



# Accelerating deployment of responses to the challenge of Climate Change

November 5<sup>th</sup> 2008

Dr David Clarke

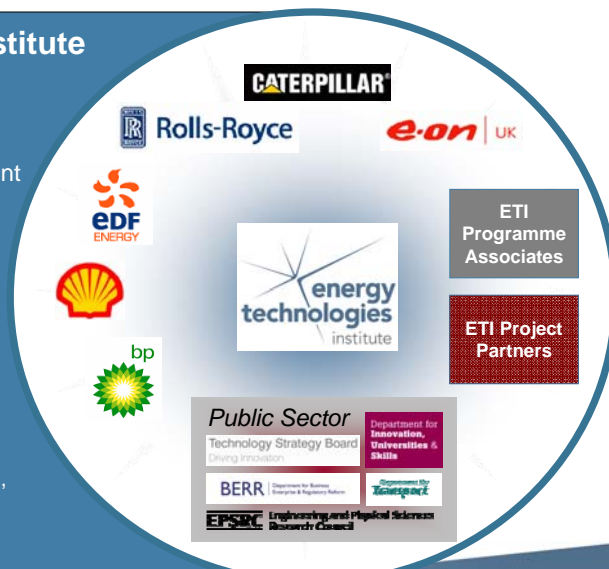
Chief Executive

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## Energy Technologies Institute

- Bringing together the complementary capabilities of global industrial groups in a unique approach with government
- Addressing the challenges of climate change and low carbon energy
  - Demonstrating technologies and systems
  - Improving energy usage, efficiency, supply and generation
  - Developing knowledge, skills and supply-chains
  - Informing development of regulation, standards and policy
  - Enabling deployment of affordable, secure, low carbon energy systems



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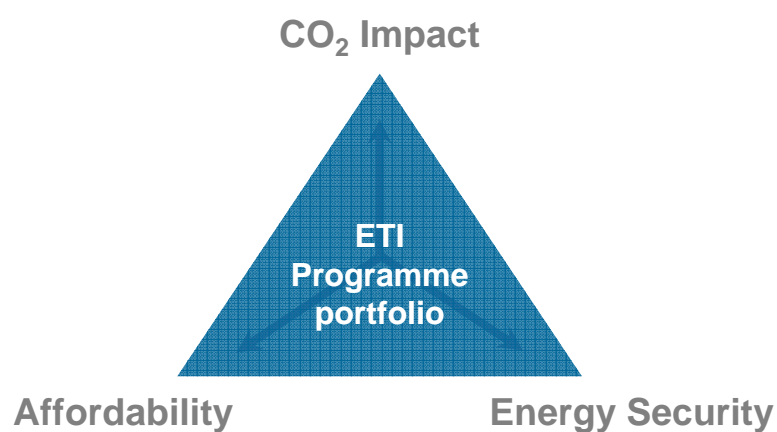


## ETI supports projects that .....

- Develop and demonstrate system level capabilities based on novel low carbon energy technologies or services
- Create additional value through the synergistic capabilities of the ETI Members and Project Partners
- Create new partnerships - improving skills, knowledge, capabilities and supply chain capacity
- Create benefit in the UK and globally – through deployment, skills, knowledge base or exports
- Reduce risk associated with novel energy systems and supply-chains
- Identify barriers requiring ‘next generation’ science and technology support
- Inform development of regulations, standards and policy

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## Balancing the drivers ....



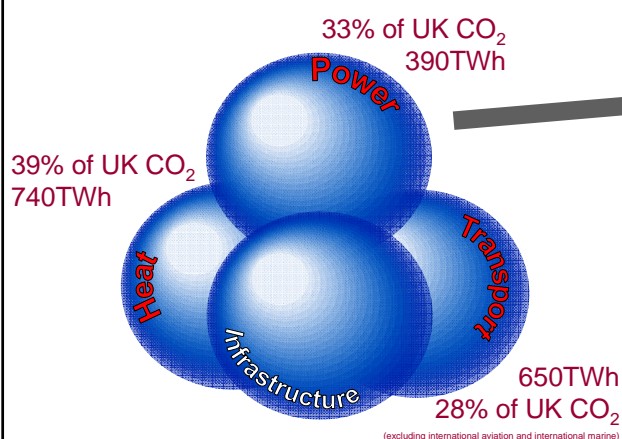
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## ETI programmes focus on key energy challenges

