



MARINE GATEWAY: Low-Carbon Energy System for Vancouver

IDEA CONFERENCE
JUNE 13, 2018

MARINE GATEWAY

Project Overview



Image Source: Perkins+Will

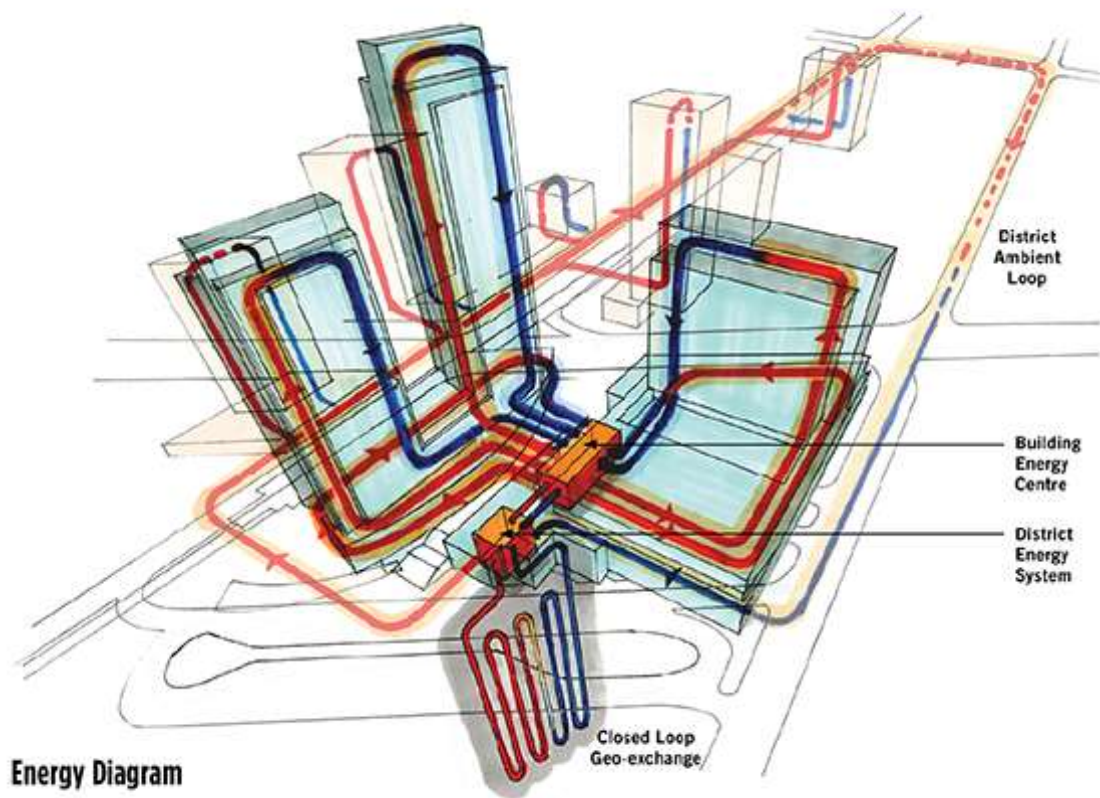
- Owned by PCI Developments
- 800,000 sqft Mixed Use
 - Office Tower
 - 450 Residential Units
 - Retail Podium
 - Grocery Store
 - Movie Theater



MARINE GATEWAY DISTRICT ENERGY

Project Overview

- Neighborhood-scale DES
- Ambient Temperature system to recover, store, re-use waste heat
- Provides low-carbon heating, cooling, and DHW
- Currently serves 4 customers at Marine Gateway block



