

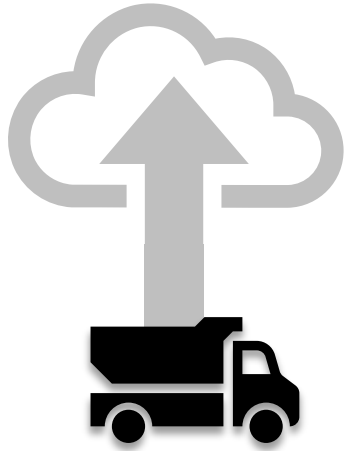


// RESILIENT TOGETHER //

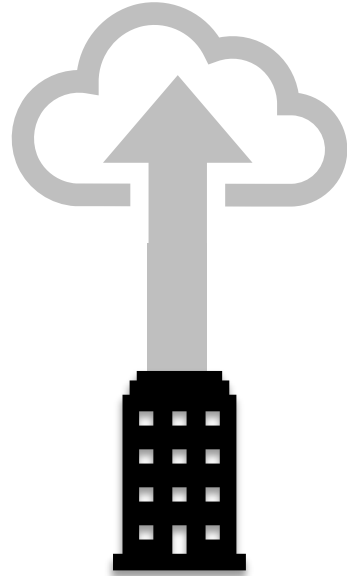
2022 Partner Exchange

Decarbonization

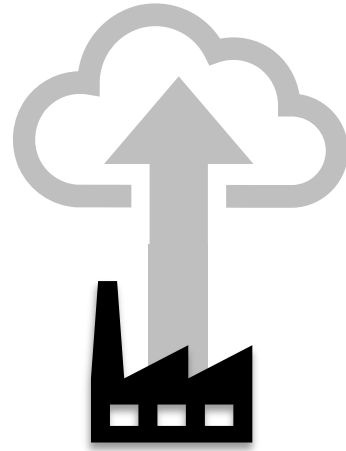
Decarbonization



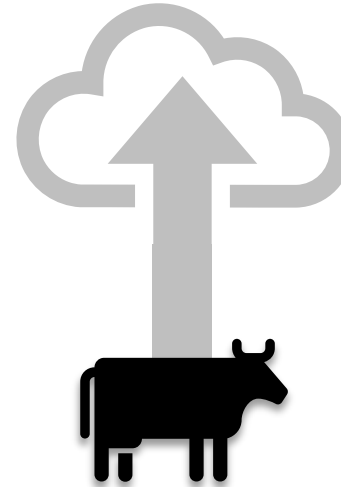
Transport



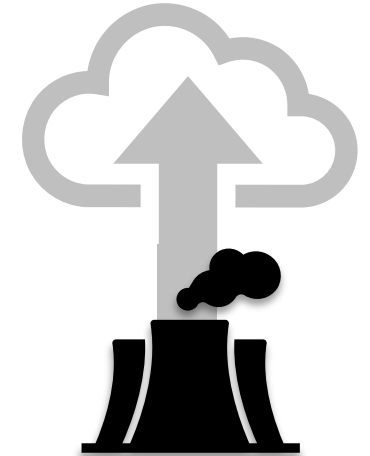
Buildings



Industry



Food/Ag

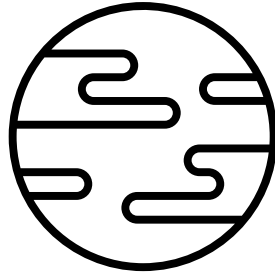


Power Generation

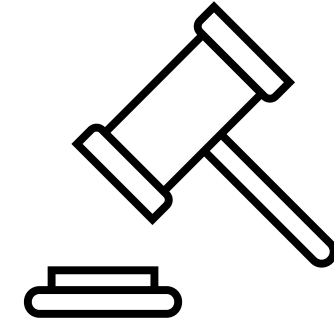
Decarbonization Drivers



ESG / Environmentalism



Local Policy

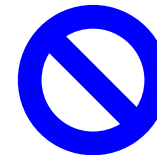


BlackRock

Carbon Disclosure Project

**Securities and Exchange
Commission**

339 Cities have quantifiable
emission reduction targets



NG Bans



Carbon
Caps



Stretch
Codes



Carbon
Tax

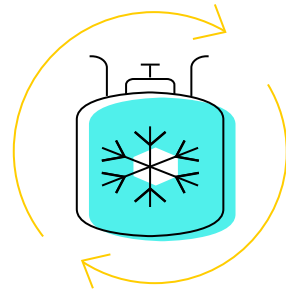
Where Are Emissions Generated From?

