Policy and Regulation for the Future Grid - Leading the Transition or Lagging the Disruption?

UNSW Project for the CSIRO Future Grid Cluster: Robust energy policy frameworks for investment into future grids

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Relevant policy processes ... in theory

(PEER, 2009)

“a system of laws, regulatory measures, courses of action, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives.”

Level 1: Policy Strategies
- Government programme
- Climate change strategy
- Other relevant strategies

Level 2: Policy Instruments
- Selection of policy instruments
- Objectives
- Inputs: Financial resources, Personnel
- Policy outputs: Policy instrument 1, 2, 3 ... n

Level 3: Policy Outcomes
- Climate impacts
- Outcome n
- Outcome 2
- Outcome 1
In practice – contested, potentially rapidly changing context, high associated uncertainty always challenging, occasionally shambolic
Policy guidance in practice…

*Electricity Industry as a Socio-Technical System*

(Sue et al, 2014)
Policy: proactive transition vs reactive disruption?

- "Prediction is very difficult, especially if it's about the future."
  - Nils Bohr, Nobel laureate in Physics
- "The best qualification of a prophet is to have a good memory"
  - Marquis of Halifax,
- "If you have to forecast, forecast often"
  - Edgar R. Fiedler in *The Three Rs of Economic Forecasting*

- “Many of us who keenly observe the energy sector can take a pretty good guess at what our next big challenges are”
  - Senator MacFarlane, 10th September 2014
An earlier predictive effort

- Virtually no discussion of potential:
  - CSG (CSM)
  - East Coast LNG export
  - Falling demand
  - Falling costs and growing penetrations of Wind, PV

Figure 3: Demand/Supply balance for electricity—Medium electricity demand scenario
More recently

- Internationally well regarded eg. IEA support for CEF
- However, no real discussion of potential:
  - Carbon Price Repeal
  - Reduction in RET target
  - Removal of ARENA, CEFC
Now, here we go again

Foreword

Australia’s economy and prosperity are built on access to secure, affordable and reliable energy.

Our energy diversity is one of Australia’s natural strengths and one of our most potent competitive advantages. That diversity has provided Australian homes and business access to the energy required to build our industries and our communities.

Long an exporter of coal, Australia is now entering a new phase in which our gas and uranium exports will also supply global markets hungry for energy security.

While Australia consolidates its position as an energy superpower, it is essential that we have a long-term framework in which the energy sector can grow.

This Green Paper builds on our pre-election Policy for Resources and Energy in which we promised coherent, consistent energy policy to protect jobs and investment, and take cost pressures off energy users.

- A markedly changed context in some regards but still many shared issues, some new and some now largely missing issues
  - Only 1 mention of climate change in 2014 Green paper

Australia is engaged, with other countries under the United Nations Framework Convention on Climate Change (UNFCCC), in negotiations for a new global agreement that will include emission reduction commitments for the period beyond 2020. Countries will consider their commitments to post 2020 climate action in the lead up to the final negotiations on a new agreement in 2015. These post-2020 commitments could have implications for the composition of the global energy mix.
Policy guidance in practice - *Robust policy frameworks*

- **Optimal decision or policy**
  - one that is expected to be optimal for a given predicted future
  … but how will it perform under other possible scenarios

- **Robust/resilient decision or policy**
  - one that has *the ability to perform reasonably well under a wide range of possible futures*

- **Strategies for developing more robust policies**
  - **Anticipatory**: scenario analysis, multiple policy instruments for comprehensive, coherent action driving multiple, diverse and ideally modular options
  - **Adaptive**: built-in policy adjustments, effective policy review and learning (governance) *(adapted from Twomey et al, forthcoming)*
Robust energy policy frameworks for investment into future grids

- What will be different for future grids?
  - High renewables
  - Distributed generation
  - Storage? EVs? DSP?
  - Other surprises

- Real challenge not getting single policies right, but framework

- Hence, explore robustness of energy policy frameworks in “challenge” scenarios incorporating these elements

- Generation
  - Closure of fossil fuel and nuclear
  - More renewable technologies
  - More intermittent generators
  - More location-dependent

- Networks
  - Need to adapt to changes in demand and supply
  - Connection of remote renewables
  - Increasing interconnection
  - Communications and smart grid
  - Incentive-based regulation

- Demand
  - Changes in quantity, time and location
  - Energy efficiency
  - Electrification of transport and heating
  - Smarter appliances

- Consumer participation
  - Ability to produce and store electricity as well as consume

- More distributed and embedded generation

- Distributed energy storage
  - Time of use retail tariffs
  - Time shifting of loads
Robust energy policy frameworks – *3 policy pillars*

