Submission

Infigen

Level 17, 56 Pitt St,
Sydney NSW 2000
Australia

T 02 8031 9900
infigenenergy.com

Infigen Energy Ltd
ABN 39 105 051 616

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Subject Frequency Control Rule Changes

Overview:

Infigen Energy (Infigen) welcomes the opportunity to make a submission. Infigen delivers reliable energy to customers through a portfolio of wind capacity across New South Wales, South Australia, Victoria and Western Australia, including both vertical integrated assets and PPAs. Infigen also owns and operates a portfolio of firming capacity, including a 123 MW open cycle gas turbine in NSW and 120 MW of dual fuel peaking capacity in SA, and a 25 MW / 52 MWh battery in SA. Our development pipeline has projects at differing stages of development covering wind, solar and batteries and we are also exploring further opportunities to purchase energy through capital light PPAs. This broad portfolio of assets has allowed us to retail electricity to over 400 metered sites to some of Australia's most iconic large energy users.

Infigen supports the AEMC's work package, and thanks the AEMC for providing a well-considered paper with clear questions for consultation. Our key comments are:

- FFR should be implemented as soon as practical, to ensure that frameworks are in place for when they are needed.
- For both FFR and PFR, establishing new, clearly defined, real-time ancillary service markets would provide the greatest transparency, certainty of response to the market, and clearest signals for investment (rather than relying on aging resources that will inevitably exit the market more rapidly than current closure dates suggest).
- Reviewing and clearly defining the FOS is critical, and the FOS should act as both a standard *and* as a target, with the quantity of each service procured adjusted over time to minimise costs to consumers (as required by the NEO) while still meeting the standard.

Infigen has provided some more detailed comments to AEMC's questions below.

1. FFR

QUESTION 1: PROBLEM DEFINITION AND REFORM OBJECTIVE — FFR RULE CHANGE

What are stakeholders' views on the problem definition and reform objective for FRR as set out in section 4.5.3 of the directions paper?

We agree with the AEMC's assessment that there is a missing market for FFR, and that existing market and regulatory arrangements do not explicitly provide for effective utilisation of FFR services to help control system frequency at the lowest cost.

The AEMC suggested that under the step-change ISP scenario, R6 requirements could double by 2025. We note that the step-change scenario is already out of date, with legislated NSW policy already far exceeding the step-change figures. We expect that future targets will be even higher, given Australia's commitments under the Paris Agreement to work towards limiting warming to 1.5 degrees and the net-zero by 2050 targets of all states and territories.

QUESTION 2: FFR PROCUREMENT

In relation to the discussion of potential procurement arrangements for FFR services in section 4.7.1 of the directions paper:

- What are stakeholders' views on the pros and cons of establishing new FCAS market arrangements for FFR services versus revising the existing arrangements to incorporate FFR within the fast raise and fast lower services?
- Do stakeholders agree that the existing arrangements for contingency FCAS provide an appropriate model for FFR market arrangements?
- What are stakeholders' views on how each of the proposed procurement arrangements for FFR would interact with the arrangements for the existing contingency services?
- Are there any aspects of the existing contingency FCAS arrangements that should be varied for procurement of FFR services?

QUESTION 3: FFR PRICING ARRANGEMENTS

In relation to the discussion of potential pricing arrangements for FFR services in section 4.7.2 of the directions paper:

- What are stakeholders' views on the pros and cons of maintaining the existing FCAS pricing arrangements for FFR services?
- What are stakeholders' views on the potential pros and cons of incorporating performance based multipliers into the pricing arrangements for FFR services?
- Do stakeholders have any other comments or suggestions in relation to the pricing arrangements for FFR services?

The key role of the proposed FFR service is to ensure that AEMO has sufficient resources to manage system security in an efficient way (including by trading off various services).

Infigen supports establishing an explicit FFR market, modelled on the existing contingency FCAS markets. A well-defined FFR market will provide a clear investment signal with greater certainty for future participants.

