BUILDINGENERGY NYC

Meeting a Building Where It's At: A Guide to Staged Electrification

Corinne Arnold (The Victoria)
Amalia Cuadra (EN-POWER GROUP)

Curated by Lea Keating and Crystal Ng

Northeast Sustainable Energy Association (NESEA) | October 24, 2024

AMALIA CUADRA, PE

SENIOR DIRECTOR OF ENGINEERING

As the Senior Director of Engineering, Amalia oversees EN-POWER GROUP's growth strategy with a focus on consulting, engineering design, controls integration, and commissioning services. Amalia has implemented countless energy-saving and decarbonization projects, capitalizing rebate structures to optimize return on investments. Amalia is energized by managing large capital projects that will make buildings more mechanically sustainable and resilient – a role that bridges her strong engineering background, management skills, and social and environmental values.

EDUCATION

- M.S in Chemical Engineering, University of Delaware
- B.S. in Chemical Engineering, University of Florida

CERTIFICATIONS/LICENSES

- Licensed Professional Engineer (PE)
- Certified Energy Manager (CEM)
- Multifamily Building Analyst (MFBA)

CORINNE ARNOLD

Board President & Co-Founder and Managing Partner of EZ Election Solutions

Corinne brings ten years of board leadership experience to her 500-unit building in Flatiron, where she has served as Treasurer, Vice President, and has been President since 2019. As a client services and communications expert, Corinne excels in building consensus to drive projects forward. Her professional background includes working at The Economist and collaborating with Fortune 500 companies, NGOs, and government organizations across five continents. Corinne's dual expertise in governance and global client management equips her to lead with insight and purpose.

THE VICTORIA

- Board President (5+ years)
- Board Vice President (5 years)
- Board Treasurer (1+ year)

EZ ELECTION SOLUTIONS

- Co-Founder & Managing Partner (4+ Years)

OCTOBER 24, 2024

MEETING A BUILDING WHERE IT'S AT:
A Guide to Staged Electrification

Presented by EN-POWER GROUP's Amalia Cuadra, PE,
and Board President of The Victoria Corrine Arnold.

ABOUT US

ENGINEERING FIRM — DESIGNING, DEVELOPING, AND DELIVERING COMPREHENSIVE SOLUTIONS FOR BUILDING DECARBONIZATION.

Founded in 2003, ENPG comprises of engineers, auditors, designers, analysts, and project managers.

DECARBONIZING NYC

NY City buildings contribute about 70% of all carbon emissions.

NY City: Local Law 97 mandates emission limits on buildings above 25,000 sq ft.

NY State: The Climate Act (CLCPA) requires that 70% of New York's electricity come from renewable sources by 2030 and 100% by 2040.

ELECTRIFICATION

BENEFITS

- Reduces/eliminates carbon emissions
- LL97 friendly
- CHW technology readily available and easier to implement
- Opportunity for decentralization of heating, cooling, and maintenance costs

CHALLENGES

- High capital costs, mainly for heating and DHW
- High operation costs, mainly for air-source heating and DHW
- Electric modifications to meet heating loads can be extensive
- Space constraints

MEETING A BUILDING WHERE IT'S AT

- Technical gaps
- Adoption and fiscal gaps
  - Communicating the technical – both challenges and opportunities – working through uncertainties
  - Understanding decision-making
  - Abandoning the all-or-nothing mentality
  - Funding (i.e., incentives) for electrification efforts

THE VICTORIA

MULTIFAMILY & RETAIL

ENERGY SYSTEMS:

- **Heating and DHW Fuel:** Natural Gas (Primary)
- **Heating System:** Steam Boilers, Qty 2
- **Heating Distribution:** Dual Temperature – Hot water distribution in winter
- **DHW System:** Steam boiler used for BDW production in steam to DHW converters
- **Cooling System:** Steam absorption chillers
- **Cooling Distribution:** Dual Temperature – Chilled water distribution summer

