

Decarbonization of the Built Environment: Business Case for Investing in Sustainability





Alternate title:

Why is this worth so much...?

Reason #1:
Because they said so.

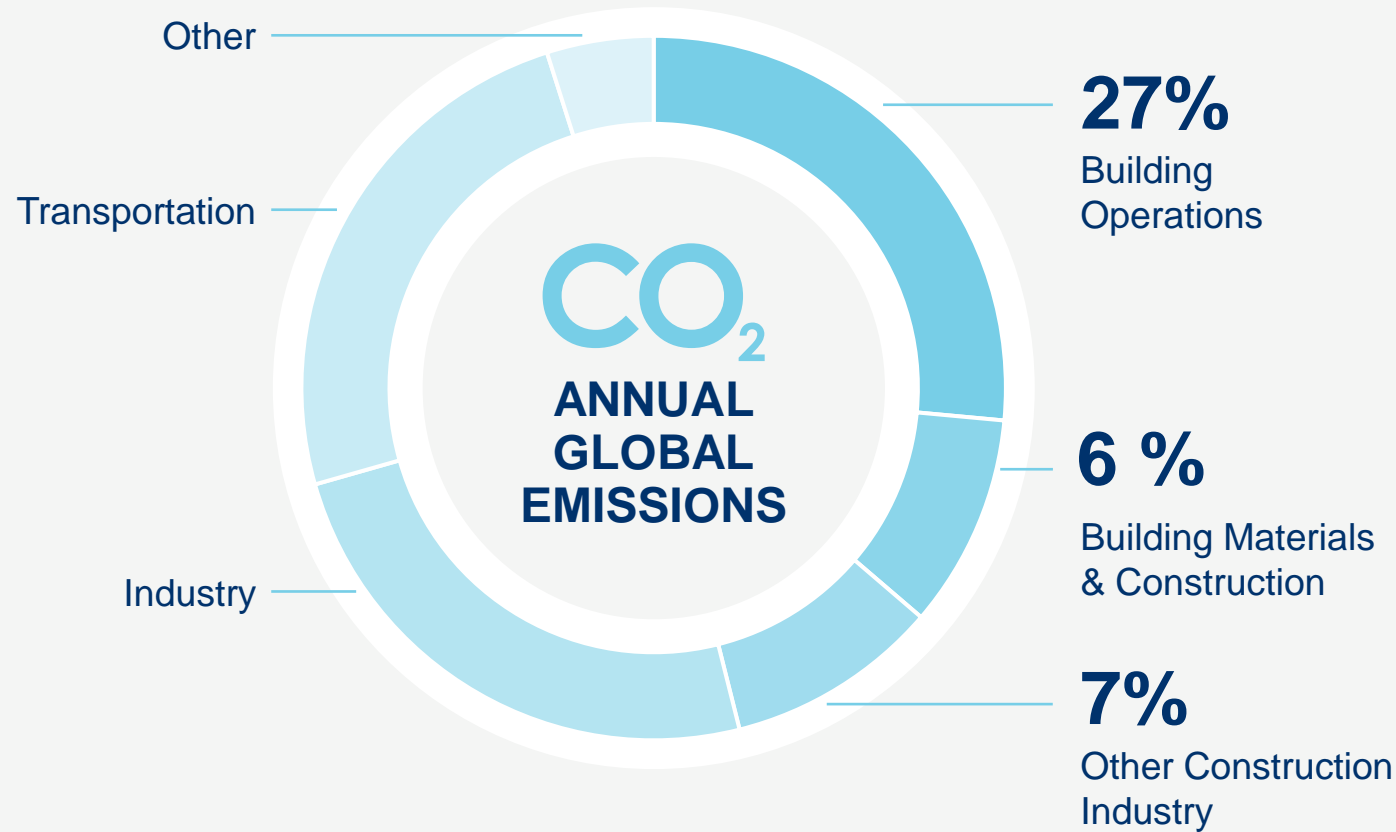
Walmart





Decarbonization:
the process of reducing or
eliminating carbon emissions

The Built Environment



Source: <https://architecture2030.org/why-the-building-sector/>



~40%
generated
by built
environment

Decarbonization Efforts

Crowded, Complex & Fragmented



**92% of S&P 500 companies
have committed to sustainability**

**NYC strengthens Climate Mobilization Act
building requirements**

**New York Developers Rush to Reduce
Emissions as Heft Fines Loom**

**SEC Disclosure Rules Focus on
Climate-related Financial Risks**

**Governor and Mayors of San Diego,
Sacramento & San Francisco
participating in National Building
Performance Standards Coalition**

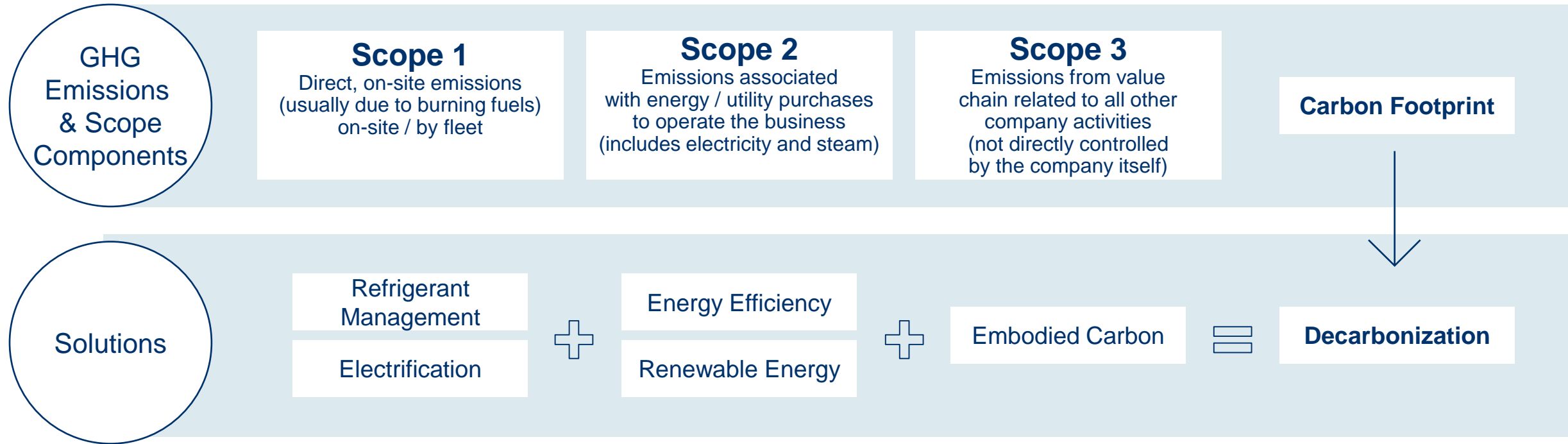
**Boston City Council adopted amendments and
strengthened the Building Energy Reduction
and Disclosure Ordinance**

**Miami Adopts Goal To Use
100% Renewable Energy**

**Minneapolis sets goal to reduce
GHG emissions 80% by 2050**

Understanding Carbon Emissions

3 Categories of Emissions



Why Should We Care?

