GSA Public Buildings Service

Road to Net Zero Buildings

Transforming our Future in Federal Buildings

PBS National Customer Forum
May 7 & May 8, 2024

Agenda

01 Key GSA Sustainability Drivers

02 Goals and Metrics

03 Energy Management in GSA Facilities

04 Conclusion and Discussion

Hi.

I’m Walter Tersch, GSA Sustainability Program Manager

- Background in environmental law; advancing project sustainability at GSA since 2009
- Lately focused on “Buy Clean”: reducing the environmental footprint of construction materials
- I work for the Chief Engineer within the Office of Architecture and Engineering

01 Key GSA Sustainability Drivers

Sustainability

The condition under which humans and nature can exist in productive harmony…

…ensuring that future generations are not disadvantaged by the current generation.

Strategic Backdrop

All Effective Policy Drivers Seek to Eliminate Emissions

zero emissions

Energy Independence & Security Act, 2007

- New construction & modernization: 90% fossil fuel free by 2025;
- 100% fossil fuel free by 2030

Newly finalized regulation!

Energy Act, 2020

- Accomplish 100% of energy efficiency projects identified in studies;
- 50% must be installed via Performance Contracting

Inflation Reduction Act, 2022

- $1.225Bn direct energy investment; none can be used for fossil fuel burning equipment

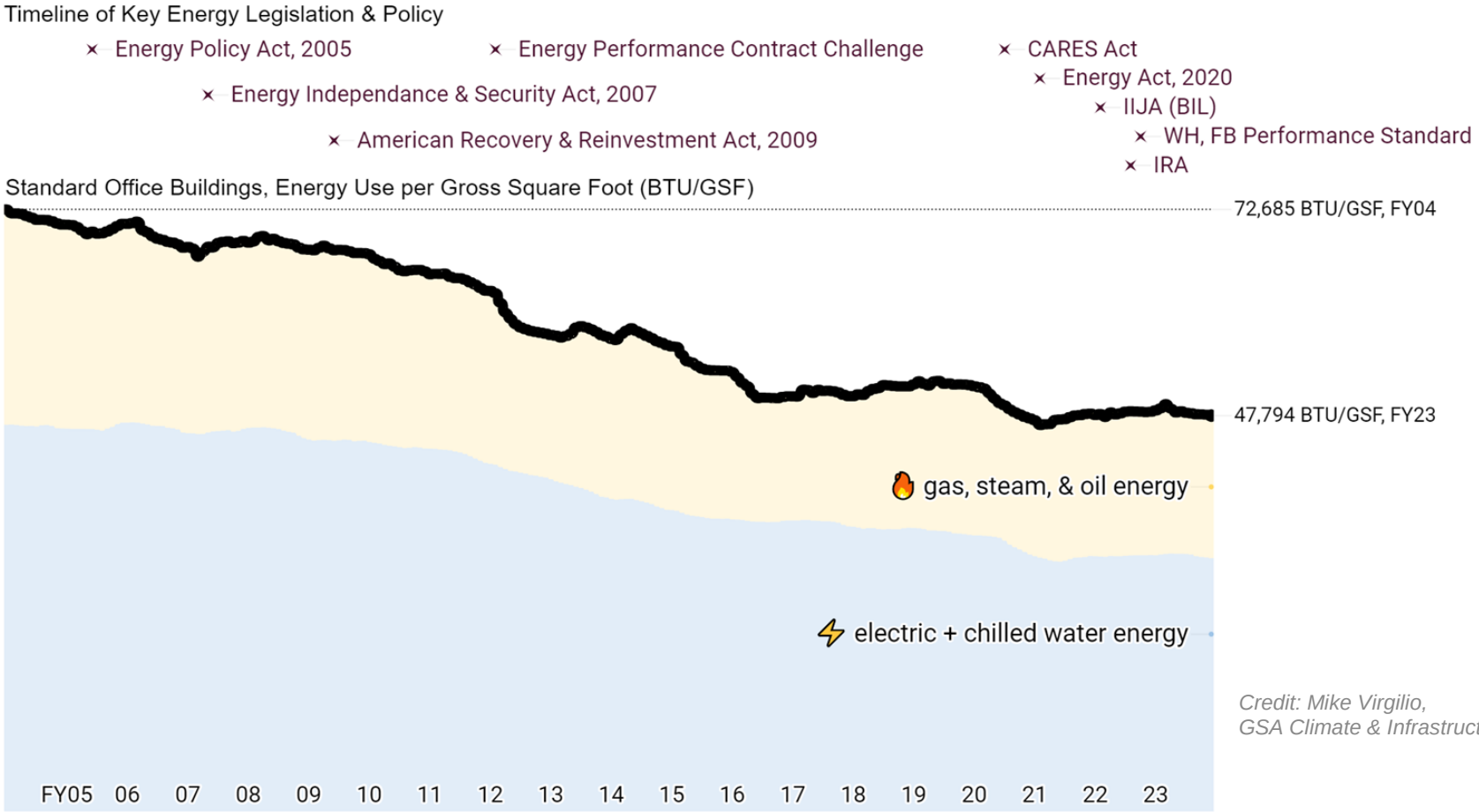
Executive Order 14057 & Building Performance Standard, 2022

- Reduce operational emissions by 65% by 2030
- 100% carbon pollution free electricity by 2030
- 100% net-zero building emissions by 2045
- 30% of applicable GSF must be all-electric by 2030

