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Demonstrating Innovative Solutions to Convert Californiaâ€™s Forest Biomass Resources into Renewable Natural Gas

Additional submitted attachment is included below.

Demonstrating Innovative Solutions to Convert California's Forest Biomass Resources into Renewable Natural Gas

Comments to Questions

1. Are the technical targets for the pilot demonstration clear and reasonable? Should they be narrowed further? If not, why not? Please identify the specific targets that should be changed and the recommended change.

Individually, all technical targets are reasonable, but in combination, they are too narrow/aggressive. In order to meet the gas quality, the gas production rate, and the number of hours all in one plant, such a plant would need to contain nearly the same unit operations as a large commercial plant, except at a smaller size. Applying scaling factors from the GoBiGas 20MW(RNG) demonstration, or comparing with the Güssing 1MW(RNG) demonstration, would lead to a capital cost of at least $15M. Additionally, there would be substantial operating costs, because the plant would not be profitable, and even if not operated, some costs for rent and maintaining the plant arise.

The technical targets could be widened by allowing to skip well-known unit operations such as carbon dioxide or water removal, especially if the applicant can prove from gas measurements that the natural gas standards would be (theoretically) met if carbon dioxide or water were to be removed.

Similarly, certain process steps could be allowed to operate at less than 500 hours, if such a long-term operation would not add value, and if other process steps could still be operated at 500 hours by using stored gases/liquids from previous process steps (or synthetic equivalents).

Certain key developmental process steps should be allowed to operate at a smaller scale (<50 scf/min), as long as the technology is the same as for a commercial scale, and the applicant can show that operating the technology at 500 hours would essentially be the same at a larger size.

2. Are the target cost and technical specifications for a commercially-mature system clear and reasonable? Should they be narrowed further? If not, why not? Please identify the specific targets that should be changed and the recommended change.

The target costs for a commercially-mature system could be clearer. For example, $12-21/mmBTU might already include carbon credits or RINS (hence the higher than market price for natural gas), but is the commercial plant allowed to employ other subsidies to achieve the <$21/mmBTU target (Investment Tax Credit, Fire Prevention Subsidies, ...)? It is assumed that the Payback the simple payback time without interest? If not please specify. For the System Lifetime, please specify if this means that the equipment needs to last at least that long (>15 yrs), or if this means that capital costs and returns must be paid back (to investors and lenders) before that time (<15 yrs).

There are no technical targets for the commercial plant, unless System Lifetime is seen as a technical target (>15 yrs). Other technical targets could be the size (e.g. 10-100 MW RNG, 34-340 mmBTU/hr), efficiency from biomass to RNG (e.g. 40-70%), or carbon intensity. This would make clear which

technologies should be targeted, since technologies are different for 10MW, 100MW, and 1GW. Feedstock moisture could also be specified (summer or year-round operation), and if it will be dried by the supplier (forest waste) or if the commercial plant needs to have a dryer.

The target costs are reasonable. Costs are currently high because of capital costs, labor costs, and feedstock (including transport) costs. There is potential to reduce all three costs, by improving technologies, improving automation, and subsidizing dead-tree removal from forests.

If the System Lifetime is longer (e.g. 20-30 years), the Payback might also be longer. The current targets would discourage anyone to build a plant with a long lifetime.

Suggested targets: Payback: 10-20 yrs, System Lifetime (useful life for depreciation): 15-30 yrs. Feedstock moisture at plant gate: >30w%. Feedstock size at plant gate: >2in.

3. Will a technology that achieves these targets have the characteristics required for a commercially-viable woody biomass to RNG system? What targets are missing that would help improve commercial viability?

The technical targets for the pilot plant do not guarantee commercial viability, since the technologies at the pilot scale may be different than those at the large scale. Also, for the pilot plant, no cost targets were specified.

The technical and cost targets for the commercially-mature system will allow for a commercially-viable woody biomass to RNG system if it includes the above suggestions.

4. Are the feedstock requirements clear and reasonable?

Yes, the feedstock requirements for the pilot demonstration are clear and reasonable. If the feedstock is different than that for the commercial plant (smaller size, lower moisture, lower ash), the applicant should explain how this would be relevant for the commercial plant.

5. Are the correct technologies being focused on (conversion, cleanup, and upgrading systems)? Are there components that offer more opportunity for cost reduction?

Yes, these technologies do offer opportunities for cost reduction.

6. What is the best way to evaluate the levelized cost of methane presented by proposed projects? Would requiring a technical overview of the pathway, assumptions used, and economic estimates be sufficient?

The best way to evaluate the levelized cost of methane is if the assumptions include actual costs from previous and similar projects, third-party estimates and quotes, and the used scaling factors. New and uncertain technologies must also include higher contingencies. Economic estimates should include feedstock price and properties, subsidies and credits, plant size and locations.