European Commission

ETIP SNET Keynote speech

European Technology and Innovation Platform
Smart Networks for Energy Transition

Digitalization and decentralization:
How to unleash the full potential of this synergy?

Inigo Azpiri
ETIP SNET Vice-Chair
14.09.2021

ETIP SNET examples: Goals and Mission

The European Technology and Innovation Platform *Smart Network for Energy Transition* has been created under the SET PLAN with other 9 sectorial ETIPs

*In the framework of Integrating and optimising all sources and vectors of the entire energy system, ETIP SNET guides R&I in support to Europe's energy transition a*ddressing the innovation challenges for the energy system and market evolution, toward climate resilience and renewables integration, while ensuring affordability and security of supply ***beyond smart electricity grids.***

- *Bringing together a multitude of stakeholders and experts from the energy sector:*
- *Preparing and updating Visions, Roadmaps and Implementation Plans bringing a consolidated stakeholder views on R&I to European Energy Policy initiatives*
- *coordinating with other Initiatives at National (Members States), European and International level to reinforce the alignment of Strategic Agendas and R&I priorities and needs*
- *identification of innovation barriers, related to regulation and financing and developing further enhanced knowledge-sharing mechanisms that help bringing R&I results to deployment*

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The Energy System towards 2050: relevance of Energy System Integration for Deep Decarbonization.

- Members of this very wide stakeholder group see *electricity distribution and transmission grids as the "backbone" of the future low-carbon energy systems with a high level of integration among all energy carrier networks,* by coupling electricity networks with gas, heating and cooling networks, supported by energy storage and power conversion processes.
- Such *energy systems will be fully digitalised*, with a high level of automation.

- *Efficient markets supported by digital platforms*, from wholesale to retail, will *allow all stakeholders of the energy system to trade energy*, including prosumers selling their excess energy to the neighborhood in peer-to-peer transactions.
- *All system flexibility solutions*, including those for prosumers and consumers, will be adopted to *optimise the grid capacity uses from different generation and consumption centres* that are very distant and/or very near to each other.

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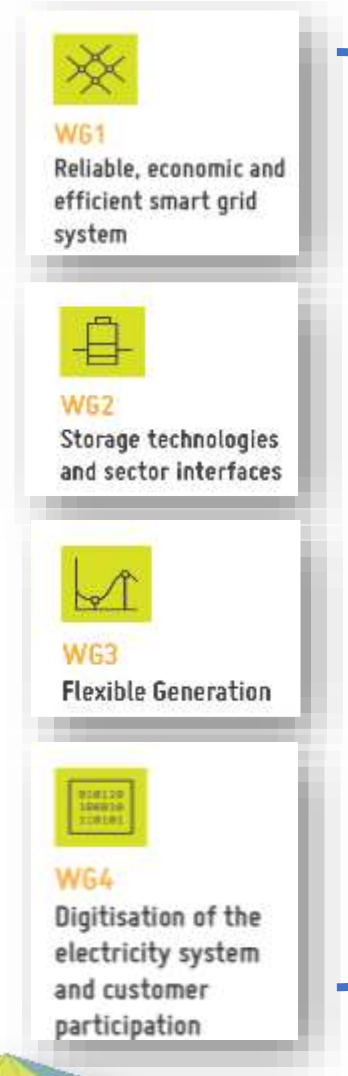
ETIP SNET and the view of the future energy system



Last July the ETIP SNET released an interesting Position Paper on *Smart Sector Integration, towards an EU System of Systems – Building blocks, enablers, architecture, regulatory barriers, economic assessment*, led by WG1.

- ***The energy transition context is presented considering all the relevant building blocks: architectures, enablers, economic assessment criteria, regulatory and market issues, as well as the related research and innovation needs.***
- The ***need for a consistent cross-sector approach to the use cases*** is emphasised.
- It is recognised that the future energy system will require **more integrated and enhanced dynamics between all steps** and **full integration of digitalisation in all processes.**
- The **future energy system will need to address all value chains of the energy sectors** while delivering energy transition and decarbonisation goals, linking in an optimal way various energy resources and networks to the consumption sectors.
- This brings to a **System of Systems vision**, where electricity becomes the leading energy carrier, with power grids as the backbone for the decarbonisation of all energy sectors.
- In this context, **smart sector integration is expected to** deliver a scalable solution to improve overall system efficiency, resiliency, allowing greater integration of renewables, while enabling flexible consumption and deeper consumer empowerment.

ICT Backbone and enabling technologies

The EU Strategy for Energy System Integration proposed by the EC sets that:

Sector integration is complementary and conditioned to more direct decarbonising ways, *so it is an instrument and not a target itself; it propose* an holistic view including:

- **Digitalisation:** especially for decentralised solutions.
- **Research, Development and Innovation**

Consequently

- Smart sector integration will encourage further stakeholder cooperation ***facilitated by digital platforms and interoperable solutions*** based on advancements of TSO-DSO-aggregator cooperation on flexibility and storage and a revamped EU Emission Trading Scheme
- ***The ICT backbone and the enabling technologies as well data related considerations are of high importance for successful implementations***. The system of systems approach that takes all of the components forming cyberphysical considerations for smart sector integration is necessary.
- Close collaboration with the evolving EU-wide initiatives focused on data policies, management, and security and governance topics is required.
- ***Regulatory barriers, research and innovation needs, complimentary building blocks considerations such as ICT architectures, the related tools, the enabling use cases and solutions are introduced with the aim of facilitating the scale-up relying on a system of systems approach leading towards faster market uptake and integration***.

Two examples: Storage and DSO

ENERGY STORAGE

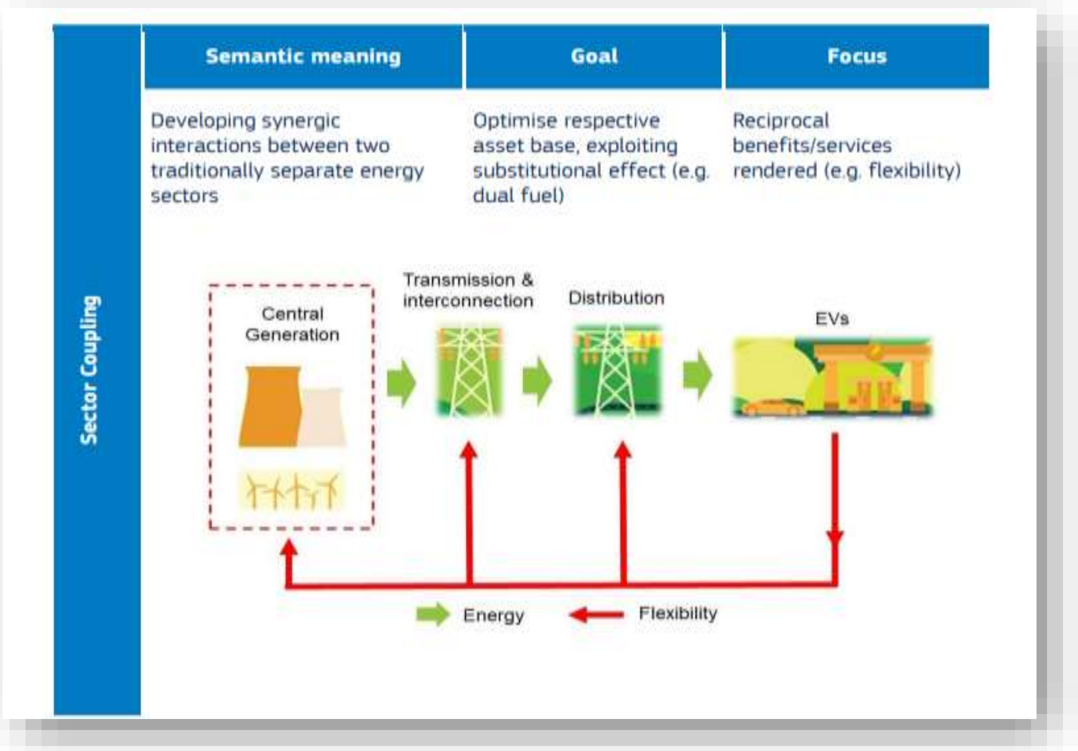
- The **meter market for energy storage is contributing to the decentralisation of the energy system.**
- **New business models** that allow for decentralised energy storage are driven by the digitalisation of energy
- **However, decentralisation/digitalisation solutions are still not properly supported by policies:**
  - Tariffs, grid and levies do not take into account the contribution of decentralised solutions to the stability of the energy system
  - Digitalisation allows for new revenue streams for storage that should be properly remunerated
  - Market products for such services are still lacking
- ***Smart, digital energy storage solutions for buildings are also not fully considered***
- Still, it is important to stress that digitalisation greatly impact every aspect of behind the meter, as residential, the commercial & industrial sector, and even grid-scale solutions all rely on smart solutions

DSO perspective

- **Multi-directional approach** in the energy system is increasing, and the energy landscape is becoming more diverse, with various new actors emerging.
- ***The electricity distribution network is the direct link between energy consumers and distributed energy sources on the one hand and conventional electricity generation units and transmission on the other. It is the 'backbone' of our energy system, connecting more than 90% of renewable generation in Europe.***
- The ***implementation of new IT technologies and innovative digital services is crucial*** to foster the integration of distributed resources and reap all the benefits that they can provide for the whole system.
- **Smart meters offer a great opportunity to digitalize the energy sector**, gathering crucial data that constitute the basis for increased engagement from distributed resources and customers in general.
- Current initiatives on the **digital regulatory framework should support this transition and avoid regulatory barriers** to the participation of distributed resources and grid users using more decentralized generation or the provision of flexibility services.

Sector coupling philosophy

- Sector coupling will *develop synergic interactions* between two traditionally separate energy sectors.
- The main goals of the interactions are:
  - *to optimise the respective asset base, exploiting substitutional effect*
  - to *include large-scale electrification*, where electricity would substitute fossil energy vectors for end-use applications like buildings, transport, process heating in the industry.
- This will increase the demand for electricity, and thus provides the possibility of connecting additional, distributed energy resources, with the aim of improving the share of renewable energy in these sectors (on the assumption that the electricity supply is, or can be, increasingly renewable).
- Therefore, *it is necessary to achieve synergies across sectors to optimise and facilitate the path to decarbonisation.*



In a nutshell, sector coupling focuses on reciprocal benefits/services rendered through a strategy allowing to provide greater flexibility to both coupled sectors so that decarbonisation can be achieved in a more cost-effective way.

Smart sector integration and digitalisation

Smart sector integration

It is expected to support the ***further deployment of smart grids at different scales*** improving operating efficiency ***through greater digitalisation*** to allow the growing ***penetration of distributed generation*** and resulting in the integration of demand-side flexibility resources

Evolving flexibility markets supported by digital platforms

They are expected to ***create services driven by revenue opportunities for sector-coupling technologies*** that can also be delivering congestion management goals.

The digitalisation of the energy infrastructures

- **It is a clear enabler of sector coupling in energy systems**
- This transformation is supported by the use of novel sensors, Big Data tools, artificial intelligence, 5G and distributed ledger technologies resulting in data handling being increased through interoperable platforms.

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Digitalisation as key enabler

Digitalisation is key in order to manage future energy systems smartly.

- With increased digitalisation and smart management of the energy system, ***challenges related to cybersecurity also emerge.***
- There are ***existing barriers within the regulatory frameworks and market designs*** that potentially hinder the deployment of technologies enabling the integration of energy sectors.
- ***Demos, pilots, sand boxes and even small energy communities, in specific cases, deserve attention***, as they can be used to show the (near) real-life application of technologies, devices and systems that are required for a smart integration of energy sectors.

THEREFORE

- **Challenges faced, and lessons learned, from these demonstration projects** are needed to be communicated to the scientific and societal community as well as to industries.
- **Open exchange of data, methods, and results** can accelerate learnings if they are distributed to stakeholders and industries across sectors.
- When addressing topics of digitalisation for smart sector integration, the **role of data governance, availability and the related enabling infrastructures cannot be underestimated**

Last but not least…

Besides monitoring, forecast and management of distributed generation need to be improved.

Conseguently

- The **optimisation and increase in efficiency**, connecting the various energy carriers and the flexibility and resilience of the energy systems is also **expected to increase.**

- The **consumers are empowered** by being part of a system that connects them to different suppliers, namely replacing imported natural gas and petroleum products with local production in a distributed energy supply, helping to reduce the dependency on energy imports and creating a more circular energy economy within Europe.

Conclusions

In order to reach the best from the integration among digitalisation and decentralisation in a System of System,

the ETIP SNET community believe that 3 areas could be enabled by smart sector integration:

1. connected dynamic markets,
2. the advanced data exchange infrastructures rollout,
3. increased data handling capacity enabled by close to real-time communication and technologies.

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Thank for your attention and...

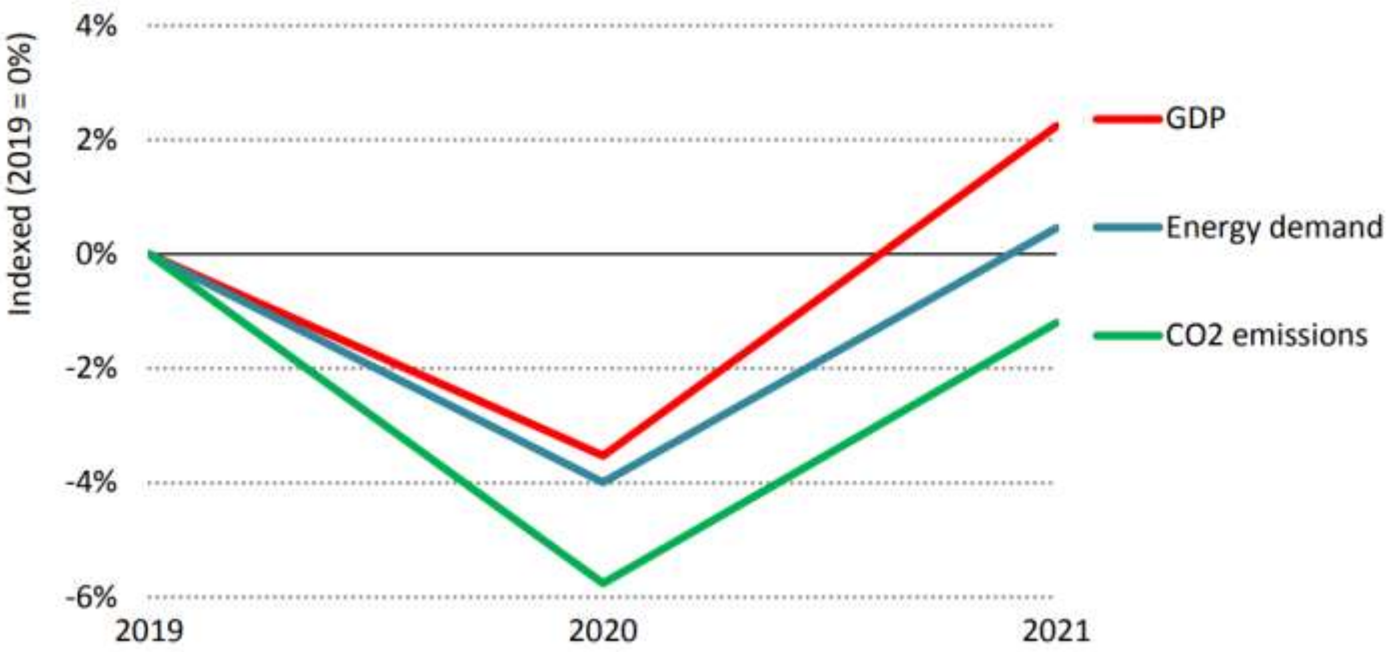
ENJOY THE WORKSHOP!

Digitalising energy

Pauline Henriot, Energy Policy Analyst

Global CO_2 emissions are on the rebound

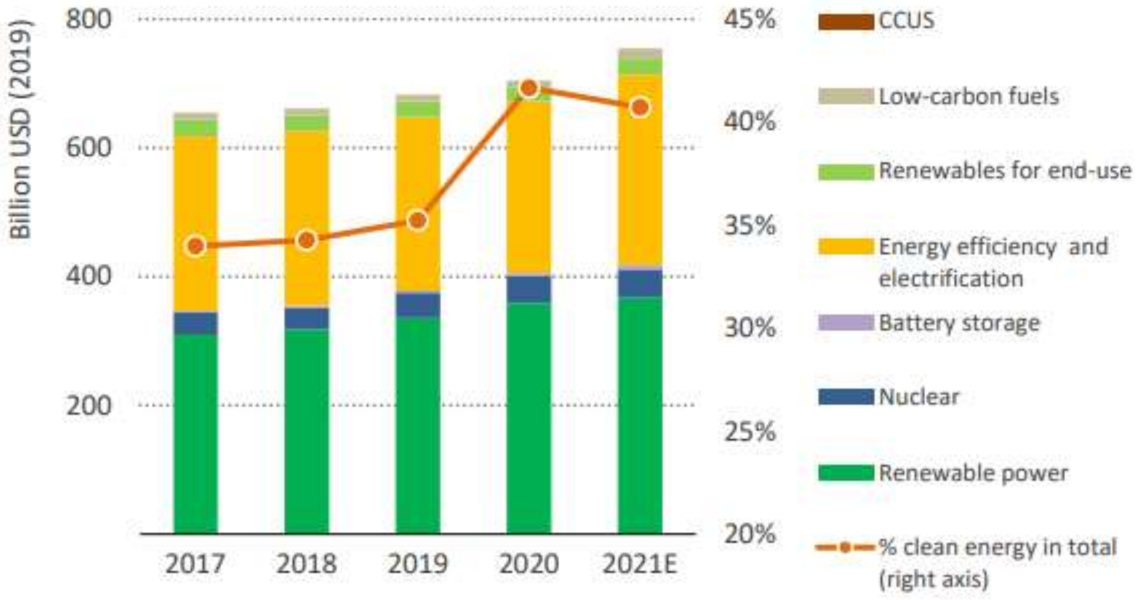
Evolution of global GDP, total primary energy demand, and energy-related CO_2 emissions, relative to 2019



Global energy demand is set to increase by 4.6% in 2021, surpassing pre-Covid-19 levels.

