



Investigation of Alternative Break Point for 0 - 293 MWh pa Range Modelling Impacts

DESC 11^h November 2008

Alternative breakpoints (0 to 293 MWh): Background

- Jan '08 DESC agreed to investigate two possible breakpoints for 0-293 MWh pa range – work to be completed Autumn 2008.
- Current breakpoint is 73.2 MWh p.a.
 - Band 01B: 0-73.2 MWh pa & Band 02B: 73.2-293 MWh pa
- Current modelling basis uses following data sets
 - Band 01B: validated domestic sample supply points only – by LDZ
 - Band 02B: all available validated sample supply points – by LDZ
- DESC agreed two alternative breakpoints: 30 MWh pa and 60 MWh pa
 - 0-30 & 0-60 MWh pa to use validated domestic sample supply points only
 - 30-293 & 60-293 MWh pa to use all available validated sample supply points
 - Using latest available datasets – 2007/08

Alternative breakpoints (0 to 293 MWh): Methodology

- Analysis undertaken compares the following:
 - Indicative Load Factors (ILF) – indication of spread of Load Factors
 - Higher spread between sub bands greater distinction of consumption characteristics
 - Root Mean Square Error (RMSE)
 - Difference between fitted model & data point spread (compare 'error')
- Justification of sub band modelling appropriateness requires:
 - Same or better spread of IL
 - No degradation identified by RMSE
- Analysis: Compare results from current models to alternative band models

Alternative breakpoints (0 to 293 MWh): Analysis 1 Results: 0-30 and 30-293 MWh pa

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 30 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-30 ILF	30-293 ILF	RMSE	
SC	41%	41%	6792074.3	40%	41%	7111037.0	-4.7%
NO	34%	29%	4903933.2	34%	30%	5046273.8	-2.9%
NW/WN	37%	33%	10920701.2	37%	33%	11168919.1	-2.3%
NE	37%	28%	6745061.3	36%	28%	7421995.4	-10.0%
EM	37%	32%	8708644.7	36%	32%	8657528.1	0.6%
WM	34%	30%	6517783.6	33%	30%	7262488.6	-11.4%
WS	35%	29%	4389734.9	34%	30%	4245646.1	3.3%
EA	34%	30%	6596031.1	33%	30%	6723442.4	-1.9%
NT	34%	34%	7803317.1	32%	35%	8359603.7	-7.1%
SE	32%	32%	9147047.5	32%	32%	9486853.4	-3.7%
SO	30%	31%	5973237.1	29%	30%	5835267.0	2.3%
SW	32%	32%	5198161.8	31%	32%	5699362.4	-9.6%
Overall			7350476.3			7506453.7	-2.1%

- Differences in ILFs very similar for 0-73.2 and 0-30 (3 same, 8 within 1 point, only NT is 2 points different)
- Difference in ILF even more similar for 73.2-293 and 30-293 (8 same, 4 within 1 point)
- RMSE shows degradation in model fit for 75% of LDZs

Alternative breakpoints (0 to 293 MWh): Analysis 2 Results: 0-60 and 60-293 MWh pa

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 60 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-60 ILF	60-293 ILF	RMSE	
SC	41%	41%	6792074.3	40%	41%	6977500.2	-2.7%
NO	34%	29%	4903933.2	34%	30%	5068008.6	-3.3%
NW/WN	37%	33%	10920701.2	37%	33%	10951230.7	-0.3%
NE	37%	28%	6745061.3	37%	27%	6825655.2	-1.2%
EM	37%	32%	8708644.7	37%	32%	8741197.3	-0.4%
WM	34%	30%	6517783.6	33%	30%	6738846.4	-3.4%
WS	35%	29%	4389734.9	35%	29%	4352562.1	0.8%
EA	34%	30%	6596031.1	33%	30%	6709649.2	-1.7%
NT	34%	34%	7803317.1	33%	34%	8036651.5	-3.0%
SE	32%	32%	9147047.5	33%	31%	9189844.3	-0.5%
SO	30%	31%	5973237.1	29%	31%	6041712.7	-1.1%
SW	32%	32%	5198161.8	32%	31%	5664788.5	-9.0%
Overall			7350476.3			7454889.0	-1.4%

