



Maryland Climate Change
Commission
Meeting #3
August 15, 2007

Welcome and Introductions

- MCCC Members
- Members of the Public
- Center for Climate Strategies

Agenda

- Welcome and Introductions
- Updates from Working Groups
 - Mitigation Working Group
 - Adaptation and Response Working Group
 - Scientific and Technical Working Group
- GHG Emissions in Maryland
 - Review of Preliminary GHG Inventory & Forecast
- Setting GHG Goals and Targets
- Agenda, Time and Date for Next Meeting
- Public Input and Announcements
- Wrap Up

Mitigation Working Group

- Tad Aburn, MDE

Adaptation and Response Working Group

- Zoë Johnson, DNR

Scientific and Technical Working Group

- Don Boesch, UMD

Break



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GHG Emissions in Maryland

- Preliminary fact-finding by CCS, assisted by MDE
- Joint fact-finding on a sector-by-sector basis as the Mitigation Work Group TWGs proceed, and in concert with the Scientific and Technical Work Group's efforts.

Inventory Approach

- Standard US EPA and UN methodologies, guidelines, and tools
- Emphasis on transparency, consistency, and significance
- Preference for Maryland or regional data, where available
- Include consumption- and production-basis emissions from electricity generation
 - Note: Very simplified approach used for initial analysis

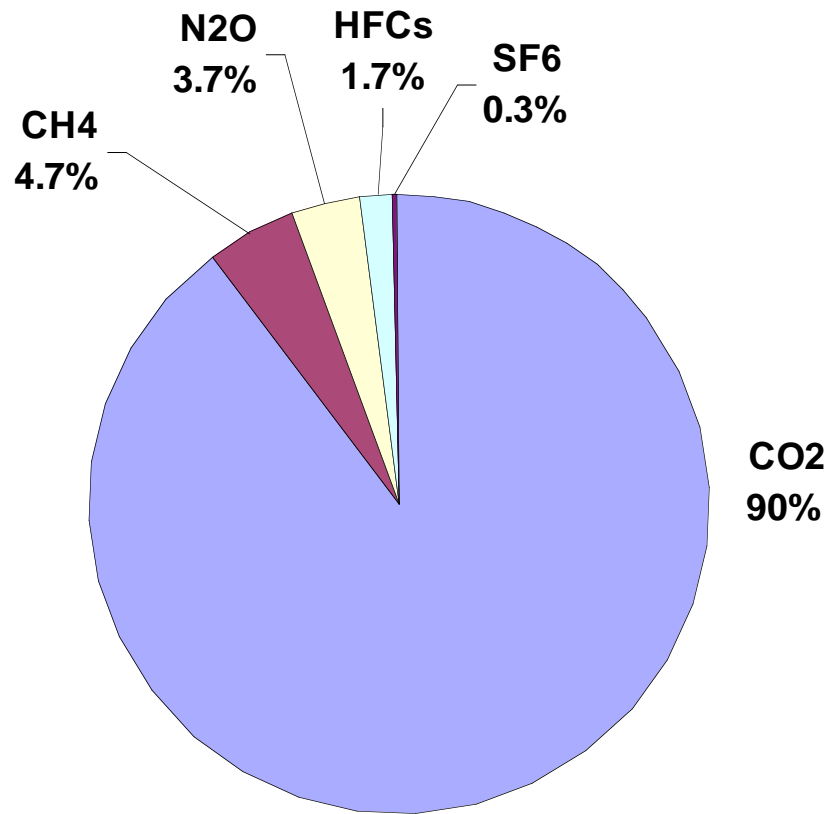
Projection Approach

- Reference case assumes no major changes from business-as-usual (BAU)
 - Includes approved policies and actions to the extent possible
- Growth assumptions from existing sources
 - State population forecasts
 - US Census and Bureau of Labor & Statistics
 - US Energy Information Administration
 - Onroad vehicle miles traveled (VMT) projections provided by Maryland Department of the Environment (MDE)

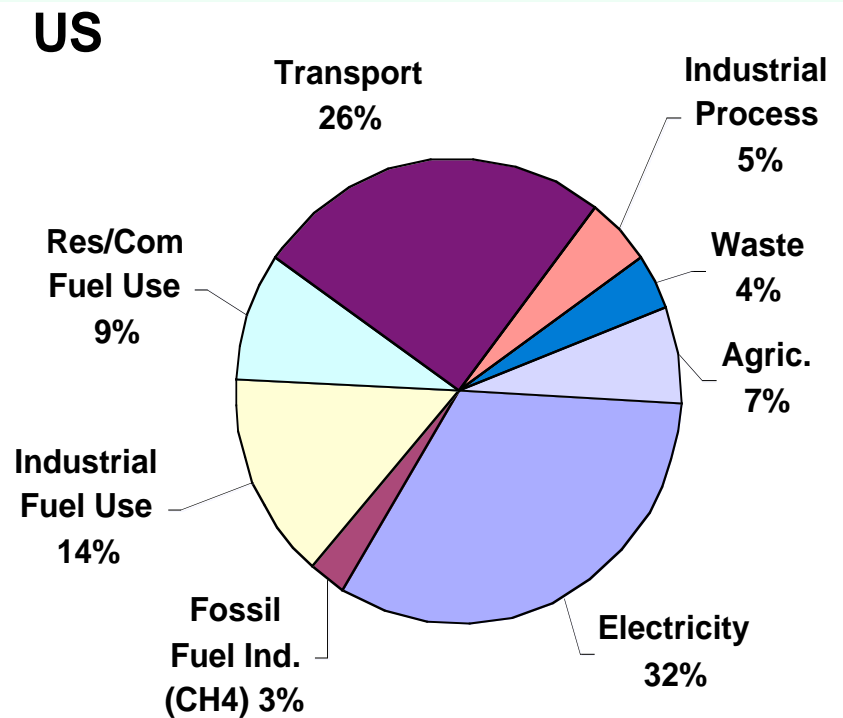
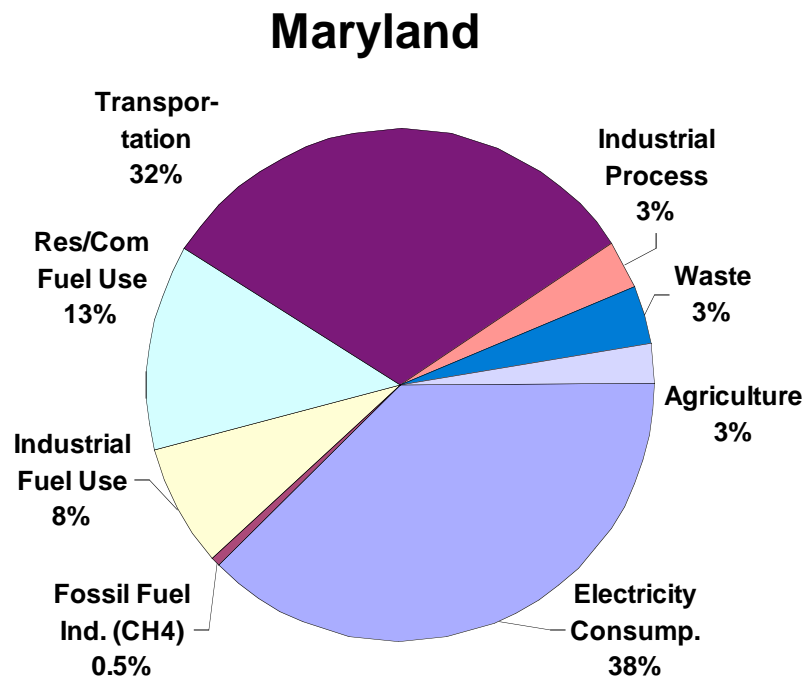
Coverage

- Six GHGs per UNFCCC and USEPA guidelines
 - Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF₆)
- All major emitting sectors
 - Electricity Supply & Demand (Consumption-Based)
 - Residential, Commercial, Industrial (RCI) Fuel Use
 - Industrial Non-Fuel Use Processes
 - Transportation (Onroad and Nonroad)
 - Natural Gas Pipeline Transmission & Distribution
 - Agriculture, Forestry, and Waste
- Emissions expressed as CO₂ equivalent

