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Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Submitted via www.aemc.gov.au
Ref: EPR0053 (Please cross-list with associated rule change requests ERC0208, ERC0211, ERC0214)

13 October 2016

Dear Mr. Pierce,

Response from EnerNOC to the Commission's consultation paper: System Security Market Frameworks Review (EPR0053)

EnerNOC is a global provider of energy intelligence software and demand response services. We work with commercial and industrial end users to offer their demand side flexibility into wholesale capacity, energy, and ancillary services markets, as well as demand response programs offered by utilities. Locally, EnerNOC is a market participant in the Wholesale Electricity Market (WEM), the National Electricity Market (NEM) and the New Zealand Electricity Market (NZEM). EnerNOC's regional head office for Asia-Pacific is located in Melbourne.

EnerNOC is grateful for the opportunity to provide comment on this important topic. EnerNOC notes that the recent black system event in South Australia has brought this topic into sharper focus, and that many of the theoretical scenarios described in the Commission's consultation paper have now been observed in the field.

In EnerNOC's view the importance of maintaining system security by managing Rate of Change of Frequency (RoCoF) cannot be understated. We would like to draw attention to an important component of any efficient solution to the challenge of managing high RoCoF that has been insufficiently discussed to date: the employment of interruptible loads ("IL").

Today, nearly all the NEM's Frequency Control Ancillary Services (FCAS) are delivered by traditional thermal power stations. In our view, such FCAS resources are too slow to serve the NEM's needs – the events of 28 September 2016 in South Australia seem to confirm this view. To manage high RoCoF conditions, we believe the NEM needs to source *faster* frequency response resources, and procure them through a transparent market based mechanism. We are not supportive of AGL's proposed inertia "market" as a standalone solution to address the challenge of high RoCoF, and note that the proposed rule change does not describe a market, but a tender process. We do consider that provision of incremental inertia supply may have role to play in the future of system security, but believe that the most efficient approach would be for such provision to be achieved through a transparent market mechanism, similar to today's FCAS markets. In this way, competitive markets for inertia supply and fast frequency response can exist to procure what are effectively RoCoF management services. Transparent, competitive markets should ensure that the NEM's needs are addressed via the least-cost mix of technologies.

EnerNOC has extensive experience in providing IL-based FCAS in other global energy markets (most relevantly in New Zealand and Alberta) – and we believe the Commission's review of System Security would benefit from a deeper understanding of the role that customer load can and should play in the future system security in the NEM. Accordingly, in this submission we detail the following:

1. Our perspective on the Commission's proposed framework for assessment.
2. How IL functions to provide FCAS in other global energy markets, including detail on how fast it can respond.
3. How the NEM today largely fails to take advantage of customer load for FCAS provision, having low quantities of IL deployed relative to peer markets.
4. How the current FCAS services are too slow.
5. How the above impact South Australia specifically.
6. Our perspectives on how future "fast" FCAS services should be procured.
7. Why an inertia market is not the right solution.
8. Our perspectives on the consultation paper's explicit questions, where unaddressed in the above sections.

As the Commission's consultation paper has done, where applicable this submission provides examples in the specific context of South Australia, and how faster FCAS might help AEMO plan for and manage the possibility of (or occurrence of) a double circuit failure of the Heywood Interconnector.

1. Framing the future challenge of high RoCoF

EnerNOC notes that the discussion around system security and RoCoF management challenges has led for calls for the tender-based contracting of inertia services. As the Commission considers various options to address this challenge, we suggest that the Commission view the matter through the lens proffered by AEMO in its August Update on its Future Power System Security Program:

"Picturing the future energy market having less synchronous generation, it would be tempting to say the potential challenge is a "lack of inertia". This is not the problem, but, as the level of system inertia reduces, the underlying technical challenge becomes more apparent. The underlying technical challenge is managing frequency deviations – inertia provides a means to do this, but not necessarily the only means."[1]

[1] AEMO, Future Power System Security Program Progress Report, August 2016, p.16

EnerNOC agrees with AEMO in this regard, and considers that IL and inertia services are just some of the options that should be considered as tools to manage frequency deviations. Inertia provision may be considered to have merits, but it should be considered alongside (and/or competitively procured in parallel with) other options such as faster frequency response services, so that the most cost-effective solutions are brought to market.

2. What is interruptible load (IL), how does it participate in global FCAS markets, and how fast does it respond?

Interruptible load resources are sourced from distributed demand-side end users of electricity, typically commercial and industrial consumers. A special device is installed at each participating facility to monitor grid frequency, and to reduce the consumption of the connected loads rapidly once specific trigger conditions have been met. The trigger conditions are typically that the system frequency falls below a threshold and stays below it for a certain number of milliseconds.[2] In this way, IL can help arrest the fall of frequency following a deviation[3]. This has the same effect as ramping up generation plant to remedy the imbalance in supply and demand, the primary difference is that demand-side IL can react much faster than generation plant, and can thus be more effective in arresting a rapidly falling frequency.

The speed of response that is required varies between markets from several seconds (like the NEM's 6-second FCAS market) down to hundreds of milliseconds (i.e. 0.2 seconds). To provide a response within milliseconds, usually the only option is to trip the relevant loads off at a circuit breaker. With response times of one second, however, there is enough time to communicate with plant control systems and allow them to carry out a more graceful shut-down. This allows a wider range of loads to participate. We would consider a service that is required to respond within one second to be a "fast frequency response" service.

