

Concerted Action for the deployment of offshore wind energy COD

Berlin, 23 March 2004

Ruud de Bruijne



Who is COD?

Ministerial Working Group

Members: Energy Ministries DK, SE, IR, PO, DE, UK, BE

Advisory board

Chair: Christian Kjaer, European Wind Energy Association
Members: EUREC, ETSO, Greenpeace, WWF, SAR

Observers

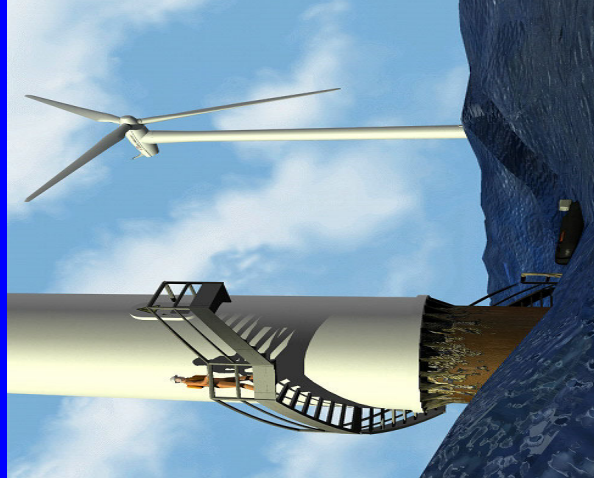
European Commission (Roberto Gambi)
Energy Agencies EC memberstates

Working Group

Co-ordinator: Ruud de Bruijne, Netherlands Energy Agency
Members: Energy Agencies DK, IR, SE, PO, TU-Berlin (DE), 3E (BE) and Garrad Hassan (UK)

Subcontractors

TU-Delft (website)
New Energy Works (benchmarking)



What does COD?

- Environmental impact offshore windfarms
 - collect and benchmark data from environmental monitoring programmes
 - guidelines and best practices for EIA's
- Legislation, consents procedures
 - collect and benchmark legislation procedures
 - guidelines and best practices
- Electrical infrastructure



Offshore wind energy

- **Potential**
- **State of the art**
- **How to boost the market**
- **Cost of energy & financing**
- **Industry**
- **Consents and legislation**
- **Grid connection**



Potential

- **Enormous potential : 50 - 240 GW**
- **100 GW = 360,000 GWh/a**
- **EC Directive renewable electricity:
green share from 14 => 22% in 2010**
- **100 GW offshore wind ~13%(EU₁₅)
*(but not in 2010)***

Potential

- **Enormous potential : 50 - 240 GW**
- **100 GW = 360,000 GWh/a**
- **EC Directive renewable electricity:
green share from 14 => 22% in 2010**
- **100 GW offshore wind ~13%(EU₁₅)
(but not in 2010)**

Conclusion:

Offshore wind energy is one of the most important options to full fill the EC directive on Renewable Electricity

State of the art

- **DK, UK, NL, IR, BE & FR planned & aimed 20 GW + GE 65 GW = 85 GW**
- **Development in shallow waters only: Baltic seas, North Sea and Irish Sea**
- **Realised 0.6 GW; DK and UK only**

State of the art

- **DK, UK, NL, IR, BE & FR planned & aimed 20 GW + GE 30 GW = 50 GW**
- **Development in shallow waters only: Baltic seas, North Sea and Irish Sea**
- **Realised 0.6 GW; DK and UK only**

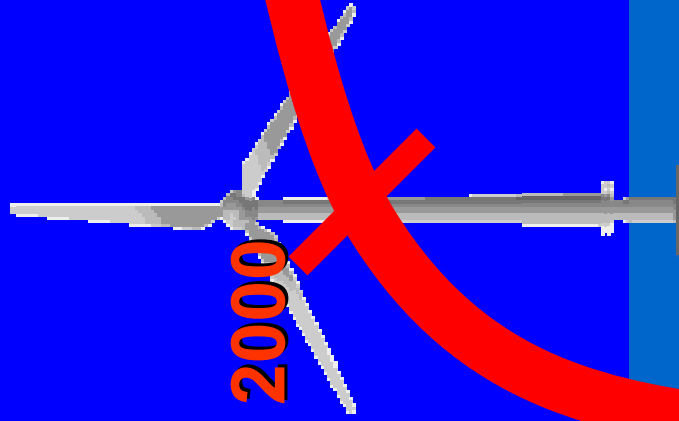
Conclusion:

Long way to go, little experience gained so far.

Offshore wind energy not yet a proven technology.

Pilots

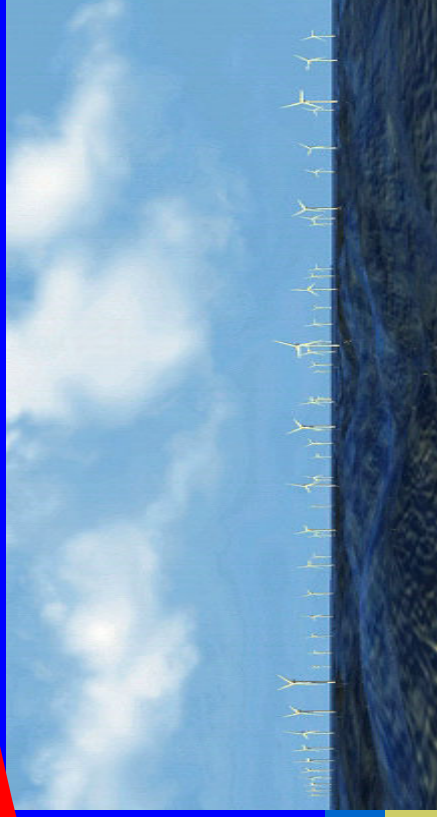
Shallow waters, small projects.



2000

First projects

Water depths <20 m. Visible from shore. Units 100-150 MW.

