Maryland Climate Solutions Now Act

CCS Technical Modeling Approach

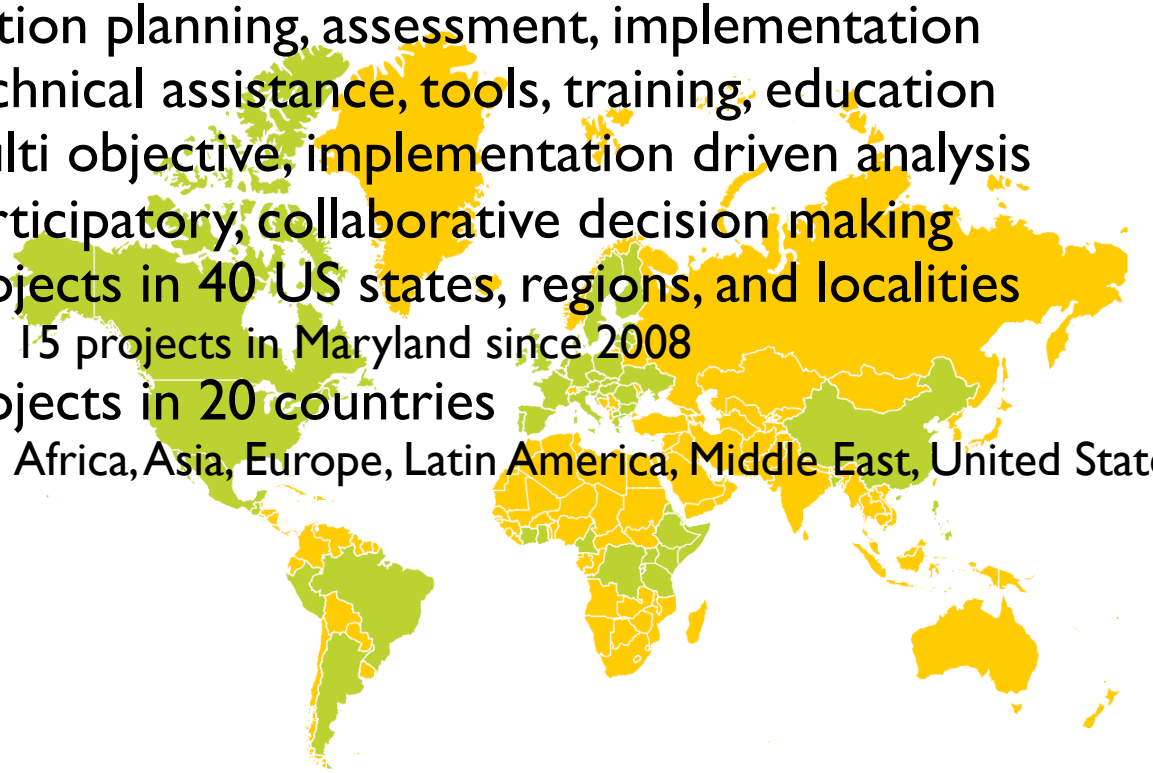
Tom Peterson, David von Hippel, Holly Lindquist

