Thermal Energy As a Service

Moderator: **Venetia Lannon / *Consolidated Edison***

Speakers: **Cameron Best / *Brightcore Energy***

Tim Banach / *Endurant*

Michael Albertson / *SHARC*

Brightcore
BUILDING ENERGY PERFORMANCE™

BRIGHTCORE ENERGY

The Next Generation of Geothermal Heating and Cooling

Prepared for:

NY GEO

October 23rd, 2024

BRIGHTCORE ENERGY DEPLOYS
A RANGE OF ELECTRIFICATION SOLUTIONS FOR C&I CUSTOMERS

including…

GEOTHERMAL HEATING & COOLING

LED LIGHTING & CONTROLS

EQOOGTE CN"("EQOOWP V["UQNCT"
CPF "DCVVGT["GPGTI ["UVQTCIG"

Our building electrification solutions capitalize on market forces and address regulatory requirements.

ENERGY-AS-A-SERVICE

What are we trying to accomplish?

*Broadly, the goal of **Energy-as-a-Service** is to reduce the capital costs of geothermal projects such that counterparties without access to capital can access geothermal technologies.*

ENERGY-AS-A-SERVICE

How effective is EaaS at accomplishing this goal?

- EaaS has had limited success at accomplishing this goal
  - Investment Tax Credits – single entity must be the legal tax owner of the system
  - Counterparty credit risk – those who cannot borrow funds may pose credit risk
  - Non-removable asset – on vs. off balance sheet treatment
  - Bonding covenants – public bonds come with covenants that restrict debt capacity
- Until some of the structural challenges, largely driven by IRS rules change, EaaS will be constrained

IRA HAS CREATED A NEW PARDIGM

BRIDGE FINANCING

- Inflation Reduction Act is driving very attractive paybacks
- Most clients approach their replacement projects with some budget
- GSHP is most often cost neutral when compared to electrified alternatives (ASHP, electric boilers, etc.)
- Under the new paradigm, the new challenge is bridging the gap between commissioning and ITC receipt

270,000 SF Multifamily Building (Year 1 Payback)

	Geothermal	ASHP
HVAC	$6,840,000	$6,840,000
Ground Loop	$3,760,000	$ -
Investment Tax Credit	- $4,250,000	$ -
Con Edison	- $ 705,000	$ -
Project Net of Incentives	**$5,645,000**	**$6,840,000**

145,000 SF Three Building Campus Retrofit (Year 1.3 Payback)

	Geothermal	ASHP
HVAC	$4,240,000	$4,240,000
Ground Loop	$4,260,000	$ -
Investment Tax Credit	- $3,146,000	$ -
Con Edison	- $1,622,000	- $715,000
Project Net of Incentives	**$3,731,000**	**$3,525,000**

CONCLUSION

EAAS can work, but it is constrained

- The financial mechanics of EaaS work, but the regulatory constraints challenge its utility
- As an industry the more salient financial challenge is bridge financing
  - Low interest loans from green banks or other incentive programs can help
  - Bridge financing will enable more project completion than EaaS as a financial tool
- Caveat: If the regulatory barriers are reduced or eliminated there the market would be ripe for EaaS

VJ CP M"[QW#

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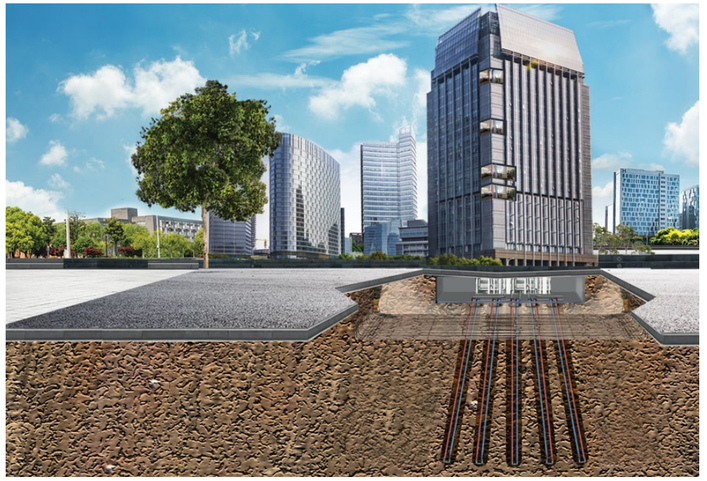