- A new market for FFR guarantees that the service is provided with the desired timeframe, while restructuring the fast services does not guarantee this (if the current 6s timing definition is maintained for fast services).
- Current contingency FCAS market arrangements are broadly appropriate for FFR, particularly the hand-off between existing fast, slow and delayed responses.
- Procurement should be in line with current contingency FCAS procurement methods (if a new FFR market is formed) with the quantity procured to be determined by AEMO based on a co-optimisation of (at least) FFR, inertia, and contingency size. We acknowledge that some minimum level of FFR may be appropriate under all circumstances (e.g., even under high inertia conditions) to manage system security.

The pricing scalars approach would provide a price signal for delivering a faster response within the (say) fast raise service. However:

- This does not necessarily provide certainty to AEMO that the faster response would be available if required for system security. This could only be guaranteed if AEMO preferentially dispatched resources with high scaling factors (i.e. faster response) – at which point, a separate market would be more efficient.[1]
- Furthermore, the FFR service is likely to have a sharper cooptimisation (compared to the quantity of fast raise service) with other related services, including the level of inertia and the size of the maximum contingency/protected event. Therefore, providing AEMO an explicit trade-off will be critical.
- Well-defined FFR and FCAS markets should remove the need for both price and volume scalars. Instead, AEMO can define and procure the required (faster) response more acutely through an established FFR market.
- We note there could be a role for pricing scalars within the FFR market itself to incentivise even faster responses (if this is desirable to AEMO), but this might complicate dispatch and settlement if higher costs must be recovered from consumers for some resources.

Constraints on registration of response

A broader review of the FCAS Rules and the MASS will be needed to ensure that all resources can participate. This includes appropriate droop settings, deadband settings, as well as benchmark frequency ramps that will

[1] Note that the usefulness of price scalars is somewhat in contrast to the existing volume scaling relationships in the fast services where the *energy* delivered within 6 seconds determines the extent of the frequency change. This is therefore an appropriate (if imperfect, as subsequently discussed) proxy for the necessary response, and so energy delivered is used to determine the registered response as a volume scalar.

need to be defined to ensure that very fast ramping resources can participate fully in the FFR market. This will ensure that AEMO has the tools to manage the system and the most efficient mix of resources can be utilised.

For example, the MASS currently limits the response from fast-response generators (such as batteries) based on the standard frequency ramp used to benchmark fast services. We note that the Instant Ramp shown in AEMC's Fig 4.6 is not achievable due to the limitations of this frequency ramp, and also highlight the downstream impacts that volume-weighted responses have on registerable capacity in the slow markets.

Some batteries also have more restrictive limits than others on droop settings, imposed by AEMO, which means not all batteries can maximise their contribution to the current FCAS markets. Agreeing on a uniform set of parameters (or range of parameters, e.g., allowing developers to select within a range of droop settings) for all providers with a view to maximising participation in FFR will be critical for an efficient market.

Rather than the time-average MW approach currently used for Contingency FCAS, FFR provision could be measured as the MW response at 0.5-2 seconds of frequency step-changing from 50Hz to 50.5 Hz, for example. This is similar to a recent request for tender for the provision of FFR services which does not use frequency ramps.

QUESTION 4: FFR COST ALLOCATION

In relation to the discussion of arrangements for the allocation of costs associated with FFR services set out in section 4.7.3 of the directions paper:

- What are stakeholders' views on the arrangements for the allocation of costs for FFR services?
- Would it be appropriate for the cost of FFR services to be allocated in a similar way to the existing arrangements for the allocation of contingency FCAS costs?

The AEMC has identified the key issues in terms of cost allocation, and we are broadly supportive of recovering FFR costs similar to the existing contingency FCAS services.

We note that further input from AEMO on the volume of FFR procurement may be helpful. For example, if the FFR volume was being particularly driven by managing protected events (e.g., major transmission failure), it may be more appropriate to recover both Raise and Lower FFR costs from all participants and customers.

QUESTION 6: VALUATION OF INERTIAL RESPONSE

In relation to the potential arrangements for the valuation of inertial response described in section 4.8.1 of the directions paper:

- What are stakeholders' views on the valuation of inertial response as part of the contingency services, including the proposed new FFR contingency services?

- What are stakeholders' views on the current governance arrangements for contingency services; where the detailed service specification is determined by AEMO and documented in the MASS? (Is it appropriate for the NER to provide further guidance on how inertial response should be considered in the MASS?)

