AUG Technical Workgroup of UNCC

Proposed AUGS Walkthrough

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11 January 2019

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SAFER, SMARTER, GREENER

Agenda

- Meeting Purpose

- Project Overview

- Project Status

- Analysis Summary and Methodology changes from previous year

- Methodology Overview

  – Overall Unidentified Gas estimation

  – EUC/Product split

  – Conversion to factors

  – Directly estimated Unidentified Gas components

  – Balancing Factor

  – UIG factors

- Modifications & Industry updates

- Q&A

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Meeting Purpose

- AUG Expert to update Technical Workgroup (TWG) on

  – Overall project status

  – Findings from analysis work during 2018/19 AUG year

  – Updates to methodology

  – Latest view of UIG Factors

- Prepare TWG for consultation period

  – Early opportunity to raise questions & seek clarification

 – Prompt discussion

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Project Overview

- AUG Expert appointed July 2016

  – Develop a methodology to calculate Weighting Factors to apportion UIG by EUC/Product Class

  – Populate table of Weighting Factors to apportion UIG by EUC/Product Class

- Mod639R - Review of AUGE Framework and Arrangements

  – New Timeline

  – Generic Terms of Reference

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Project Overview

- Mod 0639R – Review of AUGE Framework and Arrangements
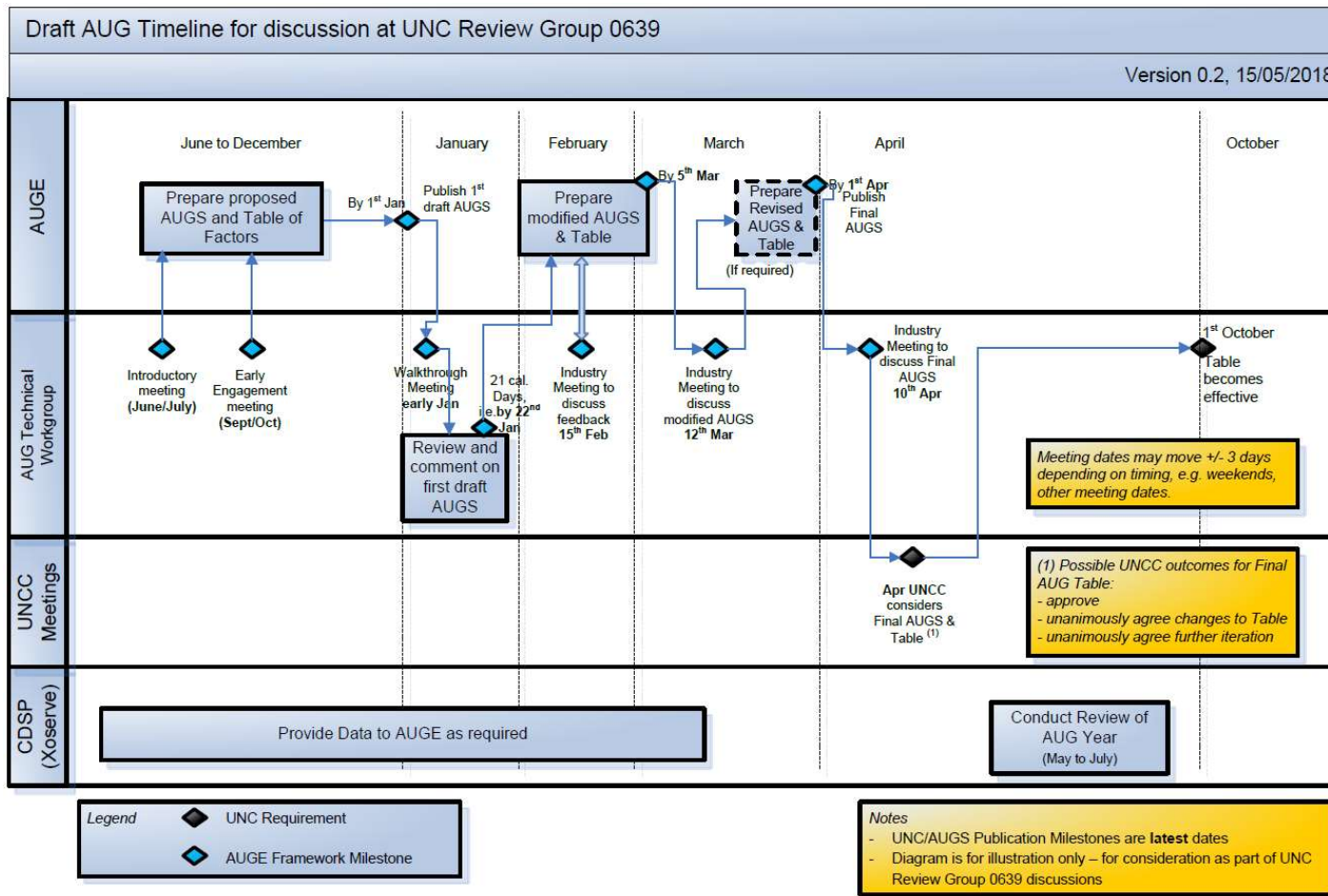
Project Status

- Overall ON TARGET
- Data Challenges
  - First year of data extraction from Post-Nexus systems
  - Meter asset & read data a particular issue
    - Current UIG factors based on old consumption calculations
  - Additional theft data requested from SPAA
    - Permission granted for AUG Expert to receive data
    - Expected delivery of data to AUG Expert mid-Jan
    - Separate theft methodology published to allow review during consultation
- Issues Status
  - New issues identified and assessed
  - Analysis completed for all but 3 issues (8, 35 & 37)
    - Awaiting additional information/data

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Data Status – Outstanding Issues

- Offline Adjustments

  – Only provided by billing month

- Meter Asset Information

  – CSEP Flag incorrectly populated preventing updated consumption calculation

  – Outstanding queries regarding meters with volume conversion

- IGT CSEPS

  – May not include SIUs

  – CSEP rejection process no longer managed by Xoserve

    – Need to identify alternative data source

- Theft

  – SPAA data expected mid Jan

- Meter Exchanges

  – Does AUGE dataset include all reads?

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Analysis Summary

- Issue 8 – More Detailed Theft Analysis
  - Methodology developed and documented as addendum to AUGS
  - Calculation set up using simulated data
  - Data expected mid-Jan

- Issue 14 – Theft from PC2 sites
  - Methodology updated to differentiate based on site history (ex-PC1)

- Issue 21 – Improved Replacement Values in Consumption Calculation
  - Methodology updated to interpolate where possible
  - Not included in current UIG factors (consumptions not recalculated)

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Analysis Summary

- Issue 25 – Use of Static Correction Factors for Volume Conversion
  - Detailed assessment carried out
  - Methodology updated to include UIG based on actual atmospheric pressure (~75GWh)
  - Methodology updated to include UIG from meter temperature differences from assumed average of 12.2C
    - Insufficient evidence to recommend moving away from 12.2C average
    - UIG from meter temperature is therefore zero
  - Findings shared with UIG Taskforce

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UIG Taskforce Issue 12.2

- Use of Standard National Conversion Factor

- What are the issues that the industry wishes to address?
  - Daily UIG, Annual UIG, Billing?
  - Allocation, Reconciliation, AQ Calculation?
  - National vs Local?
  - Seasonal Normal vs Actual?

