European Commission

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# Smart Grid Baltic

# Smart grid challenges and opportunities in the Baltic region

*14-15 November, 2016,*
*Riga, Latvia*

Gangale, F., Mengolini, A.,
Vasiljevska, J.

2018


Joint Research Centre

EUR 28895 EN

**JRC Science Hub**
https://ec.europa.eu/jrc

JRC108685

EUR 28895 EN

PDF ISBN 978-92-79-76901-6 ISSN 1831-9424 doi:10.2760/479938

Luxembourg: Publications Office of the European Union, 2018



How to cite this report: Gangale F., Mengolini A., Vasiljevska J., *Smart Grid Baltic - Smart grid challenges and opportunities in the Baltic region - 14-15 November, 2016, Riga, Latvia*, EUR 28895 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-76901-6, doi:10.2760/479938, JRC108685

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## Acknowledgements

European Commission, Joint Research Centre, Directorate C – Energy, Transport and Climate, Organising Committee:

Marcelo Masera, Gerda Gouwens, Flavia Gangale

Local Organising Committee:

Olga, Bogdanova (Latvian Ministry of Economic Affairs)

Diana, Zalostiba (Riga Technical University).

***Authors***

Flavia Gangale

Anna Mengolini

Julija Vasiljevska

## Agenda of the workshop[1]

# Agenda

| DAY 1: 14 November 2016 | |
|---|---|
| 13:30 – 14:00 | Registration & coffee |
| 14:00 – 14:20 | Welcoming speech: Smart grid development: a perspective from Latvia and the Baltic Sea region.<br>**Olga Bogdanova**, Director of the Energy Market and Infrastructure Department, Latvian Ministry of Economic Affairs |
| **Session 1 - Cohesion Policy, S3P and Smart Grids** | |
| 14:20 – 14:45 | General aspects and current work of S3PEnergy<br>**Javier Gomez**, European Commission, DG JRC - Sevilla |
| 14:45 – 15:10 | Smart Grid investments in Europe: lessons learned and current developments<br>**Flavia Gangale**, European Commission, DG JRC - Petten |
| 15:10 – 15:40 | Coffee break |
| **Session 2 - S3 Smart Grids priorities and regional cooperation** | |
| 15.40- 16.05 | Smart Grid related specialization areas in Latvia, investment programs and instruments<br>**Olga Bogdanova**, Director of the Energy Market and Infrastructure Department, Latvian Ministry of Economic Affairs |
| 16.05-16.30 | Smart Grid related specialization areas in Estonia, investment programs and instruments<br>**Laura Arengu**, Smart Specialisation expert, Estonian Ministry of Economic Affairs and Communications |
| 16.30-16.55 | European Integrated Research Programme on Smart Grids<br>**Irina Oleinikova**, Director, Institute of Physical Energetics , Latvia |
| 16.55-17.20 | Ongoing transnational Smart Grid projects<br>**Oskars Krievs/ Diana Zalostiba**, Riga Technical University |
| 17.20-18.00 | Discussion: Possible areas for regional cooperation |
| 19:00 | Social dinner |

[1] The power point presentations can be downloaded from S3 platform, in the section dedicated to the event: http://s3platform.jrc.ec.europa.eu/-/smart-grid-challenges-and-opportunities-in-the-baltic-region-?inheritRedirect=true

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| DAY 2: 15 November 2016 | |
|---|---|
| **Session 3 – Smart Grid implementation in the Baltic region: lessons learned and future opportunities** | |
| 09:00 – 09:20 | Smart grid data in the client side experience. Future data applications<br>**Janis Šipkovs** ISO Ltd, Energodata project, Latvia |
| 09.20-9.40 | Estfeed data sharing platform as facilitator of demand-side related services<br>**Kalle Kukk**, Strategy Manager, Elering, Estonia |
| 09.40-10.10 | Smart grid development in Lithuania<br>**Arturas Klementavicius**, Lithuanian Energy Institute – Lithuania |
| 10.10-10.30 | Smart metering projects and new analytics in grid operations<br>**Heikki Kolk**, senior specialist at the Network technology department of Elektrilevi OÜ, Estonia |
| 10.30-11.00 | Discussion: lessons learned and future opportunities |
| 11:00 – 11:30 | Coffee break |
| **Session 4 - Strengthening cooperation in the Baltic region** | |
| 11.30-11.50 | Smart City Riga,<br>**Timurs Safiulinis**, Director, Riga Energy Agency |
| 11.50-12.10 | Transnational digital collaboration in the Baltic region<br>**Torben Aaberg**, Head of Public & Digital Affairs, Baltic Development Forum |
| 12.10 – 12.30 | Smart Grid Projects of Common Interest<br>**Julija Vasiljevska**, JRC |
| 12.30 – 13.00 | Discussion: Intraregional cooperation on smart grids, the way forward |
| 13:00 | Lunch and networking |

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VISIT to the research laboratories of the Riga Technical University

## Abstract

The Joint Research Centre – Directorates C (Energy, Transport and Climate) in collaboration with the Latvian Ministry of Economic Affairs and the Riga Technical University organized the workshop "Smart Baltic" with the aim to facilitate a constructive exchange about the implementation of the Smart Specialisation Strategy (S3) priorities related to smart grids in the Baltic region. The event addressed specific examples of how S3 regions are preparing the ground for smart grid deployment, including intraregional cooperation as a key aspect to support S3 implementation and the effective uptake of the cohesion policy funds for smart grids. The workshop offered an opportunity for the industry, research & innovation sectors, regional authorities and other stakeholders to exchange good practices and innovative concepts supporting smart specialization strategies and energy policy in the Baltic region.

# 1 Introduction

In November 2016, the Joint Research Centre of the European Commission, Directorate C – Energy, Transport and Climate, organized the workshop "Smart Baltic. Smart grid challenges and opportunities in the Baltic region". The workshop was organised in the framework of the Smart Specialization Platform for Energy (S3PEnergy) and aimed to facilitate the exchange of knowledge, ideas and lessons learned on smart grids development in the Baltic region.

The S3PEnergy was established to support the implementation of the smart specialisation strategies of those regions/countries that have chosen energy-related priorities in their S3, in particular as regards energy innovation activities at (sub)national, regional and local levels. The Platform is also intended to assist countries in the uptake of the cohesion policy funding opportunities for energy, supporting the financing of viable investments in line with the EU's Energy Union strategy and the EU plan for strategic investments in jobs and growth. The S3PEnergy contributes to the EU energy policy priorities by facilitating partnerships between EU regions and by promoting alignment between local, regional, national and European activities on energy sustainability, competitiveness and security of supply[2].

The workshop was the second in a series of workshops that the JRC is organizing in the context of S3PEnergy[3]. Regional authorities, companies, universities and research centres met and exchanged knowledge and experiences on smart grid development in the Baltic area and discussed energy policies and measures and novel funding opportunities. The Workshop served as an occasion to reinforce the interaction between local and international stakeholders, to discuss their projects, needs and expertise and to investigate the opportunities offered by S3PEnergy for the diffusion of smart grid technologies.