Maryland Gross Emissions by GHG Year 2000 (MMtCO₂e Based)

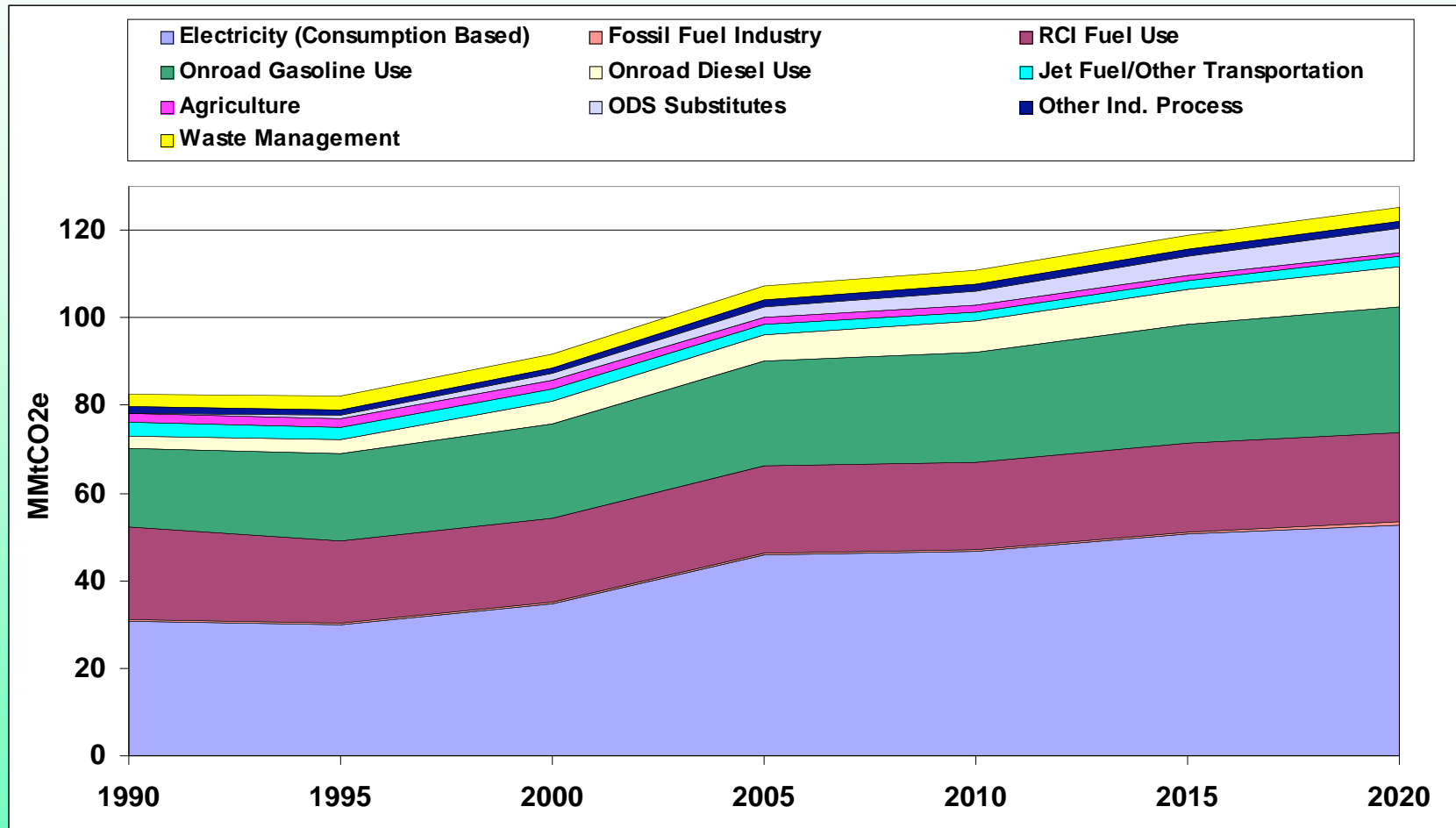


Preliminary Maryland Inventory Gross GHG Emissions By Sector

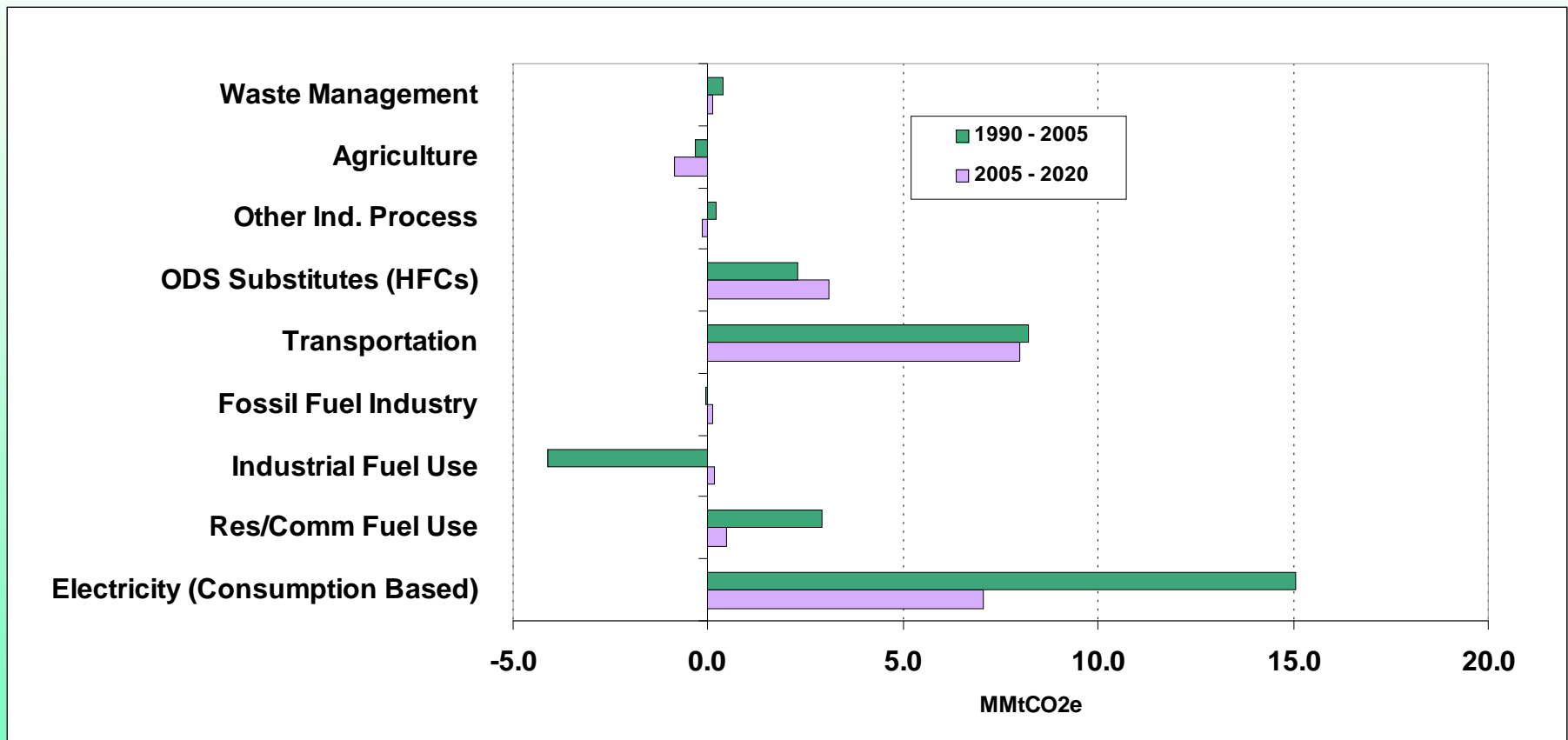


Year 2000 Data

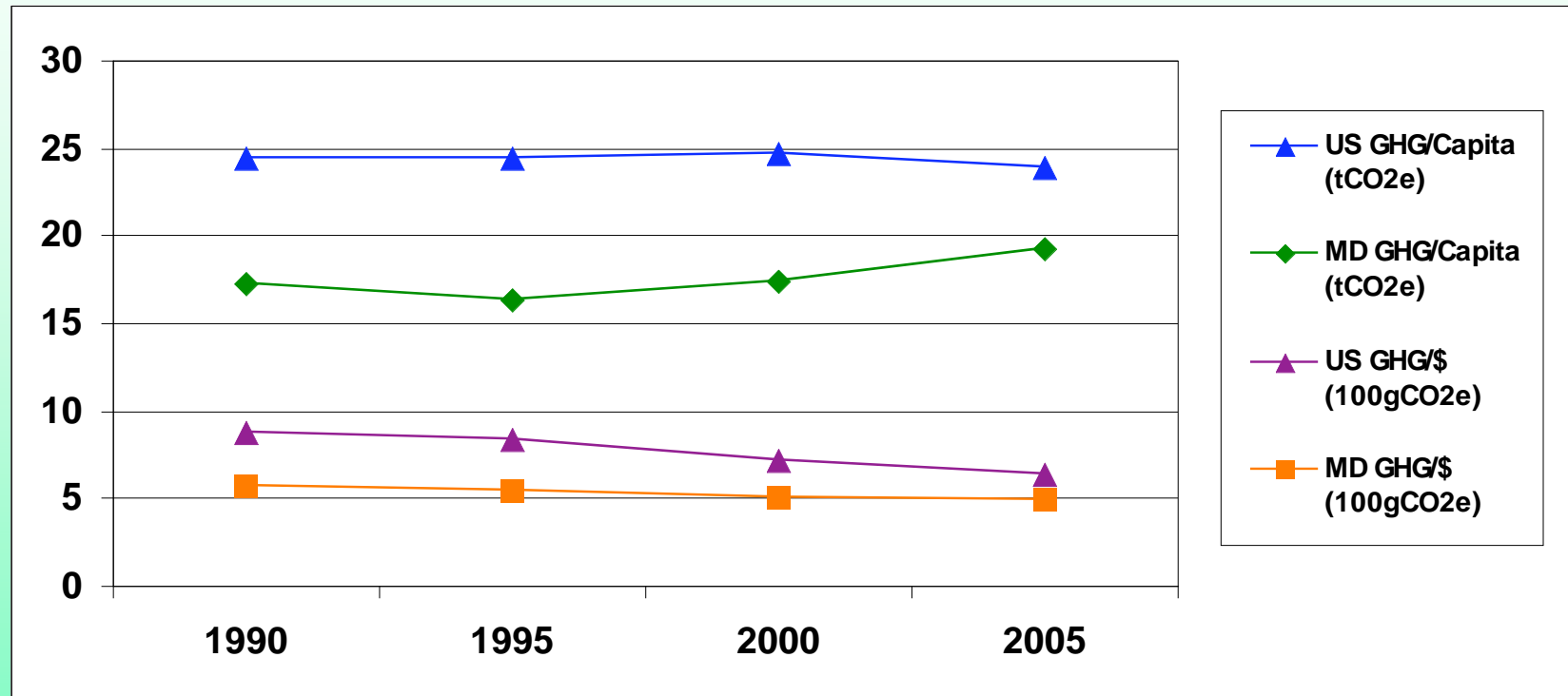
Maryland Gross GHG Emissions by Sector, 1990-2020



Maryland Gross Emissions Growth (MMtCO₂e Basis)



Per Capita and GSP/GDP Gross GHG Emissions, 1990-2005



Inventory Considerations

- Preliminary draft inventory does not include effects of California Low Emission Vehicle II (Cal LEV II) program
 - CA LEV II program will be accounted for as a reduction from the reference case projections
- Growth not fully accounted for in industrial process (non-fuel use) sector at this point

Key Inventory Points

- Very preliminary draft
