Energy Facilities Master Plan

Board Update No. 1

September 27, 2022

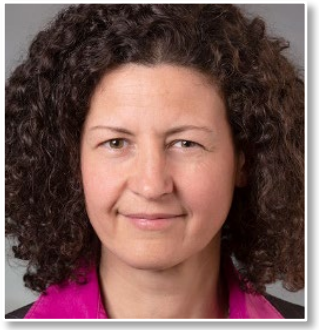
Dublin San Ramon Services District
Water, wastewater, recycled water

// Agenda

- Project overview
- Review Energy and GHG baseline for all DSRSD facilities
- Review preliminary energy opportunities assessment
- Solicit preferences on the Guiding Principles

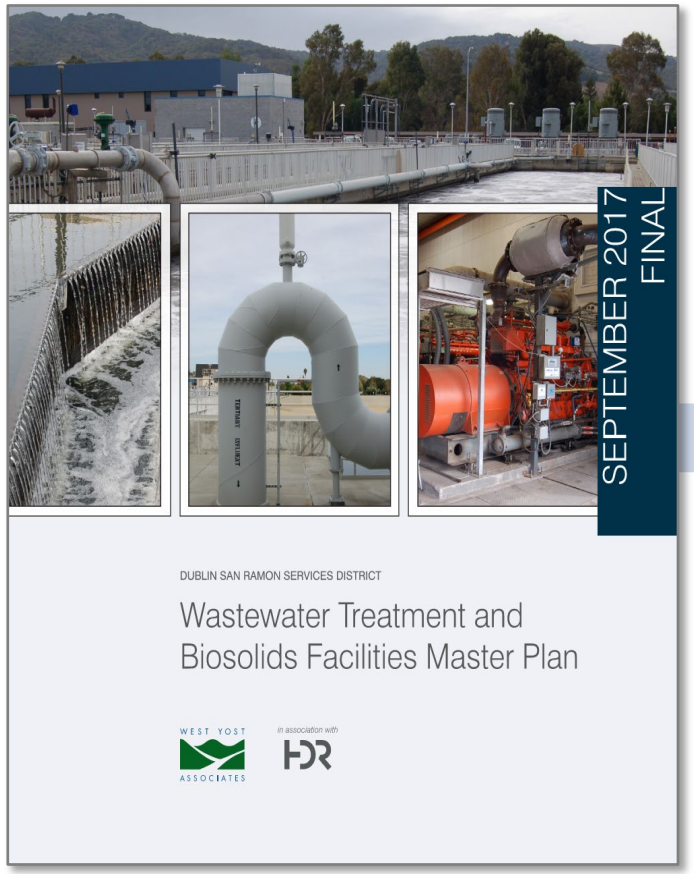
Speakers today:

Jason Ching
Project Manager



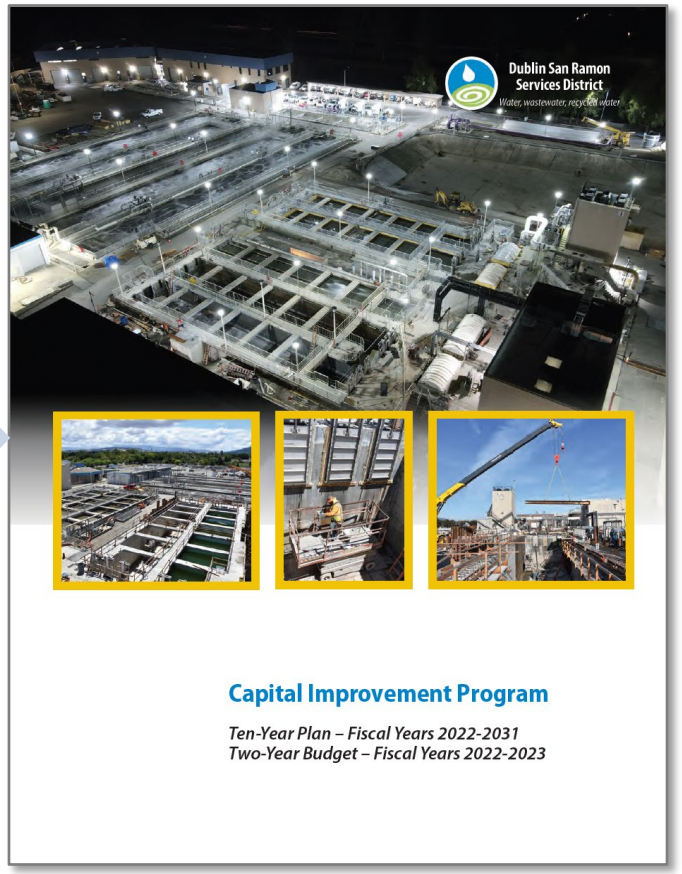
Tanja Rauch-Williams
Project Manager

// Project Background



Wastewater Treatment and Biosolids Facilities Master Plan

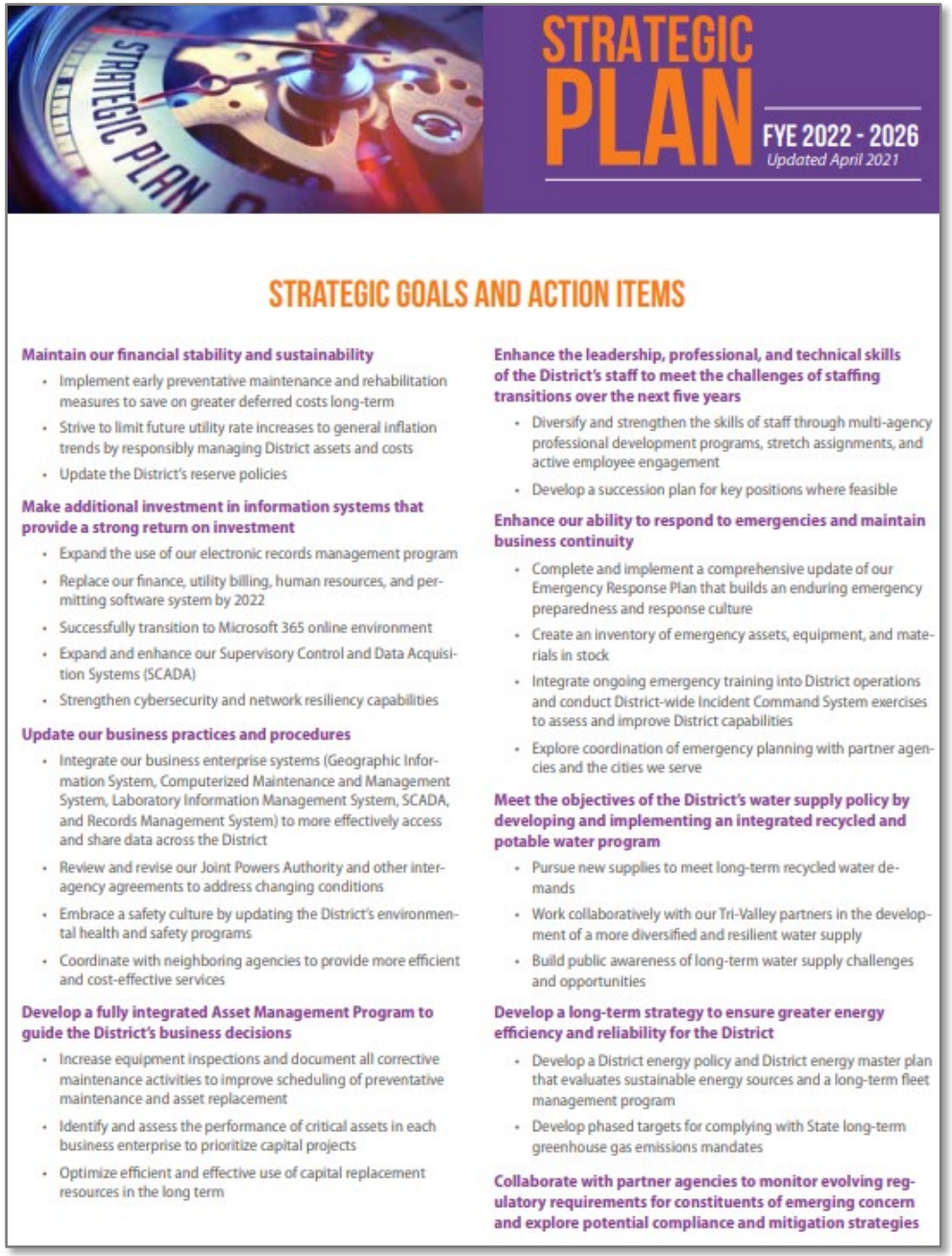
Strategic Plan



Capital Improvement Program

// Strategic Plan Goal

- **Develop a long-term strategy to ensure greater energy efficiency and reliability for the District**
  - Develop a District energy policy and District energy master plan that evaluates sustainable energy sources and a long-term fleet management program
  - Develop phased targets for complying with State long-term greenhouse gas emission mandates



STRATEGIC PLAN

FYE 2022 - 2026

Updated April 2021

STRATEGIC GOALS AND ACTION ITEMS

Maintain our financial stability and sustainability

- Implement early preventative maintenance and rehabilitation measures to save on greater deferred costs long-term
- Strive to limit future utility rate increases to general inflation trends by responsibly managing District assets and costs
- Update the District's reserve policies

Make additional investment in information systems that provide a strong return on investment

- Expand the use of our electronic records management program
- Replace our finance, utility billing, human resources, and permitting software system by 2022
- Successfully transition to Microsoft 365 online environment
- Expand and enhance our Supervisory Control and Data Acquisition Systems (SCADA)
- Strengthen cybersecurity and network resiliency capabilities

Update our business practices and procedures

- Integrate our business enterprise systems (Geographic Information System, Computerized Maintenance and Management System, Laboratory Information Management System, SCADA, and Records Management System) to more effectively access and share data across the District
- Review and revise our Joint Powers Authority and other interagency agreements to address changing conditions
- Embrace a safety culture by updating the District's environmental health and safety programs
- Coordinate with neighboring agencies to provide more efficient and cost-effective services

Develop a fully integrated Asset Management Program to guide the District's business decisions

- Increase equipment inspections and document all corrective maintenance activities to improve scheduling of preventative maintenance and asset replacement
- Identify and assess the performance of critical assets in each business enterprise to prioritize capital projects
- Optimize efficient and effective use of capital replacement resources in the long term

Enhance the leadership, professional, and technical skills of the District's staff to meet the challenges of staffing transitions over the next five years

- Diversify and strengthen the skills of staff through multi-agency professional development programs, stretch assignments, and active employee engagement
- Develop a succession plan for key positions where feasible

Enhance our ability to respond to emergencies and maintain business continuity

- Complete and implement a comprehensive update of our Emergency Response Plan that builds an enduring emergency preparedness and response culture
- Create an inventory of emergency assets, equipment, and materials in stock
- Integrate ongoing emergency training into District operations and conduct District-wide Incident Command System exercises to assess and improve District capabilities
- Explore coordination of emergency planning with partner agencies and the cities we serve

Meet the objectives of the District's water supply policy by developing and implementing an integrated recycled and potable water program

- Pursue new supplies to meet long-term recycled water demands
- Work collaboratively with our Tri-Valley partners in the development of a more diversified and resilient water supply
- Build public awareness of long-term water supply challenges and opportunities

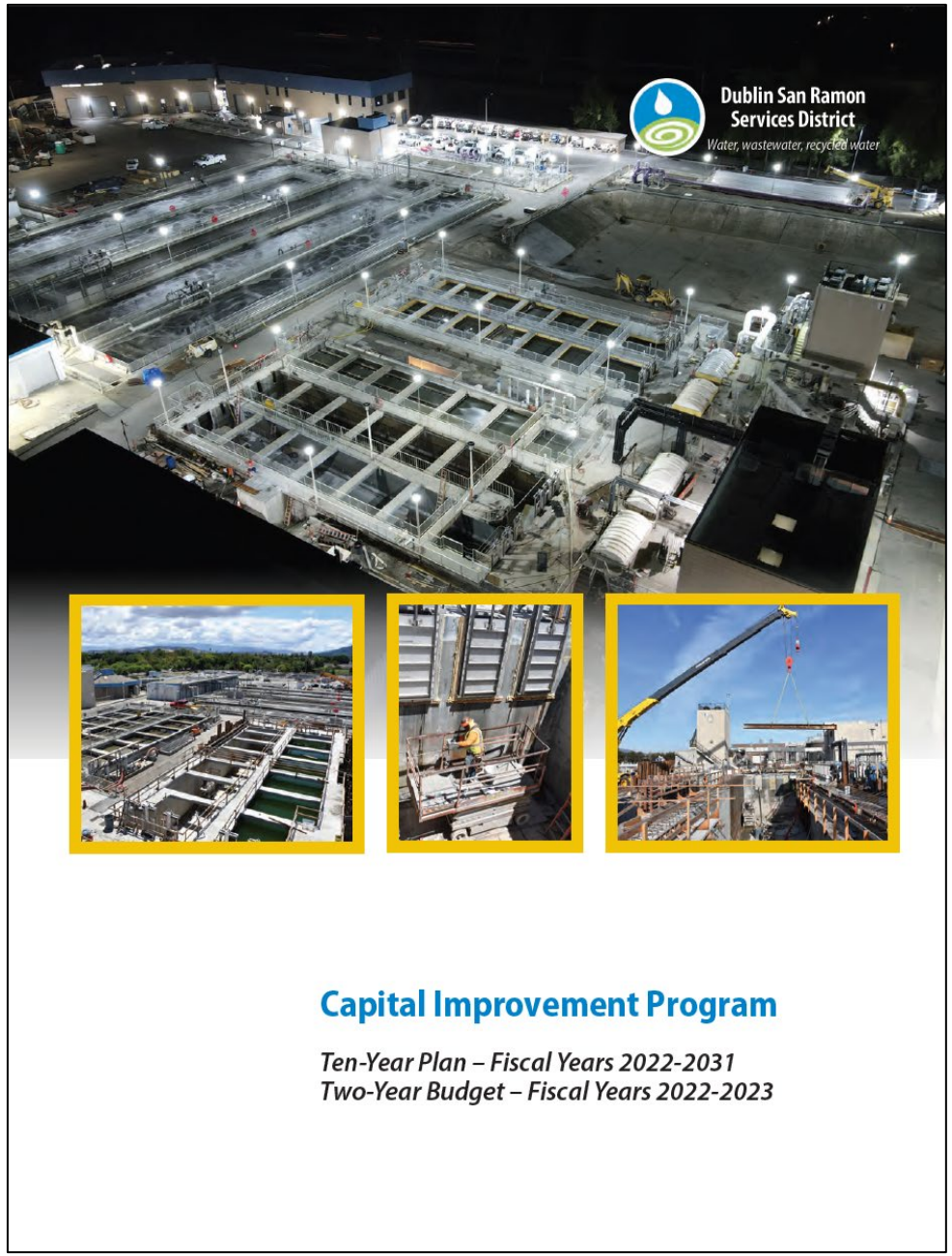
Develop a long-term strategy to ensure greater energy efficiency and reliability for the District

- Develop a District energy policy and District energy master plan that evaluates sustainable energy sources and a long-term fleet management program
- Develop phased targets for complying with State long-term greenhouse gas emissions mandates

Collaborate with partner agencies to monitor evolving regulatory requirements for constituents of emerging concern and explore potential compliance and mitigation strategies

// Project Overview

- All-Encompassing Review of All District Facilities
  - Wastewater Collections System
  - Wastewater Treatment Plant
  - Potable Water Distribution System
  - Recycled Water Distribution System
  - Administration & Field Office Buildings
  - Fleet
- Energy Policy
- Energy Master Plan
- Capital Improvement Program



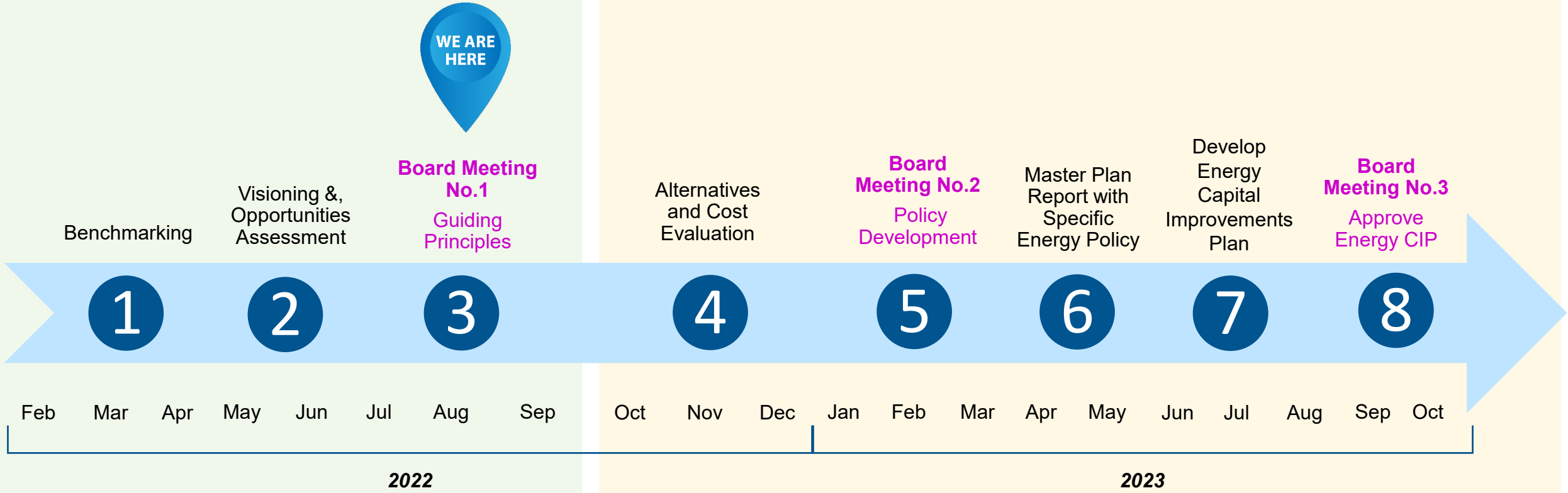
// Scope of Phase 1 and 2 of this planning project

Phase 1

State of the District Energy Baseline

Phase 2

Alternatives Evaluation and Prioritization



Baseline Energy and GHG Emissions

// Scope of Phase 1 and 2 of this planning project

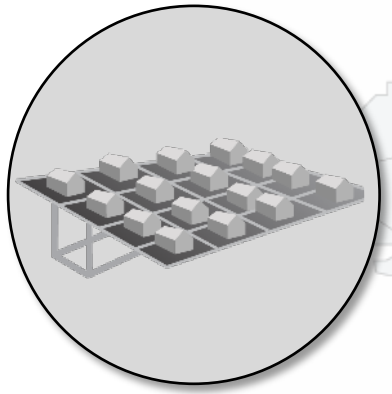
Phase 1

State of the District Energy Baseline

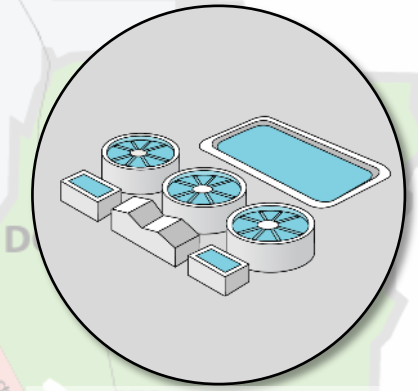
Phase 2

Alternatives Evaluation and Prioritization

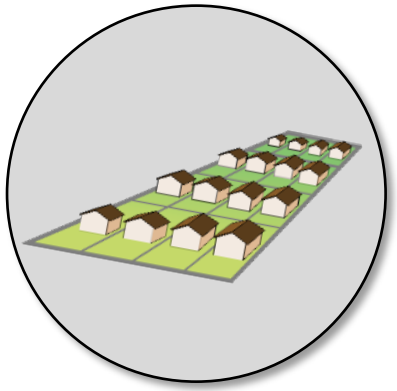
// Facilities included in the planning effort



Wastewater Collection System



Wastewater Treatment Plant



Water Distribution System

Recycled Water Treatment & Distribution (DERWA)

Wastewater Effluent Discharge (LAVWMA)

Recycled Water Distribution

Offices & Buildings

Fleet

// Types of “energy”

Energy Demands

Fuel

Thermal (Natural Gas)

Electricity

Energy Production

Heat Recovery

Renewables

Biogas

Dublin San Ramon Services District

Water, wastewater, recycled water

Electrical Energy Demand

// Electrical Energy Demand

Total Electrical Demand:

~15 M kWh/year

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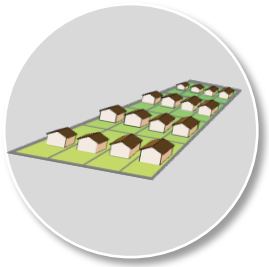
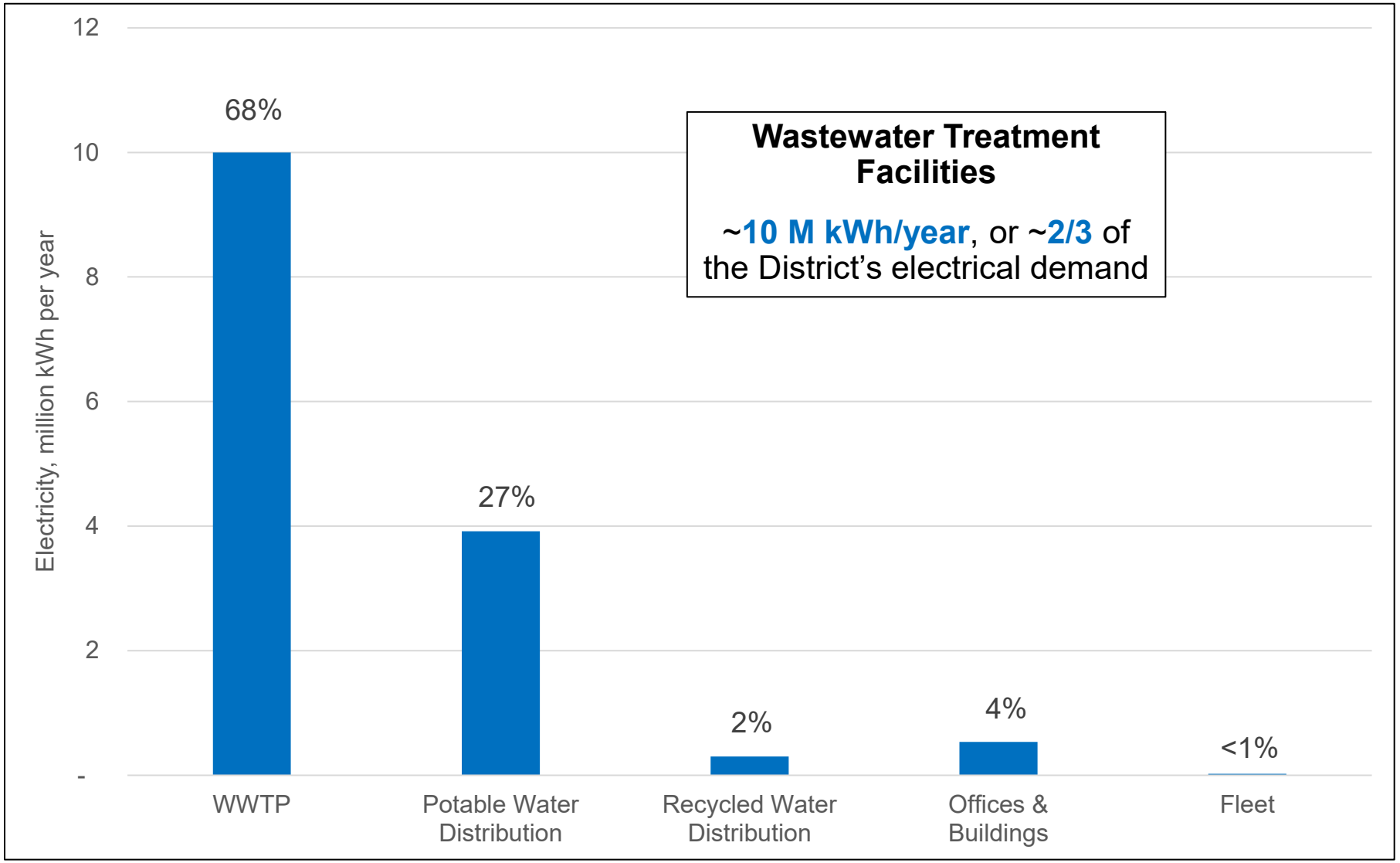


~2,500 Homes



// Electrical Energy Demand (including LAVWMA & DERWA)

Total Electrical Demand:

~23 M kWh/year

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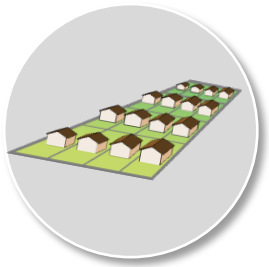

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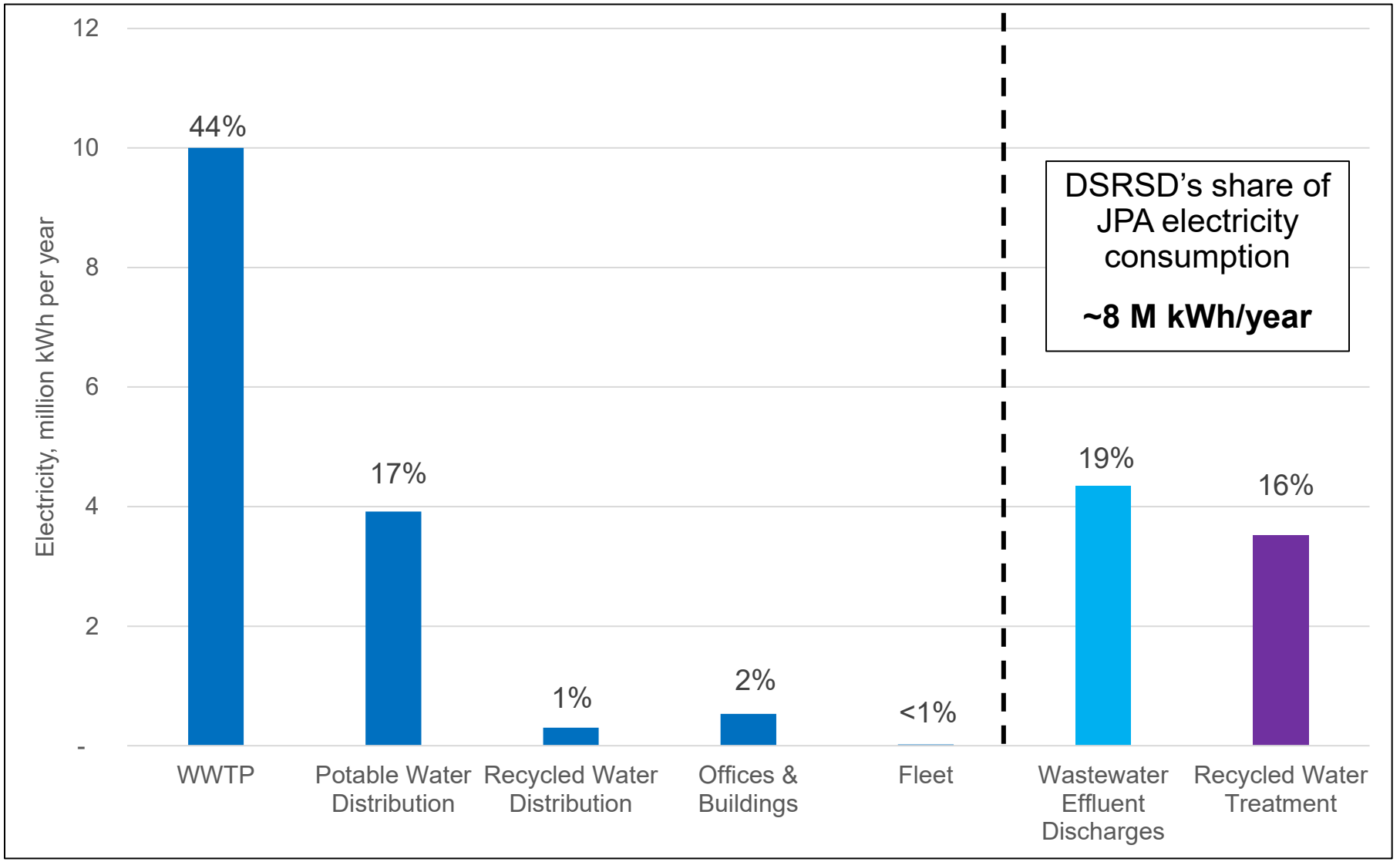

