**Questions and Answers Document**

# **Disclaimer**

The following answers are based on California Energy Commission (CEC) staff’s interpretation of the questions received. The applicant is responsible for reviewing the Solicitation Manual and determining whether its proposed project is eligible for funding by reviewing the Eligibility Requirements within the solicitation. The CEC cannot give definitive advice as to whether a particular project is eligible for funding, because not all proposal details are known.

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# **Administrative**

1. **When will the slides will be posted?**

The workshop slides were posted on January 26, 2023, and can be found on the GFO-22-504 solicitation webpage: <https://www.energy.ca.gov/solicitations/2023-01/hydrogen-blending-and-lower-oxides-nitrogen-emissions-gas-fired-generation>.

The recording can be found on the workshop event webpage: <https://energy.zoom.us/rec/share/X4DH7Swc_LiraPBKj95fxRCh4jol1iapcfjsegpvXmy9rS5gq4YICdjFJGTCs-XG.amDRbHZbBHTGGeXX>

# **Applicant and Project Eligibility**

1. **Can you confirm that this solicitation is focused on power generation technology that may inherently emit zero/low oxides of nitrogen (NOx) as opposed to focused solely on technology that reduces NOx in the power generation sector?**

The purpose of the solicitation is to fund the development and demonstration of “emission-mitigating technologies and gas-fired power generation technologies” (please refer to the Solicitation Manual, Section I.A Purpose of the Solicitation). The intention is for the current gas-fired technologies to run on high blends of hydrogen in the fuel stream while mitigating greenhouse gas and NOx emissions, without compromising generation efficiencies and performance, to support meeting California’s goals for carbon neutrality and improving public health and safety. Projects demonstrating gas-fired power generation technologies that may inherently emit zero/low NOx may be eligible if they demonstrate the ability to be fueled with high blends of hydrogen and meet all other solicitation requirements.

1. **Why is this solicitation limited to engines and microturbines? What is the process for allowing additional technologies to participate?**

A clarification on eligible technologies is included in Addendum 1 of the Solicitation Manual. The technologies are limited to internal combustion engines such as microturbines and reciprocating engines to focus on decarbonizing the dominant gas-fired generation technologies that rely on fossil gas. There is no process for allowing additional technologies that are outside the scope of requirements of this solicitation. Non-eligible power generation technologies under this solicitation may be eligible under future CEC grant funding opportunities.

1. **Can additional technologies be added, e.g., linear generators? Linear generators utilize a non-combustion reaction to generate electricity.**

Linear generators that can be categorized under internal combustion engines would be eligible under this solicitation.

1. **For fuel blends, is it possible to consider hydrogen blended with fuels other than natural gas (e.g., methanol)?**

The Solicitation Manual does not restrict the fuel that hydrogen is blended with but does state that demonstration projects will need to establish a baseline for the generation system using 100 percent fossil gas (or zero percent hydrogen) and then subsequently operate using the blended fuel (page 8).

1. **What is light industrial?**

Light industrial is a zone that is available for light manufacturing, warehousing, distribution, or other related limited-intensity activities.

1. **Our office laboratory is in a census tract identified by CalEnviroScreen as below 80% of the statewide median income. With our location being in a “Disadvantaged Community” and our engine generates little useful heat available for Combined Heat and Power (CHP) use, can our test site and our laboratory site be the same address?**

Section II.A. Eligibility, on page 22 of the Solicitation Manual explains that eligible demonstration projects must be located in the service territory of a California gas Investor-Owned Utility (Gas IOU), which includes Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Gas Company. All projects in this solicitation must benefit Gas IOU ratepayers.

Additionally, for pilot testing activities, the applicant must include a site commitment letter signed by an authorized representative of the proposed pilot test site. The letter must: (1) identify the location of the site (street address, parcel number, tract map, plot map, etc.), which must be consistent with Attachments 1 and 8, and (2) commit to providing the site for the proposed activities. This is item 5 of the Screening Criteria as shown in Section E. Stage One: Application Screening on page 34 of the Solicitation Manual.

1. **Can a company outside California partner with a local lab or business entity for this grant?**

Yes. This solicitation “is open to all public and private entities” as stated in Section II.A. Eligibility of the Solicitation Manual. Researchers, universities, or companies from outside of California are eligible to apply.

