


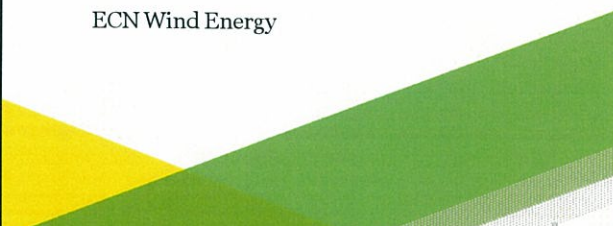
## Introduction to ECN – Energy Research Centre of The Netherlands

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Director ECN Wind Energy



www.ecn.nl


## ECN Wind Energy



### ECN at a glance

**Mission:**  
...To develop with and for the market knowledge and technologies that enable a transition to more sustainable energy systems...

**Founded in 1974**  
Commercial licensing deals 3/7  
6000 Employees  
1000 patents/year  
€ 1.5 billion turnover



ECN Focus Areas


- Solar energy
- Biomass
- Policy studies
- Energy efficiency
- Wind energy
- Environment & energy engineering

### Vision

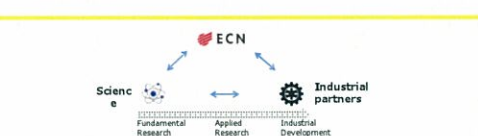
ECN Wind Energy as one of the leading institutions on

**Innovative Solutions for Offshore Wind Power Plants**

- Reduce cost of energy of offshore wind power plants
- World leading innovative products and solutions
- Critical success factors are our world leading facilities
- Beyond state of the art wind farm services



### ECN acts as a bridge between science and corporate innovation



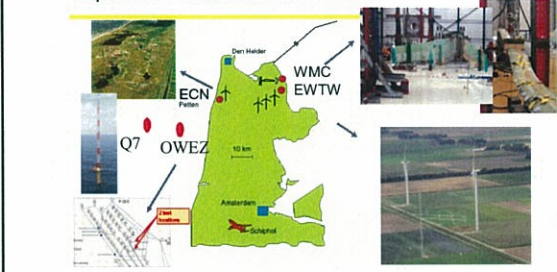
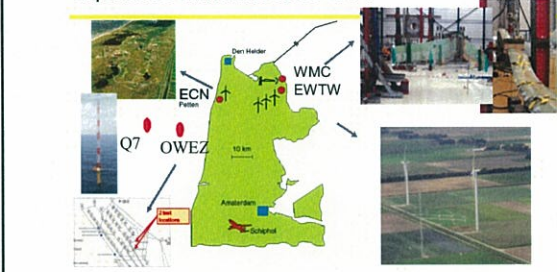
**What we do**

- Problem Solving
- Technology development
- Studies & Policy Support

**How we can work with you**

- Consultancy & Services
- Contract R&D
- Tech development & Transfer
- Joint Industry Projects

### Energy Research Centre of the Netherlands: Experience with wind since 1974

## ECN's reputation

### Integral Wind Farm Design and Development

- Together with partner RoyalHaskoning DHV
- We own patents
- We have the best tools and expertise available



### Operations and Maintenance

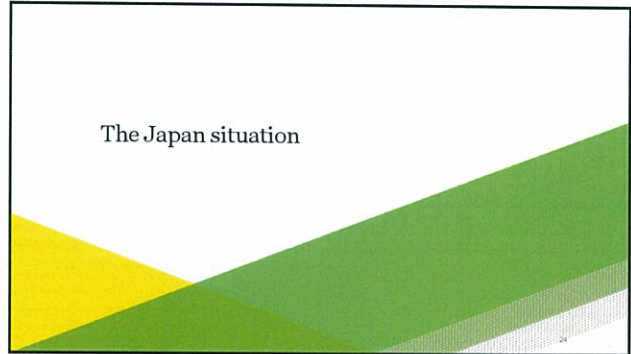
- Our methodology has been approved for by DNV-GL
- More than 80% of all European Offshore Wind Farms has been modelled, analyzed and advised for via the ECN O&M Methodology
- We have developed and are now rolling out for the future O&M Methodologies

### Testing

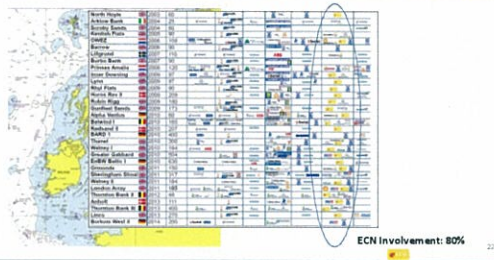
- Prototype testing (certification) for GE, Siemens, Alstom and XEMC
- ECN Testsites In The Netherlands and abroad
- Wind Farm testing, validating, due diligence
- Wind Climate testing



