The Treatment of Intermittent Generation in the SWIS Capacity Market

Review of Certified Reserve Capacity Calculation Methodologies for Intermittent Generators

Senergy Econnect Project No: 2413

Prepared For:	Office of Energy Level 9, Governor Stirling Tower, 197 St Georges Terrace, PERTH WA 6000

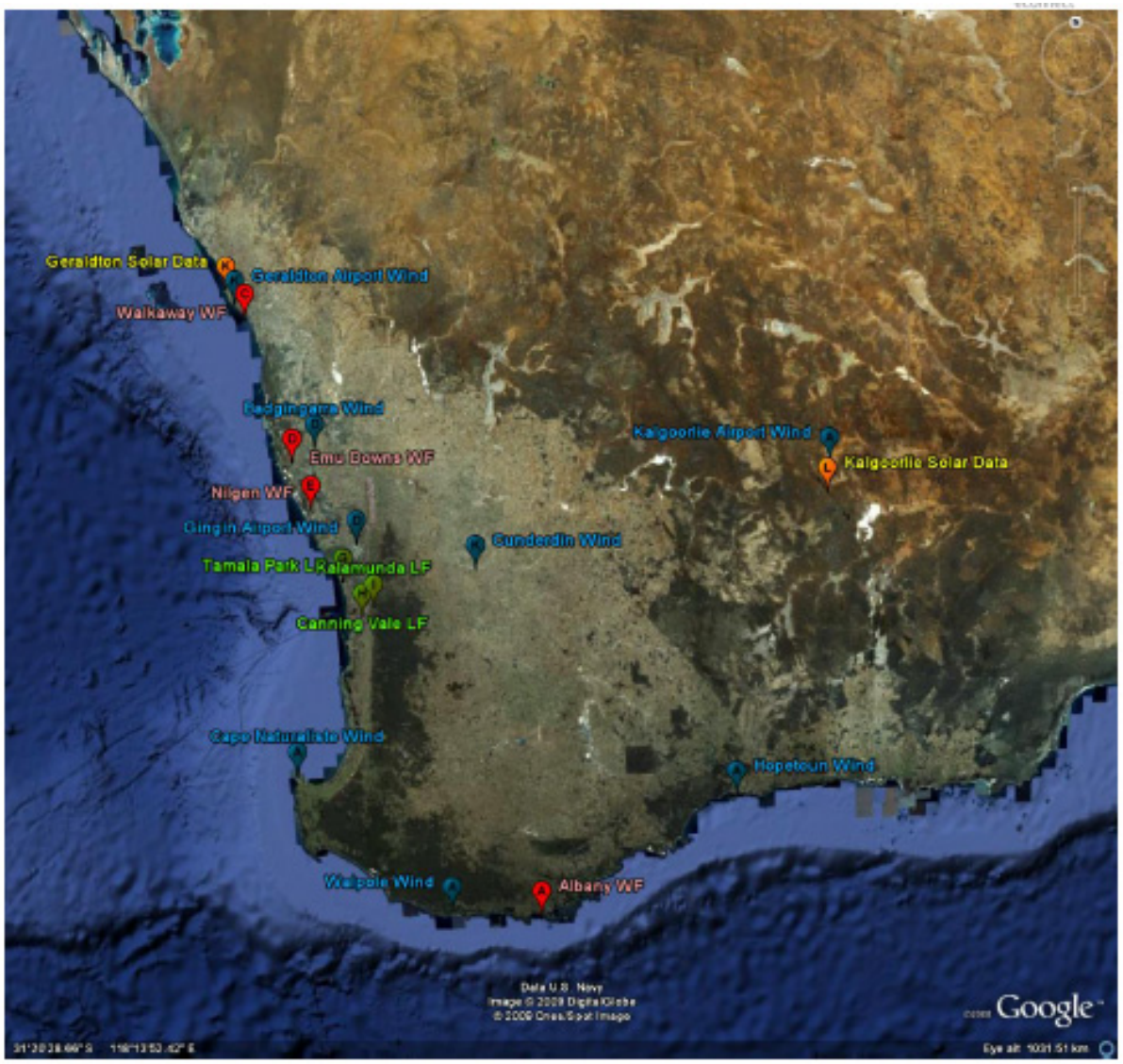

Figure 2: Map of the SWIS region with the location of recorded data identified by markers corresponding to their source (see Table 2). Red labels denote Wind Farms (WF), Green denotes Landfill Gas Plants (LF), Yellow denotes Solar Resource Locations (Solar) while blue denotes a BOM recorded wind data site. Image produced courtesy of Google Earth.

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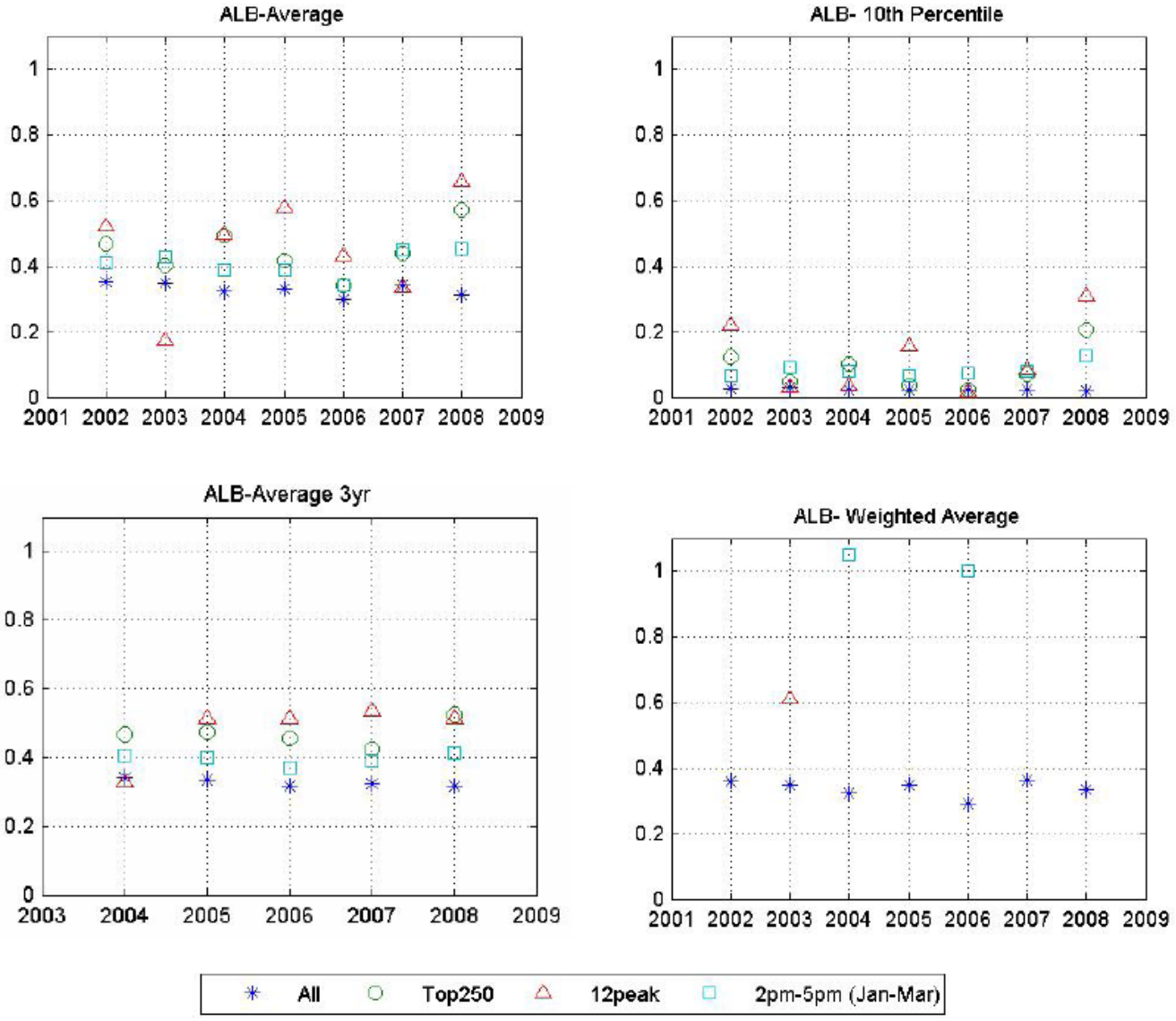

Figure 50: Comparison of results found when calculating Reserve Capacity based on all methodologies for ALB wind generation over single year time frames.

