



UK Science
& Innovation
Network



British
Consulate-General
Vancouver



ACCELERATING TO NET ZERO WITH HYDROGEN BLENDING STANDARDS AND REGULATION DEVELOPMENT IN THE UK, CANADA AND THE US

Summary Report

Sian Summerton
Knowledge Transfer Manager – International & Development
Sian.summerton@ktn-uk.org

Steffan Eldred
Knowledge Transfer Manager – Clean Energy &
Infrastructure
Steffan.eldred@ktn-uk.org



Global
Alliance

TABLE OF CONTENTS

<i>BACKGROUND</i>	2
<i>WORKSHOP: SHARED INTERESTS & COLLABORATION OPPORTUNITIES</i>	3
Materials and Infrastructure	3
Safety	4
Consumer Engagement/Social Licence to Operate	5
<i>ANNEX 1: LIST OF WORKSHOP ATTENDEES' ORGANISATIONS</i>	7

BACKGROUND

Hydrogen is expected to play a critical role in the move to a net-zero economy. However, large-scale deployment is still in its infancy and there is still much to be done to drive forward blending and production.

Exciting pilot projects are being conducted and explored in the UK, Canada and US states such as California to determine the technical feasibility of blending hydrogen into existing natural gas systems. Whilst the deployment of hydrogen is in its early stages, there is increasing interest around permitting significant percentage blends of hydrogen into gas networks, which would enable the carbon intensity of gas supplies to be reduced, create a new demand for hydrogen and, with the use of separation and purification technologies downstream, support the transportation of pure hydrogen to markets.

Gaps in codes, standards and regulation need to be addressed to enable adoption, and there may be opportunities for international collaboration and harmonisation to ensure that best practices are shared globally and to facilitate the growth of trade and export markets. There is an opportunity for the UK, Canada and the US, three G7 countries, to work together and show market-making leadership in key enabling regulation for the new hydrogen economy.

The British Consulate-General Vancouver and the UK Science and Innovation Network in Canada and the US partnered with KTN to deliver two open-audience webinars on 2 and 3 March 2021 and a workshop on 15 March 2021.

The webinars showcased hydrogen blending pilot projects in the UK, Canada and California, highlighting challenges and opportunities with regard to standards development for hydrogen blending and supporting further transatlantic collaboration in this area. The webinars brought together experts from industry, academia and policy from the UK, Canada and California. You can access the webinar recordings on the KTN website [here](#).

The subsequent workshop provided a platform for industry, regulatory, policy and academic leaders from the UK, Canada and the US to meet virtually and share their expertise around the common solutions needed for standards in hydrogen blending, including where future action should be focused. Through breakout group discussions and plenary sessions, participants were given the opportunity to identify and assess opportunities to collaborate further and add value to wider international cooperation in this area. Areas covered in detail included materials and infrastructure, safety and consumer engagement/ the social license to operate.

This report provides a summary of the workshop discussions. Key themes that emerged from the workshop included the need to work more closely together across a range of topics, including (but not limited to) materials research, harmonisation of standards, information sharing and additional mechanisms enabling cross-border working.

As well as supporting UK-Canada-US collaboration in the development of the low carbon hydrogen economy, these events form part of the UK's international engagement to build momentum towards a successful outcome at COP26, the UN climate summit that the UK will host in Glasgow in November 2021.

WORKSHOP: SHARED INTERESTS & COLLABORATION OPPORTUNITIES

The workshop on 15 March 2021, facilitated by KTN and the UK Science and Innovation Network, included discussions around materials and infrastructure, safety and consumer engagement. A list of organisations that attended the workshop can be found in Annex 1. A summary of the discussions can be found below. Please note that these points reflect the personal opinions and experiences of attendees and may not reflect the policies or views of all present or their organisations.

