Greenhouse Gas Reduction Act

40-By-30 Goal

DRAFT Plan Overview

July 16, 2019

Today

Modeling results for GGRA

1. MDE: Overview of Draft Plan and Summary Results

2. E3: GHG Modeling
   - PATHWAYS Model for GHGs from Energy Use
   - Agency analyses for forests & soils

3. Towson RESI: Economic & Public Health Modeling
   - REMI Model for Macroeconomic Impacts
   - COBRA Model for Public Health

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The Bottom Line … Spoiler Alert

- The draft plan is comprehensive … Includes over 100 large and small initiatives
  - Traditional strategies like energy and transportation and non-traditional strategies like partnerships, healthy soils, just transition and social equity
  - Also includes proposals for several bold new programs like a 100% clean and renewable energy standard and a transportation and climate initiative
- The draft plan will:
  - Achieve more than the 40% by 2030 reduction required by the law
  - Make significant progress and position the State to achieve longer term goals like a 80% reduction or carbon neutrality by 2050
  - Have a positive impact on Maryland's economy
  - Create and maintain new jobs
  - Also help Maryland protect public health and meet Chesapeake Bay and Air Quality goals
- More detail to follow …

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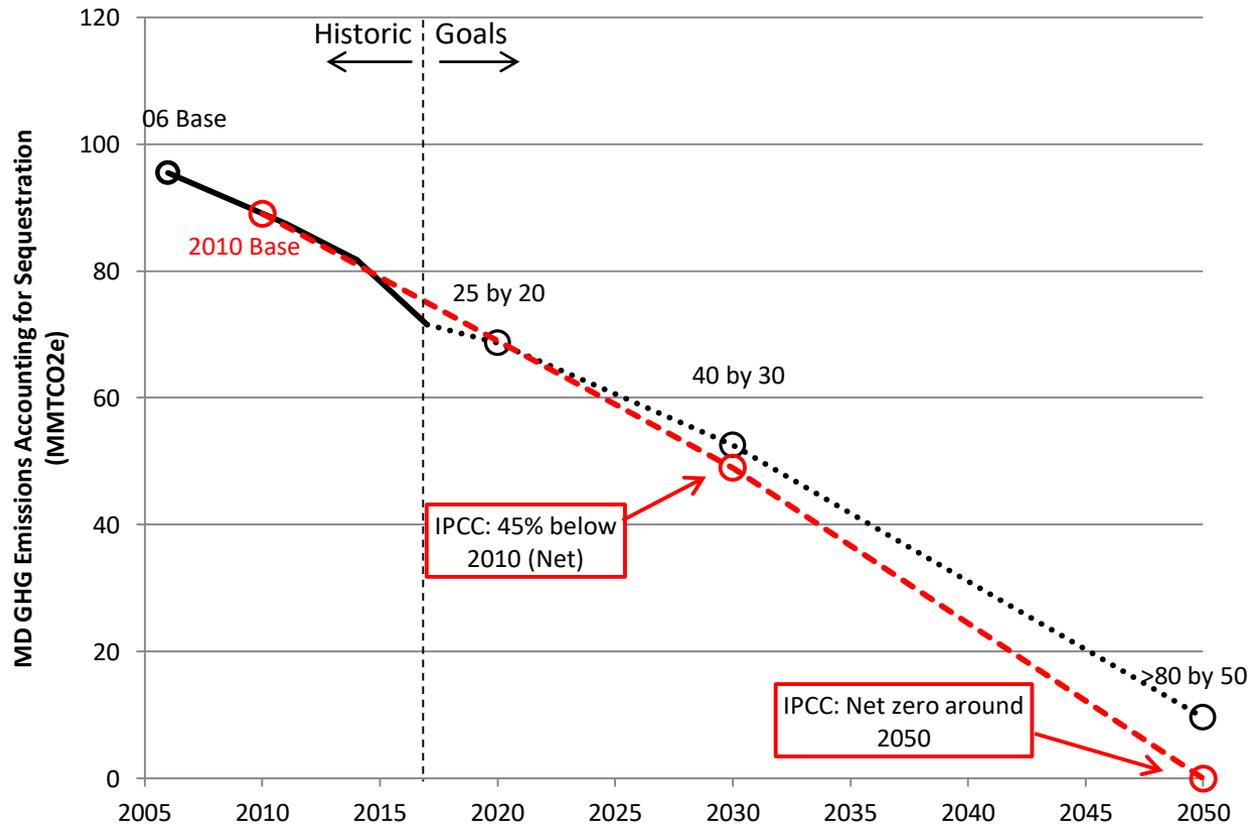
The Greenhouse Gas Reduction Act

