1st Annual Global Platform of Leading Electricity Distribution Operators

26 January 2021, 09.00 — 12:15CET

On an initial idea of Rosseti and Enel GI&N, organised and hosted online by E.DSO, EPRI and Eurelectric

#GlobalDSO21 @GlobalDso @EDSO_eu @eurelectric @EPRINews

Opening

Roberto Zangrandi

Secretary General, E.DSO

Housekeeping Rules

Video and audio

- Video and audio are allowed only for Speakers or Panelists.
- Speakers will be asked to switch audio OFF when not talking.

Participants Questions

- Participants can place their questions directly through the platform or the chat feature at the bottom right. Please direct your question or answer to "Everyone".
- Indicate your name and company/institution when posting your question.
- The Moderator will select a couple of questions and ask the relevant speakers or panelists to comment.
- Raise the hand feature will not be used.

Welcome and Keynote Speech
The value of shared creation of knowledge to tackle the present and envision the evolution of the distribution value chain

João Torres

CEO, EDP Distribuição;

Vice-Chair, E.DSO

Keynote Speech
Vision on Energy Transition as booster for Sustainable Development

Antonio Cammisecra

Head, Global Infrastructure & Networks,
Enel

Keynote Speech
The need for a global reflection on distribution system issues, risks, priorities and energy transition requisites

Andrey Mayorov

First Deputy Director General and Chief Engineer, Rosseti, PJSC

Monitoring the Change — a global platform to track the transition

Roberto Zangrandi, Secretary General, E.DSO

Mark McGranaghan, Vice-President Innovation, EPRI

Kristian Ruby, Secretary General, Eurelectric

E.DSO-Eurelectric study on investment needs in distribution grids

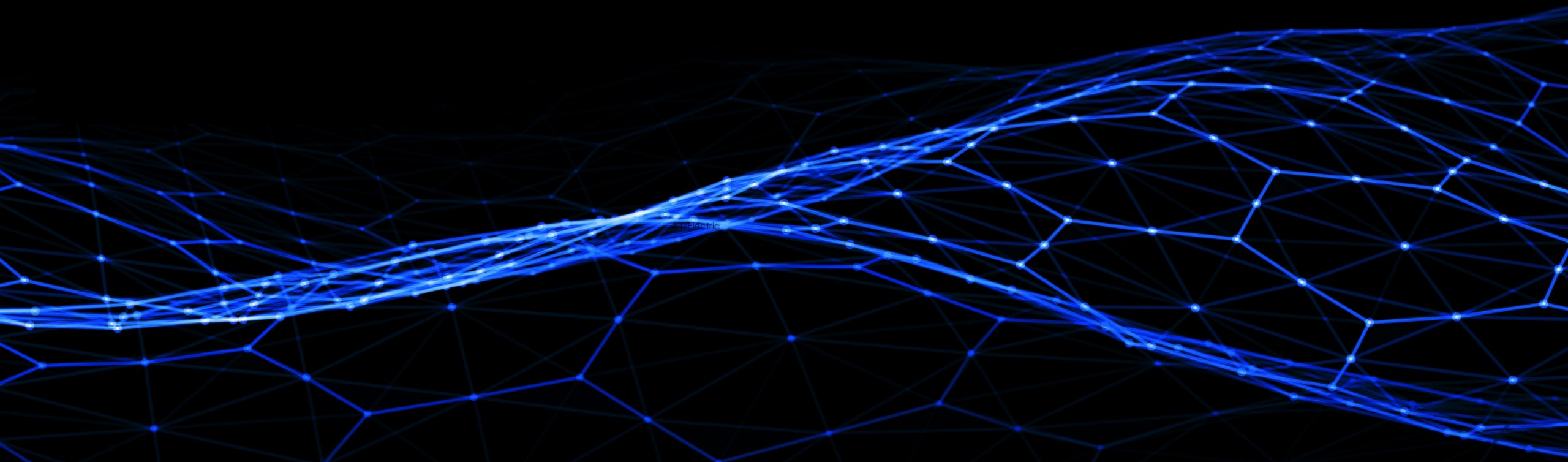
Knud Pedersen

Chair, Radius

Chair, Eurelectric Distribution & Market Facilitation Committee

Connecting the dots

Distribution grid investment to power the energy transition



Jointly undertaken with

E.DSO

#ItsElectric #PowerGrids #Investments

A €400 billion investment challenge

5. Investments rely heavily on enabling regulatory requirements frameworks

4. This investment increase should not translate into a major additional cost to the KWh

3. Societal benefits with regards to sustainability, competitiveness and the economy significantly outweigh the economic impact on distribution tariffs

2. This is a considerable investment, **50-70%** higher than today

1. DSO investment needs: **€375-425bn**

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Massive energy system changes needed by 2030

Electrification

+40-50m heat pumps

50-70m electric vehicles

+335 TWh (add. demand) industrial and P2X

Emission- free generation

+470 GW centralised renewables

+40 GW self-consumption

~70%

renewable capacity connected to distribution grids

Energy efficiency & conservation

>50% EV charging in off-peak hours

Foster the roll-out of smart meters

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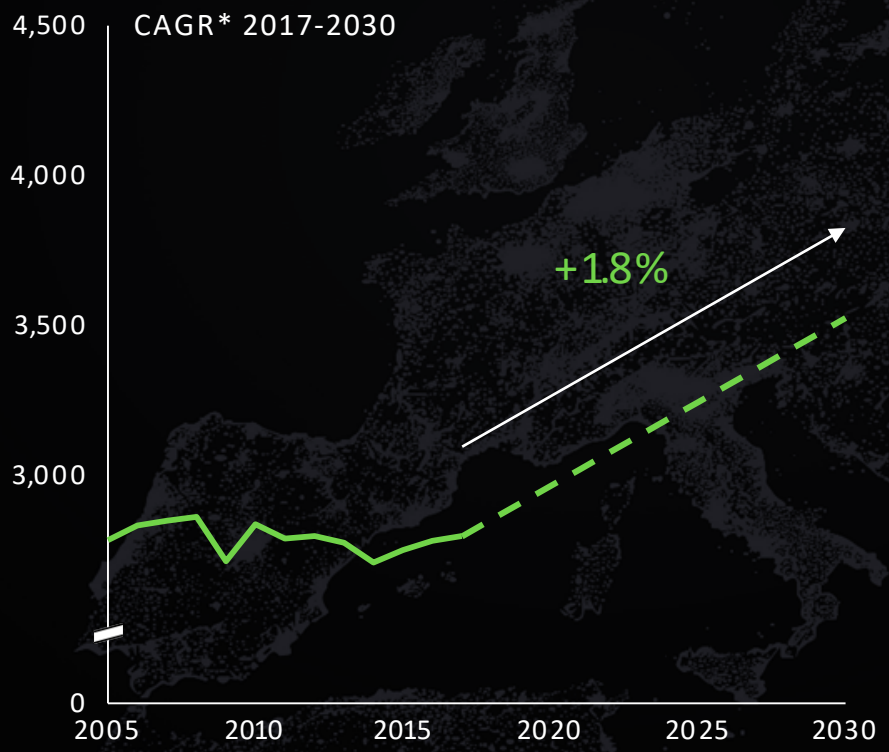
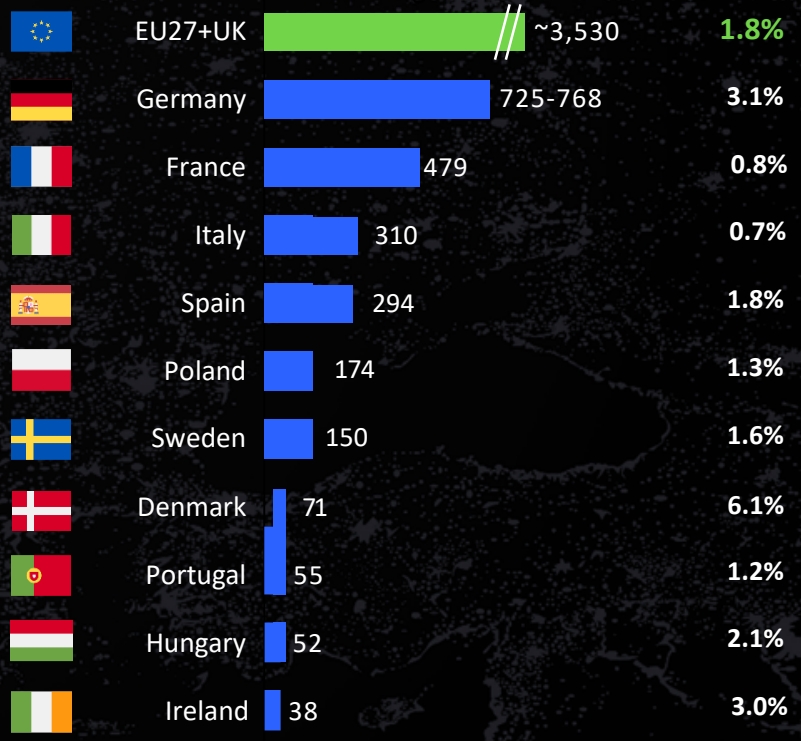
Total electricity demand will rise by +1.8% per year by 2030