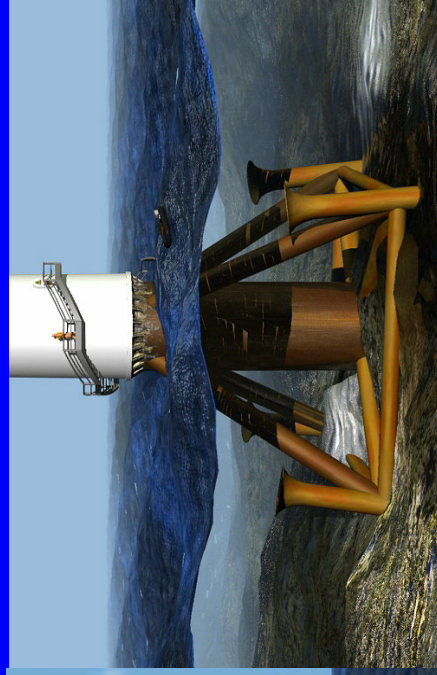


2005

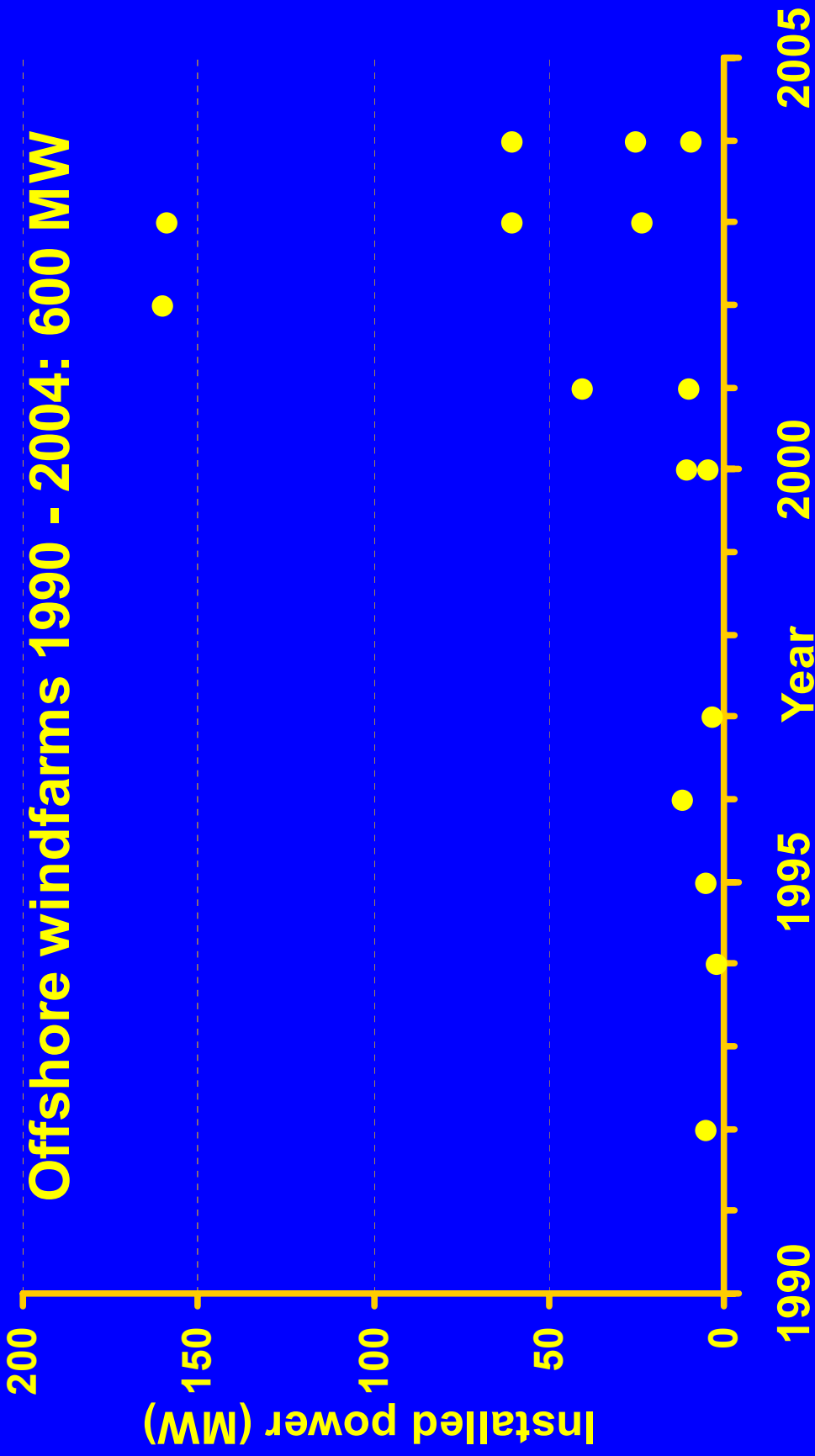
Large scale wind farms

2010

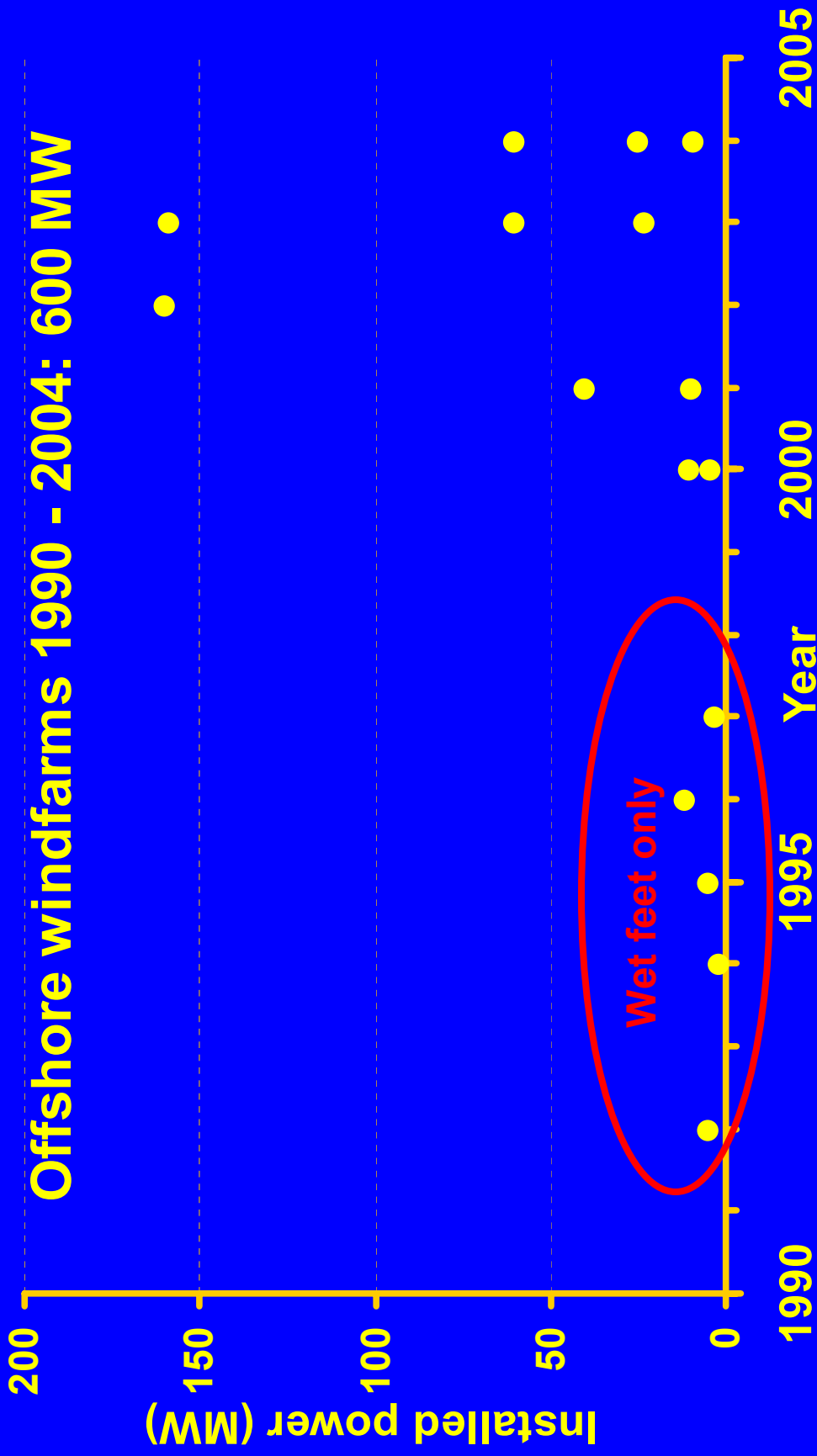
Water depth 20-?m. Invisible from shore. Units >500 MW.



