

Community Choice Aggregation for Climate Action Plans



Jack Hegenauer
7 April 2016

Terms & Acronyms

Term	Definition
BAU	Business-As-Usual
GHG	Greenhouse Gas
CO ₂ (CO ₂ -e)	Carbon Dioxide (equivalents)
Metric Ton, MT (U.S.)	S.I. "Tonne" (1000 kg = 2205 lb)
RPS	Renewables Portfolio Standard (electricity generation)
CCA (CCE)	Community Choice Aggregation, Community Choice Energy, Community Clean Energy
IOU	Investor-Owned Utility
REC	Renewable Energy Credit

State law enabling local governments to aggregate electricity demand within their jurisdictions

- * to procure alternative energy supplies;
- * to maintain the existing electricity provider (IOU) for transmission, distribution, and billing services

Community Choice Aggregation (CCA)

State regulation requiring the increased production of energy from renewable energy sources, such as wind, solar, biomass, and geothermal

Renewables Portfolio Standard (RPS)

California RPS Targets

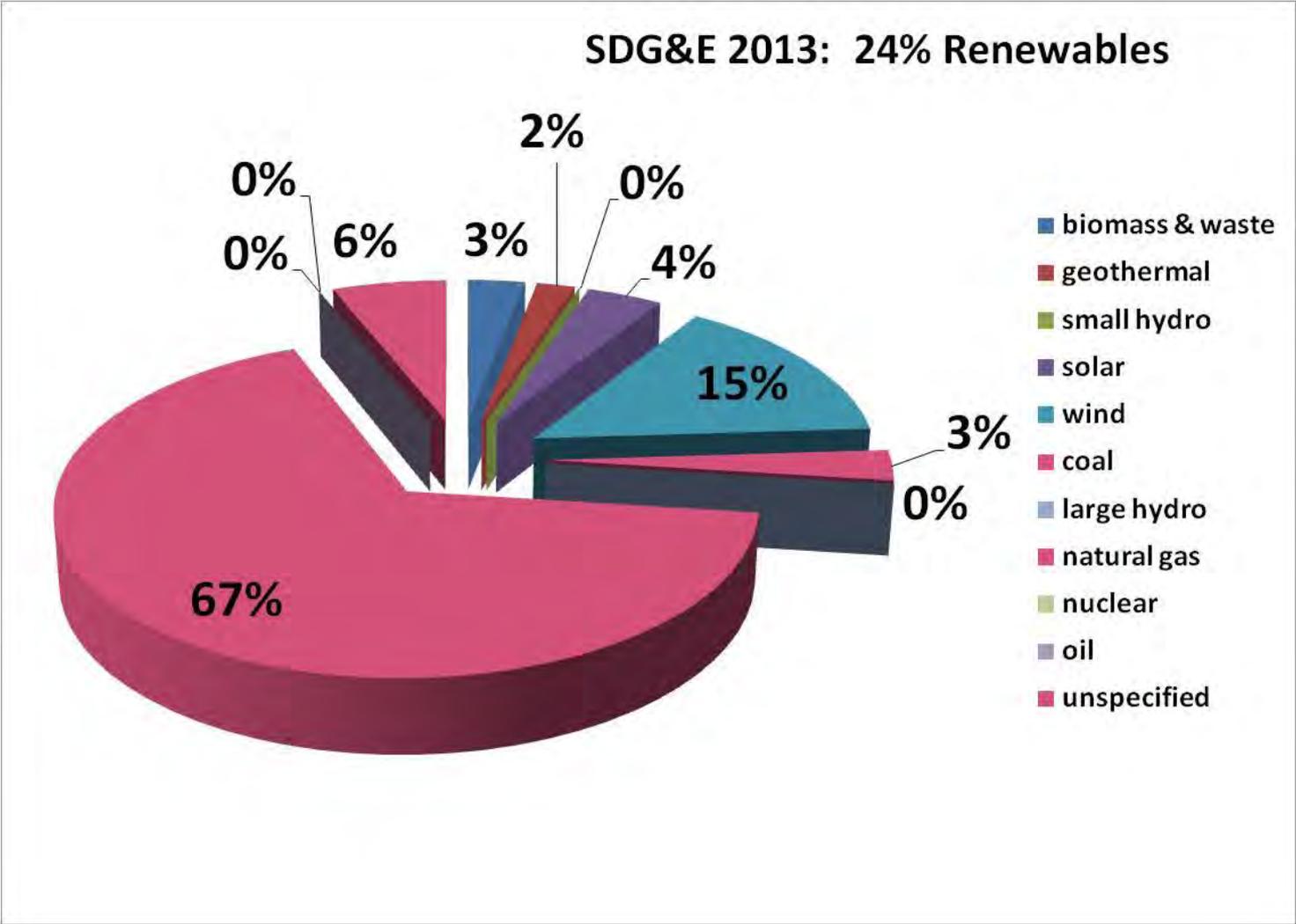
Renewables Target	Year
20 %	2013
25 %	2016
33 %	2020
40 %	2024
45 %	2027
50 %	2030 +

Too little, too late?

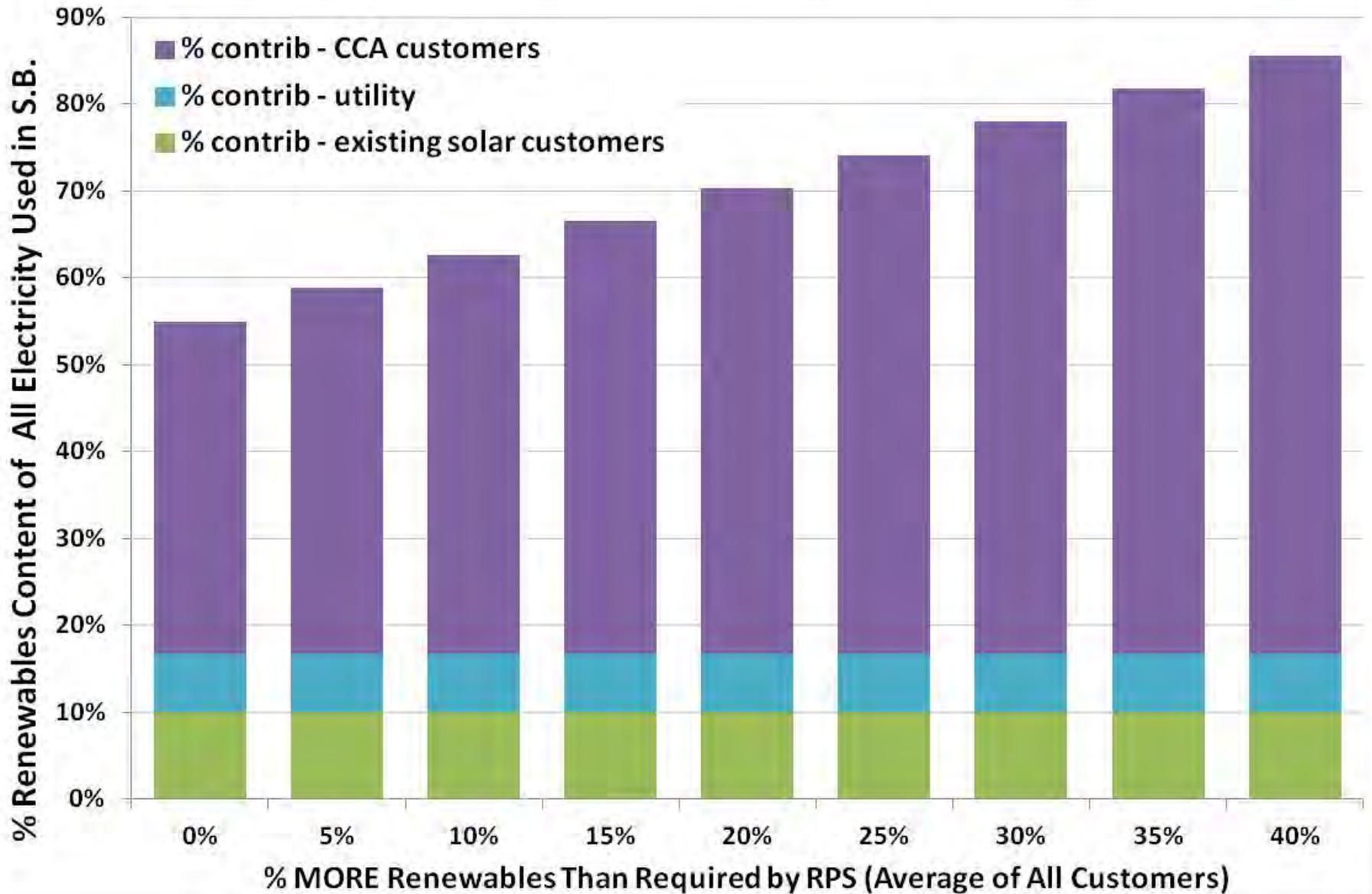
Should we depend on IOU's alone?

50% RPS by 2030?

SDG&E 2013: Sources of Electricity Generation



Example: 85% Participation in CCA "Green Products"



Big Ticket Items for a Solana Beach Climate Action Plan



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CEQA	California Environmental Quality Act (environmental impact reports)

CAP Structure, Implementation

- Premise: Quality of Life threatened by runaway climate alteration
- Plan: Community Sustainability
 - Reduce CO₂ Emissions (Mitigation)
 - Adapt to Climate Alteration (Resiliency)
 - Improve Public Health (Quality of Life)
- Legislation: Codes, monitoring, enforcement
- Internal: Staffing, funding, accountability

Some Common Goals of Climate Action Planning

(Example: City of San Diego)

The Climate Action Plan Serves Four Primary Purposes:

1

Provides a Roadmap to achieve GHG reductions

2

Conforms to California laws and regulations

3

Implements the 2008 General Plan

4

Provides CEQA tiering for new development's GHG emissions

Terms & Acronyms

Term	Definition
ICLEI	International Council for Local Environmental Initiatives (Local Governments for Sustainability)
EPIC	Environmental Policy Initiatives Center (Univ of San Diego School of Law)
CARB	California Air Resources Board
SANDAG (MPO)	San Diego Association of Governments (a Metropolitan Planning Organization)

Terms & Acronyms

Term	Definition
AB 32	Calif Assembly Bill 32, Global Warming Solutions Act, 2006
S-3-05	Executive Order S-3-05 (Schwarzenegger)
B-30-15	Executive Order B-30-15 (Brown)
CAFÉ	Corporate Average Fuel Economy
Pavley I	Calif Clean Car Standards
EV	Electric Vehicle
PV	Photovoltaic (solar electric)
SHW	Solar Hot Water

Solana Beach Planning Milestones

- U.S. Mayors Agreement on Climate Protection
- Clean & Green “4-way” cost/benefit screening
- Clean & Green 2010 GHG inventory
- ICLEI / SD Foundation 2005 GHG inventory
- USD/EPIC GHG mitigation tool
- A little controversy ...
 - Consultants v. The Informed Public
 - ICLEI v. EPIC
- Updated 2010+ GHG inventory (EPIC, 2016)

