Renewable Energy Systems Group

• One of the world’s leading renewable energy companies

• Established in 1982, part of Sir Robert McAlpine Group

• 400 staff in 15 offices across the world

• Development, Construction, Ownership, O&M
  - Wind, Onshore & Offshore
  - Biomass
  - Solar PV and Solar Thermal
  - Geothermal Heat Pumps
  - Tidal

• Sustainable Buildings
RES in Wind

- Wind farms built and in construction
  - 69 Projects
  - 3,089 MW
  - 2,007 Turbines

- 16,000+ MW capacity in development

- 489 MW owned (Operating and in Construction)
PLUGGING THE GAP
A survey of world fuel resources and their impact on the development of wind energy

GLOBAL WARMING
A guide to its origins and effects
Market Drivers - The Twin Challenges

- Security of Future Energy Supplies
- Global Warming
RES Approach

• Understand the Issues
• Position the Company
• Show Leadership
• Help Develop the Markets
• Grow the Business
Global demand grows by more than half over the next quarter of a century, with coal use rising most in absolute terms.
So Where Are We Now?

- Oil Discovery peaked in the 1960’s
- We’re now consuming >3 times as much as we discover
- Expect a peak in the next decade (2012-2016) around 90 Mb/d
- IEA projects a demand (and supply) of 121 Mb/day by 2030 >gap = 5 times the current production of Saudi Arabia
• **Gas Production**

• We have just started to use more gas than we find

• Peak is expected around 2030.

• By then gas demand will have doubled and the gap would be equivalent to the current production of Europe + the FSU

• **BUT**, gas is not a perfect global market like oil. Transport is restricted and expensive

• **SO - regional shortages** might occur well before the global peak
The US - on a Cliff Edge

- Gas wells are declining dramatically.
- Considerable amounts of LNG will be needed very soon.
- Intense competition for LNG supplies is expected.
- “Official” forecasts can be very misleading.

![Graph showing US, Canada, and Mexico annual gas production and 23-year shifted conventional mean discovery](image)

![Graph showing domestic production](image)

![Graph showing LNG imports](image)
The Role of Coal

- Global proved recoverable reserves amount to **909 GTons**, equivalent to twice the remaining oil.

- By 2050 we will have consumed 40% of the coal reserves.

- Then 10% per decade.

- Coal is abundant and most countries have some.

- Big energy consumers like the US, the FSU, China and India are self-sufficient in coal and will be in the foreseeable future.
The Fossil Fuel Era

Fossil Fuel Era – 1800 – 2100 AD – 300 years
Mankind on Earth – 250,000 years
Fossil Fuel created – 600 Million years ago
The Uranium Resource Base

- Present reserves would last 60 years with modest growth in nuclear generation (highest *business as usual* scenario)
- In the long term alternatives would have to follow, but their expected cost does not seem to affect generation costs heavily
  - Enhanced fuel recycling
  - Uranium from phosphates
  - Thorium cycle
- Nuclear currently only 6.5% world energy demand
- So - conventional resources could not sustain a substantial growth in nuclear
Upsala Glacier, Argentina 1928-2004

Once the biggest in South America, now disappearing at a rate of 200 metres per year.
IPCC Projected Temperature Changes
Global Temperature Increase Predictions to 2070-2100

Global Warming Predictions

2070-2100 Prediction vs. 1960-1990 Average

Based on HadCM3

Temperature Increase (°C)
September ice extent from 1979 to 2007
Sea ice extent for September 16, 2007, compared to previous record

Current Ice Extent
09/16/2007

Total extent = 4.1 million sq km

Current Ice Extent
09/21/2005

Total extent = 5.3 million sq km
The Stern Warning

• Cost of Climate Change will be 5-20% of GDP pa if no action taken

• Cost of taking action would be ~1% GDP pa

• Action needs to be taken over next 10-20 years

• Need to stabilise at 500-550ppm (380ppm now) initially then reduce substantially

• Power sector needs to be >60% decarbonised by 2050
Response to the Twin Challenges

• Reduce consumption

• Reduce carbon/fossil based generation

• Replace with sustainable, low carbon sources
EU 2020 Renewables Targets

- Electricity: 34%
- Heat: 18%
- Transport: 12%
- All Energy: 20%
## Renewable Technologies Potential
### Electricity and Heat by 2020

<table>
<thead>
<tr>
<th>Technology</th>
<th>Electricity</th>
<th>Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Solar</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Geothermal</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Wave</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tidal</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Wind Industry Growth Prospects