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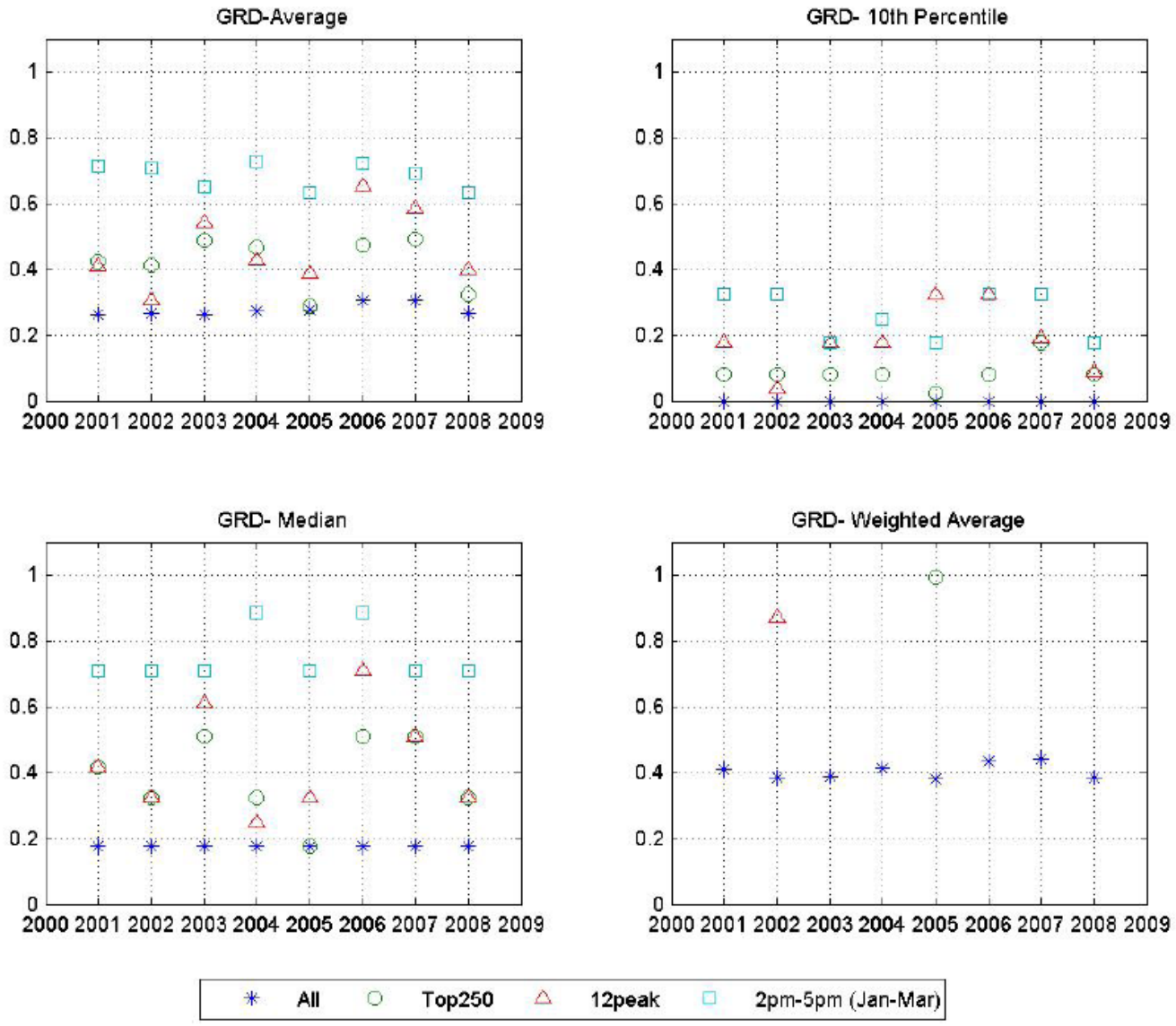

Figure 42: Comparison of results found when calculating Reserve Capacity based on all methodologies for GRD modelled wind generation over single year time frames.

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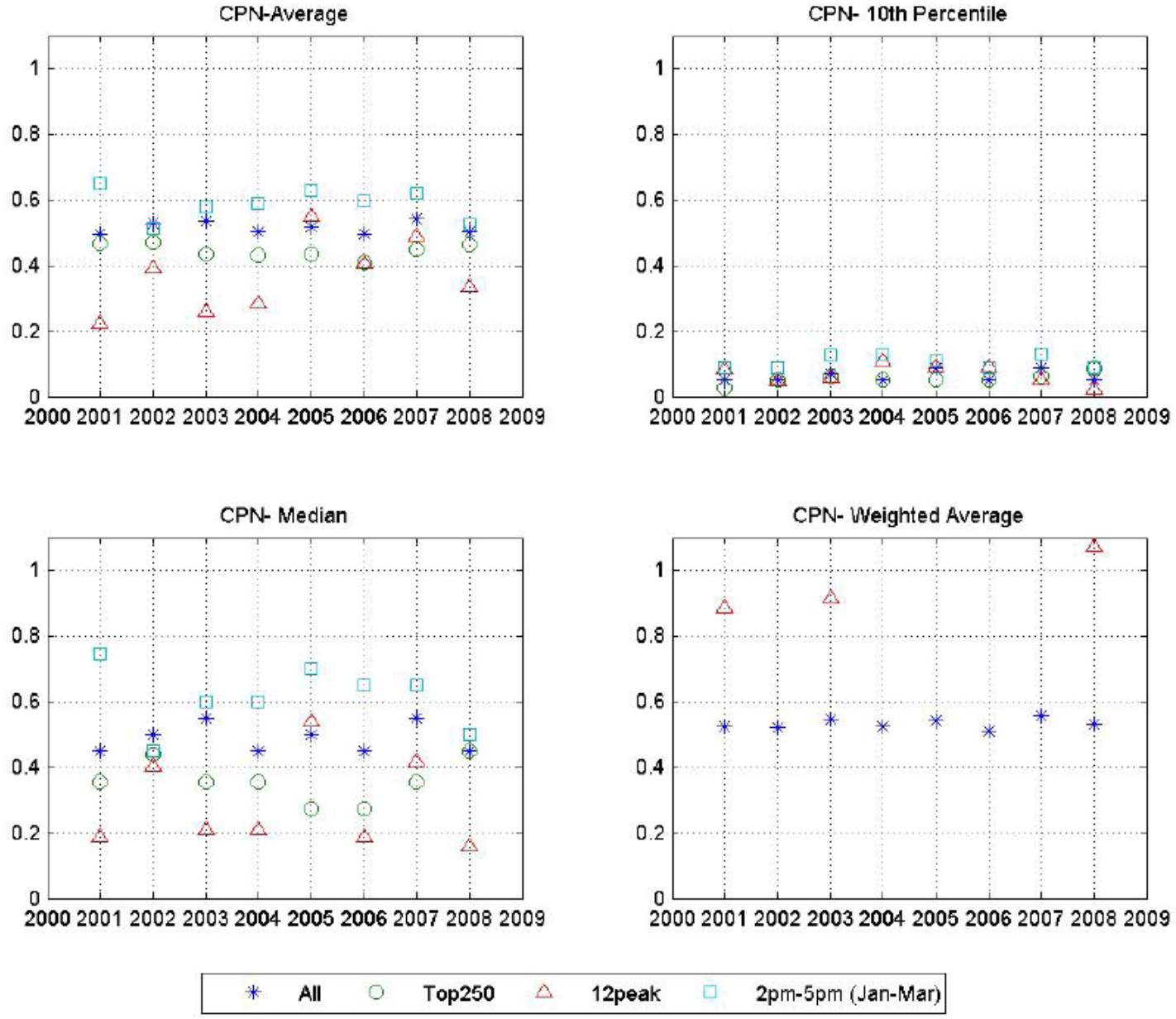

Figure 38: Comparison of results found when calculating Reserve Capacity based on all methodologies for CPN modelled wind generation over single year time frames.

