POWERLINK DEMAND AND ENERGY FORECASTING FORUM
22 MARCH 2016

OVERVIEW

In order to appropriately plan the Queensland transmission network, Powerlink develops ten year demand and energy forecasts. These are published each year in our Transmission Annual Planning Report (TAPR) and since 2011 in update forecasts published around March.

In recent years, the development of these forecasts has been challenging for a numbers of reasons including the economic downturn, changed consumer behaviours and several other drivers of change. The purpose of this forum was to further explore these drivers for change that have already or may soon impact electrical energy and demand usage.

These drivers of change include:

- battery storage
- energy efficiency
- tariff reform
- demand side management and other new/emerging technologies (e.g. solar PV generation and electric vehicles).

Please note that solar PV generation and electric vehicles were not reviewed or discussed in detail at this forum. As there is now a significant amount of data available for installed solar PV, and electric vehicles are not expected to significantly impact market share in the medium term, the discussion focused on the other key drivers listed above.

Great ideas and concepts were put forward and it is important to view these in the context of items requiring further investigation rather than statements of future trends and outcomes.

FORUM APPROACH

Powerlink hosted the forum to engage with industry experts in order to seek different points of view and to learn more about the potential impact of these drivers. The forum was attended by representatives from transmission and distribution businesses, Australian Energy Market Operator (AEMO), Queensland Government and a range of industry experts.

Attendees were then split up into four groups, with each group given the opportunity to contribute to each of the four change drivers (battery storage, energy efficiency, tariff reform, and Demand Side Management and other new/emerging technologies). Discussions were engaging and sometimes challenging. Many ideas were raised and a copy of the discussion on each change driver is provided in the following attachments. All ideas were recorded as the purpose of the forum was to challenge current thinking and identify potential future impacts.

WHAT NEXT?

From here, Powerlink will review the information in detail to assess the impact that each driver for change may potentially have on future demand and energy. This task will be ongoing as further information becomes available and trends develop. It is also recognised that there are strong interdependencies between some of the drivers.

Powerlink is committed to ongoing engagement as it continues to refine its forecasting methodology. This will take place though future forums and ongoing discussions with a wide range of stakeholders.

Attachment 1

Battery storage

- Most discussion focused on batteries, specifically around residential installations
- Price will be a big factor for uptake
    - Currently not economic for most customers, but early adopters are out there
    - May be possible to use PV uptake model to forecast uptake ahead of economics – Energiea have done some work in this space, however it is based on Return on Investment not capital
    - Australian dollar
    - Payback currently ~17-20 years for most – price reduction to 50% (5-7 years) will result in a payback of 6-8years
    - Queensland Household Energy Survey (QHES) respondents estimated cost of system at $4.6k (SEQ) and $7k (Regional) whereas reality is over $10k

- Drivers may not be all economic:
    - Insurance
    - Grid backup
    - What is the impact on customer reliability if they have a battery?
    - Marketing / hype
    - Consumer sentiment – perhaps not as strong as when PV was rolling out
    - Policy incentives
    - There were multiple drivers for PV including SCMs, renewable energy certificates, high feed-in tariffs

- Tariffs
    - Roll off of premium feed-in tariffs may lead to a surge (more so in NSW before QLD)
    - How to set tariffs to improve utilisation

- Retailers leading the push
    - Feeling that some solar installations / installers were less than adequate
    - Safety and warranty of concern to purchasers
    - Locking in customers – payment plans / purchase agreements

- Other barriers to uptake include:
    - Physical space requirement
    - Management of batteries
    - System standards
    - Australian dollars - PV surge occurred when Australian dollar was high, whereas it is now significantly lower. Inverters account for approx. 50% of capital cost

- Realising benefits
    - Retailer (Arbitrage)
    - Network Service Provider (Demand management)
    - Customer (Price – dependant on tariffs)

- Ownership and control
    - Competing priorities as peak price and local peak may occur at different times, and this may be a different time to any demand tariff timing which would maximise benefit to the consumer
    - Appropriate ring fencing needs to be in place for retailer and Network Service Provider owned systems

- Edge of grid installations – suggestions that it may already be economic at the edge of the grid
    - Suggestion that may already be economical with densities of 1 customer / 6km
    - Horizon Power implemented to avoid replacing 400km of line that was destroyed by bushfire

- Pilot programs
    - Need to assess the benefits of systems with full home area network / energy management system to better understand the impact

Other storage technologies discussed

- Neighbourhood / network side storage
    - What are the drivers for this?
    - Greater economic benefits / economies of scale
    - Ergon are trialling 25kWh installations at edge of grid

- Thermal storage
    - Precooling of buildings (cooling a building down 2 degrees lower than its setpoint in the morning, and allowing it to float back to its set point in the afternoon)
    - Chilled water cooling / central cooling

- Question and discussion on whether 185MW / 0GWh was appropriate
    - General consensus that the energy was a neutral proposition
    - No general consensus on demand, some felt it was about right, one felt it was too low, others felt it was a bit high
    - Represents approximately 90,000 households (@2kW / household ADMD)
    - Point was raised that Powerlink must also consider where this would be located
    - Is this captured in the Ergon and Energex forecast? Are we double counting?

