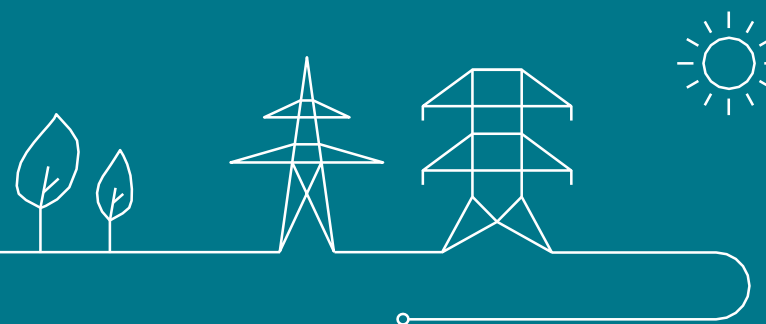


Workshop grid design MOG 2

14.10.2022

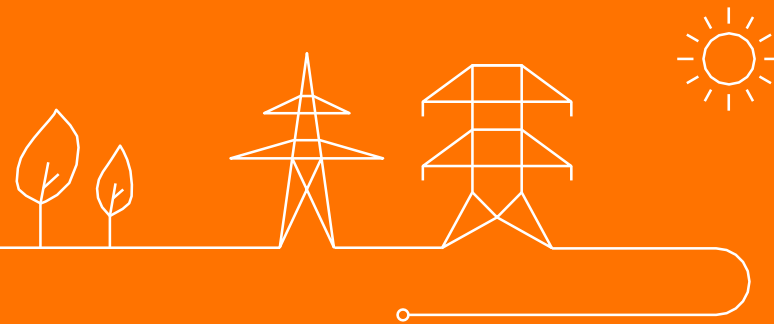
Market & grid design - workshop

Bertrand Vosse



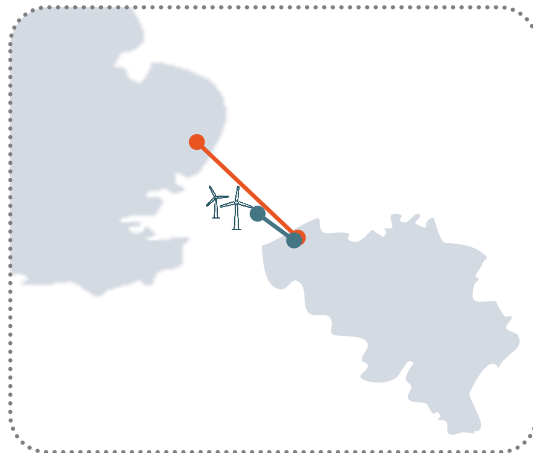
Why is Nautilus connected to the Princess Elisabeth island ?

FDP 2024-2034



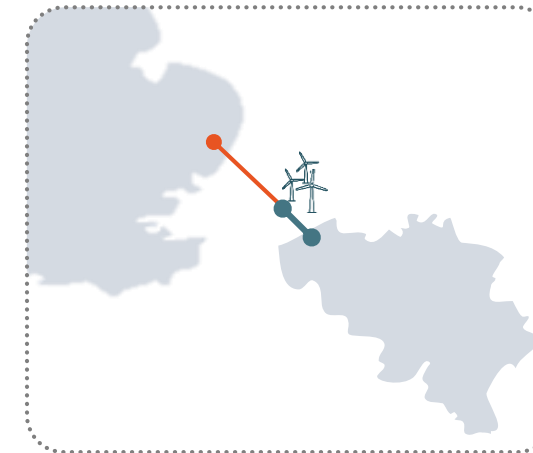
Scopes of Nautilus and MOG2 have evolved these last years

From MOG2 : 1,75 – 2,1 GW
Nautilus Point-to-Point Interconnector



Federal Development
Plan 2020-2030
(2019)

To MOG2: 3,15 – 3,5 GW
Nautilus Hybrid to the Princess Energy Island¹



Federal Development
Plan 2024-2034
(now)



