ETIP SNET WG4

Digitisation of Energy System and Customer Participation (Digital Energy)

Professor George Huitema
(george.huitema@tno.nl)
Working Group 4 Representative
Scientist at TNO, University of Groningen

Northern Regional Workshop
Riga, December 8th 2017

WG4 Objectives

- Support the **energy transition**
- Support the **digital transformation** introduced in every aspect of the **economy and customers**' daily life
- Bring **innovations** related to digitalization of energy sector
- Contributions will be required to **provide expertise** and to get a **better knowledge of ongoing R&I projects**

WG4 Membership

- **Chairman**: Maher Chebbo (ESMIG; GE Power)
- **Vice Chairmans**:
  - Esther Hardi (EDSO; Alliander)
  - Miguel Sanchez (EUTC; Iberdrola)
- Members:
  - 60 are selected to be active members of the WG4. Selection criteria: Expertize, Stakeholders, European Coverage, Gender, Motivation and time allocated
  - 40 are informed Quarterly, invited sometimes as guest speakers

Scope of WG4

- Full digitalisation in both **transmission and distribution networks**
  - **Development of tools** for monitoring, automation and control, cybersecurity; use of big data, IoT and tools to network management
  - Use of IoT and data mining to develop **smart asset management strategies**, manage the network, closer to physical limits
  - Coordinate and participate in **standardization activities** for communication and data exchanges between stakeholders
  - Develop scalable solutions to address **large-scale data management** issues in power system
  - Ensure **physical and cyber-security** of digital substations

Scope of WG4

- **Cybersecurity** issues:
  - Identify and define **cyber-security issues** (confidentiality, integrity, vulnerability and availability of information flow) by considering the different layers of SGAM
  - Identify the existing **standards**, possible **gaps** and provide potential **improvement**
  - Explore possible **cyber-security R&I issues** for Smartgrids
- Leverage knowledge of **consumer data**:
  - Efficient **data mining algorithms** for various applications (generation/load forecast, consumer behavior, failure/aging models for network components)
  - Efficient **data mining algorithms** for market players to create **new business opportunities**
  - Address **data privacy** concerns, while ensuring **transparent** and **non-discriminatory** access to the data for all market players
  - Develop standard systems for **editing smart meter data** with different costumer interfaces and **connected to smart appliances**

Scope of WG4

- **Consumer involvement** in the development and operation of the energy system:
  - **Improve public awareness** of long term energy challenges and the need to build and protect energy infrastructure to increase the social benefit of energy use
  - **Assessment** of **new environmental challenges** improvement of the energy infrastructure land use and **environmental integration**
  - Exploit new channels for the **public consultation processes**

Digitalisation of the Energy System

- The digitalization of the energy system is not starting in these days but it is a process that is active since at least 10 years. Main focus so far has been on the infrastructure operation and coherently the concept of **Smart Grid** has been the focus of research and applications.
- In this sense, the digitalization of the energy system is a broader concept than Smart Grid **with significant social components** and not only technology innovation.
- The final goal is to enable a flexible open market of energy with equal possibility of participation of every player as envisioned by the Winter Package.
- **Digitalisation** is the process of moving to a digital business, that is using digital technologies to change business models and provide new revenue streams and value producing opportunities.

Digitalisation of the Energy System

- In this sense, with respect to the traditional idea of a Smart Grid, the digitalization process involves other new factors such as:
  - Customer involvements and possible disruptive new business models that could emerge from this involvement
  - Greater attention to sector coupling and then correspondingly a convergence of Smart Energy and Smart City
  - New concepts that are emerging also at the physical layers thanks to a greater role played by electronics in the new system.