Clean energy investment is growing slowly

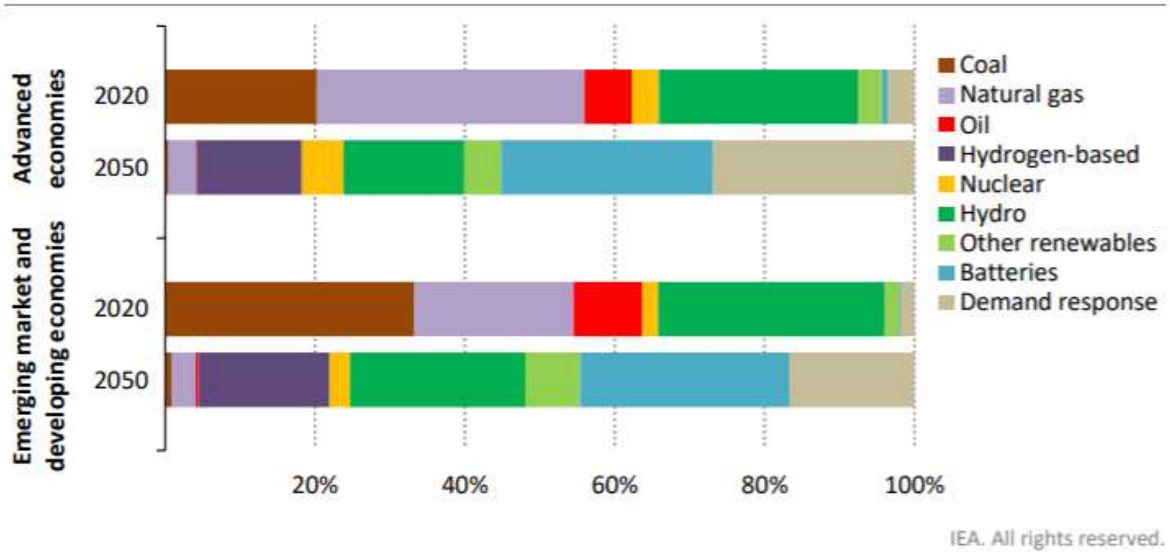
Global investment in clean energy and energy efficiency 2017-2021



Total clean energy investment is set to rise in 2021 by around 7%

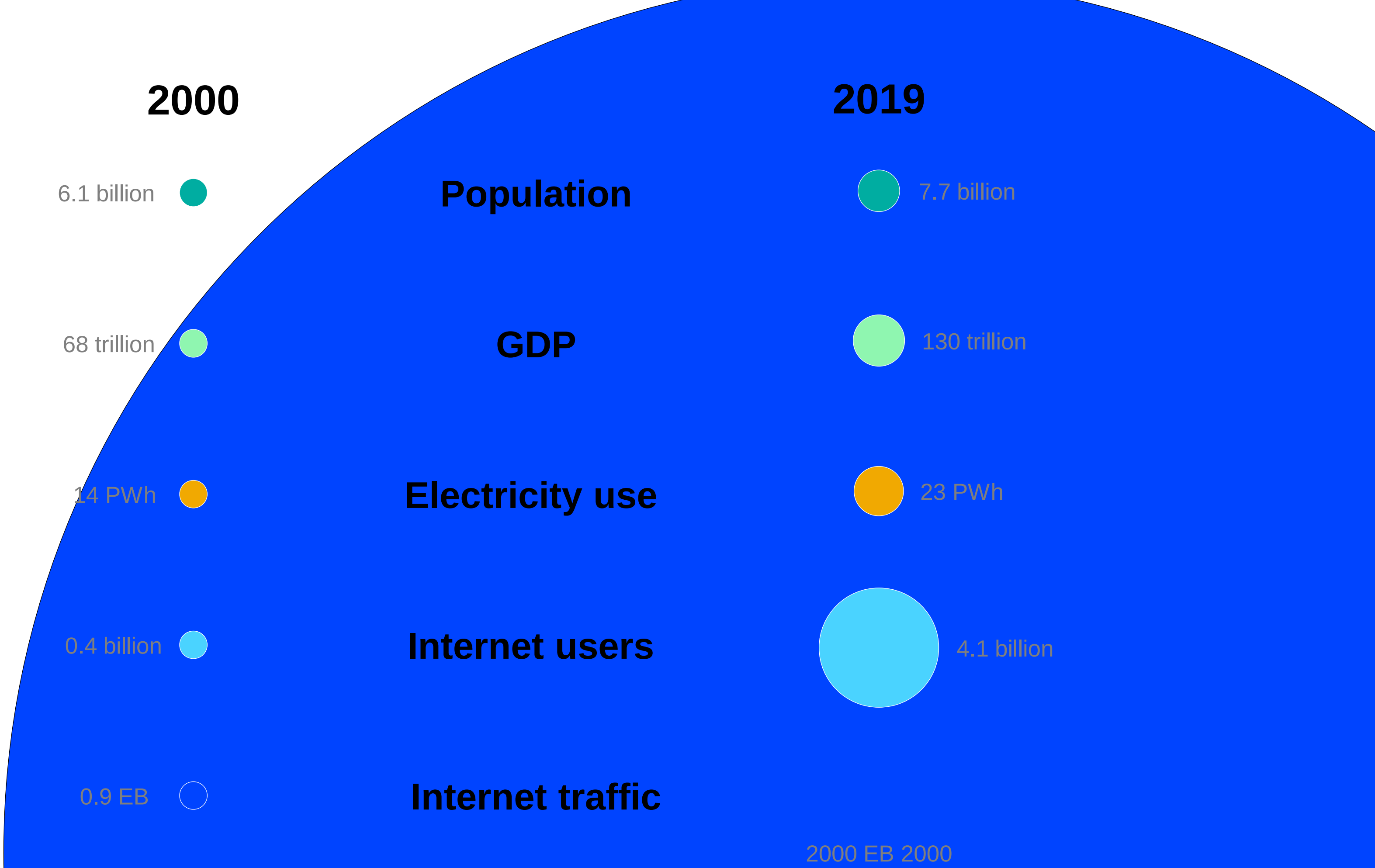
The demand-side is at the centre of clean energy transitions

Electricity system flexibility by source in the NZE



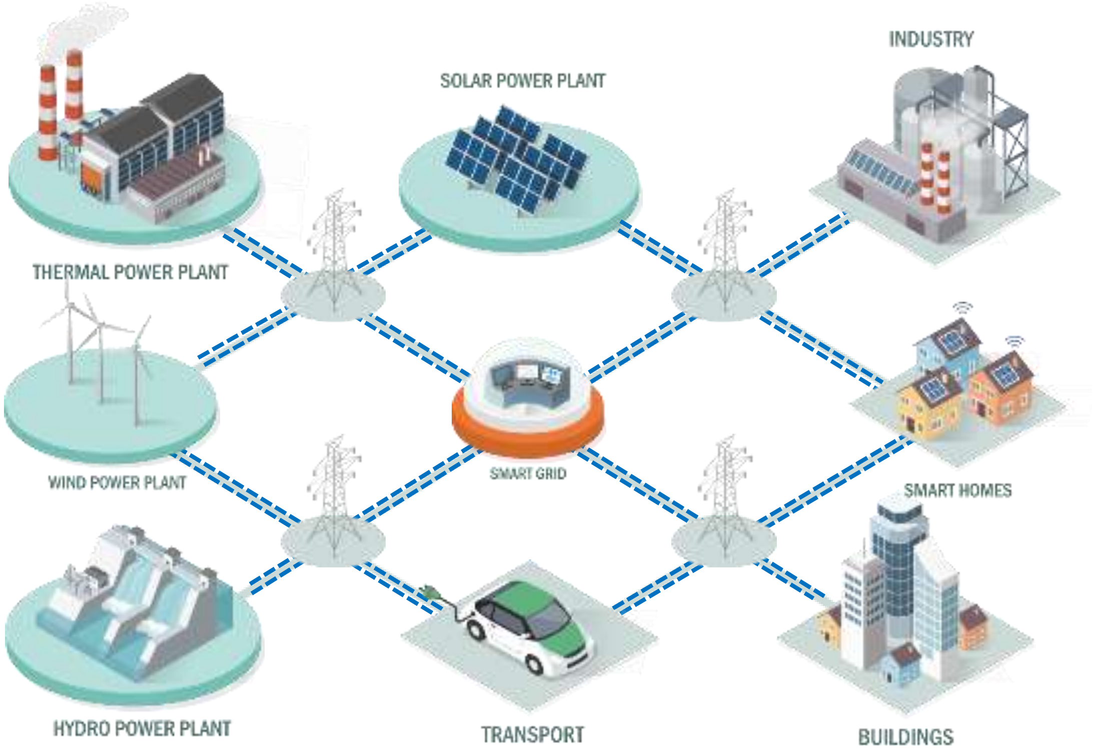
To meet four-times the amount of hour-to-hour flexibility needs, batteries and demand response step up to become the primary sources of flexibility

Net Zero by 2050 - https://www.iea.org/reports/net-zero-by-2050



Sources: UN (2019), World Population Prospects 2019; World Bank (2020), Data Bank: GDP, PPP (Constant 2017 International $); IEA (2020), Data and statistics; ITU (2020), Statistics; Cisco (2015), The History and Future of Internet Traffic; Cisco (2018), Cisco Visual Networking Index: Forecast and Trends, 2017–2022

The digital transformation of the energy system



Pre-digital energy systems are defined by unidirectional flows and distinct roles, digital technologies enable a multi-directional and highly integrated energy system

A deep transformation of energy systems, with electricity at the centre

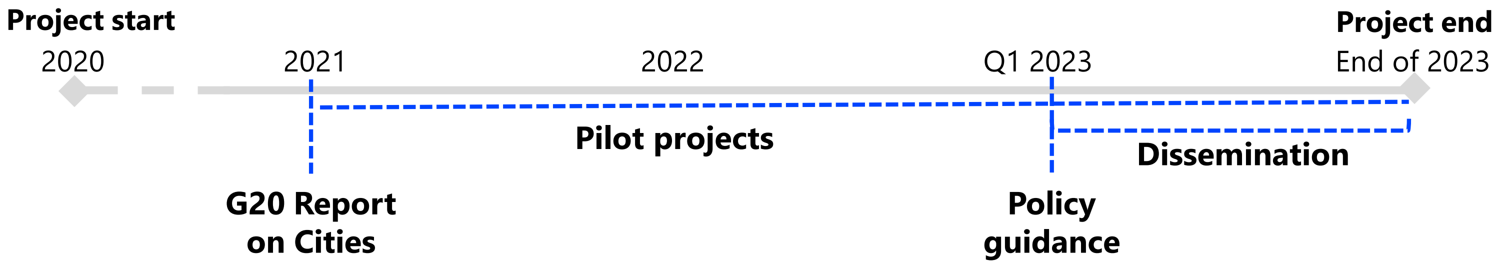
Electricity systems are transforming → More flexibility is needed, with active participation of consumers → Policies to empower digitalisation are essential to reap benefits

- **Digitalisation** can help leverage opportunities:
  - Create a more interconnected and responsive electricity system
  - Support carbon emissions reduction
  - Help to minimise system cost and need for new investment
  - Improve stability, resilience and security
  - Enhance quality of power supply

Implementing right policies, digital technologies and new business models is key to enable transformation

Overview of Digital Demand-Driven Electricity Networks Initiative (3DEN)

- **Aim of the Project** - providing actionable guidance to policy makers on the policy, regulatory, technology and investment context needed to accelerate progress on power system modernisation and effective utilisation of demand side resources
- **Outputs**
  - Tools and policy guidance documents
  - Pilot projects assessment guide including methodology and indicators
  - Interim outputs: webinars, roundtables, events, articles, chapters in publications and commentaries
- **Geographic focus, including but not limited to**
  - Key Countries – Brazil, Colombia, India, Indonesia, Morocco, South Africa, Tunisia
  - Key Regions – Latin America, Africa, South East Asia
- **Tentative Project timeline**



***B**lockchain based **E**lectricit**Y** trading for the integration **O**f **N**ational and **D**ecentralized local markets*

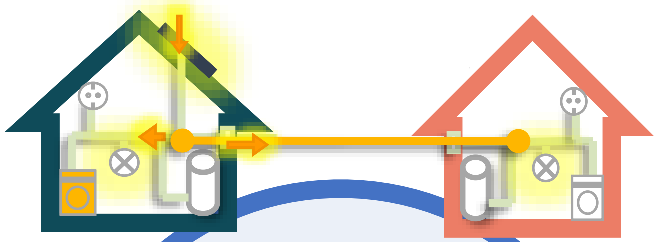
#Local Markets # Prosumers # Blockchain

Dr. Pedro Crespo del Granado

Digitalization and decentralization:
How to unleash the full potential of this synergy?

IEA EUWP IESCG MEETING, 14.09.2021

Smart Energy Systems ERA-Net
This project has received funding in the framework of the joint programming initiative ERA-Net Smart Energy Systems' focus initiative Integrated, Regional Energy Systems, with support from the European Union's Horizon 2020 research and innovation programme under grant agreement No 775970



Local electricity markets

Blockchain technologies or others

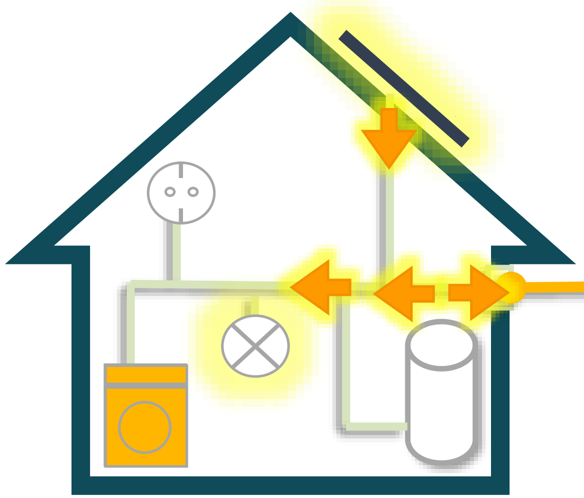
Implementation & Analysis

BEYOND
Blockchain-based electricity trading for the integration of national and decentralized local markets

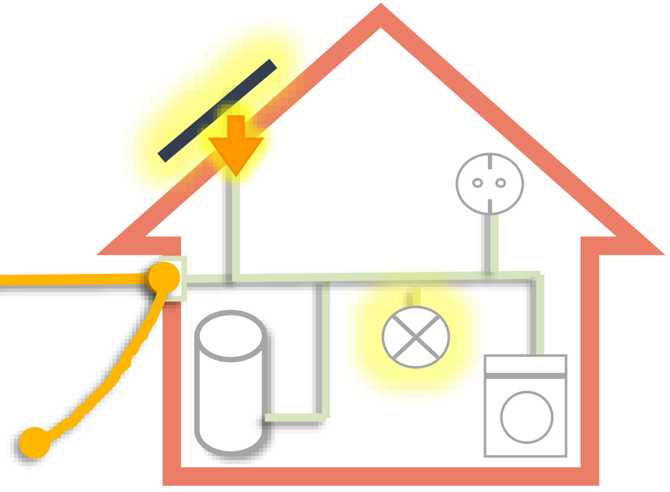
Energy market place connects households that **produce energy** with households that **consume energy directly** from them.

eFRIENDS

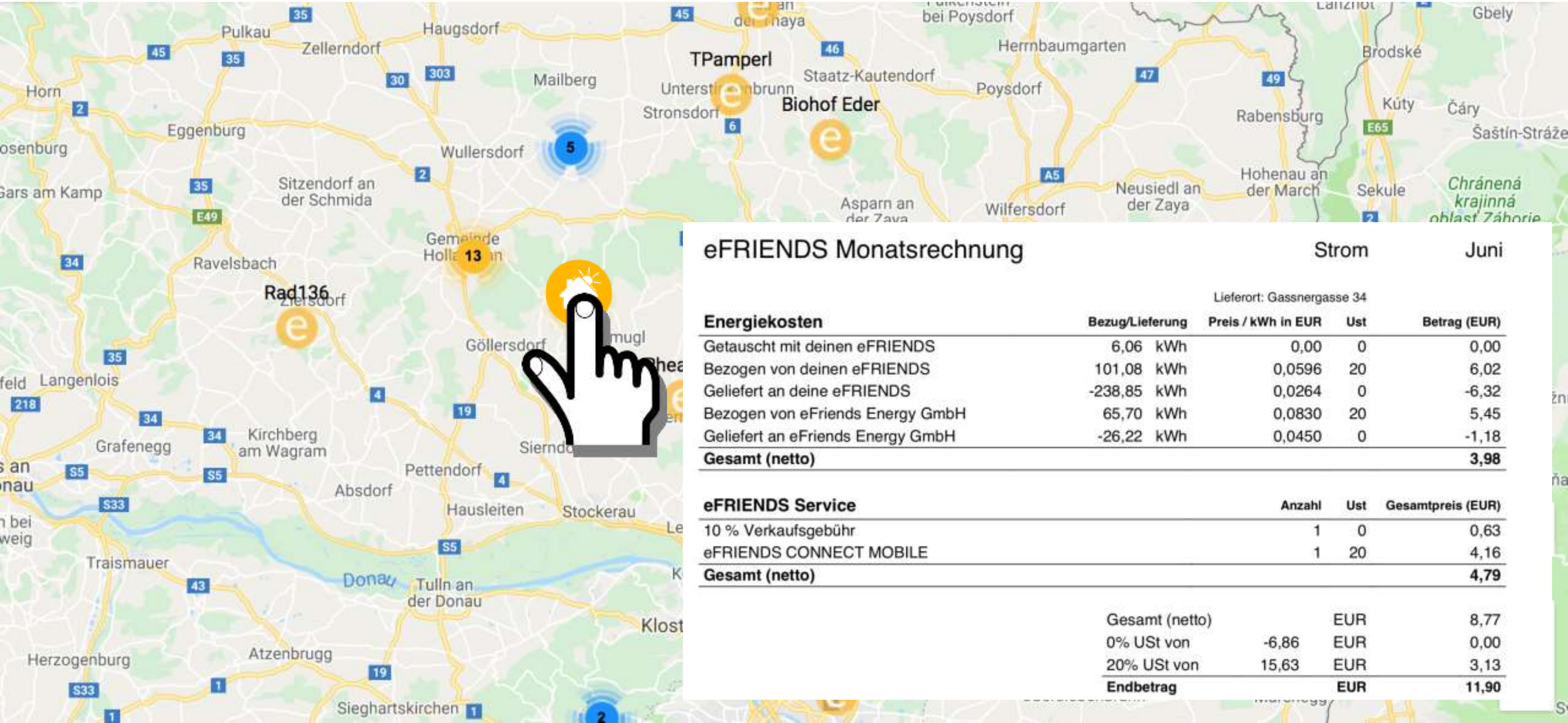
dein strom. dein marktplatz.



Let‘s **share energy!**



eFRIENDS the first energy sharing community



eFRIENDS Monatsrechnung

Strom Juni

Lieferort: Gassnergasse 34

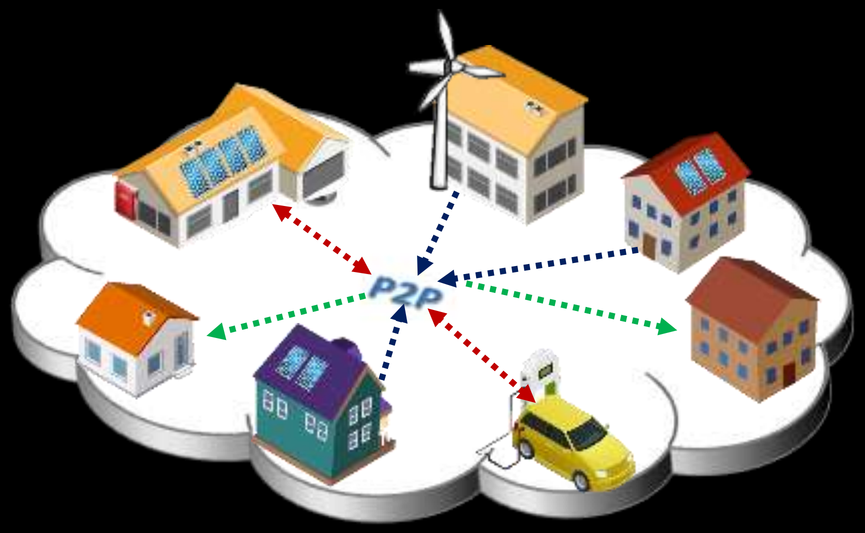
Energiekosten	Bezug/Lieferung		Preis / kWh in EUR	Ust	Betrag (EUR)
Getauscht mit deinen eFRIENDS	6,06	kWh	0,00	0	0,00
Bezogen von deinen eFRIENDS	101,08	kWh	0,0596	20	6,02
Geliefert an deine eFRIENDS	-238,85	kWh	0,0264	0	-6,32
Bezogen von eFriends Energy GmbH	65,70	kWh	0,0830	20	5,45
Geliefert an eFriends Energy GmbH	-26,22	kWh	0,0450	0	-1,18
Gesamt (netto)					**3,98**

eFRIENDS Service	Anzahl	Ust	Gesamtpreis (EUR)
10 % Verkaufsgebühr	1	0	0,63
eFRIENDS CONNECT MOBILE	1	20	4,16
Gesamt (netto)			**4,79**

Gesamt (netto)		EUR	8,77
0% USt von	-6,86	EUR	0,00
20% USt von	15,63	EUR	3,13
Endbetrag		**EUR**	**11,90**

Dynamic allocation of Peer-to-Peer clusters in virtual local electricity markets: A marketplace for EV flexibility?