Typically, providers of IL will recruit and enable large portfolios of distributed loads within a region, and offer the FCAS to market in an aggregated fashion. Each aggregated IL provider must forecast how much load its portfolio will be able to shed during each dispatch interval, and ensure that its market offers are such that they will be able to comply with dispatch instructions reliably. In most global markets, IL participates in central dispatch, and must comply with the same set of rules and compliance standards as traditional generation FCAS resources.

The following section discusses EnerNOC's experience providing IL-based fast frequency response in two other markets: New Zealand and Alberta. The examples are convenient in that the former has opted for a "market based" procurement of FCAS, while the latter has opted for a "tender based" procurement mechanism. In our experience, there are pros and cons to each -

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[2] This time-based condition sometimes referred to as "dead band" (200ms in New Zealand) serves two purposes: to prevent resources responding to very short transients where their help is not needed, and to reduce the likelihood of them being triggered by noise.

[3] In this submission we refer to IL's ability to offer "Contingency Raise" FCAS services, assisting the System Operator in raising the frequency following an unexpected loss of supply. In some instances loads do offer the inverse services (equivalents to the FCAS lower services), but in the immediate term in the NEM, we see the primary opportunity for loads to provide raise services.

notwithstanding, both markets sufficiently facilitated the participation of the demand side in the provision of FCAS.

New Zealand Electricity Market:

In New Zealand, EnerNOC has been offering an IL resource to the local FCAS Contingency Raise (equivalent) market since 2009. The wholesale electricity market in NZ is similar to the NEM in that it's a gross-pool, energy-only market with 5 minute dispatch and 30 minute settlement, and competitive markets for the supply of contingency FCAS. The fastest contingency FCAS service in NZ is the "Fast Instantaneous Reserves" (FIR) service, where IL providers must deliver their full offered quantity within 1 second, and maintain the response for 60 seconds. Generators offering FIR services are only obliged to deliver their full quantities within 6 seconds, similar to the raise6sec FCAS market in the NEM. This technological discrimination – requiring different services from different classes of participants competing in the same market is not best practice. However, the NZ experience does illustrate that a wide range of loads are able to cost-effectively compete against generators in FCAS markets to provide a fast (sub-second) response to frequency deviations. In support of this view we submit Figure 1.

Figure 1 (below) shows the frequency of the system in New Zealand's North Island following an unexpected loss of supply[4] on 16 May 2016. EnerNOC's aggregated IL portfolio shed approximately 135 MW of load within 1 second of the frequency excursion reaching the trigger threshold of 49.2 Hz[5]. This chart represents the aggregate load drop in the "positive" direction, the way the output of a generator would typically be represented – noting that that EnerNOC is not aware of any generators that can ramp 135 MW in one second.

[4] In this instance, Huntly Unit 5 tripped offline (a CCGT with 403 MW nameplate capacity).

[5] The trigger frequency is lower than for the equivalent services in mainland NEM regions because New Zealand's operational frequency tolerance bands are wider: they require the frequency to remain above 48 Hz during a credible contingency. This is very similar to the NEM's arrangements in Tasmania, and is presumably derived from an economic analysis that found that the benefits of maintaining frequencies within a tighter band would be outweighed by the costs, given the small size and low inertia of the systems.

Figure 1:

