Innovating at Scale: Stony Brook University's Integrated Approach to Campus Energy Decarbonization

Presenters: Kurt Blemel, CEM
Rachel Carpitella
Tom Lanzilotta, CEM, CEA

Date: February 4th, 2026

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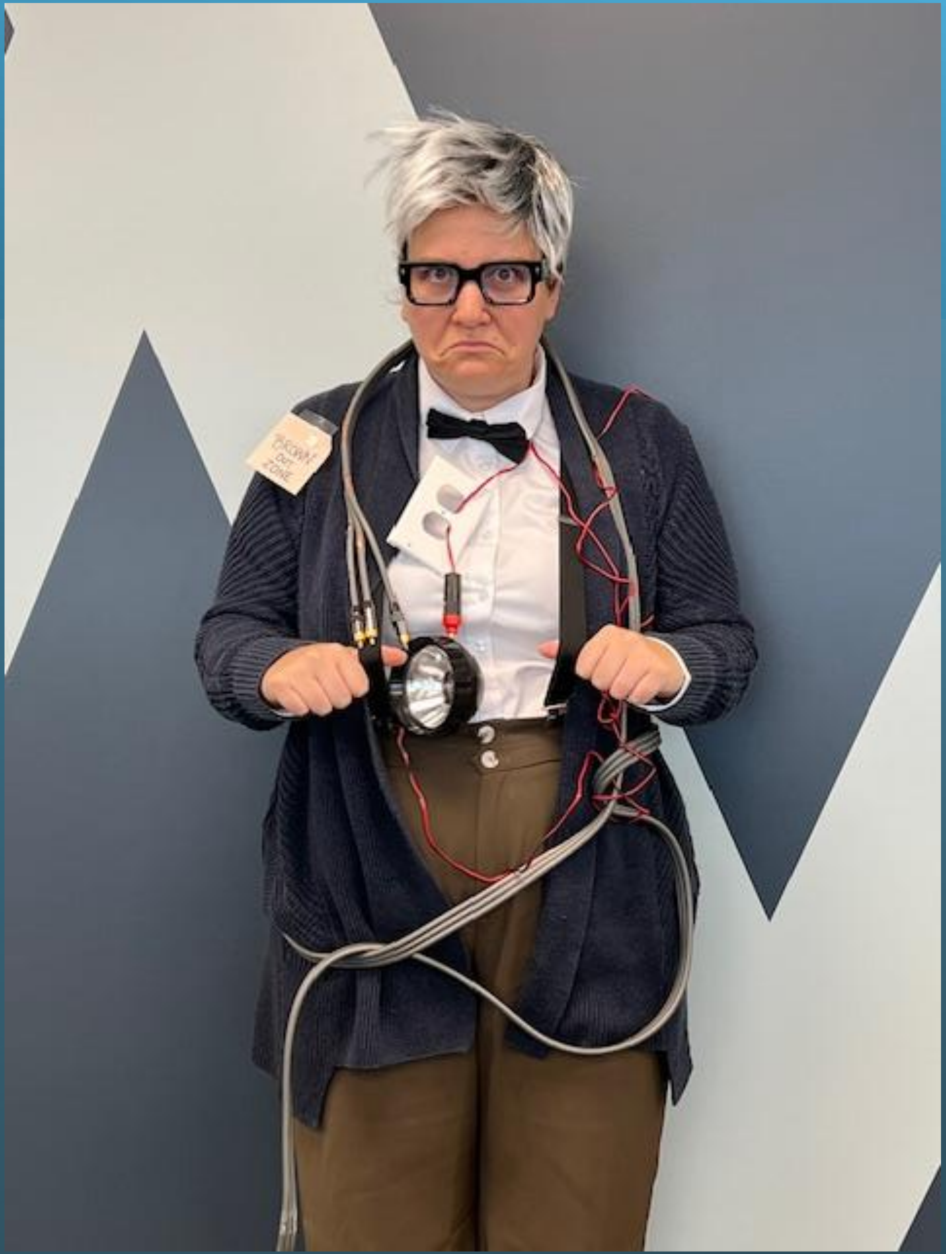

Agenda

- Introductions
- Stony Brook University Solutions and Impacts
- Campus Planning
- Funding
- Open Discussion

Introductions

Kurt Blemel,
CEM
WENDEL

- **Role** | Energy Engineer
- **Experience** | **25** Years
- **Expertise**
  - Combined Heat and Power Plants
  - Energy Efficiency Measure Development
  - Energy Project Development
  - Energy Master Planning

Rachel Carpitella
WENDEL

- **Role** | Business Development
- **Experience** | **20** Years
- **Expertise**
  - Decarbonization Strategy
  - Energy Program Development
  - Stakeholder Engagement
  - Grant & Funding Strategy
  - Workforce & Partnerships

Tom Lanzilotta,
CEM, CEA
STONY BROOK UNIVERSITY

- **Role** | Assistant Director of Energy
- **Experience** | **22** Years
- **Expertise**
  - Campus Energy Strategy
  - Metering & Data Analytics
  - Efficiency Project Oversight
  - Utility Cost Management
  - Energy Modeling & Verification

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About Wendel

85 year-old

architecture, engineering, energy efficiency and construction management firm

4

Main practice areas

350+

Employees, nationwide.

15

Offices Nationwide

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6
NY offices

85 yrs
In business

$850M
Energy Improvements since 2001

$350M
Annual Client Energy Savings

MECHANICAL ENGINEERING
Heat Recovery Heat Pumps
Geothermal Heat Pumps
VRF systems
Packaged rooftop units
Custom AHUs
Laboratory System Design / Retrofits
HVAC Controls
Chiller Plants
Boiler Plants
Distribution Systems

ELECTRICAL ENGINEERING
Building Electrical System Design
Distribution Electrical Systems
Renewable energy systems
Energy Storage
Electric Vehicle Charging
Switchgear upgrades and replacements

STRUCTURAL ENGINEERING
Building retrofits
Vertical high-rise
Inspections
Utility plants
Foundations

ARCHITECTURAL SERVICES
Building Design
Façade & Roof Replacements
Building Envelope Commissioning
Landscape and Interiors

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Program Intent

Program Intent

The 2023-24 State Budget directed NYPA to lead the Decarbonization Leadership Program, which calls for the development of energy and emissions profiles for State government's largest carbon-emitting facilities and calls for decarbonization action plans that will guide state agencies on facility improvements that will reduce carbon emissions in support of the State's nation-leading Climate Leadership and Community Protection Act.

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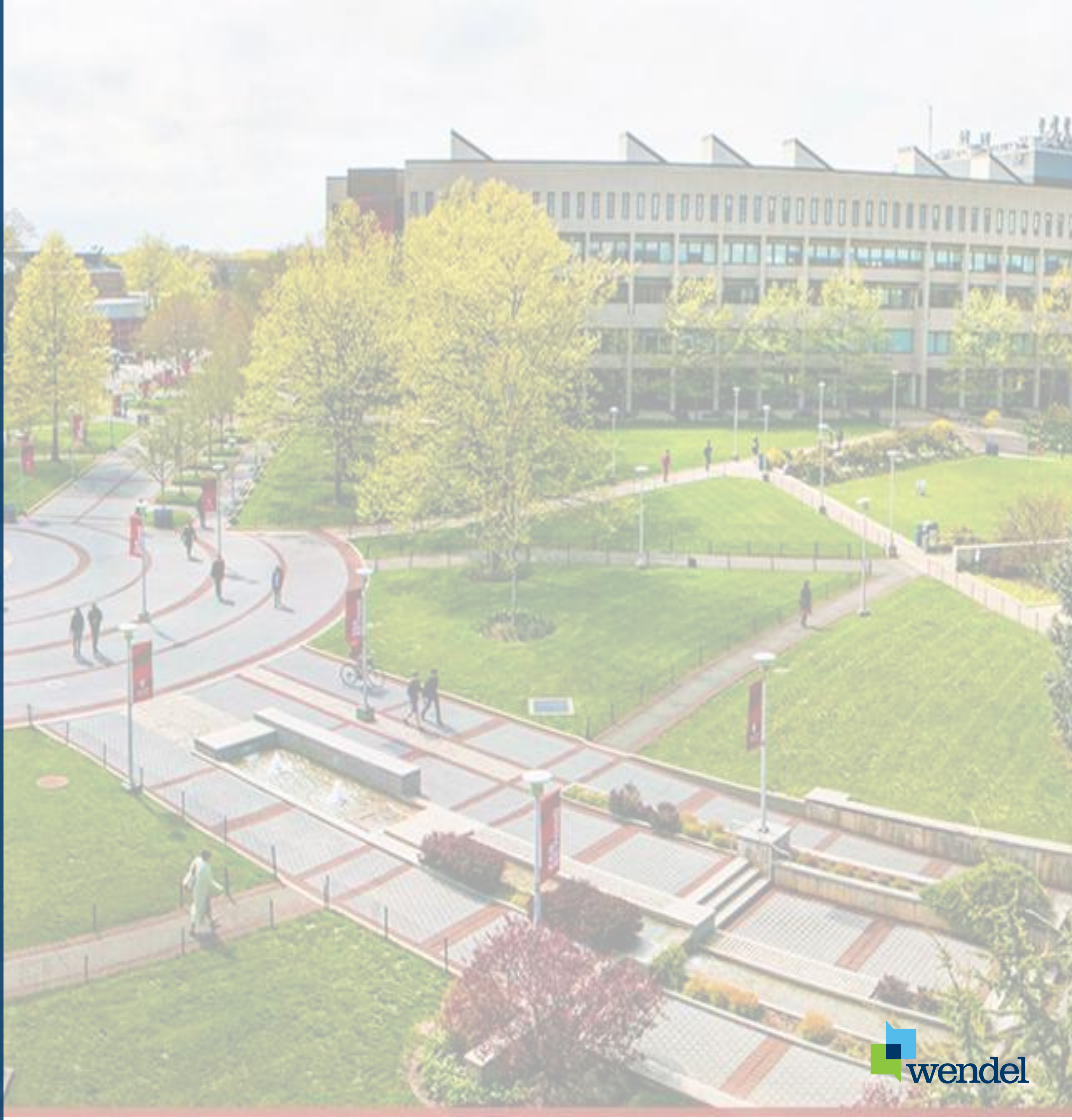
Stony Brook / NYPA Objective

1. Identify constraints to decarbonization.
2. Provide a pathway to decarbonize campus energy systems.
3. Identify near term actionable projects that will facilitate the transition to cleaner energy infrastructure.



Stony Brook University Overview

- **13** million square feet of space
- **1,452** acres of land
- **213** buildings
    - **1,466** lab spaces
    - **6** dining facilities
    - University Hospital
    - On-Site Cogeneration Plant
- **26,000+** students
- **18,000+** faculty and staff

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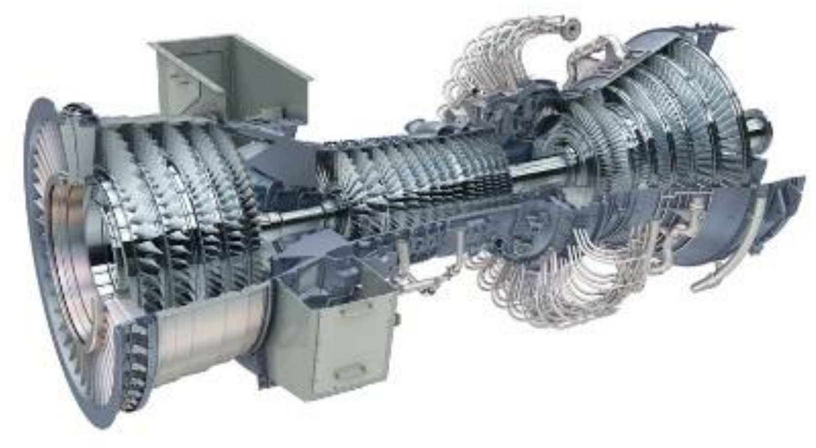
Background of SBU Utilities



GE LM6000 gas turbine

Central Power Plant

Chiller Plant

Utilities Distribution

Utility Distribution

- Cogen/Utility provide electric @ 69kV
- Stepped down to 13.8 kV and distributed through ~ 30 miles of underground cables.
- Hot and chilled water for heating/cooling
- Multiple natural gas utility services