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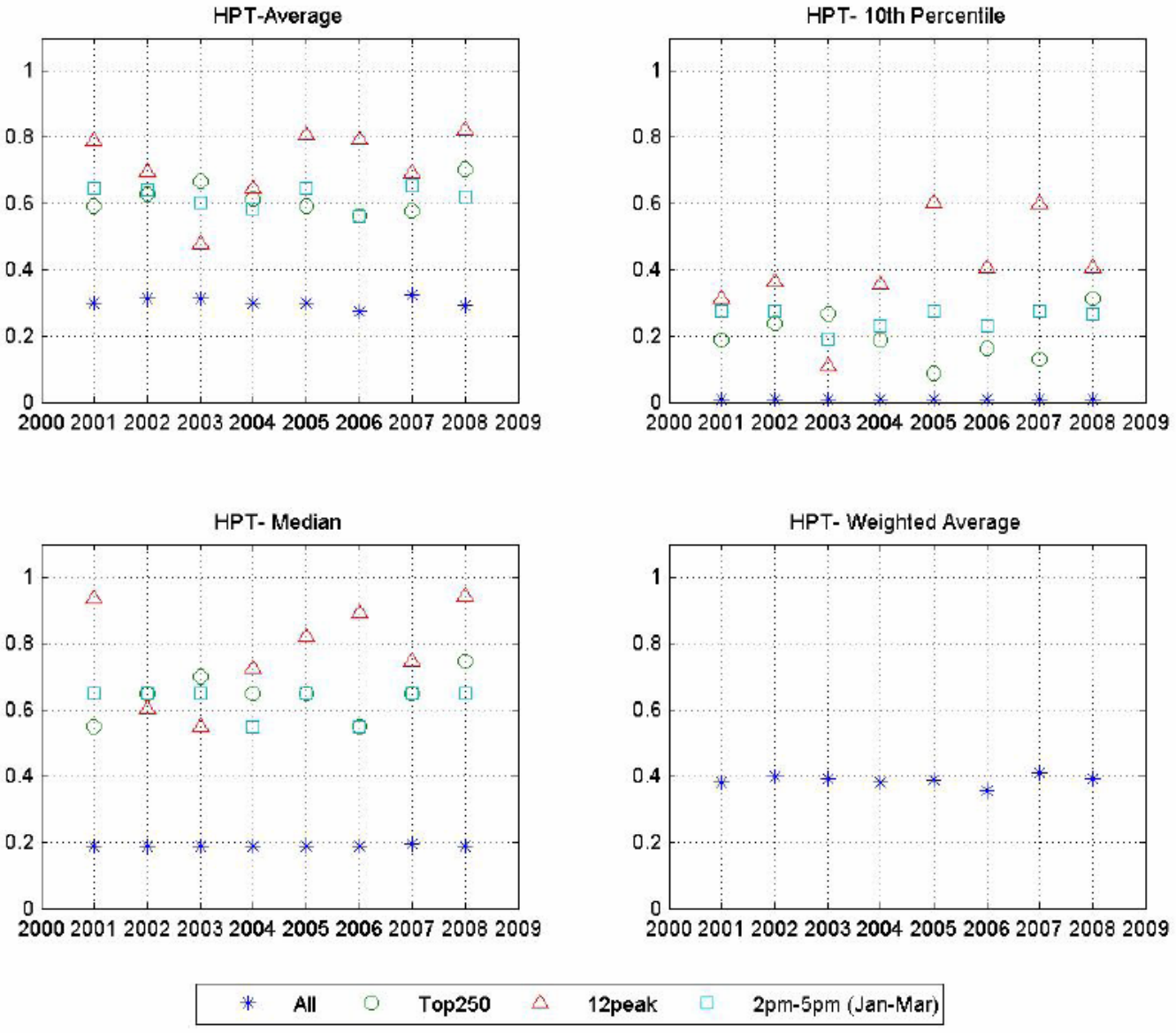

Figure 44: Comparison of results found when calculating Reserve Capacity based on all methodologies for HPT modelled wind generation over single year time frames.

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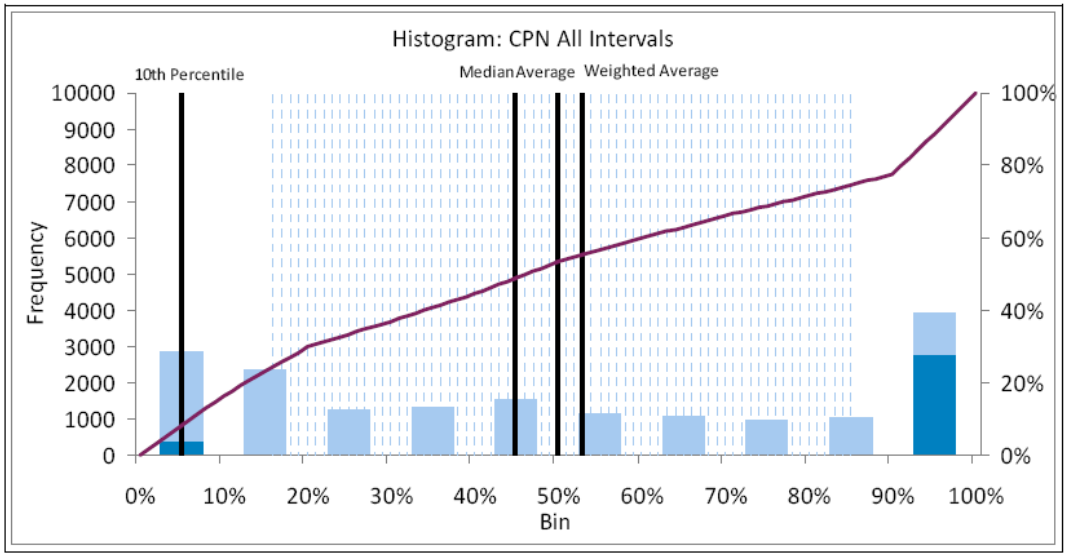
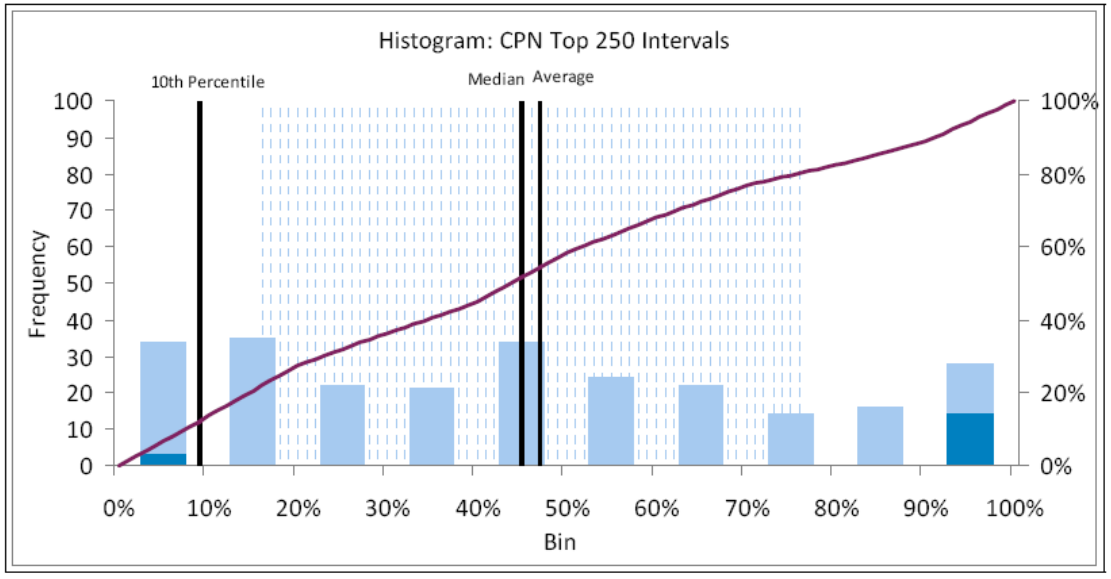
16.5 CPN Histograms and Distributions (Wind)

