
Optimal Reliability for the NEM

AEMC Reliability Forum

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Overview

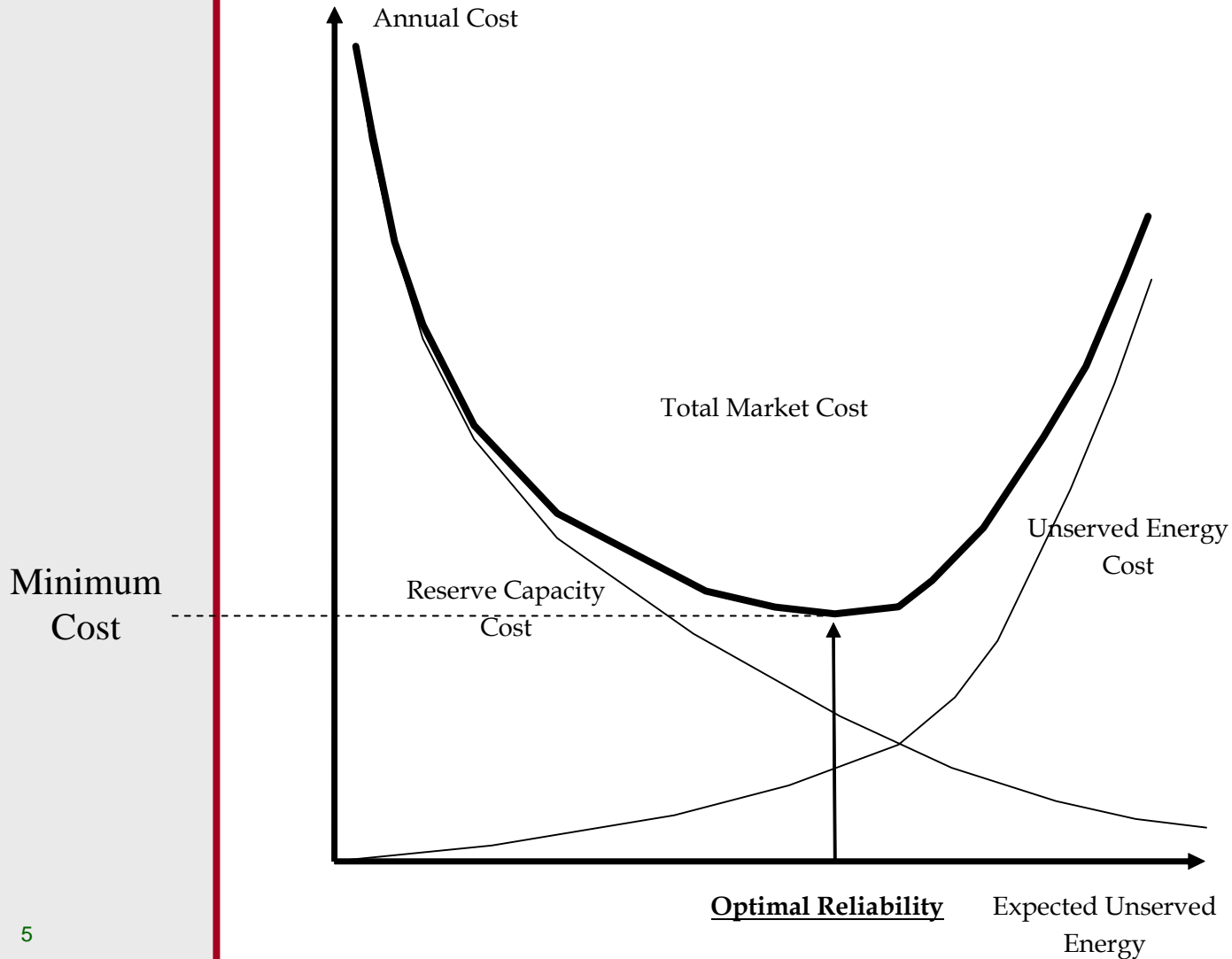
- **Optimal reliability study**
 - Purpose
 - Results
 - Implications for NEM Participants

Purpose of Study

- Question whether reliability standard is economic
- Develop a practical methodology to calculate an economic reliability standard using a detailed NEM model
- Identify how the current standard can be improved in definition and application

