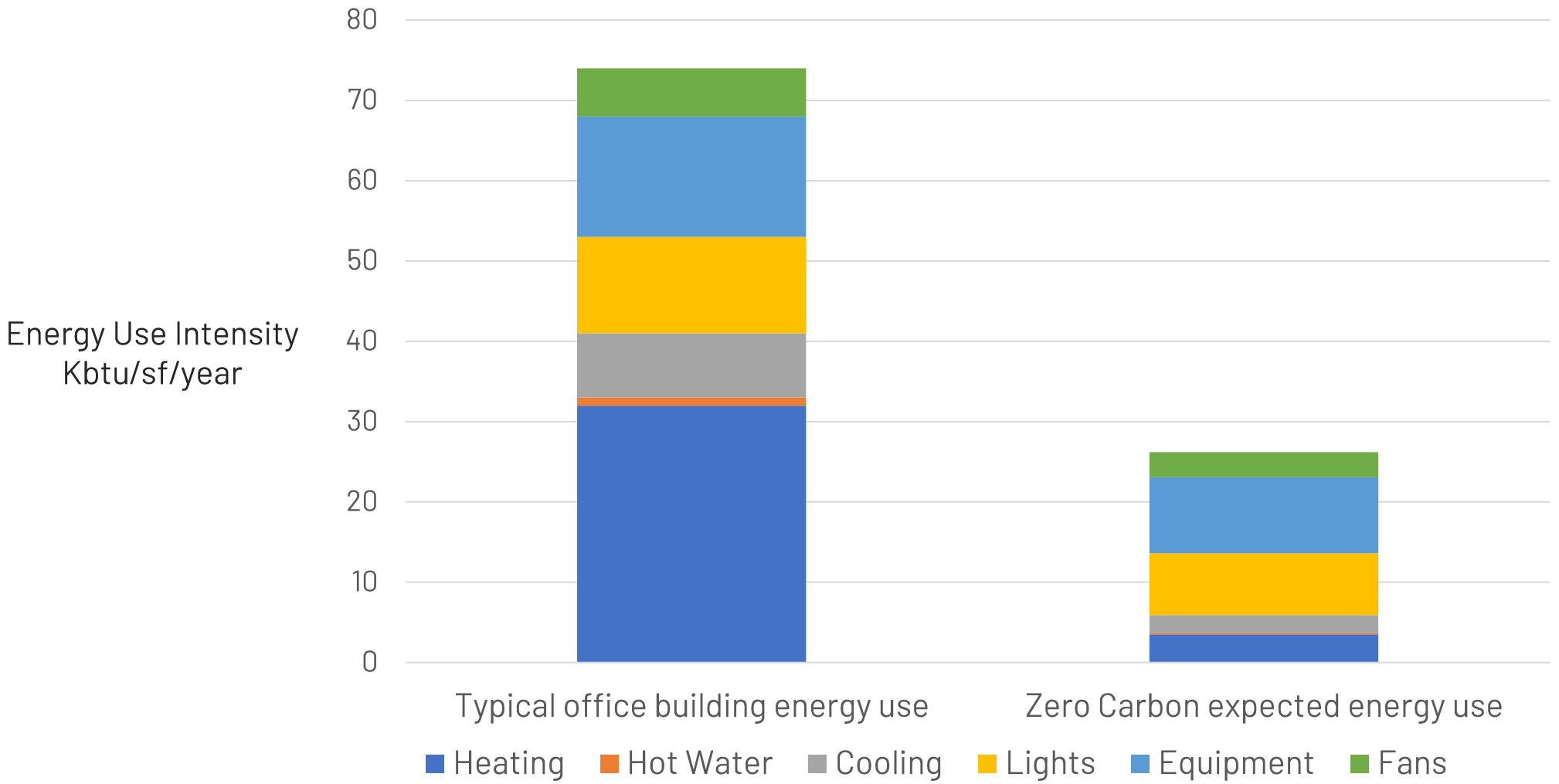
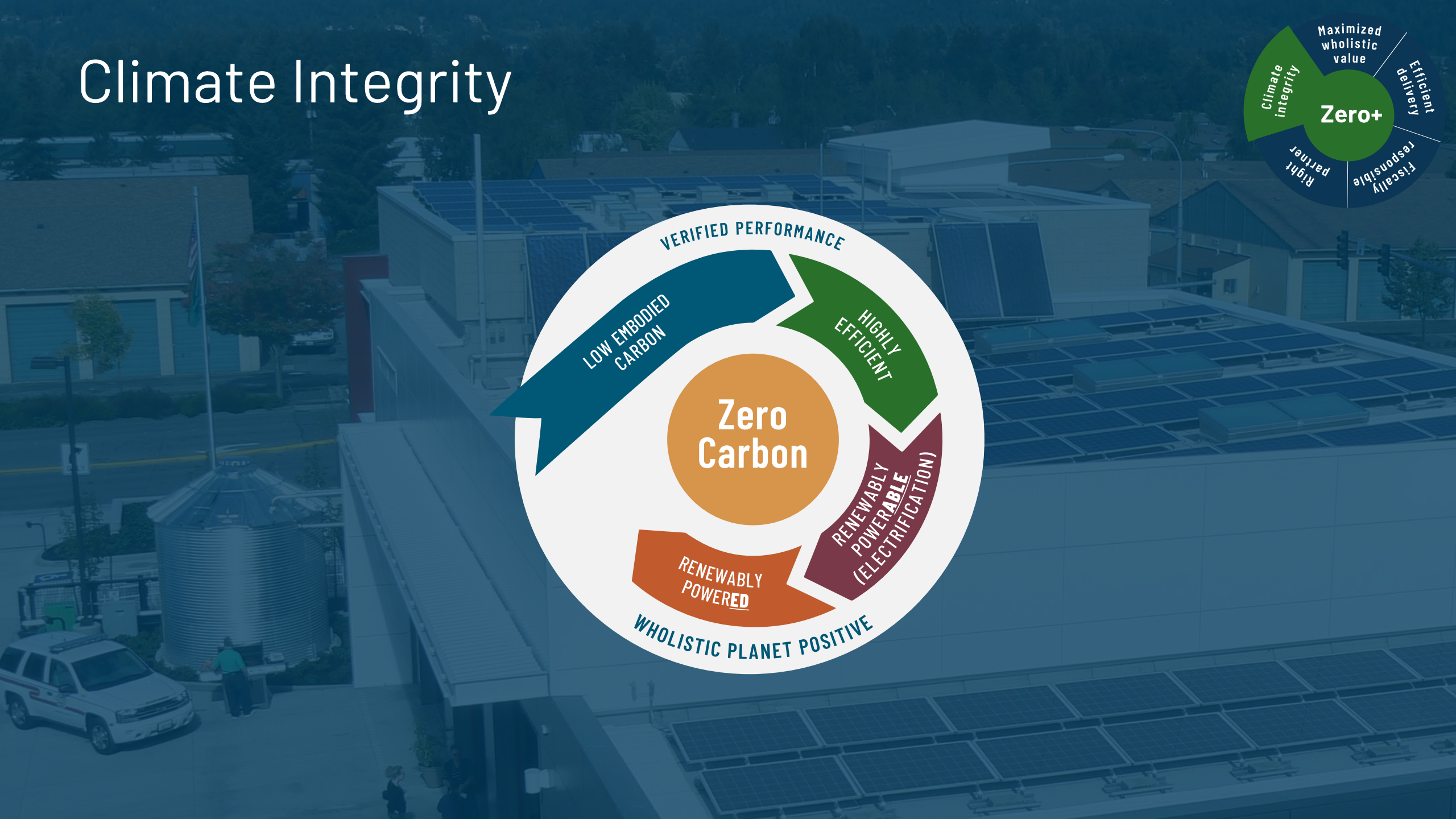
Building operations = **40% of US CO2**



