Office of Energy and Climate Change

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NSW GOVERNMENT

Peak Demand Reduction Scheme

Consultation paper for Rule 1

April 2022

Acknowledgement of Country

The Office of Energy and Climate Change acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Peak Demand Reduction Scheme

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More information

Cover image: Woman about to open the fridge door in a store. Source: Katherine Wilson Photography

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Contents

Have your say on the PDRS

The release of this paper starts the consultation period. The NSW Government invites submissions from all interested parties on the questions posed throughout this consultation paper.

The closing date for the written submissions is 5:00pm AEDT on Friday 13 May 2022. Please send your submissions to:

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Energy, Climate Change and Sustainability

Office of Energy and Climate Change

sustainability@environment.nsw.gov.au

The NSW Government is committed to an open and transparent process, and all consultation responses and submissions will be made publicly available. Written submissions should be provided as documents that can be published on the NSW Office of Energy and Climate Change website.

If you wish for your written submission to remain confidential, please clearly state this in your submission, and only your organisation's name will be published. We will remove personal details from submissions made by individuals.

Please be aware that even if you state that you do not wish certain information to be published, there may be legal circumstances that require the NSW Government to release that information (for example, under the *Government Information (Public Access) Act 2009*).

Part 1: Making the PDRS operational

1.1 The Energy Security Safeguard

In November 2019, the Energy Security Safeguard was announced to incentivise the rollout of energy savings and peak demand reduction measures through the existing Energy Savings Scheme (ESS) and the new Peak Demand Reduction Scheme (PDRS).

The PDRS became law in September 2021 when it was added to the Energy Security Safeguard (the Safeguard) under the *Electricity Supply Act 1995* (the Act).

The Energy Security Safeguard position paper[1], published in September 2021, provides details of the government's policy intent for the PDRS as a key component of the Safeguard.

1.2 What is the Peak Demand Reduction Scheme?

The PDRS is a new certificate scheme to reduce peak electricity demand in NSW, starting in the summer of 2022-23. The next major step to make the PDRS operational is the development of the rule which will commence in August 2022.

This consultation paper draws from the Act and the position paper to bring the scheme to life through the establishment of the first PDRS Rule for the calculation and creation of Peak Reduction Certificates (PRCs).

1.3 Scheme objectives

The primary objective of the PDRS is to create a financial incentive to reduce peak electricity demand by encouraging Recognised Peak Activities (RPAs) that will reduce capacity during hours of peak demand.

The PDRS also has 3 sub-objectives that are aligned with the Safeguard objectives, which are focused on improving reliability by reducing NSW peak demand, improving affordability by placing downward pressure on NSW wholesale electricity prices and improving sustainability by increasing load flexibility.

[1] Energy Security Safeguard Position Paper

1.4 Scheme commencement and the staged introduction of activities

As outlined in the Safeguard Position Paper, the PDRS will start in the summer of 2022-23 with a peak demand reduction target of 0.5%. This target gradually increases to 10% by the summer of 2029-30. The target will then remain at 10% until the end of the scheme in 2050.

The PDRS Rule is only one aspect of making the new scheme a reality. Additional important milestones, such as the making of regulations and the implementation of a new certificate registry, are still to come. Figure 1 provides an overview of key milestones in the scheme's operation.

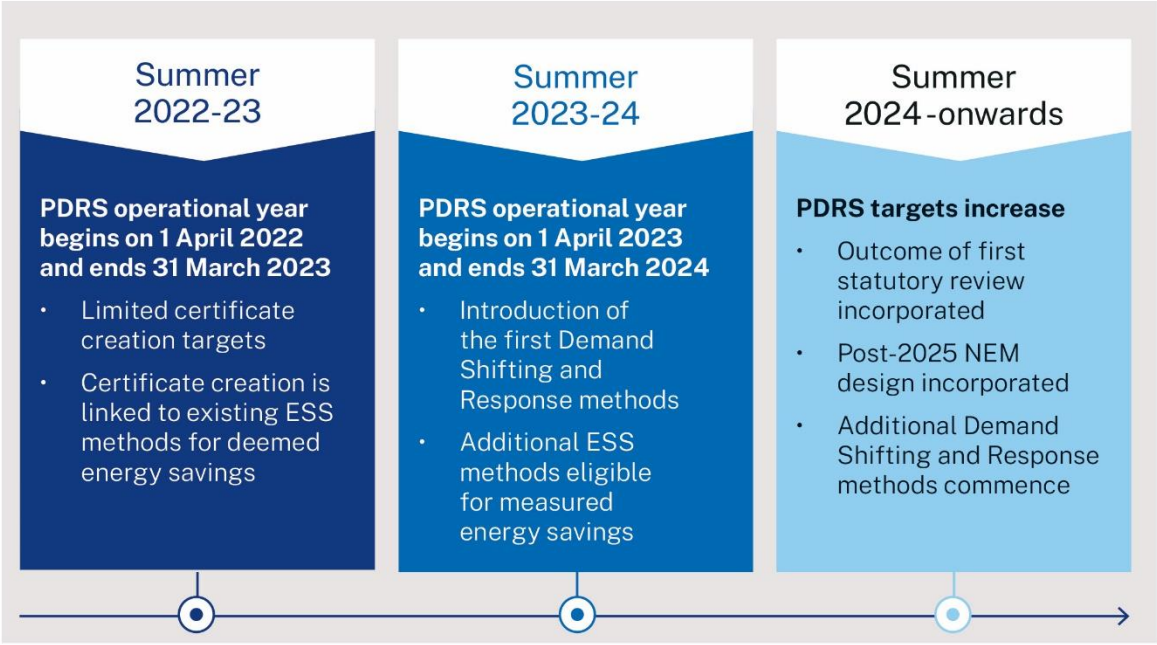

Figure 1 PDRS Milestones

1.5 Early commencement of activities to ensure certificate supply

The first PDRS Rule will be built on activities already in the ESS.

Figure 2 sets out the proposed timeline for eligible activity, accreditation of Accredited Certificate Providers (ACPs) and commencement of certificate creation for the PDRS to be active for the 2022-23 summer.

The eligibility of an RPA for PRC creation is dependent on the accreditation of the ACP under the ESS and subsequent approval for accreditation under the PDRS.