LOCATION
MANHATTAN

UNITS
506

AREA
443,400 SQ FT

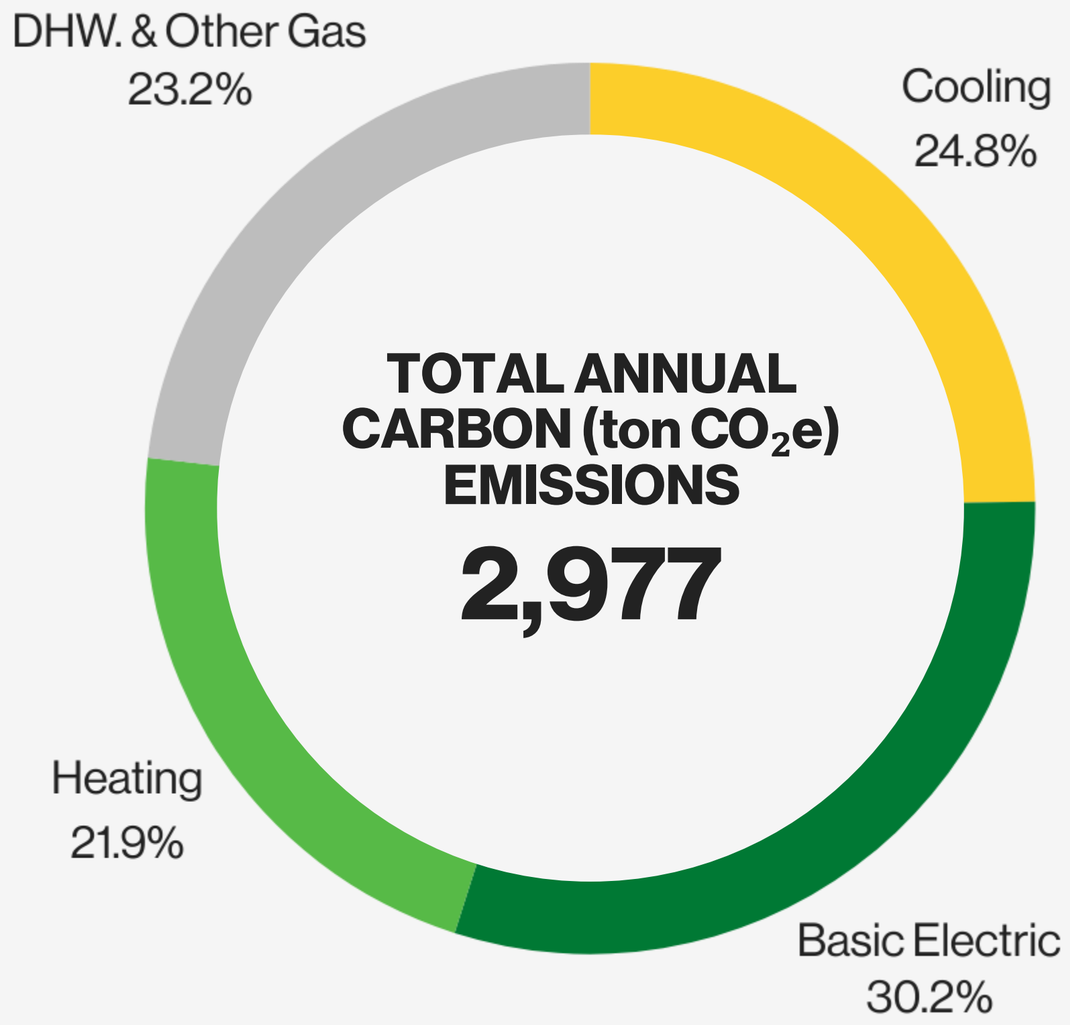
YEAR BUILT
1965

ENERGY USE
47,489 MMBTU PER YEAR

Using a billing period of January 2022 through January 2023.

Energy use - Billing Period (January 2022 to January 2023)					
Fuel	**Use**	**Units**	**MMBTU**	**Cost**	**All-In Rate**
Electricity	3,289,178	kWh	11,223	$802,559	$0.24
Gas	362,660	therms	36,266	$522,230	$1.44
Total	-	-	47,489	$1,324,790	-

CURRENT ANNUAL CARBON EMISSIONS (2022 - 2023)



PROJECTED LL97 PENALTIES $6.1 MILLION

Below are The Victoria's current and projected carbon penalties from 2025 to 2049.

The $ 6.1 Million in projected penalties is a cumulation of LL97 penalties from 2024 to 2050.

Projected Carbon Emission Penalty for Your Property				
Local Law 97 Impact	**2024-2029**	**2030-2034**	**2035-2039**	**2040-2049**
Your Emissions (tons CO2e)	2,973	2,498	2,259	2,020
Emission Limit (ton CO2e)	3,041	1,420	1,131	845
Estimated Annual Penalty	$0	$288,845	$302,280	$314,844
% Reduction Required for $0 Penalty	-	43%	50%	58%

LL97 has not defined coefficients for 2035 and beyond. These are assumptions.

