

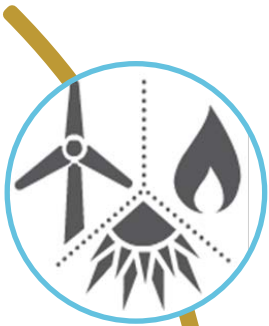
Breaking the Gridlock

Quantum Shift in Supply Chain - How disruptive technologies are reshaping the electricity industry?

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Overview



Distributed Energy – A Quantum Shift

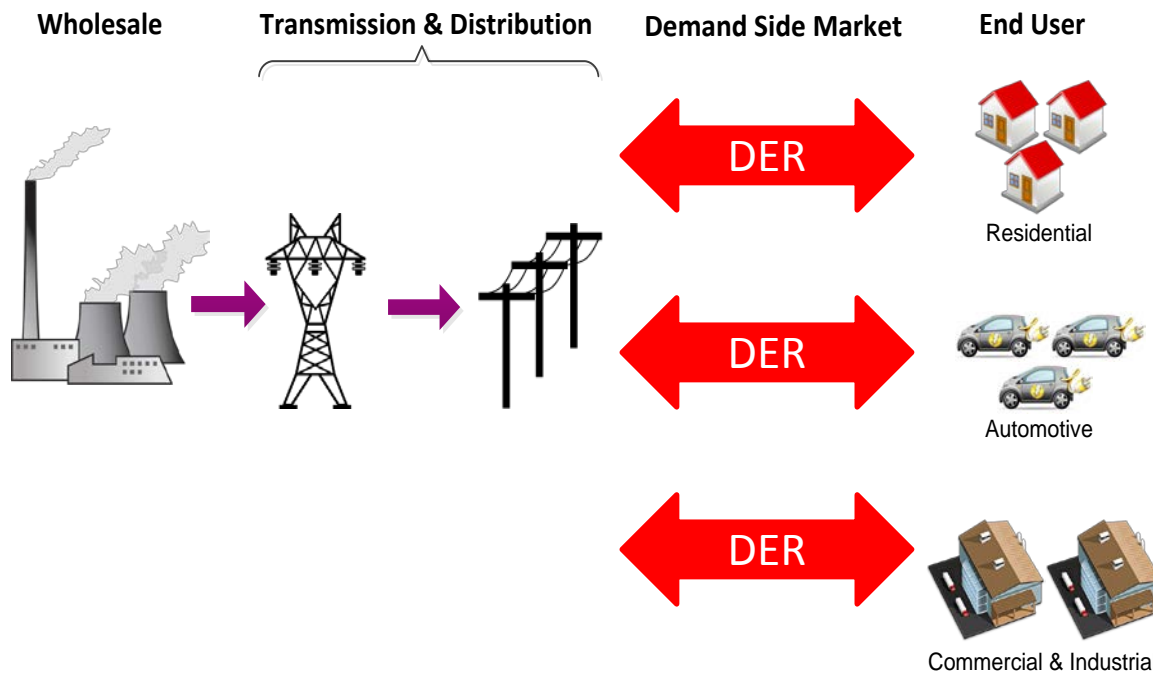


Global Trends & Australian Case Study



Future Adaptation Considerations

Definition of Distributed Energy Resources (DER)



Categories	Examples
Energy Efficiency	Lighting Smart Appliances Building Efficiency
Distributed Generation	Solar CHP Wind
Demand Response	DSM Electric Vehicles Energy Storage
Smart Grids	Microgrids Smart Devices Virtual power stations