It makes good business-sense



Remove Business Risk



Corporate Citizenship



Help Reduce Operational Cost

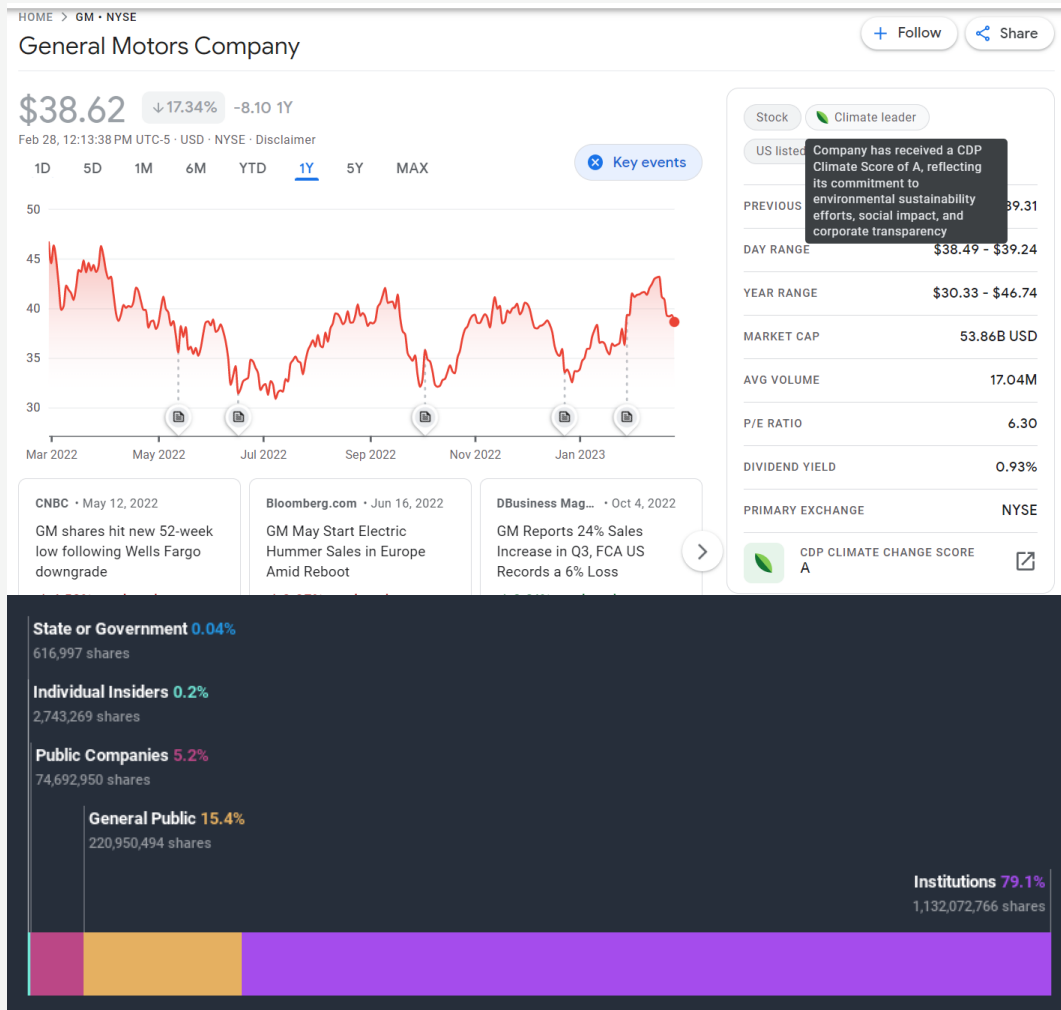
**US \$1 T
RISK**

Financial impacts of climate risks identified by 215 of the world's biggest companies

**US\$2.1T
OPPORUNITY**

Potential climate-related opportunities by 220+ companies with sustainability goals

