Title: 2016 Excellence Award Entry
Category: Landfill Gas and Biogas
Name of Entrant(s): Aria Energy and Sarasota County
Title of Entry: Sarasota County Landfill Gas to Energy Facility
Jurisdiction: Sarasota County, FL
Approximate Population of Jurisdiction: 400,000
Cost per Household for Project: None
Approximate Budget: $8.7 Million
Executive Summary

Aria Energy provides engineering, design, construction, operations and maintenance services for Landfill gas (LFG) to energy facilities. They own and/or operate a diversified portfolio of 44 LFG recovery and processing projects across 16 states, collectively representing 265.9 MWe of energy capacity. They also provide operations and maintenance (O&M) services to 9 projects owned by third parties.

The result of a public-private partnership between Landfill Energy Systems Florida LLC (Aria Energy) and Sarasota County, the Sarasota County Project is a 4.8 MW landfill gas-to-energy facility. Renewable energy is produced by capturing and processing the methane gas generated at Sarasota County’s Central County Solid Waste Disposal Complex (CCSWDC) located at 4000 Knights Trail Road in Nokomis, Florida.
1) Site Design & Construction

Aria Energy was selected, through a request for proposals released by Sarasota County, to complete recovery facility design, permitting and construction. Aria owns and operates the facility on a site leased from the County. The facility houses three Caterpillar 3520 engine generators, each of which uses about 500 cubic feet of landfill gas per minute. The facility was built with no capital outlay by Sarasota County. It is fully financed, owned and operated by Aria Energy. Sarasota County receives a steady revenue stream based on a percentage of the power purchase revenues collected by Aria Energy. The project generated two full-time jobs at the plant and contributed more than $500,000 to local vendors and companies for construction. The innovative technology shows Sarasota County’s commitment to clean energy and a sustainable future.

Aria is the largest developer and operator of landfill gas to energy projects in the State of Florida, with 32 MWs of installed capacity. Aria has operating landfill gas to electricity projects in Nokomis, Jacksonville, Cocoa, Brooksville, and Geneva and has long-term agreements with the Counties of Brevard, Hernando, Sarasota and Seminole and the City of Jacksonville. Along with operating staff at each location, Aria also has a Regional Manager living in Florida and dedicated to the Florida project sites.

Aria Energy has extensive experience constructing landfill gas to energy facilities and has found that each project presents its’ own challenges. The site leased to Aria Energy by Sarasota County was suitable for construction. A review of the Sarasota County Web Soil Survey showed that there are three (3) primary soil-mapping units within the vicinity of the project site: EauGallie and Myakka fine, Holopaw fine sand and Pineda fine sand. SPT and hand auger borings encountered loose to dense fill soils composed of sand to silty sand with cemented sand, shell, concrete fragments, stockpile material including limerock, and/or clay nodules from the ground surface to a depth of approximately 4 feet, underlain by dense natural sandy soils to depths of approximately 5½ to 8 feet, underlain by medium dense silty sand to an approximate depth of 13 feet. At the time of the field activities, the groundwater table was encountered at depths ranging from approximately 2¼ to 4 feet below the existing grades.

Aria Energy imported fill to raise the building and gravel road so the site would not interfere with or impede the landfill’s established stormwater management and drainage plan. Due to the landfill’s water management plan containing a drainage swale behind the facility’s leased area, we designed and
installed a retaining wall along the east side to accommodate the finished flooring elevation. We also had to reroute the storm water for approximately 110 feet.

Aria Energy employs standard construction practices to mitigate the impact to the surrounding environment. The construction site was fenced to keep workers and equipment away from wetlands and other environmentally sensitive areas. During construction hay bales were utilized to prevent sediment from draining away from the site in the event of heavy rains. Aria designs each of its plants to minimally impact the environment once operational and to be a good neighbor. Features include hard piping of both lube and waste oil lines from tanks to engines, concrete containment base around the oil tanks, all oil piping is above ground for easy inspection. There is an oil containment pit around the primary transformer, and containment trenches located between the engines and in front of the engines so that in the event of a major catastrophe leaking fluids would be contained inside the plant. As previously mentioned, it was required that the site not interfere with or impede the landfill’s established stormwater management.