Attachment 2

Energy efficiency

General

- There continues to be ongoing improvements in common appliances. More uptake of LED lighting, air-conditioner replacements with more efficient units and other appliance replacement. Price of LED lighting still coming down.
- Consider the possibility of sectorial analysis – break into residential, industrial, commercial
- Regression could back out energy efficiency from history and then add back in
- Pricing of products to impact consumer behaviour
- Need to be careful that price is not double counted. Price is included in the underlying regression but also plays an important role in the uptake off energy efficient behaviours and appliances.
- There may be some value into assessing the separation of energy efficient behaviours as opposed to energy efficient technology change. For example, when it is hot, some people will go to the shopping centre or the movies.
- Improvement in pumping technologies including making use of solar PV, diesel generation and general modernising.
- The proposal to move “back to trend” rather than having energy efficiency improvements beyond historic trend was felt to be reasonable. There is a view that much of the “low hanging fruit” has already been taken.
- Need to monitor and assess policy changes (e.g. Clean Energy Council) and government intervention
- Factor in the learnings from the Queensland Household Energy Survey (QHES) In particular, the 2015 QHES indicated that people value their comfort more than in recent years.
- People moving from houses to apartments will have an impact
- Schemes to promote energy efficiency need to be automated. Busy people will not likely be able to continually monitor and review. Beware of information overload.
- Housing – brownfield vs greenfield
- Mandatory building standards, MEPs.

Leads

- Ausgrid – have done some work in backing energy out of the regression input data
- CSIRO have developed a customer model for energy efficiency

Attachment three

Tariff reform

General

- Tariff reform is about changing residential and small business electricity tariffs from energy tariffs to time of use tariffs. Under time of use tariffs (also known as price reflective tariffs), electricity prices would be lower during the off-peak periods when the electricity networks are underutilised but higher during peak periods when the electricity networks are heavily loaded.
- Price reflective tariffs would remove cross subsidies and would make electricity pricing fairer. Therefore some consumer groups will benefit and other consumer groups which are currently benefiting from the cross subsidies will be financially disadvantaged.
- Ergon currently has a peak and off-peak tariff (tariff 12) however take-up has been extremely low
- New price reflective tariffs need to balance the signals given to customers and total cost recovery. Network Service Providers (NSPs) still need to fill the revenue cap set by the Australian Energy Regulator (AER).
- Existing meters for residential and small businesses are energy meters, and are inadequate for price reflective tariffs. Smart meters will need to be installed for price reflective tariffs to work.
- Currently there is a disconnect with PV feed-in tariffs and price reflective tariffs, as the feed-in and the supply costs are priced differently. Therefore smart meters that are currently being used for PV feed-in cannot be used for price reflective tariffs.
- In subsequent stages of tariff reform, there may be an option for localised distribution and/or transmission congestion to be incorporated into the development of tariffs.

Customer behaviour

- Customers hate complicated tariffs
- Price reflective tariffs are currently voluntary; therefore customers will need to see solid benefits before moving onto a new tariff structure.
- Customers will need additional information on instantaneous energy usage and appliance information to take advantage of the price signals. This may include some form of energy management system eg an Apple app.
- One idea is to use ripple control signals across distribution/ transmission lines to signal the peak periods to consumers and maybe modify the electricity consumption of certain loads.

Impact on other technologies

- The general opinion was that a move towards price reflective tariffs would result in fewer incentives for consumers to invest in new technologies such as PV and battery storage. However the rate of investment decline in these technologies will be dependent on the tariff price signals.
- Battery uptake could increase for customers with higher peak loads.
- Electric Vehicle (EV) batteries could be utilised to import power back into the grid at peak times. However manufacturers don't like this option as it shortens the battery life.

Role of retailers

- Retailers/aggregators are in the best position to increase the uptake of price reflective tariffs by offering attractive packages to consumers
- Retailers could take advantage of the new tariffs and create packages that could benefit customers and keep their customers in the long run
- Origin's 'predictable plan' could be a good first step to simplicity and faster uptake of packages
- Retailers need to treat customers as different classes/groups
- Use the broadband model – purchase a plan for access, demand & energy
- Lots of air conditioning, kids, dishwasher, clothes dryer etc. – higher plan, if you go over your pre-plan then you may start to lose your discount.

