Benefits of reduced peak demand

Prepared for the AEMC

Power of Choice, Public Forum

3 October 2012

The Power of Choice draft report makes a number of recommendations

If adopted, these are likely to lead to reductions in peak demand

Today's presentation seeks to estimate the magnitude of these impacts and quantify the associated benefits

- Nature of recommendations
- Estimating the reduction in peak demand
- Benefits of reduced peak demand
  - Network
  - Energy
  - Impact on consumers
- Conclusion

The draft report recommends numerous changes that may lead to a change in demand...

Key recommendations

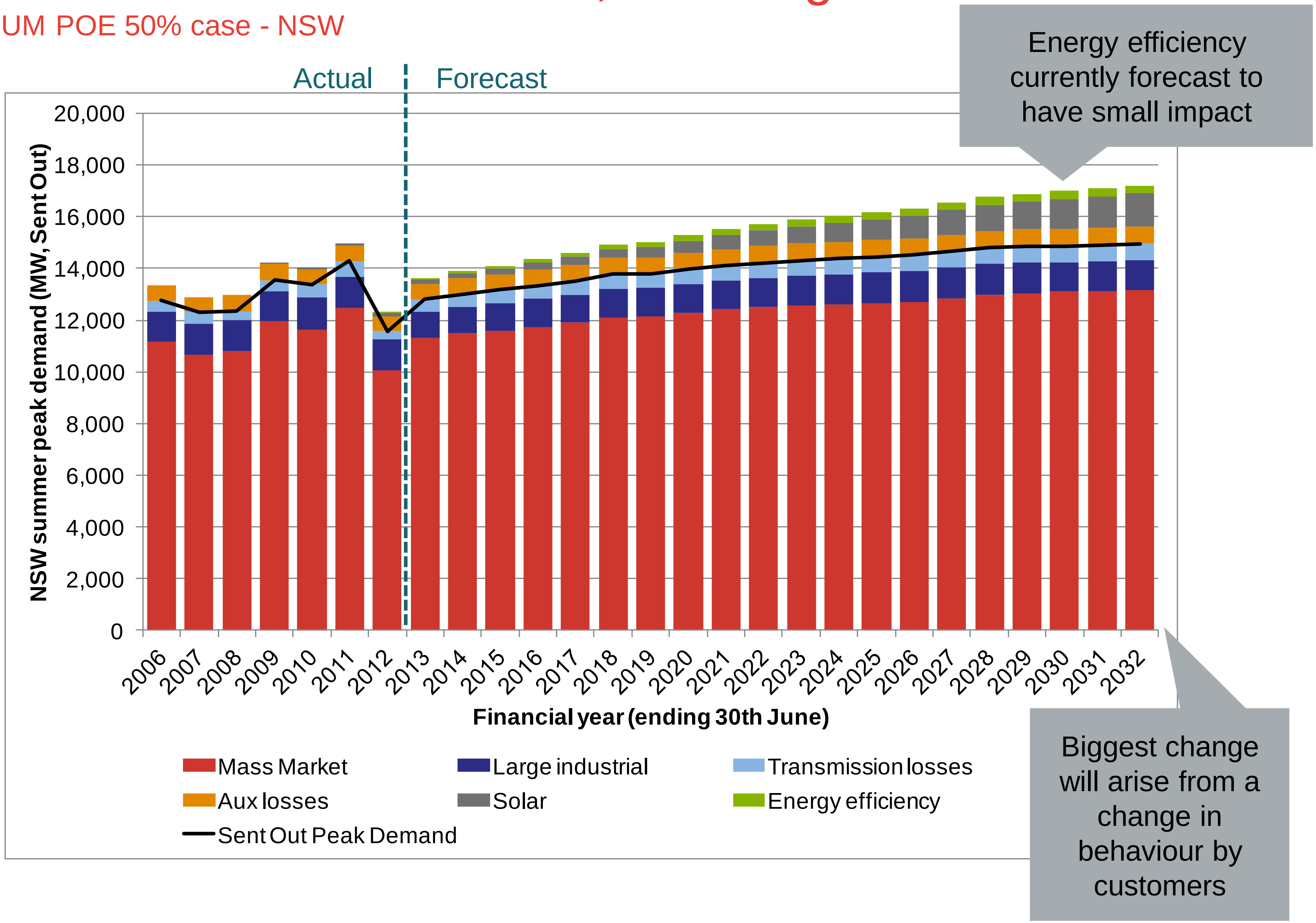
The following Power of Choice recommendations are likely to reduce peak demand

- DSP in wholesale markets
  - "mechanism that pays changes in demand"
- Efficient pricing
  - Band 1 (large) customers – network tariff component mandated to be dynamic
  - Band 2 (medium) customers – "opt out" of dynamic network pricing
  - Band 3 (small) customers – "opt in" to dynamic network pricing
- Enabling technology
  - Interval meters with **remote communication**
- Distributed generation
  - Changes to foster embedded generation (with may reduce net peak demand)
- Energy efficiency
  - greater focus on peak demand impacts of current white certificate schemes (e.g. NESI)

