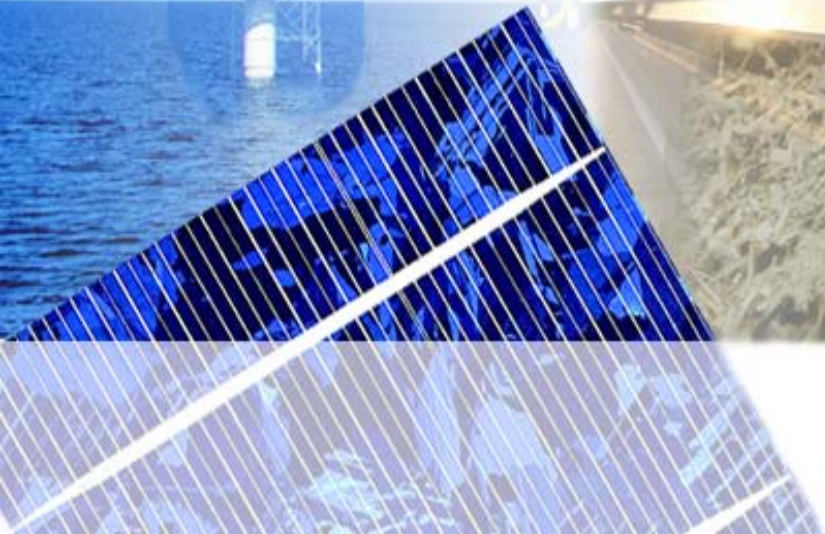




***Research Priorities
for Renewable Energy Technology
by 2020 and Beyond***

**Keith Melton
President**

***Renewable Energy Research Conference
Trondheim
June 2010***



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EUREC Agency members

44 prominent mostly public R&D groups from across Europe active in research, development and demonstration for all renewable energy technologies

- ✓ Photovoltaics
- ✓ Solar thermal electricity
- ✓ Solar thermal heat & cool
- ✓ Solar buildings
- ✓ Biomass
- ✓ Wind
- ✓ Hydro
- ✓ Marine
- ✓ Geothermal

...and supporting technologies
(energy efficiency, storage, distribution, integration)

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Sector Approach

- Electricity Generation
- Heating and Cooling
- Transport



RESEARCH PRIORITIES
FOR RENEWABLE ENERGY
TECHNOLOGY BY 2020 AND BEYOND

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Technical maturity

- Research
- Development
- Pilot
- Demonstration
- Commercial

The background of the slide is a collage of renewable energy images. On the left, a large white wind turbine stands on a blue sea under a clear blue sky. In the bottom left corner, there are blue solar panels. On the right, a long, low solar collector or solar tower is visible, with a bright sun low on the horizon behind it, creating a lens flare effect. The overall scene is bright and represents various clean energy technologies.

