

ARENA

DEMAND RESPONSE SHORT NOTICE RERT TRIAL YEAR 2 REPORT

SEPTEMBER 2020

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1.0

OVERVIEW OF THE DR SN RERT TRIAL

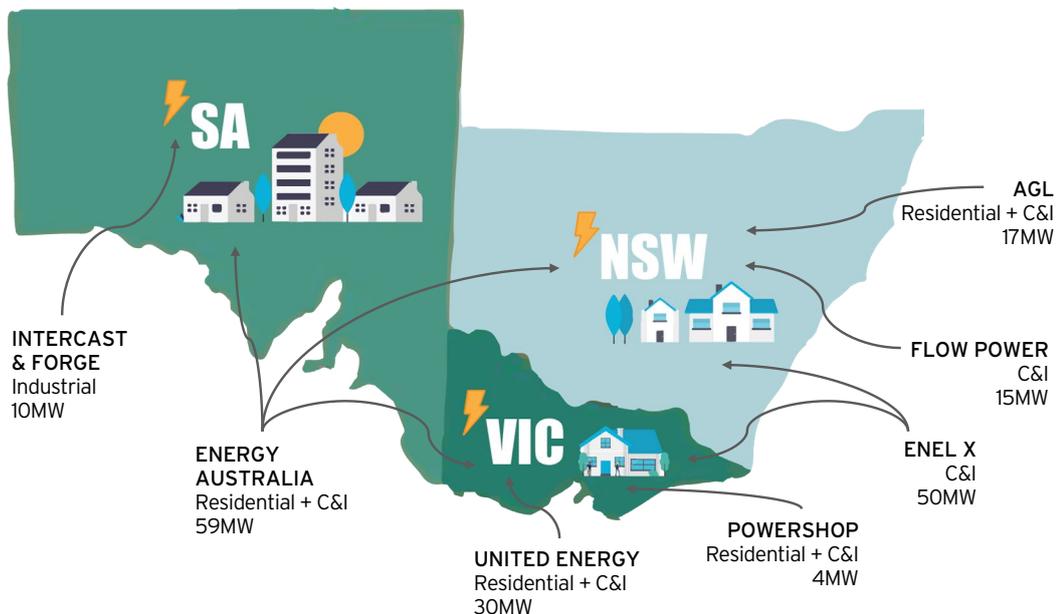
1.1 ABOUT THE DR SN RERT TRIAL

In 2017, the Australian Renewable Energy Agency (ARENA) and the Australian Energy Market Operator (AEMO) entered into a Memorandum of Understanding to jointly develop suitable 'proof of concept' projects. As part of this initiative, a three-year Demand Response Short Notice Reliability and Emergency Reserve Trader (DR SN RERT) Trial was established to test and spearhead innovative ways of managing the grid through demand response (DR).

Each year of the three-year trial across 2017 to 2020 is separated into two periods – Period 1 and Period 2. Participants must demonstrate their ability to deliver the contracted amount of DR capacity in their portfolios during a testing period schedule held prior to Period 1 (December to May) and Period 2 (June to November), respectively. The testing period for Period 1 spans late October to early December, while for Period 2, it takes place from late April to early June.

The DR SN RERT Trial is a \$35.7 million program, with ARENA providing \$28.55 million and the NSW Government funding \$7.18 million. Eight¹ organisations (participants) from New South Wales, South Australia and Victoria were selected to trial 10 creative demand response projects to deliver emergency demand response across both residential and commercial-industrial (C&I) customer classes.

DR CONTRACTED FOR YEAR 2



¹ Zen Ecosystems left the program at the end of Year 1.

1.2 DR SN RERT TRIAL 2

This report explores the key results and lessons learnt from the second year of the trial. A summary of Year 2 results is set out below, and presented in more detail in the following chapters.

AT A GLANCE: SUMMARY OF YEAR 2 RESULTS

SUCCESSFUL OVERALL PERFORMANCE

- › Participants collectively delivered more than their contracted DR capacity.
- › Testing Period 1: Participants delivered 192.2 MW (110.4 per cent of the contracted capacity of 174.0 MW).
- › Testing Period 2: Participants delivered 233.8 MW (132.9 per cent of the contracted capacity of 176 MW).
- › Although individual participants varied in their performance, the number of participants delivering more than their contracted DR capacity was still significantly higher than the number that delivered less than they were contracted for.

PERFORMANCE BY CUSTOMER CLASS

- › Over-delivery of contracted DR capacity in both testing periods arose primarily from the C&I portions of the participants' portfolios.
- › The over-delivery more than compensated the delivery shortfall of contracted DR capacity by the residential segments of the participants' portfolios in the same testing periods.
- › As the residential portfolios represented only about 5 per cent of the DR capacity recruited in Year 2, the amount of C&I over-recruitment required to counterbalance any deficit was relatively small but not immaterial.

PERFORMANCE BY NOTIFICATION PERIOD

- › Portfolios using a 10-minute notification period exceeded their aggregate contracted DR capacity in both Testing Periods 1 and 2.
- › Portfolios using a 60-minute notification period did not meet their combined contracted DR volume in Testing Period 1, mainly due to the C&I portfolios under-performing substantially.
- › However, in Testing Period 2, both the residential and C&I 60-minute notification period portfolios exceeded their contracted DR capacities.

DR RECRUITED IN COMPARISON TO DR CONTRACTED

- › Total contracted DR capacity increased by 17.2 per cent since Year 1, from 116 MW in Year 1 to 136 MW by Period 2 of Year 2.
- › The amount of DR capacity recruited has consistently exceeded the level of DR contracted, reflecting the practice over-recruiting that is usually undertaken by DR aggregators to manage any potential risks.

DEVELOPMENT OF DR BUSINESS MODELS

› Residential DR Programs

- › Residential portfolios in Year 2 included both behavioural DR programs (BDR) and controlled load programs.
- › Overall, the BDR programs had a higher level of participation than the controlled load programs. This is due to the nature of the BDR programs, in which:
 - more customers are eligible to participate,
 - the customer does not need to install additional equipment, and
 - the customer retains complete control over their energy use and participation.
- › Testing of residential controlled load programs through direct load control of air-conditioners and pool pumps, the use of behind-the-meter (BTM) battery storage systems such as Virtual Power Plants (VPPs), and remote control of electric vehicle (EV) charging enjoyed limited participation primarily due to the consumer reticence, cost and technical difficulties.

› C&I Portfolios

- › The most common type of program offered to C&I customers was based on load curtailment.
- › The curtailment was either undertaken manually by the customer upon notification from the participant, or, less commonly, was automatically activated by the participant with the agreement of their customer.
- › The total contracted MW in the C&I portfolios increased from their Year 1 levels.
- › Participants were mixed in their assessment of the potential for additional DR in the C&I sector. Four of the five respondents felt that there is considerable additional DR potential in the market. The fifth felt the additional potential would best be considered moderate.
- › However, it was noted that the Frequency Control Ancillary Services (FCAS) and wholesale markets (given that the Wholesale Demand Response Rule change proposal has been approved) will create significant competition for RERT in the C&I sector.

