SHARC ENERGY

Turn Your Wastewater into Opportunity

The Average Person Uses **30 Gallons** of **Hot Water** per Day at 120°F*

- Average Residential Wastewater Temperature is 70°F
- Commercial & Industrial Wastewater Temperature can reach 140°F or Higher

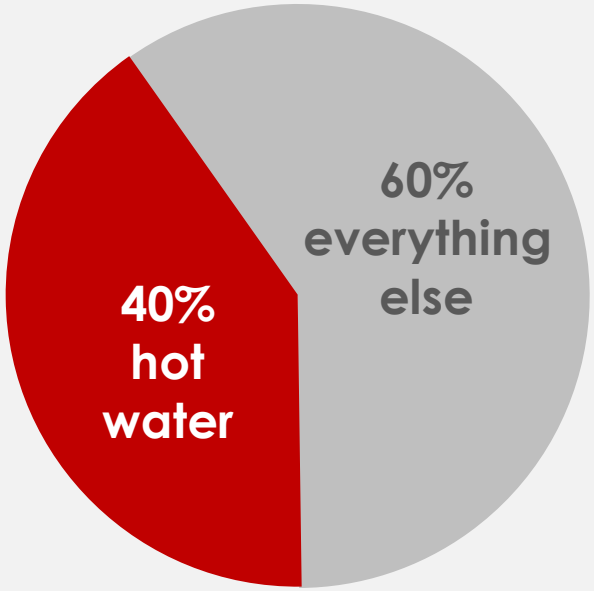
Wastewater sources:

- Black and Grey Water Within Buildings
- Sanitary Sewers
- Lift Stations/Treatment Centres

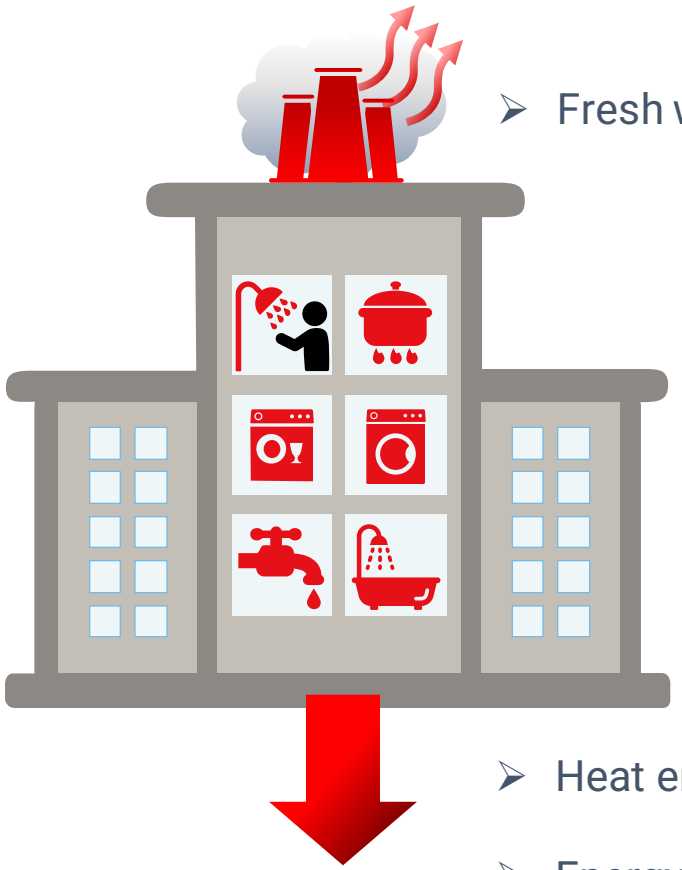
**estimated 60 gallons/day of wastewater*

