

# Reducing GHG Emissions in Buildings

## An Analysis of Policy Options for San Diego County

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Energy Policy Initiatives Center  
University of San Diego School of Law

November 4, 2009



# Presentation Overview

**GHG emissions in San Diego County**

**GHG reduction targets**

**Strategies to reach GHG targets**

**Local government reduce GHG emissions from buildings**

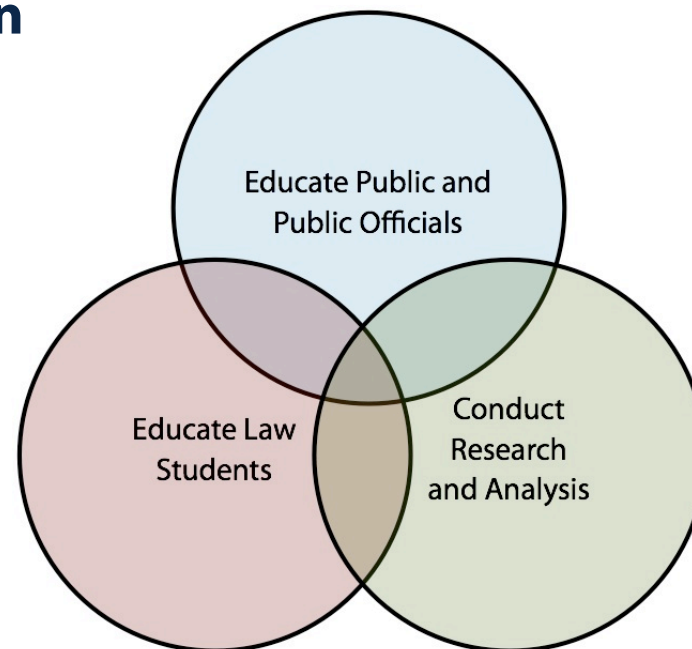
**Conclusions and Recommendations**

# About EPIC

## Academic and Research Center

- University of San Diego School of Law

## EPIC Mission



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# GHG Emissions in San Diego County

# GHG Inventory Project Overview

## Geographic Scope

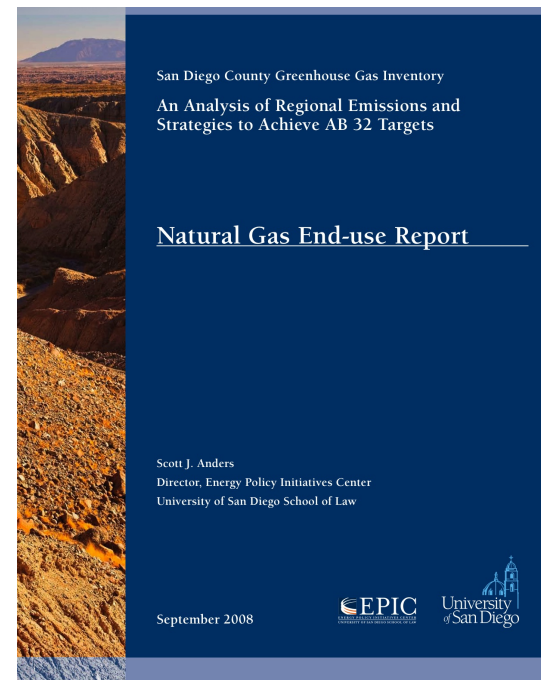
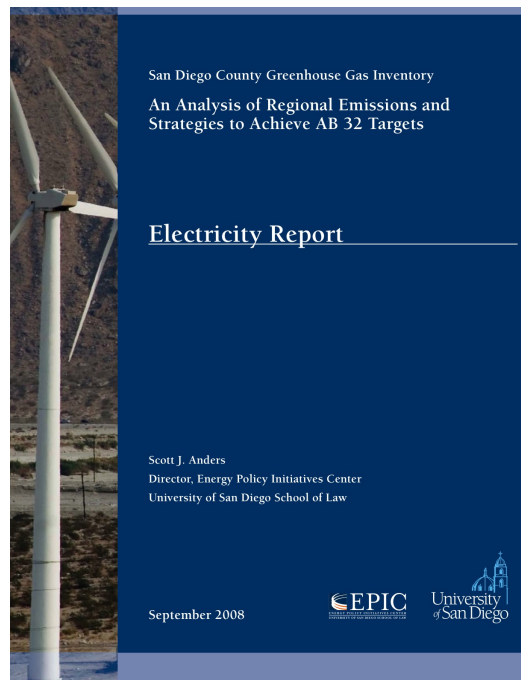
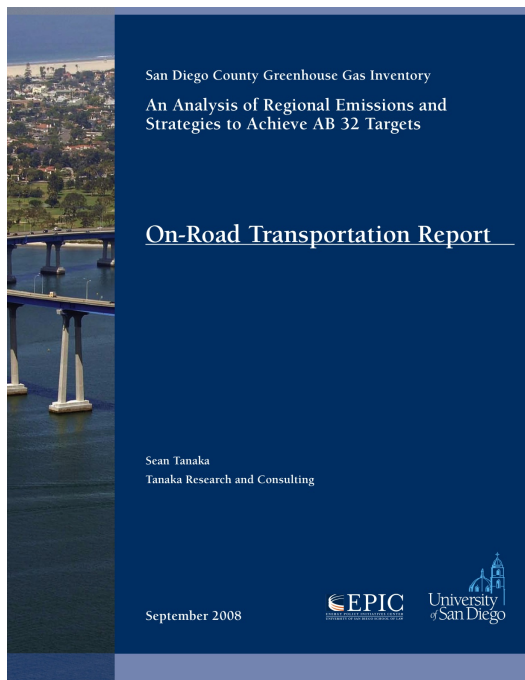
- San Diego County
- All Economic Sectors
- Entire Population
- Military Not Fully Captured

## Method

- Followed CARB Method
  - Based on the IPCC Protocols
- Modified where Appropriate



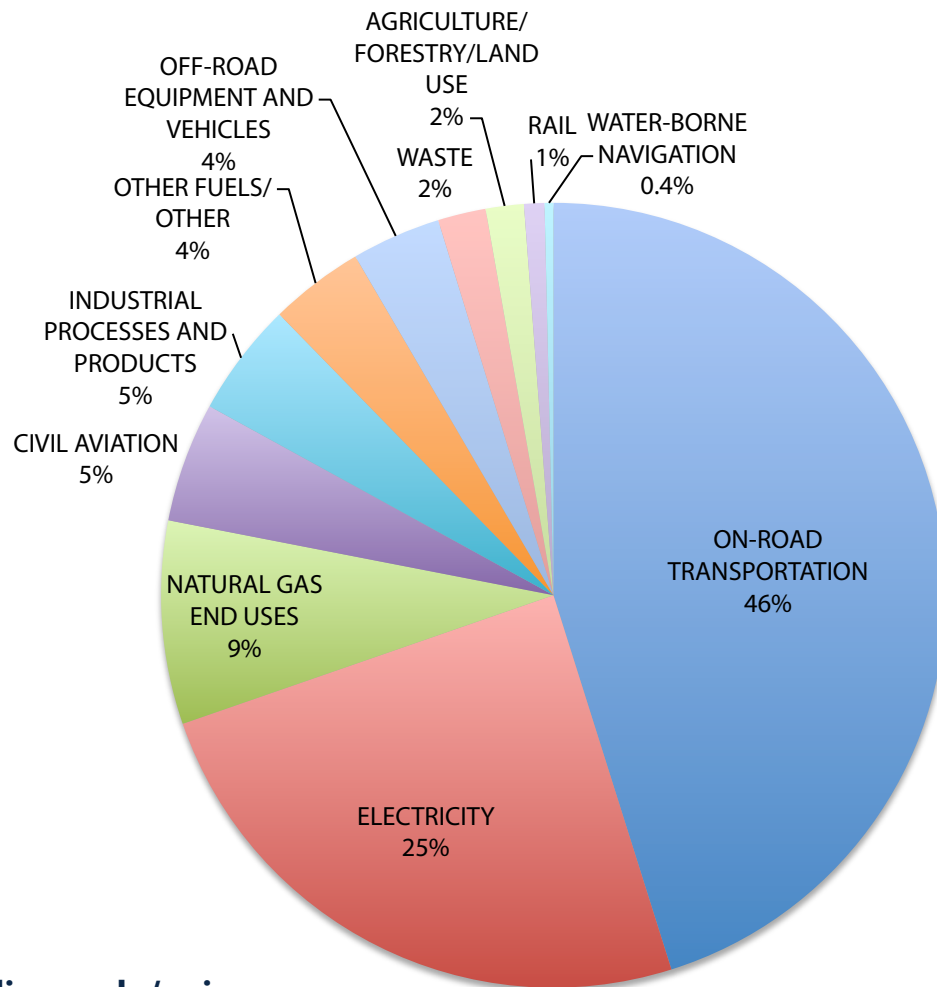
# GHG Inventory Project Overview



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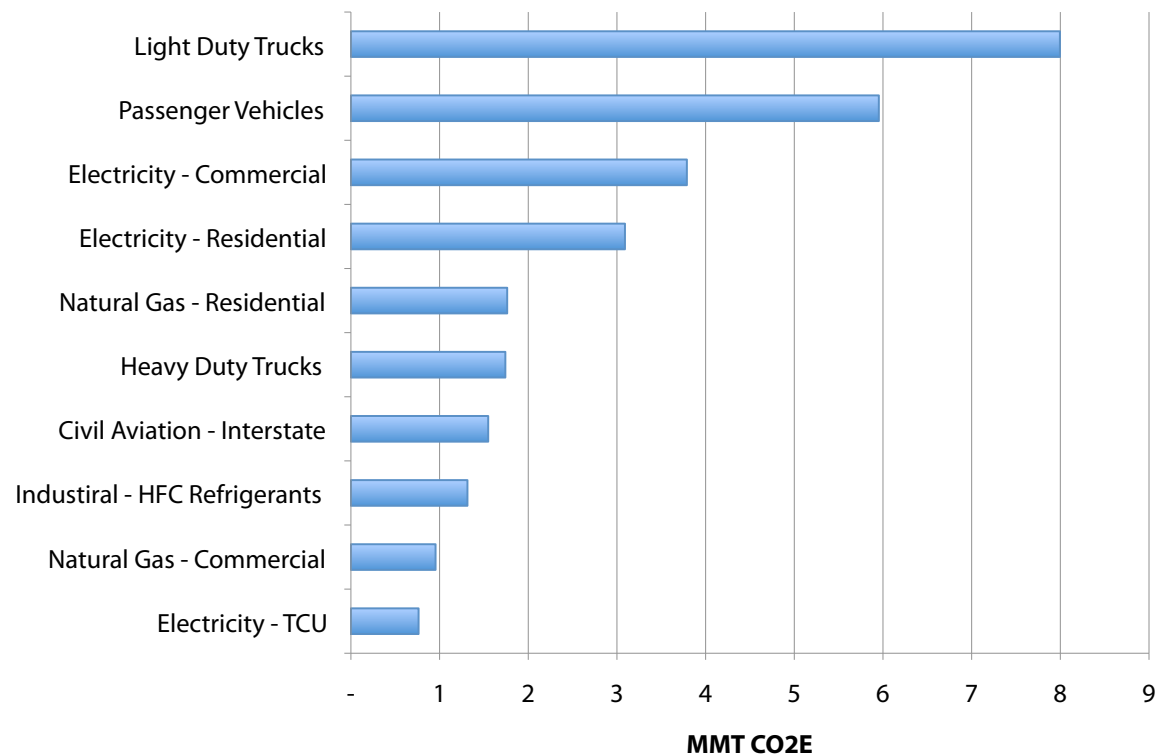
# GHG Inventory Project Results



**GHG Emissions  
for San Diego  
County (2006)**

# GHG Inventory Project Results

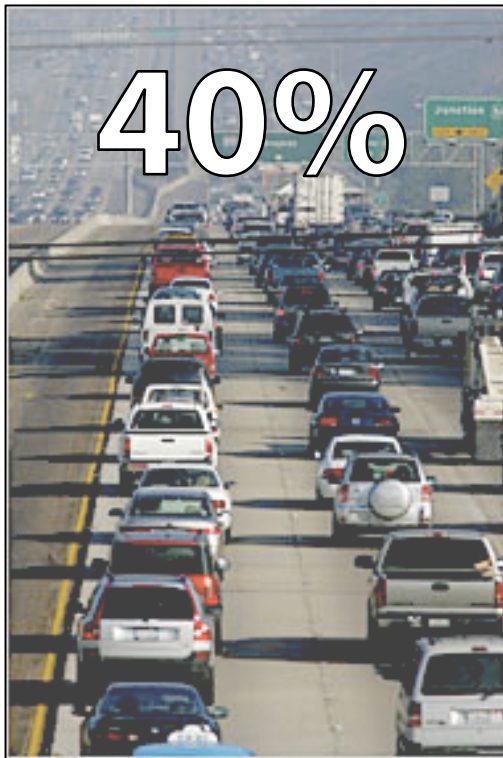
## Top 10 GHG Emitting Subcategories San Diego County (2006)



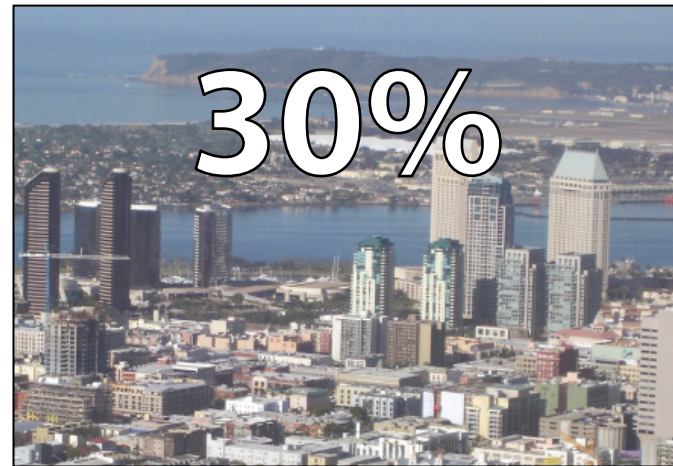


# GHG Inventory Project Results

Emissions in SD County come primarily from...



