Decarbonization pathways and the new role of DSOs

Kristian Ruby
Secretary General
Eurelectric

3 April 2019

eurelectric
powering people

We have modelled 3 deep decarbonization scenarios based on electrification of key economic sectors

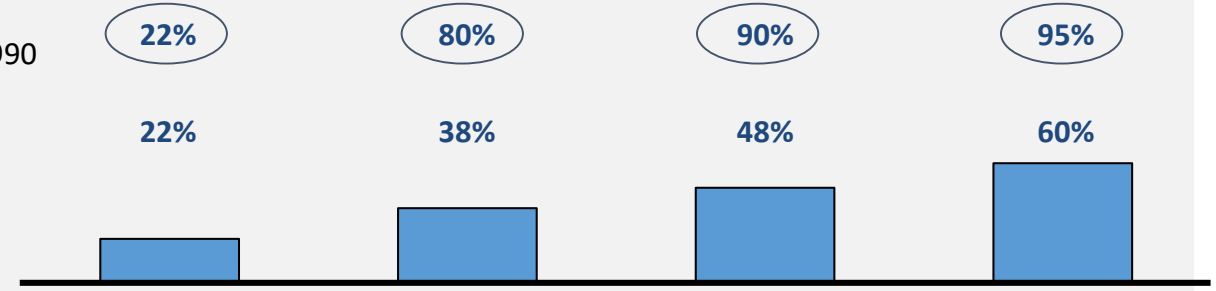
	2015 – Baseline	2050 scenarios		
		Scenario 1	Scenario 2	Scenario 3
EU economy decarbonization achieved vs. 1990[1,2]	~22%	~80%	~90%	~95%
Direct electrification rate	~22%	~38%	~48%	~60%

Cost breakthrough scenario in which we are driving towards full EU economy decarbonization. Assumes accelerated cost decline for renewables, nuclear, CCS and storage

1 Emissions out of scope are expected to contribute proportionally to the decarbonization effort required in each scenario
2 Decarbonization will be different by sector depending on relative costs and available technologies, industry contributing least with below 80% of emission reduction in all scenarios

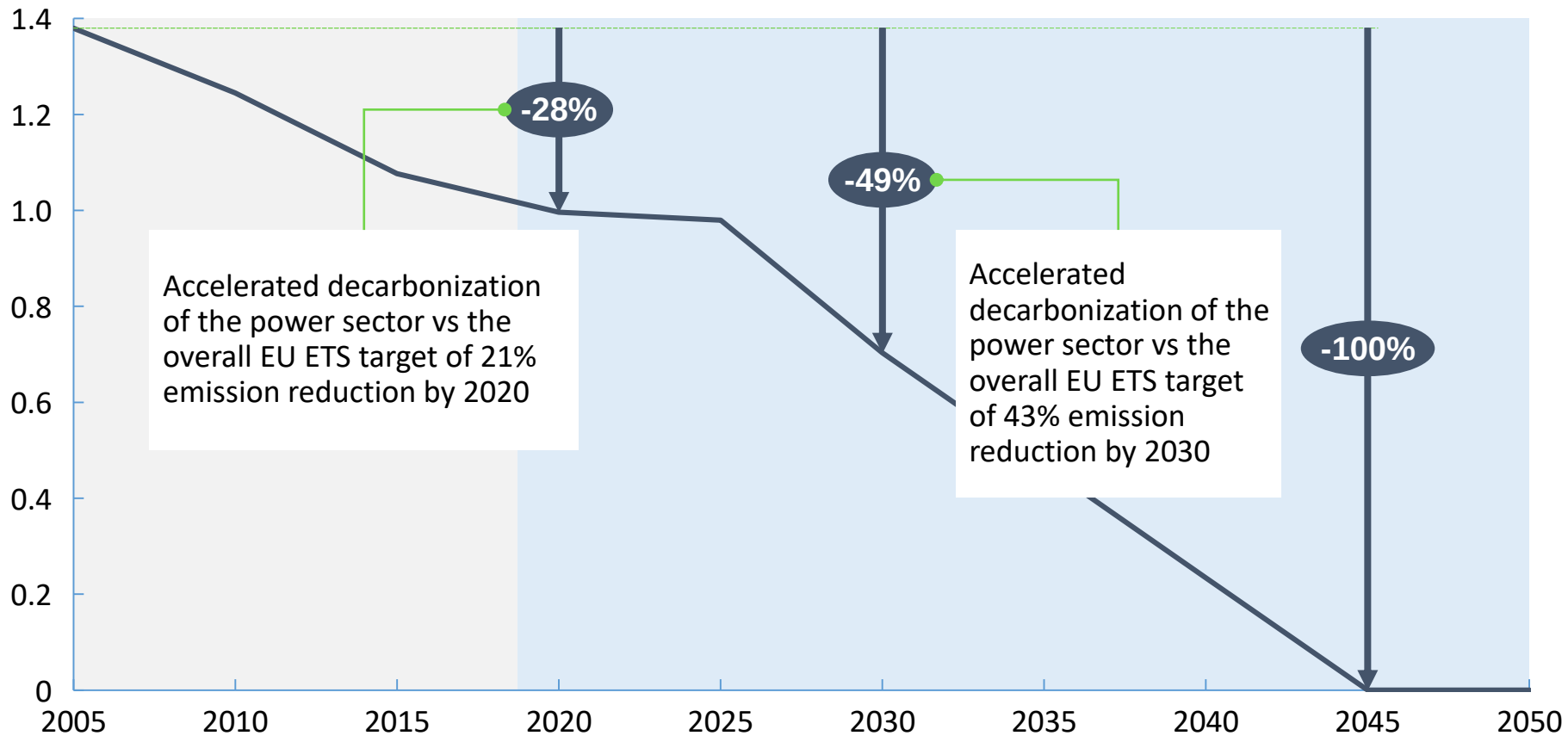
Direct electrification to play a key role