March 16, 2023

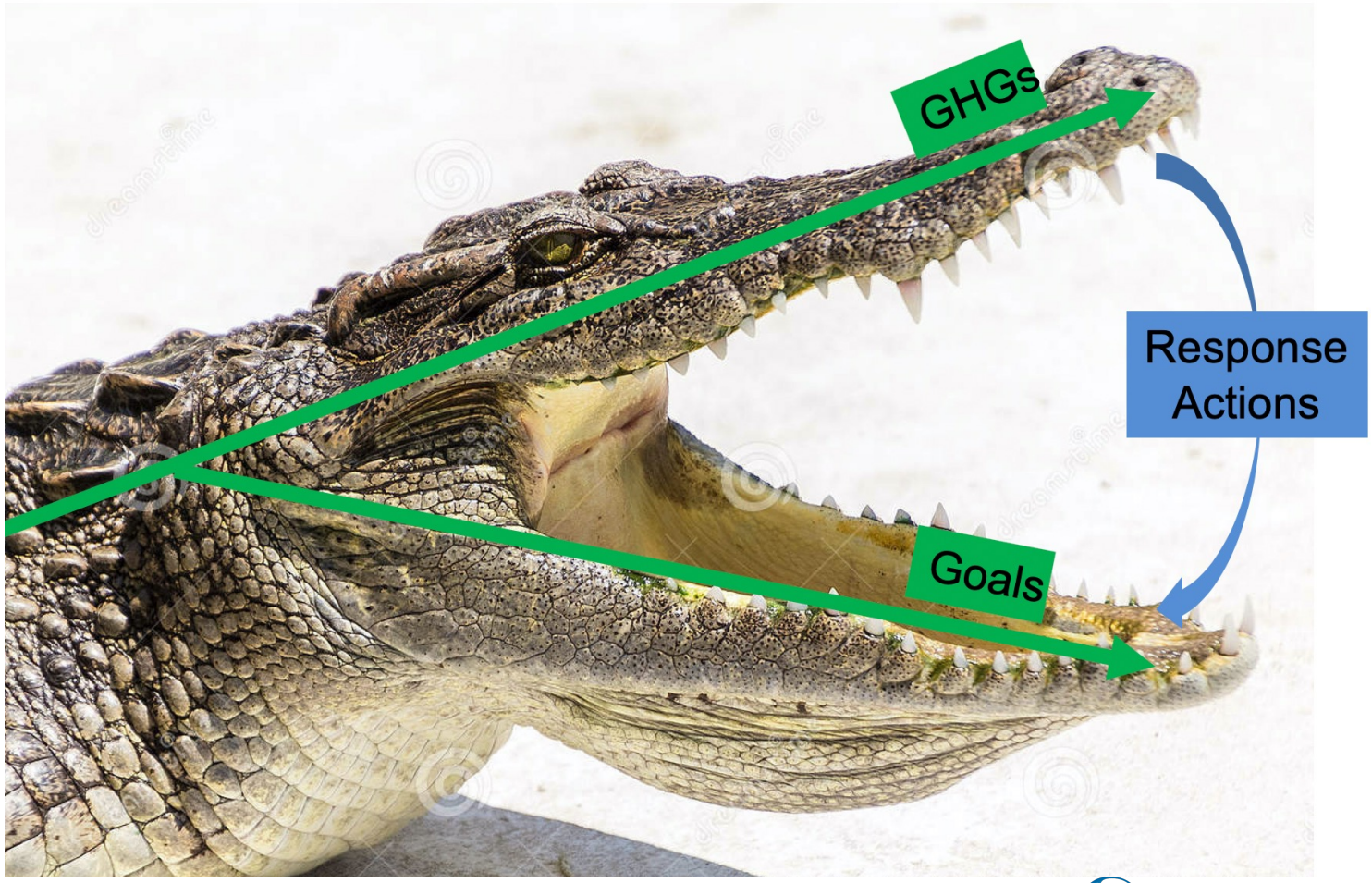
THE CENTER FOR
CLIMATE STRATEGIES

The Center for Climate Strategies (CCS)

- Founded in 2004, neutral, independent nonprofit
- Leading catalyst for public, private sector solutions
- Action planning, assessment, implementation
- Technical assistance, tools, training, education
- Multi objective, implementation driven analysis
- Participatory, collaborative decision making
- Projects in 40 US states, regions, and localities
  - 15 projects in Maryland since 2008
- Projects in 20 countries
  - Africa, Asia, Europe, Latin America, Middle East, United States

