Outline:

1. Status of global markets
2. Short and medium term projections
3. Challenges
4. Conclusions and Looking Ahead
Provisional 2012=$268 bn; down 11% from revised 2011 figure of $302 bn.

Global Total New Investment in Clean Energy 2004-2011 (US$ Bn)

Includes Corporate and Government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions.  
Source: Bloomberg New Energy Finance
New investment in RES: Top 10 countries 2011, and growth on 2010 ($bn)

- **China**: 51 ($bn), Growth: 18%
- **United States**: 48 ($bn), Growth: 61%
- **Germany**: 31 ($bn), Growth: -12%
- **Italy**: 29 ($bn), Growth: 43%
- **India**: 12 ($bn), Growth: 63%
- **United Kingdom**: 9 ($bn), Growth: 59%
- **Spain**: 9 ($bn), Growth: 45%
- **Japan**: 9 ($bn), Growth: 23%
- **Brazil**: 7 ($bn), Growth: 8%
- **France**: 5 ($bn), Growth: 34%

Top 10 countries. *Asset finance volume adjusts for re-invested equity.
Excludes corporate and government R&D
Source: Bloomberg New Energy Finance, UNEP
Global Market Overview – Power Markets

- Renewables accounted for nearly half of the estimated 208 GW of new electric capacity installed in 2011.
- Renewable electric power capacity worldwide reached 1,360 GW (+8%) in 2011.
- Renewable energy comprised more than 25% of global power generation capacity.
- 20.3% of global electricity was produced from renewable energy.
2011 growth: 18.7%

16 yr avg growth: 27.7%
**2012 growth: 10%**

**16 yr avg growth: 26.5%**
Market Forecast 2012-2016

- Annual installed capacity [GW]
  - 2011: 40.6 GW
  - 2012: 46.0 GW
  - 2013: 45.8 GW
  - 2014: 49.4 GW
  - 2015: 55.2 GW
  - 2016: 59.24 GW

- Cumulative capacity [GW]
  - 2011: 237.7 GW
  - 2012: 283.7 GW
  - 2013: 329.5 GW
  - 2014: 378.9 GW
  - 2015: 434.1 GW
  - 2016: 493.33 GW

- Annual installed capacity growth rate [%]
  - 2011: 6.0%
  - 2012: 13.4%
  - 2013: -0.4%
  - 2014: 7.7%
  - 2015: 11.9%
  - 2016: 7.26%

- Cumulative capacity growth rate [%]
  - 2011: 20.3%
  - 2012: 19.4%
  - 2013: 16.2%
  - 2014: 15.0%
  - 2015: 14.6%
  - 2016: 13.65%

Source: GWEC
Annual Market Forecast by Region 2012-2016

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<tbody>
<tr>
<td>Europe</td>
<td>10.3</td>
<td>11.0</td>
<td>12.0</td>
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<td>8.1</td>
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<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Middle East and Africa</td>
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<td>0.5</td>
<td>1.2</td>
<td>1.6</td>
<td>2.0</td>
<td>3.0</td>
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Source: GWEC
Cumulative Market Forecast by Region 2012-2016

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<tr>
<td>Europe</td>
<td>96.6</td>
<td>107.6</td>
<td>119.6</td>
<td>132.6</td>
<td>146.6</td>
<td>161.6</td>
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<tr>
<td>North America</td>
<td>52.7</td>
<td>63.7</td>
<td>71.7</td>
<td>80.2</td>
<td>91.0</td>
<td>103.02</td>
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<tr>
<td>Asia</td>
<td>82.0</td>
<td>103.4</td>
<td>125.4</td>
<td>148.9</td>
<td>174.1</td>
<td>200.04</td>
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<td>Latin America</td>
<td>2.3</td>
<td>3.9</td>
<td>5.6</td>
<td>7.3</td>
<td>9.1</td>
<td>10.89</td>
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<tr>
<td>Pacific</td>
<td>2.9</td>
<td>3.4</td>
<td>4.4</td>
<td>5.4</td>
<td>6.9</td>
<td>8.36</td>
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<tr>
<td>Middle East and Africa</td>
<td>1.1</td>
<td>1.6</td>
<td>2.8</td>
<td>4.4</td>
<td>6.4</td>
<td>9.42</td>
</tr>
</tbody>
</table>

Source: GWEC
Projections

„Forecasting“

Future World

langfristiges Zieljahr

Quantified Targets

Required actions

„Backcasting“

2000 2010 2020 2030 2040 2050
Global Power supply:
2009: 19% Renewables
2020: 37% - 2050: 94%

Figure 5.6: Global electricity generation structure under the reference scenario and the energy [r]evolution scenario (including electricity for electromobility, heat pumps and hydrogen generation)
Global Power Supply:

**Figure 5.7**: Global total electricity supply costs & specific electricity generation costs under two scenarios.
Global Heat Supply:
2009: 25% Renewables
2020:35% - 2050:91%
**E[R] Transport**

*Figure 5.13*: Global: final energy consumption for transport under the reference scenario and the energy [r]evolution scenario.
Saving the Climate