		2015 Baseline	2050 Scenario 1	2050 Scenario 2	2050 Scenario 3
Total EU economy	EU economy decarbonization vs 1990	22%	80%	90%	95%
	Direct electrification rate	22%	38%	48%	60%
Total transport	Direct electrification rate	1%	29%	43%	63%
Total buildings	Direct electrification rate	34%	45%	54%	63%
Total industries	Direct electrification rate	33%	38%	44%	50%



In all three scenarios, the European power sector is carbon neutral by 2045

CO_2 emissions from power sector in all scenarios, GT CO_2



By 2045 we envision a carbon neutral power sector that makes a significant contribution to decarbonization of the EU economy

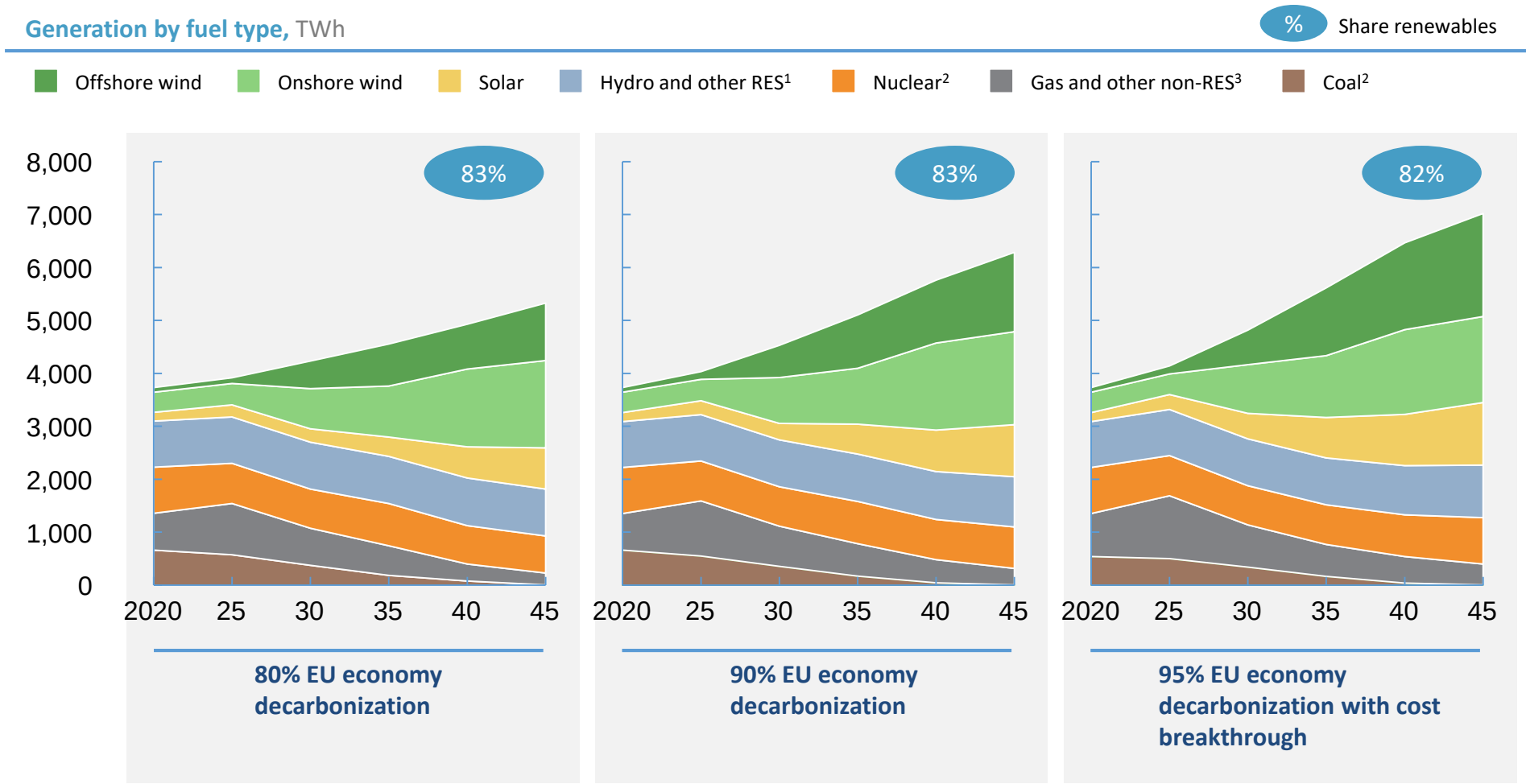
High penetration of renewables and transmission build will be the main driving force of the European energy transition. Renewables will represent >80% of electricity supply driven by large untapped potential and rapidly declining cost