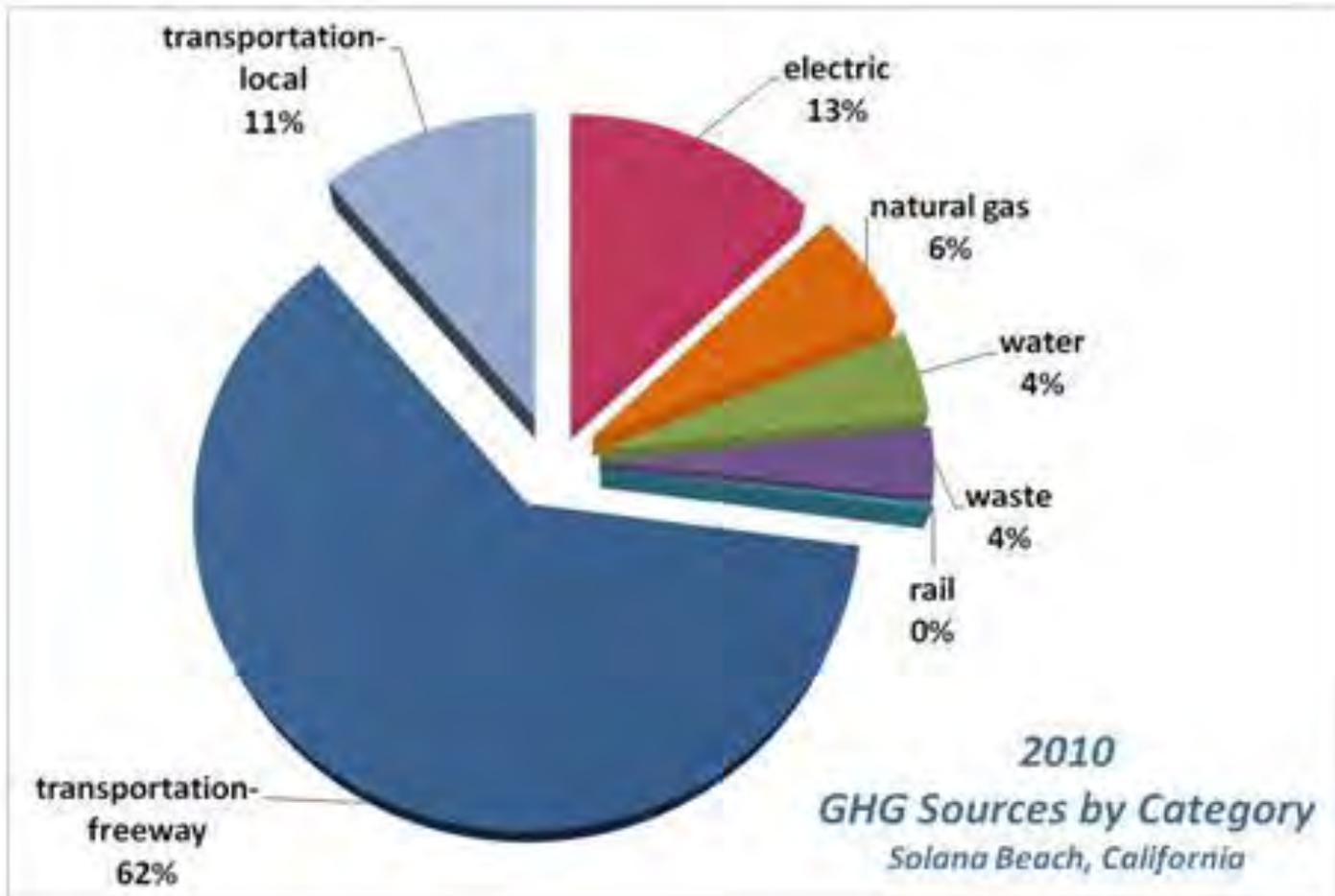
ICLEI 5-Milestone Methodology

- Conduct baseline inventory & forecast
 - Adopt an emission reduction target for forecast year
 - Develop a local Climate Action Plan
 - Implement policies and measures
 - Monitor and verify results
-
- *ICLEI = International Council for Local Environmental Initiatives - Local Governments for Sustainability*

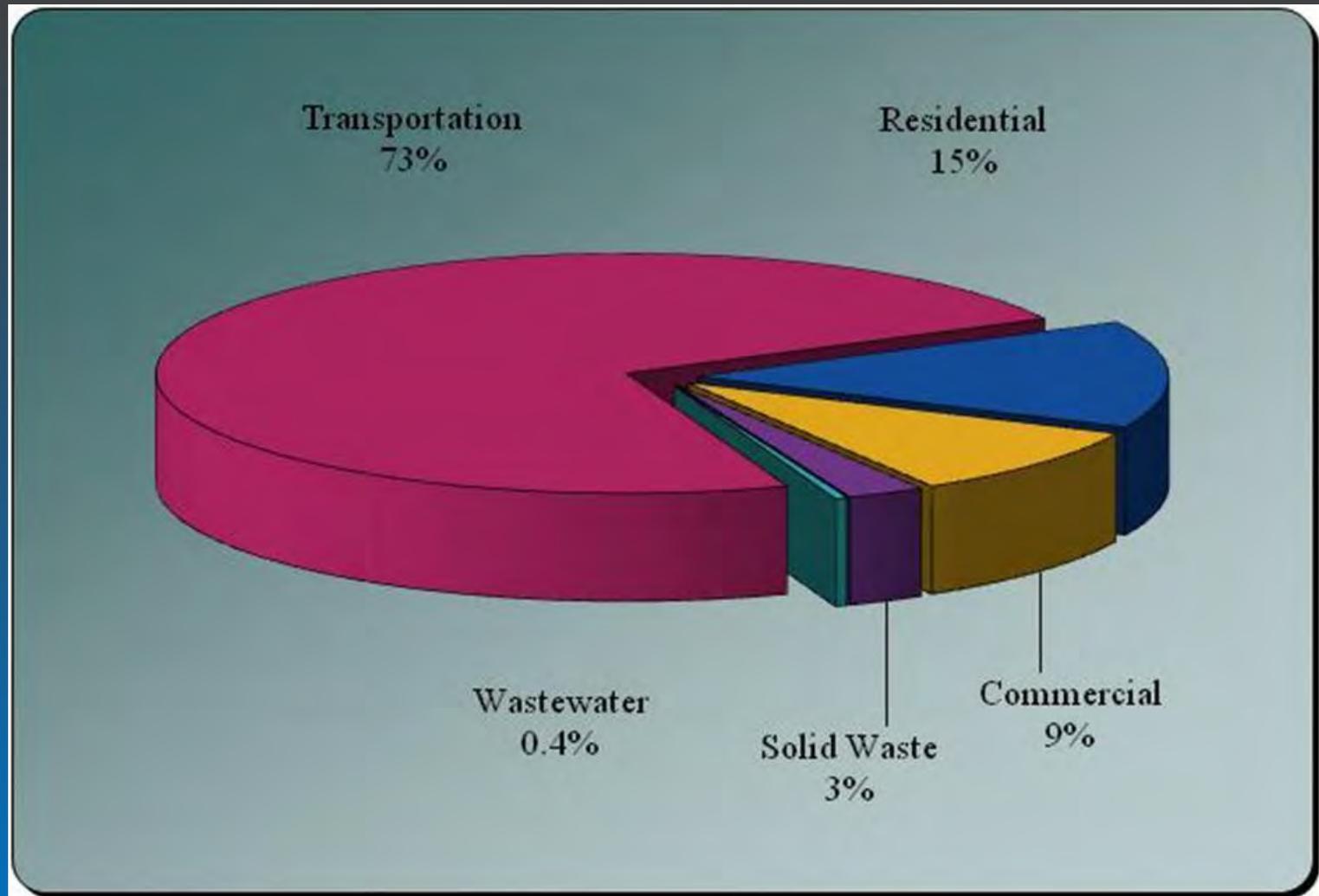
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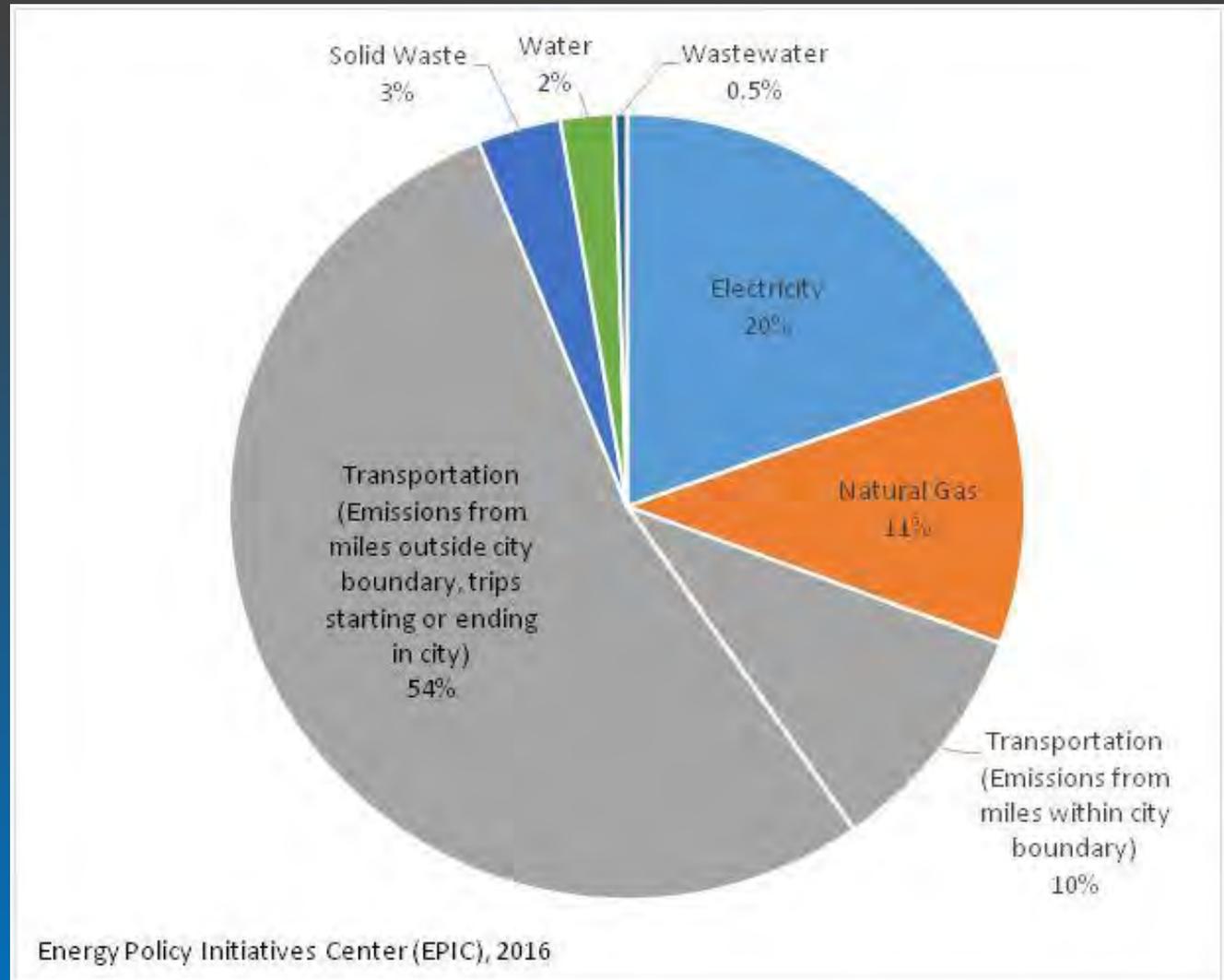
Clean & Green GHG Inventory



ICLEI 2005 GHG Inventory



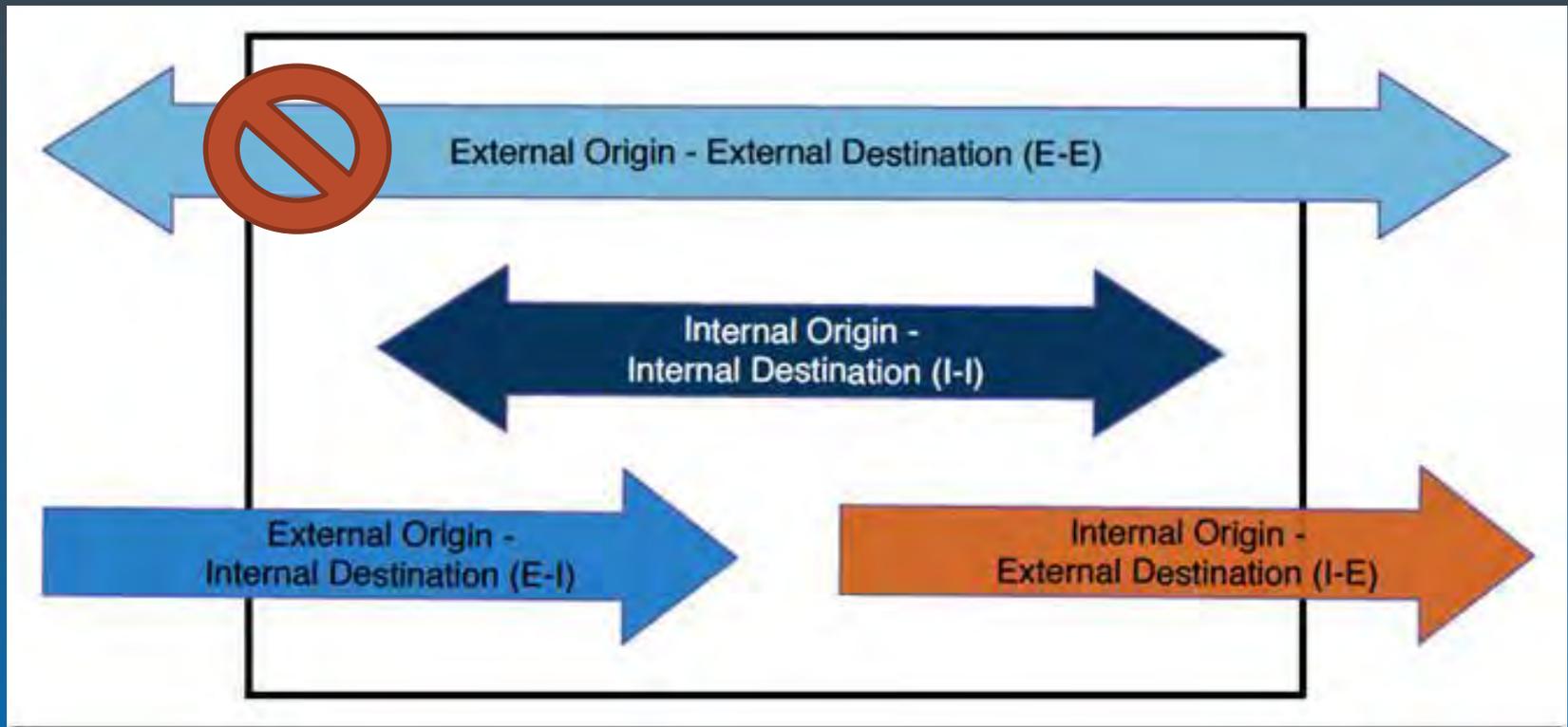
Solana Beach GHG Emissions by Category (2010) [Fig. 1, EPIC 2016]



