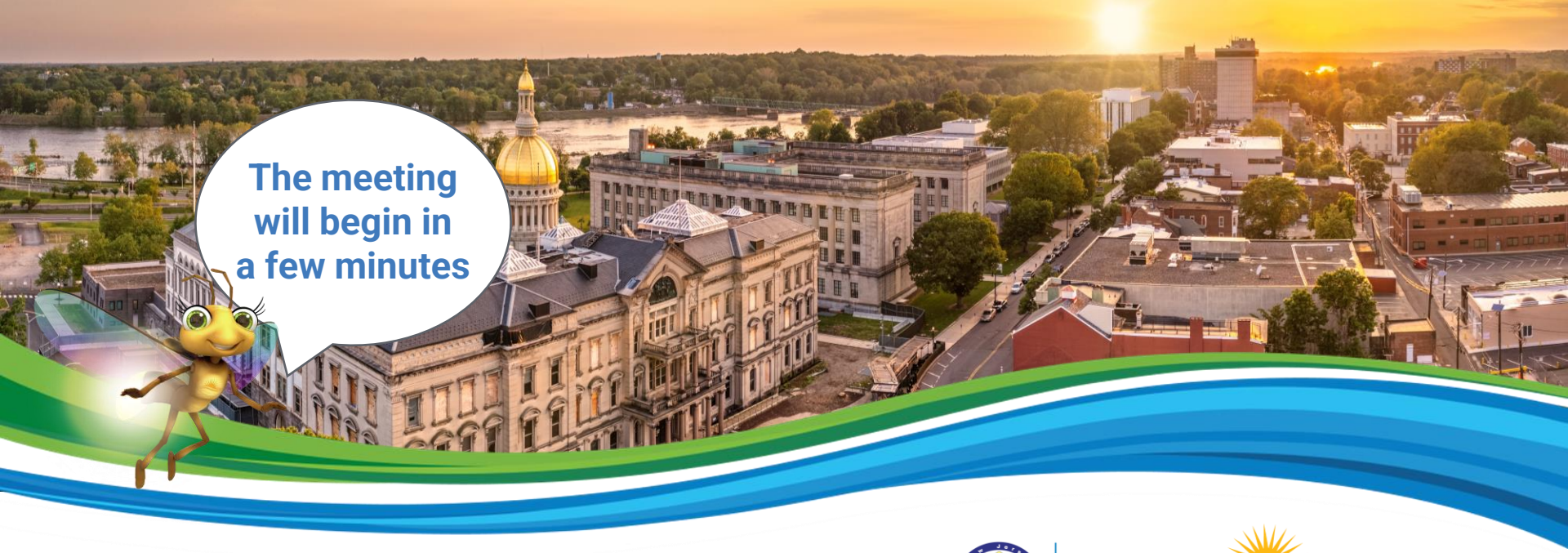

TRC

BPU | New Jersey's cleanenergy program™

Energy Efficiency Stakeholder Meeting

March 20, 2025

Agenda

1. Re-cap of Last Meeting
2. New Jersey Energy Efficiency Programs
3. Energy Efficiency Updates
    - NJCEP Updates
        - New Construction Program Update
        - Benchmarking Update
    - Utility Updates
        - Building Decarbonization and Demand Response Programs
4. Guest Presentation – Geothermal Case Study: Princeton University
5. General Q&A
6. Items of Interest
7. Next Meetings

Recap of Last Month

February Monthly Recap

What we covered:

- ✓ NJCEP Updates
  - ✓ NJCEP New Construction Program
  - ✓ Program Year 4 Technical Reference Manual Update
- ✓ Utility Updates
  - ✓ Commercial & Industrial Program Overview
- ✓ Guest Presentation
  - ✓ Clean Energy Learning Center Overview
- ✓ Q&A

New Jersey Energy Efficiency Programs

www.NJCleanEnergy.com/EEP

NJBPU and NJCEP Administered Programs

- New Construction (residential, commercial, industrial, government)
- Large Energy Users
- Energy Savings Improvement Program (financing)
- State Facilities Initiative*
- Local Government Energy Audits
- Combined Heat and Power, & Fuel Cells

* State facilities are also available for utility programs

Utility Administered Programs

- Existing Buildings (residential, commercial, industrial, government)
- Efficiency Products
  - Lighting & Marketplace
  - HVAC
  - Appliance Rebated
  - Appliance Recycling

NJBPU and NJCEP Administered Programs

New Jersey's Clean Energy Program

Energy Efficiency Updates

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More NJCEP Information

Quarterly Newsletter:

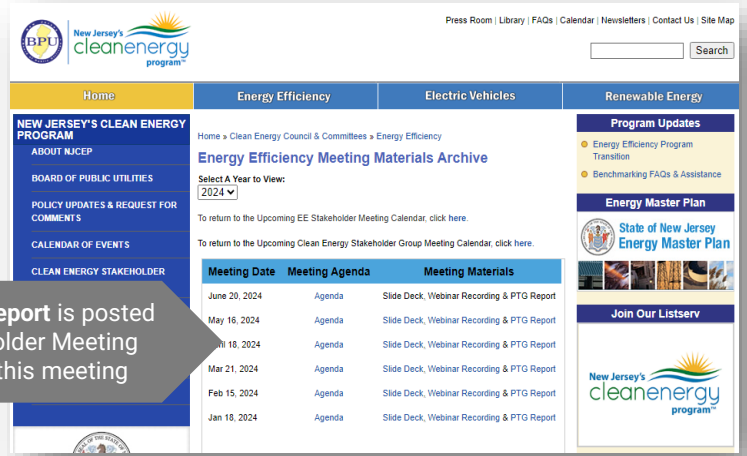
NJCleanEnergy.com/NEWSLETTER

Clean Energy Program Filings:

NJCleanEnergy.com/FILINGS

Clean Energy Program Monthly Progress to Goal Report:

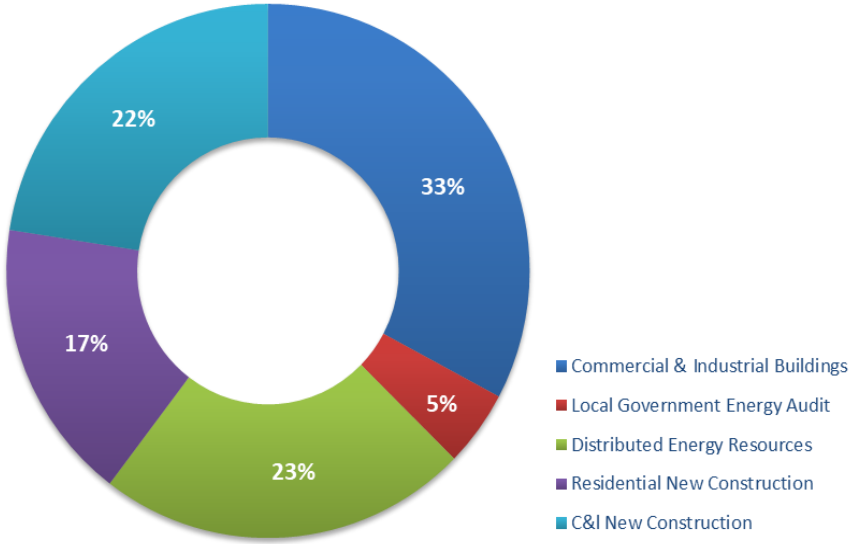
NJCleanEnergy.com/EE - Meeting Materials Archive



Progress to Goals Report is posted with post-EE Stakeholder Meeting resources following this meeting

Budget Break-down by Program (TRC Managed Programs)

FY25 Incentive Budget: $136,939,168



Energy Efficiency Programs FY25

NJCEP

Closed

- Residential Products & HVAC
- Residential Existing Homes
- Direct Install

Closing Out

- C&I Buildings (existing buildings)
  - SmartStart Retrofit EB
  - Pay for Performance EB
- School & Small Business Stimulus Program (federally funded)

NJCEP/TRC Managed

Open

- New Construction

  Was: Residential New Construction, SmartStart New Construction, Pay for Performance New Construction, Customer Tailored Energy Efficiency Pilot New Construction
- Large Energy Users
- Local Government Energy Audit
- Distributed Energy Resources

BPU/Utility Managed

Open

- Comfort Partners

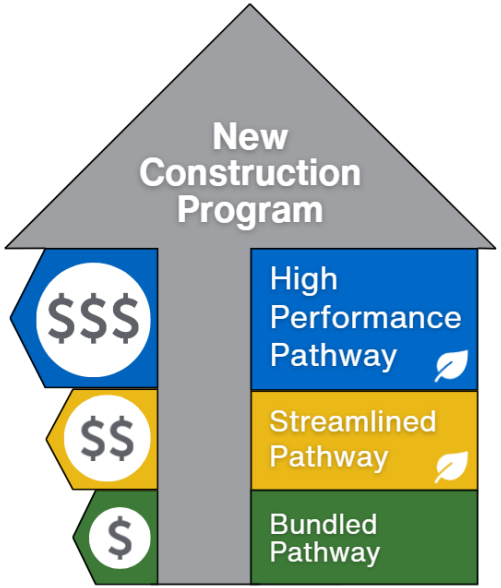
Coming Soon: New Construction Program

ABOUT THE PROGRAM
Three pathways to fit your needs to achieve greater energy savings

