



# Maryland Greenhouse Gas and Carbon Mitigation Working Group

Meeting #2, September 7, 2007

Maryland Department of the Environment

Maryland Energy Administration

The Center for Climate Strategies

# Welcome and Introductions

- Maryland Department of the Environment
- Maryland State Agencies
- Maryland Greenhouse Gas and Carbon Mitigation Working Group (MWG)
- Members of the Public
- Center for Climate Strategies

# Agenda

- Introductions and review of agenda
- Approval of draft summary of MWG Meeting #1
- Update on Commission meeting and other climate-related developments
- Update on Maryland's Draft GHG Inventory and Forecast
- Review and addition of items to the Catalog of State Actions
- Discussion of process and timeframe for identifying initial policy option priorities for TWG analysis
- Agenda, Time and Date for Next Meeting
- Public Input and Announcements

# Recent Developments Update

- Western Climate Initiative goal: 15% below 2005 levels by 2020
- UN interim meeting in Vienna - industrialized countries should cut GHGs by 25-40% of 1990 levels by 2020.
- MCCC Meeting – August 15, 2007
  - Goals Discussion
  - Interim Report Needs Discussion

# MCCC Goals Discussion

- Overview by Ken Colburn & Tom Peterson, CCS, and Tad Aburn, MDE

# Setting GHG Goals and Targets

- Typically a climate action plan cornerstone
- 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

# Key Issues in Setting Statewide GHG Reduction Goals or Targets

- Growth Rate
- Baseline
- Level(s) of Reduction
- Target Date(s) – Short-term? Long-term?
- Consumption vs. Production Approach
- Gross Emissions vs. Net Emissions
- Aspirational vs. “Ground-Up” Approach

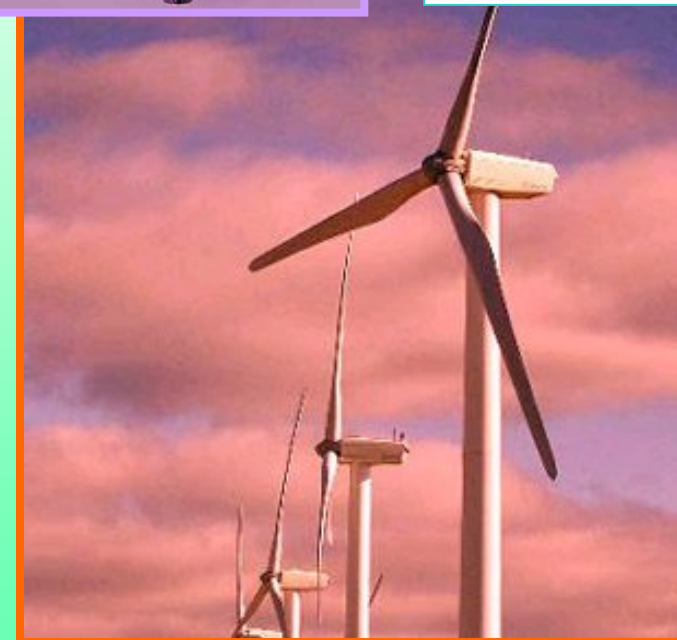
# Question: Short or Long Term Goals?

- Most states have set both short and long term goals
  - Short term
    - 2010-2015
  - Mid term goals
    - 2020-2025
  - Long term goals
    - 2050 and beyond
- Early goals are generally more “concrete”
- Later goals are often more “visionary” and aspirational