- As result, the digitalisation is affecting the energy system at three different levels. For each of these level there are peculiarities that bring different technologies to play a key role. We can define these three layers this way:
  - Physical Layer
  - Infrastructure Layer
  - Business Layer

WG4 Digitalisation Topics (1/2)

For WG4 the relevant cluster 2 of the ETIP SNET Implementation plan 2017 – 2020 is detailed by the following topics paving the way to a full digitalisation of the energy system allowing efficient markets, empowering customers, etc.:

- **Topic 4 (Digital Technologies, Reference Architectures and Standards for a Scalable Energy Transition)** for the overview of the development of a suitable ICT infrastructure, data availability and common standards for data exchange which will help to connect efficiently network operators and market players (including prosumers);
- **Topic 5 (Demonstration of integrated IT-solutions for new markets and business models across the system)** for the design and the demonstration of specific ICT solutions for market players;
- **Topic 6 (Customer participation and New Markets and Business Models)** for the design and the demonstration of specific ICT solution, with the associated business models, allowing the end-users' participation in energy markets;
- **Topic 7 (Design and Demonstration of Grid digitalisation)** to specify and demonstrate for the future energy system the digital technologies ensuring system reliability.

WG4 Digitalisation Topics (2/2)

The full digitalisation of the energy system will bring new opportunities (e.g. Internet of Things -IoT) and challenges (e.g. cybersecurity) which are addressed in two topics:

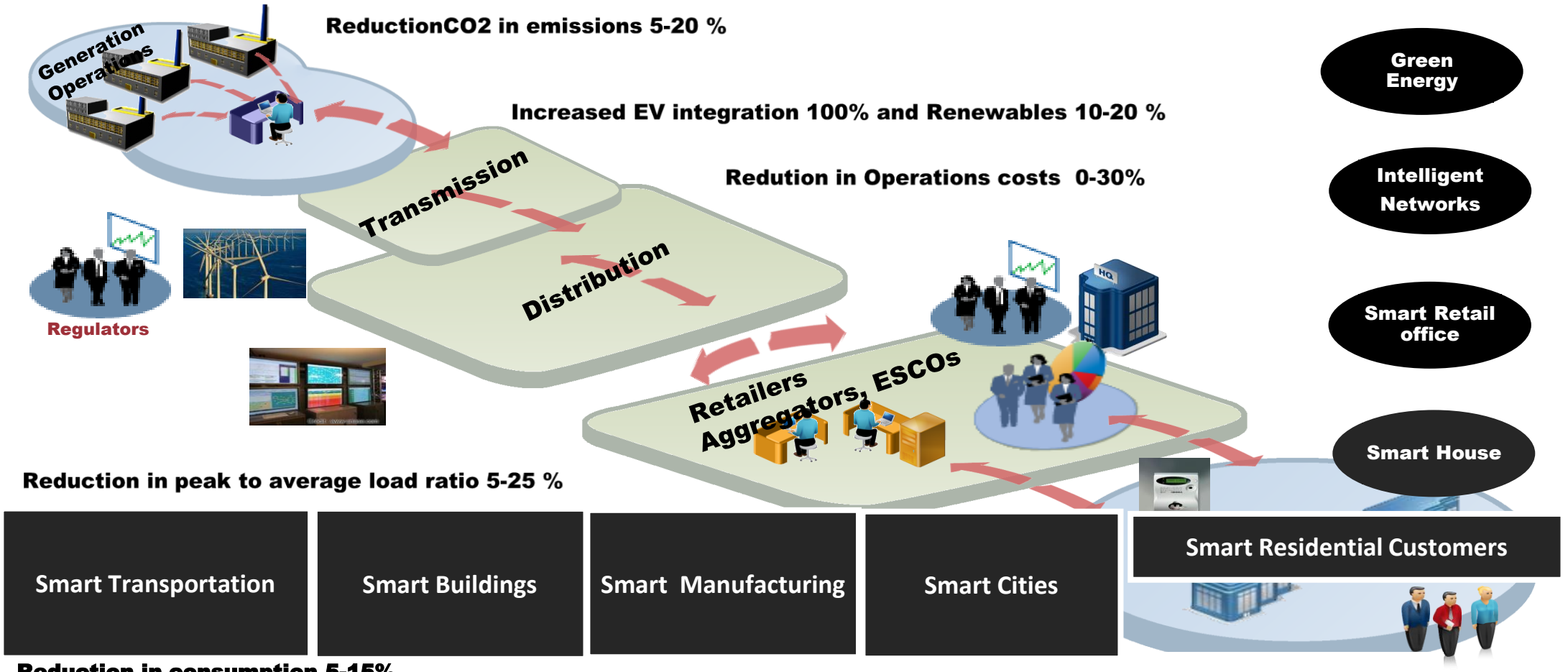
- **Topic 8 (Digitalisation and Big Data, IOT and IIOT)** for example how to make use of IoT and data mining techniques (big data) to develop smart asset management strategies;

- **Topic 9 (Cybersecurity of critical energy infrastructures)** to assess in depth cybersecurity issues and propose solutions so as to maintain the system robust against possible cyber threats.

