Combined Heat and Power at NYCDEP Wastewater Treatment Plants

Luis Carrio, P.E., Division Chief

Infrastructure Sustainability Planning

NYCDEP-BWT

November 15, 2011

Presentation Outline

- **DEP-BWT Mission**
- **NYC Plant Description**
- **Co-Gen at City Wastewater Treatment Plants**
- **Challenges, Opportunities & Future Outlook**

Bureau of Wastewater Treatment's Mission

"To protect and enhance the

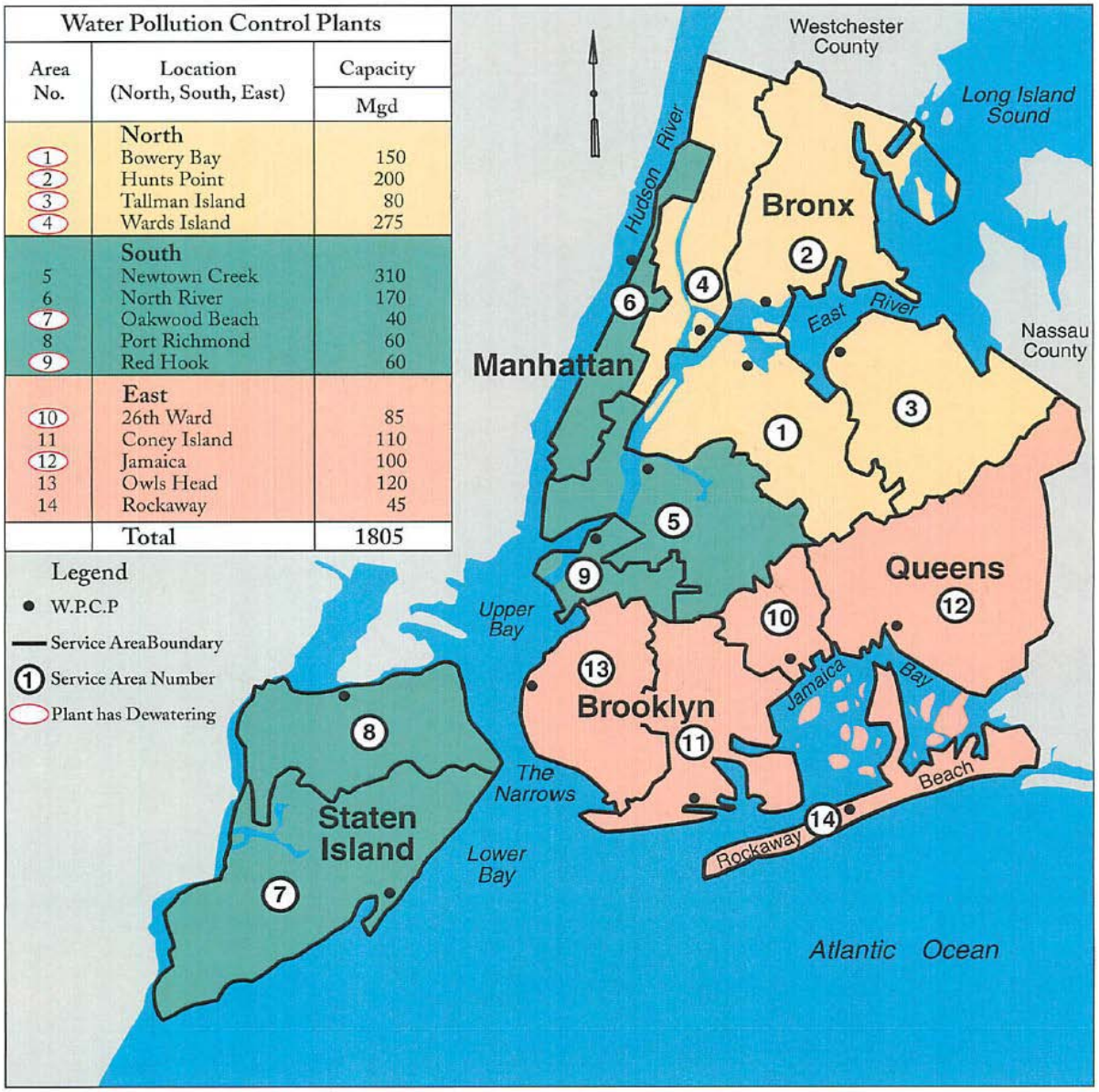
quality of the receiving waters"

1. Manages 14 wastewater treatment plants ranging in a design size from 45 to 310 MGD.
2. 95 Pumping Stations and 450 regulators.
3. 4 Combined Sewer Overflow Facilities.
4. A fleet of vessels to transport sludge and monitor the receiving waters.

