

**DOCKETED**

<b>Docket Number:</b>	19-ERDD-01
<b>Project Title:</b>	Research Idea Exchange
<b>TN #:</b>	224599
<b>Document Title:</b>	Comments by Evan Hughes and Bountiful Applied Research Corp.
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	Evan Hughes
<b>Submitter Role:</b>	Applicant
<b>Submission Date:</b>	8/24/2018 4:57:34 PM
<b>Docketed Date:</b>	8/27/2018

*Comment Received From: Evan Hughes  
Submitted On: 8/24/2018  
Docket Number: 19-ERDD-01*

## **Comments by Evan Hughes and Bountiful Applied Research Corp.**

### INTRODUCTION

Evan Hughes, Ph.D., as an independent consultant is considering a proposed project that will address the CEC's intention to include pilot demonstration of a hybrid system which combines gasification with unconventional methods (e.g., dry fermentation, water electrolysis) to demonstrate an innovative biomass to RNG pathway. The unconventional method involves wet processing of dry biomass (forest residues) to produce RNG via the APADICS technology of Bountiful Applied Research Corporation (BARC) of Bountiful UT. APADICS is a hybrid of conventional pulping technology--but one which includes an innovative lignin separation step via the El Shall process licensed to BARC with anaerobic digestion (AD) to make the high-methane content biogas stream which is made into renewable natural gas (RNG) to be used in the transportation sector as renewable CNG (R-CNG) for vehicle fuel, especially for trucks and including trucks that haul forest residue biomass.

### COMMENTS

Evan Hughes and BARC have comments below in bold--in reply to two of the six questions posed in the announcement.

Question 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.** We think the size given in Table 1, 50-100 scf/minute RNG output, is too large for the funding of \$750,000 to \$2M range of the expected awards.

Question 5: **Are the correct technologies being focused on (conversion, cleanup, and upgrading systems)? Are there components that offer more opportunity for cost reduction?** We think that the focus on components implied here is too narrow. In our proposal we would show how it is the system as a whole that enables the meeting of the cost target, specifically it is the integrated system with two major byproducts--lignin and cellulose, in our case--that enable the RNG to meet the cost target when deployed at commercial scale.

*Additional submitted attachment is included below.*

DOCKETED Docket Number: 19-ERDD-01 Project

Title: Research Idea Exchange

Document Title: Evan Hughes & BARC Comments

Description:

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

Filer: Evan Hughes

Organization: Evan Hughes, Ph.D., Consultant, Biomass Energy and Geothermal Energy

Submitter Role: Public

Submission Date: 8/24/2018 (submitted at approximately 5pm PDT)

Docketed Date: 8/24/2018

## COMMENTS ON DRAFT SOLICITATION ON DEMONSTRATING INNOVATIVE SOLUTIONS TO CONVERT CALIFORNIA'S RESIDUAL FOREST BIOMASS RESOURCES INTO RENEWABLE NATURAL GAS

### INTRODUCTION

Evan Hughes, Ph.D., as an independent consultant is considering a proposed project that will address the CEC's intention to include pilot demonstration of "a hybrid system which combines gasification with unconventional methods (e.g., dry fermentation, water electrolysis) to demonstrate an innovative biomass to RNG pathway." The unconventional method involves wet processing of dry biomass (forest residues) to produce RNG via the "APADICS" technology of Bountiful Applied Research Corporation (BARC) of Bountiful UT. APADICS is a hybrid of conventional pulping technology--but one which includes an innovative lignin separation step via the El Shall process licensed to BARC — with anaerobic digestion (AD) to make the high-methane content "biogas" stream which is made into renewable "natural gas" (RNG) to be used in the transportation sector as renewable CNG (R-CNG) for vehicle fuel, especially for trucks and including trucks that haul forest residue biomass.

### COMMENTS

Evan Hughes and BARC have comments—below in **bold**--in reply to two of the six questions posed in the announcement.

Question 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." **We think the size given in Table 1, 50-100 scf/minute RNG output, is too large for the funding of \$750,000 to \$2M range of the expected awards.**

Question 5: "Are the correct technologies being focused on (conversion, cleanup, and upgrading systems)? Are there components that offer more opportunity for cost reduction?" **We think that the focus on "components" implied here is too narrow. In our proposal we would show how it is the system as a whole that enables the meeting of the cost target, specifically it is the integrated system with two major "byproducts" — lignin and cellulose, in our case — that enable the RNG to meet the cost target when deployed at commercial scale.**