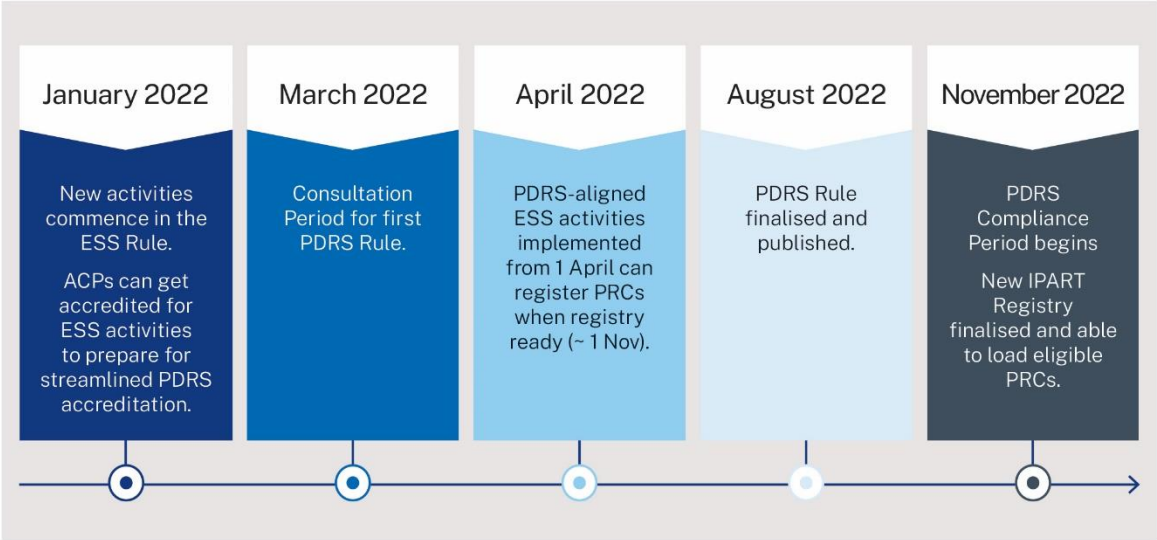

Figure 2 Timeline of key events for certificate creation by 1 November 2022

Transitioning accreditations and aligning ESS activity

Streamlined accreditation options may be available for ACPs with an accreditation for complementary ESS methods described in Part 3 of this paper. The basic concept is that once an ACP has an ESS accreditation for the PDRS aligned activity, implementation of this activity from 1 April 2022 will be eligible for the creation of PRCs, subject to the requirements of both schemes being met.

To facilitate this, the PDRS Rule proposes:

- to allow for activities implemented from 1 April 2022 if a Recognised Energy Saving Activity (RESA) under the ESS is also an RPA
- to provide IPART the flexibility to streamline the PDRS accreditation for ESS ACPs after the commencement of the rule in August 2022, so long as the scheme administrator is satisfied the person is eligible.[2] Under this process, ESS ACPs are required to indicate whether they want to be accredited for the PDRS but do not need to complete a formal application.

These measures are designed to facilitate activity under the PDRS before publication of the Rule, and before completion of the new PDRS certificate registry. It seeks to:

- recognise that activity is essentially the same under both schemes, though calculations and some requirements may differ
- balance the need to have certificates available to meet individual certificate targets in the first year without knowing the exact number of certificates (until gazettal of the rule).

[2] *Electricity Supply Act 1995* (NSW) sch 4A cl 112.

The first version of the PDRS Rule will use activities already in the ESS

While energy savings through the ESS and demand savings through the PDRS may arise from the same implementation, they are separate elements that have different values to the NSW grid.

The ESS rewards year-round energy savings from an activity. The PDRS rewards the activity's capacity to reduce summer peak demand and recognises the value of time-specific energy savings at the times when they are most valuable i.e. summer peaks. In the same way, electricity consumption charges are a different element to demand charges on an electricity bill and are priced considering different aspects of the electricity network.

The activities outlined in Part 3 are built off activities already in the ESS. Requirements for activities in the PDRS are aligned with existing ESS activities where possible. This will allow for the same project to value stack and create PRCs and Energy Savings Certificates (ESCs) where all requirements are met. Calculation methods for the PDRS have a similar structure to the ESS where a primary equation (Equation 1) is used to calculate the number of certificates, and subsidiary equations are used to calculate the quantity of capacity created.

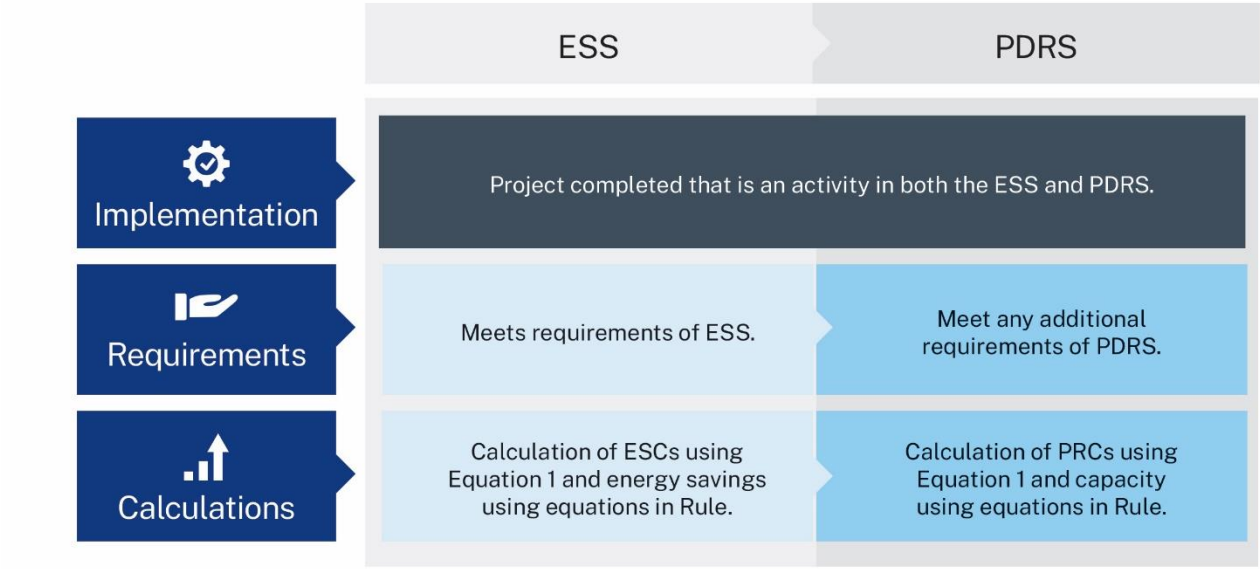

Figure 3 Similarities and differences between ESS and PDRS demand savings calculations

The next few iterations of the PDRS Rule will expand opportunities beyond the initial settings. Part 2 provides more information on the approach for consultation on subsequent activities.

