AER price-responsive reporting guideline

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AUSTRALIAN ENERGY REGULATOR

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Amendment record

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1	9 September 2025	7

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Shortened forms and definitions

Term	Definition
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DRSP	Demand response service providers classify and aggregate the demand response capability of large market loads for dispatch through the NEM's standard bidding and scheduling processes as part of the wholesale demand response mechanism.
FCAS	Frequency control ancillary services
Forecast deviation	The difference between forecast load for a particular trading interval, developed for pre-dispatch and for dispatch, and the actual load during that trading interval.
Guideline	AER price-responsive reporting guideline
IRP	Integrated resource providers own, control or operate an integrated resource system connected to a transmission or distribution network.
MW	Megawatt
MWh	Megawatt hour
NEL	National Electricity Law
NEM	National Electricity Market
NER	National Electricity Rules
Report	AER price-responsive reporting
RERT	Reliability and emergency reserve trader
Unscheduled price-responsive resource	A resource that: 1) is not a scheduled resource 2) is capable of changing output or consumption depending on changes in forecast or actual spot prices 3) includes a voluntarily scheduled resource only if it is a hibernated voluntarily scheduled resource.
WDR	Wholesale demand response

1 Purpose of the AER price-responsive reporting guideline

We publish this AER price-responsive reporting guideline in accordance with rule 3.10C.3(g) of the National Electricity Rules (NER). This guideline specifies how we will fulfil our monitoring and reporting obligations to analyse the impact of unscheduled price-responsive resources on forecast deviations and the consequential impacts on the efficiency of the market.

1.1 Process for guideline revision

We may amend or replace any part of this guideline from time to time in accordance with the consultative procedures set out in Chapter 8 of the NER.[1] A date of issue will identify each version in the amendment record of this guideline.

Circumstances that may warrant amending or replacing part of this guideline include, but are not limited to:

- if there are material changes that alter our monitoring and reporting functions
- if there are material changes to the impact of unscheduled price-responsive resources on forecast deviations.

2 Approach to analysis

The objective of the AER's monitoring and reporting framework is for us, as part of our wholesale market monitoring and reporting functions under section 18C of the National Electricity Law (NEL), to provide transparency on the impacts of unscheduled price-responsive resources on efficient market outcomes to inform future market reform.[2]

This guideline sets out the approach we will take to meet our monitoring and reporting functions. It includes:

- defining the concept of efficient market outcomes
- outlining our analytical approach.

2.1 Purpose and scope of our functions

Through our reporting, we are required to monitor and report on the impacts of unscheduled price-responsive resources to inform what additional reform may be required to improve the efficiency of the market. In doing so, we are required to analyse the impact of unscheduled price-responsive resources on the efficiency of the market and make recommendations for how to improve efficiency based on our findings.

[1] NER, cl 3.10C.3(g).

[2] NER, cl 3.10C.3(a).

We must prepare and publish an annual report on the impact of unscheduled price-responsive resources for the previous financial year by 31 December each year. The report must analyse the impact of unscheduled price-responsive resources on forecast deviations, and the consequential impacts on the efficiency of the market, including estimates of:

1) additional amounts paid to generators, integrated resource providers (IRP) and demand response service providers (DRSP) for different quantities and prices of electricity and wholesale demand response (WDR) that are dispatched
2) the costs incurred by generators, IPRs and DRSPs for different quantities and prices of electricity and WDR that are dispatched
3) additional amounts paid to:
    i. ancillary service providers for additional market ancillary services that are enabled
    ii. cost recovery market participants for ancillary service transaction payments under clause 3.15.6AA of the NER
4) additional amounts paid under the Reliability and Emergency Reserve Trader (RERT) for scheduled reserves that are dispatched and unscheduled reserves that are activated
5) additional greenhouse gas emissions resulting from the relative increases referred to in (1) to (4) above.

The report must also include:

6) identification of trends and outcomes on the efficiency of the market as a result of the matters set out above when compared with previous financial years (as applicable)
7) our recommendations for how to improve the efficiency of the market in respect of the matters set out above
8) any other relevant information the AER considers necessary or convenient to include in the report.

