PLAN.
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ETIP SNET
EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM
SMART NETWORKS FOR ENERGY TRANSITION

WG2:
Storage Technologies and Sector Interfaces

Madrid 2018

Carlos Arsuaga – CIRCE
WG2 co-chair

Agenda

1. WG2 scope

2. WG2 organisation

3. WG2 activities in 2018
    i. ETIP SNET Vision
    ii. Mission oriented objectives for the new framework programme (Horizon Europe)

4. WG2 activities in previous years
    i. H2020 Work Package 2018-2020 input
    ii. SET Plan Key Action 4
    iii. ETIP SNET Implementation Plan 2017-2020

5. Relevant topics for WG2

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WG2 scope

Name: **Storage Technologies and Sector Interfaces**

Specific objective: addressing the technological and market developments related to energy storage solutions and the interfaces between energy sectors as tools to ensure the required level of flexibility for the transmission and distribution of electricity.

All energy storage technologies and **all possible interfaces are covered**, among others:

- Power-to-power
- Power-to-gas
- Hydro and marine storage
- Compressed air energy storage
- Thermal mass of buildings
- Hot water storage…

The **entire value chain of all energy storage options** is also covered, starting from the development and demonstration of new materials, technologies and solutions, addressing their integration into the overall energy system, the evaluation of their impact on flexibility and the related costs/benefits.

Interfaces between the power sector and the sectors **heat, gas and transport** are also included.

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WG2 organisation

Chair: Cristiana La Marca (Enel)

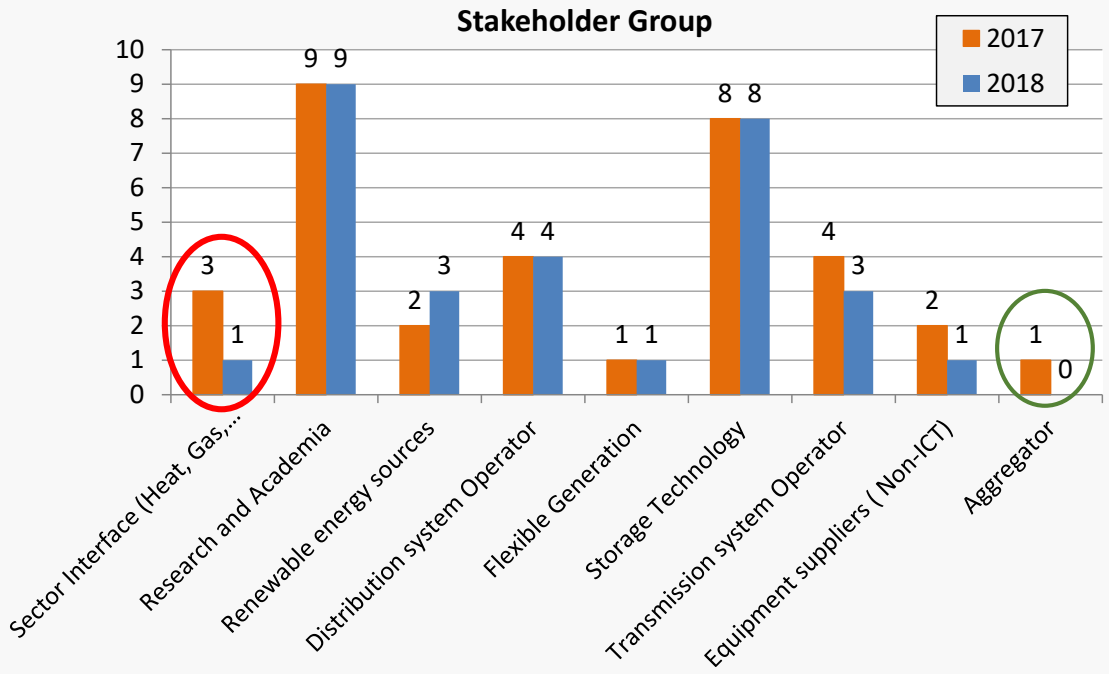
Co-chairs: Cristina Gómez Simón (ENTSO-E) and Carlos Arsuaga (Circe)

