Renewable Natural Gas

Its Potential, Opportunities, and Challenges

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Talking Points

- Who is CAPCOA
- Sources of Renewable Natural Gas
- Biomethane Potential
- Uses of Renewable Natural Gas
- Issues and Challenges
- Summary

Who is CAPCOA?

- Non-profit Association of Air Pollution Control Officers
  - Represent all 35 local air districts in California
  - Formed in 1975
- *We are nationally recognized experts in the field of air quality management*

CAPCOA
CALIFORNIA AIR POLLUTION CONTROL OFFICER'S ASSOCIATION

35 air districts in California.

Renewable Natural Gas - Sources

- Natural Gas – CH_4 (Fossil Derived)
- Biogas – CH_4 (Non-fossil Derived)
- Biogas derived primarily from anaerobic digestion of organic material
  - Cellulosic Solid Waste
  - Dairy Waste

Renewable Natural Gas - Sources

Biogas Yield of Different Organic Materials

	Biogas Yield ft3/lb TS	Methane Content of Biogas (%)
Municipal		
Food Waste	7.7	70
Green Waste		
Summer	5.3	55
Winter	3.8	55
Agriculture and Food		
Fish Processing Waste	16.6	76
Vegetable Waste	7.3	60
Rice Straw	5.1	50
Dairy manure	4.7	65

Biomethane Potential

	CH_4 Generated (BTU/lb input)
Vegetable oil	16024
Office paper	5609
Corrugated paper	4389
MSW C	2586
MSW B	2466
MSW D	2387
Food waste	1969
MSW A	1918
Newspaper	1534
Branches	1519
Grass	1161
Blend of grass, leaves, branches	1130
Leaves	1123

Sources:
Chynoweth, et.al., (1993)
Owens and Chynoweth (1993)
Eleaser, et.al., (1997)
Tchobanoglous, et.al.., (1993)

Uses of Renewable Natural Gas

Power Generation

- 1 m^3 of biogas (=35.3K Btu)
- Generates 1.5 to 1.7 KWh
- Equals 1 lb of LPG
- Calorific Value – 1000 Btu/m^3
- Contains 65% CH_4 and 35% CO_2

Source: 1) Government of Alberta, Agriculture and Rural Development
2) Senederra, et. al. University of Adelaide

Uses of Renewable Natural Gas

Transportation Fuel

- CNG
- LNG
- Hydrogen

Issues and Challenges

- Criteria Pollutant Standards
  - Two Types of Standards
    - Primary – Health Effects
    - Secondary – Damage to Crops, Vegetation, Buildings
  - Regulation/Enforcement at Local Level
- NO_x and Ozone primary concern in some areas (Non-attainment areas)
  - Emission sources are cars, trucks, buses, etc.
  - Ozone forms by mixing NOx,VOCs, and sunlight

Issues and Challenges – EPA Standards

- New NO_2 Standard - Jan 1, 2010
  - More Stringent – 53 ppb annual average
  - Monitors required near major roads – urban areas
- New Ozone Standard
  - Current Standard – 0.075 ppb (8 hour standard)
  - Will be more Stringent
  - Not sure when new standard will be issued
- Check with your local air district

Issues and Challenges – Engine Use

- Primary Use for Renewable Natural Gas
  - Internal Combustion Engines (stationary and mobile)
- Primary Source of NO_x
  - Internal Combustion Engines
- Ozone Formation –
  - NO_x + VOCs + Sunlight

Renewable Natural Gas– GHG Implications

- Methane 25X greater global warming potential than CO_2
- Major element in Scoping Plan
  - 2020 Reduction Goal – 2 $MMTCO_2E$
- Mature Technology for Production
- High Potential for Distributed Generation

Renewable Natural Gas – Summary

- Derived from anaerobic digestion of organic material
- Similar calorific value as fossil-derived natural gas
- Can be used for energy/fuel production
- NO_x and Ozone could major issue in non-attainment areas

Renewable Natural Gas – Summary

- Higher GWP than CO_2 (25X)
- Mature technology lends to easy production/capture
- Can contribute to numerous policy goals
  - GHG Reduction
  - Renewable Portfolio
  - Low-Carbon Fuels
- Biggest may be NO_x Reduction

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