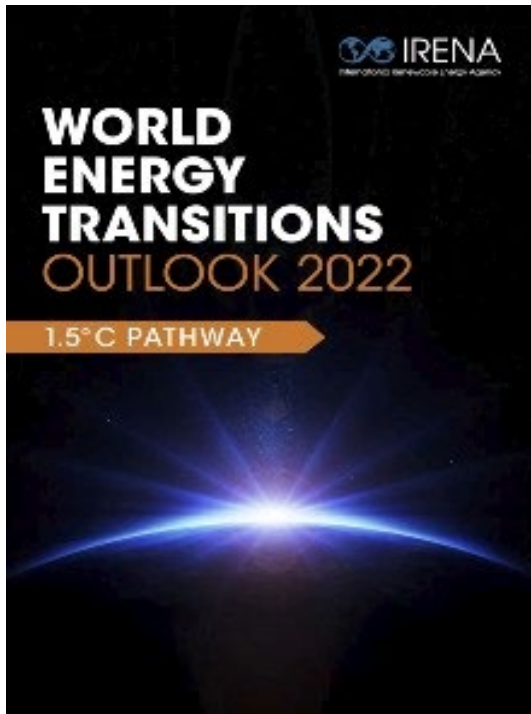


The energy transition: global and regional perspectives and the role of renewable energy in Ukraine

- Group of Experts on Renewable Energy-
7 October 2022

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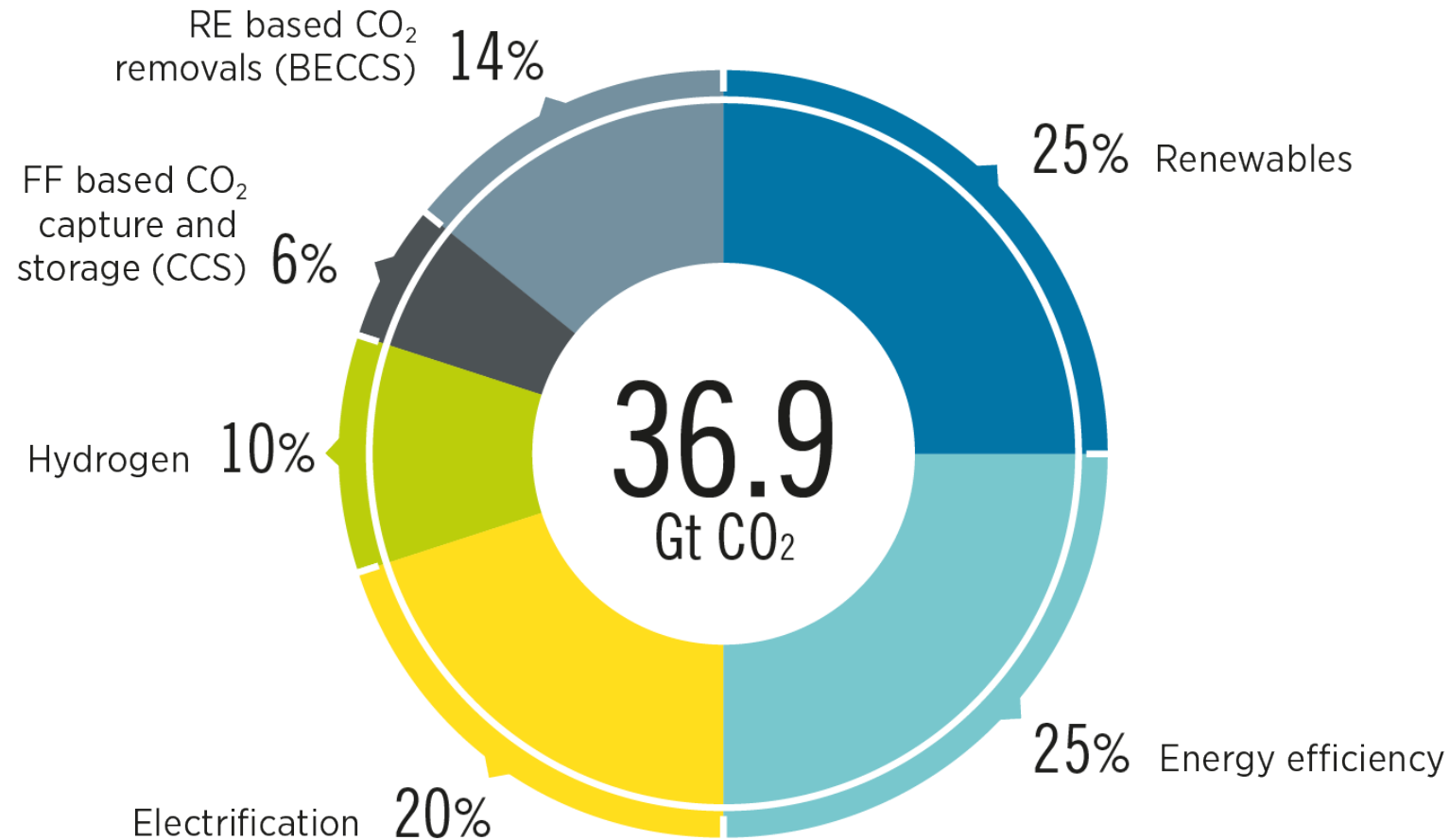


March 2022

The WETO report presents **options to limit global temperature rise to 1.5° C and bring CO₂ emissions to net zero by 2050**, offering high-level insights on technology choices, investment needs, policy framework and the socio-economic impacts of achieving a sustainable, resilient and inclusive energy future.

