Broward NRWWTP Biogas to Energy Project

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Broward County

Water and Wastewater Services

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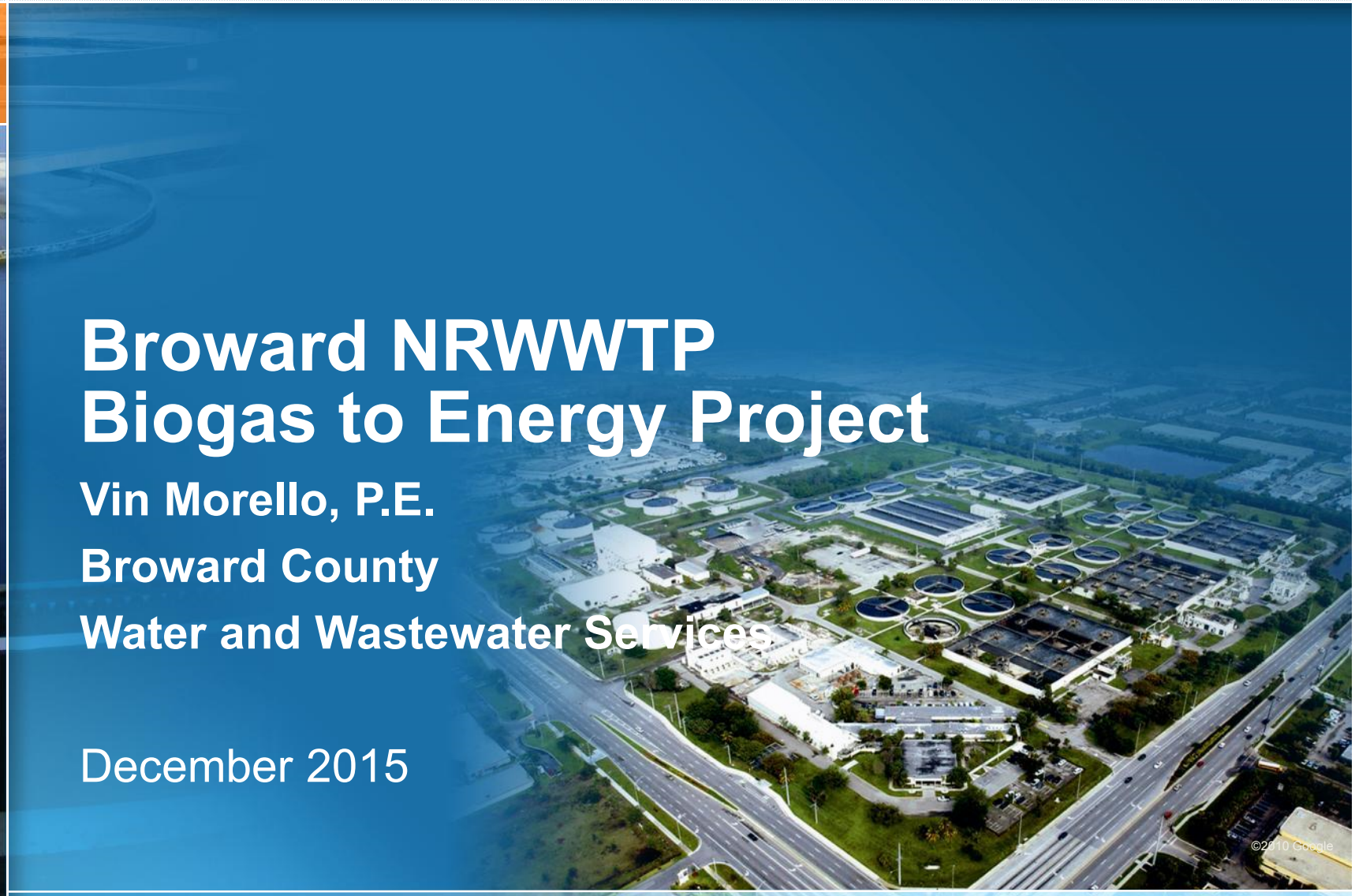


Cogeneration Agenda

- Project Development
- FOG Receiving Station
- Cogeneration
- Project Benefits

Project Development

Broward County, FL

- Project Development
  - Energy conservation study completed in 1992 but never implemented
  - Broward County Green Initiative
  - Florida Statute 489.145(4)(a) allowing ESCO implementation at Water/Wastewater Treatment Plants

ESCO Delivery

Pros	Cons
Speed	Proof of payback burden
Stake in success	Added operation
Innovation	Risk of quality
Payback Defined/Funding	Risk “it only needs to fail once”

Focus on Energy Conservation

- Sep. 2009 Broward County selects the OpTerra / Hazen and Sawyer Team
- Jan. 2011 Energy Audit ($350k)