NY GEO

Energy-as-a-Service

Tim Banach

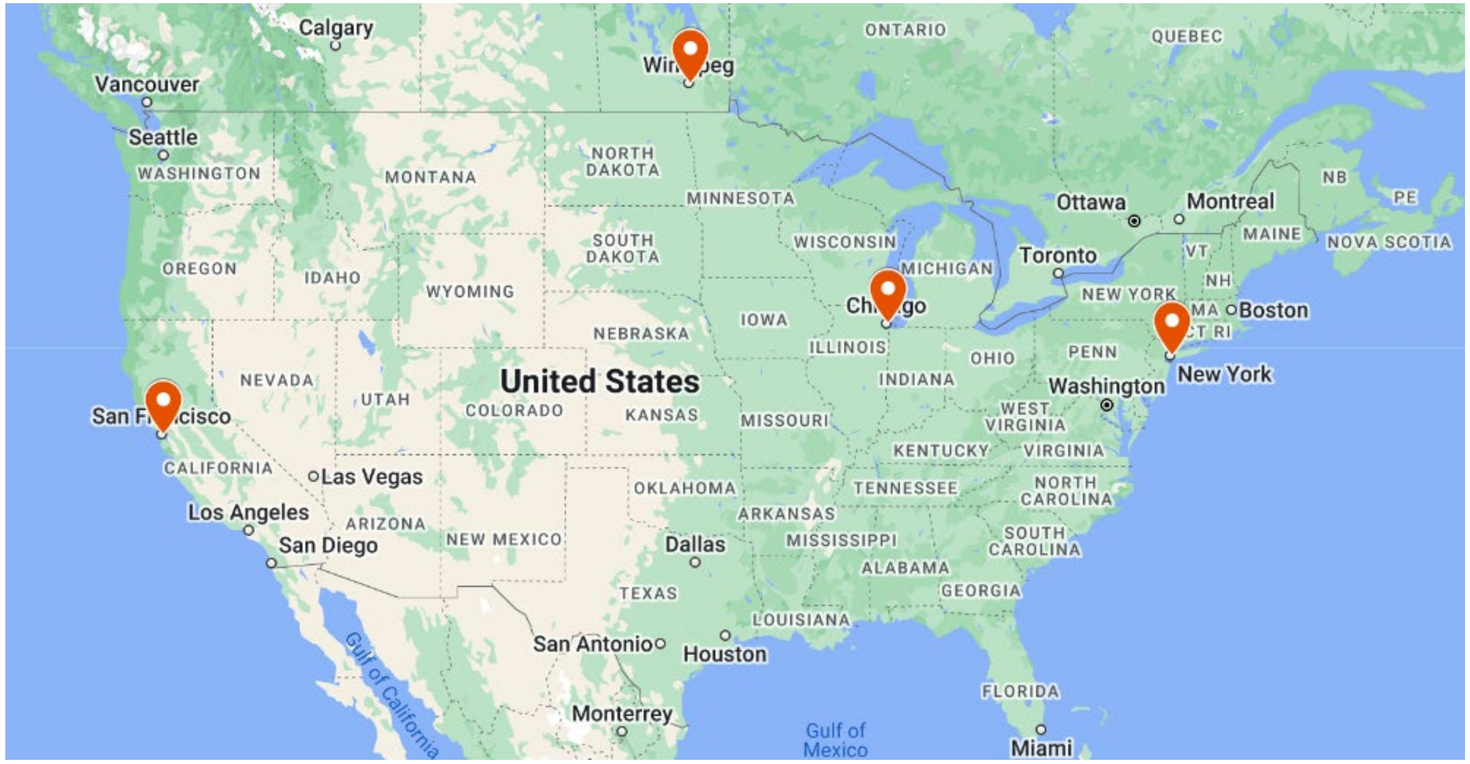
VP, Development

October 23, 2024

Geothermal EaaS Opportunities

District Thermal Energy Networks

- Multiple buildings, thermally connected
- Diversity of building use
- Ambient Temp Loops and Central Plants
- Hybrid systems
- New construction and retrofits



Geothermal EaaS

Value Proposition & Challenges

Value Proposition

- Greater efficiency
- Platform for building electrification
- Flexible design and ability to harness thermal resources from ground, sewers, buildings, water bodies, etc.
- Eliminates noisy condensers
- Conserves water

Challenges

- Long-term EaaS commitment
- Occupancy risk / revenue certainty

Geothermal EaaS

Ingredients for Success

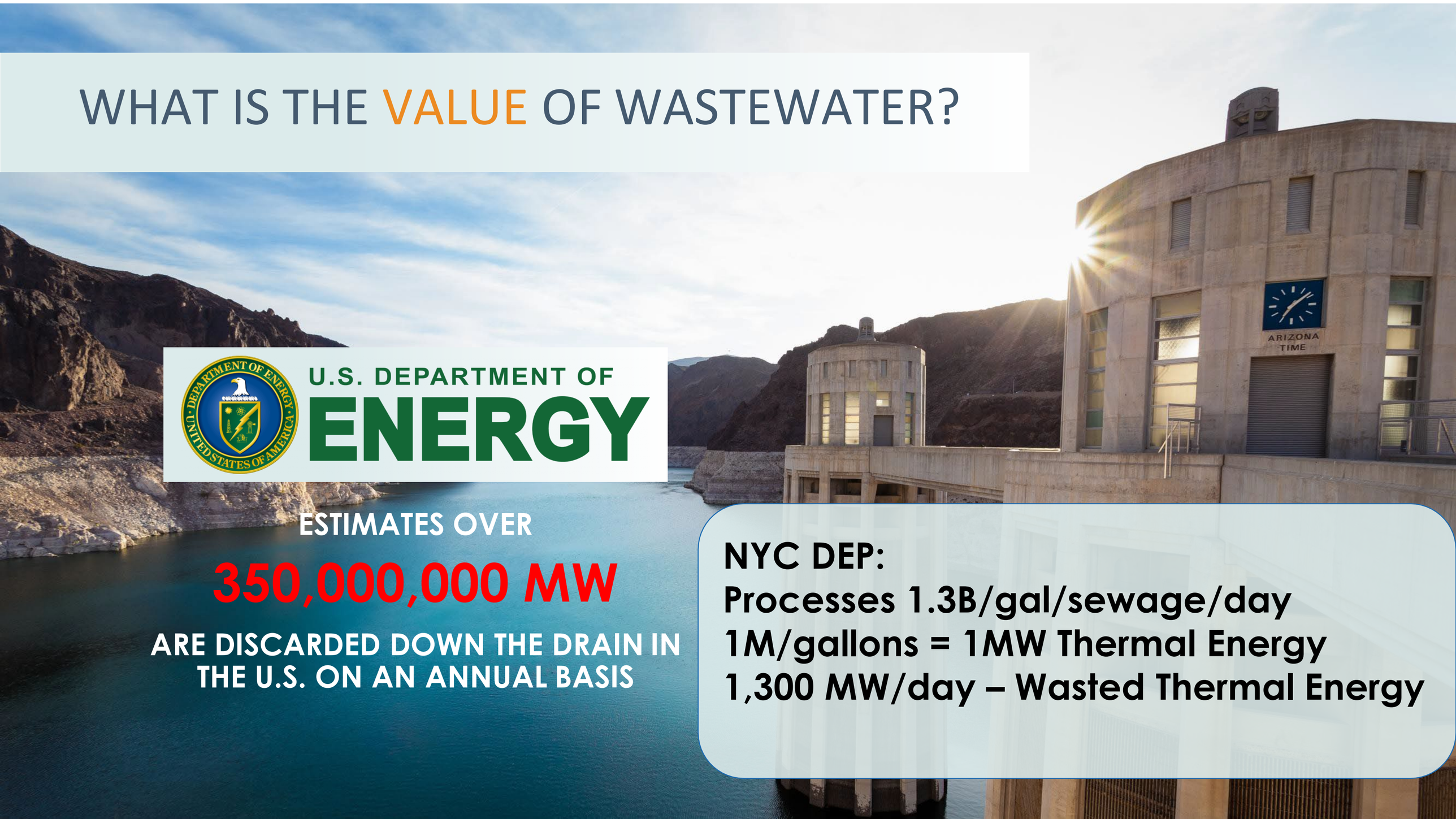
Keep it simple…

- Large anchor tenant
- Single contractual counterparty
- Incentives to connect and remain a customer for the long term

SHARC ENERGY

Turn Your Wastewater Into Opportunity

WHAT IS THE VALUE OF WASTEWATER?



U.S. DEPARTMENT OF ENERGY

ESTIMATES OVER

350,000,000 MW

ARE DISCARDED DOWN THE DRAIN IN THE U.S. ON AN ANNUAL BASIS

NYC DEP:
Processes 1.3B/gal/sewage/day
1M/gallons = 1MW Thermal Energy
1,300 MW/day – Wasted Thermal Energy

Wastewater Energy Transfer (WET) Market Applications

PIRANHA SERIES

- Wastewater-source heat pump
- Active energy recovery
- No filtering needed
- **Small footprint**
- **No odor**

Residential

- Multi-Family Housing
  - ➢ PIRANHA (35–350 Units)
  - ➢ SHARC (350+ Units)
- Student Housing
- Senior Living
- Community Housing
- Corrections

Commercial

- Hospitals
- Micro-Breweries
- Hospitality
- Commercial Laundry & Car Wash

Industrial

- Commercial Food Production
- Pulp and Paper
- Textiles
- **District Energy**

SHARC SERIES

- High capacity
- High volume filtration
- Uses custom heat exchanger
- **Small footprint**
- **No odor**

