public interest
ADVOCACY CENTRE

Submission to Primary Frequency Response rule change

14 November 2019

Level 5, 175 Liverpool Street, Sydney NSW 2000
Phone: 61 2 8898 6500 • Fax: 61 2 8898 6555 • www.piac.asn.au

About the Public Interest Advocacy Centre

The Public Interest Advocacy Centre (PIAC) is an independent, non-profit legal centre based in Sydney.

Established in 1982, PIAC tackles barriers to justice and fairness experienced by people who are vulnerable or facing disadvantage. We ensure basic rights are enjoyed across the community through legal assistance and strategic litigation, public policy development, communication and training.

Energy and Water Consumers' Advocacy Program

The Energy and Water Consumers' Advocacy Program (EWCAP) represents the interests of low-income and other residential consumers of electricity, gas and water in New South Wales. The program develops policy and advocates in the interests of low-income and other residential consumers in the NSW energy and water markets. PIAC receives input from a community-based reference group whose members include:

- NSW Council of Social Service;
- Combined Pensioners and Superannuants Association of NSW;
- Ethnic Communities Council NSW;
- Salvation Army;
- Physical Disability Council NSW;
- St Vincent de Paul NSW;
- Good Shepherd Microfinance;
- Affiliated Residential Park Residents Association NSW;
- Tenants Union;
- Solar Citizens; and
- The Sydney Alliance.

Contact

Craig Memery
Public Interest Advocacy Centre
Level 5, 175 Liverpool St
Sydney NSW 2000

T: (02) 8898 6522
E: cmemery@piac.asn.au

Website: www.piac.asn.au

Public Interest Advocacy Centre

@PIACnews

The Public Interest Advocacy Centre office is located on the land of the Gadigal of the Eora Nation.

Contents

Context for frequency control

There are many transitions underway in energy systems in Australia and abroad. Given the uncertainty inherent in this environment, PIAC's view is that the long-term interest of consumers in the NEM is best served by developing adaptable long-term plans to manage the risks associated with uncertainty rather than relying heavily on narrow forecasts.

One transition fundamental to managing system frequency, but seldom considered, is from a predominantly mechanical electricity system to a predominantly electronic one. This transition is occurring in concert with others – notably from centralised to decentralised, and dispatchable to variable – with common and interrelated drivers, including the falling cost of power electronics and the proliferation of inverter-connected generation and storage, from small scale and demand-side to large scale and transmission-connected.

The 'mechanical' system we are moving from is one where electrical energy is provided by centralised clusters of large generation plant, and consumed instantaneously, some pumped hydro and hot water storage notwithstanding. The generators are 'direct connected' AC machines that have to be electrically synchronised, effectively operating as a single spinning mass – they both provide, and are dependent on, the collective inertia of this mass.

The 'electronic' system we are moving to involves energy being generated from multiple, often dispersed and smaller sources, with some consumed instantaneously and the remainder stored for later consumption. The defining characteristic is that generation and storage plant in this system includes full electronic power conversion, mainly by devices called rectifiers and inverters, so the task of maintaining and synchronising frequency is simpler and not linked to capacity or output. The generators, batteries and power electronics themselves neither provide, nor depend on, material amounts of 'traditional' inertia in the system. They can, however, provide 'synthetic' or artificial inertia, which has substantively different attributes – some advantageous and some disadvantageous - to traditional inertia.

Managing frequency in an all-mechanical or all-electronic system is relatively straight forward, but the transition from the former to the latter presents many challenges. In a predominantly mechanical system, some amount of electronic generation has little or no negative impact, but the reverse is not true: a single large-scale mechanical thermal generator requires the system to provide enough inertia to ride through a generator fault without threatening the security of the system, irrespective of the composition of the wider generation fleet.

Increasing electronic generation, and decreasing the overall penetration of mechanical generation, may require changes to the system operation in the form of inertia, frequency control and/or other services needing to be procured. In a system with a changing mix of mechanical and electronic generation, there is a challenge in identifying the most appropriate ways to value and incentivise the services that efficiently maintain reliability and security, along with who should pay for which services and how trade-offs can be managed.

Principles for addressing the need for frequency control

Risk allocation and cost recovery

With most questions of risk allocation, PIAC considers that risk should be borne by those best placed to manage it. Distinct from the allocation of risks, is the recovery of costs – noting that while the costs and risks are related, they are not the same, and different principles apply.

For recovering costs, PIAC considers it more efficient and fairer to use a 'beneficiary-pays' principle, so that costs are allocated those who benefit from a given investment or action. Where there are multiple beneficiaries, the costs should be recovered proportionally to their share of the benefits. Where it is not practical and transparent to identify the beneficiaries or confidently measure the benefits, a causer-pays approach could be used. Cross-subsidies should only be in place where they are accepted by informed preferences from the providers of that subsidy – particularly if they are consumers – or are immaterially small.

