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Technical Work Group

Weather datasets analysis Spring 2014 modelling

15th January 2014

Action - DTW1101

- **Action DTW1101:**

- Xoserve to review old and new temperature/wind data and provide a view on the impact to CWV.
- This was requested following Xoserve recommendation to undertake current gas industry history for the 2014 Spring Modelling.

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Data Used in analysis

- **Data Comparison:**

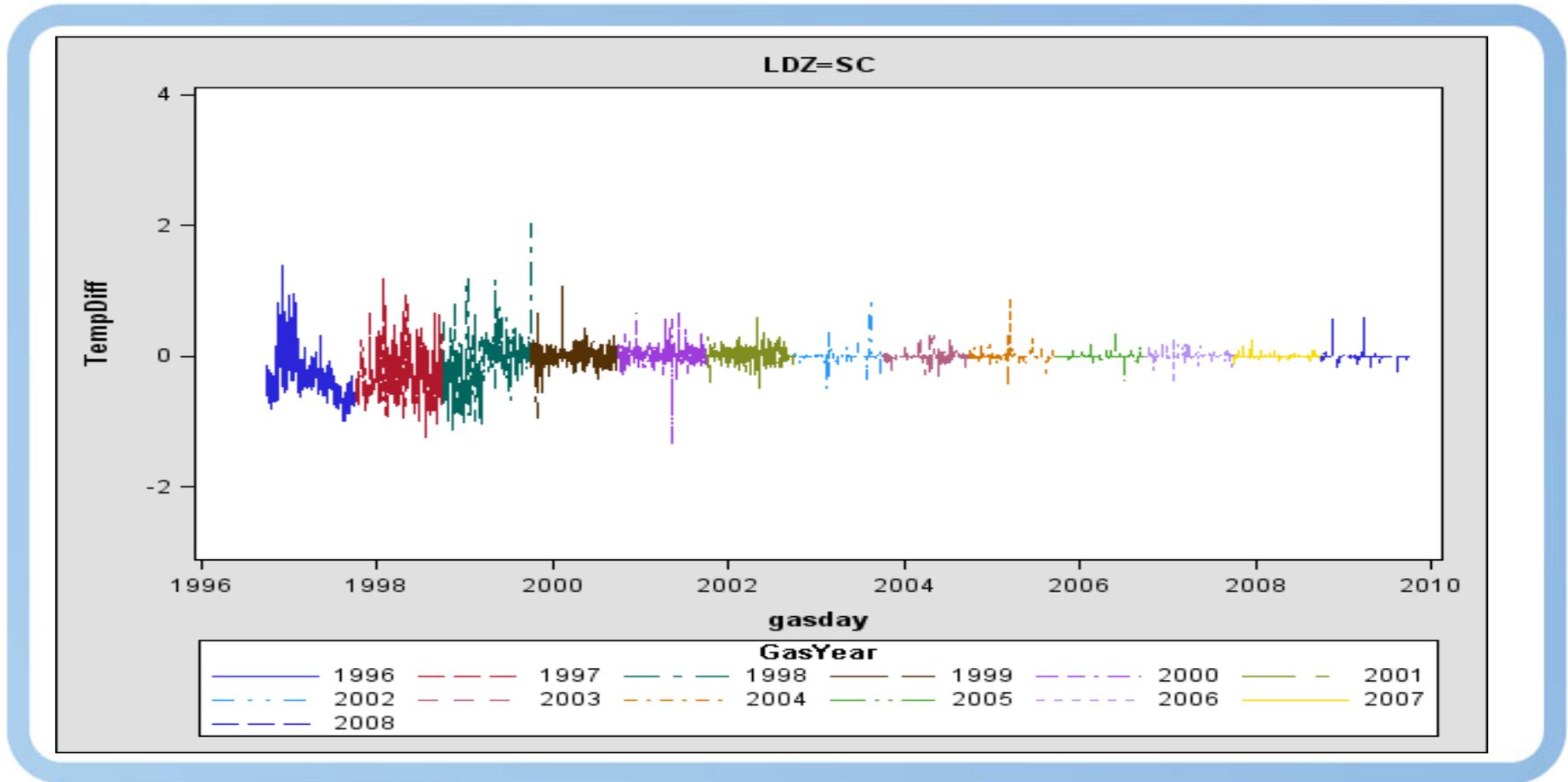
- Current Gas Industry dataset vs. outputs from WSSM (Phase 1 of Mod 330)
- Analysed the weather stations currently used by the gas industry
- Compared Daily Average temperatures
- Compared Daily Average wind speeds
 - Note: WSSM data has had to be converted to knots to allow comparison with gas industry daily average
- Known gaps in the earlier years of WSSM dataset
- Focused on the period 1st October 1996 to 30th September 2009
 - The WSSM dataset has no missing values (Method 10) for hourly data over this period.
 - This data range is the same as used to derive CWV parameters in the SN2010 review.