A special attention was dedicated to the potential for interregional collaboration, building on existing and future synergies at institutional and industrial level. The discussion focused on the identification of the most promising smart grid areas for regional development, on the foreseeable replicability/scalability opportunities and on ways to allocate funds more effectively. Public and private stakeholders discussed regional similarities and differences and exchanged experiences, best practices and lessons learned. The positive feedback received by the audience was a confirmation of the validity of the initiative and of the need for more collaboration and knowledge sharing events.

[2] More information on S3PEnergy can be found at http://s3platform.jrc.ec.europa.eu/s3p-energy.
[3] The first workshop was organized in Bari in June 2016 [1].

# 2 Workshops sessions

The workshop was introduced by Olga Bogdanova, Director of the Energy Market and Infrastructure Department, Latvian Ministry of Economic Affairs and it was structured around four sessions. Session 1 introduced some general aspects of the Smart Specialization Platform and its objectives and it gave a general overview of the JRC work in the field of smart grids.

Session 2 introduced the national strategies and funding opportunities in the field of smart grids and gave an overview of the main R&D and demonstration efforts in Latvia with a special attention to international collaboration links.

Session 3 presented some interesting experiences and case studies from the three Baltic States with a special attention to possible synergies and collaboration opportunities with other countries in the Baltic region.

Finally, Session 4 presented the experience of the city of Riga to move towards a more sustainable energy system and offered some interesting hints and points to move towards a closer interregional collaboration in the field of smart grids.

In the following sections, the main highlights of each session are summarized. The power point presentations can be downloaded from the S3 platform website, in the section dedicated to the event[4].

## 2.1 Session 1: Cohesion policy, S3P and smart grids

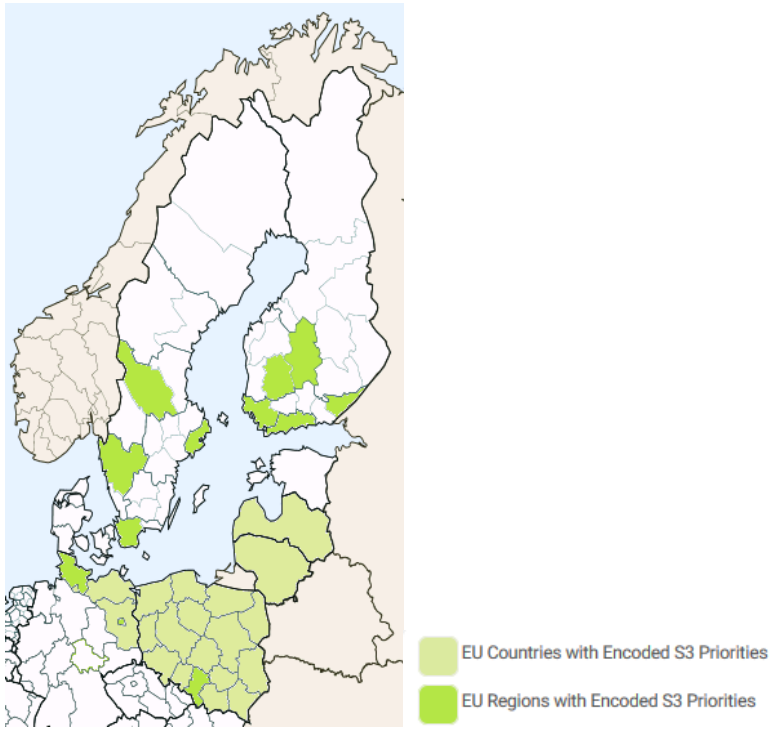
**General aspects and current work of S3P Energy**, *Javier Gomez* (JRC)

The Smart Specialisation Strategy (S3) is a new regional and national innovation strategy. It represents a driver of territorial development. On the one hand, it is smart because it is a fact-based methodology that includes local resources and local actors, on the other hand it is also smart because it addresses all ways of innovation, not only technological innovation, but also social innovation, procedural, administrative, etc. The core of the strategy is what has been called the "entrepreneurial process of discovery" where the different stakeholders included in the quadruple helix (government, industry, academia and civil participants) cooperate to identify a common idea and develop it as a strategy for the future. The regional bodies are required to be facilitators of the strategy, and are asked to coordinate the inputs received by all the potential stakeholders. In terms of funds, the S3 represents an ex-ante conditionality for receiving support through the European structural funds related to innovation.

The presentation provided an overview of achieved results and evidence from S3P Energy, focusing on the current situation in the Baltic region (Figure 1).

[4] http://s3platform.jrc.ec.europa.eu/-/smart-grid-challenges-and-opportunities-in-the-baltic-region-?inheritRedirect=true

Figure 1: Smart Specialisation Strategies with a priority in Smart Cities, Smart Grids and/or Smart Metering in the Baltic region[5]




**Smart Grid investments in Europe: lessons learned and current developments,** *Flavia Gangale* (JRC)

The JRC presented one of its line of activities in the field of smart grids, the Smart Grid Projects Outlook[6].

Since 2011, in its role as an independent observer of the energy system, the JRC has made a strong effort to collect, process and analyse smart grid project data with the aim of providing different stakeholders with a tool to better understand the rapidly changing scene, enabling early identification of developments and opportunities and supporting evidence-based policymaking.

The presentation introduced some of the main findings of the Outlook. It highlighted that strong differences exist between Member States in the number of projects and the overall level and pace of investment (Figure 2). Differences exist also in the choice of smart grid technologies and applications. Generally speaking however, the domains with highest investment are smart network management[7], demand-side management[8] and integration of distributed generation and storage[9], together accounting for around 80% of the total investment (Figure 3).

In view of the workshop, the JRC investigated the projects developed in the Baltic area and identified some interesting findings that could be used as a starting point to feed the discussion on the specific challenges and opportunities lying ahead.

[5] Source: S3 Tool EYE@RIS3, http://s3platform.jrc.ec.europa.eu/map
[6] https://ses.jrc.ec.europa.eu/smart-grids-observatory
[7] The smart network management category includes projects aiming at improving the observability, monitoring and controllability of the networks (e.g. substation automation, fault identification and localisation and real time asset monitoring).
[8] The demand side management category includes demand response and energy conservation projects.
[9] The integration of distributed generation and storage category includes projects aiming at the seamless integration of these sources into the grids, while assuring system security and reliability (e.g. voltage control/reactive power control of distributed energy resources for the provision of ancillary services, the implementation of aggregation mechanisms, etc).

Based on our data, there are important differences among Member States in the area. While Denmark, Sweden, Finland, and, to a lesser extent, Poland, show a relatively high level of investments, the three Baltic States seems to be still lagging behind (Figure 4).

