NSCG workshop – Clean Energy Week

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

ETIP SNET WG4 Digital Energy POV

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ETIP SNET WG4 Digital Energy – Task Force 2 leader – Disruptive Use Cases and New Markets

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Zagreb, 20 September 2018

ETIP SNET's organisation

WG1
Reliable, economic and efficient smart grid system

WG2
Storage technologies and sector interfaces

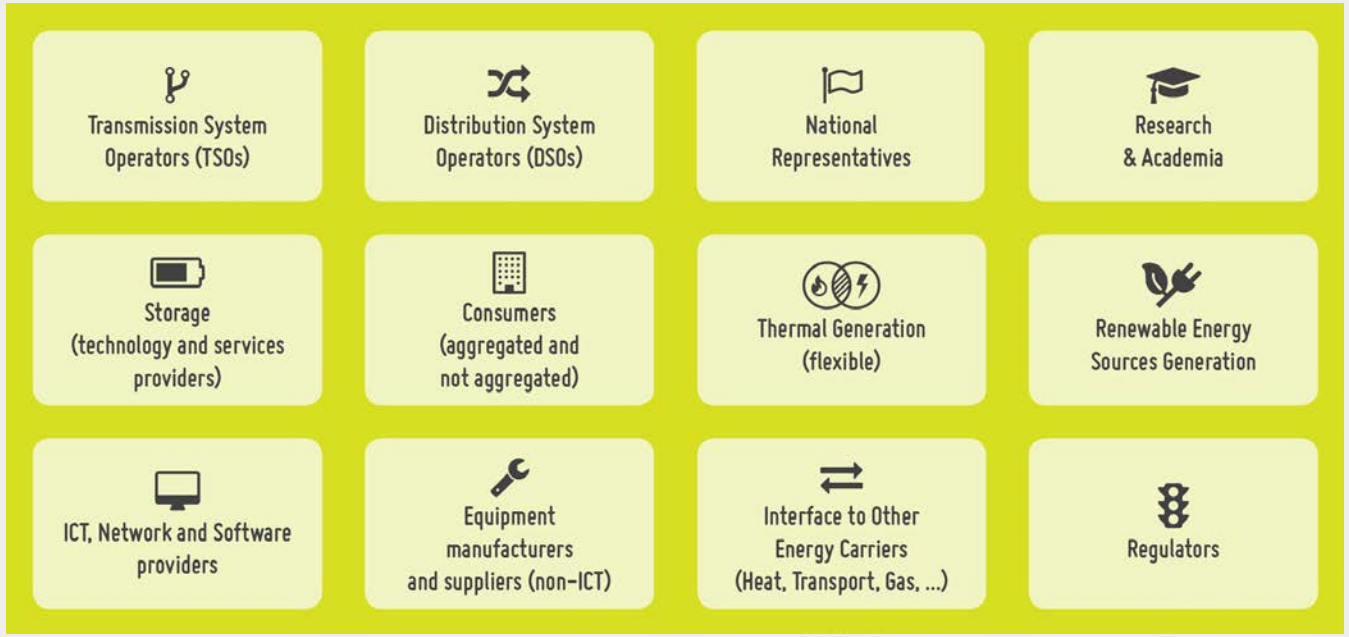
WG3
Flexible Generation

WG4
Digitisation of the electricity system and customer participation

WG5
Innovation implementation in the business environment

ETIP SNET Stakeholders & WG4 Digital Energy

ETIP SNET Stakeholders



WG4 Digital Energy Stakeholders

- Consumers
- DSO/TSO
- Equipment suppliers
- ICT Technology providers
- Telecom operators
- Renewable Energy Sources providers
- Research and Academia
- Others

ETIP SNET WG4 : Digital Energy

WG4
Digitisation of the electricity system and customer participation

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

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Antonello Monti
George Huitema

Digital Technologies (enablers)

Task Force 2

Elena Boskov-Kovacs

Digital Use Cases (services)