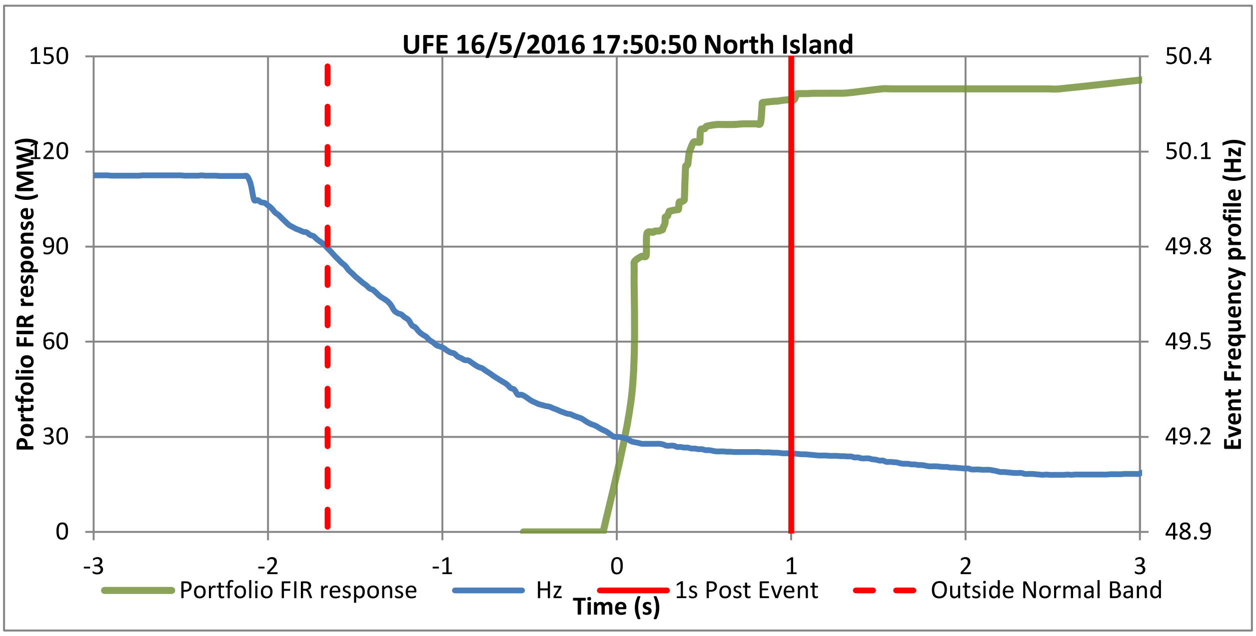
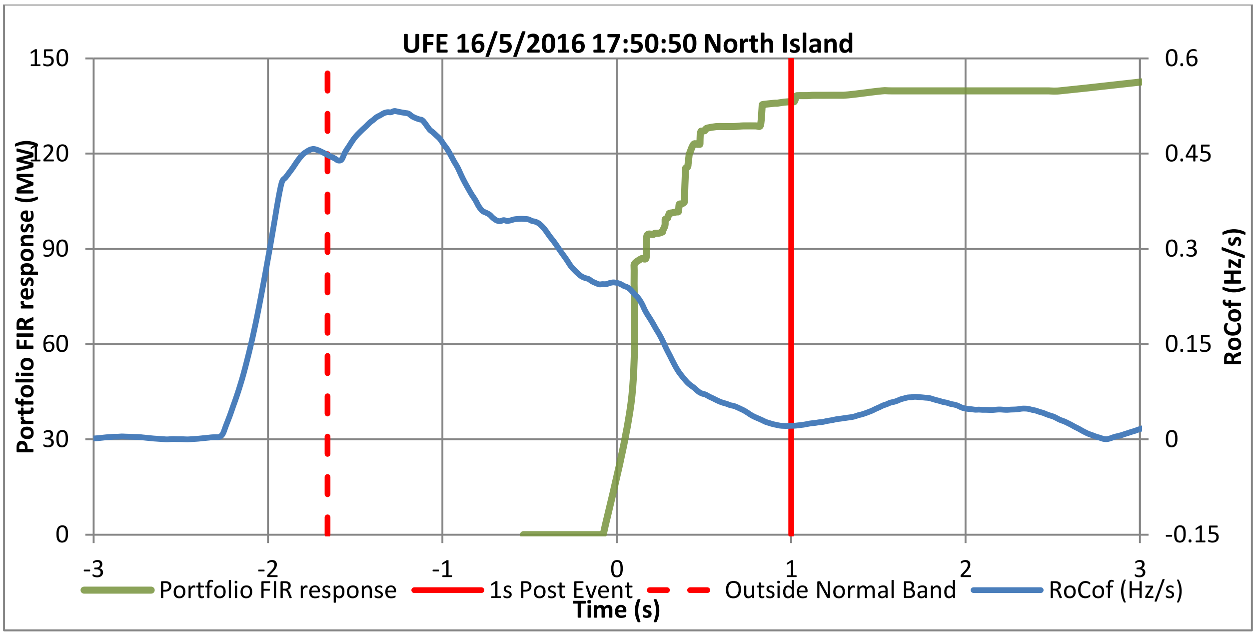


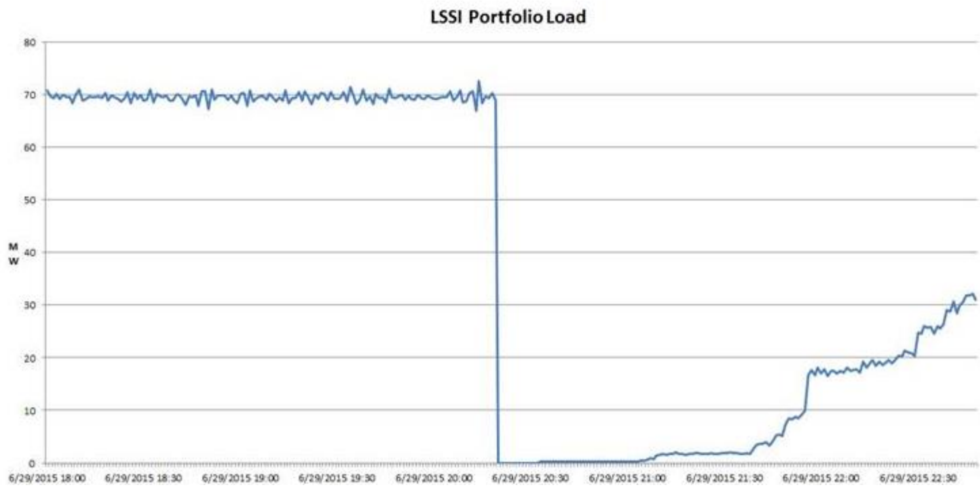
Figure 2 (below) is the same chart with the RoCoF of the frequency profile plotted. Immediately following the loss of supply, the RoCoF reaches a maximum of approximately 0.51 Hz/sec. At the time the IL trigger frequency is reached, RoCoF is approximately 0.25 Hz/sec. One second later after IL has been delivered, the RoCoF is near zero and has flattened out (frequency has stabilised).



