

## Action: NTS508 - Changes to the Merit Order within the Transportation Model



NTS Charging Methodology Forum (NTSCMF)  
15<sup>th</sup> September 2014

# Agenda

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- Introduction to the analysis undertaken
- Review of Merit Order analysis in Waters Wye/GSOG paper
- NGGT Analysis
- Summary

# National Grid's review of Waters Wye/GSOG Paper

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- In reviewing the GSOG / Waters Wye paper on Storage charging, National Grid is only looking at merit order
- Current merit order was established as part of GCM16 and implemented in 2009
- It was reflective of the supply utilisation at the time and established through industry consultation
- Merit order has not been reviewed to reflect the changes in the supply utilisation in recent years.
- Merit order in UNC, used in supply matching in the Transportation Model, should reflect up to date supply utilisation patterns

## Highest Demand Day Analysis

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- Analysis of the previous years highest demand day data based on percentage of supplies used on the particular highest demand day in each year:

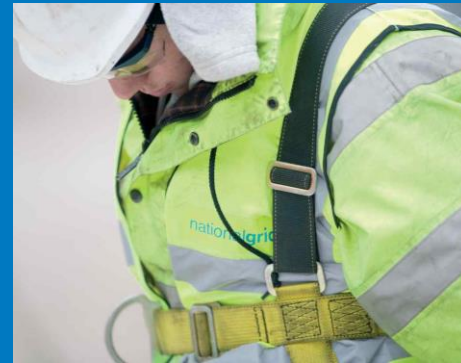
Year	LNG	MRS
2010/2011	17.36%	3.77%
2011/2012	18.70%	12.12%
2012/2013	7.70%	16.79%
2013/2014	2.47%	13.24%

## Amending the Merit Order

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- In reviewing the analysis and the trends in the supply matching the key question we are looking to address is whether MRS should be ahead of LNG in the Merit Order
  - Decreasing amount of LNG utilised over the recent years
  - Percentage of MRS utilised has increased
  - Proportion of LNG and MRS utilised in all years

## Analysis to review the Waters Wye/GSOG Analysis



## Current Merit Order

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- Beach Terminals
- Pipeline Interconnectors
- Long Range Storage Facilities
- LNG Importation Facilities
- Mid Range Storage Facilities
- Short Range Storage Facilities

## Waters Wye/GSOG Analysis

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- Waters Wye/GSOG paper proposed 2 scenarios to amend the merit order:
  - Scenario 1 – Amended Base Case – Proportion of supply stays on LNG based on Cold Day Forecast in Winter Outlook Report, remaining supply is on MRS
  - Scenario 2 – High Storage Case – All LNG supply moves to MRS



# National Grid Analysis

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- National Grid have worked through these scenarios based on:
  - QSEC 2014 Transportation Model
  - Winter Outlook Report 2013/14
  - Minimum price still applicable
- We will talk through the analysis and results
  - Detailed tables are attached in the appendix

## Scenario 1 – Amended Base Case

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- Original value against LNG was 1334.68GWh
- Values in amended base case scenario within the merit order set at:
  - LNG – 551.5GWh
  - MRS – 783.2GWh
- Pro-rated on each supply point based on the physical capability
- ASEPs are capped at obligated levels

## NGG Findings – Amended Base Case

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- Greatest increase in Exit Prices in WA2
- Decrease greatest in Exit Prices in NE1, NE2 and NO2
- Greatest increase in Entry Prices at Barrow and Fleetwood
- Decrease in Entry Prices at Cheshire and Bacton

## Scenario 2 – High Storage Case

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- Original value against LNG was 1334.68GWh
- High Base Case scenario within the merit order set at:
  - MRS ahead of LNG in merit order
- Proportion on each supply point based on the physical capability
- ASEPs are capped at obligated levels
- 86% of MRS used and zero LNG needed

## NGG Findings – High Storage Case

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- Greatest increase in Exit Prices in WA2
- Decrease greatest in Exit Prices in NE1 and NO2
- Greatest Increase in Entry Prices at Barrow and Partington
- Greatest decrease in Entry Prices at Dynevor Arms and Hatfield Moor