New models factor in lower amounts of on-road transportation

Accounting for Differences in 2005 & 2010 Inventories

Components of Origin-Destination (O-D) method for VMT



Breakdown of GHG Emissions by Category [Table 2, EPIC 2016]

Category	2010	2011	2012	2013
Electricity	27,182	25,267	30,762	29,205
Natural Gas	15,504	15,631	15,315	15,614
Transportation (Emissions from miles within city boundary)	13,489	13,484	13,433	13,513
Transportation (Emissions from miles outside city boundary, trips starting or ending in city)	74,560	74,772	74,718	75,395
Solid Waste	4,736	4,622	4,419	4,862
Water	3,052	2,963	3,601	3,553
Wastewater	693	673	621	607
Total (MT CO₂e)	139,216	137,412	142,868	142,750

ICLEI 5-Milestone Methodology

- ▣ Conduct baseline inventory & forecast
- ▣ Adopt an emission reduction target for forecast year
- ▣ Develop a local Climate Action Plan
- ▣ Implement policies and measures
- ▣ Monitor and verify results

Setting Objective Targets for GHG Reduction

- 2005 GHG Inventory (ICLEI), updated to 2013
- 2020 Target [AB32]
 - 1990 level (benchmark)
- 2050 Target [Executive Order S-3-05]
 - 80% below 1990 level
- 2030 Target [Executive Order B-30-15]
 - 40% below 1990 level
- 2035 Target [extrapolated]
 - $[2020 \text{ level} + 2050 \text{ level}] / 2$

We know 2005-2013 GHG levels ...

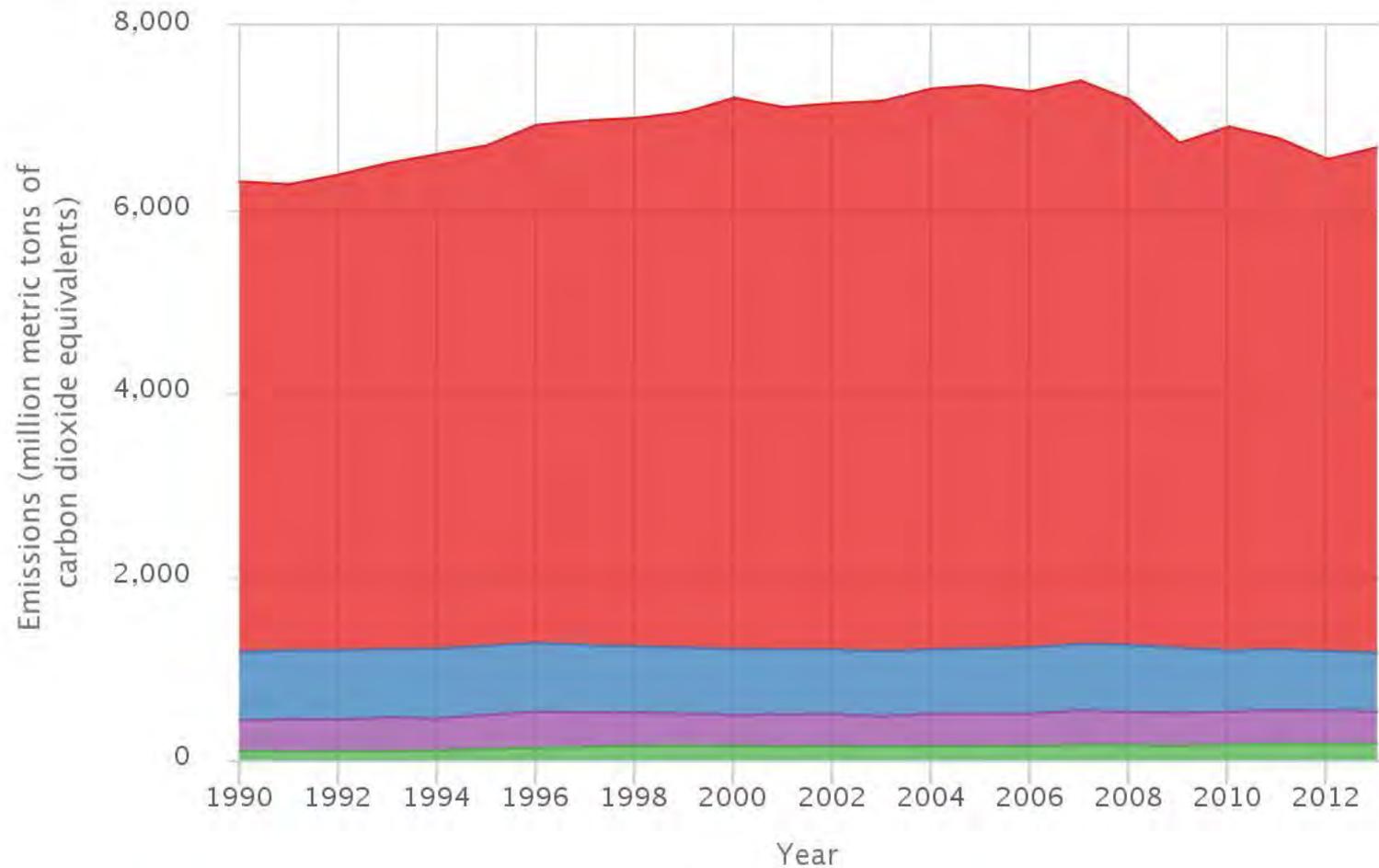
How do we determine 1990 GHG baseline ?

CARB/Western Climate Initiative (2007)

- California, Arizona, New Mexico, Oregon, Washington, Utah, Montana
- Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec.
- adopted goals to reduce greenhouse gas emissions by 15% below 2005 levels by 2020
- *This regional goal is approximately equal to California's goal of returning to 1990 levels by 2020.*

[CARB = California Air Resources Board]

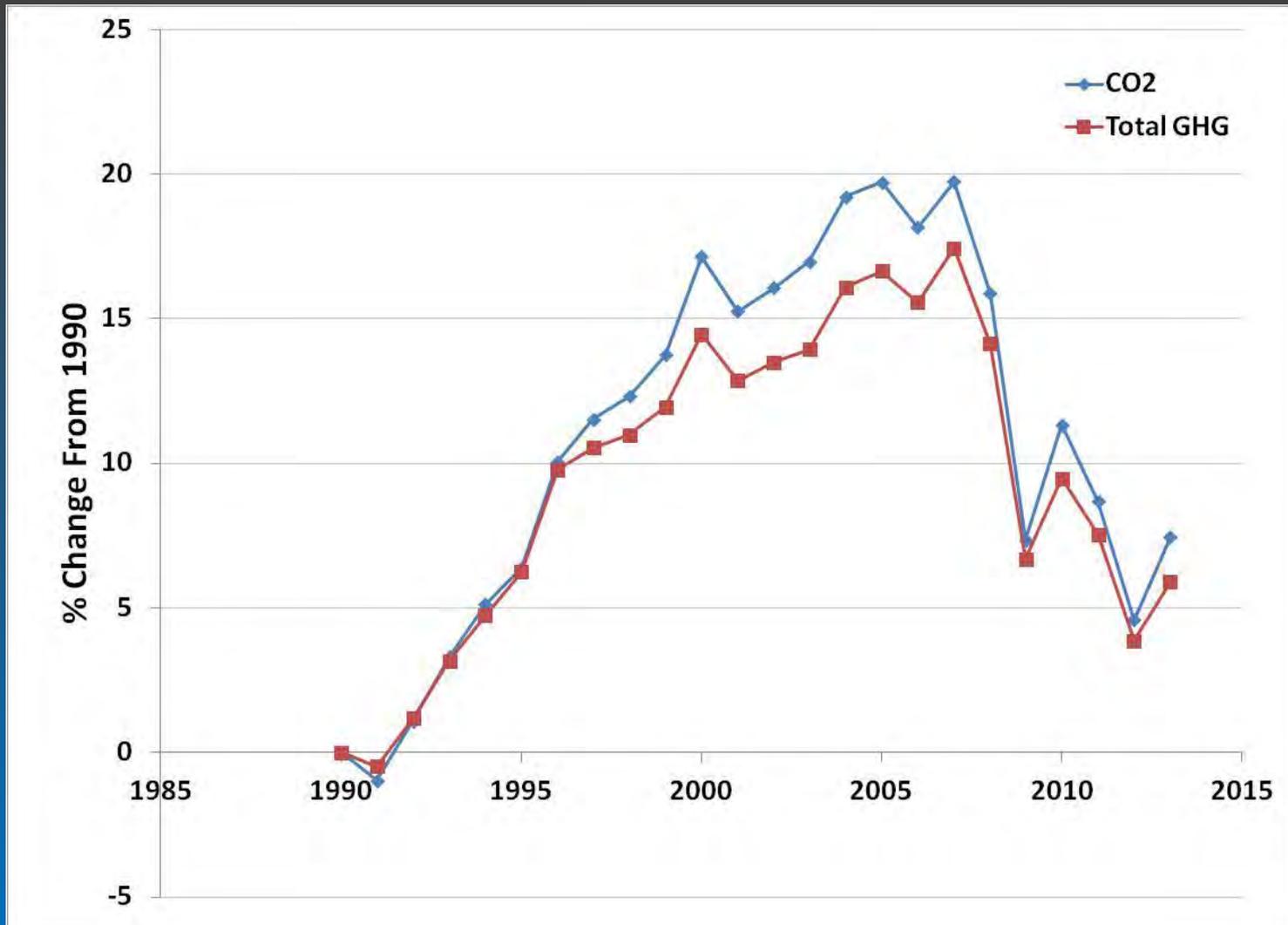
U.S. Greenhouse Gas Emissions by Gas, 1990–2013



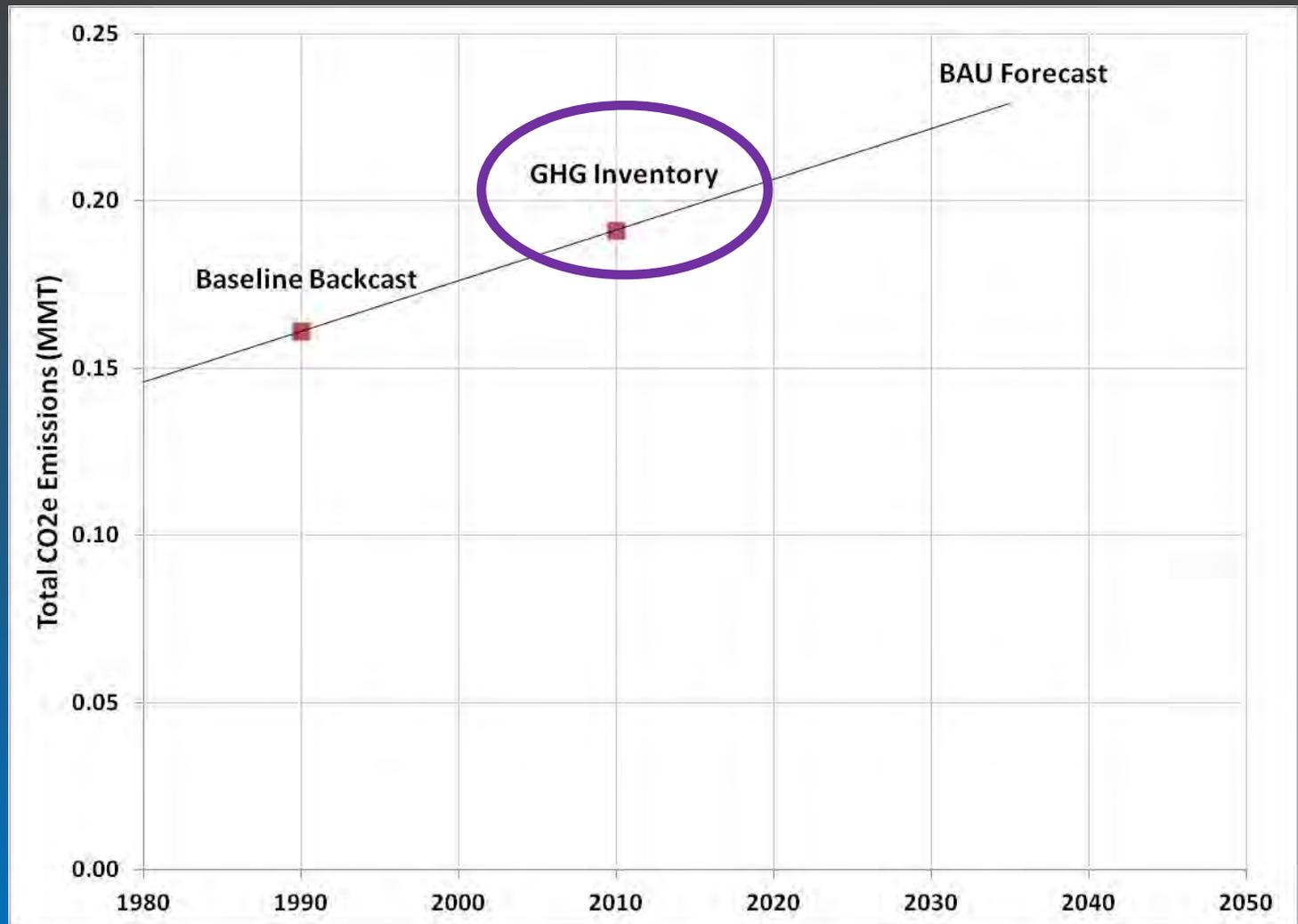
Carbon dioxide Methane Nitrous oxide Fluorinated gases

Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2013.
<http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>

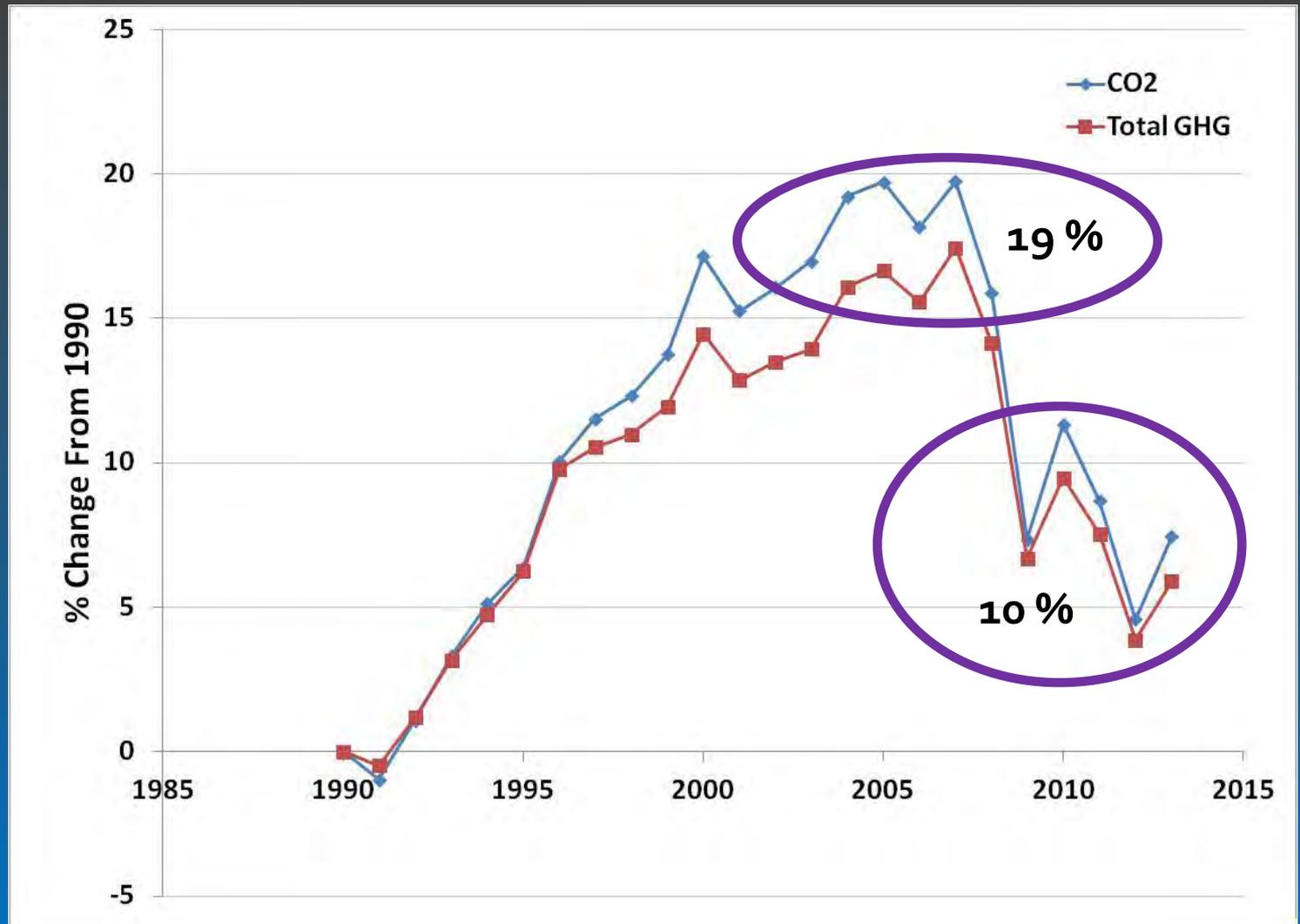
Change in U.S. GHG Emissions (EPA, 1990-2013)



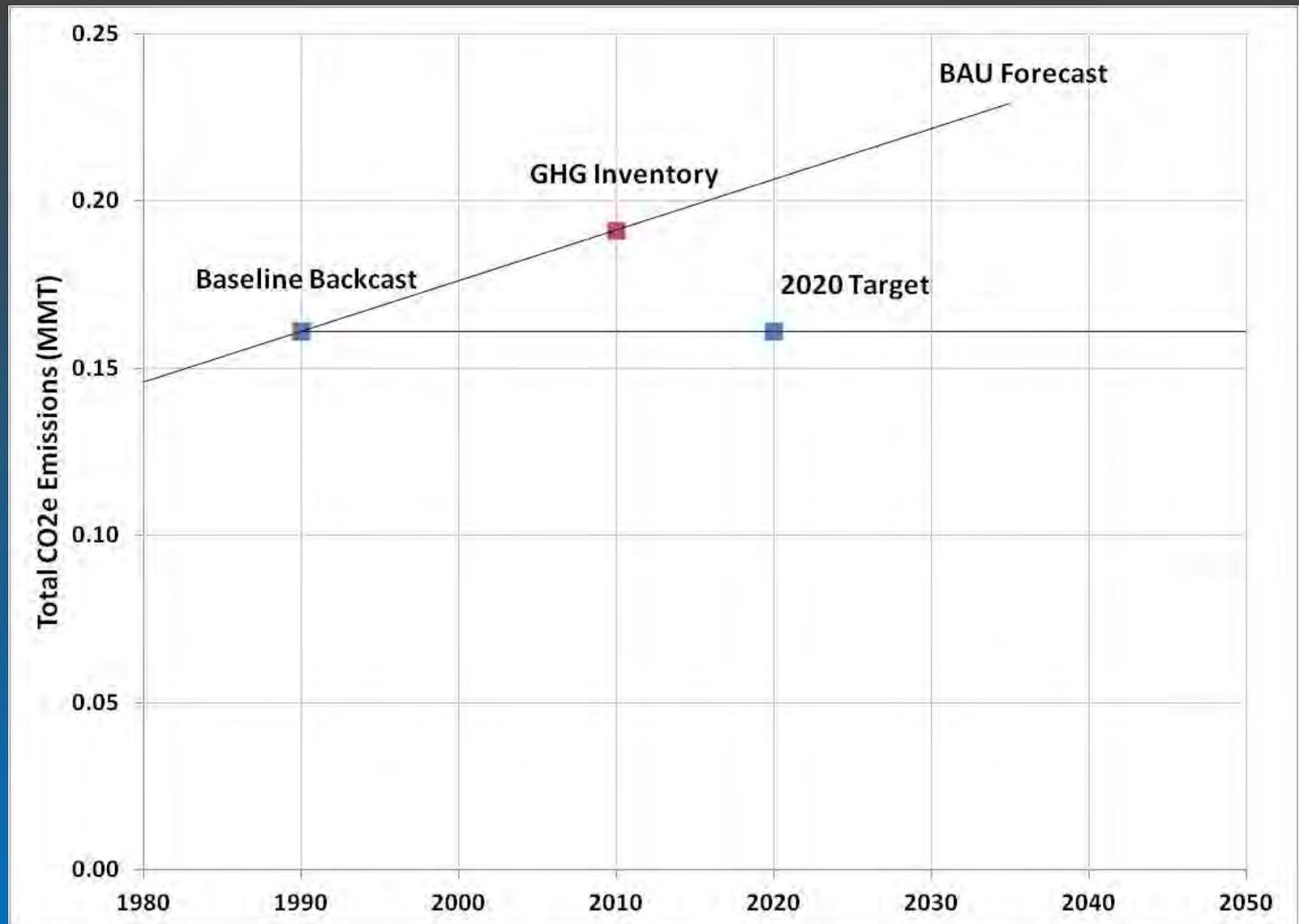
Option 1: Local Jurisdiction Inventory + Backward Extrapolation



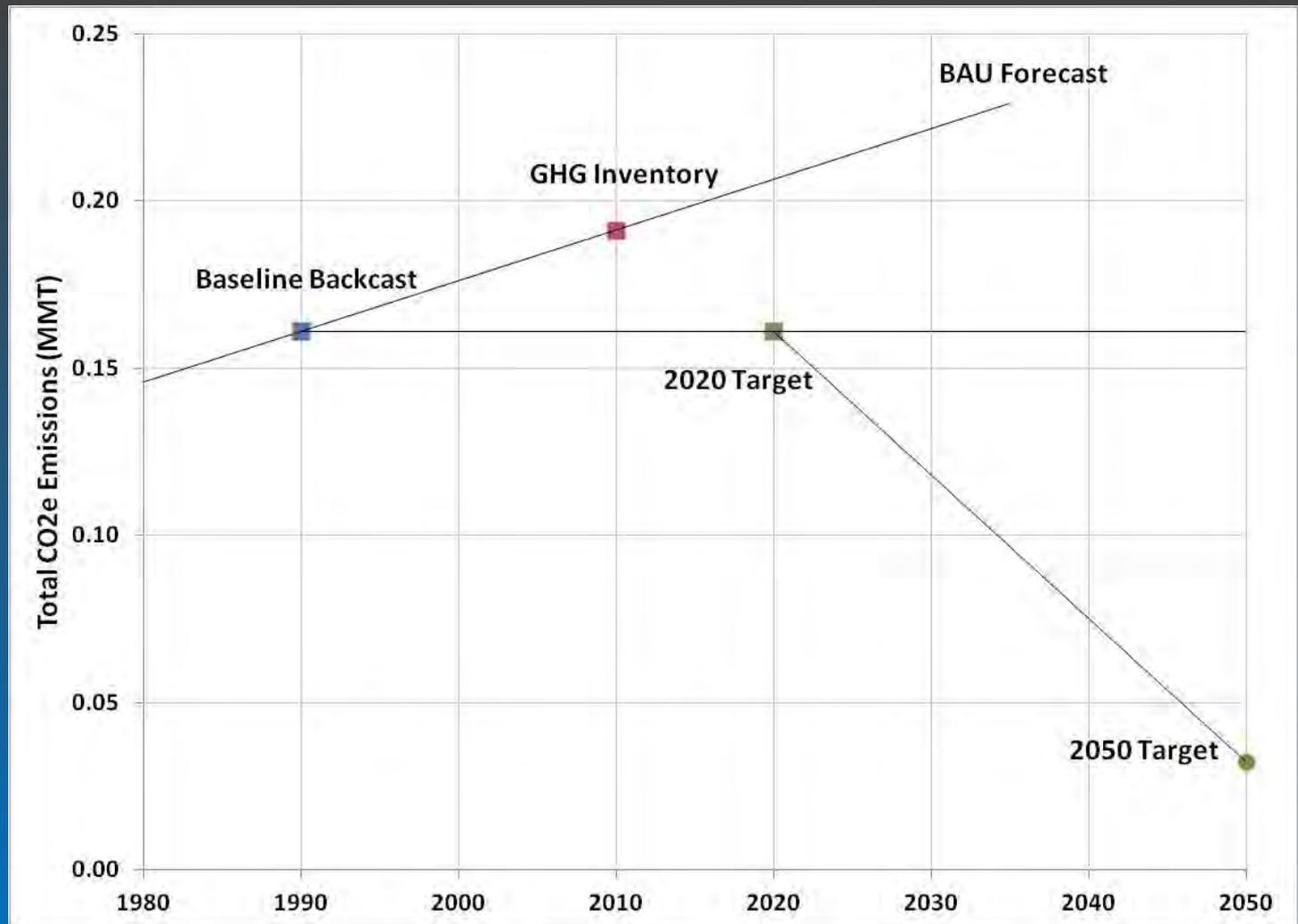
Option 2: Regional Average (CARB)



