

Assessment of the implementation of smart energy networks (smart grids and smart gas grid) from a legal/regulatory perspective

100% Climate Neutrality Conference
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- ▶ Offices in Berlin, Munich, Cologne, Hamburg, Stuttgart, Erfurt and Brussels

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- ▶ 1982 Research assistant, University of Hamburg
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Agenda

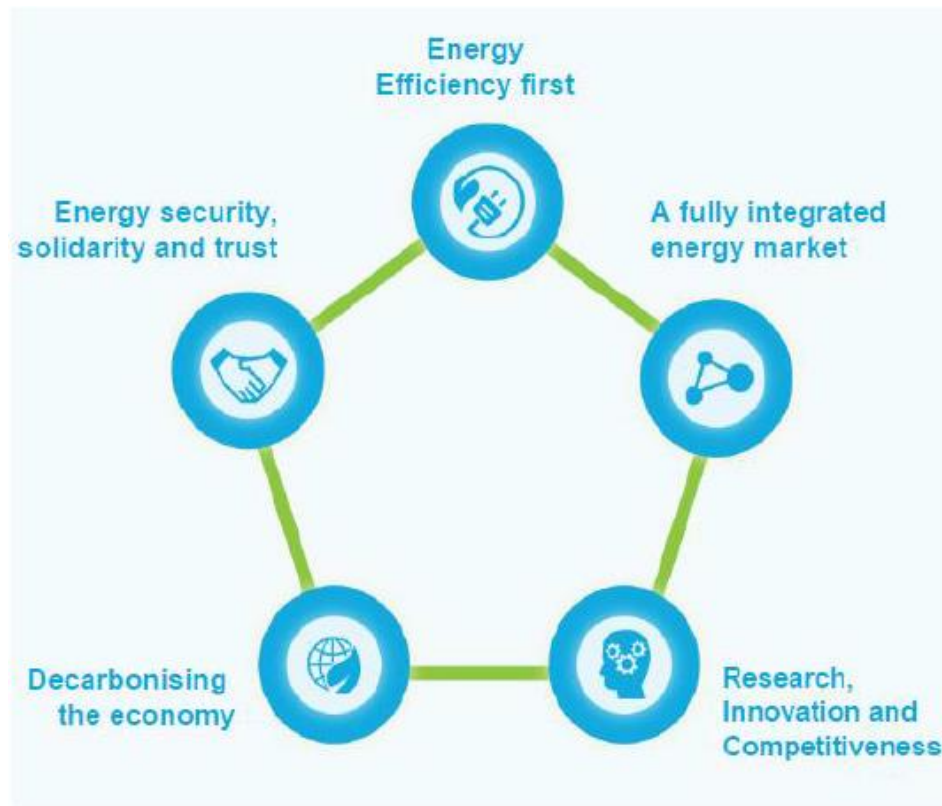
1. Smart energy networks: solution to significant changes of the energy systems
2. Role of NRA to enhance the implementation of smart grids and overview of smart grids projects in 2017
3. Should we move towards more regulation?
4. Ongoing reform: the “Winter Package”
5. Blockchain: enabler of smart transition

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EU targets: important drivers for innovation in the energy sector (1)

- ▶ **Priority policy of the EU:** implementing the Energy Union



» Source: EU Commission, Interreg Sudoe

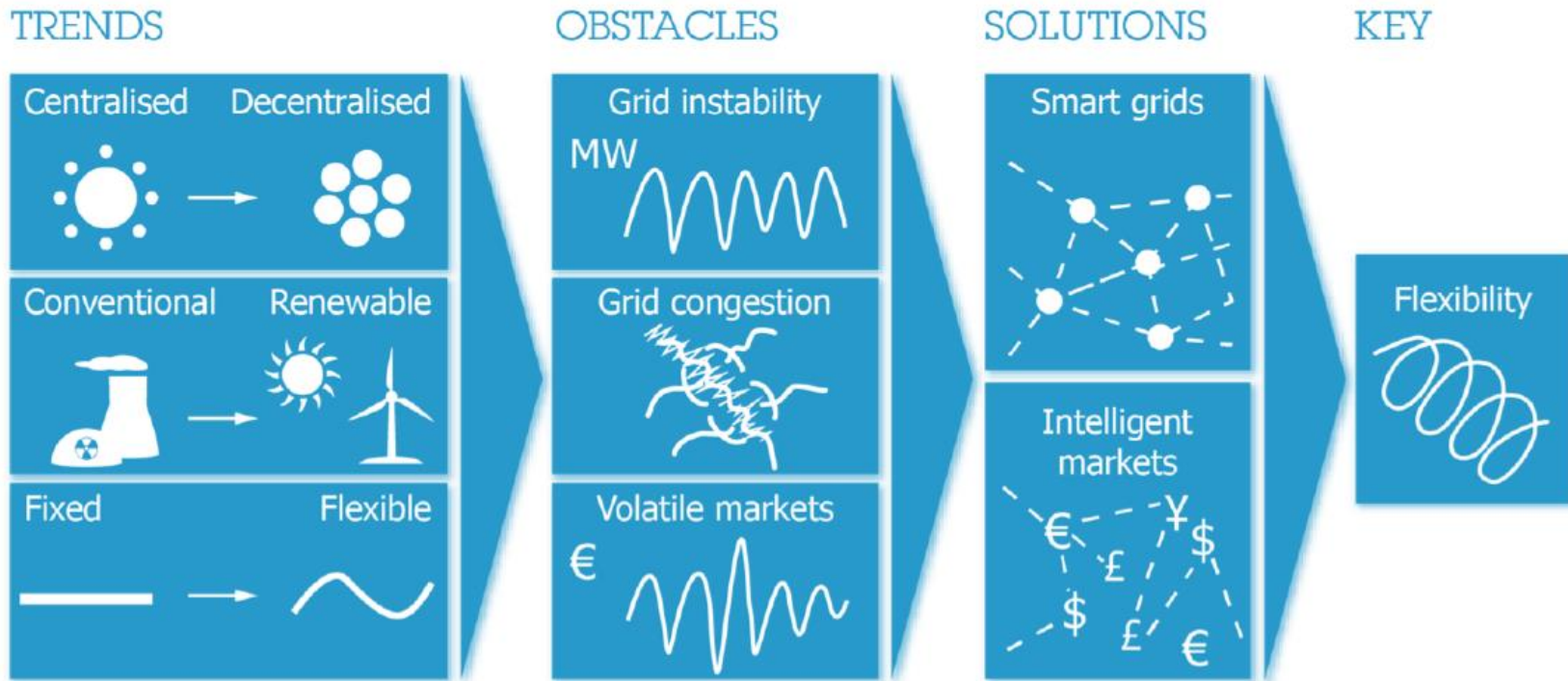
EU targets: important drivers for innovation in the energy sector (2)