● directly supports electrification ● indirectly supports electrification

Credit: Mike Virgilio, GSA Climate & Infrastructure PMO

20 Years of Energy Policy Affecting Federal Buildings



Credit: Mike Virgilio,
GSA Climate & Infrastructure PMO

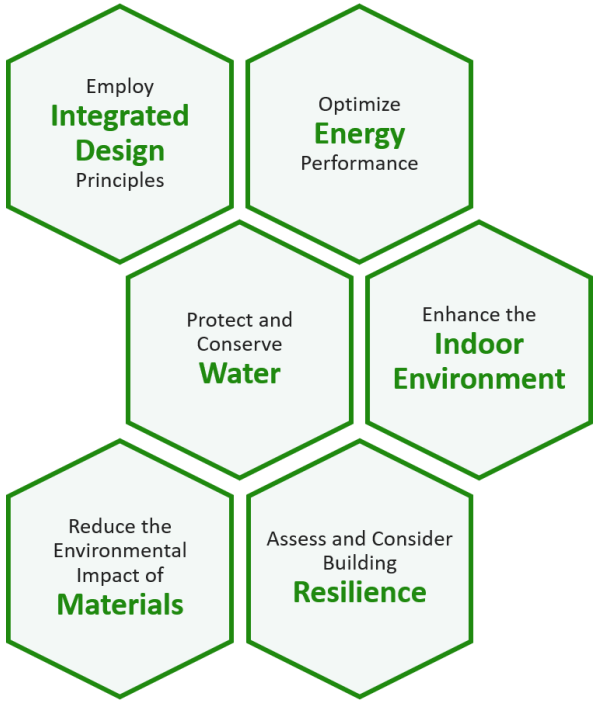
Executive Order 14057 summary

Executive Order (EO) 14057 *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (December 8, 2021) requires Federal government agencies to, among other things:

1. Reduce Scope 1 and 2 **greenhouse gas (GHG) emissions** (onsite combustion and purchased energy) 65% by 2030, compared to a 2008 baseline;
2. Pursue building **electrification** strategies in conjunction with carbon pollution-free energy, efficiency, and space reduction/ consolidation;
3. Design new construction and modernization projects greater than 25,000 GSF to be **net zero ready** (able to achieve net-zero operational emissions) by 2030;
4. Achieve climate **resilient** infrastructure and operations
5. Use 100% **carbon pollution-free electricity** on a net annual basis by 2030; and
6. Move toward net-zero emissions from Federal procurement, including through a **Buy Clean** policy promoting use of construction materials with lower embodied GHG emissions.

The Guiding Principles for Sustainable Federal Buildings

- New construction and major modernizations must follow GSA's 2022 Sustainable Design Checklist, starting at concept design.
  - Executive Order 14057 § 205(c)(iii) and P100 § 1.9.2.6
- Other key drivers include laws such as the Energy Independence and Security Act of 2007 (EISA) and the Energy Act of 2020



Inflation Reduction Act of 2022

Funding for GSA = $3.375 billion

$2.15 billion

for low embodied carbon (LEC) materials in construction and renovation projects.

$975 million

for emerging and sustainable technologies (E&ST).

$250 million

for measures to convert GSA facilities into High-Performance Green Buildings

- The LEC and E&S Tech funding must be 100% obligated by September 2026.
- GSA's appropriations are in IRA sections 60503, 60504, and 60502
- The Federal Highway Administration also received $2B for LEC material grants
- EPA issuing grants and providing technical assistance to improve material transparency

What is Embodied Carbon?

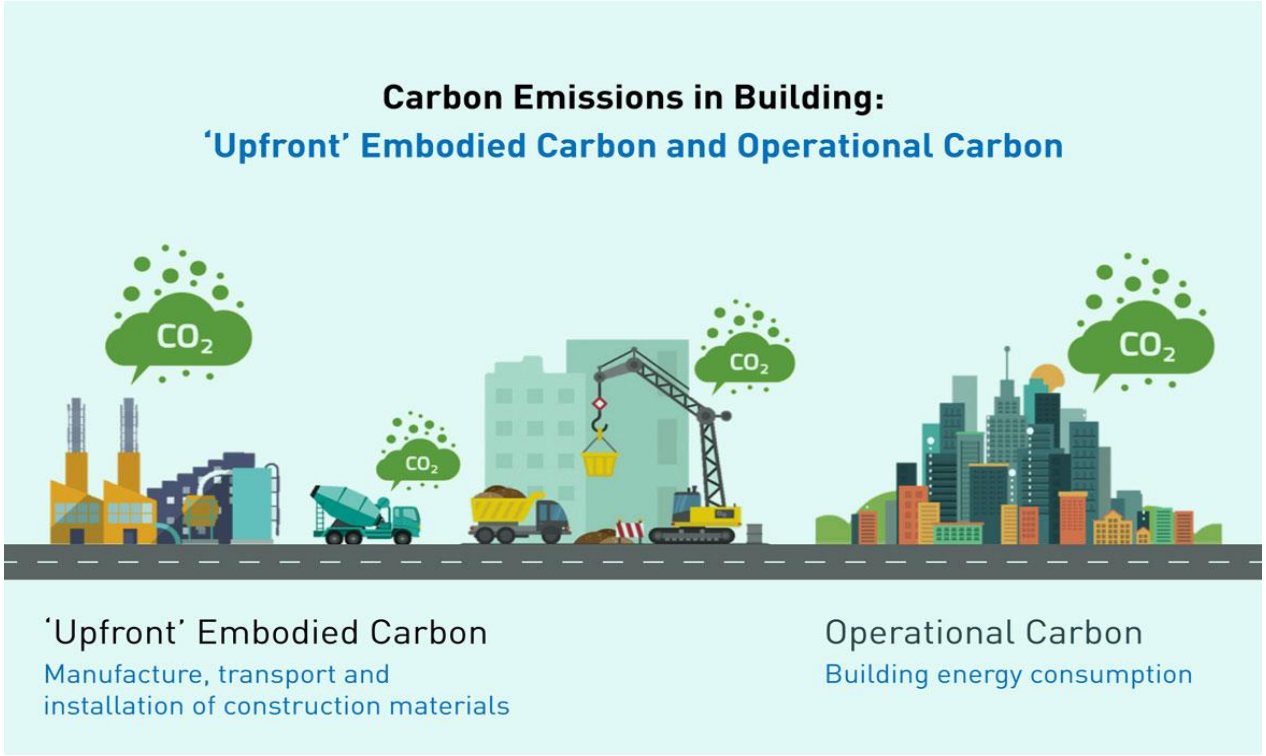
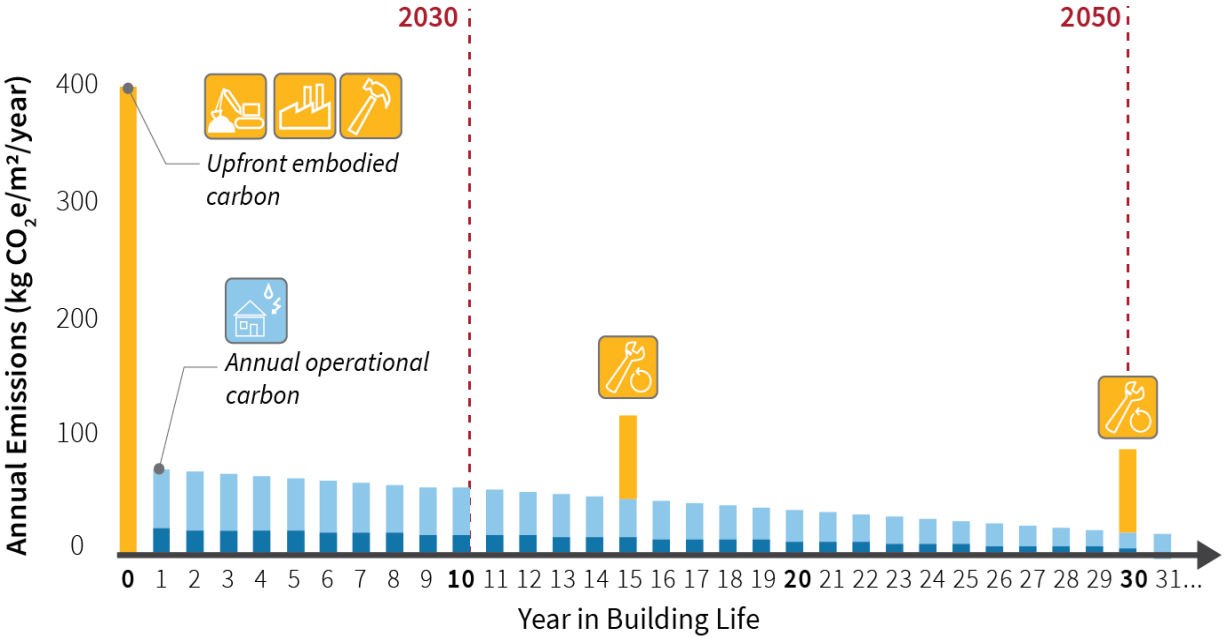