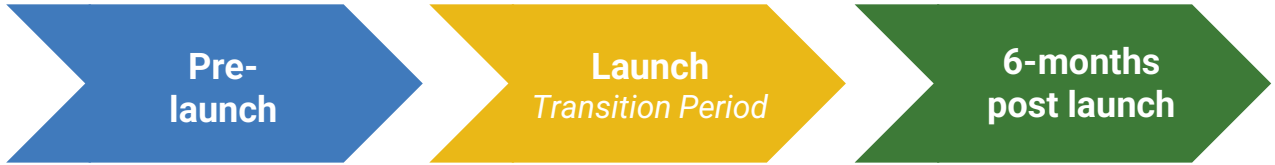
INCENTIVES
Based on selected pathways and size

WHO IS ELIGIBLE
All new construction buildings or eligible major renovation projects

ADDITIONAL OPPORTUNITIES
Incentives for energy efficiency beyond code requirements, encouraging greater energy savings



Program Launch Timeline



- Continue to use **existing programs**
  - *Residential New Construction*
  - *SmartStart Buildings*
  - *Pay for Performance*
- Option to use **existing programs** *OR* all-new **New Construction Program**
- Only use all-new **New Construction Program**
  - *High Performance Pathway*
  - *Streamlined Pathway*
  - *Bundled Pathway*

New Jersey's cleanenergy program™

Benchmarking Update

- Scorecards will be provided soon if a building owner or operator benchmarked a building in 2024 to the email registered in Portfolio Manager for reporting
  - Scorecard will show the total energy usage, how the building energy use compares to similar buildings, and resources for energy efficiency programs based on the building's utility territory
- A quarterly email newsletter has been launched for resources and updates on the benchmarking program. To subscribe, please sign up here:
  - https://mailchi.mp/839161371c7c/nj-benchmarking-bulletin

Benchmarking Update Cont'd.

- To facilitate communication, please add your email address to our records for your building through this link: https://nj.beam-portal.org/helpdesk/tickets/submit/35/
  - The communication will include benchmarking program updates, status of reporting and compliance for the building that is benchmarking throughout the reporting period, and scorecard information.
- To update building owner, operator, or third-party support contact information for our records, please use the update building contact information form to provide all relevant updated contact information for your building: https://nj.beam-portal.org/helpdesk/tickets/submit/36/
  - The form will update our records for contact and information on whether a property manager or third party is benchmarking on the building owner's behalf and updated information on the current building owner. Also, this will determine to whom we directly provide our future communications.

Benchmarking Update Cont'd.

- Information on the 2024 reporting year, January 1, 2024 through December 31, 2024, will be available shortly on the following website: https://nj.beam-portal.org/helpdesk/
  - Building owners and operators whose buildings are listed on the covered buildings list will receive a notification for this reporting year, 2024, through email or postal mail in the coming weeks.
  - Reporting deadline this year is July 1, 2025.
- A helpdesk is available to answer any questions about the benchmarking program
  - To submit an inquiry to the Helpdesk, please visit: https://nj.beam-portal.org/helpdesk/ and select "New Ticket" or call 888-533-4571.

BPU New Jersey's cleanenergy program

Utility Updates

Energy Efficiency Updates

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Utility Updates

NJ Energy Efficiency Stakeholder Meeting

Tim Fagan, PSE&G
Kyle Haddock, Rockland Electric
Jamie Mize, New Jersey Natural Gas
Virginia Bowman, Jersey Central Power & Light
Marilyn Fincher, Atlantic City Electric

on Behalf of The NJ Joint Utilities – March 20, 2025

atlantic city electric™ AN EXELON COMPANY

ELIZABETHTOWN GAS

Jersey Central Power & Light A FirstEnergy Company

New Jersey Natural Gas

PSE&G

Rockland Electric Company

SOUTH JERSEY GAS®

Antitrust Statement

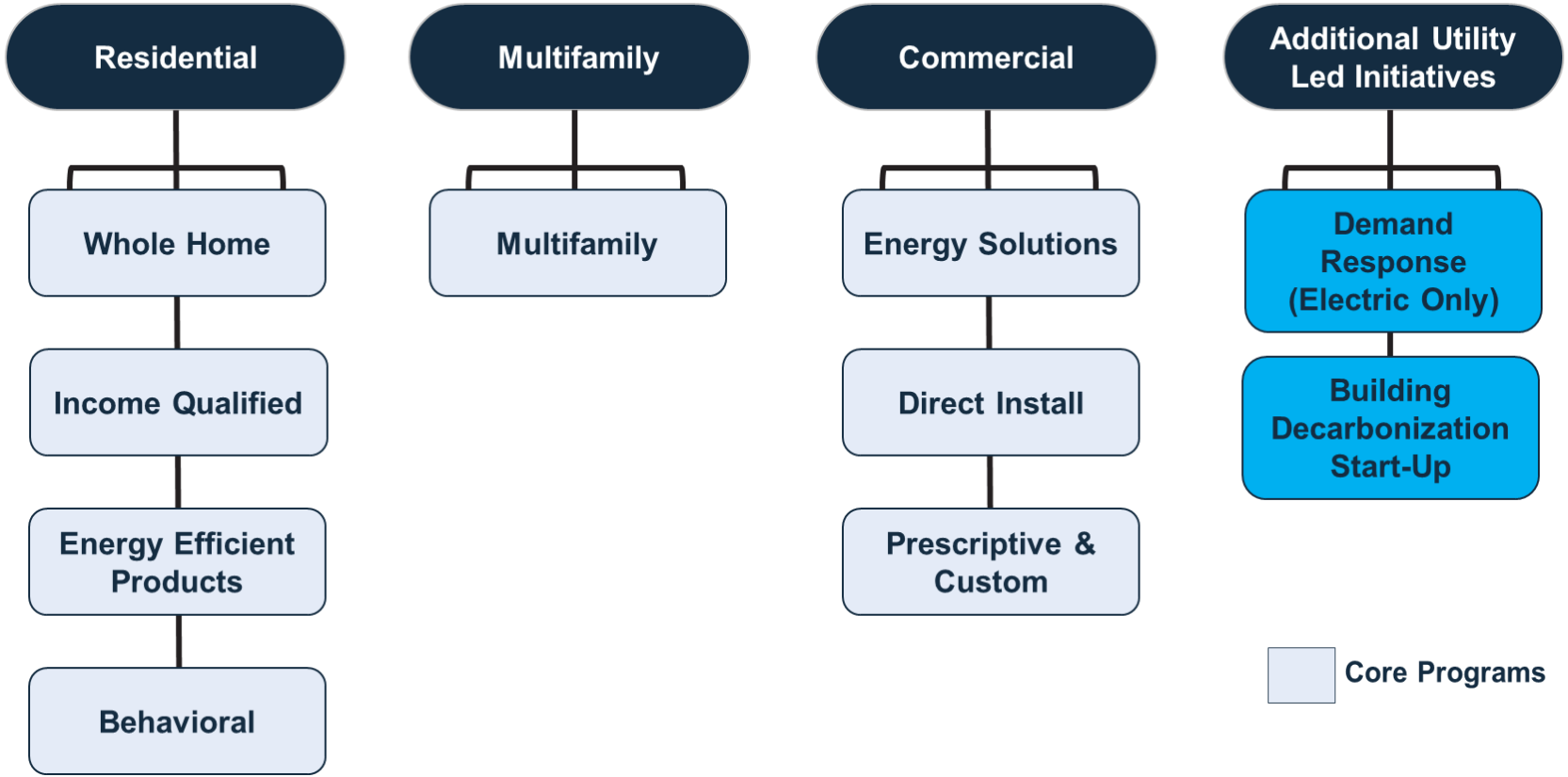
- The New Jersey Utilities are committed to full compliance with all laws and regulations as well as maintaining the highest ethical standards. We adhere to all federal and state antitrust laws.
- Coordination of Energy Efficiency programs by the utilities is in response to BPU requirements set forth in the 1st and 2nd triennium EE Framework Orders.
- The utilities do not engage in price fixing or any other anticompetitive behavior.