Operational Emissions

Scope 1 Emissions

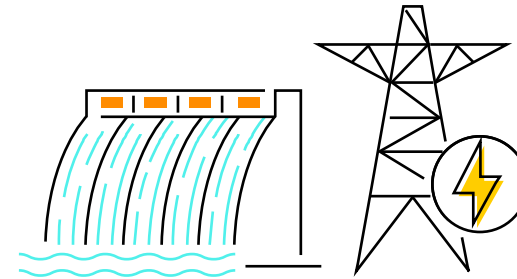


Direct Fossil Fuel
Combustion



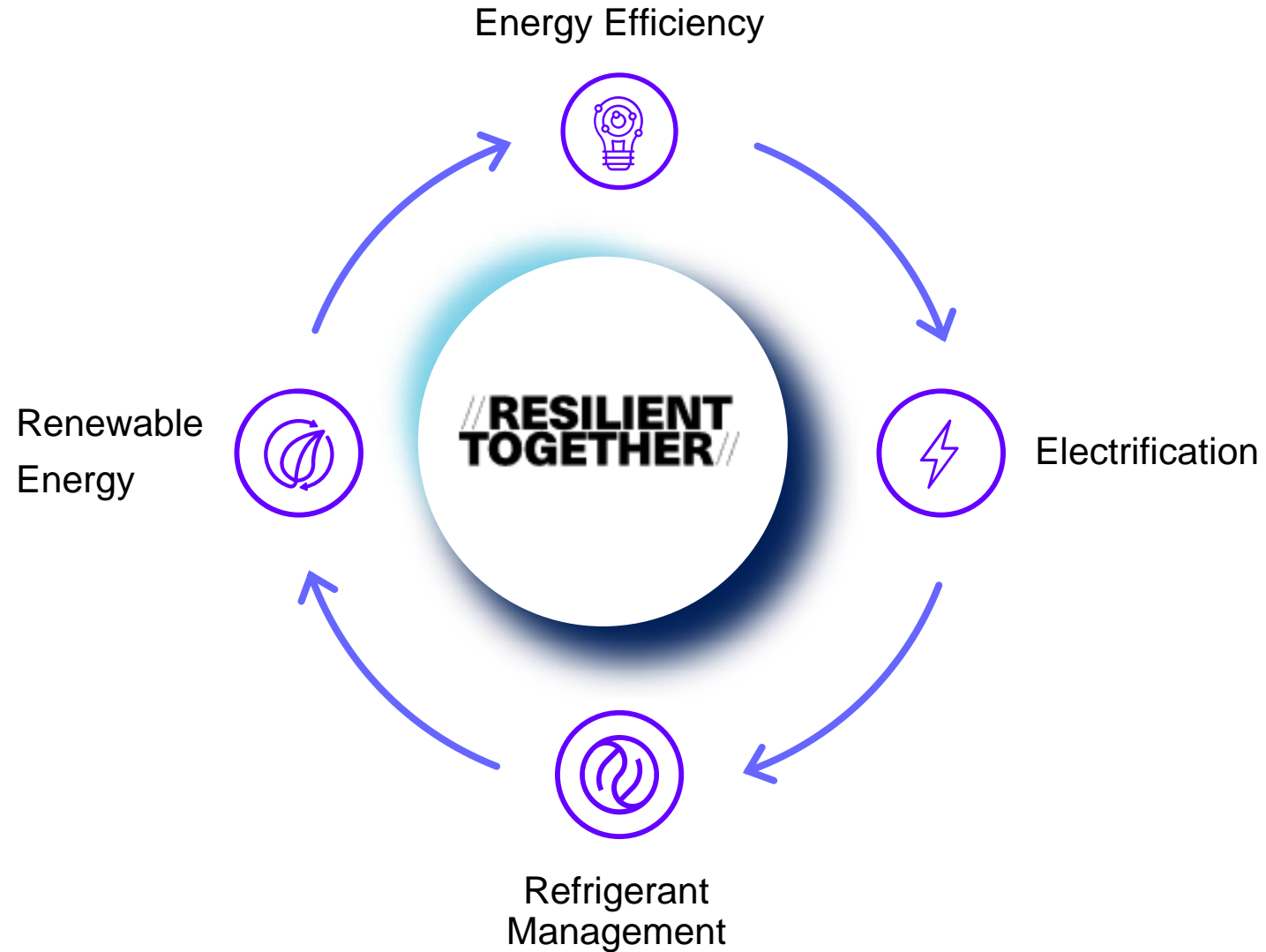
Refrigerant
Emissions

Scope 2 Emissions



Carbon Intensive
Electricity Sources

Decarbonization Levers

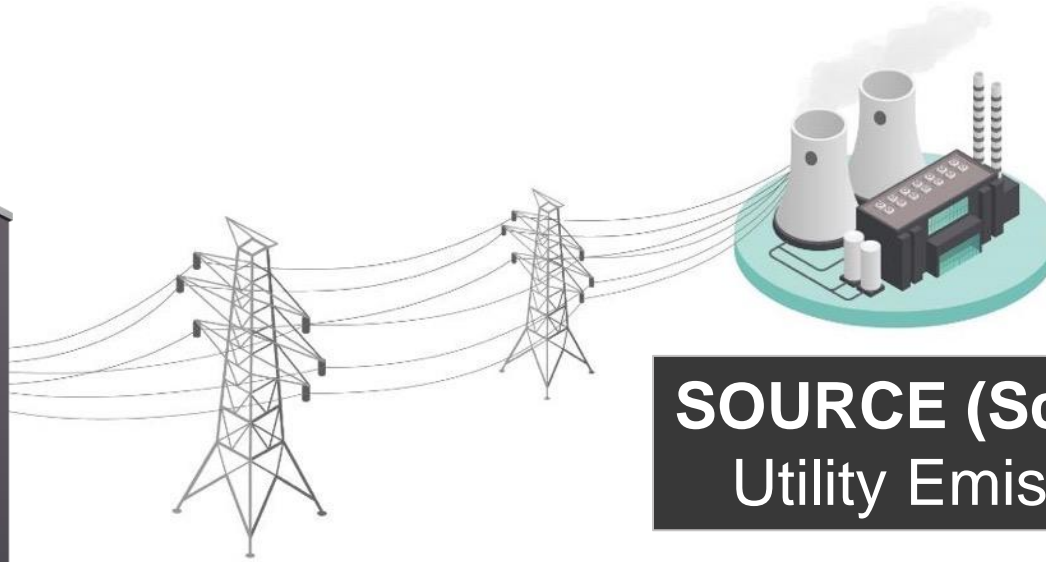


Efficiency



SITE (Scope 1)
Building Emissions

Lower Energy Usage = Lower Carbon



SOURCE (Scope 2)
Utility Emissions

OPPORTUNITIES

- Higher efficiency products/systems
- Controls/optimization
- Building upgrades (lighting, windows, etc.)
- Documentation

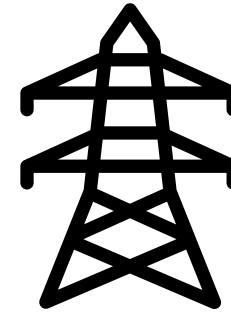
What is the carbon impact of energy efficiency?

