Bioenergy Interagency Working Group

Issues Affecting the Bioenergy Action Plan

Barriers and Solutions to Advancing Sustainable Bioenergy Development in California

June 11, 2007

Pacific Gas and Electric Company

Key outstanding market or institutional barriers to sustainable biomass use in California

- For purpose-grown biofuels:
  - Food versus fuel
    - Corn-based ethanol
    - Vegetable oil-based biodiesel
  - Costs
  - Water needed to grow and process biofuels
- For the abundant agricultural and forestry wastes:
  - Conversion to a useful form of energy
  - Dispersed nature of bio-waste can make it too costly to collect
  - Seasonality of resource
  - Emissions trade-offs

Near-term actions needed to overcome these barriers

- Accelerate technology funding to:
  - Make biofuels from waste biomass so that transition can be made from food crops or high water use crops
  - Convert to portable and/or storable forms of energy
  - Address scale issues:
    - Create new technologies in sizes to be used locally
    - Reduce costs of new technologies by developing scale
  - Develop low-emissions conversion options
- Fund CCAR to develop more protocols to get GHG value from more bio-sources

Example: Dairy Biogas

- California has 1.7 million cows in ~2,000 dairies
  - 75% in Northern California
  - 50% in San Joaquin Valley
- Dairies release methane and other reactive organic gases (ROGs)
- Methane has 21 times the greenhouse gas (GHG) impact of CO_2
- San Joaquin Valley is a non-attainment area for air quality, which is affected by ozone created by ROGs
- Dairies now have several options made possible by technology and new GHG reduction revenue stream, including generation or pipeline injection
- Converting methane to pipeline-quality gas or generating electricity reduces methane-related issues while producing income

Example: PG&E ClimateSmart Program

- Will allow customers to make their PG&E electricity and natural gas use “climate neutral” (three year demonstration program)
- Customer participation is voluntary
- Premiums invested in California-based greenhouse gas emission reduction projects will make them possible
- Competitive solicitation for projects with CCAR protocols
- First protocol in forest sequestration projects
- Manure management protocol next
- Other agriculture and forestry protocols needed

Potential: San Joaquin Valley Air Pollution Control District

- District must address open burning issue:
  - SB 705 requires open burning permits to be phased out with most terminated in 2010
  - In 2005, almost 800,000 tons of biomass were open burned
  - 800,000 tons is the equivalent of ~300 MW of generation
- Need to explore how best to dispose of agricultural waste including:
  - co-firing in few coal and petroleum coke plants
  - restarting closed biomass plants (recently signed contracts for two plants)
  - demonstrate new technologies
- Biggest challenges with SJV agricultural waste are dispersed nature and seasonality

Biomass Conversion Technologies - Gasification

- Gasifier technology converts biomass into hydrogen and carbon monoxide “syngas”.
- Syngas can be burned to produce electricity or combined with steam and catalyzed into ethanol or pipeline-quality gas.
- Examples: a small (12’ diameter x 30’ high) gasifier could turn 50 tons/day of biomass into 5 -10 MW electric generation, 10 -15 mcfd of pipeline gas, or 3,000 - 5,000 gallons of ethanol per day.
- Agricultural waste currently open-burned in the San Joaquin Valley would be a good feedstock.

Biomass Conversion Technologies - Pyrolysis

- Scientists working at Cornell and University of Western Ontario on pyrolysis of biomass.
- Pyrolysis (low-temperature burning without oxygen) produces bio-oil, gases that are recycled into process, and “biochar”.
- Bio-oil is condensed and transportable form of energy.
- “Bio-char” has high concentration of carbon in its residue, which when returned to the soil results in energy with “negative carbon”.
- Cornell soil scientist claims that biochar has been shown to improve the structure and fertility of soils, to enhance the retention and efficiency of fertilizers as well as to improve the productivity of soil.