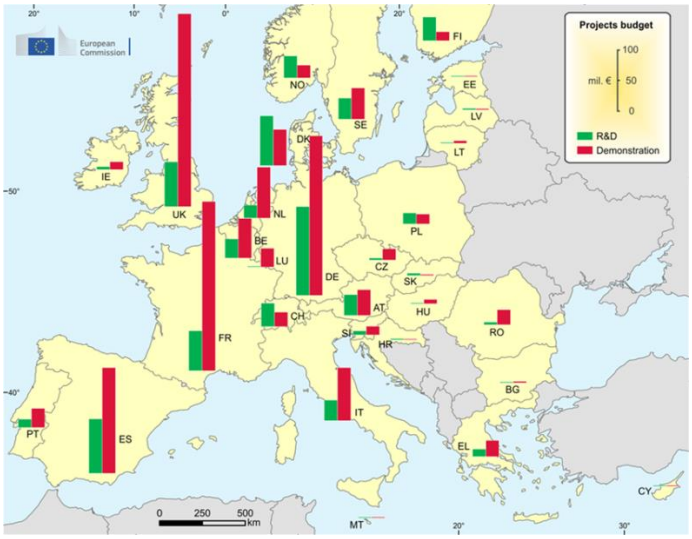
Also, the three Baltic States seem to have their own priorities for investment in smart grid technologies and applications (Figure 5). It appears that the most targeted application category is demand side management in Latvia, the integration of distributed generation and storage in Lithuania, and smart network management in Estonia.

The JRC also investigated the projects where at least one of the project partners comes from one of the Baltic States. The database contains only few such projects (Figure 6 – where the size of the circles represents projects' relative budget) and therefore no statistically significant conclusion could be drawn. The analysis however gives some rough indication and provides some food for thought to stimulate the discussion. An interesting observation is that only very few projects see the participation of more than one Baltic State. This might imply that collaboration links between Baltic States in the field of smart grids can be improved. On the other hand, projects show close collaboration links with other countries in the Baltic region, in particular with Germany. Also, there are very few recent projects in the database; most of them have already ended. This observation might suggest the loosening of regional collaboration links.

Another observation is that the whole spectrum of organizations is represented in the projects, from ministries to academia to network operators. There is however a somewhat limited participation of Baltic technology providers and ICT companies.

In conclusion, smart grid development in the Baltic area shows a different path and pace in each country, but many commonalities can also be observed. Strengthening international collaboration between different actors and sharing successful national experiences seems to be of paramount importance to advance the deployment of smart grids. Also, supporting local stakeholders and providing opportunities for them to learn and grow can help developing a local innovative supply chain.

Figure 2: Smart grid projects (R&D and demonstration) investment in EU[10]




[10] Smart Grid Projects Outlook 2017, https://ses.jrc.ec.europa.eu/sites/ses.jrc.ec.europa.eu/files/u24/2017/sgp_outlook_2017-online.pdf

Figure 3: Percentage distribution total investment per smart grid domain and country

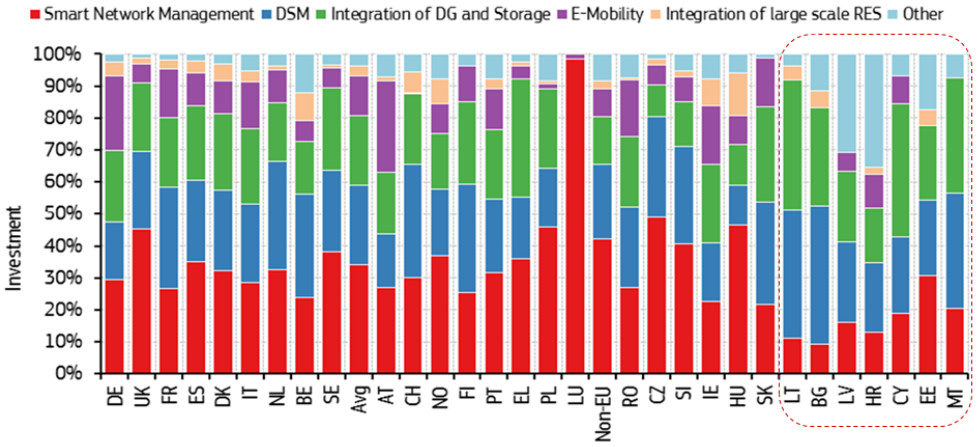



Figure 4: Smart grid projects investment in the Baltic region

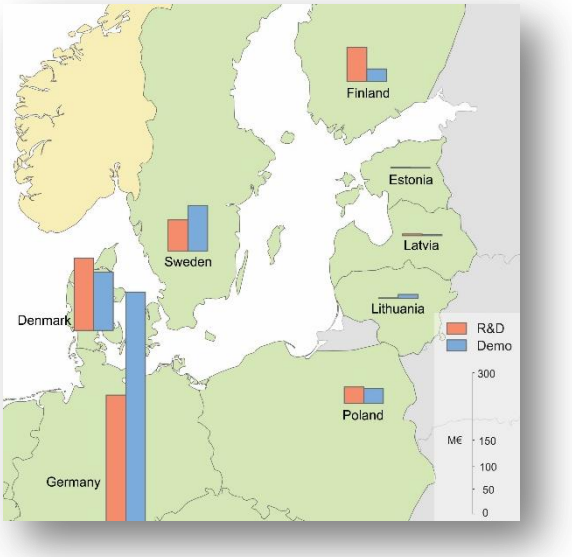



Figure 5: Distribution of investment per domain per country (LT, LV and EE)

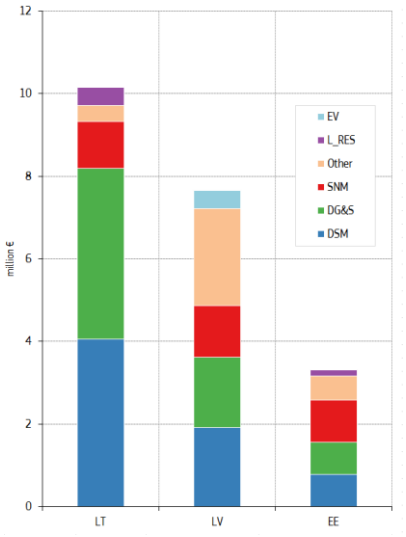
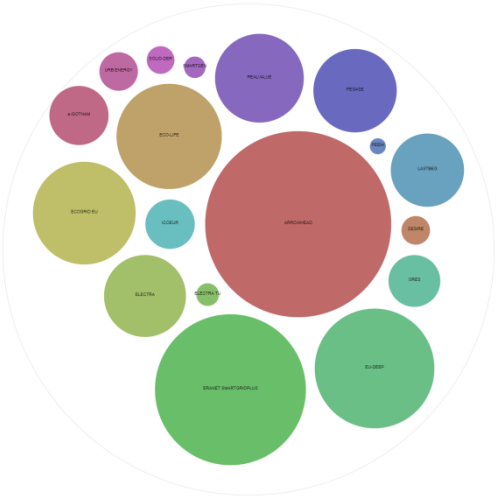



