2018 Pennsylvania Climate Action Plan Updates

December 4, 2018

Prepared for the Climate Change Advisory Committee Meeting

Deb Harris (ICF)
Bansari Saha (ICF)

Agenda

- **Introduction**
  - Presenter Introductions
- **CCAC and CAP Process Overview & Timeline**
- **Draft CAP Overview - GHG, Energy, and Economic Modeling Results from CAP**
- **Draft CAP Overview – Organization and presentation of CAP**
- **CCAC Feedback and Discussion**
- **Next Steps**

Introduction

ICF Presenters

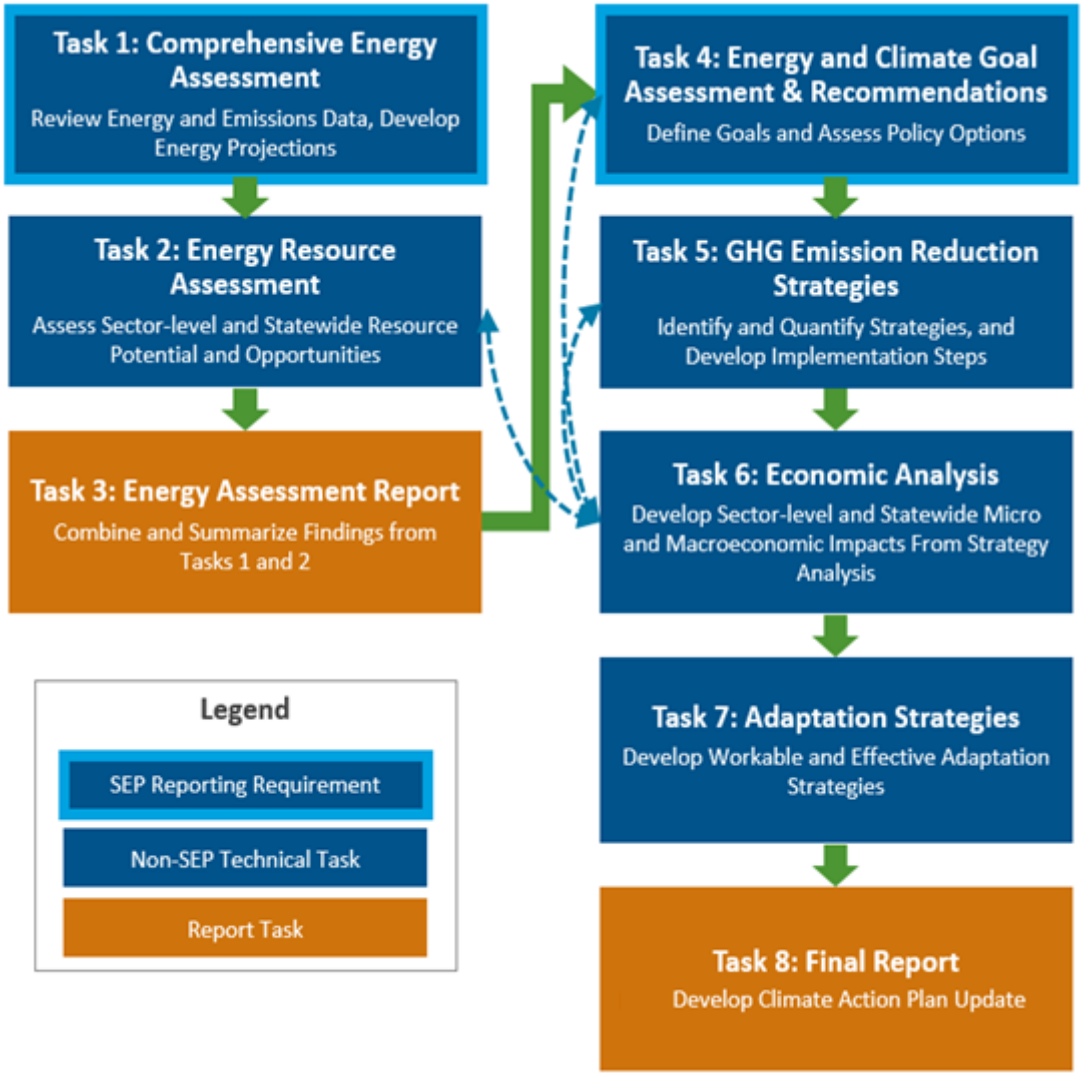
Bansari Saha, Economist

- 16 years of complex economic modeling experience
- Nationally renowned expert in the use of REMI Insight model
- Expert in modeling for policy decision making

Deb Harris, Project Manager

- 10 years of experience climate change and energy
- Managed Philadelphia EMP
- GHG inventory and data analysis expert

