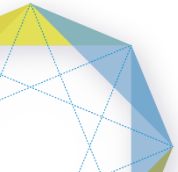
ETIP SNET

European Technology and Innovation Platform
Smart Networks for Energy Transition

12th ETIP SNET Regional Workshop
Parallel Session 2
Integrated Energy Networks: focus on storage

Integrated Energy Networks: focus on storage

WELCOME AND INTRODUCTION	- **Nikos Hatziargyriou** – ICCS - **Franco Di Persio** - CIRCE (ETIP SNET WG2)
99 SECOND PITCH	- **Gianluigi Migliavacca** – RSE (**FlexPlan project**) - **Jean-Jacques FRY** – Hydropower Europe Coordinator (**HYDROPOWER EUROPE project**) - **Nathalie Grisey** – RTE France (**Osmose project**) - **Shafi Khadem** – IERC (**StoreNet project**) - **Mia Ala-Juusela** – VTT Finland (**STORY project**)
PANEL DISCUSSION	
	- **Iñigo Azpiri Irazabal** – Iberdrola (**ETIP SNET Association Representative for Energy Storage technology and services providers**) - **Silvia Bodoardo** – Politecnico di Torino (**ETIP SNET WG2**) - **Georgios C. Christoforidis** – University of Western Macedonia (**ETIP SNET WG3**) - **Gianluigi Migliavacca** – RSE (**FlexPlan project**) - **Jean-Jacques FRY** – Hydropower Europe Coordinator (**HYDROPOWER EUROPE project**) - **Nathalie Grisey** – RTE France (**Osmose project**) - **Shafi Khadem** – IERC (**StoreNet project**) - **Mia Ala-Juusela** – VTT Finland (**STORY project**)



General organisation rules

- ***Switch off your microphone and Camera***
- ***Only Panellists and Moderators will have Camera and Microsoft on***

Questions & Answer session

- Please write your questions in the ***chat on TEAMS***

The entire workshop (including the parallel sessions) will be recorded !

accessing links

- They will be ***posted in the chat*** before each session change!

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Select Parallel Session 2 (Integrated Energy Networks: focus on storage) at the top left

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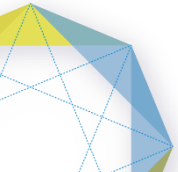
- *Which sector are you from?*
- *In which country is your company/organisation located?*
- *Which of the following research areas do you represent the most?*



99-Second Pitches

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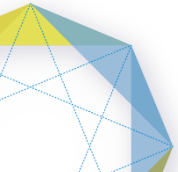

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FlexPlan project

The FlexPlan project

- **Start date: 01.10.2019**
- **End date: 30.09.2022**

… aims at establishing a new grid planning methodology considering the opportunity to introduce new storage and flexibility resources in electricity transmission and distribution grids as an alternative to building new grid elements.

- **Research Partners:**
  - **RSE**, Italy (Project Coordinator, WP7 and WP8 leader)
  - **EKC**, Serbia
  - **KU-Leuven**, Belgium (WP1 leader)
  - **N-SIDE**, Belgium (WP3 leader)
  - **R&D NESTER** Portugal (WP5 leader)
  - **SINTEF**, Norway (WP6 leader)
  - **TECNALIA**, Spain (WP2 leader)
  - **TU-Dortmund**, Germany (WP4 leader)
  - **VITO**, Belgium
- **Transmission System Operators:**
  - **TERNA**, Italy
    - **Terna Rete Italia** as Linked third Party
  - **REN**, Portugal
  - **ELES**, Slovenia
- **Distribution System Operators**
  - **ENEL** Global Infrastructure and Networks
    - **e-distribuzione** as Linked third Party

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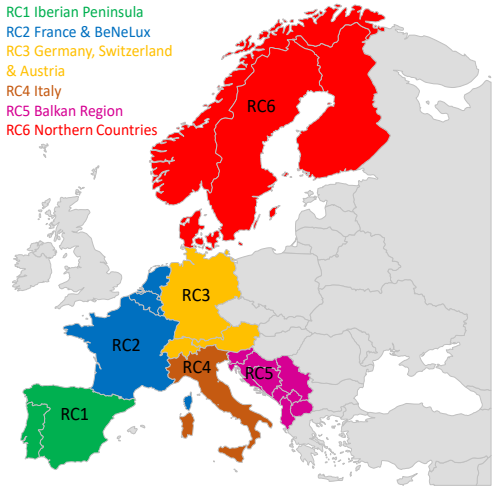
What FlexPlan will achieve

1 – New planning methodology - Creation of a new tool for optimizing T&D grid planning, considering the placement of flexibility elements located both in transmission and distribution networks as an alternative to traditional grid planning: in particular, storage, PEV, demand response)



2 – Scenario analysis 2030-40-50 - New methodology applied to analyse six regional grid planning scenarios at 2030-2040-2050. A pan-European scenario will deliver border conditions to initialize in a coherent way the 6 regional cases.

