IPRA Submission to the AEMC

"NERA Technical Paper - Estimating Long Run Marginal Cost in the NEM"

(AEMC Reference ERC0123)

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1 Introduction

International Power-GDF Suez Australia (IPRA) appreciates the opportunity to respond to the AEMC consultation process on Potential Generator Market Power in the NEM and specifically the NERA "Long Run Marginal Cost in the NEM" technical paper published on 19 December 2011.

International Power entered the Australian energy industry in 1996 and has grown to become one of the country's largest private energy generators, with assets in Victoria, South Australia and Western Australia. International Power also includes Simply Energy; a gas and electricity retail business.

In February 2011, International Power combined with GDF SUEZ's energy assets to form a world leader in independent power generation, with more than 72,360 MW of power generation worldwide and further 15,503 GW under construction.

2 Summary

- A meaningful process for determining generators' LRMC must identify and capture the range of uncertainties, including policy and regulation as well as specific input variables (such as capital costs, operating costs, fuel costs etc).
- Generation asset lives are long, and numerous assumptions need to be made over their potential asset life. Many of these assumptions are highly subjective and uncertain.
- For input assumptions data is to be meaningful, it must come from real world investors (who risk their own capital),, both existing and prospective, and not consultants (who have no capital at risk).
- The optimal portfolio concept is relevant to a centrally planned system expansion but is ill suited to market based outcomes in the NEM where a high degree of uncertainty affects investors.
- Revenue adequacy for all plant (energy and reserve) is essential and it is unclear how this will be achieved for a notional "optimal portfolio" and for each individual plant.
- Interpretation of market prices and LRMC results
    - Key uncertainties need to be expressed as a range for each input variable.
    - The comparison market outturn data needs to be filtered to ensure that it does not contain "outliers"
    - Given the range of uncertainties in determining the LRMC and the variability of the short term historical NEM prices, it is unlikely that either of these quantities will be representative over a longer time frame. Therefore a statistical approach needs to be applied (eg null hypothesis test) to establish relevance.

3 Concerns with the NERA framework

The NERA approach examines the system over a relatively short timeframe and without key uncertainties being considered.

For example:

- System reserves appear to be considered, but it is unclear how they will be paid for in an energy-only market
- Given that the electricity system is over-capacitated by design (excess capacity needed to meet reliability criteria), the system based LRMC is likely to produce a negative value in relation to generation expansion
- The process considers an optimal expansion profile which requires perfect foresight and fails to include numerous key uncertainties facing a potential investor. Such an approach is more applicable to a centrally planned system, not market based outcomes
- In part due to past decisions by state based vertically integrated utilities, the current plant portfolio is not "optimal".
- It is assumed that capital is freely available
- WACC can't be adjusted for risk, unless future risks are first identified and quantified.
- Depending on the risks involved, investors may not be able to (or may not want to) increase their capital exposure

4 Optimal portfolio considerations

The NERA technical paper defines the cost characteristic of an "optimal portfolio" as satisfying a particular load profile at the "least cost".

In order to calculate LRMC for an "optimal portfolio", a least cost planning model would need perfect foresight in terms of costs (capital and operation and maintenance "O&M"),, competitors' actions, and regulatory and policy developments over a long period of time (typically over the life of a generating asset).

This is impossible to achieve in practice where such risks are not possible to quantify and manage. Faced with this challenge, investors tend to give preference to lower capital cost technologies, particularly open cycle gas turbines (and some combined cycle gas turbines) in order to reduce their risk exposure.

The assumption the NERA technical paper makes is that capital will be available irrespective of the risks, provided WACC is sufficiently high. This is not the case where the generation sector is unattractive to investors and it is difficult to secure finance in competition to other sectors.

Therefore it can be expected that the system LRMC in the NEM context will be significantly higher than the system LRMC calculated based on a notional "optimal portfolio" as considered in section 3.1 of the NERA technical paper.

When "real world" plant mix is considered in conjunction with other uncertainties previously outlined in Section 10 of this submission, the actual costs could be some 50-100% in excess of the costs determined using perfect foresight in a centrally planned system (lowest possible costs - essentially a utopian view).

In summary, there are two fundamentally flawed and manifestly incorrect assumptions made to render the optimal portfolio LRMC metric irrelevant as follows:

1) The set of assumptions made is as good or superior to those made by investors
2) The market actually delivers a least cost expansion

5 Input Assumption Sources

As previously stated, and also covered in section 10 of this submission, there will be a range of assumptions needed as input to LRMC modelling. It is imperative that these reflect the assumptions used by real investors in the NEM.