System reliability and flexibility needs provided by multiple sources in the power sector and from other industrial sectors. These include hydro, nuclear power and gas, and emerging sources deployed at scale such as demand side response, battery storage, hydrogen electrolysis and power-to-X

Changing role of fossil generation. Fossil electricity supply will be gradually phased out and represent only ~5% of total supply by 2045. However, gas will still represent ~15% of total installed capacity to contribute to system reliability, especially in regions that don't have access to hydro or nuclear

Decreasing costs of carbon neutral technologies and innovation to abate the last tons of CO2 emissions (e.g. CCS, negative emissions) coming from the marginal use of the remaining thermal capacity such as negative emissions and CCS technologies

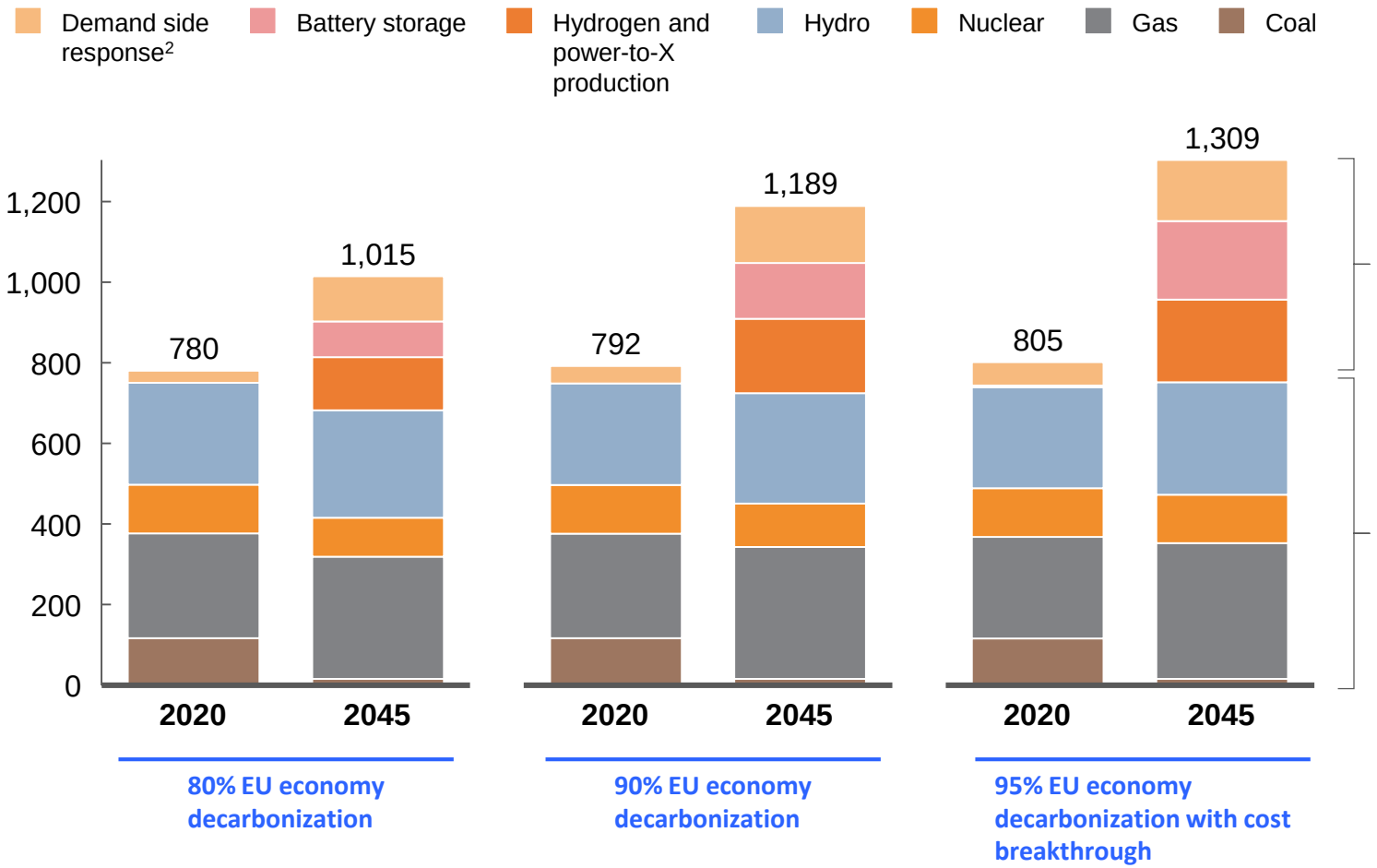
In the least-cost, carbon neutral electricity system the bulk of electricity is provided by renewables and nuclear



