Demand and Energy Forecasting Forum
April 2017

Overview

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

In recent years, the development of these forecasts has been challenging due to the external environment and other drivers of change. The focus of this year's forum remained similar to previous years. We remain keen to continue to build on our understanding of how technology, economics and consumer behaviour are playing an ever-increasing role in future demand and energy needs.

This year's forum provided an opportunity for industry experts to explore and debate the following:

- how new technology will impact on future network demand and energy forecasts
- how the growth of new technology will be impacted by future economic conditions
- input into how Powerlink should develop load forecasting themes for the 2018 Transmission Annual Planning Report.

Forum participants provided a range of input and ideas which will be further investigated and considered in the development of the 2017 TAPR demand and energy forecast.

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 impacts of external drivers of change. The forum was attended by representatives from distribution businesses, the Australian Energy Market Operator, Queensland Government and a range of industry experts.

Attendees were split into groups and given an opportunity to discuss and debate the questions outlined above. Discussions were robust and engaging, with a wide range of ideas and concepts shared and debated. All information was recorded as the purpose of the forum was to challenge current thinking and identify future scenarios and impacts.

What next?

In developing future demand and energy forecasts, Powerlink will use the information provided at the forum in terms of the range and types of scenarios of the future and potential new technology impacts. This process will be ongoing as new information comes to hand and emerging trends develop.

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

Attachment 1

Workshop 1 – New technology impacts

Q1.1 What new technology and policy developments have surprised you over the previous 12 months?

Sharp decline in battery costs:

- Presently observing battery costs that were expected to be realised in five years' time.
- Consequence of an increase in supply (e.g. Tesla's Gigafactory coming online), combined with competitive forces.
- In terms of the impact on future cost trajectories, it is felt that they will still follow an S-curve. Prices are expected to continue to decline over time, but at a decreasing rate.

Significant uptake of Solar PV farms

- Solar PV farms to connect to both the transmission and the distribution network.

Decline in traditional generation:

- Closure of Hazelwood and Northern Power Stations.
- Significant increase in future hedged contract prices, which may feed back into reduced electricity consumption.
- How do we ensure power system security?

Commodity price movements/availability:

- Recovery in global coal prices has supported coal extraction and export activities.
- Significant increase in domestic gas prices and limited domestic gas availability has impacted wholesale electricity prices and economic activity, and in turn, electricity consumption.

Lack of progress on cost reflective tariffs

- Limited uptake of cost reflective tariffs with no agreed strategy to achieve widespread take-up.

Lack of policy/support for new technologies

- Perceived lack of policy support for new technologies within the power industry and National Electricity Market.

Q1.2 What is going to drive changes in demand and energy over the next five years?

Tariff Changes

- If cost reflective tariffs were widely adopted, they have the potential to significantly modify consumer behaviour and incentivise the uptake of batteries.
- In Queensland, the lack of availability of interval metering is a barrier to widespread uptake. One retailer is known to be deploying interval meters to their customers and other retailers may follow suit when the Power of Choice rule changes come into effect in December 2017.
- In Queensland, the rate of the standard feed-in tariff incentivises households with PV to maximise daytime consumption. Conversely, those on the premium feed-in tariff are incentivised to defer electricity consumption until after sunset.
- Any changes to tariffs creates winners and losers, and are likely to be controversial.

Battery Storage

- Battery costs should continue to decline due to improvements in energy density, economies of scale, and increased competition.
- Continued decline in battery costs should result in increased consumer adoption.
- Various industry initiatives to optimise and coordinate the behaviour of individual batteries may enhance their effectiveness.

Demand Response Automation

- Automating the response of batteries and household appliances to tariffs and dynamic signals should lead to increased participation from consumers.

Political/Policy Changes

- Political debate means there is ongoing uncertainty relating to renewable energy, carbon emissions and electricity market policy, and there is the possibility of significant changes over coming years.

