The socio-economic impact of 6 GW offshore wind development in Belgium

MORE DEPLOYMENT OF WIND ENERGY AT SEA DELIVERS MAJOR ECONOMIC AND CLIMATE BENEFITS FOR BELGIUM

Executive summary – Confidential Draft

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Study performed by CLIMACT – October 2020
Authors Michel Cornet, Julien Pestiaux, Quentin Schobbens and Charles Vander Linden

Summary written by Belgian Offshore Platform

This study builds on a previous study conducted by CLIMACT with Prof. Thierry Bréchet (UCL) and Prof. Johan Eyckmans (KULeuven). Information was gathered during interactions with key stakeholders from the industry and offshore wind experts:
Participated in the previous study: AGORIA, ALSTOM, BOP, EDORA, ELIA, DEME.
Participated in this study: BOP, OTARY, PARKWIND.

Offshore wind energy: cornerstone of the energy transition

Supported by strong industrial and political actions, the Belgian offshore wind industry completed the installation of 2,262 MW offshore wind capacity by the end of 2020. The first offshore wind energy zone in the Belgian North Sea has been fully built within the set timeframe, an important milestone for the offshore wind industry in Belgium. From 2021 and onwards, the fleet of 399 offshore wind turbines will generate about 10% of the average yearly electricity demand in Belgium. **Despite the small available area at sea, Belgium is currently positioned at the fifth place worldwide in terms of installed offshore wind capacity and after Denmark at the second place worldwide in terms of offshore wind production per inhabitant.**

The costs and benefits generated by these offshore wind park investments have been analysed in the study "The socio-economic impact of the offshore wind industry in Belgium" carried out in 2017 by CLIMACT[1]. The results of this assessment in terms of jobs creation, impact on Gross Domestic Product and trade balance, etc. positively confirmed the relevance and merits of policy choices that supported the development of offshore wind in Belgium.

Today, **wind energy at sea is an essential cornerstone of the sustainable energy transition**. Given the great importance of offshore wind energy in the European Green Deal and the European recovery policy[2], it is now more than ever time to raise the deployment ambitions of this technology which can generate green electricity on a large scale and at the same time offer interesting macro-economic opportunities for Belgium in the post-Covid recovery.

The second offshore wind zone allocated by the Maritime Spatial Plan of 2020, will allow to double the installed capacity in the Belgian North Sea to 4,400 MW. After the completion of the construction works of the wind park Seamade in December 2020, it is expected that new constructions of offshore wind parks will remain suspended for 5 years or more, as according to the planning of the competent authorities the allocation of the first 700 MW of new offshore wind capacity is only expected in the second half of 2024, with new constructions following a couple of years later.

Two trends have drastically changed in the last couple of years. First, the cost of offshore wind developments has been reduced much faster than expected – making **offshore wind one of the most competitive zero carbon technologies**. Second, the new development plans and targets for offshore wind deployment in Europe and worldwide have become much more ambitious thanks both to the cost reduction and policy signals such as the one given by the EU commission in the EU Green Deal (2019) and related Offshore Wind Strategy (2020).

[1] https://www.belgianoffshoreplatform.be/app/uploads/The-socio-economic-impact-of-the-belgian-offshore-wind-industry.pdf
[2] https://ec.europa.eu/energy/topics/renewable-energy/eu-strategy-offshore-renewable-energy_

This study attempts to answer two questions that arise from the abovementioned elements:

1. To what extent do the policy decisions in terms of new development and the economic changes in terms of costs and international capacity projections affect the socio-economic impact?
2. Would a more ambitious development of offshore wind in the Belgian North sea make sense from a macro-economic point of view and hence consistently support Belgium in its objectives for the post-Covid recovery of the economy as well as for its national climate and renewable energy objectives?

An input-output multiplier approach has been used to develop the offshore wind energy socio-economic model. This methodology is a standard approach, used by the Federal Planning Bureau. This work leverages the multipliers which they have developed, using 2015 data[3].

