

International Conference

“The prospects for introduction of “green” innovative energy efficiency technologies in the electric power industry of Turkmenistan”

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Studying practices of European countries in implementation of energy efficiency technologies in the housing sector

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Energy efficiency requirements for buildings in the EU

- Buildings currently account for approximately 40% of energy consumption and 36% of energy-related greenhouse gas (GHG) emissions in the European Union (EU)
- Improving buildings' energy performance will contribute significantly to achieving the EU's goal of becoming climate neutral by 2050
- To achieve this, the reduction energy consumption of buildings is critical, in parallel with decarbonizing the heating, cooling and electricity sectors. Therefore:
 - New buildings should be Nearly Zero-energy Buildings
 - Existing buildings should be renovated to improve their energy performance

Energy efficiency requirements for buildings in the EU (2)

- The most important elements in the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) include:
 - Reinforced long-term renovation strategies for EU countries
 - Nearly Zero-energy Buildings (nZEBs)
 - Energy Performance Certificates
 - Consideration e-mobility (e-charging points) and smart technology (smart meters, self-regulation equipment) in new buildings
- In addition, each EU country needs to present its strategy for tackling energy in buildings for the period until 2030 through its integrated National Energy And Climate Plans (NECPs)

Energy efficiency requirements for buildings in the EU (3)

According to the revised EPBD:

- Each EU member state need to reduce the average primary energy use of residential buildings by 16% by 2030, and 20-22% by 2035
- At least 55% of the decrease in the average primary energy use will be achieved through the renovation of the worst-performing buildings
- 16% worst-performing non-residential buildings will need to be renovated by 2030 and 26% by 2033
- EU member states have to ensure that new buildings are fit to host rooftop solar PV or solar thermal installations. Existing public and non-residential building solar will need to be installed starting from 2027.

Renewable Energy technologies applicable for buildings - Research and Development under the HORIZON programme

- Under the EU Research and innovation funding programme Horizon Europe, number of projects have been funded aimed at the development of technologies for nZEBs
- RE-COGNITION (2019-2022)- Renewable Energy Technologies for near Zero Energy Buildings – with the following objectives:
 - Combined application of different Renewable Energy Technologies (such as solar, wind and bioenergy) and storage systems
 - Development of software to improve self-consumption in the building/building block
 - Development a platform for the best design of the RE technology configuration and the optimal management of the technologies installed during the operations

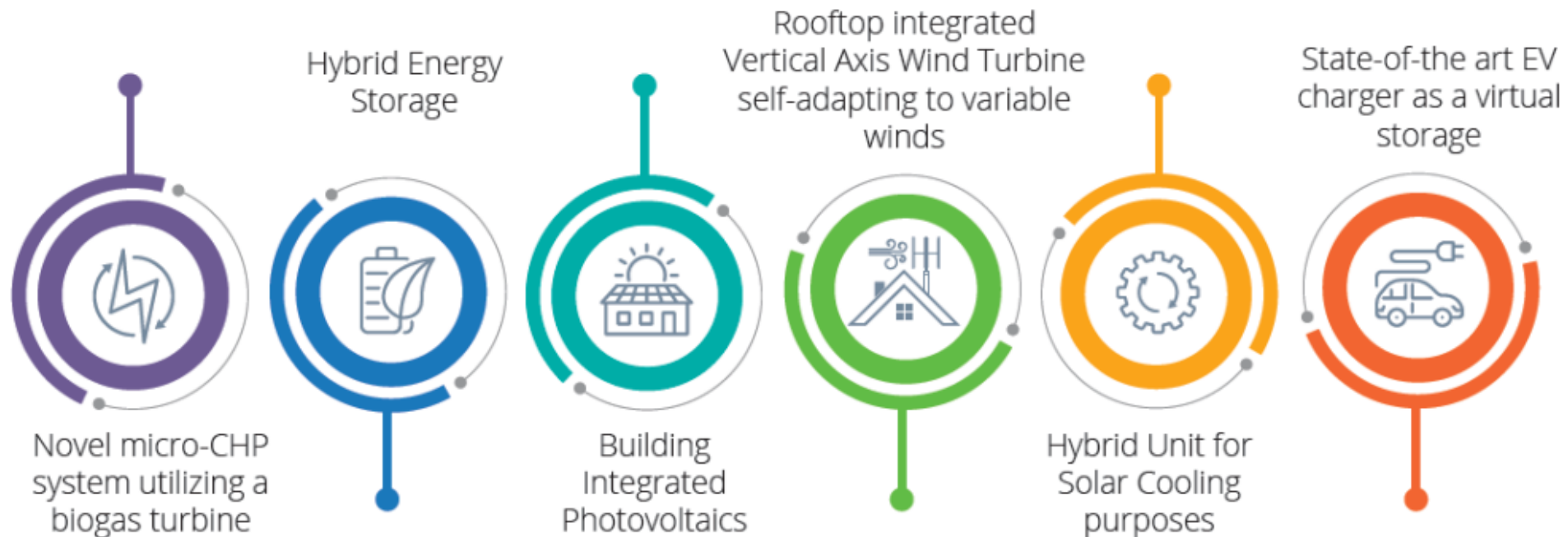
RE technologies applicable for buildings - Research and Development under the HORIZON programme (2)

