CalRecycle/CARB
Waste Management Sector Plan Workshops

COMPOSTING AND ANAEROBIC DIGESTION
(June 18, 2013 draft)

Supportive written copies prepared by Edgar & Associates, Inc. provided during the June 18, 2013 CalRecycle/CARB Waste Management Sector Plan Workshops.

Section 111.A – Collection – *Discuss fleet emissions and Carbon Negative Fleets*

The solid waste and recycling industry as a system – including greenhouse gas (GHG) emissions from collection and processing, and not including landfilling, - typically emit 90% of their GHG from collection considered as Scope 1 direct emissions, and 10% of their GHGs as Scope 2 indirect emissions from processing the material.

Today in California, there are over 15,000 refuse and recycling collection vehicles in California, with over 2,000 plus collection vehicles running on CNG, or about 13% of the fleet. The South Coast Air Quality Management District (SCAQMD) adopted Rule 1193 requiring the use of CNG vehicles for all new refuse and recycling contracts, and a five-year phase-in for current contracts. SCAQMD reports that today there are over 1,850 CNG vehicles in the district, with a projected 4,500 CNG vehicles by 2020. Using CNG fuel reduces GHG by 22% per truck compared to diesel. With a dramatic transition underway from diesel to CNG vehicles, there will be a demand for renewable CNG (RNG). Using RNG from biomethane has been declared to be carbon negative where you could have a carbon negative fleet. Making carbon negative fuel from the biomethane generated at anaerobic digestion facilities using food waste and green waste need to be recognized in this Technical Paper.

The California Air Resources Board (CARB) studied the lifecycle analysis of diesel and substitutes for diesel, and adopted carbon intensity for each fuel type. The Low Carbon Fuel Standard requires a 10% reduction in fuel carbon intensity from 2010 to 2020. As noted in the graph below, ultra-low sulfur diesel is 95 on the carbon intensity scale using units of g CO2e/MJ, and pipeline CNG is 75 g CO2e/MJ, a 22% reduction in greenhouse gases. CNG from landfill gas is 13 g CO2e/MJ on the carbon intensity scale, or an 86% reduction in greenhouse gases. CARB staff has releases a fuel path