Car & Trucks



Buildings

# GHG Reduction Targets

# GHG Inventory Project Results

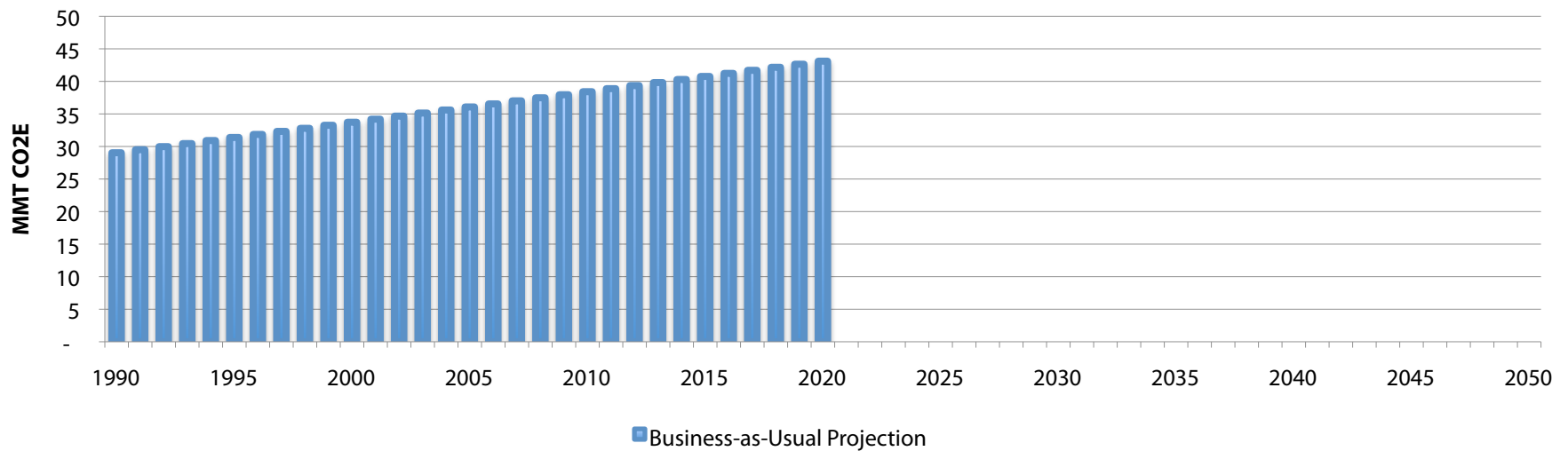
## Greenhouse Gas Reduction Policies in California

- AB 32 – Global Warming Solutions Act of 2006
  - Goal: 1990 levels by 2020
  - Does not apply specifically to cities or counties
- Executive Order S-3-05
  - Goal: 80% below 1990 levels by 2050



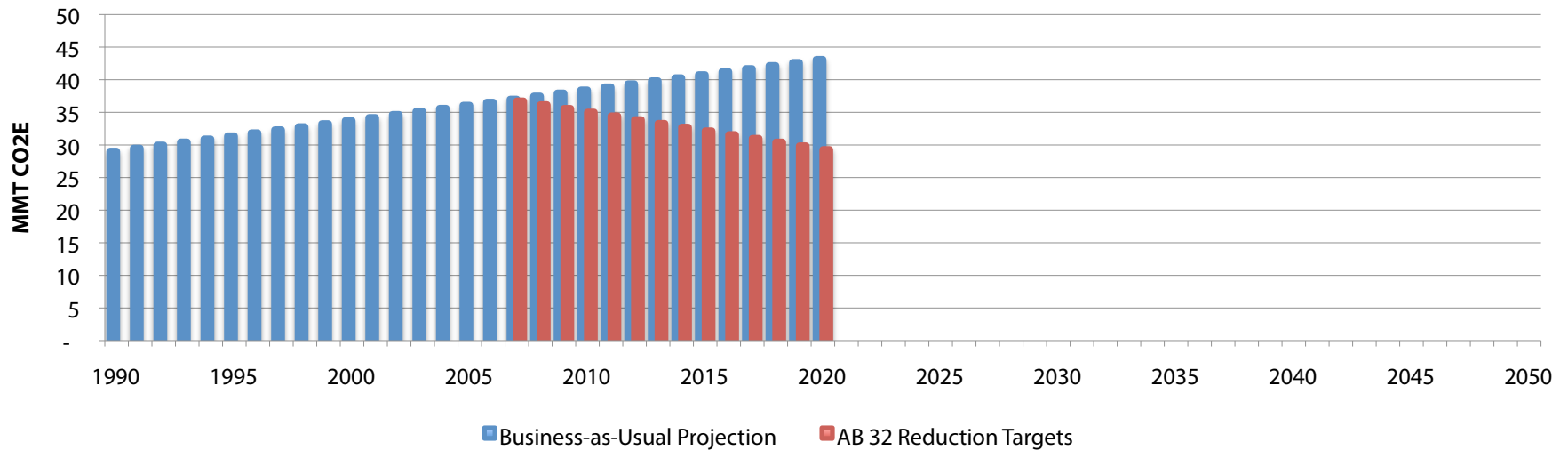
# GHG Inventory Project Results

## Theoretical GHG Reduction Targets for San Diego County



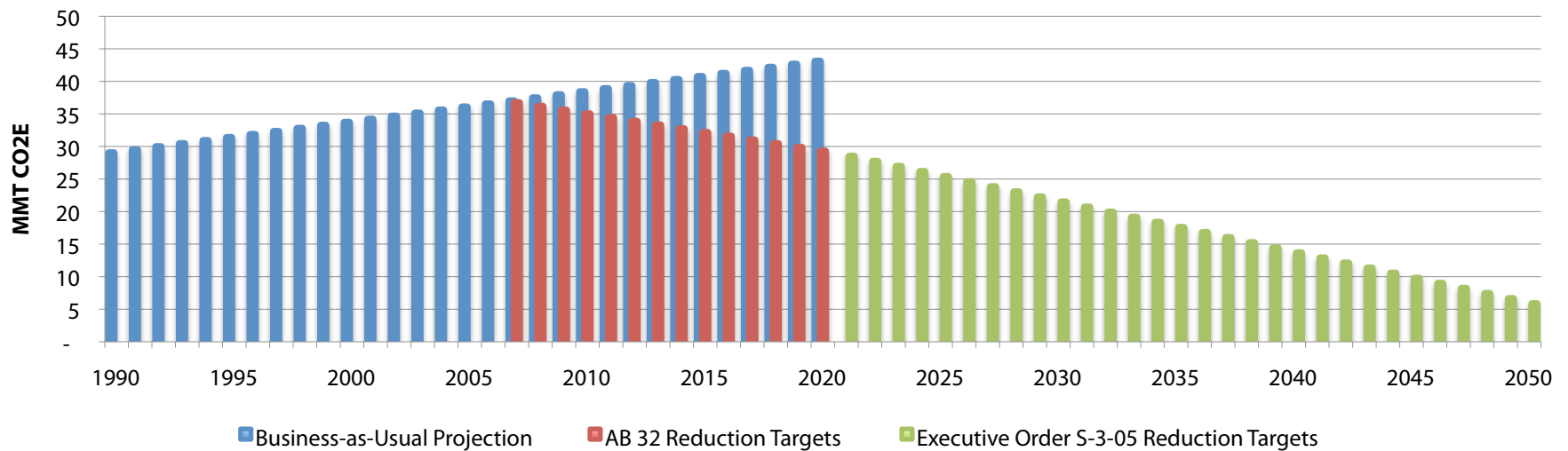
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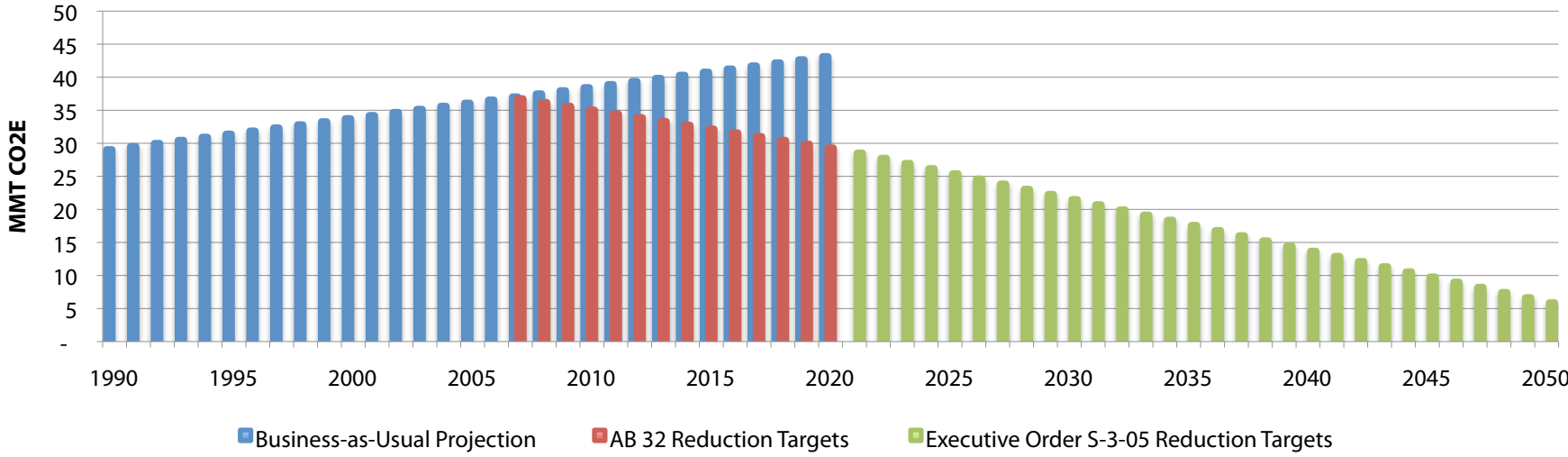
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# GHG Reduction Targets

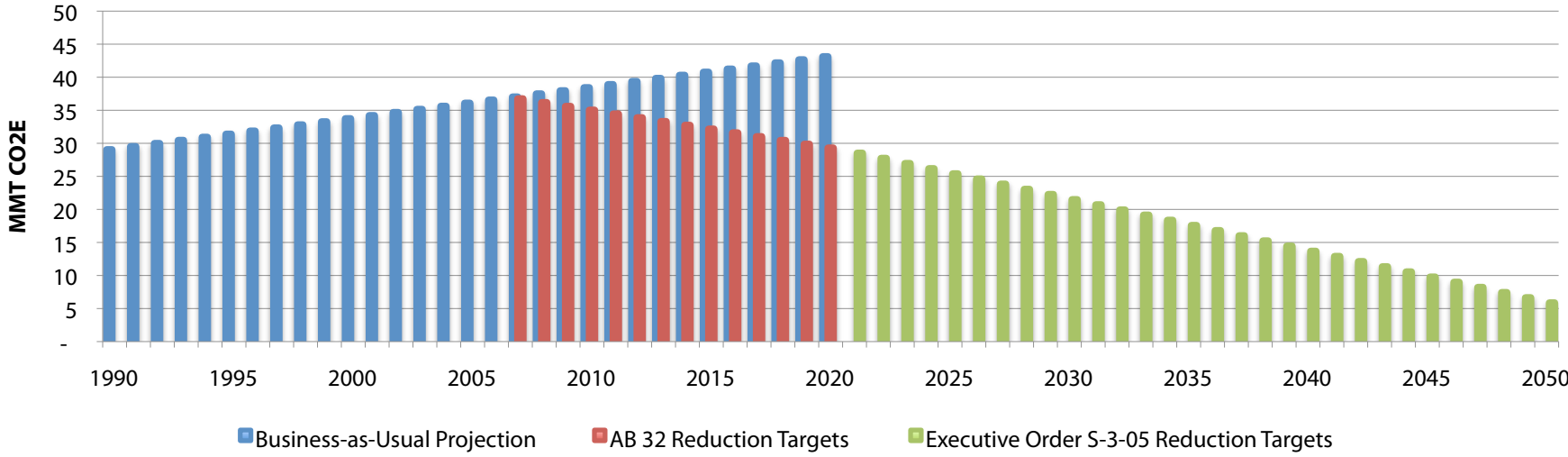
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**12**  
MT/person