Image Credit: Building Transparency and Skanska USA

Embodied carbon refers to the greenhouse gas (GHG) emissions associated with the materials' manufacturing, transportation, installation, maintenance, and disposal.

Calculated as **global warming potential** (GWP). Expressed in metric tons of carbon dioxide equivalent **(CO2e)** within standard third-party verified environmental product declarations (**EPDs**)

Why is Embodied Carbon Important?



Embodied carbon

Scenario 1: Standard performance building

Scenario 2: High-performance building

	2030	2050
Embodied	67%	56%
Operational	33%	44%

Embodied carbon contributes more climate-changing emissions than 30 years of operating a high-performance (e.g. typical new GSA) building!

Image Source: *AIA-Carbon Leadership Forum Embodied Carbon Toolkit for Architects, 2021*

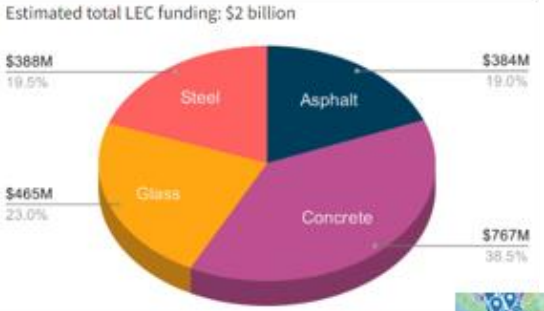
GSA Low Carbon Material Requirements

GSA set global warming potential (GWP) limits for concrete, asphalt, steel, and glass based on publicly-available industry average and product-specific EPDs, filtered by material type, PCR(s) specified in GSA's Requirements, North American geographical scope, and validity dates of 1/1/2022 or later.

We ran a six-month pilot starting 5/16/2023

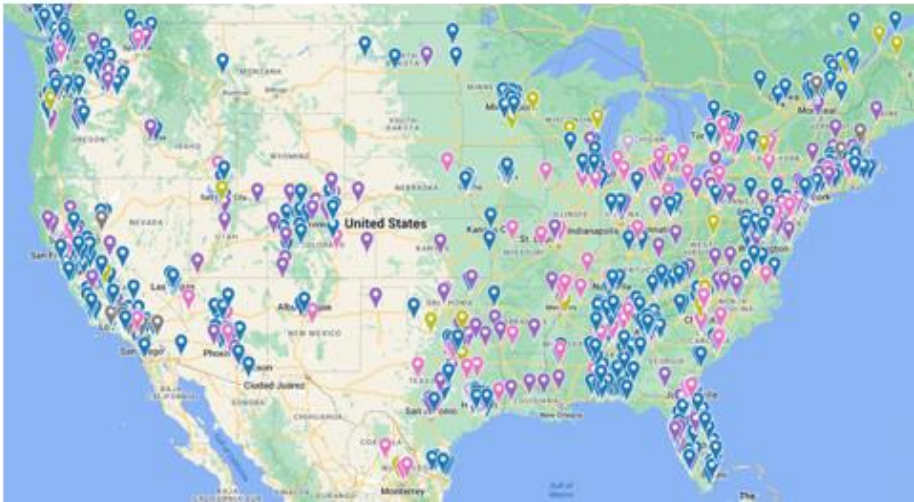
	GSA IRA Limits for Low Embodied Carbon Concrete (EPD-Reported GWPs, in kilograms of carbon dioxide equivalent per cubic meter - $kgCO_2e/m^3$)		
Specified concrete strength class (compressive strength [f'c] in pounds per square inch [PSI])	**Top 20% Limit**	**Top 40% Limit**	**Better Than Average Limit**
≤2499	**228**	**261**	**277**
3000	**257**	**291**	**318**
4000	**284**	**326**	**352**
5000	**305**	**357**	**382**
6000	**319**	**374**	**407**
≥7200	**321**	**362**	**402**

