



NDM Algorithm Consultation

Background Briefing

October/November 2020

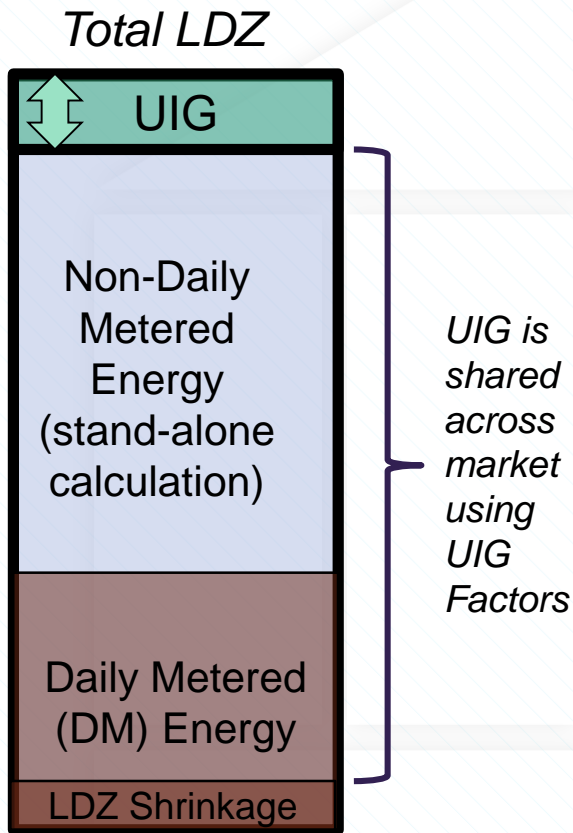
Objective of Briefing

- Provide background information behind the launch of the industry consultation on the future of the NDM Algorithm
- Explain the consultation objectives
- Provide an opportunity for industry participants to ask questions

NDM Algorithm – UIG Task Force

- The Unidentified Gas (UIG) Task Force undertook several phases of Machine Learning investigation
- Aims were to better understand drivers of UIG and identify options to reduce levels/volatility of daily UIG
- As the Balancing Figure in each LDZ each day, UIG is dependent on all the inputs to the calculation i.e. measurements and estimates of LDZ, DM, NDM and Shrinkage
- After initial investigations the focus of Machine Learning has been on improving the Non-Daily Metered (NDM) estimation algorithm to reduce UIG, as this was shown to be a major contributor to daily UIG – Task Force finding [13.2.6](#) suggests a reduction in base UIG of up to 70% on average

NDM Algorithm and UIG



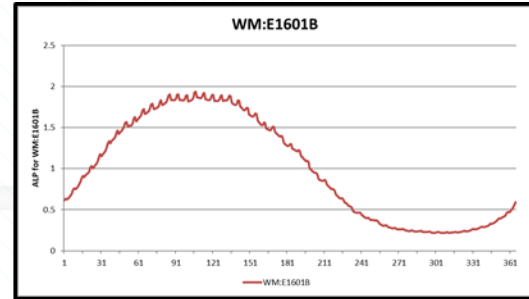
- UIG = daily Balancing Figure
- UIG is dependent on all the other data inputs
- Most days NDM Energy is the largest part of LDZ throughput
- NDM Algorithm has a big influence – but so do the AQs
- UIG shared on basis of daily Throughput and Weighting Factors
- AUGE determines Weighting Factors each year for sharing UIG

NDM Algorithm – Current Approach (1 of 2)

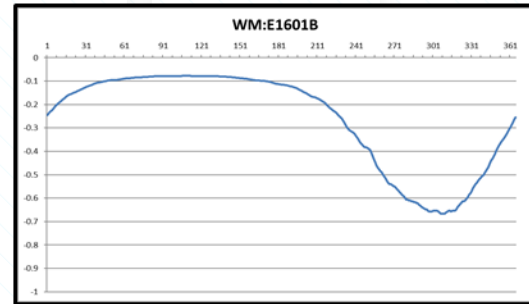
- The NDM Algorithm uses the following key inputs:
 - Assessment of Seasonal Normal weather (SNCWV)
 - Updated from Gas Year 2020/21 to include more appropriate Climate Change inputs
 - Actual within-day weather observations (CWV)
 - Updated from Gas Year 2020/21 to include Solar Radiation
 - Annual Load Profile (ALP) – daily gas usage patterns under seasonal normal conditions, by End User Category
 - Daily Adjustment Factor (DAF) – measure of daily sensitivity to weather fluctuations, by End User Category
 - Annual Quantity (AQ) – uses ALP, DAF and actual weather to correct actual consumption to a Seasonal Normal position (i.e. relies on a. to d. above)

