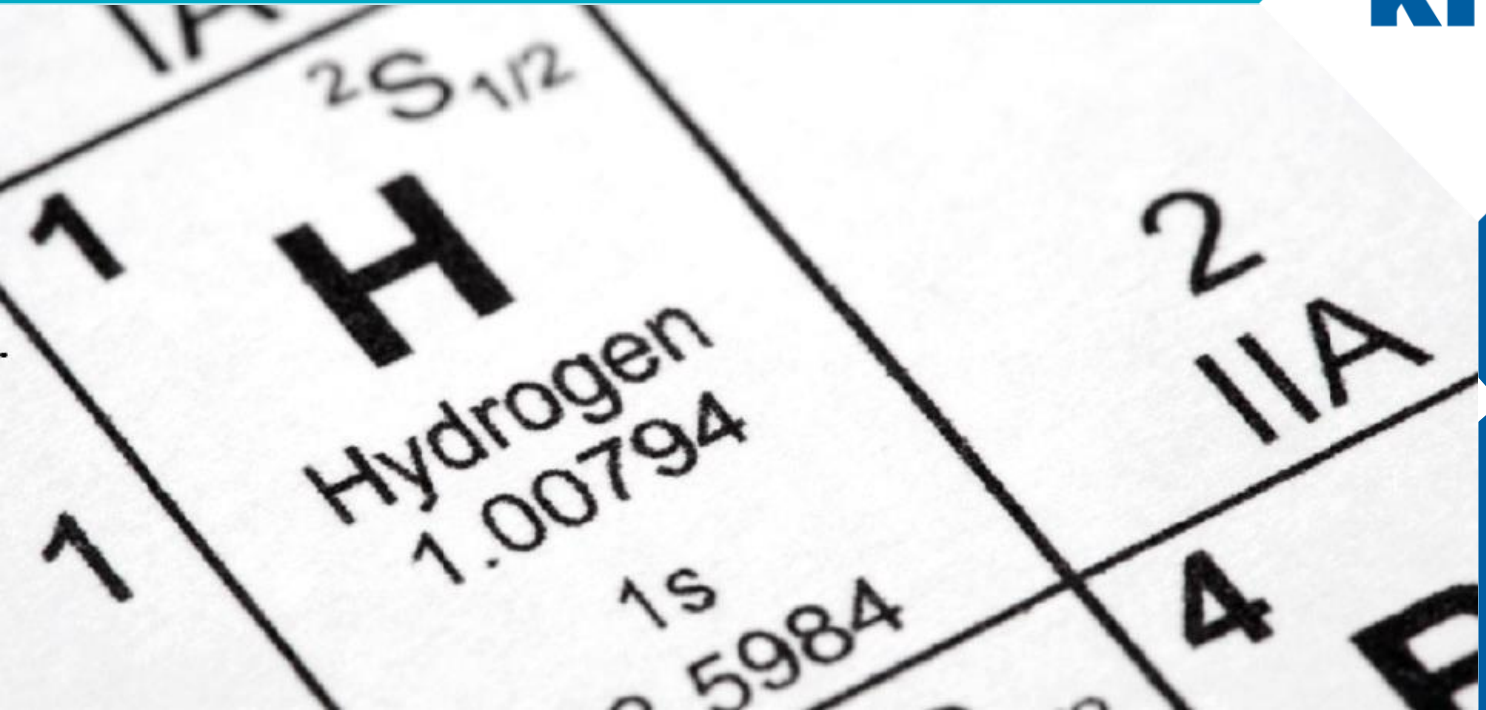
Kiwa SMR - Demonstrating Local Hydrogen Production, Distribution and Use

