



# Renewable Energy Generation Working Group

## Evaluation of Intermittent Generation Capacity Valuation Methods

Summary of MMA analysis

30/07/2010

[www.imowa.com.au](http://www.imowa.com.au)

## Scope of Work

- Three valuation methods presented at June REGWG meeting
- MMA requested to analyse, assess and report on the merits and disadvantages of each proposal
- Material contained in this presentation has been prepared by Dr Ross Gawler with minor editing by IMO
- MMA will prepare a report to accompany this analysis

# Analysis

- Using historical data from October 2001 to September 2009
- Scaled data considered for 2012/13 to 2014/15 for Proposal 2A
- Solar plants were considered incremental and mutually exclusive in this analysis
- Albany, Walkaway and Emu Downs were the existing wind farms
- There was no description of the treatment of new plants for Proposal 1
- Capacity shown for a capacity as calculated in that year
  - Would be applied to a future year (eg value calculated in 2009 would be applied in 2012)

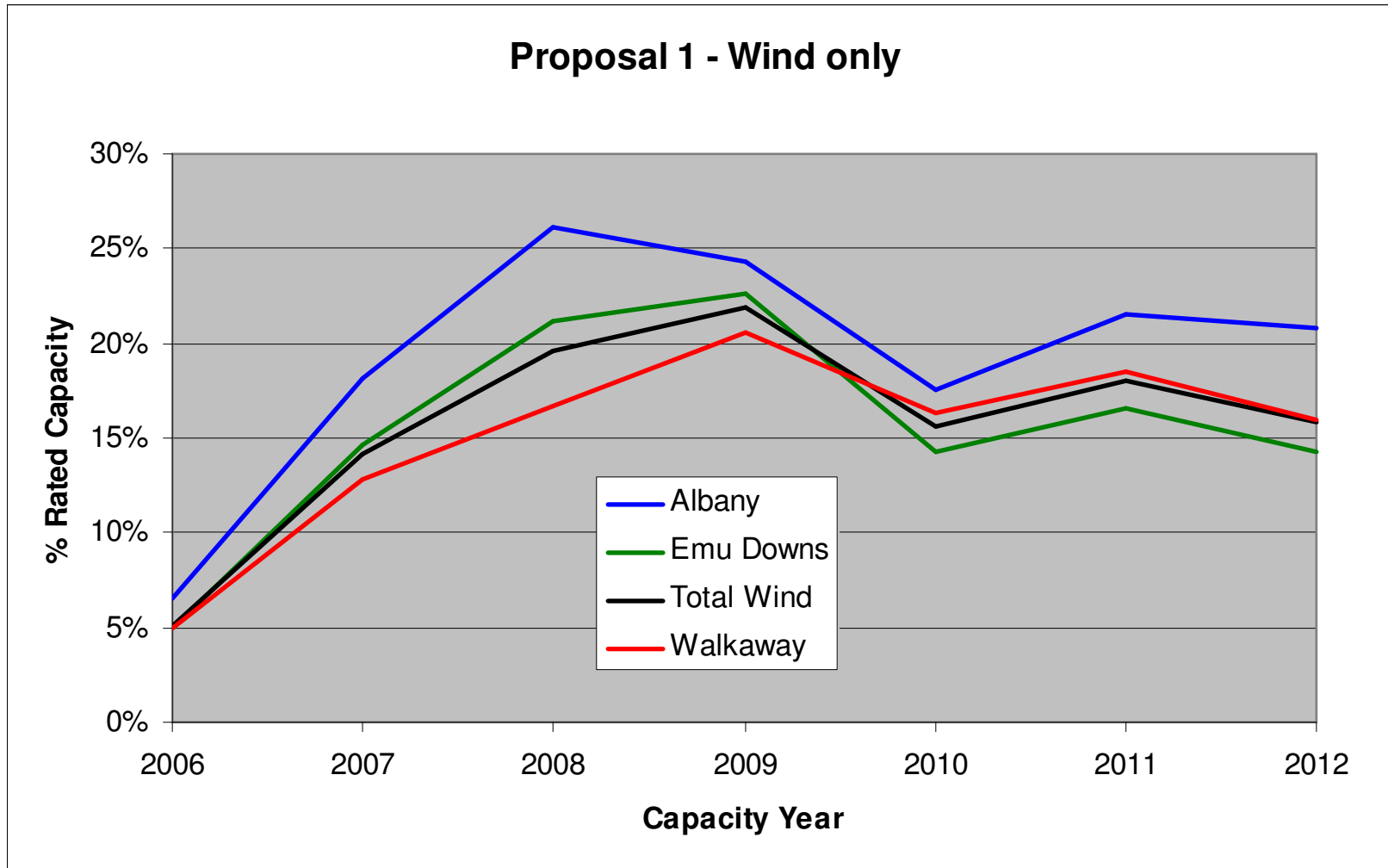
# Proposal 1

- Based on historical weather since October 2001 and the top 12 intervals with highest Load for Scheduled Generation (LSG)
  - Not the standard definition for capacity obligation for load
- Determine an annual average fleet total output over the top 12 intervals (LSG) at 95% probability of exceedance based on the distribution of annual values (30.0 MW = 15.8% of rated 189.3 MW to September 2009)
- Allocate according to last three years output at 250 trading intervals based on highest LSG
- Apply individually to new plants on a combined fleet basis
- Conservative assessment with moderate volatility
- Percentile application to incremental plants distorts the relative contributions relative to reliability contribution

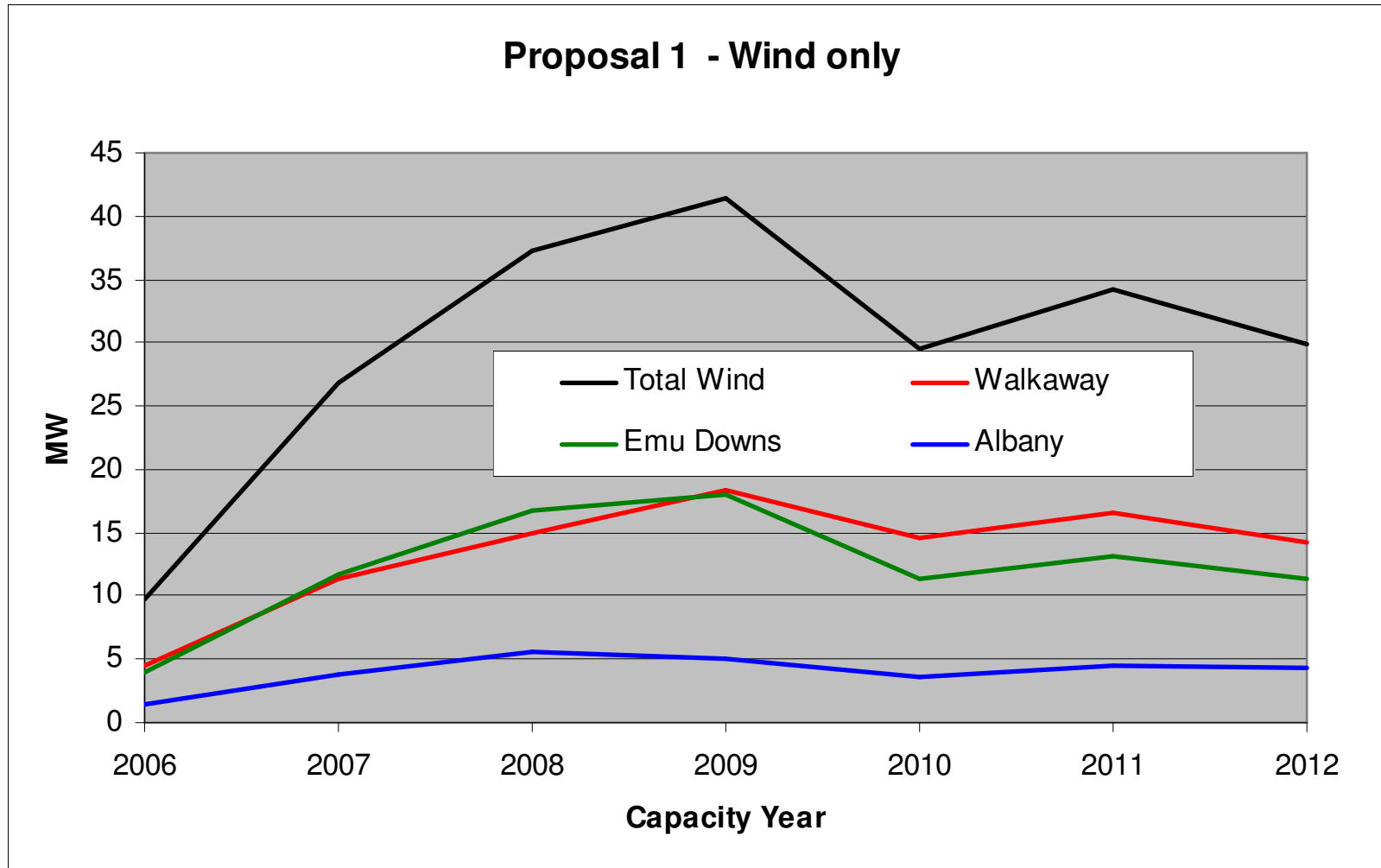
# Sensitivity

- If 90% PoE level is used rather than 95%, assessed capacity over the last three cycles is increased by 4% - 30%
- If system peak demand is used rather than LSG, assessed capacity over the last three cycles is increased by 2% - 18%
  - Not recommended because it does not address diversity and penetration impacts