NDM Algorithm – Current Approach (2 of 2)

- Development of ALPs and DAFs



ALP – Annual Load Profile



DAF – Daily Adjustment Factor

Simple regression formula between NDM Sample Demand and daily Composite Weather Variable

Input data and output parameters are published – users can recreate the ALPs and DAFs from the data

ALPs and DAFs published and consulted on before the start of the Gas Year

NDM Algorithm – Industry use of Parameters

- One of the benefits of the current approach is that the parameters (e.g. ALPs and DAFs) used in the NDM Algorithm are known before the Gas Year starts (apart from Actual weather). This is also a disadvantage as the NDM estimate will not always adapt quickly to events such as extreme weather, economic downturns or pandemic lockdowns
- The current approach does offer the industry the ability to reproduce the calculations used in producing the demand models and subsequent parameters
- Although the parameters are primarily created to calculate the daily NDM Nominations and Allocation values, they are also used to support AQ calculations and Read estimation processes. We know that the wider industry also use the parameters in their own systems for their own purposes
- An important feature of the consultation, therefore, is to understand 1) how embedded some of the NDM Algorithm parameters are in customer's systems and 2) how important 'transparency' of the calculations and/or a clear audit trail on how they have been derived are to customers

NDM Algorithm – Section H Uniform Network Code (UNC)

- UNC Section H (2.2.1) contains the formula ('NDM Algorithm') for determining daily NDM demand
 - Supply Meter Point Demand_t = $(AQ/365) * ALP_t * (1 + [DAF_t * WCF_t])$
 - The calculation above is used daily in Gemini for NDM Nominations and Allocations (as well as supporting AQ calculations and Read Estimation processes)
 - The formulas for calculating the “ALP”, “DAF” and “WCF” are set out in the UNC Related document – “Demand Estimation Methodology” which is maintained by Demand Estimation Sub Committee (DESC)
- This formula became effective from 1st June 2017 following the implementation of UNC Modification 0432 (Project Nexus – Gas Demand Estimation, Allocation, Settlement and Reconciliation Reform)
- At the same time, the concept of Unidentified Gas (UIG) was introduced which became the balancing figure in daily demand attribution. Since then the level and variability of daily UIG has been unpredictable and has caused industry participants considerable issues (UIG Task Force was established as a result)

NDM Algorithm – DESC Review

- The current formula is now a stand alone 'bottom up' estimate of NDM demand and is no longer the balancing figure (a role now taken up by UIG), meaning its accuracy and performance is more open to scrutiny and review
- UNC Demand Estimation Sub-Committee (DESC) now has an obligation to review the NDM Algorithm formula every three years (UNC H2.2.2)
- At the end of September 2020 a third complete Gas Year under the current NDM Algorithm will have been completed i.e. Gas Years 2017/18, 2018/19 and 2019/20
- DESC is aware that significant changes to the NDM Algorithm, such as the introduction of Machine Learning could have wider industry impacts
- In order to avoid wasted effort and ensure industry support of any proposals is more likely to succeed, it has agreed that **an industry consultation** would be a sensible activity before proceeding with any industry Review Groups and/or detailed analysis of alternative options

