# Cutting the Electric Bill by $18,600 a Month
# Northwest Regional Water Reclamation Facility
# Fox Lake, IL

Wisconsin Wastewater Operators Association
Wisconsin Dells, WI
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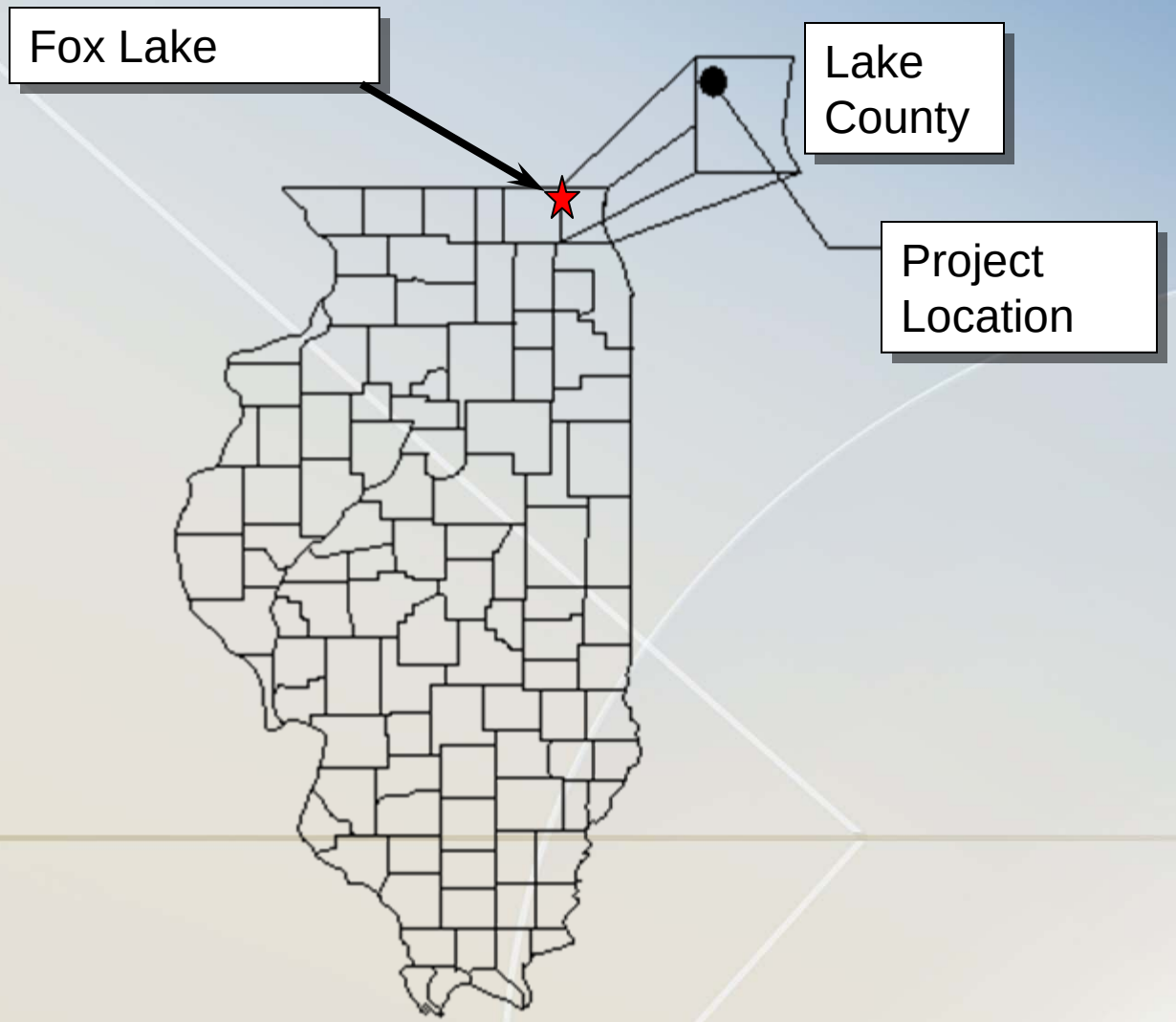
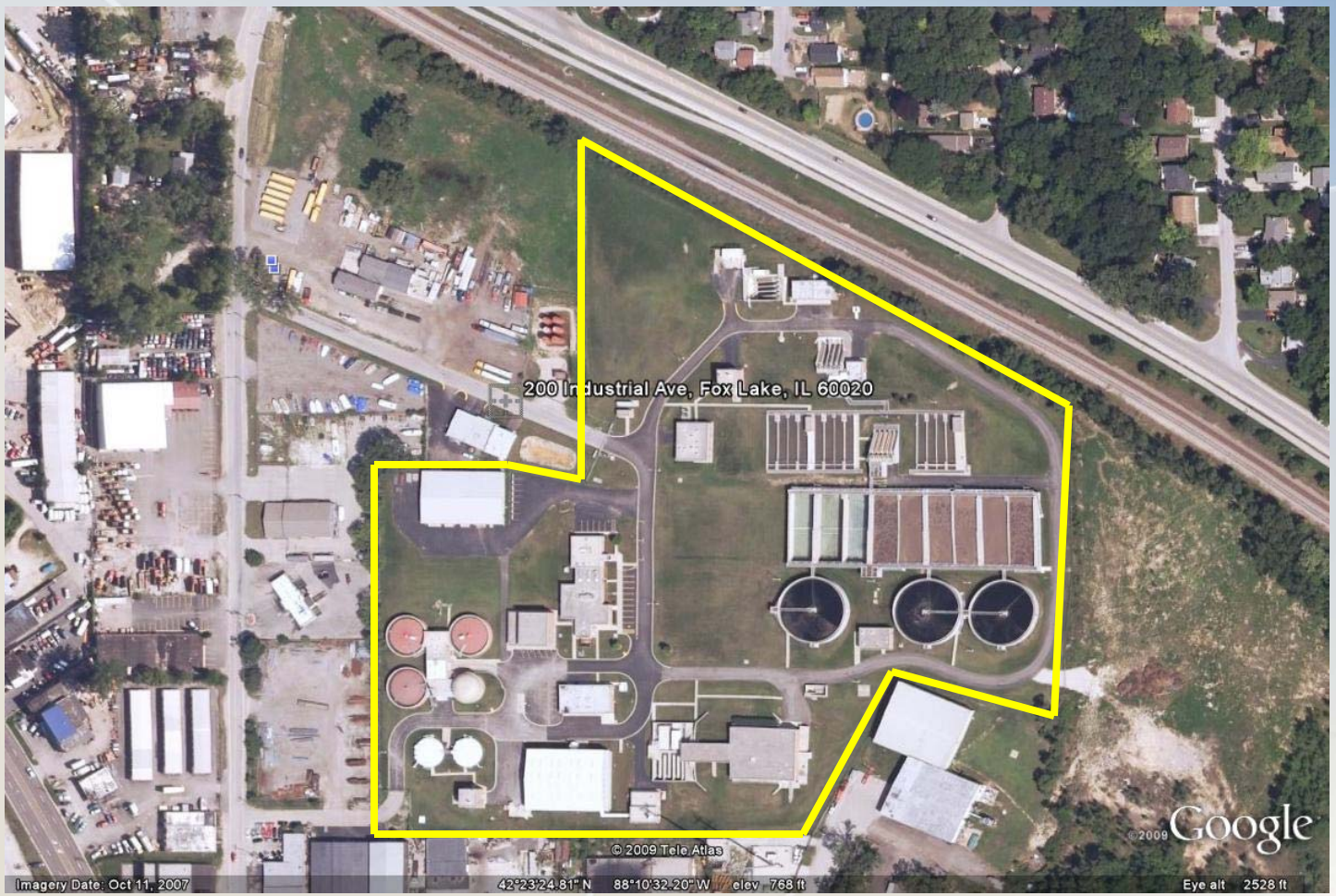
# Village of Fox Lake