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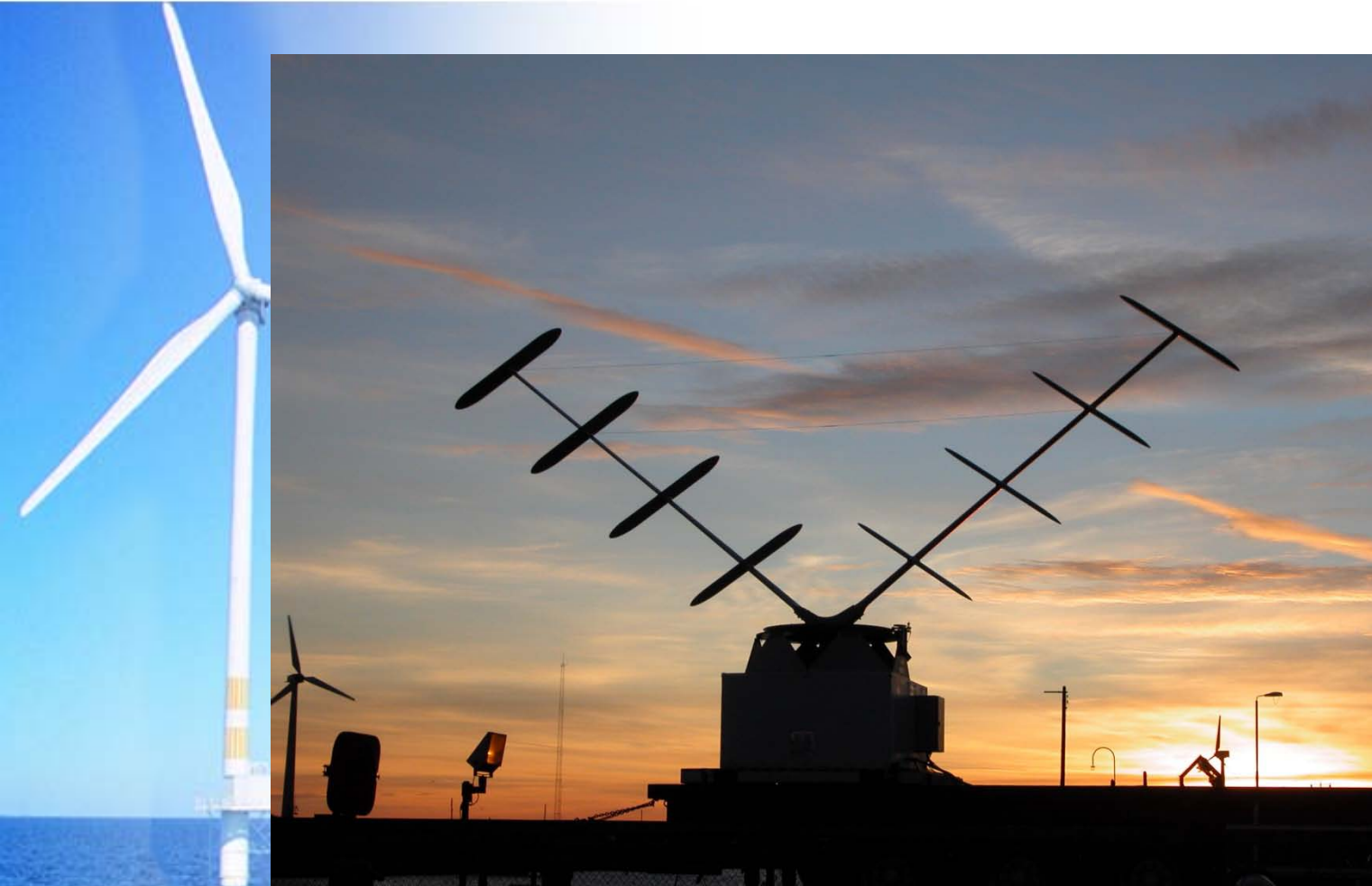
Electricity Generation

- Wind,
 - Onshore Commercial
 - Offshore Development / Commercial
- Biomass for power generation
- Small hydro power
- Photovoltaics
- Concentrated Solar Power (CSP)
- Ocean

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Vertical Axis Wind Turbine



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Source; Windpower

Offshore Wind energy- Research Needs

- Foundations including floating platforms for deep water
- More robust gearboxes / gearless drives
- Condition monitoring systems
- Electrical connectors (also Ocean Energy)
- AC-DC-AC transmission systems