Triennium 2 Utility Programs

Background

- The Clean Energy Act of 2018 requires utilities to reduce the energy use in their territory by 2.0% for electricity and 0.75% for gas within 5 years of implementation.
  - The State has retained responsibility for serving some markets and retained a portion of these goals.
- BPU approved Utilities' Triennium 2 programs on October 30, 2024
- Triennium 2 began on January 1, 2025 and runs through June 30, 2027
  - Programs started on or about January 1, 2025
  - Some newer programs may take longer to be operational

Triennium 2 Programs



Triennium 2 Utility Budgets

	ETG	SJG	NJNG	PSE&G	ACE	JCP&L	RECO	TOTAL
Residential	$38,871,000	$73,794,000	$76,100,000	$618,000,000	$144,000,000	$148,000,000	$16,013,000	$1,114,778,000
Commercial & Industrial	$22,072,000	$15,860,000	$93,500,000	$1,210,000,000	$184,000,000	$447,750,000	$24,147,000	$1,997,329,000
Multifamily	$64,883,000	$41,337,000	$12,900,000	$205,000,000	$67,000,000	$5,250,000	$800,000	$397,170,000
Building Decarbonization	$0	$0	$7,250,000	$101,000,000	$32,500,000	$27,000,000	$3,600,000	$171,350,000
Demand Response	$0	$0	$0	$26,000,000	$22,500,000	$9,900,000	$799,000	$59,199,000
Other Non-Core (incl. WFD and CBO Outreach)	$1,675,000	$1,775,000	$2,250,000	$49,000,000	$2,000,000	$2,350,000	$960,000	$60,010,000
Net Transfers for Dual Fuel Projects	$20,700,000	$49,600,000	$33,000,000	-$16,000,000	-$52,000,000	-$43,000,000	$5,000,000	-$2,700,000
	$148,201,000	$182,366,000	$225,000,000	$2,193,000,000	$400,000,000	$597,250,000	$51,300,000	$3,797,136,000

- The above includes budgets for incentives and administrative costs

Triennium 2 OBR and Financing

- **0% interest On-Bill Repayment (OBR) or financing available from all utilities for eligible measures**
- Funding available for OBR from the below utilities:

ETG	SJG	NJNG	PSE&G	JCP&L
$71,704,000	$125,426,000	$160,500,000	$968,000,000	$176,500,000

- Funding available to buydown interest rates for third party financing from the below utilities:

ACE	RECO
$75,500,000	$3,500,000

Building Decarbonization

Overview

The Building Decarbonization (BD) Start-up Programs are designed to promote the installation of heat pump and electrification technologies in residential, multi-family and Commercial & Industrial sectors.

The BD programs will offer a range of measures and incentives which may cover the following equipment end-uses: space heating and cooling, water heating, cooking, laundry, and outdoor lawncare.

Building Decarbonization Programs are Additional Utility-Led Initiatives and included as a Sector.

**There may be variances between Utilities in offerings.*

Elizabethtown Gas and South Jersey Gas do not have a BD offering.

Incentives and technical specifications may vary among the utilities for similar end uses.

Residential Building Decarbonization

Building Decarbonization Program Overview

- **Target Market:**
  - Served by at least one NJ investor-owned Utility
  - Single family and multifamily dwelling units
  - Existing homes with designed fossil fuel heat

- **Incentive Approach**
  - Space Heating Incentives: Air Source Heat Pumps (ASHP), GSHP, and PTHP
  - Product incentives for HP water heaters, HP clothes dryers, induction stoves
  - Incentives for full and partial displacement heating with fossil fuels with ccASHP
    - Incremental incentives for
      - Decommissioning
      - Re-ducting
      - Displacing delivered fuels
      - Integrated controls
    - Can be combined with completed Whole Home Energy Solutions project
    - Enhanced incentives for LMI projects not participating in Comfort Partners or Income-Qualified Programs

BD – EDC Full Displacement – Clean Heat

Full Displacement:

Cold Climate Air Source Heat Pump (ccASHP)

No need for integrated controls

Equipment Sized for 100% of the heating load of Manual J and not to exceed the capacity resulting from Manual S

Decommissioning of existing fossil fuel equipment <u>required</u>

Lesser of $10,000 or 50% of installation cost
LMI enhanced incentive of $12,000 or 60%
(per home covering the largest ccASHP unit)

Incremental Adders:

i) up to $2,000 for re-ducting (if Manual D calls for it), and
ii) up to $2,000 for decommissioning (Decommissioning Checklist needed for incentive)

iii) Contractor Bonus:
(1) $250 for full-load, or
(2) $750 for full load and conversion from delivered fuel system

Additional ASHP units installed in home are eligible for additional per unit incentives at the ASHPs level

i) $2,000 per subsequent ccASHP to meeting the heating load

Equipment Standard:

Must be on the NEEP equipment list or meet current NEEP specification at the time of installation

i) NEEP: Ductless ccASHP – SEER2 > 15, HSPF2 > 8.5, COP 5F > 1.75

ii) NEEP: Ducted ccASHP – SEER2 > 14.3, HSPF2 > 7.7, COP 5F > 1.75

Financing Cap $25,000

BD – EDC Dual Heat

Lesser of $5,000 or 50% of project cost
LMI enhanced incentive of $6,000 or 60%
(per home covering the 1st system)

Dual Heating:

Cold Climate Air Source Heat Pump (ccASHP)

Must include integrated control of ASHP & fossil fueled heating source

Equipment Sized for 100% of the heating load of Manual J and not to exceed the capacity resulting from Manual S

Decommissioning of existing fossil fuel equipment is not required

Incremental Adders:

Incremental Adders:
i) No re-ducting incentive
ii) No decommissioning incentive
iii) No contractor bonuses

Additional ASHP units installed in home are eligible for additional per unit incentives at the ASHPs level

i) $2,000 per subsequent ccASHP to meeting the heating load

Equipment Standard:

Must be on the NEEP equipment list or meet current NEEP specification at the time of installation

i) NEEP: Ductless ccASHP – SEER2 > 15, HSPF2 > 8.5, COP 5F > 1.75

ii) NEEP: Ducted ccASHP – SEER2 > 14.3, HSPF2 > 7.7, COP 5F > 1.75

Financing Cap $25,000

BD – EDC Hybrid Heat*

Partial Displacement:

Non-Cold Climate Air Source Heat Pump (ASHP) Heating/ Cooling Per House

Must include integrated control of ASHP & fossil fueled heating source

Equipment Sized for 100% of the **cooling** load of Manual J

Decommissioning of existing fossil fuel equipment is not applicable

Lesser of $2,000 or 30% of project cost
LMI enhanced incentive of $4,250 or 45%
(per home)

Incremental Adders:

i) No re-ducting incentive
ii) No decommissioning incentive
iii) No contractor bonuses

Additional ASHP units not provided incremental unit incentives by RECO or PSEG at this BD level*

RECO/PSEG Equipment Standard*:

SEER2 ≥ 15.2, EER2 ≥ 11.7, HSPF2 ≥ 7.8

Financing Cap $25,000

BD – EDC Ground Source Heat Pumps

Full displacement:

Ground Source Heat Pumps

No need for integrated controls

Equipment Sized for 100% of the heating load of Manual J and not to exceed the capacity resulting from Manual S

Gas to BD Customers:
Lesser of $3,000/10,000 BTUh or 50% of project cost

Delivered fuel to BD customers:
Lesser of $4,000/10,000 BTUh or 50% of project cost

Income-Qualified enhanced incentive:
Additional $1,000/10,000BTUh or 10% of project cost

Equipment Standard:

In progress

Financing Cap $25,000

Additional Decarbonization Incentives

Measure – Detail	Incentive
Heat Pump Water Heaters 120v/240v	$750
Packaged Terminal Heat Pump	$2,000
Lawnmower – Push	$50
Lawnmower – Ride	$75
Snow Blower, Leaf Blower, Trimmers, Chainsaws	$25
Heat Pump Clothes Dryer	$200 ES
Induction Stove	$250
Heat Pump Pool Heater	$1,000
Wx through Whole Home Energy Solutions before BD	$1,000
Multi-end use bonus (i.e., ccASHP, PTHP, GSHP, HPWH, Induction Stove, HPPH, etc.)	$500 per customer
Electric Ready – IQ Panel Upgrade: Full cost up to $4000 for panel + $2500 for wiring only when installing BD measures. The upgrade shall include enough capacity to support the needed upgrades and a Level 2 EV charger (where possible).	
Electric Ready – Non-IQ Panel Upgrade: Up to $300 per circuit for each BD measure requiring a 240V circuit purchased under the program up to four circuits, or $300 for a panel upgrade, only when installing BD measures. Financing up to $2000.	

Commercial & Industrial Building Decarbonization

Building Decarbonization Program Overview

- Building Decarbonization incentives will be available to all eligible Commercial & Industrial customers of participating utilities
- Utilities working to streamline participation process as much as possible

Decarbonization Incentives

Measure – Detail	Incentive
Electric Ready – Panel Upgrades	$7,500 per business
Cold Climate Air Source Heat Pump	Lesser of $3,000/ton or 50% of install cost
Air Source Heat Pump	Lesser of $2,500/ton or 40% of install cost
Air Source Variable Refrigerant Flow (VRF) Heat Pump	Lesser of $3,250/ton or 50% of install cost
Water Source Heat Pump	Lesser of $3,000/ton or 50% of install cost
Water-Cooled VRF	Lesser of $3,000/ton or 50% of install cost
Ground Source Heat Pump	Lesser of $6,500/ton or 50% of install cost
Packaged Terminal Heat Pump	Lesser of $5,000/unit or 50% of install cost
Heat Pump RTU	Lesser of $5,000/ton or 50% of install cost
Heat Pump Water Heater (greater than 120 gallons)	Lesser of $2,000/ton or 80% of install cost
Electric Lawn Equipment (Commercial)	Varies
Electric Forklift	Up to $9,000
Custom	Up to $500/MMBtu

Multifamily Building Decarbonization

Multifamily BD Incentives

- Multifamily customers are eligible for Building Decarbonization incentives
- Multifamily customers may be eligible for either Residential or Commercial BD incentives, depending on the facility and system arrangements, if the measure will be used by a single unit, multiple units or in a common area, etc.
- Incentives will include heat pumps for both space and water heating, electric cooking appliances, and additional measures that facilitate the electrification of homes and buildings.

