



# Energy Efficiency & Renewable Energy Incentives for Achieving Climate Goals & Sustainable Buildings

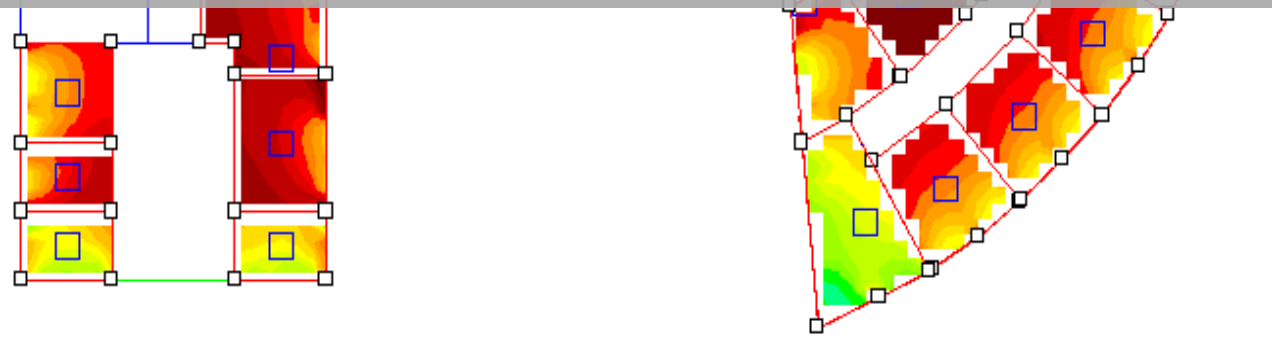
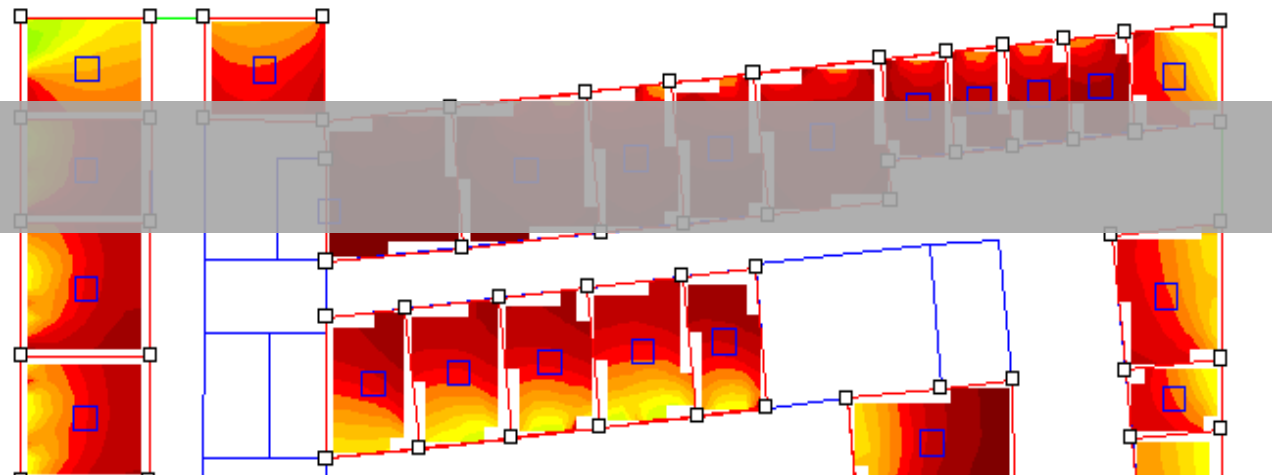
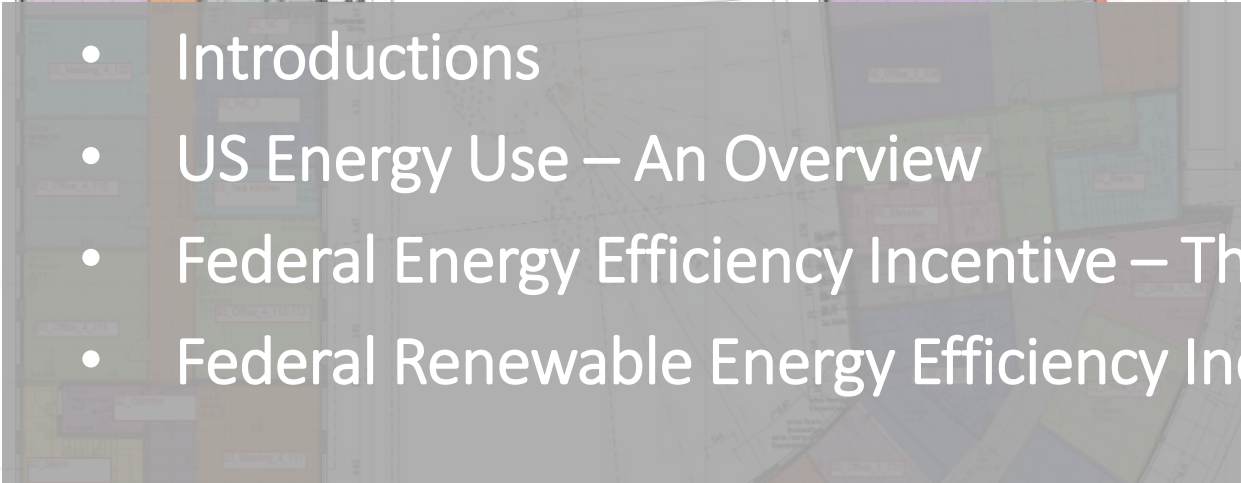
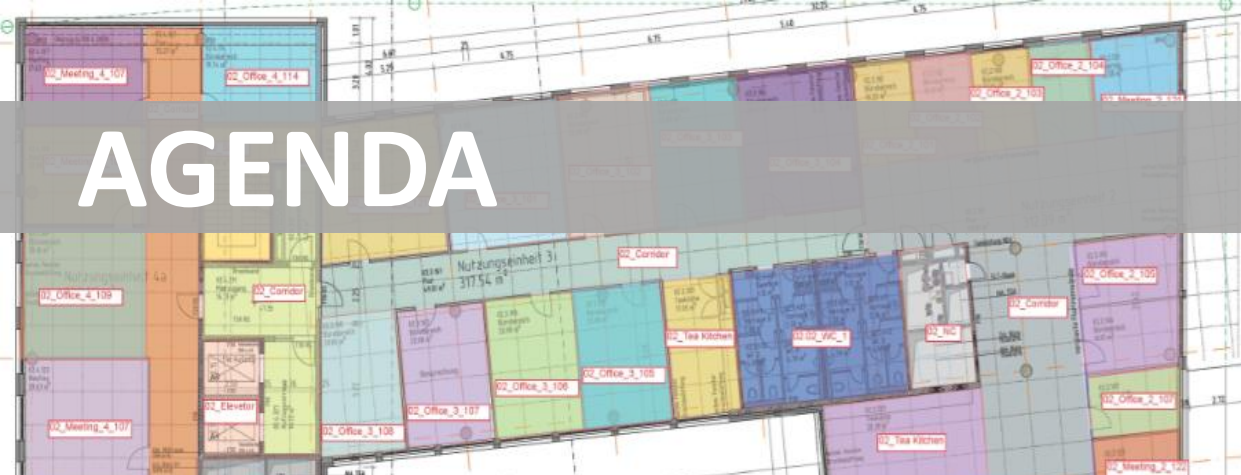
October 12, 2023

Ajit Naik, PE BEMP, CCP



# AGENDA

- Introductions
- US Energy Use – An Overview
- Federal Energy Efficiency Incentive – The 179D Tax Deduction
- Federal Renewable Energy Efficiency Incentive – The Renewable Investment Tax Credit