The Problem

We are wasting energy & water



TOTAL ANNUAL ENERGY BILL

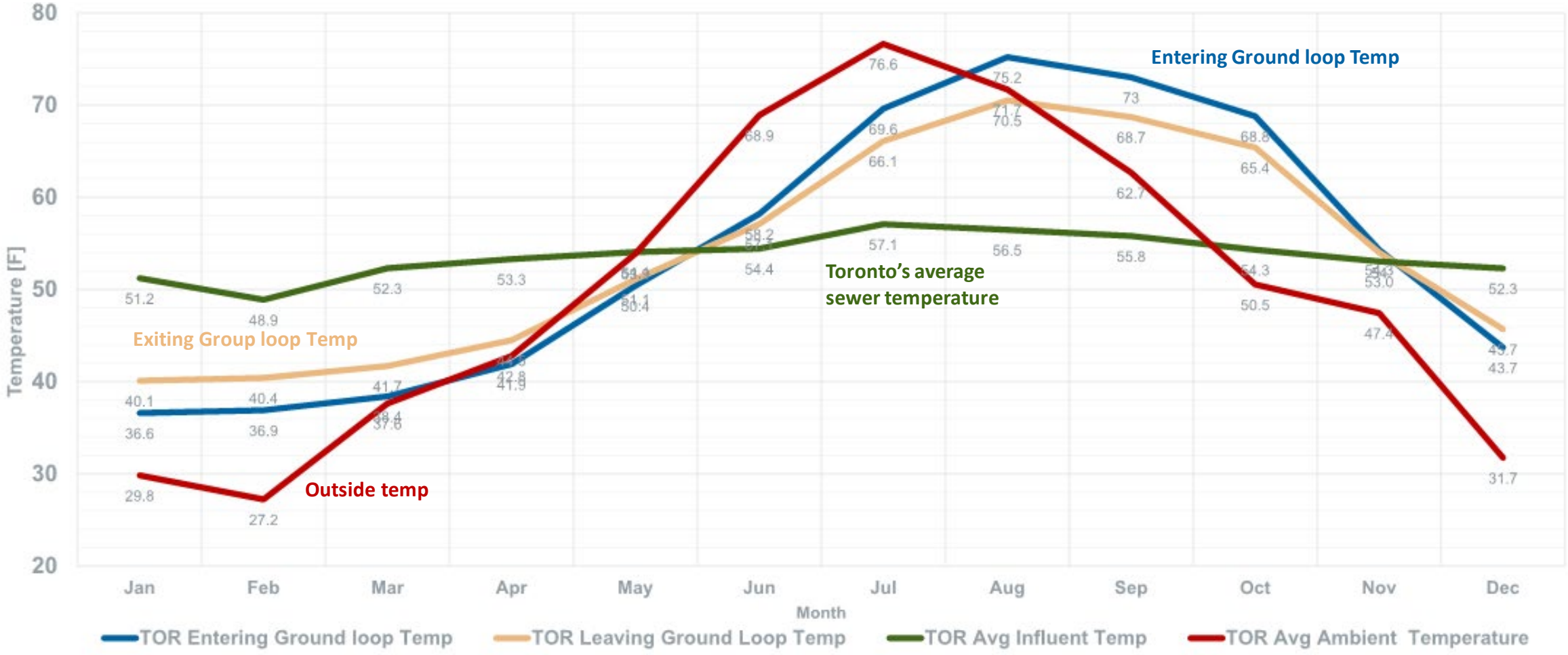


- "Unwanted" heat wasted
- Fresh water consumed for cooling
- Heat energy flushed
- Energy/fossil fuels burned
- CO_2 emitted

The most effective clean energy spend.

	SHARC ENERGY WASTEWATER	AIR SOURCE HEAT PUMP	SOLAR	WIND	GEOTHERMAL
CONSISTENT	✓	✗	✗	✗	✗
SPACE EFFICIENT	✓	✗	✗	✗	✗
COST EFFECTIVE	✓	✗	✗	✗	✗
LOW MAINTENANCE	✓	✓	✓	✓	✓
HIGH EFFICIENCY	✓	✓	✓	✓	✓
WORKS IN ANY CLIMATE	✓	✗	✗	✗	✓

Consistency of Wastewater Temperature



** Source: City of Toronto*

Product Fit

PIRANHA SERIES

- All in one wastewater-source heat pump
- Active energy recovery
- No filtering needed
- **Small footprint**
- **No odor**

Residential

- Multi-unit housing, 50–-500 units
- Student Housing
- Senior Living
- Community Housing

Commercial

- Hospitals
- Micro-Breweries
- Hospitality
- Commercial Laundry & Wash
- Ski Resorts & Spas

Industrial

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

SHARC SERIES

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

The PIRANHA Series

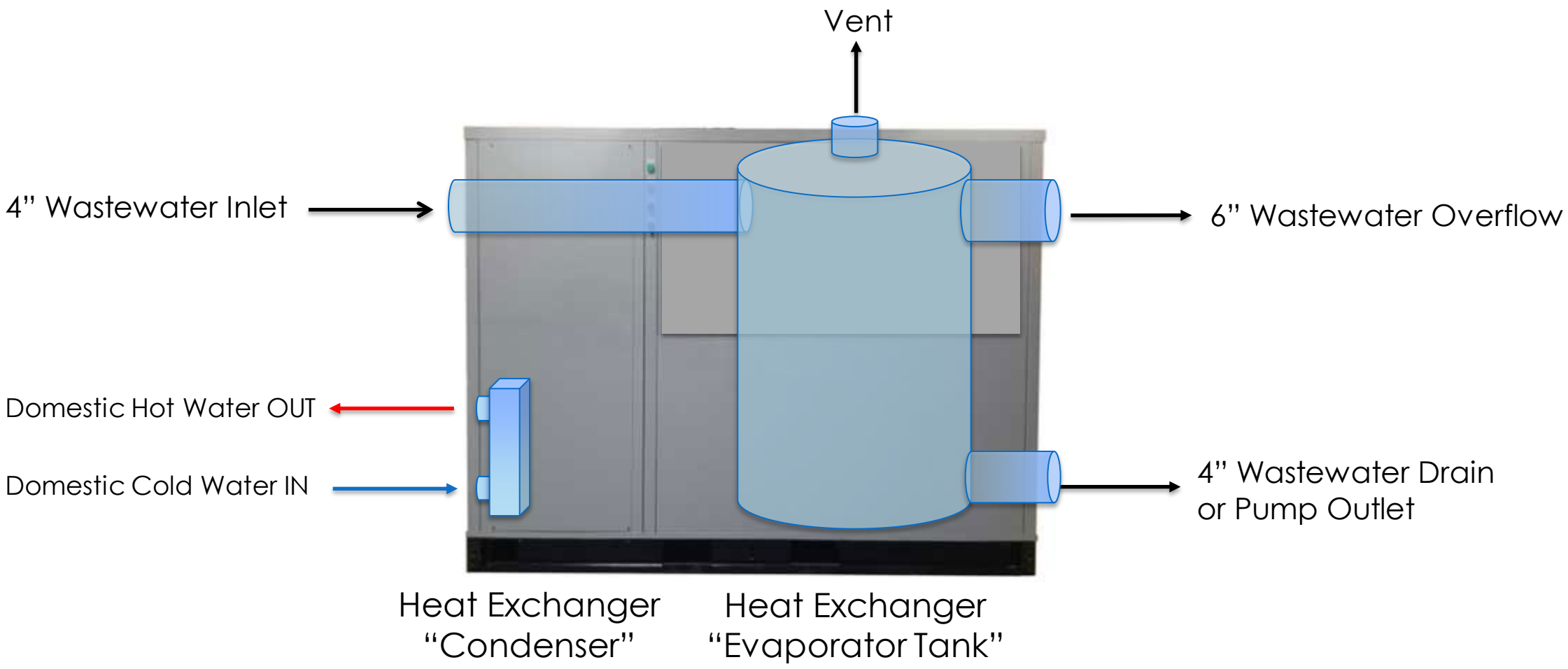
The PIRANHA is a self-contained heat pump that uses a specifically designed direct expansion heat exchanger to recover thermal energy from a building's wastewater for domestic hot water heating

