

## Newsletter #6 – October 2021





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# **Editorial**

## SHAKTI, the Indian demonstration

Welcome to IElectrix 6<sup>th</sup> Newsletter!

We at Tata Power-DDL are glad to have the opportunity to be a part of the smart grid IElectrix demonstration named as SHAKTI. The system includes a battery energy storage system, a smart transformer, an LV ECC switchboard, and a set of digitalization software. This demonstration has received funding from the European Union's H2020 research and innovation program as part of the IElectrix project.

The objective of this project is to build a Flexible and Smart Microgrid to address current challenges of the energy transition, such as integrating renewable energy sources into the network by connecting local energy communities. With 200 kW of rooftop PV panels installed capacity, the SHAKTI will also contribute to the India's target of 175 GW of renewable energy generation by 2022.

Within the framework, Indian Demonstration has specific goals such as Integration of local PV system, mobile storage system & smart substation, adapted demand-side management & customer engagement, managing Islanding capacity of the Microgrid in case of an outage. This will also encourage consumers to reduce their carbon footprint and contribute to the environment positively.



Abhinav Pal Technical Assistant to CEO (Tata Power DDL)

Annually, this project has potential to reduce approximately 150 Tons of CO2 emissions.

Key challenges for implementing the demonstration are: How to maximize the penetration of local energy in the LV grid, to increase the local consumption of renewable energy & improve the resilience of the local energy system. How to engage and enhance the involvement of the customers.

We are hopeful and proud to be a part of the consortium and to everyone who is supporting us to take it forward. We are looking forward to a fruitful association with the different teams on board. Currently, we are working as per the timeframe to install the equipment and later commission the project within the schedule and achieve our milestone.

Take care and stay tuned...





### **Hungarian demo inauguration**

### 1<sup>st</sup> September 2021 Zánka - Hungary

The 1<sup>st</sup> of September this year was special not only because school started for elementary and high school students. It was also the kick-off day of HELGA's second energy storage, which took place in the quaint town of Zánka. This event was memorable for two reasons.

Firstly,after a year and a half, the members of the international technical committee of the IElectrix project were finally able to meet in person. Secondly, the extreme windy weather will also make us talk about the event for a long time. Speeches were direct, personal and professional, as well as very motivating. It could be felt that all participants fully support the project for a more sustainable and green future.

After the opening speech, Attila Kiss, President and CEO of E.ON Hungária Group, presented the project and the reasons behind the investment: "E.ON is already reducing greenhouse gas emissions wherever it has a direct impact We have committed on processes. ourselves internationally and domestically to halve our emissions by 2030 and to be completely carbon neutral by 2050. The energy storage installed in the IElectrix project also supports these goals." excerpt of Attila Kiss's speech.

Miklós Filep, the Mayor of Zánka, was glad to cooperate with the IElectrix team and emphasized how important this project is for cities as well as to support sustainability. Furthermore, he drew attention to the vast land of area around Zánka where similar forward-looking projects could be implemented.

Mark Ritzmann, Managing Director of E.ON Group Innovation, shared the following statement: "Innovation is so simple. In the first place, it is not about money or brilliant technology. It is just about a problem and about people who want to solve it. IElectrix is a perfect example of such an innovation. Building a network that can deal with the millions of PV systems, e-mobility chargers and heat pumps that will be installed in the future will require a lot of time. [...] By implementing such a battery system we can speed up the energy transition and deliver a stable network."

Pierre-Jacques le Quellec, the IElectrix project coordinator, also spoke at the press event about the consortium and the role of E.ON: "Most important part of the project is coming now: Delivering of the demonstration results! Not only the European Commission awaits for the results of our work, but also the European regulators and most important at the end: the final customers and European citizens".

Bernadett Hanyecz





### Renewable Energy India Expo 2021 -Macaronight

### 15 – 17 September 2021 Online event

During the 14<sup>th</sup> edition of the Renewable Energy India Expo (REIE) which took place online, there was an EU Zone, supported by EU-India Clean Energy & Climate Partnership project. The EU Zone provided the possibility for European business associations, European projects and possibly some European companies to present their work and activities in India.



