CENTRAL FLORIDA WASTE-TO-ENERGY INITIATIVE – WORKPLAN

1. OVERALL PROJECT SUMMARY AND APPROACH

A Coalition representing the Orlando-Kissimmee-Sanford Metropolitan Statistical Area (Orlando MSA)/Central Florida region is leading the pioneering **Central Florida Waste-to-Energy Initiative (CFWEI)**, poised to revolutionize biosolids management, mitigate environmental risks, and foster sustainable energy generation. Currently, biosolids generated by wastewater treatment facilities pose significant environmental challenges being directed towards landfills or land application. In response, the CFWEI Board, composed of representatives of the CPRG Coalition members named in this proposal, is spearheading a strategic public-private partnership (P3) aimed at maximizing resource utilization and minimizing environmental impact.

Through collaboration with a third-party private entity and relevant technical partners, the CFWEI aims to capture methane gas from biosolids generated by the region's wastewater treatment facilities and convert it into Renewable Natural Gas (RNG) through well-established anaerobic digestion (AD) technology. This RNG will be seamlessly integrated into the natural gas pipeline and utilized as compressed natural gas (CNG) for transportation purposes throughout the region, including the fueling of the biosolids transport fleet.

Moreover, the innovative Supercritical Water Oxidation (SCWO) process will be employed to address contaminants such as per- and polyfluoroalkyl substances (PFAS) and other environmentally challenging components of the biosolids in the AD digestate, concurrently generating clean turbine power. Through the SCWO process, PFAS and other organic chemicals are destroyed and biosolids are rendered an inert mineral solid with less than 30% of their initial volume remaining to be land-applied or directed to landfills. While the SCWO technology is being successfully used to eliminate PFAS and other organic matter in a variety of waste-related applications, this proposal represents the first application of SCWO in the wastewater treatment sector at this scale.

By leveraging biosolids waste as resources for energy production, the CFWEI addresses not only pressing environmental challenges but also establishes a sustainable model for resource management. The revenue generated from the sale of RNG and associated Renewable Identification Number (RIN) credits, as well as the savings associated with providing a portion of the site power demands from the SCWO turbine power, will be shared among the participating jurisdictions of the CPRG Coalition. This comprehensive approach to Waste-to-Energy creates a multifaceted approach for energy generation and revenue generation, positioning the region as a trailblazer in sustainable energy innovation.

a. Description of GHG Reduction Measures

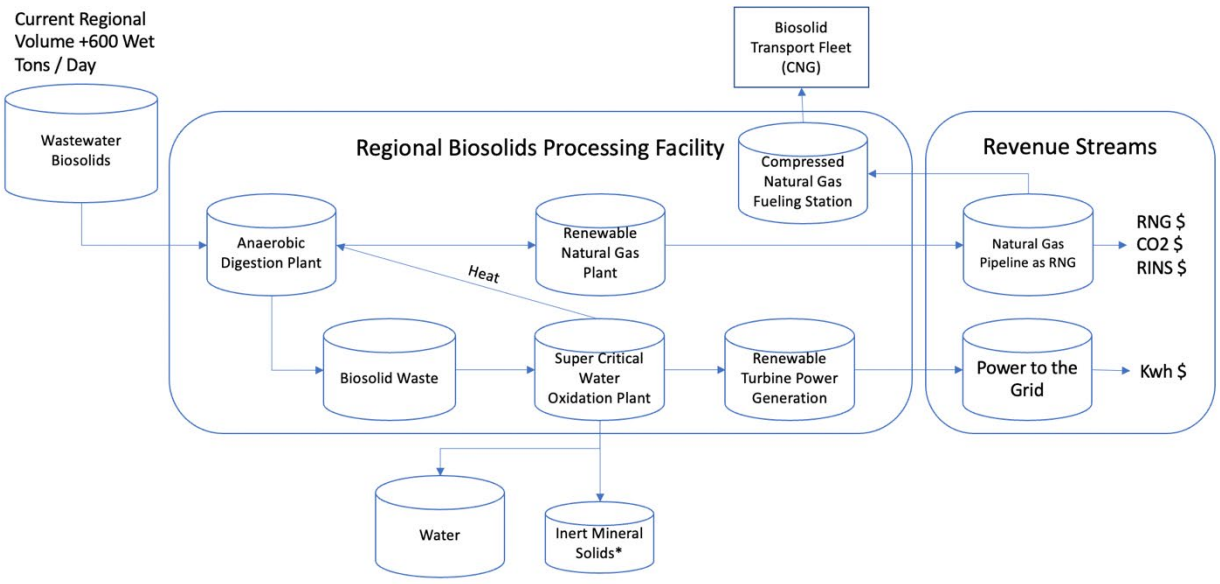
In direct alignment with the measures outlined in ***East Central Florida's Priority Climate Action Plan*** (adopted February 2024 and included in the attachments), spearheaded by the East Central Florida Regional Planning Council and East Central Florida Regional Resilience Collaborative, the CFWEI contributes to the region's science-based target of reducing emissions by 54.3% by 2030 and its strategy to reduce and divert waste while also capturing emissions generated.

By formulating a unique P3 that maximizes the potential of an emerging innovative technology, complemented by a broad-reaching community outreach and education effort, the CFWEI has designed a regional emissions reduction program that will revolutionize wastewater treatment in the Central Florida area. The CFWEI, as presented, has a high probability for further regional expansion and is replicable nation-wide. As such, the CFWEI addresses all four goals of the CPRG program.

This proposal is put forth by a Coalition of municipalities representing the Central Florida region, including Osceola and Seminole Counties, the Cities of Altamonte Springs, Orlando, Oviedo, and Winter Springs, Toho Water Authority, and the East Central Florida Regional Planning Council, each of which has provided Letters of Intent, included in the attachments. Coalition members, each of which will be represented by a seat on the CFWEI Board, are committed to entering into a Memorandum of Agreement (MOA) for the purpose of project planning and implementation, with anticipated submission to the EPA in advance of the July 1, 2024 deadline following final approval of the MOA by the Seminole County Board of Commissioners (as lead CPRG applicant) no later than their June 11, 2024 meeting. Roles and responsibilities of each party are detailed in Section 3c.

GHG REDUCTION MEASURE: REGIONAL BIOSOLIDS PROCESSING FACILITY

The proposed regional facility will process wastewater biosolids via a six stage process:



*For Every 1 Wet Ton of Biosolid, <600 lbs (<30%) of inert mineral solids remain (e.g. PFAS remediation)

1) Divert biosolids from landfilling and land application

The two major biosolids/wastewater sludge disposal practices utilized in Central Florida are landfilling and land application, both of which can emit significant amounts of GHGs during the hauling, pre-treatment, and active treatment stages of these processes. Significant volumes of wet sludge must be long-hauled via commercial vehicles that typically run on fossil fuels and emit significant amounts of GHGs. Once at the landfill, organic matter in the sludge decomposes, releasing potent GHGs such as methane directly into the atmosphere. To address these issues, this project features the diversion of biosolids from being landfilled or land-applied to instead be processed entirely using AD followed by the emerging technology of SCWO.

2) Process biosolids using anaerobic digestion (AD)

Orlando Bioenergy is currently in the process of constructing, through an approximate $60 million private financial investment, a source-separated organic processing facility (SSOPF) to service the City of Orlando. At such a facility, a combination of often difficult to handle feedstocks is taken from large urban areas, agriculture, and industry, and processed such that the carbonaceous component is converted into RNG. The RNG is used for multiple purposes, depending on the relevant scenario at the facility's location, either for grid injection, transportation fuel such as CNG, or power generation. Further, remaining CO_2 from the

process is captured and processed for sale to industry. This gives two output streams – NG and CO_2 developed from renewable waste products – that can be directly used to replace the equivalent fossil fuel-derived products. The Orlando facility, registered as an SSOPF with the State of Florida, holds an air construction permit, and is poised to break ground in November 2024.

The Coalition proposes the design, permitting, and construction of a complementary, dedicated biosolids stream processing line at this Orlando facility in years 1-3 of the grant period. Here, wastewater biosolids will be stabilized through AD, then further processed to destroy PFAS and other environmentally challenging components of the biosolids. The line will have a capacity for 290,000 wet tons/year of biosolids. These biosolids will generate RNG and CO_2 in the facility's upgrading system for grid injection and use as transportation fuel. Once online, the wastewater biosolids processing line is expected to ramp up in capacity through year 3, achieving 100% capacity in years 4 and 5 of the grant period.

Though wastewater biosolids must be isolated from the other organic waste being processed by the SSOPF, requiring a separate processing line, this project benefits through the synergized approach of the facility, as the existing line will process commercially-sourced food and industrial wastes using the same AD technology. The addition of a wastewater biosolids stream allows the sharing of technology, personnel, expertise, and equipment, providing a more economical and viable solution than would be possible with a standalone facility for wastewater biosolids.

3) Upgrade AD biogas to grid ready, compressed natural gas

Ancillary to the AD process and RNG generation, the facility will include a CNG dispenser for transportation fuel, constructed and operated by Nopetro Gas Marketing. This dispenser will chiefly be used in relation to the hauling of the municipal wastewater biosolids, but also commercially for the SSOPF portion of the facility by transporting food waste to the facility for landfill diversion and RNG generation, then transporting the generated biofertilizer for land application and/or synthetic fertilizer displacement.

