



NORTH SEA OFFSHORE VISION

JUNE 7TH, 2017

ECOFYS

A Navigant Company

AT A GLANCE: ECOFYS, A NAVIGANT COMPANY



Global consulting company founded in 1984 with the **mission** to enable **sustainable energy for everyone** – since 2016, Ecofys has been part of Navigant's global Energy practice



Ecofys has **five offices** in four countries: Utrecht, the Netherlands; Cologne & Berlin, Germany; Brussels, Belgium; London, United Kingdom – as part of Navigant, our experts are based in **more than 20 offices in the US and Canada, Hong Kong, and the Middle East**



We have over **600 experts** skilled in energy, climate, environment, economy, communication, law, and psychology – in 2007, 11 of our experts supporting the Intergovernmental Panel on Climate Change were awarded the Nobel Prize together with Al Gore



More than 30 years of experience in developing and evaluating policies, sustainability strategies, and scenarios for companies and sectors provides us with deep knowledge of markets and consumer behaviour

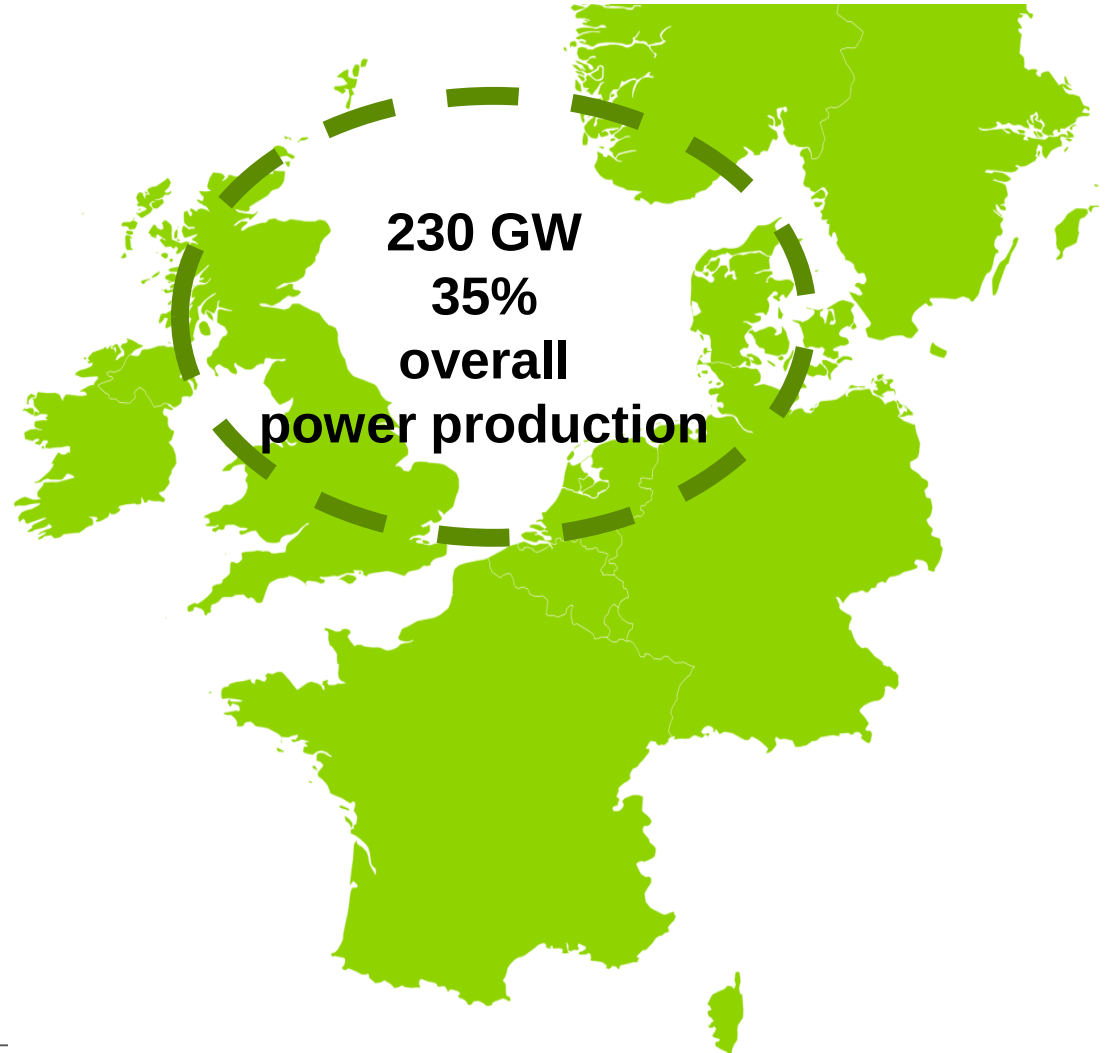


Our strength lies in our strategic understanding of complex energy and climate transition issues: Ecofys **connects the dots** within the triangle between **governments, energy players, and energy-intensive end-users**

NORTH SEA

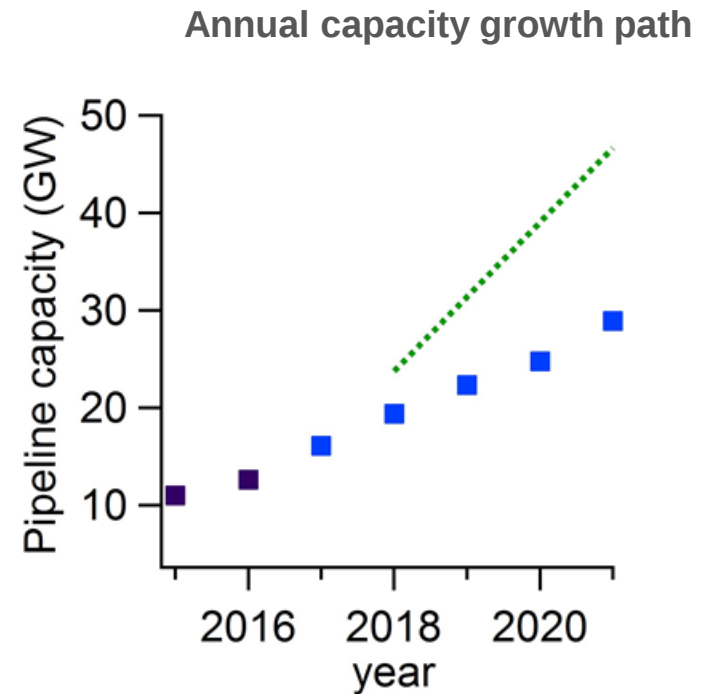
A POTENTIAL POWERHOUSE FOR NORTH-WEST EUROPE

- Allow for high vRES penetration
- Allow for realization of the 2050 vision of a fully sustainable power system
- Increase security of supply
- Drive significant investment
- Increase the number of jobs in the RES sector threefold



1. A COORDINATED REGULATORY ACTION

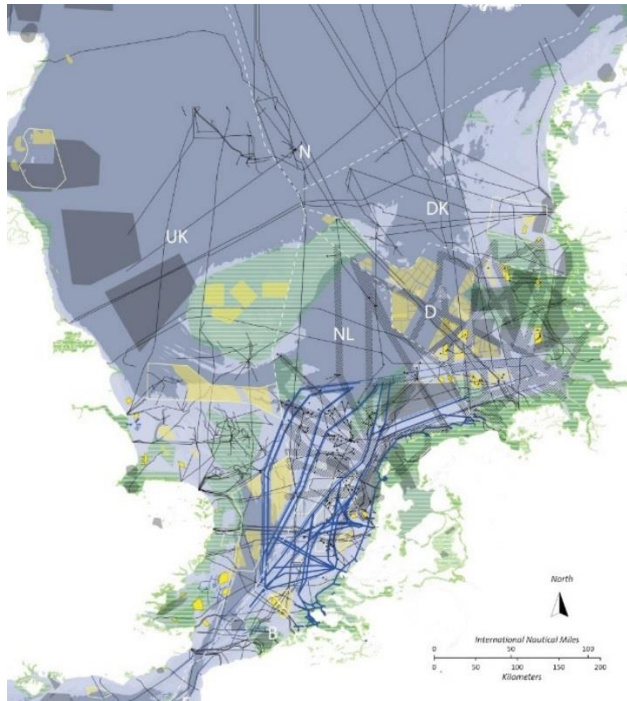
- Ambitious long term policy goals
- Strong and transparent governance
- Coordinated/ joint support schemes
- Stronger standardization of standards and regulations