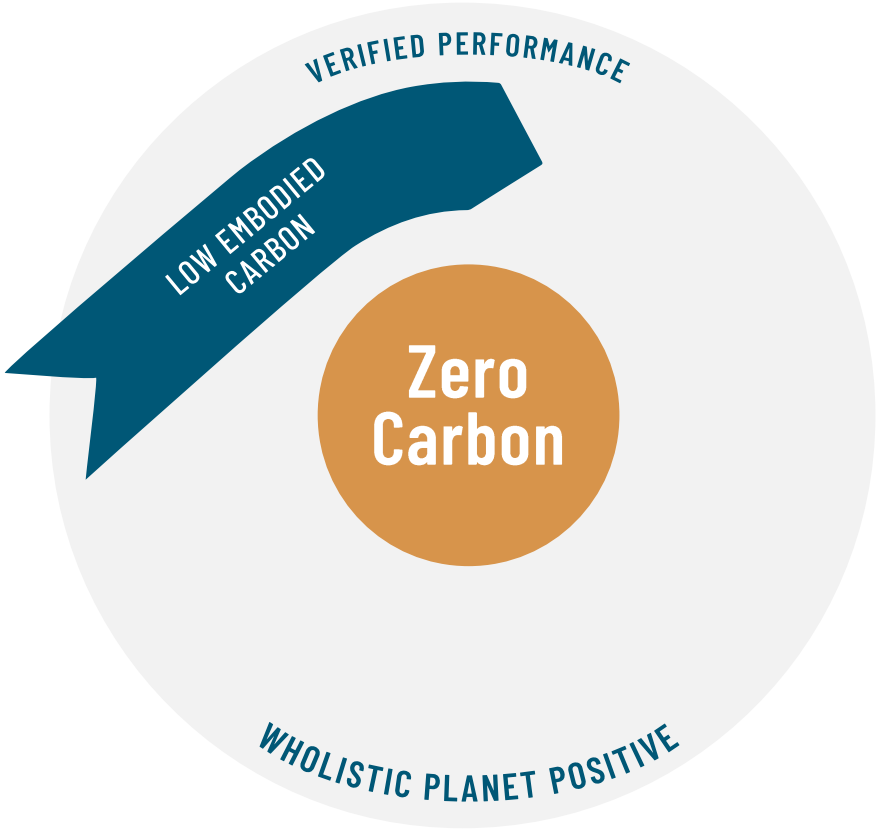
How low can we go?

McKinstry
For The Life Of Your Building

Climate Integrity



Typical Zero+ project elements



Low Embodied Carbon

- Existing buildings

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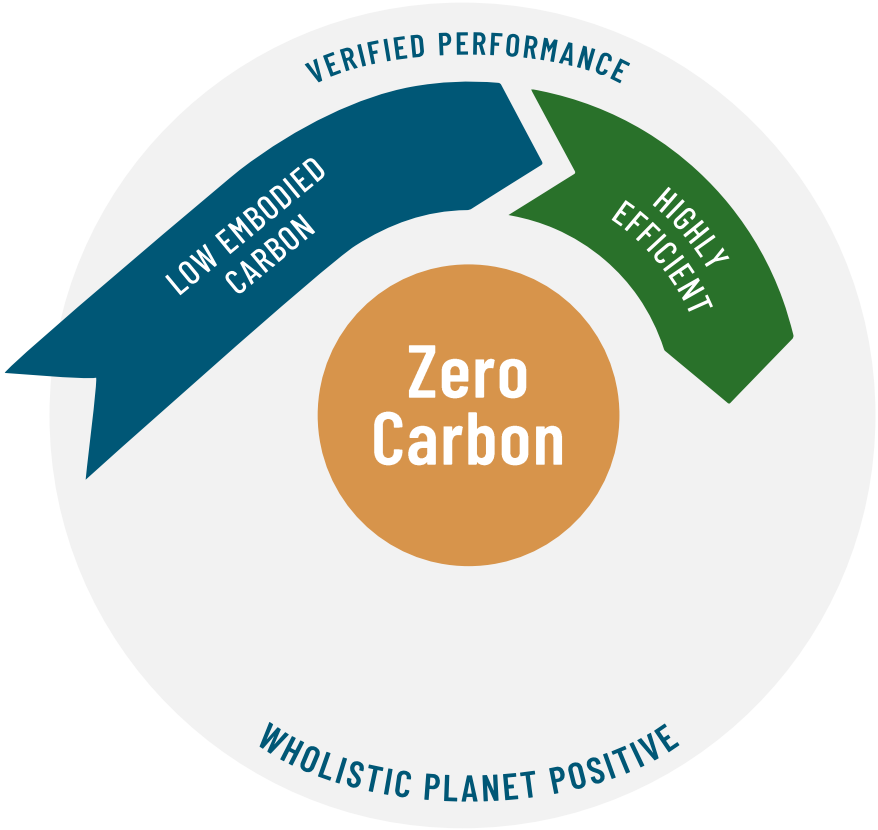

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Highly Efficient

- Retrocommissioning
- LED lighting
- 4R plug load reduction program
- Air sealing + other envelope imps
- Miscellaneous