3 – Regulatory guidelines – FlexPlan goal is to provide:

- **an optimized planning methodology for the future usage of TSOs and DSOs**
- **indications on the potential role of flexibility and storage as a support of T&D planning**
- **guidelines for NRA for the adoption of opportune regulation.**

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HYDROPOWER EUROPE

Hydropower as catalyst for energy transition in Europe

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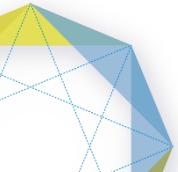
Our project and our deliverables

HYDROPOWER EUROPE is a 3 year Coordination and Support Action funded by the European Commission to develop a Research and Innovation Agenda (RIA) and Strategic Industry Roadmap (SIR).

- **The RIA identifies priority research themes covering all aspects of hydro generation**
- **The SIR identifies priority strategic actions for the industry to address**
- **Together, these provide a plan of action to support a greener, more efficient and effective role for hydropower in supporting the European Green Energy transition**



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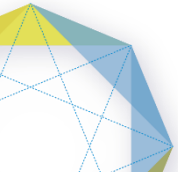
Our contribution to the Energy Transition

Our vision includes:

- Promotion of new environmentally friendly, **multipurpose hydropower schemes by using hidden potentia**l in existing infrastructures
- **Increasing the flexibility of generation** from hydropower plants by adaptation and **optimisation of infrastructure and equipment** combined with innovative solutions for the **mitigation of environmental impacts**
- **Increasing storage of existing dams** to help ensure flexible energy supply and support food and water supply (hence contributing to the Water-Energy-Food nexus and achievement of SDGs)
- **Strengthening flexibility of supply** from **pumped storage schemes**, developing innovative arrangements with existing water infrastructure



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OSMOSE project

OSMOSE : 3 storage demonstrators

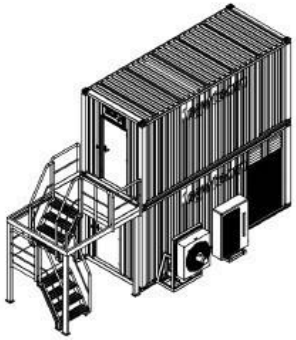

Figure 3.1: HESS layout

AC/DC	1000 kVA
Battery Li-ion	500 kW – 60 min
Supercapacitors	1000 kW – 10 s
Transformer	600 V – 20 kV

Ingeteam

Rte Le réseau de transport d'électricité

Objectives :

- ✓ Test the robustness and effectiveness of grid forming control in two real environments
- ✓ Assess multi-services compatibility
- ✓ Define DC power and energy management strategies
- ✓ Test the portability of the control strategies over different hardware platforms

Figure 2.1: The 720kVA/500 kWh grid-connected BESS installed at the EPFL campus

AC/DC	720 kVA
Battery Li-Titan	720 kW – 45 min
Transformer	300 V – 21 kV

EPFL

Battery Li-ion	2MW – 15min
Supercapacitors	800 kW
STATCOM	4 MVar
Transformer	1500 V – 20 kV

OSMOSE at a glance

- H2020 funded
- 27M€ budget
- 33 partners
- 9 countries
- 2018-2022

ULPGC GPTech SAFT CENER ADItech RED ELÉCTRICA DE ESPAÑA

Objectives :

- ✓ Define a Master Control to coordinate different flexibility solutions
- ✓ Design a new hybrid and modular storage solution offering multi-services
- ✓ Develop a lithium-ion battery connected at high voltage in DC (≥ 1 kV)

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OSMOSE : other works on storage

- Long-term studies on the “optimal mix of flexibilities” and the role of storage
- Optimized application-specific design and control of BESS
- Shared feedback database from field-experience of BESS

The project has received funding from the European Union’s Horizon 2020 research and innovation program under grant agreement No 773406

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StoreNet project

StoreNet

IERC
International Energy Research

- ✓ A Network of distributed ESS behind the meter, cloud based centralised (aggregated) control to form a VPP

Key exploitable results:

- ✓ Real life testing of integrated energy system (necessary hardware, software and ICT)
- ✓ Mitigation of peak demand (voltage profile improvement) and provide grid ancillary service (primary operating reserve)
- ✓ Developed new control approaches
  - Energy Arbitrage (EA)
  - Peak shaving (PS)
  - Load leveling (LL)
- ✓ Utility supplier concentrates on new demand profile, thus impact on their revenues.