150 low-carbon material projects in 39 states



Currently-published concrete, asphalt, steel and glass EPDs based on EC3* data

**GSA does not endorse this nor any other third-party resource, tool, or service.*

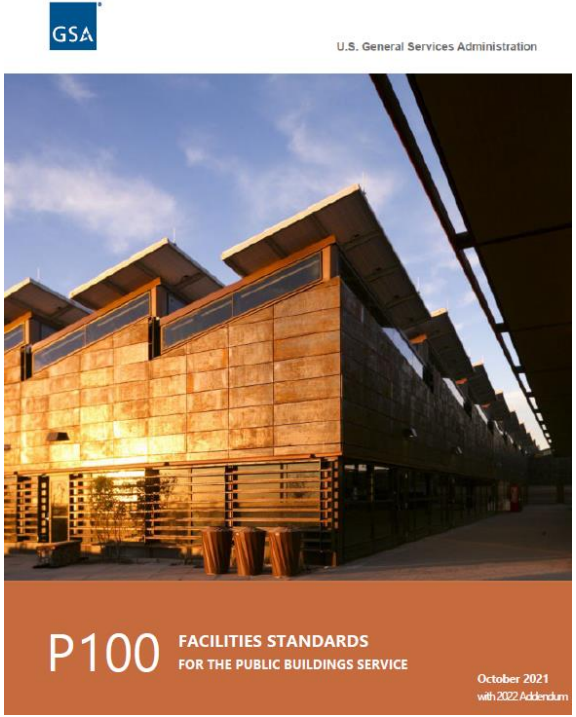


02 Goals and Metrics

2022 Addendum to GSA's P100 Facilities Standards

- Exceed ASHRAE 90.1-2019 energy efficiency by 30%
- All-electric space and water heating operation
- New material sustainability provisions:
  - **Concrete and asphalt** standards
  - **Whole-building life-cycle assessment**
  - **Buy Clean requirements for interior finishes** including environmental product declarations
  - EPA SNAP (Significant New Alternatives Policy) "acceptable" **refrigerants**
- Electric vehicle chargers

All GSA projects' design contracts signed 10/1/2022 and later must use this version of the P100. See gsa.gov/p100



PBS Climate and Sustainability Goals and Performance

Net Zero Operational Greenhouse Gas (GHG)

65% GHG Reduction by 2030

- Energy efficiency
- Fuel switching
- Carbon pollution-free electricity
- Refrigerants

Tons GHG & % GHG Reduction

Energy Use Intensity (Btu/GSF)

All-Electric Bldgs/Total Bldgs (%)

CFE (%) & Renewable (%)

HFC Leaks (lbs) & (MTCO2e)

Sustainable Portfolio

50% Buildings GSF

- Energy
- Water
- Resilience
- Indoor environment
- Waste
- Materials

% Sustainable Buildings

Energy Use Intensity (Btu/GSF)

Water Use Intensity (Gal/GSF)

Construction & Demolition

Waste Diversion (%)

Green and Net Zero Leases (%)

Safeguarding Assets

Net Zero Ready, sustainable and resilient buildings

- Net Zero
- Energy Savings
- EV Charging
- Embodied CO2
- Climate Risk Management
- Cost Savings
- Jobs

Net Zero Ready Buildings (#)

Utility Savings ($, Btu, Gallons))

EV Charging Stations (#)

Project Climate Profiles (#)

Job-Years (#) Created

Two Electric Facilities To Consider:

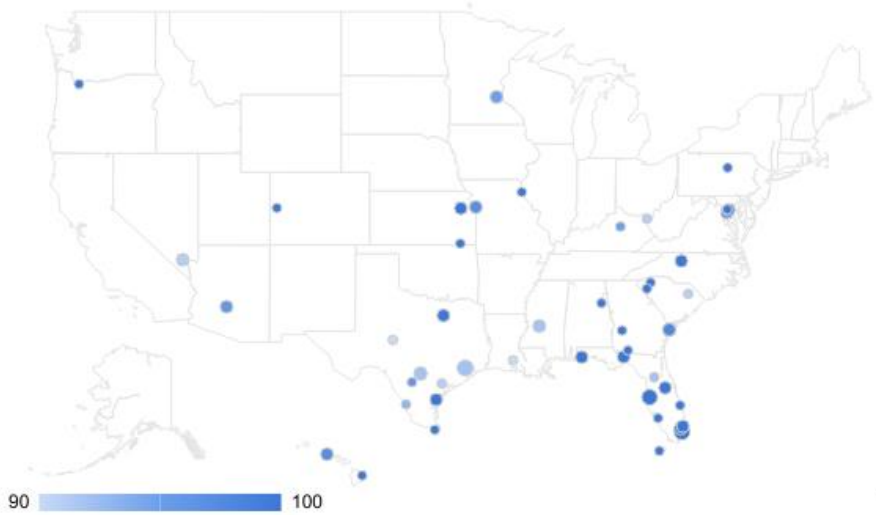
Credit: Mike Virgilio, GSA Climate & Infrastructure PMO