Figure 1 - IElectrix' virtual booth at REIE

IElectrix took part to this event alongside other H2020 projects and had its own virtual booth in the EU Zone, where videos, pictures and brochures on the project were displayed.

### 24 September 2021 Online event

This September 24<sup>th</sup> was held a Researchers Night for some of the EU's outermost regions (Canary islands, Madeira, Azores and Cap Verde). This year the central theme was the EU Green Deal. All kinds of activities were proposed for the occasion such as the EU Corner exhibition where IElectrix was part of.



MacaroNight 2021 is an initiative framed in the "European Researchers' Night" since 2018 that aims to disseminate the research activity conducted in European universities and R&D centers, as well as to promote scientific vocations among young people.Thus, the EU Corner was sent to all Macaronesian schools.

This year were present more than 50 European projects including IElectrix project that are contributing to the European Green Deal. The areas covered by these projects are vast and include the energy sector, fisheries, mining, tourism, urban planning and many other sectors where sustainable initiatives can be implemented.







### **Sustainable Places**

### **29 September 2021** Hybrid event – Roma, Italy

The sustainable Places is an annual evenement where new innovative ways of designing and managing the environment in which we live in are presented. The main purpose is to reach the sustainability targets and climate change objectives.

In a context of sustainable development the European and where Union maximize their implication for making a greener Europe, they have released an important European regulation, the Clean Energy for All Europeans Package in 2019. They started to fund realities projects on of energy communities and local energy networks integrating smart energy systems.

Four demonstration projects funded by the European Commission - MUSE GRIDS, COMPILE, MERLON and **IELECTRIX** - are working on strategies maximize impact of energy to communities, studying different contexts and energy system setups. Their tangible experience in physical and/or virtual demo sites provides valuable suggestions and ideas on technical and non-technical tools that can support local energy networks and energy communities in Europe.



IElectrix project through one of their partners, Tanguy Choné from Odit-e has presented an innovative solution for the Indian demonstration. A low voltage network digital twin model built from smart meters measurements. This empirical model reproduces the exact behaviour of the LV grid without any network components information such cables types/length, as network topology, or GIS.



Newsletter #6 October 2021





EXTENDED PROGRAMME 11-22 OCTOBER TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM

#EUSEW2021

### **EU Sustainable Energy Week 2021**

### 18 October 2021 Online event

Like last year, IElectrix was present at the 16<sup>th</sup> EU Sustainable Energy Week 2021 (EUSEW 2021) extented programme which virtually took place from 11 to 22 October 2021. EUSEW is an annual conference organised by the European Commission on renewables and efficient energy in Europe. This year theme was "Towards 2030: Reshaping the European Energy System".

On the 15<sup>th</sup> of October, along with other H2020 projects, some of IElectrix members participated in a session on "Energy Storage Systems: Key players for the European Energy Transition". The aim of the session was to understand how Energy Storage Systems can help the EU to reach its sustainability targets through concrete use cases and boosting the use of Renewable Energy Sources.

Pierre-Jacques Le Quellec, IElectrix project coordinator shared to all participants the progress made on the demonstration from last year and the lessons that the consortium have learned during the progress of the project. The german and hungarian Batteries Energy Storage System (BESS) are in place and operational. While the indian and austrian BESS are being installed and will be soon operational. Our project coordinator gave also some issues that the project faced. IElectrix is the first H2020 project implementing a BESS in India, part of the SHAKTI demonstration. Implementing a BESS in India proved to be quite a challenge, with very high import cost to import a BESS manufactured in Europe to India. In EU, the european demonstrations showed that many member states have not yet defined the regulatory framework for the operation of storage systems, the service they can offer and the rules for connecting them to the network.

Next year will probably be the last EUSEW for IElectrix project as the end of the project is scheduled for october 2022 and will be about the end results of all the demonstrations.

#### YouTube link to the workshop:

https://www.youtube.com/watch?v=foQ DF3Y08\_4



Newsletter #6 October 2021





HELGA Demo in Hungary led by E.on EED

The BESS at Dúzs has been installed, and a press event was held on the 1<sup>st</sup> of September. You can find a report with details on that event in this newsletter.

For a long time, the Technical Committee team could meet in person and now for the first time in Hungary.