1.6 Supporting digital delivery of the rules

Digital ready version of the PDRS Rule

The Safeguard position paper highlights opportunities to digitise the delivery of the Safeguard rules. ACPs and other ESS stakeholders told us that it is difficult to interpret rule changes and there is an absence of effective rule change feedback[3].

Providing a digital ready, coded version of the PDRS rule ready for API integration[4] is one way we will work towards addressing these issues. The 'rules as code' approach is a way to develop an authoritative machine-consumable interpretation of legislation or rules.[5]

Having these rules connected to software platforms provides a centralised reference, so rule updates can flow through directly to software applications. Developing the digital version of the rule involves using a multi-disciplinary team to co-draft rules in both human and machine readable language in parallel. This also helps to simplify the rule, making it easier to understand and apply.[6]

Publishing savings scenarios and calculation tools

The PDRS will have a significant impact on ESS participants as they look to expand their systems to incorporate the additional requirements of the PDRS. Similarly, new entrants will also need to develop digital systems to help manage their accreditations.

We propose using the coded rules to publish scenarios and case studies relevant to you on the interpretation of the rules. Based on research to date, this could include comparison tools allowing the user to modify example calculations. These will demonstrate how changing input values will impact the eligibility and results of a particular implementation.

For more information on the possibilities, we encourage you to investigate our work on the NABERS ESC Estimator, a web application built from a coded version of the ESS Rule.

If you are interested in helping test the digital rules and working with us to develop scenarios and case studies demonstrating how digital rules might work for you, register your interest at the consultation forum.

[3] Energy Security Safeguard Position Paper

[4] An API will allow external parties to access features or information from a coded ruleset and build web services or other applications that draw from these features or information. Stakeholders can perform the PDRS calculations by integrating the API endpoint into their systems.

[5] OECD Cracking the Code

[6] Productivity Commission 2021 *Productivity Commission White Paper 2021 Rebooting the economy* p.138

1.7 Questions on Part 1

We are interested in hearing your thoughts on the questions listed below. Please submit your responses by 5:00pm AEDT on 13 May 2022. A full list of questions is available in appendix 1.

1. What administrative processes could be improved by implementing better digital systems? How would that impact your organisation?
2. Do you use systems managed by other organisations to deliver the ESS rules and/or would you use them for the PDRS? If so, which ones, and how do you use them?
3. Are there any digital tools, or specific software applications that could improve the PDRS customer experience or understanding of the PDRS? If so, what are they and how could they be used?
4. Would you use an open calculation API if it is made available? Why/why not?

Part 2: Establishing the Rule

We are seeking input on the proposed PDRS Rule. We want to ensure it will clearly and effectively describe how activities are to be undertaken and subsequently how certificates are created. All activities in the first PDRS Rule can be done in parallel with the relevant ESS activities. We seek feedback to ensure activities are both best practices and compatible with the current ESS activities.

As this is the first opportunity for stakeholders to review the PDRS Rule, please focus on the rule in its entirety, as well as the interdependencies between the rule, the Act and the Electricity Supply (General) Regulation 2014. Details of general rule clauses are listed below.

While developing the draft PDRS Rule, we considered multiple sources of feedback: the Safeguard consultation in June 2020, the ESS consultation in June 2021 and targeted industry consultation in September 2021.

The next steps in establishing this rule include:

A) the review and consideration of submissions to this consultation
B) publication of the first PDRS Rule in the NSW Government gazette, and publication of a position paper detailing the final positions.

This part of the paper introduces core concepts for the rule and an overview of clauses 1 to 8.

2.1 Introducing the concepts for the PDRS

2.1.1 Recognised Peak Activities

RPAs are at the heart of the Rule, driving the creation of peak demand reduction capacity and certificates while delivering the objectives of the Safeguard. This concept is covered in clause 6 of the PDRS rule.

An RPA must:

- provide capacity to reduce peak demand during the Peak Demand Reduction Period – defined in the Electricity Supply Act 1995 as the period between 2.30pm and 8.30pm AEST from 1 November to 31 March[7]
- be eligible to create PRCs and occur in a site (or sites) within the jurisdiction covered by the PDRS and
- be lawful to be carried out on the implementation date.

[7] *Electricity Supply (General) Regulation 2014* (NSW) cl 61.

If the activity requires the replacement or removal of end-user equipment, that end-user equipment can't be refurbished, re-used or re-sold. Instead it must be appropriately disposed of, including recycling refrigerants.

Exclusions and ineligible activities

Clause 6 also lists the situations where an RPA is not permitted, even if the requirements within an activity definition are otherwise met. This includes situations where the implementation of an RPA:

- reduces safety levels
- leads to a net increase in greenhouse gas emissions
- is done to comply with mandatory legal requirements or as part of standard control services and prescribed transmission services by a network service provider.

Lastly, activities eligible under the Commonwealth Renewable Energy Target (RET) are ineligible – except for solar water heaters and heat pump water heaters.

2.1.2 Peak demand reduction capacity

Peak demand reduction capacity is created from the implementation of an RPA. The PDRS rule sets out the equations that are to be used in calculating how much peak demand reduction capacity is created from an implementation. The unit for peak demand reduction capacity is kilowatts (kW) of capacity averaged over one hour.

