Royal Academy of Engineering

Request for proposals: Facilitation of two-day workshop on UK green hydrogen delivery framework

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Deadline for proposals: Wed 15 November

Please send submissions to: andrew.chilvers@raeng.org.uk

Summary of invitation

The purpose of this commission is for the provision of preparatory support and for facilitation during a planned two-day residential workshop, convened by the Royal Academy of Engineering (RAEng) and the Royal Society (RS). This meeting will convene approximately 30 participants from industry, academia and government to identify the key technical and scientific targets and stages needed to achieve the UK's strategic aims with regards to the scale of low-carbon hydrogen production, transport and use. The residential workshop is planned to run from the evening of 22 January to late afternoon on 24 January 2024 at Cumberland Lodge, Windsor Great Park.

The full scope of the workshop, the preparatory support and the facilitation required during the two-days is outlined in the following section.

Facilitation: Royal Society and Royal Academy of Engineering Hydrogen Delivery Framework Workshop

1. **Summary**

1.1 About the Royal Academy of Engineering

Engineering underpins our daily lives, drives economic growth, plays a critical role in addressing major societal challenges and helps ensure our readiness for the future, from providing a sustainable supply of food, water and clean energy, to advancing healthcare, and keeping us safe and secure.

As the UK's national academy for engineering and technology, the RAEng brings together the most talented and successful engineers – our Fellows – to advance and promote excellence in engineering for the benefit of society.

Our vision is engineering in the service of society. Our charitable mission is to deliver public benefit through engineering excellence and technology innovation. We have outstanding convening power nationally and internationally.

In everything we do, we are guided by our five values:

- **Progressive leadership** – embodying the courage, commitment and ambition to drive positive change for engineering and society
- **Diversity and inclusion** – creating cultures in which everyone can thrive and diverse perspectives enrich our collective performance
- **Excellence everywhere** – bringing evidence, expertise, integrity and a passion for continuous improvement to everything we do
- **Collaboration first** – prioritising collaboration and building partnerships to improve outcomes
- **Creativity and innovation** – solving problems and generating opportunities through creative thinking and innovation.

Our overarching goal for 2020-2025 is **to harness the power of engineering to build a sustainable society and an inclusive economy that works for everyone.**

Via our Engineering Policy Team, we convene and manage the National Engineering Policy Centre (NEPC) - a partnership of 42 professional engineering organisations that cover the breadth and depth of our profession. Working with the NEPC, our Climate

and Sustainability Policy Team have delivered programmes of work on energy decarbonisation, for example:

- In September 2022, the NEPC produced a report on the role of low carbon hydrogen in a net zero energy system and the key opportunities, risks and dependencies that need to be managed if it is to be rapidly scaled up.
- Between Sept and Dec 2023, the Climate and Sustainability team are convening a series of 5 roundtables with policymakers, industry and researchers on key whole-system questions relating to delivery of a decarbonised electricity system.

1. 2 About the Royal Society

The Society's fundamental purpose, reflected in its founding Charters of the 1660s, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society has played a part in some of the most fundamental, significant, and life-changing discoveries in scientific history and Royal Society scientists continue to make outstanding contributions to science in many research areas.

Our principles

- Independence
- Partnership and convening
- Equality, diversity and Inclusion
- International and global focus

Our strategic priorities

- The Fellowship, Foreign Membership and beyond
- Influencing
- Research system and culture
- Science and society
- Corporate and governance

1.3 About the planned workshop

As the transition to net zero by 2050 gains pace, the need to convert sustainable electricity into a more storable form of energy to decarbonise the UK's energy system is becoming more apparent. The front runner technology is green hydrogen, generated from the electrolysis of water, which could be used for or as a precursor for:

- Large-scale, long-term stores of clean energy
- Fuel for difficult to decarbonise transport sectors e.g. aviation
- Decarbonisation of heating in industry and homes
- Decarbonisation of the chemical industry
- Decarbonisation of fertiliser production and of high-heat industries, such as steel production.