1 Includes also small amounts of geothermal, biomass and biogas
2 National policies on nuclear and coal phase out have been reflected
3 Up to 15% of gas capacity with CCS and other non-renewables

System flexibility is provided by several sources of dispatchable resources serving as back-up for days with low renewable generation

Dispatchable resources[1], GW



New sources of flexibility

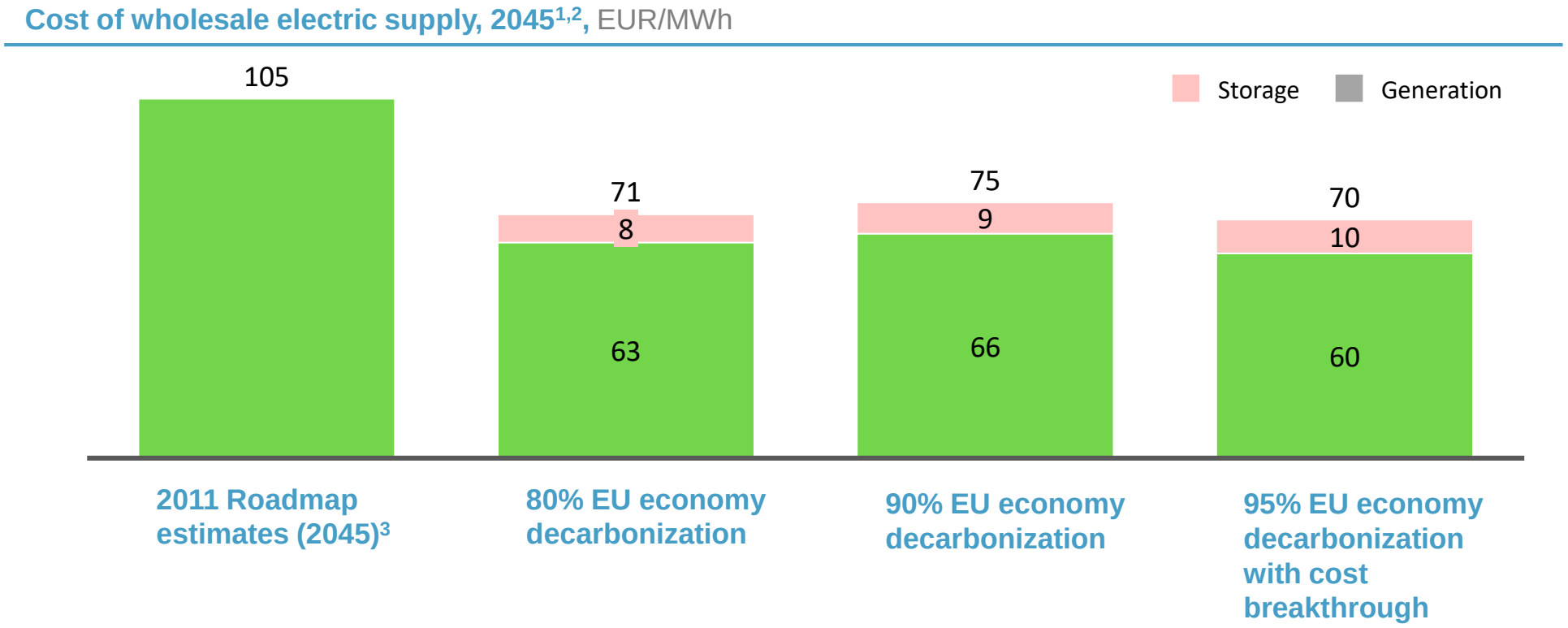
- Enable better utilization of other generators
- Significant increase in capacity expected