Upgrading AD biogas to grid quality RNG involves a series of sophisticated processes aimed at purifying the biogas into a high-quality, pipeline-grade methane product. Initially, the raw biogas, primarily composed of methane and CO_2 along with trace impurities such as hydrogen sulfide and moisture, undergoes pre-treatment to remove contaminants and moisture, typically through methods like desulfurization and dehydration. Following pre-treatment, the biogas enters the upgrading system where it undergoes purification via other established technologies. These processes selectively capture CO_2 and other impurities resulting in a methane-rich gas stream suitable for injection into natural gas pipelines.

Once purified, the upgraded biogas is compressed into RNG, meeting the same quality standards as conventional natural gas for grid injection and suitable for use in various applications, including vehicle fuel, heating, and electricity generation. The production of RNG from AD biogas not only offers a sustainable alternative to fossil fuels but also helps mitigate GHG emissions by converting organic waste into a valuable energy resource.

4) Utilization and sequestration of CO_2 from AD biogas

In addition to the production of RNG, the CO_2 rich off-gas from the biogas upgrading system can be recovered and used as an additional revenue stream. The facility will include a CO_2 liquefaction station, which can produce liquid food-grade CO_2 (99.9% purity) in a containerized system with a small footprint. The CO_2 is compressed and dried to completely remove moisture. This CO_2 then passes through a fine filter to remove any remaining odorant compounds or impurities. The purified gas is sent to a CO_2 liquefier

from which pure liquid CO_2 is produced. This liquid CO_2 can be used in a variety of industries such as food and beverage, breweries, distilleries, refrigeration, bioethanol facilities, and greenhouses.

Alternatively, the captured CO_2 can be transported via pipelines or tanker trucks to suitable storage sites such as geological formations like depleted oil and gas reservoirs or deep saline aquifers. At these storage sites, the CO_2 is injected deep underground and permanently stored, preventing its release into the atmosphere, resulting in a carbon negative process.

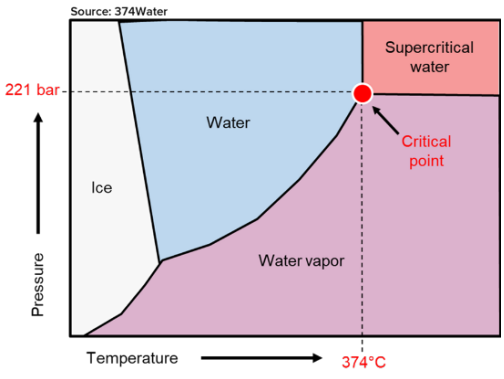
The process of CO_2 sequestration from AD biogas further boosts AD's green credentials, removing CO_2 from the atmosphere and carbon cycle and significantly reducing GHG emissions while enhancing the environmental sustainability of biogas production. By capturing and storing CO_2 emissions, biogas facilities can significantly reduce their carbon footprint as it removes CO_2 from the atmosphere. This makes AD a more environmentally friendly option for organic waste management and renewable energy production.

5) Process digestate using supercritical water oxidation (SCWO)

Next, the AD digestate is treated using 374Water's AirSCWO technology. During the SCWO process the digestate's temperature and pressure are elevated above the critical point of water (374°C, 221 bar) so that all organic compounds are oxidized rapidly and completely. These conditions prevent the formation of incomplete combustion byproducts and formation/release of GHGs other than CO_2 (e.g., methane, a major GHG released during landfilling). During SCWO, carbon is converted into a nominal amount of CO_2 and released in the vent gas.

This step features (1) the diversion of the AD digestate from landfilling or land application to SCWO and (2) the treatment of AD digestate using a clean-tech low GHG emission technology. 374Water will design and integrate their patented AirSCWO units to execute this step, while working closely with Orlando Bioenergy to optimize the process flow between AD and SCWO to reduce energy usage and, therefore, reduce potential GHG emissions.

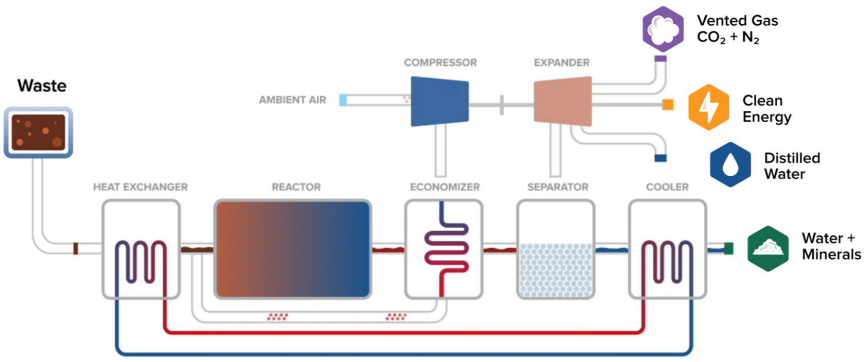
SCWO is a waste-agnostic process that transforms waste into reusable water, recoverable energy, and inert mineral solids. Its efficacy has been demonstrated across various waste types, including industrial sludge, biosolids, spent GAC, spent IEX resin, diluted AFFF, and landfill leachate. One of the most notable applications for SCWO is for the near complete elimination of organic matter, including contaminants such as PFAS, microplastics, and pharmaceuticals from these waste streams.



The reaction medium for SCWO is supercritical water, which is water heated above 374°C and pressurized above 221 bar. SCW has select properties of both gas and liquid that facilitate oxidation reactions to take place with a limited energy barrier and dissolves organic compounds, allowing for the rapid mineralization of organic waste into inorganic material. This results in only distilled water, energy, and inert mineral solids as byproducts.

Before feeding organic waste into the SCWO reactor, the waste and ambient air are pre-heated and pre-pressurized. The slurry is then sent to the reactor where oxidation reactions occur rapidly, with a typical waste residence time of less than 40 seconds. The SCWO effluent is cooled to sub-critical conditions, where distinct gas and liquid phases are formed.

The gas is sent to an expander to produce electricity. This process also aids in condensation, resulting in distilled water and dry vent gases. The mineral-rich liquid effluent stream comprises approximately 30-40% of the total liquid output. This stream is filtered to separate the minerals, which are 2-3% of the total wet waste input by mass.



The initial prototype unit was developed at Duke University through funding from the Bill & Melinda Gates Foundation. 374Water has since developed commercial-scale units that are configured to each process 6, 30, and 200 wet tons per day.

There are numerous benefits to SCWO, including: (1) a large reduction in waste volume, (2) near complete elimination of PFAS and other organic contaminants, (3) production of value-added products such as distilled water, recoverable heat, turbine power, and inert mineral solids, and (4) a reduction in GHG emissions due to reduced dependence on fossil fuels.

6) Recover heat and generate power from SCWO

GHG emissions can be further reduced by eliminating dependence on external energy sources with significant GHG emissions. 374Water's AirSCWO system is equipped with an energy recovery system that renders the system net energy-positive once steady state is established (within a few hours of a cold start). The efficient startup and shutdown processes are the only time when external energy is required and, once self-sustained, only a minor amount of CO_2 is emitted in the vent gas.

Additionally, the excess heat from 374Water's system will be captured and sent to preheat the AD system. To accomplish this, 374Water will evaluate the site design plans for site configuration and obtain quotes for ancillary equipment needed to integrate the AD and SCWO systems so that required equipment can be in place once commissioning is underway.

TASKS AND MILESTONES

Significant milestones related to the development of the regional biosolids processing facility include:

Contracting *(3 months)* – Upon execution of a CPRG grant contract between Seminole County and the EPA, the County will develop and execute an agreement with Bioman Florida to provide management and oversight for the development of the facility. Agreement execution is expected by December 2024.

Design and Permitting *(7 months)* – Local civil engineering consultants will be utilized in close collaboration with Orlando Bioenergy, 374Water, and Nopetro Gas Marketing to ensure seamless integration of the various required technologies. Bioman Florida will facilitate the design of the facility. Permits for the wastewater sludge line, beyond those in hand for the SSOPF currently underway, must be obtained from both the City of Orlando (site location) and the Florida Department of Environmental Protection (FDEP). As permitting for the SSOPF portion of the facility is currently in progress, additional permitting is anticipated to have a shorter timeframe than would otherwise have been possible. Design is expected to be complete by June 2025 and permits in hand by July 2025.

Procurement *(1 month)* – Bioman Florida will procure the services of a prime contractor. Contract execution is expected by July 2025.

Construction *(18 months)* – Construction of the primary facility is expected to be complete in January 2027. Complementary construction elements include the following, to be completed by July 2027:

- Concurrent with onsite construction, 374Water will manufacture the two AirSCWO units offsite, to begin in December 2024 with expected completion in May 2026. These units and their energy recovery systems will be tested utilizing pretreated digestate samples from May to July 2026 in advance of shipment and installation, expected to be complete in January 2027.
- Civil/utilities construction by Nopetro Gas Marketing will occur between January and March 2027, followed by installation of the CNG fueling station in June and July 2027.
- Development of the connection to the Florida gas transmission pipeline is expected to have a 1-year lead time due to required quality testing, monitoring, and approval of the RNG for grid injection. Nopetro Gas Marketing will request service connection from the local distribution company in August 2026, with connection expected to be complete in July 2027.

Commissioning and Start-Up *(7 months)* – Commissioning and start-up activities will occur between February and August 2027, including commissioning of the SCWO units from March to May, grid injection in May, and testing and commissioning of the CNG fueling station in July.

Full operation of the regional biosolids processing facility is expected to begin at 25% capacity in August 2027, with full operation at 100% capacity expected by August 2028.

A Gantt chart detailing the CFWEI's comprehensive timeline, including public engagement, evaluation, reporting, and other CFWEI proposed activities described throughout this proposal, as well as detailed elements above and beyond those described in the processing facility summary above, is included in Section 3c.

