# DC Water Carbon Footprint:

## *Current Modeling and Future Projections*

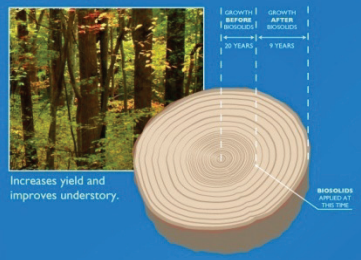
**370 MGD plant capacity**
**Largest AWTP in the world**

# NUTRIENTS and CARBON RECYCLING

## FARMING

Provides carbon and nutrients valued at $300.00 per acre.

## SILVICULTURE




Increases yield and improves understory.

## RECLAMATION

Restoring mines to their natural state and providing wildlife habitats.

## URBAN RESTORATION

Grow trees and reduce runoff.

# BLUE PLAINS ADVANCED WASTEWATER TREATMENT PLANT: A RESOURCE RECOVERY FACILITY

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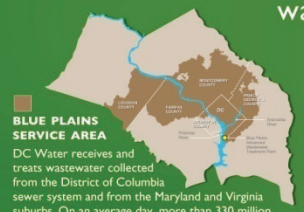
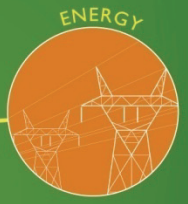
water • nutrients • carbon • energy



**BLUE PLAINS SERVICE AREA**

DC Water receives and treats wastewater collected from the District of Columbia sewer system and from the Maryland and Virginia suburbs. On an average day, more than 330 million gallons of raw sewage flow into the Blue Plains Advanced Wastewater Treatment Plant from area jurisdictions.


CARBON NUTRIENTS

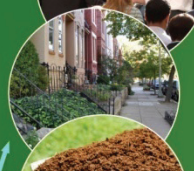
CLEAN WATER


CHESAPEAKE BAY

CARBON NUTRIENTS

CARBON NUTRIENTS

CARBON NUTRIENTS

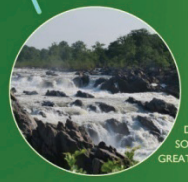


DC METRO AREA


CARBON NUTRIENTS

CARBON NUTRIENTS

AGRICULTURAL, FEED CORN, GRASSES, HAY ETC.

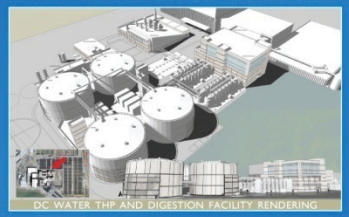


DRINKING WATER SOURCE: POTOMAC RIVER AT GREAT FALLS AND LITTLE FALLS

**dcwater.com/biosolids**

# GREEN ENERGY BIORENEWABLES


## THERMAL HYDROLYSIS PROCESS (THP) AND DIGESTION FACILITY



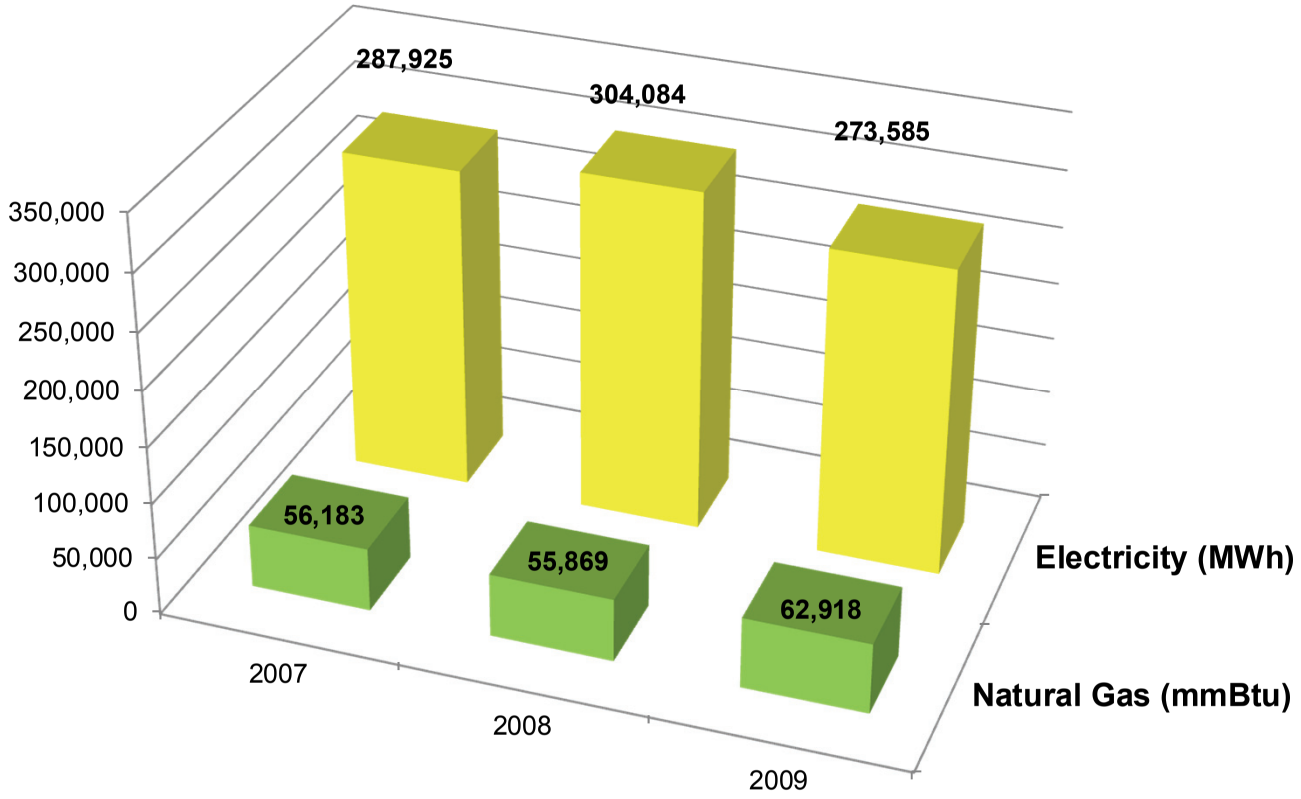
DC WATER THP AND DIGESTION FACILITY RENDERING

DC Water will be the first in North America to use thermal hydrolysis for wastewater treatment. When completed, this facility will be the largest plant of its kind in the world.

**GREEN BENEFITS:**

- Produce combined heat and power, generating 13 MW of electricity
- Save DC Water $10 million annually cutting grid demand by a third (DC Water is the largest consumer of electricity in the District)
- Reduce carbon emissions by approximately 50,000 metric tons of CO2e per year.
- Reduce trucking by 1.7 million miles per year.
- Save $10 million in biosolids trucking costs
- Produce Class A biosolids to grow trees, sequester carbon and reduce runoff