Rate of uptake

- One of the major hurdles for the uptake of price reflective tariffs is the requirement for a new smart grid meter. Currently the customer is required to pay between $300 to $500 for a smart meter and hardware, before they can go onto a price reflective tariff.
- If the customer is required to pay for a new meter, they will want to know what the payback period will be
- The uptake of price reflective tariffs is expected to remain low if these tariffs remain voluntary and without retailer packaging of the smart meter cost. Low uptake expected within the first 3+ years.
- Retailers may need to update their metering/billing software to be able to offer the new tariff structures
- Customers may need a safety net to assist in transitioning to the new tariffs to minimise any bill shock
- Retailers could facilitate a much faster take up.

Attachment 4

Demand Side Management (DSM) and other new/emerging technologies

General

- DSM is quite entangled with other issues (tariffs, efficiency etc.). There is a risk of double counting the same effect in multiple categories.
- DSM can be activated by a number of mechanisms:
    - Directly controlled using Audio Frequency Load Control (AFLC, also known as 'Zellweger' or 'ripple' control), which occurs with the off-peak tariffs, or peak-smart air conditioners
    - Respond to pool price (the actual price or the forecast price through pre-dispatch)
    - Signalled through some other mechanism, such as communications a Demand Response Aggregator has established to implement demand response. In New Zealand, Transpower utilises an iPhone App to invite participants to bid responses to demand response events, and tell them if their bid has been successful.
- The precise level of existing demand-response is hard to quantify i.e. how much higher would the load have been if response had not be called/the pool price had not increased (or even been forecast to increase in pre-dispatch).
- Historically DSM in Queensland has predominantly been led by the distribution businesses. The reduction in forecast capex has reduced the imperative for distributors to promote/incentivise DSM. Ergon is not renewing a number of its demand response contracts. Energex is targeting its DSM procurement at specific areas, and winding back its system-wide DSM initiatives.
- Ergon has recently started operating its audio-frequency load control differently. Historically AFLC has been switched at fixed times. Now, in North Queensland, it has been set to operate when the regional load exceeds and drops below certain thresholds.

DSM for commercial and industrial customers

- The Queensland pool price is particularly volatile compared to the other states (apart from South Australia) – and this provides an opportunity for commercial and industrial to save money if they accept some market exposure and curtail consumption during high price events.
- There is a trend towards increasing use of embedded or co-generation in industrial processes. The generation is run when the pool price is highest (to maximise revenue), which nets off the processes' consumption.
- Some customers are prevented from responding to price signals by the limited sophistication of their industrial processes. As equipment is incrementally replaced or upgraded, there is often greater scope for central visibility/coordination, and hence a greater opportunity to be price-responsive.

DSM for residential customers

- There are a number of impediments to further growth in residential demand response in the near term:
    - Existing type 6 metering (manually read accumulation meters) limits ability to pass on any time-specific price signals to residential consumers

- The vast majority of residential consumers strongly favour certainty and simplicity. Orgin's new 'predictable' plan targets this customer segment.
- Historical experience in field trials has shown the consumers struggle to respond appropriately to price signals (e.g. initially trying to keep loads off and then 'giving up' and turning them all on at once, creating a peak that is higher than what they would normally have created), and fatigue of energy conscious behaviours over time (feedback from Queensland Household Energy Survey)
- A number of land developers are now building private distribution network, obscuring the distributor's view of how these households are behaving.

- The installation of household batteries is likely to be accompanied by the installation of household load management systems (probably accompanied by phone apps). These systems will provide an opportunity for greater residential demand response:
  - The systems should be "set and forget" from a consumer's perspective – not reliant on them to maintain certain behaviours.
  - The battery is itself a significant load that can be controlled
  - There is an opportunity for demand response aggregators to pool the response of many household load management systems
  - Reposit Power is an early example of this concept www.repositpower.com/

Electric vehicles

- Forecasting electric vehicles is quite complex, with a wide variety of factors which need to be taken into account
- These factors are not just economic. They include brand and reputation.
- There is the potential for rapid uptake in certain segments, including taxis, couriers, haulage
- There are synergies with self-driving cars.

Other impacts on future demand and energy

- There is significant mothballed capacity in Queensland industry at present. Given the right economic conditions (e.g. currency exchange rates), there is the potential for the load to increase consumption rapidly.
- A significant amount of gas is used for heating – both in households and industry. An investigation by the Dept of Energy and Water Supply has already shown that it would be cost effective for many houses to drop their gas supply (given the high fixed connection cost) and switch to solely electric power. If the global price of oil were to increase, it would further strengthen the case to switch from gas to electric power. (Australian domestic gas prices have historically been much lower than international prices, but are now coupled with the international market.)
- Given the increasing pace of technological and economic change, further upside or downside shifts are likely down the track ie "I can't tell you what it is, but it's going to be big".