



City of Napa Anaerobic Digestion and Renewable Natural Gas Project

Overview

The City of Napa in a 25-year Public-Private Partnership (PPP) with Napa Recycling and Waste Services (NRWS) and Zero Waste Energy (ZWE), is planning the development and operation of a state-of-the-art dry anaerobic digestion and renewable natural gas project (the “Project”) that will generate renewable natural gas and electricity.

The project will be sited on 22,000 square feet of property at the City’s existing Material Diversion Facility located at 820 Levitin Way, Napa, CA.



The AD-RNG facility is designed to process up to 32,000 tons per year of source separated organics (“SSO”) and green waste. SSO will be sourced from City of Napa, County of Napa, and third-party sources. Biogas generated from the AD-RNG facility will be used to produce 350,000 diesel gallon equivalents of Compressed Natural Gas and 550 kW of renewable electricity, both of which will be sold onsite to the City and NRWS. Pathogen-free digestate will be managed by NRWS and will undergo further processing in a covered aerated static pile system.

The City of Napa selected ZWE to provide the organic waste treatment and renewable energy solution. ZWE is an integrated project development and technology company in the organics treatment industry that provides facility design and technology and equipment supply services. ZWE’s parent company is Bulk Handling Systems (BHS), a leading designer and manufacturer of advanced recycling and waste processing systems.

The key activities within the Project will include the following four steps which are further described herein:

- (1) Feedstock Pre-processing (by NRWS);
- (2) SMARTFERM Plug-flow anaerobic digestion (by ZWE);
- (3) Biogas to renewable natural gas and electricity (by ZWE); and
- (4) Separation of solids and liquid in digestate (by ZWE).

1. Feedstock Pre-Processing

The Project is designed to process up to 32,000 tons per year (TPY) of SSO and green waste controlled by the City and County of Napa.



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Commercial SSO consists of both pre- and post-consumer food scraps and food soiled paper/cardboard generated by restaurants, hotels and convention centers in addition to certain seasonal waste streams such as grape pomace. Commercial SSO also includes packaged and spoiled food waste generated by grocery stores. Liquid winery waste will also be made available to the Project for enhanced biogas production enhanced. Green waste primarily consists of grass clippings, leaves, branches and other organic waste streams generated from landscaping maintenance activities.

SSO and green waste feedstock will be received in the existing Organics Material Recovery Facility which is operated by NRWS under a long-term contract with the City of Napa. Following classification and rejection of unacceptable materials, feedstocks will be size-reduced by a shredder and screened to a 3" or less fraction size. Prepared feedstocks will be mixed and then conveyed to the Project automated loading bunker. Additionally, the City and NRWS will separately process pre-consumer food waste in a food depackaging system located at the MDF. The recovered organic stream will be mixed with the screened organics prior to being conveyed to the loading bunker. From the loading bunker, feedstock will be metered and conveyed to the state-of-the art SMARTFERM plug-flow digester for treatment.

2. SMARTFERM Continuous Plug-Flow Anaerobic Digestion

The SMARTFERM plug-flow dry anaerobic digestion system is designed to accept and process SSO and green waste seven (7) days per week in a highly automated manner. Pre-processed feedstocks are conveyed to a 225 cubic yard walking floor loading bunker. The walking floor speed is regulated to meter feedstock to the SMARTTURN digester via a covered conveyor system over a 7-day loading schedule to optimize biogas production.

