart meter roll-out	BA	DSO-MH ERS Trebinje	Tendering finalised	11,25	7.500.000 KM own resources + 15.000.000 KM EBRD loan
2. Smart metering project of Energo Pro Georgia	GE	DSO-Energo Pro Georgia	Ongoing project	1,2	Seeking to acquire grant
3. Smart meter roll-out	KS*	DSO-KEDS	Ongoing project	22	No, the company will be able to install additional meters only with additional budget support/grant
4. Smart meter roll-out	MD	DSO-Premier Energy Distribution	Feasibility study in preparation	No estimation available yet	No
5. Extension and upgrade of the automatic meter reading system	ME	TSO-CGES	Installation of equipment ongoing	No estimation available yet	No
6. Smart meter roll-out	ME	DSO-CEDIS	Ongoing project	8	Yes, CEDIS investment budget.
7. Installation of smart meters on distribution grid	MK	DSO-EVN	Ongoing project	12,176	Yes, company's investment program
8. Installation of smart meters on distribution grid	RS	DSO - JSC ODS EPS Distribucija d.o.o.	Feasibility study in preparation	No estimation available yet	No, EBRD 50% + EIB 50%
9. Smart meter roll-out (DSO1)	UA	DSO-DITEK	Installation of equipment ongoing	No estimation available yet	No
10. Smart meter roll-out (DSO2)	UA	DSO-RGC Ukraine	Installation of equipment ongoing	No estimation available yet	No

6.2.4 Table 6: Asset management

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. SAP expansion with module asset management	BA	DSO – MH ERS Trebinje	No activity	No estimation available yet	No
2. WAM system (Work & Assets Management)	GE	TSO-GSE	Finalised	0,13	No
3. FID (Fault Indicator Detector) for Overhead Lines	KS*	DSO-KEDS	Ongoing project	0,07	No, the company will able to implement the project only if it receives additional budget/support/grant for this job.
4. Outage management system (regional cooperation preferred), (Migration of information systems for distribution activity (SGI, Open Operation, BDIv10, SGM, SGT)	MD	DSO-Premier Energy Distribution	Ongoing project	0,027	No
5. Drone for inspection of transmission lines with thermos-vision	ME	TSO-CGES	Financing negotiations	No estimation available yet	No
6. Video surveillance of substations	ME	TSO-CGES	Financing negotiations	No estimation available yet	No
7. System for remote access to process networks and connection of new facilities to NDC SCADA system	ME	TSO-CGES	Installation of equipment ongoing	No estimation available yet	No
8. Procurement of 110 kV mobile cables	ME	TSO-CGES	Feasibility study in preparation	No estimation available yet	No

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
9. Installation of devices for controlled switching	ME	TSO-CGES	Feasibility study in preparation	No estimation available yet	No
10. Implementation of asset management system for DSO	ME	DSO-CEDIS	Feasibility study in preparation	No estimation available yet	No
11. Integration of AM principles and tools	MK	TSO-MEPSO	No activity	No estimation available yet	No
12. Smart network asset management, outage management system (regional cooperation preferred)	UA	DSO-DITEK	Prefeasibility study in preparation	No estimation available yet	No

6.2.5 Table 7: Digital markets

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Regional Operation Centre Balancing Cockpit (ROC-BC)	RS	TSO-AD EMS	In preparation	No estimation available yet	No
2. Virtual Storage Plants (VSP)	RS	TSO-AD EMS	In preparation	No estimation available yet	No
3. T-market coupling framework	RS	TSO-AD EMS	In preparation	No estimation available yet	No
4. T-sentinel toolset	RS	TSO-AD EMS	In preparation	No estimation available yet	No
5. T-RES control centre	RS	TSO-AD EMS	In preparation	No estimation available yet	No
6. Wholesale and ancillary market toolset (AM)	RS	TSO-AD EMS	In preparation	No estimation available yet	No
7. Flexibility services, imbalance netting, block chain technology, VPP	UA	DSO-DITEK	No activity	No estimation available yet	No