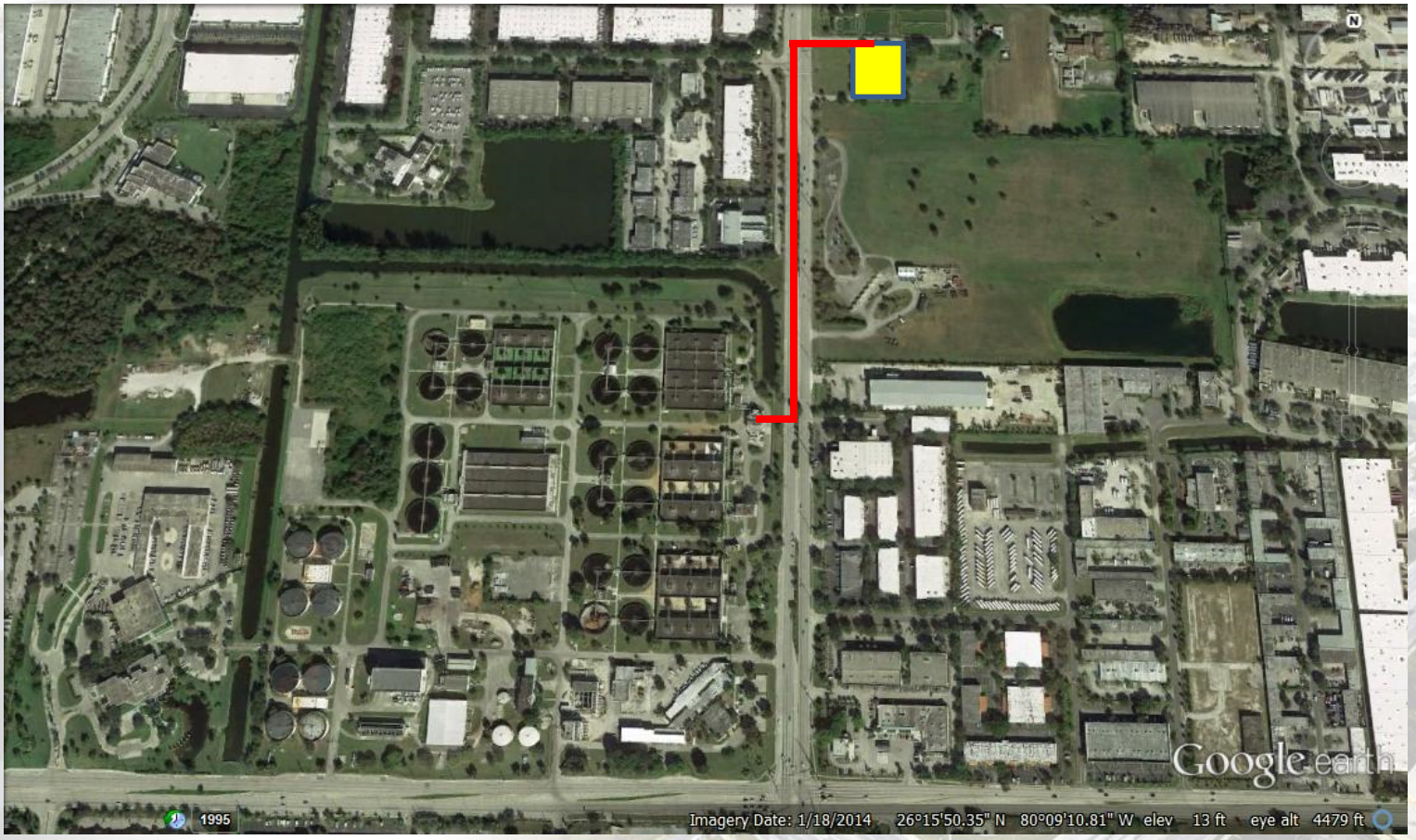
Energy Conservation Measures (ECMs)

Fine Bubble Conversion

FOG/Cogeneration

Additional Considerations

- FOG impacts the NRWWTP



Additional Considerations

- FOG impacts the NRWWTP

Influent Pipe from Septage Receiving Facility

Biogas to Energy Project

- Jul. 2012 Design & CM ($2.9M)
- Apr. 2014 Construction ($14.8M)

Cogeneration

- 1,625 kW savings
- 2 MW generator
- 8,846 Tonne reduction on carbon emissions

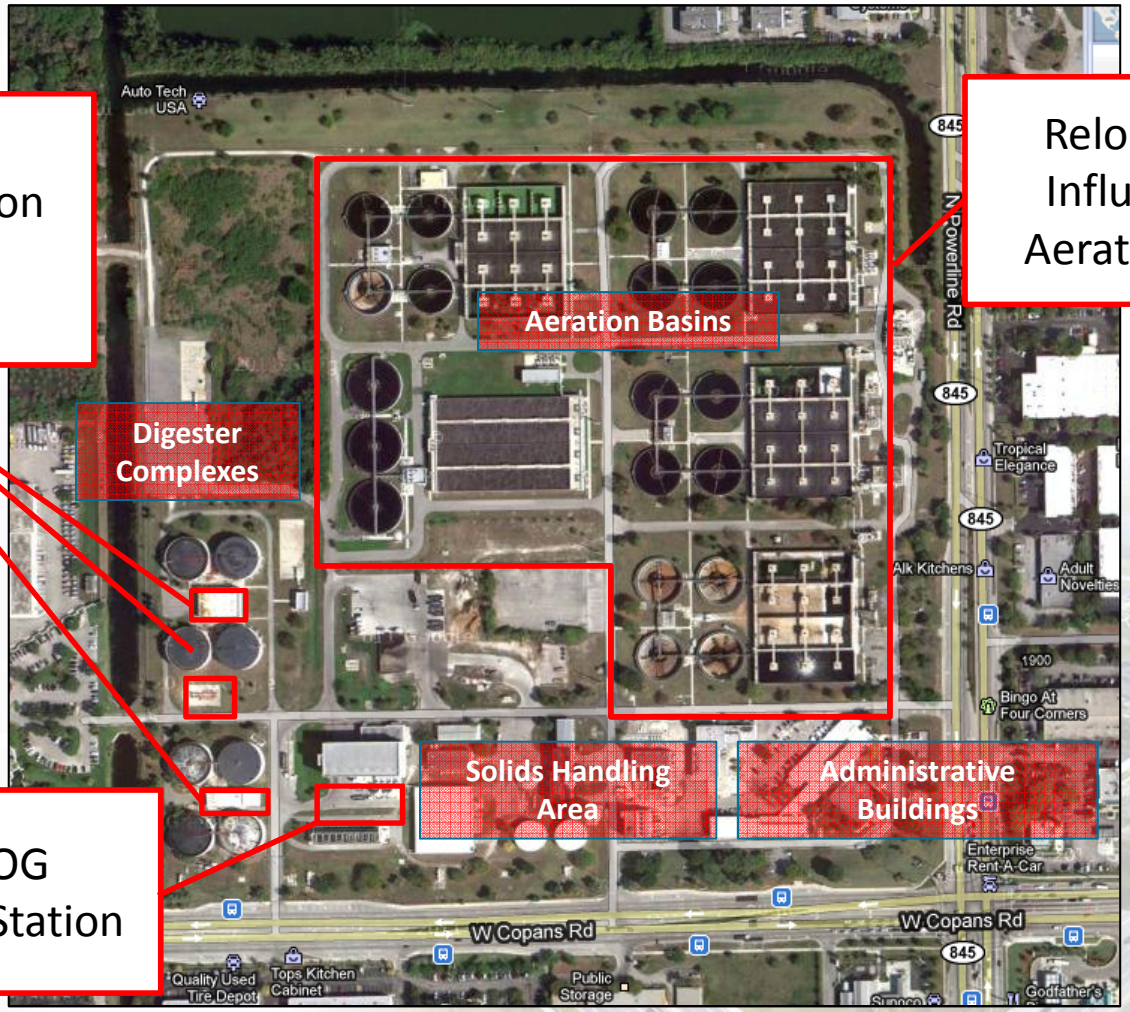
FOG (Fat, Oil and grease)