DSO grids will need reinforcements and additional transformation capacity in substations to effectively accommodate for the anticipated rise in demand and ensure quality of supply

Final electricity demand (TWh; 2005-2030)



Final electricity demand per country (TWh; 2030)



Source: Eurelectric; DSOs and associations; iea; Monitor Deloitte

*Compound annual growth rate

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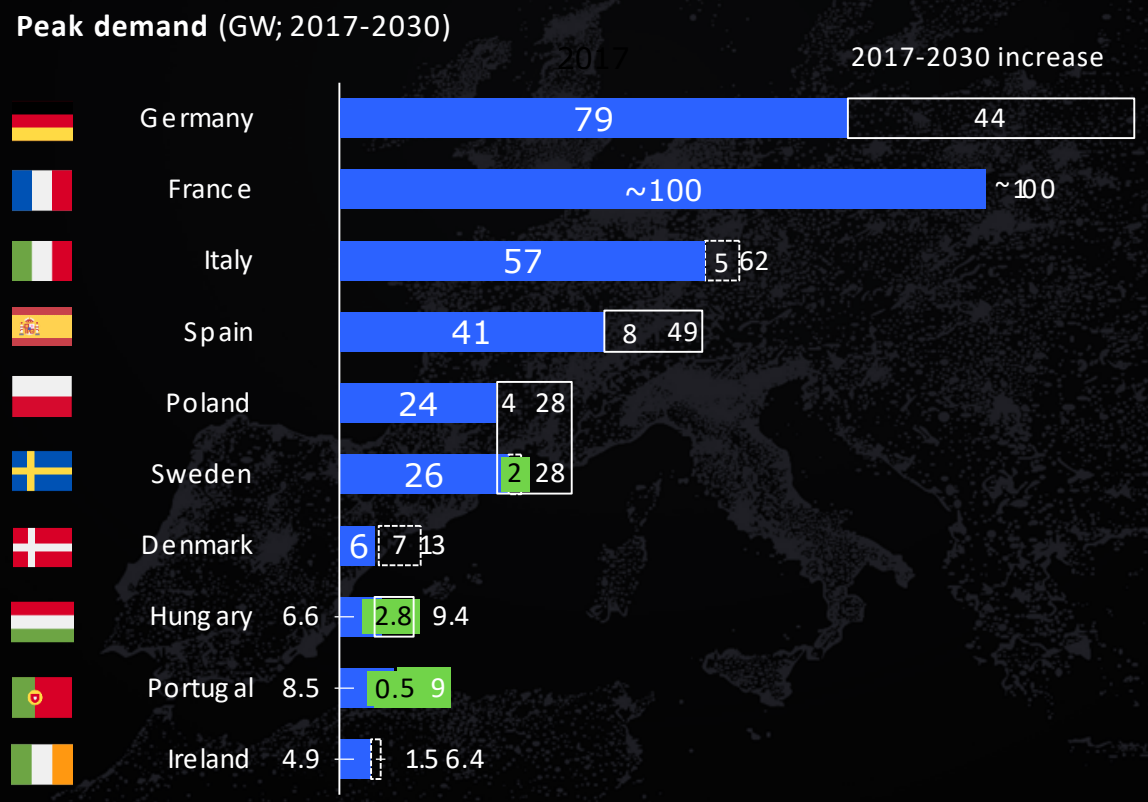
Peak demand will grow at different pace

Countries should deploy flexibility through load, generation, or storage related measures depending on technical (e.g. ramp response), economical, and regulatory conditions (e.g. saving potential, conducive framework)



	Peak demand (CAGR; 2017-2030)	Electricity demand (CAGR; 2017-2030)
Germany	3.5%	3.2%
France	~0%	0.8%
Italy	0.6%	0.7%
Spain	1.4%	1.8%
Poland	1.2%	1.3%
Sweden	0.6%	1.6%
Denmark	5.8%	6.1%
Hungary	2.7%	2.1%
Portugal	0.4%	1.2%
Ireland	1.9%	3.0%

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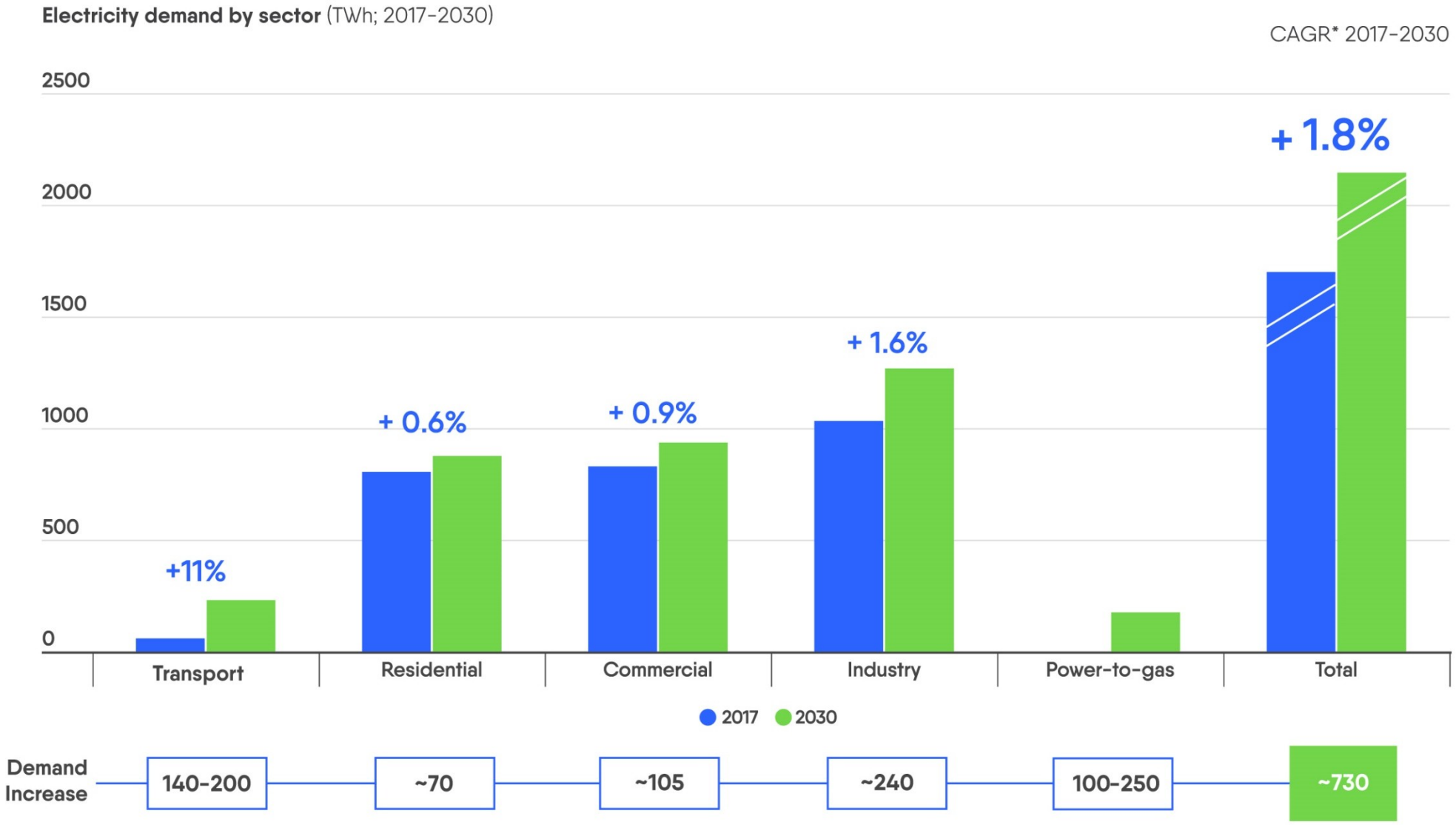
All sectors will contribute to electricity demand growth