# GHG Reduction Targets

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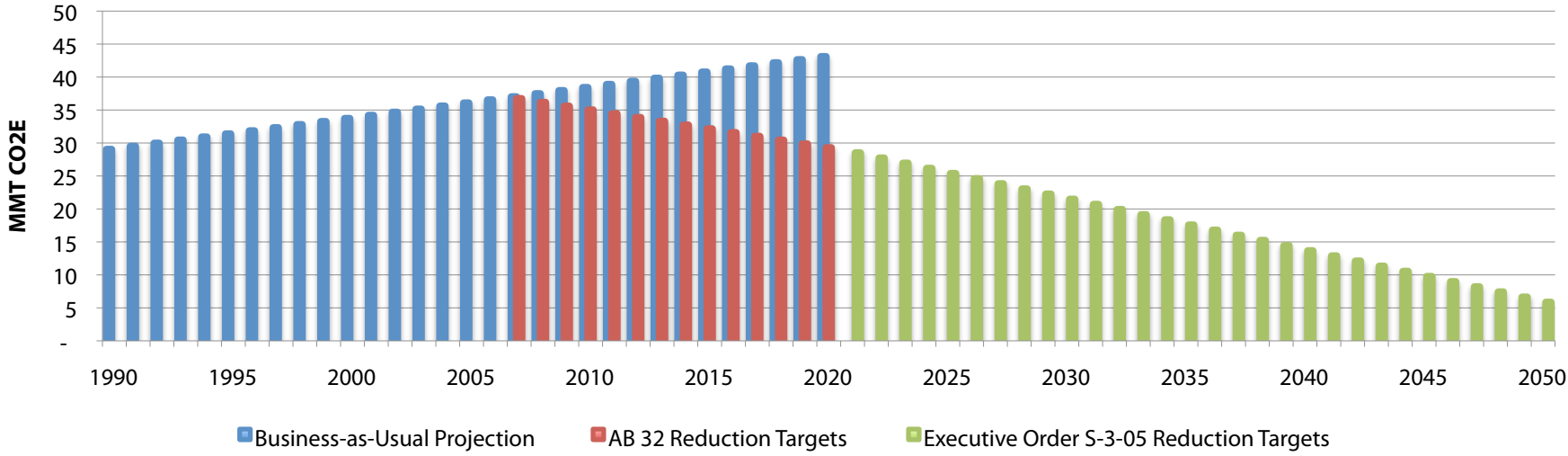
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MT/person

**8**  
MT/person



# GHG Reduction Targets

## Theoretical GHG Reduction Targets for San Diego County



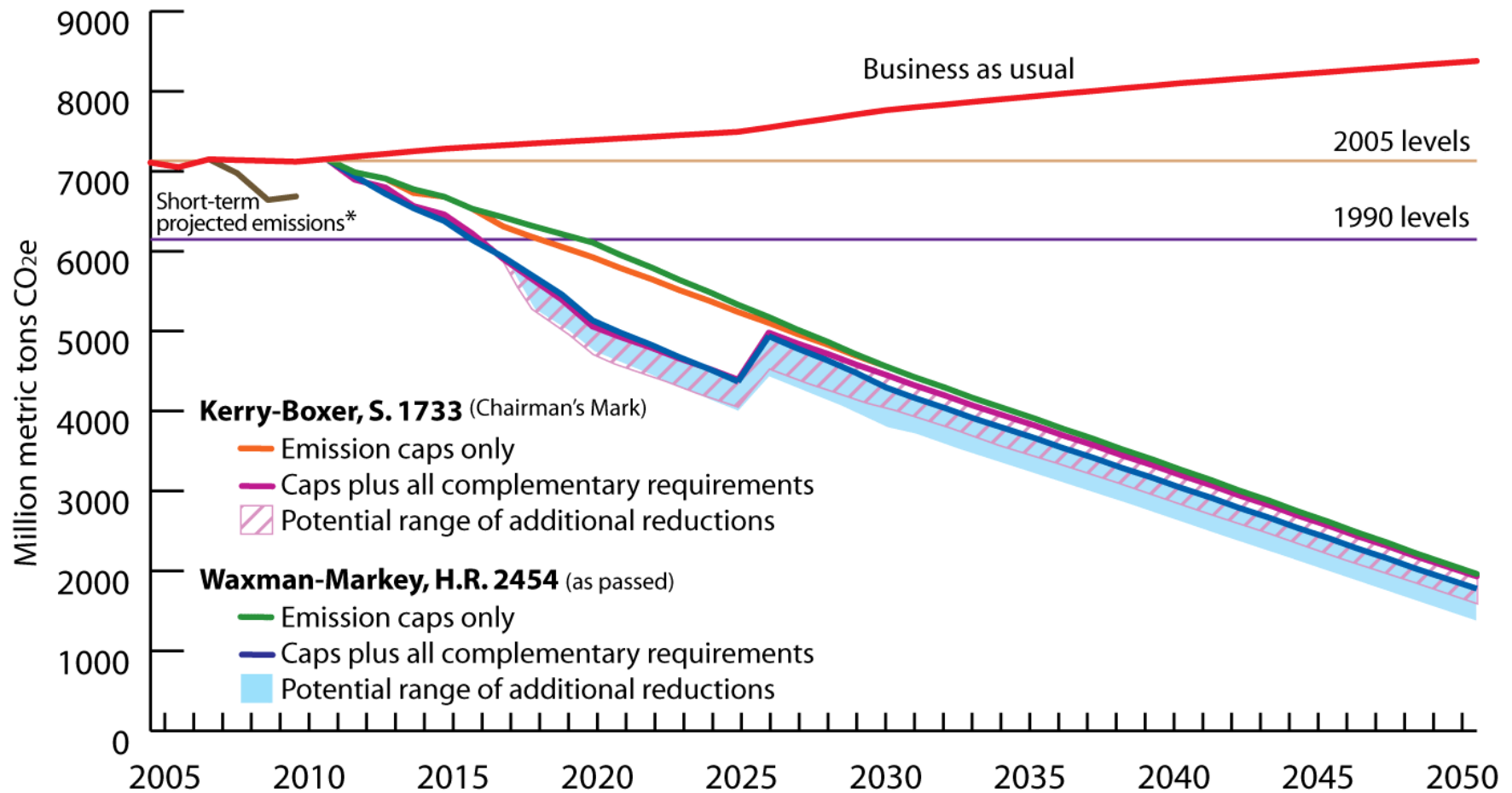
**12**  
MT/person

**8**  
MT/person

**1.5**  
MT/person

# Emission Reductions Under Cap-and-Trade Proposals in the 111th Congress, 2005-2050

October 28, 2009



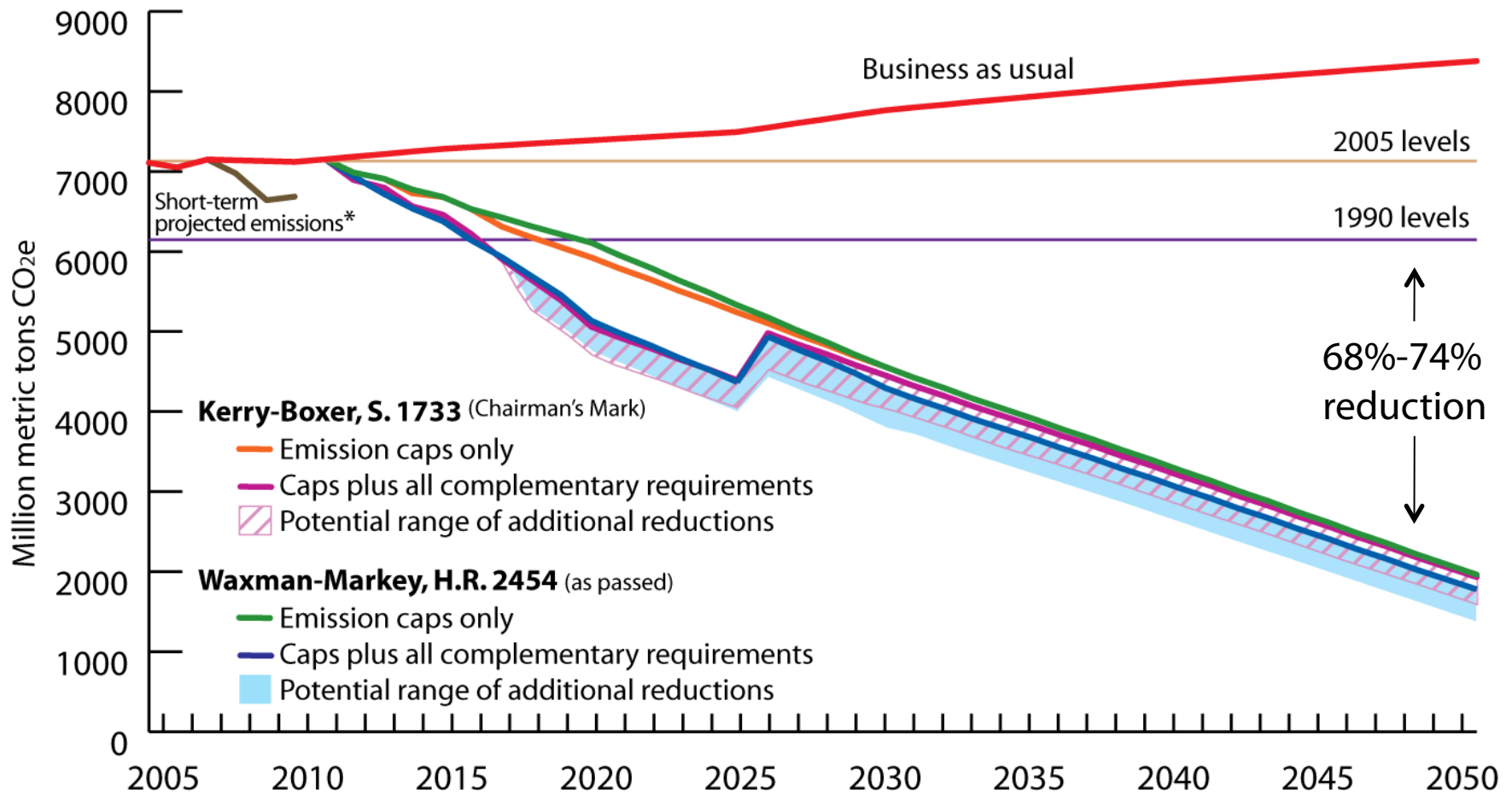
 WORLD RESOURCES INSTITUTE

For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>.

\* "Business as usual" emission projections are from EPA's reference case for its analysis of the Waxman Markey Discussion Draft. "Short-term projected emissions" represent EIA's most recent estimates of emissions for 2008-2010.