**What does “economic” reliability
mean?**

An Economic Reliability Standard



Process

- **Using Plexos conducted 30 simulations of 17 capacity states for the NEM for 90%, 50% and 10% POE load profiles (6, 9, 15 simulations)**
 - Aimed to get results in the 0.001% to 0.004% range
- **Regressed Expected Unserved Energy (USE) as a function of regional capacity:**
 - Assume $USE = \exp(a + bV + cN + dS + eQ)$
- **Calculated customer cost for each unserved energy event in the 30 simulations**
- **Regressed Customer cost as a quadratic function of USE**
- **Calculated USE by region for minimum total cost**
- **Also looked at using standard average of \$30/kWh USE cost**

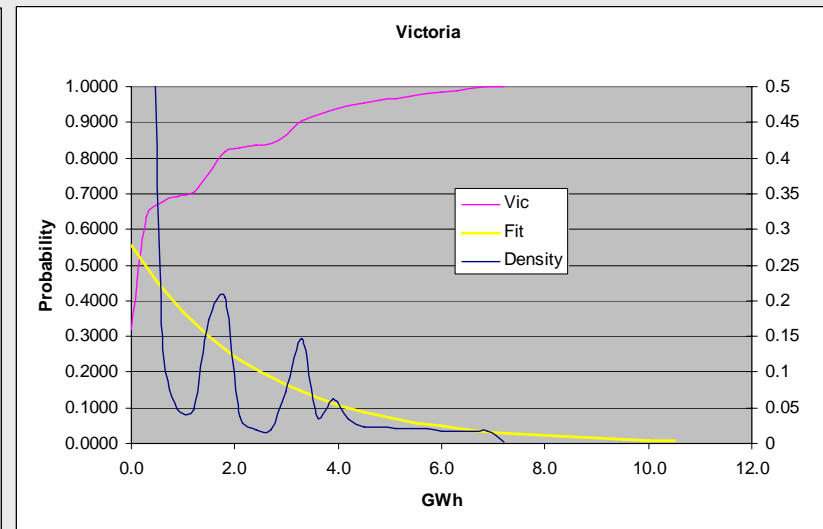
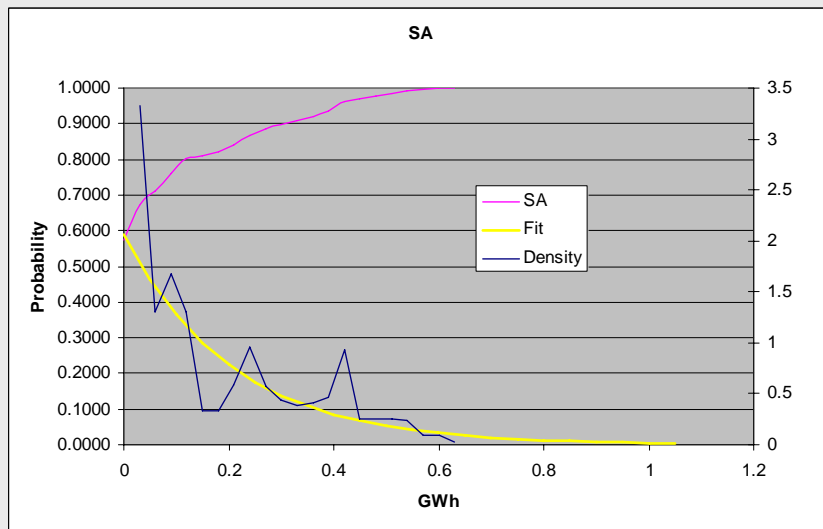
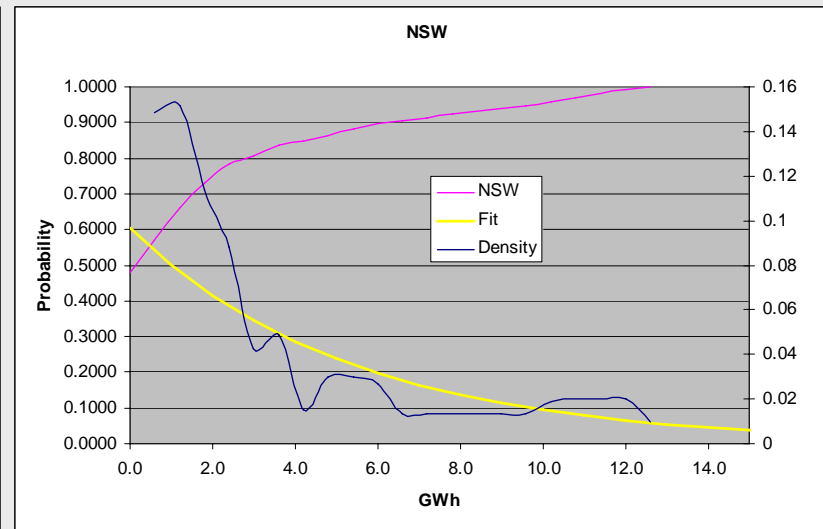
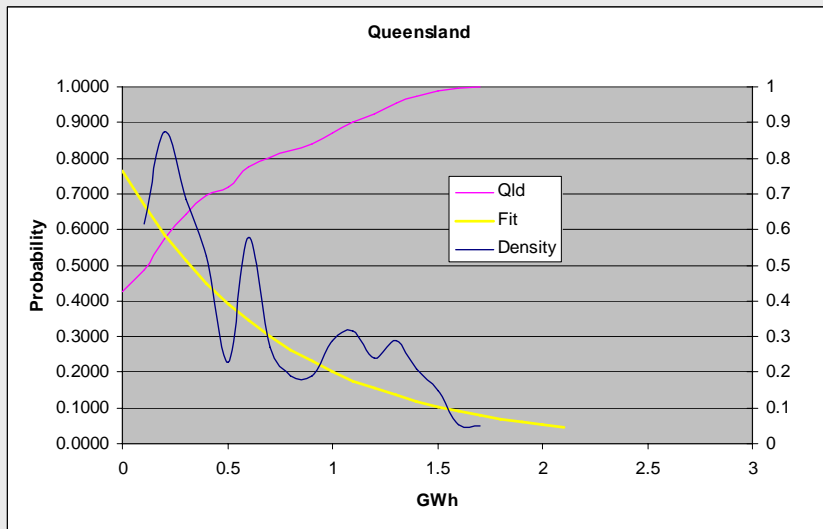
What were the load shedding policies?