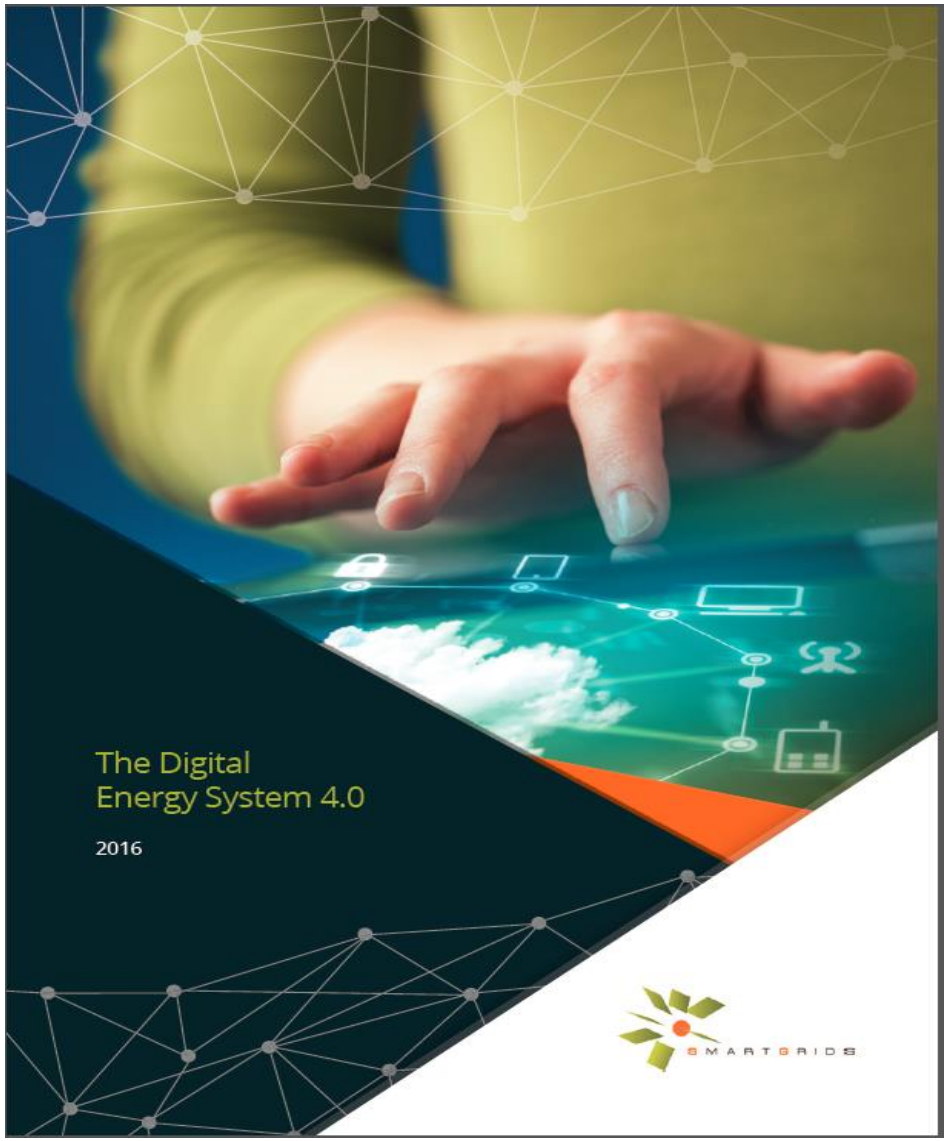
Position Paper WG4
Digitalisation in the energy Transition,