However, it's difficult to estimate the level of response

Baseline data - ESOO 2012, Planning scenario

MEDIUM POE 50% case - NSW



Quantification of peak demand reduction

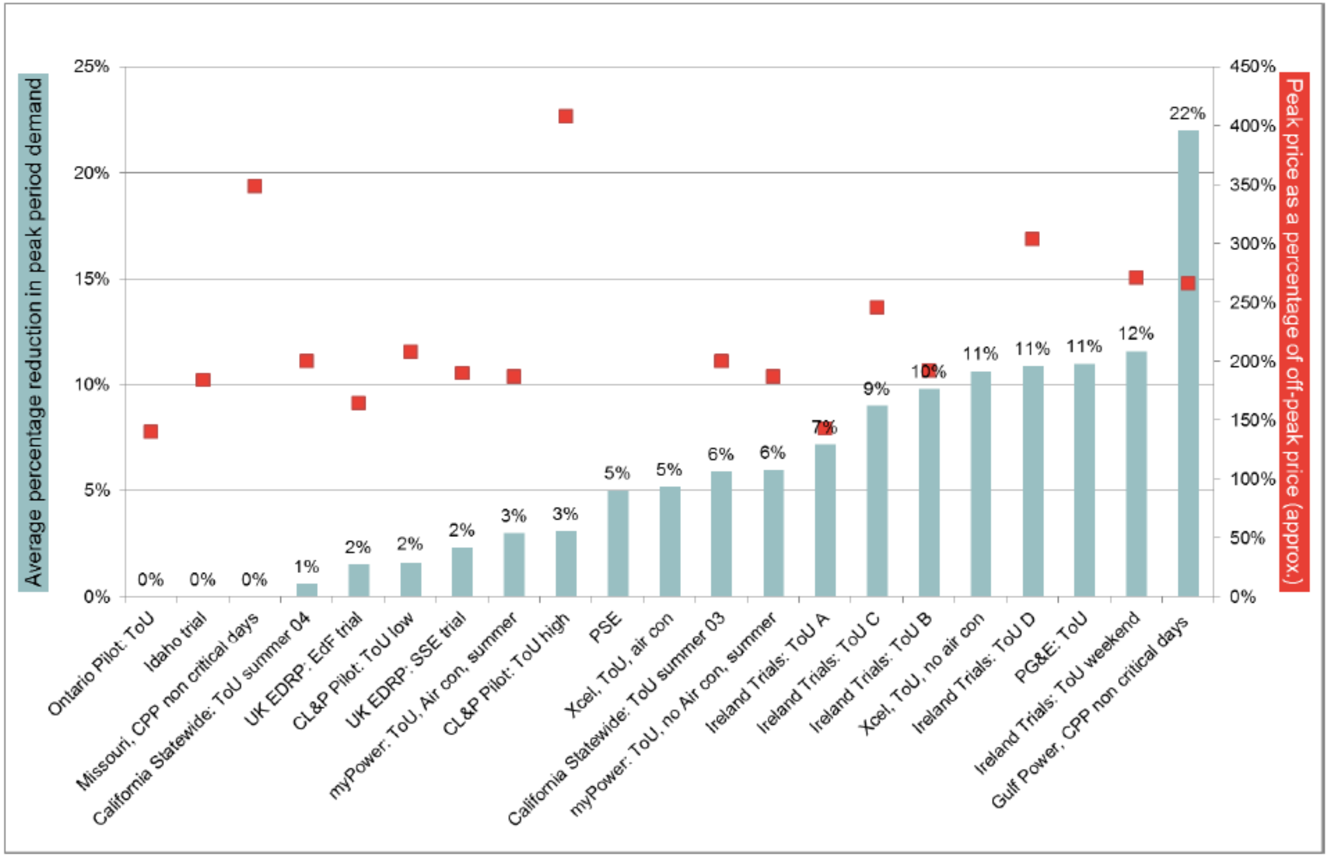
Source of peak demand reduction has been considered to arise from three sources...

- Energy efficiency (EE)
  - Increase in energy efficiency over AEMO's forecast baseline
- Demand response (DR)
  - Reduction in demand from C&I customers
- Efficient pricing (Pricing)
  - Reduction in demand from residential customers

It's difficult to estimate the magnitude of each effect

Frontier UK review – ToU pricing

Figure 4: Peak period demand reductions and peak to off-peak price differentials under ToU tariffs



- Large range of response levels
- Relatively uncorrelated with peak/offpeak price ratio
- Response driven by price but also
  - Information (e.g. household critical peak notification)
  - Enabling technology