Location of the UK connection point for illustrative purposes

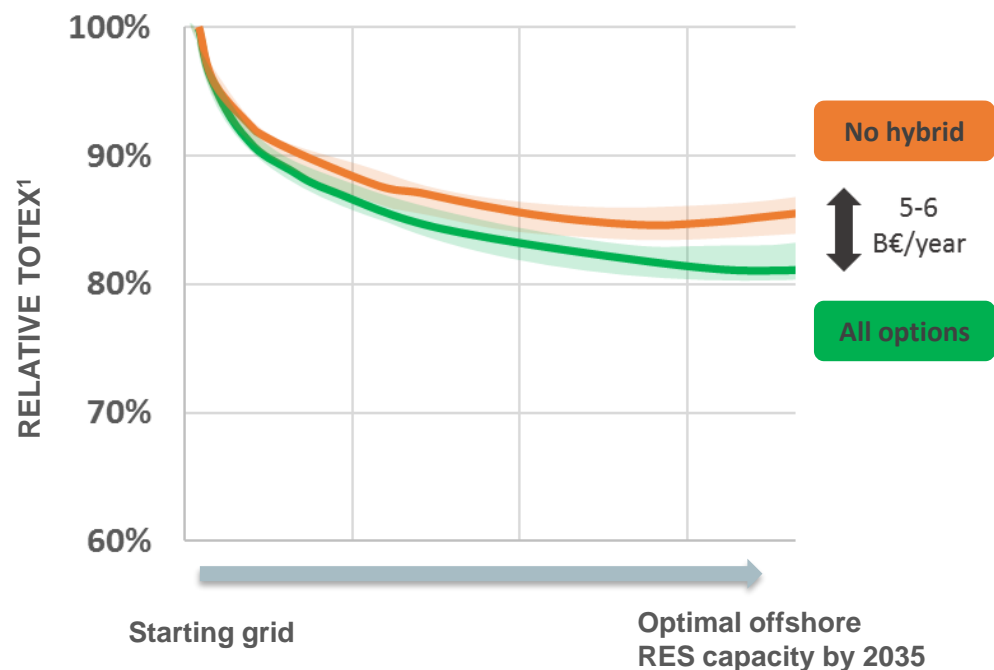


1) An alternative with UK wind connected to Nautilus is still under analysis in the UK as part of the Offshore Transmission Network Review (OTRN)



Key message from FDP 2024-2034 Identification of System Needs

Hybrid systems & meshed offshore grid facilitate additional cost savings



- ▶ **5-6 B€ / year extra cost savings** can be achieved at EU level thanks to **hybrid systems** and meshed offshore grids
 - ▶ Cheaper power system also imply **more realistic** to develop and **more environmental friendly** (less cables, less converter stations, less landing points,...)
-
- ▶ Increased **coordination** at EU level is key
 - ▶ **Future-proofness** is key to allow this coordination while not slowing down RES integration.