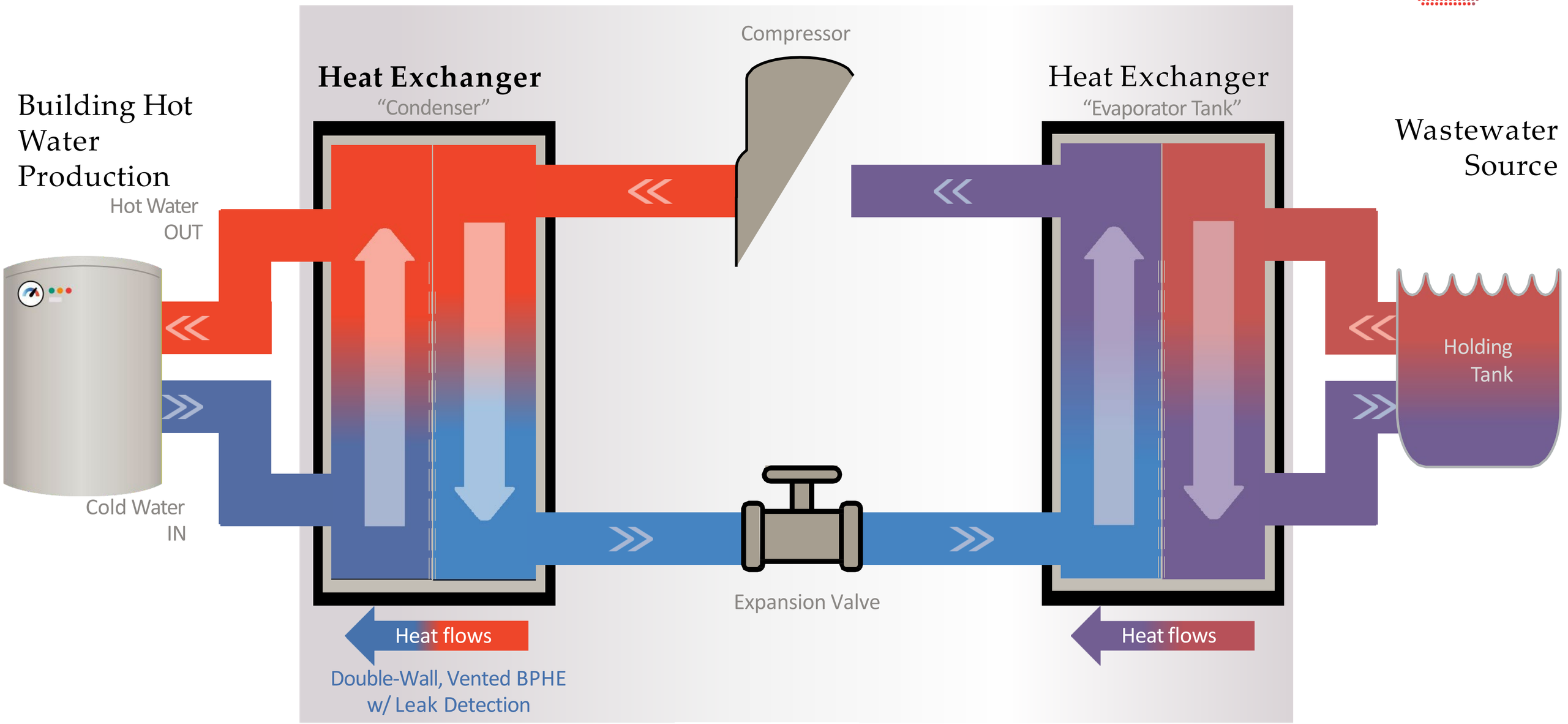
The PIRANHA Series

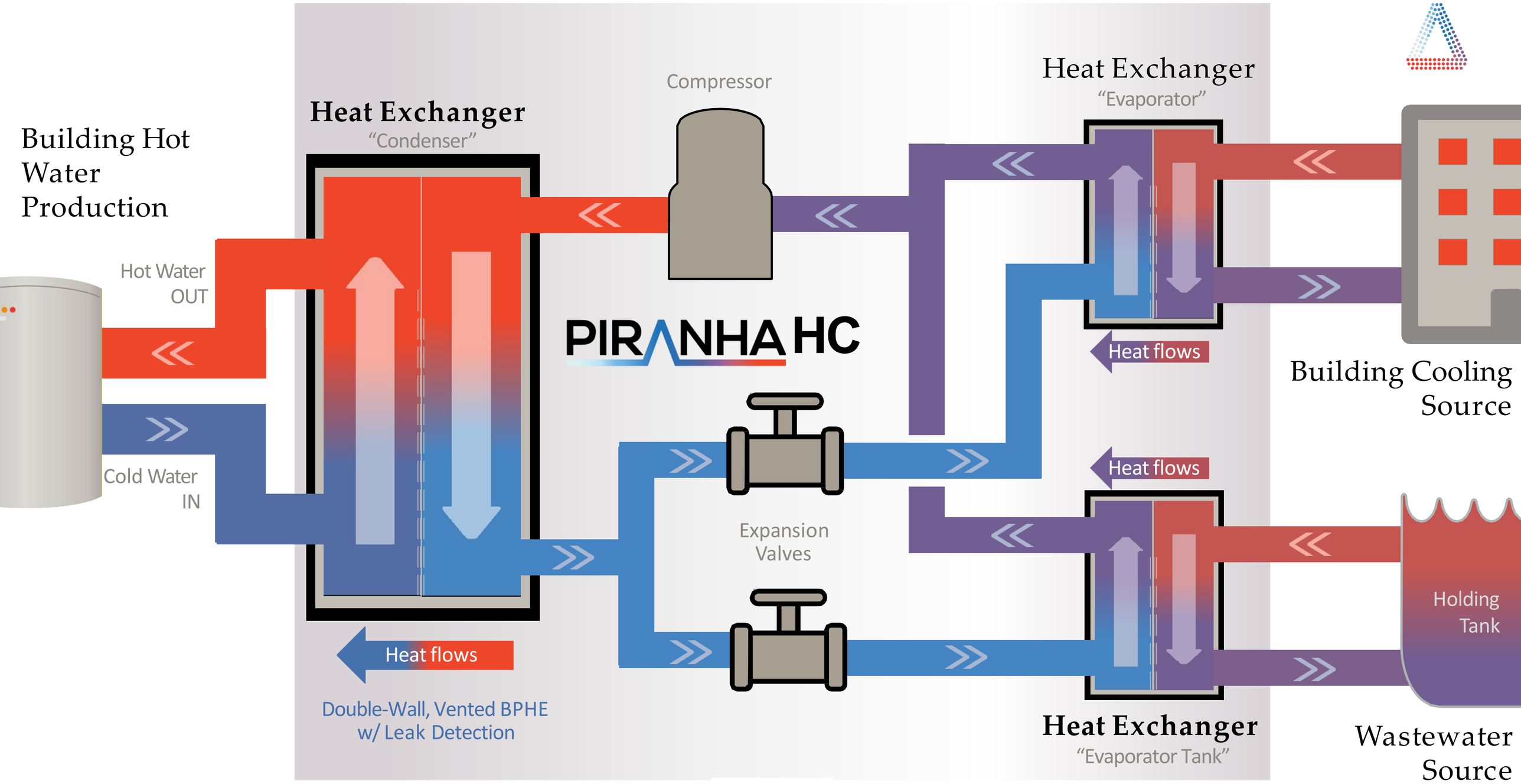
The PIRANHA is a self-contained heat pump that uses a specifically designed direct expansion heat exchanger to recover thermal energy from a building's wastewater for domestic hot water heating