Utility-Specific Building Decarbonization

NJNG Building Decarbonization – Hybrid Heat Program

Hybrid Heat consists of an HVAC, dual-fuel system with:

- ✓ A natural gas furnace or boiler
- ✓ A ducted or ductless air-source heat pump
- ✓ A compatible, integrated thermostat

BEST FIT: Single-family homes with central air conditioning and < 5-year-old natural gas-powered furnaces.

Equipment Eligibility	Rebate Details
Partial Displacement Air source heat pump (ASHP) / Cold climate air source heat pump (ccASHP) *Must include integrated controls. **Equipment must be installed at the service address associated with the customer account.	• Non-ccASHP: Lesser of $2,000 or 30% of equipment and installation cost. • Low- to moderate-income customers can be eligible for lesser of $3,000 or 40% of equipment and installation cost. • Systems sized for at least cooling load. • Full incentive available for first ASHP, additional ASHPs are eligible for $2,000 per ccASHP or up to $750 per standard ASHP.
On-Bill Repayment (OBR)/Financing	7 years at 0% APR

BD – NJNG Hybrid Heat

Partial Displacement:

Non-Cold Climate Air Source Heat Pump (ASHP) Heating/ Cooling Per House

Must include integrated control of ASHP & fossil fueled heating source

Equipment Sized for 100% of the **cooling** load of Manual J

Lesser of $2,000 or 30% of project cost
NJNG IQ enhanced incentive $3,000 or 30%
(per home)

Incremental Adders:

i) No re-ducting incentive
ii) No decommissioning incentive
iii) No contractor bonuses

NJNG Additional ASHP Tier 1: $500
NJNG Additional ASHP Tier 2: $750
NJNG Additional ccASHP: $2,000

NJNG Equipment Standard:

1st ccASHP ducted or ductless
SEER2 > 15.2, EER2>10, HSPF2 > 7.8, COP 5F > 1.75
Additional ccASHP
SEER2 > 15.2, EER2>10, HSPF2 > 8.1, COP 5F > 1.75

1st and additional ASHP Tier1:
SEER2 > 15.2, EER2>11.7 HSPF2 > 7.8

Additional ASHP Tier 2:
SEER2 > 17.1, EER2>11.7 HSPF2 > 7.8

Financing Cap $25,000

NJNG Building Decarbonization – District Geothermal

NJNG is investing $750,000 in a ***District Geothermal Feasibility Study*** to identify potential sites for projects, gather data, and conduct initial engineering to determine feasibility and costs.

Feasibility Study

NJNG's approach begins with a feasibility study to determine:

- The site has a diversified load
- Energy intensity
- Positive drilling characteristics
- Thermal conductivity
- Preliminary Engineering

Engineering Design

Finalize engineering design:

- Plan the bore field and system
- Design the system – specify the physical parameters including depth of bore holes, pipe diameter and distribution pipe and system
- Central plant, customer loads, etc.

Project Management

Important project milestones include:

- Rate Design
- Board of Public Utilities Approval
- Construction

PSE&G Building Decarbonization

- **Networked Geothermal:** As part of the BD program, PSE&G will undertake a Network Geoexchange Study to evaluate the feasibility of installing, owning, and operating shared geoexchange loop(s) serving multiple customers
- Study will include the following scope
- Potential site selection identification and evaluation
  - Evaluation criteria will include community, technical, customer and utility factors
- Rate design options and cost allocation considerations
- Outreach to potential anchor customers and other customer groups
- Preliminary design of potential projects with:
  - Drawing packages
  - Design and performance summary
  - Cost estimate (30%)
  - Energy impacts

Building Decarbonization Questions?

Demand Response

PSE&G Demand Response

- **NEW** program, designed to reduce peak load across the system

3 Program Pathways:

- **Direct Load Control** –
  - Provides annual or per event incentives in exchange for allowing PSE&G to adjust electric equipment during peak events, within well-defined parameters
  - Pathways available for residential and small commercial PSE&G electric customers
  - Eligible equipment will be predominately smart thermostats at first; will expand to other equipment (water heaters, EVs, etc.)

(continued on next slide)

PSE&G Demand Response

- **Pay for Performance** -
  - Gives residential customers a fixed $/kWh rebate or bill credit for measured energy reduction during peak events
  - Uses AMI to compare usage during event days to typical usage patterns under similar conditions
  - (Customers cannot participate in both Pay-for-Performance and Direct Load Control)

- **Virtual Power Plant (VPP)** –
  - Pilot offering to better understand economics, technology, and effectiveness of energy storage management
  - Up-front incentive of $5,000 per 8 kWh battery system to residential customers for behind-the-meter storage that PSE&G can use to add value to the grid
  - Could be used for capacity reduction as well as other services, such as load shifting and/or frequency regulation

ACE Demand Response

NEW DEMAND RESPONSE PROGRAMS

The programs are designed to reduce peak load across the system

Anticipated to launch June 2025

- **Direct Load Control** - Provides enrollment and annual incentives in exchange for allowing Atlantic City Electric to adjust air conditioner or heat pump equipment during peak events, within well-defined parameters
  - Available for residential and small commercial electric customers
  - Eligible equipment will be customer owned smart thermostats (BYOD)

- **Flexible Load Management** - Provides annual incentives in exchange for allowing Atlantic City Electric to make frequent and short-interval temperature adjustments based on timing, system locational need, or a customer's peak load contribution
  - Available for residential and small commercial electric customers
  - Eligible equipment will be customer owned smart thermostats (BYOD)

Cross promotion to be included in Energy Assessments, Home Energy Reports and within Online Marketplace

JCP&L Demand Response

Expansion of T1 Load Optimization/Peak Demand Response program

- Including Smart Thermostats and adding Electric Vehicle Chargers and Battery Storage Systems
- Expected to launch in June 2025

Bring-Your-Own-Device program

Cross promotion to be included in Home Energy Reports and within Online Marketplace

Targeting 50,000+ participants

RECO Demand Response

Peak Demand Reduction Program

This program is designed to encourage customers to make temporary reductions in their electricity usage during peak demand periods from May through September. These periods, which can last a few hours, typically occur during the hottest days of the year when the electric grid is constrained by the high demand for energy.

Continuation of T1 Demand Response offering

- Commercial Systems Relief Program (CSRP) min. of 50kW reduction commitment, interval meter availability
- Including Smart Thermostats, Electric Vehicle Chargers, smart water heaters, and Battery Storage Systems
- Continued and rolling enrollments in preparation for Summer 2025

Bring-Your-Own-Device (BYOD) program

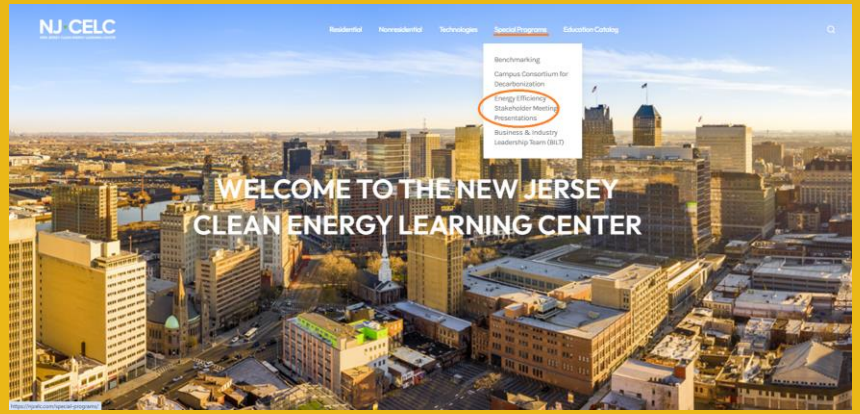
- Central AC and HP wi-fi enable thermostats $85/per thermostat signed up, $25/summer after 2nd summer with >80% performance
- Cross promotion through HEAs, HERs, and Online Marketplace

Questions?

