Question 1: Do you agree that this project should be approved, and at the value proposed?

We agree with the principle of the LTS Futures Project and support the proposed level of expenditure. However, we believe that the Deliverables from the £30 Million investment can be significantly improved to better support the feasibility of transition to H2 and we have set out our summary technical comments in an attachment. We believe it would be helpful for SGN to respond in detail to these challenges before the project is launched and consider adjustments to their plan to modify the Deliverables.

Question 2. Do you agree with our assessment of and additional requirements for SGN's project plan?

No comment

Question 3. Do you agree with our proposals on how we will hold SGN to account for the project deliverables?

No comments

Question 4. Do you have any views on the appropriate funding approach for this project?

No comment

Question 5. Do you agree with our assessment of SGN's proposed level of contribution and treatment of benefits in kind?

No comment

Summary Technical Comments

Our comments are set out in a number of key areas, below:

1. The 65 Evidence Gaps

- We understand that the HSE identified 65 evidence gaps which need to be filled to support a move to hydrogen and this project will cover 31 of the evidence gaps. We would like to understand how the 31 gaps are being filled and whether there are alternative options to achieve this at lower cost. It may be that the project is not required as laboratory testing of the existing LTS steel and desktop calculations will show whether it would be practical to reuse existing assets.

- It would be useful to understand the other options considered (including cost/benefit) to meet the project goals including closing the 31 HSE gap actions to show why they think this is the most economic option (e.g. why not just cut out a section of the pipeline, move it to a test centre and fill with hydrogen there, supplement with desktop modelling and save most of the £30 Million cost).

We do believe the scope can perhaps be developed to include additional deliverables. We believe there are critical issues in relation to LTS which are important in relation to a transition to Hydrogen but we do not know if they are part of the 65 Gaps. These include:

  - Reduction in diurnal storage and throughput capacity from lower CV
  - Impact of dust from higher velocities
  - Intelligent pigging of pipelines at higher velocities
  - Use of Reinforced Thermoplastic Pipe
  - Impact on Building Proximity Distances (BPD) from higher pressure

2. Pressure

- Many if not most LTS pipelines are operated at max 38 barg MOP as that keeps them below the ductile to brittle failure mode transition stress level (30% SMY). This allows lower BPDs reflected in pipeline routing and post commissioning land developments. Raising the MOP (or redefining it as utilising the available design factor) may raise significant issues

- Appendix L Table 23 mentions that the pipeline will be pressurised to 17 bar. Given the majority of LTS pipelines operate above 19 bar and this project will focus on the ability to also upgrade the MOP to allow for the additional capacity required for hydrogen it is suggested that a significantly higher operating pressure should be trialled subject to the fitness for purpose of the existing assets.

3. Linepack

- It is difficult to see the LTS in a H2 world without knowing what is downstream and how linepack is handled. For example, linepack for diurnal storage may need to be from the LTS in which case there may be no point uprating it as there may need to be a larger diameter

new one or at parallel pipeline. We have worked on H2 storage for truck use and do not believe (in many cases) that it will be feasible for high pressure H2 storage in towns and cities due to HSC/Comah which may require H2 diurnal in the LTS. In which case why repurpose the pipeline it if it has not got the capacity or the linepack?

- Diurnal storage in pipelines is the cheapest way to provide this essential storage, but only when built at the same time as transmission capacity, say by upsizing a planned pipeline. The storage requirement is likely to be approximately treble the equivalent volume of natural gas. Raising the upper pressure limit increases the pipe capacity, but this can be used for either storage or flow capacity (or reduced increase in both) at the same time. To increase both transmission (to deliver the same energy rate) and storage capacity (to meet consumer demand pattern) requires extra pipe volumetric capacity.

- With 1/3 the energy content, the linepack range would have to be around 3 times the existing pressure cycling range which leads to an exaggerated Damage Fraction count (as defined in TD/1 ed. 5 Section 6.6). Although the annualised fatigue figures currently are low, the lifetime allowances would increase with this extra pressure cycling.

4. Capacity

- We think it is highly unlikely that it will be feasible to try to recover the lost capacity with higher pressure and velocity and believe it is likely to need significant investment in new LTS pipelines. We believe the Project should review the use of Reinforced Thermoplastic Pipe (RTP) such as (for example) 6" Soluforce which is designed for up to 100 bar and is used in the Netherlands for H2 service.

- A significant length of LTS is in rural areas and this lends itself to parallel Soluforce pipelines and we believe SGN should review their network in Scotland to identify those parts with potential for parallel RTP pipeline in (substantially) the same easement/BPD

https://www.soluforce.com/track-record/a-global-first-hydrogen-application-of-flexible-composite-pipe.html

5. Dust and Velocity

- Under Section 3.6 Element 1 preparatory works as part of the integrity and condition assessment of the existing pipeline In Line Inspection (ILI) and hydrotesting is proposed. The trial makes no mention of cleaning the pipeline and assessment of dust which has the potential to cause problems with the higher velocities proposed. The project should confirm provisions for cleaning and monitoring dust before and during the trial, and an assessment of any dust related issues which may impact on future hydrogen service associated with high velocities.

- We believe that the issue of dust is critical and should be a key issue for this project. We have seen a lot of dust on 2 bar pipelines following installation of gas engine plants which increase flows. The word 'dust' is not mentioned in the paper.

- Older pipes are more prone to give up their internal lining, making more dust, this possibility should be reviewed in this project

6. Final Testing after Completion of the Project

- The capability to carry out In Line Inspection (ILI) should be assessed as part of the process to determine the effect of increased velocities and varied momentum of gas in the operation. The OLI equipment will need to be stable with velocity fluctuations in order to be sure that the data is reliable across a wide range of conditions.

- Although Section 3.6 Element 1 preparatory works confirms OLI and hydrotesting will be carried out, the Element 4 Live trial suggests the pipeline will be vented and purged back to nitrogen following the trial with no further testing. It would be prudent as part of the pipeline assessment to repeat the integrity tests that were carried out at the start of the trial i.e. a final OLI to compare with the fingerprint from the initial OLI to identify any impacts from hydrogen service, and also to carry out a repeat hydrotest to confirm continued integrity following hydrogen service.

7. Customer

- We believe it would be better if the project could at least supply a customer(s)as part of the demonstration and also if there was some enduring use for the pipeline including the new 3" hydrogen supply pipeline. Without knowing the details of the pipeline we cannot make any suggestions but the use of H2-natural gas blends for back up gas generation could be an opportunity as could segregating the pipeline for operation at 2 different pressures with compression and pressure reduction operated and tested

8. Project Delivery

- Under section 3.7 procurement SGN have consulted with framework contractors regarding the cost of the works and it is proposed to carry out a competitive process for procurement. However, it is not specified whether the works will be open to suppliers who are not on SGNs framework contract. As this is an innovation project we believe that the works should also be open to competent suppliers outside of the normal SGN framework to allow access to all available industry capability and innovation and provide the most cost effective solution for customers.