Optimal Reliability for the NEM

AEMC Reliability Forum

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Overview

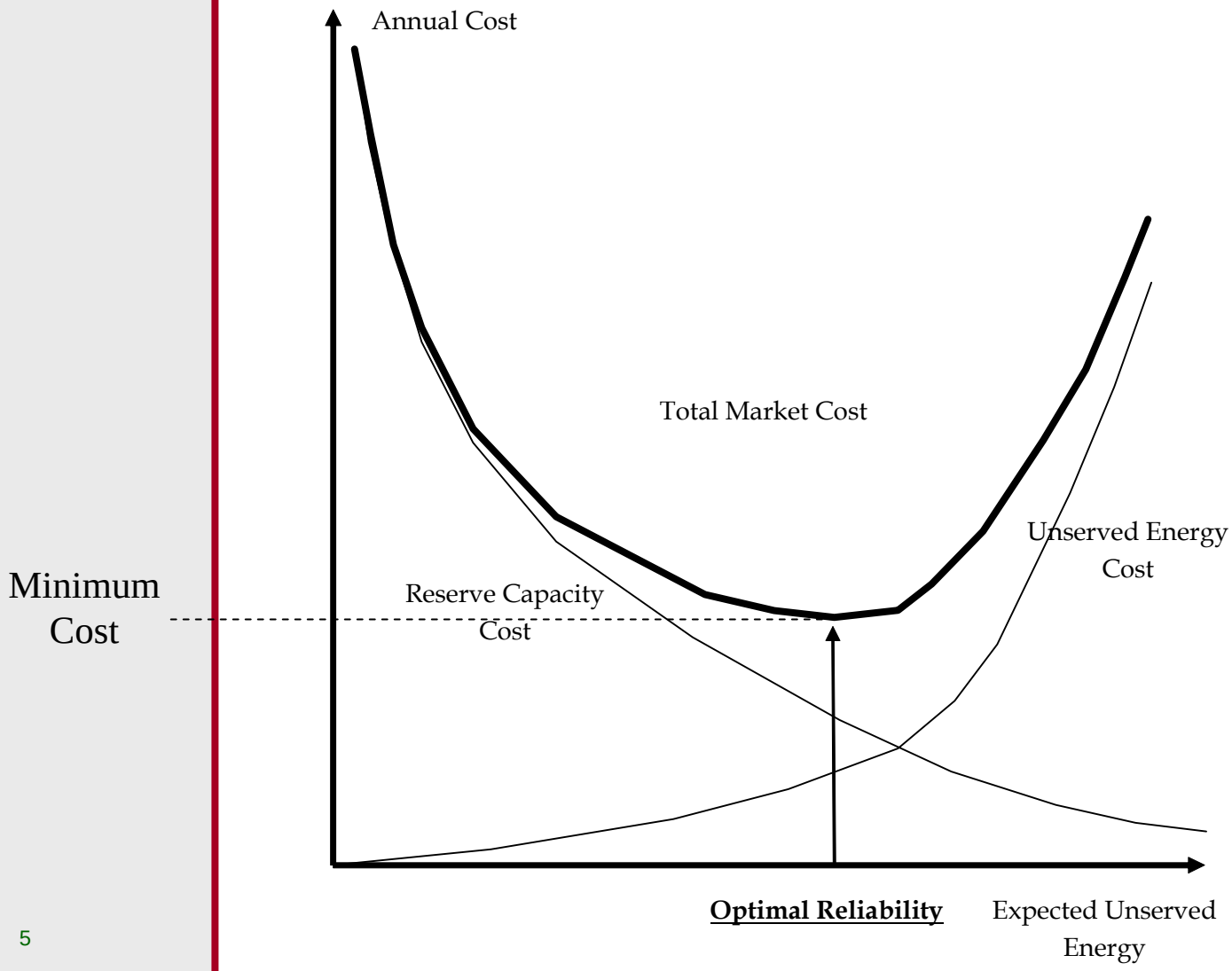
- **Optimal reliability study**
  - Purpose
  - Results
  - Implications for NEM Participants

