ETIP SNET

EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM

SMART NETWORKS FOR ENERGY TRANSITION

Implementation Plan 2017-2020

Briefing

PLAN. INNOVATE. ENGAGE.

INTRODUCTION

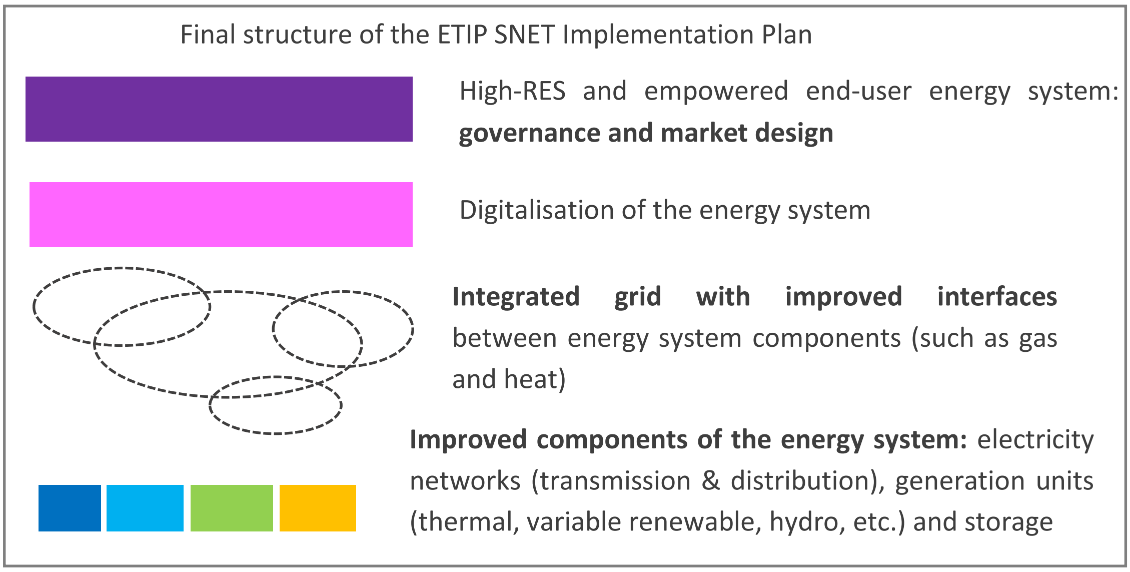
The ETIP SNET Implementation Plan (IP) 2017-2020 has just been released in October 2017 in the frame of the European Utility Week 2017. It can be downloaded here.

The IP aims at listing the short-term priorities for research and innovation (R&I) in ETIP SNET's scope and as defined by the action 4 of the EU's Strategic Energy Technology Plan: Increase the resilience, security and smartness of the energy system. It is based upon the ETIP-SNET R&I roadmap 2017-2026 which specifies the long-term R&I activities for the evolution of the European energy system and published in January 2017.

The IP is the result of a long and comprehensive stakeholder's consultation process as it went through a complete review by the 200+ members of the ETIP SNET Working groups and was adapted after a comprehensive public consultation where over 69 contributions were gathered. It makes the IP a widely recognised document by all the European energy transition stakeholders.

It should serve as reference document for all funding organisations (EU, national, regional and even global) as regards short term R&I priorities in the area of energy system.

The following figures shows the final structure of the IP which has resulted from the comprehensive consultation process undertaken to elaborate it, taking as starting point the latest ETIP SNET Roadmap.