- Any approach based on using 'Actual' Temperature needs to be based on real measured meter temperatures
  - Recommend study to develop relationship between air temperature and meter temperature taking into account meter location and site type

UIG Taskforce Issue 12.2

- Meter Gas Temperature survey (outline scope)
  - Objective
    - To find a relationship between air temperature and gas temperature in meters
    - Could be used on day by day basis to provide an accurate volume conversion
  - Requires suitably sized sample to include
    - Sheltered, non-sheltered and indoor meters
    - Different market sectors
    - Different geographical locations
    - Several hundred sample sites required as minimum, potentially more depending on accuracy expectations
  - Requires temperature gathered over 12-18 months period to cover seasonal changes
    - e.g. garage based meters will be warmer than outside air temperature during winter and cooler than outside during summer

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UIG Taskforce Issue 12.2

- Timescales
  - Procuring a service provider (6m+)?
  - Generating a target sample (1-2m)
  - Procurement of measurement equipment and installation (9-12m+)
  - Obtaining data over period of time (12-18m)
  - Carrying out analysis – report/recommendations (2-4m could overlap data acquisition)
  - Implementation (industry wide or limited to UIG?)
- Cost
  - Depends on sample size and technical issues – likely to be several £'00k possibly £1m+
- Risks
  - Getting consumers to agree to have monitors installed is very challenging
  - If sample size too small, resulting model uncertainty may be too large

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UIG Taskforce Issue 12.2

- Option A – "Amend AUGE Process to re-distribute UIG based on estimated impacts of conversion factors (forecast basis)"

  - Methodology already updated BUT…

    - Assumes T_{av}=12.2C (no UIG) as data does not support alternative value

    - Assumes a single National value for T_{av} as UIG factors are at National level

    - Does not resolve the level of UIG, just redistributes it

    - Interdependency between AUG process and daily UIG calculation

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UIG Taskforce Issue 12.2

- Additional Suggestions (not considered in detail)
  - Continue to use ALP/DAF Scaling ("Do Nothing")
  - Record temperature at NDM sample sites (not necessarily all)
  - Use 'Actual' Temperatures in AQ calculation
  - Mandatory Volume Conversion
    - for daily read sites (PC1/PC2)
    - for more sites
  - Temperature Conversion for all sites (GTER currently allows this for all but 01B)
  - Separate Volume Conversion Error from UIG
    - CDSP estimate Volume Conversion Error daily based on temperature
    - Volume Conversion Error apportioned based on throughput for MPRs without volume conversion devices (greater incentive to install converters)
    - Remaining UIG apportioned using AUG factors
      - AUG Methodology would need to change

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Analysis Summary

- Issues 26, 27 & 29 – Correction Factor Issues
  - Issues identified and raised with CDSP for investigation
  - Impact assessment based on latest data shows insignificant contribution to permanent UIG
    - Assumes CDSP records are updated with site-specific CFs from MAMs

- Issue 28 – Accuracy of Volume Converters
  - Standards IGEM/GM5 & BS EN 12405 apply
  - 0.5% overall device error
  - No evidence of significant bias

- Issue 30 – CV Accuracy
  - Ofgem require absolute error in CV < 0.1MJ/m3
  - Analysis carried out by Dave Lander Consulting
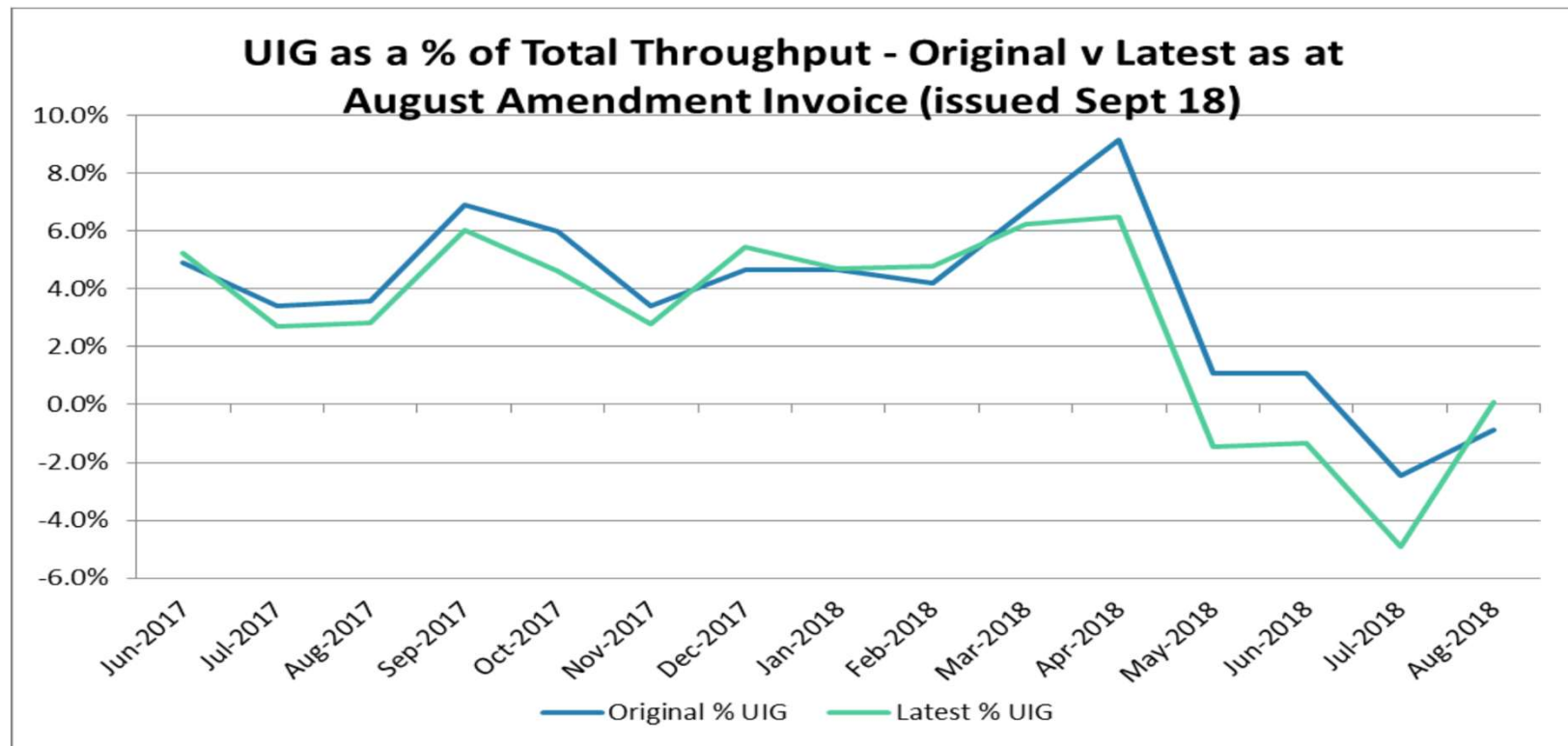 - No evidence of significant bias

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Analysis Summary

- Issues 31 – Changes in Product Class Populations
  - Extrapolation of population and AQ to forecast year
    - Capture ongoing trend
    - Avoid impact of step changes
  - Method described in AUGS and applied to data

- Issue 32 – Changes in Site Level UIG on Product Class Change
  - UIG Factors are NOT site specific but represent PC/EUC average

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Analysis Summary

- Issue 33 – Level of Permanent (Final) UIG Post-Nexus
  - UIG Taskforce Update to Ofgem, Nov 2018
  - 15 months since Nexus, UIG reduced from 4.65% to 4% through reconciliation

UIG as a % of Total Throughput - Original v Latest as at August Amendment Invoice (issued Sept 18)

