Western European Region Workshop ETIP-SNET

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

PLAN.
INNOVATE.
ENGAGE.

ETIP SNET WG4 Digital Energy POV

Professor George Huitema

Senior Research Scientist, TNO

george.huitema@tno.nl

ETIP SNET WG4: Digital Energy

WG4
Digitisation of the electricity system and customer participation

Maher Chebbo (Chair)
Esther Hardi (Co-Chair)
Miguel A. Sánchez Fornié (Co-Chair)

Task Force 1

Antonello Monti (RWTH Aachen)
George Huitema (TNO)

Digital Technologies (enablers)

Task Force 2

Elena Boskov-Kovacs (Blueminds)

Digital Use Cases (services)

Task Force 3

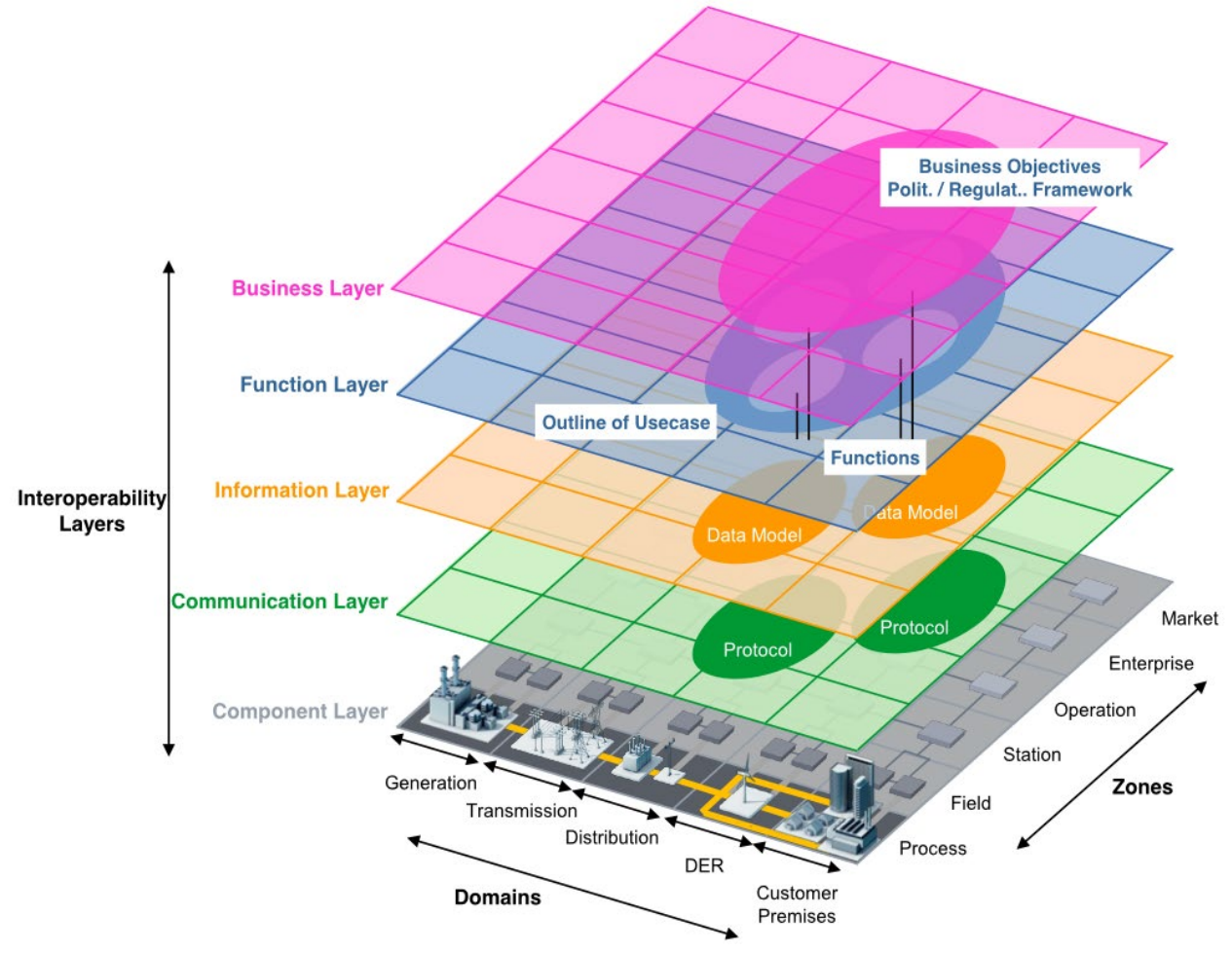
Marcus Meisel (TU Wien)