RISKS

The structure of the project naturally mitigates risks associated with timeline, as multiple milestones can be worked on in parallel with dedicated, non-overlapping teams. For example, as the site is being constructed, 374Water will build and test its AirSCWO units using digestate provided by processed waste from an existing site. This will allow the installation of 374Water's units on the newly built site to take place as soon as possible. Success relies on the synergy between the construction and commissioning of each of the technology partners' systems on site. Delays in integration due to logistics will be minimized by developing a comprehensive planning, construction, and installation plan, with associated site visits, prior to breaking ground.

The longest lead item and most significant risk to the project is developing the connection to the Florida gas transmission pipeline due to hurdles related to the pipeline owner's need to test, monitor, and approve the quality of the RNG for grid injection. However, as with the rest of the construction package, significant progress in relation to the SSOPF portion of the site has already been made, mitigating associated risks and potential delays.

As directed by the requirements of the CPRG program, having members of the Coalition enter into an MOA in advance of grant award will mitigate any risks associated with their future signing of contractual agreements for the diversion of their locally generated wastewater biosolids to the facility. The MOA will

encourage waste providers to remain actively involved throughout the planning phase so that, if/when CPRG funding is awarded, all are confident signing said contractual agreement.

GHG REDUCTION MEASURE: SEMINOLE COUNTY LANDFILL GEOMEMBRANE

To supplement the cycle of biosolids processing proposed above, Seminole County also intends to install a geomembrane at the Seminole County Landfill to improve the efficiency of its current methane collection system and reduce fugitive methane emissions from the landfill. The Seminole County Landfill is a 240-acre Class 1 landfill situated on a 6,000-acre property in Geneva, FL. Operated by the County's Solid Waste Management Division, the landfill serves each of the County's seven municipalities, unincorporated areas of the County, the Cities of Winter Park and Maitland in neighboring Orange County, and a variety of commercial entities.

The 3-phased, natural clay lined landfill receives between 420,000 and 440,000 tons of waste annually. The landfill is currently fitted with gas recovery and leachate removal systems that extract gas from the disposal area and deliver it to an on-site, third-party operated power generation facility. A flare system operates to mitigate emissions when the gas-to-energy plant is not operating. An analysis completed by Seminole County indicated that a maximum of 50% of the available methane is being extracted.

The proposed 79.5-acre phased geomembrane covering of the outside slopes of the landfill will serve as a protective barrier, reducing the volume of GHG emissions that escape into the atmosphere from waste decomposition. The additional methane sequestered will be fed into the landfill's existing gas to energy plant for processing into RNG.

Implementation of the geomembrane cover will involve meticulous planning, stormwater permitting and improvements, site preparation, and installation to ensure effective coverage and long-term performance. The County will procure a qualified local contractor for the installation, which will be conducted in three phases to accommodate the site's ongoing operations: Phase I – 47 acres; Phase II – 21 acres; Phase III – 11.5 acres. The geomembrane will be designed to remain in place until necessary removal to facilitate the site's overall phased operations. This term is expected to be 10 years or longer.

As Florida is prone to severe storms, the frequency of which has significantly increased in recent years, damages related to membrane lift resulting from high winds during severe storms are an acknowledged risk. Efforts to mitigate this risk will be integrated into the geomembrane's design and installation.

This project aligns with the County's commitment to environmental stewardship and regulatory compliance as it enhances the landfill's methane capture efficiency and reduces the facility's environmental footprint. Furthermore, by minimizing methane emissions and managing stormwater runoff, the geomembrane cover will contribute to sustainable waste management practices, promoting the health and well-being of the community and surrounding environment.

RELATION TO THE EAST CENTRAL FLORIDA REGIONAL PCAP

The convening of the region's local government waste professionals during the development of the *East Central Florida Regional Priority Climate Action Plan* identified a series of vulnerabilities of the region's waste system and physical infrastructure with an emphasis on those related to the propensity for landfills, material collection sites, recycling facilities, and transfer facilities to face physical challenges caused by storm surge, sea level rise, and flooding, later expanded to include factors such as facility capacity, workforce availability, and land availability, amongst others. Evaluation of these vulnerabilities resulted

in the establishment of seven waste strategy recommendations to be implemented. The CFWEI speaks to these strategies as follows:

- Encourage regional collaboration for sustainable materials management – At present, seven municipal entities from the Central Florida region are active participants in the CFWEI: Osceola and Seminole Counties, the Cities of Altamonte Springs, Orlando, Oviedo, and Winter Springs, and Toho Water Authority, with potential for future regional participants.
- Optimize waste reduction – The CFWEI will divert biosolids from landfilling and land application, minimizing GHG emissions by processing beyond the typical AD process via SCWO so that all organic compounds are oxidized rapidly and completely.
- Identify opportunities for collaboration between public and private sectors – The success of the CFWEI relies upon relationships developed with four private entities operating in the technology sector: Bioman Florida, Orlando Bioenergy, 374Water, and Nopetro Gas Marketing.
- Promote innovative technologies – 374Water's innovative SCWO technology is a waste-agnostic process that transforms waste into reusable water, recoverable energy, and inert mineral solids, one of its most notable applications being the near complete elimination of organic matter, including contaminants such as PFAS, microplastics, and pharmaceuticals from these waste streams. 374Water's participation in the CFWEI helps to showcase the application of this promising, cutting-edge science and engineering to the wastewater sector.
- Advance and strengthen the regional waste network – The participation of multiple municipal wastewater treatment facilities in the CFWEI represents the first collaboration of said entities, creating a regional network to address GHG emissions generated by wastewater biosolids.
- Promote consistent messaging about waste diversion – The collaborative efforts of Seminole County's SERV Program, a variety of existing municipally-led community task forces, and the Orlando Science Center, with input and participation from the CFWEI's private technical partners, will result in a comprehensive curriculum for the POO-2-REVENUE program, with broad yet consistent public awareness and community education applications, as further detailed in Section 4b.
- Improve transparency and efficiency in waste management operations – The POO-2-REVENUE program will be designed and implemented such that both youth and general audiences are given the opportunity to learn about the wastewater treatment process with particular focus on the environmental benefits realized by the CFWEI.

Further, the conversion of AD biogas to RNG, utilization and sequestration of CO_2 from said biogas, and energy and heat recovery from SCWO will address a variety of the region-wide GHG reduction high impact actions and goals identified in the PCAP related to decarbonization measures:

- Increase waste to energy conversion
- Promote efficient and reliable grid practices
- Develop and expand distributed generation solutions and grid reliability
- Increase biogas to energy conversion

ADDRESSING CPRG GOALS

The CFWEI seeks to revolutionize biosolids management in wastewater treatment facilities across the region, offering environmental benefits, economic opportunities, and a blueprint for sustainable practices. By leveraging innovative technologies and strategic partnerships, the project will minimize GHG emissions and create multiple green energy revenue streams. Moreover, its comprehensive public education effort and GHG monitoring program will significantly benefit low-income and disadvantaged communities (LIDAC). The CFWEI establishes a sustainable model for resource management and energy production that sets a precedent for other regions to follow in addressing environmental challenges while

promoting economic growth and community well-being. As such, the CWEI not only aligns with the 4 goals of the CPRG program and the commitment of CPRG Coalition members to environmental responsibility, but positions the region as a leader in sustainable development and innovation.

b. Demonstration of Funding Need

The development of the Orlando MSA's PCAP served as the impetus for discussions related to developing a region-wide initiative to curbing GHG emissions related to wastewater treatment and its residual waste products. These discussions brought to light previous studies, including the *Regional Biosolids Study* (Tetra Tech, 2023) conducted on behalf of a collaborative including Orange County, the Cities of Altamonte Springs and Orlando, and Toho Water Authority, which recommended the development of a regional biosolids management facility. The existing effort to develop a food waste digestion plant in the City of Orlando prompted discussions as to whether the site was suitable for expansion to serve this purpose. This collaboration also revealed that the City of Orlando had received a principal forgiveness loan through FDEP's State Revolving Fund (Orlando Clean Water Emerging Contaminants Grant, #WW4804C0) to host a pilot test of SCWO technology to demonstrate PFAS elimination in wastewater biosolids. The initial brainstorming team was able to leverage standing relationships with entities both implementing existing technologies in the Central Florida region and developing innovative uses for emerging technologies, leading to a series of whiteboard sessions in January 2024 that confirmed the technical feasibility of the proposed project and the formation of the Coalition submitting this proposal.

The timeliness of the funding opportunity presented by the CPRG Implementation program as a potential means to finance this project motivated the aggressive pace with which the Coalition has approached this endeavor. While the CFWEI will leverage the approximate $60 million private investment being made to construct the SSOPF on property previously acquired, this proposal is the first attempt by the Coalition to secure funding specific to the wastewater biosolids processing component.