- Compounding crises underscore the pressing **need to accelerate the global energy transition**
- Acceleration of the energy transition is **essential for long term energy security, price stability and national resilience**

Reducing emissions by 2050 through six technological avenues



90% of all decarbonisation in 2050 will involve renewable energy through direct supply of low-cost power, efficiency, electrification, bioenergy with CCS and green hydrogen.



Key Priority Areas and Actions to reach 2030 Milestone

- Decarbonization of electricity sector with solar and wind leading the transformation
- Measures to eliminate market distortions and incentivize energy transition solutions
- Ramping up Renewables with aggressive energy efficiency strategy
- Increased system resilience and flexibility
- Green hydrogen should move from niche to mainstream by 2030
- Wider use of bioenergy coupled with strong sustainability procedures and regulations
- The majority of car sales should be electric by 2030
- Significant increase in renovation rates and only energy efficient new buildings
- Efficient use of energy across sectors through demand side management
- Investment certainty through increased ambition in NECP and NDC
- Comprehensive set of policies covering all technological avenues

Falling Renewable costs mark the next stage in the Energy Transition

Record high capacity
additions in 2021

↑ **257 GW**

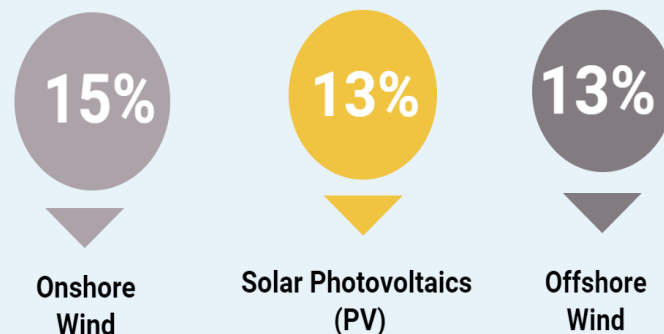
global renewable
generation capacity

↑ **9.1%**

renewable capacity

In 2021, competitiveness of renewables
continued amid the fossil fuel crisis

Costs continued to fall



**Supply chain challenges and rising commodity prices in 2021
have a lagged impact on project costs**

The price pressures in 2022 will be more pronounced.

Yet, even if overall renewable costs increase these increases are dwarfed by the overall economic and climate gains of renewables in comparison to very high fossil fuel prices.

- **RE power cost reduction changed how we think of the energy transition**
- **Cost reduction brings additional economic, environmental and social benefits to the energy transition**
- **The benefits from renewables further increase in the current fuel price crisis**
 - ✓ *The lifetime cost per kWh of new solar and wind capacity added in Europe in 2021 will average at least 4 to 6 times less than the marginal generating costs of fossil fuels in 2022*
 - ✓ *Just between January and May 2022 in Europe, solar and wind, alone, avoided fossil fuel imports of more than USD 50 bln*

Looking at the cost trends in Europe and their impact

2021:

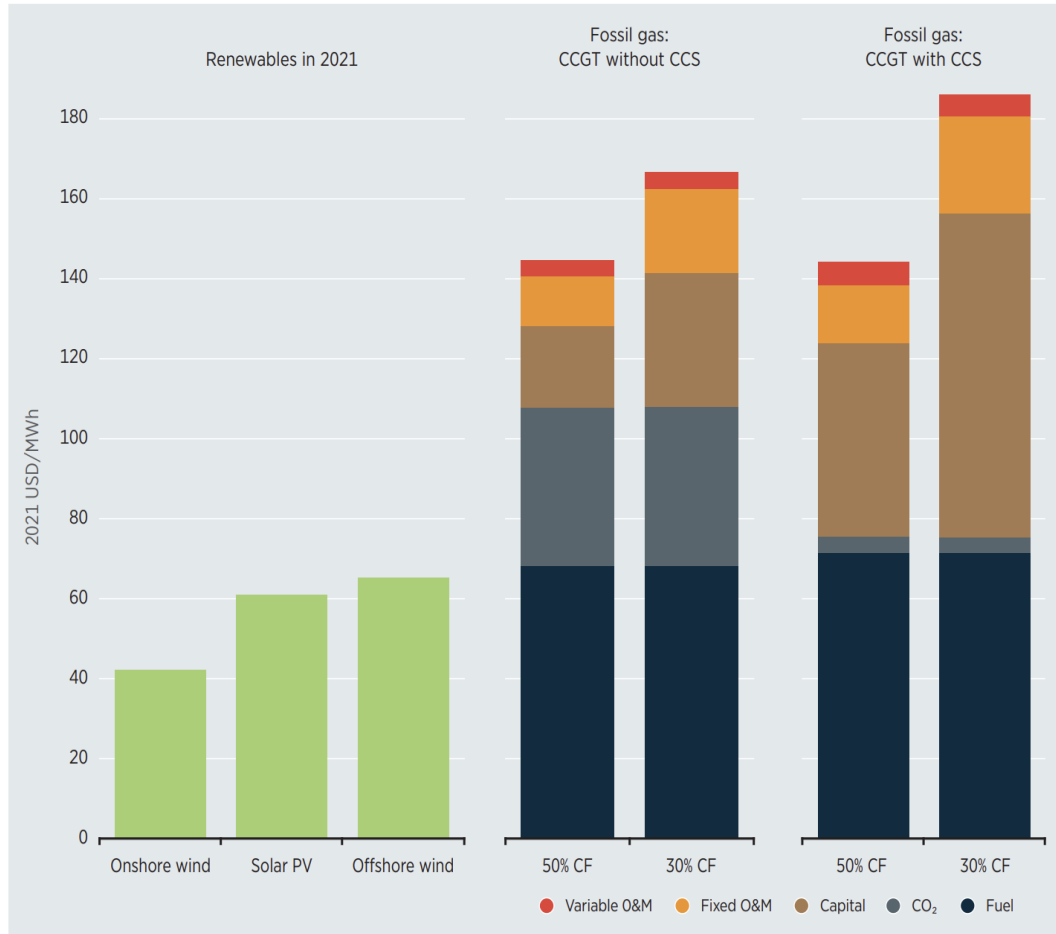
- The weighted average LCOE of newly commissioned projects fell 29 % from USD 0.092/kWh to USD 0.065/kWh
- The LCOE reduction was driven by a 25% reduction in total installed costs year-on-year to USD 2 775 kW and an increase in the weighted average capacity factor of new projects from 42% in 2020 to 48% in 2021
- Constantly increasing benefits of economy of scale in large projects, as well as supply chain and O&M optimization over the last five years
- Some individual projects commissioned towards the end of 2021 already experienced higher costs, but on average the costs were still lower