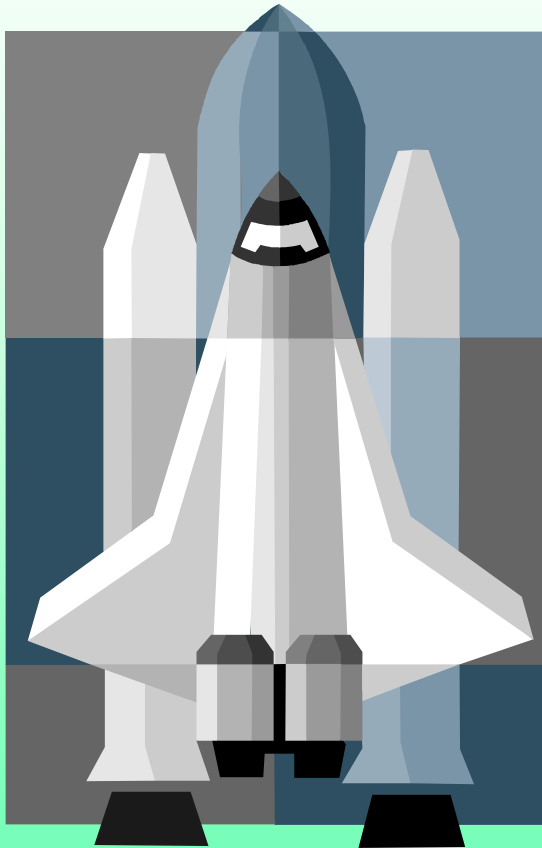


# Question: Periodic Goal Updates?

- Many state action plans recognize the need to update action plans and goals if necessary
- Again, reflective that:
  - Earlier goals are typically more certain
  - Later goals are likely to need “tweaking” or “course corrections” as programs are actually implemented and available data improves