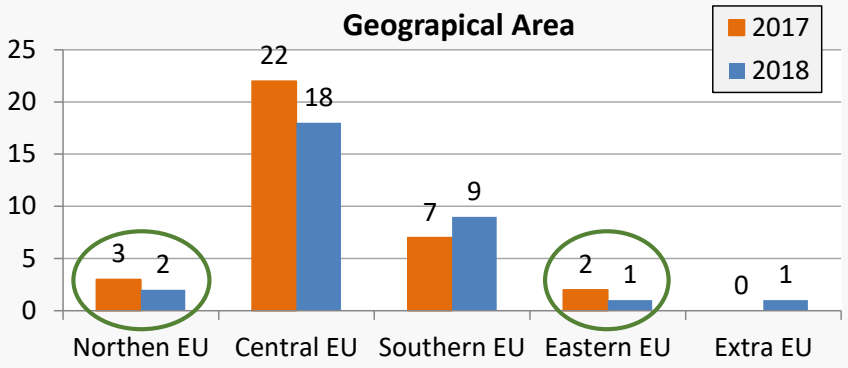
Special adviser: Omar Perego (RSE)

Organizational support: Thomas Otuszewski (EASE), Emin Aliyev(EASE)

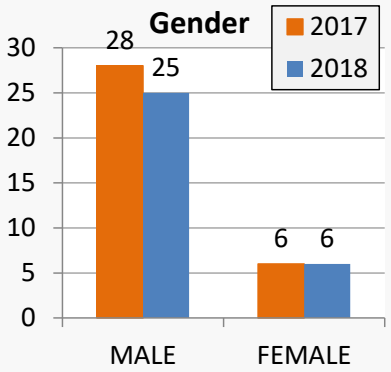
Annual expert renovation in 2018: 9 new experts joined → Current total number of WG2 experts: **31**

→ **Profiles missing!! – Sector interface; Aggregator…**





A call for experts' missing profiles will be soon launched – Procedure to joint still to be defined



