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ENERGY MODELLING EXPERTISE

AEMC - Reliability Standard and Settings Review for 2012-13 and 2013-14

Public Forum

Date: 12th February 2010 **Venue: Melbourne**

ROAM's CRA Benchmark

- This benchmark was performed to assess how ROAM's forecast of MPC matches CRA's forecast when both are based on 2007 databases.
- ROAM modelled 25 market simulations at half hourly intervals of both 10% and 50% PoE demand forecasts for the entire NEM.
- The results are shown as a weighted average, with a 70% weighting for the 50% PoE and a 30% weighting for the 10% PoE.
- The Reliability Standard of 0.002% USE has been targeted in this scenario by adjusting generation capacity.
- The following chart shows the forecast USE in each region and the weighted average in all regions.

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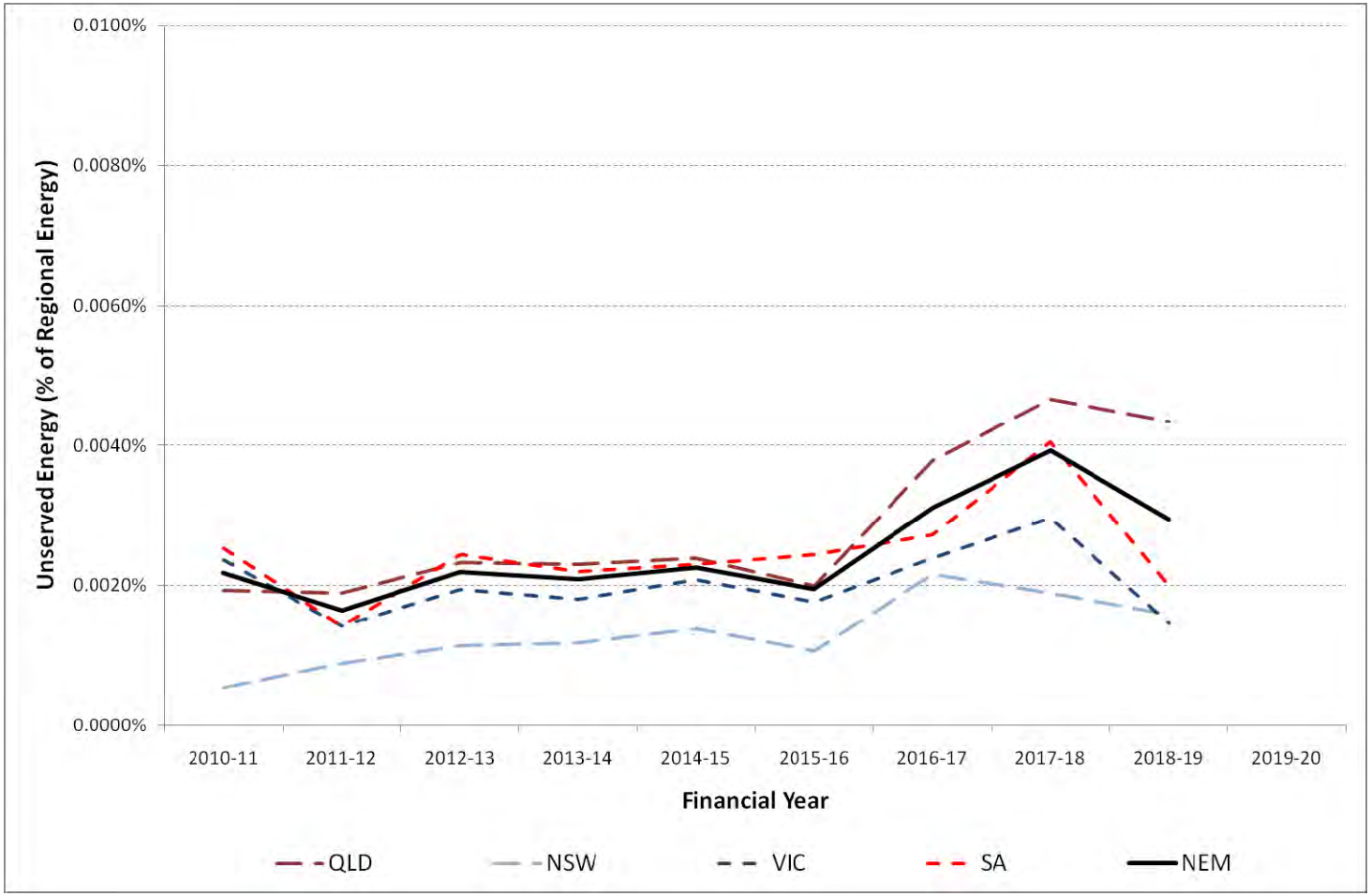
ROAM USE Forecast - CRA Benchmark



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NSW in ROAM's CRA Benchmark

- NSW has been left out of the weighted USE and MPC calculations as it is well below the Reliability Standard and the USE level of the other regions.
- However, this could have been corrected by undertaking more simulations with progressively more NSW generation withdrawn.

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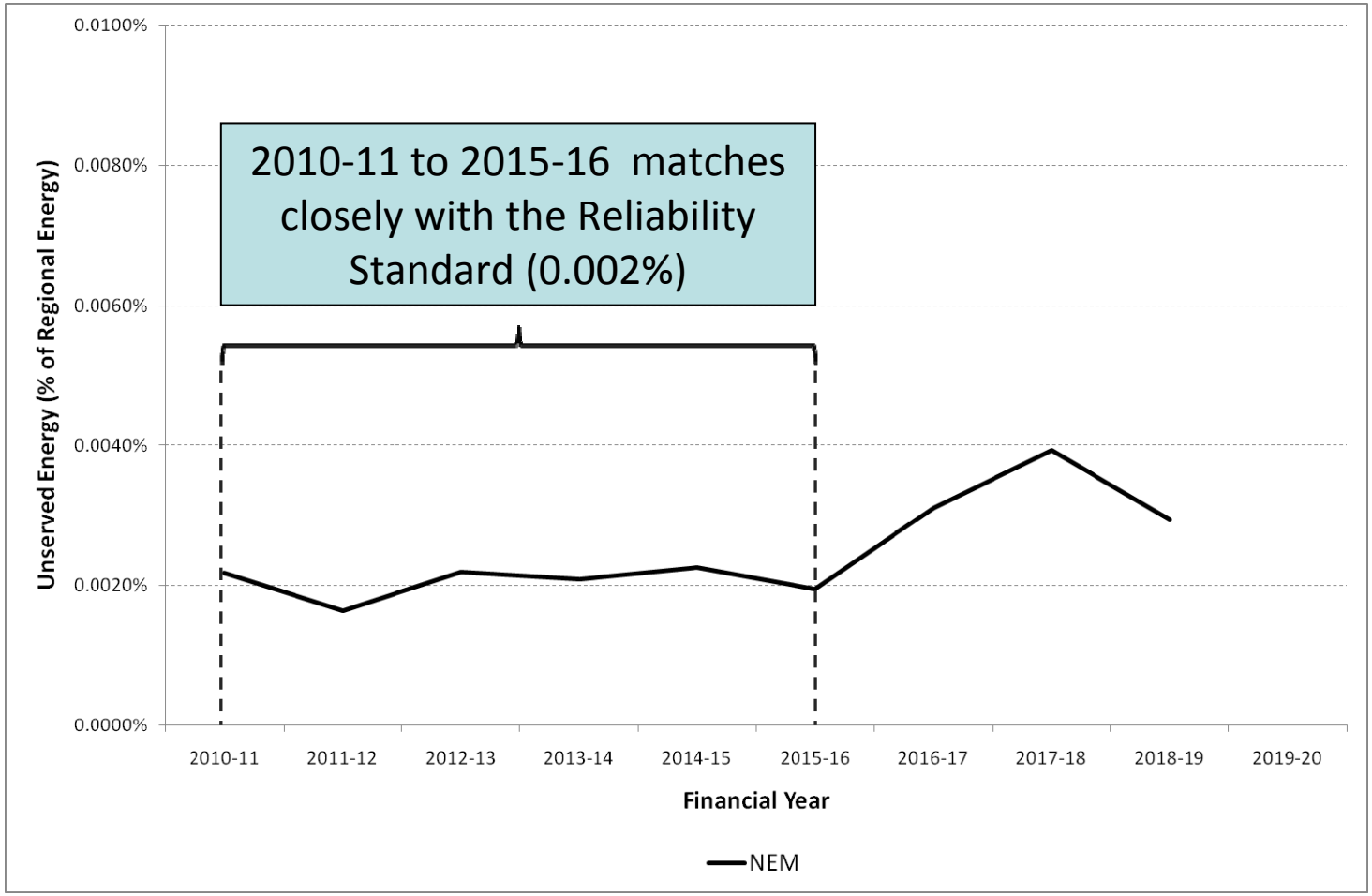
ROAM Weighted USE for CRA Benchmark