Traditional sources of flexibility

- Similar capacity needed in a high renewables, higher demand system as today
- Provide electricity when renewables production is low and ability to leverage DSR has been exhausted
- Hydro plays a unique role and can improve the overall dispatch and system economics

1 District heating that is coupled with power sector is not included in this analysis
2 DSR flexibility is provided by hour to hour load shifting in transportation, buildings and heating

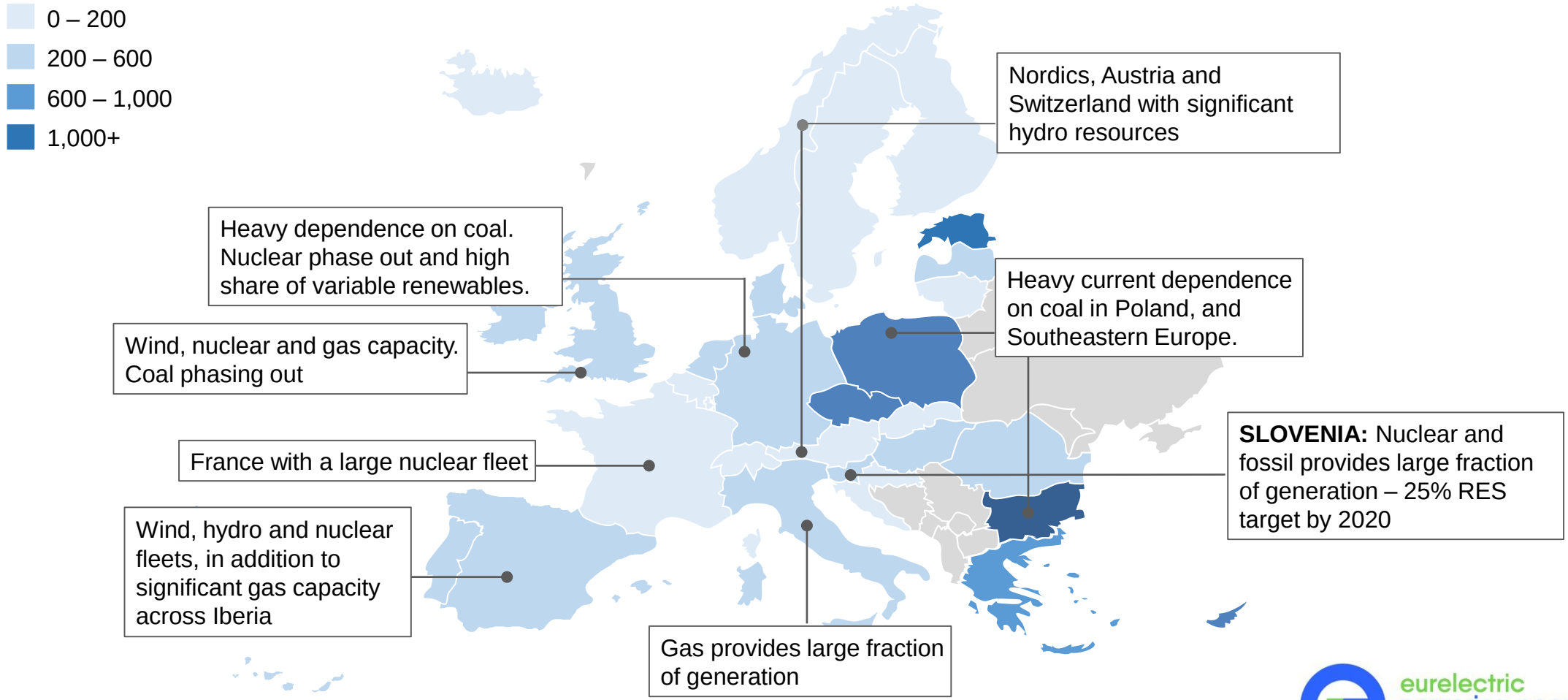
Due to cost declines of renewables, decarbonization of the power sector now comes at a reduced