Energy Diagram

Image Source: SAB Magazine

OUTLINE

Marine Gateway Low Carbon Energy System

1. Ambient Temperature DES
2. Building Performance & Policies
3. Case Study: Marine Gateway



OUTLINE

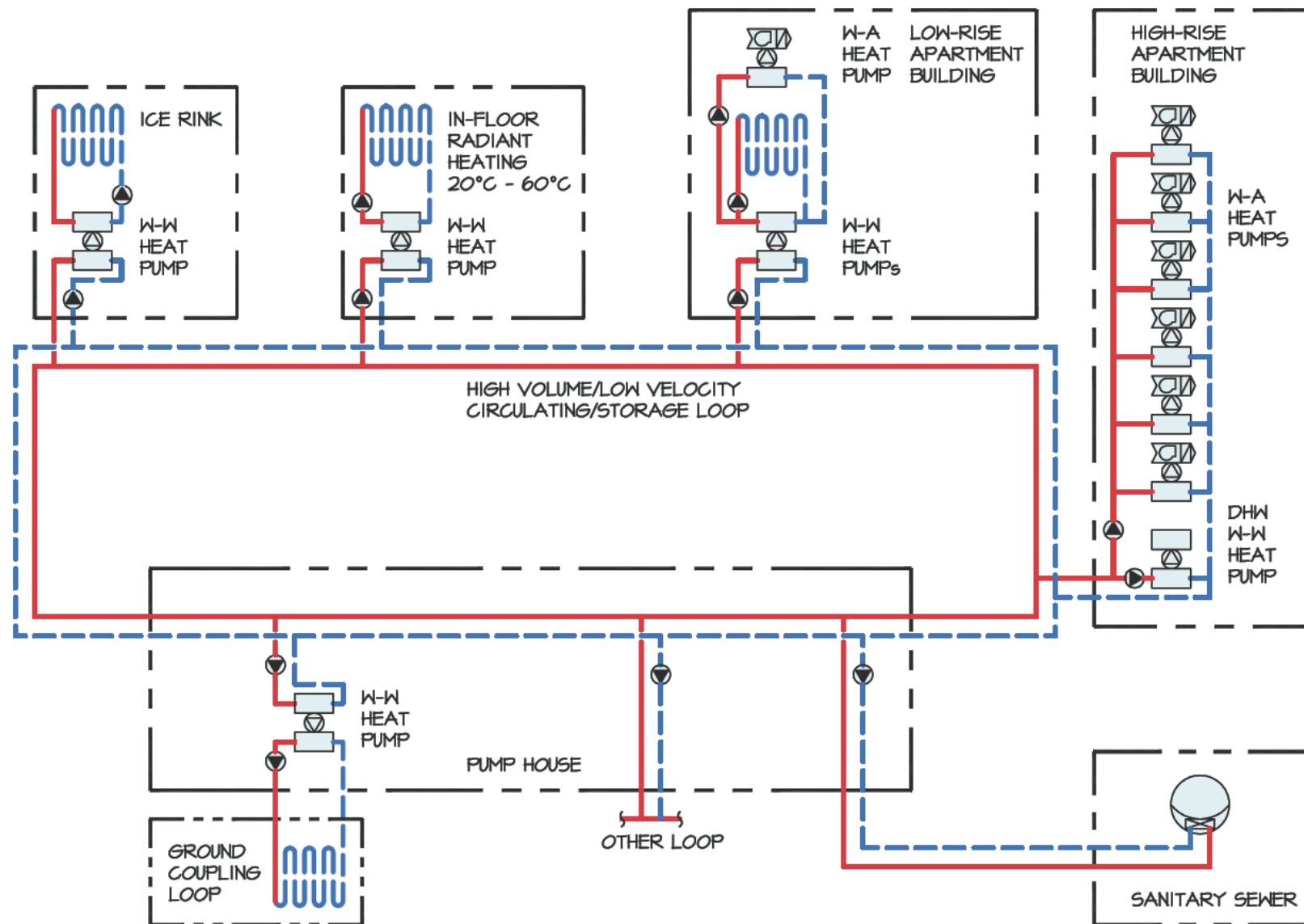
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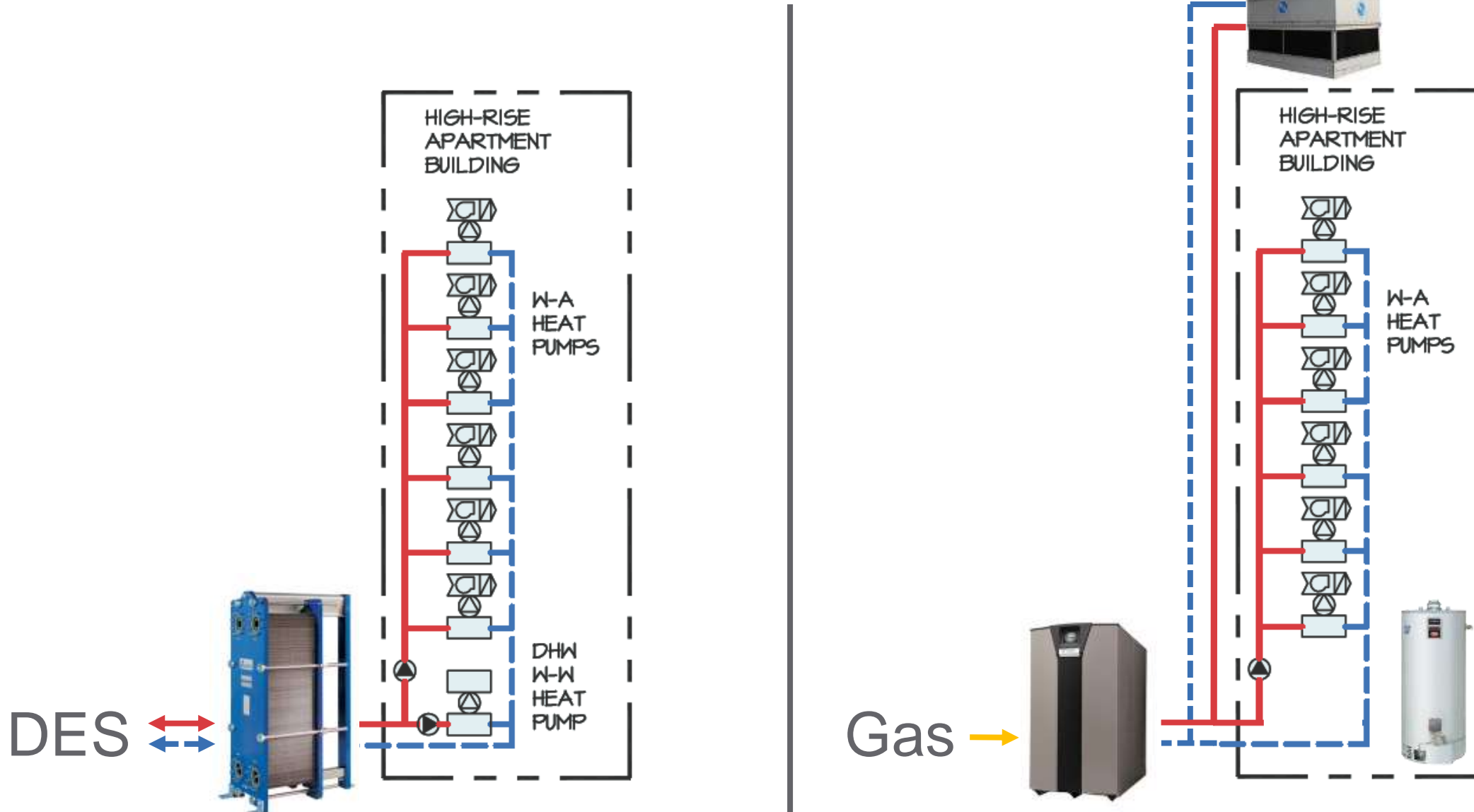


AMBIENT TEMPERATURE DES

- 10°C - 25°C operating temp
- Heat pumps in each ETS
- Heating and Cooling
- Renewable energy sources



