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ETIP SNET virtual workshop

Parallel session 3

“Digitalisation enables new services for Integrated Energy Systems”

18th June 2020

Welcome to the ETIP SNET virtual Parallel Session 3

Survey to see which entities are presented by the attendees

LINK on the chat

Rules for interaction during the PS3

- **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 3

- *PS3: Digitalisation enables new services for integrated energy systems - (F6 - Digitalisation)*

- Collaboration to reach the 2030 EU Energy System Goals
- How can ETIPs, PPPs and Associations support ETIP SNET in reaching 2030 goals (transition towards 2050)?

Agenda – Parallel Session 3

Virtual Parallel sessions *15h00 – 16h00*		
General introduction by the supporting Core team: Explain the different Functionalities		
15:00-15:05	**Digitalisation enables new services for integrated energy systems** (F6 - Digitalisation)	Introduction
15:05-15:20	**Moderator:**  **Maher Chebbo** ETIP SNET	A: Discussion Priorities “Digital Technologies”
15:20-15:45		B: Discussion Priorities “Digital Use Cases”
15:45-16:00	**Core team support:** Rainer Bacher **Validation of key points with participants (last 15 minutes)**	**Working on Conclusions**

BB: Building Blocks and associated Functionalities

BB1: The efficient organisation of energy systems

BB2: Markets as key enablers of the energy transition

BB3: Digitalisation enables services for the integrated energy systems

BB4: Infrastructure for integrated energy systems as key enablers of the energy transition

BB5: Efficient energy use

FUNCTIONALITY (Full name)	Short FUNCTIONALITY[29]
F1 Cooperation between system operators	F1 Cooperation
F2 Cross-sector integration	F2 Cross-Sector
F3 Integrating the subsidiarity principle – The customer at the center, at the heart of the Integrated Energy System	F3 Subsidiarity
F4 Pan-European wholesale markets	F4 Wholesale
F5 Integrating local markets (enabling citizen involvement)	F5 Retail
F6 Integrating digitalisation services (including data privacy, cybersecurity)	F6 Digitalisation
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 (Software)	F9 Simulation
F10 Integrating flexibility in generation, demand, conversion and storage technologies	F10 Flexibility
F11 Efficient heating and cooling for buildings and industries in view of system integration of flexibilities	F11 Heating & Cooling
F12 Efficient carbon-neutral liquid fuels & electricity for transport in view of system integration of flexibilities	F12 Transport

Table 1: IP Period 2021–2024 with expected budgets (budgets in millions of Euros)

ETIP SNET Buidling Blocks (ETIP SNET Vision 2050)						
Budgets ETIP SNET R&I Implementation Plan 2021–2024 for 5 building blocks and 6 Research Areas	The efficient organisation of energy systems	Markets as key enablers of the energy transition	Digitalisation enables new services for Integrated Energy Systems	Infrastructure for Integrated Energy Systems as key enablers of the energy transition	Efficient energy use	
Functionalities	F1, F2, F3	F4, F5	F6	F7, F8, F9	F10, F11, F12	Totals
ETIP SNET Research Areas						
1. CONSUMER, PROSUMER and CITIZEN ENERGY COMMUNITY						77
2. SYSTEM ECONOMICS						86
3. DIGITALISATION						241
4. PLANNING – HOLISTIC ARCHITECTURES and ASSETS						187
5. FLEXIBILITY ENABLERS and SYSTEM FLEXIBILITY						163
6. SYSTEM OPERATION						201
Totals	179	111	108	296	261	955

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What digitalisation needs to be enabled?

Digitalisation enables new services: Transition via 2030 towards 2050

In 2050, digitalisation facilitates services and the full integration of all kinds of energy systems.

- **Shared platforms facilitate data exchange and decision-making in all parts of the Integrated Energy Systems,** thus enabling advanced planning, operation, protection, control and automation of the energy systems.
- Aggregation of **smart charging technologies for electric vehicles, stationary batteries, heat pumps and power-to-gas, power-to-fuels and/or power-to-chemicals** provides controllable electricity loads.
- **Decentralised control techniques and peer-to-peer electricity trade** permeates local energy communities and their interconnection to the electricity system.