			Whipple Federal Center, MN0000TC					Carol Campbell Courthouse, SC0017ZZ			
			Value	Unit	Versus Service Center Average			Value	Unit	Versus Service Center Average	
Energy Usage											
	Total Energy Usage		36,522	BTU/GSF	-33%			34,456	BTU/GSF	-22%	
		Oct-Mar Energy Usage	20,383	BTU/GSF	-37%			17,237	BTU/GSF	-27%	
		Apr-Sep Energy Usage	16,139	BTU/GSF	-27%			17,219	BTU/GSF	-15%	
Energy Cost											
	Total Energy Cost		$1.15	/GSF	-35%			$1.06	/GSF	-23%	
		Oct-Mar Energy Cost	$0.61	/GSF	-33%			$0.54	/GSF	-22%	
		Apr-Sep Energy Cost	$0.53	/GSF	-38%			$0.52	/GSF	-24%	
Energy Rates											
	Total Energy Rate		$31.60	/mmBTU	-4%			$30.64	/mmBTU	-1%	
		Oct-Mar Energy Rate	$30.13	/mmBTU	+6%			$31.27	/mmBTU	+8%	
		Apr-Sep Energy Rate	$33.06	/mmBTU	-16%			$30.00	/mmBTU	-10%	
Operating Costs											
	Operations & Maintenance		$1.93	/SF	-35%			$2.74	/SF	-10%	

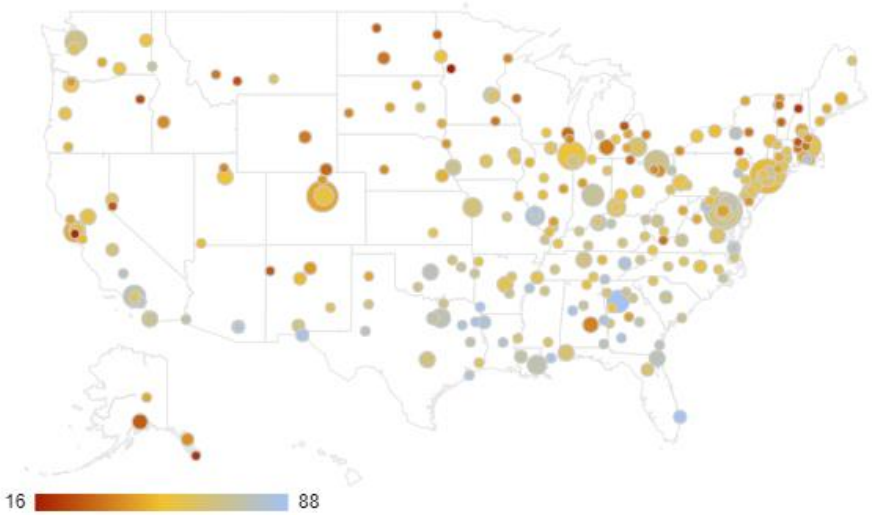
Lots of Work to Do…

Electricity Usage as Percent of Onsite Energy, Aggregated by City*

Electricity is 90% or More of Energy
(Electric and near all-electric)



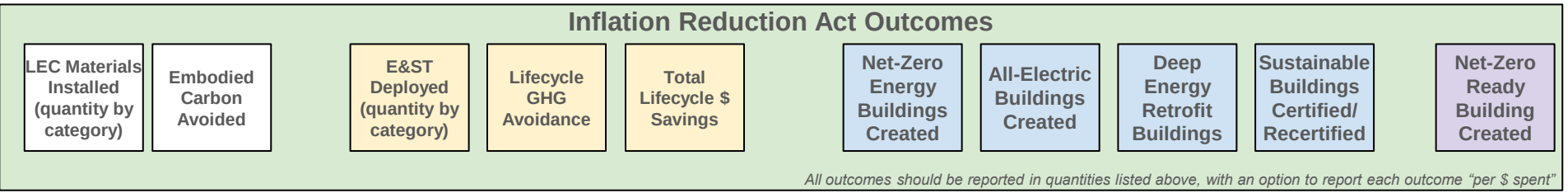
Electricity is Less than 90% of Energy



64% of GSA's standard office building energy is electricity + chilled water

Credit: Mike Virgilio, GSA
Climate & Infrastructure PMO

Select Inflation Reduction Act metrics



03 Energy Management in GSA Facilities

Hi.

I’m Tyler Harris, Director of Energy at GSA

- 15 Years of Experience at GSA
- A recent project I am proud of is transforming the Oklahoma City Federal Building into a grid-interactive efficient building (GEB).
- I am passionate about saving money and energy at our federal buildings
- I work in the Energy Division within the Office of Facilities Management