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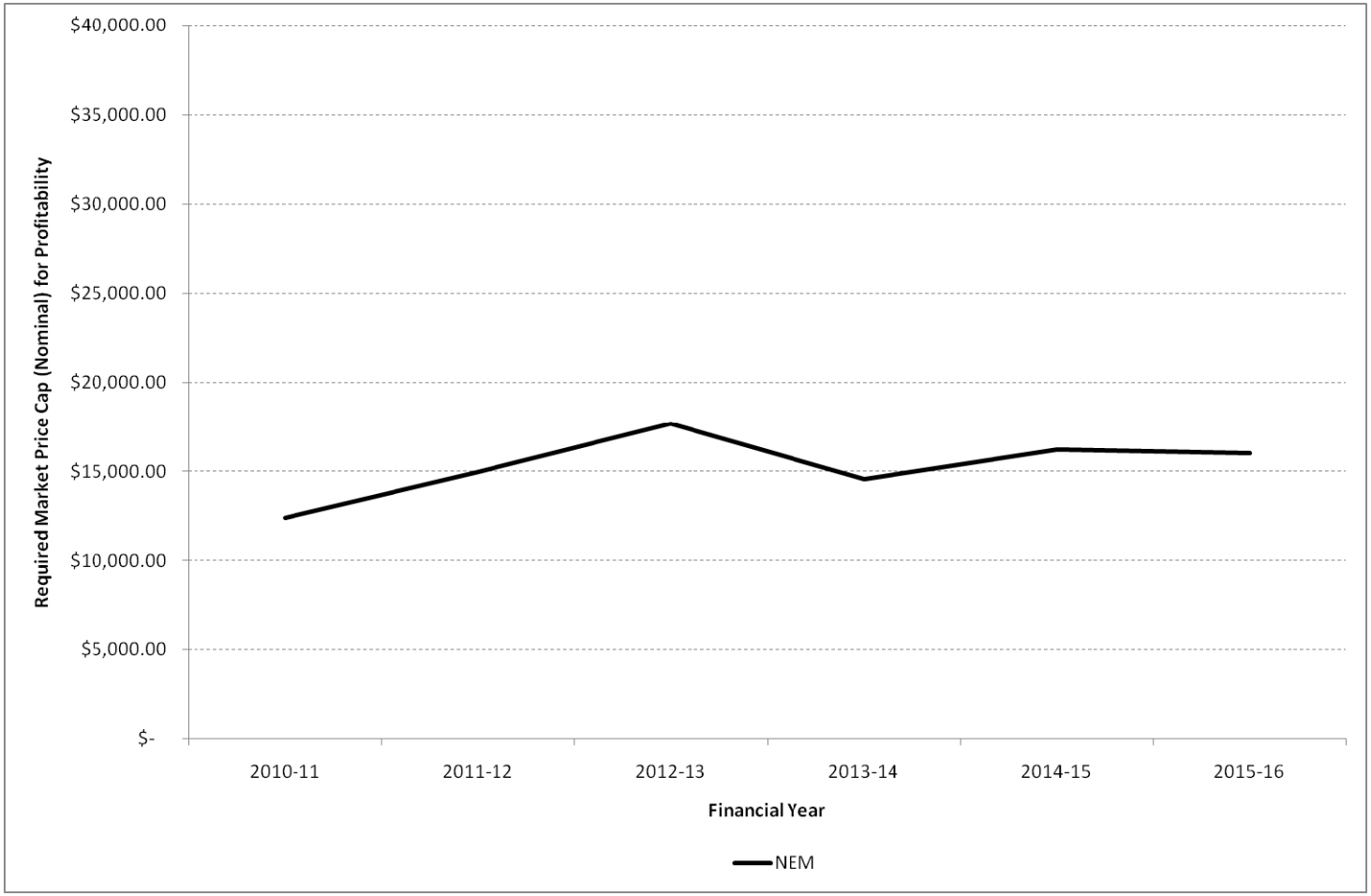
MPC Required for CRA Benchmark



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CRA Benchmark Conclusions

- The MPC required is as low as $12,500/MWh in 2010-11 and $15,000/MWh in 2011-12.
- Therefore ROAM has been able to successfully achieve a close alignment with CRA findings.

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RSSR OUTCOMES

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Modelling Methodology

- The market must provide sufficient incentive for generators (or DSM) to deliver the capacity required for this short period such that the Reliability Standard is achieved.
- ROAM has therefore included an extreme peaking generator in each region in the NEM (excluding Tasmania) which are assumed to be bidding just under the MPC.
- The hypothetical generator is modelled in each region using existing real-world generators:
  - QLD: Mackay GT
  - NSW: 1 unit at Hunter Valley GT
  - VIC: 1 unit at Jeeralang A
  - SA: 1 unit at Dry Creek GT
- Given that this generator should be profitable, the MPC is therefore derived from the amount of running hours the generator would expect given that the weighted USE is 0.002%.
- This generator is modelled using the annualised capital cost of the simulation year.
- The generator therefore represents the profitability of a hypothetical new entrant generator in each year.

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Modelling Methodology

- OCGTs are the lowest cost peaking generator.
- For the purpose of this study, these generators have to be profitable running for only the hours in which USE would otherwise occur.
- The forecast shape of USE is narrow and deep.