Dr. Leighton Holyfield, June 2022



Trust
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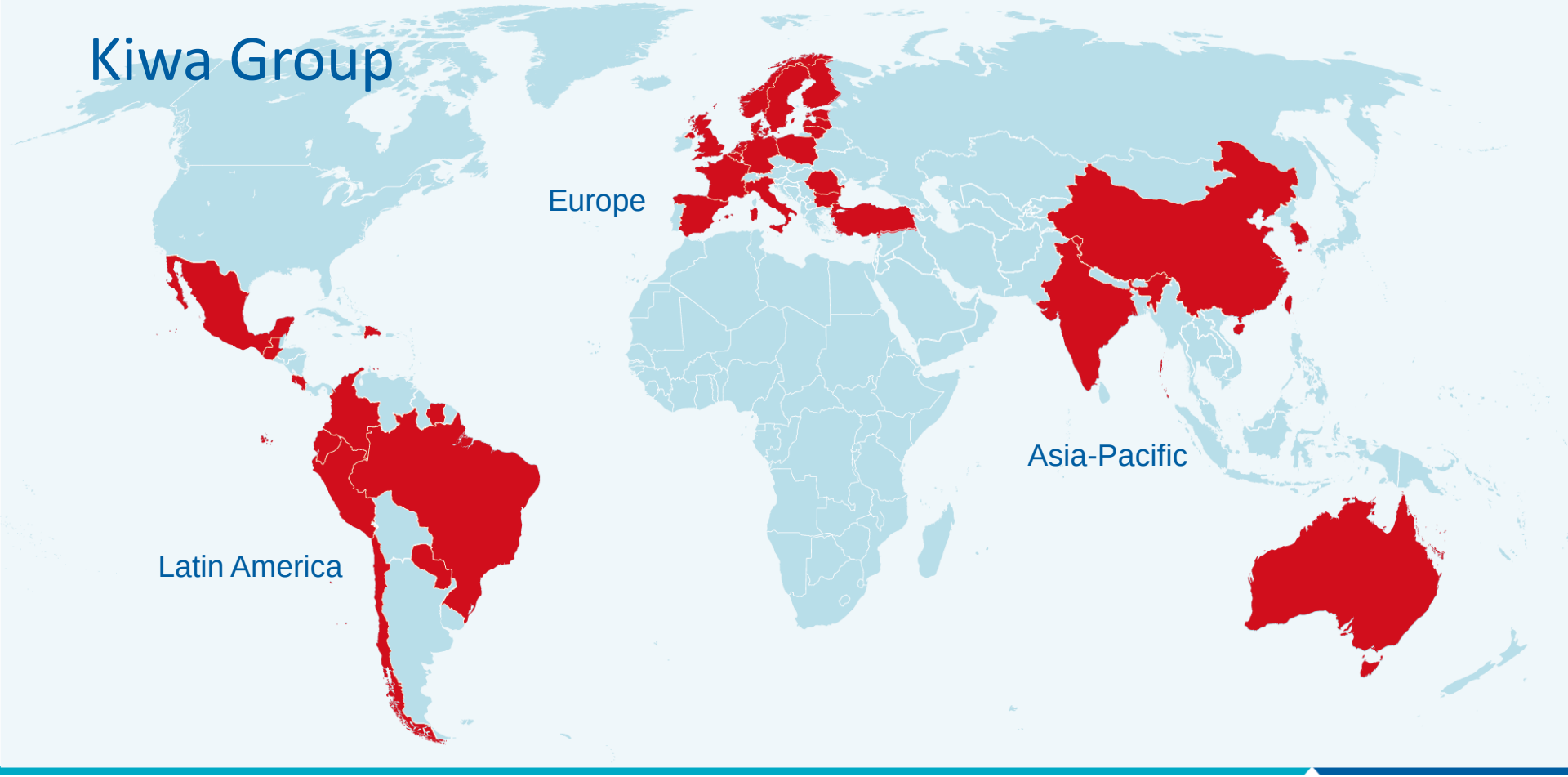
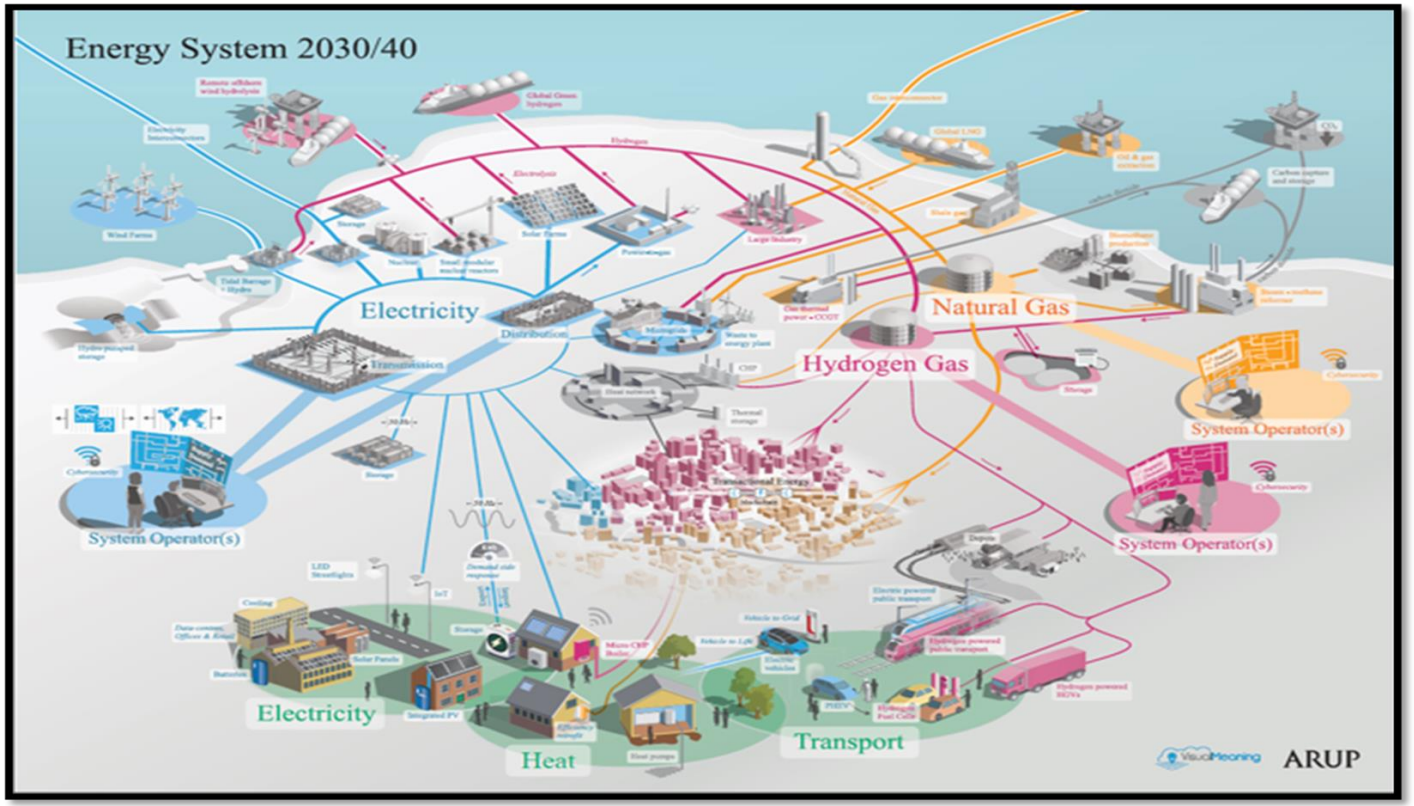
Progress