Aside from weather caused construction delays, the construction of the Sarasota Facility was a smooth process, with COD reached February 12, 2015. The renewable energy produced at the facility is being sold to Jacksonville Electricity Authority (JEA), supplying electricity to approximately 2,800 homes.
2) **Environmental Controls**

The Sarasota CCSWDC landfill gas collection and leachate collection systems are operated by staff from the Sarasota County Solid Waste Division. The landfill is a Title V Air Emissions site permitted by the Florida Department of Environmental Protection under the Federal Title V regulations. However, the facility is not currently required to collect landfill gas under the Title V New Source Performance Standards Subpart WWW because the non-methane organic compounds (NMOCs) threshold has not been exceeded. The County, in order to collect methane to limit its release to the environment from fugitive emissions as well as to prevent any potential gas migration, decided to construct the landfill gas collection early with the end goal of using it to produce a beneficial end use product. Even though not required by regulation, the County routinely adjusts and maintains the landfill gas collection wells to ensure proper operation, maximize the gas collection efficiency, and provide the highest quality fuel to Aria’s Landfill Gas to Energy Facility.

The CCSWDC includes a comprehensive monitoring system surrounding the landfill, which includes groundwater monitoring wells, surface water monitoring locations, and landfill gas migration soil monitoring probes. These monitoring points are sampled by County staff on a routine schedule and compared to permit and regulatory limits. The leachate collection system is operated and maintained by the County and consists of pumping systems which move leachate collected by state of the art bottom liner systems. These systems consist of geosynthetic high density polyethylene liner and drainage materials to maximize collection of leachate and minimize environmental impacts. In addition, the County collects the gas condensate produced from the Aria Landfill Gas to Energy Facility in the existing leachate collection system. The County and its landfill operation contractor work diligently to limit and minimize the production of leachate. We currently produce approximately 20,000 – 40,000 gallons of leachate per day, which is collected, pumped to leachate storage tank and then pumped to wastewater treatment plan.

Within the last few years, the County has worked closely with FDEP Solid Waste regulators on groundwater issues at the site in regard to naturally occurring elements such as arsenic and iron. Florida soils are notorious for containing these parameters naturally and it has been observed at many sites...
throughout Florida that after construction of a landfill these elements will tend to rise in concentration overtime. One theory is the “shadow effect” which hypothesizes that when an area is cutoff from natural runoff and percolation of rainfall, i.e. placement of a large area of liner materials, the deprivation of oxygen rich water to these soils creates an anoxic environment which will tend to release these elements to the groundwater. The County was able to work with FDEP to develop an extended zone of discharge for the site which included these naturally occurring parameters to better understand this effect and ensure protection of the environment. Aria Energy and Sarasota County work together to ensure that the environment is protected at all times and is a primary goal of everything that is done at the CCSWDC.

The site itself has a significant impact on both resource conservation and environmental quality. The EPA estimates that a 4.8 megawatt landfill gas to energy project reduces carbon dioxide emissions by 236,000 metric tons each year, due to the reduction in methane emissions from the landfill and reduced consumption of fossil fuels. The reduction is equivalent to the annual carbon dioxide emissions from nearly 50,000 passenger vehicles.