Electric Vehicles (EVs)

- The limited uptake of EVs at present is unsurprising due to limited incentives and current automotive efficiency/emission standards (compared to other countries which have much higher uptake). Changes to Australia's incentives and standards could significantly increase the adoption rate.
- New EV models have higher capacities and lower costs – addressing two of the key barriers to EV uptake.
- There is a trend towards higher capacity chargers (e.g. from 10A to 40A) although CSIRO research suggests that most users have little need for a higher charging rate. This has the potential to adversely impact the maximum demand supplied by the electricity grid.
- It is technically possible for EVs to discharge back into grid e.g. to support the grid during times of peak demand. However, current tariffs do not provide sufficient incentive to offset the cost of using the battery's finite number of cycles for this purpose.
- In addition to the sale of new electrically-powered cars, it is possible to convert existing petrol-driven vehicles to be electrically powered. EVs may also be used for freight transportation and public transport (e.g. with charging infrastructure at depots and stations).

Energy Efficiency

- The progressive adoption of more energy efficient appliances that has been observed over the past decade is expected to continue into the future. e.g. lighting: incandescent → flourescent → LED and TV: CRT → plasma → LED.
- Additionally, there is a trend for IT/media devices to increasingly comprise portable battery-powered devices utilising cloud-based services, rather than energy-intensive desktop devices.

Electricity Prices and Economic Conditions

- Changes in electricity and commodity prices, and movements in exchange rates can affect the production volumes and viability of industry, and particularly trade exposed, energy intensive industries such as smelting.
- Electricity prices and consumer sentiment also impact upon the rate at which consumers are likely to adopt new technologies such as PV and batteries, and their propensity to run discretionary appliances such as air-conditioning.

Fuel substitution

- If gas prices remain elevated, then there may be a swing back to using electricity for heating, cooking and industrial applications.
- This is also potential to substitute electrical energy from petrol in mining and traction industries.

Customer Segments and Regional Effects

- A consumer's ability to adopt new technologies can be impacted depending on whether they own or rent their home (i.e. ability to make changes is often easier for property owners than renters/lessees), and the type of dwelling (e.g. freehold detached housing vs apartments with body corporate). Hence, lower socio-economic segments can be disadvantaged.
- Different effects will be more pronounced in some areas than others, due to different industries, socio-economic conditions, and other local effects (e.g. EV uptake may be less in regional areas due to the longer distances needing to be travelled).

Q1.3) How will new technology such as PV, electric vehicles, battery storage, energy efficiency and tariff reform be affected by high and low economic growth?

- Under high and low economic growth scenarios, there are factors that counteract these scenarios, driving the scenario towards the medium forecast. For example, underlying demand may increase at a higher rate under high economic growth, but the higher uptake of PV and batteries counteract this.

- The impact of high and low economic growth will not be uniform across regions and customer segnments.

- The scenarios need to be designed with regard to their intended purpose e.g. stress-testing potential network investments.

- The four ENA/CSIRO 'Future Grid' scenarios relate to other drivers, and each could occur under various economic conditions.

- Australia is a receiver of technology due to global pressures/drivers – local economic growth may have a lower impact on technology development and adoption compared to economic conditions and policy settings in some overseas countries.

Attachment 2

Workshop 2 - How should Powerlink approach the development of themed scenarios?

Q2.1) What is the value of aligning with existing scenarios (e.g. ENA/CSIRO or AEMO ESOO/NTNDP) vs having independent scenarios?

It is important that scenarios are fit-for-purpose. It may not be appropriate to re-use scenarios that were originally developed for another purpose:

- Aligning with existing third party scenarios does not necessarily make them more defendable. There are also compromises when aligning with existing scenarios that may make them less useful for network planning purposes.

- Energy Networks Australia (ENA)/CSIRO scenarios were designed as book ends of the range of expected outcomes. They are focused at the national and state level, and there is limited granularity behind them. Connection point level effects are important for transmission and distribution planning, so ENA/CSIRO scenarios may not be appropriate for network planning purposes.

- The Australian Energy Market Operator's Energy Statement of Opportunities (ESOO) scenarios have a very broad purpose. Additionally there is limited spread between the ESOO scenarios, and this may be inadequate to properly stress test a proposed investment. AEMO are likely to include an additional scenario in their National Transmission Network Development Plan (NTNDP) for this purpose. The NTNDP scenarios are focused on the assessment of inter-regional transmission requirements.

It is important for forecasts to align with Energex and Ergon (Energy Queensland):
- Consistency in the forecasts used to plan the distribution and transmission networks is very important to underpin coordination and co-optimisation.