Figure 6: Smart grid projects in LT, LV, EE

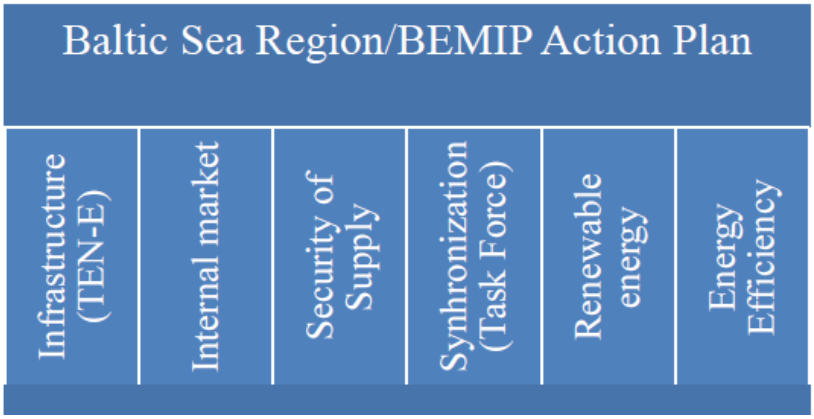


## 2.2 Session 2: S3 Smart grids priorities and regional cooperation

**Smart Grid related specialization areas in Latvia, investments programs and Instrument**, *Olga Bogdanova* (Latvian Ministry of Economic Affairs)

The Baltic Sea region and the Latvian energy policy is focused on increasing economic competitiveness, promoting security of energy supply and sustainability. The Ministry of Economics of Latvia is the EU Strategy for the Baltic Sea Region (EUSBSR) Policy Area (PA) Energy coordinator. The aim of the PA Energy is to improve the implementation of the EU Strategy for Baltic Sea Region (EUSBSR) Action Plan and the Baltic Energy Market Interconnection Plan (BEMIP). These two actions plan have been merged together since 2015 and together they define the priorities that Baltic countries should take towards the achievement of their energy goals. It includes six areas where results are expected (Figure 7). Three of these areas - renewable energy, energy efficiency and internal market - are the core of smart grids.

Figure 7: BEMIP & EUSBSR Policy Area - Energy




The objectives of the flagships is to highlight areas of activity that are ongoing within the EU or in other international frameworks, but which require greater coordination within the Baltic Sea region and consistent funding strategies to be implemented successfully.

There are many projects being presented in the EUSBSR on energy. Those approved in 2016 are presented in Figure 8. Flagship projects are projects developed in the Baltic Sea Region in order to foster the implementation of the action plan. These are projects that can work as example and lead the way for other projects and should have a high regional impact.

Figure 8: Flagship projects

| Project title | Project idea |
|---|---|
| Development of flexibility services for energy market (Baltflex) | Project tackles the flexibility market development issues regionally.<br>The Project will have two main outputs:<br>a) Description of regional market design for flexibility services.<br>b) Created technological (IT) prerequisite for flexibility services on Baltic-Nordic region level. |
| Conceiving and Piloting Resources Efficiency Management Measures for a carbonfree heating in rural BSR communities (COPREMM) | Project multiplies actions to a more efficient use of climate-friendly resources by sharing best practices and testing adequate heating technologies.<br>Project aims that municipalities develop adequate solutions for their heating demands by using diverse local RES. |

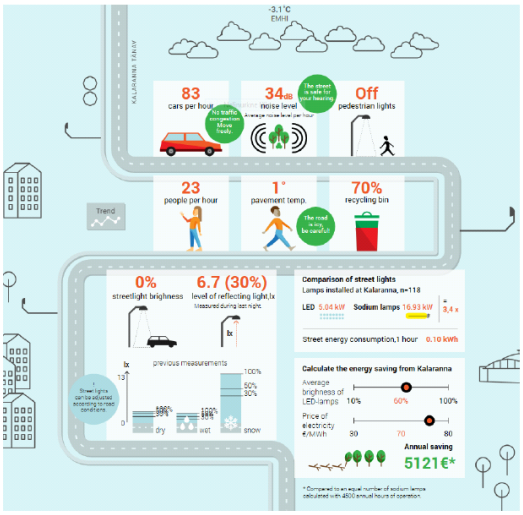
| Project title | Project idea |
|---|---|
| **Establishment and operation of cooperatives to generate energy** (CO-ENERGY) | The best way to boost energy efficiency and renewables is by setting up energy co-operatives.<br>Main project goals:<br>- implementation of best practices for energy co-operatives;<br>- setup of 12-15 power generating co-operatives by 90 SMEs;<br>- completion of at least one pilot co-operative;<br>- setup of regional power innovation clusters and development of regional strategies;<br>- tested trainings and concepts of counselling. |
| **Integrated Baltic offshore wind electricity grid development** (Baltic InteGrid) | Offshore wind energy development and cross-border power grid integration within the Baltic Sea Region by focusing on: grid development concept, communication platform and business development.<br>Project aims to provide concrete and realistic solutions for offshore grid development integrated with offshore wind farms. And project intends to help overcoming main challenges related to infrastructural limitations, high connection costs and legal constrains. |

**Smart Grid related specialization areas in Estonia, investment programs and instruments,** *Laura Arengu* (Estonian Ministry of Economic Affairs and Communications)

The presentation provided an overview of current developments on smart grids in Estonia. Even though energy and smart grids are not smart specialization priorities for Estonia, smart grids can benefit from the implementation of other priorities of the Estonian strategy that are strongly linked to the development of smart grids, e.g. automation, resource efficiency, knowledge-based construction, etc. The presentation gave an overview of projects and activities that do not always strictly fall into the definition of smart grids but that can benefit or support the development of a smart grid environment. Some of the presented projects are briefly introduced below.

In 2014, seven Estonian towns switched to LED streetlights, allowing 60-70% cost savings. Currently there is an open funding application round for municipalities to renovate street lighting infrastructure with support from the EU structural funds. The presentation focused on the SmartELI project by ELIKO[11], a technology competence development centre. SmartELI is a modular street lighting control system that makes street luminaires more energy efficient and cuts maintenance cost. SmartELI controls the complete street light management infrastructure in Tallinn, Estonia. The smart street lighting system is designed to be future-proof. It uses open IP-based wireless communication enabling standalone street lighting infrastructures to become hubs for Internet of Things (IoT) and Cloud-based services. A visualization of the system that provides information on the data collected in the demonstration street (Kalaranna Street in Tallinn) is available on the project website (Figure 9).

Figure 9: Smart Street Lighting System (based on real time data from SmartELI™)




Another interesting project introduced by the presentation is the SmartEnCity[12] project. This is an H2020 project whose aim is to provide a complete solution for a smart and urban environment. The pilot area is located in Tartu and consists of an old housing apartment blocks. The idea is to turn them into smart buildings through renovation, smart home solutions, innovation in district heating, etc.

Finally, the presentation briefly introduced the Estfeed data sharing platform[13] (provided by Elering, the Estonian TSO) whose objective is to allow network companies, energy producers and consumers to interact more efficiently and make the energy consumption data understandable and usable for end users.