The Quantum Shift

Cause

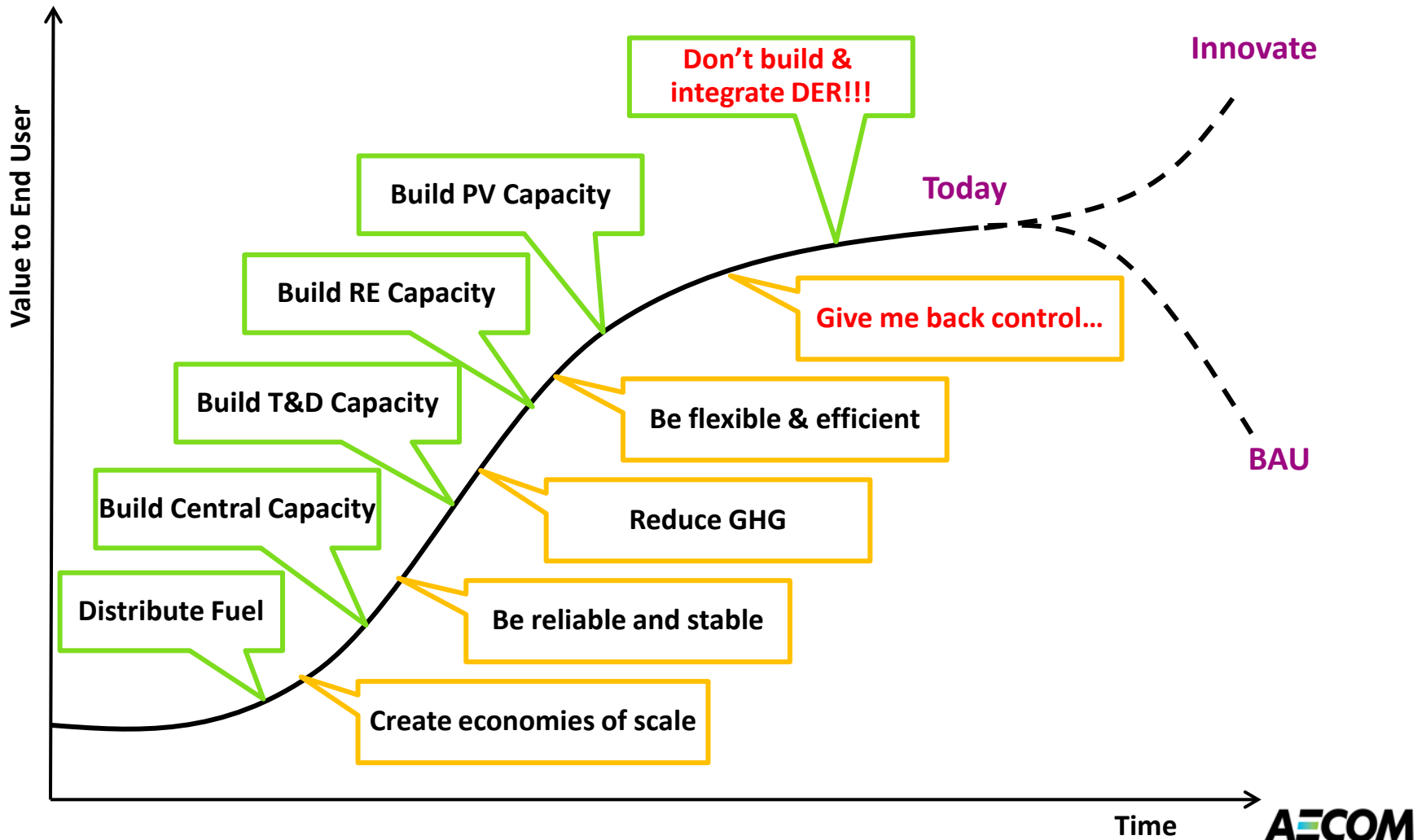
- Commercialisation and rapid uptake of RE and DER
- Slow regulatory change and politicisation of climate change and the electricity policy
- Industry, government & regulator motivation to maintain the status quo
- Inaccurate forecasting, lack of data transparency and awareness of the consumer
- The system is now grid not generation centric

Effect

- Poor asset utilisation and overinvestment
- Unintended power quality and system issues
- Inaccurate Demand Forecasting
- Delayed reform and privatisation
- Lack of competition in the value chain
- Increased investment risk, costs and instability

History of electricity sector

Industries challenge is to abandon sunk investments for an inevitable distributed approach



Global DER Evolution



USA - California

Being the national leader of installed PV capacity California DER uptake is spurred by renewable targets and they are pursuing mandates to ensure DNSPs better integrate DER onto the grid.

USA – New York

Fears of repeated power outages caused by natural disasters such as Hurricane Sandy are the drive behind NY states Reforming the Energy Vision (REV) program.

Germany

Traditional coal and gas fired power stations are closing as a result of aggressive renewable targets. >50% of the countries capacity is now DG meaning major reforms are underway.