Requirement: Publish a plan to reduce GHGs by 25% by 2020, and 40% by 2030.
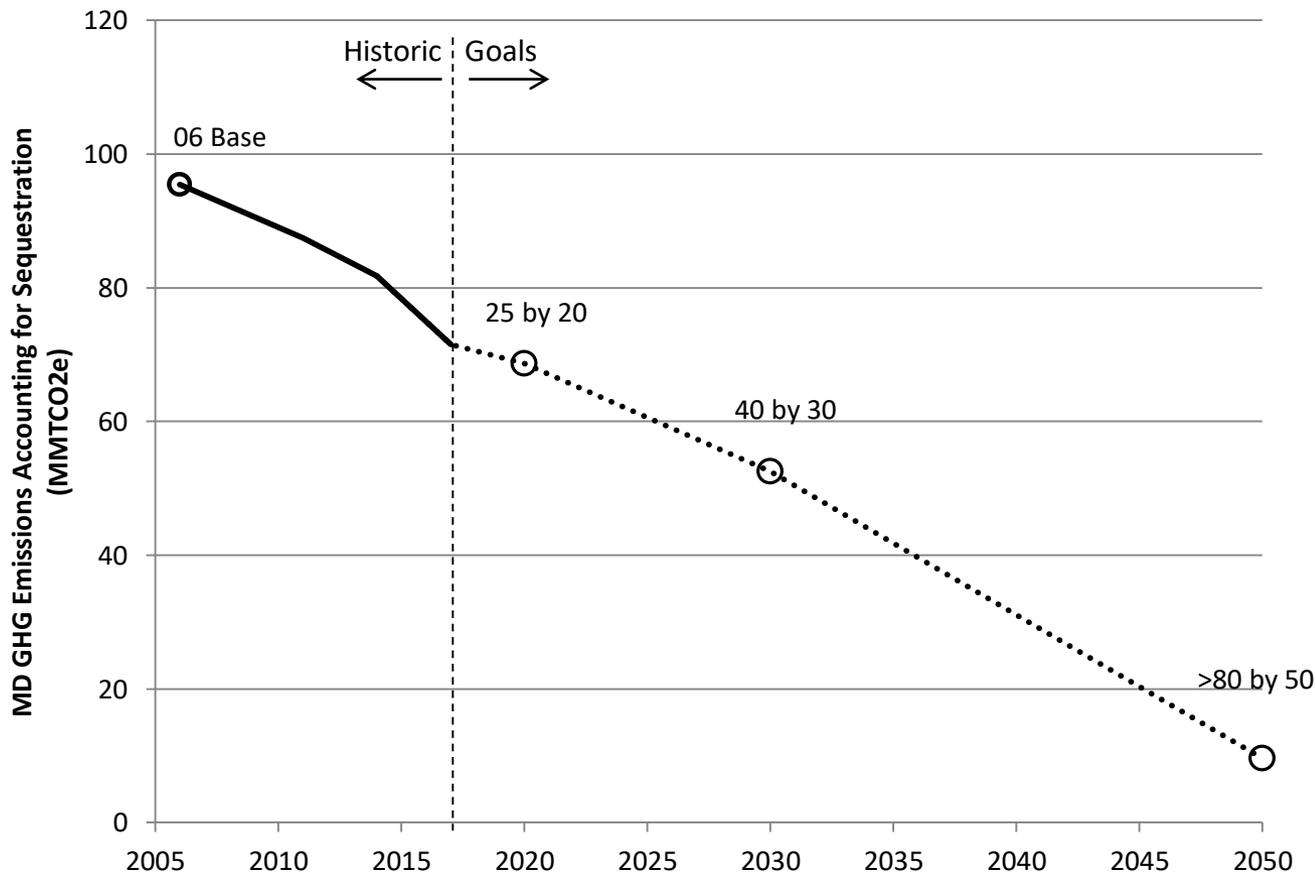
Increasing Urgency to Limit Climate Change