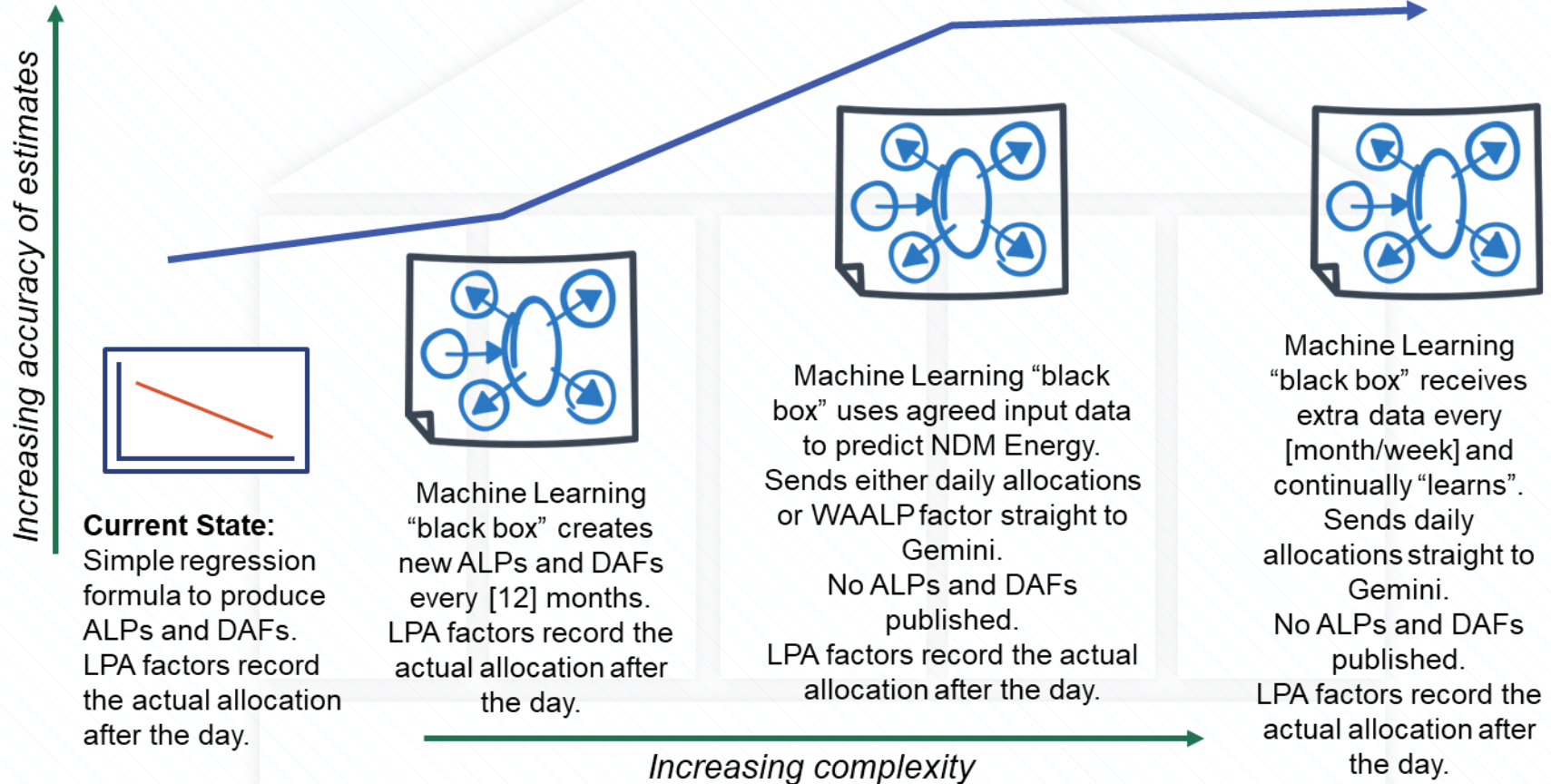
NDM Algorithm - Consultation Objectives

- All participants in the Gas Industry are invited to provide their views on the future of the NDM Algorithm via a 4 week consultation period concluding on Friday 20th November
- Consultation objectives:
 - To gather quantitative information from a wide range of gas industry participants on the level of support for improvements in the Non-Daily Metered (NDM) gas allocation algorithm, including the use of Machine Learning techniques
 - To gather additional information on whether there is a requirement to retain the existing NDM gas allocation formula and its component parameters
 - To gather industry participants' views on the future direction of the NDM sector of the GB gas market, to help assess the business case for changes to it
 - To quantify any financial benefits of a reduction in UIG due to improvements in the NDM allocation algorithm
- After the consultation, the industry's 'no-go areas' should be clearer

What is Machine Learning?

- Machine learning is a branch of artificial intelligence
- Uses complex computer systems teaching themselves how to perform tasks without being explicitly programmed to do so
- Usually based on input data and observed outcomes
- The process of providing the input data to the Machine Learning system so that it can “learn” the relationships between historic data and results is often referred to as “training”

NDM Algorithm – Possible Machine Learning Options



NDM Algorithm – Comparison of Options

Option	Pros	Cons
As-Is: Simple Regression Analysis, Annual ALPs and DAFs	Well understood Easy to replicate ALPs and DAFs can be used by all parties for forecasting, estimation etc	Limited set of inputs Not the most accurate way to estimate NDM Demands
Annual Machine Learning development of ALPs and DAFs	ALPs and DAFs produced each year, can be used by all parties for forecasting, estimation etc. Harnesses benefits of ML, using wider range of inputs	Outputs much harder to replicate or explain Only updated once a year Can only learn based on historic observations
Machine Learning model outputs daily energy allocations to the Balancing system	Harnesses more ML benefits Same process can calculate consistent Nominations and Allocations	No ALPs and DAFs produced before the start of the year Needs a new solution to support users' forecasting processes prior to D-1
Ongoing within-year Machine Learning, outputs daily energy allocations to the Balancing system	Model regularly updated for new trends/behaviours	No ALPs and DAFs produced before the start of the year Needs a new solution to support users' forecasting processes