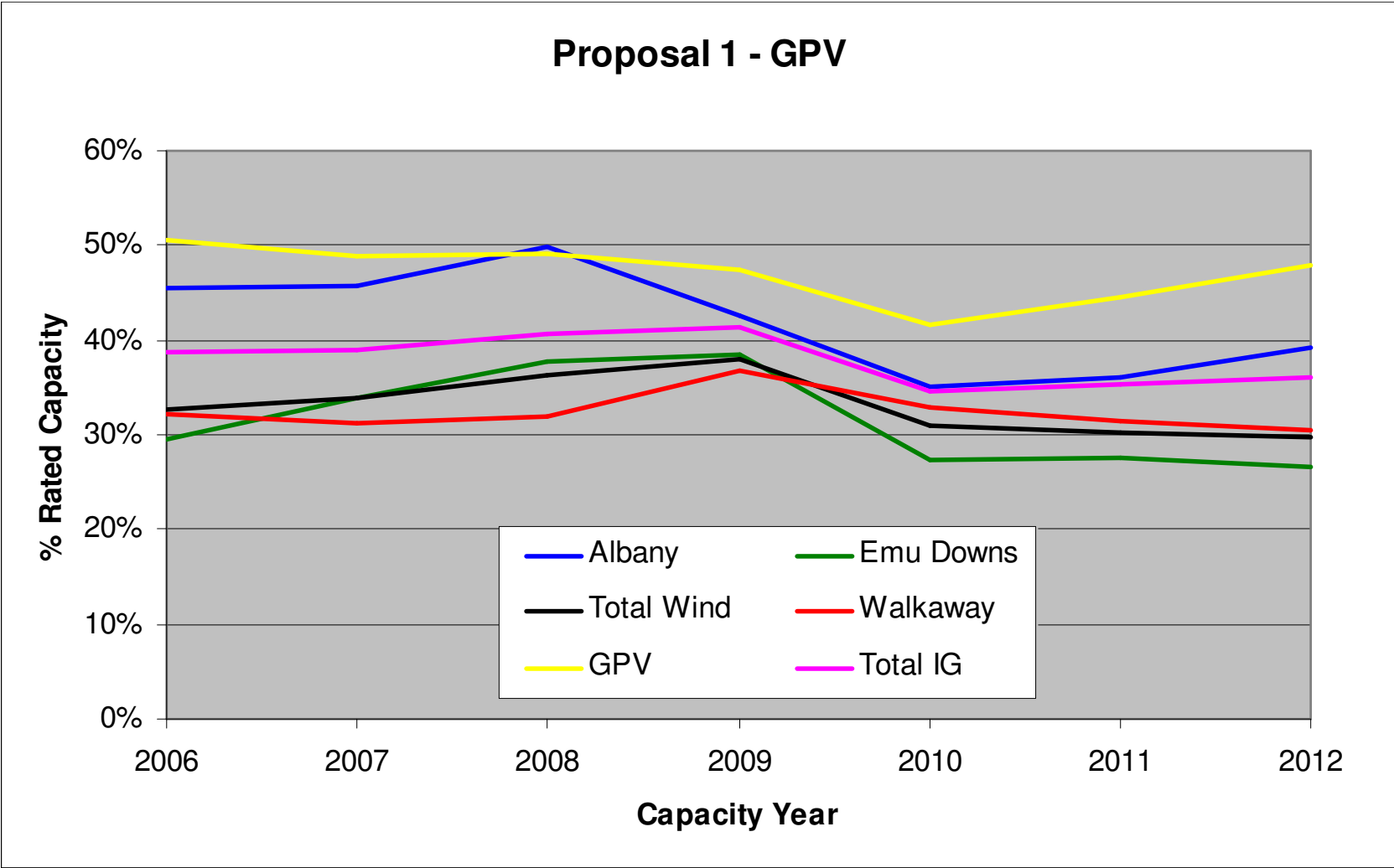
# Proposal 1 – existing wind farms



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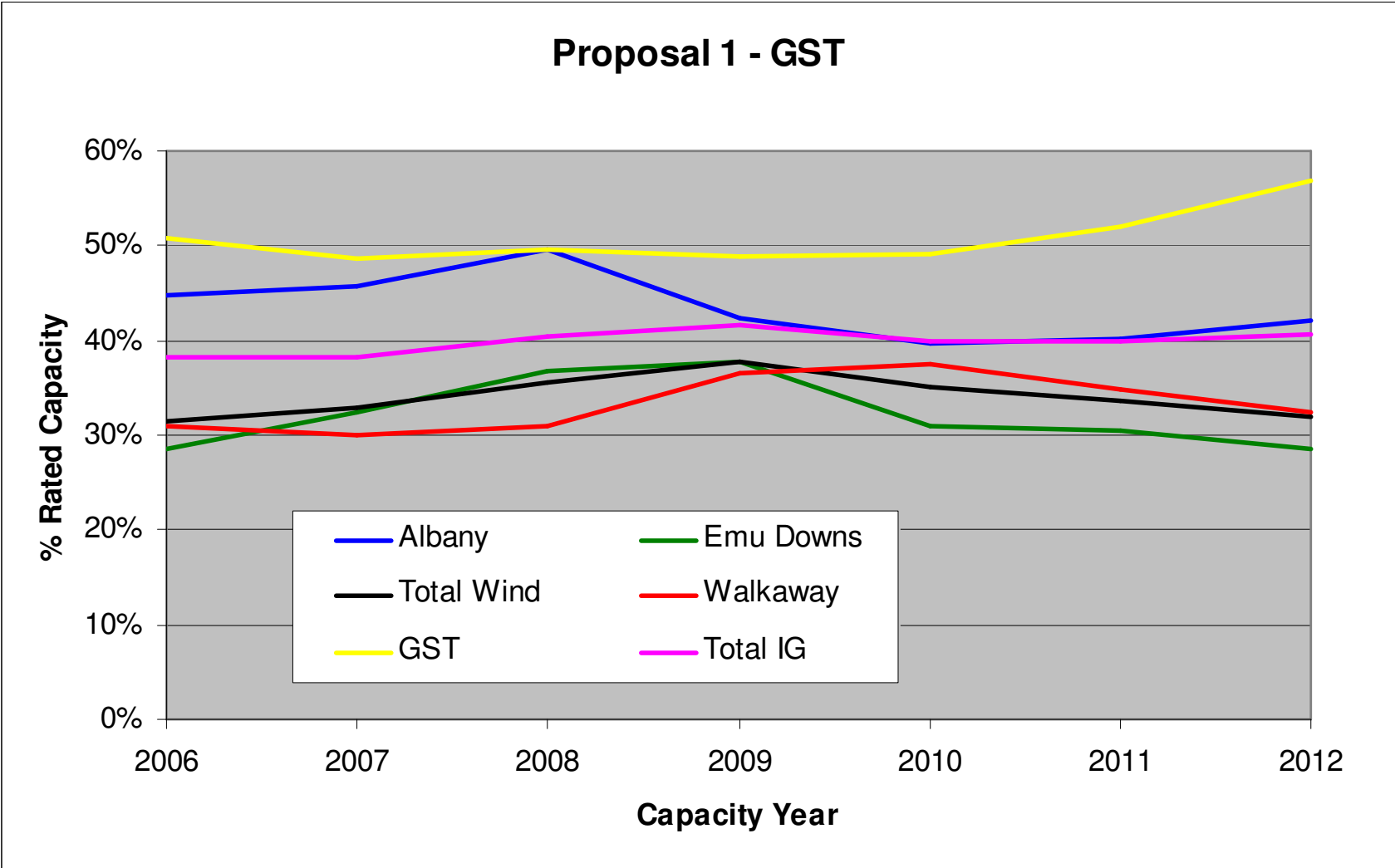