ICF's Integrated Project Approach

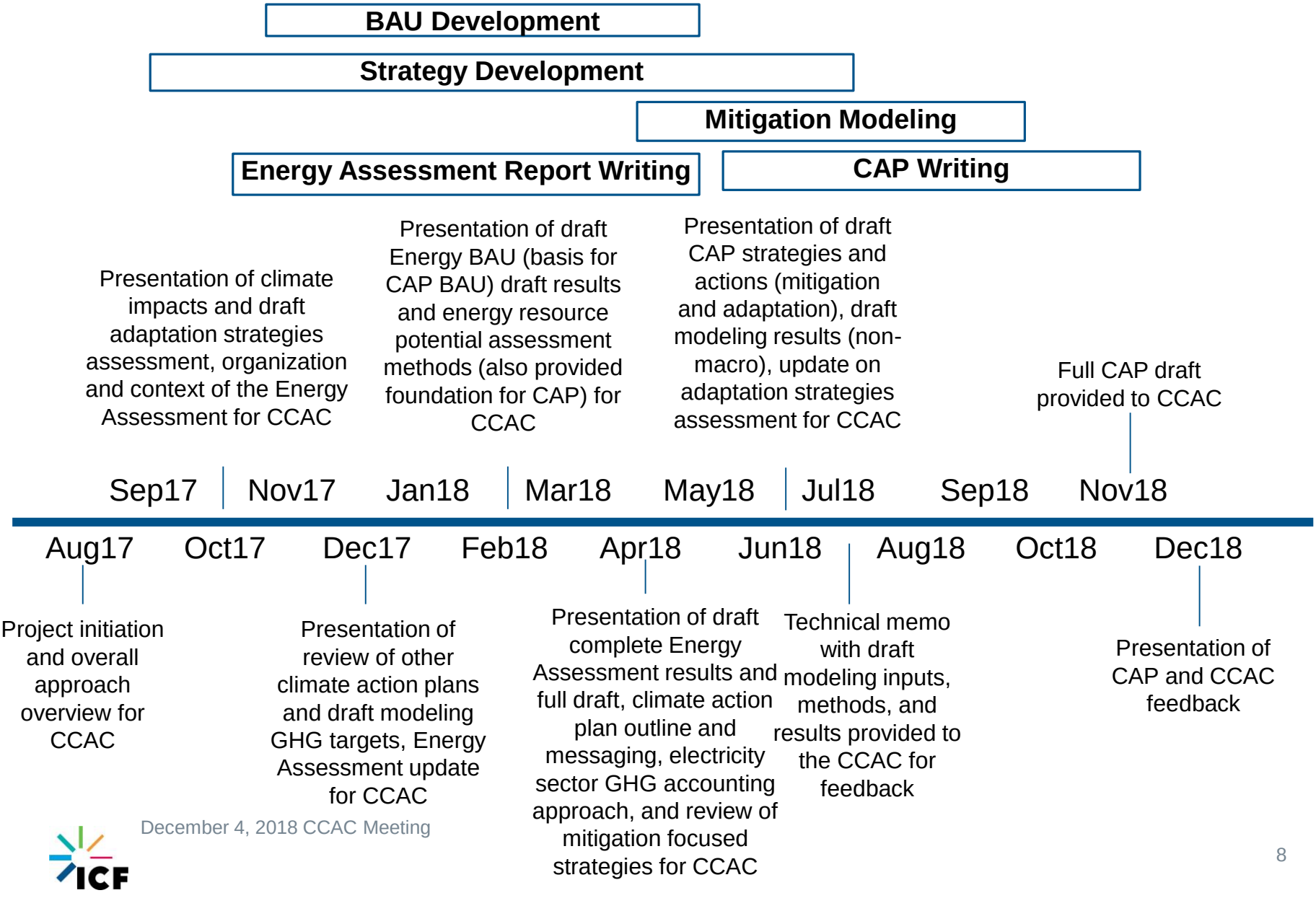


CCAC and CAP Process Overview & Timeline

CAP Development Process Overview

1. DEP and ICF identified initial mitigation and adaptation strategies, then prioritized and integrated these strategies
2. DEP sought feedback on strategies from sister agencies and the CCAC, and used this feedback to refine the list and select strategies for quantification
3. DEP and the analysis team conducted modeling for selected strategies for GHG, energy, and micro-economic effects
4. DEP and the analysis team conducted macro-economic modeling (e.g., changes in jobs) for each strategy was conducted using the REMI PI+ model
5. DEP and the analysis team outlined additional specific actions within each strategy for leaders, citizens, and businesses, and specified implementation steps for modeled actions

CAP Development Timeline



Draft CAP Overview - GHG, Energy, and Economic Modeling Results from CAP

Framing the Results

- Over **100 leadership actions** (in addition to citizen and business actions) are identified to help the Commonwealth to reduce GHG emissions, adapt to the changing climate, and reduce the risks of climate impacts
  - 15 actions under 7 strategies were quantitatively evaluated
    - Selected based on a set of criteria, such as largest potential for GHG reductions
  - Analysis considers a suite of strategies recommended to maximize GHG reductions and are cost-effective for Pennsylvania
  - Strategies for GHG mitigation are modeled interactively, not individually in a vacuum

Framing the Results

- GHG reduction targets used in this Plan for **gauging the results** of a set of potential GHG reduction strategies are:
  - **26 percent reduction of net GHG emissions by 2025, from 2005 levels**
  - **80 percent reduction of net GHG emissions by 2050, from 2005 levels**
- Targets in line keeping global temperature increases below 2 degrees Celsius - the threshold for global temperature rise beyond which dire consequences would occur,
- It's been projected that United States GHG emissions would need to be reduced 26-28% by 2025 and 80% by 2050 to ensure global temperatures stay below that level, which is consistent with many other countries and states
- If all states achieved such targets, and other nations met comparable goals, climate science analysis suggests that global temperature rise could be kept below the 2-degree Celsius threshold