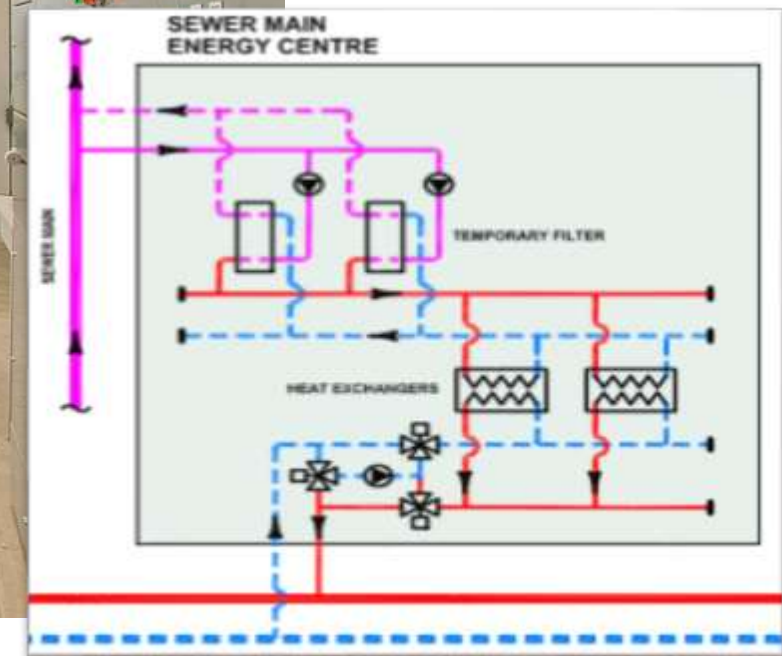
AMBIENT TEMPERATURE DES



AMBIENT TEMPERATURE DES



Saanich WWTP DES Energy Centre



AMBIENT TEMPERATURE DES

- Distribution system is HDPE
- Not insulated
- Low line losses
- No delta-T concerns



Westhills DESS Distribution Piping System

OUTLINE

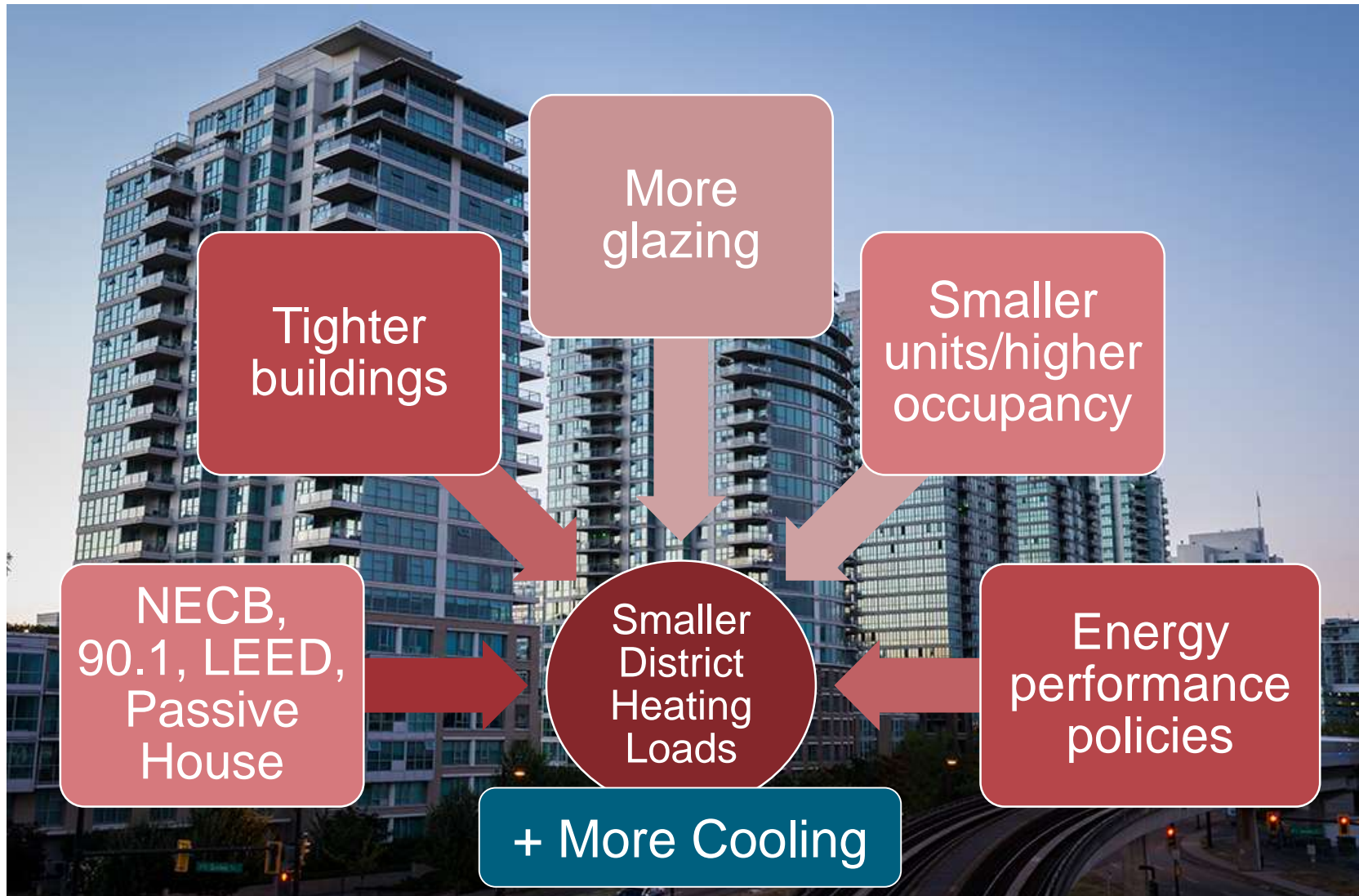
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BUILDING ENERGY PERFORMANCE

