Alexei Watson

ESSENTIAL ENERGY
The Grid, Solar & Electric Vehicle Fast Charging Infrastructure

Alexei Watson, North Coast Distribution Planning Manager
Alexei Watson : Who am I?

- North Coast Distribution Planning Manager – Essential Energy
- Power Engineer (BENH)
- Previously built, owned and lived with Electric Vehicles
- Thirteen years of Engineering with Essential Energy
- Prior research using Virtual Power Plant to address network constraints
- Renewable and sustainable energy enthusiast
Essential Energy and the supply chain

Generation
- Generates electricity

Transmission
- Carries high voltage electricity long distance

Distribution
- Essential Energy responsibility

Retail
- Electricity bill

Customer
- Power supplied to consumers
One of Australia’s largest distribution networks

- 1,381,758 power poles – which equates to 1.6 power poles for every customer
- 1,442 powerlines with 10 that are longer than 1,000km, the longest spanning 1,905km
- 95% of NSW and parts of southern Queensland
- 377 zone substations and 140,000 distribution substations
- 183,612 km of overhead powerlines – equivalent to driving around Australia 13 times
- 4.6 customers to fund every 1km of overhead powerlines
- 40m kms travelled by our employees each year
- 36 years average age of network assets
- 737,000 square kilometres of network
- >840,000 customers

Extreme variations in both weather and terrain
Network of the Future: Future house

- **Smart meter**: Enables peer to peer trading with neighbours.
- **Electric vehicle**: Draws energy at off-peak times and can store energy.
- **Rooftop solar**: Provides renewable energy to match peak demand. Could be shared through grid-enabled peer to peer trading.
- **Smart appliance control**: Responds to grid disturbances and shifts in consumption away from peak periods.
- **Smart appliances**: Responds to grid disturbances and shifts in consumption away from peak periods.
- **Electricity storage batteries**: Store off-peak power to use during peak periods and back-ups.
- **Temperature control**: Allows demand management incentives.
Network of the Future: Key focus areas & initiatives

Large Scale Embedded

Demand Management

Electric Vehicles

Micro Grids & Customer Tech
Our Vision, Purpose and Values

**Our Vision**
What we want to be
Empowering communities to share and use energy for a better tomorrow.

**Our Purpose**
What we stand for
To enable energy solutions that improve life.

**Our Values**
What we care about
- Make safety your own
- Be easy to do business with
- Make every dollar count
- Be courageous, shape the future
- Be inclusive, supportive and honest

**Business Objectives**
- Continuous improvements in safety culture and performance
- Operate at industry best practice for efficiency, delivering best value for customers
- Deliver real reductions in customers’ distribution network charges
- Deliver a satisfactory Return on Capital Employed
Value for customers through data

- Customer concerns of energy affordability are being heard loud and clear
- Five slides of data showing challenges and opportunities from solar generation and fast charging
Solar uptake in NSW
Lennox Head Load Profile - 2008 vs 2018

**Lennox Head, NSW (8000 people)**

**2018**
- Demand minimums occur in the middle of the day
- Peak demands have not changed significantly
- 3 MW installed PV panels capacity
- 2 MW of modelled generation (lower due to efficiency losses, inverter size & export limiting, etc)
- > 50% Penetration

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**Essential Energy**

11 | Commercial-in-confidence
DC Fast Chargers & Commercial: Load profile

- DC fast charger: real world site
  - 7 days shown
  - Loads are ‘peaky’
  - Asset utilisation is low

- Commercial Premise: real world site
  - 7 days shown
  - Loads are predictable
  - Asset utilisation is high

DC Fast Charger Load Profile

Typical Commercial Load Profile
DC Fast Chargers: Load Duration Curve (LDC)

- LDC illustrates asset utilisation
- Typical Commercial site shown is above 150 kVA for 22% of a year.
- DC fast charger shown is above 150 kVA for just 0.188% of a year – just 16 hours
- Increasing asset utilisation provides better value for EV charging businesses and for ongoing maintenance
- Asset utilisation will increase as more cars hit the road
> Normalised profile shows time of power flows
> Created by averaging a year of metered data
> Most highway travel occurs during daylight hours
> Solar and highway EV charging coincide
> DC fast charging is useful for ‘solar soak’
> Trend to continue as EV adoption improves
EV Charging Industry Working Group

Purpose

- Find and remove areas of excessive bureaucracy
- Improve site identification and installation process
- Provide value for installers and customers
- Identify opportunities for innovation trials

Participants

- Tesla
- ChargeFox
- Evie (FastCities)
- NRMA

Outcomes to date

- Commitment for obligation free preliminary feasibility enquiries
- Automatic tariff review and change from demand charge structure to Time of Use (ToU) for sites with less than 160 MWh of energy per year
- Facilitating first Dynamic DC fast charger trial
  - Fast charger connected through existing shared asset with spare capacity available
  - Ability to monitor site capacity and limit charge speed if required
  - Significant reduction in installation costs and requirements
- Review of Essential Energy’s application of Service and Installation Rules (SIR) clauses regarding one connection point for each electrical installation
  - Introduced allowance for EV charging exemptions by application
Essential Energy

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EV charging station management
About Everty

EV driver interface

Charging station operator dashboard

Find + Start / Stop → Pay
Charging station locations

- Cities and Highways
- Carparks
- Shopping Centres
- Hotels/Restaurants
- Workplaces
- Homes

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<th>Commercial</th>
<th>Residential</th>
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Progress in Australia

Public Sector funding

- VIC - 2m
- NSW - 5m for chargers, 10% target for fleets
- QLD - 21 fast chargers sites
- ACT - 470k for chargers, new fleet to be EVs by 2021

Private Sector funding

- Tesla Supercharger Network
- NRMA - 10m for 40 fast charger sites
- Evie Networks - 27m for 42 ultra-rapid charger sites
- Chargefox - 15m for 23 ultra-rapid chargers sites
- Major fuel suppliers are investigating EV charging
Challenges in the transmission and distribution networks

DC fast charging

- The newest chargers can provide up to 475 kW electricity (very costly to install due to power units, transformers, equipment costs)

Home charging

- Transformers in the low-voltage grid may require upgrades

Building load constraints

- Retrofitting chargers in old buildings with large car parks

Difficult to plan/forecast

- Knowing when and where cars will charge is very important to prepare the grid