Ajit Naik, PE, BEMP, CCP  
VP, Director of Building Performance Analytics

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# Presenter

## **Our Vision**

**Deliver solutions for a carbon-neutral real estate industry.**

## **Our Mission**

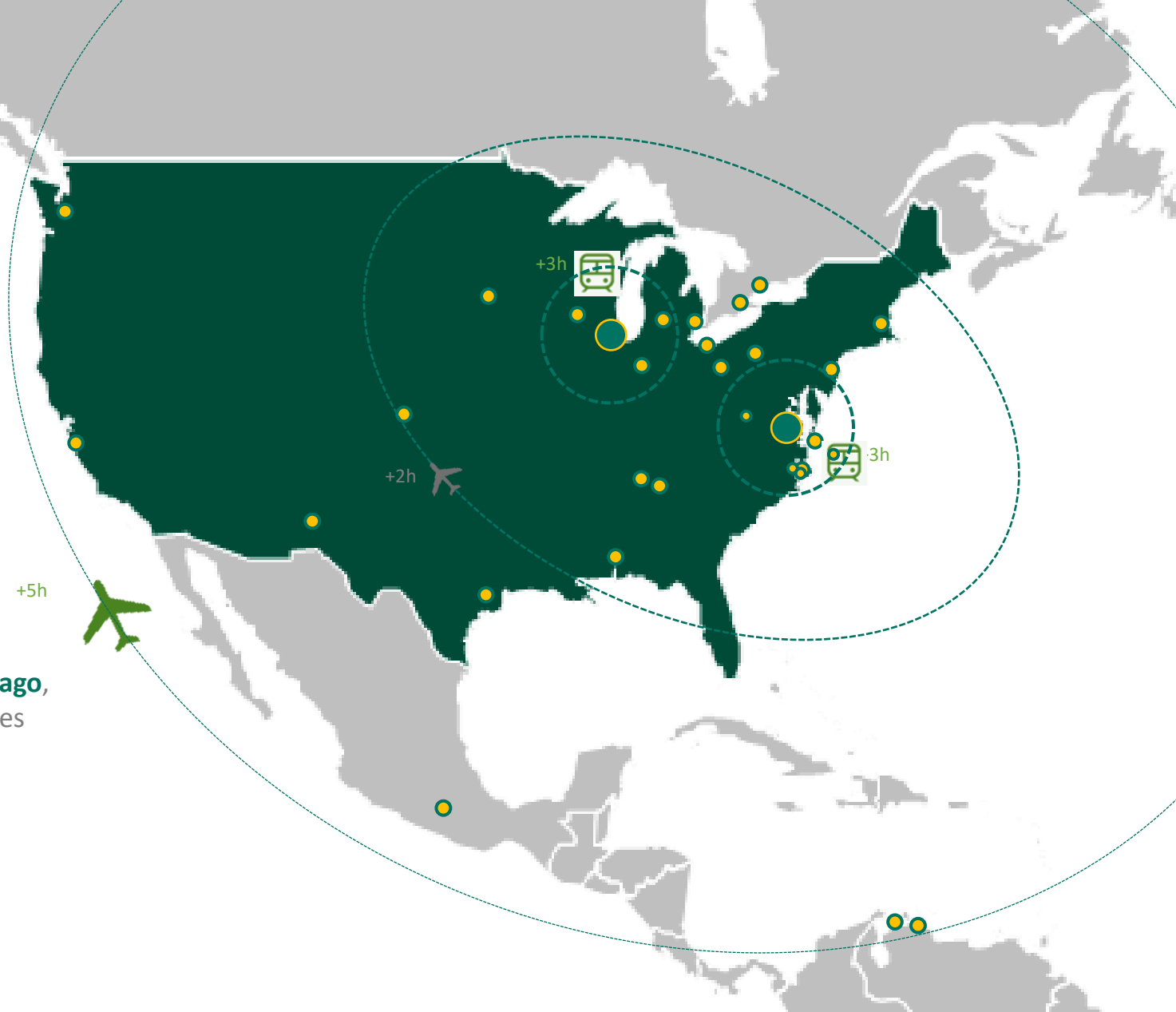
**Add value to our customers, improve the lives of our employees, and enhance the communities we live in.**

# Vision & Mission




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# Services






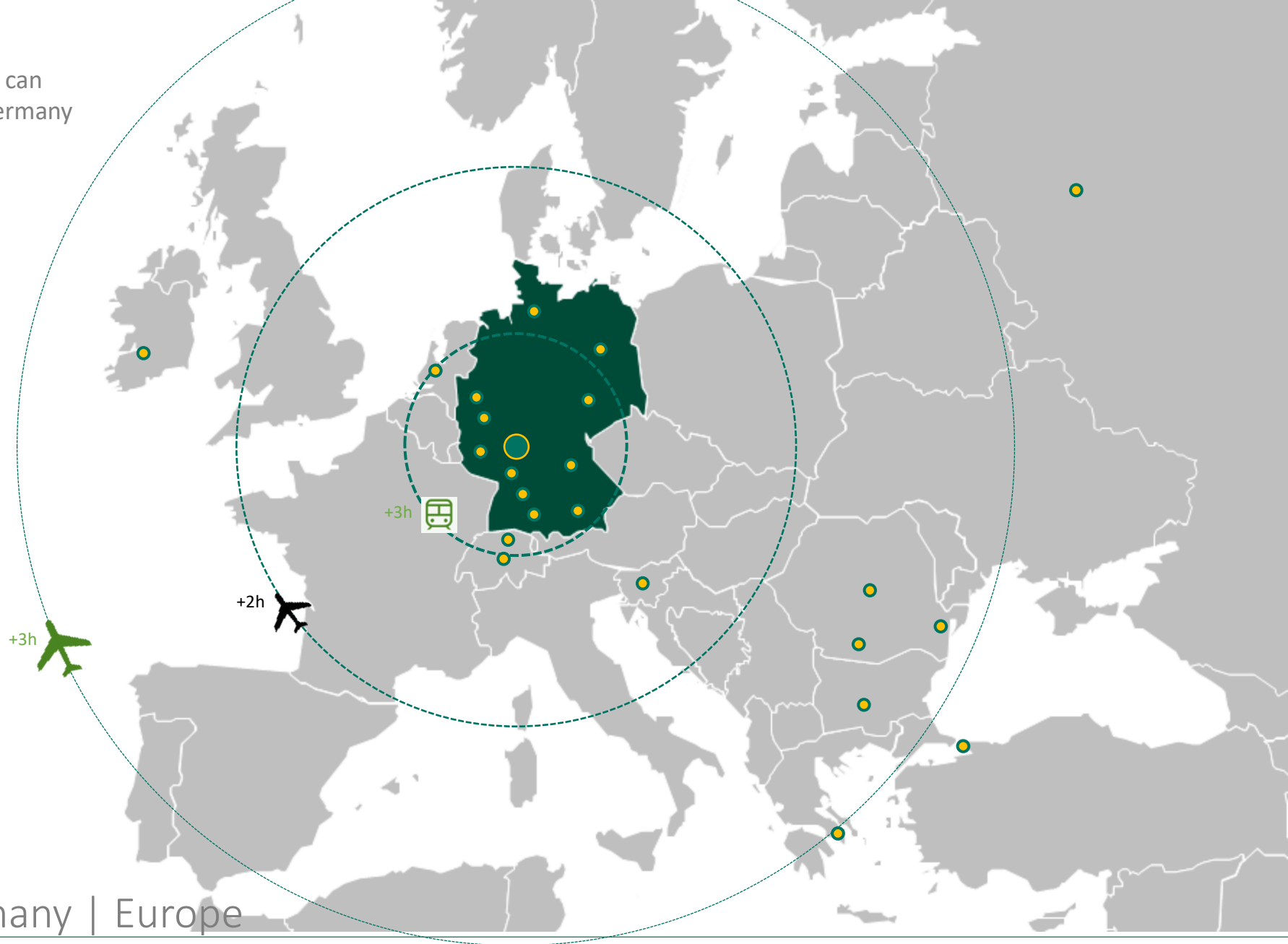
From our office locations in ● **Washington, D.C.** (HQ) and ● **Chicago**, we can conveniently reach ● project sites across the United States and North America

