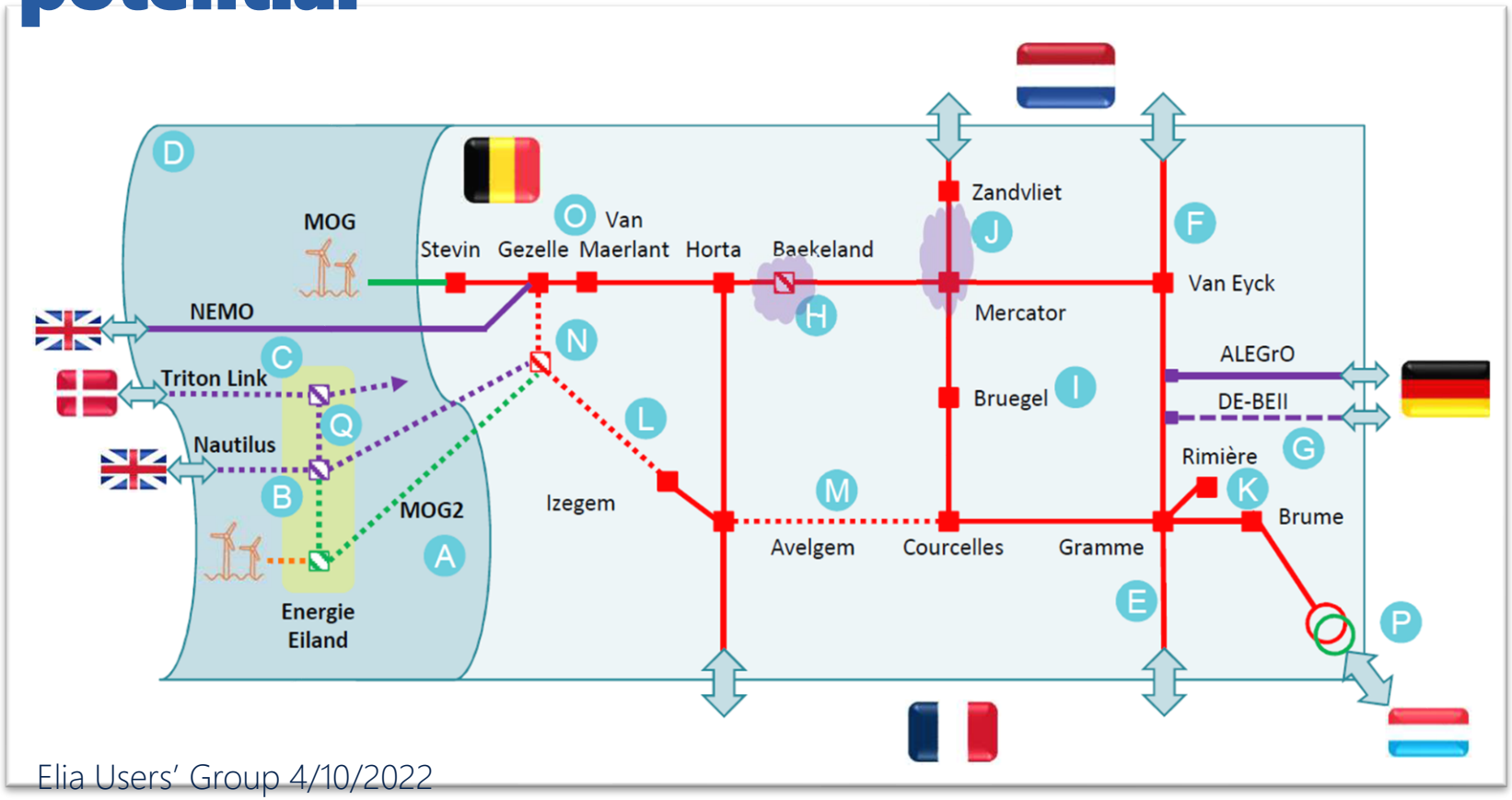
BELGIAN OFFSHORE PLATFORM

MOG2 grid design

Elia MOG2 workshop – 14 October 2022 - Brussels

13-okt-22

Federal Development Plan 2024-2034 proposal does not create sufficient grid capacity to tap into offshore potential



Elia Users' Group 4/10/2022

Required capacity to coast <2030:
8,2 GW (without TritonLink)