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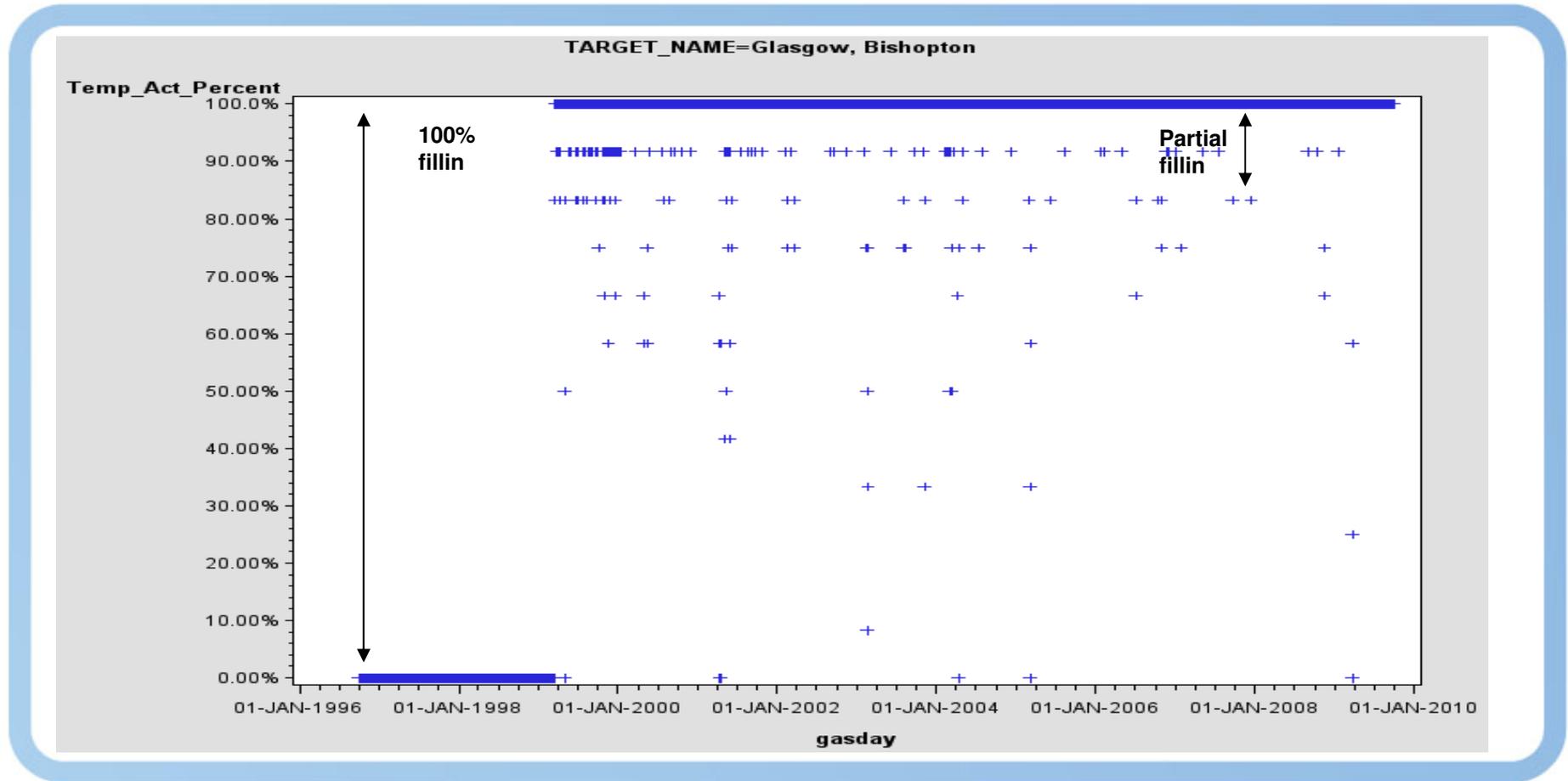
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SC Temperature differences Oct 1996 to Sep 2009