# National Grid vs Waters Wye/GSOG nationalgrid Analysis

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- When comparing the results we have some differences but these can all be explained:
  - 2013 TYS figures slightly different as National Grid used the internal figures provided in GWh and Waters Wye used the mcm figures and converted to GWh
    - This has an impact on the prorated values against both LNG and MRS
    - Even small changes to the supply data within the Transportation Model has the potential to change the direction of the flow of gas and this is likely to noticeably impact prices
  - National Grid have included Moffat in Transportation Model and all analysis produced

## Other Years Scenarios



## Other Years Scenarios

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- National Grid have also looked at the changes based on the same scenarios but for a different year
  - Scenario 1 – Amended Base Case – Proportion of supply stays on LNG based on Cold Day Forecast in Winter Outlook Report remaining supply is on MRS
  - Scenario 2 – High Storage Case – All supply on LNG moves to MRS
- Completed the analysis for 2013 using:
  - QSEC 2013 Transportation Model
  - Winter Outlook Report 2012/13 for the Cold Day LNG data
  - Minimum price still applicable



## Scenario 1 – Amended Base Case

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- Original value against LNG was 1519.70GWh
- Values in amended base case scenario within the merit order set at:
  - LNG – 881.6GWh
  - MRS – 638.1GWh
- Proportion on each supply point based on the physical capability
- ASEPs are capped at obligated levels

## Amended Base Case - Results

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- Greatest increase in Exit Prices in WA2
- Decrease greatest in Exit Prices in NE2, NO1 and EM2
- Greatest increase in Entry Prices at Barrow, Isle of Grain and Fleetwood
- Decrease in Entry Prices at Dynevor Arms and Garton

## Scenario 2 – High Base Case

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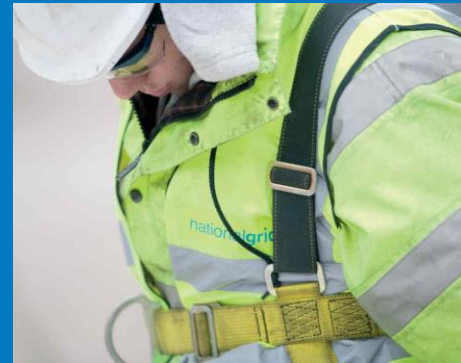
- Original value against LNG was 1519.70GWh
- High Base Case scenario within the merit order set at:
  - MRS ahead of LNG in merit order
- Proportion on each supply point based on the physical capability
- ASEPs are capped at obligated levels
- 100% MRS used and 7% LNG used

## High Storage Case - Results

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- Increase greatest in Exit Prices in WA2
- Greatest decrease in Exit Prices in NE2, NO1 and NO2
- Greatest increase in Entry Prices at Barrow, Isle of Grain and Fleetwood
- Decrease in Entry Prices at Dynevor Arms and Garton

## Options and Summary



## Options for Merit Order

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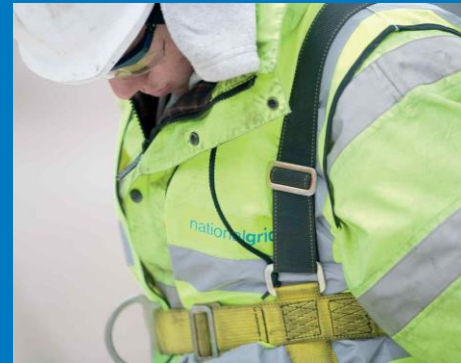
1. To leave merit order as is today with LNG utilised ahead of MRS in supply matching
2. To amend merit order to promote MRS ahead of LNG
3. LNG and MRS grouped together in merit order
4. Use the amount specified against LNG within Winter Outlook Report first then utilise MRS and then remaining amount to LNG
  - Links to the Winter Outlook Report
  - Any other options that should be considered?

