

FAQs on the EOI to develop end-to-end Low or Zero Carbon Ammonia Power Generation and Bunkering Solution in Singapore

Q1 Can proposals for other hydrogen carriers besides ammonia be considered for this EOI or deployed?

Ans The scope of the EOI is for an end-to-end low or zero-carbon ammonia power generation and bunkering solution. Hence, only proposals for imported ammonia to meet this requirement will be considered. Participants may propose for the ammonia to be used directly as a fuel or converted to hydrogen to be used subsequently for the power generation solution.

For avoidance of doubt, the Singapore Government may consider launching projects or EOIs for other types of hydrogen carriers or low-carbon fuels in the future.

Q2 Is there a carbon intensity limit for the low-carbon ammonia for the EOI?

Ans We have not prescribed a carbon intensity limit for the low-carbon ammonia for the EOI. Nevertheless, the ammonia should be produced from low-carbon methods or sources. . These low-carbon methods include ammonia that is produced from renewable energy, or ammonia produced using fossil fuels with the emissions captured upstream in the source countries.

Participants should propose the carbon intensity of the low-carbon ammonia that they plan to use, and provide details on how the carbon intensity will be measured and verified or certified. As stated in Section 4.2 of the EOI document, Participants shall provide the following information on the carbon intensity of the ammonia:

- (i) Approach to certify and account for the carbon emissions of the ammonia/hydrogen (tonnes of CO₂ equivalent per kg of ammonia/hydrogen) during the Project;
- (ii) The method or international benchmarks used to certify, measure, report and verify the carbon intensity; and
- (iii) Reference examples used in other jurisdictions.

Where the carbon intensity of the low-carbon ammonia used is expected to vary significantly over the project lifespan, participants should clearly explain how the carbon intensity changes over time. If the low or zero-carbon ammonia supply cannot be achieved immediately, Participants shall indicate what is the lowest carbon intensity that can be achieved and the plan to reduce the carbon intensity over the lifespan of the project. A breakdown across different stages of the ammonia production and transportation value chain should be included, if applicable.

Q3 Can a forecast for carbon tax be provided for Participant's financial modelling?

Ans In Budget 2022, Singapore announced that the carbon tax will be raised to \$25/tCO₂e in 2024 and 2025, and \$45/tCO₂e in 2026 and 2027, with a view to reaching \$50-80/tCO₂e by 2030. The rates post-2030 will be determined in relation to the global situation and progress made towards our 2050 net-zero targets.

Q4 **What are the government support mechanisms available?
Will the government consider investing upstream and/or provide subsidy on ammonia molecules?**

Ans As stated in Section 3.10 of the EOI document, Participants shall indicate the fiscal and/or regulatory support needed from the Singapore Government in their proposals. Participants can also propose the mechanism in which this support can be provided.

Q5 **Are submissions without a full consortium covering end-to-end ammonia power generation and bunkering allowed?

Will government intervene in consortium formation and members in the subsequent stages of the EOI?**

Ans The primary purpose of the EOI is for the Government to assess the feasibility of developing an end-to-end solution for low or zero carbon ammonia procurement, import, storage, distribution, and end-use for both power generation and bunkering. Hence, submissions with end-to-end solutions are encouraged. Nevertheless, we will also consider submissions with partial solutions and will evaluate them based on the merits of the proposal.

The formation of a consortium is a commercial decision by the Participants as they are in a better position to select their own partners to develop a commercially feasible proposal to meet the EOI requirements. Participants may participate in more than one proposal.

Depending on the proposals submitted for the EOI and suggestions by the industry on feasible solutions, the Singapore Government will decide on the next steps, which may include launching an RFP with more specific requirements.

Q6 **What is the rationale behind the requirement of 50 MW of minimum power generation and 0.1MTPA capacity of ammonia bunkering? Are there plans beyond 50 MW? Specifically for power generation, can 50MW be applied to hydrogen blended power generation?**

Ans The minimum power generation capacity and ammonia bunkering volume was set at 50 MWe and 0.1 MPTA respectively, at the start, to ensure that the project is of a minimum scale to attract commercial interest, and allow the Singapore Government to validate the technical and economic feasibility of ammonia power generation and bunkering. Participants can propose solutions with higher capacities. Participants may also propose a plan to scale up above the minimum volumes specified in section 3.1 of the EOI document.

Hydrogen produced from low or zero-carbon ammonia may be blended with natural gas for power generation. However, the minimum 50MWe must be fully attributed to the amount of low-carbon hydrogen (obtained from low or zero-carbon ammonia) used in the power generation, by fuel calorific value. For example, 50MWe of hydrogen fuel (derived from appropriate amount of ammonia) can be blended with 450MWe of natural gas fuel in a 500MWe CCGT.