# Total DC WATER Energy Consumption




**Based on invoices**
**2009 electricity based on PEPCO metering data**

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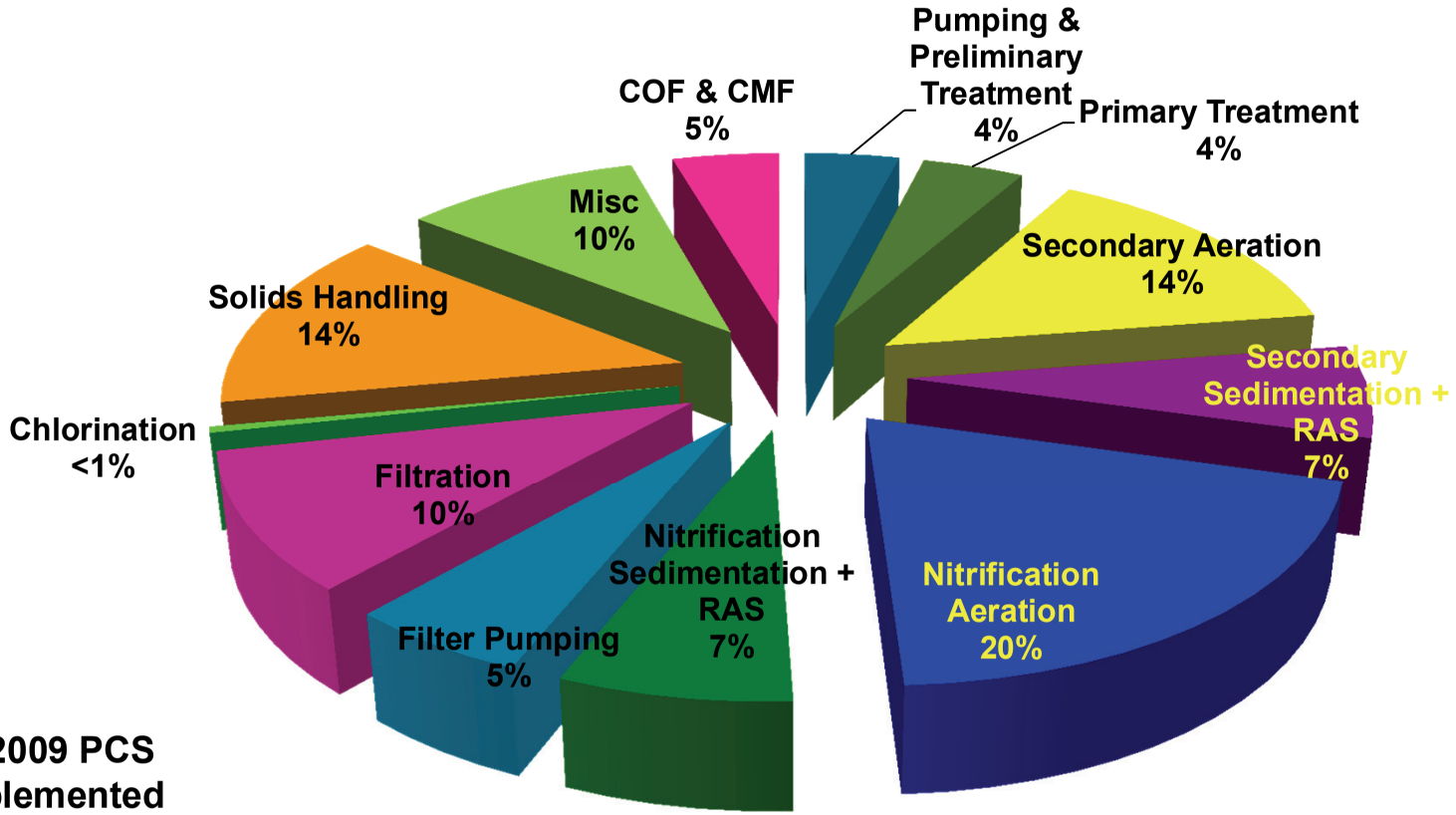
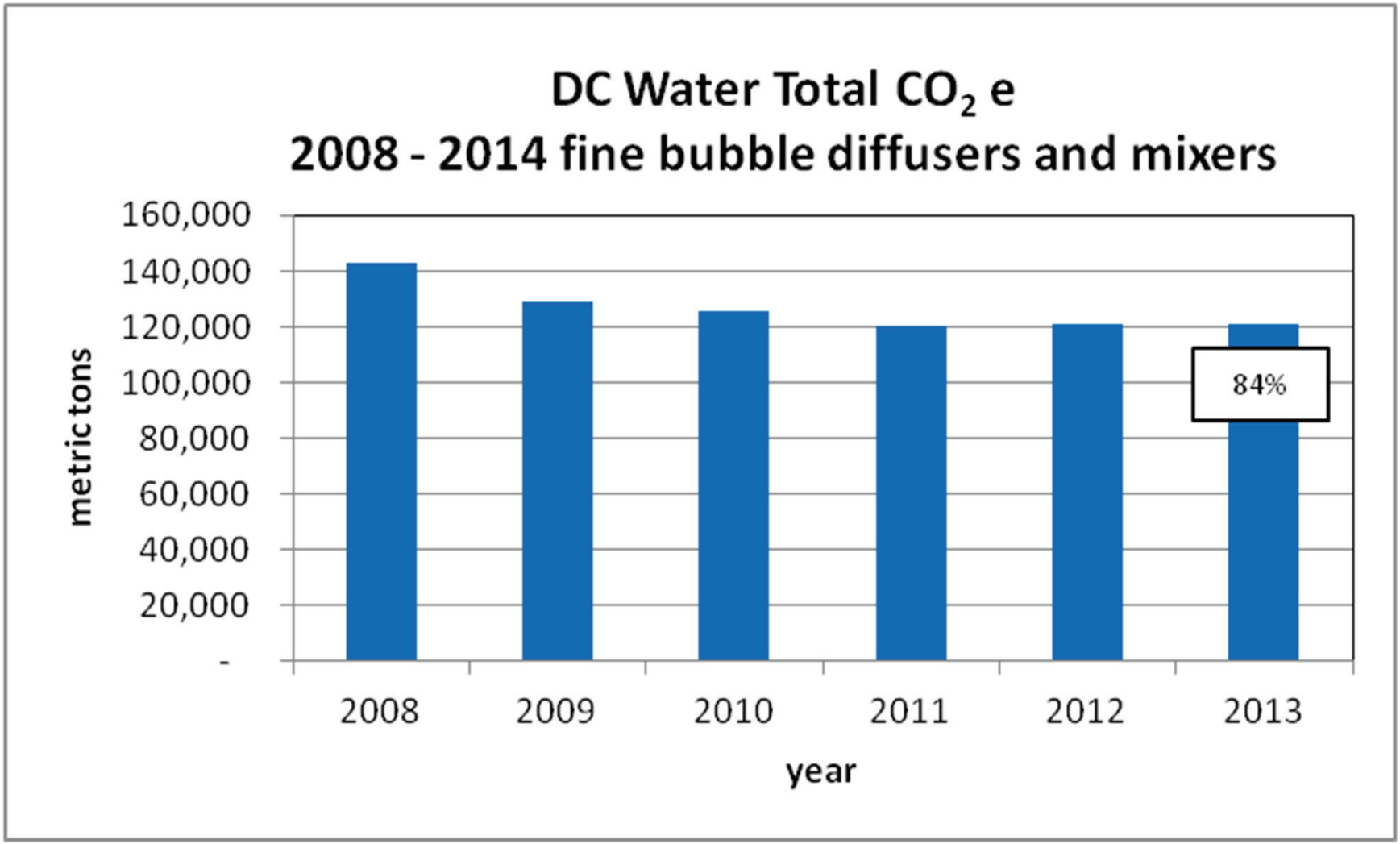
| Table 1. Summary of Annual Emission Estimates, Calendar Year: 2008 | | |
|---|---|---|
| Emission Source | Annual Emissions Estimate Metric Tons CO2e | Scope 1 and 2 Percent Contribution |
| **Scope 2** | | |
| Electricity | 146,920 | 88% |
| DSS | 11,053 | 7% |
| DWS | 9,163 | 5% |
| DWT | 126,704 | 76% |
| **Scope 1** | | |
| Natural Gas | 2,967 | 2% |
| CS | 197 | 0.1% |
| DSS | 371 | 0.2% |
| DWS | 441 | 0.3% |
| DWT | 1,924 | 1% |
| FLEET | 34 | 0.02% |
| Vehicle (fuel usage) | 2,586 | 2% |
| Compressed Natural Gas (CNG) | 0.064 | 0.00004% |
| Diesel Fuel No. 1 and 2 | 1041 | 0.6% |
| Motor Gasoline | 1545 | 0.9% |
| Refrigerants | 142 | 0.08% |
| Nitrification/Denitrification (process emissions) | | |
| CO2 from Addition of Methanol | 12,007 | 7% |
| N2O from Dentrification | 443 | 0.3% |
| Effluent Discharge (process emissions) | 2,009 | 1% |
| **Total with Scope 1 and 2** | **167,074** | |
| **Scope 3** | | |
| Biosolids Hauling (fuel usage/distance travelled) | 4,107 | |
| Chemical Hauling (distance travelled) | 1,450 | |
| Lime Production | 14,883 | |
| Methanol Production | 6,747 | |
| N2O Emissions from Land Application of Biosolids | 52,548 | |
| Methane Emissions from Landfilling Biosolids | 7 | |
| **Total with Scope 3** | **246,815** | |
| **Carbon Credits** | | |
| Carbon Sequestration Land Application | 26,844 | |
| Carbon Sequestration Land Application with Composting | 13,576 | |
| Carbon Sequestration Landfill | 2 | |
| Avoided N2O Emissions from Replacement of Inorganic Fertilizers | 52,548 | |
| Fertilizer Credits Direct Applied Biosolids (N and P) | 9,006 | |
| Fertilizer Credits Composted Biosolids (N and P) | 1,692 | |
| **Total** | **103,668** | |
| **GRAND TOTAL** | **143,147** | |