Task Force 3

Marcus Meisel

Digital Cyber Security (Robust)

ETIP SNET WG4 : Members of the TF1

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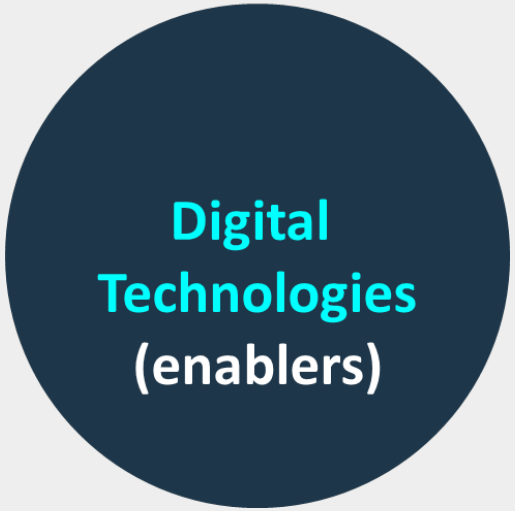

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DIGITALIZATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION

Technical Position Paper WG4

COMPLETED

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WG4 Task Force 1 : Highlights

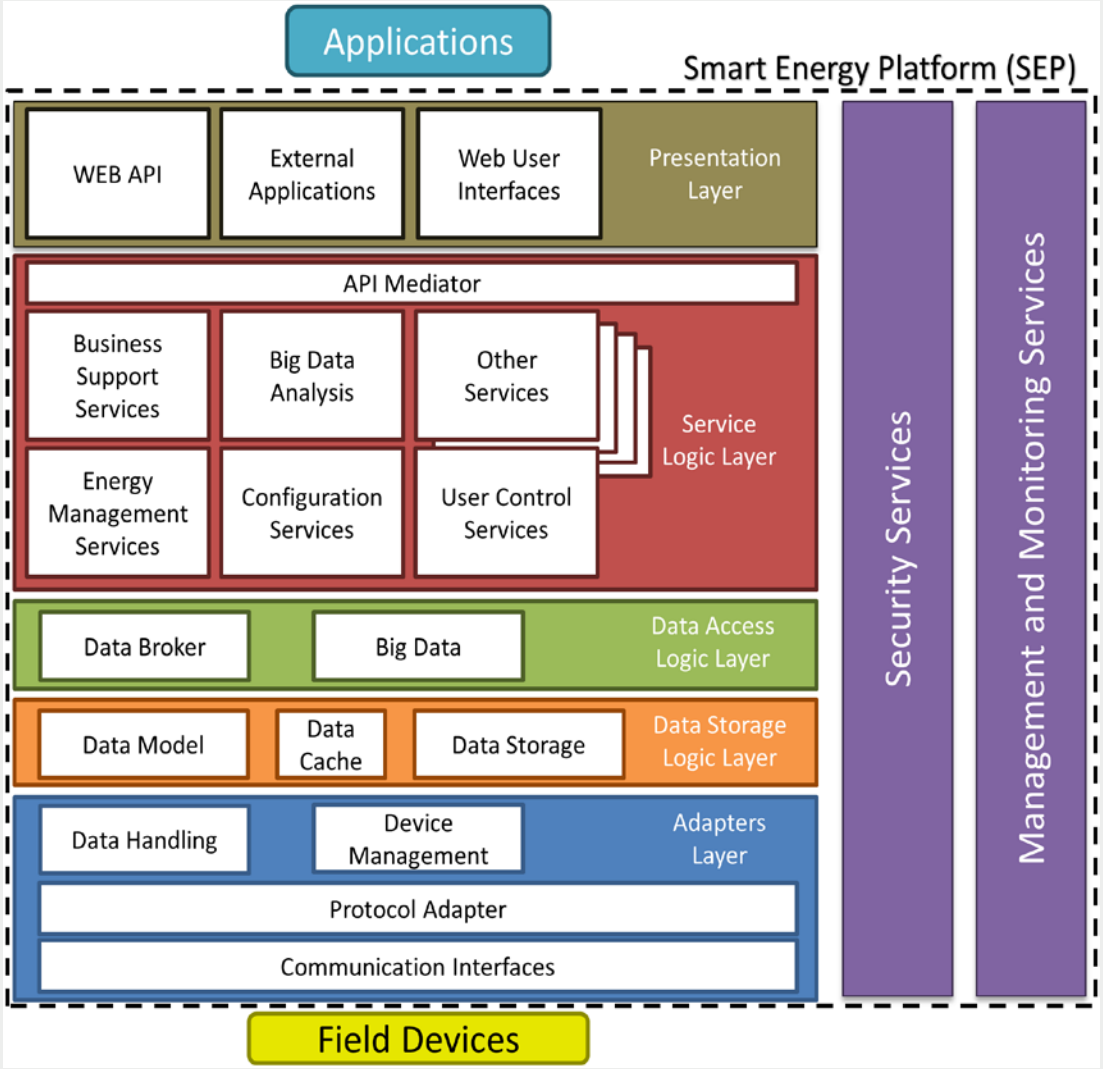
Digital Technologies (enablers)