Emission Factors: Natural Gas vs Electricity



Fixed Emission
Factor

117 Lbs CO₂e / MMBTU

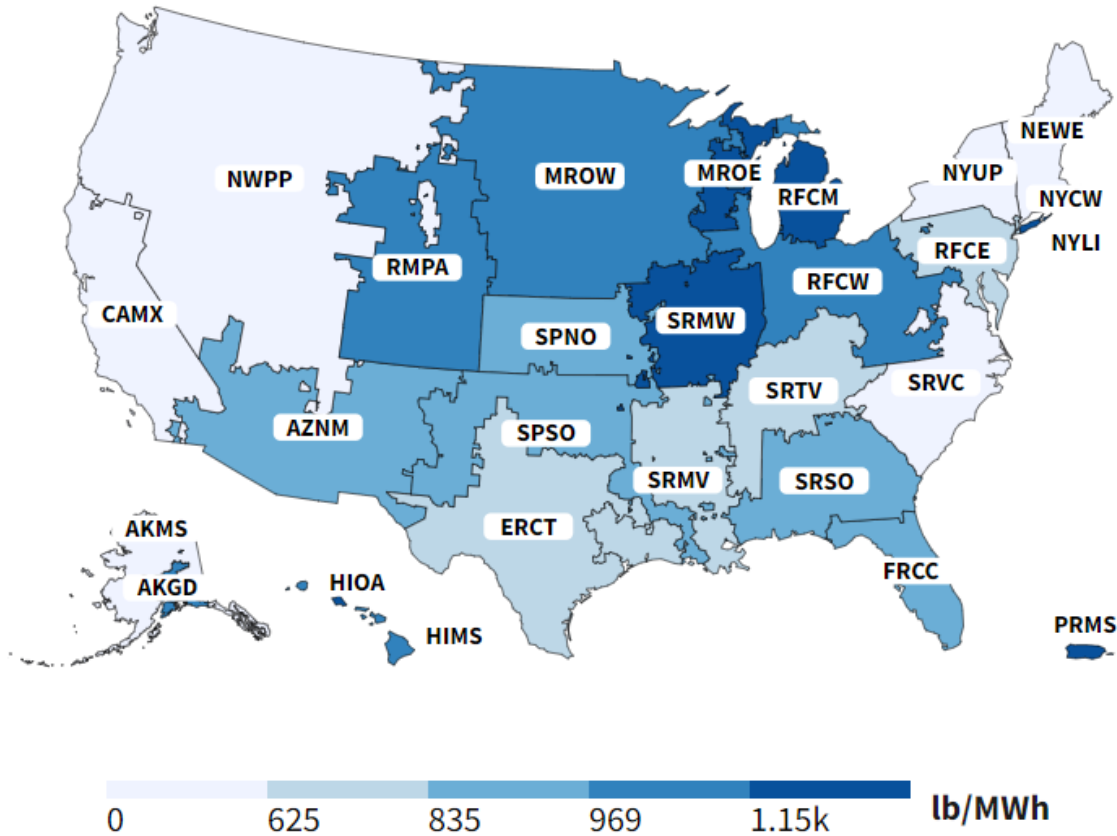


Variable
Emission Factor

Utility Grid Emission Factors

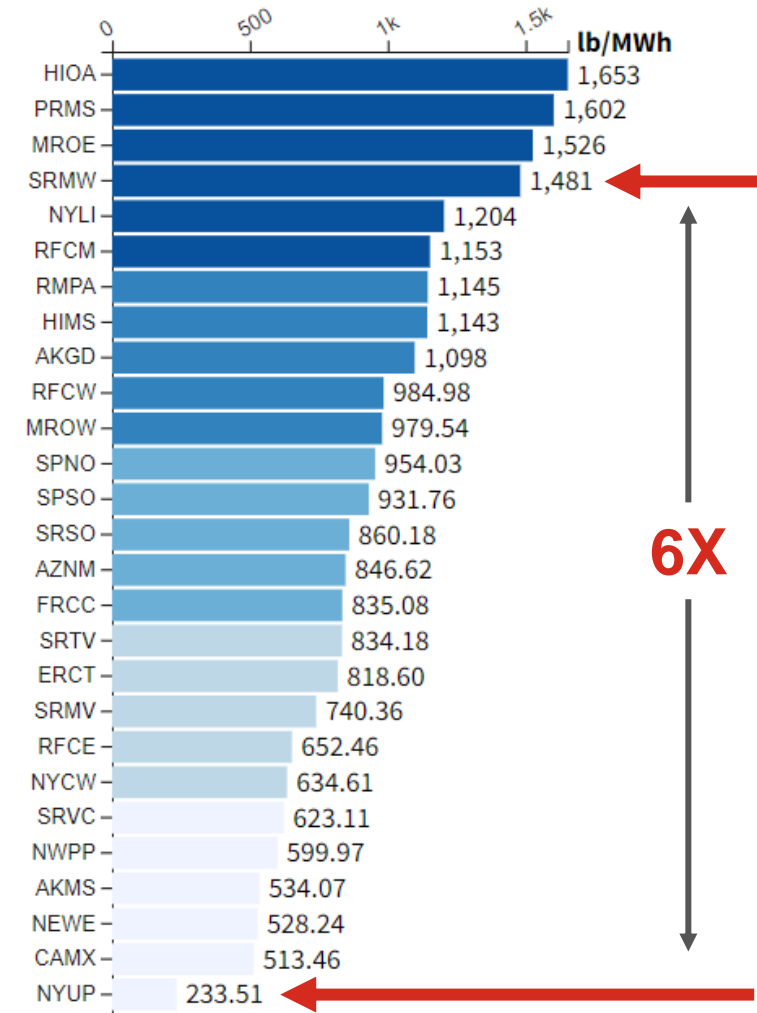