# Proposal 1 with GPV

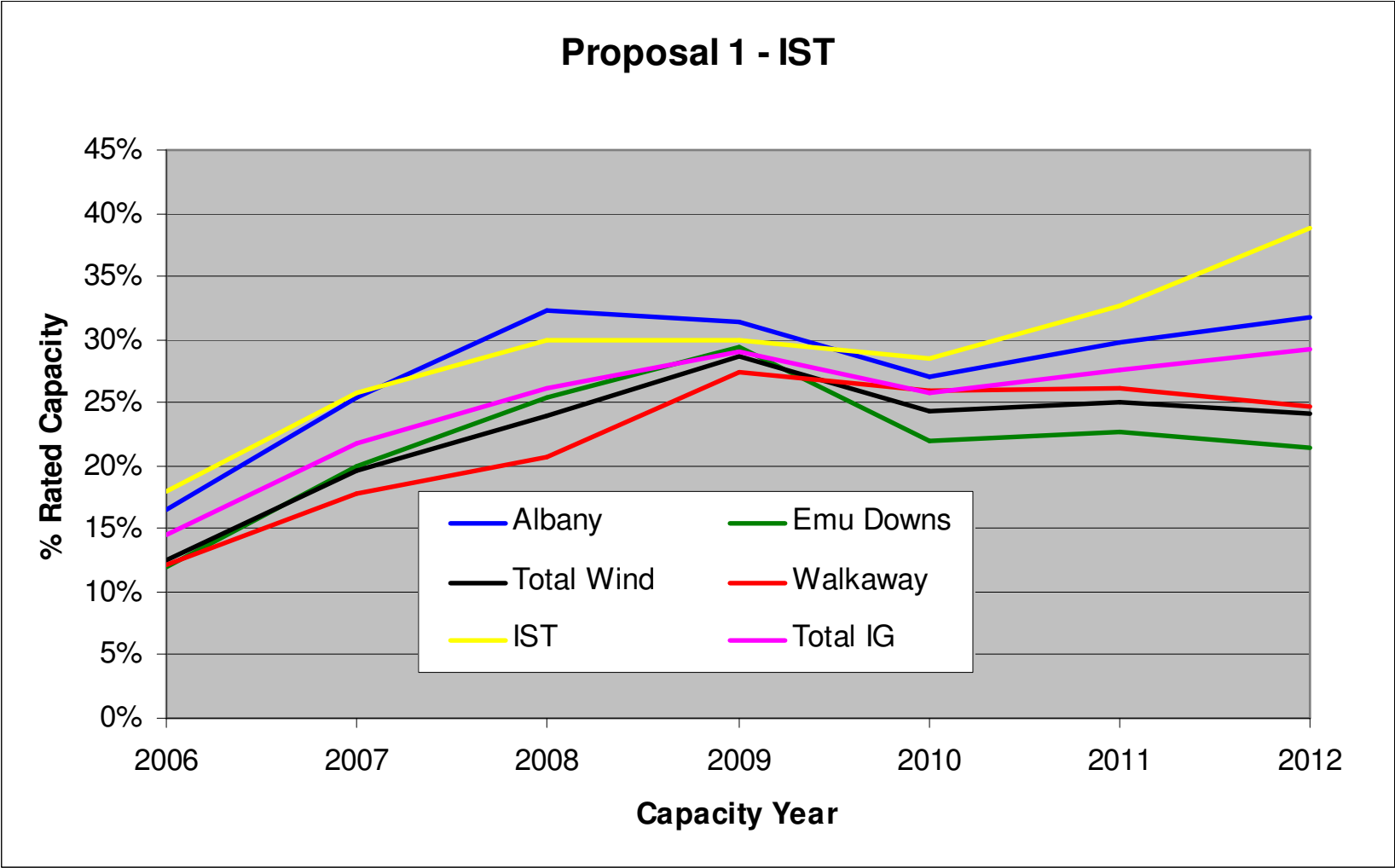




# Proposal 1 with GST



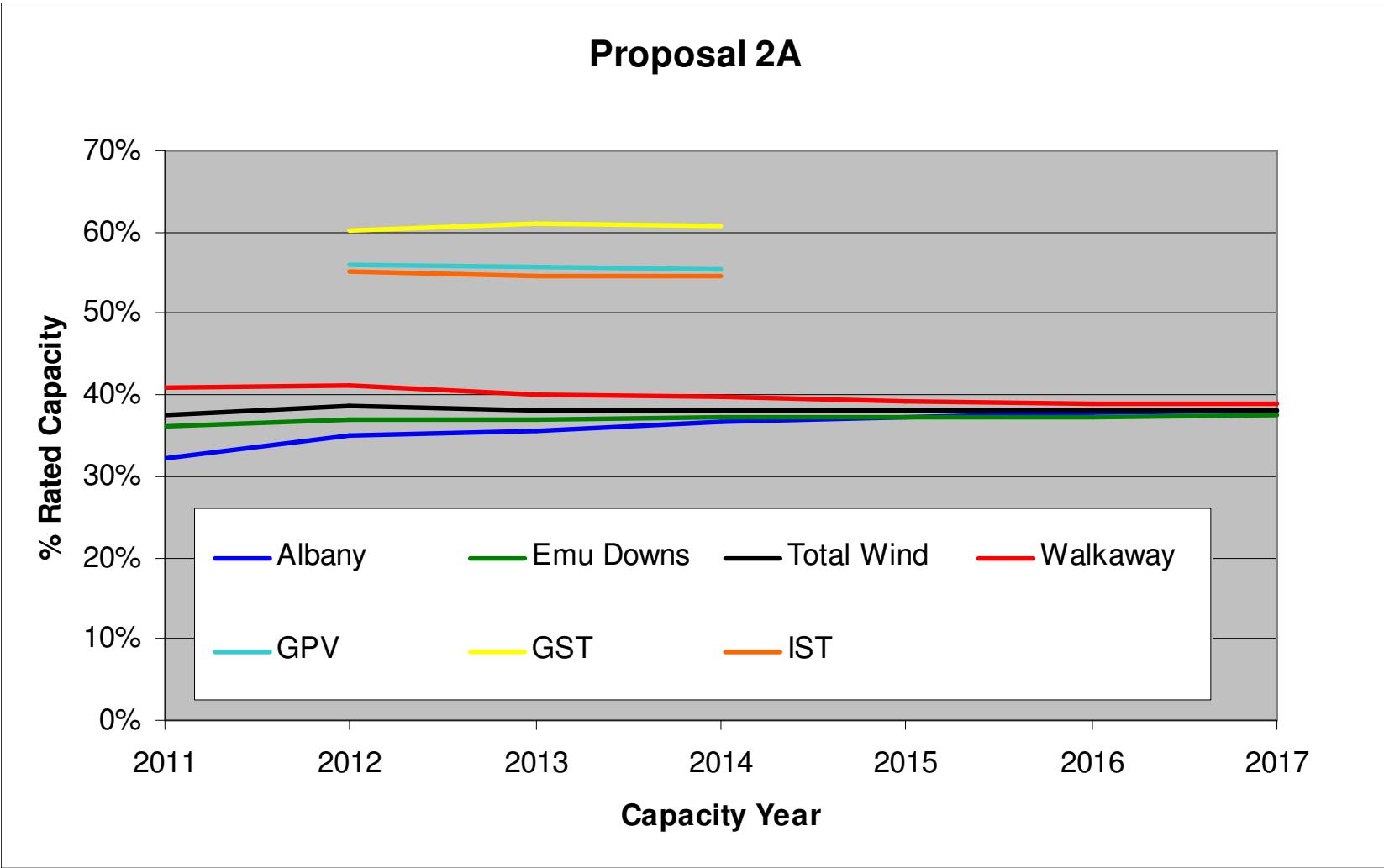
# Proposal 1 with IST



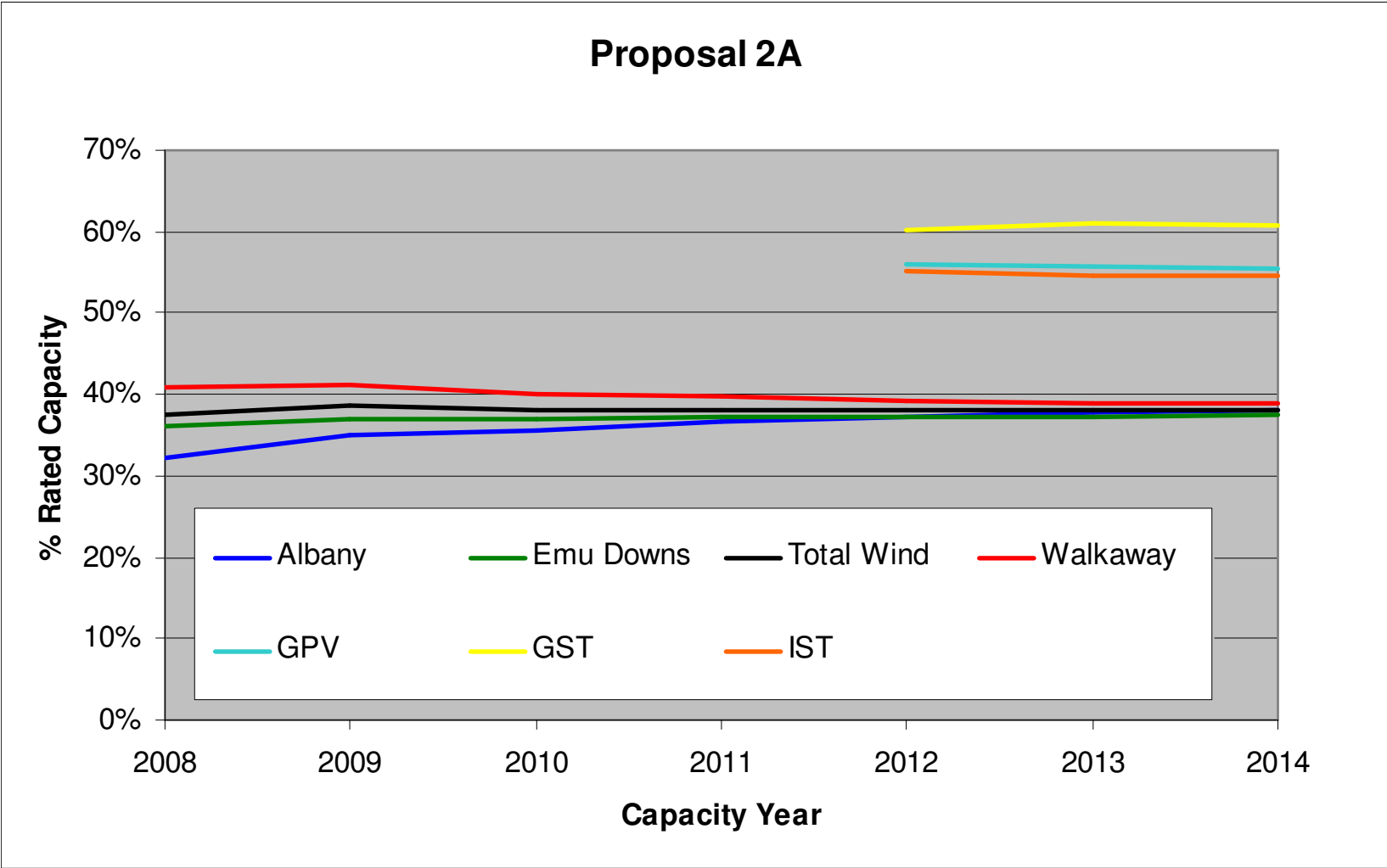
## Proposal 2A

- Three year rolling average based on historical three years representing 50%, 30% and 10% POE peak demands and scaled for future year profile
- Use 2002/03, 2003/04 and 2004/05 which represent 50%, 10% and 30% POE summer peak years
  - Based on peak demand distribution
  - Critical periods based on maximum load for scheduled generation
- Average value with that assessed for previous two years
- Solar projects evaluated as 100 MW capacity mutually exclusively in this analysis
- High volatility when new reference years are selected, low otherwise
- Much better aligned to value for reliability