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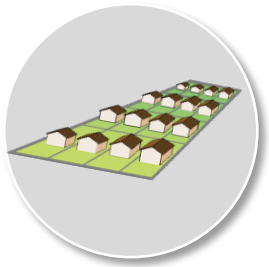

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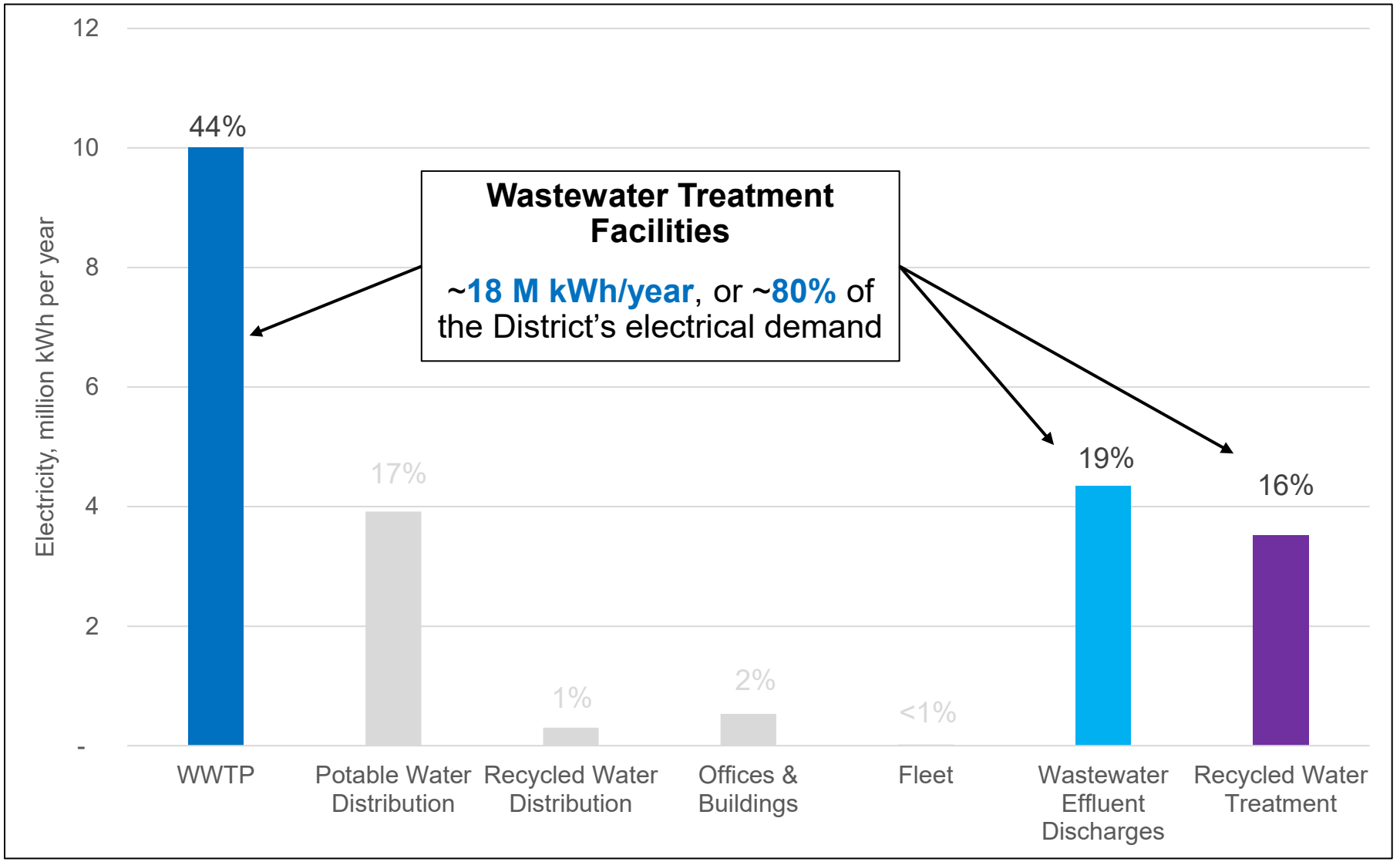

Thermal Energy Demand

// Thermal Energy Demand

Total Thermal Demand:

~340,000 therms/year

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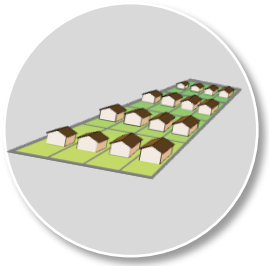
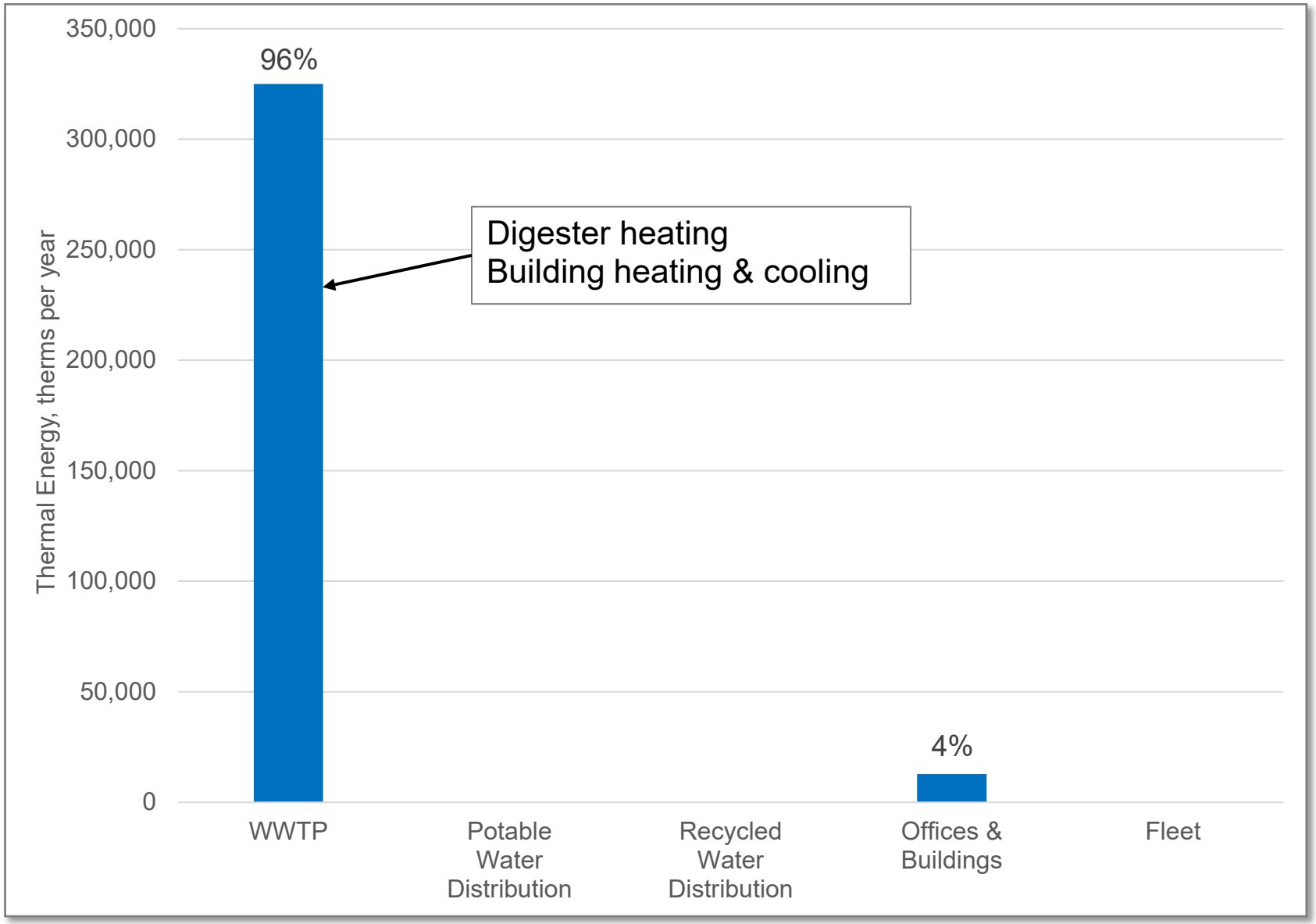


~1,000 Homes



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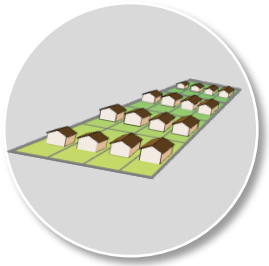
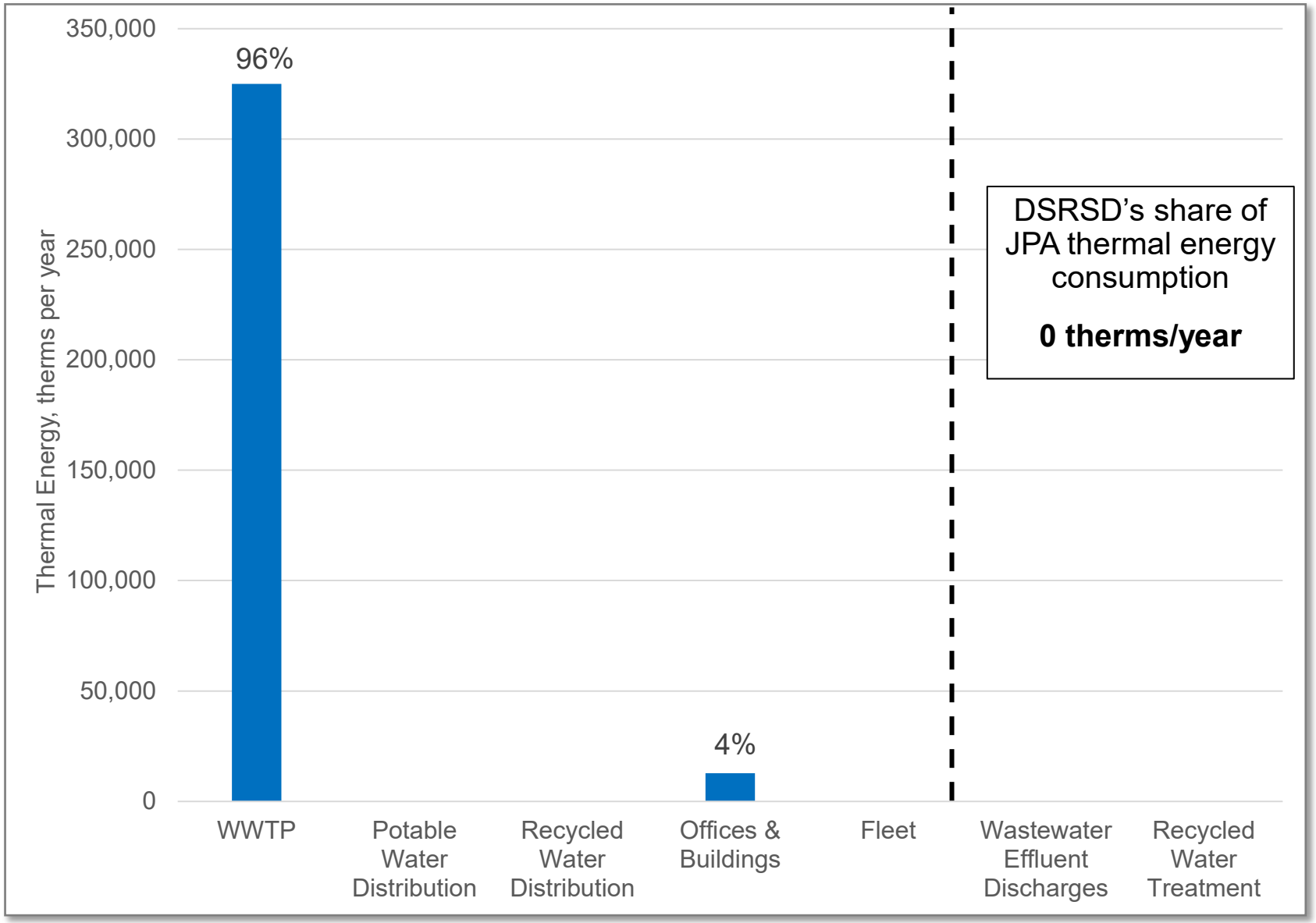


~1,000 Homes



Fuel Consumption

// Fuel Consumption

District Fleet Summary:

- Vehicles: 59

- Electric-Powered Golf Carts: 22

- Backup Power Equipment: 9

- Cargo Equipment: 8

- Heavy Equipment: 24

Total Fuel Consumption:

~28,000
Gasoline gallon equivalents/year

=

~60
Vehicles

Total Energy (Electrical + Thermal + Fuel) Demand

// Total Energy Demand (Electricity + Thermal + Fuel)

Total Energy Demand:

~25 M kWh$_e$/year

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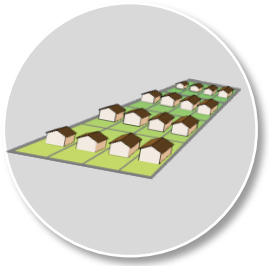
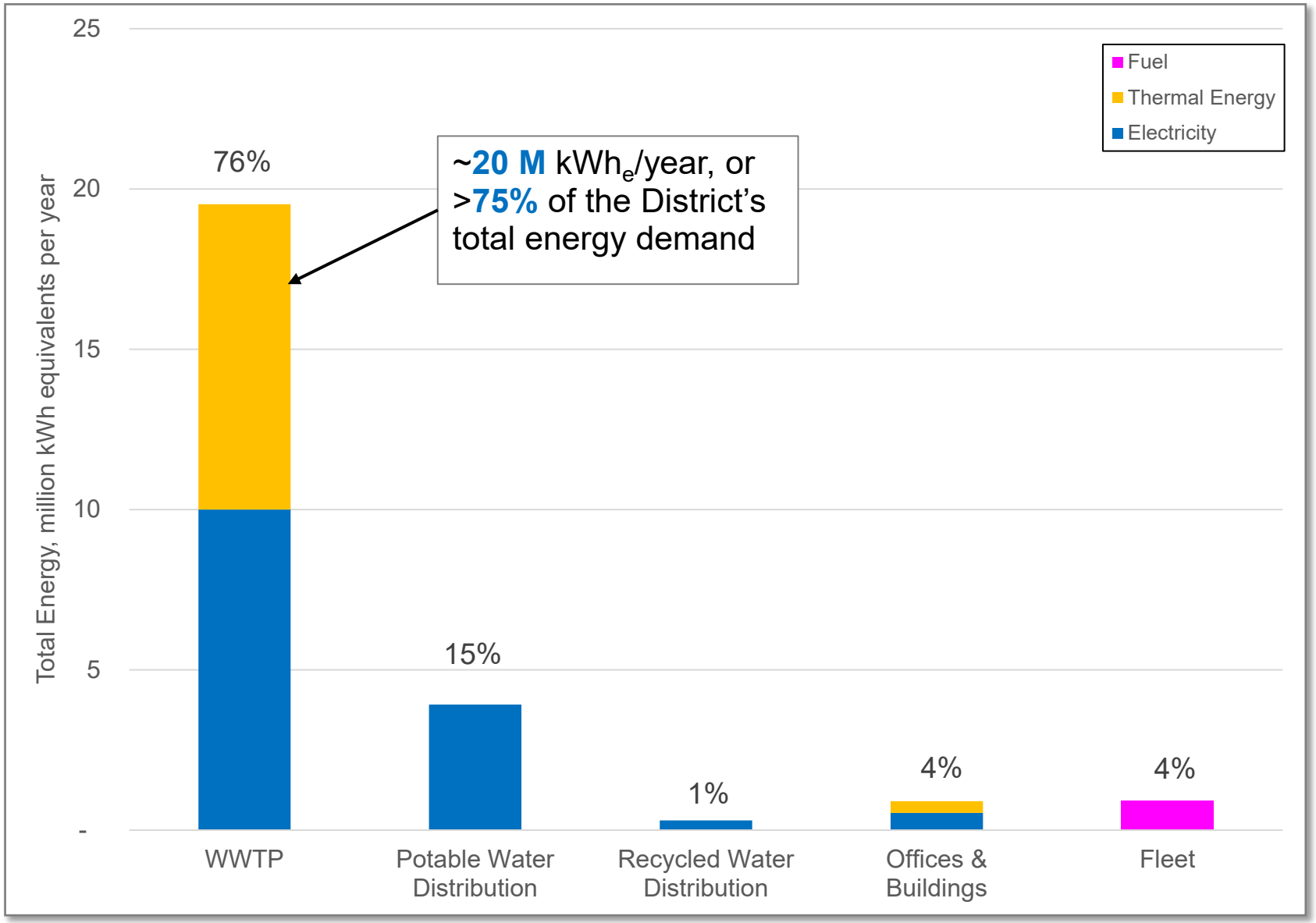


~4,000 Homes



// Total Energy Demand (Electricity + Thermal + Fuel) including LAVWMA + DERWA

Total Energy Demand:

~33 M kWh_e/year

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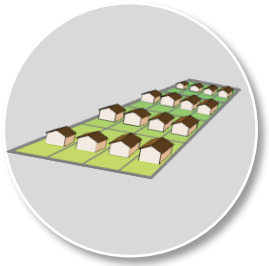
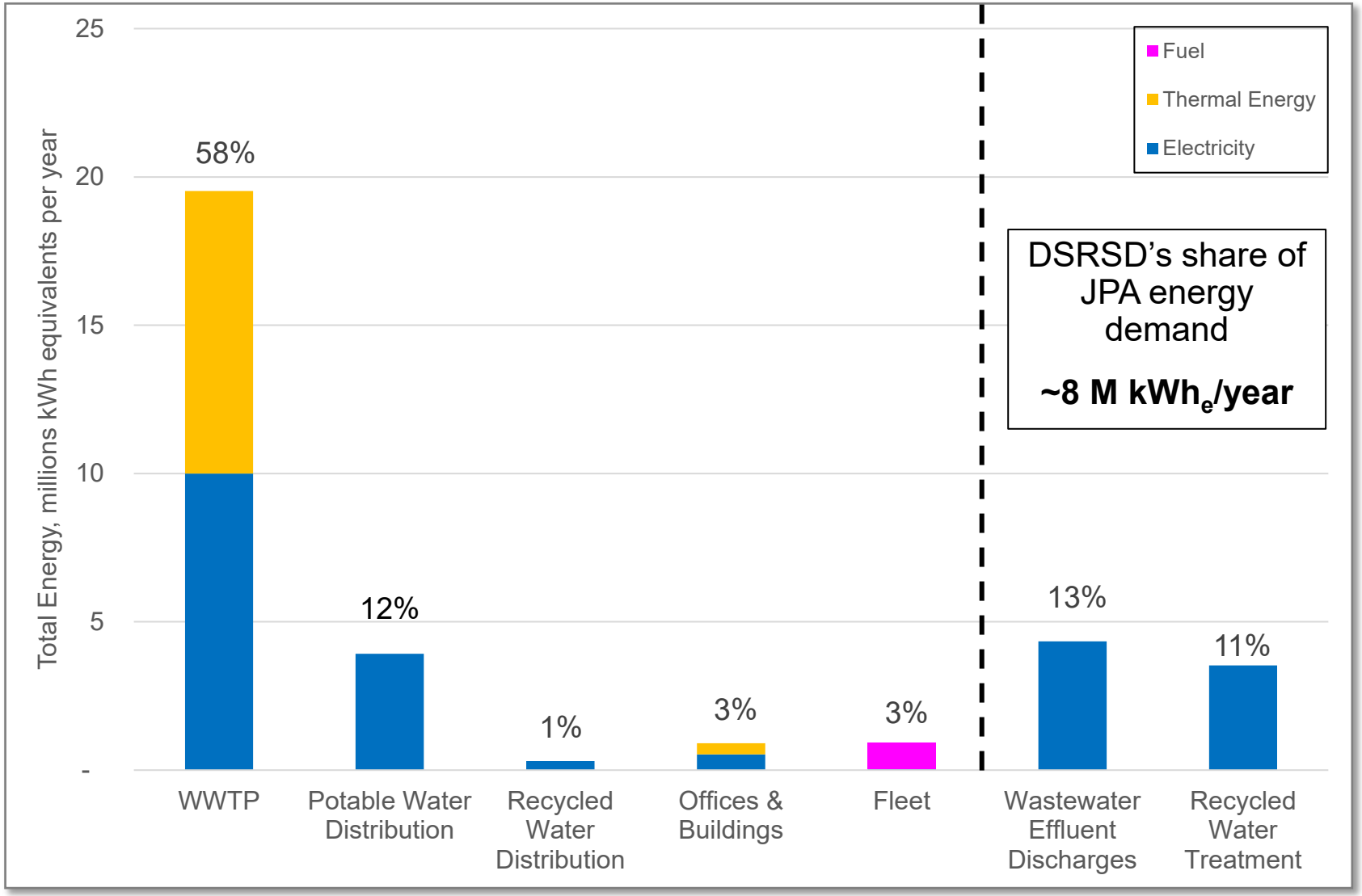


~5,000 Homes



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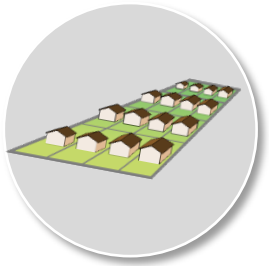
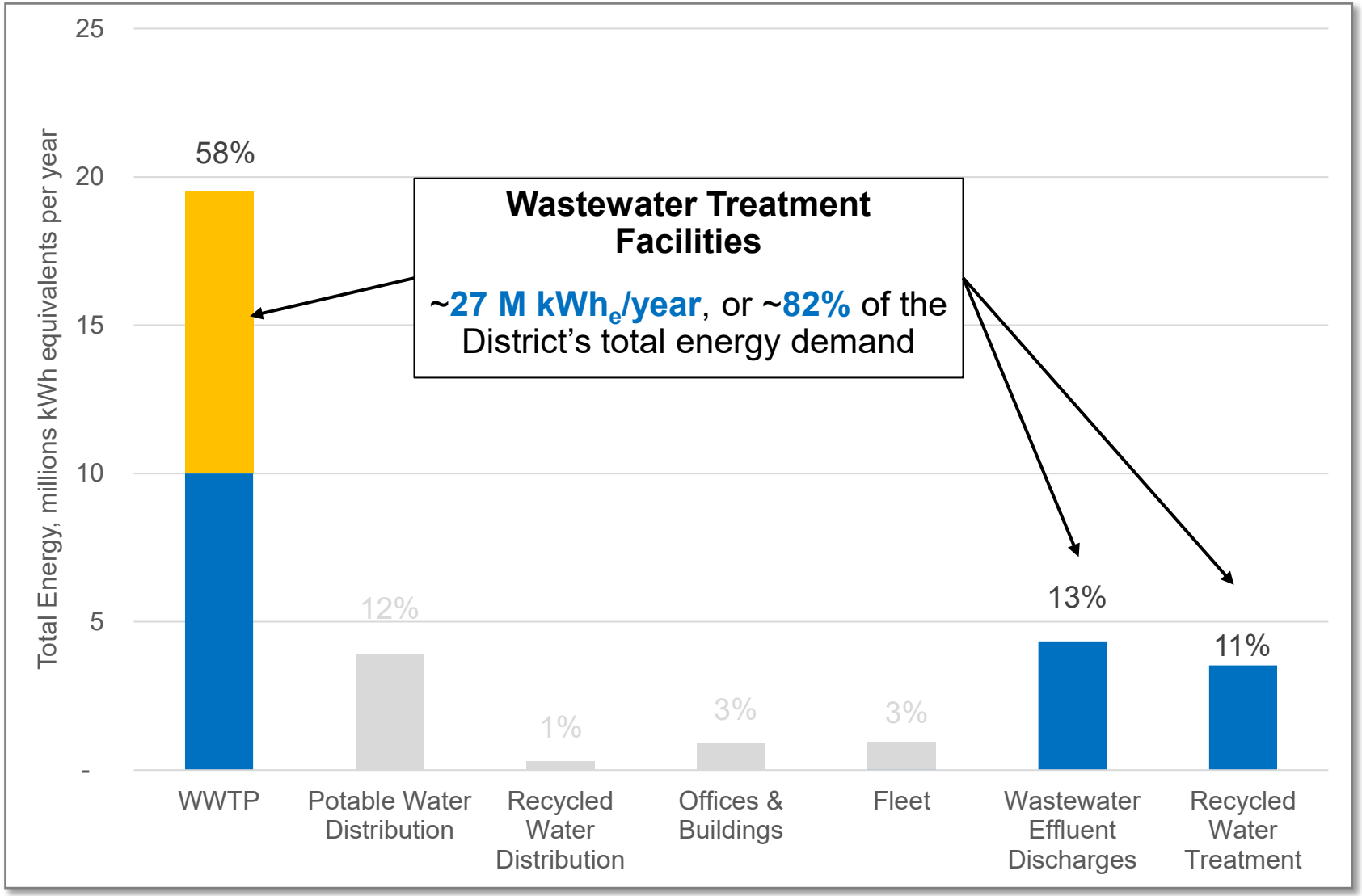