# Village of Fox Lake

## Northwest Regional Water Reclamation Facility






Clark Dietz ENGINEERS

# Cutting Energy Costs

## Goal: Focus on the big ticket items!

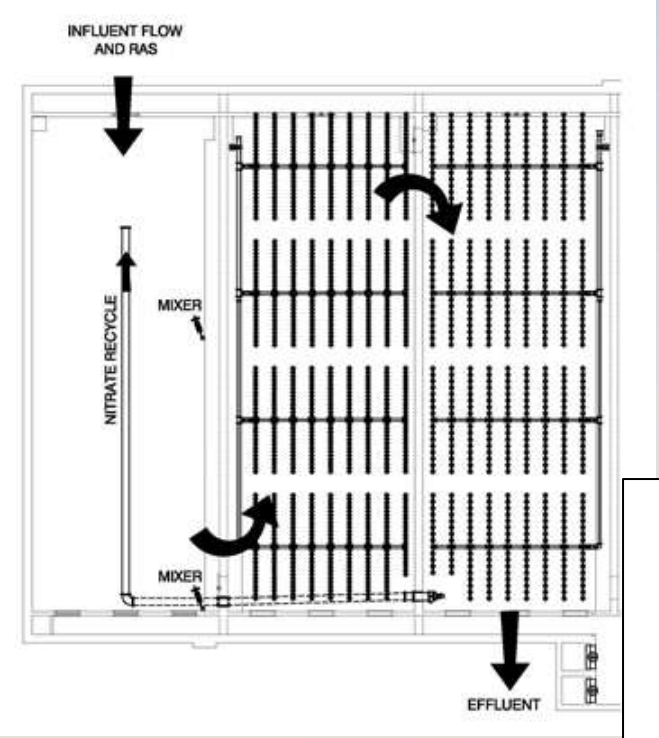
- Aeration / Biological Process Changes
  - Conventional Activated Sludge vs. MLE System
  - High speed turbo blowers w/ D.O. Controls
  - Fine bubble membrane diffusers
- Biogas Fueled Generator
  - Offsets power demand at the main feed

# Biological Process

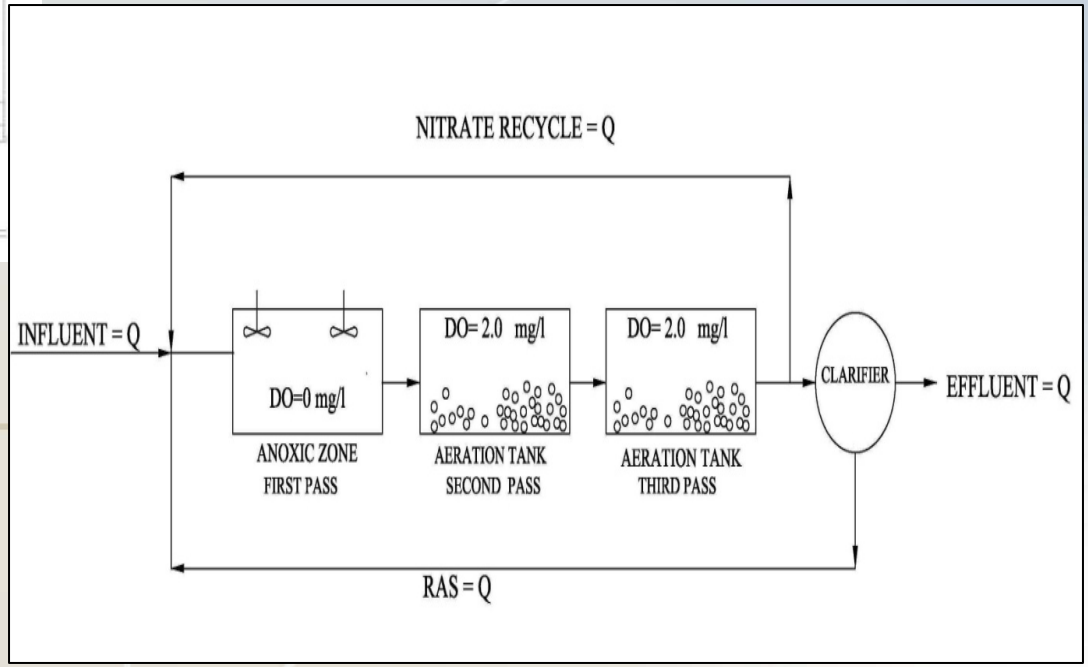
## What is driving the project?