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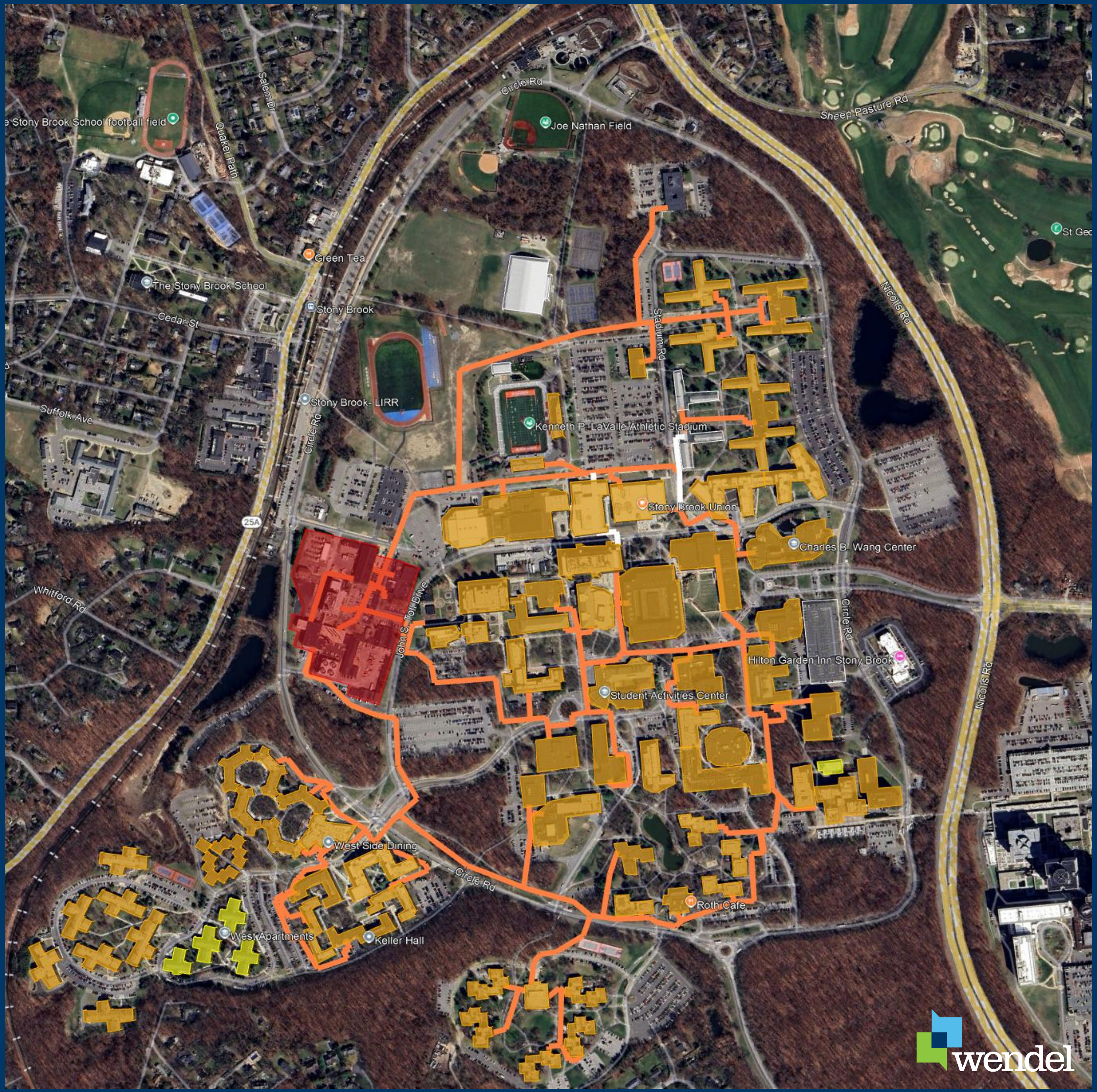
Complicated Infrastructure

- Multiple Campuses
- ~150 Buildings
- High Temp Hot Water
- Steam generated Chilled Water
- Buried Piping
- Hospital
- Grid Power Unreliable
- High O&M Expenses



Decarbonization Action Plan – Key Steps

<u>ASSESSMENT</u>

- Data Collection
- Interviews
- Energy Audits
- Preliminary Energy Analysis
- Baseline Modeling

<u>Infrastructure / Barriers:</u>

- **Central Steam Systems**
- **High Temperature Hot Water**
- **Buried Infrastructure**
- **Limited Open Space/Land**

<u>PLANNING</u>

- Analysis
- Technology Screening
- SOW Development
- Cost Estimating
- Scenario Planning
- Implementation & Phasing
- Life Cycle Cost Analysis
- Decarbonization Action Plan

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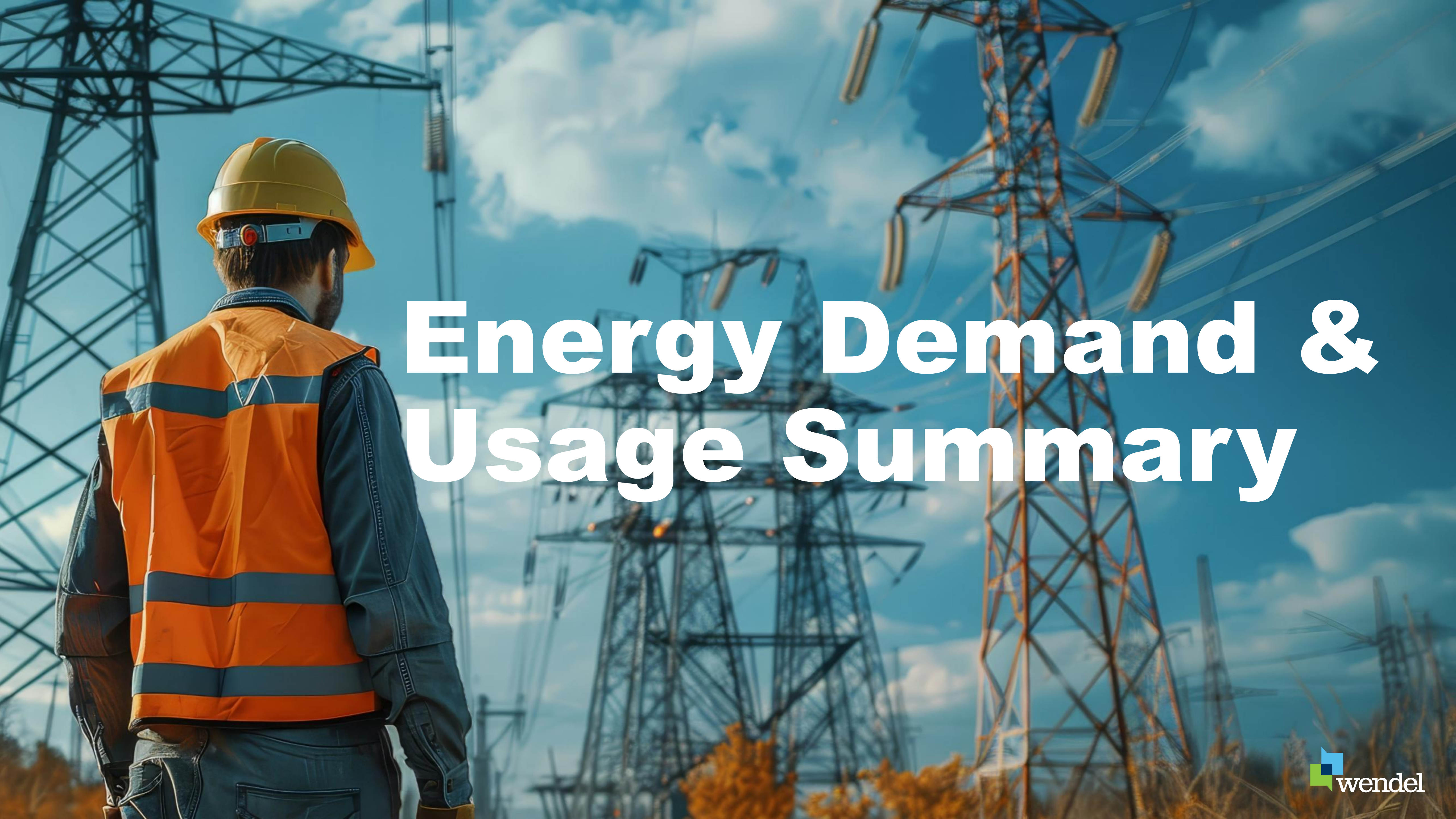
Energy Demand & Usage Summary



Energy Use Summaries (All Campuses)

	Year	Annual Energy Usage		Cost	Blended Rate
Cogen Electric	2023	199,532,823	kWh	$17,957,954	$0.09
Grid Electric	2023	33,742,312	kWh	$4,386,500	$0.13
Steam	2023	864,683	mmBtu	$10,261,164	$11.87
Natural Gas	2023	303,839	mmBtu	$2,174,164	$7.16
Fuel Oil	2023	4,659	mmBtu	$145,901	$31.32
Total	2023	1,969,116	mmBtu	$34,608,920	$17.58

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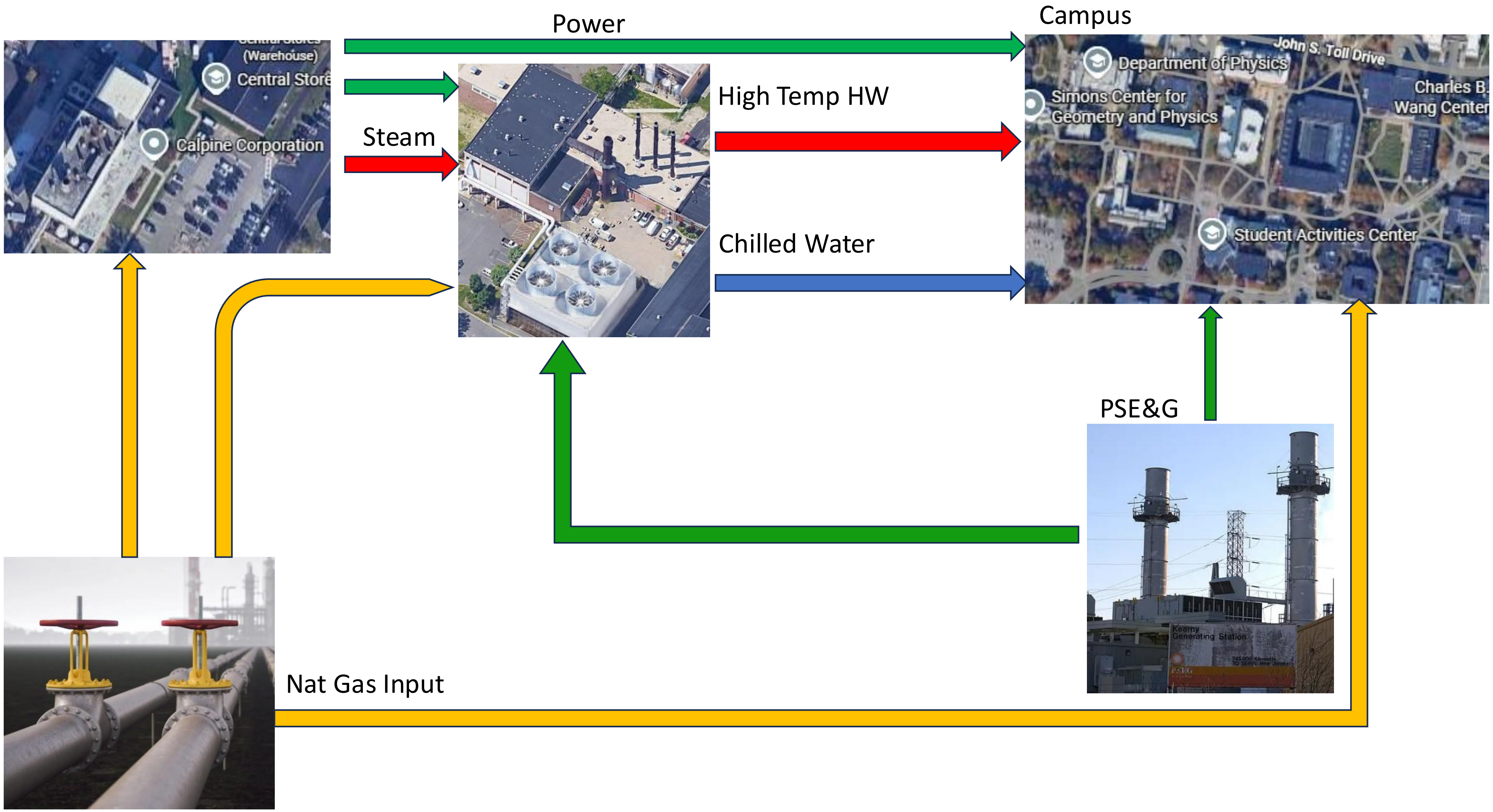
Scenario 0: Business as Usual

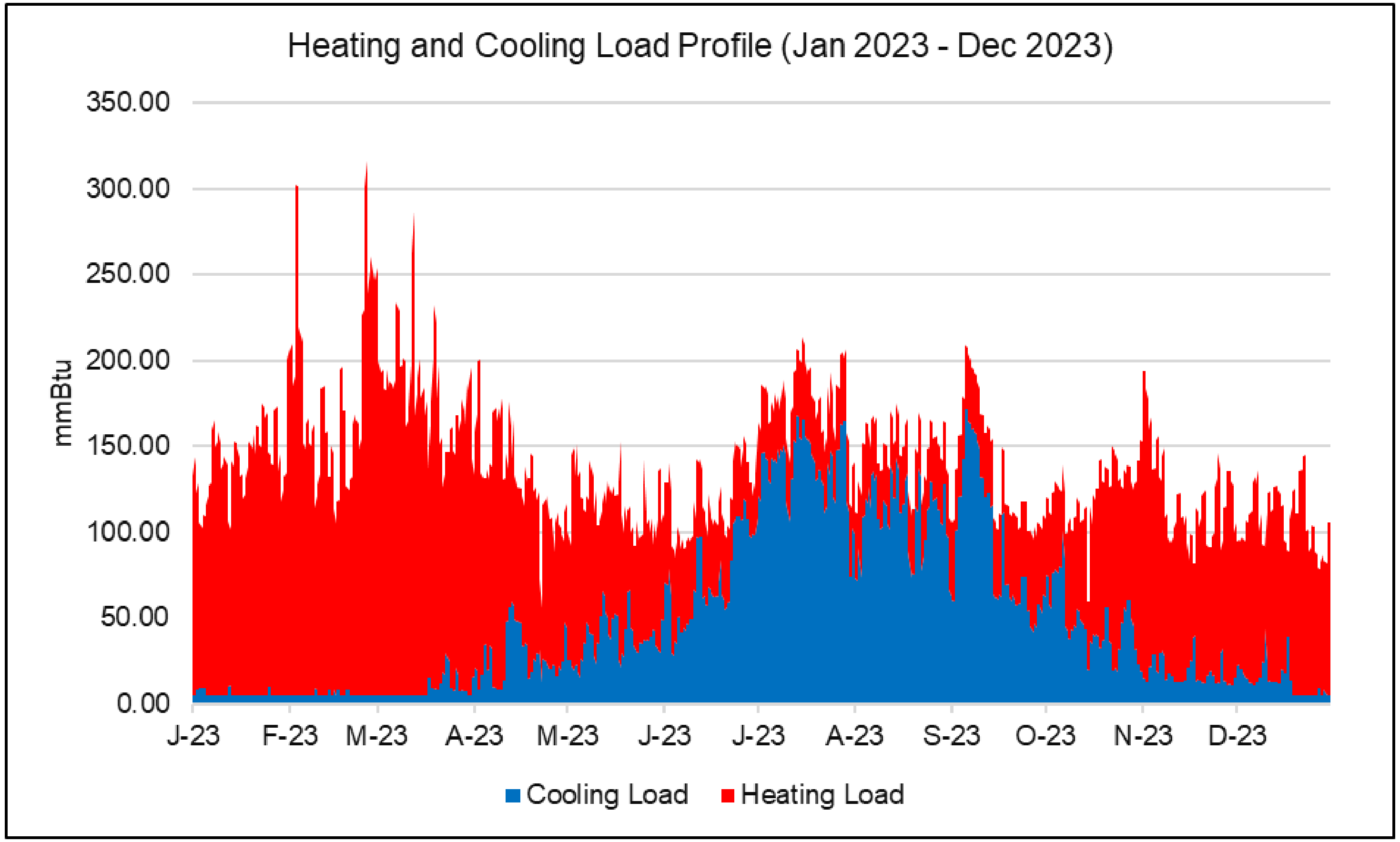
45 MW CO-GEN POWER PLANT



Calpine Plant

- The plant is a 45-Megawatt combined cycle power plant that provides both electric and steam to the East and West campuses, and power to other campuses
- The typical electrical usage from the plant is approximately 35 Megawatts
- The plant generates up to 305 Mlbs/hr of steam at 450 psi
  - Used in heating and cooling the majority of buildings