Energy Star Score	52
Letter Grade	D

Energy Usage Intensity	
Site EUI (kBTU/ft^2)	114.6
Source EUI (kBTU/ft^2	166.1

RECOMMENDED ELECTRIFICATION MEASURES SUMMARY

Electrification Measures

1. Full electrification of cooling
2. Partial electrification of heating
3. Partial electrification of DHW production

#	Description	Annual Energy Savings	Net Cost w/ Incentives	CO2e Penalty Savings	Simple Payback (yrs)	Simple ROI
1	Install Electric Chiller with Heat Pump	$90,289	$1,300,000	$133,818	5.8	17%
2	Install High Efficiency Heating and DHW Plants	$55,697	$996,500	$55,053	9.0	11%
3	Install Heat Pumps for Summer Operation of DHW Plant	$14,749	$475,000	$58,990	6.4	16%
4	Upgrade Distribution Pumps & Cooling Tower	$45,153	$445,388	$14,331	7.5	13%
5	Install Building Management System	$26,826	$150,000	$16,102	3.5	29%
6	Upgrade Building Windows	$4,514	TBD	$6,691		
	Total	**$237,229**	**$3,366,888**	**$284,985**	**6.4**	**16%**

MODULAR BOILERS

Hot Water Boilers

- Installation of modular natural gas-fired hot water boilers to eliminate existing natural gas steam boiler

MODULAR HEAT PUMPS

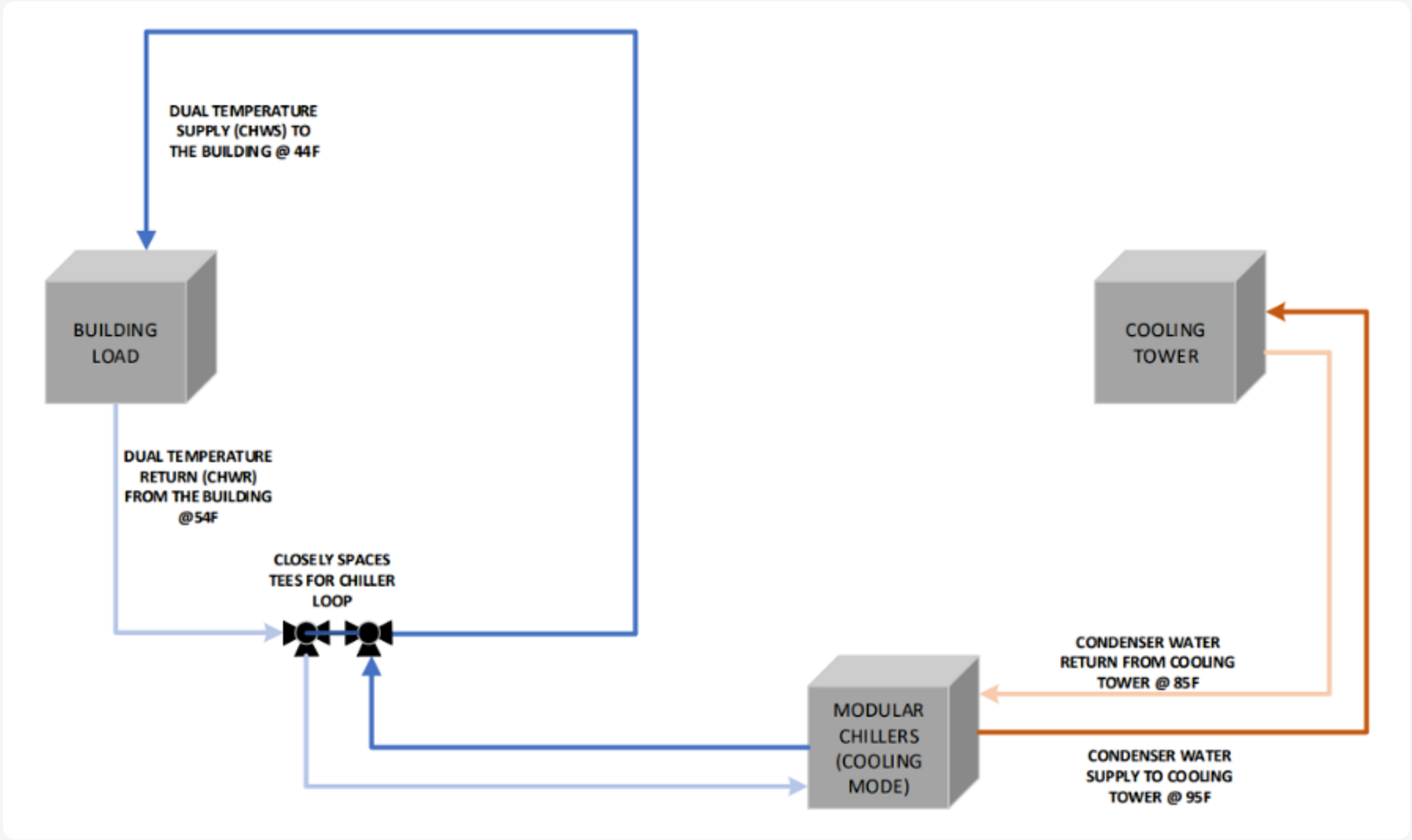
Cooling System – Full Electrification

- Capacity: 16 modules, 30 tons/module for a total of 480 tons of cooling, 100% of cooling load with some redundancy
- Efficiency 0.74 kW/ton or over 10x the efficiency of the existing absorption chiller