## The Japan situation



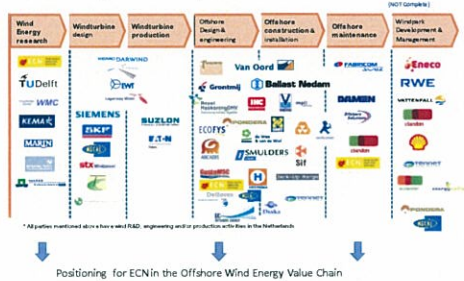
## Possibilities in Europe's offshore Wind Energy market: The Dutch Experience



## Japan's Energy Challenge

- Large dependency on Nuclear Power plants (Fossil Fuel)
- ➔ Ambition for transition towards Renewable Energy
  - Wind Energy emerging energy source
- A stable economy
- Very good Wind Climate Conditions
  - Sometime challenging: Typhoons, Deep water, Long distance grid connections
- An offshore Wind Energy sector still to further gain in experience and maturity

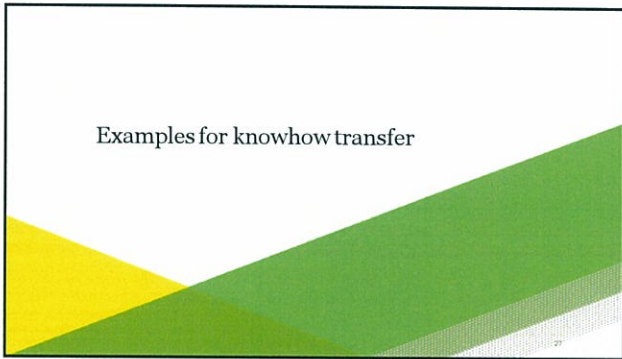
## Dutch offshore expertise in all phases



## What can ECN offer?

- Large dependency on Nuclear Power plants (Fossil Fuel)
- ➔ Ambition for transition towards Renewable Energy
  - Wind Energy emerging energy source
- A stable economy
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### Examples for knowhow transfer

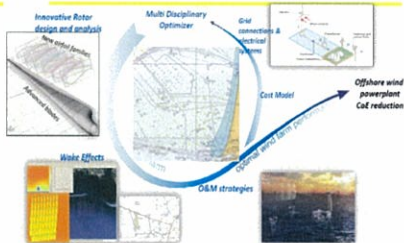


### Deep waters, Example 'Floating wind turbine design'

- Semi-Submersible: natural periods out of wave period range, so little motions.
- Special shallow depth mooring system for 50 to 100m depths, conventional system for > 100m
- No active ballasting for pitch compensation: robust system
- No braces: easy fabrication & no fatigue sensitive details with limited access
- Stable when afloat: installation with tugs on pre-laid mooring system
- Specific design can be adapted to site conditions and usage: meteorology mast, substation etc.

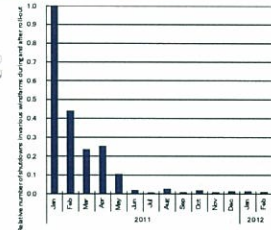
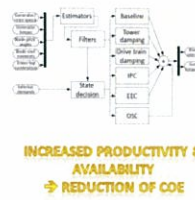


### design, Example 'Roadmap for the Future'



### Advance turbine control ECN Typhoon controller

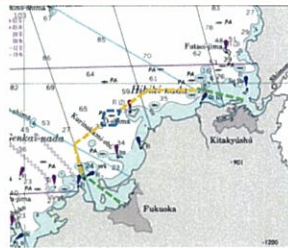
JSW The Japan Steel Works, Ltd.



INCREASED PRODUCTIVITY & AVAILABILITY  
⇒ REDUCTION OF COE

### O&M strategy building, Example 'Japan'

- Transport options
  - Type of vessels
  - Port & location
  - Costs involved
  - Duration
  - Logistics
  - Harbour facilities
- Farm layout
  - Maintainability
  - Expected costs
  - Cabling costs
  - Grid integration
- Turbine behaviour
  - Predictive maintenance
  - Preventive maintenance
  - Expected failure rate of major components



### Japan and The Netherlands: To summarize



**.....WE SHARE 400 YEARS OF HISTORY  
AND LEARNING**



**SO, LET'S CONTINUE**

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**Innovative solutions**  
to lower the cost of energy

**Thank you very much for your attention**  
どうもありがとうございました

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