- Existing 9 MGD plant expanded to 12 MGD
  - Replace 20+ year old equipment as part of the facility upgrades
- Biological Nutrient Removal (BNR) required
  - Chemical phosphorus removal
  - Modified Ludzack-Ettinger (MLE) for Total Nitrogen reduction

# MLE Process




- What is an MLE system?
  - BNR process primarily for Total Nitrogen reduction
  - Designed for TN removal below 10 mg/L



# Biological Nutrient Removal

- In addition to the blower change, the plant will begin to operate the MLE process
- No aeration in the first tank to create an anoxic zone = less oxygen demand.

# Reduction in Aeration Demand

- Conventional Activated Sludge: 10,540 scfm
  - Required 2-400 HP blowers
- MLE Design: 6,100 scfm
  - Requires 1-200 HP blower

# Existing Blowers / D.O. Control

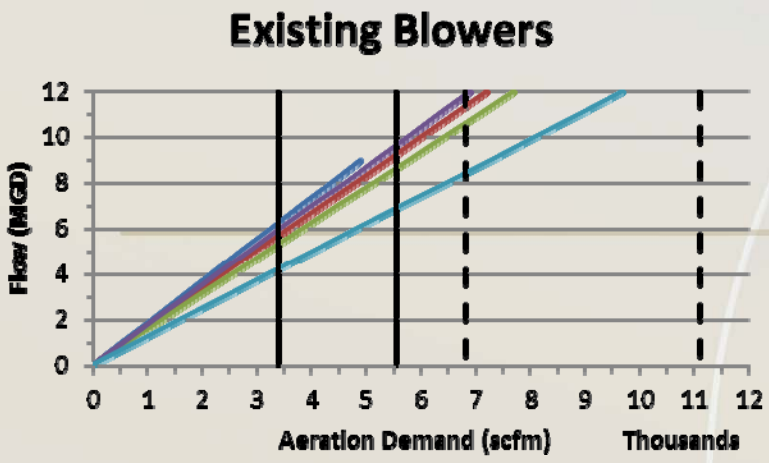
- *Size:* 4- 400 hp centrifugal blowers
- *Flexibility:* Inability to throttle flow, inoperable D.O. Control system
- *Inefficient:* 3-4 times the required D.O. levels in the aeration basins

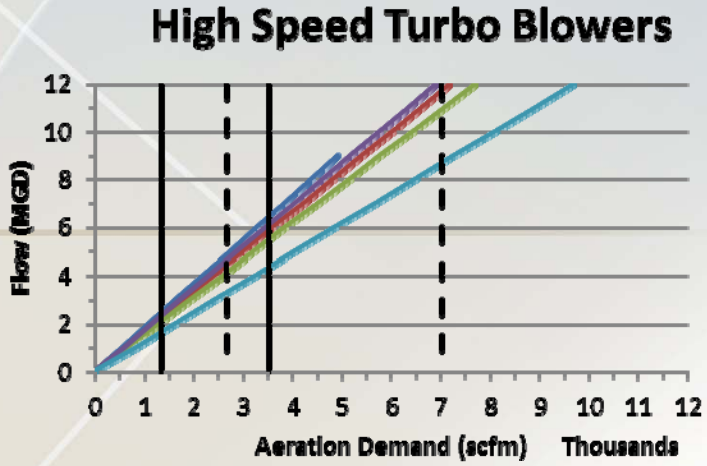
# High Speed Turbo Blowers

- High Speed Turbo Blowers have become an increasingly popular choice
- Achieving air demands with less horsepower
- Using D.O. controls and VFD drives to minimize the amount of air used

# Why High Speed Turbo Blowers?

- Lower horsepower on the motor [200hp]
- Ability to meet full range of air flows
- Provide just the air needed, 2 mg/L vs. 5-8 mg/L D.O.
- Bottom Line: Lower energy bill each month!