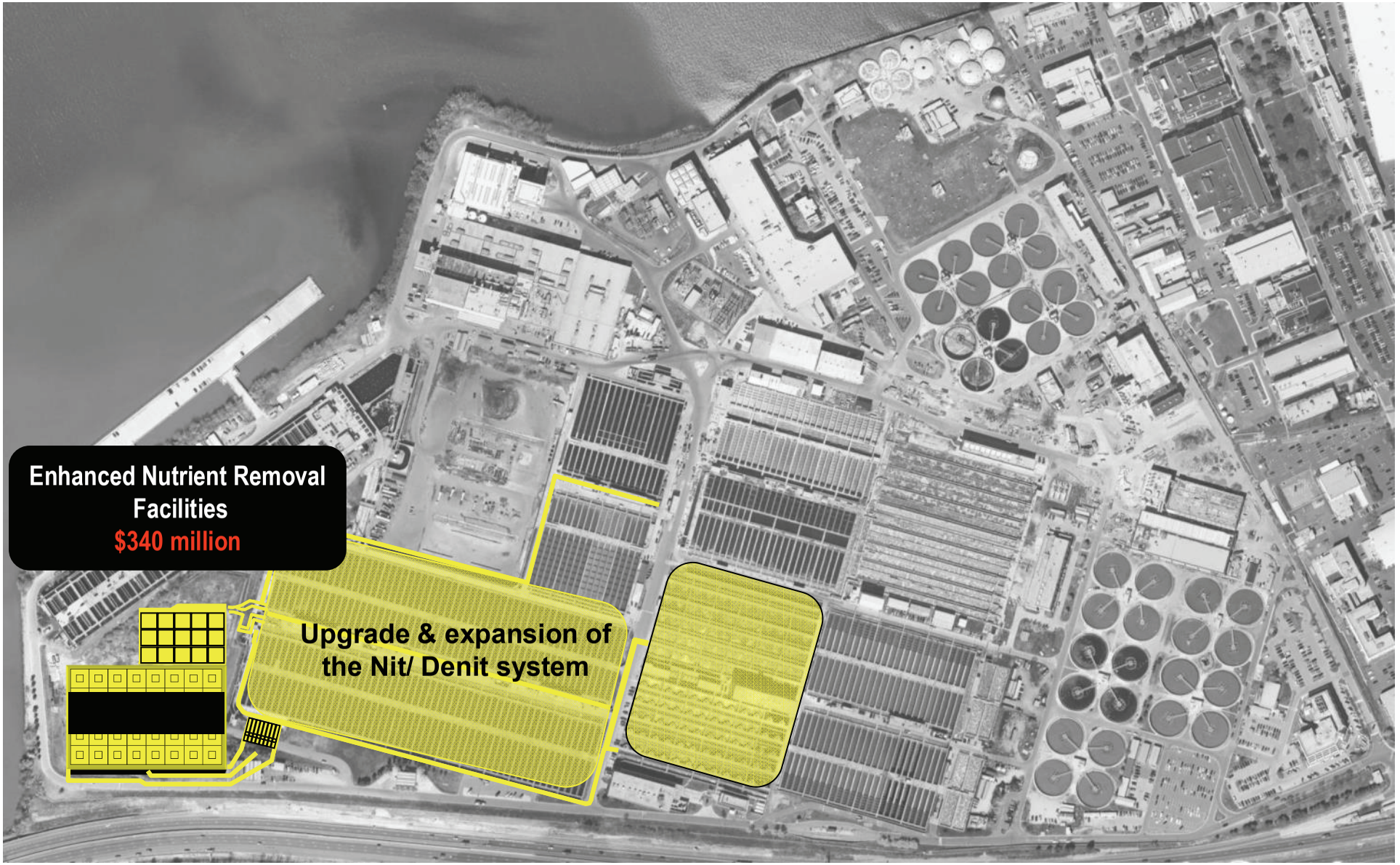
# Breakdown of Electricity Consumption Blue Plains

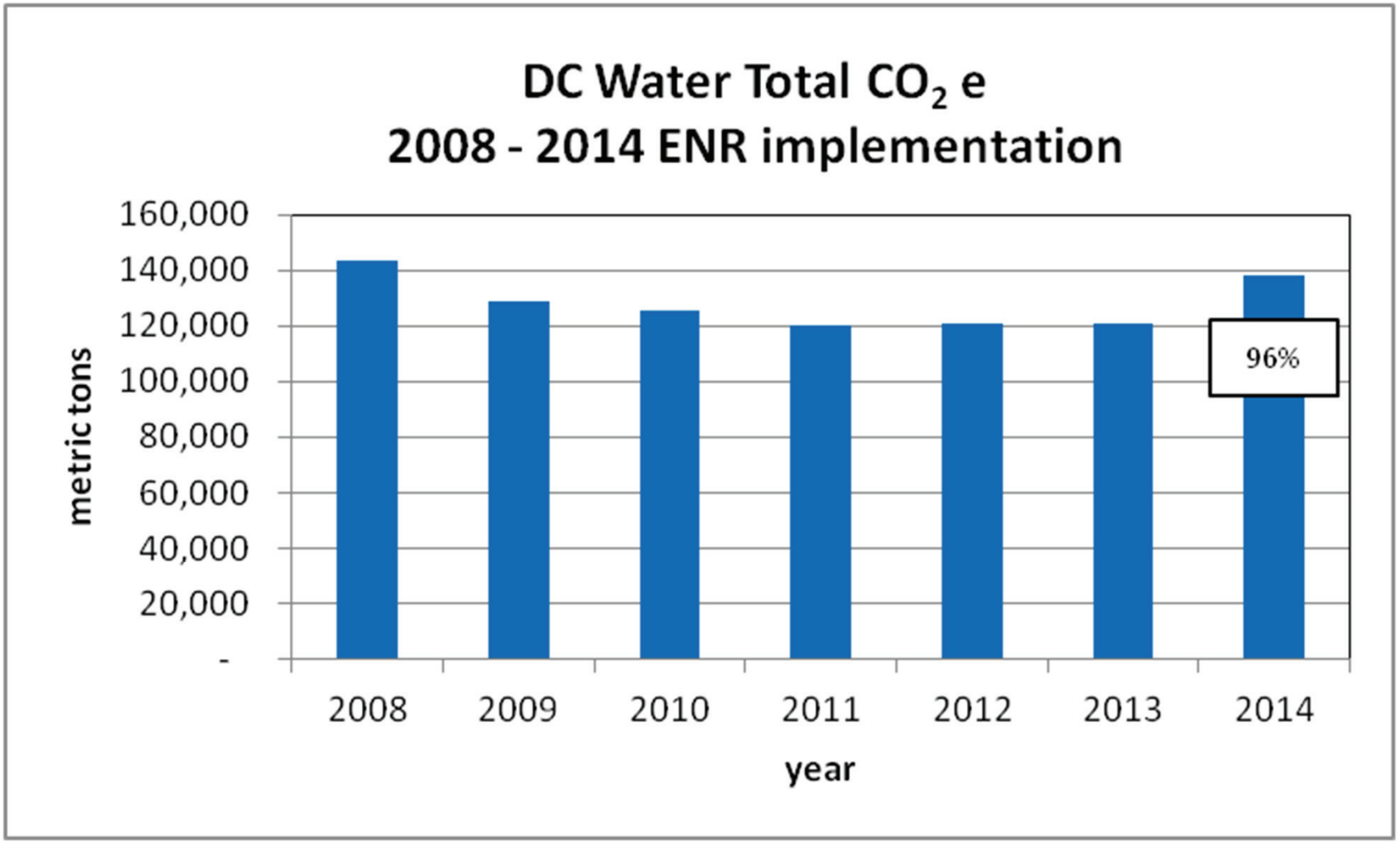



**Source:** 2009 PCS data supplemented with estimates


DC Water Total $CO_2$ e
2008 - 2014 fine bubble diffusers and mixers
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
metric tons
84%
2008
2009
2010
2011
2012
2013
year