- Difference by gas day - noticeable differences at the beginning of the period

WSSM Temperature Observations Actual % Glasgow – LDZ SC



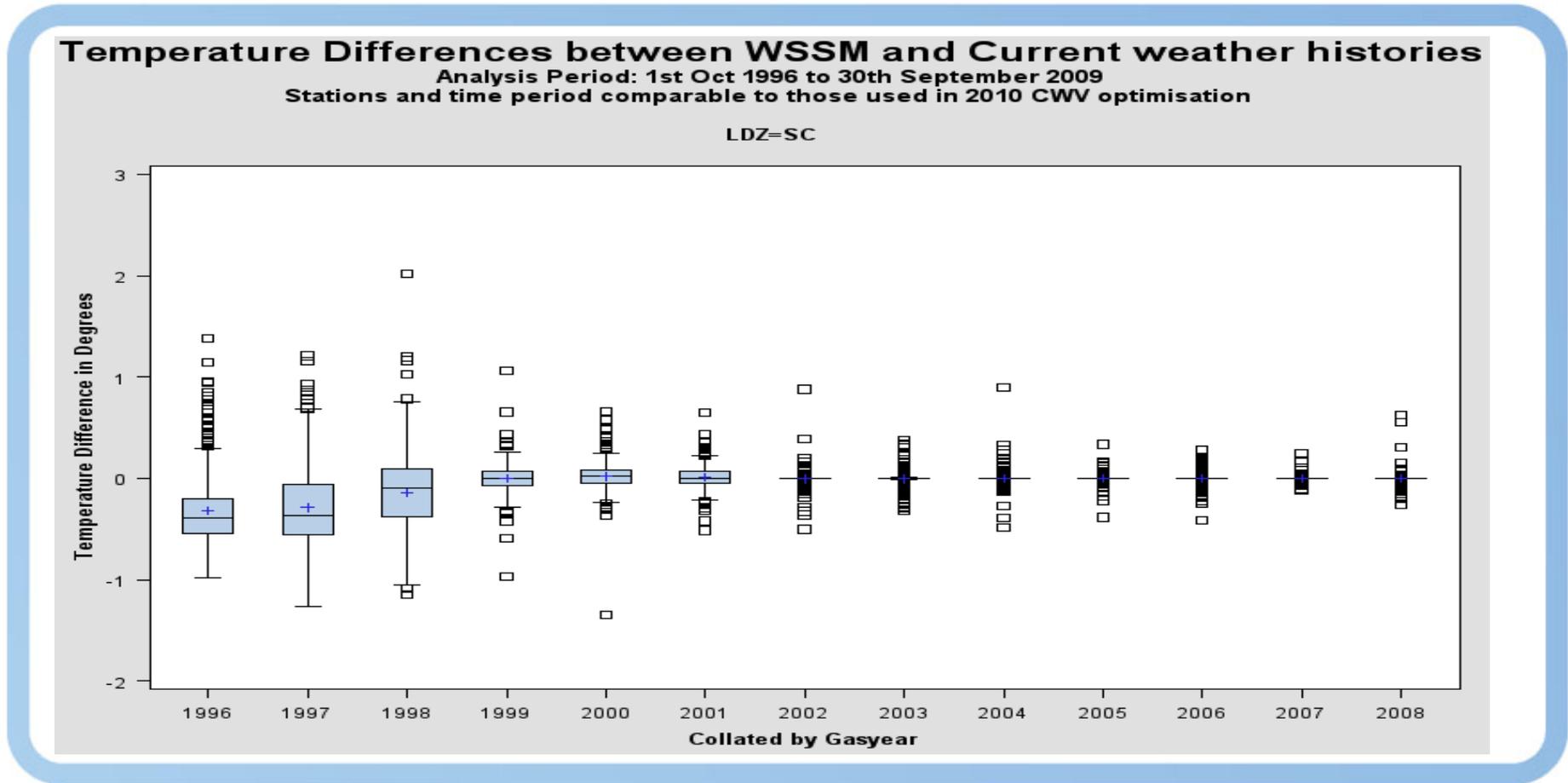
- WSSM temperature data from 1st October 1996 to 18th March 1999
100% filled in.
- Consistent time frame with period of noticeable differences between the
two datasets

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SC Box Plot of distribution of temperature differences



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SC Temperature differences

- For SC comparison of temperature differences most noticeable in periods where the WSSM datasets have been filled in.
- Amount of fill in data could introduce differences.

Substitute	Class	Priority	In fill comment. (Days when substitute was used for at least 1 observation)
Abbotsinch	2	1	Method 6: Oct 1996 to Mar 1999 (899 days)
East Kilbride No 2	2	4	Method 6 / 2: Apr 2000 to June 2005 (43 days)
Salsburgh	3	5	Method 6 / 2: May 1999 to Mar 2009 (26 days)
Drumalbin	4	6	Method 6 / 2 May 1999 + Nov 1999 (6days)
Edinburgh, Gogarbank	4	11	Method 6: 1 observation 4 th May 1999