- ⇨ **Wind**
    - ⇨ Offshore specific systems
  - ⇨ **Marine**
    - ⇨ Tidal Stream and Wave
  - ⇨ **Distributed Energy (DE) and energy use in Buildings**
    - ⇨ Heat, Power, demand side management, efficiency
  - ⇨ **Carbon capture, handling and storage (CCS)**
    - ⇨ Storage, Capture, Monitoring and Verification
  - ⇨ **Energy Networks**
    - ⇨ Infrastructure, management, operation
    - ⇨ Storage Technologies
  - ⇨ **Transport**
    - ⇨ electric mobility, vehicle efficiency
  - ⇨ **Systems modelling**
- ⇨ Skills
  - ⇨ Technology
  - ⇨ Capacity

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## 4 key sectors – all interact together

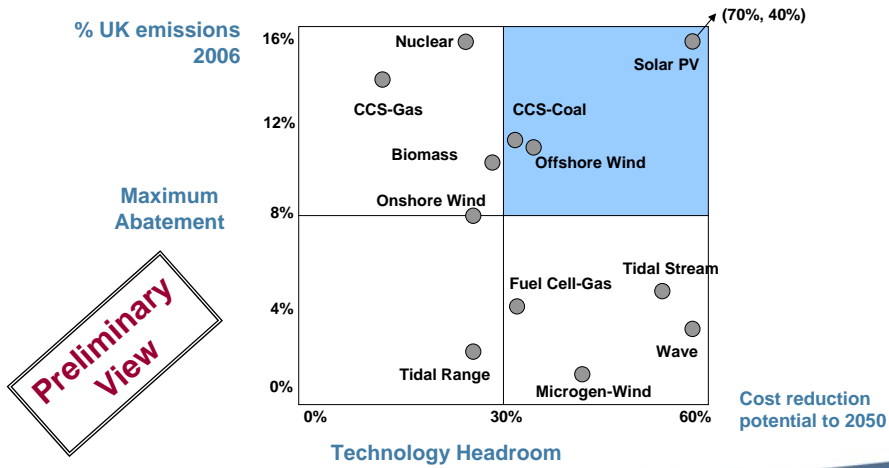


### Includes .....

- ⇨ Nuclear
- ⇨ Solar PV
- ⇨ Coal + CCS
- ⇨ Gas + CCS
- ⇨ Fuel cell (gas)
- ⇨ Biomass
- ⇨ Onshore wind
- ⇨ Offshore wind
- ⇨ Microgeneration – wind
- ⇨ Tidal stream
- ⇨ Wave
- ⇨ Tidal range
- ⇨ .... and others

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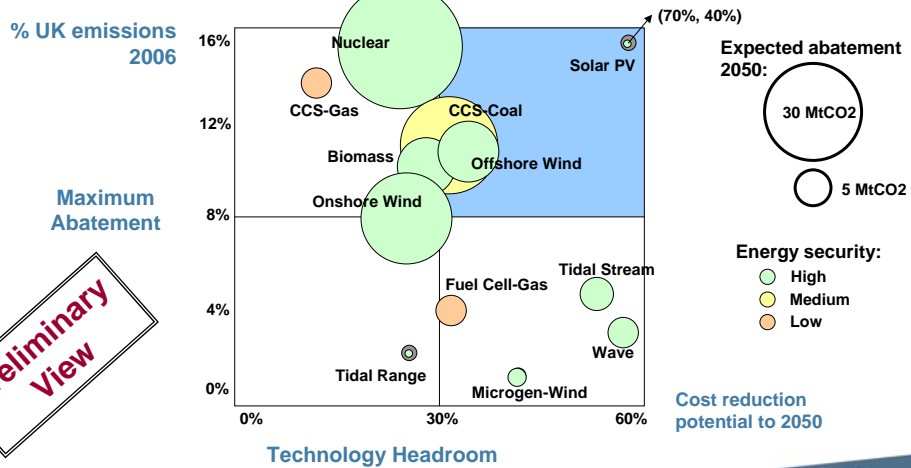
## Technology opportunity – power



**Preliminary View**

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## Technology opportunity – power



**Preliminary View**

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## Offshore Wind

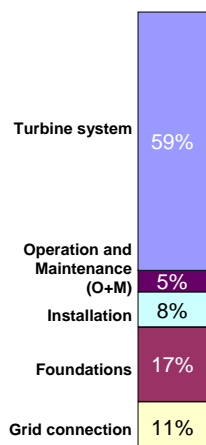
- Move to further offshore (UK 'Round 3') brings ....
  - Opportunity to access additional 25GW of capacity
  - But ..... >80% of this sea floor is
    - deeper than 40m
    - further than 60nm offshore
  - Good resource potential but ...
  - Challenging environment
- Brings significant cost and risk challenges
  - System design
  - Operation (Reliability / Downtime)
  - Maintenance
  - Installation
  - Grid connection



Courtesy - Talsman / Scaldis  
**REpower 5MW** turbine being installed on Beatrice Project in 44m of water on a jacket structure. Rotor - 126m diameter  
 Tower, nacelle and rotor installed in one lift as pre-assembled unit

