

# OSMOSE INSIGHTS

Project newsletter #5

NOVEMBER 2020

# OSMOSE

OPTIMAL SYSTEM-MIX OF FLEXIBILITY  
SOLUTIONS FOR EUROPEAN ELECTRICITY

## Editorial

*Dear partners and colleagues from the power system community,*

*By the end of 2020 OSMOSE will have completed its third year of project life. Significant progress on models and on-site equipment installation has been achieved and presented at the review with the EC and the General Assembly held in last September. The pandemic situation would only delay the demonstrations by a few months. By Q1 2021, all four demonstrators will be up and running, and some first experimental results available.*

*We are looking forward to sharing those results with you!*

*William Phung, RTE,  
OSMOSE Coordinator*

## Latest news in brief:

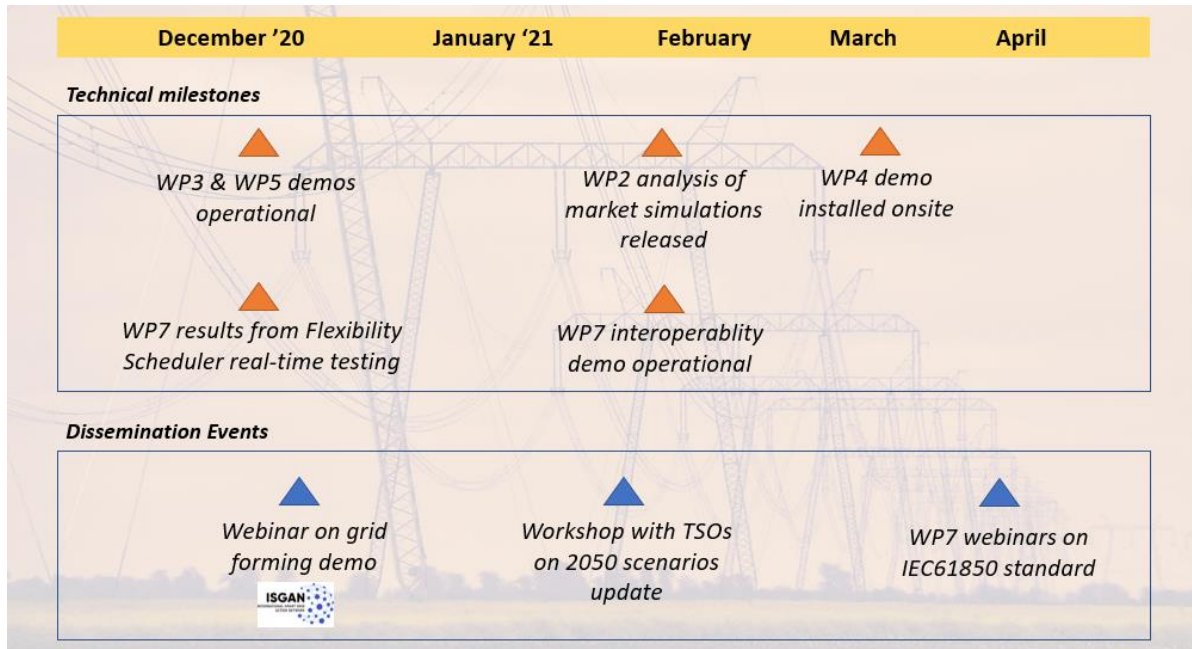
- WP3 demonstration on grid forming connected to the transmission network is installed on-site and will be operational by the end of November this year
- WP4 Hybrid Flexibility Device for multiple grid services will be containerised by December, for a full commissioning by March 2021
- WP5 demonstrator involving RES plants and industrial end-users will be up and running next month
- WP6 achieved its successful transition from development and implementation to demonstration phase
- OSMOSE held a panel session at the ISGT conference in October, and presented specific project results at CIGRE e-sessions and IEEE PES General Meeting in August

Next 6-  
months  
highlights

Update on  
Work package  
status

Upcoming  
events &  
publications

## Next 6-month highlights



## Update on work packages

### WP1 – Flexibility scenarios development

WP1 deals with the identification and quantification of flexibilities in three scenarios designed for the 2050-time horizon.

