Report 2022

Belgium

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In 2023, the federal government began planning the first Belgian offshore wind farm in the North Sea. In 2004, the government created a 156-km² area in the Belgian Exclusive Economic Zone (EEZ) in international waters for wind farms. The first wind turbines were installed in this area in 2009.

All eight wind farms in the Belgian North Sea have been fully operational since December 2020. This means 2022 is the second year with fully installed generation capacity for the Belgian North Sea power plant.

During these two years, the annual production of green electricity has remained relatively constant: in 2022, a total output of 6.6 TWh was injected into the Belgian power grid.

This corresponds to the annual electricity needs of nearly 2 million households, or about 8% of the total electricity demand in Belgium. Construction works are expected to remain at a standstill for a few years while awaiting the official tender procedure for new developments in the more western Princess Elisabeth Zone, where space is already allocated for doubling wind capacity at sea to 4.5GW.

Table 1. Key national statistics 2022: Belgium

Total (net) installed wind power capacity	4.7 GW
Total offshore capacity	2,262 GW
New wind power capacity installed	0 GW
Decommissioned capacity (in 2022)	0 GW
Total electrical energy output from wind	11, 94TWh
Wind-generated electricity as percent of national electricity demand	14,3%
Average national capacity factor	34,9% (estimated by average capacity)
Target	
National wind energy R&D budget	

Development beyond the second offshore wind zone will be complex. Belgium is exploring the option of interconnection with or developing new offshore wind capacity in the waters of other countries.

In February 2021, Belgium and Denmark signed a memorandum of understanding for developing an electricity interconnector from an energy island Denmark plans to build in the North Sea. The interconnector could connect Belgium to large offshore wind farms off the Danish coast. Power from the wind farms would be transmitted to both countries.

On 18 March 2022, the Belgian Council of Ministers decided to speed up the energy transition with a view to greater energy independence. Therefore, the federal government is accelerating its efforts to produce renewable energy and has decided to:

- Reduce as much as possible the thresholds (distances to radars, height restrictions, surface area and location of exclusion zones, etc.) that exist for the rollout of renewable energy (a potential increase of 1.5 GW of renewable energy);
- Take the necessary initiatives to have the first wind turbines in the Princess Elisabeth zone operational in 2027;
- Investigate how offshore capacity in the North Sea can be optimized and further expanded to an installed capacity of up to 8 GW;
- Increase the production of renewable electricity in the first zone by conducting a study into repowering, in combination with the previous point, this concerns a potential increase of 2GW;
- Take the lead in setting up a fast-track task force together with North Sea neighbouring countries for the accelerated development of an offshore wind network;
- Accelerate investment in solar energy at sea (floating solar). This concerns a potential of 1GW.

Market Development

Targets and Policy

By the end of 2022, Belgium's total land-based installed capacity had reached 2476,1 MW.

In 2022, the 399 wind turbines, spread over nine offshore zones, produced approximately 6.77 TWh. This corresponds to the annual electricity demand of almost 2 million households, or 8% of the total electricity demand in Belgium.

Regarding offshore wind power, the transmission system operator (TSO), Elia, is obligated to buy green certificates from generators at a minimum price set by federal legislation. This system was established in 2002 and amended in 2014 and 2016. The regulator, CREG, must approve purchase agreements. Purchase obligations apply for 22 years but may not exceed the depreciation period.

Progress and Operational Details

Offshore wind-generated electricity began in 2009 and progressed rapidly to 2,262 MW in 2020, comparable to the capacity of the two largest nuclear reactors (Doel 4 and Tihange 3) combined.

Land-based wind capacity remained low until 2004 when the installed capacity and production started to double year after year from 96 MW in 2004 to 2476,1 MW in 2022.

Matters Affecting Growth and Work to Remove Barriers

Work to remove barriers to new wind energy projects continues. Such barriers include spatial planning limitations (i.e., military, aeronautical, or traffic-related restrictions) and lengthy permitting procedures. The federal administration has created a 'one-stop-shop' to simplify and speed up the license procedures.

Lengthy legal procedures also affect the sector. For example, cases where local communities appealed against the construction of wind energy facilities have taken years to resolve. Such legal matters could potentially be avoided by involving the local communities more closely at the project planning stage and by offering them the opportunity to participate in investments through cooperatives.

The main issue affecting the growth of wind is the number of judicial appeals filed at the State Council, which has severely hindered the development of land-based wind farms in the Flemish and Wallonia regions. Belgium has limited space for wind energy compared to many other countries.