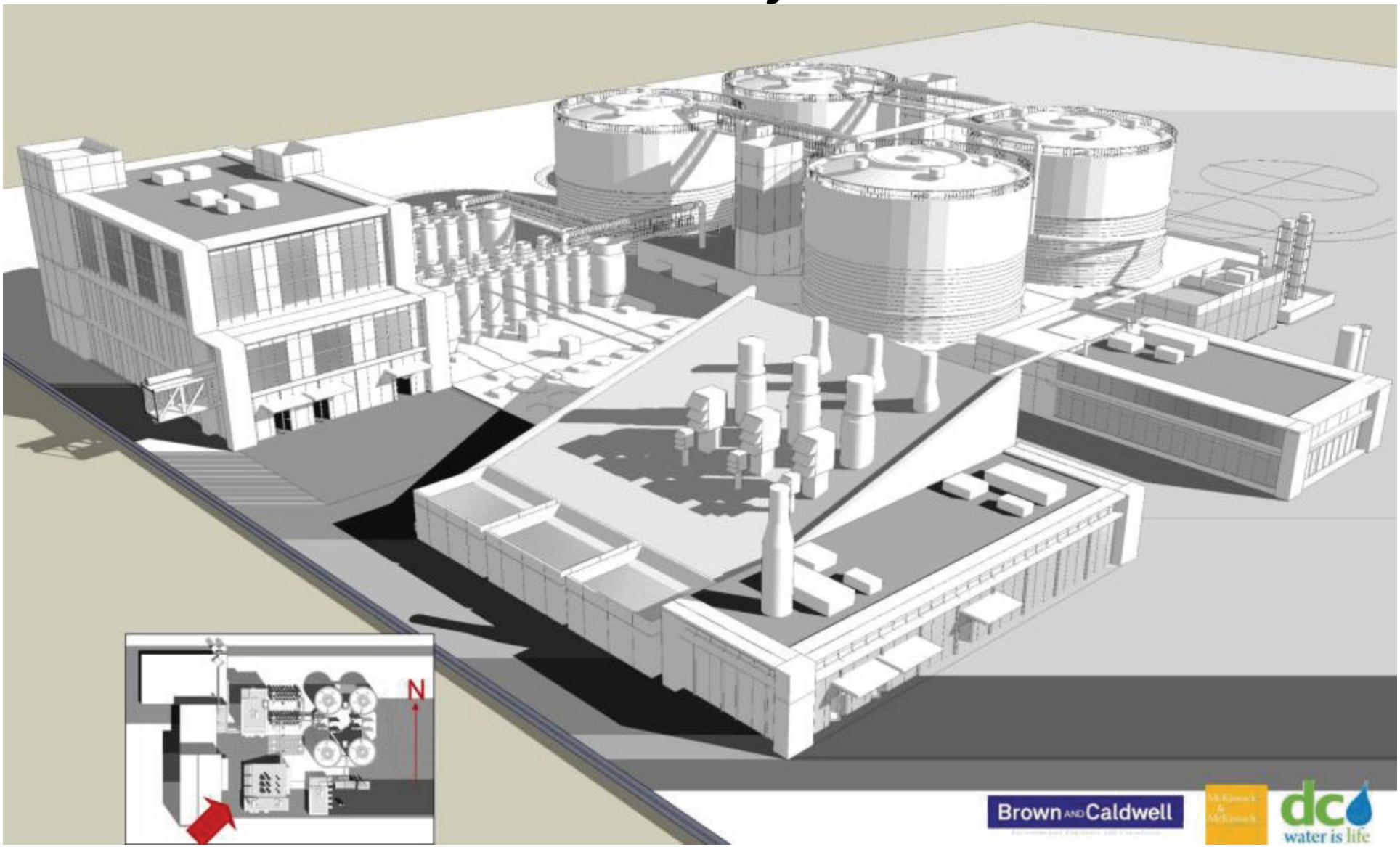
# Enhanced Nutrient Removal



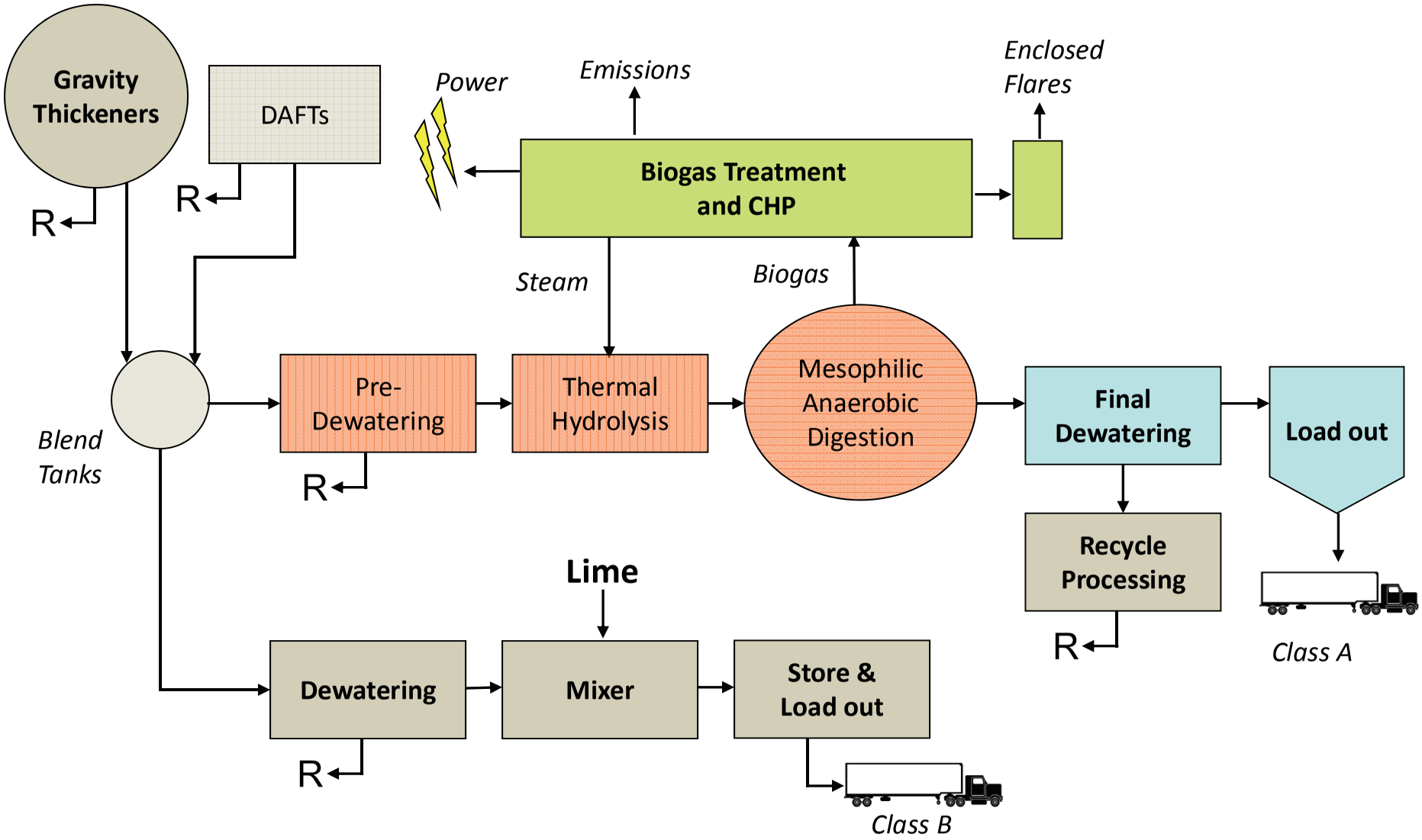

DC Water Total $CO_2$ e
2008 - 2014 ENR implementation
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
metric tons
96%
2008
2009
2010
2011
2012
2013
2014
year