Alberta Energy Market:

As a second example of the speed that IL can react to help stabilise frequency following a deviation, see Figure 3 below. Alberta (AB) is an energy-only market with a key interconnection with neighbouring British Columbia (BC). In order to enable greater import capability from BC, the Alberta Electric System Operator (AESO) procures IL resources[6] from providers, including EnerNOC. IL resources are procured via Ancillary Service Agreements with multi-year terms (in contrast to New Zealand's 5-minute market based procurement). When enabled, IL resources are obliged to deliver their full offered quantity within 0.2 seconds (12 cycles[7]) of the frequency reaching 59.5 Hz (which will typically only occur after the unexpected loss of the interconnection), and maintain the response until restored by the System Operator (typically less than 30 minutes, but up to one hour).

Figure 3: shows EnerNOC's (enabled) portfolio response to a frequency deviation in Alberta due to the loss of the AB-BC interconnector on 29 June 2015, where 70 MW of load was shed in less than 0.2 seconds.



EnerNOC considers that the Alberta example is particularly analogous to the case of South Australia, in that the load shedding service is designed to allow the System Operator to run its interconnector at higher loadings (when the market determines that greater imports are economically efficient), whilst managing the contingency scenario of losing the interconnection (and resulting frequency deviation within Alberta). The System Operator calls this IL-based, contingency raise FCAS equivalent service "Load Shed Service for imports" (LSSi). LSSi procurement is administered in much the same way the South Australian Minister for Mineral Resources and Energy has proposed in rule change request ERC0214, in that the System Operator (AESO) has legislative powers to design and procure (via competitive tender) ancillary services products that meet its technical needs.

In creating a specification requiring response in 0.2 seconds, the AESO created a prescriptive service that only loads are able to practicably offer. In procuring the service via tender, contract holders are not known publicly, nor are the full details of the contract prices they earn for providing the service (we disclose that EnerNOC holds one such contract). However, based on the market's annual cost recovery for the service it can be inferred that LSSi is a considerably more expensive service than New Zealand's FIR. This is partly due to the very fast response

[6] More info can be found at https://www.aeso.ca/market/ancillary-services/load-shed-service-for-imports/
[7] North America's system is 60 Hz

requirements, which rules out participation by some classes of load, but mainly due to what could be perceived as over-specified technical requirements, which require that participating customers must have very stable and predictable consumption patterns, and very accurate and granular real-time telemetry. These greatly limit the range of loads that are able to participate, and increase the per-site costs of participation, such that it is only worthwhile for very large loads.

EnerNOC considers that a more cost-effective outcome could have been achieved through a less elaborate technical specification and market-based procurement more similar to the NEM's contingency FCAS or New Zealand's FIR. Nevertheless, LSSi is an effective program, bringing economic benefits to Alberta by allowing more efficient management of the risk of an interconnector trip, and hence for increased quantities of lower-cost energy to be imported.

It may also be useful to look to New Zealand and Alberta as a reference for the quantity of fast frequency response that can be sourced within a market. The table below contains an analysis of the quantities of IL offered in each market[8] during the three month timeframe from 18-May to 17-Aug 2016. The data suggest to EnerNOC that the NEM should be able to support hundreds of MW of IL based contingency FCAS raise, far more than is being offered in the NEM today.

	Alberta (LSSi)[9]	New Zealand (FIR)[10]
Max IL offered (MW)	326	260
Avg IL offered (MW)	263	189
System peak demand (MW)	11,229	6,700

International energy market examples, including NZ and Alberta, show that IL-based FCAS can respond extremely quickly to frequency deviations and are leveraged as a critical tool to arrest falling frequency. EnerNOC urges that the Commission and AEMO consider IL (and the role it plays in peer energy markets) as a potential element of the future technology mix used to address the challenge of high RoCoF.

[8] Per trading interval. Alberta's trading intervals are 60 minutes, the NEM's are 30 minutes
[9] Source: Public data, retrieved via Morningstar, and AESO 2015 stats.
[10] Source: EM6 Aggregated Reserves Report, and Electricity Authority.

3. The current FCAS markets have brought very little fast-responding IL to market

Relative to peer energy markets, the NEM has very little IL participating in the FCAS markets today. Figure 3 and Figure 4 compare the contingency raise FCAS markets in both NZ and the NEM in July 2016. During this time 74.0% of the cleared contingency raise FCAS in New Zealand came from interruptible loads, and during 3% of the time, NZ was sourcing 100% of its FCAS raise requirement from interruptible loads. This suggests to EnerNOC that loads are able to provide FCAS services more cost-effectively than generators, effectively crowding generators out of the reserves merit order. Based on EnerNOC's own customer base and our knowledge of the market, we estimate that more than 200 physical loads are participating in NZ's FCAS markets, across a wide range of industries and commercial sites.