Guest Presenter

Edward "Ted" Borer, PE
Borer Energy Engineering LLC
Princeton University, retired

Find the EE Stakeholder Guest Presenter Recordings at www.njcelc.com



BPU | New Jersey's cleanenergy program™

A Time of Energy Transition At Princeton University

Energy Efficiency Stakeholders Meeting

March 2025

Edward “Ted” Borer, PE

ted@borerenergy.com

The Challenge

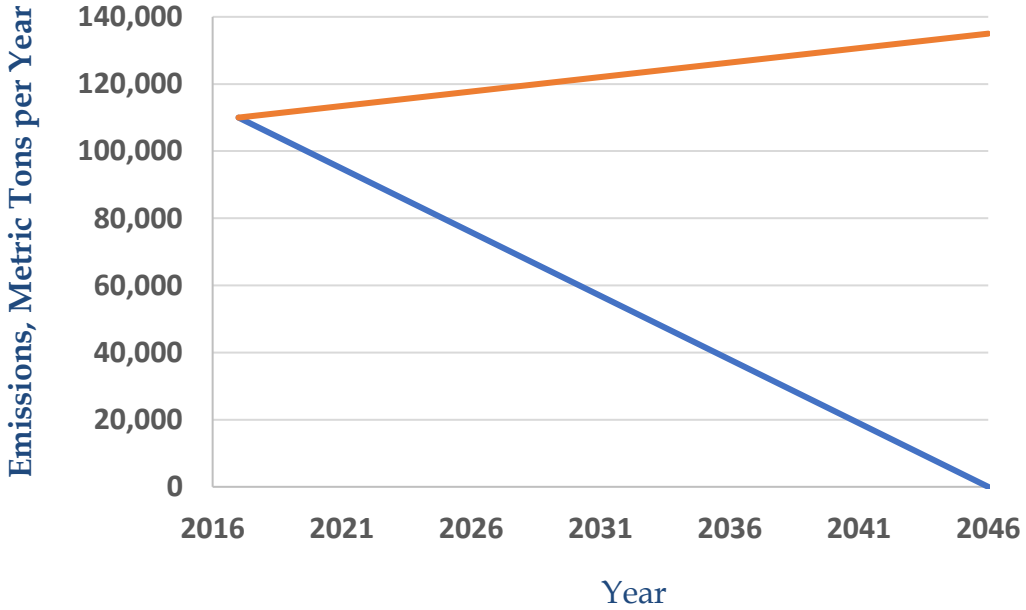
- **Growth of Core Business**:
  - Education & Research
- **Aging Infrastructure**
  - Nearly 120-year-old steam lines still in service!
- **Commitment to Carbon Neutrality**
  - by 2046

Key Definitions

- Electric Microgrid
- District Energy
- Thermal Storage
- Heat Pump
- Geoexchange & Geothermal

Citation: The source for all information in this presentation is: Princeton University Facilities Engineering Department.

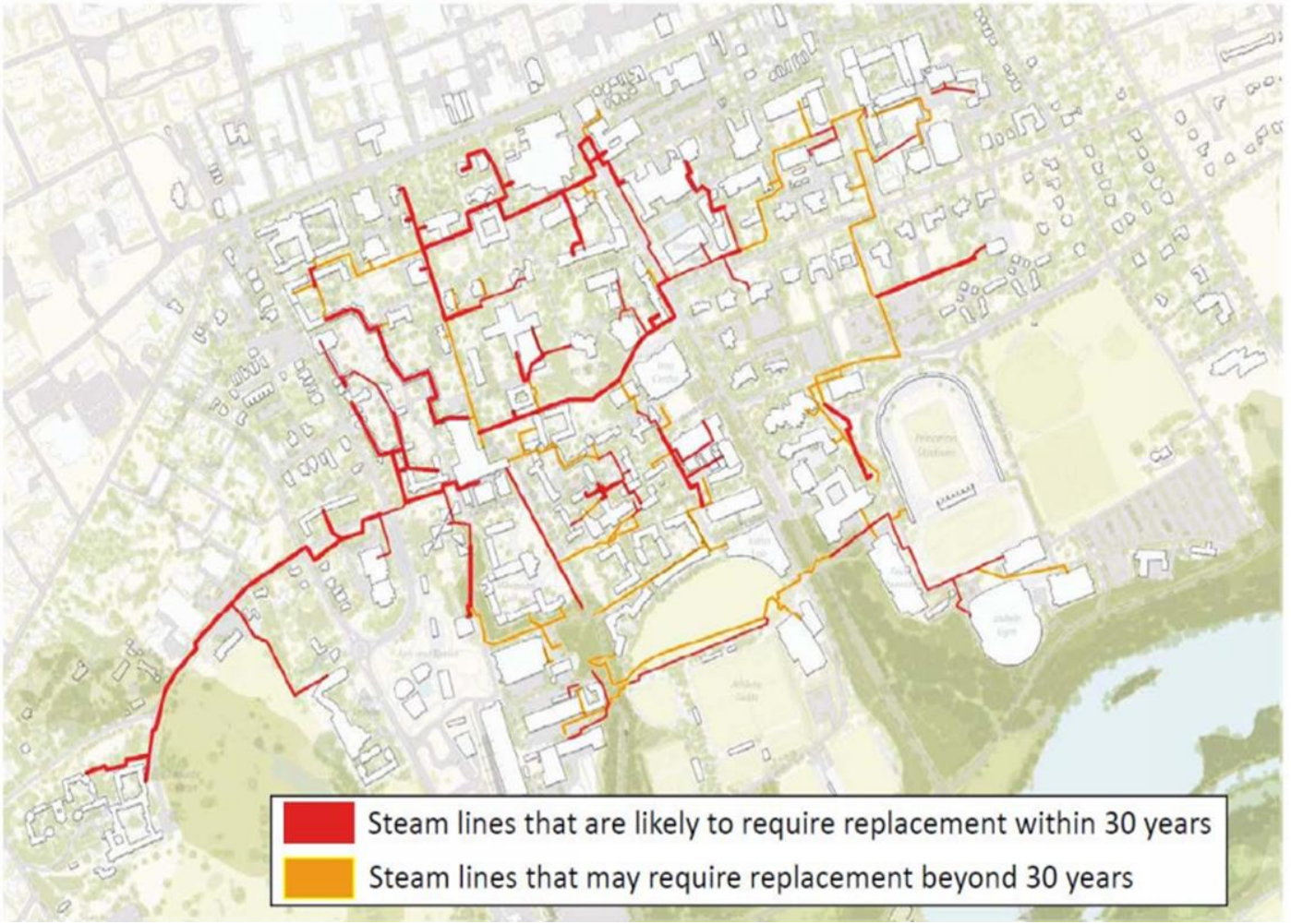
Campus Scope 1 & 2 CO_2 Emissions Business As Usual & Goal



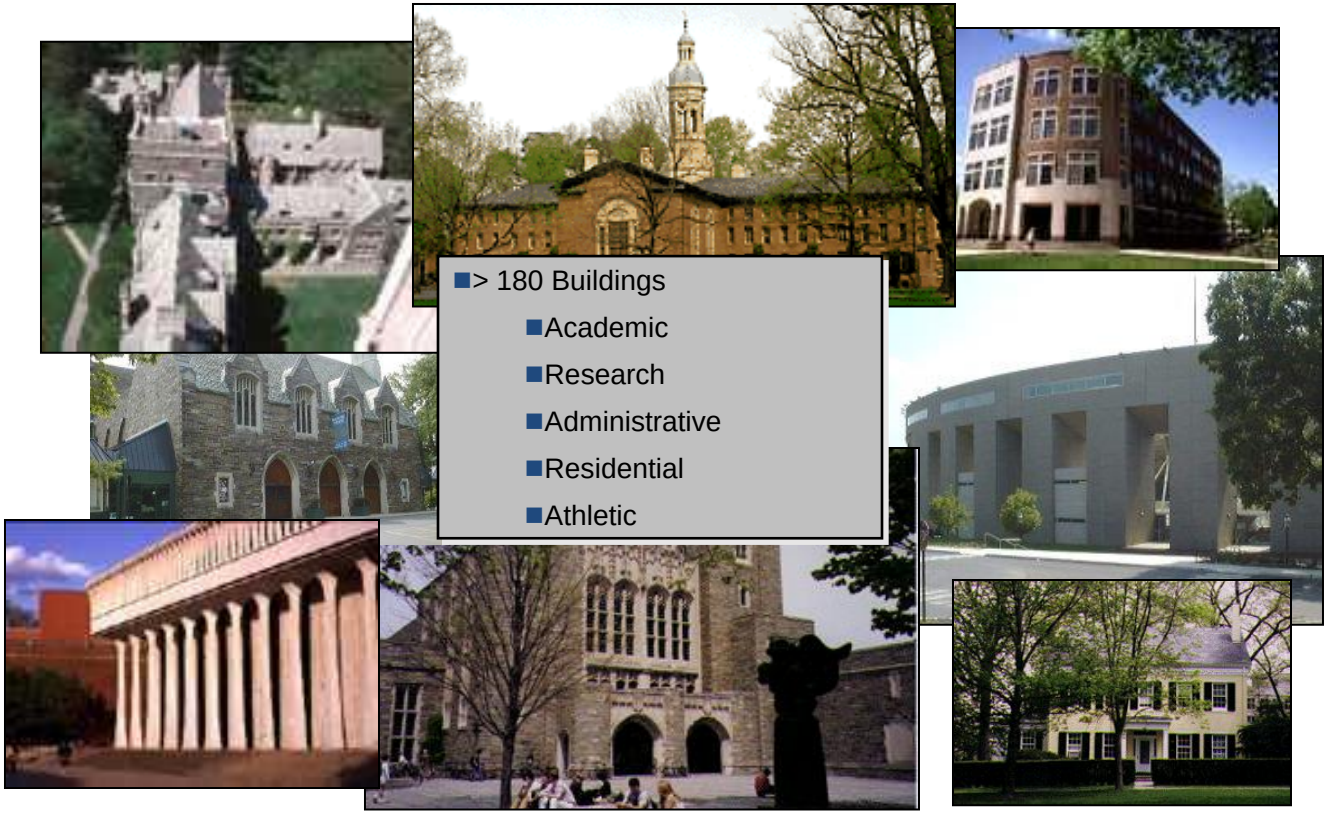
- Carbon Neutrality by 2046
- Continuous downward slope from present