As the stimulus for securing the team and technical expertise to facilitate the project, preparation of this proposal has now positioned the Coalition to explore additional funding opportunities should a CPRG grant not be awarded. Initial research has identified the following potential resources:

- Construction loan through **FDEP's Clean Water State Revolving Fund**, which received an influx of funds through the BIL – A low-interest CWSRF loan is considered an alternative, though the County prioritizes grant funding over loans as a matter of financial policy.
- Technical assistance to address knowledge gaps, specific challenges, decision-making considerations, planning, and project implementation strategies through the **National Renewable Energy Laboratory's Waste-to-Energy Technical Assistance**
- Further exploration of various new and expanded grant programs included in the BIL and the IRA is required to confirm eligibility and viability of the following:
    - Carbon Capture Demonstration Projects and Large Scale Pilot Programs
    - Carbon Dioxide Transportation Infrastructure Finance and Innovation Program
    - Solid Waste Infrastructure for Recycling
- The Coalition may also have the option to leverage private sector financing opportunities afforded by the IRA through new programs developed by way of the **National Clean Investment Fund**.
- Also, critically important to the private sector are various tax credits available through the Bipartisan Infrastructure Law and the Inflation Reduction Act which include:
    - Clean Electricity Investment Tax Credit
    - Clean Electricity Production Tax Credit
    - Clean Fuel Production Credit
    - Extension of Second-Generation Biofuel Incentives

- Extension of Tax Credits for Alternative Fuels
- Extension of Tax Credits for Biodiesel and Renewable Diesel
- Production Tax Credit for Electricity from Renewables

c. Transformative Impact

The uniqueness of this project in terms of its integration of SCWO technology into the processing of AD digestates positions the CFWEI to revolutionize the wastewater sector, as the technology is pioneering in the reduction of energy consumption for treatment and elimination of wastewater treatment residuals in comparison with currently utilized residual treatment pathways for the treatment of PFAS.

SCWO is a well-developed clean technology that has been used since the 1980s, but has only just been differentiated and commercialized for the water, wastewater, and waste management markets by 374Water. The implementation of SCWO in these markets is unique in that the SCWO system is a near end of the pipe technology (depending on application), and integrates seamlessly with existing and traditional water/wastewater/waste processing efforts. This is highlighted in this project as SCWO units can synergize with anaerobic digesters with minimal effort. By integrating SCWO into the wastewater treatment process, particularly as a post treatment step after AD, SCWO can effectively break down complex organic compounds, including those unaffected by AD, to ensure near complete conversion of organic matter into CO_2, preventing the formation and release of other GHGs.

Moreover, SCWO offers the additional benefit of recovering heat generated during the oxidation process, which can be harnessed to offset the energy required for heating the digesters used for AD. By utilizing the heat generated from SCWO to preheat the sludge entering the anaerobic digesters, the facility will reduce its reliance on external energy sources, have a lower demand for biogas generation, and incur lower operational costs, all of which improve energy sustainability.

This unique partnership provides a technological solution to the environmental impacts of waste streams from large municipalities and urban areas. The project will be replicable in other metropolitan areas, where landfilling of organic wastes and land application of biosolids are a significant challenge. By constructing a centralized, shared facility rather than applying the technology to newly constructed facilities that serve individual municipalities, cost savings can be achieved. Further synergy benefits are achieved by combining the biosolids handling with the commercially operated SSOPF. Heat and power recovery, integration between the different processes, as well as the sharing of personnel and experience provide an efficient, resilient, and effective solution. The additional benefit of refining the waste CO_2 to food-grade quality provides an additional sellable product replicable throughout the U.S. Moreover, the revenue generated from the sale of AD generated RNG and associated RIN credits will provide a perpetual revenue stream to help offset the cost of treatment for the participating Coalition members.

2. IMPACT OF GHG REDUCTION MEASURES

GHG emissions resulting from the current biosolids treatment process (landfilling of secondary waste with various methods of pretreatment/stabilization depending on the facility), referred to as the business as usual (BAU) case, includes emissions from the decomposition of biosolids (methane and CO_2) and emissions from the transportation of biosolids to the landfill using diesel tractor-trailers. To estimate the BAU biosolid GHG emissions, projected annual biosolid production from each facility included in this proposal was projected out to 2050 based on results from the aforementioned *Regional Biosolids Study*. Emissions resulting from transportation of biosolids to the landfill were calculated based on the daily volume of biosolids requiring disposal and distance to the respective landfills. Estimated fugitive emissions

from the Seminole County Landfill as well as CO_2 produced during energy generation or flaring at the landfill were also included as part of the BAU estimate.

Estimates of GHG emissions were developed from each of the proposed treatment processes for the regional biosolids processing facility, as well as upstream emissions from transportation of biosolids and downstream emissions from the final landfilling/land application of treated inert mineral solids.

Process	GHG Emissions (mt CO2e) 2025-30	GHG Emissions (mt CO2e) 2025-50
Biosolids - Landfilling	205,000	1,394,131
Biosolids - Transportation	11,621	52,634
Seminole County Landfill Fugitive Emissions	2,265,705	13,729,903
Total	**2,482,327**	**15,176,668**

The proposed project includes various sources contributing to GHG emissions. GHG emissions result from the initial construction of the facility. Once operational, the facility's electricity consumption, particularly by the AD process, incurs emissions, partially offset by the SCWO turbine. The AD process also generates emissions through biomass processing, gas upgrading, and CO_2 liquefaction. Minor fugitive emissions occur during biosolids processing in addition to emissions associated with flaring of methane if the gas upgrading plant is inactive. SCWO operations contribute emissions through feedstock oxidation and diesel-fueled heat for startup and trim. Moreover, post-SCWO inert mineral solids transportation via CNG-fueled tractor-trailers to landfills is also included in the GHG emissions calculations. Lastly, GHG emissions resulting from treated and reduced biosolids in landfills, encompassing CO_2, methane, and potentially other species were included.

The project includes measures to offset GHG emissions. Notably, recoverable heat from the SCWO process is utilized as heat for AD, eliminating the need for natural gas heating. Additionally, ancillary equipment to the SCWO units will generate electricity required to operate the SCWO units and will contribute some electricity to power the AD process.

In the near term, GHG reductions are targeted through several strategies. Switching from diesel to CNG tractor-trailers for transportation, as well as placing the new facility closer to existing wastewater treatment plants and landfills, aims to minimize vehicle miles traveled. Additionally, efforts to further decrease the volume of biosolids requiring landfilling through the SCWO process contributes to emissions reductions. Emissions associated with the operation of the power generation facility at the Seminole County Landfill, based on improved collection of methane associated with the installation of the geomembrane, were also calculated.

Process	GHG Emissions (mt CO2e) 2025-30	GHG Emissions (mt CO2e) 2025-50
Plant Construction	10,772	10,772
Transportation of Biosolids	9,816	44,460
Plant Electrical Consumption	30,750	204,481
Plant Diesel Consumption	819	4,915
Plant Fugitive Emissions	15,666	107,431
Plant Flared Emissions	7,857	53,884
Plant Feedstock Oxidation	43,201	284,081
Inert Biosolids Disposal	50,322	55,294
Seminole County Landfill	1,378,773	8,355,199
Total	**1,547,975**	**9,120,517**

Worthy of note is that the GHG emissions associated with landfilling the biosolids prior to plant commissioning in 2027 were not included in the GHG emission calculation. GHG emissions associated with electrical consumption are expected to decline as more renewables are incorporated into the grid; however, information about the utility's future plans for renewable deployment were not available for analysis. As such, emissions associated with current electrical production measures were used for the

duration of the analysis. Detailed assumptions and calculations are provided in Technical Appendix and associated Technical Calculations Spreadsheet included in the attachments.

a. Magnitude of GHG Reductions from 2025 through 2030

Case	GHG Emissions (mtCO2e) 2025-30
BAU	2,482,327
Proposed	1,547,975
GHG Savings	**934,351**

Annual GHG emissions from 2025-30 show rapid improvements associated with reduced transportation distances for biosolids and migrating existing diesel assets to CNG. Additional emissions reductions are associated with reduced landfilled quantities of biosolids and reduced quantities of volatile species in those biosolids beginning in 2027 when the plant becomes operational; however, these reductions show a much more significant cumulative impact over the full life of the project.

The emissions reductions present from 2025-30 represent a permanent, durable GHG emission reduction. The plant will be designed for a minimum useful life of 25 years; however, it is likely to operate for considerably longer at maximum capacity consistent with operation of similarly constructed wastewater treatment facilities. Emissions associated with the construction of the new facility, which will occur between 2025 and 2027, will only occur during the initial construction of the project and will not be repeated during the project's lifecycle.

b. Magnitude of GHG Reductions from 2025 through 2050

Case	GHG Emissions (mtCO2e) 2025-50
BAU	15,176,668
Proposed	9,120,517
GHG Savings	**6,056,151**

Annual GHG emissions from 2025-50 show significant reductions compared to the BAU case as a result of reduced landfilled quantities of biosolids and reduced quantities of volatile species in those biosolids, reduced transportation distances for biosolids and shifting transportation assets from diesel to CNG, and improvements in methane collection at the Seminole County Landfill.

The emissions reductions present from 2025-50 also represent a permanent, durable GHG emission reduction for the same reasons presented in the previous section (25+ year useful life/non-recurring construction emissions).

c. Cost Effectiveness of GHG Reductions

Period	Project Cost ($)	GHG Emissions Reduction (mtCO2e)	Cost Effectiveness ($/mtCO2e)
2025-2030	$174,837,252	934,351	$187.12
2025-2050		6,056,151	$28.87

As evidenced by the table, the GHG reductions are significantly more cost effective in the long-term (2025-50) due to the cumulative effect of reducing emissions in perpetuity.

Sector Dynamics: The treatment process is expected to be cost-effective for the water/wastewater/ waste industries in general, and is especially attractive for this facility which will process large volumes of sludge (and resulting digestate). The project provides an economy of scale as ever growing populations may increase the amount of sludge to be managed over time and more municipalities/generators may choose to divert sludge from landfills by sending it to the shared facility. These efforts would result in larger GHG reductions and cost-savings in terms of energy sourcing/usage, waste and residual disposal costs, and permitting, alongside potential revenue sources from the biogas, inert mineral solids, recoverable heat, and electricity produced by the various technologies.