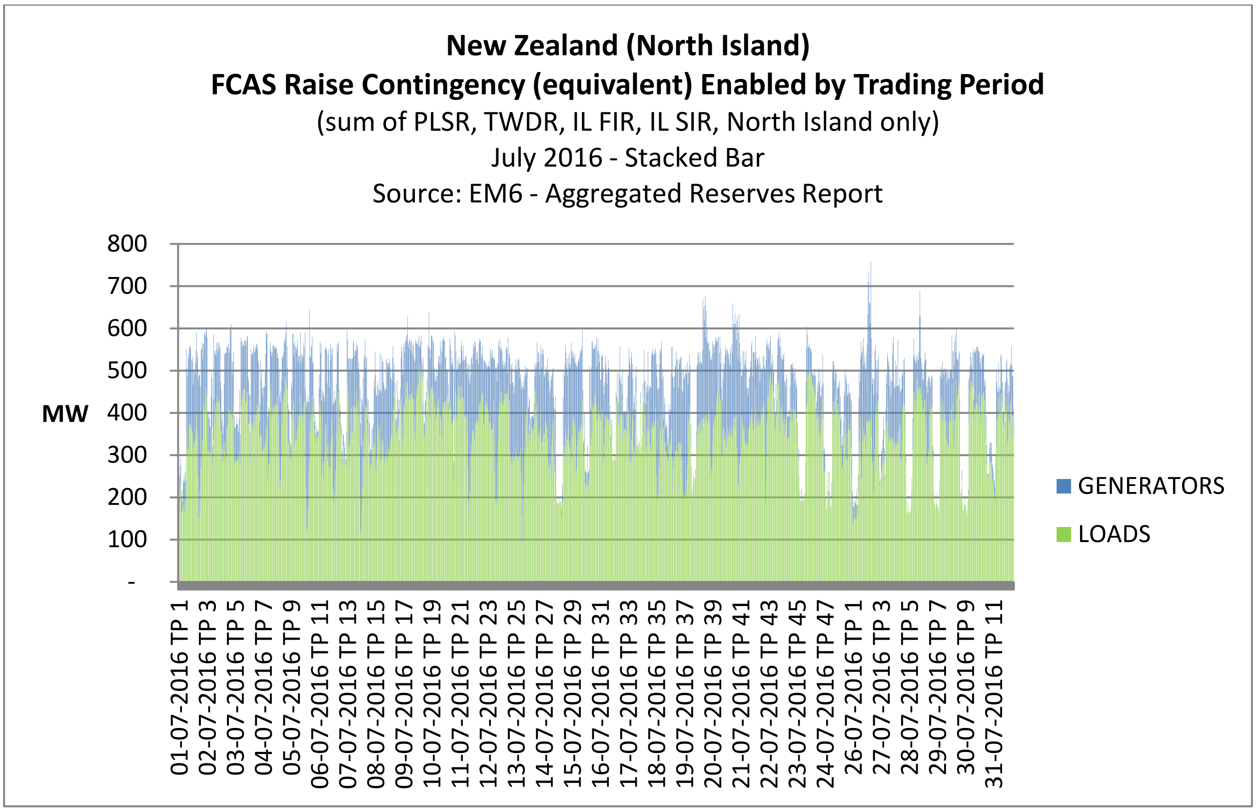
During the same time period in the NEM, just 4.6% of cleared contingency raise FCAS was sourced from interruptible loads, and this came entirely from two dispatchable units: a smelter in Victoria (25% of cleared MWh from loads), and a large pumped-storage hydro power station in Queensland (75% of cleared MWh from loads).[11]

The reason the NEM has seen so little IL brought to market is due to the current National Electricity Rules (NER) that present administrative barriers to entry such that few customers choose to participate[12]. EnerNOC notes that the Commission has indicated its intent to lower these barriers in its draft determination on "Ancillary Services Unbundling" (ERC0186). EnerNOC applauds this initiative and considers that more IL-based FCAS should be brought to market as a result. However, EnerNOC also notes that the current FCAS markets may not properly value the potential sub-second response of IL-based FCAS, which may dampen the economic signals sent to potential IL providers and new market entrants. EnerNOC considers that a new market for fast frequency response services would more appropriately value the contribution of IL (and other fast responding technologies) to frequency arrest and stabilisation.

[11] Note: the difference in the *amount* of FCAS in Figures 3 and 4 (NZ typically procuring around 550 MW, the NEM typically procuring around 1200 MW) is mostly related to the fact that while the NEM has three distinct contingency raise FCAS markets (raise6sec, raise60sec, raise5min), NZ has only two (FIR, SIR), and our employment of a stacked bar chart that sums all services in each market. The amount of contingency raise FCAS procured in any individual market will be related to the largest single risk facing the system at the time – usually the largest generating unit.