BEYOND



LEM technological development and digitalization. New emerging marketplaces?

Rewarding flexibility assets

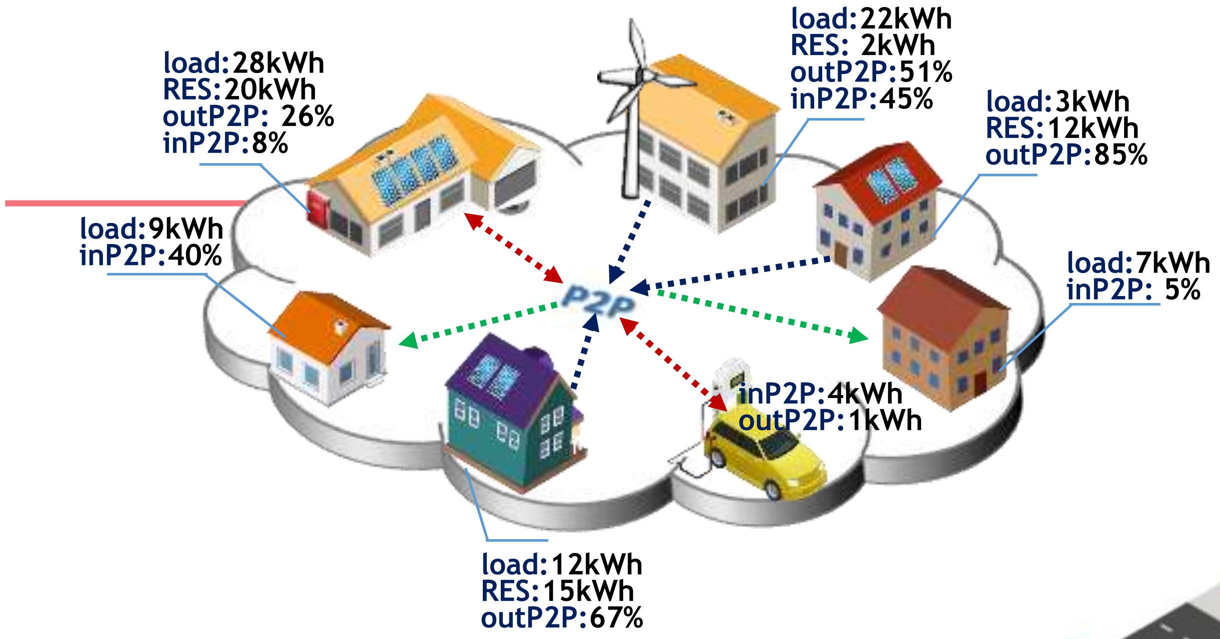
Coordinate operations with local DSOs

Scalability

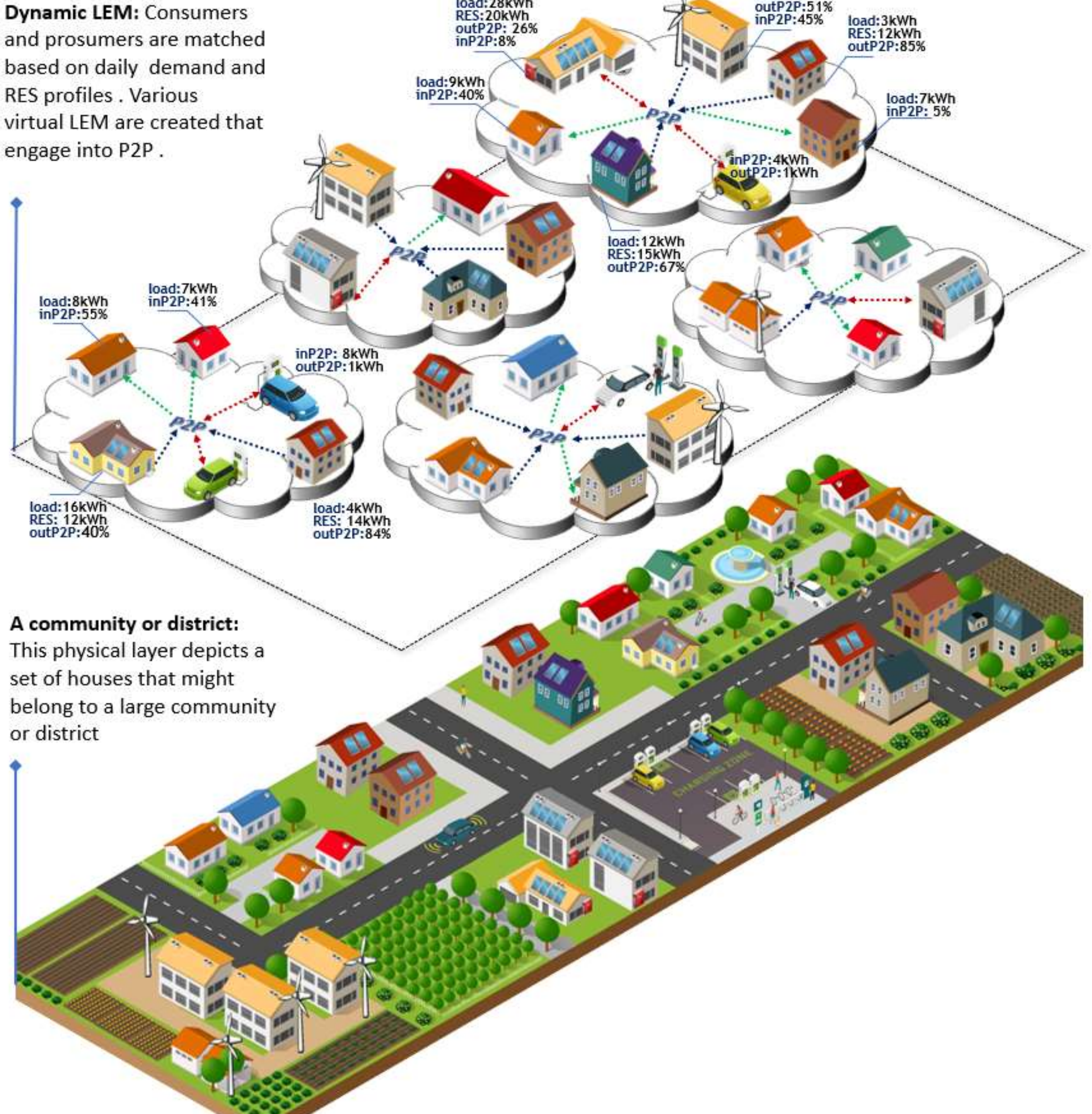

EV Flexibility
I want to do P2P
I have solar surplus

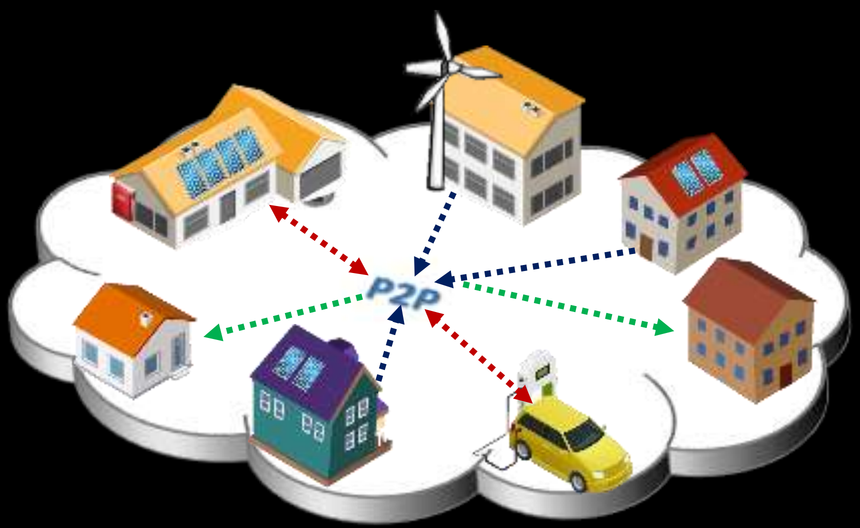
A community or district:
This physical layer depicts a set of houses that might part of a large community or district where

Load: total electricity load in a day (kWh)
RES: total Renewables generation in a day
inP2P:% of Demand covered by peers/LEM
outP2P:% of prosumer RES to peers/LEM



So, what is the idea here? Why?



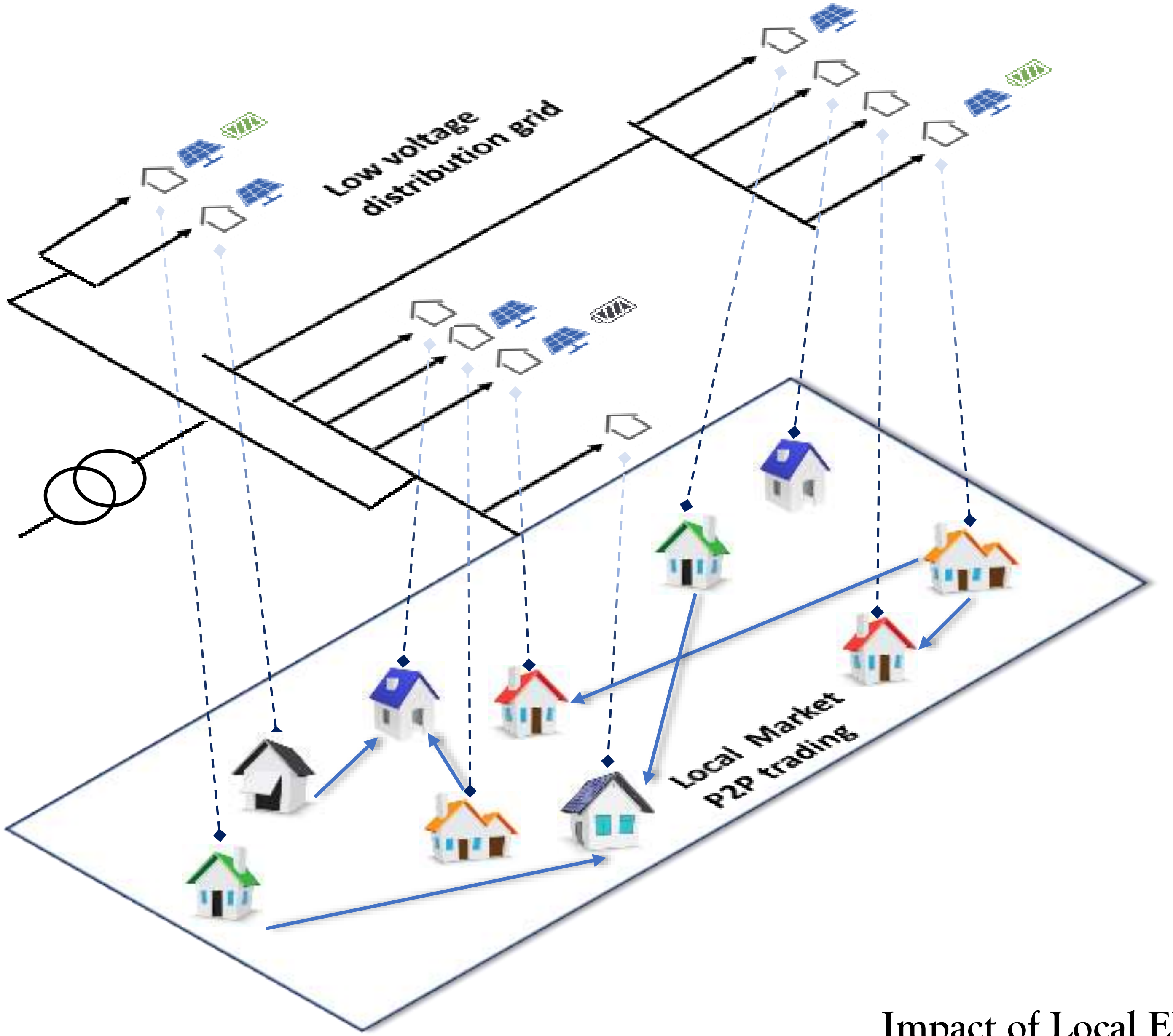

P2P

Main insights

1. Clustering can lead to new ideas for local market designs tailored to EVs flexibiltity or other Flexibility providers
2. Results indicate that enabling prosumers-consumers participate in the virtual LEM, on average, reduces both the electricity costs and the dependency on the grid by £114 and 725 kWh per month.
3. Integration of EVs in the P2P transactions, especially in the periods with higher renewable production, increases these numbers to £180 and 943 kWh per month.

At the intersection of digitalization and decentralization

1. Clustering can support the creation and the large-scale integration of consumers and prosumer actors (whole cities).
2. Clustering of P2P and local communities can be a business service for market operators and other actors
3. Clustering could be seen as the «airbnb» or «uber» for energy citizenship



Impact of Local Electricity Markets and Peer-to-Peer Trading on Low-Voltage Grid Operations

BEYOND

Partners:

NTNU Norwegian University of Science and Technology

TU Wien Technische Universität Wien

UPC Universitat Politècnica de Catalunya

FH Technikum Wien University of Applied Sciences

Sonnenplatz Großschönau

ms.gis

SINTEF

iERC International Energy Research Centre

Forschung Burgenland Research & Innovation

FLEXIDAO

eFRIENDS dein strom. dein marktplatz.

Moosmoar Energies OG

best→connect

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LinkedIn

http://www.linkedin.com/in/beyond-project

More info:

https://beyond-project.eu/

References and more information

- Dynge, Marthe Fogstad; Crespo del Granado, Pedro; Hashemipour, Seyed Nasar; Korpås, Magnus. (2021) Impact of local electricity markets and peer-to-peer trading on low-voltage grid operations. *Applied Energy.* vol. 301.
- Hashemipour, Seyed Nasar; Crespo del Granado, Pedro; Aghaei, Jamshid. (2021) Dynamic allocation of peer-to-peer clusters in virtual local electricity markets: A marketplace for EV flexibility. *Energy.* vol. 236.

A business case for managing volatile renewables in the energy system

Presentation to IEA

Erwin Leeuwis, Director of Strategy,
Eneco Group

Eneco

Eneco is an integrated energy company (‘gentailer’) active in Germany, Belgium, UK and the Netherlands

Key figures as of 31 Dec 2020

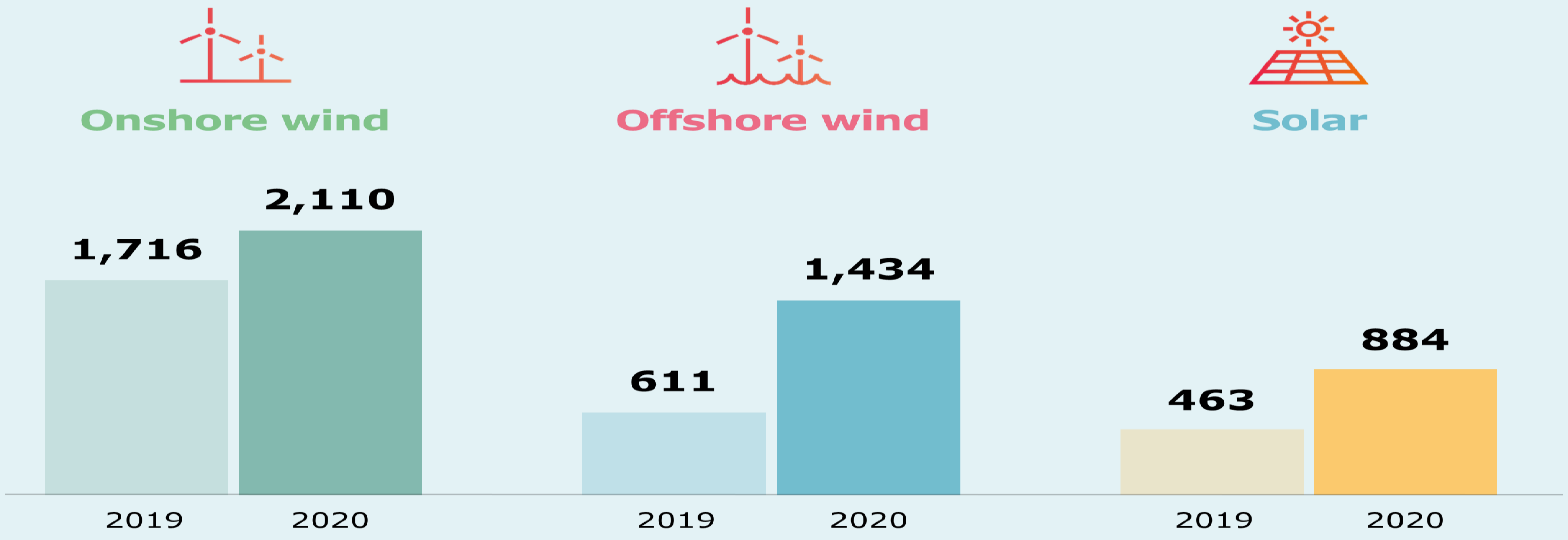
Operating results
163
€ million (EBIT)