 - To be refined by CCS for review and revision by MD
- Inventory & Forecast for diagnosis of GHG emissions and trends, not a baseline for modeling or compliance for individual options
- Consumption and Production methods
- Net and Gross methods

Break



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Setting GHG Goals and Targets

- Executive Order direction:
 - Evaluate and recommend goals that include but not be limited to the reduction of Maryland's greenhouse gas emissions to *1990 levels by 2020* and *80% of 2006 levels by 2050*
- Experience from other states and regions
- Key issues in setting statewide GHG reduction goals or targets

States Consistently Shape Federal Policy

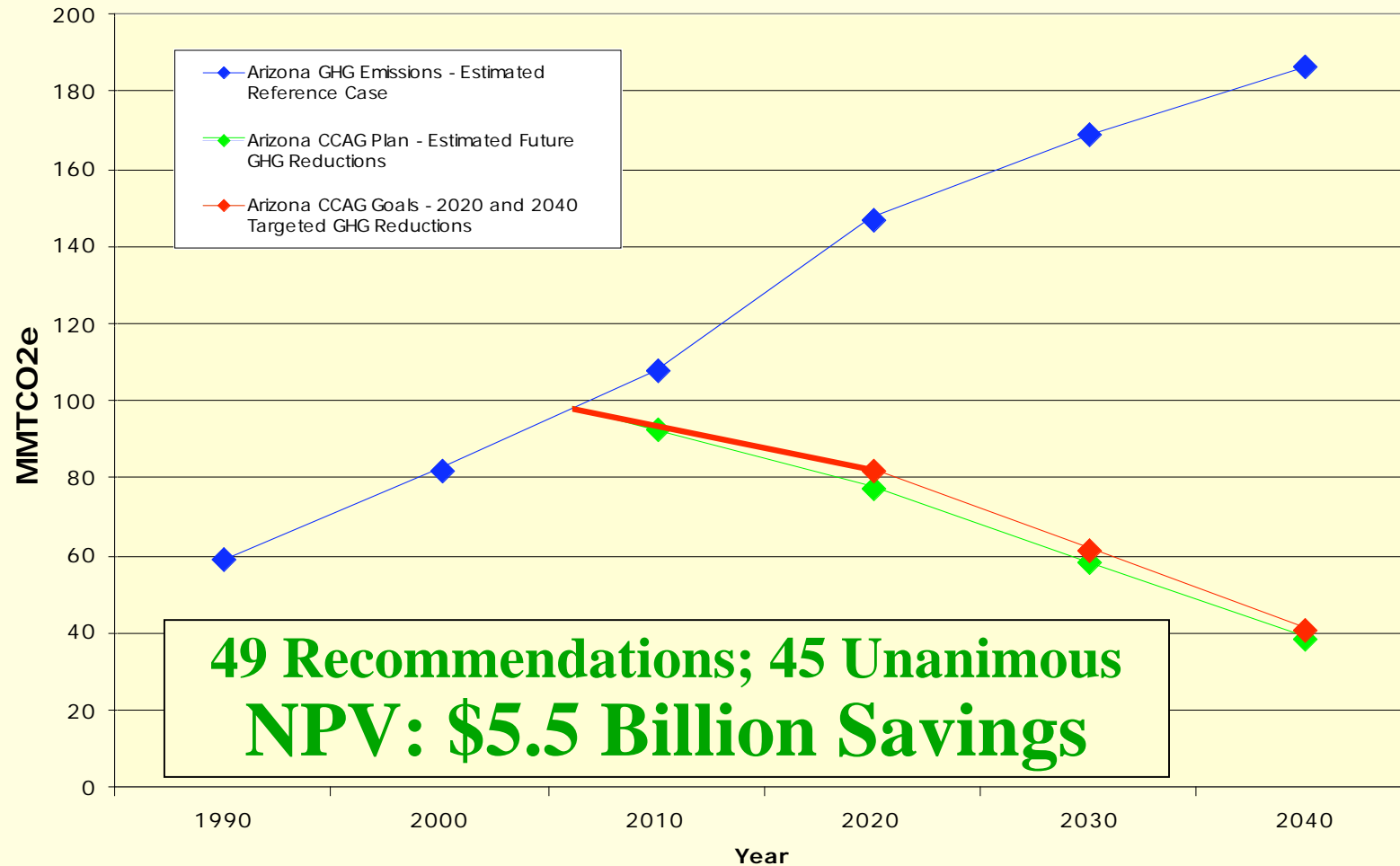
More “pioneers” than “laboratories”; where real policy gets hammered out:

State Action	When	<i>Corresponding Federal Action</i>	When
State Acid Rain Laws	1985	<i>Federal Acid Rain Program</i>	1990
State Air Toxics Laws	1987	<i>Federal Air Toxics Program</i>	1990
State NO_x Trading (OTC)	1995	<i>Federal NO_x SIP Call</i>	2004
State Mercury Laws	1998-2002	<i>Federal CAMR Rule</i>	2005
State RPS Laws	1997-2007	<i>Federal RPS Law</i>	<i>Introduced</i>
State “4-P” Laws for Power Plants	1997-2002	<i>Federal “4-P” Law</i>	<i>Introduced</i>
Statewide GHG Reduction Laws	2003-2006	<i>Federal GHG Reduction Law</i>	<i>Introduced</i>
State GHG Reductions from Vehicles	2002	<i>Federal Vehicle GHG Standards</i>	?

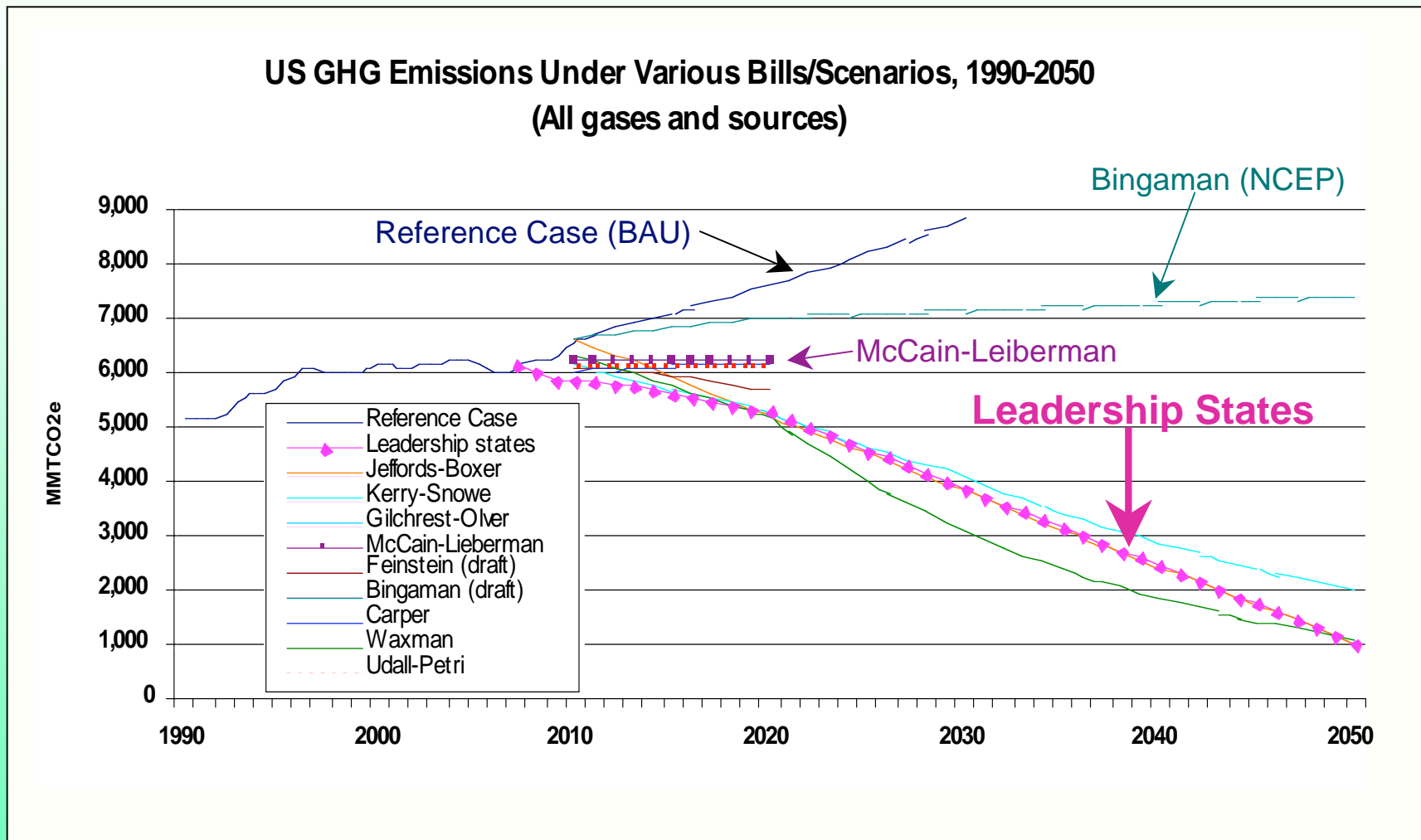
State	1990-2020 GHG Forecast	State Goals	Climate Plan Coverage
Arizona	144%	2000 levels by 2020; 50% below by 2040	106%
California	40%	E.O.: 2000 level by 2010; 1990 by 2020; 80% by 2050 AB-32: 1990 levels by 2020	100%
Colorado	81%	?	TBD
Connecticut	32%	1990 level by 2010; 10% below by 2020; 75% by 2050	100%
Florida	?	2000 level by 2017; 1990 level by 2025; 80% below 1990 by 2050	?
Massachusetts	?	1990 level by 2010; 10% below by 2020; 75% by 2050	?
Maine	34%	1990 level by 2010; 10% below by 2020; 75% by 2050	100%
Maryland	52%	TDB: 1990 level by 2020; 80% below 2006 levels by 2050	TBD
Minnesota	48%	Next Generation Energy Act: 15% below 2005 levels by 2015; 30% by 2025; 80% by 2050	TBD
Montana	31%	1990 level by 2020; 80% below by 2050 (consumption & production)	89%-105%
North Carolina	113%	?	TBD
NEG/ECP	?	1990 level by 2010; 10% below by 2020; 75-85% ultimately	TBD
New Jersey	?	E.O. 54: 1990 level by 2020; 80% below 2006 levels by 2050	TBD
New Mexico	65%	2000 level by 2012; 10% below by 2020; 75% below by 2050	133%
New York	24%	5% below 1990 by 2010	?
Oregon	52%	1990 level by 2010; 10% below by 2020; 75% by 2100	85%
Puget Sound	37%	1990 level by 2010; 10% below by 2020; 75% by 2100	100%
Rhode Island	35%	1990 level by 2010; 10% below by 2020; 75% by 2050	100%
Vermont	26-59%	25% below 1990 levels by 2012; 50% below 1990 by 2028; 75% by 2050	TBD
Washington	40%	E.O.: 1990 levels by 2020; 25% below 1990 by 2035; 50% below 1990 by 2050	TBD
WCI	54%	- TBD	TBD