Recent findings from the IPCC, the National Climate Assessment, and UMD point to increasing urgency to reduce emissions, even beyond GGRA Goals.
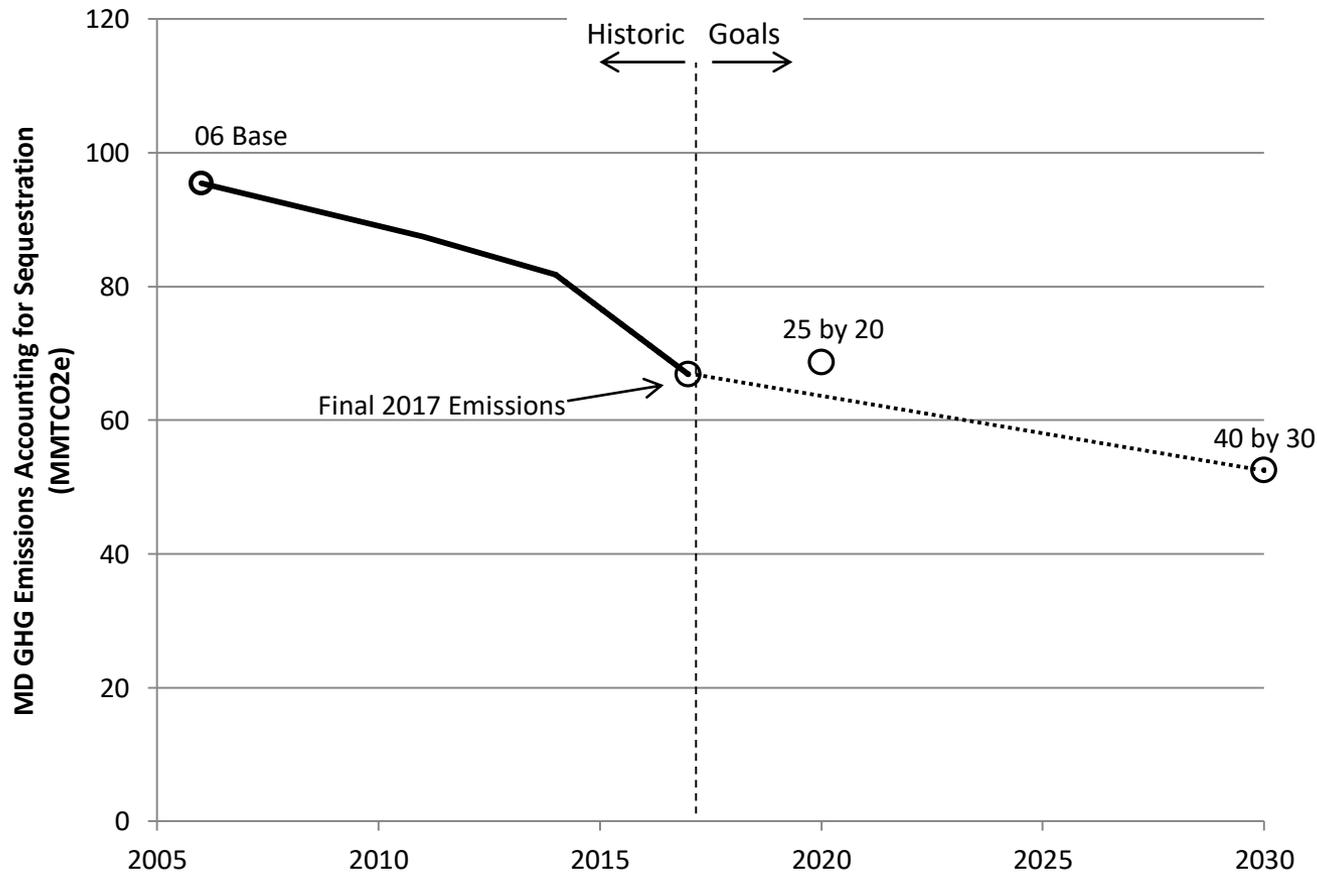
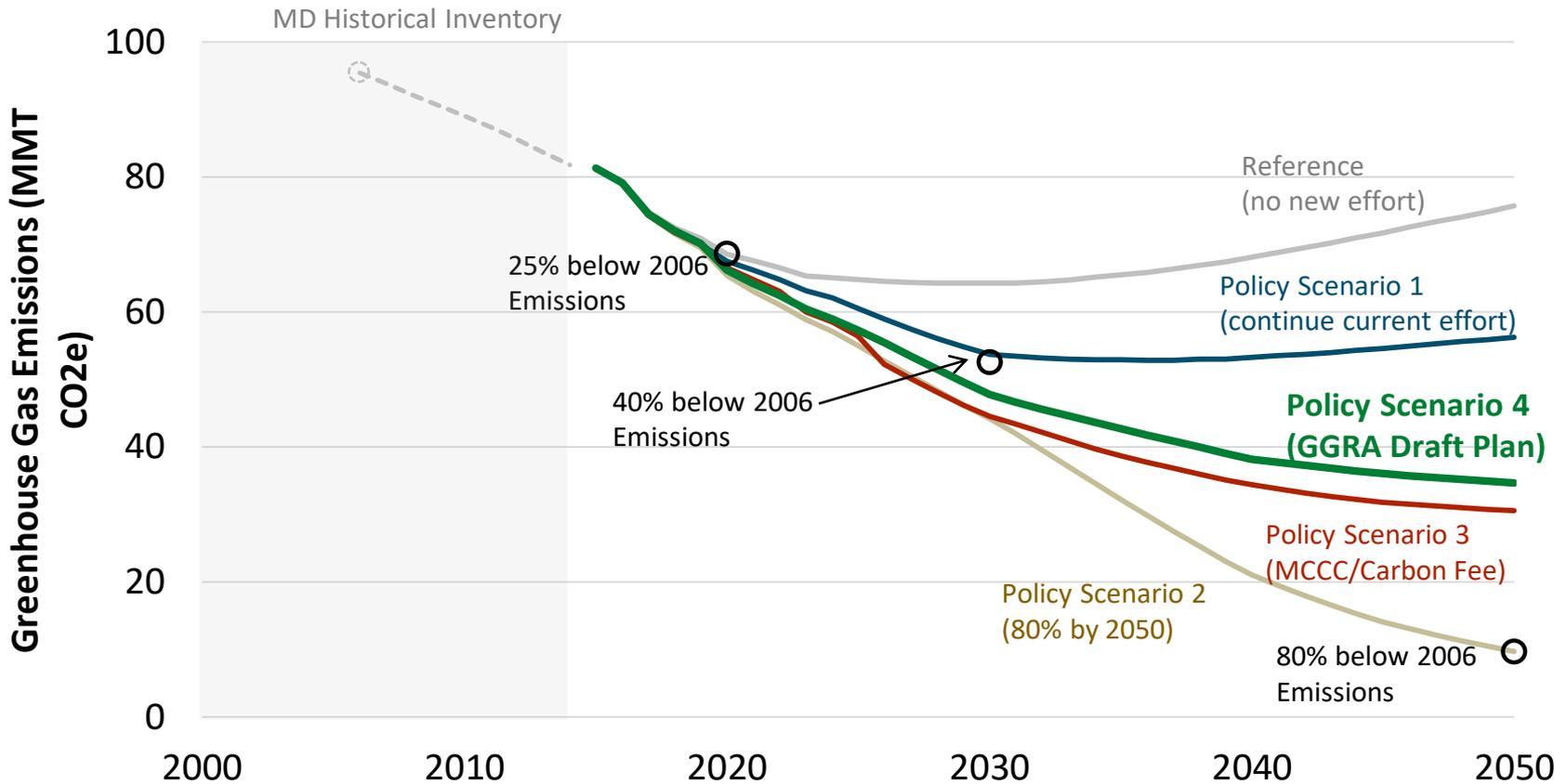# Good News – 2017 Emissions

The final 2017 inventory will show emissions below the 2020 goal.
BUT: We had favorable weather, so need to keep making progress to ensure we meet it in 2020.

