

Section D: High Level Solution Options

D1: Solution Options

<p>Solution Option Summary:</p>	<p><u>XRN5298 - H100 Fife Project - Phase 1</u></p> <p><u>Background</u></p> <p>SGN are developing a world-first 100% hydrogen network in Levenmouth that will bring renewable hydrogen into homes in early 2023, providing zero-carbon fuel for heating and cooking. In the demonstration's first phase, the network will aim to heat around 300 local homes using clean gas produced by a dedicated electrolysis plant, powered by a nearby offshore wind turbine.</p> <p>The <u>H100 Fife demonstration</u> is set out to prove the role that hydrogen can play in decarbonising heat and will comprise of an end to end system, including power generation incorporating offshore wind, hydrogen production, storage, pressure reduction, odorisation, distribution and consumer connections serving domestic hydrogen meters and appliances.</p> <p>Approximately 300 end consumers in Levenmouth will be asked if they want to take part in the demonstration (opt in). For those consumers taking part they will have, along with the installation of a hydrogen compatible meter, their gas appliances changed (i.e. boilers, cookers, gas fires, gas meters) to ones that can run on 100% hydrogen.</p> <p>H100 Fife is a critical demonstration, funded by the Ofgem Network Innovation Competition (NIC) and a Scottish Government Grant, to show that 100% hydrogen can play a role in the future of gas and help the industry achieve the UK Government Net Zero targets by 2050, and 2045 in Scotland. As well as showing that 100% hydrogen can be used as an alternative to natural gas, the demonstration must ensure that consumers that opt in to the H100 Fife demonstration:</p> <ul style="list-style-type: none">• Can opt out of the demonstration – i.e. revert back to natural gas provisions should they choose to• Can switch their Shipper and/or Supplier whilst participating in the demonstration• Not be (negatively) financially impacted, participation is on a cost neutral basis• Have any disruption kept to a minimum <p>From a central systems perspective these sites will continue to be subject to settlement processes so the CDSP have been looking at how it can support this demonstration to achieve the above within the timescales of its first phase (targeting November 2022 Major Release).</p>
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Please note that, as yet, no confirmed end date for this demonstration has been set. The Government are aiming to decide on whether hydrogen is proven as an alternative to natural gas by 2025. These consumers may remain on hydrogen for a number of years until an enduring, long-term solution is agreed by the industry.

Calorific Value (CV)

The CV of 100% hydrogen is greatly different than the CV of natural gas (hydrogen CV is approx. 12, whereas natural gas CV is approx. 39.2). This means that a greater volume of hydrogen needs to flow through the meter to burn the same amount of energy (kWh) as natural gas.

If the Flow Weighted Average Calorific Value (FWACV) attributed to the Local Distribution Zone (LDZ) that these sites reside within were used to calculate volume, it would appear as though these sites were utilising approx. 3 times the amount of energy they are actually consuming (based on the volume to energy calculation currently performed to derive Settlement charges).

If the hydrogen CV were to be used in the current FWACV process, the CV for the specific Scotland LDZ (SC) would be capped at 13, in accordance with the obligations set out in the **Gas (Calculation of Thermal Energy) Regulations**. This would mean that hydrogen energy would be overstated, and natural gas understated which would impact energy balancing and settlement processes for all sites within the specific LDZ. For the avoidance of doubt, this would include sites not taking part in the demonstration.

For reference, the CV of natural gas is measured at over 110 different locations on the pipeline system. Each LDZ has a number of these measuring locations within it. The CV from all the locations is taken and a FWACV is determined for each LDZ. The FWACV is capped at 1MJ/m³ (megajoule per cubic meter) above the lowest CV value for that LDZ. This FWACV CV (for natural gas) is currently sent to Shippers, via the .SC9 file, and published on National Grid's MIPI website.

The proposal under the H100 Fife demonstration is to declare a CV of approx. 12MJ, and that this CV is not included in FWACV calculations. As part of the project the H100 Fife CV will be defined prior to go-live.