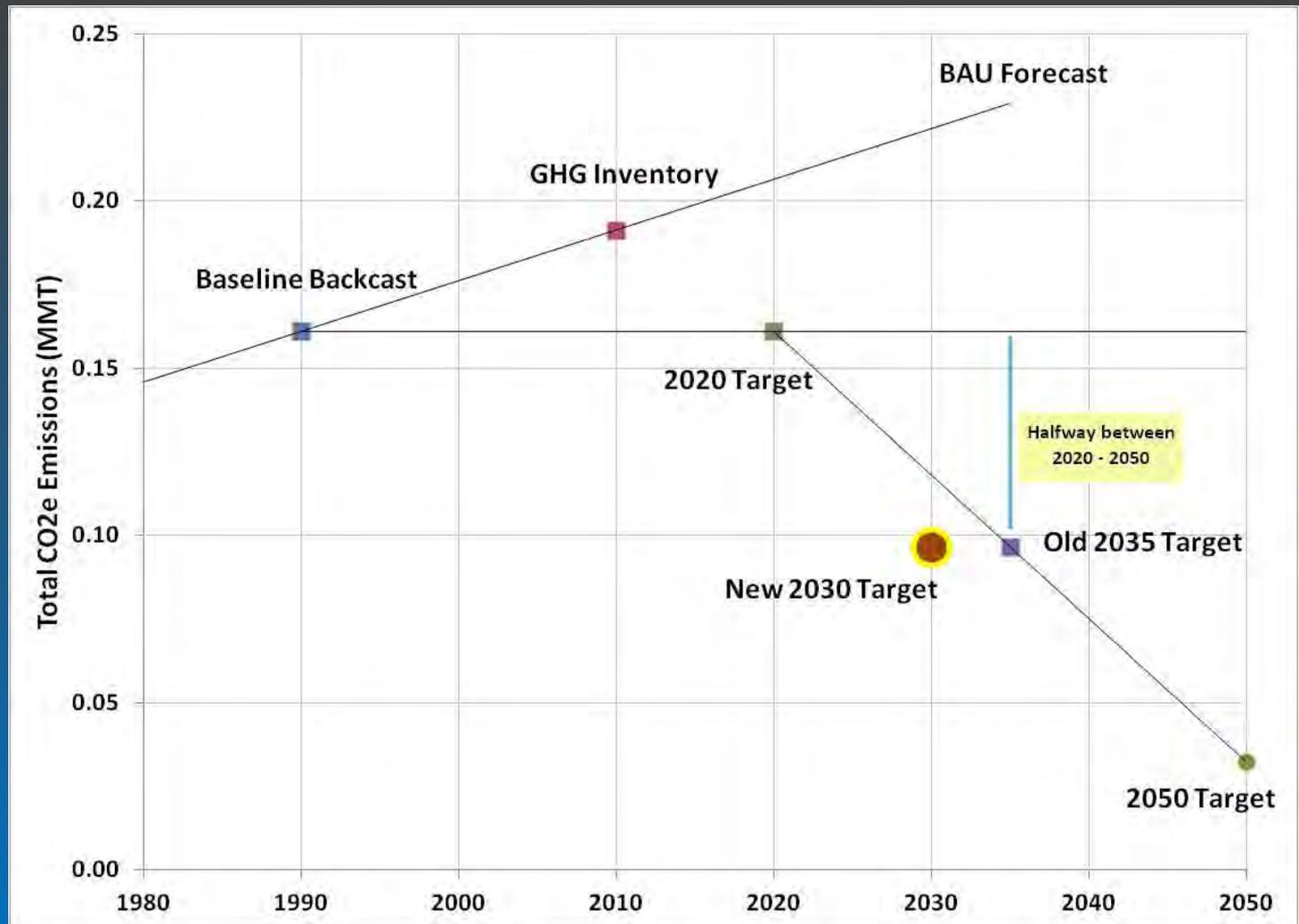
AB32: 2020 Target = 1990 Level



Exec Order S-3-05: 2050 Target = 80% below 1990 Level



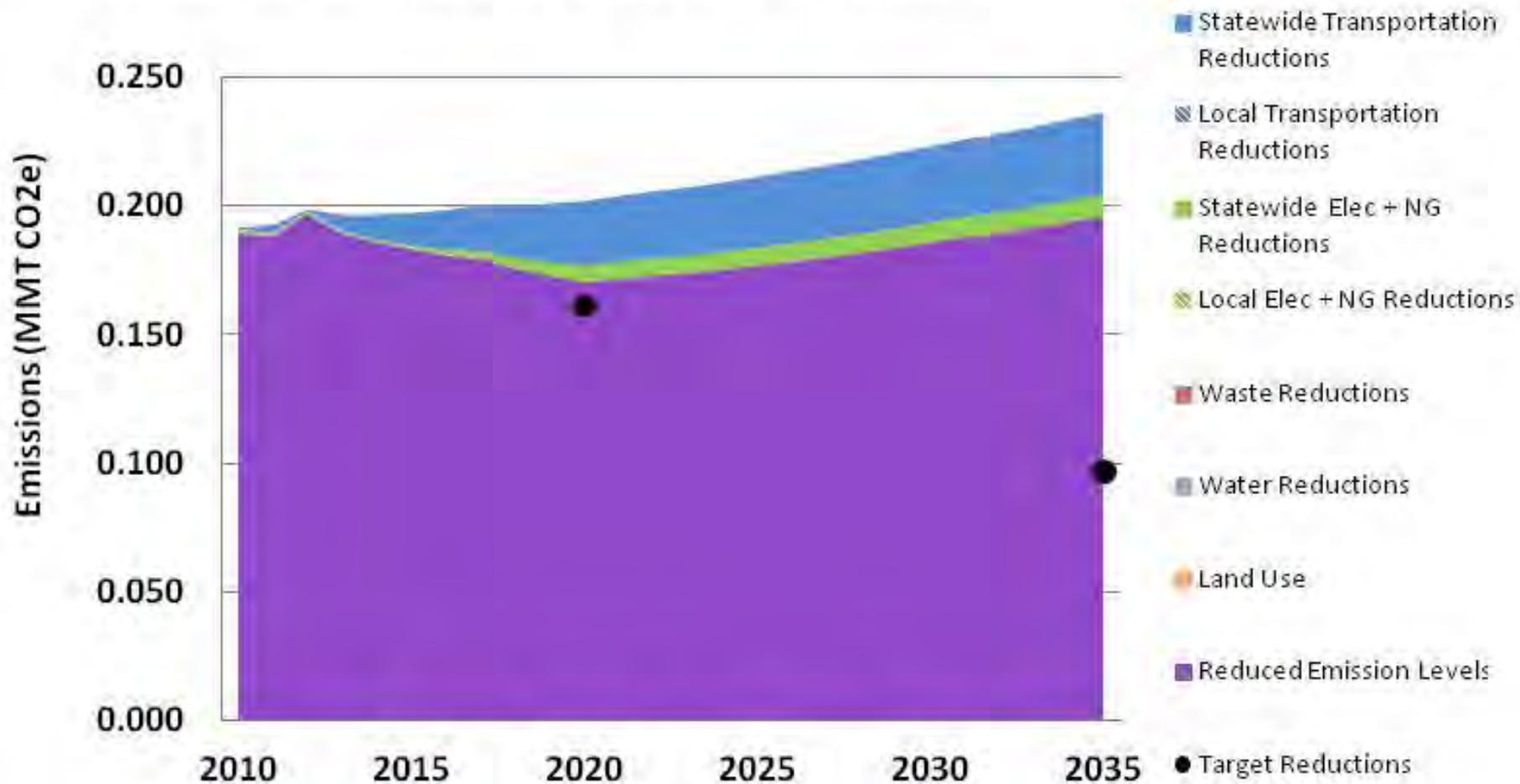
Exec Order B-30-15: 2030 Target = 40% below 1990 Level



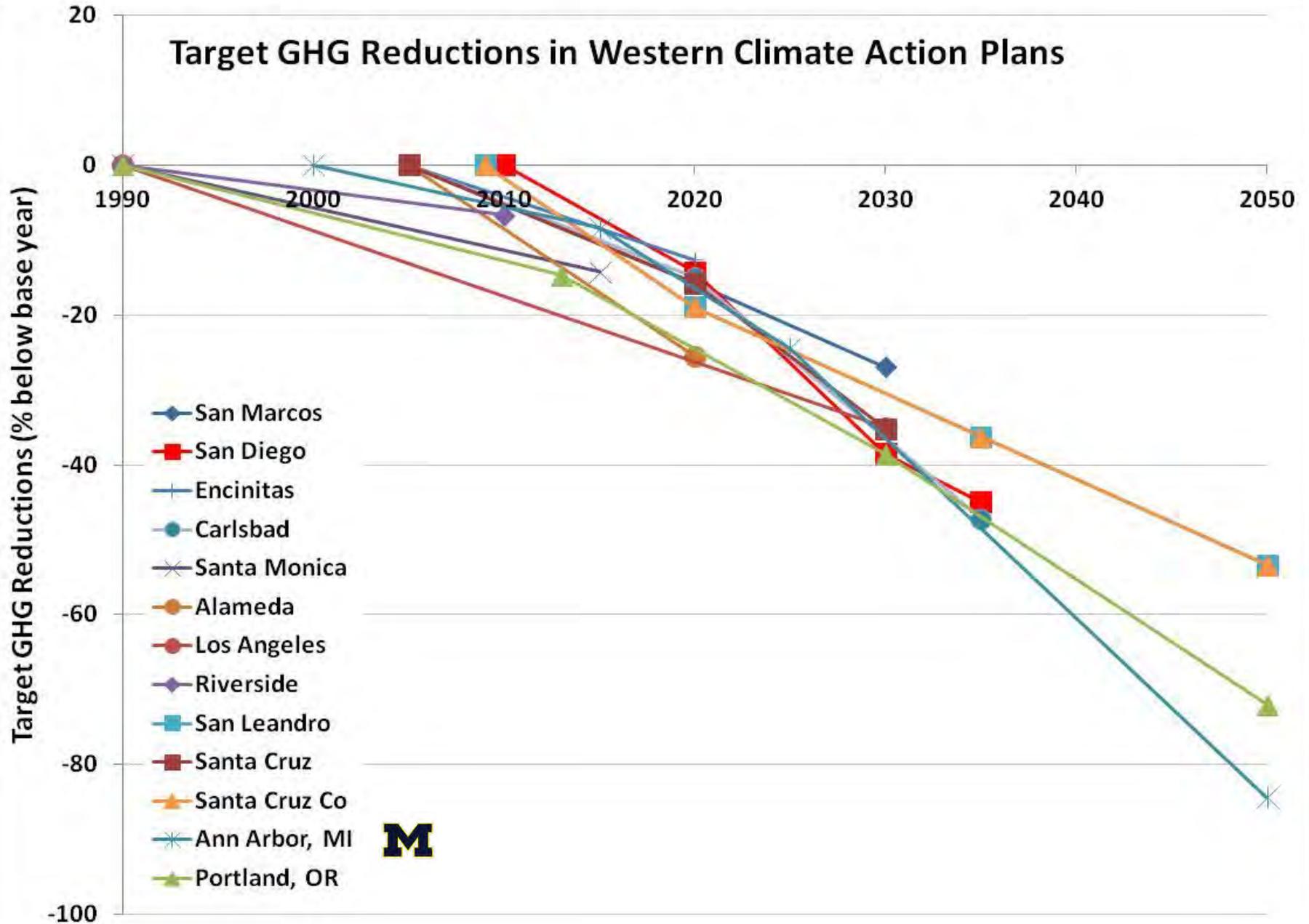
2020 & 2035 Targets

(Older EPIC Model w/ more transport. GHG)

Business-As-Usual and Mitigated Emissions Projections



Target GHG Reductions in Western Climate Action Plans



ICLEI 5-Milestone Methodology

- ▣ Conduct baseline inventory & forecast
- ▣ Adopt an emission reduction target for forecast year
- ▣ Develop a local Climate Action Plan
 - *GHG / CO₂ Reduction (Mitigation)*
 - Climate Adaptation (Resiliency)
 - Public Health & Quality of Life
- ▣ Implement policies and measures
- ▣ Monitor and verify results

CAP Software for CO₂ Mitigation

(USD / EPIC, ~~ICLEI~~)

Summary: Mitigation Measures

Mitigation Measures (v 2.1)

	2020	2035
Federal & State Measures		
Renewables Portfolio Standard		
Low Carbon Fuel Standards		
Vehicle Efficiency Standards - Pavley I/CAFÉ		
Electric Vehicles Program		
Pump Price of Gasoline		
CARB Tire Pressure Program		

Mitigation Measures (v 2.1)

Local Measures	2020	2035
Strategy 1: Transportation		
Average Commute		
Alternate Work Schedule		
Mass Transit Ridership		
Municipal Zero Emission Vehicle		
Bicycle Strategy		
Ecodriving		
Pricing Parking		
Reduced Parking		
Preferential Parking Spaces for EVs		
Retiming Traffic Signal		
Roundabouts		
Telecommuting		
Van Pooling		
Pedestrian Mobility Plan		

Mitigation Measures (v 2.1)