Expected Beneficiaries: The aforementioned revenue streams result in economic and health benefits for various stakeholders, including wastewater treatment operators, industrial facilities (during future expansion), and local communities. For example, reduced contaminant and GHG loadings in emissions will lead to improved public health outcomes and lower healthcare costs for communities living in the service areas of the source wastewater treatment plants.

Prevailing Costs and Regulatory Environment: The cost-effectiveness is influenced by prevailing costs in the implementation areas, including energy prices, labor costs, and waste disposal fees. In regions where landfill tipping fees are substantial, the economic case is more compelling. This is a large consideration as compliance fees and waste disposal costs are expected to increase with increasing restrictions on sludge disposal due to emerging contaminants (e.g., PFAS) that can be eliminated by these processes. Additionally, based on carbon pricing mechanisms, the implementation of this project may become more economically attractive due to the potential for carbon credits or compliance cost savings. Conversely, lax regulatory standards may dampen the economic incentive for adoption, although this is not anticipated.

d. Documentation of GHG Reduction Assumptions

Documentation of GHG reduction assumptions and methodology is detailed in the Technical Appendix and associated Technical Calculations Spreadsheet included in the attachments.

3. ENVIRONMENTAL RESULTS – OUTPUTS, OUTCOMES, AND PERFORMANCE MEASURES

a. Expected Outputs and Outcomes

OUTPUTS:

- RNG from biogas that can be used for power generation and can also be supplied to external entities, and the associated RINs credits to help offset costs
- CO_2 sequestration in liquid form that can be sold for beneficial reuse
- Purchase of 5 low-emission CNG powered tractor-trailers and 31 hauling trailers to replace existing diesel vehicles to transport biosolids to the new processing facility and ultimate disposal facility
- Improved methane collection process at the Seminole County Landfill, providing additional RNG for power generation

OUTCOMES:

Environmental

- Reduction in an estimated 934,351 $mtCO_2e$ GHG emissions from 2025 to 2030
- Reduction in an estimated 6,056,151 $mtCO_2e$ GHG emissions from 2025 to 2050
- Reduction in criteria pollutants from transportation activities associated with the hauling of biosolids including 97% of nitric oxide and nitrogen dioxide (NO_x), 63% of particulate matter 10 microns or less (PM_{10}), 63% of $PM_{2.5}$, 64% of volatile organic compounds (VOCs), and 61% of sulfur oxides (SO_x)
- Collaboration with local transportation authorities and fleets to promote CNG adoption as a clean energy alternative to reduce transportation sector emissions
- Mitigation of harmful organic contaminants that have the potential to leach to groundwater, including PFAS, through the SCWO process
- Decrease in the volume of biosolids disposed in landfills, contributing to overall waste reduction and environmental conservation
- Reduced volumes of leachate requiring collection at the Seminole County Landfill

Energy Generation and Revenue Streams

- Generation of RNG from captured methane gas, contributing to sustainable energy production
- Revenue generation from the sale of RNG and associated RINs credits, offsetting biosolids processing costs

- Cost savings from clean turbine power generated through the SCWO process, further enhancing financial sustainability

Economic Benefits

- Creation of job opportunities in the renewable energy sector, supporting local economic growth and employment
- Generation of revenue streams for participating jurisdictions within the Central Florida region, fostering economic resilience and stability

Community Engagement and Awareness

- Increased awareness and engagement of local communities in sustainable practices and environmental stewardship
- Positive perception of the Central Florida region's commitment to environmental responsibility, fostering community pride and support for the CFWEI

Sustainable Model for Resource Management

- Establishment of a sustainable model for biosolid management and energy production, serving as a blueprint for other regions
- Demonstration of the feasibility and effectiveness of Waste-to-Energy initiatives, in general, in addressing environmental challenges and promoting resource efficiency

b. Performance Measures and Plan

The University of Central Florida (UCF) will serve as the CFWEI's outside evaluator throughout the grant period, conducting research, monitoring, and quarterly and annual reporting activities related to progress toward achieving the expected GHG reduction measures. UCF's responsibilities will take place under the direction of Dr. Haofei Yu in the College of Engineering and Computer Science as Principal investigator, supported by a team of 6 Co-Principal Investigators, 5 Ph.D. level students, and 75 undergraduate students through a newly developed paid internship program.

Task 1. Evaluating GHG emissions from biosolids prior to proposed treatment

Five test sites will be prepared to mimic the conditions of combinations of biosolids stabilization and disposal methods as currently used in the Central Florida region: lime stabilization followed by landfill disposal, landfill disposal without lime stabilization, AD followed by land application, land application without digestion, and composting.

Flux chamber techniques will be employed to quantify GHG fluxes from biosolids before the proposed AD and SCWO treatment process. Test sites will be selected based on their biosolids and inert mineral solid management practices. Within each site, 5-10 locations will be strategically selected to capture possible spatial variations. Each selected location will be precisely GPS located, and a polyvinyl chloride collar (20cm diameter, 11.4 cm height) will be pre-installed. These collars will be inserted into the ground ensuring approximately 5cm remains above the surface. They will remain in place throughout the study, though removed and replaced in the same position if needed.

Flux measurements will be conducted on a monthly basis, with additional measurements taken to track variations in environmental conditions. GHG flux measurements will be obtained using a semi-automated chamber (8200-01S, LiCor Inc., Lincoln, NE, USA) tightly sealed on top of the pre-installed collars. This chamber will be paired with two trace gas analyzers (LI-7810 for CH_4 and CO_2, and LI-7820 for N_2O, LI-COR Inc., Lincoln, NE, USA) to monitor GHG concentrations inside the chamber every second for 120 seconds. SoilFluxProTM software (LI-COR Inc., Lincoln, NE, USA) will be utilized to calculate GHG fluxes over time based on the exponential/linear increase in GHG concentrations.

Prior to each measurement, collar height above the surface will be assessed at four locations within each collar at 90° intervals, and the mean value will be used to correct for the actual chamber volume during flux calculations. Additionally, temperature at a depth of 5cm within the landfill site will be measured in conjunction with each gas measurement event using the LI-8100A temperature probe attached to the GHG flux system. This probe will be inserted into the ground within 20cm outside of the collar and temperature data will be recorded at the same intervals as GHG concentration measurements.

Data analysis will be conducted using the R program (v 4.2.0, R Core Team and the R Foundation for Statistical Computing, Vienna, Austria). Cumulative annual GHG fluxes will be calculated for each year. Specifically, GHG fluxes will be converted to daily fluxes and linear interpolation will be applied between flux measurements. The cumulative flux for each year will then be determined as the sum of the interpolated daily GHG fluxes. Finally, the annual GHG fluxes from landfill sites with treated inert mineral solids will be compared to those with untreated biosolids to assess the GHG flux reduction.

Task 2. Evaluating GHG emissions from biosolids after AD and SCWO treatment
Task 2 will be conducted similarly to Task 1, with biosolids replaced by those treated by the AD and SCWO process. Experimental setup will also be similar.

Task 3. Monitoring GHG release from AD and SCWO facility
The objective of this task is to monitor and quantify unexpected GHG emissions from the regional biosolids processing facility. Although the facility will be designed to be self-contained, unexpected releases of GHG could occur during plant operations or scheduled downtimes. Such unexpected GHG releases counteract the overall efforts of this project and should be quantified and addressed, as possible. Assumptions for a specific percentage of fugitive GHG emissions were included in the expected emissions calculations. In this task, the team will install and operate a methane and CO_2 monitoring sensor network around the facility to continuously measure ambient concentrations and to locate potential release locations.

The UCF team has developed a prototype monitor and corresponding online dashboard that is capable of continuously monitoring for methane and CO_2 while displaying real-time sensor readings. The equipment has been tested in real-world applications; as such, risks associated with its malfunctioning are not expected. Automatic warning notifications to repair malfunctioning sensors will be incorporated.

Task 4. Quantify Total Biosolid GHG Emissions using Anaerobic Digestor and Life-Cycle-Assessments
The temporal variations of GHG emissions from land application and compost can be assessed during a relatively short time period. However, landfill emissions may last for more than 10 years. Total GHG emissions from landfill disposal of biosolids will be estimated using AD.

In this study, the direct emission of the biosolids after AD for land application will be measured using flux chambers. The life-cycle cost and GHG emission of the AD process will be evaluated using the Solid Waste Optimization Life-cycle Framework (SWOLF), including the aforementioned parameters for AD, transportation of biosolids from the source (and to the site), and direct emission during land application. The economics of AD for sludge and biosolids can differ from solid waste AD due to the differences in feedstock characteristics, treatment requirements, and end-product utilization opportunities. A detailed cost-benefit analysis, considering capital and operating costs as well as potential revenue streams from biogas and digestate, is essential for evaluating the feasibility of such projects.

Task 5. Monitoring GHG release from Transportation Activities
The team will track the trips required to transport biosolids to the proposed facility and for final disposal. The results will be used to evaluate GHG emissions based on fuel type using AFLEET for transportation activities and compared to the baseline assumptions.

Task 6. Methane Collection Monitoring at Seminole County Landfill
The team will track the changes in landfill gas collection flow and emissions from the Seminole County Landfill as a result of the installation of the geomembrane cap and compare results to the previously prepared LandGEM Model to track collection efficiency.