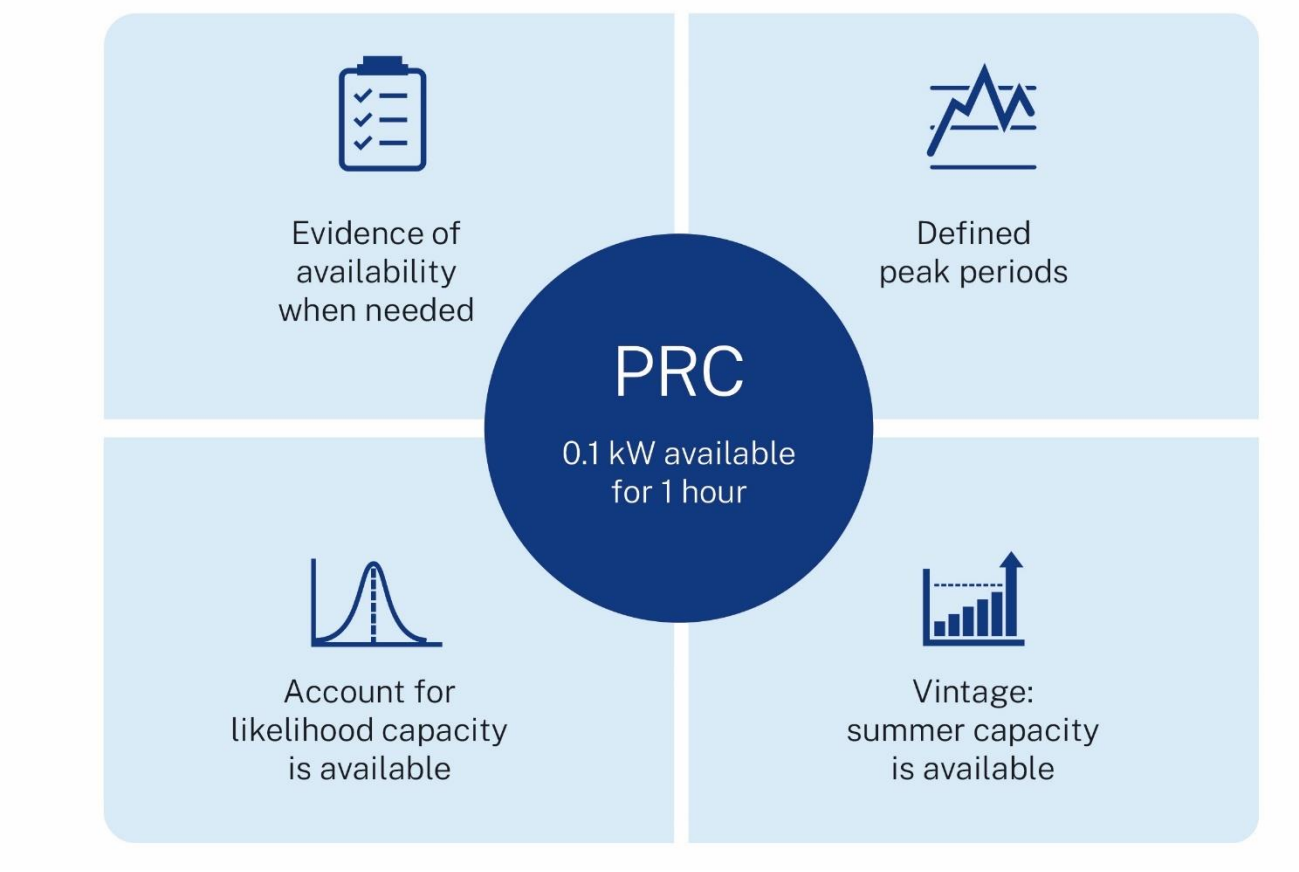

Figure 4 The component parts of Peak Demand Reduction Certificate calculations

By focusing on capacity, the PDRS is not duplicating national dispatch mechanisms such as the wholesale demand response mechanism (WDRM). Rather the focus on capacity allows the PDRS to complement existing mechanisms by reducing barriers for NSW electricity customers to participate in demand-side initiatives. In turn, this will lead to more NSW capacity participating in the WDRM and retailer dispatch than would have done so otherwise.

2.1.3 Capacity holder

Each implementation of an RPA increases the capacity to reduce peak demand. A capacity holder is a person under the rule with the right to that capacity. More specifically, the capacity holder can create PRCs and nominate another person as a capacity holder.

There is only one capacity holder at a time for each implementation of an RPA. If the capacity holder successfully nominates someone else, their rights pass to the nominee. A nomination is successful if the nominee consents and the nomination meets the scheme administrator's requirements. The nominee becomes the capacity holder, gaining the rights of the previous capacity holder, including the right to nominate someone else.

The person defined as the capacity holder varies for each method. It may be the purchaser or remover of equipment for deemed activities, while for future demand response and shifting activities it may be the electricity bill payer or their nominated proxy.

2.1.4 Collection and use of data

Clause 8.1(D) is the equivalent of clause 6.8 in the ESS rule. The data requirements for the PDRS are aligned with those of the ESS initially but may evolve as new demand shifting and response activities are introduced.

2.2 Peak Reduction Certificates

PRCs relate to the peak demand reduction capacity for the implementation of an RPA. The number of certificates must be calculated using Equation 1:

$$Number\ of\ Peak\ Reduction\ Certificates$$
$$= Peak\ Demand\ Reduction\ Capacity\ (kW) x\ Network\ Loss\ Factor\ x\ 10\ (\frac{hW}{kW})$$

An ACP creates the certificates if certain conditions are met.

1. The ACP needs to be accredited for that activity before the implementation date and must be the capacity holder at the time of certificate creation. For the first year after rule commencement, early start provisions will apply where an RPA is also a RESA. See Part 1.4 of this paper for more details. The certificates can't already be created for that activity and that compliance period.

2. The ACP needs to provide the relevant data and evidence to the scheme administrator. The registration date must be before the relevant deadline but after the PDRS has commenced.
3. The implementation must meet all activity requirements in the PDRS Rule.

The PDRS will allow peak demand reduction capacity to be totalled for multiple implementations of the same RPA, allowing certificates to be created in batches.

Network loss factor

The network loss factor accounts for line losses that occur in supplying electricity. This factor is broken up by the distribution network service providers that operate in NSW, being Ausgrid, Endeavour Energy and Essential Energy. It has been calculated using the published network loss factors and energy groupings from Regulatory Information Notices.

2.3 Structure and common features of equations

2.3.1 Calculation of peak demand reduction capacity

The calculation of peak demand reduction capacity sets the foundation for calculating capacity for different use cases. **Error! Reference source not found.**a calculates capacity for demand saving activities, with future methods for demand shifting and demand response capacity calculations to be added as subsequent equations (2b, 2c, etc).

Equation 2a:

$$Peak\ Demand\ Reduction\ Capacity = Peak\ Demand\ Savings\ Capacity\ x\ Summer\ Peak\ Demand\ Reduction\ Duration\ x\ Lifetime$$

The following sections provide more detail on the components of this equation.