Arizona – Climate Plan Results

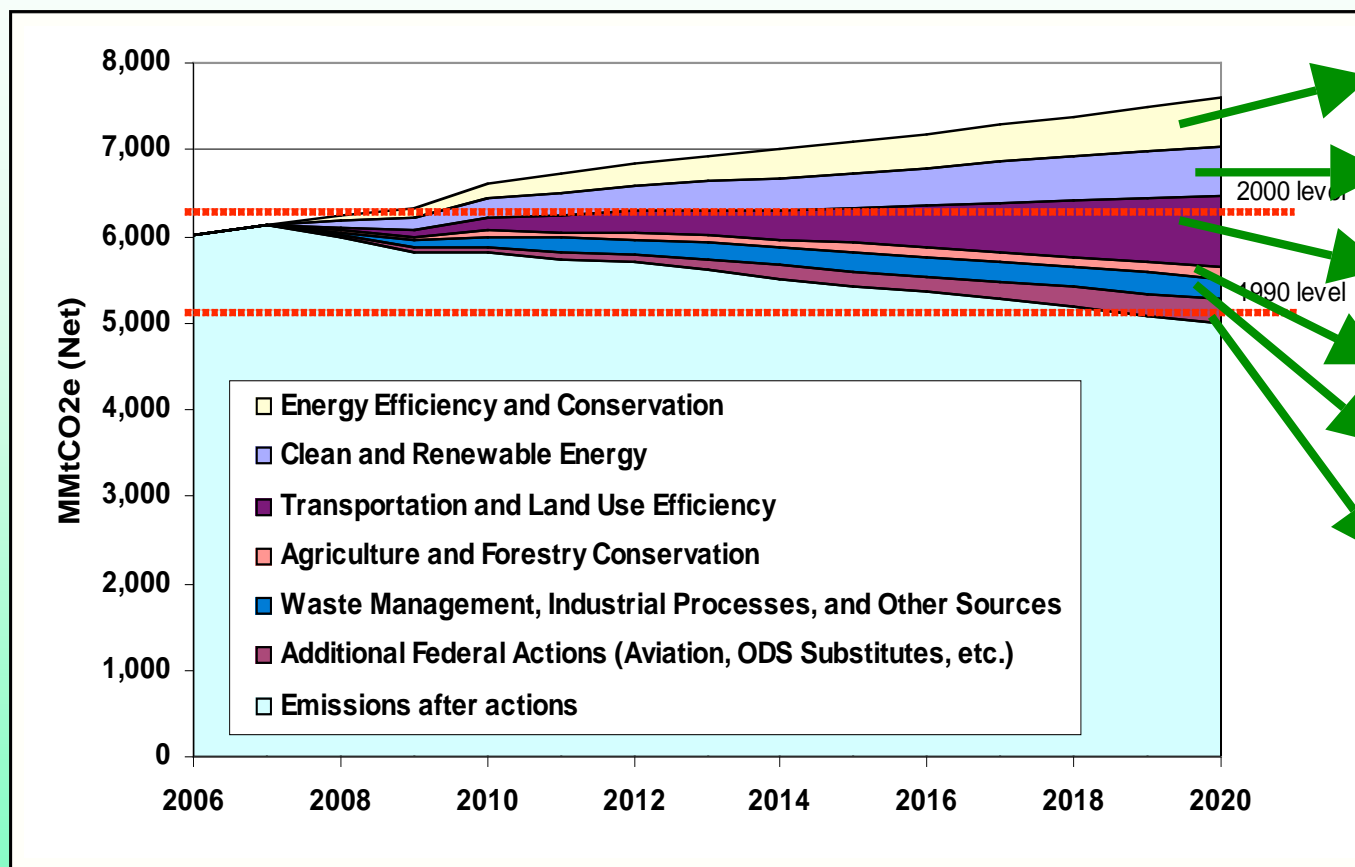
AZ CCAG Goals vs. Estimated CCAG Plan Results



Comparison to National Bills



Leadership States' "Wedges"



% of Gap	Sample Cost
~24%	-\$10 to -\$30
~24-30%	\$7 to \$21
~20-36%	-\$32 to -\$36
~6-9%	-\$1 to -\$5
~11-18%	?
~6-18%	?

Conclusion
:
Closing the gap is quite doable

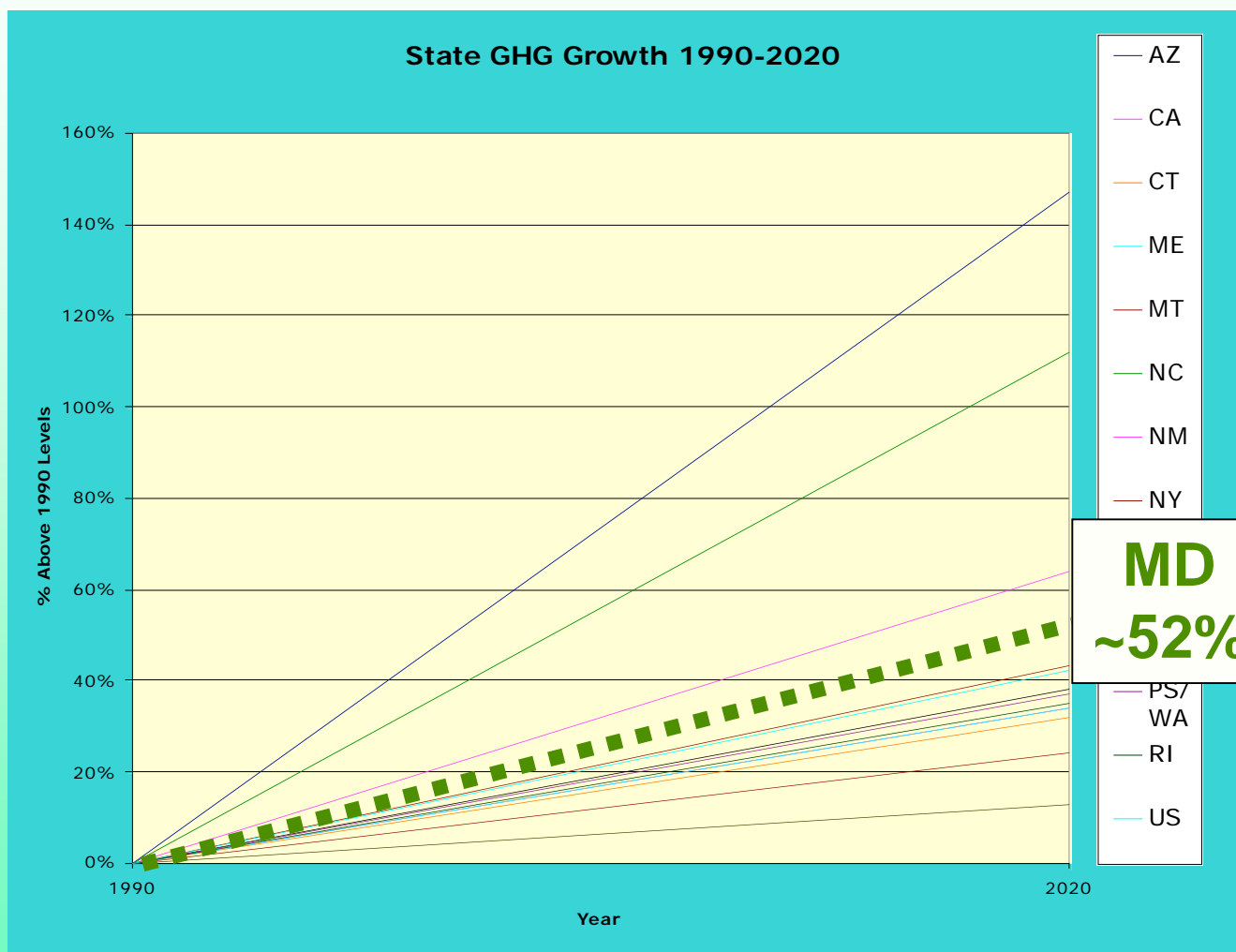
National “Gross-Up” of States’ Actions

Potential US 2020	% of “US 1990” Goal	M Tons GHG	Sample Cost/Cost Savings	Total Savings (Best Guess)
Energy Efficiency and Conservation	~24%	555	-\$10 to -\$30	-\$11 Billion
Clean and Renewable Energy	~24%	565	\$7 to \$21	\$8 Billion
Transportation and Land Use Efficiency	~36%	831	-\$32 to -\$36	-\$28 Billion
Agriculture and Forestry Conservation	~6%	132	-\$1 to -\$5	-\$0.4 Billion
Waste Management, Industrial Processes, and Other	~11%	246	?	?
Additional Federal Actions	(~6-18%)	264	?	?
Total	NPV 2007-2020: -\$117 Billion			

