IES
Intelligent Energy Systems

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Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Attention: Claire Richards

Submission on Integration of Energy Storage – Regulatory Implications

I would like to make a few general and personal comments on the above Discussion Paper.

Overview

A main theme of the Paper is the extent to which residential and small commercial/industrial energy storage should be subject to direct control by a distributor in a regulated environment, or left to entities such as aggregators, or even customers themselves, operating in a competitive environment.

Some services that storage can provide are currently market-based (e.g. energy at times of high price) while some might appear to require direct control or direction by a regulate entity (e.g. distribution network support and voltage control). Even where a service such as the provision of FCAS is market-based and competitive at the wholesale level, there is a question as to how such a service provision is to be measured and certified at small embedded installations. Small scale storage may even be seen as a cause of some FCAS requirement if competitive aggregators, or even individual storage owners, switch their controls simultaneously at retail price boundaries.

I contend that there is a great deal of scope for pricing innovation in these areas. With such innovation, services currently viewed as regulated or impractical for competition could be set up to operate competitively, with much better and more transparent outcomes for customers.

I take this position based in part on IES's and the author's personal experience as a principal designer of key elements of the current FCAS markets, including the current system for charging for regulation known as "causer pays". We have since undertaken further work internally to extend these pricing concepts.

We outline below some key areas where some improvement or innovation in pricing could support a competitive rather than a monopolistic approach to the storage sector. Some of these matters are addressed in the consultation paper, some not. The consultation paper does not appear to propose any pricing solutions to some of these issues.

Addressing the "5 Minute Problem"

Wholesale energy prices for each half hour are set as an arithmetic average of six sequential 5-minute prices. This process removes any impact of price variation and associated causes and responses due to market events within the half hour. If storage is to react to wholesale prices under some load management arrangement, the value of a response is diminished for both the storage owner/operator and the market as a whole.

This matter was studied and addressed at the time of the FCAS market development fifteen years ago. There are several quite simple and elegant solutions that would essentially introduce a ramping ancillary service spanning the 5-30 minute time period as well as a simple machanism to price and settle it.

However, this concept was never implemented because of claimed high costs of implementation in retail systems, a claim many, including the then market operator, found hard to accept but which prevailed nevertheless. I understand the matter has been revisited but the incumbents seem comfortable with current arrangement. They may see that offering an opening for smaller service providers, able to provide services for 5 to 10 minutes but less able to do so for half an hour, would not be good for their own businesses.

The risk with increased small storage penetration is that the value stream potentially available here, especially as the inertia of the system decreases, will be more difficult to manage and less profitable than it could and should be.

Even worse, if small storage operators do not see prices reflecting short term responses at the 5 minute level as well as the even shorter FCAS level, they may begin to cause an additional requirement for FCAS. Why? They are likely to switch their storage charge and discharge policies at retail price boundaries. This in turn could be used as an argument to require centralised control of small storages on system stability grounds.

A Fully Functional 4 second FCAS Market

Another proposal for the ancillary services review of 15 years ago was to establish 4 second, balanced FCAS market after an initial period of trial with the causers pays logic that applies to regulation FCAS. Causer pays logic uses 4 second SCADA measurements of actual generation and loads, available to AEMO, to assess the causes of and providers of power variations that cause frequency deviations. It is currently implemented as a mechanism to assign regulation FRCAS costs only – provision of the service is dealt with by providers offering into the regulation FCAS raise and lower markets. They get paid for enablement, not actual performance, although performance is monitored.

A 4 second market with both buyer and sellers would be a simple extension of the current causer pays logic. It could be an overlay on the current arrangements. It does not require the making of offers. Analysis shows that competitive pressure for the 4 second market would diminish the value of the bid-based FCAS markets but they could remain for security reasons.

One might think that a 4 second market would be quite impractical to apply to small generators and storages but this is not so. Critical measurements relating to performance in the 4 second market (in essence, the product of locally measured frequency deviation and site load/generation) can be accumulated locally and downloaded, aggregated and submitted to AEMO by an aggregator when convenient. Suitable rules and certification procedures would be required. Studies would need to ensure that the arrangements were set up to be stable in a system control sense.

Such an arrangement would not only allow storage to participate in the FCAS markets, but it would also encourage storage operators to avoid causing instabilities through too much simultaneous switching. If this can be achieved through pricing, it need not be done with centralised control.

