

TECHNOLOGY DEVELOPMENT PROJECT FACT SHEET

FF010: EMISSIONS TO FUEL PROJECT

The APS Emissions to Fuel Program creates an alternative to greenhouse gas (CO₂) sequestration, by reconstituting organic carbon via natural processes. Power plant emissions are supplied to algae (plant) which consume the CO₂ as nutrients with sunlight. This natural process is called photosynthesis. In photosynthesis, oxygen is released from the CO₂, leaving behind the carbon which combines with water to produce sugar in the algae. In the natural process of life, the sugar is metabolized into lipids, proteins, and starch. Hence, the algae grow and divide. The APS program harnesses this renewable energy concept to manage greenhouse gas emissions.



GEN3 BioSolar Reactors at Red Hawk

GreenFuel Technology has developed an advanced process for using algae to capture CO₂ emissions. The algae can then be harvested and processed into biodiesel and ethanol fuel as vehicle fuel. The GreenFuel process grew out of a NASA project for extended time in space and was tested at MIT.



Oil extracted from algae grown from Red Hawk plant emissions

In Phase I of the APS Program, GreenFuel applied their technology, tested at MIT to the APS Red Hawk natural gas-fired combined cycle power plant. Using a slip-stream from the Red Hawk stack, power plant emissions were fed into GreenFuel's GEN3 BioSolar Reactors, containing a natural pre-selected, screened and locally incubated algae. The GEN3 BioSolar Reactors were four times larger than the effort at MIT.

Actual results from Red Hawk emissions demonstrated an algae growth rate of 57 grams per square meter-day, which is the highest growth rate recorded for algae in a flue gas fed commercial scenario. This growth rate extrapolated to 150 tons/acre-year of carbon capture which would yield about 11,000 gallons of biofuel annually per acre (biodiesel and ethanol). Algae can be grown with very low quality water on non-arable land.

APS is moving forward with GreenFuel into Phase II of the project, which will incorporate GEN5 BioSolar Reactors with 11,000 square feet of surface area at the Red Hawk power plant. These reactors should grow an average of 100 to 127 pounds per day of algae from plant emissions.