Source: Eurelectric; DSOs and associations; iea; Monitor Deloitte

*Compound annual growth rate

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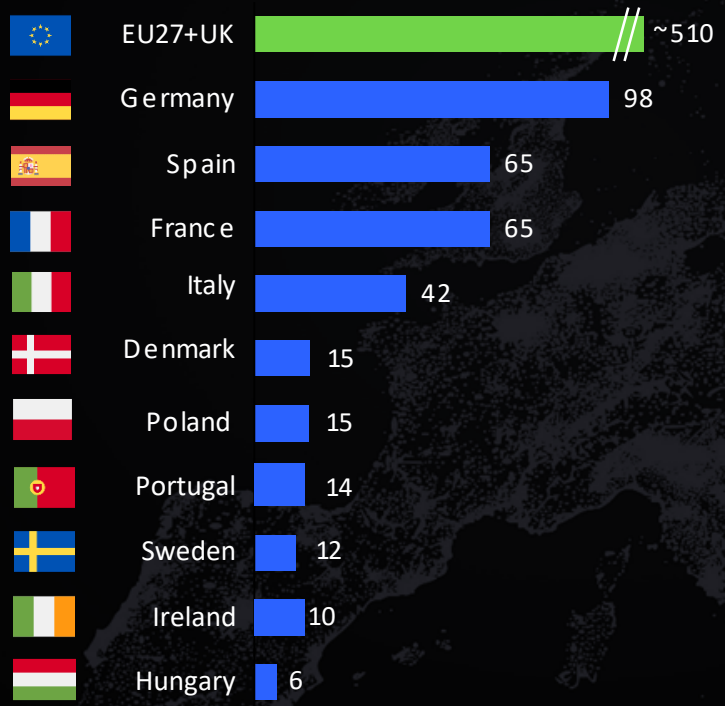
70% of new 510 GW RES capacity will be connected at distribution level

RES capacity additions (GW; 2017-2030)



New RES connected to DSO grids (%; 2017-2030)	Self-consumption capacity additions (GW; 2030)	Cumulative RES capacity (GW; 2030)
~70%	**~40**	**~940**
~93%	**9.0**	**179**
~25%	**2.3**	**119**
~85%	**~1**	**111**
~83%	**~0**	**95**
~37%	**0.2**	**22**
~67%	**6.6**	**24**
~56%	**1.9**	**27**
~30%	**n.a.**	**38**
~43%	**0.2**	**13**
~90%	**n.a.**	**7**

Source: Eurelectric; DSOs and associations; Monitor Deloitte

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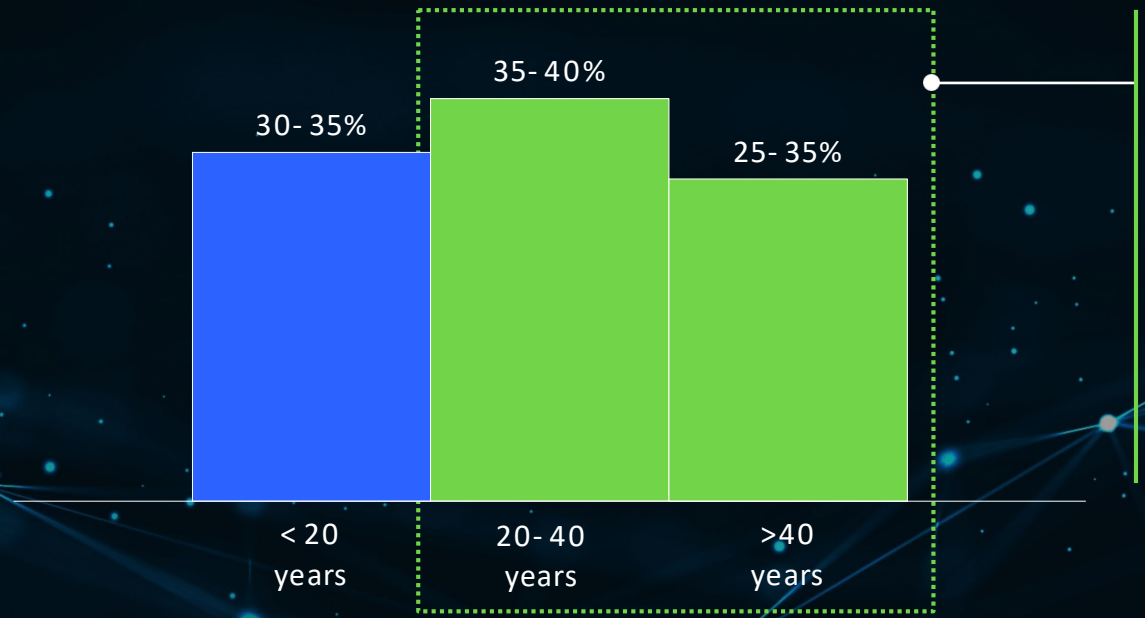
Distribution grids are ageing

Average age of low-voltage lines in 2020 (in %)



- **Investment needs due to modernisation by 2030 may grow**
- If assets are not replaced after their useful life, **40-55% of our low-voltage lines could be >40 years old by 2030**
- Modernisation needs vary depending on expansion timings at national level

The replacement equipment must be planned to ensure compatibility with new digital assets and avoid obsolescence

Source: Eurelectric; DSOs and associations; Monitor Deloitte

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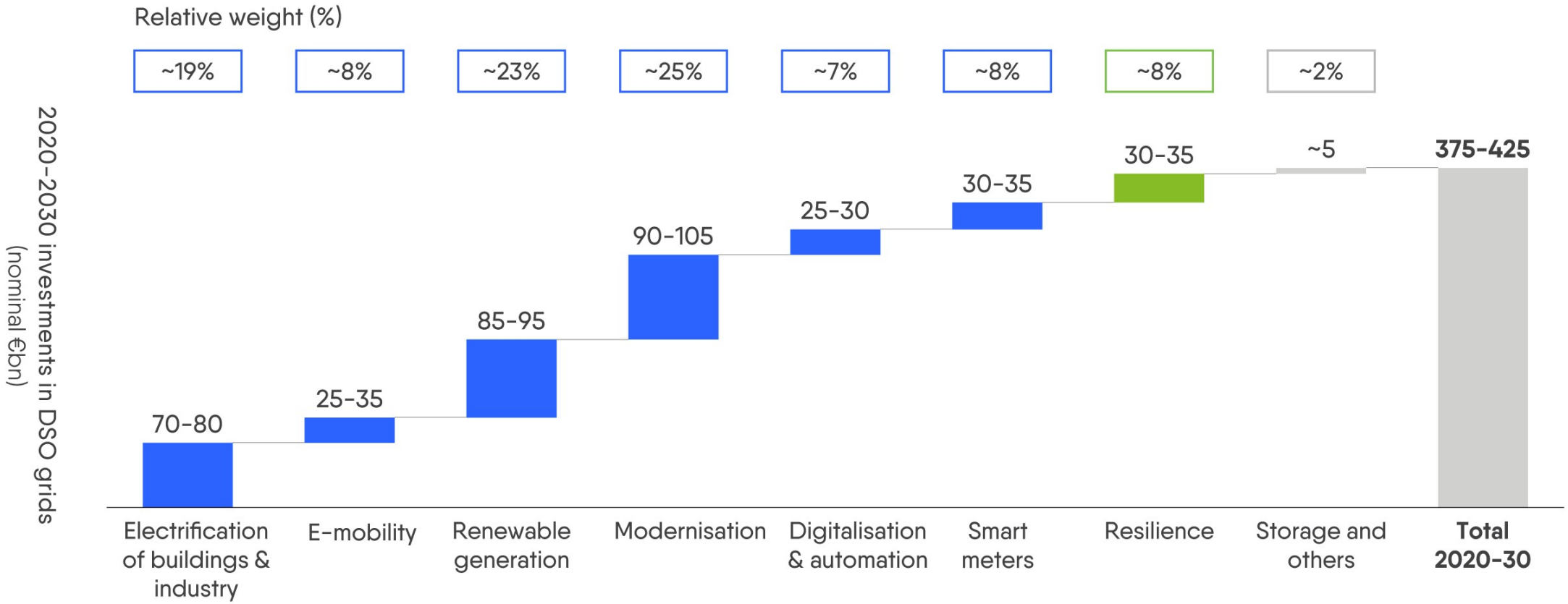
Key investment drivers: modernisation, renewables and electrification



Source: DSOs and national associations; Monitor Deloitte

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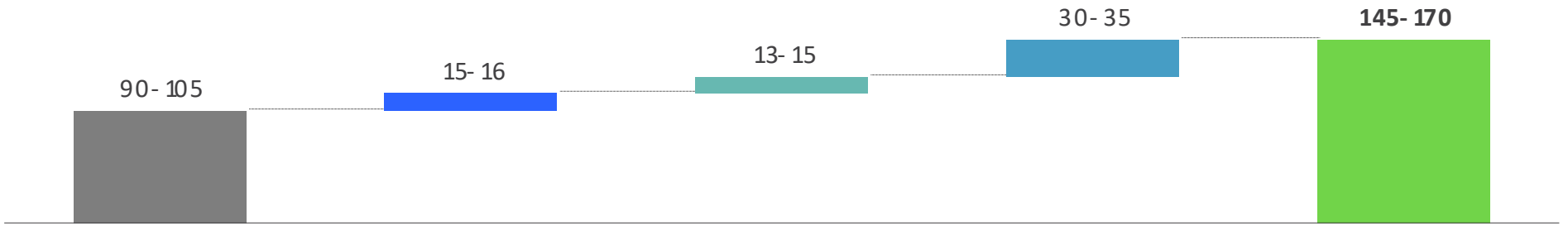
Modernisation is the first area of investment in most of countries

(nominal €bn; 2020-30)



Replacement and modernisation of grid assets (e.g. lines, transformation centers), to maintain high levels of robustness

Automation of substations at distribution level, including remote control of substations

Grid monitoring to improve efficiency and security of supply

Data management (storage, processing, cybersecurity, etc.)