Summer peak reduction duration

Summer peak reduction duration is 6 hours, based on the peak demand reduction period of 2.30pm to 8.30pm AEST.

Lifetime

Lifetime is the number of years the capacity is considered available to reduce peak demand. In most cases with deemed activities, this is the lifetime of the product and is consistent with the equivalent lifetime used in ESS activities. The addition of lifetime savings at this point means Equation 2 can be flexibly applied to a wide range of capacity calculations.

2.3.2 Calculating peak demand savings capacity

In the common peak demand savings capacity equation, baseline input power and input power use product characteristics such as input power, output rating and efficiency, or annual or daily energy consumption.

Equation 3:

$$Peak\ Demand\ Savings\ Capacity = ((Baseline\ Input\ Power\ x\ Baseline\ Peak\ Adjustment\ Factor) - (Input\ Power\ x\ Input\ Peak\ Adjustment\ Factor))\ x\ Firmness\ Factor$$

The first set of activities to calculate peak demand savings capacity is the reducing demand using efficiency (RDUE) method in schedule 1 of the PDRS rule. It uses input power compared to a reference product with an adjustment to account for normal operation during conditions typical of a summer peak demand event for a range of different technologies.

Baseline peak adjustment factor (*af*) and input peak adjustment factor are then calculated for each equipment type and sector. These adjustment factors modify the baseline input power and the input power of new equipment to account for data published in the Greenhouse and Energy Minimum Standards (GEMS) Registry that does not account for typical operation and performance during summer peak conditions.

Firmness factor

Firmness factor calculations represent the likelihood of peak demand reduction capacity being both available and able to contribute to reducing peak demand. For the RDUE method activities, the assigned value is 1 as peak demand reduction capacity is always available.

Part 3: Reducing demand using efficiency method

In determining the list of activities for inclusion in the first PDRS Rule, all ESS activities were initially considered. The ESS activities that have been targeted in the draft PDRS Rule all draw on a significant aggregated load during peak times, especially temperature-based end-use equipment.

There was a range of reasons why ESS activities were not progressed for the first version of the PDRS rule, including no electricity demand for gas end-use equipment and a broad range of specific operation for liquid chilling packages. A residential activity to replace electric resistance water heaters with heat pump water heaters was on the shortlist for inclusion in the first version of the PDRS rule. However, complexities with controlled load tariffs require further investigation. These activities may be considered for future versions of the rule where the case for significant peak demand reduction becomes clearer.

Schedule B of the PDRS rule lists each of the PDRS activities in the RDUE method. The rule text for each RPA mirrors the ESS rule requirements for activity, installation, equipment and eligibility requirements. In the proposed rule text, ESS numbering is annotated to the activity to aid comparison with the ESS. Table 3:1 lists out the first round of RPAs and the correlating RESAs in the ESS.

Table 3:1 Comparing activities in Schedule B of the PRDS Rule and Schedule C, D and E of the ESS Rule

End-use Equipment	PDRS Activity Definition	ESS Method	ESS Activity Definition
Residential air conditioners	HVAC1	Home Energy Efficiency Retrofits	D16
Commercial air conditioners	HVAC2	High Efficiency Appliances for Business	F4
Commercial heat pump water heaters	WH1	High Efficiency Appliances for Business	F16
Non-primary refrigerators and freezers	RF1	Removal of Old Appliances	C1
Refrigerated cabinets	RF2	High Efficiency Appliances for Business	F1
Motors (refrigeration and ventilation)	SYS1	High Efficiency Appliances for Business	F7
Residential pool pumps	SYS2	Home Energy Efficiency Retrofits	D5

For the technologies in Table 3:1 and Table 3:2, the equation contains the following parameters:

- **Baseline input power** determined for an average reference product
- **Baseline peak adjustment factor** which considers the usage of the equipment during the peak period and the impact of ambient temperature
- **Input power** for the new end-user equipment determined using data available in the GEMS Registry or VEU Product Registry
- **Input peak adjustment factor** with the same assumptions as the baseline peak adjustment factor, except where noted for solar and heat pump water heaters
- **Firmness factor** of 1 for all deemed activities in this section.

For additional detail and consultation questions for each proposed activity see sections 3.1.1 to 3.1.8 below.

Table 3:2 Comparison table of inputs for technologies in Schedule A of the PDRS Rule for RDUE method

Technology	Baseline Input Power	Baseline Peak Adjustment Factor	Input Power	Input Peak Adjustment Factor	Requirements
HVAC1: Residential air conditioning	Cooling performance of reference equipment is determined by dividing the Cooling Capacity of the new EUE by the Baseline EER where the Baseline AEER as tabulated in the Rule.	The Baseline Peak Adjustment Factor is calculated using: • a temperature factor based on the BCA Climate Zone • a usage factor of 0.72.	Cooling power input of the new model as recorded in the GEMS Registry.	Same assumptions as the Baseline Peak Adjustment Factor.	Requirements for replacement and new air conditioner activities are aligned with the D16 requirements of the ESS Additional requirement for demand response capability in accordance with AS4755.3.1.
HVAC2: Commercial air conditioners	Cooling performance of reference equipment is determined by dividing the Cooling Capacity of the new EUE by the Baseline EER where the Baseline AEER as tabulated in the Rule.	The Baseline Peak Adjustment Factor is calculated using: • a temperature factor based on the BCA Climate Zone • a usage factor of 0.72.	Cooling Power Input of the new model as recorded in the GEMS Registry.	Same assumptions as the Baseline Peak Adjustment Factor.	Requirements are aligned with the requirements of activity F4 in the ESS.