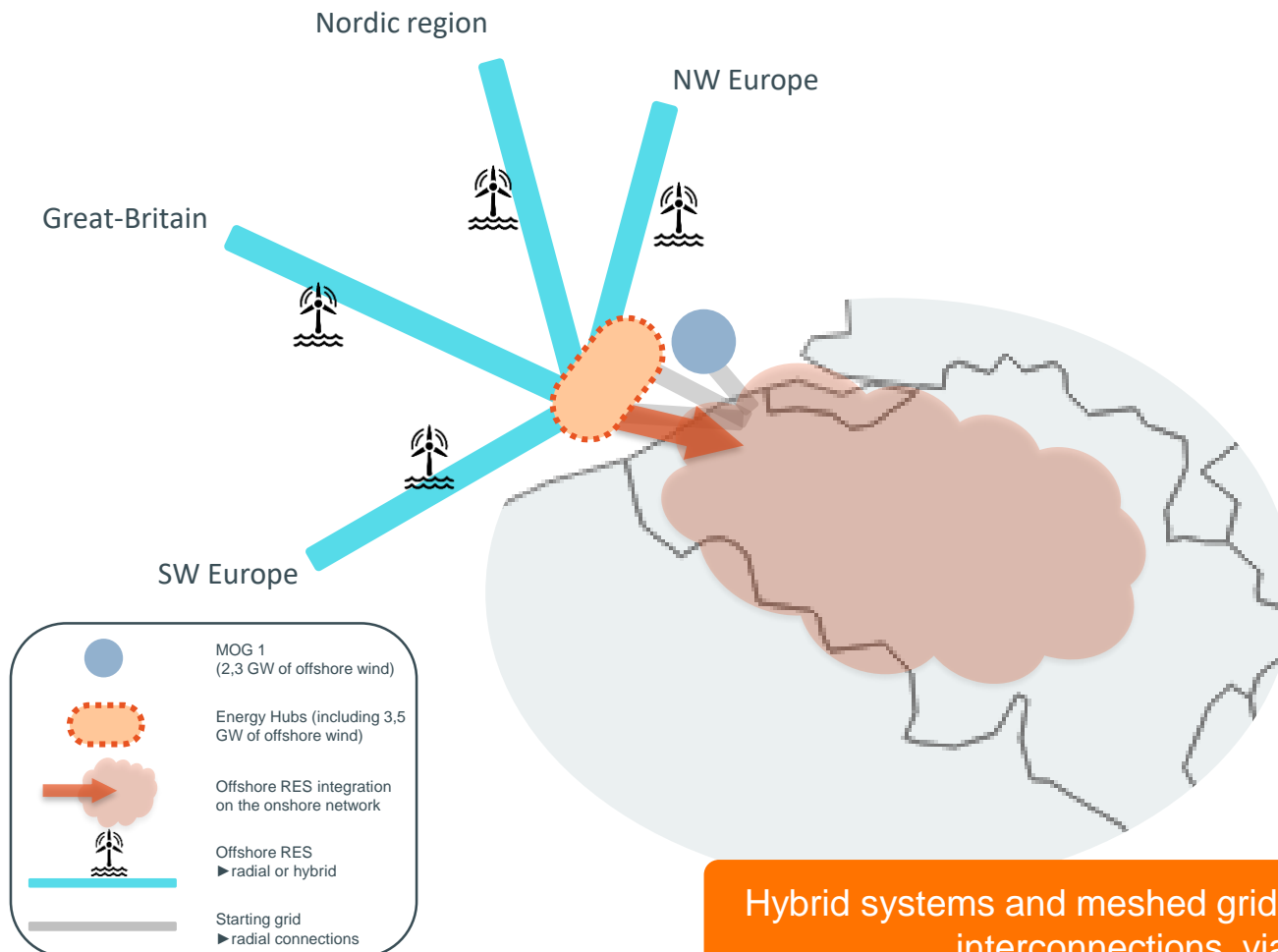


The timely development of the required technological solutions (multi-terminal HVDC, multi-vendor,...) is currently the biggest uncertainty and is an absolute condition to make offshore meshed grid happen.

⁽¹⁾ TOTEX = Operating cost of the system (fuel & CO2) + Investment cost in grid extension/RES connections
The analysis has been performed base on 1 scenario and 1 time horizon (Large Scale e-RES in 2035).

Key message from FDP 2024-2034 Identification of System Needs

Energy hub(s) off the Belgian coast are the corner stone of an efficient RES integration in EU & BE



- ▶ These **energy hub(s)** are chosen to be a major Belgian **access point¹ to the North Sea RES potential**. Doing so, RES energy is **optimally shared** between EU countries. → Benefit from decorrelation effect at EU level
- ▶ Offshore cross-border interconnections will be **complementary** to the onshore cross-border reinforcements, as soon as they have reached their full potential.
- ▶ **Reinforcement needs** are identified between these hubs and the onshore network (-> link with Backbone IoSN)