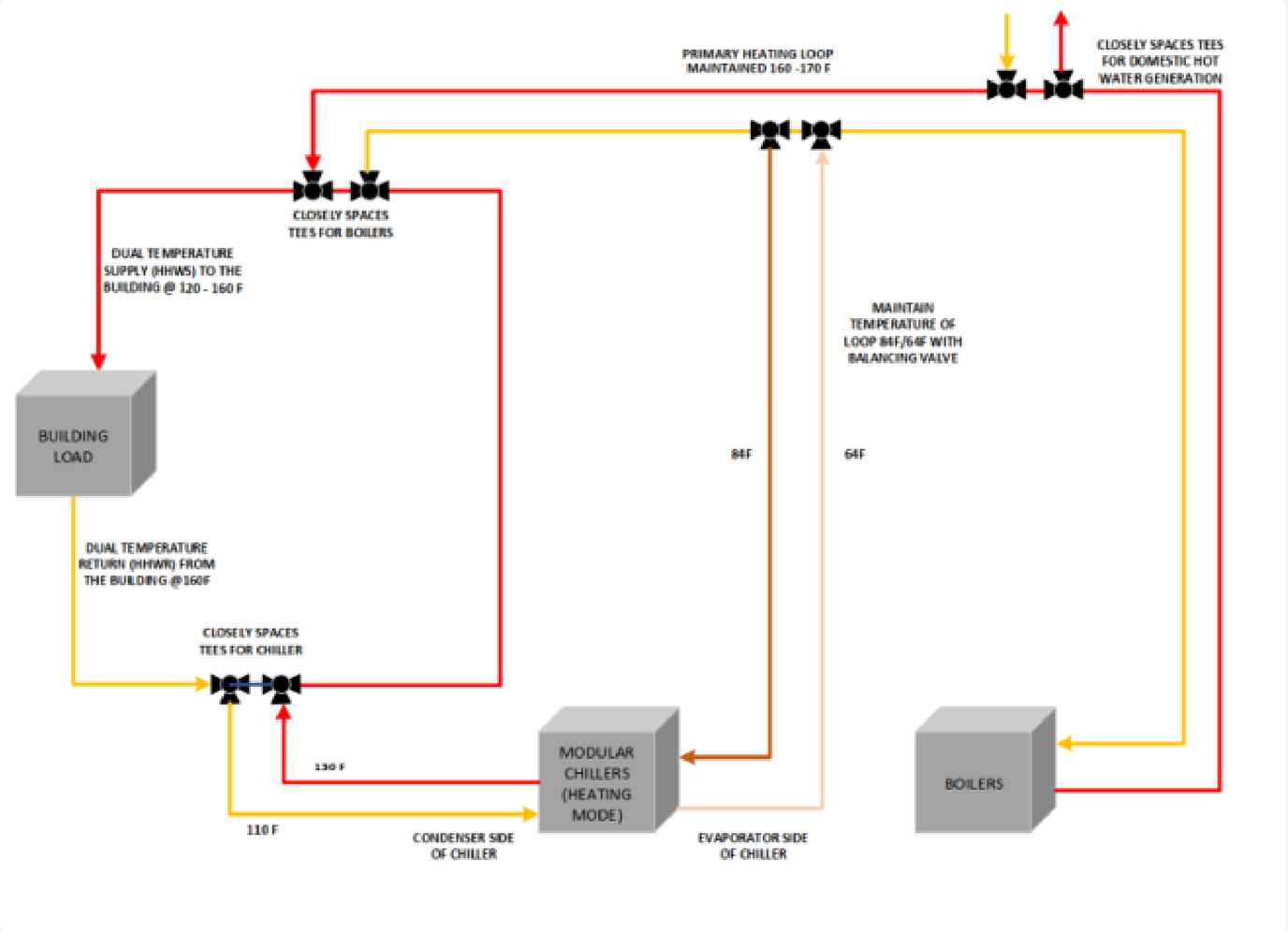
Heating System – Partial Electrification