Q7 What is the rationale behind the scale up to 1 MTPA and what is the associated timeline? Is this a demand projection? Does this include bunkering demand?

Ans We would like to understand the scalability of hydrogen and ammonia imports which would help us to assess the potential for large-scale deployment of low or zero-carbon hydrogen in the long term to meet our net-zero targets by 2050. 1 MTPA is an estimate of the scale for a single-site to support large-scale deployment of low or zero-carbon ammonia to serve multiple sectors, including bunkering. Participants should articulate plans to scale up for better land and operational efficiency.

Q8 Will Participants be required to guarantee the information provided in the EOI submission, particularly the LCOE and LCOH?

Ans The EOI is non-binding and Participants are not required to guarantee the information provided in the EOI. However, the information should be based on well-grounded facts and research outcomes, and the associated carbon accounting so that we can assess the different proposals fairly. Participants should justify the information shared and state the level of uncertainty in figures provided, where possible.

Q9 Does the backup fuel for generation units need to be diesel?

Ans As per the Electricity License for Generation Licensee, the generating unit should have enough fuel reserves to last at least 60 days. If stockpiling of low or zero-carbon ammonia fuel reserve is not feasible, then the design of the generating unit should cater an alternate fuel with the equivalent of 60 days of fuel reserve.

Q10 Is it sufficient if agreements with off-takers are non-binding, and could it be subject to future changes?

Ans Some interested Participants have given feedback that it may be challenging to secure off-take agreements in this early stage of the project, as more time and studies will be needed for Participants to develop commercial proposals for long-term offtake agreements.

Hence, EOI submissions are not required to include fully concluded off-take agreements (e.g. PPAs), but should minimally include indicative cost estimates and pricing. Any additional documentation, e.g. Letters of Intent, would be advantageous.

Q11 What if the target operational date of 2027 could not be met?

Ans We understand that the project may depend on the production and development of low or zero-carbon ammonia supply chains and technologies. Participants should provide the best timeline possible and state the uncertainties/bottlenecks in their assumptions, and if any crucial R&D is required to meet their timeline. If a later operational date is proposed (for the entire project or a part of the project), please provide the reasons for the later date.

Q12 Would we be allowed to participate in the RFP without submitting an EOI proposal?

Ans We highly encourage interested Participants to submit proposals for the EOI stage.

Q13 What will be government's role in the future of hydrogen supply chain and distribution development? Will we expect a similar concept as LNG where government appoints an aggregator to import LNG and develop national infrastructure to support its deployment?

Ans We are studying the possible models for the import and deployment of low-carbon hydrogen and its carriers.

The ammonia power generation and bunkering project will provide insights and help us build capabilities in the import and handling of ammonia, which will be valuable as we consider potential large-scale deployment of hydrogen or ammonia in the future.

Q14 Is there expectation for Participants to engage land planning agencies on availability of various land plots for the EOI?

Is there a plot of land set aside for this project, and if so where?

Ans Participants are not required to engage the land planning agencies at the EOI stage. Participants should propose potential sites for the project based on their own operational efficiency considerations. These may include greenfield or brownfield sites, or a mix of both greenfield and brownfield sites. It can include sites owned or occupied by the Participant. EMA and MPA will facilitate engagements with land agencies in the later phases of the project. Land allocation for the project will be determined based on the infrastructure requirements of the proposals submitted, as well as environmental, health and safety requirements.

Q15 Does the EOI allow offshore solutions? If so, what about sea space requirements?

Ans Yes, Participants may propose offshore solutions in their proposals.

For more details on offshore and/or floating storage/power generation options, the Participant may refer to section 4.4.3.2 in the EOI document. Note that the Participant shall provide

- (i) a breakdown of the sea space footprint needed for these offshore solutions,
- (ii) site layout for the ammonia import/ bunkering terminal, storage and liberation (if applicable) facilities, and power generation facility and any related connecting infrastructure (if applicable).
- (iii) details on relevant safety and marine risk assessments for these offshore facilities.

MPA will further work with the various agencies and parties post the EOI, and may impose additional requirements for options at sea.

Q16 Will details of submitted proposals be shared with participants/companies?

Ans No. Details of submitted proposals are only for the Singapore Government and will not be shared with any other companies during or after the EOI.

Q17 Are there plans to award an ammonia bunkering license from this EOI?

Ans We will assess the award of an ammonia bunkering license separately.