Overlay to Show Simultaneous Heating and Cooling



Demand profiles based on energy use data from CY2023 (includes all buildings)

Decarbonization Action Plan

PATHWAY TO DECARBONIZATION

Strategic Plan

Strategic Plan

Energy Efficiency

EEMs

Lighting System
- Interior LED Lighting Upgrades and Controls

Building Envelope
- Weatherization
- Window Insulated Panels
- Window Replacements
- Garage Rapid Roll Up Doors
- Garage Door Air Curtains
- Cool Roof
- Roof Replacements
- Green Roof

Water Conservation
- Plumbing Fixtures
- Cooling Towers | Increase Cycles of Concentration

HVAC Controls Upgrades
- Controls optimization
- Enthalpy Economizer
- Shutdown or setback during unoccupied
- Morning/Afternoon Warmup/Cooldown mode
- Supply Air temperature reset
- Static pressure reset
- Demand Controlled Ventilation (CO2 Controlled)
- Full BMS Installation Connecting All Major Equipment
- Three-way valve to two-way valve
- Zone level controls
- Occupancy sensor integration for standby operation
- Window sash sensor integration for standby operation

Chiller Plant
- Chiller Replacement/Upgrades
- Add Water Side Economizer
- Water Side Economizer Optimization
- Variable Volume Primary Flow
- Chilled Water Energy Valves/PID Loops
- Chiller Plant Optimization
- Electrification of chiller plant
- Heat Recovery Chiller / Heat Pump
- Thermal Storage
- Cooling Tower Fans/Controls
- DX to CHW Conversions

Steam/Boiler Plant
- Condensing Hot Water Boilers
- Pressure Reducing Valve to Micro turbine conversion
- Pipe insulation / thermal jackets
- Heat Recovery for make-up water
- Electrification of heating | Electric Boilers
- Heat Recovery Chiller / Heat Pump

Central HVAC System
- Bi-polar ionization (w/DCV or OA rebalance)
- Fan Wall
- SZCV to Variable Volume
- CV/MZ/DD to Variable Volume
- Dehumidification | Independent OA Sub-cooling
- Atomizing humidification
- Air to Air Heat Recovery | Run-around loop, Heat pipe, Enthalpy Wheel
- Air to Water Heat Recovery | Run-around loop
- Steam to LTHW conversions
- AHU Replacements

Laboratories
- Air change rate reduction Occupied/Unoccupied
- Fume hood Constant Volume to Variable Volume
- Fume hood face velocity reduction Occupied/Unoccupied
- Fume hood proximity/room occupancy sensors
- Laboratory system rebalancing
- Laboratory exhaust VFD & discharge velocity adjustments
- Strobic Fans

Terminal HVAC System
- Heat Pump conversion | Terminal ASHP, WSHP, VRF
- Radiator reflectors to reduce envelope loss
- Thermostatic steam valve replacements & upgrades
- Steam trap replacement
- Destratification Fans
- Steam to LTHW conversions
- Electric Conversions | Resistance, Radiant, IR

HVAC Adjustments / Retro-Commissioning
- Rebalance ventilation System to Reduce OA Intake
- Rebalance hydronic loops
- Replace Filters
- Fan belt and shiv O&Ms
- Advance Analytics and Fault Detection

Pump / Motors / Drives
- Retrofit pumps with VFDs
- Simultaneous operate multiple pumps with VFDs
- Pump Replacement with EC Motors

Domestic Hot Water Systems
- Natural Gas Fired Condensing Domestic Hot Water
- Electric Resistance Domestic Hot Water
- Heat Pump Domestic Hot Water
- Booster heater
- Wastewater Heat Recovery
- Domestic Hot Water Heat Recovery Chiller Tie-In
- Solar Thermal HW

Specialty Systems & Plug Loads
- High Efficiency transformer replacements
- UPS system replacements
- Data Center | Hot Aisle/Cold Aisle Containment
- Computer Power Management
- Vending Machine Controls
- Elevator Drives with VFDs and Regenerative Drives
- Autoclave, Glass Wash & Cagewash Electrification
- Replacement of ultra-low temperature freezers
- Process Heat Recovery HP (IT, Cold Room, MRI)
- Cooking/Lab Gas-to-Electric
- Kitchen hood controls
- Pool Cover
- Walk-in cooler/Cold Room optimization
- Compressed Air Leak Detection
- Air Compressor Replacement with Heat Recovery

Renewable Energy and Storage
- Solar PV
- Small Wind
- Fuel Cells
- Lithium Battery Banks
- Biogas

Thermal Networks
- Air Source Heat Pumps
- Ground Source Heat Pumps
- Condensate Heat Recovery
- Wastewater Heat Recovery
- Exhaust Air Heat Recovery
- Thermal Storage

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Low Temperature Hot Water Conversion

- Building Systems converted to low-temp hot water over time
- Become technology agnostic within buildings
- Allows the campus to start incorporating any technologies to generate hot water
- Potential to use Plastic Piping CPVC to reduce leaking and O&M Costs ~$5M / yr

Strategic Plan

Energy Efficiency

Energy Recovery

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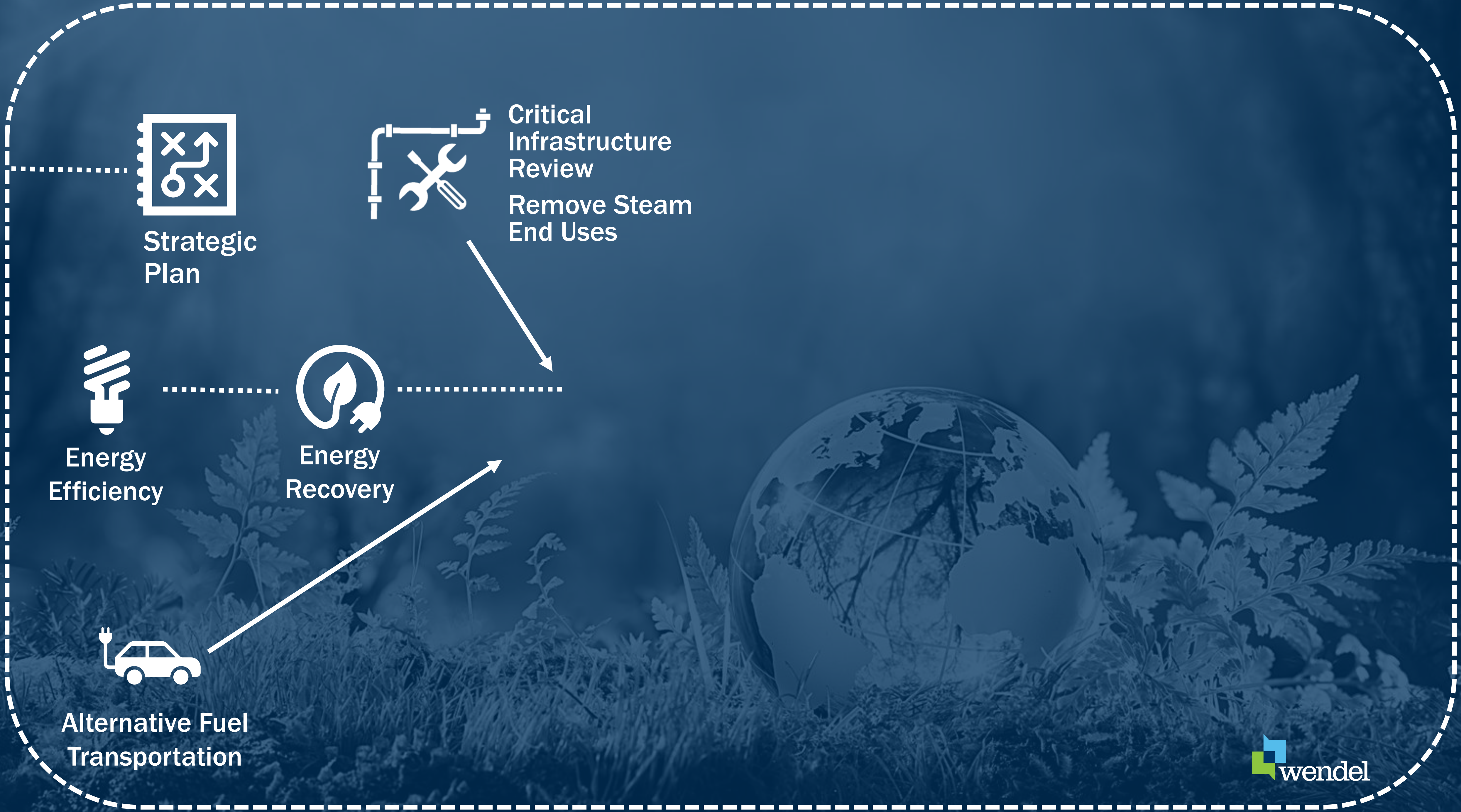
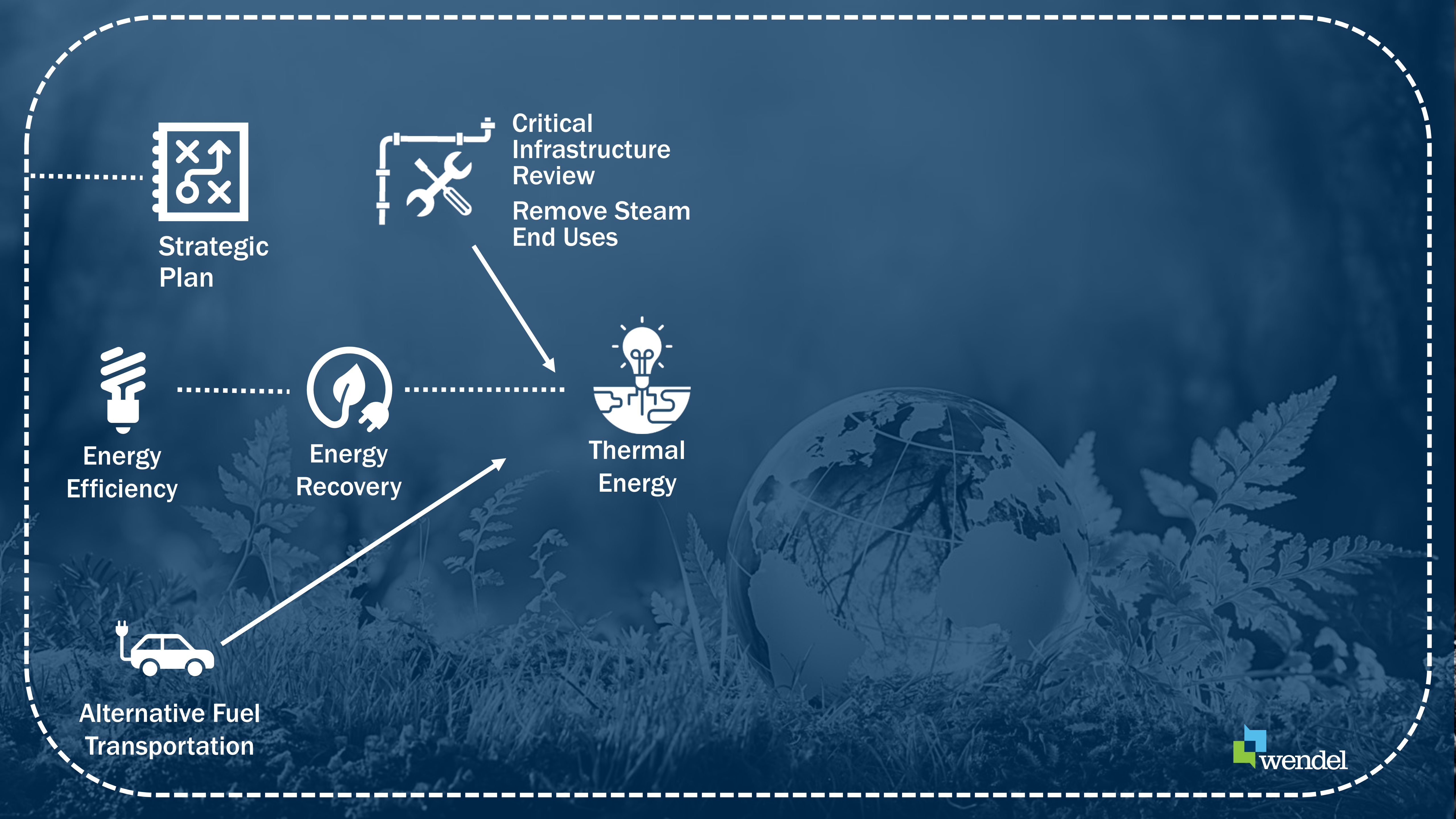
Strategic Plan
Energy Efficiency
Energy Recovery
Alternative Fuel Transportation


