



Europe's renewable revolution

ABSTRACT

Global initiatives like COP 28 underscore the urgency of decarbonizing energy systems, driving a resounding call for embracing renewable energy sources worldwide. Europe is witnessing an unprecedented surge in renewable energy integration, with

projections indicating the addition of 475 GW of capacity between 2024 and 2028, predominantly led by solar PV and wind power. While ambitious national renewable targets and supportive policies fuel this growth, challenges persist, particularly in meeting wind energy targets due to permitting delays, grid constraints, and undersub-

scribed auctions, necessitating concerted efforts to overcome barriers and ensure Europe remains on course towards a sustainable energy future.

KEYWORDS:

renewable energy, Europe, decarbonization, sustainability, energy transition

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the pace compared to previous years, is poised to reshape the continent's energy landscape. Leading this charge are solar photovoltaic (PV) systems, accounting for over 70% of the expansion, with distributed installations taking precedence over utility-scale projects. Following closely behind is wind power, contributing 26% of the new capacity, predominantly from onshore projects.

Paving the path: National renewable targets

European Union (EU) member states are in the process of reaching a consensus on a forthcoming renewable energy goal. The objective is to achieve a renewable energy share of 42.5% for the entire bloc by 2030.

The anticipated surge in solar utility-scale installations is poised to be remarkable,

with projections indicating an addition of 140 gigawatts (GW) over the next five years, representing a staggering 94% increase compared to the previous five-year period. Simultaneously, wind capacity is set to soar by 114 GW within the same timeframe, marking a 42% increase from historical levels. This exponential growth within Europe's renewable energy sector is set to ignite a surge in demand for transformers. As utilities embark on grid expansion and modernization, they try to accommodate the additional capacity from renewables and the variable nature of this capacity, which necessitates a multidirectional flow of electricity.

Driving this surge in renewable energy capacity are the ambitious targets set by key European nations. Germany, for instance, aims to achieve 100% renewable energy by 2035, with targets of 215 GW of solar

The exponential growth within Europe's renewable energy sector is set to ignite a surge in demand for transformers

In the wake of global initiatives like COP 28, held in the UAE, the urgency of decarbonizing our energy systems has never been more palpable. Across the globe, there's a resounding call for embracing renewable energy sources as the bedrock of a sustainable future. Europe, at the vanguard of this movement, is witnessing an unprecedented surge in renewable energy integration, marking a decisive shift towards cleaner and more sustainable power generation.

Europe's renewable growth: A paradigm shift

Between 2024 and 2028, Europe is set to undergo a seismic transformation, with a projected addition of a staggering 450 GW of renewable energy capacity. This exponential growth, doubling

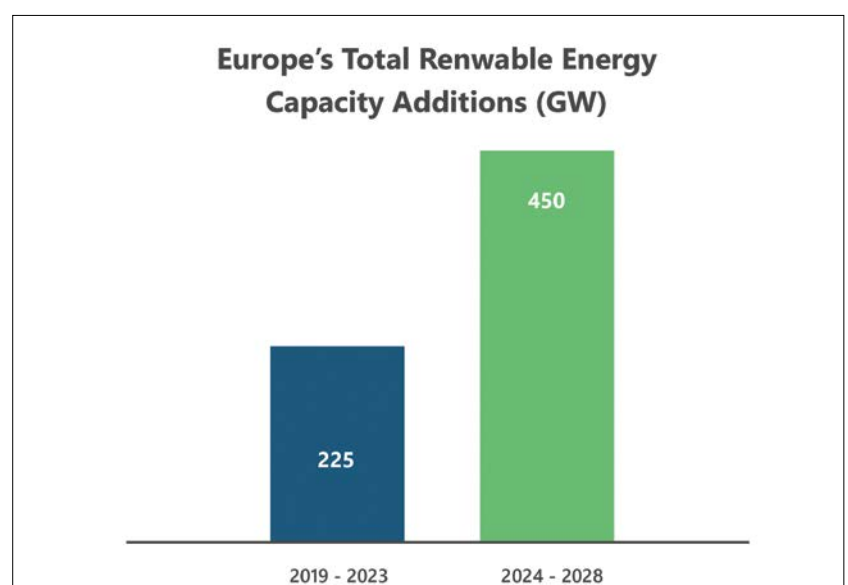


Figure 1. Total renewable energy capacity additions (GW) of Europe over two distinct periods

Source: PTR Inc.