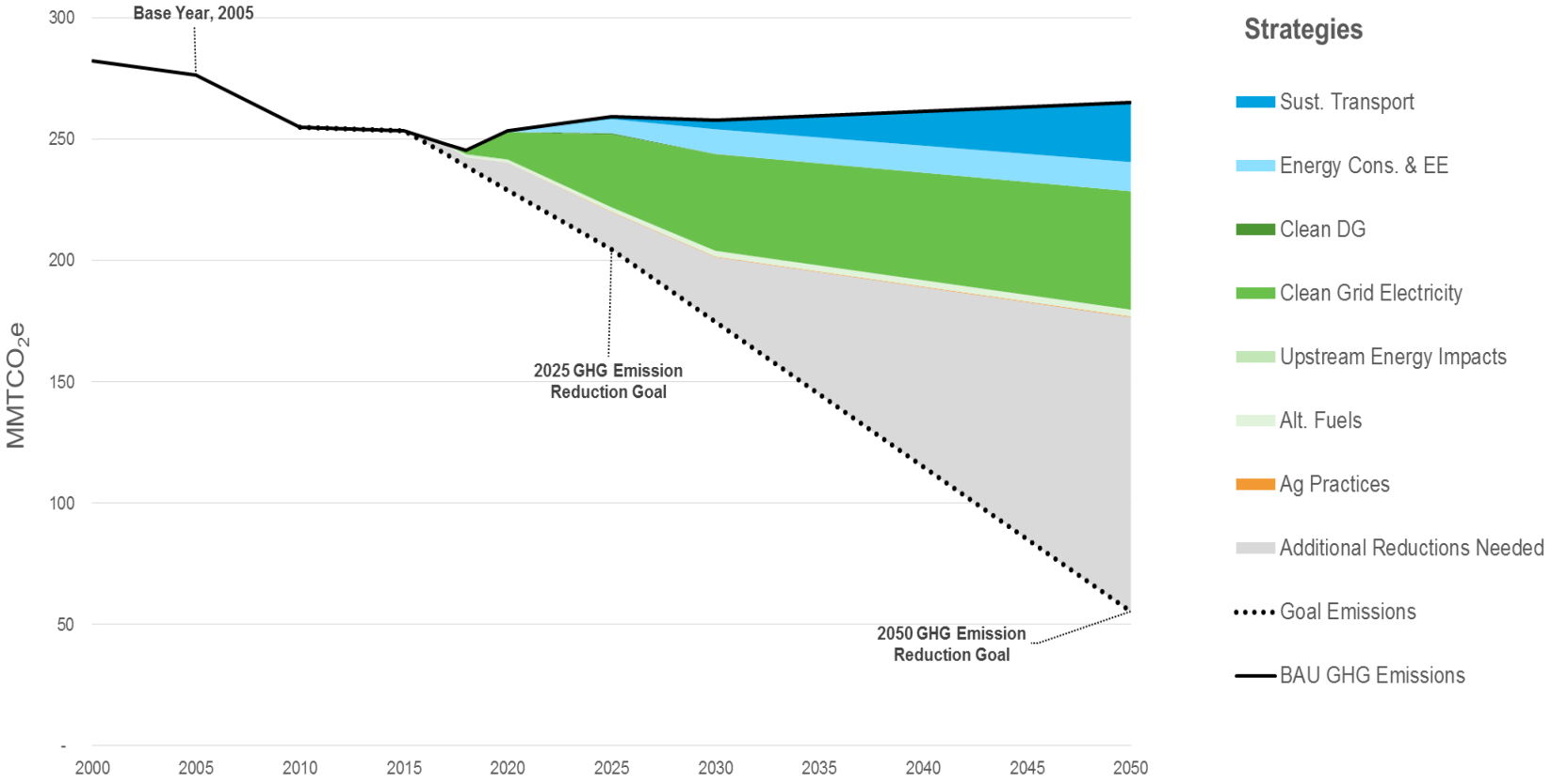
Evaluating Cost-Effectiveness

- Consider multiple factors together to understand the cost-effectiveness of a strategy.
  - **Net present value (NPV),** provided for each strategy action, which is a narrow analysis of direct costs and benefits, and uses zero NPV as a benchmark. This is useful as a simple microeconomic perspective.
  - **Cost per ton of CO2e**, provided for each strategy action, which uses the social cost of carbon as a benchmark. Anything that falls below the benchmark could be considered cost-effective based on one perspective.
  - **Macroeconomic factors**, which captures multiple benefit and cost effects, including employment, gross state product, and personal income. This is useful as a richer set of indicators.