Infigen supports a technology neutral approach to the delivery of the FFR service: a MW change in response to a frequency excursion.

Currently, inertial response is excluded from the contingency FCAS response, based on AEMO's expected response given the facility's inertia constant.

We note that inertial response is a qualitatively different response to the Contingency FCAS markets, responding to RoCoF (slowing and arresting the frequency change) rather than frequency deviations (arresting the frequency change and then bringing frequency back to within the NOFB). Counting the inertial response towards FFR would require careful consideration of "double counting" both from a settlements perspective but also a system security perspective (e.g., AEMO's FFR procurement quantity would need to take that into account)

In any case, FFR does not remove the technical or economic need to maintain some inertia in the system, and this will likely require a dedicated procurement method. More broadly, in our view inertia is best considered a network service and should be procured on investment timeframes by TNSPs, similar to the proposed system strength arrangements. TNSPs should purchase inertia *ahead* of a shortfall, ensuring that the grid can operate efficiently into the future. This could include TNSPs purchasing new assets, developing transmission, or contracting with existing resources. This is far more efficient than the current 'do no harm' approach if it applied to inertia, which increases the unit cost of this service provision due to it being uncoordinated. Synchronous condensors and grid forming batteries are likely to be the dominant providers of this service in the near future.

QUESTION 7: PRICE RESPONSIVE DEMAND FOR CONTINGENCY SERVICES

In relation to the discussion of arrangements for incorporating price responsiveness into the procurement of contingency services in the NEM set out in section 4.8.2:

- What are stakeholders' views on the potential pros and cons associated with the implementation of a "demand curve" approach to procurement of FCAS?
- What are stakeholders' views on the priority of such a change to the market frameworks?
- If such an approach was to be implemented, what are stakeholders' views on the appropriate governance arrangements, including the potential oversight role for the AER?

In principle, a demand curve approach (procuring more when the service is cheap) could deliver value to consumers, to the extent that the demand curve is set appropriately. Increased contingency services (beyond what is required for system security) may improve the resilience of the NEM to non-credible events, but it is difficult to quantify those benefits.

We suggest that FFR is particularly suited to a demand curve approach as additional FFR is likely to assist with a broad range of events, and the cost of the service is not likely correlated with its benefits (i.e., additional FFR will have additional benefits to consumers even when low cost, by helping to manage non-credible contingencies).

Infigen would suggest that implementing a fixed requirement (which might vary based on system conditions, but not on the cost of the service), similar to the existing FCAS services, would be an appropriate first step. Once operational experience and modelling studies increase, the benefits of further procurement could be explored.

QUESTION 8: INTERACTION BETWEEN MANDATORY PFR & FFR ARRANGEMENTS

What are stakeholders' views in relation to the potential interactions between new FFR arrangements and the Mandatory PFR arrangement?

Currently, the MASS allows for response within the normal band to be registered towards the contingency FCAS services. This removes disincentives for providing PFR, but creates a new risk: that the response from these units will be used up due to normal frequency variation at the time of a contingency event.

This could be managed by procuring higher levels of contingency FCAS, however we note that the interaction between the services is ultimately a question of risk management. For example, in the WEM, load follow (regulation) has been counted towards the spinning reserve (contingency) requirements[2]. This implicitly assumes that the risk of the largest contingency coinciding with high usage of load following resources is low – consistent with a tightly maintained frequency.

Similarly, providers of regulation reserves must currently also deliver PFR if capable. If, as Infigen recommends, a dedicated PFR market is developed, it will be necessary – either in the Rules or in AEMO procedures with the guidance of the Reliability Panel – to consider the overlap of services and whether the "balancing" role of PFR can also be counted (if fast enough) towards the provision of FFR or Contingency FCAS, and how this should impact the volumes to be procured once the mandatory requirement is removed.

For example, if the PFR service is expected to be utilised only briefly before handing over to Regulation FCAS (with clearer performance obligations on providers), then the quantity of at least the R6 service might be able to be reduced (i.e., if a 100 MW contingency must be managed, then 30 MW of contingency response might be allowed from PFR with the remaining 70 MW procured from Fast Raise). Alternatively, a more risk averse approach would procure PFR *in addition* to 100 MW of Fast Raise (with any additional PFR response during a contingency event being considered a "free" system response).