- ▶ **EU Targets for 2030** (remembering growing energy needs)
 - 40% cut in greenhouse gas emissions compared to 1990 levels
 - at least 27% share of renewable energy consumption
 - at least 27% energy efficiency

These targets too low and unambitious to reach Paris goal

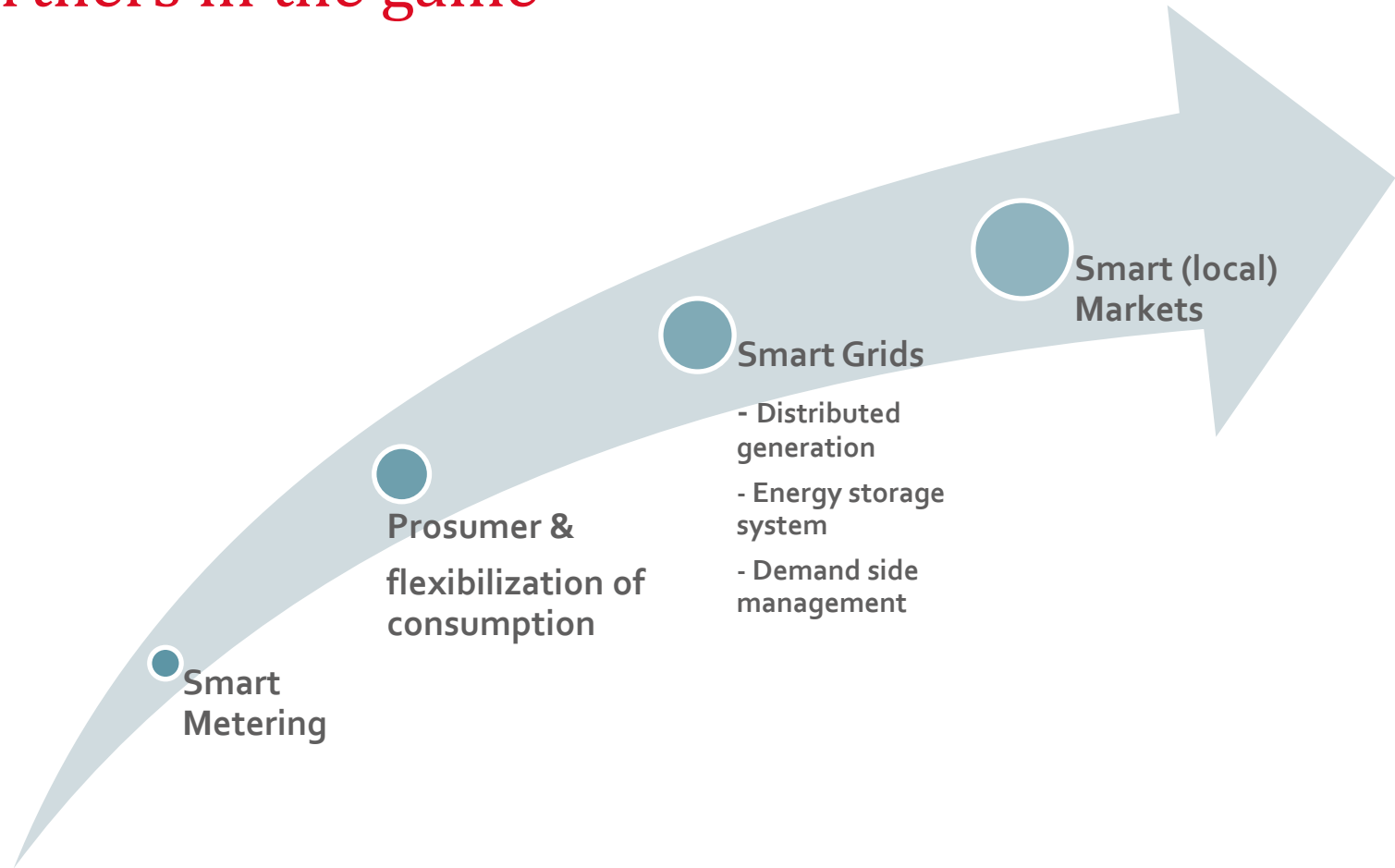
- ▶ Achieving these and hopefully higher targets requires a big change of Europe's energy system.