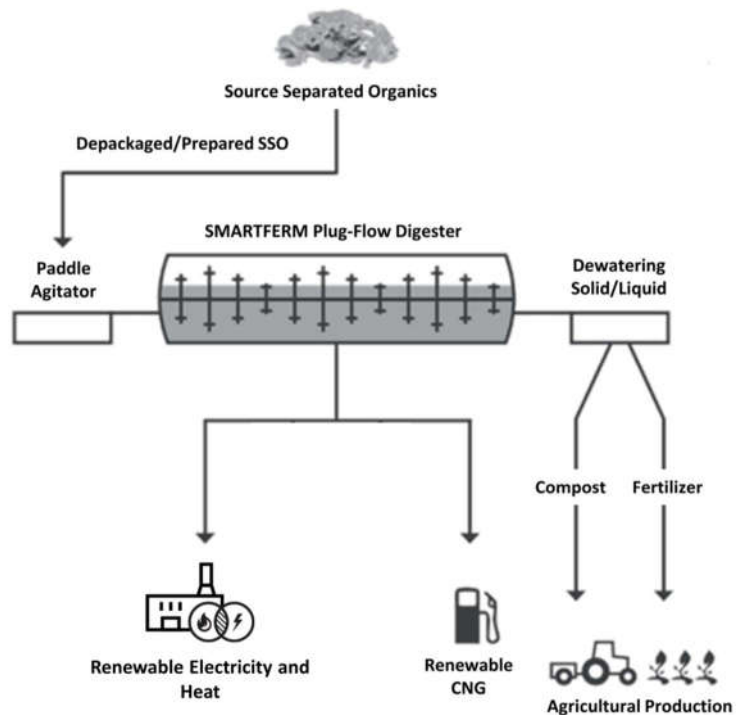
From the loading bunker, the feedstock will be charged to a specially-designed dual-shaft mixer which further homogenizes the feedstock and has the capability to add stored winery waste and digestate press water. Following mixing, the feedstock is hydraulically pumped through a heat exchanger tube that pre-heats the feedstock while it is pumped to the front of the SMARTFERM digester.



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The SMARTFERM plug-flow digester is ideal for organic waste containing a high level of impurities such as commercial SSO. All processing occurs in a single biological reactor which accepts waste on one side and extracts digestate on the other.

Key components such as the accessible, heated digester floor and robust and powerful paddle stirrers have been patented for the digestion industry to optimize biogas production. SMARTFERM stirrers are characterized by their ability to handle difficult materials and perform on a variety of feedstocks. The paddles and shaft guarantee high stirring efficiency and a virtually unlimited service life - even under the highest seasonal loads. This is achieved by the unique shape of the paddle head which is made of highly wear-resistant steel.



The digestion process inside the digester is based on an anaerobic, thermophilic and completely biological process, classed as High Solids Anaerobic Digestion. The digester has a process temperature of approximately 131°F and an average dry substance content of >25%. Process temperature will be maintained via a process hot water system supplied by the biogas-fired combined heat and power unit. The residence time of the feedstock in the digester is approximately 21 days, but may range from 19 to 36 days depending on the volume of input material processed.

Biogas is captured in the headspace of the digester and piped to a biogas storage buffer. Biogas is a biological by-product of anaerobic digestion, and is comprised primarily of methane and carbon dioxide. Approximately 159,175,000 cubic feet per year of biogas will be produced based on Biomethane Potential testing of feedstocks performed by ZWE. With an average methane content of 55%, approximately 78,224 MMBtus of energy will be produced annually for use in onsite renewable energy production.



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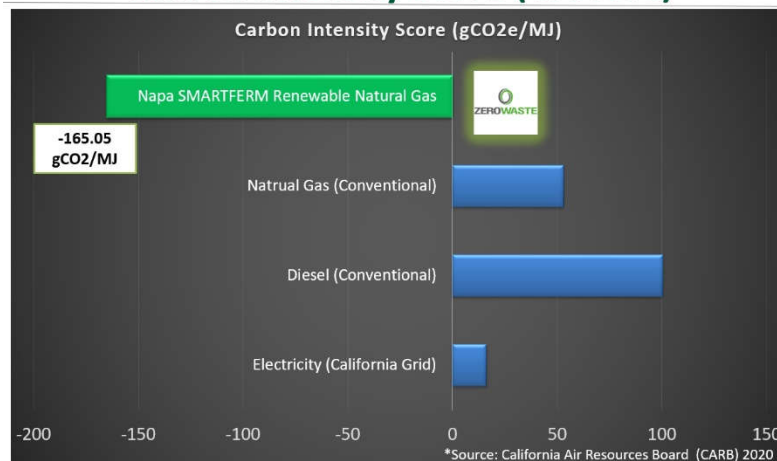
3. Renewable Natural Gas and Electricity

Biogas is nominated to an upgrading system which first removes impurities in the gas such as water and hydrogen sulfide and then selectively captures up to 99% of the available methane in an advanced membrane system. The resulting “Renewable Natural Gas” will be boosted to 3600 psi and dispensed in an onsite time-fill fueling system which will supply 36 City and County collection vehicles under long-term contracts with ZWE. The annual production of vehicle fuel will be approximately 350,000 diesel gallon equivalents or 44,000 MMBtus.