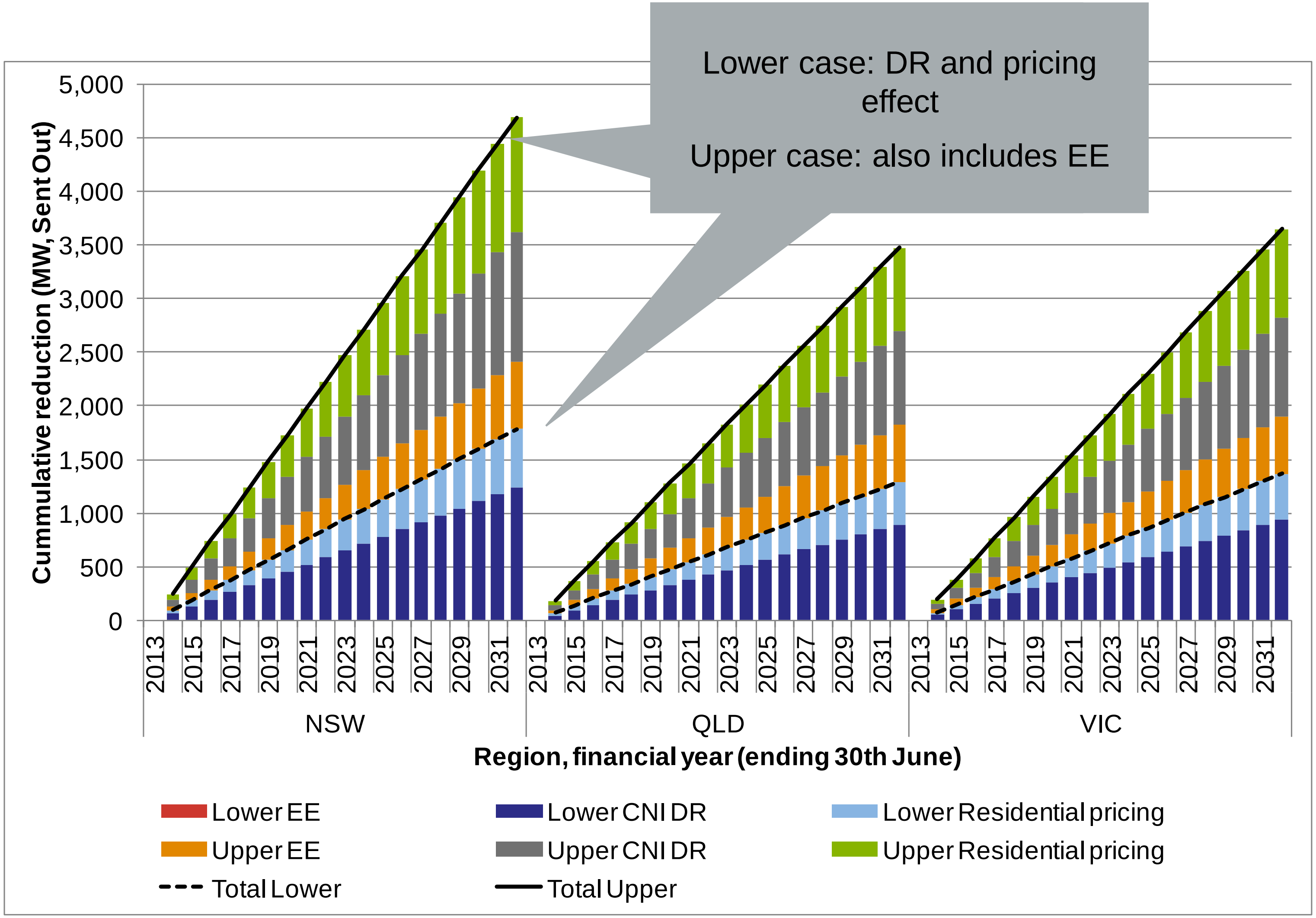
Impact on peak demand

Impact considered in terms of EE, DR and Pricing

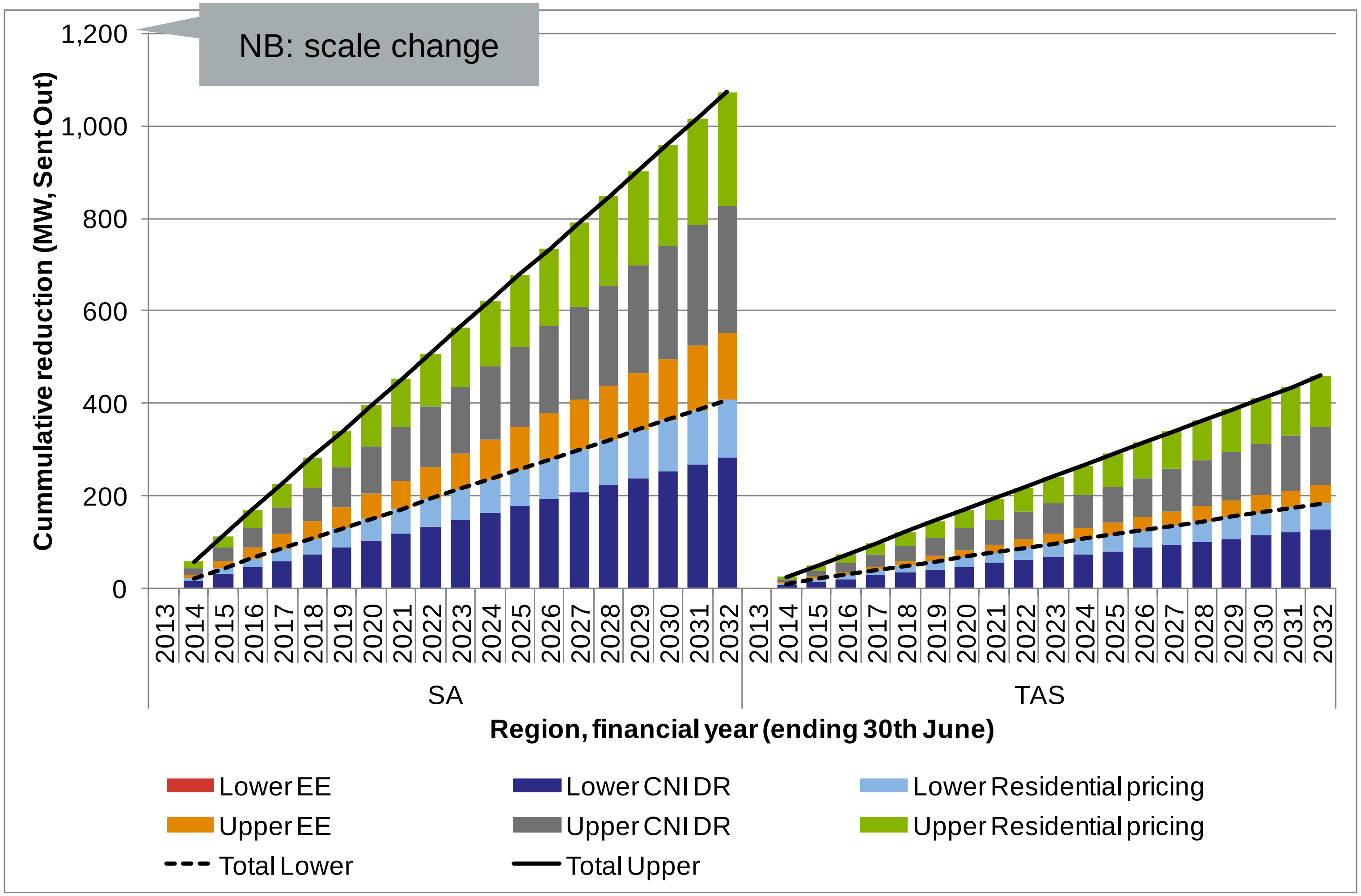
- Impact considered for reference year 2019/20
  - 2017/18 for DR, 2019/20 for EE/Pricing
  - Recommendations matured
  - Linear interpolation from the reference year (may underestimate long term, overestimate short term impact)
- Energy efficiency
  - Lower bound: 100% of AEMO forecast (no change)
  - Upper bound: 200% of AEMO forecast (consistent with AEMO Scenario 1)
- Assume residual peak demand
  - C&I: 45%, Residential: 55%
- Demand Response
  - Lower bound: 5%, Upper bound: 10%
- Pricing
  - Lower bound: 2.5%, Upper bound: 7.5%

This leads to significant reductions...