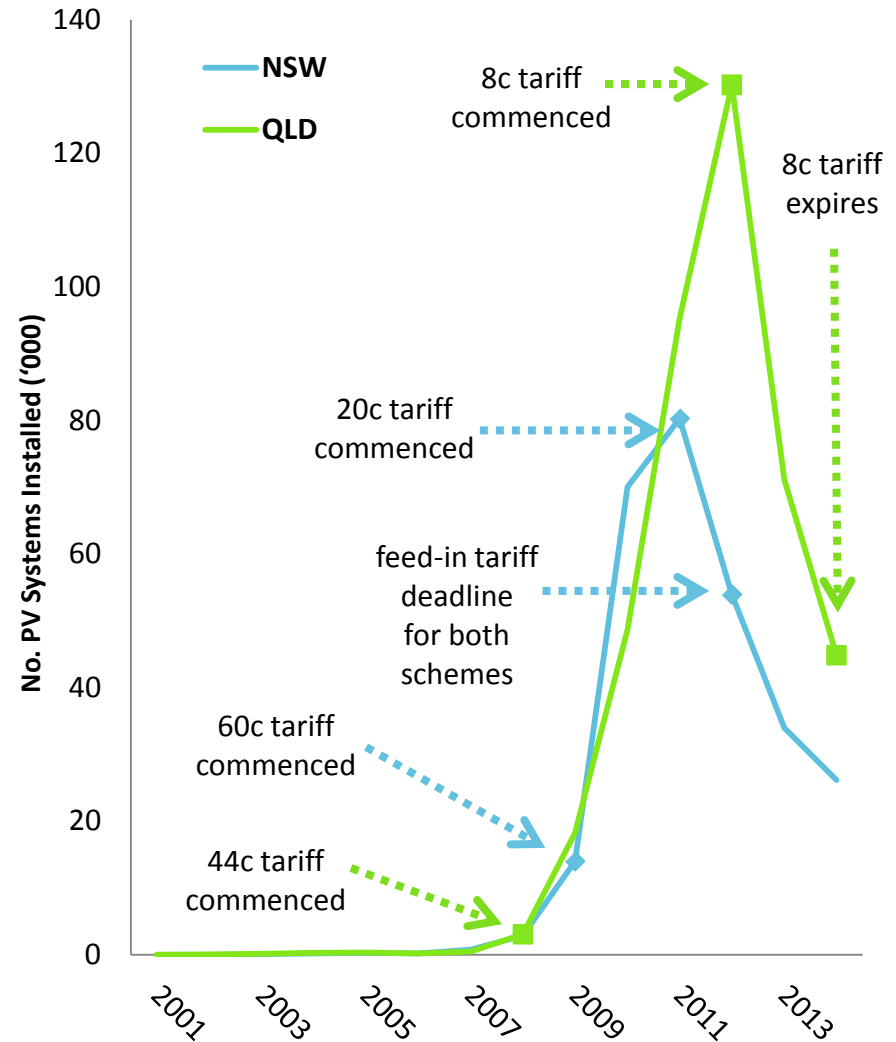
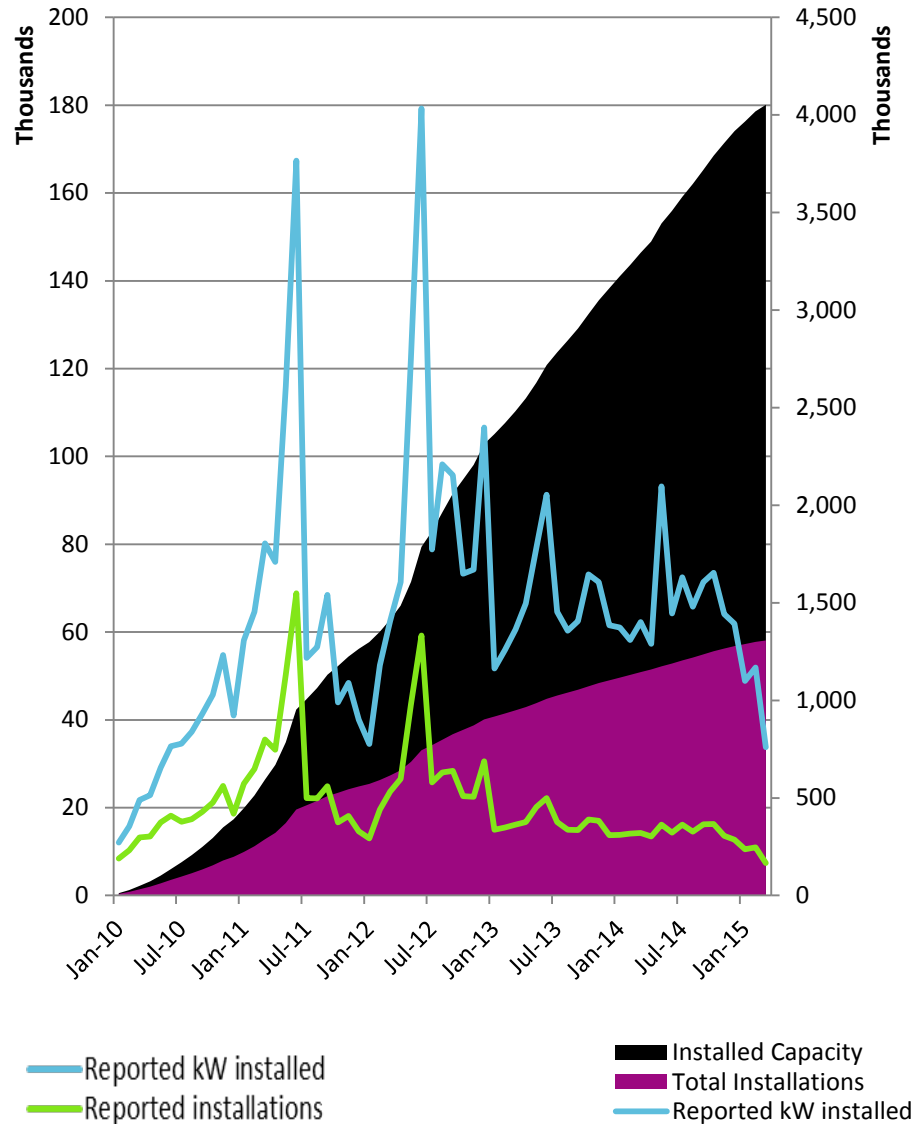
India

Focus is on using DER, renewables and smart technologies to achieve their goal of electricity supply to 100% of the population by 2027.