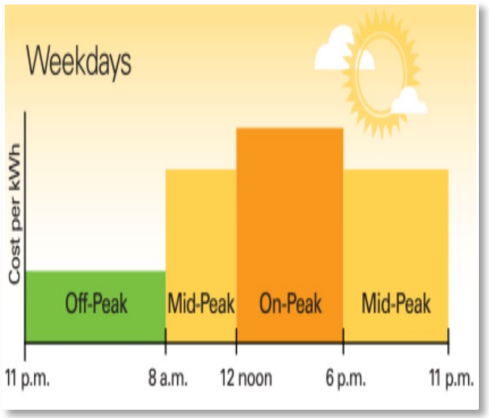
~5,000 Homes



// District's Historical Commitment to Energy Demand Management

Biosolids disposal
at the FSLs and DLDs
is highly energy efficient

Operational improvements and **optimization**

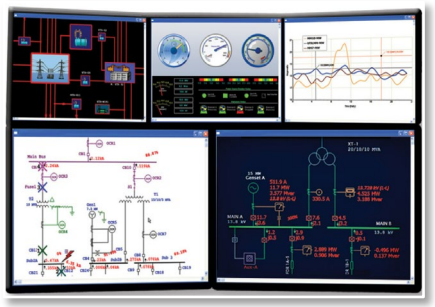


Point-of-Use pumping in the **water distribution system** has reduced electricity costs

Invested into more **energy-efficient buildings**

Alternative energy

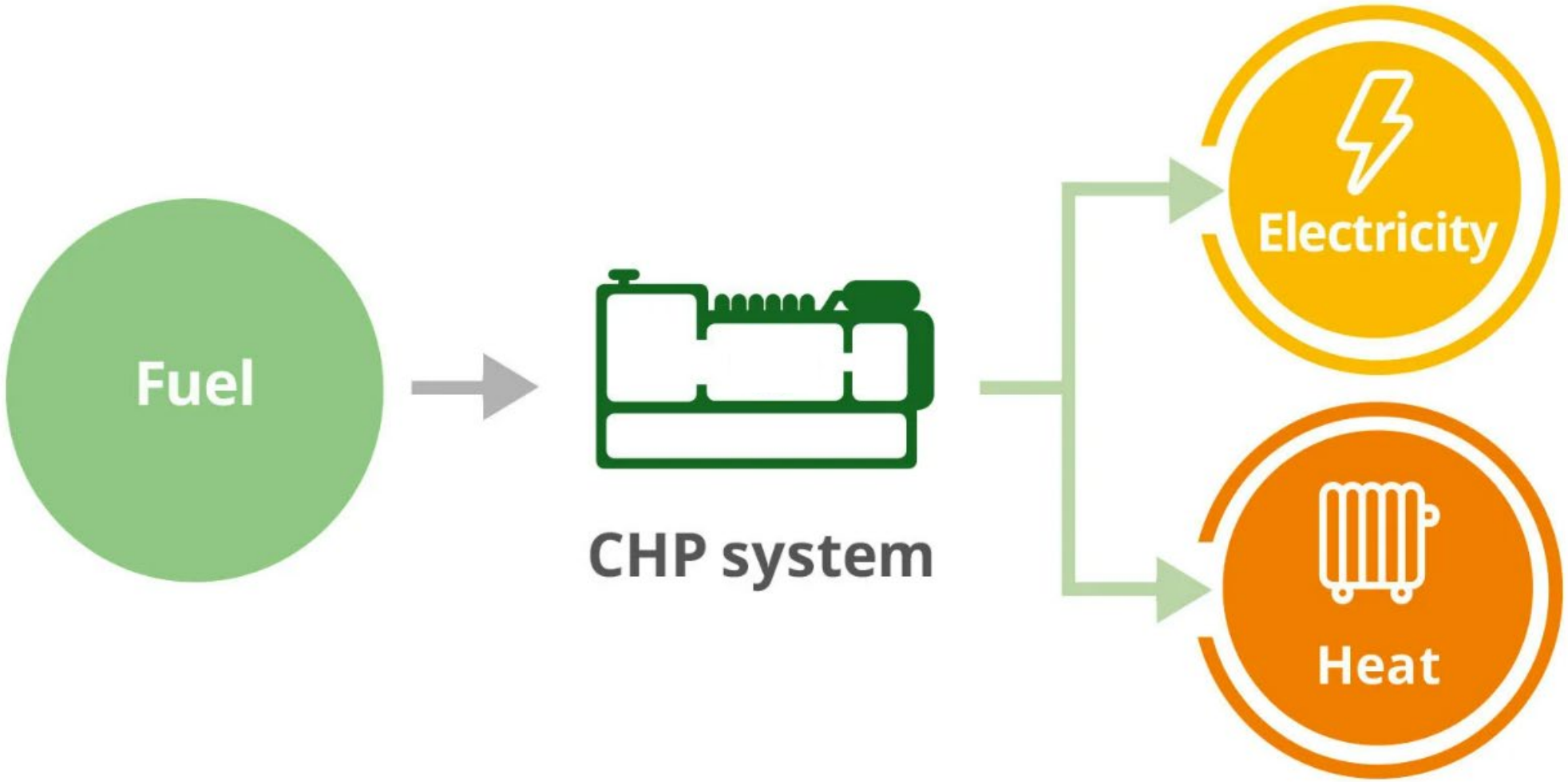
Fleet Management



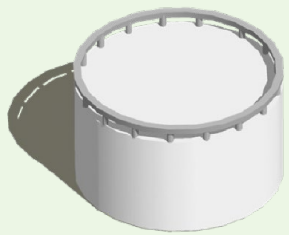
Technology
Power monitoring

Energy Generation

// Cogeneration (Combined Heat and Power)



// Energy Generation and Heat Recovery thru Cogeneration



Anaerobic Digester

Biogas

Natural Gas

Pacific Gas and Electric

Cogeneration

Electricity

~9.5 M kWh/yr

Energy recovery for WWTP Operation

Heat Energy

~325,000 therms/yr

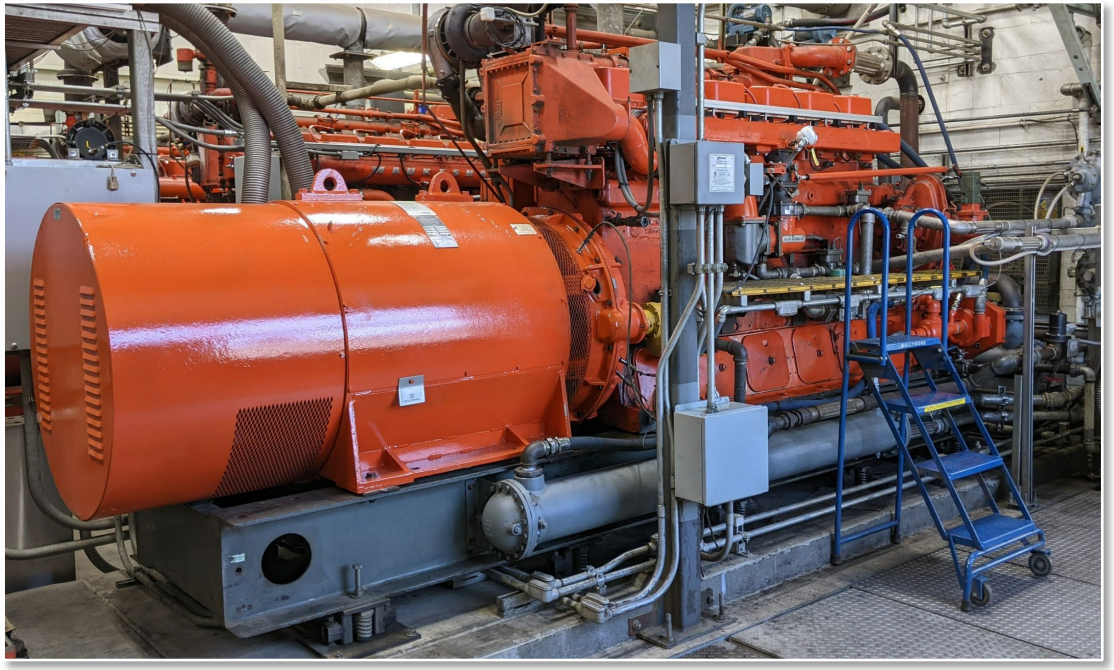
Energy Production: **9,500,000** kWh/year

Heat Recovery: Provides nearly all the thermal energy requirements for the WWTP

// Energy Generation and Heat Recovery thru Cogeneration

- **Fuels**: Biogas (**40%**) and Natural Gas (**60%**)
- **Energy Production**: ~**9,500,000** kWh/year
- **Heat Recovery**: ~**325,000** therms/year
- **Energy Savings**

PG&E Electricity	Cogeneration Biogas	Cogeneration PG&E Natural Gas
$0.22 per kWh	$0.04 per kWh	$0.10 per kWh



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- **Energy Savings**
  - Biogas: **>80% cost savings** vs. PG&E

PG&E Electricity	Cogeneration: Fueled w/ Biogas	Cogeneration: Fueled w/ PG&E NG
$0.22 per kWh	**$0.04** per kWh	$0.10 per kWh

Electricity Generated Using Biogas

Estimated Savings of ~$700,000 per year (>80% savings)

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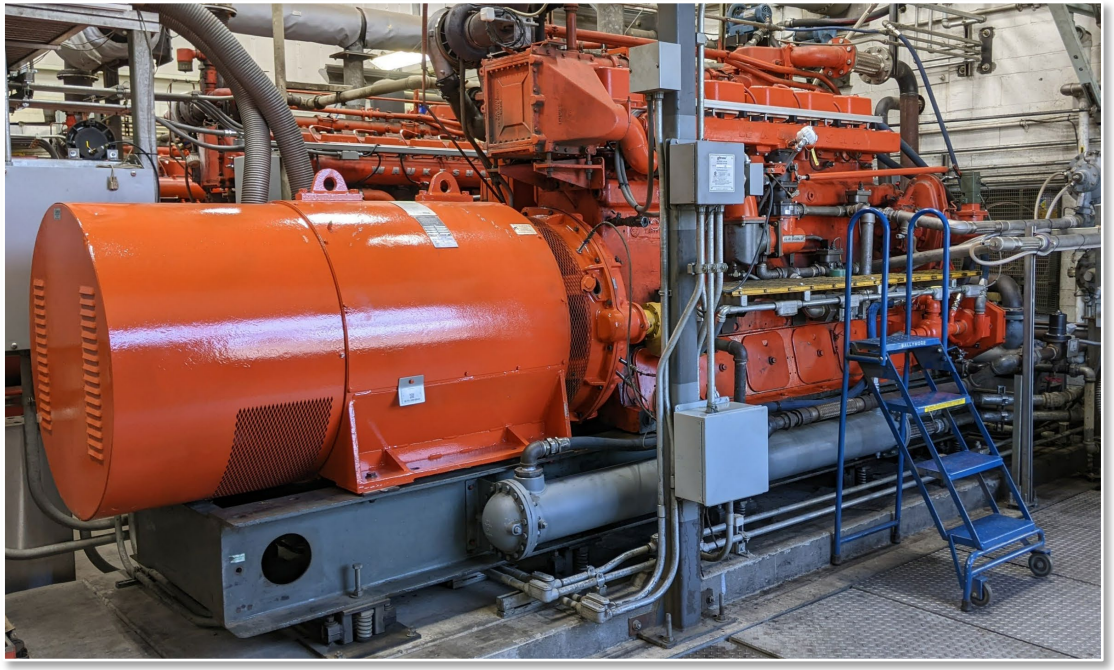
- **Energy Savings**
  - Biogas: >80% cost savings vs. PG&E
  - Natural Gas: **>50% cost savings** vs. PG&E



PG&E Electricity	Cogeneration: Fueled w/ Biogas	Cogeneration: Fueled w/ PG&E NG
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Electricity Generated Using Natural Gas

Estimated Savings of ~$700,000 per year (>50% savings)

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- **Energy Savings**
  - Biogas: >80% cost savings vs. PG&E
  - Natural Gas: >50% cost savings vs. PG&E
  - Combined: **>65% cost savings** vs. PG&E

PG&E Electricity	Cogeneration: Fueled w/ Biogas + PG&E Natural Gas
$0.22 per kWh	**$0.08** per kWh

Cogeneration System - Total

Estimated Savings of ~$1,400,00 per year (~65% savings)

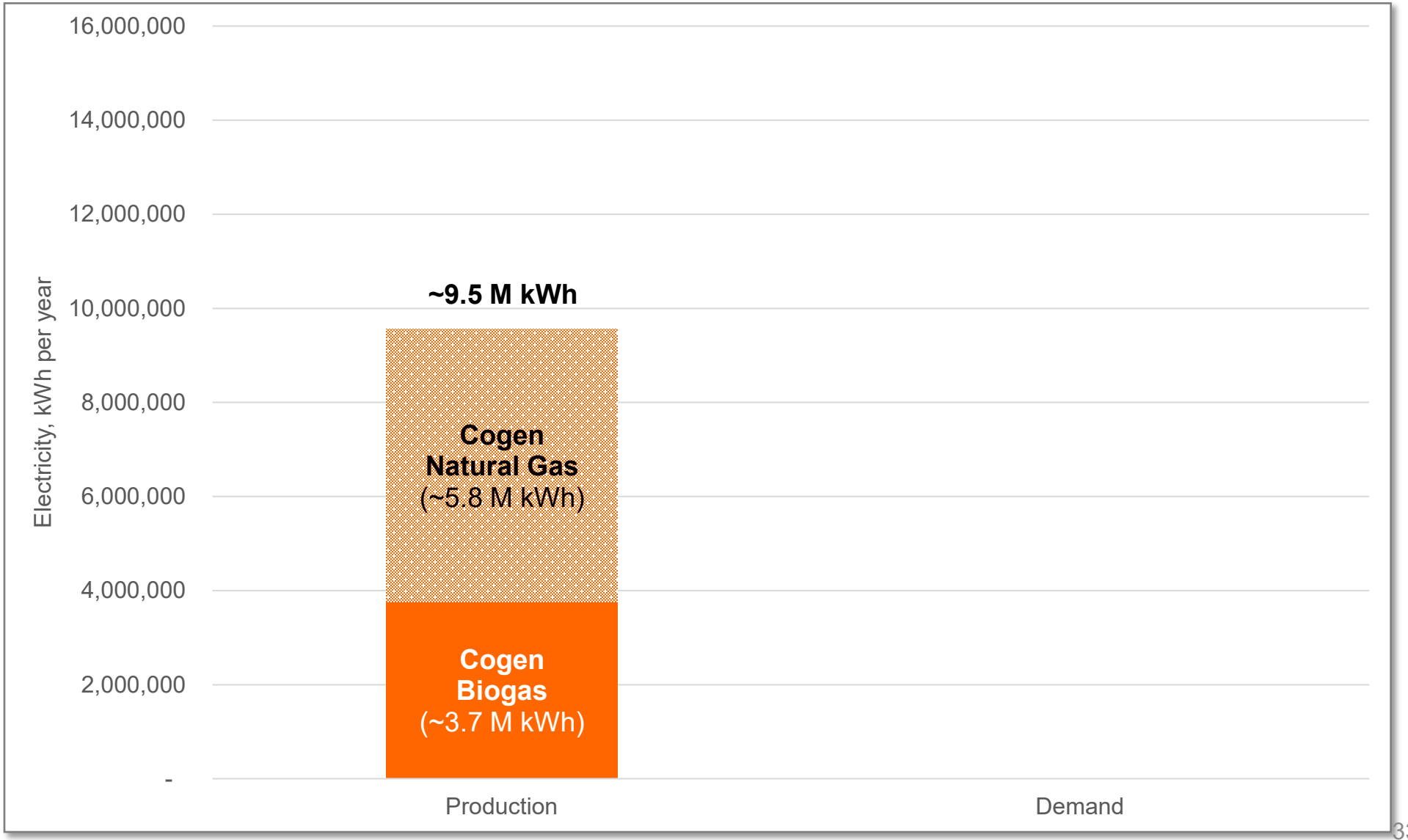
// Electrical Generation vs. Electrical Demand

// Electrical Generation vs. Electrical Demand

In 2021, approximately **9.5 M kWh** of electrical energy was generated through the WWTP cogeneration system.

Biogas generates approximately **3.7 M kWh**.

Natural gas generates approximately **5.8 M kWh**.



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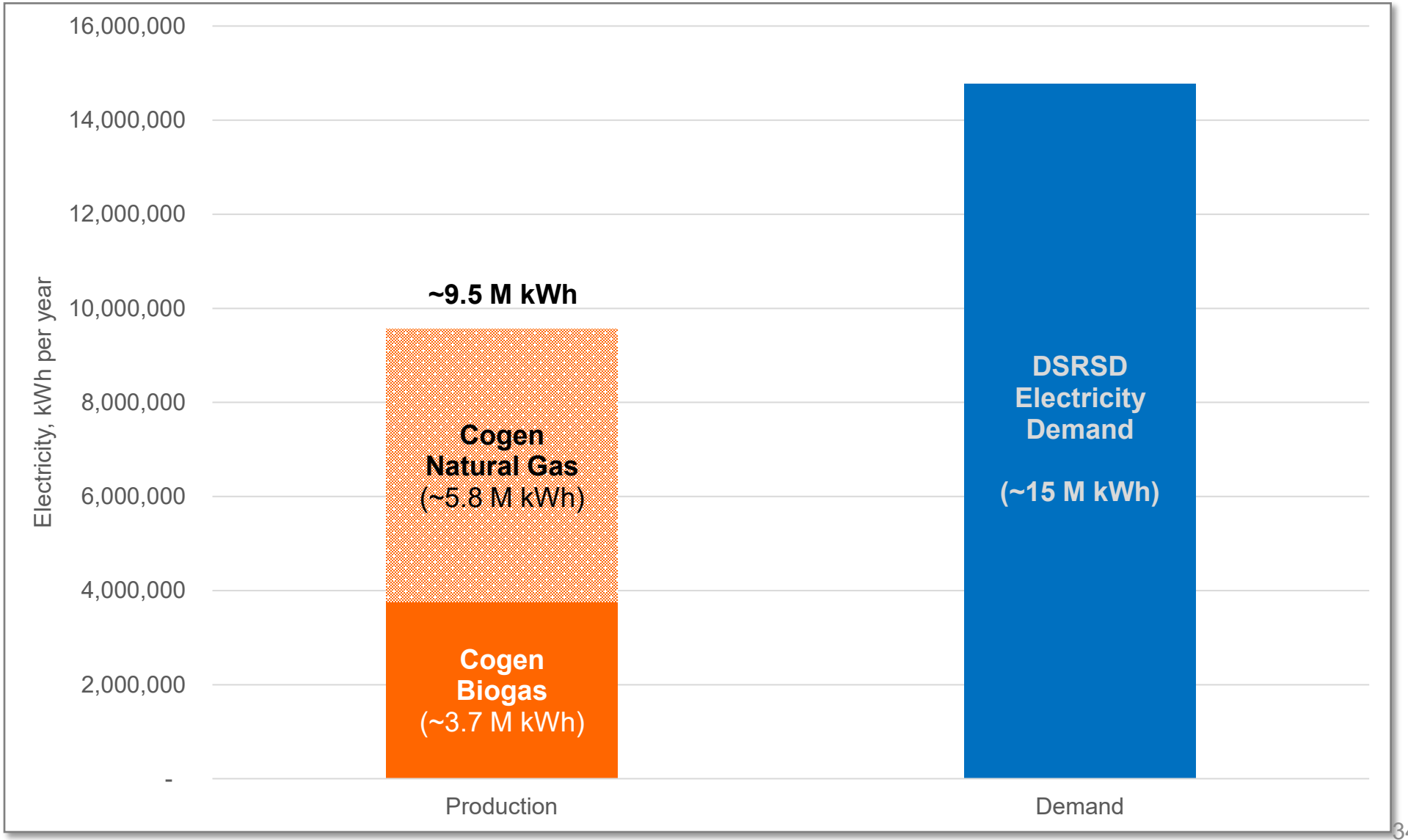

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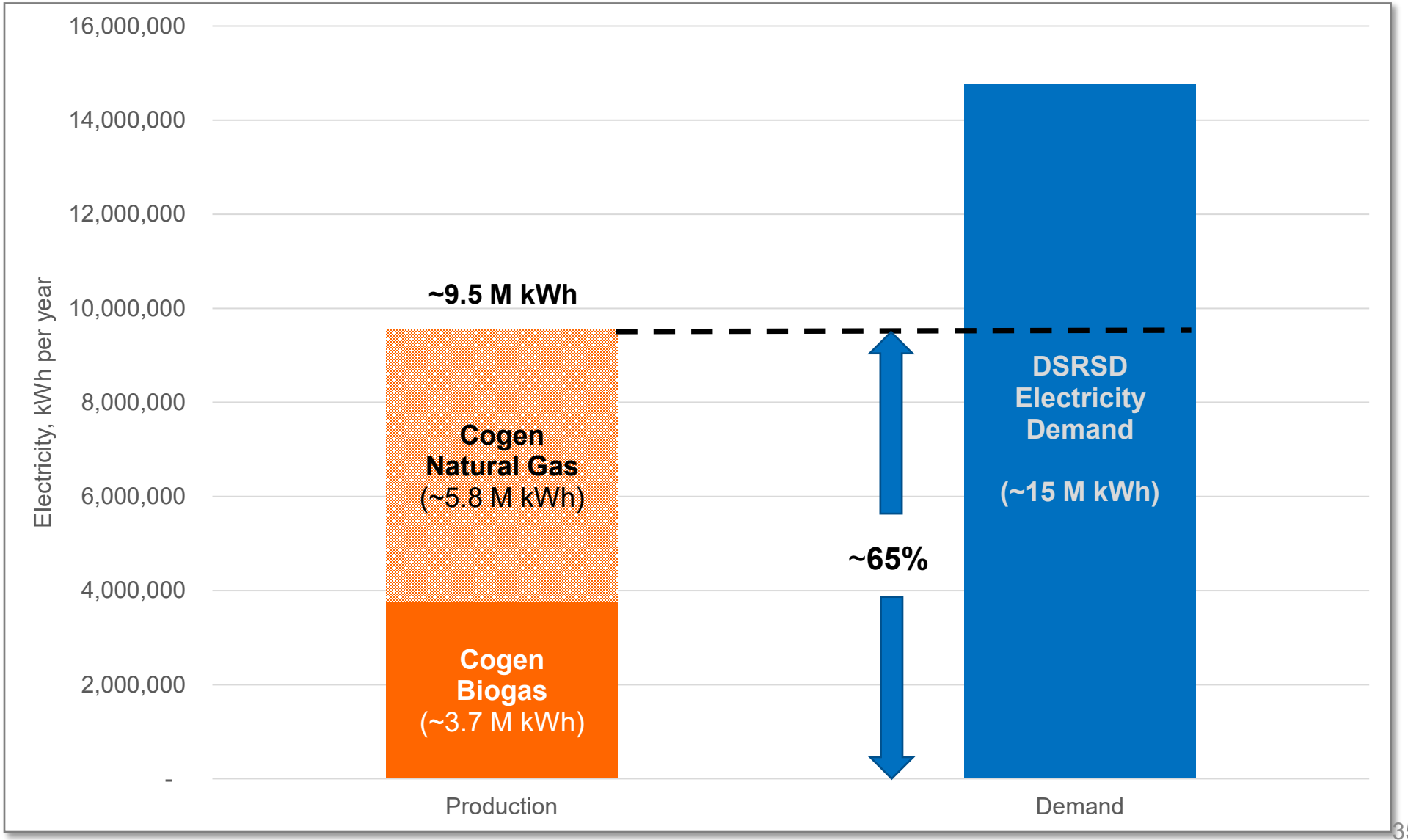
In total, cogeneration generates approximately **65%** of the District's electrical demands



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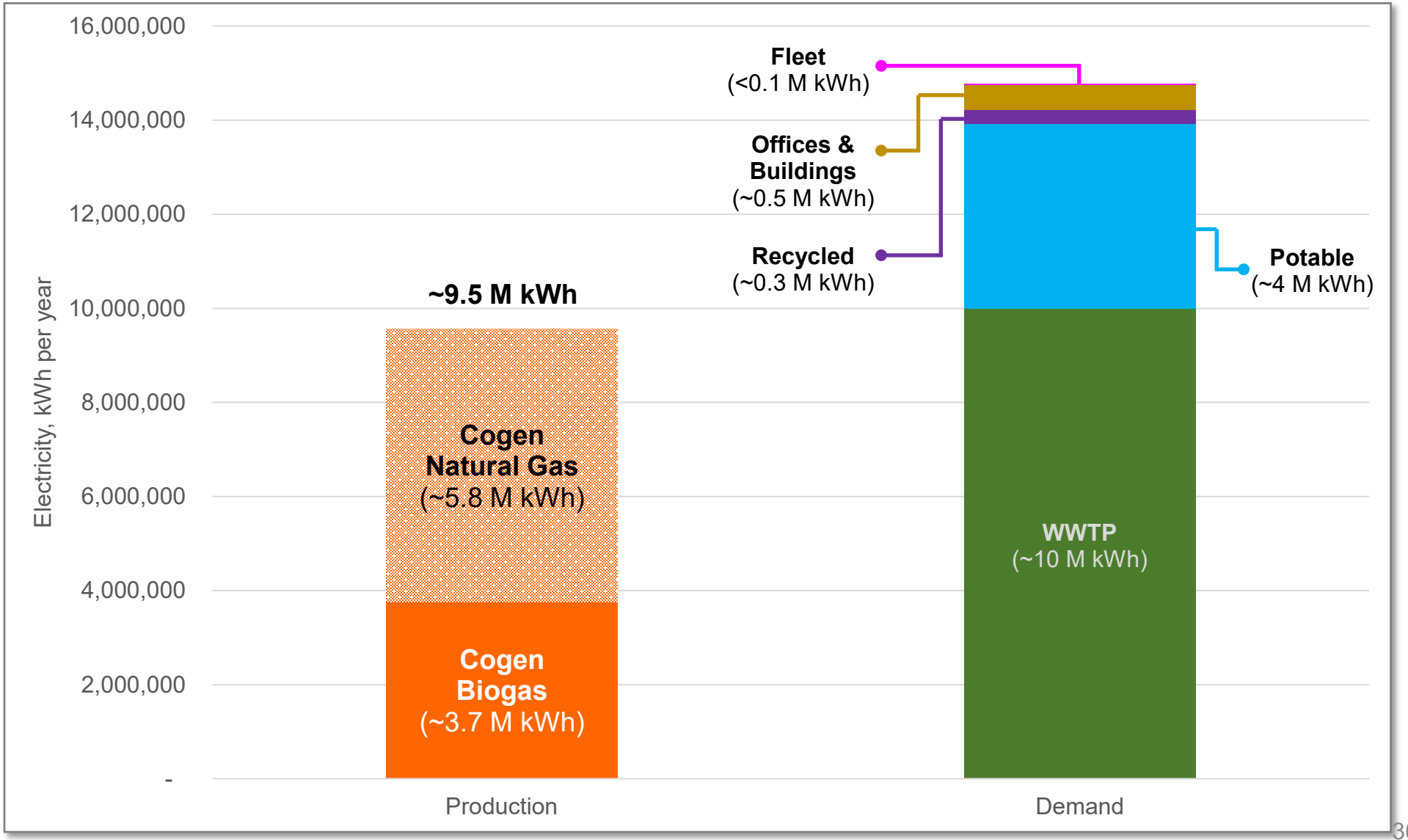