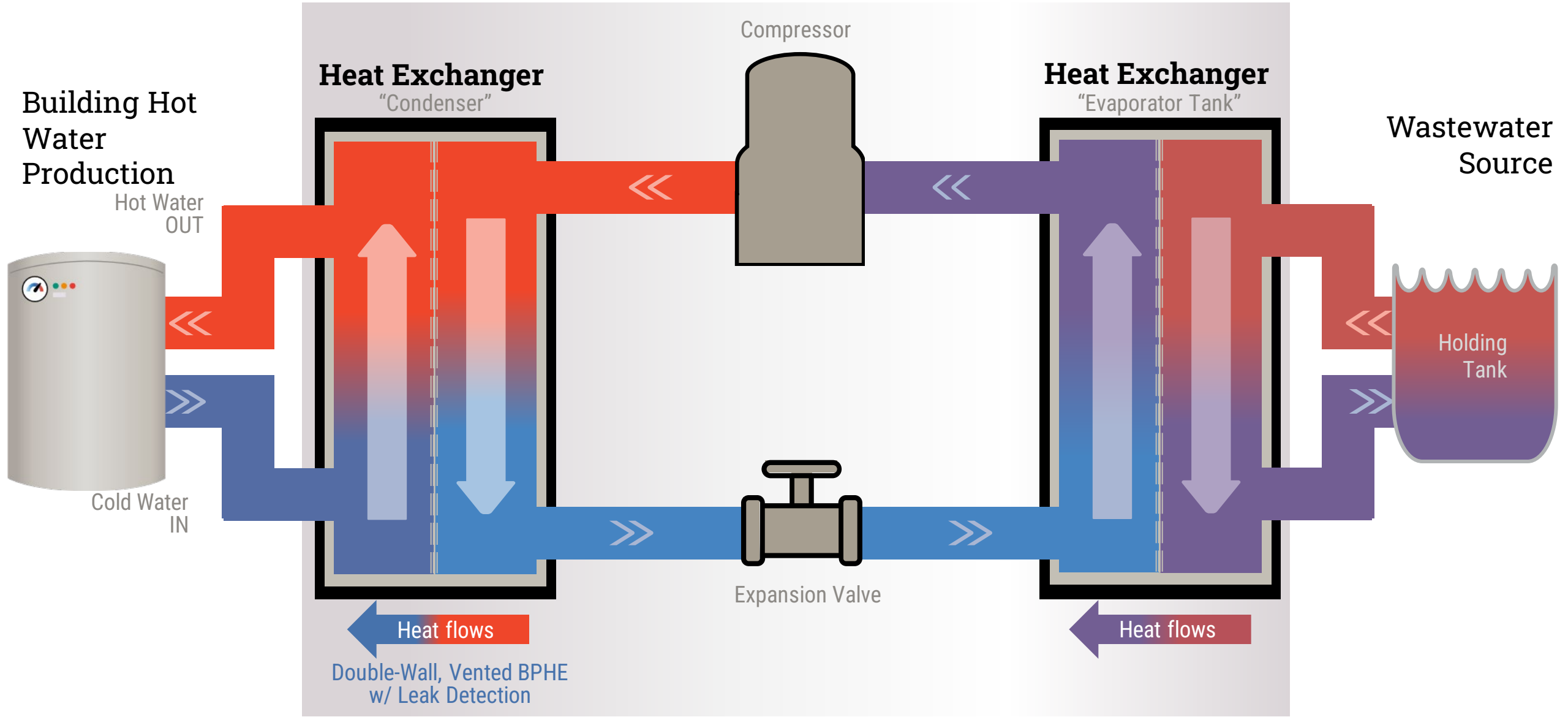
Models: T5 / T10 / T15

- Design heat output
  - 60 / 120 / 180 MBH
  - Output scalable with multiple units
- Designed to fit through standard double door
- **Average COP of 3.5 – 6.0***
- NSF-372 rated BPHE
  - Double-wall, leak detection
- R-513a
  - 56% Lower GWP than R-134a
  - Same performance
- **Completely Sealed System – ODOR FREE**