Good News – Emissions Pathways

We have found multiple pathways to meet and excel beyond the 40-by-30 goal while benefitting the economy.

Good News - Economics

The GGRA Draft Plan achieves the 2030 goal with significant benefit to the state's economy.

MD impact relative to Reference Case	Through 2030	Through 2050
Average job impact*	+ 11,649 job-years	+ 6,703 job-years
GDP Impact**	+ $ 11.54 billion	+ $ 18.63 billion
Personal Income Impact**	+ $ 10.04 billion	+ $ 15.67 billion
Avoided Mortality**	+ $ 0.74 billion	+ $ 4.79 billion
Avoided Climate Damages**	+ $ 4.38 billion	+ $ 27.55 billion

* Average number of job-years created or sustained each year.
** 2018 Dollars, Cumulative, Net Present Value using 3% discount rate.
Climate damage evaluated using Federal Social Cost of Carbon (2015 Update)

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Policy Scenario Modeling

1. <u>Reference Case</u>: "Business-as-usual" scenario incorporating effects of major policies as they currently exist on the books.

2. <u>Policy Scenario 1</u>: Extension of current program framework (e.g. EmPOWER extension, 50% RPS).

3. <u>Policy Scenario 2</u>: New programs and changing program frameworks. Long-term measures to reach 2050 goal.

4. <u>Policy Scenario 3</u>: Climate Commission scenario: Carbon Price and complementary policies (including 50% RPS).

5. <u>Policy Scenario 4</u>: GGRA Draft Plan, drawing upon state agency determined cost-effective measures from prior scenarios, including the basics of a Clean and Renewable Energy Standard (CARES).

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Reference Case Scenario

Major Programs

<u>Electricity Supply</u>
Renewable Portfolio Standard: 25% RPS by 2020
RGGI: 30% cap reduction from 2020 to 2030

<u>Transportation</u>
Federal CAFE standards for LDVs by 2026
Meets ZEV mandate by 2025 (270,000 ZEVs)

<u>Building Energy Use</u>
EmPOWER through 2023

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GGRA Draft Plan (Policy Scenario 4)

Major Programs:

Electricity Supply
Clean and Renewable Energy Standard
Continued RGGI Geographic Expansion

Transportation
Numerous MDOT Investments
Clean Cars / ZEV Mandate
50% ZEV Transit Buses
Compact Development
Transportation and Climate Initiative (TCI)
could fund & enable other measures.

Carbon Sequestration
Enhanced Forest Management
Enhanced Healthy Soils Incentives

Building Energy Use
Extended EmPOWER
Heat Pump Incentives
Compact Development
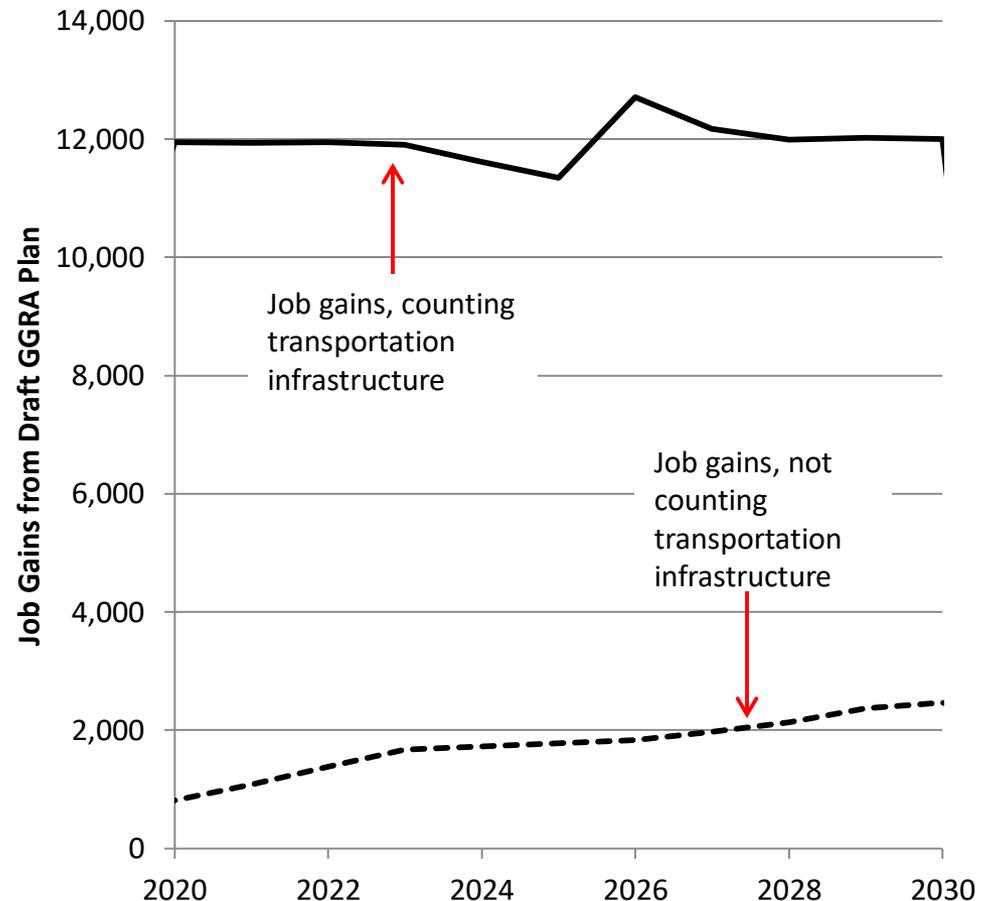State Building Efficiency EO

