Kiwa – Hydrogen Services

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Trust
Quality
Progress

Presentation Outline

- **Kiwa Gastec – Energy and Environment**
- **Kiwa Hydrogen Consultancy**
  - HyHouse
  - Leeds H21 – Parts 1 and 2
  - **HyDeploy**
  - **BEIS Hydrogen for Heat**
  - **Hydrogen 100**

Kiwa Hydrogen Expertise
Changing Energy For Good

- **Kiwa Automotive Hydrogen**

Kiwa Gastec - Energy and Environmental TIC Technology Agnostic

- Appliance testing – gas, oil, biomass, mineral fuels, electrical appliances – UKAS accredited
- NoBo 0558
- Heat pump test laboratory EN 16147 certification
- MCS certification body
- Ecodesign of Energy Related Products Certification
- Energy and environmental consultancy
- Carbon verification
- Training
- Test equipment sales
- Off-site boiler testing incl. biomass
- Technology evaluation
- Automotive component certification
- **Hydrogen and gas quality**

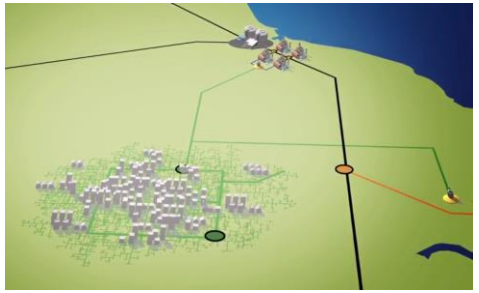
Kiwa UK – Hydrogen in the Gas Grid

Hydrogen Grid Feasibility – Progress over time

Safety?

HyHouse

Economically Feasible?



Leeds

Technically Feasible?

HyDeploy

Keele UNIVERSITY

Practicality?

Hy4Heat

Hydrogen 100 project

Hydrogen Technology Enabler?

kiwa

HyDeploy - Keele University

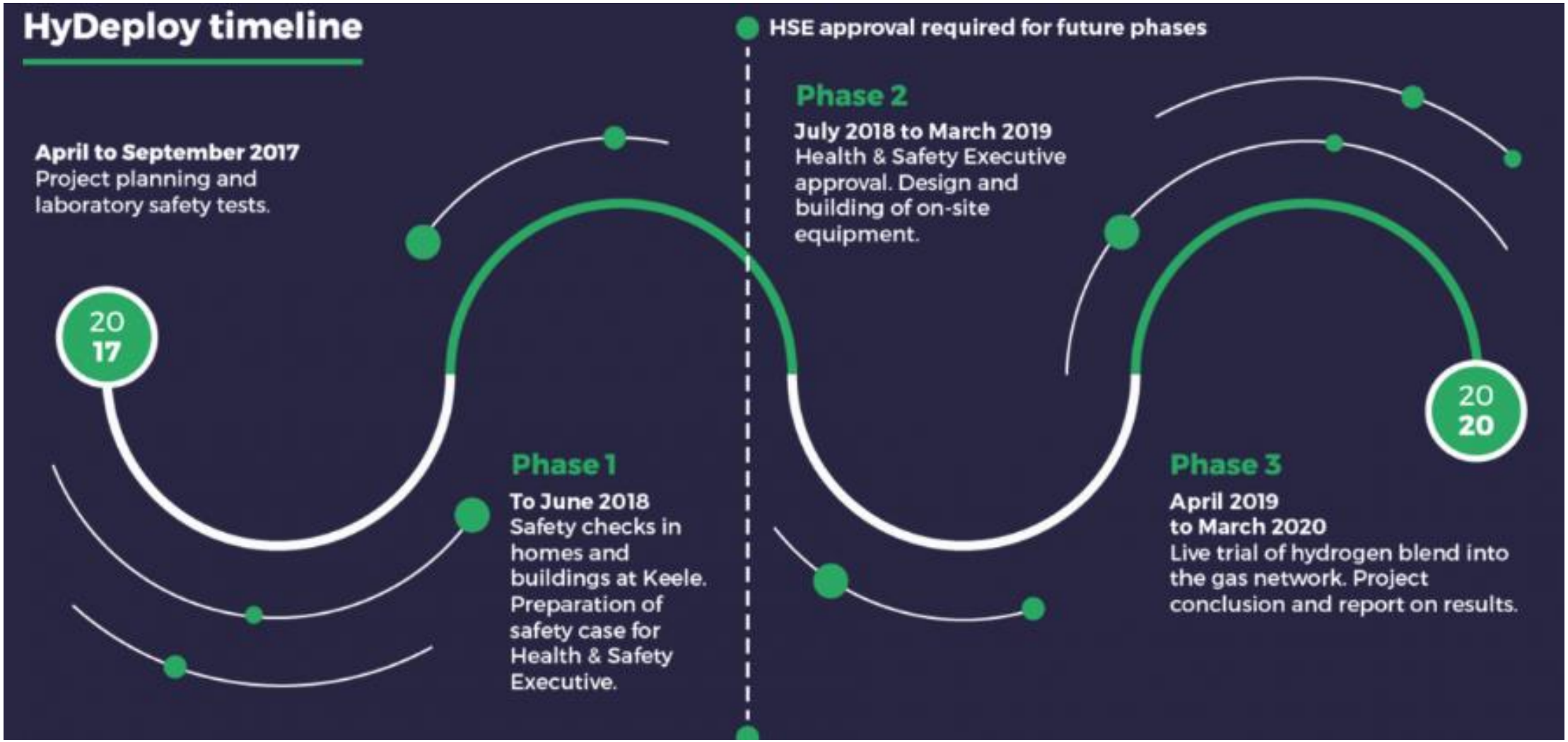
- Own discrete gas network – 17 buildings and 100 residential properties
- Up to **20% H_2 mixed with 80% CH_4** to supply the properties
- What effects will there be on appliance operation and performance? Will they need modification?
- Kiwa are testing a range of appliances the effects of H_2 on:

Flame Temperature?
Flame Shape?
Flame Velocity?
Flame Length?
Operating Pressure?
Ignition?

Flame Ionisation Detector?
ODS Sensor Operation?
Delayed Ignition?
Fuel/Air Ratio?
Cross Lighting?
Flame Colour?
Light-back?

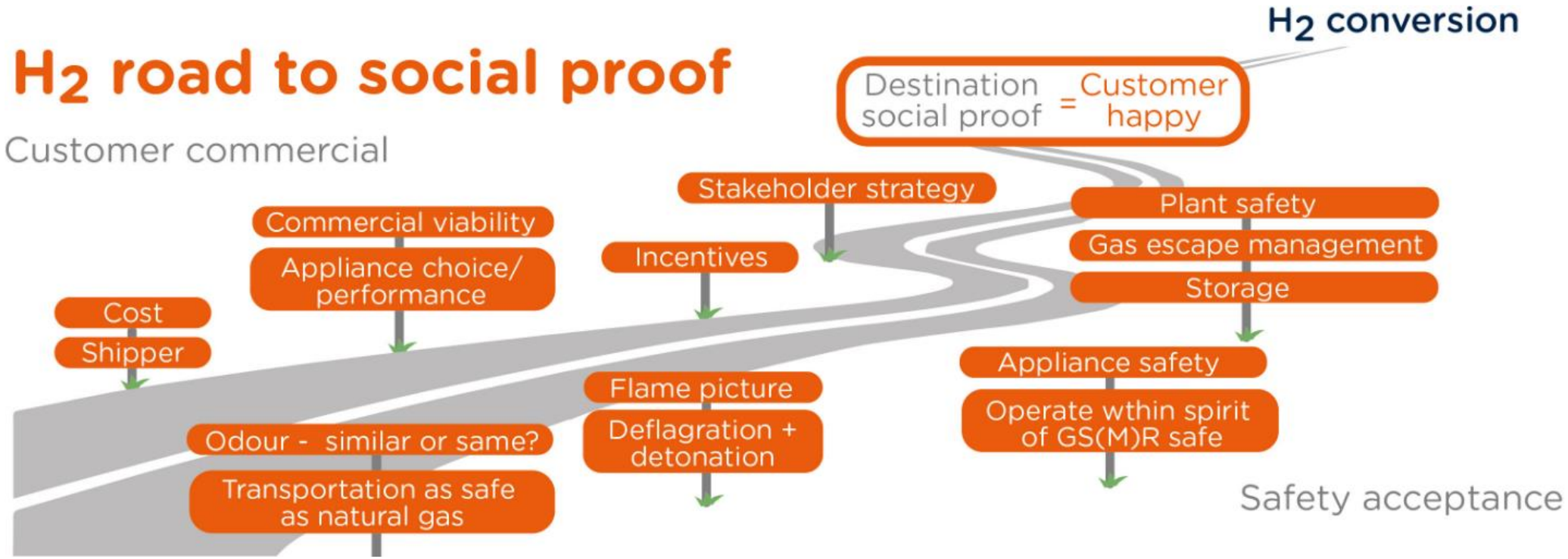
Cooking Performance? **Boiler/Stove Efficiency?** **Flue Gas Products?** **Soot Formation?** **NO_x Emissions?** **Smoke Number?** **Product Safety?**