2.2 Defining efficient market outcomes

Our monitoring and reporting obligations require that we monitor and report on the impacts of unscheduled price-responsive resources on forecast deviations and consequential impacts on efficient market outcomes.

To examine the extent to which unscheduled price-responsive resources impact whether the market is functioning efficiently, we will analyse and discuss inefficiencies in the market, their causes and whether they are likely to be detrimental to the efficient functioning of the market in the long term. Inefficiencies may include:

- higher spot prices and FCAS and RERT costs that lead to higher costs for consumers
- lower spot prices that create inaccurate price signal for resource availability.

While the National Energy Laws (NEL) do not provide an explicit definition of efficiency, it is a well understood concept in economic literature. Economic efficiency is concerned with maximising overall welfare (or the sum of consumer and producer surplus) in a market given the available resources. Consumer surplus is the difference between the value consumers

place on a good or service and the price they actually pay. Producer surplus is the difference between the price producers receive and their marginal costs of production.[3]

Economic efficiency has 3 dimensions:[4]

- allocative efficiency – resources are allocated to their highest valued uses
- productive efficiency – the value of resources used are minimised for a given level of outputs
- dynamic efficiency – resources are allocated efficiently over time.

We will discuss the impact of unscheduled price-responsive resources however, a range of factors, such as participant conduct, market design and other external features, can also create inefficiencies in each of these categories.

2.3 Impact of unscheduled price-responsive resources on forecast deviations

Forecast deviations are the result of multiple factors which include, but are not limited to, unscheduled price-responsive resources. This means that while the scale of the forecast deviations are known, the amount caused by unscheduled price-responsive resources is not known.

To estimate the megawatt (MW) impact of unscheduled price-responsive resources on forecast deviations, we will use available information from the Australian Energy Market Operator's (AEMO) unscheduled price-responsive reporting, forecast deviations and any other relevant information. Given the impact of unscheduled price-responsive resources is unknown, we may use a range to account for the uncertainty of the estimate. As the impact of unscheduled price-responsive resources is expected to be immaterial unless spot prices are very negative or high, we may also use an estimated impact of 0 MW for intervals where the spot price is within a threshold. Any thresholds would be estimated each year and informed by the most recent AEMO unscheduled price-responsive reporting and price sensitivity analysis as we expect the impact of unscheduled price-responsive resources may change over time. If we do use a threshold, we will publish the threshold alongside the estimate. For example, if we find that the impact of unscheduled price-response is immaterial where the spot price was between –$300/MWh and $300/MWh then we may estimate a 0 MW impact for intervals with a spot price within this threshold. This means we would only examine periods where the spot price was less than –$300/MWh or greater than $300/MWh.

2.4 Analytical approach

This section sets out the analytical approach we will take to fulfil our monitoring and reporting obligations to prepare and publish annual reports that analyse the impact of unscheduled price-responsive resources. This includes:

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3 Pindyck, R.S. and D.L. Rubinfeld (2001), Microeconomics, Fifth Edition (International Edition), Pearson Education Inc (New Jersey), pp. 123, 269.

4 For example, see The National Competition Policy: Report by the Independent Committee of Inquiry (F. Hilmer, M. Rayner and G. Taperell), 1993, AGPS, Canberra, p. 4.

- additional amounts paid to generators, IRPs and DRSPs
- costs incurred by generators, IRPs and DRSPs
- additional amounts paid to ancillary service providers and cost recovery market participants
- additional amounts paid under RERT
- additional greenhouse gas emissions
- identification of trends and outcomes on the efficiency of the market and recommendations for how to improve the efficiency of the market.

2.4.1 Additional amounts paid to generators, IRPs and DRSPs

For each 5-minute interval and region we estimate the impact of unscheduled price-responsive resources on the forecast deviation, we will estimate the additional amounts paid to generators, IRPs and DRSPs for generation and WDR by multiplying the difference between:

- the spot price based on the demand forecast at dispatch
- an estimate of a counterfactual spot price based on the estimated impact of unscheduled price-responsive resources on the demand forecast

with the relevant quantity for each participant type:

- generator: the metered quantity of generated energy (MWh)
- IRP: the metered quantity of generated energy or WDR (MWh)
- DRSP: the metered quantity of WDR (MWh).