Advice from the Jurisdictional Co-ordinators

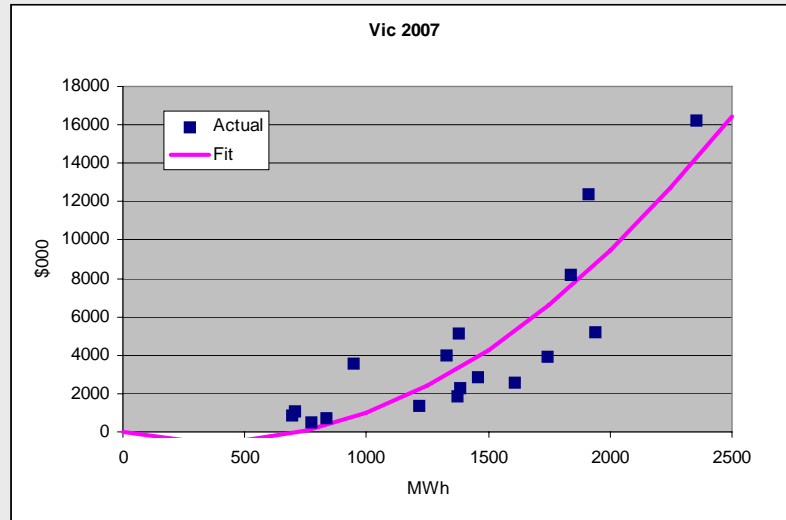
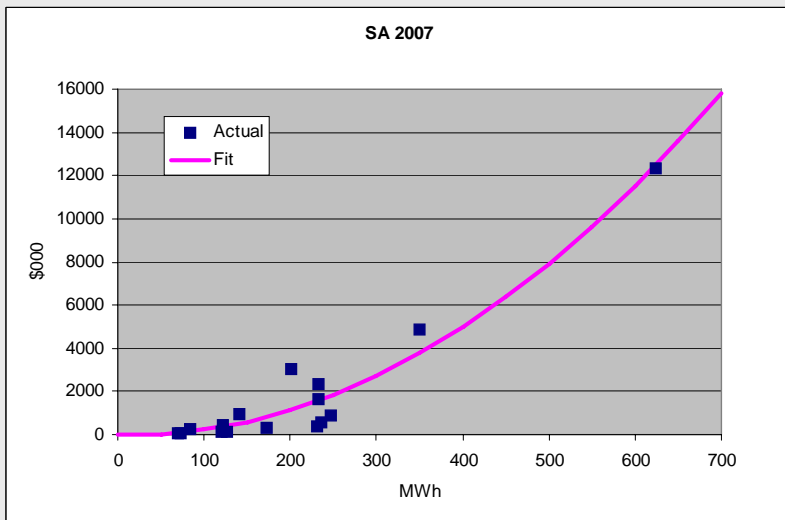
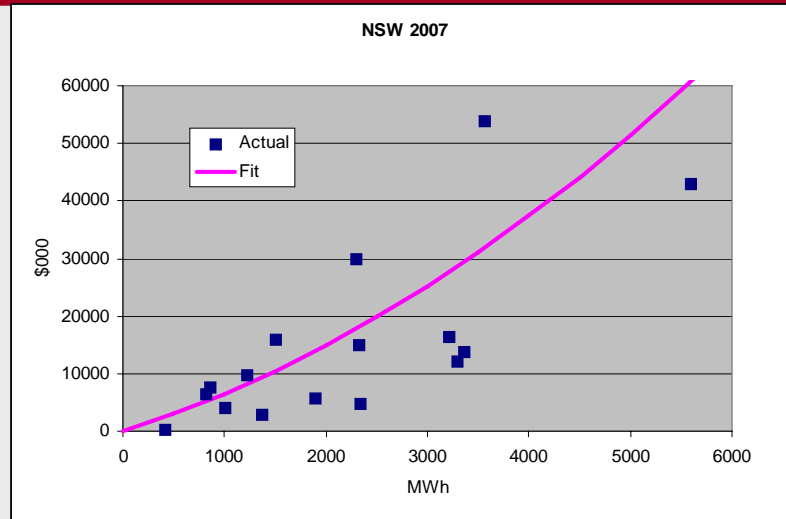
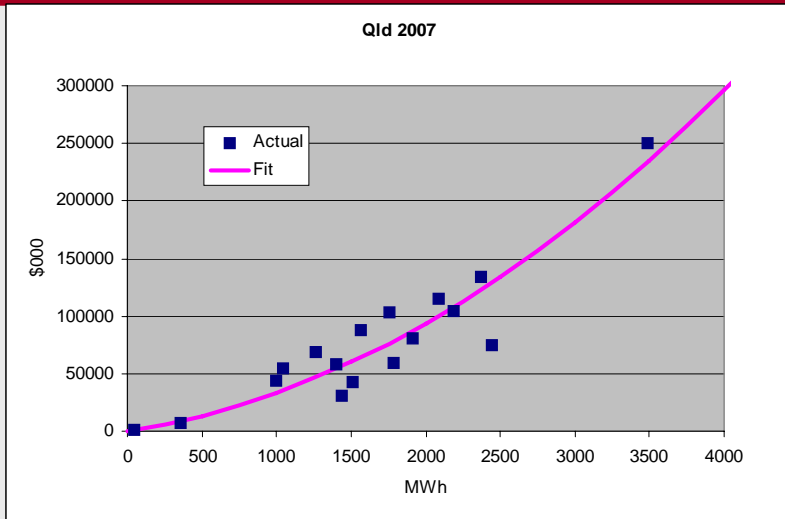
- **Jurisdictional Co-ordinators would not provide any quantitative data on load shedding policies (volumes at risk by market segment)**
- **JC's provided a general overview which was then interpreted by MMA**
 - Qld: shares risk over all sectors but not large industrial loads
 - SA: 100 MW water pumping, residential and small business, rationing the next day.
 - Vic: limited smelter shedding of 600 MW for 1.5 hours (900 MWh) and 4500 MWh for a year, residential and small business next
 - NSW: limited smelter shedding of 800 MW for 1.5 hours (1200 MWh) and 6,000 MWh for a year, residential and small business next
 - Above a defined level, restrictions would be imposed for 10 times the USE volume. This was priced on the original unserved energy but at a higher cost.
- **These concepts were entirely derived by MMA as no real data were available. These parameters are an important driver of economic reliability level**

What did the results look like?