Energy Management Beginnings - Cheyenne, WY

JC O'Mahoney CH/FB

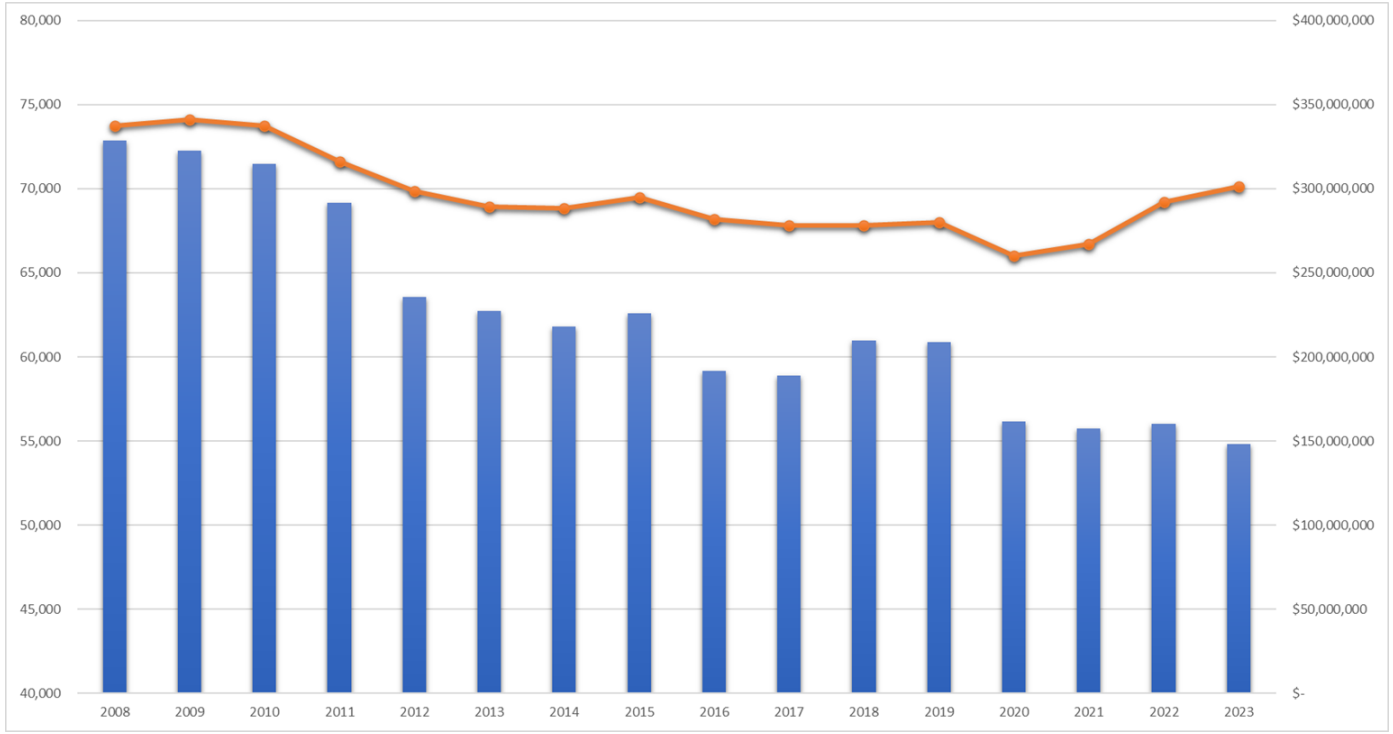
Cheyenne FB

Energy Management Beginnings - Fort Worth, TX

Fort Worth Federal Center

Where we've been….

Through increased efficiency, GSA avoided $827M in utility costs



Energy Management in Building Operations

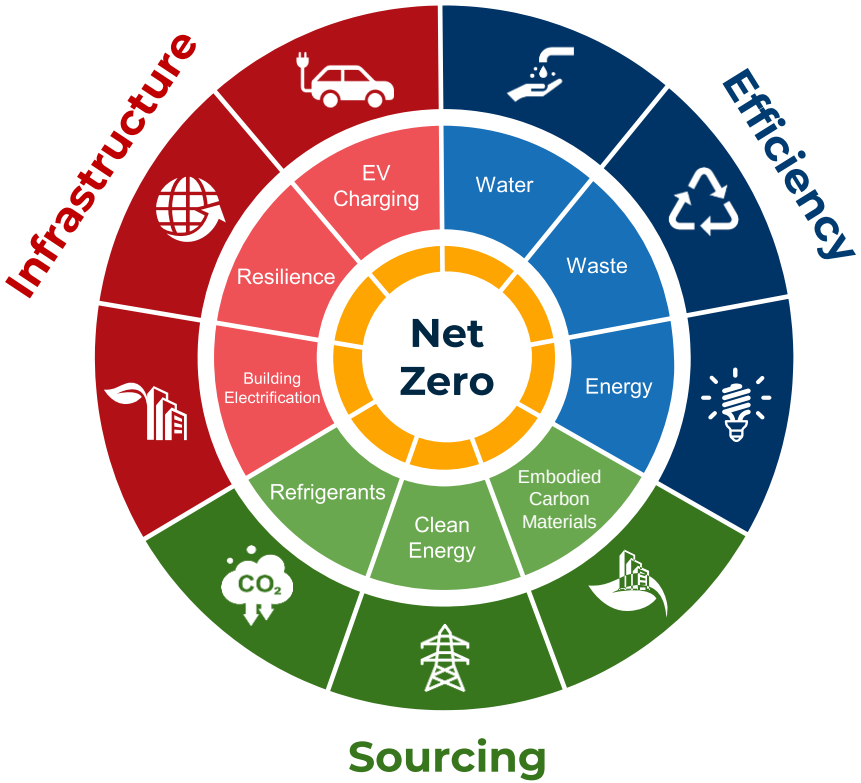
Intentional Investment (1)

Efficient Operations (2)

Targeted Re- tuning(3)

"Decarbonization Strategy is Energy Strategy"

Ways to Achieve Our Portfolio Goals



Infrastructure

- Federal Building Performance Standard
- Microgrids and storage
- Electric vehicle charging stations