Effect on District Energy Systems



ENERGY PERFORMANCE POLICIES

Province of BC – Energy Step Codes

- New provincial alternative to NECB and ASHRAE 90.1 standards.
- Performance-based modelling targets
- Fuel Neutral

Table 10.2.3.3.A. Energy Performance Requirements for Residential Occupancies

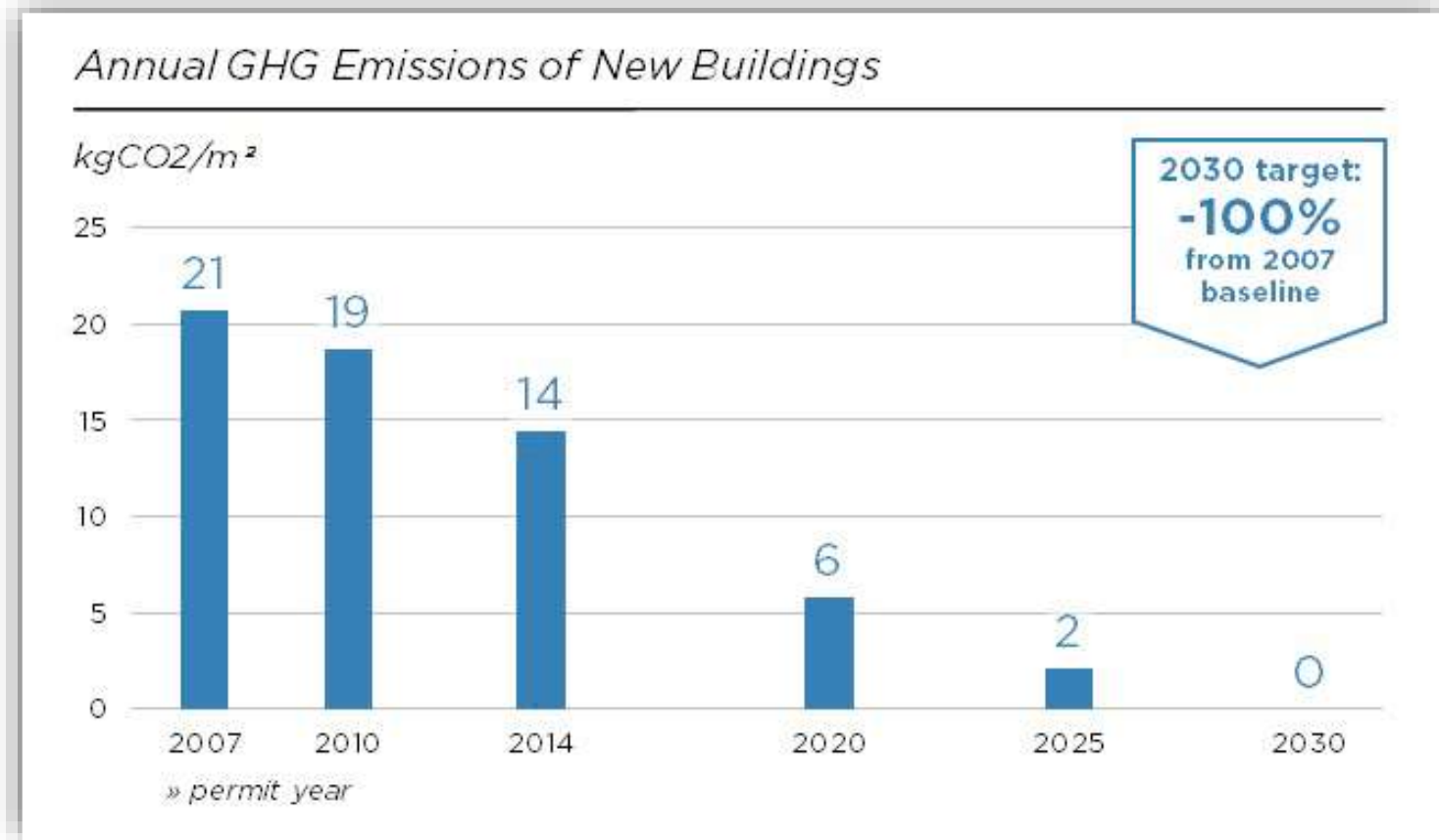
Forming Part of Sentences 10.2.3.3.(1) and (2)

STEP	EQUIPMENT AND SYSTEMS – MAXIMUM TOTAL ENERGY USE INTENSITY (KWH/M ² •YEAR)	BUILDING ENVELOPE – MAXIMUM THERMAL ENERGY DEMAND INTENSITY (KWH/M ² •YEAR)
1	Conform to Part 8 of the NECB	
2	130	45
3	120	30
4	100	15

ENERGY PERFORMANCE POLICIES

City of Vancouver – Zero Emission Building Plan

- For new buildings
- 90% emissions reduction by 2025
- 100% emissions reductions by 2030



ENERGY PERFORMANCE POLICIES

City of Vancouver – Zero Emission Building Plan

Path 1 Building Envelope



$\text{TEDI} \leq 32 \text{ kWh/m}^2$

Reduce the heating energy and resulting GHG emissions

Path 2 Low Carbon Energy System



$\text{TEDI} \leq 40 \text{ kWh/m}^2$

Reduce the GHG emissions intensity of the energy source

ENERGY PERFORMANCE POLICIES

ADVANTAGES - Low Carbon Energy ATDES

- Resource Recovery
 - Makes waste heat into a fuel source
- Guaranteed GHG Savings
 - Not reliant on end user behavior
- Provides DHW Solution
 - DHW is a large source of GHG emissions
- Reliability
 - Long-term savings through Utility oversight and operating expertise
- Provides Cooling
 - Adds value for customer and increases utility revenue



