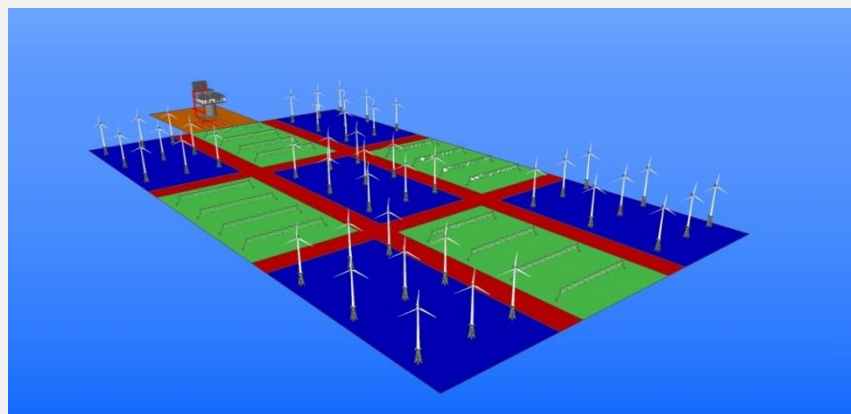


Combining offshore wind energy and large-scale mussel farming



Ambition & conceptual design

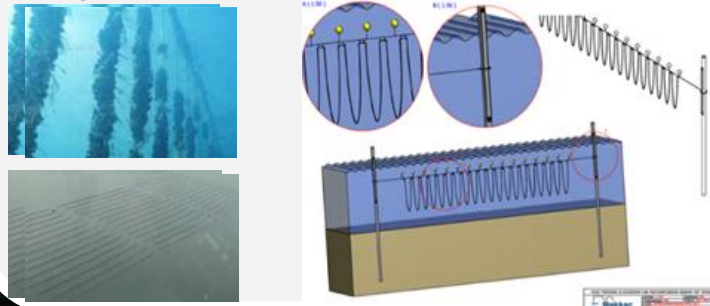
- **Wind energy:** 5 clusters with 40 x 5MW-turbines each → 5x 200 MW = 1.000 MW
- **Mussel farming:** 4 clusters with 1,800 mussel long line systems each → 50,000 (36,000-75,000) tons production per year



- 200 MW Wind Turbine Clusters
- 12.500 ton Mussel Farming Clusters
- Electrical Grid & Distribution System
- Shipping Lanes

Mussel farm cluster outline

longlines held by poles or anchors



Risks and opportunities

- **Operational wind farm:** e.g. collision (birds, bats); potential barrier effect (sea mammals); Benefits: new habitat, potential refuge (fish)
- **Aquaculture system:** e.g. barrier effect (sea mammals), attraction of invasive species; Benefits: increased phytoplankton production, potential refuge (fish)
- **Combination:** e.g. enhanced risk of biofouling/corrosion due to effects on seawater chemistry; Benefits: increased food availability/ new habitat/ shelter → enhanced biological production

Overall conclusions from the Blauwdruk project

- 10% synergy seems feasible by combining Operation & Maintenance (O&M) activities; model simulations show an increased Return on Investment (ROI)
 - Mussel & seed mussel culture considered most promising for offshore aquaculture in Dutch North Sea
 - Wind farm foundation type: monopile or gravity based (lower risk of high drag force incident)
 - Mussel farm: type and size determine extent of effects on water/ sediment quality (e.g. corrosion resistance of materials used) → risk assessment needed
 - Individual marine ecosystem components may be affected differently by different pressures: no generalisation possible concerning ecosystem impacts
- **Stepwise learning-by-doing: from small-scale pilot projects to large-scale**
- **Development from pilots to full-scale commercial cultures will likely take ca. 8-10 years**
- **Other aquaculture options (fisheries, seaweed, lobsters, oysters) might also be considered during this development period, to optimize spatial use within (or in the vicinity of) wind farms**