-  East Coast / Mid-Atlantic & Midwest
-  Eastern half of United States & Ontario
-  Entire US & Canada & Central America

## Offices & Projects in North America

From our office location in **Frankfurt**, we can conveniently reach **project sites** across Germany and Europe

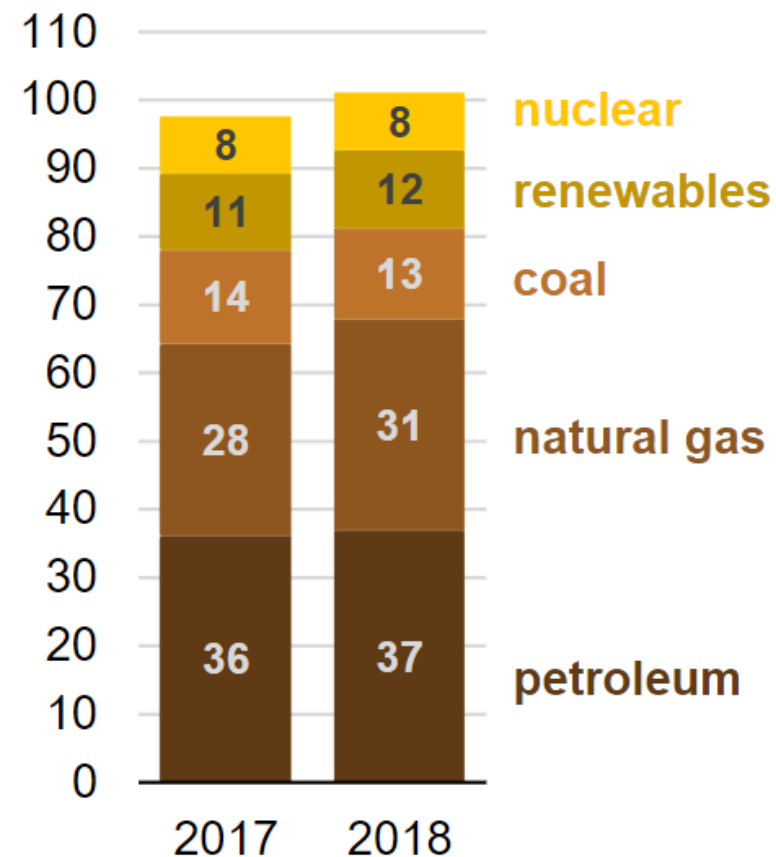
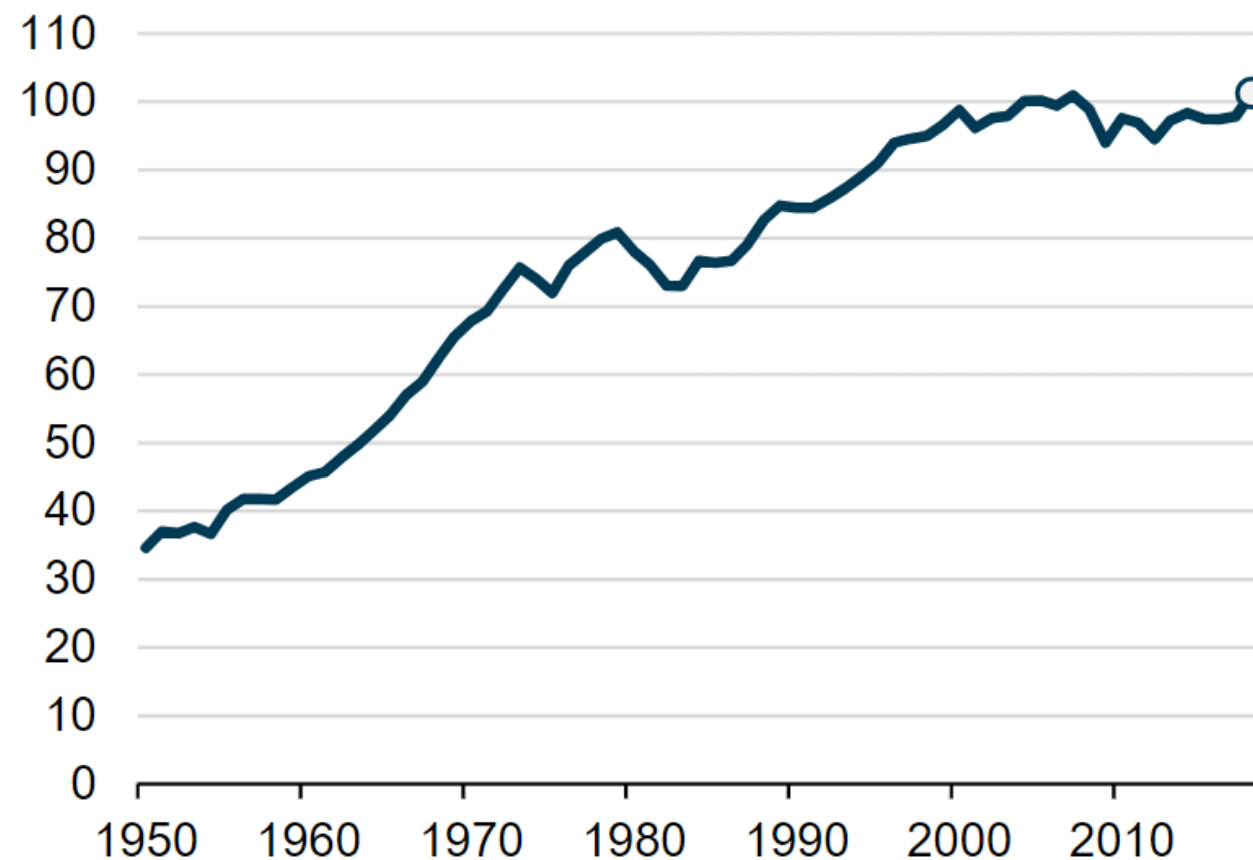
-  Most of Germany
-  Central Europe
-  Entire Europe