Other
HFCs

GGRA Draft Plan Employment Results

- Draft Plan drives substantial job gains.

- Almost all of MD's fossil fuel comes from out of state.

- Investments that reduce fossil fuel consumption drive positive impacts for MD's economy.

Job gains, counting transportation infrastructure

Job gains, not counting transportation infrastructure

Job Gains from Draft GGRA Plan

Large transportation projects drive substantial job gains in the near-term; investments in in-state clean energy and fuel-saving measures provide more modest underlying gains. (Transportation gains dependent on Federal funding)

Why Policy Scenario 4?

Policy Scenario 4 best balances economic and emissions benefits for 2030
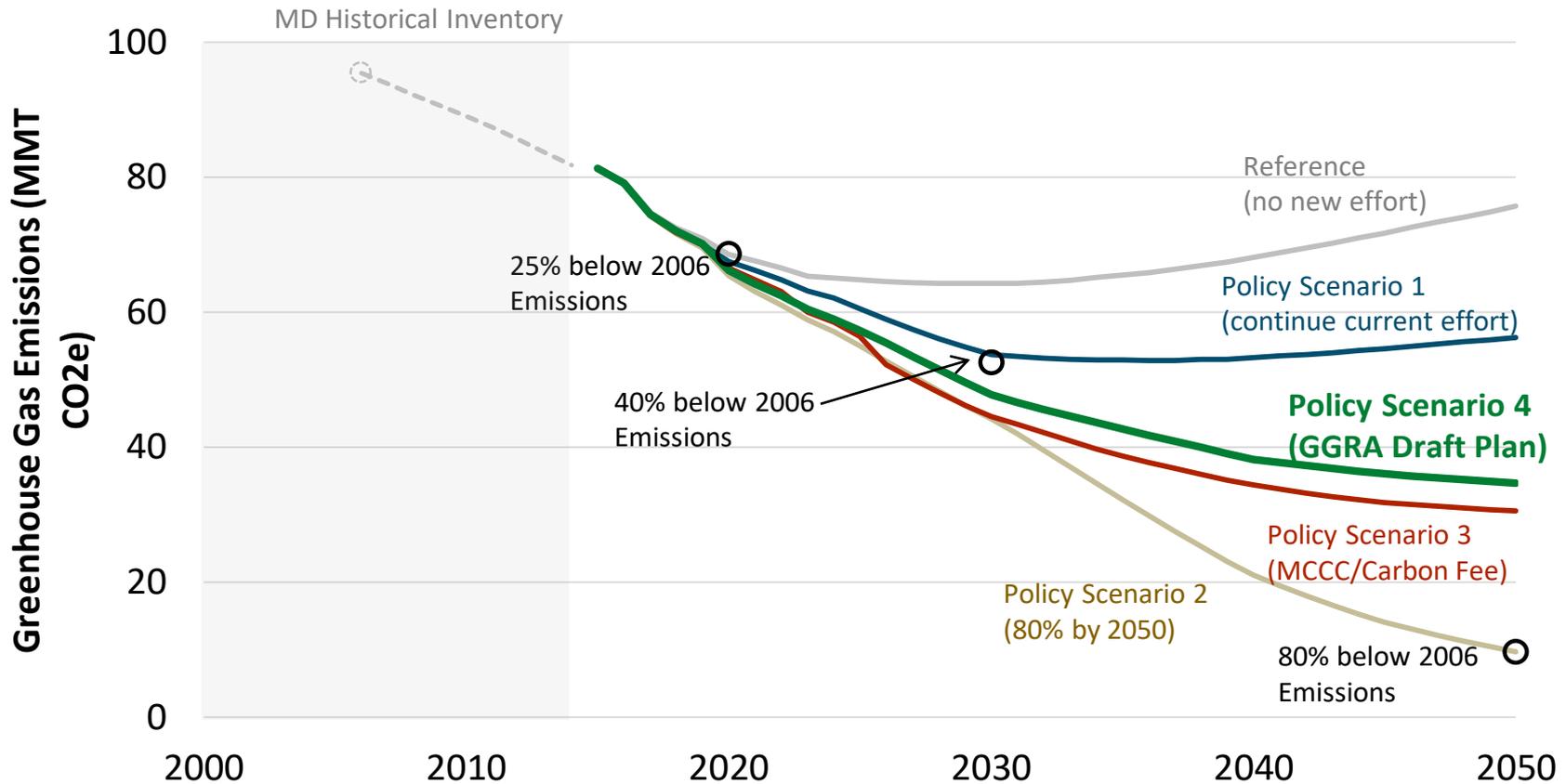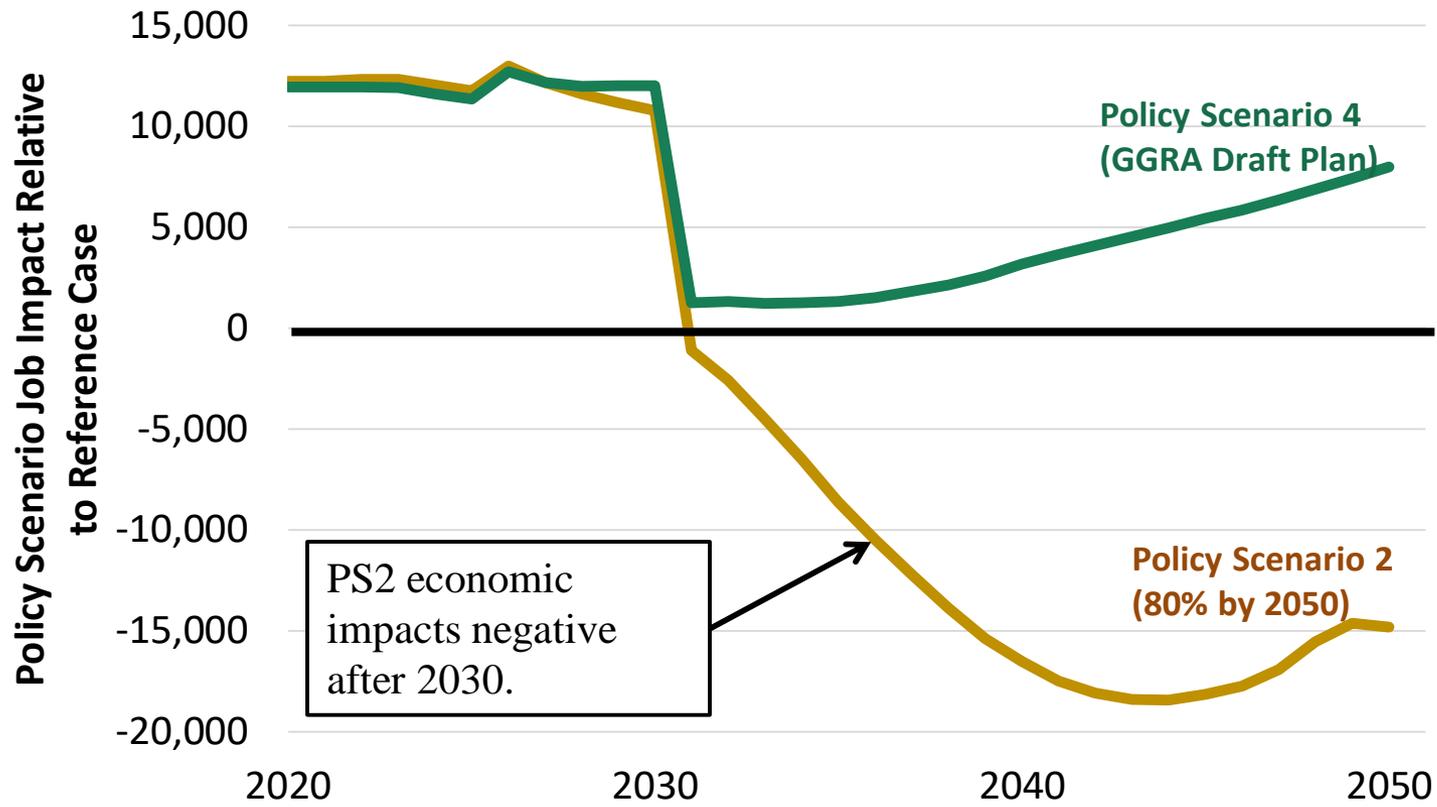
Why Policy Scenario 4?