Smart grids : backbone of the future decarbonised energy system



Source: EU Commission, Interreg Sudoe

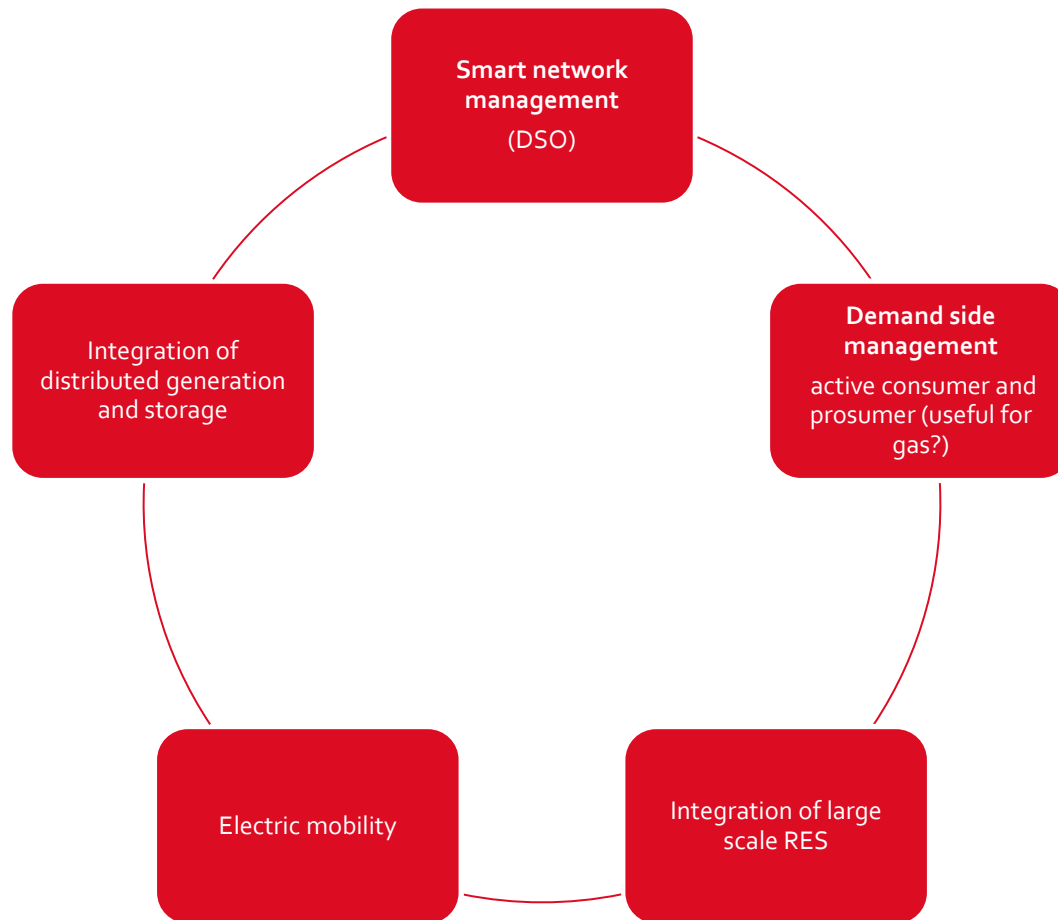
Partners in the game



Definition of a smart network/a smart grid ?

- ▶ Varieties of definition
- ▶ CEER (EU energy regulators) adopted a user-centric and technology neutral definition of a smart grid taken up by EU Commission:
 - *“A smart grid is an electricity network that can cost-efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and thoses that do both – in order to ensure economically efficient, sustainable power systems with low losses and high levels of quality and security of supply and safety” => **but limited to electricity***
- ▶ Smart Grids Task Force set up by EU Commission uses a more general definition including all energies:
 - *“Smart grids are energy networks that can automatically monitor energy flows and adjust to changes in energy supply and demand accordingly.”*

Smart grid domains



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Role of National Regulatory Authorities (NRA) to enhance the implementation of smart grids

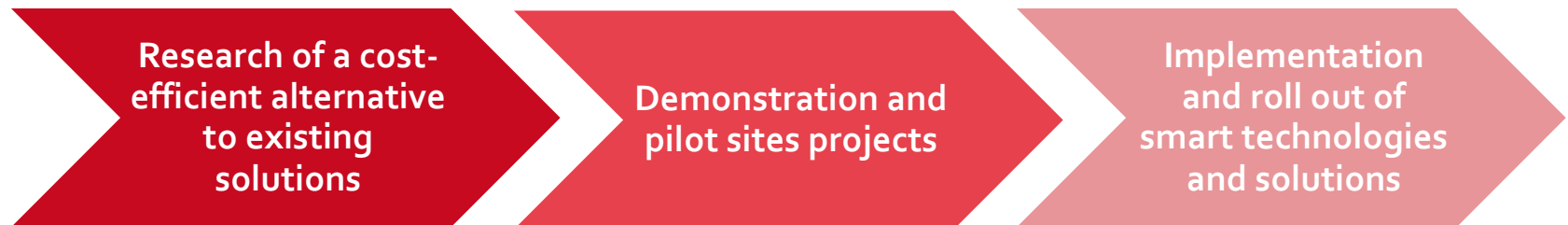


- ▶ Main areas of intervention:
 - incentivising and information provision
 - promoting and monitoring Research and Development (R&D) projects and Demonstration and Deployment (D&D) projects
 - definition of goals and input for legislation based on cost-benefit analysis
- ▶ Main priorities identified by CEER :
 - concentrate on outputs of the regulated entity, by tailored regulatory mechanisms
 - favour cooperation among stakeholders, with emphasis on standardisation, also in order to identify the possible barriers to smart grid development and
 - encourage an adequate level of innovation, while protecting consumers by the identification of costs and benefits of smart grid demonstrations and deployed solutions