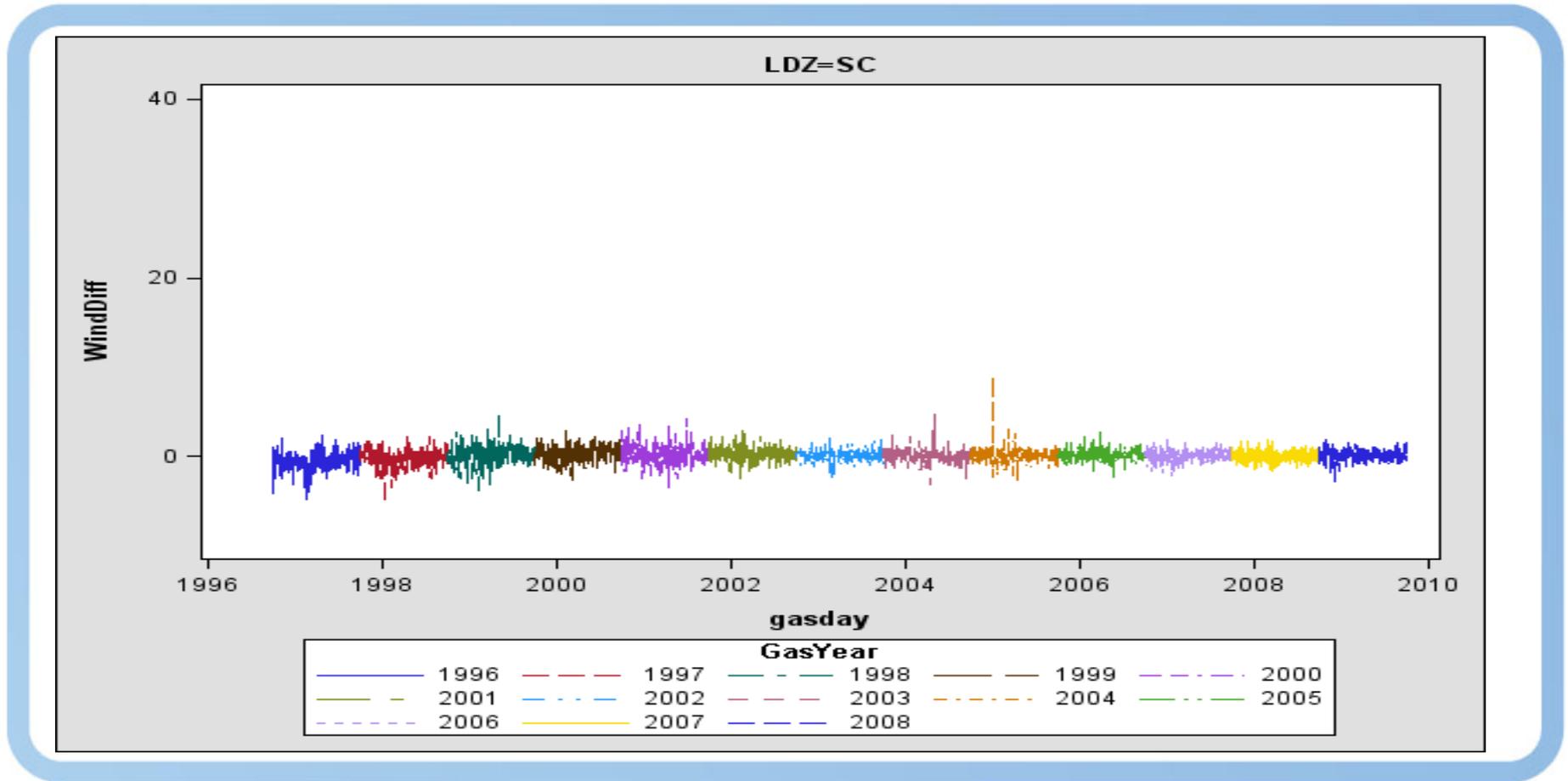
- Method 2: Shape Adjusted Interpolation
- Method 6: Monthly and Time of Day bias adjusted substitute