## Summary

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- National Grid analysis shows:
  - More MRS supply is utilised in recent years
  - Both MRS and LNG utilised on any cold day over past 4 years
- National Grid propose that the merit order within the Transportation Model should be kept under review

## Appendix 1 – QSEC 2014 Analysis Results





# Amended Base Case Results - Entry

Entry Point	Original TM	Amended Base Case	Difference	Percentage
AVONMOUTH_LNG	0.0001	0.0001	0	0%
BACTON_TERMINAL	0.0096	0.0094	-0.0002	-2%
BARROW_TERMINAL	0.0001	0.0085	0.0084	8400%
BURTON_POINT_TERMINAL	0.0001	0.0001	0	0%
CAYTHORPE_(MRS)	0.0125	0.0135	0.001	8%
CHESHIRE_(MRS)	0.0001	0.0001	0	0%
DYNEVOR_ARMS_LNG	0.0071	0.0001	-0.007	-99%
EASINGTON&ROUGH_TERMINAL	0.013	0.0132	0.0002	2%
FLEETWOOD_(MRS)	0.002	0.007	0.005	250%
GARTON_(MRS)	0.0129	0.0129	0	0%
GLENMAVIS_LNG	0.0128	0.0175	0.0047	37%
HATFIELD_MOOR_(MRS)	0.005	0.0046	-0.0004	-8%
HOLEHOUSE_FARM_(MRS)	0.0001	0.0001	0	0%
HORNSEA_(MRS)	0.0118	0.0128	0.001	8%
BARTON_STACEY_(MRS)	0.0001	0.0001	0	0%
ISLE_OF_GRAIN_TERMINAL	0.0013	0.0046	0.0033	254%
MILFORD_HAVEN_TERMINAL	0.0205	0.0242	0.0037	18%
PARTINGTON_LNG	0.0001	0.0001	0	0%
ST_FERGUS_TERMINAL	0.043	0.0484	0.0054	13%
TEESSIDE_TERMINAL	0.009	0.0122	0.0032	36%
THEDDLETHORPE_TERMINAL	0.0123	0.0136	0.0013	11%
WYTCH_FARM_TERMINAL	0.0001	0.0001	0	0%
MOFFAT	0.0067	0.0099	0.0032	48%
CANONBIE_TERMINAL	0.0034	0.0066	0.0032	94%

# Amended Base Case Results – Exit

DN Exit Zone	DN Exit Price (p/kWh/day)	Amended Base Case	Difference	Percentage
EA1	0.0038	0.0034	-0.0004	-10.53%
EA2	0.0038	0.0033	-0.0005	-13.16%
EA3	0.0001	0.0001	0.0000	0.00%
EA4	0.0102	0.0097	-0.0005	-4.90%
EM1	0.0001	0.0001	0.0000	0.00%
EM2	0.0022	0.0017	-0.0005	-22.73%
EM3	0.0147	0.0142	-0.0005	-3.40%
EM4	0.0093	0.0089	-0.0004	-4.30%
NE1	0.0037	0.0007	-0.0030	-81.08%
NE2	0.0004	0.0001	-0.0003	-75.00%
NE3	0.0001	0.0001	0.0000	0.00%
NO1	0.0001	0.0001	0.0000	0.00%
NO2	0.0043	0.0005	-0.0038	-88.37%
NT1	0.0209	0.0204	-0.0005	-2.39%
NT2	0.0112	0.0108	-0.0004	-3.57%
NT3	0.0106	0.0102	-0.0004	-3.77%
NW1	0.0168	0.0129	-0.0039	-23.21%
NW2	0.0223	0.0178	-0.0045	-20.18%
SC1	0.0001	0.0001	0.0000	0.00%
SC2	0.0001	0.0001	0.0000	0.00%
SC4	0.0001	0.0001	0.0000	0.00%
SE1	0.0121	0.0138	0.0017	14.05%
SE2	0.0209	0.0204	-0.0005	-2.39%
SO1	0.0146	0.0142	-0.0004	-2.74%
SO2	0.0239	0.0240	0.0001	0.42%
SW1	0.0125	0.0183	0.0058	46.40%
SW2	0.0216	0.0248	0.0032	14.81%
SW3	0.0346	0.0378	0.0032	9.25%
WA1	0.0245	0.0204	-0.0041	-16.73%
WA2	0.0041	0.0235	0.0194	473.17%
WM1	0.0194	0.0184	-0.0010	-5.15%
WM2	0.0156	0.0152	-0.0004	-2.56%
WM3	0.0130	0.0143	0.0013	10.00%