# Digestion and CHP

# Digestion and Thermal Hydrolysis Project

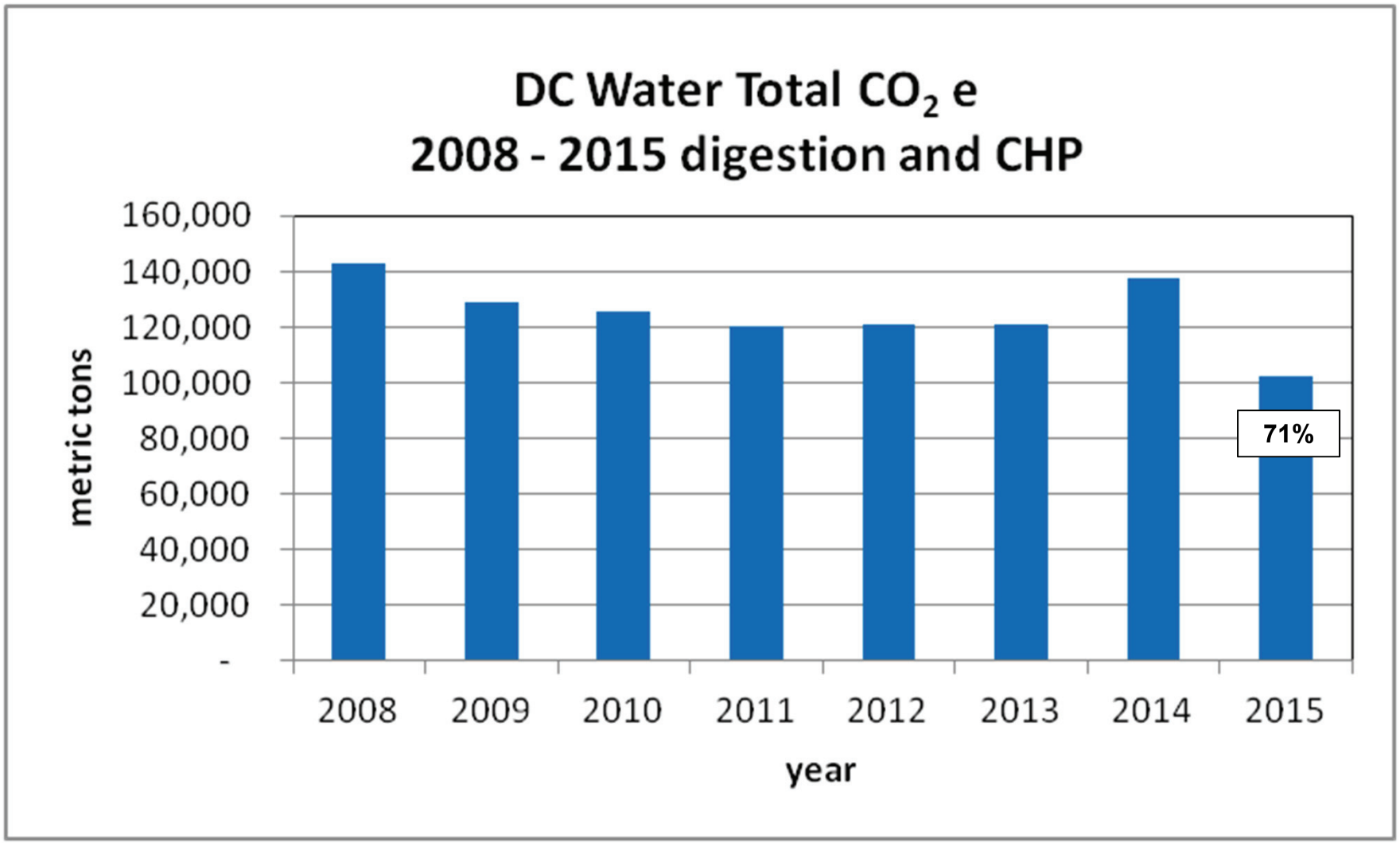


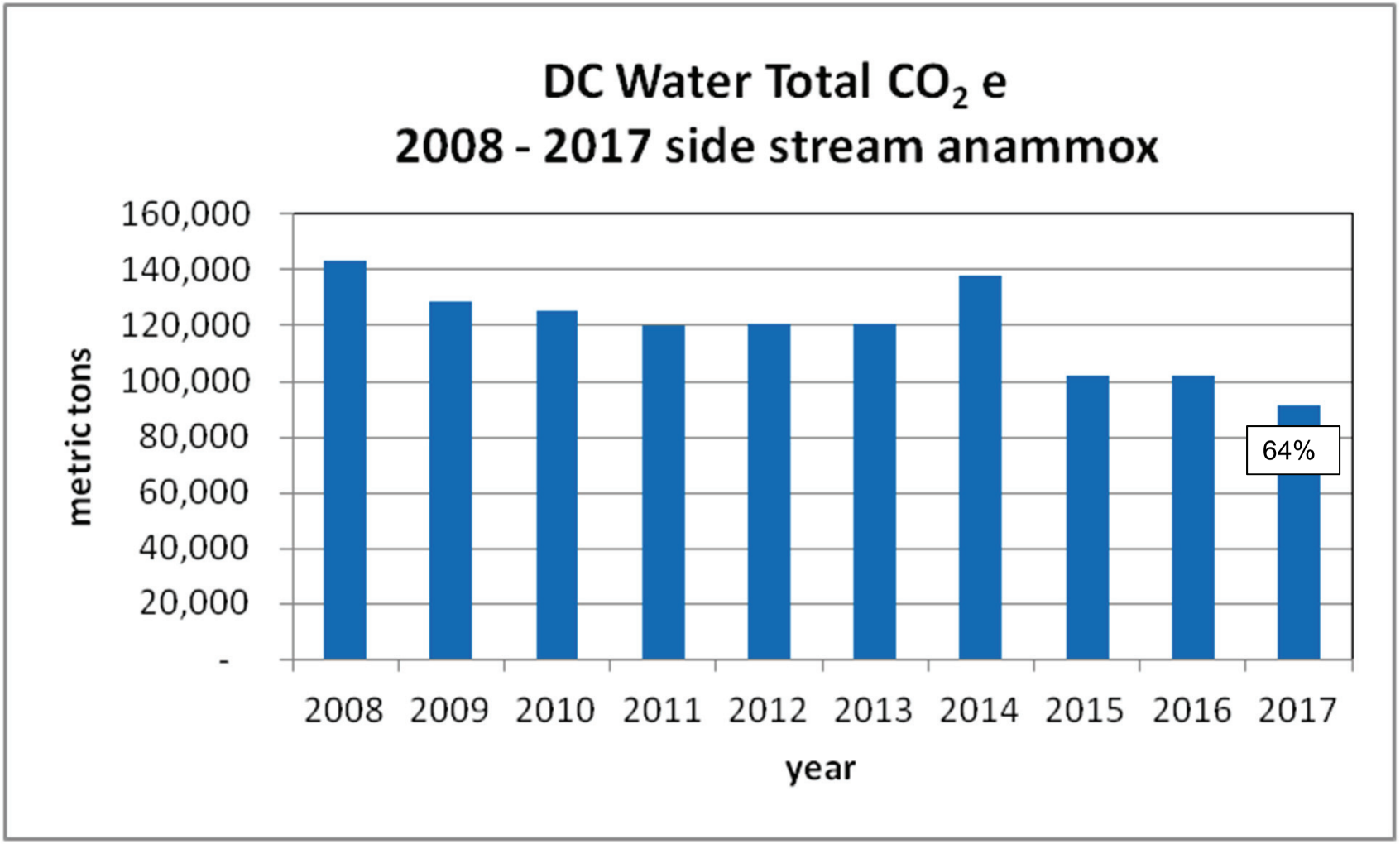
# Biosolids Management Plan



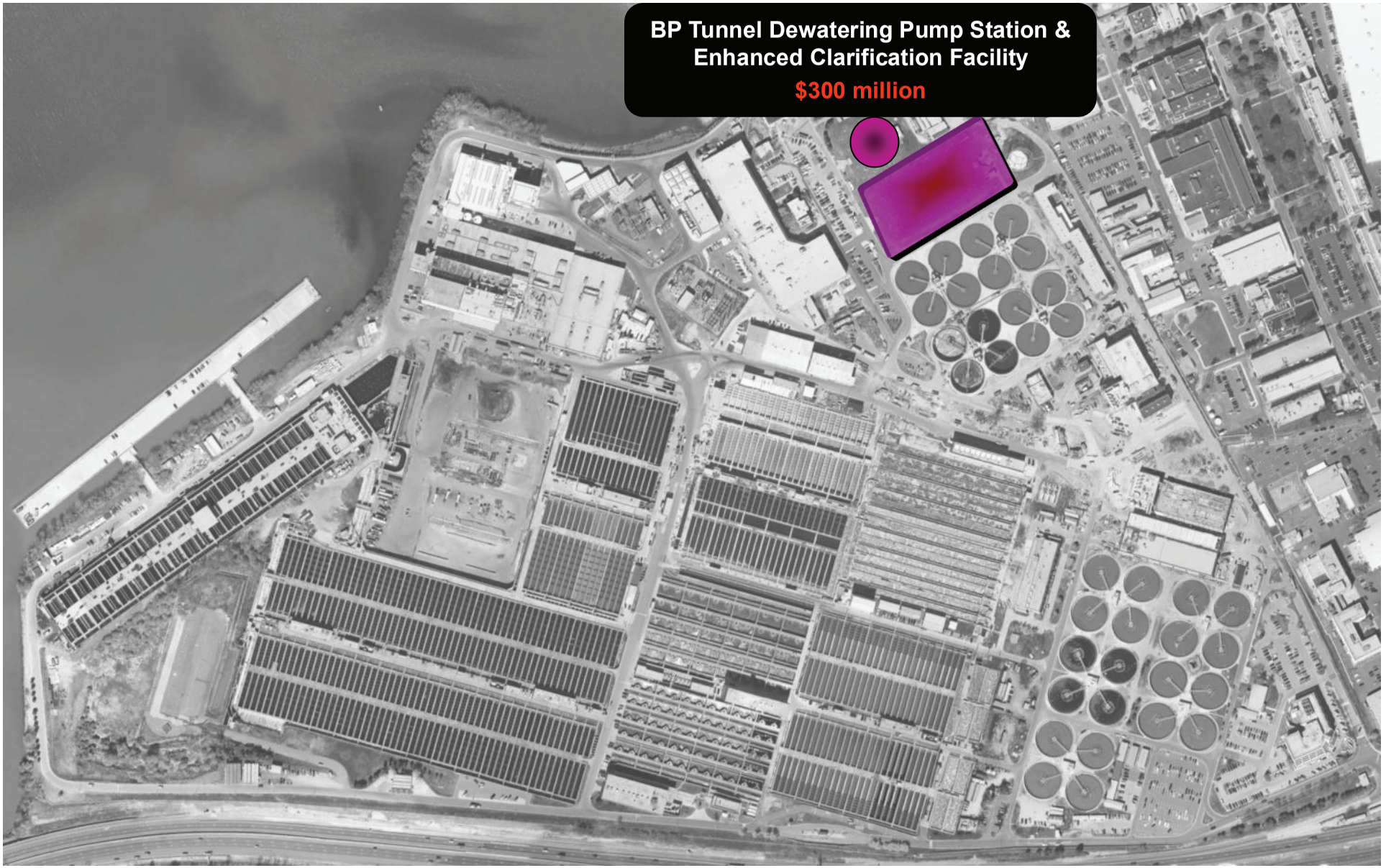
# Thermal Hydrolysis Vessels

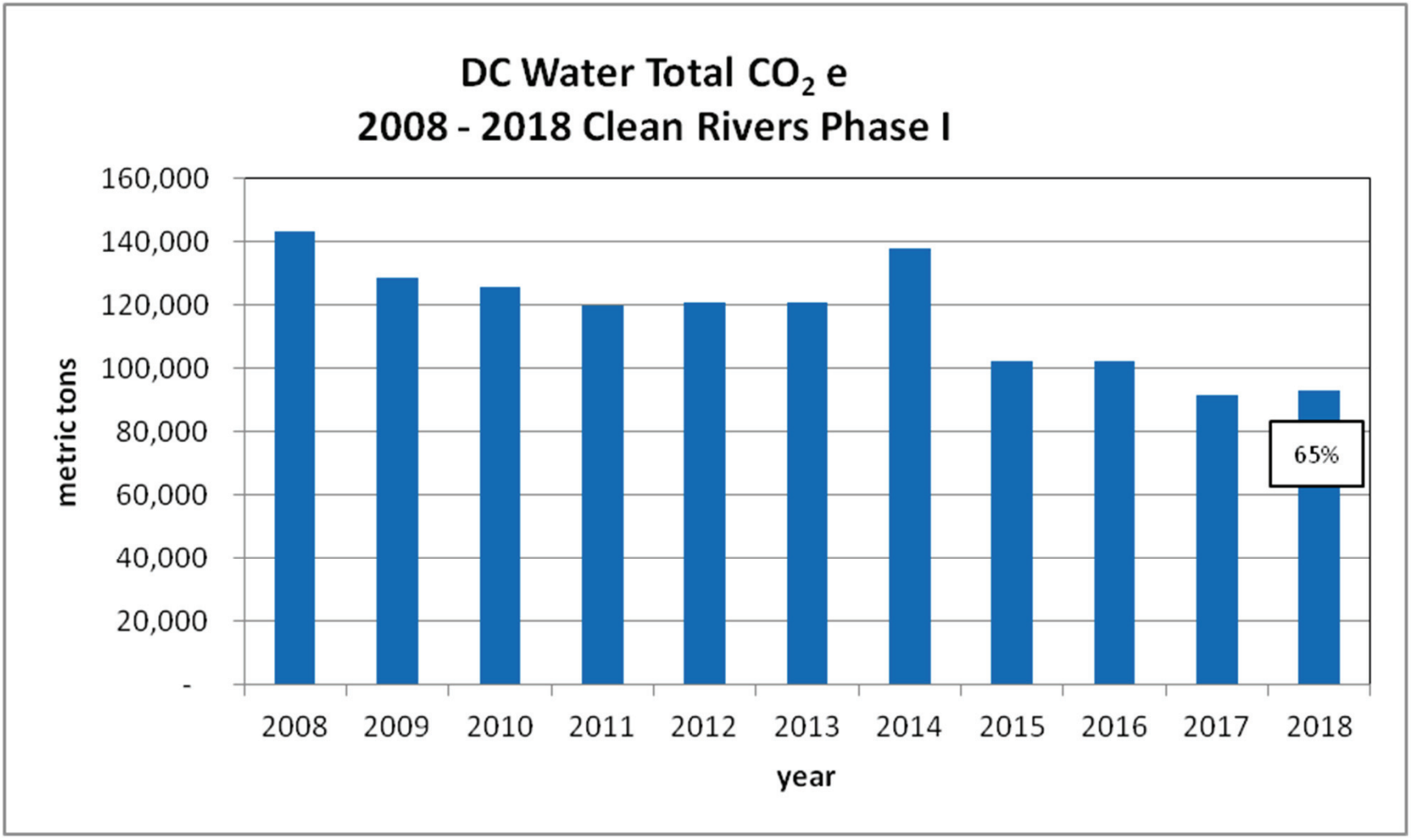