Digitalization of the energy system

<u>Enabling Digitalization – Relevant Technologies & Standards</u>
- Technologies at the Physical Layer
- Power grid operation
- Technologies at the Business Layer

<u>Standards in support of Digitalization</u>

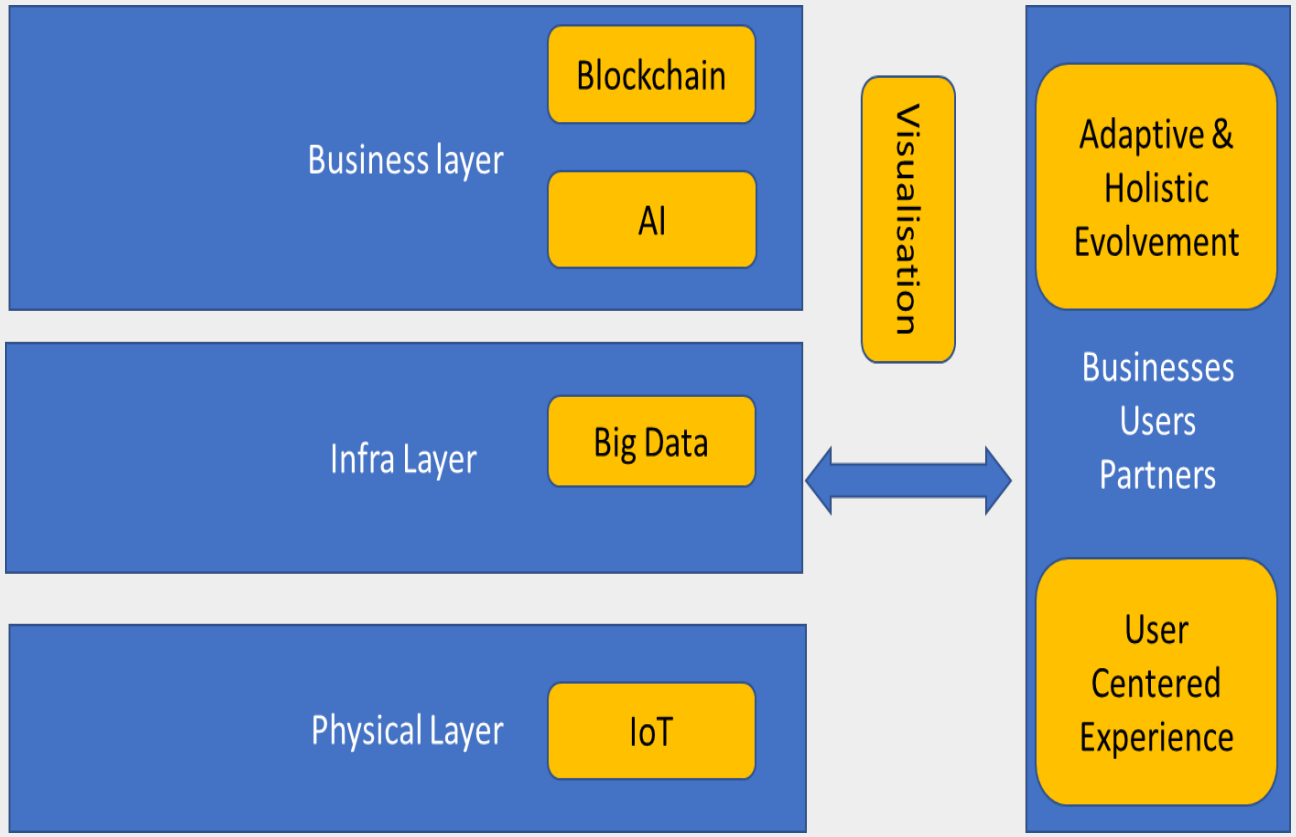
<u>Enabling Digitalization – Trends</u>
- Adaptive & Holistic Evolvement
- User centered Experience
- Future role of aggregation platforms
- Disruptive Enabling Technologies