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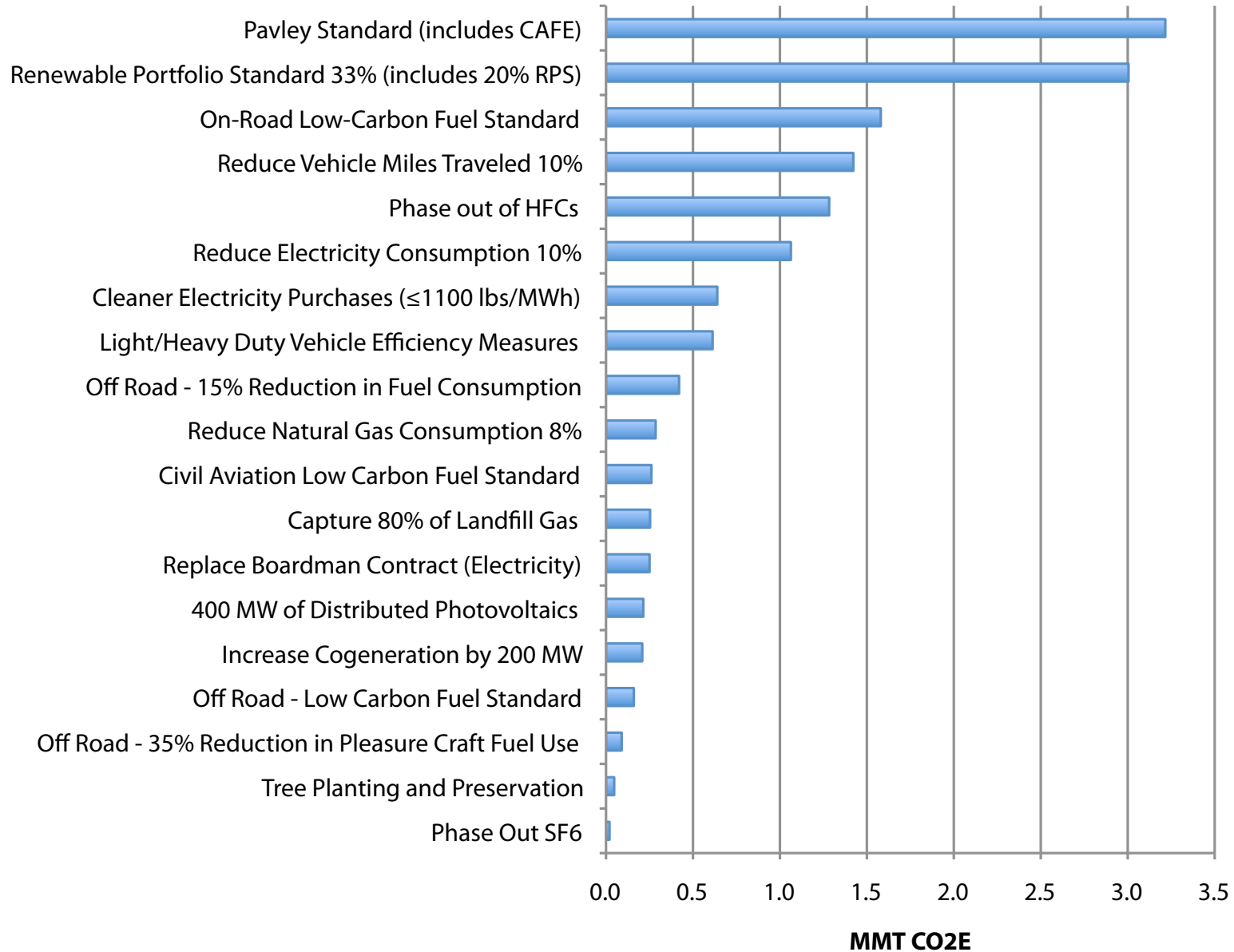
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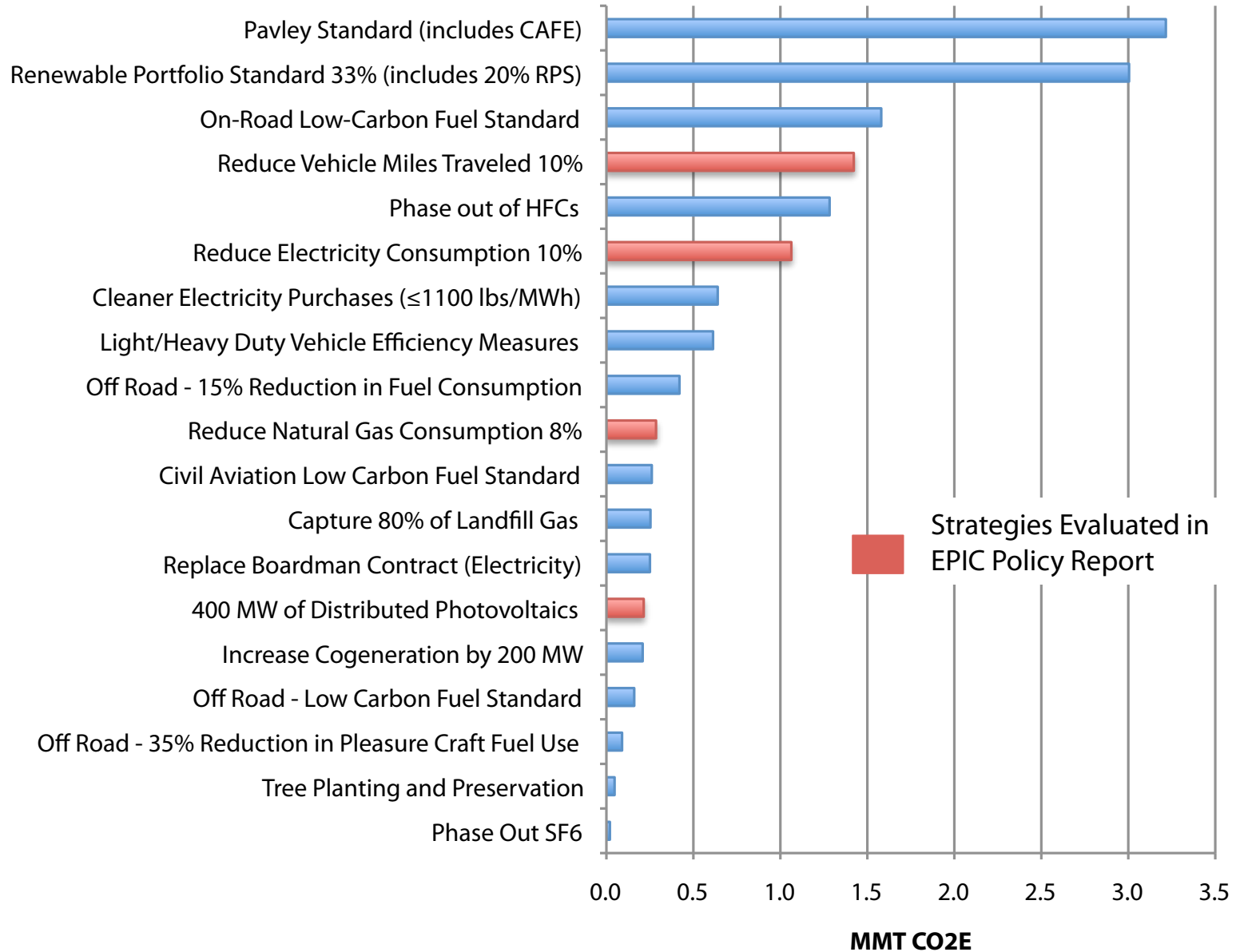
# Strategies to Reach GHG Targets

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## Emission Reduction Strategies for San Diego County to Meet Hypothetical AB 32 Targets by 2020



# Emission Reduction Strategies for San Diego County to Meet Hypothetical AB 32 Targets by 2020





Background

# GHG Policy Project Overview

October 2009 | Executive Summary

## Reducing Greenhouse Gases from Electricity and Natural Gas Use in San Diego County Buildings

*An Analysis of Local Government Policy Options*



October 2009 | Executive Summary

## Reducing Greenhouse Gases from On-Road Transportation in San Diego County

*An Analysis of Local Government Policy Options*



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# GHG Policy Project – Buildings



<b>Emissions Category / Strategy</b>	<b>Reduction Amount (MMT CO<sub>2</sub>E)</b>	<b>Percentage of Total Reduction</b>
<b>ELECTRICITY</b>	<b>3.8</b>	<b>28%</b>
Renewable Portfolio Standard 20%	1.2	8%
<b>Reduce Electricity Consumption 10%</b>	<b>0.7</b>	<b>5%</b>
Renewable Portfolio Standard 33% (Incremental)	0.7	5%
Cleaner Electricity Purchases (≤1100 lbs/MWh)	0.6	4%
Replace Boardman Contract (Coal)	0.3	2%
<b>Increase Distributed Photovoltaics to 400 MW</b>	<b>0.2</b>	<b>1%</b>
Increase combined heat and power by 200 MW	0.2	1%
<b>NATURAL GAS END-USE</b>	<b>0.3</b>	<b>2%</b>
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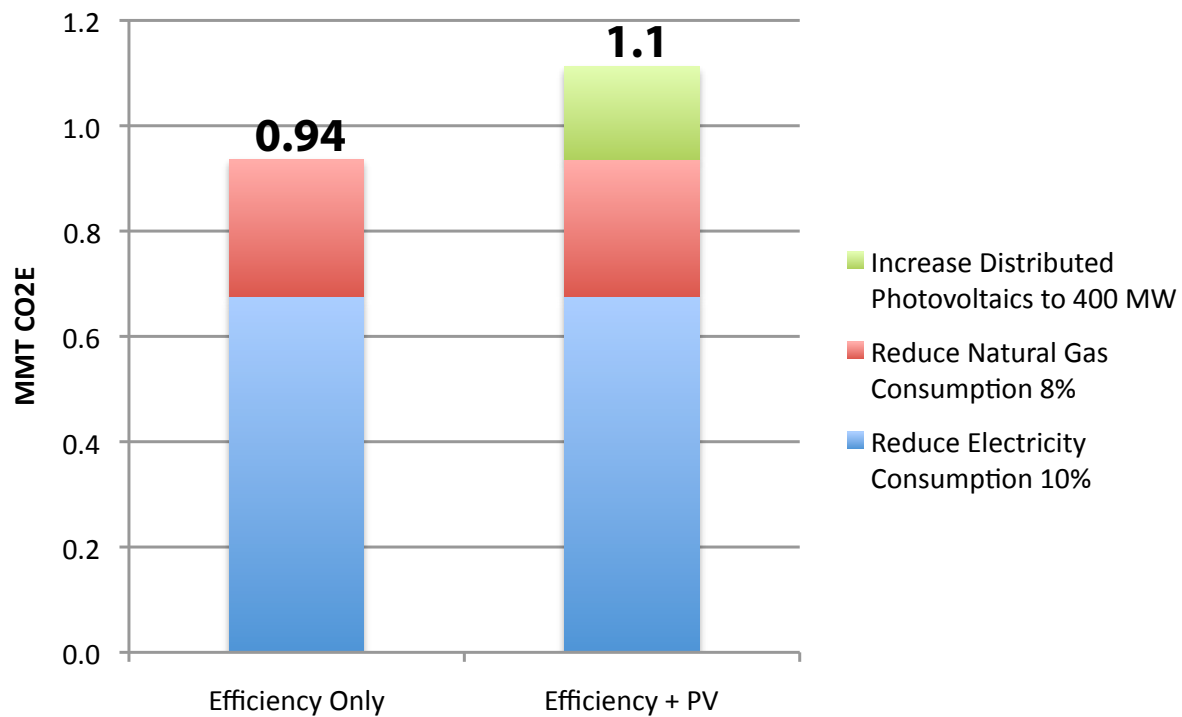
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# GHG Policy Project - Buildings

## GHG Reductions from Building-Related Strategies



# Electric & Natural Gas Efficiency

**How do we reduce electric and natural gas energy use?**

[www.sandiego.edu/epic](http://www.sandiego.edu/epic)



# Electric & Natural Gas Efficiency

**How do we reduce electric and natural gas energy use?**



**New Building Standards**

[www.sandiego.edu/epic](http://www.sandiego.edu/epic)

# Electric & Natural Gas Efficiency

How do we reduce electric and natural gas energy use?