Japan

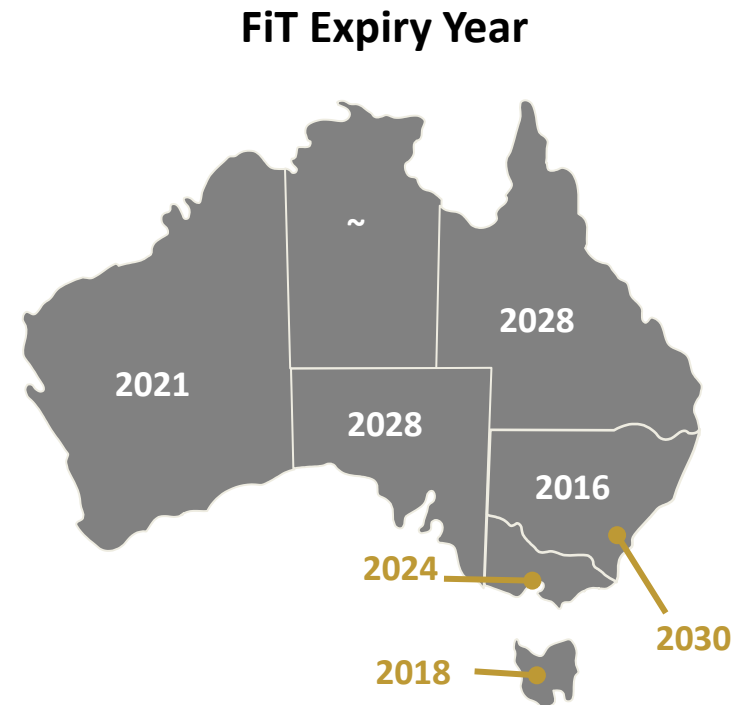
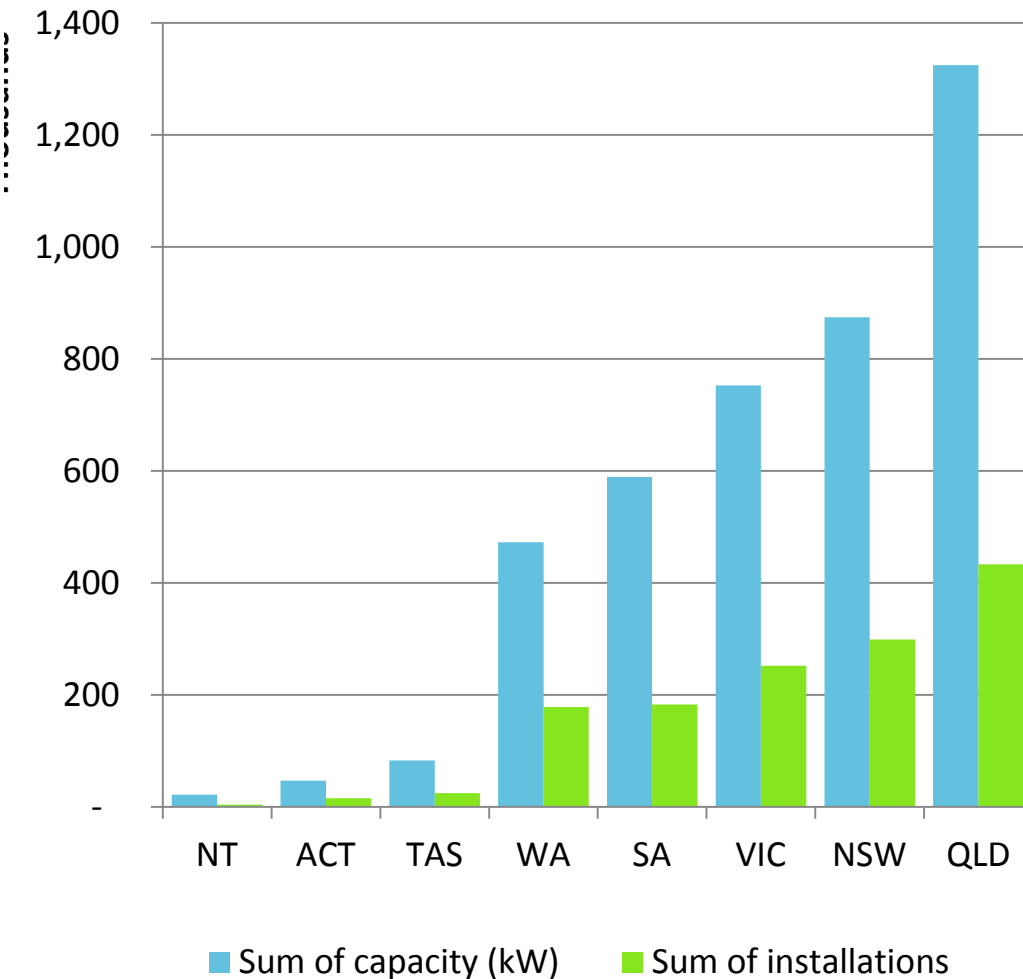
Rising power prices and a consumer focus on self-sufficiency post the Fukushima nuclear disasters has led to greater uptake of DER and micro-grids.