6.2.6 Table 8: Distributed energy sources and storages

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Distributed renewable energy sources and storages integration	BA	DSO-MH ERS Trebinje	No activity	No estimation available yet	No
2. Integration of large scale and also distributed renewable energy based power generation, energy storages 1	GE	TSO-GSE	Feasibility study finalised	No estimation available yet	No
3. Integration of large scale and also distributed renewable energy based power generation, energy storages 2	GE	TSO-GSE	Ongoing project	0,05	Yes, project was financed by USAID Energy Program.
4. Integration of large scale and also distributed renewable energy based power generation, energy storages 3	GE	TSO-GSE	Feasibility study in preparation	No estimation available yet	Yes, project is financed by EIB with 600 000 EUR.
5. Distributed renewable energy sources and storages study	ME	DSO-CEDIS	No activity	No estimation available yet	No
6. Distributed renewable energy sources and storages study	MK	TSO-MEPSO	No activity	No estimation available yet	No
7. Integration of large scale and also distributed renewable energy based power generation, energy storages	UA	DSO-DITEK	Feasibility study in preparation	No estimation available yet	No

6.2.7 Table 9: Communication and data management

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. SAP project	BA	DSO-MH ERS Trebinje	In operation	No estimation available yet	No
2. Frequency management and provision of system services	GE	TSO-GSE	No activity	No estimation available yet	No
3. Optical ground wire (OPGW) cables or power line carrier (PLC)	GE	TSO-GSE	Installation of equipment finalised	0,828	Yes, the project is funded by the government.
4. Active communication equipment	ME	DSO-CEDIS	Tendering in preparation	2,5	CEDIS investment budget
5. New telecommunication system	ME	TSO-CGES	Feasibility study in preparation	No estimation available yet	No
6. New telecommunication system	MK	TSO-MEPSO	Installation of equipment ongoing	11	42% loan 42% national contribution, 16% grant
7. New telecommunication system with OPGW	RS	DSO - JSC ODS EPS Distribucija d.o.o.	Ongoing project	2,5	Yes, national contribution only
8. ICT systems, data exchange formats and procedures, optical ground wire (OPGW) cables or power line carrier (PLC)	UA	DSO-DITEK	Feasibility study in preparation	No estimation available yet	No

6.2.8 Table 10: Improved DSO2TSO communication, forecast and system operation

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. DSO/TSO cooperation	ME	DSO-CEDIS	No activity	No estimation available yet	No
2. DSO/TSO cooperation	MK	TSO-MEPSO	No activity	No estimation available yet	No

6.2.9 Table 11: Electric vehicles (EV)

Project name	CP	Implementing company	Status of implementation	Estimated Cost [MEUR]	Financing resolved
1. Pilot projects for EV	ME	DSO-CEDIS	No activity	No estimation available yet	No
2. Pilot projects for EV	MK	TSO-MEPSO	No activity	No estimation available yet	No
3. Pilot projects for EV	UA	DSO-DITEK	Prefeasibility study in preparation	No estimation available yet	No

7. Task 3 – Potential for smart grid development in the Energy Community

Energy digitalisation areas where major developments are currently ongoing in the EU and which are of high relevance for the Energy Community are, as follows:

- **Smart network management** - aiming at minimizing operational and planning costs of DSOs, support of the further development of the wholesale, retail and balancing markets,
- **Demand side management** – with the objective to optimise electricity consumption, reduce peak demand, help reduce energy bills and improve the quality of electricity supply,
- **Integration of large scale and also distributed RES based power generation** – the future RES targets in the WB6 cannot happen if not properly facilitated by the electrical networks,
- **Energy storages,**
- **DSO and TSO information sharing and cooperation (DSO2TSO vertical data integration).**

In the Secretariat's view, the areas which require the most investment when it comes to the TSO business in the Energy Community are power system control and digital markets, currently only addressed by Serbia.

In the case of DSOs, the most urgent investment is rolling out smart meters. Today, there is a big gap between the implementation of best available technologies in the EU and in the Contracting Parties as well as a lack of activities related to electric vehicles and TSO/DSO cooperation.