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**

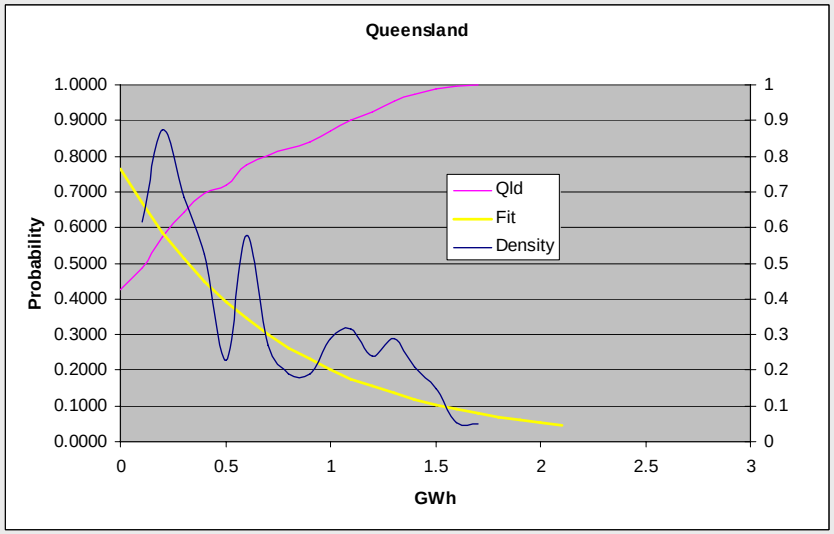
What were the load shedding policies?

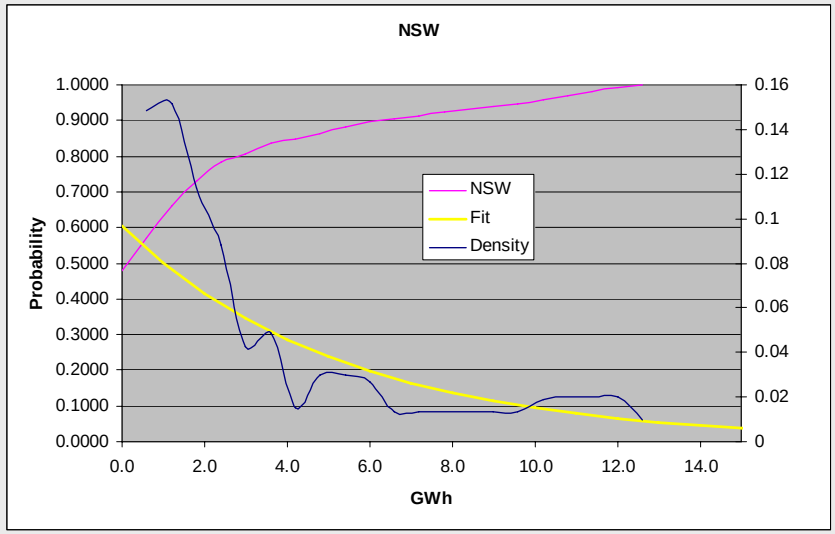
Advice from the Jurisdictional Co-ordinators