Australian Solar Market Story

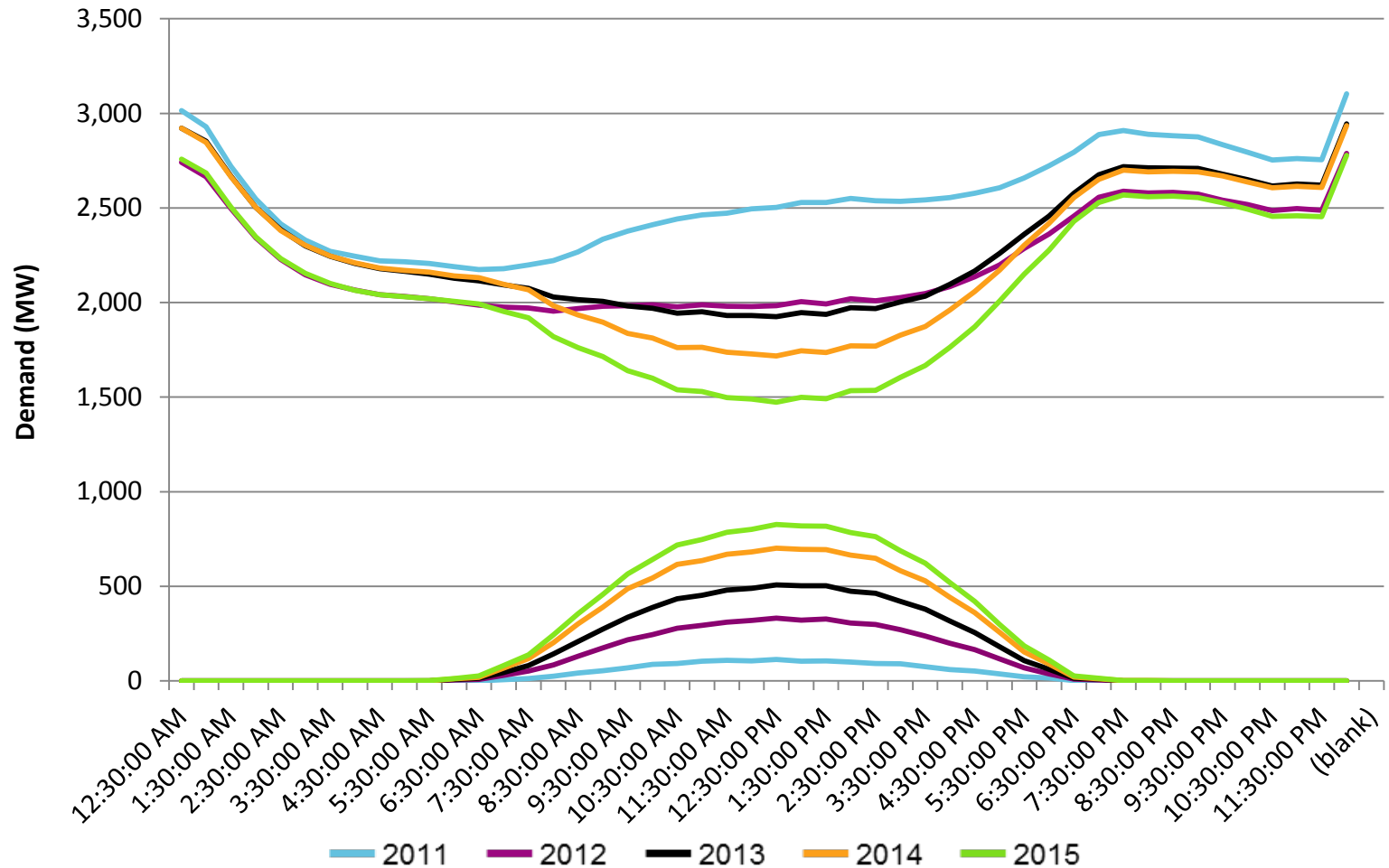


Solar Market Story (cont.)