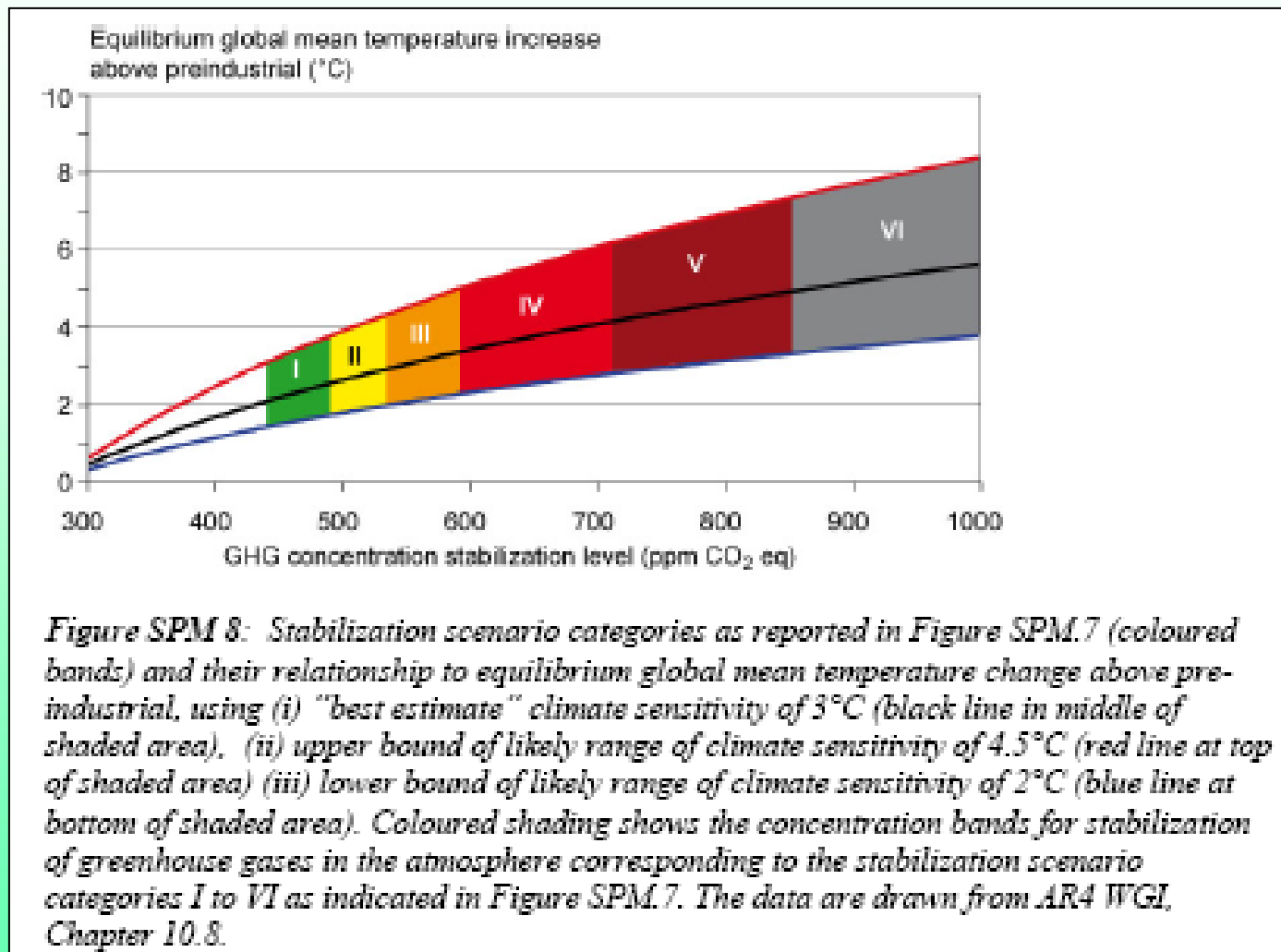


# Question: What's Science Say?



- What are scientists really telling us?
- Reductions as high as 85% appear to be needed by 2050
- Reductions that are earlier or greater provide significant additional benefits in reversing global warming

# IPCC FAR WGIII – Equilibrium Temperature Rise



# IPCC FAR - Working Group III

*Table SPM.5: Characteristics of post-TAR stabilization scenarios [Table TS 2, 3.10]<sup>a)</sup>*

Category	Radiative Forcing (W/m <sup>2</sup> )	CO <sub>2</sub> Concentration <sup>c)</sup> (ppm)	CO <sub>2</sub> -eq Concentration <sup>c)</sup> (ppm)	Global mean temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity <sup>b), c)</sup> (°C)	Peaking year for CO <sub>2</sub> emissions <sup>d)</sup> (year)	Change in global CO <sub>2</sub> emissions in 2050 (% of 2000 emissions) <sup>d)</sup> (%)	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.