# Proposal 2A



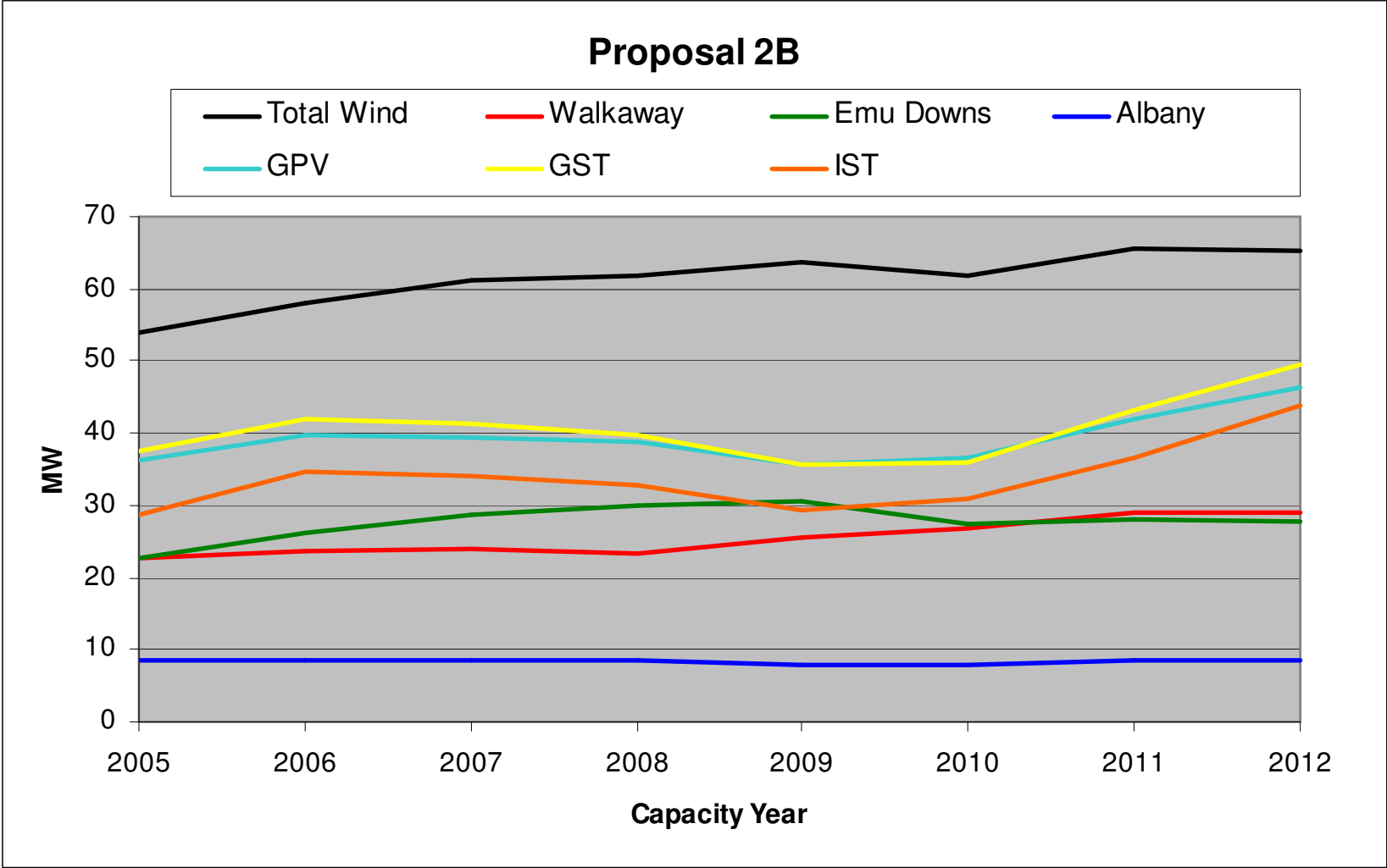
# Proposal 2A



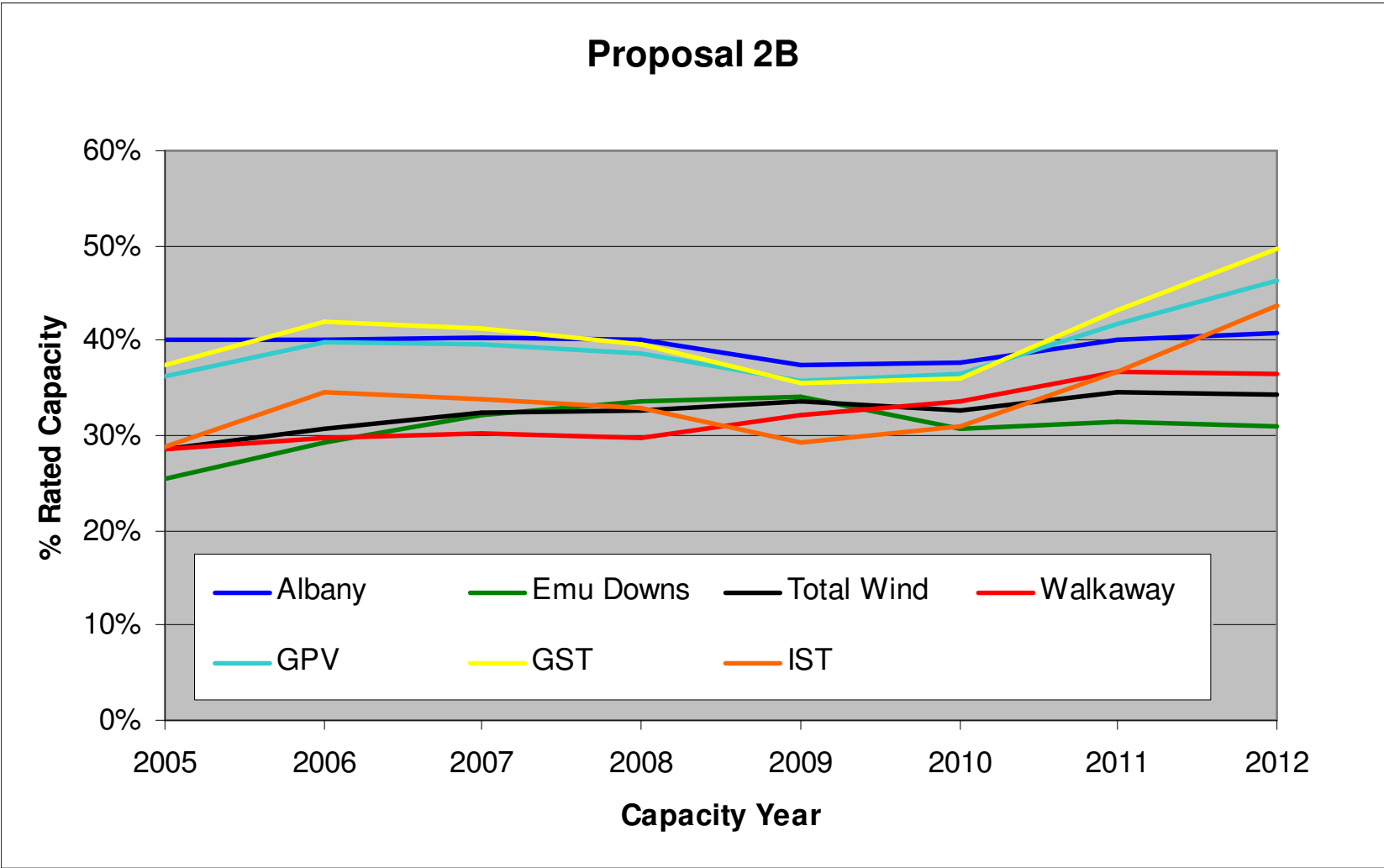
## Proposal 2B

- Three year rolling average for 750 highest trading intervals based on last three years and Load for Scheduled Generation
- Average value with that assessed for previous two years
- Good accuracy with moderate volatility
- Conservative because it is not forward looking relative to demand growth