## Office & Projects in Germany | Europe

## U.S. total energy consumption (1950-2018)

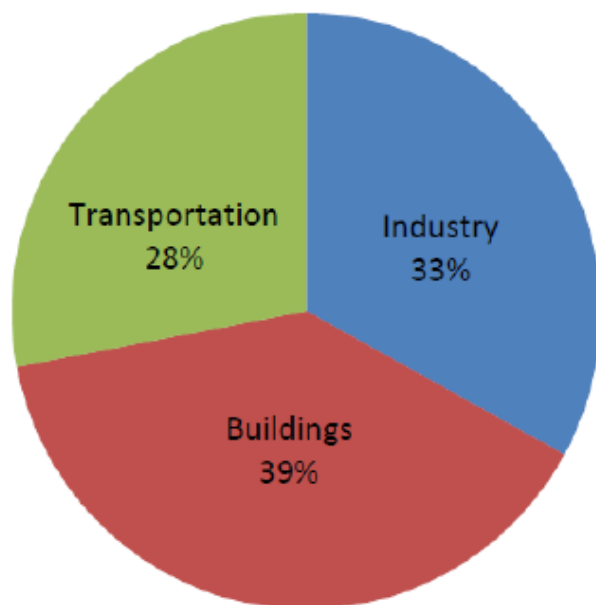
quadrillion British thermal units



## US Energy Use Since 1950

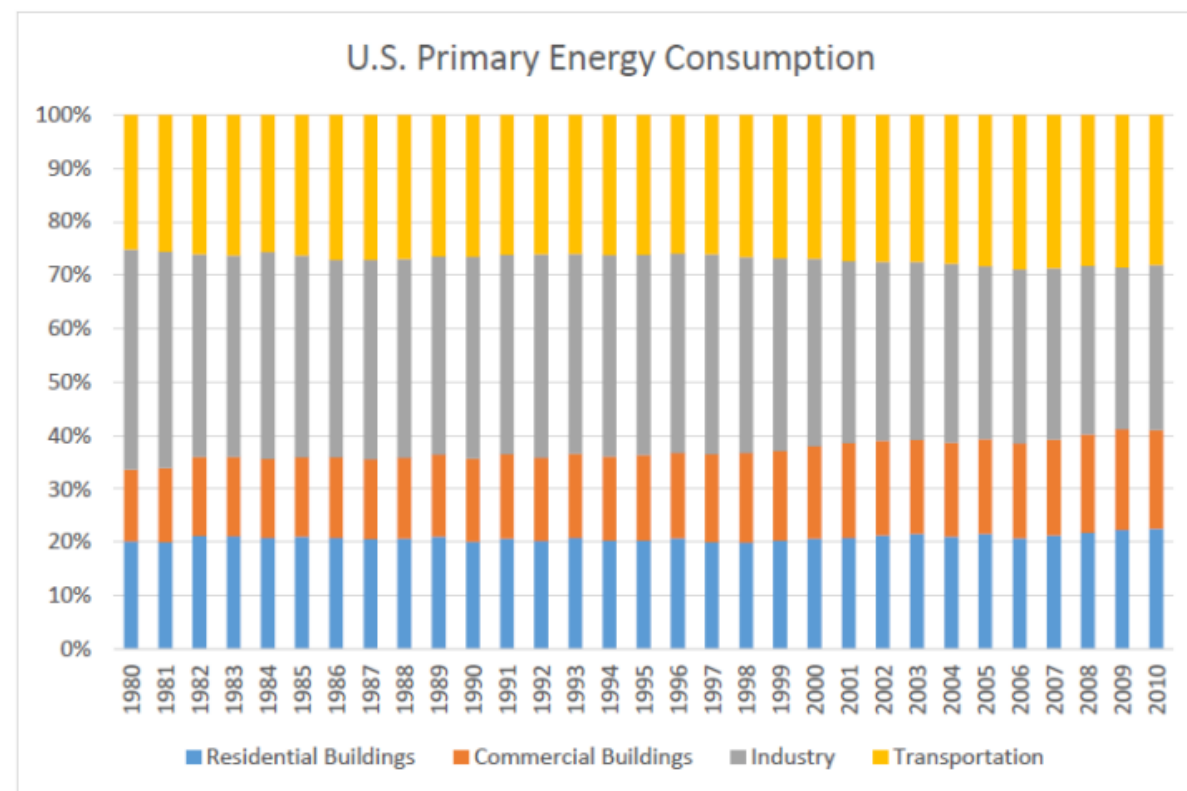


## U.S. Energy Consumption



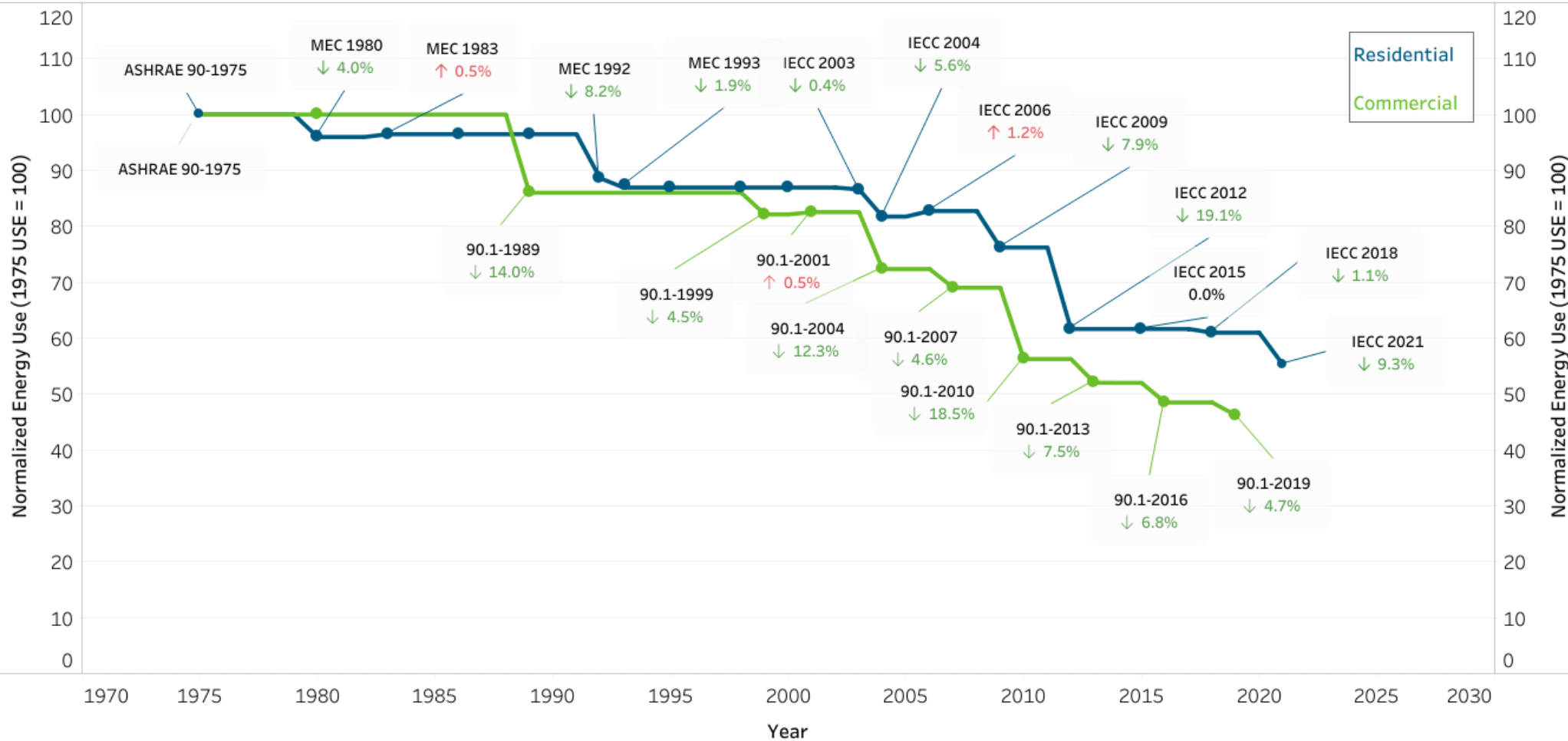
ASME 2011 Conference on Smart Materials, Adaptive Structures and Intelligent Systems

Figure 1. Buildings Share of U.S. Primary Energy Consumption, 1980-2010



Source: <https://content.aia.org/sites/default/files/2017-05/Section179DAnalysis-051817.pdf>