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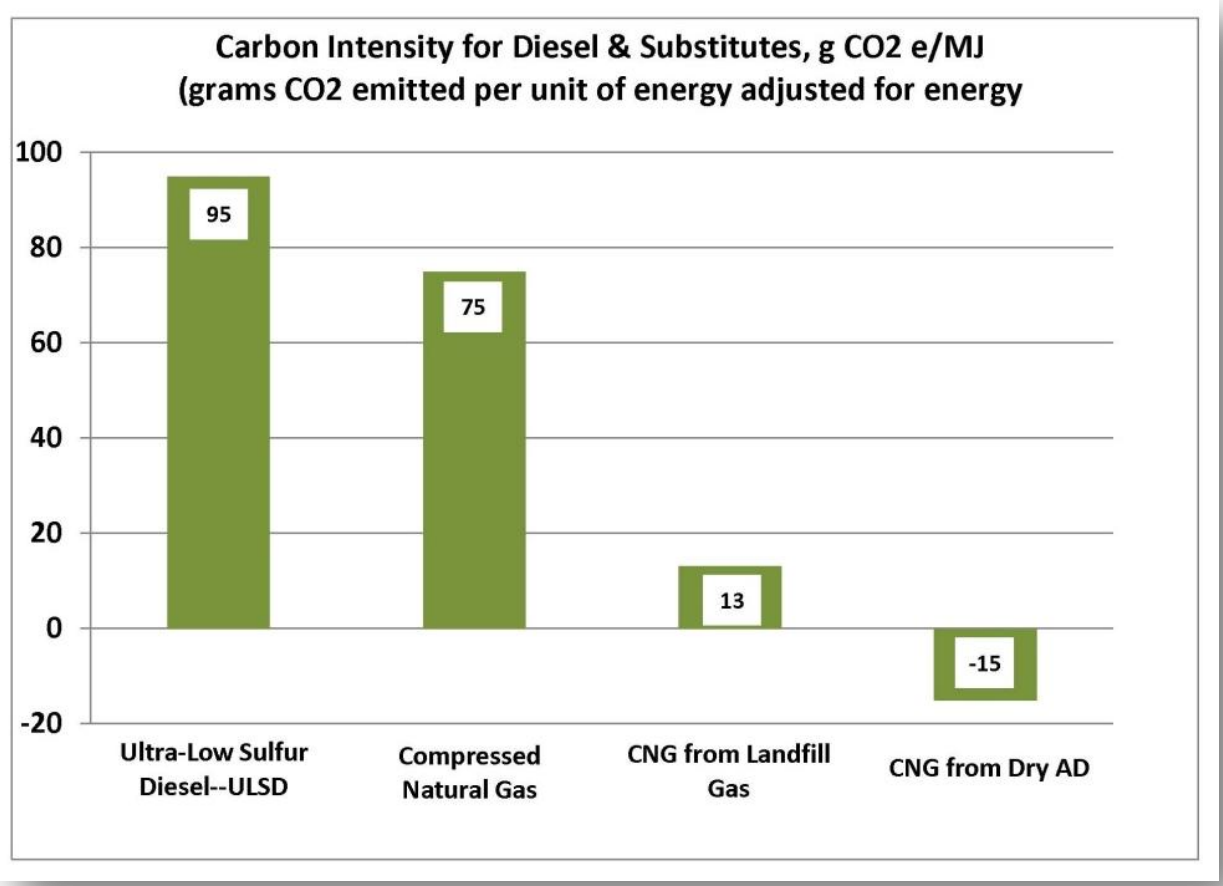
for renewable, or biogenic, CNG to be minus 15 g CO2e/MJ for carbon intensity, as noted on adjacent chart. Imagine CNG generated from the anaerobic digestion of food waste and green waste that is carbon negative, where the industry could have a carbon negative fleet run on the organic waste it collects. Below is a material flow diagram that shows the flow of organic waste to digestion to energy products that are return back into the system. The mass of the digestate is reduced by 25% to 30% and is hauled to a permitted compost facility.



The California Department of Resources Recycling and Recovery (CalRecycle) adopted a Program Environmental Impact Report (EIR) in 2011 for the statewide development of anaerobic digestion (AD) facilities. One of the 100 adopted measures of the AB 32 Scoping Plan in 2008 was the development of AD facilities to reduce greenhouse gases by 2 million metric tons of CO2 by 2020. CalRecycle, in the recently adopted Program EIR, has projected that 80 facilities of 200 tons per day, or 52,000 tons per year (TPY), or 210 anaerobic digestion facilities of 20,000 tons per year, would be needed by 2020. These AD facilities would meet the AB 32 goals, as well as address the statewide 75% diversion goals by 2020, their Strategic Directive No. 6 to divert 50% of landfilled organics by 2020, and implementation of mandated commercial recycling regulations. The metrics of BioCNG production show it is more efficient for larger scale commercial facilities of 20,000 TPY or more, and these larger facilities will be commercialized in the future, such as the much larger 78,000 TPY facility now under construction in San Jose

by ZeroWaste Energy. In addition, these AD facilities produce an organic digestate that is further processed into a valuable compost product that can be return to the local farm for food production.