WH1: Commercial heat pump water heaters	Baseline Power Input of a reference electric resistance water heater is calculated using the hourly peak load based on the cooling zone the product is installed and considers the hourly tank heat loss which is assumed at 5%.	The Baseline Peak Adjustment Factor is 1.	Input Power is calculated using • the Annual Energy Savings value for a product as published on the Product Registry and • Baseline Power Input.	The Input Peak Adjustment Factor of 0.77 is based on lower power requirements in summer due to higher ambient temperatures.	Requirements are aligned with the requirements of activity F16 in the ESS.
RF1: Removal of non-primary refrigerators and freezers	Baseline Power Input of 0.093 kW based on the figure of 5.7 megawatt hours (MWh) over 7 years for the equivalent ESS activity.	Baseline Peak Adjustment Factor of 1.25 based on ambient temperature and usage being higher during the Peak Demand Reduction Period.	N/A this is a removal activity.	N/A this is a removal activity.	Requirements are aligned with the requirements of activity C1 in the ESS.
RF2: Refrigerated cabinets	The Baseline Power Input is calculated using the: • the Total Energy Consumption (TEC) as recorded in the GEMS registry is converted into an hourly value and • ratio between the Product EEI as recorded in the GEMS registry for the new refrigerated cabinet model and the Baseline EEI as tabulated in the Rule.	Based on the product type as some products have compressors in air-conditioned areas while some are at ambient temperature.	TEC of the new model as recorded in the GEMS registry is converted into an hourly value.	Same assumptions as the Baseline Peak Adjustment Factor.	Requirements are aligned with the requirements of activity F1 in the ESS.

SYS1: Motors (refrigeration and ventilation)	Performance of a reference motor calculated using: • the Rated Output of the new motor and • the Baseline Efficiency of the old motor as recorded in the GEMS Registry or tabulated in the Rule if unknown.	For refrigeration motors, this value is 0.56 For ventilation motors, the Baseline Peak Adjustment Factor is calculated using the same assumptions as the commercial air conditioner activity.	Performance of the new motor calculated using: • the Rated Output of the new motor and • the New Efficiency of the motor as recorded in the GEMS Registry.	Same assumptions as the Baseline Peak Adjustment Factor.	Requirements are aligned with the requirements of activity F7 in the ESS.
SYS2: Residential pool pumps	Calculated based on a reference pool pump with a 3-star rating for different pool volumes and pool pump types.	Calculated at 0.28 based on data from a set of NSW pool pumps.	Tabulated based on the pool volume, type of pool pump and the star rating.	Same assumptions as the Baseline Peak Adjustment Factor.	Requirements are aligned with the requirements of activity D5 in the ESS.

3.1 Residential air conditioners activity (HVAC 1)

High efficiency air conditioners provide a significant amount of capacity to reduce electricity demand during the peak demand reduction period. This activity has been developed to be carried out in conjunction with D16 from the ESS rule.

Baseline input power

For air conditioning activities, the baseline input power is calculated based on the cooling performance of reference equipment using the below equation.

Equation 4:

$$\textbf{\textit{Baseline Input Power}} = \frac{\textbf{\textit{Cooling Capacity}}}{\textbf{\textit{Baseline EER}}}$$

Where:

- the cooling capacity at 35°C, in kW, is that of the new end-user equipment; and
- the baseline EER, in kW per kW, is:
    - for new activities, defined by the 2019 Minimum Energy Performance Level; and
    - for replacement activities, defined by the 2010 Minimum Energy Performance Level.

Baseline peak adjustment factor

Residential weekday occupancy, based on data from the Australian Bureau of Statistics (ABS), is estimated to be 57% at 2:30pm and increases to 85% at 8:30pm. The average during the peak demand reduction period is 72%.

Analysis into the temperature in the different BCA climate zones across NSW during electricity system peak events between 2017 and 2021 was used to calculate the temperature factors.

Input power

The cooling power input, in kW, is based on the cooling power input of the new end-user equipment at 35°C as found in the GEMS Registry data.

Input peak adjustment factor

The input peak adjustment factor uses the same assumptions as the baseline peak adjustment factor.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements for replacement and new air conditioner activities are aligned with the D16 requirements as much as possible to minimise the hurdles to participating in both the ESS and PDRS.

There is one requirement additional to the requirements for D16 of the ESS rule where new or replacement end-user equipment must have demand response capability in accordance with AS4755.3.1.

3.2 Commercial air conditioners (HVAC2)

We have identified the opportunity to potentially incentivise high efficiency air conditioners that can provide a significant amount of capacity to reduce demand during the peak demand reduction period. This activity has been developed to be carried out in conjunction with F4 from the ESS rule.

Baseline input power

For air conditioning activities, the baseline input power is calculated based on the cooling performance of reference equipment using the following equation:

$$Baseline\ Input\ Power = \frac{Cooling\ Capacity}{Baseline\ EER}$$

Where:

- the cooling capacity at 35°C, in kW, is that of the new end-user equipment; and
- the baseline EER, in kW per kW, is:
    - for new activities, defined by the 2019 Minimum Energy Performance Level; and
    - for replacement activities, defined by the 2010 Minimum Energy Performance Level.

Baseline peak adjustment factor

Air conditioner usage profiles from the National Construction Code were used to calculate a weighted average factor across all building sub-classes based on current estimates of existing building stock in NSW. This calculation resulted in a usage factor of 0.6 for commercial air conditioners between 2.30pm and 8.30pm.

Analysis into the temperature in the different BCA climate zones across NSW during electricity system peak events between 2017 and 2021 was used to calculate the temperature factors.

Input power

The cooling power input, in kW, is based on the cooling power input of the new end-user equipment at 35°C as found in the GEMS Registry data.

Input peak adjustment factor

The input peak adjustment factor uses the same assumptions as the baseline peak adjustment factor.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements for replacement and new air conditioner activities are aligned with the F4 requirements as much as possible to minimise the hurdles to participating in both the ESS and PDRS.

There is one requirement additional to the requirements for F4 of the ESS rule where new or replacement end-user equipment must have demand response capability in accordance with AS4755.3.1.

3.3 Commercial heat pump water heaters (WH1)

We have identified the opportunity to potentially incentivise heat pump water heaters that can provide a significant amount of capacity to reduce demand during the peak demand reduction period. This is only applicable to replacements of electric water heaters with a resistive element. This is similar to ESS activity F16, with the exception that replacement of gas water heaters is ineligible.

Baseline input power

The baseline input power is determined as follows:

$$Baseline\ Input\ Power = 0.008\ x\ ComPkLoad$$

Where:

- *ComPkLoad* is the peak daily (winter) load in megajoules per day as recorded in the product registry
- 0.008 is calculated using:
    - 5% being the reference system heat loss
    - 20.5% of the commercial and industrial daily load profile delivered between 2.30pm to 8.30pm AEST
    - the average seasonal load profile from November to March being 0.81

Baseline peak adjustment factor

For commercial and industrial settings, it is assumed that the performance of the reference electric resistance water heater during the summer peak period is captured in the baseline input power calculation.