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SC Wind speed differences



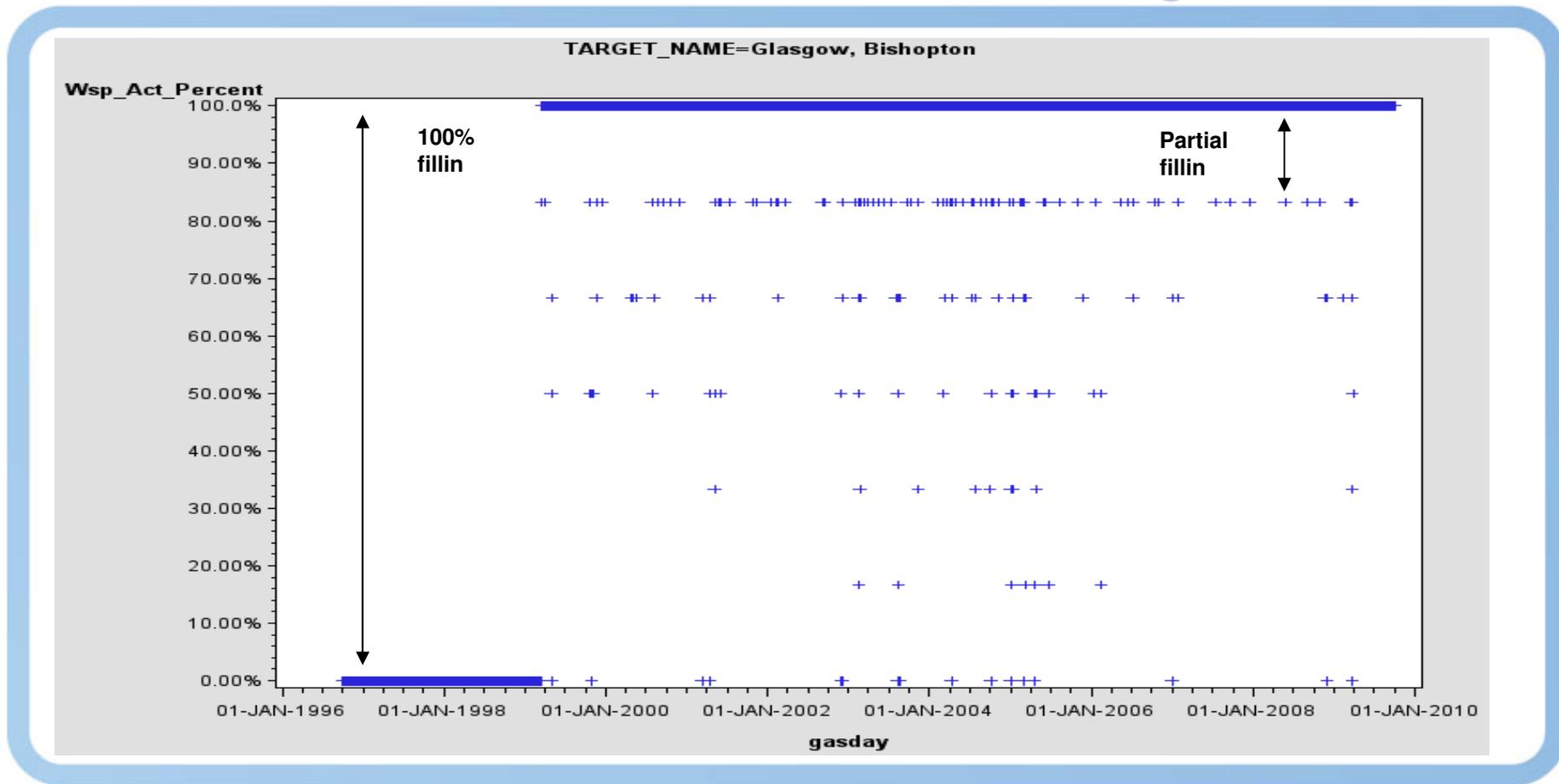
- Consistent level of small differences over the period.

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WSSM Wind speed Observations Actual % Glasgow – LDZ SC



- WSSM wind speed data from 1st October 1996 to 18th March 1999
100% filled in.