Reason #2: Institutional Investors are Driving Change



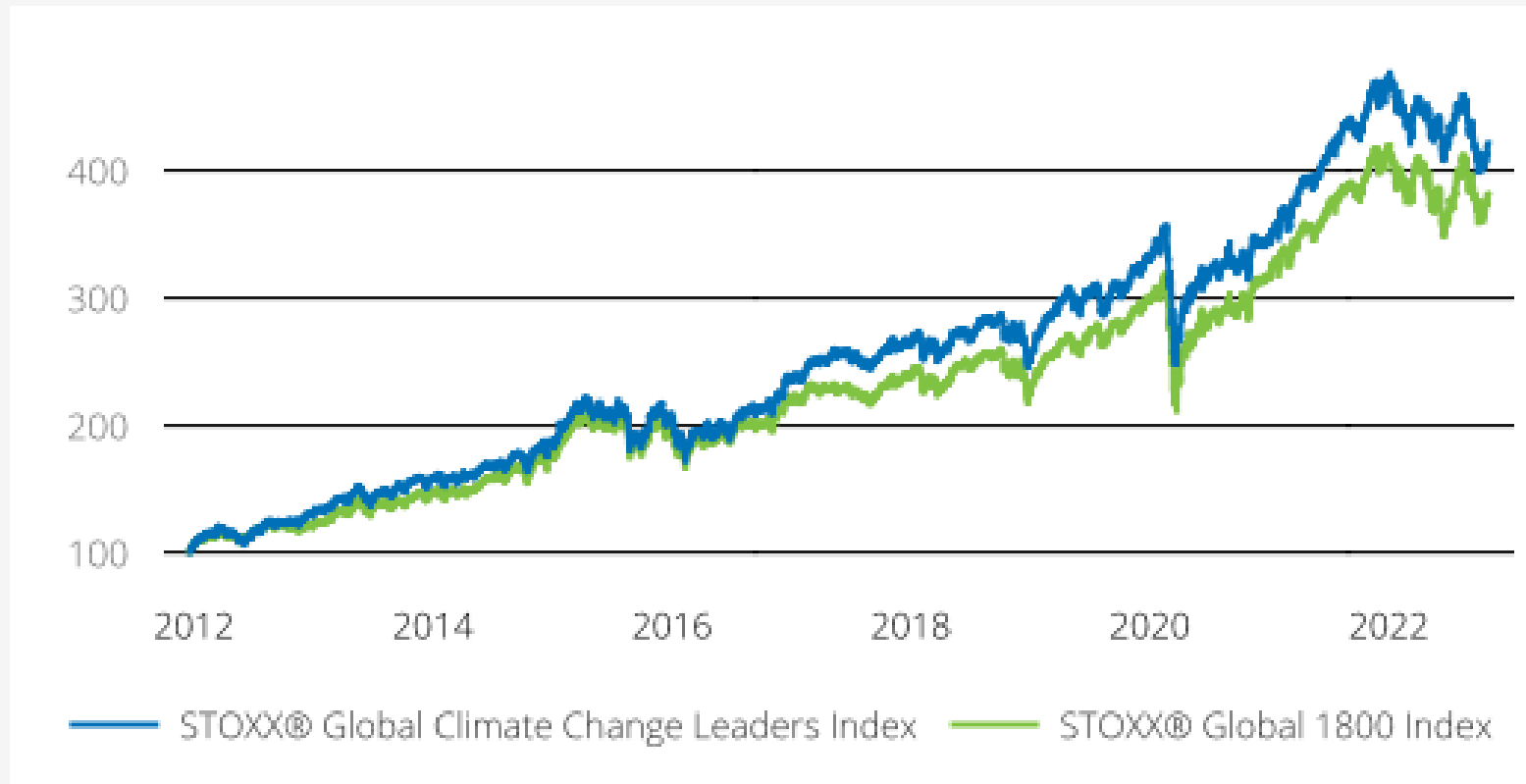
“There is no company whose business model won’t be profoundly affected by the transition to a net zero economy – one that emits no more carbon dioxide than it removes from the atmosphere by 2050...As the transition accelerates, companies with a well-articulated long-term strategy, and a clear plan to address the transition to net zero, will distinguish themselves with their stakeholders – with customers, policymakers, employees and shareholders – by inspiring confidence that they can navigate this global transformation.”

Larry Fink – CEO, Blackrock
in his 2021 Letter to CEOs



Blackrock owns 10.9% of Outstanding GM Stock

A-List Outperforms the Rest of the Market



Financial Performance

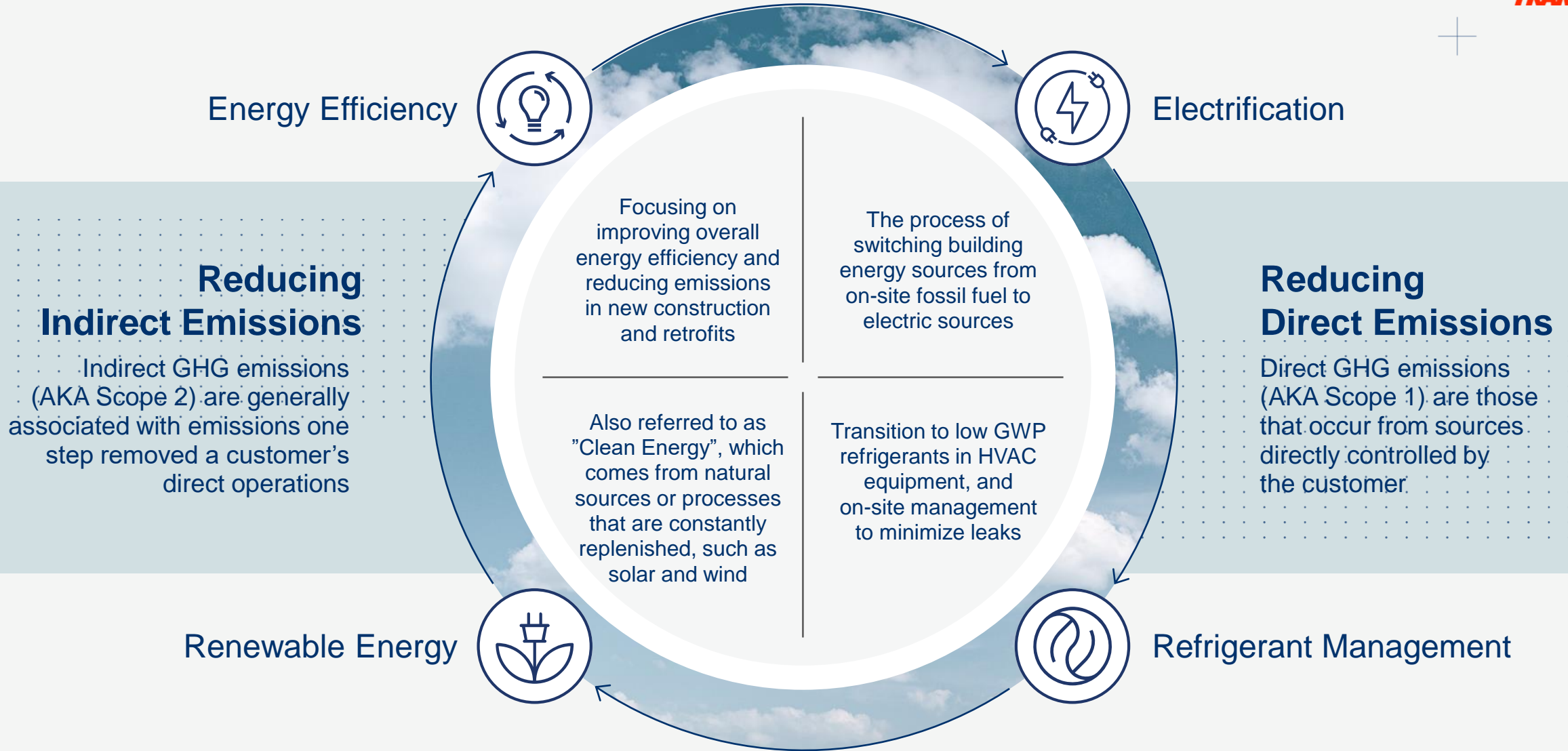
200 of the 13,126 companies that filed CDP disclosures on Climate Change received an 'A' Rating