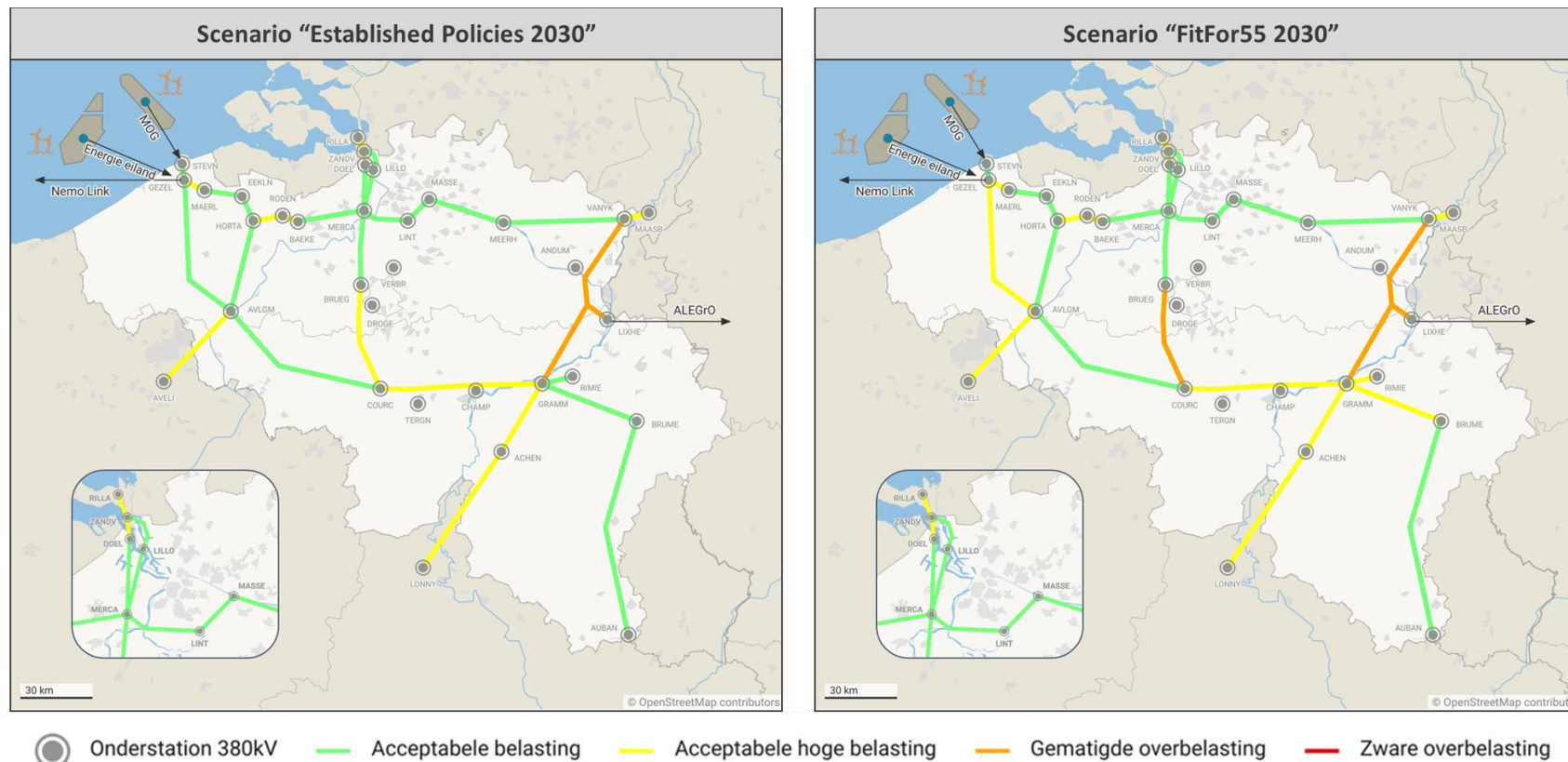
⁽¹⁾ Onshore cross border reinforcements are complementary

Hybrid systems and meshed grid allows both RES integration and new interconnections, via common infrastructure.