Strategic Plan
Critical Infrastructure Review
Remove Steam End Uses
Energy Efficiency
Energy Recovery
Alternative Fuel Transportation

Complicated Infrastructure Issue Solutions

Infrastructure Issues	Potential Solutions
Multiple Campuses	Different Solutions Campus Bases
~150 Buildings	Building by building solutions, stress testing
High Temp Hot Water	Convert to Low temp hot water
Steam generated Chilled Water	Convert to electric chilled water generation
Buried Piping	Replacement and /or GIS mapping of buried infrastructure with easier maintenance possibilities
Hospital	Battery Storage / Power Quality, isolation
Grid Power Unreliable	Use current technologies to address this, battery storage, thermal storage
High O&M Expenses	Solution should provide options for lower O&M expenses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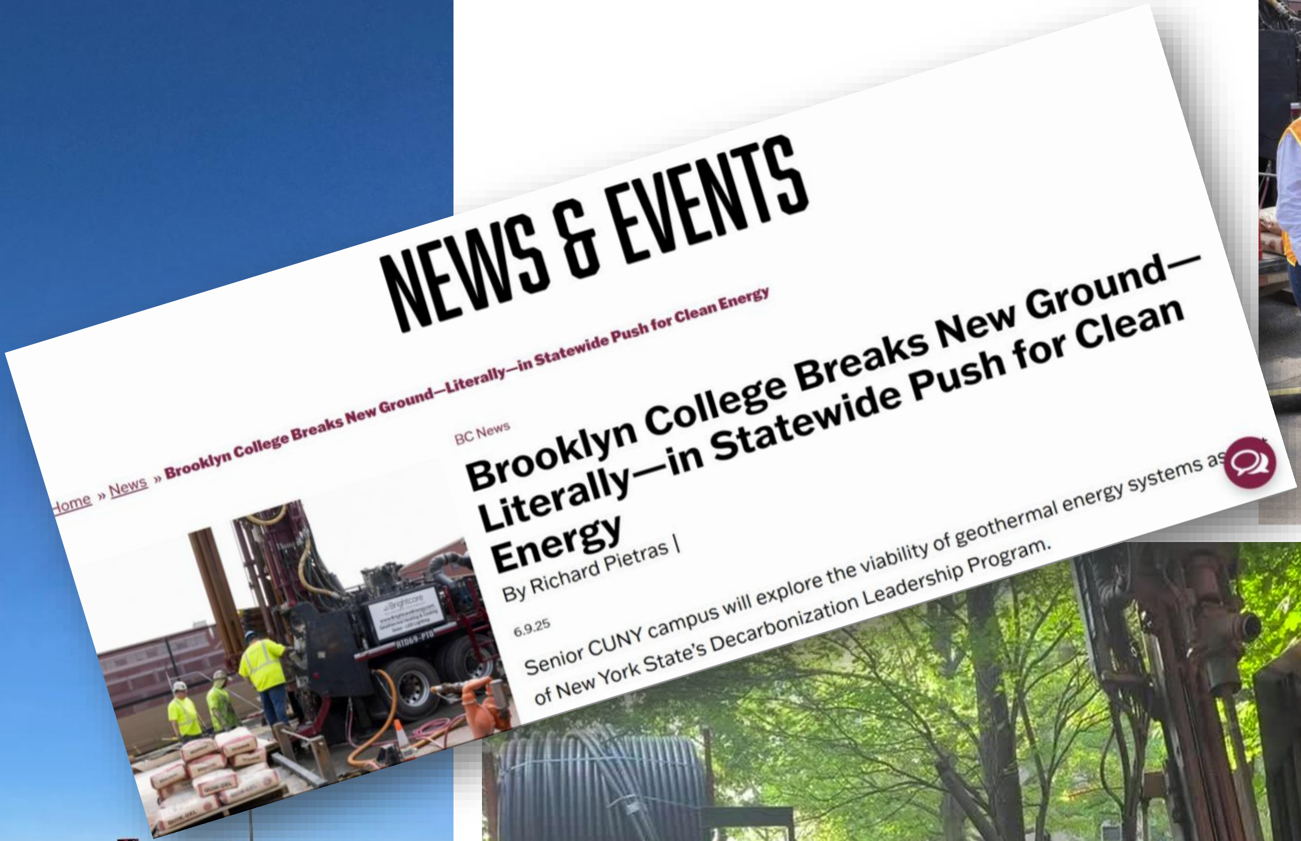

NEWS & EVENTS

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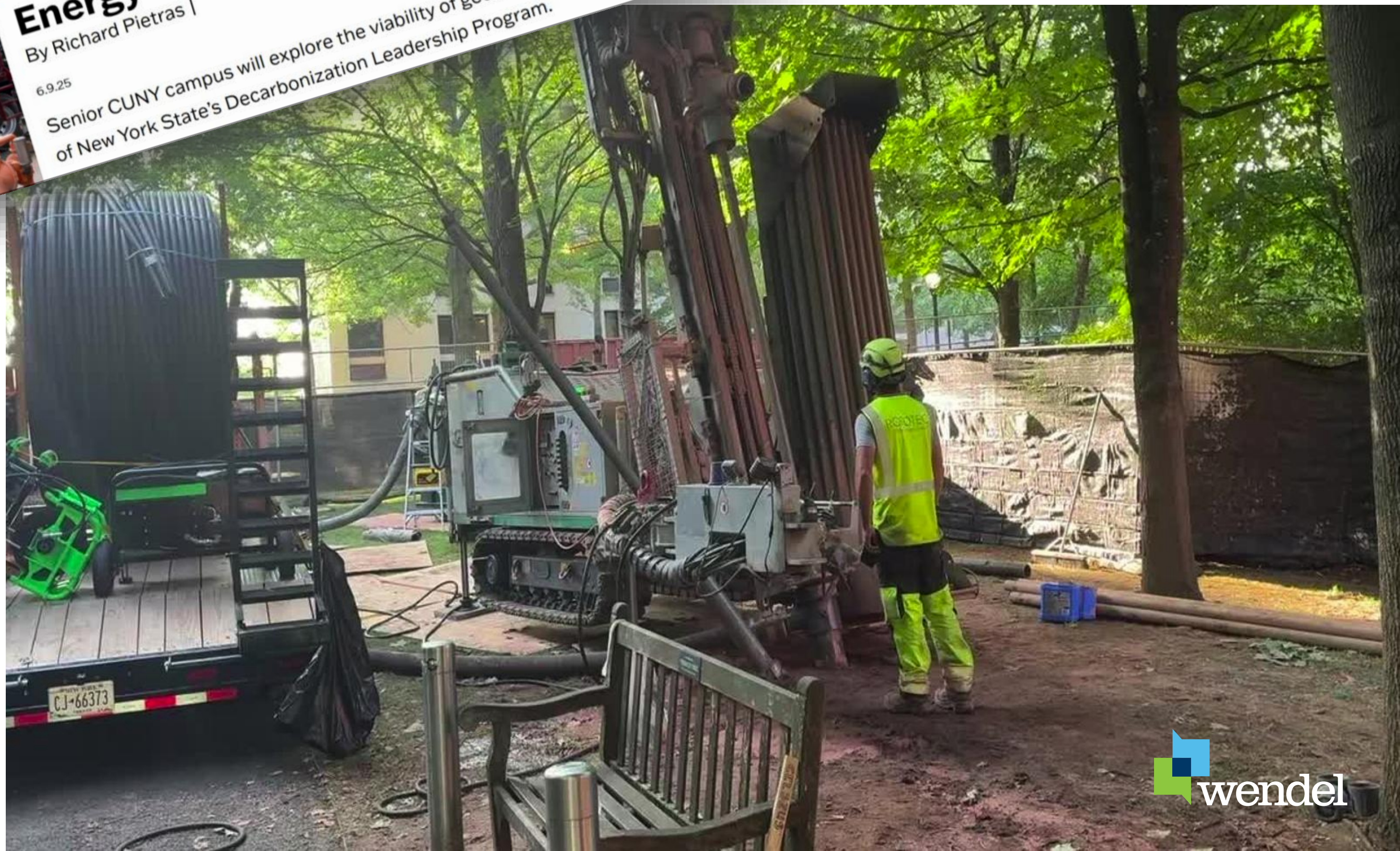
BC News

Brooklyn College Breaks New Ground—Literally—in Statewide Push for Clean Energy

By Richard Pietras |

6.9.25

Senior CUNY campus will explore the viability of geothermal energy systems as
of New York State's Decarbonization Leadership Program.



NYS Decarbonization Leadership Program

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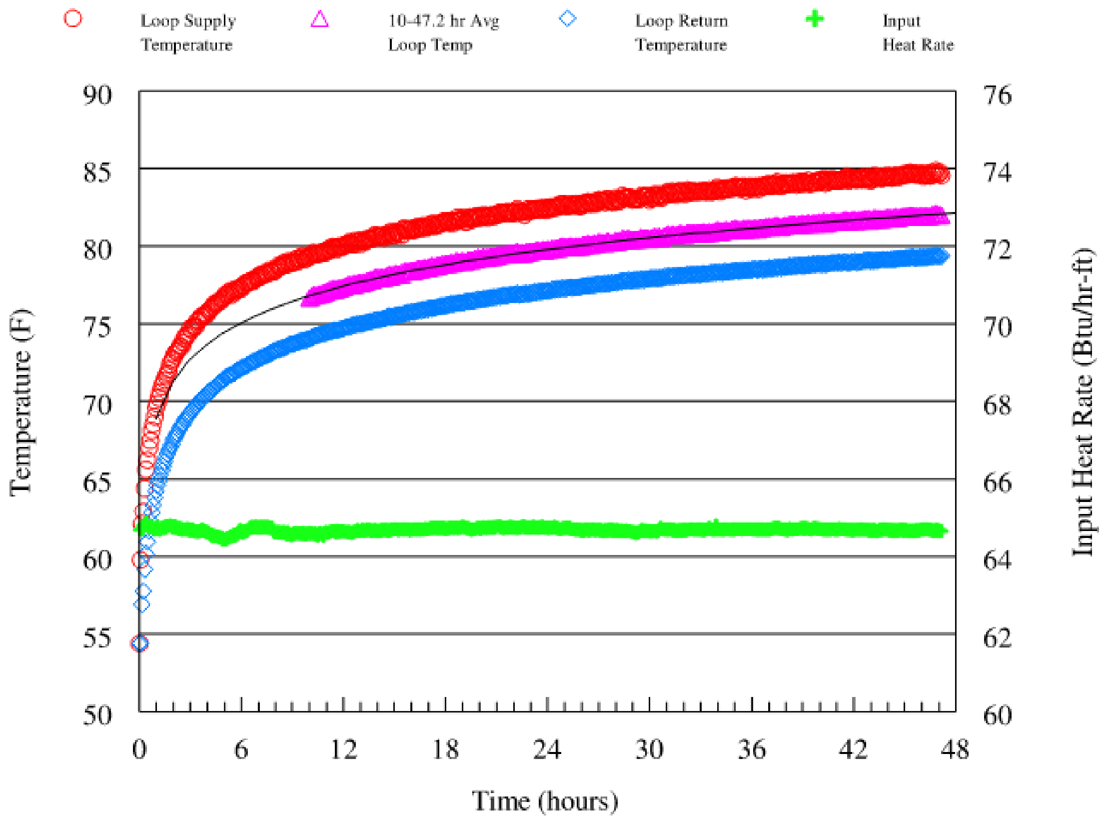
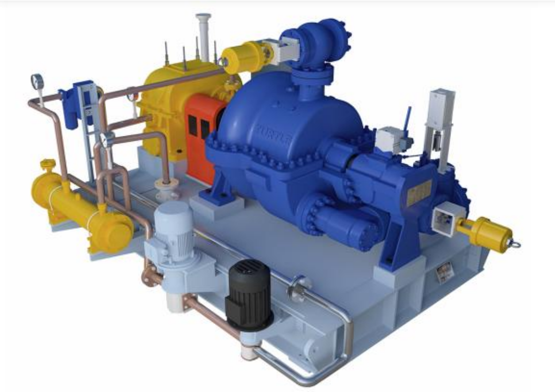
Drill Log

Formation Description	Depth (ft)
Sand, gravel	0'-50'
Gravel, sand, streaks of clay	50'-90'
Big gravel	90'-130'
Coarse gravel #2	130'-170'
Grey clay	170'-190'
White clay/gravel	190'-290'
White with brown clay	230'-290'
Multicolored clay	290'-310'
White sandy clay	310'-390'
Little gravel mixed with clay	390'-410'
Sandy gravel	410'-448'
Grey clay	448'-470'
Hard grey clay	470'-505'