Key Issues in Setting Statewide GHG Reduction Goals or Targets

- Growth Rate
- Baseline
- Level(s) of Reduction
- Target Date(s)
- Consumption vs. Production Approach
- Gross Emissions vs. Net Emissions

State GHG Growth Forecasts

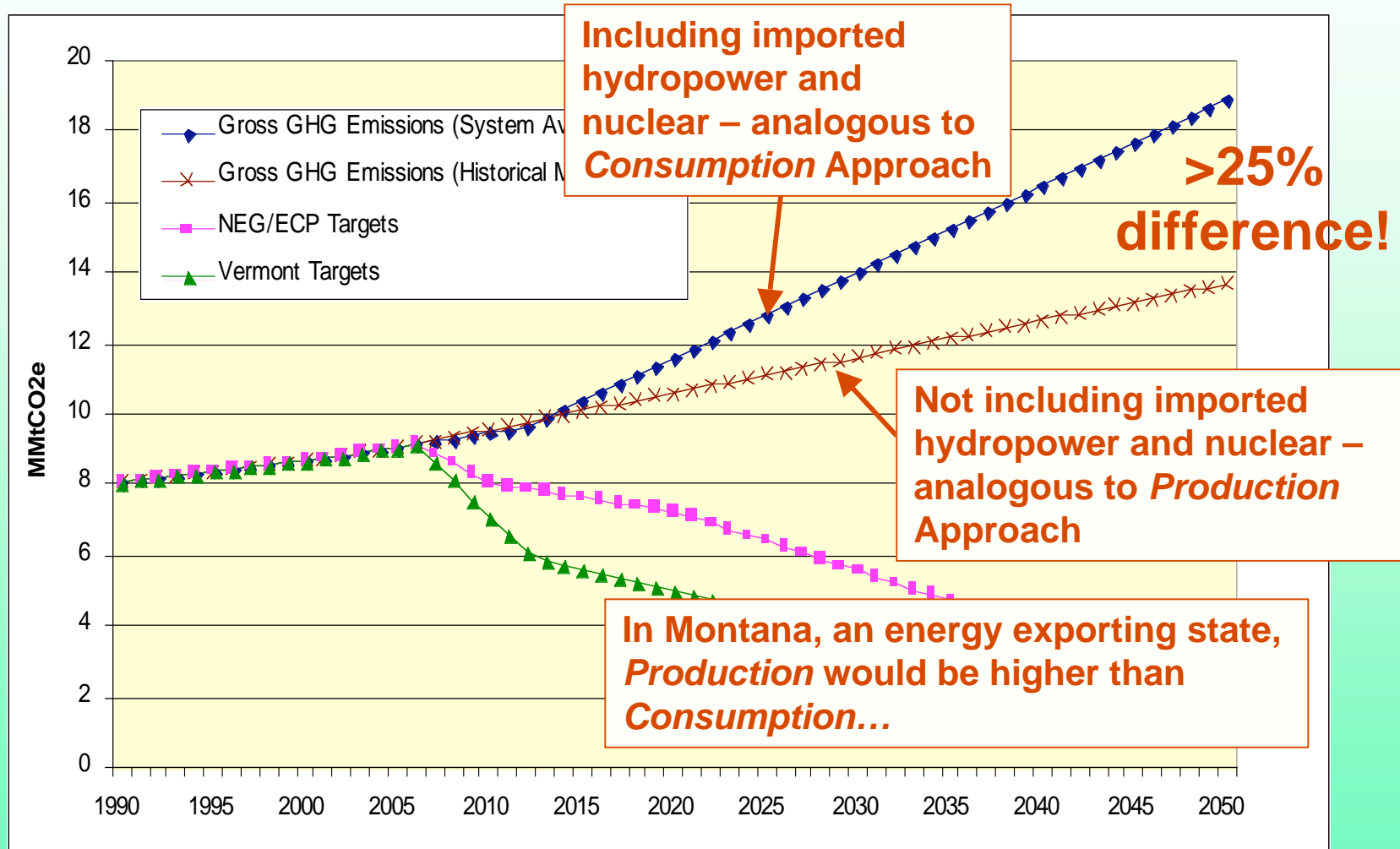


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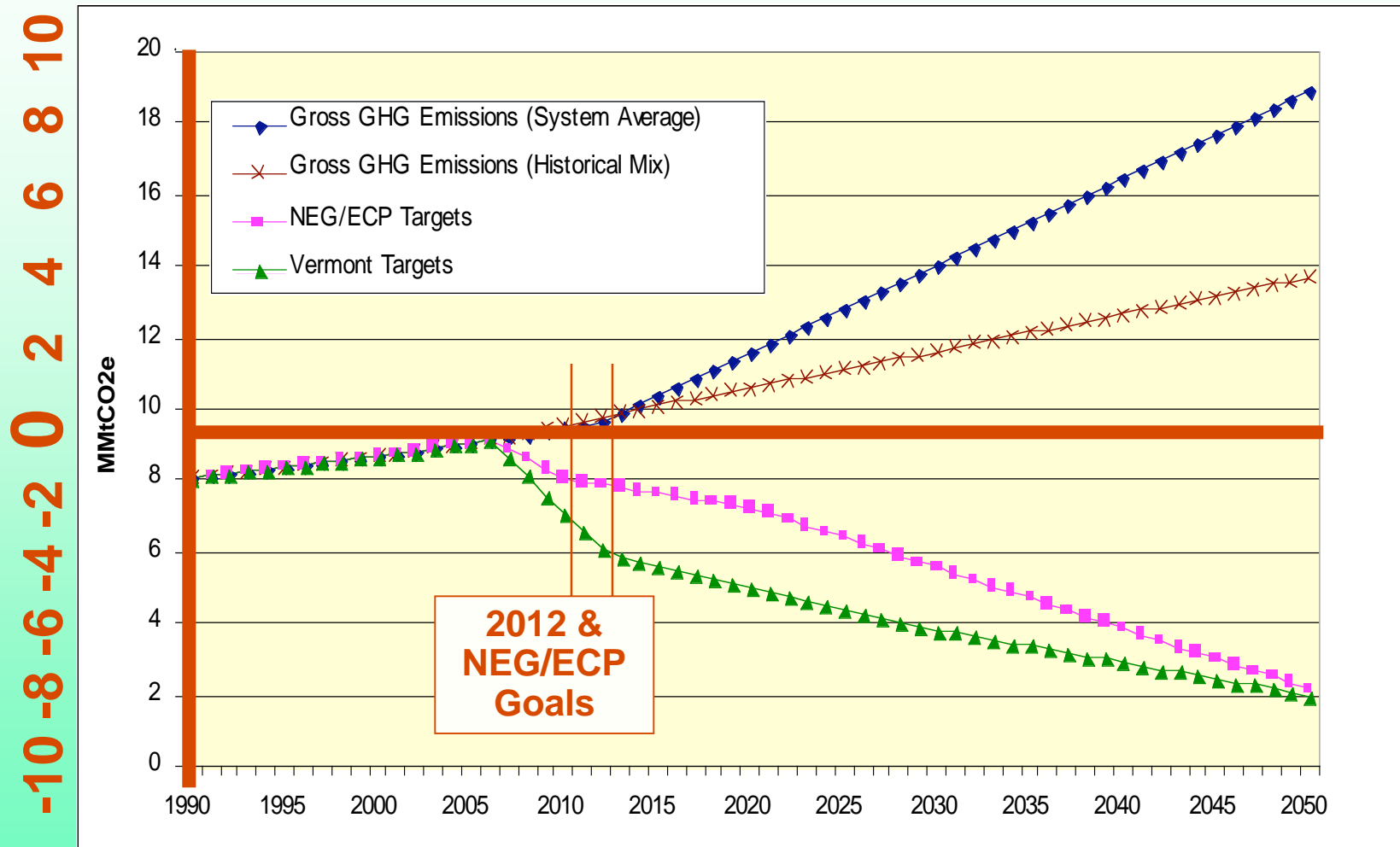
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Production vs. Consumption Illustration: Vermont GHG Emissions