Despite the optimistic forecast for solar photovoltaic (PV) projects, Europe faces challenges in meeting its wind energy targets

and 115 GW of wind capacity by 2030. France, the UK, Spain, and Italy are equally committed, each with their ambitious goals for renewable energy deployment by 2030.

Supportive policies have served as catalysts for this renewable energy boom. Measures such as new feed-in tariffs, tax exemptions, and enhanced auction schemes have incentivized rapid renewable deployment. For example, Germany and France have implemented policies like raising price ceilings and indexing contracts to inflation-related expenses, accommodating increased developer costs, and fostering an environment that enables renewable expansion.

Despite the optimistic forecast for solar photovoltaic (PV) projects, Europe fac-

es challenges in meeting its wind energy targets. The continent is currently not on track to achieve these objectives. This discrepancy underscores the need for concerted efforts and innovative solutions to overcome barriers hindering wind energy deployment and ensure Europe remains on course towards achieving its renewable energy aspirations.

Wind energy: Facing the headwinds

Wind Europe underscores the urgency for EU countries to ramp up their annual wind energy installation rate, aiming for over 30 gigawatts (GW) per year on average to meet the renewable energy target of 42.5% by 2030. However, the current trajectory falls short, with installations hovering around 20 GW annually.

The wind sector grapples with multifaceted challenges, chief among them being permitting and grid constraints. Delays in obtaining permissions for wind farm construction and grid connections hinder growth, with project timelines stretching to 7-10 years from inception to grid connection, stalling electricity production.

Furthermore, undersubscribed auctions for wind projects exacerbate the issue. In September 2023, the United Kingdom's offshore wind power auctions failed to attract bids, attributed to government offers not aligning with escalating costs and funding expenses. Similarly, Spain faced poor auction results in December 2022, with only 50 MW of wind projects subscribed against a planned allocation of 3.3 GW for onshore wind power and solar panels.

Rising commodities and material costs, coupled with higher interest rates and subsidy uncertainties, compound the challenges. These factors impede the expected return on investment, prompting some utilities to halt or suspend projects. For instance, Vattenfall announced the suspension of its 1.4 GW offshore wind farm development on the Dutch coast due to a 40% cost increase, negatively impacting future project earnings.

To address these obstacles, the European Union has introduced new rules aimed at simplifying permitting processes. In Germany and Spain, efforts to streamline regulations resulted in a 70% increase in permits for onshore wind projects compared to the previous year. Additionally, raising investment ceilings has led to the allocation of more capacity, fostering a conducive environment for wind energy expansion.

The symbiotic relationship between transformers and renewable energy

Europe's dynamic shift towards renewable energy sources directly influences its transformers market. With utilities endeavoring to modernize and expand their grids to accommodate the influx of renewable energy, the demand for transformers has soared. This demand is not solely driven by the additional capacity generated by renewables but also by the variable nature of renewable energy pro-

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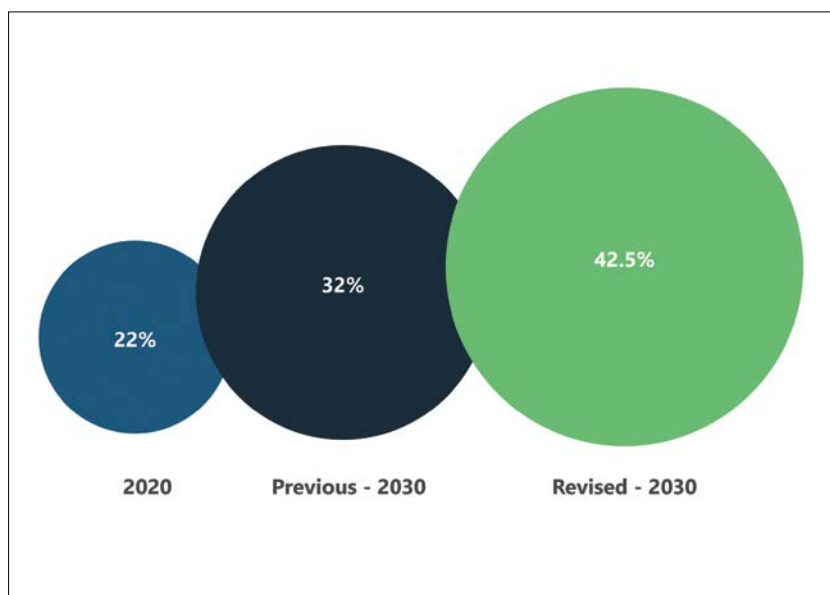


