



ENA

Skills and Productivity in the Rapidly Changing Energy Industry

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Energy Skills Qld Annual Conference
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Outline

1. Introduction to the ENA
2. Context - What's Changing?
3. Future of the Grid
4. Productivity Opportunities
5. Skills and Workforce of the Future

Energy Networks Association

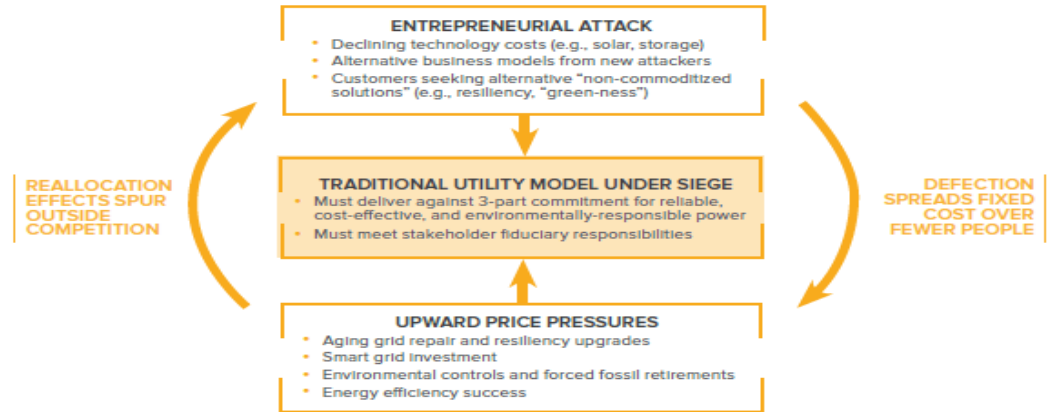
- > The peak national body representing gas distribution and electricity transmission and distribution businesses throughout Australia.
- > 26 members of ENA
- > Approx \$100 billion in assets and almost 15 million customer connections nationally.
- > Total line length of distribution infrastructure is more than 900 000 km



Energy Supply system facing significant change

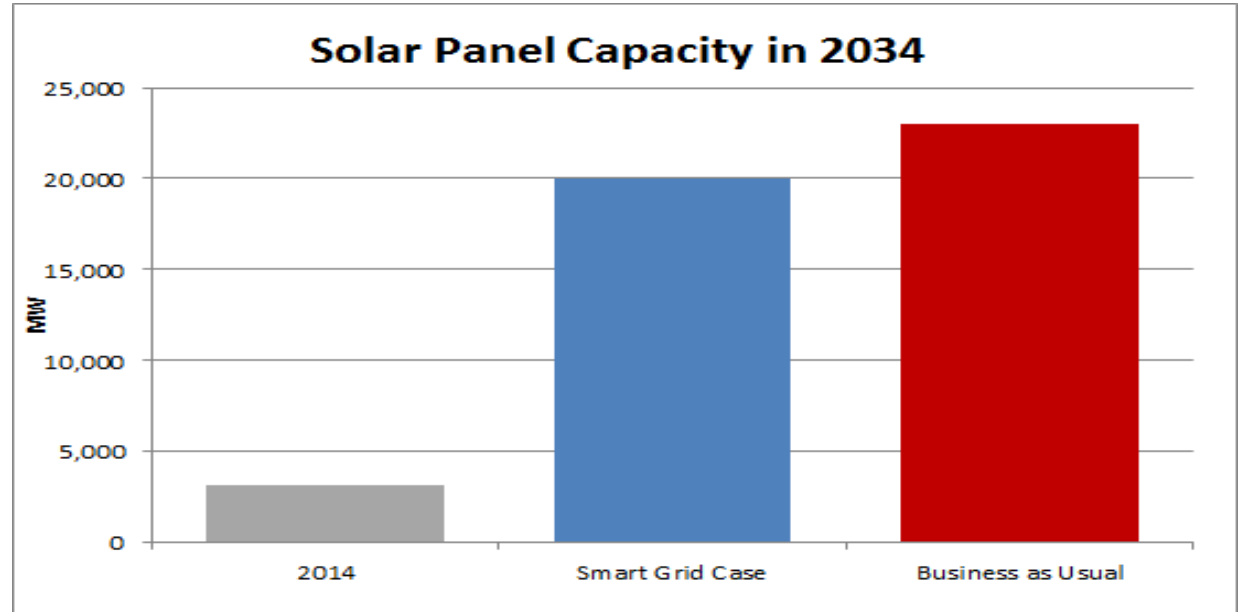
- Energy Efficiency
- Price-elastic Demand
- Falling technology costs
 - Embedded Generation
 - Storage
 - Electric Vehicles.
- Pro-sumers and Distributed Energy Resources
- Engaged Consumers, Home Automation, the Internet of Things
- Micro-grids
- GHG Abatement
- Renewables policy

FIGURE 6: PRESSURE ON TRADITIONAL UTILITY BUSINESS MODELS



Change and More Change to Come...

