ETIP SNET

Where should R&I and associated Demonstrations for Carbon-neutral Energy System Integration be deepened and be accelerated?

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CETP TRI1, Module 2

2 – RES Demo Power Flex

This Call Module is meant to **demonstrate technologies** and solutions for **enhancing** the **flexibility** along the energy value chain to enable the transition to **high shares of RES** in the European system.

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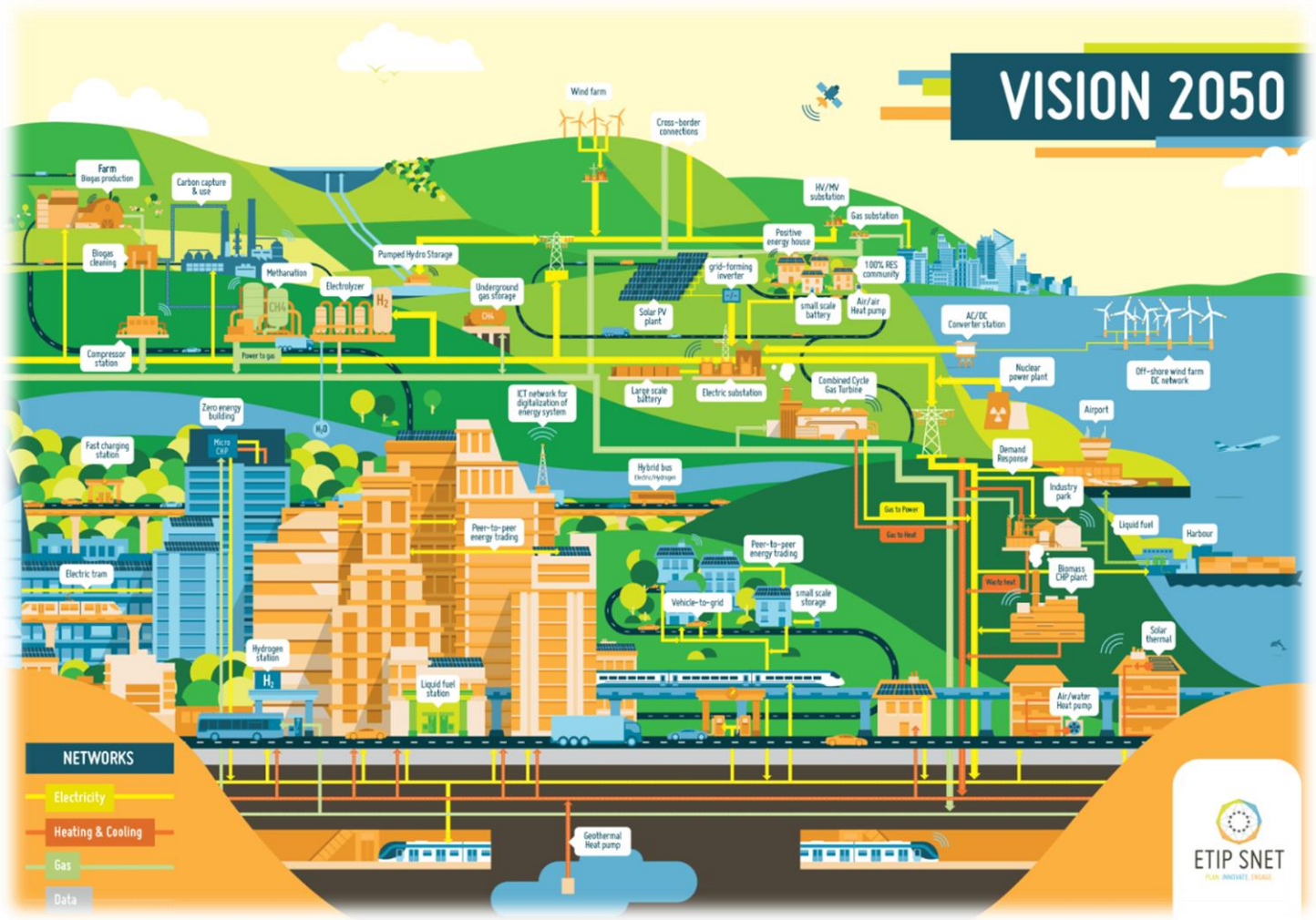
ETIP SNET Vision 2050