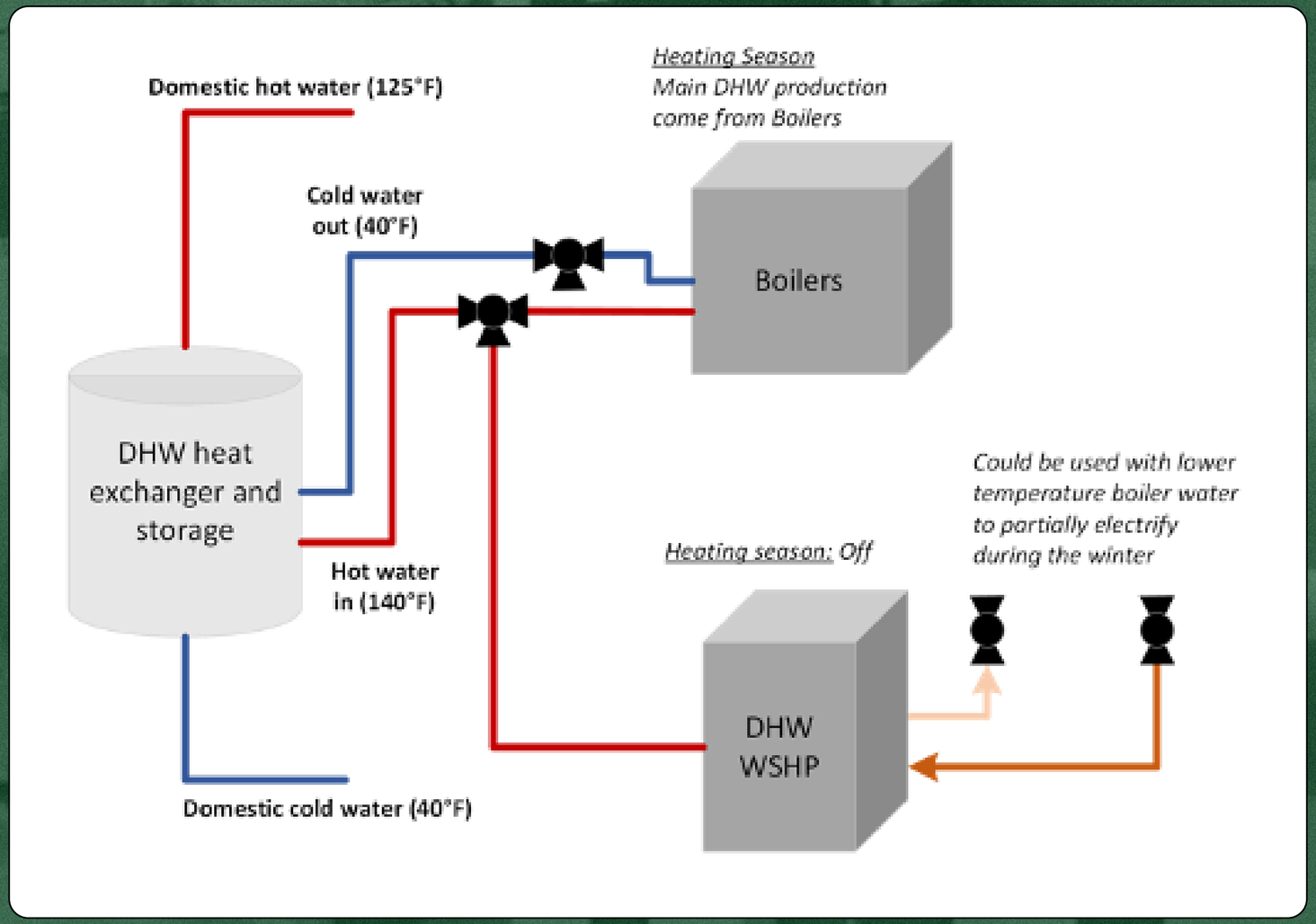
- Capacity: 16 modules, 550 MBH/module for a total of 8,800 MBH, covering about 60% of the heating and DHW loads**
- Efficiency: COP of 4. or 5.5x of the proposed hot water boilers
- Energy Cost Benefit: Electric Heating and Gas-Fired Heating costs are about the same!