2022:

- The cost declines seen in 2021 may not be repeated for solar PV and wind power in 2022 due to supply chains constraints and commodity price rise
- The projects with contracts for differences or PPA that are not indexed to inflation are likely to be much more exposed and project delays or renegotiations of contract terms may be justified
- The extent to which increases in materials and transportation costs, as well as other supply chain costs increase, get passed on into higher costs for components in solar and wind projects depends on a variety of factors: the intensity of use of materials; the ability to substitute cheaper alternatives; the impact of additional efficiency improvements; the level of the market power (to what extent costs couldn't be passed on)

Natural Gas is losing its transition role in power generation in Europe

LCOE comparison in Europe 2021/2025



Source: IRENA analysis based on IRENA Renewable Cost Database and Lyons, Durrant and Kochbar, 2021.

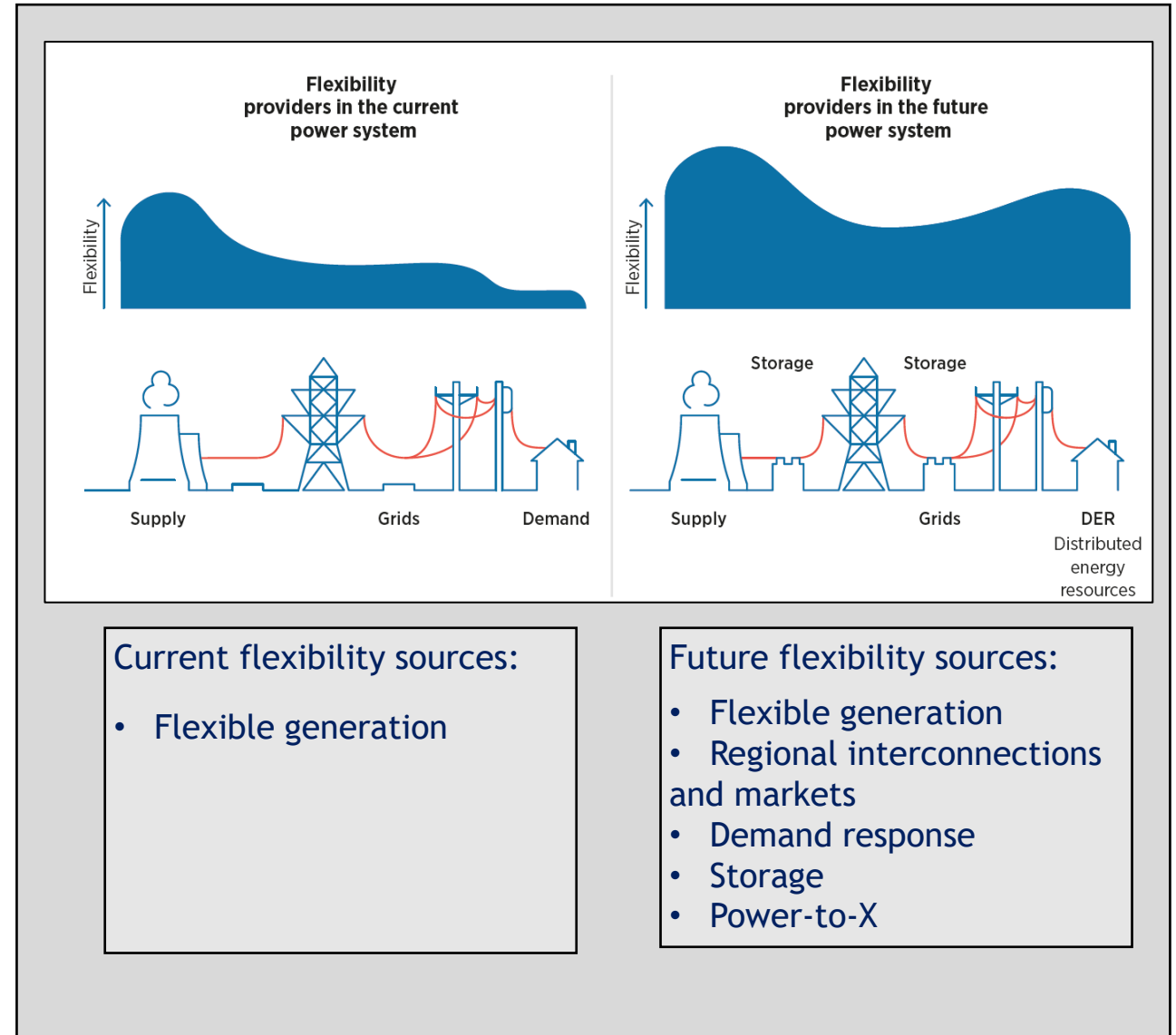
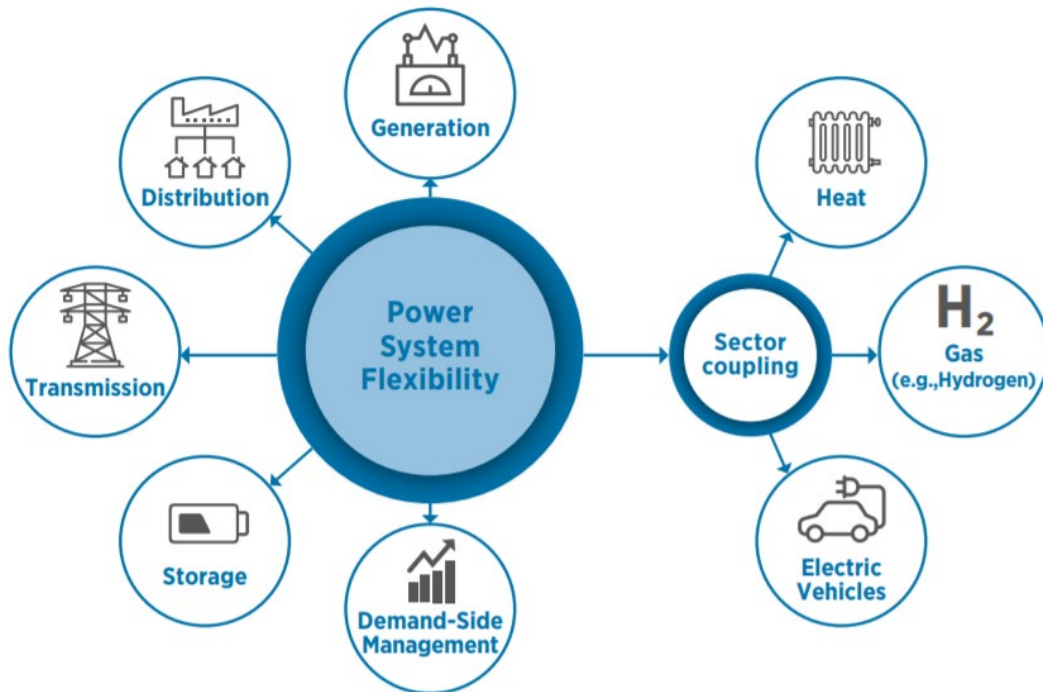
The increase in coal and fossil gas prices in 2021 and to-date in 2022 has highlighted that for Europe, the low-cost era of fossil gas ended in 2004