Strategy 2: Electricity and Natural Gas		
Community Choice Aggregation Program		
Residential Distributed PV		
Non-Residential Distributed PV		
Point of Sale Energy Assessment and Disclosure Ordinance (Res)		
Point of Sale Non-Residential Energy Assessment and Disclosure Ordinance		
Residential SHW Installs (New Con. & Retrofits)		
Commercial SHW Installs (New Con. & Retrofits)		
Incorporating Cool Roofs into Building Code		
Municipal Energy Strategy and Implementation Plan		
Utility Efficiency Program		

Mitigation Measures (v 2.1)

Strategy 3: Waste and Water		
Divert Waste from Landfills & Capture Emissions		
Capture Emissions from Wastewater		
New Water Billing Structure		
Water and Energy Conservation Ordinance (Water Only)		
Pool Cover Program		
Strategy 4: Urban Tree Planning Program (Land Use)		
Total GHG Reductions from Federal and State Measures		
Total GHG Reductions From Local		
Total GHG Reductions		
Total GHG Reductions		

EPIC 2014 GHG Reduction Model (v 1.2.1.2)
[includes all pass-through VMT]

**Previous Work with EPIC Mitigation
Tool**

Community Scale Greenhouse Gas Emissions Model

Electric + Natural Gas

Legend		User Defined	User Defined Inputs		
Smart Default			2010	2020	2035
Statewide Measures					
<u>Renewable Portfolio Standard (% of Sales)</u>				50%	100%
Local Measures					
<u>Residential Photovoltaics</u>			2010	2020	2035
BAU Forecast PV Installed (Megawatt)			0.23	0.95	1.98
User Defined PV Installed (Megawatt)			0.23	5.00	10.00
<u>Non-Residential Distributed PV</u>			2010	2020	2035
BAU Forecast PV Installed (Megawatts)			0.32	1.32	2.78
User Defined PV Installed (Megawatts)			0.32	5.00	10.00
<u>Cogeneration</u>			2010	2020	2035
BAU Forecast Capacity (Megawatts)			0.57	0.72	0.86
User Defined Cogen Capacity (Megawatts)			0.57	5.00	10.00
<u>Residential Efficiency Retrofits - SF</u>			2010	2020	2035
Energy Reduction (%/Unit)			30%	30%	30%
Percent of Units Retrofit			1%	25%	50%
<u>Residential Efficiency Retrofits - MF</u>			2010	2020	2035
Energy Reduction (%/Unit)			20%	20%	20%
Percent of Units Retrofit			1%	25%	50%

Stress Test (“To the Max”)

EPIC 2014 GHG Reduction Model (v 1.2.1.2)

Mitigation Strategy	Stress Test	% of Target 2020	% of Target 2035
electric vehicles	100% of VMT	343	101
CAFÉ standard - improvements	200->150 g CO ₂ /mile	150	76
gasoline price	\$10/gal	139	61
Community Clean Energy (CCA)	100% participation	67	31
Renewable Portfolio Standard (RPS)	100% of sales	66	32
energy retrofits (non-res, comm)	100%/non-res unit, 100% of sales	45	18
telecommuting	100% participation	43	16
mass transit	100% commuter ridership	41	16
average commute	0 miles	41	16
van pooling	30/van, 100% participation	37	14
energy retrofits (SF)	100%/SF unit, 100% of sales	26	9
retimed traffic signals	100 total	20	7
ecodriving	100% of drivers trained	19	8

Stress Test (Cont.)

EPIC 2014 GHG Reduction Model (v 1.2.1.2)

Mitigation Strategy	Stress Test	% of Target 2020	% of Target 2035
solar hot water	100% res, 100% non-res	17	7
parking	\$100/space and/or 100% of spaces removed	14	6
preferential parking for EV's	100% reserved	14	6
waste diversion + waste/water emissions capture	100% diversion	14	5
energy retrofits (MF)	100%/MF unit, 100% of sales	13	5
energy retrofits (non-res, comm)	100%/non-res unit, 100% of area	13	5
bicycle strategy	50 bike lane miles/square mile	11	4
roundabouts installed	25 total	11	4

Stress Test (Cont.)

EPIC 2014 GHG Reduction Model (v 1.2.1.2)

Mitigation Strategy	Stress Test	% of Target 2020	% of Target 2035
3 water conservation measures	pricing, in/outdoor conservation	9	3
improvement over Title-24	100%	8	3
CARB tire pressure program	100%	8	3
alt work schedule	100%, 0 miles commute	7	3
urban tree planting	100% coverage, 4 sq mi	6	2

Slope Test

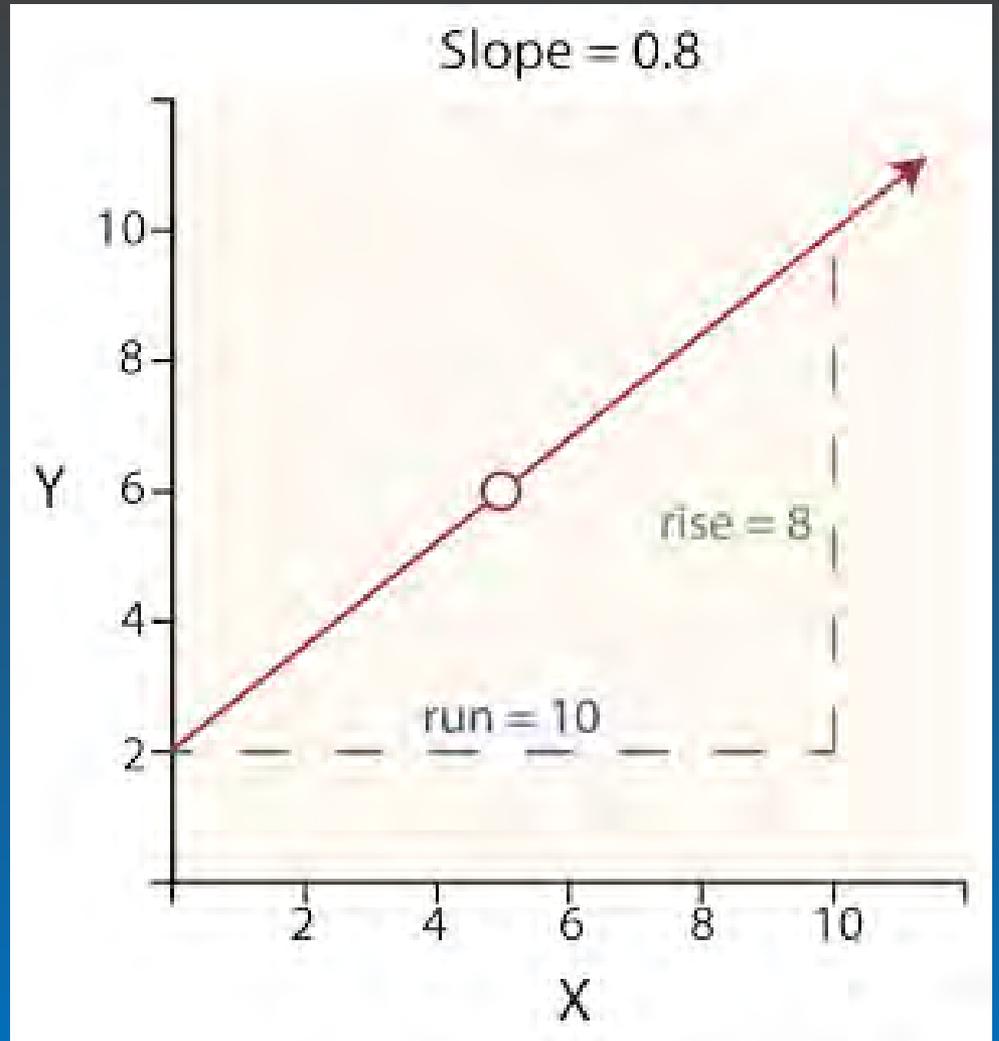
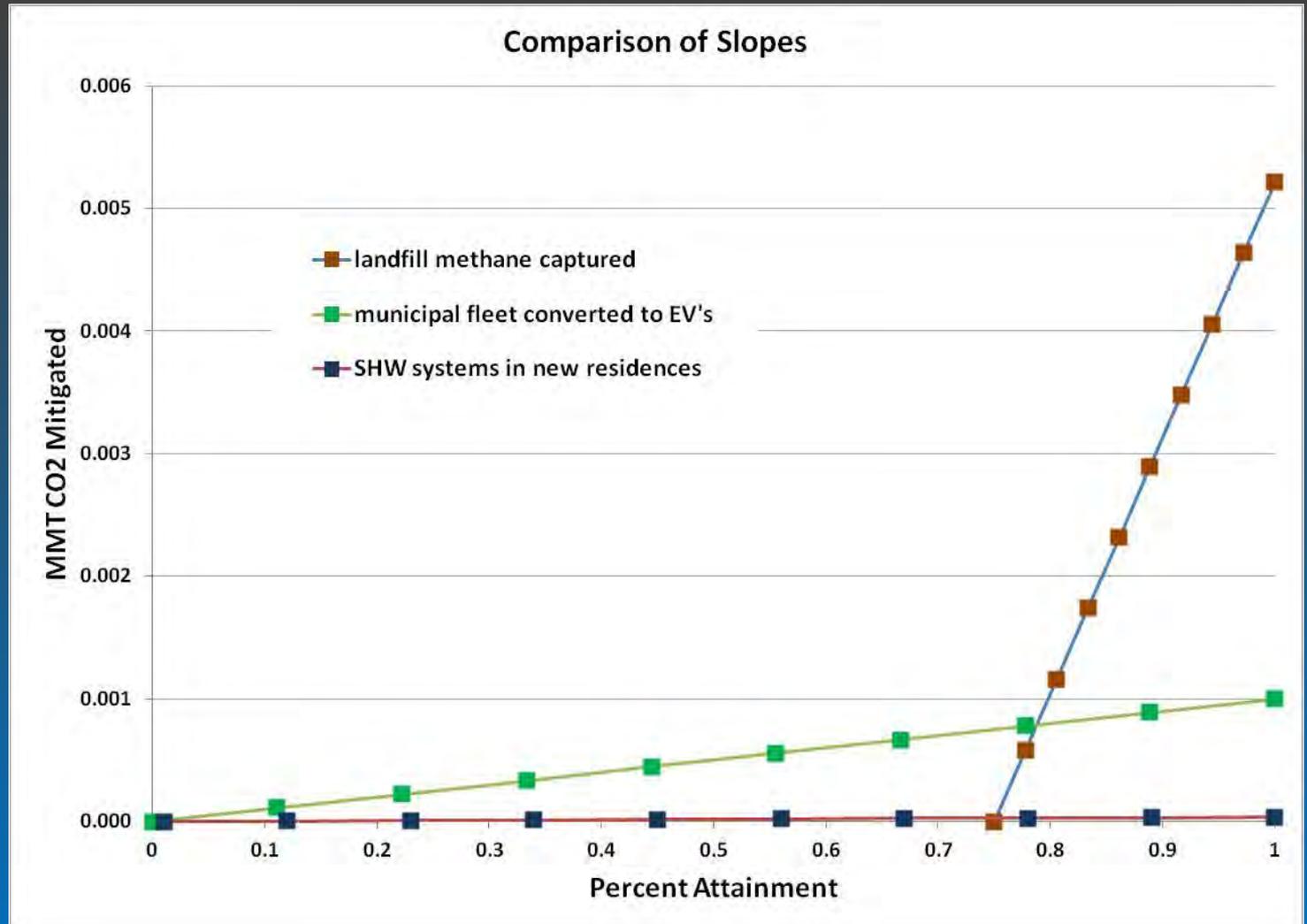
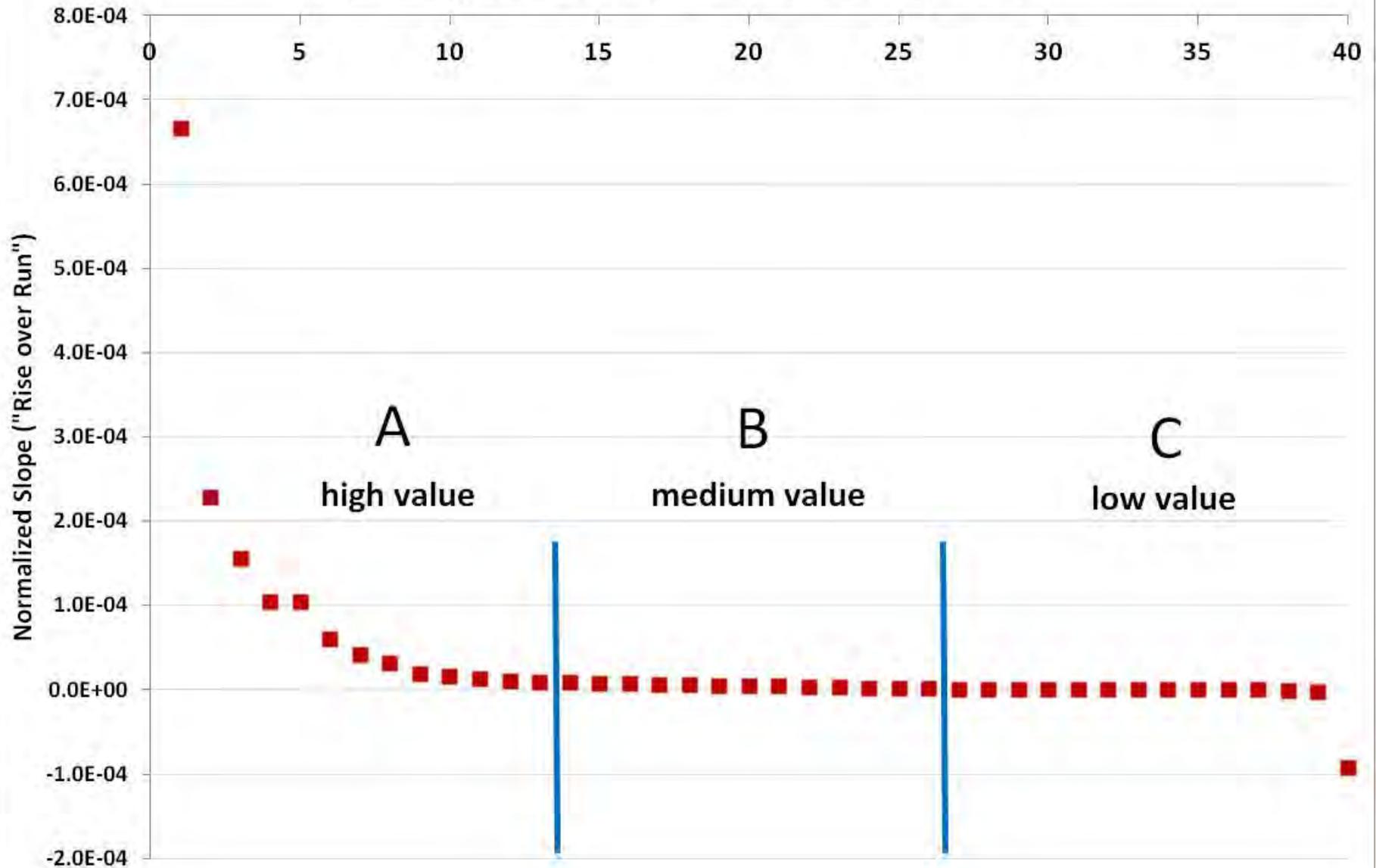