WG4 Task Force 1 : Recommendations

Digital Technologies (enablers)

- Physical Layer
  - Need for new principles of operation
  - Using AC versus DC
- Infrastructure Layer
  - Sharing infrastructure investments
  - Need for overall covering architectures
- Business Layer
  - Need for trust raising technologies
  - Need for adequate Service Management &Ops
- General recommendations
  - Need for adequate education
  - Adaptation of legislation



WG4 Task Force 2 : Highlights

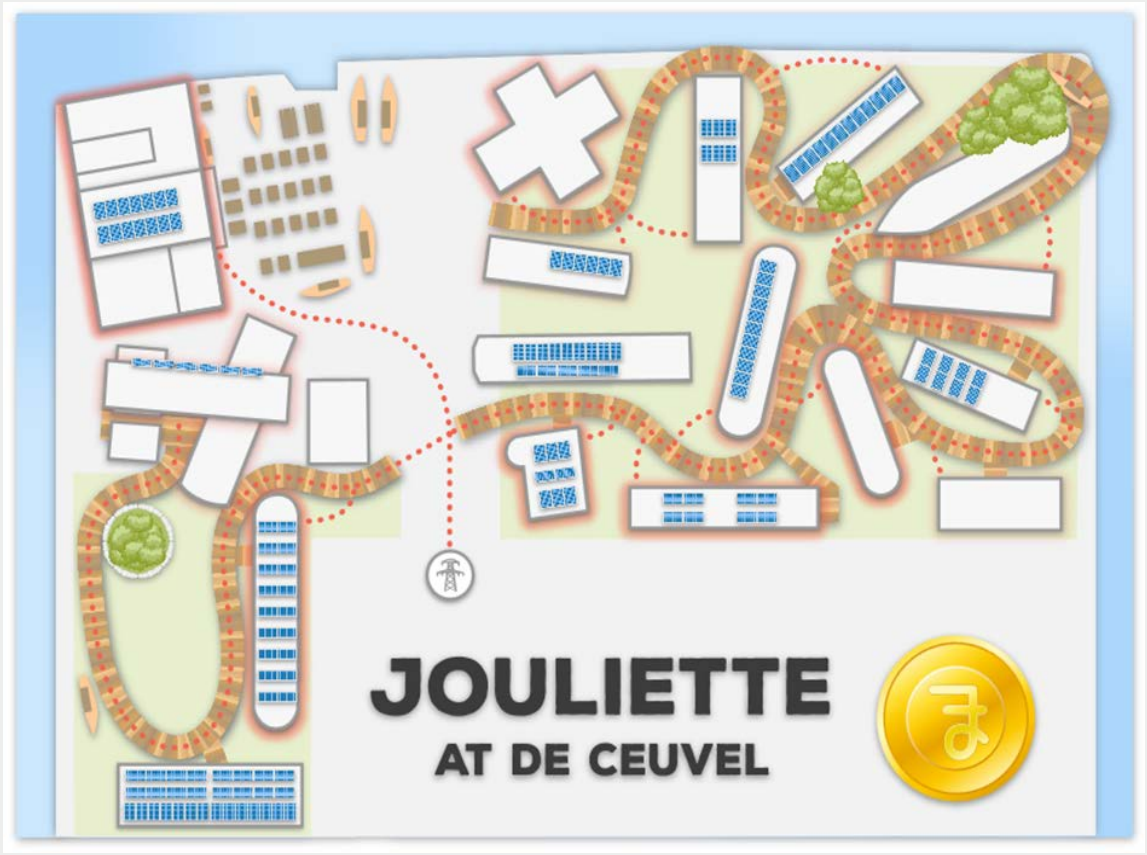
Digital Use Cases (services)

