Demand Estimation Sub Committee

4.0 Seasonal Normal Review 2025
CWV Formula Review
19 July 2023

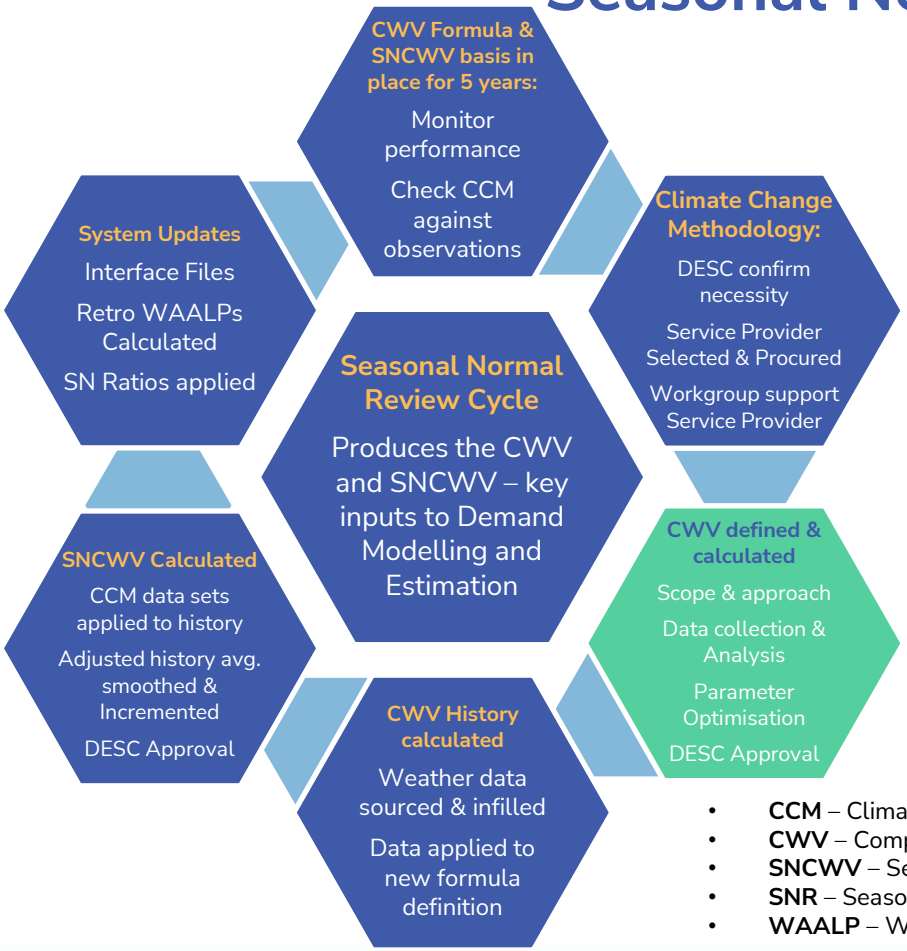
Contents

- Overview, Timetable, Background, and Objectives
- Composite Weather Variable (CWV) Formula review

4.0 Seasonal Normal Review 2025

OVERVIEW, TIMETABLE, BACKGROUND, AND OBJECTIVES

Seasonal Normal Review



- An overview of the Demand Estimation process and output can be found here
- Composite Weather Variable (CWV) and Seasonal Normal CWV (SNCWV) are key inputs to the Demand estimation process
- Seasonal Normal Review (SNR) cycle, undertaken at minimum once every 5 years, represented in diagram opposite
- This presentation relates to the "**CWV Defined and Calculated**" phase of the SNR cycle

- **CCM** – Climate Change Methodology
- **CWV** – Composite Weather Variable
- **SNCWV** – Seasonal Normal **CWV**
- **SNR** – Seasonal Normal Review
- **WAALP** – Weather Adjusted Annual Load Profile

