

Resource Recovery & Electrical Energy (R2E2)

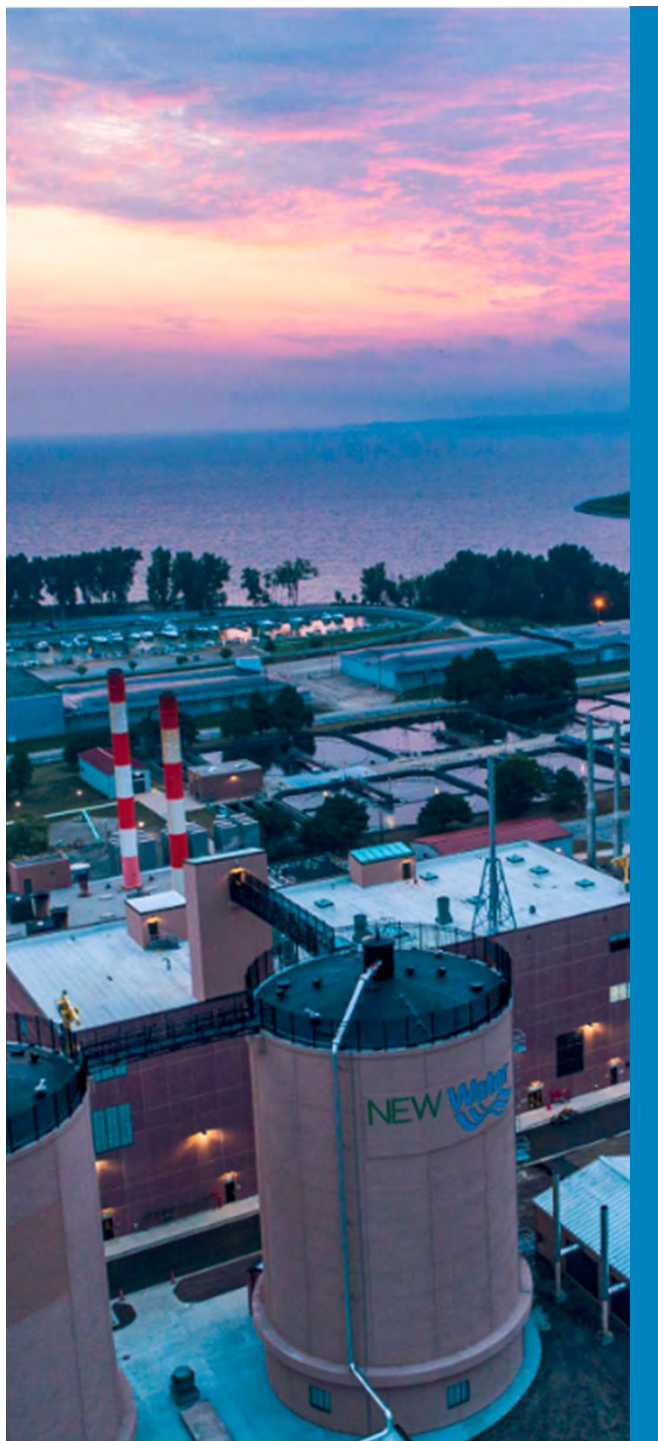
WWOA

Lake Michigan Region Meeting

May 23, 2019

Bruce Bartel

Jake Becken




NEW Water
The brand of the Green Bay
Metropolitan Sewerage District

Who or What is NEW Water?



- Brand of the Green Bay Metropolitan Sewerage District (GBMSD)
- Two treatment facilities serving NE Wisconsin 24/7/365
- Governed by five member Commission



An aerial photograph of the Great Lakes region, showing the five large lakes (Superior, Michigan, Huron, Erie, and Ontario) surrounded by green land. A dark, semi-transparent overlay covers the water bodies, making them appear black or very dark blue. The surrounding land is a vibrant green, with some white clouds visible in the upper right corner.