- ✓ **TRL: 5 - 8**

Figure 1 StoreNet demonstration (located in the Dingle peninsula in the southwest of Ireland and controlled by the aggregator in Cork, southeast of Ireland) & partners role

Lessons learned and barriers:

- ➢ Regulation for ESS
- ➢ Funding mechanism
- ➢ Purchasing equipment
- ➢ ICT solution (net connectivity)
- ➢ Consumer engagement (especially in remote areas)

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Tyndall National Institute Institiúid Náisiúnta
Rialtas na hÉireann Government of Ireland
Tionscadal Éireann Project Ireland 2040
Ireland's European Structural and Investment Funds Programmes 2014-2020 Co-funded by the Irish Government and the European Union
European Union European Structural and Investment Funds
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StoreNet

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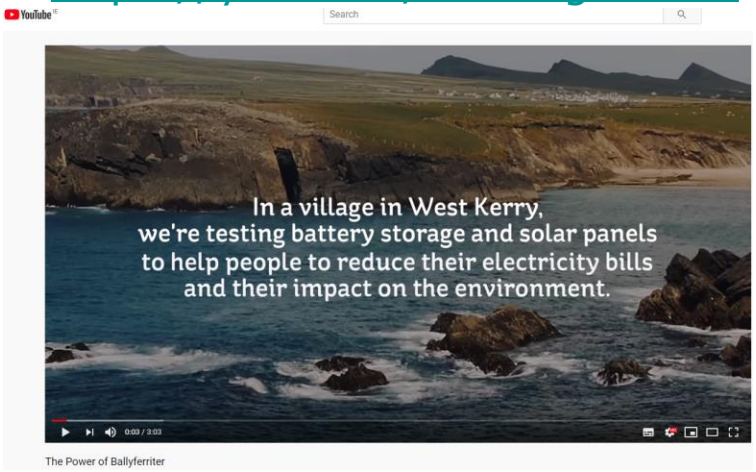
- ✓ A Network of distributed ESS behind the meter, cloud based centralised (aggregated) control to form a VPP

Deployment Prospects:

- ✓ The project serves as a proof of concept for delivery of grid services from residential assets (energy storage).
- ✓ We see it as an important demonstration to facilitate the development of a marketplace for such services in Ireland.
- ✓ It presents a real-world demonstration and verification of the functionality of VPP software solution, FlexiGrid.
- ✓ It is highly energy efficient and intelligent solution
- ✓ Highly prospective
- ✓ Highly Replicable

Real Impact:

- ➢ The Power of Ballyferriter https://youtu.be/bRAUngMPmos



Future R&I:

- ➢ Consumers interest on DSM participation
- ➢ Impact on Power quality
- ➢ Participation in P2P energy trading, from local to national/regional market

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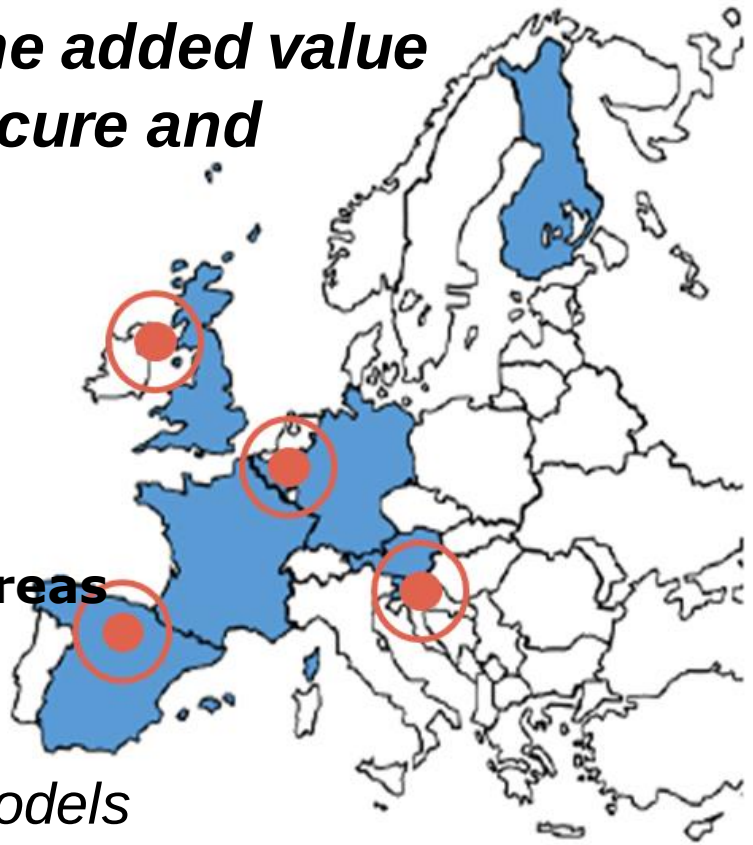
STORY project