CDSP / DESC Obligations and Timetable: October 2022 to September 2023

Milestone	UNC H Ref	2022			2023								
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
DESC Membership confirmed	1.12	✔											
NDM Sampling: Data Collection and Validation	1.6	✔						✔					
NDM Algorithm Performance for Gas Year 2021/22	1.8			✔								✔	
DESC Adhoc Workplan	1.7	✔		✔			✔						
DESC Modelling Approach – EUCs and Demand Models	1.7			✔			✔						
Single Year EUC Demand Modelling	1.7								✔				
Model Smoothing and Draft Gas Demand Profiles	1.7									✔			
Industry Consultation	1.8									✔	✔		
Gas Demand Profiles finalised and Core systems updated	1.9											✔	
Climate Change Methodology progressed (SN Review 2025)	1.4			✔			✔		✔		✔		

Note: Timetable above represents DESC Gas Year. Seasonal Normal Review 2025 Milestones will continue for next two DESC Annual cycles as per Timetable on slide 13

Background

- DESC are responsible for a number of obligations in Section H of UNC, amongst them are the requirements to:
  - Review the Composite Weather Variable (CWV) (H 1.4.3) and
  - Review the Seasonal Normal equivalent referred to as the SNCWV (H 1.5.3)
- Reviews of the CWV formula and Seasonal Normal basis are normally only carried out by DESC every 5 years due to the time taken to perform the review and the need for stability. This would mean the next Seasonal Normal basis is scheduled to take effect from 01 October 2025
- DESC confirmed the next steps in the procurement of a Climate Change Methodology at it's meeting on 05 July 2023. This work is due to take place in the first half of 2024
- The latest DESC review derived a new CWV formula and new basis for the Seasonal Normal, which both came into effect from the 01 October 2020

Objectives

- Present options for CWV formula review
- Confirm scope of CWV Formula review — Vote Required
- Look at next steps for the Seasonal Normal Review cycle

4.0 Seasonal Normal Review 2025

CWV FORMULA REVIEW

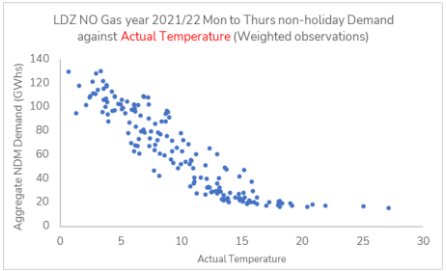
CWV Formula Recap

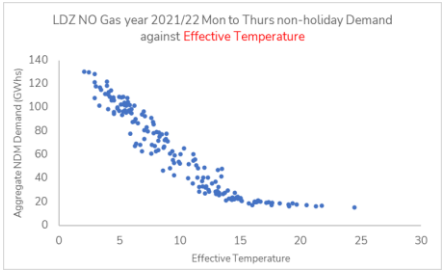
- Alongside the Seasonal Normal Review, DESC have the option to review the CWV formula, this was last performed in 2019 and below is a reminder of the CWV Formula implemented [01 October 2020]

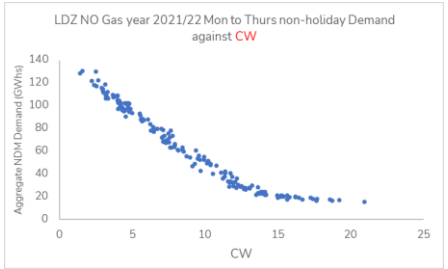
$$\mathbf{CW_t = I_1 * E_t + (1.0 - I_1) * S_t - I_2 * Max(0, W_t - W_0) * Max(0, T_0 - AT_t) + S_0 * SR_t + P_0 * P_t}$$

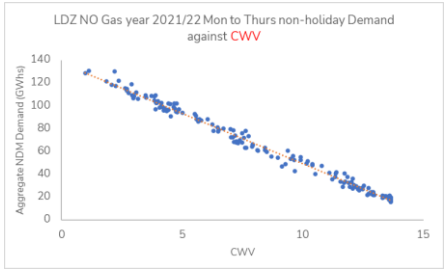
$\mathbf{CWV_t = V1 + q * (V2 - V1)}$	if $\mathbf{V_2 \leq CW_t}$	(summer cut-off)
$\mathbf{CWV_t = V1 + q * (CW_t - V1)}$	if $\mathbf{V_1 < CW_t < V2}$	(transition)
$\mathbf{CWV_t = CW_t}$	if $\mathbf{V_0 \leq CW_t \leq V1}$	(normal)
$\mathbf{CWV_t = CW_t + l3 * (CW_t - V0)}$	if $\mathbf{V_0 > CW_t}$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