# High Storage Case Results - Entry

Entry Point	Original TM	High Storage Case	Difference	Percentage
AVONMOUTH_LNG	0.0001	0.0001	0	0%
BACTON_TERMINAL	0.0096	0.0065	-0.0031	-32%
BARROW_TERMINAL	0.0001	0.0072	0.0071	7100%
BURTON_POINT_TERMINAL	0.0001	0.0001	0	0%
CAYTHORPE_(MRS)	0.0125	0.0131	0.0006	5%
CHESHIRE_(MRS)	0.0001	0.0001	0	0%
DYNEVOR_ARMS_LNG	0.0071	0.0001	-0.007	-99%
EASINGTON&ROUGH_TERMINAL	0.013	0.0116	-0.0014	-11%
FLEETWOOD_(MRS)	0.002	0.01	0.008	400%
GARTON_(MRS)	0.0129	0.0104	-0.0025	-19%
GLENMAVIS_LNG	0.0128	0.0205	0.0077	60%
HATFIELD_MOOR_(MRS)	0.005	0.0029	-0.0021	-42%
HOLEHOUSE_FARM_(MRS)	0.0001	0.0001	0	0%
HORNSEA_(MRS)	0.0118	0.0123	0.0005	4%
BARTON_STACEY_(MRS)	0.0001	0.0001	0	0%
ISLE_OF_GRAIN_TERMINAL	0.0013	0.0056	0.0043	331%
MILFORD_HAVEN_TERMINAL	0.0205	0.0241	0.0036	18%
PARTINGTON_LNG	0.0001	0.0032	0.0031	3100%
ST_FERGUS_TERMINAL	0.043	0.0513	0.0083	19%
TEESSIDE_TERMINAL	0.009	0.0162	0.0072	80%
THEDDLETHORPE_TERMINAL	0.0123	0.0123	0	0%
WYTCH_FARM_TERMINAL	0.0001	0.0001	0	0%
MOFFAT	0.0067	0.014	0.0073	109%
CANONBIE_TERMINAL	0.0034	0.0107	0.0073	215%

# High Storage Case Results - Exit

DN Exit Zone	DN Exit Price (p/kWh/day)	High Storage Case	Difference	Percentage
EA1	0.0038	0.0050	0.0012	31.58%
EA2	0.0038	0.0052	0.0014	36.84%
EA3	0.0001	0.0001	0.0000	0.00%
EA4	0.0102	0.0116	0.0014	13.73%
EM1	0.0001	0.0001	0.0000	0.00%
EM2	0.0022	0.0026	0.0004	18.18%
EM3	0.0147	0.0146	-0.0001	-0.68%
EM4	0.0093	0.0100	0.0007	7.53%
NE1	0.0037	0.0001	-0.0036	-97.30%
NE2	0.0004	0.0001	-0.0003	-75.00%
NE3	0.0001	0.0001	0.0000	0.00%
NO1	0.0001	0.0001	0.0000	0.00%
NO2	0.0043	0.0001	-0.0042	-97.67%
NT1	0.0209	0.0223	0.0014	6.70%
NT2	0.0112	0.0126	0.0014	12.50%
NT3	0.0106	0.0120	0.0014	13.21%
NW1	0.0168	0.0077	-0.0091	-54.17%
NW2	0.0223	0.0114	-0.0109	-48.88%
SC1	0.0001	0.0001	0.0000	0.00%
SC2	0.0001	0.0001	0.0000	0.00%
SC4	0.0001	0.0001	0.0000	0.00%
SE1	0.0121	0.0157	0.0036	29.75%
SE2	0.0209	0.0223	0.0014	6.70%
SO1	0.0146	0.0161	0.0015	10.27%
SO2	0.0239	0.0258	0.0019	7.95%
SW1	0.0125	0.0193	0.0068	54.40%
SW2	0.0216	0.0259	0.0043	19.91%
SW3	0.0346	0.0388	0.0042	12.14%
WA1	0.0245	0.0140	-0.0105	-42.86%
WA2	0.0041	0.0278	0.0237	578.05%
WM1	0.0194	0.0126	-0.0068	-35.05%
WM2	0.0156	0.0162	0.0006	3.85%
WM3	0.0130	0.0153	0.0023	17.69%