Performance indicators for smartness

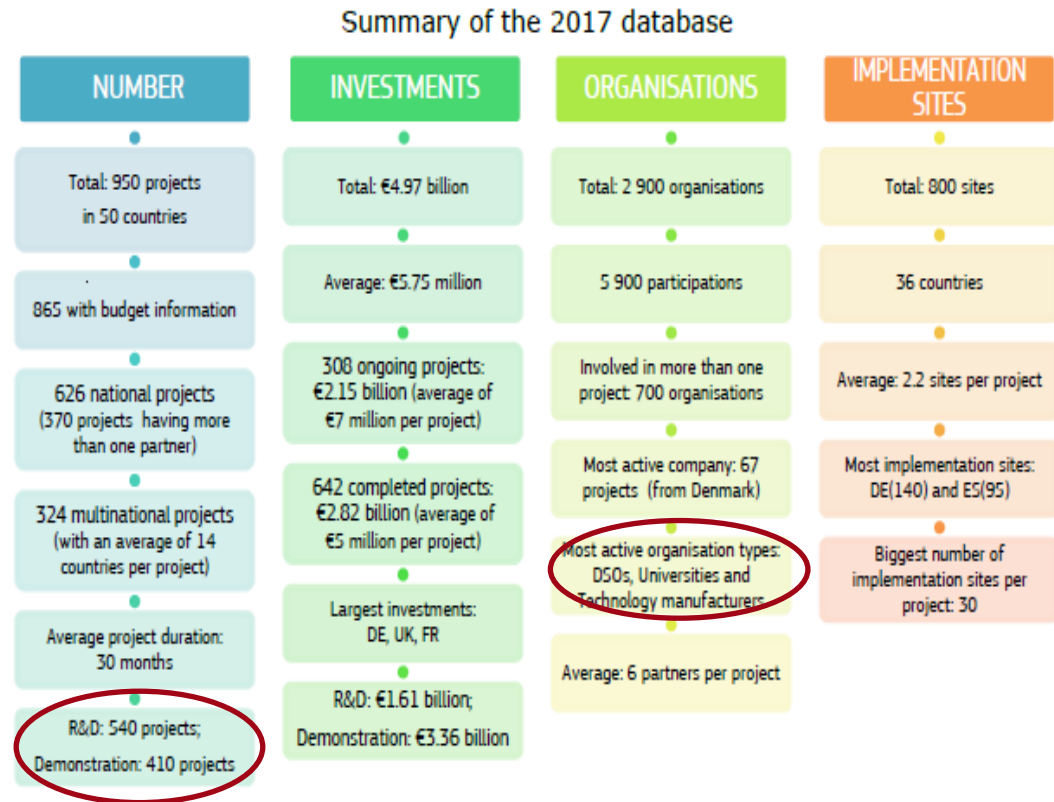
- ▶ Importance of the performance indicators for regulators in encouraging smart grid solutions (used as a revenue driver or under consideration for monitoring)
- ▶ Performance indicators identified by CEER Status Review of regulatory approaches to smart grids 2014:
 - **Hosting capacity for distributed energy resources in distribution grids**
 - Allowable max. injection of power without congestion risks in transmission networks
 - **Energy not withdrawn from renewable sources due to congestion and/or security risks**
 - **Measured satisfaction of grid users for the grid services received**
 - Level of losses in transmission and distribution networks
 - Actual availability of network capacity with respect to ist standard value
 - Ratio between interconnection capacity of one country/region and ist electricity demand
 - Exploitation of interconnection capacity
 - Time for licensing/authorisation of a new energy transmission infrastructure

Development stage of smart grids



Smart grids projects outlook 2017: Main findings of JRC Science for Policy Report

- ▶ Strong differences between MS (n° of projects and level of investment)
- ▶ Still more R&D than D&D projects
- ▶ Most important source of financing: private investment
- ▶ Stakeholder with the highest investment: DSOs (but emerging stakeholders are steadily increasing their investment)
- ▶ Domains with highest investment (80%): smart network management, demand side management and integration of distributed generation and storage



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Identified regulatory challenges for the implementation of smart grids (1)



- ▶ Specific compensation for innovation activities of network companies only in few MS
- ▶ Most NRAs tend to support short term innovation (difficult to implement the policy objectives and plan for the future)
- ▶ Price signals are not always efficiently passed onto consumers (tariff should be increasingly reflecting the impact of consumer on the electricity grid)
- ▶ Regulation has to take into account new market players (aggregators, storage and distributed generation), and define the role and responsibility of all stakeholders

Identified regulatory challenges for the implementation of smart grids (2)



- ▶ Current regulatory framework does not allow DSO to be flexible and cope with variable RES
- ▶ Specific obstacles, for example for the development of energy storage (Rules of ownership, access to the grid, lack of incentives for TSO, uncertainty concerning grid fees and levies, lack of markets for the set of services provided to the grid)

Regulation needs to adapt but no need for full harmonisation

- ▶ Ensure benefits to customer, quality and security of supply
- ▶ Ensure stable framework for innovation in order to attract investors
- ▶ Incentive more innovation and support the development of new research and demonstration activities
- ▶ Incentive cooperation between DSOs (with ACER as facilitator)
- ▶ Incentive cooperation between TSOs and between TSOs and DSOs
- ▶ Clear definition of the objectives and NRAs should cooperate and support the changes in the energy sector by encouraging network operators to become innovation leaders.