- 260 kW savings on aeration load
- O&M savings

Broward NRWWTP

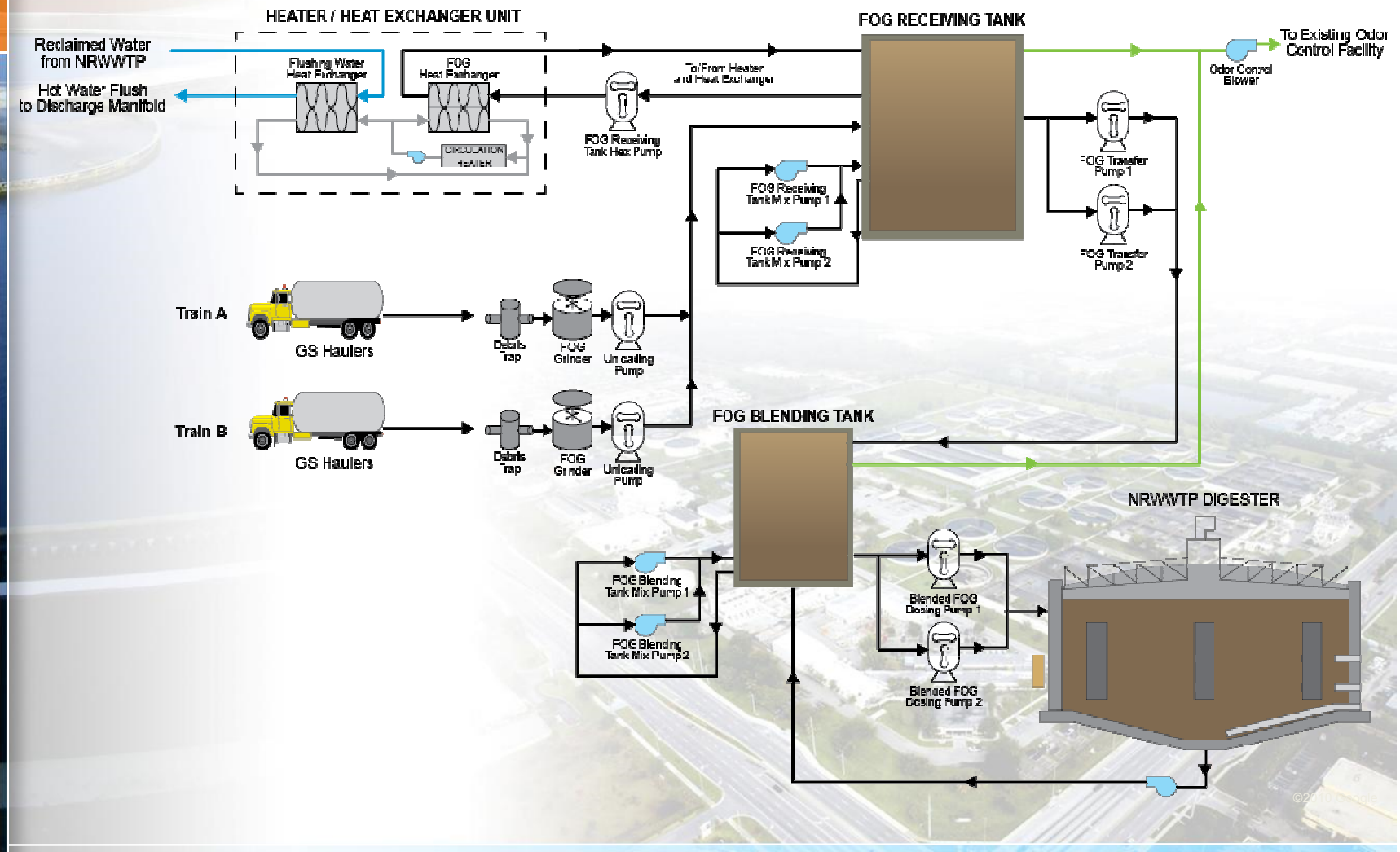
New Cogeneration Equipment

Relocate FOG Influent from Aeration Basins

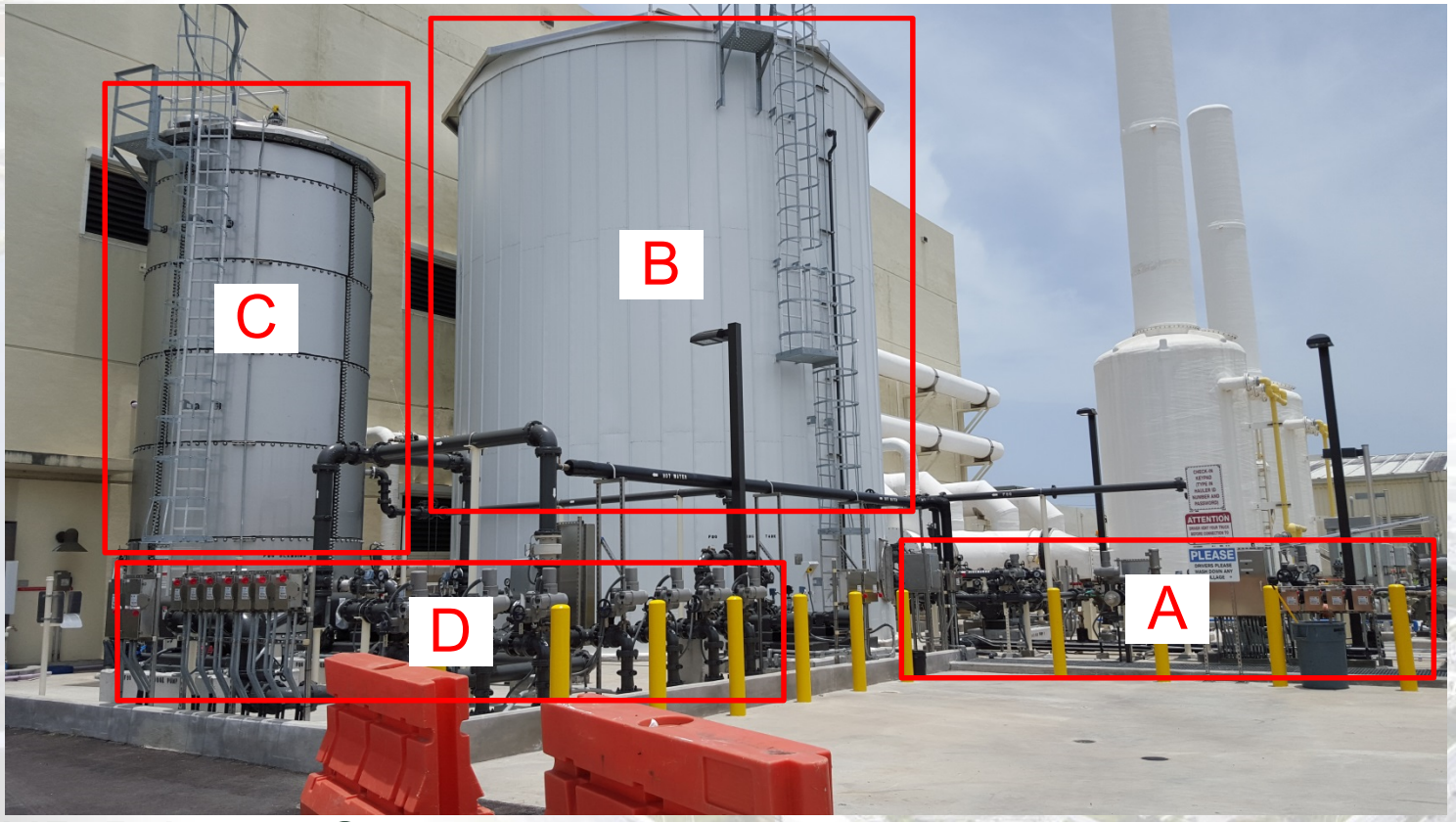