Materials and Infrastructure

Work already done that can be shared

- Pipeline Research Council International/ GHD Hydrogen Blending State of the Art Global Study.
- Hy4Heat (UK).
- HyDeploy (UK).
- The Fort Saskatchewan Blending Project (Canada).
- The Future Billing Methodology (UK).
- FutureGrid (UK).
- Real-Time Networks projects (UK).
- Enbridge in Ontario injects hydrogen produced from electrolysis in their network (Canada).
- University of California, Irvine, and Southern California Gas Company joint hydrogen demonstrator (US).
- Fortis BC has committed to decarbonise its grid by 30% (Canada).
- The Institution of Gas Engineers and Managers (IGEM) have the HyTechnical programme to develop supplements to the existing suite of gas standards in the UK.
- Polyethylene (PE) Natural Gas infrastructure and CSA standards for hydrogen in Canada.

Gaps where collaboration would be helpful

- All areas of hydrogen blending, including assets for transmission, distribution and material testing.
- New standards development, especially at the international level.
- Impacts on various types of meters, including diaphragm and ultrasonic.
- Salt cavern storage of blended hydrogen.
- How to refine and update standards without having an adverse impact on the sector.
- Producing a framework to link standards.
- Opportunity to share knowledge to support hydrogen strategy development.
- Regulators in all three countries are asking the same questions; collaboration has the potential to save a lot of time and effort for all parties.
- Materials research at low pressures (particularly metallic mains).
- Appropriate quality standards for composition and transmission.
- A thorough investigation of the materials needed for hydrogen from end-to-end.
- Polyethylene insertion into existing metal pipelines.
- Blending at high pressure.

How collaboration can happen

- Collaborative platforms spanning industry, academia and policy to share knowledge.
- Collectively developing global understanding of materials and infrastructure.
- Online workshops and webinars that cover issues all nations face.
- Networking activities.
- Working groups.
- Conferences.
- Sharing specialist whole system design proposals by each nation.
- Opportunities for knowledge exchange.
- A central signposting mechanism to flag future projects and collaboration opportunities.
- Linking research-based systems between universities.
- Providing regulators with peer-reviewed evidence around materials and infrastructure.
- Using existing CSA committees in Canada to collaborate.

Safety

Work already done that can be shared

- The British Standards Institution (BSI) has launched the first hydrogen fired gas appliances guide (UK).
- The UK Environment Agency is developing Best Available Technology guidance aimed at hydrogen production from methane combined with CCUS.
- Work by Northern Gas Networks (NGN) to build H21 Street at the DNV Spadeadam test facility near Carlisle (UK).
- Work by Scottish Gas Networks (SGN) and Kiwa on H2 safety in domestic properties (UK).
- Work by Enertek on the testing of H2 appliances (UK).
- UK and European success stories.
- The results of global pilots.
- Updates on ongoing discussions by technical experts and committees on the need for changes to existing standards, including CSAZ662 and CSAZ245 (Canada).
- Worcester Bosch has already developed a hydrogen ready boiler (UK).
- An incident database is managed through the American Chemical Society (US).

Gaps where collaboration would be helpful

- All elements of the supply chain need to be assessed in unison.
- A full understanding of the costs and benefits.
- Detonation studies.
- Appliance safety, including ensuring existing equipment can operate on a fluctuating blend without any problems.
- International sharing of appliance data for hydrogen blending, including burner control and nitrous oxide issues.
- Systematic reviews of pipeline integrity.
- The effectiveness of mercaptans at different blends.
- The impacts of leaks on indoor air quality and enclosed spaces.

- Optimal solutions for injecting into the grid.
- Maximising the repurposing of existing assets safely.
- Quantitative risk assessments and other risk analysis.
- The safety impact of hydrogen on industrial consumers (due to its lower calorific value).
- Training and skills around safety and metrology standards.
- Risk assessments of high population density.
- Establishing carbon intensity methodologies.
- Quantifying policy effectiveness.
- Government alignment.
- Commercial testing labs for the evaluation of materials and products.
- Shipping standards.
- Harmonisation of safety standards to facilitate international trade opportunities.