Models: T5 / T10 / T15

- Design heat output
  - **60 / 120 / 180 MBH**
  - Increase output scalable with multiple units
- Designed to fit through standard double door
- Average COP of 3.5*
- **NSF-372 rated BPHE**
  - Double-wall, leak detection
- R-513a
  - 56% Lower GWP than R-134a (573 vs 1,430)
  - Same performance

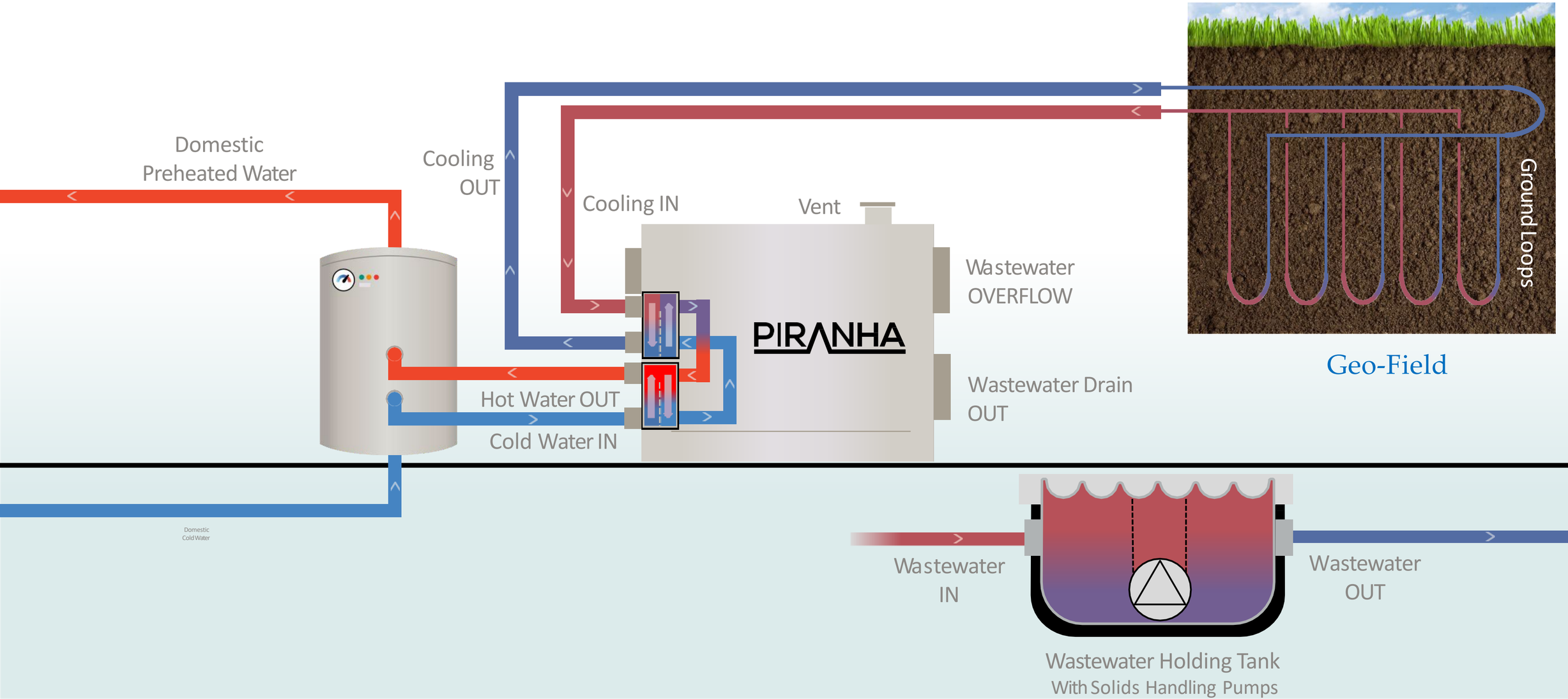
*Average COP across a range of source temperatures, output temperatures and application types.


Building Hot Water Production
Hot Water OUT
Cold Water IN
Heat Exchanger
"Condenser"
Compressor
Heat Exchanger
"Evaporator Tank"
Wastewater Source
Holding Tank
Expansion Valve
Heat flows
Heat flows
Double-Wall, Vented BPHE w/ Leak Detection


Building Hot Water Production
Hot Water OUT
Cold Water IN
Heat Exchanger
"Condenser"
Compressor
PIRANHA HC
Heat Exchanger
"Evaporator"
Heat flows
Building Cooling Source
Expansion Valves
Heat flows
Heat flows
Double-Wall, Vented BPHE w/ Leak Detection
Heat Exchanger
"Evaporator Tank"
Holding Tank
Wastewater Source

PIRANHA paired with Geothermal

Simultaneous Heating + Cooling



SHARC Series

The SHARC is a wastewater separator/filter that allows access to thermal energy by temporarily removing solids from wastewater.

The filtered wastewater is then passed through a Heat Exchanger where the thermal energy is transferred to/from the building.

SHARC Model	Max Flow	Typical Energy Transfer
660	550 GPM / 34 L/s	2,474 MBH / 0.725 MW
880	1,200 GPM / 75 L/s	5,399 MBH / 1.6 MW
1212 †	2,500 GPM / 157 L/s	11,248 MBH / 3.3 MW