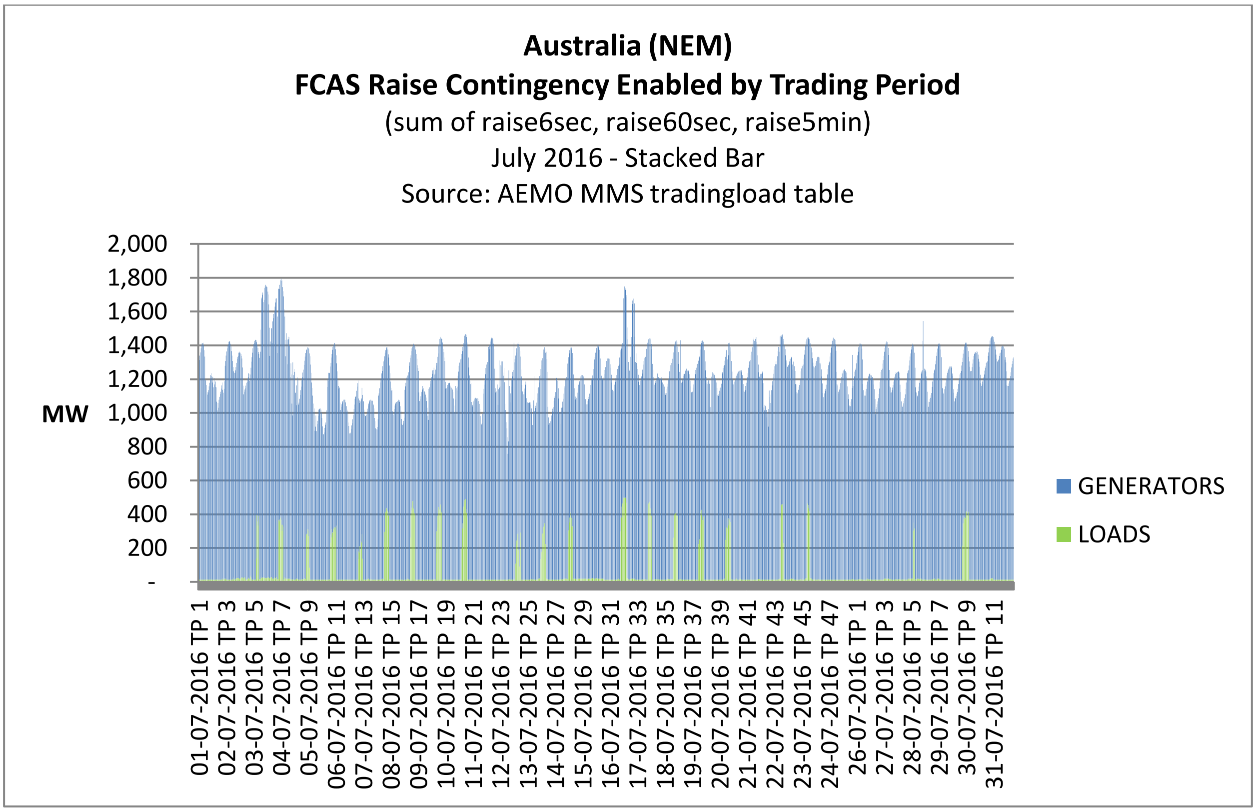
[12] We provide more detail on these reasons in our submission to the Commission's Draft Determination on the Demand Response Mechanism and Ancillary Services Unbundling (ERC0186), viewable on the Commission's website

Figure 3: Contingency FCAS Raise in New Zealand, July 2016



NZ: Loads **74.0%** of cleared Contingency FCAS Raise, Sourced from 200+ physical sites

Figure 4: Contingency FCAS Raise in the NEM, July 2016



NEM: Loads **4.6%** of cleared Contingency FCAS Raise, sourced from 2 dispatchable units

4. The current FCAS markets are too slow, and are not incentivising FCAS supply from the right locations, to ensure system security

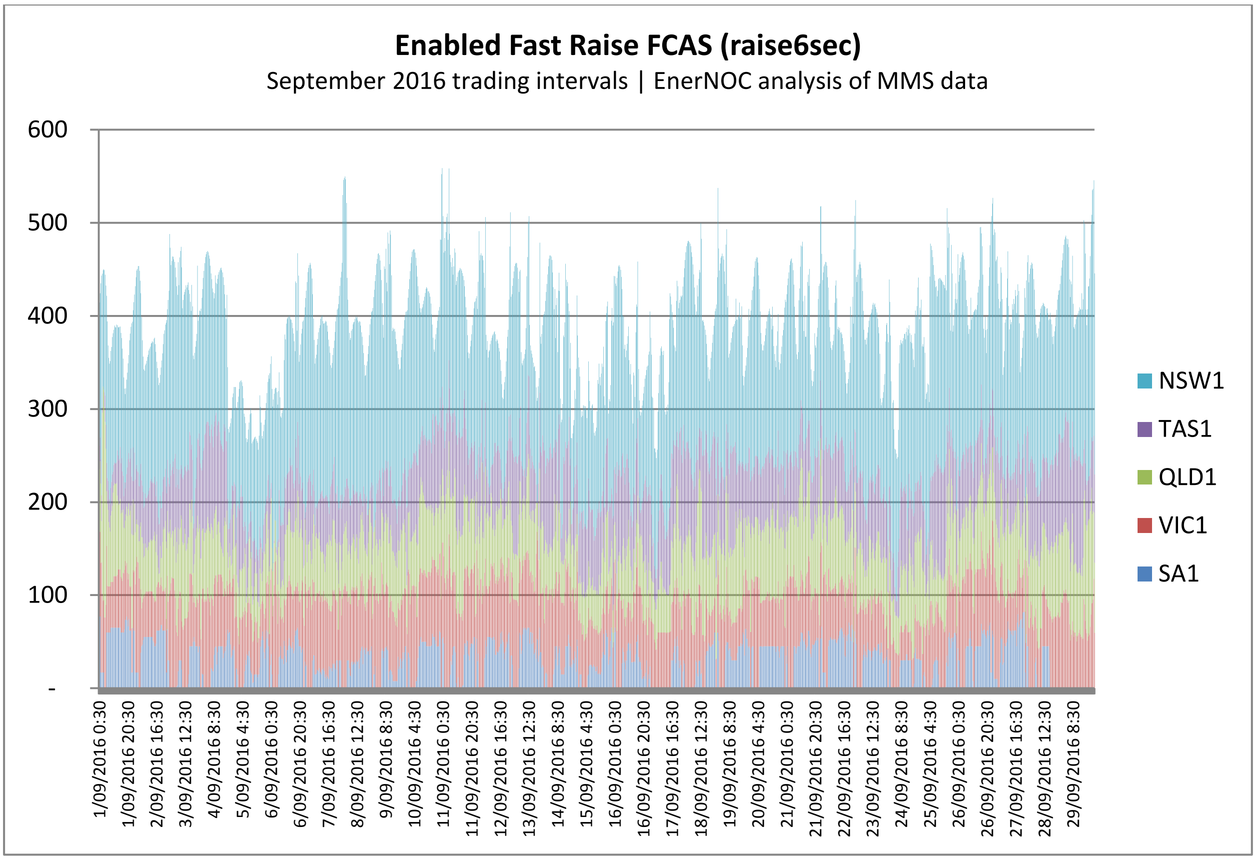
EnerNOC notes that the "fastest" contingency FCAS service currently available to AEMO today is the Fast Raise service.[13] Today this service is almost exclusively served by thermal generation plant (see Figure 4), and the standard measurement and verification ("M&V") outlined in AEMO's Market Ancillary Services Specification ("MASS") indicates that, following a frequency deviation of requisite magnitude, AEMO expects Fast Raise providers to ramp linearly to their offered quantity over the following 6 seconds. EnerNOC considers that IL can deliver its full offered quantity much faster than most generation plant, typically in less than one second. Other technologies such as energy storage have similar capabilities.

