

Breakthrough Agenda: Hydrogen Breakthrough

IPHE Steering Committee Discussion

Slides for Circulation

26th April 2022



**UN CLIMATE  
CHANGE  
CONFERENCE  
UK 2021**

IN PARTNERSHIP WITH ITALY

# Re-cap on the Breakthrough Agenda

---

*The Breakthrough Agenda's goal is to accelerate clean technology transitions in each sector through strengthened international collaboration, cooperation and coordination.*



Launched at COP26 by 45 countries representing more than 70% of global GDP, with all G7 members endorsing the Agenda.



Countries committed to work together this decade to scale and speed up clean technologies, making them affordable and accessible for all, and agreeing on common goals across key sectors including power, road transport, steel and hydrogen.



Progress will be measured, and new recommendations made, in a State of Sectoral Transitions Report led by the IEA, IRENA and the UN High Level Action Champions.



By collaborating in this way, we can make the transition quicker, cheaper and easier for everyone - driving faster innovation, greater economies of scale, bigger incentives to invest, and level playing fields where needed.

“As an initial step under this Agenda, we collectively launched the ‘Glasgow Breakthroughs’ – global goals that aim to make clean technologies the most affordable, accessible and attractive option in each emitting sector globally by 2030”\*:

- **Power:** Clean power is the most affordable and reliable option for all countries to meet their power needs efficiently by 2030.
- **Road Transport:** Zero emission vehicles are the new normal and accessible, affordable, and sustainable in all regions by 2030.
- **Steel:** Near-zero emission steel is the preferred choice in global markets, with efficient use and near-zero emission steel production established and growing in every region by 2030.
- **Hydrogen:** Affordable renewable and low carbon hydrogen is globally available by 2030.
- **[NEW] Agriculture:** Climate-smart, sustainable agriculture is the most attractive and widely adopted option for farmers everywhere by 2030.

# The work this year is an opportunity to show progress on real world action

---

This year aims to:

1. Build a shared understanding of the **global trajectory** required to reach our Breakthrough goals for 2030 in each sector

2. Build a shared understanding of the ways the **international architecture can be strengthened** in each sector to enhance impact

3. Together identify the additional **priority international actions** that will be taken forward for accelerating the pace of sectoral transitions

4. Embed the Breakthrough Agenda as an **annual process** to speed and scale progress to achieve the Breakthrough goals by 2030.

Backed up by:

- Individual **sectoral convenings under each Breakthrough** in Q2 and Q3 which will provide opportunities to shape and steer the discussion.
- The **State of Sectoral Transitions (SoST) report**, being developed by a partnership of the IEA, IRENA and the UN High Level Action Champions.
- The **Breakthrough Agenda written response** to the findings of the SoST report which will be published later in 2022.