Discounted Solution Overview (for information only)

Following high-level requirements gathering for XRN5298, these options have been considered and discounted due to constraints detailed below:

- Create a new LDZ (specifically for end consumers that have opted into the hydrogen demonstration) so that the hydrogen specific CV can be applied to each MPRN in that LDZ.

Primary Constraint The new LDZ would have to be created across the industry, including Gemini and UK Link, which cannot

be achieved within the timescales of the demonstration. Therefore, primarily due to time constraints and impacts to customers, this solution option has been discounted.

- Create a new Scottish Independent Network (these are effectively LDZs with discrete MPRNs and arrangements associated to them).

Primary Constraint This was investigated as an alternative to setting up a new LDZ however as many of the processes are mirrored to that of an LDZ it is just as complex and cannot be achieved within the timescales of the demonstration. Therefore, primarily due to time constraints and associated impacts to customers, this solution option has been discounted.

- Apply an Annual Quantity (AQ) backstop to prevent the AQ from becoming impacted by the increased volume. Compensation payments would be processed and issued to the Shipper who must pass these onto the Supplier and ultimately the end consumer.

Primary Constraint The AQ would not be accurate over time as multiple AQ Backstops would need to be applied. The compensation payments are likely to be 3 times the billed position and the end consumer may, for a period of time, be financially disadvantaged (depending when the compensation payment is processed) therefore the solution is not sustainable, nor fair, to impose on end consumers. This solution option has been discounted primarily on the basis on customer disadvantage.

- Rather than using the standard Conversion (correction) Factor (where an AQ is less than 732,000 kWh the standard conversion factor is 1.02264) a value will be determined and used to effectively convert the hydrogen volume into natural gas volume.

Primary Constraint The Gas (Calculation of Thermal Energy) Regulations would require either updating or a derogation applied which cannot be achieved within the timescales of the demonstration. Also, UNC/IGT UNC recently introduced (MOD0681S / XRN4932) the authority for the CDSP to amend Conversion Factors at Supply Meter Points where the AQ goes above or below 732,000 (with the standard Conversion Factor being applied for AQ's below), therefore a Modification or derogation may be needed to exclude demonstration MPRNs from this rule. Therefore, primarily due to time constraints, this solution option has been discounted.

- Calculate, and record, the CV for every MPRN, including MPRNs that are not included in the demonstration, which would be used to calculate energy.

Primary Constraint Changes would be required to multiple legislations, codes and systems throughout the gas industry. As it has yet to be determined that hydrogen will be used in the long term a change of this scale is not yet required. Therefore, this solution option has been discounted on the basis of the scale of industry disruption required for implementation.

Change/Solution Overview (for representation)

Two viable high level solution options have been developed further and are presented here for industry consideration and representation. For clarity, the below options have been assessed as suitable solutions to support smaller scale 100% hydrogen demonstrations, including the hydrogen village trials programme. Further engagement and discussion will be undertaken across the industry to develop solution options for hydrogen conversion roll out at scale.

Option 1: Consumption Adjustment: Use the hydrogen CV to reverse calculate the volume that would have been used had the meter been flowing natural gas

This solution option will apply a consumption adjustment to adjust the volume following receipt of a Valid meter read where a Reconciliation Period is generated or updated.

When a Valid meter read is received, triggering reconciliation, the volume and energy will be calculated as per standard processes, using the LDZ FWACV. The energy will then be recalculated, using the hydrogen CV, and a consumption adjustment will then be applied to override the original volume calculated.

The CV for hydrogen will be calculated, provided and issued by SGN to the relevant Shippers. This will be in addition to the existing .SC9 file which contains the FWACV data.

The details used to calculate Shipper Settlement and Reconciliation charges will be made available in existing invoicing files and supporting information datasets. Under this option it is recognised that downstream of Shippers, Suppliers may need to consider associated Consumption Adjustment details when billing end consumers.

Option 2: Amend the Multiplication Factor (MF) within the volume to energy calculation

This solution option will use a MF developed/defined specifically for hydrogen meters. When a Valid read is received this value will be used in the calculation of consumption to account for the difference in volume that is required for hydrogen to deliver the equivalent energy of natural gas.

