



DEMAND MANAGEMENT INNOVATION ALLOWANCE 2013-2014 REPORT

Submission to AER

Prepared by Secondary Systems

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1.0 EXECUTIVE SUMMARY

Endeavour Energy currently has two Demand Management Innovation Allowance (DMIA) projects, the Glenmore Park Demand Response Trial which was approved in the previous regulatory year (FY 2012/13) and the Pool Pump Trial which commenced in FY 2013/14. The total DMIA claim for 2013/14 is \$173,360.

Project	Operating expenditure (\$ nominal)	Capital expenditure (\$ nominal)	Total expenditure (\$ nominal)	New or Continuing
Glenmore Park Demand Response Trial	\$117,669	\$9,600	\$127,269	Continuing
Pool Pump Trial	\$17,420	\$28,671	\$46,091	New
Total	\$135,089	\$38,271	\$173,360	

2.0 BACKGROUND

This report has been prepared in accordance with the AER's Demand Management Incentive Scheme (DMIS) for the ACT and NSW 2009 Distribution Determination's Demand Management Innovation Allowance (DMIA) scheme, November 2008.

As per Section 3.1.4 of the scheme, Approval of Expenditure under the DMIA, Endeavour Energy is required to submit an annual report describing its expenditure and the nature of its demand management activities for review by the AER. The annual reporting requirements are outlined below.

A DNSP's annual report must include:

1. The total amount of the DMIA spent in the previous regulatory year and how this amount has been calculated.
2. An explanation of each demand management project or program for which approval is sought, demonstrating compliance with the DMIA criteria detailed at section 3.1.3 with reference to:
 - a. the nature and scope of each demand management project or program,
 - b. the aims and expectations of each demand management project or program,
 - c. the process by which each project or program was selected, including the business case for the project and consideration of any alternatives,
 - d. how each project or program was/is to be implemented,
 - e. the implementation costs of the project or program, and
 - f. any identifiable benefits that have arisen from the project or program, including any off-peak or peak demand reductions.
3. A statement signed by a director of the DNSP certifying that the costs of the demand management program:
 - a. are not recoverable under any other jurisdictional incentive scheme,
 - b. are not recoverable under any other state or Commonwealth government scheme, and
 - c. are not included in the forecast CAPEX or OPEX approved in the AER's distribution determination for the next regulatory control period, or under any other incentive scheme in that determination (such as the D-factor scheme for NSW).
4. An overview of developments in relation to projects or programs completed in previous years of the next regulatory control period, and any results to date.

3.0 PREVIOUSLY APPROVED PROJECTS

This section reports on the progress of projects previously approved by the AER.

3.1 GLENMORE PARK DEMAND RESPONSE TRIAL

The Glenmore Park Demand Response Trial was conducted from 2012 to 2014. The trial provided an insight into how smart meters can be used to reduce peak demand through time-based financial incentives, information from in home displays (IHDs), and direct control of air conditioners. The technology for the trial, including IHDs and AS4755 DRED controllers for air conditioners, were acquired and tested in a laboratory environment prior to a small field test for evaluation, followed by a mini trial in the Glenmore Park area prior to a larger implementation.

3.1.1 NATURE AND SCOPE

The scope of the work was to deploy the Glenmore Park Demand Response Trial to Glenmore Park residents who had existing smart meters installed at their premises (which were installed as part of a previous smart meter trial) or located within range of smart metering communications infrastructure. Under this project the following tasks were completed:

- Conducted laboratory tests of vendor equipment
- Implemented a small field trial of equipment for evaluation
- Performed an initial analysis of energy consumption within Glenmore Park
- Conducted a targeted marketing campaign in order to sign up participants located within the Glenmore Park smart metering area
- Created a robust control group
- Developed a productionised demand response management system
- Tested IHD and air conditioning control technology
- Validated the demand response outcomes from the trial

3.1.2 AIMS AND EXPECTATIONS

The purpose of the project was to assess:

1. The technical/usability performance of IHDs with the general public
The advancements in IHD technology are rapidly developing, with new and continued improvement in both functionality and performance. The main focus of this trial was to test the usability and technical performance of IHDs in the homes of customers in Endeavour Energy's network area.
2. The perceived benefit of IHDs to the general public
IHDs allow customers to view their household consumption in real time and also view historical usage. The IHD provides customers with a tool in which they can use to learn more about their energy usage. The IHD provides customers with a tangible interface with which they may relate to better use information communicated to it from the smart meter. The aim of the trial was to qualitatively assess, via customer surveys, the perceived benefit of IHDs and the amount of electricity customers believe they may have saved as a result of its use.
3. The quantity of energy/demand reduction from IHDs (to the extent possible given small sample size)
The trial aimed to quantify the energy/demand reduction from the use of IHDs by comparing the electricity use/demand reduction of IHD users with a control group (non-trial participants). Whether this was possible and to what level of statistical robustness given the relatively small sample size was dependent on the size of behavioural change and other factors such as variance across customer groups.
4. The demand reduction from time-based financial incentives
The Peak Time Rebate program (marketed as *PeakSaver*) had been successfully deployed in Rooty Hill as part of a live demand management program. This program provided customers a financial incentive to reduce peak demand on selected peak days by paying \$1.50 per kWh the customer saved over the peak period compared to a forecast of their consumption over that period.

No control group was set up as part of the Rooty Hill program, although it was clear that participants responded compared to a calculated baseline of their own usage. This Glenmore Park trial aimed to address this issue by determining a robust control group for Glenmore Park program participants.

5. The ability to productionise demand management initiatives for a broader rollout
The systems Endeavour Energy used for the *PeakSaver* program depend heavily on manual processes on systems such as Microsoft Access databases and Excel spreadsheets. One of the deliverables in this project was a Demand Response Management System which aimed to address this issue by providing better integration with existing systems to reduce the chance of errors and streamline the approach to managing customers on the *PeakSaver* program.
6. The level of demand reduction achievable from one marketing campaign
Marketing campaigns involving *PeakSaver* thus far has been to achieve a set target number of participants. Although minimum targets were set for the Glenmore Park program, the objective was to allow continued recruitment above the set minimum target number (removal of target capping), until marketing channels were fully exhausted of customer take-ups. The required investment associated with this customer recruitment was limited, due to the relatively small volume of smart meters available in the area.
7. Technical capability to use smart metering for control of air conditioners using AS4755 interfaces
Wireless communications from the smart meter to AS4755 interfaces is new technology. The reliability through different installations are variable due to several factors that are potentially site specific such as the distance of the air conditioner to the meter, the construction material of the home, line of sight and positioning of the interface. This trial assessed these issues in real life scenarios.

3.1.3 PROJECT JUSTIFICATION

This project aimed to deliver a study into *PeakSaver* as a viable option in the demand management arsenal within a network business. *PeakSaver* was run as part of the Rooty Hill Residential Demand Management program.

The deliverables of this project were as follows:

- Demand Response Management System
- Report on the peak demand reductions achieved with the various programs
- Report on the technology of IHDs and air conditioner control through smart metering communication

3.1.4 IMPLEMENTATION PLAN

The first step in this trial was to select and test the technology prior to deploying the project to the public in Glenmore Park. A pilot mini-trial was established for selected staff members residing in the program area, to test the devices and their overall suitability for extended trials.

Phase 1 of this trial only involved the Glenmore Park residents with existing smart meters installed at their residence. The total number of existing households with smart meters in Glenmore Park is 2,222. In order to achieve the target numbers specified of 150 (minimum 80) *PeakSaver* and 200 IHD customers, each with their own control groups, the target area was potentially required to expand beyond the current smart metering pilot area to target up to 5,328 customers (Phase 2). The expanded areas marked Areas 1-7 did not require every home to have a smart meter but to install smart meters on households that have signed up to a program such as *PeakSaver*, *CoolSaver*, IHD or have been selected as part of the control group. This measure was designed to significantly reduce metering and installation costs.

Figure 1: Trial area and proposed phase 2 (Areas 1-7) expansion areas if required



3.1.5 IMPLEMENTATION COSTS

Expenditure claim in 2013/14 financial year is \$117,669 OPEX and \$9,600 CAPEX covering the costs for marketing and communications, customer recruitment, customer payments, IHDs and customer surveys.

Phase 2 expansion into other areas of Glenmore Park was not required as the main objective of recruiting a minimum of 80 *PeakSaver* participants to ensure statistical significant results had been exceeded.

