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Demand response in Queensland

Response to written question on notice, Senate Select Committee into Fair Dinkum Power

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Written question on notice

> *You stated to the committee that 55 per cent of the Queensland consumer base is currently contracted to provide demand response services (Hansard, p. 31). Are you able to elaborate on how this program works; specifically the way in which these services are provided by consumers, and in turn, monitored by the Queensland Government, AEMO and the electricity generators and transmission companies?*

Answer

In order to answer the question on notice from the Chair of the Senate Select Committee into Fair Dinkum Power, it is necessary to first explain different types of demand response.

Types of demand response

There are five types of demand response technology with different and complementary functions. The five types are listed in Figure 2. Queensland's demand response capability is 95% network demand response (type 1) and 5% Virtual Power Plant (type 5).

Network demand response is procured by network companies as a way of increasing the reliability of the network and also reducing or deferring the cost of more expensive capital upgrades to the poles and wires. Queensland has over 800 MW of network demand response.

Network demand response is constantly evolving but the original technologies are many decades old and use a control signal sent down the same wires that deliver the

electricity to consumers.[1] These signals remotely control devices, in order to reduce peak load or shift load to times of the day when there is less aggregate demand.

Figure 1: Queensland's demand response delivery programs (excluding Yurika)

DM Program end use customers	Energex (MW)	Ergon (MW)	Total (MW)	How our customers help the network
Load control tariff 33 (hot water and pool pumps)	367	103	470	Reduce peak demand
Load control tariffs (other appliances)	0	48	48	Reduce peak demand
Load control tariff 31 (hot water)	154	52	206	Reduce peak demand
Peak Smart Air Conditioners	58	0	58	Improves reliability on extreme weather days
Contracted demand response	24*	27	51	Provide efficient non network alternative
Network mobile and embedded generation	0	17	17	Provide efficient non network alternative
Total	603	247	850	

Source: Energy Queensland (2018) Demand management plan 2018-19, https://www.ergon.com.au/__data/assets/pdf_file/0005/241394/Demand-Management-Plan-2018-19.pdf

Queensland is also home to Yurika, Australia's largest Virtual Power Plant.[2] What makes this 'virtual' is that it is a computerised network of many energy devices in different locations. They are coordinated by software to deliver 'negawatts' of conservation or megawatts of supply, as if they are a conventional power plant.

Queensland demand response programs

Queensland's network demand response efforts have been practical and successful, with the latest data showing that 1.214 million or 55% of Queensland's 2.2 million energy consumers are enrolled in demand response programmes, spread across much of the state.

These programs are listed in Figure 1. The consumers in these programs are almost all households.

[1] Cass (2017) *Saving mega bucks with negawatts*, p.11

[2] Energy Queensland (2018) *Annual Report 2017-18*, p.39

How consumers participate in Queensland demand response

Most of the consumer participation in Queensland's network demand response programs consists of household devices such as pool pumps or hot water services. When Queensland energy consumers sign up for a load control tariff, they must then connect their devices to the Load Control System of either Energex (which manages the electricity network in South East Queensland) or Ergon Energy (in regional Queensland).

This is the most important demand-side programme in Australia, with 1.09 million consumer hot water systems enrolled and 38,000 pool pumps.[3]

Under these programmes, households sign up for a lower electricity tariff for certain devices and the network is able to switch them off for some of the day, when network load is high. Consumers benefit through lower bills and a cash rebate.

For example, households on the Energex network can sign up for Tariff 33 for their pool pump systems. A typical customer can expect to save $105 per year in electricity costs plus received one off payment of $200 from the Positive Payback Program.[4]

In addition to traditional load control demand response, Queensland has also driven the innovation of a new system, called PeakSmart. This is currently used exclusively for air conditioners.