New FOG Receiving Station

FOG Receiving Facility – Process Flow Diagram



FOG Receiving Facility



FOUR Primary Systems

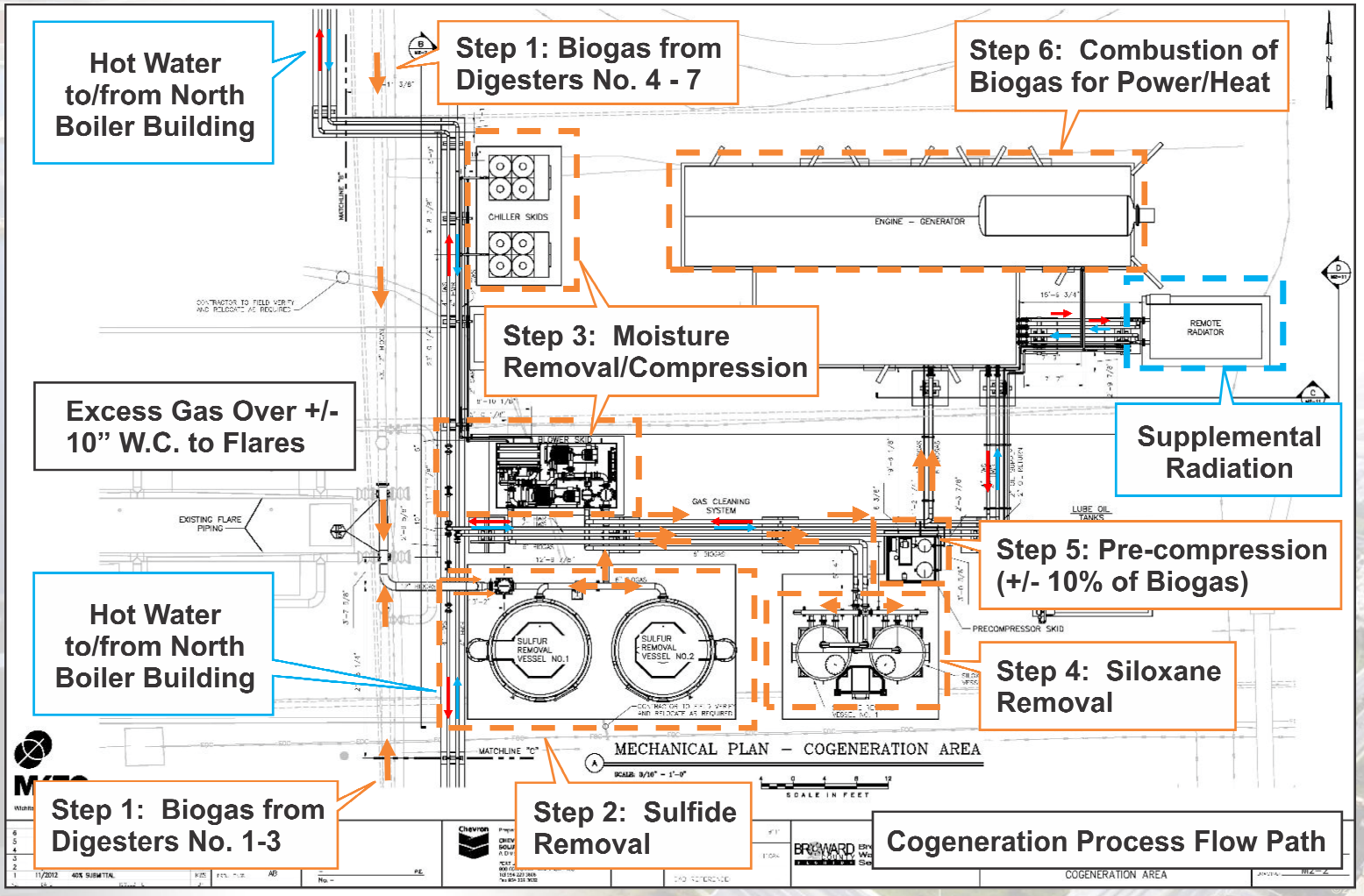
A: FOG Receiving Station

B: FOG Receiving Tank