# Proposal 2B



# Proposal 2B

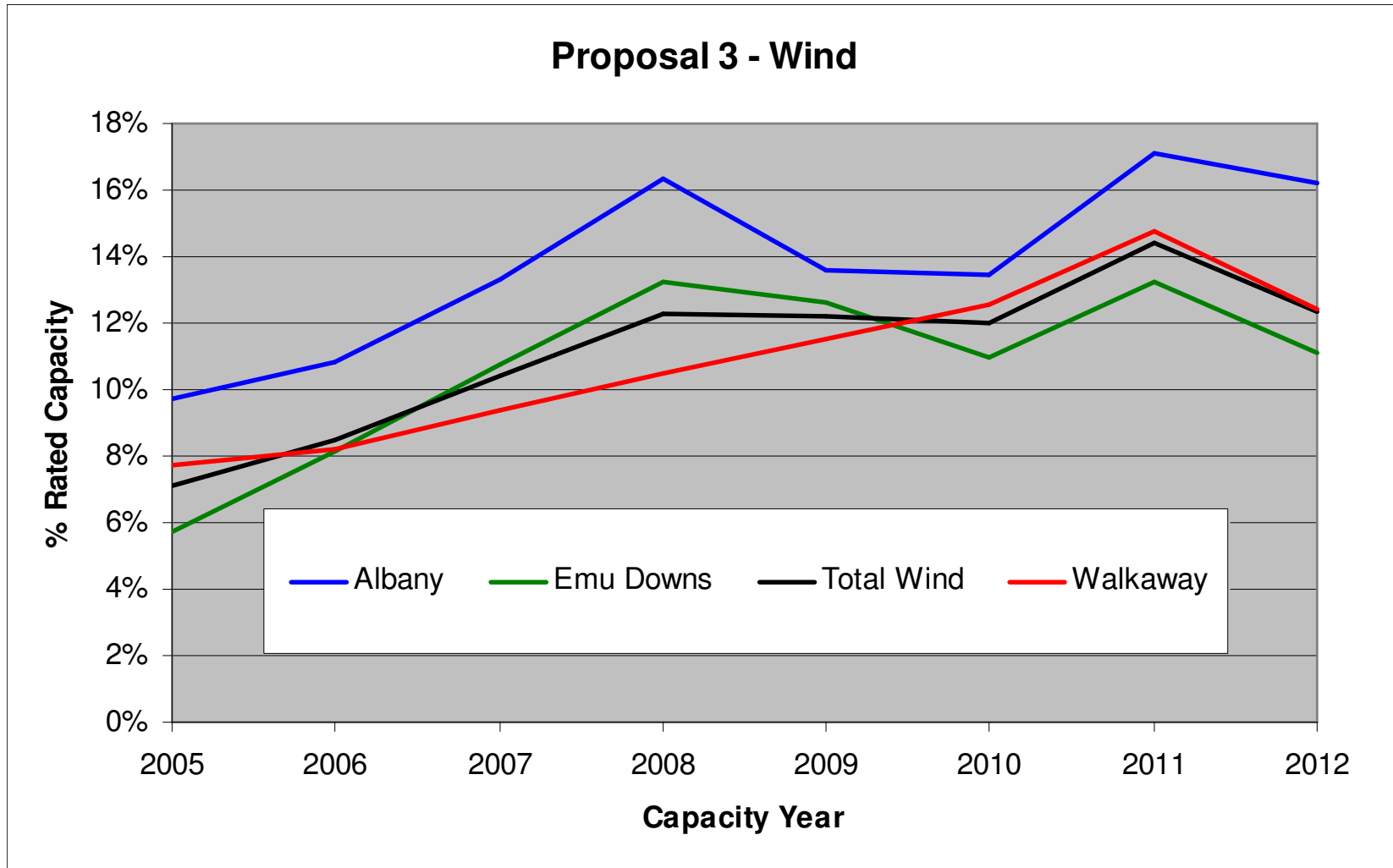




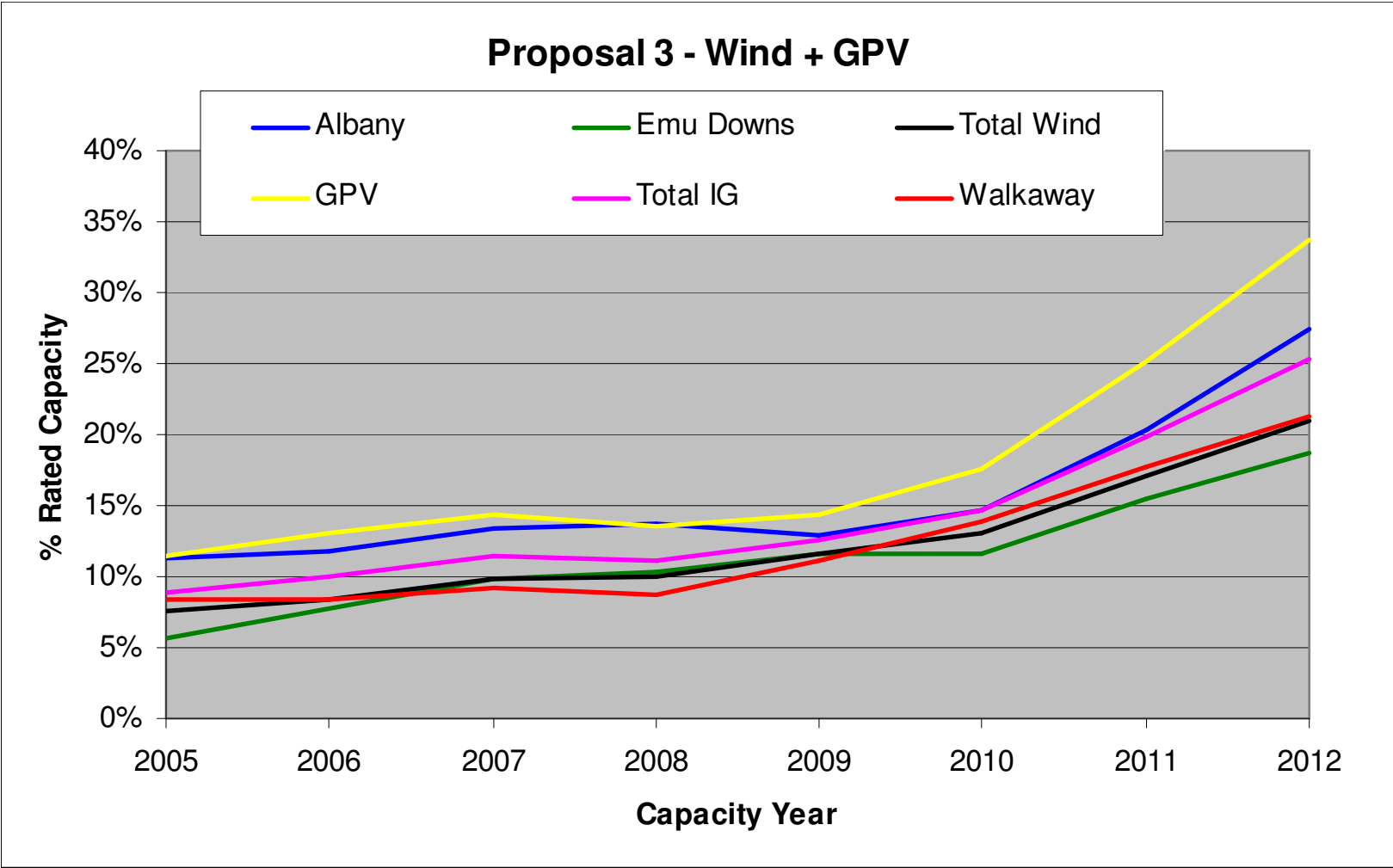
## Proposal 3

- Three year rolling average for 750 highest trading intervals based on last three years and Load for Scheduled Generation
- Average value with that assessed for previous two years
- Very conservative and tends to distort the proper analysis of contribution to reliability