## Appendix 2 – QSEC 2013 Analysis Results



# Amended Base Case Results – Entry

Entry Point	Original TM	Amended Base Case	Difference	Percentage
AVONMOUTH_LNG	0.0001	0.0001	0.0000	0.00%
BACTON_TERMINAL	0.0080	0.0095	0.0015	18.75%
BARROW_TERMINAL	0.0001	0.0064	0.0063	6300.00%
BURTON_POINT_TERMINAL	0.0001	0.0001	0.0000	0.00%
CAYTHORPE_(MRS)	0.0105	0.0124	0.0019	18.10%
CHESHIRE_(MRS)	0.0001	0.0001	0.0000	0.00%
DYNEVOR_ARMS_LNG	0.0076	0.0001	-0.0075	-98.68%
EASINGTON&ROUGH_TERMINAL	0.0107	0.0122	0.0015	14.02%
FLEETWOOD_(MRS)	0.0005	0.0038	0.0033	660.00%
GARTON_(MRS)	0.0125	0.0121	-0.0004	-3.20%
GLENMAVIS_LNG	0.0108	0.0124	0.0016	14.81%
HATFIELD_MOOR_(MRS)	0.0031	0.0046	0.0015	48.39%
HOLEHOUSE_FARM_(MRS)	0.0001	0.0001	0.0000	0.00%
HORNSEA_(MRS)	0.0112	0.0118	0.0006	5.36%
BARTON_STACEY_(MRS)	0.0001	0.0001	0.0000	0.00%
ISLE_OF_GRAIN_TERMINAL	0.0002	0.0029	0.0027	1350.00%
MILFORD_HAVEN_TERMINAL	0.0198	0.0222	0.0024	12.12%
PARTINGTON_LNG	0.0001	0.0001	0.0000	0.00%
ST_FERGUS_TERMINAL	0.0423	0.0462	0.0039	9.22%
TEESSIDE_TERMINAL	0.0086	0.0093	0.0007	8.14%
THEDDLETHORPE_TERMINAL	0.0114	0.0134	0.0020	17.54%
WYTCH_FARM_TERMINAL	0.0001	0.0001	0.0000	0.00%
MOFFAT	0.0052	0.0068	0.0016	30.77%
CANONBIE_TERMINAL	0.0020	0.0035	0.0015	75.00%

# Amended Base Case Results – Exit

DN Exit Zone	Original TM	Amended Base Case	Difference	Percentage
EA1	0.0050	0.0036	-0.0014	-28.00%
EA2	0.0051	0.0036	-0.0015	-29.41%
EA3	0.0002	0.0001	-0.0001	-50.00%
EA4	0.0114	0.0098	-0.0016	-14.04%
EM1	0.0001	0.0001	0.0000	0.00%
EM2	0.0036	0.0021	-0.0015	-41.67%
EM3	0.0158	0.0142	-0.0016	-10.13%
EM4	0.0106	0.0091	-0.0015	-14.15%
NE1	0.0051	0.0035	-0.0016	-31.37%
NE2	0.0004	0.0001	-0.0003	-75.00%
NO1	0.0003	0.0001	-0.0002	-66.67%
NO2	0.0057	0.0042	-0.0015	-26.32%
NT1	0.0217	0.0202	-0.0015	-6.91%
NT2	0.0118	0.0108	-0.0010	-8.47%
NT3	0.0118	0.0102	-0.0016	-13.56%
NW1	0.0178	0.0163	-0.0015	-8.43%
NW2	0.0232	0.0211	-0.0021	-9.05%
SC1	0.0001	0.0001	0.0000	0.00%
SC2	0.0001	0.0001	0.0000	0.00%
SC4	0.0001	0.0001	0.0000	0.00%
SE1	0.0107	0.0138	0.0031	28.97%
SE2	0.0217	0.0202	-0.0015	-6.91%
SO1	0.0157	0.0142	-0.0015	-9.55%
SO2	0.0236	0.0236	0.0000	0.00%
SW1	0.0068	0.0155	0.0087	127.94%
SW2	0.0157	0.0245	0.0088	56.05%
SW3	0.0283	0.0371	0.0088	31.10%
WA1	0.0253	0.0236	-0.0017	-6.72%
WA2	0.0002	0.0075	0.0073	3650.00%
WM1	0.0203	0.0187	-0.0016	-7.88%
WM2	0.0166	0.0151	-0.0015	-9.04%
WM3	0.0107	0.0132	0.0025	23.36%

