

Scenario Outlook and System Adequacy Forecast 2011–2025

Main Findings

Key Points

Europe is on track to deliver Renewable Energy Sources (RES) and electricity carbon reduction targets whilst maintaining adequate generation capacity. Analysis carried out by ENTSO-E is the first detailed assessment of the impact of adoption by Member States of their National Renewable Energy Action Plans (NREAPs) on the adequacy of generation margin throughout the period 2011 – 2020¹.

The RES share in meeting electricity consumption at ENTSO-E level is estimated to be 38 % while at EU level is estimated to reach 36 % in 2020². Electricity from non-fossil fuel sources is set to deliver carbon reductions of between 26 % – 57 % at EU level compared to 2009. At the higher end of this estimate, relying on anticipated advances in generation technology, electricity will deliver the total European 2020 carbon reduction target of 20 %.

Scenario Analysis and Scenario EU 2020

The Scenario Outlook & Adequacy Forecast (SO&AF) incorporates two Europe-wide 'bottom up' scenarios (Conservative and Best Estimate) developed by Transmission System Operators (TSOs) to help calculate transmission system requirements and the likely adequacy of generation in ENTSO-E Europe. In addition to the scenarios conventionally used, a 'top-down' scenario 'EU 2020' was prepared using the NREAPs' projections for RES developments and on TSO estimations of advances in other technologies. The NREAPs have been provided by Member States to provide concrete roadmaps towards the attainment of the EU climate and energy policy targets.

This document discusses the 'top-down' scenario and its impact on the generation adequacy of the European power system and the attainment of the EU energy policy targets.

Generation Adequacy

Net Generating Capacity (NGC) is used to describe the generation connected to the system at a given time. The total NGC for whole ENTSO-E is increasing until 2020 driven mainly by RES; which NGC is projected to increase from 288 GW in 2011 to 512 GW in 2020. Nuclear and non-renewable hydro power plants (pure pumped storage power plants) are

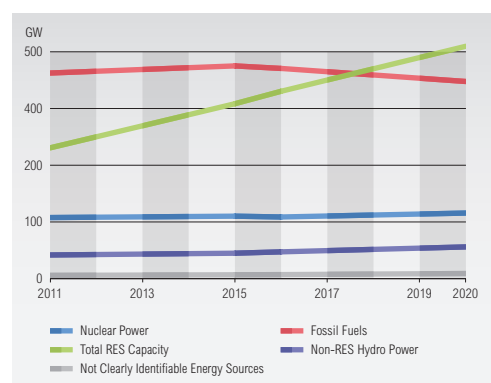


Figure 1:
ENTSO-E total Net Generation Capacity breakdown,
Scenario EU 2020, winter evening reference point

increasing slightly during the forecasted period. The NGC of fossil fuels is expected to increase until 2015 (+3 % rate) and falls after that year to approximately 435 GW by 2020 (-7 % rate).

The decrease of fossil fuelled generation in 2020 is a direct consequence of the continuously growing capacity of RES expected and, to a limited extent, the entry into force of the Large Combustion Plants Directive in 2015 for EU countries. Finally, the energy consumption at the ENTSO-E level is growing at a fairly constant and smooth rate exceeding 3.500 TWh before 2020.

Generation Adequacy at Key Points in the Period

A power plant cannot be assumed to be available to run 100 % of the time. Taking into account the unavailability of a power plant for any reason a Reliable Available Capacity (RAC) is derived as part of the NGC. The Remaining Capacity (RC) on a power system is the difference between the RAC and the load.

RC is therefore that part of NGC available to the system to cover any unexpected load variation and unplanned outages at a reference point. In addition, the Adequacy Reserve Margin (ARM) is the part of NGC that should be kept available at all times to ensure the security of supply for the whole period each reference point represents.

¹ Energy research Centre of the Netherlands: Published a report (12/13/2010) presented an overview of all renewable energy data that have been published in the National Renewable Energy Action Plans (NREAPs) so far.