**New Building Standards**



**Appliance Standards**

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**New Building Standards**



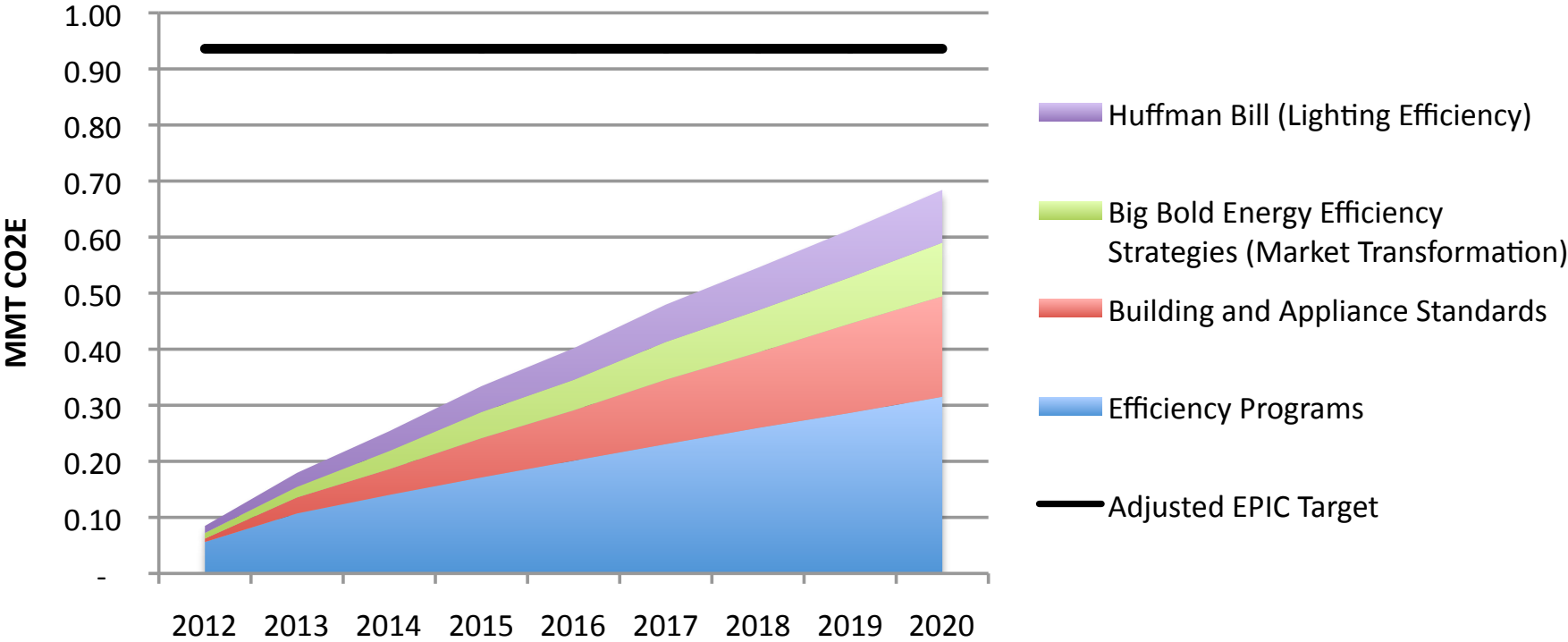
**Appliance Standards**



**Programs**

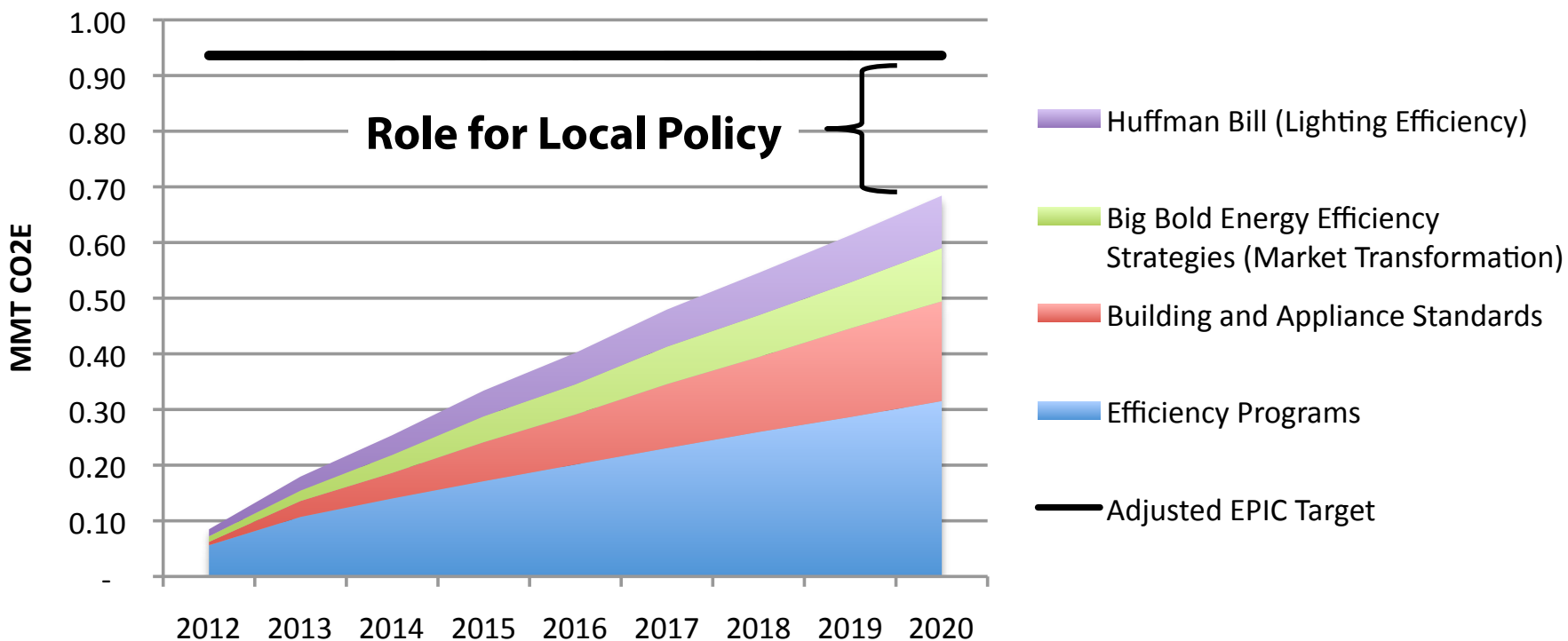
[www.sandiego.edu/epic](http://www.sandiego.edu/epic)

# Electric & Natural Gas Efficiency



Source: CA Public Utilities Commission

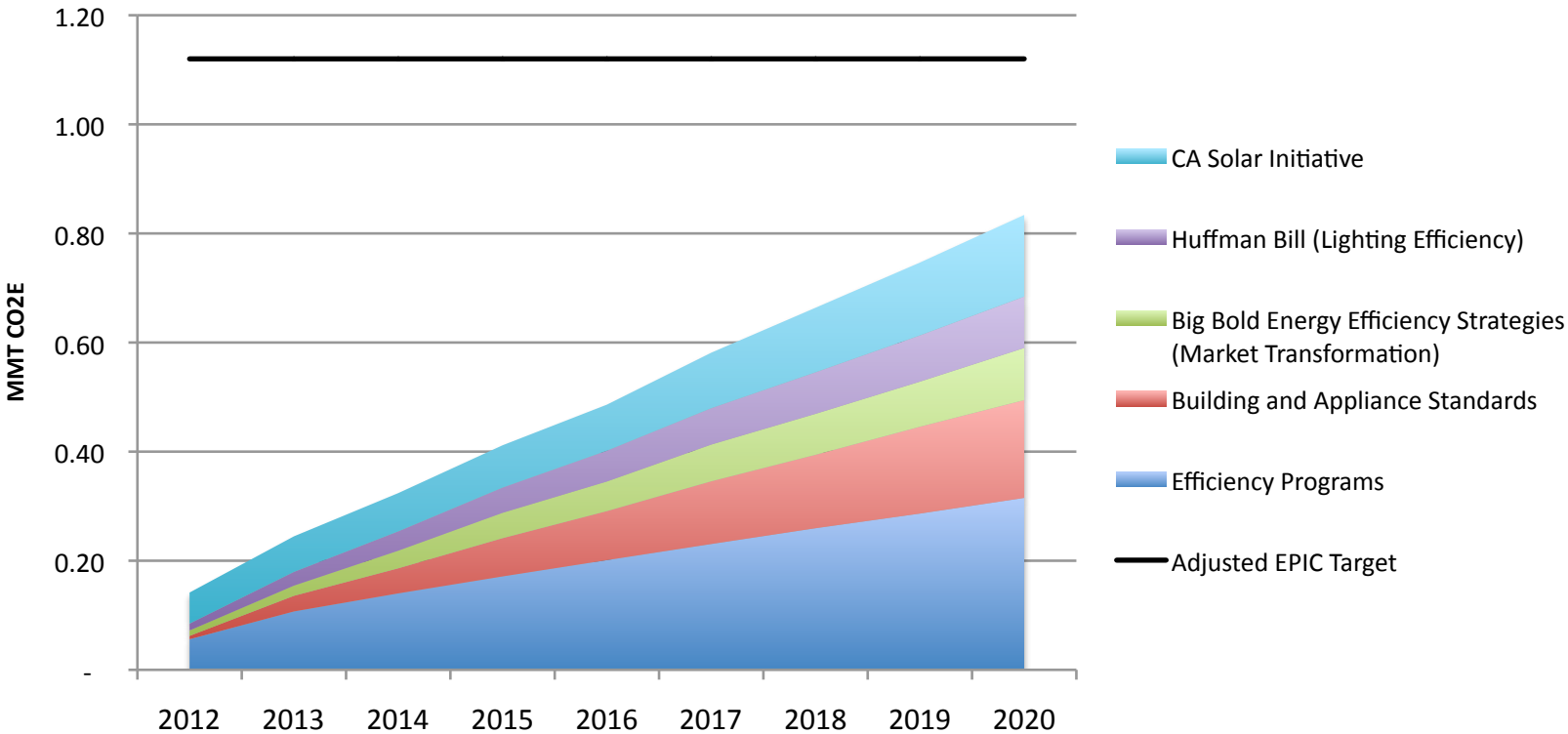
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Source: CA Public Utilities Commission

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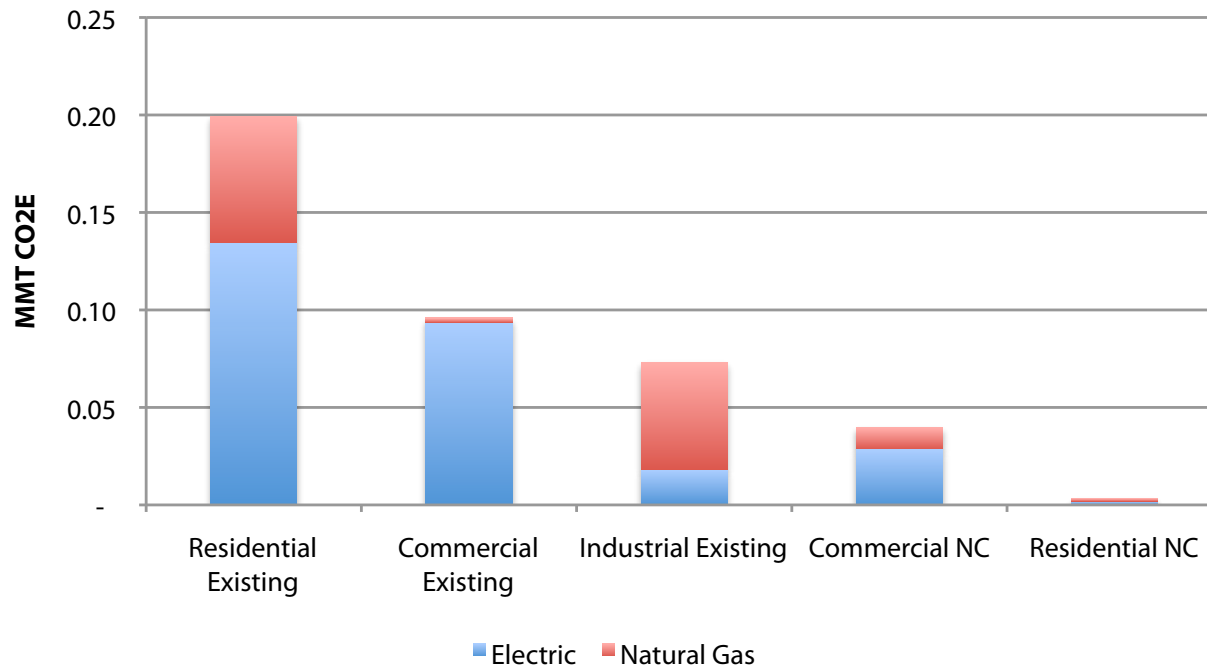
# Electric & Natural Gas Efficiency + PV



Source: CA Public Utilities Commission

# Electric & Natural Gas Efficiency

## GHG Emissions Reduction Potential - Energy Efficiency Programs (San Diego County 2020)



Source: Itron Inc.

# Characteristics of SD Building Stock

## New



**1%**

per year

## Sales



**3%**

per year

## Remodel



**~1%**

per year

# Characteristics of SD Building Stock

<b>Year</b>	<b>Single Family</b>	<b>Multi Family</b>	<b>Mobile Home</b>	<b>Total</b>	<b>Percentage of 2008 Total</b>
1980	440,794	245,290	37,907	723,991	63%
1985	485,403	274,715	41,466	747,339	65%
1990	554,023	346,414	45,803	946,240	82%
1995	591,621	355,724	46,360	993,705	87%
2000	628,652	364,636	46,861	1,040,149	91%
2005	678,221	384,242	46,037	1,108,500	97%
2008	699,004	403,094	45,802	1,147,900	100%

# Characteristics of SD Building Stock

<b>Year</b>	<b>Total Square Footage (MM SF)</b>	<b>Percentage of 2008 Total</b>
1980	208	39%
1985	263	50%
1990	337	64%
1995	388	74%
2000	436	83%
2005	500	95%
2008	528	100%



# Existing Buildings

The background is a solid dark blue color. On the right side, there are several overlapping, curved, lighter blue shapes that resemble stylized waves or abstract architectural forms, creating a sense of movement and depth.

# GHG Reduction Policy Options

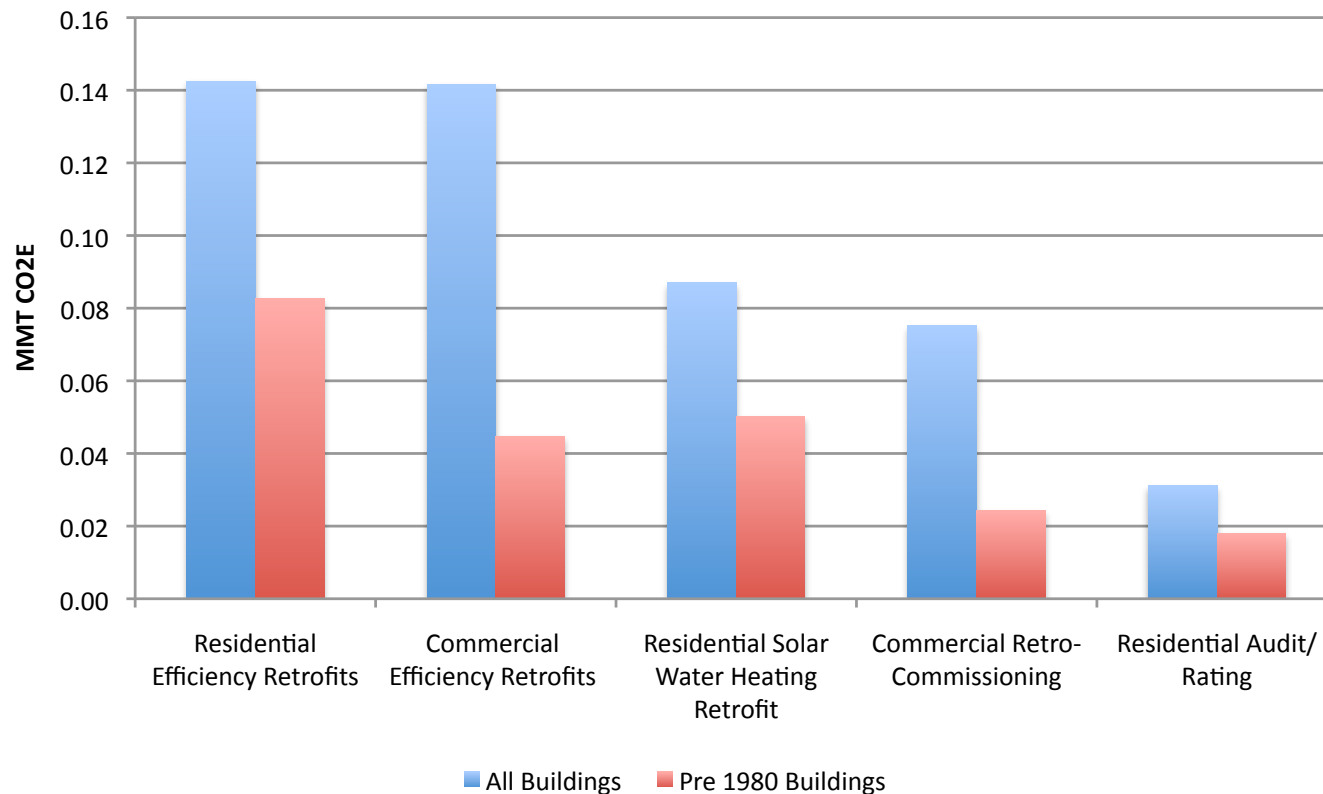
## Existing Buildings

- Residential Audits/Rating and Disclosure
- Residential Efficiency Retrofits
- Residential Solar Water Heating Retrofits
- Commercial Retro-Commissioning
- Commercial Efficiency Retrofits