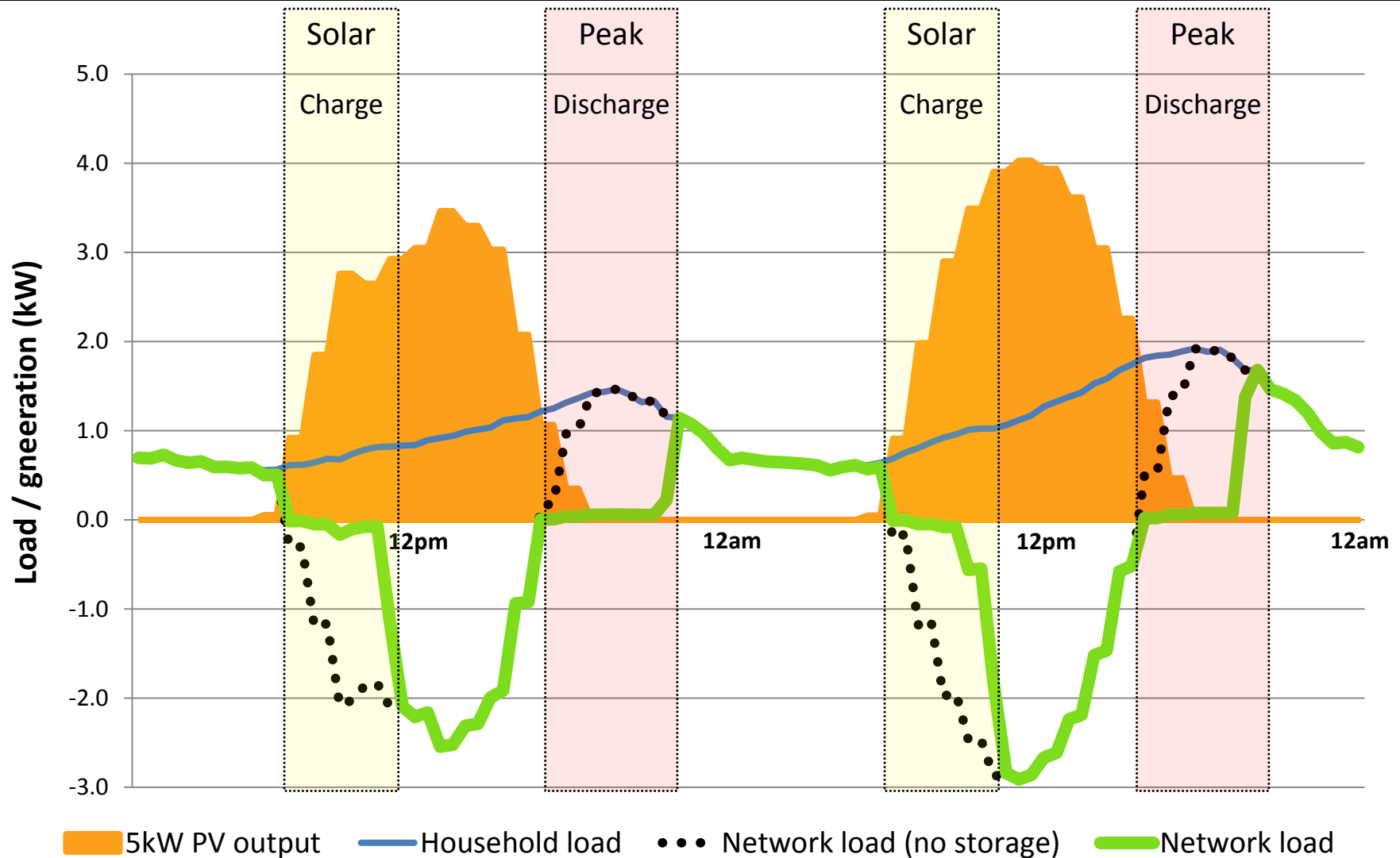
Over 4GW installed over 1.3m installations in 5 years