Smart meters (1st and 2nd generation) to enable customers' monitoring and increase observability of LV grid

Modernising and replacing aging assets, especially in low voltage, has no downside

Investments in digitalisation will help integrate a high volume of DER resources, and enable customer participation

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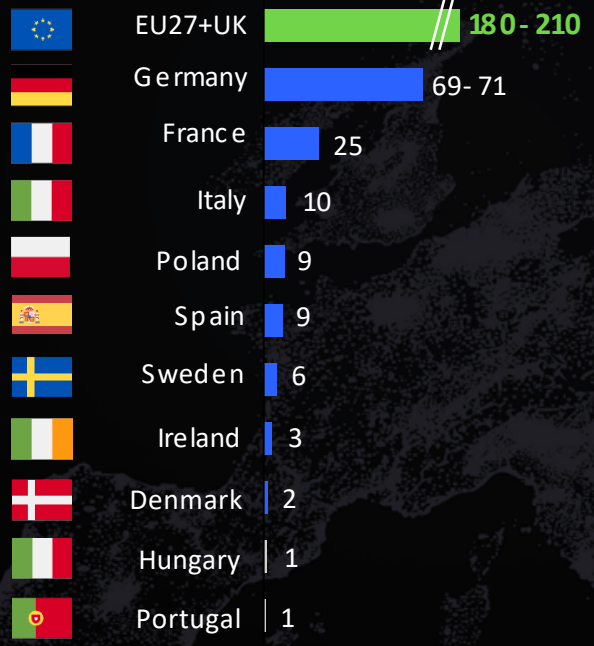
Electrification and decarbonisation will trigger new grid build out

Investments in distribution grids due to electrification and renewables by country (nominal €bn; 2020-30)



	Final electricity demand (CAGR; 2017-2030)	**Electric Vehicles** (BEV and PHEV) (million; 2030)	**RES connected to distribution grid** (GW; 2017-2030)
EU27+UK	1.8%	50-70	+360
Germany	3.2%	10-24.3	+91
France	0.8%	6.0	+55
Italy	0.7%	6.0	+35
Poland	1.3%	1.5	+10
Spain	1.8%	4.0	+16
Sweden	1.6%	1.0	+3
Ireland	3.0%	0.9	+4
Denmark	6.1%	1.5	+6
Hungary	2.1%	0.2	+6
Portugal	1.2%	0.6	+8

Examples

1. Electrification in commercial and residential sectors (+400 000 new customers /year in France), is mainly driven by heat pumps (ex: 600 000 domestic heat pumps in Ireland) and renovations

2. Renewable capacity willincrease by x6 in Hungary by 2030; strong development needs for rural grids in Germany to integrate renewable generation

3. The grid has the capacity to integrate the majority of the charging needs by 2030 coming from strong penetration of electric vehicles

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Grid investments have major societal benefits

SUSTAINABILITY

€17-22bn annual CO_2 savings

€40-140bn annual savings in health

58,000 premature deaths avoided

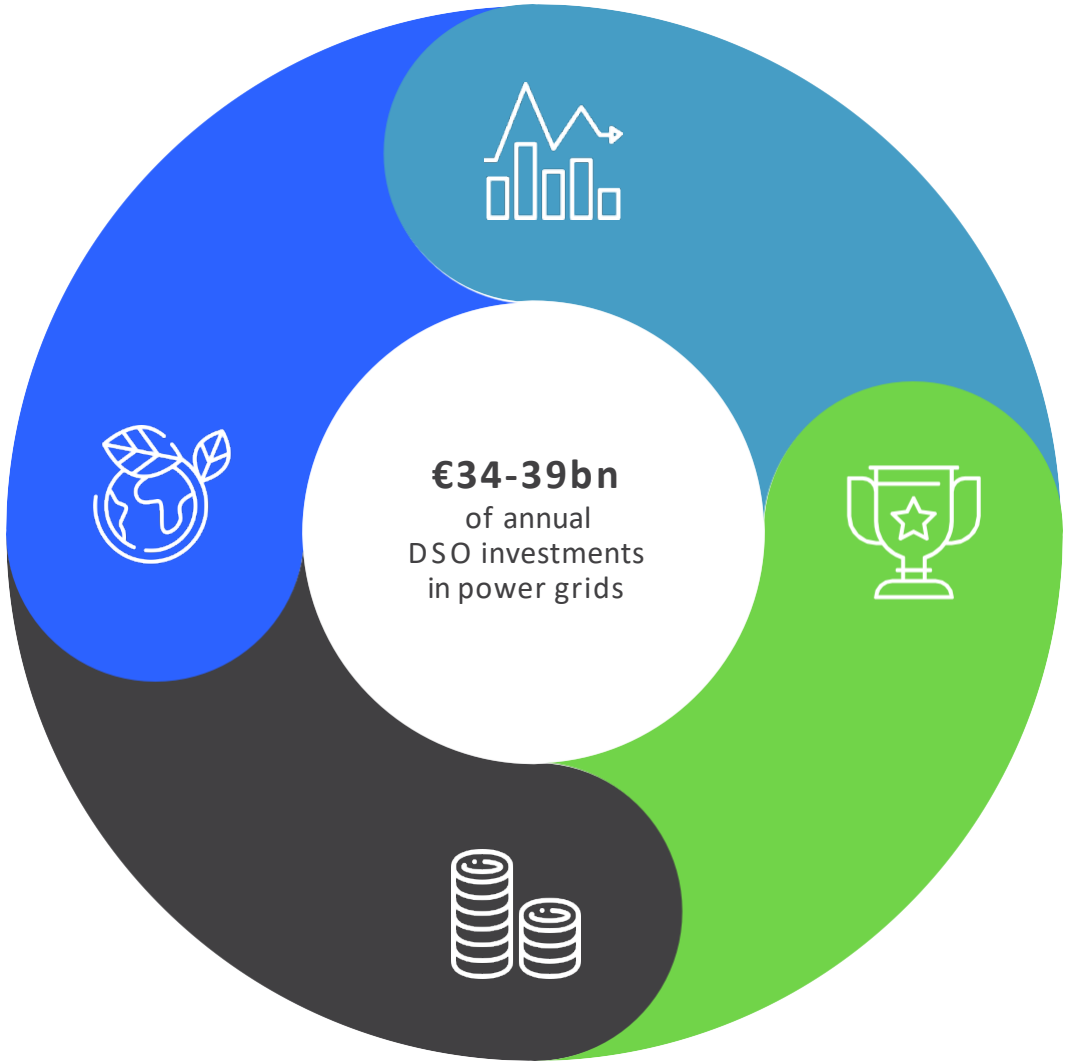
460 Mtoe less of final energy consumption by 2030, achieving 32.5% of efficiency target

COMPETITIVENESS

Territorial cohesion and promotion of local economies

€28-37bn average electricity cost reduction (thanks to 50-65% lower RES than fossil generation cost)

+€175bn annual savings in fuel imports



~0.2-0.3% of current EU GDP in annual investments in power distribution grids

ECONOMY

€ 30-35 bn of annual revenues for EU companies (e.g. manufacturers & service providers)

440-620k quality jobs per year related to DSO grids

€30-35bn annual sales in equipment (~90% of total investment)

CUSTOMER EMPOWERMENT

~40 GW self-consumption capacity added

50-70m EVs with smart charging

New services: storage, electric heating, smart appliances, aggregators

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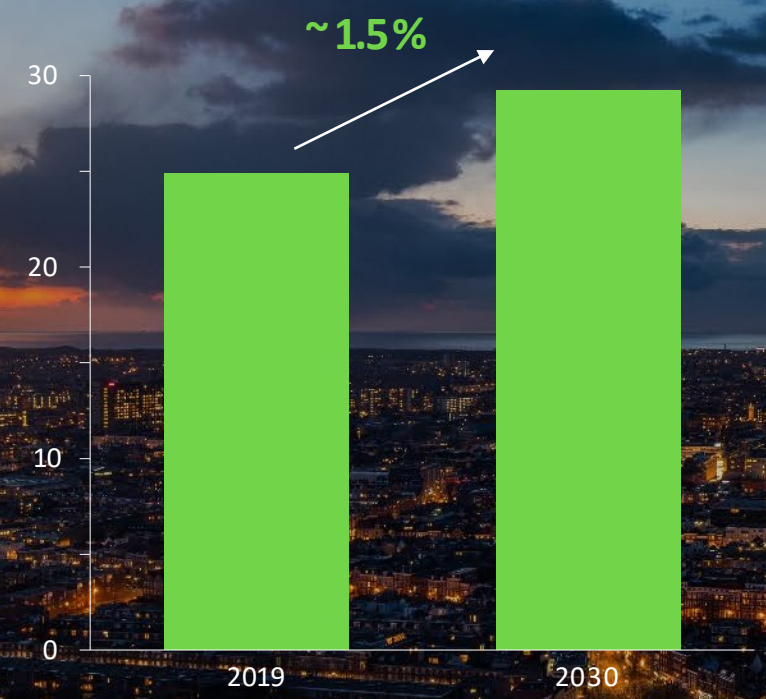
Investments will marginally impact electricity costs