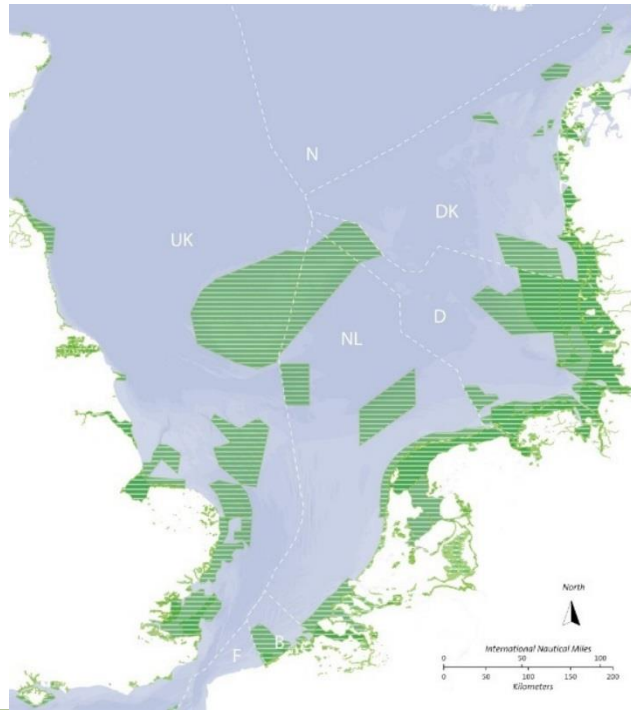
*Development path at ~7 GW/year until 2045
will secure realization of the vision*