These companies outperformed the reference index by

5.8%

per annum from 2011 to 2021

Pillars of Decarbonization



Energy Price Inflation Illustration

Energy Cost Intensities - Rolling Annual Average



This illustrative client example, with 100+ locations across the United States has experienced a:

8.5%

increase in
Rolling 12 month
Electricity prices

22.73%

increase in
Rolling 12 month
Natural gas prices

From December 2021 – Oct.
2022

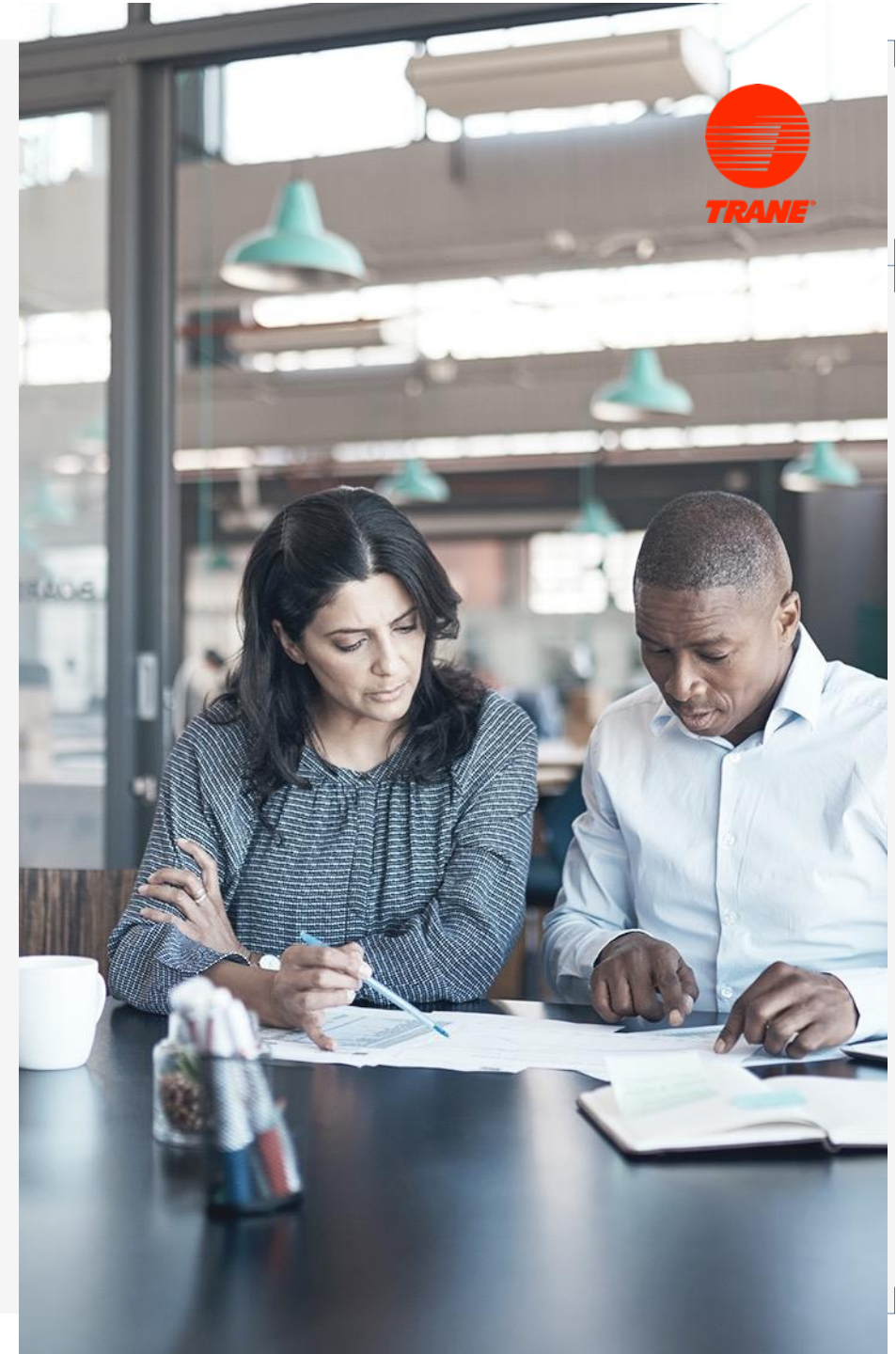
Reason #3:

Today's Workforce & Consumers are Picky

78% of MBA Students surveyed in 2022 reviewed their employer's environmental policy before accepting a position