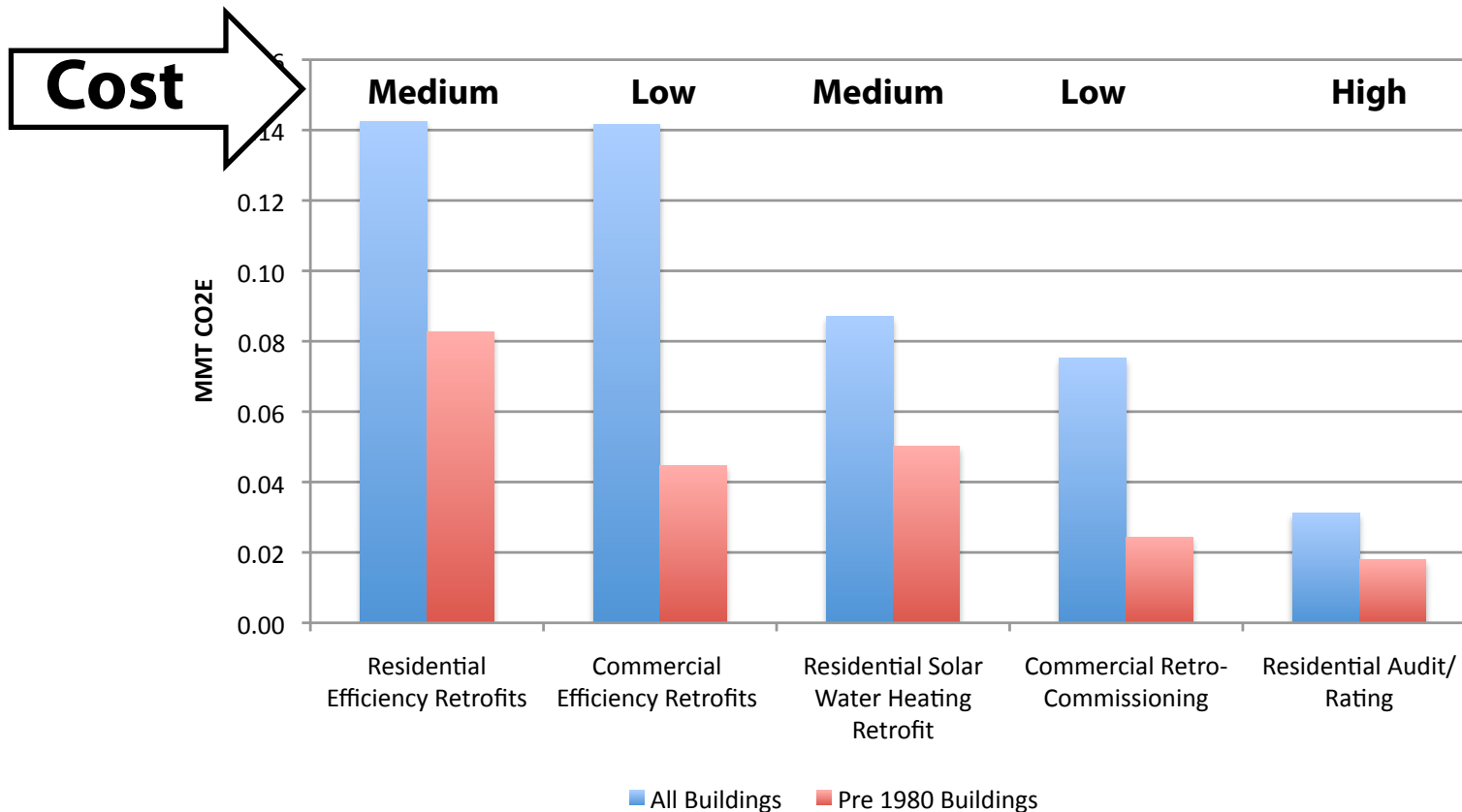
## Two Scenarios

- All Buildings
- Buildings Built in 1980 and Earlier

# GHG Reduction Policy Options - *Draft Results*



# GHG Reduction Policy Options - Draft Results



# New Buildings

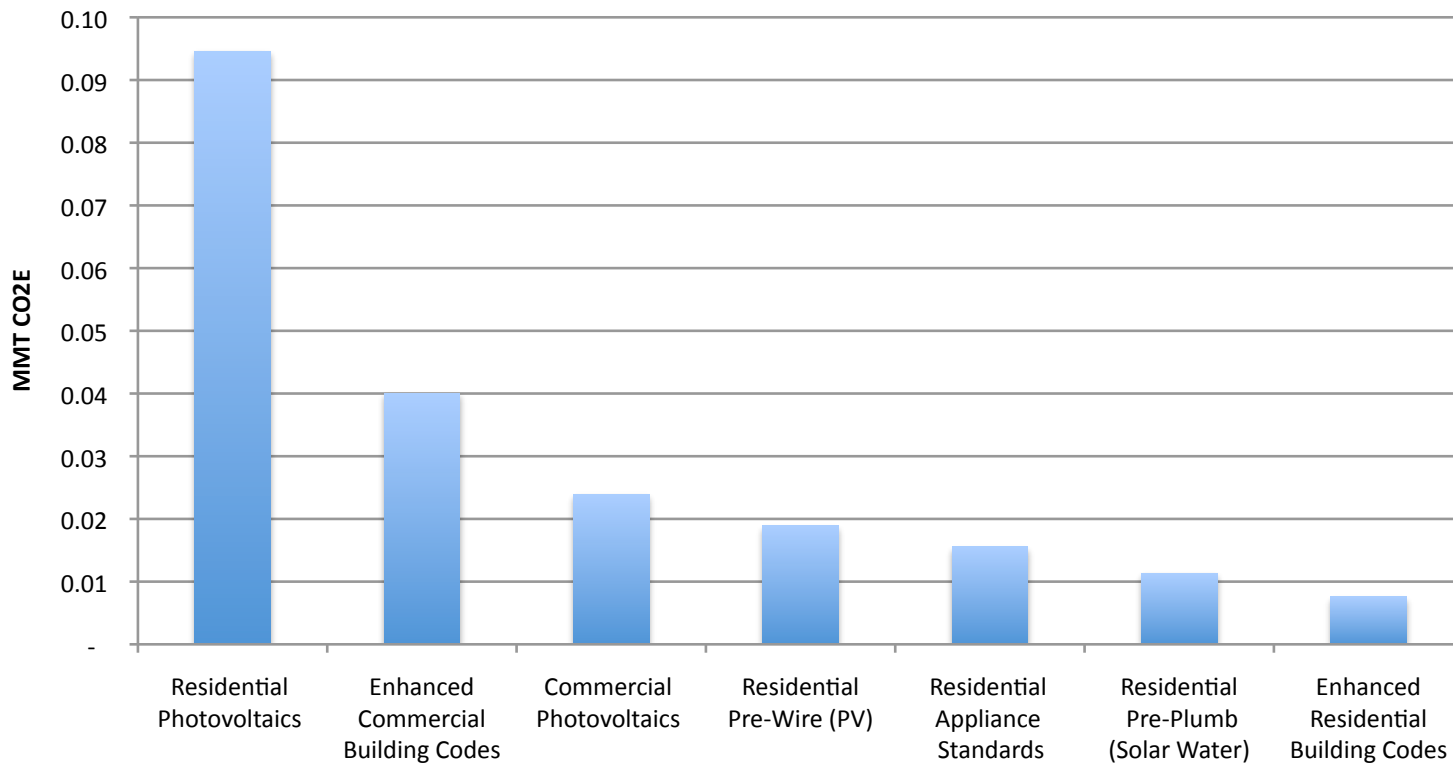
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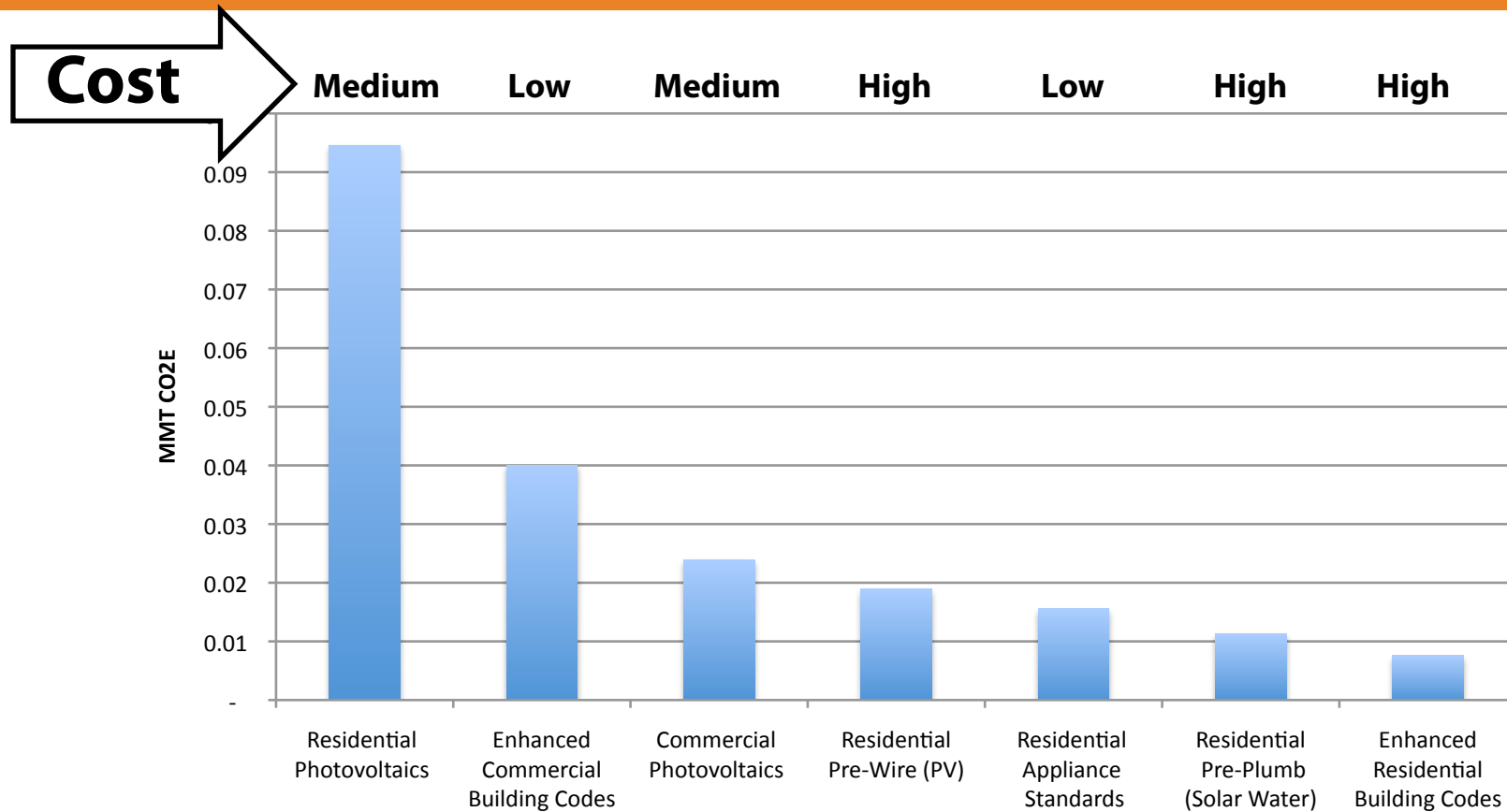
## New Construction

- Residential Enhanced Efficiency Standards (Title 24 +)
- Residential Appliance Standards (Energy Star)
- Residential Solar Photovoltaics Pre-Wire
- Residential Pre-Plumb
- Residential Solar Photovoltaics
- Commercial Enhanced Efficiency Standards (Title 24 +)
- Commercial Solar Photovoltaics