Digital Cyber Security (cyber robustness)

WG4 Impact

- Publications
  - https://www.etip-snet.eu/publications/etip-publications/
  - Vision 2050
  - Technical Position Paper + Executive Summary
    - Description and Recommendations of Technologies, Use cases and Cybersecurity
- Participation in the Regional Workshops
- Communicating the activities of the WG4 in journal papers, public events
- Active participation: on average 45 out of 60 experts participate

Scope



- **Digitalization** 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.
- The final goal is to enable a **flexible open, transparent trade market of energy with equal possibility of participation of every player** as envisioned by the Winter Package.
- The report uses a **three-layer approach of the energy system**, which can be uniquely mapped to the broadly used **Smart Grid Architecture Model (SGAM)** for designing smart energy systems.

Technical Position Paper WG4 – TF1 Enabling Technologies

- Digitalization is affecting the energy system at every level. In particular, the transformation from an electromechanical system to an electronic system is a fundamental change that will transform the fundamental principles around which the energy system is operating.
- Classical networks are based on a global balancing concept. This idea is now extended with the exploitation of flexibility. In a longer future, though, it may be easily understood that the flexibility exploitation has a limit and it will call for new ways of operations beyond synchronous balancing

Recommendations:

- **Need for new principles of operations** in a power electronics driven grid
- **Using AC versus DC**
- Enabling **sharing of infrastructures** such as 5G to support joined investments schemas
- **New and overarching architectures** able to include customers and the interactions with other verticals
- Creating a culture of **open API** to exploit the strength of open source in the energy sector
- Development of **open platforms** for a data economy
- Need for **trust technologies** such as, e.g. Blockchain
- Need of **adequate service management and operations** exploiting modern data analytics
- Need of **adequate education** breaking barriers between energy and ICT
- **Adaptation of legislation** and regulation to better support investments in software solutions

Technical Position Paper WG4 – TF2 Promising Use Cases, New Markets, Business Models

Infrastructure Layer

- Monitoring, visualisation, and analytics per stakeholder
- Use Cases between DSO and TSO

Physical layer

- Transparent market for labelled energy (ENSquare)
- Local Energy Community (LEC)
- Deliver Flexibility to the market (GOFLEX)
- Transparent Flexibility Market with LV monitoring (from Agder Energi – Norway)
- Preventive Maintenance – smart metering use case
- EV / mobility use case

Business Layer

- Increasing PV self consumption with digitalization using BC
- Jouliette – BC based energy token
- Consumer empowerment, customer relationship and behavioral change
- Democracy by design
- Digital Twin

Technical Position Paper WG4 – TF2 Promising Use Cases, New Markets, Business Models

With respect to the traditional concept of a Smart Grid and Smart Networks, the digitalization process involves other new factors such as Customer involvements and possible disruptive new business models that could emerge from this involvement

Recommendations:

- **Enabling monitoring, visualization, and analytics** for every stakeholder group
- Building data hubs with new data sets
- **Cross-sector coupling** – needed to offer complete service to customer
- **Local energy communities** – offer benefits but need further work on regulation and ownership structure
- strong collaboration between industry leaders and utilities
- **Existing infrastructure** such as smart metering should be **further exploited** and utilized
- **Establishing Innovation/Expert centers** – case in point for EV penetration
- Data transformation – **digital twin**
- **Decomposing blockchain challenges** through research
- Customer empowerment – needs not only technology but behavioural change
- **TSO-DSO cooperation and coordination**