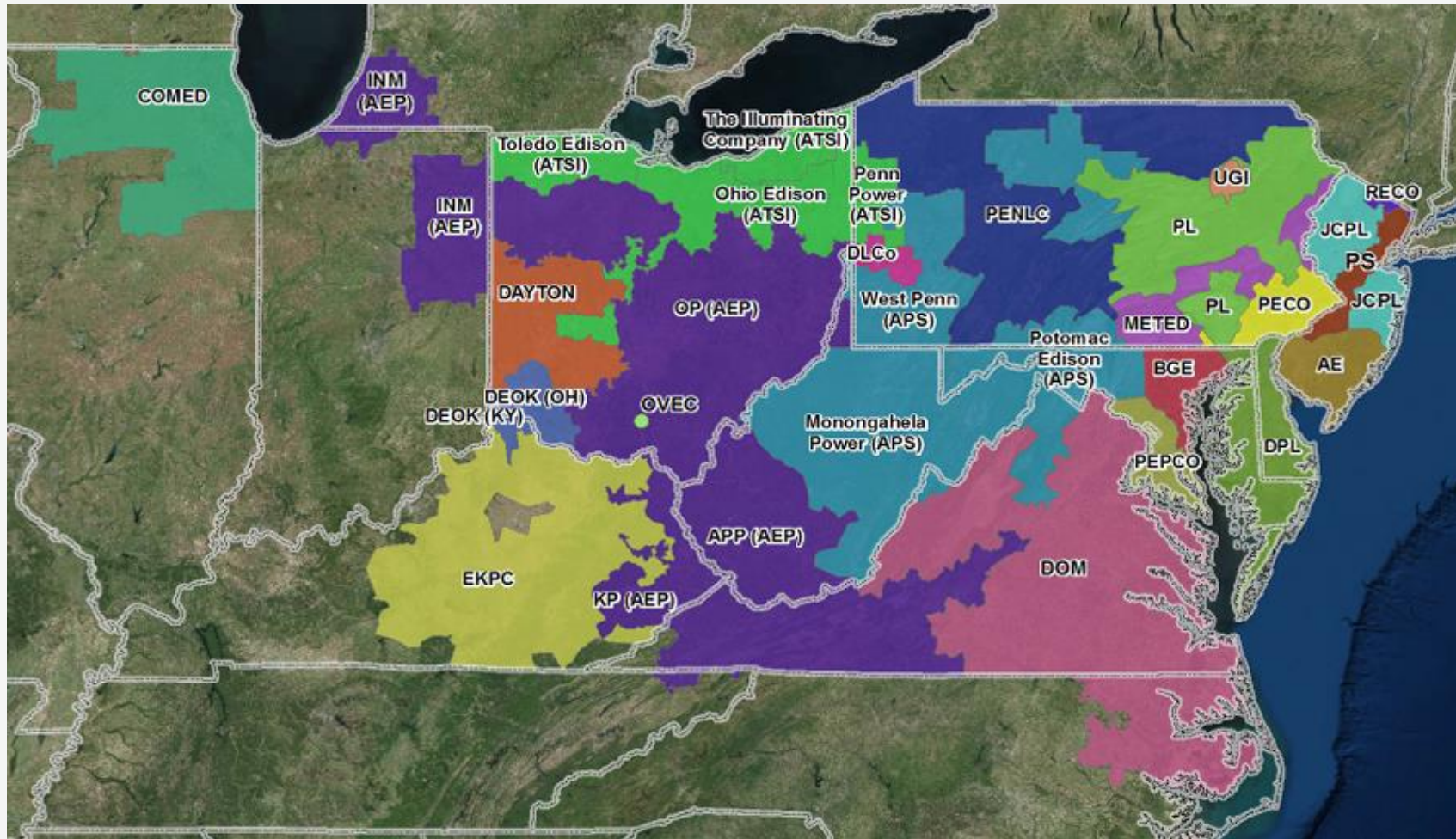
80% of the Fortune 500 have a published CSR Report


39% of consumers actively seek companies providing eco-friendly products & services



Decarbonization & the Electric Grid

The Impact on Electricity Transmission and Why it's Important to PJM



An aerial night photograph of a city, showing a dense network of streets and buildings illuminated by warm, golden-yellow lights. The lights create a complex, web-like pattern against the dark background of the city. A semi-transparent white rectangular box is overlaid on the left side of the image, containing text.

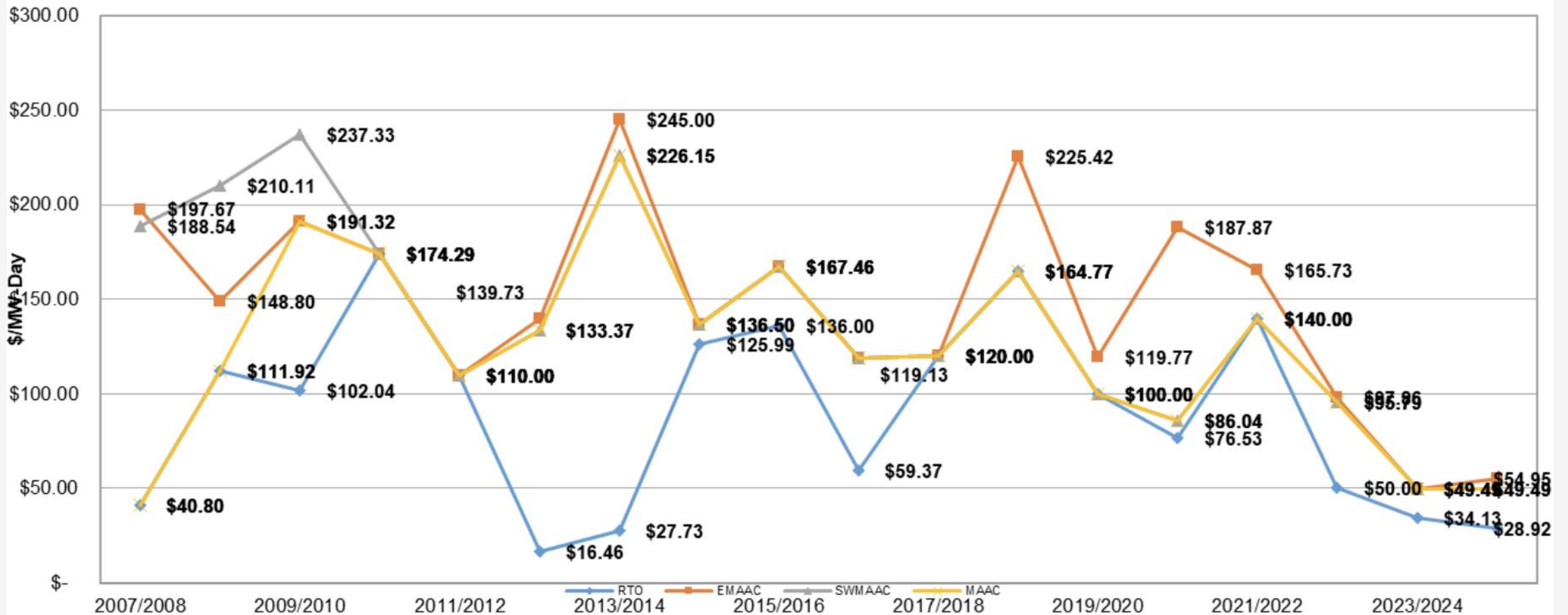
The cleanest and least expensive energy is the energy that never has to be produced.

Power Market Pricing & the Need for Decarb Efforts

At these prices, who wants to invest in new generating assets?