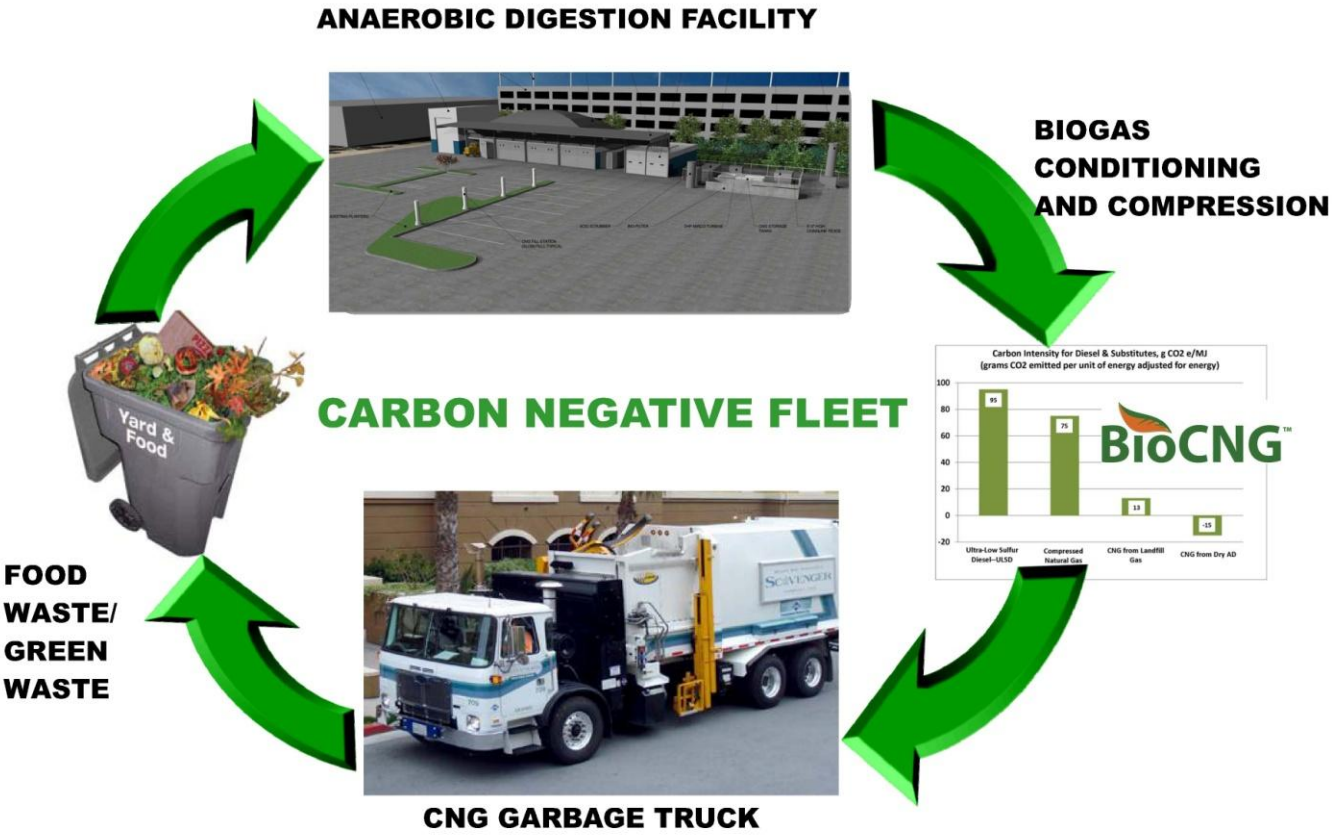
The tipping fee at these facilities for commercial organics and compostable plastic varies from $60 per ton to $90 per ton, based upon the size of the facility (10,000 TPY to 20,000 TPY), and the amount of contamination that needs to be process. The typical tipping fee at transfer stations in the San Francisco Bay area is about $100 per ton and in the Los Angeles area is about $60 per ton. The value of the BioCNG will be indexed to the market rate of pipeline CNG, where the savings will be realized in the transition from diesel fuel to CNG. These facilities can typically be sited in-town using the best available control technologies for power generation, a microturbine, and a biofilter for volatile organic compounds and odor control. The footprint of the facility is compact varying from 15,000 square feet to 40,000 square feet and can co-located at a transfer station or material recovery facility, or site in abandoned commercial warehouses. Hauling costs to remote landfills and regional compost facilities would be avoided.

The High-Diversion Mixed Waste Processing Facilities are being developed in California to recover the traditional dry recyclables and the commercial organic waste. Using *Bulk Handling Systems* technology, Green Waste Recovery and Newby Island are both experiencing high levels of organic waste diversion designed for these anaerobic digestion facilities, which can accommodate levels of contamination typical to mixed waste processing. Having tolerance for contamination, the High-Diversion Mixed Waste Processing Facilities can get more materials separated to deliver to anaerobic digestion.