Market Domain Data (MDD) will need to reflect the defined MF. This will be dependent on agreement from the meter manufacturer(s) that when updating the MDD with the hydrogen meter they will include the developed/defined MF.

It is expected that the standard process for updating meter details in CDSP systems will continue i.e. MAM installs the meter and provides

	<p>details to the Supplier, Supplier provides the details to the Shipper and the Shipper provides the details to the CDSP.</p> <p>General considerations/proposals for both Solution Options:</p> <p>Both solution options would need to take into account the following considerations:</p> <ul style="list-style-type: none"> • <u>Notification of MPRNs in the demonstration</u> – It is proposed that the existing Network Project Flag, in Data Enquiry Service, will be utilised to allow users to identify sites included in the demonstration. SGN will be responsible for maintaining this data item in the Supply Point Register. <p>A notification will also be issued to Shippers when they take on a MPRN that is included in the demonstration.</p> <ul style="list-style-type: none"> • <u>Ofgem</u>– Each option has been discussed with Ofgem and the solution option that is approved by the industry will be communicated to Ofgem to ensure consumers remain protected and are not disadvantaged. • End consumers who take part in the demonstration may remain on hydrogen under the solution option chosen, for a number of years, until an enduring long-term solution is agreed by the industry. • For the duration of the demonstration the CDSP will look to provide visibility of these sites within the Data Discovery Platform (DDP). • To support accurate billing of end consumers, gas Suppliers may need to be provided with, via their Shipper, the same information that the CDSP has used to calculate settlement charges. This is to enable them to accurately calculate the end consumers energy usage and associated charges. <p><u>High Level Solution Option</u></p> <p>For reference please see attached HLSO for XRN5298</p>
Implementation Date for this Solution Option:	Proposed Implementation Date of November 2022 (UK Link Major Release)
Xoserve preferred option: (including rationale)	<p>Option 2: Amend the Multiplication Factor (MF) within the volume to energy calculation</p> <p>As this option utilises existing MDD data that every Shipper and Supplier will use there is a significant reduction of risk that the end consumer will be billed incorrectly. This option is less complex than option 1, with lesser impact on CDSP systems.</p>
DSG preferred solution option: (including rationale)	Being presented at DSG on 25 th October 2021
Consultation closeout:	08/11/2021

Section E: Industry Response

Solution Options Review

Please consider any commercial impacts to your organisation that Xoserve need to be aware of when formulating your response

E1: Organisation's preferred solution option

User Contact Details:	Organisation:	Octopus Energy
	Name:	Dion Tickner
	Email:	dion.tickner@octoenergy.com
	Telephone:	07927978345
Organisation's preferred solution option, including rationale taking into account costs, risks, resource etc.	<p>The options put forward are not entirely clear. Our understanding is that you are asking suppliers to implement extensive and costly changes to billing platforms in both these scenarios? As per the pledge that participants 'will not be (negatively) financially impacted, since participation is on a cost neutral basis', the onus ought to be removed from suppliers to calculate the difference in charges and this responsibility should rest with SGN as the administrators of the scheme - the cost must be built into the trial costs not the supplier costs as this will significantly and negatively impact all consumers.</p> <p>Contrary to the listed constraint, our view is that the most feasible option would be to apply an Annual Quantity (AQ) backstop to prevent the AQ from becoming impacted by the increased volume. Compensation payments would be processed and issued to the Shipper who must pass these onto the Supplier and ultimately the end consumer, as is already done in other hydrogen trials. Though temporarily at a financial disadvantage, participants would, on aggregate, be no worse off than the alternative options outlined in this document might leave them.</p> <p>Though also discounted, the proposal for a value that will be determined and used to effectively convert the hydrogen volume into natural gas volume rather than using the standard Conversion (correction) Factor would mitigate the need for a supplier to alter their billing process and pass costs to the end consumer in doing so. The installation of gas meters using emerging technology such as thermal-mass flow (for example in Secure branded SMETS2 gas meters) could offer a solution depending on how long it would take to update the relevant regulations.</p>	
Implementation Date:	Reject	
Xoserve preferred solution option:	Reject	
DSG preferred solution option:	Reject	