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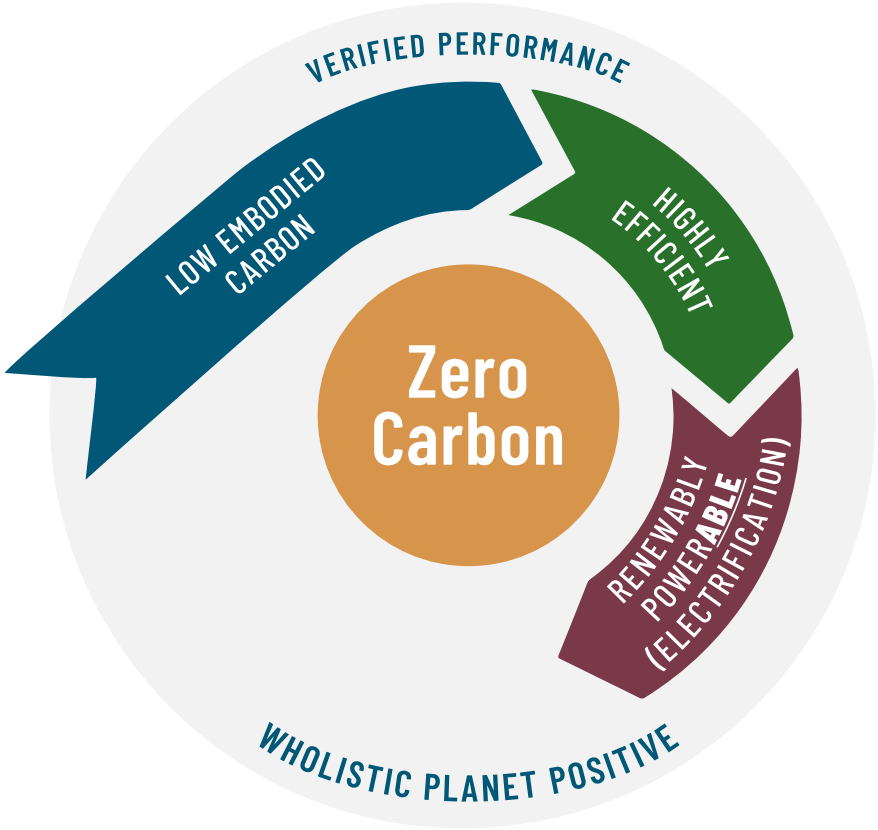

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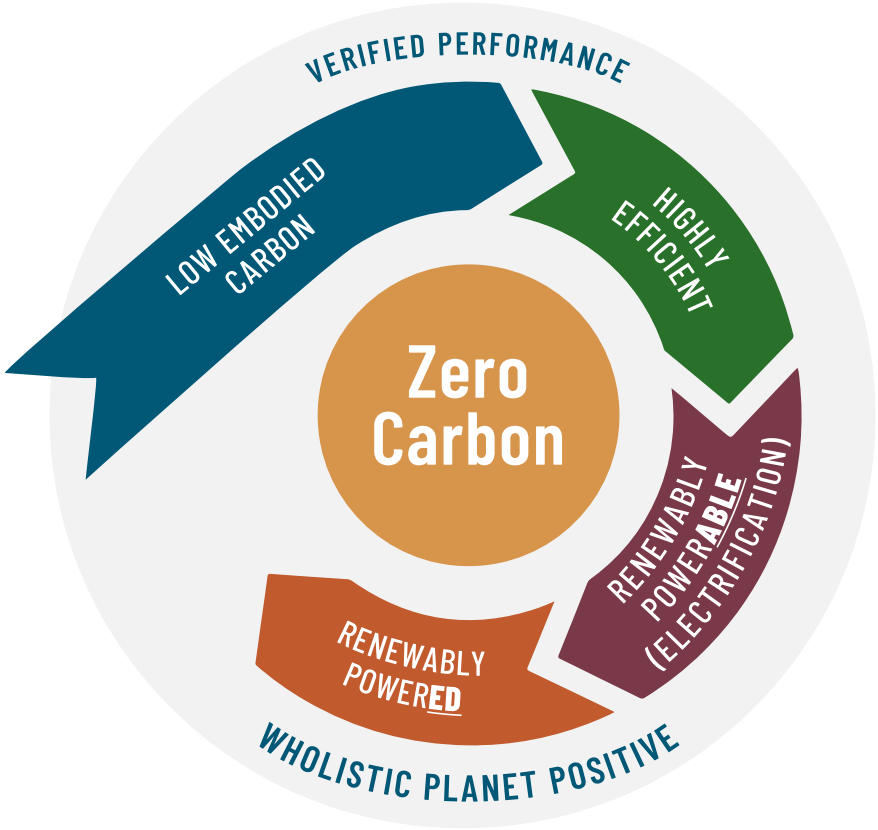

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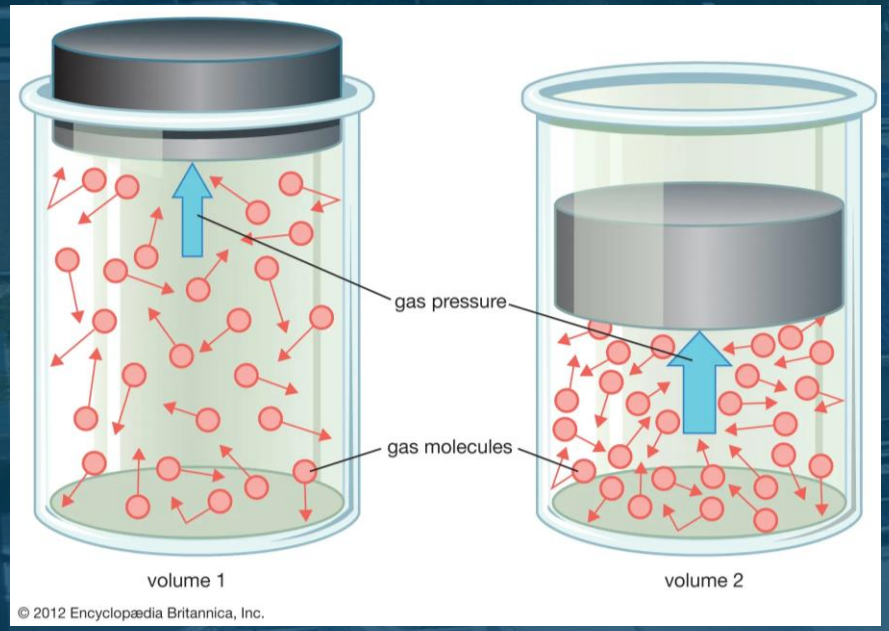
Renewably Powered
- Rooftop solar
- Ground solar
- Grid integrated (time of use + batteries)
- Utility provided renewables