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Final UIG vs Initial UIG

- Differences between Final UIG and (Initial UIG + Reconciliations)
  - AUGE Expert estimate of Final UIG assumes Seasonal Normal Weather
    - 2017 T_{av} 1C lower than average of 2011-2016 (~1.5TWh UIG)
    - UIG during 'Mini Beast from the East' was ~13%[*]
  - Meter Point Reconciliations
    - Final UIG is an estimate assuming all reconciliations up to Line in the Sand
    - Reconciliations only approximately assigned to month
    - Potential for reconciliations close to line in the sand
  - Offline Reconciliations (LDZ Metering Errors, DM & Unique Site Adjustments)
  - MOD0429 Adjustments
  - Asset Data Updates (e.g. CF) not reconciled

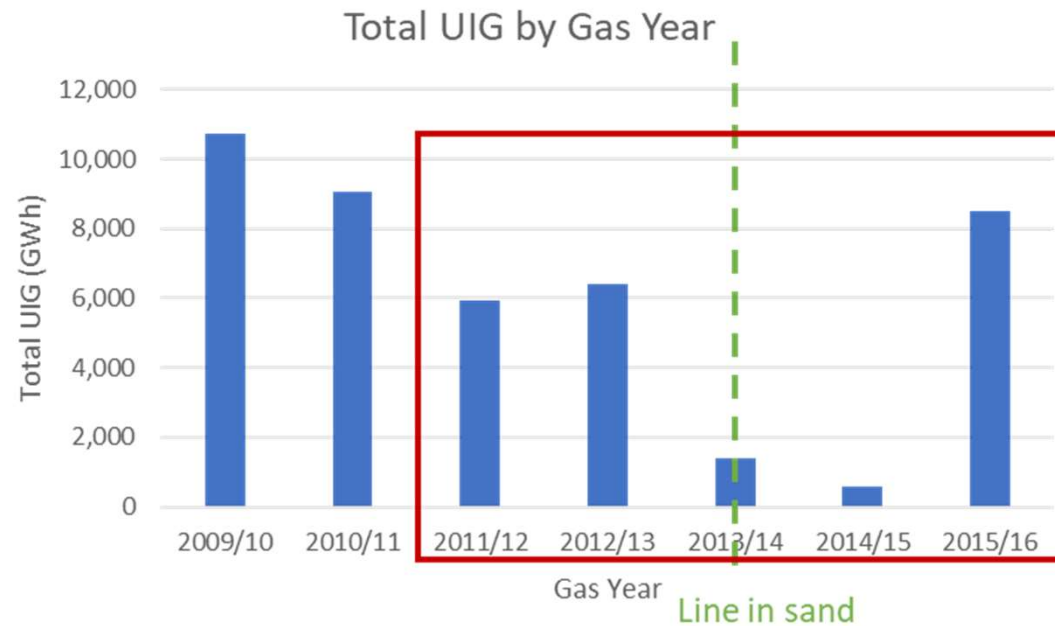[*] UIG Taskforce Sprint 1 Findings

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D+5 UIG: 1 Jun to 25 Dec

- Many UIG issues identified and resolved

- ALP/DAF uplift applied starting 1 Oct 2018

- Average (June-Dec) UIG: +4.6% in 2017 vs -0.2% in 2018

UiG % by Gas Day (D+5) - 13 LDZs

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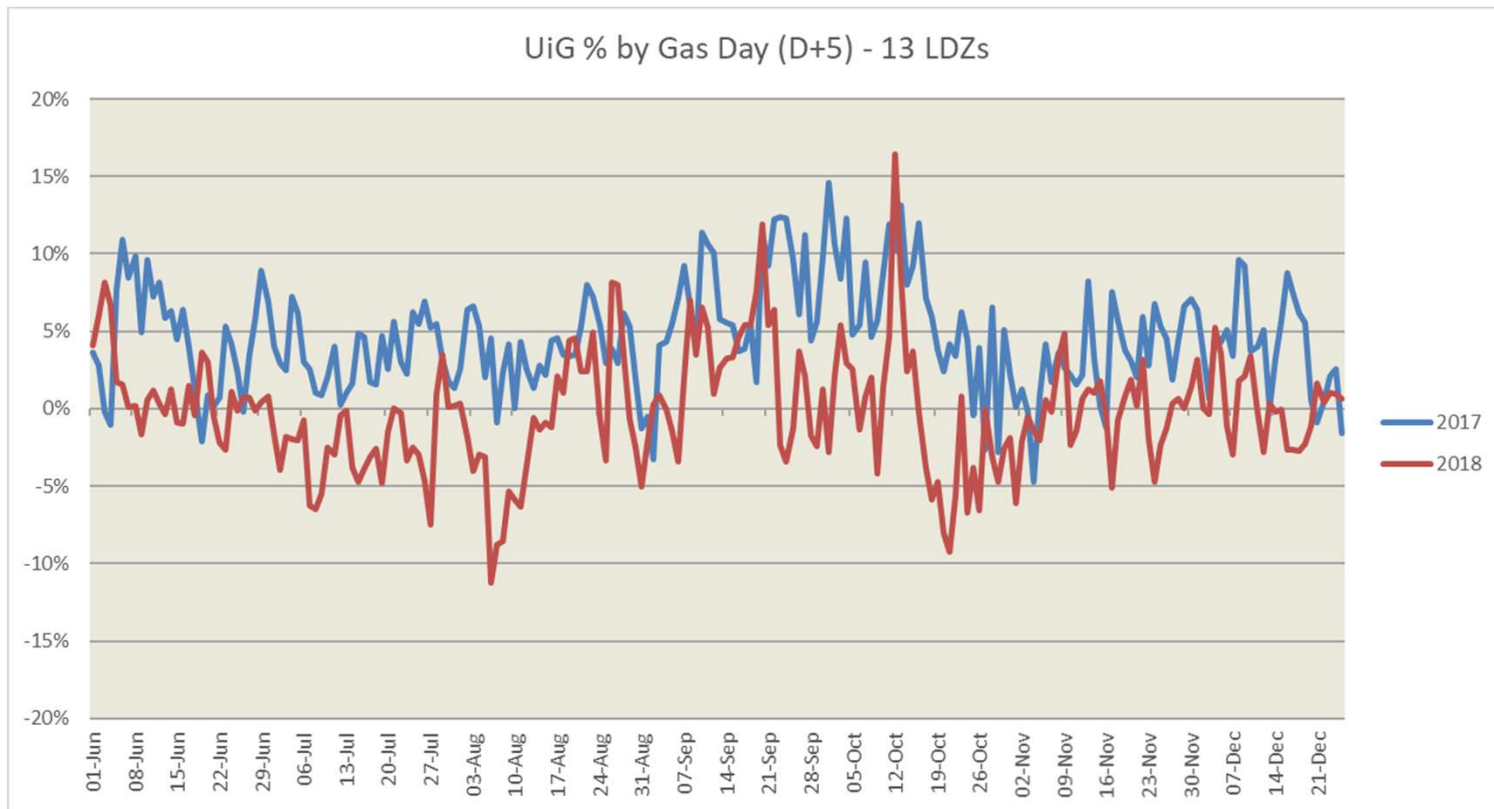
Final UIG Estimation (for 2018/19)

- AUG Expert determines which historic years to include
  - Relevance
  - Level of Reconciliation
  - Data Quality

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CSEP Consumption

- Pre-Nexus, no Meter Point level information
  - High degree of uncertainty in Consumption estimate
  - Based on AQ
- Post-Nexus, meter read information available
  - Opportunity to re-assess CSEP contribution to UIG
  - Review methodology going forward