Non-Normal Distribution of Unserved Energy



Unserved Energy Cost for 2006/07

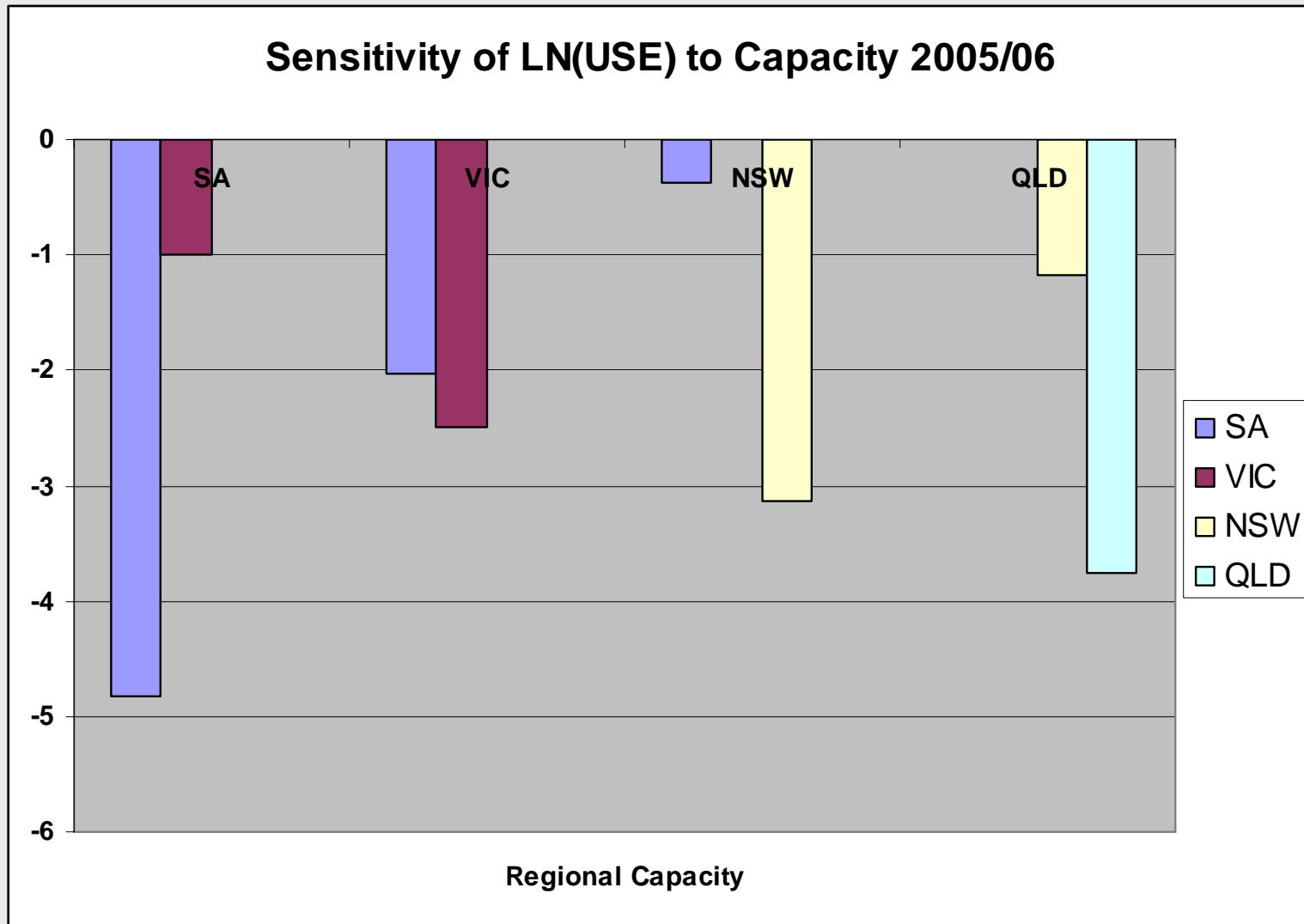


Note: Results for 17 capacity states

Cost Versus USE

- **More linear in Queensland because of assumption about equal pain**
- **More curvature elsewhere because of potential role for smelters and water pumping**
 - useful role for water pumping in South Australia
- **As expected some statistical uncertainty about cost for a given level of expected unserved energy**