- 2,3GW + 3,5GW Offshore wind
- 1 GW Nemolink
- 1,4 GW Nautilus

Available capacity to coast: 6,7GW

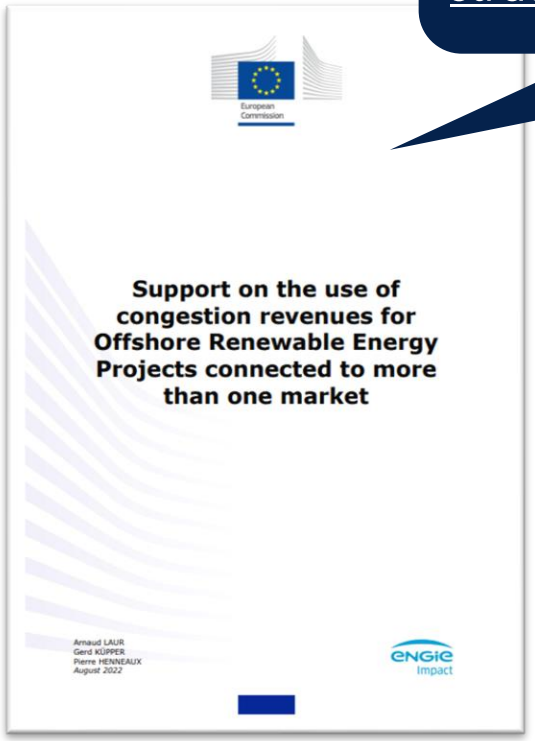
Available capacity onshore: ~7GW (to 8GW)
with Stevin + Ventilus + Boucle du Hainaut corridors

Structural shortage in grid capacity
Especially from island to coast 1,4GW short

OBZ is a way to allocate grid capacity in case of a shortage. It does not solve the underlying shortage

"The hybrid system should typically be designed in such a way that the entire wind production can structurally be exported onshore"

"Together, we have set ambitious combined targets for offshore wind of at least 65 GW by 2030"



How can Belgium contribute to "the North Sea as a Green Power Plant of Europe, with multiple connected offshore energy projects and hubs" without a long-term plan for grid design that allows us to actually bring this energy onshore?

What is the long-Term grid design?
Is the current bottleneck part of this design?

The current grid design replaces underutilisation of OW cables to BE with underutilisation of Nautilus

Availability on Nautilus	Underutilisation of Nautilus	3,5 GW Offshore wind
0 GW available	20% of time	Full capacity
< 0,9 GW available	30% of time	> 75% capacity factor
< 1,4 GW available	40% of time	> 60% capacity factor

- In an OBZ, OWF will not be curtailed in favour of UK import per se, but will merely be exposed to the UK's lower prices
- As soon as OWF produce more than 2.1 GW (load factor of > 60%, i.e. 40% of the time) and UK prices are lower than in BE, Nautilus cannot be used to its fullest to import cheap UK electricity, due to the bottleneck between island & onshore

→ A hybrid grid design limits the use of the Nautilus interconnector during hours with high wind production: ~40% of the time

- The current grid design appears to favour a fully utilised island-shore connection (the short link), over a fully utilised UK-island connection (the long link)
- According to Elia's predictions, UK will have an abundance of cheap, green (wind) electricity in the near future. Should our grid design than not focus on ensuring we can actually import all of it?

→ An OBZ makes UK green power compete with BE green power, instead of ensuring we have both, to push grey power out of the market

The OBZ is a novel concept, creating significant legal and technical uncertainty

Unstable investment framework creates realisation risks for offshore wind developments

Introduction of an OBZ for the PE zone creates un unstable investment framework with many uncertainties for offshore wind developers and potential delays due to conflicting timelines

- Absolute and long term clarity of bidding zone required prior to the opening of the tender (end 2023)
- Many open questions with only complex answers in unexplored territories: no examples, no best practices, unclear regulatory framework
- Far from a decision on EU level on market design for hybrid projects
- An OBZ implies regulatory changes with risk for delays

Unclear balancing market creates significant risks for off-takers / BRPs

- Unknown balancing risks and price setting in a bidding zone without flex assets
- BRP's cannot easily use their flex portfolio in BE to balance the OWF
- Unclear EU – UK relationships w.r.t. market coupling and balancing abilities on either end

OBZ does not make costs disappear, the 'bottleneck' costs are just passed on to another market party

In the 'home market' set-up, the costs of a bottleneck lie with the TSO, as congestion costs

In the 'OBZ' set-up, these costs are transferred to the production units, as lower revenues

- These costs have not disappeared
- But the incentive for the TSO to resolve the congestion, has disappeared