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Analysis Summary

- Issue 35 – UIG from Meter Exchange

  – Initial high-level investigation suggests this could be a source of UIG

    – Closing read but no opening read can result in negative volume

    – Opening read but no closing read can result in missing volume

    – Opening and closing reads with gap can result in missing volume

  – Working with CDSP to understand issues

- Issue 37 – Discrepancies between Converted & Unconverted Meter Reads

  – Analysis requires additional information

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Analysis Summary

- Issue 39 – Accuracy of NDM Algorithm

  - Generally impacts temporary UIG only

  - Insights from Volume Conversion Analysis shared with UIG Taskforce

  - Introduction of ALP/DAF Scaling have mitigated impact at allocation

- Issue 49 – Accuracy of NDM Read Estimates

  - Consumption calculation does not differentiate between actual and estimated reads

  - Small % of Estimated Reads used

| Gas Year	Number of Reads	Number of Estimated Reads	% of Estimated Reads
2011	40,843,119	8,227	0.02%
2012	40,804,781	12,010	0.03%
2013	40,896,074	13,138	0.03%
2014	40,229,396	38,320	0.10%
2015	36,677,781	34,333	0.09%

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Summary of Methodology Changes

- Proposed new approach to Theft Split

- Differentiation between sites in PC2 (ex-PC1, ex-NDM)

- Improved Replacement Values in Consumption Calculation
  - Described in current AUGS but not included in UIG Factors

- Volume Conversion Errors Resulting from Static CFs

- Product Class Population/AQ – extrapolation method

- Update of Consumption Methodology to Handle Post-Nexus Meter Read Data
  - Update to logic as all new meter reads are converted to metric
  - Not included in current AUGS or UIG Factors

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Methodology Overview

- Evolving methodology

  – Similar methodology to previous years

  – Estimate Total Unidentified Gas & Split by EUC/Product class

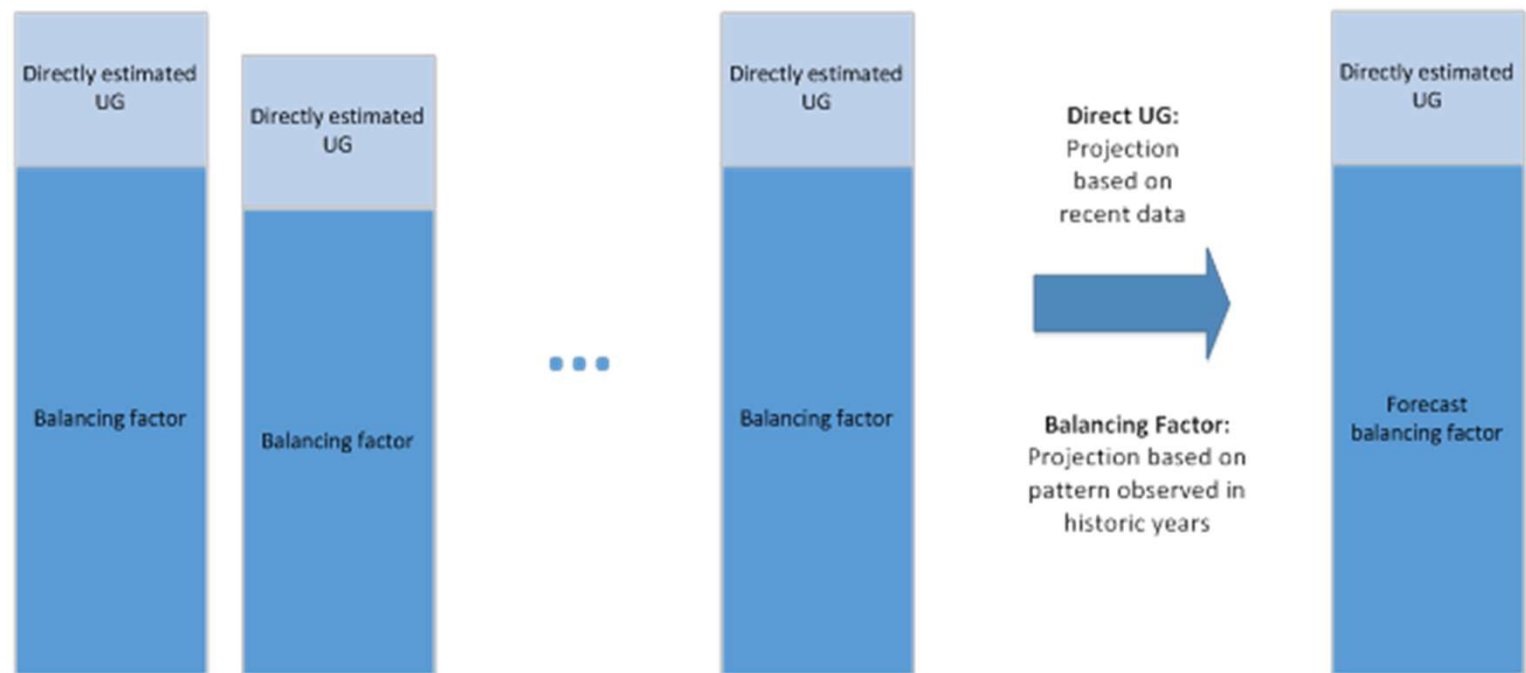 – More post-Nexus data available

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Total Unidentified Gas Estimation

- Need estimate of Total Unidentified Gas to calculate factors (Consumption Method)
- Estimate Total Unidentified Gas = LDZ Input – Sum of Consumption for all MPRs
  - LDZ Input Metered
  - Consumption is estimated based on meter reads, AQ etc

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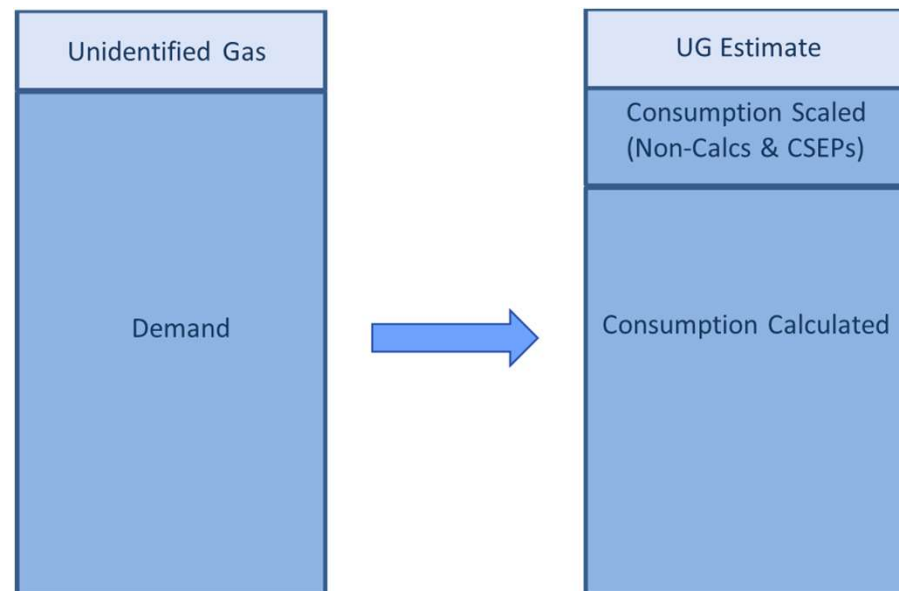
Forecast Unidentified Gas