- RE-COGNITION proposed the following technologies for buildings:
 - Micro Combined Heat and Power Unit - a small-scale cogeneration system based on a microturbine able to operate with biogas
 - Lightweight Photovoltaic - in older buildings, the deployment of solar PV can be limited by the load-bearing capacity of the different building parts (i.e., roof, facade, etc.)
 - Vertical Axis Wind Turbine – is designed for rooftop and/or ground installations; the overall dimensions (1.5 m × 1.5 m) enhance building-scale integration
 - Latent Heat Thermal Storage, in which the storage volume is reduced (2-3 times compared to water storage) - important aspect for buildings where space for installation of appliances is limited

RE technologies applicable for buildings - Research and Development under the HORIZON programme (3)



RENEWABLE ENERGY SOURCES AND STORAGE TECHNOLOGIES



Source: RE-COGNITION-Brochure-2020



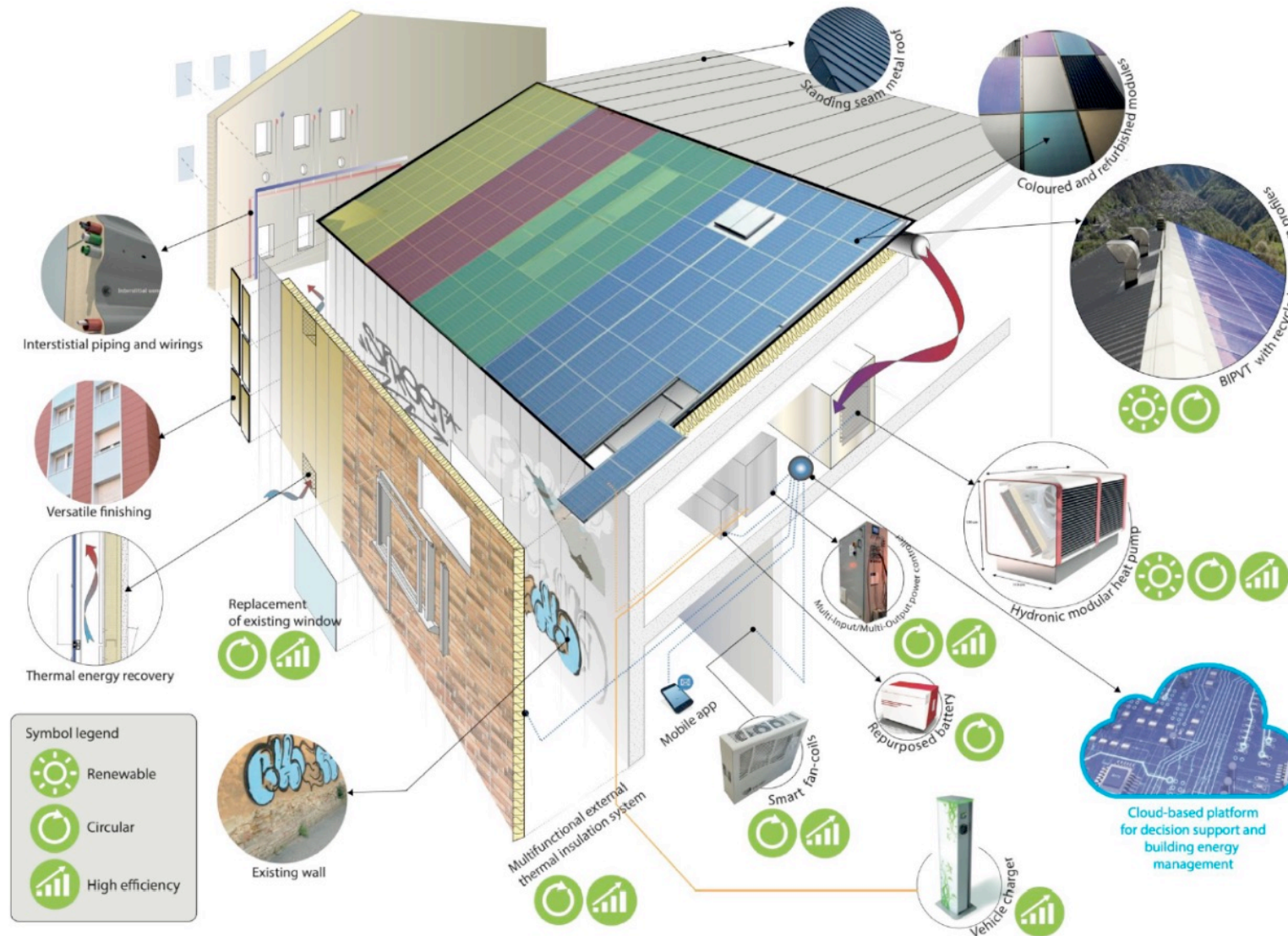
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RE technologies applicable for buildings - Research and Development under the HORIZON programme (4)