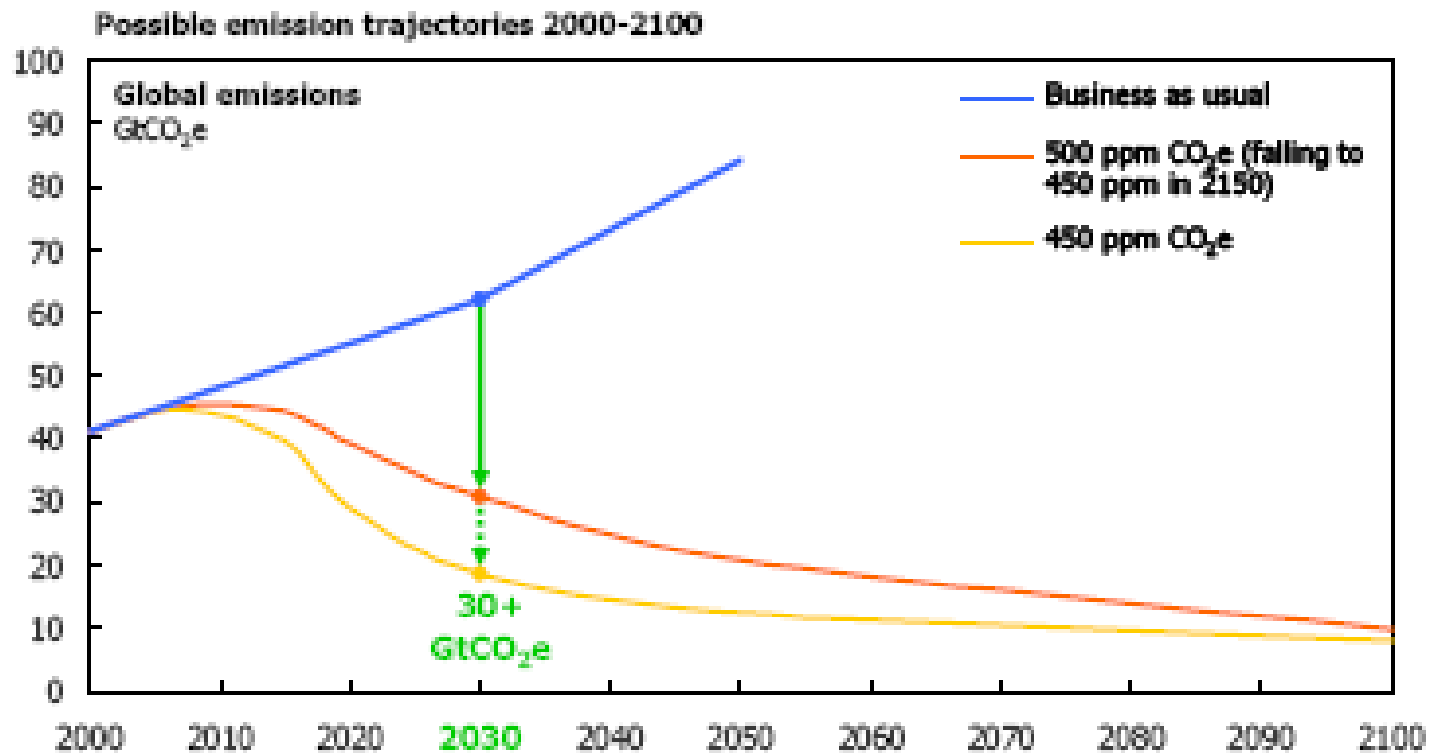
b) The best estimate of climate sensitivity is 3°C [WG I SPM].

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 15<sup>th</sup> to 85<sup>th</sup> percentile of the post-TAR scenario distribution. CO<sub>2</sub> emissions are shown so multi-gas scenarios can be compared with CO<sub>2</sub>-only scenarios.

# As Framed by the Stern Review

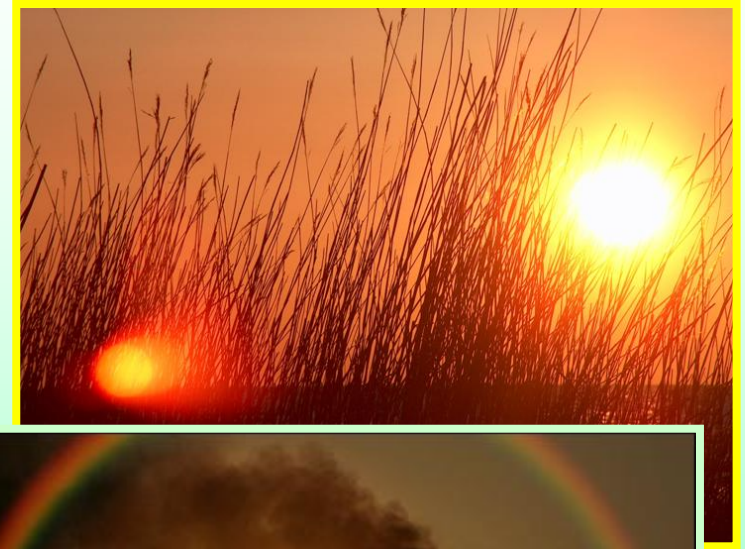
**FIGURE 6: Stabilizing Emissions Requires a Minimum 30 Gt**