USE OF TRIAL RESULTS TO INFORM DR POLICY

The DR SN RERT trial continues to inform the development of other DR policy and program initiatives. Most notably, the Australian Energy Market Commission (AEMC) has relied on the trial's baselining experience to form its own recommendations on baselining in the Wholesale Demand Response mechanism².

² See Appendix F in AEMC, *Wholesale demand response mechanism, Rule determination*, 11 June 2020.

2.0

DR PERFORMANCE IN TESTS AND RERT EVENTS

2.1 OVERALL TEST PERFORMANCE

Overall, ARENA considers Year 2 to be another successful year as collectively, the participants were able to deliver more DR capacity than they were contracted for.

- › Testing Period 1: Participants delivered 192.2 MW (110.4 per cent of the contracted capacity of 174.0 MW).
- › Testing Period 2: Participants delivered 233.8 MW (132.9 per cent of the contracted capacity of 176 MW).

While there was a degree of variation in DR delivery against the contracted DR amount across the participants' portfolios (see Table 1), the number of participant portfolios that delivered more DR than their contracted capacity exceeded the number that failed to do so (7 to 3 in Period 1, and 9 to 1 in Period 2). This demonstrates a significant improvement from the Year 1 trial, when only 5 out of 10 in Period 1 and 4 of 10 in Period 2 were able to meet or exceed their contracted capacity.

TABLE 1: NUMBER OF PARTICIPANTS WITH DELIVERED DR AS A PERCENT OF THEIR CONTRACTED AMOUNT

TEST	LESS THAN 50%	50% TO 75%	75% TO 100%	100% TO 125%	125% TO 150%	MORE THAN 150%
Period 1	0	1	2	4	3	0
Period 2	0	0	1	5	2	2

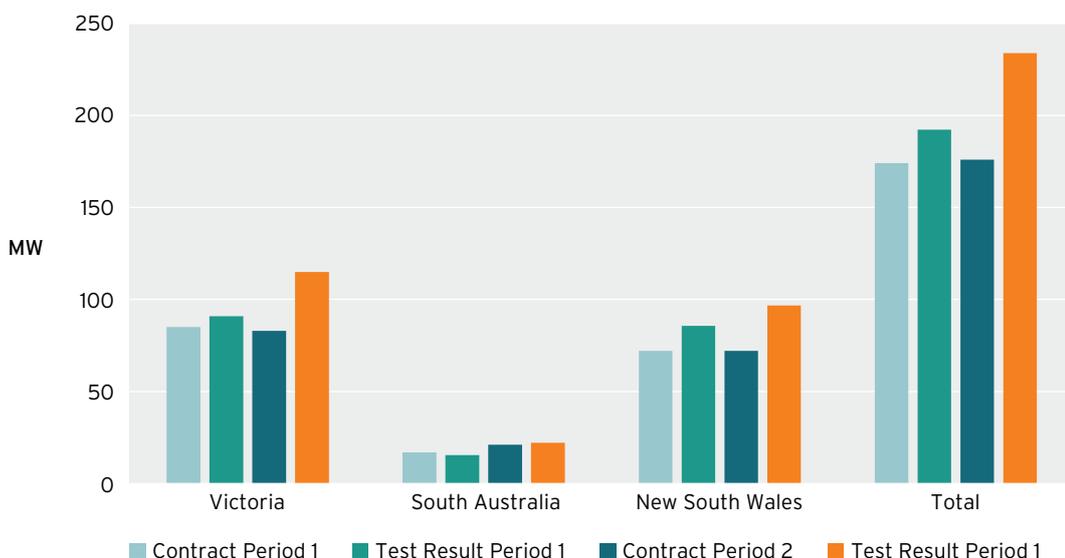
2.2 RESULTS BY STATE

Figure 1 below compares the contracted DR amount and test results for each of the Year 2 test periods by state.

As can be seen in the figure, the DR delivered in tests exceeded the contracted DR volume in all but one instance. This was in Period 1 in South Australia, when the shortfall was about 1.4 MW of the 17 MW contracted, reflecting an under-recruitment of DR capacity, as discussed further in Section 3 of this report. Interestingly, the test result for Period 2 in South Australia exceeded the level that had been contracted for, despite another instance of under-recruitment. However, this outcome was the result of an over-delivery of DR capacity by one of the participant's portfolios.

These test results represent an improvement from Year 1, where the test results in both Victoria and South Australia for Period 2 failed to meet the contracted DR volumes.

FIGURE 1: TEST RESULTS FOR PERIODS 1 AND 2 COMPARED TO THE CONTRACTED DR AMOUNTS (MW, BY STATE)



2.3 RESULTS BY CUSTOMER CLASS

As AEMO does not currently have access to information on the customer class associated with individual National Metering Identifiers (NMs), and is principally interested in DR at the portfolio level, test results at the customer class level are only available where:

- (a) a portfolio consists of a single class of customers, or
- (b) the participant provides information on test results by customer class within their portfolio.

The following analysis of customer-class performance is the result of re-aggregating participant test result data:

- › Performance of portfolios with only C&I customers – Enel X (formerly EnerNOC), Flow Power, and Intercast & Forge – are reported on a combined C&I basis as it was not possible to separate test result data within those portfolios between commercial and industrial customers.
- › Test results for the remaining participants' portfolios – AGL, EnergyAustralia, Powershop, and United Energy – were able to be separated into the residential and combined C&I customer classes.

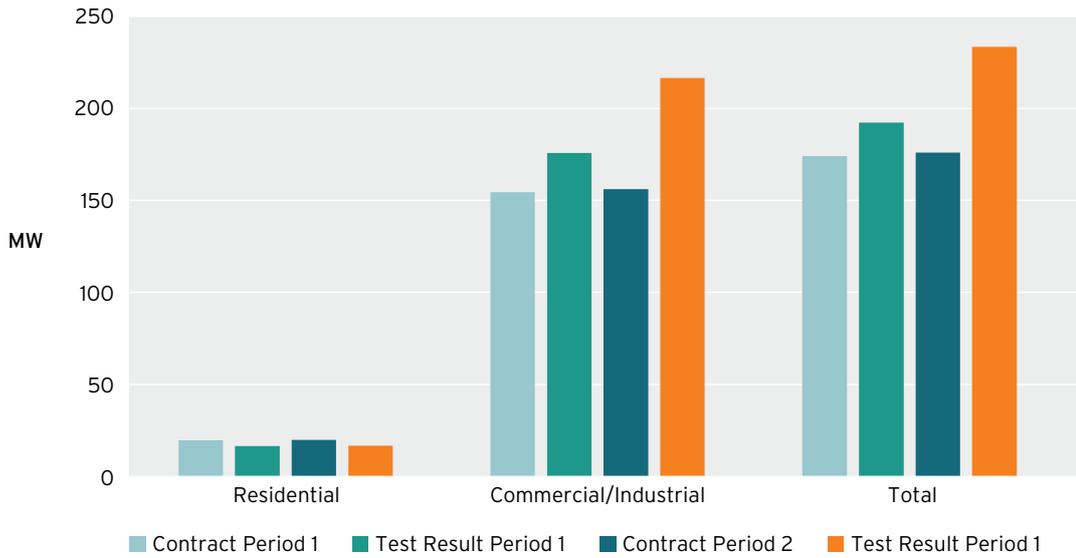
Key findings of the analysis of customer class performance were:

- › The majority of the DR capacity contracted during Year 2 was from C&I customers. See Figure 2.
- › Over-delivery of contracted DR capacity in both testing periods arose primarily from the C&I portions of the participants' portfolios.
- › The over-delivery more than compensated the delivery shortfall of contracted DR capacity by the residential segments of the participants' portfolios in the same testing periods.
- › As the residential portfolios represented only about 5 per cent of the DR capacity recruited in Year 2, the amount of C&I over-recruitment required to counterbalance any deficit was relatively small but not immaterial.
- › Overall, the Year 2 trial delivered more DR capacity than contracted for in both tests.