Valuable feedback was gathered from the consortium’s TSOs on the three scenarios 2050 produced by TUB, allowing further methodological improvements. A workshop will be organized in early 2021 to gather additional feedback from external TSOs, which will lead to an update of [Deliverable D1.1](#).

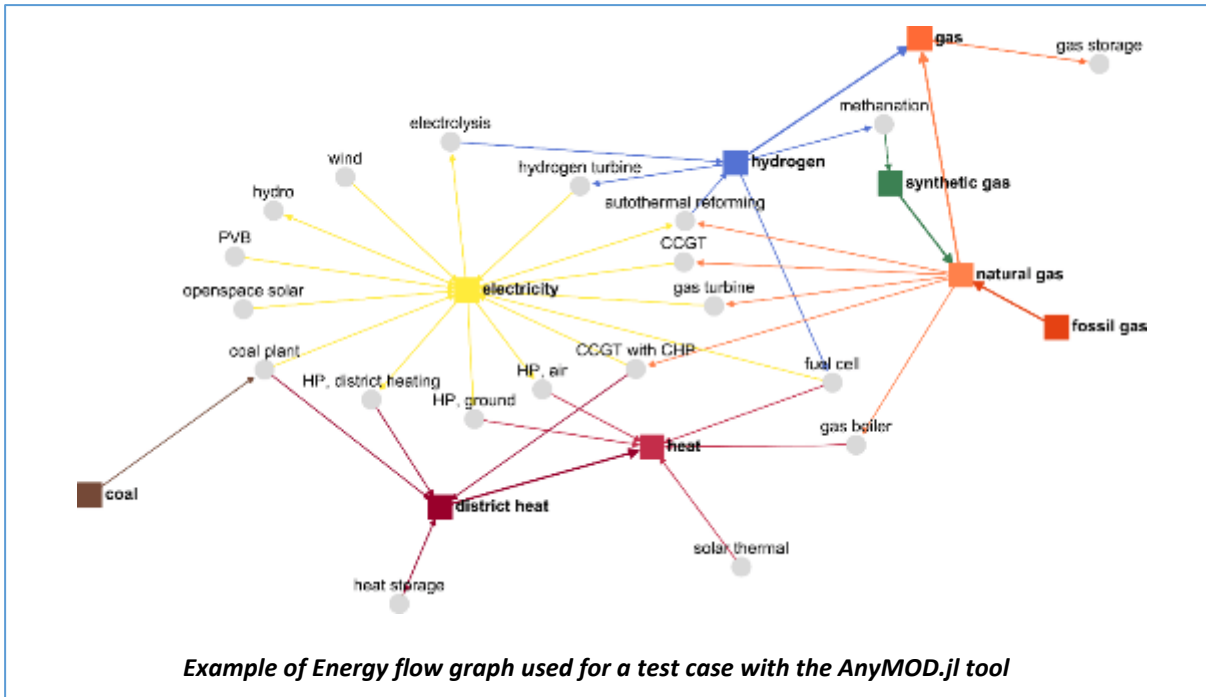
All three scenarios 2050 were simulated and assessed by RTE and EKC using the ANTADES tool (unit-commitment model) and additional time series will be produced using finetuned models and data.

They will serve as inputs to the more detailed simulations performed in Task 1.4 that will address the sizing and location of flexibility options, cross-border reserve exchange and network stability aspects. REN, ENSIEL and NESTER have prepared the routines and models for those upcoming simulations.

Finally, the AnyMOD.jl tool developed by TUB is now available open-source on [GitHub](#): addressing the challenges of modelling high levels of intermittent generation and sectoral integration, the tool provides a Julia framework to create large scale energy system models with multiple periods of capacity expansion formulated as linear optimization problems.