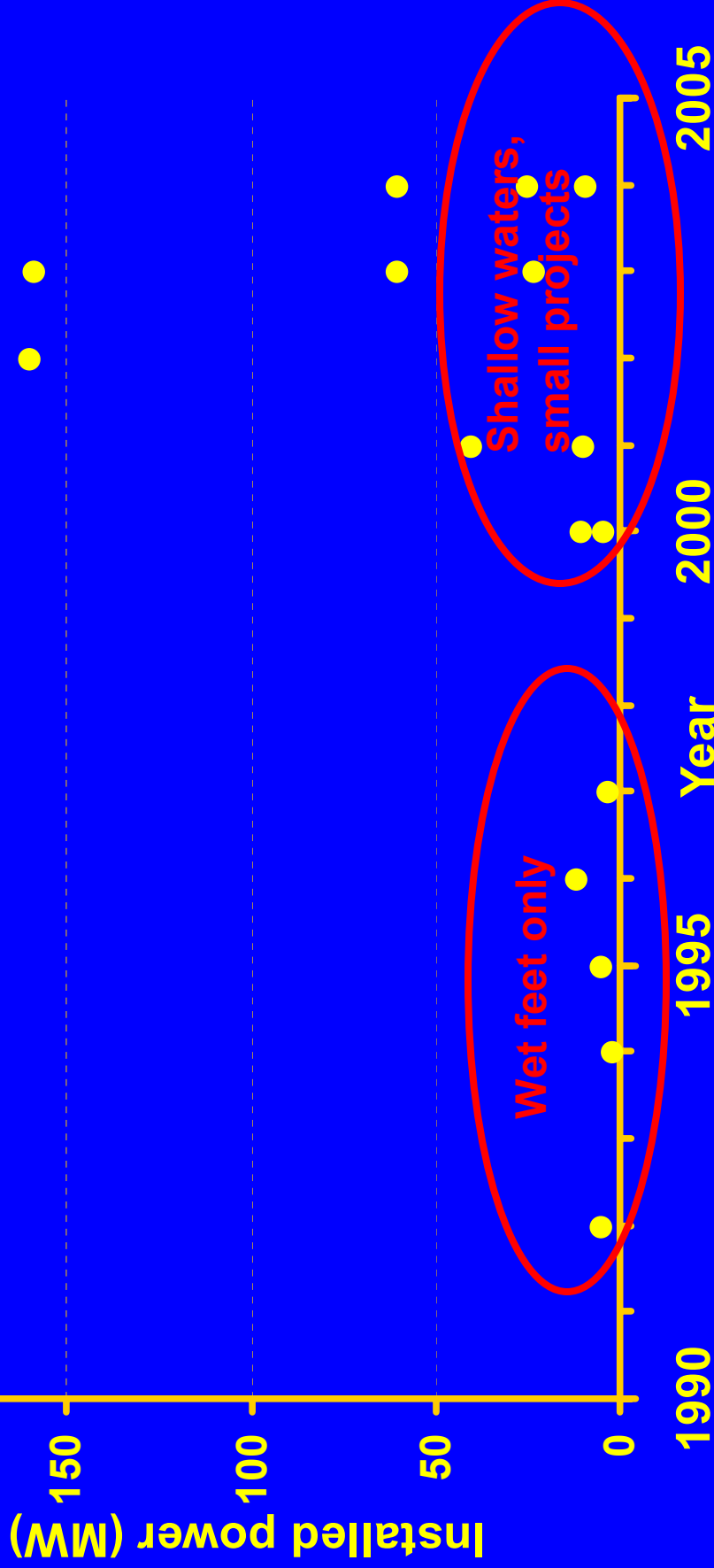
Offshore windfarms 1990 - 2004: 600 MW



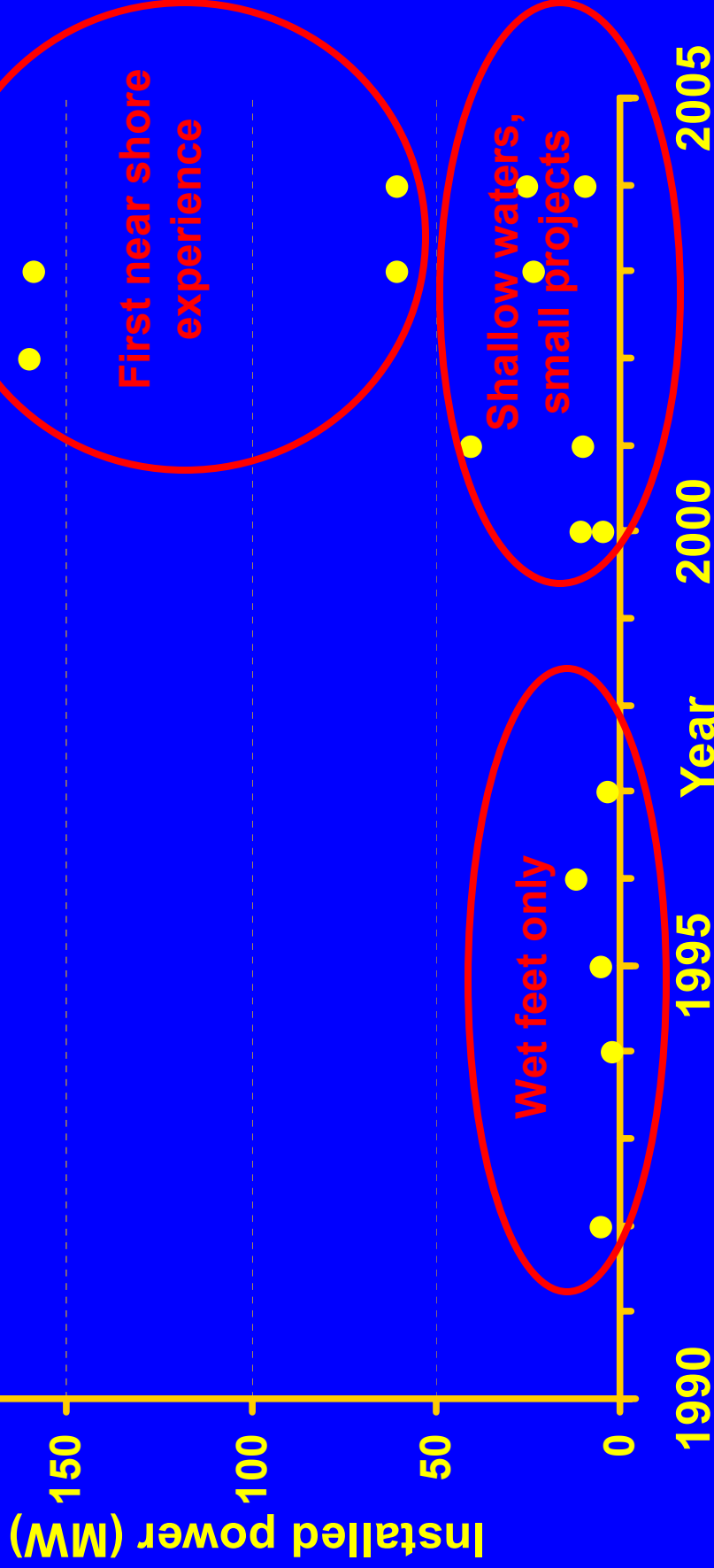
Offshore windfarms 1990 - 2004: 600 MW