- **1. Regulation**
  - Transmission network planning
  - Distribution network planning
  - Grid codes

- **2. Market Design**
  - Fundamental market design
  - Spot market rules
  - Ancillary service market rules

- **3. External Policy Drivers**
  - Carbon policies
  - Renewable & energy efficiency policies
  - Fuel policies
  - Broader relevant policies

- Most policies will affect all three (complex and interrelated)
- Assessment of any policy must be **highly contextual**
  - Impact of a particular policy depends heavily upon surrounding policy settings
  - Subtle and seemingly distantly related factors can have a big influence
Big picture external (+policy) uncertainties

- More scenarios and sensitivities, computational multi-scenario simulation
- More formal modelling of uncertainties and tradeoffs…

(Vithayasrichareon et al, 2014)
Ongoing work on wholesale market design - Designing electricity mkts for high RE penetrations

- J. Riesz, M. Milligan, Invited overview article for Wiley Interdisciplinary Reviews – Energy and Environment (WIREs). Accepted (in press)

- Renewable technologies can be:
  - Variable & Uncertain
  - Low SRMC
  - Non-synchronous

Therefore markets should ensure:
- Flexibility
- Effective investment signals
- Suitable grid codes
NEM coal plant old & cheap – an exit problem

- ‘Steam punk’ alive and well in the electricity industry – one of the few industries where 50 yr old technology still competitive

(Noone, 2012)
Ongoing work on market design – 
**Optional Firm Access Model for Tx network**

(Riesz, Gilmore and MacGill, CEEM Working Paper, May 2014)

AEMC efforts reflecting a potentially significant issue of network congestion

However, grandfathering firm access to incumbents creates barriers to entry and exit, and exacerbates competitive disadvantage for new entrants.

Propose instead that existing network access is auctioned.

OR

New entrants provided with scaled access on equal footing with incumbents.
Retail market design matters too – Distributed PV represents ‘welcome’ competition to a currently dysfunctional set of arrangements

Australian PV installations since April 2001: total capacity (kW)

Proportion of dwellings with PV systems

(HPVI Solar map, www.apvi.org.au)

2014-06
Reported installed capacity (kW): 3,572,520
Estimated installed capacity (kW): 3,690,858
Hundreds of thousands of WA households could be hit with higher electricity prices under a proposed shake-up of bills aimed at recovering the massive cost to the system caused by the popularity of rooftop solar panels. WA’s energy chiefs are understood to be pushing for a change in the structure of bills to make customers pay more in fixed charges. At present, most of a householder’s electricity bill stems from the amount of electricity used. Fixed costs, such as the supply charge, make up about 15 per cent of the bill. However, solar panels have slashed consumption for those households, cutting revenue to State-owned power companies, including retailer Synergy and network operator Western Power. The trend has been highlighted as one of the big issues facing the electricity system and Energy Minister Mike Nahan has been warned that if nothing is done the consequences could be catastrophic. Either households without solar panels would be left to pick up the tab, forcing their bills to unaffordable levels, or electricity providers would be financially crippled. WA’s take-up rate of photovoltaic cells - initially fuelled by generous State and Federal incentives - stands at more than 10 per cent of households and this figure is expected to double within years.” (West Australian, 2013)

<table>
<thead>
<tr>
<th>Tariff Component</th>
<th>Frozen 2012-13</th>
<th>Transitional 2013-14</th>
<th>Increase</th>
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</thead>
<tbody>
<tr>
<td>Fixed charge (cents/day)(^1)</td>
<td>26.170</td>
<td>50.219</td>
<td>91.9%</td>
</tr>
<tr>
<td>Variable charge (cents/kWh)(^1)</td>
<td>23.071</td>
<td>26.730</td>
<td>15.9%</td>
</tr>
<tr>
<td>Annual Bill(^2) ($, GST inclusive)</td>
<td>1,184</td>
<td>1,451</td>
<td>22.6%</td>
</tr>
</tbody>
</table>

1. GST exclusive.
2. Based on a typical (median) customer on Tariff 11 consuming 4,250kWh per annum.

(Solar Citizens, 2013)
Regulation and the ‘death spiral’?

Rising prices encourage end-users to reduce consumption or even leave, meaning fixed costs have to be recovered from less and less MWh and/or customers.

A problem arising from some highly desirable trends for a clean energy future.

Challenge of retaining incentives for socially optimal investment whilst managing network returns.

More of an issue for electricity or gas?
Where next?

"The best way to predict your future is to create it!"

Abraham Lincoln

“It depends….”

- many factors outside our jurisdictional policy making efforts
- but certainly opportunities to improve likely outcomes
Thank you… and questions

Many of our publications are available at:
www.ceem.unsw.edu.au