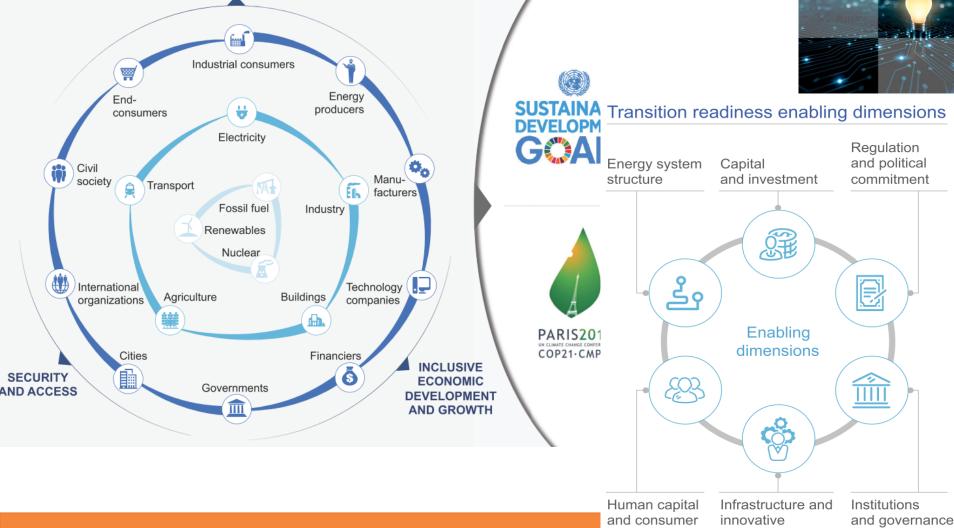
Energy transition

ENVIRONMENTAL SUSTAINABILITY

energy systems - sources, uses, participants, objectives, wider context transition – ready, willing and able

Fostering Effective Energy Transition A Fact-Based Framework to Support Decision-Making





participation

business environment

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

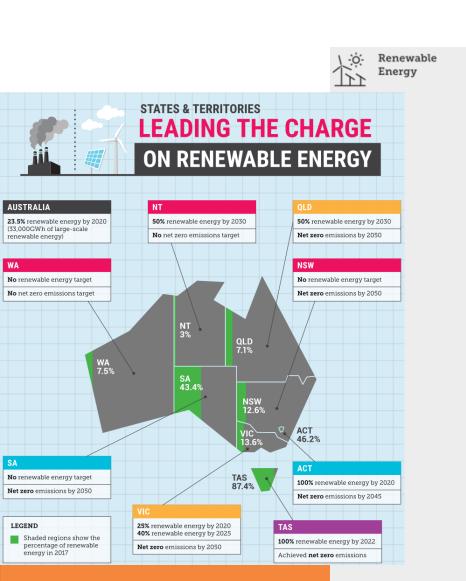
Market Deployment Comprehensive and coherent policy development process 3. External Policy 2. Market Design 1. Regulation Drivers Carbon policies Transmission Fundamental network planning market design Renewable & Spot market rules energy efficiency Distribution network planning policies · Ancillary service market rules Fuel policies Grid codes Robustness and Resilience: ability to perform reasonably well under a wide range of possible futures **Key transition** challenges

Stimulate market pull Technology-neutral Voluntary (green) competition demand TGC Carbon trading (EU ETS) Mature technologies (e.g. hydro) Low cost-gap technologies Imposed market risk, (e.g. wind guaranteed but declining onshore) minimum return Continuity, RD&D, create market Price-based: FIP attractiveness Quantity-based: TGC with Capital cost incentives: investment tax technology banding credits, rebates, loan guarantees etc. **High cost-gap Prototype &** technologies Stability, low-risk demonstration stage incentives (e.g. PV) technologies (e.g. 2nd Price-based: FIT, FIP generation biofuels) Quantity-based: Tenders Mass market Time Development Niche markets Need for seasonal storage Phase 6. Monthly or seasonal surplus or deficit of VRE supply Longer periods of energy surplus or deficit Phase 5. Growing amounts of VRE surplus (days to weeks) Power supply robustness under high VRE generation **Phase 4.** The system experiences periods where VRE makes up almost all generation Greater variability of net load and new power flow patterns **Phase 3.** VRE generation determines the operation 3 pattern of the system Phase 2. VRE has a minor to moderate impact on system operation

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

Minor changes to operating patterns

Australian RE policy status – State and Federal





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.

Invest \$100 million in Neighbourhood Renewables Program to help renters and social housing tenants to benefit from renewable energy.

Bioenergy Strategy to boost development of this industry.

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 and 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 contract and build energy storage at

El transition for Power plants Phase 6 high renewables – Large-scale Synthetic Long-term networks to fuels for storage smooth power gen Tap new seasonal Phase 5 loads via Medium-term NEM status, work ahead variability electrification storage Re-evaluate electricity taxation Battery Advanced Digitalization Commercial storage Phase 4 plant design and and smart grid Flexibility r residential Reform of system Use of existing technologies System-friendly services markets storage, e.g. pumped hydro Flexibility Policy tool Additional from VRÉ strategy Phase 3 large Grid industrial Effective short-term reinforcement, Retrofit wholesale markets, interconplants for Grid codes that require advanced trade with neighbours nections flexibility **Participa** Phase 2 capabilities System service Improve VRE balanci capabilities forecasting, Advanced design of system economic dispatch services markets Have to ask more of all generation – new and old, large and small Integrated planning of grid including DERs; non-synchronous generation penetration limits seem infrastructure and generation Location of deployment Mexi Locational signals in remuneration schemes

particularly key to high RE, FCAS needs attention, wider services NEM improving ISP but are scenarios sufficiently 'stretched', AEMC Tx evel 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 market premium technology that generates during systems, US Tax Credits times of high electricity prices

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?

SV reflected in multi-technology auctions **Economic design** Partial exposure to market prices via premium systems criteria Integrated An integrated long-term plan for planning, VRE and flexible resources. monitoring and updated regularly revision

(IEA, Next Generation Wind and Solar, 2016)

Technology mix

Technology-specific auctions that

reflect the value of each technology as determined in long-

term planning