In applying these principles to the treatment of primary frequency response, the nature of benefits and to whom they accrue should be considered. Noting the need to remain adaptable to changing circumstances, allocating responsibilities or obligations to maintain tighter control of power system frequency need to reflect that:

- the need to maintain tight control of frequency may not increase indefinitely and could conceivably reduce; and
- the distribution of direct benefits (as in, those consumer and/or market participants whose presence imposes a need for tighter frequency control) may change substantially over time.

This is illustrated in the example below.

The changing need for frequency control

In 2030, the NEM will still be partway in the transition from a mechanical to an electronic system – with material volumes of both connected. In this scenario, the beneficiaries of tighter frequency control would be relatively broad and may include:

- Groups of asynchronous generators such as wind turbines (particularly older model wind turbines).
- Individual synchronous thermal generators with units of sufficient size to impact system frequency when they cut out unexpectedly (these are the generators that have traditionally provided inertia and frequency response under normal operating conditions).
- Some electronic generators that are particularly sensitive to the rate or magnitude of changes in frequency (these generators may also provide limited inertia, artificial inertia or frequency response).
- Individual large energy users that have:
    - Loads, particularly motors, of sufficient size to affect system frequency when they are turned on, turned off or cut out
    - Equipment that is particularly sensitive to the rate or magnitude of changes in frequency.
- Mass-market energy users.

A plausible later scenario is that in 2040 the grid will be closer to a completely electronic system characterised by smarter electronics, in both generation and load and on both the supply and demand side, including a high level of DER, and two or three remaining large thermal generators.

By contrast, under this later scenario, the main beneficiaries of tighter frequency control would likely be a smaller group of parties, such as:

- The remaining synchronous thermal generators that are of sufficient size to impact system frequency when they cut out unexpectedly. These may also be providing inertia under normal operating conditions.
- Individual large energy users that have:
    - Loads, particularly motors, of sufficient size to effect system frequency when they are turned on, turned off or cut out
    - Equipment that is particularly sensitive to the rate or magnitude of changes in frequency.

Responses to consultation questions

QUESTION 1: ISSUES RAISED BY AEMO IN ITS RULE CHANGE REQUEST, MANDATORY PRIMARY FREQUENCY RESPONSE

PIAC tends to agree that the issues raised are currently being experienced in the NEM. However, as described earlier in this submission, while these issues are current, this may change in the future. The types of issues and their relative consequences in the NEM will change as the power system transitions towards one primarily consisting of electronic rather than mechanical systems. In making any rule change, the AEMC should remain cognisant of this fact.

QUESTION 2: ISSUES RAISED BY DR SOKOLOWSKI IN HIS RULE CHANGE REQUEST, *PRIMARY FREQUENCY RESPONSE REQUIREMENT*

See Question 1.

QUESTION 3: ISSUES RAISED BY AEMO IN ITS RULE CHANGE REQUEST, *REMOVAL OF DISINCENTIVES TO PRIMARY FREQUENCY RESPONSE*

PIAC seeks to engage further on the issues related to the disincentives to providing primary frequency response. We submit that the issues raised here are, at least to some extent, related to the interpretation of the Rules rather than the current wording of the Rules themselves. PIAC would prefer that such issues be addressed, if possible, without a change to the Rules, for instance through operating conditions, guidance documents or guidelines. However, given the nature of the concerns raised, we are not opposed to implementing a change to the Rules to address these issues.

QUESTION 4: CAPABILITY OF GENERATION PLANT AND THE IMPLEMENTATION PROCESS FOR AEMO'S PROPOSED MANDATORY PFR REQUIREMENT

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 5: AEMO'S EXPECTED COSTS AND BENEFITS FOR ITS PROPOSED RULE, MANDATORY PRIMARY FREQUENCY RESPONSE

While we consider that the proposed changes will increase power system frequency stability, the trade-off between the cost incurred and the benefits derived by consumers must remain central to any decision of whether or not to make a change.

Increasing, or even maintaining, system security levels will necessarily have a cost impact and this must be traded off against the benefit expected to accrue to consumers as described in the National Electricity Objective. PIAC does not support introducing obligations that increase system security without balancing this against the value consumers place on this and their willingness to pay.

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 6: DR SOKOLOWSKI'S EXPECTED COSTS AND BENEFITS FOR HIS PROPOSED RULE, PRIMARY FREQUENCY RESPONSE REQUIREMENTS

PIAC is concerned by the proposal to introduce a mandatory frequency response capability in the connection standards as this will only apply to new or modified generation connections – and not to incumbent generators. This is problematic for two reasons:

- It means that obtaining the necessary level of primary frequency responsive generators will be slower than if it were to also be introduced for existing generators. Any benefits of improved system frequency control, to the extent it exists, will, therefore, take longer to be delivered.

- It is potentially counter to the beneficiary-pays principle. As described earlier in this submission, as the transition from a mechanical to an electronic system progresses, the primary beneficiaries of tighter frequency control will be the remaining synchronous thermal generators who will not be subject to the proposed requirement. Instead, the requirement would be imposed on newer generation which is unlikely to benefit from improved frequency control.