In conclusion, Estonia shows a strong interest in the transition to a smarter energy system. Even though smart grids are not yet a priority specialization area, the high level

[11] http://www.eliko.ee/smartstreet/
[12] https://smartencity.eu/
[13] https://elering.ee/en/connecting-smart-grid-platform

of digitalisation of the Estonian economy and the overall positive climate for innovation in the country are encouraging drivers for smart grid deployment.

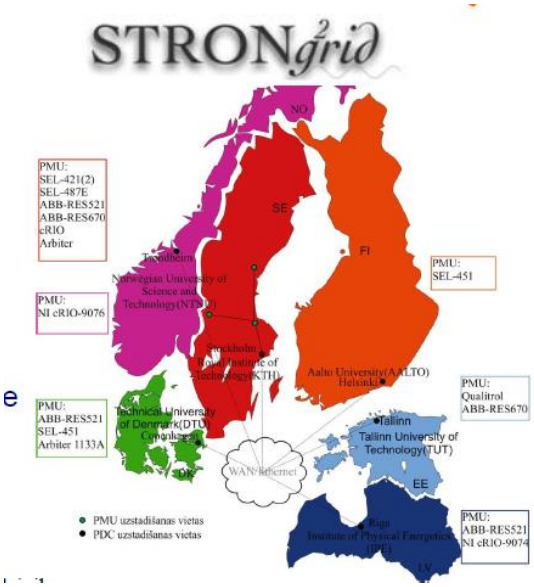
**European Integrated Research Programme on smart grids**, *Irina Oleinikova* (Institute of Physical Energetics, Latvia)

The presentation introduced the smart grid research activities at the Institute of Physical Energetics that specifically focus on smart metering, demand side management, e-mobility, prosumer, and electricity market design, taking into account the power system development perspective.

National and regional initiatives on smart grids have been established since 2014 through the Smart Grids Latvia National Smart Grid Platform. The platform mission is to bring together utilities, industries, universities and research centres and all stakeholders related to smart grids in Latvia to collaborate, facilitate smart meter roll-out programs through knowledge transfer and to promote the diffusion of smart grid technologies among electricity consumers to enable them to choose services that meet their needs.

Among the many R&D activities discussed by the presentation, the STRONgrid[14] project in particular (Figure 10) was presented as a success story. This is a project financed by the Nordic Energy Research that involves several partners in the Baltic region. This project seeks to develop better tools to address the increasing need to move electricity across national borders. More interconnected electricity grids in both the Nordic region and Europe are seen as an important facilitator of more sustainable energy systems, and international cooperation is critical in achieving this vision. The project seeks not only to create R&D knowledge, but also to create infrastructure and to attract new people and also students to the project. The projects provided very interesting results and concrete case studies, such as the Latvian and Estonian interconnection lines.

Figure 10: STRONgrid Project




The presentation also stressed the need for increased research cooperation not only among Baltic countries but also at European level. As an example of such cooperation the presentation introduced the Electra IRP Project. The ELECTRA Integrated Research Programme on Smart Grids brings together the partners of the EERA Joint Programme on Smart Grids to reinforce and accelerate Europe's medium to long term research cooperation in this area and to drive a closer integration of the research programmes of the participating organisations and of the related national programmes. It also aims at supporting coordination and support activities (CSA) at European and extra-EU level.

[14] https://ses.jrc.ec.europa.eu/strongrid

**Recent and ongoing research projects related to smart grids**, *Oskars Krievs, Diana Zalostiba* and *Dagnija Blumberga* (Riga Technical University)

The presentation by the Riga Technical University gave an overview of the R&D projects carried out by the University in the field of smart grids. Most of the presented projects received funding under the EU Research Framework Programmes for Research and Innovation (FP6, FP7and H2020). The University also serves as a demonstration facility for some of them.

A very interesting project for which the University serves as test bench is the AREUS project - Automation and Robotics for European Sustainable Manufacturing. The project aims to demonstrate new functions of electrical energy exchange. The core idea is the utilization of direct current (DC) energy transfer link, enabling the smart utilization of energy storage technologies and the integration of renewable energy sources close to the final energy consumers. The Workshop included a visit to the demonstration facilities.

## 2.3 Session 3: Smart grids implementation in the Baltic region: lessons learned and future opportunities

**Smart grid data in the client side experience. Future data applications**, *Janis Šipkovs* (ISO Ltd, Energodata project, Latvia)

The presentation introduced the Energodata project, a demand side management project dedicated mainly to the commercial sector (mostly retailers, some factories and office buildings).

Smart grid technologies have made it easy to access customer data and manage their consumption. Obstacles and challenges to the diffusion of commercial demand side management solutions, however, still remain. The Energodata project has highlighted that customer engagement is one of the main problems. Customers seem to get lazy after an initial period of interest. They want to be advised on the right behaviour to take without being bothered with the technicalities. They do not want to spend too much time interpreting data and making decision but they want the energy management solution to make a decision for them. Automation is therefore key for successful energy management at least in the small industrial and commercial sectors.

The solution developed by Energodata is already available to the market and has not received any funding. The company is now working on an application for the residential sector, where many opportunities are offered by retrofitting projects. For successful retrofitting applications however, other data are necessary, e.g. indoor climate, CO2 emissions, inside and outside temperature, humidity etc.

The project has also highlighted that data privacy and security are not seen as main concerns unless problems arise. In the future however, they are going to become more and more important. Several actors are entering the demand side management business in Latvia. Many of them, ESCOs in particular, are still struggling to enter the market as energy is still very cheap in the country.

**Estfeed data sharing platform as facilitator of demand-side related services**, *Kalle Kukk* (Elering, Estonia)

The presentation provided an overview of the Estfeed data-sharing platform developed by Elering, the Estonian electricity and gas transmission system operator (TSO). The project started three years ago as a small R&D initiative. Estfeed brings together data sources and applications. Data sources range from electricity, gas and district heating smart meter readings to weather forecast and energy day-ahead prices. It can also include consumption information from individual devices in industry, offices, households, etc. Estfeed is a portal that gives developers a chance to access this information flow. By interpreting and combining data they can create useful applications for themselves or their customers (end consumers). The aim of the applications is to create efficiency, either for cost optimization or for end consumers.