# Digester Vessels

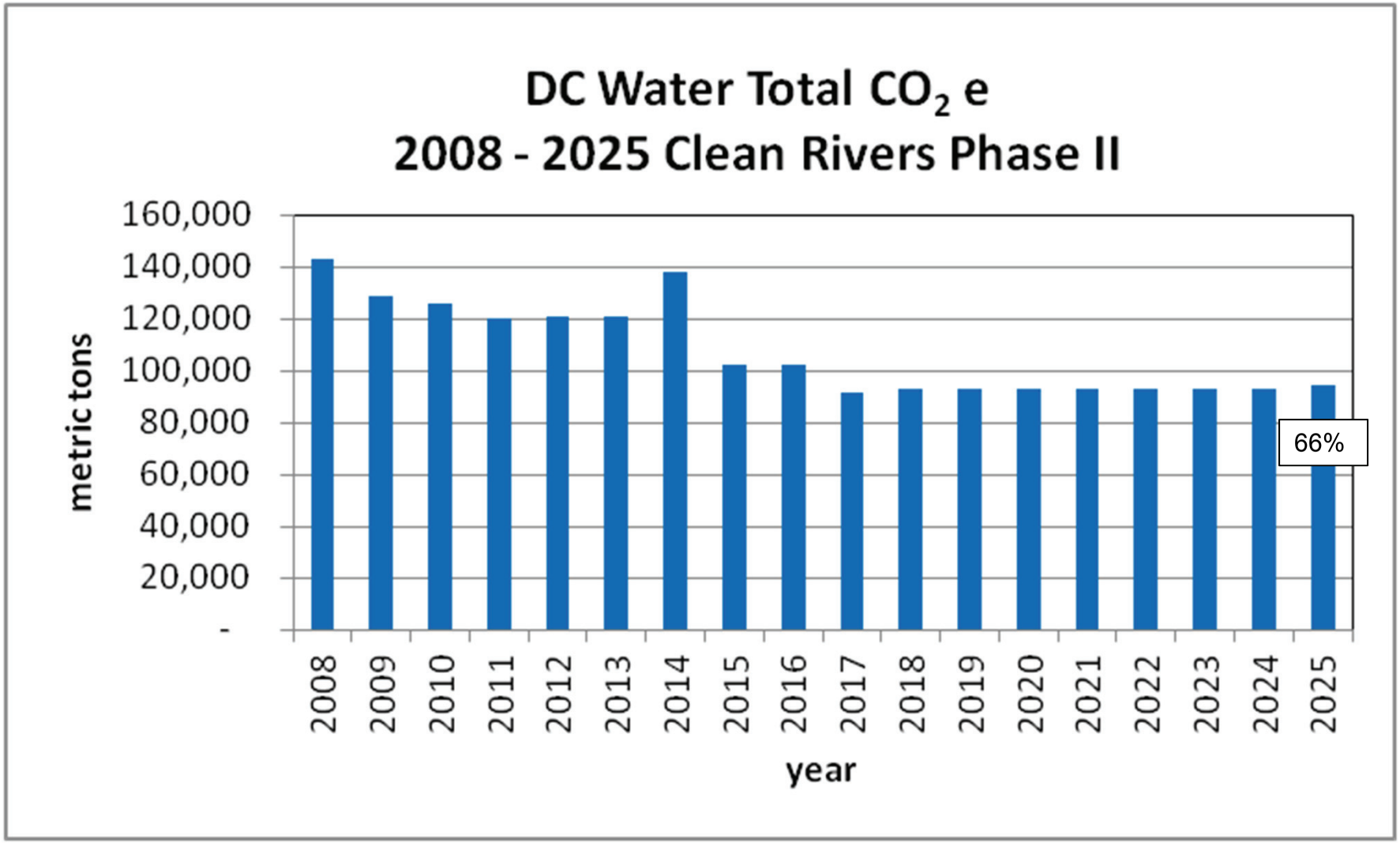

DC Water Total $CO_2$ e
2008 - 2015 digestion and CHP
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
metric tons
71%
2008
2009
2010
2011
2012
2013
2014
2015
year