3.1.6 RESULTS

Overall the project achieved the main objective of delivering statistical significant results for the calculation of *PeakSaver* peak demand reduction 17.1% (+/- 6.7%) on Event days. The implementation of *CoolSaver* through a Demand Response Management System (DRMS) integrating to a smart metering system through to a ZigBee home area network communicating to a Demand Response Enabled Device connected to an AS4755 compliant air conditioner was another milestone. Not only did the project achieve the technology outcomes; the participants, our customers, enjoyed a positive experience in contributing to reducing peak demand through the time-based financial incentive *PeakSaver* program. The IHD program was successful in educating customers on their overall energy consumption and prompted participants to actively think about reducing their energy consumption.

3.1.6.1 RECRUITMENT

The *PeakSaver* minimum target participant number (80) was exceeded, the number of IHD and *CoolSaver* registrations was below expectations.

The target numbers set may have been too optimistic. If the control group target number and the program participant target numbers were to be achieved, nearly half of the customers targeted would have had to respond.

TABLE 1 – GLENMORE PARK RECRUITMENT RESULTS SUMMARY

Program	Number of Participants		
	Year 1	Year 2	Total
<i>PeakSaver</i>	109	34	143
<i>CoolSaver</i>	0	3	3
IHD	46	47	93

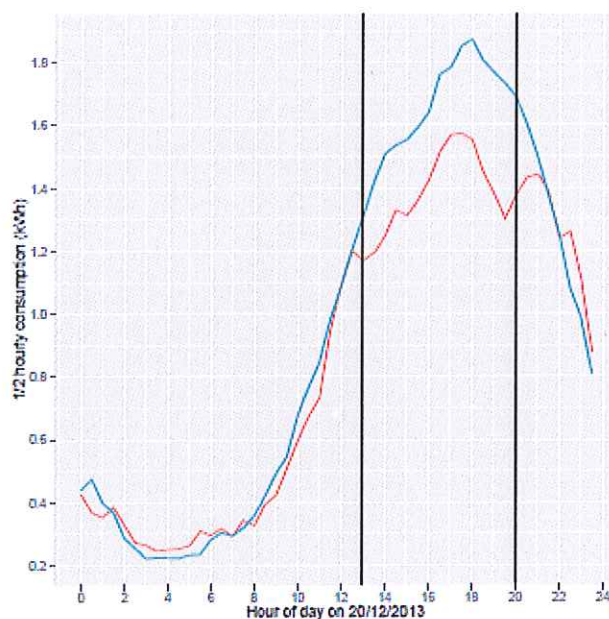
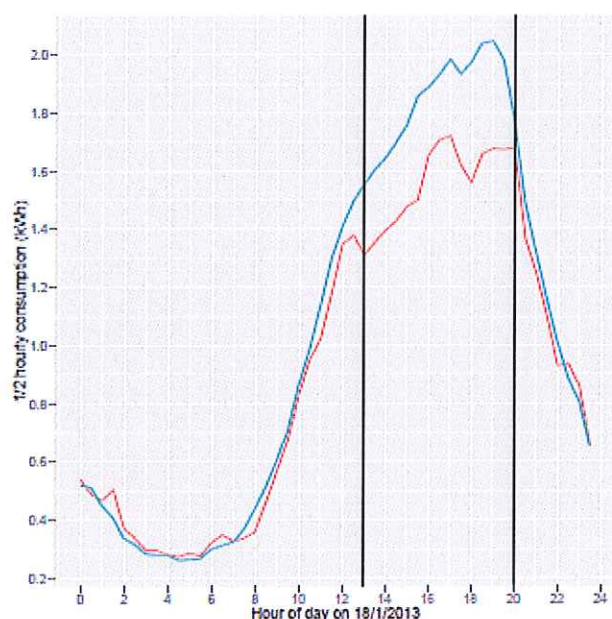
3.1.6.2 DEMAND REDUCTIONS

Statistical analysis was undertaken by an external data analysis company on the *PeakSaver* program with the aim of verifying demand reductions against control groups (a subset of residents in Glenmore Park who did not participate in the programs) rather than a calculated baseline. Analysis estimates that, on average, the Glenmore Park *PeakSaver* program caused participating households to reduce their peak time (1-8pm) consumption by 3.7 kWh (+/- 1.1 kWh), or 17.1% (+/- 6.7%) on Event days.