How collaboration can happen

- A shared knowledge base of all appliances impacted by the move to hydrogen.
- Working groups with technical leads from regulators.
- Faster paced funding available for industry.
- Case studies of evidence to protect industrial consumers.
- Sharing research reports with industry.
- Sharing of incidents and investigations related to hydrogen infrastructure.
- Incident databases.
- Driving collaboration across supply chains

Consumer Engagement/Social Licence to Operate

Work already done that can be shared

- The Ontario Energy Board has a robust process for addressing socioeconomic approaches (Canada).
- British Columbia is developing a Hydrogen Strategy for public release that will highlight BC's hydrogen and fuel cell sector and share information on building out the local hydrogen economy, including actions, safety standards, economic opportunities, and emissions reduction potential; Canada has recently published its hydrogen strategy (Canada).
- The University of British Columbia is transforming a city block on its Vancouver campus into a hydrogen demonstration site that will act as an 'outdoor exhibit' for hydrogen technologies (Canada).
- Two open access show homes where all the appliances are powered entirely by hydrogen are being built in Gateshead (UK).
- The H21 North of England programme has been running customer engagement and research over several years to determine the level of public knowledge around climate change and natural gas (UK).
- The California Public Utilities Commission delivered a series of environmental justice workshops to brainstorm opportunities to further principles of environmental and social justice in future policies and activities (US).

Gaps where collaboration would be helpful

- Building on public enthusiasm for hydrogen through education and social media.
- Communicating cost benefits, safety and positive impacts to the public.
- Sharing real-world examples with consumers.
- Standardised measurement of carbon reduction.
- Public education.
- Understanding the role that social media plays in public education.
- Developing unbiased information across a range of low carbon heat technologies and what that means for consumer costs and homes.
- Public engagement on carbon capture and storage.
- Messaging around different types of hydrogen.
- Advertising the use of hydrogen in manufacturing.

How collaboration can happen

- Infrastructure owners and operators should take greater responsibility in driving forward public acceptance, with honesty and transparency at the core of this process.
- Recruiting 'champions' at the consumer advocacy level.
- Sharing best practice and providing unbiased information across the range of low-carbon heat technologies.
- Addressing safety and not-in-my-backyard concerns related to hydrogen pipelines.
- Using the body of evidence to share 'good news' stories.
- Continuously sharing good practice of consumer engagement.
- Local government and community engagement through public workshops.
- Building on continued engagement already taking place around vehicles.

ANNEX 1: LIST OF WORKSHOP ATTENDEES' ORGANISATIONS

Canada

Alberta Energy Regulator
BC Oil & Gas Commission
CSA Group
Enbridge Gas Inc.
Energir
FortisBC Energy Inc.
FortisBC Inc.
GHD Limited
National Research Council Canada
Pembina Institute
Province of British Columbia
Régie du bâtiment du Québec
SaskEnergy
Technical Safety Authority of Saskatchewan
Triple E Energy Advisors Inc.
University of British Columbia
WSP Canada

United States

American Gas Association
California Public Utilities Commission
National Renewable Energy Laboratory (NREL)
University of California Irvine

United Kingdom

BP
BSI
British High Commission Ottawa / British Consulates-General in Calgary, Houston, Los Angeles and Vancouver/
UK Science and Innovation Network
Department for Business, Energy & Industrial Strategy
DNV
Engineering and Physical Sciences Research Council
GHD
IGEM - Institution of Gas Engineers & Managers
Innovate UK
Johnson Matthey
Pale Blue Dot Energy
Progressive Energy Ltd
Protium Green Solutions Ltd
Public First
Scottish Enterprise
Scottish Hydrogen & Fuel Cell Association
WSP

Germany

Bundesverband der Deutschen Industrie e. V. (BDI)