# GHG Reduction Policy Options - *Draft Results*

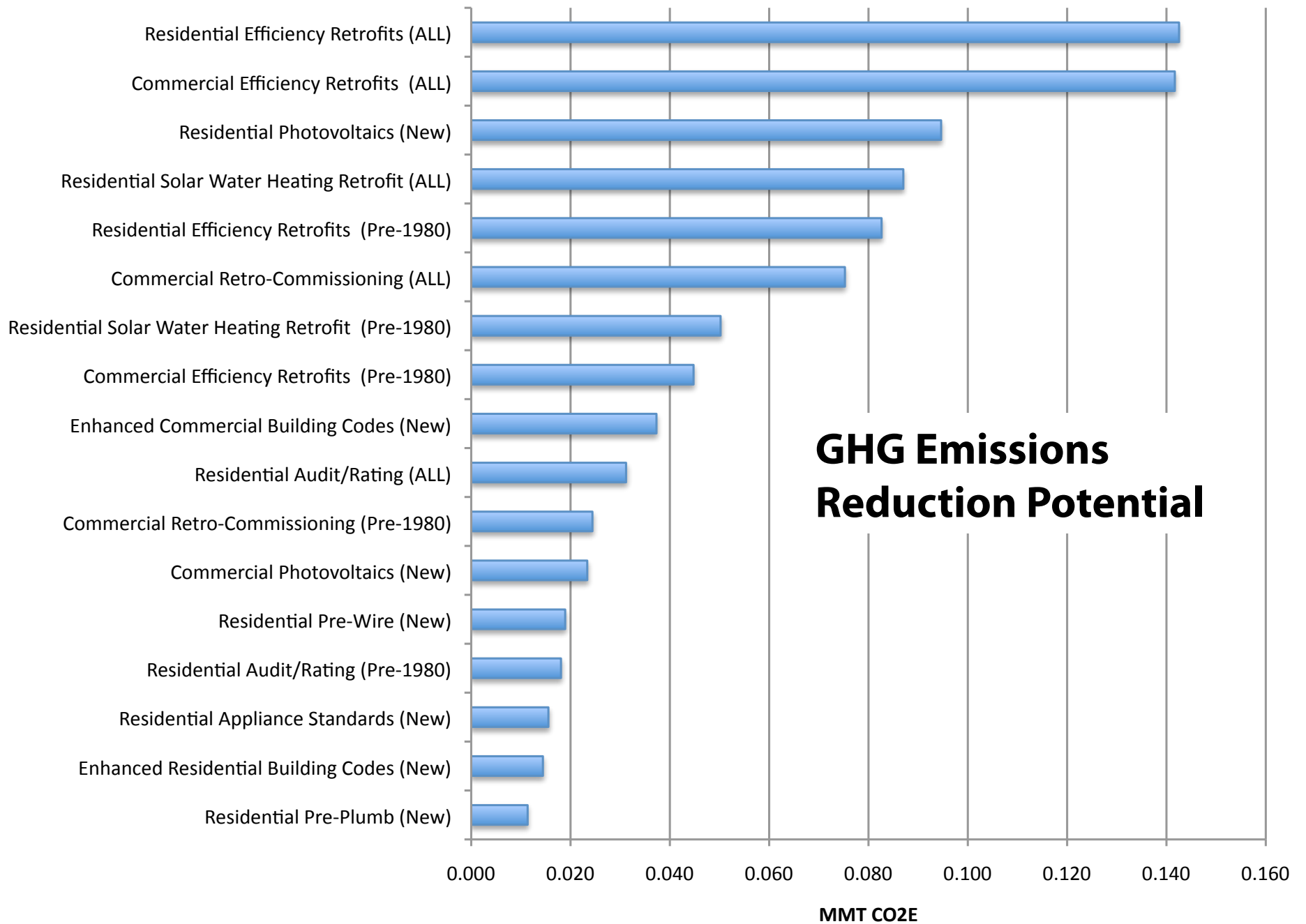


# GHG Reduction Policy Options - *Draft Results*





# Comparison of All Policies



### Cost to Reduce GHG

		Low	Medium	High
GHG Reduction	Low	<p>Commercial Retro-Commissioning (Pre-1980)</p> <p>Residential Appliance Standards</p>	<p>Commercial Photovoltaics (New Construction)</p>	<p>Residential Pre-Wire (Photovoltaics)</p> <p>Residential Rating/Disclosure (Pre-1980)</p> <p>Enhanced Residential Building Codes</p> <p>Residential Pre-Plumb (Solar Water)</p>
	Medium	<p>Commercial Retro-Commissioning (All)</p> <p>Commercial Efficiency Retrofits (Pre-1980)</p> <p>Enhanced Commercial Building Codes</p>	<p>Residential Solar Water Heating Retrofit (Pre-1980)</p>	<p>Residential Rating/Disclosure (All)</p>
	High	<p>Commercial Efficiency Retrofits (All)</p>	<p>Residential Efficiency Retrofits (All and Pre-1980)</p> <p>Residential Photovoltaics (New Construction)</p> <p>Residential Solar Water Heating Retrofit (All)</p>	<p>N/A</p>

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# GHG Reduction Policy Options

Percentage of Potential Total GHG Reduction  
(All Building Scenario)

Implementation Cost

GHG Reduction	Implementation Cost			<b>Totals</b>
	Low	Medium	High	
Low	2%	4%	7%	<b>13%</b>
Medium	7%	n/a	5%	<b>12%</b>
High	23%	52%	n/a	<b>75%</b>
<b>Totals</b>	<b>32%</b>	<b>56%</b>	<b>12%</b>	

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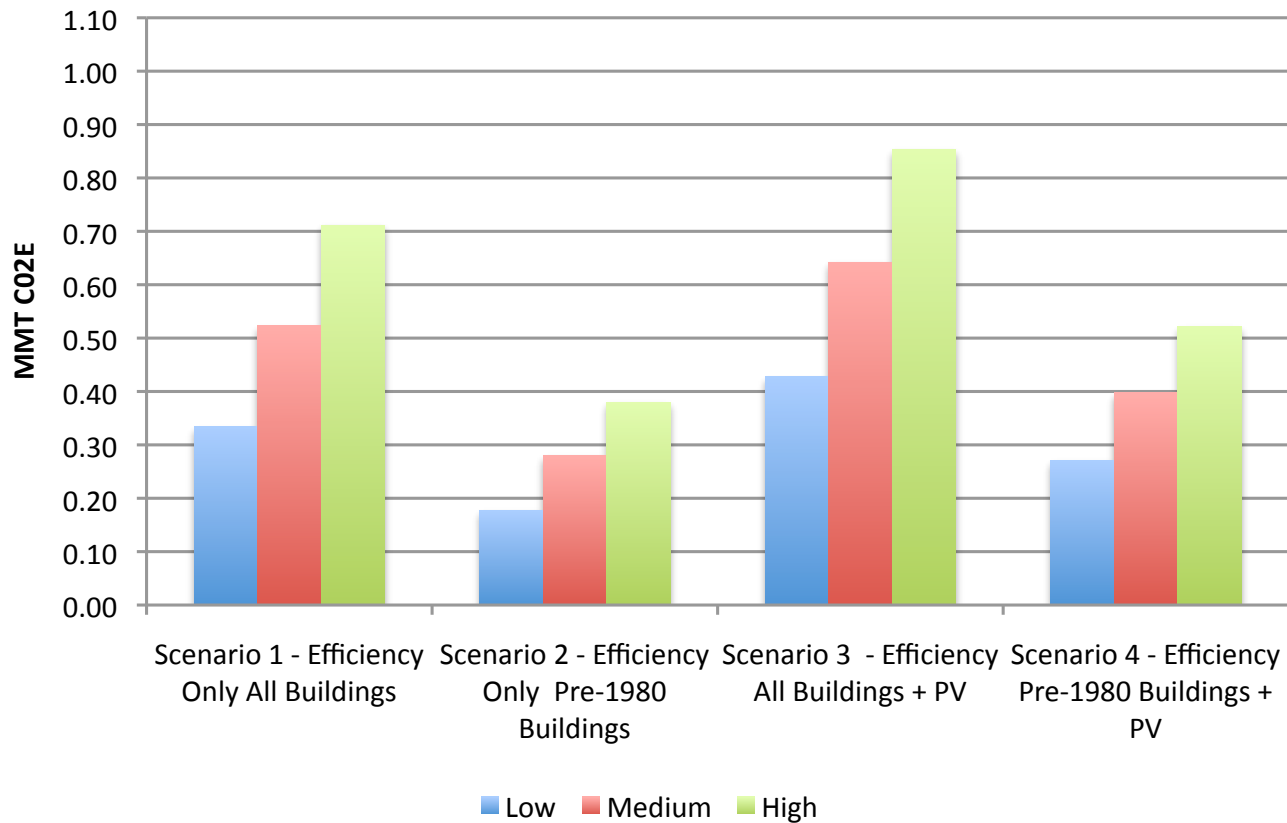
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Percentage of Potential Total GHG Reduction  
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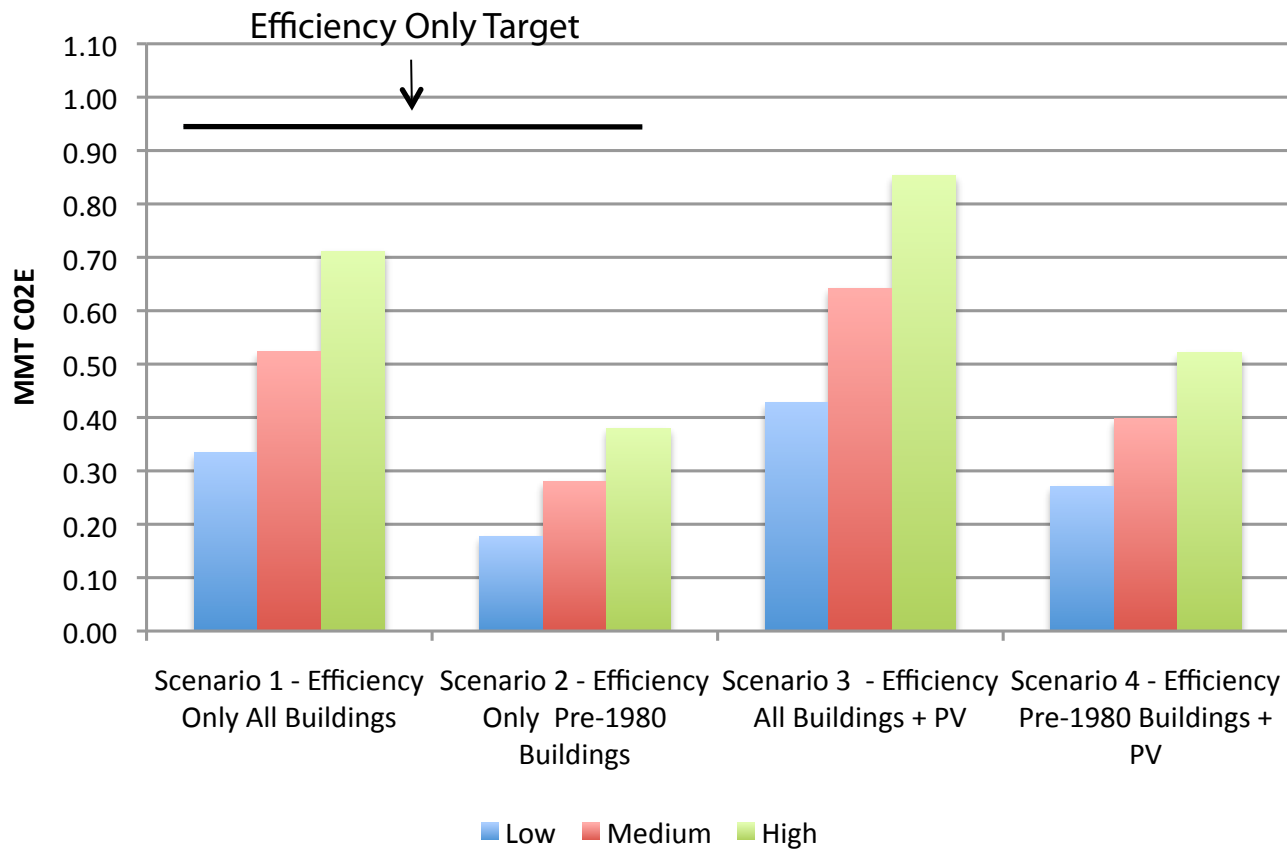
Implementation Cost

GHG Reduction	Implementation Cost			<b>Totals</b>
	Low	Medium	High	
Low	8%	5%	14%	<b>27%</b>
Medium	24%	11%	n/a	<b>35%</b>
High	n/a	38%	n/a	<b>38%</b>
<b>Totals</b>	<b>32%</b>	<b>54%</b>	<b>14%</b>	