System Overview

New York City Plant Locations and Capacities

Water Pollution Control Plants		
Area No.	Location (North, South, East)	Capacity Mgd
	North	
1	Bowery Bay	150
2	Hunts Point	200
3	Tallman Island	80
4	Wards Island	275
	South	
5	Newtown Creek	310
6	North River	170
7	Oakwood Beach	40
8	Port Richmond	60
9	Red Hook	60
	East	
10	26th Ward	85
11	Coney Island	110
12	Jamaica	100
13	Owls Head	120
14	Rockaway	45
	Total	1805



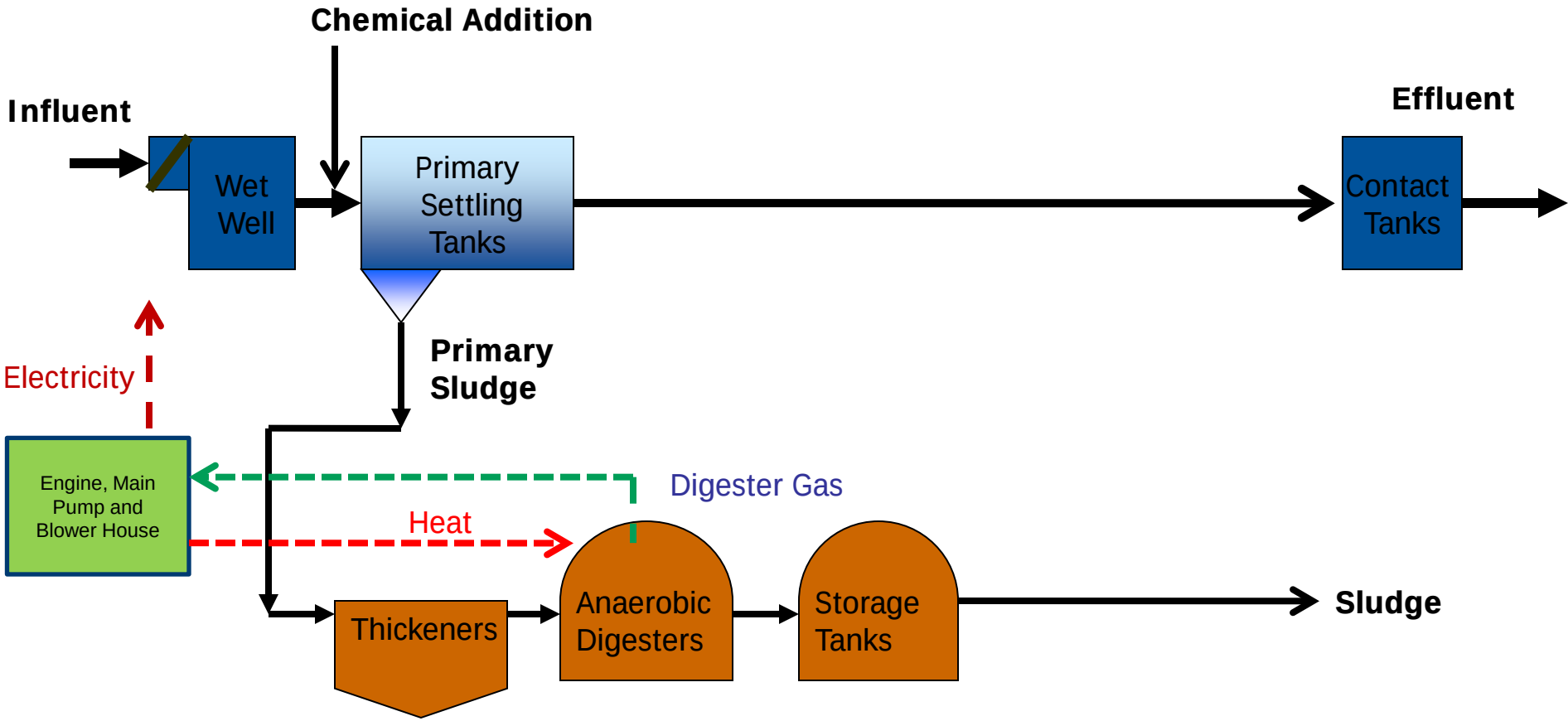
Cogeneration Use at DEP-BWT

- Original Master Plan WWTP design concept included anaerobic digestion and use of biogas as a fuel source for cogeneration. Coney Island WWTP was one of the first to use digester gas as an energy source to operate the plant
- 1950's and 1960's 9 out of 12 WWTPs had some form of cogeneration which met most of the energy process needs
- 1980's The North River, Coney Island, Owls Head, Tallman Island and Newton Creek WWTP's operated with engines
- Currently have small fuel cells at OB,26thW, HP and RH and engines at TI, OH, CI and NR..