Also note, per Section II.C, California Secretary of State Registration of the Solicitation Manual, “All corporations, limited liability companies (LLCs), limited partnerships (LPs) and limited liability partnerships (LLPs) that conduct intrastate business in California are required to be registered and in good standing with the California Secretary of State prior to its project being recommended for approval at an CEC Business Meeting. If not currently registered with the California Secretary of State, applicants are encouraged to contact the Secretary of State’s Office as soon as possible to avoid potential delays in beginning the proposed project(s) (should the application be successful). For more information, contact the Secretary of State’s Office via its website at [www.sos.ca.gov](http://www.sos.ca.gov).

“Sole proprietors using a fictitious business name must be registered with the appropriate county and provide evidence of registration to the CEC prior to their project being recommended for approval at an CEC Business Meeting.”

Please also see Section IV.F. Stage Two: Application Scoring Criterion 6 “CEC Funds Spent in California” of the Solicitation Manual; this criterion assigns scoring points for spending CEC (i.e., grant) funds in California. The definition of what constitutes funds spent in California is described in Section I.K. Funds Spent in California and California-Based Entities of the Solicitation Manual.

Note that applications will be incorporated by reference into any resulting grant agreement. Therefore, an applicant's commitment to spend a certain amount of CEC funds in California will be binding on the applicant, and failure to spend the committed amount could result in a decrease in grant amount.

1. **Does the engine developer / Original Equipment Manufacturer need to be a California-based entity (with a California headquarters and legal entity), or can they just have an office in California or even just provide workers to do the work in California?**

Please see the response to Q.8.

1. **How can we best work with others to show: hydrogen blending in fuel; on-demand** **solar-thermal storage; drying and burning community wastes; and using some plastics for fuel to reduce waste volume?**

Applicants are encouraged to sign up to the CEC’s Empower Innovation network, which can be found at <https://www.empowerinnovation.net/>, to connect with entrepreneurs, developers, investors, and local communities to partner with on their projects.

# **Scoring Questions**

1. **Are there preference points for minority-owned recipients?**

No. Preference points are outlined in the Scoring Criteria Preference Points table in the Solicitation Manual (page 41) and include up to 5 points for California Based Entities, up to 10 points for Match Funds, and up to 5 points for projects that demonstrate benefits to disadvantaged and/or low-income communities.

1. **How heavily will you weight projects with higher ratios of hydrogen used, all the way up to 100% hydrogen use? Is the goal really to have 100% hydrogen-fired generators?**

The intention is to support the development for achieving hydrogen blending up to 100% by volume. There is no specific weighing scale based on the hydrogen blending being proposed. The goal is to demonstrate decarbonization along with emissions-mitigation for the gas-fired generation technology, without compromising generation efficiencies and performance.

1. **Are bonus points available for higher hydrogen volumes (greater than 30%)?**

Please see the responses to Q.11 and Q.12 regarding preference points.

1. **The solicitation mentions and outlines energy efficiency, but the scoring doesn't specifically provide how or if efficiency is weighted.**

Table 1 in the Solicitation Manual identifies electric generation efficiency as a target metric for the project that must be demonstrated. The Scoring Criteria takes efficiency into account in several areas of the Technical Merit and the Technical Approach sections.

1. **The solicitation highlights the import of efficiency in several groups. How is efficiency weighted within the scoring of each proposal. Is the efficiency single cycle or CHP efficiency? If CHP how is the heat availability weighted.**

Please see the response to Q.14 regarding the scoring of efficiency.

CHP systems are eligible under this solicitation, and the efficiency increase they provide would be an enhancing feature for additional benefits. However, heating is not part of the main purpose of this solicitation. As explained on page 2 of the Solicitation Manual, the purpose is to demonstrate emission-mitigating technologies and gas-fired power generation technologies that can run efficiently on high blends of hydrogen in the fuel stream. Given the power generation focus, Table 1 in the Solicitation Manual sets a requirement for the electric generation efficiency.

1. **Why wouldn't the heat be more weighted if the industrial site user needs heat in addition to electricity?**

Please see the responses to Q.14 and Q.15.