CO₂ total output emission rate (lb/MWh)
by eGRID subregion, 2020

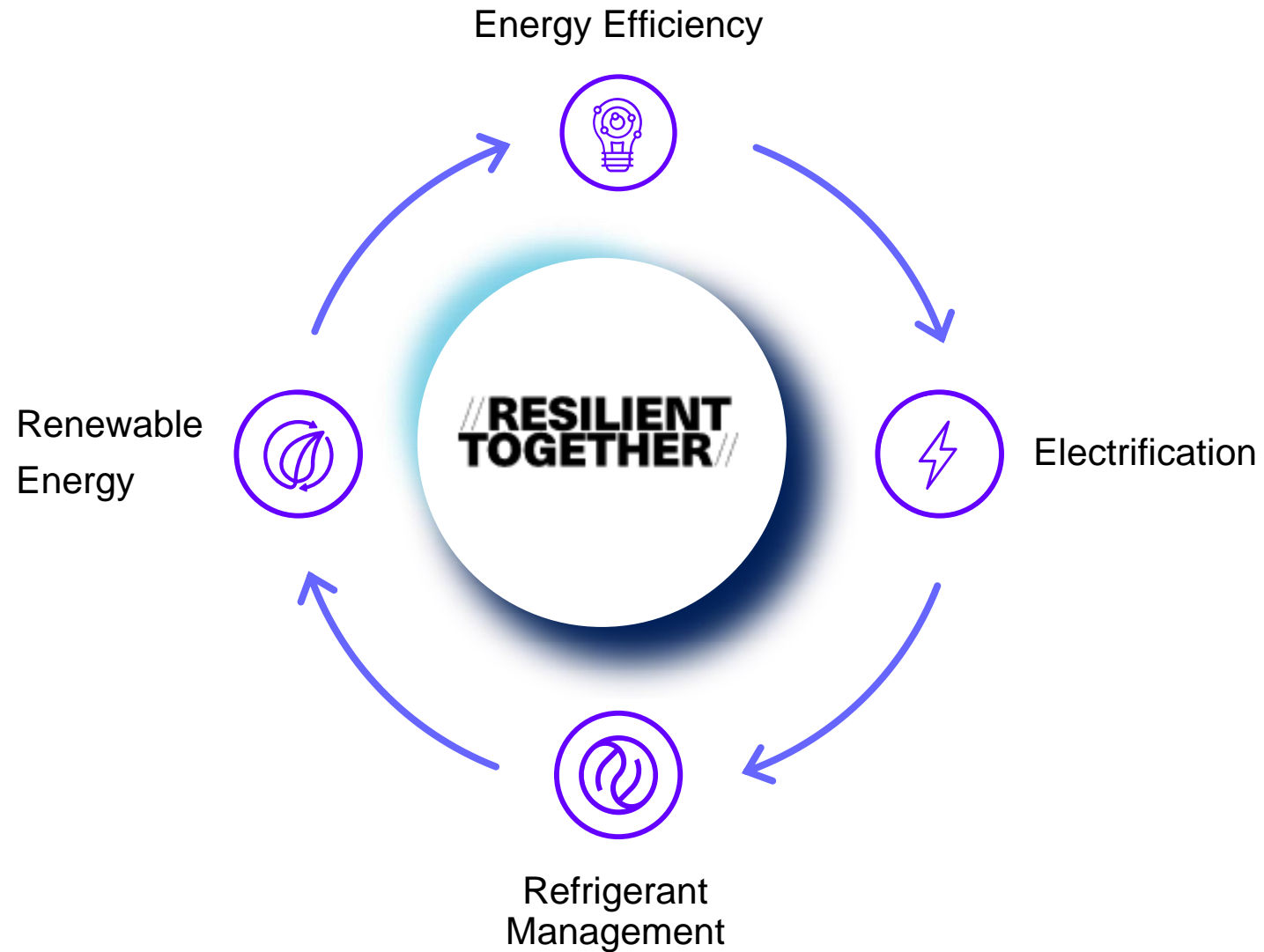


Sort A to Z Sort by Amount

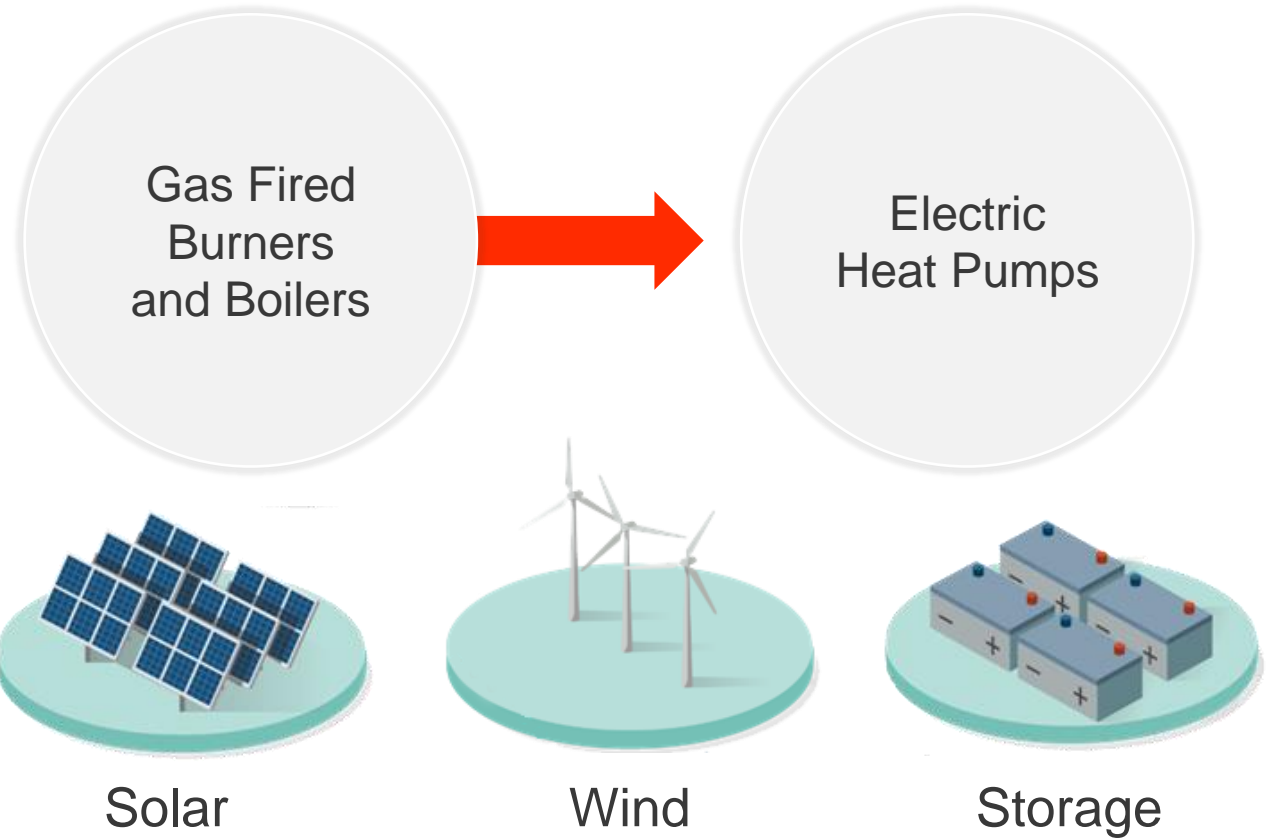
US: 818.29 (lb/MWh)