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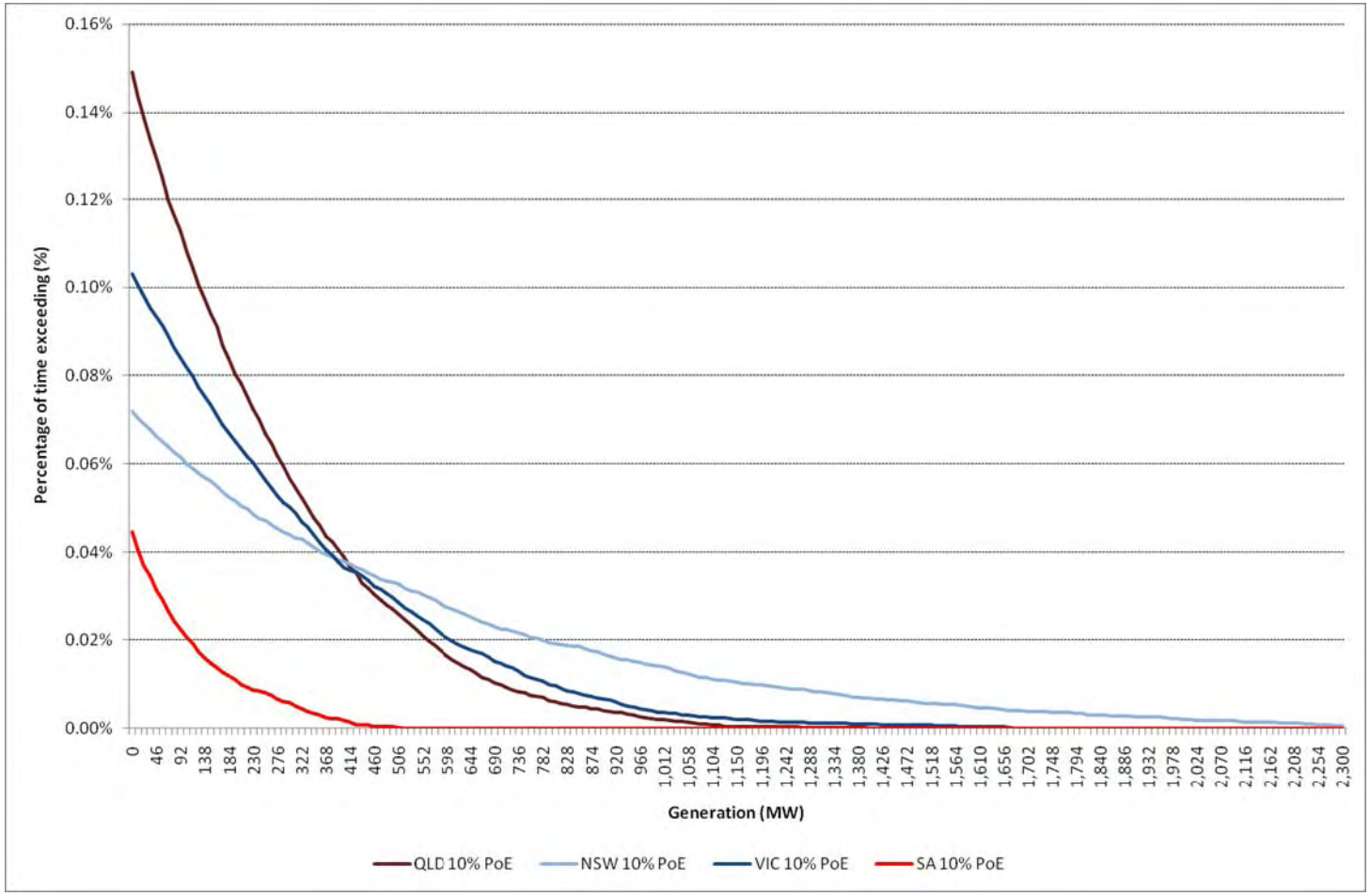
USE Duration Curves – 10% PoE 2013-14



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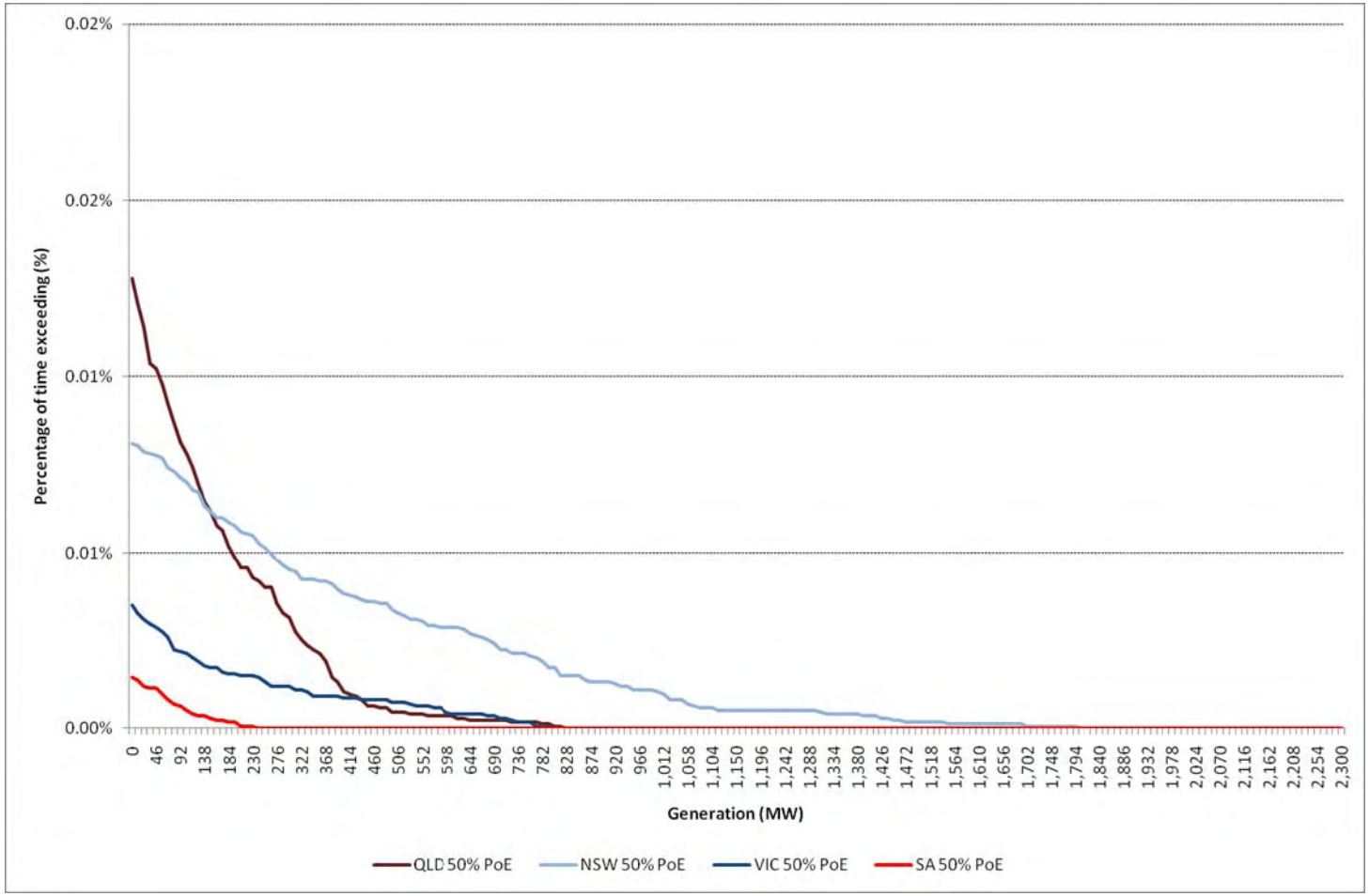
USE Duration Curves – 50% PoE 2013-14



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USE and New Entry Plant

- ROAM has created a set of strategic bids based on analysis of last year's observed bids.
- These generators will therefore set the price below the MPC except in those times that the market is short of capacity.
- The weighted USE with all committed plant may be higher or lower than the Standard. The addition of generation over the period of interest is adjusted in an attempt to closely match the Standard.
- The result is that there are a very limited number of hours when the market is short of capacity. This is determined by the amount of time just at the point when USE occurs. This can be seen in the previous figures.

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NEM Installation Schedule

Queensland

	CCGT	OCGT	Renewable
2010-11	0	308	0
2011-12	0	0	0
2010-11	0	0	20
2011-12	0	0	3
2010-11	0	308	155
2011-12	0	579	355
2012-13	302	854	591
2013-14	1026	994	705
2014-15	1276	1394	935
2015-16	1678	2622	1338
2016-17	2063	2622	1378
2017-18	2313	3549	1507
2018-19	2813	4157	1589

New South Wales

CCGT	OCGT	Renewable
Condamine (1x152MW)	Braemar	Solar Thermal

Victoria

CCGT	OCGT	Renewable
Darling Downs	Mt Stuart	(337MW) Biomass;

South Australia

CCGT	OCGT	Renewable
Mortlake	Uranquinty	Solar Thermal; Solar PV;

National Electricity Market

CCGT	OCGT	Renewable
	Generic New Entrant (1x360MW); Wellington (4x154MW); Bamarang (2x150MW)	Geothermal (280MW) (1x47MW + 2x25MW + 1x7MW) Solar Thermal; Wind Turbine (216MW)

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***Renewable shows the 'Reliable' level of capacity

CPRS Modelling

- CPRS is modelled to commence from 1st July 2011 and ROAM has incorporated the effect of this on bidding strategies for all existing and new entrant generators.
- ROAM uses the CPRS-5 carbon price projections.

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Generator Bidding

- In the examination of reliability, the bidding strategies of generators at times when prices are low is of relatively little importance compared to those times in which prices are high and the occurrence of USE is possible.
- The primary focus of reliability is to ensure that investment incentives exist for sufficient generation to be installed to meet the Reliability Standard in the event of market failure.
- ROAM has therefore used historical generator bidding strategies for existing generators while new entrant generators adopt typical bidding strategies of their generation technology.