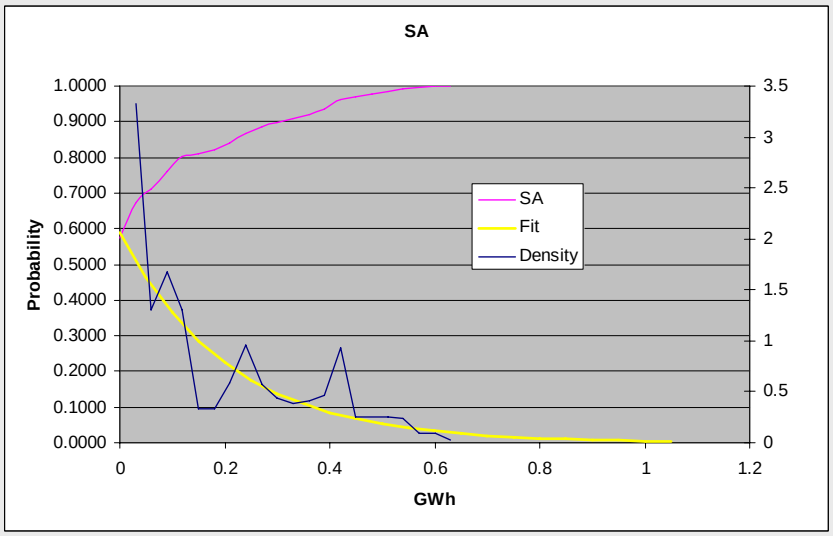
- **Jurisdictional Co-ordinators would not provide any quantitative data on load shedding policies (volumes at risk by market segment)**
- **JC's provided a general overview which was then interpreted by MMA**
  - Qld: shares risk over all sectors but not large industrial loads
  - SA: 100 MW water pumping, 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**

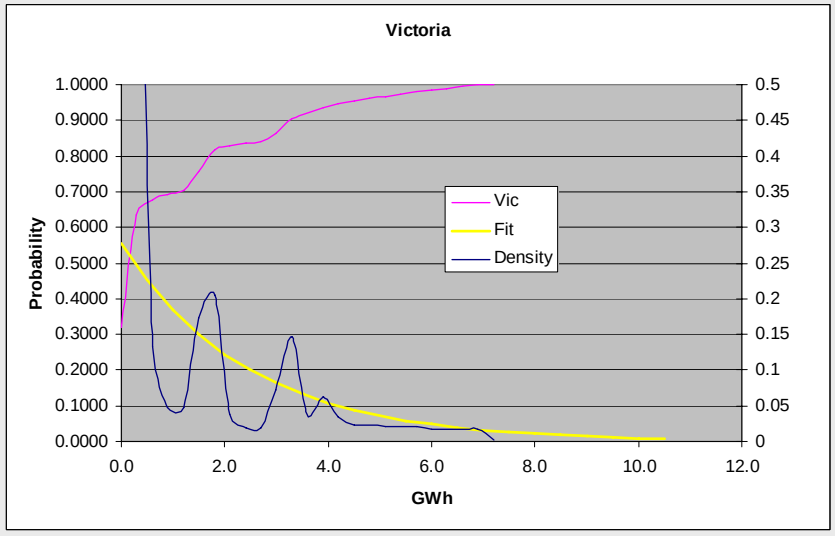
What did the results look like?