Decarbonization technologies: heat pumps



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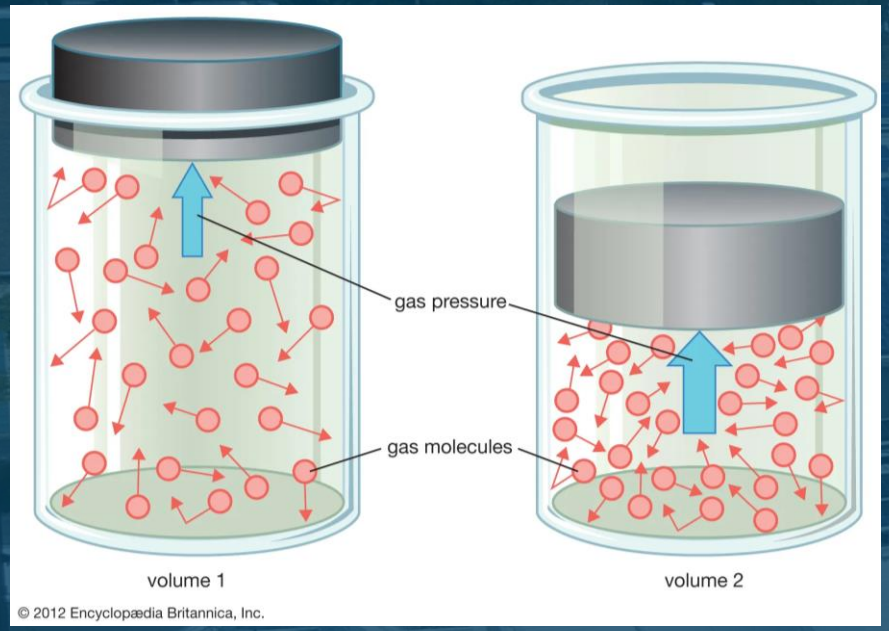

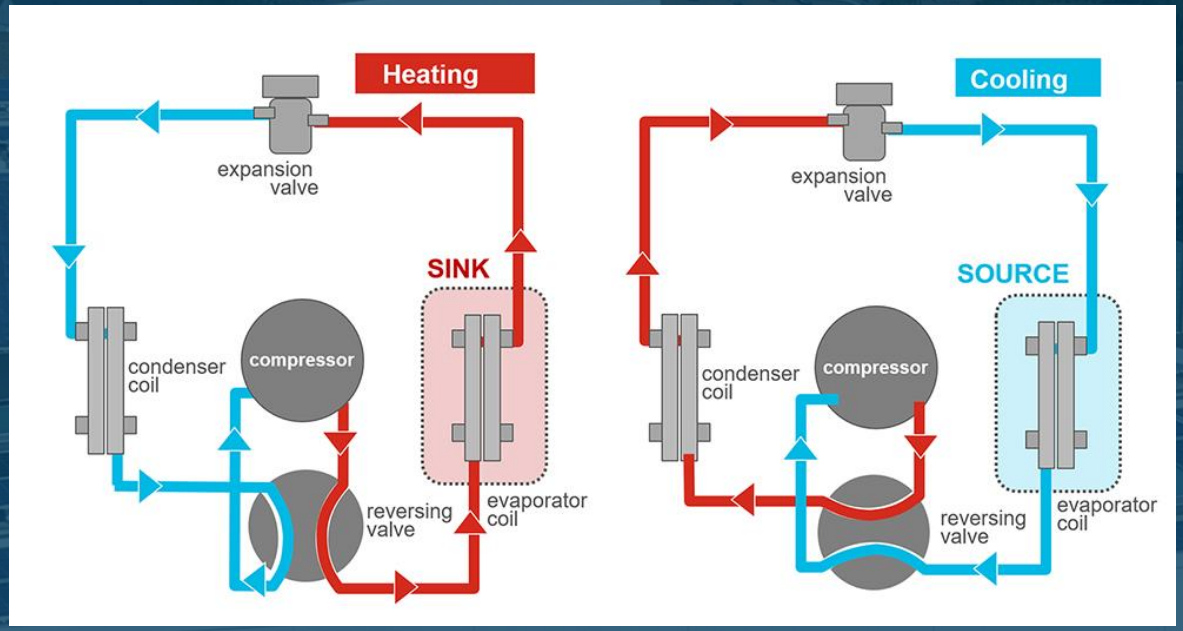

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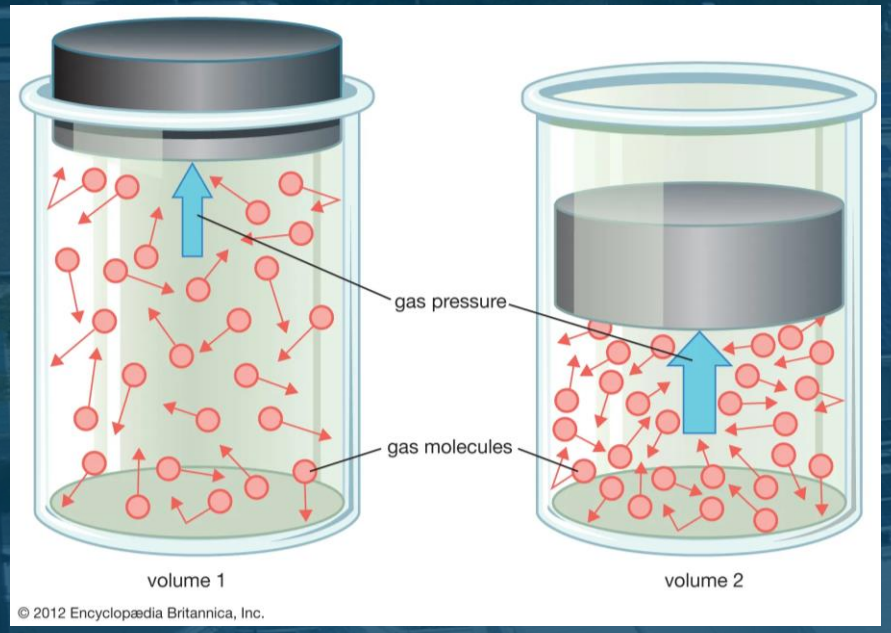