² ENTSO-E includes more member countries than are in the EU. To see ENTSO-E country members area follow the link <https://www.entsoe.eu/the-association/members/>

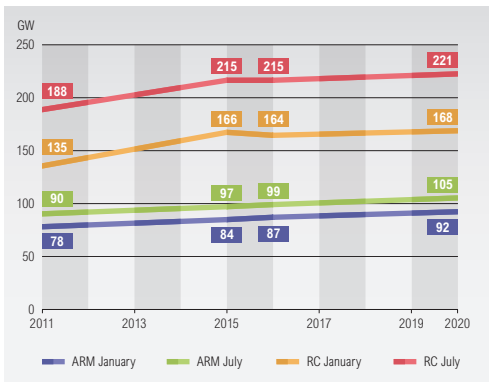


Figure 2: ENTSO-E RC and ARM comparison, Scenario EU 2020

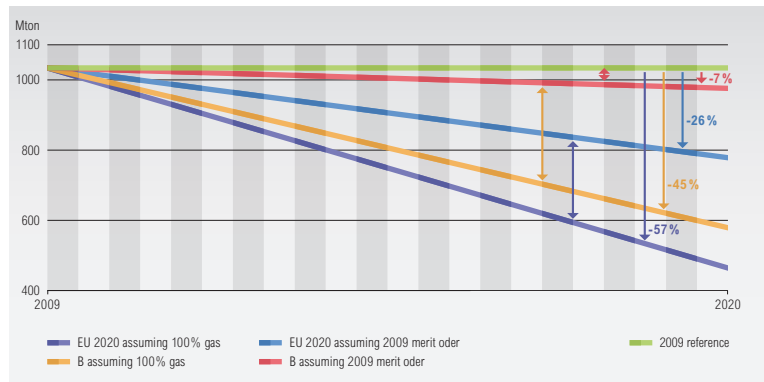


Figure 3: CO₂ emissions indicator percentage at EU level

Generally speaking, generation adequacy is ensured when the difference between RC and ARM is positive. Figure 2 shows that generation adequacy is maintained for the monitored period throughout the ENTSO-E area.

Focus on RES

The increase in RES capacity as a result of different support schemes on national or European level is noteworthy, reaching 512 GW in 2020 from 288 GW in 2011. Wind generation dominates the technology mix (219 GW in 2020) followed by hydro (163 GW), solar (87 GW), and biomass (39 GW). Hydro capacity shows a moderate increase in capacity compared to the growth provided by the other RES sources. Off-shore wind farms are becoming more important within the total wind installed capacity (22% in 2020 compared to only 3% in 2011).

CO₂ Emissions Reduction

The CO₂ emissions reduction in electricity production is estimated between 26% and 57% for the EU in case of the EU 2020 scenario compared to 2009. The 57% reduction represents the theoretical maximum cutback given the projected RES capacity levels as it assumes that the non-RES production will have CO₂ content equivalent to those of gas units. The 26% reduction on the other hand is calculated on the basis of rough approximations for CO₂ content levels in 2009 for non-RES technologies. Given the above assumptions, prudent interpretation of the results is advisable.

Nevertheless, both the 57% and the other boundary scenario's 26% reductions are substantial and illustrate how the electricity sector can significantly contribute to reducing total CO₂ emissions in the European Union.

Benefits of Transmission Networks

The NREAPs provided by the Member States confirm that electricity is the key to delivering RES and carbon reduction targets. Forecasts produced by ENTSO-E show that the RES share in meeting electricity consumption will reach 36% at EU level by 2020 with CO₂ emissions in the electricity sector reduced much more than 26% when compared to emissions in 2009. Therefore electricity is a significant contributor to meeting European RES and CO₂ targets for 2020.

ENTSO-E studies confirm that power systems in the European Union maintain adequate power margins during the transition to RES under the scenario EU 2020. The geographical distribution of RES makes effective and adequate transmission the foundation for delivering NREAPs. The 2012 TYNDP will use this SO&AF to provide a comprehensive assessment of the transmission infrastructure required to meet the generation derived from this outlook of the power system in 2020.

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