Non-Normal Distribution of Unserved Energy

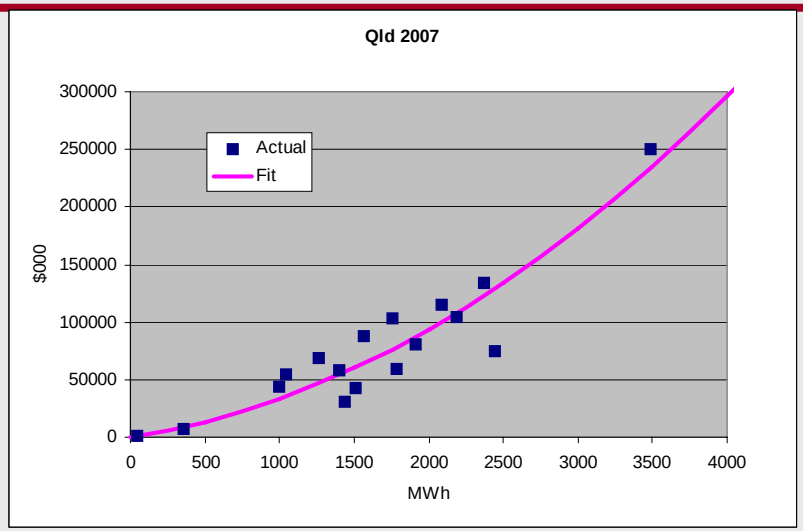


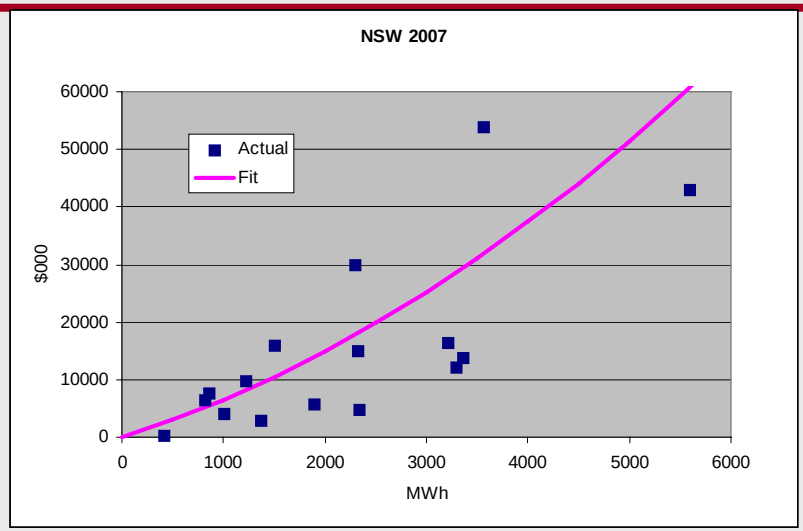


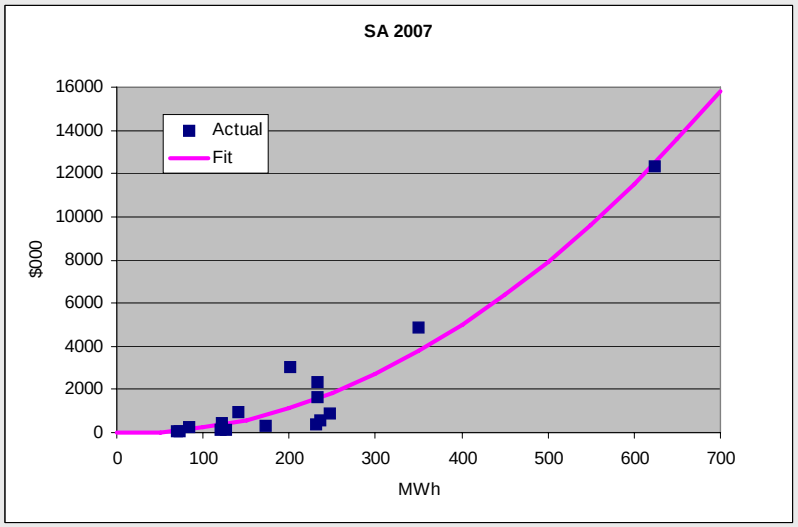


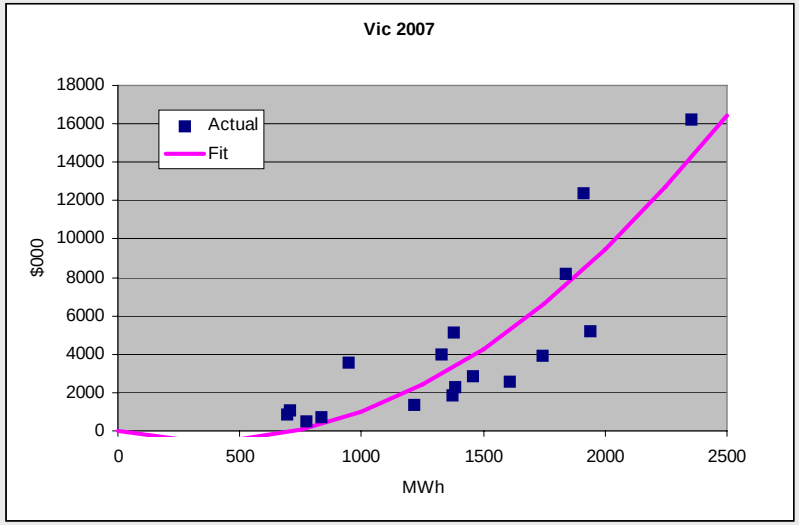