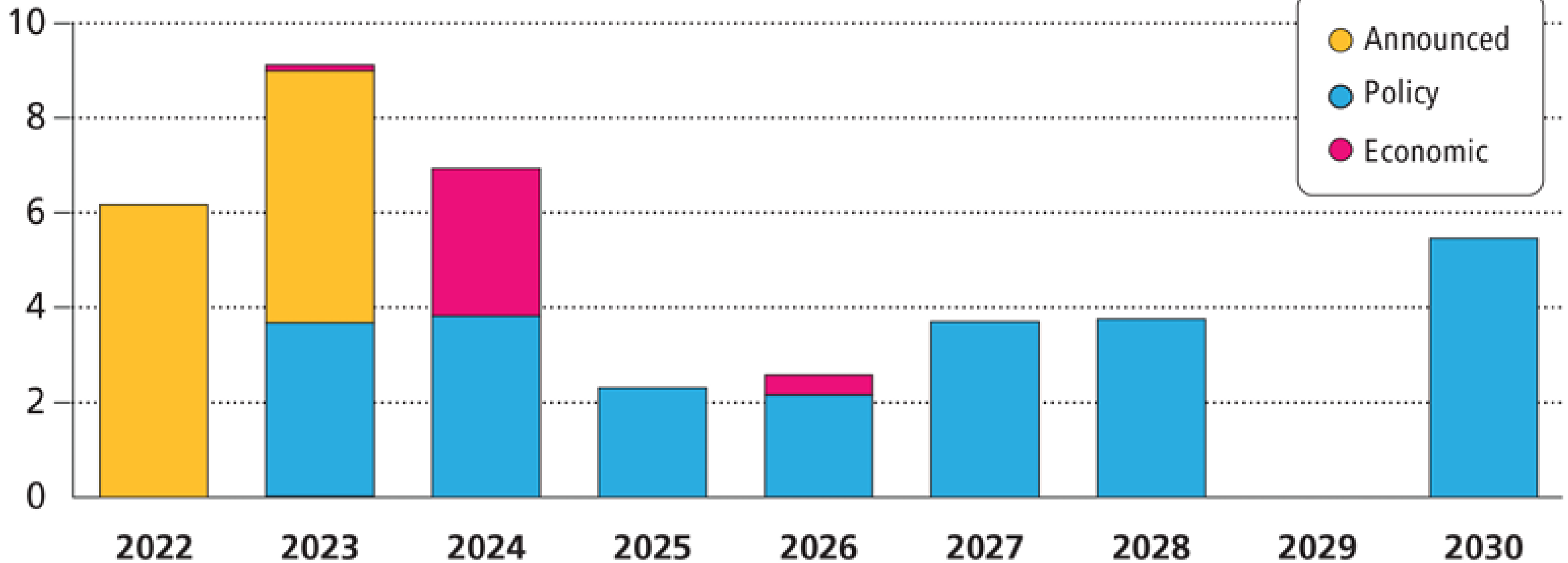
RPM Base Residual Auction Resource Clearing Prices



Generating Capacity Retirement Forecast








Retirement Capacity (GW ICAP)



Ensuring Future Capacity



Balance Sheet Summary (2022–2030)

Retirements	New Entry Wind/Solar ⁶	New Entry Standalone Storage	New Entry Thermal	Load Growth
40 GW 60% Coal 30% Natural Gas 10% Other	Low = 48 GW-nameplate / 8 GW-capacity High = 94 GW-nameplate / 17 GW-capacity	Low = 3 GW High = 4 GW	Low = 4 GW High = 9 GW	2023 Forecast = 11 GW Electrification Forecast = 13 GW
				
Unless otherwise noted, thermal capacity values are expressed in ICAP, without adjustment for EFORD.				

The Role of Energy Efficiency & Demand Response



Delivery Year	2021/2022	2021/2022	2022/2023	2022/2023	2023/2024	2023/2024	2024/2025	2024/2025
Data	Offered	Cleared	Offered	Cleared	Offered	Cleared	Offered	Cleared
	UCAP	UCAP	UCAP	UCAP	UCAP	UCAP	UCAP	UCAP
Coal	53,444	47,531	45,754	39,230	37,164	31,811	35,114	31,532
Distillate Oil (No.2)	3,254	3,155	3,178	2,897	2,894	2,855	2,776	2,674
Gas	78,863	76,164	85,562	79,329	85,217	81,643	85,469	83,258
Nuclear	32,541	21,898	31,944	26,140	31,960	31,960	31,835	31,629
Oil	5,218	3,955	2,674	2,527	2,350	2,269	2,493	2,220
Solar	644	589	2,633	2,096	2,945	2,935	4,234	4,232
Water	7,239	6,760	6,917	6,749	6,375	6,375	6,137	6,137
Wind	1,551	1,526	2,595	1,839	1,608	1,416	1,396	1,396
Battery	-	-	-	-	16	16	36	36
Hybrid	-	-	-	-	-	-	10	10
Other	1,419	1,318	1,205	1,168	1,185	1,185	1,153	1,153
Demand Response	12,114	11,353	10,604	8,903	10,652	8,631	10,334	8,180
Aggregate Resource	-	-	484	386	511	511	503	503
Grand Total (w/o EE)	196,288	174,249	193,551	171,263	182,875	171,605	181,491	172,961
Energy Efficiency	2,955	2,832	5,057	4,811	5,471	5,471	8,417	7,669
Grand Total (w/EE)	199,243	177,081	198,608	176,073	188,346	177,076	189,908	180,630

Monetizing Energy Efficiency and Decarbonization



AmericanEfficient

PJM Market Energy Efficiency Initiatives



LIGHTING

VFD's

INSULATION

PUMPS

FANS

UPS

SERVERS

Measured data not needed

Carbon Market Initiatives



Renewables

Solar projects in US regions with the dirtiest grids, delivering the greatest carbon reductions and local economic benefits.

OFFSETS GHG SCOPE 2 & 3



Electrification

Building electrification projects that eliminate toxic, indoor fossil fuel use from the places where we live, work and play.

OFFSETS GHG SCOPE 1 & 3



Demand Response

Energy reductions delivered when demand is high and peaker plants are online, one of our greatest environmental justice opportunities.

OFFSETS GHG SCOPE 2 & 3



Measured Data Needed

Carbon Marketplace

Auditable—Traceable—Accountable



Decarbonize

All WattCarbon projects eliminate fossil fuels and replace them with clean energy production & technology.