# Hydrogen Breakthrough: Activity to Date

# Collaborative Process not an Initiative.

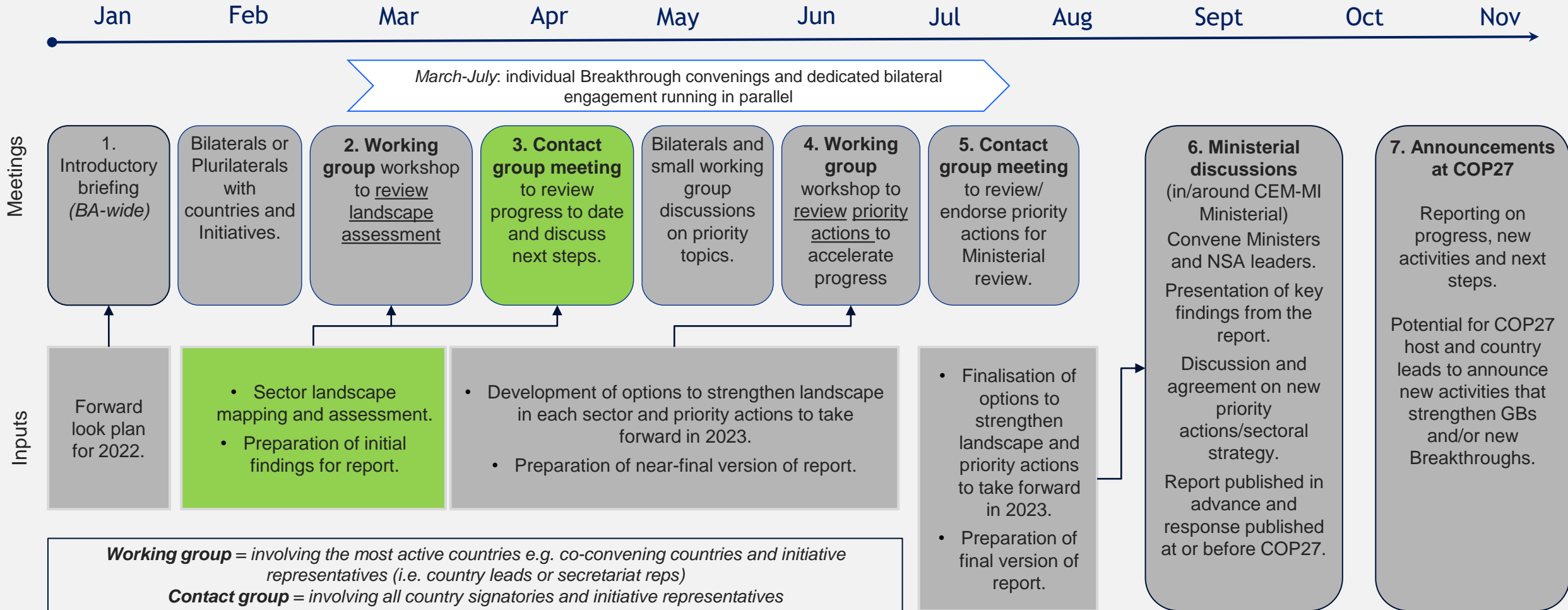
---

- Breakthrough Agenda is a process not an initiative. Aiming for an inclusive, collaborative process. Complements and strengthens the work of initiatives.
- Hope this will prove its value and can embed it as annual cycle, distinct from but linked back into the UNFCCC COP process. Exploring using the MI & CEM forums to facilitate that.
- UK in its COP26 Presidency year is coordinating the process and convening discussion in partnership with other countries.
- The Hydrogen Breakthrough process this year is being co-convened by the USA and UK but very open to, keen for, other countries engage as closely as you wish.

## **Activity to Date:**

- Developed a landscape map – showing how work of different initiatives relates to each other and key enabling conditions. Continue to refine and deepen that.
- Identified a number of topics which appear to have strong potential for strengthened collaborative action – that warrant deeper discussions.
- Bilaterals and workshops with all key initiatives. Discussions at CEM-MI Gathering.

# Process timeline for H2GB



# Mapping H2 International Initiatives



# International Hydrogen Initiatives

## Public-sector-led global Hydrogen Initiatives

International Partnership for Hydrogen and Fuel Cells in the Economy

CEM Hydrogen Initiative

Mission Innovation's Clean Hydrogen Mission

G7's Hydrogen Action Pact

UNDP's Hydrogen Initiative

Hydrogen Energy Ministerial (HEM)