Offshore wind development in Belgium and abroad

Two possible scenarios for Belgium

Currently 2,262 MW of offshore wind capacity is installed in Belgium. The combined annual production of the offshore wind parks represents approx. 8 TWh, equivalent to about 10% of the total electricity demand in Belgium. This corresponds to the annual electricity demand of about 2.200.000 homes or almost half of the Belgian households.

Two scenarios are analysed to assess the differences in socio-economic impact according to the level of ambition of developments in Belgium. The scenarios are described below and illustrated in Figure 1.

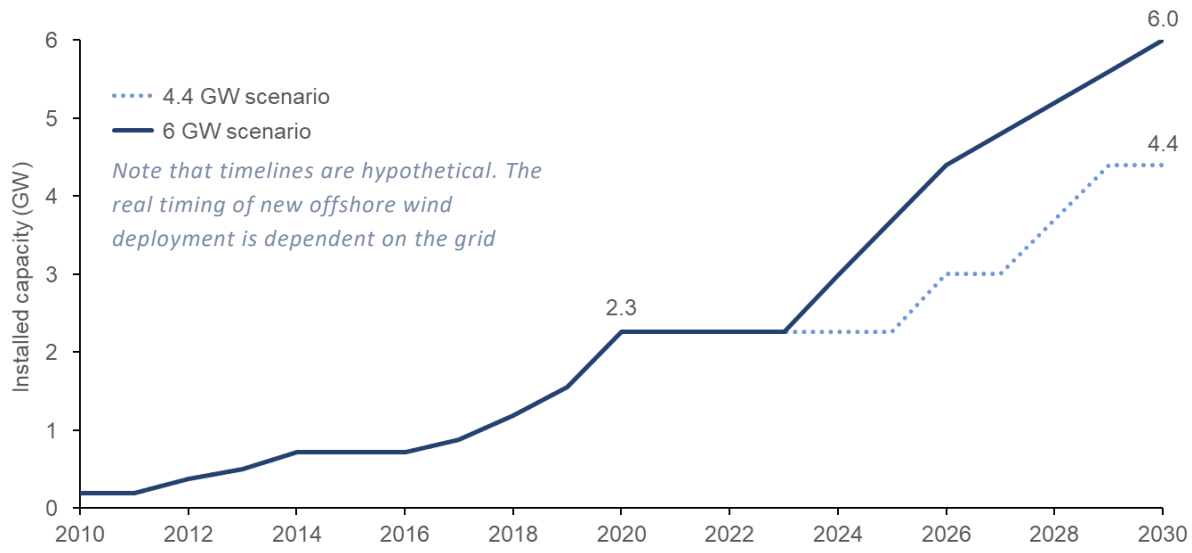
- The first scenario, called '4.4 GW scenario' is in line with the federal development trajectory for offshore wind development: ~3,000 MW is expected by 2026-2027 and ~4,400 MW by 2028-2029. This scenario considers a halt of new installations in Belgium from 2021 until 2025, then ~700 MW new installations in 2026, 2028 and 2029.
- The second scenario, called '6 GW scenario', explores an increased capacity in the Belgian North Sea with ~6,000 MW by 2030. The halt in new offshore wind developments is expected to last until 2023, then ~700 MW are installed annually from 2024 until 2026. As of 2027, ~400 MW are built every year until 2030.

Note that the timeline in the two scenarios is hypothetical. The real timing of new offshore wind deployment is dependent on the grid connection capacity.

Although the benefits of further offshore wind developments will last beyond 2030, it should be noted that the economic impact is analysed only up to 2030 in this study.

[3] https://www.plan.be/publications/publication-1845-en-input_output_tables_2015

Figure 1: Cumulative installed capacity over time in Belgium (GW)



More offshore wind energy is required to cut carbon emissions by at least 55% by 2030

In its "Strategy for Renewable Offshore Energy" as announced on November 19th 2020, the EU is increasing its climate targets for 2030. The 21th of April 2021, it has been agreed upon by the EU Council, the EU Commission and the EU Parliament to put into law the objective of a collective, net greenhouse gas emissions reduction target of at least 55% by 2030 compared to 1990 levels and to reach climate neutrality in 2050 at the latest[4]. Renewable energy will play an important role in this more ambitious EU climate law. This includes the generation of more energy at sea and from the sea. The EU is already a world leader in offshore renewable energy generation and related technologies. Further development in a cost-effective manner is possible. The European Commission's renewable offshore energy strategy will ensure this and maintain the EU's leadership in this sector.