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Generator Bidding

- The MPC should be determined by considering this ‘market failure’ case, where extreme peaking generators only generate at times of necessity, as the price would otherwise not reach the MPC.
- Therefore, although these generators may increase their running hours by bidding at lower prices, the analysis of the Reliability Settings must be evaluated against a withdrawal of this extreme peaking capacity to the cap.
- Determining the MPC by allowing ‘opportunistic bidding’ may not provide sufficient incentives for those generators unable or unwilling to operate in such a fashion.
- ROAM therefore considers that the use of a static bidding model for extreme peaking generators is the most appropriate method for the RSSR assessment.

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USE Targeting

- ROAM has targeted a weighted average USE (across all regions and both demand traces) of 0.002% from 2012-13 to 2018-19.

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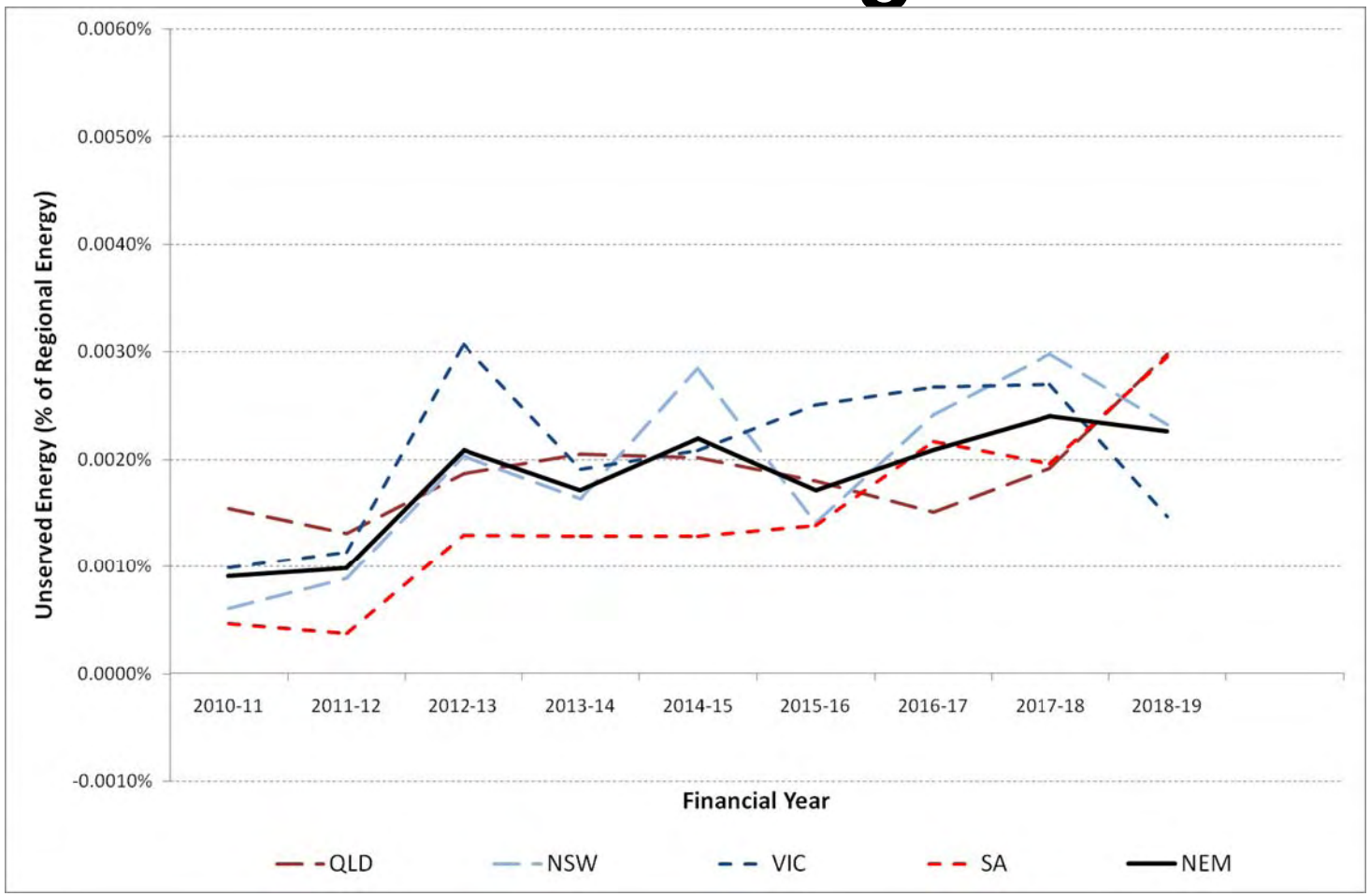
Weighted USE Forecast in RSSR Modelling



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Calculating the MPC

- The MPC is the value that allows the extreme peaking generator to just achieve profitable returns while achieving the Reliability Standard.
- ROAM has calculated this value by analysing the relationship between the USE modelled and the MPC required by the extreme peaking generator for all of the iterations in the study.
- This relationship can be seen below both for the NEM as a whole and for each region.

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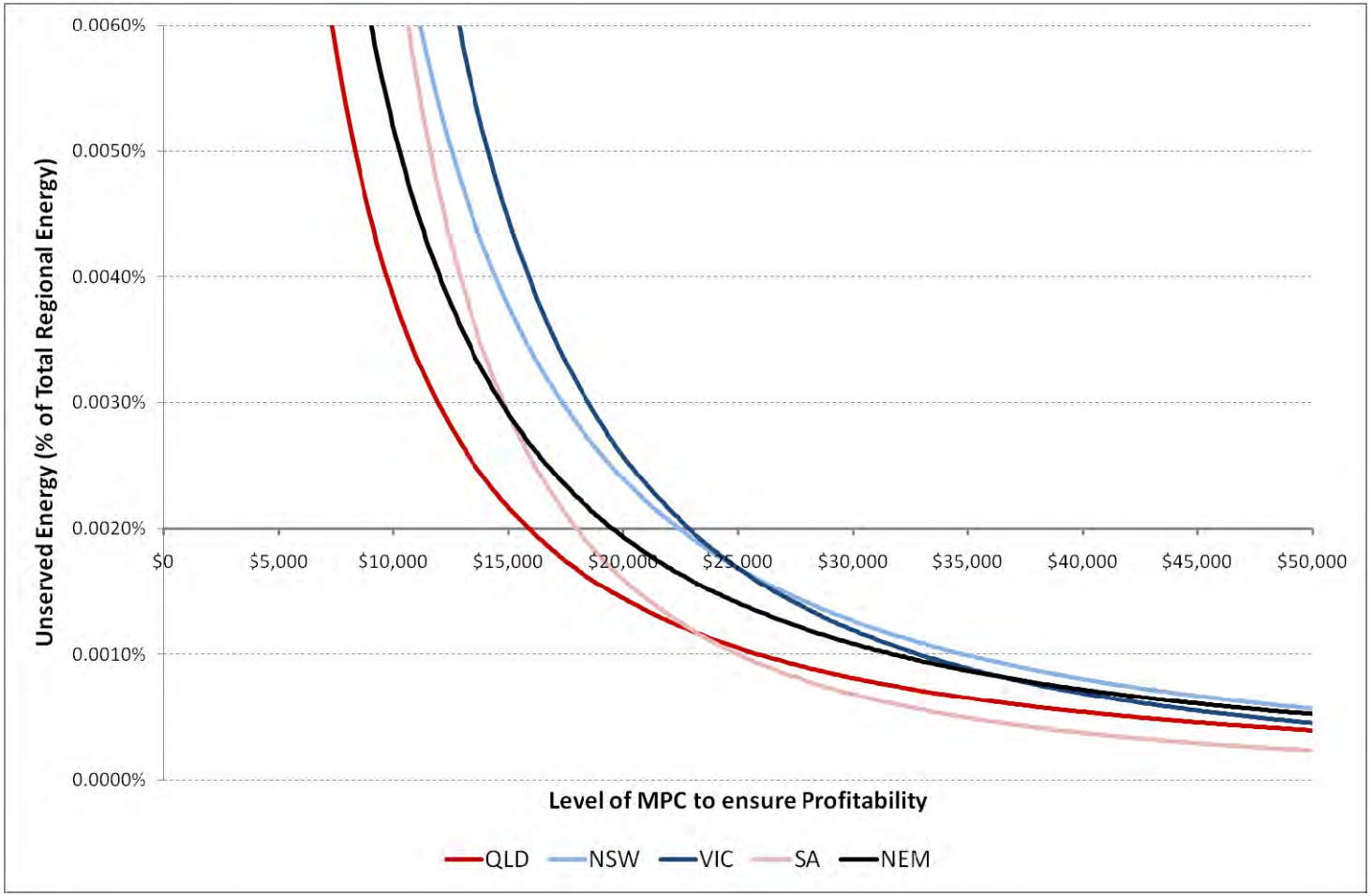
Relationship between USE and MPC – All Regions (all years)