Key message from FDP 2024-2034 Identification of System Needs

Reinforcements needs are clearly identified on the onshore network

2030 vs. today: incl. Brabo 3, MOG II AC & DC, 1st PST Achêne, (include CCGT's Awirs & Seraing)

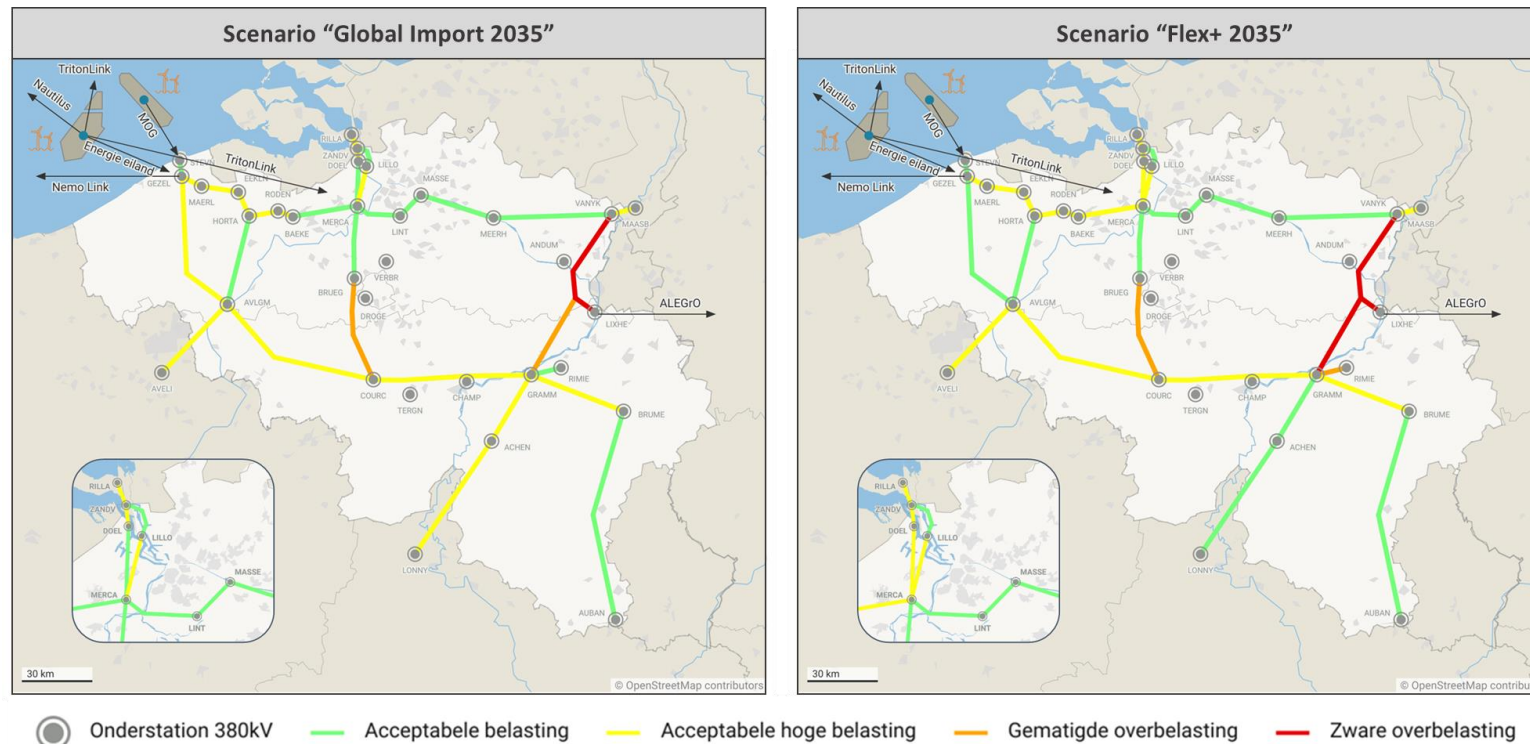


By 2030, the backbone network already reaches its limit on several axis with the Energy Island.