Efficiency

- Operational Technology
- Deep energy retrofits
- Performance Contracts

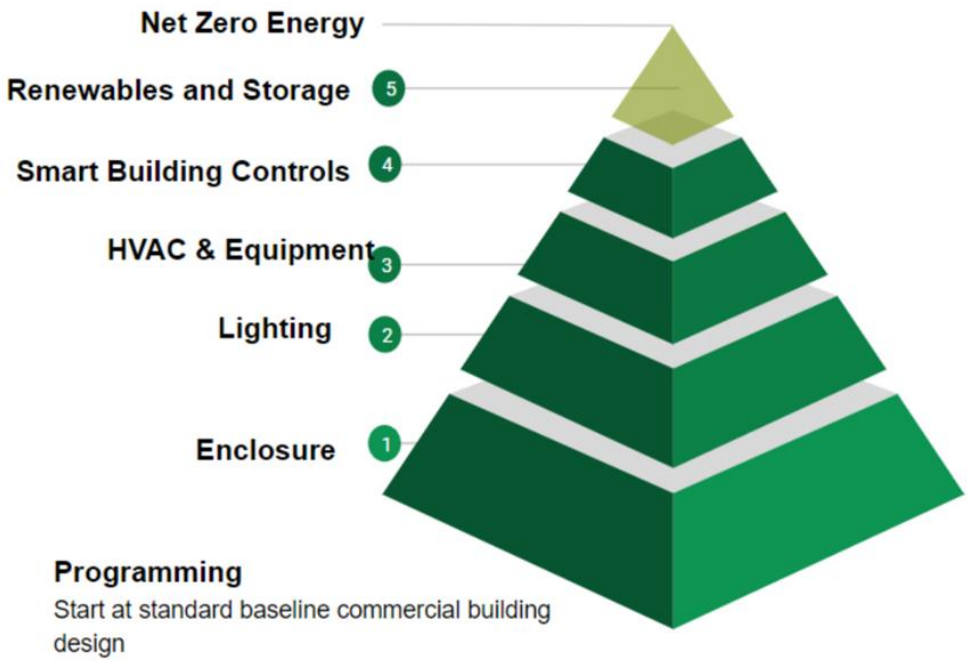
Sourcing

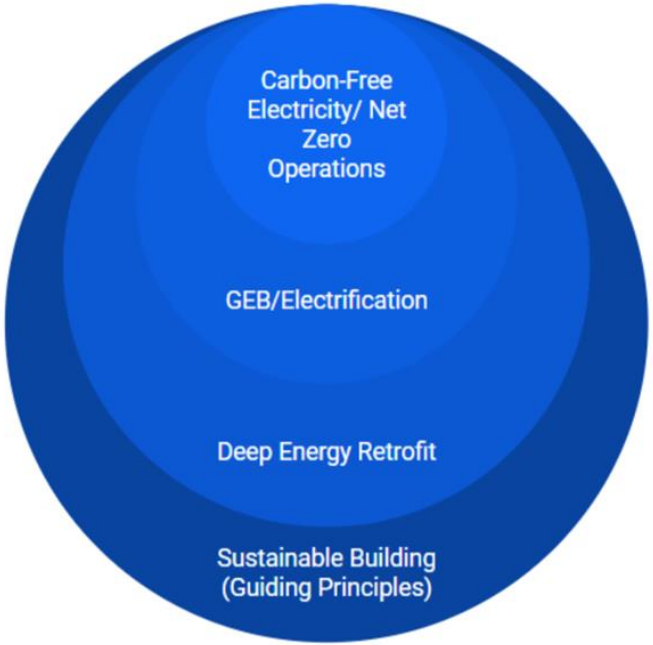
- No/low global warming potential refrigerants
- Carbon pollution free electricity
- Low embodied carbon material standards

Sustainability Strategic Plan Goals

	Goal area	Target summary*
Existing facilities	Reducing emissions	Agency-specific scope 1 and 2 GHG reduction targets
	Increasing energy efficiency	Agency-specific EUI reduction target
	Increasing water efficiency	Agency-specific WUI reduction target
	Deep energy retrofits	40% reduction in energy use intensity across 30% of covered facilities by 2030
	Building performance standards	Zero on-site fossil fuel consumption across 30% applicable facilities by 2030
	Leveraging performance contracting	Agency-specific GHG reduction target, in support of 2.8M MT CO2e/yr reduction
	Carbon Pollution Free Electricity	100% CFE (50% 24/7) by 2030 and 100% 24/7 CFE by 2035
New construction	Net-zero emissions new construction	All new construction designed to be efficient, all electric and achieve net-zero by 2030
Leased spaces	Green leases and leasing in net-zero emissions building	All new leases green leases starting 2023, all new leases after 2030 in net-zero emissions buildings
Cross-cutting	Sustainable federal buildings	50% of GSF by 2025