UNIDO's Hydrogen Initiative

IEA's Hydrogen TCP

## Private-sector-led Global Hydrogen Initiatives

Hydrogen Council

Green Hydrogen Organisation

First Mover Coalition

Green Hydrogen Catapult

## Public & Private-sector Global Hydrogen Initiatives

IRENA's Collaborative Framework on Green Hydrogen

WEF's Accelerating Clean Hydrogen Initiative

Breakthrough Energy Catalyst

## Regional Hydrogen Initiatives

African Green Hydrogen Alliance

Hydrogen Europe

MENA Hydrogen Alliance

## Global Initiatives working on related topics

CEM Investment and Finance Initiative

Mission Possible Partnership

Green Grids Initiative

Breakthrough Energy Catalyst

Development Banks

Not an exhaustive list – feedback welcomed on other initiatives to be added

# Exploring Coordination & Collaboration Gains

Enabling condition	What's Needed?
<b><u>Long-term vision &amp; action plans</u></b>	Putting in place strategies and targets and developing action plans to provide longer-term confidence in and clear direction on the transition.
<b>Demand Creation &amp; Management</b>	Stimulating lead markets for clean solutions via procurement, smartly matching supply and demand and mitigating inefficient use via resource efficiency policies.
<b>Infrastructure &amp; Supply Chains</b>	Ensuring that the necessary supporting infrastructure is in place (e.g. hydrogen, CCUS, electricity networks) and that supporting supply chains are sufficiently at scale.
<b>Finance &amp; Investment</b>	Ensuring the availability of finance and capability / confidence of investors to support the widespread scale-up of clean solutions.
<b>Research &amp; Innovation</b>	Ensuring strong support for and collaboration on research, development and demonstration of new or enhanced solutions and capabilities.
<b>Market structures</b>	Developing and applying standards and certification processes, supported by accurate, verifiable data, to enable the differentiation of low emission products and services and to facilitate their use.
<b><u>Standards &amp; Certification</u></b>	Ensuring national and international trade conditions for system components and the resulting commodities support rapid adoption of clean solutions.
<b>Trade Conditions</b>	Using policy and regulation to structure markets in partnership with business, supporting the large-scale, rapid adoption of clean solutions.
<b>Knowledge, Capability &amp; Skills</b>	Ensuring the widespread availability of the technical and administrative capability and skills needed to implement policy / deploy clean solutions.
<b>Social Acceptance</b>	Ensuring the sector transition takes account of the views and needs of diverse social groups, supports wider social, economic or environmental goals and is accepted by society.

# Mapping Initiatives to Enabling Conditions – open to comments /amendments

Landscape Coordination	Hydrogen Breakthrough in partnership with the initiatives below							
Long-term Vision & Action Plans	Hydrogen Energy Ministerial (HEM)	International Partnership for Hydrogen & Fuel Cells in the Economy	G7's Hydrogen Action Pact	IRENA's Collaborative Framework on Green Hydrogen	Green Hydrogen Organisation	UNIDO Global Programme for Green Hydrogen in Industry	Green Hydrogen Catapult	IEA's Hydrogen TCP
Demand Creation & Management	Mission Possible Partnership	First Mover Coalition	WEF's Accelerating Clean Hydrogen Initiative	CEM Hydrogen Initiative	Hydrogen Council	Green Hydrogen Catapult		
Infrastructure & Supply Chains	Mission Innovation's Clean Hydrogen Mission	CEM Hydrogen Initiative	Hydrogen Council	Green Hydrogen Catapult	IEA's Hydrogen TCP			
Finance & Investment	CEM Investment and Finance Initiative	WEF's Accelerating Clean Hydrogen Initiative	Green Hydrogen Organisation	Hydrogen Council				
Research & Innovation	Mission Innovation's Clean Hydrogen Mission	IEA's Hydrogen TCP	Green Hydrogen Organisation	Green Hydrogen Catapult				
Regulation, Standards & Certification	International Partnership for Hydrogen & Fuel Cells in the Economy	IEA's Hydrogen TCP	Green Hydrogen Organisation	IRENA's Collaborative Framework on Green Hydrogen	Mission Innovation's Clean Hydrogen Mission	WEF's Accelerating Clean Hydrogen Initiative	Hydrogen Energy Ministerial (HEM)	Green Hydrogen Catapult
								Hydrogen Council
International Markets & Trade	International Partnership for Hydrogen & Fuel Cells in the Economy	CEM Hydrogen Initiative	Green Hydrogen Organisation	WEF's Accelerating Clean Hydrogen Initiative				
Knowledge, Capability & Skills	International Partnership for Hydrogen & Fuel Cells in the Economy	CEM Hydrogen Initiative	IRENA's Collaborative Framework on Green Hydrogen	Mission Innovation's Clean Hydrogen Mission	Green Hydrogen Organisation	UNIDO Global Programme for Green Hydrogen in Industry	Hydrogen Energy Ministerial (HEM)	IEA's Hydrogen TCP