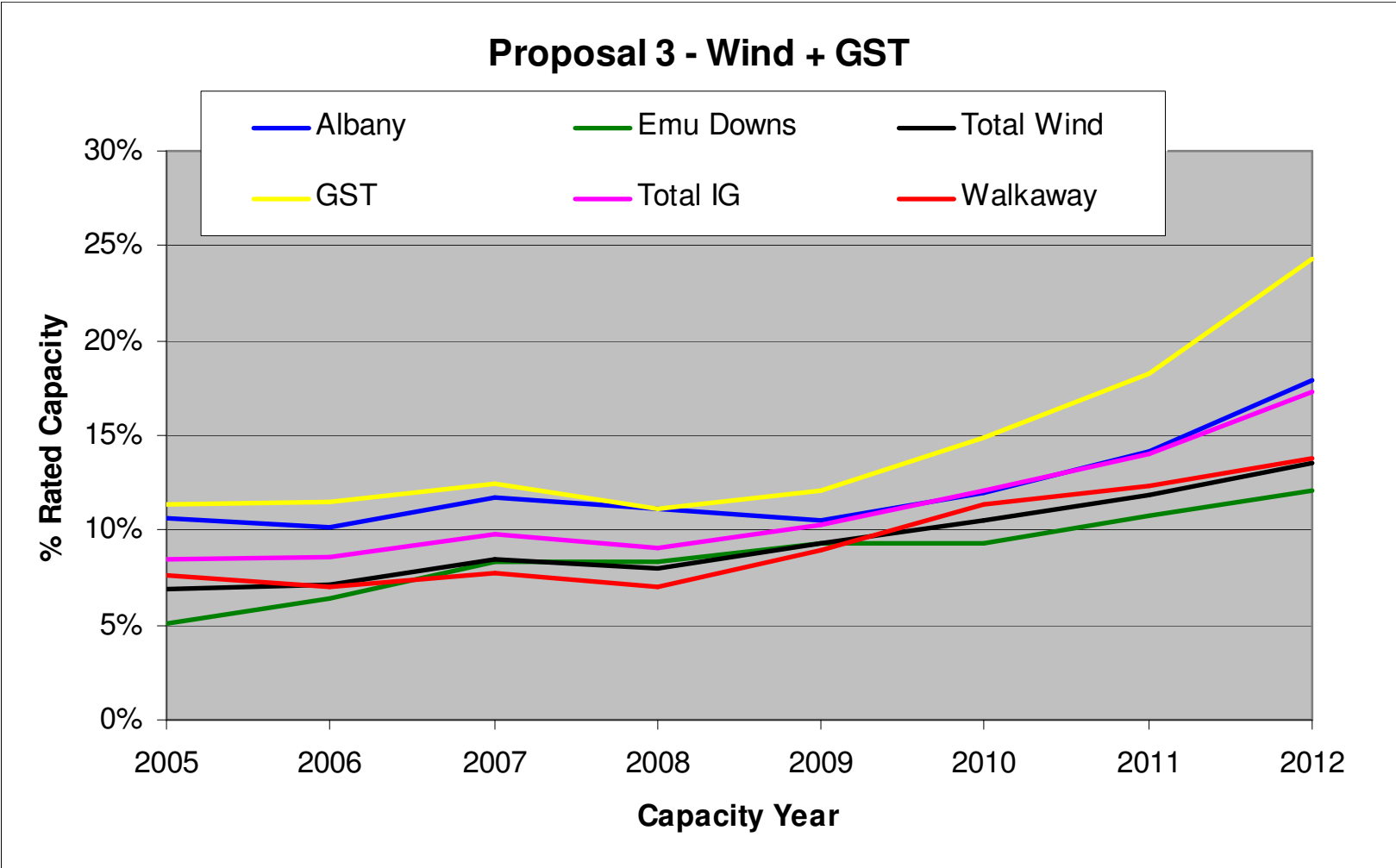
# Proposal 3 – wind only



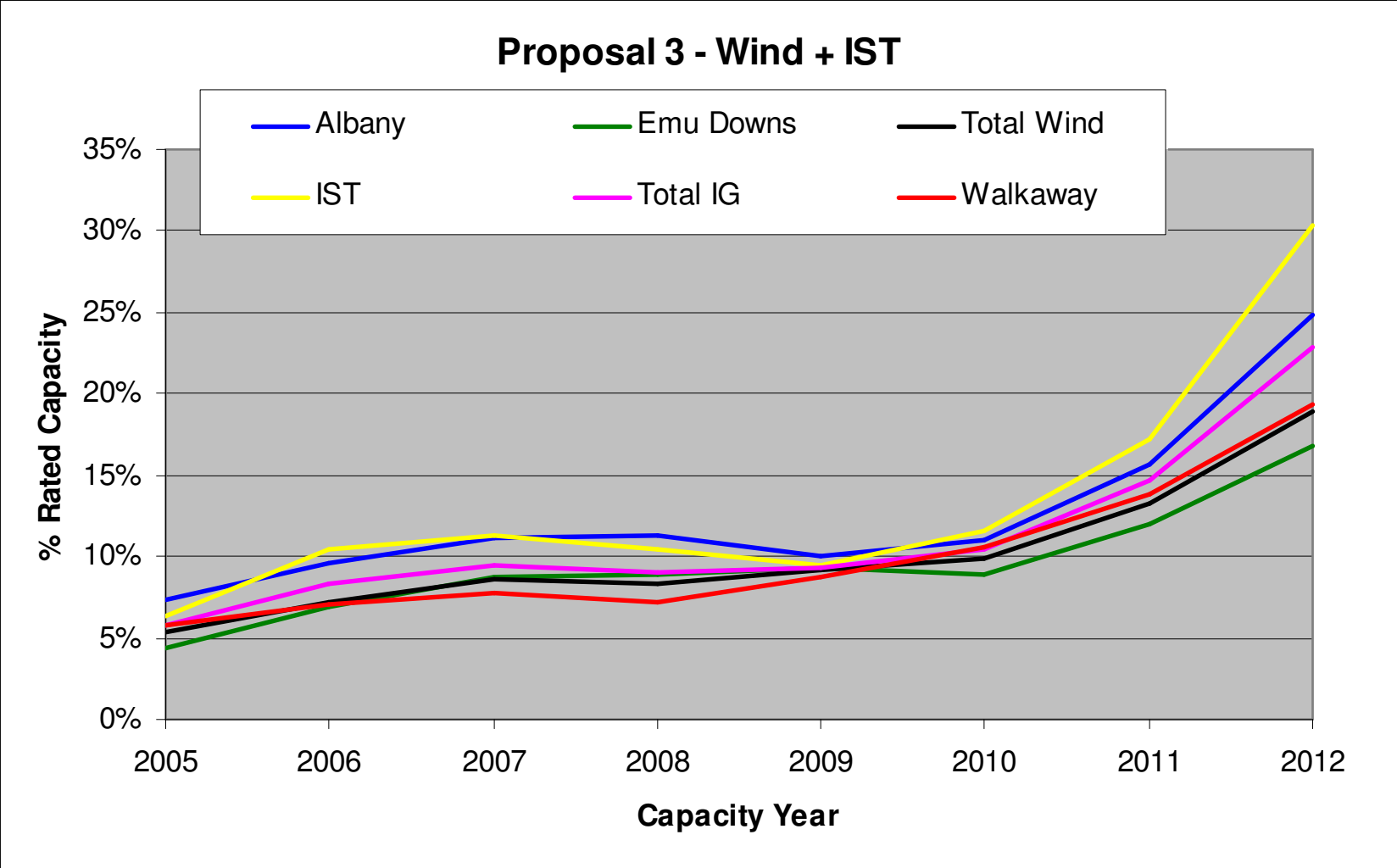
# Proposal 3 – wind plus 100 MW GPV



# Proposal 3 – wind plus 100 MW GST



# Proposal 3 – wind plus 100 MW IST



# Summary of Proposals

- Proposal 1
  - Simple to apply
  - Not very volatile based on historical observations
  - Under-states capacity value for wind farms relative to reliability impact
  - Using 90% instead of 95% for the percentile yields a higher outcome by between 4% and 30% for the last three years
  - Using system peak demand increases assessed value by between 2% and 18% for last three years
- Proposal 2A
  - More complex to apply
  - Moderately volatile – when new historical profiles are chosen, otherwise low volatility because it is based on standard years
  - Similar to current measure for wind farms
  - Good representation of capacity value based on reliability