Constraints

- Good financial stewardship
- Existing buildings, steam lines & campus aesthetics
- Space limitations
- Existing technologies
- Existing codes, tariffs
- No interruption of education and research
- Additionality
- Replicability
- No discomfort
- Reliability


Steam lines that are likely to require replacement within 30 years
Steam lines that may require replacement beyond 30 years

Energy Demands at Princeton

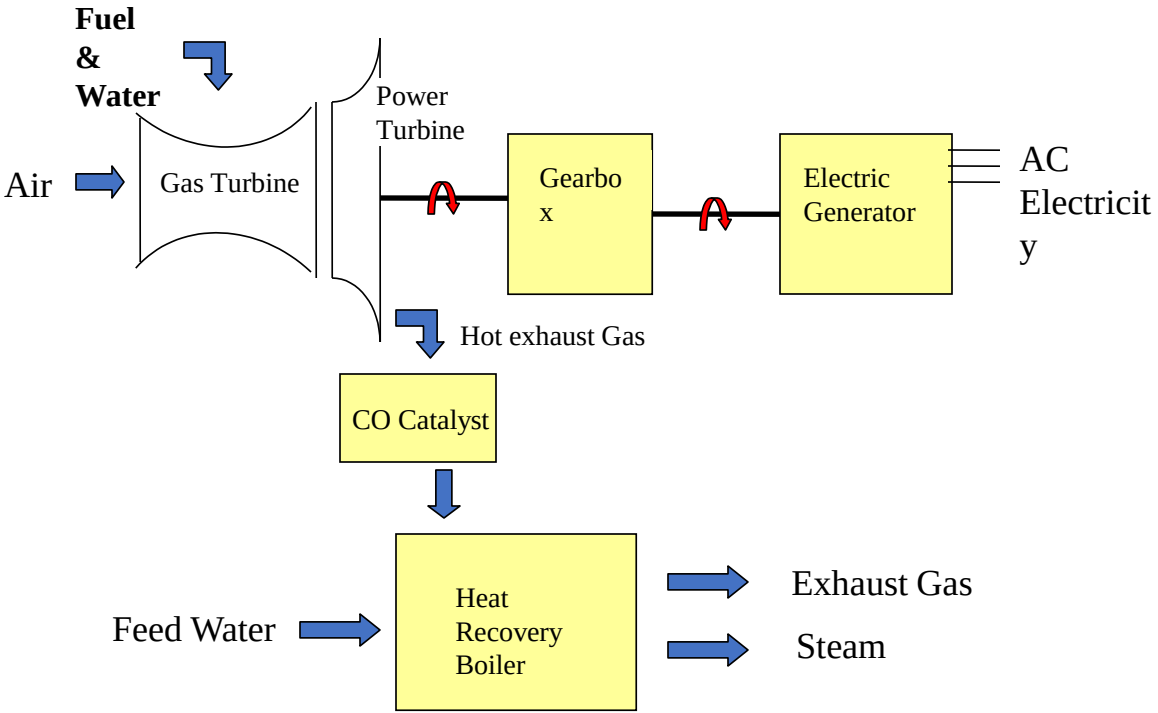


- > 180 Buildings
  - Academic
  - Research
  - Administrative
  - Residential
  - Athletic

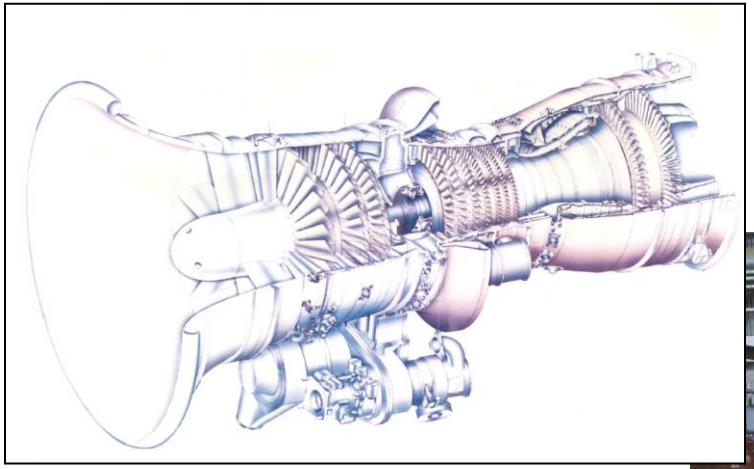
2023 Energy Equipment and Peak Demands

	Capacity	Peak
Electricity Demand		
(1) Gas Turbine Generator	15.0 MW	30 MW
Solar Photovoltaic System	16.5 MW	
Steam Generation		
(1) Heat Recovery Boiler	180,000 #/hr	
(2) Auxiliary Boilers @ 150 ea.	300,000 #/hr	240,000 #/hr (70.3 MW heating)
Chilled Water Production		
(3) Steam-Driven Chillers	10,100 Tons	
(5) Electric Chillers	10,700 Tons	15,000 Tons (52.7 MW cooling)
(1) Thermal Storage Tank	40,000 Ton-hours	
*peak discharge		10,000 tons (peak)

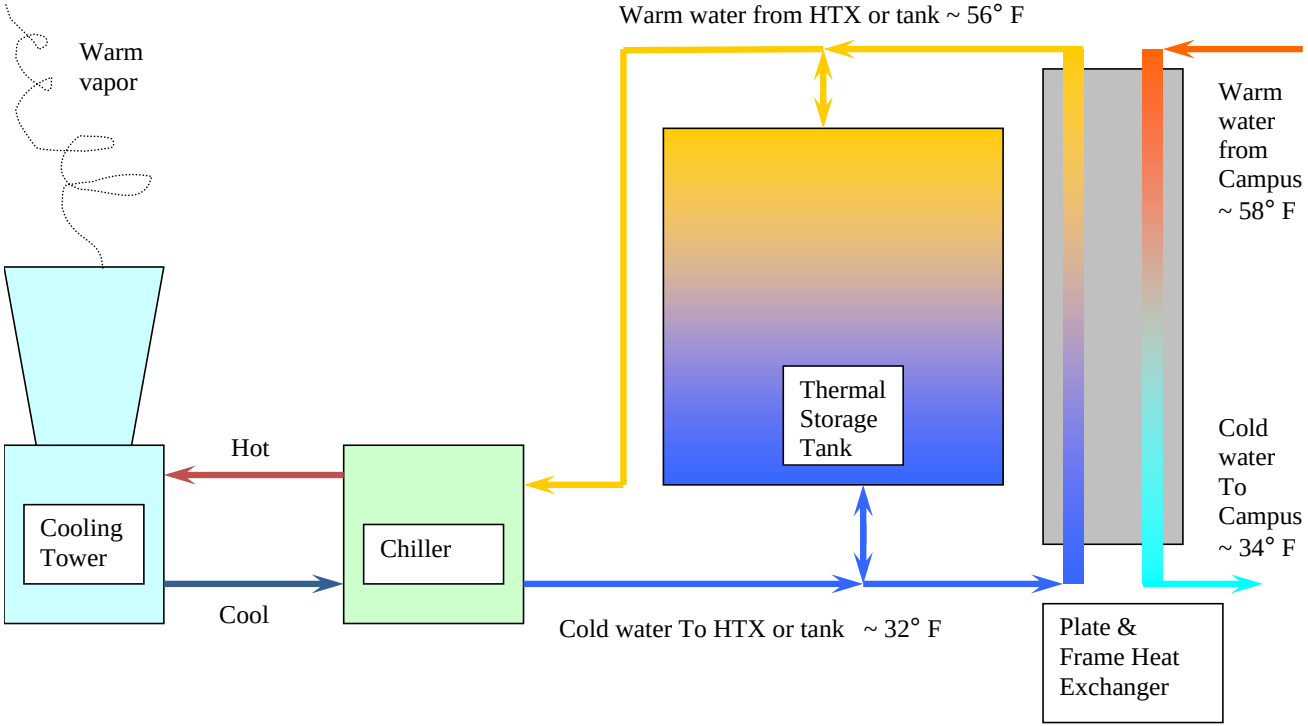
Combined Heat & Power, "Cogeneration"