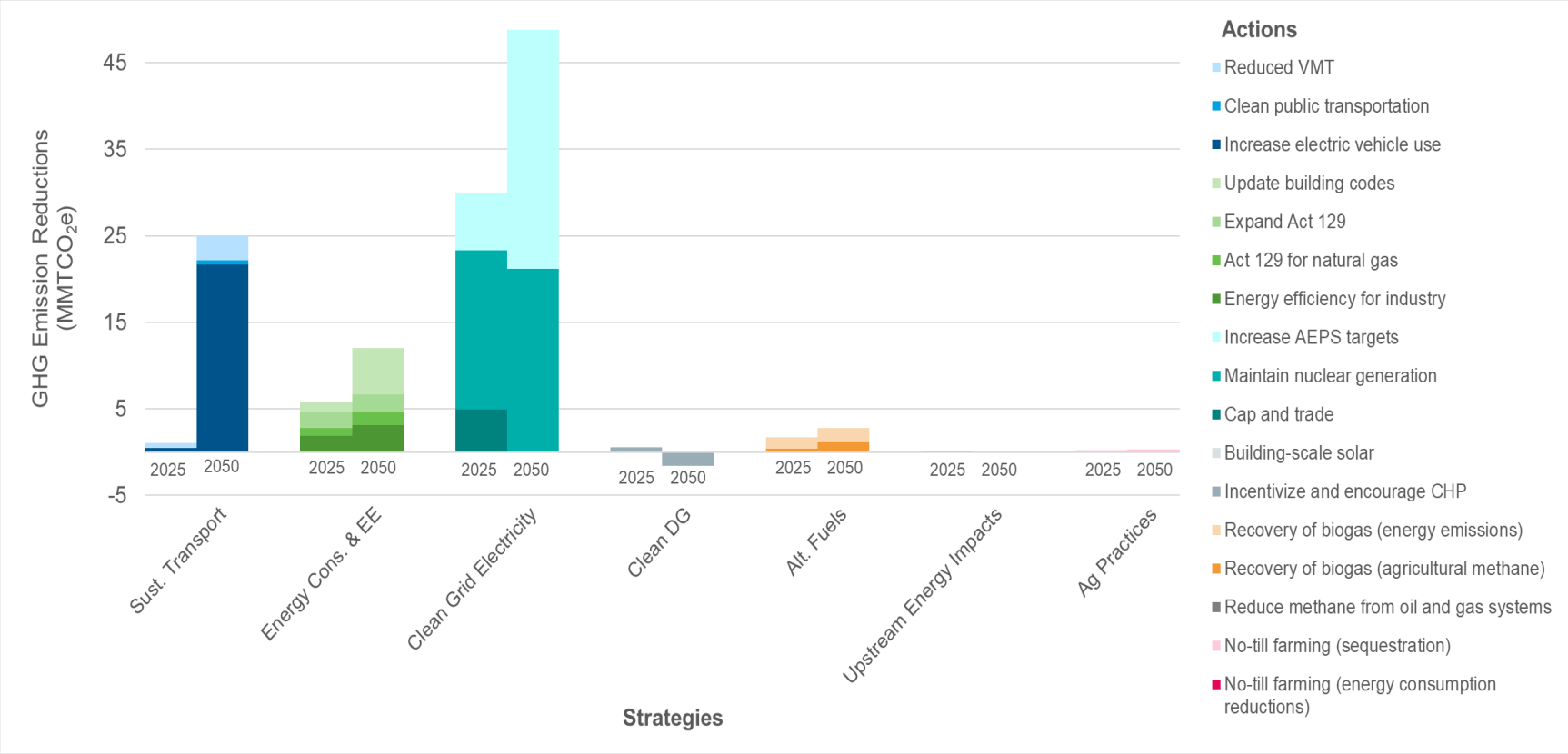
Modeled Actions

Sectors	Strategies	Actions Included in Quantitative Modeling
Energy Consumption	Increase end use energy conservation and efficiency	• Update building codes
		• Increase adoption of energy efficiency, and expand Act 129
		• Create an Act 129-like conservation and efficiency program for natural gas
		• Expand energy assessments and provide more trainings on energy efficiency for industry
	Implement sustainable transportation planning and practices	• Reduce vehicle miles traveled for single-occupancy vehicles
		• Implement a strategic plan and incentives for increasing electric vehicle use
		• Increase the use of clean public transportation through electric municipal bus fleets
Energy Production	Increase use of clean, distributed electricity generation resources	• Invest in and promote building-scale solar
		• Incentivize and increase use of combined heat and power (CHP)
	Create a diverse portfolio of clean, utility-scale electricity generation	• Increase Alterative Portfolios Energy Standard (AEPS) Tier 1 targets, and further increase in-state generation and use of renewables
		• Implement policy to maintain nuclear generation at current levels
		• Limit carbon emissions through an electricity sector cap and trade program
	Reduce upstream impacts of fossil fuel energy production	• Implement policies and practices to reduce methane emissions across oil and natural gas systems
	Increase production and use of alternative fuels	• Increase recovery and use of gas from coal mines, agriculture, wastewater, and landfills for energy
Agriculture	Use agricultural best practices	• Implement and provide training for no-till farming practices

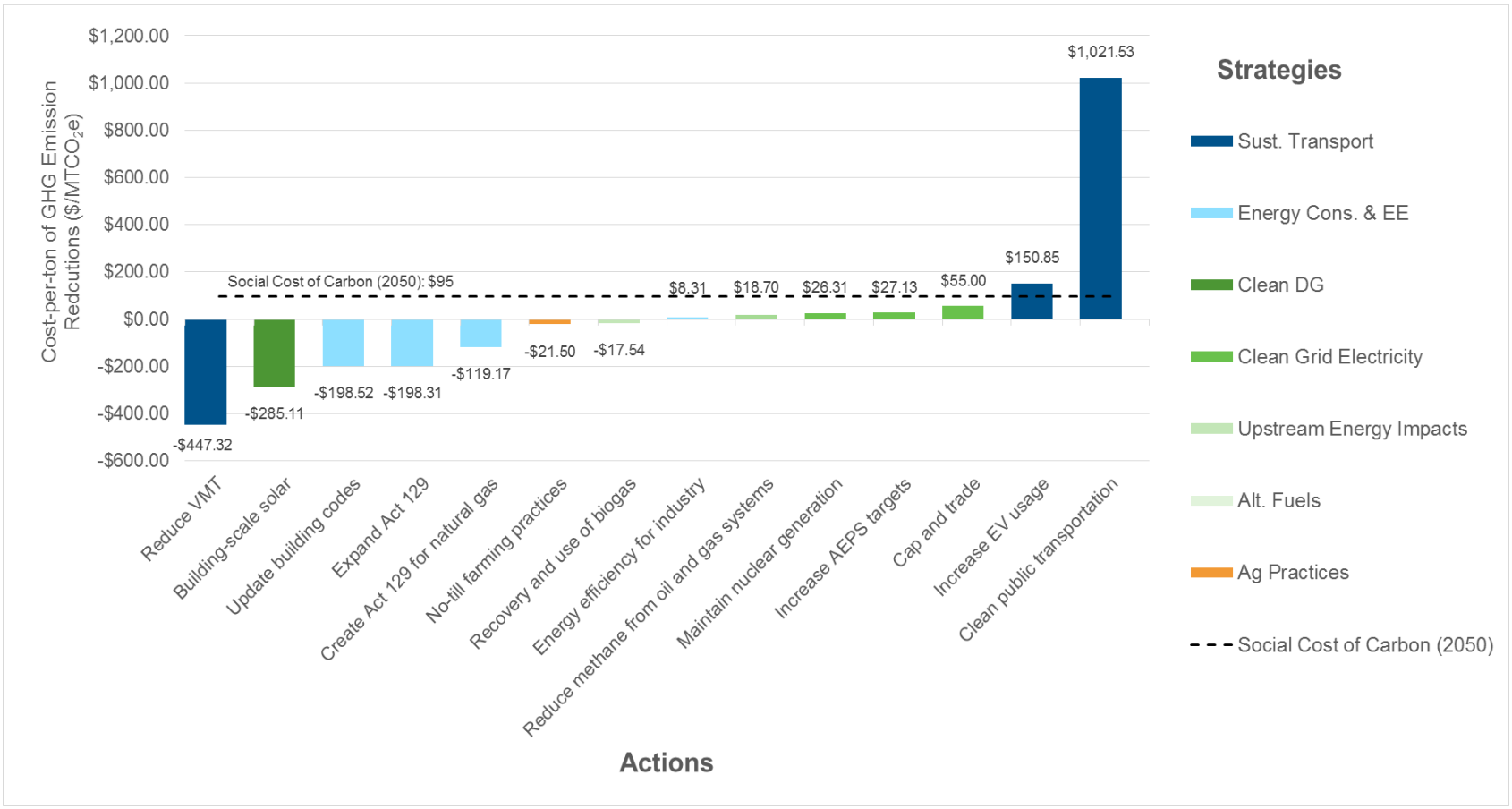
GHG Reductions Through 2050 for All Strategies, Grouped by Sector