MODULAR ELECTRIC HEAT PUMPS: COOLING SYSTEM



MODULAR ELECTRIC HEAT PUMPS: HEATING SYSTEM



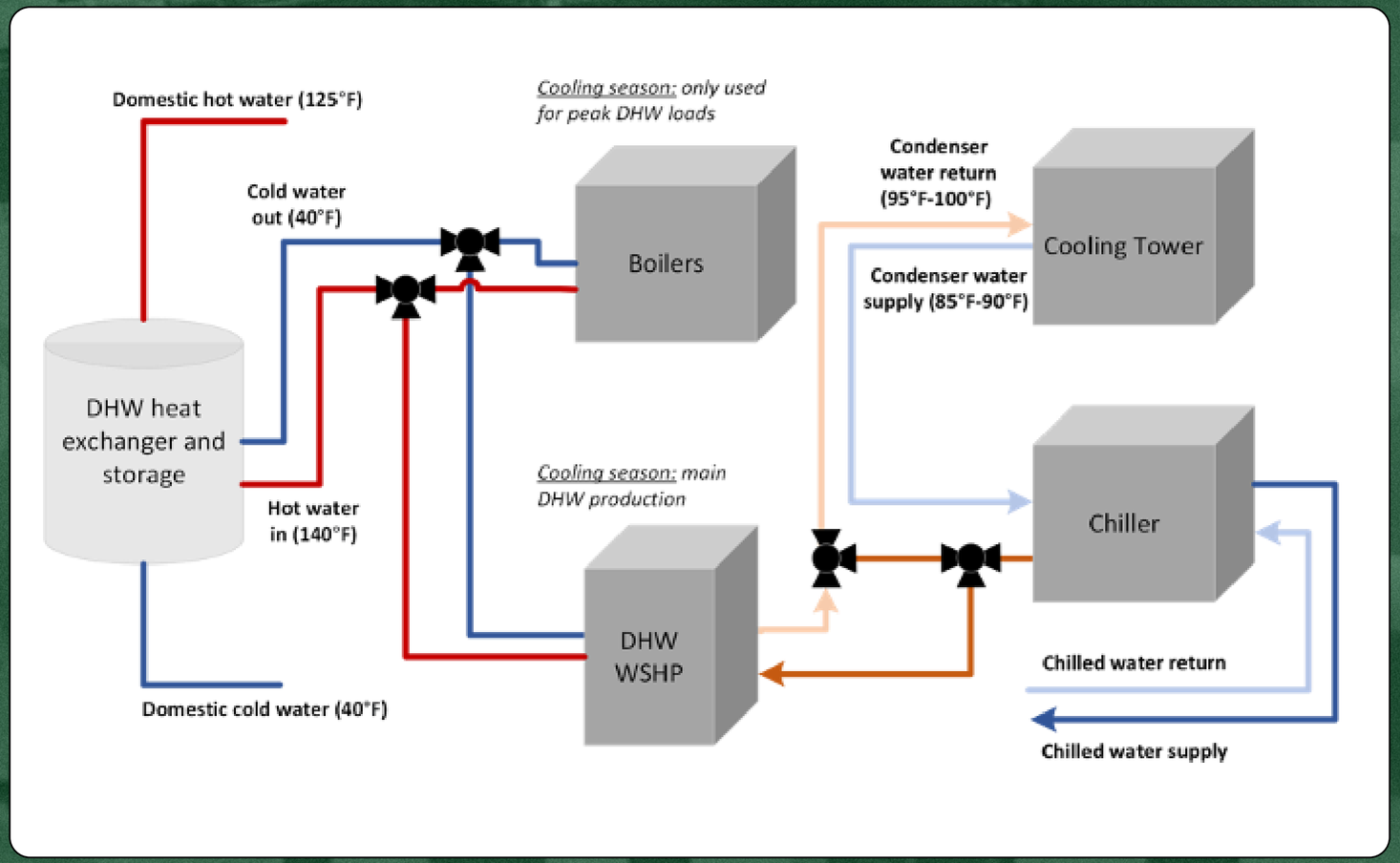


SUMMER DHW HEAT PUMP WITH HEAT RECOVERY

Winter Operation

- Utilize heating boilers for DHW with storage and heat exchangers
- Water-Source Heat Pumps (WSHP) backup/standby
- Efficiency: 85% gas fired