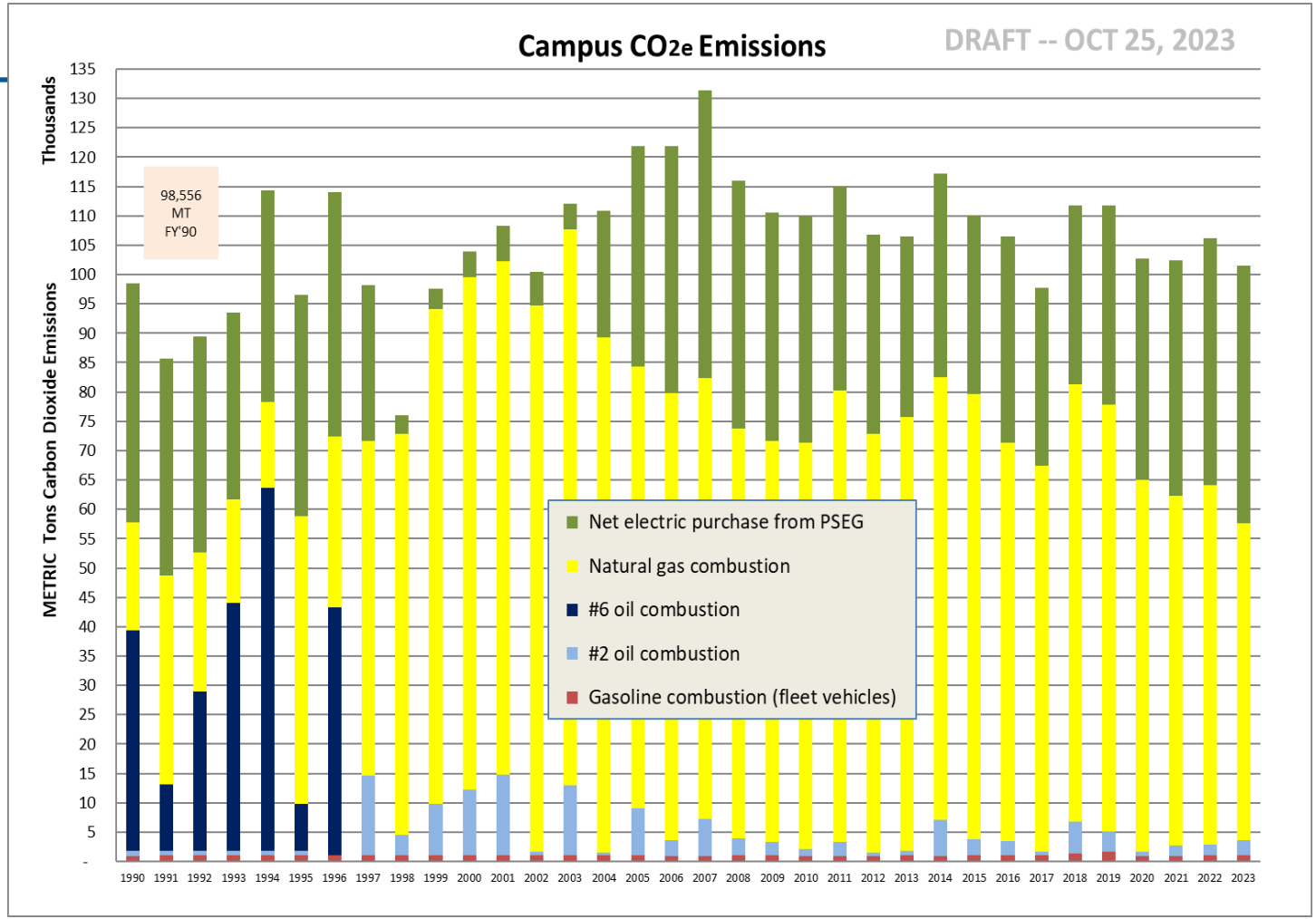
The GE LM-1600 Gas Turbine



Chilled Water & Thermal Storage



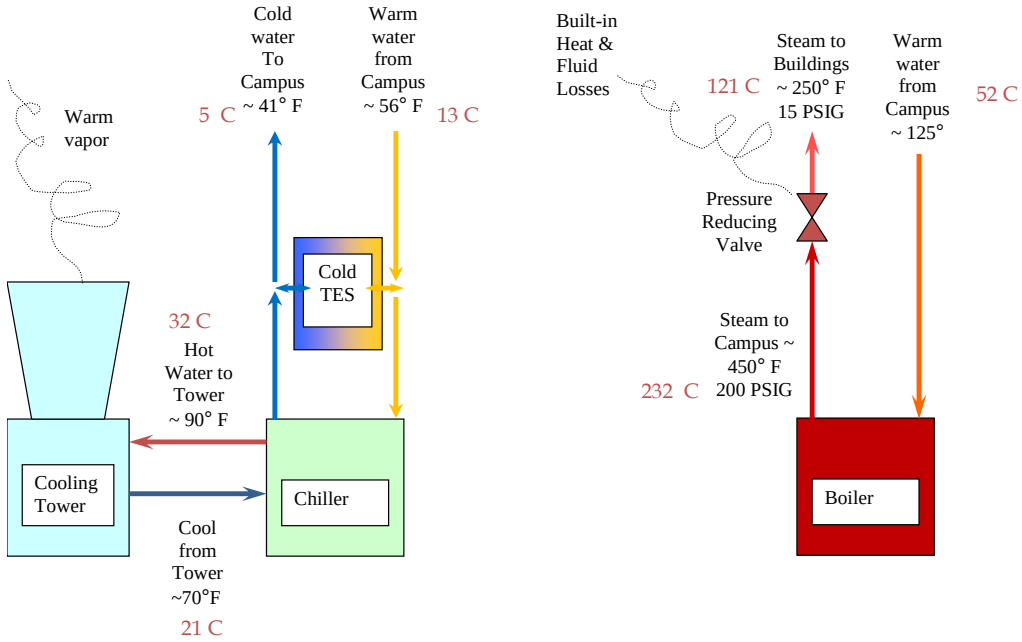
Princeton University Energy Plant


Campus CO2e Emissions
DRAFT -- OCT 25, 2023
Thousands
METRIC Tons Carbon Dioxide Emissions
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
-
98,556
MT
FY'90
Net electric purchase from PSEG
Natural gas combustion
#6 oil combustion
#2 oil combustion
Gasoline combustion (fleet vehicles)
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

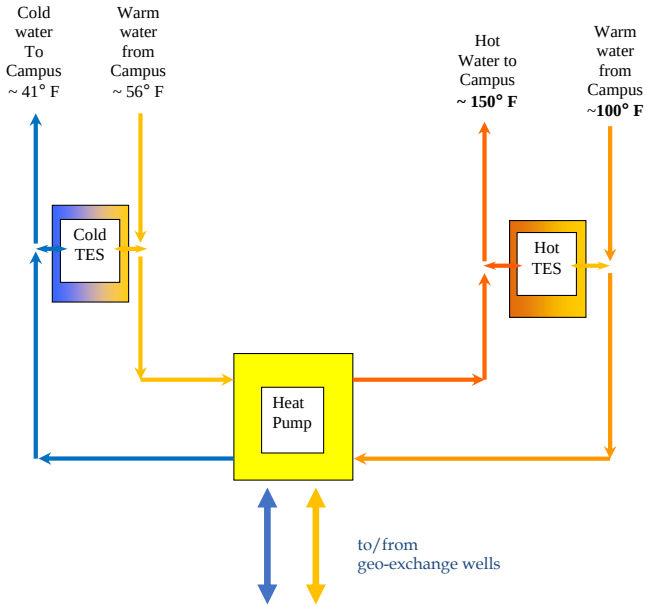
Major Areas of Work to Minimize Carbon Footprint:

- High performance building envelope, passive design, use of hot water for space and domestic water heating
- Replace district steam system with district hot water system
- Build electric-powered Heat Pump facility
- Build daily thermal storage – tanks
- Install seasonal thermal storage – geoexchange
- Install on-site renewable energy production – solar PV
- Supplement with off-site renewable energy