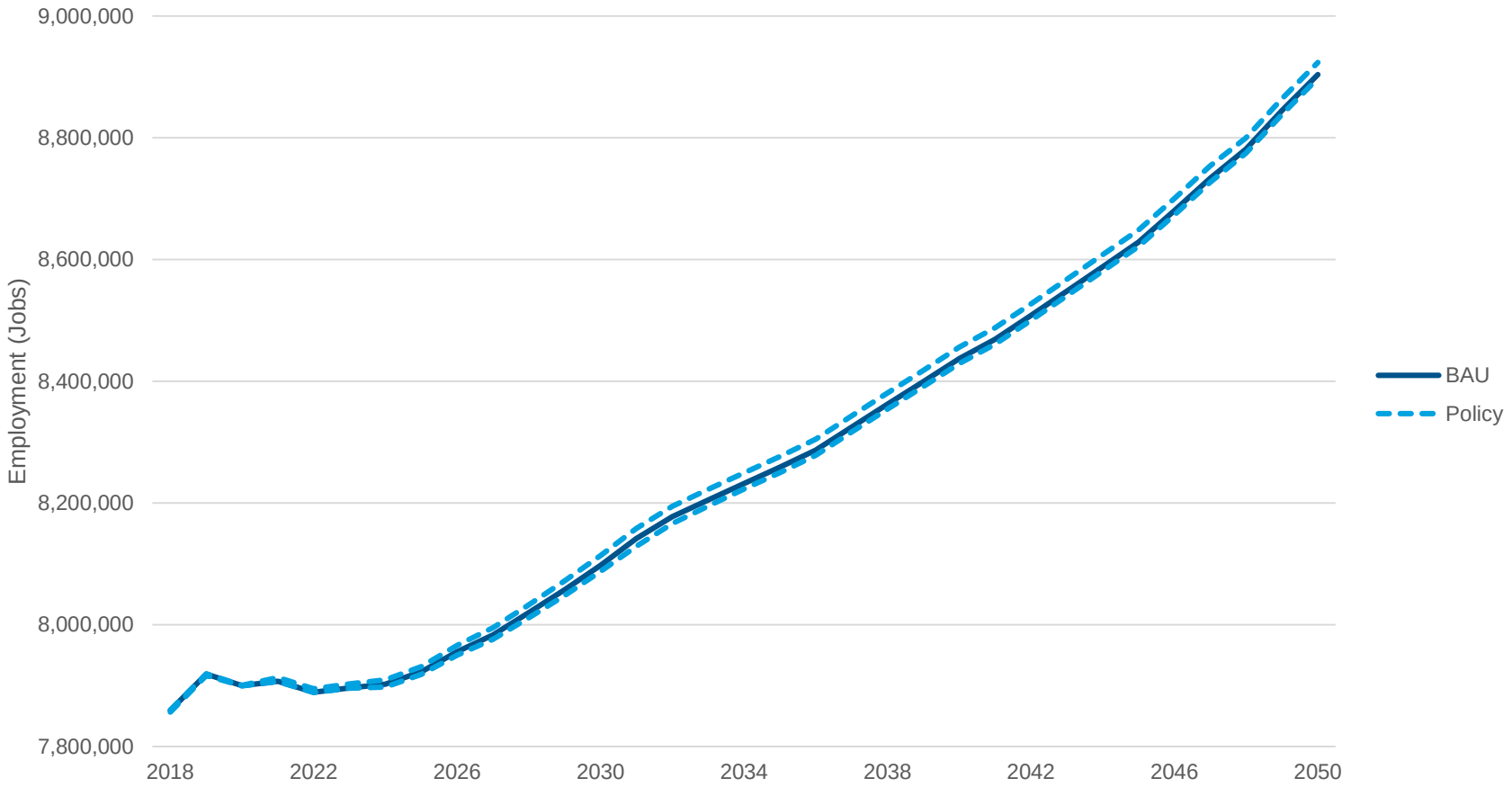
Annual GHG Reductions Compared to BAU for All Quantified Strategies and Actions in 2025 and 2050



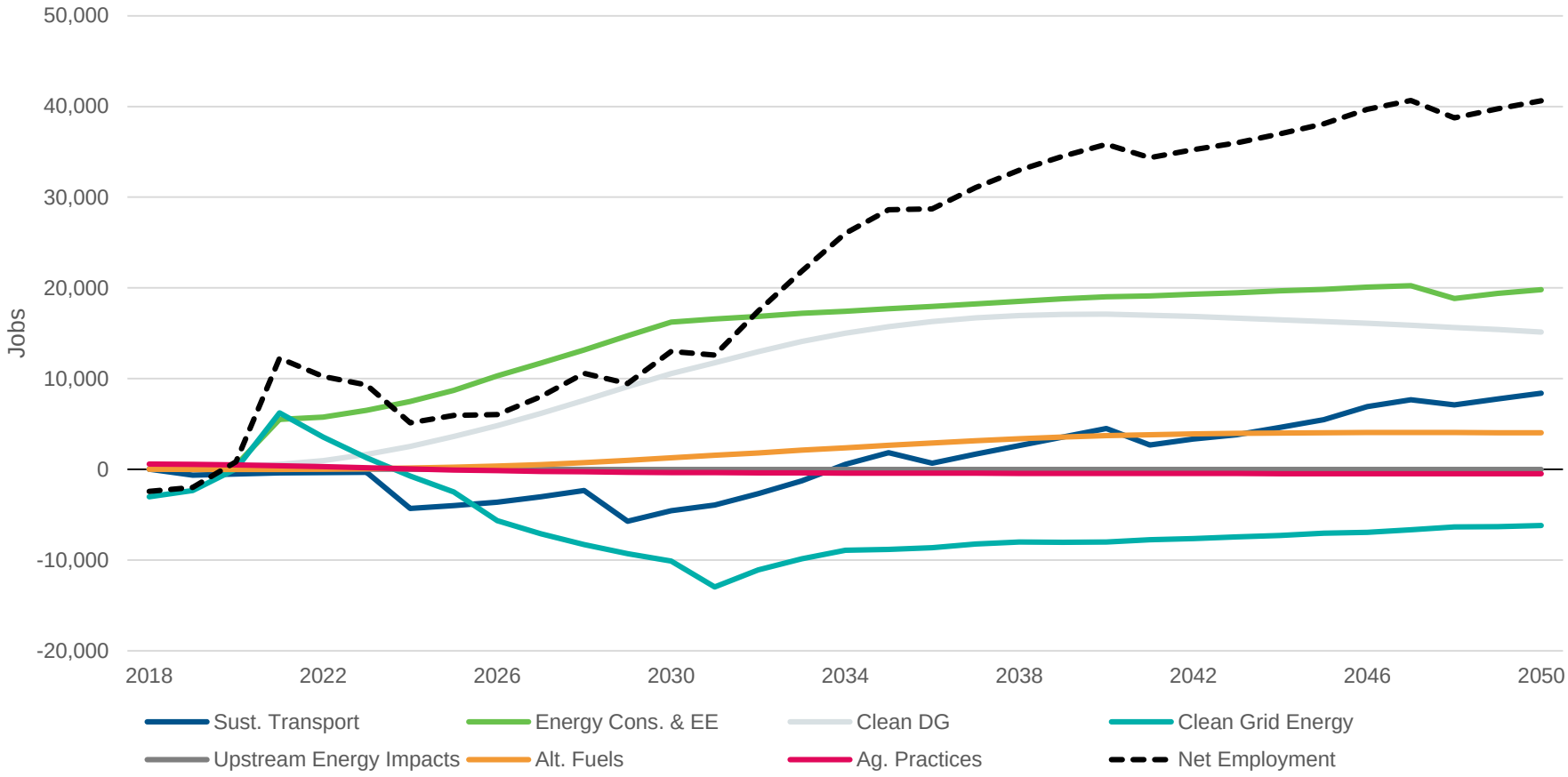
Cost per Ton of CO2 Reduced for All Actions, By Sector ($/MTCO2e)