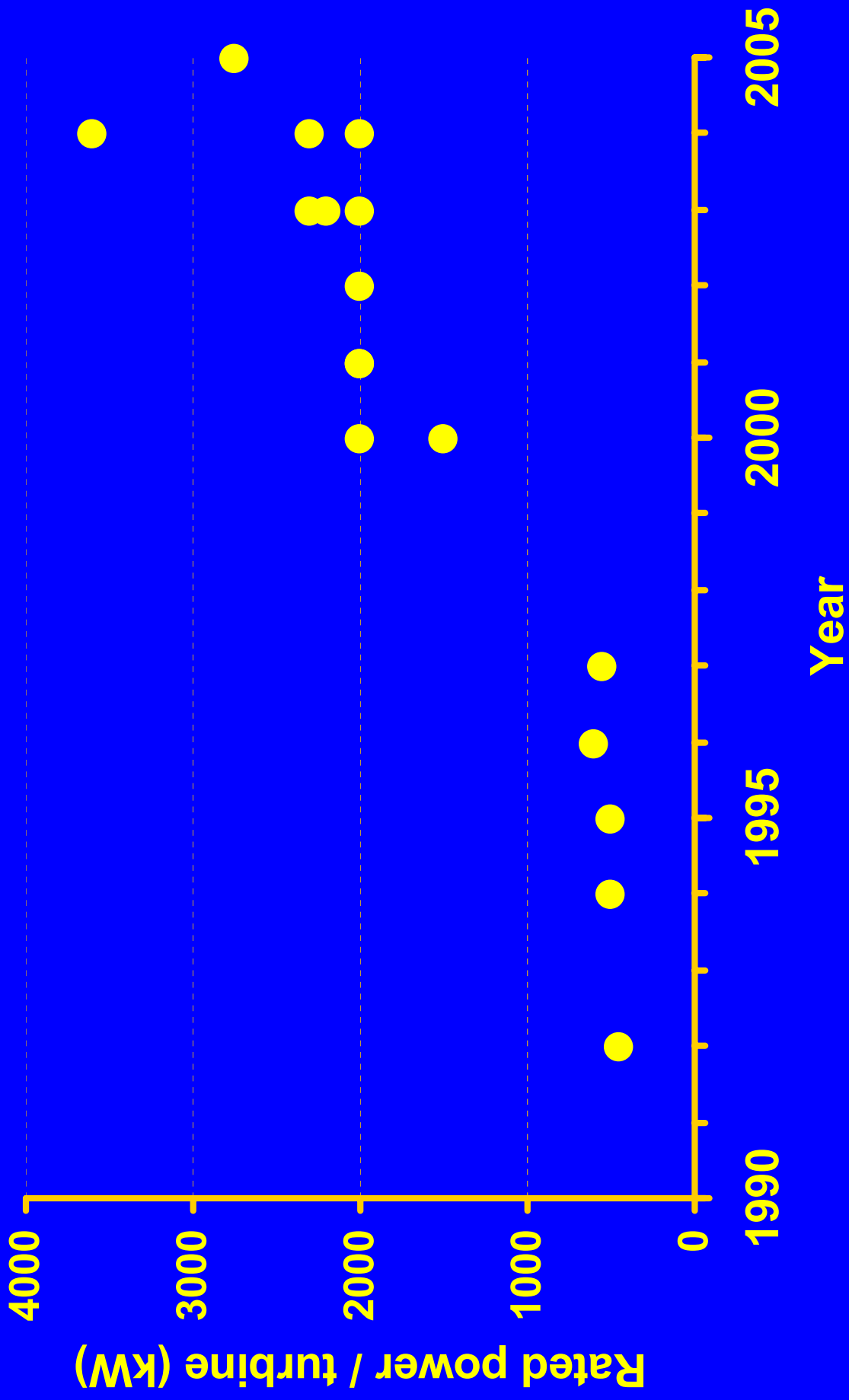


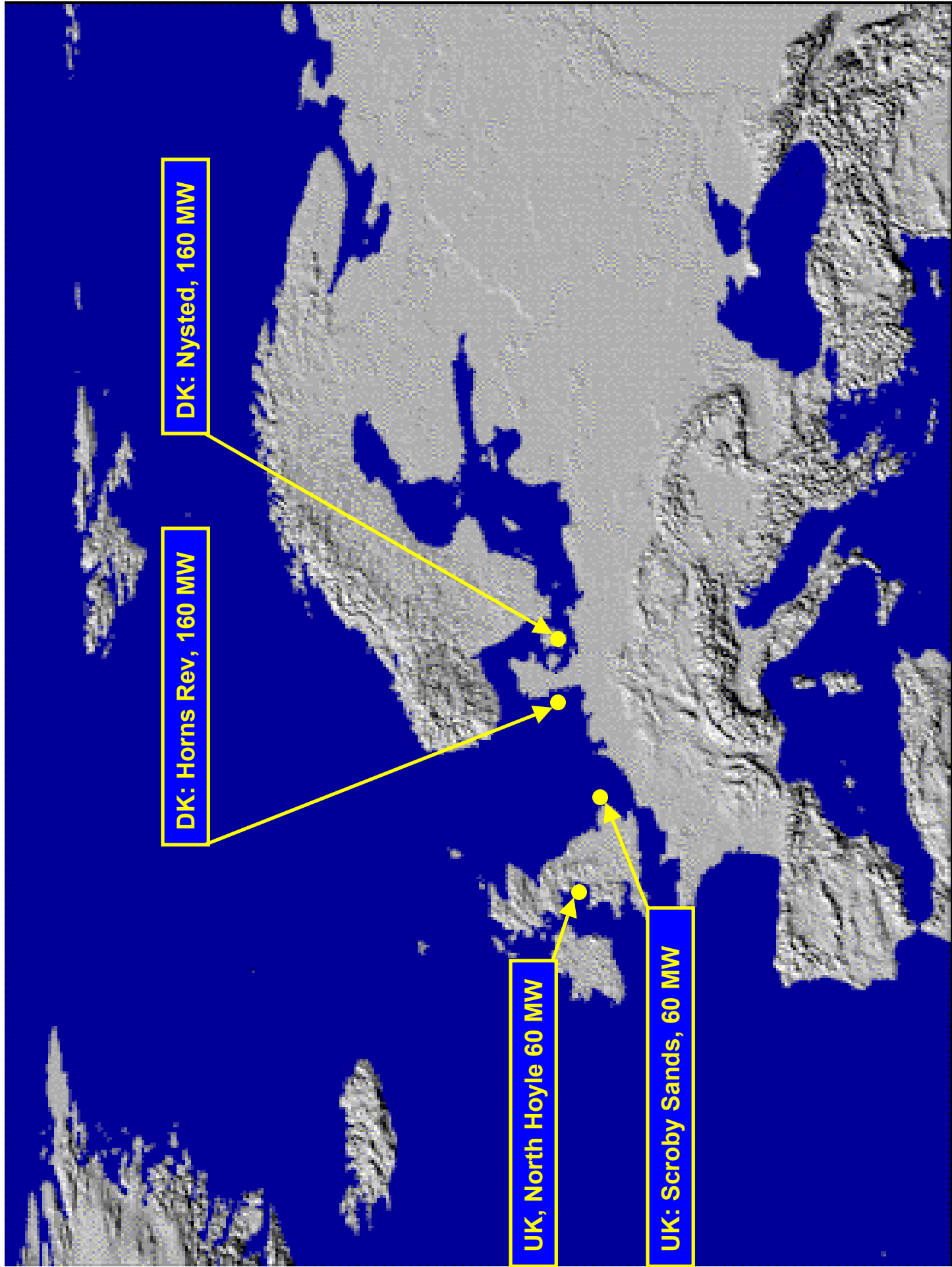
Offshore windfarms 1990 - 2004: 600 MW



Offshore windfarms 1990 - 2004: 600 MW







DK: Nysted, 160 MW

DK: Horns Rev, 160 MW

UK, North Hoyle 60 MW

UK: Scroby Sands, 60 MW



Nysted, Denmark: 160 MW

Scroby Sands, United Kingdom 60 MW



How to boost the market?