Figure 5.16: Global development of CO₂ emissions by sector under the energy [r]evolution scenario (‘EFFICIENCY’ = reduction compared to the reference scenario)

Mill t/a

- Population development
- Savings from ‘efficiency’ & renewables
- Other sectors
- Industry
- Transport
- Power generation

Million people

- 9,000
- 8,000
- 7,000
- 6,000
- 5,000
- 4,000
- 3,000
- 2,000
- 1,000
- 0

Years:
- 2009
- 2015
- 2020
- 2030
- 2040
- 2050
# Investments vs Fuel cost Savings

**Table 5.2: Global Investment Costs for Electricity Generation and Fuel Cost Savings under the Energy [r]evolution Scenario Compared to the Reference Scenario**

<table>
<thead>
<tr>
<th>INVESTMENT COSTS</th>
<th>$</th>
<th>2011 - 2020</th>
<th>2021 - 2030</th>
<th>2031 - 2040</th>
<th>2041 - 2050</th>
<th>2011 - 2050 AVERAGE PER ANNUM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIFFERENCE E[R] VERSUS REF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional (fossil &amp; nuclear)</td>
<td>billion $</td>
<td>-1,780</td>
<td>-2,310</td>
<td>-2,108</td>
<td>-2,108</td>
<td>-8,508</td>
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<tr>
<td>Renewables</td>
<td>billion $</td>
<td>4,596</td>
<td>8,087</td>
<td>10,896</td>
<td>10,896</td>
<td>36,720</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>billion $</td>
<td>2,816</td>
<td>5,777</td>
<td>8,788</td>
<td>8,788</td>
<td>28,213</td>
</tr>
</tbody>
</table>

**Cumulative Fuel Cost Savings**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Fuel oil</td>
<td>billion</td>
<td>304</td>
<td>1,088</td>
<td>1,252</td>
<td>1,107</td>
<td>3,750</td>
</tr>
<tr>
<td>Gas</td>
<td>billion</td>
<td>-209.1</td>
<td>1,837</td>
<td>7,731</td>
<td>16,886</td>
<td>26,244</td>
</tr>
<tr>
<td>Hard coal</td>
<td>billion</td>
<td>625</td>
<td>3,152</td>
<td>7,155</td>
<td>11,140</td>
<td>22,072</td>
</tr>
<tr>
<td>Lignite</td>
<td>billion</td>
<td>42</td>
<td>185</td>
<td>245</td>
<td>259</td>
<td>731</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>billion</td>
<td>762</td>
<td>6,262</td>
<td>16,382</td>
<td>29,390</td>
<td>52,797</td>
</tr>
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</table>
Key findings:

- 2010 and 2011 markets ahead of Moderate scenario;
- 2012-2016 growth updated to reflect actual development;
- IEA scenario more positive: 573 GW for 2020 – was 573 GW for 2030 two years ago;
- Reflects increasing credibility of wind power with key international bodies;
- Even stronger than predicted growth in Asia, mainly in China, but that is stabilizing’;
- Key emerging markets: Brazil, Mexico, India, South Africa.
GWEO forecasts vs. real market development

1999 WIND FORCE 10 BLUEPRINT AND ACTUAL DEVELOPMENT. TOTAL GW WIND CAPACITY INSTALLED GLOBALLY

- Actual
- Wind Force 10

GW

0 50 100 150 200 250


10 GW

237 GW

229 GW
GLOBAL CUMULATIVE WIND POWER CAPACITY

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<tr>
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<tr>
<td>2011</td>
<td>237,699</td>
<td>583</td>
<td>237,699</td>
<td>583</td>
<td>237,699</td>
<td>583</td>
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<tr>
<td>2015</td>
<td>397,859</td>
<td>976</td>
<td>425,155</td>
<td>1,043</td>
<td>530,945</td>
<td>1,302</td>
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<td>2020</td>
<td>586,729</td>
<td>1,439</td>
<td>759,349</td>
<td>1,863</td>
<td>1,149,919</td>
<td>2,821</td>
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<td>2030</td>
<td>917,798</td>
<td>2,412</td>
<td>1,617,444</td>
<td>4,251</td>
<td>2,541,135</td>
<td>6,678</td>
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</table>

MW: Megawatt, TWh/a: Terawatt hour per annum
WIND POWER SHARE OF GLOBAL ELECTRICITY DEMAND

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2015</th>
<th>2020</th>
<th>2030</th>
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<tbody>
<tr>
<td><strong>New Policies scenario</strong></td>
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<tr>
<td>IEA demand projection</td>
<td>3.5%</td>
<td>4.7%</td>
<td>6.0%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Energy efficiency demand projection</td>
<td>3.5%</td>
<td>4.8%</td>
<td>6.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td><strong>Moderate scenario</strong></td>
<td></td>
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<tr>
<td>IEA demand projection</td>
<td>3.5%</td>
<td>5.0%</td>
<td>7.7%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Energy efficiency demand projection</td>
<td>3.5%</td>
<td>5.1%</td>
<td>8.3%</td>
<td>15.8%</td>
</tr>
<tr>
<td><strong>Advanced scenario</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEA demand projection</td>
<td>3.5%</td>
<td>6.3%</td>
<td>11.7%</td>
<td>22.1%</td>
</tr>
<tr>
<td>Energy efficiency demand projection</td>
<td>3.5%</td>
<td>6.4%</td>
<td>12.6%</td>
<td>24.8%</td>
</tr>
</tbody>
</table>
Climate Imperative