Further, the global (NEM-wide) procurement of Fast Raise FCAS may mean that today's providers are not physically located in in the right places to maintain System Security in all situations. In its August Update on its Future Power System Security Program, AEMO notes that:

"To date, there has been no appreciable increase in required regulation or contingency FCAS. As, however, it is a NEM-wide market with sufficient NEM-wide FCAS, the market may not provide signals of tightening availability in certain regions at the relatively infrequent times where FCAS needs to be locally enabled."[14]

To illustrate this idea, **Figure 5** shows enabled (cleared) Fast Raise FCAS over the month of September 2016.

[13] This service is referred to as "raise6sec" in AEMO's Market Management System; we use this term in our figures.
[14] AEMO, FUTURE POWER SYSTEM SECURITY PROGRAM PROGRESS REPORT Published: August 2016, p26



5. Contingency FCAS in the context of South Australia

Figure 5 reveals that there is very little Fast Raise FCAS currently enabled (dispatched) within South Australia. Indeed - during the month of September 2016 South Australia had only two market participants providing the Fast Raise service, both gas-fired power stations. During that time, the maximum enabled Fast Raise from within South Australia was 82.0 MW, and the average was 28.8 MW.

At the time of the black system event in South Australia on 28 September 2016[15], AEMO was procuring Fast Raise globally (NEM-wide), meaning there was no specific requirement to ensure any of it was sourced from within South Australia, as it was assumed that following an unexpected loss of supply within South Australia, the FCAS response would be provided via the Heywood interconnector. EnerNOC's interpretation of the data released to date by AEMO[16] is that, even if Fast Raise had been fully enabled from all available providers within South Australia at the time, it would have been both insufficient in quantity and too slow in response to prevent the overloading of the Heywood Interconnector and the subsequent black system event. If AEMO's final report into the event confirms this view, it would suggest to EnerNOC that the

[15] EnerNOC respectfully defers to AEMO in all determinations of the causes and contributors to the system black event. Any perspective offered here is our own, is based on available data, and is only raised for discussion based on its relevance to the issues posed in the Commission's consultation paper.

[16] AEMO, PRELIMINARY REPORT – BLACK SYSTEM EVENT IN SOUTH AUSTRALIA ON 28 SEPTEMBER 2016. Published: 5 October 2016. Accessed by EnerNOC 10 October 2016.

current FCAS markets are inadequate to manage system security into the future, and that some form of *faster* FCAS needs to be procured, with improved geographic signalling.

The Commission's consultation paper notes that because of the apparently insufficient quantity of Fast Raise that can be sourced from within South Australia, South Australia has chosen to rely on the Under Frequency Load Shedding (UFLS) scheme in order to control frequency following a separation event. This passage from AEMO's Power System Operating Incident Report from the 1 November 2015 separation event describes this in greater detail:

"The SA government had, however, previously instructed AEMO, via a SA Jurisdictional System Security Coordinator notification, to amend the Separation Event Frequency Standard for SA to 47–52 Hz. This means the frequency in SA is allowed to operate within a wider band immediately following a separation event, and as a result less contingency FCAS is required. On that basis, AEMO has determined that no contingency raise FCAS is required if flow on the Heywood interconnector is towards SA, as frequency will be maintained above 47 Hz by the operation of UFLS which starts at 49 Hz."[17]

EnerNOC considers that South Australia shouldn't need to rely on UFLS as its primary mechanism for controlling frequency following a separation event. Involuntary load shedding is costly, because it is unexpected and indiscriminate. This is very different from IL, in which customers are choosing particular loads with tolerably low opportunity costs, so as to compete to provide the required services to the market. In EnerNOC's view it would be preferable to use a market to procure voluntary provision of the services.

Increased quantities of fast FCAS can and should be cost-effectively sourced from within South Australia – interruptible load is one mechanism that could be brought to market to meet this need. However or order for this to occur, the barriers to doing so need to be lowered, and an appropriate procurement mechanism designed and implemented. Building a portfolio of fast-responding IL in South Australia could allow for lessened reliance on UFLS, and allow South Australia to employ Frequency Operating Standards in line with the other mainland states. Further, sourcing IL from within South Australia should allow AEMO to operate the Heywood Interconnector at higher loadings, allowing increased imports of (presumably cheaper) power from Victoria to reach consumers in South Australia.