Around 88,000 Queensland consumers have been rewarded for enrolling in the PeakSmart air conditioning programme. When people join they are paid a rebate of up to $400 and given a free signal receiver which connects their air conditioner to the network demand response system. During a peak period, the energy consumption of their air conditioner can be reduced by up to 50% for short periods.[5]

In the future, the PeakSmart standard can allow demand response or more sophisticated Virtual Power Plants to control diverse fleets of devices, including loads such as air conditioners, hot water systems and pumps but also new battery storage systems including those in electric vehicles.

Consumer feedback on demand response

In February 2018 Queensland experienced heat wave conditions that put its network demand response programmes to the test. Energex used PeakSmart controls to limit

[3] Ergon/Energex (2018), *2018-19 Demand Management Plan*, p.8.

[4] Energex (n.d.) *Pool equipment on Tariff 33 FAQs*, https://www.energex.com.au/about-us/contact-us/frequently-asked-questions/pool-equipment-on-tariff-33

[5] *2018-19 Demand Management Plan*, p.14.

load from participating air conditioners. A subsequent survey found that 77% of respondents who participated in the PeakSmart events reported no change in their comfort level. Over 80% of those surveyed indicated they would recommend the program to other consumers.[6]

Visibility, scheduling and efficiency limitations

Queensland's network demand response capacity is not 'monitored' in real time by AEMO and the market. The million plus consumer devices that deliver the demand response are not 'visible' to AEMO. They are not dispatched in the wholesale market, as 'negawatts'. There is no real-time information about this demand response capacity available to generators and other market participants or the public, through AEMO data feeds nor third party data providers.

This lack of visibility and dispatch control is a major impediment to the full utilisation of demand response in Queensland. In order to fully utilise these resources, they would have to be integrated into the wholesale electricity market, as wholesale demand response.

The Australia Institute is a co-sponsor of a rule change that is currently before the Australian Energy Market Commission, to open up the marked to wholesale demand response.[7] Our rule change is specifically designed to maximise the benefit of demand response, by giving AEMO and the market visibility of demand response resources and allowing them to bid into the wholesale market, to improve competition. This rule change is opposed by the Australian Energy Council, which represents large retailers and generators.[8]

Virtual Power Plants

The most sophisticated form of demand response is the Virtual Power Plant. This is an emerging technology that would provide dispatchable energy, negawatts or frequency services from thousands or millions of distributed energy resources. These resources would include loads such as PeakSmart devices and crucially, also batteries and supply such as rooftop solar PV.

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[6] *2018-19 Demand Management Plan*, p.14

[7] Public Interest Advocacy Centre, Total Environment Centre & The Australia Institute (2018), *Wholesale demand response energy market mechanism : rule change request*, submission to Australian Energy Market Commission (ERC0247 / RRC0023)

[8] Australian Energy Council (2019) *Demand Response Mechanisms (Rule change request)*, submission to Australian Energy Market Commission (ERC0248 / RRC0025)

In January 2018 Energy Queensland and Dr Anthony Lynham, the Queensland Minister for Energy, launched Yurika, the largest virtual power plant in Australia. In February 2018,[9] it provided 44MW in peak demand capacity to help Queensland deal with summer heat wave conditions.[10]

Whereas PeakSmart is designed to help residential energy consumers sell their demand response as a service, Yurika is focused on helping commercial and industrial users sell demand response. Yurika's two foundation customers are zinc refiner Sun Metals and MSF Sugar.[11] In April the Toowoomba Regional Council signed up 11 of its largest energy loads to Yurika, including water pumping stations.[12]

Yurika runs on the software developed by Australian start-up Greensync, which has up to 150 MW available for VPP services in Queensland.[13]

Unfortunately, Yurika is not able to fully compete in the wholesale market under current market rules. Technologies such as these should be allowed to sell all the services that they are capable of delivering, including frequency, energy, network and emergency demand response.

