Jobs and Investment Potential of Renewable Energy for Australia

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Energy and sustainability

• Energy services play a critical role in society
  – Australians using average 8kW (ABS, 2001)

• Our present energy sector has very high environmental and social externalities
  – 1.8 billion people worldwide without electricity (IEA, 2002)
  – Stationary energy sector contributes ~50% of Australia’s GHG emissions (AGO, 2002)

• These externalities are unsustainable
  – BAU energy sector development means 1.4 billion people without electricity in 2030 (IEA, 2002)
  – BAU for Australian stationary sector means GHG emissions up 50% by 2020 (AGO, 2002)
Energy, sustainability + renewables

• Required energy sector transformation is large
  – “Over this century the world is going to have to reduce its global greenhouse gas emissions by some 50-60%” Dr Kemp, Federal Environment Minister (The Age, 2002)

• This transformation need not be hard
  – Many ‘no regrets’ measures available (IPCC, 2001)
  – Energy is only a small component of GDP
    • Australian household expenditure on stationary energy only ~2% of total spending (ABS, 2002)
    • For vast majority of businesses - stationary energy costs <3% of input costs

• …and Renewable Energy will play a valuable role
Motivation – Value of renewables

• Growing awareness of economic, social + environmental value of renewables
  – Environmental + energy security concerns with fossil fuels
  – Falling costs of many renewables
  – Needs of the 2 billion people without commercial power supply
  – Economic development + job creation potential of renewables
Renewables + ‘Strategies into Action’

• Regional development
  – “Regional Australia stands to benefit from a greater update of renewable generation technologies” COAG Draft Energy Market Review

• Industry development
  – MRET (Renewable Energy Bill, 2000) objectives:
    • to accelerate the uptake of renewable energy in grid-based applications, so as to reduce GHG emissions
    • ...provide an ongoing base for the development of commercially competitive renewable energy and.... internationally competitive industries
AEPG Project

- AEPG study of investment + job creation prospects in the Australian Renewable Energy Industry

- Study focussed on wider ‘economic’ values of renewables
  - No attempt to estimate any ecological ‘values’

- Study results support view that these wider economic values are significant
  - Hence, supports value of ecological transition
Global energy technology markets

<table>
<thead>
<tr>
<th>Source</th>
<th>Average annual growth rate (%) over 1990-2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind power</td>
<td>25</td>
</tr>
<tr>
<td>Solar photovoltaics</td>
<td>20</td>
</tr>
<tr>
<td>Solar thermal (Europe)</td>
<td>18</td>
</tr>
<tr>
<td>Biomass</td>
<td>3</td>
</tr>
<tr>
<td>Natural gas</td>
<td>1.6</td>
</tr>
<tr>
<td>Coal</td>
<td>-1.0</td>
</tr>
</tbody>
</table>

- Future growth projections generally optimistic given
  - Present trends
  - Environmental drivers + related policy developments
  - Technical advances
Aust. sustainable energy market

- Non-hydro renewables only minor contributor to stationary energy sector
  - <1% of electricity generation (IEA, 2002)
- Little data on industry turnover + employment
  - NSW renewables + EE industry estimated sales of $1.8b + 5900 jobs in yr2000 (SEDA, 1999)
  - Grid wind 100MW => ~$200m investment + 800 jobyears (MacGill, 2002)
  - PV has annual sales $113m + 600 jobs (Watt, 2002)
- Future growth projections cautiously ‘optimistic’
  - MRET has key role yet a low (2% by 2010) target
Renewables for $investment + jobs

- Investment + economic development
  - Large potential market
  - Present strong growth
  - Rapid technical progress and innovation
    - Innovation and knowledge underpinning tech. development recognised as critical drivers for econ. development + growth
  - Regional investment focus from best availability of renewable resources, high value applications

- Jobs (arising from above), also
  - Tech. characteristics: small unit sizes, distributed application, biomass = labour intensive fuel provision
  - Present small scale of industry
Analysis - scale

- Project case studies
  - AEPG Stage I
- Industry sector, by country or region
  - Stage II
- Macro-economic modelling of wider impacts of renewables or policy scenarios at regional or national level
  - Stage III?
Analysis - scope

• Direct development and employment outcomes
  * AEPG Stage I & II

• Outcomes given substitution for the economic activity and job creation of conventional energy options used otherwise
  * Approximated in AEPG Stage I & II

• Macroeconomic modelling
  – impacts + opportunity costs of investment in renewables compared to other options
  – type I & type II multipliers for supply chain + wages spending

  * AEPG Stage III?
Analysis - methodology

• Surveys
  – Applicable for project, industry sector studies
    
    *AEPG Stage I & II conducted select company + industry surveying + also surveys in international lit.*

• Input – Output Analysis
  – Economy wide statistics on industries used to link inputs of an industry to outputs of all supply industries
    => multipliers for indirect and induced impacts
  – Required for macro-economic analysis
    
    *Not used in AEPLG study, however estimates of Australian content of investment do play key role*
Analysis – renewables industry