- New fossil gas-fired power generation in Europe doesn't look likely to be economic over its lifetime in the near future, although as a replacement for retiring (less efficient) gas fired capacity, there might be a business case
- The opportunity that previously existed for fossil gas to be an economic source of firming capacity in a scenario with a high amount of VRE appears to be closing, as the wedge between fossil gas and solar and wind costs widens
- The high fossil fuel prices greatly expand the range of economic clean solutions as pumped hydro, batteries demand side management, sector coupling, hydrogen, ect. for balancing an electricity grid with high shares of VRE

Flexibility needs to be harnessed in all sectors of the energy system

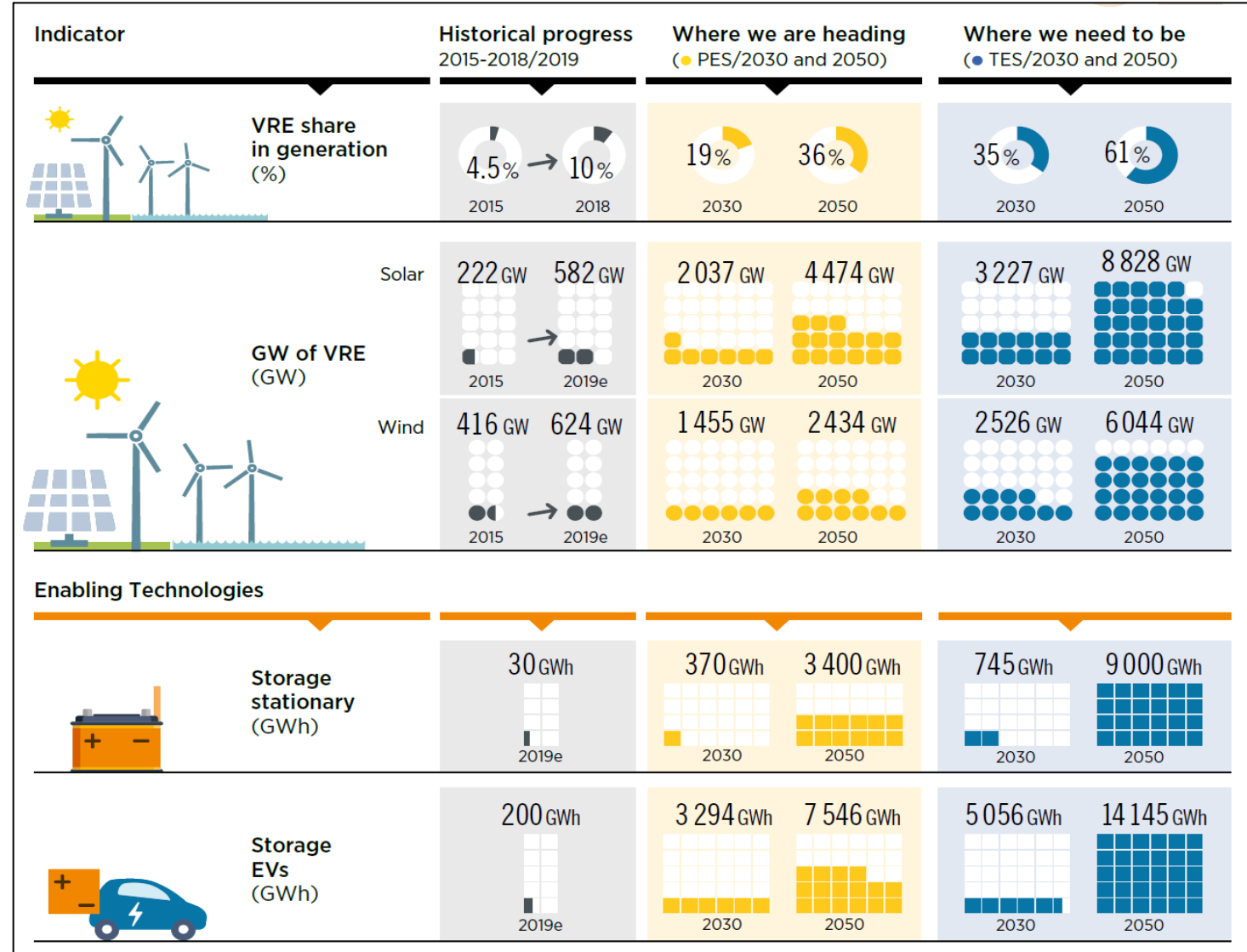
Flexibility according to IRENA:

*“...the **capability** of a power system to cope with the **variability and uncertainty** that **VRE generation introduces** into the system at different time scales, avoiding curtailment and reliably supplying demanded energy to customers”*

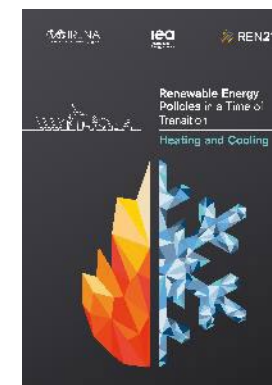
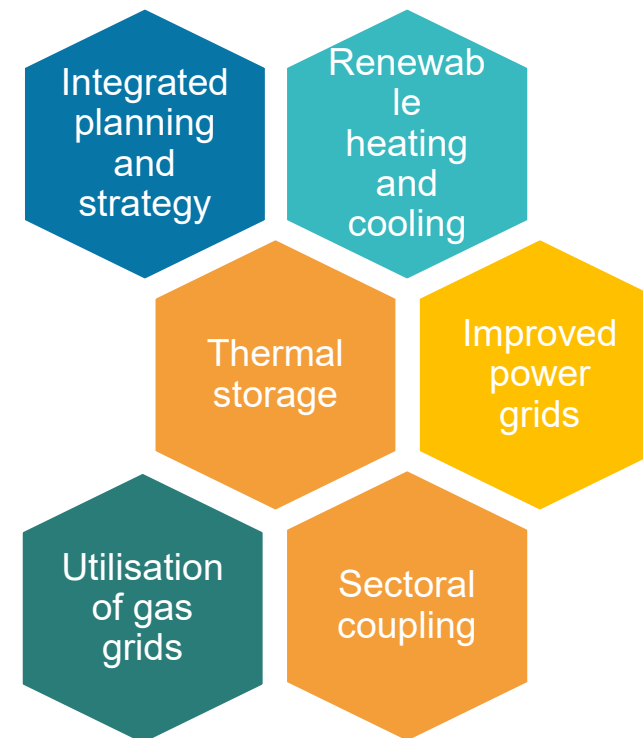
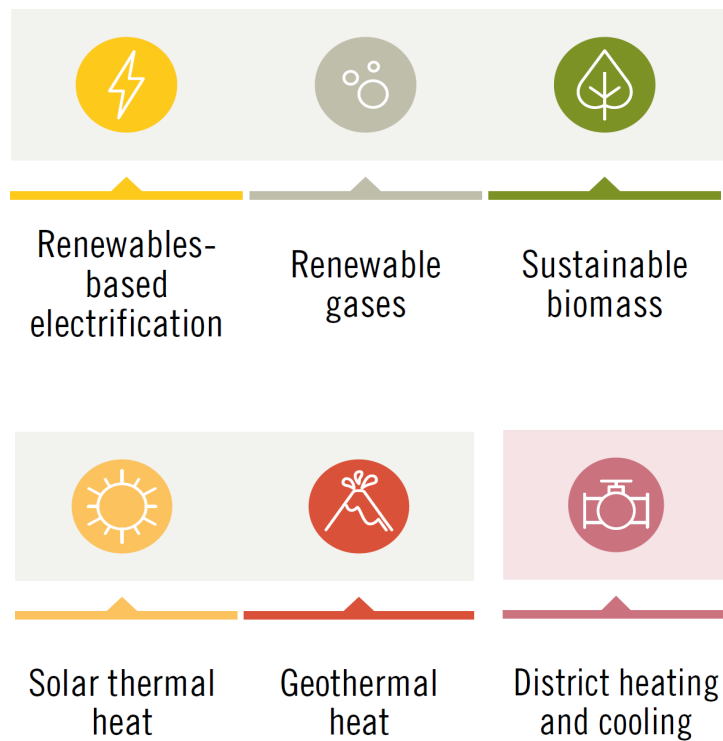