1. **Decarbonization without weighing the byproduct heat seems counter to reducing GHG.**

Please see the responses to Q.14 and Q.15.

1. **GFO-22-504 scoring criteria 1, Technical Merit requires applicants to “Describe(s) the competitive advantages of the proposed technology over state-of-the-art (e.g., efficiency, emissions, durability, cost).” Does “efficiency” within the competitive advantages pertain only electric generating efficiency exclusive of any high temperature heat for CHP?**

Yes. Please see the responses to Q.14 and Q.15 for additional details.

1. **Of the emissions criteria outlined within GFO-22-504 Table 1: Project Target Metrics, is there any emission “energy credit” for CHP as defined in document** [**https://ww2.arb.ca.gov/sites/default/files/2020-08/guidelines.pdf**](https://ww2.arb.ca.gov/sites/default/files/2020-08/guidelines.pdf)**?**

No. The target emission metrics in Table 1 are intended for the generation with NOx mitigation systems. Although CHP systems are eligible, the purpose of this solicitation is focused on power generation and not on heating.

1. **Please explain how applications are to be scored in the Solicitation GFO-22-504 in Scoring Criterion 3.a (annual thermal savings)?**
   1. **Is the “thermal savings” attributable solely to single cycle electric generation and exclusive of any credit for use of any heat resulting from generating the electricity?**
      1. **If not, how is the heat potentially available to CHP applications scored?**

Scoring Criterion 3 evaluates the impacts and benefits for California Gas IOU Ratepayers. For the “annual thermal savings” criterion, proposals must explain how using high blends of hydrogen in their projects would allow for energy savings, energy cost reductions, generation reliability, etc. Projects that provide clear and justifiable estimates that can be quantified would score higher than those that are vague or use unreasonable estimates.

Yes, the thermal savings are solely attributable to the gas-fired power generation exclusive of heating, as the fuel input is decarbonized by using higher blends of hydrogen.

Please see the responses to Q.14 and Q.15 regarding the scoring of CHP applications.

1. **The solicitation states that “Technologies and applications of interest are microturbines or internal combustion engines that could support either local power generation or be used in combined heat and power (CHP) systems.”**
   1. **Please identify within solicitation GFO-22-504 where there is consideration in an application score for a proposed technology’s use in CHP systems?**

Please see the responses to Q.14 and Q.15 regarding the scoring of CHP applications.

1. **We wanted to better understand whether electricity only systems will be scored more or less advantageously than comparable CHP designs that in combining their heat and power outputs are more than 80% efficient.**

Please see the responses to Q.14 and Q.15 regarding the scoring of CHP applications.

# **Technical Questions**

1. **We assume something novel needs to be done on these projects, and not just demonstrating that hydrogen blends can be successfully used in an engine or turbine - something novel like new ways to reduce NOx, fuel delivery systems, etc. Is this correct?**

Yes. Page 8 of the Solicitation Manual explains the focus on supporting the innovation and advancement strategies required to maintain or improve upon the performance, efficiency, and durability of the system when compared to the baseline using the same generation system running on 100 percent fossil gas (or zero percent hydrogen), while remaining emissions compliant.

1. **How do you define an "engine" - just spark-ignited, Otto cycle based?**

Please see response to Q.3 regarding internal combustion engines.

1. **The NOx and CO emissions reduction targets are referenced to a “baseline at 0% H2 blend”. Does this infer the “baseline” must be fueled with natural gas? What about a “baseline” reciprocating ICE based on a diesel platform?**

The Solicitation Manual does not restrict the baseline fuel used for the gas-fired generation but does state in Section C. Project Focus that demonstration projects will need to establish a baseline for the generation system using 100 percent fossil gas (or zero percent hydrogen) and then subsequently operate using the blend.

The technology focus of the solicitation is on gas-fired generation systems, which normally use fossil gas. Therefore, engines using a diesel platform as a baseline would not be eligible.

1. **Should the applicant identify the H2 sources (steam reforming of methane or renewable) for this solicitation?**

Yes. Section C. Project Focus on page 10 of the Solicitation Manual explains that in the Project Narrative, proposals must describe the plan for sourcing the hydrogen to be used in the project. Please note, proposals using hydrogen sourced from low carbon pathways will be scored favorably.