HyDeploy - Keele University



Hydrogen 100 Project

- SGN project to provide 100% hydrogen to 3 demonstration sites in Scotland
- Kiwa safety testing – CH_4 versus 100% H_2 explosion studies under way



BEIS Hydrogen for Heat Programme

- £25M BEIS Programme
- Kiwa to provide technical expertise in an Arup-led consortium
- Feasibility of converting a small village or estate to 100% hydrogen gas
- Facilitate design and manufacture of new appliances for 100% hydrogen
- Project will also be used to monitor ‘public attitude’ to hydrogen conversion

Hy4Heat

- Work Package 1: Programme Management led by Arup
- Work Package 2: Development of gas standards for best practice with H_2 – residential gas installation requirements, fittings, odourant? colourant?
- Work Package 3: Capability in the UK for testing H_2 & appliances using H_2?
- **Work Package 4:** Assessment of domestic appliances; boilers, cookers, stoves to be assessed technically against TRLs, Safety, NO_x emissions. Economically viable?
- Work Package 5: Technical & practical assessment of commercial H_2 applications, e.g. catering outlets
- Work Package 6: Technical assessment of industrial H_2 applications
- Work Package 7: Use work packages 1-6 to build a safety case and submit to HSE
- Work Package 8: Run an 'unoccupied' demonstration trial of a 100% H_2 house
- Work Package 9: Potential occupied trial: 100% H_2 300 homes, monitor consumer confidence, **Target date of March 2021**

Full Quantitative Risk Assessment to be issued at this stage for 100% H_2 in the grid

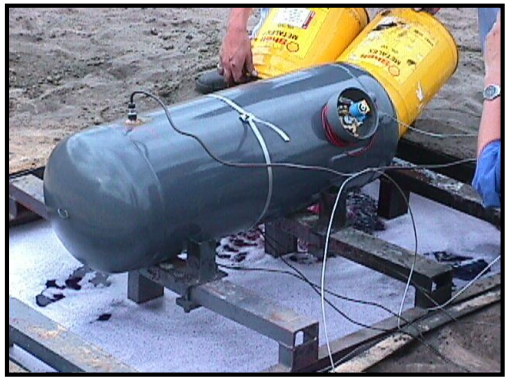
Kiwa Hydrogen Expertise - Kiwa as a Notified Body

- **Pressure Components Applicable Directives/Regulations**
  - **Automotive**
  - EC 79/2009 & EU 406/2010
  - UN ECE R134
  - GTR No.13
  - ANSI HGV 3.1-2015
  - CSA/ANSI HGV 4.2-2013
  - ANSI HPRD 1-2013
  - **Non-Automotive**
  - Pressure Equipment Directive
  - Transportable Pressure Equipment Directive
  - ATEX Directive
  - Medical Devices Directive

Kiwa Hydrogen Expertise
Changing Energy For Good

- **Fuel Cell Applicable Directives**
  - **Automotive**
  - GTR No.13
  - **Non-Automotive**
  - Gas Appliances Directive/Regulation
  - Machinery Directive
  - Low Voltage Directive
  - EMC Directive
  - Pressure Equipment Directive
  - Transportable Pressure Equipment Directive
  - ATEX Directive

Kiwa Automotive Hydrogen Tanks & Component Testing



Conclusion

- **Kiwa has helped to demonstrate:**
  - H_2 could be rolled out using the existing gas infrastructure
  - Appliances and infrastructure could be upgraded to H_2 with minimum disruption & cost
  - Its rollout would appear today as technically feasible & economically feasible
  - The safety case is underway

- **Kiwa supports tech developers in the H_2 supply chain, offering testing & certification for:**
  - H_2 vehicle components
  - H_2 storage tanks
  - H_2 (and non-H_2) fuel cells
  - Electrolysers and SMRs
  - Solid fuel H_2 Storage Media

- Next steps – How to convert grid H_2 to automotive fuel cell purity requirements?
- **Kiwa will continue to lead the way through the transition to a sustainable H_2 future**