The dropping cost of offshore wind energy and the growing enthusiasm of political and industry leaders for the development of renewable energy has led to a significant revision of offshore wind turbine installation projections in Europe and elsewhere in the world. For the expectations in Europa and the rest of the world, this study builds on several analyses (from the IEA[5], IRENA[6] and the European Commission[7]). The average of these projections is used as a single scenario for development outside of Belgium.

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[4] https://www.consilium.europa.eu/en/press/press-releases/2021/04/21/european-climate-law-council-and-parliament-reach-provisional-agreement/
[5] International Energy Agency, Offshore Wind Outlook 2019, Paris, 2019
[6] IRENA, Future of wind - Deployment, investment, technology, grid integration and socio-economic aspects, Abu Dhabi, 2019
[7] European Commission, State of the Union Address by President von der Leyen at the European Parliament Plenary, Brussels, 2020

In this report, the cumulative installed capacity for Europe (excluding Belgium) rises towards 85 GW by 2030, and the corresponding capacity for the rest of the world to 199 GW. These estimates have a significant impact on macro-economic indicators such as GDP.

Impact of offshore wind on renewable energy and climate targets

6 GW offshore wind energy can avoid up to 4% of the Belgian carbon emissions

The more ambitious '6 GW scenario' can avoid an extra 10 to 28 million tonnes of greenhouse gas emissions in the period 2020 to 2030 compared to the '4.4 GW scenario', and from 2031 and onwards 2.2 to 6.1 million tonnes extra CO_{2e} emissions avoided per year.

The '6 GW scenario' can avoid the cumulative emission of 47 million tonnes of CO_2e between 2020 and 2030, considering that the offshore wind power replaces gas-fired electricity production[8]. This means that in this period an extra 10 million tonnes of CO_2e can be avoided compared to the '4.4 GW scenario' (see Figure 2). From 2031 and onwards, the difference between the scenarios in annual avoided emissions amounts 2.2 million tonnes of CO_2e (see Figure 3). This corresponds to 1.5% of Belgian 1990 emissions (146 $MtCO_2e$)[9], the yearly carbon footprint of around 140.000 inhabitants (16 tCO2e/year per inhabitant) of Belgium or the annual emissions of 950.000 private cars (2.3 tCO2e/year per car[10]).

As the electricity grids and markets are coupled within Europe and carbon emissions are regulated under the European Emission Trading System (EU-ETS), offshore wind production in Belgium might also, under specific market conditions, replace coal-fired electricity produced outside Belgium. Considering that all offshore wind power in Belgium replaces coal-fired electricity[8], the '6 GW scenario' can avoid the emission of 130 million tonnes of CO_2e between 2020 and 2030. The cumulated difference in greenhouse gas emissions between the two scenarios in this period reaches 28 million tons of CO_2e. From 2031 and onwards, the difference between the scenarios in annual avoided emissions amounts 6.1 million tonnes of CO_2e. This is equivalent to 4.2% of Belgian 1990 emissions, the yearly carbon footprint of around 380.000 Belgian citizens or the annual emission of 2.6 million private cars.

In reality offshore wind electricity will replace a mix of coal-fired and gas-fired electricity production. The indicated numbers can thus be considered as a range for the emission saving potential of offshore wind in Belgium.

