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Elia Group publishes "*Roadmap to Net Zero*", our vision on building a climate-neutral European energy system by 2050

- Our study provides energy system insights and defines focus points for an efficient energy transition as we head towards 2050.
- The results are relevant for Europe as a whole, the entire energy sector and for policymakers.

BRUSSELS – BERLIN | Tremendous efforts from across society are required to fight global warming. And yet, uncertainty remains about the necessary policies and the roadmap that can lead us to net zero. It is this uncertainty that triggered our present Elia Group study, which focuses on the electricity system and includes insights into three of its most important dimensions: energy balance, flexibility and adequacy. Based on these key insights, we identified different focus points that should be considered on the road to 2050.

What could a decarbonised European energy system look like in 2050? Does Europe have sufficient renewable energy sources (RES) to fully decarbonise? How will we balance demand and supply in a high RES system and keep the lights on during longer periods with little or no wind and sun?

This new Elia Group study addresses these and many other questions. We considered them from a European perspective, whilst zooming in on our home countries, Germany and Belgium.

To understand how the electricity system might work in 2050, we explored three dimensions of the European electricity system: **energy balance**; **flexibility**; and **adequacy**. Following this, we investigated two distinct transformation pathways to net zero (see Figure 1 below).

FIGURE 1: THE THREE DIMENSIONS OF THE CLIMATE-NEUTRAL ENERGY SYSTEM IN 2050 (LEFT) AND PATHWAYS (RIGHT) WHICH WERE INVESTIGATED.

1. ELEC-pathway: Europe's final electricity demand in 2050 is assumed to increase by 70% compared with today's demand as a result of strong electrification.

2. MOL-pathway: Europe's final electricity demand in 2050 is assumed to increase by 30%, accompanied with a higher share of 'green molecules' in the final energy consumption.

1. ENERGY BALANCE INSIGHTS

Europe is short on the renewables it needs to achieve net zero by 2050. Our analysis reveals that there will be insufficient domestic RES to cover its total energy demand. While Europe will have sufficient RES to cover its direct electrification needs, imports of green molecules from other continents will be required.

Europe's direct electricity demand in 2050 can be met, but only if we accelerate annual renewable expansion by a factor of three, increase efficiency and build more interconnectors.

FIGURE 2: STRONG ELECTRIFICATION OF END USE (AS UNDER THE ELEC-PATHWAY) SAVES UP TO 1,800 TWH AT THE EUROPEAN LEVEL COMPARED TO THE MOL-PATHWAY. DIRECT ELECTRICITY DEMAND UNDER THE ELEC-PATHWAY INCREASES BY 70% COMPARED TO TODAY'S DEMAND. A TRIPLING OF TODAY'S RES EXPANSION RATE IS NEEDED TO MEET THIS DIRECT ELECTRICITY DEMAND.

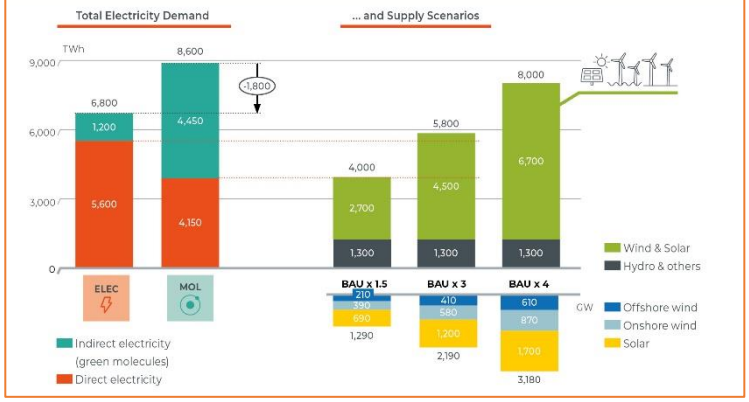

Figure 2 shows that the total electricity demand under the MOL-pathway is 1,800 TWh higher than under the ELEC-pathway. This is equivalent to the annual production of about 400 GW of offshore wind or three times today's electricity demand in Germany.

Note: BAU = Business As Usual

2. FLEXIBILITY INSIGHTS

RES are inherently intermittent, causing daily, weekly and seasonal fluctuations in energy supply. A well-designed RES system will be able to manage these fluctuations in an efficient way.