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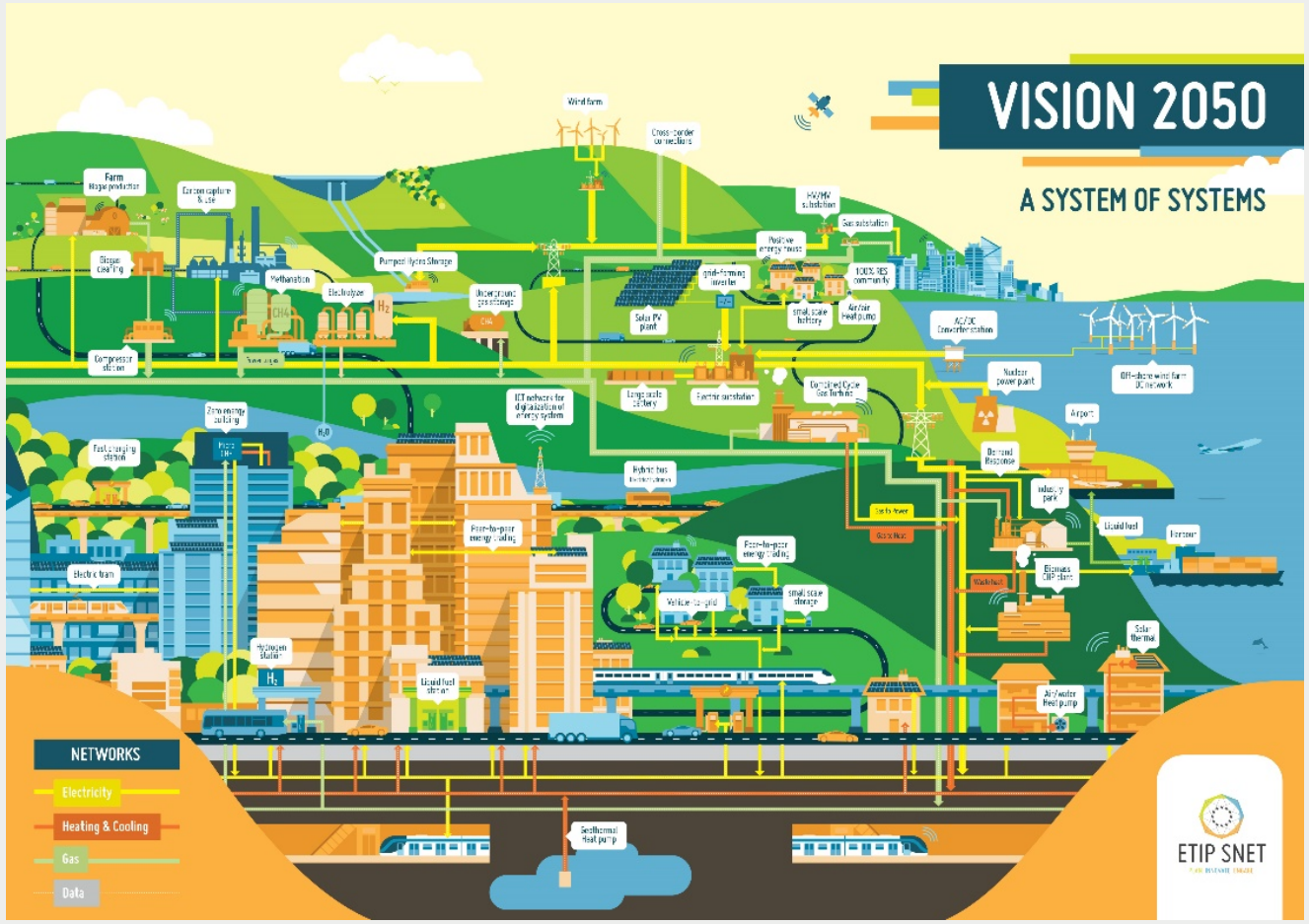
Support to ETIP SNET Vision document

❖ ETIP SNET Vision

The WG2 members also participated in the elaboration of the ETIP SNET Vision, which is a document that **highlighting issues including and beyond those already documented, researched, implemented, developed**, and which are key for satisfying the needs of the future energy system towards 2050.

The Vision has been released the 27th of June 2018.



Support to ETIP SNET Vision document

Activities

- All WG2 experts were asked to send specific comments to ETIP SNET Vision 2050 v.04 (05.03.2018)
- WG2 Vision Task Force discussed all comments received (09.03.2018)
- WG2 Chair sends consolidated input to Vision Core Team (14.03.2018)

Input of WG2:

- 13 WG2 experts provided comments and suggestions to the document
- Around 10 general comments and over 150 specific comments to different parts of the Vision document
- Main messages consolidated around 7 areas:
  - Missing elements in renewables, CO_2, EV, etc.
  - Energy independence and European leadership
  - Energy storage technologies
  - Energy conversion and storage
  - The role of network operators and consumers
  - Figures 4 & 5 of the document
  - Funding and finance

Support to Mission Oriented objectives

❖ Mission oriented objectives for the new framework programme (Horizon Europe)

The WG2 worked and proposed 3 mission-oriented objectives for the new framework programme:

1. Flexible, efficient and secure energy systems - Develop smart strategies and (digital) tools to promote the interoperability of energy storage with distributed and centralised RES and all energy vectors (gas including H2, heat, electricity) in order to reach a 35% share of RES in secure energy systems by 2030

2. Agile energy markets - Develop one self-organised holistic market in order to reach zero curtailment of RES and carbon free energy, optimise the exploitation of local resources, and create value from the energy vector interface (conversion and storage) by 2030