Further, the East Central Florida Regional Planning Council (ECFRPC) will partner with the CFWEI to conduct an annual regional scale report that tracks progress toward achieving the GHG emissions reduction and workforce goals established in the region's first integrated *Climate Action Plan*, anticipated for completion by July 2025. The ECFRPC will also publish a final capstone report capturing achievements, milestones, and overarching sustainability outcomes at the conclusion of the grant period. The ECFRPC aims to contribute resources, expertise, and commitment to the CFWEI's efforts to reduce carbon emissions, promote sustainable practices, and enhance resilience in alignment with shared goals.

c. Authorities, Implementation Timeline, and Milestones
Each CFWEI Coalition member will be asked to appoint a representative to a newly established CFWEI Advisory Board, which will guide the planning and implementation process. Membership preference will be given to biosolids experts and/or waste and wastewater professionals at the director level.

Seminole County has accepted the role as lead Coalition member and grant applicant, and will assume responsibility for all activities related to the administration of the grant award, including monitoring of subrecipient activities, preparation and submission of semi-annual and final reports, serving as the fiscal conduit of grant funds to subrecipient, and contracting Construction Engineering Inspection (CEI). Seminole County's Solid Waste Management Division will be responsible for execution of the installation of geomembranes at the County landfill. The County will also contract with the Orlando Science Center for the development and execution of community education initiatives, as described in Section 4b, as well as the ECFRPC to conduct annual regional sustainability impact reports and a final capstone report.

All municipal Coalition members that own wastewater treatment facilities – Osceola and Seminole Counties, the Cities of Altamonte Springs, Orlando, Oviedo, and Winter Springs, and Toho Water Authority – will enter into an MOA wherein biosolids generated at each of their facilities will be transported to the regional biosolids processing facility for further processing. As early on-boarders to the project, parties to the MOA will benefit from revenue streams generated by the facility.

The Coalition will continue to encourage municipalities outside of the MOA to utilize the regional biosolids processing facility, as its intake capacity will be designed to exceed the anticipated contributions of current Coalition members, affording the potential for large-scale, regional impact. Active discussions are currently underway with Orange County and the Cities of Casselberry and Sanford, among others.

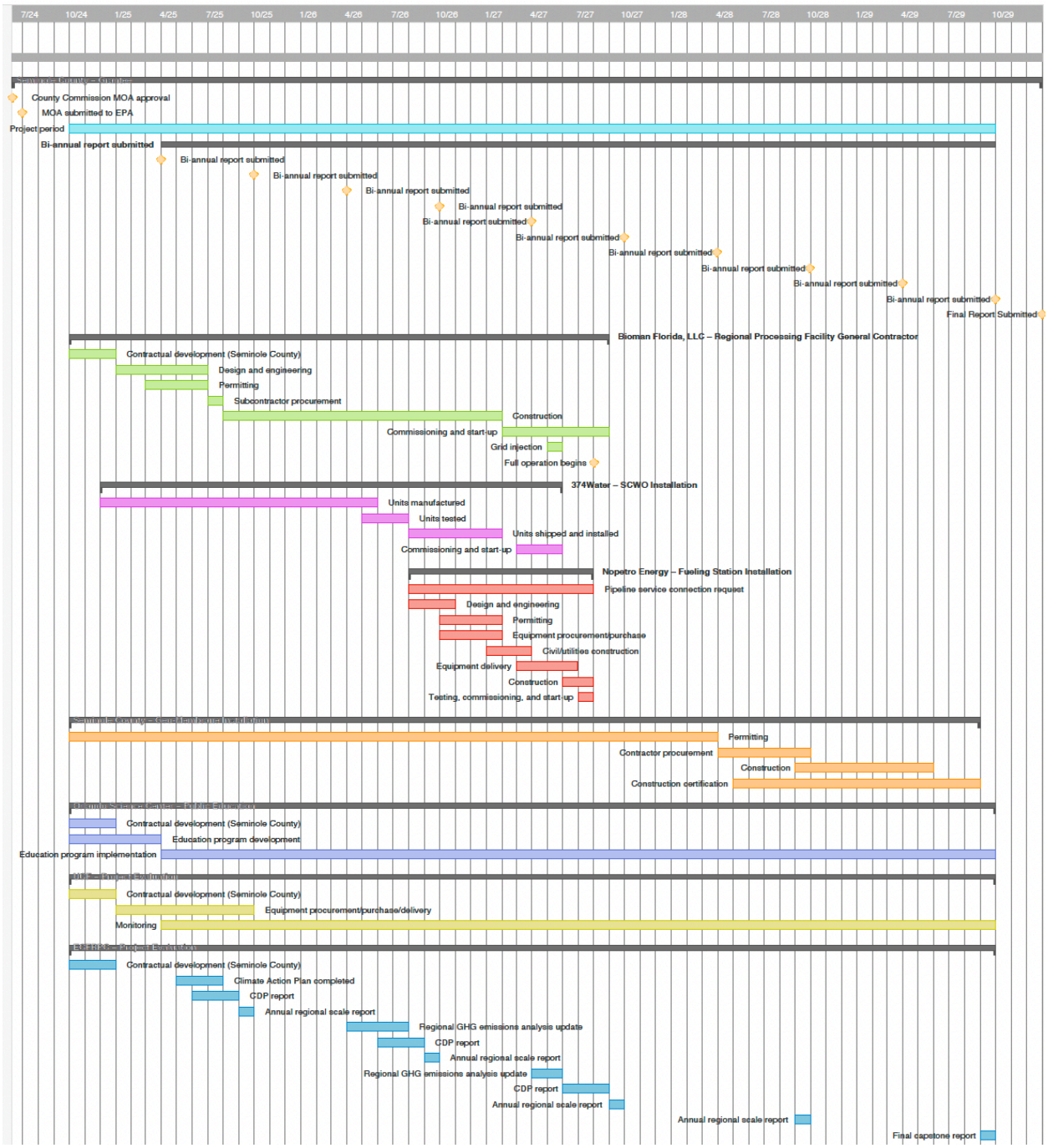
Subrecipients will include:

- Bioman Florida – Responsible for management and oversight of the development of the regional biosolids processing facility, in collaboration with the prime contractor and subcontractors, to include private entities with expertise in AD, AD biogas to RNG conversion, and CO_2 utilization/sequestration from AD biogas (Orlando Bioenergy), SCWO (374Water), CNG dispensing station construction and

operations (Nopetro Gas Marketing), and subcontractors to be determined in the areas of engineering integration, mechanical and equipment supply, and civil and building construction

- University of Central Florida – Evaluator responsible for ongoing research, monitoring, and reporting

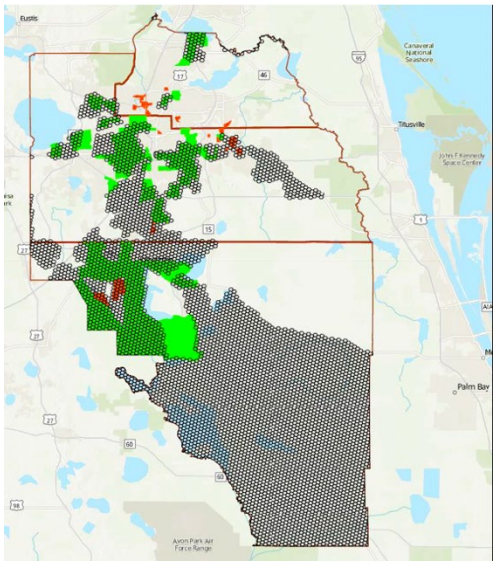
TIMELINE



4. Low-Income and Disadvantaged Communities

a. Community Benefits

The Central Florida region is characterized by its diverse ethnic and racial demographics, with substantial African American and Asian communities and significant Hispanic and Latino populations, particularly in Osceola County, which has a notable Puerto Rican community. Economically, the region-wide reliance on the millions of annual visitors attracted by the tourism industry, which is highly vulnerable to economic fluctuations, creates substantial hurdles for residents to experience upward mobility. Across all three counties, the economic landscape is marred by income inequality, with a large segment of the workforce trapped in low-paying, service-oriented positions and a significant portion of the population struggling with the high cost of living, particularly in the area of housing. These economic vulnerabilities highlight the pressing need for investment to improve the region's economic stability. Fortunately, an expanding technology sector and burgeoning research and development scene, propelled by collaborations between universities, tech startups, established corporations, and local governments drive optimism in the region's ability to diversify its economic base and improve wage standards. Taking advantage of these trends, the CFWEI exhibits substantial potential to impact local economic growth and resilience.



Within the tri-county area, 119 census tracts (Orange County – 78; Osceola County – 19; Seminole County – 22) were identified by the Climate Economic Justice Screening Tool (CEJST) that meet the socioeconomic threshold of low-income (at or above the 65th percentile) and have indicators measured at or above the 90th percentile. A list of said census tracts and their associated communities is included in the attachments.

The regional nature of the CFWEI will result in benefits to populations across the broad geographic area of Central Florida. Reduced contaminant and GHG loadings in emissions will lead to improved public health outcomes, fewer hospitalizations, and lower healthcare costs, particularly as they relate to conditions impacted by air pollution such as heart disease and respiratory illnesses, both noted in multiple census tracts by CEJST. While modest, reductions in exposure to diesel particulate matter resulting from the conversion of the biosolids transport fleet to CNG fuel may also be seen. Economic benefits driven by job creation (as described in Section 5), revenue generation, and heightened community engagement and awareness (as described in Section 4b), will further benefit LIDACs, underscoring the CFWEI's potential to drive positive change within the region. With the exception of minor traffic delays due to construction, no negative impacts are anticipated.