Whilst it is relatively easy to source data from overseas institutions, these lack real cost data in the Australian context.

The NERA technical paper is silent regarding the process for developing the key assumptions. It is imperative that the AEMC develops an effective process to make the key assumptions and that these accurately reflect the "real world". This means that investors, both existing and prospective need to be extensively involved.

6 Market modelling

The essential objectives of the LRMC modelling are that

a) it is reflective of the market outcomes and

b) that sustainable returns for all plant are achieved.

The NERA paper contemplates using the AEMO 10POE and 50POE demand projections. Since the current energy only market doesn't explicitly reward capacity, plant required to maintain the 10POE will need to derive sufficient revenue from the energy market to achieve revenue adequacy.

This implies that the 10POE demand projection needs to be specifically modelled and included in the LRMC metric.

The NERA paper is silent on the sustainability issue and any modelling methodology needs to be developed with this specific element in mind.

Contract revenue, when available, would serve to smooth out the pool revenue stream, but ultimately for the contract market to work in a stable manner, the pool revenue needs to be sustainable. It would be erroneous to assume any specific contract premiums and contract levels since they serve to distort modelling of the pool behaviours and revenue outcomes.

7 Reference data – pool outturn

Historical pool outturn data is certain but its interpretation as being representative of the longer term is uncertain.

Typically in a given year there will be some market event outliers. The challenge is to determine what constitutes an outlier, how it contributes to the longer term outlook and most importantly how it impacts market sustainability. An added complication is that if a particular event is removed from the time series as an outlier, there is no way of determining what would be the behavioural response by participants in such a counter factual scenario.

Having "filtered out" the outliers, what is the interpretation of the resultant filtered data set? Is it representative of an average, 10POE, 50POE pool outcome?

The two to three year sample period suggested in the paper is not a suitable timeframe over which to measure the market based prices. There may-be a range of factors contributing to a particular price outcome, for example:

- Rainfall levels
- Wind generation yield (very high, very low)
- Transmission outages and congestion

- Gas supply impacts
- Bushfires
- Major plant failures (transmission and generation)
- Major storms
- Unusual temperature events.

Whilst each of the events would not happen in an average year, they are very typical of the longer term. Who decides the frequency and what is an outlier and how does it relate to private investors?

It is far from clear how the NERA LRMC metric copes with such events in a meaningful way.

8 Comparing results – statistical significance

As articulated in the previous sections, there is large amount of uncertainty when dealing both with the input assumptions and modelling methodology used to determine the LRMC, and the interpretation of pool outcomes.

A comparison of single numbers determined by the described processes would be unhelpful, as it would fail to deal with the inherent uncertainties.

Another approach maybe to present the data as ranges, thus capturing some of the uncertainty. However an objective comparison still could not be made when there is significant difference between the data ranges.

The use of statistical techniques is advocated, with a particular focus on the "null hypothesis" test to determine the difference between the LRMC and pool outcomes

9 Market design considerations

The current energy only market (NEM) is under pressure from climate change policy regulations impacting both the supply and demand side. These are acting to both increase capacity (through the renewable energy target) and abate demand growth via energy efficiency measures.

Capacity in the NEM isn't explicitly rewarded; instead the trading model relies on periods of high prices and volatility. It may not be possible for a generator to earn adequate revenues without some extreme market events that create volatility in the market. The market design can be described as very fragile and previous work by the Reliability Panel determined that the energy only market can be sustainable; but only if "left alone".

Specifically, in the AEMC Reliability Panel Comprehensive Reliability Review Final Report dated December 2007 the panel states that *"Energy market prices must not be subject to distortion by external factors such as investments that are not undertaken in response to market price signals, but are undertaken through intervention"*.

Should there be any attempt to reduce generators potential revenue by limiting prices to a medium term LRMC (or average costs), then the market must be redesigned to include explicit and long term capacity payments for all plant.

It should also be noted that capacity markets would not be effective as they would essentially mirror the energy markets (i.e. highly correlated, both high or both low at the same time).

10 Appendix - Conventional LRMC definition for generation

The conventional use of the LRMC term by the industry typically refers to a levelised cost of production for a particular generating technology (i.e. OCGT, CCGT, coal, etc.). In order to calculate the LRMC, a range of key parameters need to be selected and fixed for the life of the plant.