The need for power system flexibility

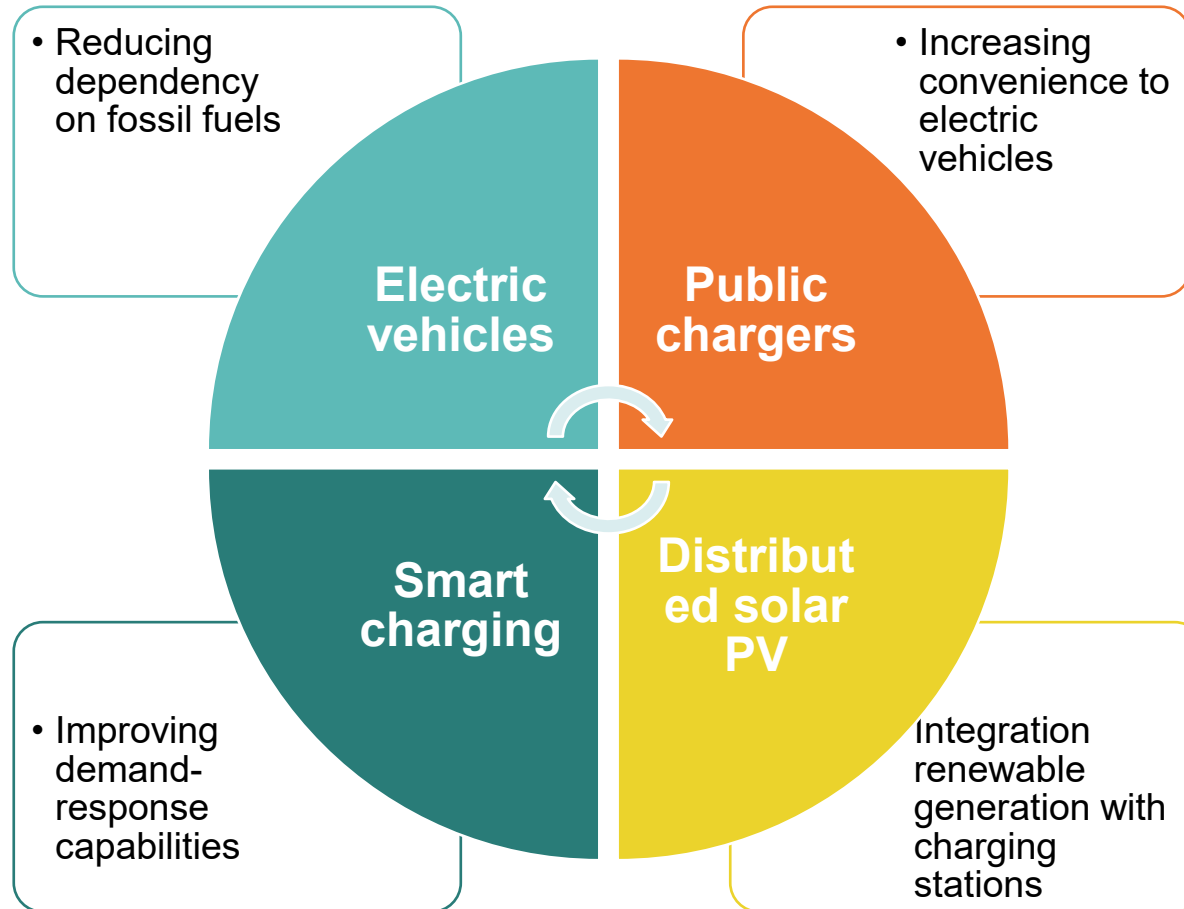
- **Flexibility in power systems is a key enabler for the integration of variable renewables:** the backbone of the electricity system of the future.
- **Power systems must achieve maximum flexibility**, based on current and ongoing innovations in enabling technologies, business models, market design and system operation.
- On a technology level, **both long-term and short-term storage will be important for adding flexibility.**



Integrating renewable heating and cooling solutions and infrastructures



Increasing transport resilience through electric vehicles and smart charging



Keeping up the momentum: key recommendations for Western Balkans 6 from our CESEC report

- Renewables are ready to compete, but they need fair competition with fossil technologies. Key elements are the elimination of remaining subsidies to fossil fuels and a fair set of market and operation rules.
- Reduce perceived risks for investors, for example by adopting best practices in policy and regulatory instruments such as auctions and simplifying administrative procedures and also by working with international partners and finance and insurance institutions to develop region specific risk mitigation mechanisms.
- Coordinate national energy planning with subnational entities to accelerate the transition in areas such as electromobility and the adoption of distributed renewables.
- Work closely with neighbours to tap the synergies of regional co-operation. One key area for regional co-operation is the transition towards integrated electricity markets, which will be instrumental for cost-effective decarbonization.
- Work towards regional or subregional co-ordinated investment plans to share the costs and benefits of key infrastructure for the transition to renewables such as equipment manufacturing facilities, transboundary hydro projects, biofuel conversion plants and EV charging infrastructure.
- Stability, predictability, and long-term visibility of policies and regulations will be also key to give certainty to investors, reduce risk (and therefore the cost of capital) and ensure that the current progress is sustainable in the medium and long term.