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

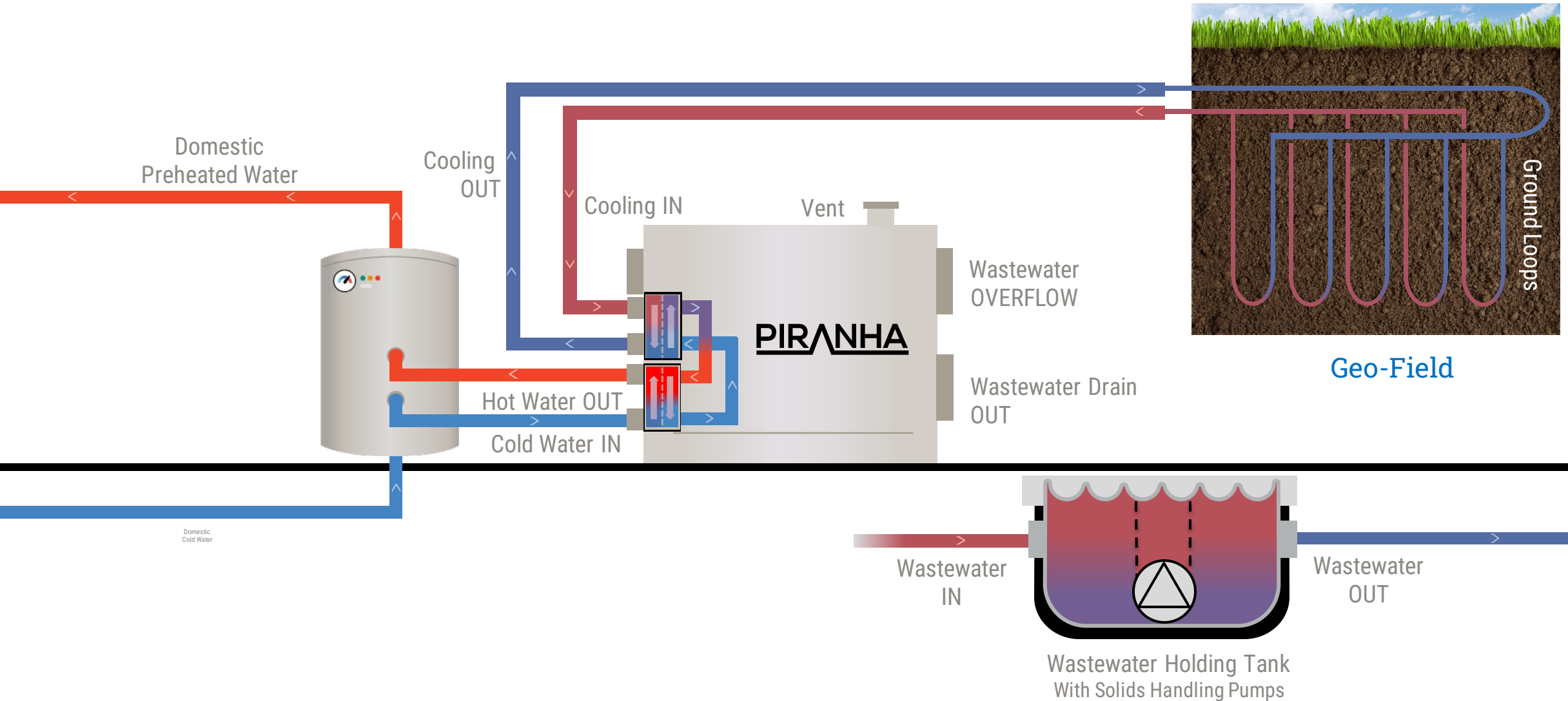
PIRANHA


Vent
4" Wastewater Inlet
6" Wastewater Overflow
Domestic Hot Water OUT
Domestic Cold Water IN
4" Wastewater Drain
or Pump Outlet
Heat Exchanger
"Condenser"
Heat Exchanger
"Evaporator Tank"


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

PIRANHA paired with Geothermal

Simultaneous Heating + Cooling



Seven35

North Vancouver, BC

SHARC

CASE STUDY

- The first multi-family LEED® for Homes Platinum building in Canada

- Certified BuiltGreen Gold
- 60 Residential Units
    - **PIRANHA T10** Commissioned Spring 2016
    - **9,350 Therms Natural Gas reduction**
    - **GHG Emission reductions of approximately 49.6 t CO_2e/year**

- PIRANHA system provides domestic hot water preheating

- Piranha contributed to LEED® Platinum certification

- **PIRANHA HC EPRI Challenge Site**

Lake Louise Inn

Lake Louise, Alberta

SHARC

CASE STUDY

- Commissioned Summer 2018
- 247 room Hotel
- In-House Laundry
- PIRANHA T10 recovering heat from 4 commercial laundry washing machines
- Produce an average of **1700 Gallons** of Hot water per day
  - **Average COP of 5.25**
- Main fuel source – Propane
  - **Approximate load reduction of 22,680 liters/year**
  - **GHG emission reduction of approximately 35 t CO2e/year**

Wall Centre Central Park

Vancouver, BC

SHARC

CASE STUDY

Two-Phase Development by Wall Financial in Vancouver

- **Phase One – 700 Residential Units,**
  - **SHARC 660 system**
  - Commissioned Summer 2017
- **Phase Two – 350 Residential Units**
  - **(2) PIRANHA T10 units running in parallel**
  - Commissioned Summer 2018

Approximately 4,800 GJ Total Natural Gas Reduction

GHG emission reductions of approximately 248 tons CO2e/year across both phases

- Both systems provide preheat domestic hot water
- SHARC and PIRANHAs contributed to LEED® Gold certification of the building

CANADA GREEN BUILDING COUNCIL • CONSEIL DU BÂTIMENT DURABLE DU CANADA •
LEED® CANADA
GOLD · OR
2014

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

SHARC ENERGY SYSTEMS

- **Turns the sanitary line into "Urban Geothermal"**
- **Variable Use**
  - 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 System – ODOR FREE**