In our view, Regulation and PFR could be procured from the same resources (if capable). That is, both services are intended to adjust supply and demand within a dispatch interval and, for example, the autonomous primary response could be transitioned to a centralised secondary response (bringing the frequency back to 50 Hz in the process).

If a dedicated PFR market is established, there may also be complications of registering (for example) FFR from resources that only sometimes participate in PFR. A battery could have two different contingency responses based on its operating setpoint just before a contingency event depending on its PFR enablement; presumably this could be managed through suitable constraints.

[2] https://www.erawa.com.au/cproot/15264/2/Agenda%20Item%206%20Presentation%20-%20Review%20of%20LFAS%20Quantity%20Requirements.pdf

QUESTION 9: IMPLEMENTATION AND STAGING FOR FFR

In relation to the discussion of the implementation arrangements for FFR services as set out in section 4.8.4:

- What are stakeholders' views in relation to the process for the implementation of FFR arrangements in the NEM?
- What are stakeholders' views on the potential need for interim or transitional arrangements as part of the transition to spot market arrangements for FFR?

In our view, FFR is a relatively straightforward service that should be implemented as early as possible, even if the quantity to procure were to be low or even zero in some initial periods (for example, if AEMO did not determine that FFR would provide value).

We are concerned that further delays in defining and procuring FFR will place the system at risk of *not* having this service when it is needed, as evidenced by the South Australian tender for FFR which shows there is already value for this service. Engineering needs and technical capabilities will always evolve over time, but this should not be used as an excuse to continually defer an efficient market. Organised spot markets allow for the efficient pricing of services based on real-time conditions – this both delivers efficient outcomes to consumers, and provides clear price signals to investors. In contrast, tenders for longer-duration contracts necessarily require participants to make conservative estimates of the likely opportunity costs in the future

2. Incentivising Primary Frequency Response

QUESTION 10: THE ROLE OF MANDATORY PFR

In relation to the discussion of the role for mandatory obligation as part of the enduring PFR arrangements in the NEM, set out in section 5.1.3:

- Do stakeholders agree that a mandatory PFR arrangement provides a valuable safety net to help protect the power system from significant non-credible contingency events?
- Do stakeholders agree that the narrow, moderate and wide settings for a mandatory PFR response band, adequately represent the broad policy options for the frequency response band for Mandatory PFR?

As noted in previous submissions, a mandatory narrow deadband PFR requirement with no headroom obligations:

- does not provide certainty that sufficient resources will be available to maintain a secure operating state, or provide incentives for future participants to provide the most valuable responses
- does not define how much response is required to maintain a sufficiently narrow frequency distribution (resulting in either over- or under-procurement)
- does not allow the response to be provided by the most efficient resources (consistent with the NEO)

Infigen therefore supports an incentive based approach to delivering PFR, as discussed below, that will deliver both capable and sufficient headroom.

Infigen supports maintaining a mandatory, wide deadband PFR response as a safety net - requiring all participants, regardless of the cost of the service, to be available to support the system in the event of an extreme frequency deviation. Given that such a service would only be required infrequently, the cost to consumers would be low, but it would increase the resilience of the NEM. Qualitatively, these trade-offs appear consistent with the NEO.

AEMO has suggested that mandating a wide response would cause some generators to change their response bands. However, with an appropriate frequency operating standard *plus* the explicit procurement of PFR, this is unlikely to impact AEMO's ability to manage credible or protected events. Furthermore, changes to deadband settings that would threaten system security would not generally be allowed by AEMO. Finally, we note that it is highly likely that many existing thermal generators (and any associated mandatory response) are likely to close over the next 10 years, and so we should be future focused as a market: establish appropriate parameters and requirements that are robust into the future. AEMO should not be relying on unregulated or unprocured response to manage system security.

> QUESTION 11: PROBLEM DEFINITION AND REFORM OBJECTIVE — PFR INCENTIVE ARRANGEMENTS RULE CHANGE
>
> What are stakeholders' views on the problem definition and reform objectives for enduring PFR arrangements set out in section 5.4?

Infigen supports the AEMC's approach and comments.

