XOSERVE

Composite Weather Variable

Demand Estimation – July 2025

Glossary of Terms

- **Non-Daily Metered (NDM)** – of the c.25m Gas Supply Meter Points the majority are Non-Daily Metered

- **Annual Quantity (AQ)** – An estimate of the amount of gas (in kWh) that a Supply Meter Point will use in the coming year under seasonal normal weather conditions

- **Annual Load Profile (ALP)** - a daily value which represents typically how each LDZ/EUC combination is likely to consume gas, assuming average weather, for the Gas Year

- **Daily Adjustment Factor (DAF)** - a daily value which represents typically how an EUC's gas demand reacts to changes in the weather – i.e. weather sensitivity

- **Pseudo Seasonal Normal Effective Temperature / Solar (Pseudo-SNET / Pseudo-SNES)** - A profile derived from observed demand and weather trends which serves as a pseudo benchmark for Effective Temperatures and Effective Solar Radiation

- **Local Distribution Zone (LDZ)** - Each LDZ represents a geographical area of the country. Each LDZ is 'owned' by a specific gas transporter and determine the area for which they distribute gas.
  Here is a helpful LDZ Map.

Composite Weather Variable – What is it ?

- The Composite Weather Variable (CWV) is one of the key outputs from the Demand Estimation process, as described in Section H of UNC:
  - *"The '**Composite Weather Variable**' for an LDZ and a Day is a single variable estimated to represent for the relevant LDZ the combined effect of demand for the day of the components of weather which affect demand"*
- The CWV is a single measure of daily weather in each LDZ and is a function of Actual Temperature, Wind Speed, Solar Radiation, Effective Temperature, pseudo-SNET, and pseudo-SNES. The definition of CWV includes provision for summer cut-offs during warm weather and cold weather upturn during low temperature extremes, defined such that a linear relationship applies between daily aggregate NDM demand in the LDZ and the CWV.
- Each year, as part of Demand Estimation modelling processes, the full description of the CWV is published in Section 11 of the NDM Algorithms booklet, which can be found on the secured area of www.xoserve.com (UKLinkDocs) by any party who has access, under folder:

18. NDM Profiling and Capacity Estimation Algorithms > Gas Year > 4 NDM Algorithms Booklet

CWV – Why is it needed?

- The CWV is a key input to the NDM Supply Meter Demand formula i.e.

  NDM Supply Meter Point Demand$t$ = (AQ / 365) * ALPt * (1 + [DAFt * WCFt])

  Note: A minimum constraint of 0.01 applies to the '(1 + [DAFt * WCFt])' part of the formula (to prevent negative demand)

  The WCF is defined as WCFt = **CWV**t - SNCWVt

- Where: CWVt is the Actual or Forecast Composite Weather Variable for the LDZ for day '*t*'.
- SNCWVt is the Seasonal Normal value of the Composite Weather Variable for the LDZ for day '*t*'. Further information on the SNCWV can be found on the Demand Estimation Home page here.

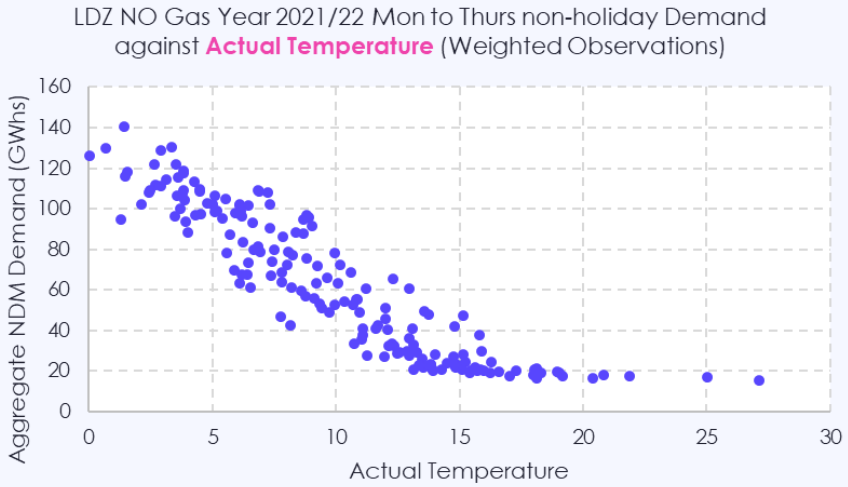
CWV – How is it Calculated? (1 of 2)