*Protecting our most valuable
resource, water.*

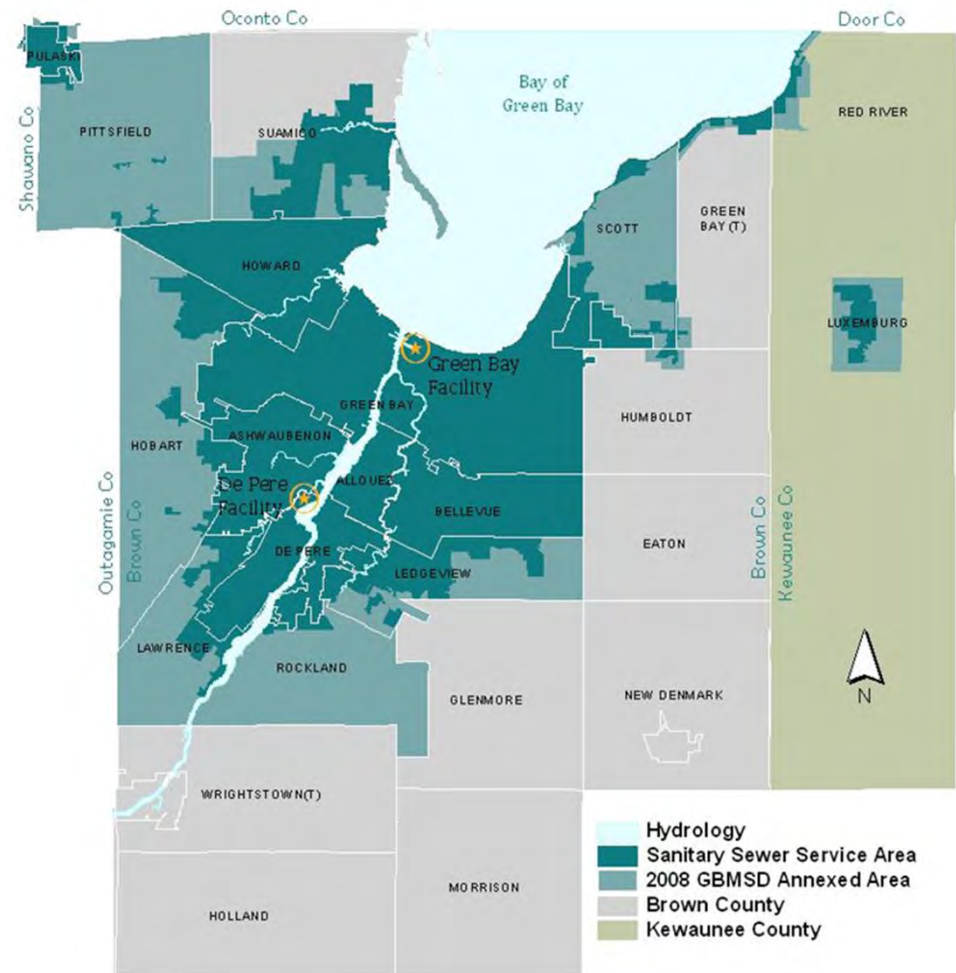
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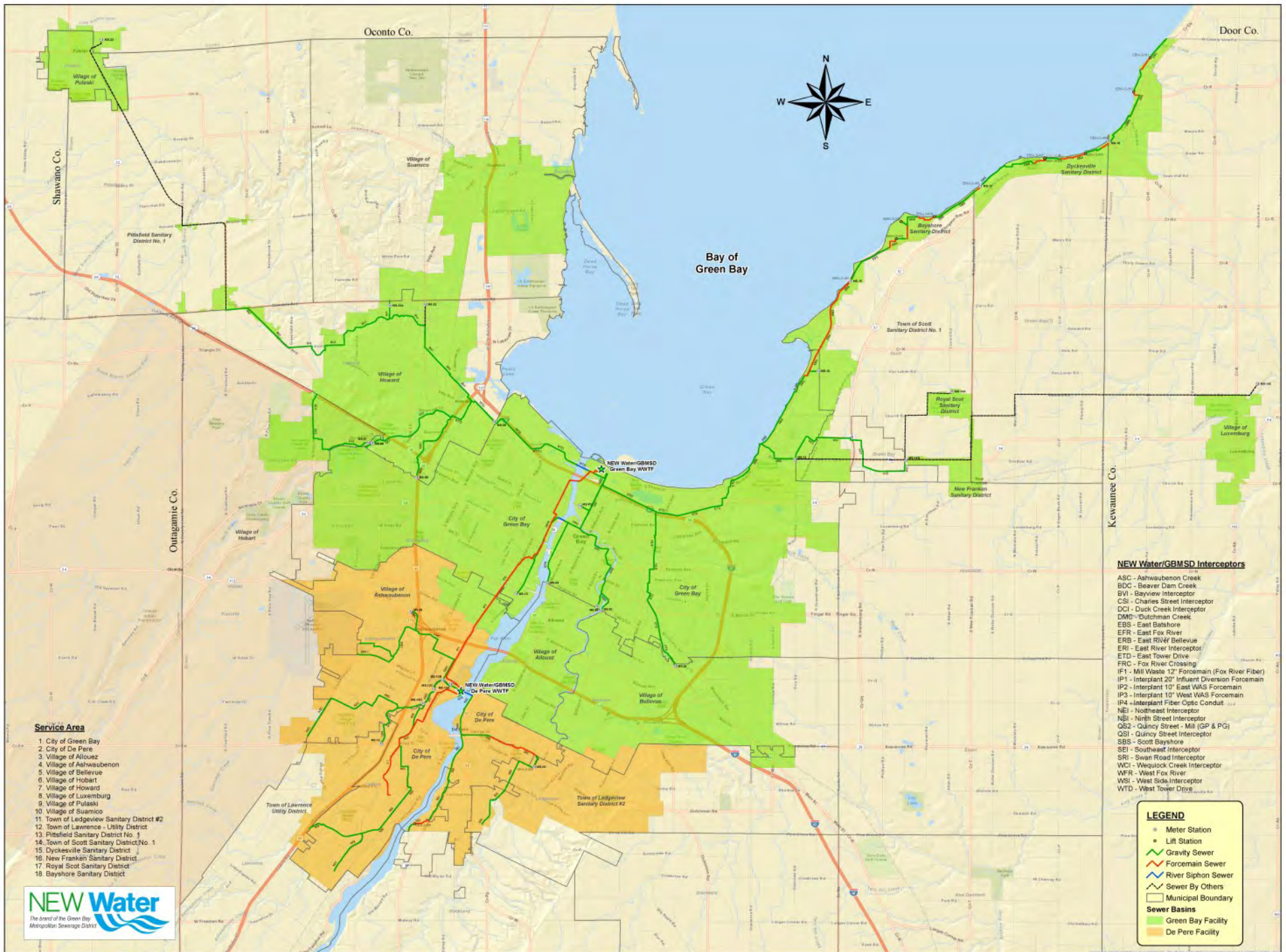
A stylized white wave logo consisting of three curved lines that sweep upwards and to the right, positioned to the right of the text.