STORY

The main objective was to show the added value storage can bring for a flexible, secure and sustainable energy system.



- *2015 - 2020*
- *18 partners from 8 countries*
- *Six demos in four countries:*
  - **Different sizes of storages and areas**
  - **Different types of areas**
  - **Different storage technologies**
- *Control algorithms, KPIs, business models*
- *Policy and regulatory recommendations*
- *Large scale simulations*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646426

Learnings

- *Market not really ready to provide the full products*
- *Interoperability issues need to be solved*
- *Lack of integrators on the market*
- *Business models are heavily dependent on the regulations*
- *Stability in the regulations is important*
- *Need of robust technology*
- *Technical, social and market issues are interrelated*
- *Environmental benefits only with important share of renewables in the grid.*

Animated images from the STORY ani

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Panel Discussion

Panellists

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HYDROPOWER EUROPE Project - ***Jean-Jacques FRY*** – *Hydropower Europe Coordinator*

Osmose project - ***Nathalie Grisey*** – *RTE France*

StoreNet Project - ***Shafi Khadem*** – *IERC*

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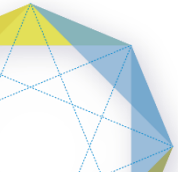
Moderators

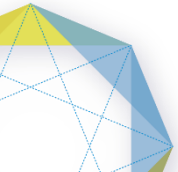
Nikos Hatziargyriou – *ICCS*

Franco Di Persio – *CIRCE (ETIP SNET WG2)*



Questions for the panellists

- *What are the main regulation, market and operational barriers for storage deployment?*
- *What is the size (large centralized storage plant, distributed storage (industrial and residential) and what are the technologies used (e.g. batteries, reverse hydros, thermal storage (hot water tanks, cooling systems), gas storage, liquid storage)*
- *What are the main functionalities of your storage project, e.g. frequency regulation, renewable energy balancing, load time shift, etc?*
- *Have you performed a Cost Benefits Analysis and a Life Cycle Assessment of the related Investments?*



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→ Parallel Session 2

In which storage technology is more R&I needed?

a) Reverse Hydro Plants
b) Batteries
c) Fuel Cells
d) Hot water tanks
e) storage for CO2-neutral or free gases and liquids
f) CAES
g) other

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→ Parallel Session 2

Where is R&I needed for the wide implementation of storage technologies? (more than one choices possible)

a) Technical (Models, algorithms, controllers, etc)
b) Regulation & Business Cases
c) Pilot Demonstrations
d) No more R&I needed

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Particular areas of R&I to exploit the flexibility of storage technologies? (more than one choices possible)

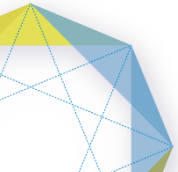
a) *Flexibility services to energy system operation by different storage systems, i.e. large storage plants, or aggregation of distributed storage devices (industrial and residential), or hybrid storage*

b) *Planning methods capable to appraise the potential of storage as an alternative to building new assets*

c) *Methods for optimal location, sizing and coordination of different forms and technologies of energy storage at different voltage levels in the power system*

d) *Tools to assess the cost/benefit balance and more generally to evaluate the economics of storage applications*

e) *Multicarrier hybrid storage systems including Conversion Technologies to investigate their economic benefits in comparison to single storage units*



Results from SLIDO

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Q&A

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Thank for your participation and attention!

Please attend the Plenary Session from 12:10-13:00.