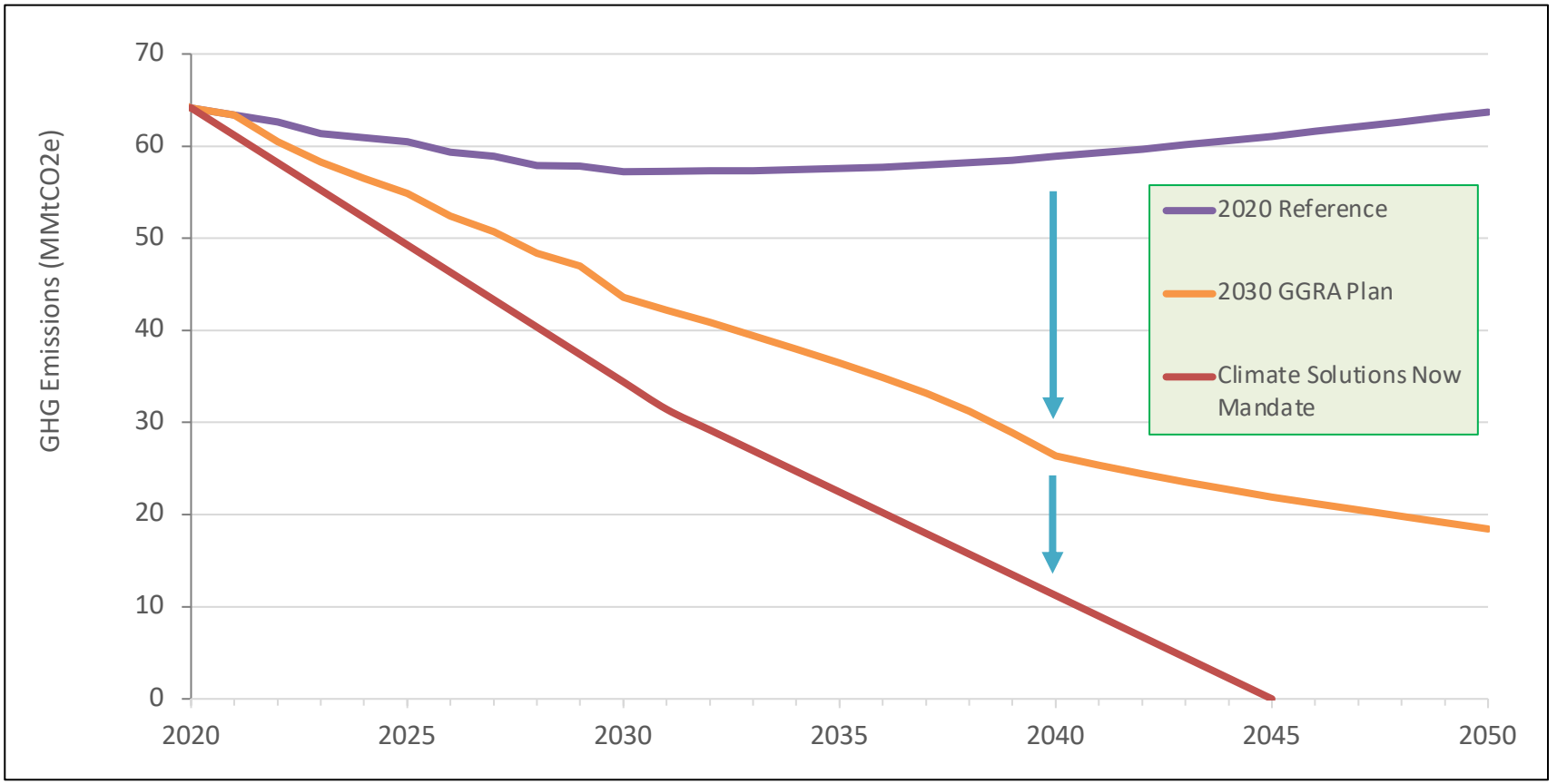


Close Maryland Emissions Gap

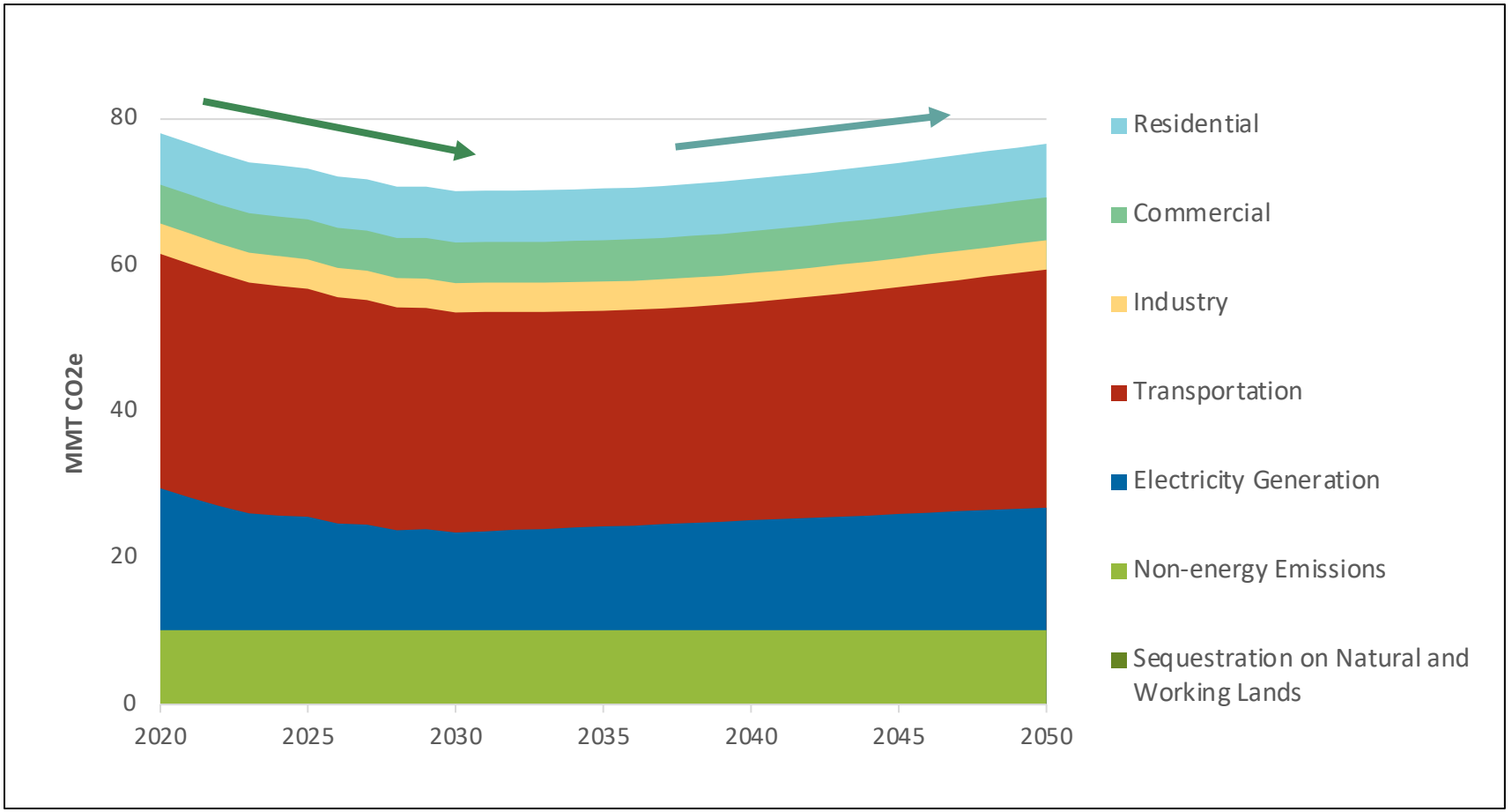