Evidence suggests that the baseline method used to calculate the amount of DR delivered is not well-suited to weather-sensitive loads and loads that are materially impacted by the use of rooftop PV systems³. This, along with the comparatively small proportion of residential recruitment, would have potentially affected the residential portfolios to a greater extent than the C&I portfolios.

³ For more information on the challenges of developing baselines for rooftop PV systems, see Section 4.6 of *Baselining the ARENA-AEMO Demand Response RERT Trial* (September 2019).

FIGURE 2: PERIOD 1 AND 2 TEST RESULTS COMPARED WITH CONTRACTED DR VOLUMES (MW, BY CUSTOMER CLASS)⁴



For the MW values behind Figure 2, see [Table A in Appendix](#).

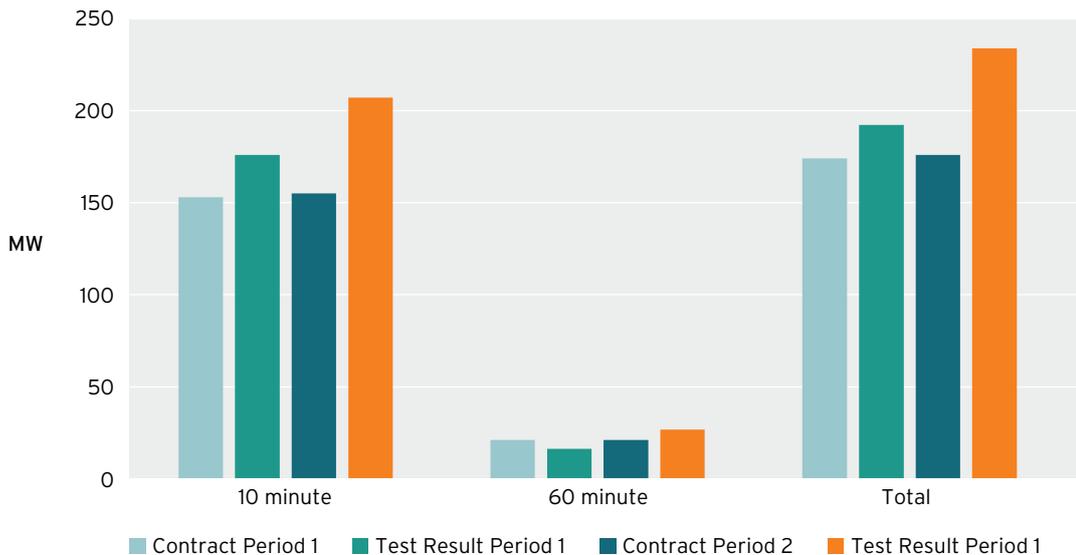
2.4 RESULTS BY NOTIFICATION PERIOD

The results presented in Figure 3 show that the portfolios using a 10-minute notification period exceeded their aggregate contracted DR volume in both Testing Periods 1 and 2. This was also the case in Year 1.

Portfolios using a 60-minute notification period did not meet their aggregate contracted DR volume in Testing Period 1. Unlike Year 1, this was not primarily due to the under-performance of residential portfolios, but rather, the under-performance in Testing Period 1 of C&I portfolios with 60-minute notification periods. A 60-minute residential portfolio also under-delivered in Testing Period 1, but only by a very small amount (0.12 MW).

However, in Testing Period 2, both the residential and C&I 60-minute notification period portfolios exceeded their contracted DR capacities.

FIGURE 3 PERIOD 1 AND 2 TEST RESULTS COMPARED WITH CONTRACTED DR VOLUMES (MW, BY NOTIFICATION PERIOD)



⁴ Note that Figure 2 and consequently, Table A (Appendix), do not include information on the test results of the residential portion of AGL's portfolio. AGL already had sufficient Year 2 capacity within the C/I portion of its portfolio to meet its program contract target. AGL undertakes its own performance tests of its residential portfolio. See Section 4.2.1 for more details.

2.5 RERT ACTIVATIONS

RERT events were activated in South Australia and Victoria on 24 and 25 January 2019, and AEMO called upon three Victorian-based ARENA participants on each of those days. Table 2 below shows the amount of demand reduction that was requested and delivered by each of the participants.

TABLE 2: RESULTS OF RERT ACTIVATIONS IN JANUARY 2019

PARTICIPANT	24 JANUARY 2019			25 JANUARY 2019		
	MW ACTIVATED	MW (AVG) DELIVERED	MW OVER/ (SHORTFALL)	MW ACTIVATED	MW (AVG) DELIVERED	MW OVER/ (SHORTFALL)
Powershop	5	3.2	(1.8)	4	3.9	(0.1)
Enel X	30	23.3	(6.7)	30	29.7	(0.3)
United Energy ⁵	30	45.5	15.5	30	51.8	21.8
Total	65	72.0	7.0	64	85.4	21.4

Although two of the participants were unable to deliver the full amount of demand reduction requested by AEMO on these two days, the aggregate demand reduction of all three of the ARENA participants exceeded the amount requested by AEMO on both days.

5 The results presented for United Energy are based on United Energy calculations and accepted by AEMO.

3.0

DR RECRUITED IN COMPARISON TO DR CONTRACTED

This section compares the amount of DR capacity recruited by participants with the amount of DR capacity they had contacted to deliver.

In most DR programs, over-recruitment of DR capacity is undertaken to manage potential risks for the following reasons:

- › The DR aggregator does not have automated control over their end-customers' electricity-using equipment. Even if they do, the amount of load on that equipment may vary during different DR events.
- › End-customers are generally not required to reduce demand on every occasion. Even if a customer does respond to each request, their ability to reduce load is likely to vary based on a number of factors.

Note: The Intercast & Forge and the United Energy portfolios are not included in Section 3 (including in the section's figures and tables), as neither of them need to recruit the DR capacity they provide.

3.1 IN TOTAL AND BY STATE

The total amount of DR contracted by the portfolios has increased by 17.2 per cent since Year 1, from 116 MW in Year 1 to 136 MW by Period 2 of Year 2.

The amount of DR capacity recruited has consistently exceeded the contracted recruitment levels (see Figure 4 and Table 3), reflecting a standard risk management practice used in DR aggregation (see Tables 5 and 6).

FIGURE 4: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY STATE (MW)



Further to Figure 4 above, Table 3 below provides the specific MW amounts contracted and recruited on state level, by Program Period.