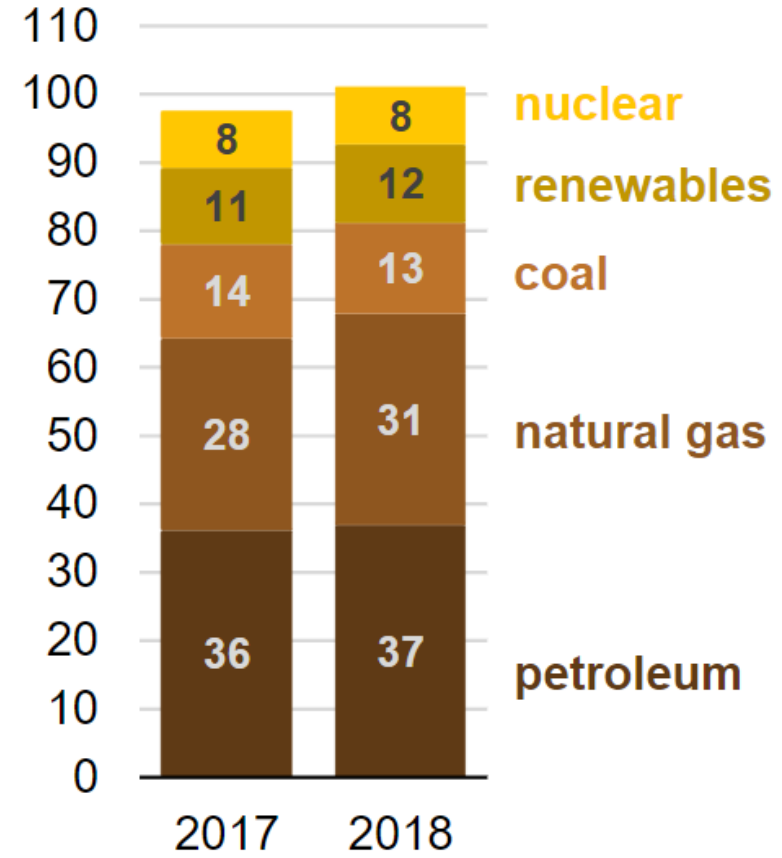
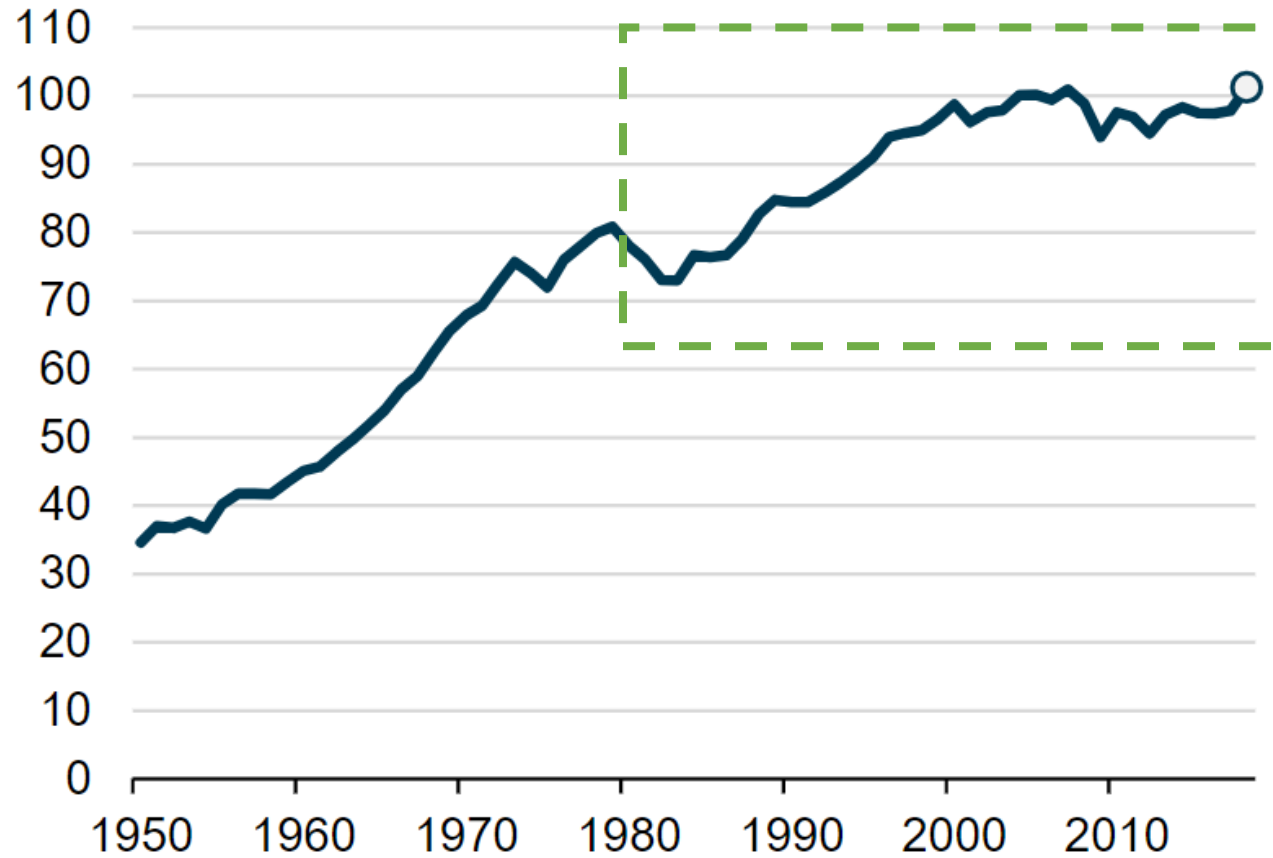
# Energy Use by Buildings Today



# Improving Building Energy Codes

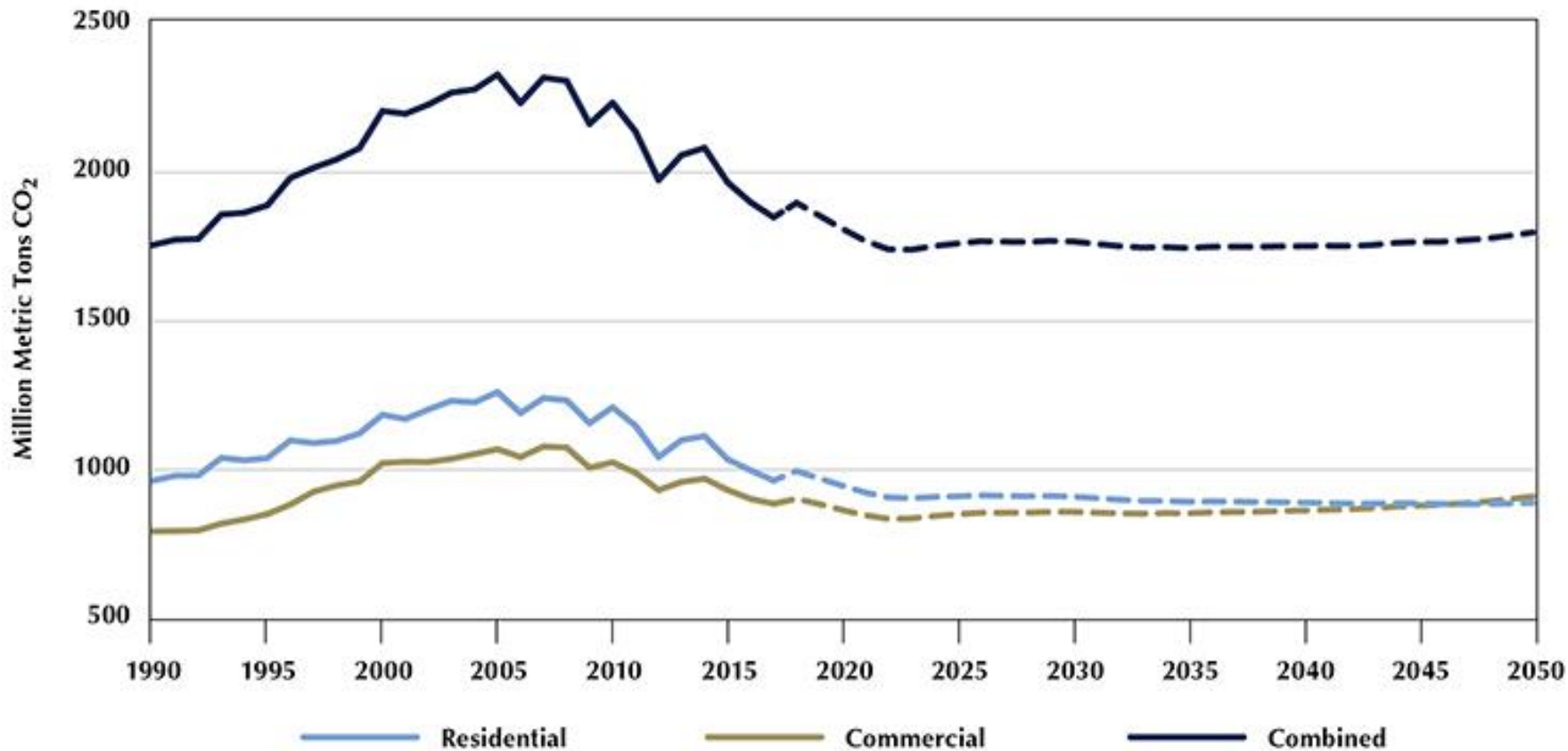
# U.S. total energy consumption (1950-2018)

quadrillion British thermal units



## The Impact – Energy Use Since 1980

**FIGURE 2: Building Energy-related CO<sub>2</sub> Emissions, 1990–2050**



Source: U.S. Energy Information Administration, Monthly Energy Review February 2018, DOE/EIA-0035(2018/02) (Washington, DC: U.S. Department of Energy, 2018), <https://www.eia.gov/totalenergy/data/monthly> and U.S. Energy Information Administration, Annual Energy Outlook 2018 (Washington, DC: U.S. Department of Energy, 2018), <https://www.eia.gov/outlooks/aeo>.