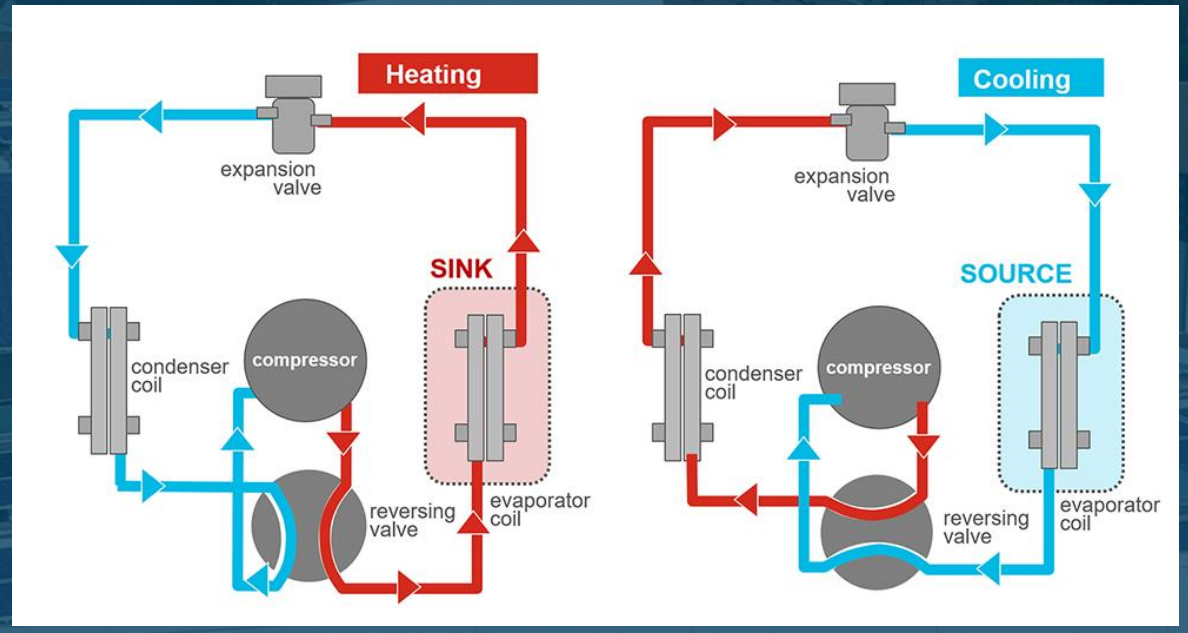

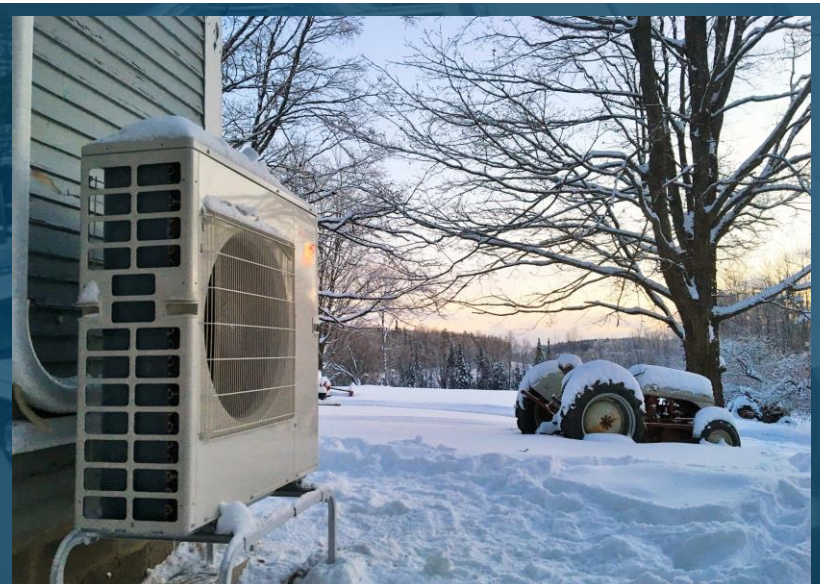

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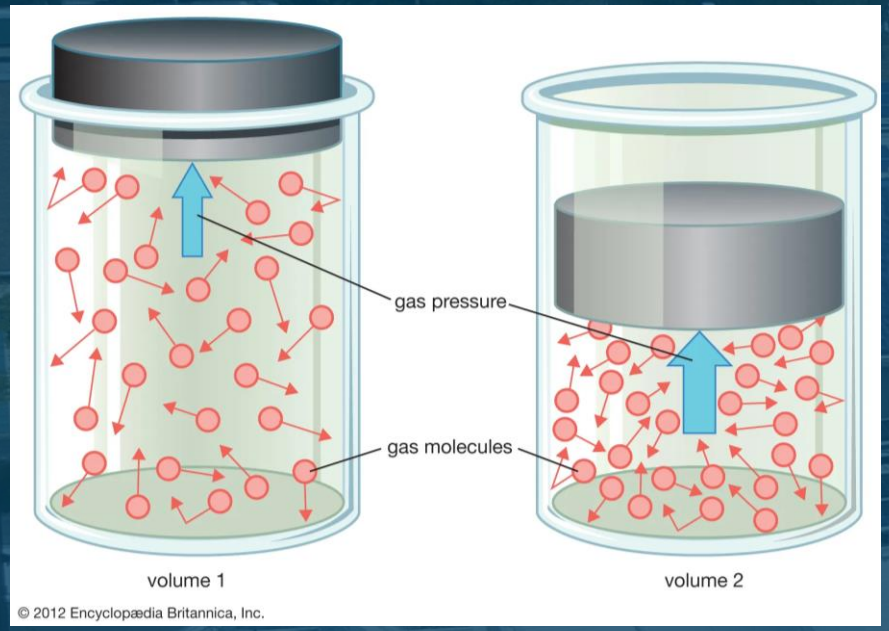