Kiwa Group



What does the future Energy System look like?



Source: http://nearyou.imeche.org/docs/default-source/Power-Industries-Division-NW-Centre/imeche-hydrogen-for-decarbonisation-11-dec-final.pdf?sfvrsn=2

Kiwa's Local Hydrogen Project is a UK first

- The hydrogen plant will be the first to produce biogas-derived hydrogen from a local source
  - It will act as a template for thousands of waste treatment, water treatment and other anaerobic digestion sites to produce hydrogen across UK.

- The pipeline will be the first hydrogen pipeline to be operated under the Gas Act 1986
  - It will create a useful source of real data on the reliability of hydrogen production plants and distribution networks to guarantee security of supply to customers.

- The upgraded labs will be the first to be fed by pipeline quality, odorised hydrogen
  - They will provide appliance manufacturers with a more realistic and cheaper test gas than the bottled gas they currently use.

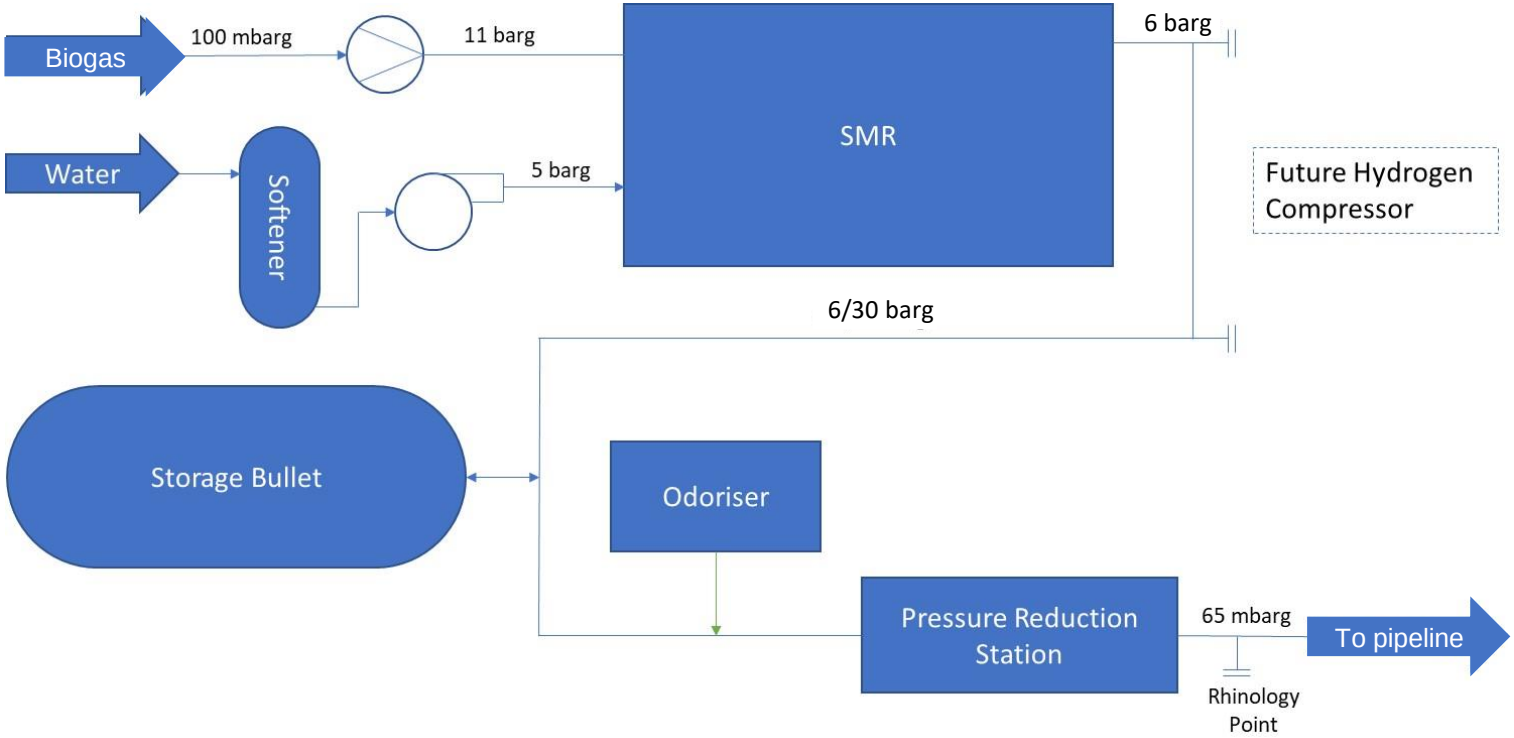
Local Hydrogen Project Aim and Objectives

- To provide Kiwa Gastec with a low cost, plentiful supply of hydrogen to facilitate business growth, research & development:
  - Testing, Inspection and Certification of hydrogen products, appliances and systems
  - Demonstration of production of local low carbon hydrogen from biogas and local scale carbon capture and usage technology
  - To provide bulk hydrogen and enable R,D&D on the distribution and local clean-up of hydrogen to fuel cell quality
  - Provide evidence to support UK Government decarbonisation effort (e.g. evidence of operational reliability of local systems helps to understand security of supply)
  - Development of hydrogen expertise within Kiwa Gastec
  - To provide a secure, localised energy supply to Kiwa House