- Balancing Factor
  - BF = Total Unidentified Gas – Directly estimated Unidentified Gas
  - Projected forward using data up to 2015/16
- Directly estimated Unidentified Gas
  - Most recent data available

Forecast Unidentified Gas Components (GWh)

Temporary Unidentified Gas

Permanent Unidentified Gas

Forecast Balancing Factor

Forecast Year

← Product 1-4 →
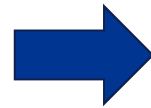
↑ EUC 1-9 ↓
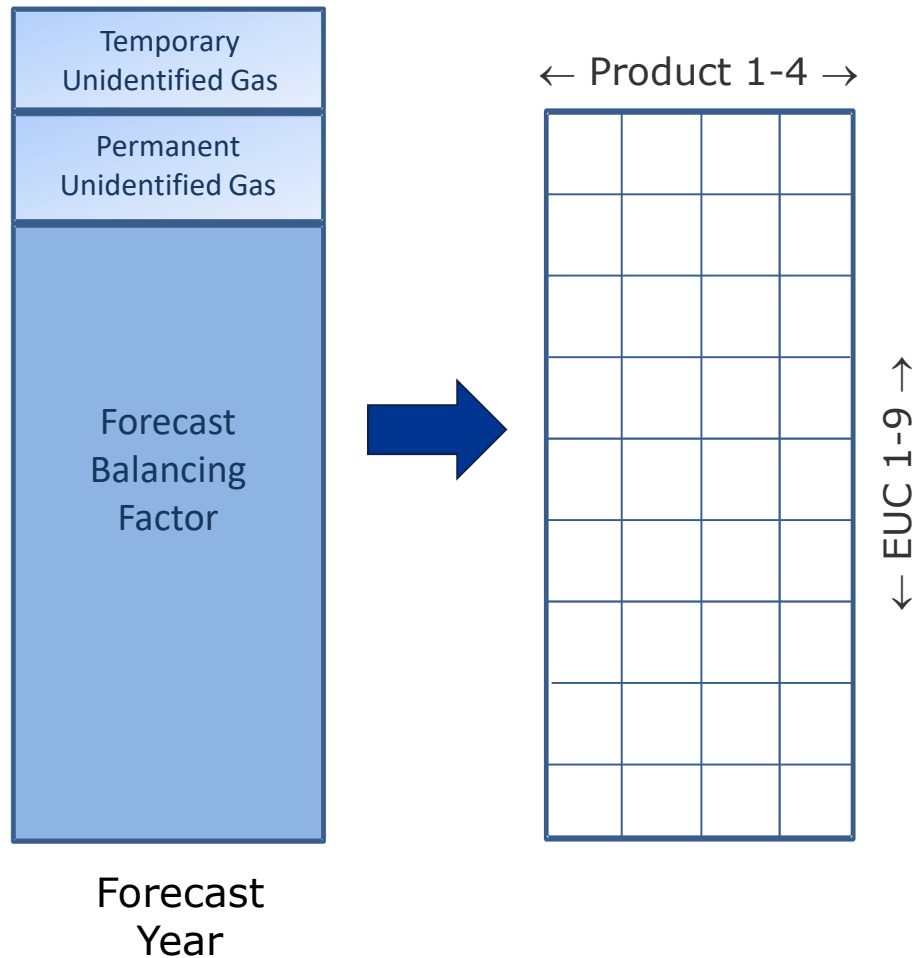
- Split of directly calculated Unidentified Gas categories is part of this calculation

- Balancing Factor is nearly all undetected theft

  – Split by throughput, amended for relative difficulty of stealing from different meter types and metering regimes

    – Smart meter, AMR, traditional meter

    – Daily meter readings, periodic meter readings

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Energy → Factors

Energy (GWh)   … divide by …   **Throughput (TWh)**   … x100 …   **Factors**

← Product 1-4 →   ← Product 1-4 →   ← Product 1-4 →

← EUC 1-9 →   ← EUC 1-9 →   ← EUC 1-9 →

11 January 2019

4 January, 2019

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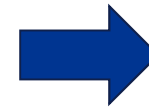
Population/Throughput Calculations

- Based fully on post-Nexus data
  - Actual Product Class

- Xoserve have supplied data for a number of points in time
  - Earliest is June 2017
  - Latest is August 2018

- Establish trends and extrapolate to April 2020
  - Full 36-way Product/EUC split
  - Avoid duplicating effects of step changes

- Total Smart Meter population (large suppliers) from BEIS Q2 2018 Report
- AMR population (small suppliers, EUC 02B and 03B) from ICoSS
  - Split Product Class 4 into Smart and traditional meters
  - All sites in EUCs 04B and above are required to have AMR

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Population/Throughput Calculations

Market Sector	Smart Meter / AMR Population 30/06/2018	Smart Meter Population 31/03/2020	Smart Meter Percentage 31/03/2020
Domestic	4,891,475	9,572,023	45.9%
Non-Domestic	143,496	185,983	36.0%

Domestic Smart Meter Installations by Quarter - Actual and Forecast

Non-Domestic Smart Meter Installations by Quarter - Actual and Forecast
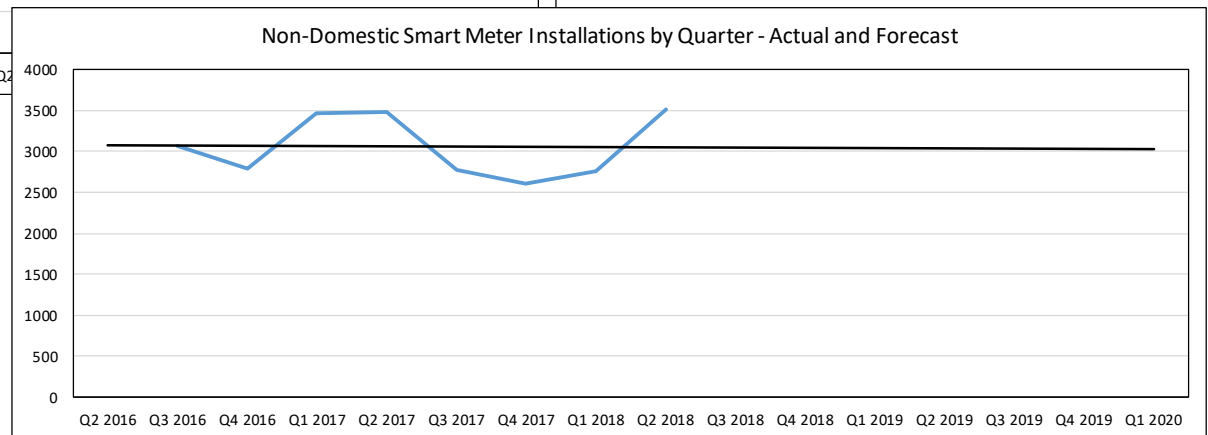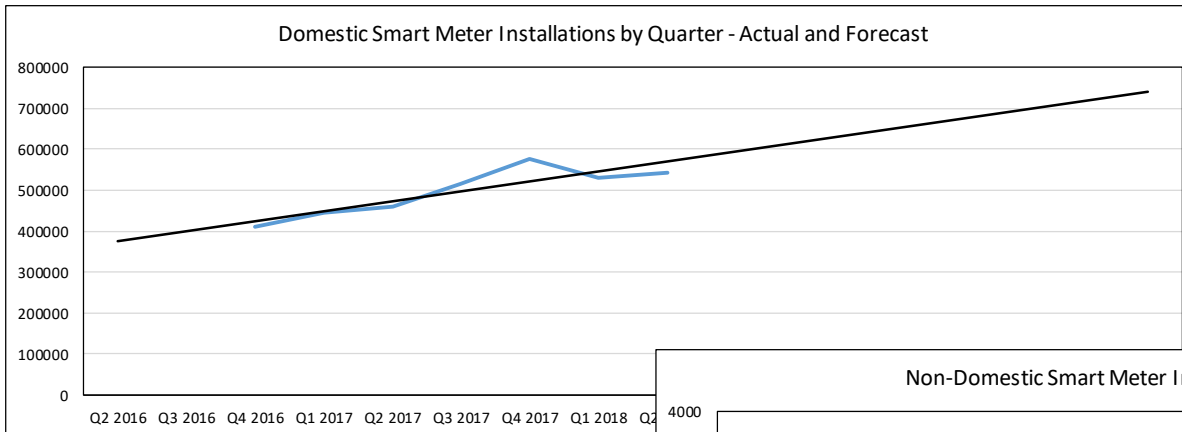
Population Forecast by EUC and Product Class