SHARC

SYSTEM

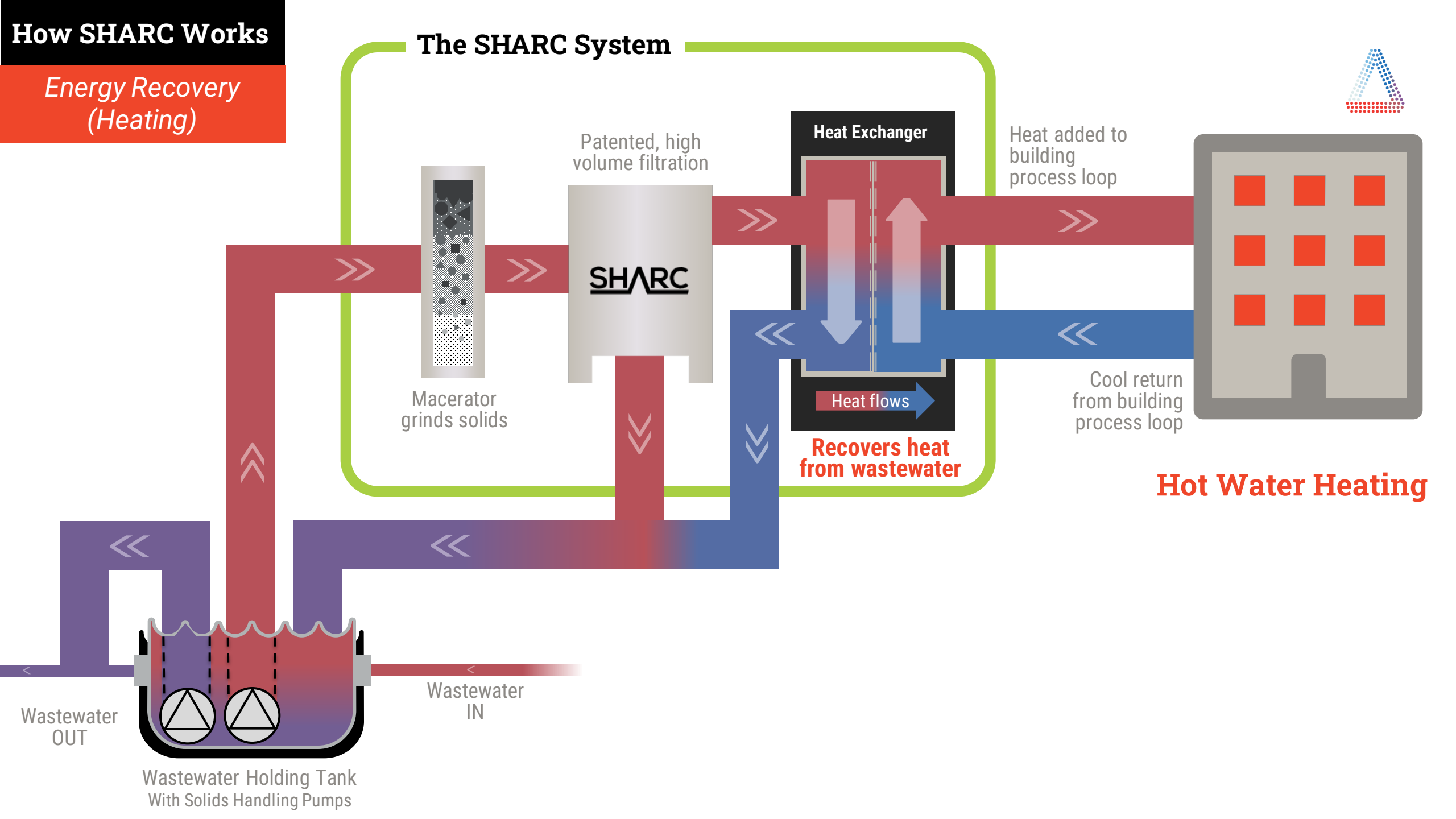
- SHARC Filter Unit
- Support Frames/Skids
- Control Panel
- Macerator/Grinder
- Piping/Valve Assembly
- Plate & Frame Heat Exchanger
  - Wide Gap

- Wastewater Holding Tank & Solids Handling Lift Pumps
  Existing Tank can be used
- Heat Pump
  - May not be needed in ambient/low temp systems

