Skills and Productivity in the Rapidly Changing Energy Industry

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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

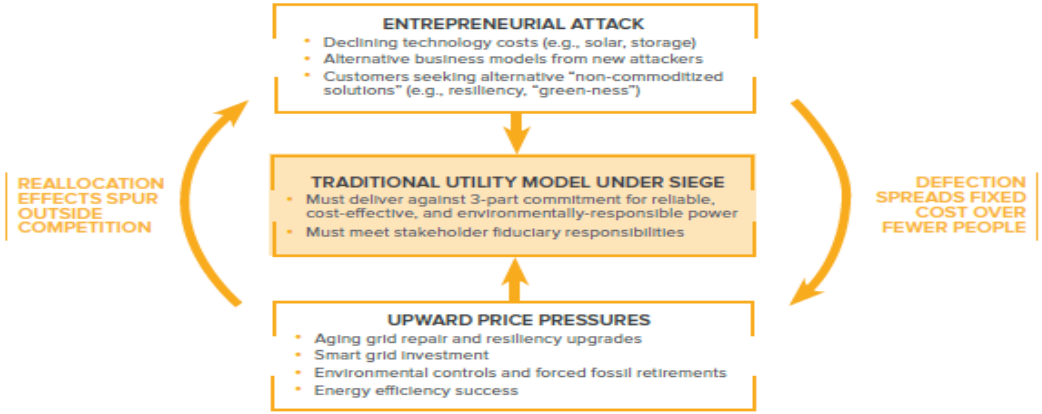
Energy Networks Association

- 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

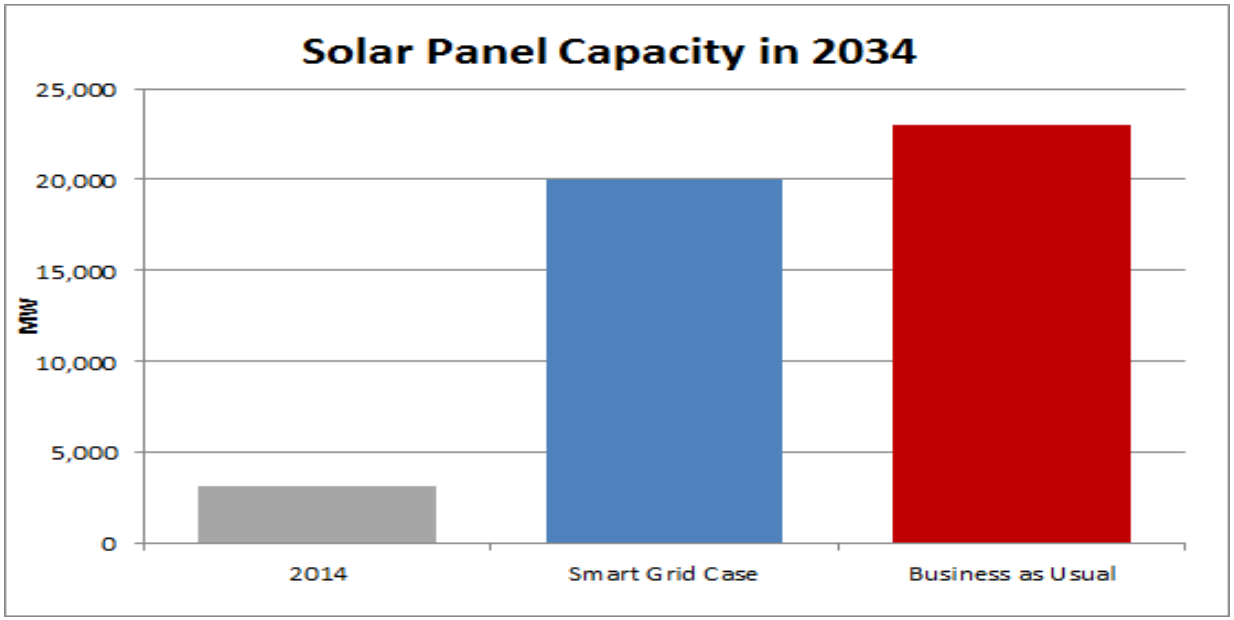
FIGURE 6: PRESSURE ON TRADITIONAL UTILITY BUSINESS MODELS



Rocky Mountain Institute – The Economics of Grid Defection, page. 12

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….