PS2 identified important long-term measures that should be re-evaluated as technologies mature, but are not cost-effective under current technology.

These measures may be cost-effective when the time comes. In the meantime, the Draft Plan focuses on measures necessary for 2030.

Modeling Refinements for Final Plan

- Update with 2017 inventory data

- Establish specific CARES approach
  - Explore storage & other grid technologies in dispatch model

- Align transportation assumptions with TCI states' analysis

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Next Steps

- MDE and modelers finalizing detailed results spreadsheet for distribution soon.

- Full plan draft going through interagency review before release for comment.

- Final 2017 GHG inventory to be published July/August (preliminary already available)

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Appendix & Extra Slides

GGRA Plan Requirements

Must achieve the 40-by-30 Goal

ALSO

- "Be developed in recognition of" need for 80% to 95% reduction by 2050
- "Produce a net economic benefit to the State's economy and a net increase in jobs in the State"
- Consider impacts to low-income, low-to-mid-income, minority, and rural communities; any other particular class of ratepayers; the agricultural sector; the manufacturing sector.
- Do not "decrease the likelihood of reliable and affordable electrical service and statewide fuel supplies"

State Agency Programs & Assumptions

MEA: CARES structure, CHP role & costs, rooftop solar assumptions

MDOT : Transportation infrastructure investment costs & benefits
EV deployment estimates

MDP: Compact development impacts in transportation & buildings

DNR: Forest management sequestration impacts

MDA: Healthy soils sequestration impacts

DHCD: EmPOWER low income & multifamily impacts

DGS & MEA: 10% reduction in state building energy use

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Transportation Investments Modeling

PATHWAYS models changes on vehicle stock (e.g. EV deployments), not VMT impacts or congestion.