- Renewable and Environmental-Sustainable Kit for building INtegration (RE-SKIN)
 - Duration: 2023-2026
 - Objective: development of an integrated and multifunctional system for energy retrofit of existing buildings (in two main subsystems, roof and façade, combined with the building's HVAC system)
 - The roof is equipped with a hybrid photovoltaic-thermal system, which produces electricity and heat and at the same time thermally and acoustically insulates the slab beneath. Electricity powers the building's loads, interacts with the grid and EV charging stations. Heat is used by a heat pump for heating and hot water preparation



RE technologies applicable for buildings - Research and Development under the HORIZON programme (5)



Source:
<https://reskinproject.eu/>

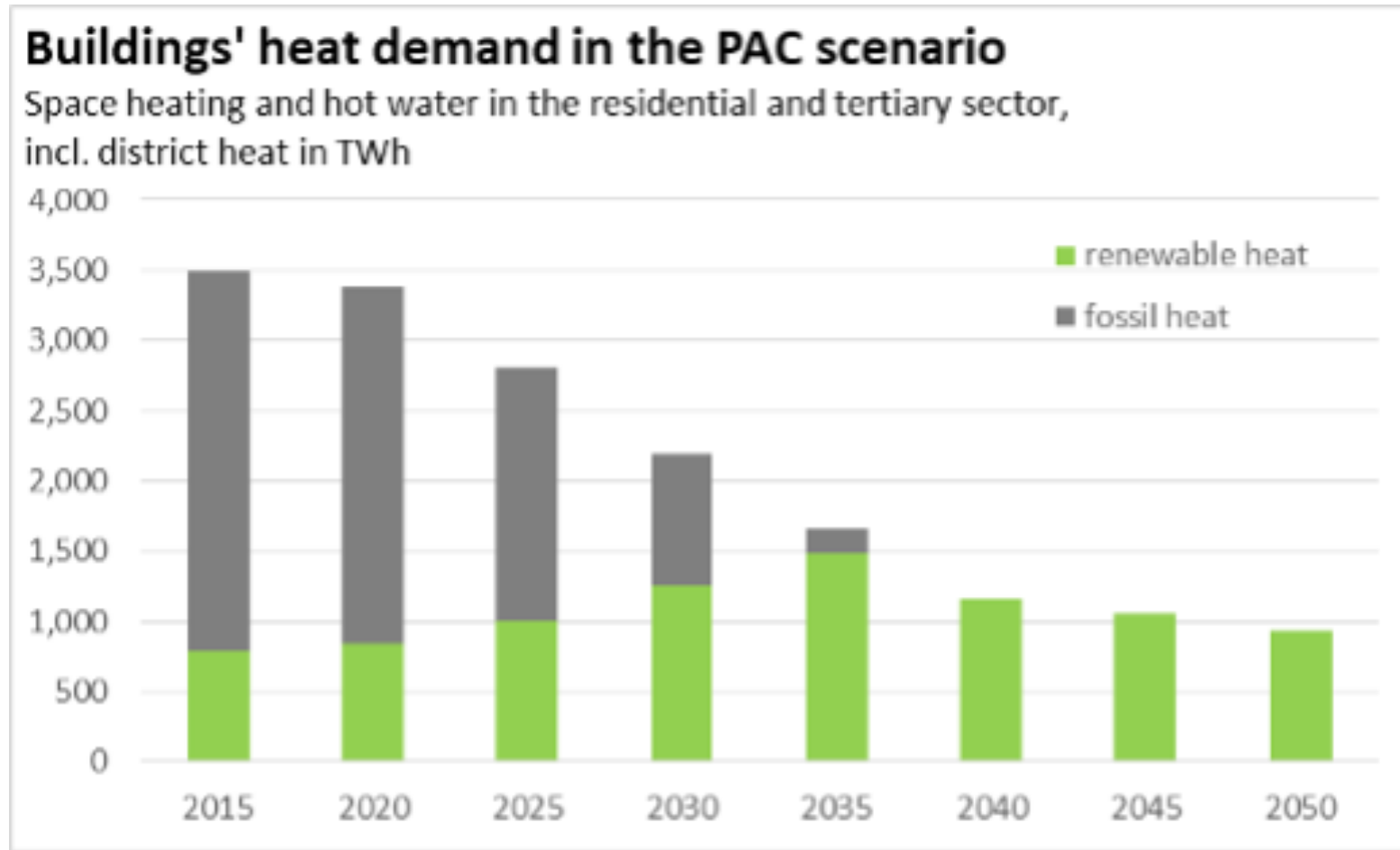


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Paris Agreement compatible (PAC) energy scenario

- Paris Agreement compatible (PAC) energy scenario – under development by *civil society organizations*, has been established to develop a future energy scenario for Europe which is compatible with the Paris Agreement
- The PAC scenario will be guided by three ambitious goals:
 - A 65% reduction in GHG emissions by 2030 (official EU target: at least 55%)
 - Net-zero GHG emissions by 2040 (Official EU Target: climate neutrality within the EU by 2050)
 - 100% renewables in Europe by 2040 in all sectors (Official target: the share of energy from RES in the gross final consumption in 2030 should be at least 42.5%)

PAC energy scenario (2)



Source: https://caneurope.org/energy_transition_buildings_factsheet/



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PAC energy scenario (3)

RE technologies for heating considered in the PAC energy scenario applicable for buildings:

- Electric heat pumps that use renewable electricity to capture ambient heat or shallow geothermal heat – will cover 80% of buildings' heat demand in 2040
- Solar thermal collectors on rooftops - will cover 5% of demand in 2040
- Solid biomass, i.e. combustion of wood waste and residues in individual boilers, while phasing out inefficient individual wood stoves by 2040



Rooftop solar Systems



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Rooftop solar Systems (2)