# Example of ongoing mapping of activities – see end slides

Initiative	Brief summary of overall objectives	Category	Main Workstreams/Activities in 2022 & 2023 (ideally maximum of 5)	Main focus*
Hydrogen Energy Ministerial	Coordination platform: launched and chaired by Japan in 2018, the HEM aims to assemble representatives from governments, regions and international organizations working on hydrogen, and to discuss the realization of hydrogen society. Its Tokyo Statement and subsequent Global Action Agenda call for information-sharing and collaboration across different pillars of the hydrogen 'ecosystem', from production to end use. We have been working with participating countries through IPHE and CEM etc..	Public	Global Action Agenda of Tokyo Statement:	Long-term vision & action plans
			1. Collaboration on Technologies and Coordination on Harmonization of Regulation, Codes and Standards	Regs, Standards, Certification
			2. Promotion of Information Sharing, International Joint Research and Development Emphasizing Hydrogen Safety and Infrastructure Supply Chain <ul style="list-style-type: none"> <li>• Mobility across Applications</li> <li>• Hydrogen Supply Chains</li> <li>• Sector Integration</li> </ul>	Long-term vision & action plans Knowledge, Capability & Skills
			3. Study and Evaluation of Hydrogen's potential across sectors Including Its potential for reducing both CO2 emissions and other pollutants	Knowledge, Capability & Skills
			4. Communication, Education and Outreach	Knowledge, Capability & Skills
Clean Energy Ministerial Hydrogen Initiative	Deployment focus: via intergovernmental activities, aims to advance policies, programmes and projects that accelerate the commercialisation and deployment of hydrogen and fuel cell technologies across all aspects of the economy.	Public	Global Aspirational Goals	Long-term vision & action plans
			Global Ports Hydrogen Coalition	Demand Creation, Production Capacity, Supply Chains & Infrastructure, Knowledge, Capability & Skills
			Northwest European Forum	International Markets & Trade
			Hydrogen Trade	International Markets & Trade
			Hydrogen Twin Cities Initiative	Knowledge, Capability & Skills
International Partnership for Hydrogen and Fuel Cells in the Economy	Standards, safety and awareness: the IPHE acts as the key global forum for discussion of regulatory questions (including methodology for calculating carbon emissions from hydrogen production; and future trade rules). It is also active in areas including consumer awareness, safety, careers/ skills.	Public	Quantification Methodologies for H2 Production, Conditioning and Transportation	Regs, Standards, Certification International Markets & Trade
			Review of Trade Rules for H2 and Carriers	International Markets & Trade Infrastructure & Supply Chains
			Safety Standards Issues: Transport Infrastructure Land & Marine	Regs, Standards, Certification International Markets & Trade Infrastructure and Supply Chains
			Education & Outreach – Early Career Network	Knowledge, Capability & Skills

# Discussing Coordination Gains

---

- Doing a lot of good things, but not everything we need.
- What are the priorities for strengthened international collaboration and coordination – to help us collectively go further, farther, faster?
- Focus on identifying those topics which current initiatives:
  - Are not addressing at all;
  - Or the scope does not cover all that's needed;
  - Or resources/engagement is less than needed;
  - Or activities are not joined-up;
  - Or there is unproductive duplication of effort.
- Need to prioritise – looking for topics where strengthening international collaboration and coordinated action now can have the most impact.

## Questions:

Considering our *Objectives* (economic, widely available, just transition) and what we are currently doing:

- a. Do you agree with 4 prioritised topics?
- b. What should we focus on and who should be involved in a deeper dive?
- c. How can this help IPHE / where can IPHE support?

# Emerging Priorities for Strengthened Collaboration

Provisional insights from bilateral discussion and workshops to date. Not set in stone – can be refined with feedback.

Doing a lot of good things, but not everything we need. There is a lot of **scope for strengthened collaboration in all enabling conditions** but see particularly **pressing need and likely sizeable impact** from:

Demand Creation & Management	Finance & Investment	Research & Innovation	Regulation, Standards & Certification
<p>Demand signals are a potentially <b>important driver of investment</b> in supply and infrastructure; builds investor and confidence.</p> <p>Some existing activity but <b>not yet coordinated, visible or with sufficient scale and breadth</b>.</p> <p>Scope to explore how public and private sector actors can strengthen demand signals.</p>	<p>Access to appropriate finance is critical. <b>Investments starting</b> to be made but <b>scale still small</b> relative to need. Developed countries face challenges but <b>particularly acute for developing world</b>.</p> <p>Some existing activity but <b>not yet coordinated, visible or with sufficient scale and breadth</b>.</p> <p>Scope to explore how public and private sector investment can be stepped up and how investment into developing countries can be enabled and coordinated.</p>	<p>R&amp;I underpins progress across hydrogen systems – helping <b>reduce costs, improve performance and broaden applicability</b>.</p> <p><b>Significant existing activity with initiatives</b> driving action. However scope to <b>further increase scale</b> – particularly for pilot and demo projects and to broaden to more countries.</p> <p>Scope to explore how to <b>build on existing initiatives to increase diversity of demo projects</b> in different contexts, involve more countries and share learning more widely.</p>	<p>Regulatory frameworks including <b>internationally accepted and implemented standards &amp; certification</b> schemes across the hydrogen value chain are essential enablers of production, trade and use.</p> <p>Significant work underway from a wide range of actors on key elements. However <b>activities not closely coordinated</b> and <b>unclear if gaps</b> are resulting. Ensuring <b>rapid and wide adoption remains challenging</b>.</p> <p>Scope to explore how to connect existing work, identify and plug gaps and elevate and broaden political support.</p>
<p><b>Initiatives with current activity or interest include:</b> MPP, FMC, WEF-ACHI, CEM-HI, HC, GHC. <b>Need to add to the discussion:</b> [suggestions welcomed]</p>	<p><b>Initiatives with current activity or interest include:</b> CEM-HI, WEF-ACHI, GHO, HC. <b>Need to add to the discussion:</b> MLDs and other funding streams.</p>	<p><b>Initiatives with current activity or interest include:</b> MI-CHM, IEA-H2TCP, GHO, GHC. <b>Need to add to the discussion:</b> [suggestions welcomed]</p>	<p><b>Initiatives with current activity or interest include:</b> IPHE, IEA-H2TCP, GHO, IRENA-CFGH, MI-CHM, WEF-ACHI, HEM, GHC, HC. <b>Need to add to the discussion:</b> [suggestions welcomed]</p>