Unserved Energy Cost for 2006/07







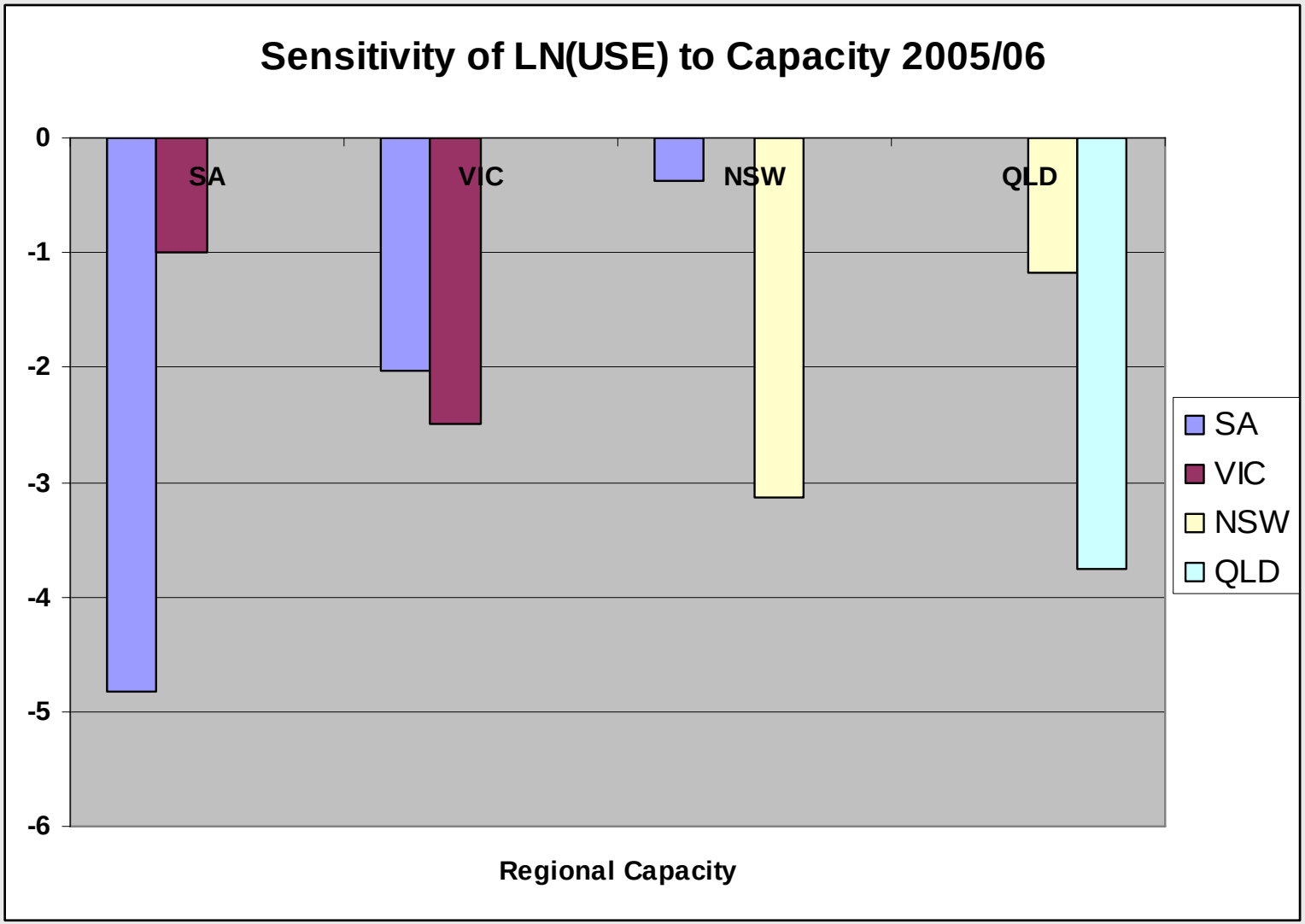


Note: Results for 17 capacity states

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**