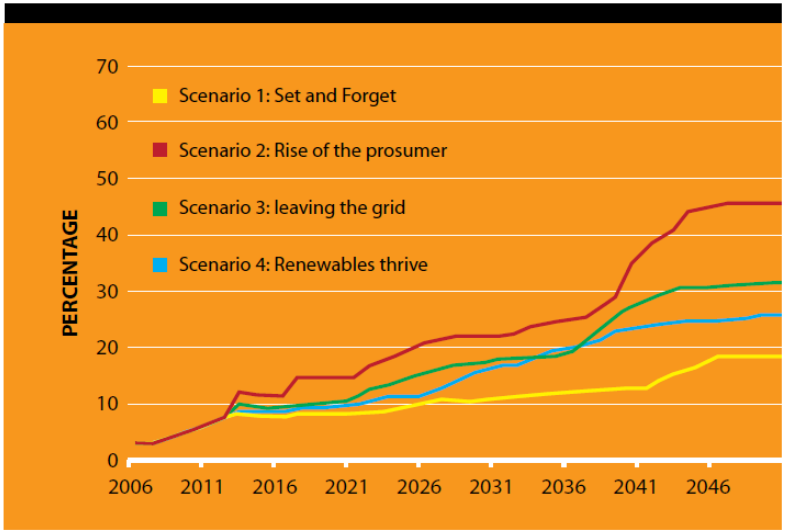
FIGURE 1

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

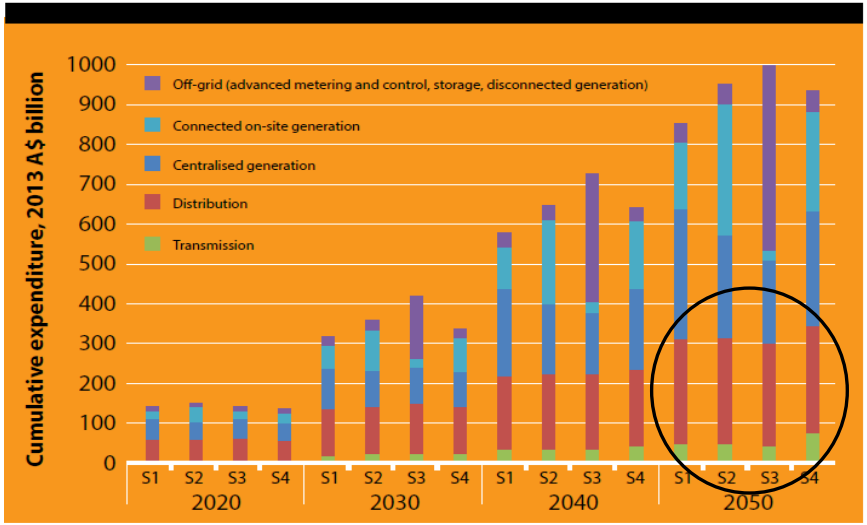
CSIRO FGF: Diverse futures, Diverse Role for Grid