1st April 2020

Number of Sites

	01B	02B	03B	04B	05B	06B	07B	08B	09B	Total
Product 1	0	0	0	0	0	0	0	0	322	322
Product 2	18	104	21	49	76	251	250	284	0	1,053
Product 3	115,516	23,289	10,154	2,676	607	172	57	23	0	152,493
Product 4	24,265,451	184,875	37,290	17,259	4,337	1,415	509	195	0	24,511,332
Total	24,380,984	208,267	47,465	19,984	5,021	1,839	816	502	322	24,665,200

Number of Sites (Percentage by EUC)

	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Product 2	0.00%	0.05%	0.04%	0.24%	1.52%	13.68%	30.68%	56.53%	0.00%
Product 3	0.47%	11.18%	21.39%	13.39%	12.10%	9.34%	6.95%	4.60%	0.00%
Product 4	99.53%	88.77%	78.56%	86.37%	86.38%	76.98%	62.37%	38.88%	0.00%

Based on CDSP asset data from Jun 2017 – Aug 2018 extrapolated to April 2020

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Throughput (AQ) Forecast by EUC and Product Class

1st April 2020

Aggregate AQ (GWh)

	01B	02B	03B	04B	05B	06B	07B	08B	09B	Total
Product 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57,808.7	57,809
Product 2	0.5	9.8	11.6	69.5	331.8	2,613.0	5,193.9	11,884.3	0.0	20,114
Product 3	2,046.8	3,639.9	4,483.9	3,141.2	2,107.7	1,523.4	1,143.3	919.7	0.0	19,006
Product 4	325,477.8	24,737.2	16,776.8	20,751.7	14,627.3	12,673.0	10,324.9	7,720.0	0.0	433,089
Total	327,525.1	28,386.9	21,272.2	23,962.4	17,066.8	16,809.5	16,662.1	20,523.9	57,808.7	530,017.6

Aggregate AQ (Percentage of Total)

|	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.91%
Product 2	0.00%	0.00%	0.00%	0.01%	0.06%	0.49%	0.98%	2.24%	0.00%
Product 3	0.39%	0.69%	0.85%	0.59%	0.40%	0.29%	0.22%	0.17%	0.00%
Product 4	61.41%	4.67%	3.17%	3.92%	2.76%	2.39%	1.95%	1.46%	0.00%

Based on CDSP asset data from Jun 2017 – Aug 2018 extrapolated to April 2020

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Shipperless/Unregistered Sites

- Snapshots Sep 2011 – Sep 2018

- EUC from AQ (supplied in snapshots)

- Split as appropriate for
  - Pre/post Mod 410A (using Effective Date)
  - Pre/post Mod 424 (using Isolation Date)
  - Pre/post Mod 425 (using Isolation Date)
- Split between Temporary and Permanent using existing rules
- Split between Products for each EUC
  - These sites do not have a defined Product Class
  - Therefore split using tables in previous slides

- Trend over time → extrapolate to forecast year

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Shipperless/Unregistered Sites – Example Trend

- Each trend needs to be constructed using a piecewise approach
- Effects of relevant Mod over time

UG (GWh): Permanent Pre-Mod Orphaned Sites, Product 4, EUC 01B, EA LDZ
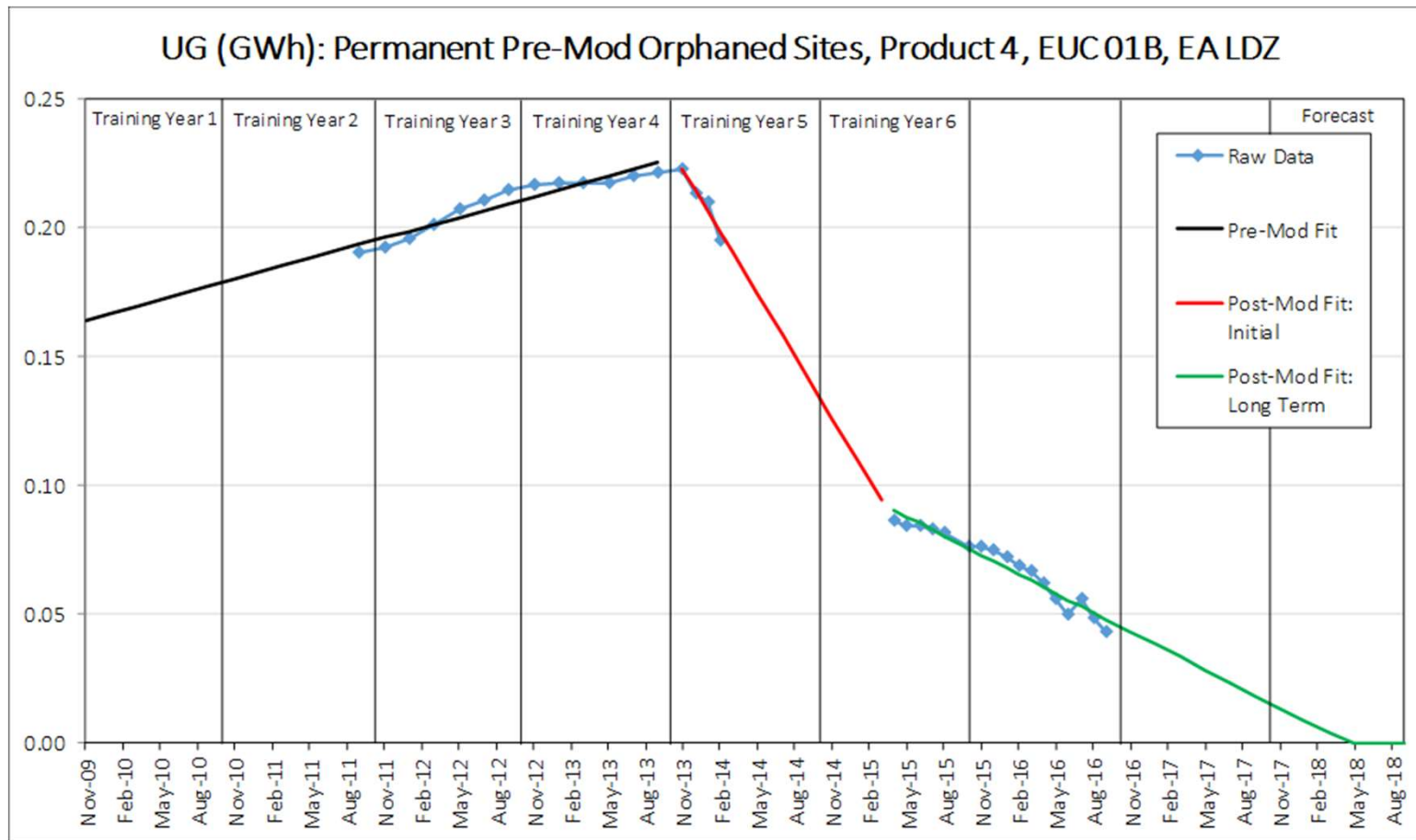
Shipperless/Unregistered Sites