MDOT analyzed those impacts, which were incorporated into PATHWAYS as VMT changes, and phased in through 2030.

Transportation Investments Modeling

Emerging Strategies		2030 Impacts		
Strategy	Approx. Reductions (MMT CO2e)	VMT Reduction	Fuel reduction (g gasoline)	Fuel reduction (g diesel)
Freeway Management/Integrated Corridor Management (I-270 example, SHA I-95/MD 295 pilot)	0.052		5,209,998	427,449
Arterial System Operations and Management (expanded signal coordination, extend CHART coverage)	0.049		5,546,896	402,247
Limited Access System Operations and Management (other management technologies including ramp metering)	0.023		2,319,544	190,305
Managed Lanes (Traffic Relief Plan Implementation)	0.053		5,231,211	429,189
Intermodal Freight Centers Access Improvement (Strategic Goods Movement Plan)	0.017			415,997
Commercial Vehicle Idle Reduction (Maryland's Idling Law)	0.050		1,676,878	137,578
Medium/Heavy Duty Vehicle Low-Carbon Fleet/Fueling Incentives and Programs (inc. dray trucks)	0.005			42,823
Eco-Driving (informal implementation underway)	0.042		4,136,469	339,373
Lead by example - Alternative Fuel Usage in State/Local Govt Fleet	0.004		10,301	374,635
Truck Stop Electrification	0.007			150,000
Transit capacity/service expansion (fiscally unconstrained)	0.069	251,126,400		
Expanded TDM strategies (dynamic), telecommute, non-work strategies	0.314	1,142,326,291		
Expanded bike/pedestrian system development	0.081	293,542,659		
Freight Rail Capacity Constraints/Access (Howard St. Tunnel)	0.072	46,253,740		
MARC Growth and Investment Plan / Cornerstone Plan completion	0.052	206,630,615		

Transportation Investments Modeling

Innovative Strategies	2030 Impacts			
Strategy	Approx. Reductions (MMT CO2e)	VMT Reduction	Fuel reduction (g gasoline)	Fuel reduction (g diesel)
Autonomous/Connected Vehicle Technologies (Transit/Passenger/Freight Fleet)	0.647		72,765,759	5,276,787
Speed Management on Freeways (increased levels of enforcement)	0.083		9,353,658	678,303
Zero-Emission Trucks/Truck Corridors	0.059			482,152
Ridehailing / Mobility as a Service (MaaS)	0.256	995,937,400		
Pay-As-You-Drive (PAYD) Insurance	0.062	223,902,645		
Freight Villages/Urban Freight Consolidation Centers	0.023			186,396

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Policy Scenario 1 Results: Overall

Misses the 2030 Goal

PS1 Impact relative to Reference Case	Through 2030	Through 2050
Average job impact*	+ 4,564	+ 2,116
GDP Impact**	+ $ 5.28 billion	+ $ 5.11 billion
Personal Income Impact**	+ $ 3.57 billion	+ $ 4.40 billion
Avoided Mortality**	+ $ 0.6 billion	+ $ 3.38 billion
Avoided Climate Damages**	+ $ 2.58 billion	+ $ 14.4 billion

* Average number of job-years created or sustained each year.
** 2018 Dollars, Cumulative, Net Present Value using 3% discount rate.
Climate damage evaluated using Federal Social Cost of Carbon (2015 Update)

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Policy Scenario 2 Results: Overall

Meets GGRA Requirements for 2030

PS2 Impact relative to Reference Case	Through 2030	Through 2050
Average job impact*	+ 11,665	- 3,811
GDP Impact**	+ $ 11.86 billion	- $ 12.87 billion
Personal Income Impact**	+ $ 10.04 billion	- $ 6.38 billion
Avoided Mortality**	+ $ 1.35 billion	+ $ 10.1 billion
Avoided Climate Damages**	+ $ 5.57 billion	+ $ 41.4 billion

* Average number of job-years created or sustained each year.
** 2018 Dollars, Cumulative, Net Present Value using 3% discount rate.
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Policy Scenario 3 Results: Overall

Meets GGRA Requirements for 2030

PS3 Impact relative to Reference Case	Through 2030	Through 2050
Average job impact*	+ 10,950	+ 7,504
GDP Impact**	+ $ 7.01 billion	- $ 1.77 billion
Personal Income Impact**	+ $ 19.7 billion	+ $ 42.4 billion
Avoided Mortality**	+ $ 1.28 billion	+ $ 8.94 billion
Avoided Climate Damages**	+ $ 5.2 billion	+ $ 31.5 billion

* Average number of job-years created or sustained each year.
** 2018 Dollars, Cumulative, Net Present Value using 3% discount rate.
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Policy Scenario 4 Results: Overall

Meets GGRA Requirements for 2030

PS4 impact relative to Reference Case	Through 2030	Through 2050
Average job impact*	+ 11,649	+ 6,703
GDP Impact**	+ $ 11.54 billion	+ $ 18.63 billion
Personal Income Impact**	+ $ 10.04 billion	+ $ 15.67 billion
Avoided Mortality**	+ $ 0.74 billion	+ $ 4.79 billion
Avoided Climate Damages**	+ $ 4.38 billion	+ $ 27.55 billion

* Average number of job-years created or sustained each year.
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Clean and Renewable Energy Standard (CARES)

- Incorporates low- and zero-carbon resources that are not renewable.