- **Cost of energy & financing**
- **Industry**
- **Consents and legislation**
- **Grid connection**

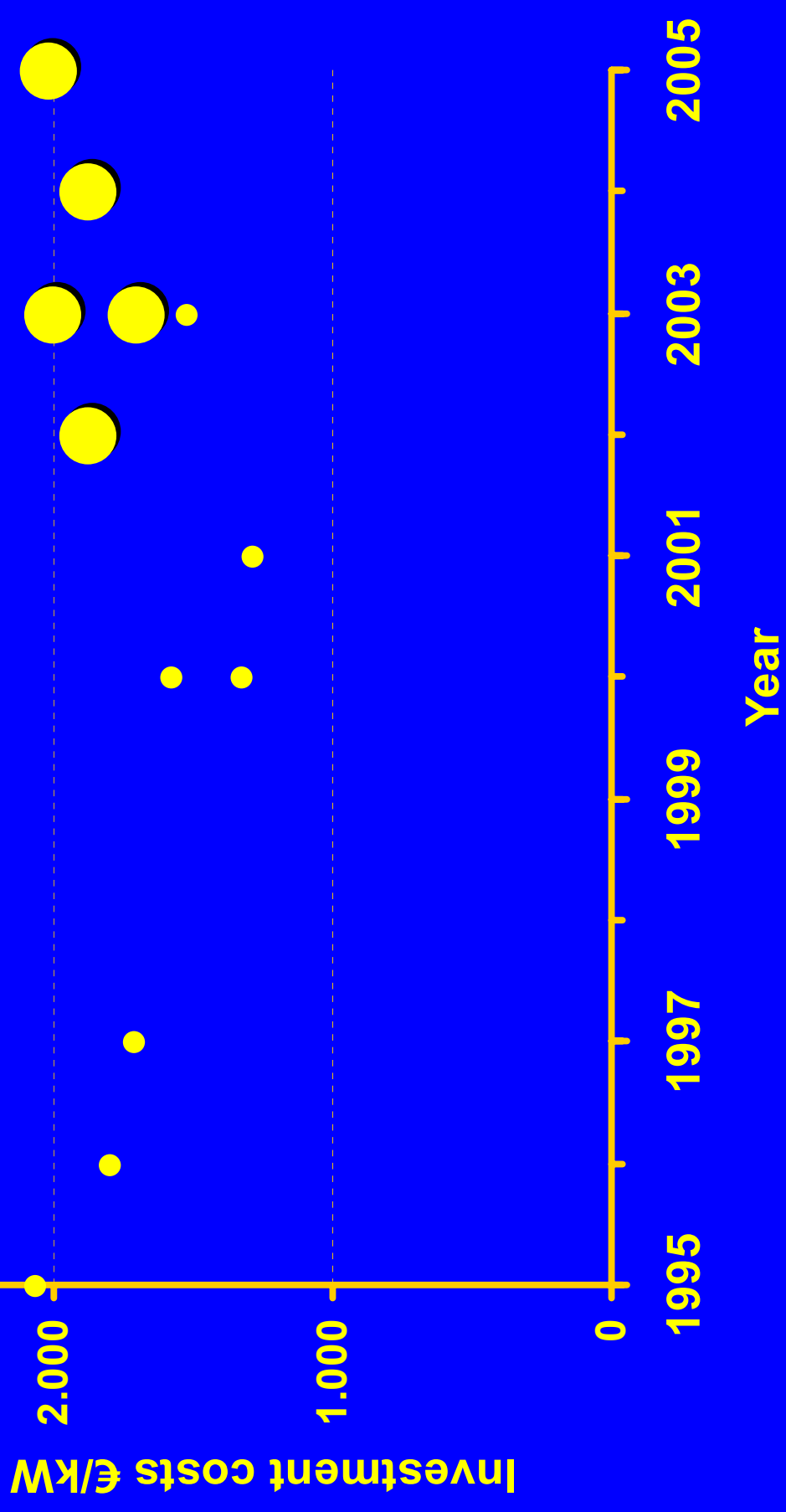


Cost of energy

	Investment costs €/kW	Load factor %	Cost of energy €/kWh	Availability %	Uncertainties
Offshore	1,500 - 2,000	30-40%	0.08 - >0.10	?? (70% but increasing)	Little experience, difficult to finance
Onshore	1,000	20 -30%	0.05 - 0.08	95-99%	>25,000 MW experience, easy to finance

Cost of energy

	Investment costs €/kW	Load factor %	Cost of energy €/kWh	Availability %	Uncertainties
Offshore	1,500 - 2,000	30-40%	0.08 - 0.10	?? (70% but increasing)	Little experience, difficult to finance
Onshore	1,000	20 -30%	0.05 - 0.08	95-99%	>25,000 MW experience, easy to finance



	Rated power / turbine (MW)	Costs (€ / kW)	Water-depth (m)	Distance to shore (km)
Horns Rev	2,0	1,700	6 - 12	14 - 20
Nysted	2,2	1,400	5 - 10	10
North Hoyle	2,0	2,000	10 - 20	6
Scroby Sands	2,0	1,900	4 - 8	3
NSW	2,8	2,000	10 - 15	12

	Rated power / turbine (MW)	Costs (€ / kW)	Water-depth (m)	Distance to shore (km)
Horns Rev	2,0	1,700	6 - 12	14 - 20
Nysted	2,2	1,400	5 - 10	10
North Hoyle	2,0	2,000	10 - 20	6
Scroby Sands	2,0	1,900	4 - 8	3
NSW	2,8	2,000	10 - 15	12

Conclusion:
No cost trend yet. Likely to decrease.