- > Australia connecting Rooftop Solar at world leading penetration rates
- > Likely to see rooftop solar capacity increase by **6 to 7 times** in next twenty years.



Data from Smart Grid, Smart City - Shaping Australia's Energy Future (2014)

Leading to speculation on the future of the Grid....

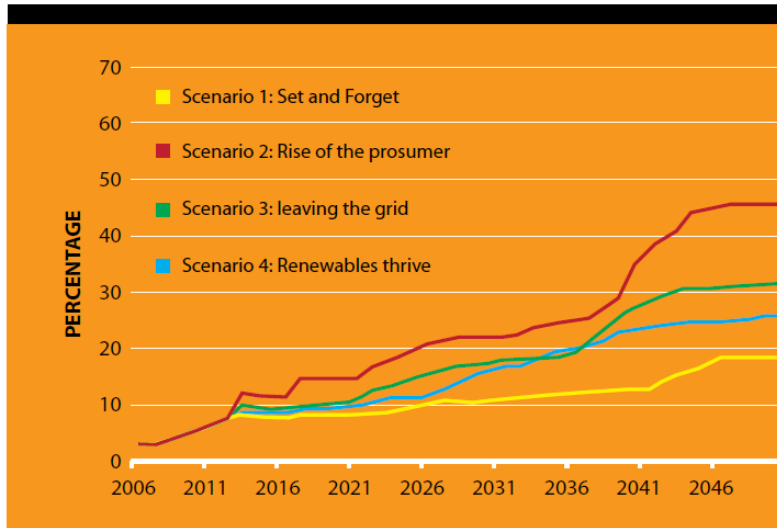
FIGURE 1
 Years until Solar + Storage Reaches Grid Parity from end-2014 (x-axis), versus Perceived Regulatory Risk (y-axis)



Note: Perceived regulatory risk on a blend of Barclays Equity Research regulatory ranking (lowest cost of capital with a score of 1 to 5 for highest cost of capital, Figure 32), and RRA state regulatory ranking (we convert their nine tiers into a similar 1 to 5 range with the score of 1 awarded to Above Average/1 and 5 awarded to Below Average/3, (Figure 33); see Appendix B. Years from end of 2014. Source: SNL RRA, Barclays Research

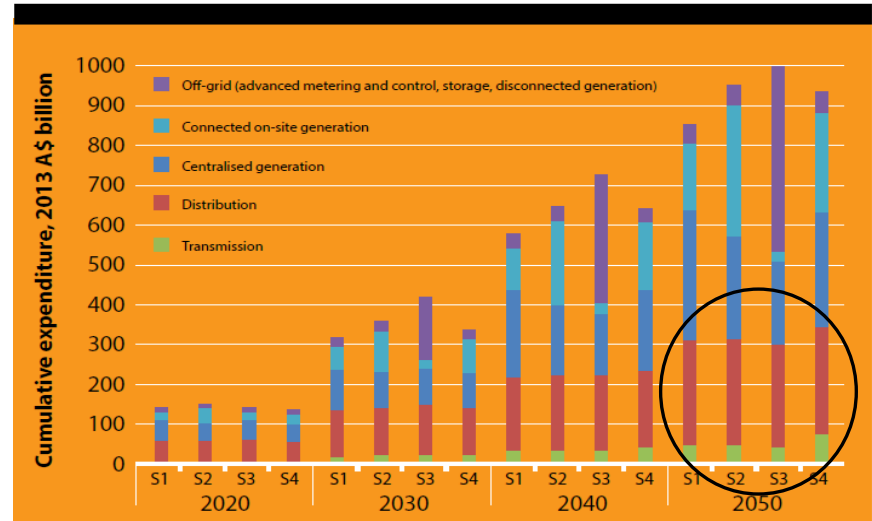
CSIRO FGF: Diverse futures, Diverse Role for Grid

FIGURE 1: PROJECTED SHARE OF ELECTRICITY DELIVERED FROM ONSITE GENERATION



Data sourced from 'Change and Choice' Figure 16, p. 34

FIGURE 2: PROJECTED CUMULATIVE SYSTEM COST BY 2050



Data sourced from 'Change and Choice' Figure 23, p. 44

Network responses – new business models

1. ***Offering a wider range of customer centric services***
2. ***Value to networks of optionality in future investment***
 - Trade-offs between operating vs capital solutions
 - Non-network solutions to defer Infrastructure decision window
 - Innovation to build new markets in Distributed Energy Resources
3. ***'Enabling Networks' and Distribution System Operators***
 - Central to State of New York's *Renewing the Energy Vision*
 - Pacific North-West Smart Grid Demonstration Project
 - Storage Solutions focused on utility benefits

“Enabling Networks” competing on Value

Driving Forces -

- > A competitive environment
- > Reshaping the Commercial Model
 - Cost Control
 - Business Development
- > Consequences for Regulatory Framework

VALUE OF THE GRID TO SOLAR HOUSEHOLDS...