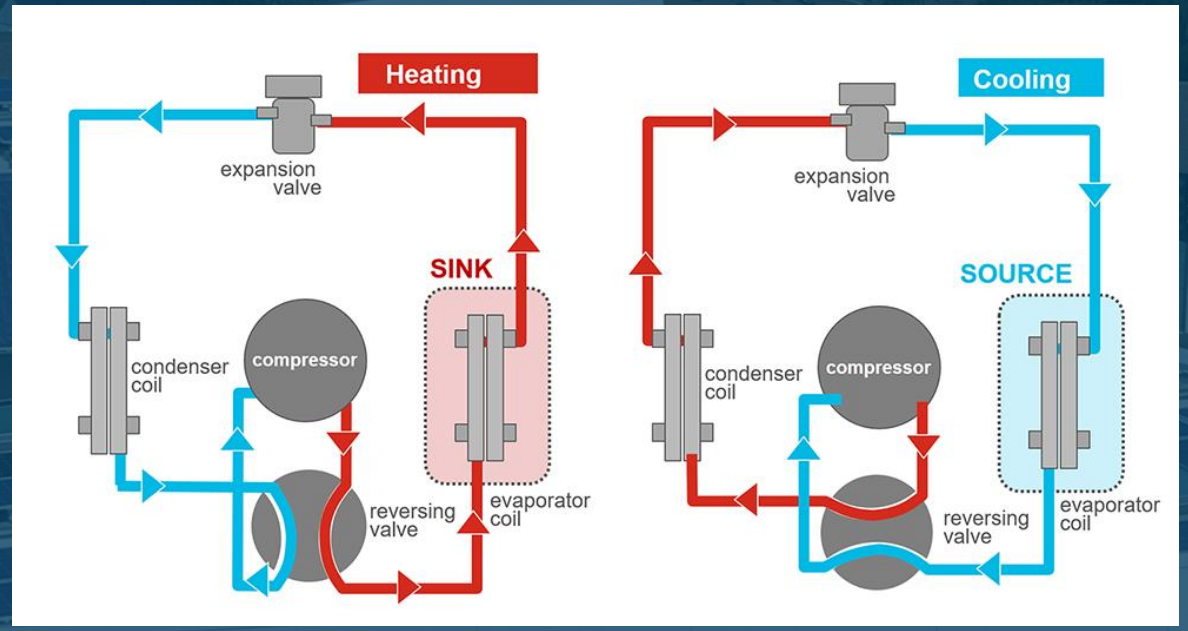

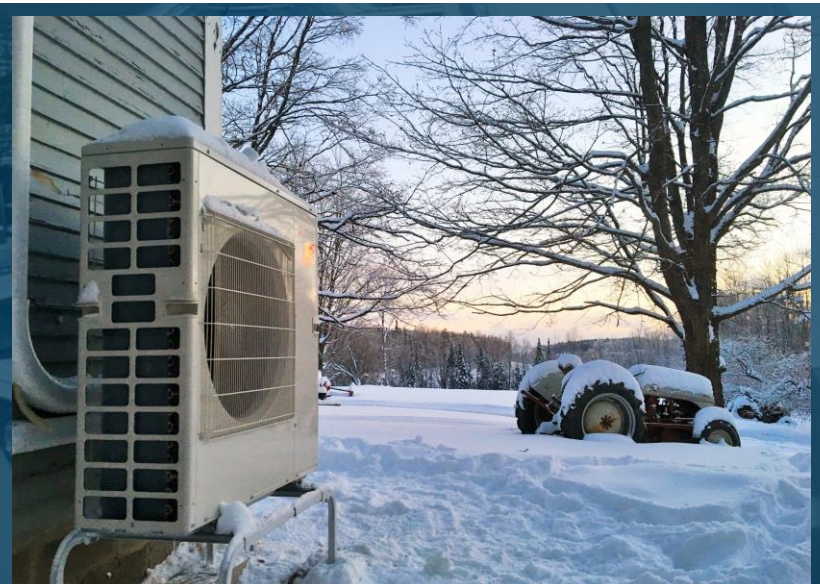

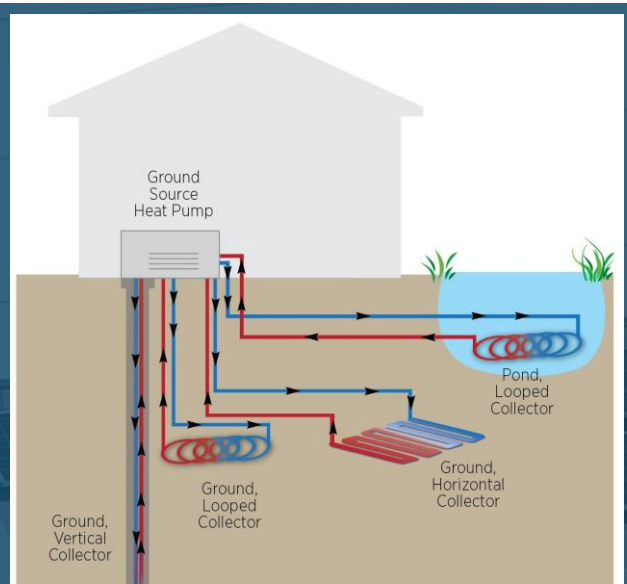

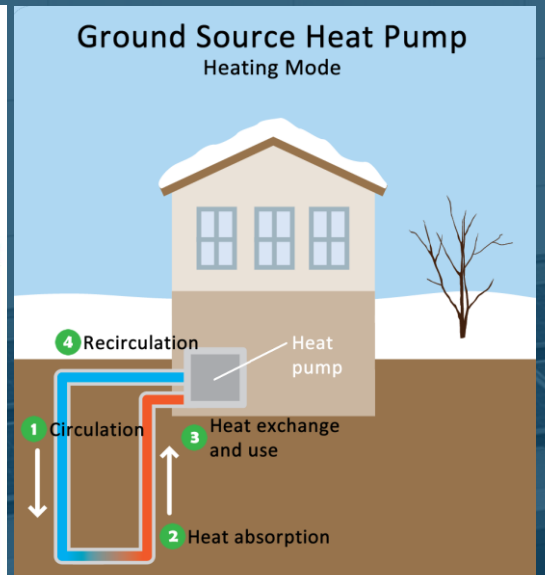

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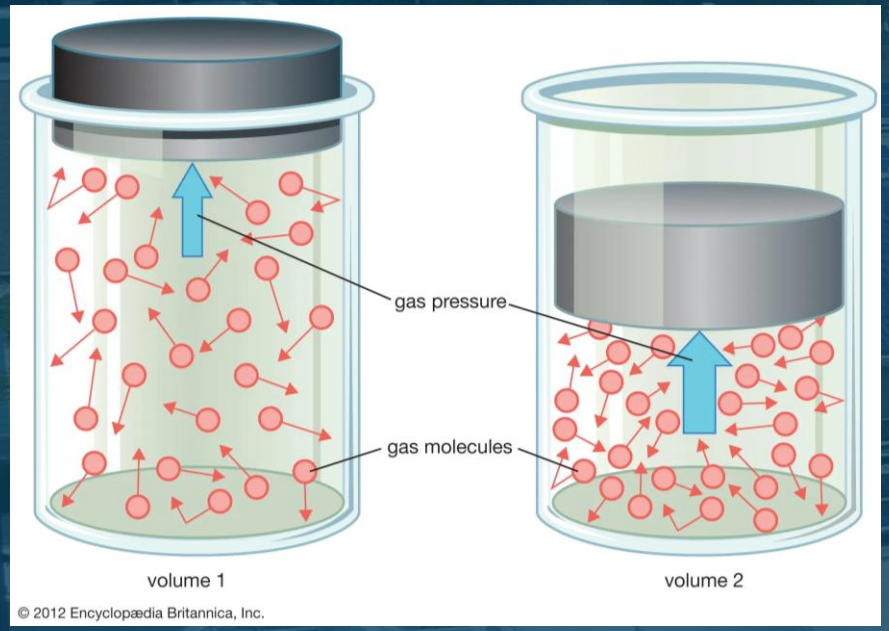