→ In any case the costs end up with the end-consumer

The EC 2020 study* shows specifically negative impact (>10%) on market revenues for OWP in a hybrid BE-UK project, corresponding to >1650 million euros (assuming 65€/MWh)

Even if such costs are compensated via a two-sided CfD, one can wonder if these funds would not be better utilised to actually resolve the congestion, rather then compensate OWFs for the consequence of the congestion

→ The 'bottleneck' costs could be better utilised to resolve the congestion

* EC study 2020 by Thema Consulting Group – October 2020: Market Arrangements for Offshore Hybrid Projects in the North Sea: https://op.europa.eu/en/publication-detail/-/publication/28ff740c-25aa-11eb-9d7e-01aa75ed71a1/language-en

Key messages

1. Structural shortage in current offshore grid design is inconsistent with long term needs for integrating offshore renewables
2. A consistent long-term planning is required prior to introducing an Offshore Bidding Zone
3. The grid design creates an under utilisation of the Nautilus interconnector
4. Have renewables compete with non-renewables instead of with each other (via an Offshore Bidding Zone)
5. Pushing congestion costs away from the TSO does not let them disappear for consumers

Plan for a grid design that really maximizes integration of renewables from the Princess Elisabeth zone and the entire North Sea

5 bepalende principes
Voor het uitwerken van het Federaal Ontwikkelingsplan

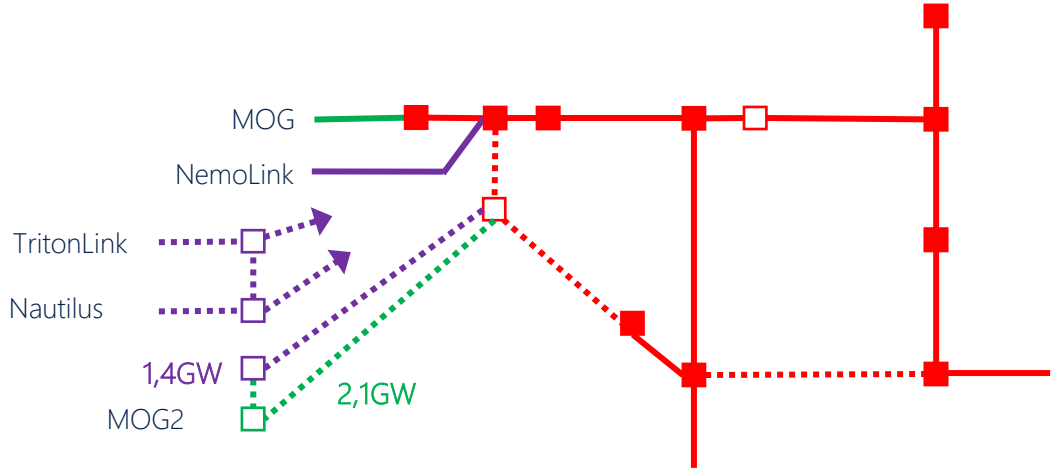
1. MAXIMALE INTEGRATIE VAN HET EIGEN POTENTIEEL AAN HERNIEUWBARE ENERGIE IN HET ELEKTRICITEITSSYSTEEM

elia
Elia Group

5 grid design proposals

Option 1

Nautilus inland



- Use currently planned MOG2 design for 3,5GW OWP
- Direct Nautilus to Gent-Antwerp-Brussels area:
  - Corridor is feasible for TritonLink, so also feasible for Nautilus (similar technology);
  - Bundling of TritonLink and Nautilus corridors might reduce local impact
- Coupling Nautilus and MOG2 later in time when DC technology is ready

