Johnson Matthey response to DOE RFI on Clean Hydrogen Production Standard

Company / institution name:	**Johnson Matthey**
Company / institution contact	**Andy Walker**
Contact's address:	**Johnson Matthey, Orchard Road, Royston, Herts, SG8 5HE, UK**
Contact's phone number:	**+44 7967 278118**
Contact's e-mail address:	**andy.walker@matthey.com**

Please Read First:

DOE's Proposal for a Clean Hydrogen Production Standard (CHPS)

Request for Information Categories and Questions

1) Data and Values for Carbon Intensity

a) Many parameters that can influence the lifecycle emissions of hydrogen production may vary in real-world deployments. Assumptions that were made regarding key parameters with high variability have been described in footnotes in this document and are also itemized in the attached spreadsheet "Hydrogen Production Pathway Assumptions." Given your experience, please use the attached spreadsheet to provide your estimates for values these parameters could achieve in the next 5-10 years, along with justification.

JM response: the 95% carbon capture assumption is a valid one, and JM believes that this can be increased to the 97% and 98% level going forward for optimised ATR/GHR facilities

b) Lifecycle analysis to develop the targets in this draft CHPS were developed using GREET. GREET contains default estimates of carbon intensity for parameters that are not likely to vary widely by deployments in the same region of the country (e.g., carbon intensity of regional grids, net emissions for biomass growth and production, avoided emissions from the use of waste-stream materials). In your experience, how accurate are these estimates, what are other reasonable values for these estimates and what is your justification, and/or what are the uncertainty ranges associated with these estimates?

JM response: JM believes that it is important to allow local upstream CH4 emissions to be used, specific to particular projects, where it can be demonstrated that these fugitive emissions are lower than those assumed in GREET. We also believe it makes sense to allow companies to use the EPA tool for "eGrid Region by Zipcode" accessed via the link: (power_profiler_zipcode_tool.xlsx (live.com))

c) Are any key emission sources missing from Figure 1? If so, what are those sources? What are the carbon intensities for those sources? Please provide any available data, uncertainty estimates, and how data/measurements were taken or calculated.

JM response:

d) Mitigating emissions downstream of the site of hydrogen production will require close

monitoring of potential CO2 leakage. What are best practices and technological gaps associated with long-term monitoring of CO2 emissions from pipelines and storage facilities? What are the economic impacts of closer monitoring?
JM response:

e) Atmospheric modeling simulations have estimated hydrogen's indirect climate warming impact (for example, see Paulot 2021).19 The estimating methods used are still in development, and efforts to improve data collection and better characterize leaks, releases, and mitigation options are ongoing. What types of data, modeling or verification methods could be employed to improve effective management of this indirect impact?
JM response: One useful approach here would be to ask developers to produce a plan outlining how fugitive hydrogen emissions at the production facility will be minimised

JM would also like to see DOE and other bodies funding more research into the indirect impact of hydrogen on climate warming, to enable better quantification of the impact and the development of a more accurate global warming coefficient for hydrogen

f) How should the lifecycle standard within the CHPS be adapted to accommodate systems that utilize CO2, such as synthetic fuels or other uses?
JM response: Other CHPSs (eg the one in the UK) do not give any credit for CCUS applications - the only projects that fall within the scope of the low carbon hydrogen standard are those where the CO2 is permanently sequestered. We believe this is a sensible approach

2) Methodology
a) The IPHE HPTF Working Paper (https://www.iphe.net/iphe-working-papermethodology-doc-oct-2021) identifies various generally accepted ISO frameworks for a) The IPHE HPTF Working Paper (https://www.iphe.net/iphe-working-papermethodology-doc-oct-2021) identifies various generally accepted ISO frameworks for
LCA (14067, 14040, 14044, 14064, and 14064) and recommends inclusion of Scope 1, Scope 2 and partial Scope 3 emissions for GHG accounting of lifecycle emissions. What are the benefits and drawbacks to using these recommended frameworks in support of the CHPS? What other frameworks or accounting methods may prove useful?
JM response: Based on other CHPS frameworks, it is best to limit the analysis to that shown in the CHPS document (which includes Scope 1, Scope 2 and partial Scope 3 emissions) – this is the approach we are seeing elsewhere. Any other approach will likely put the US CHPS at odds with other such schemes and further complicate efforts to develop global CHPS approaches to facilitate global trade in clean H2 with a common approach to the system boundaries etc of such schemes

b) Use of some biogenic resources in hydrogen production, including waste products that would otherwise have been disposed of (e.g., municipal solid waste, animal waste), may

