EPCOR ROAD MAP TO NET-ZERO

Rossdale Water Treatment Plant

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OUTLINE

1. EPCOR GHG emission reduction status and goals
2. Building energy audit and road map to net-zero
3. Recal building HVAC system
4. Heat recovery analysis
5. HRV energy savings and payback

EPCOR 2022 GHG EMISSIONS

GHG EMISSIONS BY SOURCE (TONNES CO_2 E)

SCOPE 2 EMISSIONS

Scope 2 emissions are indirect emissions from the creation of purchased energy. Most of EPCOR's electricity consumption is used to pump large volumes of drinking water through the treatment process and to customers, and to move and treat wastewater.

Electricity consumption	154,468	72%
Total emission credits for kīsikāw pīsim solar farm*	787	<1%

SCOPE 1 EMISSIONS

Scope 1 emissions are direct emissions from owned or controlled assets.

Wastewater treatment processes (N_2O)	27,986	13%
Natural gas and propane consumption	14,206	6.6%
Vehicle fuels	10,077	4.7%
Sulphur Hexaflouride (SF_6) Carbon Tetraflouride (CF_4) Methane (CH_4)	7,977	3.7%

GREENHOUSE GAS EMISSIONS (tCO_2E)

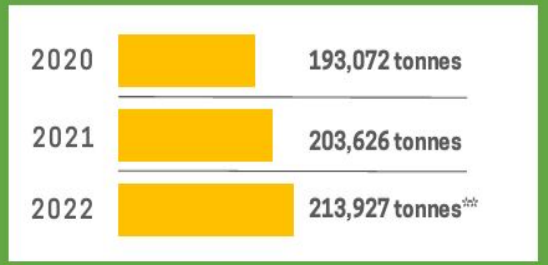
PERFORMANCE UPDATE:

213,927

TONNES

Target: 50% reduction in net greenhouse gas emissions by 2025, 85% by 2035, and net zero by 2050.*

For the complete ESG Consolidated Scorecard see page 65



* Reduction targets set from baseline 2020 emissions.
** The addition of reporting of CH_4 and NO_2 emissions from our Clover Bar Lagoons increased overall GHG emissions by 3%.

CHALLENGES

EPCOR operates in some of the fastest growing regions in North America

- In 2022, Alberta welcomed 153,000 new residents while Arizona's population grew by more than 94,000

EPCOR continues to expand into new geographies across North America

- Extending natural gas service to communities in Ontario
- Growing footprint in the US Southwest where EPCOR is among the largest private water utilities

NET-ZERO GOALS & ROAD MAP

ROADMAP

Focus on greening our electricity supply

- The kīsikāw pīsim solar farm – 20,000 MWH annually
- Procurement of renewable attributes from the Hilda Wind Farm
- The installation of electric vehicle chargers – free to use.

NET-ZERO ACTIVITIES – ENERGY AUDIT

Phase 1

- WTP process related power and gas usage, energy efficiency, and emission status
- First road map to net-zero

Phase 2

- Focus on building operation related to power and natural gas efficiency and GHG reduction
- Complete GHG emission analysis

Phase 3

- Complete the Climate Change Strategic Plan
- Synergize cooperation opportunities
- Finalize road map and action plan