*Sourced Separately

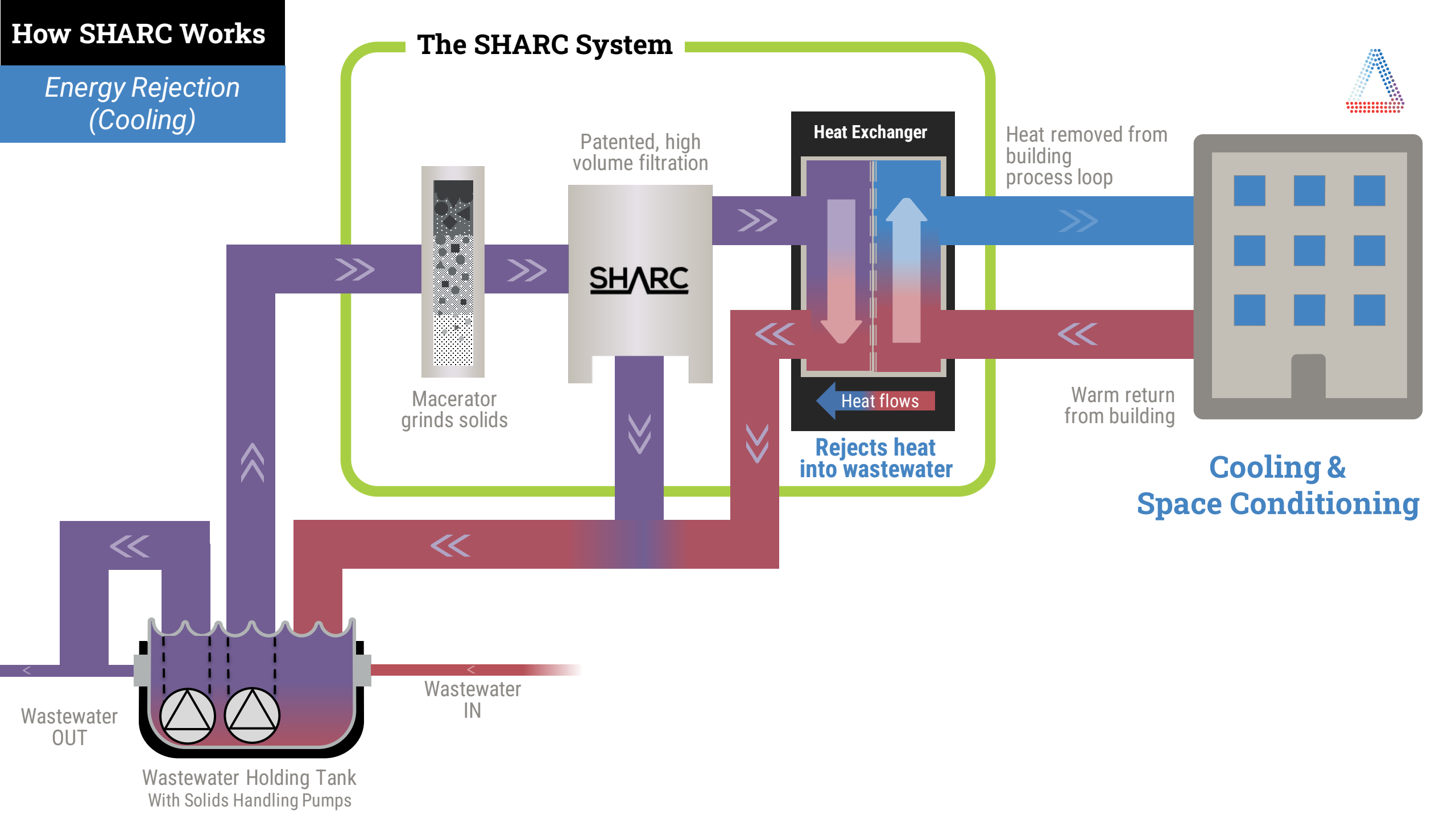
How SHARC Works

Energy Recovery (Heating)



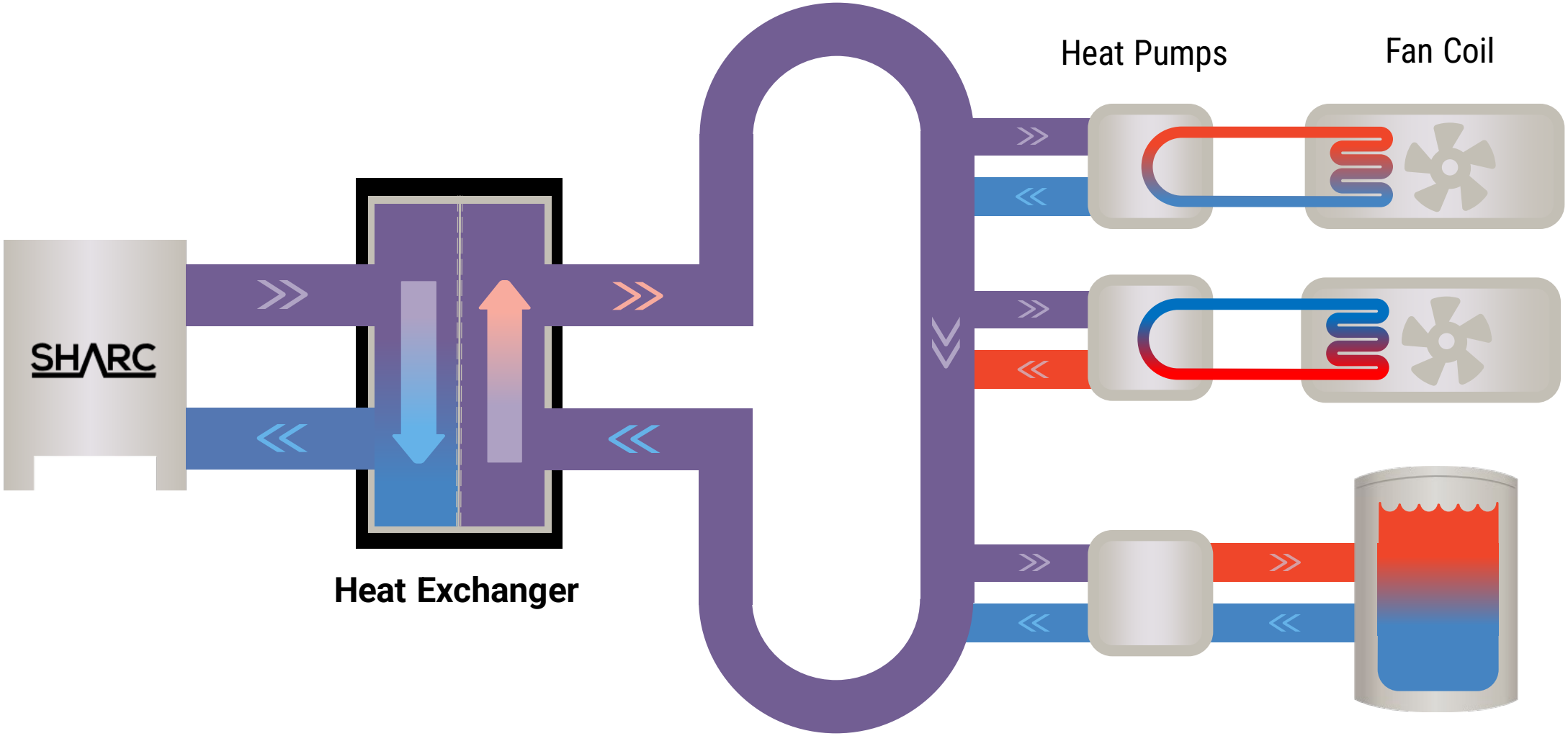
How SHARC Works

Energy Rejection (Cooling)