RD&D Activities

National RD&D Priorities and Budget

Several key technologies that Belgium wants to invest in for the future have been put forward via the Steering Group of the SET-Plan.

With some research projects like GREDOR or SmartWater in the Walloon Region, Belgium is developing services that will ease the future integration of a larger share of wind energy by modernizing the electric grid and offering capacity for clearly tailored storage.

The Flemish Region supports RD&D in offshore- and land-based wind via several projects. In 2022, the cluster Innovative Business Networks (IBN) Offshore Energy project (embedded in OWI-Lab [1], the Belgian RD&I expertise collaboration in onshore and offshore wind setup in 2017) initiated, set up and executed multiple RD&I projects in offshore wind power.

The IBN-Offshore Energy [2] is a network of Flemish companies innovating in offshore energy (offshore wind, floating wind, wave and tidal). The activities of IBN Offshore Energy are oriented towards facilitating innovation in this area. The support team's mission is to support the process from the back-of-the-envelope idea toward a project plan for an innovative product or service ready to be executed.

The projects that have been set up focus on six key topics in which industry-driven R&D is set up:

1. Smart) structures and foundations (incl. new materials, structural integrity topics, etc.).
2. Innovative electro-mechanical equipment and connections (incl. new drivetrains, electrical power conversion, etc.).
3. Using robots (UAVs, drones, cobots, etc.).
4. Offshore energy in the grid (incl. storage, ancillary services, power quality, etc.).
5. Installation of offshore energy.
6. Emerging offshore energy technologies (floating wind turbines, wave and tidal energy, etc.).

National Research Initiatives and Results

Results achieved by OWI-lab:

- Successful demonstration of structural health monitoring solutions for monitoring dynamic parameters, e.g., frequencies and damping of offshore foundations, and solutions for monitoring load/lifetime parameters, e.g., bending moments, damage equivalent loads, and damages of offshore foundations.
- Successful windfarm wide load assessment using AI and machine learning algorithms demonstrated on C-power jacket foundations.
- New 4G/5G IOT sensor set-ups and AI techniques set-up in Belgian offshore wind farms as part of the ICON Supersized 4.0 project.

Test Facilities and Demonstration Projects

- Ongoing tests on the Belgium windfarms, Northwester, and Norther for the validation of advanced structural health monitoring strategies using IOT sensors and optical fibres in the framework of the DBC ICON Supersized project.
- Ongoing measurement campaigns for improving the soil-structure interaction models/digital twins within the Northwester 2 and Rentel windfarms in the framework of the ETF project Windsoil and DBC SBO Soiltwin project.
- New large icing spray test array installed in Sirris/OWI-Lab large climatic test chamber as part of EU H2O2 Newskin project.
- New humidity testing feature in Sirris/OWI-Lab large climatic test chamber.

New projects

- H2020 platoon: digitizing the energy sector.
- EU DOCC-OFF project Digitalization of Critical Components in OFFshore wind turbines.

Collaborative Research

International collaboration is essential to accelerate necessary investments in research and development in renewable energy, such as wind. To that end, the Federal Public Service of Economy joined the IEA Wind Technology Collaboration Program in 2015.

Belgium is active in several Tasks of IEA Wind (11, 31, 27, 41, 34, 46, 48 and 50).

Impact of Wind Energy

Economic Benefits

The wind energy sector creates excellent economic opportunities. Being active in this industry has also created export opportunities. In addition to wind farm constructions, there is a need to build grid infrastructure, grid connections, and connections with neighbouring countries.

The impact on employment is substantial, and jobs are created in the design, construction, maintenance, and replacement of wind farms, in addition to the permanent workforce, often in areas with few job opportunities. The offshore wind industry supports about 16.000 jobs in Belgium, including export activities, construction and operations, and maintenance. More specifically, the offshore wind industry will continue to provide significant direct and indirect contributions to the energy sector, which has about 50,000 direct jobs today.

Environmental Impact

In addition to adding sustainable energy capacity, offshore wind energy developments also increase biodiversity, specifically organisms such as sea corals and plants. Offshore wind turbine foundations form artificial reefs, where mussels and other sea life grow. The foundations also contribute to the growing fish population, providing many opportunities to further develop the marine culture in the Belgian North Sea.

Next Term

Belgium is preparing for the tender for the second offshore zone. The tender is expected to be launched in 2024.

References

[1] OWI Lab website.
https://www.owi-lab.be/

[2] BN Offshore Energy project.
https://www.offshoreenergycluster.be/index_en.php