Thermal Conductivity Test Data



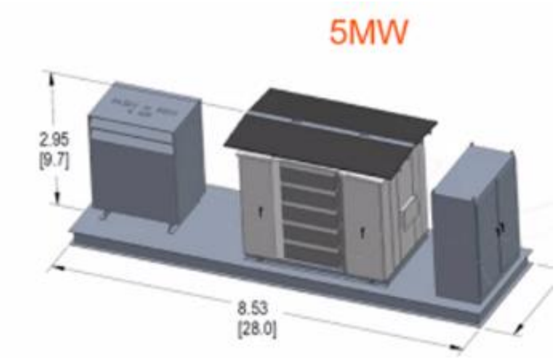
Technology Review



Back pressure turbine

Turbine

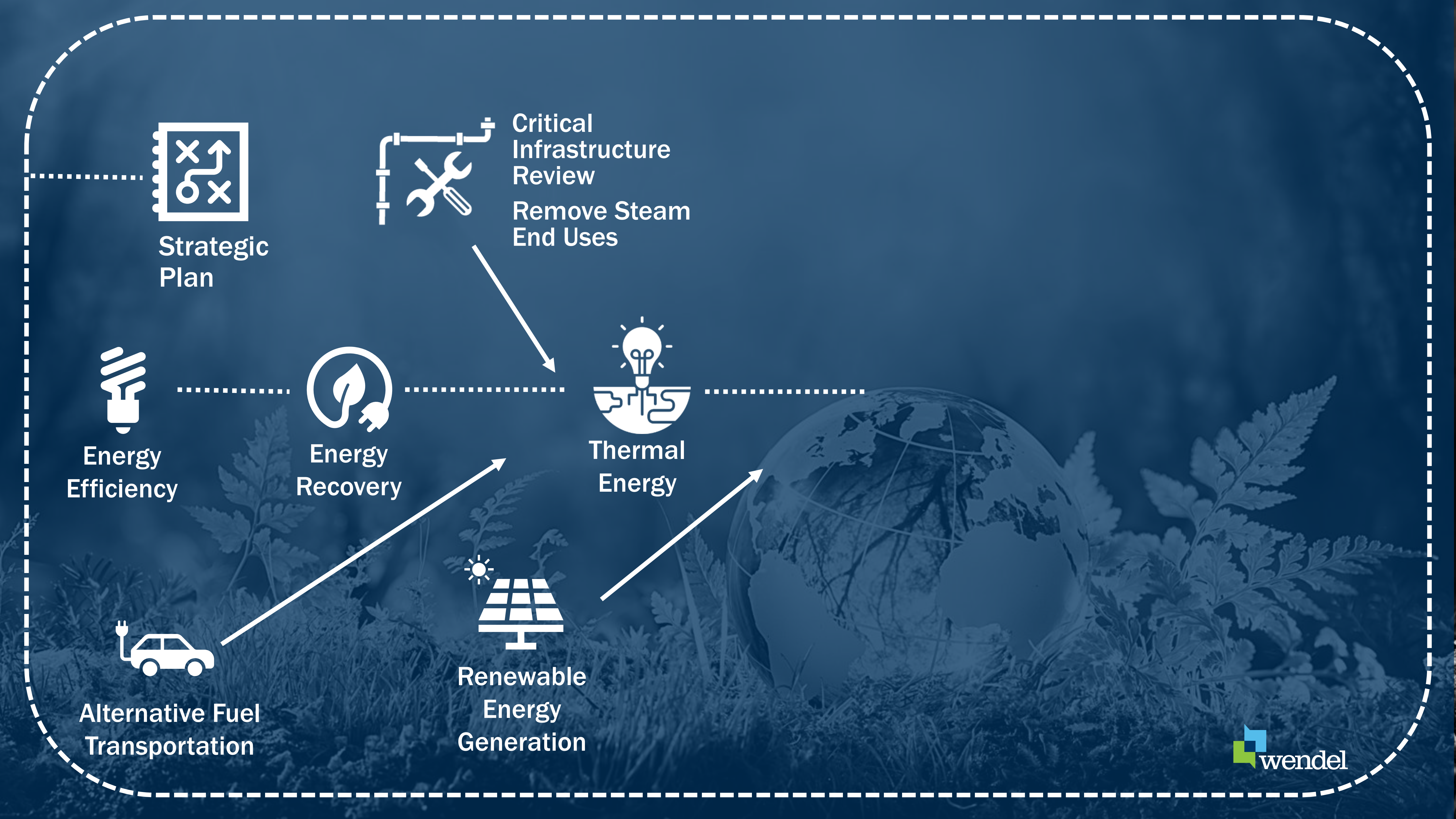
Micro turbine



Battery

Fuel Cell

Heat Recovery Air-Source Heat Pump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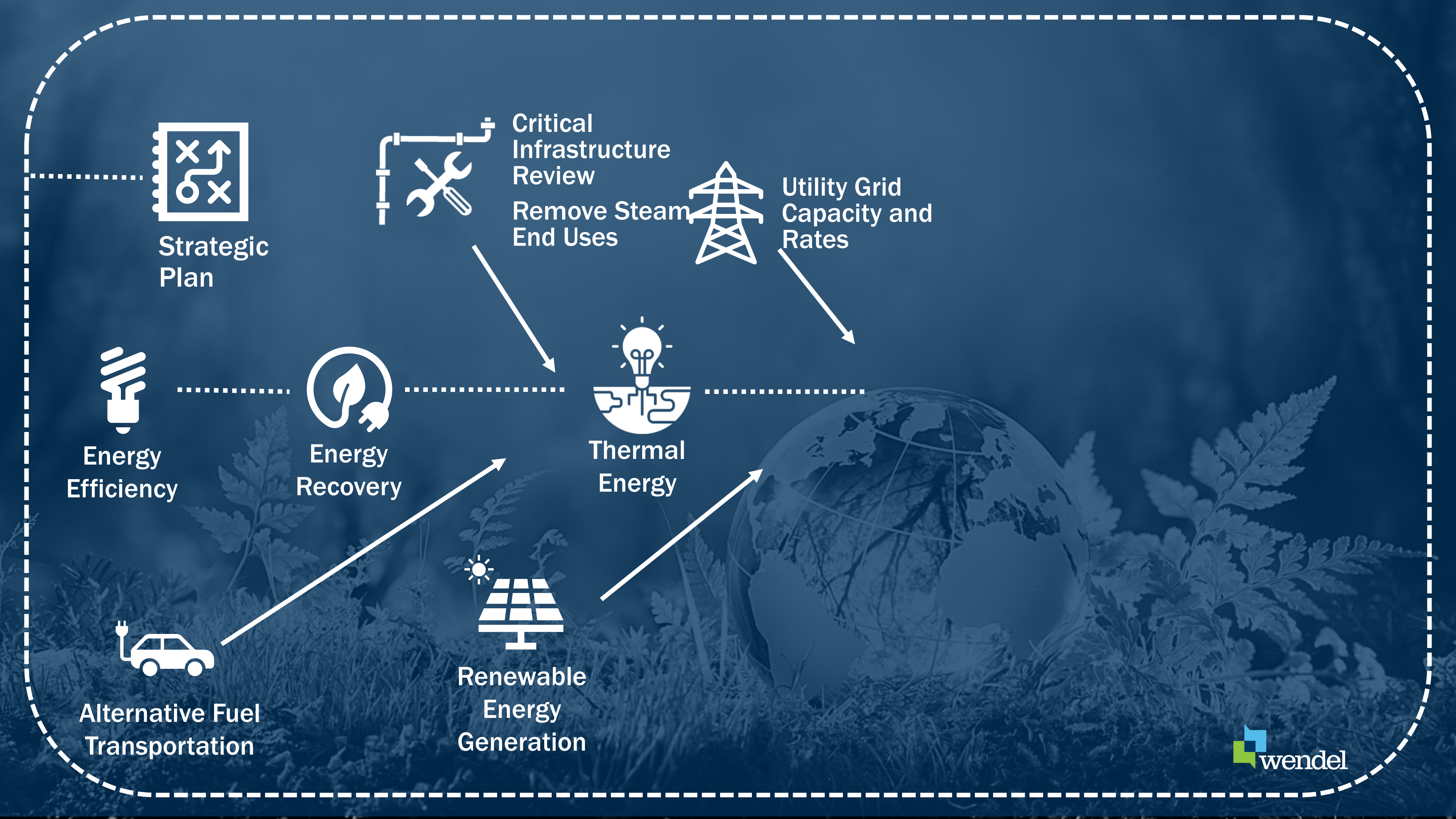
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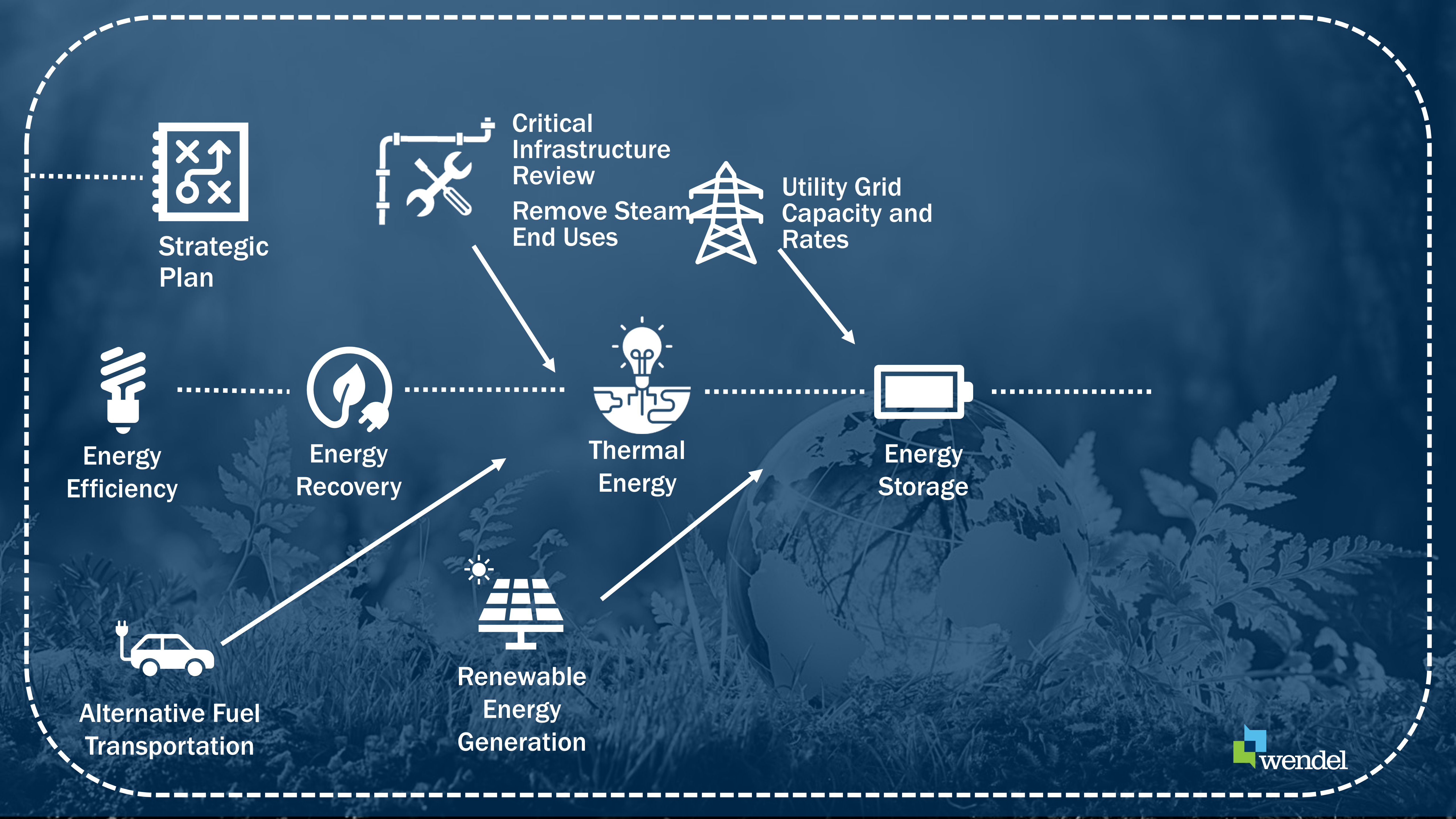

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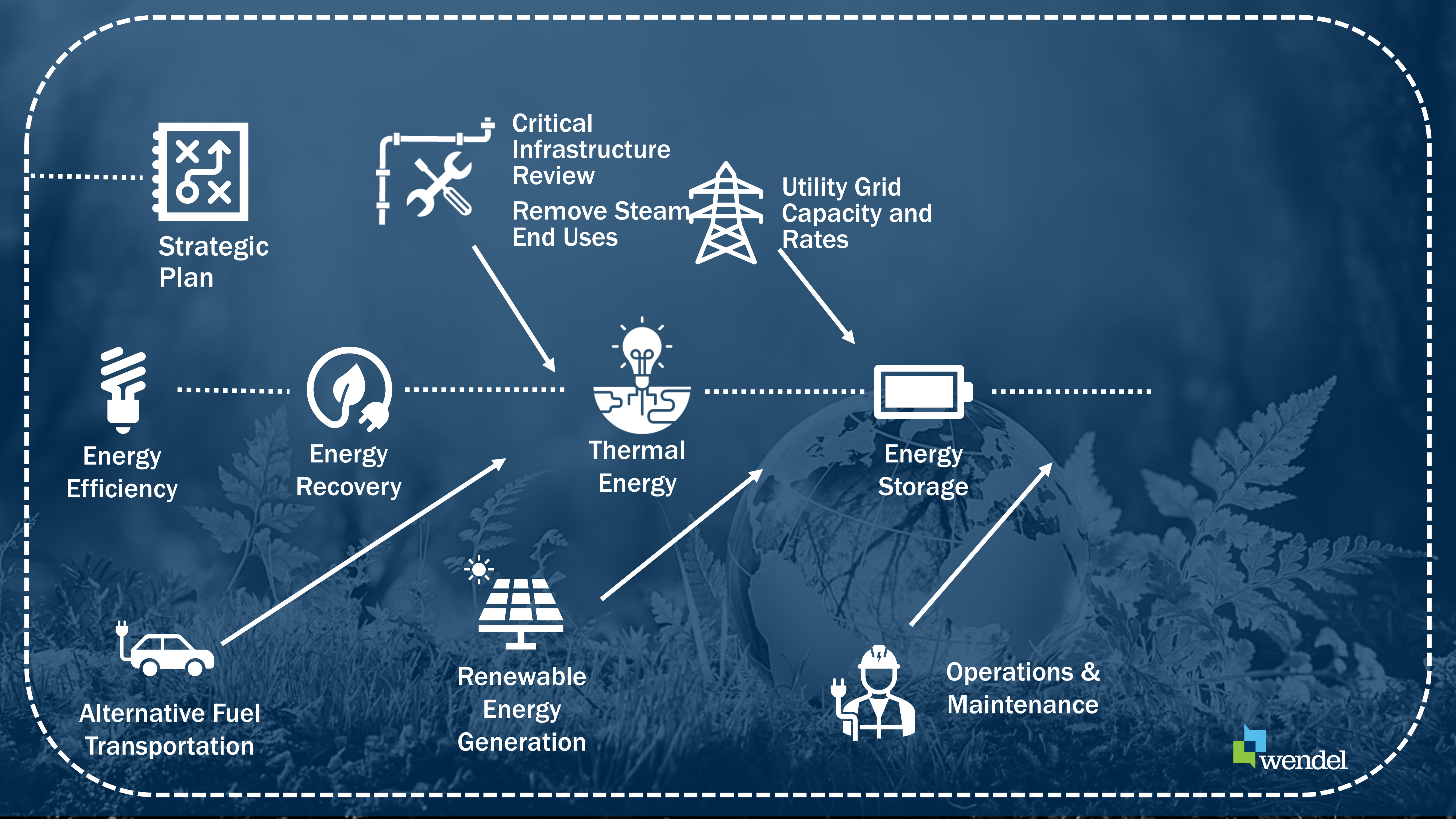