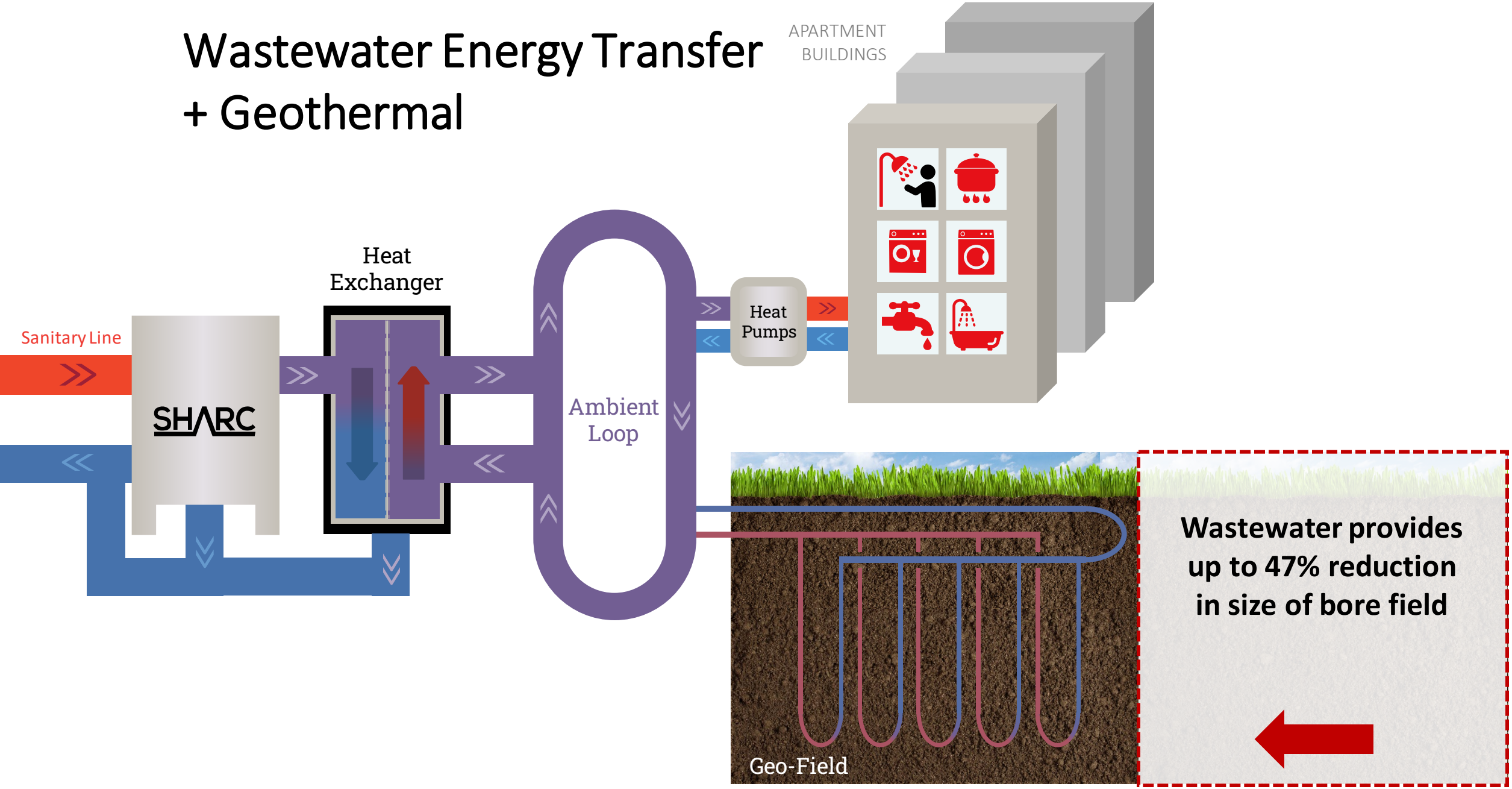


How SHARC Works

Multi-Use (Heating/Cooling)



Wastewater Energy Transfer + Geothermal



Simple Cleaning & Servicing

SHARC's patented design allows for unparalleled cleaning characteristics.

- Superior continual cleaning of the filter screen ensures high flow rates to meet demand.
- Minimal wear on internal parts for longer lasting components.
- Low pressure drop across the SHARC filter.
- Little or no fresh-water usage.

2x SHARC 880's serviced & back online <5 hours!

SHARC's filter ***after 300 million gallons of sewage in 5 months, 24x7 operation!***