## Demand Creation & Management

We need a **growing demand for R&LC-H2**, both as the replacement of existing demand of **unabated fossil-based hydrogen** and demand generated in new applications.

Robust, credible, demand signals are a potentially **important driver of investment** in supply and infrastructure by strengthening the business case and confidence needed for investment in production and supply infrastructure.

Some existing activity will contribute but currently **not closely coordinated, visible or with sufficient scale and breadth.**

Scope to explore how international collaboration between both public and private sector actors can support stronger demand signals for renewable and low carbon hydrogen.

### Initiatives with current activity or interest include:

Mission Possible  
Partnership

First Mover  
Coalition

WEF's  
Accelerating  
Clean Hydrogen  
Initiative

CEM Hydrogen  
Initiative

Hydrogen  
Council

Green Hydrogen  
Catapult

## Standards & Certification

Internationally accepted and implemented standards & certification schemes across the hydrogen value chain are essential enablers of production, trade and use.

**Significant work underway from a wide range of actors on key elements.** However activities not closely coordinated and unclear if gaps are resulting. Ensuring rapid and wide adoption remains challenging.

Scope to explore how to **connect existing work, identify and plug gaps and elevate and broaden political support.**

### Initiatives with current activity or interest include:





## Finance & Investment

Access to appropriate finance is critical for all parts of the hydrogen value chain. **Investments starting to be made but scale still small** relative to need and not tailored to specific needs. Developed countries face challenges but **particularly acute for developing countries.**

Some existing activity to provide or facilitate investment specifically for hydrogen but **not yet coordinated, visible or with sufficient scale and breadth.**

Scope to explore how public and private sector investment can be stepped up and how investment into developing countries can be enabled and coordinated.

### Initiatives with current activity or interest include:

CEM Investment and Finance Initiative

WEF's Accelerating Clean Hydrogen Initiative

Green Hydrogen Organisation

Multilateral Development Banks

Development Finance Funds

[others?]

## Research & Innovation

R&I underpins progress across hydrogen systems – helping **reduce costs, improve performance and broaden applicability.**

**Significant existing activity with initiatives** driving action. However scope to **further increase scale** – particularly for pilot and demo projects and to broaden to more countries.

Scope to explore how to **build on existing initiatives to increase diversity of demo projects** in different contexts, involve more countries and share learning more widely.