Digitalisation supports **optimised and interconnected services**, providing **real-time information** to operators and aggregators as well as to users connected to any energy network thereby enhancing **system balancing and resilience** at all time scales from seconds to weeks and in the case of any unforeseen, sudden contingencies.

Where is digitalisation in 2030 on the path towards 2050?

Digitalisation enables new services: Transition via 2030 towards 2050

In 2050, rights for privacy are guaranteed to all stakeholders including for data ownership, especially information from smart meters about consumer (and prosumer) energy and service use.

In 2050, energy systems are not vulnerable to cyberattacks even under strong growth of IoT and rapid changes in digital technologies and decentralisation.

WHY Functionality F6?

Why Building Block 3/Functionality F6?
Integrating digitalisation services (including data privacy, cybersecurity)

WHY	NEEDS
The future electricity system should make **use of all available sources of flexibility, particularly demand side solutions and energy storage**. The key is **digitalisation through the integration of innovative technologies with the electricity system by interoperable, standardised data architectures and related communication.**	**Data Privacy** **Cyber Security**

ETIP SNET RAs and TOPICs (R&I IP 21-24)

Research Areas (RA)	TOPIC No.	TOPIC	Budget 2021–2024 (Millions of Euros)
1. CONSUMER, PROSUMER and CITIZEN ENERGY COMMUNITY	1.1	Social campaigns and social studies (related to societal acceptance and environmental sustainability of energy infrastructures)	15
	1.2	Adaptive consumer/user behaviour including energy communities (interaction, incentives by dynamic tariffs)	29
	1.3	Consumer and prosumer device control	33
2. SYSTEM ECONOMICS	2.1	Business models (including Aggregators)	22
	2.2	Market design and governance (Retail, Wholesale; Cross-border; Ancillary services; Flexibility markets)	64
3. DIGITALISATION	3.1	Protocols, standardisation and interoperability (IEC, CIM, Information models)	
	3.2	Data Communication (ICT) (Data acquisition, Smart Meter, Sensors (monitoring), AMR, AMM, smart devices)	61
	3.3	Data and Information Management (Platforms, Big Data, SW, IoT)	35
	3.4	Cybersecurity (vulnerabilities, failures, risks) and privacy	66
	3.5	End-to-end architecture (integrating market, automation, control, data acquisition, digital twin, end-users)	24
4. PLANNING – HOLISTIC ARCHITECTURES and ASSETS	4.1	Integrated Energy system Architectures (design including new materials and hybrid AC/DC grids)	55
	4.2	Long-term planning (System development)	72
	4.3	Asset management and maintenance (maintenance operation, failure detection, asset lifecycles, lifespan and costs, ageing)	48
	4.4	System Stability analysis	29
5. FLEXIBILITY ENABLERS and SYSTEM FLEXIBILITY	5.1	Demand flexibility (household and industry related)	38
	5.2	Generation flexibility (flexible thermal, RES such as Hydro, PV and wind generators)	28
	5.3	Storage flexibility & Energy Conversion flexibility (PtG&H, PtG, GtP, PtL, LtP; PtW; WtP)	53
	5.4	Network flexibility (FACTS, FACDS, smart transformers and HVDC)	40
	5.5	Transport flexibility (V2G/EV; railway, trams, trolleybus)	24
6. SYSTEM OPERATION	6.1	Supervisory control and State estimation	26
	6.2	Short-term control (Primary, Voltage, Frequency)	20
	6.3	Medium- and long-term control (Forecasting (Load, RES), secondary & tertiary control: LFC, operational planning: scheduling/optimization of active/reactive power, voltage control)	37
	6.4	Preventive control/restoration (Contingencies, Topology (including Switching) optimisation, Protection, Resilience)	54
	6.5	Control Center technologies (EMS, platforms, Operator training, Coordination among Control Centers)	64
Total expected budget for the ETIP SNET R&I Implementation Plan 2021–2024			955