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Legislative proposals of the EU-Commission in the „Winter Package“

Design of the electricity market:

- Proposal for a revised electricity regulation
- Proposal for a revised electricity directive
- Proposal for a new regulation on risk preparedness in the electricity sector

Energy efficiency:

- Proposal for a revised energy efficiency directive
- Proposal for a revised energy performance of buildings Directive

Ecodesign:

- Proposal for regulation on ecodesign requirements for air heating and cooling products and chillers
- Proposal for regulation on tolerances in verification procedures for all eco-design measures
- Regulation on tolerances in verification procedures for all energy labelling measures

Renewable energies:

- Proposal for a revised Renewable Energy Directive

Governance

- Proposal for a revised regulation on a European Agency for the Cooperation of Energy Regulators (ACER)
- Proposal for a regulation on the Governance of the Energy Union

The Winter package and the role of Consumers

- ▶ Consumers are active and central players on the energy markets of the future: better choice of supply, access to reliable energy price comparison tools and the possibility to produce and sell their own electricity.
- ▶ All consumers across the EU entitled to generate electricity for either their own consumption, store it, share it, consume it or to sell it back to the market. Households and businesses to become more involved in the energy system, to better control their energy consumption and respond to price signals.
- ▶ The Commission will accelerate the deployment of smart meters and ensure access to dynamic electricity price contracts which are essential to bridge the gap between consumers and the market. (EU Commission)

Proposed smart metering framework

- ▶ Right to request a smart meter (to be installed within 3 months with a set of minimum functionalities defined by MS). Cost should be supervised by MS and borne by the end user.
- ▶ Proposed smart metering functionalities to give an appropriate advice and information to consumers on the full potential of smart meters and privacy issues:
 - Provide near real time information to consumer on actual consumption in order to support energy services
 - Follow security and data protection EU requirements
 - Provide data to be available to consumers or service providers of their choice
 - Enable measurement and settlement at the same time intervals as the imbalance period in the national market

Proposed framework for demand response

- ▶ Enabling demand response:
 - Entitlement to a dynamic electricity price contract
 - Remove market barriers for aggregators
 - Introduce additional rules for flexible markets

- ▶ Enabling active consumers and energy communities:
 - Entitlement to all consumers to generate, self-consume, store or self generated electricity while ensuring non-discriminatory network tariffs

Proposed measures for access to data

- ▶ Define responsibilities for parties involved in data handling
- ▶ Set principles on non-discriminatory and transparent access to data
- ▶ Certification and compliance of the parties responsible for data handling (including DSOs)
- ▶ Standardised data format

=> Support active consumer and facilitate switching operators and billing

Proposed measures for distribution networks

- ▶ Proposed measures to make distribution networks more flexible:
 - Enabling framework for DSOs to procure and use flexibility to lower grid costs and tariffs
 - Neutrality of DSO in new tasks: storage, electrical vehicles infrastructure and data management
 - Cooperation between DSOs and TSOs alongside a EU DSO entity
- ▶ Proposed measures for tariffs and DSO remuneration:
 - EU-wide principles for distribution network tariffs
 - DSOs to prepare multiannual development plans
 - ACER recommendation and network code on network tariffs
 - Monitoring smart grid development and transparency of network tariffs methodology and costs

Member States views on Commission's proposal of the Winter Package



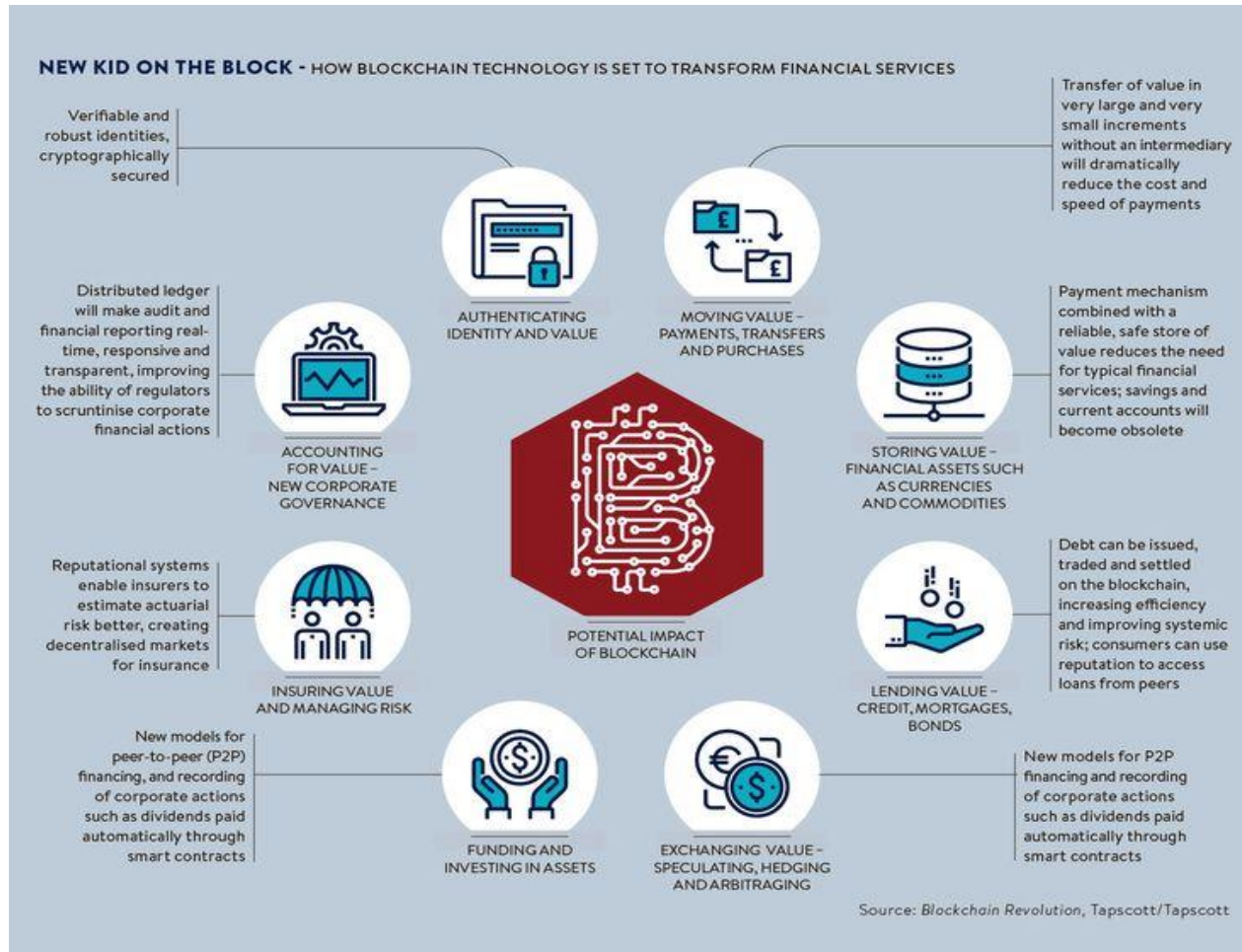
- ▶ Summary paper from AT, CZ, DE, DK, FI, LU, NL, NO and SE on common views on the electricity market design as outlined in the Commission's proposal dated 18.09.2017
 - **MS express their concern towards too much harmonisation at EU-level. Ex:**
 - Delegated acts, Network Codes and Guidelines: Majority of MS request a clear definition of objectives, scope and content of what is being transferred to Network Codes (reduce the margin of discretion, restrict to "non-essential elements")
 - Network charges: some choices in DSO tariff structures are "MS specific nature"
 - Aggregators: necessity or not to implement a regulated framework for independent aggregation should be decided by MS
 - Smart meters: avoid too high technical requirements