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[8] Emission factors can be found in ADEME Bilan Carbone Database v8.3.1. Only the combustion is considered. The emission factor for coal-based electricity is 0.969 kg CO_2e/kWhe and 0.351 kg CO_2e/kWhe for gas-fired plants.
[9] Note that emissions reductions in Belgium from the energy sector are regulated under ETS, are included in the Belgian greenhouse gas inventory, but are not accounted for in the national reduction objectives
[10] https://www.transportenvironment.org/sites/te/files/publications/2018_04_CO2_emissions_cars_The_facts_report_final_0_0.pdf

Figure 2: Cumulative avoided emissions per scenario (Million tons of CO_2e)

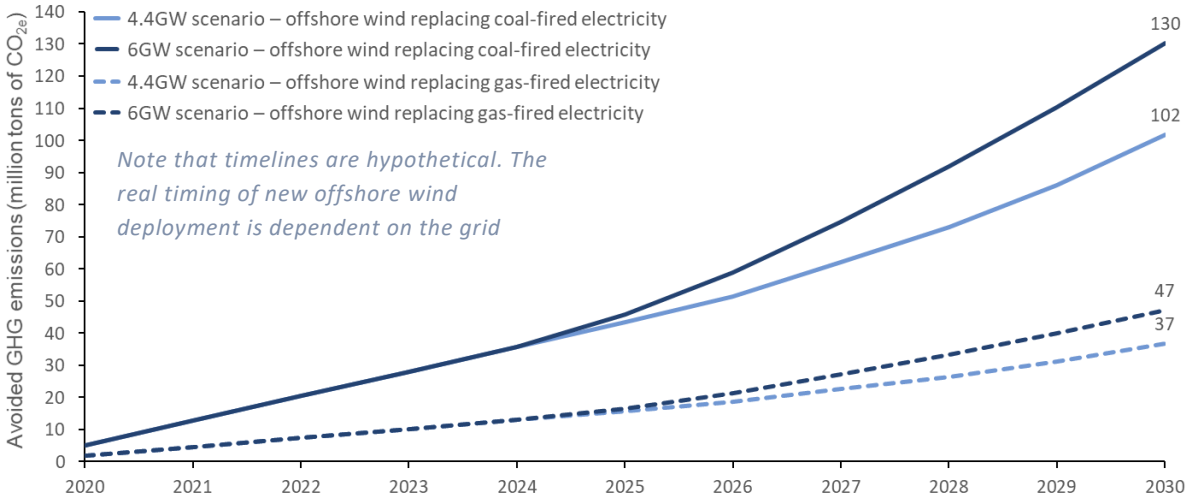
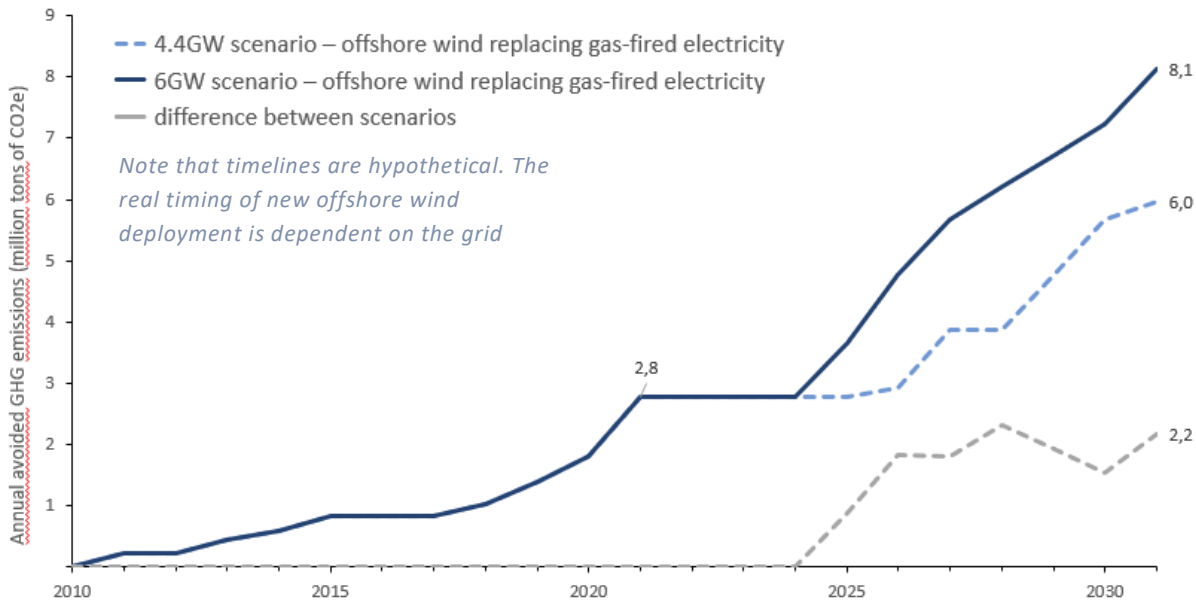