under certain circumstances be calculated as having net zero or negative CO2 emissions, especially given scenarios wherein biogenic waste stream-derived materials and/or processes would have likely resulted in large GHG emissions if not used for hydrogen production. What frameworks, analytic tools, or data sources can be used to quantify emissions and sequestration associated with these resources in a way that is consistent with the lifecycle definition in the IRA?
JM response:

c) How should GHG emissions be allocated to co-products from the hydrogen production process? For example, if a hydrogen producer valorizes steam, electricity, elemental carbon, or oxygen co-produced alongside hydrogen, how should emissions be allocated to the co-products (e.g., system expansion, energy-based approach, mass-based approach), and what is the basis for your recommendation?
JM response: JM believe it makes sense to do this on an energy allocation basis (using LHV energy content of the relevant products) – as has been done in CHPS schemes elsewhere

d) How should GHG emissions be allocated to hydrogen that is a by-product, such as in chlor-alkali production, petrochemical cracking, or other industrial processes? How is byproduct hydrogen from these processes typically handled (e.g., venting, flaring, burning onsite for heat and power)?
JM response:

3) Implementation
a) How should the GHG emissions of hydrogen commercial-scale deployments be verified in practice? What data and/or analysis tools should be used to assess whether a deployment demonstrably aids achievement of the CHPS?
JM response:

b) DOE-funded analyses routinely estimate regional fugitive emission rates from natural gas recovery and delivery. However, to utilize regional data, stakeholders would need to know the source of natural gas (i.e., region of the country) being used for each specific commercial-scale deployment. How can developers access information regarding the sources of natural gas being utilized in their deployments, to ascertain fugitive emission rates specific to their commercial-scale deployment?
JM response: As discussed above, it should be an option for projects to utilize such regional fugitive emissions data, as long as developers can demonstrate such traceability for their project

c) Should renewable energy credits, power purchase agreements, or other market structures be allowable in characterizing the intensity of electricity emissions for hydrogen production? Should any requirements be placed on these instruments if they are allowed

to be accounted for as a source of clean electricity (e.g. restrictions on time of generation, time of use, or regional considerations)? What are the pros and cons of allowing different schemes? How should these instruments be structured (e.g. time of generation, time of use, or regional considerations) if they are allowed for use?
JM response: Renewable energy credits, PPAs and other market structures should be allowable when characterizing the intensity of electricity emissions for hydrogen production. The question of additionality is an interesting and important one – it's important to get the balance right between the principle of additionality and ensuring that onerous requirements are not introduced which will slow the rate of uptake of green hydrogen – so perhaps this is a view that needs to evolve over time, with a more flexible approach initially (to drive the initial green hydrogen projects), with more requirements around additionality being introduced later

d) What is the economic impact on current hydrogen production operations to meet the proposed standard (4.0 kgCO2e/kgH2)?
JM response:

4) Additional Information
a) Please provide any other information that DOE should consider related to this BIL provision if not already covered above
JM response: The DOE should look at this Standard as something intended both to minimize GHG emissions during clean hydrogen production and to facilitate global trade of clean hydrogen. For both reasons, JM believe that a lower carbon intensity than the 4 *kgCO2e/kgH2* proposed should be implemented. A lower intensity CHPS would drive minimization of GHG emissions during clean hydrogen production and would further intensify efforts to mitigate upstream fugitive emissions. It would also be a key enabler of global trade in clean H2, and we note that the IRA puts the US in a globally-leading position to export clean H2 due to the very low production costs once the IRA credits have been applied. This export potential will be facilitated by the US having a CHPS aligned to, or even lower than, CHPS levels in other jurisdictions. Other CHPSs are moving to a lower intensity than the 4 kg/kg – for example the EU is expected to implement a 3.3 kg/kg standard, and the UK is going even lower, at 2.4 kg/kg – so we feel the US should be more ambitious. This will also allow the US to take a more ambitious position within the IPHE and other discussions about how best to develop and facilitate global trade in clean hydrogen.

JM does not see any significant issue in tightening the intensity from the 4 kg/kg level currently proposed, particularly since the DOE is clear that existing projects and some incoming plans within eg Hydrogen Hub projects will not be impacted by setting a lower intensity level – the DOE position is that this approach to the CHPS will *not* categorically exclude projects from eligibility for DOE funding programs related to the BIL or EPAct 2005 if their emissions exceed the emissions threshold for "clean hydrogen" or the lifecycle target set by the CHPS. The BIL provisions governing Regional Clean Hydrogen Hubs make

clear that DOE can select projects that do not meet the CHPS so long as the selected projects "demonstrably aid the achievement" of the CHPS.

Finally, JM believe that this CHPS is intended solely for the production of low carbon hydrogen (as it should be), such that other molecules derived from clean hydrogen, including clean ammonia, clean methanol, and sustainable fuels derived from clean hydrogen, should have separate carbon intensity standards to be developed at a later date.