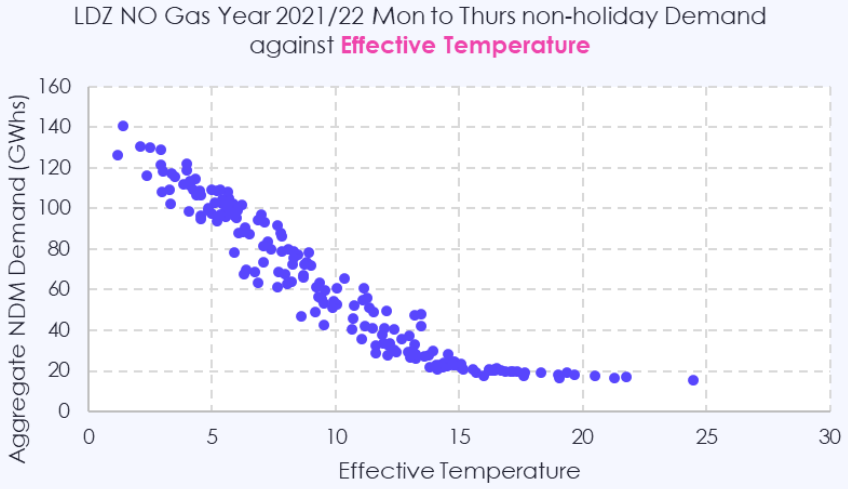
Actual Temperature (ATt), Daily Windspeed (Wt) and Solar Radiance (SRt) are calculated by taking 24 hourly observations per Gas Day and applying a weighting to them to give a single daily figure. A relationship can be seen to begin to form between Actual Temperature and Aggregate NDM Demand

An **Effective Temperature** (Et) for a Gas Day (t) can be calculated as a proportion (y) of the previous day's Effective Temperature, and the within day Actual Temperature (ATt).

$$E_t = y * E_{t-1} + (1 - y) * AT_t$$

Incorporating the Actual Temperature into the Effective Temperature creates an improved relationship to demand, by reducing the spread of observations





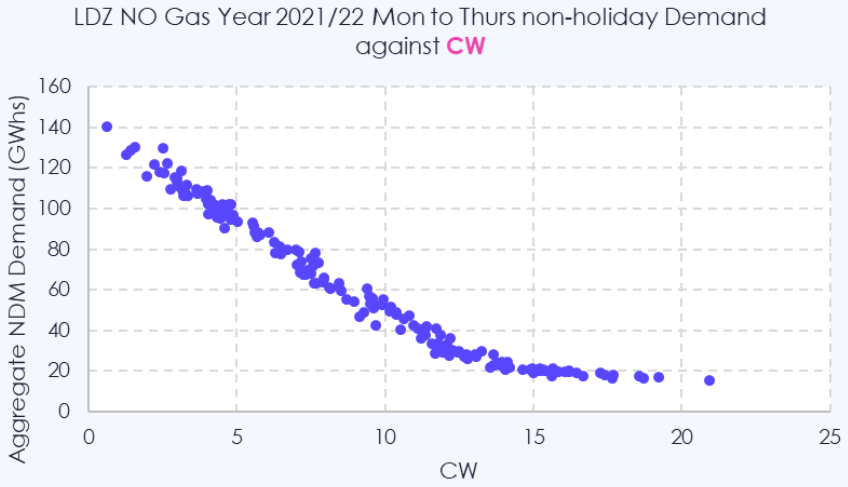
CWV – How is it Calculated? (2 of 2)

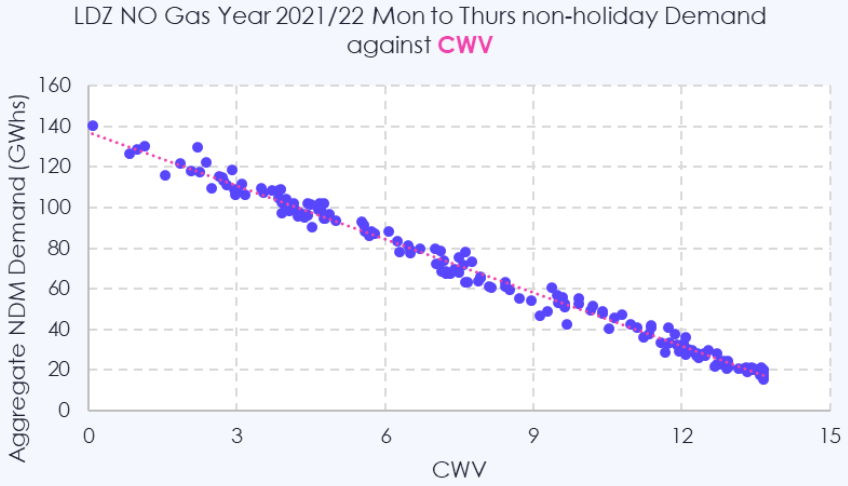
CW, an intermediary step in the CWV calculation which introduces a Windchill and a Solar Radiation term, can then be calculated for a Gas Day (t) using the following formula:

$$CW_t = I_1 * E_t + (1.0 - I_1) * S_t - I_2 * Max(0, W_t - W_0) * Max(0, T_0 - AT_t) + S_0 * SR_t$$