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Operations & Maintenance
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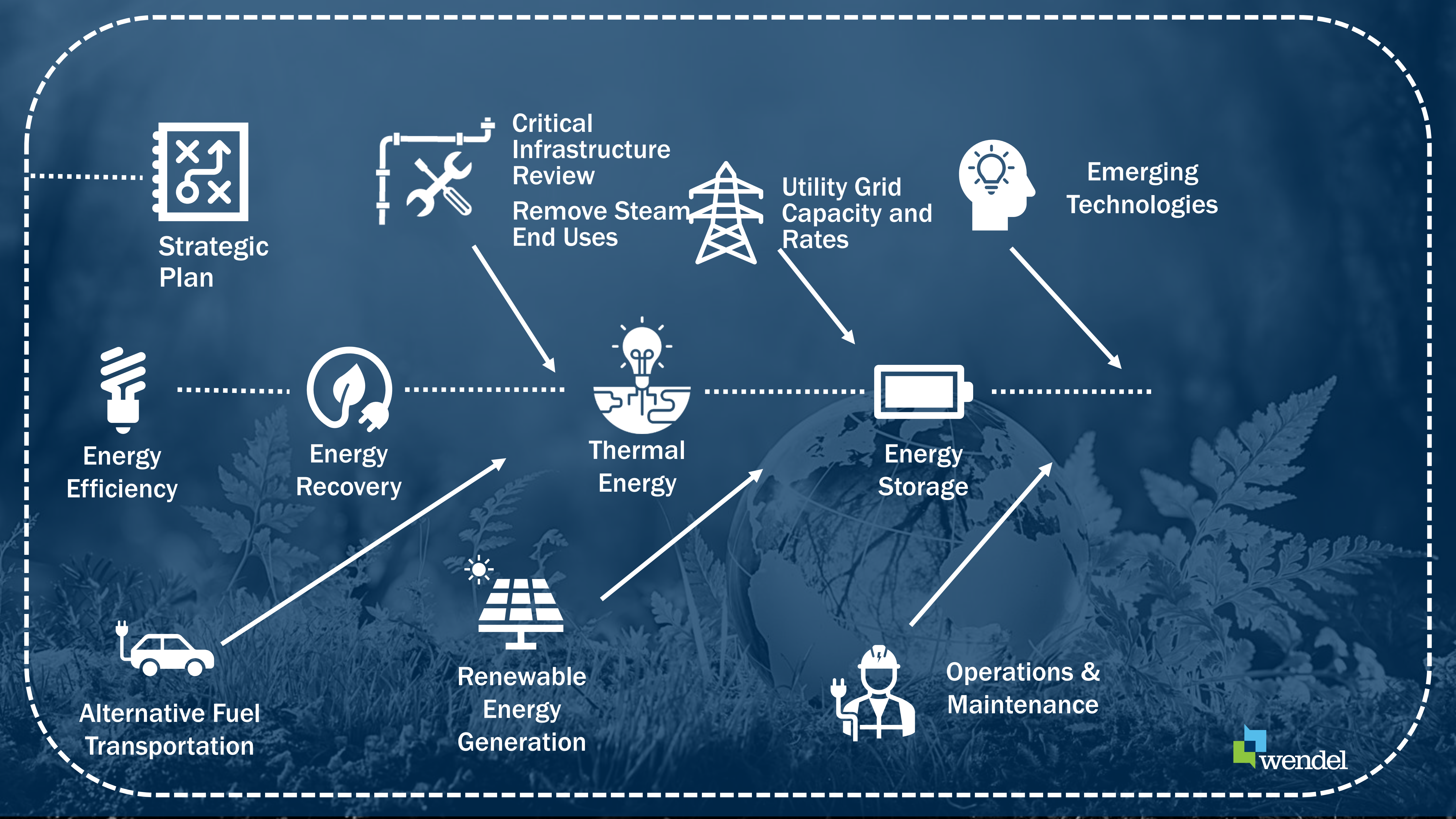

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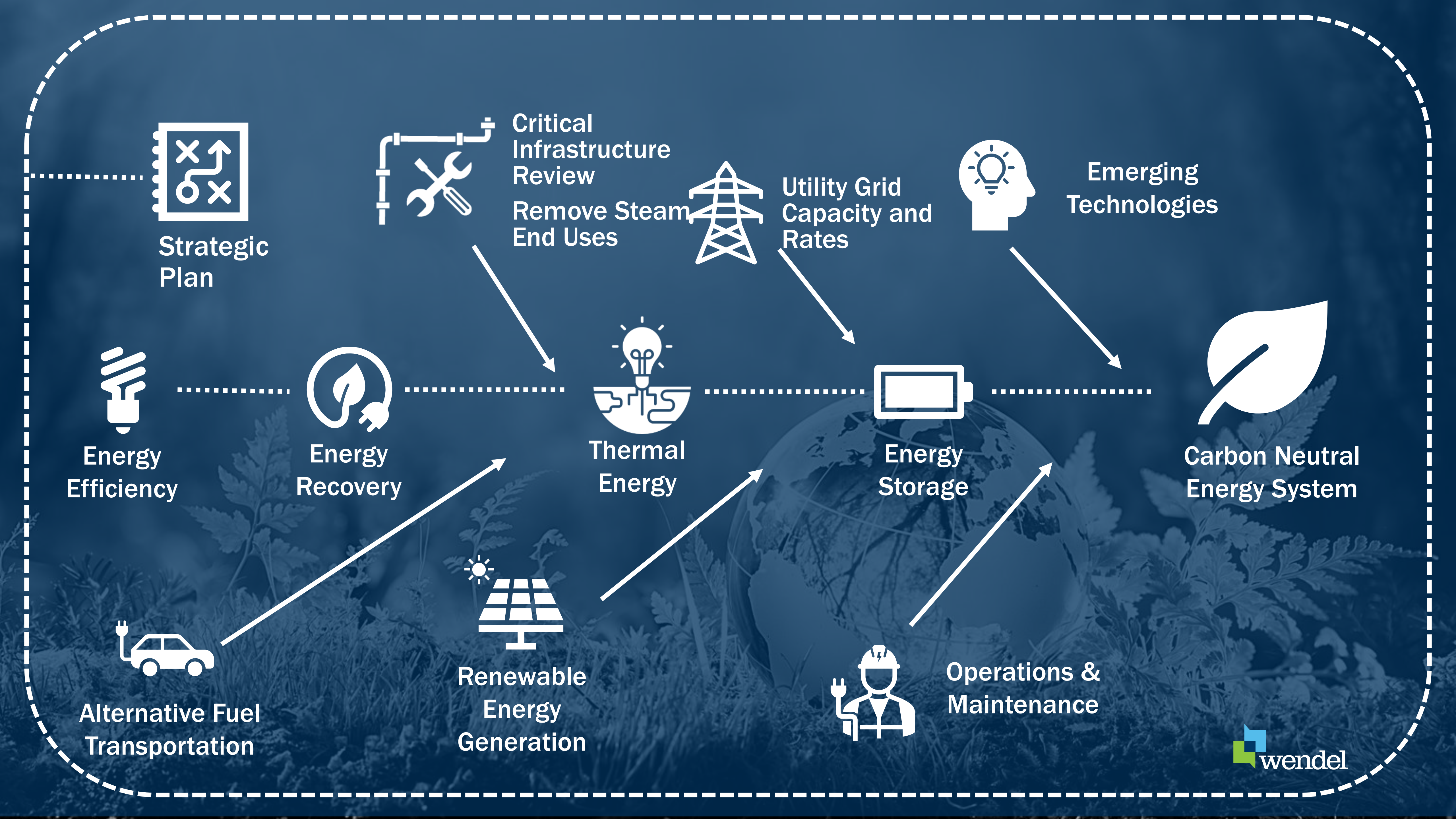
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Operations & Maintenance
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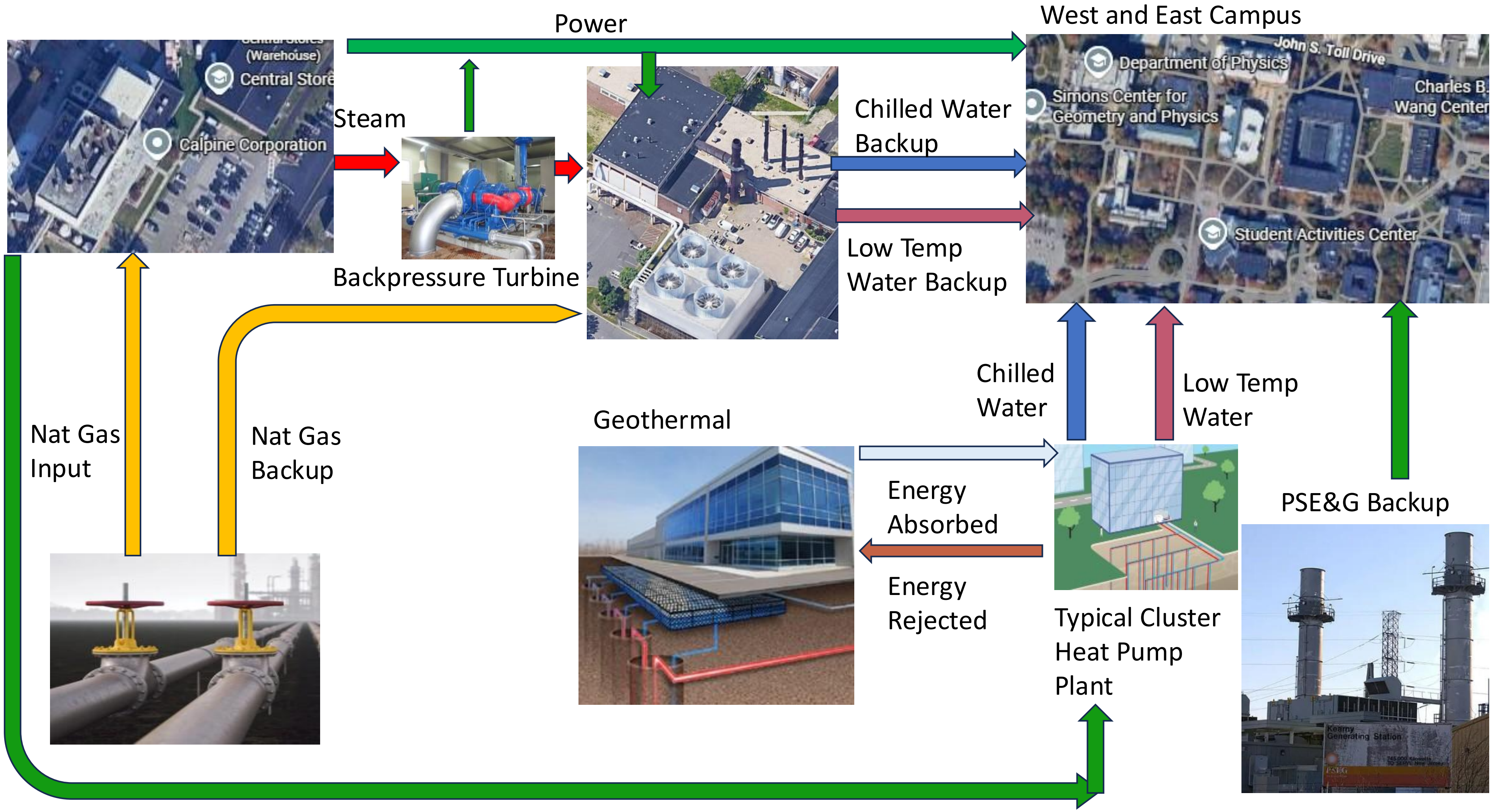
Scenario Summary

Scenario	Business as Usual	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Network configuration	Current system	Current CHP Plant and Heat Pump Clusters	New East Campus CHP Plant and West Campus Clusters	Electric Boilers	Heat Pump Clusters
Baseload technology	N-gas & Co-gen steam	Ground Source HP	Co-Gen Hot Water & Ground Source HP	Electric Boilers	Ground Source HP
Peaking Technology	N-gas	N-gas	Electric	Electric	Electric
Summer, DHW	Local gas / Central	Local electric / Central	Local electric	Local electric	Local electric
Winter, DHW	Local gas / Central	Local electric / Central	Local electric	Local electric / Central	Local electric
Space cooling	Steam Driven & Electric Chillers, & Local DX	Electric Chillers, GSHP Chillers, & Local DX	Electric Chillers, GSHP Chillers, & Local DX	Electric Chillers & Local DX	GSHP Chillers
Backup heat	Boiler: N-gas	Boiler: N-gas	Boiler: N-gas	Boiler: N-gas	Boiler: N-gas
Thermal energy storage	No	No	No	Yes	Yes
Thermal Balancing	NA	Balanced System	Heat injection from East Campus CHP Plant	NA	Balanced System