- A rooftop solar system, or rooftop PV system, is a photovoltaic system with solar panels generating electricity installed on the roof of a residential or commercial building or structure
- There are 3 types of rooftop solar systems
 - On-grid system - the most common type, where the systems are connected to the grid. If net metering is available, the excess electricity produced by the solar panels is used to offset the electricity bill
 - Off-grid system - the energy from the solar panels must be stored in batteries and used as needed
 - Hybrid - combining an on-grid system with a battery



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Rooftop solar Systems (3)

- The deployment of rooftop solar PV systems has increased significantly in recent years due to rapidly decreasing costs and supportive policies
- In many markets, self-consumption of electricity from PV installations is already economically more attractive than buying electricity from the grid
- According to the International Energy Agency, the number of households relying on solar energy will grow from 25 million in 2022 to more than 100 million by 2030

Rooftop solar systems in the EU

- On 18 May 2022, the European Commission published the REPowerEU package, which sets out a roadmap to end dependence on Russian fossil fuel imports. The package includes:
 - A first-of-its-kind EU Solar Strategy, which sets the following targets:
 - ✓ Adding 19 TWh (i.e. 16 to 19 GW) of rooftop solar in the first year of its implementation
 - ✓ 58 TWh by 2025 (i.e. 50.7 to 58 GW)
 - Several steps to accelerate solar deployment

Rooftop solar systems in the EU (2)

The EU Solar Energy Strategy includes:

- European Solar Rooftops Initiative
- EU large-scale skills partnership for renewable energy
- EU Solar PV Industry Alliance
- Commission's permitting package (legislative proposal, recommendation and guidance)

Rooftop solar systems in the EU (3)

- The main element to achieve the objectives of EU Solar Strategy - the introduction of a solar mandate:
 - On all new public and commercial buildings with useful floor area larger than 250 m² by 2026
 - On all existing public and commercial buildings with useful floor area larger than 250 m² by 2027
 - On all new residential buildings by 2029
 - The EU proposes to ensure that at least one renewable energy community is set up in every municipality with a population higher than 10,000 people by 2025

Rooftop solar systems in the EU (4)