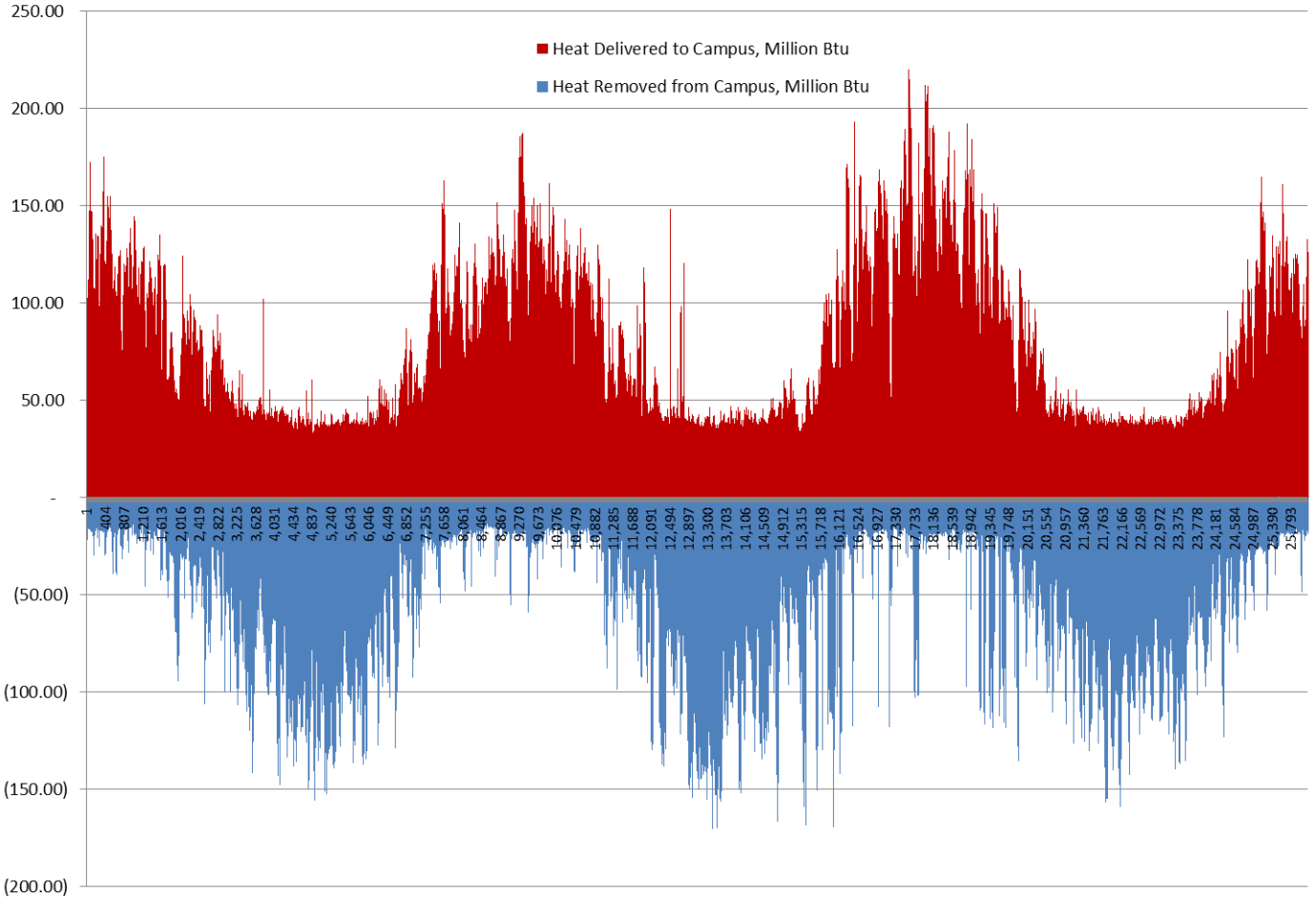
Separate Heat Removal (CHW) & Addition (Steam)



Combined Heat Removal (CHW) & Addition (HTW)



Hourly Heat Addition to campus and heat removal from campus
3-year period, Jan 2012 - Dec 2014

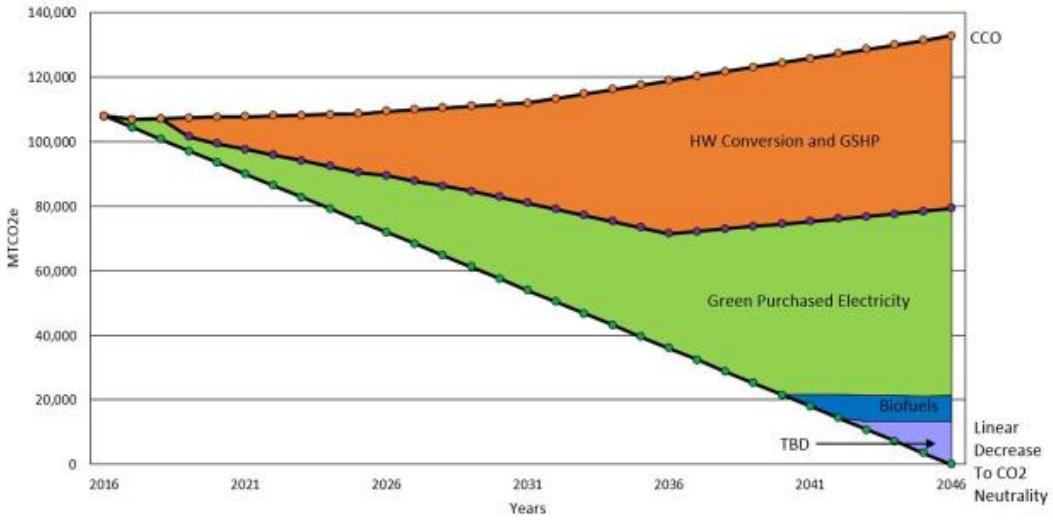


Drilling Rig and Heat Pump

1.5” HDPE Geoexchange Pipe

TIGER Plant Rendering

Energy: GHG Reductions vs. Net Zero



General Q&A

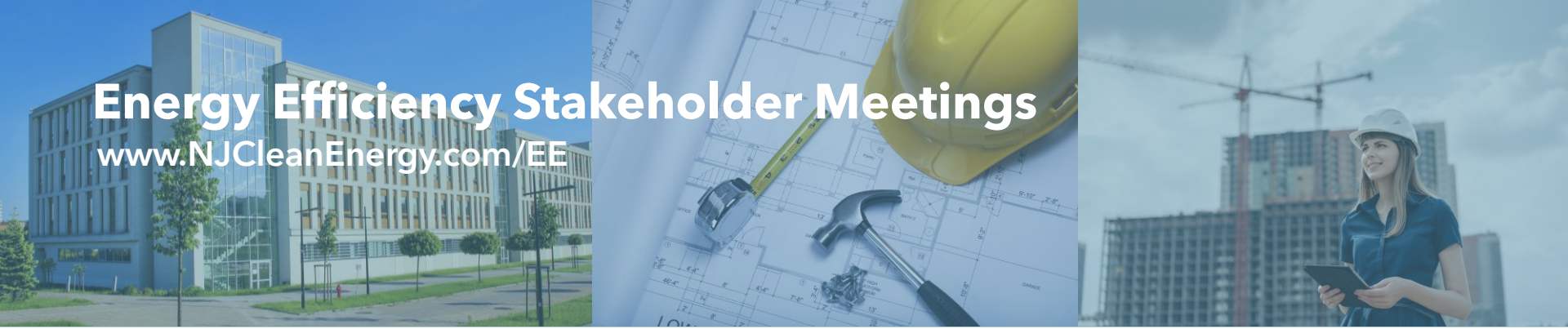
To submit questions in advance for next month: EnergyEfficiency@bpu.nj.gov

New Jersey's cleanenergy program™

Items of Interest

Next Meeting

New Jersey's cleanenergy program™



Energy Efficiency Stakeholder Meetings

www.NJCleanEnergy.com/EE

Registration Link

3rd Thursday of the Month, 1:00 - 2:30 pm

- ✓ **April 17, 2025**
- ✓ May 15, 2025
- ✓ June 26, 2025
- ✓ July 17, 2025
- ✓ August 21, 2025
- ✓ September 18, 2025
- ✓ October 16, 2025

No November Meeting

- ✓ December 18, 2025

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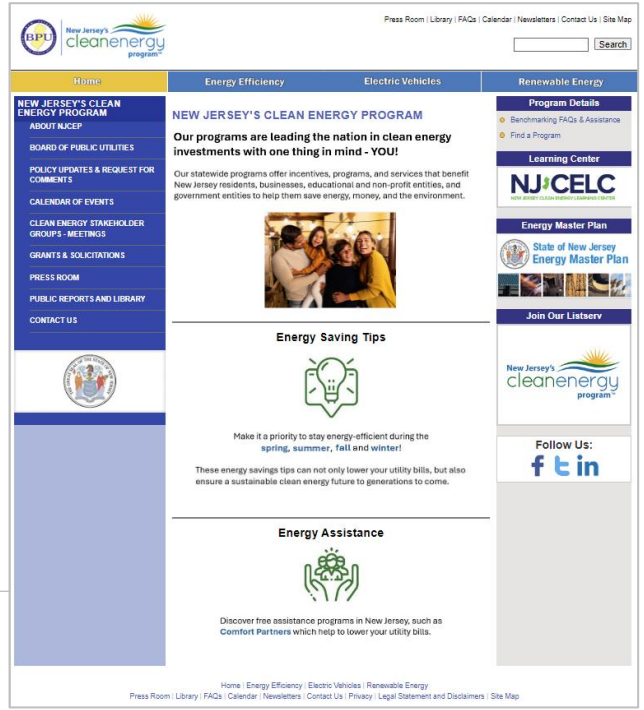

Thank you