• Usual challenges in measuring, analysing, modelling + projecting industry economic + job outcomes
• For renewables industry, add its
  – Great diversity
  – Relative youth of many sectors
  – Rapid growth and evolution
  – Generally distributed implementation
  – Common integration with other activities
    • Eg. use of agricultural waste streams.
• Data availability is poor worldwide, very poor in Aust. => a major motivation for AEPG study
## Analysis: $$ + job indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Units</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy production</td>
<td>GWh</td>
<td>Estimated annual energy production</td>
</tr>
<tr>
<td>Capital Investment</td>
<td>A$ millions</td>
<td>Total expenditure to develop installed capacity including equipment and construction</td>
</tr>
<tr>
<td></td>
<td>(1991 dollars)</td>
<td></td>
</tr>
<tr>
<td>Australian investment component</td>
<td>A$ millions</td>
<td>Amount of this capital investment spent in Australia.</td>
</tr>
<tr>
<td>O&amp;M expenditure</td>
<td>A$ millions</td>
<td>Total expenditure on Operations and Maintenance of installed capacity</td>
</tr>
<tr>
<td>Aust. Manufacturing &amp; construction jobs</td>
<td>Jobyears</td>
<td>Total direct Australian jobs created by local manufacture of equipment and its installation in Aust.</td>
</tr>
<tr>
<td>Aust. O&amp;M jobs</td>
<td>Jobs</td>
<td>Total direct Australian ongoing jobs for O&amp;M of installed capacity</td>
</tr>
</tbody>
</table>
Stage I - Aust. Case studies

- Narrogin Oil Mallee
- Albany Wind Farm
- AES Golden Plains Gas
- SWERF
- Rocky Point Cogen plant
- Tarong North power station
Comparative capital investment

- Narrogin IWP
- SWERF
- Rocky Pt Cogen
- Albany Wind
- AES Gas
- Tarong Nth Coal

$m / MW
Comparative Aust. content

Narrogin IWP
SWERF
Rocky Pt Cogen
Albany Wind
AES Gas
Tarong Nth Coal
Aust. Manufacturing + Constrn jobs

- Narrogin IWP
- SWERF
- Rocky Pt Cogen
- Albany Wind
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jobyears / MW

Acre

The University of New South Wales • Sydney • Australia
Stage II - Renewable Industry Scenarios

- **Wind** + Photovoltaics completed
- **Biomass** + Solar Hot Water coming

**Example: Australian wind industry scenarios**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Aust. Wind capacity in 2010 (MW)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1000</td>
<td>Existing MRET and projected Greenpower requirement</td>
</tr>
<tr>
<td>Medium</td>
<td>3000</td>
<td>5% MRET target</td>
</tr>
<tr>
<td>High</td>
<td>5000</td>
<td>AusWEA and Greenpeace target</td>
</tr>
</tbody>
</table>
# Analysis methodology

<table>
<thead>
<tr>
<th>Factor</th>
<th>2002 indicator for scenarios</th>
<th>Indicator change to 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment</td>
<td>$1.8m/MW</td>
<td>Reduction at 5% annually to $1.2m/MW in 2010 (2001 dollars) – an overall 33% reduction.</td>
</tr>
<tr>
<td>Australian content</td>
<td>50%</td>
<td>Linear increase to 90% by 2008 then steady</td>
</tr>
<tr>
<td>Total Australian jobyears for</td>
<td>3.7 jobyear /MW (ie. 50%</td>
<td>Reflects falling total jobyears yet increasing Australian content giving 4.5 jobyears</td>
</tr>
<tr>
<td>manufacture + installation</td>
<td>Aust. Content)</td>
<td>/MW for installations in 2010</td>
</tr>
<tr>
<td>Ongoing Australian O&amp;M jobs</td>
<td>0.12 jobs /MW</td>
<td>Falls at 9% annually to 0.06 jobs/MW for installations in 2010 – an overall 50%</td>
</tr>
<tr>
<td>Ongoing O&amp;M expenditure</td>
<td>$18k/MW per year</td>
<td>reduction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Falls with falling capital costs to $12k/MW for installations in 2010</td>
</tr>
</tbody>
</table>
## Scenario outcomes

### Cumulative impacts 2002-2010

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1400</td>
<td>1000</td>
<td>4000</td>
<td>50</td>
<td>230</td>
</tr>
<tr>
<td>Medium</td>
<td>4000</td>
<td>3200</td>
<td>13000</td>
<td>160</td>
<td>840</td>
</tr>
<tr>
<td>High</td>
<td>6700</td>
<td>5400</td>
<td>22000</td>
<td>260</td>
<td>1400</td>
</tr>
</tbody>
</table>

### Industry size in 2010

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>300</td>
<td>390</td>
<td>310</td>
<td>1300</td>
<td>80</td>
</tr>
<tr>
<td>Medium</td>
<td>600</td>
<td>740</td>
<td>670</td>
<td>2800</td>
<td>210</td>
</tr>
<tr>
<td>High</td>
<td>1100</td>
<td>1300</td>
<td>1100</td>
<td>4800</td>
<td>360</td>
</tr>
</tbody>
</table>
Comparisons with conventional energy sectors

- Expand coal + gas project case studies?
  - Very conservative (generous) assumptions
  - How to capture overall direction of industry?

- Incorporate wider trends
  - NSW coal industry now <10,000 jobs
    (NSW power stations take only 25% of production)
  - ‘BAU’ coal jobs projected to fall 40% by 2010
    (PC, 1999)
Where next…

- Worldwide, renewables show great potential
- Australian renewables offers significant $ + jobs potential
- Export opportunities too…

- **BUT** industry support to develop local markets will be required (expanded MRET + more)
Acknowledgements

• Funded by ACRE Energy Policy Group
  – Business Council for Sustainable Energy
  – Renewable Energy Generators of Australia

• Industry contributors to data + methodology
  – Authors remain responsible for any and all possible errors