Number of customer contracts
5.9
million

Number of employees (FTE)
2,835

Investment
385
€ million

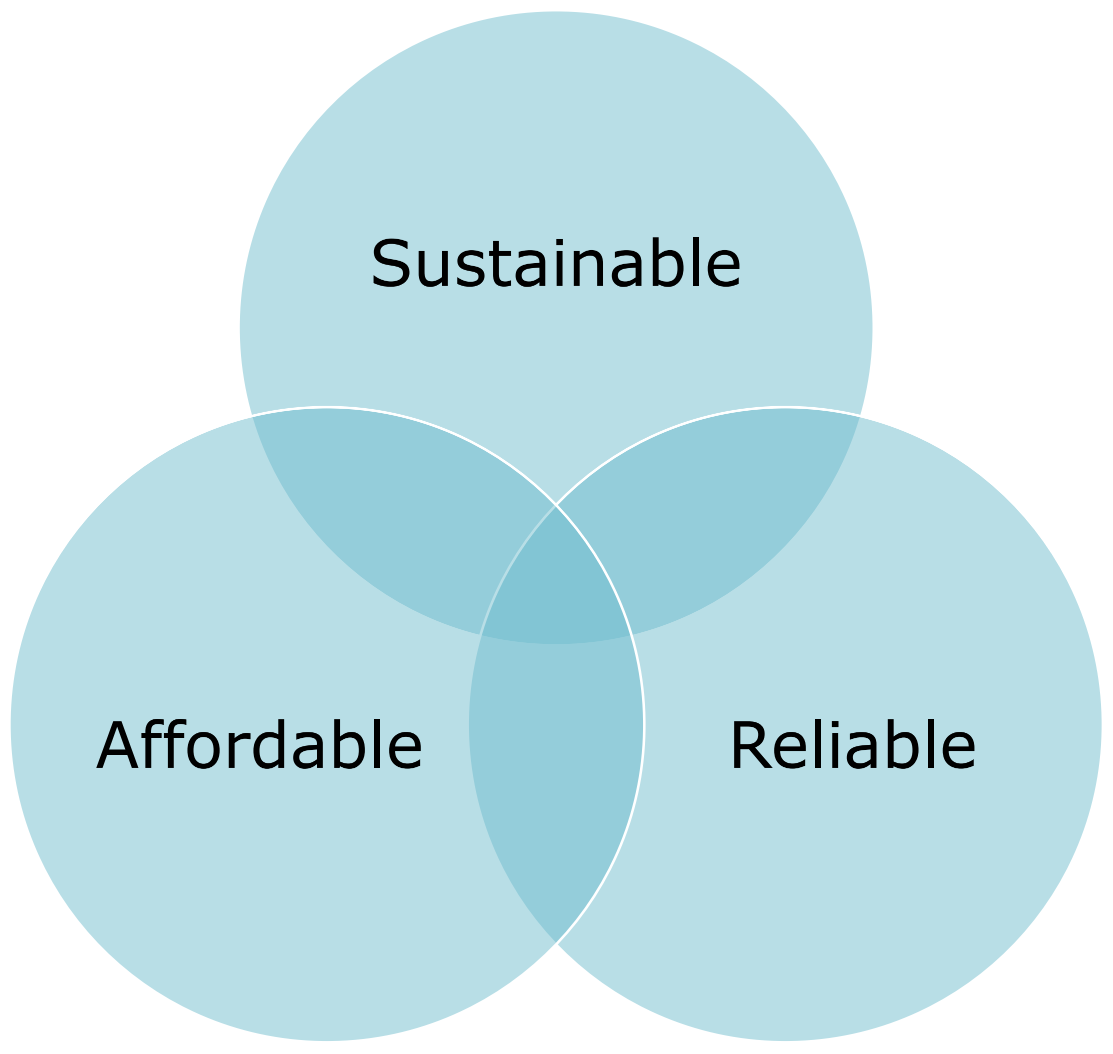
Renewable production capacity (in MW; incl. contracted)



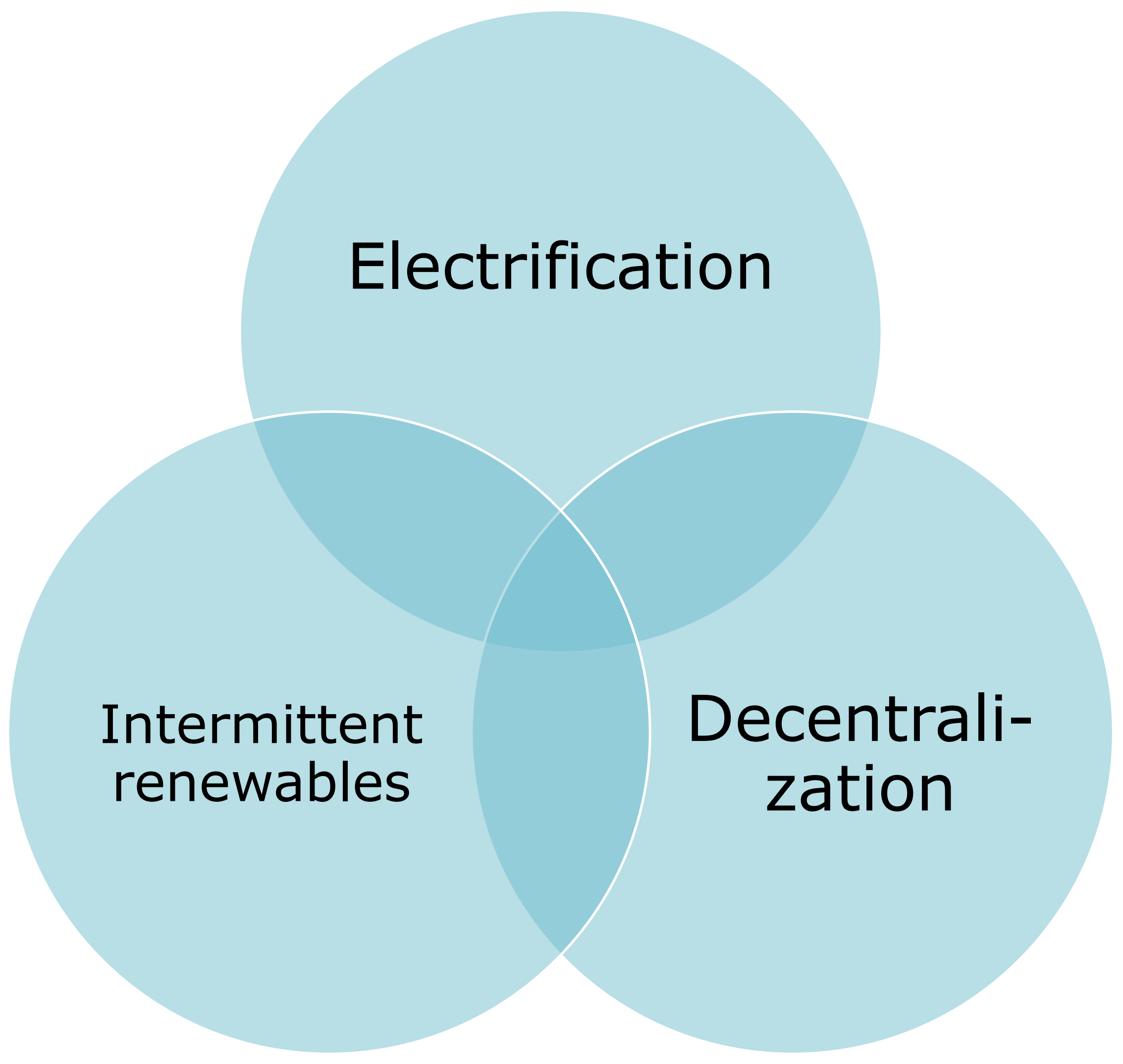
What are our challenges?

Decarbonisation requires rethinking our energy system, including setup of the electricity grid and role of demand, storage and supply

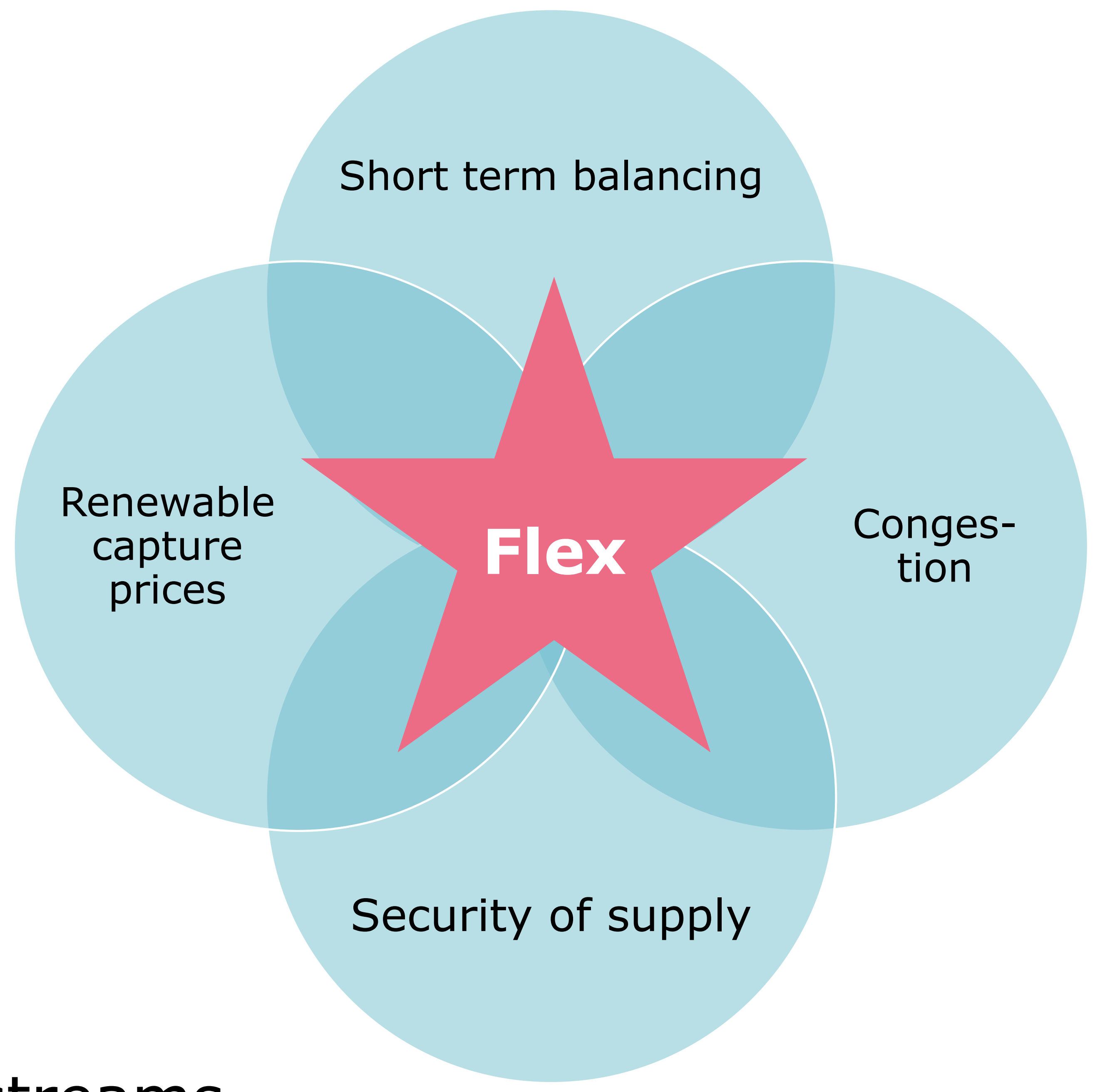
Energy transition



Electricity system impact



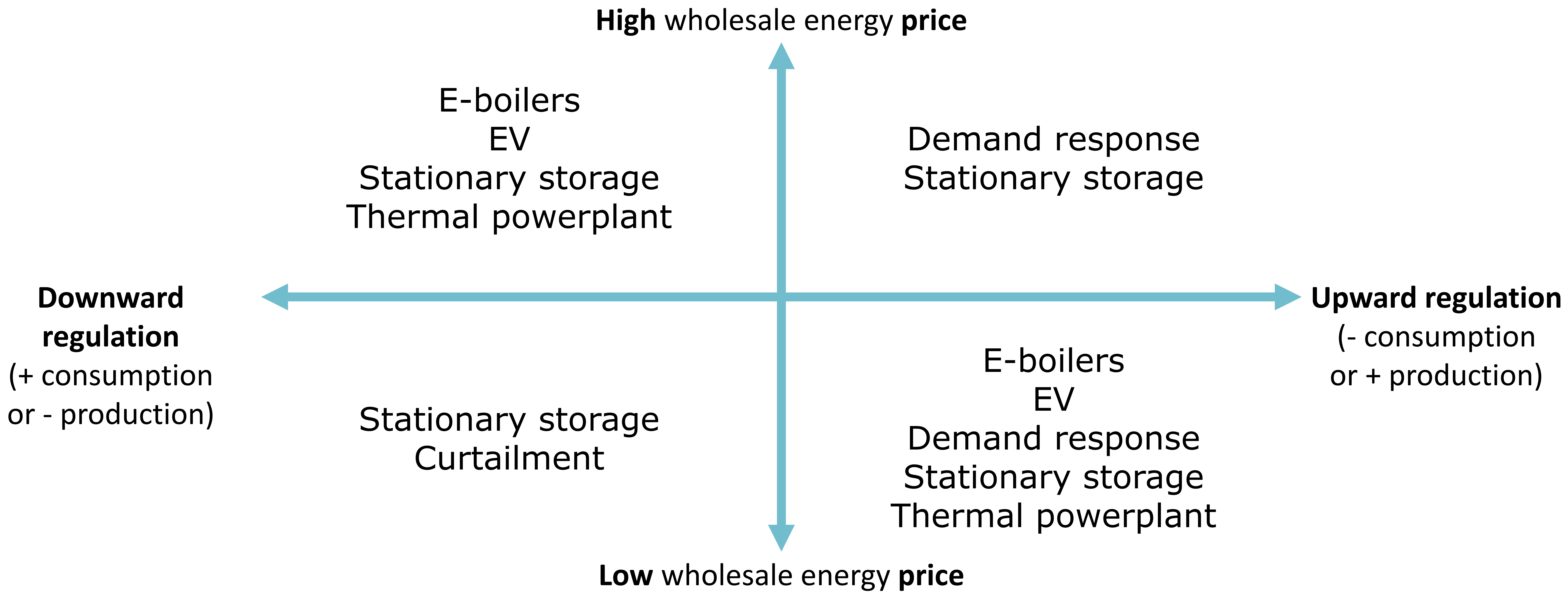
Power market challenges



- Need for flexibility is driven by multiple power market challenges
- Ideally a flexibility source (demand, supply or storage) taps into multiple revenue streams
- Smart electrification will be big part of the solution (e.g., hybrid heat pumps, e-boilers, elektrolyzers, EVs, home batteries, etc.)

Based on Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Flex comes in different shapes and different situations require different types of flex



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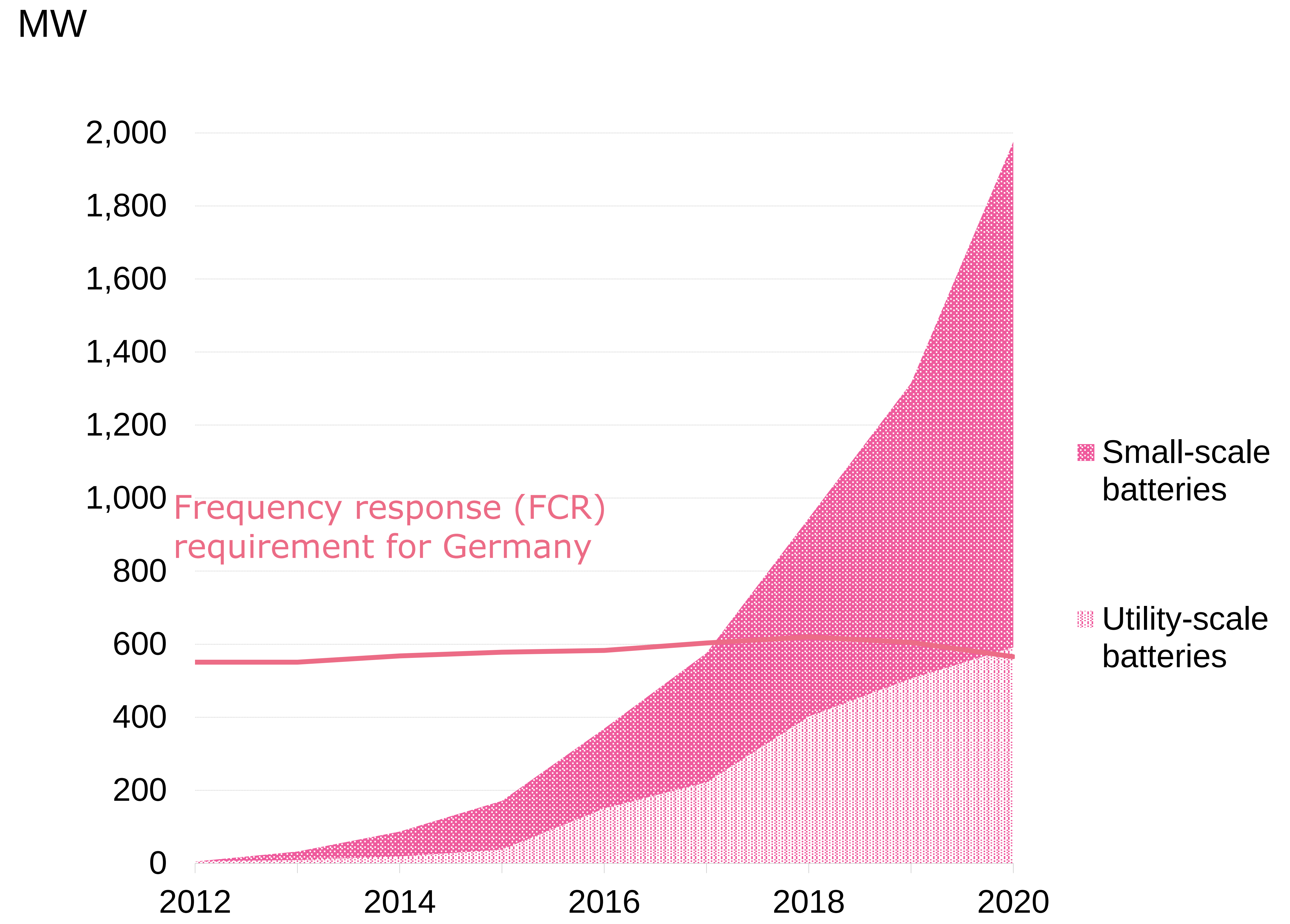
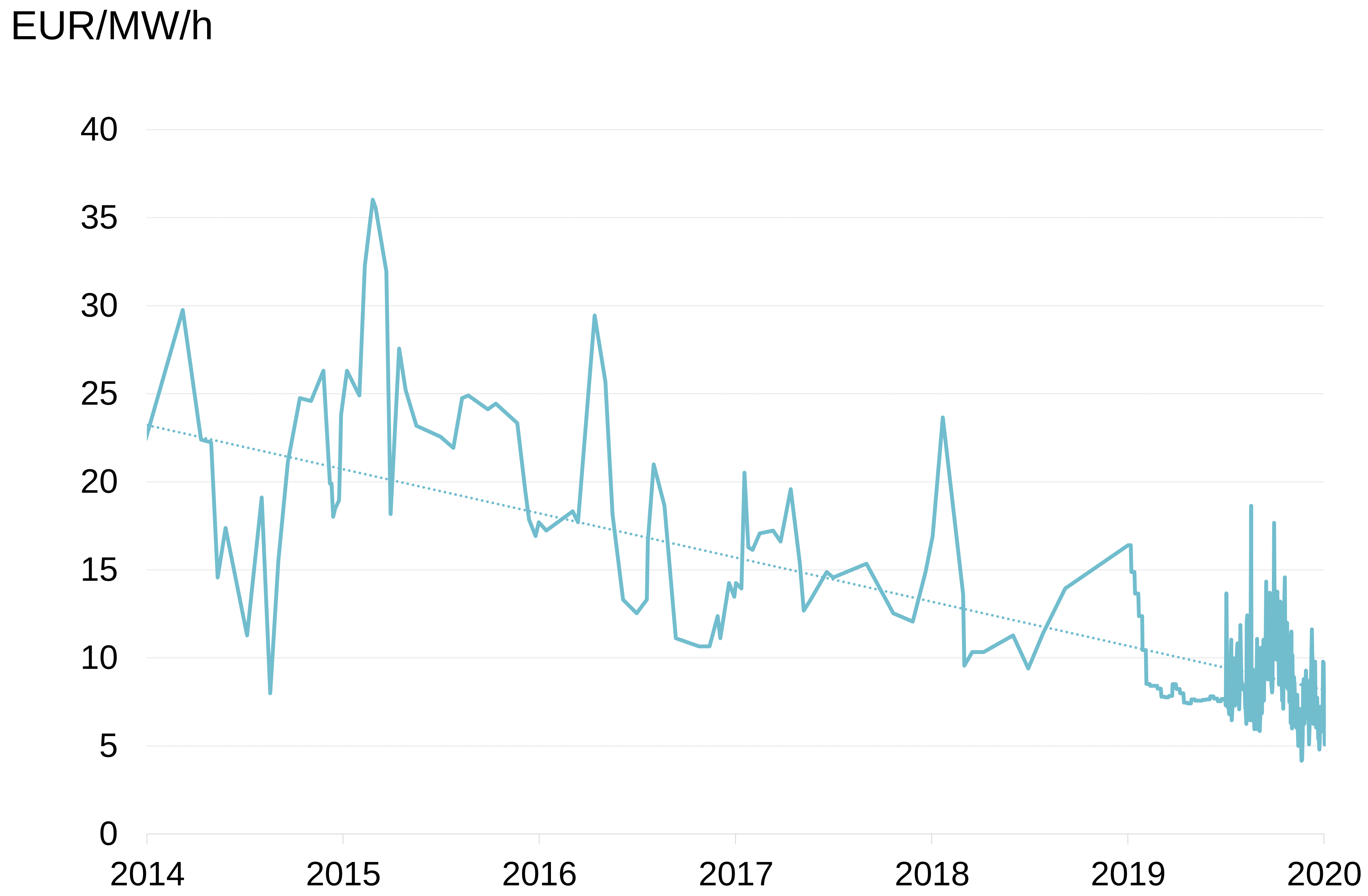
Flex demand increases, but so does supply: price pressure

German battery capacity increased tenfold between 2015 and 2020 whilst the FCR requirement remains constant. This puts downward pressure on prices

German frequency control reserve (FCR) market size



Germany frequency market prices clearly shows a downward price trend and more volatile pricing*.