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

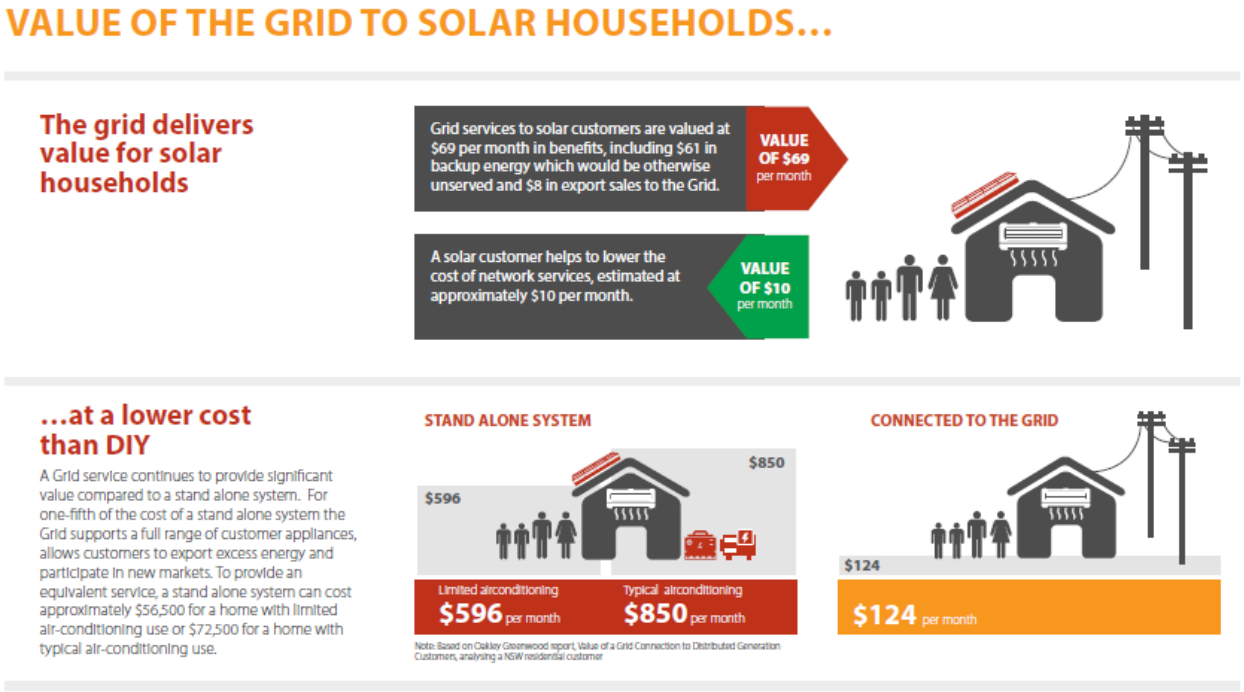
Network responses – new business models

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 -

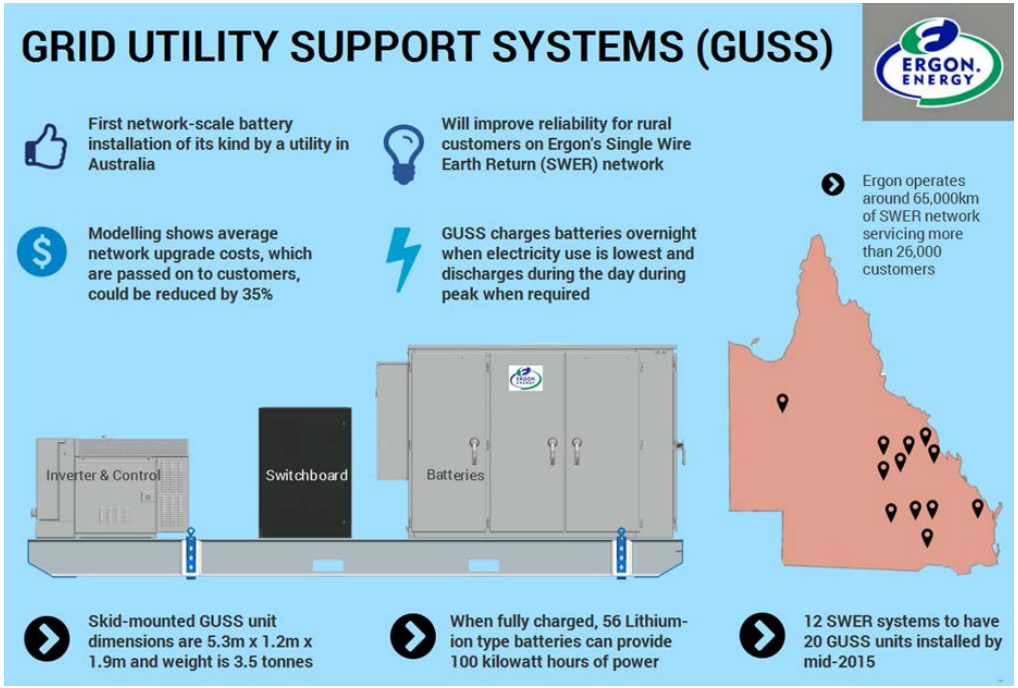
- A competitive environment
- Reshaping the Commercial Model
  - Cost Control
  - Business Development
- Consequences for Regulatory Framework



Opportunities to create value for customers …

In Storage:

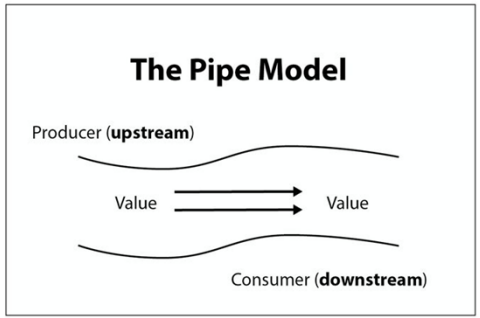
- **Ergon** commitment to G.U.S.S. for SWER lines
- **SP Ausnet's** mobile 1MW/1MWh Storage /Diesel
- **Ausgrid's** 60kW battery storage in Sydney
- **Horizon** tender for 6 towns PV/Storage

