



# **Assessing the changes in safety risk arising from the use of natural gas infrastructures for mixtures of hydrogen and natural gas**

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# Naturalhy project safety work package



# Outline

To identify and quantify the major factors influencing safety in the transportation, distribution, and delivery of hydrogen/natural gas mixtures by means of existing natural gas infrastructures.



# Purpose

To provide information to allow risk assessments to be performed to assist decisions concerning:

- The amount of hydrogen that can be introduced into natural gas systems
- The conditions under which such systems should be operated, and
- The identification of vulnerable locations where modifications to a system may be required



# Approach

- Introduction of hydrogen will require that:
  - risks remain below levels that are acceptable to the regulator
  - the concept is acceptable to the general public
- Identify appropriate information on hydrogen/natural gas mixtures (up to 50% H<sub>2</sub>) to enable current risk assessment methodologies to be used to quantify the effect of:
  - changes in the amount of hydrogen
  - changes in the operating conditions (i. e. operating pressure)
  - the introduction of risk reduction measures



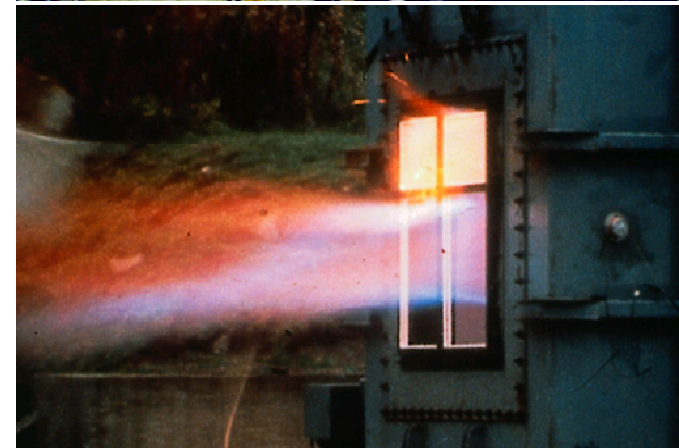
# The main operational and gas utilisation activities will be studied

- Domestic and industrial utilisation
  - confined/vented explosions
- Transmission and distribution
  - pipeline rupture fires
- Operational sites (processing and storage)
  - jet fires
  - vapour cloud explosions



# Domestic and industrial utilisation (confined/vented explosions)

- Gather information on leak frequency and ignition probability
- Undertake experiments on gas build-up and explosions in confined/vented enclosures. The data will be compared with data and predictive tools available for natural gas
- Particular emphasis will be placed on identifying conditions (if any) which might result in transition to detonation





# Transmission and distribution (pipeline rupture fires)

- Undertake transmission pipeline fire experiments to study the important early stages of fireball development and the generation of overpressure
- The data generated will be compared with data and predictive tools available for natural gas
- Information gathered in this area is essential for land use planning, the classification of hazardous areas and the development of operational procedures







# Transmission, distribution and operational sites (jet fires)

- Undertake high pressure jet fire experiments to study heat transfer to objects within and outside the flame envelope
- The data generated will be compared with data and predictions of tools developed for natural gas





# Operational sites (vapour cloud explosions)

- Undertake experiments involving high pressure gas releases into congested regions to study gas build-up and explosion. The data will be compared with data and the predictions of tools developed for natural gas
- Particular emphasis will be placed on identifying conditions (if any) which might result in transition to detonation





# Risk assessment

- The information gathered in the work described in the previous slides will be incorporated into risk assessment methodologies pertinent to natural gas networks
- Risk assessments of selected sections of gas infrastructure carrying a hydrogen/natural gas mixture will be undertaken and the results compared with those obtained for natural gas



# Assessment tool

Finally, the output from the Safety Work Package will be incorporated into the Assessment Tool, one of the main deliverables of the Naturalhy Project.



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# The Naturalhy Project

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# Participants

- Loughborough University
- HSE
- Transco
- Shell Hydrogen
- Leeds University
- CEA