Financing

- **Successful start first projects**
but little experience & high risk
- **No cost trend yet (too early)**
- **Project development long & expensive**
lead times 3-5 year
costs € 3 - 5 mln.
- **Long term commitment government on RES**
support needed

Financing

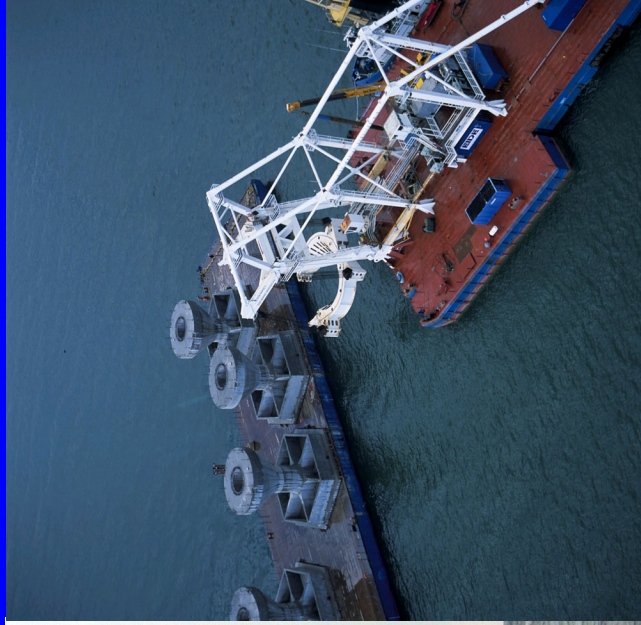
- **Successful start first projects**
but little experience & high risk
- **No cost trend yet (too early)**
- **Project development long & expensive**
lead times 3-5 year
costs € 3 - 5 mln
- **Long term commitment government on RES**
support needed

Conclusion:

Decreasing costs and reducing risks are the keys to competitive RES from sea. This can be achieved with a joint effort of industry and governments

Industry

- **Windturbine suppliers: production capacity: ok**
improvements: offshore designed turbines; larger turbines; costs + or -?
- **Offshore contractors: capacity: ok**
improvements: dedicated vessels; logistics; <<costs



Consents and legislation

- **Consents**
- **Legislation**
 - Construction integrity
 - External safety
 - Labour requirements
 - **Environmental impact**



Consents and legislation

	NL	BE	DK	GE	UK
Pre selection	Intended	Yes	Intended	No	Yes
Procedure	Minimum requirements	Tender	Tender	-	Tender
Criteria	Financial & technical (businessplan); MW/km ²	Financial & technical (businessplan); MW/km ²	Financial & technical (businessplan); MW/km ²	-	Financial & technical (businessplan); MW/km ²
Authorised projects	2	0	9	2 (+2?)	12
Pre selected area's	No	Intended	Yes	Intended	yes

Environmental impact

- 4 fases
 - pre construction => base line
 - construction => small impact
 - operational => effect
 - decommissioning ??
- Issues
 - visibility
 - birds
 - fish
 - marine mammals
 - benthos
 - morphology



Environmental impact

- COD tracked 150 EIA studies
- First impression:
 - Barrier effects (+ & -) significant (birds, fish, marine mammals)
 - EIA's focus on negative impact, not the positive impact (requirements extensive compared to other sectors)
 - Cumulative effects ???

*But: Effect studies take 3 - 5 year,
First windfarm (Horns Rev) <2 year in operation*

- Overview & results all recent / ongoing studies on COD website

www.offshorewindenergy.org/cod

Environmental impact

- **COD tracked 150 EIA studies**
- **First impression:**
 - **Barrier effects (+ & -) significant**
(birds, fish, marine mammals)
 - **EIA's focus on negative impact, not the positive impact**

Conclusions:

Environmental impact + underestimated; -overestimated

Guideline needed: focus on major impacts

Cumulative impacts requires international collaboration

Bring EIA requirements in balance with + effects and other sectors

Grid integration

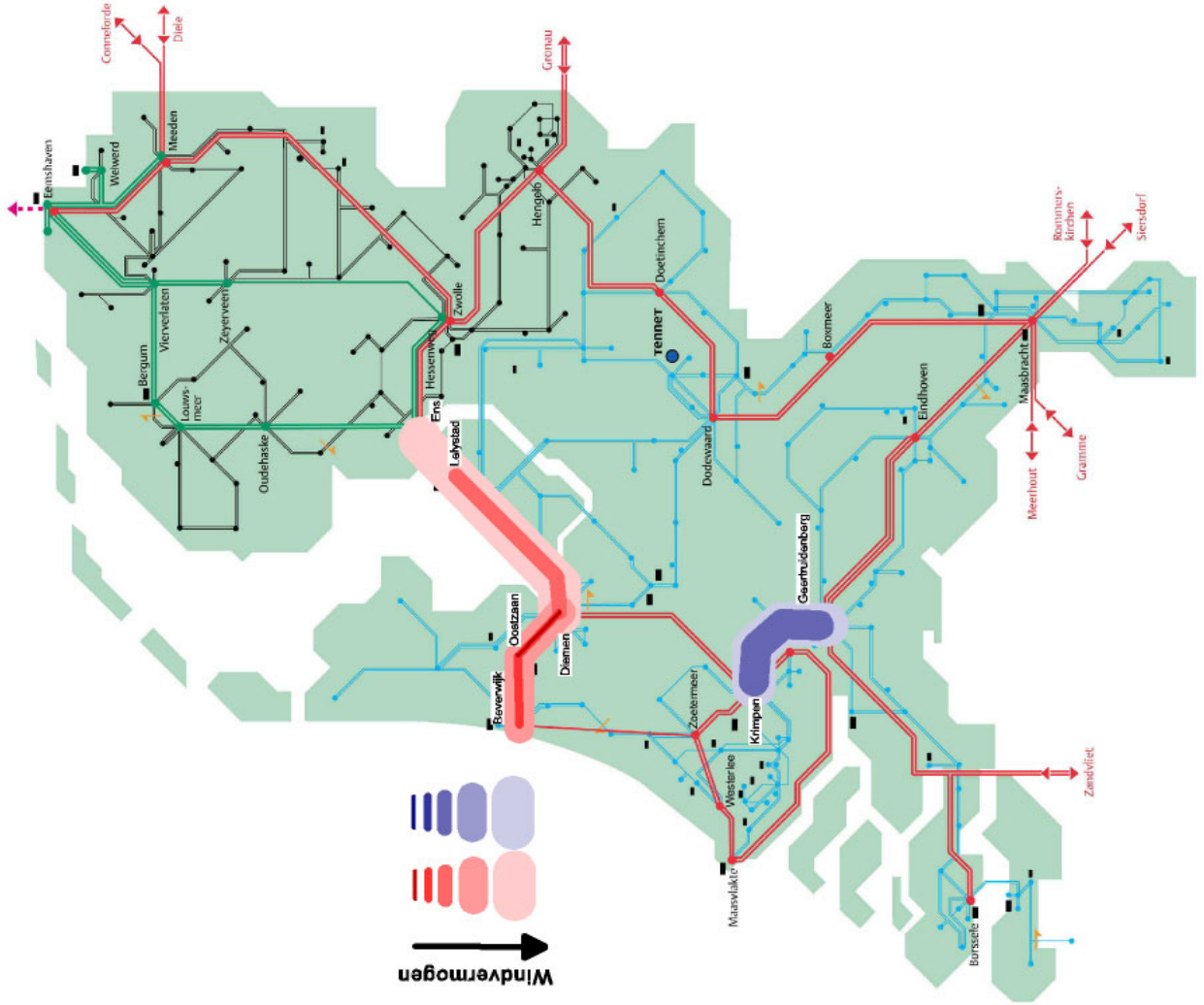
- **Grid connection**
- **Security of supply**
- **Who's responsible, TSO's or industry?**