3. Environmental-Friendly Energy System - Develop efficient low-carbon energy storage and conversion systems with no use of CRMs (Critical Row Materials) to increase RES penetration preserving Environment and Biodiversity

Next steps –> ExCo consolidated all missions received by WGs and proposed a single ETIP SNET vision to be approved by the Governing Board on 2nd October: **Let's aim at decarbonising Europe by 2050!**

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❖ Horizon 2020 Work Package 2018-2020 contribution

WG2 provided input to the draft of the Horizon 2020 Energy Work Programme 2018-2020. WG2 recommendations included:

General comments

- Low share of 'Energy Systems' topics compared to 'Energy Efficiency' and 'Renewable Energy'
- Development of technologies should be considered on top of integration strategies

Topic ES1 – Consumer and demand response

- Explicitly mention energy storage solutions to allow automation in demand management.

Topic ES2 - Distribution Grid

- Include demonstration of small scale storage integration in low-voltage network, focusing on the role of the aggregators, and propose solutions of full scale virtual power plants

Topic ES3 – Transmission Grid

- Include stand-alone storage installation at utility scale in specific transmission network nodes

Topic ES4 – Integrated Energy Systems

- Better express the need of introducing thermal storage capacity to increase flexibility and reliability of fully integrated energy systems.

Topic ES5 – Islands

- Include storage coordinated with conventional generators and renewables to provide a reliable and efficient hybrid system operation in an isolated system

Topic ES7 – Advanced tools

- Add advanced technologies (storage and hybrid)

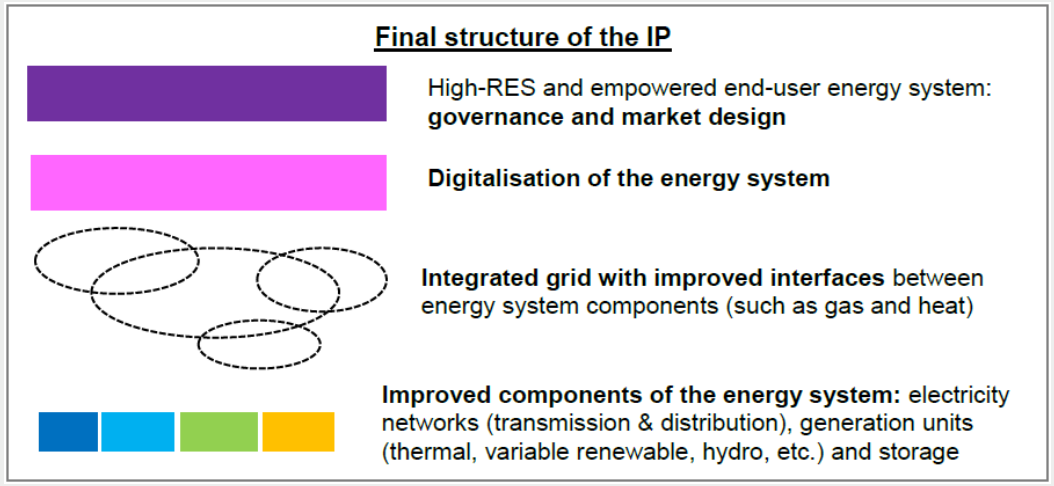
WG2 activities

❖ **SET Plan Key Action 4 "Increase the resilience, security and smartness of the energy system"**

The WG2 experts were asked to:

- Review the strategic targets of Action 4.1 "An optimised European power grid" of the SET PLAN - Declaration of Intent
- Identify the objectives and KPIs which are relevant to energy storage and interaction between energy networks
- Discuss input for the reformulation of targets
- Consolidating the "innovation fiches" of the draft SET Plan IP document
- Encouraging Member States to implement them, after the SET Plan IP has been published

❖ ETIP SNET Implementation Plan 2017-2020



3 topics
- **Topic 2: Market design for trading heterogeneous flexibility products**

