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ETIP SNET Virtual Workshop

Parallel session 4

Infrastructure for integrated energy systems as key enablers of the energy transition

18th June 2020

Welcome to the ETIP SNET virtual Parallel Session 4

Survey to see which entities are presented by the attendees

LINK on the chat

Rules for interaction during the PS4

- **ALL ATTENDEES of the Plenary Session are invited to switch on the Camera – if possible.**

- **TO INTERACT WITH THE SPEAKERS DURING THE PS:**
  - The attendees who want to speak or make some questions are invited to **raise the hand** on TEAMS and the floor to them will be given at the end of each speech.
  - The attendees are also invited – if preferred – to **write their questions/statements in the chat**. They will be read at the end of each discussion rounds

- **The link to come back to the Final plenary session** will be shared at the end of each Parallel Session via chat
  - Please note that it is the same of the current Plenary Session.

Parallel Session 4

- *Parallel session "Infrastructure for integrated energy systems as key enablers of the energy transition" (F7-Networks, F8 - Business, F9 – Simulation).*

Infrastructure for Integrated Energy Systems as key enablers of the energy transition	**F7 Upgraded electricity networks, integrated components and systems**	**F7 Electricity Systems and Networks**
	F8 Energy System Business (incl. models, regulatory)	F8 Business
	F9 Simulation tools for electricity and energy systems (SW)	F9 Simulation

General introduction by the supporting Core team: ***Explain the different Functionalities***

The FUNCTIONALITIES are chosen in such a way that together and in accordance with the Building Blocks defined in the ETIP SNET Vision 2050, they represent the **set of features enabling the functioning of an integrated energy system by the year 2030**.

These functionalities are strongly independent from each other.

F7: The growing electrification and the more decentralized deployment of renewable power generation will require **reinforced and smarter electricity networks**, able to accommodate both **centralized and decentralized elements** and to make the best of RES allocation over the European territory. Pervasive **network digitalisation**, supported by high-capacity cyber-secure communication networks, will ensure **decentralized monitoring and control**. Not only density of the network, but also **interconnection capacities** –with harmonized security, planning and operation standards- will be needed to match growing RES supply and electricity demand over larger areas, as well as transparency to market participants all over Europe.

F8: Business models are constantly to be adapted in real-world business. The following aspects related to the energy system assets need to be addressed: **Business models, market design, regulatory** rules, market governance, business models adapted to energy and computer - ICT- and **monitoring and control system architectures**, managing grid-connected flexibilities and their optimal aggregation.

F9: New simulation tools are needed for the integrated energy system (beyond electricity). **Short-term market-related simulations** including for handling security issues of all kinds, long- and medium-term integrated energy-system (heating and cooling, gas) and electricity **system planning** related models and simulations, electricity system **congestion and stability-handling** tools for all time intervals from seconds to hours; electricity system **analysis, observation and optimisation tools** and SW; system-control-related model-predictive simulations and optimisations of the electricity system and life-cycle related ageing simulations.

Route towards 2030

- The transition towards 2050 will be ensured by achievements that are formulated in the Roadmap 2030
- Some achievements in relation with F7, F8 and F9 are presented

Route to F7 – F8 – F9
Extensive **observability and controllability** must be ensured to integrate VRES: 80% of the high voltage and medium voltage substations and 25% of low voltage substations shall be monitored (including state estimation). **Decentralised control schemes** are implemented on distributed generation, **manageable loads and storage**, set for **bi-directional power flows**
vRES, storage and synchronous power generation systems provide **balancing services** based on enhanced ancillary services, are well dispatchable, contribute to network stability, promote smart connection to the grid and a significant improvement of forecasting quality compared to today;
Flexible thermal plants, achieved by technology upgrade or integrating other flexibility options, provide doubling the present average ramping rates, 50% less losses for part-load operations and reduce minimum technical load by 30% compared to today.
HVDC, AC, hybrid AC/DC and a majority of DC microgrids are connected to AC transmission grids, for serving prosumers, local energy communities, synergies between main grid and urban e-mobility grids. **High Voltage Direct Current (HVDC) technology plays an increasing role** in the connection of offshore wind farms and help establishing a pan-European electricity super-grid, without strong opposition by the public.
Effects of reduced inertia are not yet strongly visible but all necessary adaptations to the control and protection equipment must have been designed so that they can **provide synthetic inertia** and can sense faults in the real-world implementation

Research is needed

- Several Research Areas and Research Sub Areas contribute to F7, F8 and to F9
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- Bullet points proposal on issues extracted from the Implementation Plan tasks needed to fulfill F4 and F5 functionalities. They could be used to initiate the discussion.