There are several obstacles to achieving the widespread use of green hydrogen, including:

1. The cost of green hydrogen and the need to be competitive with fossil hydrogen (so-called 'grey' hydrogen) and alternatives

2. The scale of production needed, including the low-carbon electricity required as an input
3. Minimising the full life cycle environmental impacts of production and use – from the raw materials needed, to waste streams and pollution.

While these problems are global, there is a need to identify UK relevant solutions and to determine where the UK's strengths and opportunities lie within those solutions. The UK Government has published a hydrogen strategy which sets out the direction and aims, but it does not detail the many scientific and technical problems that will need to be overcome to achieve those aims.

The production of low cost, green hydrogen at scale will be dependent on:

1. the cost of sustainable electricity (~60%)
2. the growth of ready markets for the product
3. and the development of distribution networks.

The RS and RAEng will convene a meeting of around 30 participants from industry, academia and government to identify the key technical and scientific targets, research questions and stages needed to achieve the UK's hydrogen strategy aims, as well as potential risks and barriers. The meeting would be residential over two days in January.

It is proposed that sessions comprising presentations, breakout groups and discussions will cover:

1. Identification of main technical and scientific barriers considering
    a. Production including water supply, electricity generation demands and grid constraints
    b. Storage and transport e.g. compatible materials
    c. Use – fuel cells and combustion
    d. Environmental impacts, safety and Life-Cycle Assessment
    e. Quality and purity for applications
    f. Policy and regional uncertainties, including spatial constraints.
    g. Barriers to taking a systems view.
2. Setting realistic targets (e.g. target £/kg green hydrogen, tonnes H_2/year production) and key pre-requisites to achieving them.
3. Identifying the policies needed to facilitate development of green hydrogen
4. Outlining realistic timescales to achieve the targets
5. Identifying the centres of expertise both in the UK and globally.

A proposed agenda for the two-day workshop has been developed and is contained in **Annex 1**. The RAEng and RS are working with an expert steering group comprised of leading researchers, industry figures and policy officials working in this area to oversee and steer this activity. The workshop will be chaired by Professor Nigel Brandon OBE FREng FRS.

1.4 Purposes of the commission

The workshop will be attended by academics, industrialists and government officials with a broad range of backgrounds and expertise. To get the most out of this event it is important that all within the group engage and contribute to the workshop. The

purpose of this commission is to secure the support of an experienced facilitator or facilitator team who can support the RAEng and RS staff teams and its expert steering group in scoping, designing and delivering the two-workshop described above which:

- Picks up from the most recent information from government on their strategic planning and direction for green hydrogen
- Achieves quality engagement with participants including:
    - Early group formation, buy-in and productivity toward the goals of the workshop
    - Being inclusive while also well-paced and efficient in covering the topics to be covered by the workshop
    - Providing a quality and enjoyable experience for participants.
- Produces outputs/draws conclusions from the planned sessions which:
    - Pinpoint the gaps in UK delivery planning which need to be addressed
    - Provide a clear view of the delivery steps and milestones which need to form the focus of delivery for government's goals and strategy, thereby rapidly producing a complementary and more granular set of deliverables that can support government in delivery of its strategy
    - Can be captured and synthesised into an end report.

As set out further below, support from the facilitator or facilitator team will include up to 4 days of preparatory work with the RAEng and RS staff team, and steering group where needed, focused on detailed workshop design and supporting the specification of the achievable outputs from each session and how they can piece together into a roadmap for green hydrogen.

We proactively seek to procure services from diverse teams and diverse suppliers. We expect the project to be delivered in line with our values of inclusion and diversity and to the highest ethical standards. Diverse perspectives should be considered in the development of proposals and outputs should be inclusive.