Incorporating Summer Cut-offs (where Demand levels out at higher temperatures), Transition (where this effect begins), and Cold Weather Upturns (where Demand increases non-linearly at colder temperatures) gives the final form of the **CWV**:

$$CWV_t = V1 + q * (V2 - V1) \quad \text{if } V_2 \leq CW_t \quad \text{(summer cut-off)}$$
$$CWV_t = V1 + q * (CWt - V1) \quad \text{if } V_1 < CWt < V2 \quad \text{(transition)}$$
$$CWV_t = CWt \quad \text{if } V_0 \leq CWt \leq V1 \quad \text{(normal)}$$
$$CWV_t = CWt + l3 * (CWt - V0) \quad \text{if } V_0 > CWt \quad \text{(cold weather upturr}$$





CWV – What are the CWV parameters?

- The CWV parameters represent the coefficients and cut-offs used in the CWV formula, and are defined as:

- **'y'** – The weighting factor applied in the Effective Temperature calculation for Gas Day 'D' between D-1's Temperature and D's Actual Temperature
- **'$I1$'** – A weighting factor applied between the Effective Temperature and the pseudo-SNET for Gas Day 'D' in the CW calculation
- **'$I2$'** – 'Windchill' magnitude
- **'$I3$'** – 'Cold Weather Upturn' magnitude
- **'$V0$'** – The CW boundary between 'Cold Weather Upturn' and 'Normal' phases
- **'$V1$'** – The CW boundary between 'Normal' and 'Transition' phases
- **'$V2$'** – The CW boundary for the 'Summer Cut-Off' (Max CWV)
- **'q'** – A constant used to determine the magnitude of the 'Transition' phase and 'Summer Cut-Off'
- **'$W0$'** – Minimum Wind Speed threshold for the 'Windchill' effect
- **'$T0$'** – Maximum Temperature threshold for the 'Windchill' effect
- **'$S0$'** – Magnitude of Solar Radiation

LDZ	y	I1	I2	I3	V0	V1	V2	q	W0	T0	S0
EA	0.460	0.723	0.015	0.109	-0.235	15.131	18.885	0.368	-0.477	12.650	0.635
EM	0.480	0.689	0.010	0.138	-1.344	13.008	16.897	0.424	-2.417	17.377	0.698
NE	0.459	0.672	0.009	0.083	-1.261	12.924	16.679	0.446	-1.652	21.596	0.568
NO	0.492	0.646	0.008	0.126	5.000	12.005	15.779	0.438	-0.894	16.657	0.950
NT	0.473	0.715	0.015	0.066	4.898	15.029	19.184	0.429	-3.811	12.833	0.695
NW	0.498	0.646	0.009	0.315	2.694	12.775	16.466	0.513	-5.000	21.312	0.802
SC	0.505	0.680	0.011	0.000	1.053	12.590	16.402	0.509	-2.992	15.476	0.507
SE	0.484	0.772	0.006	0.266	1.335	13.996	18.523	0.375	-0.721	21.613	0.566
SO	0.438	0.692	0.015	0.405	0.141	14.745	18.715	0.345	-2.076	11.978	0.559
SW	0.448	0.623	0.008	0.258	3.476	13.254	17.898	0.337	0.705	21.707	0.801
WM	0.471	0.692	0.010	0.163	4.385	13.392	17.480	0.368	-3.619	17.569	0.678
WN	0.482	0.618	0.009	0.324	3.773	13.477	16.987	0.445	-3.926	18.249	0.679
WS	0.543	0.657	0.008	0.079	1.797	13.826	17.186	0.384	-1.910	17.068	0.776

- The above parameters were last reviewed in 2019, and were derived from a process referred to as CWV Optimisation, using aggregate NDM demand from Gas Years 2010/11 to 2017/18

- The parameters were implemented on Gas Day 01 October 2020 and will remain effective until Gas Day 30 September 2025

CWV – Do the CWV Parameters Change?

- Every 5 years, the CWV formula, including all parameters is reviewed and optimised against the latest patterns in consumer behaviour as part of the 'Seasonal Normal Review' – further info can be found on the Demand Estimation Sub-Committee (DESC) homepage here.