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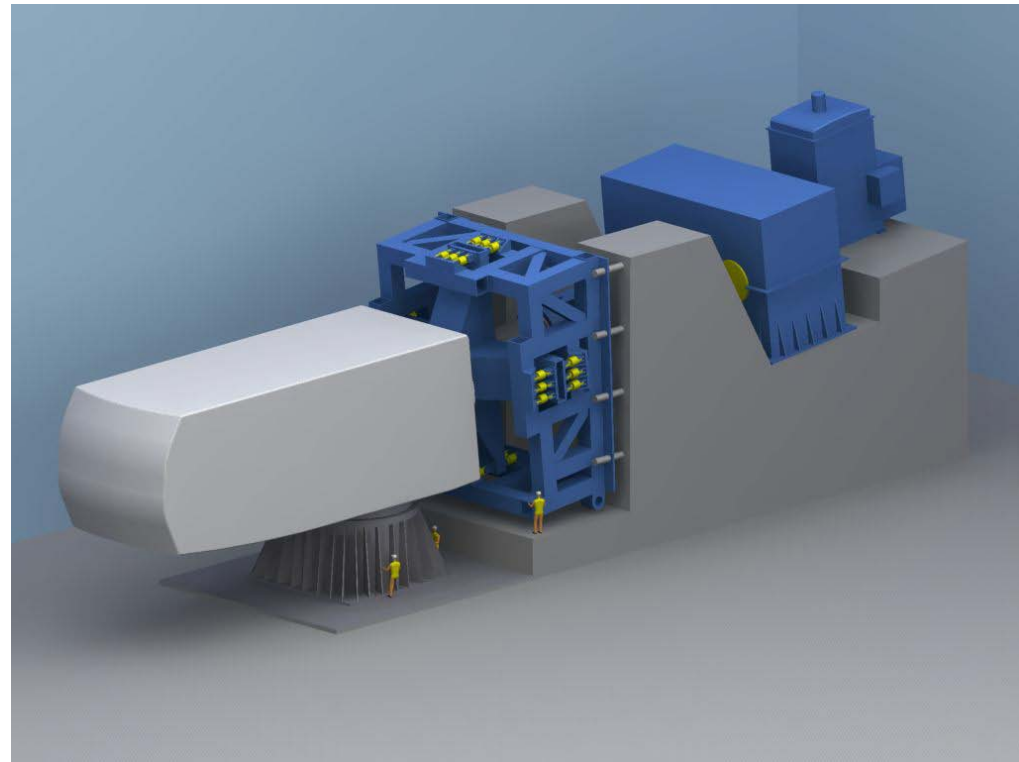
Offshore Wind energy- Research Needs

- Testing facilities for mechanical components eg Drive Train
- Few opportunities to pilot onshore
- Reduce risk and accelerate deployment

Drive train / Full nacelle Test-rig



- 15MW drive system capable of testing the full nacelle of a 10MW turbine:
 - with either gearbox or direct drive
 - includes drive shafts, bearings, gearbox, generator, converter.
- Mechanical loads:
 - ultimate
 - fatigue.
- Electrical loads and grid faults.



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Ocean energy

- Wave and Tidal Stream in Europe
- Europe leading
- Development / Pilot / Demonstration phases
- Tidal Stream – more advanced
 - Storm survivability less of an issue
 - Transfer of technology from wind
- Wave – wide range of technical solutions