TABLE 3: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY STATE (MW)

STATE	YEAR 1		YEAR 2 PERIOD 1		YEAR 2 PERIOD 2	
	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED
Victoria	46.0	52.6	55.0	63.9	53.0	64.1
South Australia	9.0	12.1	9.0	6.1	11.0	10.1
New South Wales	61.0	73.2	72.0	88.8	72.0	85.6
Total	116.0	137.9	136.0	158.8	136.0	159.8

TABLE 4: RECRUITMENT COMPARED TO CONTRACTED AMOUNTS, BY PROGRAM PERIOD, BY STATE (%)

STATE	YEAR 1	YEAR 2 PERIOD 1	YEAR 2 PERIOD 2
Victoria	114.3%	116.3%	121.0%
South Australia	134.4%	67.2%	91.7%
New South Wales	120.0%	123.3%	118.9%
Total	118.9%	116.7%	117.5%

The results presented in Figure 4, and Tables 3 and 4, indicate that while over-recruitment exists at the program level as a whole, it varies at the state level, with recruitment in South Australia being below contracted levels in both Periods of Year 2.

It needs to be noted that the dip in the recruitment level in this case was the result of an increase in the contracted level for one of the participants at the start of Year 2 that was not matched by recruitment. However, by the end of Year 2 this deficit had been almost entirely made up.

3.2 BY CUSTOMER CLASS

In general, the C&I sector has accounted for roughly 93 per cent of the DR capacity contracted and recruited in each of the three time periods (see Figure 5 and Table 5). In addition, to account for the minority of the capacity in the program, the capacity recruited in the residential sector tended to lag the amount the portfolios had intended to contract. See Section 4 for more information on this.

Table 6 shows that participants were much more successful in over-recruiting in the C&I sectors as compared to the residential. This is important because over-recruitment provides the participant with a hedge against its contracted capacity requirement in the event that some customers are unable to deliver DR at the time of an event.

FIGURE 5: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY CUSTOMER CLASS (MW)

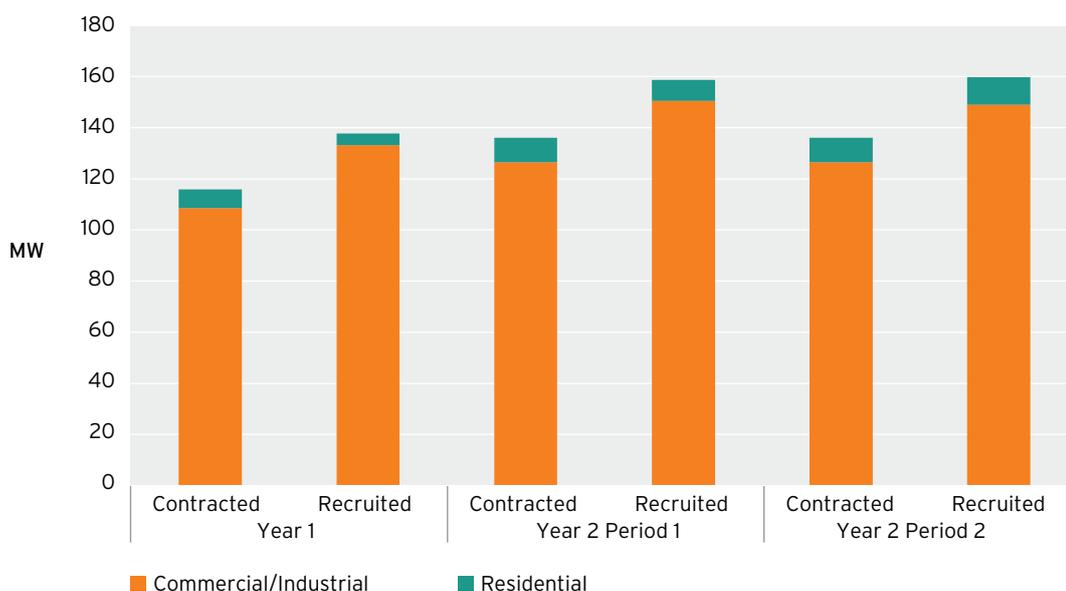


TABLE 5: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY STATE (MW)

CUSTOMER CLASS	YEAR 1		YEAR 2 PERIOD 1		YEAR 2 PERIOD 2	
	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED
Residential	7.3	4.6	9.5	8.3	9.5	10.8
C&I	108.6	133.2	126.5	150.5	126.5	149
Total	115.9	137.8	136	158.8	136	159.8
C&I as % of total	93.7%	96.7%	93.0%	94.8%	93.0%	93.2%

TABLE 6: OVER-RECRUITMENT BY PROGRAM PERIOD, BY CUSTOMER CLASS (%)

STATE	YEAR 1	YEAR 2 PERIOD 1	YEAR 2 PERIOD 2
Residential	63.0%	86.4%	113.3%
C&I	122.7%	119.0%	117.8%
Total	118.9%	116.7%	117.5%

3.3 BY NOTIFICATION PERIOD

As can be seen in Figure 6 (and also Tables 7 and 8), significantly more capacity was contracted for and recruited in the 10-minute notification portfolios, as compared to the 60-minute notification portfolios.

As noted in Year 1, the amount of DR capacity that was able to respond with a 10-minute notification is a reflection of recent technological advances. Several of the participants installed new communications and control equipment in end-user facilities that would enable this relatively rapid response.

FIGURE 6: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY CUSTOMER CLASS (MW)

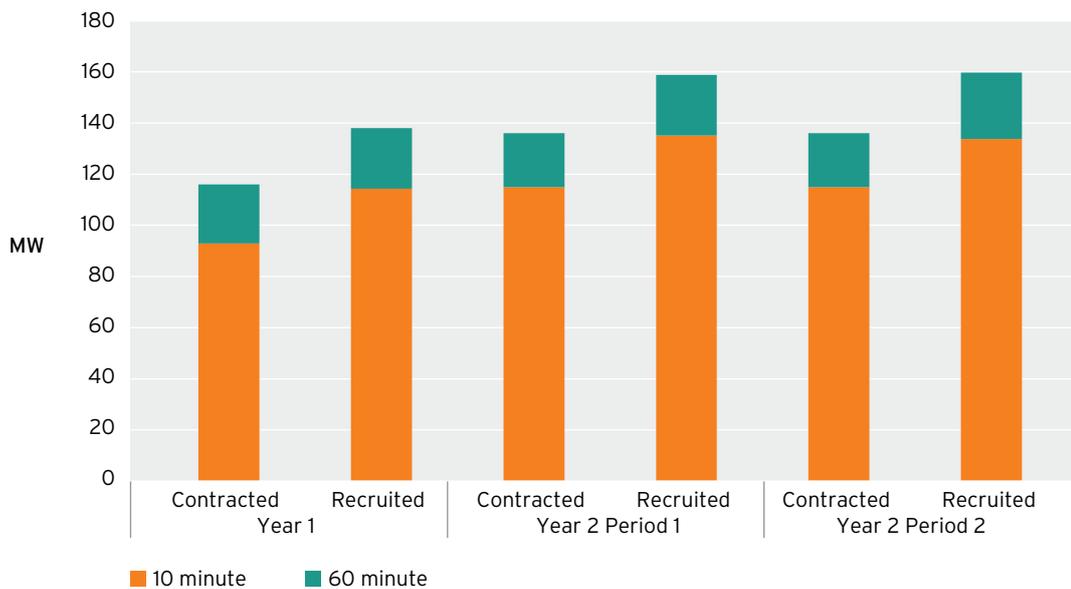


TABLE 7: DR CONTRACTED FOR AND RECRUITED BY PROGRAM PERIOD, BY PORTFOLIO NOTIFICATION PERIOD (MW)