As next steps for 2021 the updates for the generated scenarios, taking into account the feedback and using the new AnyMOD.jl tool, will be calculated. The prepared detailed simulations will be performed.



## WP2 – Market design & regulation

WP2 aims at proposing some market designs and regulations that would best enable the optimal flexibility mixes assessed in WP1. Based on a survey conducted by UPD and NESTER, a set of candidate market designs was selected for analysis. Improved market simulators were then developed by UDE, RTE, and ENSIEL, to simulate those different market designs, notably nodal and zonal markets, at different geographical scopes, with a modelling of weather and generation uncertainties, and flexibility levers (Prometheus/Atlas and JMM/E2M2 tools). UDE, RTE, and ENSIEL are now performing the first simulations of both nodal and zonal markets. Most first simulations use one of the three scenarios of WP1 at the 2030 time horizon, with up to 860 nodes and 1700 lines and some of the flexibility levers, showing preliminary phenomenon on market prices. One simulation by RTE on the same scope uses data from other sources to model a nodal market on a small region of France. ENSIEL is currently providing direct input to the latter simulation: they already have applied their TSO-DSO interface model to this case, and they are now adapting it to the specificities of the region. The simulations will be completed by the beginning of next year and shared during a dedicated open session around February 2021. A list of 77 KPIs was consolidated by UPD as a comprehensive tool to analyze these simulations and assess the performance of each candidate market design. UPD also developed a comprehensive overview of existing and potential sources of revenues for flexibility providers, as an input to the ongoing assessment of the replicability and scalability potential of OSMOSE demonstrations (WP8).



### WP3 – Demo Grid Farming

WP3 includes two demonstrators aiming to increase the maturity of grid forming solutions, respectively on the campus of EPFL (720kVA BESS with Li-Titan battery) and at RTE 600-20kV substation (1000kVA BESS with supercapacitors and Li-ion battery).



The first demonstrator at EPFL premises is running from last May until December this year. The PMU installed inside the BESS container successfully enables to assess the impacts on the local frequency when the BESS control is set in Voltage Source Converter (VSC) mode. Experimental tests have been run to assess the evolution of the KPIs, and simulation tests on the 39-bus grid were carried out to assess the BESS response in different grid cases.

As for the second demonstrator at RTE substation, the Factory Acceptance Tests were successfully completed in last July. The full installation has been performed, grid connection included, and the site acceptance tests are close to completion. The demonstrator is planned to be operational by the end of November 2020.



Installation of the storage & control system at RTE substation

### WP4 – Demo Storage + FACTS for multi-services

The demonstrator to be installed at CENER grid-connected facilities will operate a Hybrid Flexibility Device (HFD) combining STATCOM, supercapacitors and 1500V DC Battery system. The integrated solution will provide different flexibility services (inertia emulation, frequency regulation, voltage control, ...). The engineering of the solution is completed, as well as the factory acceptance tests of the 0.5MWh/2MW Lithium-ion battery system. The modelling of the Hybrid Flexible Device and microgrid is ongoing for the development of the master control and its SCADA.



Simulations were conducted on the Lanzarote-Fuerteventura system to select optimal parameters for the HFD Device control system. GPTECH is currently working on the containerization and wiring of all power module components in the container, which should be completed by December this year. The overall demonstration is planned to be installed in-field by March 2021.