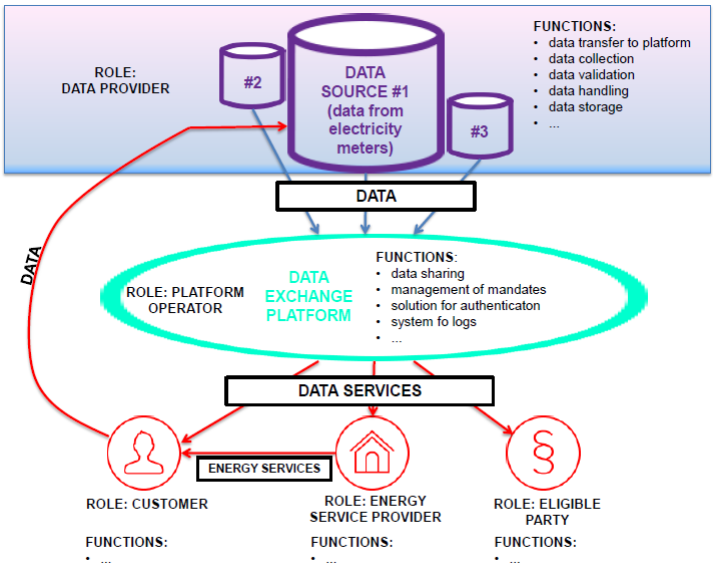
Elering decided not to develop a new platform but it got a free licence from the Estonian government to use a platform owned and managed by the government, which connects all the public services in Estonia. Estfeed is therefore an integrated part of the Estonian public information exchange platform called X-Road (Figure 11). This means high security standards as X-Road is a secure platform containing all sort of data and personal information. A central platform also means better economics for the society. Thanks to the use of this platform users also have access to all the existing databases. This information is also freely usable by any third platform. It's a one stop shop. The same communication protocol is used for all exchanges. X-Road enables access to all kind of public data sources which may be of relevance for the developers of Estfeed applications.

Elering, as neutral party, is well placed to provide data sharing services to the public in a reliable and independent way. It translates the TSO role into something new: Elering is the smart energy system operator and Estfeed is the tool for realizing the smart grid. Estfeed is not about storing the data and not about providing a service to the market but it's about facilitating the provision of services to the market.

Estfeed is not the only data sharing platform in Europe, other platforms already exist. In some cases the platform is operated by the TSO, in some others by the distribution system operator (DSO), in others by third parties. Data sharing platforms should comply with a set of core minimum functionalities: they should share metering data (consumption and generation); they should serve the whole country and not only one or few DSO; data should be made available at least with hourly resolution (where smart meters exist) with the time lag of one day; everyone (including the customer) should have access to the data; customers should be enabled to authorise third parties (e.g. DSOs or aggregators) to access their data. Several platforms in Europe are in line with these minimum requirements.

Elering's intention is to launch the Estfeed platform together with the customer portal in January 2018. Elering will not look at the data, it will only ensure that the consent given by the owner is valid and it will keep logs of data movements. The platform does not apply fees, not even to commercial partners. It will be financed through transmission tariffs. The only cost third parties will have is the cost associated with creating an interface with the system. The expectation is that Estfeed will help third parties, especially aggregators, to enter the business.

Figure 11: Estfeed datasharing platform

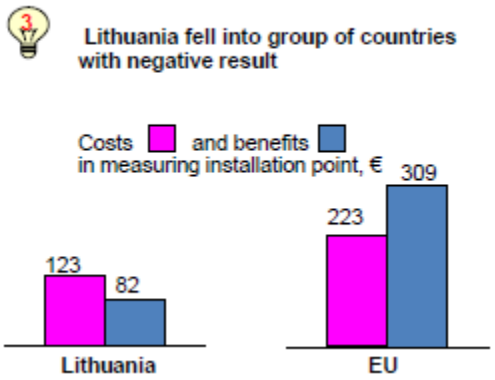


**Smart grid development in Lithuania**, *Arturas Klementavicius* (Lithuanian Energy Institute)

The use of smart technologies for the management of the electricity distribution network and the provision of services to final consumers is currently underdeveloped in Lithuania, compared to other EU Member States. Remote meter reading technology is used only by some large business customers; grid management automation is fragmented, used only in isolated grid zones. Lithuania will seek to invest in smart electricity distribution network management technologies that allow offering new services to consumers and facilitate their active participation in the electricity market (distributed generation, demand-side management, energy storage, etc.), and enable a more efficient and smooth grid management.

Projects are being conducted in all smart grid domains to test new technologies and to deploy commercial solutions, particularly in the smart network management domain. Regarding smart meters, there is a current demonstration project whose aim is to justify the smart metering roll-out in Lithuania after negative results of the cost benefit analysis conducted in 2012 (Figure 12). The project will provide Lithuanian residents with 3,000 smart meters.

Figure 12: Smart metering roll-out CBA 2012



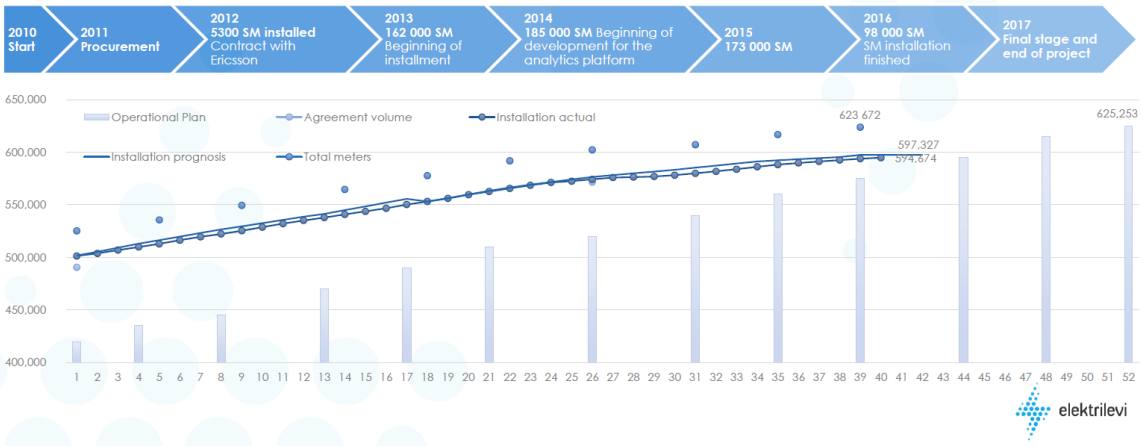

**Smart metering projects and new analytics in grid operations**, *Heikki Kolk* (Elektrilevi, Estonia)

The presentation introduced a case study carried out by Elektrilevi - the main Estonian DSO - on what the DSO can do with the data provided by the smart meter. Digital network technology can provide a great help to DSOs; the main goal of introducing such innovation is to optimise the business processes, automating it and doing more work remotely; it can also help developing new customer services and business streams.

There are indeed two ways to harvest the value from the data received from the meters and sensors installed in the network. They can be used to come up with ideas for new business and services, but also to improve business processes, thus improving the quality of services to customers. This can help keeping the tariffs down in an era when the expectations from customers are constantly rising, and at the same time the amount of renewables installed in the network makes it harder to manage the network efficiently while providing all the services that are expected from a modern DSO.

The opportunity to start the case study introduced by the presentation arose when a new law was passed mandating every DSO to install remotely readable meters for each customer in Estonia. The roll-out started in 2010 and it will be completed at the end of 2017 (**Figure 13**). The procurement was won by Erikson that installed almost 200.000 meters per year. The new grid visibility gave Elektrilevi a lot of potential to manage the grid better.

Figure 13: Metering Project




A lot of Elektrilevi's network is affected by strong winds, falling trees and so on; there is a lot of difference between urban areas where there are cable networks and rural areas where there are overhead lines. The system average interruption duration per customer in rural areas is 1800 minutes of outage per year, almost 3 hours per month per average customer. The smart metering project was one way to address this problem.