- Visual Representation of steps in the CWV calculation:









CWV Parameters Recap

The current Parameters utilised by the CWV formula are shown in the table below

LDZ	y	I_1	I_2	I_3	V_0	V_1	V_2	q	W_0	T_0	S_0
SC	0.505	0.680	0.011	0.000	1.053	12.590	16.402	0.509	-2.992	15.476	0.507
NO	0.492	0.646	0.008	0.126	5.000	12.005	15.779	0.438	-0.894	16.657	0.950
NW	0.498	0.646	0.009	0.315	2.694	12.775	16.466	0.513	-5.000	21.312	0.802
NE	0.459	0.672	0.009	0.083	-1.261	12.924	16.679	0.446	-1.652	21.596	0.568
EM	0.480	0.689	0.010	0.138	-1.344	13.008	16.897	0.424	-2.417	17.377	0.698
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
EA	0.460	0.723	0.015	0.109	-0.235	15.131	18.885	0.368	-0.477	12.650	0.635
NT	0.473	0.715	0.015	0.066	4.898	15.029	19.184	0.429	-3.811	12.833	0.695
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

Note - P_0 not included as set to zero for all LDZs:

- 'y' Represents the proportion of D-1's Effective Temperature (E_{t-1}) which is used in the Effective Temperature (E_t) calculation as below, with the remainder being the proportion of Actual Temperature (AT_t) :

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

- I_1 and I_2 are used to represent the magnitude of overall Temperature and Windchill respectively
- $W_0, T_0, S_0,$ and P_0 are constants relating to the magnitude of individual weather variables
- $V_0, V_1, V_2, q,$ and I_3 collectively govern the Cut off points and magnitudes of the Cold Weather upturn and Summer Cut offs

Seasonal Normal 2020 Optimisation

- Optimisation Tool creation
  - An individual tool for each LDZ was created in Microsoft Excel which utilised the in-built ‘Solver’ process to perform a trial-and-error based optimisation routine.

- Data import
  - Relevant data was sourced and imported into the tool, this included but was not limited to: Weather Data (Temperature, Windspeed, Solar Radiation), Aggregate NDM Demand, and current pseudo-SNET Profiles for Gas years 2010/11 to 2017/18. Considerations were taken over which data points should be included in the optimisation process i.e. removing Holidays, weekends and erroneous data points

- Pseudo SNET/ Pseudo-SNES Optimisation
  - The Solver function was utilised first to reoptimize the existing pseudo-SNET profile, and to create a new pseudo-SNES profile by reducing the sum of error squared between observed Effective temperatures and Solar Radiation and the pseudo-SNET and pseudo-SNES values respectively

- Parameter Optimisation
  - The Solver function was again utilised and given the predefined goal of reducing error in the linear regression analysis of CWV vs aggregate demand. This is achieved by allowing solver to change all other parameters which make up the remainder of the CWV formula in order to drive towards the optimal answer.

CWV Formula Review

- Some of the options presented at DESC on 05 July 2023 included a review of the parameters, the introduction of Precipitation, or a review of the underlying daily Weighting Factors