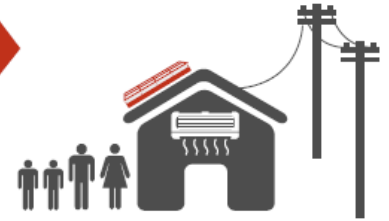
The grid delivers value for solar households

Grid services to solar customers are valued at \$69 per month in benefits, including \$61 in backup energy which would be otherwise unserved and \$8 in export sales to the Grid.

VALUE OF \$69 per month

A solar customer helps to lower the cost of network services, estimated at approximately \$10 per month.

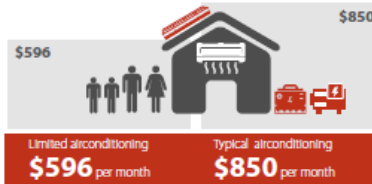
VALUE OF \$10 per month



...at a lower cost than DIY

A Grid service continues to provide significant value compared to a stand alone system. For one-fifth of the cost of a stand alone system the Grid supports a full range of customer appliances, allows customers to export excess energy and participate in new markets. To provide an equivalent service, a stand alone system can cost approximately \$56,500 for a home with limited air-conditioning use or \$72,500 for a home with typical air-conditioning use.

STAND ALONE SYSTEM



CONNECTED TO THE GRID




Note: Based on Oakley Greenwood report, Value of a Grid Connection to Distributed Generation Customers, analyzing a NSW residential customer


Opportunities to create value for customers ...


In Storage:


- > **Ergon** commitment to G.U.S.S. for SWER lines
- > **SP Ausnet's** mobile 1MW/1MWh Storage /Diesel
- > **Ausgrid's** 60kW battery storage in Sydney
- > **Horizon** tender for 6 towns PV/Storage


GRID UTILITY SUPPORT SYSTEMS (GUSS)


 First network-scale battery installation of its kind by a utility in Australia

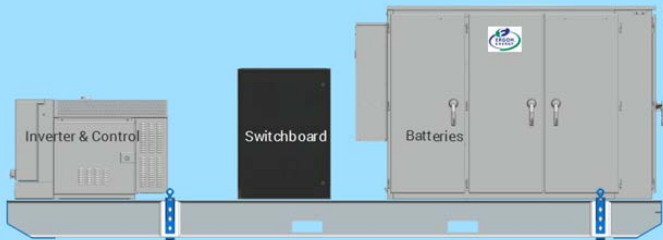
 Will improve reliability for rural customers on Ergon's Single Wire Earth Return (SWER) network


 Modelling shows average network upgrade costs, which are passed on to customers, could be reduced by 35%


 GUSS charges batteries overnight when electricity use is lowest and discharges during the day during peak when required




 Ergon operates around 65,000km of SWER network servicing more than 26,000 customers



 Skid-mounted GUSS unit dimensions are 5.3m x 1.2m x 1.9m and weight is 3.5 tonnes

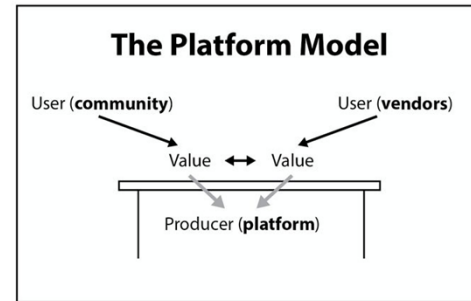
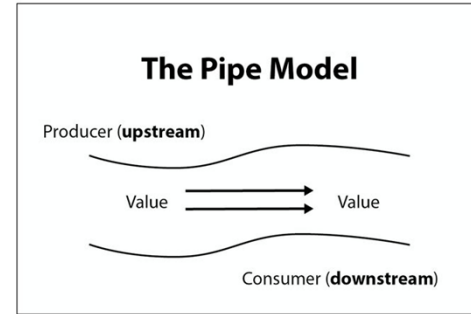
 When fully charged, 56 Lithium-ion type batteries can provide 100 kilowatt hours of power