3) Regulatory Compliance

Consisting of roughly 50% methane and 50% carbon dioxide, LFG is produced naturally as waste decomposes. Landfills above a certain size are required to install an LFG collection system to transport the gas to be either flared to combust the methane or diverted to a beneficial-use energy project. If landfill methane is not captured it becomes a greenhouse gas 21 times more potent than carbon dioxide when it rises into the atmosphere. The EPA estimates that landfills account for 25% of all methane generation linked to human activity. Even if all landfills were closed today, they would continue to generate methane for 25-100 years. While gas can be flared or utilized in a gas processing facility, it is typically economically beneficial for a landfill to have a gas utilization project. Landfill gas to energy facilities typically offer an additional revenue stream to the governmental partner. Sarasota County recognized this fact early in the life of the Central County Solid Waste Disposal Complex and began planning installation of a landfill gas collection system for the Phase I landfill upon its closure even though regulation did not specifically require it at that time.

Aria Energy received Approval of Concurrent Site and Development Plans on June 26, 2014. The Central County Solid Waste Disposal Complex is routinely inspected by the Florida Department of Environmental Protection South District and has a stellar record from these inspections. The facility has a clean record of compliance with no comments or notes regarding even minor compliance issues. Most recently, a routine inspection was performed at the Class I facility, Waste Processing (Class III and C&D), Waste Tire Collection Center, Gas to Energy, and Separated Organics Processing Facility on June 18, 2015. All five facilities were in compliance at the time of the inspection.
As mentioned previously, the site was issued a consent order for specific exceedances in specific groundwater parameters, however, these exceedances have been determined to not be from release of leachate from the landfill and the County is working closely with FDEP on administrative ways to bring the site to compliant status.

4) Planning, Operations & Financial Management

Aria Energy uses eMaint for asset tracking, scheduling maintenance, budgeting major maintenance and a document library for safety and procedures. eMaint is a computerized maintenance management system (CMMS) that is cloud based and accessible from any PC. It is fully customized for Aria Energy. With a diversified portfolio of 44 LFG recovery and processing projects across 16 states, it is important to ensure employees are given appropriate training. Step-by-step procedures for every maintenance task are easily accessible through eMaint. The procedures are specialized to the engine type at the facility and can be updated as new safety policies are implemented. Maintenance tasks are scheduled years into the future. This allows us to budget more accurately and prevent failures, which cause downtime and lost revenue.
eMaint also stores documents related to safety policies and procedures. Aria Energy employees participate in extensive Health and Safety Training within one month of their start date. Training is re-assigned on an annual basis with additional and site-specific training assigned as needed. The magazine "On-Site" Safety Consultation for Florida Small Businesses recognized Aria Energy as 1 of 10 businesses to receive the Florida Sunshine safety award recognition in 2015. Below is an overview of some of the safety training and testing Aria Energy requires:

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<tr>
<th>Training Area</th>
<th>Training Topic</th>
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<tr>
<td>Powered Industrial Truck Safety</td>
<td>Hand and Power Tool Safety</td>
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<td>Portable Fire Extinguishers</td>
<td>Heat Stress Recognition and Prevention</td>
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<td>Fire and Safety Prevention</td>
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<td>First Aid: Basic</td>
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<tr>
<td>Bloodborne Pathogen Awareness</td>
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<td>Fall Protection</td>
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<td>Forklift Operation 1: Safety Inspection and</td>
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<td>Maintenance</td>
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<td>Workplace Harassment Prevention for Employees</td>
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<tr>
<td>Hearing Conservation</td>
<td>PPE: Foot and Leg Protection</td>
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<td>Lockout/Tagout</td>
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The ability to work safety and efficiently is important to the success of any project. The Sarasota facility has been operational for over a year and has not experienced significant outages or downtime. The chart below illustrates net generation at the facility. As landfill gas volumes increase in the future, the facility is designed with room to install a 4\textsuperscript{th} CAT 3520. This will increase the plant size to 6.4 MW.