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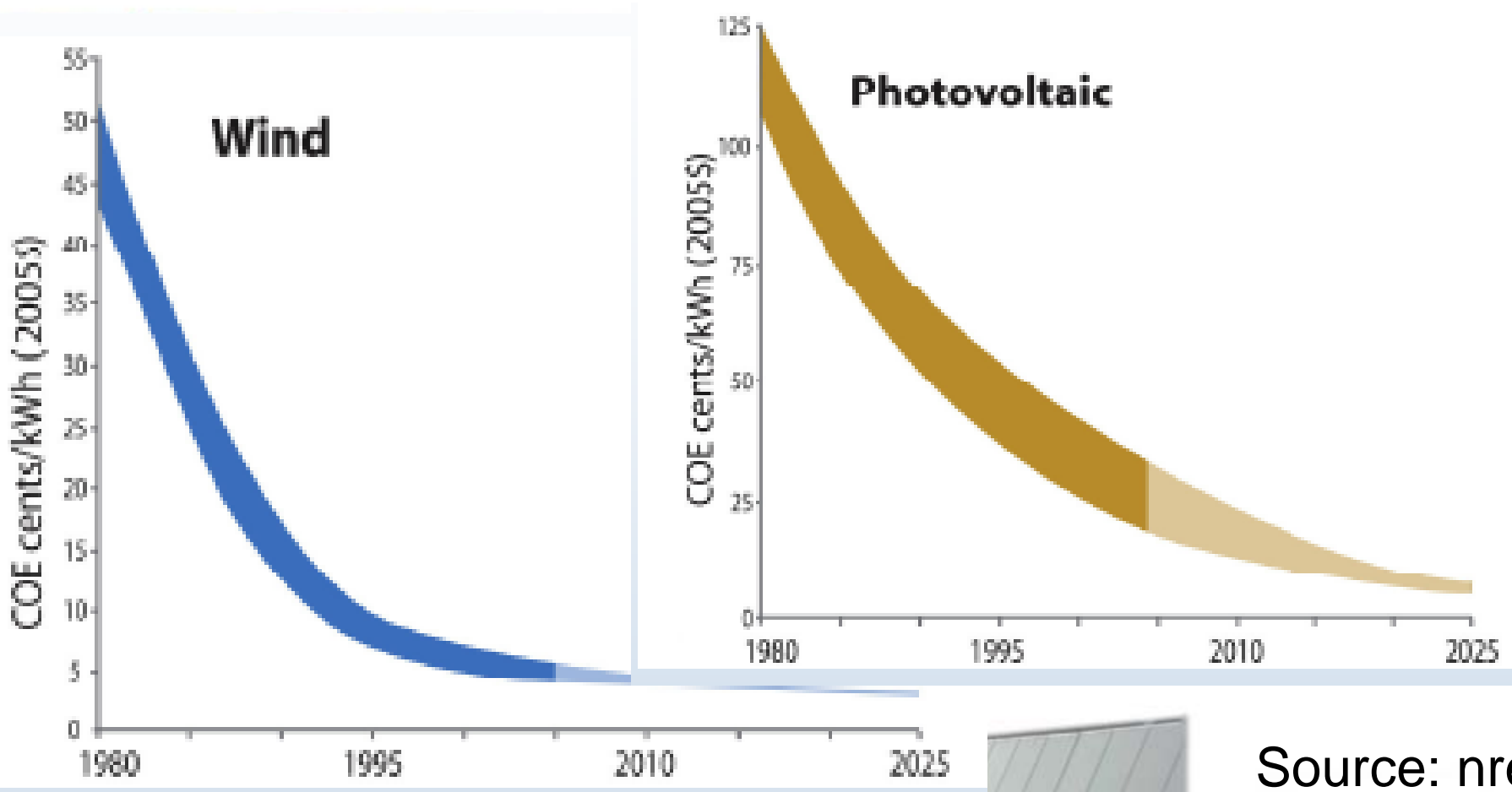
Photovoltaics

- Silicon is a mature technology
- Processing Innovation to reduce costs
- Other technologies eg polymeric PV are still in lab phase
- Need to balance short and long term R&D, recognising roles of public / private sectors

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Cost reduction curves



Source: nrel

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Overlay technology and costs

- Technologies which are at similar levels of cost of electricity but different technology maturity might require different support mechanisms
 - Ocean Energy vs Silicon PV

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Wavedragon



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Wavedragon



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Support mechanisms

- Revenue based support mechanisms are not always helpful if the technology is immature and risky
- Capital based might be more appropriate
- “One Size Doesn’t Fit All”

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Research Priorities across Europe

- Renewable Resources are not uniformly distributed across Europe
- Biomass in North, Solar in South
- Corresponding Research Priorities will vary
- European Support Mechanisms must reflect this

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Time Value of CO2 Savings

- Business is used to the Time Value of Money as a tool to assess investment opportunities
- The Time Value of CO2 Savings should be used to balance an R&D portfolio
- More investment in Renewables, less in CCS and Nuclear

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Balanced Approach

- Within the Energy Sector, we should be honest about the strengths and weaknesses of each Technology
- If we the Technical Experts cant get it right, what chance have the Politicians

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Summary

- EUREC published Research Priorities
- EU Commission SET-Plan has produced Technology Roadmaps
- Policies are in place to drive take up
 - Eg 20-20-20
- We now need to deliver!
- This Conference will make a significant contribution

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Legal Status: European Economic Interest Grouping
Registered in Belgium since 1991

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