A carbon neutral power supply by 2045 can be accomplished with generation costs of 70 – 75 EUR/MWh. Due to rapid cost declines and more options for flexibility in the system, the overall cost of decarbonization has decreased significantly since previous estimates and the pathway is now achievable

European countries have different starting points in the energy transition

2015 carbon intensity of electricity[1], kg CO_2/MWh



1 Refers to carbon intensity of domestic electricity production, i.e. does not take into account the carbon intensity of electricity mix consumed

SOURCE: Eurostat and national statistics

A low cost, carbon neutral power sector must be supported by changing political, technological and market conditions

Political commitment to deep decarbonization across all sectors of the economy and regions. Continued efforts to integrate the European energy system

Active involvement of citizens e.g. through demand response and prosumers, and **increased social acceptance** for high renewables build out and new transmission lines

Synergies with other sectors. For example, P2X and H2 production enable decarbonization of other sectors while providing balancing capabilities to the power system. Existing gas pipeline infrastructure can be repurposed for power to gas and hydrogen transport and storage

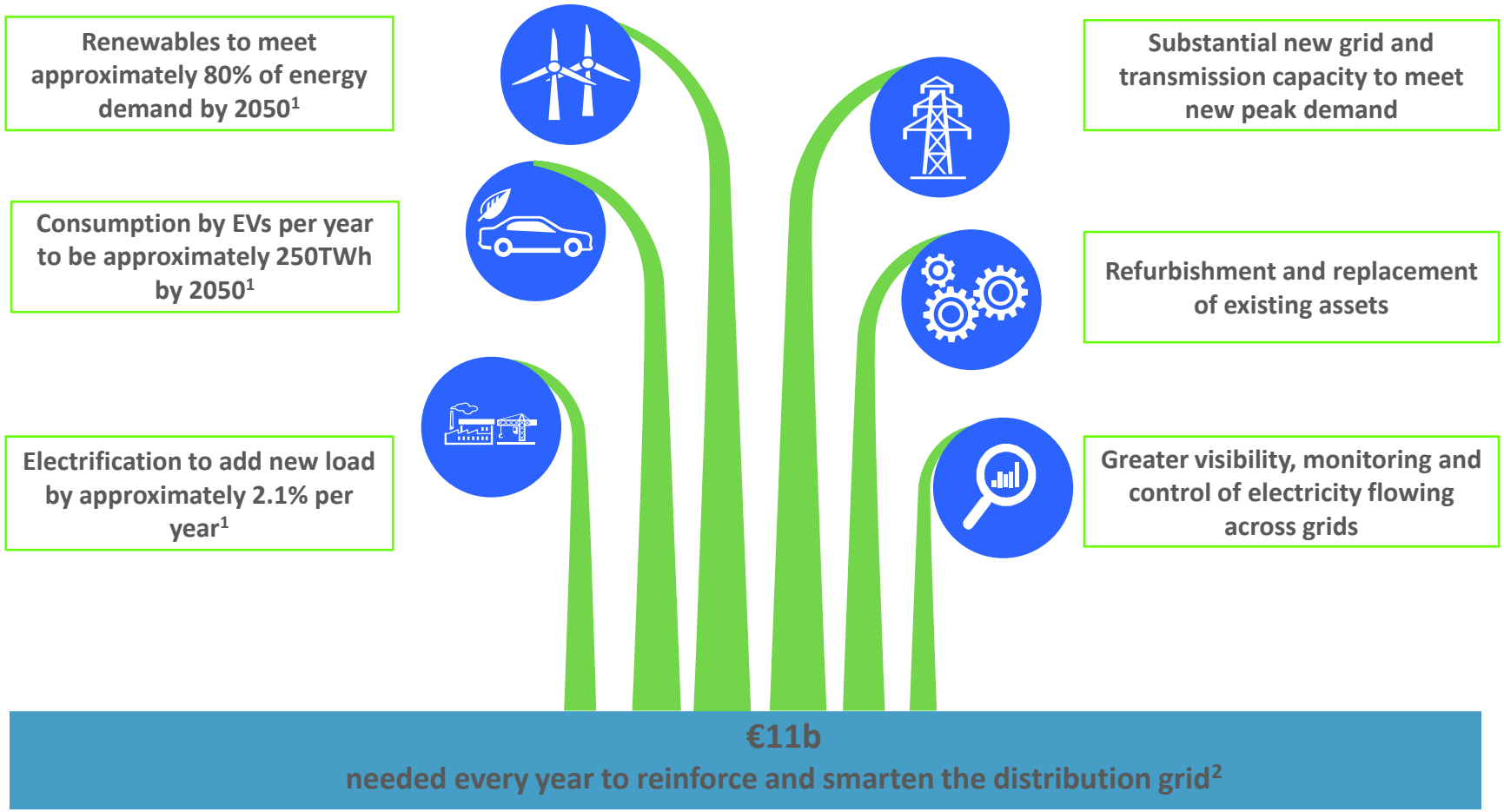
Efficient market-based investment frameworks and adequate market design to trigger investments in a high renewables-based system. For example, resources must to a larger extent be valued based on their contribution to system reliability. Meaningful CO_2 price signals will also be required to sufficiently incentivize full decarbonization