A first difficulty was posed already in the early stages of the project by the communication technology chosen for the smart meters, i.e. the power line communication (PLC). The PLC meters send the information to the central system via the power line so if there is no connection with the customer (outage) it means the meters do not have a communication line (the meters cannot send the information that there is no power). The possibility of deducing this information from the communication between the data concentrator and the smart meter was investigated but, after a few tests this solution was abandoned as it was clear that there were also other problems why the concentrator cannot communicate well with the meters.

In the end, the solution was offered by an analytics platform where all data were collected. The platform visualised the low voltage grid and showed that there were many more outage events than reported. All the over and under voltage events from the smart meters (voltage level going over or under 10% than the 230 volts from the socket) were investigated showing that more than half of the cases could be fixed right away. The main cause for the non-conformant voltage was aging equipment; the increased visibility from smart meters data allowed predictive maintenance and helped improving the quality of service for customers.

The analytics platform can also help to fix problems just before they manifests themselves, thus reducing the outage time. There was a case years ago when a small mistake by the contractor caused 10 substations to burn down; with this system in place the mistake could have been found and fixed it before the substations burned down, thus avoiding unnecessary losses. Planned outages is the holy grail of condition-based maintenance.

The system can also help with cases where the voltage level is not correct on the customer side as it allows to see it instead of calculating it. The current goal is to use this kind of tool in investment planning in rural areas low voltage network, so that investments are targeted to places where there is a real problem.

Finally, the case study also highlighted that there is a big difference in how data can be approached. So far, for network reliability analysis, Elektrilevi had used analytical models, i.e. an algorithm that takes in more 200.000 parameters to predict the condition of the network, the location of the weak spots and what should be fixed first. It took Elektrilevi more than two years to figure out the exact numbers for those parameters and another 2/3 years to see the first benefits of the algorithm. Theoretic model driven approaches require a lot of engineering work to figure out how this algorithm can be

applied to a given network. With the new platform Elektrilevi is now trying to implement the observation driven approach, where the main effort is made by IT personnel; they are given all the smart meter and network information and clues about how engineers interpret the data and make their decisions. In the future, the aim is to minimise the effort required to implement the new algorithms in new distribution networks. Artificial intelligence (AI) could be of great help: machine learning algorithms use, in particular, could be a very interesting development. The objective is to develop an algorithm that takes in whatever data a DSO has about the network and observe the decisions that the engineers make based on those data and learns from it; in this way the same algorithm could be used for different networks without requiring a long customization process. There is a need to research machine learning algorithms that every company in Europe can benefit from.

In conclusion, the case study showed that every process benefits from the analytics based on smart meter data; they enable strategic management, better services for the customers, targeted investments, planned outages etc.. It also showed that there is a way to discover and unlock the value in the data without knowing the analytical model behind it.

## 2.4 Session 4: Strengthening cooperation in the Baltic region

**Smart city of Riga**, *Timurs Safiulinis* (Riga Energy Agency)

Cities are the place where sustainable development can really start; they can become the centre for innovation, smart technologies and lighthouse projects. Riga is committed to become an economically and environmentally sustainable city and it is working hard in this direction. Riga is the largest city across the Baltic States and the first one to have signed the Covenant of Mayors to reduce CO2 emissions already in early 2007.

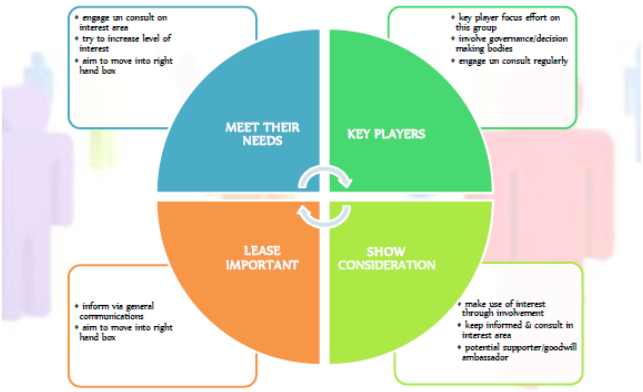
The Sustainable Energy Action Plan (SEAP) for the city of Riga includes an initial review of CO2 emissions for the period 1990 – 2012 and projections for 2020; measures for reducing energy consumption and capturing renewable energy sources in the administrative territory of the Riga city; criteria for assessing progress towards the goals of the smart city SEAP.

In 2014, the city reached the objectives set for 2020 and decided to define new and more ambitious goals. The plan is to transform Riga into a smart city but it was soon realized that there is no common definition of what a smart city is at European level. Smart cities are complex infrastructures: they should be sustainable, resilient and inclusive of different groups of stakeholders. Cities should provide opportunities to live in a more environmentally and economically sustainable environment to a variety of stakeholders (citizens, companies, industrial partners, etc), whose involvement is necessary to build a smart city (Figure 14).

Smart management is important to set the right objectives and define a sound implementation strategy. An innovative approach is needed to build an open economy that enhances the expert capacity of local markets and local SMEs.

Cooperation is key to reach these objectives, not only between academia, industry and local governments but also at international level. Knowledge sharing is of pivotal importance to build a smart city: in this field it should be all about cooperation and not competition.

Figure 14: Stakeholders involvement




**Transnational digital collaboration in the Baltic region**, *Torben Aaberg* (Baltic Development Forum)

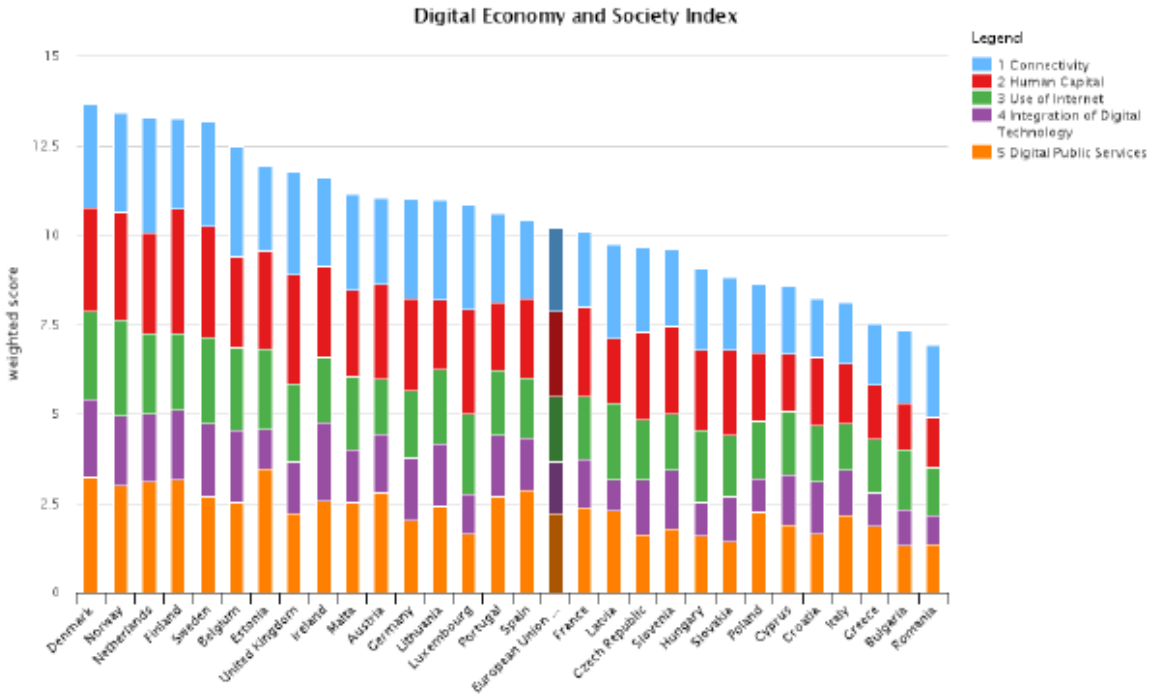
The Baltic Development Forum is a think tank that analyses certain aspect of the digital economy in the Baltic region. It aims to facilitate private public dialogue and to support the European digitalization process. Creating a digital single market is a very wide goal that encompasses many economic sectors. Even though the scope of the Forum is not sector specific but cross-sector, there is great interest for the diffusion of information and communication technologies (ICT) in the energy field.