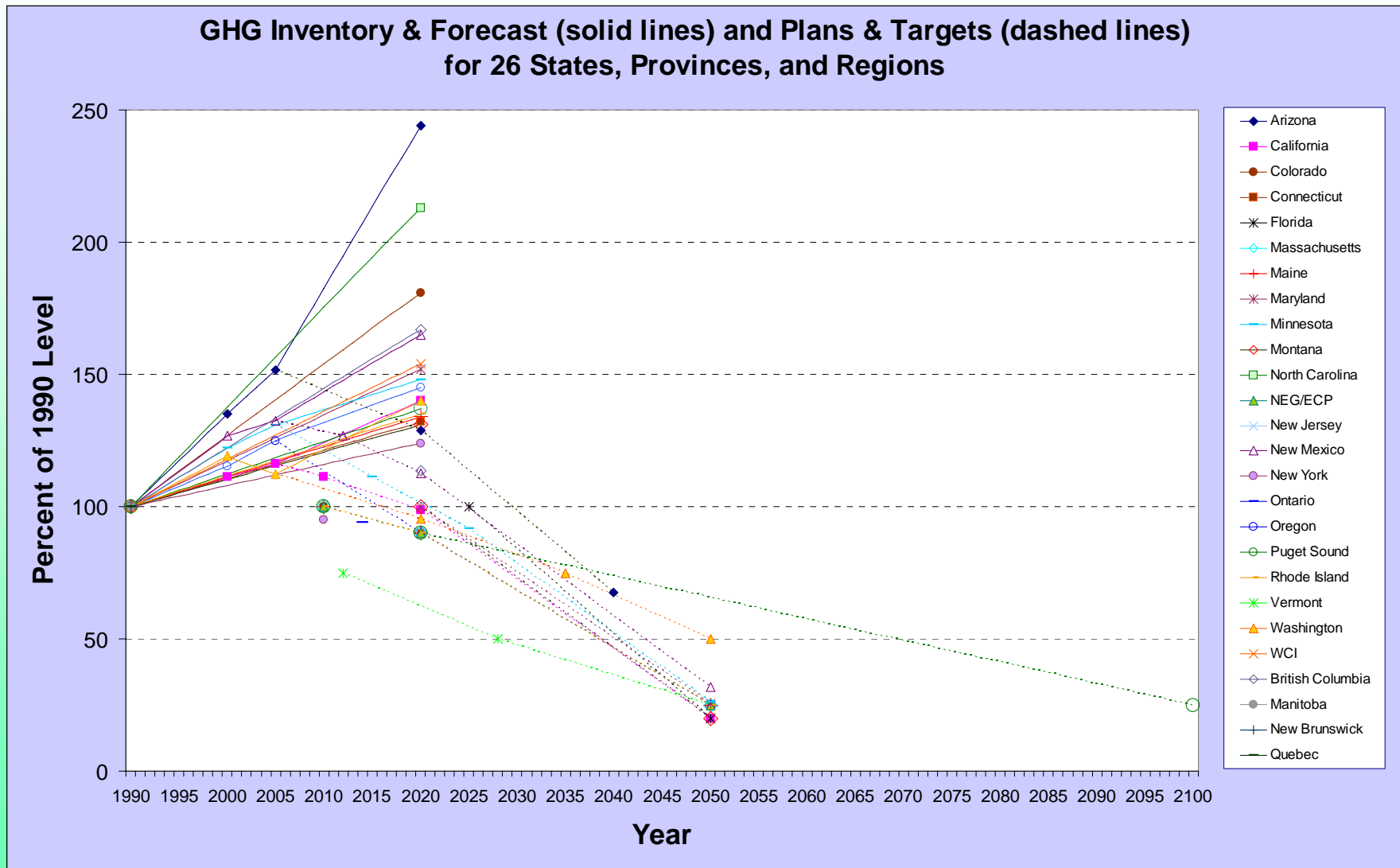
Source: Adapted from Stern Review, 2006; BAU emissions ~WEO A2 scenario; 450 ppm budget range based on Stern and preliminary IPCC analysis

# Question: What End in Mind?

- Why have climate goals?
  - One Extreme:
    - Set minimum targets we know we can reach with current technologies and programs?
    - Sometimes enforceable
  - The Other:
    - Push the envelope on technologies and programs and strive to reach it?
    - Usually aspirational