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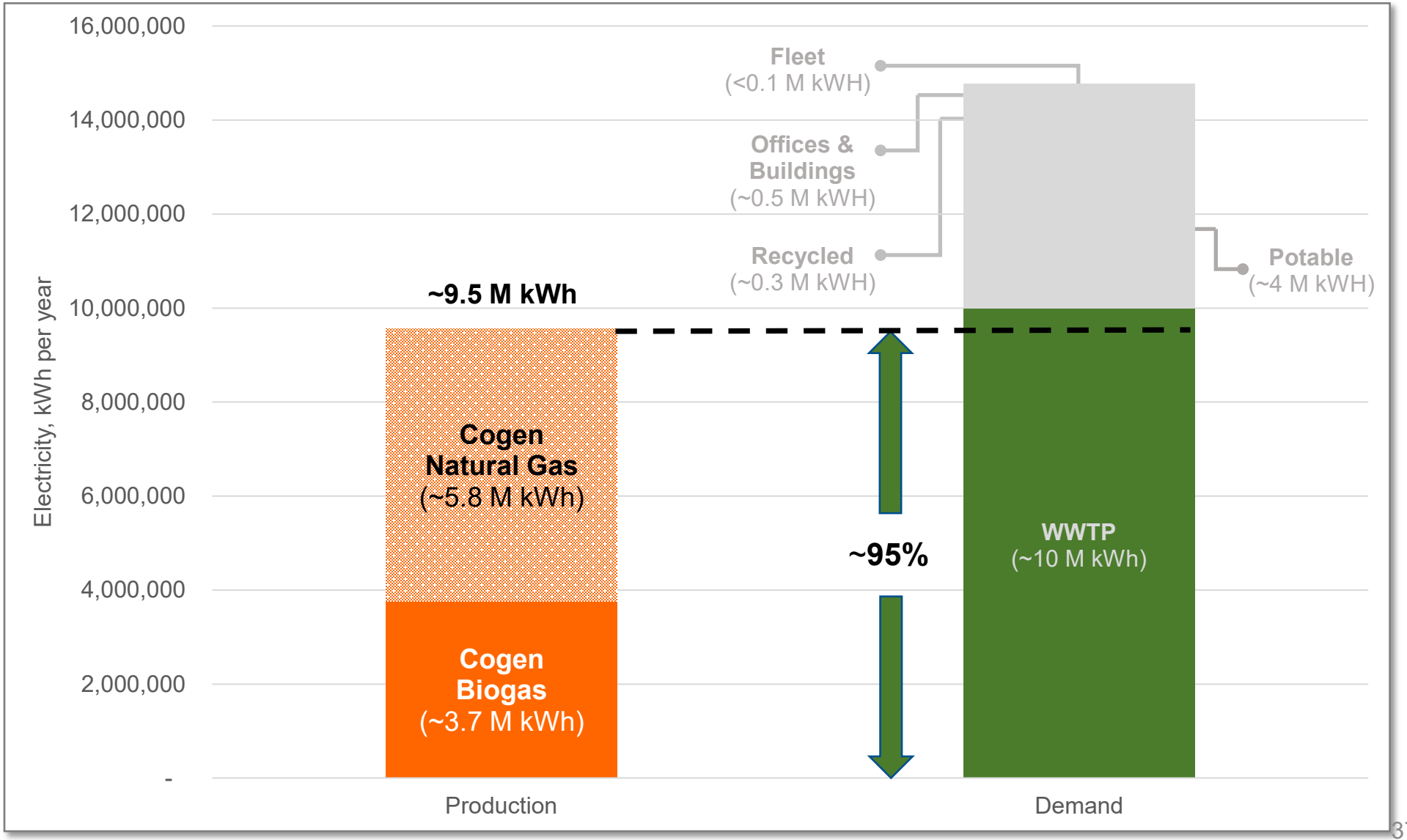
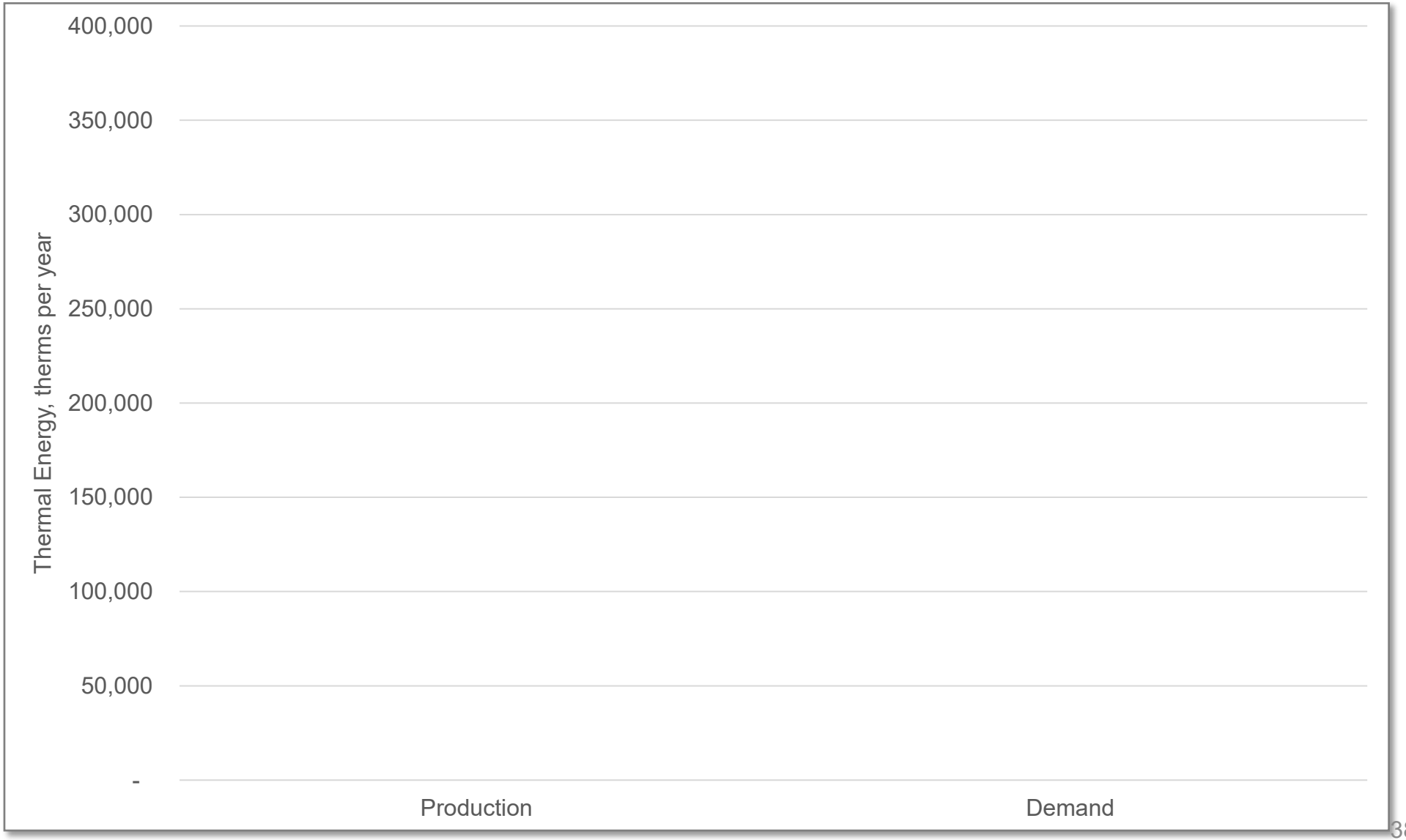
In total, cogeneration generates approximately 65% of the District's electrical demands

Cogeneration generates approximately **95%** of the electrical demands of the WWTP



// Heat Recovery vs. Thermal Demand



// Heat Recovery vs. Thermal Demand

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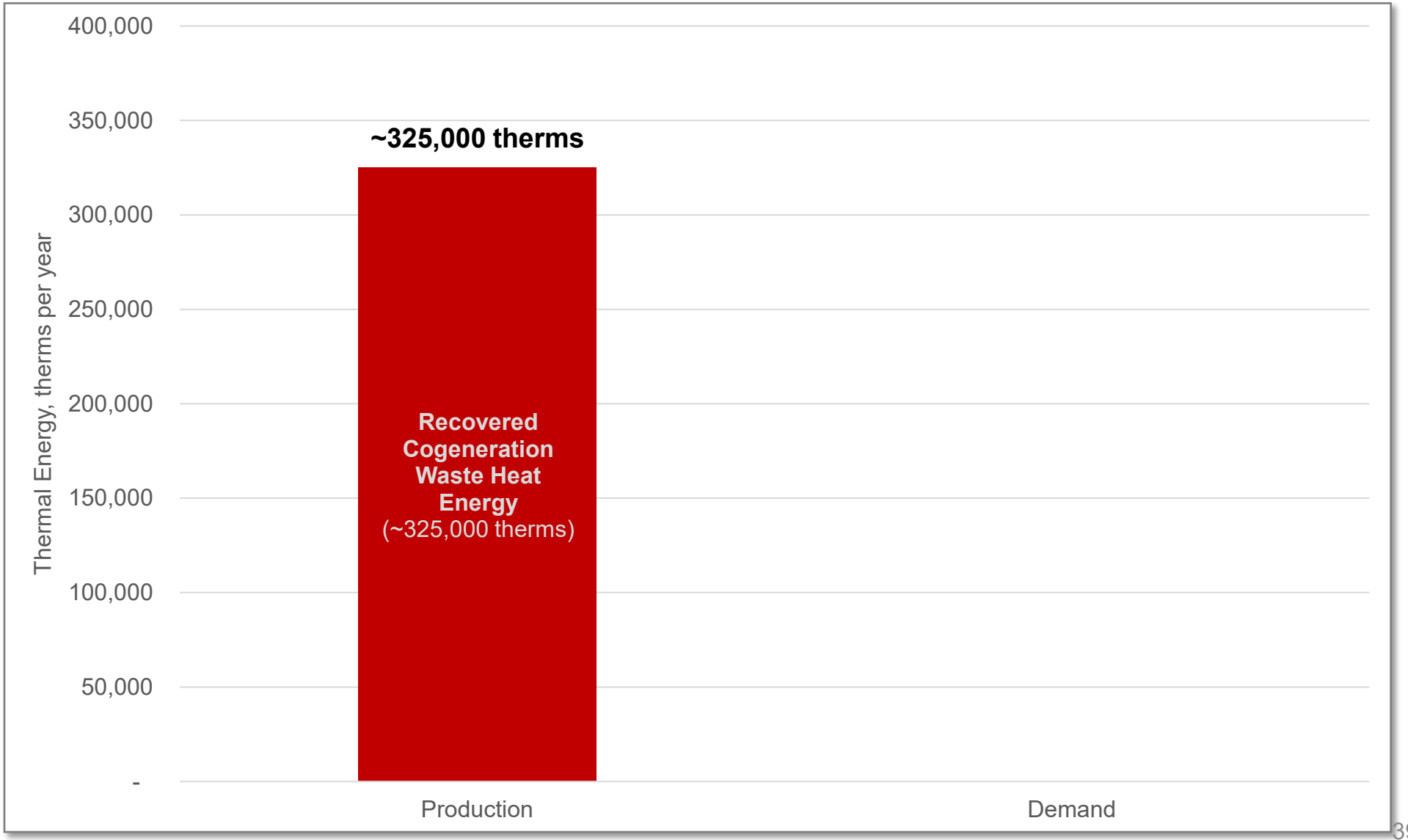
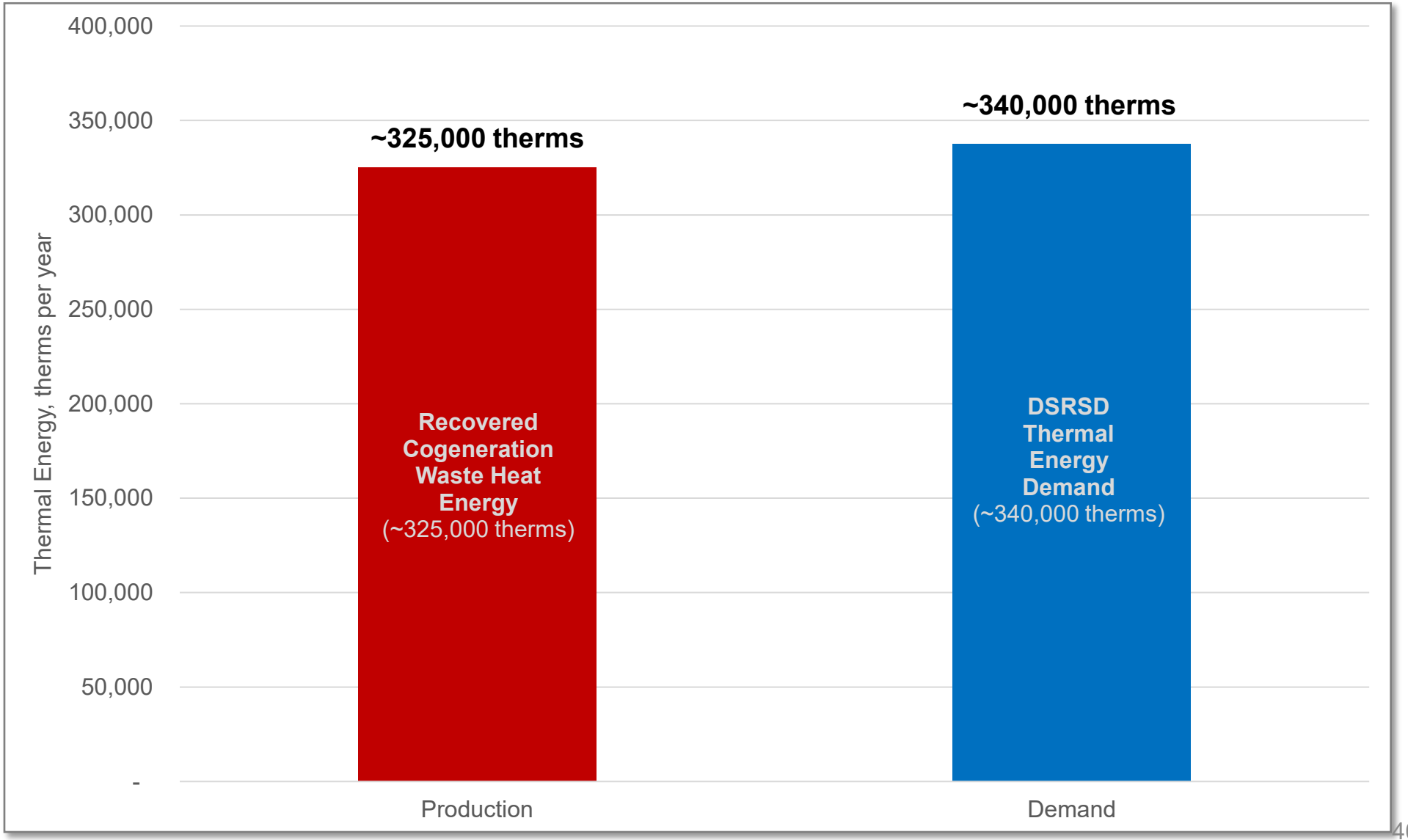


// Heat Recovery vs. Thermal Demand

325,000 therms is recovered from the cogeneration system and is used to meet the thermal demands for the **anaerobic digesters** and **heating/cooling for WWTP buildings**



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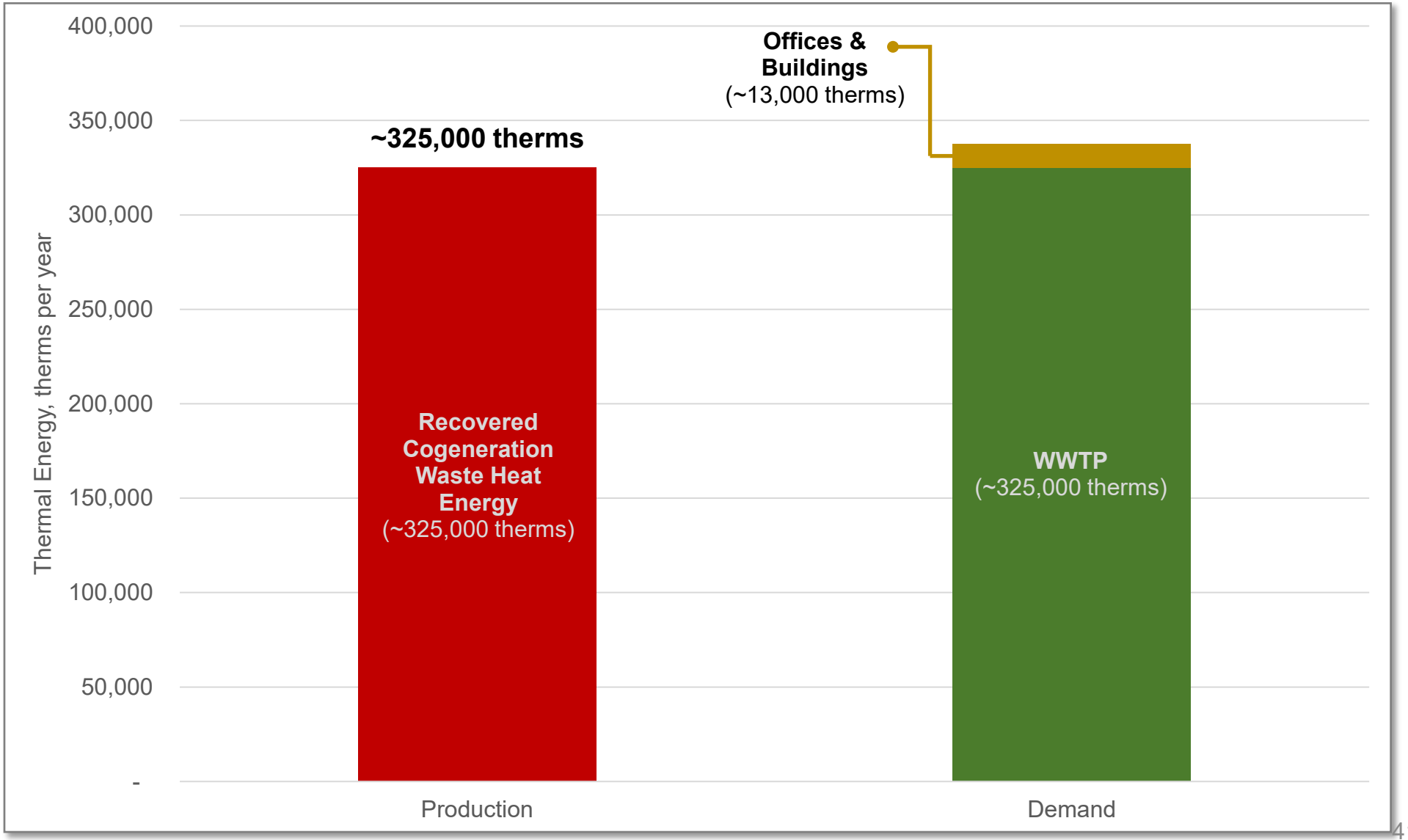
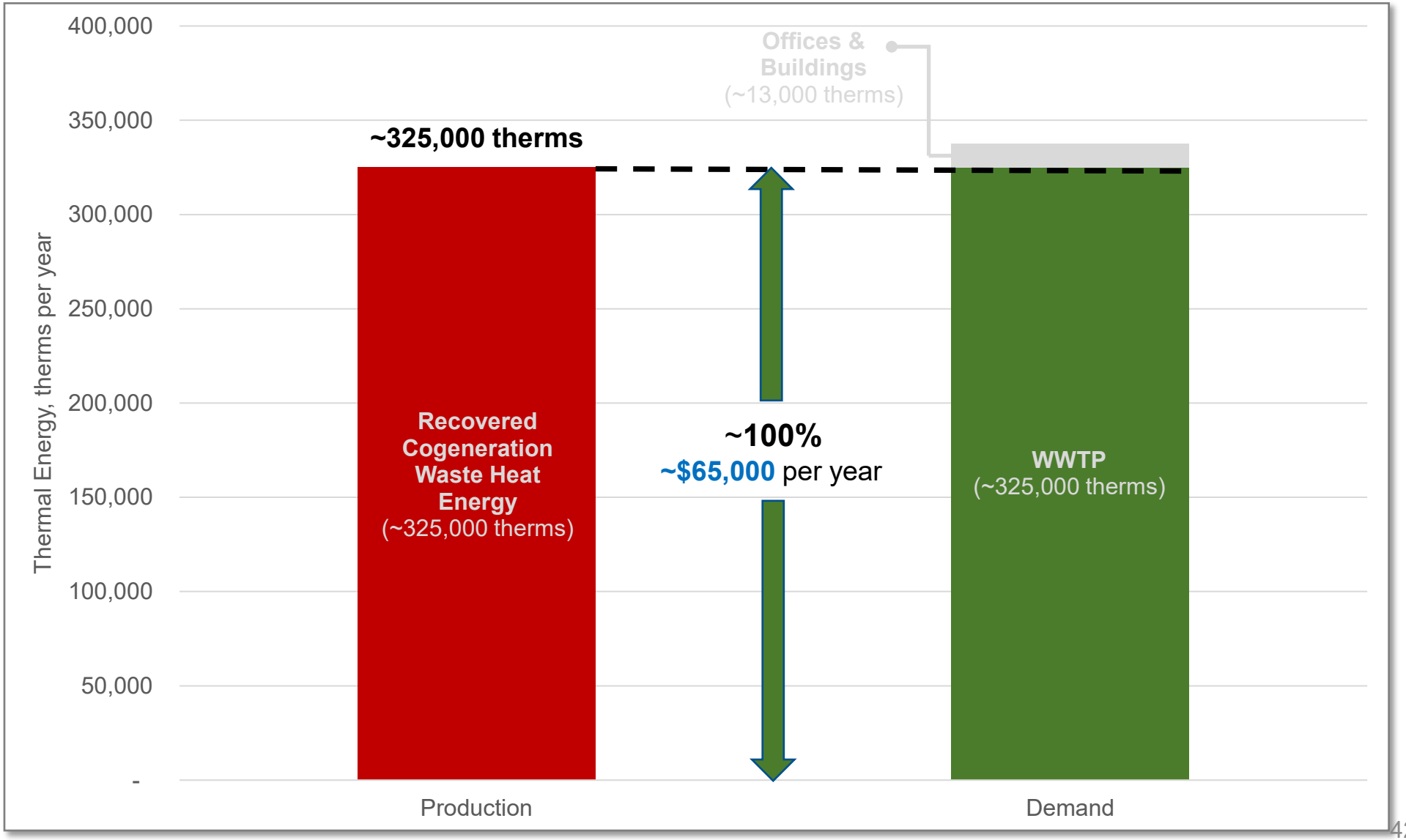


// Heat Recovery vs. Thermal Demand

325,000 therms is recovered from the cogeneration system and is used to meet the thermal demands for the **anaerobic digesters** and **heating/cooling for WWTP buildings**

Cogeneration meets nearly **100%** of the thermal energy demands of the WWTP

Estimated energy savings: **$65,000** per year



// Recent WWTP improvements will increase biogas production

Fourth Anaerobic Digester

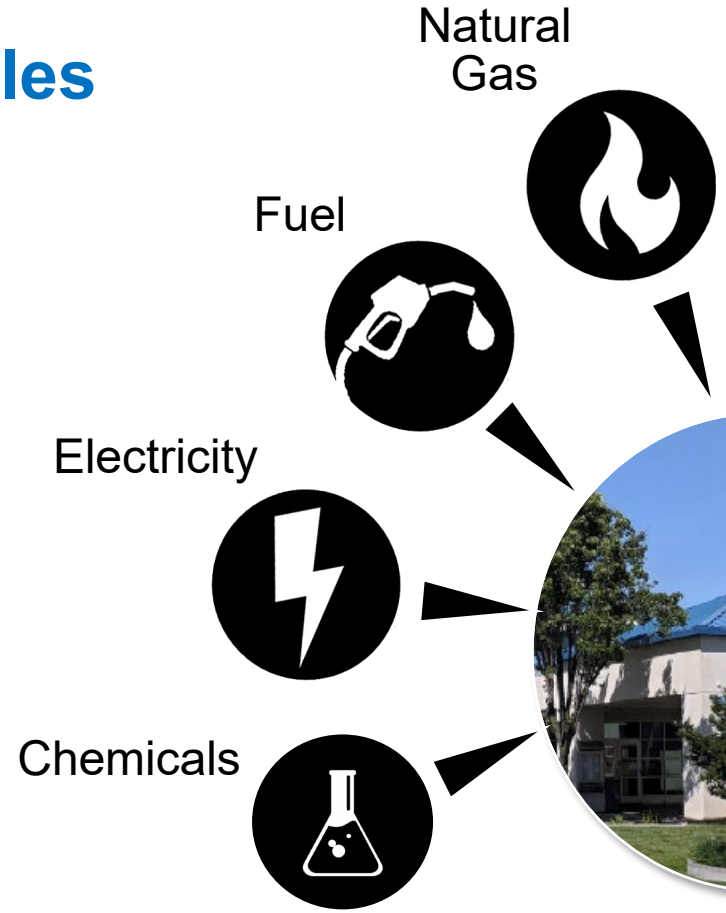
FOG Receiving Station

Primary Clarifier Addition

Greenhouse Gas (GHG) Emissions

// Defining "Greenhouse Gas Emissions"

Consumables



Greenhouse Gas Emissions

Carbon Dioxide (CO_2)

Methane (CH_4) 25

Nitrous Oxide (N_2O) 298

=

Carbon Dioxide Equivalent (CO_{2e})

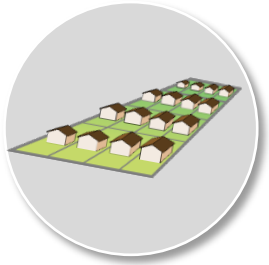
Dublin San Ramon Services District
Water, wastewater, recycled water