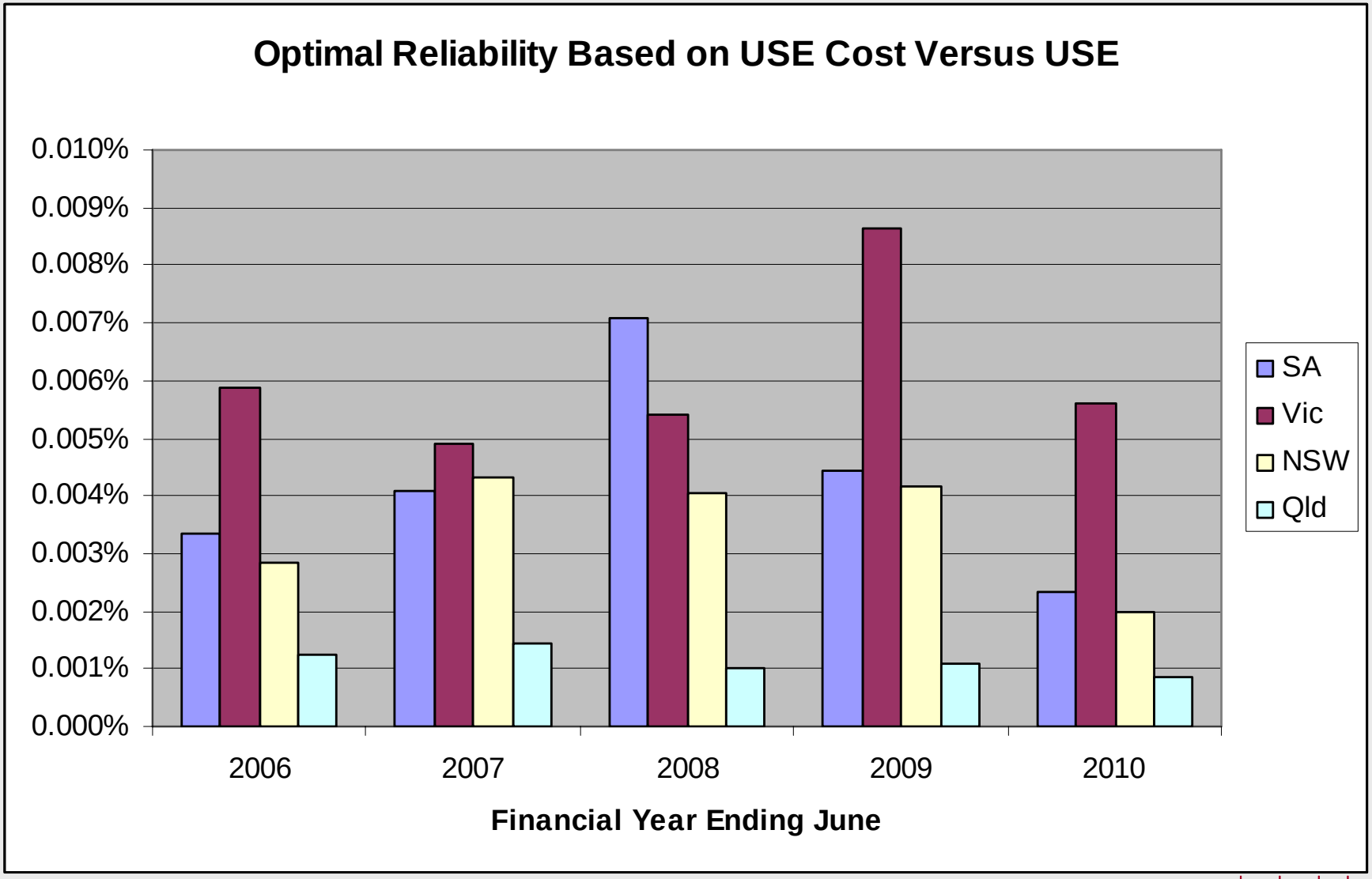
Natural Log of USE Versus Capacity



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 ±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