5) \textbf{Utilization of Equipment/Systems and Technologies}

The CAT Model 3520 is a completely integrated skid mounted package consisting of the engine, generator, and all support systems including start, fuel, lube, and control systems. Each engine is rated at 1600 kW (4160 volts) at the generator terminals. The fuel gas system at the facility includes one automatic fail-safe gas valve, one
manual gas valve, primary filter separator, the gas compressor, gas cooler, final gas filter, a single gas analyzer, single gas flow meter, piping valves and fittings to each engine. The system is designed to provide a nominal 2,200 scfm of filtered gas to the engine generators at approximately 1.5 psig and includes all equipment, piping, valves, and fittings between the gas stub-up located in the gas compressor area to the engine generator gas inlet. All gas piping above grade is stainless steel. Each engine generator has two cooling systems (jacket water and lube oil/aftercooler) capable of dissipating the heat through a water-to-air radiator. The jacket water cooling system is a closed-loop circulating system with an on engine, thermostatically controlled mixing loop, which includes a pre-heater and engine-driven pump. Heat is dissipated through a radiator with one single-speed motor-driven fan. The lube oil/aftercooler cooling is accomplished through a second closed-loop circulating system with an on engine thermostatically controlled mixing loop, and engine-driven pump and a second coil in the water-to-air radiator. The lube oil supply and make-up system consists of a 3,000-gallon storage tank, an air-operated lube oil transfer pump, piping from the lube oil tank to the engine and to the new oil make-up tank. The make-up oil tank will be mounted inside the plant on a support structure. The engines are provided with an automatic lube oil make-up system. The waste oil collection system consists of a 1,500-gallon waste oil tank, air-operated waste oil transfer pump, piping from the waste oil tank to the engine. Waste oil from engine oil changes is transferred to the 1,500-gallon waste oil storage tank via the waste oil transfer pump and stored until removal. All waste oil generated at the plant is sold to a waste oil recycler. The crankcase ventilation system is a forced draft system which uses a small blower to draw out vapors from the crankcase breather of each engine and discharges them to the outside of the plant. The overhead system consists of PVC ducting, valves, and mist eliminator/blower. The exhaust system includes the exhaust piping, supports, silencer and exhaust stacks. All engines include a critical grade silencer. An insulated exhaust stack inside the plant connects to the silencer and rise just under 37 feet above grade. The exhaust system includes access ports for emissions testing, with size and location in accordance with air quality standards. The plant compressed air system includes an air compressor, air receiver tank, air dryer/filter desiccant (for instrument air only), engine starting system and service connections with water separators. The fire protection system consists of a fire detection system and dry chemical extinguishers for the control room. A central fire alarm panel located in the control room monitors the fire detection system. The fire detection system includes several heat detectors wired directly into a central fire alarm panel for remote monitoring. The fire alarm panel is integrated into the facility’s control system and is designed for orderly plant shutdown.
upon fire detection. The plant will be equipped with a fire detection system in accordance with NFPA standards.

The plant is segregated into four rooms: the engine room, gas processing room, air compressor/utility room and control/switchgear room. The engine room ventilation air is drawn in through grade level intake fans and exhausted through roof-mounted vents. The control/switchgear room has a separate HVAC system for control room heating and cooling. Aria Energy has more experience operating and maintaining CAT engines on LFG than any other private developer, owner or operator. This equates to over 11 million hours of operation and maintenance experience specifically on the landfill gas fueled CAT engines. Aria maintains a system-wide availability of over 95%. Aria’s ability to consistently perform at high capacity factors is also due to attention to detail and the fact that the day-to-day, hands-on operation and maintenance provides Aria with valuable insight into how to keep the engines performing at their peak efficiency. Aria has over 100 employees within the organization that are primarily engaged in only operations and maintenance.

Aria is a leader in identifying vulnerable components and employs “Repair-Before-Failure” preventative maintenance strategies. Aria also has an extensive spare parts inventory valued at over $5 million and stocks all long-lead parts and equipment. This inventory not only includes parts and equipment for CAT engines and generators, but also for the balance of the plant. Maintaining an extensive inventory with long-lead items, combined with the fact that all Aria plants utilize the same or similar equipment and systems, serves to significantly improve plant availability and reduce unscheduled outages. Further, because Aria is one of the largest owners/operators of LFG Caterpillar engines, it has a direct line of communication with Caterpillar for product support.