NOTIFICATION PERIOD	YEAR 1		YEAR 2 PERIOD 1		YEAR 2 PERIOD 2	
	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED	MW CONTRACTED	MW RECRUITED
10 minutes	93.0	114.3	115.0	135.1	115.0	133.8
60 minutes	23.0	23.7	21.0	23.7	21.0	26.0
Total	116.0	137.9	136.0	158.8	136.0	159.8

TABLE 8: OVER-RECRUITMENT BY PROGRAM PERIOD, BY PORTFOLIO NOTIFICATION PERIOD (%)

NOTIFICATION PERIOD	YEAR 1	YEAR 2 PERIOD 1	YEAR 2 PERIOD 2
	10 minutes	122.9%	117.5%
60 minutes	103.1%	112.9%	123.9%
Total	118.9%	116.77%	117.5%

4.0

DEVELOPMENTS IN DR BUSINESS MODELS

4.1 OVERVIEW

All in all, the participants in Year 2 of the trial offered a wide range of residential and C&I programs.

Residential programs included both behavioural DR programs (BDR) and controlled load programs, of which the BDR programs had a vastly higher level of participation. This is due to the nature of the BDR programs, in which:

- › more customers are eligible to participate,
- › there are no technology requirements for the customer, and
- › the customer retains complete control over their energy use and participation.

In the C&I sector, the most common type of program offered was based on load curtailment. The curtailment was either undertaken manually by the customer upon notification from the participant, or, less commonly, was automatically activated by the participant with the agreement of their customer.

4.2 RESIDENTIAL BEHAVIOURAL DEMAND RESPONSE (BDR) PROGRAMS

AGL, EnergyAustralia and Powershop offered an interesting array of BDR programs. Learning from the lessons from Year 1, and having had more time for recruitment, these programs garnered substantial numbers – tens of thousands – of participants, and represent the primary channel through which residential customers are participating in the ARENA trial.

4.2.1 AGL

AGL's **Peak Energy Rewards program** benefited from the experience of Year 1. The increased target of residential customer participation from 750 in Year 1 to 3500 participants in Year 2 was achieved with a renewed recruitment effort, as well as changes to key parts of the program.

One of the significant changes that AGL made to the Peak Energy Rewards program in Year 2 was that payments were changed from being based on the customer's actual kW reduction to fixed award amounts for achieving discrete reduction targets. Although this de-links AGL's payment obligations to its customers from the revenue it receives from the RERT program, the decision to report performance on this basis was made to maintain the consistency and accuracy of AGL's reported performance.

The results of surveys that AGL undertook with participating customers after each event and at the end of the summer season indicated a high level of satisfaction with the Peak Energy Rewards program in Year 2. Specifically, 90 per cent of customers were highly satisfied with the Peak Energy Rewards program, and 96 per cent of customers said they would sign up for next year's program.

As noted earlier, AGL did not include its residential portfolio in the tests conducted by AEMO as it had sufficient C&I DR capacity to meet its contracted capacity. However, AGL conducted its own tests of its residential portfolio, details of which can be found in the appendix and in their Knowledge Sharing reports. The actual reported performance was based on the anchoring baseline that is a variant of the '10 of 10' method which AGL developed in Year 1.

The results indicate that the percentage of demand reduced by residential customers participating in the AGL events in Year 2 (42.8%) was similar to that in Year 1 (44.25%). However, information gathered by AGL regarding the Year 2 events indicated that 41 per cent of the outcomes were essentially false positives; that is, customers who reported doing nothing to reduce their consumption but whose test results indicated they had reduced their consumption relative to their baseline, and therefore had earned a reward. Additionally, 25 per cent of the outcomes involved customers who said they had attempted to reduce their consumption but did not achieve a reward. This may be due to the fact that a large percentage of Peak Energy Rewards participants have rooftop PV systems (30%). These customers tended to be more engaged in their electricity supply and therefore may be more likely to be attracted to a DR program. See [Table B in Appendix](#) for more details of the results.

4.2.2 ENERGYAUSTRALIA

The focus of EnergyAustralia's efforts in Year 1 was to establish a Minimal Viable Product design that would be ready for the test and dispatch events of the first summer of the program. In Year 2, the focus shifted to scaling the technology platforms, supporting processes and overall operations of the initial MVP offerings in order to increase the level of participation.

EnergyAustralia's recruiting efforts resulted in an increase from 373 customers participating at the start of Period 2 in Year 1, to signing up a total of approximately 19,000 residential BDR customers by the end of Period 2 of Year 2.

These customers are enrolled in EnergyAustralia's '**standard**' version of its **PowerResponse BDR program** (which is the same as the Year 1 program). Research conducted by EnergyAustralia identified that the bill credit (i.e., the financial reward) was the main reason customers participated in the program. The customers that participated in the research tended to consider community or environmental/grid stability elements as secondary benefits, rather than the main driver for participation and action.

The timing of the notification period was a key ingredient for an active and meaningful participation of BDR customers during an event. EnergyAustralia found that notifications sent out before people left for work in the morning of an event as well as on the day prior led to effective response.

EnergyAustralia also trialled a '**premium**' version of the **PowerResponse BDR program** in Year 2 in New South Wales. It provided rewards in the form of gift cards and gave customers access to information on their consumption and reduction during an event in near real-time. It also included an explicit opt-out provision with regard to participation in activations. The trial involved approximately 600 customers. EnergyAustralia reported that only about 5 per cent were found to exercise the opt-out provision. At the time of writing, EnergyAustralia was assessing whether the premium approach resulted in sufficient additional curtailment and engagement benefits to justify its higher costs. It plans to report its findings at the end of Year 3.

4.2.3 POWERSHOP

Like AGL and EnergyAustralia, Powershop grew its BDR customer base and MW capacity significantly, from 11,000 customers in Year 1 to over 19,000 customers at the start of Year 2. See [Table C in Appendix](#) for more details.

Powershop used Year 2 to trial new messaging approaches and incentives as compared to those used in Year 1 of its **Curb Your Power (CYP) BDR program**.

Five different engagement groups were established (including a control group), and all of Powershop's residential customers were allocated to one of them.