About NEW Water

- Wholesale provider of wastewater conveyance and treatment services
- 15 municipal customers (232,000 people) and two direct industrial customers
- Service area of 285 square miles
- Third largest wastewater treatment plant in Wisconsin
- Treats 38 million gallons of wastewater per day on average





*30 million
gallons per day*





De Pere Facility
8 million gallons per day

De Pere Solids Handling

- Sent to the Green Bay Facility
- 7 mile force main
- Processed and disposed at the GBF

Solids Handling Upgrade

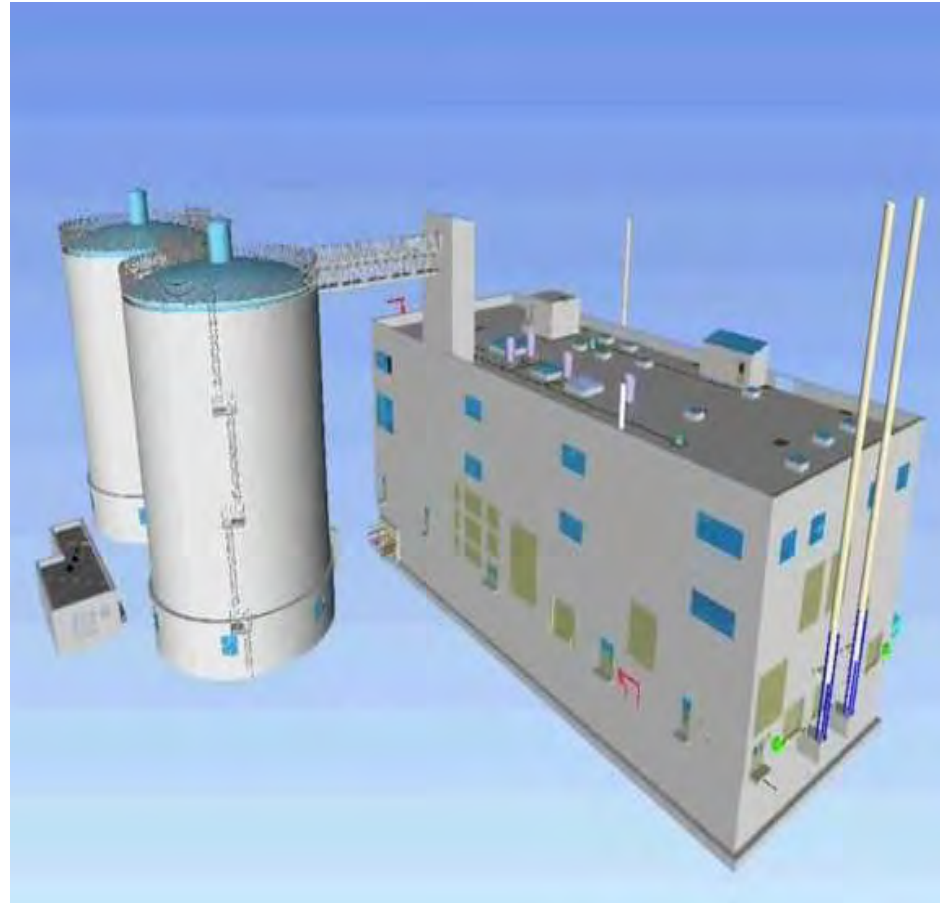


Three main drivers:

- Aging infrastructure
- Environmental regulations
- Increased capacity needs



R2E2



- Most cost-effective solution to replace solids handling at the Green Bay Facility
- Tools to treat wastewater as a resource



R2E2

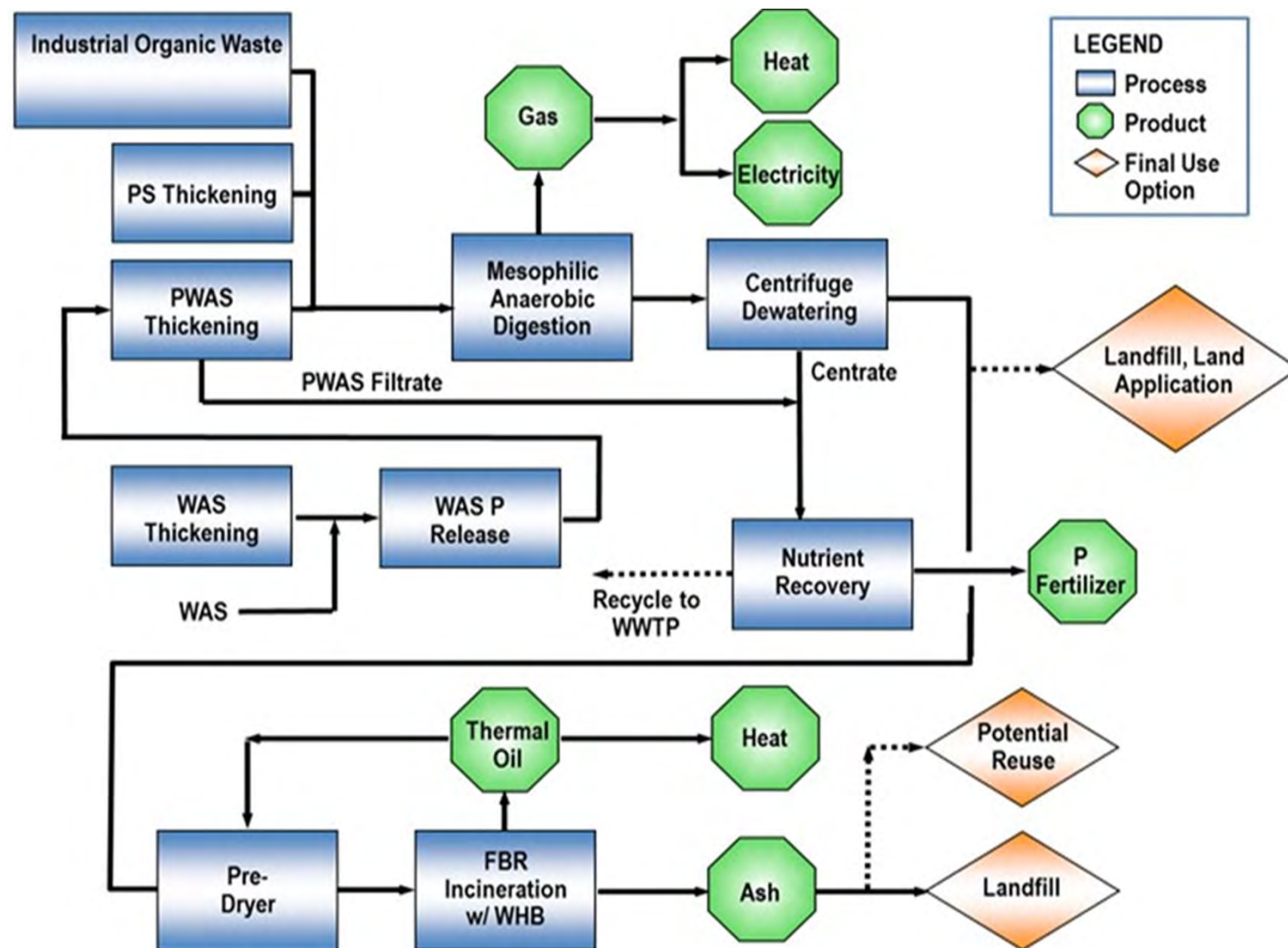
- R2E2: Solids & Digestion Facilities
 - Includes:
 - Anaerobic Digestion
 - New Solids Building (Including Office Areas and Control Room)
 - Centrifuge Dewatering
 - Dryer
 - Biogas Storage
 - Electrical Energy Generation
 - Nutrient Recovery
 - Fluid Bed Incineration
 - State of the Art Air Pollution Control
 - Power Distribution
 - Aeration Basin Reconfiguration



R2E2

- Basin Modifications
 - Adapt to changes in nitrogen load post digester startup
 - Enhance bio P removal
 - Replace outdated air diffusers
 - Improve DO control