DC Water Total $CO_2$ e
2008 - 2017 side stream anammox
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
metric tons
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
year
64%

# Clean Rivers Phase I – TDPS & ECF




DC Water Total $CO_2$ e
2008 - 2018 Clean Rivers Phase I
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
metric tons
65%
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
year


DC Water Total $CO_2$ e
2008 - 2025 Clean Rivers Phase II
metric tons
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
year
66%

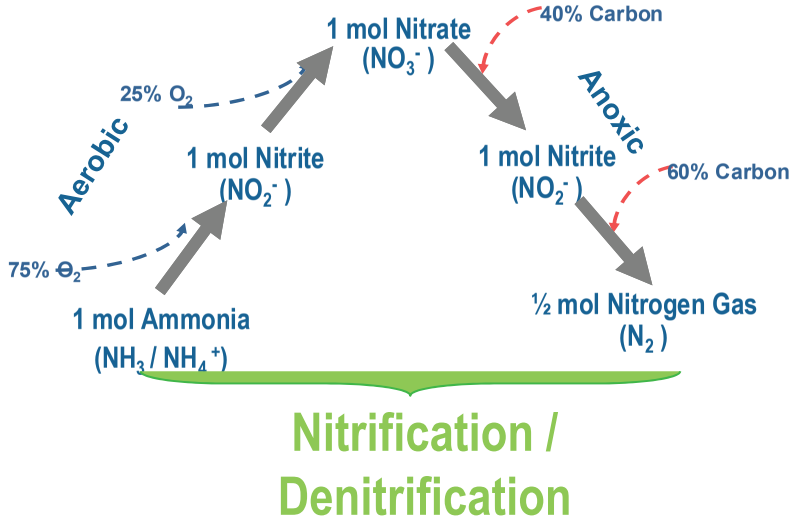
# Discretionary Projects that Could Reduce Carbon Footprint

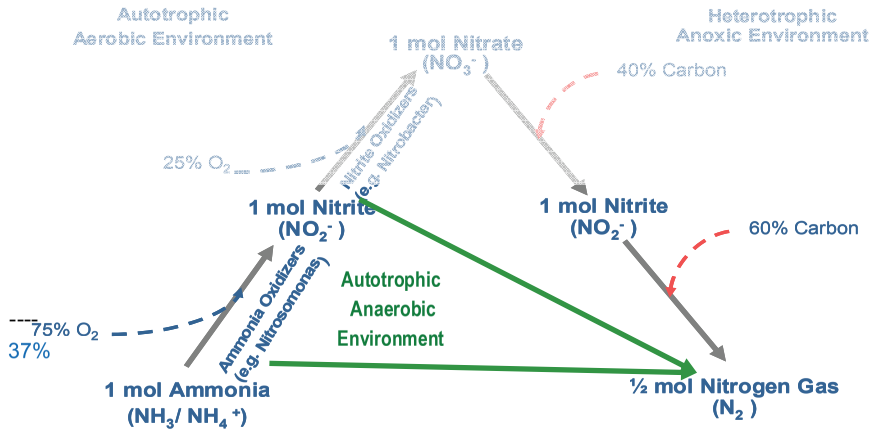
- Main stream anammox nutrient removal
- Co-digestion of foodwaste, fats/oils/grease, and other high strength wastes
- Solar power at Blue Plains

# Biological Nitrogen Removal Technologies

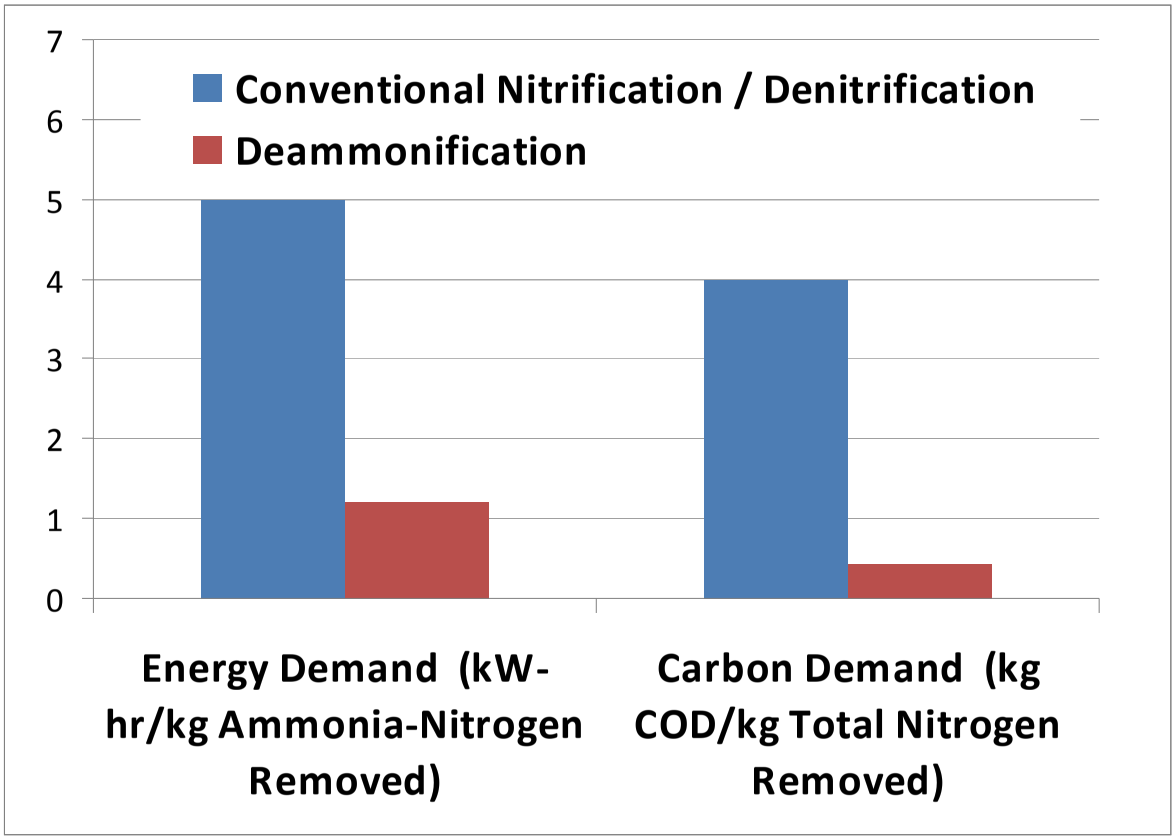
- **Traditional** – Requires use of blowers (to aerate) and use of additional chemicals (methanol) – Both are energy intensive, have large carbon footprints, and are expensive

- **Innovative** - (Anammox) – Reduces aeration and methanol addition – Results in significant reductions in energy use and carbon footprint
  - 63% reduction in Oxygen demand
  - Almost 100% reduction in Carbon demand
  - Reduced biomass production
  - Reduced $CO_2$ emissions



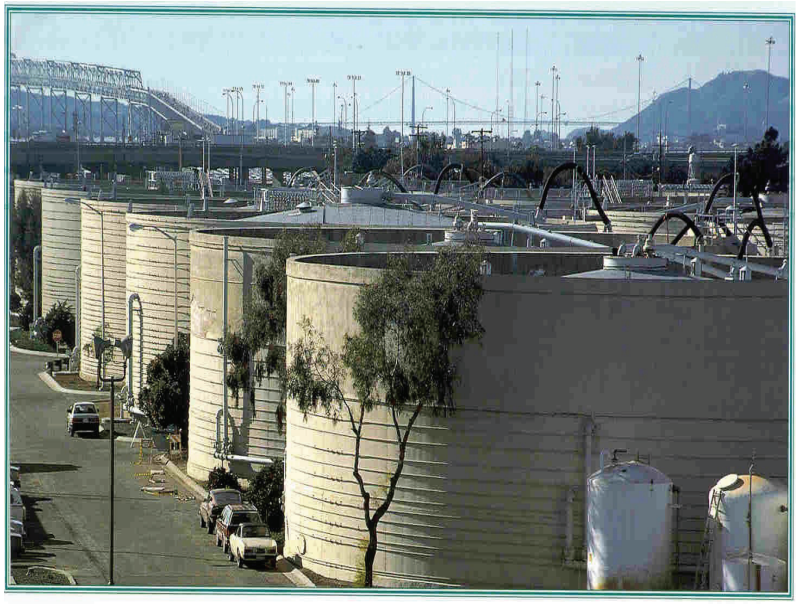



# Benefits of Innovative Nitrogen Removal Technology



# Co-Digestion and energy production has led utilities toward energy neutrality

East Bay MUD (Calif) announced April 3rd that with its new 4.6 MW ga turbine on-line, it is the 1st water/ww utility in the US to produce more power than it uses (EBMUD now sells power to the grid).