2006 Installed Capacity 75,000MW

2020 Prospect

<table>
<thead>
<tr>
<th>Region</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>300,000MW</td>
</tr>
<tr>
<td>EU</td>
<td>200,000MW</td>
</tr>
<tr>
<td>ROW</td>
<td>200,000MW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>700,000MW</strong></td>
</tr>
</tbody>
</table>

Current Industrial Capacity 15,000MW/pa
Capacity needed in 2020 75,000MW/pa
Growth rate ~12% pa compound
Today’s Challenges
Corporate

• Predicting and Managing Growth

• Human Resources
  • Recruitment and Training
  • Retention
  • Change Management

• Organisational development

• Physical Resources
Today’s Challenges
Industry and Competition

• Consolidation in Manufacturing
  • Horizontal and Vertical

• Consolidation in Development and Ownership
  • Utility and Private Equity Involvement
  • Acquire, Assemble and IPO!

• Equipment Supply Lag (eg wind turbines)
  • Project delays
  • Early financial commitments
  • Price rises
Today’s Challenges
Market Fundamentals and Infrastructure

• Market Uncertainty
  • How Big, How Quick
  • Support Mechanisms – PTC etc

• Need to Develop Markets
  • Emerging Markets
  • Implementing New Technologies

• Permitting unpredictability and timescales

• Grid constraints and associated timescales
Today’s Challenges

Financial

• Investment for Industrial Capacity
  • Components
  • Assembly

• Investment for Infrastructure
  • Grid
  • Fuel supply Chains
  • Cranes, Specialised Ships, Drilling Rigs

• Market Stability
Today’s Challenges
Financial

• Finance for Projects
  • Turbine Deposits
  • Project Equity (and Tax Equity)
  • Project Debt

• Finance for Technology Development
  • Fundamental Research
  • Development of Prototypes
  • commercialisation
What Do We Need?

- Leadership
- Buy In
- A Road Map to a Sustainable Future
  - What do we need to achieve by 2020 and 2050?
  - Which technologies will get us there?
  - What is the policy Framework necessary?
<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Rated Capacity</th>
<th>Number and Type of Turbines</th>
<th>Project Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Burrows, Cornwall, UK</td>
<td>Operational</td>
<td>4.5 MW</td>
<td>15 Bonus Combi MkII</td>
<td>Purchased by RES in 1997</td>
</tr>
<tr>
<td>Dyffryn Brodyn, Wales, UK</td>
<td>Operational</td>
<td>5.5 MW</td>
<td>11 Nordtank 500 kW</td>
<td>Purchased by RES in 1997</td>
</tr>
<tr>
<td>Carc, Donegal, Ireland</td>
<td>Operational</td>
<td>15.0 MW</td>
<td>25 Micon 600 kW</td>
<td>RES</td>
</tr>
<tr>
<td>Lendrum’s Bridge, NI, UK</td>
<td>Operational</td>
<td>5.9 MW</td>
<td>9 Vestas 660 kW</td>
<td>RES</td>
</tr>
<tr>
<td>Beennageeaha, Ireland</td>
<td>Operational</td>
<td>3.96 MW</td>
<td>6 Vestas 660 kW</td>
<td>RES</td>
</tr>
<tr>
<td>Milane Hill, Ireland</td>
<td>Operational</td>
<td>5.94 MW</td>
<td>9 Vestas 660 kW</td>
<td>RES</td>
</tr>
<tr>
<td>Souleilla, France</td>
<td>Operational</td>
<td>7.8 MW</td>
<td>6 Bonus 1.3MW</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Corbières, France</td>
<td>Operational</td>
<td>13.0 MW</td>
<td>10 Bonus 1.3MW</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Lendrum’s Bridge II, NI, UK</td>
<td>Operational</td>
<td>7.26 MW</td>
<td>11 Vestas 660 kW</td>
<td>RES</td>
</tr>
<tr>
<td>Forss, Scotland, UK</td>
<td>Operational</td>
<td>2.0 MW</td>
<td>2 Bonus 1.3MW (de-rated)</td>
<td>RES</td>
</tr>
<tr>
<td>Altahullion, NI, UK</td>
<td>Operational</td>
<td>26.0 MW</td>
<td>20 Bonus 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>RES Head Office, UK</td>
<td>Operational</td>
<td>225 kW</td>
<td>1 Vestas 225 kW (V29)</td>
<td>RES</td>
</tr>
<tr>
<td>Taurbeg, Eire</td>
<td>Operational</td>
<td>25.3 MW</td>
<td>11 Bonus 2.3 MW</td>
<td>RES</td>
</tr>
<tr>
<td>Haut Cabardès, France</td>
<td>Operational</td>
<td>20.8 MW</td>
<td>16 Bonus 1.3 MW</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Roussas-Claves, France</td>
<td>Operational</td>
<td>10.5 MW</td>
<td>6 Vestas V66</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Haut Languedoc, France</td>
<td>Operational</td>
<td>29.9 MW</td>
<td>23 Bonus 1.3 MW</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Cuxac, France</td>
<td>Operational</td>
<td>12MW</td>
<td>6 Vestas V80</td>
<td>EOLE-RES</td>
</tr>
<tr>
<td>Black Hill, Scotland</td>
<td>Operational</td>
<td>28.6MW</td>
<td>22 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Altahullion II, NI</td>
<td>Operational</td>
<td>11.7MW</td>
<td>9 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Forss II, Scotland</td>
<td>Operational</td>
<td>5.2MW</td>
<td>4 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Lough Hill, NI, UK</td>
<td>Operational</td>
<td>7.8MW</td>
<td>6 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Whirlwind, Texas, USA</td>
<td>Under construction</td>
<td>59.8MW</td>
<td>26 Siemens 2.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Marsanne, France</td>
<td>Under construction</td>
<td>16MW</td>
<td>8 x 2MW</td>
<td>Eole-RES</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>325MW</strong></td>
<td></td>
<td></td>
</tr>
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</table>
### Americas – 2007