CONCENTRATED AND DISTRIBUTED vRES

FLEXIBILITY PORTFOLIO

STORAGE SOLUTIONS

INTEGRATED ENERGY NETWORKS

SECTOR COUPLING

DIGITALISATION

European Commission

ETIP SNET defines 9 High Level Use Cases in IP 22-25 (& upcoming RM)

HLUC 1: Optimal Cross sector Integration and Grid Scale Storage

Total Budget: 130M€

HLUC 3: Pan European Wholesale Markets, Regional and Local Markets

Total Budget: 80M€

HLUC 5: One stop shop and Digital Technologies for market participation of consumers (citizens) at the center

Total Budget : 120M€

HLUC 7: Enhance System Supervision and Control including Cyber Security

Total Budget 135M€

HLUC 9: Flexibility provision by Building, Districts and Industrial Processes

Total Budget: 100M€

HLUC 2: Market-driven TSO–DSO–System User Interactions

Total Budget: 90M€

HLUC 4: Massive Penetration of RES into the transmission and distribution grid

Total Budget: 145M€

HLUC 6: Secure operation of widespread use of power electronics at all systems levels

Total Budget: 100M

HLUC 8: Transportation Integration & Storage

Total Budget: 100M€

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Each HLUC is realized by 3-5 Priority Project Concepts (PPCs) beginning 2022-25. Each PPC is described with

- Indicative PPC Budget
- Expected PPC Outcome
- Scope of PPC
- Research Tasks associated to PPC and Task-TRL-maturity

Table 2: List of Priority Project Concepts (PPCs) 2022-2025

HLUC 1: Optimal Cross Sector Integration and Grid Scale Storage (PPC 2022-2025)
PPC 1.1: Value of cross sector integration and storage
PPC 1.2: Control and operation tools for multi-energy systems
PPC 1.3 Smart asset management
HLUC 2: Market-driven TSO–DSO– System User Interactions (PPC 2022-2025)
PPC 2.1: Market models and architecture for TSO-DSO-System User interactions
PPC 2.2: Control and operation for enhanced TSO-DSO- System User interactions
PPC 2.3: Platform development for TSO-DSO cooperation
PPC 2.4: Planning tools for TSO-DSO cooperation
HLUC 3: Pan European Wholesale Markets, Regional and Local Markets (PPC 2022-2025)
PPC 3.1: Fundamental market design
PPC 3.2: Regulatory framework and strategic investments
PPC 3.3: IT systems for cross-border trading
HLUC 4: Massive Penetration of RES into the Transmission and Distribution Grid (PPC 2022-2025)
PPC 4.1: Technical barriers and technical measures for integration of RES at multiple levels and sectors
PPC 4.2: Control and operation tools for a RES based energy system
PPC 4.3: Infrastructure requirements and network technologies as solutions for integration of massive RES
PPC 4.4: Planning for a resilient system with massive penetration of RES

HLUC 5: One Stop Shop and Digital Technologies for Market Participation of Consumers (Citizens) at the Center (PPC 2022-2025)

PPC 5.1: Value of consumer/customer acceptance and engagement

PPC 5.2: Plug and play devices and IoT (Internet-of-things) including security by design

PPC 5.3: Utilisation of communication networks including cyber security

PPC 5.4: Cross-sectorial flexibility use cases

HLUC 6: Secure Operation of Widespread Use of Power Electronics at all System Levels (PPC 2022-2025)

PPC 6.1: Control solutions for next generation PV and battery inverters

PPC 6.2: Hybrid transmission/distribution and hybrid distribution AC/DC grids

PPC 6.3: Next generation distribution substation

PPC 6.4: Simulation methods and digital twins at distribution and transmission level for power electronics driven networks