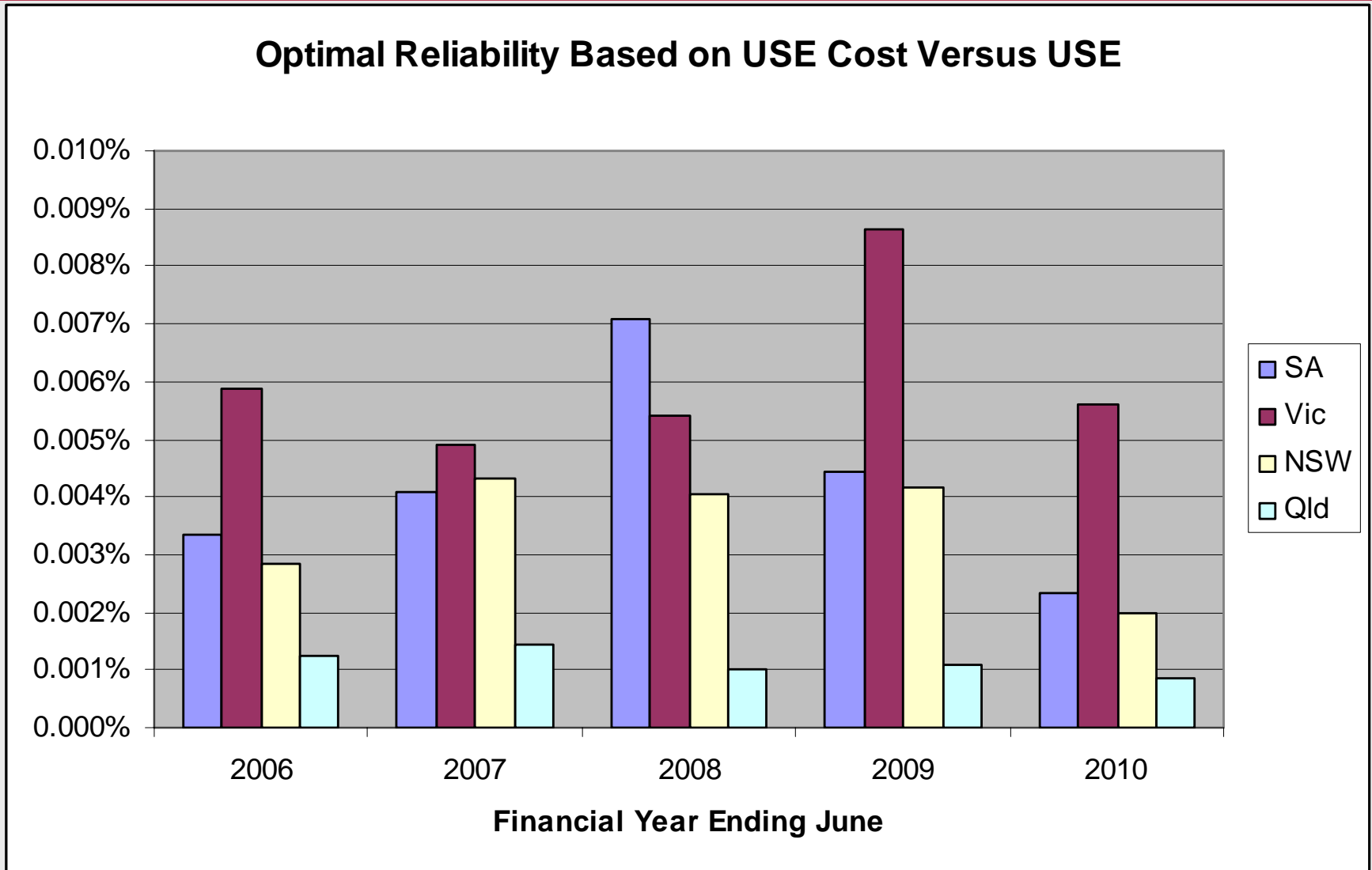
Natural Log of USE Versus Capacity



USE Versus Capacity

- Queensland is not significantly affected by southern regions
- NSW is partially affected by Queensland (via QNI)
- Victoria is affected by SA and NSW
- SA is affected by Victoria and NSW

Optimum USE based on Load Shedding



Alternative Policies and Value

- **Common Standard 0.002% is definitely in the ball park but regional differences are material**
- **Variable targets by year and region 0.0011% to 0.0086% for \$40 M pa saving is probably worth it**
 - When current state of capacity is recognised saving reduces to \$9 M pa to 2010
 - Higher USE target would mean much less intervention by NEMMCO

Basis for Intervention

- Assessed USE could easily be $\pm 30\%$ (1 St dev) based upon uncertainty in measurement and modelling
- Therefore intervention level for USE should be higher than the target value
 - Eg +28% USE for a 1 in 5 year intervention basis
 - Corresponds to 50 MW in SA, 80 MW in NSW and 100 MW in Vic and Qld reduced capacity margin

Conclusion

- **Given the uncertainties in the recent analysis, likely economic policy for reliability standard would be**
 - 0.001% in Queensland
 - 0.004% in southern regions
- **Dependent on**
 - regional load profile
 - scheduled and forced outage performance
 - the load shedding policies
 - the customers actually at risk
 - the customers' actual or perceived costs