Figure 2. EU's revised RE targets by 2030
Source: EU

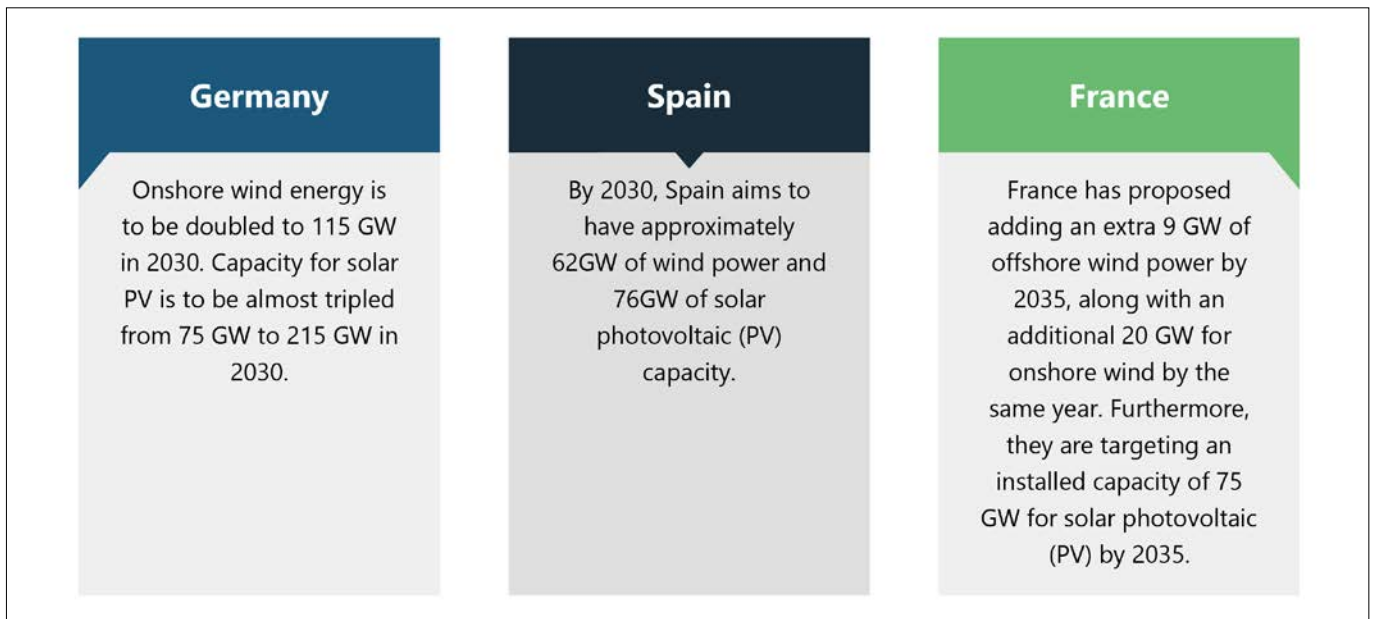


Figure 3. Key European countries' RE targets
Source: PTR Inc. and NECP 2021-2030

duction, necessitating a multidirectional flow of electricity within the grid.

Power transformers emerge as indispensable assets in facilitating this energy transition. They address critical challenges such as voltage transformation, power quality enhancement, and grid stability, enabling seamless integration of renewable energy sources into the grid infrastructure.

Moreover, the advent of digital transformers is spurred by the pressing need for more efficient and reliable grids. These transformers facilitate remote monitoring, control, and predictive maintenance, bolstering grid resilience and responsiveness to dynamic energy demands.

Additionally, ester-based transformers are gaining traction for their contributions to enhanced safety standards and environmental sustainability. With higher flash points and biodegradability, these transformers align with Europe's commitment to reducing carbon footprints and enhancing environmental stewardship.

However, the pivotal role of transformers in the power grid comes with its challenges. Surges in demand and prolonged lead times may lead to delays in connecting renewable energy projects to the grid, underscoring the importance of efficient supply chain management and infrastructure planning to ensure seamless integration of renewable energy sources into the grid.

Transformers emerge as linchpins of the current energy transition, ensuring availability and efficiency, which is crucial for powering Europe towards a sustainable, renewable future

Conclusion: A clean energy future beckons

Europe's renewable energy transition is not merely a trend but a fundamental reshaping of its energy landscape. While solar PV projects spearhead the revolution, addressing challenges in wind energy deployment

is paramount. Prompt policy interventions are needed to streamline permitting processes, improve auction mechanisms, and mitigate investment risks. As transformers emerge as linchpins in this transition, ensuring their availability and efficiency is crucial for powering Europe towards a sustainable, renewable future.

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