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
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….
CSIRO FGF: Diverse futures, Diverse Role for Grid

**FIGURE 1:** PROJECTED SHARE OF ELECTRICITY DELIVERED FROM ONSITE GENERATION

- Scenario 1: Set and Forget
- Scenario 2: Rise of the prosumer
- Scenario 3: leaving the grid
- Scenario 4: Renewables thrive

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

**FIGURE 2:** PROJECTED CUMULATIVE SYSTEM COST BY 2050

- Off-grid (advanced metering and control, storage, disconnected generation)
- Connected on-site generation
- Centralised generation
- Distribution
- Transmission

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

A solar customer helps to lower the cost of network services, estimated at approximately $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, allowing customers to export excess energy and participate in new markets. To provide an equivalent service, a stand-alone system can cost approximately $90,000 for a home with limited air-conditioning use of $72,500 for a home with typical air-conditioning use.

STAND ALONE SYSTEM

$596 per month

CONNECTED TO THE GRID

$124 per month
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

Future Training Challenges
Smart Grid Components

- Automatic Controls
- Information Technology
- Standards
- Power Electronics
- Computer Engineering
- Marketing, Economics
- Systems Theory
- Energy Conversion
- Public Policy
- Signal Processing
- Transmission & Distribution Engineering
- Engineering Physics
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
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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