Sectioning of valve stations in H2-backbone

Introduction

- Gasunie develops 1200 km H2-backbone for 100% H2
  - First pipeline operational in 2024. Mainly reuse of existing for natural gas designed pipelines. Some new pipelines necessary
  - Initial plan to replace all existing valve stations (every 15 km): total CAPEX 160 to 180 M€
- Purpose of valve stations:
  - Sectioning in case of incidents, depressurize sections for maintenance with recompression, enable venting, flaring and ILI, etc.
- Sectioning in H2-backbone
  - For reference: every 15 to 18 km valve stations in natural gas transmission system
  - Available guidelines for distance in H2-pipeline
    - ASME B31.12 (2019): PL-3.15.1 Required Spacing of Valves
    - Dutch pipeline specification NEN 3650 (also applicable for H2-pipelines) requires a “risk assessment”
- Main question because of high CAPEX
  - What should be the distance between valve stations be in H2-backbone?

ASME B31.12 PL-3.15.1 Required Spacing of Valves

(b) Notwithstanding the considerations in (a) above, the spacing between valves on a new transmission line shall not exceed the following:

(1) 32 km (20 mi) in areas of predominantly Location Class 1

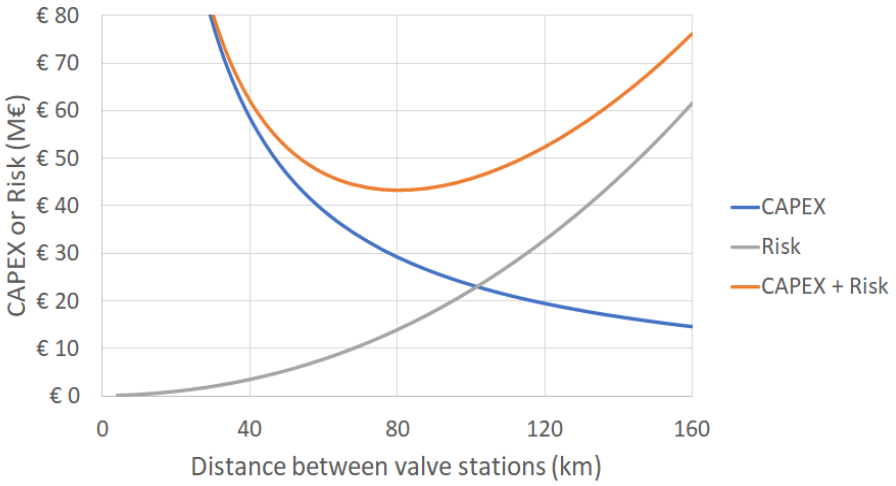
(2) 24 km (15 mi) in areas of predominantly Location Class 2

(3) 16 km (10 mi) in areas of predominantly Location Class 3

(4) 8 km (5 mi) in areas of predominantly Location Class 4

Sectioning of H2-backbone: approach and results

- Risk based approach:
  - Risk based assessment management: prevent unacceptable risk and excessive high costs
  - Optimize CAPEX for new valve stations and Risk depending on distance between valve stations
  - Relevant scenario's: pipeline rupture and leak and non-operable valves for planned maintenance
  - When these uncontrolled events occur, spacing of valve station determine cost for (uncontrolled) released/vented H2 and possible impact on end users
  - Risk = failure frequency x consequences (financial, environmental and end users).
- Results:
  - CAPEX decreases with increasing distance between valve stations
  - Risk increases with increasing distance between valve stations
  - Minimum CAPEX + risk at 70 to 90 km
  - Decision: valve station at entry, exit and at each brand pipeline then when necessary every 70-90 km
    - New valve stations will be designed and constructed, where necessary. Other valve stations removed
    - Reduction in 70-80M€



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