Energy Safe Victoria - Information Request – Hydrogen Safety – 17032022

Further to our meeting on the 11 March 2022, could you please assist us with answers to the questions below. They are with respect to APA's proposed capex of $37.9m for Business Case 200, Hydrogen safety and integrity.

In Energy Safe Victoria's opinion:

Safety and integrity issues

1. What are the likely points of entry of hydrogen into the VTS network?

   Any potential entry points would need to be connected to the VTS and have a positive pressure differential.

2. What are the circumstances in which hydrogen is likely to enter the VTS network, and what is the likelihood of this occurring?

   Connected H2 facilities operating at a higher pressure than the VTS could potentially introduce H2 in to VTS. However H2 could also be introduced into the VTS inner ring main which could impact the VTS.

   It is difficult to make assumptions on the likelihood as there are many factors that can influence this.

3. For each of these circumstances, what is:

   a. the likely amount of hydrogen that could potentially enter the VTS network at each entry point identified at question 1,

      Depends on the flow rate, operating pressure and the injection rate capability of the upstream entry point. as well as the length of time of injection.

   b. the expected frequency of any hydrogen entering the network at each entry point identified at question 1,

      It is difficult to determine expected frequency as ESV is not aware of any such hydrogen entry points currently. However, accidental injection would be a potential risk that will need to be assessed as a part of the facility's risk assessment.

   c. the likely pressure at which the hydrogen would enter the network at each entry point identified at question 1, and

      Please see response above.

   d. whether the amount of hydrogen potentially entering the network at each entry point identified at question 1 at that pressure poses a risk of damage such that mitigation would be required.

      Risk of damage is unknown as the impact of hydrogen on the VTS has not been determined at this stage Testing must be performed to prove the integrity of the VTS before H2 can enter the system.

4. What commitment is there from parties that they will be carrying hydrogen to the interface of the VTS network pipelines.

   ESV is not aware of any such commitments at this point in time.

What is the committed timing of hydrogen carriage in the Victorian networks and specifically, in the VTS?

Currently there is a project aiming to introduce a 10% Hydrogen/natural gas blend “Hyp Murray Valley” for which the final investment decision has not been made. ESV is not aware of any projects intending to introduce H2 into the VTS as at 29/4, however these projects move quickly and if H2 was to be introduced into the VTS, ESV would require proponents to demonstrate the integrity of the VTS. This can only be achieved by directly testing the impact that H2 would have on the VTS.

5. Who is responsible for mitigating the risk of hydrogen entering into their network: is it the network carrying hydrogen and/or the entity carrying the hydrogen on the adjoining network? Are you aware of risk mitigation being undertaken by adjoining networks to manage this risk?

   All network operators are responsible to ensure that they convey gas/products that are within specification and meet their license conditions

Making the network hydrogen ready

6. What information is required with respect to the pipe, welds, fittings to assess the pipeline’s capacity to safely carry hydrogen.

   Each pipeline and network is unique in terms of its design and operating parameters therefore each pipeline and ancillary equipment will need to be assessed for fitness for H2 transportation. It is a large and complex piece of work to determine whether a pipeline or network can safety carry hydrogen.

7. What knowledge of the ability of pipeline materials to carry hydrogen safely from other Australian projects or overseas projects is translatable to the VTS pipelines? ESV mentioned that ‘like for like’ can translate but ‘unique’ pipe could not. Could the ESV elaborate on this please.

   The point ESV was making here is that there may be research/testing from other Hydrogen projects which could apply to the VTS pipelines if there are similarities. This will require specialist engineering expertise to determine what is usable and what is not. The VTS is extremely unique and it is assumed that very little literature is available, therefore this is a very extensive and very important piece of work that must be conducted well in advance of H2 introduction into the VTS to ensure safety

   What grade/characteristics of pipe, welds, fittings makes it hydrogen ready versus not hydrogen ready.

   This is a very complex issue with many factors that could affect the outcome. It will require specialist engineering assessments to determine.

8. AER staff understand that it is the pressure, rather than the percentage of hydrogen in the gas mix, that causes the embrittlement of the pipes, welds, fittings. Could the ESV provide their understanding on this please.

   ESV’s understanding is that rate of H2 permeation is based on pressure. Under high pressure, the permeation rate could be considerably higher which makes the pipe material less ductile and reduce its ability to resist fracture.

9. Will the ESV require a gas safety case that addresses hydrogen safety before allowing a pipeline to carry hydrogen. If so, what requirements does the ESV envisage needing to be met before approving the gas safety case. If so, what is the timeframe for the requirement of a safety case before allowing the carriage of hydrogen by a network.

   Any existing (approved/accepted) Safety Case wishing to introduce hydrogen into their network, would need to undertake a safety assessment(SMS/FSA) to determine the change in risk not only for that entity but across the whole supply chain i.e. upstream

and downstream, where all risks associated with this change will need to be identified and minimised to as far as practicable. This means that all pipework and associated fittings must be considered and tested to demonstrate the impact of the proposed change.

Until this SC is approved by ESV, hydrogen will not be allowed to be introduced into a pipeline or network.