Impact of DSO investment on electricity cost per electricity unit (€nominal/MWh; EU27+UK)



This investment will ultimately help lower the total energy bill

- DSO investment will result in an increased cost of electricity **(CAGR~1.5%), but EU inflation rates will also be rising by 2%**
- **Investment in distribution grids has no downside, bringing long and short term benefits:**
  - **Long term reductions of incremental investment needs and tariff impact**, especially with the efficiency of grid modernisation and digitalisation,
  - **Enable RES deployment and electrification that will ultimately reduce the total energy bill**
  - **Enable flexibility measures that increase cost-effectiveness** and **may** also help reduce tariff impact

Source: Eurelectric; DSOs and associations; Monitor Deloitte

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Regulatory actions to boost investments

EU level | National level

Challenges	Policy issues		Regulatory actions	Policy level
Plan & execute investments	Planning	Low long-term visibility and lack of planning	Facilitate flexible national planning frameworks aligned with the energy transition and remove regulated investment limits	National
	Funding	Barriers for DSOs to apply for EU funds	Facilitate access of DSOs to EU funds and prioritise investments in DSO grids in EU post-COVID recovery plans	EU + National
	Execution	Bureaucratic delays in permits & environmental authorisations	Simplify and accelerate authorisation and permit processes, facilitating proper involvement of local communities	National
Improve security of supply & automation	DSO role	Little clarity on principles of enhanced role of DSOs	Facilitate a EU general framework for cybersecurity and data management. Speed-up CEP implementation, including DSO/TSO roles and responsibilities	EU + National
	Remune-ration	Historic costs and low exposure to disruptions are intrinsic features of current remuneration models	Enable cost-reflective remuneration and incentive models to enable grid transformation and the energy transition	EU + National
Enable the energy transition	Flexibility	Lack of comprehensive regulation on flexibility	Develop roles, smart infrastructure, economic signals and information exchange procedures	EU + National
	Tariffs	Electricity tariffs should be more cost-reflective	Enable tariff structures that optimise long-term power investments and facilitate economic sustainability	National

Source: Eurelectric; DSOs and national associations; Monitor Deloitte

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Monitoring the Change — a global platform to track the transition

Moderators:

Roberto Zangrandi, Secretary General, E.DSO

Kristian Ruby, Secretary General, Eurelectric

Panel Discussion
DSOs boosting the global Energy Transition

Panelists:

Konstantin Mikhaylik, Deputy Director General for Digital Transformation, Rosseti, PJSC

João Torres, CEO, EDP Distribuição; Vice-Chair, E.DSO

Johan Mörnstam, Senior Vice President of Energy Networks Europe, E.ON; E.DSO

Hervé Champenois, Member of the Management Board, Enedis

Sanjay Banga, President for Transmission and Distribution, Tata Power

Zhang Quan, Chief Engineer of State Grid Energy Research Institute (SGERI)

Panel Discussion
DSOs boosting the global Energy Transition

Konstantin Mikhaylik
Deputy Director General for Digital Transformation, Rosseti, PJSC

"Digitalisation"

4 TRENDS OF DIGITAL TRANSFORMATION OF ROSSETI GROUP OF COMPANIES

Digital transformation of Rosseti group of companies includes modification of the logics of technological and business processes and adoption of risk-oriented company management based on digital technologies

1. Digital objects are automated objects equipped with digital systems interacting in real time and functioning without permanent presence of duty personnel

- **Digital substations[1]** — IoT, Robo
- **Digital distribution zones[2]** — Big Data, IoT, Robo
- **Electrical charging stations** — IoT

2. Power grid facilities digital management systems

- **Grid management center[3]** — Big Data
- **Geoinformational system** — AI, ML, Robo
- **CIM[5] model** — ML
- **Production assets management system** — AI, ML, Big Data
- **Automated process control system** — AI, ML, Big Data

3. Digital communications: systems ensuring communication with clients and other participants (namely, with federal executive authorities)

- **Portal of electrical grid services** — AI, ML, Big Data
- **Client's mobile application** — AI, ML, Big Data
- **Light Country portal[4]** — AI, Big Data
- **Intellectual accounting system** — Big Data, IoT
- **Calculation system** — Block-chain

4. Digital employee: communication, training and employee management systems

- **Digital Electrician (patrol lineman)** — IoT, Big Data
- **Digital Employee** — AI, Big Data
- **Training platform** — AI, VR/AR

VR/AR - Technologies of virtual and augmented reality

Robo - Robotic science, unmanned aviation

AI/ML - Artificial intellect / machine learning

Big Data - Big data

IoT - Internet of things

Blockchain - Distributed registers

LoRaWAN - Wireless communication technology

[1] Digital substation (DSS) is a highly automated substation functioning without personnel and equipped with digital systems interacting in real time
[2] Digital distribution zone is a zone of distribution grids with an integrated monitoring, control and management system based on real-time data collection and processing
[3] Network control center (NCE) is a center providing operating, technological and situational control
[4] Light Country portal is a project for feedback with consumers. The primary goal of the Portal is to provide people with an ability to communicate with the power provider online
[5] CIM (Common Information Model) is a method (language) to describe elements of power supply network facilities in a format understood by human and machine

DIGITAL TRANSFORMATION PROJECTS IMPLEMENTED IN 2017-2020

38 Digital distribution zones,
incl. **Mamonovskiy DDZ in the Kaliningrad region, Valdayskiy DDZ in the Novgorod region**

84 Digital substations,
incl. Tobol 500 kV, Vasileostrovskaya 330 kV, **Port 220 kV, Molodezhnaya 110 kV, Potok 35 kV, etc.**

263 Electrical charging stations for vehicles
Installed electrical charging stations

20 Digital network control centers
including **Izhevsk and Voronezh**

13 Pilot projects
Realized digital transformation pilot projects

>2 000 000
intellectual metering instruments

CIM-model[1]
35kV+ model implemented

ADMS (SCADA)[2]
Project launched to develop national distribution network management system3

>30
Approved digital transformation standards
Development of 11 charters on standard «Digital distribution grid»

Digital electrician
Pilot functions of the system implemented
Digital Electrician **in two affiliates – Rosseti Moscow Region and Rosseti North-West**

Services for clients
Mobile application for clients launched, **utility connection portal**

1. CIM (Common Information Model) is a method (language) to describe elements of power supply network facilities in a format understood by human and machine
2. ADMS (Advanced Distribution Management System) is a system for operating technological control of distribution networks
   SCADA (Supervisory Control And Data Acquisition) is a software package intended to develop or support real-time operation of the monitored or controlled facility data collection, processing, display and archiving system
3. 2022 – start of full-scale operation of functionality with further entry to international markets

Panel Discussion
DSOs boosting the global Energy Transition

João Torres

CEO, EDP Distribuição; Vice-Chair, E.DSO

"Reskilling and New required competencies"

Panel Discussion
DSOs boosting the global Energy Transition

Johan Mörnstam

Senior Vice President of Energy Networks Europe, E.ON; E.DSO Member

"Flexibility and RES integration"

E.ON: Regional value creation as part of a sustainable recovery effort from the Corona crisis

What we do

- E.ON group present in 15 countries, 50 million customers, 70,000 employees, focus on grids and customer solutions.
- We provide the infrastructure for the new energy world. We manage our electricity and gas grids in a smart way, to promote the integration of renewable capacity.
- Energy Networks: € 3.7bn/a regular investment. Employment for 39.400 people.

