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## Comments on 19-ERDD-01

*Additional submitted attachment is included below.*

**Comments on Draft Solicitation on Demonstrating Innovative Solutions to Convert California's Forest Biomass Resources into Renewable Natural Gas**

8/24/2018

Comments of:
Michael Long
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Technical targets are clear, but the funding for such targets is insufficient. Rough estimates made from application of scaling factors to known demonstration plants and studies (Gobiogas 20MW RNG, and Gussing 1MW RNG) suggest that a ~3-6 mmBtu/hr RNG scale demonstration would cost $10 to $20 million USD in only capital costs. Considering a $2 million USD project, a more reasonable sized demonstration would be in the 0.15 to 0.6 mmBtu/hr RNG scale; obviously larger demonstrations should be allowed in the event that an applicant desires to produce a larger system.

Though having value in public and political drive for projects, from a technology development point of view, full process demonstrations are not the most economically efficient path forward. On the other hand, it is also agreed that small laboratory process unit developments are not the most direct path toward commercialization either. Ideally, funding should encourage focused laboratory/bench scale development of necessary process steps, while also pushing for a reasonably scaled demonstration of the full process, or nearly full process with particular focus on unit operation that require further development. Gas upgrading by removal of CO2 and gas compression for storage or transport, for example, are somewhat mature technologies. Being that these process steps are the final two unit operations in the RNG process train, they can be disregarded in a project without negative consequences for RNG process unit integration and development. Further, with the focus of this demonstration being RNG, it seems the keys points to demonstrate are: 1) Process scale-up of biomass through methanation to ensure there are no scaling issues, 2) Online demonstration of biomass through methanation, and 3) Long duration demonstration of methanation system operation on synthesis gases.

At the moment, biomass gasification as well as methanation are very expensive, thus a greater emphasis on the development and demonstration of the RNG related units with less strict requirements on the upstream gas generation better allows funding to be spent on development of the key technologies. Consequently the suggested reasonable process scale for a $2 million USD process from above assumes that upstream steps do not have to run the full 500 hours; but rather, are run some number of hours giving a full process demonstration while online, but also allowing for storage of gases for full 500 hours of RNG demonstration on synthesis gases from a mixture of direct full process operation and indirect full process operation using storage of the produced synthesis gases.