C: FOG Blending Tank

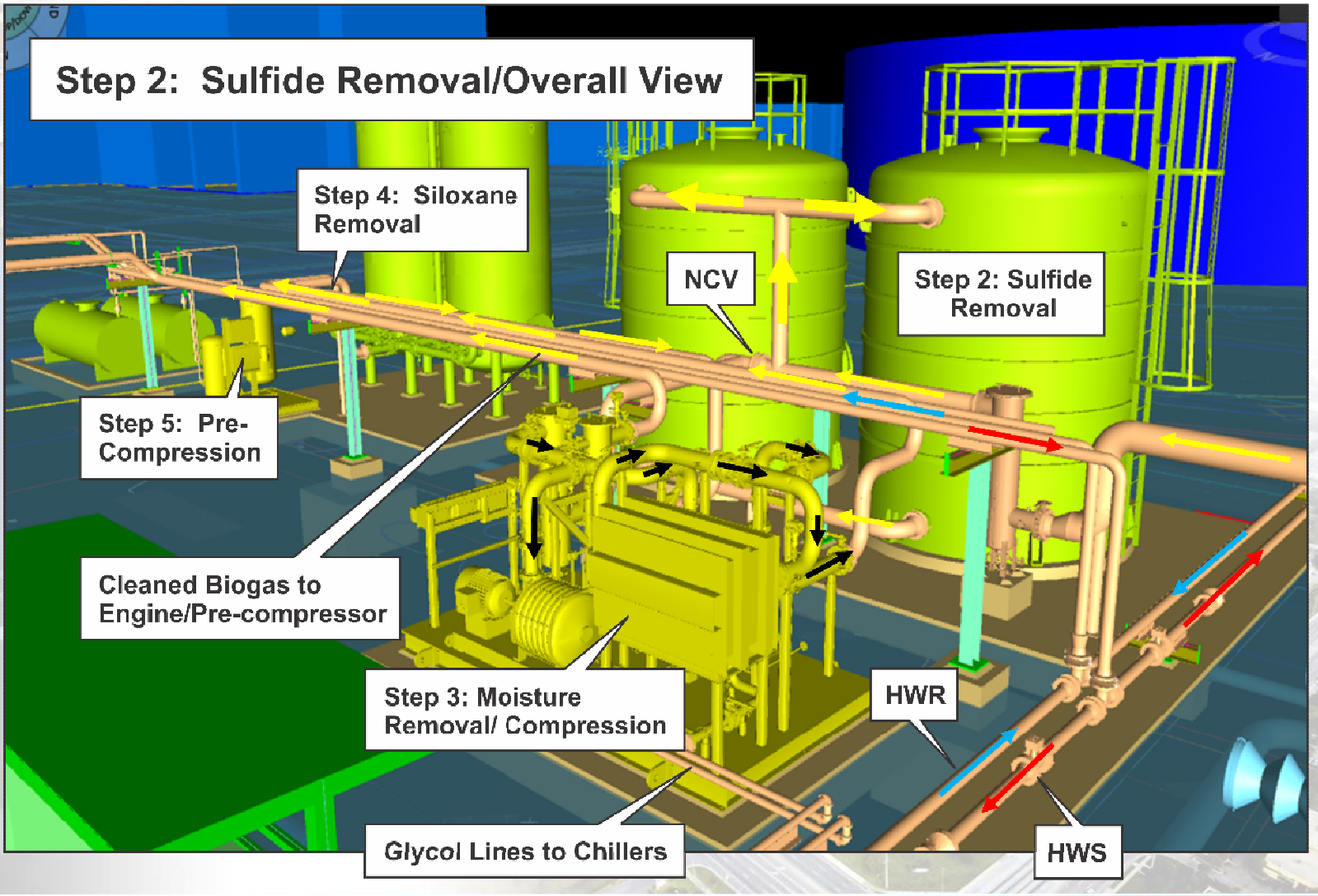
D: FOG Dosing System

Cogeneration – Schematics

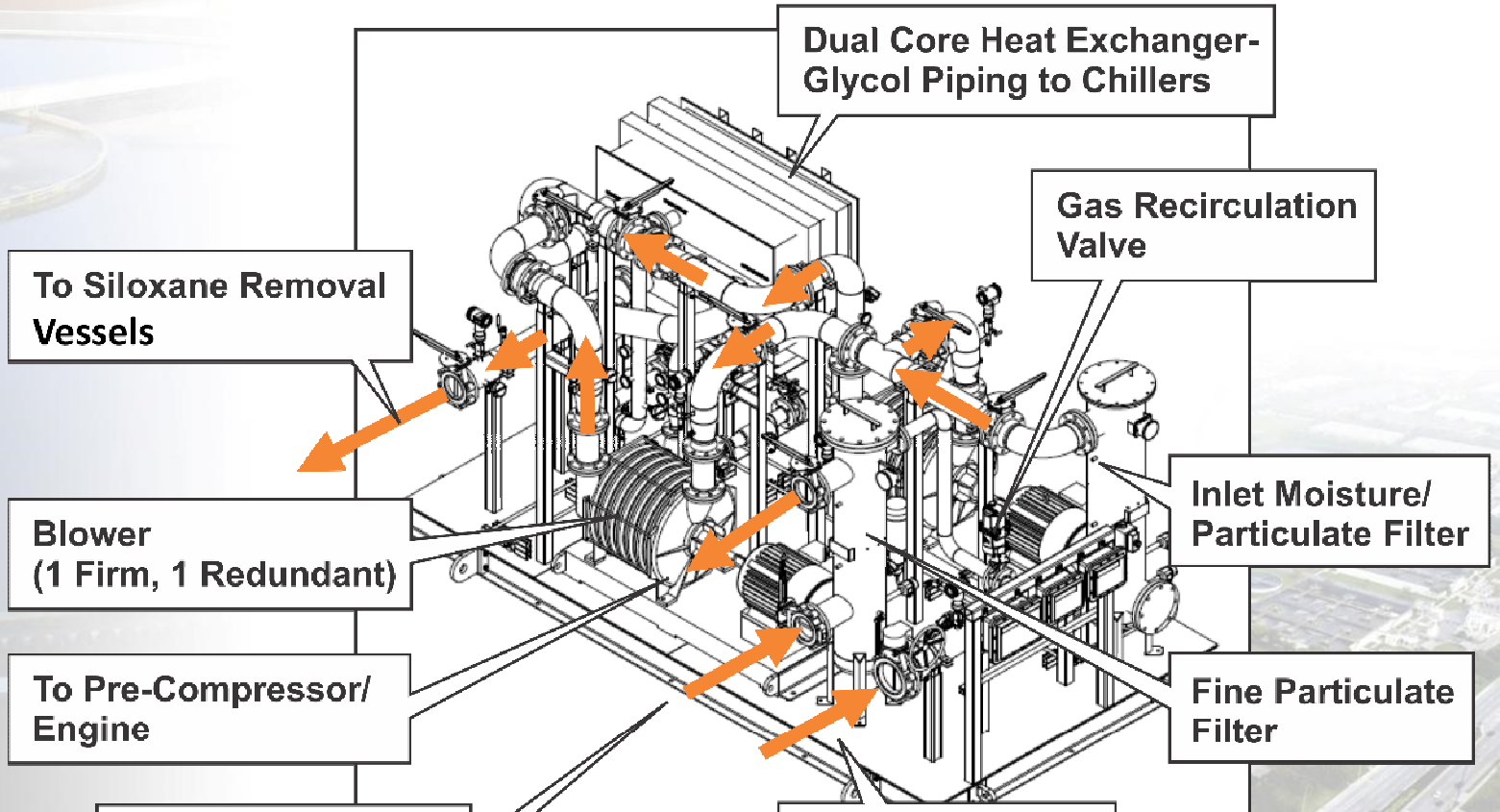


Cogeneration System

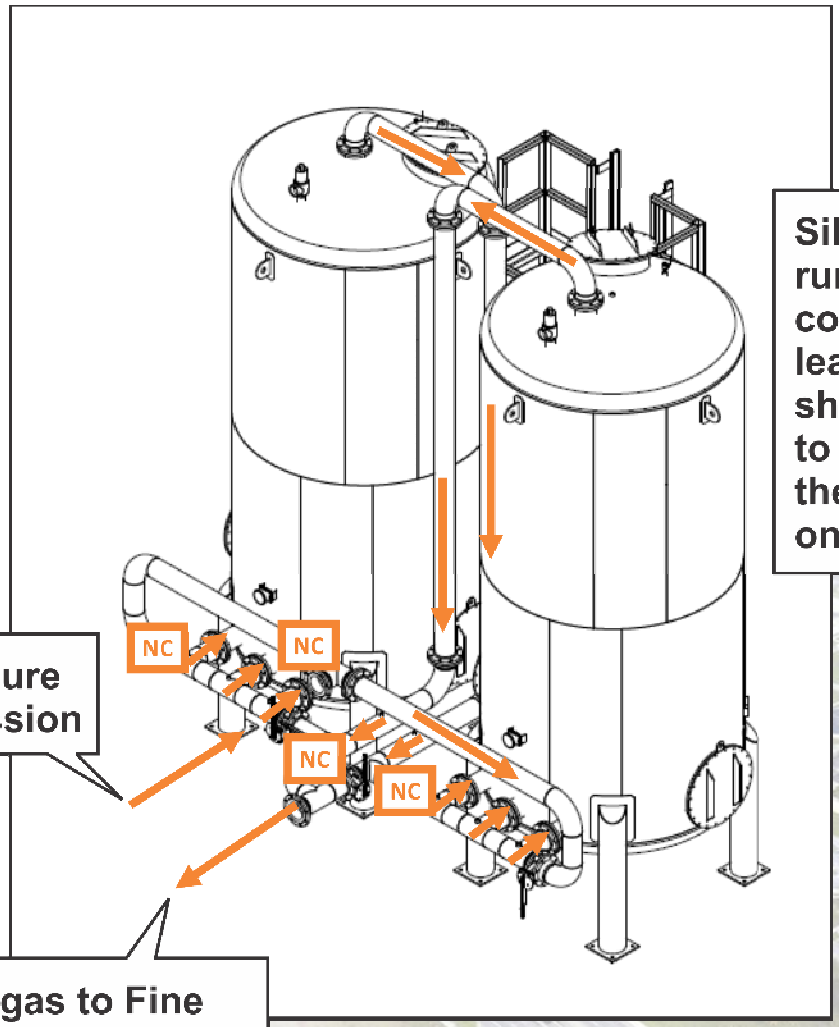