# High Storage Case Results – Entry

Entry Point	Original TM	High Storage Case	Difference	Percentage
AVONMOUTH_LNG	0.0001	0.0001	0.0000	0.00%
BACTON_TERMINAL	0.0080	0.0071	-0.0009	-11.25%
BARROW_TERMINAL	0.0001	0.0083	0.0082	8200.00%
BURTON_POINT_TERMINAL	0.0001	0.0001	0.0000	0.00%
CAYTHORPE_(MRS)	0.0105	0.0133	0.0028	26.67%
CHESHIRE_(MRS)	0.0001	0.0001	0.0000	0.00%
DYNEVOR_ARMS_LNG	0.0076	0.0001	-0.0075	-98.68%
EASINGTON&ROUGH_TERMINAL	0.0107	0.0118	0.0011	10.28%
FLEETWOOD_(MRS)	0.0005	0.0075	0.0070	1400.00%
GARTON_(MRS)	0.0125	0.0100	-0.0025	-20.00%
GLENMAVIS_LNG	0.0108	0.0201	0.0093	86.11%
HATFIELD_MOOR_(MRS)	0.0031	0.0034	0.0003	9.68%
HOLEHOUSE_FARM_(MRS)	0.0001	0.0001	0.0000	0.00%
HORNSEA_(MRS)	0.0112	0.0112	0.0000	0.00%
BARTON_STACEY_(MRS)	0.0001	0.0001	0.0000	0.00%
ISLE_OF_GRAIN_TERMINAL	0.0002	0.0054	0.0052	2600.00%
MILFORD_HAVEN_TERMINAL	0.0198	0.0231	0.0033	16.67%
PARTINGTON_LNG	0.0001	0.0001	0.0000	0.00%
ST_FERGUS_TERMINAL	0.0423	0.0501	0.0078	18.44%
TEESSIDE_TERMINAL	0.0086	0.0154	0.0068	79.07%
THEDDLETHORPE_TERMINAL	0.0114	0.0126	0.0012	10.53%
WYTCH_FARM_TERMINAL	0.0001	0.0001	0.0000	0.00%
MOFFAT	0.0052	0.0124	0.0072	138.46%
CANONBIE_TERMINAL	0.0020	0.0092	0.0072	360.00%



# High Storage Case Results - Exit

DN Exit Zone	Original TM	High Storage Case	Difference	Percentage
EA1	0.0050	0.0050	0.0000	0.00%
EA2	0.0051	0.0052	0.0001	1.96%
EA3	0.0002	0.0002	0.0000	0.00%
EA4	0.0114	0.0114	0.0000	0.00%
EM1	0.0001	0.0001	0.0000	0.00%
EM2	0.0036	0.0029	-0.0007	-19.44%
EM3	0.0158	0.0143	-0.0015	-9.49%
EM4	0.0106	0.0099	-0.0007	-6.60%
NE1	0.0051	0.0028	-0.0023	-45.10%
NE2	0.0004	0.0001	-0.0003	-75.00%
NO1	0.0003	0.0001	-0.0002	-66.67%
NO2	0.0057	0.0002	-0.0055	-96.49%
NT1	0.0217	0.0218	0.0001	0.46%
NT2	0.0118	0.0124	0.0006	5.08%
NT3	0.0118	0.0118	0.0000	0.00%
NW1	0.0178	0.0096	-0.0082	-46.07%
NW2	0.0232	0.0112	-0.0120	-51.72%
SC1	0.0001	0.0001	0.0000	0.00%
SC2	0.0001	0.0001	0.0000	0.00%
SC4	0.0001	0.0001	0.0000	0.00%
SE1	0.0107	0.0154	0.0047	43.93%
SE2	0.0217	0.0218	0.0001	0.46%
SO1	0.0157	0.0158	0.0001	0.64%
SO2	0.0236	0.0252	0.0016	6.78%
SW1	0.0068	0.0189	0.0121	177.94%
SW2	0.0157	0.0253	0.0096	61.15%
SW3	0.0283	0.0379	0.0096	33.92%
WA1	0.0253	0.0138	-0.0115	-45.45%
WA2	0.0002	0.0272	0.0270	13500.00%
WM1	0.0203	0.0125	-0.0078	-38.42%
WM2	0.0166	0.0159	-0.0007	-4.22%
WM3	0.0107	0.0151	0.0044	41.12%