### Initiatives with current activity or interest include:

Mission  
Innovation's Clean  
Hydrogen Mission

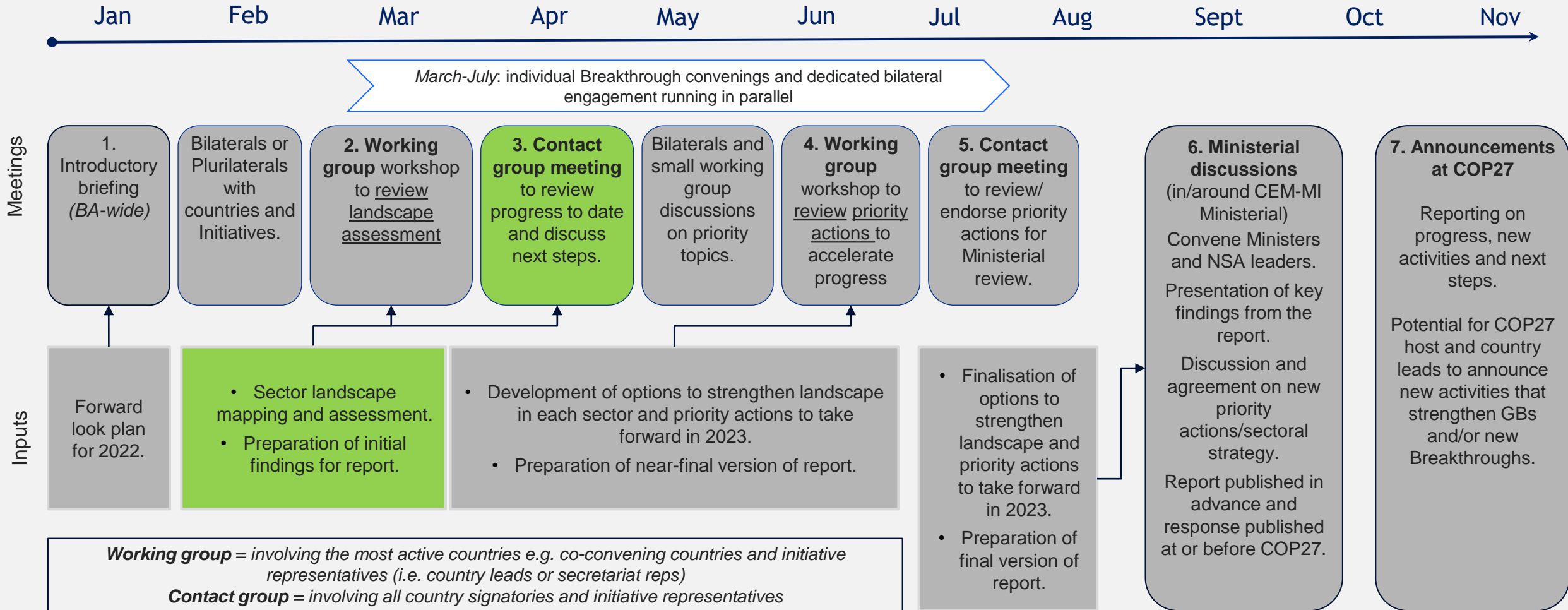
IEA's Hydrogen  
TCP

Green Hydrogen  
Organisation

Green Hydrogen  
Catapult

# Next Steps

# Process timeline for H2GB



# Next Steps

---

1. The landscape map will be updated with feedback from these discussions and wider H2GB community – and circulated by early May. [\[additional feedback very welcome – please e-mail\]](#)
2. For the 4 topics with the most promising potential collaboration gains identified from the discussions so far we will convene small-group and bilateral discussions of relevant initiatives and countries with the aim of developing proposals to address them. [\[expressions of interest to engage in specific topics very welcome – please e-mail\]](#)
3. In parallel the IEA, IRENA and the HLC's team will continue their analysis of progress and opportunities for the State of Sectoral Transitions report.
4. A second set of meetings the working group, countries and other interested parties will take place in June/July to discuss emerging proposals and seek agreement on those proposals that can be taken to ministerial discussion in September.

[Do reach out with comments or questions: paul.durrant@beis.gov.uk](mailto:paul.durrant@beis.gov.uk)

# Annex A: Additional Background Slides

# Mapping the Landscape – using enabling conditions

The Hydrogen Breakthrough goal is: **affordable renewable and low carbon hydrogen is globally available by 2030**