Maryland 2020 Baseline* v. GHG Targets

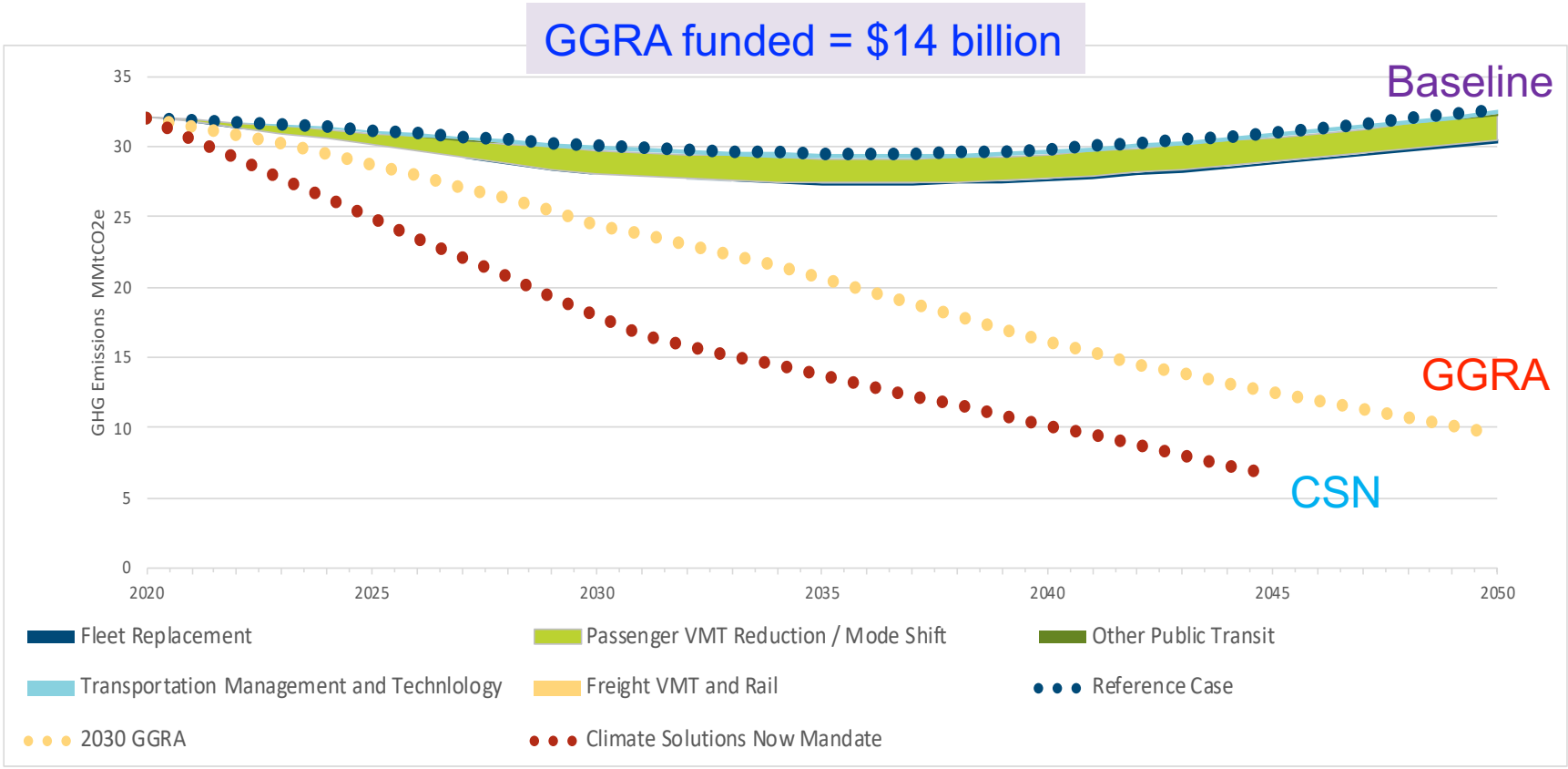
*Independent Analysis Provided to MDE; updates underway