The trial revealed the following results:

- › Those who sign up to BDR programs are less likely to be able to reduce their power usage as compared to other customers. This could be attributed to the fact that those who join the program are already more conscious of their power usage, and are therefore less able to reduce power significantly. Additionally, Powershop's research identified that CYP customers were much more likely to have rooftop PV systems than other customers.
- › By the same token, only highly engaged customers are the most likely to continue opting in for a BDR program, while the remaining segment of customers continue to be apathetic and therefore less likely to be persuaded to participate. This inaccessibility to the latter segment of the customer base creates a roadblock in the program and impedes the overall growth in its participation and DR delivery.
- › Finding ways to reach those who would not opt in will likely increase the impact of DR.⁶

Based on the results of the research, Powershop intends to maintain their 'Prize Draw' engagement strategy (winning a substantial prize in a random draw) as a continuing element in the incentives offered in the CYP program. Powershop will also use their 'Surprise' engagement strategy (opt-out approach) with non-CYP customers in order to optimise its targeting based on customers' potential load reduction.

6 BIT and Powershop, [Applying Behavioural Insights to Powershop's Curb Your Power program](#), 2019.

4.3 RESIDENTIAL CONTROLLED LOAD PROGRAMS

In Year 2, AGL and EnergyAustralia offered residential controlled load programs that included direct load control of air-conditioners and pool pumps, the use of behind-the-meter (BTM) battery storage systems as VPPs, and remote control of electric vehicle (EV) charging. All but one of these programs began in Year 2 and all were considerably smaller than the residential BDR programs – both in the number of participants and the DR capacity provided.

4.3.1 AGL

During Year 2, AGL trialled the **Managed for You program**, which included direct load control of air conditioners and remote control of smart charging for EVs.

Controlled Air Conditioning: Only air conditioners compatible with the AS4755 DRcommunications and control interface were eligible for the trial. However, during installations it was found that many AS4755-compatible models required additional hardware, which significantly increased the cost and complexity of the installations.

AGL originally received expressions of interest in participating in the program from 123 households. In the end, only 45 homes were found to have compatible air conditioning equipment.

AS4755 does not provide opt-out or override of remote controls to be executed by the customer, which AGL considers to be a “significant shortcoming” of the standard. To get around this, a day-ahead notification included an email address that the customer could use to opt out of the event.

Based on tests undertaken in Year 2, AGL concluded the following:

- › Retrofitting is complex, time-consuming and costly.
- › A significant number of participating air conditioners did not exhibit outcomes consistent with the control instructions being given remotely.
- › While higher reductions in load consumption resulted in more DR capacity delivered, AGL also received customer complaints about the level of off-time and impacts on comfort.
- › The existing system did not provide any feedback on the completion or success of transmitting an operating command.

On balance, AGL has concluded that retrofitting under AS4755 on existing air conditioning equipment is not viable at present and does not intend to continue the retrofit controlled air conditioner program.

Remote control of EV charging: Single- or three-phase smart charging stations were installed in 14 customers’ premises and their charging was remotely monitored and controlled using a Chargefox platform and app.

Five weekday test events were undertaken. The tests indicated that EV charging can be controlled to avoid peak demand periods, and that more comprehensive charging controls could provide better opportunities for more flexibility and coordination. This could potentially facilitate further integration of renewables and improved utilisation of the network. AGL noted, however, that the results came from a very small sample of highly engaged early adopters, so caution should be exercised in interpreting results.

4.3.2 ENERGYAUSTRALIA

EnergyAustralia commenced its VPP programs in Year 1 in Victoria, South Australia and New South Wales. Its load control program was also started in Year 1, but was not offered in South Australia.

Load control of devices: There was little growth in the program since the winter of 2018 (Year 1, Period 2), even with the offer of free installation of the control device. EnergyAustralia has noted that customer interest and installation difficulties created material problems for the program.

EnergyAustralia noted that this technology approach may provide limited value when installed at a home with a rooftop PV system and DR is needed in the middle of the day. This is because the controlled devices will likely be powered by the rooftop system at that time and load control will make no difference to demand on the grid.

VPPs: While EnergyAustralia’s VPP was primarily focused on BTM batteries during Year 2, it found that the VPP program could include electric vehicles and other energy storage products. While the VPP program has garnered more interest from EnergyAustralia’s customers than the load control of devices program, it has only shown modest growth and remains relatively small.

Energy Australia reported several key problems in the program:

- › Battery storage systems remain relatively expensive and this limited their customer uptake.
- › There are compatibility issues between battery storage systems and battery inverters, which caused inverters to go offline.
- › Aggregation platforms can be expensive when they need to accommodate multiple batteries and inverter types being connected to the VPP.

4.4 COMMERCIAL/INDUSTRIAL SECTOR PROGRAMS

4.4.1 AGL

AGL's Year 2 C&I portfolio was relatively similar to that in Year 1 as in Year 2, with the exception that AGL undertook greater performance due-diligence against the AEMO 10-of-10 baseline method, and improved the capacity to respond to evening RERT events.

During Year 2, AGL's portfolio comprised nine companies, including water and telecommunications utilities, shopping centres, manufacturing and recycling plants, data centres, and a university campus. There was little change in the size of AGL's C&I portfolio, in terms of either customer numbers or DR capability. See [Table D in Appendix](#) for more details.

AGL noted that there were fewer suitable new companies available to recruit in the DR program. They felt that this could be due to, for instance, a high proportion of C&I loads in NSW having already been contracted either by AGL or elsewhere to by other participants or retailers. In addition, because RERT events are likely to take place in the late afternoon to early evening, it is difficult for single shift businesses that operate on normal business hours to be sure they will be able to provide their committed DR.

AGL also found that most C&I customers will not allow an external party to control loads within their operations. In light of this, for Year 3 of the program, AGL is planning to use a monitoring regime that will provide near real-time metering data for AGL and the customer. This will allow customers within AGL's DR portfolio to better manage their loads, and AGL to better manage portfolio performance.

4.4.2 ENERGYAUSTRALIA

The DR capacity of EnergyAustralia's C&I portfolio, which includes agricultural, manufacturing and processing businesses, increased in Year 2 as compared to Year 1 in each of the three states in which it operates. The increase in DR capacity has been most significant in Victoria and South Australia, as NSW was already the focus of EnergyAustralia's C&I recruitment efforts in Year 1.

Interestingly, in each of the four program periods to date, EnergyAustralia's NSW and Victoria customers recruited and delivered more DR than the amount of DR that was committed to be delivered. However, in South Australia, both recruitment and delivery were less than the contracted amounts by a small margin. See [Table E in Appendix](#) for more details.

The following are key observations made by EnergyAustralia about its C&I portfolio and the C&I market for DR:

- › Large businesses are primarily motivated to join the RERT program for business continuity concerns. Hence, grid stability was not a strong selling point for EnergyAustralia.
- › Recruitment of C&I customers requires a significant amount of time and multiple visits to gain acceptance for the C&I program from different parts within the customer organisation.
- › Smaller C&I customers, and particularly those for whom energy is not a significant input cost, have proven more reluctant to join the program. Hence, the program needs to be very simple, easy to comply with, and non-obligatory for these customers, and there must be the potential to opt out of events.
- › Customers are not interested in allowing remote control of their internal loads. EnergyAustralia's C&I portfolio is entirely dispatched through manual processes. Similar to AGL's experience, EnergyAustralia sees the ability for the participant and the customer to see real-time (or very near real-time) metering data as a significant enabler of DR for RERT. Developing and making this capability available will require the involvement of Metering Data Providers (MDPs).