Biogas Cleaning



Moisture Removal/Compression



Siloxane Removal



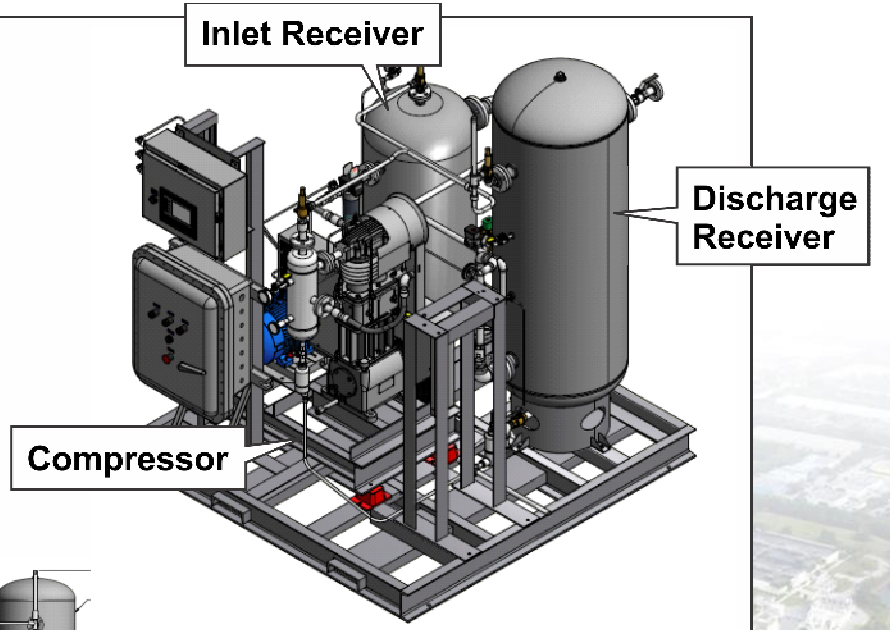
Biogas from Moisture Removal/Compression

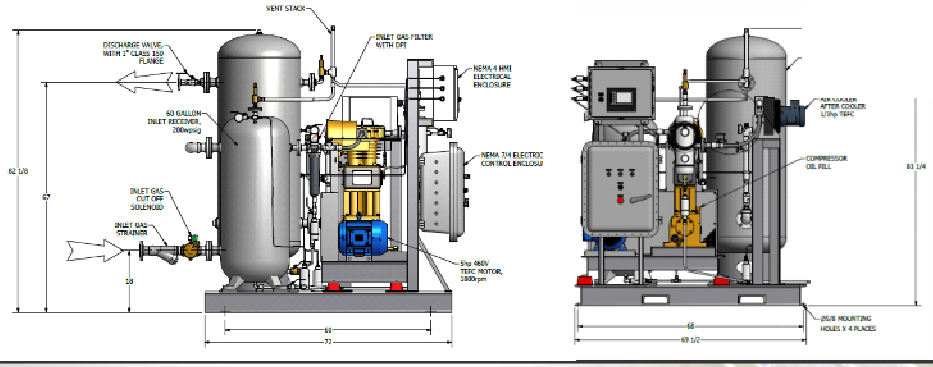
Biogas to Fine Particulate Filter

Siloxane vessels can run in parallel or lead/lag configuration. One lead/lag configuration is shown with flow going to vessel on right and then through the vessel on the left.