Maryland 2020 Baseline

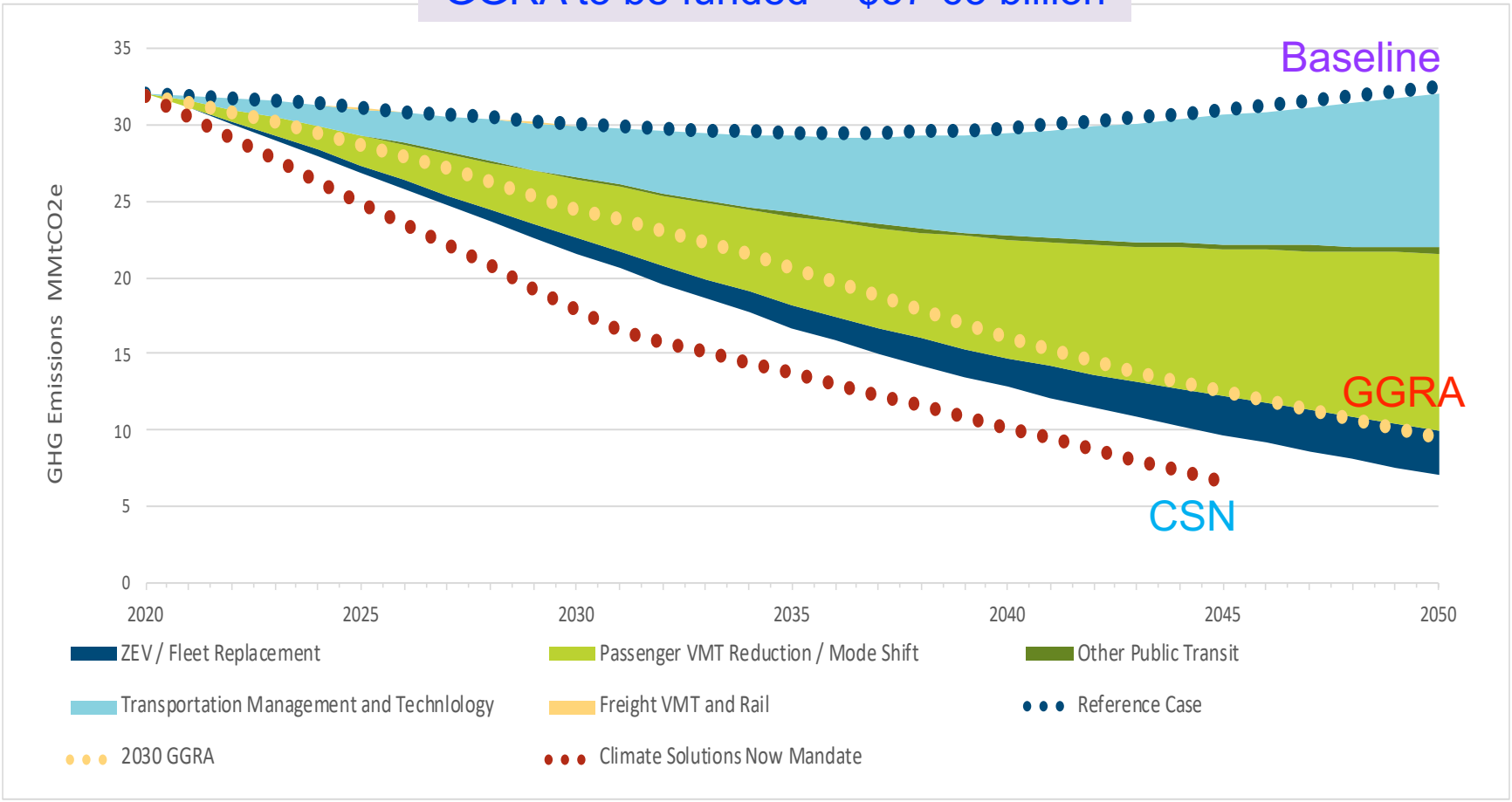


Maryland Transportation



Maryland Transportation

GGRA to be funded = $57-63 billion



CSNA Draft Options (MCCC+)

Energy Supply (heat and power)

- Utility Scale Solar
- Residential Rooftop Solar
- Commercial Rooftop Solar/Industrial Rooftop Solar
- Municipal/Institution Rooftop Solar
- Agri-voltaic Solar
- Community Solar
- Off-shore Wind
- Transmission
- Storage
- Big Hydro
- Small Hydro
- Nuclear

Buildings and Facilities

- Res Heat Pumps
- Res Appliance Electrification
- Commercial/Inst Heat Pumps
- Appliance Electrification
- Networked Ground-source Heat Pumps
- Res EE, New Homes
- Comm/Inst Building Retrofits
- Comm/Inst EE New Buildings
- Industrial Buildings /Energy
- Demand Response
- LED Street Lights
- Geothermal
- Cross cutting

Industry

- Cement
- Refrigerant (F-gases) Management
- Control of Methane Fugitive Emissions
- Energy Efficiency

Transportation and Land Use

- Light-duty Vehicle Electrification
- Medium/Heavy-duty Vehicle Electrification
- Zero Emission Offroad & Nonroad Equipment
- Marine
- Aviation
- Alternative Transport: Transit, Bike, Pedestrian, Telework
- Municipal Planning for VMT Reduction

Agriculture

- Regenerative Agriculture
- Manure Digesters
- Improved Cattle Feed for Reduced Enteric Fermentation
- Biomass Energy

Forestry

- Forest Management
- Urban Forestry
- Biomass energy

Waste

- 21st Century Sustainable WM
- MSW Source Reduction
- MSW Composting & Recycling
- Industrial Waste Source Reduction
- Industrial Waste Composting & Recycling
- Landfill Gas capture and use
- Methane capture and use at WWTPs