ROSSDALE WTP Building Emission Reduction ROAD MAP

Type	EEM #	Description	Annual GHG Reductions (tCO_2e)	Opinion of Capital Cost ($)	Simple Payback (years)
Policy and Maintenance Measures	4.1.1	Energy Star Equipment	-	-	-
	4.1.2	Air Sealing and Weather Stripping	-	-	-
No or Low-Cost Measures	4.2.1a	Low Flow Lav., Kitchen Sink, Shower	3.0	Low	5.8
	4.2.1b	Low Flow Lav., Kitchen Sink, Shower (w/ water savings)	3.0	Low	1.8
	4.2.2	Modify Office AHU Scheduling and Add Holiday Schedule	203.1	Low	Immediate
	4.2.3	Modify Space Temperature in Clarifier/Filter	74.9	Low	0.7
	4.2.4	Investigate Summer Boiler Operation	91.7	Low	Immediate
	4.2.5	Investigate Condensing Boiler Controls	19.0	-	-
Capital Measures	4.3.1a	Lighting: Replace T5/T8/T12 with LED Plug and Plays	147.8	Low	2.0
	4.3.1b	Lighting: Replace T5/T8/T12 with Full LED Fixtures & OS	285.4	High	19.0
	4.3.2	Pump VSD	14.5	Low	14.0
	4.3.3	Glycol Run Around Heat Recovery	50.5	Medium	22.3
	4.3.4	Solar Photovoltaics	280.2	Medium	14.6
End of Service Life Measures	4.4.1	Condensing Boilers	95.9	Medium	12.7
	4.4.2	Condensing DHW	1.5	Low	467.5
	4.4.3	Premium Efficiency Motors	32.1	Low	14.7
	4.4.4a	Windows - Double Glazing	25.3	-	-
	4.4.4b	Windows - Triple Glazing	64.4	Medium	65.3
	4.4.5	Wall insulation	9.6	Medium	184.8
	4.4.6a	Roof Insulation - ATD, Admin, Chem, Watermark	9.9	Medium	367.6
	4.4.6b	Roof Insulation - Filter and Clarifier	40.9	High	259.1
	4.4.7	Low Flow Toilets and Urinals	0.0	Low	116.2
	4.4.8	High Efficiency Rooftop Units with Heat Recovery	44.7	Medium	17.5

Capital Expenses:

- Low: under $100,000
- Medium: between $100,000 and $800,000

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Climate Resiliency & GHG Reduction Road Map

1. All policy and maintenance measures should be implemented including:
- EEM 4.1.1: Energy Star Equipment
- EEM 4.1.2: Air Sealing and Weather Stripping
- T-7: Set acceptable temperature range for working conditions
- T-8: Development of an Access Road Inspection Program
- P-4: Implement a Roof Snow Clearing Plan
- P-5: Implement an Exterior Hardscape Management Plan
- P-6: Implement an Emergency Chemical/Materials Supply Plan
- L-4: Implement a Lightning Event Management Plan
- WF-1 – WF-6: Coordinated Emergency Management Plan for Wildfire
- WF-7 – WF-9: Wildfire Smoke Management Plan

1-5 Years

2. All no/low-cost measures and smaller capital upgrade projects should be implemented:
- EEM 4.2.1a: Install Low-Flow Kitchen Sinks, Lavatories, and Showers
- EEM 4.2.2: Modify AHU Operating Schedule and Add Holiday Schedule
- EEM 4.2.3: Modify Space Temperature Setpoints in Clarifier and Filter Buildings
- EEM 4.2.4: Automatic Boiler Controls for Summer Shutdown
- T-1: Annual Monitoring Program for Sealants and Joints
- T-2: High Temperature Self-Adhesive Membranes and Sealants at Time of Renewal
- T-4: Monitor Building Cooling Loads
- T-5: Increase Frequency of Maintenance and Service of Major Electrical Equipment Plan and Provide Real Time Monitoring of Equipment Condition
- P-2: Upgrade Access Doors at Vulnerable Locations
- P-3: Roof Structural Assessment
- WS-1: Communication Towers - Structural Assessment

5 Year Plan

3. The following O&M/capital upgrade measures should be integrated into capital planning for future implementation in the next 5 years or implemented in phases throughout a longer period:
- EEM 4.3.1b: Lighting - Replace T5/T8/T12 with LED Fixtures and Occupancy Sensors
- EEM 4.3.2: Variable Speed Drives for Hot Water Pumps
- EEM 4.3.3: Glycol Runaround Heat Recovery
- T-6: Upgrade Emergency Power to Keep WTPs in Operation Upon Utility Power Outage
- P-1: Access Road Improvements
- WS-2: Add Upgrades to Roof Drainages