Publication of consultation response:	N/A
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E2: Xoserve' s Response

Xoserve Response to Organisations Comments:	<p>Thank you for you representation comments.</p> <p>We appreciate that a number of aspects of the proposed solutions have only been outlined at a high level at this stage, and that during detailed design we will need to work closely with impacted parties (notably Suppliers and Shippers) to ensure the solution being delivered to support this 100% Hydrogen Innovation Project is fully understood and can operate as desired with minimum impacts to all of the parties involved.</p> <p>Whilst we are actively supporting Settlement activities on an existing, blended Hydrogen Network Innovation Pilot in the form of HyDeploy 2, this is utilising a 20% injection of Hydrogen alongside natural gas within existing gas networks operated by Northern Gas Networks. When developing H100 Fife solution option, it was quickly ascertained that the materiality of the charge difference to consumers would be approximately 5 times greater. In order to protect end consumers it was confirmed that applying an AQ Backstop and issuing Compensation Payments would not be appropriate. We have therefore sought options that minimise impacts to our Shipper and Supplier customers, noting that the Consumption Adjustment will be performed automatically on receipt of a valid meter read, with the relevant charges and supporting information being provided to Shippers. In addition, the intention of utilising Multiplication Factor is that this is applied in the charge calculation and would allow charges to be calculated accurately without the need to apply any adjustments or continuously compensate consumers.</p>
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Please consider any commercial impacts to your organisation that Xoserve need to be aware of when formulating your response

E1: Organisation's preferred solution option

User Contact Details:	Organisation:	SGN
	Name:	Sally Hardman
	Email:	sally.hardman@sgn.co.uk
	Telephone:	07970 019027
Organisation's preferred solution option, including rationale taking into	<p>SGN's preferred solution: Option 2 - Amend the Multiplication Factor (MF) within the volume to energy calculation</p> <p>SGN understand from discussions with Xoserve that this option will</p>	

account costs, risks, resource etc.	<p>be able to deliver the required changes to support accurate customer billing for the H100 Fife project (Phase 1 Hydrogen Neighbourhood) delivery within the required timeline. By utilising existing data flows within the MDD process it is believed this will minimise the impact to wider industry and will deliver the project requirements.</p> <p>We are mindful that should there be evidence to the contrary this option may require additional considerations.</p> <p>If this solution could be scaled up it could further facilitate Decarbonisation projects including that of the Hydrogen Village, which SGN is putting forward a proposal for as Phase 2 of H100 Fife.</p>
Implementation Date:	Approve
Xoserve preferred solution option:	Approve
DSG preferred solution option:	Defer
Publication of consultation response:	N/A

E2: Xoserve' s Response

Xoserve Response to Organisations Comments:	<p>Thank you for your representation comments.</p> <p>We look forward to continuing to work closely with SGN on H100 Fife Project over the coming months.</p>
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Please consider any commercial impacts to your organisation that Xoserve need to be aware of when formulating your response

E1: Organisation's preferred solution option

User Contact Details:	Organisation:	REC Code Manager
	Name:	Jon Hawkins
	Email:	jon.hawkins@recmanager.co.uk
	Telephone:	07584099273
Organisation's preferred solution option, including rationale taking into account costs, risks, resource etc.	We would support Option 1, applying a consumption adjustment where a reconciliation period is generated or updated, over the proposed use of the Multiplication Factor in the Meter Product Tables set out in Option 2.	
	We are concerned that the use of the Multiplication Factor in the Meter Product Table ties the Caloric Value to the Meter Asset, and presumes that a site will always use either 100% hydrogen, or	