Scenarios for generation development:
- As the generation mix changes, including the level of renewable generation embedded within the distribution network, generation scenarios will increasingly be coupled with demand scenarios.

Q2.3) Should there be a maximum number of scenarios? If so, what is the maximum number?

- The range and number of scenarios should be adequate to assess a proposal's sensitivity to different futures

- It was determined that three to four scenarios should generally be adequate, with four scenarios being the maximum. Although this may vary in certain situations (e.g. additional local considerations).

Q2.2) What are the key variables at play, and order of significance?

The following table indicates the average response from all of the tables that completed the question.

Possible Scenario Input	**Primary Input*** Average Score	**Importance Rank** Average Score	**Comments**
Economy	Very High	High	- There is a strong linkage between economic growth and population
Population	High	Medium	- Population data is much more granular than economic data, which tends to only be available on a state or national level
Carbon emission target	High	High	- Associated with electricity price
Electric Vehicles impact on Energy Consumption	Low	Low	
Electric Vehicles impact on Maximum Demand	Very Low	Very Low	
Tariff Reform (Cost Reflective Pricing)	Low	Medium	- Industrial and commercial customers are already on price-reflective tariffs - The impact of residential tariff reform would be significant, but the likelihood and timing of tariff reform being implemented is highly uncertain.
Battery storage uptake / cost path	Low	High	- Price is not as significant as government policy/incentives for particular technologies
Embedded wind and solar farms	Very Low	Low	
Energy Efficiency - Appliance	Low	Low	
Energy Efficiency - Behaviour	Low	Very Low	
Electricity Price	High	Medium	- There can be a lag in community response to electricity price rises. - Industrial customers are price sensitive
Fuel Switching	Very Low	Very Low	

* Primary inputs are the main drivers of a scenario and secondary inputs are a consequence of the primary inputs

Attachment 3

Workshop 3

Q3.1) Currently Powerlink has a 10 year forecasting period. Is this timeframe adequate for analysing themed scenarios?

Benefit in a forecasting period greater than 10 years

- Most forum participants agreed that there was value in looking past a ten year planning horizon, but it was acknowledged that it was important to avoid a false sense of confidence as significant technology and economic changes can occur within a 10-20 year timeframe.

- The forecast horizon should be greater than 10 years to assess the enduring need for long life and capital intensive transmission network investments.

Two different forecast horizons

- It was suggested that two sets of forecasts could be developed:
    - A short to medium term forecasting horizon (0 – 5 years or 0-10 years) based on objective inputs, and with a higher level of confidence.
    - A longer term forecasting horizon (5+ or 10+ years) with a lower level of confidence. This longer horizon could incorporate more uncertain elements such as government policy and future uptake of technologies such as electric vehicles.

Major customers have a different perspective

- Some major customers, when considering their own circumstances, only had an interest in the immediate one to two year outlook, and only saw benefit going to a seven year forecast to align with Australian Energy Regulator (AER) Revenue Reset timeframes.

Q3.2) How should Powerlink present the data?

Regional Data

- There was interest in having the data broken down into regional areas, in particular differentiating fringe of grid from metropolitan South East Queensland.

Collaboration with Energy Queensland

- Concerns were raised that different parts of the network were being planned with disparate forecasts, which could result in misaligned investment timing.

- Attendees expressed interest in a combined forum with Powerlink and Energy Queensland to provide greater demonstration of forecast alignment and coordination in network planning.

Q3.3) What additional load forecasting data or format of data should Powerlink provide?

Transmission Annual Planning Report (TAPR) suitability

- Most attendees considered that Powerlink's TAPR (including the demand and energy model) provided suitable and sufficient information for the non-expert to understand what is relevant.

- Some attendees were both 'surprised and impressed' with the level of information presented at the forum and suggested Powerlink should provide this information more broadly.

Regional Information

- Some attendees expressed an interest in more detailed insight into the assumptions used at the regional level.

Additional Information

- It was suggested that additional information could be provided on how the scenarios are used in determining planning and investment outlooks.

Alternate View

- AEMO have focused on having demand growth (high demand and low demand) scenarios rather than economic growth scenarios. This could cause some confusion when attempting to align and compare the output of the different scenarios.