2. STRATEGIC APPROACH TO OVERALL SPATIAL PLANNING OF OFFSHORE WIND IN THE NORTH SEA

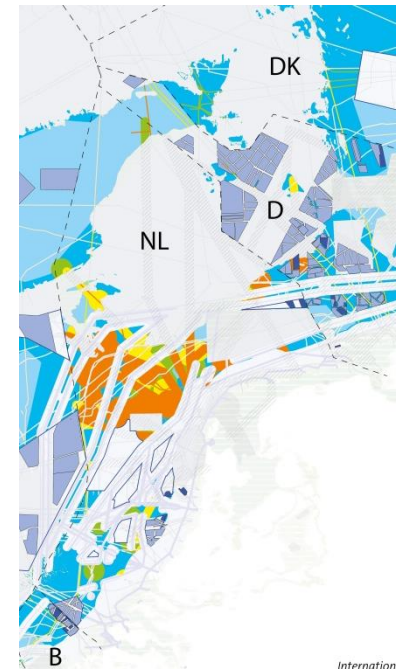
Current constraints



Natura 2000

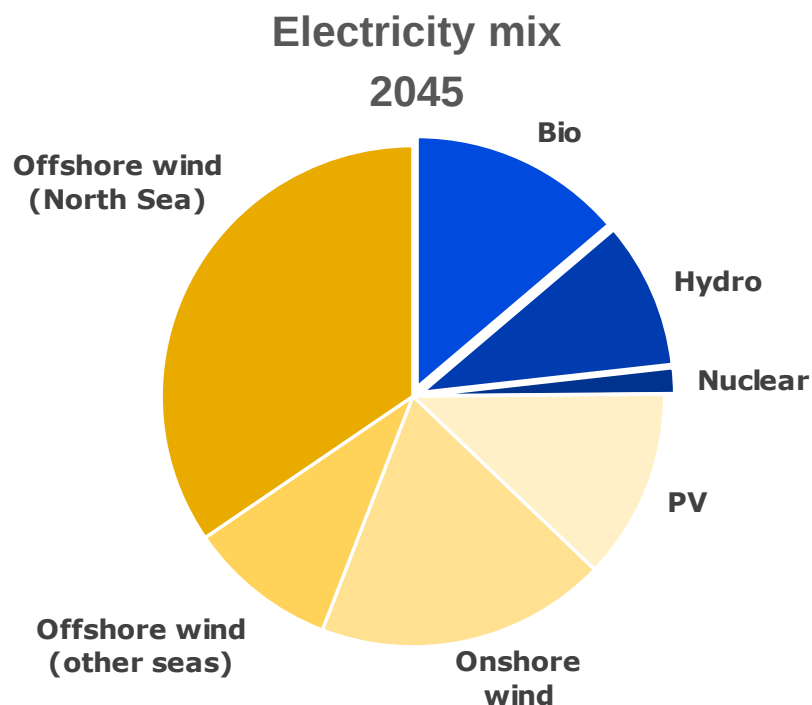


Oil & gas
decommissioning
(example Netherlands)



International spatial planning strategy will ensure **cost efficient** utilization of the resource, aligned with **off- and onshore grid developments** and maximum benefit for the **environment**

3. SIGNIFICANT INCREASE IN FLEXIBILITY OPTIONS



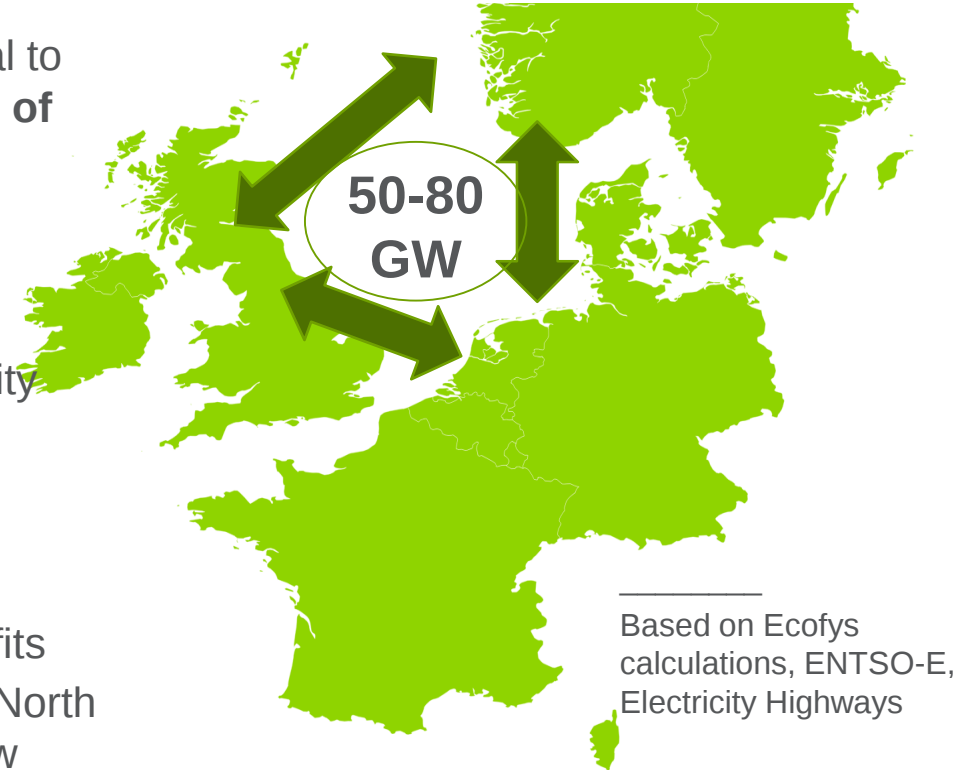
- There is need for **better understanding of market/operation issues** resulting from this energy mix, including economic triggers and additional capacity reserves.
- **Increased use of cost efficient flexibility options**, such as demand response, small/large-scale storage, power-to-gas, etc., will become essential in the 2045 scenario in face of decreasing dispatchable generation capacity.

Based on IEA, Fraunhofer ISI, PRIMES, WindEurope studies and Ecofys expert

A **realistic and robust potential roadmap** is needed for all flexibility options by 2045, including a trade-off of some flexibility options with interconnection levels.