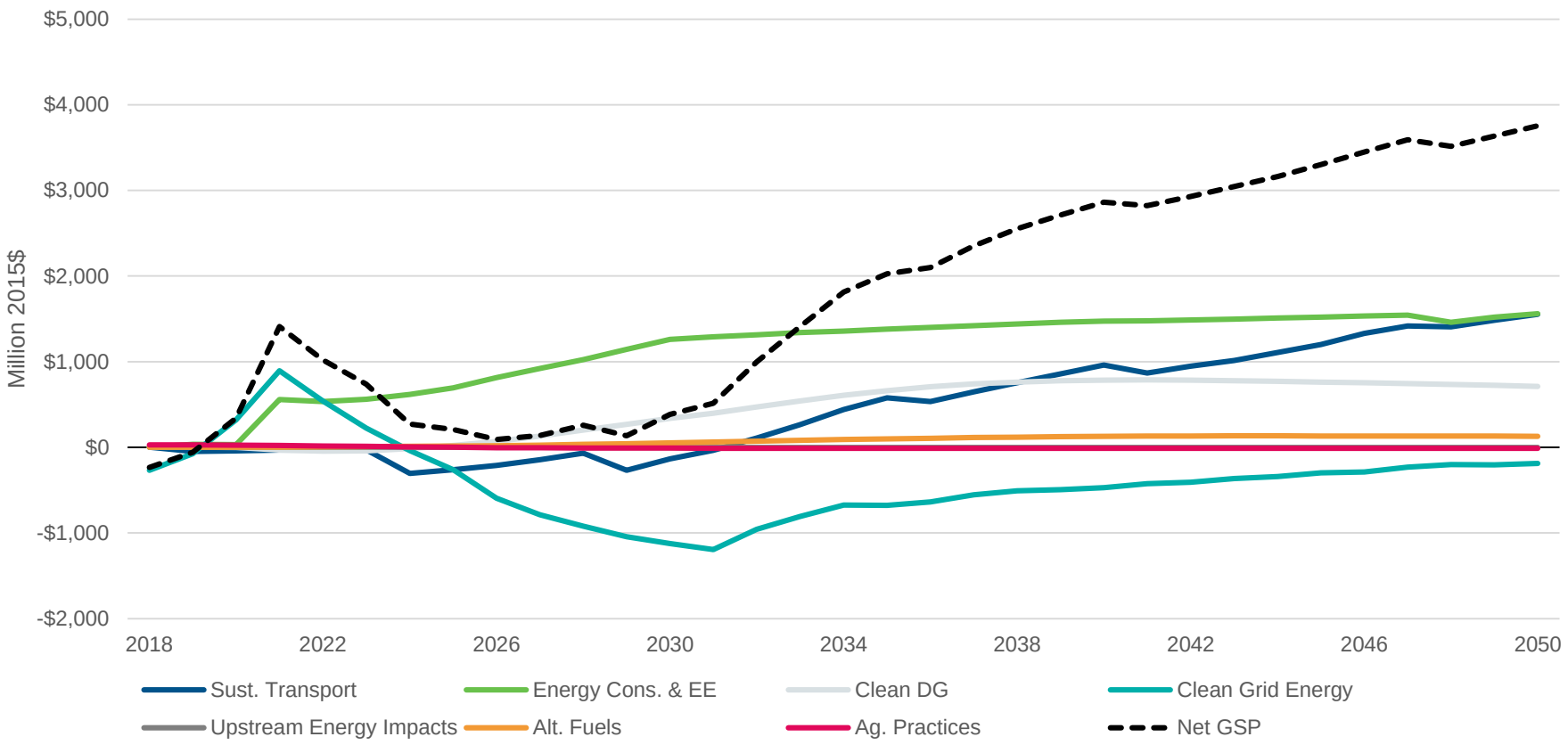
Overall BAU Employment Compared to Policy Case Employment in Pennsylvania



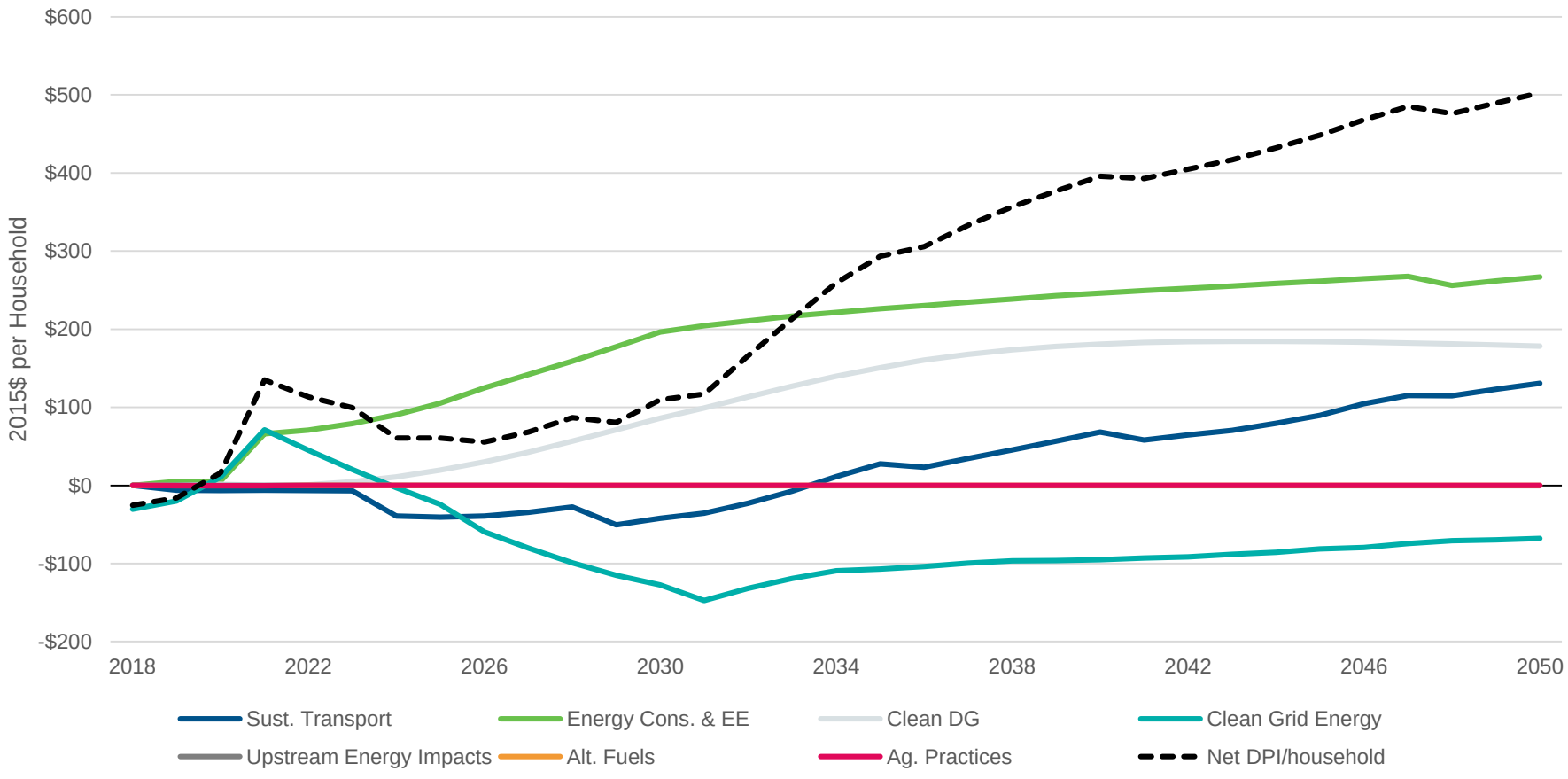
Number of Jobs Created Through 2050, by Strategy