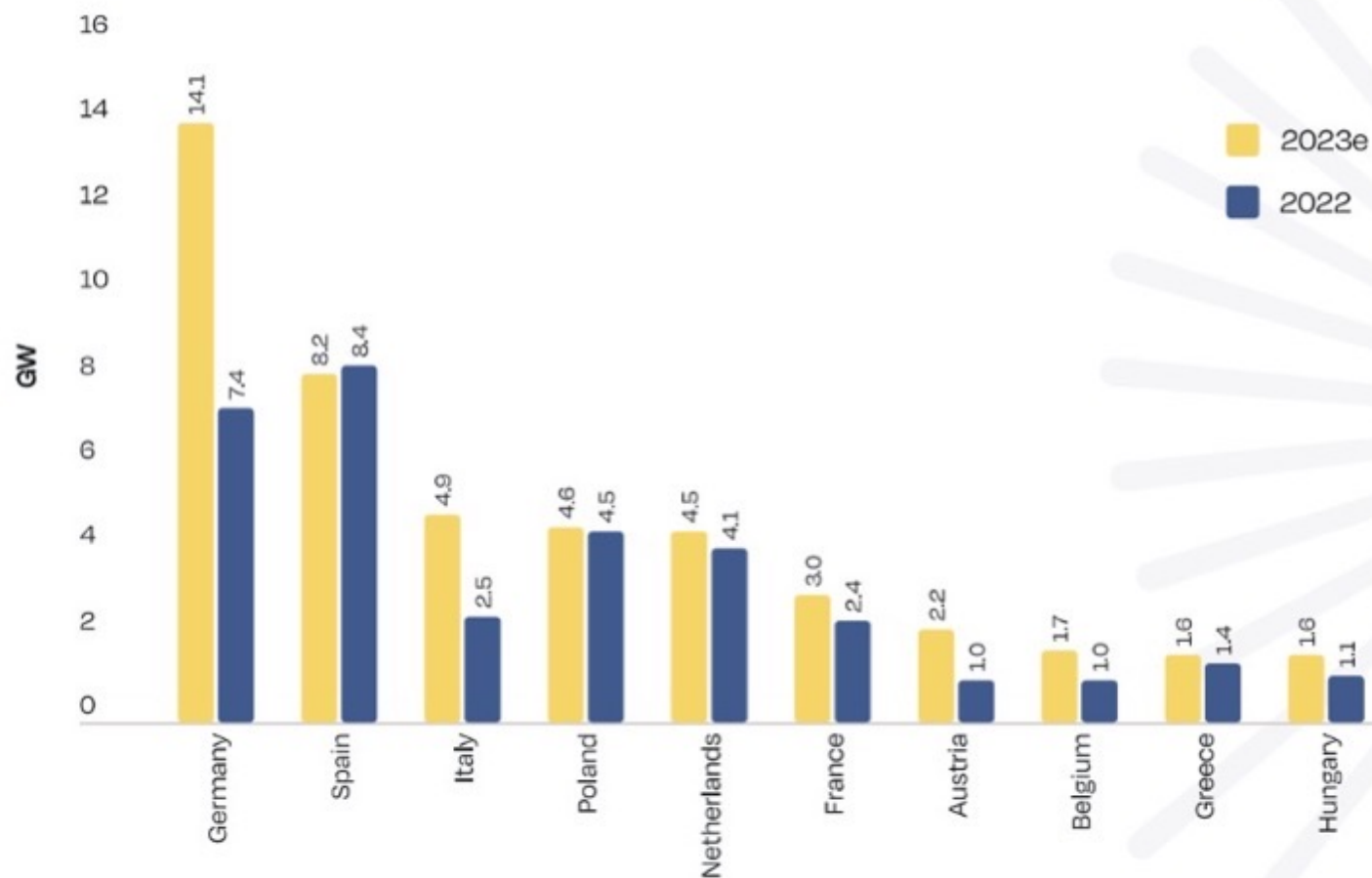
- **Steps to accelerate solar deployment**
 - In December 2022, a new EU Solar PV Industry Alliance was launched. The alliance will promote investment in large-scale factories, aiming for 30 GW of manufacturing of each key solar component, annually, by 2025 – more than six times the current average capacity of around 4.5 GW
- Both the rooftop and the utility-scale segments grew significantly with the increase of the total annual market in 2022
- But as in previous years, rooftop has remained the largest source of solar installations in the EU

Rooftop solar systems in the EU (5)

- In 2023, 55.9 GW solar PV has been installed in EU, out of which:
 - 19 GW new utility-scale PV (16 GW in 2022)
 - 37 GW rooftop PV (24 GW in 2022)
 - By countries:
 - ✓ Germany 14.1 GW
 - ✓ Spain 8.2 GW
 - ✓ Italy 4.8 GW
 - ✓ Poland 4.6 GW
 - ✓ The Netherlands 4.1 GW

Rooftop solar systems in the EU (6)

FIGURE 6 TOP 10 MARKETS 2022-2023



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