## Carbon Emissions from Buildings Over Time

In 2040, **2/3 of the global building stock** will be buildings that exist today.  
Without upgrades, they will still be emitting GHGs.



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Data Source: IEA Energy Technology Perspectives 2020, February 2021 Revised Edition

## The Problem – Value Engineering



# The Problem – Value Engineering



**How can we incentivize building owners and design teams to incorporate energy-efficient strategies in their public and commercial buildings to manage the country's energy demand, to save the government more money than it forgoes?**



## The Energy Efficiency Carrot

- The 179D commercial buildings energy efficiency tax deduction primarily enables building owners to claim a tax deduction for installing qualifying systems in buildings.
- Tenants may be eligible if they make construction expenditures.
- If the system or building is installed on federal, state, or local government property, the 179D tax deduction may be taken by the person primarily responsible for the system's design.
- The 179D tax deduction does not apply to other non-tax paying entities, including but not limited to NGOs or churches, unless there exists an energy-as-a-service agreement that is owned by a tax paying company.
- See [IRS Notice 2008-40](#) for additional information.

Buildings Open Before Jan 1 2023:  
up to \$1.88/SF

Buildings Open After Jan 1 2023:  
up to \$5/SF

## Enter the 179D Tax Deduction



# Energy Policy Act Of 2005

United States Congress House Of Representatives



Passed  
(2 years)

- Energy Policy Act, 2005

Extended  
(1 year)

- Tax Relief and Health Care Act, 2006

Extended  
(5 years)

- Emergency Economic Stabilization Act, 2008

Extended  
(1 year)

- The Tax Increase Prevention Act, 2014

Extended  
(2 years)

- Consolidated Appropriations Act, 2015

Extended  
(2 years)

- Bipartisan Budget Act, 2018

Made  
Permanent

- Consolidated Appropriations Act, 2021

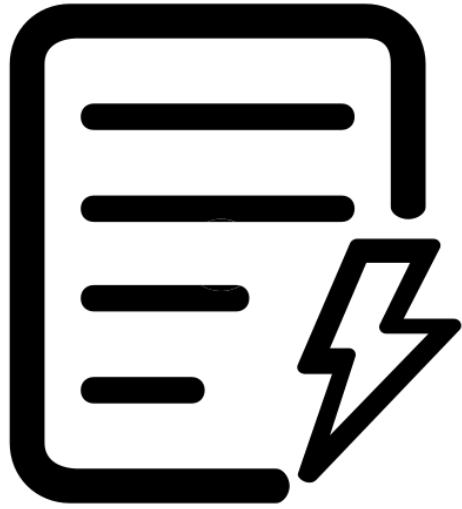
## Increased Benefits

Inflation Reduction Act, 2022

# The History of 179D



OCTOBER 11 - 12  
McCORMICK PLACE



Energy Model



**NREL**  
NATIONAL RENEWABLE ENERGY LABORATORY

**Energy Savings Modeling and Inspection Guidelines for Commercial Building Federal Tax Deductions for Buildings in 2016 and Later**

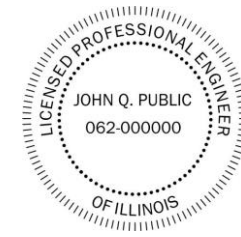
Michael Deru and Kristin Field-Macumber  
*National Renewable Energy Laboratory*



