

**Item #7**  
**December 1, 2010**  
**Energy Commission Business Meeting**

**G4 INSIGHTS, INC.**

**Grant Agreement ARV-10-023**  
**for**

**Low Temperature Thermo-Chemical Conversion of  
Forest Biomass to Biomethane Technology Testing in  
Placer County, California**

**Summary**

G4 will partner with Placer County to build and operate a demonstration and test unit (DTU) and bench top unit to test and refine their thermo-chemical process technology for converting forest biomass to pipeline quality biomethane for transportation end uses. They will be looking at biomethane product testing using California standards, pipeline distribution standards, assessing emissions using California emission standards, and performance of vehicles using the biomethane produced under the project. G4 will also partner with TSS Consultants, and Worley-Parsons, to determine the technical, economic, and environmental feasibility of commercial-scale plants in several other candidate sites in California.

This project will demonstrate the feasibility of a forest biomass conversion technology with the potential to divert a large fraction of the growing backlog of woody biomass waste streams generated from forest restoration and forest fire fuel reduction treatments. The conversion technology is a low temperature thermo-chemical process that will include hydro-pyrolysis, gas conditioning, gas separation and purification, and hydrogen generation. G4's thermo-chemical process technology offers a promising, cost-effective alternative to cellulosic technology.

G4 and Placer County will test the biomethane's performance in one of Placer County's CNG vehicles. They will also assess the feasibility of serving over 50 CNG vehicles operating in the county, including 12 CNG buses. G4 principals have extensive experience in gas cleanup technologies, and have signed a preliminary term sheet with Clean Energy Fuels of Seal Beach to sell their biomethane to the CNG vehicle customers in Southern California using the State's gas pipeline network.

The Energy Commission is providing \$1,229,966 in Alternative and Renewable Fuel and Vehicle Transportation program funds and the project participants are providing \$1,229,966 in match funds.

## **Project Benefits**

Successful completion of this project could provide the foundation for a significant forest biomass production capacity in California. G4 projects a conversion yield of 100+ gasoline gallons equivalent (gge) per Bone Dry Ton (BDT) at a net energy conversion efficiency of over 70 percent. With a 14.3 million BDT/year supply of woody biomass waste available in California, G4 technology could produce up to 1.5 billion gge/year of biomethane, displacing about 8 percent of gasoline and diesel usage in the state with a projected cost of \$1.20 per gge.

At full commercial rollout in 2020, G4 projects 541 full-time jobs for four plants, with a total direct and indirect economic benefit of \$707 million, and \$24 million in state and local tax revenues. These estimates do not include construction jobs and benefits. The project has the potential to serve as a new economic hub for biomass-based industries in rural forest communities, which are commonly areas with high unemployment.

G4's greenhouse gas emissions for this technology are estimated to be 14.4 gCO<sub>2</sub>e/MJ, or an 85 percent reduction in GHG emissions from the California's reformulated gasoline baseline.

The G4 process does not require process water in its operation. The sole feedstock will be biomass that can range from green material to dry. Water is generated in the process, and it is all recycled and reused. The full-scale (10,000 GJ/day) plant requires 1 MW of power. However, there is excess heat and energy at this scale, which can export over 15 MW of energy. The feasibility studies will analyze the use of biomethane produced for collection and delivery, and the use of excess heat for plant office heating and water needs.

## **Participants**

G4 has extensive experience in renewable energy technology development. Team members include former founders and senior engineering and management staff from Quest-Air Technologies, Inc. (now Xebec Corporation). G4 will lead the project with overall responsibility for the tasks and deliverables. Team partners include Placer County, TSS Consultants, and Worley-Parsons.

## **Implementation Schedule**

G4 expects to construct Demonstration Test Unit by July 2011, complete the pilot plant feasibility study by February 2011, and the site and economic feasibility study by February 2012. Fuel demonstration, the last major task under this project, will be completed by June 2012.