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Blockchain : Enabler of smart transition

Don Tapscott-
TED Talk
speaker



Blockchain in Energy & Utilities

Blockchain has disruptive potential for the energy industry. Applications are being explored globally and a new ecosystem of energy startups emerging. Industry uses of this technology are vast as it leverages decentralized peer-to-peer internet technology, where both computers and people share a distributed ledger.

Gridchain - Emerging Utility Applications

Applications are varied and pilots are in early stages across the energy value chain, with a primary focus on customer markets.

- #1 Generation: Carbon market with distributed registry
- #2 Transmission: P2P settlement at the transmission level
- #3 Distribution: Transactive grid settlement
- #4 Customer: Community P2P markets, transactive home energy mgmt., EV charging settlement

Startups - Emerging Global Energy Blockchain Companies



Company: Powerpeers
Country: Netherlands
Market: P2P Energy

Startup launched by Vattenfall, focusing on a digital, interactive marketplace where supply and demand for self-generated energy converge.



LO3 ENERGY

Company: LO3 Energy
Country: USA
Market: P2P Energy

LO3 have launched TransActive Grid in Brooklyn, NY - a pilot delivering real-time metering of local energy generation and usage as well as other related data.



Company: Stock.it
Country: Germany
Market: EV Charging

Startup, working with RWE to develop EV charging stations that use blockchain-based smart contracts to authenticate users and manage the billing process.



Company: SolarCoin
Country: USA
Market: Energy Incentives

Alternative digital currency reward system, SolarCoin is claimed by individuals living in homes with Solar Energy panels on their roof or large solar electricity farms.



Company: Bankymoon
Country: South Africa
Market: Energy Access

Projects aiming to enable African schools manage utility costs by leveraging the international donor market & receiving cryptocurrency payments directly to the meter.



Company: Grid Singularity
Country: Austria
Market: Various Energy Apps

Decentralized energy data exchange to facilitate data analytics, smart grid management, trading and investment decisions.

Top Industry Platform



Ethereum, the most widely used platform in the industry is a public decentralized blockchain-based platform, featuring smart contract functionality. As well as being a cryptocurrency, the Ethereum platform has multiple uses e.g. online marketplaces.