Higher flow rates achieved with parallel modules

† Upcoming Product

SHARC

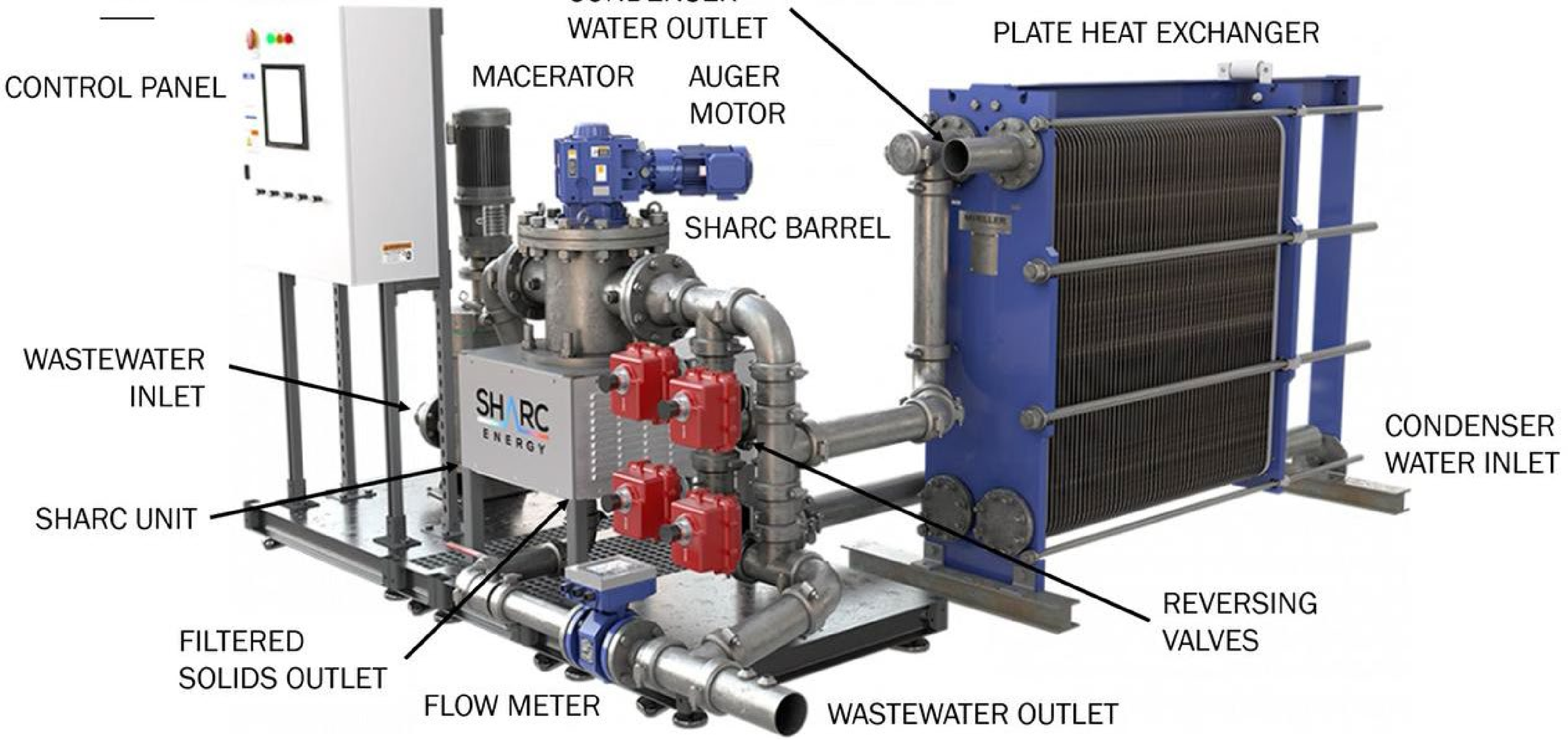
Series

- Designed to allow for high flow rates and ease of service.
  - Variable Use
    - **DHW (Domestic Hot Water)**
    - **Space Conditioning**
      - Heating (Energy Recovery) or Cooling (Energy Rejection)
    - **Wastewater Cooling**
    - **Geo-Loop conditioning and/or Geo-field offset**

- Exponential efficiency for low-temp loops
  - Up to MW of energy transferred for low kW energy input

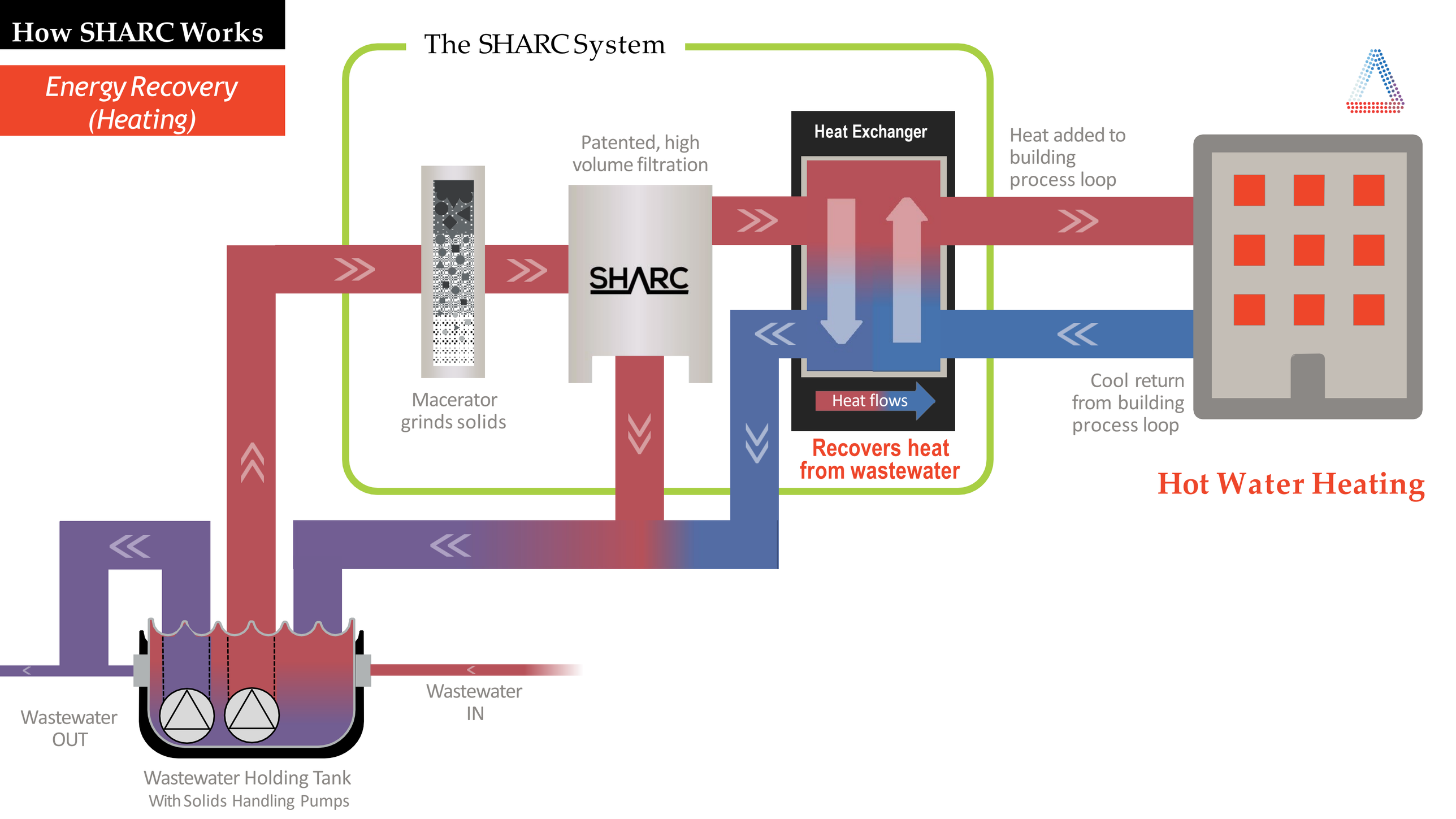
- Completely Sealed at Installation Site – Odor Free