Illustration of Slopes of Mitigation Measures



Multiply
horizontal
scale by 100 !

Ranking of Degree of GHG Reduction per Normalized Unit (40 mitigation strategies in EPIC Model, 2020)



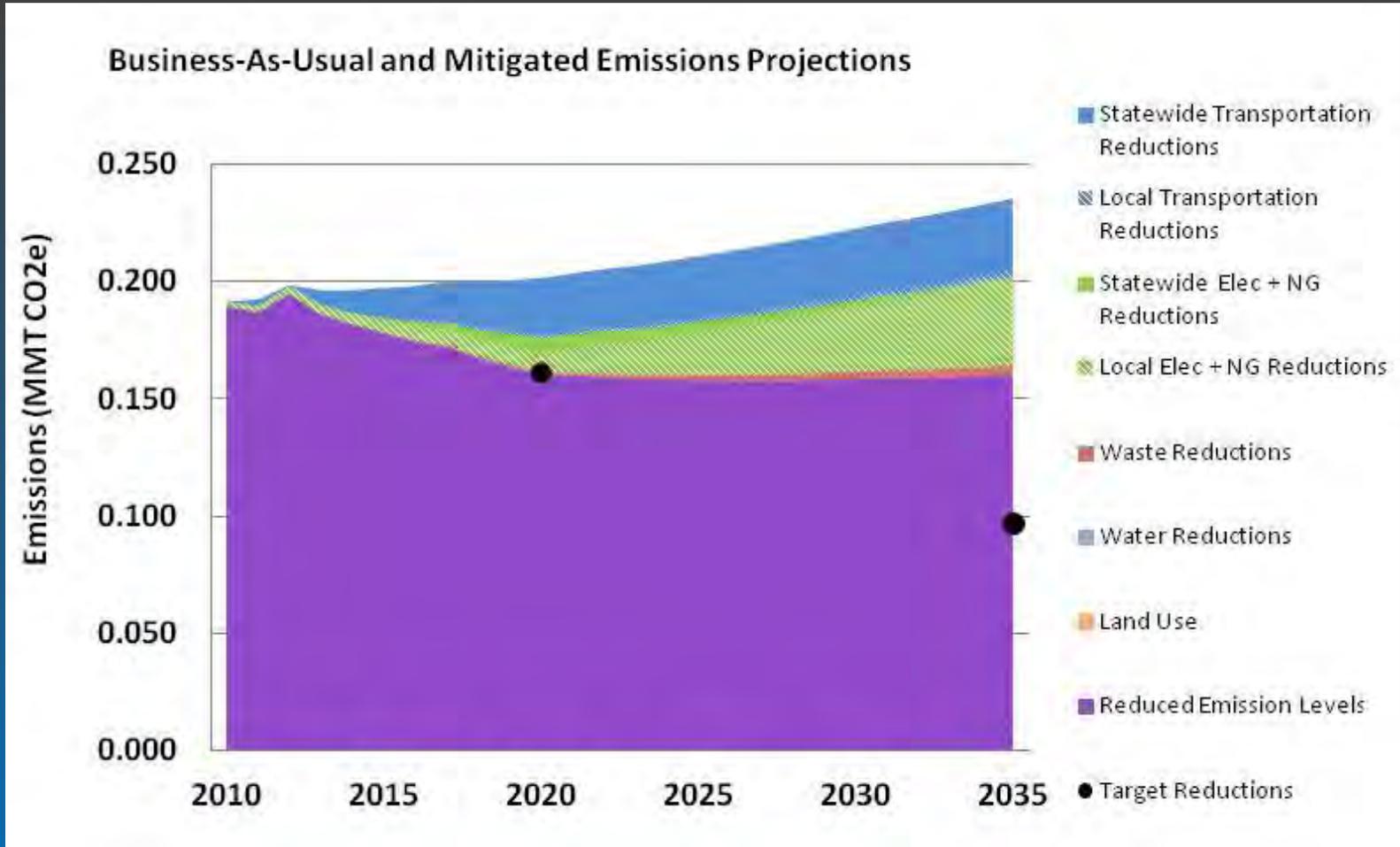
EPIC 2014 GHG Reduction Model (v 1.2.1.2)
[includes all pass-through VMT]

Some Best-Case Scenarios

Ranking of Best Mitigation Measures to Approach 2035 GHG Reduction Targets

Rank	Measure			Baseline	BEST CASE	Units	GHG Mitigated (MMT)
1	Pump Price of Gasoline	Pump \$/Gallon (2010\$)		3.50		\$	
2	Electric Vehicles	% of Total VMT Driven By Electric Vehicles		5		%	
3	Renewable Portfolio Standard (50% RPS)	% of Sales		0		%	
4	Residential Photovoltaics	User Defined PV Installed (Megawatt)		1	75	MW	0.029322
5	Solid Waste	Landfill Emissions Captured (%)		75	94.7	%	0.018725
6	Non-Residential Distributed PV	User Defined PV Installed (Megawatts)		1	25	MW	0.009774
7	Community Choice Aggregation (50% RPS)	Renewable Portfolio Standard (% of Sales)	% of Population Participating	0	75	%	0.008247

2035



EPIC 2016 GHG Reduction Model (v 2.2)

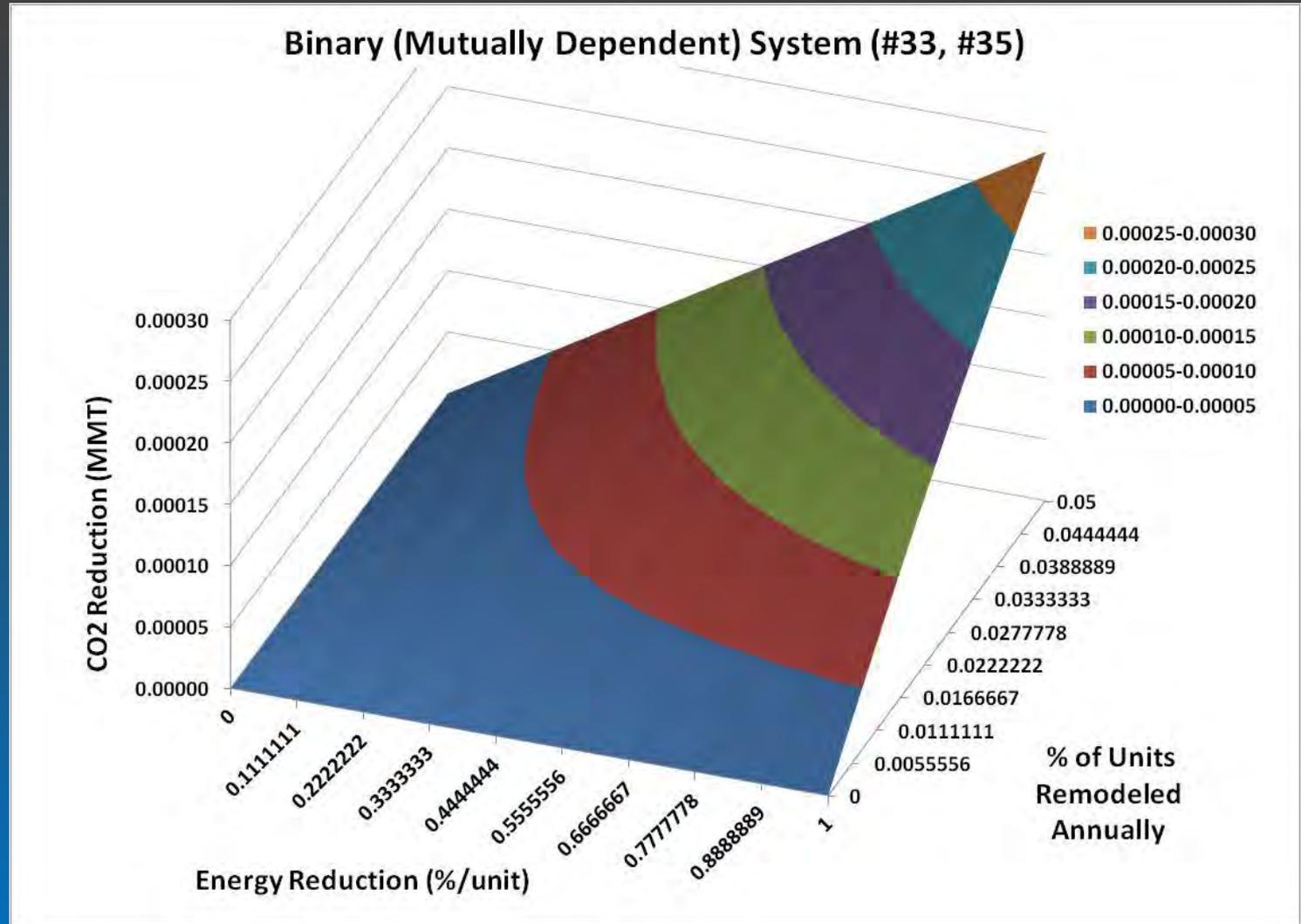
[Federal, State mitigations built into model]

[New Origin-Destination transportation model]

[New mutually dependent mitigation measures]