Research Area 3: Digitalisation
TOPICS 3.1 and 3.2

RA 3: DIGITALISATION

TOPIC 3.1: Protocols, standardisation and interoperability (IEC, CIM, Information models)

Task No	PRIORITY[9]	Tasks	Functionalities
1	R	1. **Data exchange protocols / interfaces for a well-functioning market** between all players. Protocols for stochastic model-based handling of market operations on different timescales. Common, standardised models for encrypted and authenticated market orders.	F1, F3, F4, F5, F6, F7, F8, F9, F10, F11
2	R	2. **Standardized communication protocols and ICT infrastructure between devices and networks** and also between **devices and remote management platforms** to meet requirements of network operators, retailers and aggregators. Interoperability for devices and actors of the integrated energy system (e.g. prosumers, connected buildings, DSO, storage, RES, PV, EV) etc.	F1, F2, F3, F5, F6, F7, F8, F9, F10, F11, F12
3	R	3. **Communication interfaces of smart substations**, especially on LV secondary substation level (interfaces for internal substation components and between substation with upper level and information systems, like EMS, SCADAS, legacy systems, etc.).	F2, F6, F7, F10
4	R	4. Universal device interfaces and protocols to enable **DSO and TSO information exchanges**. Data interfaces for utility business models and **decision-making support functions**.	F1, F6, F7, F8, F10

RA 3: DIGITALISATION

TOPIC 3.2: Data Communication (ICT) (Data acquisition, Smart Meter, Sensors (monitoring), AMR, AMM, smart devices)

Task No	PRIORITY[9]	Tasks	Functionalities
1	€	1. Communication infrastructures to support **demand aggregation and control**. M2M or Artificial Intelligence to Artificial Intelligence, telecommunication solutions for services required by the energy grid (including AI algorithms for decision-making in device, MEC or cloud level).	F1, F2, F3, F5, F6, F7, F10
2	€	2. ICT infrastructure for **monitoring and control of distributed generation**, e.g. PV systems, including standards and protocols.	F2, F6, F7, F10
3	R	3. Communication infrastructures for **smart meter data** for close to real-time monitoring in critical zones at critical moments (including non-GNSS (Global Navigation Satellite System) systems for time synchronisation and timestamping, consideration of latency, loss of packets, and jitter in end-to-end communications.)	F2, F5, F6, F7, F8
4		4. Optimise installation of ICT infrastructure, including costs, accuracy, redundancy, etc. for data collection and processing used for **conditional and risk-based maintenance**.	F7, F9

Research Area 3: Digitalisation
TOPICS 3.3 and 3.4

RA 3: DIGITALISATION

TOPIC 3.3: Data and Information Management (Platforms, Big Data, Software , IoT)

Task No	PRIORITY[9]	Tasks	Functionalities
1	€	1. **Big data management** from different sources: smart-meters, smart-sensors, social media for their use in planning tools, management tools, market platforms, data-driven tools supported by data analytics, artificial intelligence, and the development of digital twins.	F1, F5, F6, F8, F10
2	€	2. Investigate the use of **IoT technologies** in TSO and DSO planning, asset management, operational and market activities.	F6, F7, F8

RA 3: DIGITALISATION

TOPIC 3.4: Cybersecurity (vulnerabilities, failures, risks) and privacy

Task No	PRIORITY[9]	Tasks	Functionalities
1	R	1. Methods and tools for **cyber security protection of grid infrastructures** to avoid injection of false data through physical installations, like primary and secondary substations, MV and LV lines, Cybersecurity strategies for TSOs and DSOs.	F1, F6, F7, F8, F9
2		2. Data protection for **management of distributed energy resources**, including decentralized storage.	F3, F5, F6, F8, F10
3		3. Risk and vulnerabilities for **parallel use of legacy SCADA systems** (as a traditional means to provide remote supervisory and control).	F1, F6, F7, F9
4		4. Risks and vulnerabilities of using **public ICT and wireless infrastructures** for smart grid functionalities, e.g. connection with smart meters and energy boxes	F3, F5, F6