Local

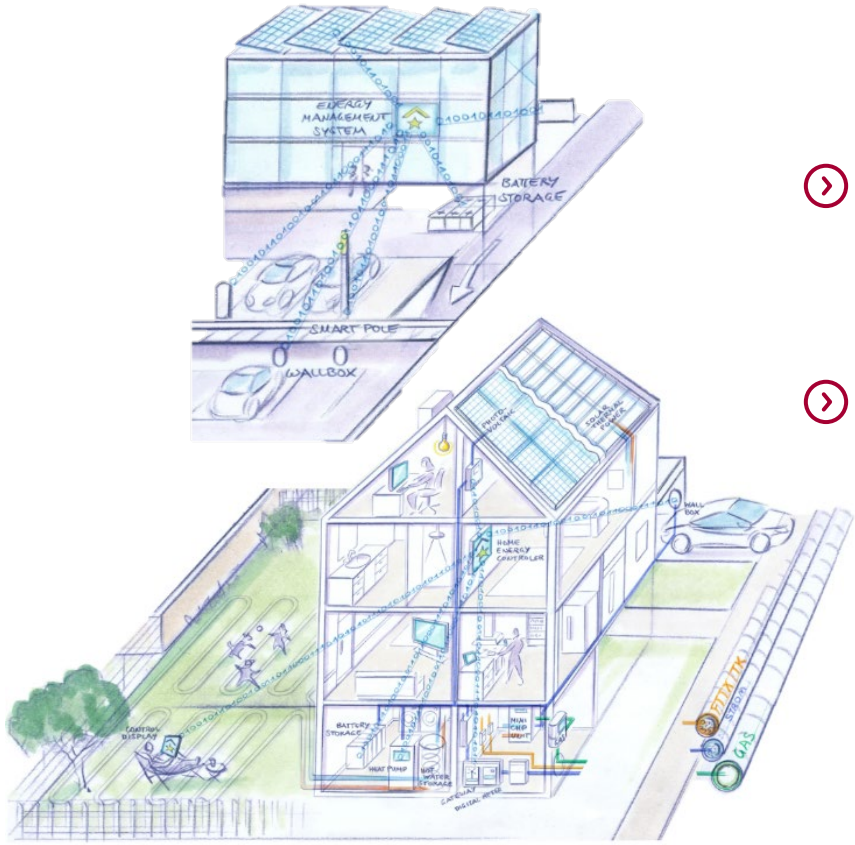
Sustainable

Recovery

Connected EU customers in million									
	CZ	DE	HR	HU	PL	RO	SE	SK	total
Electricity	1.5	14.7	n/a	6.4	1.0	1.5	1.0	1.8	28.0
Gas	0.1	1.8	0.1	0.6	n/a	1.8	n/a	n/a	4.4

Future challenges for distribution systems be addressed by smart grids providing better observability and controllability

- Integration of **decentralized volatile generation** in **rural grids**.
- Higher coincidence factor through **active prosumers**.
- New **additional loads**, e.g. electric mobility.
- Electric mobility will be the determining factor for the grids in **urban areas**.
- **Controlled charging** will enable an optimal instead of a maximal grid dimension.



- The **observability** of distribution systems must be improved significantly.
- Generation and load will be **actively controlled** on all voltage levels.
- **Digitalisation** enables active system management through intelligent automated mechanisms.

Panel Discussion
DSOs boosting the global Energy Transition

Hervé Champenois

Member of the Management Board, Enedis

"Resilience"

Panel Discussion
DSOs boosting the global Energy Transition

Sanjay Banga

President for Transmission and Distribution, Tata Power

"Digitalization and integration of smart energy sector"

Panel Discussion
DSOs boosting the global Energy Transition

Zhang Quan

Chief Engineer of State Grid Energy Research Institute (SGERI)

"Internet of Energy and Energy transition"

1.Practice of Serving Energy Transition

- Serving scale-up grid connection of renewable energy
- Deepening alternative electrification（replacing coal and oil by electricity）
- Extensive demand response

2. Practice of Building Internet of Energy

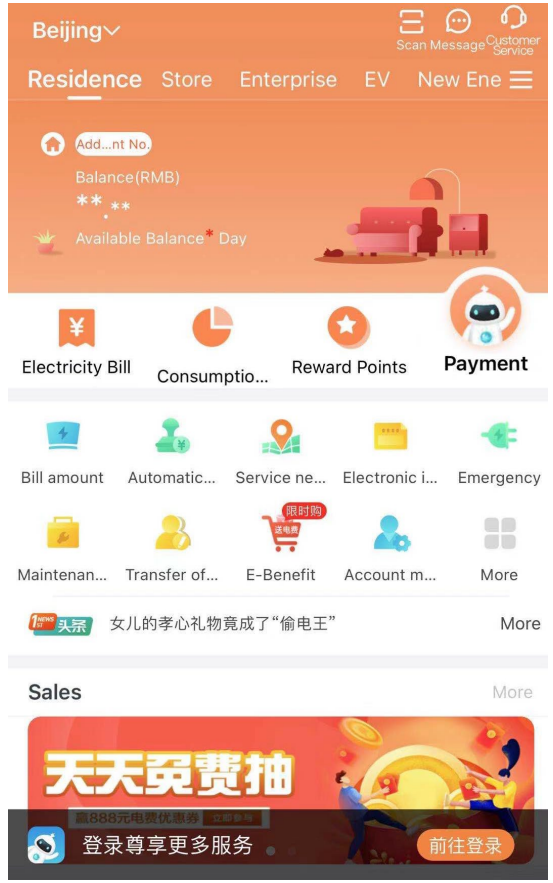
- State Grid New Energy Cloud Platform----design operation and maintenance, equipment, manufacturing, power generation enterprises access in the same platform.
- State Grid Smart Internet of Vehicles Platform----electric vehicle charging pile connection.

2. Practice of Building Internet of Energy

- Demonstrative application of Internet of Energy – Comprehensive Demonstrative Project of Tongli New Energy Town

3. Application of Digital Customer Services

- Launch of “Online State Grid “ mobile phone App
- Diversifying the non-metering functions of intelligent ammeters----precise portrait of user behaviors and combined energy use data analysis etc.