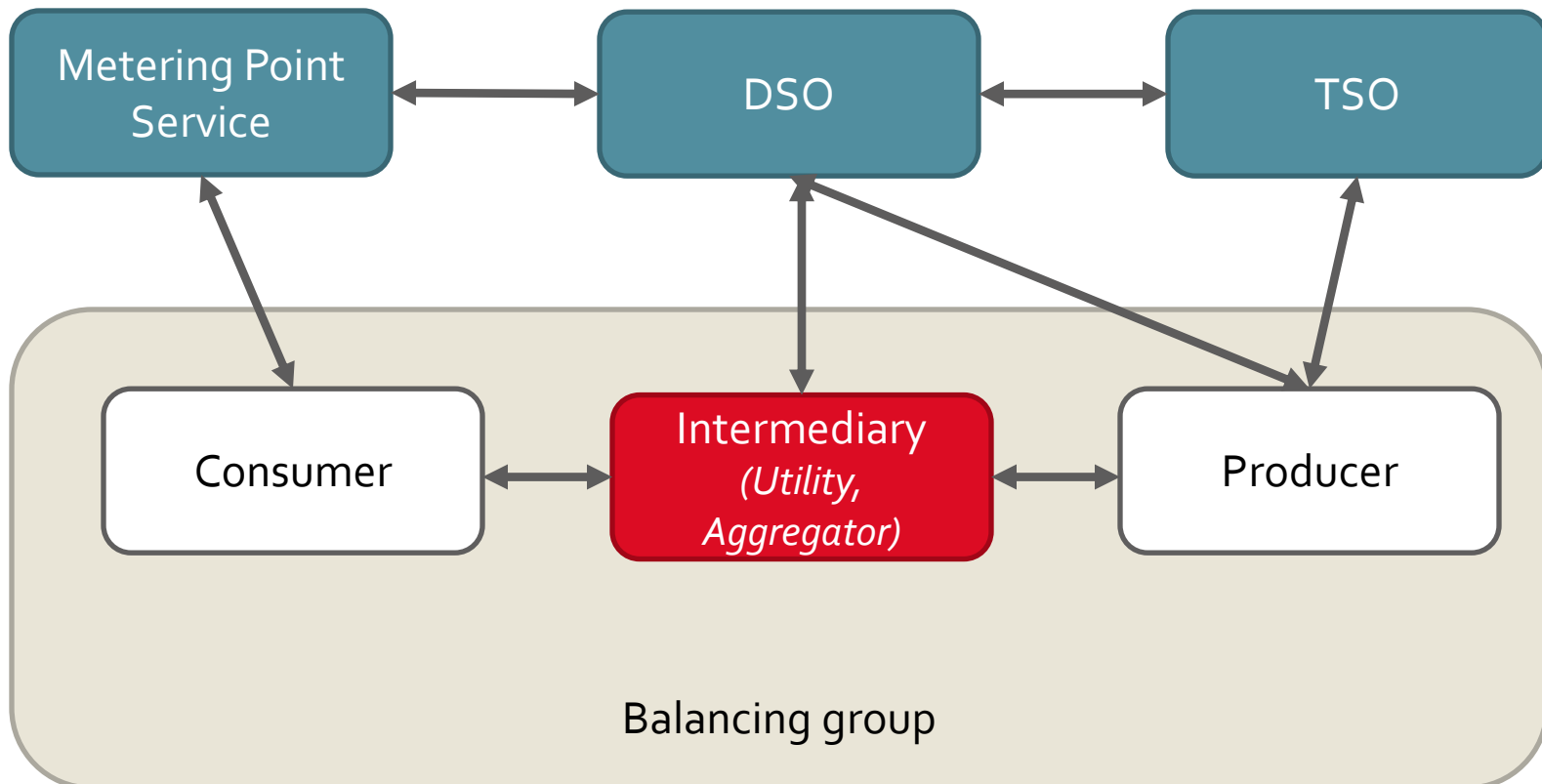
The Blockchain Energy Future

In the near-term we expect blockchain to become a popular phrase across the energy and utilities industry, however, moving beyond pilots in the medium-term is unlikely. That said, when technology and regulation eventually do find an equilibrium in the energy industry, the long-term potential of blockchain will be transformative.



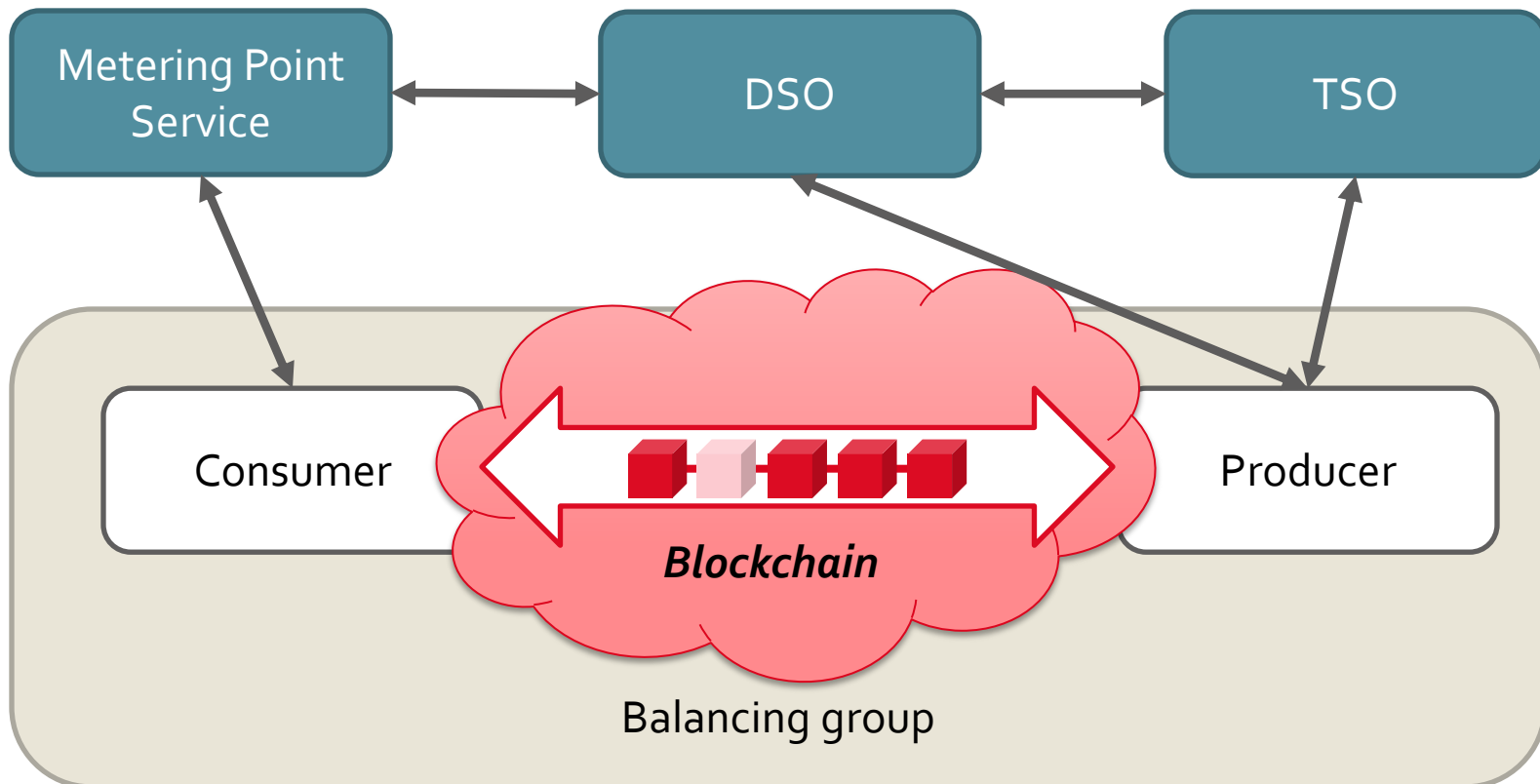
Challenges from Blockchain (1)