Aria’s reputation for equipment reliability and first class LFG projects is unsurpassed. Their power generation background, coupled with hands-on LFG experience is an asset to any project team. Projects and facilities benefit from both Aria’s operating experience and its extensive spare parts inventory.

6) Public Acceptance, Appearance and Aesthetics

The Sarasota CCSWDC, which hosts the Aria Energy Landfill Gas to Energy Plant operates not only as a fully functional municipal solid waste landfill, yard trash processing facility, construction and demolition debris processing facility, and household hazardous waste convenience center, but is surrounded by over 6,000 acres of natural lands. The facility is constantly visited by residents and tourists for its natural Florida setting and beautiful native wildlife such as deer, alligators and many species of birds, including the majestic American Bald Eagle. For this reason, the CCSWDC is kept in pristine condition to be a “good neighbor” to the natural lands. Litter is picked up within the facility and along the 5 mile access road to the facility at least twice each operational day. The roads are swept every day and kept clean. The visitors, events and activities make odor-control a priority at CCSWDC. In conjunction with installation and efficient operation of the landfill gas collection system, utilizing the landfill gas at the landfill gas to energy facility is an important aspect of odor control that makes visiting the CCSWDC a
pleasant experience for our visitors. Aria Energy is a partner in the endeavor to keep the site clean and a place that residents and visitors want to come back to on a regular basis.

One of Sarasota County Solid Waste’s goals is to make their facilities accessible to the community and make them places that residents are proud to call their own. The CCSWDC is open to visitors during operating hours for bird and wildlife watching or to just drive the miles of interior roads which look out on to thousands of acres of Florida protected lands. The CCSWDC also hosts the Venice Radio Control Air Plane Club. This club hosts several “fly ins” throughout the year which attract hundreds of visitors to the facility to see amazing R/C planes perform stunts and tricks in the air against the backdrop of the landfill. The CCSWDC is also home to some of the cycling events that are part of the Annual Gulf Coast Senior Games, which is a qualifying event for the Florida Senior Games State Championships. CCSWDC provides many tours for groups ranging from local business leaders to special needs children, and staff is always excited to educate the public on what is done at the facility and how waste is managed, disposed and used as a resource in Sarasota County. On May 12, 2015, Sarasota County and Aria Energy hosted a public ribbon cutting event for the Landfill Gas to Energy Facility. It was well attended by local leaders and residents to celebrate a great milestone in the development and future of the CCSWDC.

7) Innovation and Creativity

The creative elements of the Sarasota project involved the offtake for the facility. There were some difficulties establishing a beneficial offtake due to low demand for renewables in Florida. Aria Energy was able to leverage an existing Power Purchase Agreement to secure an offtake for this project. Aria Energy had previously entered into a Power Purchase Agreement, which allowed up to 16 MW to be supplied from facilities in Florida. There was sufficient excess capacity through that PPA to sell all the offtake from Sarasota.

The offtake for Sarasota requires power to be wheeled to a utility in a different region of Florida. The Sarasota interconnect took over 2 years to complete and required over 7 miles of reconductoring to move the power. The Sarasota County Project is not only unique in how the offtake is sold, but the flexibility offered because we interconnected with FPL. When the PPA with JEA expires, we will be able to optimize pricing by having more options for offtakers.
In the past Aria Energy has installed a gas cooler, which brings the temperature within 15° of ambient. At Sarasota, a gas chiller was also installed, which cools to a 45° dew point. This additional cooling is not required through NSPS, but proposed rule changes may require that gas is cooled to a set dew point. Having already installed equipment which will allow us to meet this requirement, we do not anticipate possible NSPS changes causing problems for the Sarasota facility. Regardless, both the building and equipment at Sarasota can be modified should it be required in the future.