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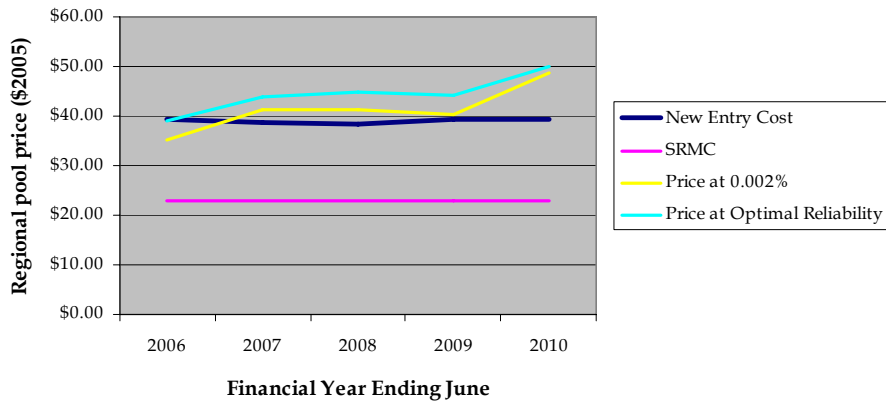
Robert Davenport
Energy Users Association of Australia
27 July 2006

Implications for Customers

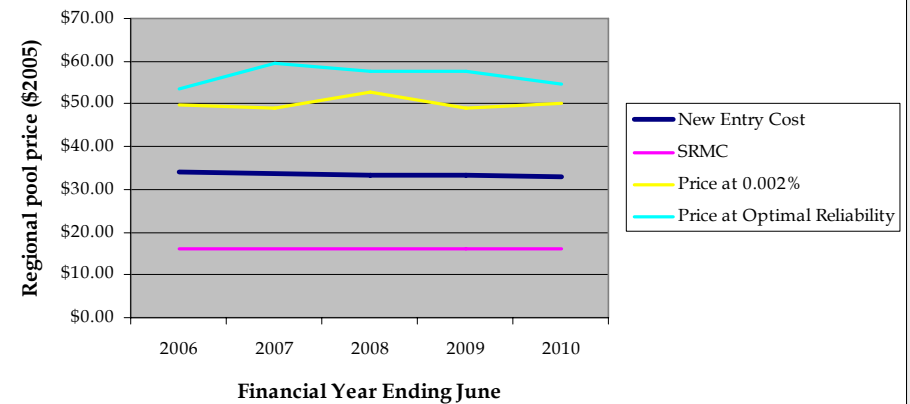
- **If optimal USE were adopted without change in market structure, pool prices would be 20-30% above new entry costs**
 - This means that the market with competitive new entry would always achieve better than the optimal reliability because of existing market power
- **Reliability increases with market power**
 - But so does price!