OUTLINE

Marine Gateway Low Carbon Energy System

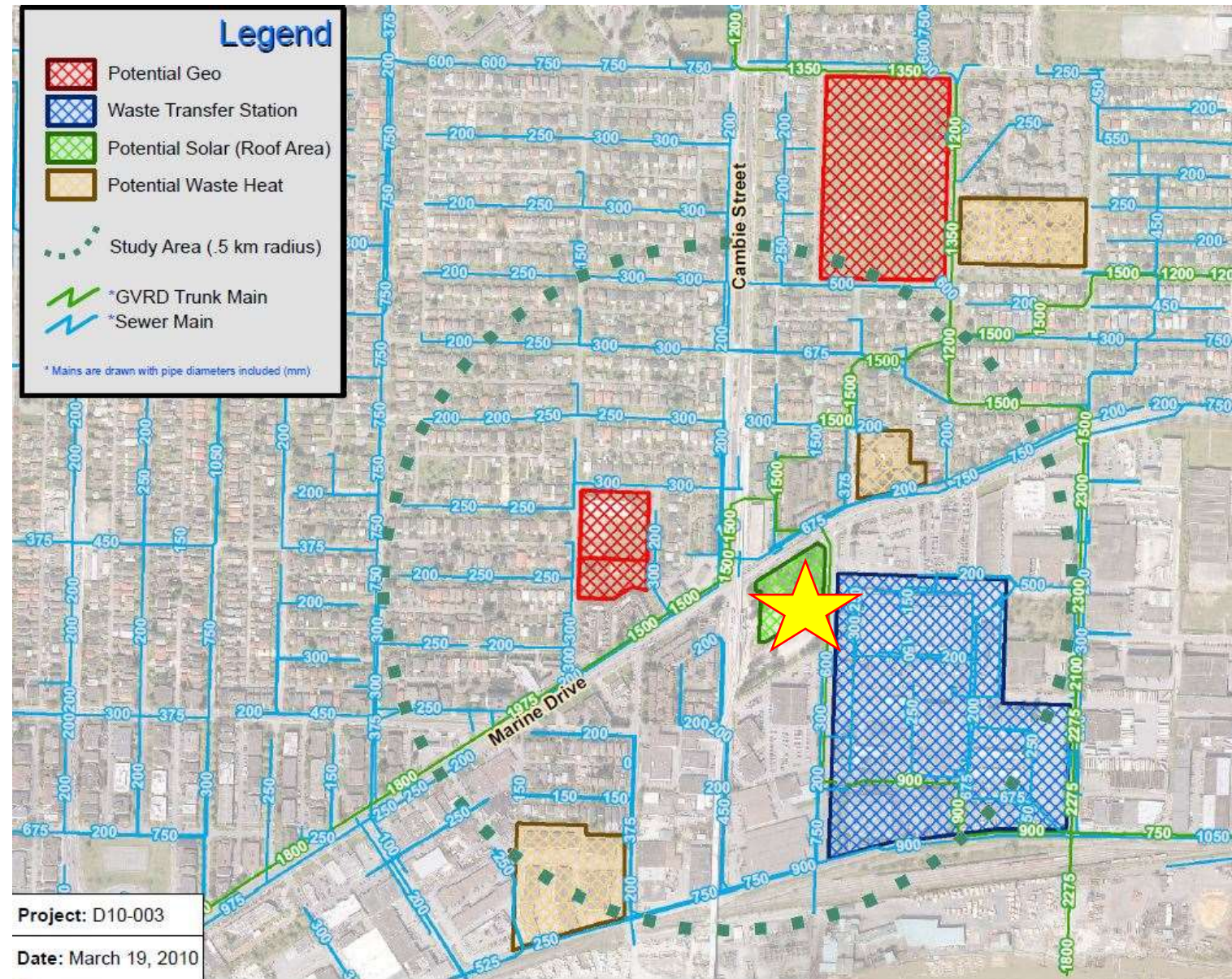
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MARINE GATEWAY

System Design

- Planning started in 2006
- Design team promoted low-carbon energy
- CoV requested study during rezoning
- FortisBC Alternative Energy Services engaged
- Feasibility study and concept design