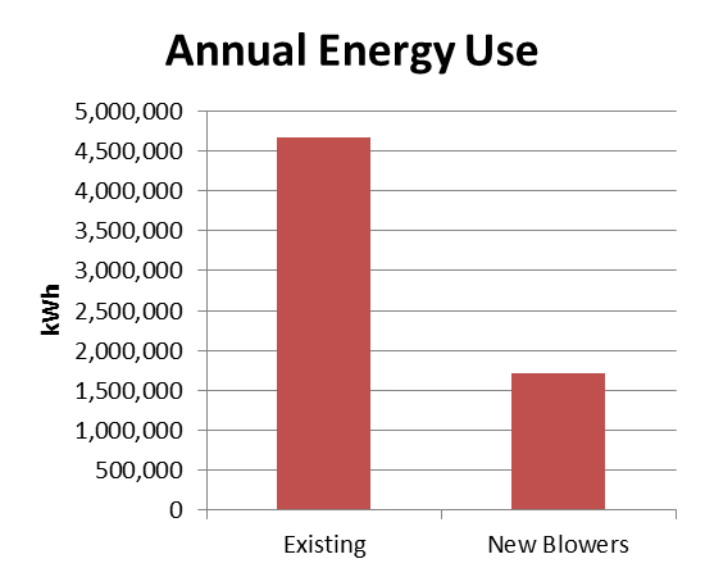



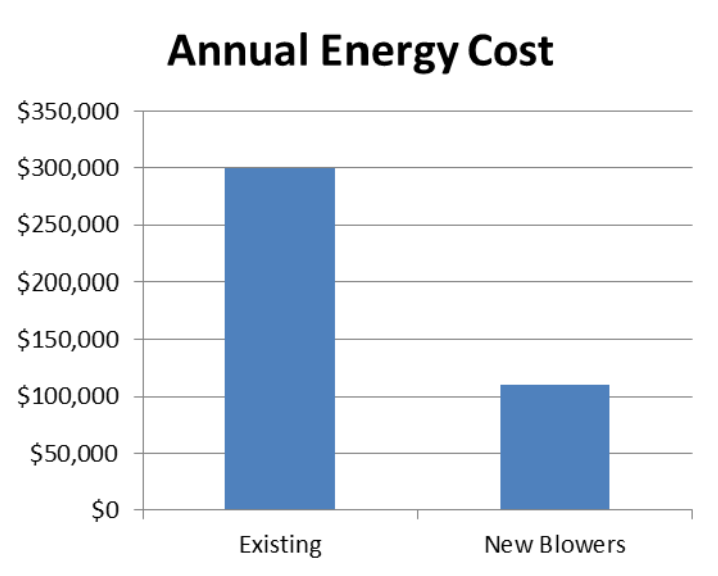
# Fine Bubble Diffusers

- It's not just blowers for aeration savings, new fine bubble membrane diffusers were added.
  - Replace 20-year old ceramic disk diffusers
  - Increase the transfer efficiency from 20-25% SOTE to 35% SOTE