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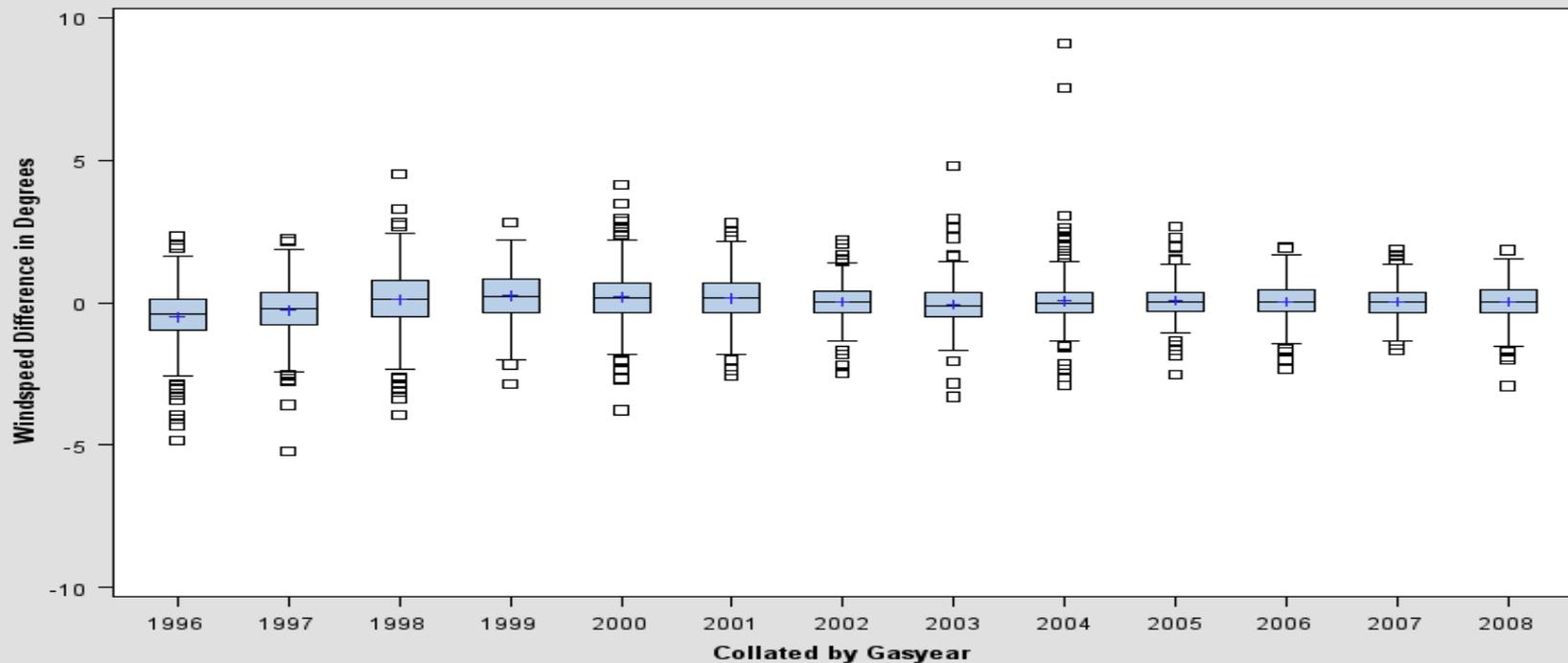
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SC Box Plot of distribution of wind speed differences

Windspeed Differences between WSSM and Current weather histories

Analysis Period: 1st Oct 1996 to 30th September 2009
Stations and time period comparable to those used in 2010 CWV optimisation

LDZ=SC



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Effect on CWV

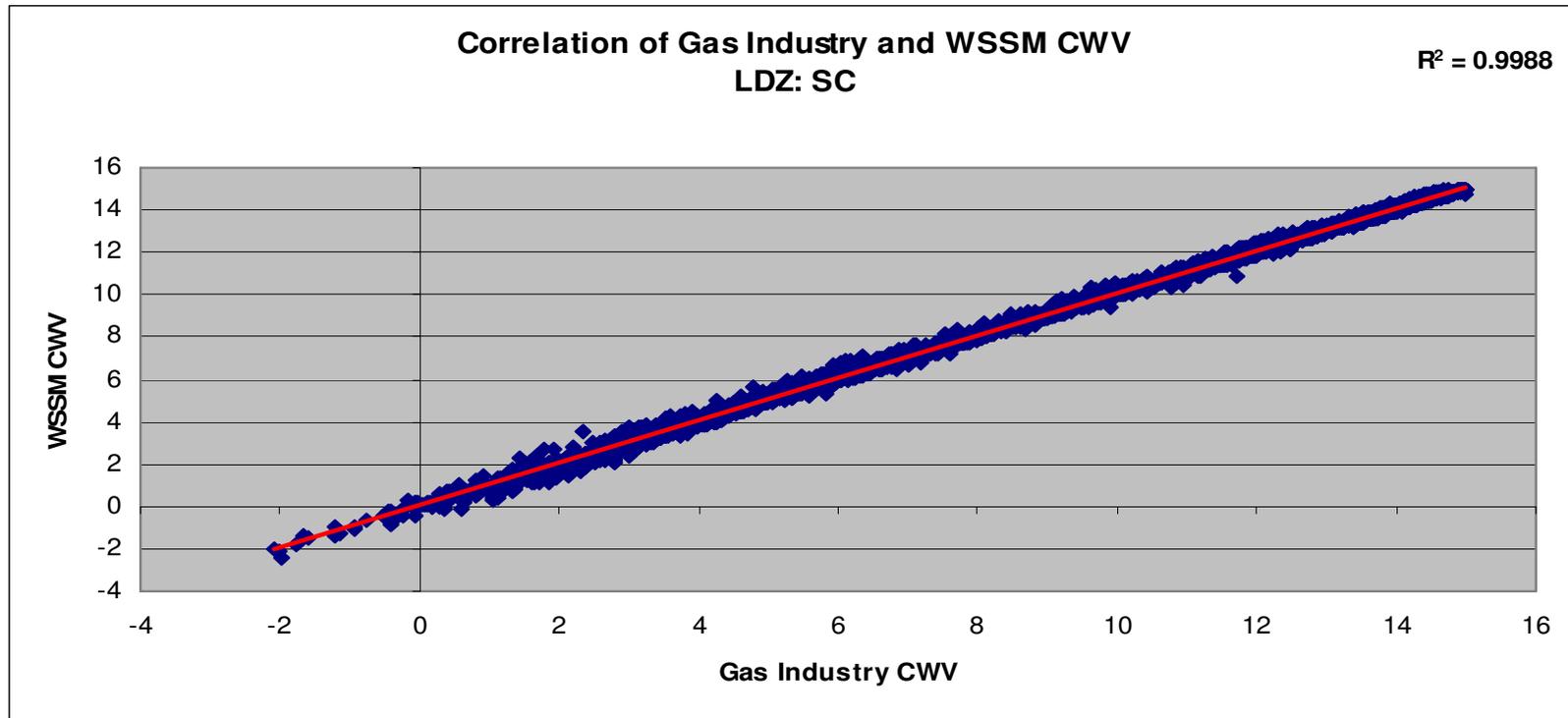
- The WSSM dataset has been used to calculate a CWV for the period 1st Oct 1996 to 30th Sep 2009
- This involved:
 - Calculating a set of Effective temperatures
 - Using existing CWV parameters to calculate CWV
- This allows comparison of CWV's based on the Gas Industry and WSSM datasets and to see if there are any patterns.