6 topics

11 topics
- *Synergies between electricity and heat systems*
  - **Topic 10: Coupling of electricity and thermal sectors**
  - **Topic 11: Increase energy efficiency by utilising excess heat from other processes via heat networks and thermal storage**
- *Synergies between electricity and gas systems*
  - **Topic 12: Coupling of electricity and gas sectors**
- *Synergies between electricity transmission networks, generation and storage*
  - **Topic 15: Multiservice storage applications to enable innovative synergies between system operators and market players**
- *Coupling between flexible generation and storage*
  - **Topic 19: Towards fully dispatchable RES: Variable RES with Storage**

18 topics
- *Electricity networks*
- *Storage units*
  - **Topic 31: Advanced energy storage technologies for energy and power applications**
  - **Topic 32: Coupling of electricity and transport networks**
- *Generation units*

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❖ ETIP SNET Implementation Plan 2017-2020

Included in SET Plan IP KA4

Topic 2: Market design for trading of heterogeneous flexibility products
Develop a market concept that allows the trading of 'heterogeneous' flexibility products (coupling electricity, heat and gas markets, both at the wholesale and retail level), taking into account the specific capabilities of each resource
Challenges: growing need for short, medium and long-term flexibility to balance intermittent renewables beside conventional fossil-fuel based generation units; flexibility needed at different time scales, different locations, applicable to different end users

Topic 10: Coupling of electricity and thermal sectors
Develop methodologies and tools to quantify and test the technical and cost performances of the coupling while addressing governance and market issues
Challenges: major part of heating and cooling still generated with fossil fuels; management and efficient operation of integrated energy systems, organisation of interactions, associated business models...

Topic 11: Increase energy efficiency by utilizing excess heat from other processes via heat networks and thermal storage
Investigate how to capture excess heat in an efficient way (energy efficiency and costs) so as to decarbonize the heat sector
Challenges: use excess heat wasted in power plants, industry, waste incineration, focus on heat network and thermal storage

Topic 12: Coupling of electricity and gas sectors
Provide additional flexibility options to manage the power system. At transmission level, gas networks can provide an alternative solution to perform large-scale storage (chemical energy) of renewable excess electricity. At distribution level, the existing gas networks, especially in cities, could be used to promote green fuels for thermal or transport applications.
Challenges: avoid dismantling of obsolete gas networks and give them a new purpose with Power-to-Gas

Relevant topics for WG2

❖ ETIP SNET Implementation Plan 2017-2020

Topic 15: Multiservice storage applications to enable innovative synergies between system operators and market players
Demonstration of bulk storage integration options in the transmission system aimed to valorize the multi (ancillary) services offered by these technologies
Challenges: storage facilities in transmission systems as promising solution for advanced grid services, for increased system flexibility and less back-up conventional energy

Included in SET Plan IP KA4

Topic 19: Towards fully dispatchable RES: Variable RES with Storage
Demonstrate the local coupling of storage with solar and/or wind energy assets enabling renewable energy to be fully flexible and ensuring the sustainability of the future energy system
Challenges: Economic hybrid systems with storage units localized at the generation plant to make renewable dispatchable, predictable, flexible.

Topic 31: Advanced energy storage technologies for energy and power applications
Validation in demonstrations of different technological options, together with R&I activities related to integration issues and business models (degradation and failure mechanisms which impact profitability) and with a focus on multiservice business models which might be a solution for profitability provided that the system services brought by storage are valued on a fair basis
Challenges: energy storage technologies for energy and power applications far from meeting technical and economic targets, strong need to optimize and demonstrate especially for intraweek and seasonal modulation

Topic 32: Coupling of electricity and transport networks
How to unlock the potential of V2G (vehicle to grid) applications by e.g. testing new business models and market mechanisms.
Challenges: energy transition in transport sector using intermittent rewable energy sources

Thank you for your attention !