*This follows the introduction of daily auctions (was weekly) and marginal pricing (was pay-as-bid) as of 1 July 2019 as well as the shortening of the bid blocks from a daily product to 4h products (1 July 2020)
Source: BNEF 1H 2021 Energy Storage Market Outlook

So what works, what doesn't?

In each individual business case, flex value is icing, not the cake

What does not work?

Stand-alone business cases for flex

What does work?

"Piggy back" on other use cases

- EV
- Home heatpump
- Home battery for self-consumption
- Electric boiler already in-house
- …

What will work more in future?

Stacking of business cases:

- Self-consumption increase
- Prevention curtailment
- Optimize grid connection (e.g. overplanting solar + PV)
- Congestion prevention
- …

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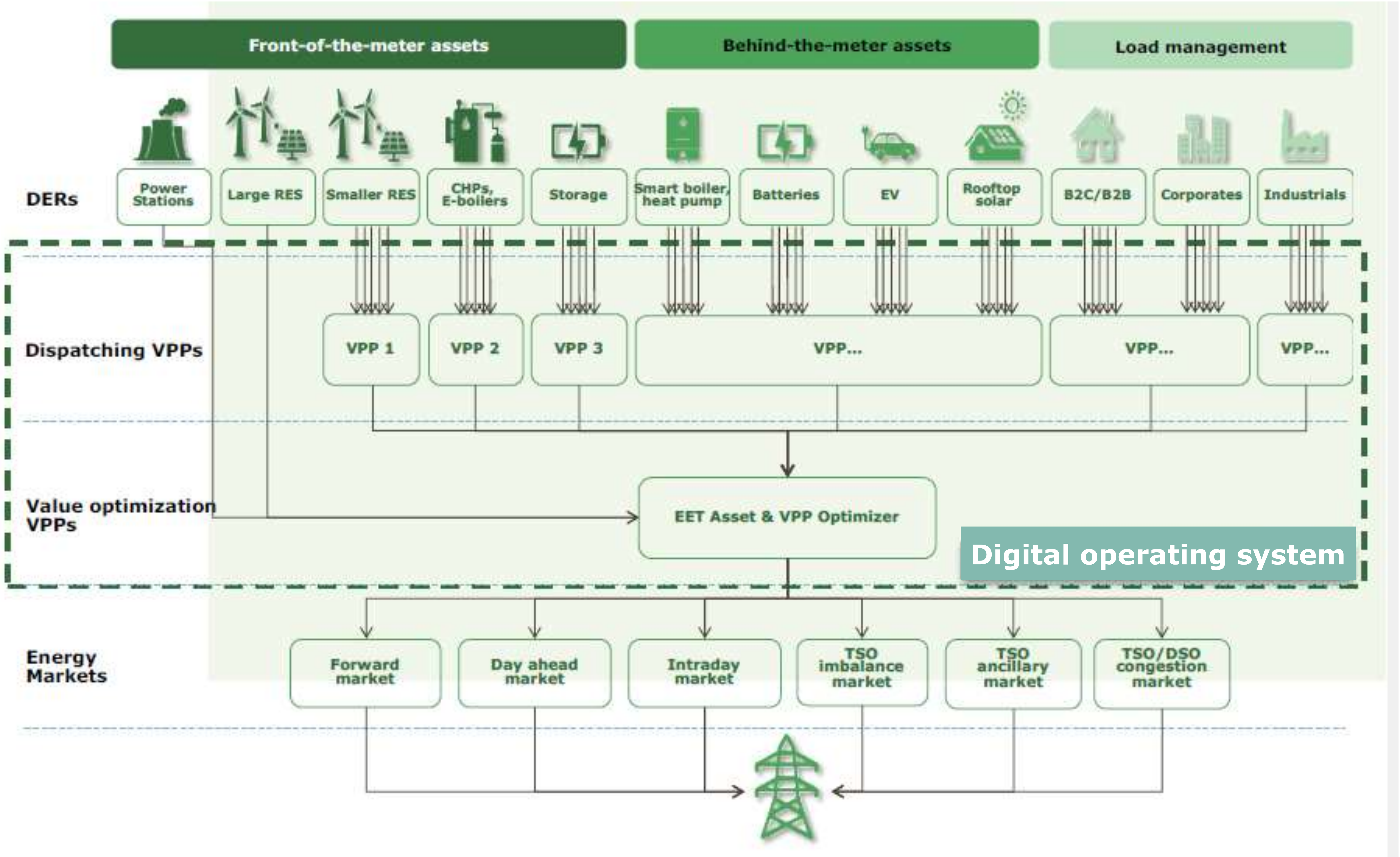
Digital operating system needed to optimize flex value and connect new types of flex and markets at low cost



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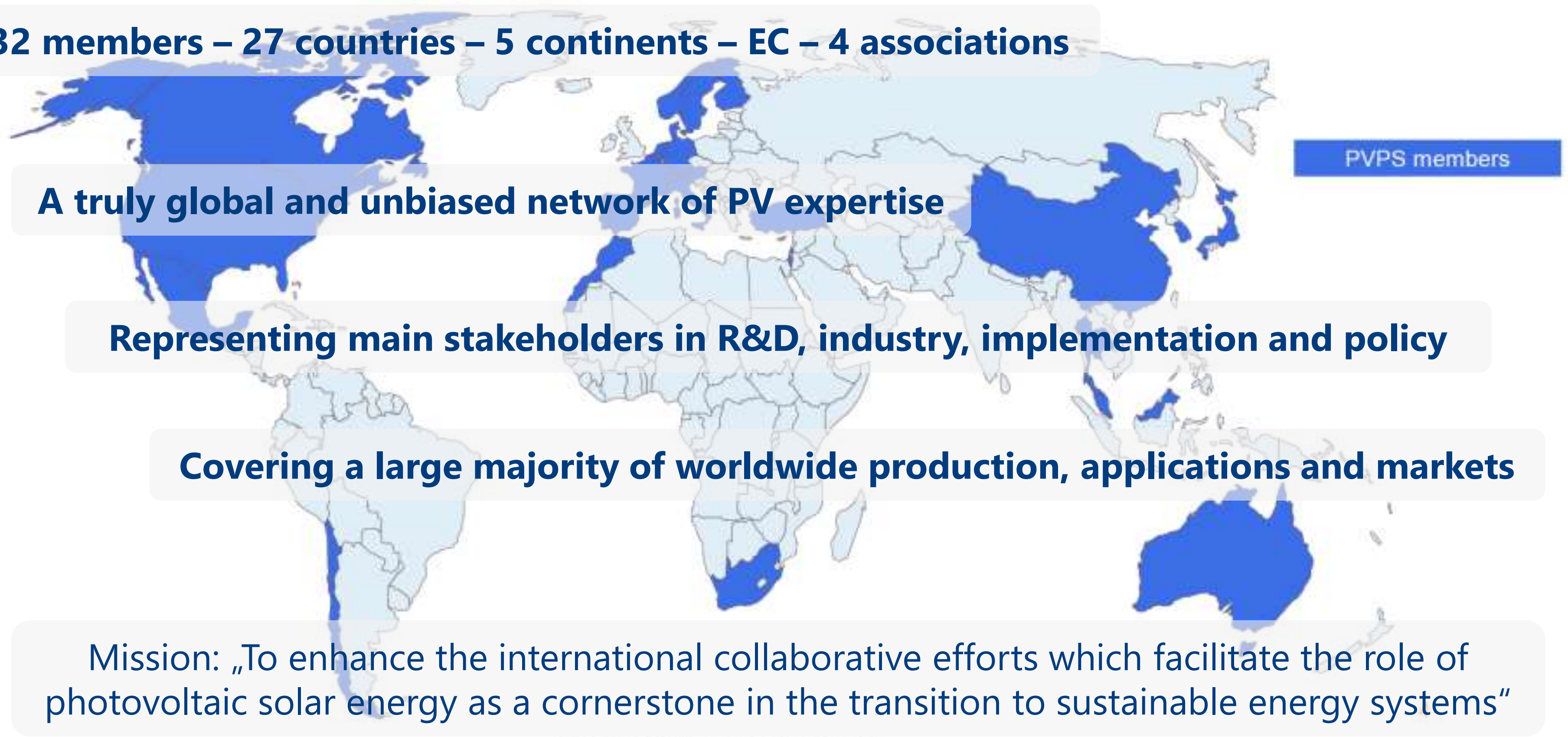
The PVPS world (2020)

32 members – 27 countries – 5 continents – EC – 4 associations

A truly global and unbiased network of PV expertise

Representing main stakeholders in R&D, industry, implementation and policy

Covering a large majority of worldwide production, applications and markets



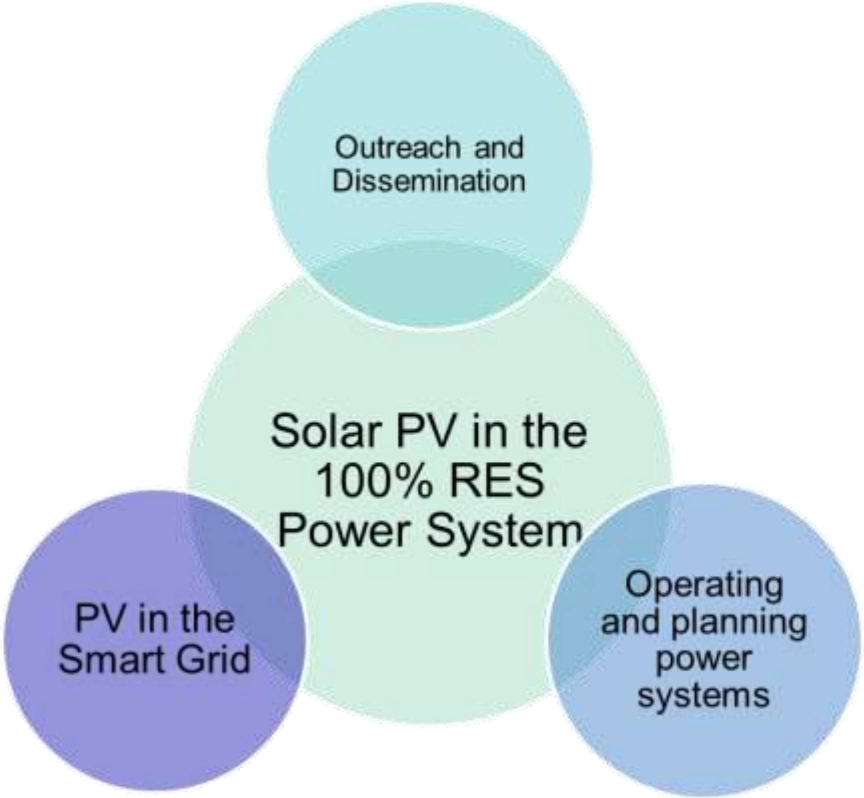
Mission: „To enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems“

World map by www.freeworldmaps.net

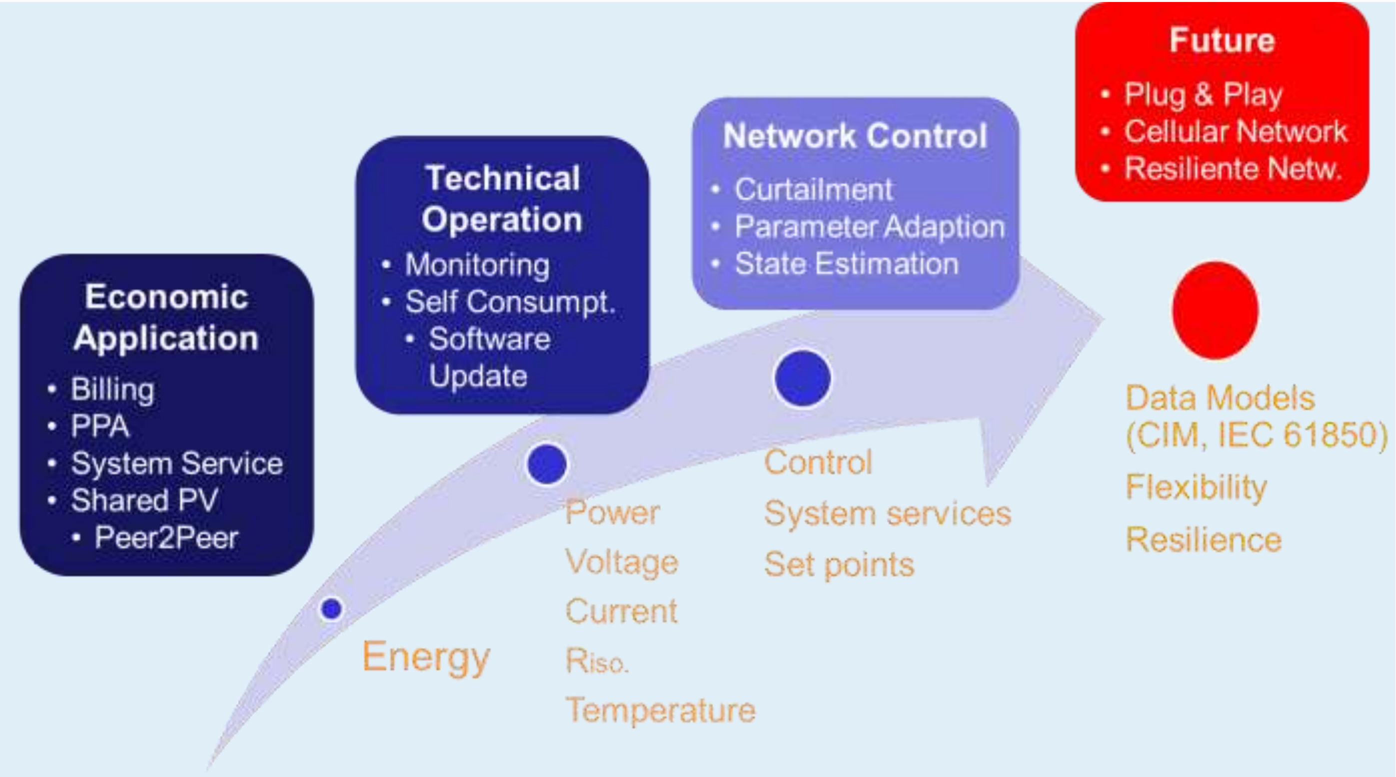
8 Active PVPS Tasks, addressing the TW challenge

- Task 1 - Strategic PV Analysis and Outreach
- Task 12 - PV Sustainability
- Task 13 - PV Performance, Quality and Reliability
- Task 14 - Solar PV in the 100% RES Power System
- Task 15 - Accelerating Building Integrated PV
- Task 16 - Solar Resource for High Penetration and Large Scale Applications
- Task 17 - PV and Transport (new 2018)
- Task 18 - Off-Grid and Edge-of-Grid Photovoltaic Systems (new 2019)

Task 14 – Solar PV in a 100% RES Power System



Task 14 – Solar PV in the Smart Grid

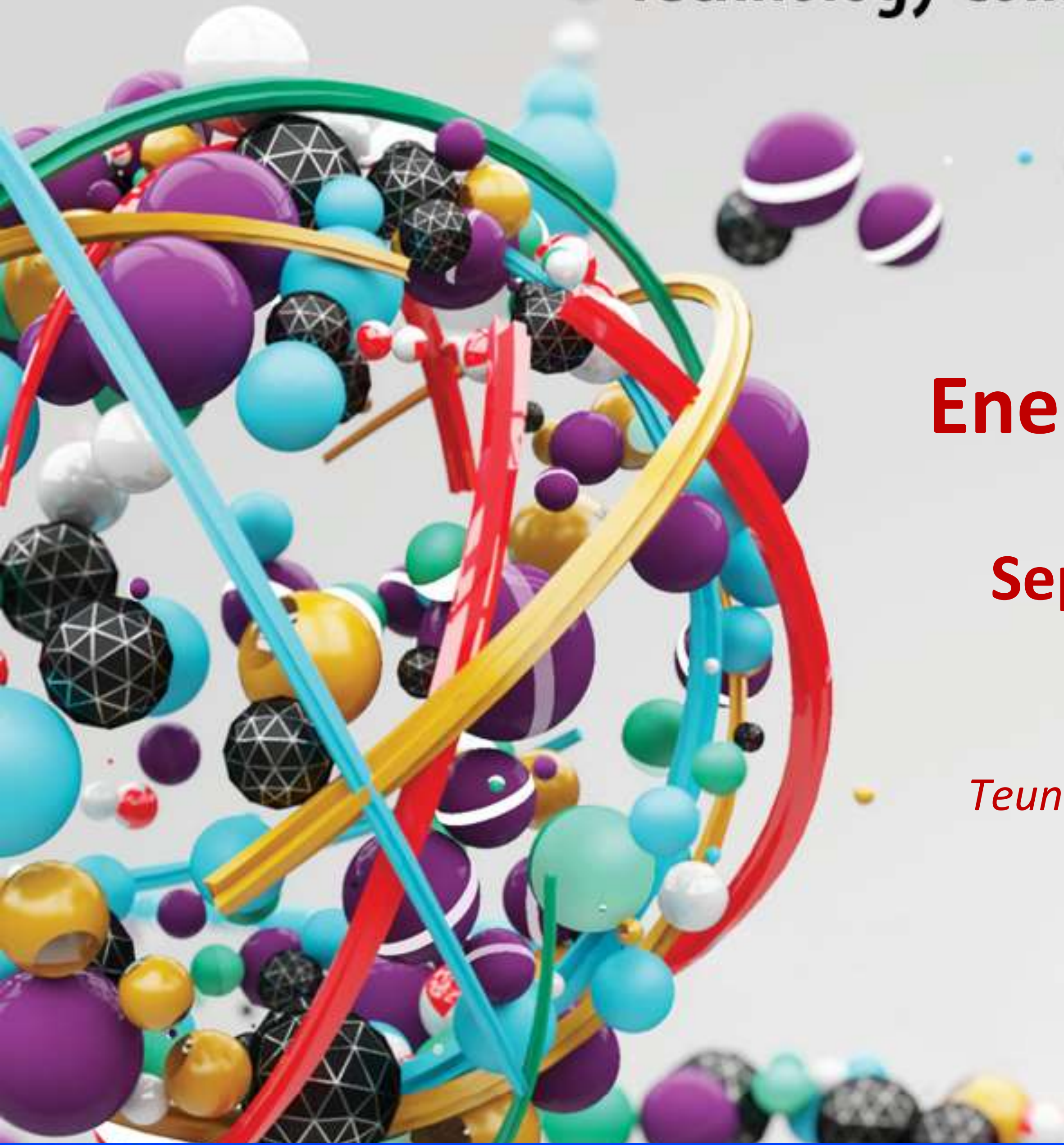


- **Standards**
- **IT Security**
- **Smart Grid integration**
- **Access to markets**
- **Collaboration**