Q&A and Polls

Concluding Remarks

Brian Motherway

Head of the Energy Efficiency Division,
International Energy Agency

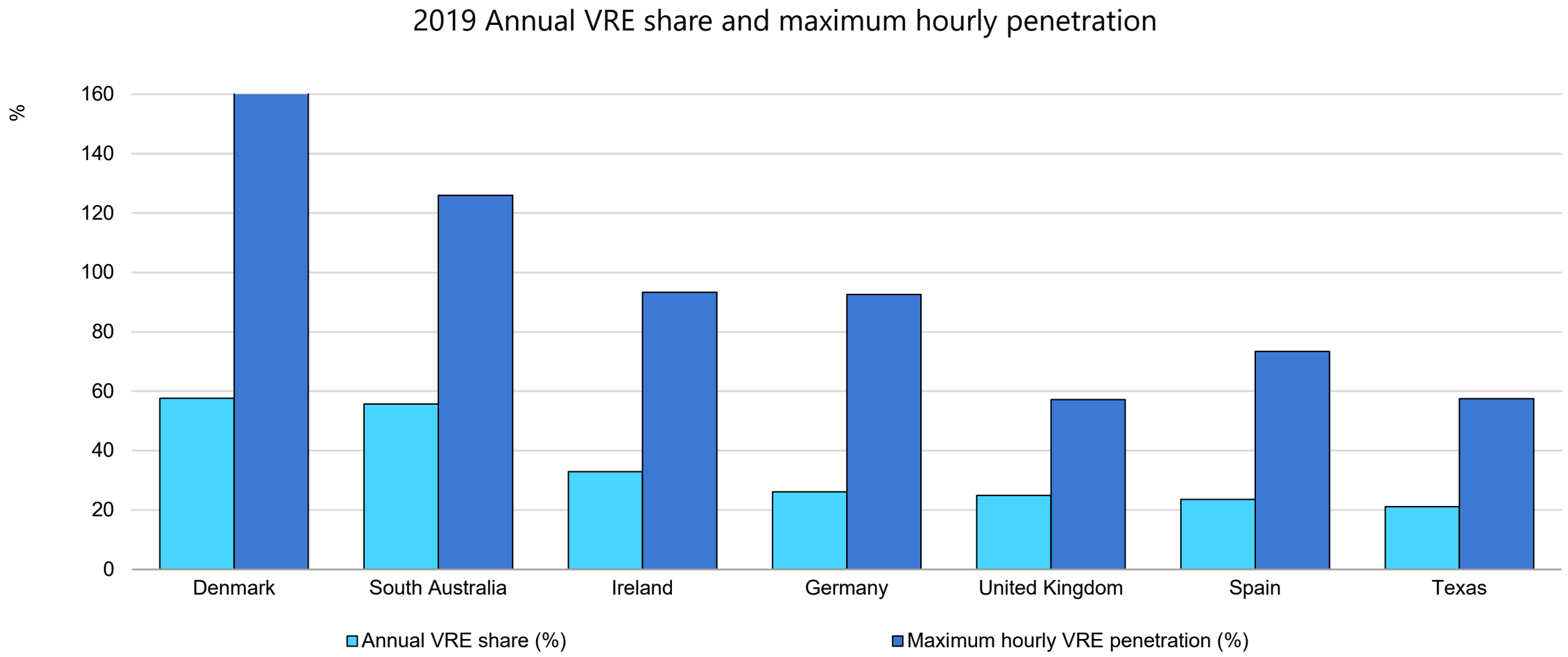
International Energy Agency

Accelerating clean energy transitions

The role of digitalisation in accelerating power system decarbonisation

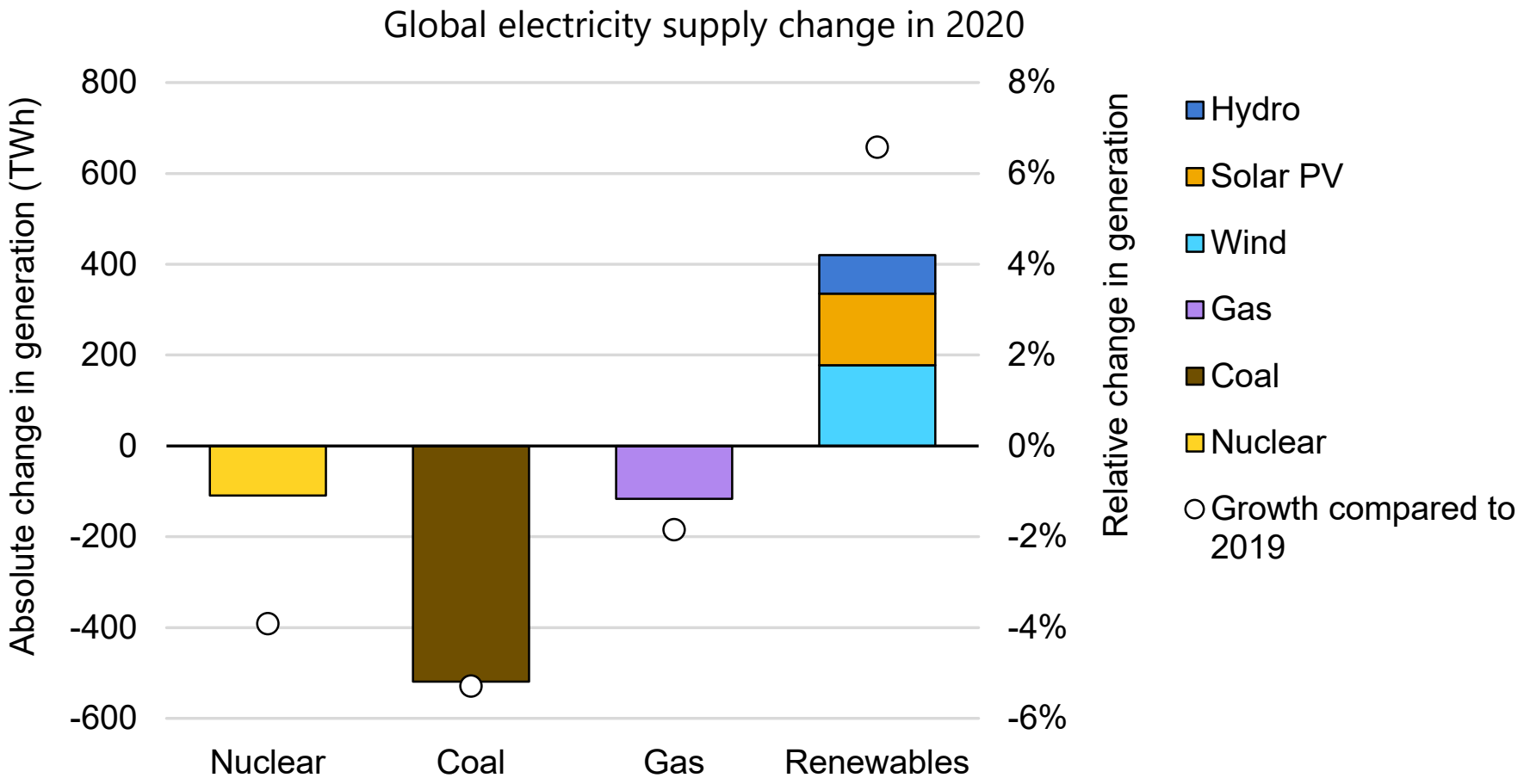
Dr Brian Motherway, Head of the Energy Efficiency Division

Locally, high annual and instantaneous shares of VRE are becoming the norm



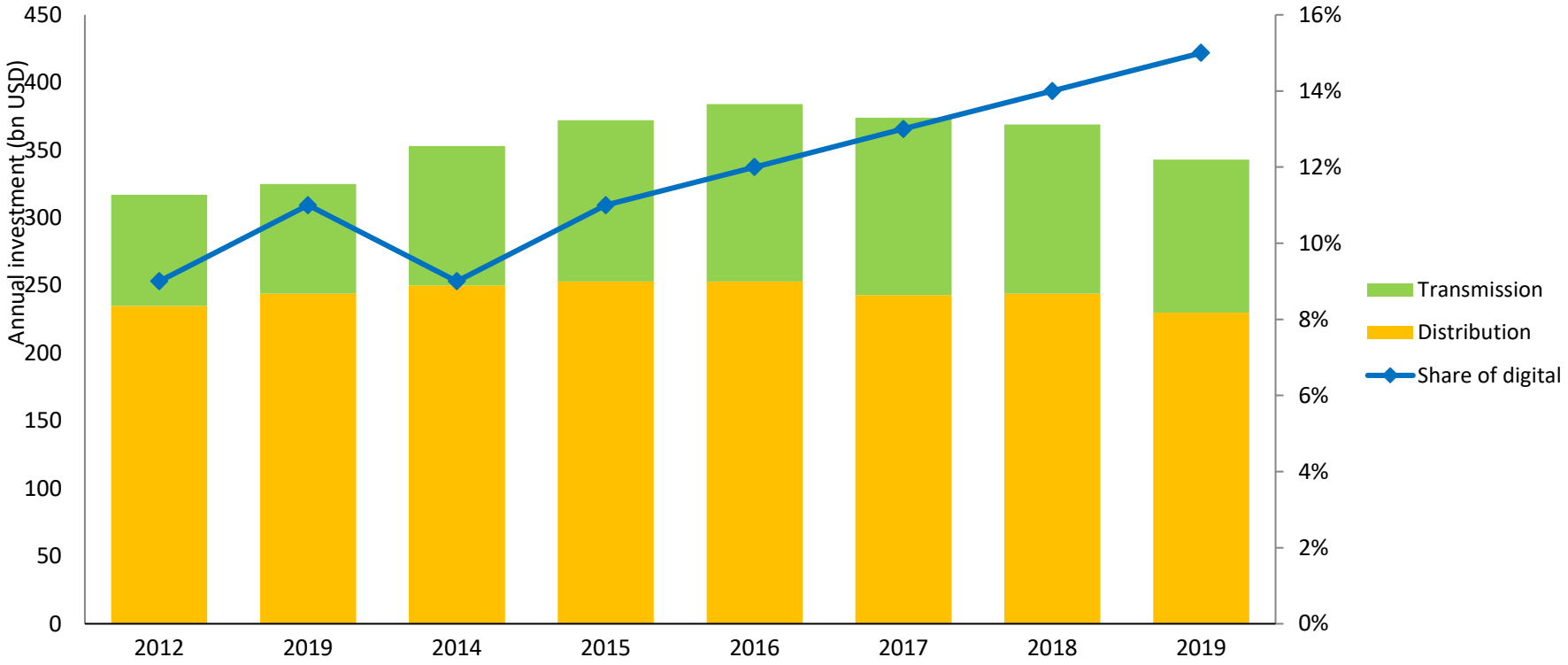
As countries and regions are attaining higher shares of VRE generation, they are also experiencing much higher instantaneous VRE infeed levels in certain periods of the year