WIND

All Intervals



Top 250 Intervals



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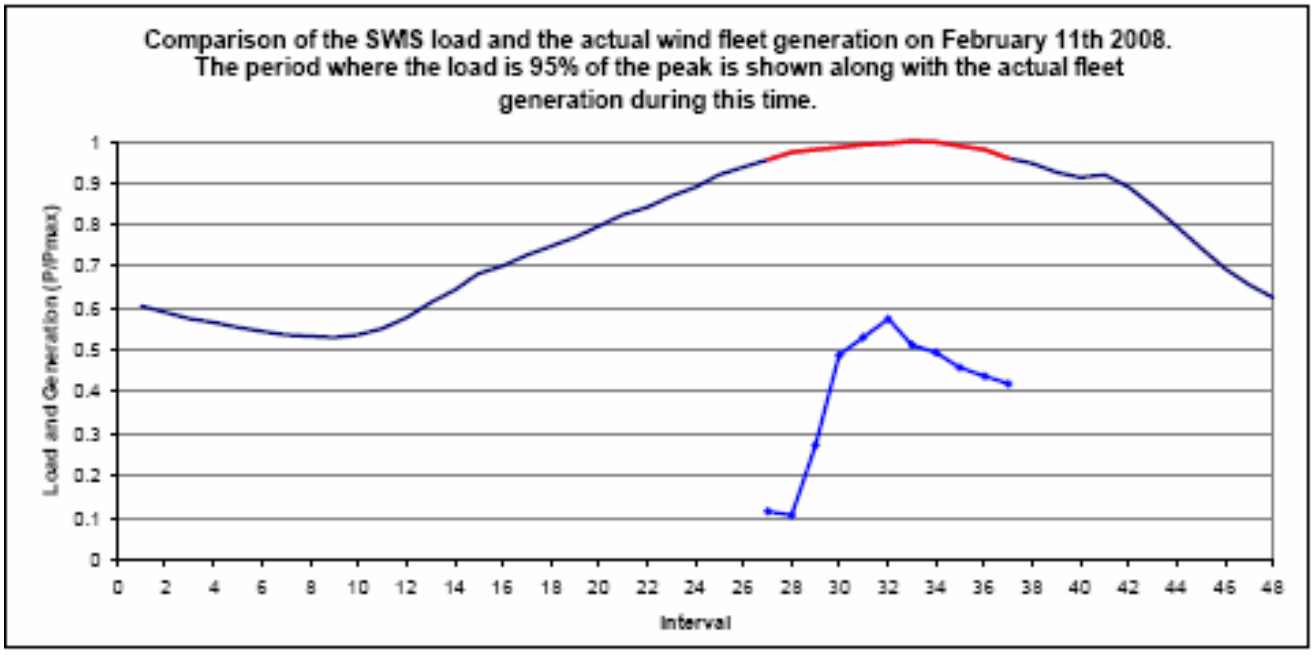
Day Number	Date	Day	Peak Load (MW)	Intervals of 0.95 x peak	Max. Temp. (Deg. C, North Perth)	Min. Temp. (Deg. C, North Perth)
1	05-Mar-07	Mon	3010	11	39.80	22.6
2	06-Mar-07	Tue	3521	10	41.60	21.9
3	07-Mar-07	Wed	3561	9	42.10	18.7
4	08-Mar-07	Thu	3346	10	37.60	19.9
5	24-Dec-07	Mon	2845	8	35.80	19.1
6	25-Dec-07	Tue	2563	15	40.40	21.6
7	26-Dec-07	Wed	2952	16	43.20	20.2
8	11-Feb-08	Mon	3603	9	36.90	22.5
9	12-Feb-08	Tue	3477	8	36.30	20.7
10	13-Feb-08	Wed	3413	10	36.30	22.6
11	25-Feb-08	Mon	3187	7	35.40	17.2
12	26-Feb-08	Tue	3331	9	36.70	17.3
13	27-Feb-08	Wed	3482	8	37.50	20.6
14	28-Feb-08	Thu	3571	11	41.30	20.9



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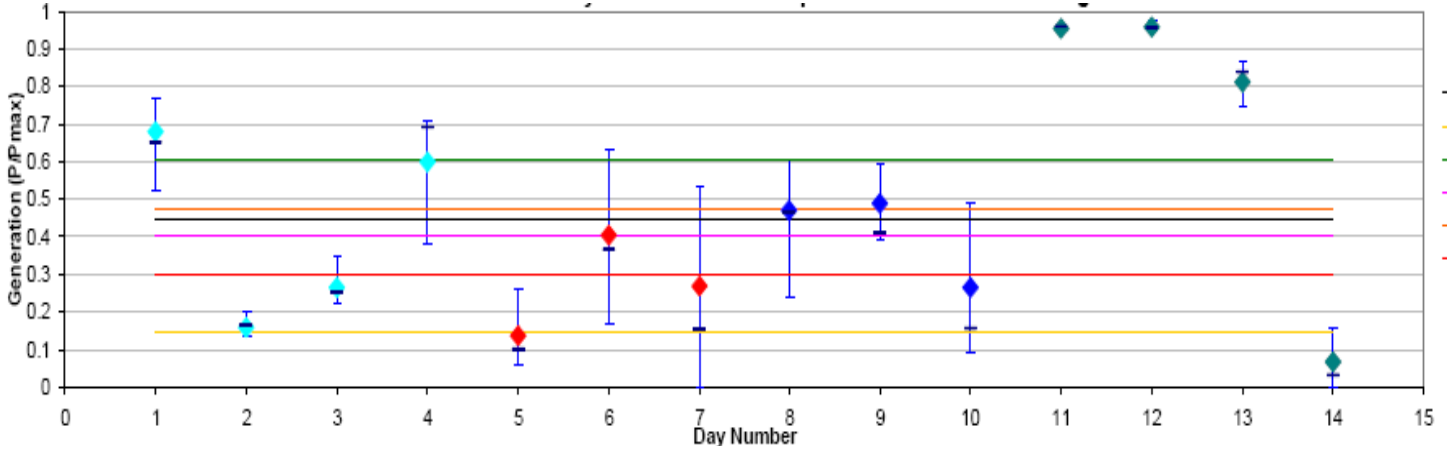
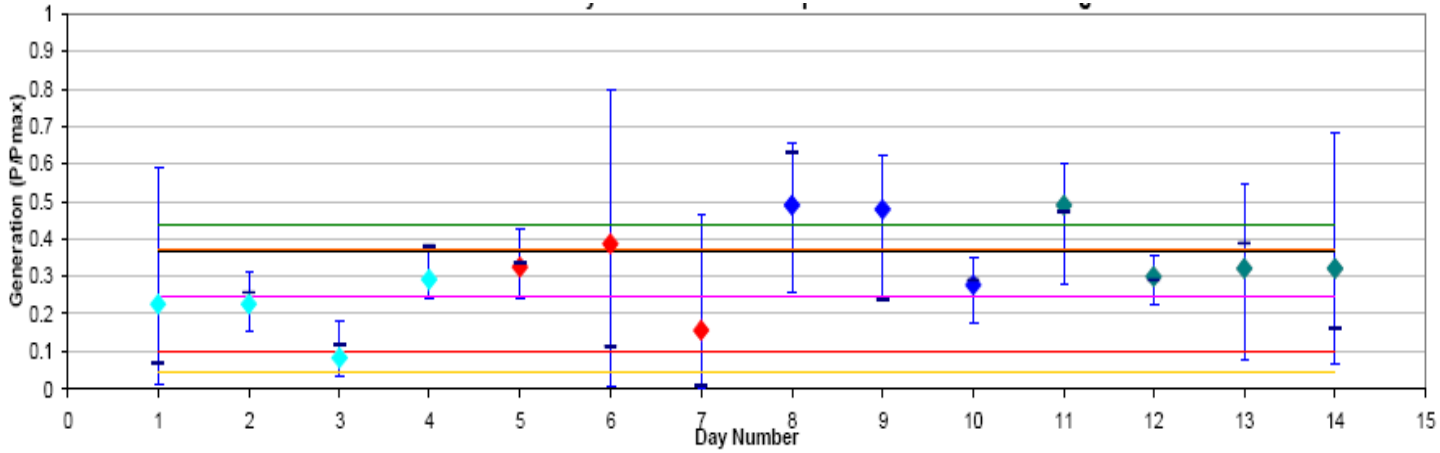
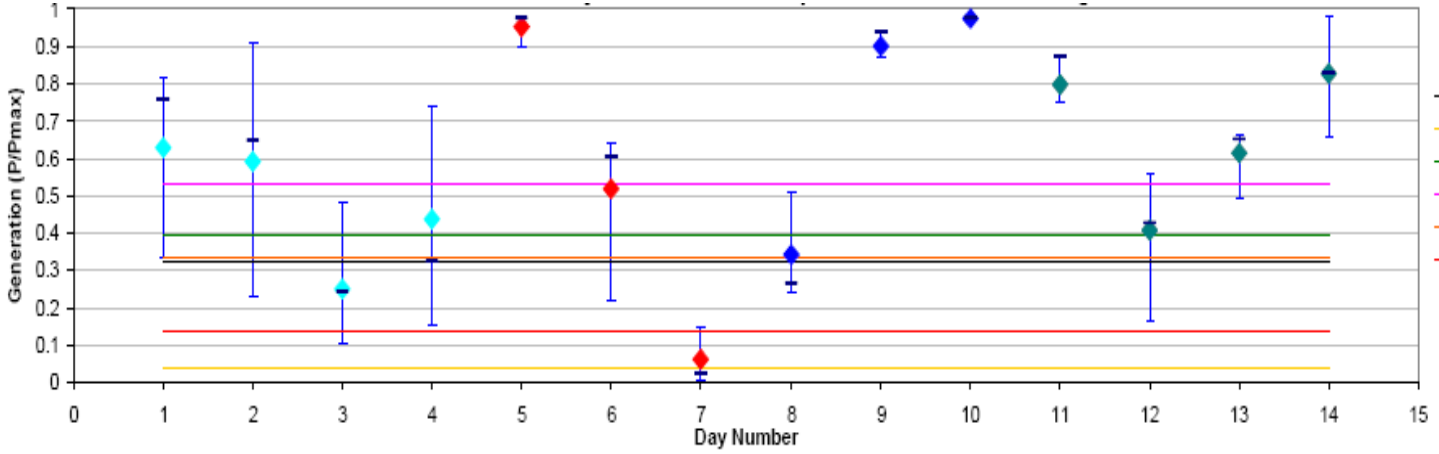
WIND