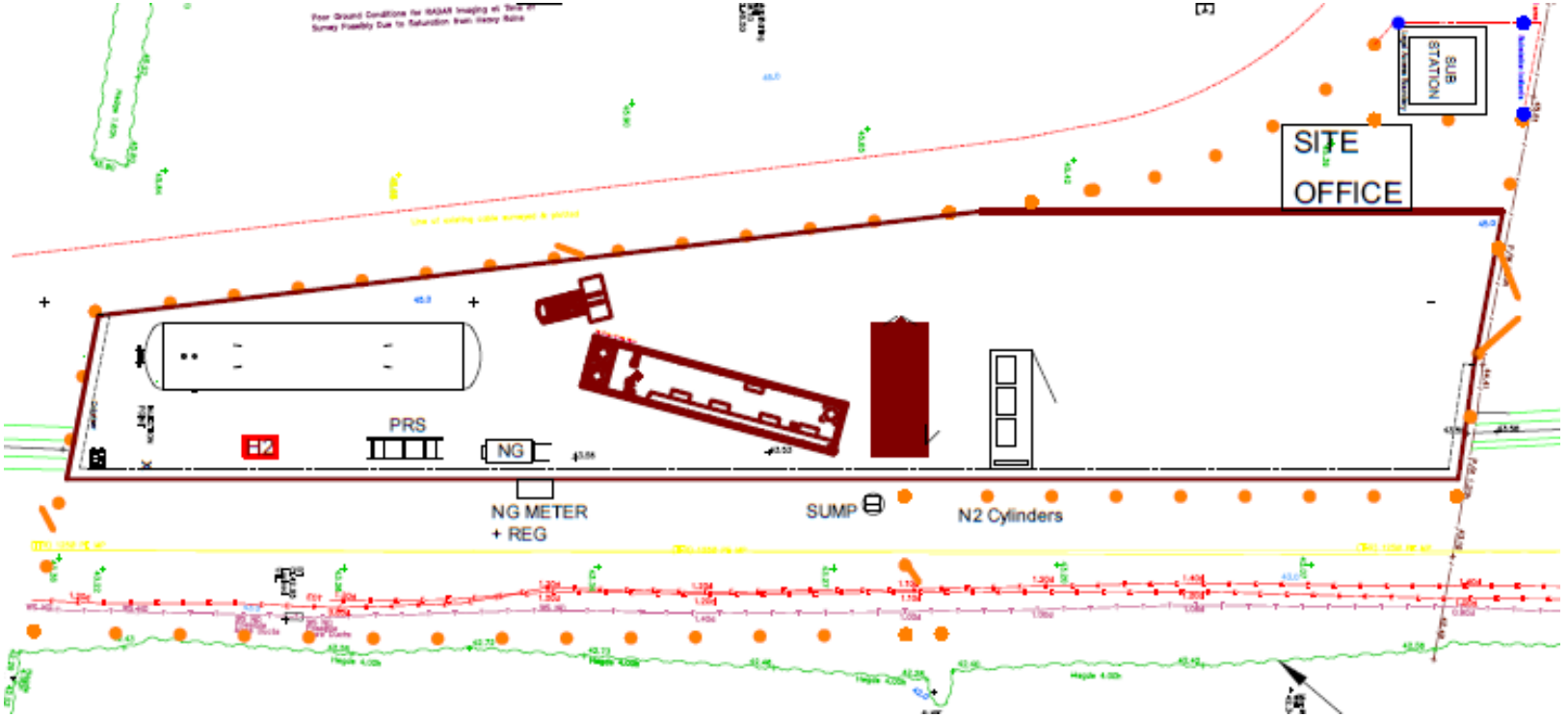
Production & Storage – Technical Specs

- Biogas is reformed to produce hydrogen
- 100 $Nm^3 h^{-1}$ or 300 kW hydrogen output
  - Site could be expanded to 900 kW
- Nominal biogas consumption of ~ 480 kW
- Efficiency greater than 60%
- Generated hydrogen stored in bullet with a capacity of 106 m^3 at up to 6 bar
  - 62.3 kg or 2,074 kWh of hydrogen storage
  - 207 normal boiler run hours (30 kW) stored
  - Could be expanded to 267.7 kg at 30 bar