MARINE GATEWAY

System Design

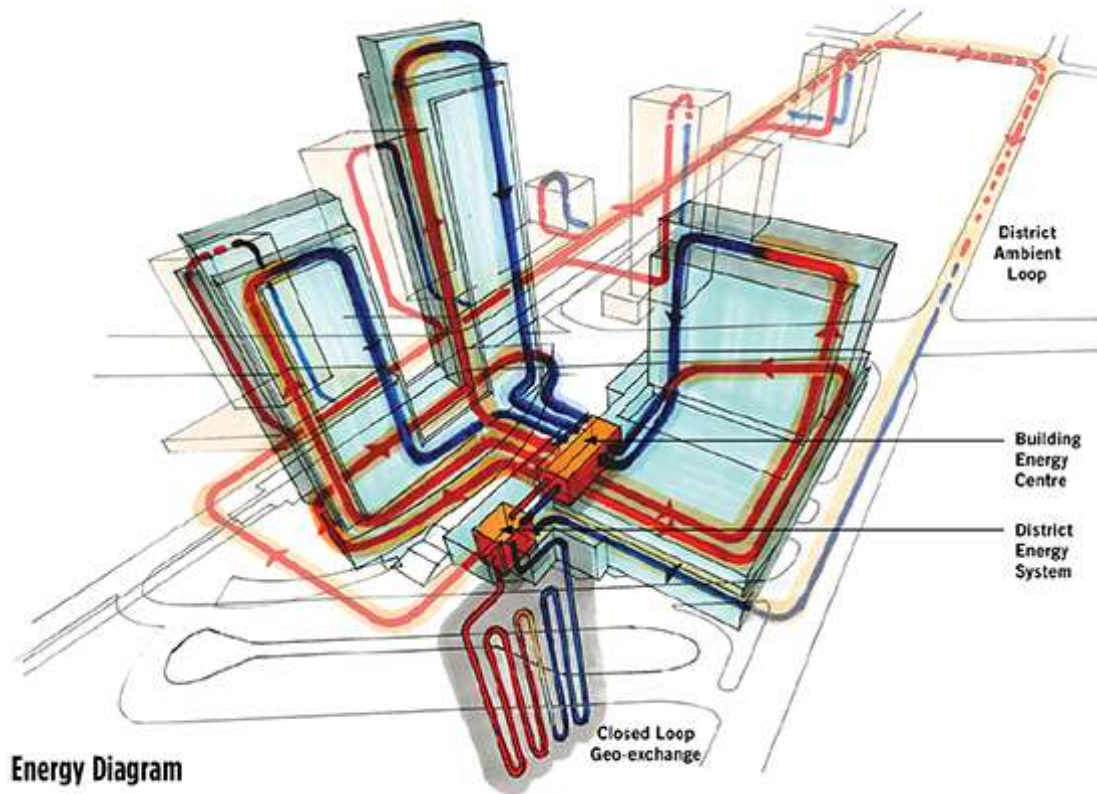
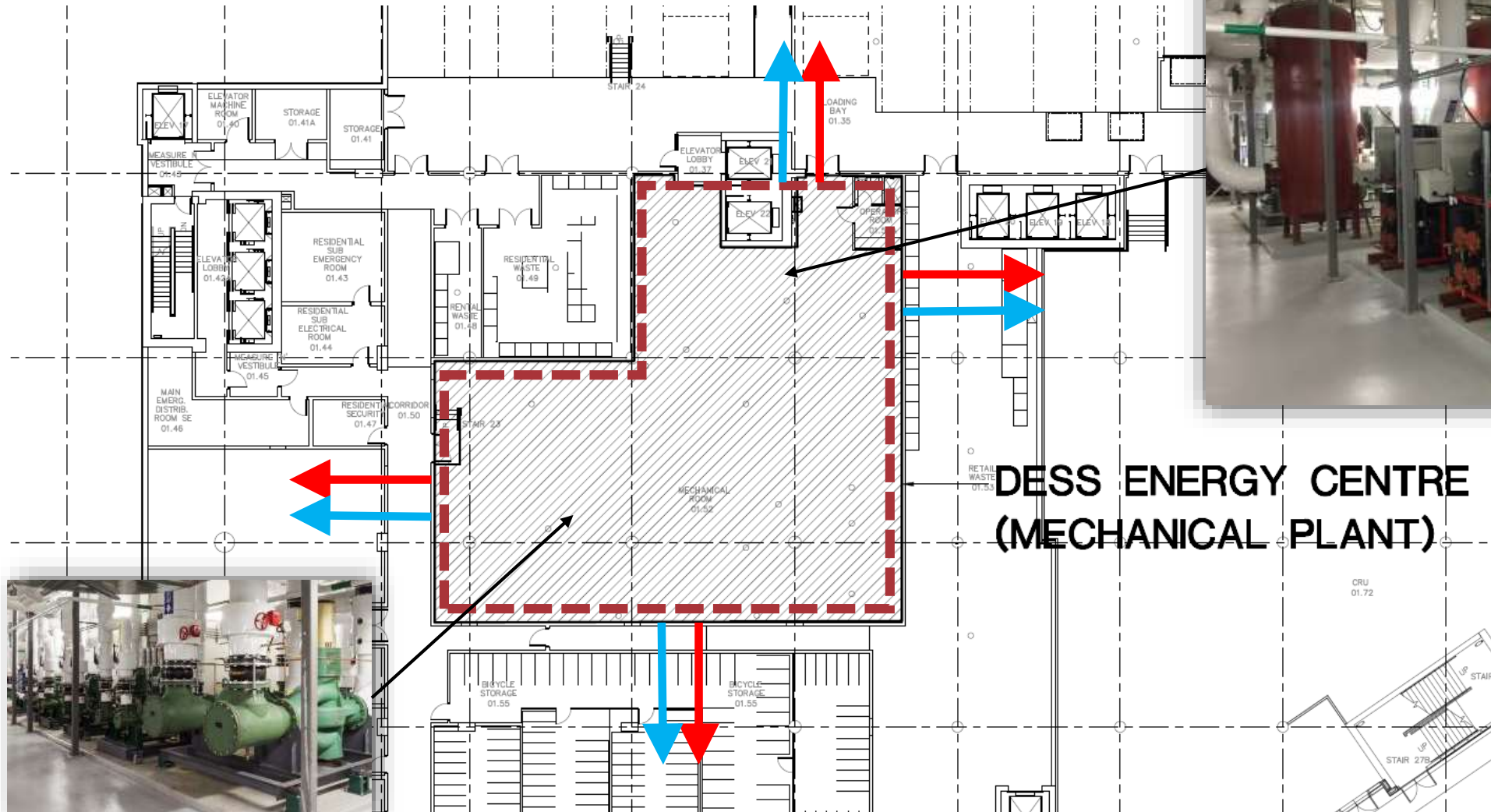


Image Source: SAB Magazine

- Office Tower Heat Recovery
- Commercial Podium Heat Recovery
- Grocery Store Heat Recovery
- Georexchange
- High Efficiency Boilers