► Actors today:



Challenges from Blockchain (2)

- ▶ Could the future energy market look like this? aussehen?



What's good for Brooklyn -



“We’re setting up a market on this street for renewable electrons to test if people are interested in buying them from each other,” Lo3’s founder Lawrence Orsini.- using blockchain typ called Ethereum, which builds in “smart” self-executing contracts between parties

- is good for Europe!

- ▶ EU FP7 Scanergy:
 - “NRGcoin gives you protection against policy change because now the payment is built into the protocol, which is decentralized. One kilowatt-hour always equals one NRGcoin—nobody can change it,” Researcher (VUB) Mihaylov.
- ▶ Scanergy has used real-world data from the Belgian energy grid to simulate how the system would work in real life.
- ▶ Watch out for grant funding and project partners to build a full-scale prototype.

Source: <https://www.fastcompany.com/3058380/how-blockchain-technology-could-decentralize-the-energy-grid>

- ▶ Q: efficiency gain, competitiveness, customer acceptance?

EU: task force on digital currencies and Blockchain technology

- ▶ EP frontrunner: Own initiative report , rapporteur Jakob von Weizsäcker (S&D, DE/SPD) :
 - “At this stage, we shouldn’t stifle innovation with pre-emptive regulation. But given the very rapid evolution in this field, we cannot afford to sit back and wait. Instead, we should establish a task force at the EU level to engage in active and close precautionary monitoring of how applications are evolving so that we are in a position to act swiftly and forcefully if need be before applications are becoming systemic. Also, existing legislation already needs to applied, for example in the area of anti-money laundering”
- ▶ Task force, to be overseen by the Commission, should build expertise in the underlying technology of virtual currencies. It would also be tasked with recommending any necessary legislation,
- ▶ Money laundering, financing of terrorism, cyber security, data protection as challenges

EU spotlight on blockchain in energy

Francois Sonnet @ Workshop of EP and DG Connect in May 2017 in Brussels:

- Electricity trading for solar owners, households and larger installs becoming Prosumers
- Prescriptive analytics: where, when and by who electricity is produced ; when Blockchain is coupled to AI ;
- Energy storage, origin tracking, smart grid applications (a minute by minute basis),
- Near live weather energy monitoring,
- O&M support operations and maintenance,
- (solar: outage, equipment life cycle analysis, tracking of module degradation)
- MicroGrids and Micro-finance potential in developing countries : imagine each producer as consumer,
- Blockchain can publish to SideChains for parallel use cases and/or Business Models. (The data can be fully public, semi-public, or private depending on encryption and keys. Data can be time delayed, or "higher quality" for price, using this same Blockchain. Different "Blockchain Explorers" could have different decryption keys)
- Prosumers Incentivizing: Market incentivizing through tools such as SolarCoin

Commission: Task force for Blockchain and Digital ledger Technology

- Coordinator for set up of Task force : European Commission, Directorate-General for Communications Networks, Content and Technology, Directorate H: Digital Society, Trust and Cybersecurity, Unit H3: eHealth, Well-Being and Ageing
- Horizontal Taskforce on FinTech and Distributed Ledger Technologies (DLT) on its way of establishment based on a small “start-up” contract on EU Parliament’s Initiative (500000 EUR for 2017 und 2018)

EU Observatory

- "Observatory" focused on blockchain as part of a wider pilot project- to "gather opinions and to voice concerns around Blockchain and DLT". The Commission plans to solicit proposals from possible partners during the second quarter of 2017.
- Cooperation with StOA
- Plan "to build and animate a platform for the European blockchain community".
- Ultimately, the pilot could lead to new policies in the EU centered around blockchain.
- "The purpose will be to inform and assist the European Commission in understanding what role – if any - European public authorities should play to encourage the development and up-take of these technologies and to formulate related policy recommendations."

Scientific Foresight – Unit of the EP (StOA)

- ▶ MEP Eva Kaili (S&D, GR), Chair of Scientific Foresight Unit (STOA):
- ▶ “Future regulations should be technology neutral and business model neutral. The priority of the Scientific Foresight Unit (STOA) is to put blockchain at the core of the works of the ITRE Committee of the European Parliament in the next 2-5 years.”
April 2017
<http://www.accaglobal.com/vn/en/news/2017/april/blockchain.html>

Conclusion : regulatory framework to enable the implementation of smart energy networks

- ▶ More incentives for stakeholders
- ▶ More cooperation between DSOs, TSOs, DSOs/TSOs and NRA
- ▶ EU regulation should set the framework and goals to reach, a detailed regulation would be counterproductive
- ▶ As you may have noticed, focus in Europe is largely on electricity grids. Develop incentives for gas grids is a bit more challenging as safety should not be jeopardized
 - More interaction between the energy carriers and the consolidation of the regulatory frameworks for electricity and gas (and thermal energy) into one regulatory framework for smart energy networks would optimize the integration of all available energy carriers

Thank you very much
for your attention.

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