Our second finding is quite surprising: you don't need large-scale amounts of green molecules to cope with seasonality. To maintain the balance and cope with fluctuations from renewables, you need a well-designed system.

- **Long-term fluctuations** can be minimised with a good balance between wind (generating more energy in winter) and solar energy (generating more energy in summer), avoiding a seasonal mismatch between power supply and demand.
- **Mid-term fluctuation** can manage by increasing interconnectors, which reduce the impact of local RES supply dips.
- **Daily fluctuations** can be covered by unlocking end user flexibility available in electric vehicles (EVs), heat pumps and home batteries.

3. ADEQUACY INSIGHTS

Even with a high level of interconnection and end user flexibility in the power system, a significant volume of 'dispatchable' capacity will be needed in 2050 to cover periods lasting up to several weeks with low RES supply and high demand. These periods will mainly occur in winter.

There will still be times of stress - like in winter - when demand is high but renewable production is low, meaning that dispatchable capacities will be needed. There is a significant need for dispatchable capacities, but they will only be activated for a limited period of time in 2050, since periods with sustained low RES infeed will be both rare and short.

The insights outlined above led us to identify a number of focus points that are outlined below. These focus points complement other well-known measures, such as the need for enabling significant efficiency gains to reduce primary energy needs.

FOUR FOCUS POINTS ON THE WAY TO NET ZERO

1. Ensure an efficient use of RES Potential

To make optimal use of the continent's scarce RES capacity, Europe needs to set up frameworks for partnerships between countries with different levels of RES potential.

2. Triple the speed of RES expansion

Policymakers at all institutional levels need to focus on measures that create the right investment framework and reduce the throughput time of RES expansion projects and the realisation of the necessary grid infrastructure.

3. Electrify, electrify, … Now!

The electrification of mobility, heating and end-use appliances should be prioritised, as this is key for reaching climate neutrality. Electrification unlocks flexibility, which further facilitates the integration of RES, and reduces the final energy demand.

4. Avoid lock-in effects for efficient decarbonisation

The use of green molecules to replace grey hydrogen and decarbonise sectors where electrification is not an option, is a priority.

> *"At Elia Group, we sincerely hope that the key insights and proposed focus points in our study will be relevant for Europe as a whole, for stakeholders from across the energy sector and for policymakers. We see a crucial role for the latter to play, since they can influence investment conditions, infrastructure planning and market arrangements. With the publication of this new Elia Group study, we want to contribute to defining the most efficient way to reach net zero by 2050. We hope you enjoy the read!"*
>
> **Chris Peeters, CEO of Elia Group**

WANT TO LEARN MORE? SCAN THIS QR CODE TO READ THE COMPLETE ROADMAP TO NET ZERO

About Elia Group

One of Europe's top five TSOs

Elia Group is a key player in electricity transmission. We ensure that production and consumption are balanced around the clock, supplying 30 million end users with electricity. Through our subsidiaries in Belgium (Elia) and north and east Germany (50Hertz), we operate 19,276 km of high-voltage connections, meaning that we are one of Europe's top 5 transmission system operators. With a reliability level of 99.99%, we provide society with a robust power grid, which is important for socioeconomic prosperity. We also aspire to be a catalyst for a successful energy transition, helping to establish a reliable, sustainable and affordable energy system.

We are making the energy transition happen

By expanding international high-voltage connections and incorporating ever-increasing amounts of renewable energy into our grid, we are promoting both the integration of the European energy market and the decarbonisation of society. We also continuously optimise our operational systems and develop new market products so that new technologies and market parties can access our grid, thus further facilitating the energy transition.

In the interest of society

As a key player in the energy system, Elia Group is committed to working in the interest of society. We are responding to the rapid increase in renewable energy by constantly adapting our transmission grid. We also ensure that investments are made on time and within budget, with a maximum focus on safety. In carrying out our projects, we manage stakeholders proactively by establishing two-way communication channels between all relevant parties very early on in the development process. We also offer our expertise to different players across the sector in order to build the energy system of the future.

International focus

In addition to our activities as a transmission system operator, we provide various consulting services to international customers through our third subsidiary, Elia Grid International (EGI). Elia (in Belgium) is also part of the Nemo Link consortium, which operates the first subsea electrical interconnector between Belgium and the UK.

The legal entity Elia Group is a listed company whose core shareholder is the municipal holding company Publi-T.

MORE INFORMATION: eliagroup.eu

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