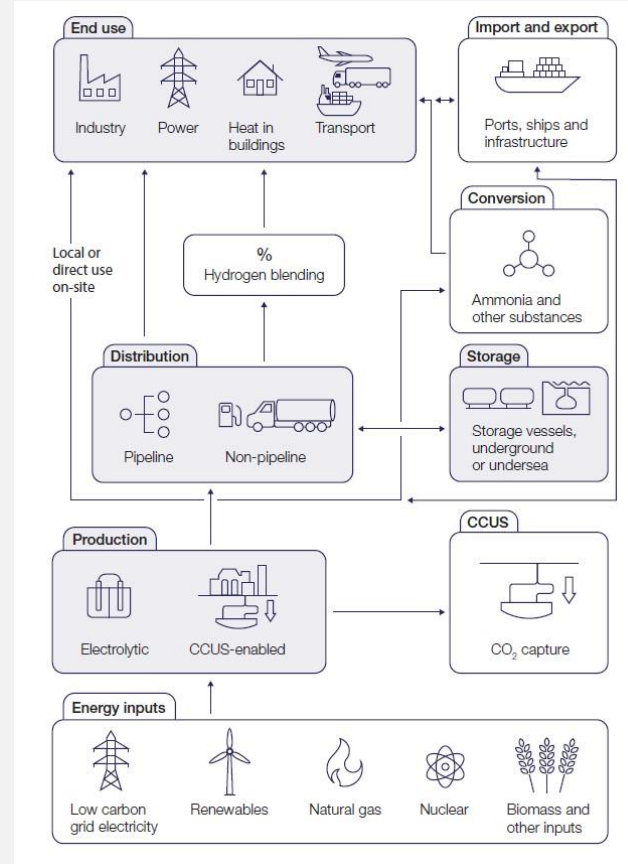
The key words there are ‘*affordable*’ and ‘*widely available*’. Achieving those objectives requires addressing a wide range of conditions across the full value chain. Addressing both is important in ensuring *just* energy transitions globally.

*Affordable* implies:

- Closing the cost gap between R&LC-H2 and polluting alternatives (either grey H2 or things H2 could substitute for) through a combination of making polluting options less attractive / affordable and reducing the system cost of R&LC-H2.
- H2 system cost reduction is driven by: **research & innovation**; scale of deployment & use; and favourable **finance**.
- Scale of deployment & use in particular is enabled by various conditions including: setting **long-term vision & action plans**; **creating demand**, building **infrastructure**, agreeing shared **standards and certification** procedures, fostering domestic and **international** trade, and ensuring stakeholders have sufficient **knowledge and skills**.

*Widely available* implies:

- Significantly scaling up production & use in a wide range of countries i.e. not enough to have a handful of front-running countries, need a wider cohort of ‘fast following’ countries. And all countries need to be in position to plan and develop the role of H2 in their energy transitions. Ensuring that including developing and emerging economies.
- Conditions that enable scaling up deployment & use are discussed above.
- Broadening H2 use to other countries implies ensuring countries have access to **knowledge, skills and capability**, can access appropriate **finance** and that there is functional international **markets** with mutually recognised **standards and certification**.



**Hydrogen System Value Chain**

# Country Membership of some Public-sector Initiatives

Country	CEM H2I	IPHE	MI H2 Mission	H2 Glasgow Breakthrough
Australia	Yes	Yes	Yes	Yes
Austria	Yes	Yes	Yes	No
Azerbaijan	No	No	No	Yes
Belgium	No	No	No	Yes
Brazil	Yes	Yes	No	No
Canada	Yes	Yes	Yes	Yes
Chile	Yes	Yes	Yes	Yes
China	Yes	Yes	Yes	Yes
Costa Rica	Yes	Yes	No	No
Denmark	No	No	No	Yes
Egypt	No	No	No	Yes
EU/ EC	Yes	Yes	Yes	Yes
Finland	Yes	No	No	Yes
France	No	Yes	No	Yes
Germany	Yes	Yes	Yes	Yes
Guinea Bissau	No	No	No	Yes
Holy See	No	No	No	Yes
Iceland	No	Yes	No	No
India	Yes	Yes	Yes	Yes
Ireland	No	No	No	Yes
Israel	No	No	No	Yes
Italy	Yes	Yes	Yes	Yes
Japan	Yes	Yes	Yes	Yes

Country	CEM H2I	IPHE	MI H2 Mission	H2 Glasgow Breakthrough
Kenya	No	No	No	Yes
Lithuania	No	No	No	Yes
Norway	Yes	Yes	No	Yes
Mauritania	No	No	No	Yes
Morocco	No	No	Yes	Yes
Namibia	No	No	No	Yes
Netherlands	Yes	Yes	No	Yes
New Zealand	Yes	No	No	Yes
Norway	Yes	Yes	Yes	No
Panama	No	No	No	Yes
Portugal	Yes	No	No	Yes
RoKorea (S. Korea)	Yes	Yes	Yes	Yes
Russia	Yes	Yes	No	No
Saudi Arabia	Yes	No	Yes	No
Serbia	No	No	No	Yes
Slovakia	No	No	No	Yes
South Africa	Yes	Yes	No	No
Spain	No	No	No	Yes
Sweden	No	No	No	Yes
Switzerland	No	Yes	No	No
UK	Yes	Yes	Yes	Yes
USA	Yes	Yes	Yes	Yes