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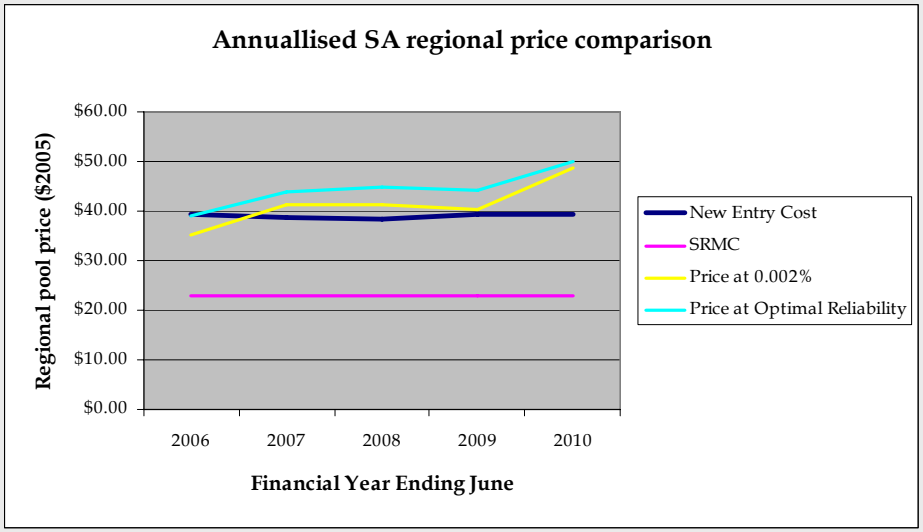
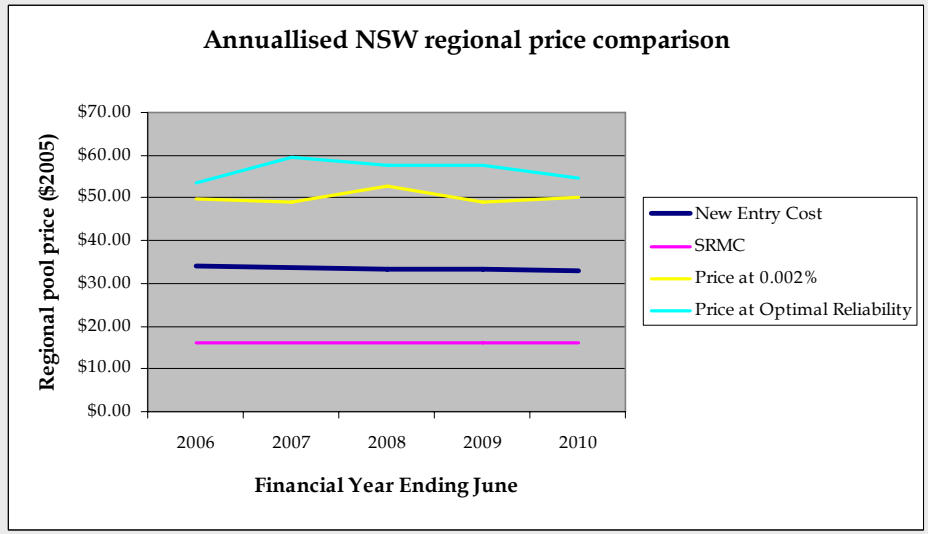
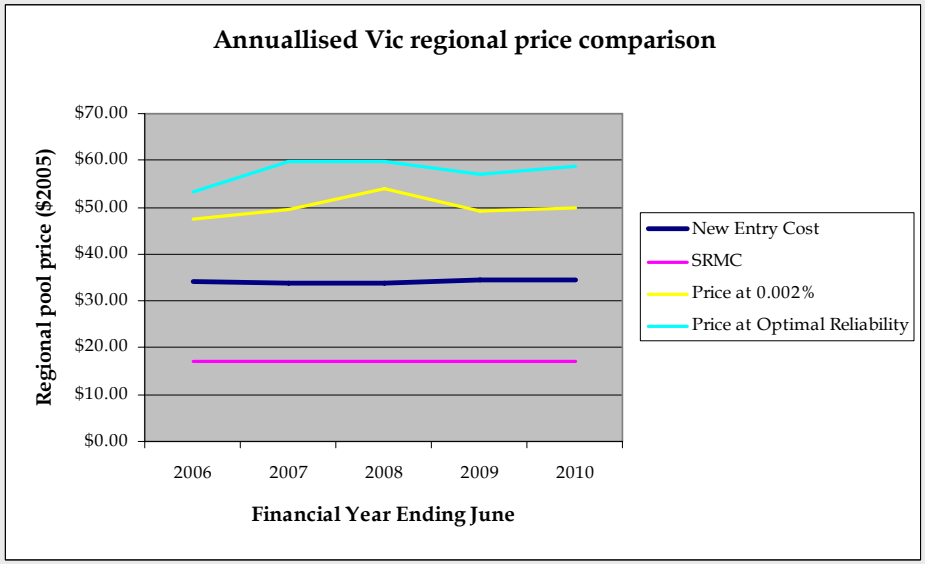
Implications for Customers