As part of its ongoing evaluation, UCF will perform air quality modeling to quantify economic and health impacts of the project on LIDACs. Specifically, UCF will:

- Perform a comprehensive "life-cycle" analysis to spatially and temporarily allocate emissions of GHGs, CAPs and HAPs;

- Perform air quality modeling to estimate ambient concentrations of GHGs, CAPs and HAPs on LIDAC, for both baseline and proposed cases, and
- Perform epidemiological analysis to estimate health and economic impacts of the project.

Further, UCF will develop an internship program to serve 15 undergraduate students per year to support its research and evaluation efforts, described in Section 3b. Each student will receive a stipend for their participation in the 20 hours-per-week, 15-week annual internship program. As a Hispanic-Serving Institution (HSI), UCF has a substantial enrollment of students from low-income and disadvantaged communities and will prioritize opportunities for these students to be included in the internship program.

The ECFRPC's ongoing analysis of region-wide progress toward GHG emission reduction and workforce goals, as described in Section 3b, will further report on the CFWEI's LIDAC impact.

b. Community Engagement

The municipalities represented by the CPRG Coalition have a rich history in public education for sustainability best practices. The public sector's efforts in this intersection have often received national recognition, including a National Geographic televised program which showcased the region's recycling and water conservation efforts.

Seminole County's SERV (Seminole Education, Restoration & Volunteer) program ensures residents play an integral role in the robust stewardship of the region's natural assets. SERV engages volunteers of all ages and from every zip code within the County to partner with staff on education and conservation efforts. In FY2023, volunteers contributed more than 4,317 hours of service, providing vital information about water quality, work on special projects (e.g. lake restoration, invasive removal, storm drain markings), and assistance in the education of residents. Champions from within the County's Wastewater and Solid Waste Divisions will produce age-appropriate curriculum and activities around biosolid conversion, named POO-2-REVENUE, to incorporate into SERV's existing education efforts.

The proposed project team will also work with the Orlando Science Center (OSC) on a mass-scale public education campaign tying in principles from the POO-2-REVENUE program. OSC's science education and public programs staff are well versed in a variety of science concepts and have the expertise to translate often complex topics such as biosolid management into understandable and digestible content for both youth and general audiences. OSC will partner with the CFWEI to deliver educational programming through general program content in their interactive exhibit halls, labs, and theaters (visited by more than 600,000 individuals annually) and outreach programs (reaching 153,000 students and educators annually). OSC's educational materials will engage local schools (specifically targeting Title 1) and communities (including LIDAC) in understanding the significance of RNG in biosolid and other waste management practices. As a trusted leader in informal STEM education, OSC will allocate resources for public awareness campaigns to educate the community about the environmental benefits of the CFWEI.

OSC's programming will include:

- Neighborhood Science – place-based STEM outreach in underserved communities, currently serving 2 locations in the 32805-zip code, which the Economic Innovation Group's Distressed Communities Index (tool for measuring the economic well-being of communities and identifying disparities) has identified as the most distressed zip code in Central Florida, enduring a low rate of high school graduation and high unemployment and poverty rates

- School field trip curriculum, including field trips for Title 1 schools (determined by the percentage of students at each school eligible for free or reduced-priced lunch), involving tours of the proposed regional biosolids processing facility in collaboration with Orlando Bioenergy
- Summer camps
- KidsTown Exhibit – serving children ages 0-7
- Cart demonstrations and activities throughout the OSC campus, engaging its youth Catalyst volunteers
- Science Matters – public information campaign
- Community engagement events

5. JOB QUALITY

The CFWEI will create high-value, long-term, family-sustaining career opportunities. Anticipated wages and benefits will be comparable, if not higher, than national averages. According to ZipRecruiter, biosolids and derived energy recovery management jobs offer wages ranging from $20 to $52 per hour. Salaries posted by the Bureau of Labor Statistics demonstrate environmental remediation careers, including those that develop the remediation products used to remove pollutants found in biosolids, earn an average annual salary of $78,540. A priority will be to ensure fair labor practices and uphold workers' rights, including the free and fair choice to join a union if desired. This will offer workers collective bargaining power, protection of their rights, and access to additional benefits and resources.

The first two years of the regional biosolids processing facility's development and construction will utilize local engineering, environmental, and technical professionals for design and permitting. The CFWEI anticipates making over 100 construction-related positions available, including engineering (estimated 20 positions), skilled trades (42), and unskilled trades (24). These roles will be offered at competitive salaries recognizing the prevailing wages of the Central Florida region. Local construction companies have already been shortlisted for the civil and construction works with local construction materials and methods being utilized to the extent that is practical.

Once operational, facility management and system technologies will require skilled workers to operate, maintain, and oversee operations. The expected professions needed range from engineers and technicians to plant operators and environmental specialists. Over 50 permanent positions will be created including senior management/professional (4), skilled trades maintenance (6), operators (5), and CDL qualified drivers (34). Specialist roles and technical expertise will initially be drawn from the existing fleet of AD plants owned by Orlando Bioenergy's parent company, Bigadan. These technical experts will be used to support and train a local workforce, passing on their experience to local operators.

Beyond the biosolid conversion process, additional jobs will be necessary to process or utilize the RNG produced to support direct input into the natural gas pipeline. These jobs carry an annual average wage of $76,550. Within the growing RNG industry, a 2021 study by the Coalition for Renewable Natural Gas projected an expected 22,600 job opportunities available nation-wide. In the state of Florida (where the CFWEI's anticipated RNG will be distributed) alone, 9 plants currently utilize these gases.

In addition to the undergraduate internship program being implemented by UCF, the CFWEI will draw upon the strong history of experience in building workforce training programs within emerging sustainability-related fields, notably in water sciences, of the proposed project team. From the Florida Water Environment Association's (FWEA's) nationally recognized high school curriculum to licensure provided through the Florida Water and Pollution Control Operators Association, any employable aged resident can receive training needed to pursue these careers. Additionally, FWEA launched a Residuals

Biosolids Sludge secondary level education program in 2005 that is still used in classrooms around the state today. The proposed project team, which includes several members belonging to the above-named organizations, will ensure this curriculum is updated to reflect the innovative processes and solutions presented by the CFWEI.

6. PROGRAMMATIC CAPABILITY AND PAST PERFORMANCE

a. Past Performance

Seminole County, which will be responsible for grant administration should an award be made, currently has over 120 active awarded grants being managed by County staff, including the following:

Hurricane Ian Emergency Watershed Protection

- Agreement #NR234209XXXXC007
- U.S. Department of Agriculture, Natural Resources Conservation Service; CFDA #10.923
- Federal funding in the amount of $13,695,025 for debris removal and channel stabilization to Seminole County waterways
- Contact: Jason Strenth, P.E., State Conservation Engineer; jason.strenth@usda.gov; (352) 338-9559

Multiple ARPA-Funded Projects

- Agreement #SLT-548
- Coronavirus State and Local Fiscal Recovery Funds – American Rescue Plan Act – U.S. Treasury; CFDA #21.027
- Federal funding in the amount of $91,6496,669 to implement various COVID-19 pandemic recovery projects
- Contact: SLFRF@treasury.gov

Seminole County Adult Treatment Court Expansion Project

- Agreement #H79TI081060
- U.S Department of Health and Human Services – Substance Abuse and Mental Health Services Administration – Center for Substance Abuse Treatment; CFDA #93.243
- Federal funding in the amount of $1,955,006 to provide substance abuse treatment services through the Seminole County Problem-Solving Court program
- Contact: Lloyd Roberts, Program Official; Lloyd.Roberts@samhsa.hhs.gov; 240-276-0435

Hiring of Firefighters

- Agreement #EMW-2020-ff-00490
- FEMA FY2020 Staffing for Adequate Fire and Emergency Response; CFDA #97.083
- Federal funding in the amount of $7,321,470 to provide salaries for thirty firefighters
- Contact: Amy Kroll, Preparedness Officer, Fire, Regional, Emergency Management Grant Programs; amy.kroll@fema.dhs.gov; 202-330-2841

Seminole County Historic Midway Community Flood Resilience and Adaptation Project

- Agreement #24SRP64
- State of Florida Department of Environmental Protection – Resilient Florida Program; State of Florida SY2023/2024 GAA #1819
- State funding in the amount of $7,194,500 for Midway stormwater drainage improvements
- Contact: Christina Ramazzotto; Christina.Ramazzotto@FloridaDEP.gov; 850-245-8367

b. Reporting Requirements

All of the above-referenced grants are current with quarterly reporting requirements and are in good standing with their respective awarding agencies. Management of these grants is carried out by staff within the department responsible for overall execution of the project in coordination with the Grant

Management Division. All referenced grants have been selected for the County's Single Audit under Office of Management and Budget guidelines and have not been issued corrections under previous yearly audits. Each has been successfully progressing through the normal process to completion.

c. Staff Expertise
Biosketches/CVs of key team members are included in the attachments.

CPRG COALITION MEMBERS (Municipalities)
1. The government of **Seminole County, Florida** (Coalition lead/CPRG applicant) is dedicated to serving its community (approximately 470,000 residents) by providing essential services, maintaining infrastructure, and fostering economic development. Dedicated to environmental stewardship, the **Environmental Services Department** oversees a range of programs and initiatives aimed at protecting water quality, conserving natural resources, and promoting sustainable practices. From managing waste and recycling programs to monitoring air and water quality, the Department works diligently to ensure the health and well-being of residents and the local ecosystem.