## WP5 – Demo Demand Response / DTR / wind farms controls

WP5 aims to demonstrate multiple grid services based on RES, demand response and grid devices coordinated through a smart management system. The demonstration is located in a HV grid portion in Apulia and Basilicata (South Italy), featuring a high occurrence of congestions and the presence of wind power plants and industrial loads. Seven industrial loads will participate for a total of ~ 121 MW of theoretical regulating capacity: the required upgrades are about to be completed in their respective premises. The same goes for the two wind parks involved and their storage facilities. On transmission side, sensors for Dynamic Thermal Rating were installed on seven 150kV lines, and some first measurements were acquired from the DTR sensor nodes. Complementarily, the master node was installed at TERNA substation. At software level, the zonal Energy Management system has been developed and first instances executed. TERNA’s system was adapted for the Z-EMS installation, and cybersecurity analysis conducted. The demonstrator will be in operation in the very next weeks.



## WP6 – Demo Near-real-time cross-border market

WP6 aim is to demonstrate a close-to-real-time optimization of generation, storage, demand & grid resources on the both sides of the Italian-Slovenian border. T).hree public deliverables were recently released which describe the software demonstration platform development, as well as the use case and Key Performance Indicators (KPIs) that will be used for the tests and monitoring of the impact related to the specific use cases(available on [this page](#)). The EN4M (Electricity Network For Market ) software package is now successfully installed into ELES IT business environment on a dedicated OSMOSE server where open loop tests are currently being performing. The flexibility providers ENEL, HDE, HSE will participate in the demonstration with either one flexibility unit or a portfolio of units. They have started installing and testing the bidding tool developed, which will provide inputs to the market optimization platform entitled FlexEnergy Market (FEM). The demonstration tests will be running until the beginning of the summer 2021.



## WP7 - Scaling up and replication

WP7 drafted a proposal of refinement to the IEC61850 engineering process to ease the specification, configuration and installation of intelligent electronic devices with optimal communication at electrical substations (deliverable [D7.1](#)). A related end-to-end interoperability demonstration has been prepared at Nester Laboratory and first tests were performed in third quarter of 2020. Results of this demonstration will lead to a series of recommendations to enhance the IEC61850 standard. Task 7.2 focuses on demonstrating the benefits of a coordinated exploitation of flexibility on DSOs grids taking into account TSO constraints. To that end, a Flexibility Scheduler software was developed, and the results of its laboratory real-time testing will be available by the beginning of 2021.



Task 7.3 developed a generic simulation-based method for the optimal sizing of Battery Energy Storage Systems (BESS) on two use cases (PV smoothing & peak shaving, and PV microgrid), and recommendations on the most influencing factors to consider for a BESS sizing procedure (deliverable [D7.5](#)). Next, a generic optimized multi-services control algorithm will be developed based on the flexibility needs addressed by the demonstrators of WP3 & WP4; its outputs will be compared with the ones of specific controls developed both demonstrators. Finally, CEA developed in T7.4 a database of feedback from BESS field-experiments, and data analytics tools to predict the remaining battery lifetime and estimate more accurately the performances of BESS as the round-trip efficiency. The next steps are the integration of on-fields BESS data from WP3 and WP4 demonstrators into the database, and the integration of the data analytic tools by other partners project partners.

## Highlight on publications

- Two papers by CEA (WP7) and RTE (WP3) are presented at the 10th International Workshop on Integration of Solar Power & Storage into Power Systems on November 5th
- A panel session was organised by OSMOSE at the ISGT Conference on October 27th, and a paper on WP6 was presented by RTE, ELES and EKC
- ENSIEL presented a paper on WP2 at European Energy Market Conference in September, and another one about WP5 with TERNA at AEIT International Annual Conference in October
- Technical University Berlin and RTE presented the project and WP1 results at the conference Energy Modelling Platform for Europe in October
- A paper by RTE is published in the Applied Energy December 2020 issue on “Quantifying power system flexibility provision”.

All presentations will be made available on the project website, and papers released on public repositories whenever the conference/ journal editorial policy allows it.

### Contribute to this newsletter's next issue!

Any news you would like to share with the OSMOSE consortium?  
Please write to Clémentine COUJARD: [clementine.coujard@dowel.eu](mailto:clementine.coujard@dowel.eu)  
We will be glad to promote your news on the project website and social media as well!



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