TABLE 2 – *PeakSaver* RESULTS SUMMARY

	08/01/2013	17/01/2013	18/01/2013	20/12/2014	17/01/2014	31/01/2014
Participants	20	89	89	140	140	141
Median Payment	\$15.22	\$6.22	\$7.16	\$3.61	\$8.50	\$1.94
Average Payment	\$18.95	\$11.09	\$15.25	\$13.15	\$14.10	\$9.39
Demand Reduction	-42.9%*	-29.0%	-16.0%	-16.2%	-13.1%	-12.1%

*discarded from average due to low number (20) of customers enrolled for this Event day

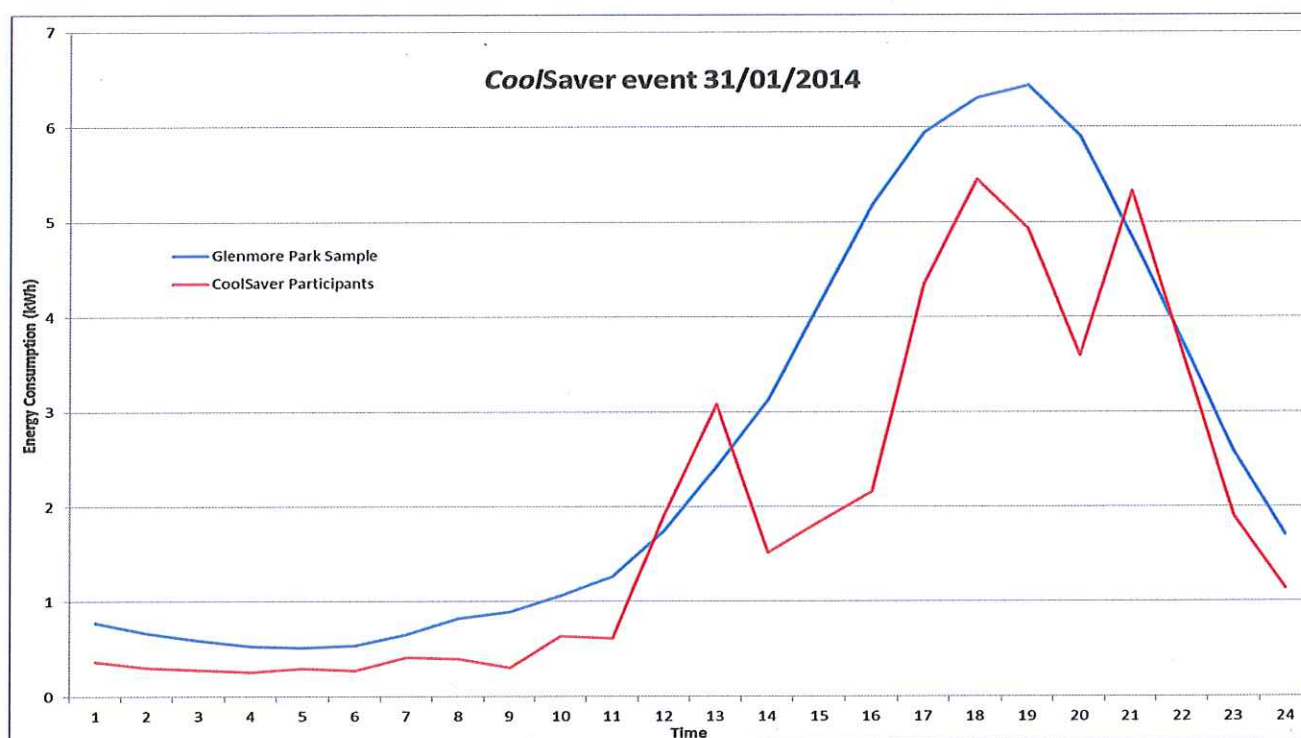


*Load profile of *PeakSaver* (red) and Control (blue) households

Analysis of data from IHDs was not able to detect any statistically significant savings from IHDs due to the low number of participants in the program. The results of statistical analysis estimates that those with an IHD reduced their consumption by 6.5% (relative to the control group), but this could be explainable by chance: the 95% confidence interval is 6.5% +/- 11.1%.