// GHG Emissions

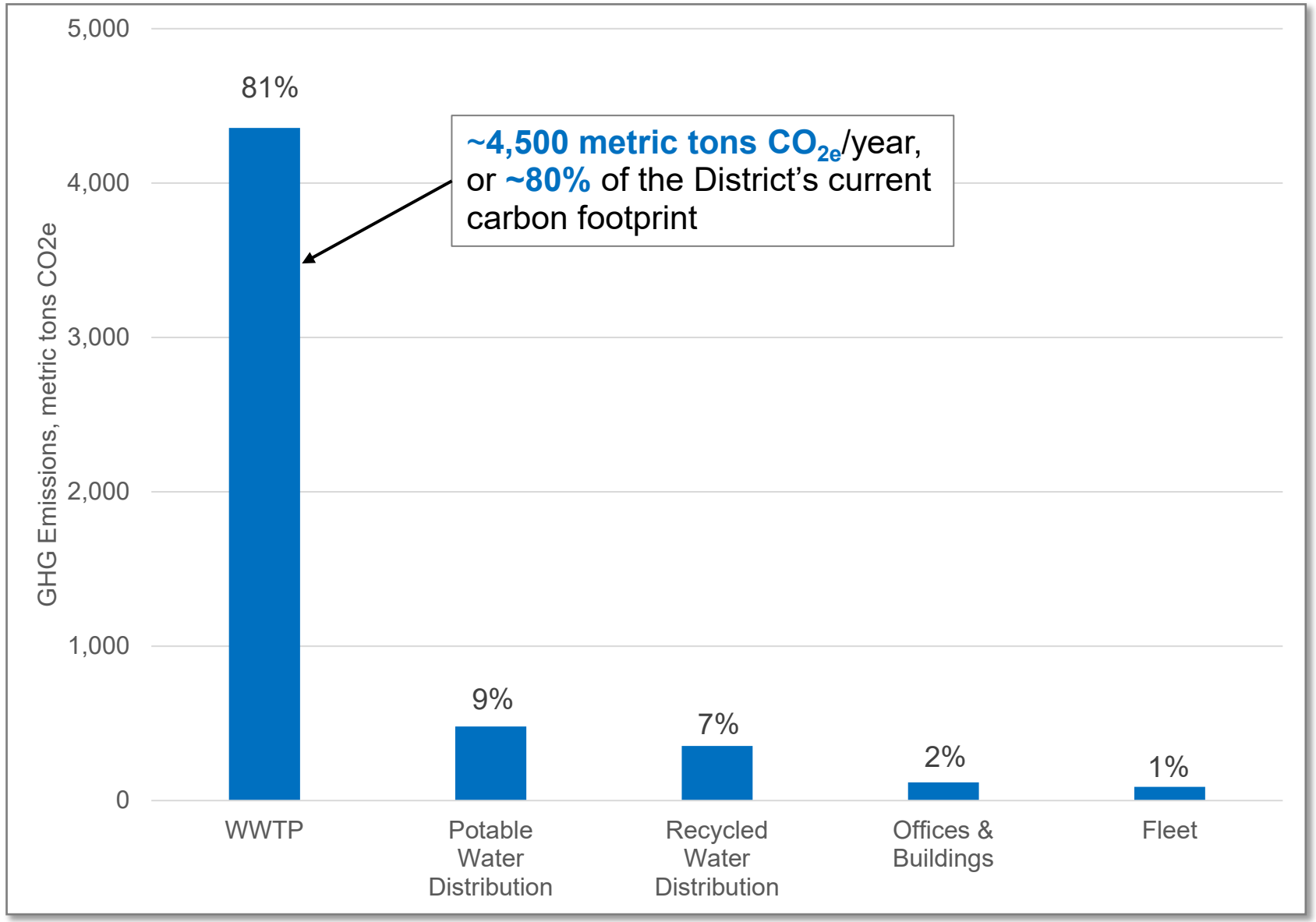
Total GHG Emissions:

~5,500 metric tons CO_{2e}/year

=



~175 homes

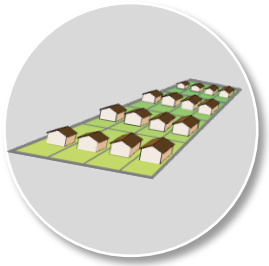


// GHG Emissions (including LAVWMA & DERWA)

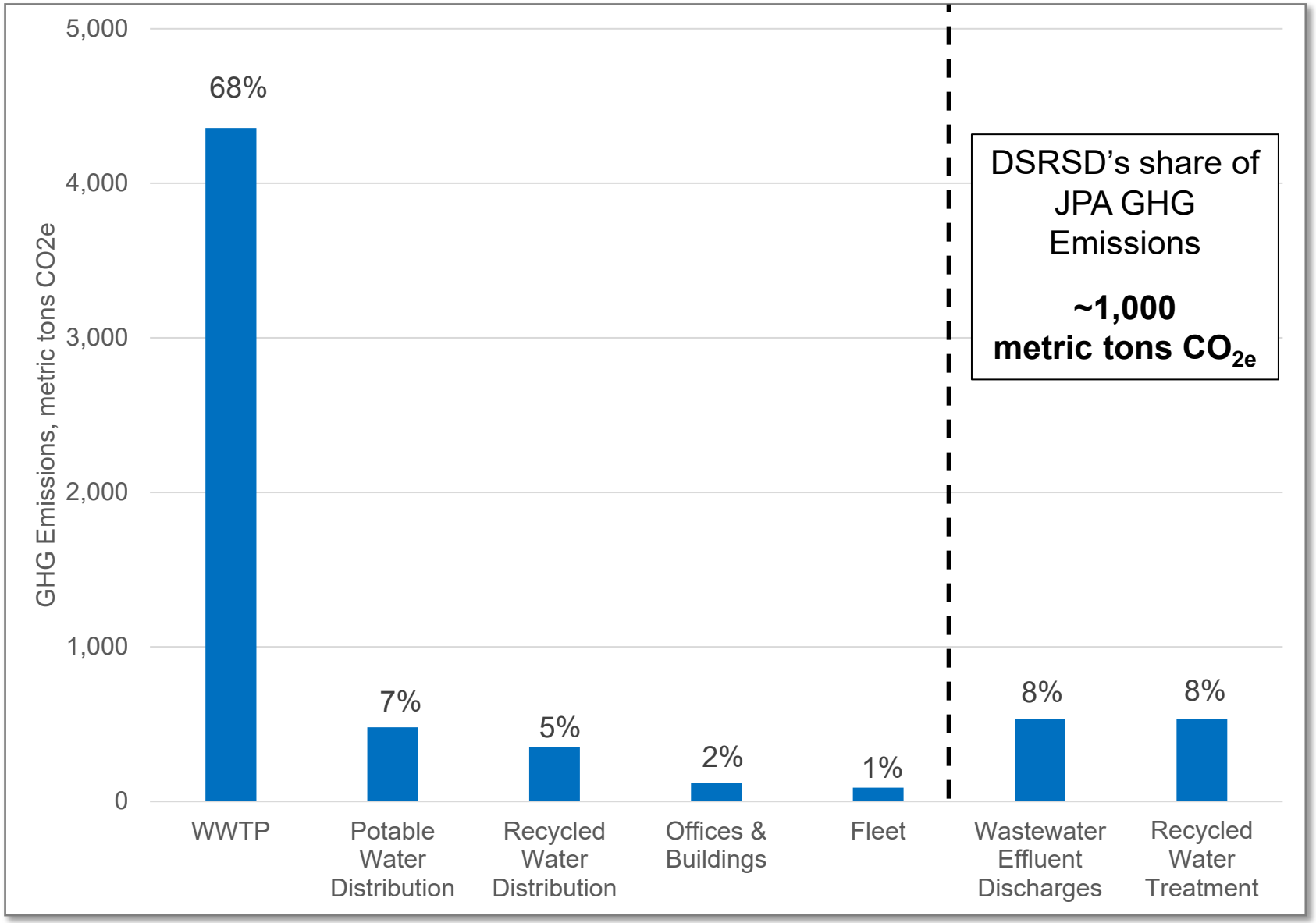
Total GHG Emissions:

~6,500 metric tons CO_{2e}/year

=



~200 homes

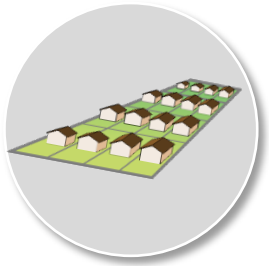


// GHG Emissions (including LAVWMA & DERWA)

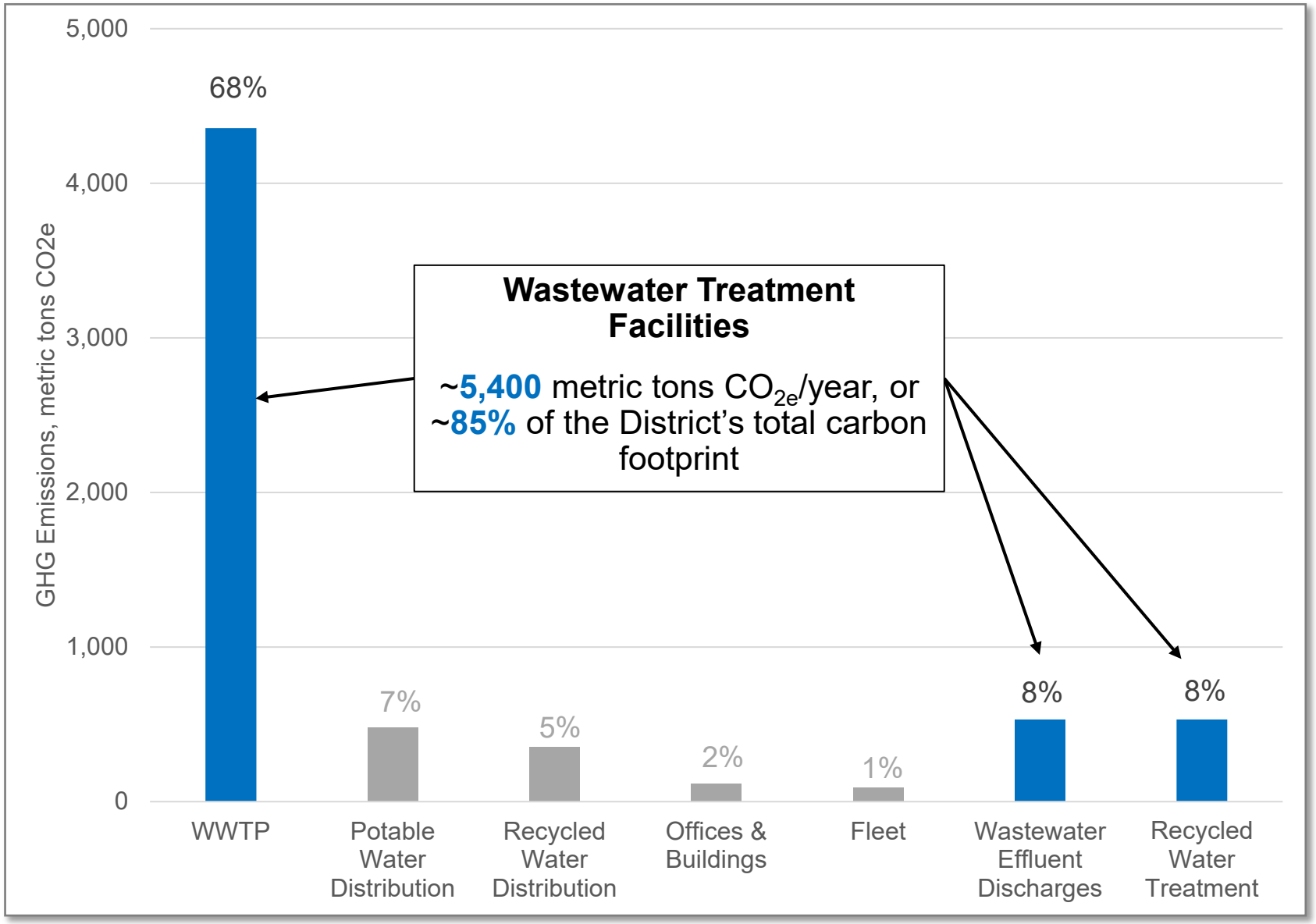
Total GHG Emissions:

~6,500 metric tons CO_{2e}/year

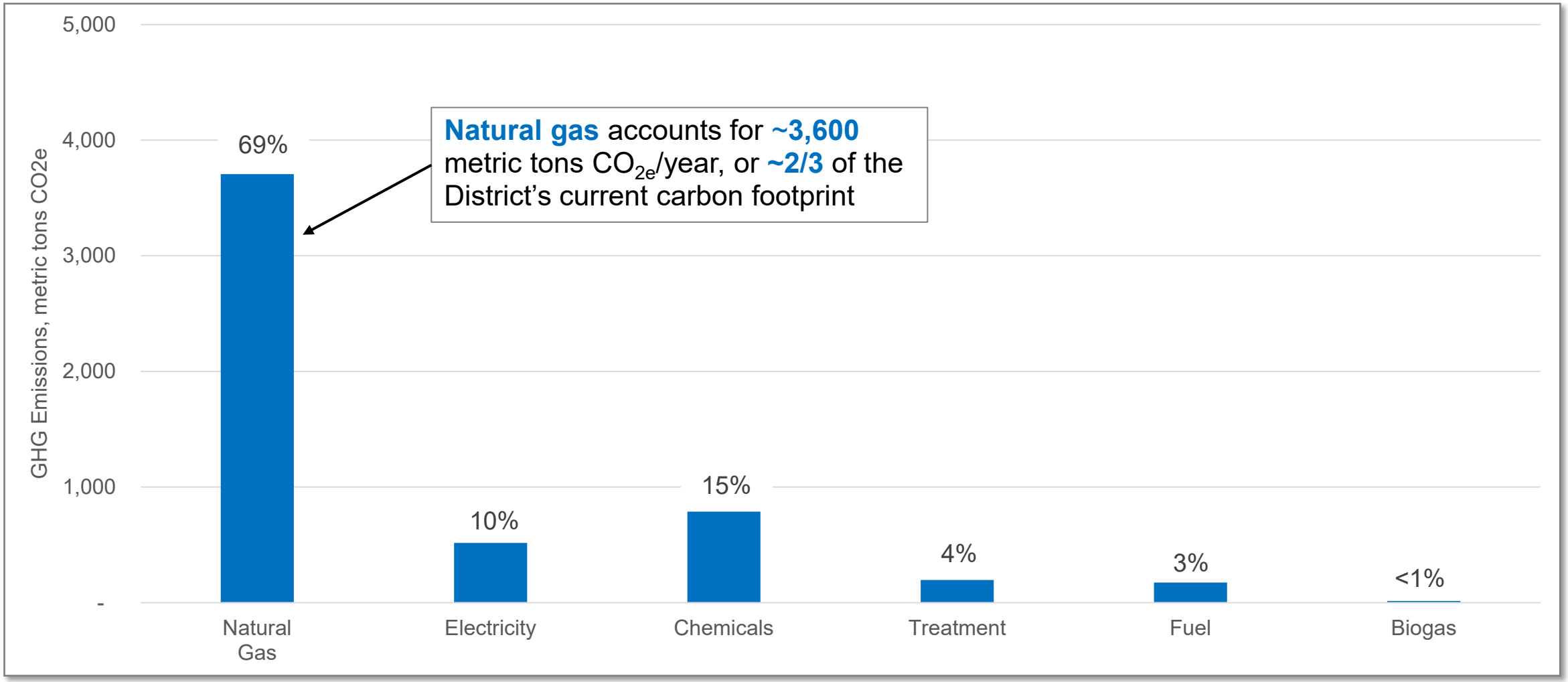
=



~200 homes



// GHG Emissions, by consumable



Cogen using Biogas	Cogen using PG&E NG	PG&E
2 g CO_2/kWh	542 g CO_2/kWh	73 g CO_2/kWh

Baseline Energy and GHG Emissions
Summary of Findings

// Summary of Baseline Findings

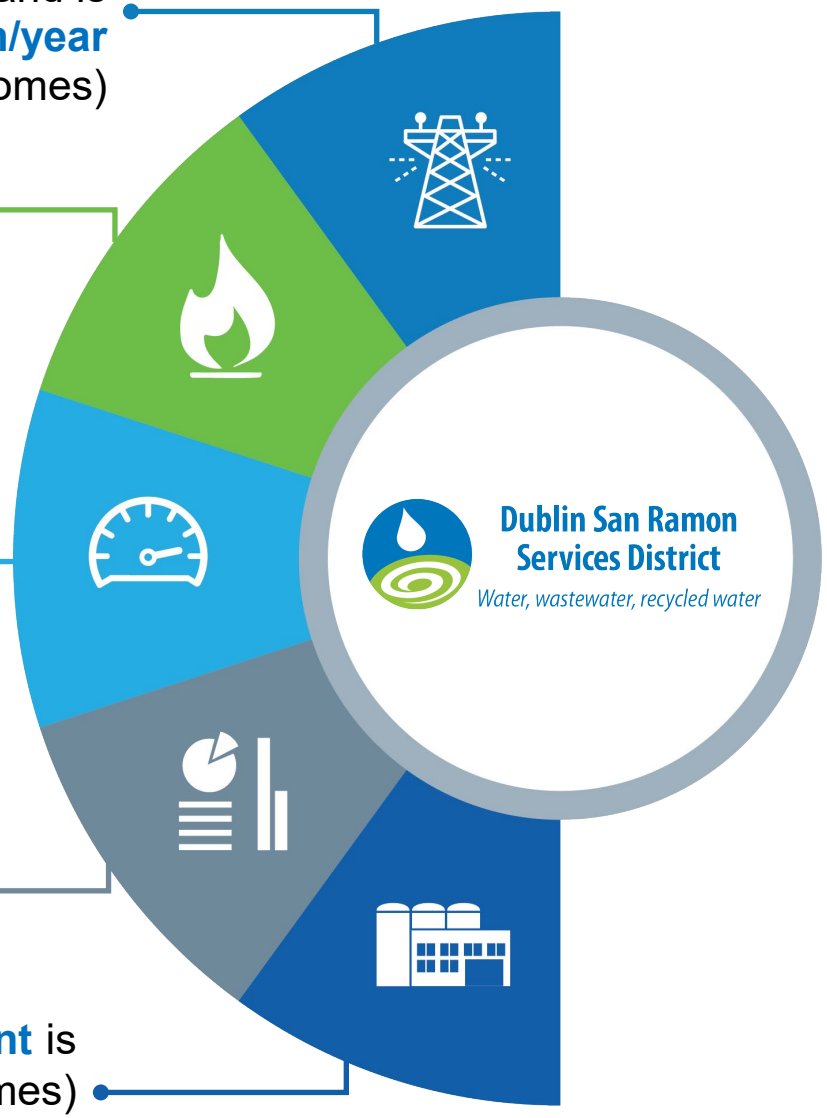
Electricity demand is **~15 M kWh/year** (~2,500 homes)

Thermal energy demand is **~340,000 therms/year** (~1,000 homes)

Fuel consumption is comparable to ~**60 vehicles** driven in the United States

~75% of the District's energy demands are associated with the operation of its **wastewater treatment facilities**

The District's GHG footprint is **~5,500** metric tons CO_{2e} (~175 homes)



95% of the power required for the WWTP is generated on-premise via the cogeneration system

Nearly **100%** of the thermal energy demands for the WWTP are met through thermal energy recovered from the on-premise cogeneration system

Questions and Break

Opportunities Assessment

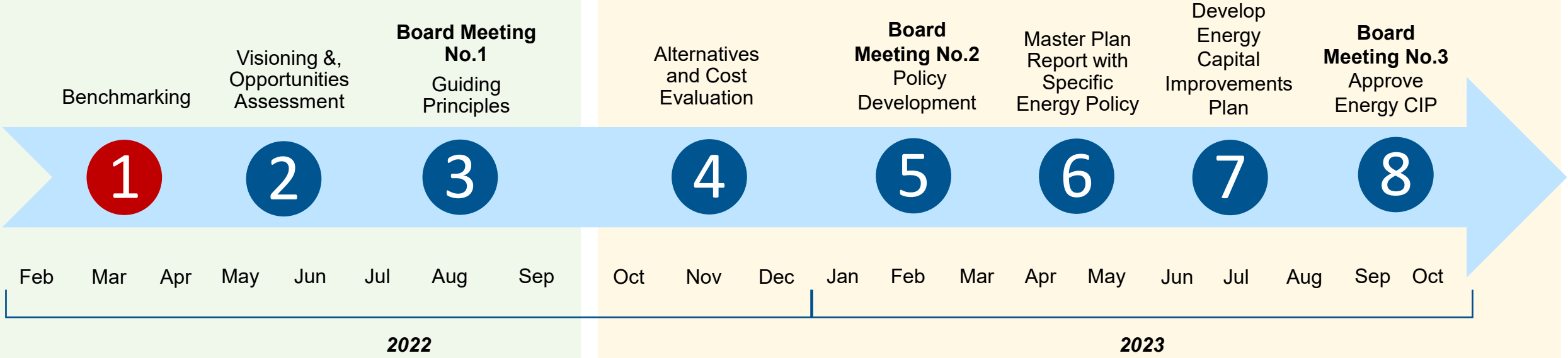
// Scope of Phase 1 and 2 of this planning project

Phase 1

State of the District Energy Baseline

Phase 2

Alternatives Evaluation and Prioritization



// Scope of Phase 1 and 2 of this planning project

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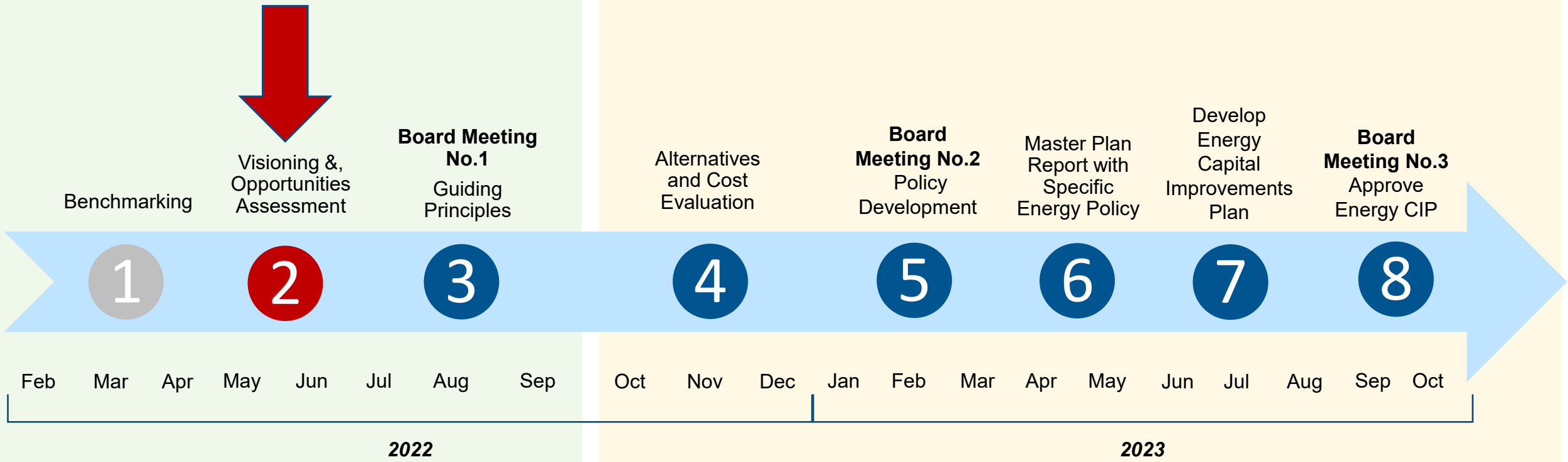
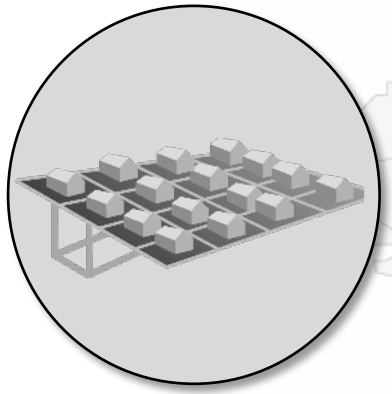
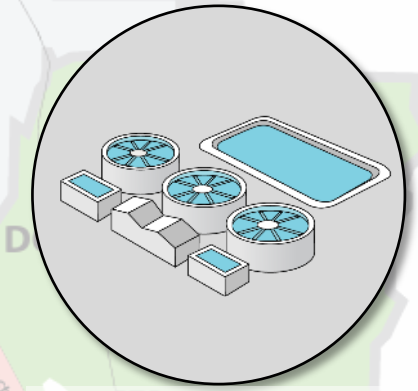
Alternatives Evaluation and Prioritization



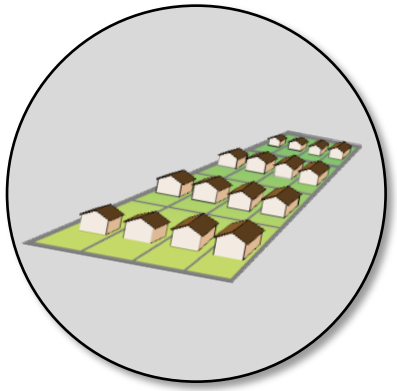
// Facilities included in the opportunities assessment



Wastewater Collection System



Wastewater Treatment Plant



Water Distribution System

Recycled Water Treatment & Distribution (DERWA)

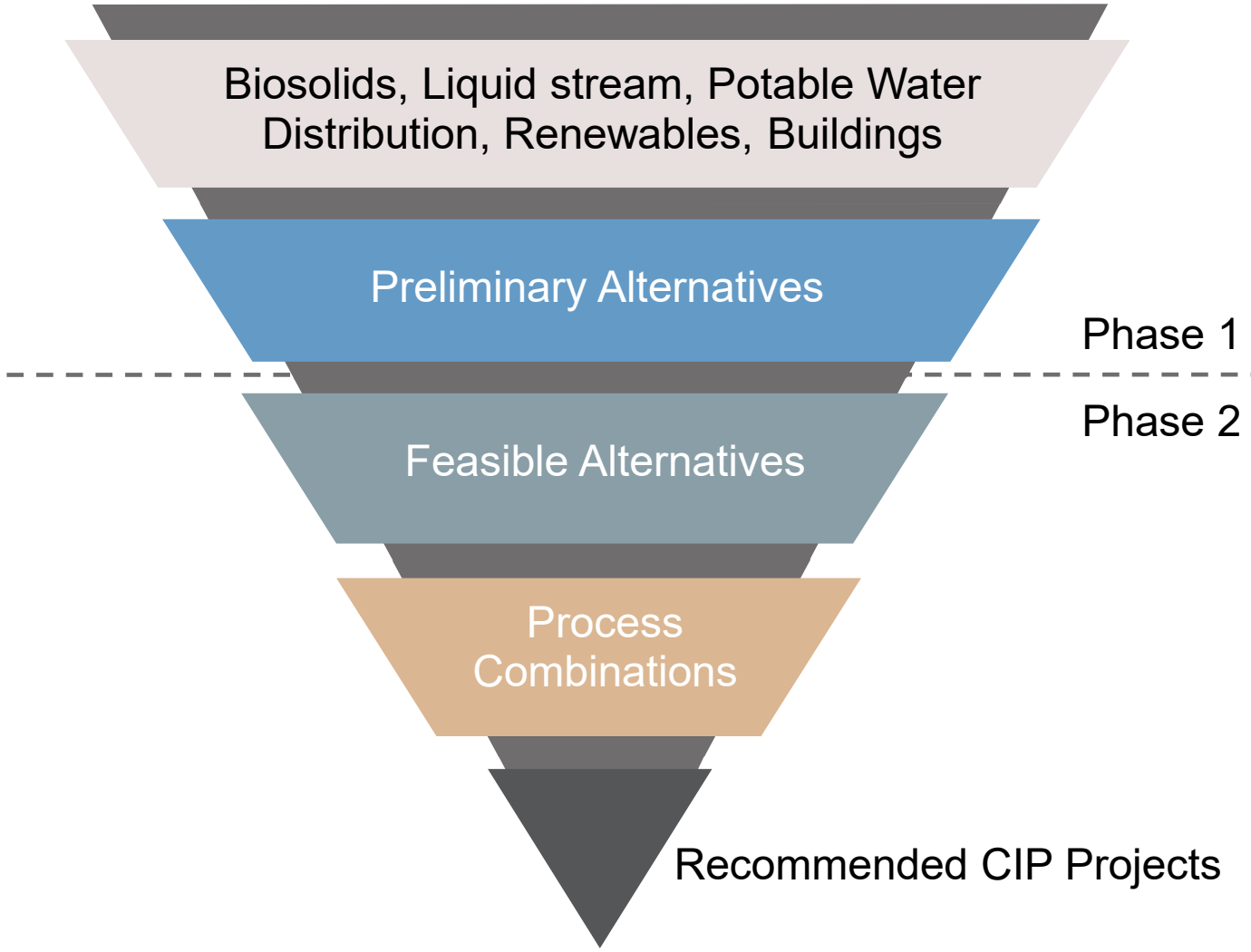
Wastewater Effluent Discharge (LAVWMA)

