Energy transition
energy systems - sources, uses, participants, objectives, wider context
transition – ready, willing and able
The policy development challenge

• What is public policy?
  • “Anything governments choose to do or not to do” *ie. decision making*

• What do governments do?
  • “Tax, spend and regulate... and repeat” *(.. and sometimes own)*

• How do they choose?
  • More and less rational policy development processes to get from goals to means to delivery

• How do they do it?
  • Tax - as able; efficient, equitable?
  • Spend – directly, via agencies; on whom
  • Regulate – including ‘designer’ market-based mechanisms; e.g. CPRS, the NEM

• How might they do it better?
  • Clear and agreed goals,
  • appropriate allocation of autonomy, accountability across decision participants
  • Processes for managing uncertainty and risk, changing circumstances
Framing renewables policy – old and new

**Comprehensive and coherent policy development process**

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

**Robustness and Resilience**: ability to perform reasonably well under a wide range of possible futures

**Key transition challenges**

1. **Phase 1.** VRE has no noticeable impact on the system
2. **Phase 2.** VRE has a minor to moderate impact on system operation
3. **Phase 3.** VRE generation determines the operation pattern of the system
4. **Phase 4.** The system experiences periods where VRE makes up almost all generation
5. **Phase 5.** Growing amounts of VRE surplus (days to weeks)
6. **Phase 6.** Monthly or seasonal surplus or deficit of VRE supply

**Figure 1. Combination framework of policy incentives in function of technology maturity**

- **Technology-neutral competition**
  - TGC
  - Carbon trading (EU ETS)

- **Stimulate market pull**
  - Voluntary (green) demand

- **Mature technologies**
  - (e.g. hydro)

- **Low cost-gap technologies**
  - (e.g. wind onshore)

- **Continuity, RD&D, create market attractiveness**
  - Capital cost attractiveness: investment tax credits, rebates, loan guarantees etc.

- **Prototype and demonstration stage technologies**
  - (e.g. 2nd generation biofuels)

- **High cost-gap technologies**
  - (e.g. PV)

- **Stability, low-risk incentives**
  - Price-based: FIT, FIP
  - Quantity-based: Tenders

- **Imposed market risk, guaranteed but declining minimum return**
  - Price-based: FIP
  - Quantity-based: TGC with technology banding
Large-scale renewable energy target: At least 33,000 gigawatt-hours (GWh) of Australia’s electricity comes from renewable sources by 2020.

Committed to 23.5% renewables by 2020 but do not have a post-2020 renewable energy target.

Small-scale renewable energy scheme provides a financial incentive for individuals and businesses to install small-scale renewable energy systems such as rooftop solar, solar water heaters and heat pumps. There is no limit on the amount of renewable energy that can be produced under the SRES. Scheme expires in 2030.

50% renewables by 2030. According to Labor, 50% renewables by 2030 will create more than 70,000 new jobs.

Establish an independent $5 billion Energy Security and Modernisation Fund to modernise Australia’s ageing energy transmission infrastructure and enable more clean energy to feed into the grid.

Double the original investment in the Clean Energy Finance Corporation by $10 billion, supporting new generation and storage across the country.

$2,000 rebates for solar batteries for 100,000 households on incomes of less than $180,000 per year, with a target of one million batteries by 2025.

100% renewables by 2030.

Establish a new $500 million government authority, ‘Renew Australia’.

Rapidly deploy the next generation of energy generation and build transmission networks so that we can open up most renewable rich areas for new jobs and investment.

Opening up renewable energy zones right around the country, backed by a $6 billion Grid Transformation Fund.

Pledge support for households and business to use solar batteries and the establishment of renewable energy zones.

Boost Australia’s ability to store clean energy by 26.65 gigawatts (GW), growing to 30 GW in 2040. An Energy Storage Target would be set to help meet the total 419 GWh of dispatchable power required by 2030. This would be further enhanced by a $2.2 billion in construction funding managed by AEMO and the Clean Energy Regulator over five years to contact and build energy storage at

Bioenergy Strategy to boost development of this industry.
EI transition for high renewables – NEM status, work ahead

### System-friendly strategy

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<thead>
<tr>
<th>System service capabilities</th>
<th>Policy tool</th>
<th>Country objective</th>
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</thead>
<tbody>
<tr>
<td>Grid codes that require advanced capabilities</td>
<td>Participate in balancing markets</td>
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<td>Advanced design of system services markets</td>
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### Location of deployment

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<th>Location of deployment</th>
<th>Policy tool</th>
<th>Country objective</th>
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<tbody>
<tr>
<td>Integrated planning of grid infrastructure and generation</td>
<td>Integrated by network operators</td>
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<td>Locational signals in remuneration schemes</td>
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### Technology mix

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<thead>
<tr>
<th>Technology mix</th>
<th>Policy tool</th>
<th>Country objective</th>
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<tbody>
<tr>
<td>Technology-specific auctions that reflect the value of each technology as determined in long-term planning</td>
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<td>SV reflected in multi-technology auctions</td>
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### Economic design criteria

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<th>Economic design criteria</th>
<th>Policy tool</th>
<th>Country objective</th>
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<td>Partial exposure to market prices via premium systems</td>
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### Integrated planning, monitoring and revision

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<th>Integrated planning, monitoring and revision (IEA, Next Generation Wind and Solar, 2016)</th>
<th>Policy tool</th>
<th>Country objective</th>
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<td>An integrated long-term plan for VRE and flexible resources, updated regularly</td>
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- NEM reasonably placed but grandfathering of existing plant – RE and conventional raising issues; need these for Distributed Resources too
- NEM improving ISP but are scenarios sufficiently ‘stretched’, AEMC Tx framework; what of possible strategic investment; queues for RE projects growing; Dx integrated planning required too
- NEM temporal and regional pricing and use of RET means project developers see some technology, temporal and locational signalling – does State moves to auctioning reduce this? And what of DERs
- NEM wholesale pricing is incomplete, misses externalities and suffers from design and structural (market power) issues. Retail markets where DER reside don’t have meaningful pricing at present, and little progress

- AEMO efforts valuable, but in the broader policy context, simply shambolic here in Australia at present, and gravely damaging opportunities for effective and efficient RE integration. State targets playing key role given Federal policy failure, but enough going forward?