Pricing Distribution Network Constraints

Transmission network constraints are respected and priced within AEMO's market dispatch engine, but the resulting price variations from such constraints are not used for settlement. It is likely that this is a secondary issue for most loads so it will not be further considered here. A recent AEMC/AEMO exercise gave up on trying to fix this issue.

However, potential constraints within the distribution network are highly relevant for loads and containing costs. The current regulatory environment includes the following elements.

- A recent determination requires DNSPs to move towards long run marginal cost pricing. While the interpretation of this concept is as yet unclear, it would seem likely that most distribution networks will move towards time of use pricing, or perhaps pricing with demand charges, applied reasonably uniformly over significant geographical areas. Such an approach is an improvement

in cost reflectivity, but falls short of the spatial and time variation in demand response that would be better in practice, as network augmentation needs are local in time and space.

- More dynamic load responses are potentially possible by parties such as aggregators doing a deal with DNSPs to deliver demand responses in particular geographical areas on request, when facilities are approaching constrained operation.

- DNSPs are required to consider demand-side options in their periodic reviews. Further, there is an incentive scheme in place whereby a DNSP may keep for 5 years the savings it might make from improved efficiency relative to its approved budget, including acquiring demand response that defers capital works.

The last two elements are intended to incentivise the DNSP in favour of demand side options, but it is hard for a DNSP to overcome the siren attraction of guaranteed, risk free returns on assets at well above risk free market rates. A regulator will surely find it hard to know whether demand-side options have been pursued with a desirable degree of enthusiasm.

Even if a DNSP did track down some demand response (e.g. from small storage facilities) it does seem generous that the benefits from that should accrue to the DNSP for 5 years without a more direct opportunity being available to small storage and load management options.

We can imagine a different, price oriented approach to this challenge. As the causer pays logic used in FCAS has demonstrated, a bid process is not required to produce a price signal. Consider the following:

- The regulator requires the DNSP to identify network elements for which it is likely to seek capital approval for expansion at the next 5 year determination (green-field assets would be treated differently).

- The regulator requires the DNSP to make available in real time the current loading on these critical network elements. At the moment, DNSPs are required to provide these data on request and at cost, but only well after the event. These delayed data are not useful for real time control. Providing real time data for a few years prior to any likely application for expenditure approval could be a pre-condition of that approval.

- This loading is then converted into price increments as the load on the network element approaches a critical value that would trigger approval of capital expenditure for expansion. AEMO could be assigned the task of performing and distributing this price calculation.

- Small scale responses to this are measured according to some agreed procedure and paid from a regulated pool; the rules around this to be determined. The size of the pool would be related to the cost of increasing capacity with capital expenditure; if the cost of load management would exceed the size of the pool, then the case for the investment is demonstrated and warranted. Otherwise the storage load management approach is more efficient and should continue.

- Real time measurements can be local; then downloaded by an aggregator for further processing.

Clearly, such an approach would need to be modelled and demonstrated in technical and economic terms and the regulatory rules be worked though. Its potential merit is that no active DNSP support (other than the provision of real time data on critical assets) is required to garner demand responses that would relieve network constraints. For this reason it is a pro-competitive concept.

Pricing Voltage Deviations/Reactive Power

Voltage at the distribution level may require closer control as penetration of storage increases. Voltage can be allowed to very within certain limits, but DNSPs seek to restrict movements outside that range.

Again, voltage management may not require direct DNSP control. We can envisage a pricing algorithm that values reactive power injections and offtakes according to some formula based on voltage deviations.

The performance against such an algorithm can be accumulated locally, downloaded by an aggregator and submitted for settlement. Suitable certification arrangements would be required.

Voltage control tends to be a localised matter, so the practicality of this approach would require much more detailed engineering and economic analysis. The payoff would be an arrangement that is pro-competitive.

Conclusions

The AEMC regulatory implications paper canvasses a range of regulatory issues around storage. There is a pro-competitive bias in the discussion as is appropriate, but not much canvassing of the pricing and related technical developments that might be marshalled to achieve that outcome. This submission touches on some of those possibilities.

Yours sincerely

Hugh Bannister
Chairman and CEO
Intelligent Energy Systems

(02) 8622 2210
0411 408 086
www.iesys.com