SUMMER DHW HEAT PUMP WITH HEAT RECOVERY

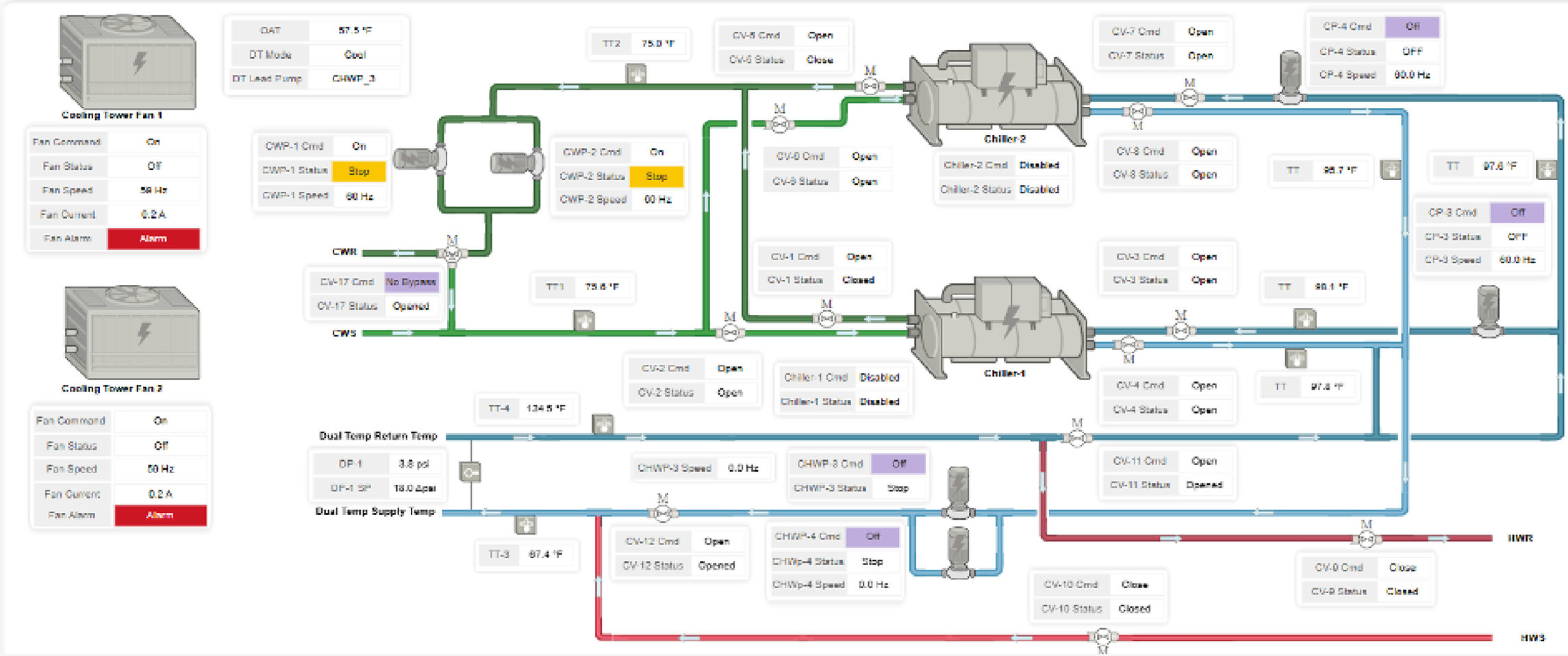


Summer Operation – Electrification with Heat Recover from Condenser Water System

- Utilization of the Water-Source Heat Pumps
- Use Condenser Water Return (to cooling tower) as the source to the WSHP
- Efficiency: COP of 3.9 with improved cooling tower performance
- Energy Cost Benefit: It is beneficial to operate the WSHPs

BUILDING MANAGEMENT SYSTEM

Implement a Building Management System to control central building systems and optimize electrification opportunities.