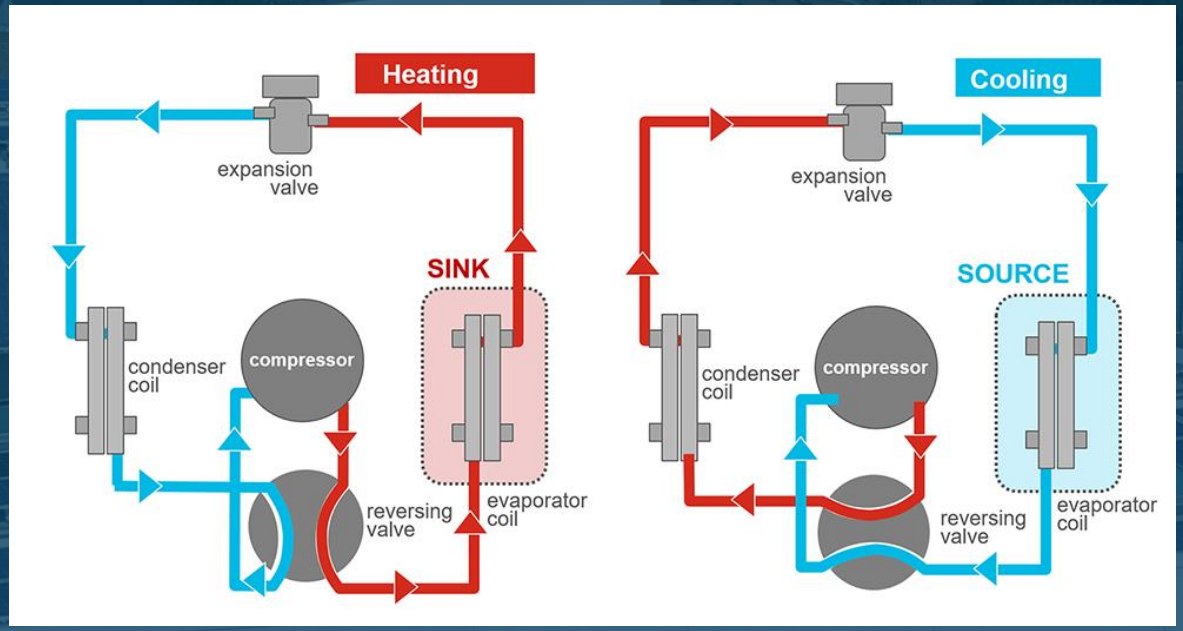

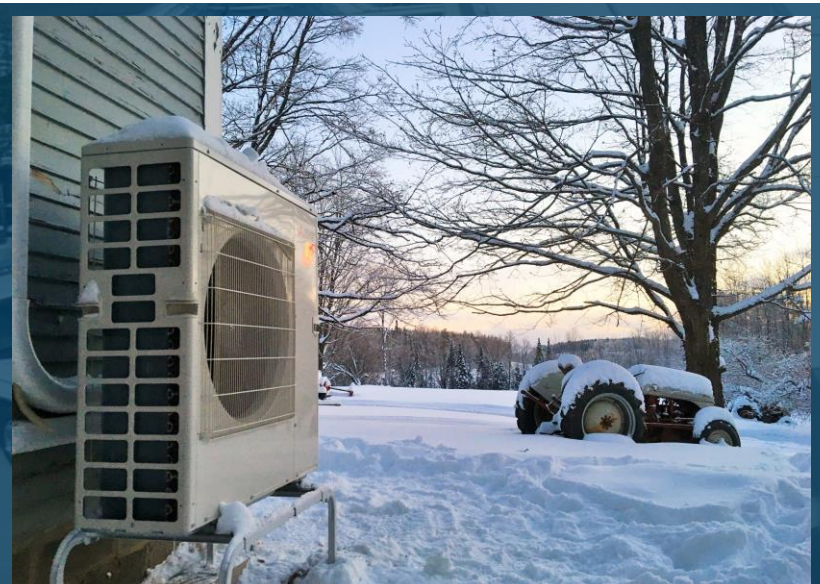

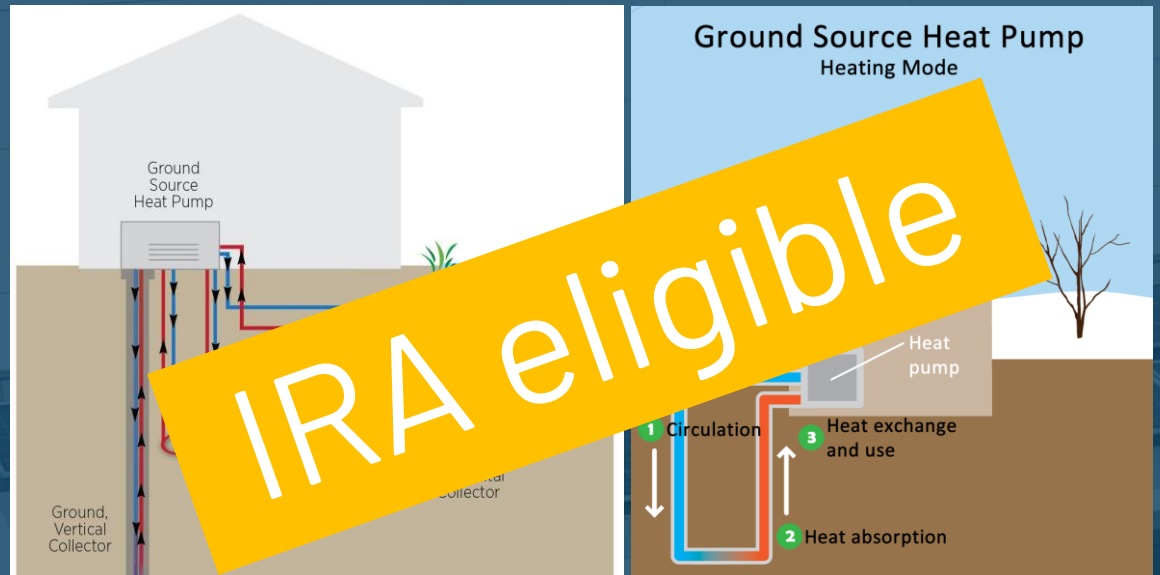

IRA eligible

Key strategies

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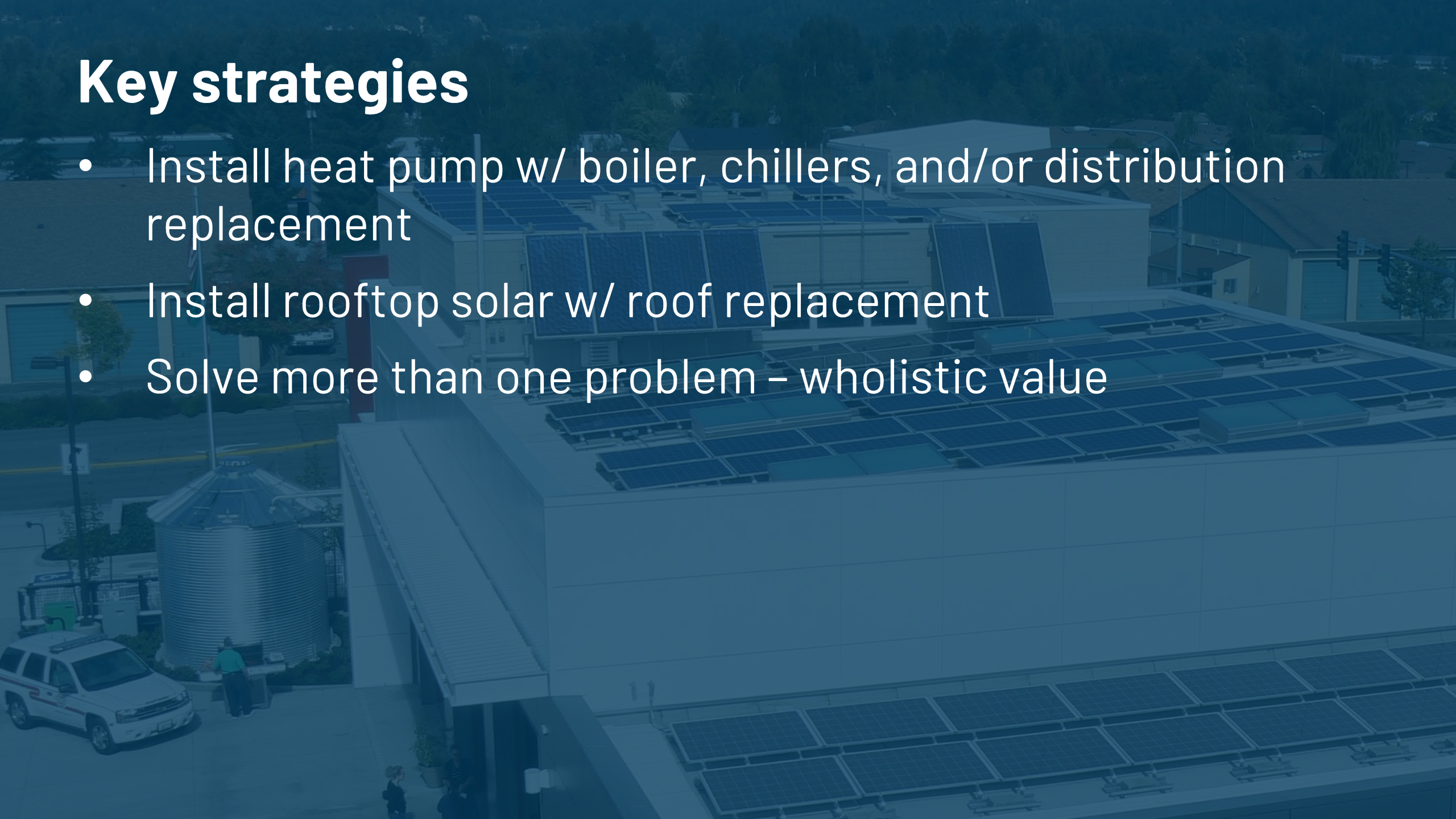

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- Install rooftop solar w/ roof replacement
- Solve more than one problem – wholistic value
- Consider hybrid electrification (retain NG boiler for peaking)
- Do quick payback items asap

Do these things now

- LED lighting
- Retrocommissioning + misc measures
- Ground mount + rooftop solar: 30% Inflation Reduction Act

Cost of Zero Carbon Electricity

Type	$/kWh	Pros	Cons
Efficiency	**0.04 $ / kWh**	• Reduces islanded electricity demand during power outages • Sometimes includes co-benefits • Avoids line loss of utility scale solar • Avoids solar/wind impacts of utility scale renewables	• Some facility disruption; contracting time/process
On-site Renewables	**0.06 $ / kWh** (assumes 25.5% IRA direct payment)	• Provides visible demonstration of carbon commitment. Contributes to power resiliency. • Avoids solar/wind impacts of utility scale renewables • Avoids line loss of utility scale solar • Enables immediate accrual of energy benefits • Production incentives also available from Xcel with REC sale.	• Requires maintenance (cost included in cost per kwh to left) • Best installed in conjunction with roof replacement, limiting time window • Can only provide portion of needed renewable electricity