Input power

The input power is derived from the annual energy savings, as published on the product registry, as follows:

$$Input\ Power = (100 - Annual\ Energy\ Savings\ \%) \times Baseline\ Input\ Power \div 100$$

Where:

- annual energy savings % is the percentage value for energy savings published in the product registry
- baseline input power is the value determined in Equation 4.

Input peak adjustment factor

Due to the higher ambient temperatures during the peak period, heat pump water heaters are expected to increase performance by approximately 30%. As such, the input peak adjustment factor of 0.77 is proposed.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements are aligned with the F16 requirements.

Additionally, replacements are only eligible where the existing water heater was on a continuous load tariff. Replacing an off-peak water heater is not eligible for incentives under the PDRS (but may still be eligible for incentives under the ESS).

3.4 Removal of non-primary refrigerators & freezers (RF1)

We have identified the opportunity to potentially incentivise the removal of spare refrigerators and freezers as providing a significant amount of capacity to reduce demand during the peak demand reduction period. This activity has been developed to be carried out in conjunction with C1 from the ESS rule.

Baseline input power

The baseline input power is equal to 0.093 kW.

This figure has been derived from the ESS deemed equipment electricity savings figure of 5.7 MWh over 7 years.

Baseline peak adjustment factor

Refrigerator and freezer energy consumption varies with ambient temperature and time of day. A recent study[8] found that summer daily usage was 114% of the annual average, and that energy consumption peaked in the early evening. It is estimated that the combined effect of these results in an average energy consumption over the peak demand reduction period of 125% of the annual average. As a result, the baseline peak adjustment factor is 1.25.

As this data is based on a study in the USA, it may be slightly different to the average load profile in NSW, however as refrigerator use is likely to be similar, the impact would be minimal.

New input power

The new power input is zero as this is a removal activity.

Input peak adjustment factor

The input peak adjustment factor is zero as this is a removal activity.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements are aligned with the C1 requirements.

3.5 Refrigerated cabinets (RF2)

Refrigerated display cabinets and refrigerated storage cabinets are used widely in the retail sector and food services industry. As these cabinets are used in supermarkets, restaurants and food outlets, they comprise a significant electrical load for the state. Furthermore, they operate continuously throughout the day, 7 days per week through the peak demand reduction period. We have recognised the opportunity to potentially incentivise high efficiency commercial refrigeration systems that can provide capacity to reduce demand during this period.

This activity has been developed to be carried out in conjunction with F1 from the ESS rule.

In order to calculate the peak demand savings for this activity, we propose to use Equation 2.

[8] Larson, Ben; Davis, Robert; Uslan, Jeffrey; *Is Your Refrigerator Running? Energy Use and Load Shapes for Major Household Appliances*, ACEEE Summer Study of Energy Efficiency in Buildings, 2014, pp. 9-235 – 9-246.

Baseline input power

The baseline input power is determined as follows:

$$Baseline\ Input\ Power = \frac{TEC}{24}\ x\ \frac{Baseline\ EEI}{Product\ EEI}\ x\ af$$

Where:

- *TEC* and *Product EEI* are as recorded in the GEMS registry for the new refrigerated cabinet model
- *Baseline EEI* is tabulated in the rule under activity definition PDRS F1
- *af* is the adjustment factor defined in Table RF2.1 and accounts for the duty of the refrigerated cabinet in comparison to the testing conditions.

Baseline peak adjustment factor

The TEC of a refrigerated cabinet is its 24h energy consumption, tested at:

- 25°C and 60% RH for RDCs and light duty RSCs and
- 30°C and 55% RH for ice cream freezer cabinets, scooping cabinets and normal or heavy duty RSCs.

Given that refrigerated cabinets are usually located in a conditioned space, the test conditions are considered to be aligned with normal operation of a refrigerated cabinet.

The baseline peak adjustment factor for this activity is one.

Input power

The input power is determined as follows:

$$Input\ Power = \frac{TEC}{24}\ x\ af$$

Where:

- *TEC* is as recorded in the GEMS registry for the new refrigerated cabinet model
- *af* is the adjustment factor

Input peak adjustment factor

The input peak adjustment factor uses the same assumptions as the baseline peak adjustment factor.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements for replacement and new refrigerated cabinets are aligned with the F1 requirements as much as possible to facilitate participation in both the ESS and PDRS.

3.6 Motors (refrigeration and ventilation) (SYS1)

We have identified the opportunity to potentially incentivise high efficiency motors used in refrigeration and ventilation applications that can provide a significant amount of capacity to reduce demand during the peak demand reduction period. This activity has been developed to be carried out in conjunction with F7 from the ESS rule.

Baseline input power

The baseline input power is calculating using the following equation:

$$Baseline\ Input\ Power = \frac{Rated\ Output}{Baseline\ Efficiency}$$

Where:

- the rated output is that of the new end-user equipment as defined in the GEMS Registry; and
- the baseline efficiency is that of the old motor as recorded in the GEMS Registry or derived from Table SYS1.1 if unknown.

Baseline peak adjustment factor

For use in ventilation applications:

- Air conditioner usage profiles from the National Construction Code were used to calculate a weighted average factor across all building sub-classes based on current estimates of existing building stock in NSW. This calculation resulted in a usage factor of 0.6 for commercial air conditioners between 2.30pm and 8.30pm.

- Analysis into the temperature in the different BCA climate zones across NSW during electricity system peak events between 2017 and 2021 was used to calculate temperature factors.

For refrigeration applications, a peak load multiplier of 0.56 is used across all commercial sectors. This value accounts for impacts such as load point, system usage and motor on/off fraction.

New input power

The new input power is calculated using the following equation:

$$New\ Power\ Input = \frac{Rated\ Output}{New\ Efficiency}$$

Where:

- the rated output is that of the new end-user equipment as defined in the GEMS Registry; and
- new efficiency is that of the new end-user equipment as defined in the GEMS Registry.

Input peak adjustment factor

The input peak adjustment factor uses the same assumptions as the baseline peak adjustment factor.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements are aligned with the F7 requirements.

3.7 Residential Pool Pumps (SYS2)

Pool pumps make up a significant amount of electricity consumption in NSW households with a total demand of up to 450 megawatts. Improving pool pump efficiency through demand savings activities will help to reduce total demand and provide a basis for future demand response and shifting pool pump activities. SYS2 has been developed to be carried out in conjunction with D5 from the ESS rule.