R2E2

- Dewatering
 - Three – 21” Centrisys Dewatering Centrifuges
 - One – 26” Centrisys Thickening Centrifuge
- Solids Drying
 - One – Haarslev Scalping Dryer
 - Thermal Oil for Heat Recovery



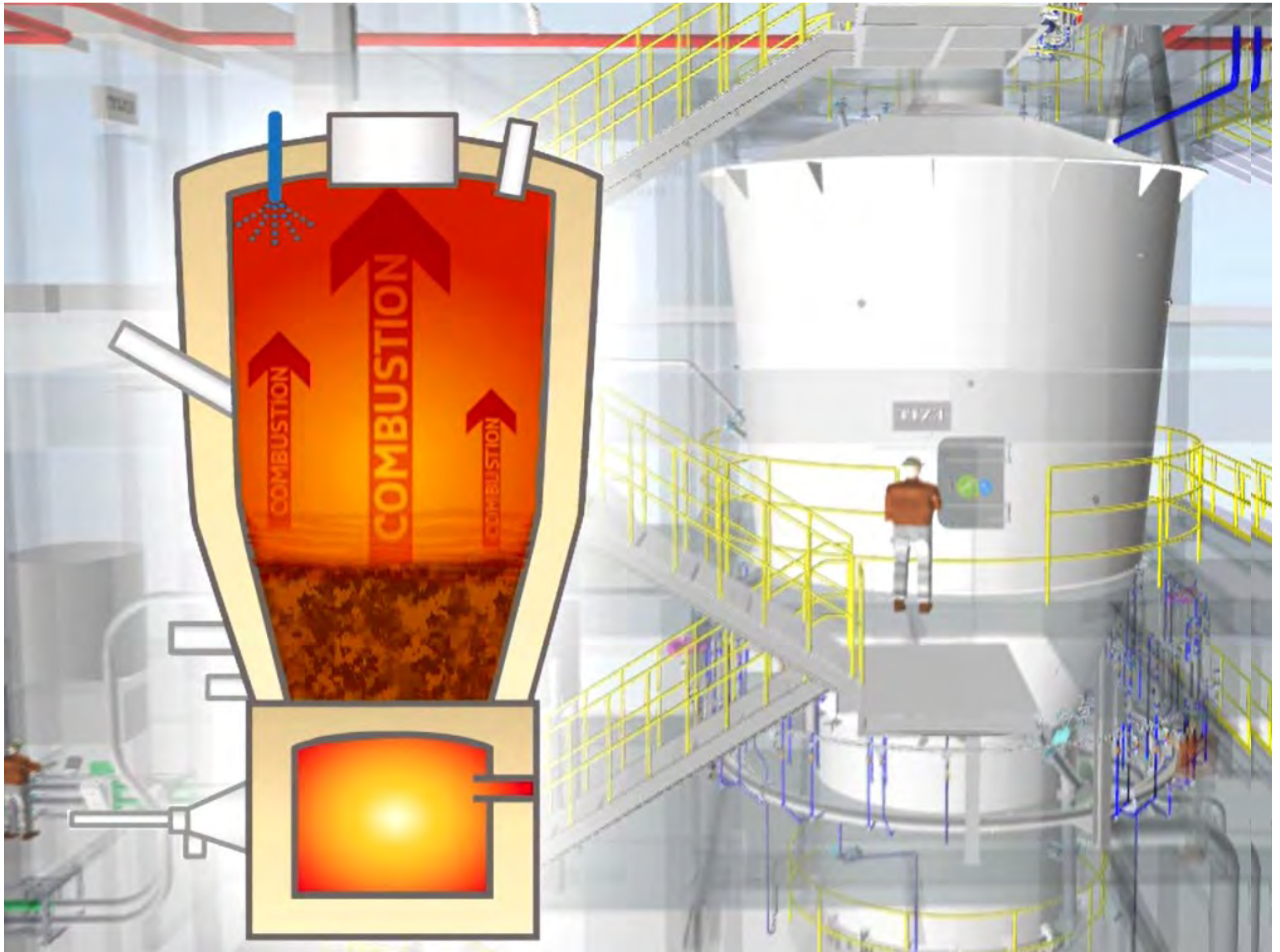




R2E2

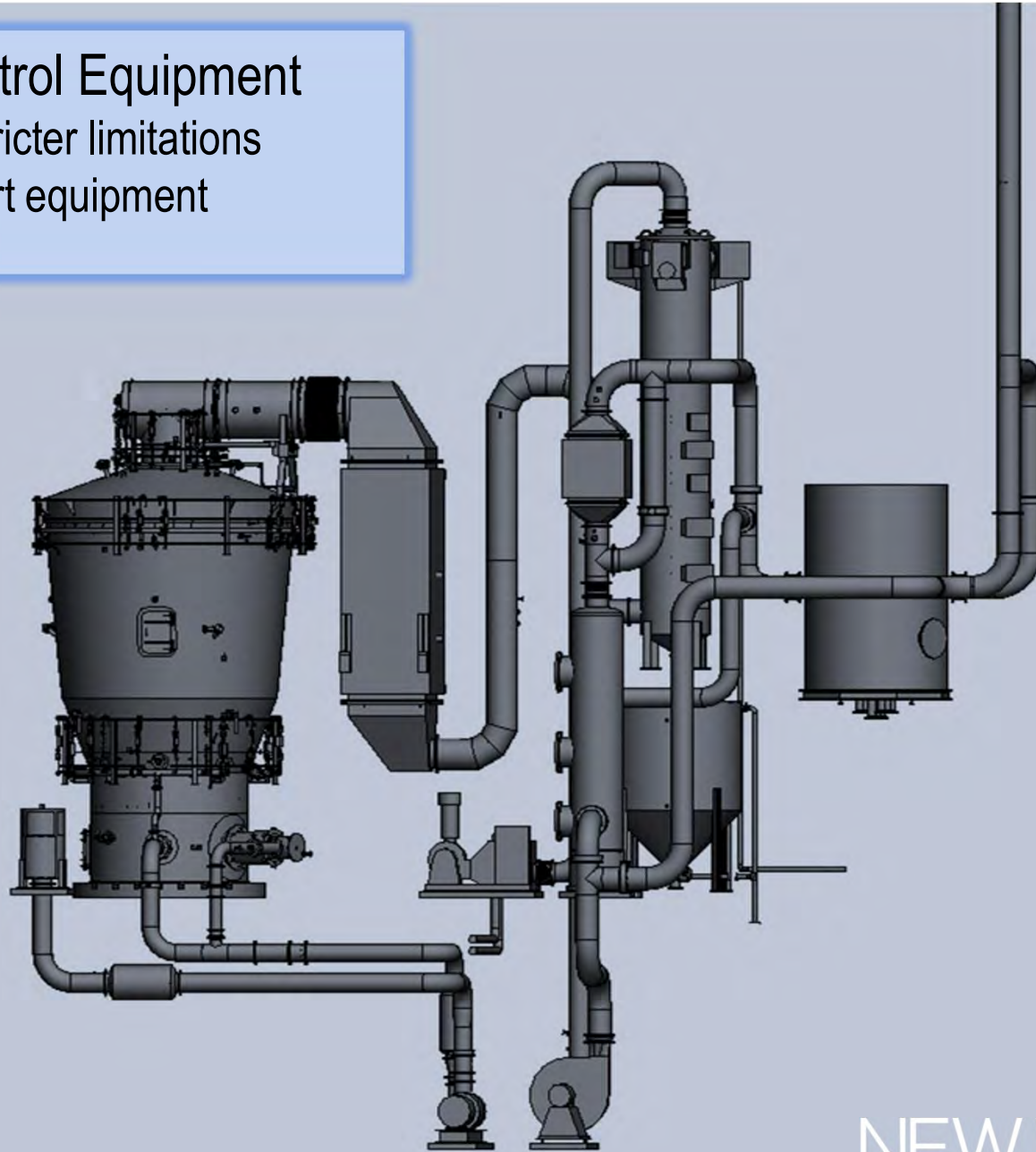
- Fluid Bed Incineration
 - One – SUEZ (IDI)
 - 51 Dry Tons per Day
 - Heat Recovery
- State of the art air pollution control equipment to reduce air pollutants and meet new standards





Air Pollution Control Equipment

- Meets new, stricter limitations
- State-of-the-art equipment



R2E2

- R2E2 Components
 - Anaerobic Digestion (mesophilic) for biogas production and solids reduction
 - Two Silo Shaped Digesters
 - 110 Feet Tall
 - 2.2 MGD Capacity Each
 - High Strength Waste Receiving