Gross vs. Net Illustration: Vermont GHG Emissions



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IPCC FAR - Working Group III

Table SPM.5: Characteristics of post-TAR stabilization scenarios [Table TS 2, 3.10]^{a)}

Category	Radiative Forcing (W/m ²)	CO ₂ Concentration ^{c)} (ppm)	CO ₂ -eq Concentration ^{c)} (ppm)	Global mean temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity ^{b), c)} (°C)	Peaking year for CO ₂ emissions ^{d)} (year)	Change in global CO ₂ emissions in 2050 (% of 2000 emissions) ^{d)} (%)	No. of assessed scenarios
I	2.5 – 3.0	350 – 400	445 – 490	2.0 – 2.4	2000 - 2015	-85 to -50	6
II	3.0 – 3.5	400 – 440	490 – 535	2.4 – 2.8	2000 - 2020	-60 to -30	18
III	3.5 – 4.0	440 – 485	535 – 590	2.8 – 3.2	2010 - 2030	-30 to +5	21
IV	4.0 – 5.0	485 – 570	590 – 710	3.2 – 4.0	2020 - 2060	+10 to +60	118
V	5.0 – 6.0	570 – 660	710 – 855	4.0 – 4.9	2050 - 2080	+25 to +85	9
VI	6.0 – 7.5	660 – 790	855 – 1130	4.9 – 6.1	2060 - 2090	+90 to +140	5
Total							177

a) The understanding of the climate system response to radiative forcing as well as feedbacks is assessed in detail in the AR4 WGI Report. Feedbacks between the carbon cycle and climate change affect the required mitigation for a particular stabilization level of atmospheric carbon dioxide concentration. These feedbacks are expected to increase the fraction of anthropogenic emissions that remains in the atmosphere as the climate system warms. Therefore, the emission reductions to meet a particular stabilization level reported in the mitigation studies assessed here might be underestimated.

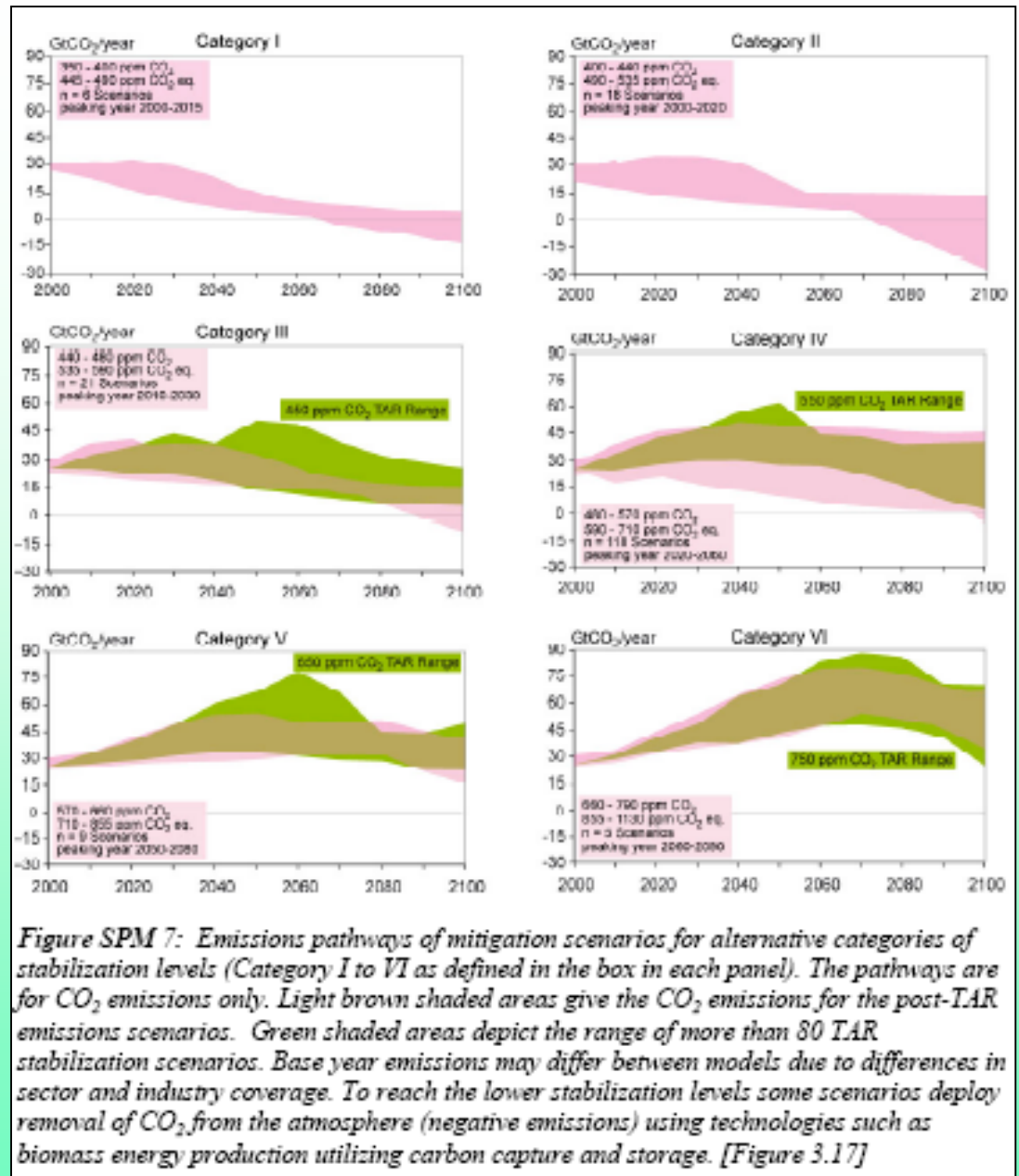
b) The best estimate of climate sensitivity is 3°C [WG I SPM].

c) Note that global mean temperature at equilibrium is different from expected global mean temperature at the time of stabilization of GHG concentrations due to the inertia of the climate system. For the majority of scenarios assessed, stabilisation of GHG concentrations occurs between 2100 and 2150.