CUMULATIVE CO2 EMISSIONS REDUCTIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>New Policies scenario</th>
<th>Moderate scenario</th>
<th>Advanced scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1,368</td>
<td>1,368</td>
<td>1,368</td>
</tr>
<tr>
<td>2015</td>
<td>2,316</td>
<td>2,411</td>
<td>2,500</td>
</tr>
<tr>
<td>2020</td>
<td>6,095</td>
<td>6,558</td>
<td>7,000</td>
</tr>
<tr>
<td>2030</td>
<td>17,522</td>
<td>24,979</td>
<td>37,504</td>
</tr>
</tbody>
</table>

1.7 billion tons/annum
How to get back on the high-growth track

*Short to medium term*

- An end to the *partisan bickering* over energy policy in the US which creates the destructive boom-bust cycles in that critical market;

- Resolution of *grid, certification, transparency and quality* issues in China;

- Flushing the free allocations out of the European Emissions Trading System;

- A *re-vitalization of the carbon markets* – the Kyoto Protocol’s Clean Development Mechanism has more than 100 GW of wind energy projects in the pipeline, but…

- The political courage on the part of at least some governments to tackle the *subsidies issue* in the conventional energy sector;

- Perhaps most importantly, *stable, bankable policy* in as many national energy markets as possible.
Challenges (1)

Perceptions

LEVELIZED COSTS: BEST NEW WIND VS NEW COAL ($/MWh)

Perception:

- Wind: 120
- Coal: 30

- New coal must cover cost of capital
- New coal requires advanced pollution control
- Wind turbines back to 2005 prices, but now perform much better

Reality:

- Wind: 65
- Coal: 68

- Wind bankability has driven down cost of capital
- Coal suffers from carbon price risk

Source: Bloomberg New Energy Finance
Challenges (2)

Integration/Transformation

Coherent and flexible energy systems

- Transportation
- Electric vehicles
- Heat pumps
- Electric boilers
- Gas & Oil - other sectors
- District Heating
- 50% of electricity demand

50% of electricity demand

energy

electricity
Challenges (3)

- *de-risking* wind investments to attract (more) institutional investments;

- *hydro-fracking*, shale gas in the US; artificially low gas prices…

- Generally sluggish or negative demand growth in most of the OECD;

- How to work *with* solar PV rather than being pitted against them;
Challenges (4)

- Having intelligent (and very public) discussions about intelligent support for RE against a background of massively increasing fossil fuel subsidies;

- Having intelligent discussions about the long term future of the energy system against a background of widespread economic crisis/uncertainty

- How to convince policy makers that protectionist measures/trade barriers hurt everyone (including their own industry) in the long run.
New Markets

Latin America: Brazil and Mexico, followed by...?


Asia: Mongolia, Viet Nam, Thailand, Sri Lanka. Japan?
Conclusions

- Asian market driving global growth – Asia is power hungry
- European market solid for now
- North America uncertain and volatile
- Largest growth markets are India and Brazil
- Downward price pressure continues
- Trade barriers/new protectionism?
- Key emerging markets in Africa and non-C/I Asia
- International commodity price volatility returns/remains a problem.
Looking Ahead (1)

2013 will be a tough year, with the single largest variable how far the US market will fall, how soon it will recover and what will be the trajectory; Canada and Mexico continue to grow.

China, India – modest recovery from ‘off’ 2012 – new markets in Asia begin to contribute

Europe – stable, with growth in offshore and eastern markets offsetting dire markets in S. Europe

Latin America – Brazil plus…?

Africa – market ‘returns’ in Morocco, Tunisia...Egypt? South Africa gets underway and Ethiopia continues to lead.
Looking Ahead (2)

Rate of global growth will slow until and unless:

- new markets fill the ‘gap’ left by lack of growth in OECD, or...
- OECD economy recovers, and/or
- new CO2 related legislation takes effect.

Downward price pressure continues:

- Oversupply and tough economic times mean margins are slashed to the bone and competition is fierce;
- ‘Consolidation’ in manufacturing sector seems inevitable.
Looking Ahead (3)

A global climate agreement will be fundamental for wind power to achieve its maximum potential, but for the short term:

**Uncertainty:**
- in international political landscape
- in the future of the carbon markets
- in ‘new’ climate-related funds

**Focus on national/regional legislation and markets**

**Market drivers all still in place,** and increasingly prominent:
- energy security; cost stability; macroeconomic security;
- local economic development and job creation; local environment and climate
Thank you!

For more information:

Steve Sawyer
steve.sawyer@gwec.net