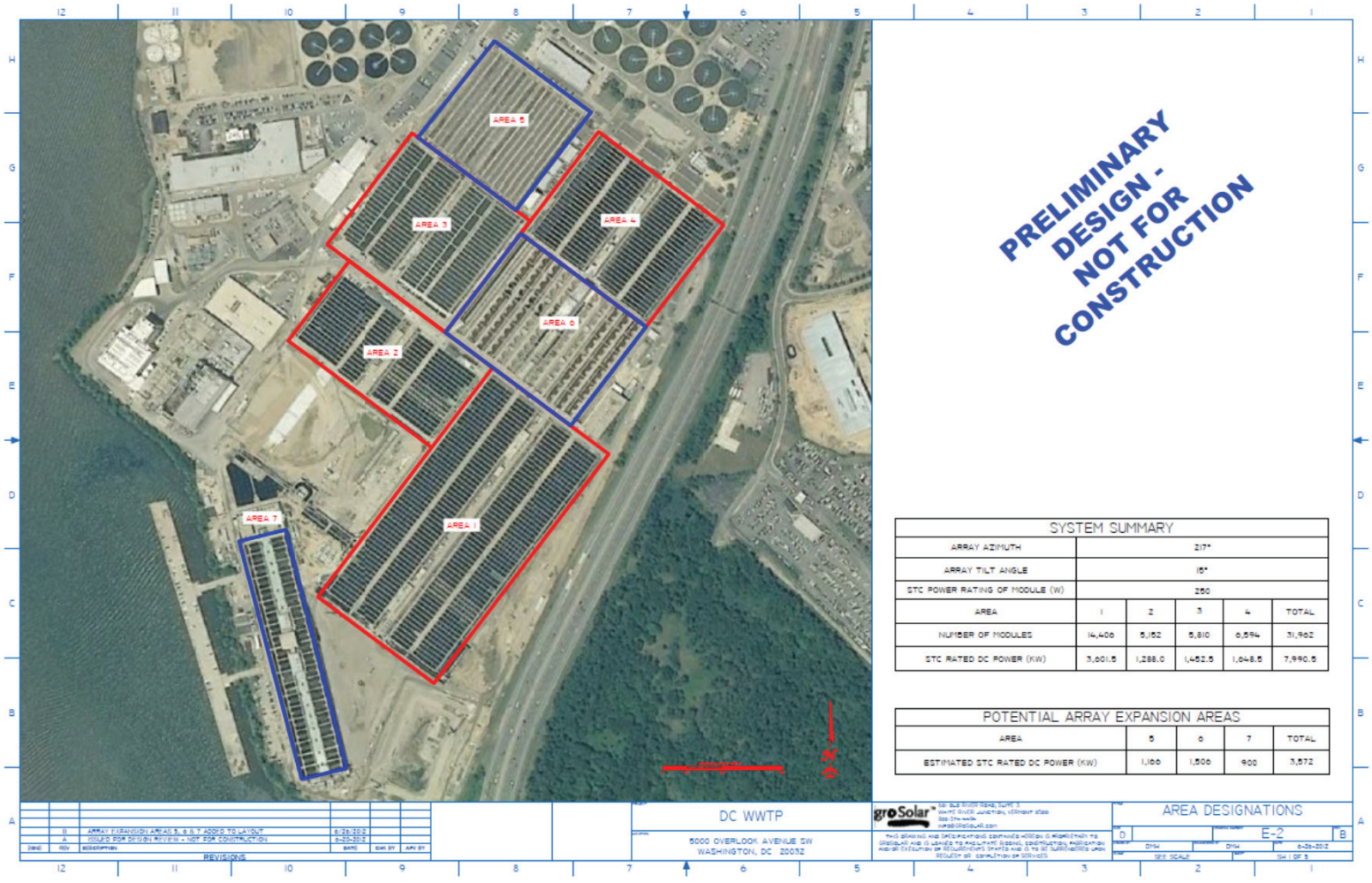
Having excess digester capacity available, EBMUD has operated like a business to allow fats, greases, and various food and beverage wastes to be trucked in and co-digested at the plant.

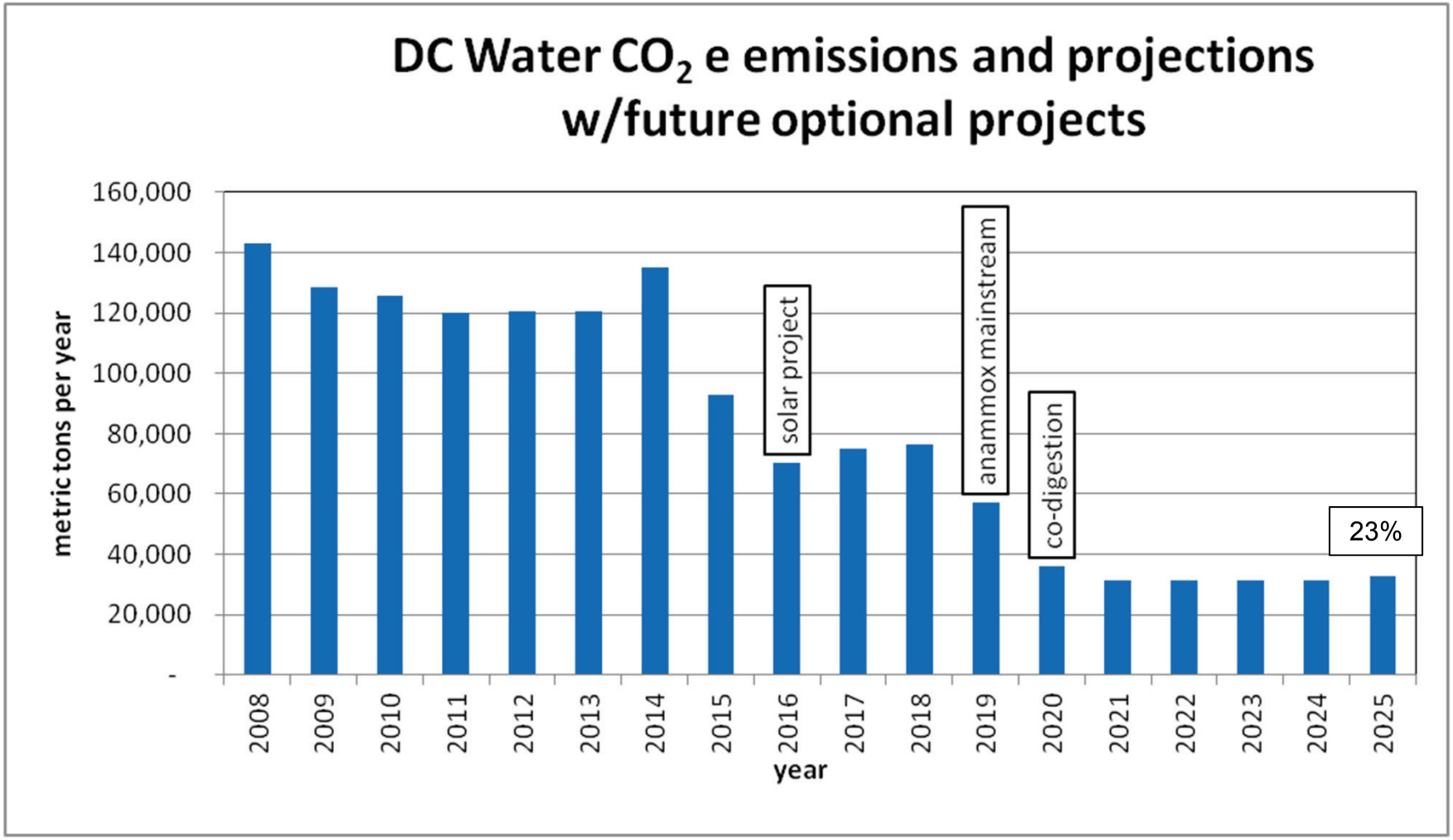
Other WWTPs use a similar approach:

1. Reduce plant power use (conservation)
2. Greatly expand renewable power production, normally via co-digestion.

# Camden County (NJ) Solar Center

# Potential array locations for Blue Plains




DC Water $CO_2$ e emissions and projections w/future optional projects
metric tons per year
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
year
solar project
anammox mainstream
co-digestion
23%

# Summary and Recommendations

- The decision process for all new projects should consider carbon footprint implications.
- Future discharge permit reductions should consider carbon intensity – may spawn discussion of less intensive options.
- Consider permit leniency when implementing innovative technologies.
- Consider discretionary projects that can reduce budget and carbon footprint.

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# THERE IS NO SUCH THING AS WASTE, ONLY WASTED RESOURCES