The implementation of *CoolSaver* allowed innovative control methods of air conditioners with AS4755 compliance. Previous communications to AS4755 air conditioners involved existing ripple control systems in the same way storage hot water systems were controlled for decades. The new method trialled as part of this project involved communications to existing smart meters via the metering communications network, in this case it was 3G wireless communications to a gateway translating to a RF mesh network of electricity meters and then translating to a home area network communicating to a DRED. The DRED converts the demand response modes to control the air conditioner to the requested level of demand reduction, in this case DRM mode 2 (50%). This functionality was one of the first to be trialled in the NEM using smart meters closely meeting the National Smart Metering Infrastructure Minimum Functionality Specification.

Although the objective of the *CoolSaver* program was purely to test the technology and trial the communications systems end to end, the demand reductions were noticeable. However, there is no statistical validity for the demand reductions from a sample of only three participants.



3.1.6.3 CUSTOMER FEEDBACK

Overall the *PeakSaver* and IHD programs have been successful in influencing attitudes towards energy consumption and energy saving. Participant satisfaction with the *PeakSaver* program has increased indicatively from the Rooty Hill program in 2012/13. The *PeakSaver* program rated at 7.7 (mean score out of 10) (+0.3 from Rooty Hill).

In line with higher satisfaction results, participants were also twice as likely to say their expectations had been exceeded (24%) when compared to the Rooty Hill program (12%). Participants tended to achieve higher bonuses than those in the 2012/13 Rooty Hill program. As expected, satisfaction and expectation ratings tended to correlate to the value of the *PeakSaver* Bonus, that is, the higher the bonus the more positive the rating.

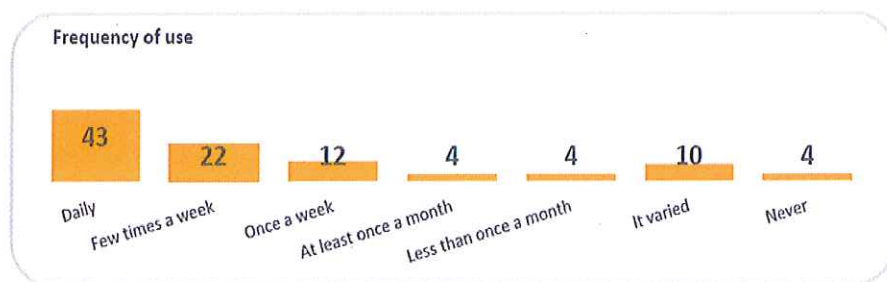
"I thought it would be just another program but the notifications and follow up letters were very good"
(Exceeded expectations)

"It wasn't that hard to comply with and fit into our routine and we got a \$150 cheque, so now my wife can buy a special appliance she's been hanging out to buy" (Met expectations)

Saving money on energy bills and reducing household energy consumption remain the two biggest reasons for signing up to the program for *PeakSaver* participants.

Overall satisfaction amongst IHD participants was fairly strong with a rating of 7.8 (mean score out of 10) and 92% stating their expectations have been met or exceeded.

Satisfaction appears to be linked to engagement, with those using the device giving more positive scores. Participants were more likely to cite perceived accuracy of information displayed on the unit and general ease of use as the main reasons for a positive experience.



"It makes us more aware of what we are using and especially for the kids they look at the machine to keep the electricity costs down." (Exceeded expectations)

Identifying high usage appliances and understanding electricity usage and behaviour on a more long term basis are the main reasons that IHD participants signed up.

The IHD participants gave the ease of registering for the program a very high rating (9.1) and scored lower on the level of information in the brochure (7.9) and level of information on the website (7.7). Participants mentioned the need for more detailed information upfront about how the device works and the information it displays.

More than three quarters (77%) say they used the IHD at least once a week, with only 4% not using the device at all. Not being able to set up the device was the reason for non-participation.

Of the high proportion (86%) of participants who took steps to reduce their energy usage, 69% say they noticed reductions on the IHD device and 64% noticed savings on their energy bills.