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Regional Differences in MPC

- The MPC for each region is therefore different given the same Reliability Standard.
- Therefore, if a single MPC is used for all regions, insufficient incentives may exist in some regions to install enough capacity locally to meet the Standard.

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RSSR Results

- The figure presented previously has shown that an MPC of approximately $20,000/MWh would be appropriate to deliver the Reliability Standard over the 7 year period.
- The following graphs show the relationship between USE and MPC for the NEM in 2012-13 and 2013-14 as these years are the primary focus of this review.

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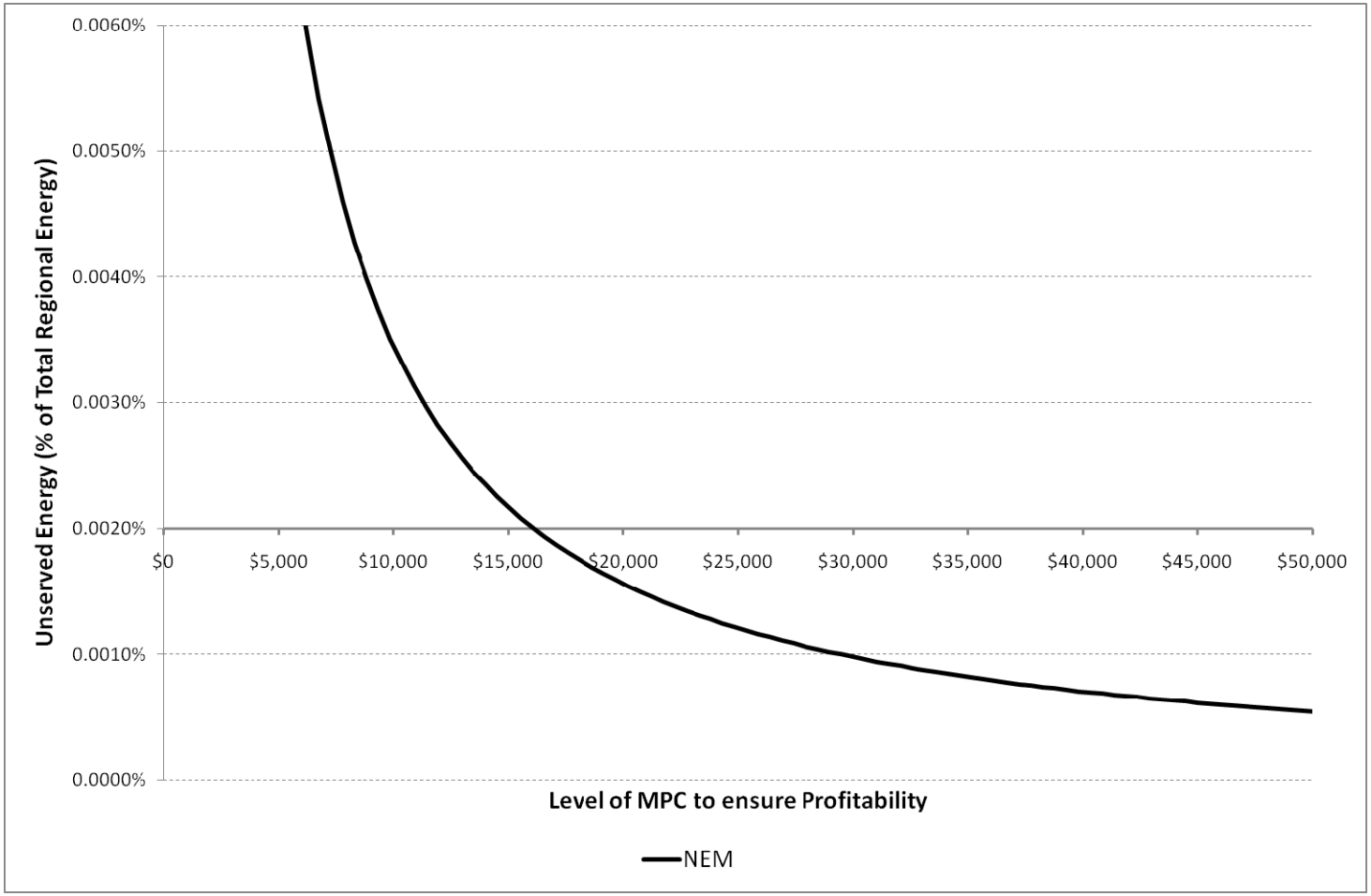
Relationship between USE and MPC – NEM Average (2012-13)



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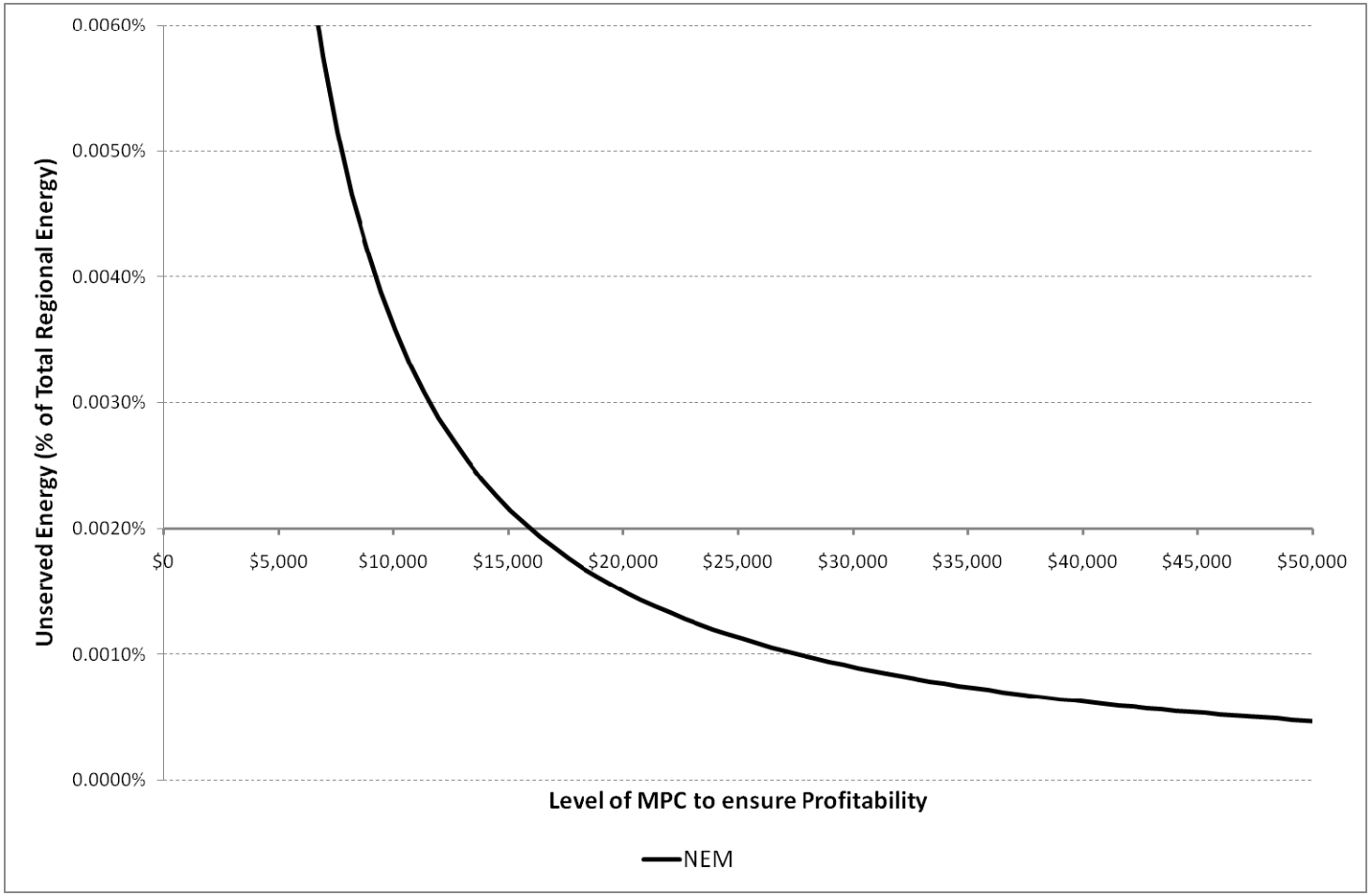
Relationship between USE and MPC – NEM Average (2013-14)