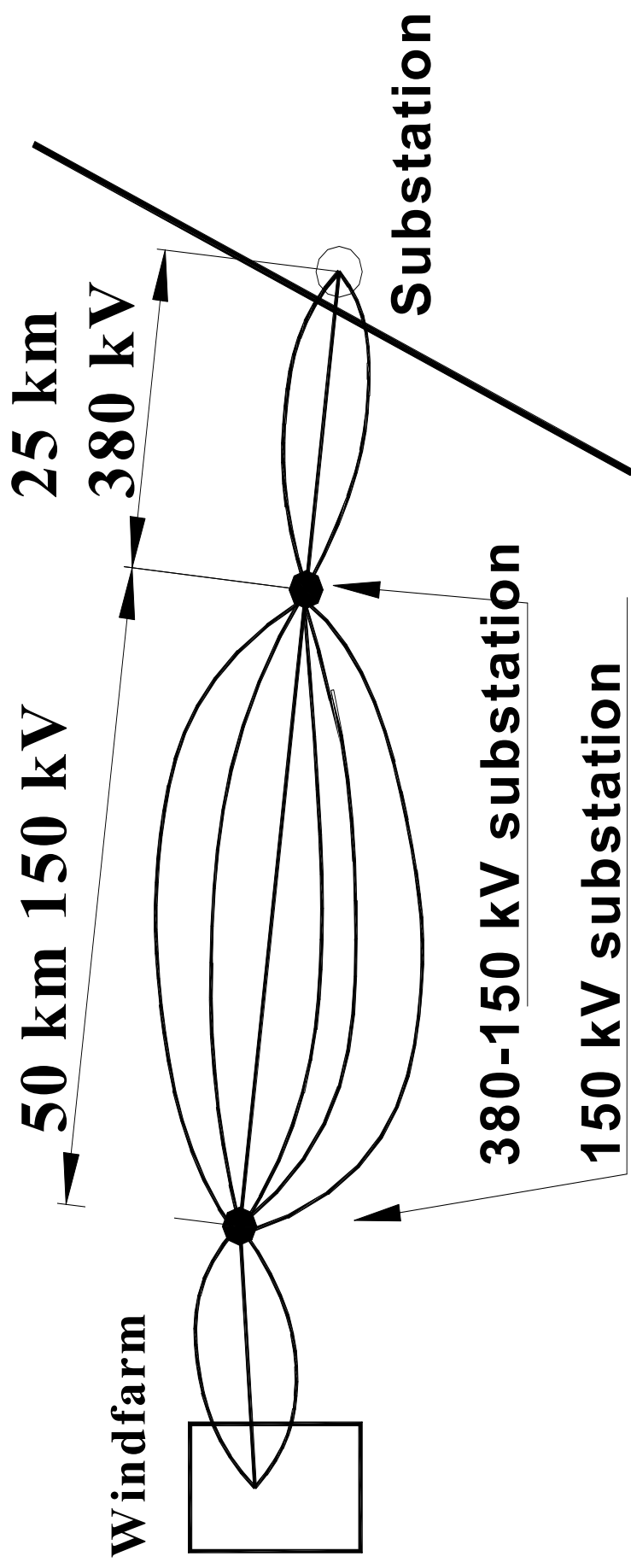
Grid connection

Studies carried out in UK; NL; GE (ongoing)

- **NL 6,000 MW:**
 - **reinforcement existing HV lines on land**
=> **€ 300 mln.**
 - **in consideration: expanding the 380 kV grid to the 12-miles zone => € 700 mln.**
- **UK 8,000 MW:**
 - **reinforcement existing HV lines on land**
=> **€ 140 mln.**
 - **in consideration: marine HV grid**



Marine HV grid



Grid integration

- **Security of supply**
 - **effects on EU scale ??**
Significant effect 40 - 100 GW offshore windpower likely
 - **more interconnector capacity needed?**
- **Who's responsible, TSO's or industry?**



Grid integration

- **Security of supply**
 - **effects on EU scale ??**
Significant effect 40 - 100 GW offshore windpower likely
 - **more interconnector capacity needed?**
- **Who's responsible, TSO's or industry?**

Conclusions:

Grid integration = bottleneck

***Responsibility TSO's must be regulated;
in EU directives on electricity and RES?***

Information needed on EU effects

Memberstates must make the grid accessible



More information

www.offshorewindenergy.org/cod

r.de.bruijne@novem.nl