SHARC WASTEWATER HEAT EXCHANGER COMPONENTS



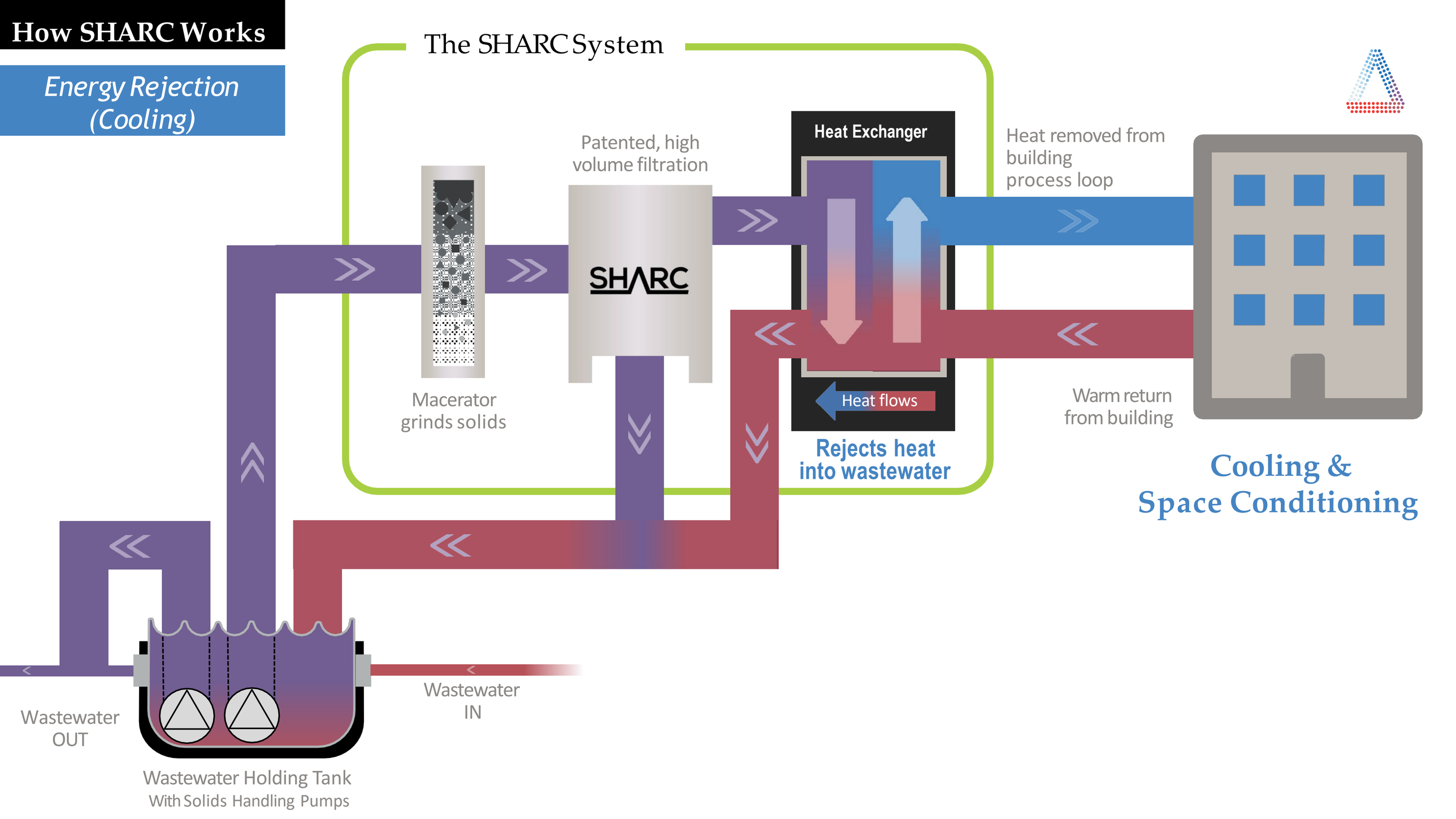
How SHARC Works

Energy Recovery (Heating)



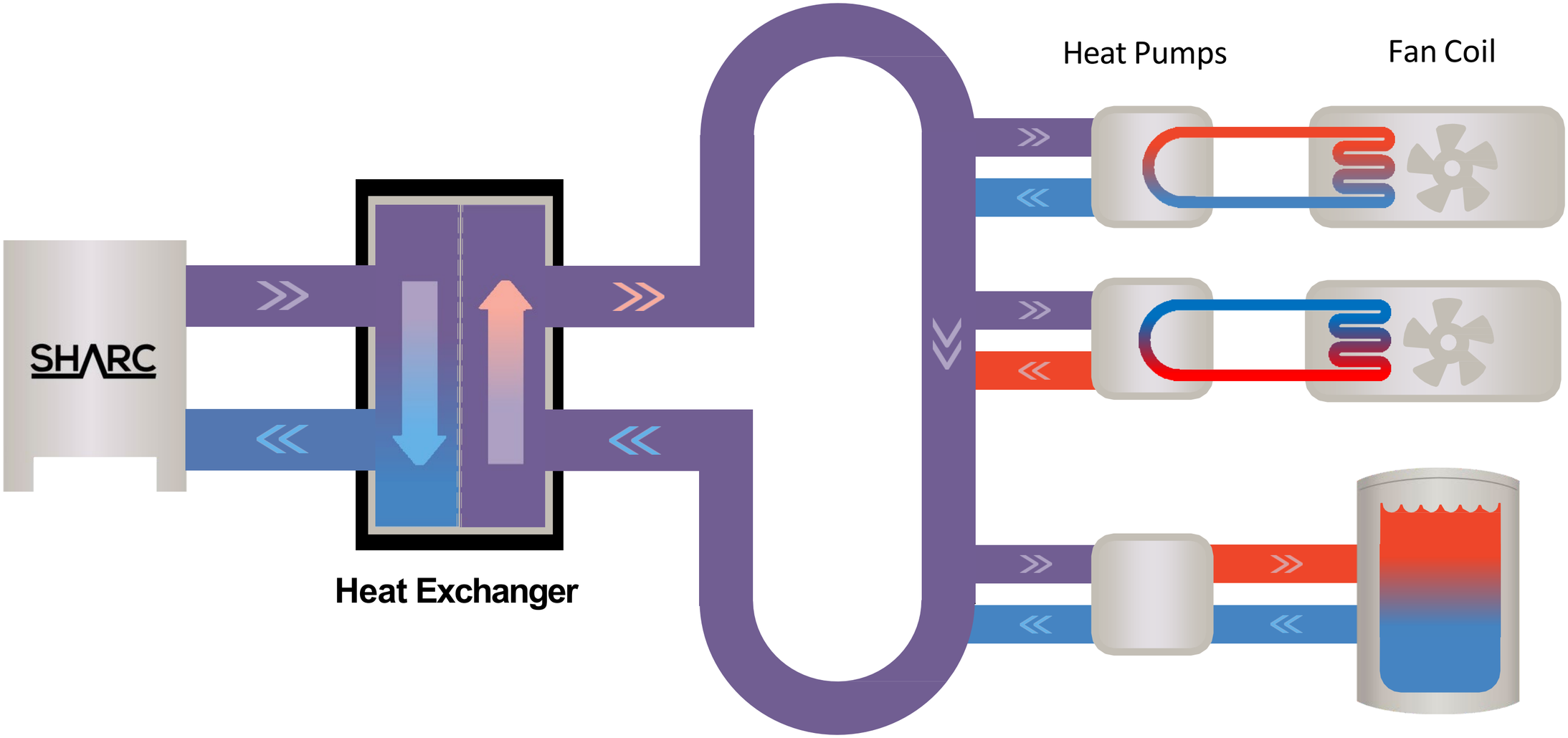
How SHARC Works

Energy Rejection (Cooling)