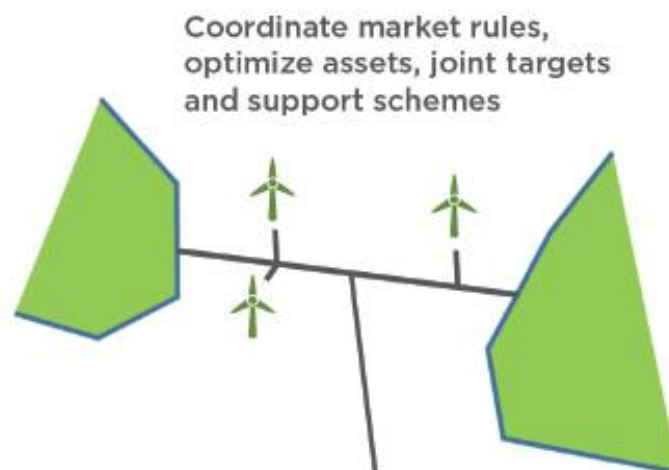
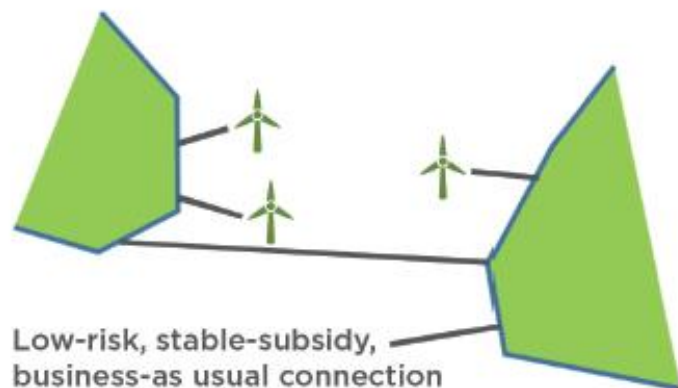
4. INCREASED INTERCONNECTIVITY

- Sufficient interconnection capacity is essential to **maintain operational security** and **security of power supply**
- A higher share of variable sources requires increased flexibility options, which may be optimally used with better interconnection
- An increased roll-out of interconnector capacity requires a cost-benefit appraisal that goes **beyond current economic triggers** of operational cost savings
- A good balance of radial, meshed and hybrid solutions is key to maximize the overall benefits
- The **onshore grid** is an essential part of the North Sea grid too, and needs to cope with new flow patterns



Development of methodology to **value grid stability** will incentivise interconnector capacity to maintain operational security