Decarbonization Levers



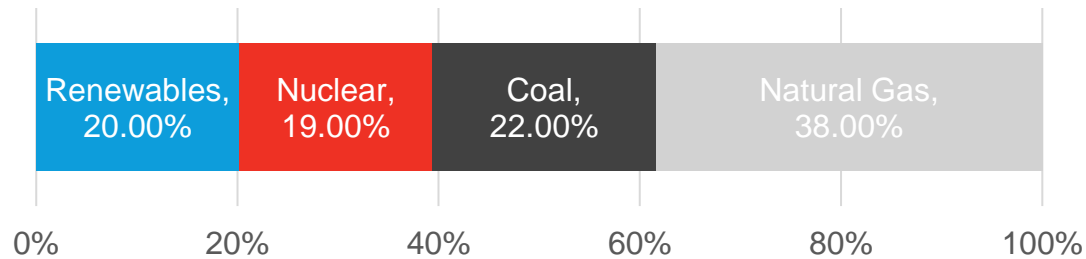
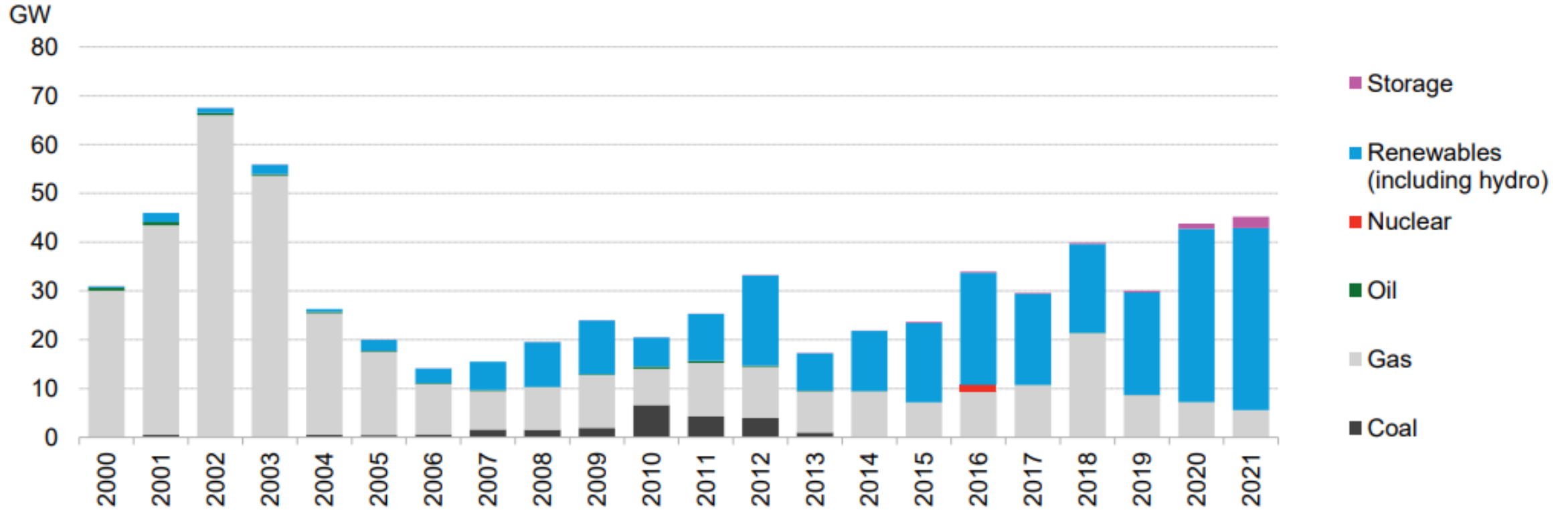
Electrification