Figure 3: Annual avoided emissions per scenario (Million tons of CO_2e)



Impact of further offshore wind development on Gross Domestic Product (GDP) and job creation

6GW offshore wind development in Belgium contributes ~1.5 billion in GDP by 2030

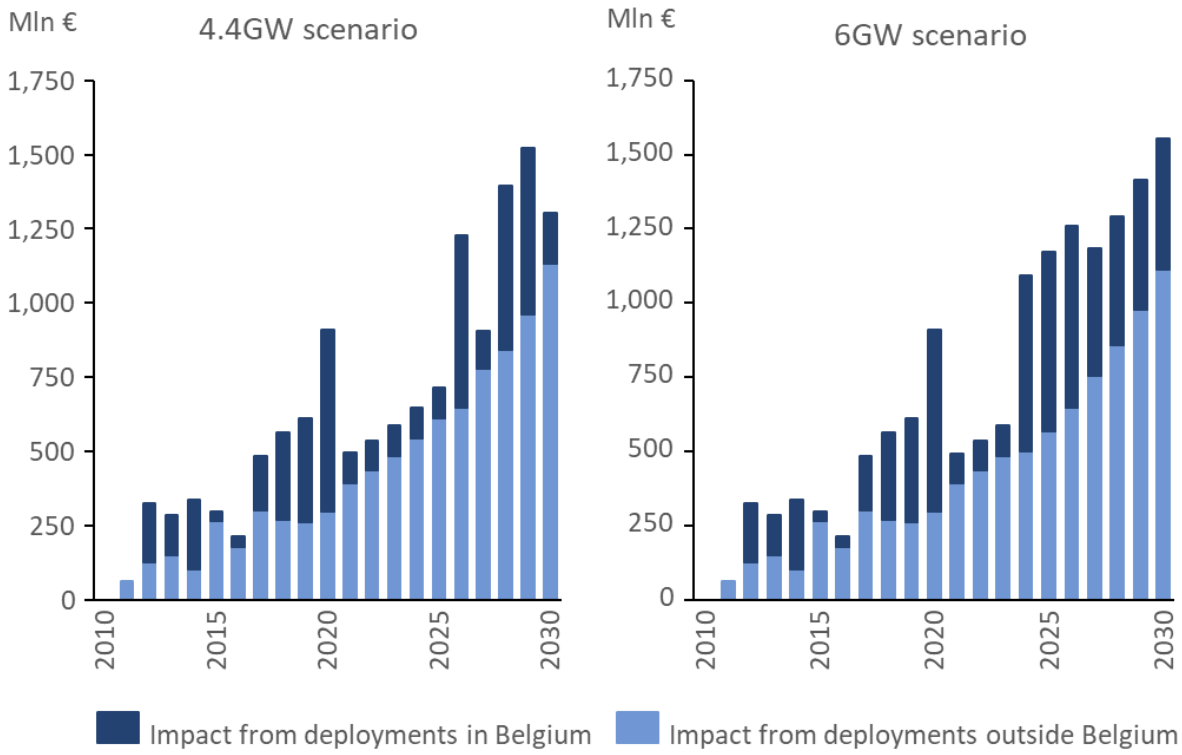
The added value of the offshore wind industry across the entire value chain is taken into account in the GDP indicator, through direct activities (from companies directly involved in the construction of wind farms) as well as indirect activities (from suppliers to the wind farms). In addition, the GDP impact indicator includes an estimate of the economic spin-offs related to the development of offshore wind energy outside of Belgium.

The analysis indicates **a total impact of offshore wind development on the GDP of Belgium of € 1 to 1.5 billion per year** (Figure 4), starting in 2024 (hypothetical given the uncertainties today of the grid connection capacity), for the '6 GW scenario'. The cumulative total of the amounts to € 10 billion for the '6 GW scenario' and € 9 billion for the '4.4 GW scenario'. The difference between the scenarios of € 1 billion is not negligible.