Impact on Gross State Product Through 2050, by Strategy ($ Million)



Change in Disposable Income per Household Through 2050, by Strategy ($/Household)



Key Take Aways

- In aggregate, the suite of strategies recommended in this Plan maximize GHG reductions and are cost-effective for Pennsylvania
- DEP, its sister agencies, and the Pennsylvania state legislature and executive branch will need to prioritize and phase strategy implementation for both the quantified and non-quantified strategies in this Plan
- 2025 is rapidly approaching, and actions with large GHG and economic benefits, and relatively low cost and political barriers offer Pennsylvania the best short-term solutions
- The Plan outlines implementation examples, policy design parameters, and potential paths forward for acting on the 15 quantified actions
- In parallel, initiating actions that may take more time and resources to implement and have more trade-offs to consider will help Pennsylvania maximize the potential impact of this Plan

Key Take Aways

- The results for 2025 and 2050 fall short of meeting the modeling targets of 26 percent (2025) and 80 percent (2050) relative to 2005 GHG emissions
- However, these findings are consistent with what other jurisdictions are seeing and with what America's Pledge and the US Climate Alliance are seeing—actions with large GHG reduction potential, such as those quantified for this Plan, are not quite enough to meet 2025 or 2050 targets, when taken alone, but they only represent a subset of actions identified which can occur
- This finding further emphasizes the need for more ambitious and quick climate action from all actors, including leadership, businesses and citizens

Draft CAP Overview – Organization and presentation of CAP

CAP Organization

1. **Why Do We Need a Climate Action Plan?**
2. **What's Included in this Plan?**
3. **Emission Reduction and Adaptation Opportunities**
4. **Summary of Benefits and Costs for Modeled Strategies and Actions (***Addressed in previous slides***)**

Appendix A. Technical Support for Strategy and Action Modeling

Appendix B. Comments from the CCAC

1. Why Do We Need a Climate Action Plan?

- **Risks to infrastructure, governments, and businesses** from higher temperatures, changes in precipitation, sea level rise, and more frequent extreme events and flooding **because of climate change**
- Climate change can also **affect clean air, safe drinking water, sufficient food, and secure shelter**
- Health impacts from climate change are expected to cause around **250,000 additional deaths globally per year between 2030 and 2050**, as well as additional **direct damage costs estimated to be $2-4 billion per year by 2030**

In Pennsylvania

- Temperatures increased by more than 1.8 ° F since the early 20th century and are expected to increase by an additional 5.4 ° F by 2050.
- Annual precipitation has increased by approximately 10 percent since the early 20th century and is expected to increase by another 8 percent by 2050.

In the United States

- Extreme weather events have cost a total of $1.1 trillion collectively since 1980.
- More extreme events such as Superstorm Sandy can have significant costs (e.g., $65 billion) individually.

Globally

- Sea level has risen 7-8 inches since 1900 (with half of the increase since 1993), and is expected to rise 1-4 feet by 2100.

2. What's Included in this Plan: Goals and Targets

- **To ensure the effectiveness of this Plan, overarching adaptation goals and emissions reduction targets are used to frame the strategies.**
- **This Plan identifies two adaptation-focused goals, which can be achieved by actions from citizen, businesses, and leaders in the Commonwealth:**
  - Minimize disruptions to Pennsylvania's citizens, economy, and environment from climate-related hazards.
  - Increase Pennsylvania's ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from climate-related disruptions.
- **GHG reduction targets used in this Plan for gauging the results of a set of potential GHG reduction strategies are:**
  - 26 percent reduction of net GHG emissions by 2025, from 2005 levels
  - 80 percent reduction of net GHG emissions by 2050, from 2005 levels

2. What's Included in this Plan: Sectors and Strategies

	Energy Consumption	Energy Production	Agriculture	Ecosystems & Forestry	Outdoor Rec & Tourism	Waste	Water	Human Health	Includes Modeled Actions	Reduces GHG Emissions	Increases Ability to Adapt
Increase end use energy conservation and efficiency	✱		●			●	●	●	✓	✓	✓
Implement sustainable transportation planning and practices	✱			●				●	✓	✓	✓
Develop, promote, and use financing options to encourage energy efficiency	✱		●			●	●	●		✓	✓
Increase use of clean, distributed electricity generation resources		✱	●			●	●	●	✓	✓	✓
Create a diverse portfolio of clean, utility-scale electricity generation		✱	●			●	●	●	✓	✓	✓
Reduce upstream impacts of fossil fuel energy production		✱		●		●	●	●	✓	✓	
Increase production and use of alternative fuels		✱	●			●		●	✓	✓	✓
Use agricultural best practices	●		✱	●		●	●	●	✓	✓	✓
Provide resources and technical assistance to farmers to adapt			✱	●			●	●			✓
Improve protection of and optimize ecosystems				✱	●		●	●		✓	✓