# Summary of Proposals

- Proposal 2B
  - Simpler to apply than 2A
  - More volatile than 2A
  - Good representation of capacity value based on reliability
  - May understate value of some resources due to assessment based on recent historical conditions rather than forecast conditions with greater system demand

# Summary of Proposals

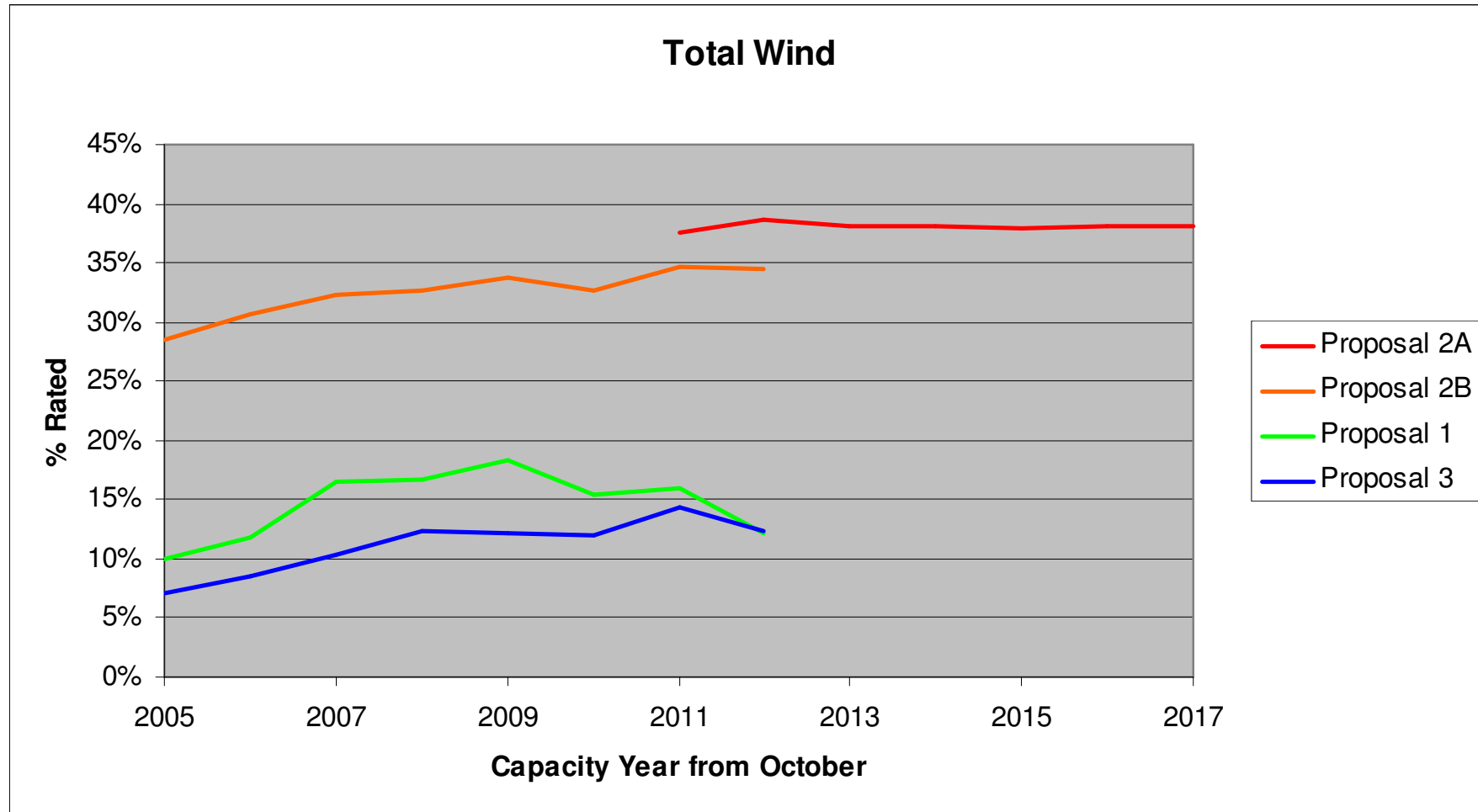
- Proposal 3
  - Shows moderate volatility and significant interaction among the fleet participants due to the variability of the 90 percentile scaling
  - Solar resources enhance the credit given to wind
  - Discounts the value of solar resources due to the 90 percentile value for the fleet
  - Does not well match the values obtained from reliability analysis
- Proposals 1 and 3 give much lower assessments due to the application of the fleet percentile
  - The solar assessment is about half to a third of what would be expected based on contribution to reliability
  - MMA considers this to be too conservative having regard to the reliability impact based on unserved energy criterion



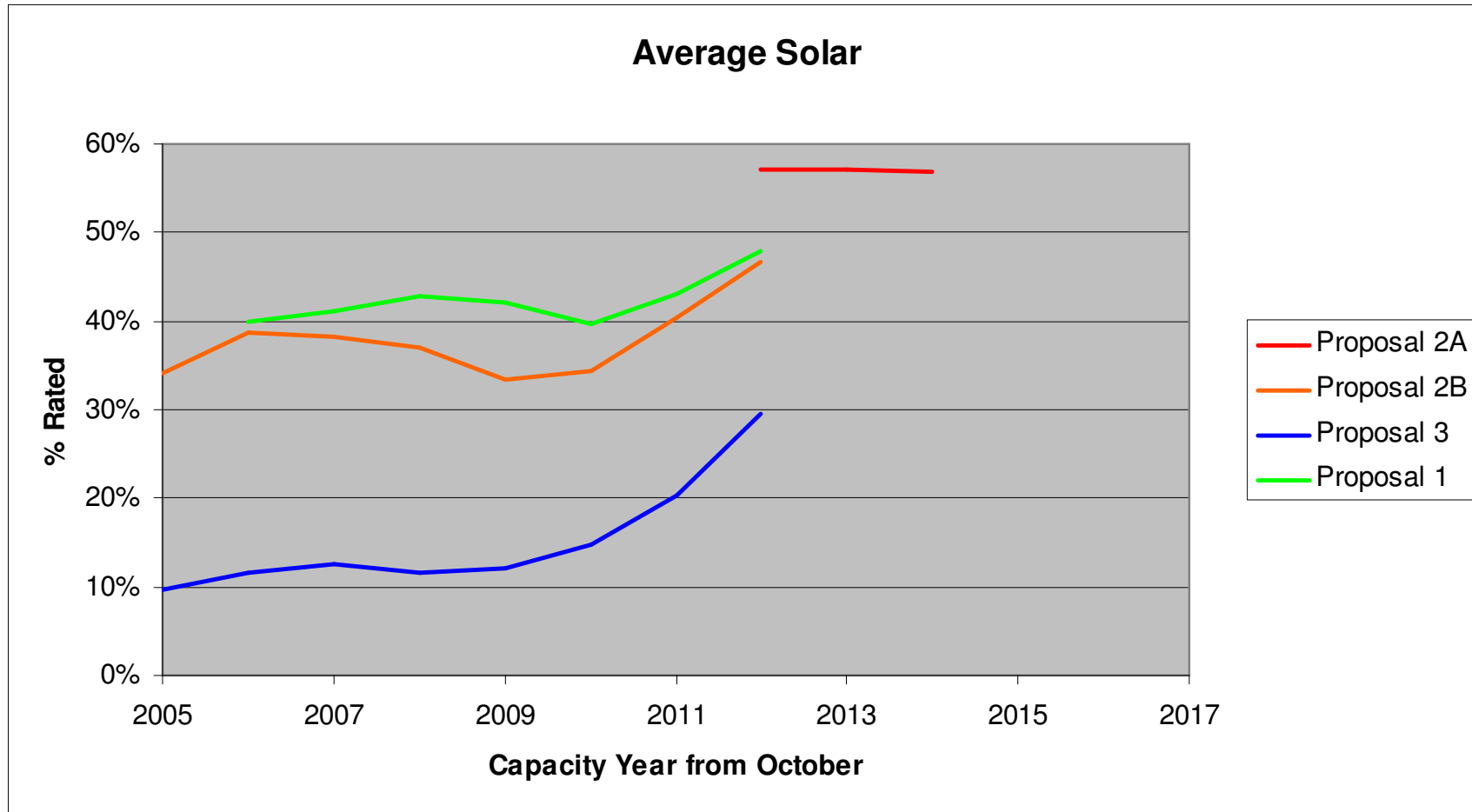
## LSG or System Peak Demand?