4.4.3 ENEL X (FORMERLY ENERNOC)

Enel X generally maintained their recruitment levels at about 20 per cent above their committed level. The split of customer portfolios (in MW terms) is about 30 per cent commercial and 70 per cent industrial, while in customer number terms it is about 50/50%.

Enel X also consistently delivered or exceeded the amount of DR they committed to provide to AEMO in Victoria and have only missed doing so once in NSW. See [Table F in Appendix](#) for further details.

In Year 2, Enel X chose to recruit loads that are less reliant on seasonal heating, ventilation, and air conditioning (HVAC) loads in order to improve performance against the 10-of-10 baseline.

Enel X offers its DR customers both availability payments and dispatch payments. Payment terms are negotiated with customers on a case-by-case basis, though Enel X has a base model that the majority of their customers find acceptable. Enel X has observed that most C&I customers prefer availability payments, which they perceive as offering reliable, bankable revenue over what they might potentially earn by way of dispatch payments.

The Enel X portfolio includes customers that manually dispatch their DR capacity upon notification from Enel X at the beginning of a DR event, and customers that allow Enel X to remotely activate their DR capacity (see Table 9 below). Enel X found that the remotely controlled DR materially outperformed that which is manually dispatched by its customers.

TABLE 9: AUTOMATED VS MANUAL CONTROL OF ENEL X'S C/I DR CAPACITY

	AUTOMATED CONTROL BY ENEL X	MANUAL DISPATCH BY CUSTOMER
Victoria	50%	50%
New South Wales	40%	60%
Total	46%	54%

Enel X plans to continue to use these results to encourage customers to take up automated control of their DR capacity. However, Enel X recognise that many customers are likely to be reluctant to accept this arrangement, and therefore will continue to include manually dispatched DR in its portfolio as well.

4.4.4 FLOW POWER

In addition to operating a New South Wales program within the DR SN RERT Trial, Flow Power also provides DR for the RERT in Victoria under a separate contract directly with AEMO. While the focus of Flow Power's efforts in Year 1 was on customer recruitment, and establishing their technology platform and business operations, the focus in Year 2 shifted to building the program.

With the exception of Period 1 Year 1, Flow Power delivered materially more MW of demand reduction than they contracted for with ARENA and AEMO. This reflects the very significant level of over-recruitment that Flow Power had undertaken, based on their Year 1 observation that customers tend to "provide one third to half of their maximum demand during a test activation".

Table 10 below presents the reserve capacity within the Flow Power C&I DR portfolio by business type.

TABLE 10: COMPOSITION OF FLOW POWER'S C&I DR CAPACITY

SECTOR	BUSINESS TYPE	APPROXIMATE DELIVERED DR RESERVE (MW)	NUMBER OF SITES
Agri-businesses	Orchards / irrigators	1.5	3
Warehouse/Storage	Refrigeration	1.2	1
Councils	Water management	1.3	5
Food processing	Packaging / manufacturing	1.7	1
Forestry	Timber mill	0.5	1
Manufacturing	Building supplies	3.7	3
Manufacturing	Steel production	15.0	1
Total		24.9	15

The following are Flow Power's key observations:

- › A number of the larger customers Flow Power initially sought to recruit in Year 1 (customers with maximum demands greater than 1 MW) felt the program's financial reward was not enough to offset any disadvantages. Flow Power therefore shifted their focus to smaller customers.
- › Increased public awareness of DR, and continuing concern about high electricity prices, has led to Flow Power being approached by other interested customers, which may allow Flow Power to diversify the portfolio.
- › The 10-minute notification period that Flow Power agreed to in the ARENA program (and its contract with AEMO) has limited participation to some extent.
- › Similar to other participants, Flow Power has encountered challenges convincing different parts of their customers' organisations of the value of participation in the trial.

- › Although NSW customers exhibited less awareness of DR programs in Year 1, as compared to customers in Victoria and South Australia, Flow Power has observed that as the program matures, individual customer performances have been improving. This is largely due to educational efforts provided by Flow Power, and improvements in Flow Power's operational systems and processes.
 - › Flow Power found that customers want more technical detail about why the need for DR arises. Once customers understood the basis for the need, they were more interested in their own DR capability.
-

4.5 OTHER PARTICIPANTS

Intercast & Forge and United Energy are discussed separately from the other participants as their programs differ in fundamental ways from the programs discussed above. Most importantly, neither Intercast & Forge nor United Energy need to recruit customers to provide their contracted DR, and neither have to allocate revenue received through the program to individual customers.

4.5.1 INTERCAST & FORGE

Intercast & Forge is a foundry located in South Australia that provides DR from its own operations by shutting down its furnaces and other operational equipment. As such, it has not needed to recruit participants, nor does it have to deal with the other concerns faced by an aggregator. However, it has had to set up communication processes, both internally and with AEMO, in order to respond to tests and activations.

Intercast & Forge has consistently exceeded their contracted capacity in all periods when called upon. See [Table G in Appendix](#) for further details.

4.5.2 UNITED ENERGY'S VOLTAGE REDUCTION PROGRAM

United Energy is an electricity distribution business that serves approximately 600,000 customers in the south-eastern suburbs of Melbourne and the Mornington Peninsula. It provides DR by reducing the voltage supplied to customers served by all but one of the company's zone substations, while ensuring that delivered voltages remain above the minimum level specified by regulation. As United Energy is required to maintain delivered voltages within a specified range, there is no need for them to inform customers of that regulation or to 'recruit' them to participate in the DR program.

The company committed to provide 30 MW of DR in Year 2 of the program and demonstrated their ability to consistently deliver this amount. United Energy has also developed a baseline method that AEMO has accepted as a variant of the 10-of-10 methodology.

In addition to their participation in testing periods and RERT events, United Energy has conducted considerable research as part of their involvement in the ARENA program, including on their voltage reduction activities.

United Energy is also assessing the potential for its Dynamic Voltage Management System (DVMS) technology to increase its Distributed Energy Resources (DER) hosting capability, and intends to report on that in Year 3 of the trial.

5.0

KEY CHALLENGES AND LESSONS LEARNED

On balance, Year 2 saw several notable successes, including the participants collectively delivering more than their contracted DR capacity. Nonetheless, there were also a number of key challenges and learnings from Year 2 that need to be taken into account, as the trial progresses into its third and final year.

5.1 CONTINUING ISSUES ABOUT BASELINES

As in Year 1, baselining continued to be an issue for Year 2 participants. Several of the participants commented on the unsuitability of the 10-of-10 baselining method when applied to loads that do not exhibit a high degree of consistency. These lessons provided valuable input into the AEMC's finalisation determination of the Wholesale Demand Response Mechanism.

As noted by the AEMC in its Final Rule Determination of the Wholesale Demand Response Mechanism, *As has been demonstrated in the AEMO-ARENA RERT trial, baseline methodologies are not 'one-size-fits-all'. This trial also showed that market participants are equipped to develop new approaches that can reflect improvements in baselining or applying baselines to new types of loads.*⁸

The AEMC also stated that the baselines to be developed for the Wholesale Demand Response Mechanism should 'reflect improvements in baseline methodologies arising from (the AEMO-ARENA) trial'⁹.

