IES
Intelligent Energy Systems

31 January 2021

Australian Energy Market Commission

Dear Project Leaders

AEMC Ref: ERC0263, ERC0296: AEMC, Frequency control rule changes, 17 December 2020

Intelligent Energy Systems (IES) wishes to respond briefly to the Consultation Paper issued by the AEMC on the above proposed rule changes.

IES is an Australian consulting and software company that has supported market reform in Australia since the mid-1980s. IES staff have advised on various aspects of market design in Australia and internationally. For example, IES designed the current ancillary service market arrangements and causer pays mechanisms in 1999-2000.

As noted in the AEMC's current Directions Paper, IES with CS Energy has undertaken some research into the Double-Sided Causer Pays (DSCP) concept referenced in the AEMC paper and will shortly commence a more detailed research and education programme in an AEC sponsored ARENA project.

DSCP and Frequency Response Deviation Pricing (FRDP)

Section 5.6.2 on Pricing presents DSCP and Frequency Response Deviation Pricing as distinct concepts. The merits of using FI or raw (4 second SCADA) frequency as the appropriate indicator are discussed at some length. This report section seems to make artificial distinctions between the two terms and appears to be equivocal about the appropriate pricing signal for PFR and AGC.

DSCP and FRDP are the the same concepts bu FRDP is the more generic term. It refers to a pricing mechanism based on a derived frequency variable appropriate for different speeds and modes of response, ranging all the way from FFR or faster (say 50ms) to 5-minute contingency services. One distinction is how the raw frequency is processed and applied – essentially the time constant through which the frequency measure is filtered to be suitable for different plant response patterns. In the case of SCADA measurements, the measurement resolution is coarse (4 seconds on the mainland) so that a raw SCADA reading is roughly equivalent to a high-resolution frequency signal processed through a 4-6 second time constant filter.

PFR and SCADA regulation are distinct but complementary services. DSCP has come to mean a particular implementation of FRDP that uses SCADA data, at least initially, but not necessarily permanently, to price PFR. They are not distinct concepts. To be clear, there are a myriad of ways that FRDP can be implemented; some good, some not so good and some rather bad (for example, the current causer pays mechanism was a severe corruption of the original 1999 proposal for a two-sided 4 second FRDP) . I argue that there is a simple, robust approach that could be applied to all or any timescales (including FFR and even down to inertia), to price actual performance. Our DSCP ARENA project with AEC will outline the basis for this assertion before focussing on DSCP and its variations. Appendix A summaries the broad approach. This summary was taken from an earlier IES submission to a frequency services consultation.

Intelligent Energy Systems ACN 002 572 090 ABN 51 002 572 090
Head Office – Sydney Level 2, 10-12 Clarke Street, Crows Nest NSW 2065 Australia PO Box 931 Crows Nest NSW 1585
Telephone 61 2 9436 2555 Facsimile 61 2 9436 1218 Email ies@iesys.com Web www.iesys.com

Broad Applicability of FRDP

As noted above, FRDP potentially has a broad applicability, including to contingency services down to the fastest acting ones including inertia (driven be acceleration rather than frequency). This does not necessarily mean it would be sole mechanism used for each service. There may be some mandatory mechanism present (as with PFR at present) or one may choose to have an enablement mechanism in place to deal with the procurement of head and foot-room. In this context FRDP can be seen as a double-sided usage component of pricing which would encourage good conformance. We commend an implementation strategy along the following lines for AEMC consideration.

1. Implement the best possible version of DSCP for PFR for when the current mandatory rule expires, keeping in place a mandatory element if that is deemed necessary. However, that mandatory element could be modified to be more sympathetic to cost and technology differences.
2. If considered useful, apply a usage element (using SCADA data) to regulation and to slower acting contingency services (60 second and 5 minutes).
3. At the same time, develop , in collaboration with one or more meter manufacturers, a meter capable of supporting FRDP at all timescales.
4. With or even before developing other mechanisms, apply a very low-level pricing signal to FFR and possibly inertia to study dynamic response. The price signal should be sufficiently low and carefully controlled/limited in scope so not to cause AEMO concerns about instability.
5. Devise a long-term strategy from there.

To summarise this approach, we advocate a program of information discovery ahead of large-scale commitment.

Conclusions

IES would be pleased to discuss these matters further with AEMC and to show its metering protype any ongoing results of further research.

Yours sincerely

Hugh Bannister, CEO
Intelligent Energy Systems
M: 0411 408 086
E: hbannister@iesys.com
Web: www.iesys.com

Appendix A

Outline of Deviation Pricing and How it can Support FCAS and any "Ahead" Arrangements

The AEMC has canvassed the concept of deviation pricing in its Frequency Control Frameworks Review. IES has ben researching the topic before and since that time and with industry partners is currently seeking an ARENA grant to work up an initial implementation: to support Primary Frequency Response (PFR) using SCADA metering.

1. The concept of deviation pricing has its roots in control theory and optimisation. This provides the theoretical basis for driving both efficiency and system stability, by managing the deviations of defined state variables from target values. Further it provides the tools make a large, highly complex system tractable and controllable.
2. The approach provides calculable control policies to keep the system stable at low cost, where those policies can be determined solely from local measurements of frequency and time error (occasionally resynchronised in the case of time error).
3. The approach also delivers prices for relevant system states. The logic can be re-expressed so that the system deviation price (for deviations from targeted levels) is driven from frequency and time error measurements and the optimal policies are functions of the components of that price
4. The components of the system deviation price are characterised by a set of time constants and gains (multipliers or weights). Broadly, these correspond the nominal times of current FCAS, as well as potential new ones such as FFR and a half hour ahead services
5. These components complement (add) to each other and can complement without adjustment all current FCAS. There is no logical basis for being concerned about double counting as income from deviation pricing would drive down the value of enablement.
6. Various adjustments to the basic theory are require to make a viable system. For example, how are the gains to be determined and is there merit in weighting the price with the local energy price to achieve geographical spread? What happens when networks separate?
7. Potentially useful additional properties of deviation pricing should also be recognised. For example, it appears that deviation settlement amounts could be relatively easily hedged in the normal energy market if weighted by the local energy price.
8. An initial (prototype or trial) implementation for PFR and potentially all slower FCAS could use SCADA data, subject to more detailed analysis of potential errors. Longer term, a suitably programmed electronic meter would deliver accurate settlement data down to the sub-second level. IES is working on a demonstration that would illustrate how such a meter and corresponding settlements would work in practice. While the calculation volume is large, the results can be summarised for uploading and settlement purposes in a relatively few 5-minute factors.

IES commends this approach to the AEMC, either as a supplement to the current or possible future frequency control services, or as an alternative in the case of some future "ahead" proposals.