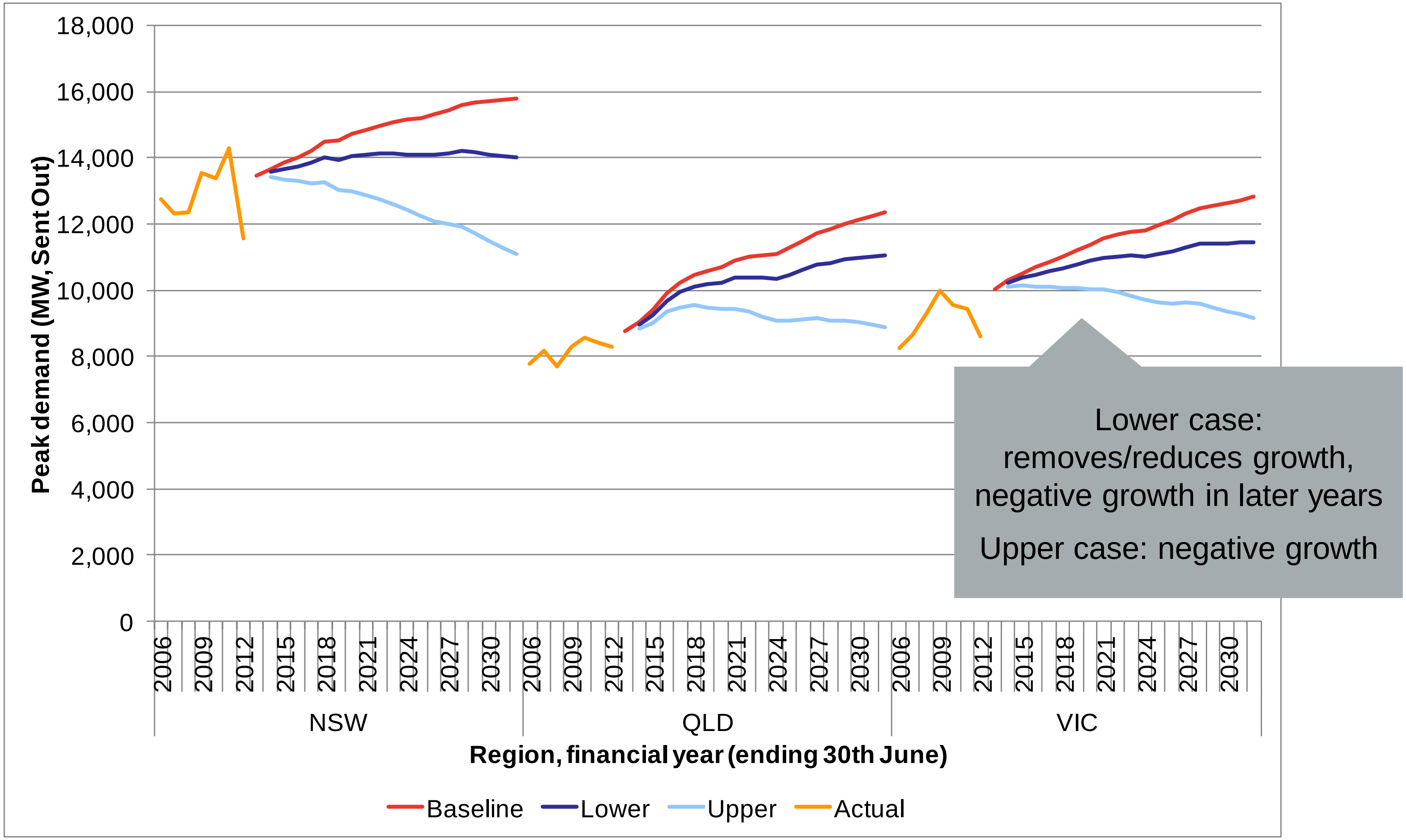
Peak reduction – summer peak NSW/VIC/QLD



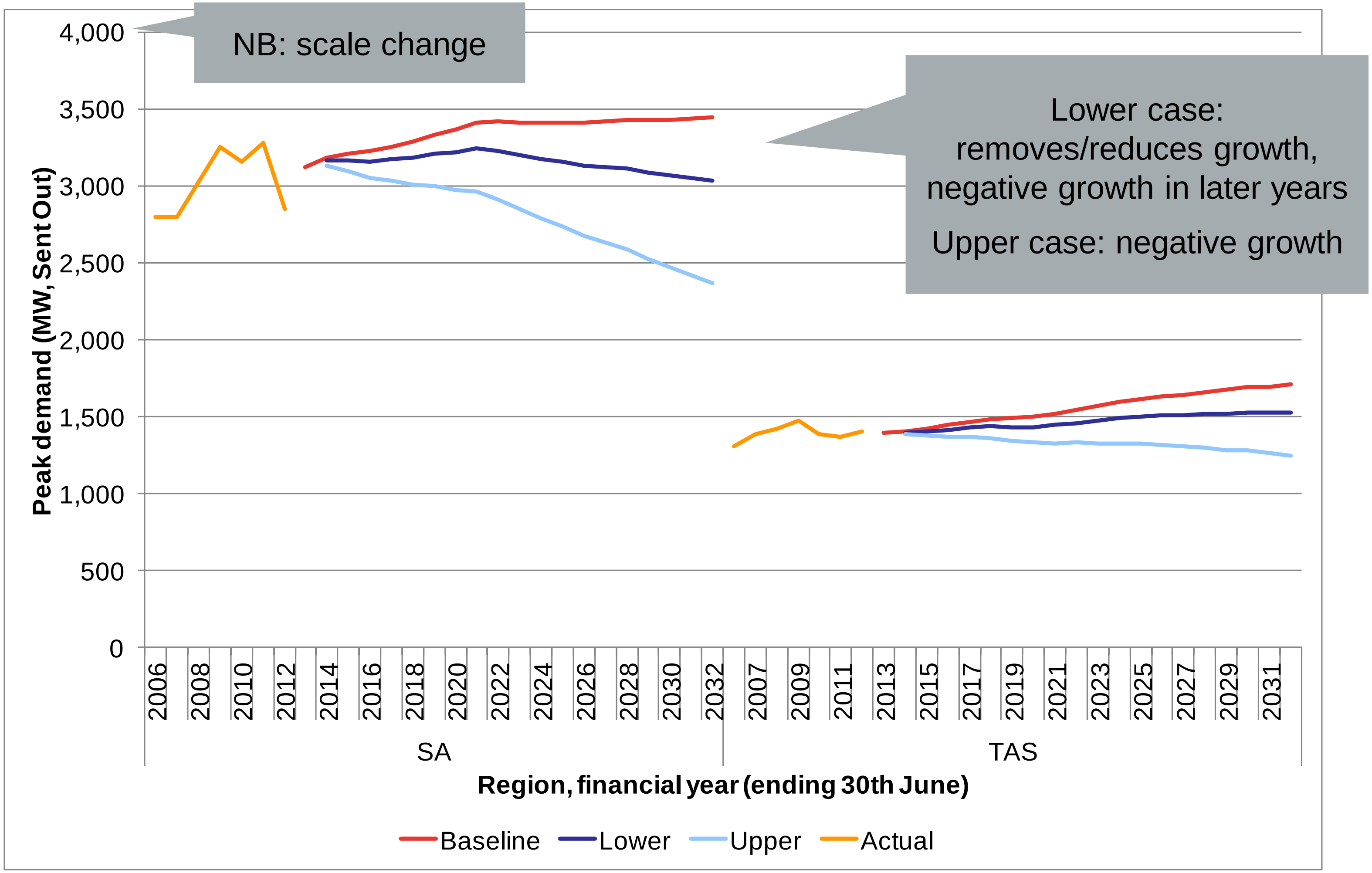
Peak reduction – summer peak SA/TAS



Demand path – summer peak NSW/VIC/QLD



Demand path – summer peak SA/TAS



Benefits

Benefits arise as savings due to avoided costs

- Network
  - Avoided fixed cost of network investment
  - Estimates of average incremental network costs
- Energy
  - Modelled savings due to avoided fixed and variable costs in *WHIRLYGIG*
  - Impact is less than cost of new entrant OCGT
    - Most of the change can be met with incumbent generation capacity
    - Victoria experiences *increases* in cost as Brown coal meets time shifted demand in the offpeak
- Both lower and upper cases lead to a situation where no new investment in needed to meet a (declining) peak
  - This reduces the scope for benefits as there are no incremental fixed costs to avoid

Various results are presented...