A smarter and reinforced distribution grid that integrates new market participants (e.g. decentralized solar PV and local flexibility sources), and plays a significant role in consumer empowerment through managing local congestions and redispatch, security of supply and grid resilience issues

The path and investments required to reach full decarbonization differs by country as European regions have different existing electricity mix and resources available. To ensure just energy transition **support and dedicated EU funding will be required** for Member States that face a more difficult starting point in the electrification and energy transition journey.

eurelectric powering people

Future of DSOs: The current ‘connect and reinforce’ model is unsustainable

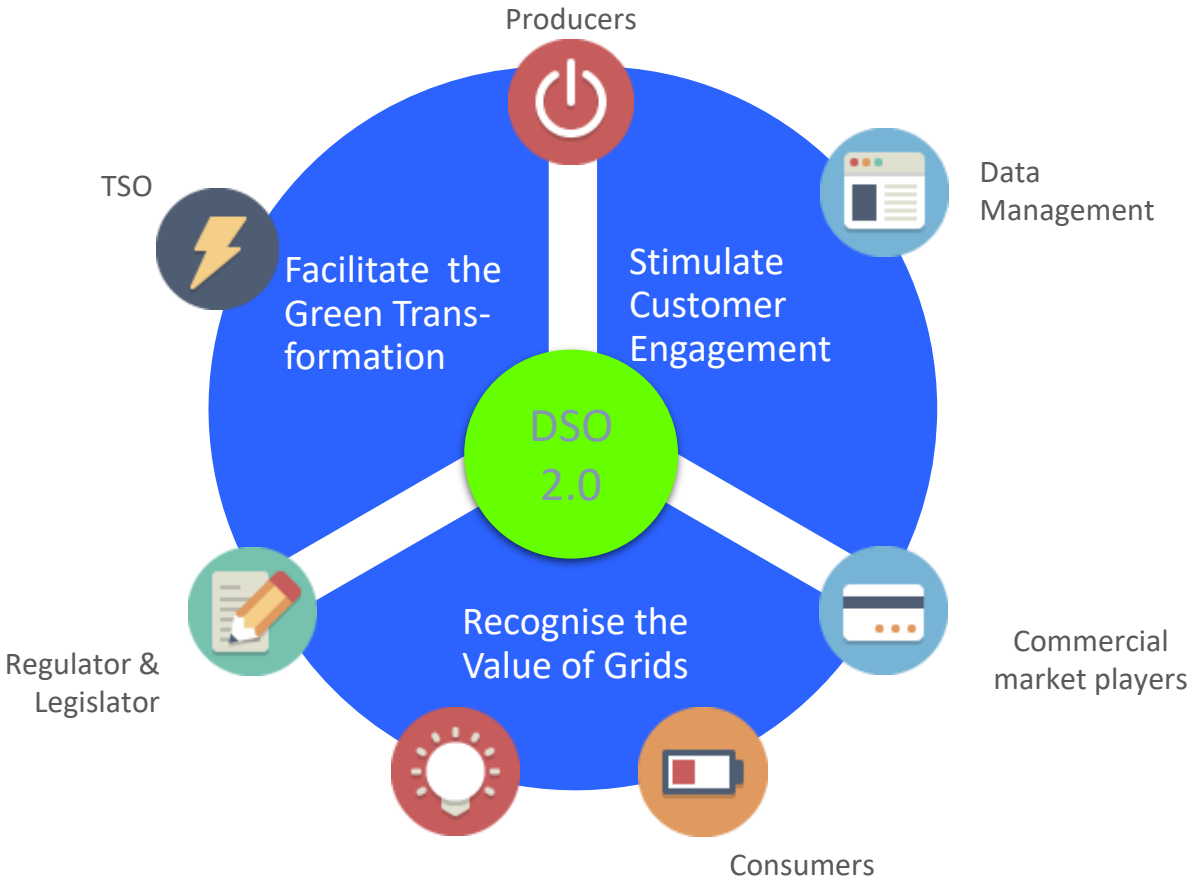


1. “Decarbonisation Pathways,” *Eurelectric*, www.eurelectric.org/decarbonisation-pathways/¸ accessed 11 January 2018.
2. “Impact assessment support study on: Policies for DSOs, distribution tariffs and data handling,” *European Commission*, ec.europa.eu/energy/sites/ener/files/documents/ce_vva_dso_final_report_vf.pdf, accessed 7 January 2019., accessed 18 January 2018