Questionnaire https://iea-pvps.org/research-tasks/solar-pv-in-100-res-power-system/survey/

PVPS

Technology Collaboration Programmes



Energy Storage - TCP

IESCG meeting

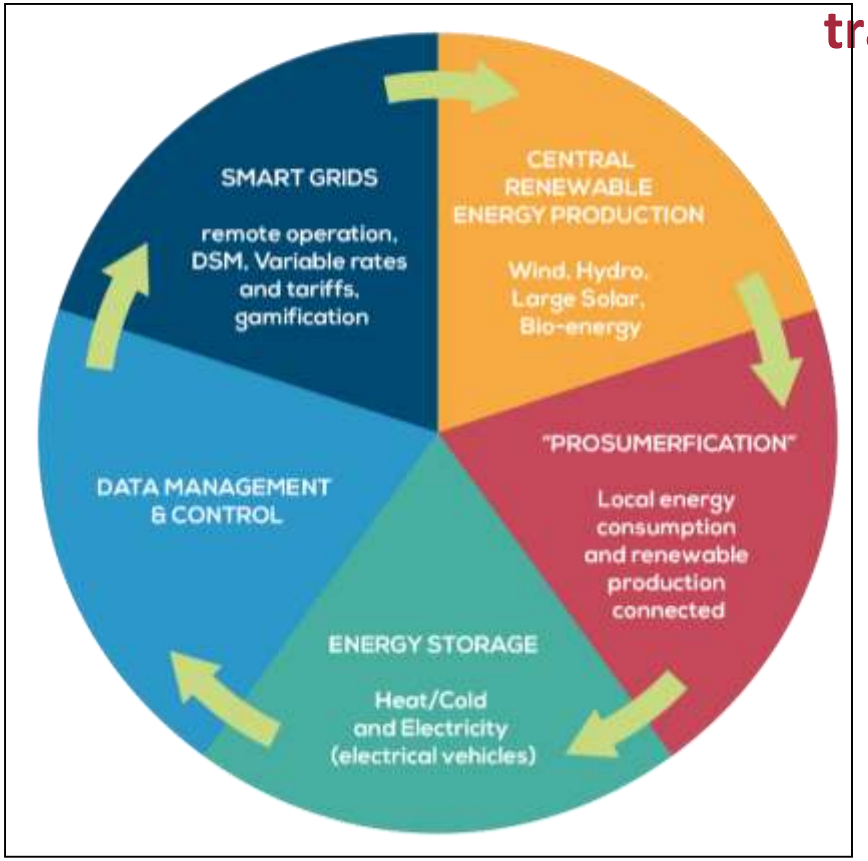
September 14th , *2021*

Teun Bokhoven, chair ExCo ES TCP

energy storage

IEA Technology Collaboration Programme

ES TCP Introduction



ES TCP anticipates on the transformation of the energy system:

- Main trend from centralised (fossil) energy production to more decentralised renewable production
- Changing energy commodities in sectors. (Renewable) electricity instead of fossil fuels in mobility, industrial process heat, heating of buildings.
- Difference in time of (renewable) production and time of use requires solutions in flexibility- of which energy storage in many forms is one of the necessary options.

energy storage
IEA Technology Collaboration Programme

Challenge is to manage flexibility

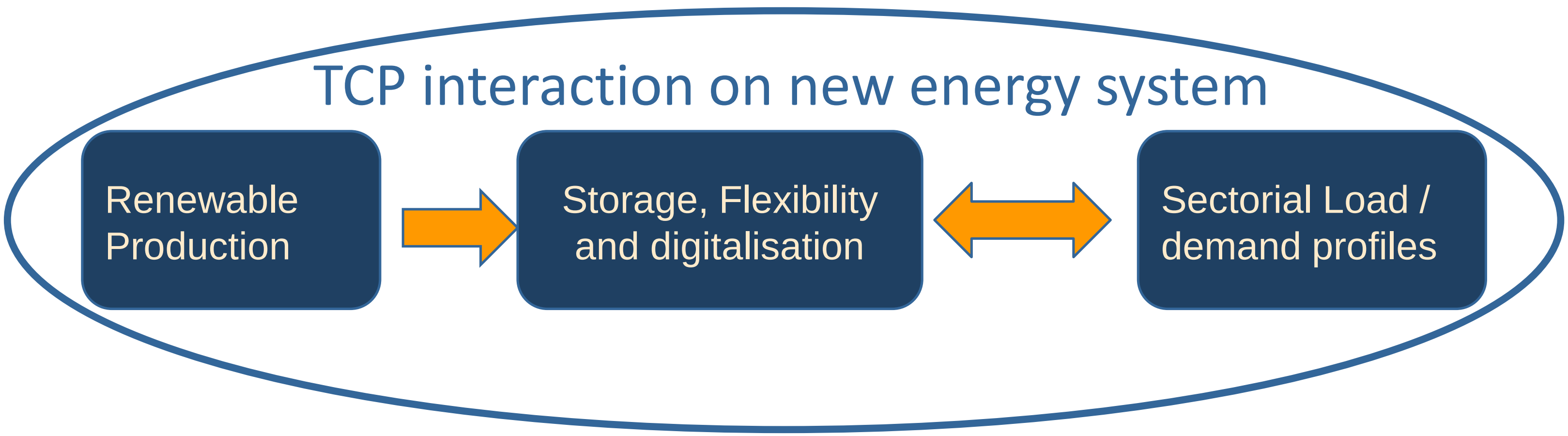
Whereby storage is needed for flexibility and flexibility needs to be managed:

- Digitalisation as tool to manage a system
- Understanding how technologies and sectors interact
- Open data required to manage the system
- Sound business cases for operators / aggregators

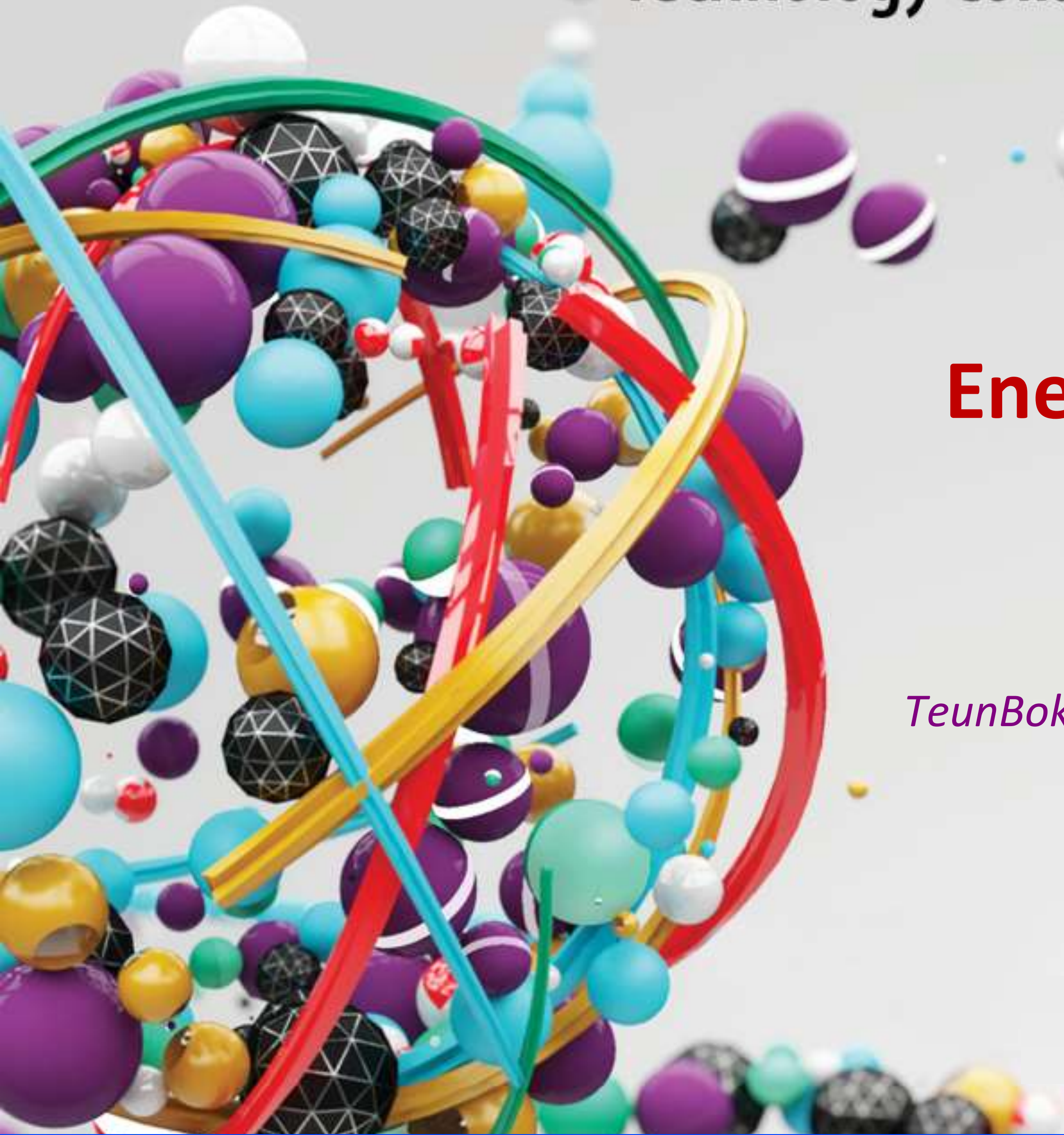
Implications for IEA TCP's

Challenges for upcoming period:

- Seek more inter TCP interaction to understand system implications and develop new solutions
- Add system integration and sector coupling as topic to technological developments and research
- Organise swift and flexible inter TCP collaborations



energy storage
IEA Technology Collaboration Programme



Energy Storage TCP
Thank you

TeunBokhoven@Consolair.nl

energy storage

IEA Technology Collaboration Programme

ISGAN
International Smart Grid Action Network

Joni Rossi – Operating agent Annex 6: Transmission and Distribution systems

14 September 2021

IEA EUWP IESCG MEETING

ISGAN in a Nutshell

The **International Smart Grid Action Network (ISGAN)** creates a strategic platform to support high-level government attention and action for the accelerated development and deployment of smarter, cleaner electricity grids around the world

ISGAN Vision and Mission

ISGAN
INTERNATIONAL SMART GRID ACTION NETWORK

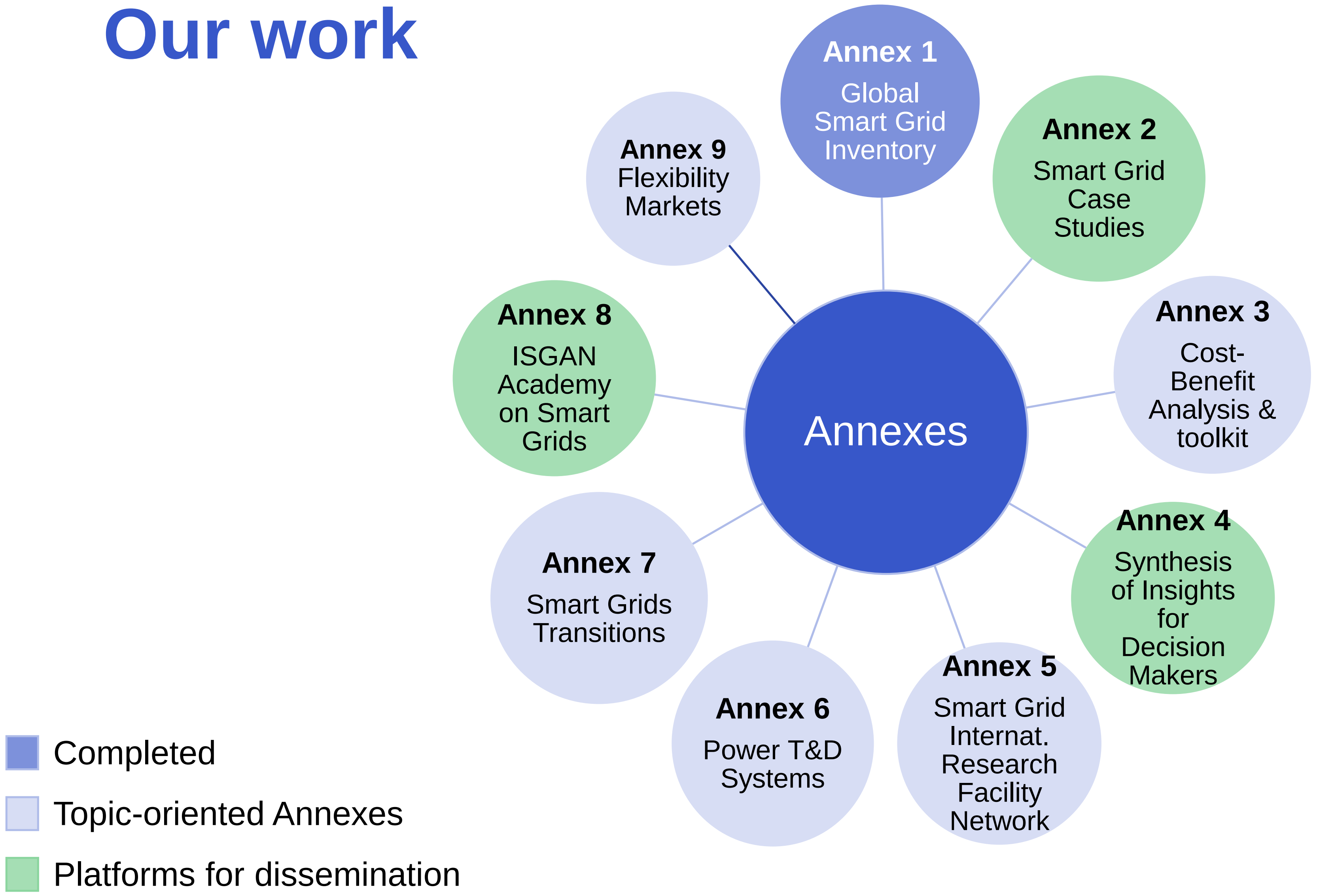
Vision

The attainment of national, regional and global clean energy and climate goals supported by the integration of a variety of smart grid technologies, applications an policies.

Mission

To provide a platform for the development and exchange of expertise and competence on smarter, cleaner electric power systems and to serve as an important channel for communication of related knowledge.

Our work


Annex 1
Global Smart Grid Inventory
Annex 2
Smart Grid Case Studies
Annex 3
Cost-Benefit Analysis & toolkit
Annex 4
Synthesis of Insights for Decision Makers
Annex 5
Smart Grid Internat. Research Facility Network
Annex 6
Power T&D Systems
Annex 7
Smart Grids Transitions
Annex 8
ISGAN Academy on Smart Grids
Annex 9
Flexibility Markets
Annexes
Completed
Topic-oriented Annexes
Platforms for dissemination

Drivers and needs in the electricity grid

Drivers for Change

Demand	Generation	Grid
Changes on several levels: user behavior is evolving electricity usage is increasing	Changes in generation mix is resulting in a true evolution of the power system	Changes in utilization is escalating the stress on the grid, which is becoming increasingly complex to develop

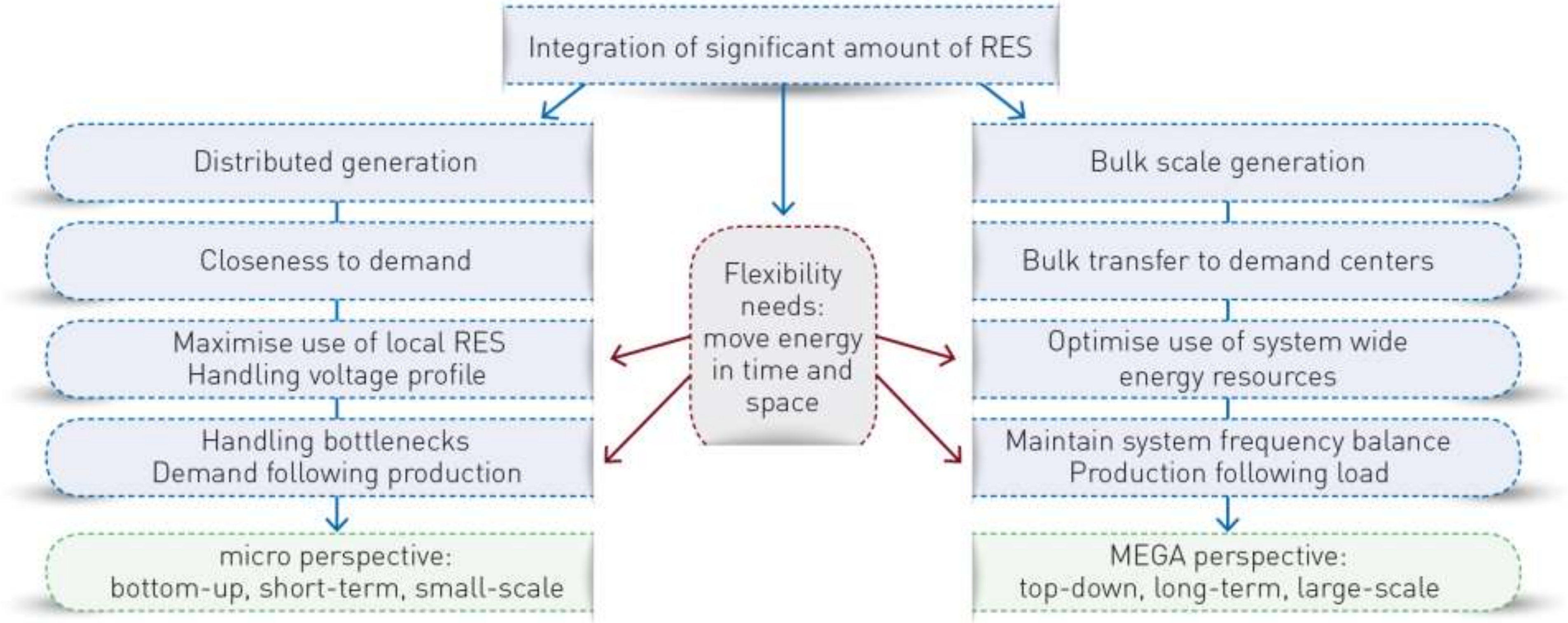
Resulting Consequences

Increased challenges to maintain secure operation and reliable long-term planning of the Power Transmission and Distribution System

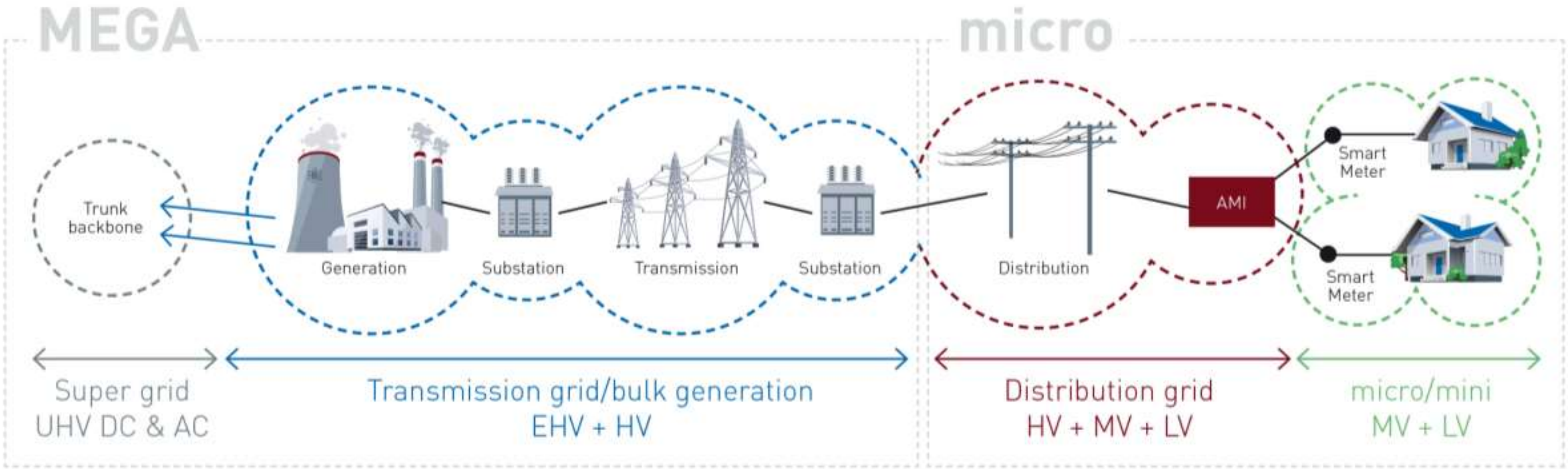
Needs to ensure sustainability & security of supply

Technology	Market	Policy
Digitalized solutions are enablers to change operation and planning of power systems, providing possibilities to implement advanced technical solutions	Exploration of innovative market solutions provide the means of utilizing flexibilities and other services	Advances in policy and regulation are needed to follow and guide technological & market developments, with test opportunities provided by regulatory sandboxes

Local and overall perspectives



Local and overall perspectives



- Significant developments and investments are required from both the micro and the MEGA perspectives
- Importance of whole-system coordination, together with cooperation between different system levels
- An optimal mix provides the most socio-economic welfare at the same time as providing an optimal use of resources.