Recycled Water Distribution

Offices & Buildings

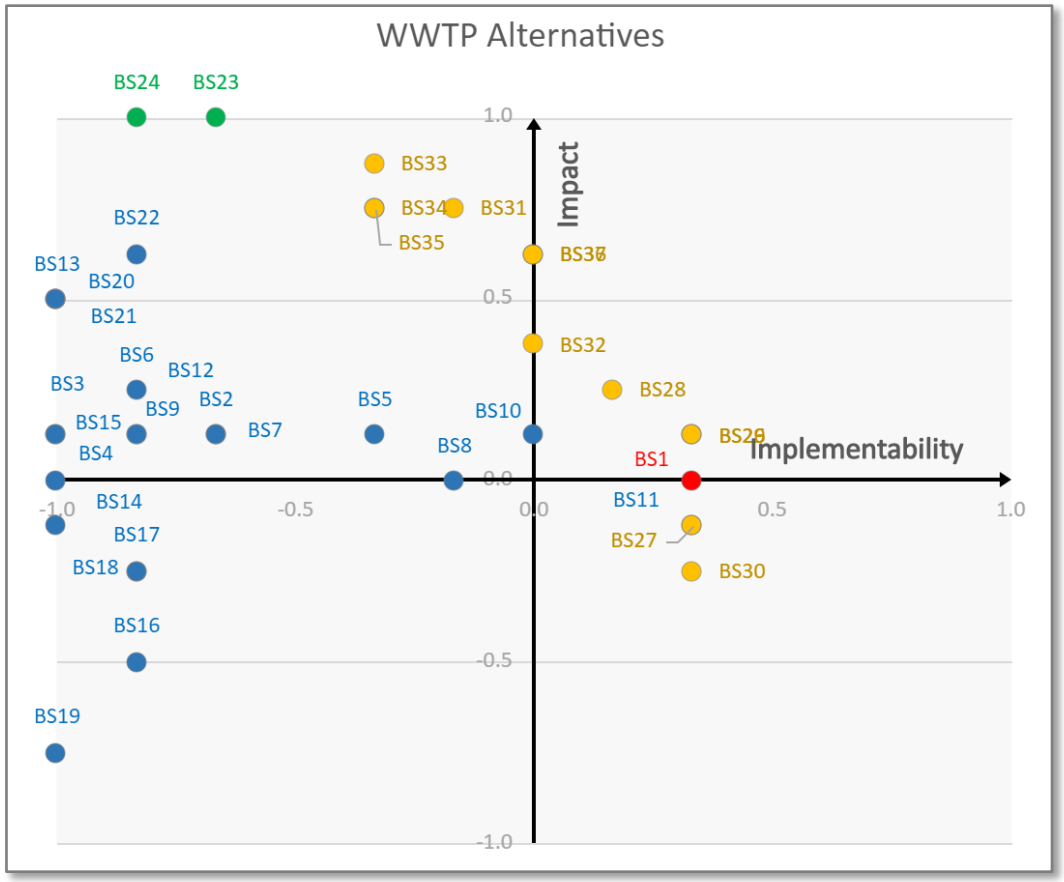
Fleet

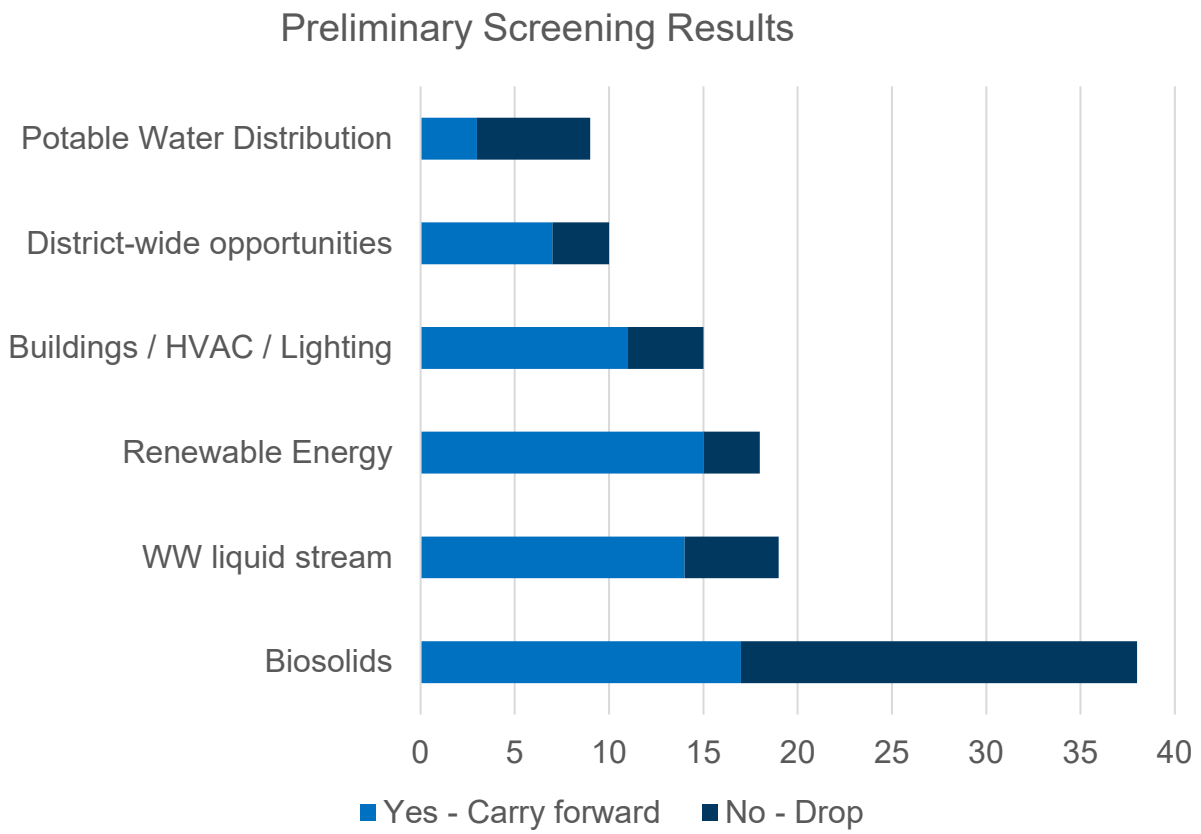
// Preliminary evaluation of options



// High level opportunities initial screening process

109 Alternatives Evaluated → **67** Alternatives Met Minimum Requirements

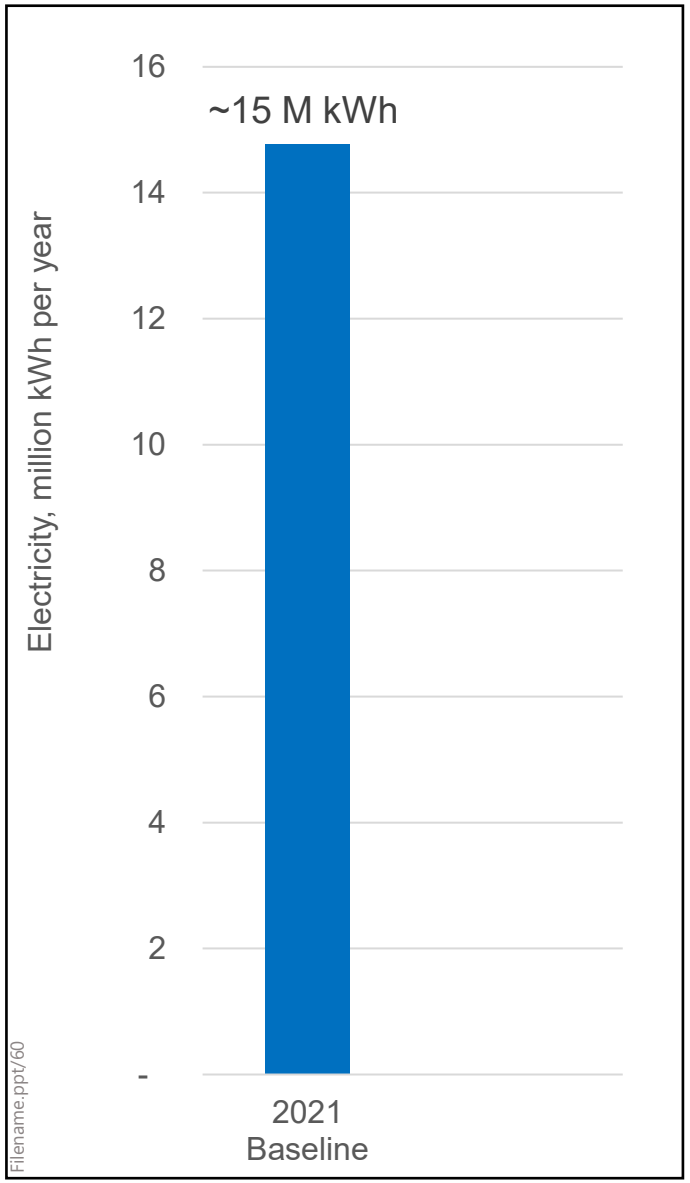




Opportunities Assessment

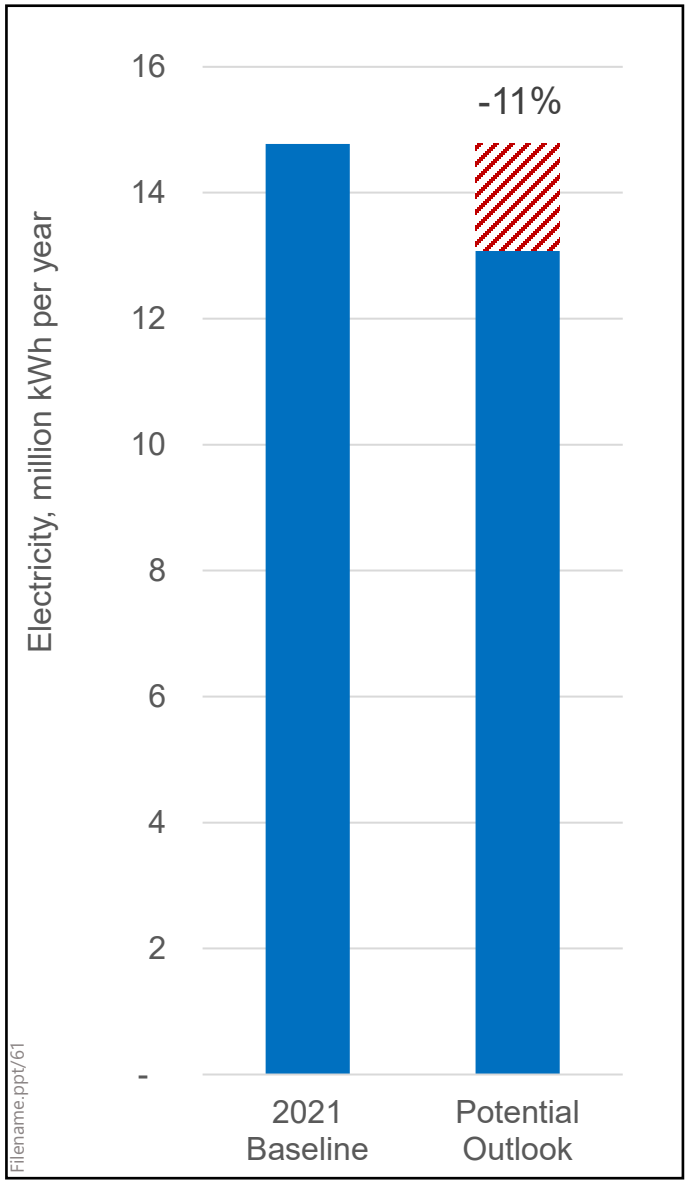
What is possible?
Energy Savings

// Opportunities Outlook – Potential Energy Savings



Current Electrical Demand:
~15 M kWh / yr

// Opportunities Outlook – Potential Energy Savings

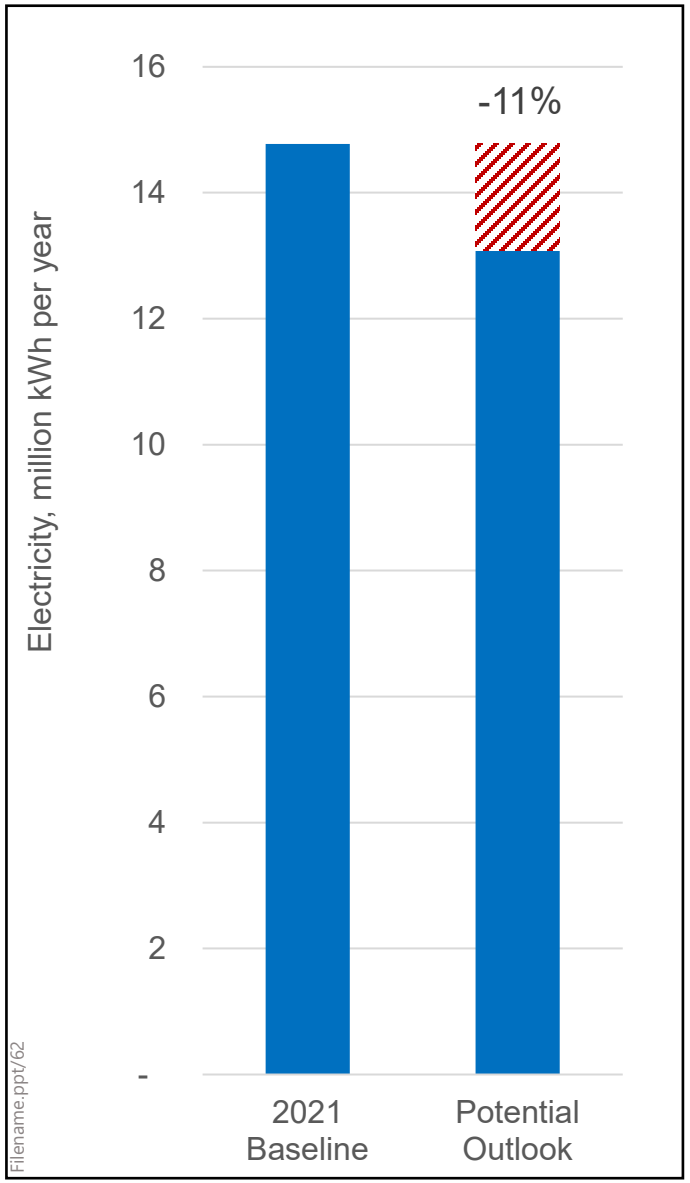


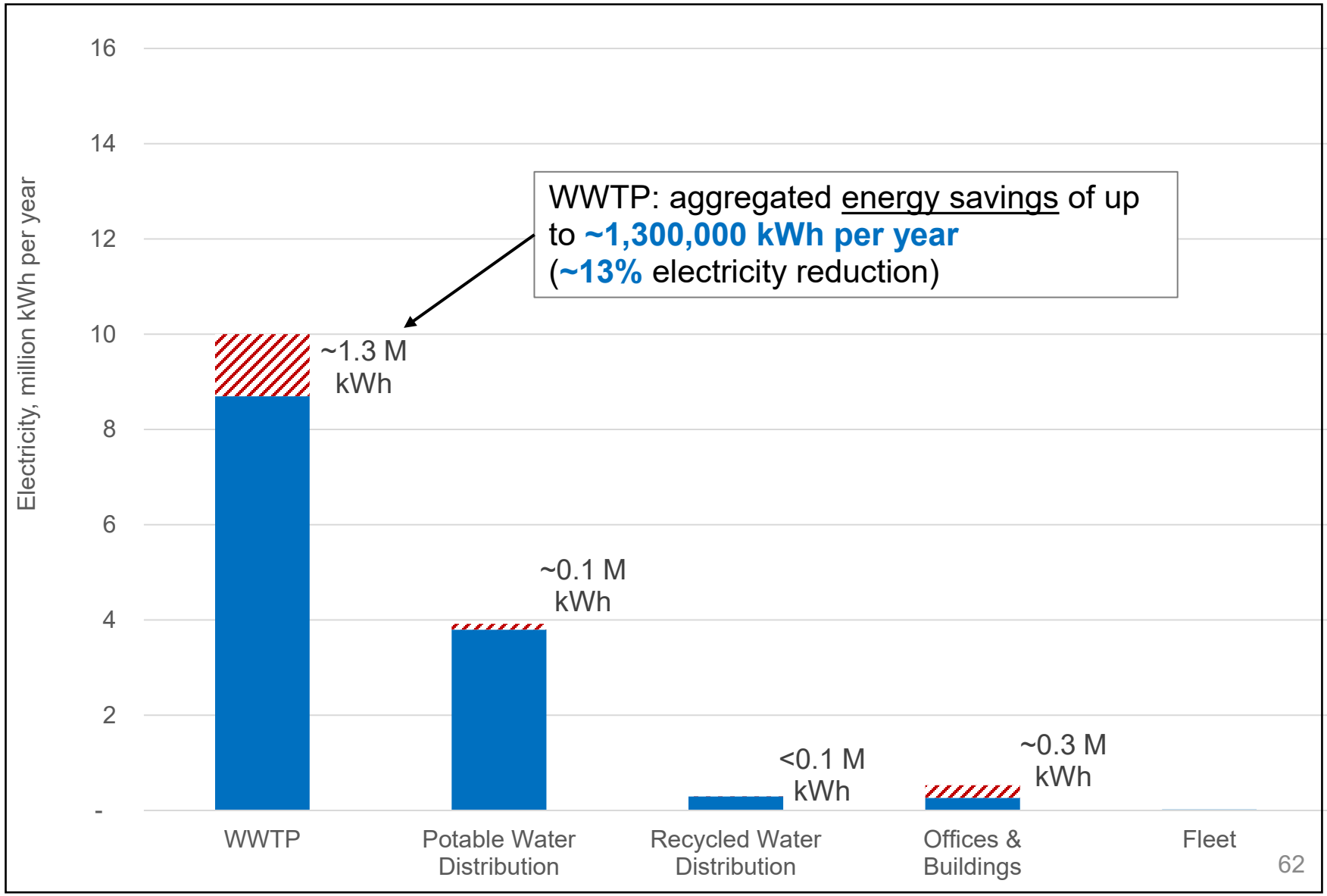
Current Electrical Demand:
~15 M kWh / yr

~13 M kWh / yr

Potential Reduction of
~1.7 M kilowatt-hours, or
approximately **11%** of District's
current electricity demand

// Opportunities Outlook – Potential Energy Savings



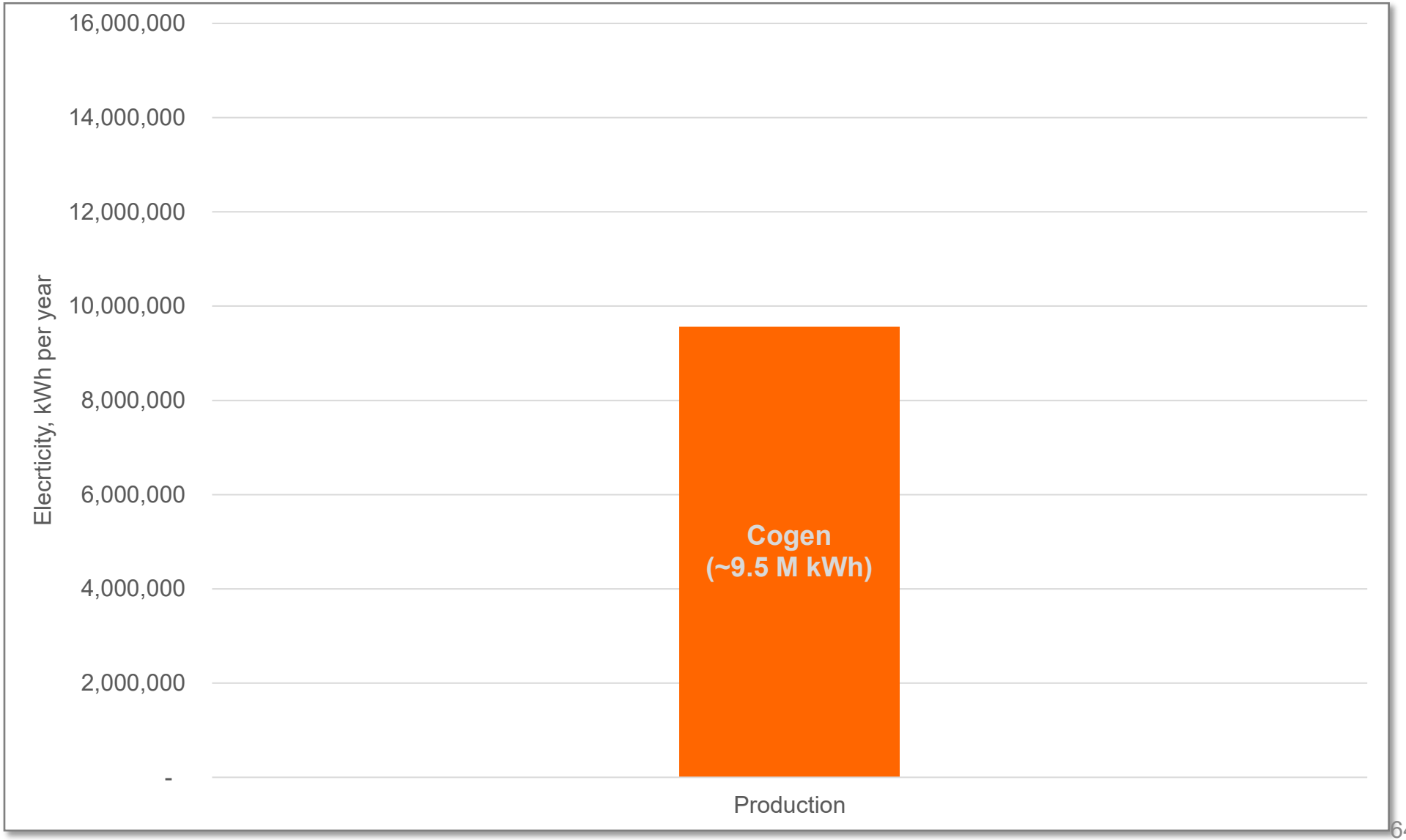


Opportunities Assessment

What is possible?
Energy Generation

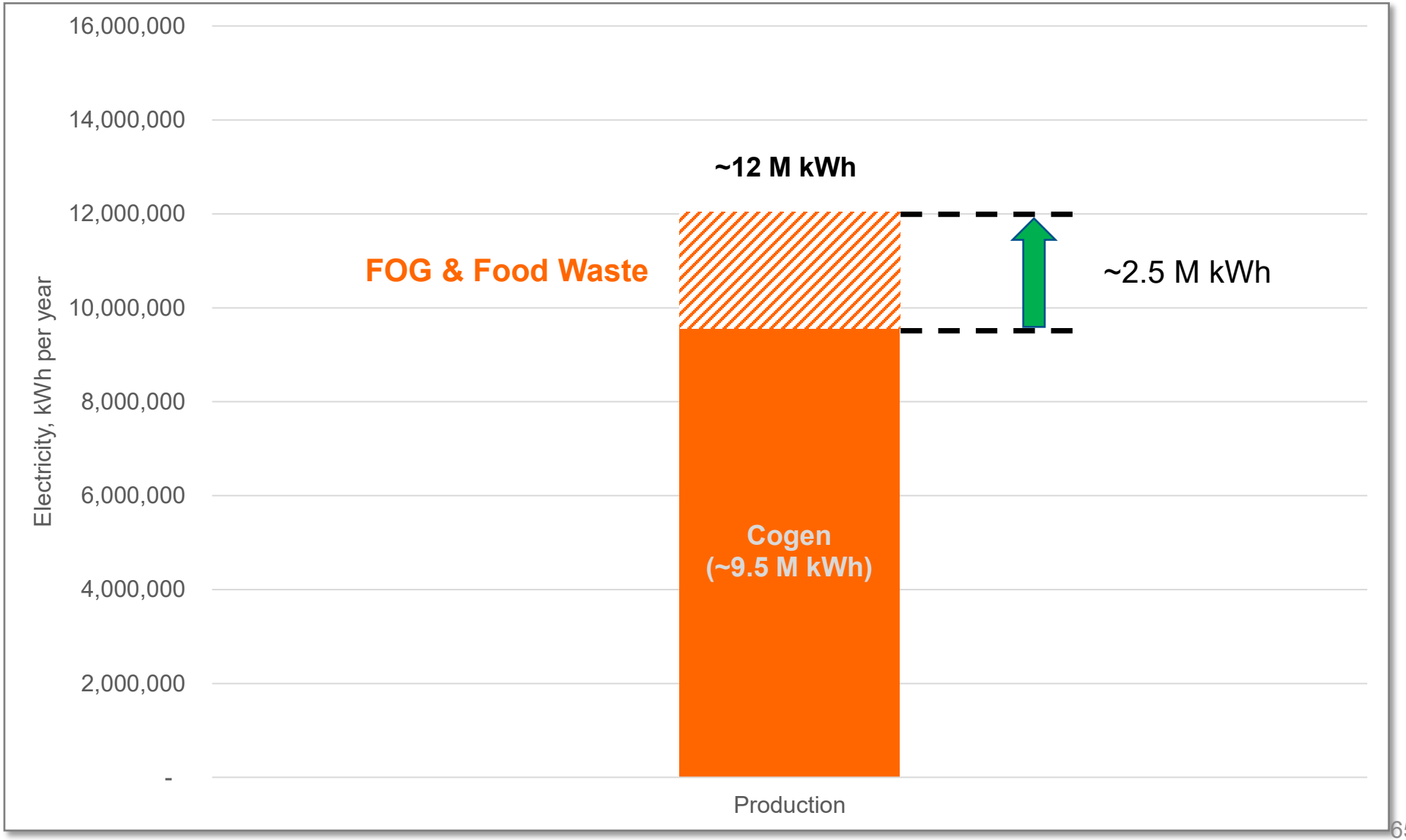
// Opportunities Outlook – Potential Energy Generation