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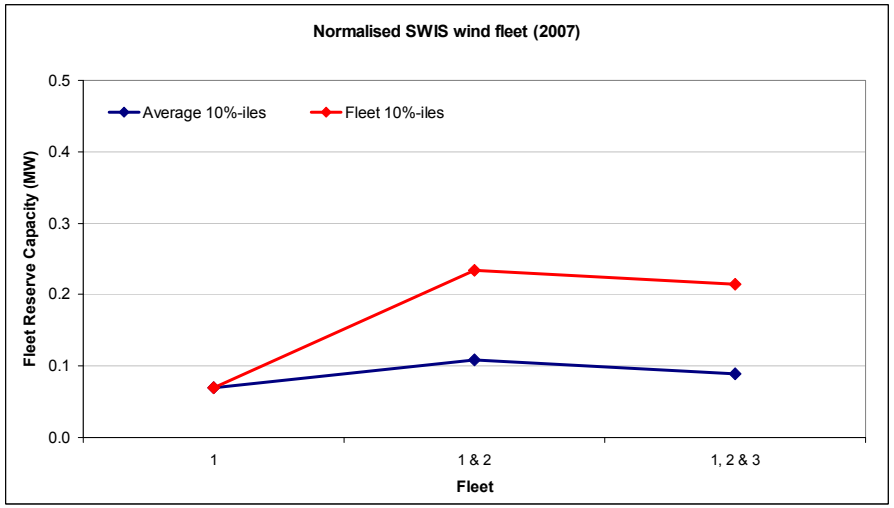