Research Area contributing to F7	Research Area contributing to F8	Research Area contributing to F9
RA1. CONSUMER, PROSUMER and CITIZEN ENERGY COMMUNITY: • **RSA 1.1 (Social campaign and social studies)** • **RSA 1.2 (Adaptive consumer / user behaviour incl. energy communities)** **RA 3. DIGITALIZATION** • **RSA 3.1 (Protocols, standardisation and interoperability)** **RA4. PLANNING - HOLISTIC ARCHITECTURES and ASSETS** • **RSA 4.1 (Integrated Energy system Architecture)** • **RSA 4.2 (long term planning)** • **RSA 4.3 (Asset Management and maintenance)** • **RSA 4.4 (System Stability analysis).** **RA5: FLEXIBILITY ENABLERS and SYSTEM FLEXIBILITY** • **RSA 5.2 (Generation flexibility)** **RA6. SYSTEM OPERATION** • **RSA 6.1 (State estimation and state supervision),** • **RSA 6.3 (medium- and longer term control),** • **RSA 6.4 (preventive control/restoration)** • **RSA 6.5 (Control center technologies**	RA**1. CONSUMER, PROSUMER and CITIZEN ENERGY COMMUNITY:** • RSA 1.1 (Social campaign and social studies) • RSA 1.2 (Adaptive consumer / user behaviour incl. energy communities) **RA 2. SYSTEM ECONOMICS** • RSA 2.1 (Business models) • RSA 2.2 (Market design) • RSA 2.3 (Market governance).	**RA4. PLANNING - HOLISTIC ARCHITECTURES and ASSETS** • RSA 4.1 (Integrated Energy system Architecture) • RSA 4.2 (long term planning) • RSA 4.3 (Asset Management and maintenance) • RSA 4.4 (System Stability analysis). **RA5: FLEXIBILITY ENABLERS and SYSTEM FLEXIBILITY** • RSA 5.3 (Storage flexibility and energy conversion flexibility). **RA6. SYSTEM OPERATION** • RSA 6.1 (State estimation and state supervision), • RSA 6.3 (medium- and longer term control), • RSA 6.4 (preventive control/restoration) • RSA 6.5 (Control center technologies

Discussion rounds

Workshop Goals and expected outcomes:

- **How do you contribute to the above ETIP SNET priorities?**
- **How do ETIP SNET priorities fit to your own ETIP/PPP/ … agenda?**

3 successive discussion rounds (15 mn each) based upon 1-2 generic underlying question(s):

Discussion **A** (15 mn) :	Discussion **B** (15 mn) :	Discussion **C** (15 mn) :
Architectures and assets	Business models, regulation and legislation	Control and operation

- Specific questions follow the guidance of our IP and we will be based on statements / key words derived from the IP

Discussion A: Architectures and assets

Discussion **A** (15 mn) :

Architectures and assets

Our priorities (based on IP) are:

- **Planning** and siting network flexibility sources – streamlined permitting;
- RES (and conventional) **generation flexibility**: forecasting, integration and operation, synthetic inertia;
- **Innovative components** (functions – HVDC meshed systems, sustainability, circularity, reliability under extreme conditions, remote monitoring)
- **Advanced asset management** (sensors, degradation models, risk assessment, end-of-life)

Discussion:

- **How do you contribute to the above ETIP SNET priority?**
- **How do ETIP SNET priorities fit to your own ETIP/PPP/ … agenda?**

Discussion B: Business models, regulation and legislation

Discussion **B** (15 mn) :

Business models, regulation and legislation

Our priorities are:

- Regulatory and **legislative framework for infrastructure upgrading**
- **Centralised and decentralised integration** of RES and impacts on planning, operational planning (resilience) an operation;
- **Business models for data analysis service** providers to energy using large-scale data bases and advanced data-mining techniques

Discussion:

- **How do you contribute to the above ETIP SNET priority?**
- **How do ETIP SNET priorities fit to your own ETIP/PPP/ … agenda?**

Discussion C: Control and operation

Discussion **C** (15 mn) :

Control and operation

Our priorities are:

- Advanced system **observability, monitoring and control** (PMUs, protections) - Standards and interoperability
- Monitoring and simulation (digital twins)
- Integrated control centres (cybersecurity)
- Advanced controllability and **stability assessment** (e.g. inertia management, system estimation, power flow tools)
- **Resilience toolbox: threats, vulnerability, contingencies, risks, restoration**

Discussion:

- **How do you contribute to the above ETIP SNET priority?**
- **How do ETIP SNET priorities fit to your own ETIP/PPP/ … agenda?**

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Thank You