Typical variables and cost categories are as follows:

- Capital cost
- Transmission costs (connection cost, on-going costs transmission, congestion costs)
- Fuel costs (time series, contract form, uncertain)
- CO2 emission costs (time series, regulatory arrangements, uncertain)
- Operating and maintenance costs
- Capacity factor (time series, uncertain)
- Return on investment – including a risk premium
- Ongoing transmission costs
- Technology risk (potential stranding of assets/shortening asset life)
- Asset life assumptions (will depend on CO2 policy, technology developments, fuel availability and fuel costs)

If these variables were held constant over an asset life, then the levelised cost of production (an average LRMC) could be calculated and expressed on $/MWh unit basis.

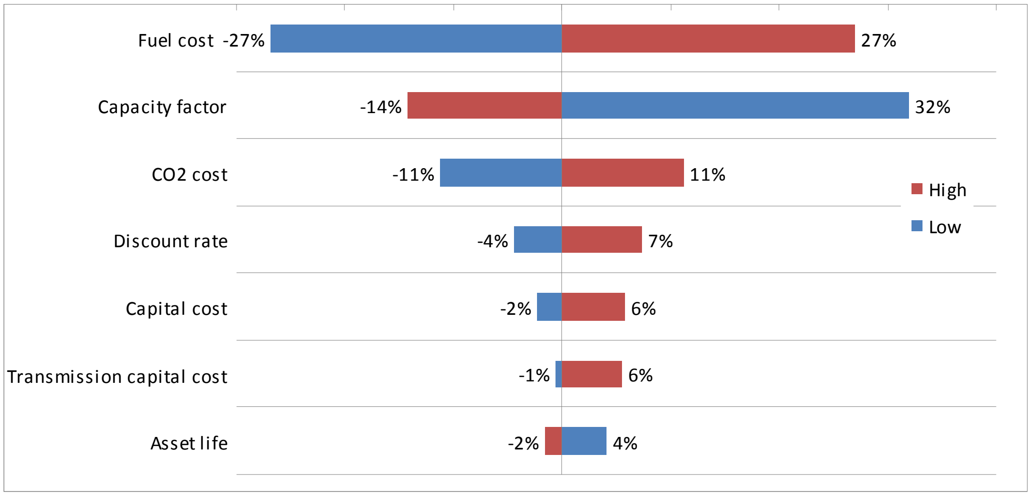
In reality, many of these parameters will be uncertain, and change over time, and the return on investment criteria when applied over the entire asset life is most likely to be front loaded. In addition, generating plant cannot run at a loss for extended periods without becoming insolvent. Therefore it must earn adequate returns in the short to medium term, and not only over the life of the asset.

To achieve such an investment outcome in practice, all supply and off-take contracts would need to be in place for the life of an asset. This is possible in some regions of the world but only in the absence of a market and by using long term financing and off-take contracting (Power Purchase Agreement).

Such outcomes cannot be achieved in the Australian NEM, where assets are exposed to market and regulatory risks, and there are heightened uncertainties over climate change policies, fuel costs (LNG related prices) and cost of carbon.

The effect of these uncertainties on the LRMC for a new entrant has been examined. The tornado diagram in figure 2 summarises the results by indicating the percentage range of each key parameter above and below a reference level. It can be seen that fuel cost and capacity factor dominate the generating costs and in combination could easily account for more than a 50% increase of the LRMC.

Figure 2: Generator LRMC tornado diagram



Explanation of variables used in the tornado diagram (real 2011 dollars)

		Model	Scenarios: Reference	Low	High
Capital cost	k$/MW	1000	1000	900	1250
Asset life	y	25	25	15	40
Fuel cost	$/GJ	6	6	3	9
CO2 cost	$/tCO2	25	25	0	50
Discount rate	%/annum	10%	10%	8%	13%
Capacity factor	%	50%	50%	25%	90%
Transmission capital cost	k$/MW	20	20	0	200
Inflation	%/annum	0.0%	0.0%	0.0%	0.0%
Carbon Intensity	tCO2/MWh	0.4	0.4	0.4	0.4
Heat Rate	GJ/MWh	8	8	8	8
VO&M	$/MWh	2.7	2.7	2.7	2.7
FO&M	k$/MW	31.1	31.1	31.1	31.1
Installed Capacity	MW	400	400	400	400
Debt	%	40%	40%	40%	40%
Cost of Debt	%	8.5%	8.5%	8.5%	8.5%
Debt Term	Years	15	15	15	15

In the NEM context, generator project proponents need to address such risks, generally without prospect of entering into long term contracts.

It is important to note that the uncertainties and risks increase over time. In the face of uncertainty, investors prefer to have their returns front loaded (i.e. high risks of partial or complete stranding of assets sometime in the future).

Clearly this approach by investors is not compatible with the currently contemplated average LRMC metric.