Benefits – Network cost estimates

A range of estimates exist

- SKMMMA analysis based on EY report for Power of Choice review
  - High level estimate by state (lower estimate)
  - Estimate by DSNP area that includes more costs
- AER state of the market / RBA cost allocation
  - AER average network expenditure for current determination period (higher estimate)
  - proportion of estimate associated with “Network Expansion” according to RBA analysis
- These sources allow a $/kW and $/customer to be estimated

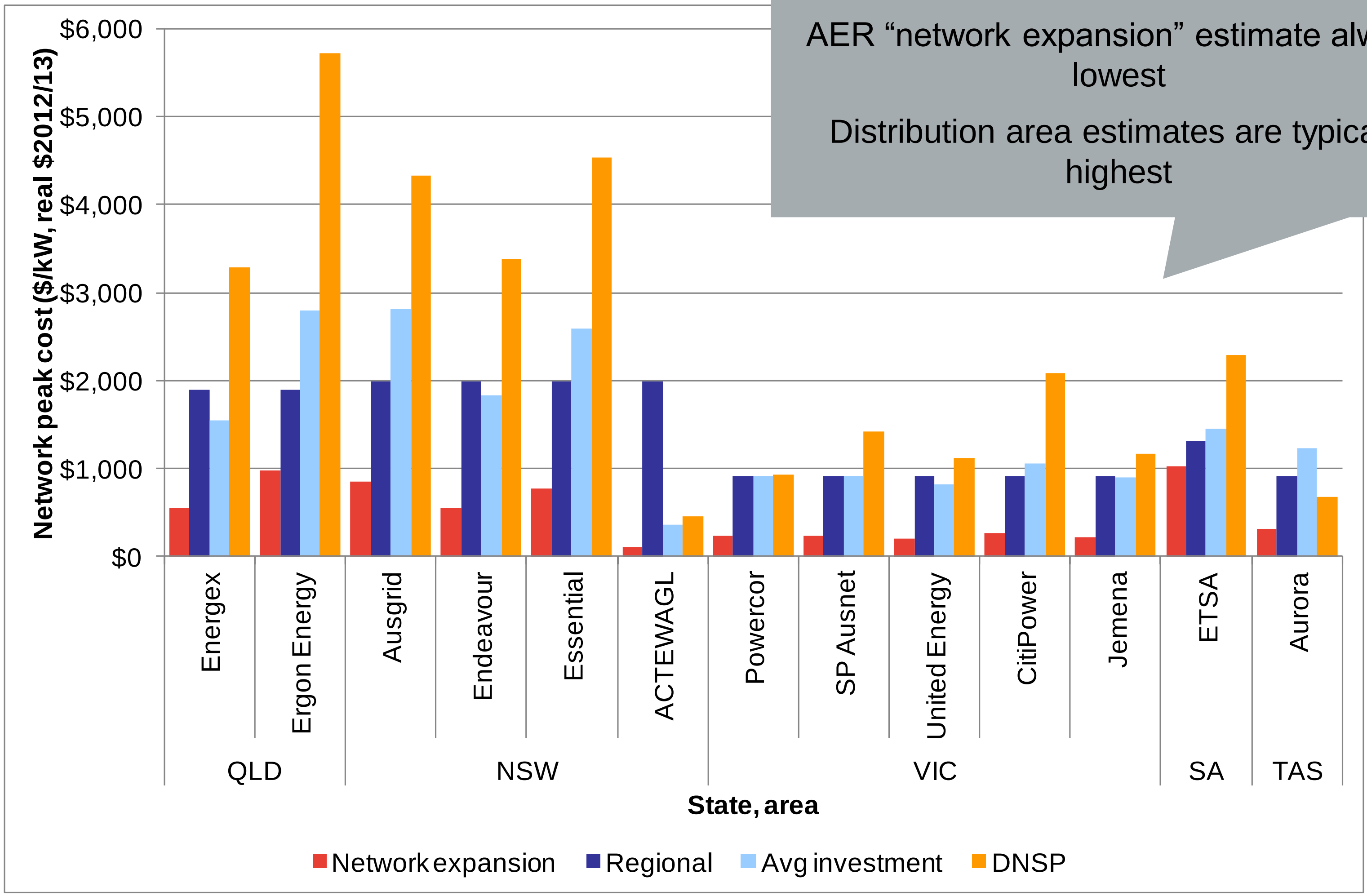
Constant estimate over time....