# **Size Questions**

1. **Does the solicitation include industrial gas turbines under 5 megawatts (MW) or was the range of up to 5 MW just for internal combustion engines?**

The 5 MW power limit is applicable to both microturbines and reciprocating engines. See also response to Q.3.

1. **How did you select the 300 kilowatt (kW) lower limit?**

The 300 kW lower limit was selected to ensure that the systems would not be exempt from the local air district emissions standards set for stationary power generation. These exempted systems generally include microturbines up to 250 kW, engines less than 37 kW, and fuel cells. They are regulated under the distributed generation certification program from the California Air Resources Board (CARB). Although small engines are exempt from district permits, most engines used in distributed generation applications are larger and therefore require district permits.

CEC staff wants to provide opportunities for technologies to mature and support their development for demonstrations at the pilot scale. The intention is to have these technologies operate on higher blends of hydrogen while meeting the emissions requirements. This means that demonstrations would be done to validate the performance of a final-form (or near final-form) technology or system in a real-world, operational environment. Being at the pilot scale, the technologies are not yet at the commercial deployment stage of maturity but could support a range of activities to demonstrate their ability to run on higher blends of hydrogen while meeting emissions requirements.

Therefore, the CEC is amending the solicitation to remove the lower power limit of 300 kW, and the technology power sizes that would normally be exempt from the local air district standards would now need to comply with the CARB emissions standards.

Please see Section C. Project Focus in the Solicitation Manual Addendum 1 for the updated solicitation language.

1. **Can you combine two 200 kW micro turbines to satisfy 300 kW limit?**

Please see the response to Q.28 regarding the lower power limit.

1. **Would a connected, modular solution in which two 230 kW generators are “daisy chained” meet the requirements of the minimum nameplate capacity of 300 kW?**

Please see the response to Q.28 regarding the lower power limit.

1. **Our products are up to 1 MW nameplate, which consists of 5, 200 kW engines operating in parallel. The most effective size for this research project would be 200 kW. Can the lower limit be re-evaluated?**

Please see the response to Q.28 regarding the lower power limit.

1. **Can the minimum nameplate capacity limit be reduced to 200 kW?**

Please see the response to Q.28 regarding the lower power limit.

1. **Will 5 kW (0.005 MW) internal combustion engine prime mover micro-CHP systems be acceptable under this solicitation?**

Please see the response to Q.28 regarding the lower power limit.

1. **Can an engine less than 300 kW be utilized in this solicitation for proving the technology and increasing the technology readiness level with the intent of going to beyond 300 kW in future phases?**

Please see the response to Q.28 regarding the lower power limit.

1. **At the current stage of technology development, it is both the fastest path forward as well as the most cost-effective way to use the current 5 kW system as the platform to advance the technology potential. We hope the CEC team will consider the amendment of the solicitation to include small internal combustion engines rather than the current size limit of 300 kW.**

Please see the response to Q.28 regarding the lower power limit.

1. **Capstone would like the minimum power requirement to be reduced from 300 kW to 200 kW to match our basic unit size. The rationale for this request is cost management and project complexity. Without the approval of this request, we would utilize our C400 system. This would require twice the hardware costs, twice the fuel costs, and additional labor. Also, test and development facilities may need to be upsized to accommodate the larger package size, fuel flow rates, and power output. Overall system efficiency and emission rates, two important metrics for this solicitation, are not impacted by testing C200 or C400 microturbine systems.**

Please see the response to Q.28 regarding the lower power limit.

1. **With a part of the goal being residential uses would behind the meter, smaller systems be of interest? The reason being that behind the meter could have a faster market adoption.**

Please see the response to Q.28 regarding the lower power limit.

1. **Everybody is talking about “small scale” up to 5 MW, are you interested in the larger scale applications? For example, on-site demonstration of some these existing engines at the larger scale?**

The upper limit for the power range is 5 MW to be commensurate with the amount of funding available under this solicitation and with the costs associated with operating the system. Systems up to this limit are eligible for funding and could include on-site demonstration as part of the proposed project.