# Aeration Savings

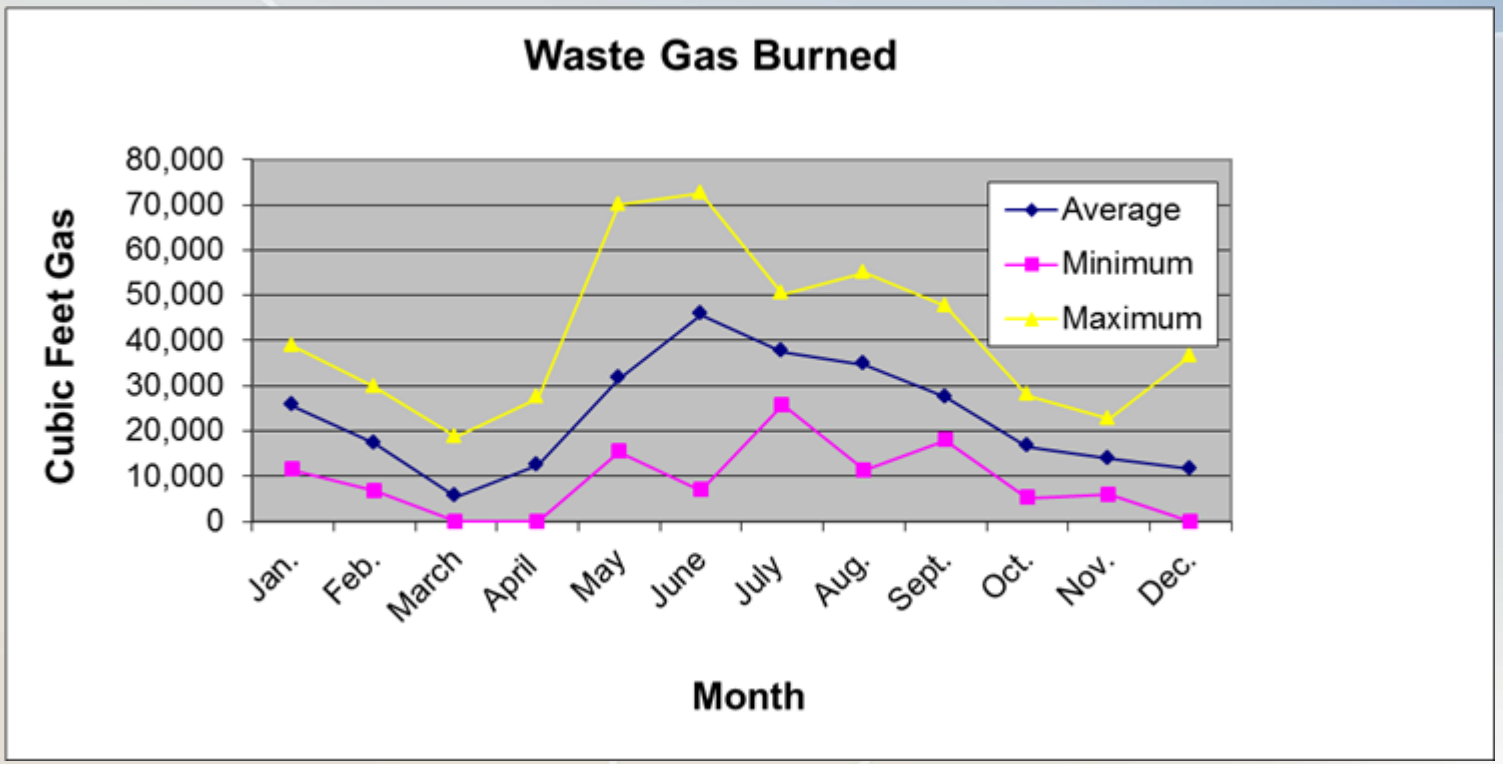
- Annual Electric Savings: 2,956,500 kWh
- Estimated Annual Cost Savings: $190,000
  - Nearly $16,000 / month in savings (blowers)
  - About $13,000 / month in actual savings (subtract the mixer / recycle pump HP)



# Biogas Utilization

- About 40,000 cu. ft. / day in wasted biogas
  - Increased mixing = increased biogas production
  - Will run a 150 kW biogas generator




Goal: Put the wasted gas to use!

# Biogas Utilization

- Dual-feed boilers
  - Digester heating
  - Building heat
- Engine generators

# Biogas Utilization

## Is running a biogas generator worth it?

- 150 kW x 24 hr. = 3,600 kWh / day
  - This equals about $250 / day
  - $7,500 / month in power savings

- Running at 75% of the time, this equals **$67,500** per year in savings

# Project Costs

- Aeration / Biological System Upgrades (blowers, mixers, diffusers, and D.O. Controls = $1.7 mil.
  - $307,831 DCEO grant for the project
  - Projected payback = 7.5 years
- Biogas Utilization Project (generator, biogas conditioning, piping and electrical = $763,000)
  - $200,000 DCEO grant for the project
  - Projected payback = 10 years

# Total Savings

- Average Electric Costs: $50,000/mo.*
  - Blower / Aeration Savings: $13,000/mo.*
  - Biogas Generator Savings: $ 5,600/mo.**
  - Projected savings: $18,600/mo.*

- 38% electrical savings annually.

* Using an average cost of $0.07 / kWh

** Based on 1,500 hours of operation / year

# Questions…..?