In addition, further support is need for Energy Community TSOs and DSOs to increase the number of activities/projects in the fields of demand side management and RES and storages integration.

To date, a number of WB6 TSOs have teamed up with their EU counterparts in three major projects funded by the EU programme Horizon 2020 (CROSSBOW, Trinity and FARCROSS).[4] The Secretariat is not aware of similar R&D projects involving Eastern Partner countries. The Secretariat is ready to provide advice and support the application process for future calls under Horizon 2020 regarding smart grids.

Overall, IFIs and donors expressed interest to finance new technologies that contribute to increasing efficiency and reliability of operations of grid system operators. For example, the Western Balkans Investment Framework (WBIF) has included in 2019 smart grids and smart meter roll-out in the eligible areas for both technical assistance and investment grants. Nevertheless, no applications were submitted to the WBIF to date. The Secretariat has responded with this initiative to also facilitate cooperation between operators and the WBIF.

[4] For additional information please consult the Annex.

Based on the preliminary analysis provided by this study, it can be concluded that the following consortia and project areas might be potentially interesting for future joint project proposals. These proposals need to be developed by the TSOs or DSOs concerned, with the facilitation of the Secretariat, and submitted to either the WBIF for further technical assistance and investment grants or apply to receive the PECI/PMI label under the smart grid category. [5]

Table 12: Potential future regional consortia based on a common smart grid topic

Topic	Potential participants
WAMS	NOS BiH, EMS, GSE
Demand side management	EMS, MEPSO, CGES
Smart meter roll-out (EaP)	Georgian DSO, Ukrainian DSO, Moldovan DSO
Smart meter roll-out (WB6)	Serbian DSO, Montenegrin DSO, North Macedonian DSO, Bosnia and Herzegovina's DSOs, Kosovo* DSO
Asset management	MEPSO, CGES, Moldovan DSO, Montenegrin DSO, Bosnia and Herzegovina's DSOs, Ukrainian DSO

[5] In order to be eligible for the label of PECI/PMI under Regulation (EU) 347/2013, projects in the area of smart grids must include more than one operator, have a cross-border impact and serve a large number of consumers (over 100,000).

8. Task 4 - Key components of a Cost Benefit Analysis for smart meter roll-out methodology

The Secretariat in consultation with the respondents to the survey about the current status of smart grids and smart meter roll-out came to the conclusion that there is a need for more capacity building on the components that should be included in a cost benefit analysis (CBA), as any economic decision on rolling out smart meters, as key elements of smart grids, should be based on a CBA. ECS has financed a capacity building project for smart meter roll-out in Ukraine. The developed methodology is presented in this chapter as an example, which can be easily applied in all other Contracting Parties.

The smart grid projects are very specific when it comes to a particular goal to be achieved and the necessary equipment. The choice of CBA criteria to be used is subject to individual pre-feasibility and feasibility studies, for each specific case, including an internal CBA to estimate the costs and benefits of different project realization options and ensure that the project's total benefits outweigh its costs.

The following section presents the general list of socio-economic benefits of the smart grid projects along with the cost elements (capital and operational expenditure), subject to a socio-economic CBA. Furthermore, the outcome of the socio-economic CBA, in terms of economic indicators such as NPV, IRR and B/C, should be used to verify whether the overall benefits outweigh the costs and, therefore, proving that the project is viable from a socio-economic point of view.

8.1 Project assessment process

Process wise the Cost Benefit Analysis should follow the following steps:

Step 1: Define the project's scope and main CBA assumptions

Step 2: Define benefits (monetized and non-monetized)

Step 3: Define and quantify costs

Step 4: Compare costs and benefits on a project lifetime span (NPV analysis, IR, B/C, PI…)

Step 5: Perform a sensitivity analysis (by introducing different development scenarios)

8.2 CBA assumptions

As a starting point, it can be assumed that the following values for the variables used in the socio-economic CBA are:

- Demand growth: an average annual demand growth of n % which was assumed for the project area;
- Peak load growth: m % as peak load forecast has been considered according to the peak load forecast analysis provided by the project promoter;

- Energy price for losses: a value of 45 €/MWh can be assumed as the average price EU Member States pay for energy losses;
- Discount rate: a value of 5 % can be used as the social discount rate;
- Time horizon: a period of ten years has been chosen as the time horizon;
- Peak demand reduction: a value of XX MW should be assumed for the project area due to the expected peak load shift and energy savings;
- Electricity price for losses: a value of 27 €/MWh has been assumed for evaluating the project impact on the level of technical losses;
- Electricity market price: XX €/MWh, for the considered area, region or country;
- Cost of energy not supplied: XX €/kWh (specific for considered area, region or country. It is also possible to use the GDP calculation approach for the calculation of the average price of ENS);
- Carbon prices: 25 €/t.

8.3 Main monetized benefits

The smart meter roll-out project is expected to deliver a set of positive impacts and in that respect the following monetized benefits could be further calculated:

- Reduced maintenance costs of assets;
- Reduced cost of equipment breakdowns;
- Deferred distribution capacity investments due to consumption reduction;
- Deferred distribution capacity investments due to peak load shift;
- Reduced electricity technical losses;
- Electricity savings due to consumption reduction;
- Electricity savings due to peak load transfer;
- Increased value of service due to reduced outage times;
- Recovered revenue due to reduced outages;
- Reduced CO2 emissions due to reduced losses;
- Reduced CO2 emissions due to wider diffusion of low carbon generation sources;
- Reduced fossil fuel usage;
- Improved efficiency of dispatching service market;
- Reduction of RES curtailment following TSO order;
- Deferred distribution investments;
- Reduced outage times;
- Increased RES hosting capacity;
- Avoided cost of capacity purchase for primary and secondary reserve;
- More competitive bids at the ancillary service market and therefore improvement in the social welfare costs (lower TSOs costs);
- Optimized DER/RES integration to support the implementation of 2020/2030 RES targets in Ukraine;
- Increased energy savings through energy efficiency, which could also result in reduction of network technical losses;

- Reduction of LV network reinforcement costs as a result of optimization of the EV charging infrastructure and processes;
- Increased penetration level of EV;
- Additional environmental benefits (reduction of SOx, NOx emissions, air quality).

8.4 Main and additional costs

Main costs associated with the project's deployment, associated with the main equipment, are as follows:

- Equipment costs, (CAPEX)
- Labour costs, including cost of installations
- Maintenance costs, OPEX

Also, on top of the main equipment costs, indirect costs of additional measures could be taken into account, which should be left for the project promoter to decide on a case by case basis:

- Smart technologies related to new substation dispatching control and protection system (remote control, cabling, voltage regulation, intelligent metering system, smart distribution board, re-closers, platform for demand side management, etc.);
- Smart technologies related to communication and network management, including smart meters (new dispatching model, optic wires, smart meters, high speed PLC communication, intelligent algorithms for network management, etc.);
- Modernization of current MV and HV power lines, and construction of new cross-border MV power lines for increase of network capacity for new network users, removing under-voltage situations, etc.;
- Power flow and power quality control devices in digitalized primary and secondary substations;
- Real-time power monitoring and fault detection devices in digitalized primary and secondary substations;
- Solutions to enhance the flexibility of assets belonging to the aggregators portfolio (e.g. local control systems, IT connection equipment, energy storage coupling to RES);
- Power forecasting and control technologies for the non-dispatchable distributed renewable plants;
- Maintenance/ insurance and personnel costs;
- Development and operation of distribution grid optimization – the smart grid taking into account the specificities of the cross-border region.