TABLE 3 – SUMMARY OF CUSTOMER FEEDBACK

Areas we did well	Areas to improve
<ul style="list-style-type: none"> Succeeded in communicating the link between Event day and reduction of air conditioning - 58% reduced or turned off their unit Number of notifications was just right for the majority of participants (75%) Customer communications (letters and notifications) Ease of participating in the program Level of information provided and registration process was generally good 92% said program had met or exceeded expectations Succeeded in making participants more aware and monitor their electricity consumption For many, the device was easy to use and information was easy to understand 	<ul style="list-style-type: none"> Obtain more than one notification method and ensure all adults receive notification to improve engagement and reduce household tension More information via website on appliance energy usage and how to reduce energy usage on Event days Use social media such as Facebook to keep <i>PeakSaver</i> top of mind with participants, increase engagement and share tips Provide additional tools such as an IHD (<i>PeakSaver</i>) and web portal to further engage participants about their energy consumption Provide clearer explanation of how to set up the IHD and its features by means of multiple mediums including a YouTube video Consider compatibility with other devices such as smartphones, tablets, apps or an online portal

4.0 NEW PROGRAMS FOR APPROVAL

This section outlines the projects for approval by the AER.

4.1 POOL PUMP TRIAL

The Pool Pump Trial allows customers to switch their pool pump energy supply from Domestic supply to Controlled Load 2 supply, saving them over 40% on their pool energy costs if they are currently on the Domestic regulated retail tariff. This could be savings of several hundred dollars per year but is dependent on the energy efficiency of their pool pump and the number of hours it is used per day. Customers will also receive \$150 after completing the switch to Controlled Load 2, to assist with electrician costs and any other costs.

The recruitment target number for the Pool Pump Trial is 250 residential customers located in selected suburbs.

4.1.1 NATURE AND SCOPE

The purpose of the trial is to control pool pumps through the Controlled Load 2 circuit in order to shift peak load to off-peak times. The trial's main objective is to quantify the peak demand reduction by investigating when customers use their pool pumps and the costs associated with controlled load conversion. The likelihood of customers disconnecting their pool pump from the Controlled Load 2 socket and plugging it into a non-Controlled Load 2 socket during peak times, and/or plugging other appliances into the Controlled Load 2 socket, will also be investigated, as this will undermine the peak demand reduction expected and would impact on revenue levels. The purpose of this project is to assess customer pool pump usage behaviour and control of pool pumps through the Controlled Load 2 circuit.

The offer to the customer is a \$150 financial incentive payment and a reduction in the energy cost incurred by pool pump operations. This could be savings of several hundred dollars per year but is dependent on the energy efficiency of the pool pump and the number of hours it is used per day.

4.1.2 AIMS AND EXPECTATIONS

The deliverables of this project are to report on:

1. Customer pool pump usage behaviour and validate usage information provided by customers against available measured usage data,
2. Acceptability of the payback timeframe to customers,
3. Likelihood of pool pumps being disconnected from Controlled Load 2 sockets and plugged into non-Controlled Load 2 sockets during peak times, and/or non-authorised appliances being plugged into the Controlled Load 2 socket, and
4. The level of demand reduction as a result of pool pump control through the Controlled Load 2 circuit.

4.1.3 PROJECT JUSTIFICATION

The high penetration of air conditioners and swimming pools across our distribution network, particularly in the western Sydney region, cause periods of peak demand that can be both very large and of short duration, resulting in poor utilisation of fixed assets. In addition, the generation and distribution systems tend to be at their lowest capacity during very hot weather when air conditioner and pool pump demands are likely to be at a maximum. Pool pump load is more readily interruptible than air conditioners. This trial aims to deliver utility control of customers' pool pump units via the Controlled Load 2 circuit.

In the longer term, any rollout of this program will be subject to demand management cost recovery (subject to future regulatory cost recovery mechanism). Regulators will need to be convinced that the program delivers the demand reduction expected.

4.1.4 IMPLEMENTATION PLAN

It was expected that the Pool Pump Trial would commence on 1 December 2013 and conclude on 31 March 2014. This project was delayed with recruitment commencing in June 2014 and concluding in 2015.

4.1.5 IMPLEMENTATION COSTS

Expenditure claim in 2013/14 financial year is \$17,420 OPEX and \$28,671 CAPEX covering the costs for marketing and communications, customer recruitment, customer payments, customer surveys and data loggers.

4.1.6 RESULTS

Results will be reported after the conclusion of the trial in 2015.

5.0 STATEMENT

Endeavour Energy confirms the funding of the projects contained in this report:

- a. are not recoverable under any other jurisdictional incentive scheme,
- b. are not recoverable under any other state or Commonwealth government scheme, and
- c. are not included in the forecast CAPEX or OPEX approved in the AER's distribution determination for the next regulatory control period, or under any other incentive scheme in that determination (such as the D-factor scheme for NSW).