# Various Growth Rates & Goals



Key Question for MWG:

*What Goals Are Right  
for Maryland?*

# MCCC Interim Report Discussion

- Overview from Tad Aburn, MDE
  - Anticipated Timing
  - Anticipated Content

# Break



September 7, 2007

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18

# MWG Timing

Date	Action
July 27, 2007	MWG Startup; 1 <sup>st</sup> MWG meeting
September 7, 2007	2 <sup>nd</sup> MWG meeting; Open TWG catalogs
September 28, 2007	3 <sup>rd</sup> MWG meeting; Approve TWG catalogs
October 26, 2008	4 <sup>th</sup> MWG meeting; Approve priority options
November 2007	INTERIM REPORT
December 2007	5 <sup>th</sup> MWG meeting; Approve straw proposals
February 2008	6 <sup>th</sup> MWG meeting; Review quantification
March 2008	7 <sup>th</sup> MWG meeting; Finalize policy options
April 20, 2008	FINAL MCCC <i>Plan of Action</i> DUE
Between MWG Meetings	TWG conference calls and meetings

# MWG Stepwise Planning Process

1. **Develop inventory and forecast of emissions**
2. **Identify a full range of possible actions (“catalog”)**
3. **Identify initial priorities for analysis**
4. Develop straw proposals
5. Quantify GHG reductions and costs/savings
6. Evaluate externalities, feasibility issues
7. Develop alternatives to address barriers
8. Aggregate results
9. Iterate to final agreements
10. Finalize and report recommendations

# Catalog of States Actions

- 300+ actions undertaken or considered by a wide variety of US states
  - Many actions provide GHG reductions coincidentally or as a co-benefit
  - Cover all economic sectors
  - Cover many implementation mechanisms
- Starting place for identifying priorities for further consideration by the MWG

# Screening of Potential Actions - Agriculture Sample

Option No.	Climate Mitigation Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Additional Impacts, Feasibility Considerations	Notes
<b>AFW-1</b>	<b>AGRICULTURE'S PRODUCTION OF FUELS AND ELECTRICITY</b>					
1.1	Manure Digesters/Other Waste Energy Utilization**					
1.2	Biodiesel Production (incentives for feedstocks and production plants)					
1.3	Biomass Feedstocks for Electricity or Steam Production**					
1.4	Ethanol Production					

# Policy Design Proposals

- TWGs screen and identify potential priority options for analysis
- MWG determines about 50 priority options for further development
- TWGs propose initial design for policy options (“straw proposals”)
  - Goals, Timing, Coverage, etc.
- CCS quantifies and presents for review
- MWG revisits as needed

# Decision Criteria

- GHG Reduction Potential (CO<sub>2</sub>e)  
(quantified)
- Cost Per Ton GHG Removed (quantified)
- Additional Issues (may or may not be  
quantified)
- Feasibility Issues (qualitative)

# Policy Option Template

- Policy Description (Concept)
- Policy Design (Goals, Timing, Coverage)
- Implementation Methods
- Related Programs and Policies (BAU)
- Estimated GHG Reductions and Costs/Savings
  - Data Sources, Methods and Assumptions
  - Key Uncertainties
- Additional (non-GHG) Benefits and Costs, as Needed
- Feasibility Issues, if Needed
- Status Of Group Approval
- Level of Group Support
- Barriers to Consensus, if any

# Policy Mitigation Areas

- Energy Supply
- Residential, Commercial, Industrial
- Transportation and Land Use
- Agriculture
- Forestry
- Waste Management
- Cross-Cutting

# Policy Implementation Methods

- Voluntary Agreements
- Legislative Initiatives
- Technical Assistance
- Financial Incentives
- Targeted Spending
- Codes and Standards
- Market Based Approaches
- Pilots and Demos
- Information and Education
- Research and Development
- Reporting and Disclosure

# Categories of Energy Supply Actions

- Expand low-emitting and renewable energy sources
- Improve efficiency of electricity generation and delivery
- Reduce emissions from fossil fuel production activities
- Capture and store carbon (geological sequestration)
- Consider GHG emissions policies

