

THE ROLE OF NETWORKS IN NAVIGATING THE GENERATION TRANSITION

RE-POWERING NEW SOUTH WALES

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Focus

- 1. What Transition do we face?
- 2. Realising the Full Value of new Energy Solutions
- 3. Managing System Security during Rapid Transformation

CSIRO - Scenarios for future system expenditure

Customers or their agents will make 25% to 40% of all investment decisions in

the energy supply system out to 2050 - up to \$400 billion.



CSIRO & ENA – Network Transformation Roadmap Interim Program Report

What Transition do we face? 1

A moment with Ray Kurwzeil..











Source: kurzweilai.net

What Transition do we face?

Kurzweil Projections of Technology Development



Brain Nanobots allow "beamed" experiences equivalent to telepathy

Virtual Reality indistinguishable from

Strong Al' passes Turing Test

Augmented human bodies, life extension

Human Brain functionality at \$1000

1. What Transition do we face?

Figure 2.1: National cumulative installations of rooftop solar PV systems



Source: Australian Photovoltaic Institute 2015.





Figure 2.7: Previous (2013) and updated (2015) battery (right axis) and rooftop solar panel (left axis) projected technology costs



1. What Transition do we face?



- Energeia Analysis of Microgrids and Stand Alone
 Power Systems released today.
- Integrated Assessment with long-term study of DER adoption to 2050.
- > Key Take-Away:
 - Customers should have freedom to choose, with frameworks that allow the whole community to reap the benefits of technological change and to integrate new technology with the energy system at the lowest cost.



- > Without regulatory changes, up to 27,000 rural connections could be required to be connected by 2050 at a higher cost than necessary.
- Supplying these customers using Stand Alone Systems - not traditional 'poles and wires' – could save \$700 million.
- > Off Grid SAPs could see improved reliability for customers & investment in over 2GW of solar PV and over 7.5GWh of battery storage across Australia.



Energeia (2016): Improvement in SAPs viability from 2016 (LHS) to 2020 (RHS)

- > Without 'win win' incentives up to 10% of customers might leave the grid by 2050 to self-supply.
- > A network 'SAPs' Tariff could reward them for staying on-grid but operating in island mode during peak period.
- Energeia estimates almost 30% of customers could take up these arrangements by 2050, saving \$1 billion from bills of other customers.



Source : Energeia (2016)

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Source : Energeia (2016)

Australia's fleet of Distributed Energy Resources

- > By 2027, over 42% of customers have DER
 20 GW solar; 30 GWh Batteries
- > By 2050 61% of customers have DER and capacity trebles to 75 GW solar, 90 GWh batteries



Key Findings – 'Second Wave' incentives

- Customers (or agents) could choose to 'opt in' to rewards for grid support in the *right place* at the *right time*:
 - Incentive Payments for 'orchestration' of DER (eg. battery discharge; smart inverters; load control; HEMs platforms);
 - Advanced Network Tariffs for Behavioural Response (eg. Critical Peak Price; Peak Time Rebates; Nodal Pricing);
 - Transactive Energy: (eg. real time pricing in future in distributed markets).



New Tricks for Old Dogs

Using our Distribution Management System Software we can now use existing hot water load control as low cost option to integrate PV into the Energex network



Energex (2016)

Key Findings – 'Second Wave' incentives

Figure 3: Total Network Non-Coincident Peak Demand (GW)



ENA



 If Networks buy grid services from DER Customers, this 'orchestration' could replace the need for \$16.2 billion in network investment, avoid cross subsidies, and lower average network bills by around 30% compared to today.



Key Findings – Second Wave Incentives

 Smart Incentives avoid significant cross-subsidies and inequity between active and passive customers

	Base Case			Preferred Scenario		
	Active \$	Passive \$	The Gap \$	Active \$	Passive \$	The Gap S
Working Couple	1,387	1,900	513	1,303	1,552	248
Medium Family	1,584	2,761	1,177	1,577	2,119	542
Large Family	2,722	4,339	1,617	2,655	3,206	552
Single, Retired	1,059	1,792	733	1,076	1,445	370

3. Managing Power Security in Rapid Transformation

 Need for a planned and national framework – but flexible to status of each NEM Region.





3. Managing Power Security in Rapid Transformation

- Need for a planned and national framework – but flexible to status of each NEM Region.
- > Coming Soon to a Distribution network near you...





3. Managing Power Security in Rapid Transformation

TOOLS FOR DISTRIBUTION SYSTEM OPERATORS

Advanced network planning models and techniques

- Network Topology Mapping tools
- DER Feeder Hosting Capacity Analytics
- DER Adoption Forecasting and Locational Valuation
- DER/Microgrid Locational Mapping tools

Communications and systems protocols supporting interoperability

- Information, Data and Communication Architecture
- Cyber-security
- Data Privacy
- Network Data Warehousing and Third-party Access

Distributed grid intelligence and control architectures

- LV System Sensing and Measurement
- Dynamic Demand/Supply Forecasting
- Enhanced Protection Mechanisms
- Support to AEMO DER visibility and potential services

For More Information:

www.ena.asn.au