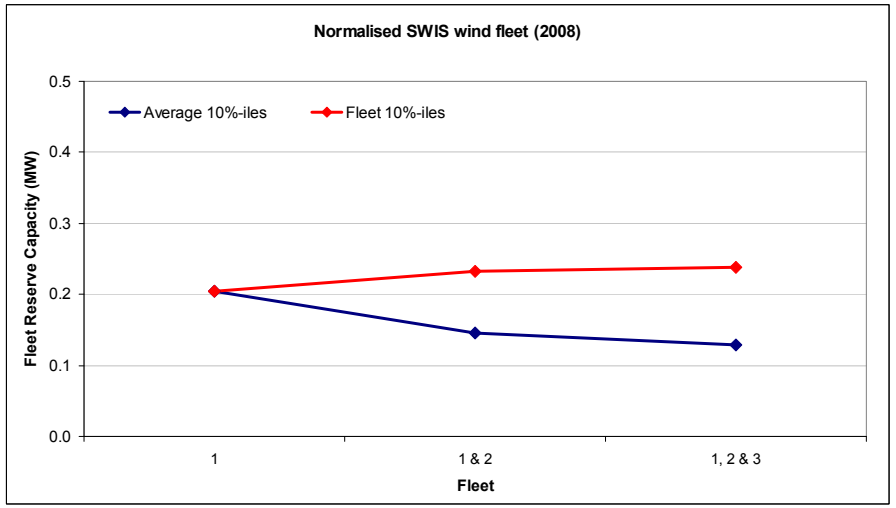

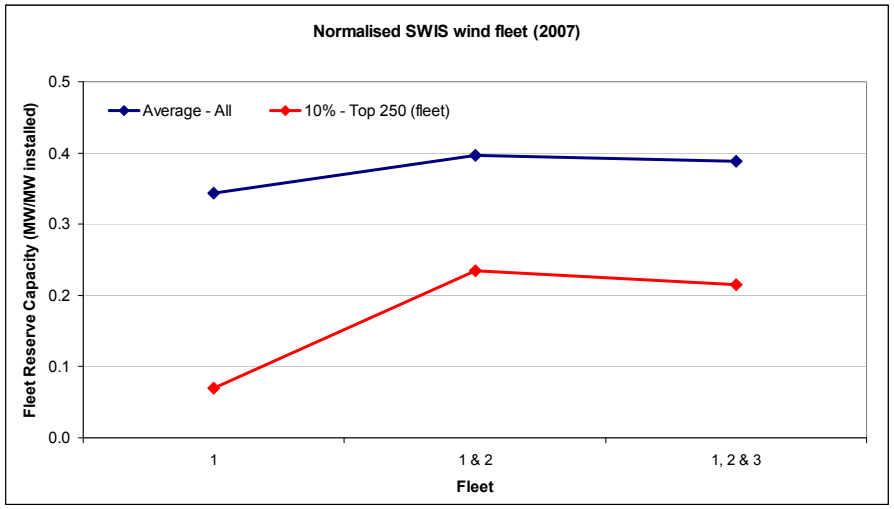

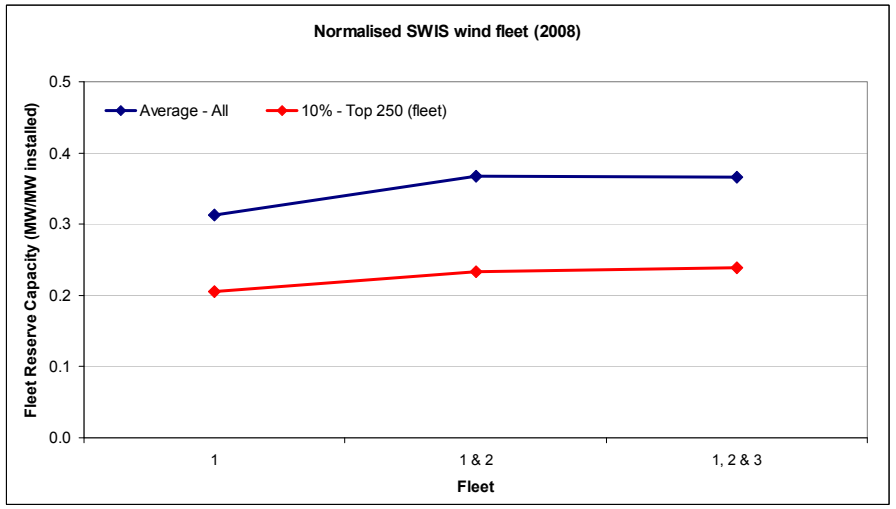

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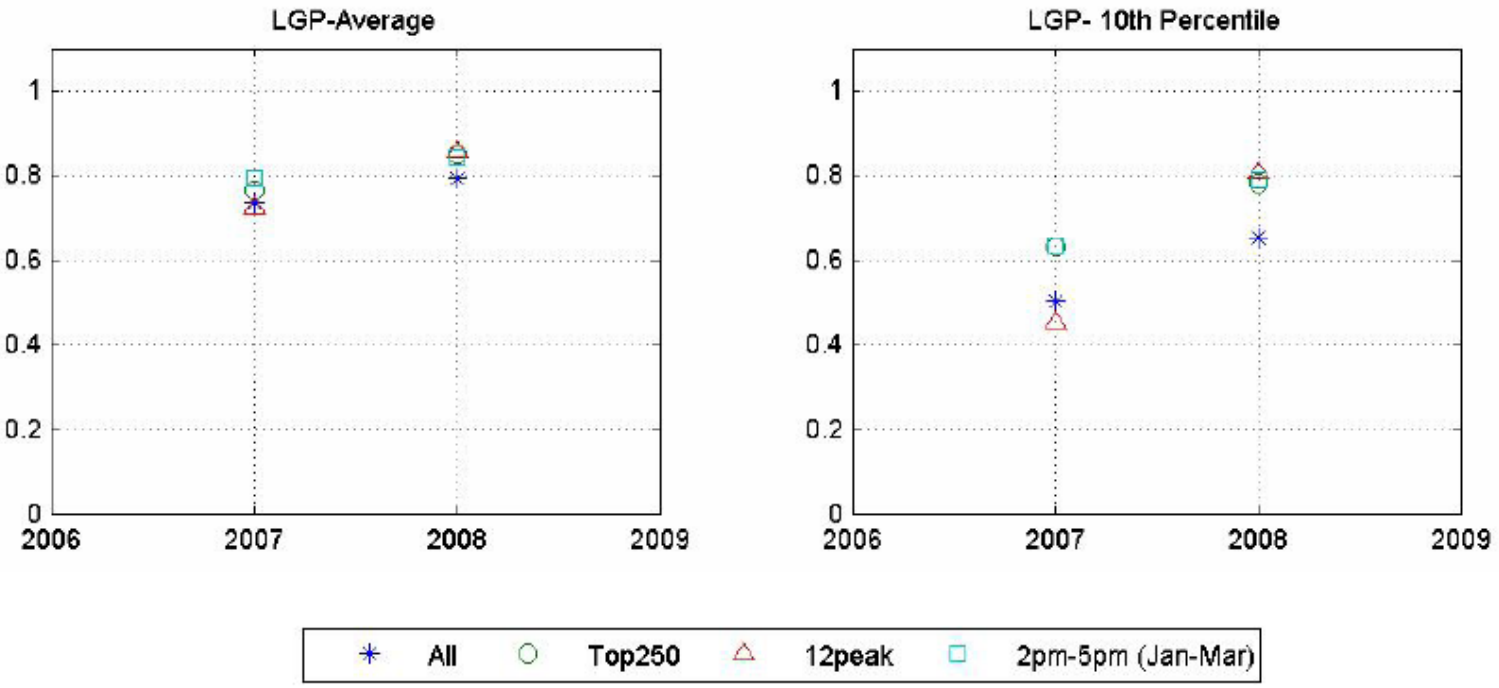
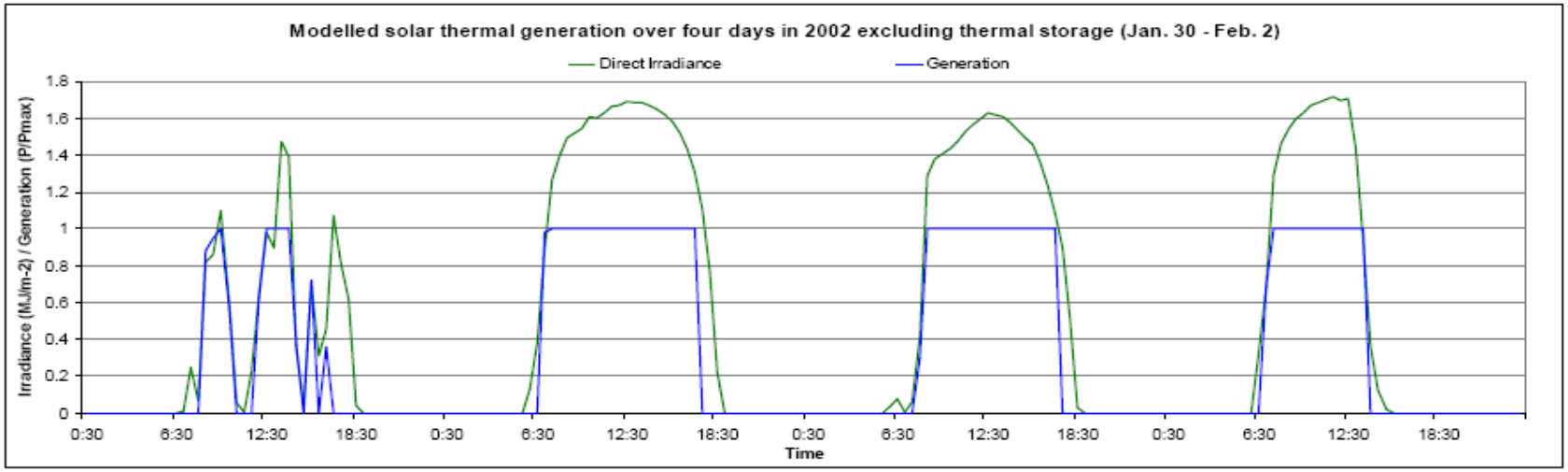
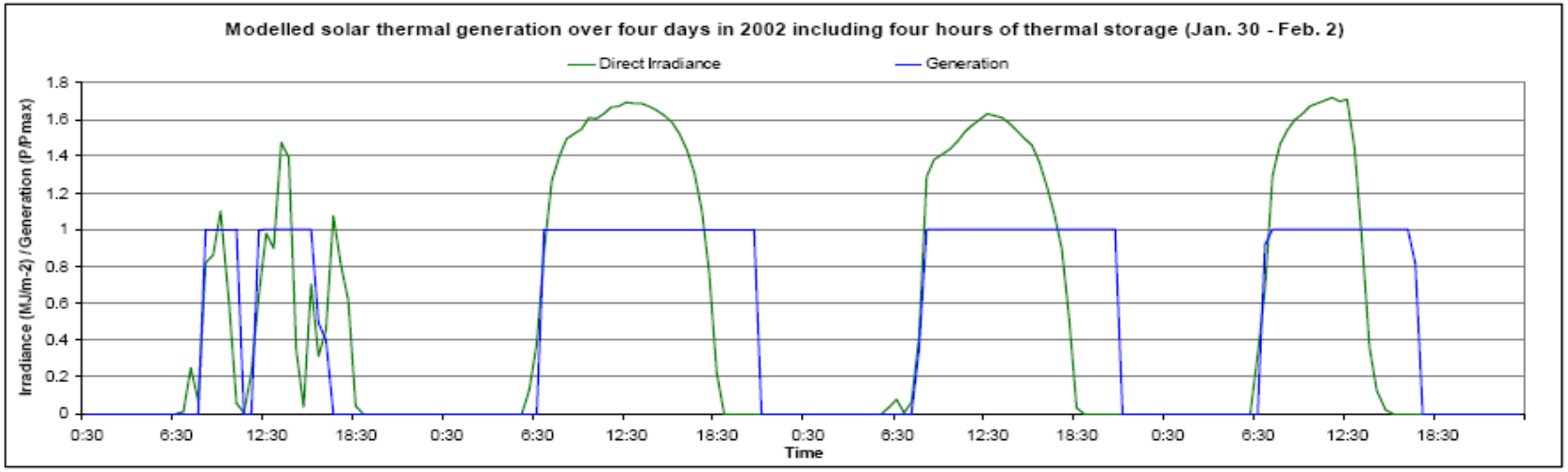


Figure 58: Comparison of results found when calculating Reserve Capacity based on all methodologies for LGP landfill gas generation over single year time frames.