Option 2

Faster elimination of Gezelle-Van Maerlant bottleneck

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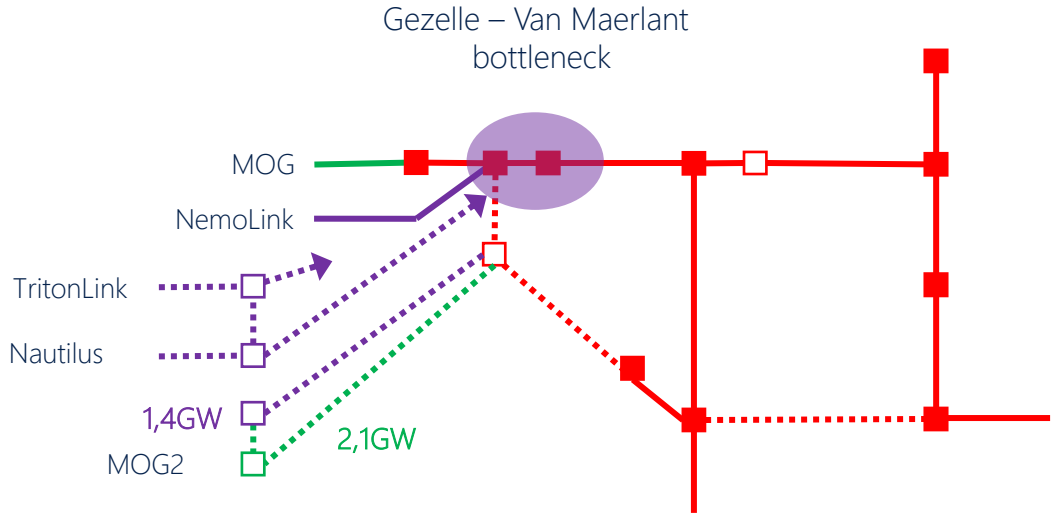
Nautilus to Stevin-corridor



- Elimination of the bottleneck on Stevin now planned for ~2035
- Accelerate this project and plan commissioning by 2030
  - Creates sufficient access capacity for both Nautilus and 3,5GW offshore wind on Stevin+Ventilus corridors
- Connect Nautilus to the Stevin corridor

Option 3

Extra 220kV AC for MOG2

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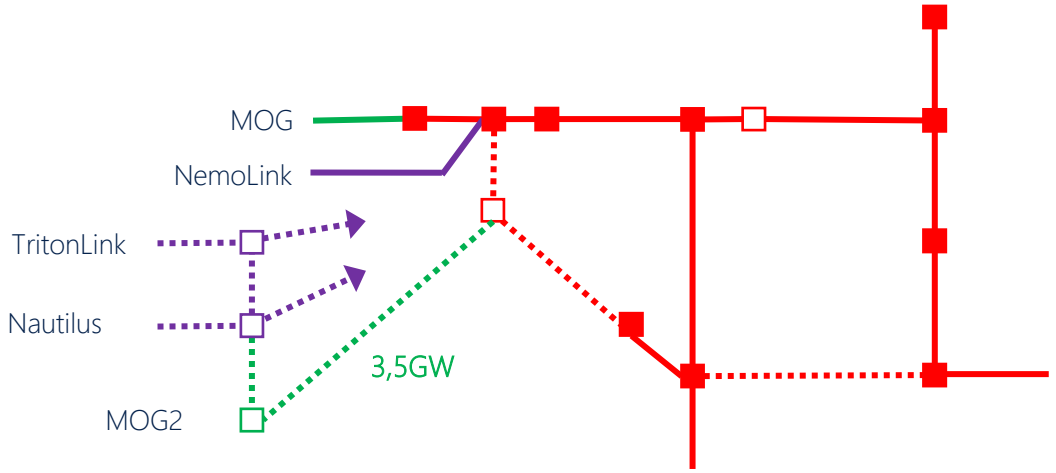
Nautilus inland



- 4 extra 220kV AC cables for MOG2: 3,5GW instead of 2,1GW
- Direct Nautilus to Gent-Antwerp-Brussels area
- No AC/DC convertor required on Ventilus might reduce local impact

Option 4

Extra 220kV AC for MOG2

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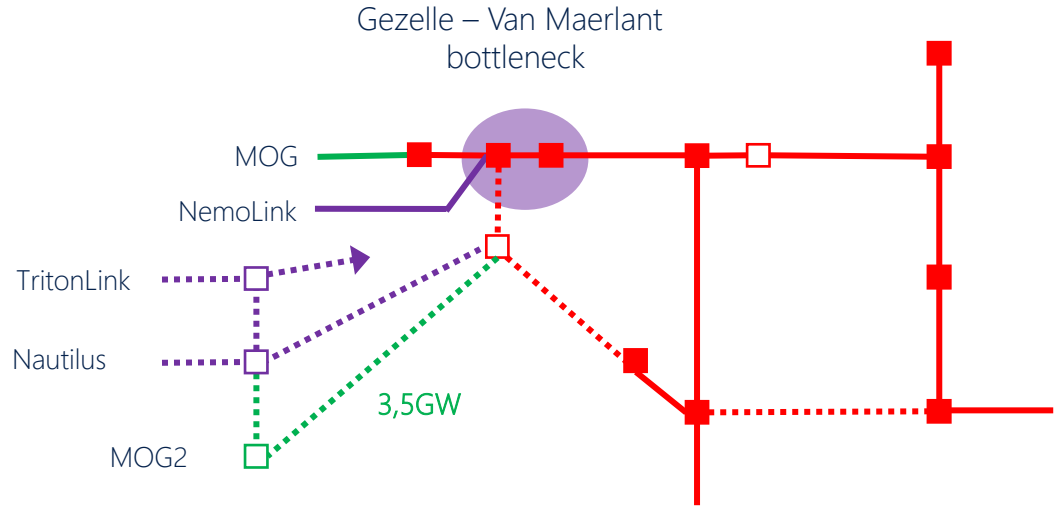
Faster elimination of Gezelle-Van Maerlant bottleneck