Prices for Optimal Reliability

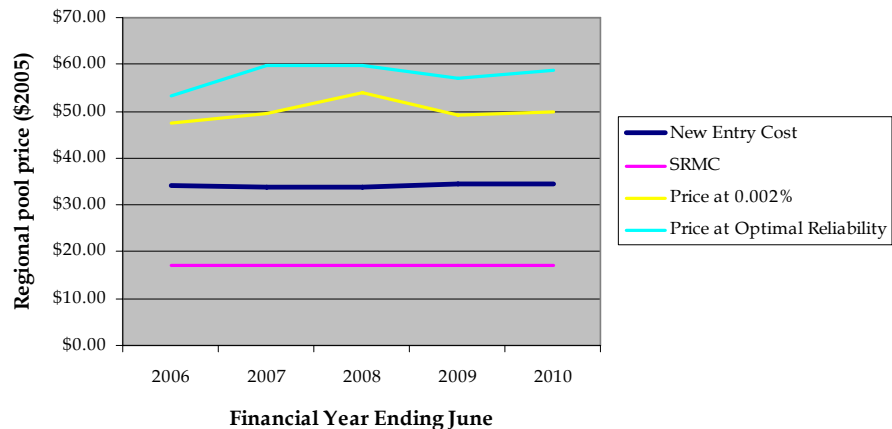
Annualised SA regional price comparison



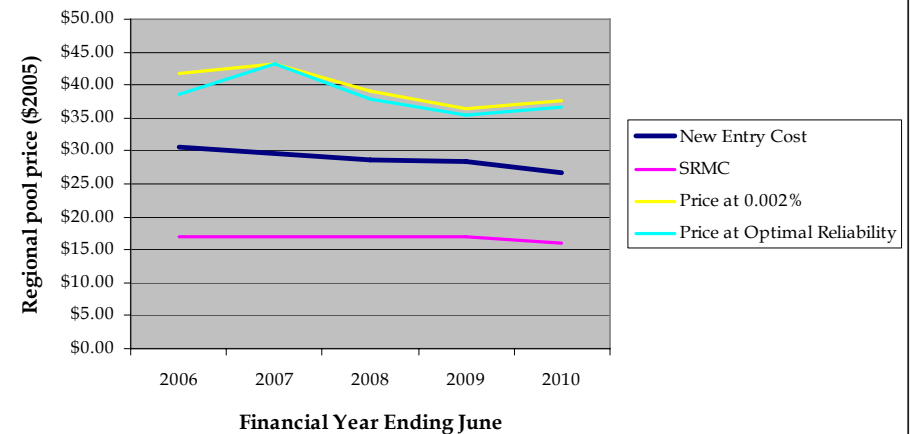
Annualised NSW regional price comparison



Annualised Vic regional price comparison



Annualised Qld regional price comparison



Price and Reliability

- The analysis confirms in part why the NEM has already delivered better than standard reliability because except for SA the pool price at 0.002% would average above new entry cost based on current market power and bidding behaviour

Implications for Users

- Risk of excessive intervention has limited opportunities for demand side response apart from belated NEMMCO intervention
- Low returns to generators means that any opportunity creates high price risk (eg 2000/01)
 - Generators face high risk and pass this on to the customers when they can
- Apart from self-insurance by retailers, proponents are finding it hard to justify peaking plant at the point when lead time demands it
 - Means higher contract premiums when supply gets tight
 - If retailers self-insure they are more likely to pass those costs on if they over do it.

Lower reliability standard with appropriate intervention

- **One might think that lower reliability standard would be bad for customers**
 - And it could be initially except that we already have sufficient capacity to do better than the optimum reliability level
- **Confidence grows that NEMMCO will only intervene when really necessary**
 - The demand side will have room to find value in participation
 - Generators will perceive lower risk and be able to accept more debt thus lowering WACC which would be passed on to users with lower and more stable prices through competition
- **Prices recover to sustainable levels and peaking plant would be commissioned with more confidence about its value**
- **Retailers risk margin reduces which lowers contract costs to customers, particularly after a hot summer**
 - remember contract prices in Vic/SA after 2000/01 summer?

Minimum electricity prices with reasonable supply risk

- **Reserve trader contracts the necessary resources**
 - extend period of commitment to reserve trading with risk adjusted measures
 - reduce the probability of intervention when market delivering optimal reliability
 - enhance longer-term application of intervention if risk adjusted reliability targets are not being matched with capacity in the pipeline

Maximum Supply Reliability at Reasonable Cost

- **Ensure economic standards and demand side participation**
 - estimate optimal level of bulk supply reliability based on customer load at risk and its value to each customer class
 - separate security from reliability aspects.
- **Protect contracted customers from involuntary load shedding**
 - examine ways of protecting contracted loads where the counterparty is available
- **Look at extremes of unserved energy as well as the market value**
 - examine not only the expected unserved energy but the asymmetry of risk



Maximum Supply Reliability at Reasonable Cost

- **Adapt reliability standard to local regional conditions and prevailing supply/demand balance**
 - adapt reliability standard to the local conditions having regard to loading diversity with neighbouring regions
- **Review VoLL for consistency with reliability target and Single Market Objective**
 - increase in the VoLL allowed generators to achieve much the same increase in annual average pool price with less than half the number of price spikes – with the price spikes being doubled in value
 - price spikes not signalling any shortage of capacity but rather generator bidding behaviour

Reliability Standard - Success or Not?

- **Has the Reliability Standard been tested**
 - lack of reliability incidents would suggest so
 - however has the true result been masked by excess capacity when the market was formed
 - and government policy decisions
- **Questions remain about whether the correct price signals are there for generators and network providers**
- **Whether market power is distorting the result**

The AEMC Reliability Panel Review

- Key components of this review relate primarily to trade-offs between price to customers and reliability of supply
- MMA report provides evidence that the reliability standard needs amendment
- Answers several questions about the type of standard, its appropriate level and how it should be interpreted
- Indicates that load shedding arrangements should not remain a mystery
 - Not in the public or private interest
 - Only in the political interest!



Questions?