5 Years+

4. The following measures should be considered at the time of end-of-service replacement, or as part of life cycle replacement:
- EEM 4.4.1: Replace Steam Boilers with Condensing Boilers
- EEM 4.4.2: Condensing DHW
- EEM 4.4.3: Premium Efficiency Motors
- EEM 4.4.4b: Glazing Upgrade - Triple
- EEM 4.4.5: Wall Insulation Upgrade
- EEM 4.4.6a/b: Roof Insulation
- EEM 4.4.7: Low Flow Toilets and Urinals
- EEM 4.4.8: High Efficiency RTU HVAC Units
- T-3 Reduce Heat Gains to Offset Increasing Outdoor Temperatures – Increase Cooling Plant Capacity
- L1-L3 Provide Lightning Protection System

GRANT APPLICATIONS

Grant application projects: GHG emission reduction, energy efficiency, green energy, climate change adaptation & mitigation

Federal grants: Disaster Mitigation Adaptation Fund (DMAF), Low Carbon Emission Fund (LCEF), Natural Resources Canada (NRCan)

Provincial grants: Alberta Innovate (AI), Emission Reduction Alberta (ERA)

INDUSTRY LEADER – SUSTAINABLE WATER UTILITY

- Apply the latest technology
- Substantial GHG emission reduction – help to meet both EPCOR and City of Edmonton environmental goals
- Federal & Provincial grants allow EPCOR matching dollars to go further
- Operational savings from energy efficiency
- Reduce costs for rate payers

HEAT RECOVERY OPTIONS – PROS & CONS

Heat pipes

PROS

- More suited to harsh environments
- Air to air heat exchanger is entirely static
- Low maintenance, no filters

CONS

- Less efficient ~50-55%
- More expensive

HEAT RECOVERY OPTIONS – PROS & CONS

Plate Heat Exchanger (HRV)

PROS

- Larger coefficient of heat transfer
- Small footprint
- Easy to maintain
- ~ 60 – 65% efficiency

CONS

- Poor sealing, easy to leak
- More expensive

HEAT RECOVERY OPTIONS – PROS & CONS

Heat Reverse Flow (ERV)