 12 SWER systems to have 20 GUSS units installed by mid-2015

A move to “Open Networks”

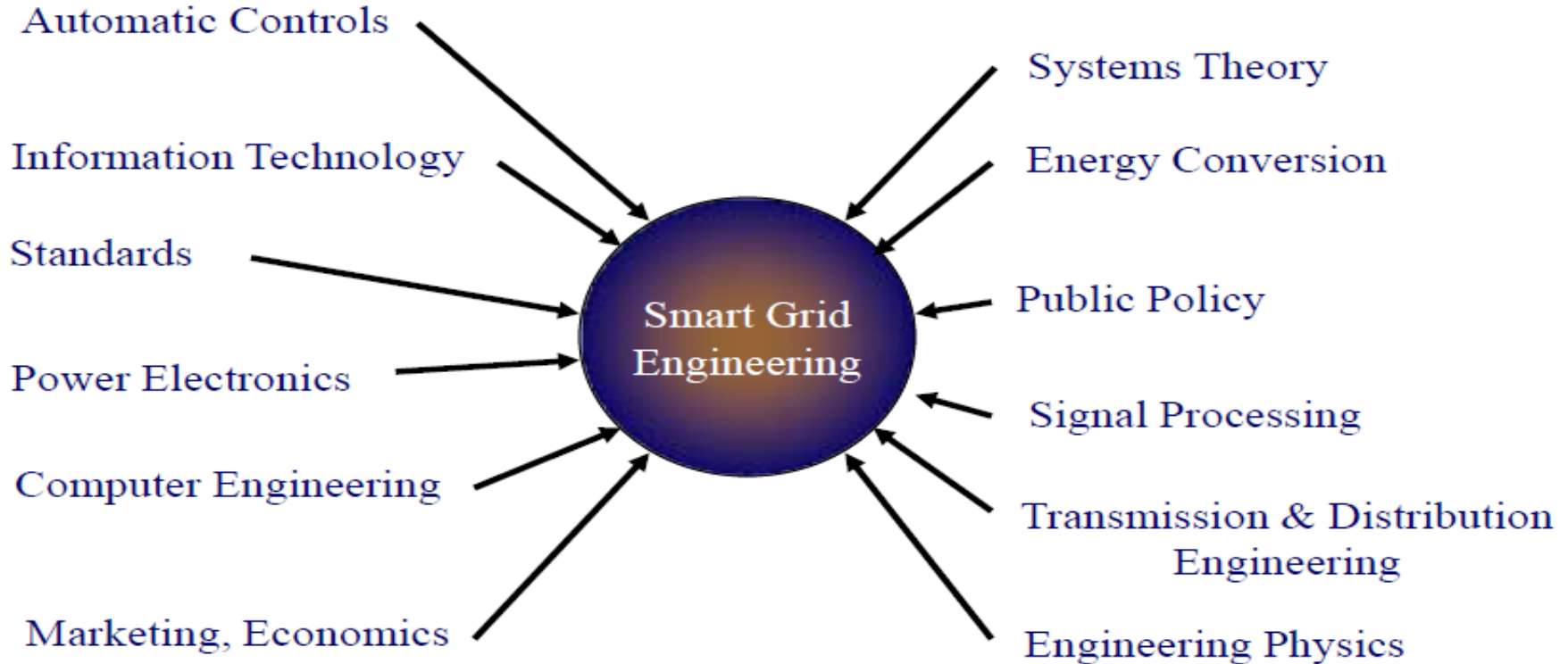
Recurring Themes:

- > Interface & Interoperability
 - Contestability in Metering
 - Distribution Intelligence
- > Customer Interaction
 - Prosumers New Technologies /Applications
 - Smart Meters may not be the gateway
- > Increasingly User Driven/“Co-Creation”
 - DAPR & related information
 - Geospatial tools to highlight constraints – opportunities for DER
 - Transactive Energy



Future Training Challenges

Smart Grid Components



Potential training curriculum subjects/enhancements

- Direct digital control;
- Power system dynamics and stability;
- Power quality and signal analysis;
- “Middleware” migration;
- Environmental aspects;
- Stakeholder and policy aspects;
- Reliability and risk assessment;
- Safety – storage;
- Economic analysis and energy markets;
- New concepts for power system monitoring, protection and control; and
- Communications and IT



Smart Grid Training opportunities

- Design retraining programs that speak directly to the training gaps of existing electrical industry workers;
- Design engineering and technical curricula for future employees that resonate with the needs of the smart grid workforce, such as broad analytical skills, strong engineering fundamentals and strong business acumen;
- Design retraining efforts to familiarise workers with smart grid technology and systems; and
- Educate current students who will be the smart grid workforce of tomorrow.