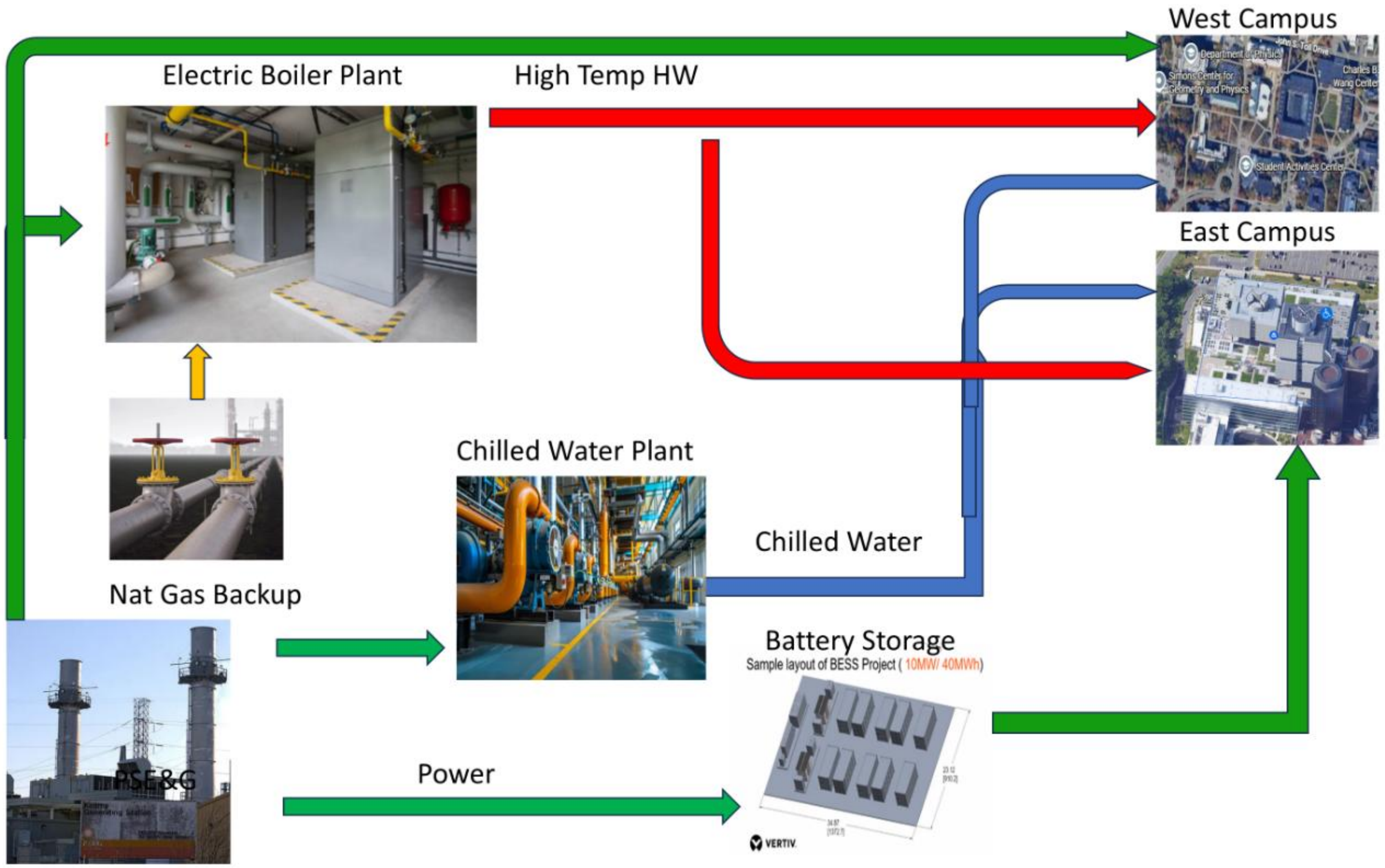
Scenario 1:

CONTINUE MAIN CO-GEN, GEOTHERMAL CLUSTERS, AND LOW TEMP HOT WATER, BACKPRESSURE TURBINES



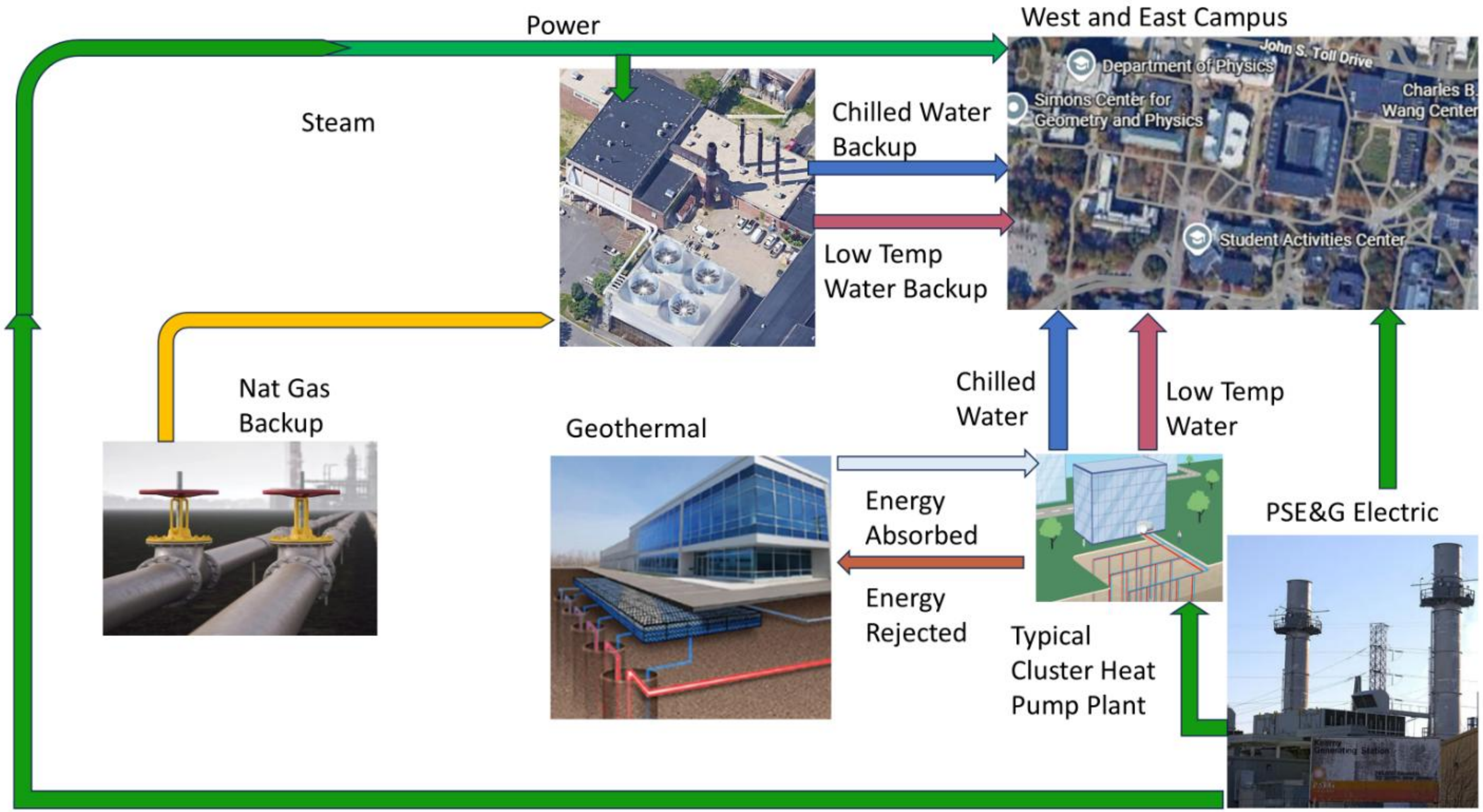
Scenario 3:

ELECTRIC BOILERS, FURNACES, AND EAST CAMPUS BATTERY BACKUP



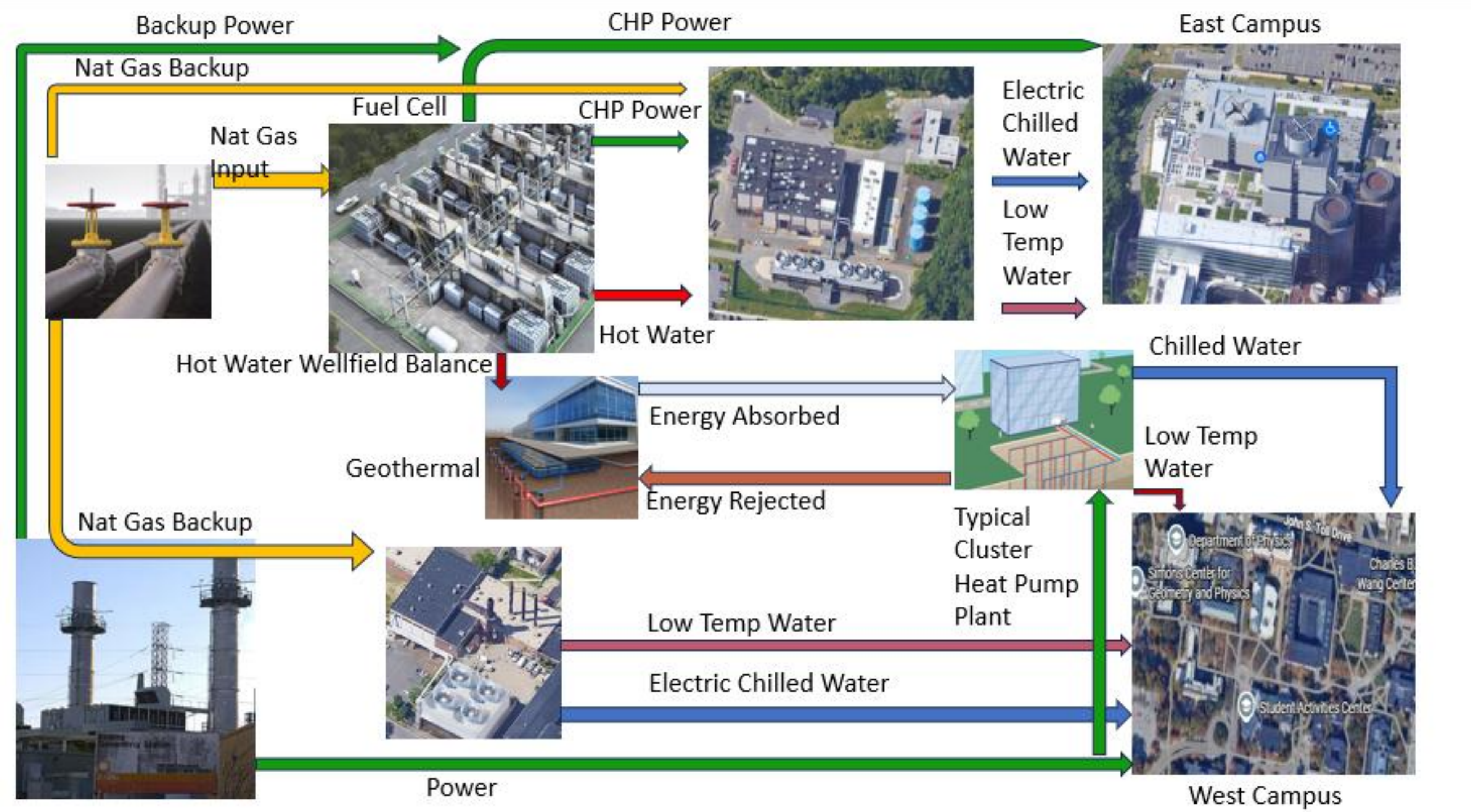
Scenario 4:

CAMPUS-WIDE GEOTHERMAL HEAT PUMP AND AIR SOURCE HEAT PUMP SYSTEMS



Scenario 2:

EAST CAMPUS CO-GEN, WEST CAMPUS GEOTHERMAL CLUSTERS, LOW TEMP HOT WATER



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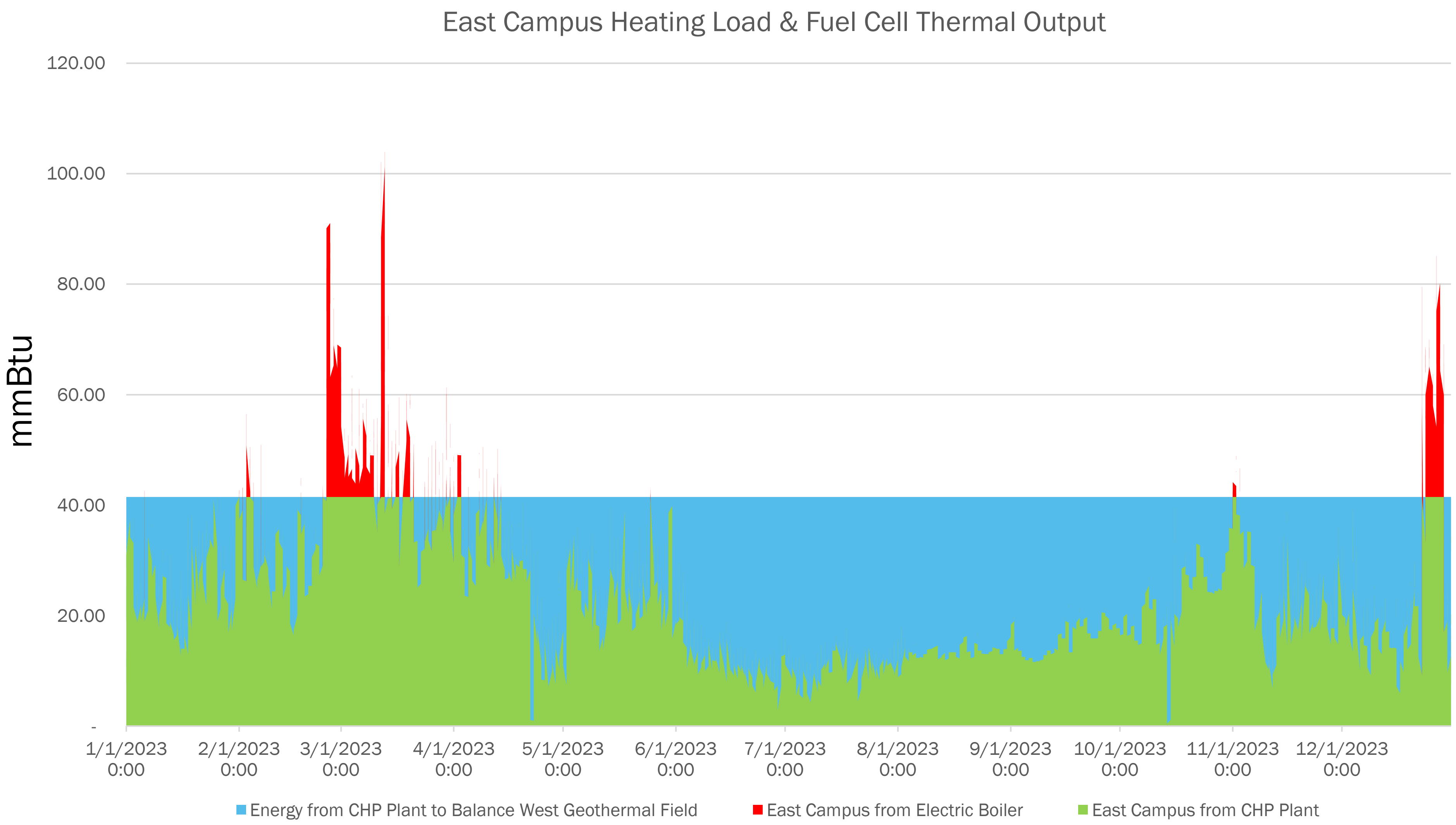
Scenario 2:

BASELOAD AND PEAK STRATEGY



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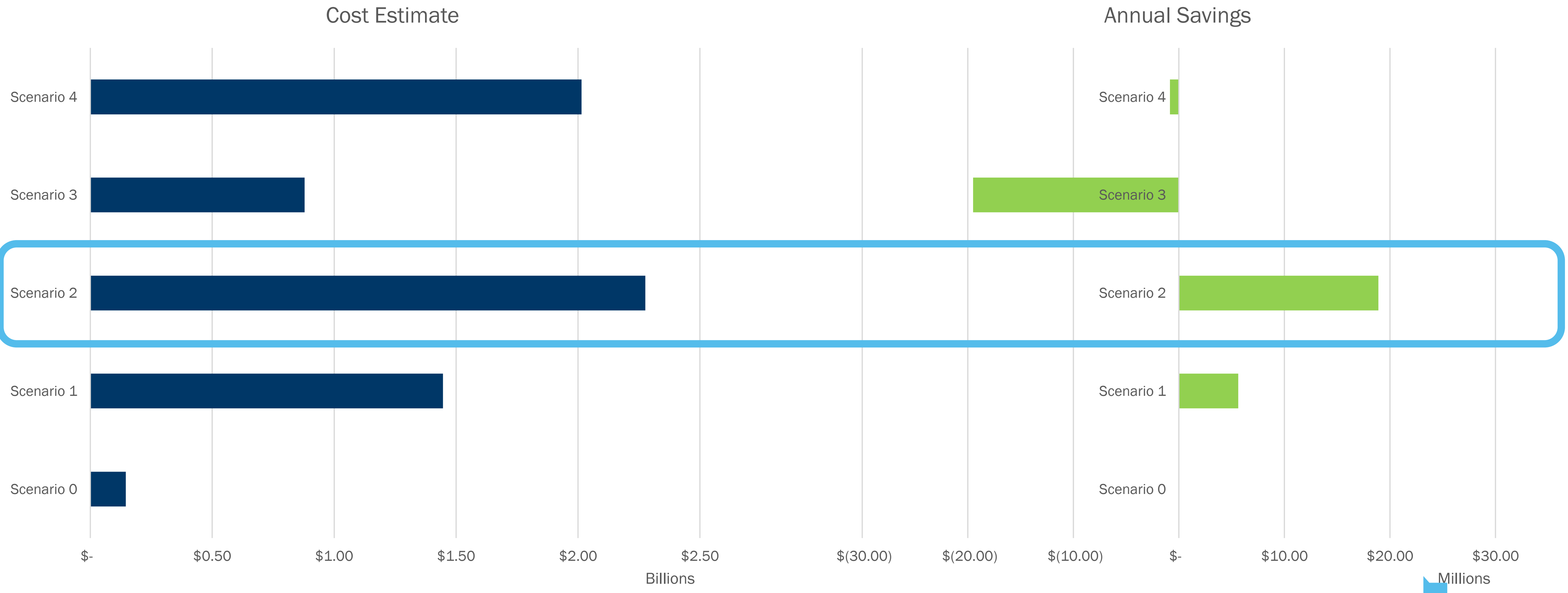
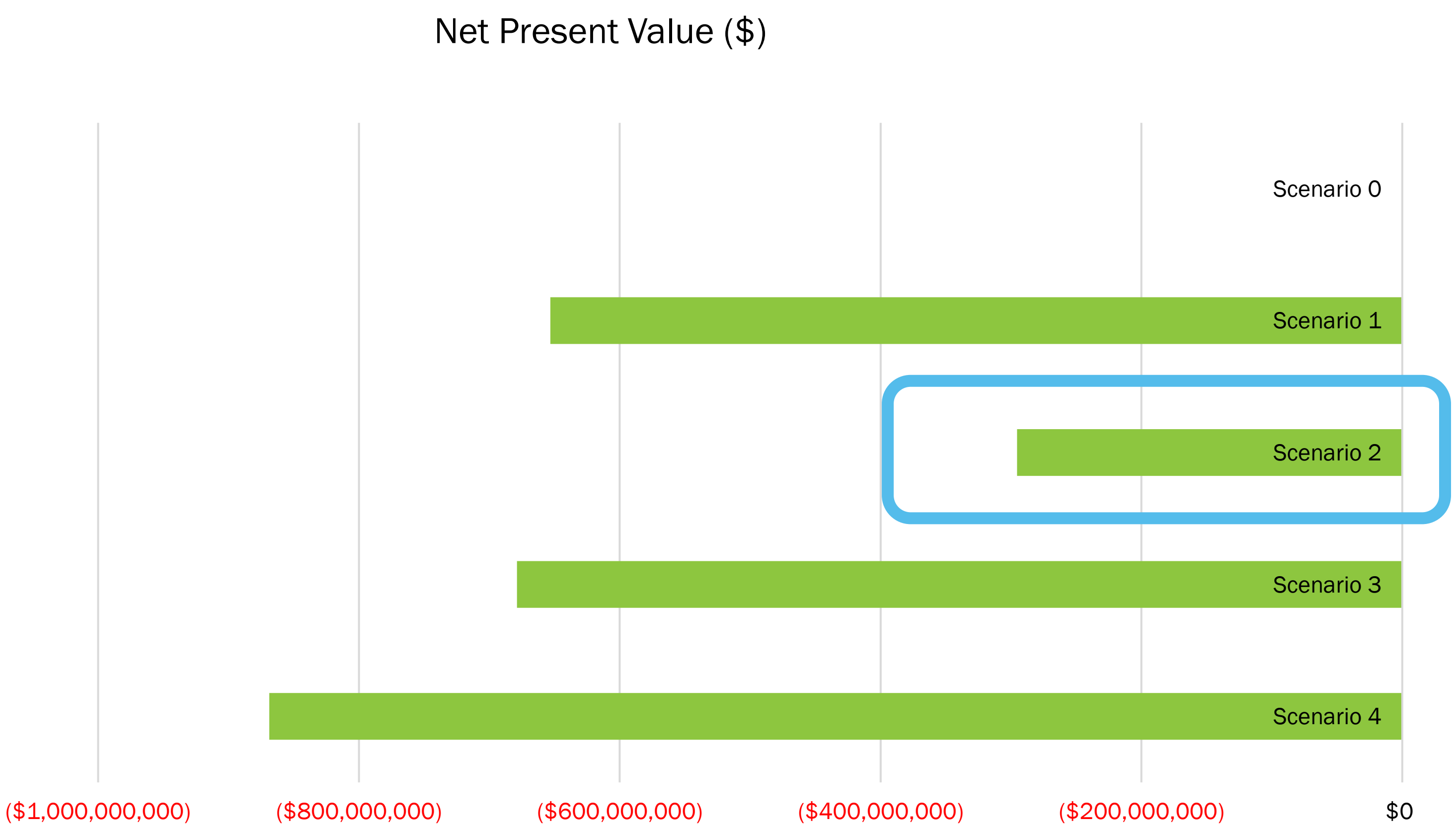
Cost Estimates & Annual Savings



Scenario NPVs



	Scenario 4	Scenario 3	Scenario 2	Scenario 1	Scenario 0
Net Present Value ($)	($868,691,678)	($678,750,473)	($295,286,674)	($653,154,466)	$0

Phasing Plan Scenario 2

35% CO_2 Reduction

$695M

Phase 1

- New Fuel Cell Co-Generation Plant at East Campus
- Campus-wide distribution for LTHW – East Campus
- Energy Efficiency Measures
- Steam to Electric Main Plant Chillers – West and East Campus

45% CO_2 Reduction

+$675M

Phase 2

- West Campus Heat Pump Clusters (1st Set)
- Campus-wide distribution for low temperature hot water – West Campus

100% CO_2 Reduction

+$905M

Phase 3

- West Campus Heat Pump Clusters (2nd set – heating only)
- Run-around loop and DHW integration ingo heat pump clusters – West Campus
- South Campus air source heat pump system
- Southampton geothermal heat pump system
- Southampton air source heat pump system
- Flax pond air source heat pump system
- Co-Generation Plant Upgrade to Hydrogen
- Zero emission power grid 2040

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Pilot Project

- Manageable
- Helps to Fix Current Issues
- Identifies any gaps from study to design and into implementation
- Aligns with long term planning energy and sustainability goals

Stony Brook Initial Pilot Project

- 2 Backpressure Turbines – add 8MW of power generation
  - Stony Brook will need additional power into the future
- New Electric Chillers to replace the steam driven ones
  - The old steam chillers are at the end of their useful life and need to be replaced
- Heat Recovery Chillers
  - Tie in 2 clusters of buildings with heat recovery chillers to take advantage of simultaneous heating and cooling
- Financials:
  - **$22,610,857** total project incremental cost ($79,832,571 total cost)
  - **$1,060,677** savings using current electric utility rates (expected to rise), includes O&M savings
  - Produce **16,000,000 kWh** initially, only during the summer
  - Saves **225,841 kWh and 16,722 mmBtu steam, and 2,200 mmBtu of natural gas**
  - Looking at New PSE&G rates, the payback on this project should be less than 14 years

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Funding Pathways for Campus Decarbonization

Key Funding Mechanisms

- Federal incentives
- State and utility incentives
- Institutional capital + budget planning
- Hybrid models (EPC, PPP, phased capital)

Why Funding Must Be Integrated Early

- Maximizes available incentives
- Improves project affordability
- Helps phase investments in alignment with campus priorities

Wendel's Current DASNY/CUNY Term Contracts

NEW YORK STATE OF OPPORTUNITY. | DASNY

Term Contract	Contract #
Energy Service Performance Contract (ESPC)	#220456
Arch & Eng Term	#223482

THE CITY UNIVERSITY OF NEW YORK (CUNY)

Commissioning	#CITYW-CUCF-04-21
Retro-Commissioning	#CITYW-CUCF-04-21

Energy Performance Contracting (EPC) Through DASNY

What EPC Provides

- No up-front capital requirement
- Guaranteed energy savings
- Streamlined procurement through DASNY

Best Uses

- Energy efficiency upgrades
- Controls + optimization
- Early-phase electrification measures

Considerations

- May not fully cover large legacy-system transitions
- Often used in combination with other funding sources

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Stony Brook's Success with EPC

- NYSERDA - STATE EnVEST Fixed Price Energy Performance Contract 2002
- Nine (9) amendments $61.5M

Amend #	$ Saved	kWh Saved	Gas Therms	Steam MMBTU	Water Mgal	Cooling Ton-hrs
1-6	$4.8 M	23,305,417	7,040,856	168,000	42.0	6,800,000
7	$1.243 M	9,475,489	20,327			
8	$650 K	4,329,984	8,661			
9	$473 K	2,786,577	6,137			
Total	**$7.1 M**	**39,897,467**	**7,075,971**	**168,000**	**42.0**	**6,800,000**

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Value of PPP for Geothermal + District Energy

Why Consider a Public-Private Partnership?

- Access to private capital for large-scale geo systems
- Ability to shift risk (design, construction, long-term performance)
- Accelerates implementation for complex infrastructure

PPP Strengths

- Proven delivery model for district-level geoexchange
- Supports phased campus transitions
- Reduces institutional burden on O&M and lifecycle management

Lessons Learned

- Identifying critical systems and infrastructure that drive the solution. For Stony Brook that was the Hospital and Large Power Generation Infrastructure across multiple discontinuous campuses
  - Resiliency, redundancy, and off-grid solutions are key for campuses as electrification advances
  - Flexibility is necessary when working with precise, life saving equipment
  - Technology Agnostic Project Development
  - Baseline costs over time is not zero
- Exploring every solution available to you allows you to create a system that helps you achieve your goals
- Campus complexity can be leveraged to create prosperous solutions

Questions?

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