Pre-Compression

Flow through pre-compression vessel is through inlet receiver, compressor, and discharge receiver.





Other Considerations

- Maintenance: Complete support for equipment
- SCADA Tie-Ins
- Maintenance of plant processes that feed Cogen System
- Measurement and Verification

Project Benefits

Projected Energy Savings

FOG

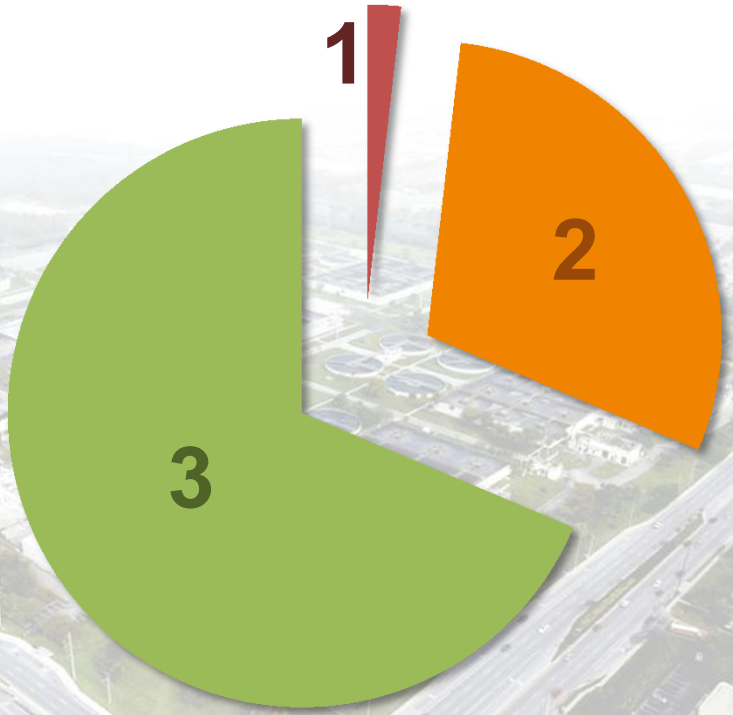
- 260 kW Savings

Cogeneration

- 1,625 kW Savings

Total WWTP 5,500 kW

1,885 kW Savings



Economic Impact

- 1st Year Electrical Savings - $1.17M
- O&M Costs - $369,000
- Net Benefit - $799,000

Projected Energy Savings

Reduce County carbon emissions:

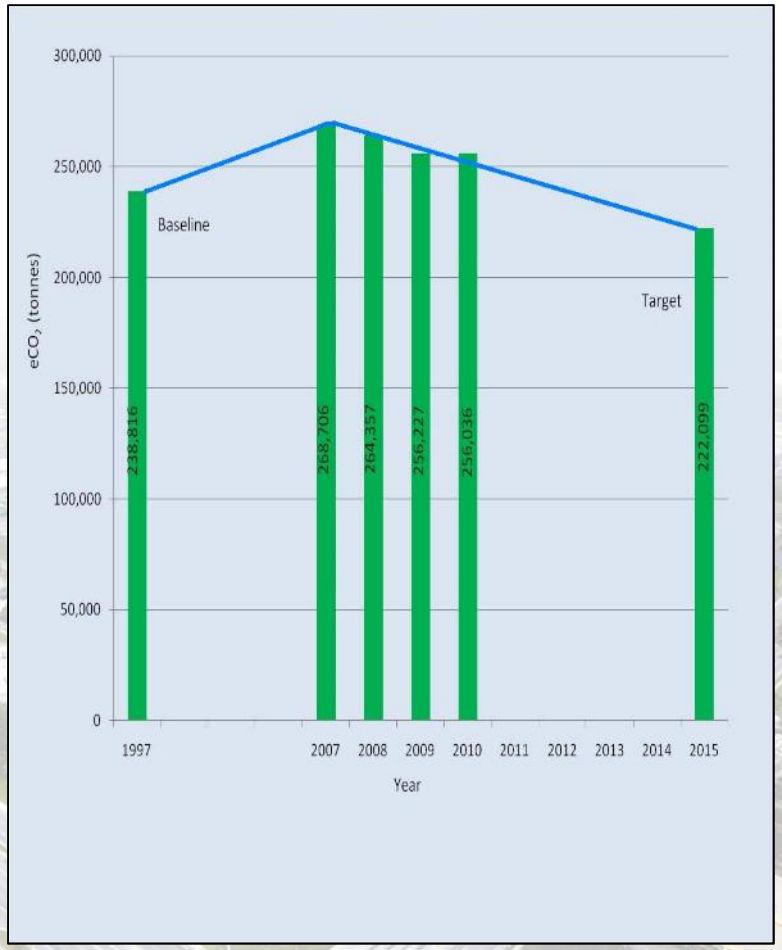
- Goal of 34,000 tonnes per year by 2015
- Project achieves 8,846 tonne per year reduction

Plant carbon footprint reduction of over 25%

Reduced flaring

Equivalent to removing:

- 1,500 cars from the road each year
- Planting 1,850 acres of pine forest per year



Project Summary

- Improved WWTP facilities
- Self-funding from savings
- Hedge against future rate increases
- Rapid implementation
- Positive environmental impact
- ASCE Broward Branch Project of the Year 2015

Cogeneration Construction

FOG Receiving Facility - Construction