Benefits – Annual network cost estimates, $/kW

Wide range of outcomes, up to factor of 10

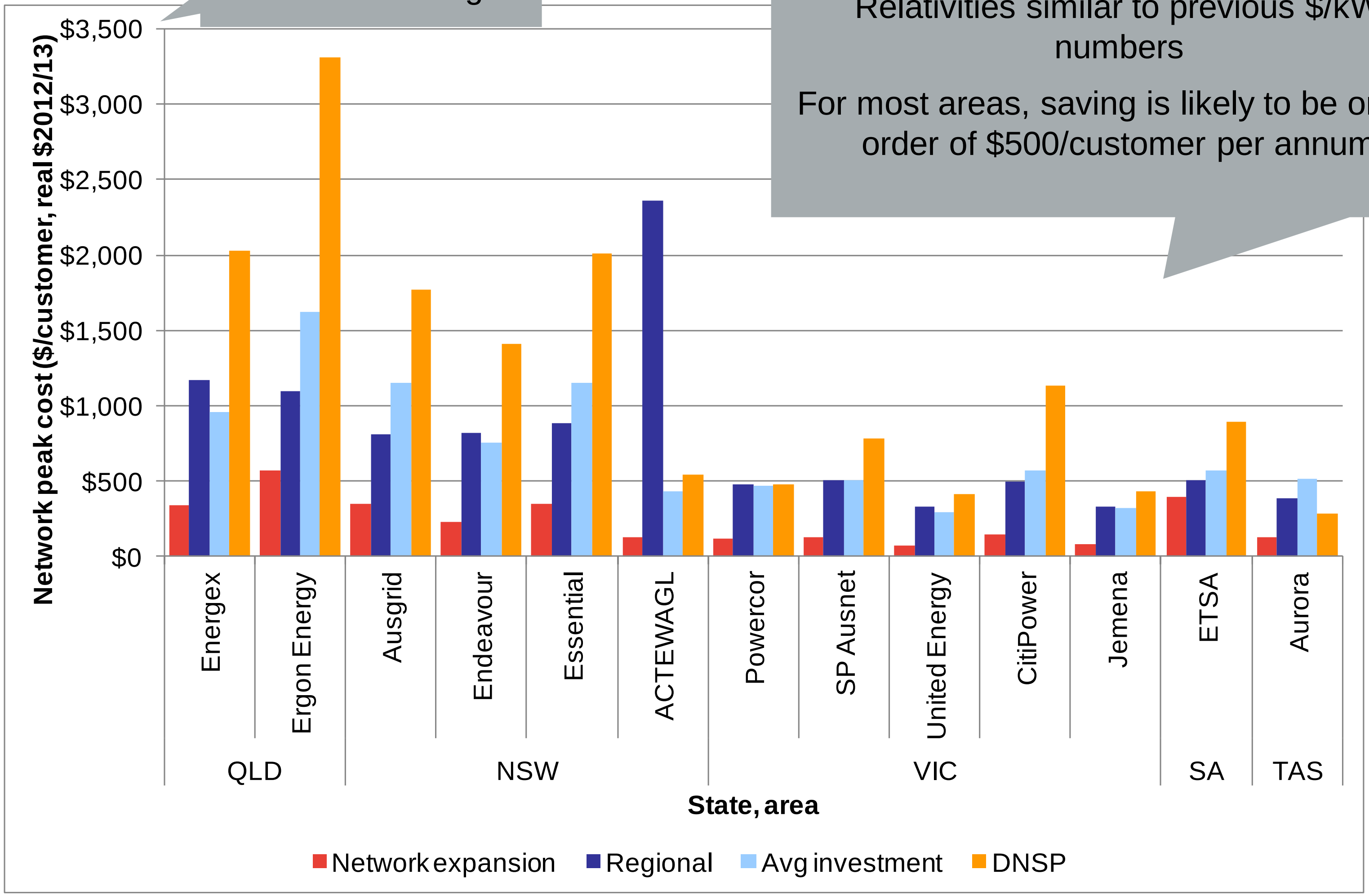
AER "network expansion" estimate always lowest

Distribution area estimates are typically highest



Benefits – Annual network cost estimates, $/customer

NB: scale change



Relativities similar to previous $/kW numbers

For most areas, saving is likely to be on the order of $500/customer per annum

Benefits – Energy, NEM system cost savings

Savings arise from changes to dispatch and investment

- Modelled using LRMC approach in Frontier's *WHIRLYGIG*
  - whirlygig electricity investment model
- Baseline compared to Lower/Upper cases
  - Load scaled such that annual energy is the same
  - This means that offpeak demand is increased

This produces some unexpected results...

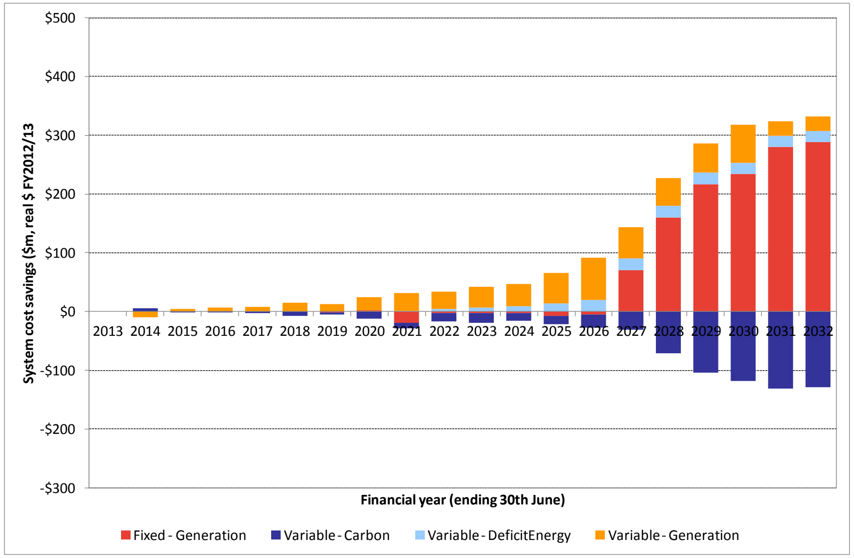
Benefits – Energy, NEM system cost savings

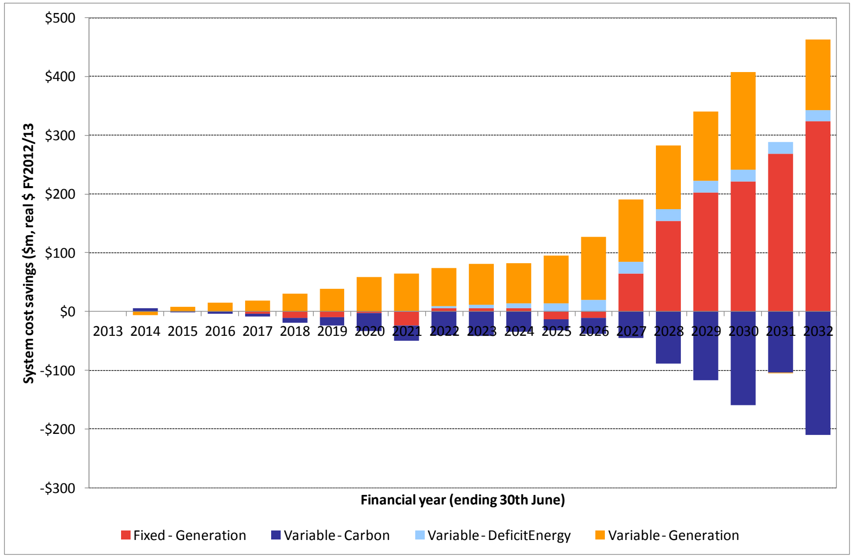
"Lower case"

- Savings in variable generation costs (fuel and VOM) in all forecast years
- Savings in fixed generation costs (due to delayed investment) from FY2027
- Increase in carbon costs
  - Incumbent coal runs during offpeak