QUESTION 12: ECONOMIC ANALYSIS OF MANDATORY PFR

In relation to the discussion of the costs and benefits of Mandatory PFR arrangements set out in section 5.4.1:

- What are stakeholders' views of the example curves for costs and benefits of Mandatory PFR with respect to the frequency response band settings, set out in figure 5.4?
- Do stakeholders agree that the frequency response band setting is a key variable for the determination of enduring PFR arrangements that meet the power system needs and are economically efficient over the long term?
- What are stakeholders' views on the effectiveness of the exemption framework under the Mandatory PFR arrangement?
- What are stakeholders' views on the role that the allowance for variable droop settings plays in relation to the cost impacts of Mandatory PFR?
- Based on the initial roll out of the Mandatory PFR arrangement to generators over 200MW, what are stakeholders' views on how the cost impacts of Mandatory PFR are impacted by the proportion of the fleet that is responsive to frequency variations?
- What other considerations are there in relation to developing effective and efficient arrangements for PFR in the NEM?

We expect that tighter deadbands will lead to higher costs, in general. Tighter deadbands are likely to lead to greater wear and tear on machines, as well as greater cycling of batteries as noted in our previous submission to the AEMC[3]. Additionally, there will be metering and compliance challenges with monitoring response to very small frequency changes.

Furthermore, while participants have suggested that wider frequency deviations also result in wear and tear, this has not yet been substantiated or the costs quantified. Similarly, the relative *total* costs of 10 units moving by 5 MW or 5 units moving by 2 MW remains unclear – i.e., there is no clear savings if *all* units deliver a tight deadband response.

Conversely, there are clear costs to units such as wind farms (as highlighted by Tilt) and batteries (as highlighted in Infigen's submission). For example, Infigen temporarily enabled a narrow deadband response at the Lake Bonney BESS from 10th August to 24th August, which was made available at all times. Infigen evaluated actual performance against the modelling provided in Infigen's submission[4]. The simplified modelling shows that the battery was expected to throughput an additional 108MWh over the trial period *if* it was never otherwise dispatched above zero. This is equivalent to battery going through one additional cycle per week. Actual throughput increase was 75 MWh – consistent with the battery being utilised for other serivces[5]. (I.e., sometimes the battery would be discharging but reduce its output)

Table 4 Additional throughput of LKBESS during battery trial

[3] https://www.infigenenergy.com/assets/Uploads/Regulatory-Submissions/Primary-Frequency-Control-submission-October-2019.pdf
[4] https://www.infigenenergy.com/assets/Uploads/Regulatory-Submissions/Primary-Frequency-Control-submission-October-2019.pdf
[5] For instance, when the battery was charging but reduced its charge rate due to an mPFR response, this would not contribute to throughput. Overs while charging were roughly balanced by unders when discharging.

	Total discharged (MWh)	Throughput cycles
Trial period (modelling)	108	2.1
Trial period (actuals)	75	1.4

These impacts are mitigated by batteries not being required to deliver mPFR if dispatched to zero. However, they are required to deliver mPFR if enabled for contingency FCAS – if this extends to FFR, it could be a deterrent for batteries offering into FFR, increasing the cost of the service and potentially distorting a demand curve procurement approach (if applied). This is complicated (as discussed below) by the current MASS potentially allowing for greater registration in the contingency FCAS services which could provide additional revenue. Developing distinct services, requirements, and registration procedures will reduce complexity and uncertainty for both investors and AEMO.

Based on the roll-out of mPFR, insight can be obtained as to how much enabled capacity is required [6]. Similar to the Regulation service, the quantity required could be adjusted empirically over time (and, indeed, the Regulation quantity should be "cooptimised" to meet the new FOS).

We consider the most critical first step is to determine the appropriate Frequency Operating Standard.

> **QUESTION 13: ADVICE FOR ENDURING PFR ARRANGEMENTS**
>
> What are stakeholders' views of the Commission's proposed approach to obtaining independent advice to inform its determination of enduring arrangements for PFR in the NEM?

We support the AEMC's approach.

> **QUESTION 14: PROCUREMENT ARRANGEMENTS FOR NARROW BAND PFR SERVICES**
>
> In relation to the discussion of potential procurement arrangements for narrow band PFR services in section 5.6.1:
>
> - What are stakeholders' views on three options identified for further consideration?
>
> a. Existing market ancillary service arrangements
> b. New market ancillary service arrangements
> c. New incentive-based arrangements for voluntary provision
> - Are there any other options that would be preferable?