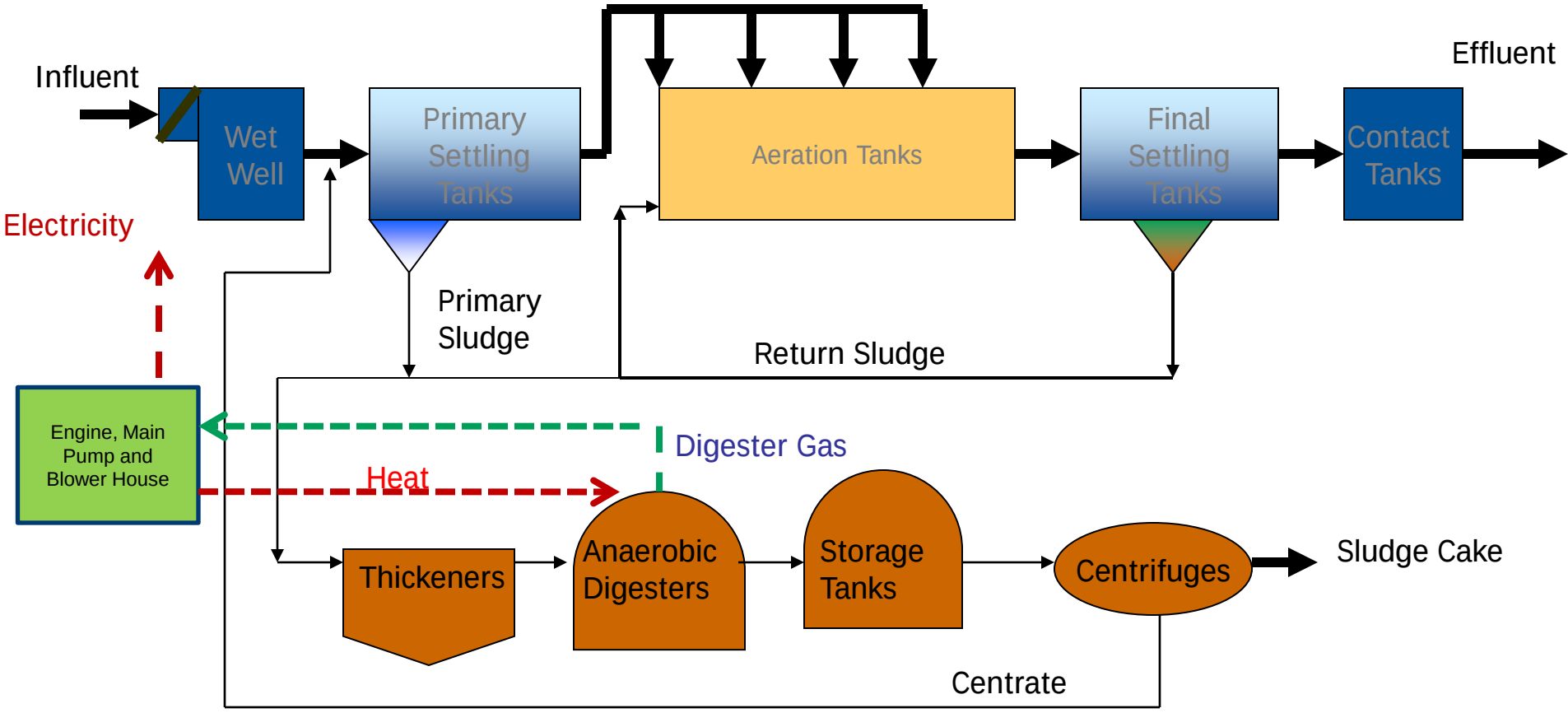
Enterprise DGSR-46 Dual Fuel Engine

Mirrless Blackstone KP-5 major dual fuel engine

Schematic of Older DEP WWTP



Schematic of Typical DEP WWTP with Co-gen Wastewater Treatment Plant



Fuel Cells

- 2000's 2 fuel cells (200 kW each) were installed at the Red Hook WWTP in 2003
- 1 fuel cells (200 kW) was installed at the Oakwood Beach WWTP in 2003
- 2 fuel cells (200 kW each) were installed at the 26th Ward WWTP in 2003
- 3 fuel cells (200 kW each) were installed at the Hunts Point WWTP in 2004.

Fuel Cells at the 26th Ward WWTP

Fuel Cells at the Hunts Points WWTP

Cogeneration at Tallman Island

- Tallman Island WWTP
- Five direct drive pump engines- DeLaval dual fuel 2 @ 520 hp, 3 @ 546 hp installed
- Five direct drive blower engines- DeLaval 1,013 hp each
- The plant is using most of the electric power from the engine generators
  - Waste heat recovery: Recovery of heat from engine for sludge heating, service water, and HVAC needs

Cogeneration at Owls Head

- Owls Head WWTP
- Three engine generators were installed (turbo charged dual fuel each 2246 hp/1600 kw)
- These cogeneration units have been in service for last 25 years
- The plant is deriving 40% of total electric power from engine generators
  - Waste heat recovery: Recovery of heat from engine for sludge heating, service water, and HVAV needs
- Plant will be using two engine generators simultaneously to increase the cogeneration capacity.

Cogeneration at Coney Island

- Coney Island WWTP
- Four engine generators were installed (turbo charged dual fuel each 2246 hp/1600 kw)