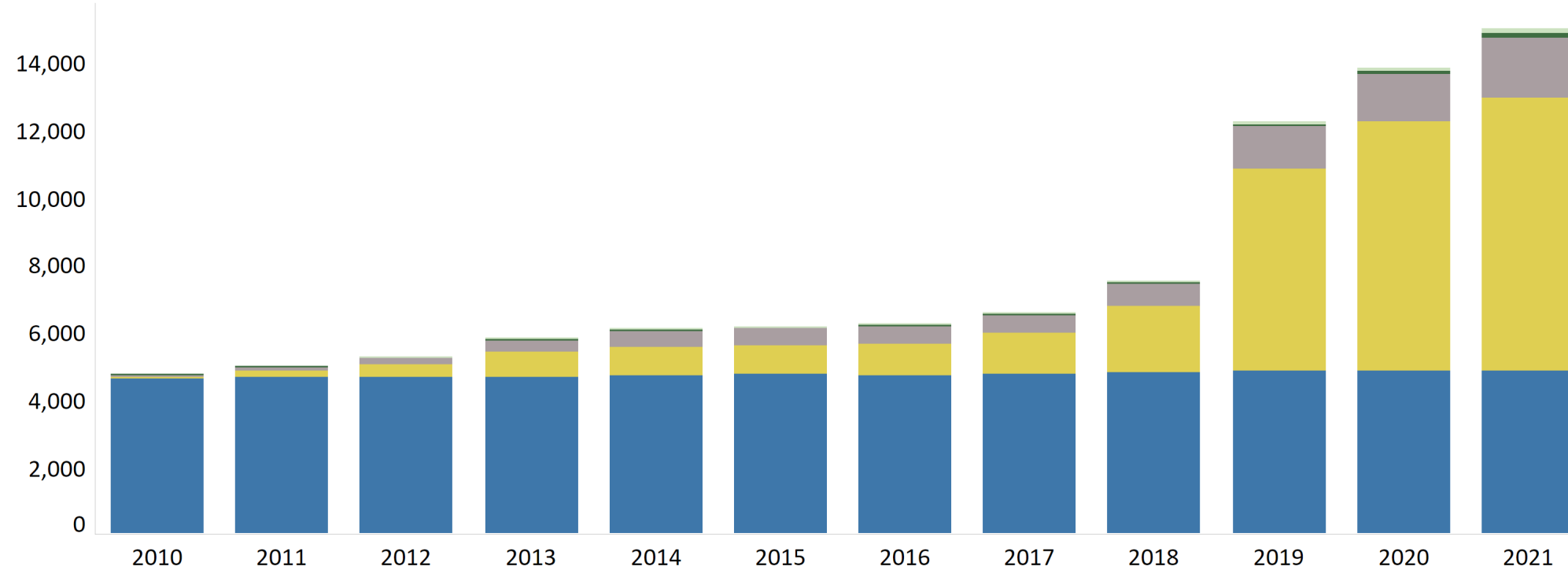
Renewable Energy Prospects for Ukraine

- Strong momentum for renewable energy development in Ukraine, with significant progress over the last few years
- In our REmap scenario for Ukraine, RE share in power sector could reach 34% by 2030, while in district heating sector it could increase even more by 43%. **Solar PV would grow up to 16 GW by 2030. Wind (offshore and onshore) could reach 8 GW by 2030. Biofuels (solid, liquid, gaseous) could reach 4 GW by 2030.**
- Careful planning for RE capacity expansion, together with the required infrastructure and the required changes in market regulations (particularly for balancing) will be key for a seamless transition towards renewables.
- Stability, predictability, and long-term visibility of policies and regulations will be also key to give certainty to investors, reduce risk (and therefore the cost of capital) and ensure that the current progress is sustainable in the medium and long term.