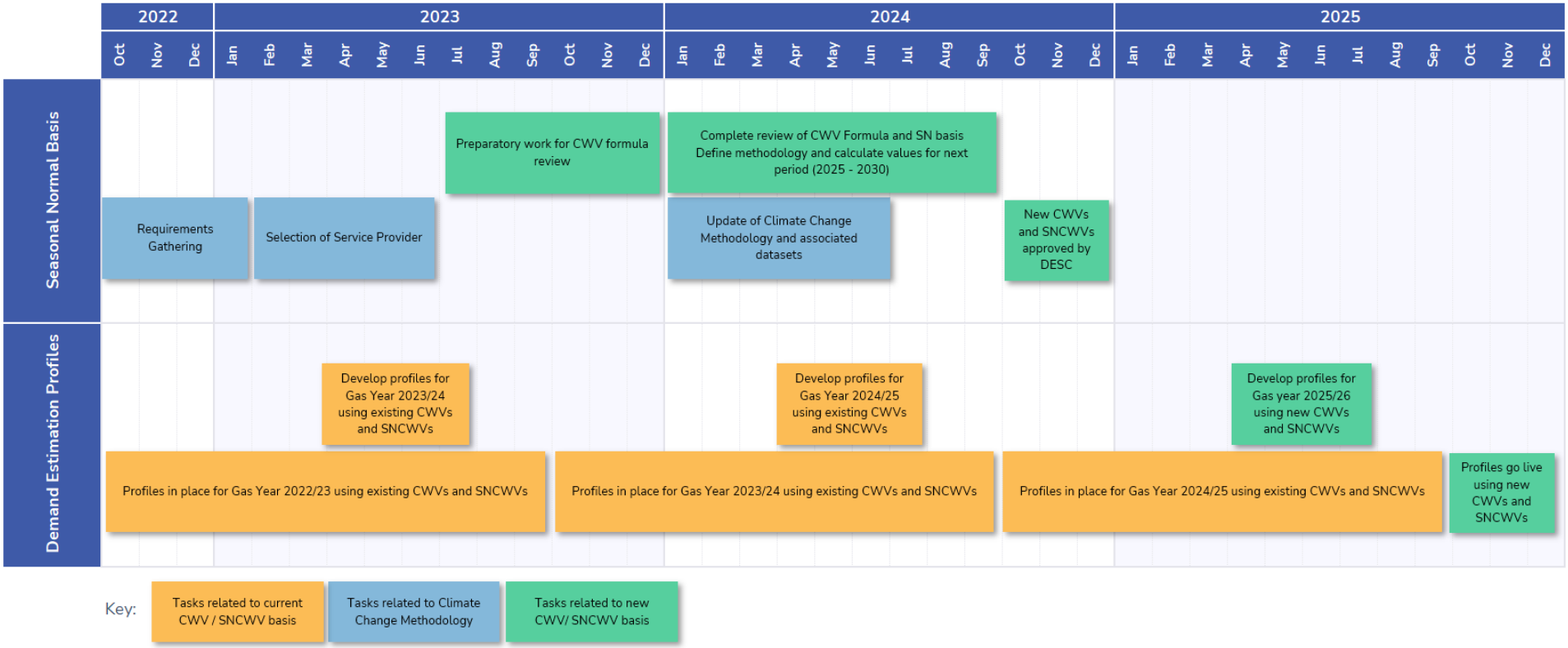
- The latest CWV Formula was undertaken by Centrica DESC Members and involved the introduction of a new variable (Solar Radiation) following clear evidence in an improved relationship to demand, as well as a full Optimisation of all parameters.

- Due to the analysis required in adding a new variable, and the need for hourly data to facilitate a review of daily weightings, The CDSP recommends retaining the existing formula with a full range of Parameter optimisation in this Seasonal Normal Cycle

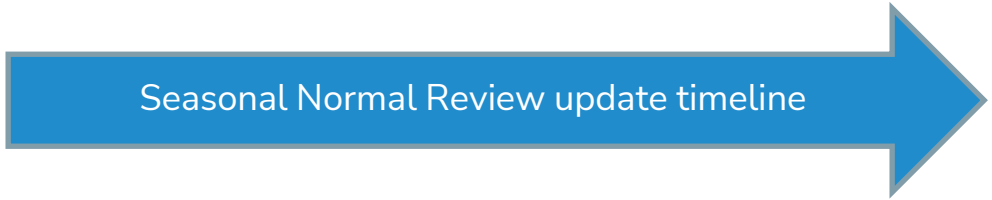
- The Parameter Optimisation would look at all variables but could be focussed on the following areas
  - Large day-to-day movements in the CWV – does the formula react too slowly or too quick to large day-to-day temperature changes? (Effective Temperature parameters)
  - Summer Cut-Offs and Winter Up-Turns – is the formula performing as well as it can at the extremes? (Cut-Off / Up-Turn Parameters)
  - Geographical Differences between LDZs and reaction to weather, e.g. under current definitions there is effectively no cold weather upturn in LDZ SC

- Are DESC happy to proceed with this approach? or do any DESC Members have any opinion on other potential areas to focus on in an optimisation cycle, or views on whether Precipitation or a weighting review should be considered?

High level Timeline



Next Steps



CDSP develop approach and preparatory work for CWV Formula review

Aug – Oct 2023

DESC Meeting: Confirm approach to CWV Formula review

04 Oct 2023

Work with Met Office to oversee creation of CCM

Jan – Jun 2024