2. Objectives and role

The specific objectives are to:

- Work with the staff teams, and steering group where needed, to further refine and finalise the design of the proposed agenda and individual sessions to ensure they achieve the outcomes (see the outcomes outlined in Section 1.4) and outputs sought. In terms of outputs these will be the definition of key targets, milestones and deliverables that should form the basis of a delivery roadmap for realisation of government targets and ambitions for green hydrogen
- Attend and facilitate the delivery of the two-day residential workshop (see below). The key responsibilities of the facilitator/facilitator team will be as follows:
    - For some of the sessions within the planned agenda, we plan to have individual expert chairs, in which case the facilitator's role will be to support the chair, by providing appropriate steers, prompts or questions to them or the participant group(s) during individual sessions in order to guide the discussions towards production of agreed discussions and outputs.

- For sessions without a chair, the facilitator's key responsibility will be to lead group conversation to get the most out of the attendees relevant to the theme of each session.
- Outside of this the key role and responsibility of the facilitator/facilitator team will be to act as the main overall or 'end-to-end' workshop convenor, with a role in opening the workshop, setting the tone and objectives, introducing the processes of discussion, co-production and information capture as well as in wrapping up and closing the workshop. In this way the facilitator will be responsible for maintaining a focus on both process and delivery of the end-outputs throughout the two-day workshop.

Note: it is envisaged that there will be a minimum of two staff members from the RAEng and RS teams available for each session for notetaking and information capture and so the facilitator/facilitator team will not be expected to fulfil this function.

3. Timing and results to be achieved

Timing:	**Deliverable:**	**Results:**
Nov – Jan	Up to 4 days of preparatory work collaborating with the staff teams	• A detailed workshop agenda and running order with a clear set of roles across the facilitator, session chairs and staff teams. • A clear definition of the process by which to reach key target outputs for each session across the areas set out in **Section 1.3** (i.e. identification of main technical and scientific barriers, setting of realistic targets, timescales by which they need to be achieved and identification of centres of expertise both in the UK and globally).

23-24 Jan	Two-day residential workshop	A two-day event that achieves:
		• Quality engagement with participants including:
		  • Early group formation, buy-in and productivity toward the goals of the workshop
		  • Being inclusive while also well-paced and efficient in covering the topics to be covered by the workshop
		  • A quality and enjoyable experience for participants.
		• Effective support and coordination across the delivery team, including support to individual session chairs
		• Outputs from the planned sessions which:
		  • Pinpoint the gaps in UK delivery planning which need to be addressed
		  • Provide a clear view of the delivery steps and milestones which need to form the focus of

		delivery for government's goals and strategy, thereby rapidly producing a complementary and more granular set of deliverables that can support government in delivery of its strategy. • Can be captured and synthesised into an end report.
W/c 29 Jan	A wash-up meeting of at least 2 hours duration.	As noted, the RAEng and RS staff teams will lead on capturing notes and information from the sessions and to write this up. However, to assist a true capture of the proceedings and outputs, to review the workshop and capture lessons learnt, it will likely be necessary to hold a wash-up meeting where the full staff and facilitator teams meet to de-brief the proceedings and outputs.

4. Budget and invoicing

A total budget of £15,000 exclusive of VAT is available for delivery this two-day workshop and the preparatory input detailed above.

5. Experience and competencies

Providers are required to meet the following competency standards:

- Recognised expertise in facilitation
- Track record of facilitation with senior policymakers, researchers and/or business leaders, preferably in the areas of hydrogen or energy policy or industrial policy more broadly.
- Preferably at least one member of the delivery team a certified professional facilitator.

6. Procurement schedule

Deadline for the submission of proposals	**Wednesday 15 November**
Review of proposals and appointment of supplier	**Friday 24 November**

7. Guide contents of the proposals

We would like you to include the following in your proposal:

- **Organisation and team**: Please clearly explain the role and relevant experience of each participating team member
- **Past experience**: Evidence of past experience as a facilitator, in particular previous facilitation of events and road mapping activities with senior policymakers, researchers and/or business leaders, in particular in the areas of hydrogen or energy policy or industrial policy more broadly.
- **Delivery proposal**: How you intend to approach this commission and the activities that would be carried out, including any ways in which you would seek to further develop and build on the proposed workshop agenda included above.