- Currently WG4 works on Position paper (2018) presenting the opinion of WG4 on Digitalisation and will be input to the development of R&I activities as follows:
- **Taskforce 1. (ENABLERS)**
  - Digital Technologies and reference architectures and standards (Advanced IT, Telecommunications, …IOT, Big Data, Blockchain, Exchange Platform), data Science and Modeling
  - covers: Topics T4, T5, T7, T8
- **Taskforce 2. (SERVICES)**
  - Digital Energy Disruptive Use Cases and New Market and Business Models
  - covers: Topic T6
- **Taskforce 3. (ROBUST)**
  - Digital Cyber-Security recommendations
  - covers: Topic T8
- Timeframe: 2017 – 2026 - 2035

Digitalisation over the Energy Value Chain



Input: The Digital Energy System 4.0 by ETP SmartGrids



1) Foreword
2) What does Digital Transformation mean? What are the use cases ?
3) Practical use cases and field trials
3.1. Digital use cases for power generation
3.1.1 Probabilistic forecasting of wind generation, forecasting of extremes and optimal use of forecasts in power system operations and markets.
3.1.2 Smart curtailment, dynamic line rating and Improved forecasting tools to maximize integration of wind
3.2. Digital use cases for transmission & distribution networks
3.2.1 The STAR project: Remote operation and Grid Automation systems
3.2.2 Innovative Tools for Electrical System Security within Large Areas
3.2.3 Autonomous grid reconfiguration and forecasting in the MV grid
3.2.4 Meter data management for network operation in the LV grid
3.2.5 Collaborative Asset Management
3.2.6 Advanced tools and ICT servicers for Distribution System Operators
3.2.7 A Platform to interface demand side management with DSO needs
3.3. Digital use cases for retailers and aggregators
3.3.1 Empowering SG Market Actors through Information and Communication Technologies
3.3.2 IDE4L Use Cases on technical and commercial aggregators
3.4. Digital use cases for consumers & Prosumers 45
3.4.1 Dynamic pricing and Demand Response Management
3.4.2 Smart houses in a smart grid environment
3.4.3 Smart charging of electric vehicles
3.4.4 Neighborhood energy management
3.4.5 Use cases
3.4.6 Technology development needed to meet the challenges
3.5. Digital use cases for new market platforms
3.5.1 Local Energy Markets
3.5.2 ICT tools for cross-border markets
3.5.3 The DSO as market facilitator
3.5.4 The Universal Smart Energy Framework
4) Main recommendations on Digital roadmap
Conclusions
Appendix: ETP SG Workshop on Energy Digitalization

SMARTGRIDS

*(ETP SmartGrids **Digital Energy 4.0** task force chaired by M. Chebbo) – white paper issued in May 2016*

The Digital Energy System 4.0 by ETP SmartGrids

- Major conclusions:
  - **Digitalization** will be happening
    - Cost-benefit analysis not always positive
  - Actors need to adjust their **internal operational and business strategy**
    - Adopt **new technologies**
    - More interaction through **dedicated platforms and data exchanges**
  - **Regulation** plays an important role
    - They have to provide the correct **incentives** to **develop** the required **technologies**
  - **Funding research agencies** will be necessary

Top 10 recommendations for the Digital Roadmap of Europe

Predicted spending of 50 b€ for the Digital Transformation of Europe
Energy 22% annual growth rate and €330 billion annual economic benefit for European Industry by 2020
Utilities can get additional 30% revenues from Energy Data Services

1. **Do not miss** the non-reversible Digital Transformation. Otherwise, it will be too late.
2. SmartGrids Management is not (yet) a **plug and play story** but Digital SmartGrids is!
3. We should **empower ICT infrastructures** using Digital simulation and forecasting models
4. The development of Open **electronic Marketplaces** will boost Digital Energy
5. **Well-guided data confidentiality** accelerates the digital transformation
6. Digital **well designed Energy Management** can successfully integrate massive renewables
7. **Leveraging Digital technologies** will also enable a well-functioning, **open and flexible markets**
8. **Digital home technologies** can shift residential consumption during peak demand
9. Keep investing in **disruptive digital technologies** while thinking first your **digital use cases**
10. Setup a **Virtual Innovation Hub** focusing on innovations in new **Energy Services**

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

Thank you!

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