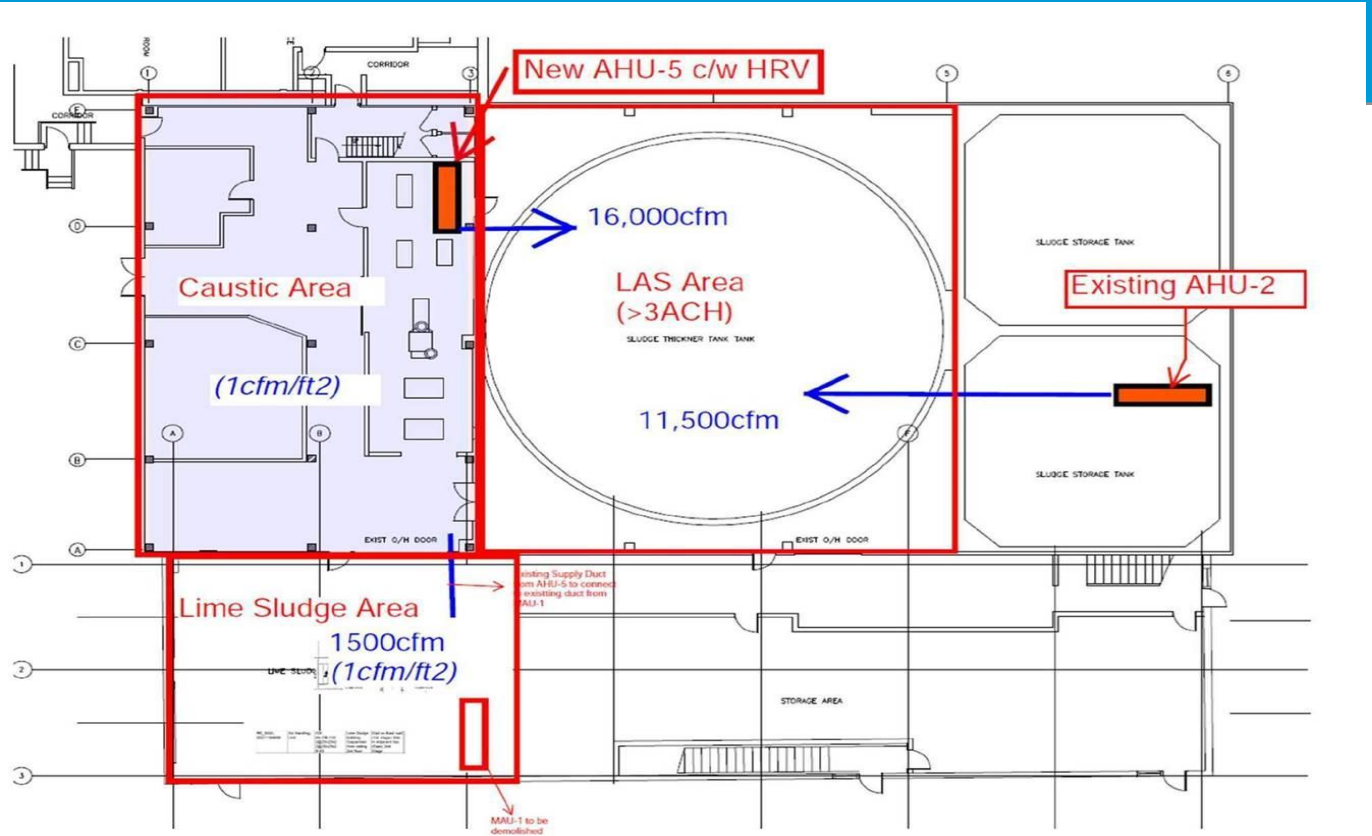
PROS

- Self cleaning, minimum maintenance
- Airflow damper is the only moving part
- Adjustable moisture recover
- More efficient ~ 81-91%