Evolution of installed renewable capacity in Ukraine from 2010 to 2021

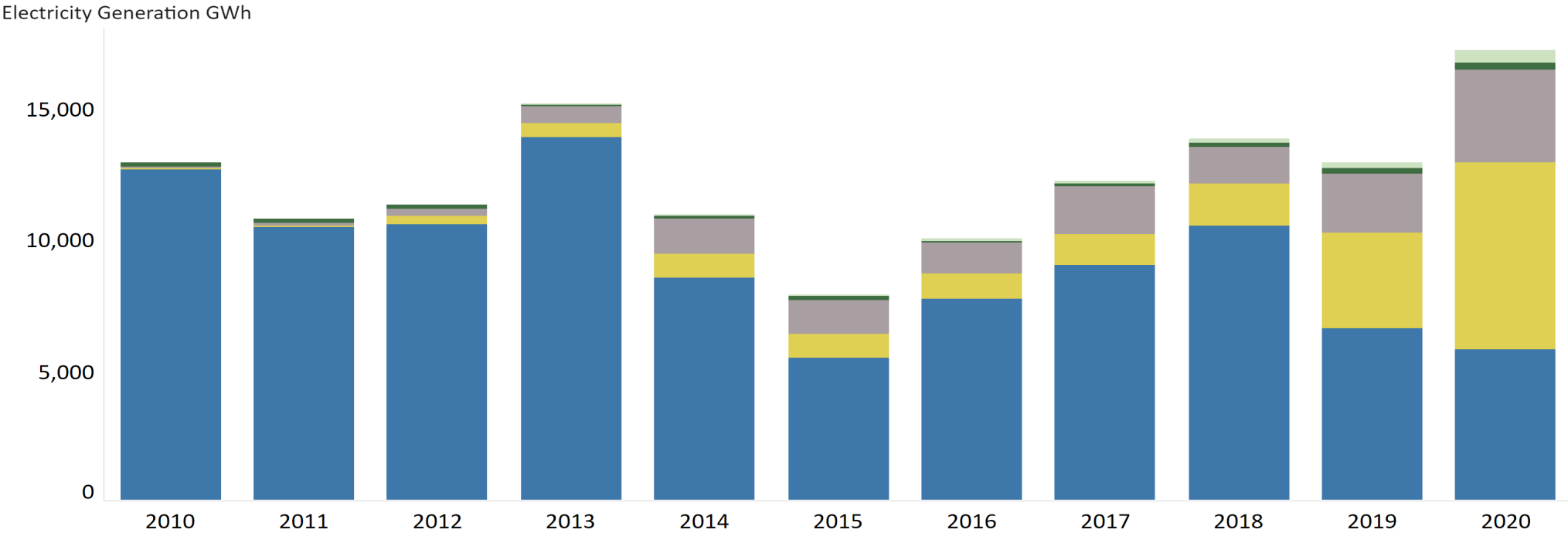
Electricity Capacity MW



selected filters: Electricity Capacity (MW), Cumulative, Show by: Sub-technology (All), Region/country-area: Europe (Ukraine)



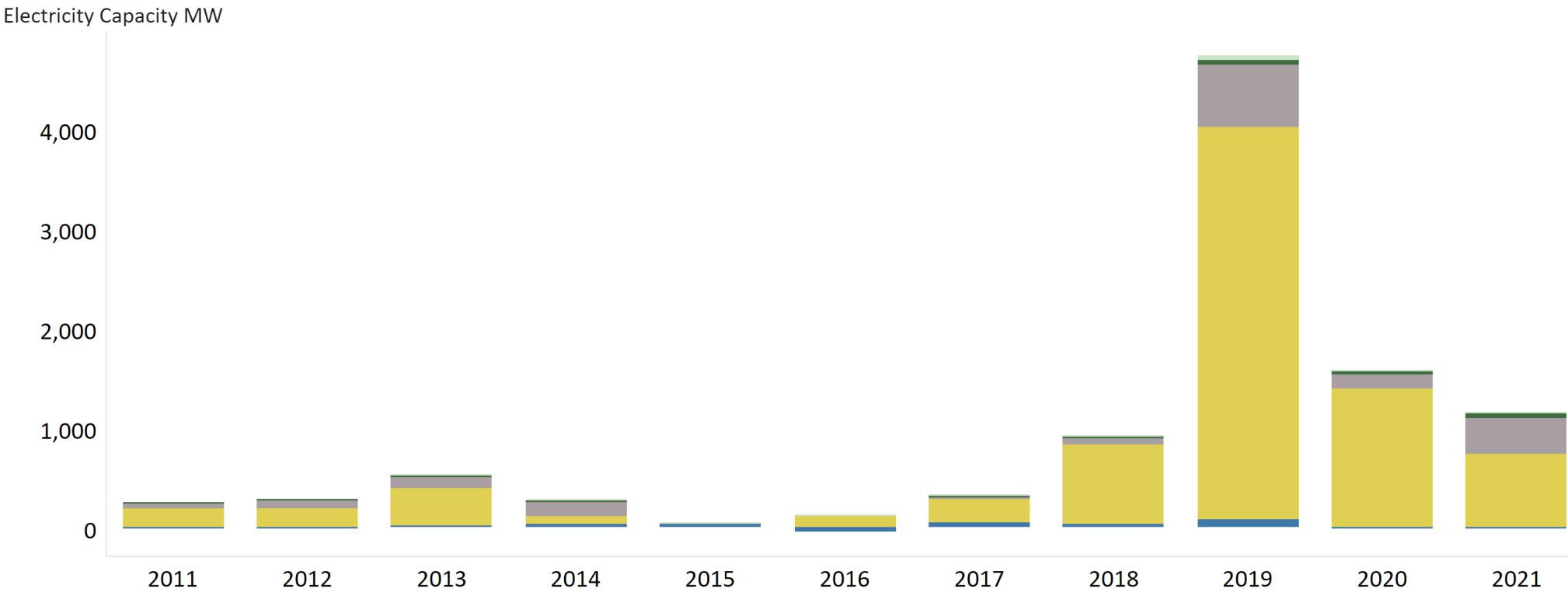
Evolution of renewable electricity generation in Ukraine from 2010 to 2020



Selected filters: Electricity Generation (GWh), Cumulative, Show by: Sub-technology (All), Region/country-area: Europe (Ukraine)

- Biogas
- Solar photovoltaic
- Solid biofuels
- Renewable hydropower
- Onshore wind

Net Renewable Electricity Capacity Additions in Ukraine from 2011 to 2021



Selected filters: Electricity Capacity (MW), Net Additions, Show by: Sub-technology (All), Region/country-area: Europe (Ukraine)



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