8.5 Sensitivity analysis

The NPV of the project varies with the variation of the following critical variables, and it should be further investigated using the deterministic or the heuristic method (etc. Monte Carlo approach…):

- Price of installed equipment
- Price of electricity for end-consumers in all categories (households, small industry and heavy industry)
- Implementation of support scheme for smart grid projects from the Government;
- Energy not supplied cost
- Peak demand reduction
- Electricity price for losses
- CO2 price
- Value of lost load
- Discount rate
- Time horizon

8.6 Additional non-monetized benefits

In addition to the quantified benefits, the proposed methodology addresses further impacts that could not be (entirely) quantified and consequently included in the KPI analysis, such as:

- Improvement of billing facilities for electric energy and other energy sources (water, heat, gas, ...);
- Improved quality of supply to serve regionally high-tech manufacturing industries – the proposed network upgrades would reduce the probability of severe voltage dips, whose presence may impair manufacturing conditions of high-tech manufacturing industries present in the project area;
- Reduced air pollutants emissions (particulate matter, SOx, NOx, and CO) due to reduced line losses;
- Reduced air pollutants emissions (dust particles, SOx, NOx, and CO) due to wider diffusion of low carbon distributed generation sources;
- Enhanced consumer awareness and market participation – the project is expected to play significant role in empowering customers to take an active role in more efficient network operation and ultimately impact the electricity price; creation of innovative market mechanisms for new energy services, such as energy efficiency, demand response, etc.;
- Increase of social awareness and acceptance – the project aims to create public awareness about the project, maintain public interest in the project and motivate people to take part in it (online and offline communication on the process to connect new installation to the smart grid, user experience reports, etc.).

9. Concluding remarks

Based on the feedback provided by the TSOs and DSOs of the Contracting Parties, including 75 smart grid projects with different levels of implementation, it appears essential to speed up the development of smart grids in the Energy Community.

A number of local projects have been planned, and some TSOs are part of international consortia in the ongoing Horizon 2020 R&D projects. Nevertheless, there are limited indications of any smart grid project being implemented and operated in the region, or of any regional coordination among stakeholders on this topic.

Network companies in the Energy Community appear to have neither the capacity nor the resources to undertake these major investments in grid digitalisation relying solely on their own financing. In the Secretariat's view, enhanced communication and information sharing on available assistance and funding opportunities from donors and IFIs would be essential for going forward successfully with the digitalisation of networks on the TSO and DSO levels. This is valid especially for WBIF technical assistance or investment grants available for smart grids and smart meters roll-out applications. This observation is also supported by the fact that over the last 3 assessments of PECI/PMIs in the Energy Community (2016, 2018, 2020), no project was proposed in the category of smart grids.

The smart grid projects assessment methodology, also presented in this paper, can be further improved and utilised for project assessments conducted under the PECI/PMI selection process or other similar processes.

In the Secretariat's view, it is essential that smart grid development projects in the Energy Community start as soon as possible; this is valid in particular as regards the transmission networks which are already mature enough for this technological development, but also the distribution networks where the main changes in the operational portfolio are expected.

This study has identified and listed potential areas of cooperation that would fit both local TSO/DSO needs and their current technical capabilities, and proposed potential regional consortia on smart grid related issues. Nevertheless, further detailed work is needed in order to prepare a number of more advanced projects to be proposed for financing through IFIs and EU funding – WBIF for the Western Balkans and Neighbourhood Investment Platform (NIP) for Eastern Partner countries.

10. References

[1] http://crossbowproject.eu/

[2] https://www.sincrogrid.eu/en

[3] https://farcross.eu/

[4] http://www.futureflow.eu/

[5] http://www.interrface.eu/

[6] https://cordis.europa.eu/project/id/825196

[7] https://cordis.europa.eu/project/id/864048

[8] Guidelines for conducting a cost benefit analysis of Smart Grid projects, JRC reference Reports, 2012

[9] Evaluation of Smart Grid projects for inclusion in the third Union-wide list of Projects of Common Interest, Vasiljevska, J., Gras, S., Flego, G., 2017

[10] Smart grids and renewables - A cost-benefit analysis guide for developing countries, IRENA

[11] Methodology for smart meter roll-out in Ukraine, TA provided by ECS and EU4Energy governance program during 2019.