Key message from FDP 2024-2034 Identification of System Needs

Reinforcements needs are clearly identified on the onshore network

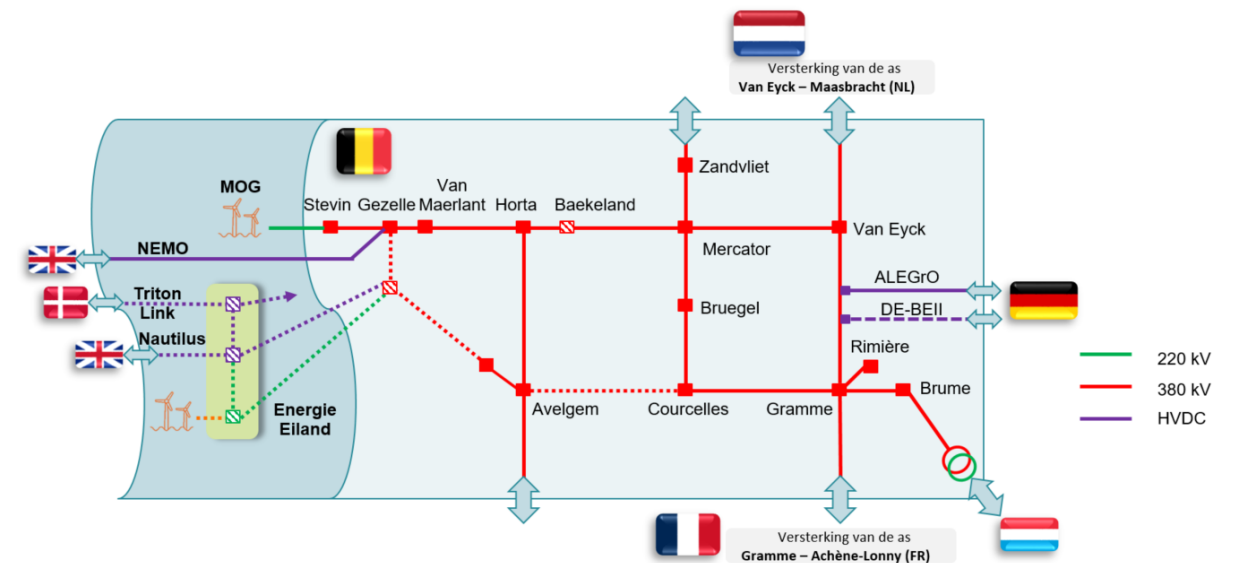
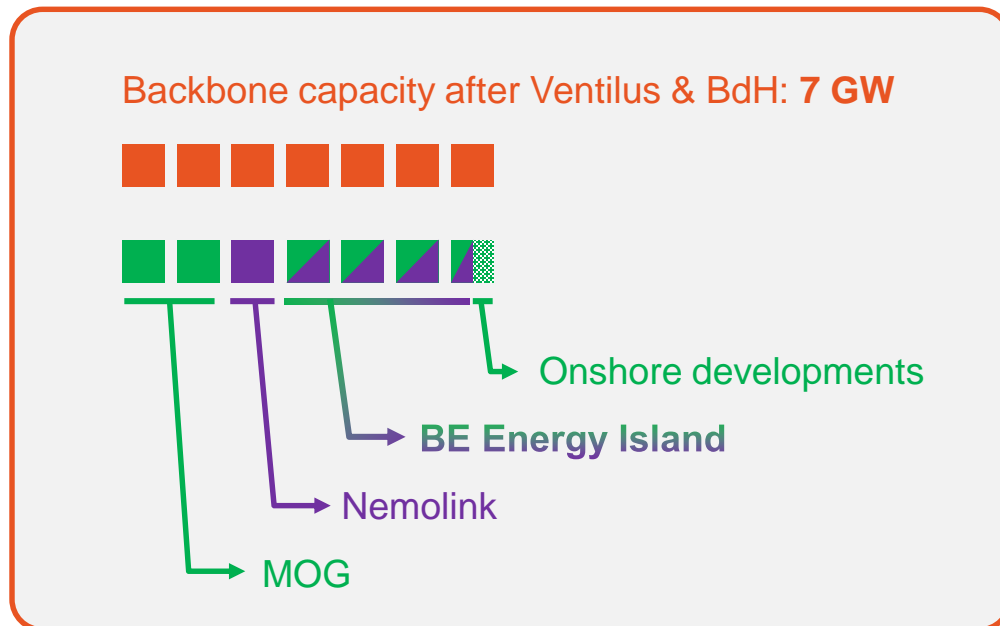
2035 vs. 2030: incl. HTLS-upgrade LAG, Triton on MERCA, Nautilus (upgrade VANYK – MAASB or BE-DE 2 not yet !!)