eurelectric powering people

The new role of DSOs – From ‚pipes to platforms‘

From value chain to valued networks



Digitalisation of physical assets → Networked business model

The new role of DSOs – From ‚pipes to platforms' II

Roles of DSOs increase in size and complexity

Key roles of DSOs: Network and System operation

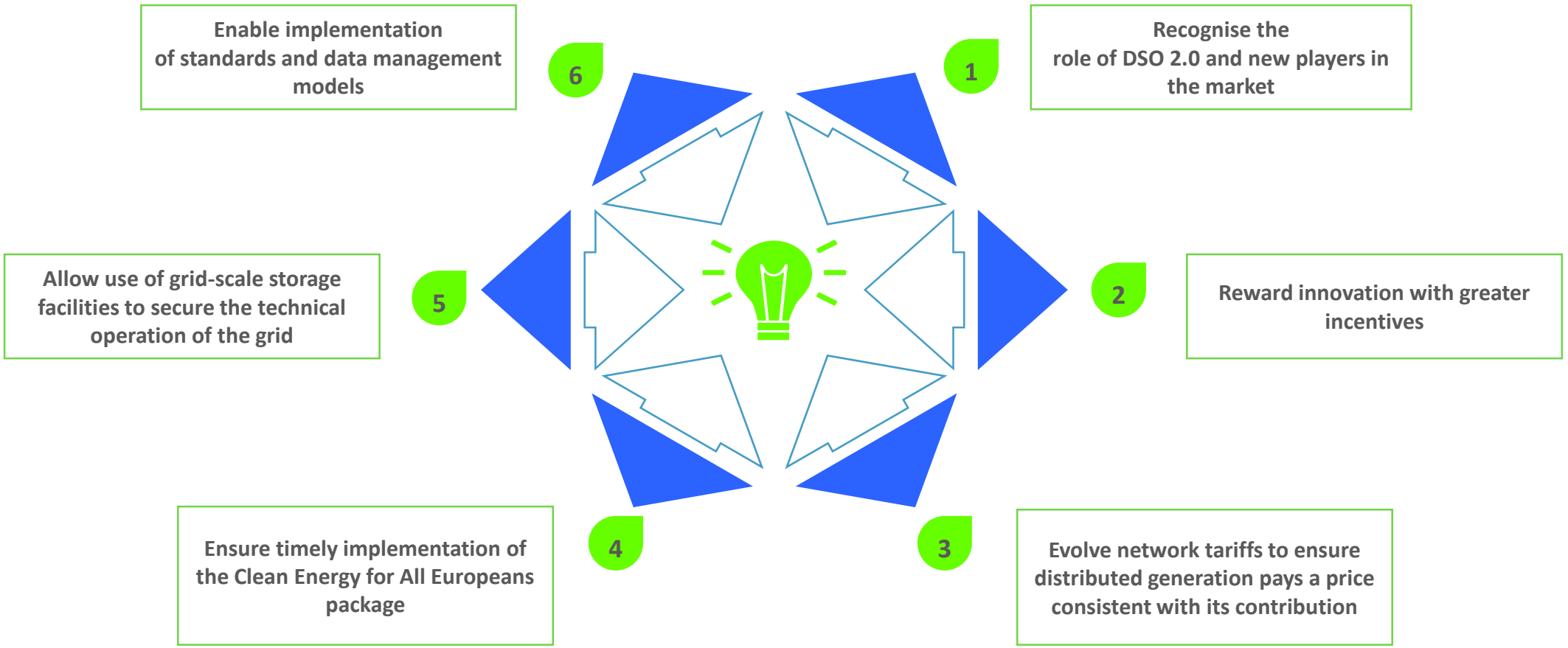
- Plan, build and optimise the grid
- Connect new customers
- Operate the grid
- Provide system services

Optional DSO activities related to market facilitation

- Metering and Smart-meter administration
- Plan, build and operate EV charging infrastructure
- Integrate local storage facilities

Already applied in distribution grids today, e.g. EWE Netz

A clear set of regulatory priorities for EU policymakers



Political frameworks are shifting (yet again) - Ensuring political leverage at EU institution level

A new institutional dimension for DSOs: the upcoming EU DSO Entity