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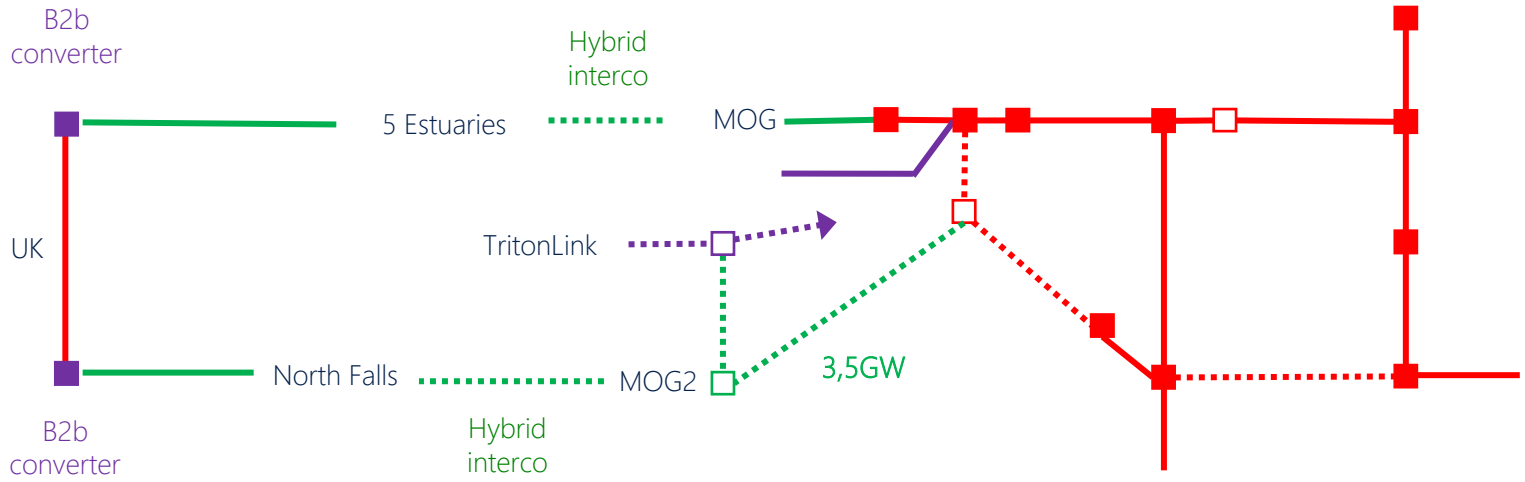
Option 5

Replace Nautilus with different hybrid interconnector(s)



- Connect the most Northern OWF in BE with the most Southern OWF in UK
- These distances of new connections are much smaller, and they will create a hybrid interconnector between UK & BE, allowing for import/export in case of low winds
- With a more limited investment (short cable + back-to-back converter), an interconnection could be made that will truly increase cable utilisation

BOP position on the offshore grid and market design

Timely and guaranteed injection potential for 3.5GW offshore wind in the PE zone, to fully use the valuable offshore wind assets

- Maximally use the planned projects for fully connecting the offshore wind assets in the PE zone
- Plan for additional grid capabilities for the interconnection projects
- OBZ implies a mismatch in timeline and regulatory framework to allow fast offshore wind developments in the PE zone

300GW offshore wind ambitions in EU demands a structural expansion of grid capacity in the North Sea

- 65GW in North Sea by 2030 / 150GW by 2050 in 4-country agreements (Esbjerg May 2022)
- Introducing bottlenecks in grid development in this stage is inconsistent with long term needs
- Future need in offshore grid expansion in the North Sea is a no-brainer, plan for the long term.

Transparent investigation in the costs and benefits of the grid design options for integrating offshore energy from BE and abroad

- E.g. has an underutilisation of Nautilus been taken into account?
- Have the costs introduced into the system (i.e. lower revenues for OWF) been taken into account?