By 2035, with Nautilus Hybrid and Triton, even more axis are reaching their limits.

These general trends also verifies locally on MOG2/Nautilus

1. The hybrid system is the cheapest and fastest way to connect both 3,5 GW of wind in the Princess Elisabeth Zone and an interconnector with Great-Britain.
 - ▶ Ventilus and BdH provide a 3,5 GW grid hosting capacity on the coast for new offshore developments.



These general trends also verifies locally on MOG2/Nautilus

2. The hybrid system (formed by Nautilus & MOG2) allows significant savings

▶ CAPEX savings:

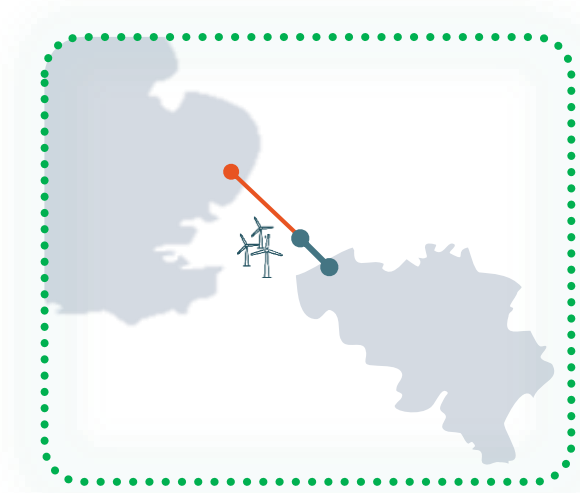
- 1 shared converter station onshore instead of 2 independent converter stations.
- 1 offshore HVDC cable system instead of 2 independent HVDC cable systems in parallel
- Additional CAPEX costs to reach a further inland connection point.

} ~ 650 – 750 MEUR

▶ OPEX savings as additional (complex) infrastructure also means additional OPEX on the whole lifetime.