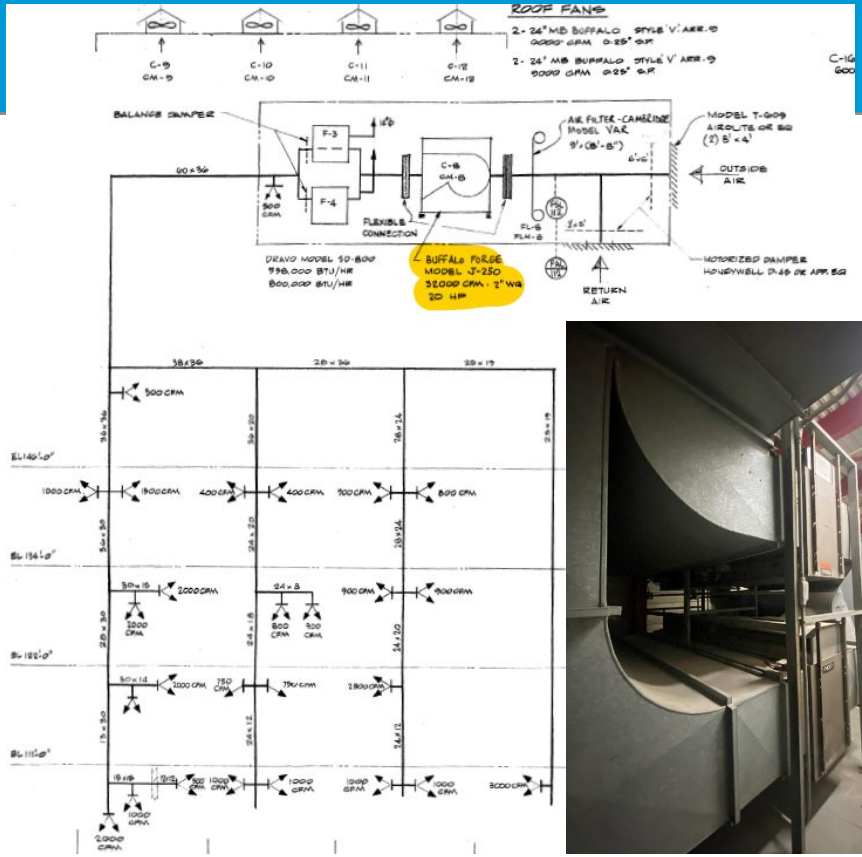
CONS

- Larger footprint
- Not as robust if the environment is moist or corrosive

RECAL BUILDING HVAC SERVICE AREAS



AIR HANDLING UNIT

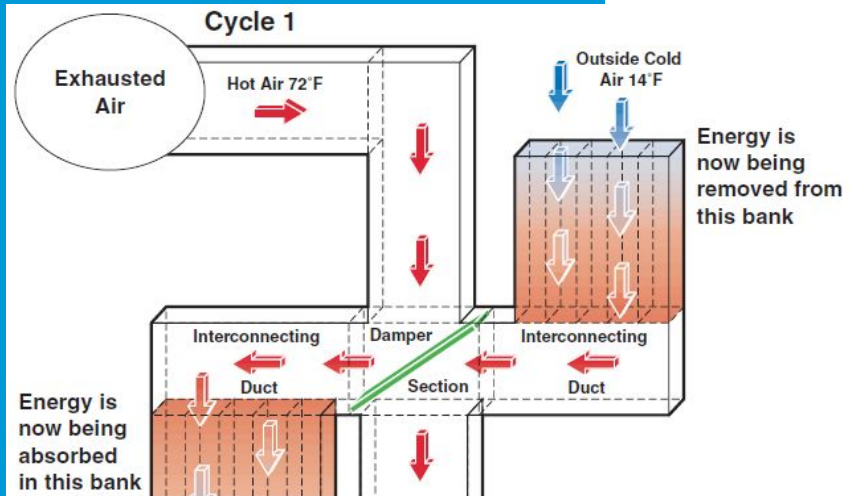


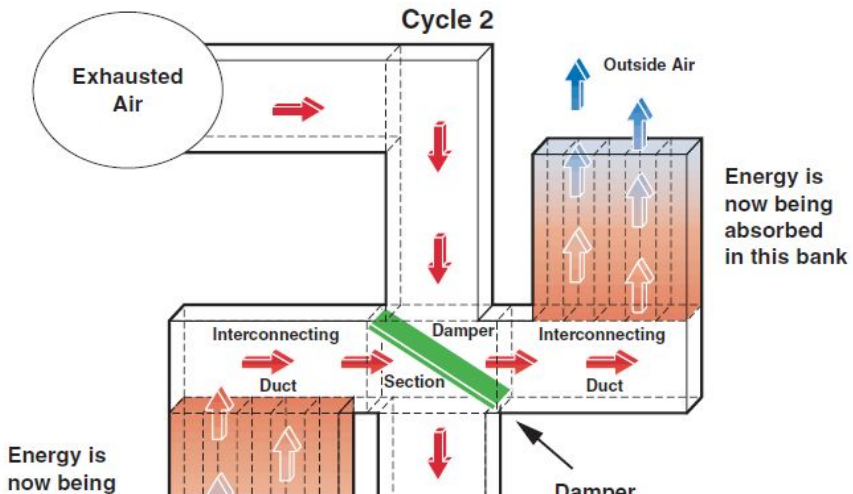
AHU-5

- Indirect gas-fired AHU
- Deliver 32,000 cfm c/w 4 indirect gas-fired heating coils
- Installed in 1975
- No cooling capacity