- The following parameters **are due to take effect on 01 October 2025:**

LDZ	y	I1	I2	I3	V0	V1	V2	q	W0	T0	S0
EA	0.442	0.720	0.012	0.065	3.774	15.312	18.901	0.391	-2.296	14.837	0.632
EM	0.437	0.683	0.009	0.049	4.222	12.832	16.490	0.446	-1.988	17.872	0.778
NE	0.429	0.669	0.009	0.024	3.063	12.853	16.624	0.454	-2.306	21.068	0.759
NO	0.494	0.661	0.009	0.130	2.388	12.240	15.320	0.477	-1.826	16.504	0.950
NT	0.496	0.724	0.014	0.078	4.995	15.256	19.309	0.439	-5.875	14.574	0.598
NW	0.469	0.634	0.008	0.227	3.041	12.513	16.192	0.479	-4.817	23.705	0.938
SC	0.476	0.661	0.010	0.138	1.173	12.672	16.119	0.497	-5.186	16.046	0.629
SE	0.426	0.756	0.006	0.141	2.658	14.182	18.640	0.373	-0.610	21.613	0.470
SO	0.434	0.698	0.014	0.090	5.000	15.213	18.028	0.427	-5.758	13.187	0.654
SW	0.440	0.626	0.009	0.162	3.982	13.511	17.044	0.355	0.511	21.866	0.802
WM	0.451	0.688	0.010	0.105	4.996	13.173	17.328	0.364	-4.105	19.128	0.751
WN	0.466	0.600	0.011	0.338	3.549	12.796	16.520	0.452	-2.910	18.139	0.861
WS	0.477	0.653	0.006	0.114	5.000	13.965	16.525	0.385	-3.815	19.590	0.958

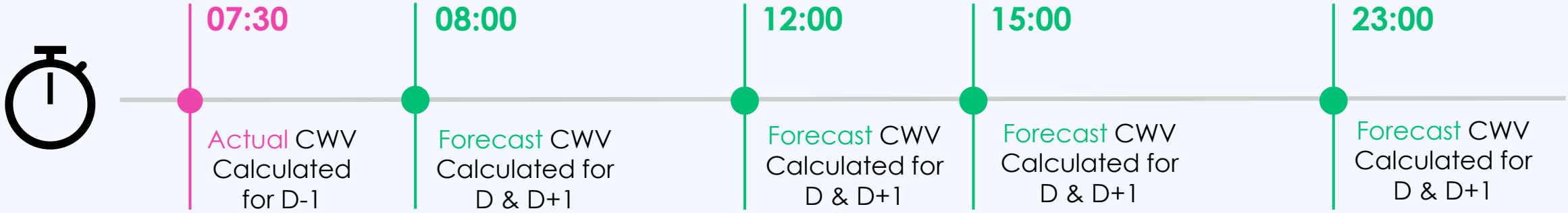
CWV – Do the CWV Parameters Change?

- The following Weather stations are used in the calculation of both Actual and Forecast CWVs:

LDZ	Temperature	Windspeed	Solar Radiation
SC	Glasgow Bishopton	Glasgow Bishopton	Glasgow Bishopton
NO	Albemarle Barracks	Albemarle Barracks	Durham Weather Station
NW	Rostherne No 2	Rostherne No 2	Rostherne No 2
NE	Nottingham Watnall	Nottingham Watnall	Nottingham Watnall
EM	Nottingham Watnall	Nottingham Watnall	Nottingham Watnall
WM	Birmingham Winterbourne 2	Coleshill	Coleshill
WN	Rostherne No 2	Rostherne No 2	Rostherne No 2
WS	St. Athan	St. Athan	St. Athan
EA	London Heathrow	London Heathrow	London Heathrow
NT	London Heathrow	London Heathrow	London Heathrow
SE	London Heathrow	London Heathrow	London Heathrow
SO	Southampton Oceanographic Institute	Southampton Oceanographic Institute	Southampton Oceanographic Institute
SW	Yeovilton Weather Station	Yeovilton Weather Station	Yeovilton Weather Station

CWV – When is it calculated and Where can I find it?

- CWVs are calculated 5 times a day for each LDZ in UKLink, one run of 'Actual' CWV for the previous Gas Day (D-1), and four runs of 'Forecast' CWVs for the current Gas Day (D) and next Gas Day (D+1) as per the timeline below



- Actual and Forecast CWVs are sent to Gemini shortly after calculation, ready to be used in Nomination and Allocation runs which occur at various points throughout the day.

- CWVs are also published via National Gas' Transmission data portal, where they can be found under:

Find gas data > Weather > Composite Weather Variable > Actual / Forecast

CWV – Where to find more information

- Uniform Network Code (UNC): Section H (Paragraph 1.4: Composite Weather Variable)
- UNC Related Document: NDM Demand Estimation Methodology (Paragraph 3.3)
- NDM Algorithms Booklet - Section 11: UK Link Docs: Folder 18. NDM Profiling and Capacity Estimation Algorithms / Gas Year / 4 NDM Algorithms Booklet
- Demand Estimation Sub Committee (DESC): Terms of Reference
- Latest CWVs are published to National Gas' Transmission data portal, under section:
  '**Find gas data** > Weather > Composite Weather Variable > Actual / Forecast'
- Please raise any questions on Composite Weather Variable via the Help Centre on Xoserve.com here by selecting "Other" and your query will be directed to the CDSP's Demand Estimation Team