The Rise of Renewables



U.S. electric generating capacity build, by fuel type



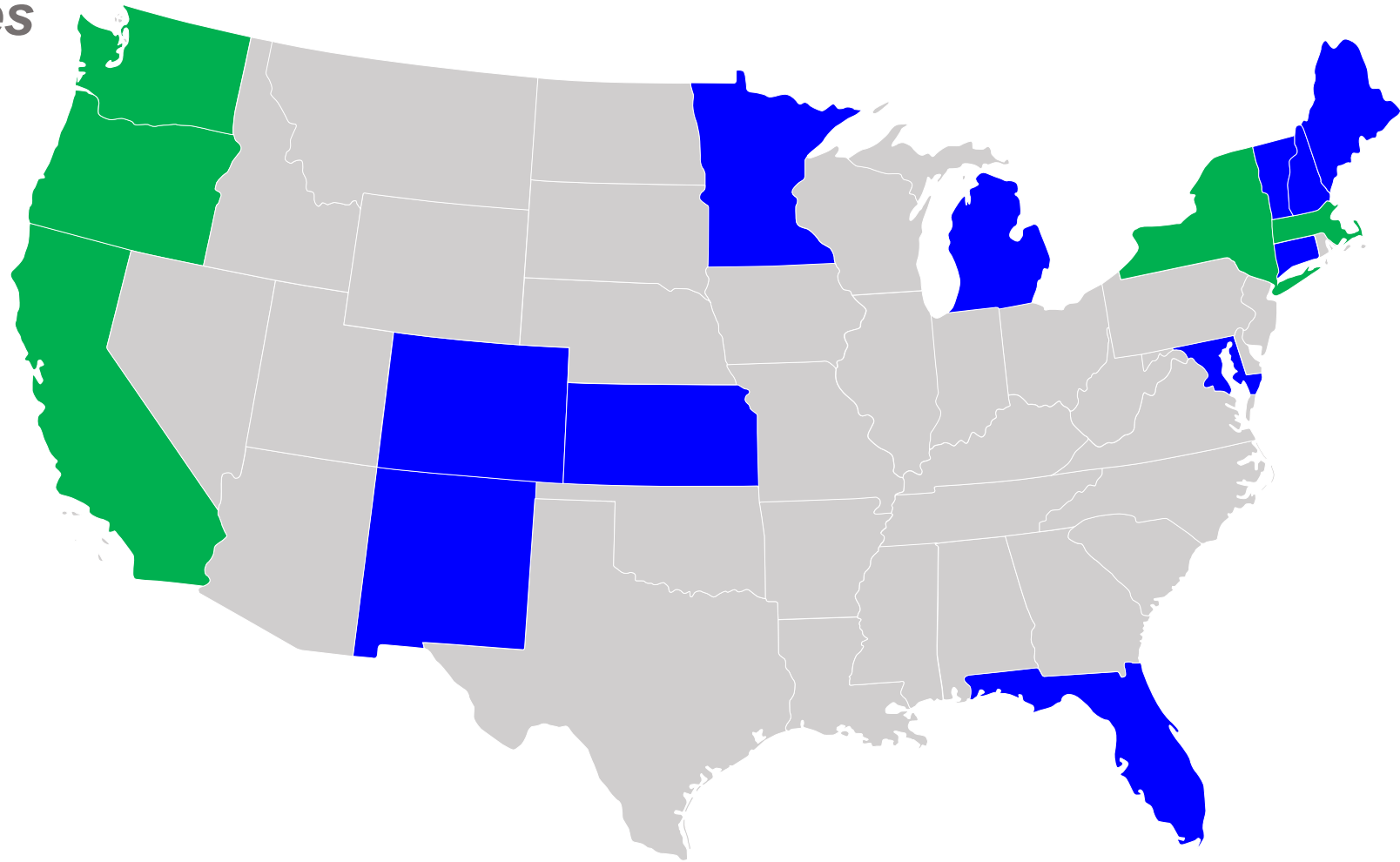
Pressure on Natural Gas

Sixteen states have counties with enacted or proposed natural gas bans



Enacted Natural Gas Ban

Proposed Natural Gas Ban



Technology Comparison



Boiler 

VS



Heat Pump

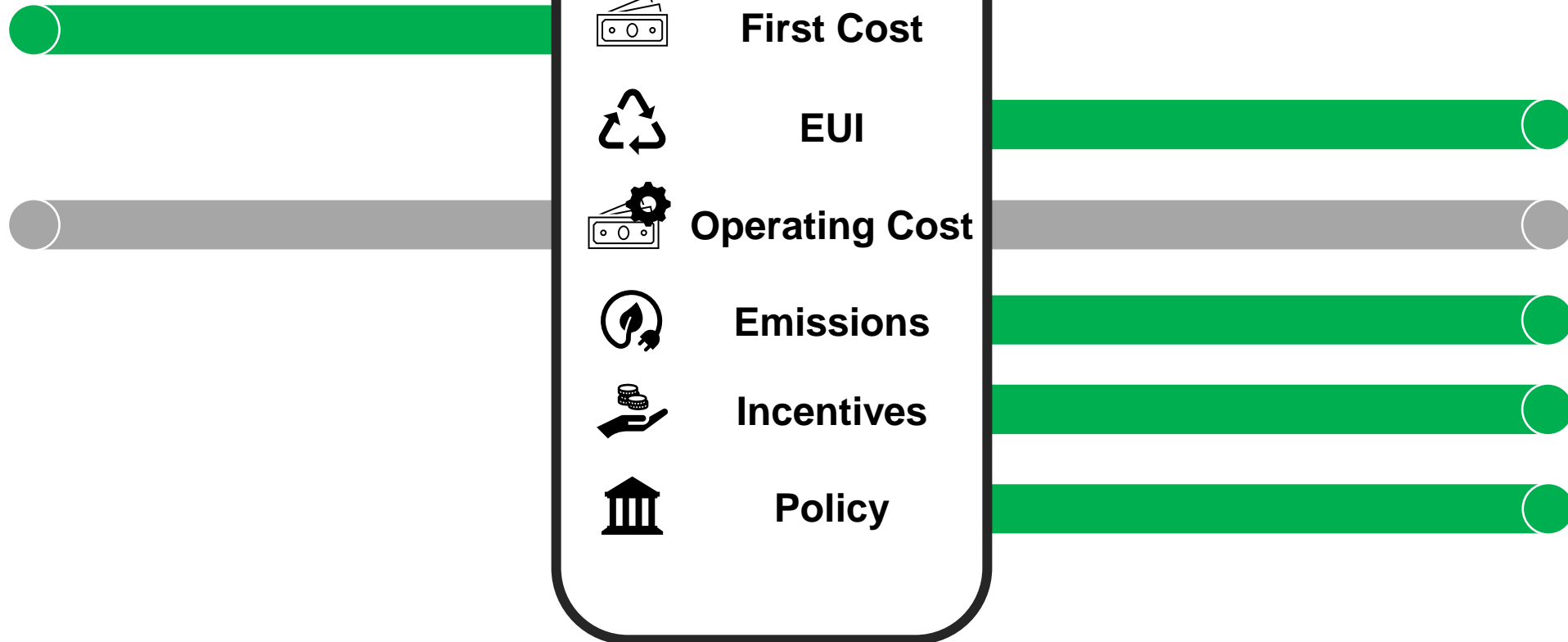




PHOTO CREDIT: NBBJ

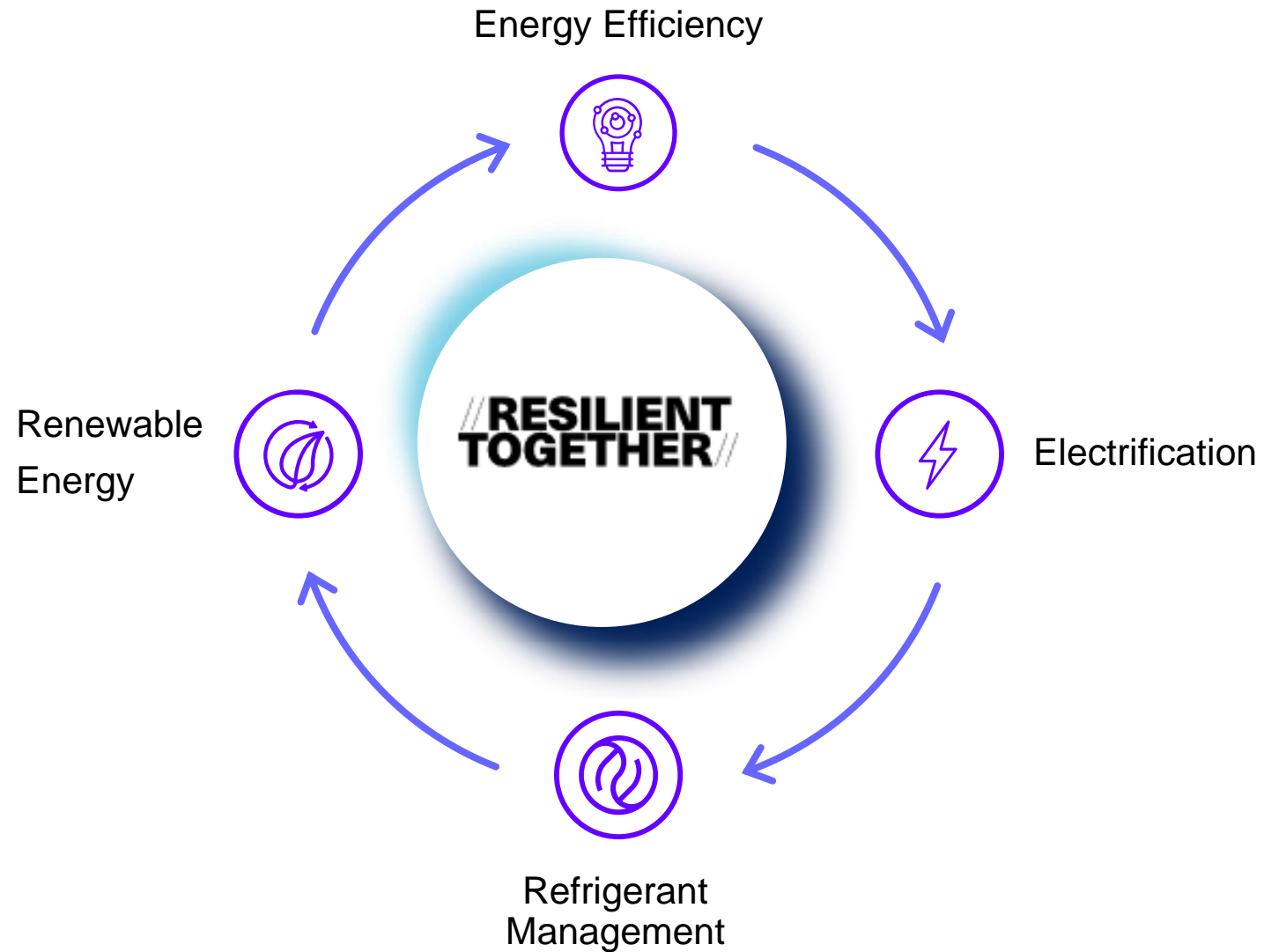
REDMOND CAMPUS CENTRAL UTILITY PLANT

REDMOND, WA / 62,247 SF / IN PROGRESS

This Central Utility Plant (CUP) project is designed for a 10,500-ton chilled water plant with heat recovery and geo-thermal energy exchange that will support the new East Campus Modernization which consists of 17 new buildings (approx. 3,000,000 square feet) on a 72-acre site. Mechanical design is shared by MacDonald-Miller and AEI. Architecture by NBBJ.

[crestia-social-share]