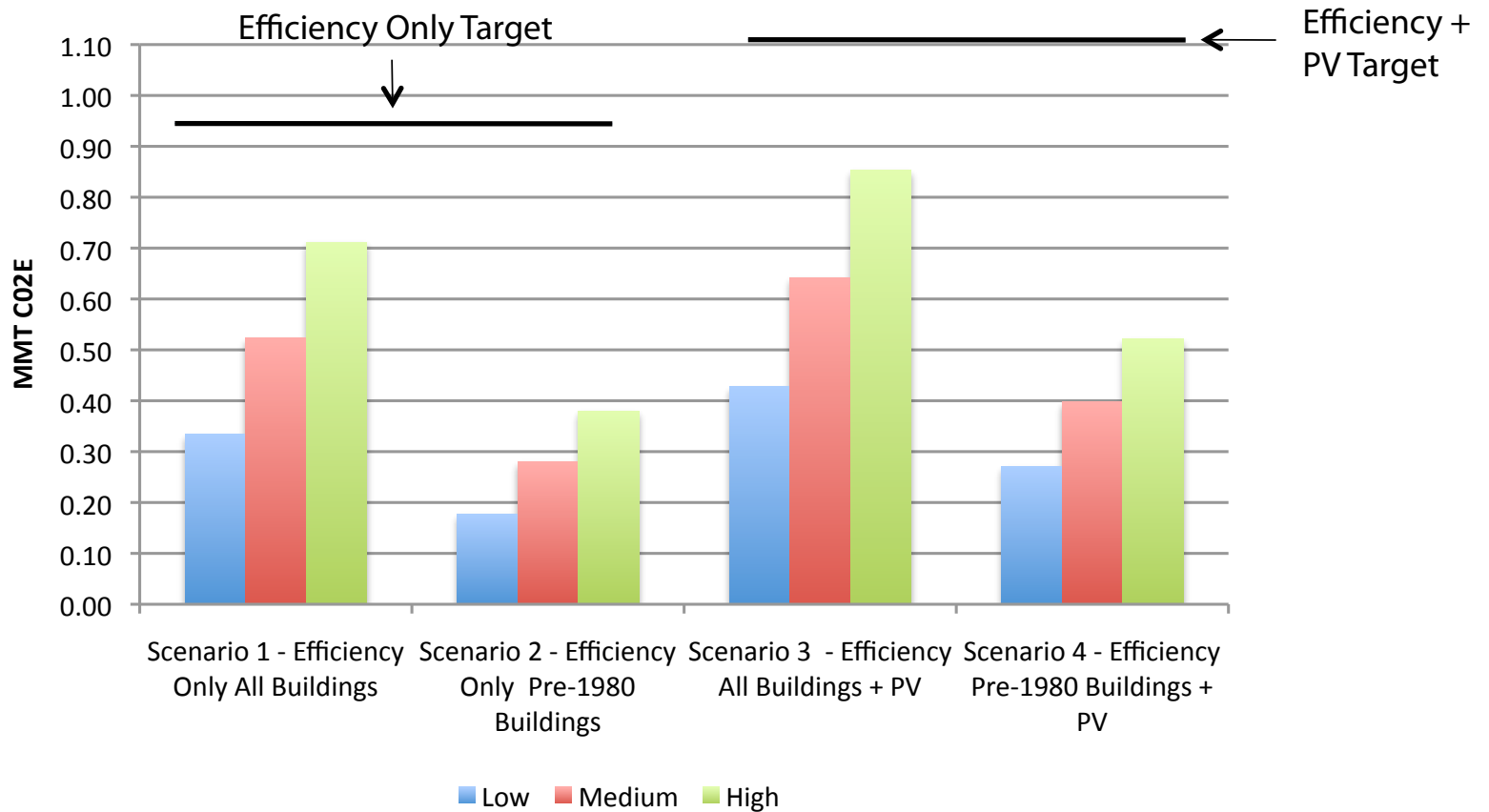
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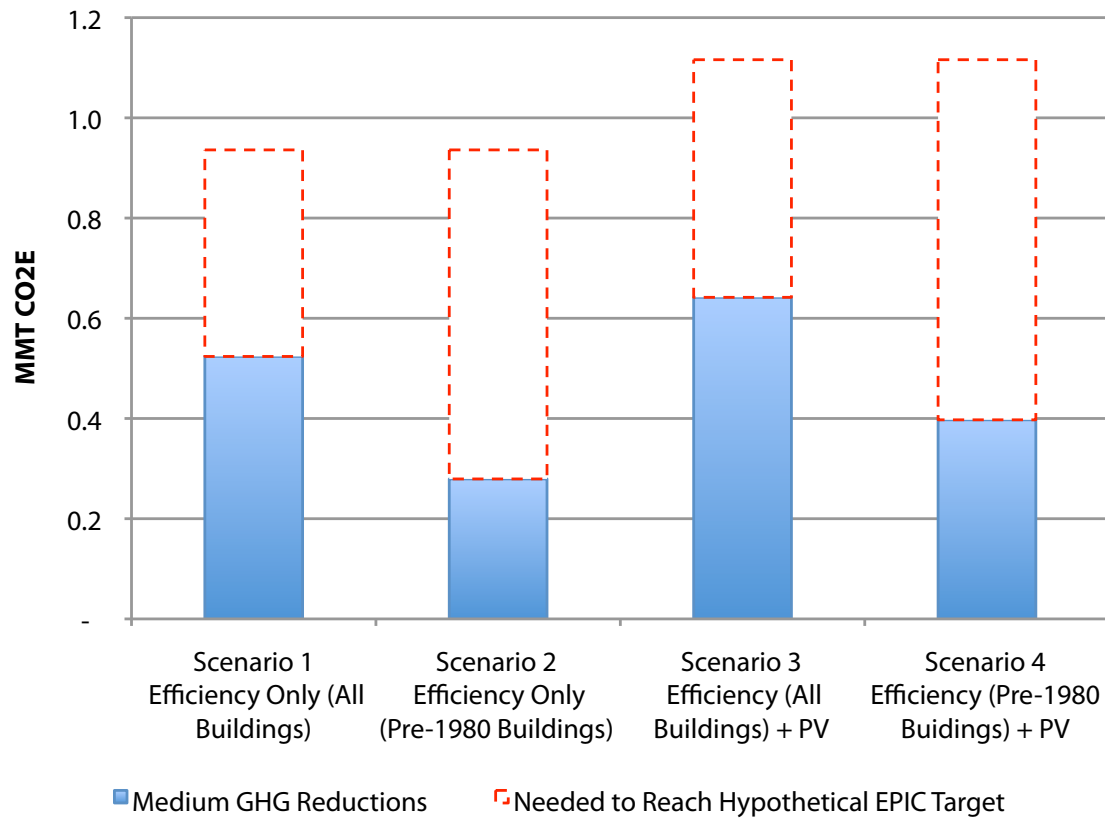
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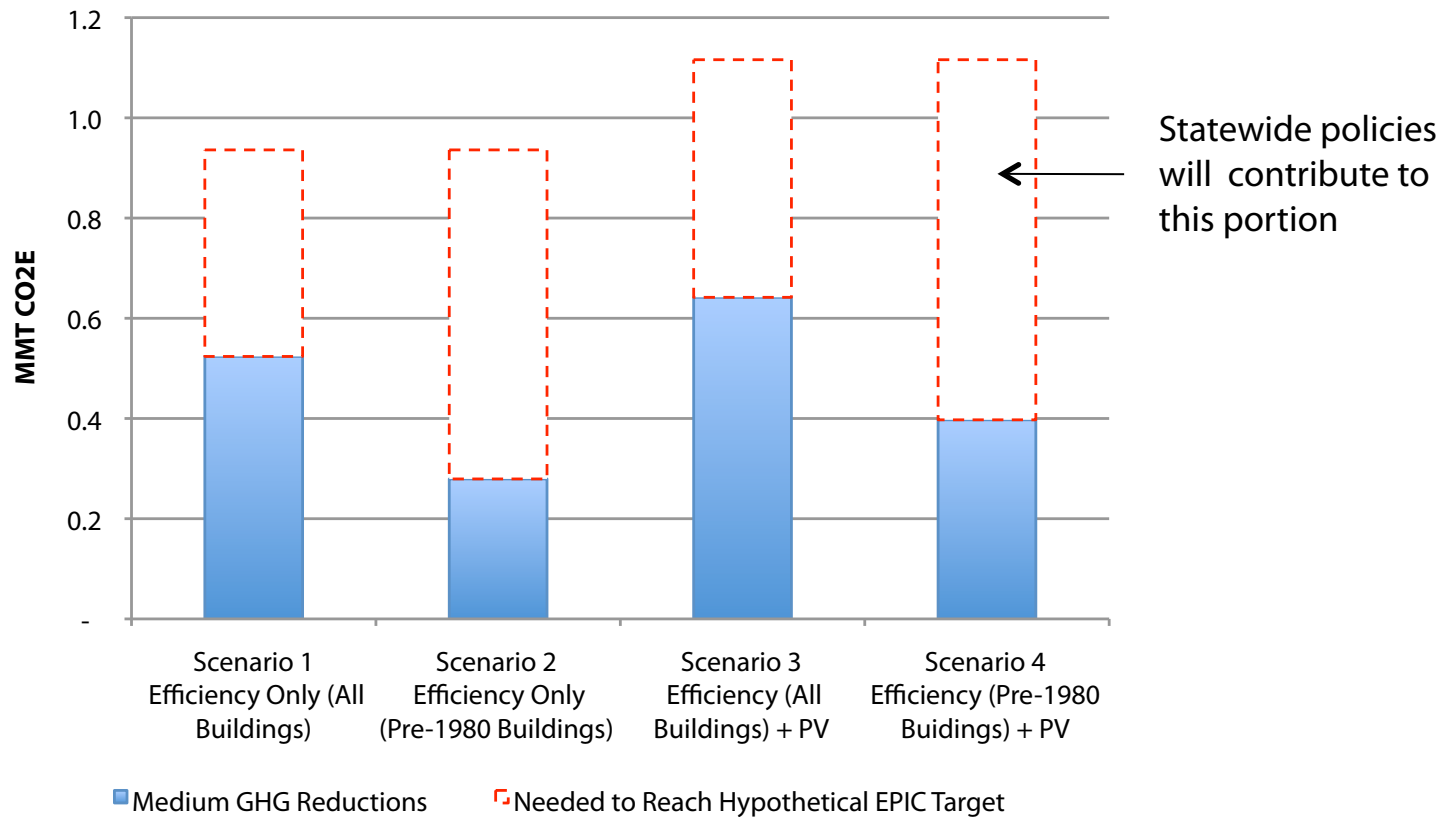
# GHG Reductions Scenarios



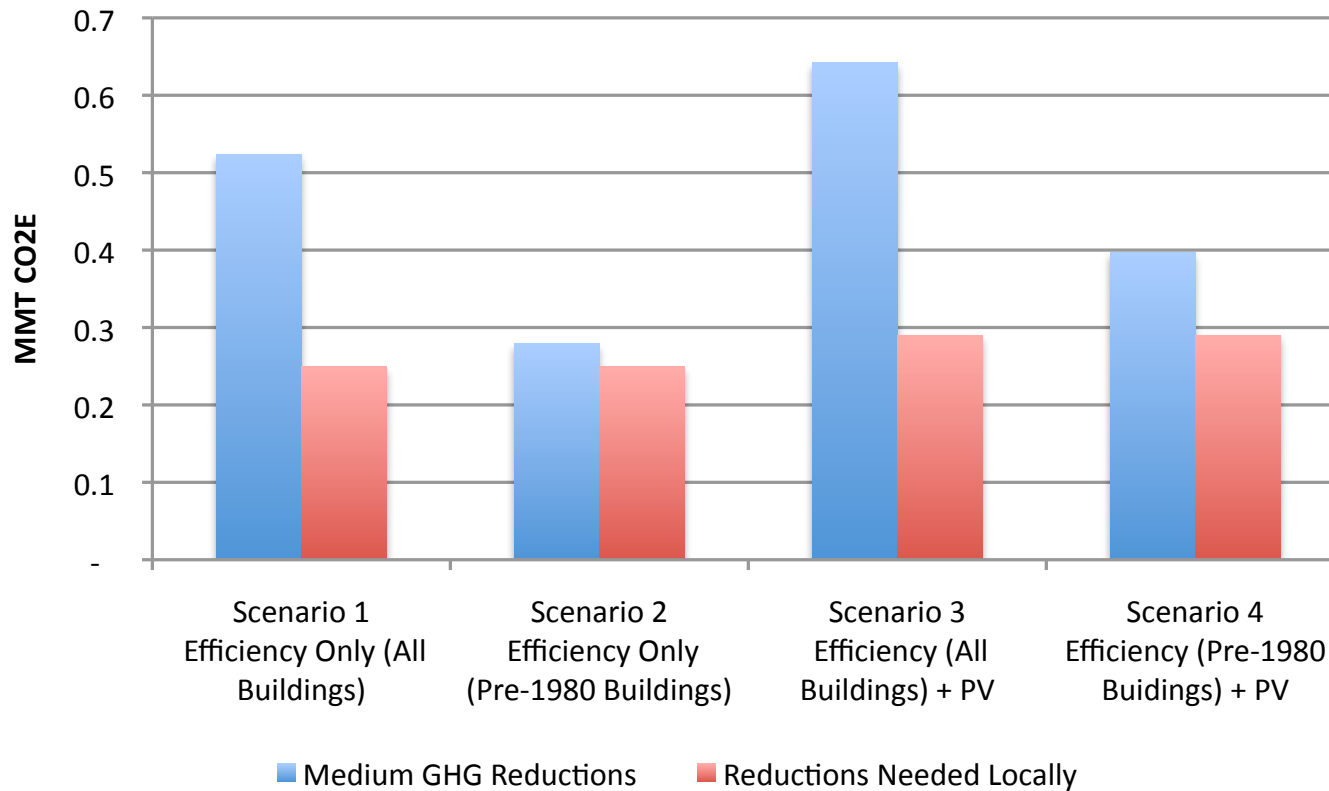
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**For more information...**

**To Download the Summary and Full Report**

[www.sandiego.edu/epic/ghghpolicy](http://www.sandiego.edu/epic/ghghpolicy)

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