Building Inspection



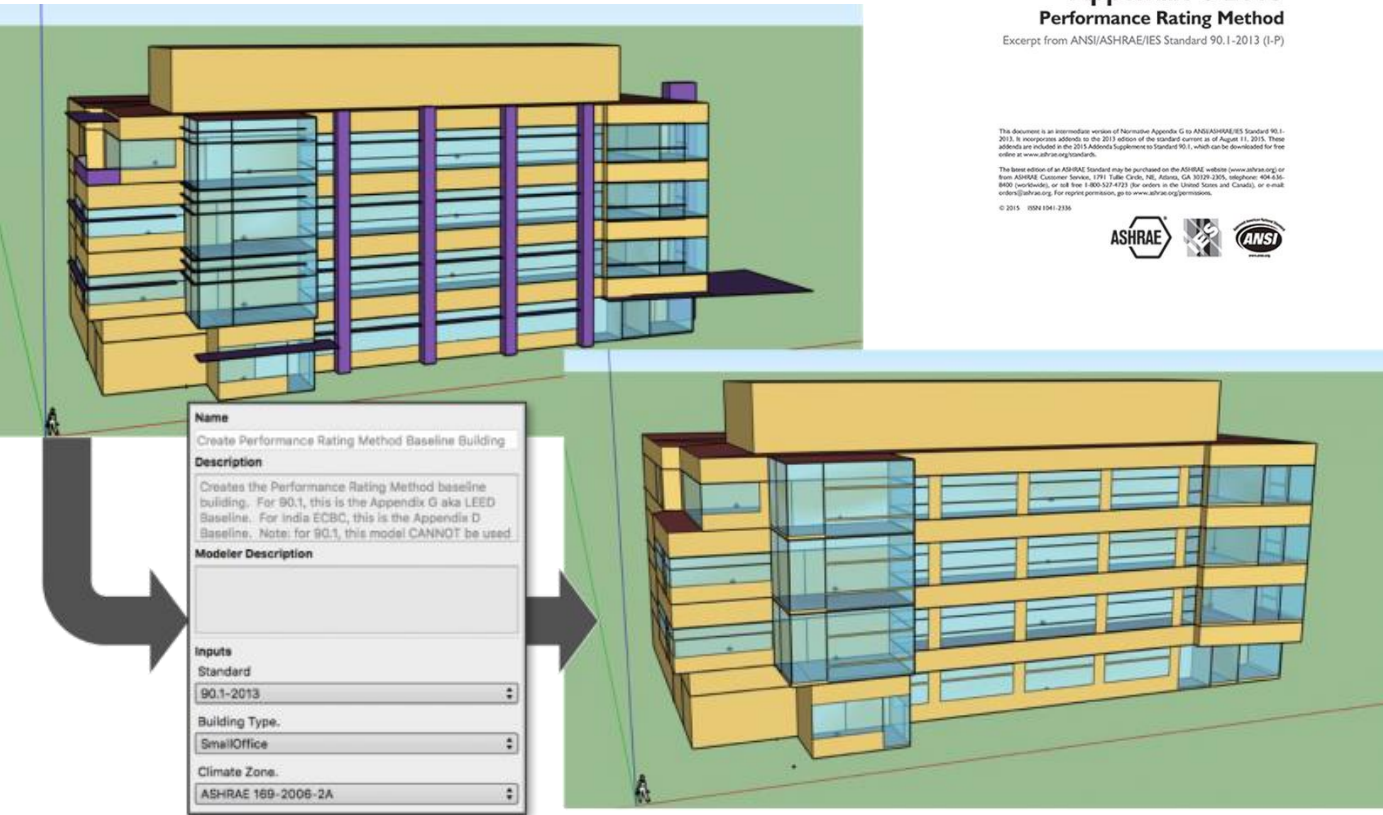
# How it works



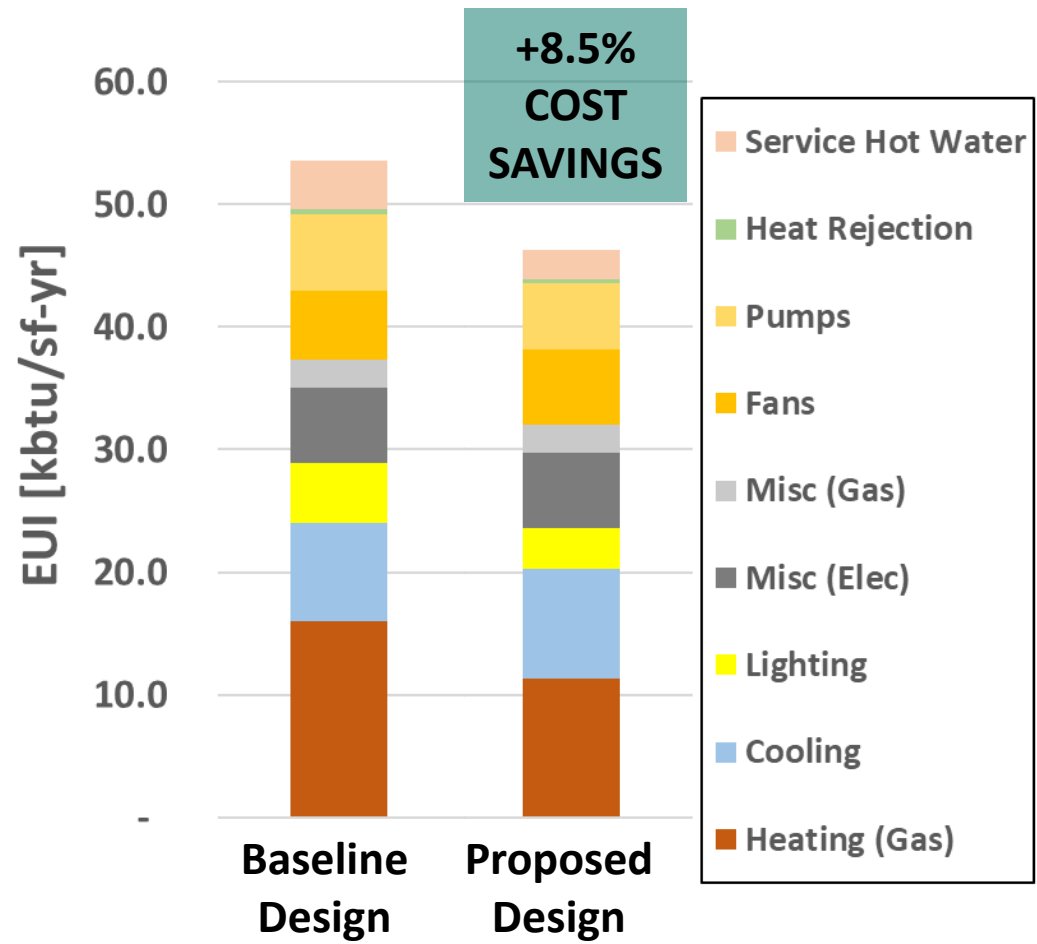
Not the complete Standard  
This is an excerpt of Appendix G

**Standard 90.1  
Appendix G 2013  
Performance Rating Method**  
Excerpt from ANSI/ASHRAE/IES Standard 90.1-2013 (I-P)

This document is an intermediate version of Normative Appendix G to ANSI/ASHRAE/IES Standard 90.1-2013. It incorporates additions to the 2013 edition of the standard current as of August 11, 2015. These additions are indicated in the 2013 Addendum Supplement to Standard 90.1, which can be downloaded for free online at [www.ashrae.org/standards](http://www.ashrae.org/standards).  
This latest edition of an ASHRAE Standard may be purchased from the ASHRAE website ([www.ashrae.org](http://www.ashrae.org)) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2955, telephone 404-834-8800 (toll-free), or toll-free 1-888-537-4723 (for orders in the United States and Canada), or e-mail [orders@ashrae.org](mailto:orders@ashrae.org). For reprint permission, go to [www.ashrae.org/permissions](http://www.ashrae.org/permissions).  
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Source: [https://projectstasio.com/single\\_graphic/what-is-the-impact-of-design-decisions-on-energy-and-cost/](https://projectstasio.com/single_graphic/what-is-the-impact-of-design-decisions-on-energy-and-cost/)



# The energy modeling process



*Alternative Path for Retrofits (Buildings >5 years old):*

- ***Compare 12 months consecutive months of utility bills not more than 1 year before and at least 1 year after retrofit (weather normalized)***
- ***Reduce Energy Use by 25%-50%+***

***...Electric HVAC equipment is ALWAYS more efficient than gas-fired HVAC equipment, though not necessarily enough to overcome the higher cost of electricity. 179D rewards electrification of existing buildings!***

## Alternative: Use Utility Bills



March 15, 2023

179D Commercial Buildings Energy-Efficiency Tax Deduction

## Hartshorne Plunkard Architecture Office

**Project No.** P.0922.U

**Client** **HARTSHORNE PLUNKARD ARCHITECTURE LLC**

**Discipline** Energy Modeling

**Created** Brianna Galvan

**Reviewed** Ajit Naik



# How to claim it?

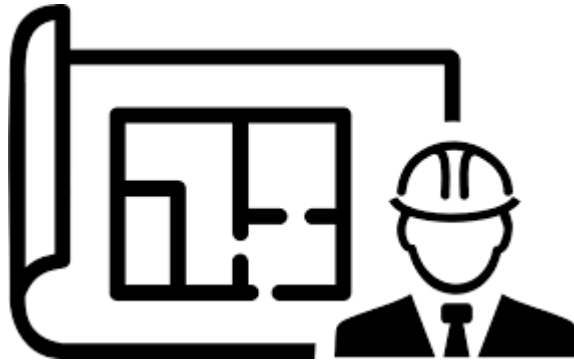


OCTOBER 11 - 12  
McCORMICK PLACE

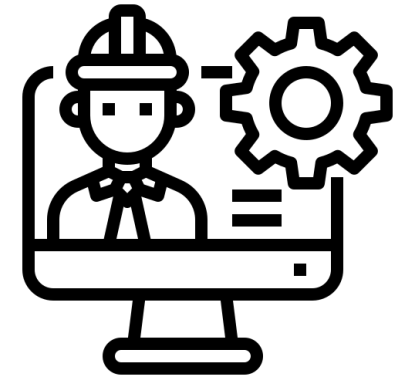




Owners

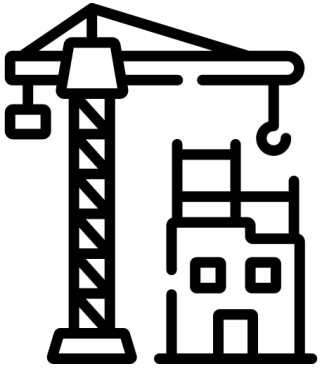


Architects



Engineers

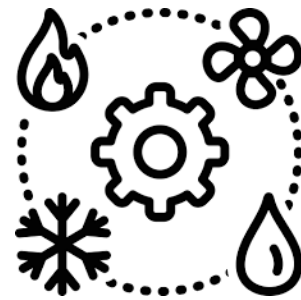
Who can claim it?