Use Cases (UC) – Main Outcome

<u>Infrastructure Layer</u>
- Monitoring, visualisation, and analytics per stakeholder
- Use Cases between DSO and TSO
- Democracy by Design use case (+ social networks)

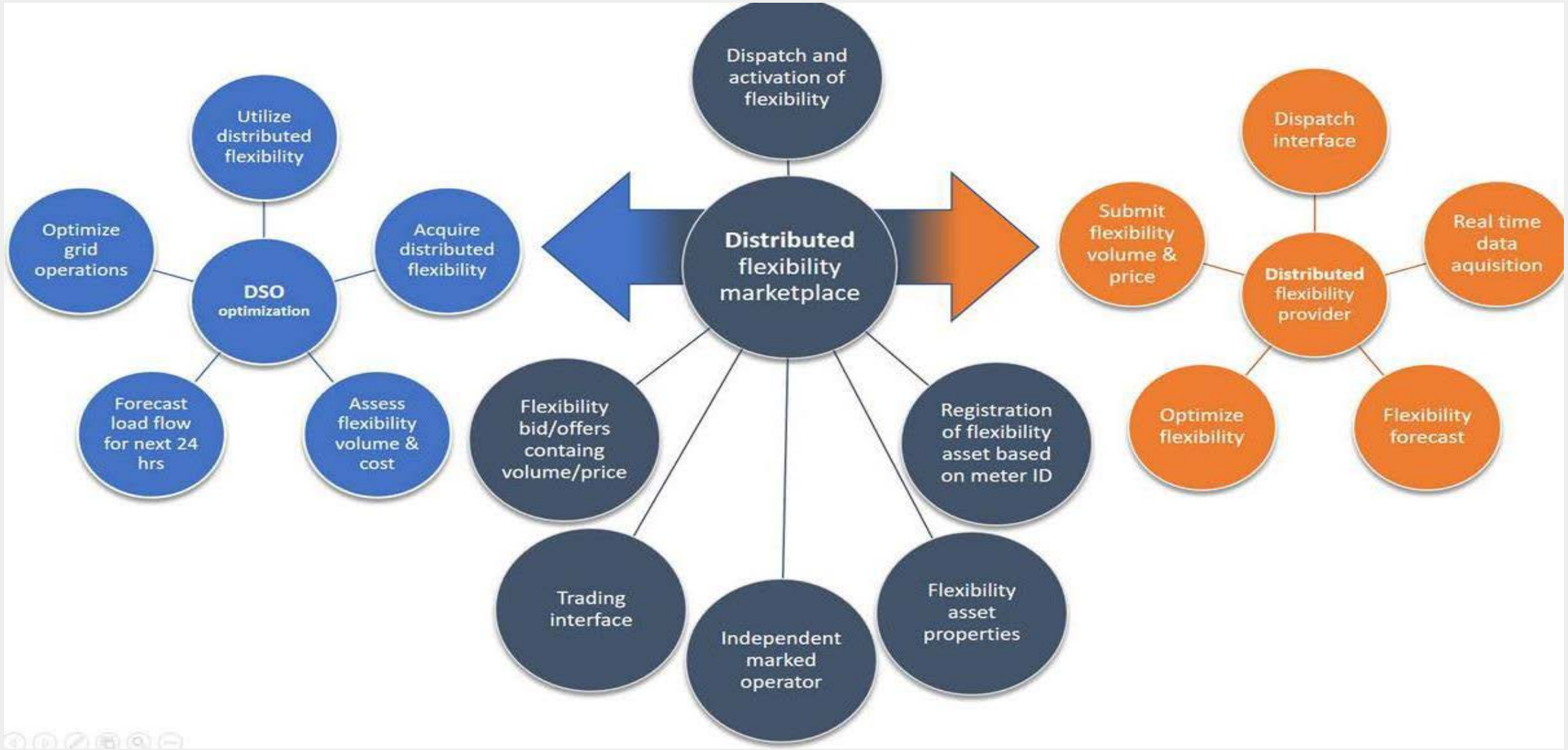
<u>Physical layer</u>
- Deliver Flexibility to the market
- Use Case from Agder Energi – Norway
- Preventive Maintenance – smart metering use case
- EV / mobility use case