In addition to HELGA energy management system and direct load control module development, we have started working on another IT solution: publicly accessible energy management interface. With this solution we can support our customers to use energy consciously.

#### Moew.e Demo in Germany led by E.DIS

The preliminary results on the impact of the battery on the first technical use case, the congestion and voltage management, in the distribution grid were published in the third report submitted to the EC on August 2021. These results are derived from several field tests and KPI simulations.

In order to prove the influence of the battery storage system on the second technical use case, the network stability, RTWH Aachen developed a battery control concept to supply virtual inertia for the grid and an algorithm for online calculation of the grid inertia. Take a look at the deep dive section for more information about this work.

#### Strom Güssing Demo in Austria led by FIB (Wirtschaftsagentur Burgenland Forschungs und Innovations GmbH)

During the most recent weeks the delivery, installation and commissioning of a BESS took place in Güssing. This is now followed by the data and measurement integration activities in order to be prepared for the demonstration phase.

In parallel to the BESS activities also the onsite installation of equipment at the prosumers participating in the Demand Response demonstration at the Austrian Demo site is progressing. A dedicated workshop is set up, in order to facilitate a discussion with the participants on the concept of the demonstration. By including their feedback and applying improvements to the concept, the demonstration phase will lead to an even more meaningful outcome.

#### SHAKTI

#### Demo in India led by Enedis

Civil works on the site are now finished. The construction of а battery shed, the refurbishment of the transformer and switchboard rooms have been well completed. TPDDL team has started the electrical connections of the main demo equipment. The engineering works are currently ongoing at site to prepare the required telecommunication links and IT prerequisite. European partners will come in Delhi in mid-November to initiate with TPDDL the commissioning phase at the demo site.

The inauguration of the demo is scheduled for the end of February 2022.

Newsletter #6 October 2021



### Focus: Moew.e

### Deepdive: virtual inertia

With the penetration of the RES in today's power grid, the system lacks inertia provided by the conventional generators synchronous (SGs). Recently, SGs are being replaced by the power-electronic driven converters to connect the RES and, thus, RESs interface with the grid through those converters. In contrast to SGs, those converters do not have inherent inertia, for instance, PV systems do not have any mechanical energy and wind turbines are fully decoupled from the grid.

Inertia in general is the resistance of a moving system when subjected to a change of its state of motion. The inertia in power systems plays a crucial role in the frequency control due to the kinetic energy stored in the rotating masses of synchronous generators to compensate the imbalance represented by the difference between the output power and the load. Therefore, substituting inertia in the power grid is required. RWTH Aachen Recently, in cooperation with E.DIS developed two different approaches namely, Linear Quadratic Regulator (LQR) and Linear Quadratic Integral (LQI), to introduce virtual inertia control strategies in the power system by utilizing a Battery

Energy System (BESS). These control strategies mimic the behavior of the SG by absorbing or releasing power from the BESS.

The approaches were validated by means of simulation and compared to the traditional open-loop Virtual Synchronous Machine (VSM) model. Nevertheless, the frequency control in the legacy power system is performed completely by the TSO. In contrast, introducing the virtual inertia require the participation of DSO to maintain the system stability in future with the presence of RES. Furthermore, the performance of the proposed concepts was evaluated in different case studies, namely:

- Tracking power reference
- Islanding of Friedland MV
  network
- Islanding of Hagedornstrasse LV network

The results of the simulation are illustrated in Erreur ! Source du renvoi introuvable. for the scenario of islanding the MV network. The upper subplot shows the change in the inverter output power following islanding, whereby all controllers succeed in increasing their power to cover the load. However, regarding the frequency different controllers regulation, the





Figure 1: simulation results of islanding the MV network

For in-depth details about the different frequency controls strategies refer to (1).

Moreover, an algorithm was developed for estimation of the virtual inertia and damping by the BESS converter. The performance of the inertia estimator was also evaluated within the framework of IElectrix project.

(1) Nouti, Diala, Martina Josevski, and Antonello Monti. "Optimal Control for Improved Damping of Virtual Synchronous Machines." 2020 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe). IEEE, 2020.







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Mail us lelectrix.h2020@gmail.com



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