[6] Obviously, not all these units would be available at all times, nor would all units have headroom. However, the emergence of bimodal peaks in the frequency distribution suggests this amount of capacity is at *least* sufficient to maintain a narrow distribution.

QUESTION 15: PFR PRICING ARRANGEMENTS

What are stakeholders' views on the arrangements for the pricing of PFR as described in section 5.6.2?

Existing market ancillary service arrangements

Infigen does not support Pathway 1 (maintaining the existing market ancillary service arrangements, with or without an incentive scheme). As noted in previous submissions, the cost of provision of PFR from different resources can vary significantly, and could be particularly material for short-duration batteries in the future. As the AEMC present in Figure 5.4, a mandatory requirement will force participation from the highest cost marginal participants for minimal incremental benefit. This is unlikely to be consistent with the NEO.

New market ancillary service arrangements

Infigen supports developing new market ancillary service arrangements. Specifically, we support establishing a new dedicated ancillary service to enable plant to provide automatic frequency regulation and respond to small frequency deviations. This would:

- Provide certainty to the market that sufficient resources are available
- Provide clear price and investment signals to new resources
- Allow for efficient cooptimisation of all energy and reserve services in the NEM
- Will be familiar to NEM participants, allowing for a more rapid implementation

We have provided relevant comments under Question 8.

We also note the volume of PFR to be purchased would likely need to be determined empirically, and likely co-optimised with the quantity of Regulation FCAS.

New incentive-based arrangements for voluntary provision

As noted by the AEMC, double sided causer pays (DSCP) has been proposed as a potential alternative (or complement) to procurement of one or more FCAS services. This would move from availability payments (e.g., Regulation FCAS) to a performance-based payment. All participants would then have a real-time incentive to improve frequency performance. Participants with deviations that have adverse impacts on system frequency make payments to those with deviations that support frequency.

This approach is appealing in theory - settlements are, by definition, neutral, and a real-time signal avoids some of the problems of efficiently allocating costs through Causer Pays. Variations on this approach can also incorporate obligations under secondary frequency control (Regulation FCAS), and has the potential to provide economical performance obligations on those providers.

However, there are a number of theoretical and practical challenges. These include:

- DSCP provides no certainty that sufficient resources to maintain a narrow frequency distribution will be available. Effectively, the desired frequency distribution must be implemented through defining a pricing function that determines payments as a function of frequency deviation, and hoping this will incentivise a sufficient response.

- The shape, or at least the magnitude, of this function would likely have to be determined empirically. While this might not seem fundamentally different to an empirically determined *volume* of reserves, it is significantly more complex and less transparent to implement and may be harder to underpin an investment case.
- The pricing function would also need to be linked to the energy price (or, more accurately, a reserve market) to ensure that frequency performance does not deteriorate whenever energy prices are high (due to reserves withdrawing from the voluntary market).
- How DSCP performance and compliance would be measured is unclear.
- Some services (Regulation) are in response to AEMO instructions (typically based on a frequency indicator rather than local frequency), while others (PFR) are on local frequency. The DSCP would likely need to measure performance against a local frequency reference. Local SCADA data would therefore need to include a frequency reference, which would be aligned in time regardless of communication lags.
- Currently revenue quality meters do not record frequency and the measurement of frequency itself is somewhat variable, depending on technology.
- While these same issues exist with the existing Causer Pays framework, the monthly averaging approach makes these inaccuracies less material; we expect that during extreme events there may be disputes over unfavourable 4s data points.
- Contingency events would need to be excluded from these calculations (to avoid extreme costs on individual participants despite paying "insurance" through Contingency FCAS). Alternative settlement arrangements in those periods would be required.
- Smaller or less sophisticated participants would have less ability to forecast revenues in the market, and revenues would be significantly more volatile. AEMO would need to develop forecasts for pre-dispatch - a complex task.
- The benefit of universal participation in frequency control may be minimal, if the FOS and procurement quantities are set appropriately. Alternatively, demand-curve approaches (where more reserves are purchased when prices are low) might deliver similar benefits.

