Incumbent Industries in Energy Transitions

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Background – Australian Electricity Sector

- Dominated by large aging coal fired power generation assets the carbon dioxide emissions from the electricity sector make up 55% of total reported scope 1 emissions in Australia, the largest single source of inventoried emissions and the most emission intensive of global developed nations.

- The majority (~75%) of Australia’s coal fired generation assets are beyond their useful design life (Nelson, 2015).

- Highly volatile interconnected market – price’s set on a 5 min period range from floor of (-) $1000/MWh to (+) $14,200/MWh*.

- Volatility managed through derivative contracts.

- New generation (such as renewables) historically financed through long term (15-20year) Power Purchase Agreements.

- FY16/17 market value $16.6 Billion*.

![Annual generation by fuel type](image)

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Percentage</th>
<th>TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>100%</td>
<td>196.5 TWh</td>
</tr>
<tr>
<td>Gas</td>
<td>77%</td>
<td>150.9 TWh</td>
</tr>
<tr>
<td>Water</td>
<td>9%</td>
<td>17.6 TWh</td>
</tr>
<tr>
<td>Wind</td>
<td>8%</td>
<td>15.5 TWh</td>
</tr>
<tr>
<td>Solar</td>
<td>5%</td>
<td>10.6 TWh</td>
</tr>
<tr>
<td>Other</td>
<td>0.3%</td>
<td>0.6 TWh</td>
</tr>
<tr>
<td>Solar</td>
<td>0.7%</td>
<td>1.3 TWh</td>
</tr>
</tbody>
</table>

## Prior research - Australian electricity industry barriers

<table>
<thead>
<tr>
<th>Sector</th>
<th>Case Study 1</th>
<th>Case Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General description</td>
<td>Vertically integrated energy utility, with fossil fuel and renewable generation assets, gas and retail portfolio. One of the top 5 scope 1 emitters under NGERs.</td>
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</tr>
</tbody>
</table>

| Location | Australia | Australia |
| Customer numbers* | 2-4M | 2-4M |
| Employee numbers* | 2,000-4,000 | 2,000-4,000 |
| Annual revenue* | $5B | $5B |
| Scope 1 emissions* | >14 MtCO2-e | >14 MtCO2-e |
| Scope 2 emissions* | >0.2 MtCO2-e | >0.2 MtCO2-e |
| CM integration strategy | Standalone sustainability department with policy integration into other areas. | Fully integrated sustainability policy with overseeing manager. No separate department as all staff are to integrate sustainability policy. |
| Interviewees** (40-70min duration each) | 5 + 1 off record discussion | 3 |
| Documents analyzed | 56 | 31 |

### External
- Uncertainty-Market
- Uncertainty-Other
- Uncertainty-Policy/Regulatory
- Uncertainty-Technological
- Financial Market/Investor Factors
- Media/NGO Pressure
- Public Perceptions/Expectations

### Internal
- Attitudes/Inertia
- Assets/Resources
- Management/Board
- Structural or Operational Targets

**Notes:**
- CS1: Top 2
- CS2: Top 2
- Top 1
- Top 3
- Top 3

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UncertaintyRelatedBarriers

Analysis from the electricity companies revealed that 50% of the barriers identified were due to perceived uncertainty.

“The biggest problem we have is political uncertainty or the uncertainty around schemes so if you go back we have had the NGACs come and go and the GECs come and go, we have had carbon legislation come and go, we have had renewable legislation change probably three times and most of these projects aren’t a once off investment like an upfront one year return. You’re investing in an asset for a 25 year life.”

“The business through us….accept that we are polluters and we want to do something about it…The key for us is having the right price signals, policy direction and not being disadvantaged in anything we do….The carbon price [process] has really fatigued us.”

“There is a lot of uncertainty in the political environment and there seems to be a lot more policy setting based around short term outcomes rather than longer term outcomes.”
Cognitive Frame by Sector

Dominant Frame: **Regulatory future is uncertain, change is expected but investing too soon may be detrimental to the companies bottom line.**

Contrasting Frame: **Change is coming irrespective of regulations.**

“Is there absolute unanimous, unambiguous, anthropogenic climate change? Look it’s not at 100% mark but it’s probably up in the 90s & if you think about it from a trading background when you have something that’s up in the 90s you want to manage that risk. What you don’t want to do is bury your head in the sand. So anytime there has been a void in the climate policy arena its never felt like it was sustainable.” (Industry Expert)

“The big challenge you have got is with wind turbines becoming so much more efficient than they once were….it’s not hard to see the current pricing of $85-90/MWh and if that gets down to $70-75 you start to question whether or not the whole energy system will just turn on itself as at $70 you are only $20 away from the cost of coal anyway.” (CS1)
Proposed link between an executive manager’s cognitive development and organizational change
Research Questions

• Is uncertainty really the barrier to decarbonisation it is reported to be?
• Does cognitive framing impact progress towards decarbonisation?
• Can dynamic capabilities moderate the impact of uncertainty?
• Can tools be developed to alter managerial cognitive frames towards decarbonisation?
Thank you

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