The impact of the standstill of offshore wind construction in Belgium as of 2021 is significant: around €400 million loss in GDP is expected each year compared to 2020 levels.

In the long run the origin of the contribution to the GDP differs strongly: as of 2027, a much greater share of the GDP is expected to come from offshore wind farms built outside Belgium. To optimally capture this export potential of knowhow, **it is important for the Belgian offshore wind companies to be able to further develop their expertise in the home market, so they can keep their international top position in the cleantech sector.**

Figure 4: Total Belgian GDP impact from deployment in Belgium, Europe and worldwide - source of added value (in million Euro in that year)



Note that timelines are hypothetical. The real timing of new offshore wind deployment is dependent on the grid connection capacity.

6 GW offshore wind deployment in Belgium creates 10,000 new jobs by 2030

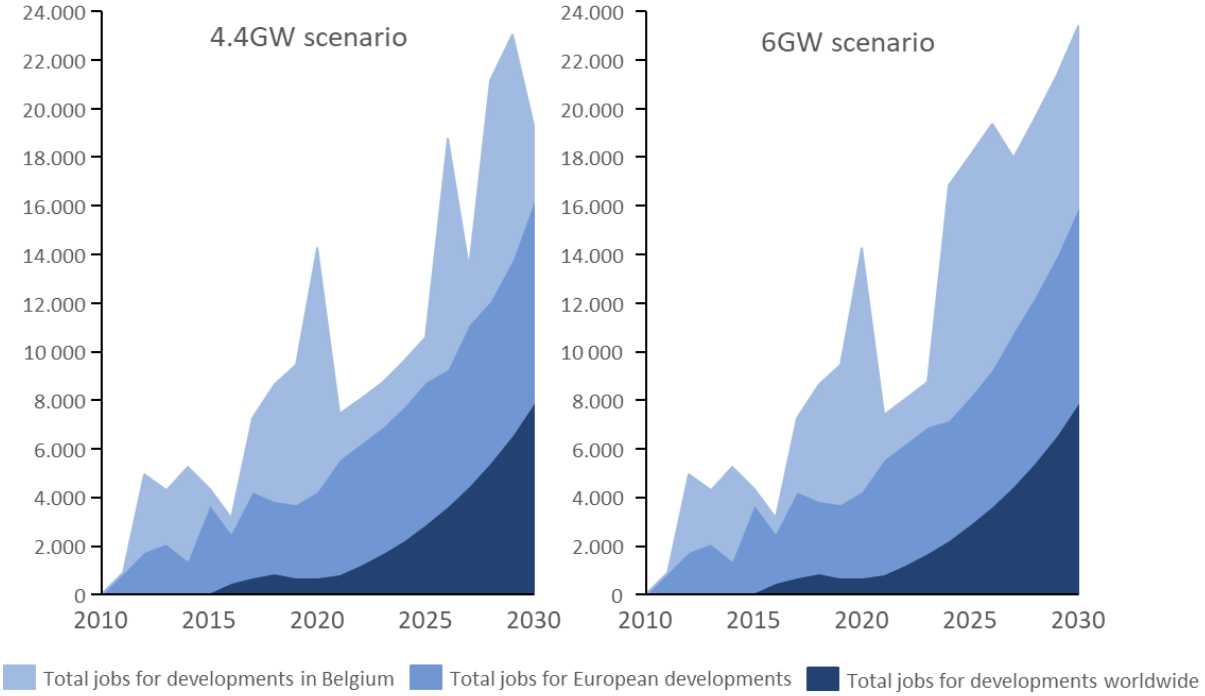
The standstill in construction of offshore wind in Belgium starting in 2021 causes a drop in employment in Belgium of over 6000 jobs (see Figure 5).

6 GW offshore wind development can support **the creation of ten thousand jobs in Belgium between 2020 and 2030**, increasing the total number of workers in the sector from ~14.000 in 2020 to ~24.000 by 2030.