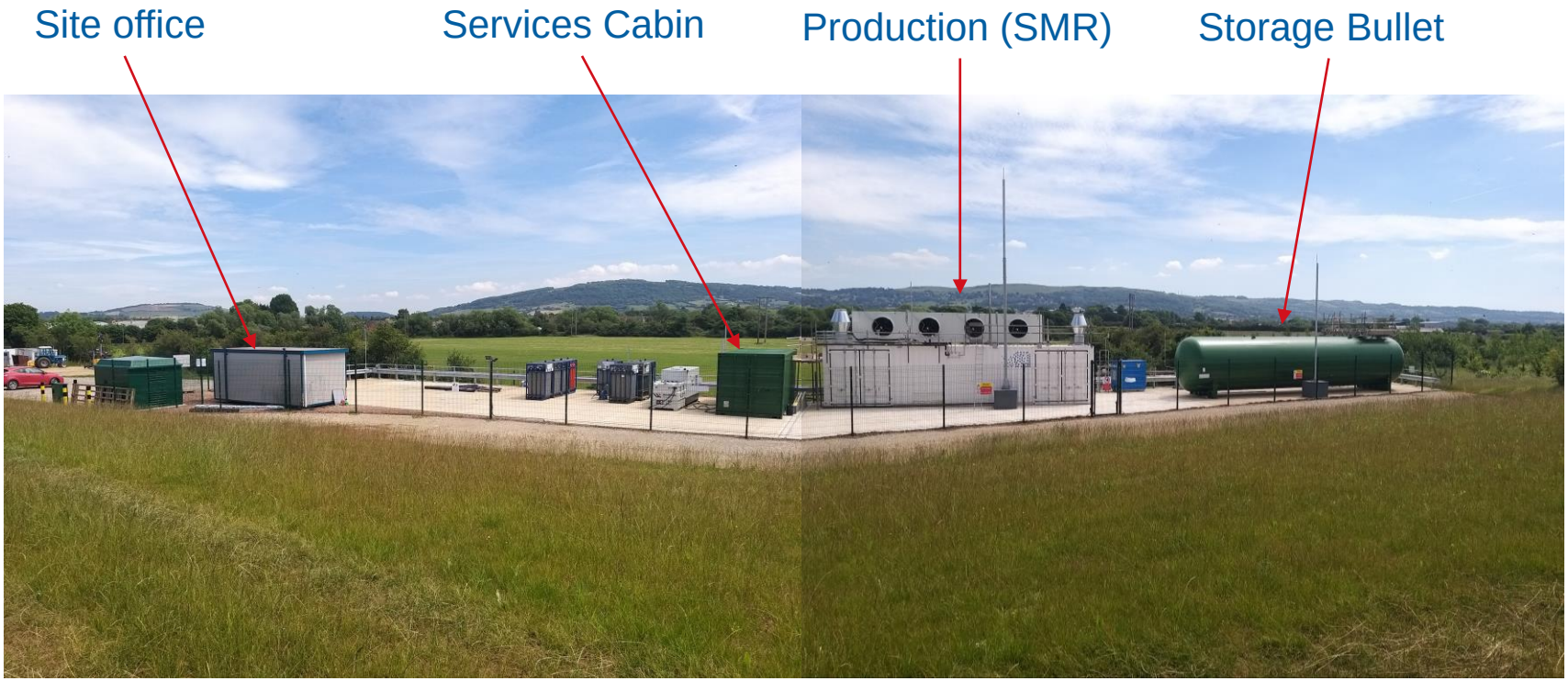
Production & Storage – Process Flow Diagram



Production Site - Layout



Production Site – panoramic view



Hydrogen distribution

- Operated under Gas Act 1986
- 180 mm MDPE pipe
- Operating procedures developed using existing NG systems as a basis
- Odorised as per current practice
- Emergency procedure developed to enable FCOs to determine which gas

Hydrogen, Natural Gas & Test Gases in Test Labs

Hydrogen, Natural Gas & Test Gases in Test Labs

There is interest in both ends of the pipe

Upstream Opportunities

- Learning about local hydrogen production and distribution
- Providing evidence for organisations such as IGEM, OFGEM, HSE and network operators on how to modify existing practices, regulation and standards to accommodate hydrogen
- Providing evidence to UK Government on the feasibility of local clean up of pipeline hydrogen
- Providing R&D opportunities to inform industrial decarbonization
  - Assessing technical and economic feasibility of CCUS at this scale
- Scope for expanding production if required

Downstream Opportunities

- Accelerated lifecycle & functional testing of hydrogen fueled products, appliances & systems
- Staff training on hydrogen installations and pipelines
- Demonstrating hydrogen heating of a commercial premises

Thank you

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