NDM Algorithm – Important Points to Note

- Any alternative option to the current NDM Algorithm would still need to produce the following outputs:
 - There will still be Peak Load Factors published before the Gas Year to determine SOQs
 - There will still be Allocation Factors after the Gas Day to enable industry participants to recreate their own allocation
 - There will still be AQ calculation factors in order to derive an AQ (equivalent to a WAALP)
- Overall accuracy of the NDM estimates will still be reliant on portfolio data, especially AQs – there will always be an element of NDM model error
- There will still be an inherent level of UIG in every LDZ due to other causes such as theft, missing sites, metering errors, unexpected consumer behaviours
- Daily UIG will still vary depending on other factors such as LDZ Offtake and DM Measurement accuracy
- NDM Allocation will still be an interim position – final positions will still require regular, timely meter read submissions

NDM Algorithm – Future of NDM Sector vs Costs ?

- Another key question in this consultation is the industry's views on the long-term future of the NDM sector. Any change to the current NDM Algorithm inevitably brings costs to the industry and so it's important we can assess any investment alongside the likely payback
- The assessment of any proposed solution, such as Machine Learning, should include a view of its predicted useful life
- To support this objective the consultation questions include asking customers to provide an estimated view of:
 - the financial benefits of a [x%] reduction in UIG
 - and
 - how much of the GB gas market is likely to require an NDM estimate in [x] years time

NDM Algorithm - Consultation Questions

- The questions cover 5 main areas and the Response Template asks for a view on how strongly you support / oppose and to provide reasons
- NDM Allocation Algorithm Improvements:
 - Do you support the industry's efforts to improve the accuracy of the NDM gas allocation algorithm?
- Machine Learning Options:
 - Do you support the use of Machine Learning as the future approach to NDM demand modelling?
- Parameters ahead of the Gas Year:
 - Do you require access to a set of parameters ahead of the gas year to allow you to forecast/simulate NDM gas allocation (as currently provided by Annual Load Profiles and Daily Adjustment Factors - ALPs and DAFs)?
- Future of NDM Sector:
 - What proportion of the GB gas market do you believe will still be NDM in 2, 5 and 10 years?
 - What proportion of your portfolio do you believe will still be Non-Daily Metered in 2, 5 and 10 years? (this information will be aggregated with other market participants' responses prior to disclosure outside Xoserve)
- Benefits to Industry in reducing UIG:
 - Can you attribute a financial benefit to a reduction in UIG levels, even if this is due to an increase in NDM Allocation? (a more accurate NDM Algorithm could result in higher NDM Allocations and lower UIG). If so please quantify (e.g. a reduction of x% in average UIG would result in a cost saving of £y per annum)

NDM Algorithm - Consultation Timetable

- Advanced Notice of Consultation issued: 16th October 2020
- Invitation to Consultation issued : 23rd October 2020
- Background Briefing / Q&A Sessions: 26th October 2020 and 3rd November 2020
- Consultation Closes for Responses: 20th November 2020
- Summary of Results / Responses published: w/c 30th November 2020
- Results/Conclusions presented to Industry Forums:
 - Demand Estimation Sub-Committee (DESC): 7th December 2020
 - Results presented to Distribution Work Group: 14th December 2020
 - Results presented to DSC Contract Management Committee: 16th December 2020

NDM Algorithm – Next Steps

- Once the industry consultation closes on **Friday 20th November**, all responses received will be reviewed and summarised into an industry consultation overview document, which will be published
 - In addition, where permission has been given, we shall also publish individual responses
- The consultation response overview document will make recommendations on where to take the NDM Algorithm review and summarise the level of industry support for making changes from the current approach and to what extent. The summarised consultation views will also be shared at various industry forums at the end of the year
- Depending on the findings from the consultation and the feedback received from the industry forums it is quite likely that the next steps will involve setting up a UNC Review Group to establish and evaluate options, develop implementation plan etc
- This means although the industry consultation will close on 20th November there will still be extensive industry engagement required to shape the future direction

NDM Algorithm Consultation

Any Questions ?