Decarbonization Levers



How to account for refrigerant emissions



Pull Charge

75 Lbs



Re-Charge

100 Lbs

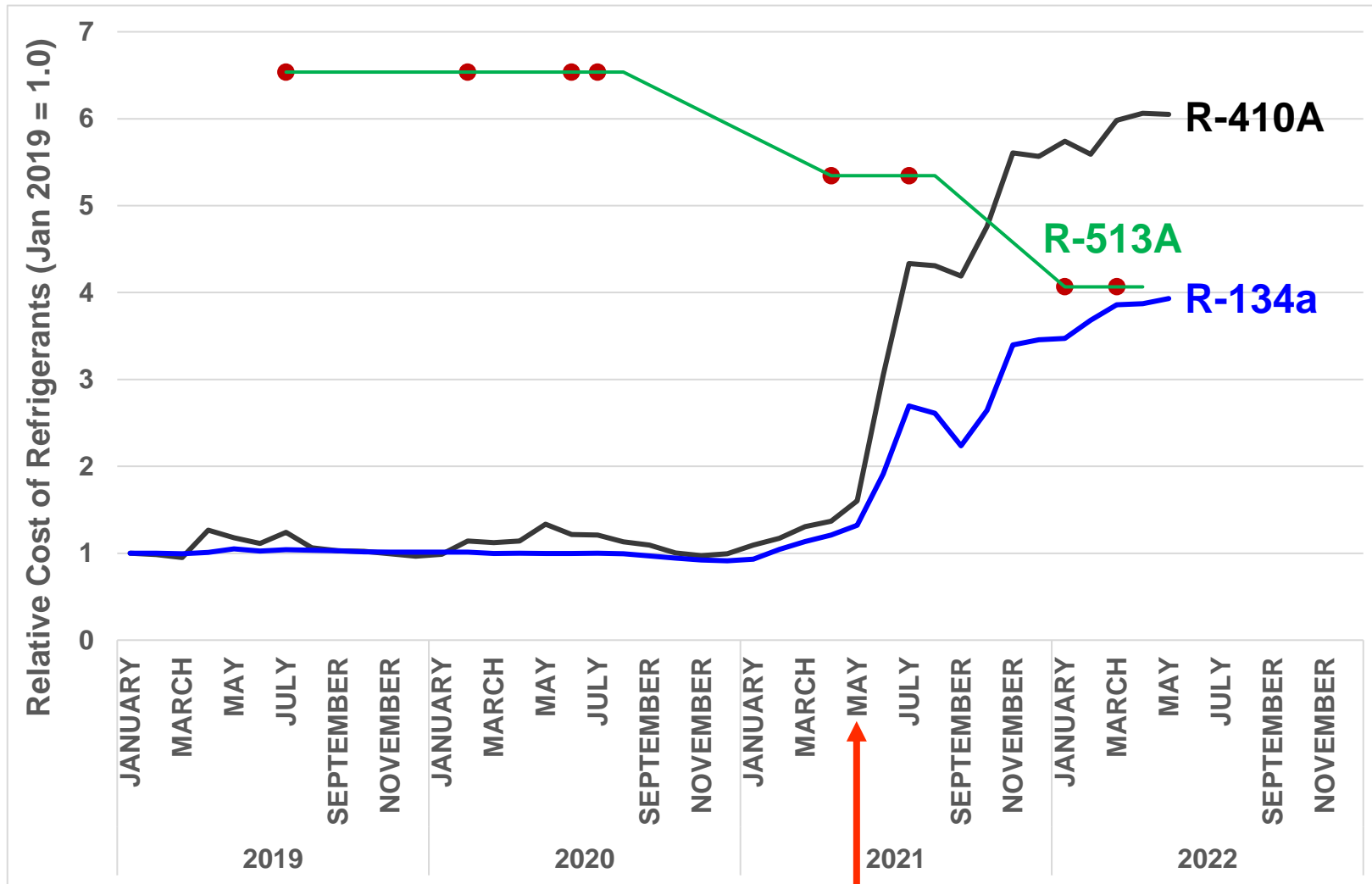


25 Lbs lost to atmosphere

2088 GWP of R-410A

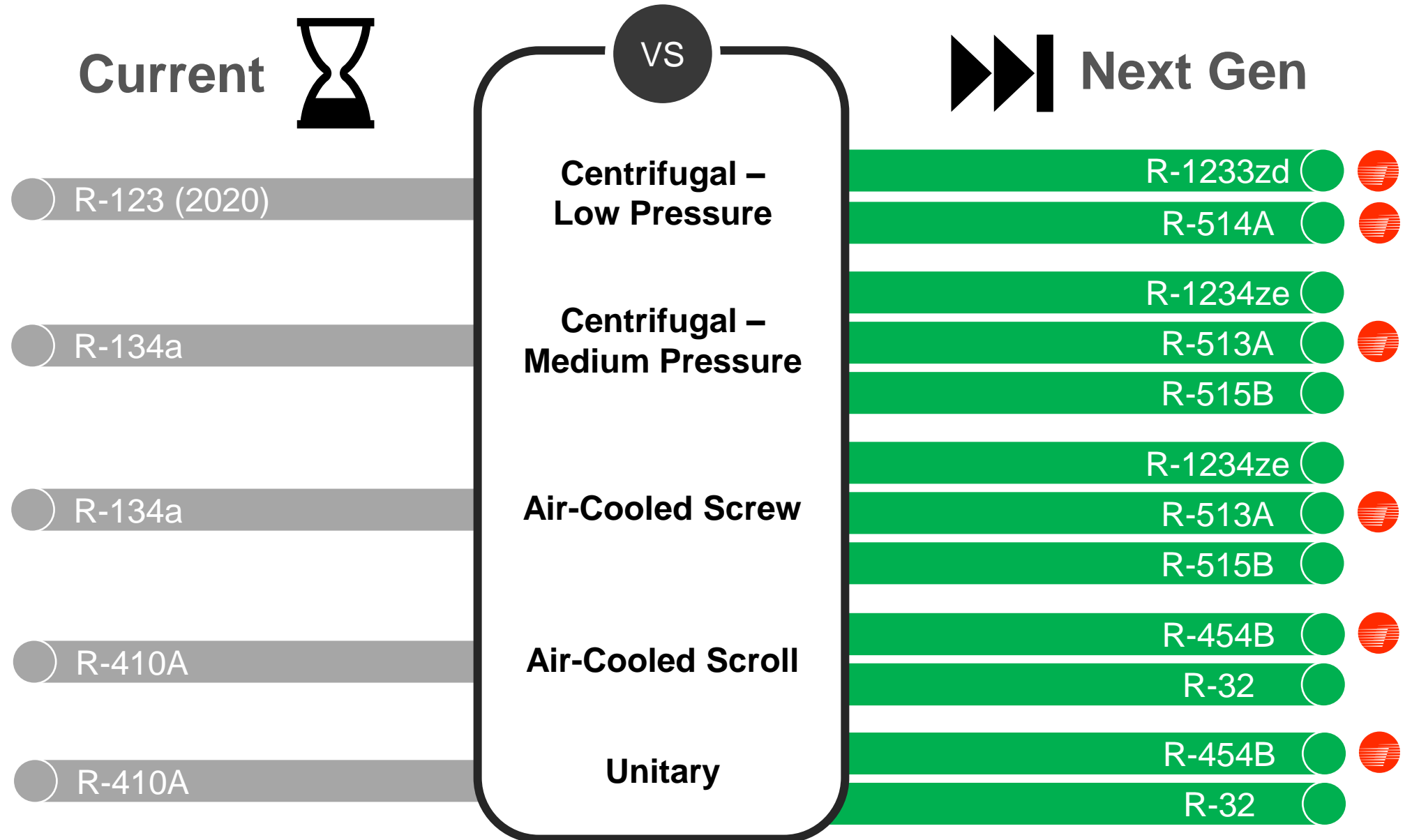