✱ strategy presented in this sector ● strategy relates to this sector

2. What's Included in this Plan: Sectors and Strategies

	Energy Consumption	Energy Production	Agriculture	Ecosystems & Forestry	Outdoor Rec & Tourism	Waste	Water	Human Health	Includes Modeled Actions	Reduces GHG Emissions	Increases Ability to Adapt
Monitor, identify, and remove ecosystem vulnerabilities				✱	●			●			✓
Help the outdoor tourism industry manage shifting climate patterns				●	✱		●	●			✓
Reduce waste sent to landfills, and expand beneficial use of waste		●	●			✱		●		✓	✓
Use stormwater best management practices	●						✱	●		✓	✓
Promote integrated water resources management and water conservation	●						✱	●			✓
Improve reliability and accessibility of public information about climate-related health risks								✱			✓
Bolster emergency preparedness and response								✱			✓
Lead by example in Commonwealth and local government practices and assets	●	●	●	●	●	●	●	●		✓	✓
Incorporate historical and projected climate conditions into siting and design decisions for long-term infrastructure	●	●	●	●	●	●	●	●			✓

✱ strategy presented in this sector ● strategy relates to this sector

3. Emission Reduction and Adaptation Opportunities

- **Each sector section includes:**
  - Sector background and relevance in Pennsylvania
  - Climate impacts for the sector
  - Opportunities to adapt and reduce emissions, by strategy

- **Each strategy includes:**
  - A brief description of the strategy
  - A list of actions that state and local leaders can take to support the strategy
    - Implementation information for each modeled actions
  - A summary of strategy benefits and costs including both quantitative and qualitative assessments of climate resilience, environmental, and economic benefits and costs
  - Performance indicators and metrics that Pennsylvania could use to measure progress toward the strategy
  - Color-coded text boxes outlining actions that citizens and businesses can take to support the strategy

Appendices

Appendix A – Technical Support for Strategy and Action Modeling

- Documents the assumptions, methods, data, and results for mitigation modeled actions
- Covers energy, micro-economic, and environmental inputs; does not address macro-economic modeling which was done in REMI
- Updated version of technical memo shared with the CCAC in summer 2018

Appendix B – Comments from the CCAC

Feedback and Discussion

Next Steps

Thank You

Deb Harris, Senior Manager

Deborah.Harris@icf.com, (202)-862-1574

Bansari Saha, Principal

Bansari.Saha@icf.com, (617)-250-4286

Support Slides

Annual (2025 and 2050) and Cumulative (2018-2050) Number of Jobs Supported

Strategies Included in Quantitative Modeling	Annual Number of Jobs Supported (2025)	Annual Number of Jobs Supported (2050)	Cumulative Number of Job-Years Supported (2018-2050)
Increase end use energy conservation and efficiency	8,690 (0.11%)	19,790 (0.22%)	475,000 (0.17%)
Implement sustainable transportation planning and practices	-4,020 (-0.05%)	8,390 (0.09%)	35,380 (0.01%)
Increase use of clean, distributed electricity generation resources	3,610 (0.05%)	15,130 (0.17%)	362,910 (0.13%)
Create a diverse portfolio of clean, utility-scale electricity generation	-2,490 (-0.03%)	-6,210 (-0.07%)	-200,440 (-0.07%)
Reduce upstream impacts of fossil fuel energy production	10 (0.00%)	-10 (0.00%)	-190 (0.00%)
Increase production and use of alternative fuels	230 (0.00%)	4,020 (0.05%)	71,290 (0.03%)
Use agricultural best practices	470 (0.01%)	-500 (-0.01%)	-8,020 (0.00%)
Net Total	6,500 (0.08%)	40,610 (0.46%)	*Blank*

Annual (2025 and 2050) and Cumulative (2018-2050) Impact on Gross State Product ($ Million)

Strategies Included in Quantitative Modeling	Annual Impact on GSP ($ Million) (2025)	Annual Impact on GSP ($ Million) (2050)	Cumulative Impact on GSP ($ Million) (2018-2050)
Increase end use energy conservation and efficiency	$700 (0.08%)	$1,560 (0.11%)	$37,180 (0.14%)
Implement sustainable transportation planning and practices	-$260 (-0.03%)	$1,560 (0.11%)	$15,860 (0.06%)
Increase use of clean, distributed electricity generation resources	$20 (0.00%)	$710 (0.005%)	$14,900 (0.06%)
Create a diverse portfolio of clean, utility-scale electricity generation	-$260 (-0.03%)	-$190 (-0.01%)	-$13,060 (-0.05%)
Reduce upstream impacts of fossil fuel energy production	$0 (0.00%)	$0 (0.00%)	-$20 (0.00%)
Increase production and use of alternative fuels	$10 (0.00%)	$130 (0.01%)	$2,540 (0.01%)
Use agricultural best practices	$0 (0.00%)	-$10 (0.00%)	-$130 (0.00%)
Net Total	$200 (0.02%)	$3,760 (0.26%)	*Blank*

Annual (2025 and 2050) and Cumulative (2018-2050) Change in Disposable Personal Income Per Household ($/Household)

Strategies Included in Quantitative Modeling	Annual Change in Disposable Personal Income Per Household ($/Household) (2025)	Annual Change in Disposable Personal Income Per Household ($/Household) (2050)	Cumulative Change in Disposable Personal Income Per Household ($/Household) (2018-2050)
Increase end use energy conservation and efficiency	$105 (0.08%)	$267 (0.18%)	$6,089 (0.13%)
Implement sustainable transportation planning and practices	-$41 (-0.03%)	$131 (0.09%)	$846 (0.02%)
Increase use of clean, distributed electricity generation resources	$20 (0.01%)	$178 (0.12%)	$3,639 (0.08%)
Create a diverse portfolio of clean, utility-scale electricity generation	-$24 (-0.02%)	-$68 (-0.05%)	-$2,319 (-0.05%)
Reduce upstream impacts of fossil fuel energy production	$0 (0.00%)	$0 (0.00%)	-$6 (0.00%)
Increase production and use of alternative fuels	$0 (0.00%)	$0 (0.00%)	$1 (0.00%)
Use agricultural best practices	$0 (0.00%)	-$5 (0.00%)	-$72 (0.00%)
Net Total	$61 (0.5%)	$503 (0.35%)	*Blank*