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Effect on CWV – SC Correlation of CWVs



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Impact of CWV on Demand

- Key relationship is regression of CWV to Demand
- For the period October 1996 to September 2009 analysis undertaken of
 - Gas Industry CWV vs. demand
 - WSSM CWV vs. Demand
 - for all Monday to Thursdays non holiday.
- The following slides shows a selection of LDZs (see appendix for the other LDZs)
 - A Positive difference indicates WSSM had higher R squared value

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LDZ SC CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	SC												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	97.73	97.41	97.95	97.44	97.98	98.84	98.19	97.66	97.68	98.27	98.12	98.40	98.03
WSSM RSQ %	97.85	97.51	97.57	97.41	98.05	98.81	98.27	97.75	97.83	98.30	98.21	98.43	98.03
Diff %	0.13	0.10	-0.38	-0.03	0.07	-0.03	0.08	0.09	0.16	0.03	0.09	0.03	0.00

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LDZ WM CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	WM												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.81	98.01	98.41	98.58	97.81	97.84	98.65	98.51	98.53	98.97	98.31	98.37	98.57
WSSM RSQ %	98.76	98.08	98.45	98.59	97.67	97.89	98.64	98.49	98.52	98.91	98.26	98.27	98.52
Diff %	-0.05	0.07	0.04	0.01	-0.14	0.05	-0.01	-0.02	-0.01	-0.06	-0.06	-0.10	-0.05

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LDZ NT CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	NT												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.29	98.41	98.72	98.41	97.47	98.27	98.70	98.85	98.40	99.16	98.37	98.46	98.86
WSSM RSQ %	98.42	98.45	98.78	98.47	97.32	98.28	98.72	98.85	98.41	99.19	98.40	98.49	98.89
Diff %	0.13	0.05	0.06	0.05	-0.15	0.00	0.02	0.00	0.00	0.03	0.02	0.02	0.03

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LDZ SW CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	SW												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.62	98.24	98.77	98.13	97.41	97.81	98.30	98.13	97.77	98.60	97.91	97.91	98.59
WSSM RSQ %	98.50	98.04	98.40	97.72	97.75	97.70	98.31	98.08	97.77	98.64	98.02	97.90	98.58
Diff %	-0.12	-0.20	-0.37	-0.41	0.35	-0.11	0.01	-0.05	0.00	0.05	0.11	-0.01	-0.01

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LDZ WS CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	WS												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	96.33	94.95	97.14	96.19	96.16	96.51	97.08	97.32	96.17	98.35	97.25	97.10	97.29
WSSM RSQ %	96.08	93.02	97.15	96.21	96.14	96.46	97.09	97.33	96.24	98.39	97.26	97.10	97.31
Diff %	-0.25	-1.93	0.02	0.02	-0.02	-0.05	0.01	0.01	0.07	0.04	0.02	0.00	0.02

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CWV vs. Demand Analysis

- The analysis shows that both CWVs are producing strong models
- Maximum difference was for WS in 1997 gas year where the R squared provided by the WSSM dataset was 1.93% poorer than the one based on the gas industry dataset
- More recent years showing very little difference in terms of R squared between the datasets

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Recommendation

- Xoserve's recommendation is to use the gas industry weather data for Spring 2014 analysis
- Implication of using the WSSM data set now.
 - Timetable to introduce the WSSM dataset for Spring 2014 modelling – gap filling required
 - WSSM data only goes to calendar day of 30 Sep 2012
 - modelling would need source data up to and including 31st March 2014
 - Impact to systems eg. WSSM only starts in 1960 but modelling systems expect weather from October 1928.
 - Impact on 2014 AQ review (off line calculation of WAALPS)