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## Offshore Wind - Technology opportunities



**Cost Breakdown**  
 Carbon Trust  
 Nominal 5MW offshore installation - £2.5m / MW

- System re-design
  - No gearbox
  - Superconducting generator
  - Aerodynamic optimisation
  - Alternative materials
- Operation and Maintenance
  - 'Fleet wide' condition monitoring and prognostics
- Installation / Foundations
  - Floating structures
- Grid Connection
  - HVDC



Courtesy - Statoil-Hydro  
 HyWind floating turbine schematic  
 Turbine capacity: 2.3 MW, Height 65m, Rotor diameter: 82.4 m  
 Weight of turbine: 138 tonnes, Total weight: 5300 tonnes  
 Draught below sea surface: 100 m, Sea depth range: 120 - 700 m

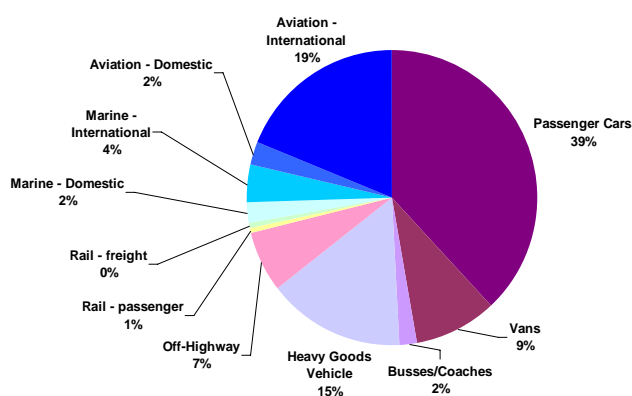
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## ETI – Offshore projects

- > £60m of ETI contracts being finalised
  - *Systems demonstration and next-generation capabilities*
  - Offshore Wind
  - Marine – Wave and Tidal
- Involvement of a broad range of partners in all activities and projects
  - SMEs, large corporates, University groups, consultancies, ETI Members
- > £10m Carbon Trust Offshore Wind accelerator launched October 2008
  - *Addressing near-term cost reduction opportunities*
  - Foundations, Electrical Systems, Wake Effects,
  - Access, logistics and transportation

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## Transport – Emissions and Opportunities



UK Transport CO<sub>2</sub> emissions by mode  
Source: DEFRA, 2007

- Transport CO<sub>2</sub> emissions

- Cars + Vans = 48%
- Heavy Duty Vehicles = 24%

- Mitigation opportunities

- Efficiency improvements
- Biofuels
- Modality shift (e.g. to rail)
- Electrification – light vehicles

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## Transport - Plug-In Hybrid Electric Vehicles (PHEVs)

- ETI / CENEX workshop early December
- Evaluation of opportunities for PHEVs
- Identification of requirements for a large scale demonstration project
- Focus on infrastructure systems
  - Underpinned by ETI Member capabilities



EDF



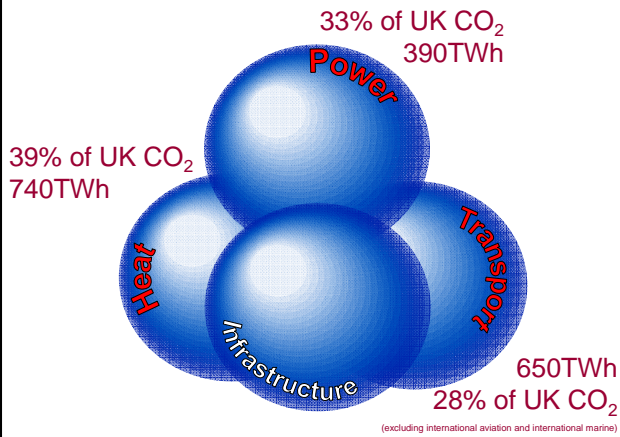
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## ETI – current status

- > £60m of contracts being finalised
  - Offshore Wind
  - Marine – Wave and Tidal
  - Systems demonstration and next-generation capabilities
- Further programmes and projects being developed
  - CCS (Storage and Capture), Transport (Plug-In Hybrids), Distributed Energy (Heat, Power and Controls)
- UK Energy System model in development
  - Toolset to enable prioritisation of programmes
- Technology roadmapping underway
  - Working with the supply communities and funders
- Involvement of a broad range of partners in all activities and projects
  - SMEs, large corporates, University groups, consultancies, ETI Members

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## 4 key sectors – all interact together



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- Accelerating the pace of energy R+D
- Catalysing deployment of low carbon solutions

### Creating .....

- Collaboration
- Focus
- Effective pull-through from the technology base
- Growth in engineering and technology skills and capacity across industry and academia
- An increased “appetite” for risk at all levels

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