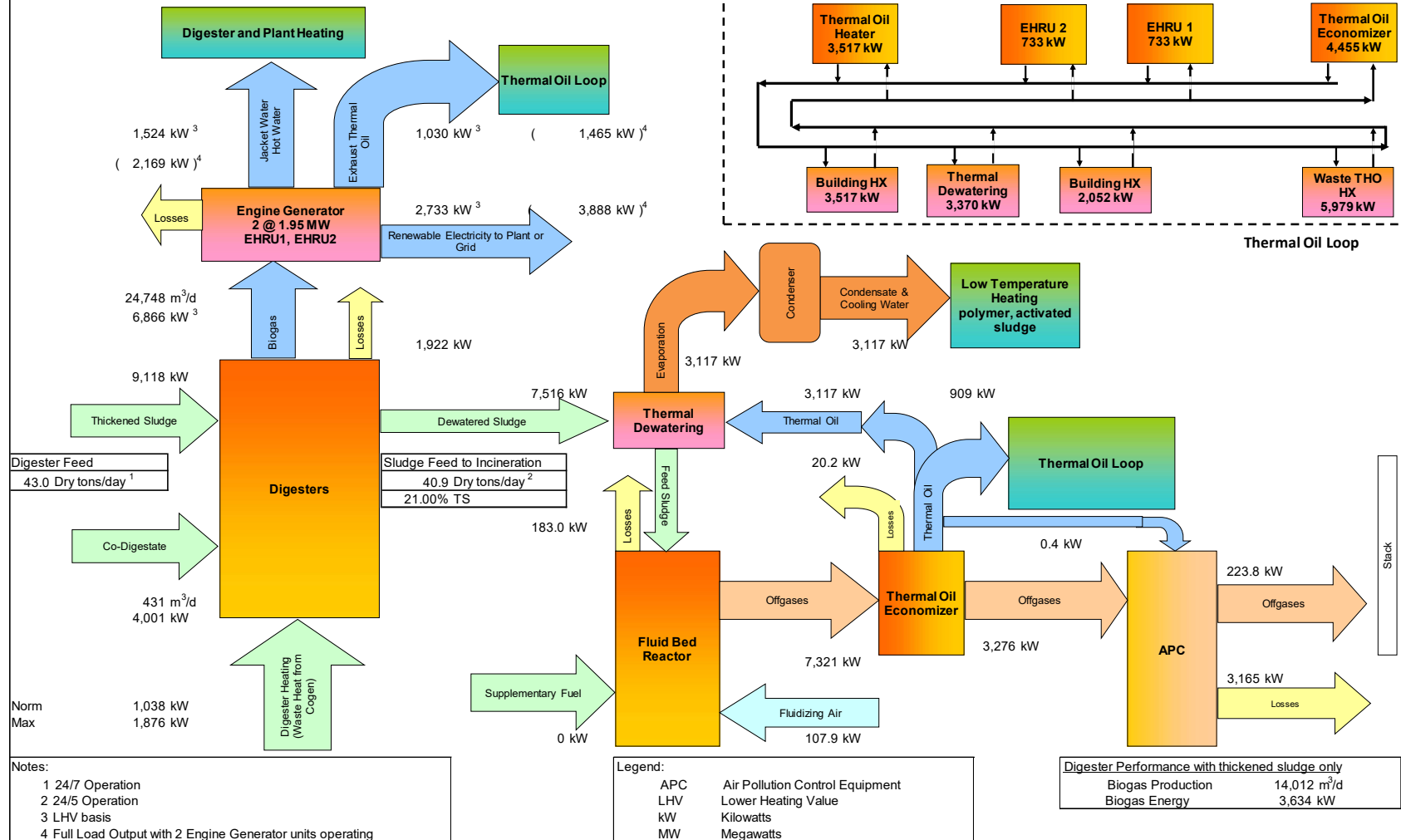
R2E2

- R2E2: Solids & Digestion Facilities
 - Energy Recovery:
 - Biogas to run two – 2.0 MGW I.C. Engines
 - Heat from the I.C. engines to heat the anaerobic digesters
 - Heat recovery from the fluid bed incinerator to run dryer
 - Autogenous incinerator operation
 - Nutrient harvesting to produce fertilizer product





Energy Summary for 2035 - Annual Average Flows (Revised: May 12 2014)



Nutrient Recovery

- Reduces phosphorus and nitrogen from solids processing recycle stream
- Reduces maintenance to manually remove struvite from equipment and piping
- Produces a beneficial re-use product



Picture above: Struvite (Magnesium Ammonium Phosphate) in pipes



Nutrient Recovery System

- *Reduces struvite maintenance issues*
- *Beneficial reuse*
- *Generates revenue stream*



Operational Challenges

- Finding the “Sweet Spot”
 - VS reduction to 60 to 65%
 - Optimize biogas production
 - Optimize electrical energy production
 - How far to dry solids
 - Autogenous incinerator operation
 - R2E2 Side Streams
- Energy Managers

Project Challenges

- Staff Training
- Process Tie In's
- Project Schedule (Very Compressed)
- Potential for Scope Creep
- Staffing Challenges



R2E2 Benefits



- Addresses the original project drivers:
 - Aging infrastructure
 - Environmental regulations
 - Increased capacity needs
- Lowest cost plan over a 20-year planning period
- Generate about 50% of NEW Water's energy needs



Energy Data

- **November 2018**

- Electricity Used – 3,088 MWH
 - Purchased – 2,863 MWH (93%)
 - Generated – 225 MWH (7%)