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Appendices



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Appendix 1

CWV R Squared Results for remaining LDZs

LDZ EA CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	EA												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.18	98.07	98.32	97.80	97.23	97.82	98.15	98.31	98.31	99.02	98.08	97.96	98.54
WSSM RSQ %	98.37	98.11	98.37	97.85	97.14	97.82	98.17	98.32	98.31	99.06	98.10	97.93	98.55
Diff %	0.19	0.04	0.05	0.05	-0.08	0.00	0.02	0.00	0.00	0.04	0.02	-0.03	0.01

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LDZ EM CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	EM												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.51	98.10	98.57	98.27	97.90	98.12	97.94	98.13	98.10	98.94	97.89	98.34	98.42
WSSM RSQ %	98.52	98.14	98.56	98.21	97.88	98.13	97.97	98.19	98.08	98.94	97.93	98.36	98.40
Diff %	0.01	0.04	-0.02	-0.06	-0.01	0.01	0.02	0.06	-0.01	0.00	0.03	0.02	-0.03

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LDZ NE CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	NE												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	96.23	96.73	97.84	97.62	96.52	97.52	96.94	97.24	96.43	98.32	97.35	96.80	97.78
WSSM RSQ %	96.23	96.75	97.81	97.61	96.55	97.54	96.96	97.31	96.42	98.33	97.39	96.86	97.74
Diff %	0.01	0.02	-0.03	-0.01	0.03	0.02	0.03	0.07	-0.02	0.01	0.05	0.06	-0.03

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LDZ NO CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	NO												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	97.62	97.82	97.87	97.46	98.02	97.76	97.95	97.45	96.87	97.78	96.65	97.29	97.70
WSSM RSQ %	97.64	97.53	97.87	97.59	97.58	97.82	97.99	97.30	96.75	97.88	96.72	97.27	97.71
Diff %	0.02	-0.29	0.01	0.13	-0.44	0.05	0.04	-0.15	-0.12	0.09	0.07	-0.03	0.01

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LDZ NW CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	NW												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.51	97.97	98.47	98.33	98.21	97.87	98.24	98.02	97.98	98.67	98.40	98.18	98.09
WSSM RSQ %	98.51	97.87	97.95	98.38	98.27	97.87	98.26	98.19	97.99	98.62	98.40	98.06	98.07
Diff %	0.00	-0.11	-0.53	0.06	0.06	0.00	0.01	0.17	0.01	-0.05	0.01	-0.12	-0.02

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LDZ SE CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	SE												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.11	98.59	98.26	98.27	97.22	98.21	98.46	98.72	98.35	98.99	98.21	97.62	98.79
WSSM RSQ %	98.26	98.60	98.38	98.29	96.90	98.22	98.49	98.72	98.34	99.02	98.25	97.67	98.82
Diff %	0.16	0.01	0.13	0.01	-0.32	0.01	0.03	0.00	0.00	0.03	0.04	0.05	0.03

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LDZ SO CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	SO												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	97.96	98.29	98.57	97.40	97.10	97.80	98.29	98.27	98.22	98.80	98.63	97.47	98.32
WSSM RSQ %	97.96	98.35	98.46	97.53	97.09	97.76	98.24	98.28	98.24	98.84	98.59	97.53	98.30
Diff %	0.00	0.06	-0.11	0.13	-0.02	-0.04	-0.04	0.00	0.02	0.04	-0.04	0.06	-0.02

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LDZ SW CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	SW												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	98.62	98.24	98.77	98.13	97.41	97.81	98.30	98.13	97.77	98.60	97.91	97.91	98.59
WSSM RSQ %	98.50	98.04	98.40	97.72	97.75	97.70	98.31	98.08	97.77	98.64	98.02	97.90	98.58
Diff %	-0.12	-0.20	-0.37	-0.41	0.35	-0.11	0.01	-0.05	0.00	0.05	0.11	-0.01	-0.01

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LDZ WN CWV vs. Demand

- R squared values: Mon – Thurs, non holiday regression

LDZ	WN												
Gas Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gas Ind RSQ %	96.58	97.13	96.08	96.22	96.21	96.49	96.92	97.10	95.72	95.43	97.71	96.34	96.39
WSSM RSQ %	96.70	97.32	94.91	96.49	96.33	96.47	96.88	97.33	95.76	95.36	97.73	96.11	96.41
Diff %	0.12	0.20	-1.17	0.27	0.12	-0.01	-0.05	0.23	0.05	-0.08	0.02	-0.23	0.02

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