Based on EnerNOC's experience recruiting and enabling IL in other energy markets and our analysis of South Australian industry, we believe there to be significant untapped potential for commercial and industrial businesses to provide IL. EnerNOC notes that given the economic climate in South Australia and the challenges facing industry from high wholesale market prices and associated retail contracts, South Australian industry may welcome increased opportunities to participate in the wholesale market and earn income for providing FCAS services.

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[17] AEMO, LOAD SHEDDING IN SOUTH AUSTRALIA ON SUNDAY 1 NOVEMBER 2015. Published: February 2016. Accessed by EnerNOC 10 October 2016.

EnerNOC notes that increased participation of IL providers in the wholesale market need not be unique to South Australia – it is simply that the immediate need seems most acute there. EnerNOC considers that increased competition from the demand side in the FCAS markets would have NEM-wide benefits. In addition to increased competition impacting FCAS spot prices, increased participation from the demand side may allow owners of traditional generation plant (who pay for FCAS contingency raise services) to free up their plant to offer into the energy market. In this way, increased participation from the demand side may effectively add liquidity to both the FCAS market and the energy market.

6. How fast FCAS might be procured

As detailed in the consultation paper, there are two options for the procurement of new RoCoF management services, which we discuss below. We strongly believe that a market based procurement approach is preferable.

1) Market based procurement

This option involves the creation new FCAS market categories. There are currently 8 FCAS markets. A new market might function similarly to the extant FCAS markets, in that participants would submit offers into NEMDE for 5-minute dispatch. EnerNOC expects that such solution should be easy to implement and considers this the most transparent and effective way of ensuring that the provision of required services is achieved at least cost. This approach would also: allow offers to be co-optimised with the energy market, be technology neutral, and facilitate entry by new technologies. In EnerNOC's global experience in other energy markets, 5 minute procurement of ancillary services, co-optimised with energy market dispatch, is considered an enviable best-practice market design by regulators and market operators.

The only challenges EnerNOC can foresee to this method are that, if the current global-FCAS market is simply replicated, this method may not solve the problems of 1) ensuring that FCAS providers are located in regions where their services are most valuable to system security, and 2) that such providers are available (able to be enabled) at times when system security requires. To achieve these outcomes, AEMO would have to apply regional constraints to the FCAS markets, which may necessitate re-thinking the default classification of the contingency risk posed by the Heywood interconnector.

2) Tender based procurement

This option involves giving AEMO increased powers to run competitive tenders to procure required RoCoF management services. This is the option that the South Australian Minister for Mineral Resources and Energy has proposed in rule change request ERC0214. In this way services such as fast frequency response and/or supplementary inertia would be procured similarly to the non-market ancillary services SRAS and NSCAS. EnerNOC considers this a less efficient option than market based procurement, because it is less transparent, tends to require long-term fixed quantities (which is unnatural both for the buyer and the seller), is unable to be co-optimised with energy market dispatch, has no guarantee of technology neutrality, and provides no guarantee or certainty that the services have been provided at lowest cost. In EnerNOC's view, in general, services should only be procured through tenders, rather than a transparent market, when there are only a small number of possible suppliers, there is long-term certainty about the quantities required, and it is important to provide that long-term certainty to suppliers (i.e. SRAS). EnerNOC considers that these criteria are not met in this instance, so there is no justification for a "behind closed doors" tender-based procurement approach.

7. Tendering for inertia services (the proposed "inertia market) is not the best solution

Regarding AGL's proposal for inertia services market, EnerNOC believes that in considering this rule change request the Commission should bear in mind that supply of inertia is not the problem that needs to be solved. Rather, paying to have more inertia provided at certain times (i.e. paying incremental inertia providers to come online when the already-efficient energy market dispatch is not contributing sufficient inertia) could be one element of a strategy for managing the risk posed by frequency excursions, alongside other frequency management services.

EnerNOC notes that the supply of inertia is not the exclusive domain of thermal generators. Some loads also provide natural inertia in just the same way: as angular momentum in synchronous rotating machines (i.e. large motors). For example, paper milling, mineral processing, and mining industries all employ large motors that can contribute natural inertia. Synchronous condensers do the same. The Commission's consultation paper and AGL's rule change request make no mention of this.

The challenge is to set up a framework in which:

- These services are defined in technologically-neutral terms, so that many participants, including unforeseen new entrants, can compete to supply them.
- AEMO can procure a near-optimal combination of these different services to meet system needs efficiently.

We believe that faster frequency response services will be an important part of the mix, due to their low cost. Inertia supply services may also have a role. Co-optimisation by AEMO's central dispatch engine (NEMDE) should be the best way to determine how much of each service is required at any given time.

8. The consultation's specific questions:

Question 3: *Do you consider it beneficial to set a standard for RoCoF? What format should this standard take and what factors should be taken into account when setting the standard? Who should set it? Would the establishment of a new standard trigger significant additional costs to comply? Do you consider there to be a role for maintaining system strength? Who should be responsible for undertaking this role or how should the responsibility be determined?*

Because RoCoF has the ability to cause existing generators to disconnect and trigger a cascading failure, EnerNOC considers it appropriate to set a standard for RoCoF, and that the existing construct of the Reliability Panel would be best placed to perform this role.

All other specific questions have either been addressed in sections 1-7 above, or EnerNOC has nothing additional to contribute on the topic.

Thank you for the opportunity to contribute to the System Security Market Frameworks review. Please do not hesitate to contact me if you have any queries.

Regards,

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