- **March 2019**

- Electricity Used – 3,452 MWH
 - Purchased – 2,151 MWH (62%)
 - Generated – 1,301 MWH (38%)

- **April 2019**

- Electricity Used – 3,337 MWH
 - Purchased – 2,066 MWH (62%)
 - Generated – 1,272 MWH (38%)



Biogas Production

- **November 2018**

- Biogas Generated – 108,924 CCF
 - Generators – 22,635 CCF (21%)
 - Flare – 86,289 CCF (79%)

- **March 2019**

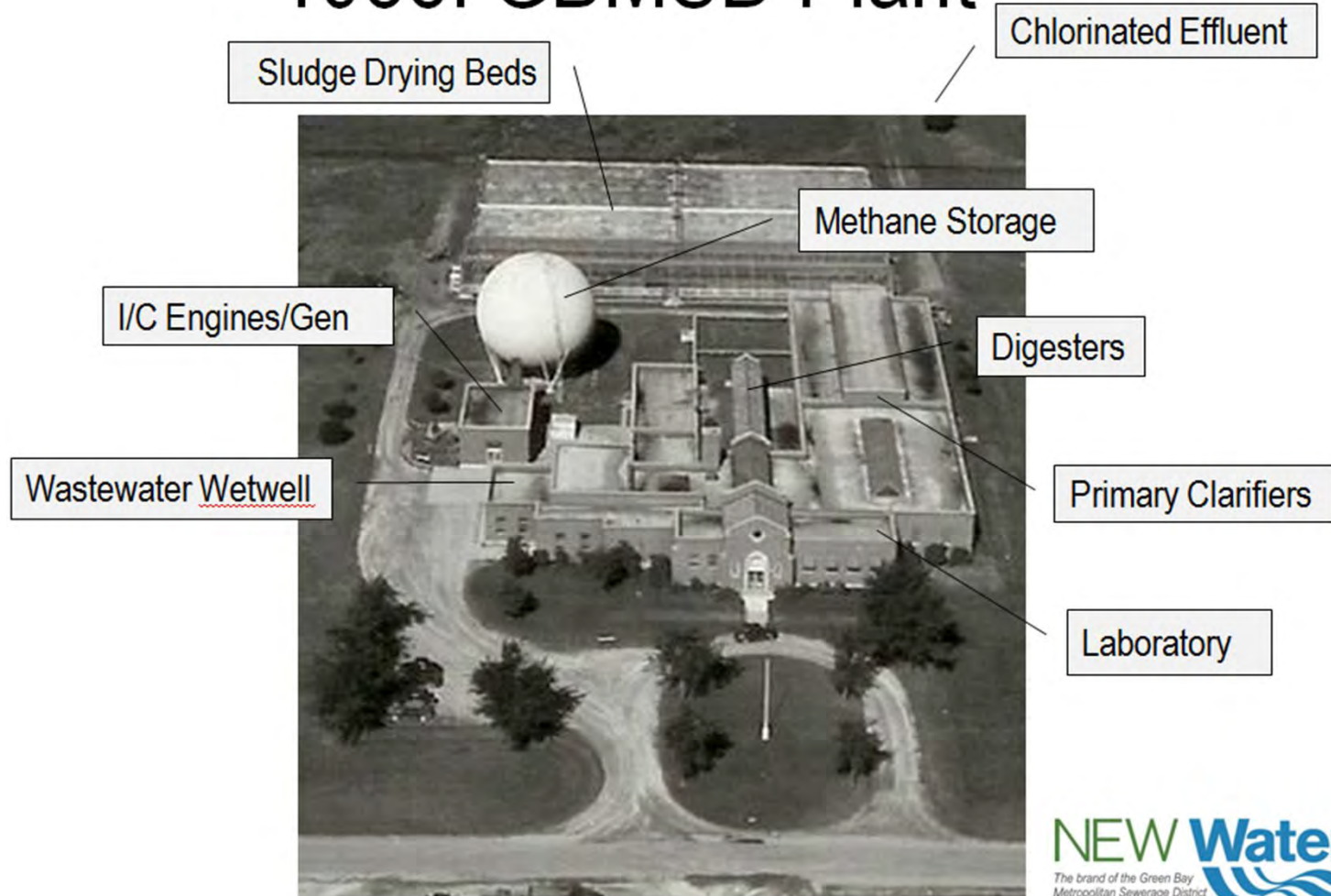
- Biogas Generated – 170,110 CCF
 - Generators – 169,817 CCF (99.8%)
 - Flare – 293 CCF (0.2%)

- **April 2019**

- Biogas Generated – 185,616 CCF
 - Generators – 182,596 CCF (98.4%)
 - Flare – 3,020 CCF (1.6%)

Back to the Future: Resource Recovery & Electrical Energy (R2E2)

1935: GBMSD Plant



Thank You!

Questions / Comments?

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