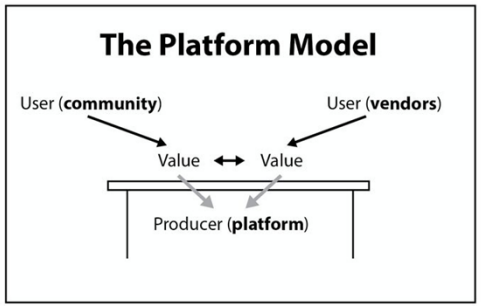


A move to “Open Networks”

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

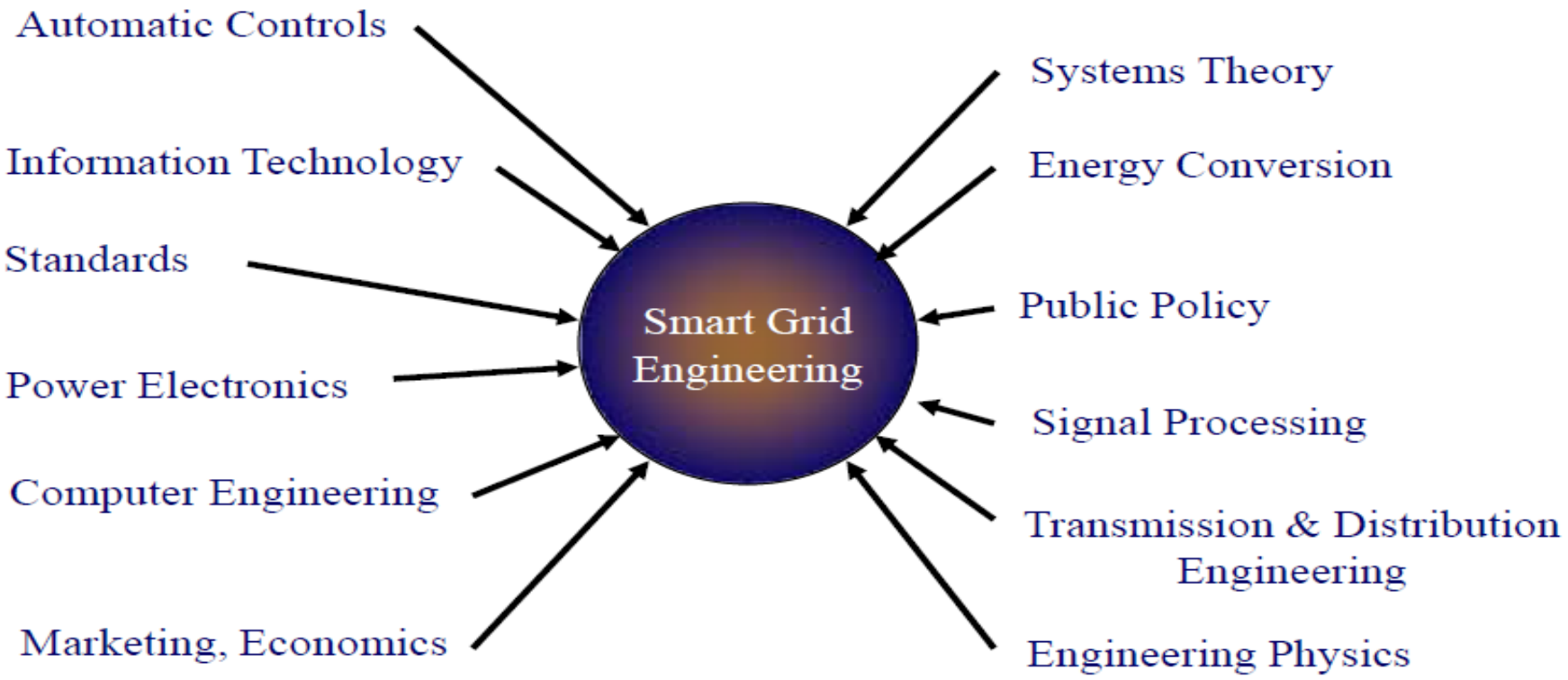




Choudary, Sangeet, *Wired (2013)* “Why Business Models Fail: Pipes vs. Platforms”