QUESTION 7: AEMO'S PROPOSED RULE, REMOVAL OF DISINCENTIVES TO PRIMARY FREQUENCY RESPONSE

As noted in Question 3, the issues raised here are, at least to some extent, related to the interpretation of the Rules rather than necessarily their current wording. PIAC prefers that such issues be addressed, if possible, without a change to the Rules, for instance through operating conditions, guidance documents or guidelines. However, given the nature of the concerns raised, we are not opposed to implementing a change to the Rules to address these issues.

QUESTION 8: AEMO'S EXPECTED COSTS AND BENEFITS ASSOCIATED WITH THE PROPOSED RULE, *REMOVAL OF DISINCENTIVES TO PRIMARY FREQUENCY RESPONSE*

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 9: DR SOKOLOWSKI'S PROPOSED CHANGES TO ADDRESS DISINCENTIVES TO THE PROVISION OF PRIMARY FREQUENCY RESPONSE

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 10: AEMO'S RESPONSIBILITY TO MAINTAIN AND IMPROVE POWER SYSTEM SECURITY

PIAC considers AEMO's role in maintaining and increasing system security is an important one, but not should be unbounded. Increasing, or indeed even maintaining, system security levels will necessarily have a cost impact and this must be traded off against the benefit expected to accrue to consumers as described in the National Electricity Objective. PIAC does not support introducing obligations that increase system security beyond the value paying consumers place on this.

QUESTION 11: INERTIA AND INERTIA SUPPORT ARRANGEMENTS IN THE NER

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 12: ASSESSMENT FRAMEWORK

PIAC generally supports the AEMC's proposed assessment framework.

As noted above, PIAC considers that risk and responsibility should be borne by those best placed to manage it. Distinct from the allocation of risks, is the recovery of costs – noting that while the costs and risks are generally related, they are not necessarily the same. For recovering costs, PIAC considers it more efficient and fairer to use a 'beneficiary-pays' principle, so that costs are allocated those who benefit from a given investment or action as described earlier in this submission.

PIAC also agrees with the principle of ensuring regulatory arrangements are flexible or adaptable to changing circumstances and notes that the need for frequency control will change as the NEM transitions from a mechanical to an electronic system. An important aspect of this is that obligations (and hence costs) are not ratcheted up or sustained when the value of the services they provide plateaus or diminishes. Further, it is also important that arrangements do not continue to recover costs from those that are no longer beneficiaries of a service.

While PIAC agrees with the final principle of "transparent, predictable and simple," we consider the differences between these three aspects and their interactions deserves investigation.

For instance, we consider that transparency and simplicity are separate principles with different applications. Simplicity should be optional, as sometimes complexity is unavoidable and, indeed needed. While desirable, simplicity should always be subordinate to principles that promote efficiency and fairness. Similarly, while predictability is important, it must also be subordinate to principles delivering efficiency and fairness and be balanced with principles delivering flexibility and adaptability. Transparency is essential, and should be treated as a pre-condition rather than traded off against other principles.

QUESTION 13: TECHNICAL REQUIREMENTS OF EFFECTIVE PRIMARY FREQUENCY RESPONSE

As noted earlier in this submission, the benefits of tighter system frequency control and to whom these benefits accrue will change as the NEM transitions towards a predominantly electronic power system. This highlights the need to remain adaptable to changing circumstances such that determining technical requirements and allocating responsibilities or obligations need to reflect:

- the need to maintain tight control of frequency may not increase indefinitely and could conceivably reduce; and
- the distribution of direct benefits (as in, those consumer and/or market participants whose presence imposes a need for tighter frequency control) may substantially change over time.

In doing so, and as noted in Question 12, simplicity should be optional, as sometimes complexity is unavoidable and, indeed needed. While desirable, simplicity should always be subordinate to efficiency and fairness.

Similarly, while predictability is important, it must also be subordinate to principles that deliver efficiency and fairness and balanced with principles delivering flexibility and adaptability.

Transparency is essential, and should be treated as a pre-condition rather than traded off against other principles.

We look forward to engaging with the AEMC and stakeholders to discuss this further.

QUESTION 14: TEMPORAL CONSIDERATIONS

See Question 12.

QUESTION 15: CONSIDERING THE COST BENEFIT TRADE-OFF FOR THE PROVISION OF PFR

As noted earlier in this submission, PIAC considers it more efficient and fairer to use a 'beneficiary-pays' principle, so that costs are allocated to those who benefit from a given investment or action. Where there are multiple beneficiaries, the costs should be recovered proportionally to their share of the benefits. Where it is not practical and transparent to identify the beneficiaries or confidently measure the benefits, a causer-pays approach could be used. Cross-subsidies should only be in place where they are accepted by informed preferences from the providers of that subsidy – particularly if they are consumers – or are immaterially small.