5.2 OTHER ISSUES

Several participants noted that additional clarity is still needed in RERT where it interacts with other areas of DR applications, such as the AusNet Services' Critical Peak Day (CPD) network tariff.

Financial incentives and subsidised equipment were considerable drivers for customers to participate in the RERT trial, and there are concerns that recruitment may face additional barriers without such offers.

Participants generally felt that the trial had provided a very valuable opportunity to deepen their relationship with their customers, and that this would certainly be taken into account in their decisions about further involvement with DR, whether or not that involvement was part of the RERT.

8 AEMC, *Wholesale demand response mechanism*, Rule determination, 11 June 2020, p 179.

9 *Ibid*, p 176.

6.0

LOOKING FORWARD TO YEAR 3

The third and final year is expected to see an increase in the combined contracted capacity from 143 MW in Year 2 to 190 MW in Year 3. Early signs from Year 3 indicate that the DR RERT trial will continue to grow and improve by building upon lessons and successes of the previous years.

Participants' knowledge sharing reports will be published on the [ARENA Knowledge Bank](#) as they become available, with additional pieces commissioned by ARENA to continue building on the trial objectives.

For any comments or questions on this report, please contact knowledge@arena.gov.au.

APPENDIX

TABLE A (APPENDIX): PERIOD 1 AND 2 TEST RESULTS COMPARED WITH CONTRACTED DR VOLUMES (MW, BY CUSTOMER CLASS)

CUSTOMER CLASS	PERIOD 1			PERIOD 2		
	CONTACTED (MW)	TEST RESULT (MW)	TEST RESULT / CONTRACTED (%)	CONTACTED (MW)	TEST RESULT (MW)	TEST RESULT / CONTRACTED (%)
Residential	19.6	16.5	84.0%	19.9	16.8	84.3%
Comm'l / Industrial	154.4	175.7	113.8%	156.1	216.5	138.7%
Total	174.0	192.2	110.4%	176.0	233.3	132.6%

TABLE B (APPENDIX): RESULTS OF AGL TESTS OF ITS PEAK ENERGY REWARDS RESIDENTIAL PORTFOLIO

EVENT DATE	25-JAN-19	31-JAN-19	12-FEB-19	05-MAR-19	22-MAR-19	31-JUL-19
Day	Fri	Wed	Mon	Fri	Fri	Fri
Time	1-3 PM	3-5 PM	4-6 PM	5-7 PM	3-5 PM	4-6 PM
Maximum temperature	34°	40°	36°	31°	26°	NA (winter)
FOR ALL 3,500 CUSTOMERS REGISTERED FOR THE PROGRAM						
DR (kW) total	979	1282	884	694	208	436
DR (kW) per registered customer	0.28	0.37	0.25	0.20	0.06	0.12
FOR ALL CUSTOMERS PARTICIPATING IN THE EVENT						
Percentage of registered customers participating	56.5%	58.3%	59.5%	58.7%	59.3%	54.1%
DR (kW) total	1300	1700	1300	1100	500	NA
DR (kW) per participating customer	0.66	0.83	0.62	0.54	0.24	NA

TABLE C (APPENDIX): POWERSHOP BDR CUSTOMER NUMBERS AND DR CAPACITIES IN YEARS 1 AND 2

	YEAR 1		YEAR 2	
	START OF PERIOD 1	START OF PERIOD 2	START OF PERIOD 1	START OF PERIOD 2
No customers	11,000	10,000	19,200	18,500
kW contracted for	3,680	3,680	4,000	4,000
kW delivered	2,860	1,720	3,883	5,922
% of DR contracted delivered	74.1%	46.7%	97.1%	148.1%

TABLE D (APPENDIX): AGL C&I CUSTOMER NUMBERS, DR COMMITMENT AND TEST RESULTS, YEARS 1 & 2

	YEAR 1	YEAR 2
No of participating customers	8	9
DR contracted to AEMO	17 MW	17 MW
DR delivered		
Period 1	15.4 MW	12.4 MW
Period 2	17.74 MW	20.9 MW

TABLE E (APPENDIX): ENERGYAUSTRALIA'S C&I RECRUITMENT AND TEST RESULTS COMPARED TO DR CAPACITY CONTRACTED FOR, BY STATE

	YEAR 1		YEAR 2	
	START OF PERIOD 1	START OF PERIOD 2	START OF PERIOD 1	START OF PERIOD 2
VICTORIA				
No customers	1	3	5	4
MW contracted for	11	11	21	19
MW recruited	10	18.5	19	19
MW delivered	10.9	13.3	23.5	48.9
SOUTH AUSTRALIA				
No customers	NA	NA	2	3
MW contracted for	0	0	9	11
MW recruited	NA	NA	6	9.3
MW delivered	NA	NA	7.3	10.1
NEW SOUTH WALES				
No customers	1	3	3	2
MW contracted for	18	18	20	20
MW recruited	22	24.5	24.5	23
MW delivered	23.2	23.8	26.5	27.5
TOTAL				
No customers	2	6	10	9
MW contracted for	29	29	50	50
MW recruited	32	43	49.5	51.3
MW delivered	34.1	37.1	57.3	86.5

Note: Year 2 in Table E (Appendix) above excludes RERT activations on 24 and 25 January 2019, as mentioned in ARENA's report entitled *Activation of the ARENA DR Trial Portfolio Under the SN RERT Panel*.

TABLE F (APPENDIX): ENEL X'S C/I RECRUITMENT AND TEST RESULTS COMPARED TO DR CAPACITY CONTRACTED FOR, BY STATE

	YEAR 1		YEAR 2	
	START OF PERIOD 1	START OF PERIOD 2	START OF PERIOD 1	START OF PERIOD 2
VICTORIA				
No customers	50	53	55	54
MW contracted for	30	30	30	30
MW recruited	30	36	36	36
MW delivered	34.7	34.3	33.6	30.0
NEW SOUTH WALES				
No customers	22	26	27	26
MW contracted for	20	20	20	20
MW recruited	20	24	25	23
MW delivered	23.5	18.1	25.1	23.1
TOTAL				
No customers	72	79	82	80
MW contracted for	50	50	50	50
MW recruited	50	60	61	59
MW delivered	58.2	52.4	58.7	53.1

Note: Year two in Table F (Appendix 1) above excludes RERT activations on 24 and 25 January 2019, reported in ARENA's report entitled *Activation of the ARENA DR Trial Portfolio Under the SN RERT Panel*. By agreement with AEMO, Enel X's delivered DR in the January RERT activations were accepted as having satisfied the Period 2 test requirement in lieu of a Period 2 test.

TABLE G (APPENDIX): DR CONTRACTED FOR AND DELIVERED BY INTERCAST & FORGE

	YEAR 1		YEAR 2	
	START OF PERIOD 1	START OF PERIOD 2	START OF PERIOD 1	START OF PERIOD 2
MW contracted for	10	10	8	10
MW delivered	10.4	0.6	8.2	12.1

Note: Intercast & Forge initially accepted the request to curtail at the start of Period 2 in Year 1, but later chose not to curtail operations for commercial reasons.

Further information is available at
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