INCENTIVES USED BY THE VICTORIA

EN··POWER GROUP

NYSERDA & PONS

- Low Carbon
- Heat Recovery

NY STATE CLEAN HEAT

- Heat Pump Technologies

CON EDISON MFEEP

- Chiller Conversion
- Electric Measures
- Boiler Installation

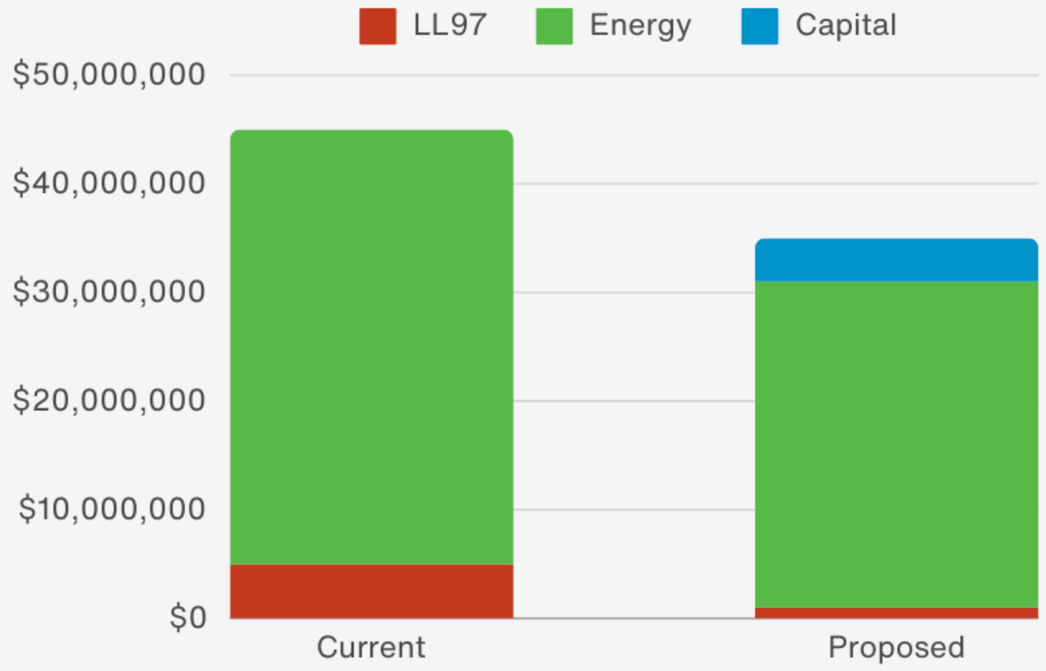
Beneficial Electrification Credits

- Chiller Conversion
- Heat Pump Heating
- Heat Pump DHW

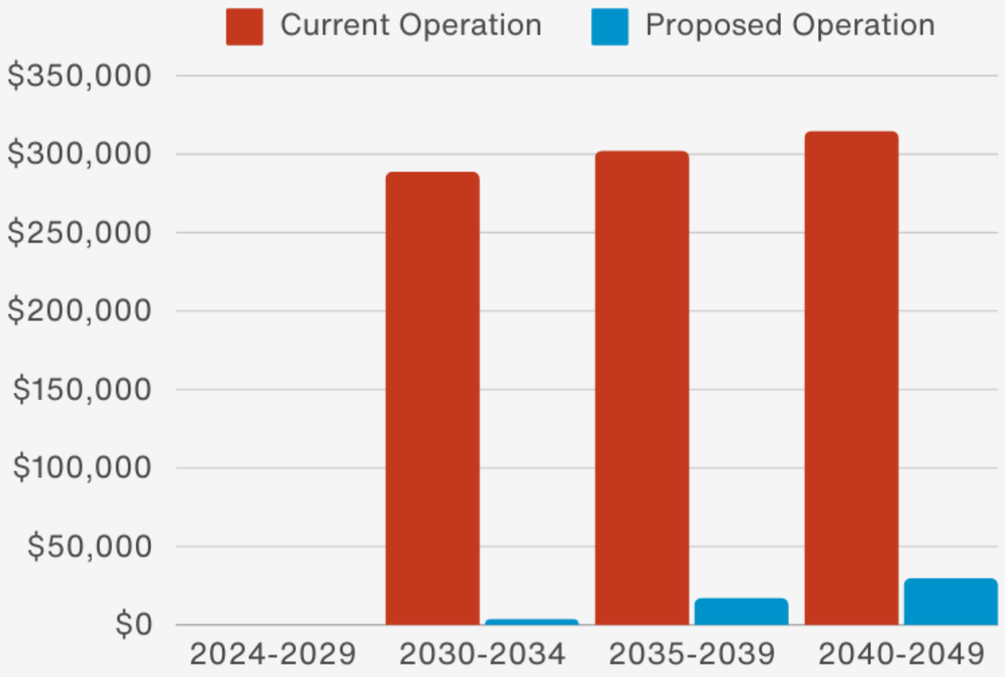
SAVINGS THROUGH 2049
$8.69 MILLION

Based on the recommended measures, The Victoria will reduce its LL97 costs and energy expenses by over $8.69 million through 2049.

PRELIMINARY ANALYSIS CUMULATIVE CASH FLOW SAVINGS (2024 - 2049)



LL97 IMPACT BASED ON 2022 BENCHMARKING SUBMISSION



STEPS FOR NAVIGATE LL97

01 **Review Benchmark Data and Submission (LL84/LL133)**

- Building areas, space types, and energy consumption

02 **Reduce Energy Consumption**

- Optimize the operation of base building systems (heating, cooling, etc.)
- Encourage energy reduction practices for residents and retail tenants

03 **Reduce Carbon Emissions through low-carbon fuels**

- Implement electrification opportunities for cooling, heating, and domestic hot water; balance with operating expenses, physical space allowances, ongoing operations

04 **Ongoing review of Capital Plan**

- LL97 is a marathon; capital planning will allow buildings to optimize funds, LL97 fines, and energy expense
- The typical life of heating, DHW, and cooling equipment is 15 – 25 years
- Every building decision should weigh the reduction in energy and carbon emissions (e.g., LL11/FISP)

GETTING BUILDINGS ON BOARD

- How to get buildings to act on carbon emission reduction projects

- How to think through a capital project

AMALIA CUADRA, PE

SENIOR DIRECTOR OF ENGINEERING

CORINNE ARNOLD

BOARD PRESIDENT & CO-FOUNDER AND MANAGING PARTNER OF EZ ELECTION SOLUTIONS

LET’S CONNECT

EN POWER GROUP

AMALIA CUADRA, PE

SENIOR DIRECTOR OF ENGINEERING

CORINNE ARNOLD

board president & co-founder and managing partner of ez election solutions