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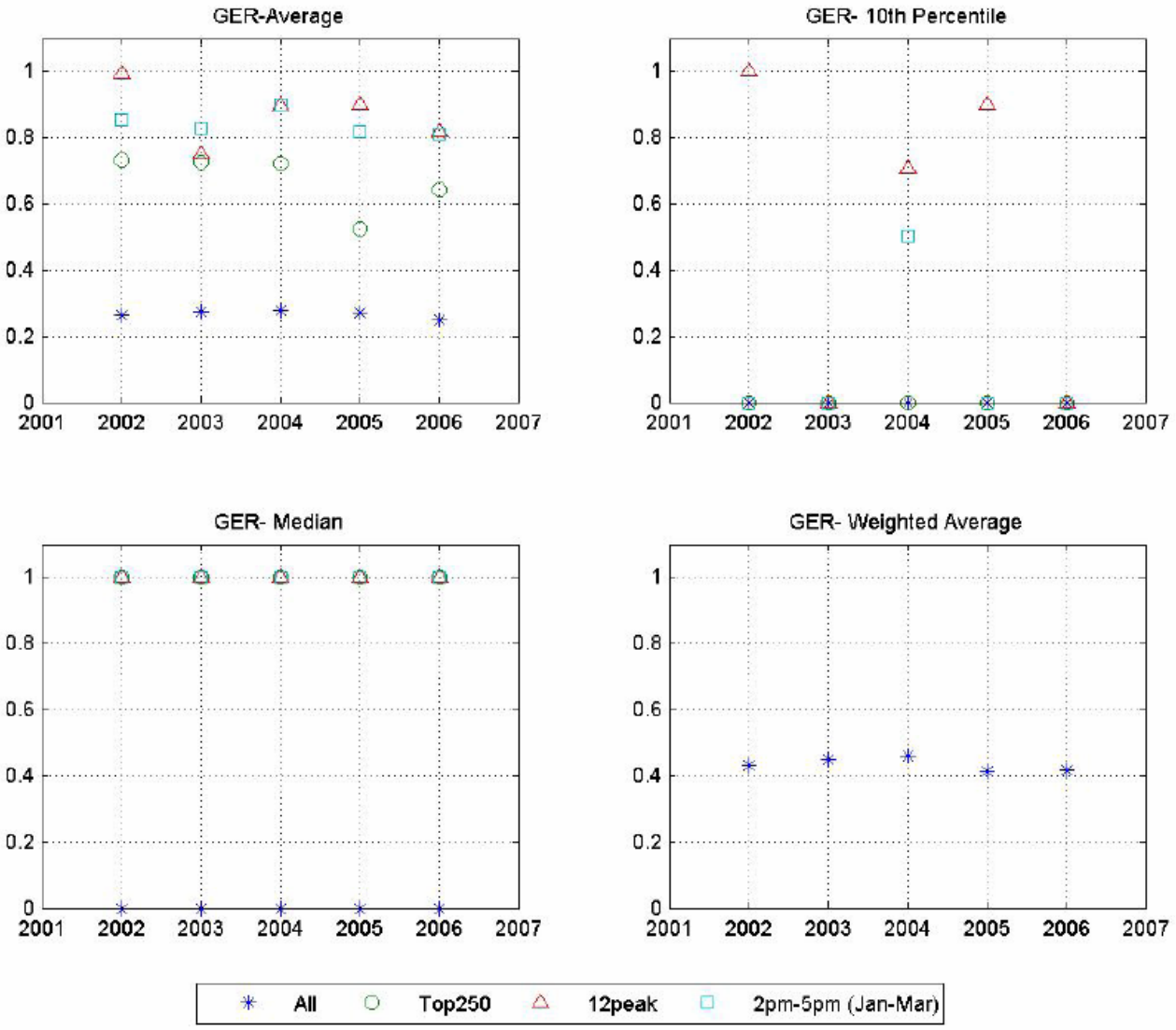

Figure 62: Comparison of results found when calculating Reserve Capacity based on all methodologies for GER solar thermal generation over single year time frames.

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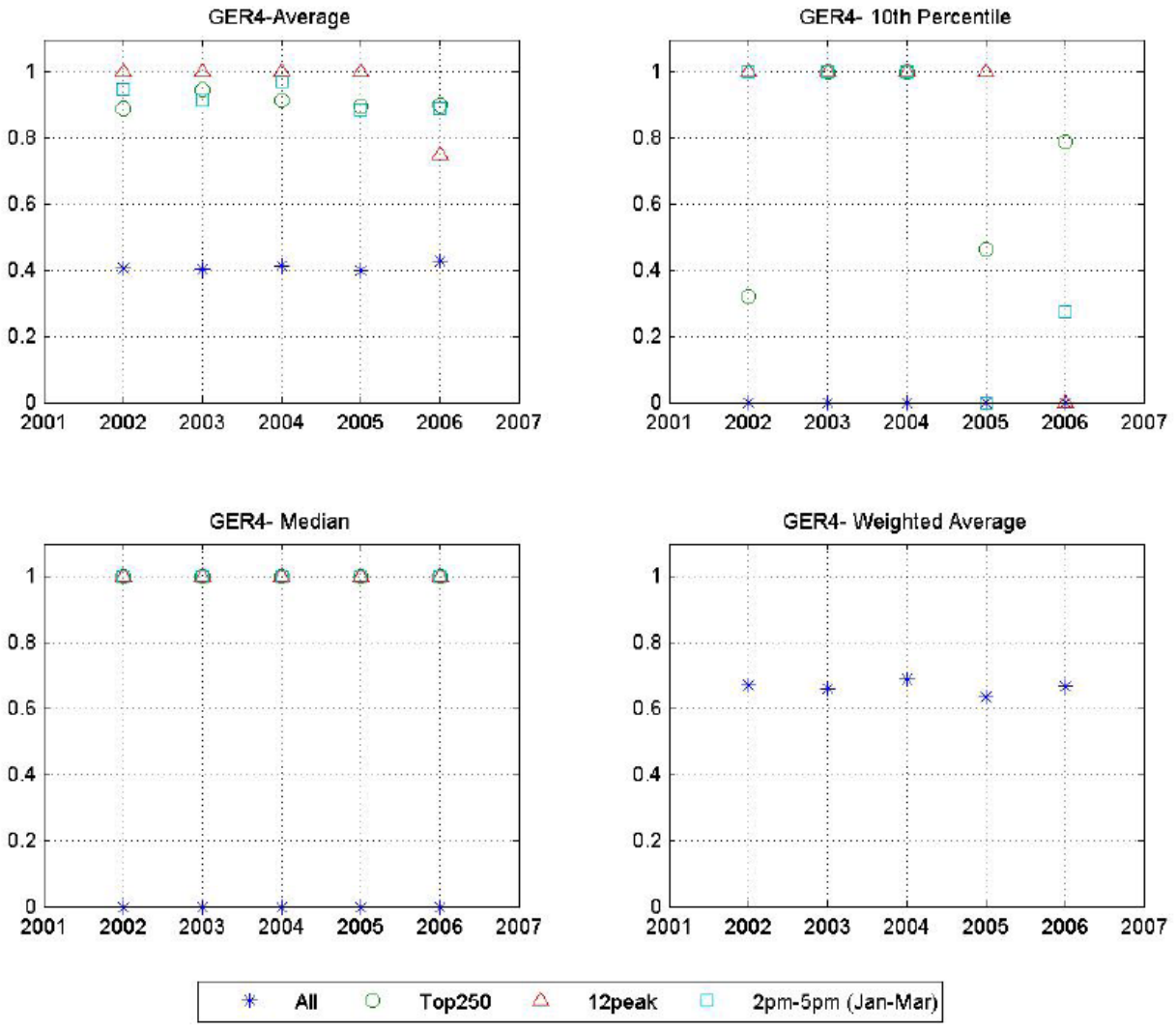

Figure 64: Comparison of results found when calculating Reserve Capacity based on all methodologies for GER solar thermal generation over single year time frames when considering thermal storage potential for four hours of generation without effective irradiance.