# Categories of Residential, Commercial, Industrial Actions

- Increase energy efficiency and conservation
- Switch to lower GHG energy sources and products
- Reduce industrial process-related emissions
- Expand waste recovery and recycling

# Categories of Transportation Actions

- Reduce travel demand for passengers and freight
- Reduce vehicle emissions for cars and trucks
- Expand use of low emitting (renewable) fuels
- Remove fine particulates (black carbon or soot)
- Reduce emissions from service equipment

# Categories of Forestry Actions

- Protect forestland (existing carbon stocks) from permanent clearing
- Restore and expand forests (expand carbon stocks)
- Improve forest regeneration and stocking (increase carbon stock densities)
- Sustainable thinning and density management of forests
  - Expand wood products carbon storage
  - Expand renewable biomass energy use
- Recycle wood products biomass waste to energy

# Categories of Agriculture Actions

- Protect farmland and existing carbon stocks, biomass supplies
- Expand soil carbon storage and future carbon stocks, biomass supplies
- Expand renewable energy production
- Reduce process/waste emissions
- Increase energy recapture and reuse
- Improve animal feed efficiency
- Reduce food delivery/transportation emissions

# Categories of Waste Management Actions

- Expand solid and liquid waste energy recovery
- Expand low emitting waste storage
- Expand source reduction, reuse, recycling
- Expand energy efficient processing of waste

# Cross-Cutting Issues

- GHG Inventory and Forecasting
- Reporting of GHG Emissions
- GHG Emission Reduction Registry
- Public Education and Outreach
- Adaptation
- Consideration of State Goals/Targets
- The State's Own GHG Emissions
- Regional Actions, Local Governments, Clearinghouses, etc.

# TWG Next Steps

- Add options to TWG catalog of state actions, as needed
- Start to identify “priorities for analysis” from catalog of state actions
  - Rank and screen options
- Review and revision of Maryland GHG inventory and forecast