Sector Level Mitigation Measures

https://www.climatestrategies.us/projects-all/us-states-climate-action-planning

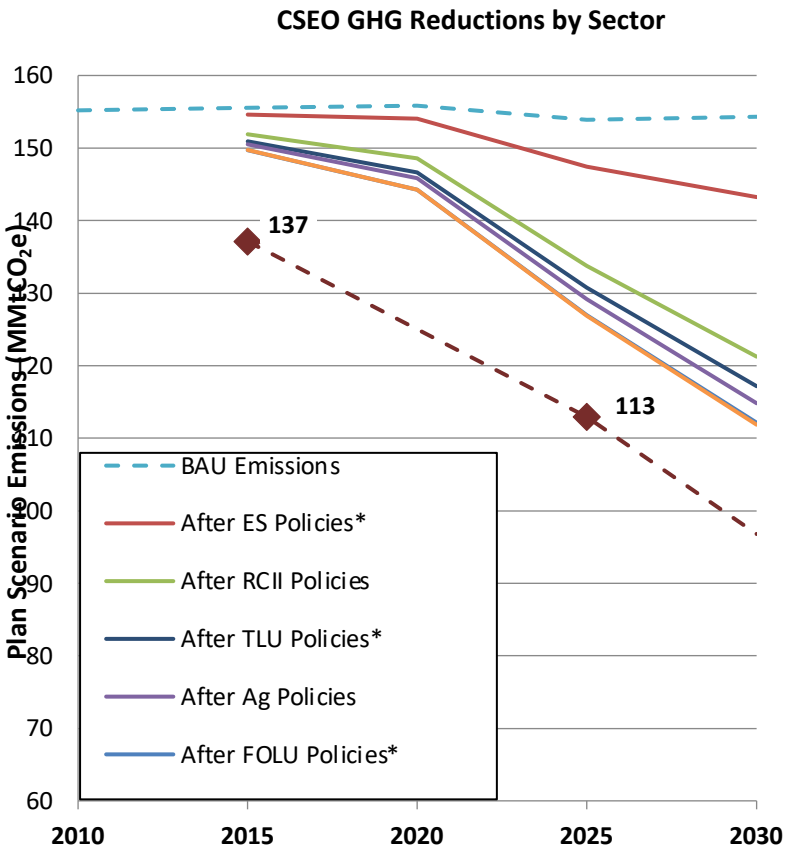


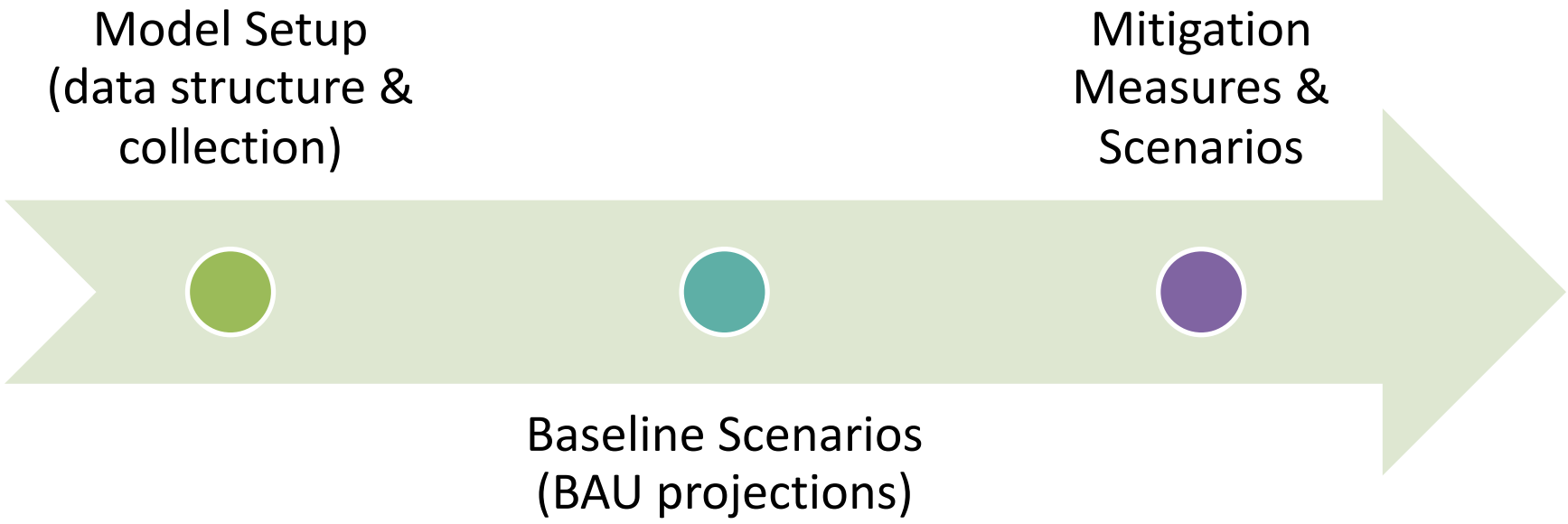
Table EX-2. Summary of Direct Impacts of Policy Recommendations

Direct Impacts of CSEO Policy Recommendations						
Policy Option	2030 Annual In-State	Cumulative In-State 2015-2030	2030 Annual Total	Cumulative Total 2015-2030	NPV Costs/Savings* 2015-2030	Cost Effectiveness
	GHG Reductions ($MMtCO_2e$)				($2014MM)	($2014/$tCO_2e$)
ES-1	5.3	53	6.3	62	($360)*	($5.8)*
ES-2	5.8	41	5.5	38	$854	$22
ES Sector Totals	**11**	**94**	**12**	**100**	**$494**	**$4.9**
RCII-1	4.9	46	5.2	49	($1,117)	($23)
RCII-2	9.3	54	11	60	($2,050)	($34)
RCII-4	4.9	34	5.2	40	($1,814)	($45)
RCII-5	2.9	22	4.1	30	$842	$28
RCII Sector Totals	**22**	**156**	**25**	**180**	**($4,140)**	**($23)**
TLU-1	2.0	21	2.6	28	$2,718	$98
TLU-2	0.82	7.0	0.97	8.2	($425)	($52)
TLU-3	0.25	2.0	0.32	2.6	($330)**	($127)**
TLU-4	1.0	5.5	1.3	6.7	$3,278***	$489***
TLU Sector Totals	**4.1**	**36**	**5.1**	**45**	**5,241**	**$116**
AG-1	0.13	1.0	0.34	2.7	($127)	($47)
AG-2	0.49	3.1	0.57	3.6	($1,346)	($377)
AG-3	1.6	14	1.6	14	($2,104)	($153)
AG-4+AG-5	0.17	1.76	0.32	3.5	$462	$133
Agriculture Totals	**2.4**	**19**	**2.8**	**23**	**($3,115)**	**($133)**
FOLU-3	0.49	3.2	0.53	3.4	$1,806	$525
FOLU-4	1.9	30	2.0	34	$187	$5.59
FOLU-5	0.34	3.0	0.34	3.0	$1,261†	$421†
FOLU Sector Totals	**2.7**	**36**	**2.8**	**40**	**$3,254**	**$81**
WM-1	0.068	0.89	0.076	0.99	($56)	($56)
WM-2	0.057	0.073	1.6	9.4	($228)	($24)
WM-3	0.15	(0.45)	2.7	27	($817)	($30)