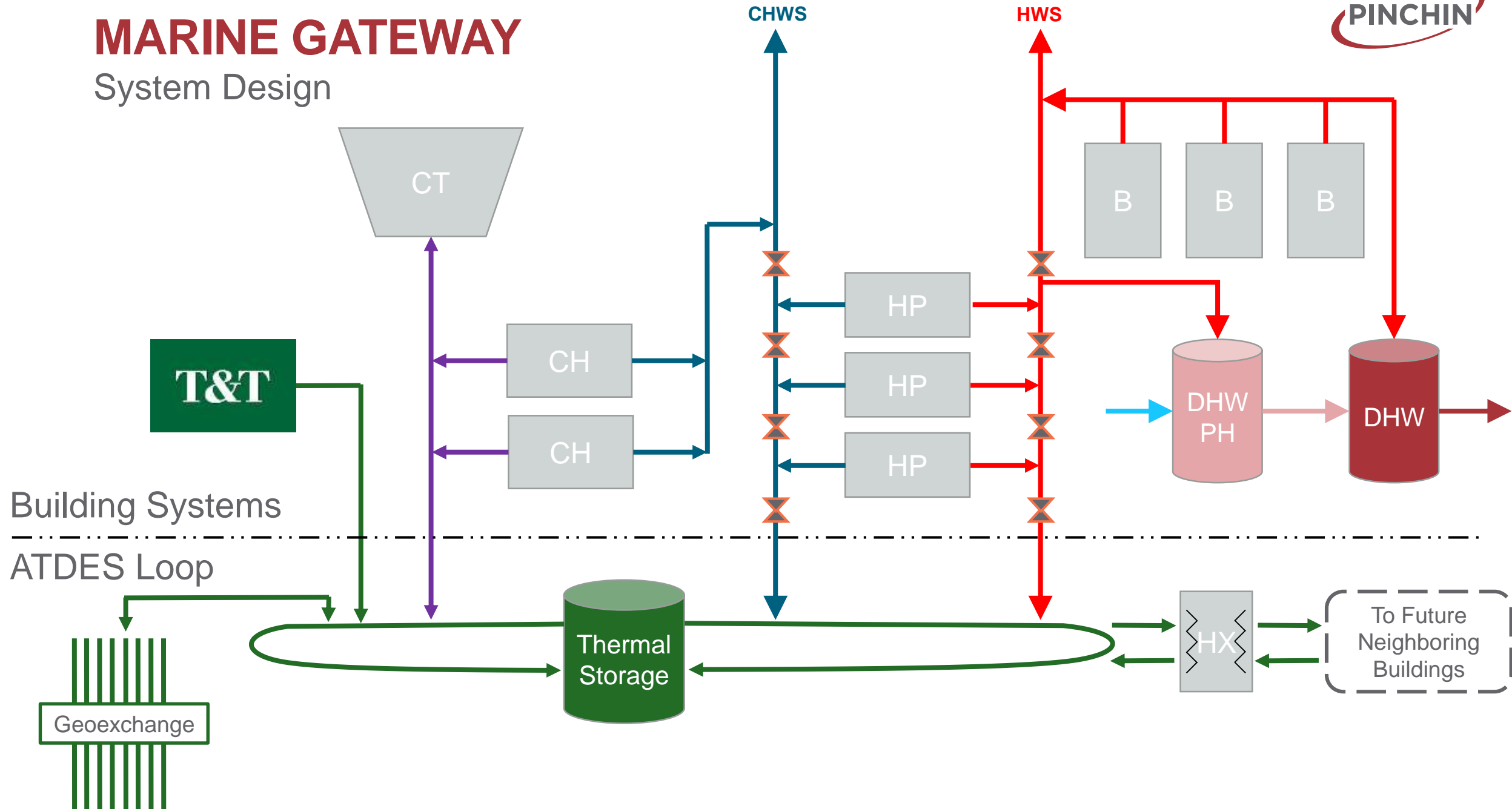
MARINE GATEWAY

System Design



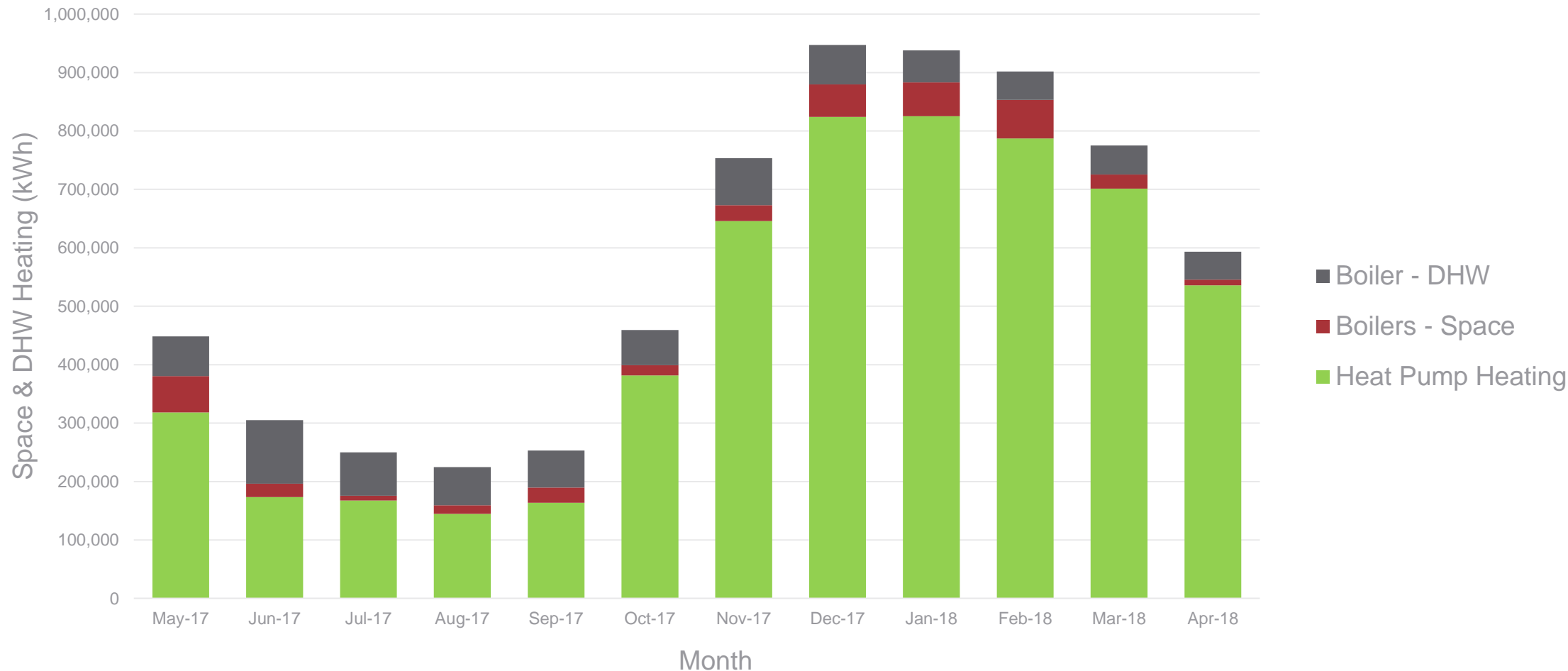
MARINE GATEWAY

System Design



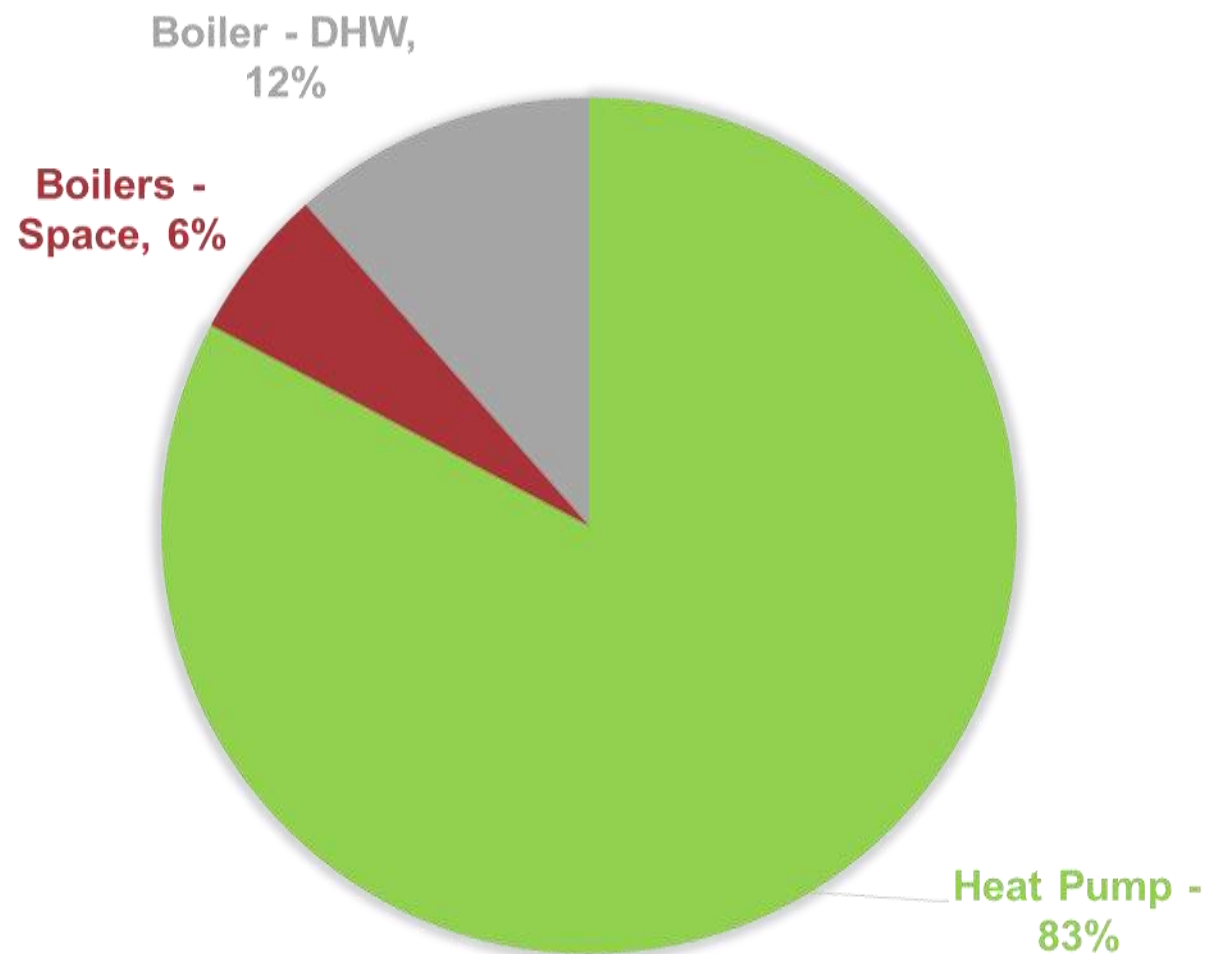
MARINE GATEWAY

Performance (May 2017 – Apr 2018)



MARINE GATEWAY

Performance (May 2017 – Apr 2018)



SUMMARY

Marine Gateway Low Carbon Energy System

- Heating intensities are falling as governments and municipalities require higher performing buildings.
- Ambient temperature DES can be deployed to provide heating and cooling with low-carbon energy sources.
- The ATDES at Marine Gateway has delivered 83% of space and DHW heating from low-carbon energy source.



ACKNOWLEDGEMENTS



Thanks to the following:

Site Developer



Energy Centre
Owner/Operator



Consultants

Architect



Building Mechanical



Geoexchange



Electrical





PINCHIN

Questions & Thank You

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