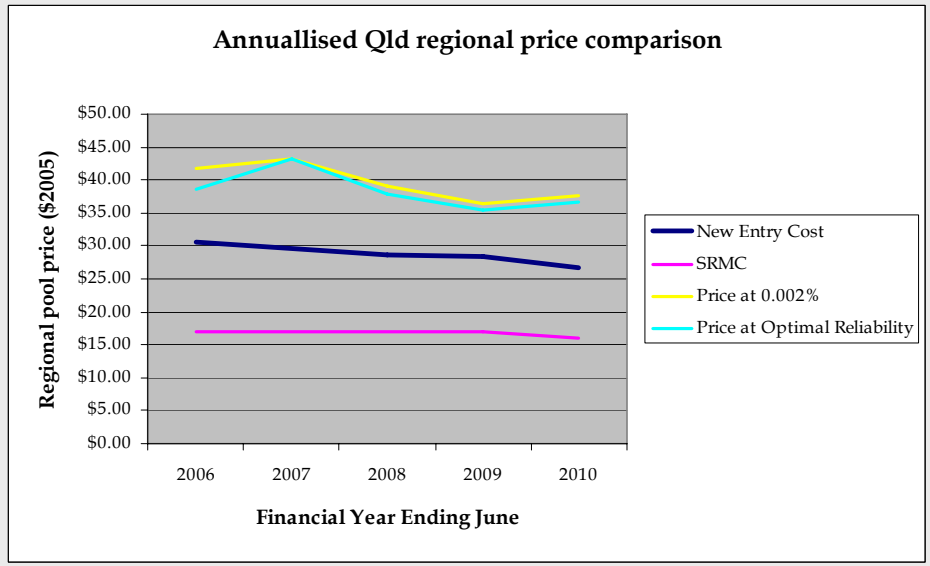
- **If optimal USE were adopted without change in market structure, pool prices would be 20-30% above new entry costs**
  - This means that the market with competitive new entry would always achieve better than the optimal reliability because of existing market power
- **Reliability increases with market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

Prices for Optimal Reliability









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?

10 years 1996-2006

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