Job creation is generated by **high value-added technical services** (e.g. engineering) with nearly 40% of jobs created, and also construction, operations, maintenance, transport, administrative and financial services (each creating 10 to 15% of jobs). These jobs are divided over deployments in Belgium, deployments in Europe and deployments in the rest of the world.

International deployment will create more jobs in Belgium than previously expected especially as of 2027. To capture these employment opportunities it is essential to maintain the technological and industrial top position of the Belgian companies across the value chain.

Figure 5: Total employment effect in Belgium from deployment in Belgium, in Europe and in the rest of the world
(in jobs in that year, including construction and operations, both direct and indirect impact)



Note that timelines are hypothetical. The real timing of new offshore wind deployment is dependent on the grid connection capacity.

Conclusions

6 GW deployment of wind energy at sea delivers major economic and climate benefits for Belgium

This socio-economic impact study of offshore wind developments in Belgium analysed two scenarios to support the impact of further offshore wind development in the Belgian North Sea. A first '4.4 GW scenario' follows the existing official development plans (as decided by the federal government), i.e. 4.4 GW offshore wind energy by 2029-2030. The '6 GW scenario' explores the possibilities of an increased capacity in the Belgian North Sea of 6 GW by 2030.

The '6 GW scenario' implies a larger reduction of greenhouse gases. From 2031 and onwards **additional emission savings of the 6 GW scenario ranges between 1.5% and 4.1% of the Belgian emissions** (in 1990 levels) corresponding to the annual carbon footprint of 140.000 to 380.000 Belgian citizens.

Offshore wind developments have a positive impact from a macro-economic point of view. The analysis indicates a total positive contribution of offshore wind development on the **GDP of Belgium of around € 1 to 1.5 billion per year.** In total the sector reached a level of ~14.000 jobs in 2020. 6 GW offshore wind deployment will create a need for an **additional 10.000 workers** in the sector in the next decade, to reach 24.000 jobs towards 2030.

The impact of the new constructions in Belgium as of 2021 is significant: compared to 2020 levels a difference of around €400 million in GDP is expected for every year without new developments; employment drops with around 6000 jobs which are only recovered after restarting new developments in Belgium; developments abroad do not fully compensate this dip in jobs in the coming years.

The impact from deployment outside of Belgium will become the lion share of the total potential for the Belgian economy in the late 2020s. Therefore it is **essential to anchor the technological and industrial top position of the Belgian offshore wind industry** to be able to capture these opportunities. **Accelerating the offshore wind developments in Belgium could contribute to capturing this potential.**

Appendix 1: Key assumptions

Note that timelines of the scenarios are hypothetical. The real timing of new offshore wind deployment is dependent on the grid connection capacity.

Factor	6 GW scenario	4.4 GW scenario	Source
Offshore capacity	4,400 MW in 2026 6,000 MW in 2030	3,000 MW 2026 4,400 MW 2030	NECP 2030 Federal development plan Elia Federal Planning Bureau "EE/RES" scenario (RES 24% in 2020) Green Deal report Wind Europe (2019)
Inflation	2%	2%	FPB/BNB
Discount rate	2%	2%	CLIMACT assumption
Tax rate on earnings	30.9%	30.9%	Pr. Brechet & Pr. Eyckmans (2017)
Tax rate on job income	Included in earnings tax	Included in earnings tax	Pr. Brechet & Pr. Eyckmans (2017)
Avoided social security costs (for reduced unemployment)	25,000 $€_{2020}$ / Job	25,000 $€_{2020}$ / Job	Pr. Brechet & Pr. Eyckmans (2017)
Electricity price	40$€_{2020}$ per MWh (assumed stable over time in real terms)	40$€_{2020}$ per MWh (assumed stable over time in real terms)	Expert discussions: 40 MWh is the average day-ahead electricity price of 2019 given by CREG 2019. The day-ahead electricity price is the one used when Belgium has to import electricity.
Lifetime of wind turbines	25 years	25 years	Expert discussions

BOP | BELGIAN OFFSHORE PLATFORM

www.belgianoffshoreplatform.be
info@belgianoffshoreplatform.be
+32 (0) 2 514 52 15