Future Training Challenges

Smart Grid Components



Potential training curriculum subjects/enhancements

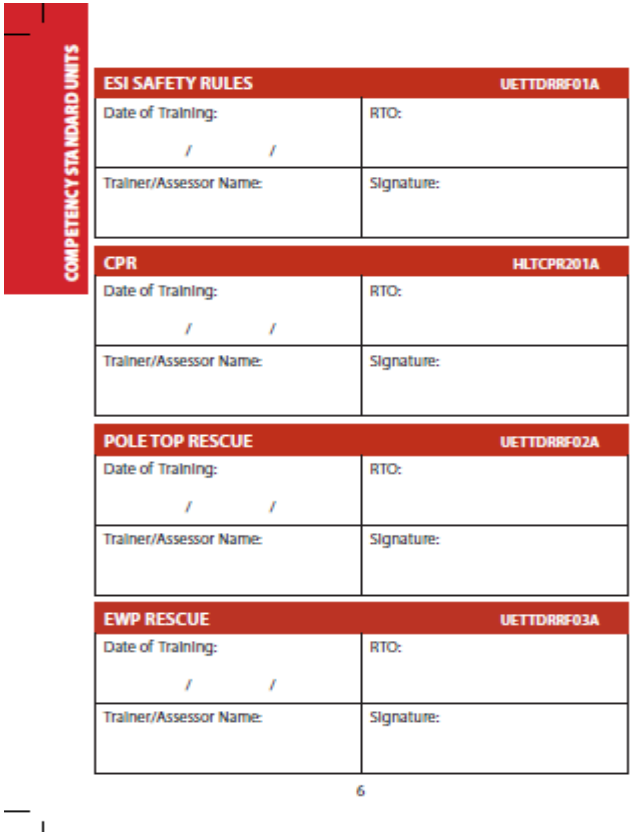
- Direct digital control;
- Power system dynamics and stability;
- Power quality and signal analysis;
- “Middleware” migration;
- Environmental aspects;
- Stakeholder and policy aspects;
- Reliability and risk assessment;
- Safety – storage;
- Economic analysis and energy markets;
- New concepts for 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	UETTDRRF01A
Date of Training: / /	RTO:
Trainer/Assessor Name:	Signature:

CPR	HLTCPR201A
Date of Training: / /	RTO:
Trainer/Assessor Name:	Signature:

POLE TOP RESCUE	UETTDRRF02A
Date of Training: / /	RTO:
Trainer/Assessor Name:	Signature:

EWP RESCUE	UETTDRRF03A
Date of Training: / /	RTO:
Trainer/Assessor Name:	Signature:

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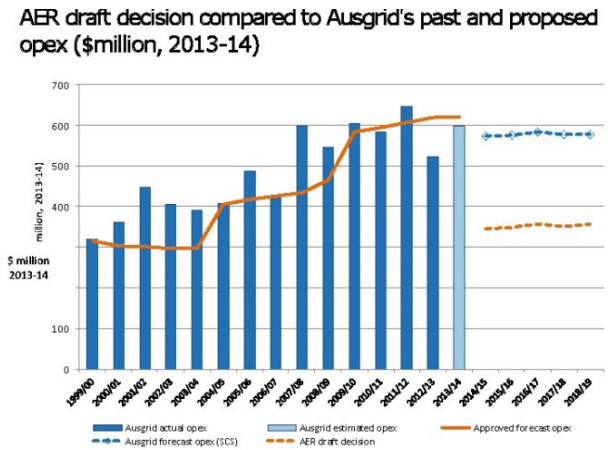
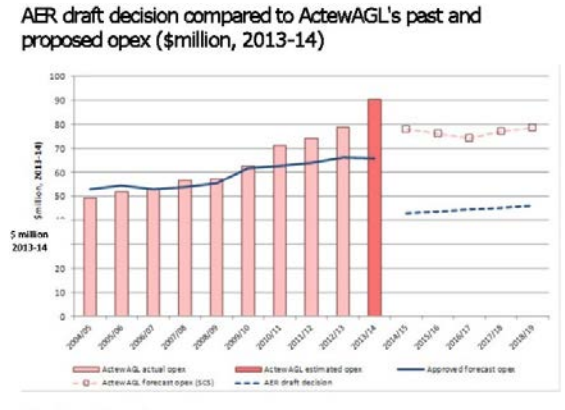
Significant Challenges to Skills Management…

- 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





THANK YOU

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