#### Projects completed and under construction

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Rated Capacity</th>
<th>Number and Type of Turbines</th>
<th>Project Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild Horse, Washington, USA</td>
<td>Operational 2007</td>
<td>229 MW</td>
<td>127 Vestas 1.8MW</td>
<td>Puget Sound Energy</td>
</tr>
<tr>
<td>Mesquite (Lone Star Phase 1), Texas, USA</td>
<td>Under construction</td>
<td>200MW</td>
<td>100 Gamesa 2MW</td>
<td>Horizon Wind Energy LLC</td>
</tr>
<tr>
<td>Post Oak (Lone Star Phase II), Texas, USA</td>
<td>Under construction</td>
<td>200MW</td>
<td>100 Gamesa 2MW</td>
<td>Horizon Wind Energy LLC</td>
</tr>
<tr>
<td>Sweetwater IV(B), Texas, USA</td>
<td>Operational 2007</td>
<td>105.8MW</td>
<td>89 Siemens 2.3MW</td>
<td>B&amp;B and Catamount</td>
</tr>
<tr>
<td>Sweetwater V, Texas, USA</td>
<td>Under construction</td>
<td>80.5MW</td>
<td>35 Siemens 2.3MW</td>
<td>B&amp;B and Catamount</td>
</tr>
<tr>
<td>White Creek, Wash., USA</td>
<td>Operational 2007</td>
<td>204.7MW</td>
<td>69 Siemens 2.3MW</td>
<td>White Creek 1</td>
</tr>
<tr>
<td>Marengo 1, Wash., USA</td>
<td>Operational 2007</td>
<td>140.4MW</td>
<td>78 Vestas V80</td>
<td>Pacificorp</td>
</tr>
<tr>
<td>Whirlwind, Texas, USA</td>
<td>Under construction</td>
<td>59.8MW</td>
<td>26 Siemens 2.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Nine Canyon III, Wash, USA</td>
<td>Under construction</td>
<td>32.2MW</td>
<td>14 Siemens 2.3MW</td>
<td>Energy Northwest</td>
</tr>
<tr>
<td>Mountain Wind I, Wyoming, USA</td>
<td>Under construction</td>
<td>60.9MW</td>
<td>29 Suzlon 2.1MW</td>
<td>Edison Mission</td>
</tr>
<tr>
<td>Marengo II, Wash, USA</td>
<td>Under construction</td>
<td>70MW</td>
<td>78 Vestas 1.8MW</td>
<td>Paciforp</td>
</tr>
<tr>
<td>Buffalo Gap III, USA</td>
<td>Under construction</td>
<td>170MW</td>
<td>74 Siemens 2.3MW</td>
<td>AEP</td>
</tr>
<tr>
<td>Mountain Wind II, Wyoming,USA</td>
<td>Under construction</td>
<td>48MW</td>
<td>23 Suzlon 2.1MW</td>
<td>Edison Mission</td>
</tr>
<tr>
<td>Hopkins II, Wash, USA</td>
<td>Under construction</td>
<td>7.2MW</td>
<td>4 Vestas 1.8 MW</td>
<td>PSE</td>
</tr>
<tr>
<td>South Trent, Texas, USA</td>
<td>Under construction</td>
<td>101.2MW</td>
<td>44 Siemens 2.3MW</td>
<td>B&amp;B</td>
</tr>
<tr>
<td>Golf Wind, Texas, USA</td>
<td>Under construction</td>
<td>271.4 MW</td>
<td>118 MHI 2.4MW</td>
<td>B&amp;B</td>
</tr>
</tbody>
</table>
### UK and Ireland – 2007
Projects completed and under construction