52,200 LBS CO₂e

Why does this matter?

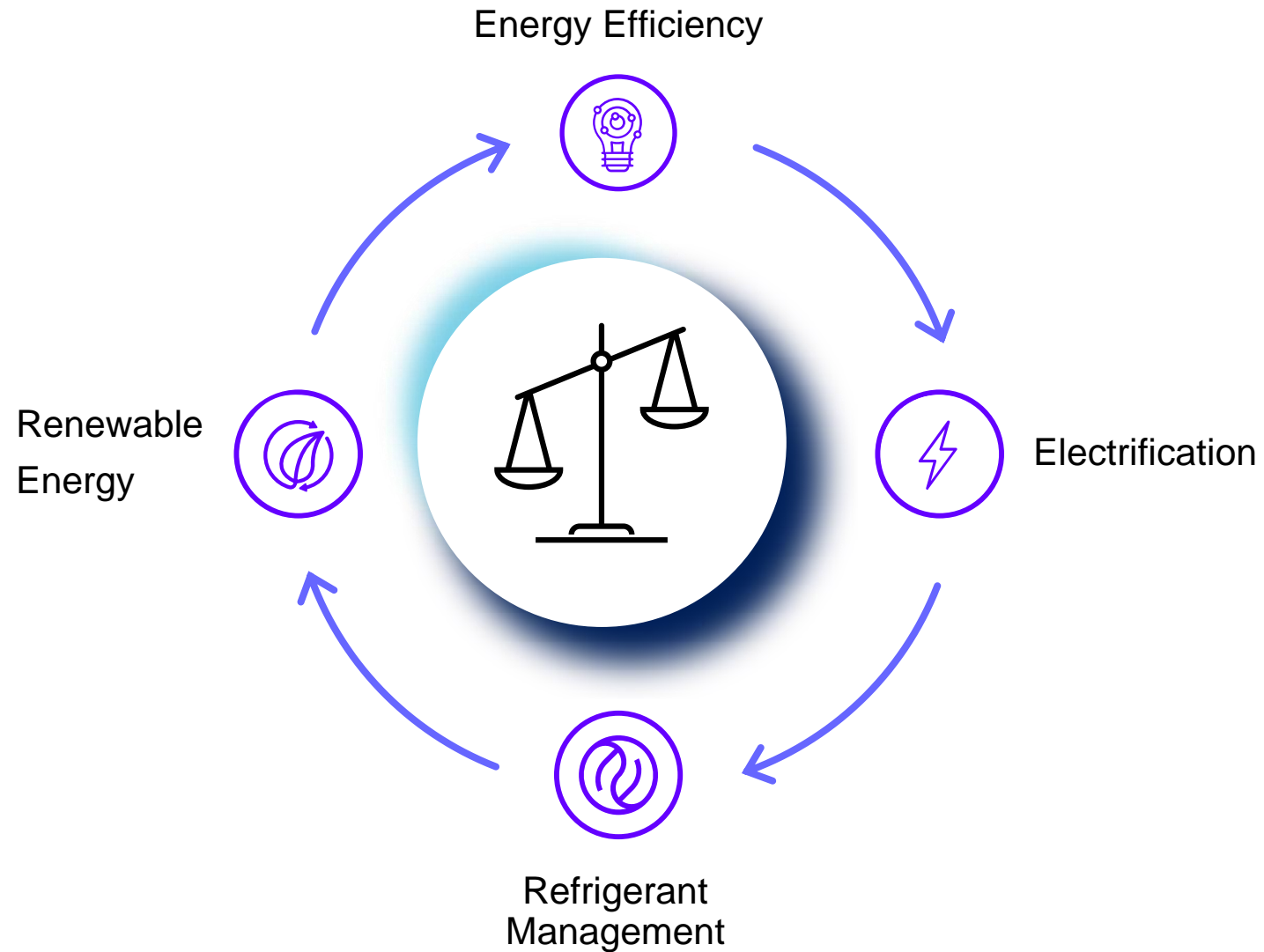


U.S. EPA Announces HFC Allocation Rule

Refrigerant Comparison – North America



Decarbonization Levers





Thank you!

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