The WWTP **Cogeneration System** currently produces **~9.5 M kWh**



// Opportunities Outlook – Potential Energy Generation

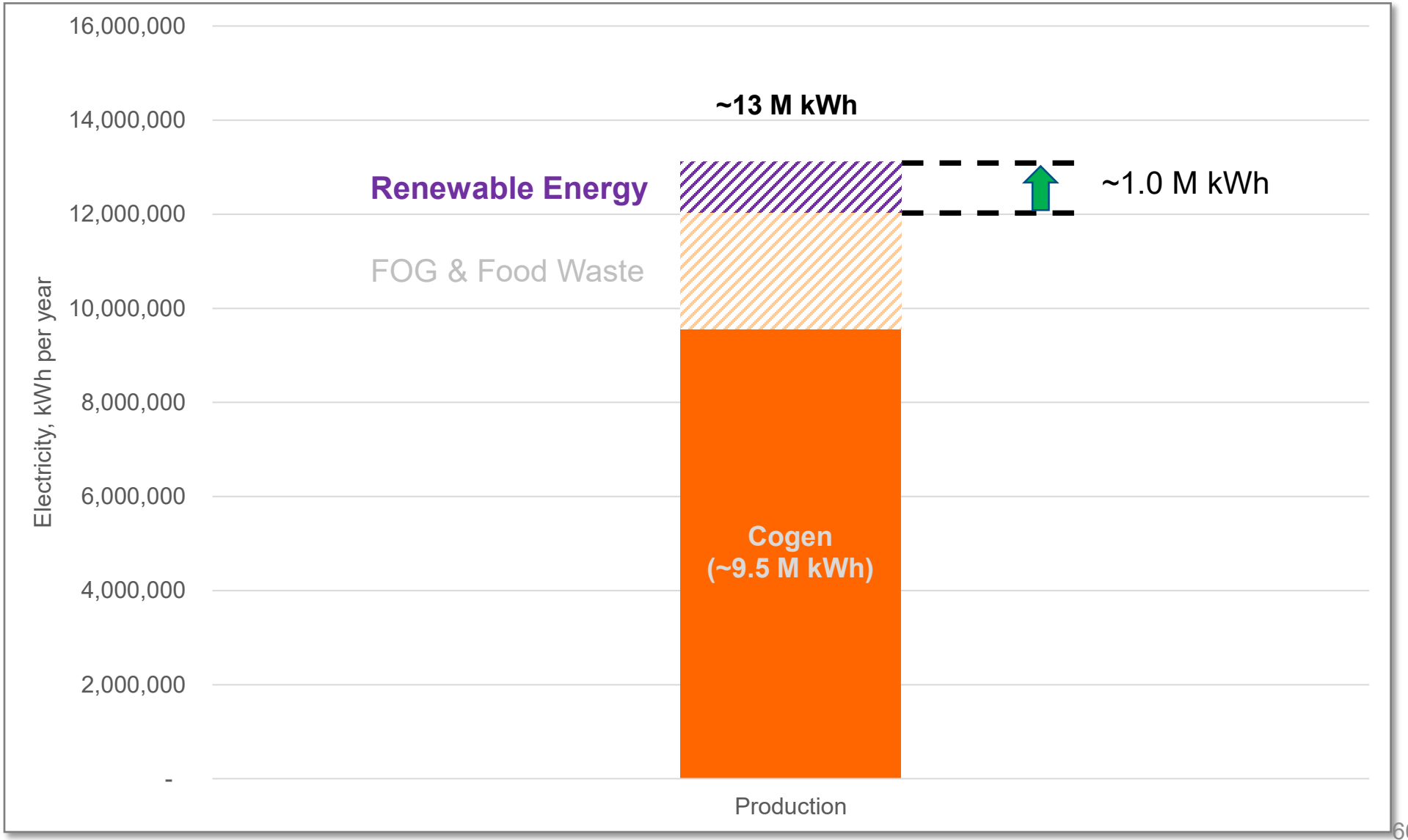
Additional Biogas through **Fats, Oils and Grease (FOG)** and **Food Waste programs**



// Opportunities Outlook – Potential Energy Generation

Additional Biogas through **Fats, Oils and Grease (FOG)** and **Food Waste programs**

Renewable Energy (i.e., Solar Power, Wind Power)



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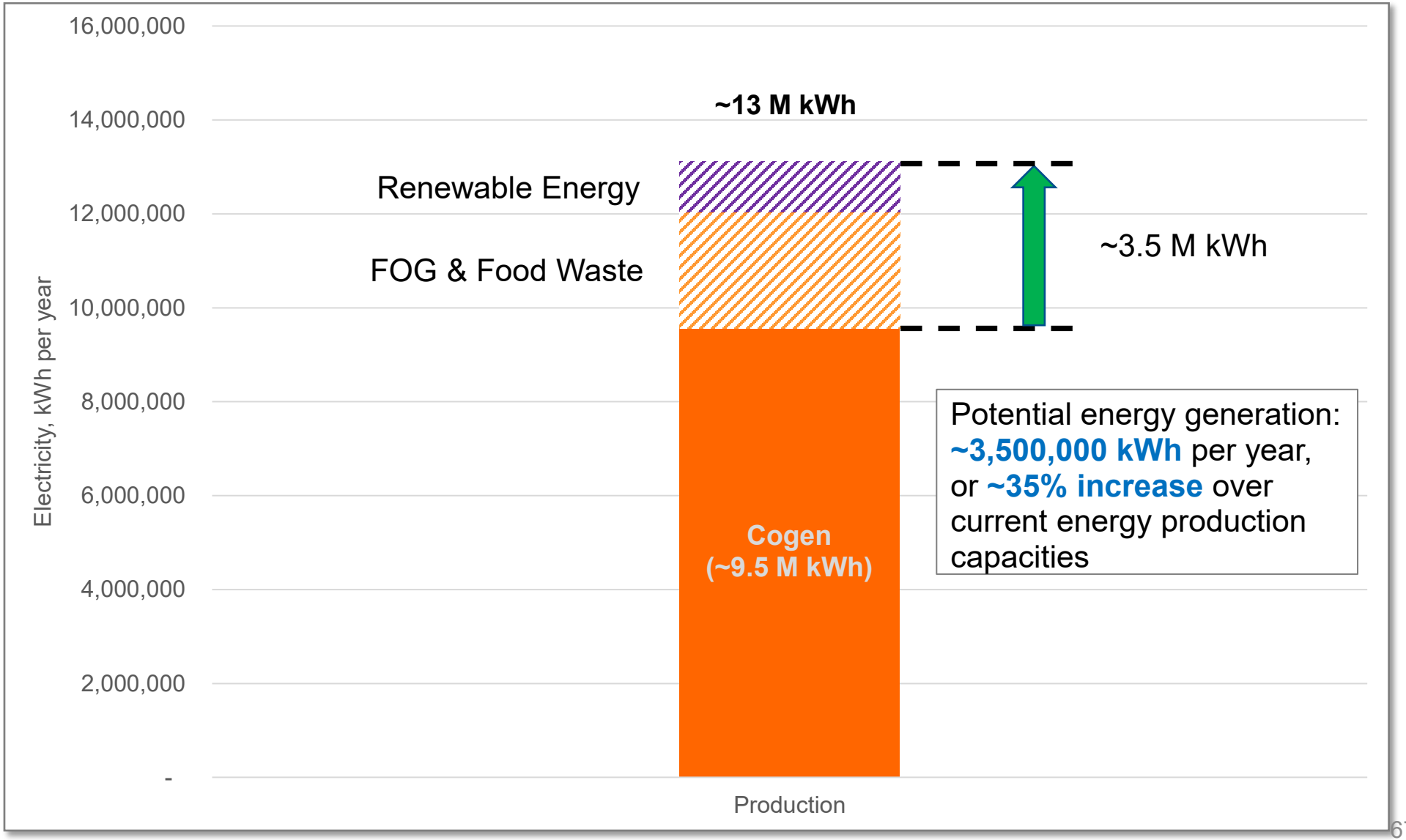
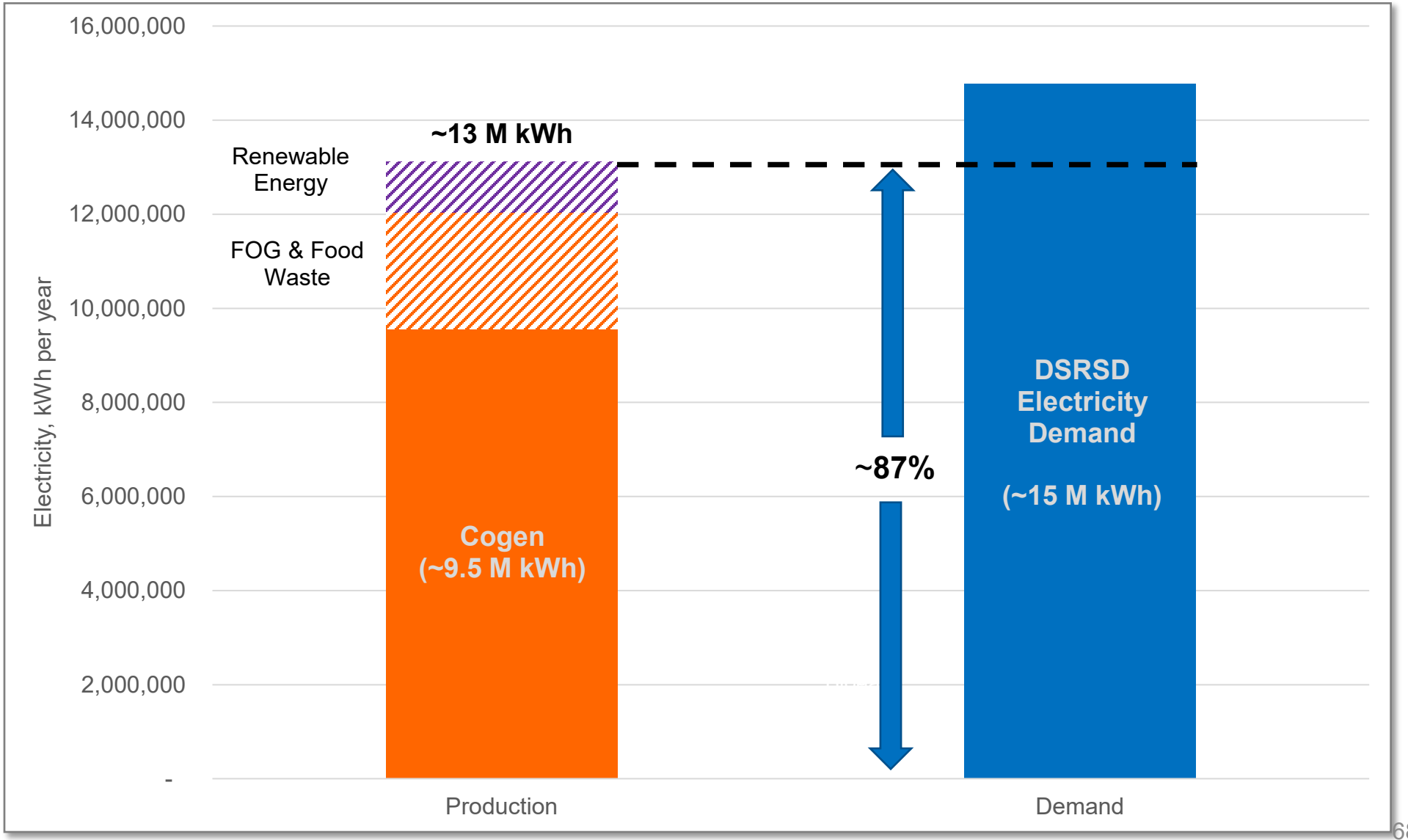


// Opportunities Outlook – Potential Energy Generation

Additional Biogas through **Fats, Oils and Grease (FOG)** and **Food Waste programs**

Renewable Energy (i.e., Solar Power, Wind Power)

Potential to generate up to **~87%** of the District's current electricity demand



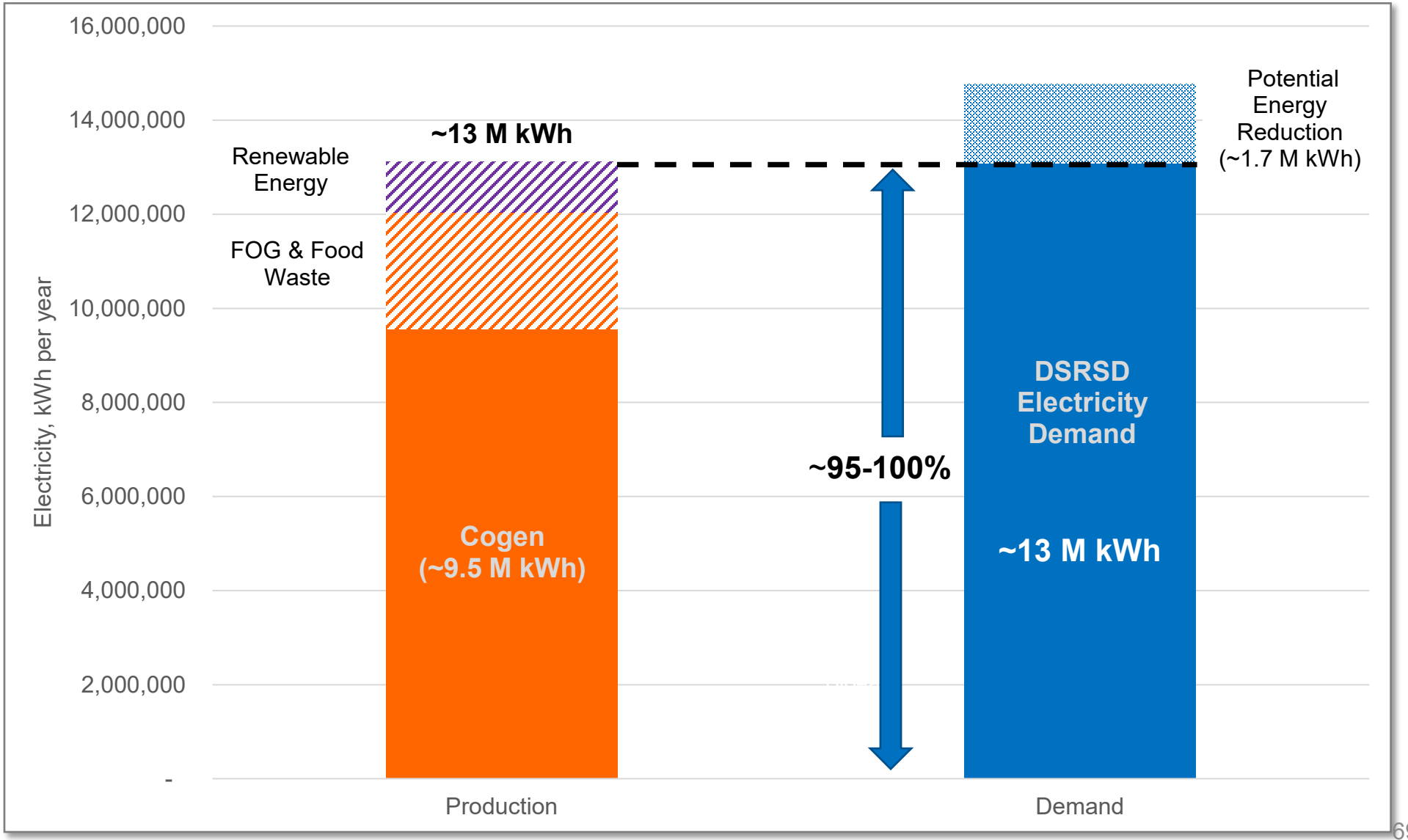
// Opportunities Outlook – Potential Energy Generation

Additional Biogas through **Fats, Oils and Grease (FOG)** and **Food Waste programs**

Renewable Energy (i.e., Solar Power, Wind Power)

Potential to generate up to ~87% of the District's current electricity demand

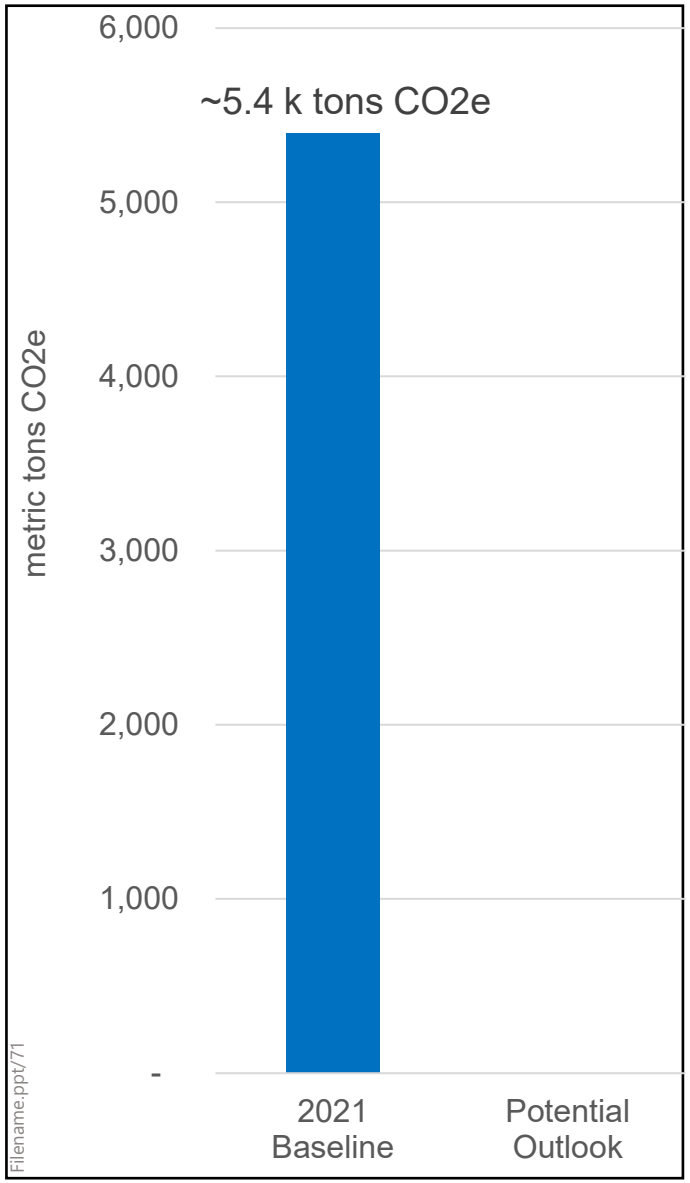
With potential energy reductions, potential to generate **~95% to 100%** of the District's current electricity demand



Opportunities Assessment

What is possible?
GHG Reduction

// Opportunities Outlook – Potential GHG Reduction

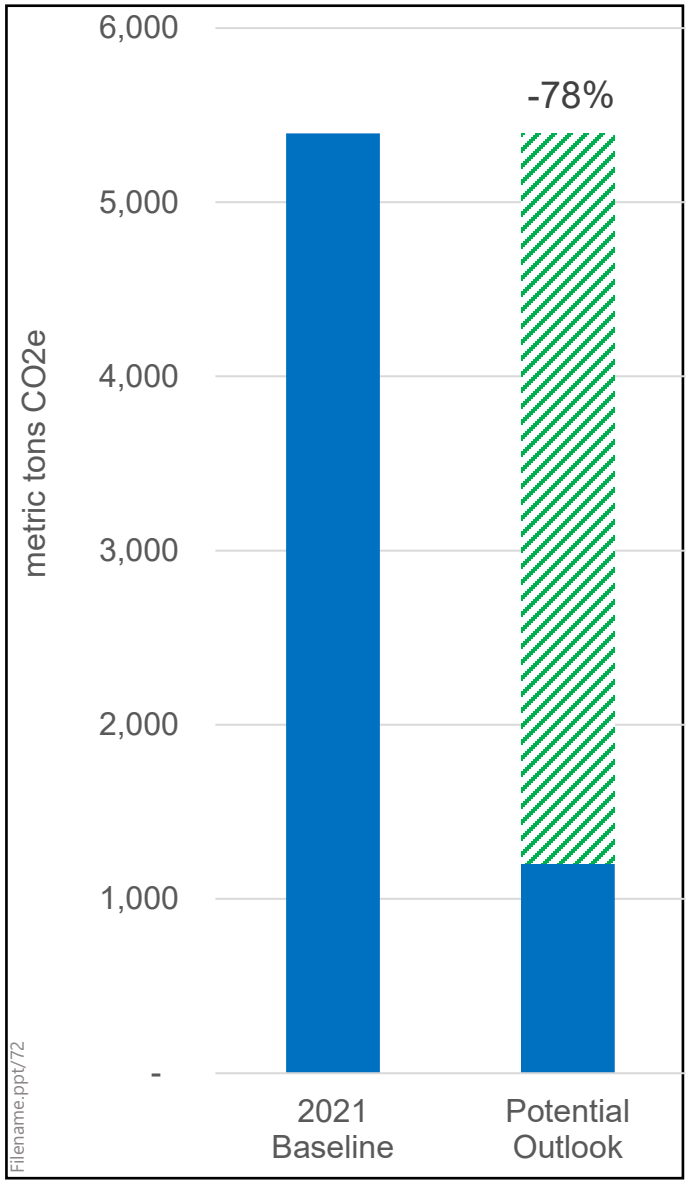


Filename.ppt/71

CO_{2e}

Current GHG Emissions: **~5,00**
Total metric tons/year

// Opportunities Outlook – Potential GHG Reduction

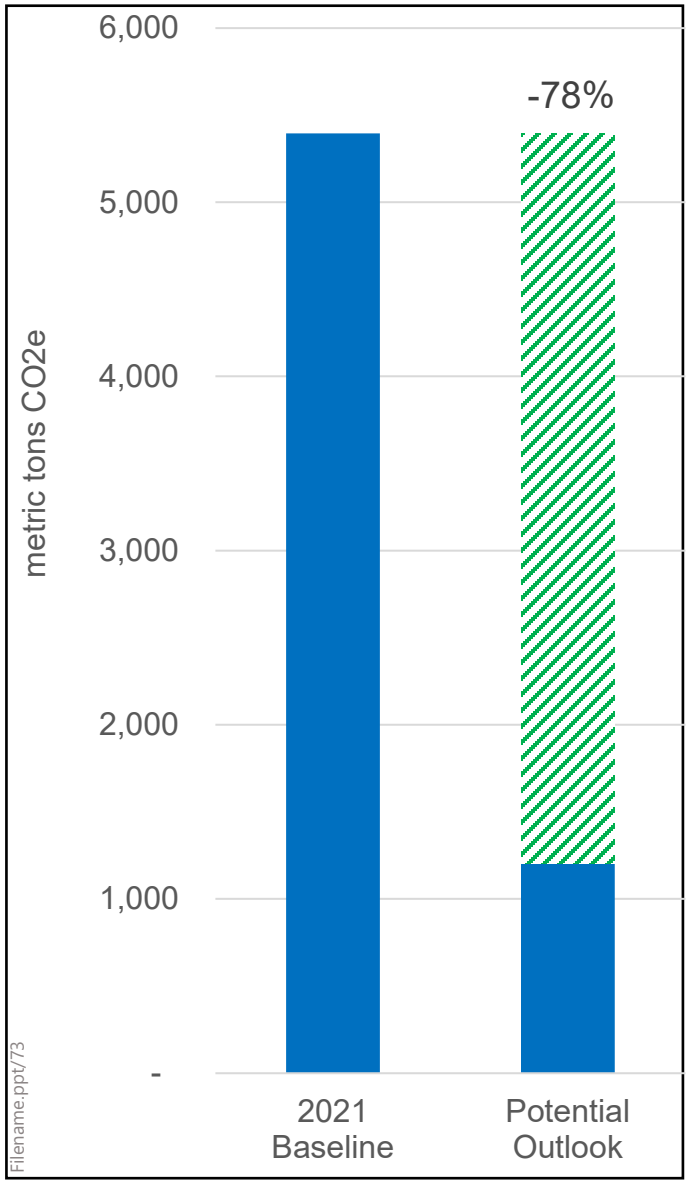


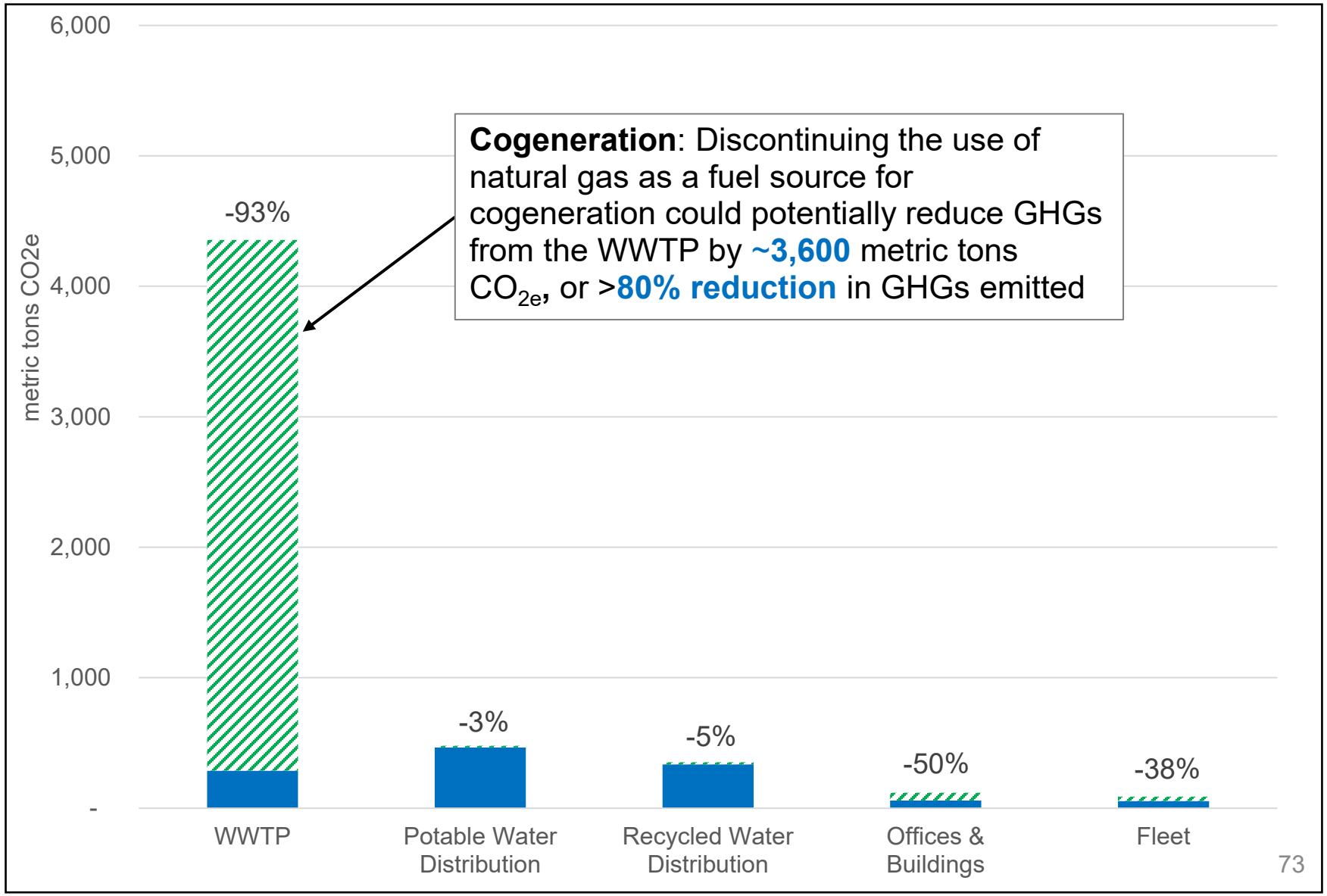
Current GHG Emissions:
~5,400 Total metric tons/year