WG4 TF3: Highlights CS Topics

Technology

- Artificial Intelligence (AI)
- Authentication
- Vision Cybersecurity Centralized vs. Distributed
- Huge Sensor Databases
- Cloud Computing
- Safety intersecting Security
- Blockchain (BC)
- Predictive Analytics
- System Integrity

Policy

- Metrics
- Existing Related/Background Efforts
- GDPR
- Naming Risk Cost Benefit
- Anonymisation Aggregation
- Privacy Layer
- NIS Directive
- Sharing of Vulnerabilities
- Training and Policy Amendments

Future Challenges

- Progress Considerations
- Societal Impact
- Quantum Processing
- Quantifying Impacts
- New Crypto Environments
- Data Stream Challenges
- Bio-Nano Challenges
- Robotics Safety Impact
- Autonomous Vehicles Regulation

WG4 TF3: Recommendations

Technology

1. AI will help cybersecurity industry to efficiently monitor sophisticated threats
2. Blockchain is considered as a promising technology to address authentication
3. Blockchain offers a secure decentralized way to guarantee the veracity of various transactions
4. Digitalization enables and relies on the massive deployment of sensors that improve analysis
5. IoT enabled devices will make the energy system more transparent and efficient with Analytics
6. For highly networked components, safety is not reachable without cybersecurity
7. Machine Learning enables predictive analytics which helps detecting specific cyber attacks
8. OT/IT Cybersecurity architecture raises the question of on-premise vs cloud based calculation
9. Grid optimization application are suitable to be deployed in a cloud environment; however safety or security relevant grid control requires still a decentralized grid asset deployment

WG4 TF3 : Recommendations

Policy

1. Metrics and frameworks should be developed for decision making of cybersecurity risks
2. Stakeholders living in isolated silos need a communication platform (IT, TSOs, DSOs, Policy).
3. Cybersecurity research at a meta level should be stimulated among the Member States
4. Transparency of data flows and standardized data models are required comply with GDPR
5. Cost benefit analyses shall be considered (e.g., black out simulators).
6. Research on regulation securing Cybersecurity investments is recommended
7. The NIS directive boosts cooperation between (US) MS for cybersecurity. Same should be for EU
8. Obscurity is not equal to security
9. Knowledge databases are used to share and access known vulnerabilities
10. Regular trainings are key to make our critical infrastructure resilient against cyber-attacks

WG4 TF3 : Recommendations

Future challenges

1. Society and energy users need awareness about cybersecurity in the energy use
2. Involvement of energy users is necessary to achieve the desired level of risk protection
3. Quantum cryptography is a promising disruptive computing technology (US)
4. Simulation is promising to quantify cyber-attack impacts on energy systems
5. Research should include field demonstrations with cryptographic open protocol solutions
6. New communication technologies, like 5G need to guarantee SLAs for critical infrastructures
7. Bio- and nano-technologies will raise the number of cyber threats which require research
8. Programming tools need to offer new testing and simulation frameworks
9. Security protocols for life forms need to guide customers at home with DIY CRISPR Kits
10. Robotics brings new threats which requires research like Physical Unclonable Functions (PUF)
11. Investigate Autonomous vehicles, like drones and cars, bringing new threats for energy grids

PLAN.
INNOVATE.
ENGAGE.

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

Thanks for your attention

george.huitema@tno.nl

More information ETIP SNET:


etip-snet.eu


@etipsnet


info@etip-snet.eu


linkedin.com/groups/8208338

Key Discussion Topics

- What's the role of Digital within the vision 2050?
- Is the digital technology ready for the Energy transition?
- What digital use cases will make SmartGrids happen?
- What are the risks with the implementation of Digital?
- How to avoid future legacy, ie. digital silo's?