In addition, the value of the RNG, ZWE will generate and sell US EPA D3 Cellulosic and D5 Advanced Biofuel Renewable Identification Numbers (RINs) and California Low Carbon Fuel Standard (LCFS) credits. Furthermore, the RNG pathway has been certified by the California Air Resources Board (CARB) under the CA-GREET 3.0 model and found to have very attractive environmental attributes, namely its very low

Carbon Intensity Score (CI Score)



Carbon Intensity, CI score. The lower the CI score garners more LCFS credits and is illustrated in the chart to the left.

Excess biogas not needed for the fleet RNG fueling application will be nominated to a 550-kW combined heat and power (CHP) system. The CHP includes a biogas-fired internal combustion engine, generator and heat recovery equipment to produce electricity and process hot water. Renewable electricity will be used onsite by the SMARTFERM AD system and approximately 1,400,000 kWh per year sold to the City of Napa by ZWE under for use in MDF operations. Process hot water will be used to heat the SMARTFERM digester.

The AD-RNG facility will produce a pathogen-free compost digestate which is the residual material that remains following biogas production. The compost digestate is pumped from the digester and processed in a mechanical dewatering station which creates a separation between the liquid and solid fractions. The liquid fraction can be used a liquid fertilizer while the solid fraction can be sold as an organic compost soil amendment for agricultural applications.

4. Solid and Liquid Digestate



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Digestate is the residual by-product of the SMARTFERM AD process and is compliant with US EPA Part 503 which regulates the sanitization and elimination of pathogens in fertilizer and compost products produced from organic feedstocks such as SSO. Digestate will be extracted from the digester by a hydraulic pump and pumped to a dewatering station where it will be processed by a vibrating screen that separates the liquid and solid fractions. Recovered liquids, or “press water” is stored in a tank. Press water can be charged with feedstock at the digester mixer or pumped to a truck for use as a liquid fertilizer. Recovered solids are temporarily stored in a bunker adjacent to the dewatering system. Solid digestate will be transferred by NRWS to the aerated static pile system located at the MDF for further drying and blending with other compost.



Both liquid fertilizer and compost products will have a high nutrient value which adds organic matter to soils and aids the growth and productivity of agricultural, landscaping, and horticultural applications.

5. Entitlements and Permitting

An Initial Study/Mitigated Negative Declaration (MND) for the Napa Renewable Resource Project (PL12 0022) was prepared and adopted on November 7, 2013 (Resolution No. PC2013-15). The MND evaluated the impacts of 25,000 TPY of SSO and green waste processed in the SMARTFERM digester. The subsequently City pursued an amendment to increase the volume to 44,000 TPY which was approved on March 5, 2018 in the form of a Planning Notice of Determination (PL18-0008).

The MDF operates under Solid Waste Permit 28-AA-0030 which allows for the transfer and processing of a maximum of 360 tons per day of municipal waste and construction and demolition debris. In addition, the permit allows 400 tons per day of composting or a maximum of 90,000 cubic yards. The Solid Waste Permit will be modified with an In-Vessel Digestion Report which will permit up to 44,000 tons of SSO and green waste to be processed in the SMARTFERM digester.

In relation to air permitting, an Authority to Construct (ATC) application for the Project was prepared and submitted to the Bay Area Air Quality Management District (BAAQMD). CEQA emissions from the Project as originally calculated for the Initial Study and updated in the Planning Amendment are all below CEQA significance thresholds; therefore, emissions are less than significant for particulate, volatile organic compounds, nitrogen oxide, carbon monoxide and ammonia pollutants.

Additionally, “ministerial” grading and building permits are expected to be received in due course from the City of Napa Building Division prior to construction.