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Annual MPC required to achieve Reliability Standard

- The above figure shows that an MPC of approximately $16,000/MWh is required to achieve the Reliability Standard in 2012-13 and 2013-14.
- The MPC required gradually increases to approximately $20,000/MWh by 2018-19.

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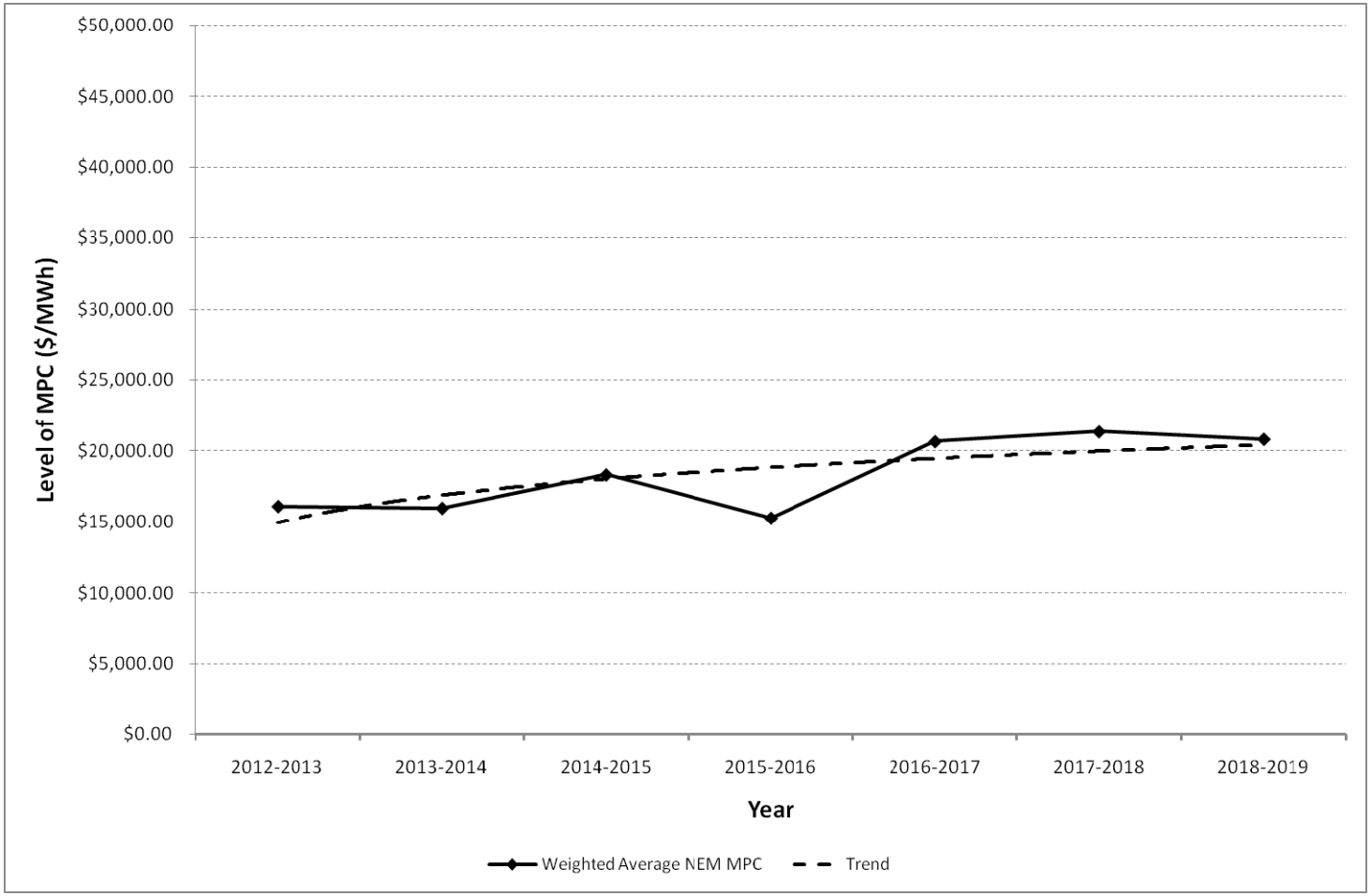
Annual movement of MPC required to deliver the Reliability Standard



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Meeting the Reliability Standard in each region

- The Reliability Standard is defined as achieving the targeted USE of 0.002% in each region in each year.
- The following figure shows the annual movement of the MPC which delivers at least this level of reliability in every region.

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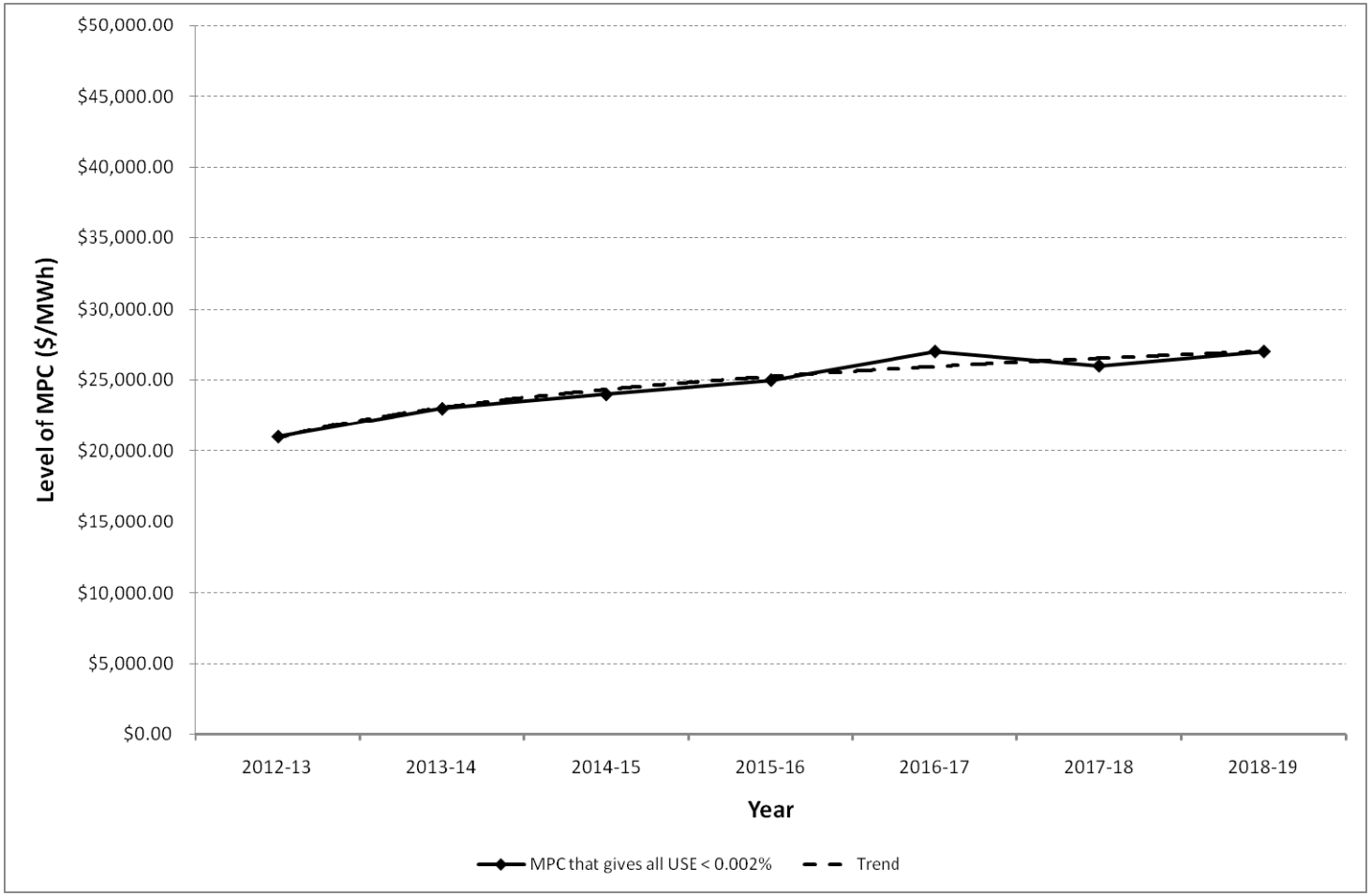
Annual movement of MPC required to deliver the Reliability Standard in each region