4 PRIORITY AREAS FOR R&I FUNDING FOR THE FUTURE ENERGY NETWORKS

The IP includes a total of 39 topics which are requiring dedicated R&D funding, these are gathered in 4 main priority areas :

1. HIGH-RENEWABLE ENERGY SOURCES (RES) AND EMPOWERED END-USER ENERGY SYSTEM: GOVERNANCE AND MARKET DESIGN

The integration of the European energy system in a context of a high share of energy (electricity and heat) produced from renewables, together with the internal energy market, raise several questions regarding both **governance** (how to organize the operations of the energy system and the associated interactions between the different stakeholders) **and market design** (market rules supporting the development of renewables and empowering prosumers). Further R&I is required to help answer these questions

2. DIGITALISATION OF THE ENERGY SYSTEM

Smart networks should allow the enhanced monitoring, automation and control of the existing networks while ensuring that all involved stakeholders (regulated and market players) **can interact:** this will be made possible by a full digitalization of the power system, and of the energy system a whole. As of today, digitalisation is under implementation in transmission networks and distribution networks (mainly MV) but also for market applications. Still, a lot of work remains to be done to achieve a full digitalisation of the energy system.

3. INTEGRATED GRID WITH IMPROVED INTERFACES BETWEEN ENERGY SYSTEM COMPONENTS

The integration of the different types of energies (electricity, gas and heat networks) to form of an integrated energy system creates specific challenges at the different interfaces, e.g. electricity-heat and electricity-gas and to some extent gas-heat. This integration also creates specific challenges for new system components of the power system such as storage and renewable generation units.

4. IMPROVED COMPONENTS OF THE ENERGY SYSTEM

- Joint transmission and distribution issues

The evolving environment of the electricity networks (renewables and new loads) modify the operating conditions of the existing assets (which were originally designed for rather steady and unidirectional power flows). New models/tools based e.g. big data, and new techniques (robotics, sensors, etc.) become available at affordable costs: this give an opportunity to revisit the existing maintenance policies of network operators so as to extend the life time of the existing assets and improve the maintenance procedures of new assets within affordable costs (OPEX).

- Transmission networks

The fast evolving environment of electricity transmission networks (e.g. generation connected at distribution level, converter based power electronics in production and demand facilities, mix of AC and DC interconnectors) **calls for increased system flexibility, stability and security. This can be achieved by several means, i.**e.

- Distribution networks

As for transmission networks, **the fast evolving environment of electricity distribution networks calls for innovative approaches for grid operation** (allowing to increase system flexibility, while maintaining stability and security) while coping with new loads, in particular Electrical Vehicles with the advent of fast charging statio*n*s

- Storage Units

Storage units are a major source of flexibility today (mainly pumped-hydro storage to store electricity at a very large scale) **for energy balancing**. In the near future (solutions are already available and some demonstrations are on-going) storage units, of different sizes and possibly located in specific areas of the electricity grid, will **provide multiple services in different markets**. Yet there are still major issues to be addressed.

- Generation Units (Thermal, Variable RES, Hydro plants, Cross-cutting issues)
    - Thermal generation

The ever increasing penetration of RES in electricity production has changed the operating conditions of thermal power generation (TPG). It must increase its flexibility, e.g. at full and partial load with possibly different fuels, at the lowest emission level as possible. New concepts are needed.

Regarding fuel flexibility, for “green” synthetic liquid or gaseous fuels produced from excess RES electricity and which can be used in TPG as well as to couple the electricity grid with the transport and gas sectors (large-scale electricity storage solution), the main challenges are the adaptation of the existing combustion technologies.

- Variable RES

As mentioned above, the increasing penetration of RES in electricity production has changed the operating conditions of TPG but also sets new constraints on RES generators which must be designed to provide flexibility (ancillary services) with no (or very few) rotating machines.

- Hydro plants

Existing medium to large-scale hydro power plants have not been designed to fulfil today's flexibility needs (e.g. ramp rates imposed by the balancing of wind and solar power). There is therefore a need to refurbish existing reservoirs/ PHS facilities with e.g. variable-speed turbines connected to the electricity network through power electronics interfaces.

The enhanced flexibility of the refurbished hydropower plants (new operating conditions) will lead to changes, at different time scales, in the fluctuations in reservoir water levels and the state of downstream water bodies and fish population.

- Cross-cutting issues

The digitalisation of generation units is key to improve design methods and tools (techno-economic performances) and operating conditions (better efficiency and extended lifetime resulting in higher profitability). Digitalisation, e.g. HPC (high-performance computing), IoT (new sensors), Big data (data mining techniques and data analytics), etc., is essential.