- Differences in ILFs very similar for 0-73.2 and 0-60 (6 same, 6 within 1 point) – more closer than 0-30
- Difference in ILF even more similar for 73.2-293 and 60-293 (8 same, 4 within 1 point) – same as 30
- RMSE shows degradation in model fit for 11 of 12 LDZs

Alternative breakpoints (0 to 293 MWh):

Analysis 3 Results: 0-30 and 30-293 MWh pa (only non-domestic)

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 30 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-30 ILF	30-293 ILF	RMSE	
SC	41%	41%	6792074.3	40%	40%	7408901.1	-9.1%
NO	34%	29%	4903933.2	34%	29%	5205166.7	-6.1%
NW/WN	37%	33%	10920701.2	37%	33%	11536477.5	-5.6%
NE	37%	28%	6745061.3	36%	27%	7684106.8	-13.9%
EM	37%	32%	8708644.7	36%	31%	8928266.8	-2.5%
WM	34%	30%	6517783.6	33%	29%	7940510.6	-21.8%
WS	35%	29%	4389734.9	34%	28%	4383193.5	0.1%
EA	34%	30%	6596031.1	33%	30%	6908265.9	-4.7%
NT	34%	34%	7803317.1	32%	34%	8562394.7	-9.7%
SE	32%	32%	9147047.5	32%	31%	9752658.0	-6.6%
SO	30%	31%	5973237.1	29%	30%	5975403.3	0.0%
SW	32%	32%	5198161.8	31%	30%	5799479.9	-11.6%
Overall			7350476.3			7784386.9	-5.9%

- Difference in ILF even more similar for 73.2-293 and 30-293 (4 same, 7 within 1 point, only SW is 2 points different)
- RMSE shows degradation in model fit for 10 of 12 LDZs

Alternative breakpoints (0 to 293 MWh):

Analysis 4 Results: 0-60 and 60-293 MWh pa (only non-domestic)

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 60 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-60 ILF	60-293 ILF	RMSE	
SC	41%	41%	6792074.3	40%	40%	7063008.4	-4.0%
NO	34%	29%	4903933.2	34%	29%	5102971.6	-4.1%
NW/WN	37%	33%	10920701.2	37%	33%	11034175.4	-1.0%
NE	37%	28%	6745061.3	37%	26%	6887304.6	-2.1%
EM	37%	32%	8708644.7	37%	31%	8795140.7	-1.0%
WM	34%	30%	6517783.6	33%	29%	6950888.4	-6.6%
WS	35%	29%	4389734.9	35%	28%	4383689.4	0.1%
EA	34%	30%	6596031.1	33%	30%	6754261.5	-2.4%
NT	34%	34%	7803317.1	33%	34%	8084043.6	-3.6%
SE	32%	32%	9147047.5	33%	31%	9240036.6	-1.0%
SO	30%	31%	5973237.1	29%	30%	6075172.4	-1.7%
SW	32%	32%	5198161.8	32%	31%	5704534.9	-9.7%
Overall			7350476.3			7525221.4	-2.4%

- Difference in ILF even more similar for 73.2-293 and 60-293 (4 same, 7 within 1 point, only NE 2 points different)
- RMSE shows degradation in model fit for 11 of 12 LDZs

Alternative breakpoints (0 to 293 MWh): Conclusions

- No benefit in splitting 0-293 MWh pa range at 30 or 60 MWh pa compared with the current basis of 73.2 MWh pa
- No significant differences in ensuing ILFs
- No clear beneficial improvement in fit
- Modelling upper sub band (30-293 or 60-293 MWh pa) with non-domestic only supply points causes further degradation to fit.

Recap. on Conclusions from Autumn 2007 Analysis

- splitting the 0 - 73.2 MWh pa range

- Following adoption of NDM proposals for 2007/08 two options were further investigated and reported to DESC in Nov. 2007
 - Split at 20 MWh pa and Split at 30 MWh pa
- Outcome:
 - Clear degradation in fit across sub-bands
 - Lesser ILF discrimination across LDZs with sub-bands
- Evidence of this analysis was very clear
- No compelling statistical grounds for representing 0-73.2 MWh pa consumption range by applying two sub-bands
- Conclusion: Retain current practice of representing the 0-73.2 MWh pa consumption range as a single EUC in each LDZ.