Infigen is supporting the Australian Energy Council in further investigating the pros and cons of this approach, including potential impacts on various participants.

However, at this time, Infigen does not support incentivising PFR through a DSCP approach.

QUESTION 16: ALLOCATION OF COSTS FOR NARROW BAND PFR

What are stakeholder's views on the allocation of costs for narrow band PFR services as described in section 5.6.3?

Do stakeholders agree that the any additional costs for narrow band PFR be allocated through the existing causer pays procedure for the allocation of regulation costs (or a revised version as described in section 5.9?

Infigen supports cost recovery being aligned for the PFR and Regulation services.

However, we also support improvements to the Causer Pays framework. For example, while we do not support DSCP at this time, there may be the opportunity to provide a real-time or closer-to-real-time causer pays factor. In particular, a (one sided) causer pays factor could be calculated for each dispatch interval and used to allocate some or all of the costs of the relevant service. This would provide sharper performance signals (but would be subject to the same caveats noted for DSCP).

However, we also note that recovery of non-energy costs needs to be considered in the context of declining operational demand (and hence also scheduled and semi-scheduled generators), and need to be robust against a range of future scenarios.

For "causer pays" approaches to be productive, there must also be some ability for the causers to reduce their impact. If the AEMC implements a narrow-band PFR ancillary service, it may not be practical for AEMO to adjust the quantity of reserves procured in real-time, and so even if all participants improved frequency performance due to high prices, the pro-rata cost allocation would be the same. (We note that this is one element that is more straightforward under a DSCP framework: no deviations means no payments or costs but, conversely, there may not be resources to respond to unexpected events.)

QUESTION 18: FUTURE REVIEW OF THE FOS

What are stakeholders' views of the Commission's proposed approach towards a future review of the FOS as part of the development of enduring PFR arrangements?

In our view, the *first* step is to determine what FOS is necessary to maintain a secure system into the future: the FOS should lead the development of appropriate rules, not the other way around. AEMO has identified that the broader distribution is no longer suitable and poses risks to system security, but has provided little quantitative evidence as to what distribution is necessary.

Furthermore, with the increase in number of markets (FFR, PFR, Operating Reserves, etc.) into the future, co-optimisation between these services will be critical to minimise system costs. It is likely that the future FOS may need to be not just a *limit* but a *target* for AEMO. That is, once a more detailed target distribution is specified, if the frequency is being more tightly maintained, AEMO will need to reduce the quantity of services procured.

Alternatively, there may need to be an upper *and* a lower bound on performance, which might trigger AEMO to procure additional or fewer resources. Clarifying AEMO's responsibilities would reduce the risk of excessive procurement, would reduce system costs (while still maintaining system security and reliability), and be consistent with the NEO.

QUESTION 19: REFORMS TO THE NER RELATING TO COST ALLOCATION FOR REGULATION SERVICES – CAUSER PAYS

In relation to the proposed reforms to the NER relating to the allocation of regulation costs, set out in section 5.9:

- What are stakeholders' views on the proposal to allocate regulation costs on the basis of performance against system frequency as opposed to Frequency indicator(FI)?
- What are stakeholders' views on the proposal to align the sample and application periods for determination of causer pays factors and shorten the application period to 5 minutes, in line with the NEM dispatch interval?
- What are stakeholders' views on the removal or shortening of the ten-day notice period for causer pays contribution factors?
- What are stakeholders' views on AEMO's proposal to pre-calculate seven sets of contribution factors including local contribution factors?
- What are stakeholders' views of AEMO proposal to include non-metered generation in the residual component for allocation of regulation costs?

- Infigen supports using system frequency rather than FI for the purposes of determining causer pays factors. We agree that this would simplify the frameworks and provide alignment between.
- Infigen in principle supports shortening the average period for the calculation of contribution factors. However, note our commentary on Question 16.
- Infigen supports the proposed approach to local contribution factors

Conclusion:

We look forward to the opportunity to continue to engage with the AEMC. If you would like to discuss this submission, please contact Dr Joel Gilmore (Regulator Affairs Manager) on joel.gilmore@infigenenergy.com or 0411 267 044.

Yours sincerely

Ross Rolfe
Managing Director