Significant industry initiatives

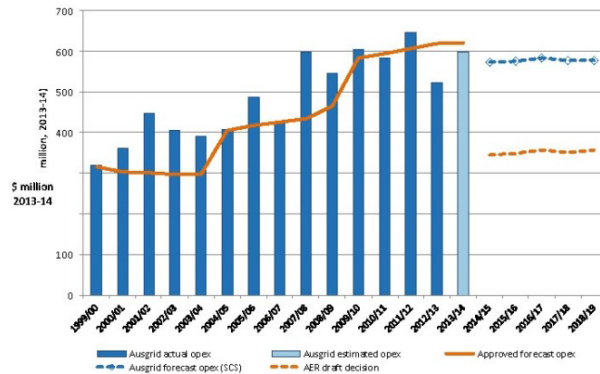
- > ESQ Programs
- > ESI Passport – Skills portability
 - Over 32,200 Passports have been issued in the Electricity Supply Industry (ESI).
- > University Funding & Partnerships
 - Australian Power Institute – university programs and bursaries
 - Direct Chair funding by Electricity Companies (eg. Ausgrid)
 - ENA’s Australian Science and Technology Program
- > Some companies training courses as RTOs to meet VET gaps

COMPETENCY STANDARD UNITS	ESI SAFETY RULES		UETDRRF01A
	Date of Training:		RTO:
	/ /		
	Trainer/Assessor Name:		Signature:
	CPR		HLTCPR201A
	Date of Training:		RTO:
	/ /		
	Trainer/Assessor Name:		Signature:
	POLE TOP RESCUE		UETDRRF02A
	Date of Training:		RTO:
/ /			
Trainer/Assessor Name:		Signature:	
EWP RESCUE		UETDRRF03A	
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Trainer/Assessor Name:		Signature:	

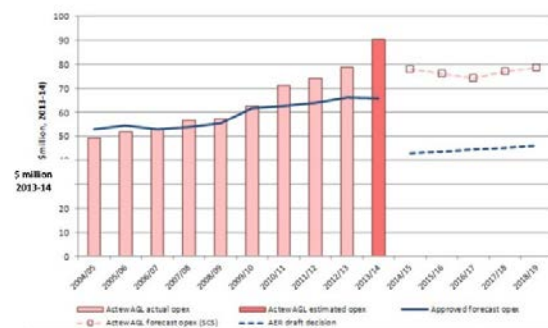
Significant Challenges to Skills Management...

- > Retaining and recruiting skilled professionals
 - From 1999 to 2009, sector employees over 55 years of age increased from 5,800 to 22,300 employees (API).
 - Gender Diversity performance has been poor in engineering (approx. 10% Workforce)
- > Warning signs of unsustainable regulatory risk
 - Opex Benchmarking experimentation risks changing the risk profile of the electricity service

AER draft decision compared to Ausgrid's past and proposed opex (\$million, 2013-14)



AER draft decision compared to ActewAGL's past and proposed opex (\$million, 2013-14)



THANK YOU

www.ena.asn.au

YOUR ELECTRICITY GRID

The Electricity Grid has been called the 'world's largest machine' - an integrated, dynamic system.

With Australian households using more appliances in their daily lives for communication, comfort and convenience the electricity grid plays an essential part in our lives.

10,561,578 customers*

Your Grid provides energy to virtually every household and business in Australia through transmission and distribution networks. Reliable, cost-effective power supply is a vital input to Australian business, industry and communities, supporting economic growth and employment.

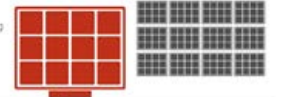


34,374 workers

Your Grid employees provide essential frontline and supporting services to customers 24x7, 365 days a year. They often work in extreme conditions during rapid emergency responses to major events, such as fires and storms to minimise customer interruptions.

1,320,423 connected Solar Panels

Your Grid is rapidly connecting new technologies, while protecting safe, reliable and affordable supply to other customers. Australia leads the world in the uptake of grid-connected solar panels, 'reversing' energy flows in some locations. Most solar customers rely on the Grid to sell excess energy and for backup supply.



917,676 kms of lines

Your Grid includes over \$84 billion in electricity assets providing the backbone of our economy and community. Long term investments are made based on consumer engagement to meet dynamic market needs, incorporate new technologies and support demand response.

99.95% reliability

Your Grid provides an exceptionally reliable service adapting in real time to millions of changing demand and supply signals. Customers benefit from the reliability, continuous supply, start-up power support, power balancing and power quality provided by the grid.

