MOD 0659:
Improvements to the Composite Weather Variable

27th June 2018

Introduction

- This presentation aims to provide some supporting information to aid discussions around UNC Modification 0659 – Improvements to the Composite Weather Variable

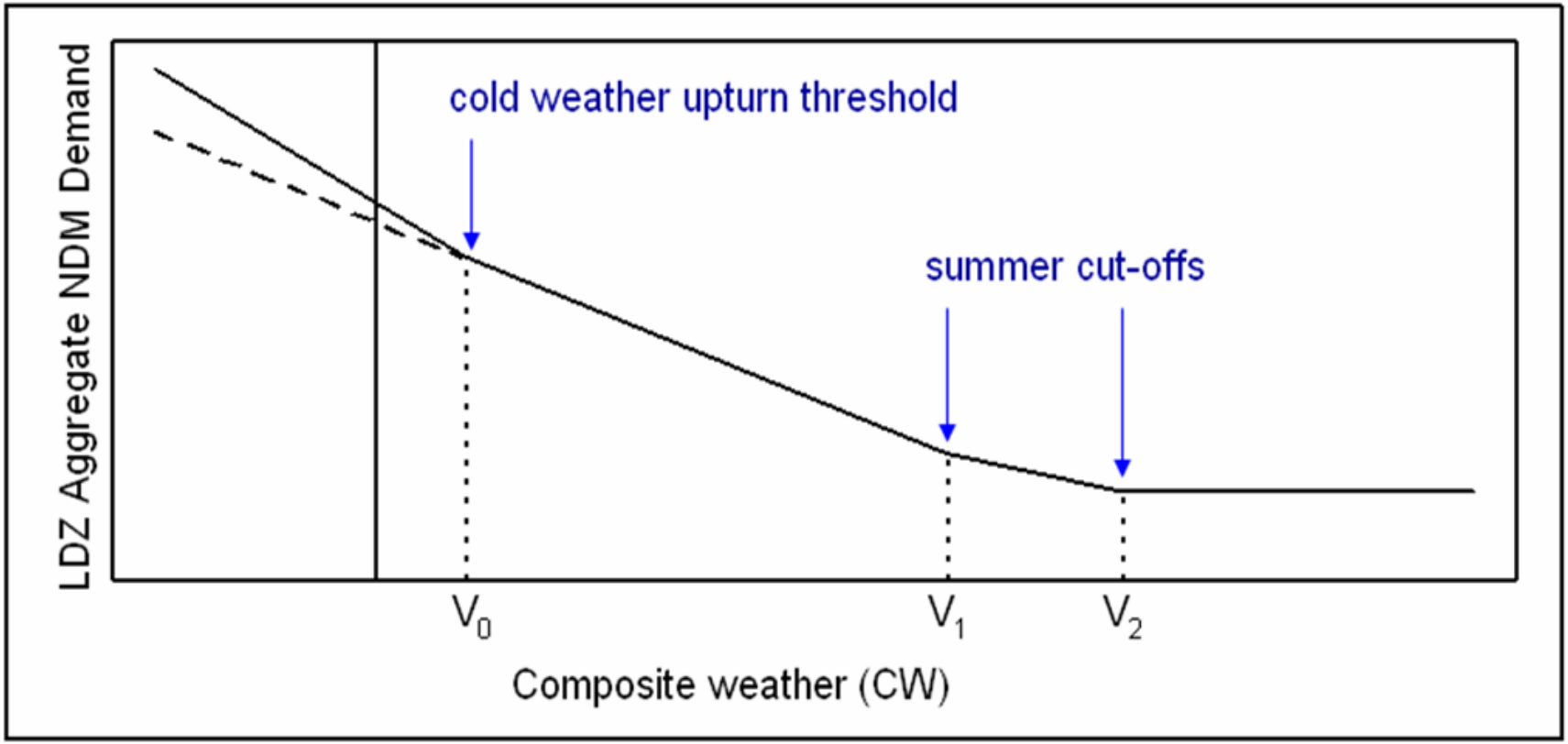
Composite Weather Variable (CWV)

- What is the Composite Weather Variable (CWV) ?
  - The “Composite Weather Variable” for an LDZ and a Day is a single variable estimated to represent for the relevant LDZ the combined effect on demand for the Day of the components of weather which affect demand (UNC 1.4.1)

- Why is the CWV needed ?
  - The objective of the CWV definition is to describe a straight line (linear) relationship between daily NDM Demand in the LDZ and the CWV. This enables demand models to be produced which are needed to derive the profiles and factors required by SAP-ISU and Gemini

- DESC’s role and the CWV ?
  - DESC determine the formula to be used for deriving the CWV (UNC 1.4.2)
  - DESC, at appropriate frequencies determined by it, review and where appropriate revise (with effect from the start of a Gas Year) the formula by which the Composite Weather Variable for an LDZ will be determined (UNC 1.4.3)
  - The most recent review of the CWV formula took place in 2014 in readiness for the Spring 2015 modelling which produced demand models for Gas Year 2015/16

Composite Weather Variable



Composite Weather Variable

The CW is made up of an effective temperature term, a seasonal normal effective temperature term and a wind chill term as shown:

$$CW_t = l_1 * E_t + (1.0 - l_1) * S_t - l_2 * \max(0 , W_t - W_0) * \max(0 , T_0 - AT_t)$$

Incorporating summer cut-offs, transition and cold weather upturn then gives the final form of the CWV:

$CWV_t = V_1 + q * (V_2 - V_1)$	if $V_2 \leq CW_t$	(summer cut-off)
$CWV_t = V_1 + q * (CW_t - V_1)$	if $V_1 < CW_t < V_2$	(transition)
$CWV_t = CW_t$	if $V_0 \leq CW_t \leq V_1$	(normal)
$CWV_t = CW_t + l_3 * (CW_t – V_0)$	if $V_0 > CW_t$	(cold weather upturn)

The parameters of each CWV are given under heading ‘5. Parameter Values’ of this section.