- Utilities turn in certificates from renewable sources (RECs) and "clean energy" sources (CECs).

- Broader competition lowers costs.

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CARES Goals

- Get to 100% Clean Electricity by 2040.

- Build upon the RPS using homegrown clean energy.

- Use an all of the above strategy that significantly reduces carbon emissions by:
  - Increasing the strategic use of zero- and low-carbon clean and renewable energy sources;
  - Recognizing the clean and safe aspects of nuclear energy;
  - Supporting hydropower, coupled directly with maintaining environmental stewardship;
  - Advancing emerging technology for carbon capture and storage; and
  - Utilizing the role of energy-efficient combined heat and power.

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CARES Benefits

- It is not possible to get to 100% renewable electricity using current technology.
  - The CARES is flexible, so will deploy more renewables if that changes.
  - CARES takes advantage of CCS and modular nuclear, if those technologies mature.

- Allowing all low/zero-carbon resources to compete based on cost will get to 100% at lowest cost.

- Complements the RPS
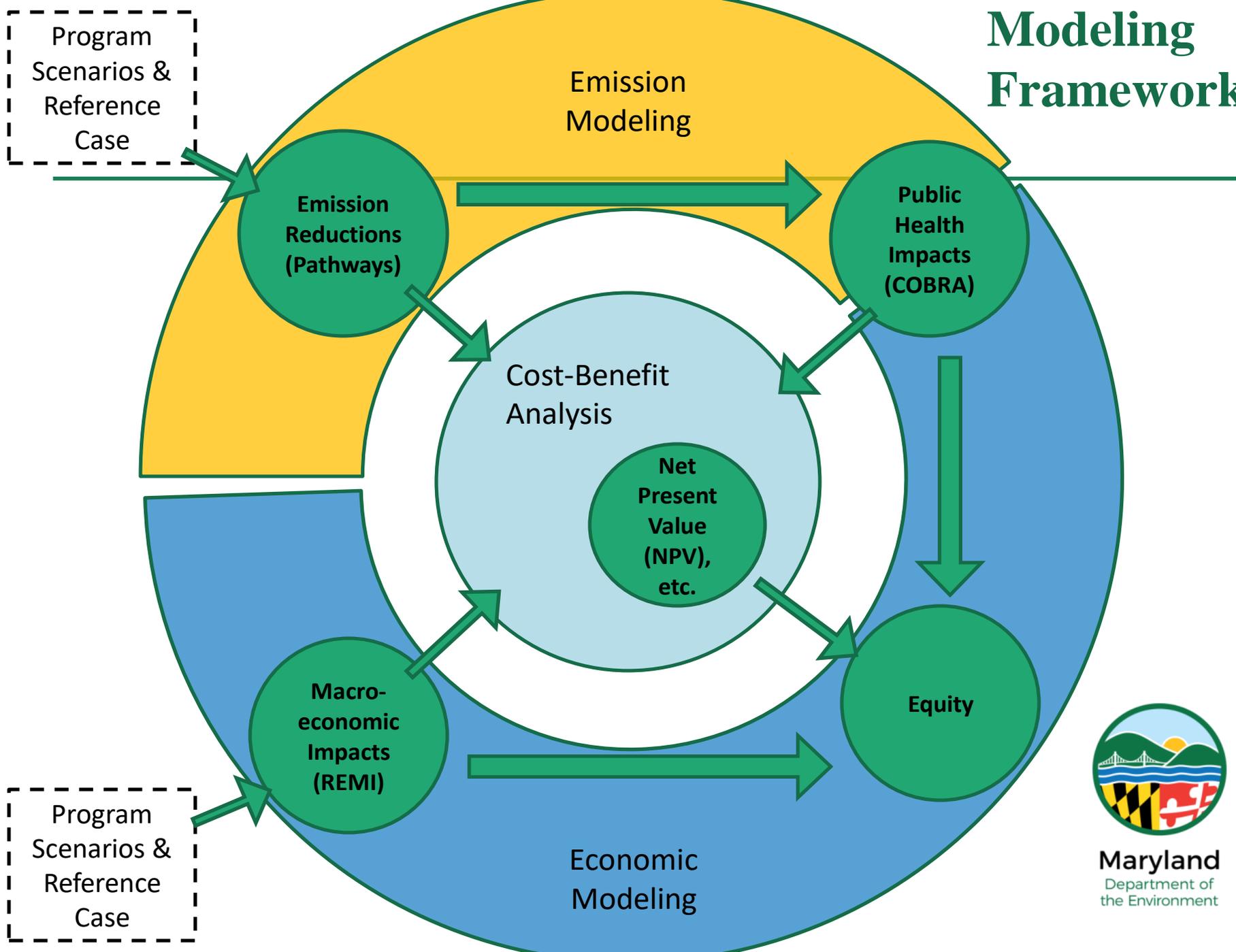
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CARES Benefits

- Additional clean and renewable energy is necessary to meet Maryland's climate change goals.

- CARES relies on homegrown energy to move beyond the current RPS.

- 100% Clean Electricity by 2040 is among the most ambitious goals in the country.