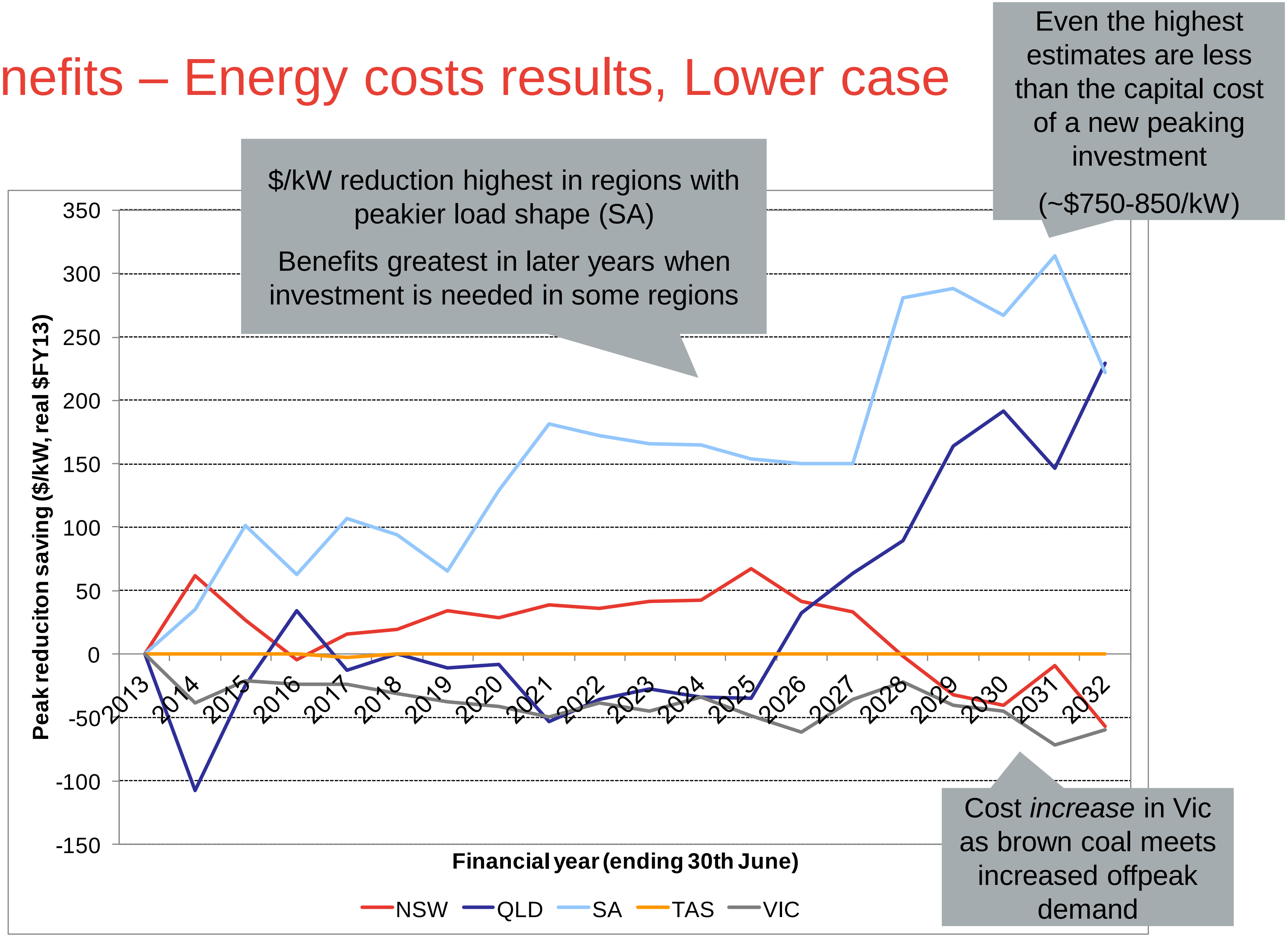
"Upper case"

- Larger savings in total $-terms compared to Lower case
  - Change to dispatch of incumbent generation
- Fixed cost savings are great, but not much greater
  - Most of the avoided investment is realised in the Lower case