<u>Business Layer</u>
- Increasing self consumption – BLOCKCHAIN Use Case 1
- BLOCKCHAIN Use Case 2
- Local Energy Community
- Democracy by design
- Digital twin



WG4 Task Force 2 : Ilustration of the Distributed Flexibility Marketplace

Digital Use Cases (services)



WG4 Task Force 2 : Recommendations

Digital Use Cases (services)

- Enabling monitoring, visualization, and analytics for every stakeholder group
- Building data hubs
- 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 is needed
- Existing infrastructure such as smart metering should be further exploited and utilized
- Establishing Innovation/Expert centers – case in point for EV penetration
- Data transformation – case of digital twin
- Decomposing blockchain challenges through research
- Customer empowerment – needs not only technology but behavioural change
- TSO-DSO cooperation and coordination

WG4 Task Force 3 : Highlights

Digital Cyber Security (Robust)

Technology

- Artificial Intelligence
- Authentication
- Vision Cybersecurity Centralized vs. Distributed
- Huge Sensor Databases
- Cloud Computing
- Safety intersecting Security
- Blockchain
- 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

Digital Cyber Security (Robust)

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

Digital Cyber Security (Robust)

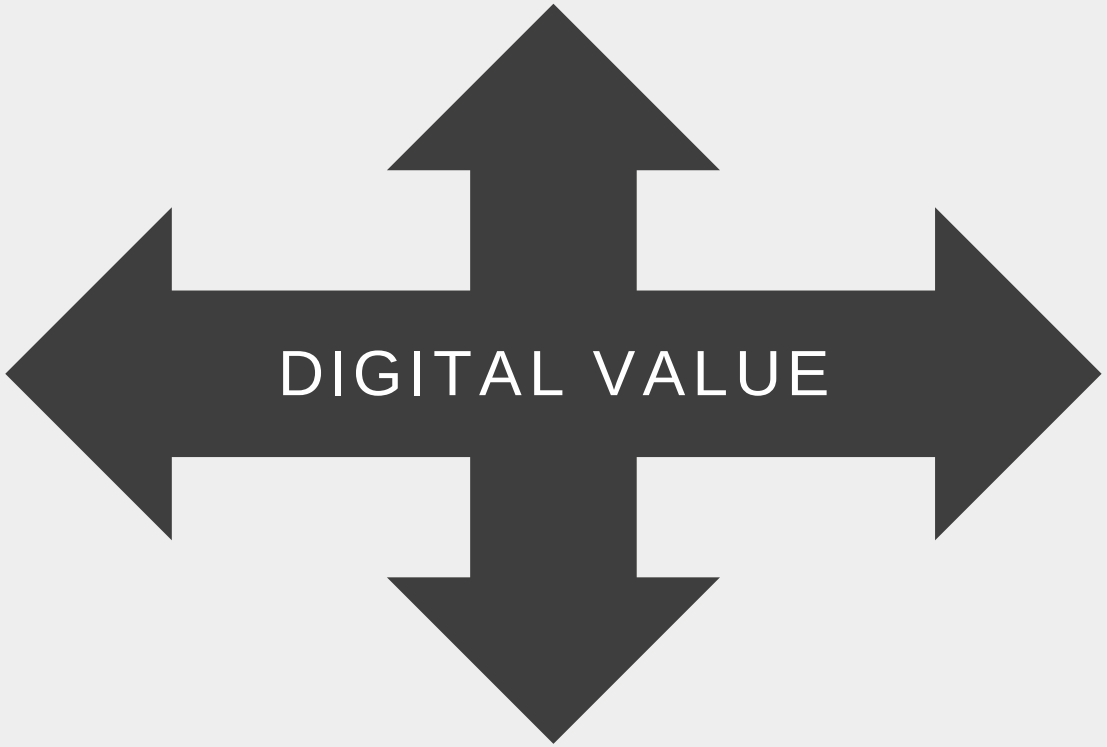
Future challenges

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

The Winning Digital Energy Equation

POLICY & REGULATION

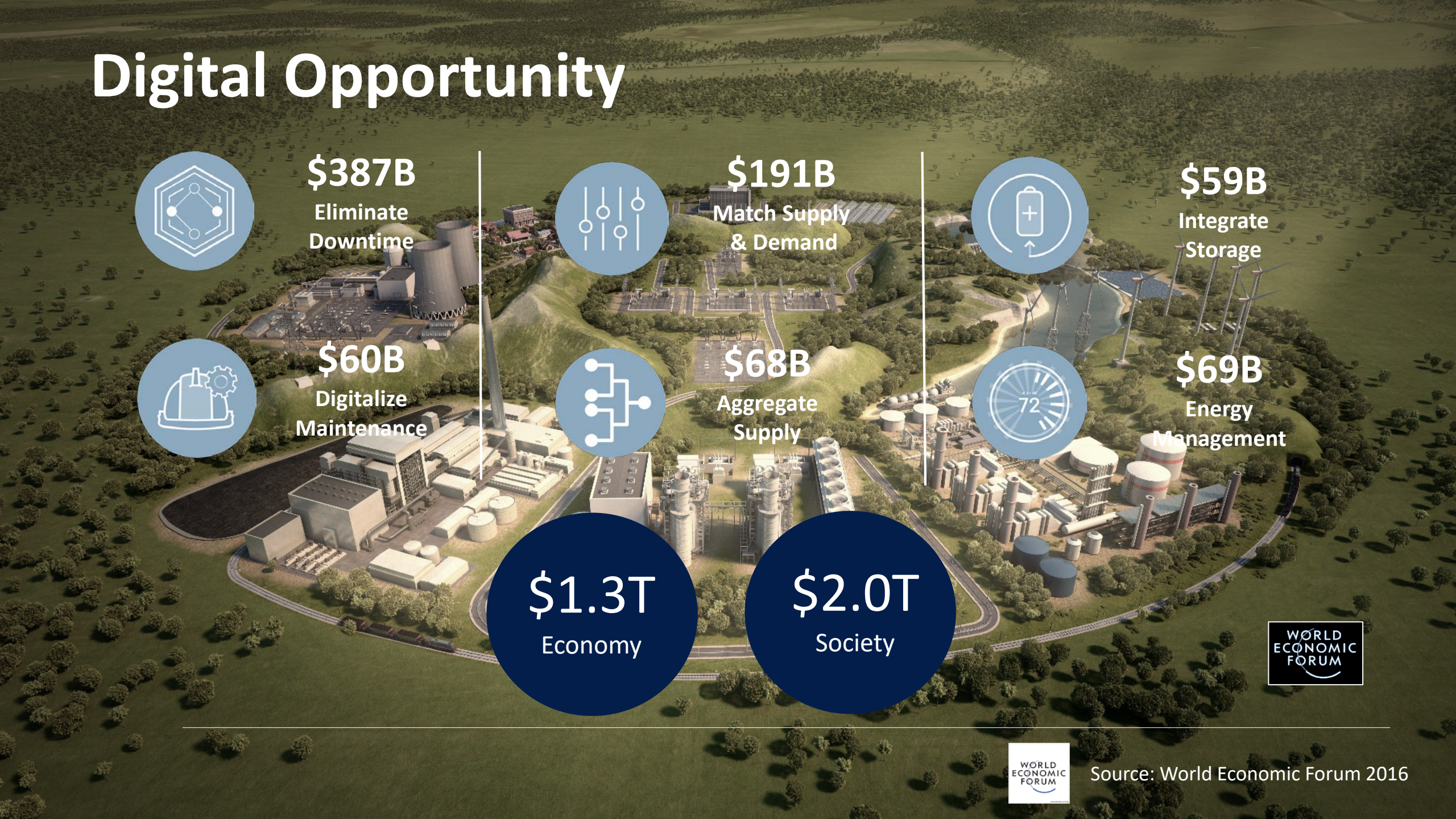
ENERGY VALUE CHAIN



SOCIO-ECONOMICS

TECHNOLOGY

Digital Opportunity



Source: World Economic Forum 2016

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Thanks for your attention

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European R&I energy policies

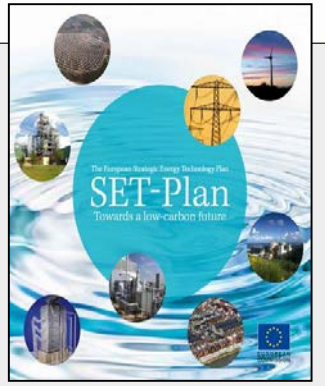
2008: The SET Plan

-20 % GHG Emissions*

20 % Renewable Energy

20 % Energy Efficiency**

binding



2014: Towards an Integrated Roadmap

- Individual Technologies → Energy system
- Policy challenges
  - Consumer at the centre