Center for Climate Strategies, Inc. I-5 www.climatestrategies.us

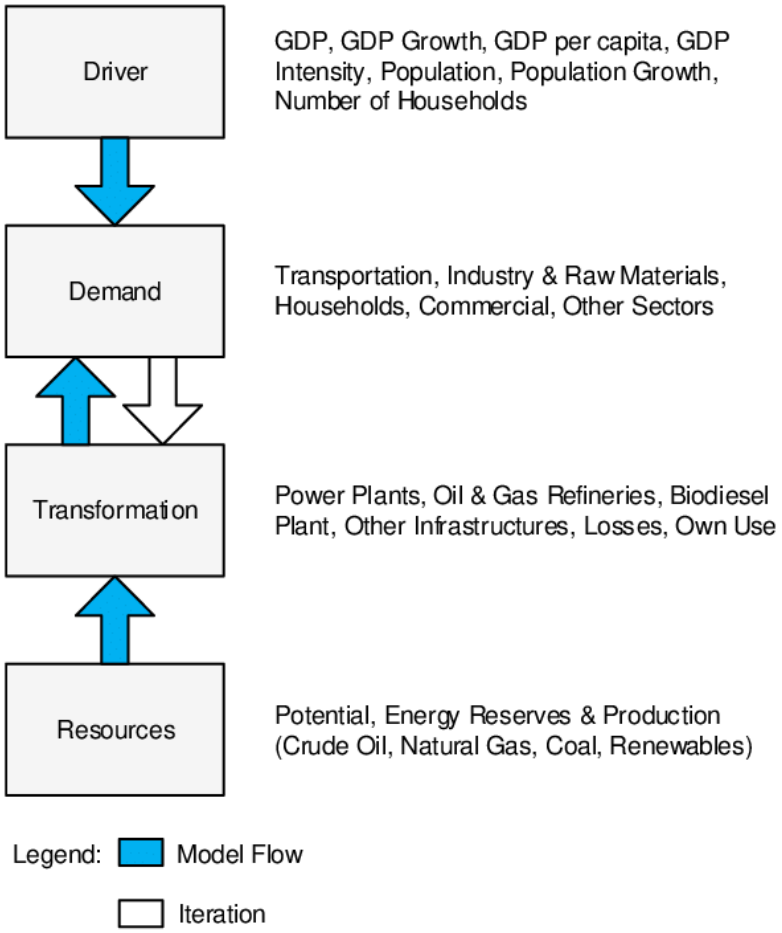
THE CENTER FOR CLIMATE STRATEGIES

Key Modeling Steps

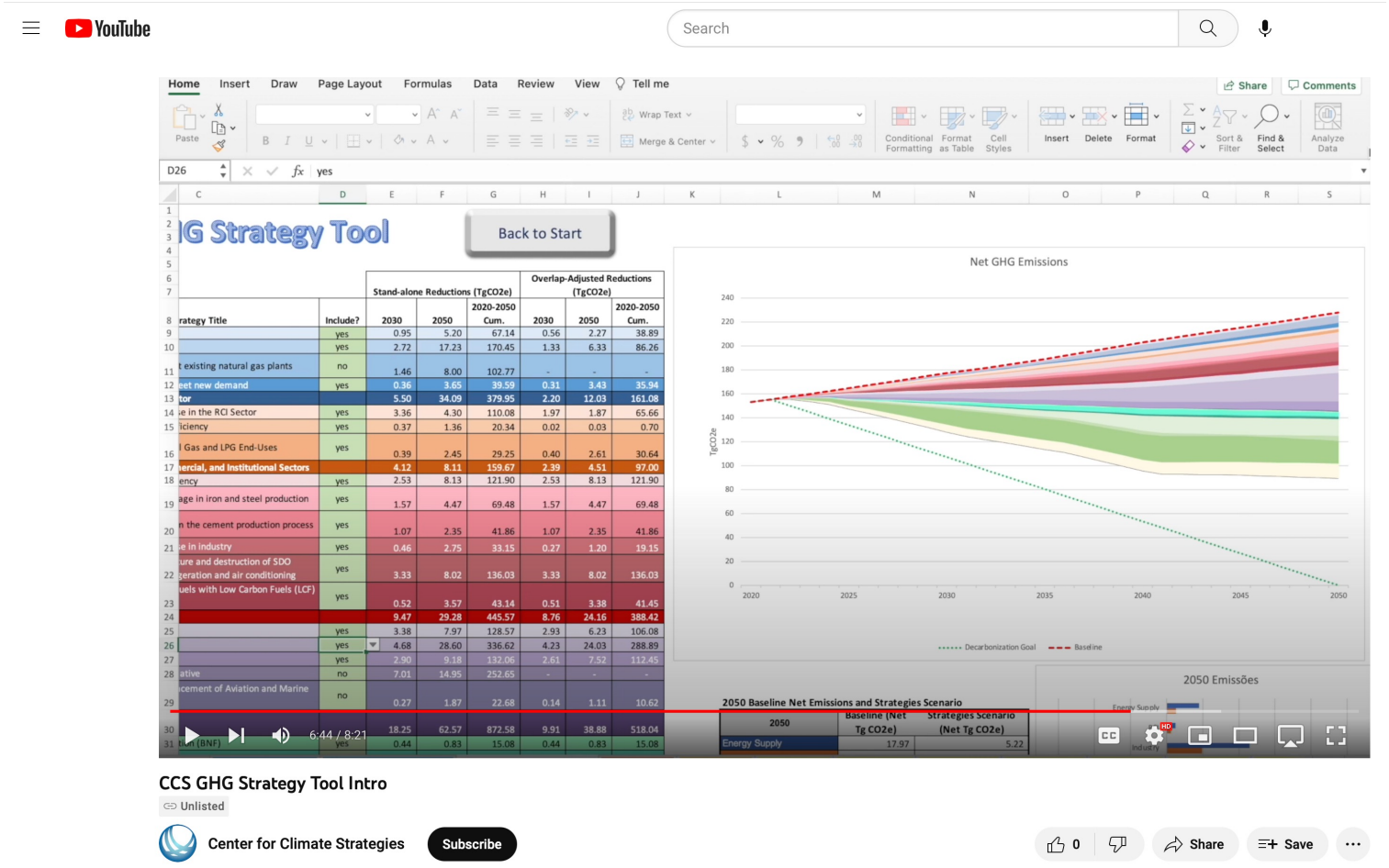


LEAP

- Low Emissions Analysis Platform
- Applied around the world, designed for study of energy strategies
  - Over 46,000 Users in 190 Countries
  - Applied, updated continuously for over 40 years
- Flexible, model-building tool – not a fixed model of a particular system
- Web-based information, tools available
- Designed for training and installation
- Designed for group participation
- Dynamic, accounting based approach
- Simulates operation of energy systems
- Provides optimization and iteration
- End-use oriented, demand-driven, scenario-based accounting software

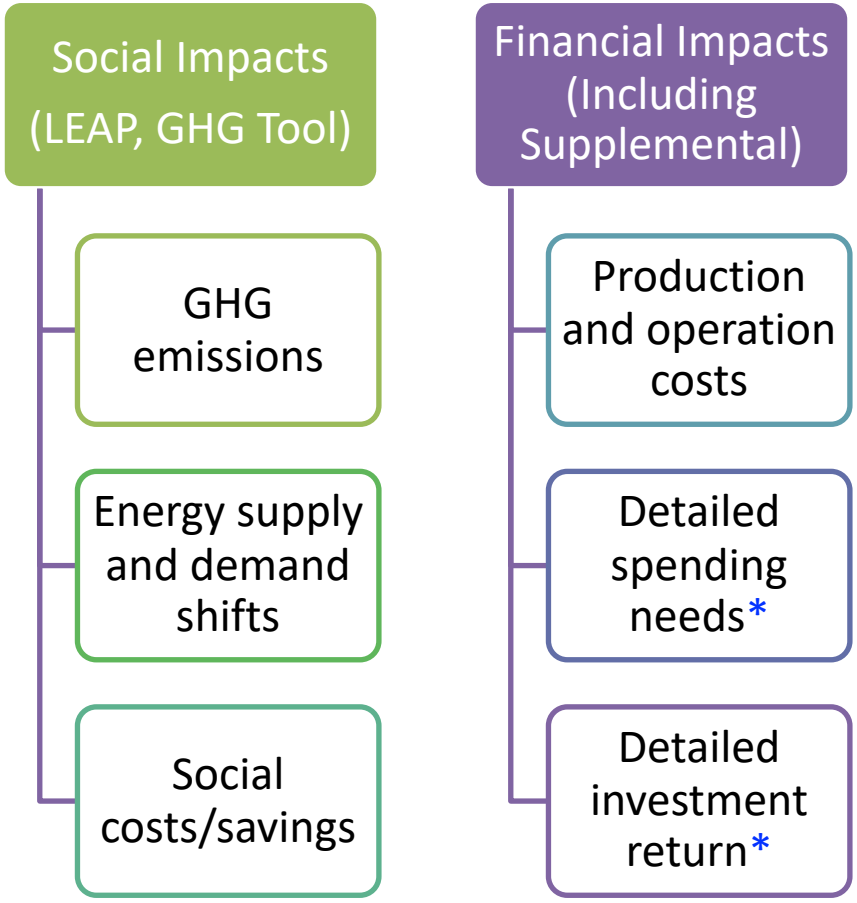


CCS GHG Strategy Tool



THE CENTER FOR CLIMATE STRATEGIES

Modeling Metrics



- Evaluates
  - energy and resource demand
  - energy supply conversion
  - resource extraction
  - environmental impacts
  - economic costs and benefits
  - air pollutant benefits
- Comprehensive accounting
  - all costs in energy and resource system
  - capital, O&M, fuel costs, demand-side costs of saving energy
  - direct impacts from energy system
  - externality costs
  - all emissions
- Platform for supplemental analysis*
  - macroeconomic
  - social equity
  - financing*
  - fiscal

Transparent Policy Design & Analysis

- Individual Policy Description (concept)
- Policy and Program Design
  - Goals, timing, implementing parties, beneficiaries
- Implementation Mechanisms
  - Finance, governance, equity
- Analysis Approach
  - Data sources, methods, key assumptions
- Existing Business As Usual Policies/Programs/Funding
- Quantification of Estimated Impacts
  - GHGs, energy, resources, costs/savings
  - Other costs and benefits
- Additional issues and feasibility Issues
- Steps for further development and implementation

Thank You!

www.climatestrategies.us