2020 has been a test-bed for coping with rapid changes in power systems



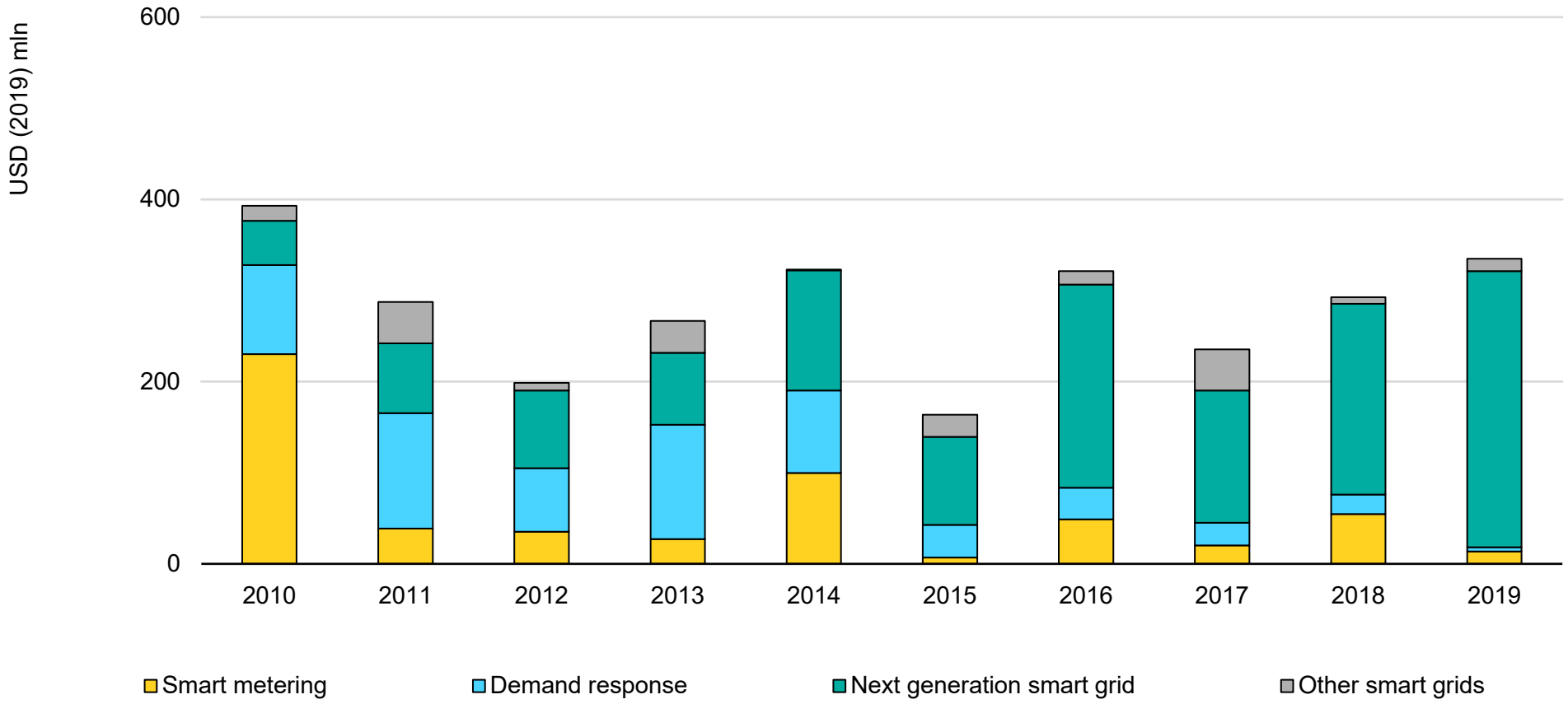
The drop in demand and the increase in VRE revealed the urgent need to transform supply and demand and invest in a diverse flexibility portfolio

Investment in grids is faltering when it needs to pick up



Spending in grids has been lagging – investment in distribution is lowest since 2011. However, digital technologies are a silver lining

Traditional grid investment giving way to new digital techs



Private-sector innovation is shifting towards new forms of distributed flexibility, increasingly based on AI, machine learning and advanced digital technology

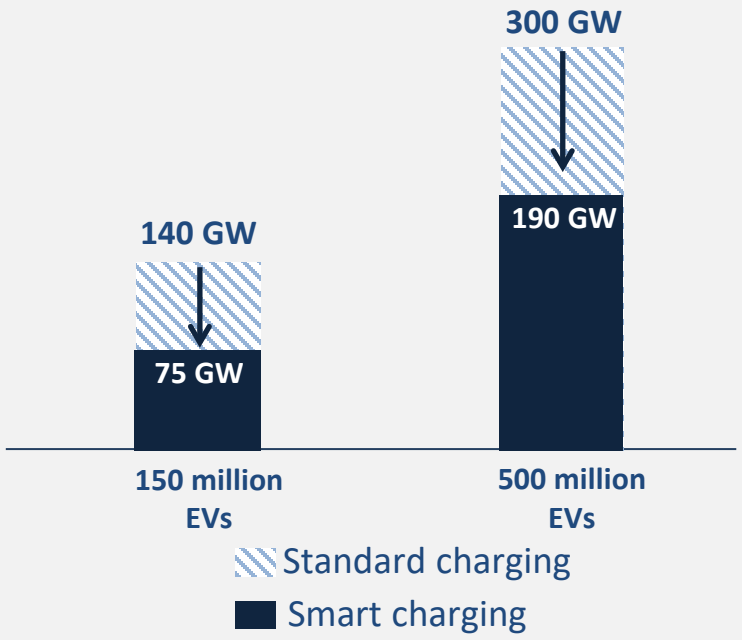
The distribution grid is set to be the hub of new forms of flexibility

Deep demand response

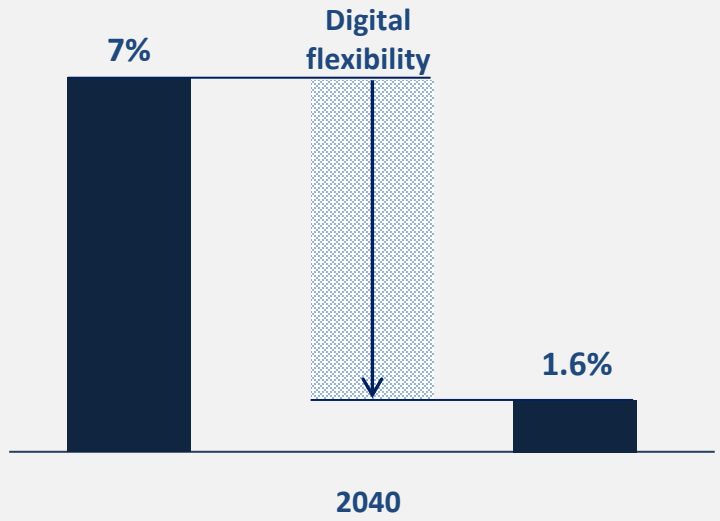
1 billion households and
11 billion smart appliances
could actively participate in interconnected electricity systems

EVs standard *vs* smart charging

Capacity requirement



Grid integration of renewables



Digitalisation has a huge potential to support integration of VRE variable and demand-side flexibility from across sectors – but all of these modalities require digital, user-centric distribution networks

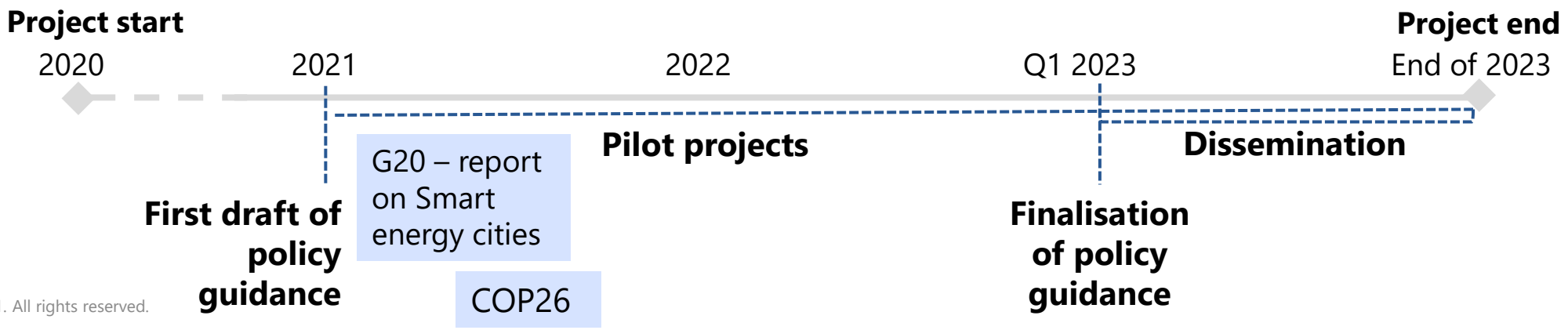
Accelerating the clean energy transition and charting the way to net-zero

The IEA is convening and charting the way towards increasing ambition levels and action

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 digitalisation of networks***
- **Geographic focus** - including but not limited to Brazil, Colombia, India, Indonesia, Morocco, South Africa, Tunisia, Latin America, Africa, South East Asia
- **Scope**
  - Smart metering and control, grid edge and connected devices
  - Price signals
  - Tariffs, and incentives for DSO to innovate
  - Access to markets, including flexibility markets,
  - Data collection, protection and ownership, Interoperability
  - Cyber-resilience

Central role of DSOs



Engagement opportunities

We are **actively engaging** with a diverse set of stakeholders on:

- **In-depth discussions** on DSOs perspectives on emerging technologies, investment trends, enabling policies and regulations, business models, lessons learned from projects and pilots;
- Participation in **webinars and workshops**;
- **Sharing knowledge and information**, research results, case studies, insights on DSO challenges and needs in the context of power system modernization, gaps to be addressed to accelerate progress;
- Conducting **joint work** and organising **joint events.**

If you are interested, contact us at **3DEN@iea.org**

Concluding Remarks

Christian Buchel

Director for Territories, Customers and Europe, Enedis

Chair, E.DSO

Thank you for your participation and see you for the second day of the event, tomorrow 27 January, at 14:00 CET!