Seasonal Normal Composite Weather Variable (SNCWV)

- What is the Seasonal Normal Composite Weather Variable (SNCWV) ?
  - A representation of the “Composite Weather Variable” using a view of ‘normal’ weather
- Why is the SNCWV needed ?
  - The demand models produced by the Demand Estimation area are expressed on a seasonal normal basis as this provides stability for the industry when producing the relevant profiles and factors required by SAP-ISU and Gemini
- DESC’s role and the SNCWV ?
  - DESC determine the SNCWV values (UNC 1.5.2)
  - DESC, at appropriate frequencies determined by it, review and where appropriate revise (with effect from the start of a Gas Year) the values of the SNCWV (UNC 1.5.3)
  - The most recent review of the SNCWV took place in 2014 in readiness for the Spring 2015 modelling which produced demand models for Gas Year 2015/16
  - SNCWV is currently calculated using output from Climate Change Methodology (CCM)
- It is normal to schedule the reviews of CWV and SNCWV in the same year as there are clear dependencies

Weather Correction Factor (WCF)

- In addition to use in demand modelling, the CWV and SNCWV are also used in the weather correction element of the algorithm which derives daily supply meter point demand for NDM sites
- The ‘weather correction element’ of the current NDM Algorithm is highlighted below:
- Supply Meter Point Demand = (AQ/365) * ALPt * (1 + [DAFt * WCFt])
- The DAF is an EUC model parameter, derived by the EUC modelling system ahead of the gas year. The formula is WSENSt / SNDt
- The WCF is an LDZ parameter, calculated daily in Gemini and SAP-ISU. The formula is CWVt – SNCWVt

DESC's Review Timetable for CWV and SNCWV

- The normal period for the current CWV formula and SNCWV values to be in place for is 5 years. The exception to this can be when a weather station closure occurs
- The current arrangements for CWV and SNCWV are expected to be in place until the end of Gas Year 2019/20 (completing 5 years since they went live)
- The next review of the CWV formula and its associated parameters, along with a revision of the SNCWV values is scheduled for 2019 with any new arrangements taking effect from Gas Year 2020/21
- The process for producing the consumption profiles and factors for Gas Year 2020/21 will start in Q1 of 2020 and as both the CWV and SNCWV are key parameters in the production of demand models, it means that DESC should conclude their review of both by the end of 2019

High Level Timeline – Work to consider

2018

- **UNC Modification 0659**
- Agree objectives / scope of analysis
- Perform analysis of additional weather variables and its relationship to demand
- Consider how results can be incorporated alongside existing CWV formula
- Perform analysis of WCF
- Clear set of conclusions and recommendations which can help feed work scheduled for 2019
- Confirm system updates needed and impacts to release schedule (Gemini / SAP-ISU)

2019

- **CWV**
- Agree approach to CWV Formula Review
- Review CWV Formula
- Define CWV Formula for next period
- Optimise CWV Formula for next period
- Review & Approve CWV Formula results
- Re-state CWV history
- **SNCWV**
- Agree approach to SNCWV values Review
- Review performance of existing SNCWV values
- Define approach for deriving SNCWV values
- Calculate SNCWV values
- Review & Approve SNCWV values

2020

- **Jan-Mar 2020**
- Re-run Historical models using new CWVs and SNCWVs
- Create revised historical ALPs and DAFs to support AQ calculations
- **Apr-July 2020**
- Run Spring Analysis 2020 and create new ALPs, DAFs and PLFs for Gas Year 2020/2021
- Ensure weather contracts/data flows reflect new CWV requirements
- Ensure SAP-ISU is ready to calculate CWV using agreed formula and weather data flows

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Points to consider:

- The CWV is calculated daily (several times per day) in SAP-ISU and relies upon a feed of temperatures and wind speeds. Contracts exist between Weather Service Providers (WSP) and Distribution Networks (DNs) to supply these observations and forecasts

- Weather variables used in CWV need to be available for the current gas industry weather stations, in 'actual', 'forecast' and 'seasonal normal' mode

- Changes to the CWV only, assuming it remains a "single variable" of weather in an LDZ for a day means system changes are restricted to SAP-ISU only

- Changes to the WCF calculation itself and/or "1+WCF*DAF" i.e. the weather correction element of NDM supply meter point demand formula, would mean system changes to SAP-ISU and Gemini

- Historically CWV parameters have been optimised against daily 'actual' NDM demand, a concept which no longer exists following Nexus implementation

Assumptions for discussion

- The CWV shall remain a “single variable” of weather in an LDZ for a day
- A value of SNCWV for an LDZ for a day is still required

Governance and System considerations

	Governance			
References to Calculation Formula and/or data Items used in it	UNC Section H	Demand Estimation Methodology	Spring Approach / NDM Algorithms Booklet	Approach to Seasonal Normal Composite Weather Variable
Change Mechanism	Modification	UNCC Approval	DESC Approval	DESC Approval
WCF	-	✓	-	-
CWV	✓	✓	✓	-
SNCWV	-	-	-	✓
DAF	-	✓	-	-
WSENS	-	-	✓	-
SND	-	-	✓	-

	Systems		
Calcuation of....	Gemini	SAP-ISU	Dem. Est. Modelling
WCF	✓	✓	-
CWV	-	✓	-
SNCWV	-	-	✓
DAF	-	-	✓
WSENS	-	-	✓
SND	-	-	✓

- The above table shows where there are references in industry documents to either the formula definition and/or data items which must be used
- The table to the left shows which systems calculate the parameters in the first instance

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