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Rated Capacity</th>
<th>Number and Type of Turbines</th>
<th>Project Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Hill, Scotland</td>
<td>Operational 2007</td>
<td>28.6MW</td>
<td>22 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Altahullion II, NI</td>
<td>Operational 2007</td>
<td>11.7MW</td>
<td>9 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Forss II, Scotland</td>
<td>Operational 2007</td>
<td>5.2MW</td>
<td>4 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Lough Hill, NI, UK</td>
<td>Operational 2007</td>
<td>7.8MW</td>
<td>6 Siemens 1.3MW</td>
<td>RES</td>
</tr>
<tr>
<td>Slieve Divena, Northern Ireland</td>
<td>Under construction</td>
<td>25MW</td>
<td>20 Nordex 2MW</td>
<td>Airtricity</td>
</tr>
<tr>
<td>Wolf Bog, Northern Ireland</td>
<td>Under construction</td>
<td>11.5MW</td>
<td>5 Vestas 2MW</td>
<td>CRE Energy Ltd</td>
</tr>
<tr>
<td>Dun Law Extension</td>
<td>Under construction</td>
<td>29.75MW</td>
<td>Vestas V52</td>
<td>CRE Energy Ltd</td>
</tr>
<tr>
<td>Project</td>
<td>Status</td>
<td>Rated Capacity</td>
<td>Number and Type of Turbines</td>
<td>Project Owner</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>-----------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Hornberget, Sweden</td>
<td>Operational 2007</td>
<td>10MW</td>
<td>5 Vestas V90 2MW</td>
<td>Jämtkraft</td>
</tr>
<tr>
<td>Håcksta, Sweden</td>
<td>Under construction</td>
<td>10MW</td>
<td>5 Vestas V90 2MW</td>
<td>Umea</td>
</tr>
</tbody>
</table>
# France – 2007

Projects completed and under construction

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Rated Capacity</th>
<th>Number and Type of Turbines</th>
<th>Project Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murat, France</td>
<td>Operational 2007</td>
<td>12MW</td>
<td>9 Siemens 1.3MW</td>
<td>TP</td>
</tr>
<tr>
<td>Lomont, France</td>
<td>Under construction</td>
<td>30MW</td>
<td>15 Vestas 2MW</td>
<td>TP</td>
</tr>
<tr>
<td>Trois Sources, France</td>
<td>Operational 2007</td>
<td>36MW</td>
<td>12 Vestas 2MW</td>
<td>TP</td>
</tr>
<tr>
<td>Marsanne, France</td>
<td>Under construction</td>
<td>12MW</td>
<td>6 Vestas 2MW</td>
<td>RES</td>
</tr>
<tr>
<td>Cuxac</td>
<td>Operational end 2006</td>
<td>12MW</td>
<td>6 Vestas 2MW</td>
<td>RES</td>
</tr>
<tr>
<td>Pays De Montbeliard</td>
<td>Under construction</td>
<td>10MW</td>
<td>5 Vestas 2MW</td>
<td>TP</td>
</tr>
<tr>
<td>St Florentin</td>
<td>Operational 2007</td>
<td>12MW</td>
<td>6 Vestas 2MW</td>
<td>TP</td>
</tr>
</tbody>
</table>
Stern Actions

- Carbon pricing, regulation and trading
- Innovation and deployment of low carbon technologies
- Remove barriers to energy efficiency and educate
- International response required
The People

Number of staff at the end of financial year

- 2002: 53
- 2003: 65
- 2004: 80
- 2005: 98
- 2006: 140
- 2007: 186
Today’s Challenges
Technological
Three Year Strategy

• Develop Operating Portfolio – 2000MW by 2010
• Focus Upon Existing Wind Markets and develop site portfolio and construction business
• Create Growth Through Expansion into New Wind Markets
• Develop Offshore Business
• Develop Heat and Power business
• Develop Sustainable Building Business