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Meeting the Reliability Standard in each region

- Given that the Reliability Standard aims to achieve 0.002% USE in each region, it may be appropriate to choose the maximum MPC required to achieve this Standard in each region.
- The previous figure shows that this approach would set the MPC at approximately $22,000/MWh which is required to achieve the Reliability Standard in NSW.
- This occurs predominantly as a result of the differences in the shape of the extreme part of each region's load curve which is where peaking generators will be dispatched.

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Cumulative Price Threshold

- The CPT exists to minimise the financial risk for market participants that arises from the occurrence of extreme events which cause the spot price to remain at high levels for prolonged periods of time.
- ROAM's time sequential modelling allows the effect of the CPT to be assessed and the interaction between the CPT and MPC.

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CPT Results

- The results below show the number of CPT breaches that occur in the 50% PoE case, the average duration of these breaches and the percentage of periods modelled as MPC periods which would in fact have had APC prices.
- These results are for an MPC of $16,000/MWh and a CPT of $240,000.

2012-13

	CPT Statistics (Average)			
	QLD	NSW	VIC	SA
Number of breaches	0.96	1.00	0.42	0.35
Average duration of breach (hours)	69	56	123	120
Percentage of MPC periods during APC	57%	62%	52%	53%

2013-14

	CPT Statistics (Average)			
	QLD	NSW	VIC	SA
Number of breaches	0.69	0.34	0.13	0.17
Average duration of breach (hours)	82	58	137	130
Percentage of MPC periods during APC	58%	63%	39%	44%

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Pool Prices

- The figures below show the weighted average pool prices for each region after CPT has been enforced.
- The prices show both the change in pool prices over time and also the difference in pool prices that results from an increase in MPC from $12,500/MWh to $16,000/MWh while maintaining the CPT multiplier of 15.

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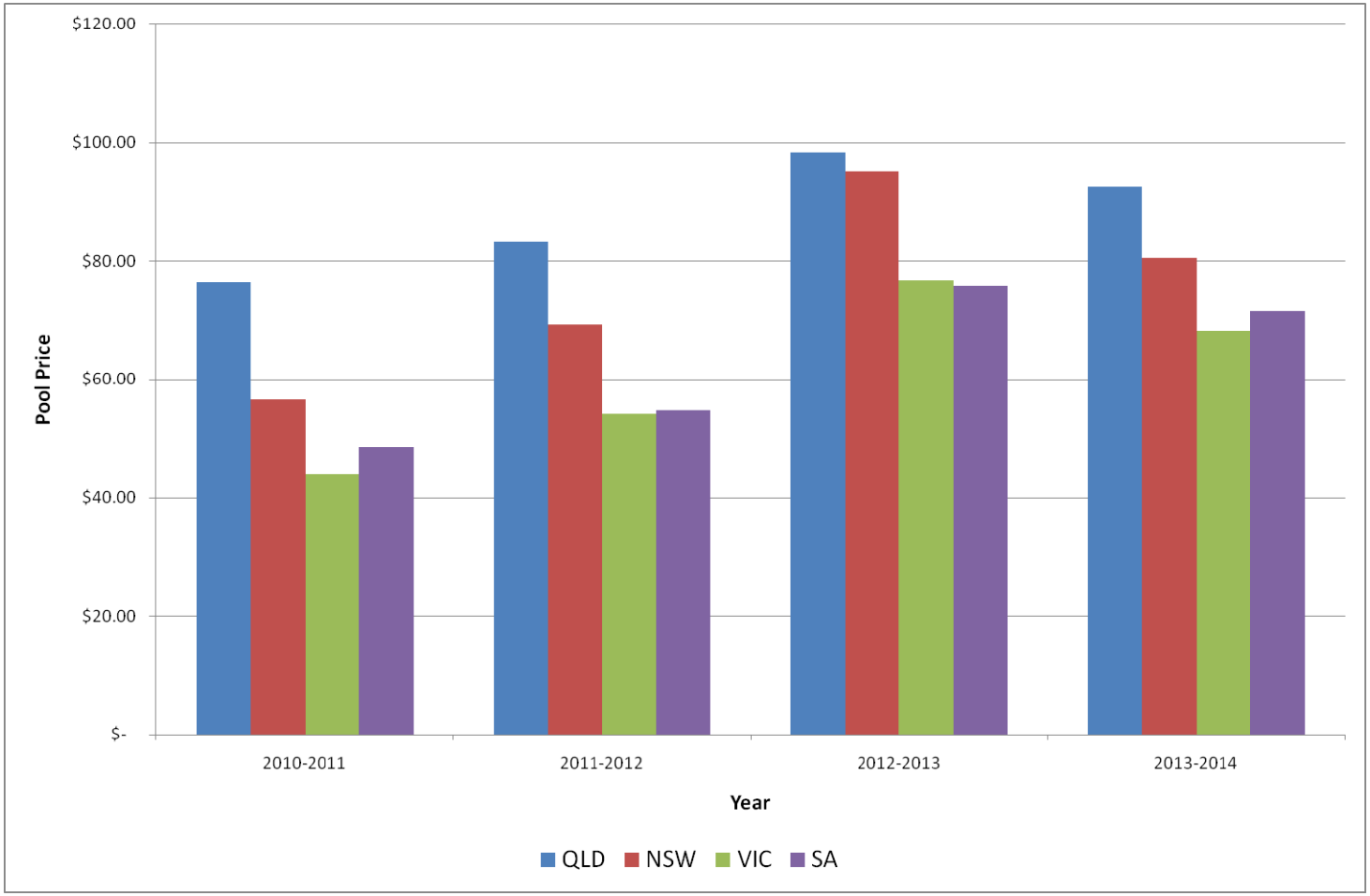
Pool Prices – MPC = $12,500/MWh, CPT = $187,500