Verified Impact

Open source carbon data verifies positive project impact.

Revenue-grade Reporting

Granular carbon accounting and savings calculations provide reporting confidence and transparency.

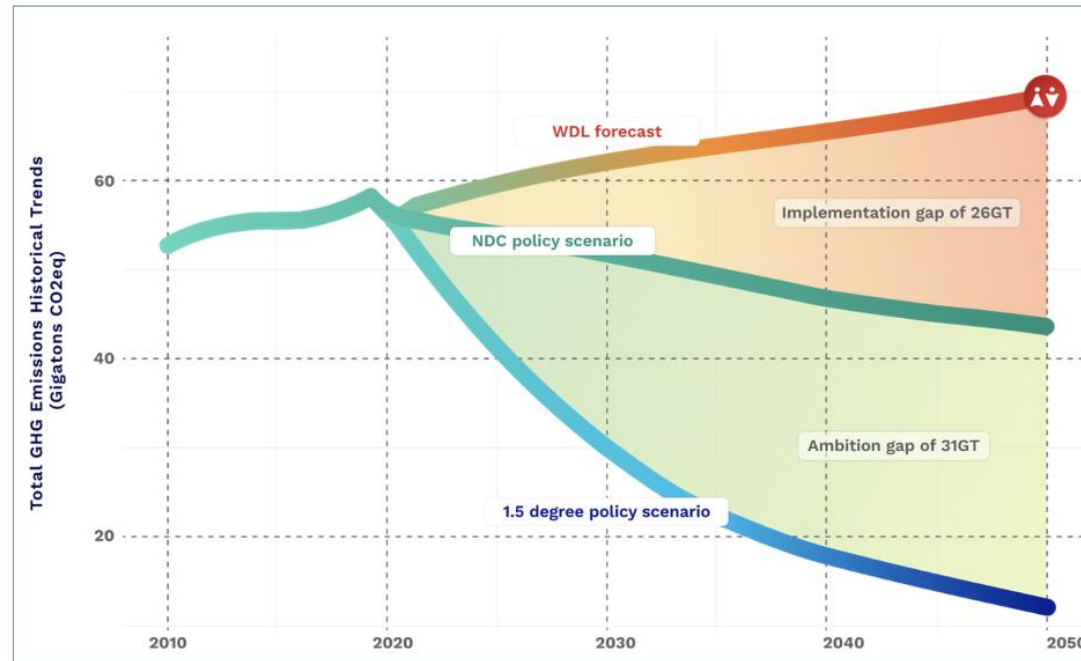
Impact powered by carbon intelligence

WattCarbon is powered by open source 24/7 carbon data, enabling a transformative shift in net-zero investing impact and measurement & verification standards.

Carbon Market Initiatives— Why Buildings



Decarbonizing buildings will eliminate 40% of annual GHG emissions, enough to meet the goals of the Paris Climate Accords. By focusing net-zero goals on eliminating emissions, we can realistically transition to a low-carbon economy within two decades.



Total GHG Emissions, Historical and Projected. Source: [The Brookings Institute](#).

The technology exists today, but building decarbonization needs a jump start. Like any new technology, adoption is slow. High upfront costs, a slow-to-transition workforce, and behavior change are all barriers to action.

But these technologies are not consumer goods. They are critical infrastructure for a carbon free future. That's why we're reimagining building decarbonization and creating new incentives to accelerate the transition to 100% clean buildings. Join us.

Innovation in Decarbonization Technologies



Thermal Energy Storage



Provides demand flexibility and can reduce reliance on grid (thus reducing costs)



Enables renewable energy and decarbonization



Offers reliable power redundancy and assurance

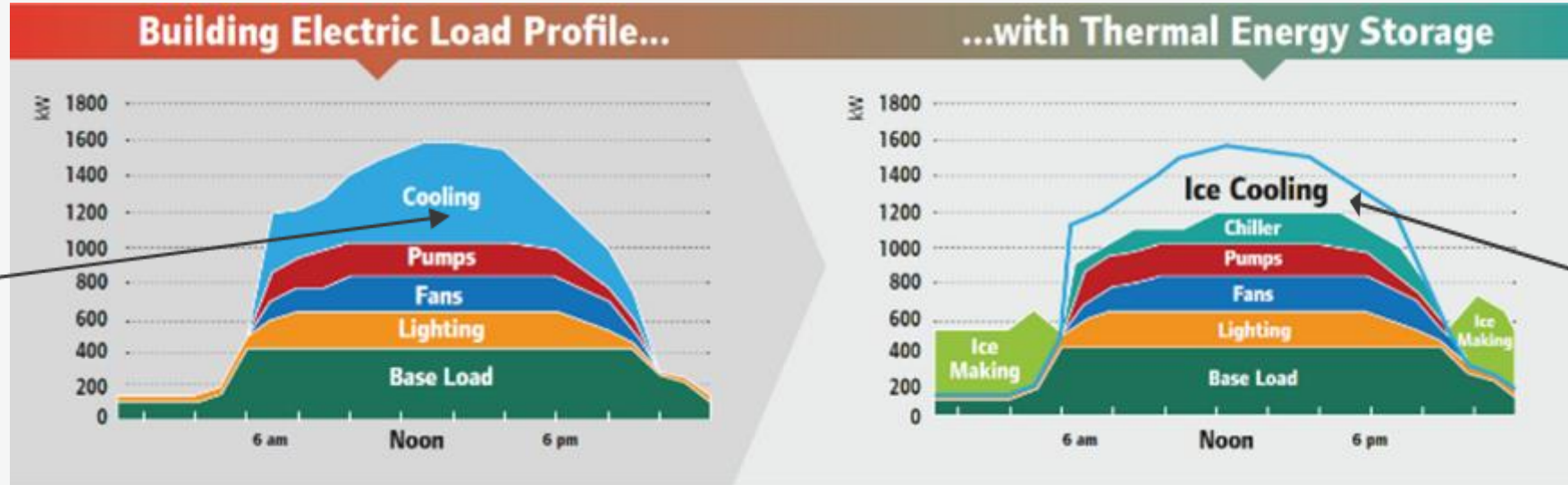


Incentivized by utility programs, federal tax incentives, and local funding programs