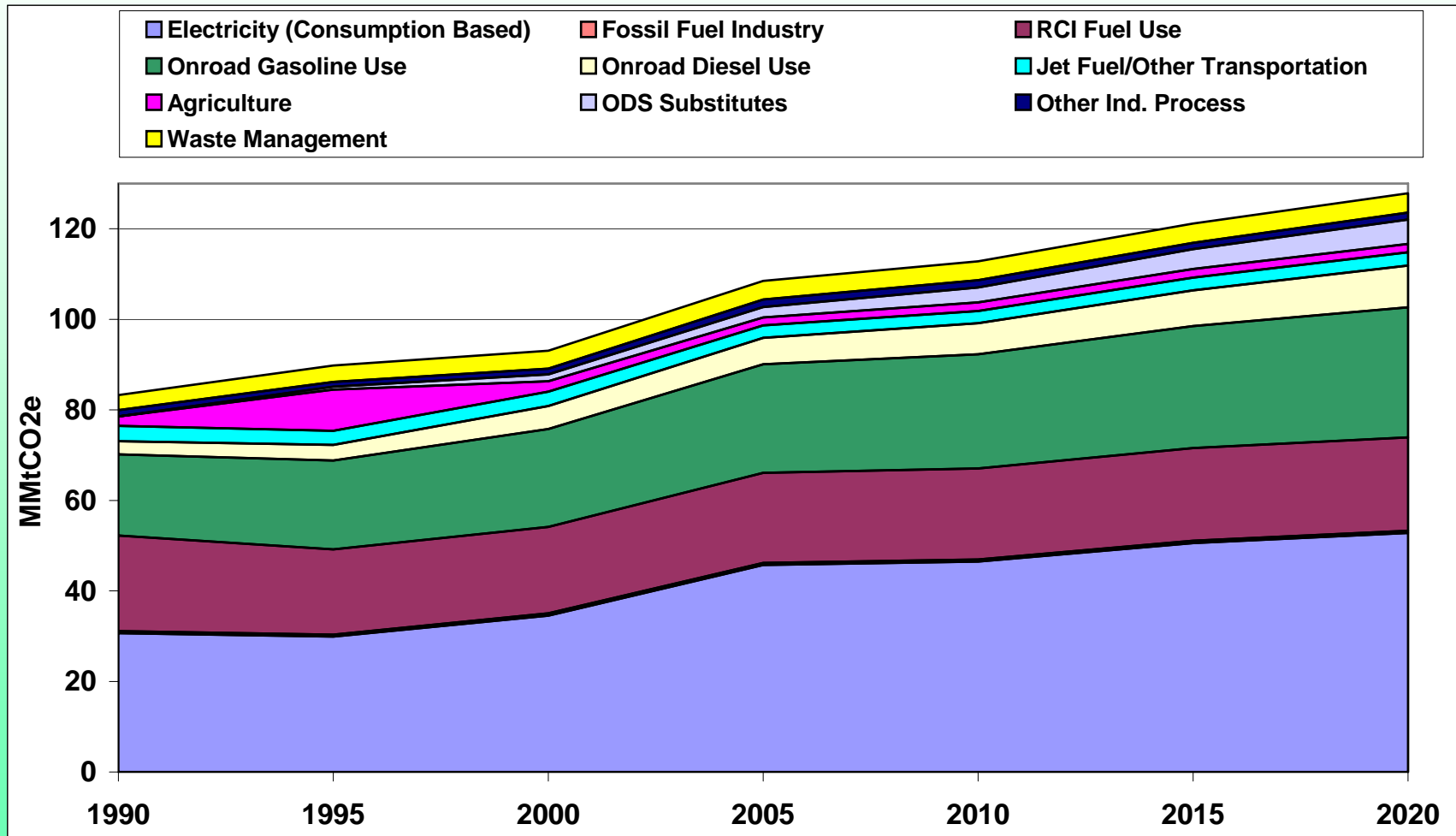
# Inventory & Forecast Update

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# Revisions to Draft GHG Inventory and Forecast

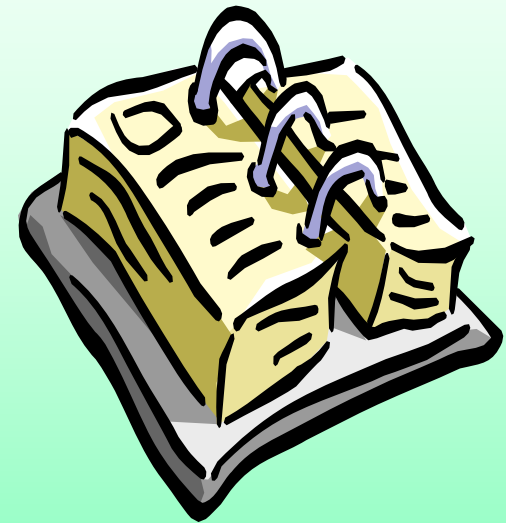
Sector	Explanation	Delta from Prior Version (MMtCO <sub>2</sub> e)	
		2005	2020
Transportation	Added emissions for off-shore boats and ships	0.31	0.37
Agriculture	Updated livestock projections	0.00	0.93
Waste Mangement	Added emissions for residential MSW open burning and industrial wastewater	0.8	1.00
Forested Landscape (excluding soil carbon)	Revised based on USFS data	-7.09	-7.09
Urban Forestry and Land Use	Added emissions for urban trees, landfilled yard-trimmings and food scraps, and nitrous oxide from settlement soils	-2.62	-3.27

# Maryland Gross GHG Emissions by Sector, 1990-2020



# Next MWG Meeting

- Date, Time, Location
  - September 28, 2007
  - Time: TBD
  - Location: TBD
- Agenda:
  - Review TWG suggested priorities for analysis of policy options
  - Discuss policy design issues and next steps for policy options
  - Review TWG suggested updates to the emissions inventory and forecast



# Public Input, Announcements