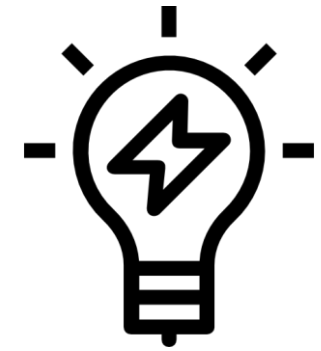
New Construction



Envelope Upgrades



HVAC/DHW Upgrades



Lighting Upgrades

# What projects are eligible?

**Buildings with construction dollars spent before Jan 1, 2023:**

Compliance Path		Savings Requirement*	Tax Deduction**
			taxable year beginning 2022
Fully Qualifying Property		50%	\$1.88/ft <sup>2</sup>
Partially Qualifying Property	Envelope	10%	\$0.63/ft <sup>2</sup>
	HVAC and HW	15%	
	Lighting	25%	
Interim Lighting Rule		25%-40% lower lighting power density (50% for warehouses)	\$0.63/ft <sup>2***</sup>

**Buildings with construction dollars spent after Jan 1, 2023:**

***Projects NOT MEETING prevailing wage and apprenticeship requirements: \$0.50 - \$1.00***

- \$0.50 for 25% savings over ASHRAE 90.1
- \$0.02 increase for every additional percentage reduced

***Projects MEETING prevailing wage and apprenticeship requirements: \$0.50 - \$5.00***

- \$2.50 for 25%
- \$0.10 increase for every additional percentage reduced

## Performance requirements



## Prevailing Wage Requirements:

Wage determinations published by the Wage and Hour Division (WHD) of the US Department of Labor (DOL) on <http://www.sam.gov>

## Apprenticeship Labor Hour Requirements:

Apprentices must work:

- Construction began before January 1, 2023: 10% of total labor hours
- Construction began after December 31, 2022, and before January 1, 2024: 12.5% total labor hours
- Construction begins after December 31, 2023: 15% total labor hours

When construction begins is based on:

- Physical work test: when physical work of a significant nature begins.
- 5% safe harbor: when 5% or more has been paid or incurred for the total cost of the facility.

# Prevailing Wage Requirements

Area	Prescriptive Lighting Path		Whole-Building Modeling Path	
	\$0.30/SF Minimum Deduction	\$0.63/SF Minimum Deduction	\$1.26/SF Partial Deduction	\$1.88/SF Partial Deduction
50,000 SF	\$ 15,000	\$ 31,500	\$ 63,000	\$ 94,000
100,000 SF	\$ 30,000	\$ 63,000	\$ 126,000	\$ 188,000
250,000 SF	\$ 75,000	\$ 157,500	\$ 315,000	\$ 470,000
500,000 SF	\$ 150,000	\$ 315,000	\$ 630,000	\$ 940,000
1,000,000 SF	\$ 300,000	\$ 630,000	\$ 1,260,000	\$ 1,880,000

Example – Projects Completed Before Jan 1 2023

Area	Prevailing Wage & Apprenticeship Requirements Not Met		Prevailing Wage & Apprenticeship Requirements Met	
	\$0.50/SF Minimum Deduction	\$1.00/SF Minimum Deduction	\$2.50/SF Minimum Deduction	\$5.00/SF Maximum Deduction
50,000 SF	\$ 25,000	\$ 50,000	\$ 125,000	\$ 250,000
100,000 SF	\$ 50,000	\$ 100,000	\$ 250,000	\$ 500,000
250,000 SF	\$ 125,000	\$ 250,000	\$ 625,000	\$ 1,250,000
500,000 SF	\$ 250,000	\$ 500,000	\$ 1,250,000	\$ 2,500,000
1,000,000 SF	\$ 500,000	\$ 1,000,000	\$ 2,500,000	\$ 5,000,000

## Example – Projects Completed After Jan 1 2023



**How can we incentivize building owners and design teams to incorporate renewable energy technology in their public and commercial buildings to manage the country's energy demand, to save the government more money than it forgoes?**



## The Energy Efficiency Carrot

## Investment Tax Credit (ITC):

Pays based on **cost** of new renewable energy systems.  
Up to 50% of first costs! Plus 5-year depreciation!

## Production Tax Credit (ITC):

Pays based on **generation** by new renewable energy systems.  
Up to \$2.81/kWh! Plus 5-year depreciation!

Enter the Renewable Investment Tax Credit

# Energy Policy Act Of 2005

United States Congress House Of Representatives



Passed  
(2 years)

- Energy Policy Act, 2000  
(capped at \$2,000)

Extended

- Energy Improvement and Extension Act, 2008  
(no cap)

Extended

- American Recovery and Reinvestment Act, 2009  
(paid as a grant)

Extended

- Tax Relief and Job Creation Act, 2010

Extended

- Consolidated Appropriations Act, 2015

Extended

- Bipartisan Budget Act, 2020

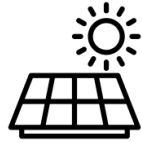
Extended  
to 2034

- Inflation Reduction Act, 2022  
(increased max to 30%, added labor requirements)

## The History of 179D



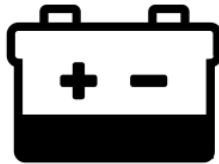
**Solar Water Heaters**



**Solar PV**



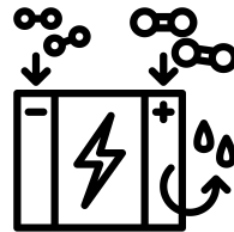
**Wind Turbines**



**Battery Storage**



**Ground-Source Heat Pumps**



**Fuel Cells**

## What Qualifies?



Homeowners\*\*\*



Business Owners



Non-Profit Entities (!!)

Who can claim it?



		Start of Construction							
		2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year <sup>a</sup> )	The later of 2035 (or three years after applicable year <sup>a</sup> )	The later of 2036 (or four years after applicable year <sup>a</sup> )	
ITC	Full rate (if project meets labor requirements <sup>b</sup> )	Base Credit	30%	26%	30%	30%	22.5%	15%	0%
		Domestic Content Bonus				10%	7.5%	5%	0%
		Energy Community Bonus				10%	7.5%	5%	0%
	Base rate (if project does not meet labor requirements <sup>b</sup> )	Base Credit	30%	26%	6%	6%	4.5%	3%	0%
		Domestic Content Bonus				2%	1.5%	1%	0%
		Energy Community Bonus				2%	1.5%	1%	0%
	Low-income bonus (1.8 GW/yr cap)	<5 MW projects in LMI communities or Indian land				10%	10%	10%	10%
		Qualified low-income residential building project / Qualified low-income economic benefit project				20%	20%	20%	20%

**200 kW PV Array  
(10,000 SF)  
\$500,000 installed**

**Up to \$250,000  
(plus depreciation  
benefits)**

## How it works - ITC

200 kW PV Array  
(10,000 SF)  
261,282 kWh/year in Chicago

Up to \$74,000 (plus depreciation benefits)

			Start of Construction						
			2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year <sup>a</sup> )	The later of 2035 (or three years after applicable year <sup>a</sup> )	The later of 2036 (or four years after applicable year <sup>a</sup> )
PTC for 10 years (\$2022)	Full rate (if project meets labor requirements <sup>b</sup> )	Base Credit			2.75 ¢	2.75 ¢	2.0 ¢	1.3 ¢	0.0 ¢
		Domestic Content Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
		Energy Community Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
	Base rate (if project does not meet labor requirements <sup>b</sup> )	Base Credit			0.55 ¢	0.55 ¢	0.4 ¢	0.3 ¢	0.0 ¢
		Domestic Content Bonus				0.1 ¢	0.0 ¢	0.0 ¢	0.0 ¢
		Energy Community Bonus				0.1 ¢	0.0 ¢	0.1 ¢	0.0 ¢

## How it works - PTC

Initial Cost Assumptions	Amount
PV System Installed Capacity	1 MW
PV System Efficiency (Standard)	19%
PV System Losses	14%
PV Installed Cost	\$2.75 Million
Annual Electricity Price Inflation Rate	2%
Annual PV System Efficiency Degradation Rate	2%

Financial Results	Amount
Year 1 Tax Credits	\$825 K
Year 1 Energy Savings	\$87.7 K (1.46 Million kWh)
Year 1 Depreciation	\$371 K
20-Year Cumulative Net Cash Flow	\$502 K
Simple Payback	15 Years
IRR	3.3%

System Capacity: 1003.8 kWdc (6692 m<sup>2</sup>)



**Without  
Federal  
Incentives:**  
31 Year Payback

**With  
Federal  
Incentives:**  
15 Year Payback

## Example – Solar ITC in Chicago



# Questions?

Ajit Naik, PE, BEMP, CCP  
VP, Director of Building Performance Analytics

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