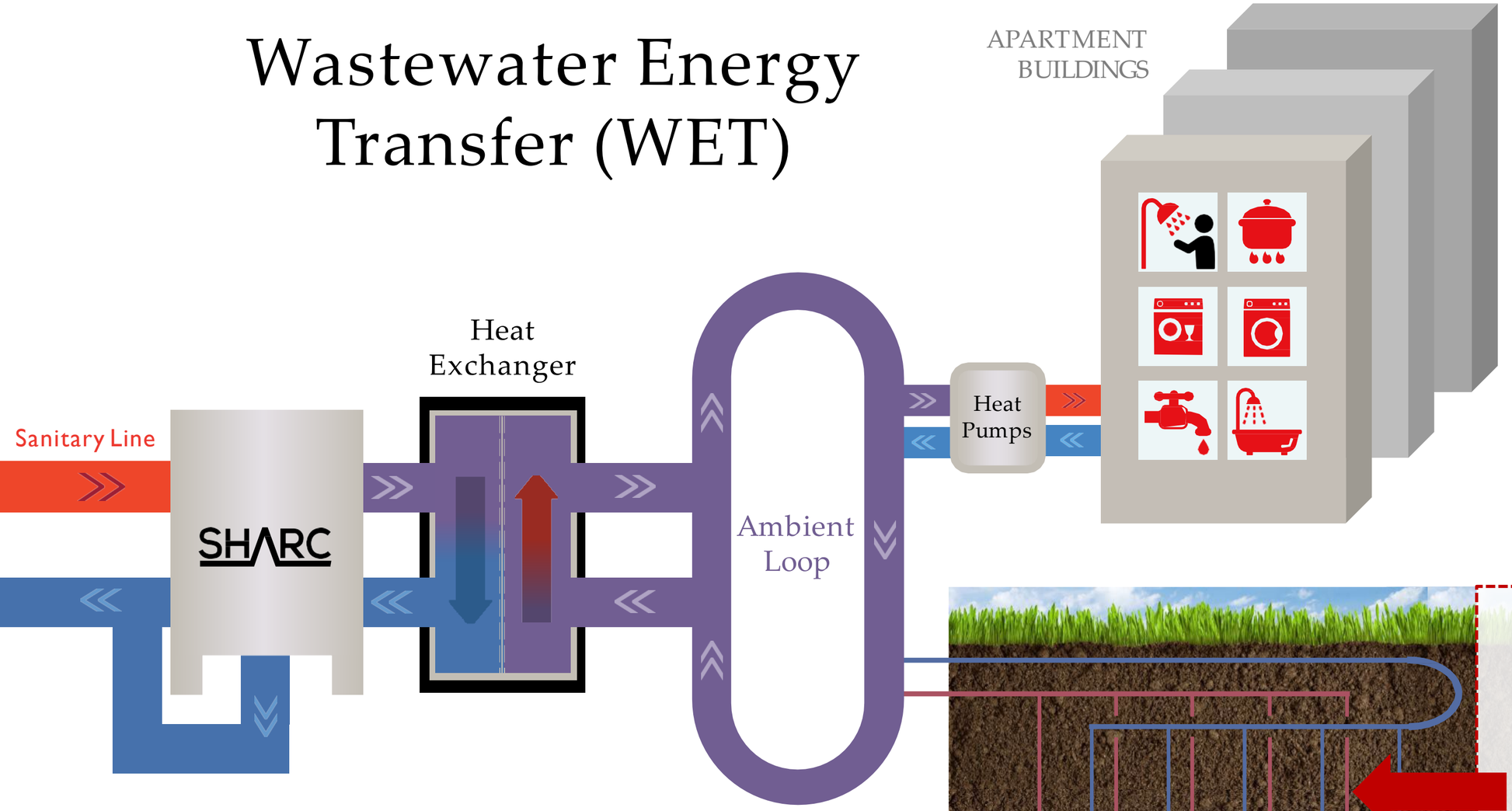


How SHARC Works

Multi-Use (Heating/Cooling)



Wastewater Energy Transfer (WET)



SHARC WET:
- **Reduction of GHX**
- **Reduce Install Cost**

-Lower Budget Overruns
- **FastTrack Project**

Alexandria Center for Life Sciences

Seattle, WA

- Alexandria Real Estates 1.6M sq ft science campus in Seattle's South Lake Union
- SHARC 660, commissioned 2024
- Leverages King County's groundbreaking legislation that enables **public-private** partnerships to access city sewer lines
- 99% carbon emissions reduction (compared to standard lab) while producing 70% of the heat for campus buildings

District Energy – SHARC

SHARC project highlight

leləm' living

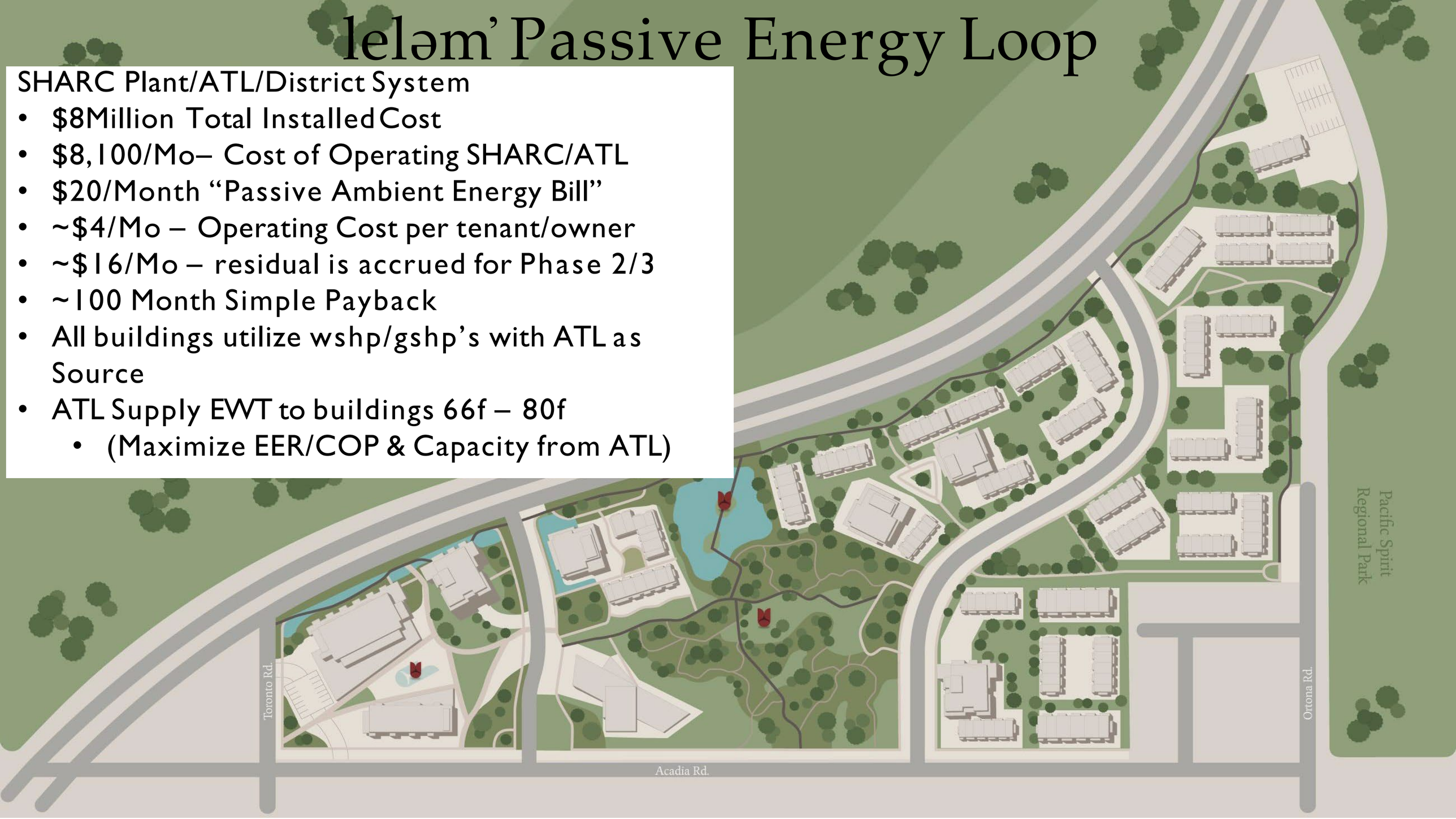
- 22-acre mixed-use
- 1.3M sq ft indoor space
- 30,000 sq ft retail, including grocery
- 1,850 residences
- 15,000 sq ft community center