VS

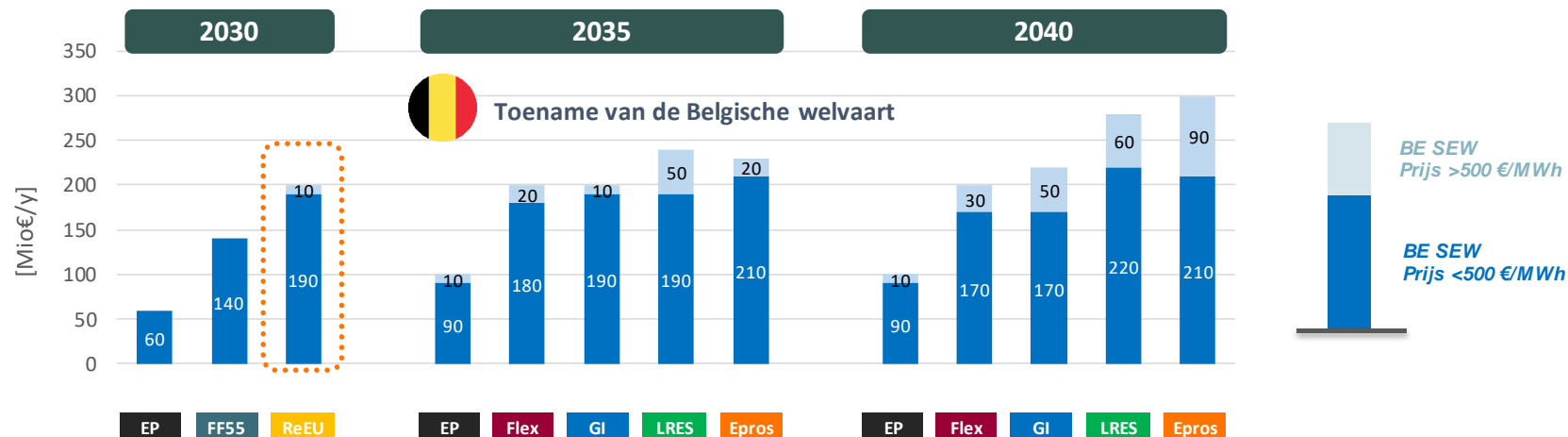


— BE Energy Island (MOG2)
— Nautilus

These general trends also verifies locally on MOG2/Nautilus

3. An early connection of Nautilus comes with significant benefits

- ▶ Benefits for Belgium of Nautilus ranging from 60 and 200 MEUR/year depending on the scenario as of 2030¹



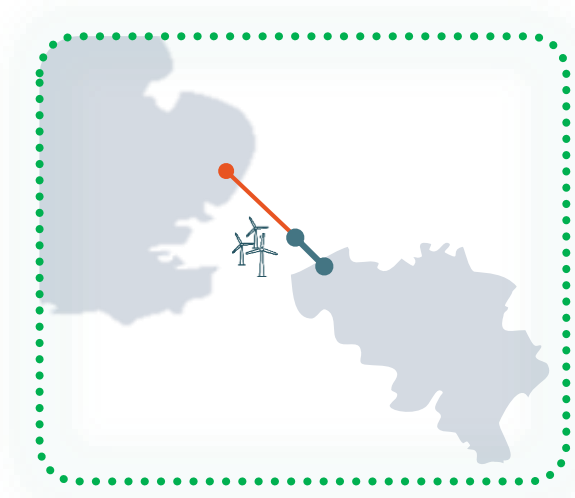
Connecting Nautilus on the BE Energy Island is faster and every year gained comes along with significant benefits for the Belgian society.

These general trends also verifies locally on MOG2/Nautilus

4. The hybrid system is fully in line with the “energy efficiency first” principle¹ developed in the EU regulation.
 - ▶ It significantly lowers the amount of (raw) material and in turns the spatial and environmental impacts while providing significant benefits to the society, thanks to a higher (more efficient) utilization rate of the infrastructure.



VS



— BE Energy Island (MOG2)
— Nautilus

The hybrid system allows to use the HVDC system between the energy island and TBD during no or low wind periods.

1. [eef_guidelines_ref_tbc.pdf\(europa.eu\)](http://eef_guidelines_ref_tbc.pdf(europa.eu))

Main take-away :

The vision is to use the Princess Elisabeth island as an offshore hub, to which both offshore wind and interconnectors will converge.

- This vision is **realistic**: a radial only strategy is neither cost-efficient nor realistic given the speed of integration required.
- This vision is **coherent** with the development of the onshore network, which prevents the emergence of structural congestions.
- This vision **supports the electrification** of Belgian society as it allows trades of clean energy between the North Sea countries without uselessly overloading the onshore network.
- This vision is **ambitious** given the technological challenges it raises and is in line with the **energy efficiency-first** principle: only the infrastructure really needed is installed.

➔ Nautilus is the first candidate hybrid system identified that fits with this vision.

➔ Other candidates will emerge anyhow.

Thank you.

