### Use of Microalgae to Mitigate Carbon Dioxide Emissions and Assessment of Biomass Quality and the Feasibility of Using Hydrothermal Liquefaction to Produce Energy

**Microalgae Grown at SRP’s Coronado Generating Station**

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#### Source Water Characterization and Microalgae Isolation

- Two sampling trips to CGS were completed (Winter 2014 & Summer 2014)
- All source waters have been characterized during both seasons (pH, salinity, nitrates, phosphates, elemental analysis)
- Dozens of microalgae strains have been isolated from several CGS source waters. Isolation efforts were made from all CGS source waters with an emphasis on the C-Reservoirs and the Evaporation Pond since they provide the largest volumes of available water.

#### Isolate Growth and Biochemical Characterization

- Growth trials have been performed at the 1 liter scale for multiple promising isolates.
- Growth trials have been performed using various proportions of CGS source waters and levels of nutrient supplementation. One strain isolated from C-Reservoir South and one strain isolated from the Cooling Tower Blowdown exhibit comparable growth rates to current AzCATI production strains.
- Biochemical characterization of growth trial biomass is in progress (total lipid, total carbs, total protein, etc.)

#### HTL Training and Experimentation at Auburn University

- We visited Auburn University to observe and receive training on downstream processing equipment (specifically hydrothermal liquefaction of biomass).
- We generated 0.5 kg biomass samples of the following for HTL processing: high lipid *Scenedesmus* and high carbohydrate *Scenedesmus*, high lipid *Chlorella* and high carbohydrate *Chlorella*, and 1.5 kg of a high protein CGS microalgae isolate.
- Performed multiple 1 liter HTL batch reactor runs to generate biocrude, characterize HTL product fractions and upgrade biocrude to biofuel.

#### Continuing Research

- The best performing strains from the growth trials will be scaled up for 1000 L open raceway pond and 100 L vertical flat panel growth trials (Winter 2014/15).
- Biochemical characterization will be completed for the biomass generated during the large scale growth trials.
- Aliquots from these growth trials will be subjected to Hydrothermal Liquefaction and HTL fraction product analysis at Auburn.

#### Suggested Future Work

- Design and build a small pilot-scale production system at CGS based on the results of our studies.
- Expand our collaboration to include common stakeholders to achieve the goal of reduced CO₂ emissions. Interested and experienced parties include The Orlando Utilities Commission, Auburn University, Duke Energy and the University of Kentucky.