Cross border collaboration is of fundamental importance to maintain a leading position in digital technologies at international level. In the digital agenda scoreboard (figure 15), Nordic countries are at the top together with Estonia, but they are moving down the rankings in many regards. There is a lot of competition coming from countries outside the EU and European countries should cooperate more and look at what their neighbours are doing to learn more from each other. Cross border collaboration is still low. For example, many countries in the Baltic region have developed very advanced digital signature solutions, but they do not work across the borders. Increased international collaboration is of fundamental importance as it would also help economic development and growth.

In the Baltic area there is a great potential for a regional digital single market that would benefit from increased international collaboration and improved mobility in the labour market. In an area characterised by mostly relatively small countries, it could be easy to support and complement the European process and proceed faster in the digitalization process.

Energy could be a field with a strong potential for digital collaboration in the near future. Many EU countries are involved in investments in smart grids and smart cities and knowledge sharing and dissemination of best practices can help to speed up the process.

Figure 15: Digital Agenda Scoreboard - DSI Index[15]




**Smart grid projects of common interest**, *Julija Vasiljevska* (JRC)

The presentation introduced the projects of common interest (PCIs)[16] as key energy infrastructure projects essential for completing the European internal energy market and for reaching the EU's energy policy objectives of affordable, secure and sustainable energy.

PCIs may benefit from accelerated planning and permit granting, a single national authority for obtaining permits, improved regulatory conditions, lower administrative costs due to streamlined environmental assessment processes, increased public participation via consultations and increased visibility to investors.

PCIs may be entitled, under specific conditions, to Union financial assistance under the Connecting Europe Facility (CEF) from 2014-2020[17], intended to speed-up the projects and attract private investors. To be eligible to become a PCI, a project must have a significant impact on the energy markets and market integration of at least two EU countries, boost competition on energy markets and boost the EU's energy security by diversifying sources, and contribute to the EU's climate and energy goals by integrating renewables.

The EC has identified "smart grids" as one of its 12 priority infrastructure corridors and thematic areas in the TEN-E Regulation. The evaluation of project proposals is based on eligibility criteria (Figure 16), economic viability and cost-effectiveness and project contribution to policy criteria[18].

[15] European Commission, digital scoreboard
[16] https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest
[17] https://ec.europa.eu/inea/connecting-europe-facility/cef-energy
[18] https://ec.europa.eu/energy/en/smart-grid-projects-common-interest

Figure 16: Compliance with eligibility requirements

| Evaluation of the project set-up | | | |
|---|---|---|---|
| Necessity for the SG thematic area | The project meets ANY of the following criteria | | |
| | a. Involves at least two MS by *directly crossing a border* of two or more MS | b. Is located on the territory of one MS and has a *significant cross-border impact* | c. *Crosses the border* of at least one MS and a EEA country |

While several projects in the region are approved as Projects of Common Interest within the priority electricity corridor BEMIP[19] with commissioning date planned in the coming years, there are currently no PCIs considered under the Smart Grid thematic area. In this regard, the JRC intervention served the purpose to inform about the possibility, conditions and benefits of a project becoming a smart grid PCI and provide guidelines for preparing a project application for the next PCI call.

[19] http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/main.html

# 3 Conclusions, lessons learned and future challenges

The workshop "Smart Baltic", hold by the JRC in Riga on 14th and 15th November 2016, represented a successful occasion to exchange experiences on smart grid project development under the EU research & development and innovation policy.

The presence of different stakeholders belonging to local governments, academia and the business sector made it possible to present different points of view and to discuss ways to foster the transition to an innovative, smart and inclusive energy system. The main findings arising from the discussions during the two-day workshop mainly regarded two aspects.

The first one is the need for national/local authorities to take the lead for the formulation and implementation of the strategy on the territory, taking into consideration the local context and the possibility of regional cooperation. Lighthouse projects can work as example, lead the way for other projects and have a high regional impact. Greater coordination within the Baltic Sea region and consistent funding strategies are however needed. Cities are the place where sustainable development can really start; they can become the centre for innovation, smart technologies and lighthouse projects. Supporting local stakeholders and providing opportunities for them to learn and grow can also help developing a local innovative supply chain. Strengthening collaboration between different actors and sharing successful national experiences seems to be of paramount importance to support this process.

Another finding is that the diffusion of smart meters in the Baltic area is helping the adoption of innovative solutions to provide new services to consumers, facilitate their active participation in the electricity market and enable a more efficient and smooth grid management. Smart meter data can be of particular value to DSOs, as they can be used to come up with new business and services, but also to improve business processes, thus improving the quality of services to customers. This can help keeping the tariffs down in an era when the expectations from customers are constantly rising, and at the same time the amount of renewables installed in the network makes it harder to manage the network efficiently while providing all the services that are expected from a modern DSO. In this context, the Estonian data sharing platform Estfeed is a very interesting example of how smart meter data can facilitate the provision of services to the market.

In conclusion, smart grid development in the Baltic area shows a different path and pace in each country, but many commonalities can also be observed. Strengthening international collaboration between different actors and sharing successful national experiences seems to be of paramount importance to advance the deployment of smart grids.

## List of abbreviations and definitions

| | |
|---|---|
| BEMIP | Baltic Energy Market Interconnection Plan |
| CEF | Connecting Europe Facility |
| CSA | Collaboration and Support Action |
| DSO | Distribution System Operator |
| EERA | European Energy Research Alliance |
| ESCO | Energy Service Company |
| EUSBSR | EU Strategy for Baltic Sea Region |
| PCI | Project of Common Interest |
| S3 | Smart Specialization Strategy |
| TSO | Transmission System Operator |

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doi:10.2760/479938

ISBN 978-92-79-76901-6