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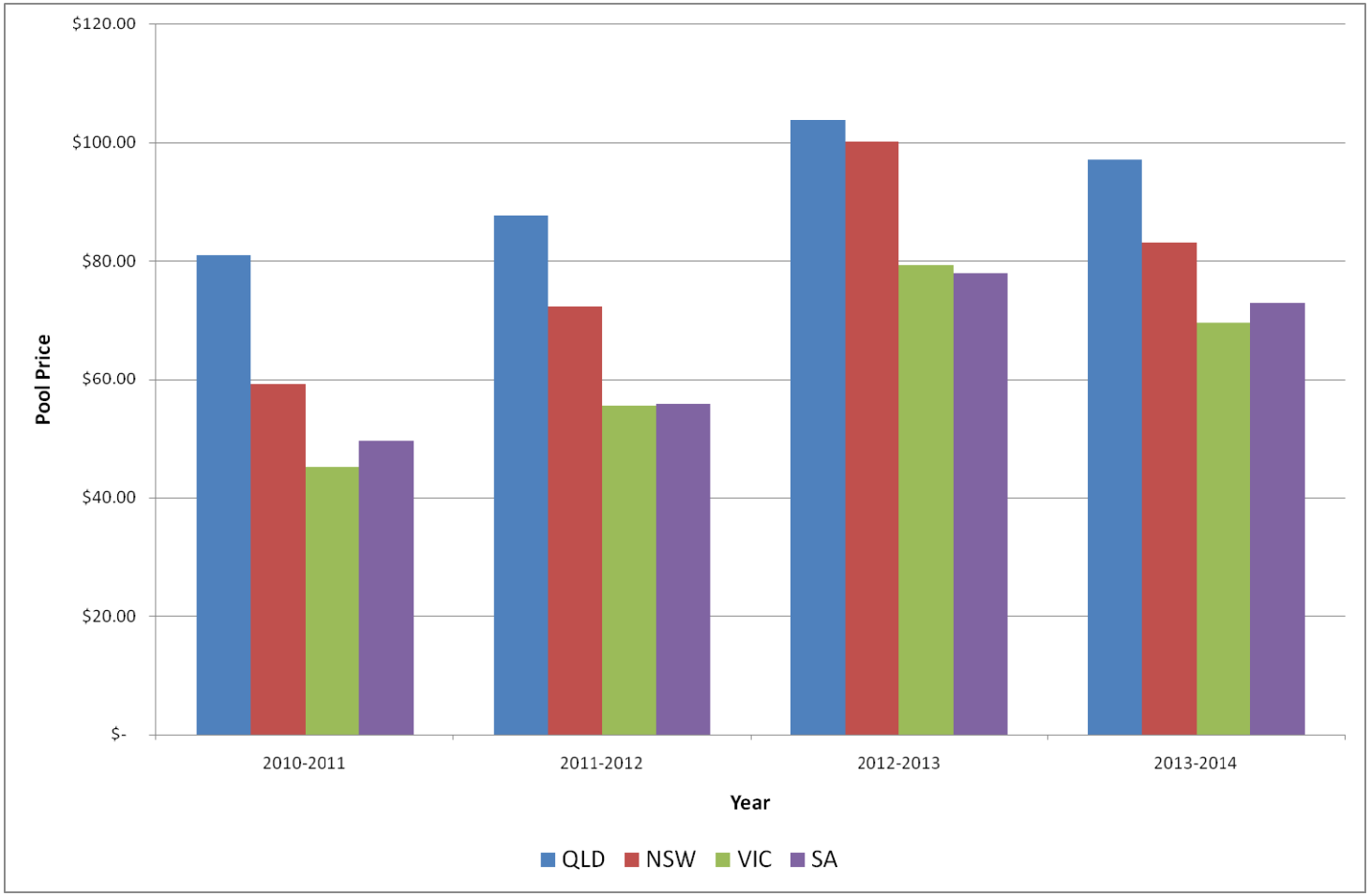
Pool Prices – MPC = $16,000/MWh, CPT = $240,000



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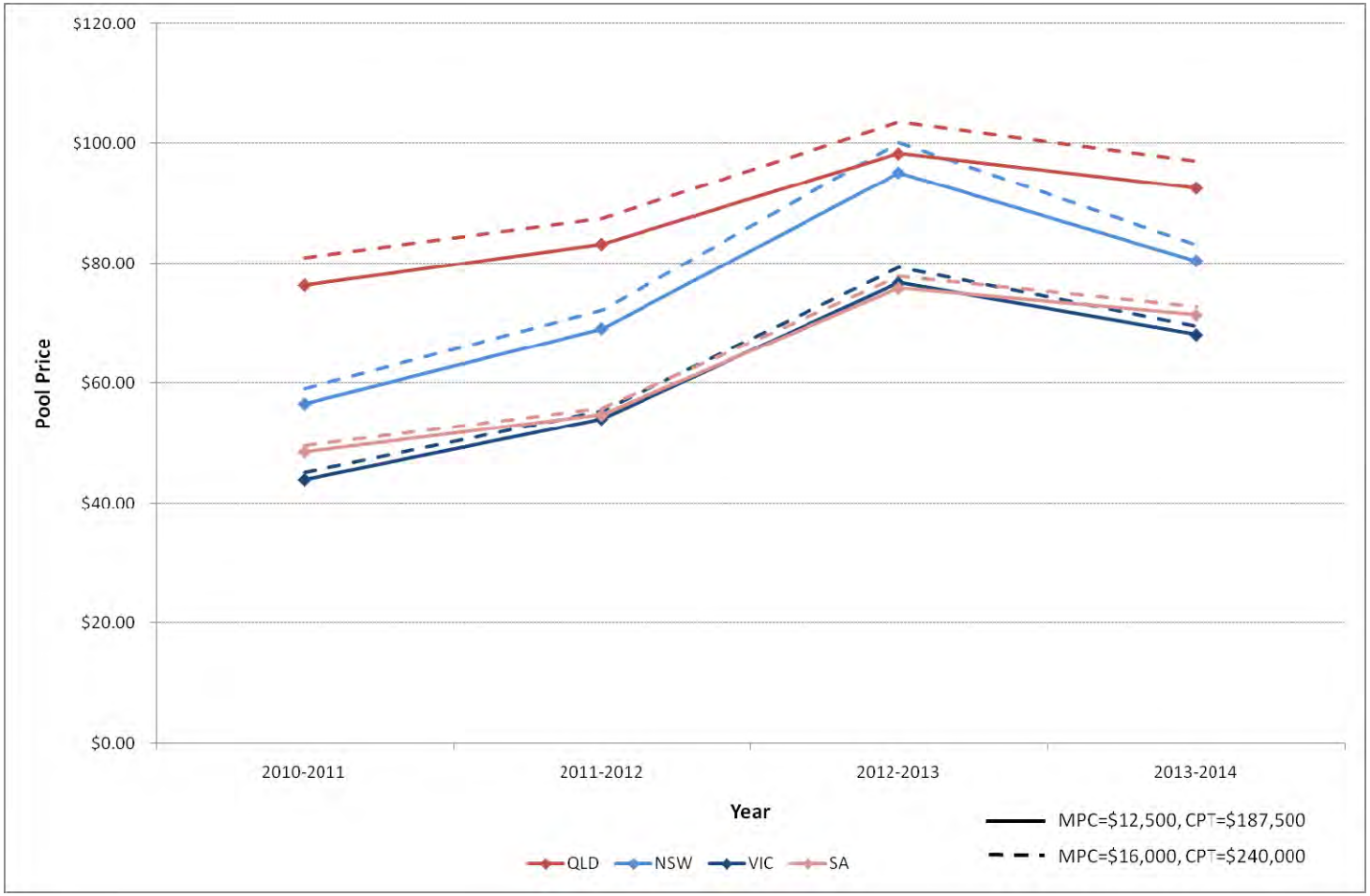
Weighted Pool Price



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RSSR Conclusion

- ROAM has determined that an MPC of approximately $16,000/MWh is necessary to ensure sufficient incentive exists for the recovery of capital, fixed and operation costs associated with an extreme peaking gas turbine while meeting an average NEM Reliability Standard of 0.002% USE.
- This applies for the 2012-13 and 2013-14 financial years.

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RSSR Conclusion

- A minimum level of CPT of $240,000 is needed for an MPC of $16000/MWh
- This maintains the 15 times multiplier on the MPC previously adopted
- Further assessment would be needed to provide a more refined estimate of the CPT to fairly incentivise generators whilst mitigating risk to market participants

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Questions?

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