The goals of developing an AD-to-CNG facility address numerous AB 32 Scoping Plan adopted measures in California to reduce greenhouse gas emissions, and is at the nexus of increasing diversion of solid waste with mandated commercial recycling programs and reducing greenhouse gases with anaerobic digestion projects and compost use, while producing low carbon fuel using renewable energy sources. The AD/CNG facilities can be replicated throughout California and the United States, based upon its modular design and small footprint, where it could be co-located at other existing permitted material recovery facilities, compost facilities, and transfer stations. The statewide commercialization of projects of this type could yield 23.5 million diesel equivalent gallons per year, or enough fuel for 1,800 CNG fueled refuse and recycling vehicles, based upon collecting 2.5 million tons per year of food waste and mixing it with 1.7 million tons of green waste. With over 6 million tons of food waste disposed of in 2008, the amount of BioCNG could double to almost 50 million diesel equivalent gallons per year, or enough for 3,500 vehicles.

Today, there are over 15,000 refuse and recycling collection vehicles in California, with over 2,000 CNG collection vehicles on pipeline CNG fuel. With a dramatic transition underway from diesel to CNG vehicles, there will be a demand for renewable or BioCNG. Using BioCNG from biomethane has been declared to be carbon negative where you could have a carbon negative fleet. We have shown true innovation when the fleet that collects the organic waste can be fueled by the biomethane that is generated from the anaerobic digestion of the same organic waste it collects. We can close the

organic loop locally as BioCNG is used to fuel our carbon negative fleet, and compost is used to grow our food. Having your fleet run on the commercial organics and compostable plastic that it collects is the best possible outcome while fully utilizing the waste resources. The time is now in 2013 for the demonstration project that is ready to be replicated in larger scale throughout California in the next 5 year and throughout the United States thereafter.



The need to develop a sustainable low-carbon waste management system needs to include the fleet collection and processing facilities, where the fleet can move to CNG and reduce GHG emission by 22% per truck, and could eventual be carbon negative by making their own fuel using the anaerobic digestion process. Processing facilities are adding solar and carbon-neutral biomass gasification facilities.

V. CHALLENGES TO MEETING GOALS

Section B – Long-Term – Beyond 2020

- *Quality of Organic Material needs to be standardized and accepted by the industry and public*

  This statement needs to be removed from the paper. Compost quality has been standardized in today's market and compost is accepted by the industry and the public today.

- *Future research*

  Research has already been indentified and should be listed.

  - Water efficiency/savings of using compost products
  - Erosion control for SWPPP Caltrans projects
  - Increase yields in crops

VI – POTENTIAL SOLUTIONS FOR MEETING GOALS

- *Offsets*

  Include the CAR Organic Waste Digestion Protocol and the Organic Waste Composting Protocol as CARB's compliance off-sets as requested annually for the last 2 years.

  Currently, CARB has only four of CAR's adopted protocols for possible inclusion in the cap-and-trade program. Two of the protocols that are not currently being considered are the CAR Organic Waste Digestion Protocol and the Organic Waste Composting Protocol. The inclusion of these protocols would provide an incentive to expand food waste diversion from landfills for treatment at anaerobic digestion (AD) and composting facilities. These efforts will help to meet the emission reduction goals of the Scoping Plan, which call for a 2 $MMTCO_2e$ reduction from anaerobic digestion of waste and another 2 $MMTCO_2e$ reduction from "Increase Production and Markets for Organics Products". Meeting these two explicit goals requires increasing the capacity of these two organic treatment processes.

  As of November 2012, CAR has already approved 18 Organic Waste Composting Projects and one Organic Waste Digestion Projects. It should be noted that although the reductions in greenhouse gases from these two CAR Protocols derive from avoided landfill emissions, there are significant ancillary benefits as well, such as:

- In the case of Organic Waste Digestion, the biomethane created is used either to generate renewable electricity or to produce a very low carbon intensity transportation fuel (CNG or LNG).

- The provision of compost to the agricultural industry, from composting facilities or digestate from anaerobic digestion, can play an important role in climate change adaptation. The increased use of compost can provide an important component of soil moisture management, reducing irrigation requirements. Since agriculture uses about 80% of California's water supply, a small decrease in demand can create a significant source for other sectors and help farmers adjust to decreasing water availability.