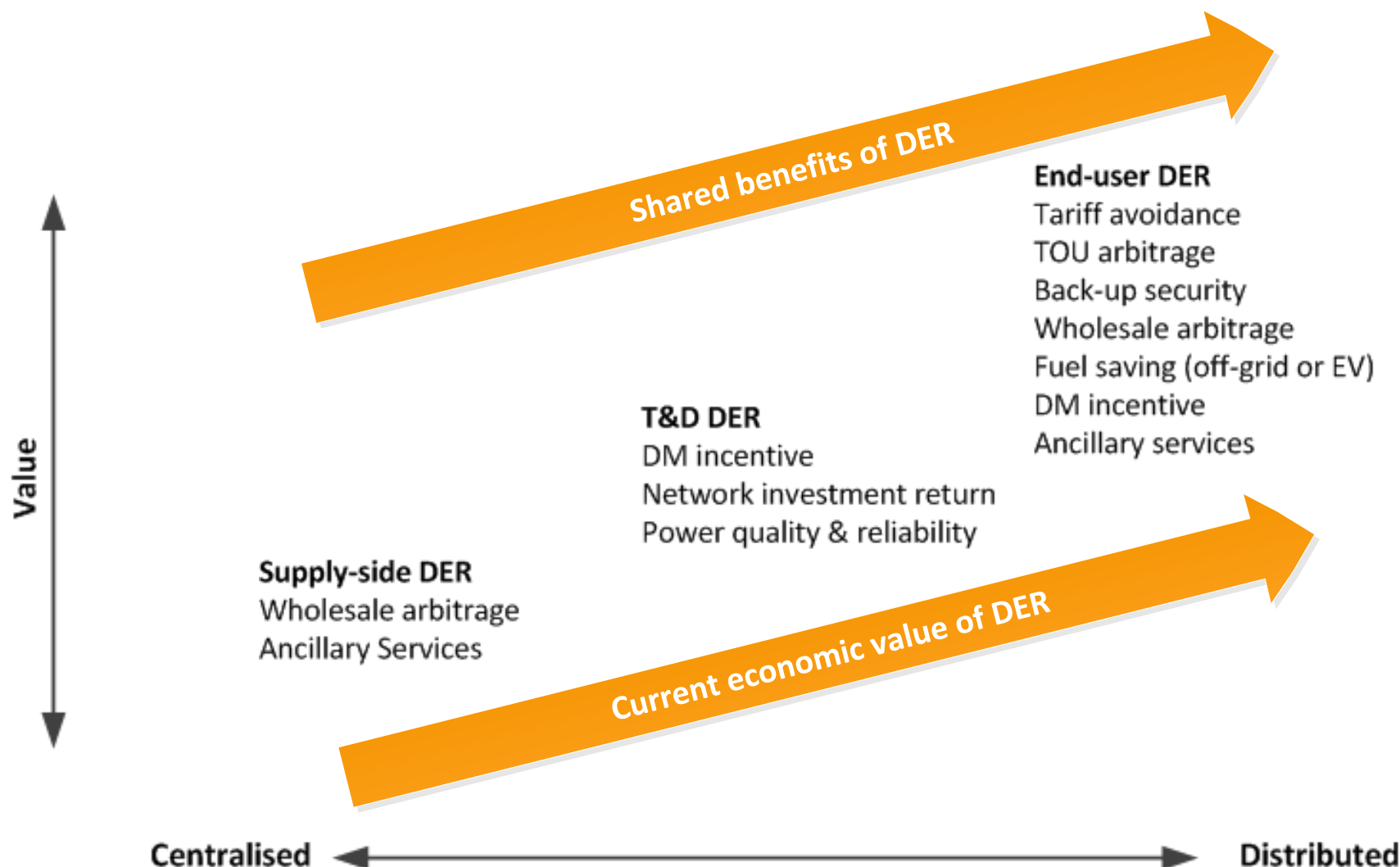
It's Duck Season...



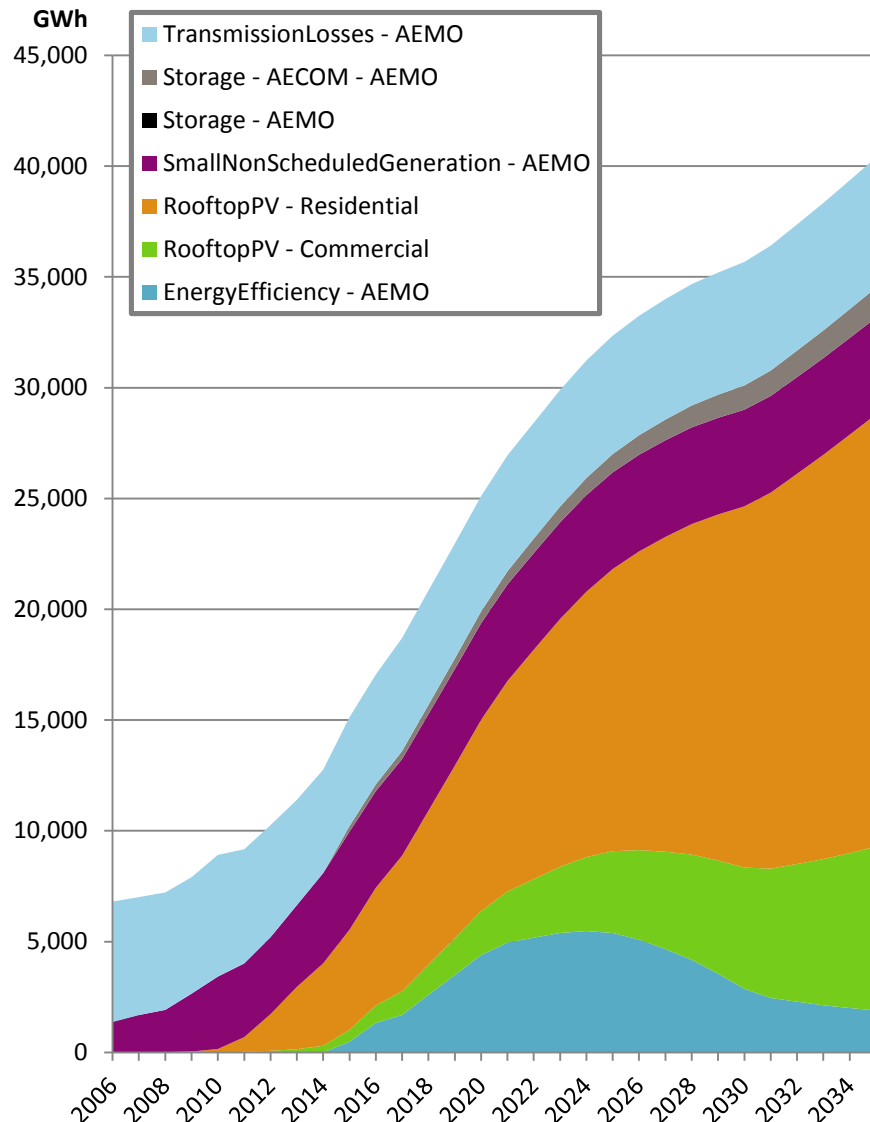
Grid impact of storage charging behaviour