Paradigm Shift to Energy Outcomes

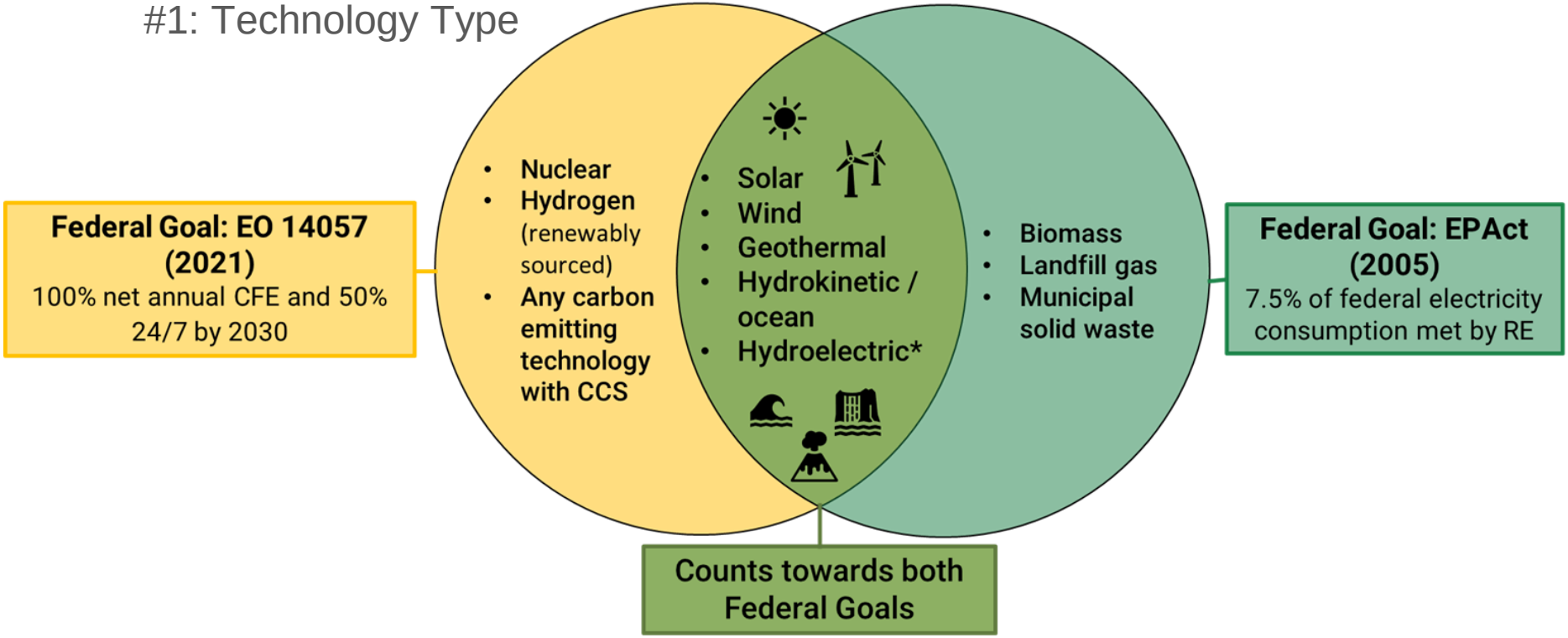




Operations and Technology vs. Outcomes

Carbon-Pollution Free Electricity (CFE)

#1: Technology Type



#2: Facility Online on/after Oct. 1, 2021

National Capital Region

Energy Savings Performance Contract (ESPC)

- Multiple Energy Conservation Measures (ECMs)
  - Ronald Reagan Building and International Trade Center (RRBITC)
  - New Executive Office Building

- Building Automation System Upgrades (White House Complex)
  - Eisenhower Executive Office Building
  - Winder Building
  - Civil Service Building (F Street)
  - Jackson Place
  - White House east and west wings

RRBITC Project Benefits

Energy reduction savings of 41.5%

GHG emissions reduction of more than 20,000 tons annually

Water savings of 50% – treated groundwater

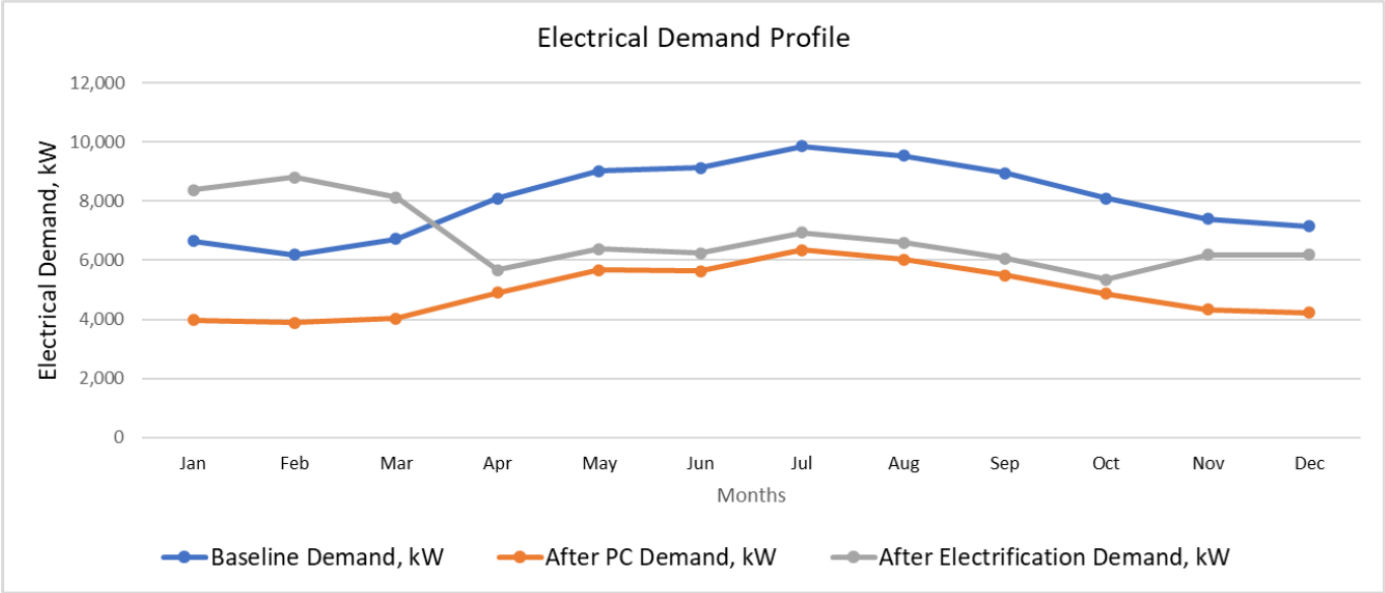
RRBITC and NEOB utility spend reduction of 44%

White House Complex BAS energy reduction savings of 12%

RRB and NEOB	Total Energy Savings (MMBtu/yr)	Electric Energy Savings (kWh/yr)	Electric Demand Savings (kW/yr)	Water Savings (kgal/yr)	Sewer Savings (kgal/yr)	Steam Savings (MMBtu/yr)
Total proposed savings	134,010	23,527,195	43,994	39,822	45,016	53,782
Usage for entire site (FY19)	323,098	61,378,847	115,261	78,219	78,219	113,612
% Total site usage saved	41.48%	38.3%	38.2%	50.9%	57.6%	47.3%
Project square footage (SF)	3,065,556					
EUI Before Project	105.4					
EUI After Project	61.7					

Electrification and Decarbonization of the RRBITC

Electrical Demand Impact



- Maximum electrification monthly demand less than FY19 baseline
- GSA has provided this preliminary information to PEPCO (utility)
- Building overall capacity adequate
- Building electrical switchgear to be added to accommodate heat pumps and boilers

Net Zero Emissions/Operations

Deep Energy Retrofit → Electrification → 24/7 Carbon-pollution Free Electricity ⇉ Net Zero Emission Building

How can tenant agencies support?

- Recognize that the federal government must follow the laws, orders and administration goals.
  - We are all in this building together!
- Be engaged when GSA is updating your building
- Follow the P100 when doing upgrades within your spaces
- Understand that many energy (and taxpayer) saving efforts are behavior-based

Conclusion and Q&A

Walter Tersch
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