- All relevant Mods well established
  - Latest is Mod 425, effective from 01/04/2014

- Effects can be tracked with the set of snapshots available
  - Construct piecewise trends

- Split each Unidentified Gas category into
  - Pre- and post-Mod sites
  - Permanent/Temporary
  - LDZ
  - EUC
  - Product Class

- 1872 trends for each main Shipperless/Unregistered Unidentified Gas category

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iGT CSEPs

- Snapshots Jan 2015 – Jun 2017 (Unknown Projects – new data source needed)

- Unregistered sites on known CSEPs (new data source needed)

- Registered sites on known CSEPs

- EUC split taken from Registered sites on known CSEPs
  - Applied to Unknown Projects

- Add Unidentified Gas from Unregistered sites on known CSEPs

- Split between Product Class for each EUC
  - Site-by-site information not available for CSEPs
  - Therefore split using tables in previous slides

- Split between Temporary and Permanent using existing rules

- Trend over time → extrapolate to forecast year

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iGT CSEPs – Example Trend

Example from EM LDZ – one of 468 trends for iGT CSEPs Unidentified Gas

iGT CSEPs UG (GWh): EM LDZ, Product 4, EUC05B

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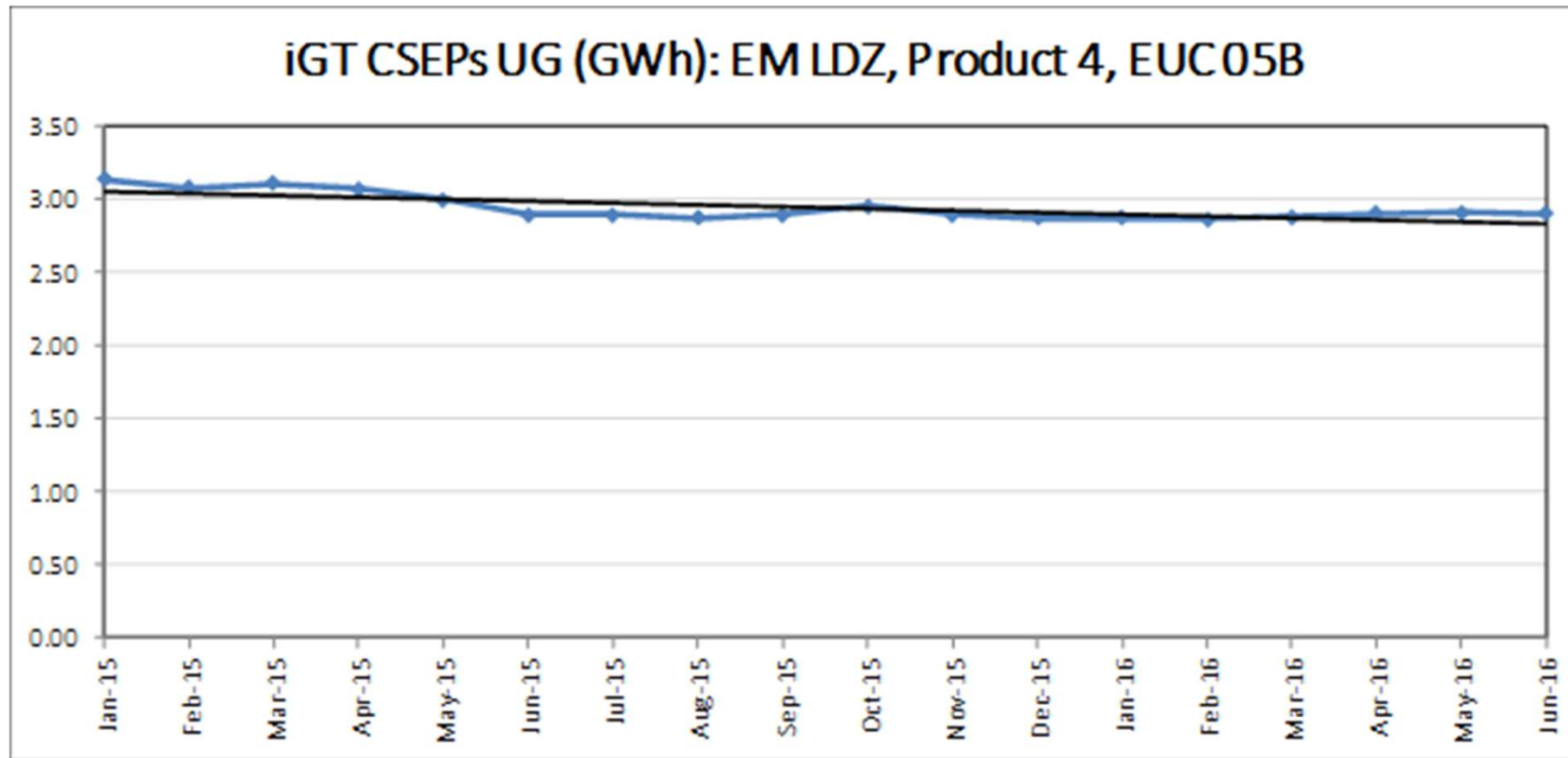
Consumer Meter Errors

- Meter capacity report

- Identify meters operating at extremes of their range
- Use AQ and Meter Capacity from report
  - Under 1% of capacity → under-read
  - Over 95% of capacity → over-read

- EUC from AQ
- Look up Product Class from asset data

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Consumer Meter Errors

- Calculate net over/under read for each EUC/Product Class combination

- Unidentified Gas from this source all Permanent

- Data limited to one snapshot per year
    - Trends are limited but there is now enough data to calculate them
    - EUC/Product Class split, individual trend for each
    - Extrapolate to forecast year

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Volume Conversion Errors

- Pressure Correction
  - Calculate Correction to Standard CF

$$CF_{err}^{std} = \left[\frac{(P_{av} - 1013.25)}{1013.25}\right] * 1.0098/1.02264$$

  - Apply to SN Consumption for all Meters without Volume Conversion
  - Calculate additional adjustment for Meters with High CF (higher operating pressures)
    - Found to be negligible (~0.2GWh/annum)

- Temperature Correction
  - Calculate Correction to Standard CF

$$CF_{err} = \frac{(273.15 + 12.2)}{(273.15 + T_{av})} - 1$$

- Apply to SN Consumption for all Meters without Volume Conversion

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Shrinkage

- Shrinkage Error
  - The AUGE Framework has been updated to exclude this from the Unidentified Gas analysis

- CSEP Shrinkage
  - No CSEP Shrinkage element in the current settlement process
  - Feeds into UIG and hence included in the Unidentified Gas analysis

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CSEP Shrinkage Calculation

- Data from DNs
  - Mains populations and number of customers (aggregate LP)
  - Network models (Cadent)
    - Mains populations and number of customers by network