- These cogeneration units has been in service for last 25 years
- The plant is deriving > 80% of total electric power from engine generators and utilize 100% digester gas production at plant
  - Waste heat recovery: Recovery of heat from engine for sludge heating, service water, and HVAC needs

Cogeneration at North River

- North River WWTP
- Ten engines were installed i(turbo charged dual fuel each 2246 hp/1600 kw)
- 5 direct drive engines for the main sewage pumps
- 5 direct drive engines for the blowers
- Waste heat recovery: Recovery of heat from engine for sludge heating, service water, and HVAC needs

Challenges

- Energy Projects Compete for Funding with projects designed for DEP's primary mission and to maintain the "State of Good Repair."
- New Regulatory Mandates – Water and Air.
- Projected Energy Use Increases.
- Tougher air regulations.
- Increasing costs.

Challenges (cont'd)

- Staffing limitations.
- Public Acceptance.
- Working with the existing grid.
- Evolving technologies.
- Site specific issues
  i.e. space limitations.

Opportunities

- System will be more efficient.
- Environmentally sound.
- Help mitigate electrical and fuel increases.
- Increase flexibility in operations.
- Participate with utilities in demand response program.
- Possible overall reduction of air emissions and greenhouse gasses.

Future Outlook

- Co-Gen – Engines, Turbines and Fuel Cells – upgrade or new.
- Private – Public Partnerships.
- New more cost effective technologies.
- Increase energy conservation.
- Increase digester gas production.
- Consider sale of digester gas.

End