- Using system peak demand instead of Load for Scheduled Generation results in higher assessed capacity values by up to 43% across the various proposals
- Using LSG better represents the reliability equivalence, and hence
  - the diversity benefits
  - the impacts of higher penetration
  - the increased value of IG as demand grows

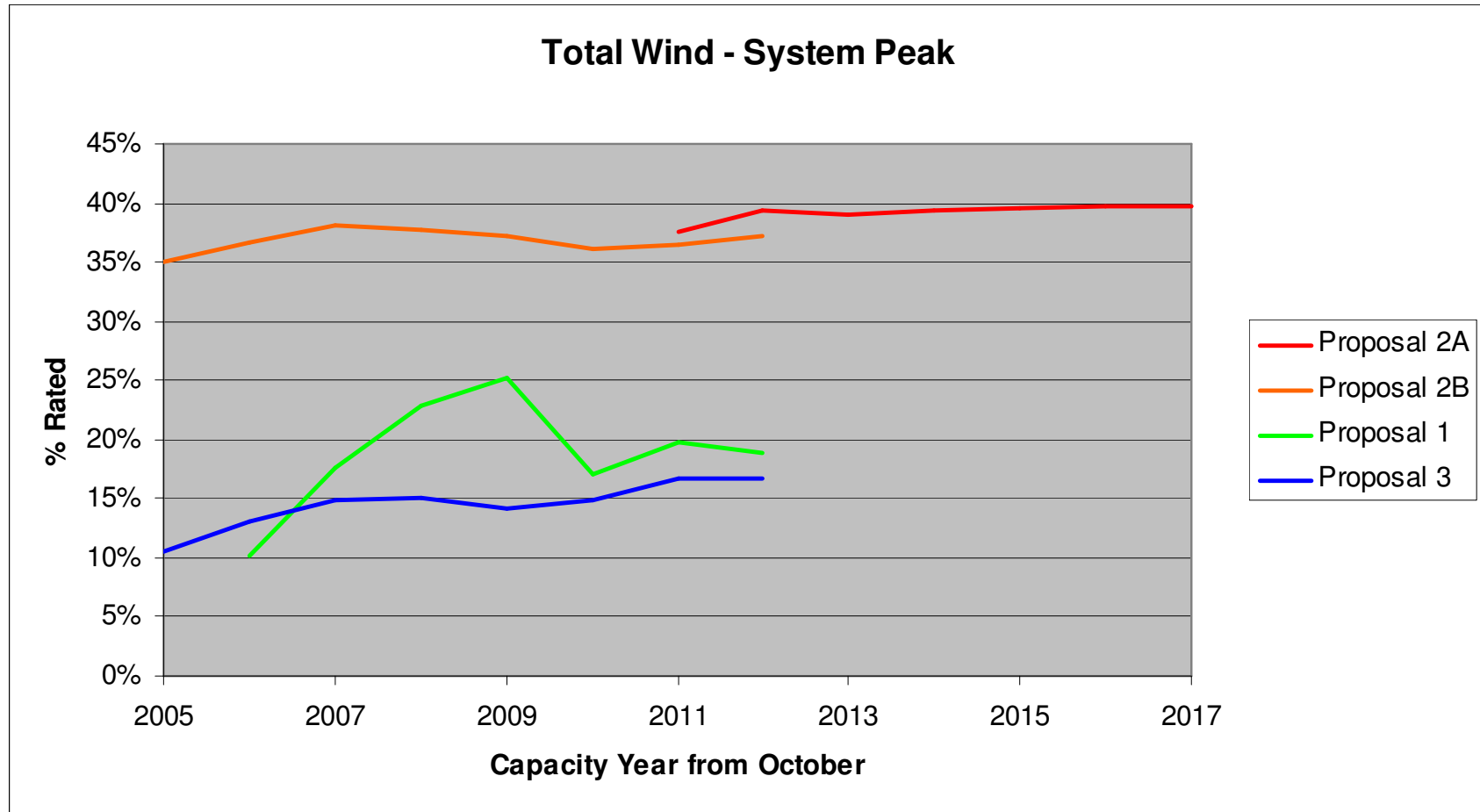
# Total wind component - LSG



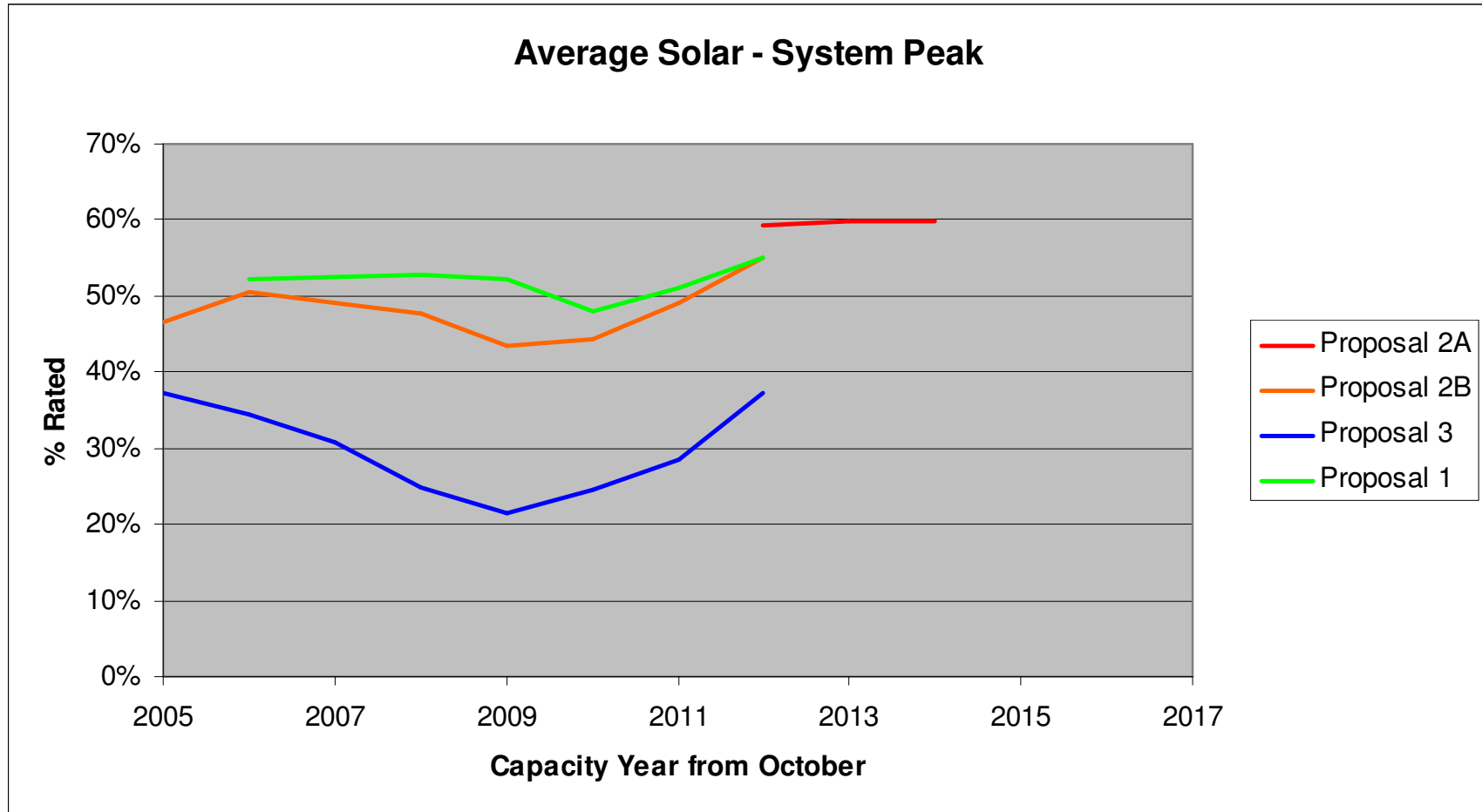
# Average Solar Capacity - LSG



# Total wind component – System Peak



# Average Solar Capacity – System Peak



# Summary

<b>Proposal ► Criteria ▼</b>	<b>1</b>	<b>2A</b>	<b>2B</b>	<b>3</b>
<b>Basis</b>	Fleet POE for 12 TI, shared on last three years 250 TI	750 TI for selected high demand years scaled to forecast	750 TI based on last three years	Fleet POE on 175 TI, shared on 250 TI over last three years
<b>Transparency</b>	Moderate - complex interactions but based on history	Moderate - some interactions and forecasting uncertainty	High - based on history	Moderate - some interactions
<b>Simplicity</b>	Moderate	Moderate	High	Moderate
<b>Fleet POE</b>	95%			90%
<b>Accuracy and Robustness</b>	Low (Conservative)	High - best represents reliability impact	Moderate (Conservative)	Low (Conservative)
<b>Continuity of valuation</b>	Low due to significant interactions among resources	High - changes infrequently, but then substantially	Moderate due to year to year variations	Moderate with significant interactions among resources

## MMA recommendation

- MMA favours 2A for accuracy and that periods of change would be infrequent when the load shapes are updated (about once every 3 - 5 years on average)
- The use of Load for Scheduled Generation is superior to using system peak demand both with respect to accuracy and conservatism