Standard Xcel Electricity	**0.065–0.070 $ / kWh**	• Provides some renewable electricity inherent in mix, increasing over time • More expensive than on-site solar per kwh • Ease of implementation, will occur on its own over time –no need for contracting for on-site renewable installation	• Possibility of Xcel not meeting promised renewable target/ uncertainty/longer uptake • Solar and wind sprawl/impacts in rural/farming areas • Line loss/less efficient • Doesn't support resiliency
Xcel Windsource	**0.07–0.08 $ / kWh** (base rate + 0.015 $/kWh)	• Enables immediate provision of 100% renewable electricity; not subject to allocation • Ease of implementation –no need for contracting for on-site renewable installation • Contractually guaranteed renewable source	• Most expensive source of renewables • Avian and aesthetic impacts of wind turbines • Line loss/less efficient • Doesn't support islandability
Xcel Renewable Direct*	**0.065–0.070 $ / kWh**	• Approximate cost parity with standard grid electricity • If can be obtained, enables immediate acquisition of renewable power	• Not currently available • Limited availability, subject to new renewable projects • Solar and wind sprawl/impacts in rural/farming areas • Line loss/less efficient • Doesn't support resiliency

**Renewable Direct is only available occasionally based on subscription. There is a current waiting list to join.*

Zero Carbon Roadmap