We will estimate the counterfactual spot price using the simplified bid stack approach set out in the box below.

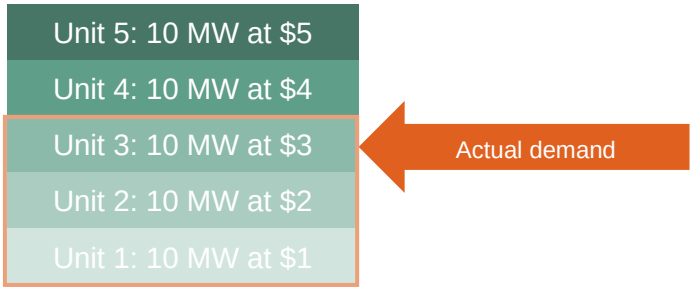
Simplified bid stack approach

Using existing data on the bid stack for each 5-minute interval and region at dispatch, we will use the estimated impact of unscheduled price-responsive resources to estimate a counterfactual dispatch scenario. This approach simplifies the bidding and dispatch processes and does not account for any network constraints or interconnector flows.

Example:

In the simplified bid stack below, the demand forecast was 40 MW so Units 1, 2, 3 and 4 were dispatched at 10 MW each and the spot price was $4.

Actual demand was 15 MW lower (note: in this example it is assumed the entire demand forecast deviation is due to unscheduled price-responsive resources). This means that in a counterfactual scenario, Units 1 and 2 would have been dispatched for 10 MW each and Unit 3 would have been dispatched for 5 MW and the counterfactual spot price would have been $3.



In this example, the metered generation paid for is 25 MW and the difference between the spot price and counterfactual spot price is $1. This means the estimate of the additional amount paid due to unscheduled price-responsive resources would be 25 MW x $1 = $25.

There may be cases where the counterfactual price is the same as the spot price and/or where the same units would have been dispatched.

There may be cases where the estimated impact of unscheduled price-responsive resources results in a higher counterfactual spot price than the actual spot price. This would result in estimated lower amounts paid to market participants and will be included in our estimate of the net additional amounts paid.

2.4.2 Costs incurred by generators, IRPs and DRSPs

There are several challenges with attempting to estimate the flow through impact of forecast deviations on the costs incurred by generators, IRPs and DRSPs.

2.4.2.1 Dynamic and distributed response to balance supply and demand

The market has several mechanisms to balance supply and demand to maintain a stable frequency range for security and reliability. These mechanisms act dynamically and mean actual generation equals actual demand for electricity, despite forecast deviations and/or variance by generators away from their dispatch instructions.

Generators are obligated to provide mandatory primary frequency response.[5] This is likely to distribute the management of unscheduled price-responsive resources across many generators. For example, the forecast of price and the target for every dispatchable generator is published at the start of a 5-minute dispatch interval. However, if a high price is forecast, then an unscheduled price response may cause demand to fall below the forecast and the supply/demand imbalance would cause the power system frequency to increase. To maintain a stable frequency, the mandatory primary frequency response obligations means that every generator that can, must immediately respond to this frequency deviation by lowering their output. This means the imbalance is shared across most generators and the impact on any individual generator is not likely to be material. Generators that provide

[5] AEMC, Primary frequency response incentive arrangements, 2022.

mandatory primary frequency response are rewarded by paying a lower proportion of frequency control ancillary services (FCAS) regulation costs.

Demand/supply imbalance that leads to a change in frequency is also managed through regulation FCAS that AEMO schedules every 4 seconds. Generators dispatched for regulation FCAS will also reduce their output – probably at a greater level than other non-FCAS enabled plant. The FCAS providers are compensated for this via the FCAS revenue received.