- **Proposed schedule:** Availability and how you propose to schedule the pre-workshop preparatory work to further refine the agenda, participation and the target outputs from the workshop.
- **Cost of these services**

8. Assessment criteria

In selecting the preferred supplier, we will take into account the following criteria:

- **Proposed content:** quality and appropriateness of the approach to the delivery of content and outputs both during and as a result of the workshop.
- **Experience and track record:** the relevant experience and track record of the proposed team in delivering similar facilitation projects.
- **Schedule and availability:** availability for delivery of key deliverables in a timely way
- **Cost:** overall value for money and appropriateness of the budget.

Your response will be scored against this criteria in the following way:

Section:	*Proposed Content*		
Description of criteria	Score	Weighting	Max Points
Quality, appropriateness and novelty of proposed approach and target outputs	0–5	5	25
All key preparatory and delivery areas covered	Yes / No	Pass / Fail	
	Total	25	

Section:	*Experience and track record*		
Description of criteria	Score	Weighting	Max Points
Expertise of the facilitator/facilitator team	0-5	1	5
Experience of successful delivery of similar programmes	0-5	1	5
	Total	10	

Section:	*Schedule and availability*		
Description of criteria	Score	Weighting	Max Points
Availability and delivery of preparatory elements in a timely way ahead of two-day workshop	0-5	2	5

Availability for the two-day workshop				Yes / No	Pass / Fail
				Total	10

Section:	*Cost*		
Description of criteria	Score	Weighting	Max Points
Is competitively priced	Yes / No	Pass / Fail	
Has accounted for all costs to deliver proposal	0-5	1	5
Expenditure broken down and pricing clear	0-5	1	5
	Total	10	

Annex 1: Proposed agenda for two-day workshop

** This agenda is a work-in-progress and is to be refined and adjusted with the commissioned facilitator/facilitator team*

Pre-workshop dinner

Day 1: 9:00 – 17:00

Welcome and introductions	Stating aims and ambition for the workshop – to produce an outline green hydrogen roadmap for the UK
Session 1 Future hydrogen scenario	Establish an agreed future for hydrogen production and use in the UK. Should include an estimate of timescales and likelihood for both production and use. What should be the target cost and volume? *Interactive session seeking input from all.*
Session 2 Green hydrogen production	Compare current state of electrolysis to the needs described above. What are the important parameters? Identify challenges and potential routes to overcome. *Summary academic/industry presentations followed by discussion.*
Lunch	
Session 3 Storing and transporting hydrogen	What is known and proven? Can it be scaled up? What will the resource requirements be (materials, land etc.)? Identify challenges and potential routes to overcome. *Summary academic/industry presentations followed by discussion.*
Session 4 Using hydrogen	Compare current state of fuel cells, turbines, engines and chemistry to the needs described above. *Summary academic/industry presentations followed by discussion.*

Evening workshop drinks and dinner

Day 2 9.00 to 16.00

Session 5 A systems view	What are the difficulties of taking a systems view of hydrogen production and use? What are the main barriers to a UK wide hydrogen system, what external pressures could influence it? *Breakout sessions to consider the issues.*
Session 6 Safety and the environment	Is enough known about the environmental impacts of nationwide hydrogen production and use? What are the main safety risk of production and storage and how might

	they be mitigated? What is the public perception of hydrogen technology and use. Identify challenges and potential routes to mitigate or reduce impacts and risks. *Summary academic/industry presentations followed by discussion*.
Lunch	
Session 7 Policy interventions and incentives to develop a world leading UK hydrogen sector.	What policies have worked, what hasn't worked and what is still needed both from a commercial and an academic point of view? Are the workforce skills available? What are the current barriers to funding and investment? Are there "no regret" options? What assets might be stranded in the development of the sector? *Government position presentation followed by discussion led by panel (gov, industry, investor).*
Session 8 Future developments	What existing/expected R&D might impact the roadmap? Are there likely to be supply problems? Are there other "off the wall" changes in industry or society that could alter the roadmap? Having discussed the barriers and opportunities, are there faster options available? *Open, interactive horizon scanning session.*
Session 9 Output	Summary of main points arising from the workshop including timescales. Next steps.

Workshop ends.