~1,200 Total metric tons/year

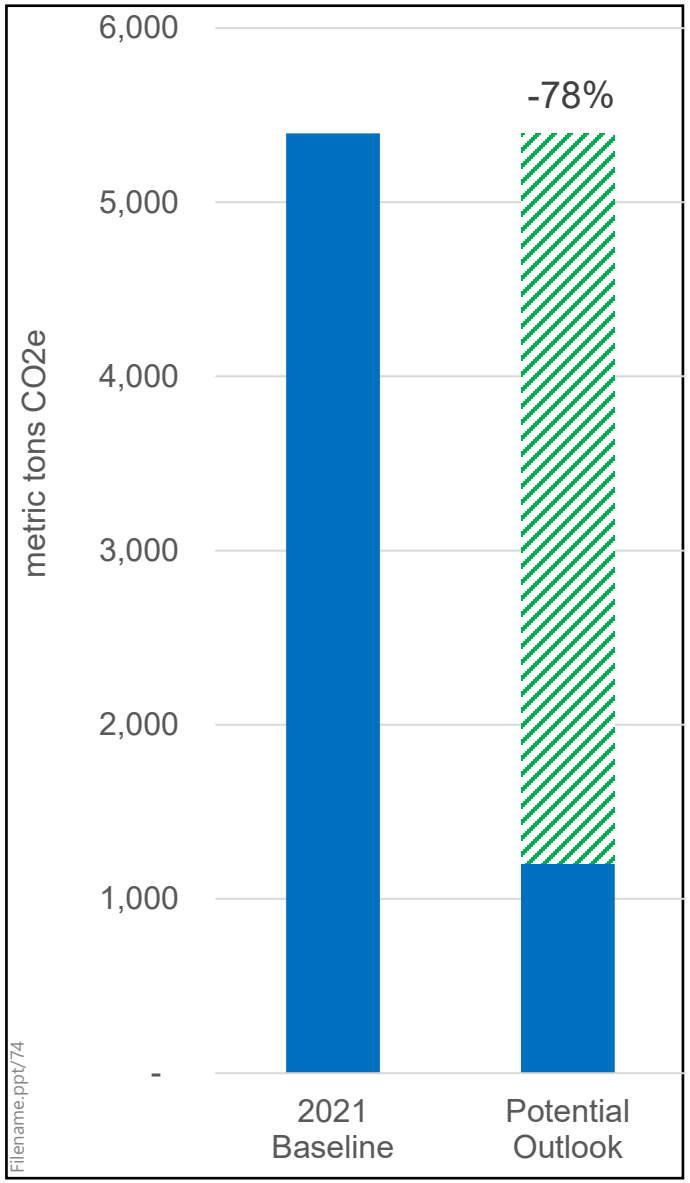
Potential Reduction of
~4,200 metric tons CO_{2e}, or
~80% of District's current carbon footprint

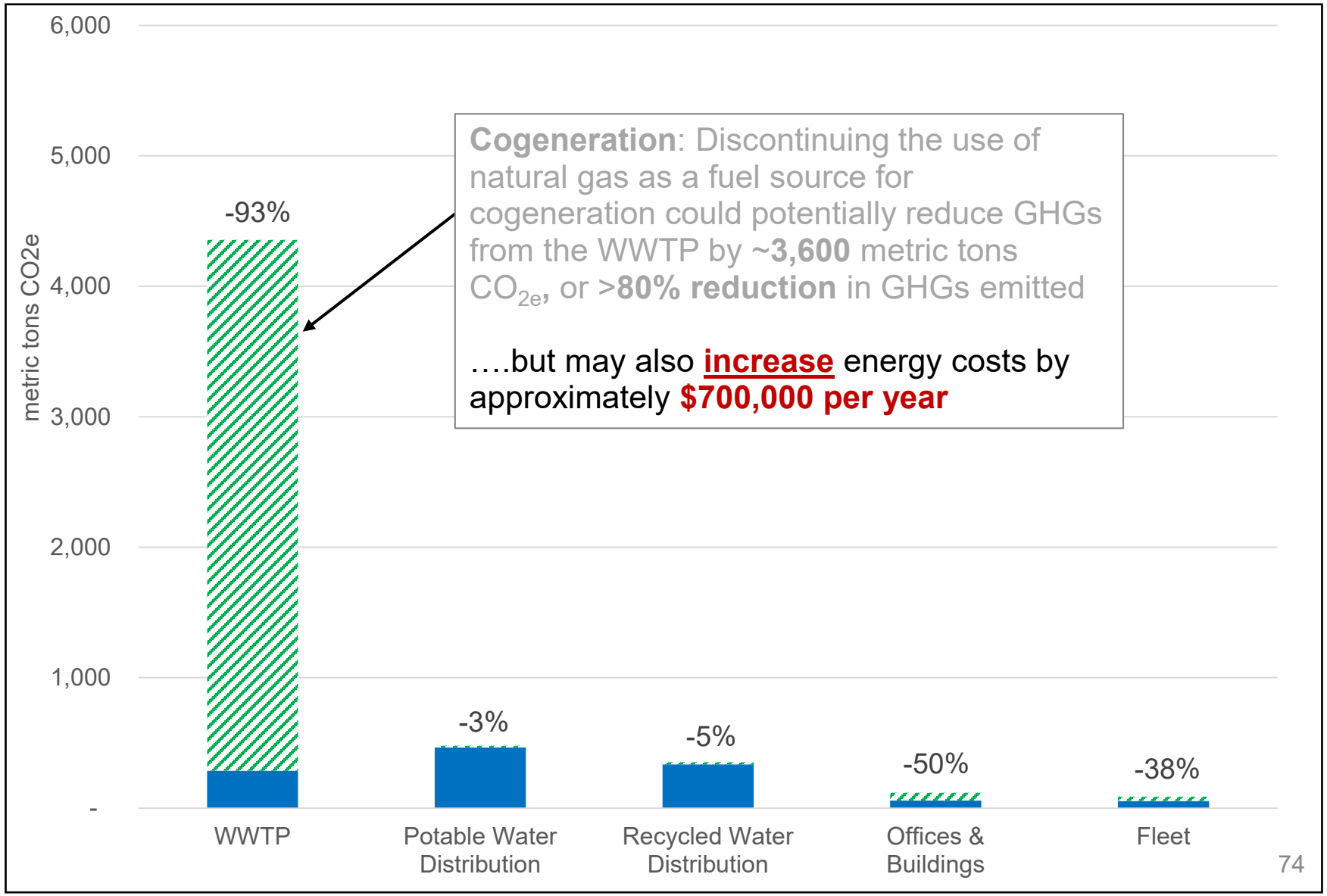
// Opportunities Outlook – Potential GHG Reduction





// Opportunities Outlook – Potential GHG Reduction





Opportunities Assessment
Summary

// Summary of opportunities estimates

Electricity savings opportunities of up to **11 percent** for DSRSD facilities

Electricity generation opportunities of up to **3.5 M kilowatt-hours**

Carbon footprint could be potentially reduced by as much as **2/3** if natural gas was discontinued as a fuel source for the cogeneration system

67 preliminary alternatives are carried forward into Phase 2 for further analysis.

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Electricity savings opportunities of up to **11 percent** for DSRSD facilities

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Questions

Energy Guiding Principles

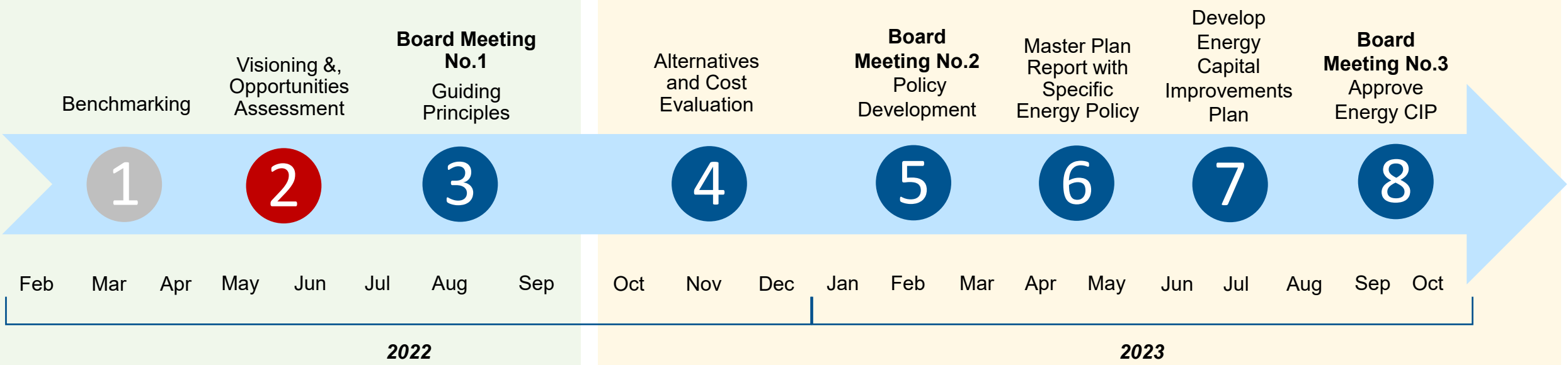
// Scope of Phase 1 and 2 of this planning project

Phase 1

State of the District Energy Baseline

Phase 2

Alternatives Evaluation and Prioritization



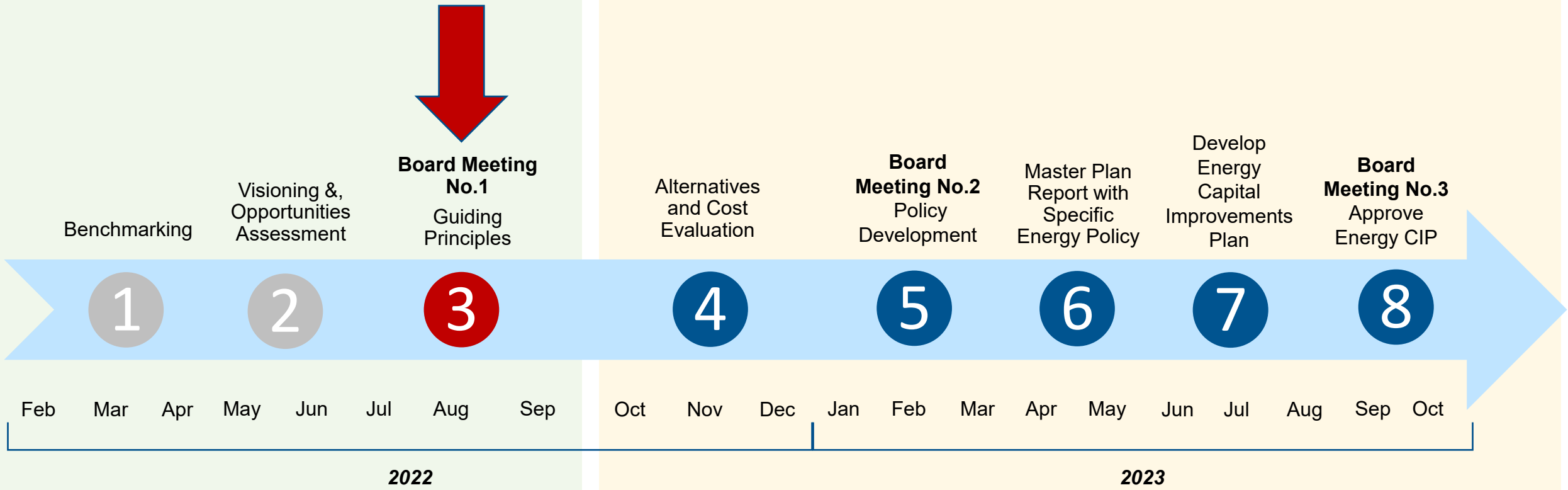
// Scope of Phase 1 and 2 of this planning project

Phase 1

State of the District Energy Baseline

Phase 2

Alternatives Evaluation and Prioritization

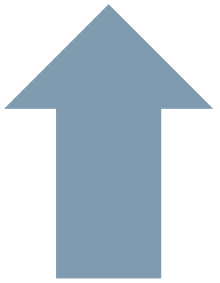


// Examples of competing project objectives

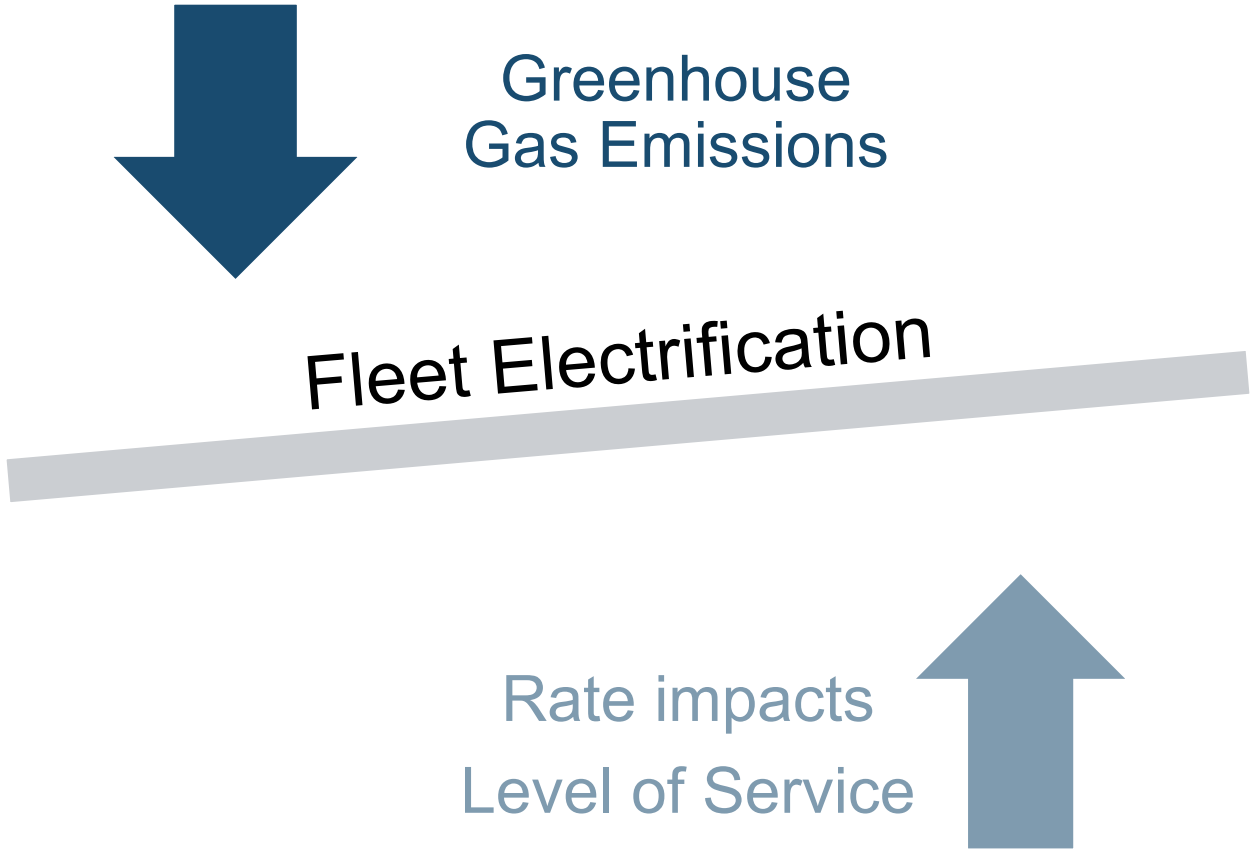
Greenhouse
Gas Emissions

Cogeneration using Natural Gas

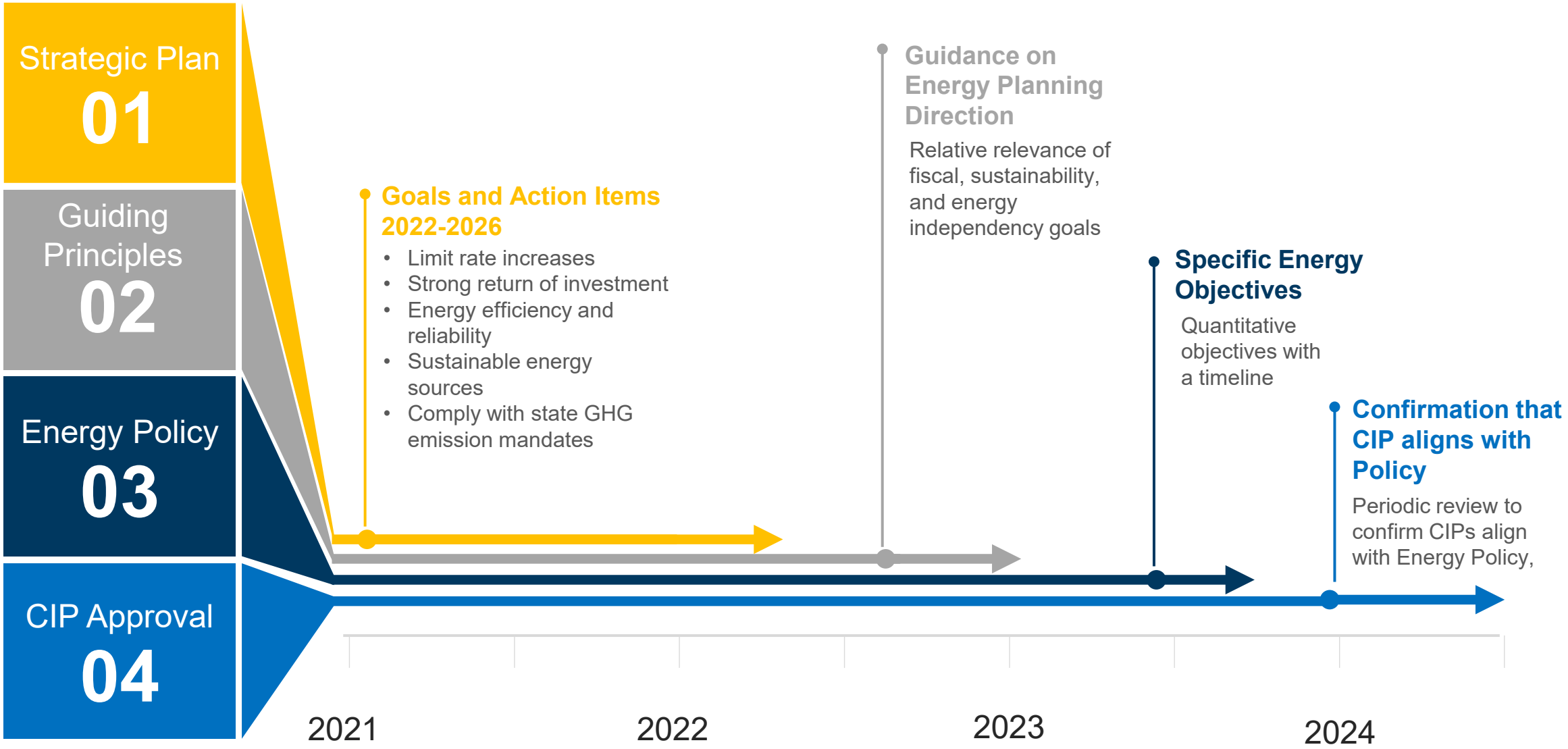
Energy Costs



// Examples of competing project objectives



// How the Board helps guide the energy CIP development

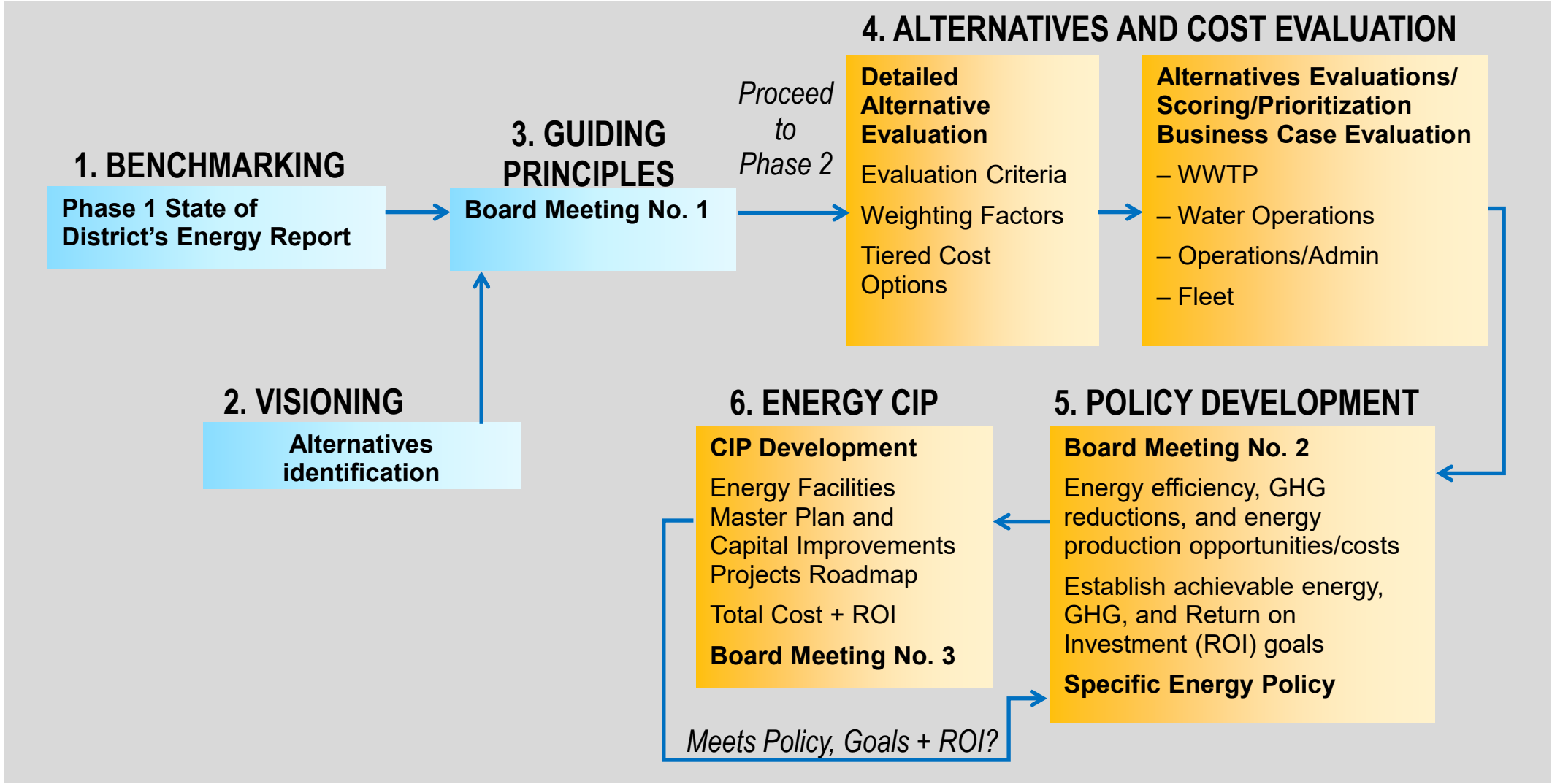


// Complexities of energy and GHG master planning

- Environmental stewardship
- Industry leadership
- GHG reduction goals
- Future regulations
- Sustainable energy sources

- Return of investment
- Sunk costs in existing infrastructure
- Reliability and Resiliency
- Limit rate increases
- Resource limitations

// How the Board's Guiding Principles help develop the Masterplan and CIP



// Energy Guiding Principles & Policy

A general statement of DSRSD's values to help guide decision making process.

A prescribed commitment for an energy objective with quantitative goal and timeline

Example

"DSRSD shall strive to find and proactively implement cost-effective means to reduce GHG emission, increase renewable energy production, and improve energy efficiency."

Example

"DSRSD shall implement infrastructure upgrades for energy improvements with a payback period of less than 10 years."

// Suggestions for DSRSD Board's consideration in developing Energy Guiding Principles

1. Comply with all regulatory energy and GHG related mandates and **strive to exceed** them when related investments are **cost-effective** with consideration to the anticipated payback period and life cycle cost.
2. Strive to establish a **diverse, reliable, and resilient** energy supply portfolio for operation of its facilities.
3. Properly plan and **budget for staffing needs and training** to employ, operate, and maintain any additional energy related infrastructure.
4. Capital improvements shall **consider the impact** on energy demand, energy efficiency, and GHG impacts where relevant.
5. Seek opportunities to **offset any additional future energy demands** with renewable energy production.
6. Strive to **lead the industry** in supporting the development of new promising energy technologies in the spirit of the guiding principles and objectives.

Discussion on Guiding Principles

Next Steps

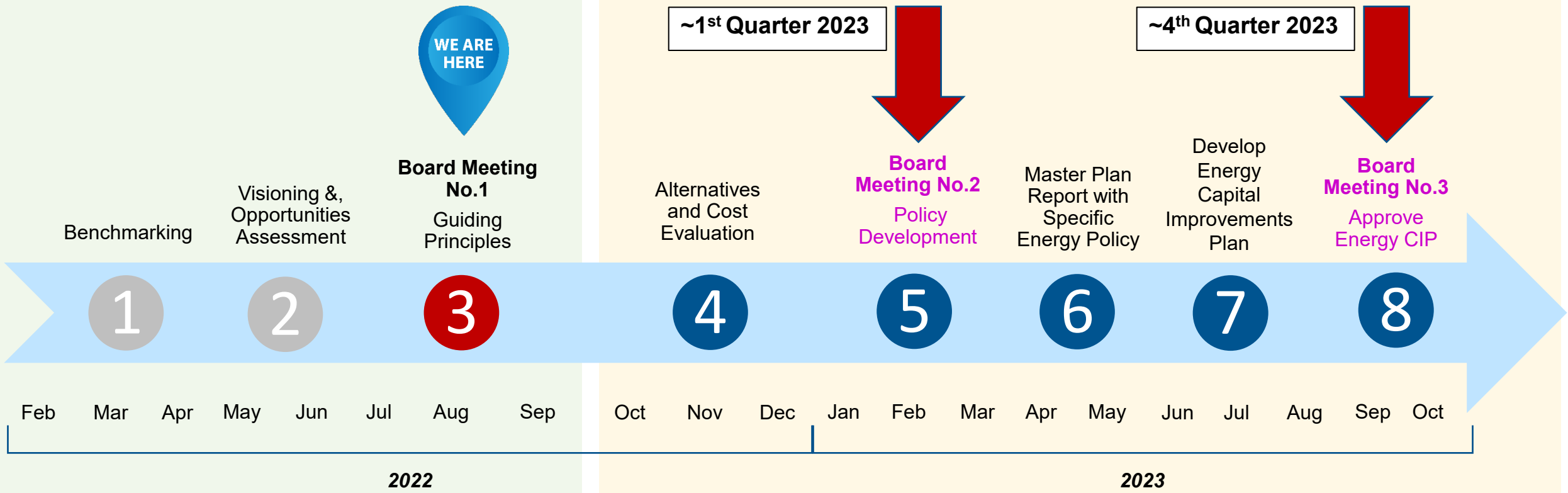
// Scope of Phase 1 and 2 of this planning project

Phase 1

State of the District Energy Baseline

Phase 2

Alternatives Evaluation and Prioritization



Questions