Complex interaction between need owners and stakeholders

- Established stakeholders
  - Changes in role and institutional framework
  - Looser network structures and partnerships
  - TSO-DSO interaction challenges
  - DSOs becoming active grid managers
  - Asset-centric companies become data-centric
- New actors
  - At the local level: consumers becoming prosumers, aggregators…
  - Local energy communities
  - New hybrid organisations

Getting involved:

- How do system/network operators and other stakeholders perceive the impact of flexibility and their interaction
  - Please fill in the questionnaire on Flexibility and stakeholder interaction

- Discussion paper on micro vs MEGA perspectives on network development

- Flexibility for Resilience: planned high-level policy workshop in spring 2022

For more information

ISGAN Website: www.iea-isgan.org

Clean Energy Ministerial: www.cleanenergyministerial.org

IEA Energy Technology Network: https://www.iea.org/tcp/

ISGAN Chair, Luciano Martini: Luciano.Martini@rse-web.it

ISGAN Operating Agent: ISGAN@ait.ac.at

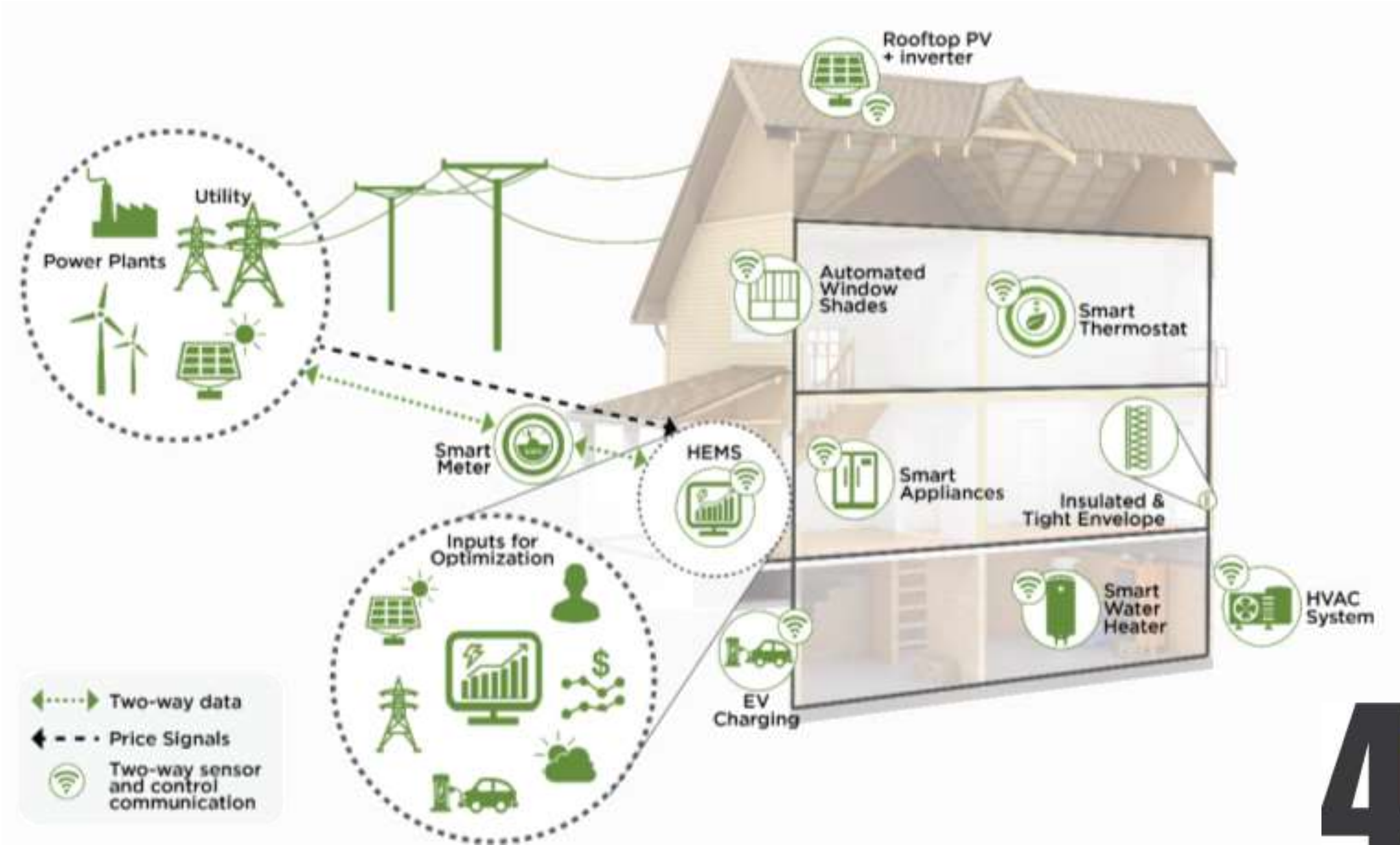
14

iea-isgan.org

Thank you

Joni Rossi

Joni.Rossi@ri.se



Electronic Devices & Networks Annex
EDNA

IEA-4E / Electronic Devices and Networks Annex

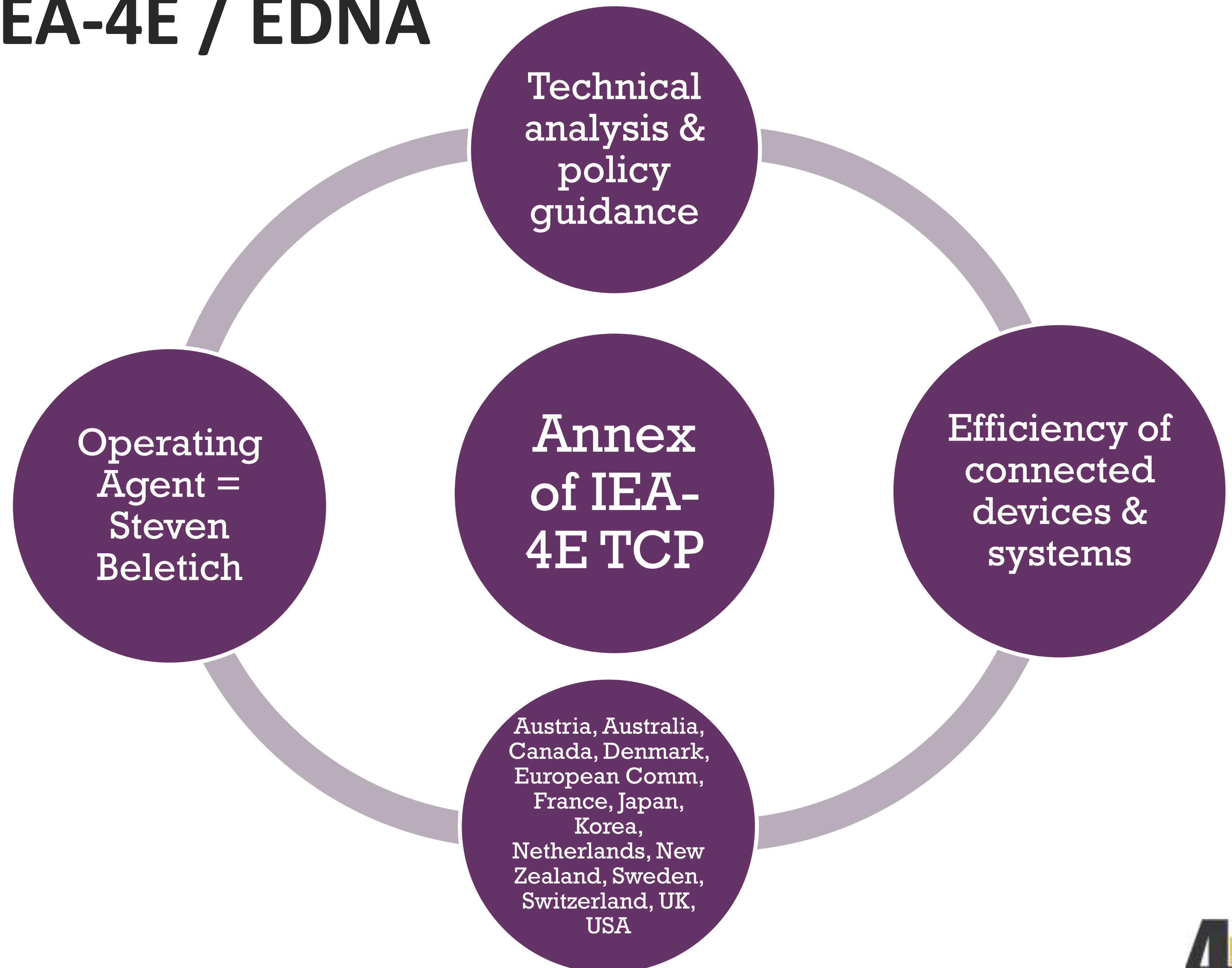
Steven Beletich, Operating Agent for IEA-4E/EDNA

IESCG Webinar, 14 September 2021

4E TCP – EDNA Annex

- Provides technical and policy guidance for network-connected devices and the systems in which they operate
- iea-4e.org/edna

IEA-4E / EDNA



Electronic Devices & Networks Annex EDNA

Energy Implications of Device Connectivity

Energy Benefits through Digitalisation

- Intelligent efficiency (IE)
- Demand flexibility (DF)

Wasted Energy

- Network standby

Energy Savings Through Digitalisation

- Consumer barriers
  - High costs and unclear benefits
  - Privacy & security
  - Complexity & technology risk (e.g. interoperability)
  - Difficulty of use
- Policy approaches to address these include
  - Demonstration projects
  - Methodologies to measure benefits
  - Consumer information e.g. labels
  - Creation of markets

Digitalisation (2)

- Not all connected devices are “smart” and not all can save energy
- Policies at the device level could help to realise their potential
  - Encourage connectivity **for energy saving / demand flexibility**
    - Monitor the environment and respond accordingly
    - Report own energy consumption
    - Respond to signals from other devices (e.g. scheduling; the grid)
  - Energy features could be mandated for devices which already connected
  - Target only larger devices (HVAC, water heating, etc.)
  - Specify open protocols
  - Address privacy & security

Digitalisation (3)

- Strategies and roadmaps are useful to realise the energy benefits of digitalisation
  - However few strategies cover energy efficiency / demand flexibility
  - EDNA reports provide guidance for how to include energy
  - Need to involve policy makers from many different jurisdictions

Wasted Energy: Network Standby

- Globally, by 2030, 300 TWh per annum could be wasted (= electricity consumption of UK)
- There is technical potential to limit this
- Policies are required (and several exist)

Electronic Devices & Networks Annex
EDNA

Danish Energy Agency

Digitalization and decentralization

IEA interactive discussion

September 14, 2021

Søren Østergaard Jensen
Danish Energy Agency
Centre for Global Cooperation
snjn@ens.dk
Danish member of IEA EBC ExCo

EBC

Energy in Buildings and Communities Programme

EBC's Mission


EBC

International Energy Agency

Strategic Plan 2019 – 2024

Energy in Buildings and Communities

Technology Collaboration Programme

→ Energy efficiency is key

To support the acceleration of the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge, technologies and processes and other solutions through international collaborative research and open innovation.

www.iea-ebc.org/Data/Sites/1/media/docs/EBC_Strategic_Plan_2019_2024.pdf

EBC
Energy in Buildings and Communities Programme

EBC's High Priority Themes

Theme #1: Integrated planning and building design

Theme #2: Building energy systems

Theme #3: Building envelope

Theme #4: Community scale methods

Theme #5: Real building energy use

Energy use in buildings stands for 30-40 % of the total energy use.
Energy efficiency is considered at first fuel

Energy efficient buildings is thus necessary for the green transition

Relevante EBC annexes

https://www.iea-ebc.org/

Energy in Buildings and Communities Programme

Ongoing

Annex 84 Demand Management of Buildings in Thermal Networks

Annex 83 Positive Energy Districts

Annex 82 Energy Flexible Buildings Towards Resilient Low Carbon Energy Systems

Annex 81 Data-Driven Smart Buildings

Annex 75 Cost-effective Building Renovation at District Level Combining Energy Efficiency & Renewables

Annex 73 Towards Net Zero Energy Public Resilient Communities

Completed

Annex 67 Energy Flexible Buildings

Annex 64 LowEx Communities - Optimized Performance of Energy Supply Systems with Exergy Principles

Flexibility – Sector coupling- Digitalization

How and why

EBC
Energy in Buildings and Communities Programme

Increased use of fluctuating renewable energy

↓ Need for

New forms of flexibility

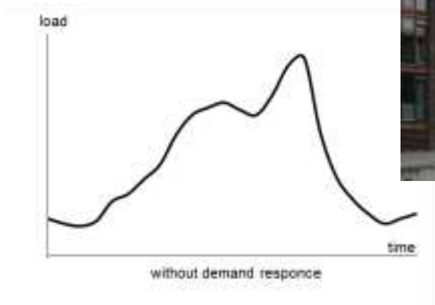
↓ Need for

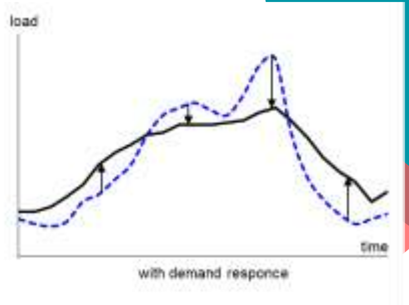
Sector coupling

↓ Need for

Digitalization

Most buildings have the ability to become energy flexible

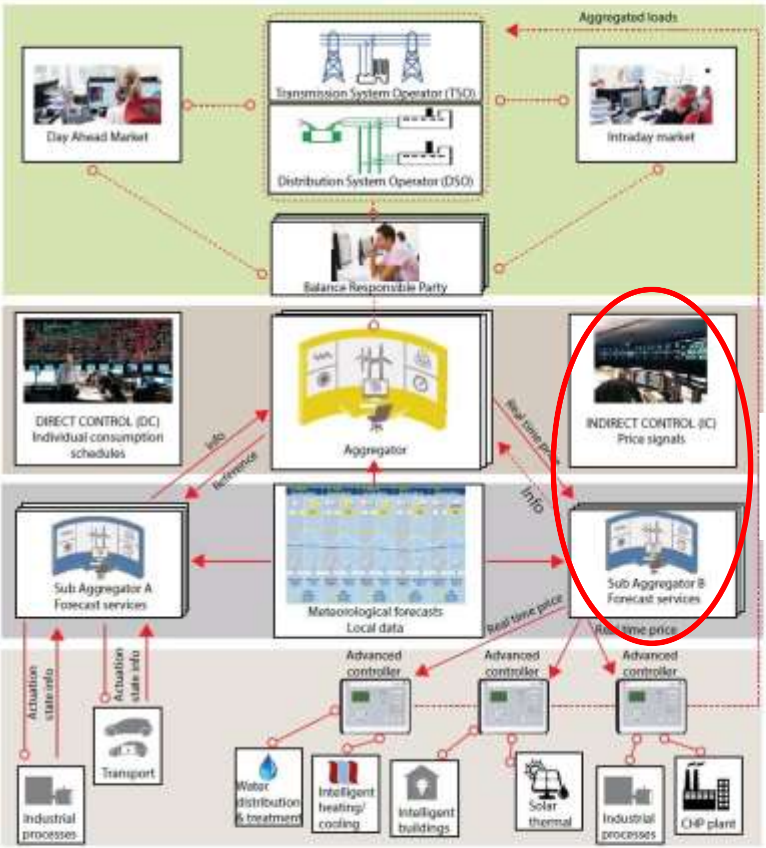




Controlers at different levels

Low level controllers -> high level controllers

EBC
Energy in Buildings and Communities Programme



http://smart-cities-centre.org/wp-content/uploads/WP5_Smart_Energy_Operation_System_Nov2020.pdf