Alternative breakpoints (0 to 293 MWh): Follow-on Analysis

- On examining the results it appears that the only possibility of a breakpoint for the 0-293 MWh pa range statistically better than the current (73.2 MWh pa) one must lie at a value greater than the current breakpoint.
- To test this hypothesis one further alternative breakpoint was assessed at 100 MWh pa:
 - 0-100 to use validated domestic sample supply points only
 - 100-293 MWh pa to use all available validated sample supply points
 - Variant 100-293 MWh pa to use only non-domestic sample supply points
 - All analyses by individual LDZ (if sample sizes permit)

Alternative breakpoints (0 to 293 MWh): Analysis 5 Results: 0-100 and 100-293 MWh pa

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 100 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-100 ILF	100-293 ILF	RMSE	
SC	41%	41%	6792074.3	41%	40%	6530094	3.9%
NO	34%	29%	4903933.2	34%	29%	4734492	3.5%
NW/WN	37%	33%	10920701.2	37%	33%	11709417	-7.2%
NE	37%	28%	6745061.3	37%	27%	6627842	1.7%
EM	37%	32%	8708644.7	37%	32%	8537723	2.0%
WM	34%	30%	6517783.6	34%	30%	6391665	1.9%
WS	35%	29%	4389734.9	35%	30%	4488867	-2.3%
EA	34%	30%	6596031.1	34%	30%	6585156	0.2%
NT	34%	34%	7803317.1	34%	34%	7833540	-0.4%
SE	32%	32%	9147047.5	33%	31%	8972960	1.9%
SO	30%	31%	5973237.1	30%	31%	5502977	7.9%
SW	32%	32%	5198161.8	33%	32%	4961744	4.5%
Overall			7350476.3			7214999	1.8%

- Differences in ILFs very similar for 0-73.2 and 0-100 (10 same, 2 within 1 point)
- Difference in ILF less similar for 73.2-293 and 100-293 (8 same, 4 within 1 point)
- RMSE shows improvement in model fit for 75% of LDZs

Alternative breakpoints (0 to 293 MWh):

Analysis 6 Results: 0-100 & 100-293 MWh pa (only non-domestic)

	Current Basis – 0 to 293 MWh pa			Alternative Breakpoint at 100 MWh pa			RMSE: Improvement (+) or Degradation (-)
	0-73.2 ILF	73.2-293 ILF	RMSE	0-100 ILF	100-293 ILF	RMSE	
SC	41%	41%	6792074.3	41%	40%	6558766	3.4%
NO	34%	29%	4903933.2	34%	29%	4741355	3.3%
NW/WN	37%	33%	10920701.2	37%	33%	11744139	-7.5%
NE	37%	28%	6745061.3	37%	27%	6653386	1.4%
EM	37%	32%	8708644.7	37%	32%	8564918	1.7%
WM	34%	30%	6517783.6	34%	29%	6503452	0.2%
WS	35%	29%	4389734.9	35%	29%	4503747	-2.6%
EA	34%	30%	6596031.1	34%	30%	6597760	-0.03%
NT	34%	34%	7803317.1	34%	34%	7847816	-0.6%
SE	32%	32%	9147047.5	33%	31%	8994438	1.7%
SO	30%	31%	5973237.1	30%	31%	5514863	7.7%
SW	32%	32%	5198161.8	33%	31%	4975723	4.3%
Overall			7350476.3			7241767	1.5%

- Difference in ILF similar for 73.2-293 and 100-293 (7 same, 5 within 1 point)
- RMSE shows improvement in model fit for 66% of LDZs

Alternative breakpoints (0 to 293 MWh): Follow-on Analysis Conclusions

- No compelling statistical grounds for inserting a breakpoint below 73.2 MWh
- Follow on analysis suggests better breakpoint greater than 73.2 MWh
- Clear improvement in RMSE using 100 MWh pa, less so with ILFs.
- Only one year of data (three years go into model smoothing)
- Some LDZs worse which complicates universal adoption
- Reassessing the 100 MWh pa breakpoint in successive future years may be worthwhile
- Impacts of higher breakpoint to RbD / Reconciliation would need to be considered
- Recommend: Retain current approach of breakpoint at 73.2 for 0 – 293 MWh pa band, review possible higher breakpoint in future workplans