  - Energy efficiency (demand)
  - System optimisation
  - Technologies (supply)

-40 % GHG Emissions*

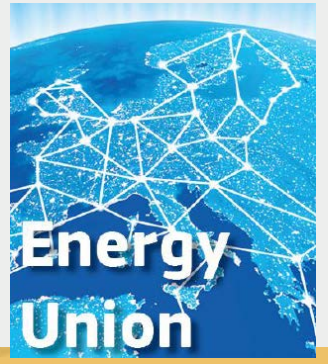
27 % Renewable Energy

27 % Energy Efficiency**

Not binding

2015: Energy Union – Priorities

- Energy security, solidarity and trust
- A fully integrated European energy market
- Energy Efficiency (EE) first: moderation of demand
- Transition to a low-carbon society: decarbonising the economy,
- **Research, Innovation and Competitiveness**



* Compared to 1990 ** compared to BAU

From a fragmented EU advisory to an integrated framework

EEGI
EUROPEAN ELECTRICITY GRID INITIATIVE

SMARTGRIDS

GRID+

GRID+ STORAGE

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

« European Technology and Innovation Platform

Smart Networks for Energy Transition »…

… addresses the innovation challenges in energy system and market evolution necessary for achieving climate protection and renewables integration with affordability and security of supply

… beyond smart electricity grids