Three words to remember: Digitalization, digitalization and digitalization

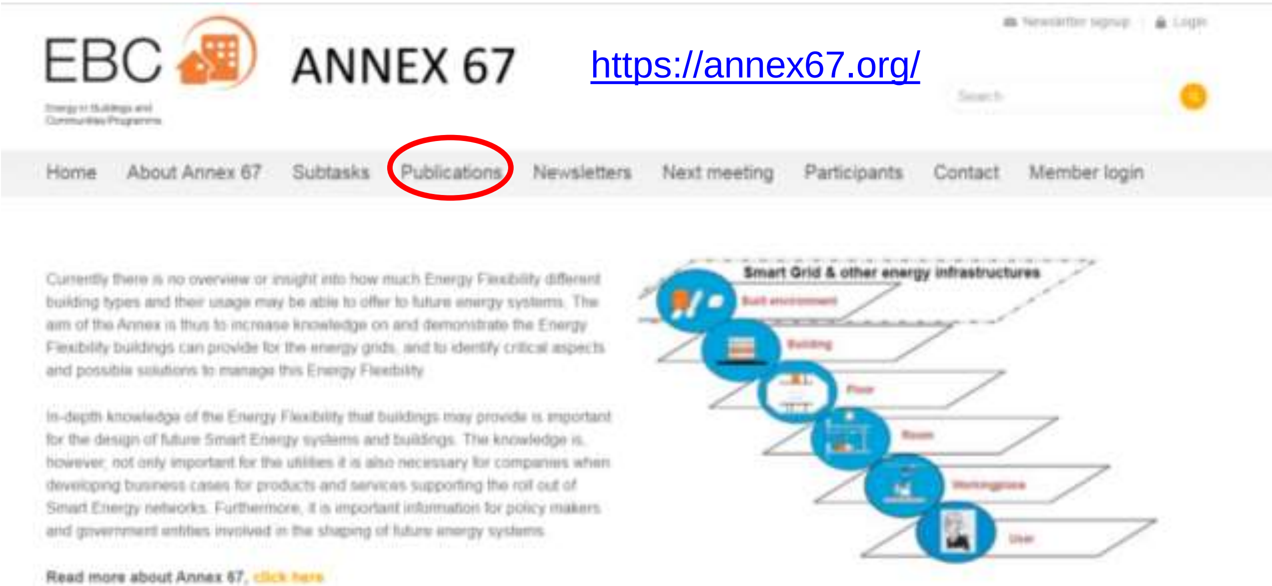
Aggregator: High-level controllers determine which penalty (control) signal to broadcast

Low-level controllers e.g. in the form of MPCs (Model Predictive Controllers)

IEA EBC Annex 67

Energy Flexible Buildings

EBC
Energy in Buildings and Communities Programme



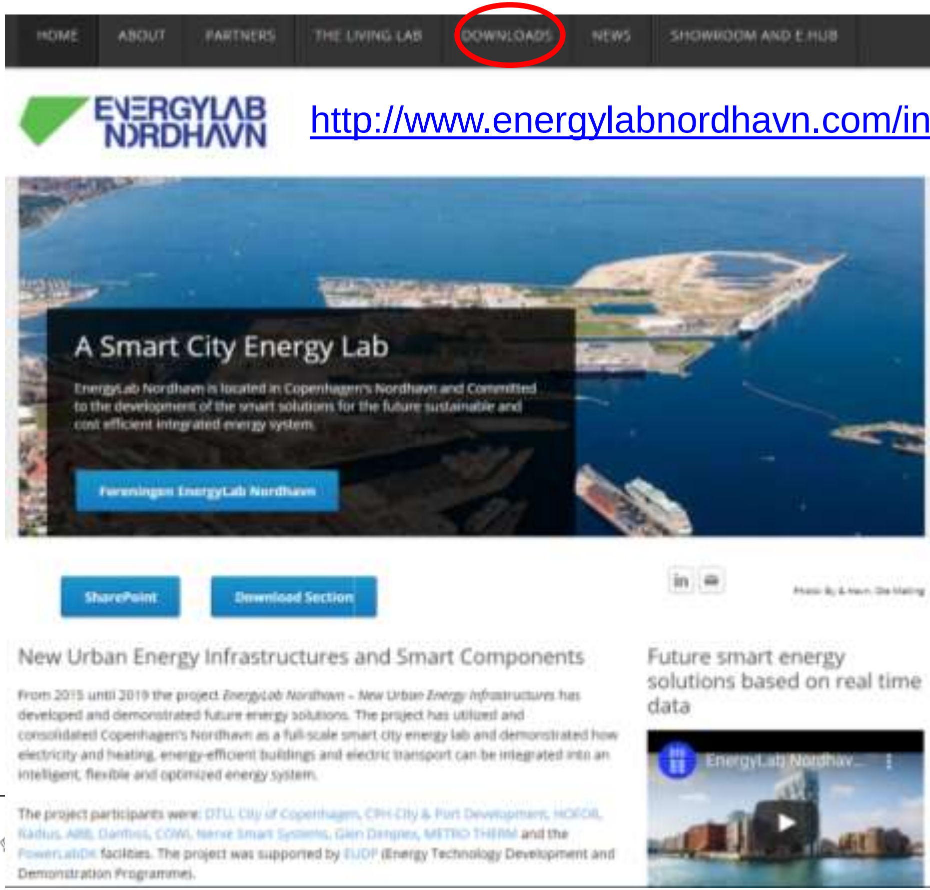
https://annex67.org/

Summary report:
https://annex67.org/media/1920/summary-report-annex-67.pdf

New annex: IEA EBC Annex 82 Energy Flexible Buildings Towards Resilient Low Carbon Energy Systems
https://www.iea-ebc.org/projects/project?AnnexID=82

EnergyLab Nordhavn

A smart City Energy Lab

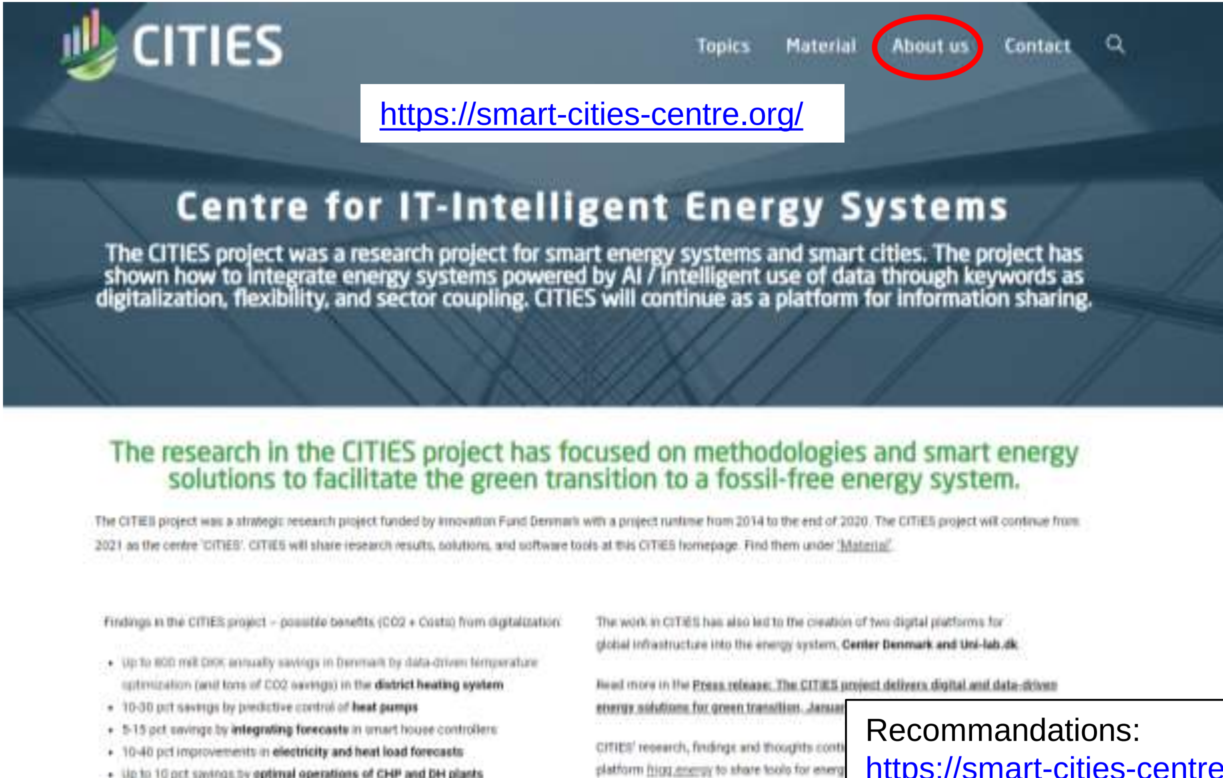


http://www.energylabnordhavn.com/index.html

Final report: http://www.energylabnordhavn.com/uploads/3/9/5/5/39555879/energylab_nordhavn_final_report_2020.pdf

CITIES

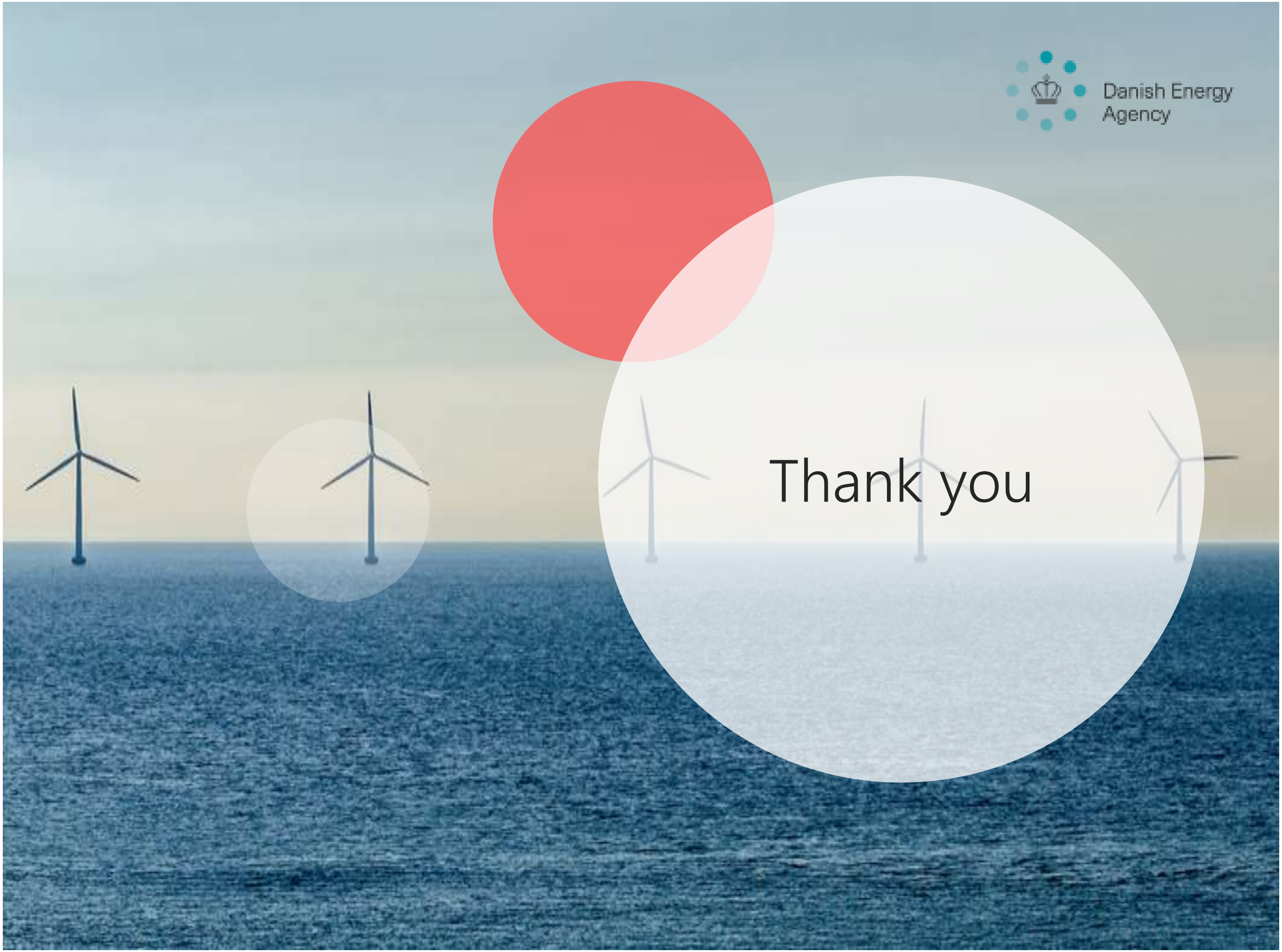
Centre for IT-Intelligent Energy Systems



https://smart-cities-centre.org/

Recommandations: https://smart-cities-centre.org/wp-content/uploads/CITIES-Recommendations.pdf

Danish Energy Agency


Danish Energy Agency
Thank you

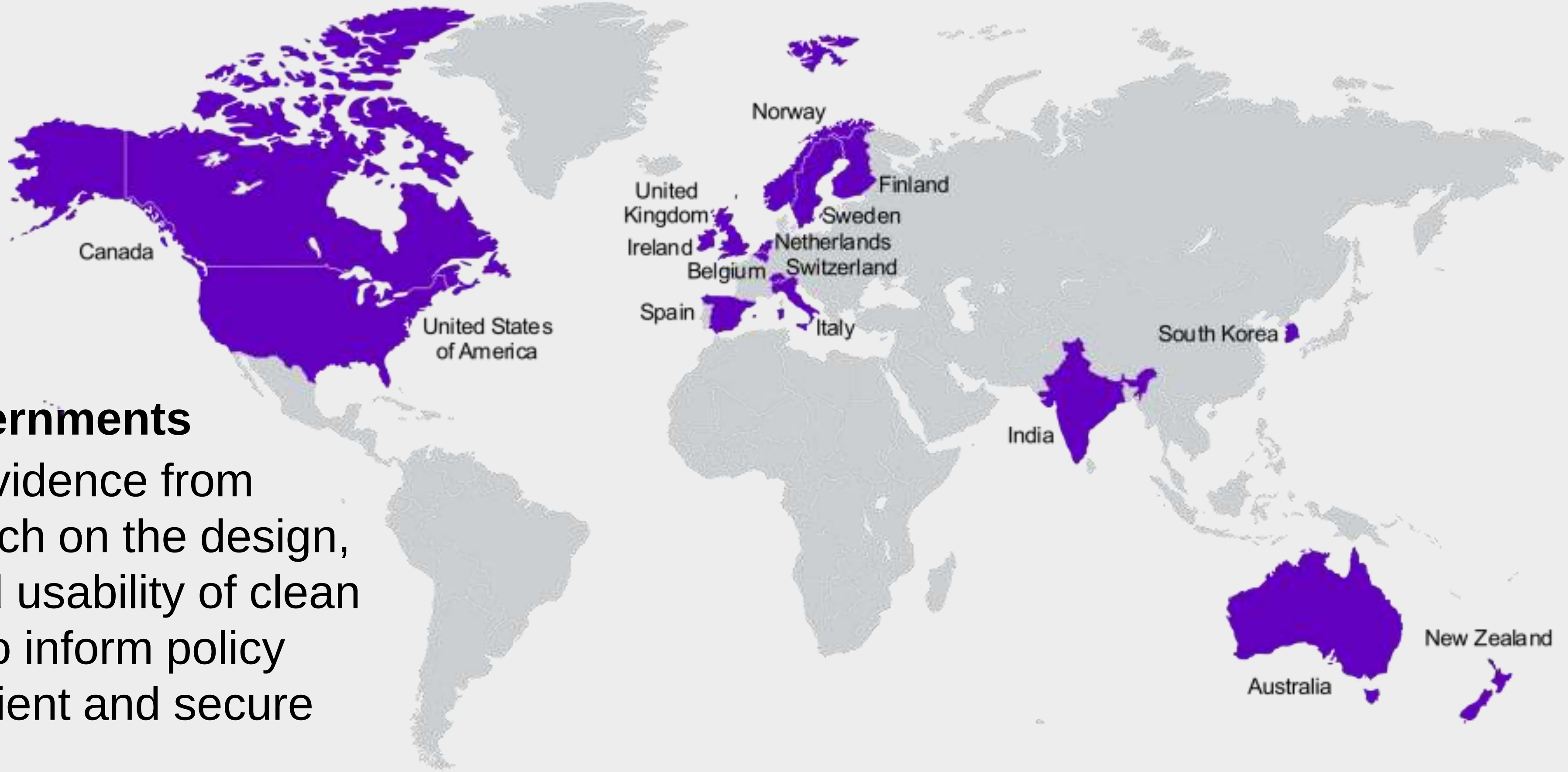
User-Centred Energy Systems

A Technology Collaboration Programme by IEA

David Shipworth - Chair

The UsersTCP is **functionally and legally autonomous** from the IEA.
Views and findings of the UsersTCP do not necessarily reflect those of the IEA.

UsersTCP



6 active Tasks

17 participating governments

Mission: to provide evidence from socio-technical research on the design, social acceptance and usability of clean energy technologies to inform policy making for clean, efficient and secure energy transitions.

Tasks

- UsersTCP | Business Models and Systems
- UsersTCP | Hard-to-Reach Energy Users
- UsersTCP | Peer-to-Peer Energy Trading
- UsersTCP | Social License to Automate
- UsersTCP | Behavioural Insights Platform
- UsersTCP | Gender and Energy

UsersTCP

Global Observatory on Peer-to-Peer, Community Self-Consumption & Transactive Energy

- Desired policy outcomes should drive system design – don't 'leave it to the market'.
- Proactive balancing is much harder than post-hoc settlement
- Multiple supplier models could help all parties
- Prosumer roles are currently legally ambiguous and risky
- Network charging models are crucial to financial viability
- Systems need to be 'cybersecure by design' and failure tolerant
- Where data is processed matters for data protection
- Regulators must support actors' changing roles and responsibilities

Social License to Automate Annex

- Transparency and benefit information is key for all types of automated DSR
- People are open to automated DSR where their values align with the aim of programme
- People are open to automated DSM where it supports (or at least does not disrupt) their current domestic routines
- The roles and responsibilities of both new and existing institutions vary from country to country depending on context

‘Plug and Play’ Smart Home Technologies

Current challenges:

- Misrepresenting SHT benefits causes distrust disengagement.
- SHTs frequently don’t accommodate user’s complex, diverse and dynamic needs.
- The onboarding experience often fails to prepare users to operate their SHTs,
- Many users feel intimidated by the complexity of the systems.
- Installation errors make using the technologies harder and the feedback less useful.
- Automation is liked – provided users remain in control.
- Poor automation undermines user trust and they intervene.

Recommendations:

- Encourage business to create usable, holistic solutions
- Develop shared infrastructures to help speed up understanding of usability issues in the energy sector
- Governments should design markets that flow the value of increased flexibility to the right place in the system, including the demand side.
- Don’t wait for usability issues to emerge, actively seek to uncover them now. The development of shared learning infrastructures can help speed this up.
- Invest in innovation to help the sector understand how to deliver positive and engaging user experiences.

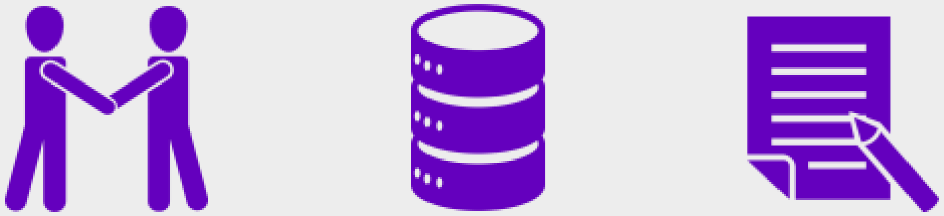
UsersTCP

Energy Sector Behavioural Insights Platform

Current programmes target:

- information simplification and framing;
- real-time feedback mechanisms;
- social norms and peer comparisons.

The Behaviour Insights Platform includes



A global network of policy makers

A database of policy case studies

Guidance for policy makers

Policy impacts likely to be improved through:

- gamification & positive competition; goal-setting & commitment devices; rewards.
- changes to product design and default options to facilitate and automatize energy efficient choices.

UsersTCP

Contact Us

For more information,
visit userstcp.org
or email TCP Secretariat
at admin@userstcp.org