HLUC 7: Enhance System Supervision and Control including Cyber Security (PPC 2022-2025)

PPC 7.1: Next generation of TSO control room

PPC 7.2: Next generation of DMS (Distribution Management Systems)

PPC 7.3: Next generation of measurements and GIS (Geographical Information System) for distribution grids

PPC 7.4: Wide Area monitoring, control and protections

HLUC 8: Transportation Integration & Storage (PPC 2022-2025)

PPC 8.1: Technical and economic implication of decarbonisation of transport sector

PPC 8.2: Enhancing effectiveness of energy system operation and resilience with electromobility

HLUC 9: Flexibility Provision by Building, Districts and Industrial Processes (PPC 2022-2025)

PPC 9.1: Value assessment of the integration of buildings, infrastructure and smart communities in a RES based energy system

PPC 9.2: Control and operation tools for the integration of buildings and smart communities

PPC 9.3: Planning for resilient integration of buildings and infrastructures in an integrated energy system

Coverage of recent R&I Projects: 2021 ETIP SNET Project Progress Report

- **Insufficient**, **medium**, **high** coverage of the six ETIP SNET Research Areas in R&I projects (BRIDGE, ERA-NET SES, National, Other)

  - Research Area 1: **Consumer, prosumer, and citizen energy community**
  - Research Area 2: **System economics**
  - Research Area 3: **Digitalisation**
  - Research Area 4: **Planning – holistic architectures and assets**
  - Research Area 5: **Flexibility enablers and system flexibility**
  - Research Area 6: **System operation**

- Report covers (120) task related achievements and **task related remaining challenges**
- 29 BRIDGE projects; 43 non-BRIDGE

TRL: Key Conclusions from the 2021 ETIP SNET Progress Report on ongoing and post R&I Projects

Subsets of Tasks exceed target TRL

- **Tasks with a high reported TRL**
  - 3.1.2. Standardised communication protocols and ICT infrastructure between devices and networks and between devices and remote management platforms,
  - 3.2.1. Demand aggregation and control,
  - 3.2.2. Monitoring and control of distributed generation,
  - 5.3.1. Storage flexibilities in operation of electrical grids,
  - 6.1.2. Observability and state estimation of distribution systems

BRIDGE remaining challenges ("Flexibility Resources")

- 5.1 Demand Flexibility; Task 5.1.1. Optimal utilisation of DSR by TSOs and DSOs.
  - Test an entire process of **management of flexibility services**. Possibility to establish some pilots with a **full involvement of TSO and customers**, scoping the test of flexibility market and services management. (EUSysFlex).
  - Test the **flexibility activation under a competitive framework** (e.g. market bidding) (InteGrid).
  - New application of storage systems foreseeing a **full integration of these devices**; **rebound-effect** from including storage flexibility; **Improved coordination** in the use of the storage by the DSO and TSO (EU-SysFlex)
  - Storage and power electronics to stabilize **weak grids and micro-grids** (INSULAE)
- 5.3. Storage flexibility & Energy Conversion flexibility; Task 5.3.1. Storage flexibilities in operation of electrical grids.
  - **Local storage economic assessment** (InterFlex)
  - Improvements on **system aspects** and components (Shar-Q)
- 5.5. Transport flexibility; Task 5.5.1. Efficient management of EV charging.
  - Further explore **private charging stations**, **V2G** and other charging points (EUSysFlex)
- 5.5. Transport flexibility; Task 5.5.3. Electric vehicles with grid to vehicle (G2V) and vehicle to grid (V2G).
  - Increase share of **EV drivers engaging in EV flexibility**. (InterFlex)

These non-yet solved challenges contribute to outcomes and/or (updated) tasks of **PPCs/HLUCs**, see **ETIP SNET IP 2022-25, PPC Description on pages 40-76**

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R&I Implementation Plan 2022-2025 is available here

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2021 R&I Project Progress Report is here

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