- Estimate of mains length per customer from network models
  - Network sections selected using polygons
  - Similar composition to CSEPs
    - Small, non-rural, heavily domestic
  - Sense check using aggregate data from other DNs

- Use CSEP customer numbers to estimate mains length
- Leakage rates from NLT used to estimate leakage
  - Assume CSEPs are all PE

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Theft

- Undetected Theft is assumed to be the main component of the Balancing Factor

- Historic detected Theft affects the total Unidentified Gas calculation for the training period

- Theft data for full training period available
- Required as aggregate figure for each LDZ only
  - Individual figures for each training year

- Most Unidentified Gas from detected Theft is temporary
  - When it is detected within reconciliation period
  - Unidentified Gas from Thefts detected later than this goes into Balancing Factor

- Feeds into Consumption Method calculation for total Unidentified Gas

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Theft Data

- Data from Xoserve records is detailed but incomplete
  - Includes vital fields for theft Unidentified Gas calculation
  - Does not include all thefts

- Data from annual Theft of Gas report is at a summary level but is more complete
  - Considerably more thefts reported by Suppliers to SPAA than by Shippers to Xoserve
  - More thefts were actually billed each year than were reported to Xoserve by the Shippers

- GWh stolen per year calculated using Xoserve data and scaled to Theft of Gas report total level
  - Each theft can be assigned to a Product Class directly, but data is only required at an aggregate level for this analysis

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Balancing Factor Split

- Assumed to be mainly undetected theft
- Split based on throughput for site categories that can be subject to theft
  - Product Class 1 and EUC 09B excluded

- High limit: Smart Meters and AMRs have the same theft levels as other meters
- Low limit: Smart Meters and AMRs have no undetected theft
- Best estimate – midpoint

	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Product 2	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.03%	0.07%	0.00%
Product 3	0.23%	0.40%	0.49%	0.35%	0.23%	0.17%	0.13%	0.10%	0.00%
Product 4	78.16%	7.12%	5.21%	2.29%	1.61%	1.40%	1.14%	0.85%	0.00%

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Unidentified Gas Factors

Supply Meter Point Classification	Class 1	Class 2	Class 3	Class 4
EUC Band 1	0.13	4.12	53.93	93.40
EUC Band 2	0.13	3.69	49.68	111.48
EUC Band 3	0.13	3.44	46.65	121.16
EUC Band 4	0.13	3.26	44.62	45.14
EUC Band 5	0.13	3.05	43.38	43.86
EUC Band 6	0.13	2.74	42.74	42.58
EUC Band 7	0.13	2.21	42.47	42.38
EUC Band 8	0.13	1.37	42.37	42.17
EUC Band 9	0.13	0.13	0.13	0.13

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Unidentified Gas Factors

UIG Factors

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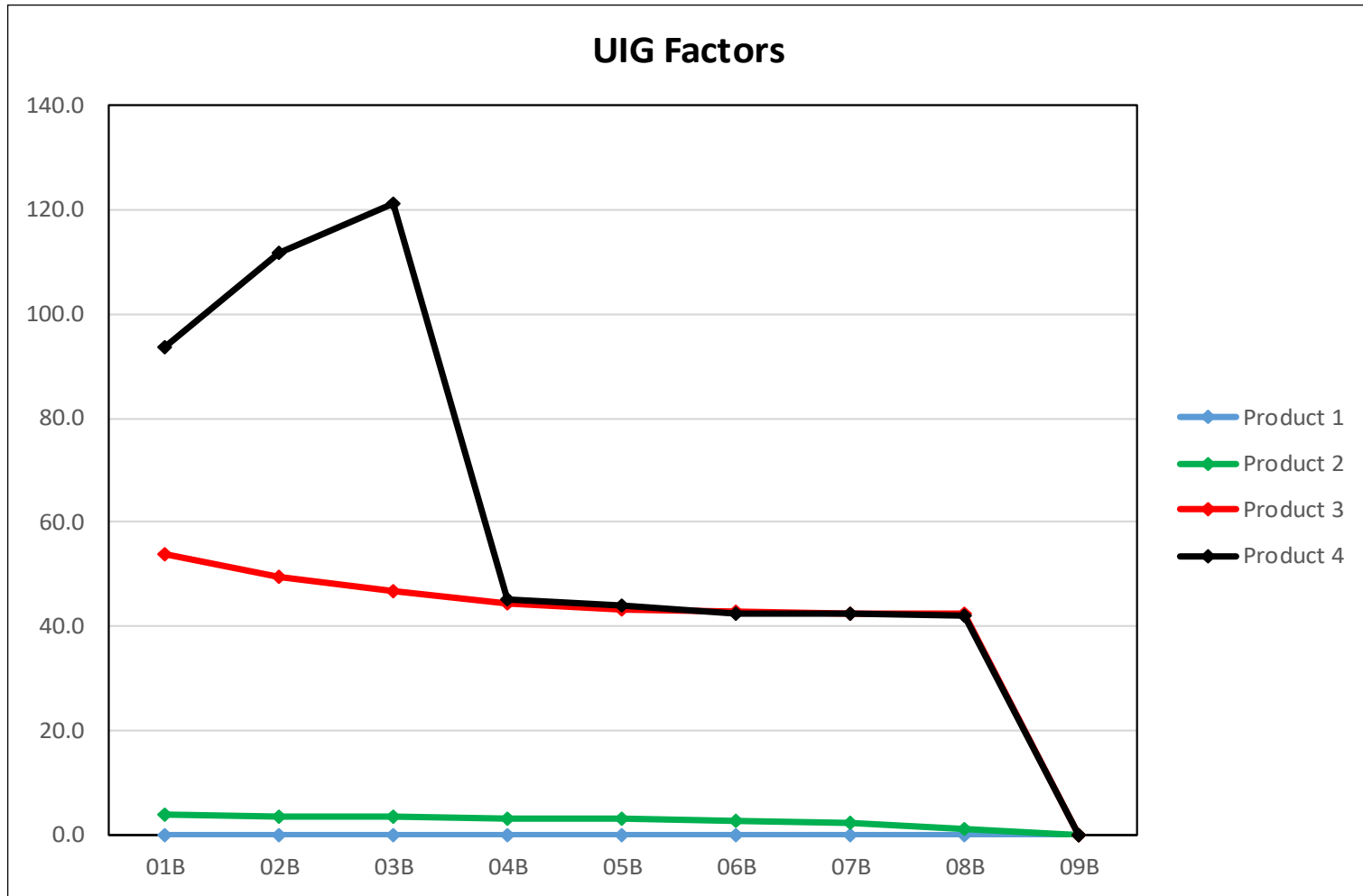
Modifications & Industry Changes

- UNC Modifications

  - 0654S Mandating the provision of NDM sample data

  - 0658 CDSP to identify and develop improvements to LDZ settlement processes

  - 0659S Improvements to the Composite Weather Variable

  - 0664 Transfer of Sites with Low Read Submission Performance from Class 2 and 3 into Class 4

  - 0672 Incentivise Product Class 4 read performance

- DSC Change Proposals

  - XRN4621 Suspension of the Validation between Meter Index and Unconverted Converter Index

  - XRN4665 Creation of New EUCs

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Next Steps

- Consultation Period 1 - 22 Jan

  – TWG to provide responses to AUG Expert asap

  – AUG Expert to provide written feedback to responses

  – Meeting to discuss feedback 15 Feb

- AUG Expert to prepare Modified AUGS & Table by 5 Mar

  – Table will be based on latest data where possible

    – Updated consumption calculations

    – Theft data

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Thank you

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