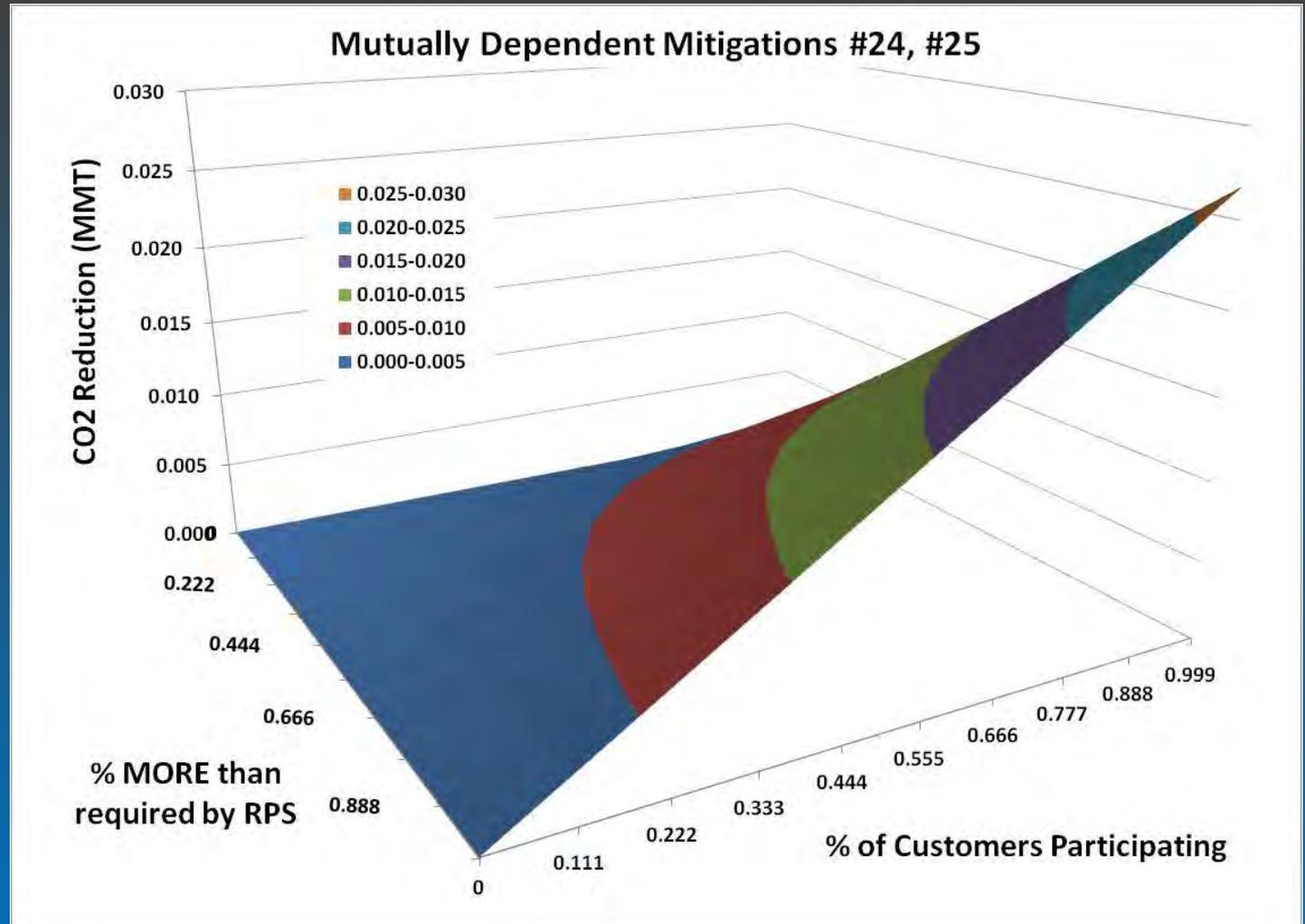
EPIC Mitigation Tool: Slope Test

2035: Energy Reduction for Remodels



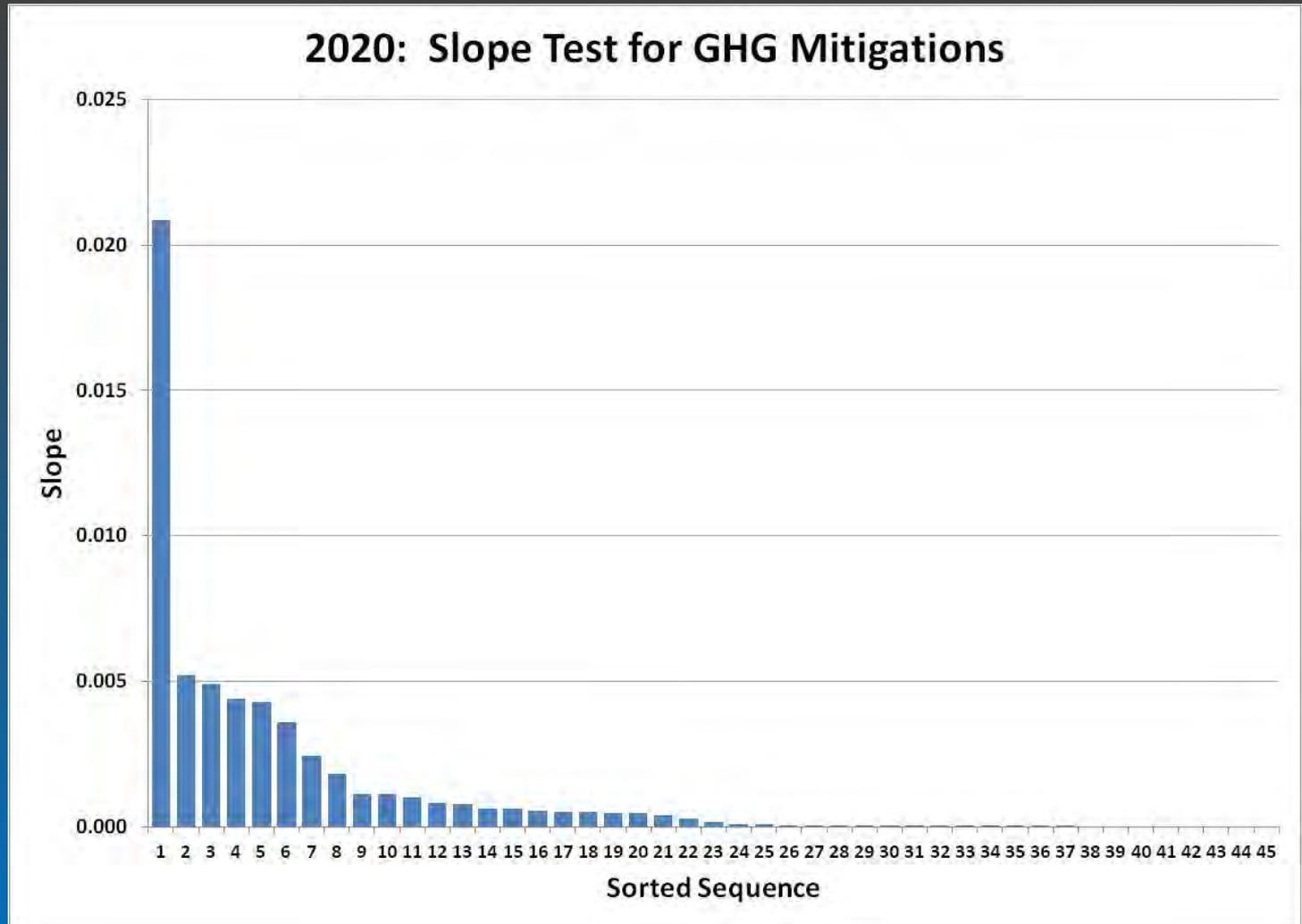
Multiply
scales by
100 !

2035: Community Clean Energy (CCA, CCE)



Multiply
scales by
100 !

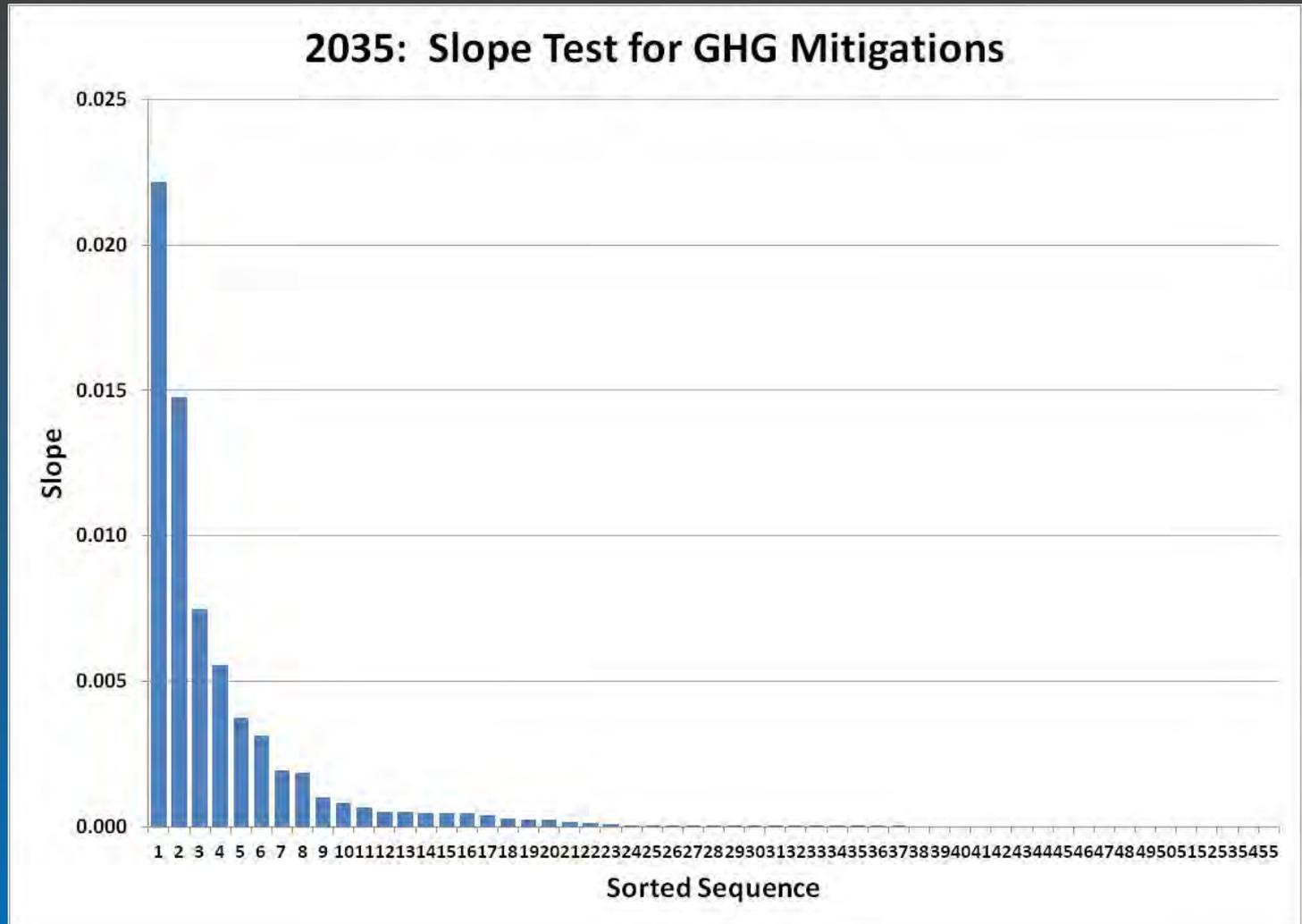
2020 Slope Test: USD/EPIC v2.1



Ranking Mitigation Strategies (EPIC v2.1, 2020)

	Sector	Jurisdiction	Area	Variable	Slope
1	Waste & Wastewater	Local Measures	Solid Waste	Landfill Emissions Captured (%)	0.0209
2	Waste & Wastewater	Local Measures	Solid Waste	Landfill Waste Diverted (%)	0.0052
3	Electric & Natural Gas	Local Measures	Commercial SHW Installs (New Con. & Retrofits)	% Commercial Water Heating Energy Affected	0.0049
4	Transportation	Local Measures	Van Pooling	Ridership (%)	0.0044
5	Transportation	Local Measures	Mass Transit	Commuter Ridership (%)	0.0043
6	Electric & Natural Gas	Local Measures	Residential SHW Installs (New Con. & Retrofits)	Systems Installed (% Existing Homes Retrofit)	0.0036
7	Electric & Natural Gas	Local Measures	Point of Sale Energy Assessment & Disclosure Ordinance (Res)	Energy Reduction (%/Unit)	0.0028
8	Electric & Natural Gas	Local Measures	Commercial SHW Installs (New Con. & Retrofits)	Reduction in Water Heating Energy	0.0025
9	Transportation	Local Measures	Alternate Work Schedule	% Workforce Participating	0.0018
10	Electric & Natural Gas	Local Measures	Community Choice Aggregation	% MORE solar than required + % of customers adopting	0.0008

2035 Slope Test: USD/EPIC v2.1



Ranking Mitigation Strategies (EPIC v2.1, 2035)

	Sector	Jurisdiction	Area	Variable	Slope
1	Waste & Wastewater	Local Measures	Solid Waste	Landfill Emissions Captured (%)	0.0222
2	Electric & Natural Gas	Local Measures	Community Choice Aggregation	% MORE solar than required + % of customers adopting	0.0148
3	Electric & Natural Gas	Local Measures	Commercial SHW Installs (New Con. & Retrofits)	% Commercial Water Heating Energy Affected	0.0075
4	Waste & Wastewater	Local Measures	Solid Waste	Landfill Waste Diverted (%)	0.0055
5	Electric & Natural Gas	Local Measures	Commercial SHW Installs (New Con. & Retrofits)	Reduction in Water Heating Energy	0.0037
6	Electric & Natural Gas	Local Measures	Residential SHW Installs (New Con. & Retrofits)	Systems Installed (% Existing Homes Retrofit)	0.0031
7	Transportation	Local Measures	Van Pooling	Ridership (%)	0.0019
8	Transportation	Local Measures	Mass Transit	Commuter Ridership (%)	0.0019
9	Transportation	Local Measures	Municipal Zero Emission Vehicle	% Gasoline Fleet Converted to EV's	0.0010
10	Transportation	Local Measures	Alternate Work Schedule	% Workforce Participating	0.0008
11	Waste & Wastewater	Local Measures	Wastewater	Wastewater Emissions Capture Rate (%)	0.0007

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