Rounds of discussion

Workshop goal and outcome expected:

- **How do you contribute to ETIP SNET goals "Digitalisation"?**
- **How do ETIP SNET priorities of "Digitalisation" fit to your own ETIP/PPP/ … agenda?**

15:05-15:20: Discussion **A** (15' mn) :

Priorities "Digital Technologies"

→

15:20-15:45: Discussion **B** (25' mn) :

Priorities "Digital Use Cases"

→

15:45-16:00 Validation of "Digitalisation" priorities

- *Interaction: Participants discuss the presented ETIP SNET Priorities on Digitalisation from the point of view of their own ETIP, PPP, etc.*

Discussion A : Priorities “Digital Technologies”

Priorities “Digital Technologies” → *CORE Digitalisation: ETIP SNET priorities*

Digital Technologies

1. Making **communication standardised and interoperable**
2. Providing **data protocols for data exchange**
3. Monitoring and control of **distributed generation**
4. Integrating **digital twins** for system control (platforms)
5. Providing **decision making tools for TSO and DSO**
6. Providing **Cybersecurity protection** of grid infrastructures
7. Handling **Smart Meter Data** and **Big Data**
8. Adapting and using **IoT technologies**
9. **Data Storage** architectural schemes
10. Managing legacy **SCADA**

Discussion:

- **How do you contribute to the above ETIP SNET CORE Digitalisation priorities?**
- **How do ETIP SNET priorities of “Digital Technologies” fit to your own ETIP/PPP/ … agenda?**

Discussion B: Priorities for "Digital Use Cases" (Part B.1)

Priorities for "Digital Use Cases" (Part B.1) → *Applying Digitalisation: ETIP SNET priorities*

Digital Use cases

1. Digitalising **smart appliances**: making demand and generation flexible
2. Digitalisation to **enable flexibility**: in grid technologies; by Load Shedding; in secondary substations;
3. Digitalisation to **enable the provision of ancillary services** by prosumers
4. Developing **State of Health (SoH)** estimates of transmission system components;
5. Digitalisation to enable **condition-based planning LV/MV based maintenance**;
6. Developing **models and digitalisation** to detect component failures;
7. Digitalising **buildings, living quarters (islands)** for stand-alone operation
8. Developing processes for **intentional islanding**;

Discussion:

- **How do you contribute to the above ETIP SNET Digital use cases priorities?**
- **How do ETIP SNET priorities of "Digital Use cases" fit to your own ETIP/PPP/ … agenda?**

Discussion B: Priorities for "Digital Use Cases" (Part B.2)

Priorities for "Digital Use Cases" (Part B.2) → *Applying Digitalisation: ETIP SNET priorities*

Digital Use cases

1. Providing RES and Hydropower forecasting;
2. Digitalisation to enable self-healing electricity / energy systems
3. Digitalisation to enable Wide Area Monitoring and Control Architecture for Transmission Systems;
4. Developing Energy Management platforms
   - for TSOs interaction with local markets;
   - for enabling DSOs active participation of customers in energy market interoperability;
5. Developing control center architectures for distributed network control;
6. Developing training simulators for DSOs and TSOs using Digital Twins;
   - Advanced MMI (Man-Machine-Interface);

Discussion:

- **How do you contribute to the above ETIP SNET Digital use cases priorities?**
- **How do ETIP SNET priorities of "Digital Use cases" fit to your own ETIP/PPP/ … agenda?**

Conclusions on Priorities "Digitalisation enables services for the integrated energy systems"

15:45 – 16:00: Conclusions (15 mn)

- General
  - …
  - …
- A: Validation Priorities **for "Digital Technologies"**
  - …
  - …
- B: Validation Priorities for "**Digital Use Cases**" …

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