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- **Wind in the SWIS is highly variable but seasonal and diurnal patterns evident.**
  - ➔ **Site and turbine selection could influence expected generation at system peak times.**
  - ➔ **Output volatility is evident at very high risk times, but no obvious pattern.**
- **Small numbers of intervals introduces volatility.**
  - ➔ **Avoid spurious boom/bust cycles in market.**
- **Independent wind regimes improve overall reliability of wind generation.**

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SOLAR

- **Solar radiation is high correlated with SWIS load during high load summer days.**

  ➔ **Balance reliability in meeting high loads in the daytime with unavailability at other times.**

LFG

- **Landfill gas generation is stable.**

  ➔ **Unlikely to be greatly affected.**

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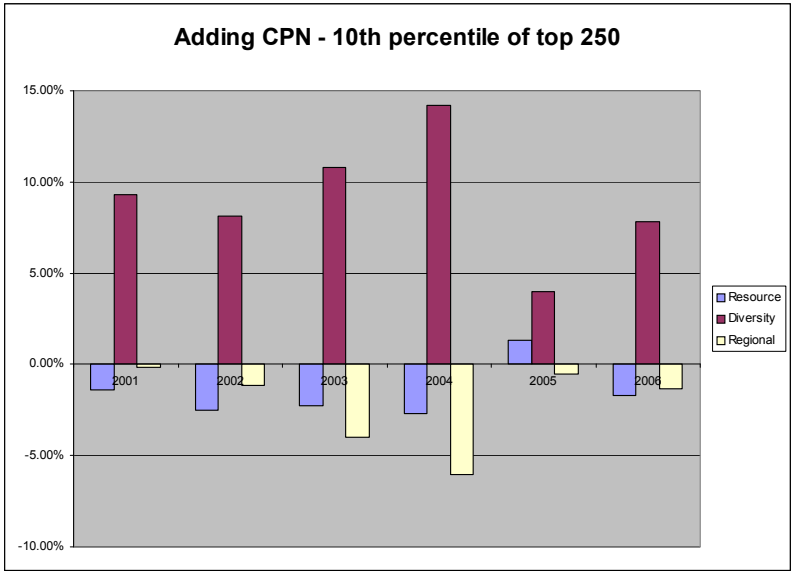
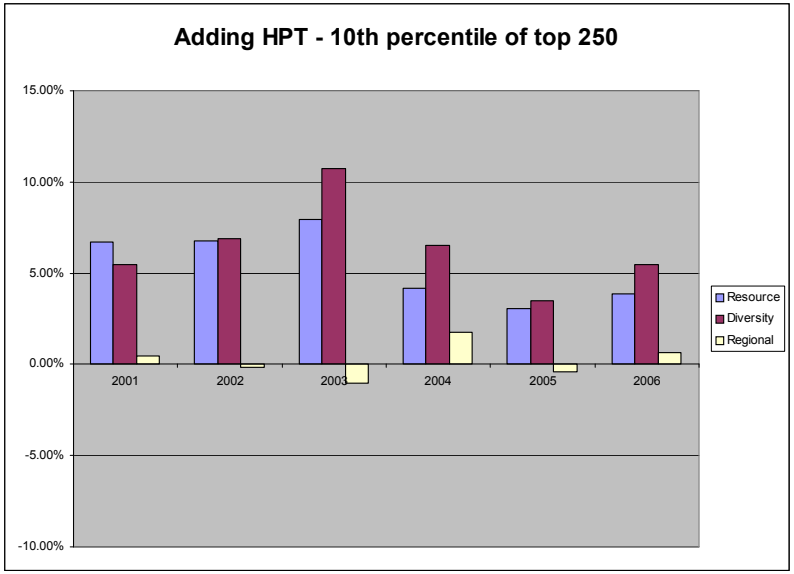
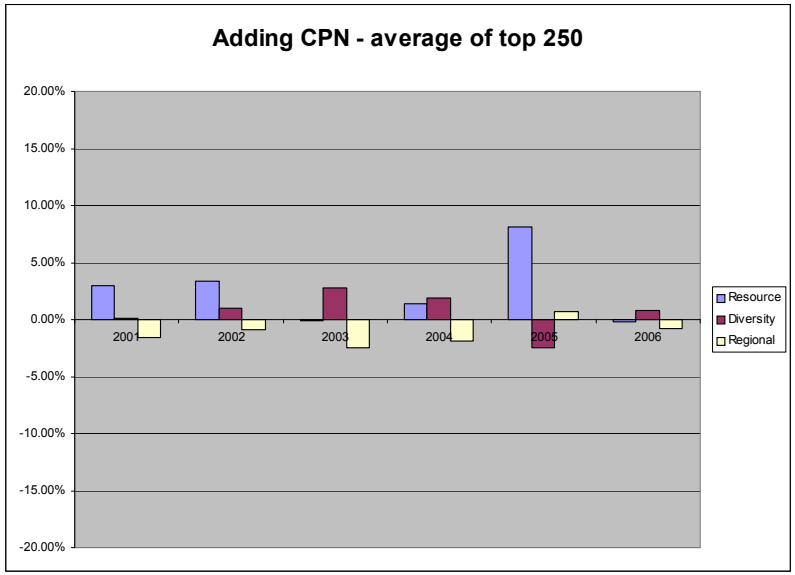
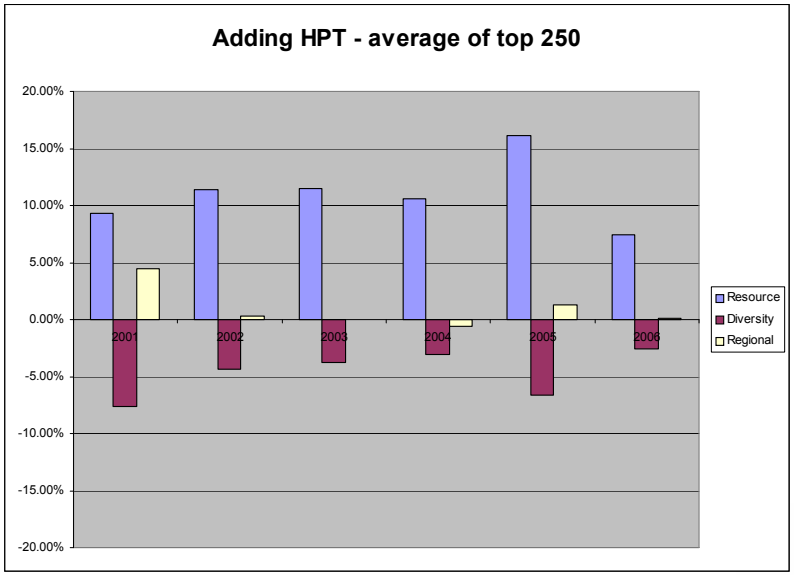
Summay Table for Reserve Capacity allocations based on single year time frames													
Site	Avail. data points	Current				PJM				Proposed			
		Min	Ave	Max	Std. Dev.	Min	Ave	Max	Std. Dev.	Min	Ave	Max	Std. Dev.
BRS	8	36.69%	40.02%	47.41%	3.57%	54.65%	59.43%	63.87%	2.89%	2.77%	7.73%	18.93%	4.93%
CDD	8	20.25%	22.08%	24.28%	1.46%	27.27%	32.92%	37.80%	3.97%	0.00%	1.12%	2.77%	1.06%
CPN	8	49.51%	51.58%	54.32%	1.85%	51.30%	58.78%	65.13%	4.89%	2.77%	5.61%	8.67%	1.63%
GIN	8	18.32%	19.38%	20.61%	0.86%	45.18%	49.18%	53.15%	2.70%	0.90%	3.51%	8.67%	2.48%
GRD	8	26.38%	27.86%	30.79%	1.82%	63.10%	68.52%	72.91%	4.02%	2.36%	8.43%	17.68%	4.21%
HPT	8	27.54%	30.16%	32.27%	1.46%	56.11%	62.00%	65.43%	3.39%	8.67%	19.75%	31.47%	7.36%

Summay Table for Reserve Capacity allocations based on three year time frames*													
Site	Avail. data points	Current				PJM				Proposed			
		Min	Ave	Max	Std. Dev.	Min	Ave	Max	Std. Dev.	Min	Ave	Max	Std. Dev.
BRS	6	37.70%	39.13%	42.03%	1.52%	57.39%	58.78%	60.48%	1.19%	5.26%	8.03%	10.78%	1.86%
CDD	6	21.39%	22.18%	23.51%	0.84%	28.66%	32.11%	34.78%	2.35%	0.00%	1.68%	2.77%	1.23%
CPN	6	50.60%	51.71%	52.33%	0.61%	56.33%	59.09%	61.48%	1.88%	3.79%	6.11%	8.67%	1.70%
GIN	6	18.45%	19.14%	19.80%	0.53%	46.97%	48.34%	50.01%	1.09%	2.77%	3.99%	5.26%	1.34%
GRD	6	26.53%	28.06%	29.77%	1.39%	67.10%	68.62%	69.63%	0.95%	7.90%	11.16%	17.68%	5.05%
HPT	6	29.11%	30.11%	30.87%	0.68%	59.69%	61.38%	63.15%	1.15%	18.93%	25.81%	31.47%	4.32%









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