Value of DER (Storage)



Australian DER Forecasted Trends



- Energy efficiency is an unknown quantity.
- PV will continue to grow significantly in residential applications
- EVs & Storage will influence peak load not necessarily energy and hence future capacity investment requirements.
- DER has the ability to reduce Transmission losses and improve Distribution losses.

Future of Utility Reaction

Defensive

Invest up to meter

Deter investment behind the meter

Defensive tariff approach

Limited or no engagement

React to regulatory change

Proactive

Invest up to meter

Invest behind the meter

Cost reflective / incentive pricing

Consistent engagement















Promote regulatory change

Partner / acquire change agents

Diversify through value adding

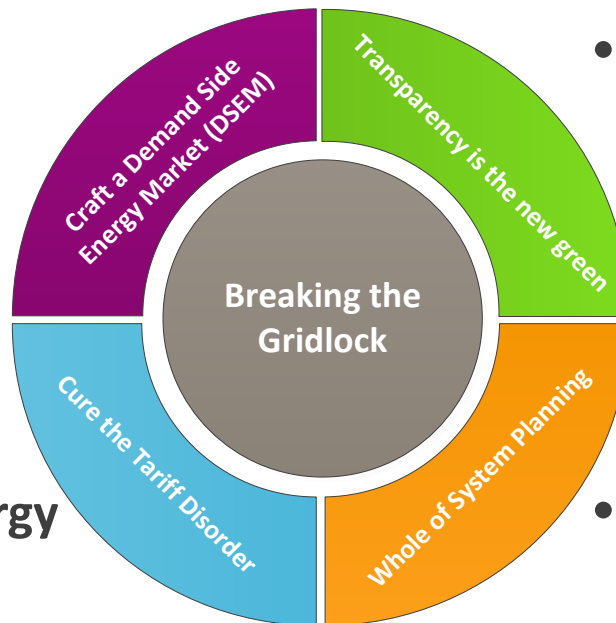


Probable futures outcomes...

Factors	<i>Proactive</i> Industry Adaptation	<i>Defensive</i> Unplanned Uptake
Regulated Asset Base	 Slow Growth	 High Growth
Peak Demand	 Stabilise or declines	 Growth
Energy Demand	 Stabilise/ Moderate Growth	 Rapid Decline
Load Capacity Factor	 Improves	 Degrades
Generation	 Centralise Decentralise (targeted)	 Centralise Decentralise (disruptive)
Demand Forecasting	 Greater Certainty	 Continued uncertainty
Cost of electricity	 Stabilise	 Increase

DER Adaptation Considerations

- Measure and monetise the locational and diurnal value (+/-) of DER in the system
- Realign the Utility and Consumer interests through shared benefits
- Convert tariffs from Energy to Power based
- Understand the Consumer
- Simplify and personalise the offering



- Data transparency will inform better decisions
- Network access
- Distribution DER assets capability
- Disaggregate to Re-aggregate
- Redefine Planning & Rules by removing the bias against DER
- Move from passive to active grid management

Conclusion – transitioning beyond integration...

- Existing frameworks assume a linear supply chain from a central source. However as RE & DER increase the traditional market demand for electricity will approach zero or negative requiring systemic change.
- Regulations currently limit economic outcomes for the consumers and significant policy and regulatory uncertainty limits efficient technology innovation and the progress to smarter grid functionality.
- Develop an understanding the real value (+/-) of DER rethink traditional structures to enable a grid of things.
- Data is one answer to being smarter....
- Bringing this transition to fruition will require participation, dialogue, and collaboration among all stakeholders but the market want solve this alone.



AECOM

THANK YOU

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