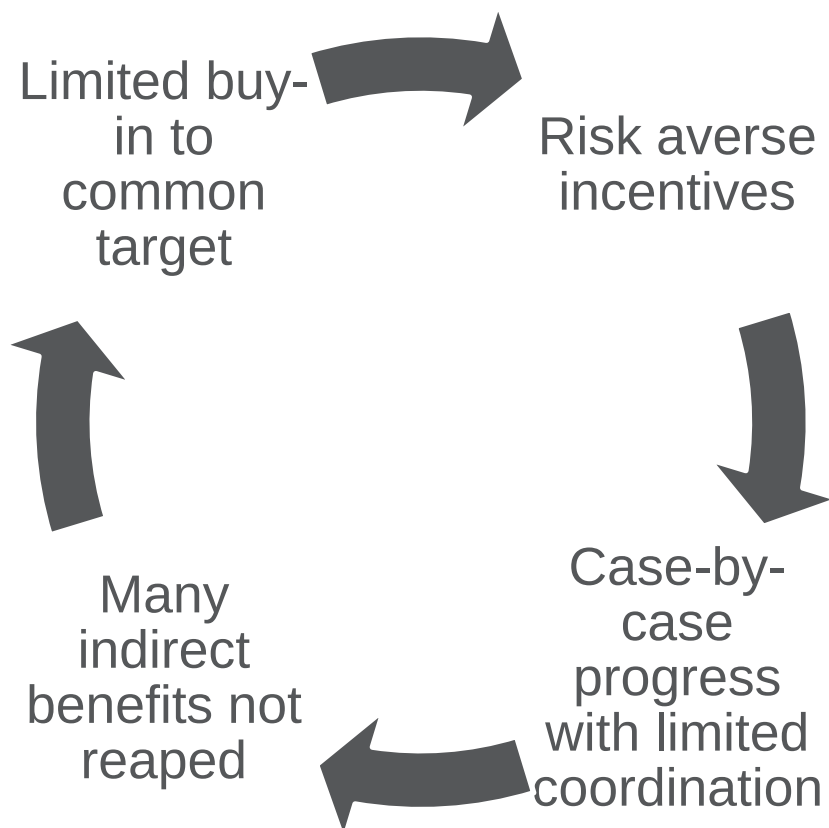
RADIAL VS MESHED GRID



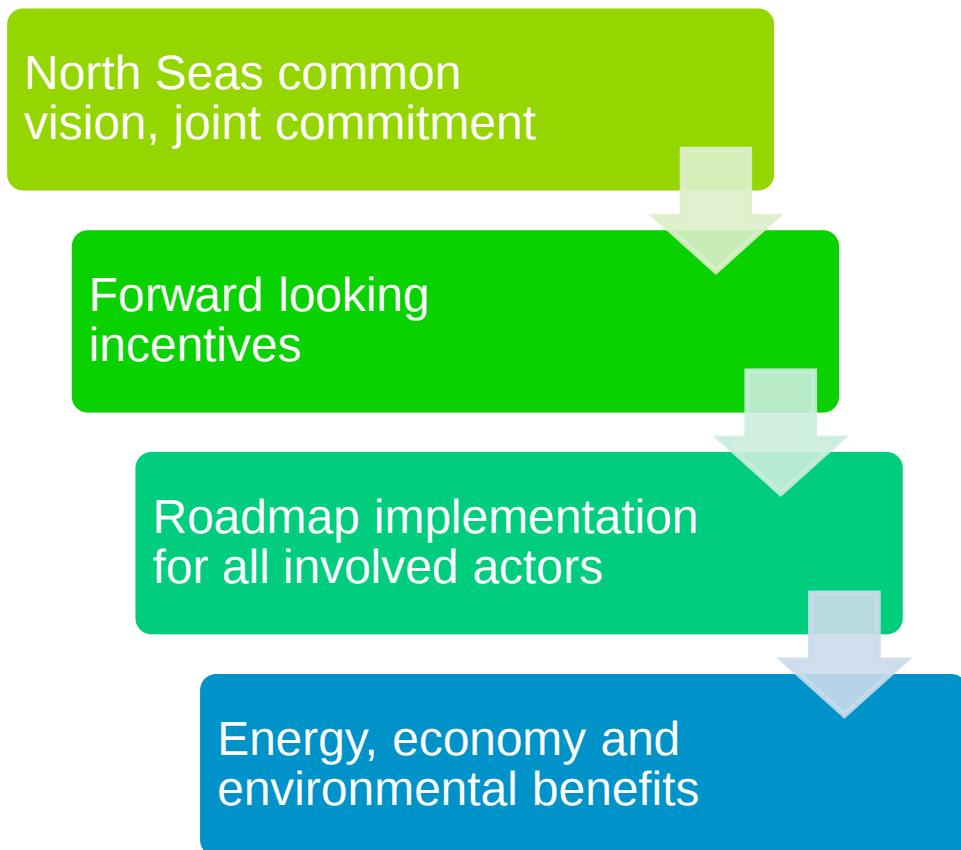
Net cost of the meshed grid may be higher and requires more coordination but the potential benefits outweigh the costs

KEY BENEFITS OF THE COORDINATED APPROACH

Uncoordinated approach



Coordinated approach



CONCLUSIONS

- The North Sea vision estimates wind offshore can cover up to 35% energy production in the region
- A concerted action is needed in the region to
 - Coordinate policies and regulatory framework
 - Develop joints approaches to spatial-, grid- and capacity planning
 - Increase interconnectivity
 - Optimize the use of flexibility resources
- It gives more broad economic benefits but also requires a coordinated action



IZA KIELICHOWSKA
Managing Consultant
i.kielichowska@ecofys.com

Ecofys.
A Navigant Company.
www.ecofys.com
www.navigant.com