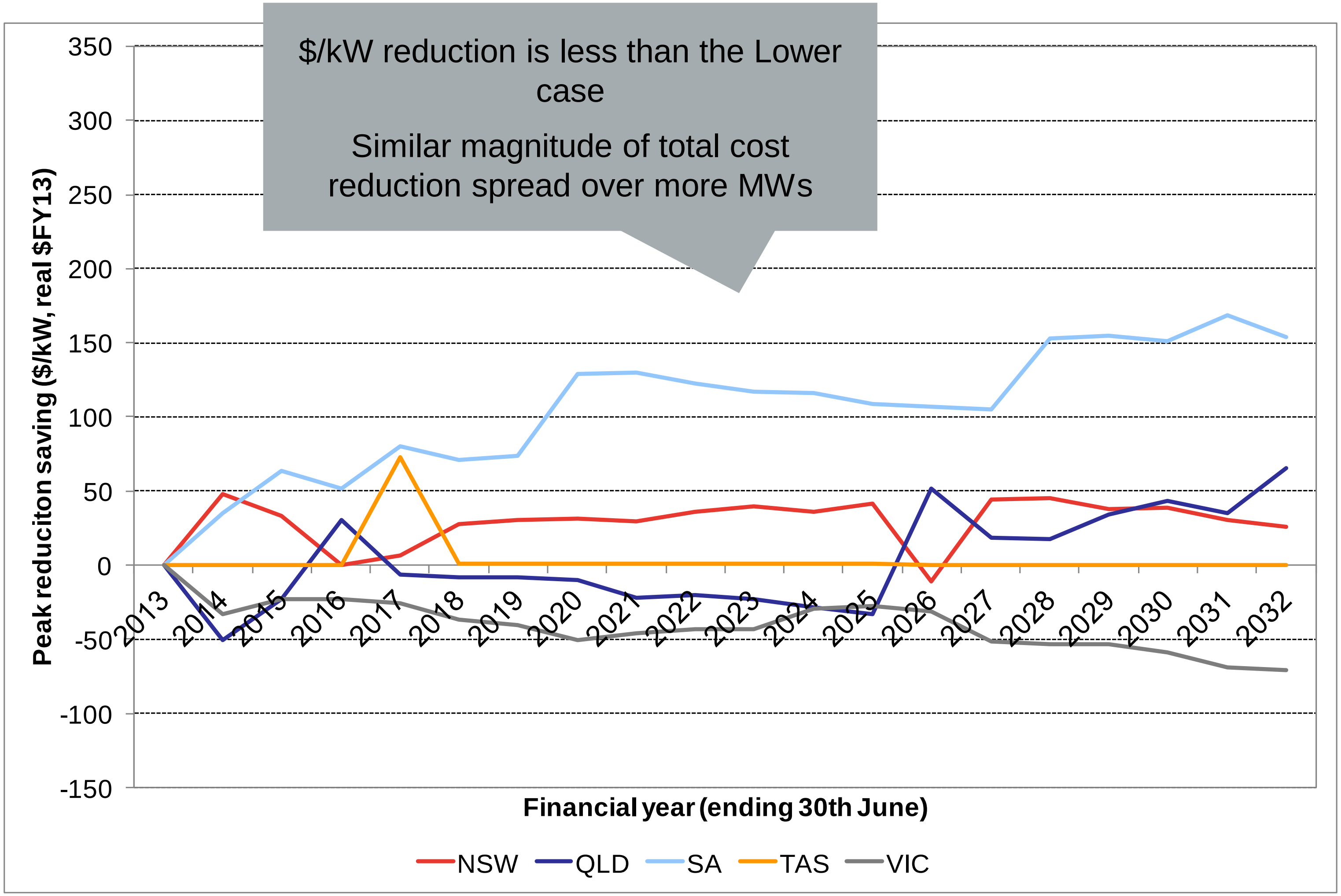




Benefits – Energy costs results, Lower case



Benefits – Energy costs results, Upper case



Benefits – Energy costs results, Turvey approach

$$\text{Turvey LRMC} = \frac{\Delta(\text{NPV of total costs})}{\text{NPV of demand shock}}$$

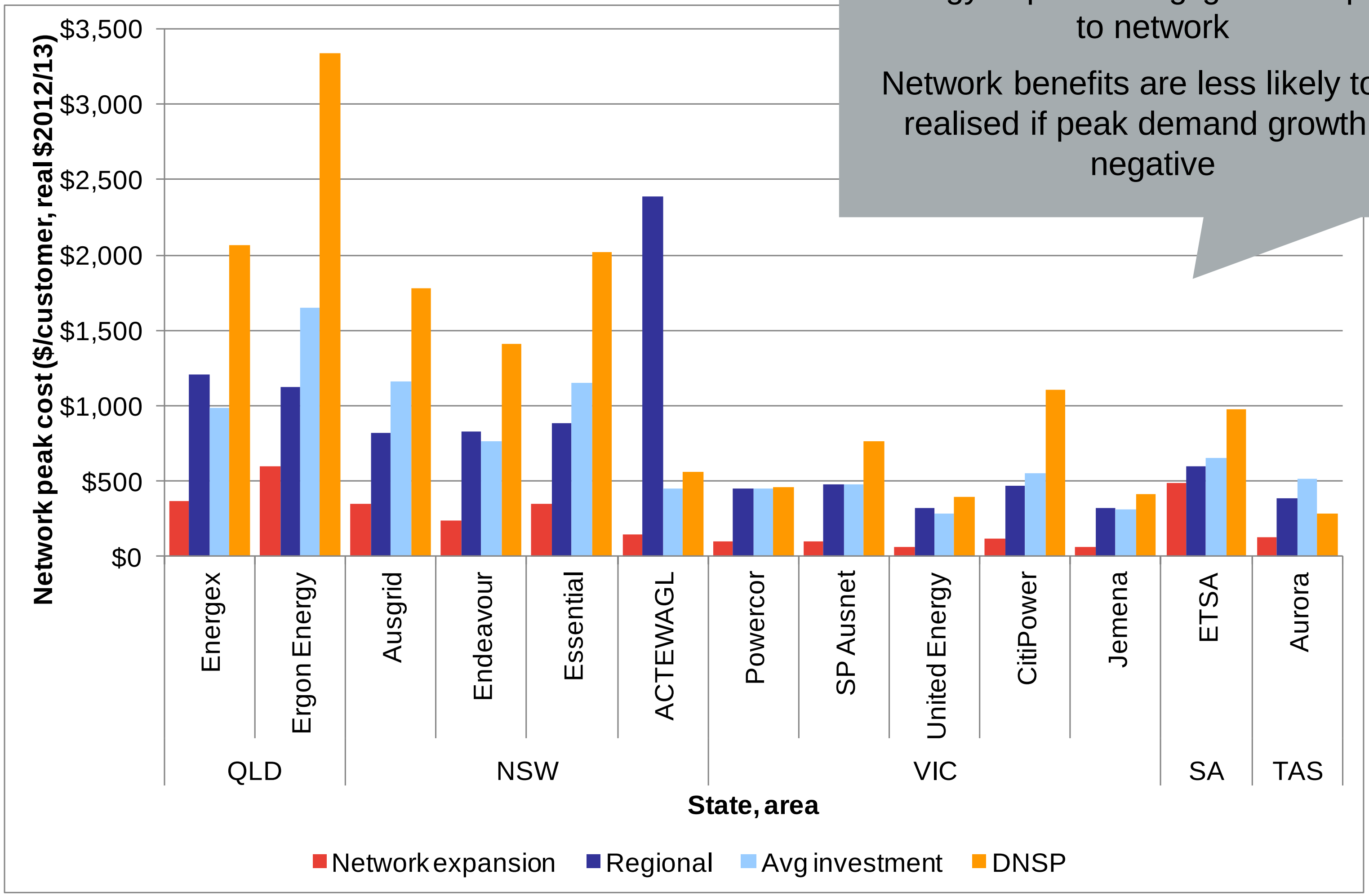
Region	Summer		Winter	
	Lower	Upper	Lower	Upper
NSW	$16	$31	$16	$31
QLD	$45	$7	$49	$8
SA	$181	$120	$230	$150
TAS	-$0	$4	-$0	$3
VIC	-$43	-$45	-$52	-$55

- Overall benefits due to deferred energy costs are small relative to network
  - Baseline has relatively benign peak demand growth and LRET investment
  - largest effect in SA due to peakier load shape, which is mitigated by peak demand reduction
  - increase in costs in VIC due to increased offpeak output

Result is that, in a low growth world, there are negligible savings to be made in energy

Benefits – Annual combined

NB: includes Lower case for energy benefit



Energy impact is negligible compared to network

Network benefits are less likely to be realised if peak demand growth is negative

Conclusions

The study has yielded some interesting results

- Energy costs are a small component of the impact
  - Given the current base case demand forecast of low peak growth benefits are less than the cost of new peaking capacity
  - Whilst NEM costs reduce as a result of lower demand, in some regions costs increase, mostly Victoria where Brown coal meets offpeak demand
- Network benefit estimates dominate impact, but vary by up to a factor of 10
  - Low range estimates exceed benefits from energy
  - Estimates are as high as $5600/kW (Ergon) which suggests that even high cost generation (such as coal/wind/solar) would be a cheaper option to meet peak demand compared to network investment

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