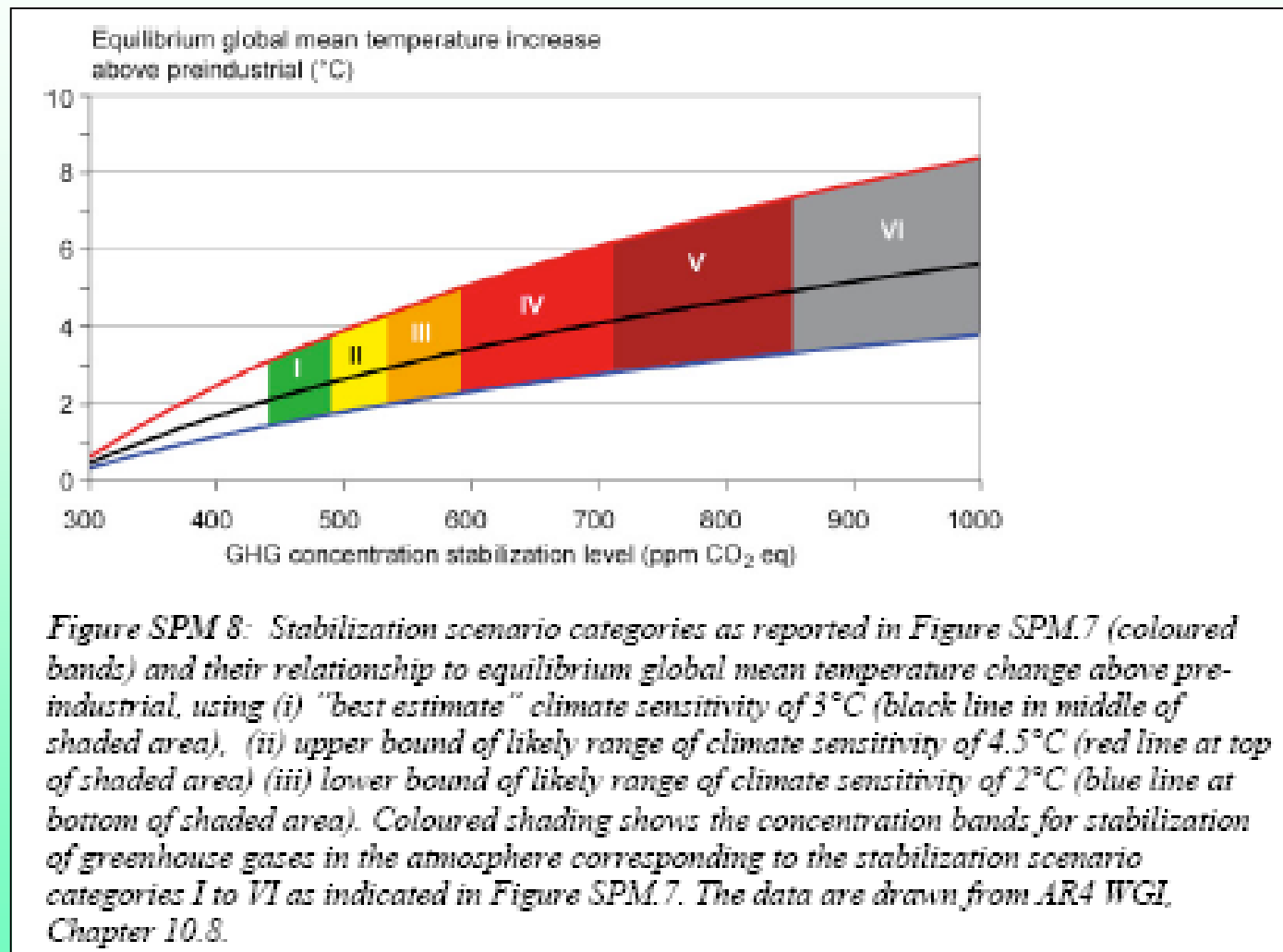
d) Ranges correspond to the 15th to 85th percentile of the post-TAR scenario distribution. CO₂ emissions are shown so multi-gas scenarios can be compared with CO₂-only scenarios.

IPCC FAR WGIII – Emissions Pathways

Note: These graphs show CO₂ only, not CO₂e.

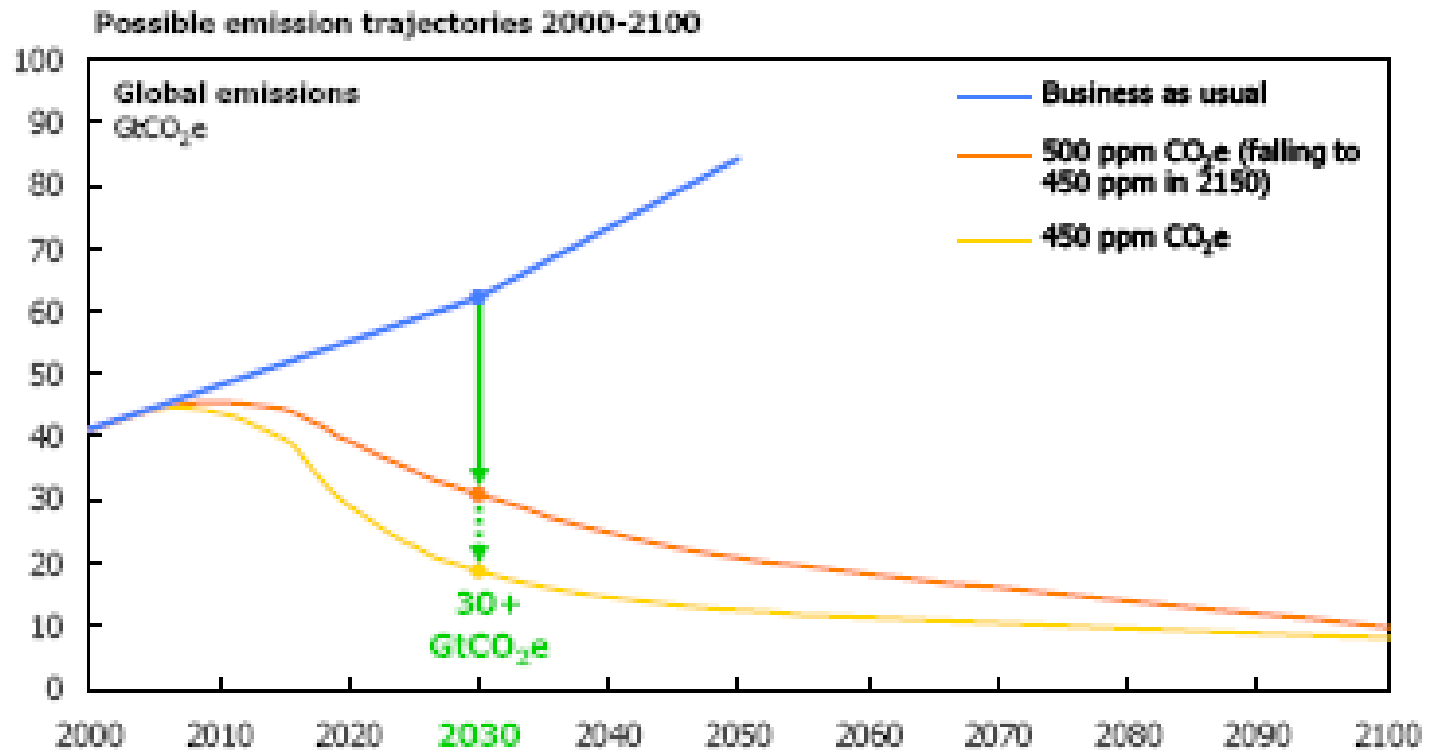


IPCC FAR WGIII – Equilibrium Temperature Rise



As Framed by the Stern Review

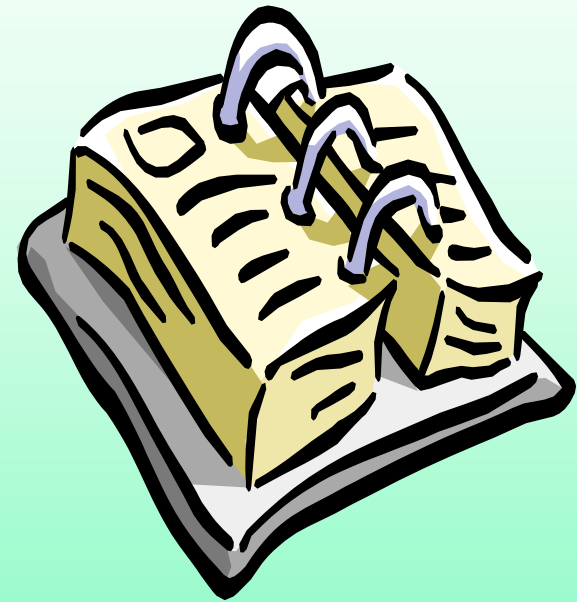
FIGURE 6: Stabilizing Emissions Requires a Minimum 30 Gt



Source: Adapted from Stern Review, 2006; BAU emissions ~WEO A2 scenario; 450 ppm budget range based on Stern and preliminary IPCC analysis

Next MWG Meeting

- Date and Location:
 - October 17, 2007; 1:00-3:00 pm
 - Baltimore
- Agenda:
 - Update from Working Groups
 - Further discussion on statewide goals
 - Other



Public Input, Announcements

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Maryland Executive Order

- Establishes a Climate Change Commission charged with addressing Maryland's climate challenge on all fronts
- Three specific areas of concern:
 - Mitigation (MDE)
 - Adaptation (DNR)
 - Science and effects in Maryland (U of M)
- Presumptive GHG reduction targets
 - 1990 levels by 2020
 - 80% of 2006 by 2050
- Initial report by November 2007
 - Action Plan by April 2008



GHG Emission Sources