11. Annex - Ongoing Horizon 2020 smart grid projects involving EnC Contracting Parties

In order to illustrate the funding opportunities for smart grid projects, please find below the description of the most recent ones, supported by the EU Horizon 2020 programme, which involve Energy Community Contracting Parties.

CROSSBOW [1]

Grant agreement ID: 773430

Website: http://crossbowproject.eu/

Status: Ongoing project

Start date: 1 November 2017

End date: 31 October 2021

Funded under: H2020-EU.3.3.4.

Overall budget: € 21 970 065,21

EU contribution: € 17 287 742,88

CPs involved: Serbia, North Macedonia, Montenegro, Bosnia and Herzegovina

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.

It is a TSO driven project that proposes a set of technological solutions which enable increasing the shared use of resources to foster transmission networks cross-border management of variable renewable energies and storage units, making possible a higher penetration of clean energies whilst reducing network operational costs and improving economic benefits of RES and storage units.

The CROSSBOW results will be evaluated by 8 TSOs in Eastern Europe, grouped to form clusters that will validate each of the project's outcomes in at least three different countries, demonstrating in all cases how CROSSBOW tackles the transnational challenges faced by these TSOs.

The objective is to demonstrate a number of different, though complementary technologies, offering TSOs higher flexibility and robustness through:

- A better control of cross-border balancing energy at interconnection points,
- New storage solutions – distributed and centralized-, offering ancillary services to operate Virtual Storage Plants (VSP),
- Better ICT and communications - e.g. better network observability, enabling flexible generation and demand response schemas,
- The definition of a transnational wholesale market, proposing fair and sustainable remuneration for clean energies though the definition of new business models supporting the participation of new players –i.e. aggregators - and the reduction of costs.

FARCROSS [2]

FARCROSS

Grant agreement ID: 864274

Website: https://farcross.eu/

Status: Ongoing project

Start date: 1 October 2019

End date: 30 September 2023

Funded under: H2020-EU.3.3.4.

Overall budget: € 13 643 692,50

EU contribution: € 9 996 497,25

CPs involved: Albania, Bosnia and Herzegovina and Serbia (one SME from Serbia)

FARCROSS aims to connect major stakeholders of the energy value chain and demonstrate integrated hardware and software solutions that will facilitate the "unlocking" of the resources for the cross-border electricity flows and regional cooperation. The project will promote state-of-the-art technologies to enhance the exploitation/capacity/efficiency of transmission grid assets, either on the generation or the transmission level. The hardware and software solutions will increase grid observability to facilitate system operations at a regional level, exploit the full potential of transmission corridors for increased electricity flows that will facilitate transition to flow-based regional market coupling, consider cross-border connections and their specific ICT and grid infrastructure, planning to use a wide-area protection approach to ensure the safe integration of renewable energy sources into the grid, mitigate disturbances, increase power system stability.

An innovative regional forecasting platform will be demonstrated for improved prognosis of renewable generation and demand response and a capacity reserves optimization tool will be tested to maximize cross-border flows. The non-harmonization of national regulation will be studied and measures will be recommended to avoid distortion of the technology benefits.

TRINITY [3]

Grant agreement ID: 825196

Website: https://cordis.europa.eu/project/id/825196

Status: Ongoing project

Start date: 1 January 2019

End date: 31 December 2022

Funded under: H2020-EU.2.1.1.

Overall budget: € 16 335 948,75

EU contribution: € 15 997 267,25

CPs involved: Serbia, North Macedonia, Montenegro, Bosnia and Herzegovina

TRINITY will develop a set of solutions to enhance cooperation among the TSOs of SEE in order to support the integration of the electricity markets in the region, whilst promoting higher penetration of clean energies.

The main objective of TRINITY is to create a network of multidisciplinary and synergistic local digital innovation hubs (DIHs) composed of research centres, companies and university groups that cover a wide range of topics that can contribute to agile production: advanced robotics as the driving force and digital tools, data privacy and cyber security technologies to support the introduction of advanced robotic systems in the production processes. The result will be a one-stop shop for methods and tools to achieve highly intelligent, agile and reconfigurable production, which will ensure Europe's welfare in the future.