2. Serving a population of approximately 375,000 residents, the government of **Osceola County, Florida** strives to provide essential services efficiently and responsibly while fostering economic growth and enhancing the quality of life for its constituents. The **Public Works Department** serves as a cornerstone of infrastructure maintenance and development within the region. With a focus on road maintenance, solid waste management, stormwater drainage, and engineering services, the Department plays a crucial role in ensuring safe and efficient transportation networks, environmental sustainability, and overall public safety.

3. With a population of over 280,000 residents, the **City of Orlando, Florida**'s government focuses on addressing the diverse needs of its residents, promoting innovation, and fostering partnerships to ensure Orlando remains a dynamic and inclusive urban center. The **Water Reclamation Division** of the Public Works Department stands at the forefront of sustainable water management, employing cutting-edge technologies and innovative practices to treat and recycle wastewater effectively. With a commitment to environmental stewardship and public health, the Division operates state-of-the-art treatment facilities that produce high-quality reclaimed water for various non-potable purposes, such as irrigation, industrial processes, and groundwater recharge.

4. The **City of Altamonte Springs, Florida** (approximately 45,000 residents) prioritizes community engagement, sustainability, and innovation, working collaboratively with residents and stakeholders to address local needs. The **Sewer and Wastewater Division** of the Public Works Department is dedicated to managing and treating wastewater to protect public health and the environment. Responsible for the operation, maintenance, and expansion of the City's sewer system, the Division ensures the safe and efficient conveyance of wastewater from homes and businesses to treatment facilities. Through proactive maintenance, monitoring, and compliance with regulatory standards, the Division works diligently to prevent sewer overflows and maintain water quality in local water bodies.

5. The **City of Oviedo, Florida** has a population of approximately 40,000 residents. Its **Public Works Department** serves as the backbone of infrastructure maintenance and development, ensuring the smooth operation and safety of essential services including potable water, wastewater, reclaimed water, stormwater management, and road maintenance. The Department works diligently to uphold the City's high standards of cleanliness, accessibility, and environmental sustainability, and is committed to excellence and responsiveness, playing a vital role in supporting the City's growth and development.

6. The **City of Winter Springs, Florida** is dedicated to providing efficient and responsive municipal services, fostering community engagement, and enhancing the overall quality of life for its approximately 38,000 residents. Responsible for a range of essential services including road maintenance, traffic management, stormwater drainage, and solid waste collection, the **Public Works Division** works tirelessly to keep Winter Springs safe, clean, and accessible. Through proactive maintenance programs, innovative solutions, and community outreach efforts, the Division strives to address the evolving needs of the City while promoting sustainability and environmental stewardship.

7. **Toho Water Authority** is a public utility serving residents and businesses in Osceola County, FL. Established to manage water resources and provide water and wastewater services, Toho Water Authority plays a vital role in ensuring reliable access to clean water and effective wastewater treatment for the community. Committed to environmental stewardship and sustainability, Toho implements innovative technologies and practices to protect water quality, conserve resources, and promote responsible water usage.

SUBRECIPIENTS

1. **Bioman Florida LLC** (for-profit) handles the full scope of logistics around a successful RNG facility. This includes dealing in the biomass that can be converted into biogas and the biomass that will subsequently be put onto agricultural land as a nutrient-rich organic fertilizer, as well as handling all logistical tasks associated with the storage and transport of biomass regardless of whether it is organic residual waste from food ingredients, food manufacturing, wastewater sludge, the pharmaceutical industry, or slaughterhouses. Further, Bioman markets and sells RNG from biogas plants to the energy and transport sectors, connecting the generation portion of the renewable energy industry to the commercial sector.

2. The **University of Central Florida Research Foundation** (not-for-profit) is a direct support organization of UCF that promotes, encourages, and provides assistance to the research activities of University faculty, staff, and students. UCF's **Department of Civil, Environmental, and Construction Engineering** conducts research focused on developing sustainable infrastructure solutions to address pressing environmental challenges. Their findings highlight innovative approaches to enhance resilience, mitigate climate change impacts, and improve the efficiency and durability of civil engineering projects, ultimately contributing to the advancement of environmentally conscious practices in the field. The **Department of Mechanical and Aerospace Engineering** has conducted groundbreaking research in the fields of propulsion, materials science, and robotics. Their work encompasses innovative designs for aircraft engines, advancements in renewable energy technologies, and the development of autonomous systems, contributing to the advancement of aerospace and mechanical engineering disciplines.

TECHNICAL PARTNERS

1. Reducing environmental impact is core to the business objectives of Bigadan, the parent company of **Orlando Bioenergy LLC** (for-profit). Bigadan has been in the biogas industry for over four decades, during which they have built over forty AD facilities around the world. They have world-class staff who are experts in project development, AD operation, biomass, RNG, and more. Bigadan works with local municipalities, businesses, and citizens to improve their use of resources and deliver environmental benefits, including reduced emissions of GHGs through its core AD technologies. The SSOPF (greenlit) and complementary regional biosolids processing facility (proposed) will be the first AD plant that Orlando Bioenergy will own and operate, utilizing a local team with worldwide experience.

2. **374Water Inc.** (for-profit) is a social impact, cleantech company based in Durham, NC. 374Water offers an innovative technology that enables a circular economy and creation of a world without waste. Their

mission is to preserve a clean and healthy environment that sustains life. This is achieved by applying cutting-edge science and engineering to recover resources from the wastes our society generates and supporting businesses and local governments in achieving their sustainable development goals. 374Water developed the AirSCWO technology to harness energy and resource recovery from hazardous organic waste using SCWO, a system that employs a physical-thermal process that converts waste to recoverable energy, water, and minerals, while eliminating organic pollutants.

3. Founded in 2007, Florida-based **Nopetro Gas Marketing, LLC** (for-profit) pioneered RNG distribution in the State of Florida and is the leading supplier of CNG fuel to heavy fleets. The company specializes in the design, financing, construction, and operation of RNG production and distribution facilities. Other important aspects of the business include significant CNG/RNG maintenance facility expertise and natural gas supply chain management. Nopetro is the trusted RNG partner to government agencies across Florida, including the City of Tallahassee, Leon County Schools, St. Johns County, and the Central Florida Transportation Authority. Nopetro's team possesses unique knowledge and understanding of the inner workings of government agencies, and prides itself on being able to narrowly tailor each RNG infrastructure project to meet the specific circumstances of its government partner.

OTHER KEY PARTNERS

1. The **Orlando Science Center** (not-for-profit) stands as a beacon of scientific exploration and education in Central Florida, captivating visitors of all ages with its interactive exhibits, engaging programs, and hands-on experiences. The Center boasts four floors filled with immersive exhibits covering various scientific disciplines, from astronomy and physics to biology and technology. Its visitors can embark on a journey through the cosmos in the planetarium, delve into the wonders of nature in the NatureWorks exhibit, or unleash their creativity in the Maker Space. OSC educates and inspires thousands of students and educators each year both onsite and at schools and community organizations. Its programs provide engaging and immersive experiences that inspire a personal connection. With its commitment to fostering curiosity and inspiring lifelong learning, OSC serves as a dynamic hub for discovery and innovation in the region.

2. The **East Central Florida Regional Planning Council** (not-for-profit) was established in 1962 and is recognized under Florida Statutes as an area-wide association of governments. The ECFRPC serves the eight-county region of Brevard, Lake, Marion, Orange, Osceola, Seminole, Sumter, and Volusia. The Council consists of 35 members representing these counties and their municipalities, focusing on addressing regional challenges and providing project, policy, and planning assistance to governments and organizations within its jurisdiction. Its mission includes promoting smart growth, economic development, and resilience through communication, collaboration, and the provision of technical planning assistance, aiming to create a healthy, sustainable, thriving, and resilient region.

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In summary, the Central Florida Waste-to-Energy Initiative is worthy of an award from the EPA's Climate Pollution Reduction Grant program due to its holistic, innovative, and replicable approach to waste management and energy production, which includes:

Environmental Impact Mitigation

- Addressing significant environmental challenges posed by biosolids generated from wastewater treatment facilities
- Minimizing the environmental impact of biosolid disposal methods such as landfills and land application

Strategic Public-Private Partnership

- Spearheading a collaborative effort between public and private sectors to maximize resource utilization and minimize environmental impact
- Engaging with a select third-party private entity to enhance efficiency and effectiveness

Renewable Natural Gas Integration

- Capturing methane gas from biosolids and converting it into RNG
- Seamlessly integrating RNG into the natural gas pipeline
- Utilizing RNG as CNG for transportation fuel purposes

Supercritical Water Oxidation Process

- Employing innovative technology to address PFAS and other organic contaminants in residual solids
- Generating clean power as an additional energy revenue stream

Biosolid Management and Volume Reduction

- Rendering biosolids into inert mineral solids, reducing their volume by over 70%
- Enabling less than 30% of the initial biosolids volume to be land-applied or directed to landfills

Revenue Sharing Mechanism

- Sharing revenue generated from the sale of RNG and associated RINs credits among participating jurisdictions

Multifaceted Approach to Energy and Revenue Generation

- Leveraging multiple revenue streams including RNG, RINs credits, and power generation
- Creating a sustainable model for resource management and energy production
- Positioning Central Florida as a trailblazer in sustainable energy innovation

Impact to Low-Income and Disadvantaged Communities

- Leveraging existing municipal partnerships and volunteer entities to increase public awareness
- Developing a mass scale public education campaign to promote the benefits of utilizing biosolid waste for clean energy
- Utilizing undergraduate students to monitor and evaluate GHG emissions reductions

Through continued collaboration, investment, and dedication to sustainability, the CPRG Coalition looks forward to realizing the full potential of this transformative initiative for the benefit of current and future generations.