Regulating the future

The regulations that govern the National Electricity Market were designed for the past. The emerging reality of electricity is that millions of producer-consumers are vying for a place in the market. This is being resisted by the incumbent firms such as Origin Energy, which claims there are no 'significant barriers or a fundamental failing of the market' in relation to demand response,[14] and EnergyAustralia which asserts that '[r]etailers are best placed to deliver the benefits of demand response to customers.'[15]

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[9] Queensland Government (2018) 'Pioneering plant harnesses industry power', Queensland Government, 2018, http://statements.qld.gov.au/Statement/2018/2/21/pioneering-plant-harnesses-industry-power

[10] Energy Queensland (2019) *Annual Report 2017-18*, p39

[11] S Vorrath (2018), 'Sun Metals, MSF Sugar sign up to Queensland "virtual power plant"', RenewEconomy, <https://reneweconomy.com.au/sun-metals-msf-sugar-sign-up-to-queensland-virtual-power-plant-37218/> [accessed 10 December 2018]

[12] Queensland Government (2018) 'Ratepayers the winners as Council joins electricity trial', Queensland Government, <http://statements.qld.gov.au/Statement/2018/4/12/ratepayers-the-winners-as-council-joins-electricity-trial> [accessed 10 December 2018]

[13] Vorrath, 'Sun Metals, MSF Sugar Sign up to Queensland "Virtual Power Plant"'

[14] Origin Australia (2019), *Wholesale Demand Response Mechanisms – Consultation Paper*, submission to Australian Energy Market Commission, p.4

[15] EnergyAustralia (2018) *AEMC 2018, Wholesale Demand Response Mechanisms, Consultation Paper*, submission to Australian Energy Market Commission, p.10

The Senate Select Committee into Fair Dinkum Power should look into how the rule making process can be improved so that distributed energy resources are fully enabled in the market.

The Australian Energy Market Operator has explained that the key market reform principle required is that distributed energy resources should be paid for the full 'stack' of energy services they can deliver:

> VPPs [Virtual Power Plants] will benefit consumers most if the VPPs can earn returns from each of the services they are able to deliver. VPPs were not contemplated when the current energy regulatory framework was developed, and it is difficult under current regulatory and operational settings for VPPs to deliver the full "value stack"…[16]

[16] Australian Energy Market Organisations (2018), *NEM VPP Demonstrations program*, p.8

Figure 2: Categories of demand response services

Category	Function and impact	Use in Australia
1. Network or 'Non Wires Alternative'	•Network company funds users to reduce peak demand. •Can provide direct financial benefits to participating consumers. •Reduces network expenditure, lowering bills for all consumers. •Mostly automated for small consumers.	•Widespread, mandated in Queensland. •Patchy, voluntary uptake in other states, sometimes lead by innovative energy companies such as Reposit.
2. Emergency	•Centrally dispatched reduction in load. Last resort to avoid load shedding. •Provides direct financial benefits to participating consumers. •This helps system operator maintain reliability for all users. •Generally automated but large users may retain manual controls.	•AEMO procures services annually through the Reliability and Emergency Reserve Trader scheme. •ARENA, AEMO & NSW Government program encouraged innovation & 200 MW increased deployment over 2019-2022.
3. Wholesale	•Dispatched by large users and by aggregators on behalf of small users. Used to avoid buying electricity when prices are high. •Provides direct financial benefits to participating consumers. •Helps lower peak prices and benefits all consumers. •Largely automated, may be manually controlled by large users.	•COAG Energy Council directed AEMC to implement by summer 2018, but did not happen. •Rule change proposal to allow this is currently under AEMC consideration.
4. Frequency	•Automated. •Dispatched by large facilities including batteries, and by aggregators on behalf of small users. •Provides direct financial benefits to participating consumers. •Helps lower peak frequency control prices and benefits all consumers.	•AEMC changed market rules in 2017 to allow demand response to compete in frequency control market.
5. Virtual power plant	•Emerging technology that integrates range of demand response services and can incorporate diverse set of technologies and consumer types.	•Yurika in Queensland is the largest VPP in Australia. •There are 10 other VPPs in development.