National Western Center, Denver CO

DC Water Headquarters

Washington, DC

SHARC

CASE STUDY

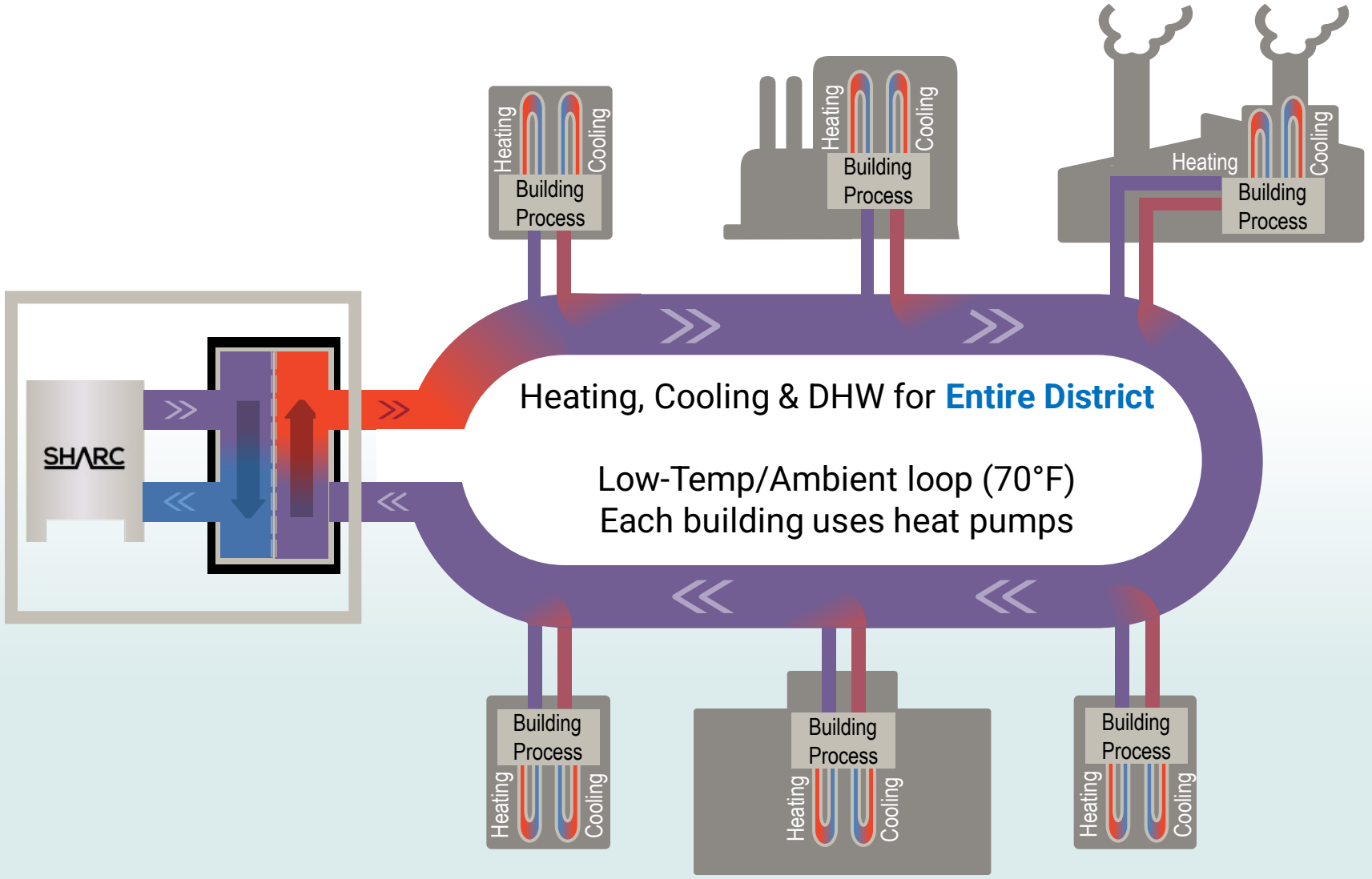
- Commissioned Summer 2018
- **SHARC 660 System**
- **250 Gallons Per Minute (GPM) flow**
- **Design heat transfer of 1.25 MMBH**
- **Estimated 30+ MMBtu/day transfer**
- Heat Demand – **3.3%**
  - Natural gas boiler offset – **est. 12.6 t eCO_2/year reduction**
- Cooling Demand – **96.7%**
- Cooling tower offset **est. 1.5M gallons of water saved annually** (evaporation & blowdown)
- Wastewater lift station sees 5M gallon per day average sanitary flow
- 150,000 ft^2 facility w/ 350 to 400 tons water-cooled HVAC (HPs / Chilled Beams / DOAS)
- LEED® Platinum

Cooling Tower offset saves the use of an estimated 1.5M gallons of fresh water annually

"I have never seen a technology that could have as positive of an impact on energy as what I have seen at the DC Water Headquarters"

- Congresswoman Marcy Kaptur, Chairwoman of the House Appropriations Subcommittee on Energy and Water Development

District Energy – SHARC



SHARC project highlight

National Western Center

- (2) SHARC 880 provide 3.8MW of thermal transfer
- 90% of total heating & cooling load for 1M sq ft of indoor space
- ~2600 mt CO_2e/yr offset
- Plans to expand plant to 10MW

CUSTOMERS.sharcenergy.com

District Energy – SHARC

SHARC project highlight

Ieləm' living

- 22-acre mixed-use
- 1.3M sq ft indoor space
- 30,000 sq ft retail, including grocery
- 1,300 residences
- 15,000 sq ft community center

CUSTOMERS.sharcenergy.com

Southeast False Creek Neighborhood Energy Utility (NEU)

Vancouver, BC

CITY OF VANCOUVER

SHARC

CASE STUDY

- NEU currently serves 5 Million ft^2 of residential, commercial, and institutional space, planned expansion to 20 Million ft^2
- 3.2 MW plant capacity output, planned expansion to 10MW.
- Qty-2 SHARC 880


SHARC
PIRANHA
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SHARC+Geo
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PIRANHA
SHARC
WET Development
In New England
PIRANHA
SHARC+GEO
SHARC

Benefits for Municipalities

Electrification	Clean Energy Jobs	Leverages limitless Untapped thermal assets
Decarbonization of Energy Communities	Heating, Cooling & DHW During Grid Outages	New Revenue Streams
Energy & Health Equity	Community Resiliency	Highly incentivized

Business Models for Delivering WET

Public/Private Partnership
Alexandria Seattle, WA

- Utilizes King County Sewer municipal line connection. 50/50 share of any REC's earned + transfer fee paid to KC
- Initial sizing 1.0MW to serve entire city block, with expansion planned to surrounding buildings
- Private developer will own and operate system

Private Ownership
Musqueam First Nations

- 0.5MW district system for Phase 1 of development.
- Initial phase serves 22-acre development of residential, community center, commercial
- Expansion will follow pace of development and increasing wastewater flowrate

Community Owned Utility
False Creek Neighbourhood Utility

- Functions as independent utility with competitive rates, free from local or federal subsidies
- Recent announced expansion from 3.2MW to 10 MW
- 70% renewable energy between WET & Renewable Natural Gas by 2025

Energy Service Company
Denver National Western (Centrio)

- Private entity, being served by district loop, owned by ESCO
- Commissioned – April 2022, 3.8MW
- Expansion to 6MW+ as more buildings are commissioned

Next Steps

GETSTARTED.sharcenergy.com

1. Identify potential WET sites
2. Collect project data – flow, temperature & load profile
3. SHARC & HTS conduct preliminary systems analysis
4. SHARC & HTS validate system design and installation parameters.
5. Project development begins…

Turn Your Wastewater into Opportunity

SHARC ENERGY

Thank you

www.SHARCenergy.com