**TES can
increase use of
renewables by
up to 50%**

Shift Building Demand by Cooling with Thermal Batteries™



Air-conditioning can account for over 40% of the summer peak-day load

Reduced need for peaking plants & other redundant grid infrastructure

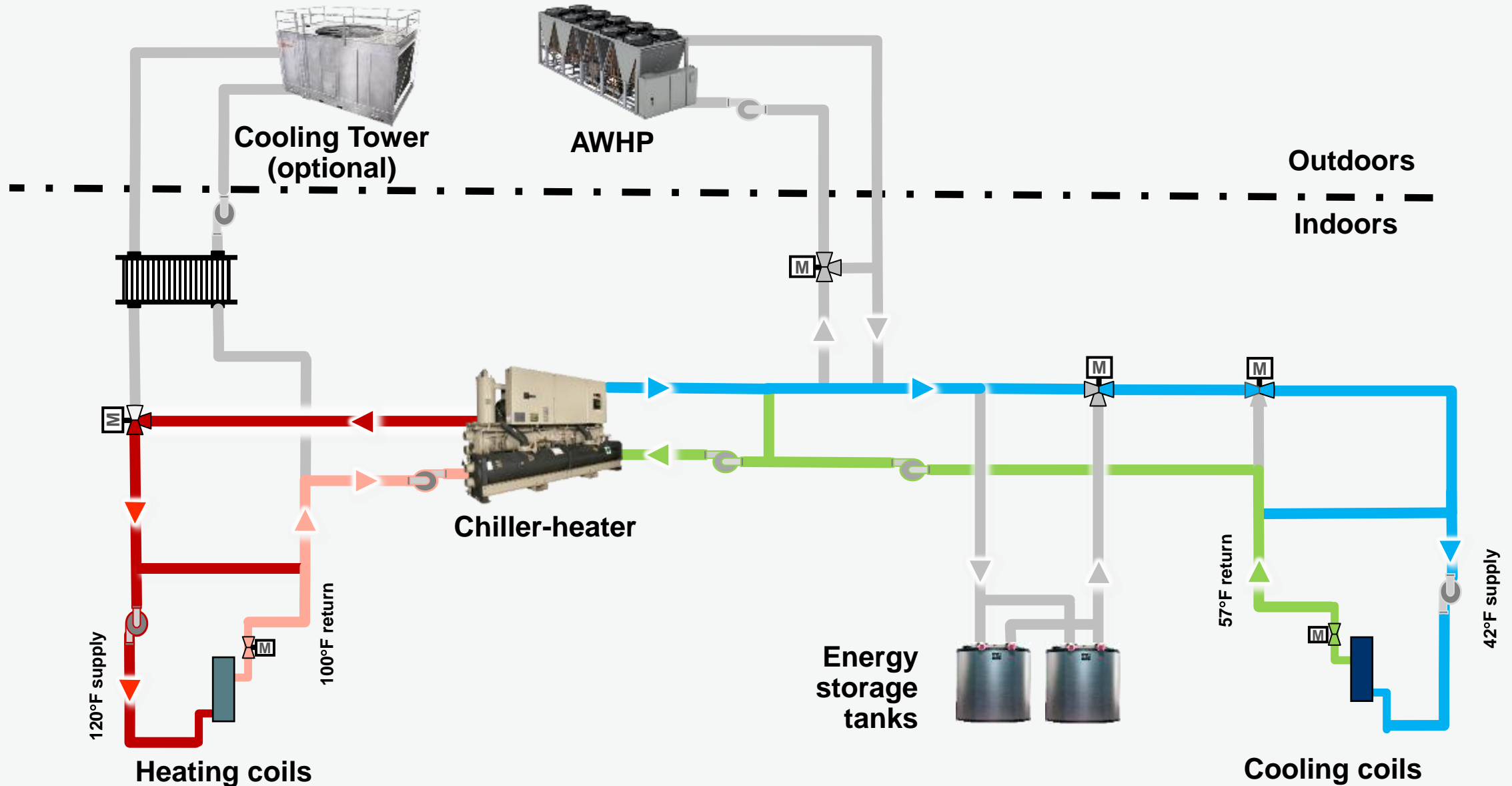
Thermal Batteries™ meet grid challenges

- Addressing **critical** utility/grid peaks
- Avoid **expensive** and **high-emission** peaker plants
- Supporting **advanced grid services** and **demand response**



Reducing Carbon Footprint with Thermal Batteries

Storage Source Heat Pump System with Cooling Tower



Key Ideas Regarding System Operation



- **Outdoor air** is the primary source of building cooling and heating using the **AWHP**. Cooling tower provides supplemental building cooling as needed.
- CALMAC **Thermal Storage Batteries** balance the net heat flow of all equipment and loads.
- **AWHP** is able to “**cool charge**” (freeze water) or “**heat charge**” (melt ice) the CALMAC Thermal Batteries when conditions are favorable.
- CALMAC[®] thermal batteries will directly **cool the building** (melt ice) to **shift the electrical load** and **limit electrical demand** in cooling season or **to store building heat** during heating season.
- **Chiller Heater** units will be used for thermal battery source **building heating** (freezing water) with hot water supply (**130F**) during **any** outdoor conditions (**including below 0F**).

Heat Pumps Combined with Thermal Storage...



Adds energy recovery

Time independent capture of excess heating or cooling

Outdoor space

Helps to reduce Space for Heat Pumps by up to 50%

Extends operating range for heat pumps to cold climates

Heat Pump Systems operations below 0 degF

Potential tax credits, rebates, carbon footprint reduction

Significant change to the Business Case



Technological Advancements



Chiller-Heater Systems

Chillers can provide cooling as well as heating by configuring them with heat recovery or heat pumps. Heat recovery is a common, extremely efficient first step to electrification.



Storage Source Heat Pump Systems

Thermal energy storage provides operational flexibility by capturing and storing reclaimed energy to heat the building efficiently and can optimize heat pump capacity.



VRF Systems

VRF heat pumps and heat-recovery systems offer versatile electric zoned heating and cooling.



Packaged Units and Split Systems

Efficient and effective heating with integrated heat pumps and hybrid systems.



Domestic Hot Water Systems

Heat2O water heater systems are designed to produce high volume domestic hot water for commercial facilities in any climate.



Heat pumps can be 3 times more efficient than other forms of electric heating