	<p>100% natural gas, and that the Meter Asset will need to be replaced every time this changes. While it is expected that a new, hydrogen ready, meter will need to be installed for any 100% hydrogen site today, it is not known if the meter will need to be changed back if they exit the trial, or if this is suitable for future trials blending the use of hydrogen and natural gas.</p> <p>We do not believe that correcting this adjustment at the Meter Asset level is a good principle for this reason, as in the future the calculation of the Calorific Value will need to be more dynamic than a fixed value associated with the Meter Asset will allow. It makes more sense for this to be managed at the Supply Point level instead for this reason.</p> <p>Therefore, of the two options presented, we believe that the use of a consumption adjustment presents the best balance between implementing a quick solution that can be implemented in time for us in the H100 trials, that can also be scaled and adjusted for future Hydrogen trials and developments.</p> <p>Note: we haven't seen the DSG's preferred solution in the change pack, so have ticked 'Defer' only as we aren't aware of their recommendation to support or oppose this.</p>
Implementation Date:	Approve
Xoserve preferred solution option:	Reject
DSG preferred solution option:	Defer
Publication of consultation response:	N/A

E2: Xoserve' s Response

Xoserve Response to Organisations Comments:	<p>Thank you for you representation comments.</p> <p>The working assumption for Option 2 (Multiplication Factor) is that a 100% Hydrogen Meter will be installed to the properties associated with the H100 Fife Project. In addition, the Hydrogen being supplied to the property is serviced by a separate infrastructure, with the natural gas infrastructure remaining in place should a customer choose to revert back to a traditional gas supply during the Project.</p> <p>The rationale for taking into account the variance of Calorific Value at Meter level is to ensure Suppliers continue to be able to bill end consumers quickly and accurately without the need to wait for any adjustments to be performed within Settlement processes.</p> <p>We will continue to monitor our working assumptions and engage with customers including industry Code Managers throughout the detailed design phase of our project, and have confirmed with DSC Customers that we will look to revert to the alternative option</p>
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	(Option 1) should it later be identified that the assumptions we have relating to Multiplication Factor are invalid.
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Please consider any commercial impacts to your organisation that Xoserve need to be aware of when formulating your response

E1: Organisation's preferred solution option

User Contact Details:	Organisation:	EON
	Name:	Clare Manning
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	Telephone:	0
Organisation's preferred solution option, including rationale taking into account costs, risks, resource etc.	<p>Based on the information provided, our preference would probably be option two but it is unclear how either option will work in practice. Option two does appear less complex, but we are unclear if under option two the hydrogen specific CV would still need to be applied or not, if it is then we assume that manual adjustments would still be required.</p> <p>Learnings need to be taken from the Hydeploy project; it will need to be clearly communicated to both shippers and suppliers what system changes are required to support this trial and both need to be involved in any process design, and be kept updated throughout. The trial should not be rushed, and the end-consumer considered at all stages.</p> <p>Other things requiring consideration: How a supplier will be able to identify these customers within the change of supply process If this is to be via updated dataflows, this will span the implementation period of FMRS How a supplier will be notified of the hydrogen meter being installed How the opt out process will work and how the supplier will be informed How the meter install process will work; any upskilling of MAMs required How suppliers smart mandates will be impacted</p>	
Implementation Date:	Approve	
Xoserve preferred solution option:	Approve	
DSG preferred solution option:	Approve	
Publication of consultation response:	N/A	

E2: Xoserve' s Response

<p>Xoserve Response to Organisations Comments:</p>	<p>Thank you for you representation comments.</p> <p>We appreciate that a number of aspects of the proposed solutions have only been outlined at a high level at this stage, and that during detailed design we will need to work closely with impacted parties (notably Suppliers and Shippers) to ensure the solution being delivered to support this 100% Hydrogen Innovation Project is fully understood and can operate as desired with minimum impacts to all of the parties involved.</p> <p>We will be looking to taking lessons and experiences gained as part of the work we are performing to support the HyDeploy Pilots, and will be sure to take the other considerations you have kindly noted into account when progressing with H100 Fife.</p>
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Section F: Approved Solution Option

F1: Approved Solution Option

XRN Reference:	XRN5298
Solution Details:	Option 2 - Amend the Multiplication Factor within the volume to energy calculation
Implementation Date:	04/11/2022
Approved By:	Change Management Committee
Date of Approval:	10/11/2021