2.4.2.2 Sub-optimal operation

Some thermal generators may incur additional costs in cases where they consume fuel at a sub-optimal efficiency due to the requirement to generate a different amount of energy than forecast via their dispatch instructions. For example, a generator may generate at a lower level than the forecast dispatch instruction because of its mandatory primary frequency response obligation or if it provides regulation FCAS services. This may cause additional costs from operating the boiler at a higher pressure and temperature in anticipation of moving to a higher operating level. We are not proposing to use the bid stack approach to assess these costs. We anticipate the additional costs associated with sub-optimal fuel efficiency to be much less than the MW difference multiplied by the generator's short run marginal costs. Other technology generators, such as hydro and battery do not experience a fuel efficiency impact. If output is lower than anticipated the stored energy is not consumed and is available for future use. Wind and solar is generally permitted to operate at the availability of the fuel source so it is also not impacted.

The impact on costs is only derived from the MWh affected by unscheduled price-responsive resources, not the total MWh generated. We consider that the benefit of developing a process to estimate the anticipated immaterial costs would not outweigh the complexity and burden to produce the estimates and burden on market participants required to provide information.

We consider any additional costs incurred by generators, IRPs and DRSPs for additional generation and WDR dispatched due to the impact of unscheduled price-responsive resources on forecast deviations are likely to be immaterial.

2.4.3 Additional amounts paid to ancillary service providers and cost recovery market participants

AEMO is required to publish its best estimate of the impact of unscheduled price-responsive resources on forecast deviations for additional amounts paid to:

i) ancillary service providers for additional ancillary services that are enabled

ii) cost recovery market participants for ancillary service transaction payments under clause 3.15.6AA.

To ensure consistency and support AEMO's role as the single source of information for the impact of unscheduled price-responsive resources on forecast deviations, we will re-publish and attribute AEMO's estimates to the extent it relates to additional market ancillary services that are enabled and ancillary service transaction payments under clause 3.15.6AA. AEMO's estimates will be used to inform our discussion of the consequential trends and outcomes on the efficiency of the market.

2.4.4 Additional amounts paid under RERT

For each 5-minute interval that RERT was dispatched, we will estimate the additional amount paid as a portion of the total amount paid. The portion will be equal to our estimate of the impact of unscheduled price-responsive resources on the forecast deviation compared with the quantity of RERT dispatched.

We will use usage charges, which are based on the RERT contract price and MWh quantity dispatched, for the total amount paid for scheduled reserves. We have chosen to exclude availability charges because these amounts are paid for each day the RERT is available regardless of whether the RERT is dispatched.

We will use usage/activation charges, which are based on the RERT contract price and MWh quantity dispatched, for the total amount paid for unscheduled reserves. We will also include pre-activation charges in the total amount paid if no RERT would have been dispatched if not for the impact of unscheduled price-responsive resources on the forecast deviation.

2.4.5 Additional greenhouse gas emissions

We expect any additional greenhouse gas emissions that may arise due to the impact of unscheduled price-responsive resources on forecast deviations will likely be from the generation mix being more emission-intensive for the MWh affected by unscheduled price-responsive resources. For example, if the impact of unscheduled price-responsive resources on the forecast deviation for a dispatch interval is 10 MWh, then only the generation mix for 10 MWh would be impacted, not the total quantity of energy generated that interval.

The change generation mix between dispatch instruction and actual generation is driven by which generators provide mandatory frequency response and scheduled to provide FCAS to keep supply and demand in balance. Whether emissions are higher overall depends on the relative changes of coal, gas and battery[6] compared to wind, solar and hydro.

Coal and gas generators may also have higher emissions per MWh if the plant is operated in a sub-optimal way. However, given the impacts described in section 2.4.2, the impact on individual plants is likely to be immaterial.

We expect these additional emissions will be difficult to identify and likely to be immaterial.

2.4.6 Identification of trends and outcomes on the efficiency of the market and recommendations for how to improve the efficiency of the market

We will use the analysis set out in this guideline and AEMO's reporting to identify trends and inform our discussion of outcomes on the efficiency of the market and recommendations.

Trends may include year-on-year and/or quarter-on-quarter comparisons as appropriate. We may also discuss the estimated scale of the impact of unscheduled price-responsive resources compared with the total payments and emissions.

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6 The emissions intensity of a battery is the grid average at the time of charging, adjusted for losses.