CUSTOMERS.sharcenergy.com

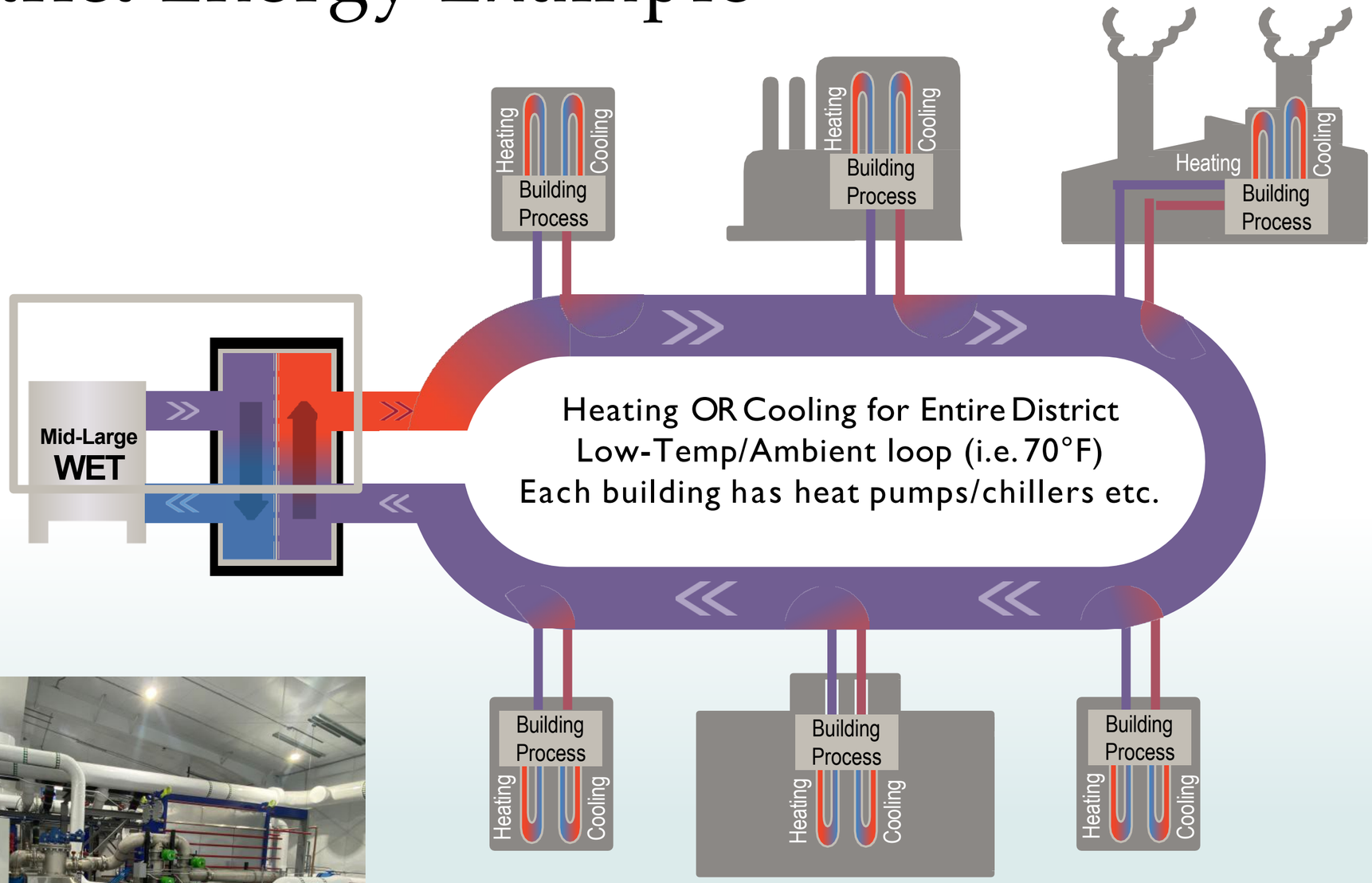
l̓eləm̓ Passive Energy Loop

SHARC Plant/ATL/District System

- $8Million Total Installed Cost
- $8,100/Mo– Cost of Operating SHARC/ATL
- $20/Month “Passive Ambient Energy Bill”
- ~$4/Mo – Operating Cost per tenant/owner
- ~$16/Mo – residual is accrued for Phase 2/3
- ~100 Month Simple Payback
- All buildings utilize wshp/gshp’s with ATL as Source
- ATL Supply EWT to buildings 66f – 80f
  - (Maximize EER/COP & Capacity from ATL)



District Energy Example



National Western Center

- North America's largest District Energy wastewater recovery system, commissioned Jan 2022
- 3.8 MW district energy system - Two Med-Large WET units, designed for up to 4.6MW
- Averages 3,000 GPM filtration of raw, untreated wastewater, used as source for onsite heatpump
- WET System provides 90% of total heating & cooling load for 1M +sq ft of indoor space
- Reduction of 2,600 mt CO_2e/year by avoiding fossil fuels

Turn Your Wastewater into Opportunity.

SHARC ENERGY

Thank you!

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