HEAT RECOVERY ANALYSIS

- Addition of HRC to Recal HVAC
- Apply the heat reverse flow for the highest energy recovery
- Capable to provide up to 12ACH through the 5 service areas
- Achieve energy savings with an 8-10 year payback





HEAT RECOVERY ANALYSIS

2023 energy rates

- Include carbon levy and distribution costs
- Natural Gas $8.50/GJ
- Power $0.127/kWh

HRV with reverse flow

- Will achieve close to 90.6% of energy recovery efficiency with these design parameters:
  - Airflow: 9600 SCFM
  - Entering outdoor air temperature ~40° F @ 24% RHY

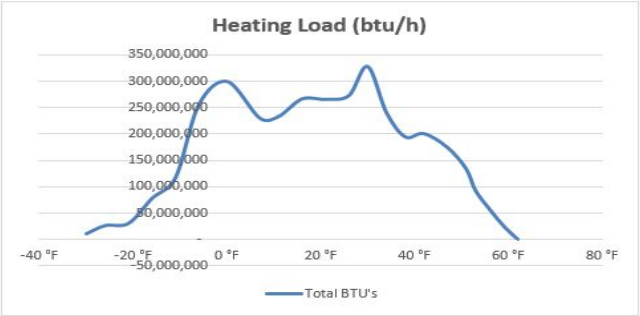
Estimated payback is less than nine years

HRV ENERGY SAVINGS & PAYBACK

Airflow:	9,600	cfm	
D/A Temp:	70	deg F.	
Fuel Cost:	$ 8.50	GJ	
Hours/day:	24		
HRRF Efficiency	90.6%		

Max. Temp. (°F)	Min. Temp. (°F)	hours/ year	Weighted hours	Temp. Diff. (dT)	BTU's Req'd/hr (cfm x 1.08 x dT)	Total BTU's
-28 °F	-30 °F	10	4	100	1,036,800	10,368,000
-23 °F	-26 °F	26	10.4	96	995,328	25,878,528
-18 °F	-21 °F	32	12.8	91	943,488	30,191,616
-13 °F	-16 °F	87	34.8	86	891,648	77,573,376
-8 °F	-11 °F	139	55.6	81	839,808	116,733,312
-3 °F	-6 °F	325	130	76	787,968	256,089,600
2 °F	0 °F	413	165.2	70	725,760	299,738,880
7 °F	7 °F	352	140.8	63	653,184	229,920,768
12 °F	11 °F	381	152.4	59	611,712	233,062,272
17 °F	16 °F	476	190.4	54	559,872	266,499,072
22 °F	21 °F	523	209.2	49	508,032	265,700,736
27 °F	26 °F	598	239.2	44	456,192	272,802,816
32 °F	30 °F	791	316.4	40	414,720	328,043,520
37 °F	34 °F	645	258	36	373,248	240,744,960
42 °F	38 °F	586	234.4	32	331,776	194,420,736
47 °F	42 °F	691	276.4	28	290,304	200,600,064
52 °F	47 °F	732	292.8	23	238,464	174,555,648
57 °F	51 °F	680	272	19	196,992	133,954,560
62 °F	53 °F	526	210.4	17	176,256	92,710,656
67 °F	56 °F	394	157.6	14	145,152	57,189,888
72 °F	59 °F	221	88.4	11	114,048	25,204,608
77 °F	62 °F	99	39.6		-	-
82 °F	62 °F	33	13.2		-	-
		8,760				

Grand Total BTU's:	3,531,983,616
MMBH	3,532
$/GJ x 1.05 = $/MMBH	8.97
Total Cost per Year	**$ 31,675**
HRRF Efficiency	90.6%
Energy savings	**$ 28,697**



**Note: Estimated savings only, does not consider site conditions, varying energy rates, additional fan power requirements etc.*

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QUESTIONS