Baseline input power

The baseline input power is calculated by taking the flow rate of a fixed speed pump required to filter the pool and dividing it by the weighted energy factor, which is calculated using the GEMS SRI formula, with a star rating of 4.5.

Baseline peak adjustment factor

Pool pump interval data from 48 swimming pool pumps in NSW was analysed to determine the baseline peak adjustment factor. The resultant adjustment factor is 0.28.

Input power

Input power is calculated by taking the flow rate of a multi speed pump, if the new pump is a multi-speed pump, or the flow rate of a fixed speed pump, if the new pump is a fixed speed, and dividing it by the weighted energy factor calculated using the star rating of the new pump.

Input peak adjustment factor

The input peak adjustment factor uses the same assumptions as the baseline peak adjustment factor.

Firmness factor

As this is a deemed activity and capacity will be available, the firmness factor is one.

Requirements

The proposed requirements are aligned with the requirements of activity D5 in the ESS.

3.8 Questions on Part 3

We are interested in hearing your thoughts on the questions listed below. Please submit your responses by 5:00pm AEDT on 13 May 2022. A full list of questions is available in appendix 1.

5. Do you support the draft calculation approach and requirements for each of the technologies in the RDUE method? Please highlight positives and negatives, including any specific barriers to uptake of this activity. Space is provided in our online form for you to provide answers on each activity.
6. Should the PDRS have a requirement for the installed end-user equipment under HVAC1, HVAC2, WH1, WH2 and SYS2 to have DRM 1, 2 and 3 capability under AS/NZS 4755? What are the alternatives?
7. Should the PDRS incentivise the replacement of continuous tariff hot water systems that are on off-peak or controlled load tariffs?

Part 4: Developing the next phase with you

4.1 Making new demand shifting and response activities

To fast-track the PDRS Rule, this inaugural rule includes only deemed demand savings activities aligned to the ESS. Building from these foundational activities, future iterations of the rule will include new activities to incentivise capacity for demand response and demand shifting. This relates to the 'how' of equipment use, where demonstrating capacity means demonstrating how technologies and systems can provide demand response and shifting capability.

As per the Safeguard position paper, we will collaborate with stakeholders to develop calculation methods.[9]

4.1.1 Work with us to develop the next round of activities

To develop the next tranche of activities, we will seek your input as we conduct targeted research, stakeholder engagement and prototyping. This will include:

1) Targeted research to identify root problems that you perceive to block the uptake of demand response and shifting activities and the demonstration of capacity to reduce demand.
2) Building on the research, we will talk to you through targeted stakeholder engagement to narrow down the next generation of activities.
3) We will then develop prototype calculation methods for you to review. These prototypes will be customer-centric, aiming to deliver solutions that meet customer needs and overcome barriers as they translate into rules for certificate creation.

This design-led approach is essential to ensure the PDRS leverages existing national schemes and incentives, such as the WDRM, and does not duplicate existing dispatch schemes. Where feasible, these activities will also be future-proofed by aligning to broader network and market opportunities, industry standards and best practices.

4.1.2 Immediate next steps

We are seeking your feedback/responses. You can help shape this exciting new space by responding to the consultation questions. Please register your interest to participate in the next steps.

[9] Safeguard position paper pp.79

In parallel with this consultation, the Office of Energy and Climate Change is beginning the targeted research on demand response and shifting in the market.

4.2 Questions on Part 4

We would like to better understand how stakeholders would like to be involved in developing these new methods. Please address the following questions and submit your response by 5:00pm AEDT on 13 May 2022. A full list of questions is available in appendix 1.

8. What aspects of the PDRS would you like to know more about, and what's the best way to provide this information to you?
9. What activities, technologies and business models are you most eager to see in the PDRS and why are these important to you?

Part 5: Acronyms

Acronym	Full Name
ABS	Australian Bureau of Statistics
ACOP	Annual Coefficient of Performance
ACP	Accredited Certificate Provider
AEER	Annualised Energy Efficiency Ratio
CER	Clean Energy Regulator
DRM	Demand Response Mode
EEI	Energy Efficiency Index
ERL	Energy Rating Label
ESC	Essential Services Commission
ESS	Energy Savings Scheme
GEMS	Greenhouse and Minimum Energy Standards
HEAB	High Efficiency Appliances for Businesses
HEER	Home Energy Efficiency Retrofit
HVAC	Heating, Ventilation and Air Cooling
IPART	Independent Pricing and Regulatory Tribunal
MEPS	Minimum Energy Performance Standards
NSW	New South Wales
PDRS	Peak Demand Reduction Scheme
PRC	Peak Reduction Certificate
RESA	Recognised Energy Saving Activity
RET	Renewable Energy Target

RPA	Recognised Peak Activity
SRES	Small Scale Renewable Energy Scheme
TEC	Total Energy Consumption
The Act	Electricity Supply Act 1995
The Safeguard	Energy Security Safeguard
TRNSYS	Transient System Simulation Tool
VEU	Victorian Energy Upgrades program
WDRM	Wholesale Demand Response Mechanism

* Definitions for some of the above terms can be found in the PDRS Rule

Appendix 1: List of Questions

Questions
1. What administrative processes could be improved by implementing better digital systems? How would that impact on your organisation?
2. Do you use systems managed by other organisations to deliver the ESS rules and/or would you use them for the PDRS? If so, which ones, and how do you use them?
3. Are there any digital tools, or specific software applications that could improve the PDRS customer experience, or understanding of the PDRS? If so, what are they and how could they be used?
4. Would you use an open calculation API if it is made available? Why/why not?
5. Do you support the draft calculation approach and requirements for each of the technologies in the RDUE method? Please highlight positives and negatives, including any specific barriers to uptake of this activity. Space is provided in our online form for you to provide answers on each activity.
6. Should the PDRS have a requirement for the installed End-User Equipment under HVAC1, HVAC2, WH1, WH2 and SYS2 to have DRM 1, 2 and 3 capability under AS/NZS 4755? What are the alternatives?
7. Should the PDRS incentivise the replacement of continuous tariff hot water systems that are on off-peak or controlled load tariffs?
8. What aspects of the PDRS would you like to know more about, and what's the best way to provide this information to you?
9. What activities, technologies and business models are you most eager to see in the PDRS and why are these important to you?