Climate Change Advisory Committee Meeting

April 27, 2021
• **Introduction**
  - Approval of February minutes
• Summary of CCAC Feedback
• ICF Presentation on 2021 CAP
  - 2021 CAP discussion
• Break
• Public Comment
• Updates
• New Business
• Next Steps/Next meeting
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## Tentative 2021 IA/CAP Review Timeline

<table>
<thead>
<tr>
<th>Meeting Date</th>
<th>Materials</th>
<th>Shared w/ CCAC</th>
<th>Feedback Requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/23/2021</td>
<td>- Final IA with refined findings&lt;br&gt;- Updated Draft CAP with supporting analysis information incorporated (GHG mitigation results, enabling technologies, adaptation pathways)&lt;br&gt;- Initial economic and co-benefits information, as available</td>
<td>2/9/2021</td>
<td>3/2/2021</td>
</tr>
<tr>
<td>4/27/2020</td>
<td>Draft Final CAP and supporting analysis information, including all near final economic and co-benefits analyses</td>
<td>4/20/2021</td>
<td>5/11/2021</td>
</tr>
<tr>
<td>6/22/2021</td>
<td>Final CAP from ICF</td>
<td>6/15/2021</td>
<td>TBD (letters)</td>
</tr>
</tbody>
</table>
## Outcomes of CCAC Dec. Feedback

<table>
<thead>
<tr>
<th>Materials Provided for Review</th>
<th>Committee Members Who Provided Feedback</th>
<th># of Written Comments and Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021 Climate Action Plan Final Draft</td>
<td>5</td>
<td>Written – 95</td>
</tr>
<tr>
<td>February 2021 Meeting Slides</td>
<td>8</td>
<td>Written – 3, Verbal – 23</td>
</tr>
</tbody>
</table>
Outcomes of CCAC Feb. Feedback

• **Feedback:** Editorial/wordsmithing comments, comments to suggest additional information be added for clarification, and suggested formatting changes (~55 written comments received).
  – **Decision:** Comments were taken and resulting changes incorporated into the CAP

• **Feedback:** Reminder to be consistent throughout the report when using MTCO$_2$e and MMTCO$_2$e. (18 written comments received).
  – **Decision:** This has been addressed throughout the report – in general, most graphs related to the baseline GHG inventory and BAU projections are in MMTCO$_2$e, while the strategy-focused sections and graphs are in MTCO$_2$e (this rule does not apply everywhere, however).
• Feedback: Request to include on-site/distributed solar as an active strategy for the building sector. (2 verbal comments received, 1 written comment received).

  – Resulting Changes:
  • Re-ran IPM to include separate generation categories for distributed and grid-scale solar.
  • Built out a new strategy that estimates GHG emissions reductions from the addition of on-site, distributed solar installations.
  • Added on-site solar strategy to CAP report and included a discussion on associated impacts/implementation.
Feedback: Requested clarification on whether stretch codes can actually be required by PA, or if they are only a voluntary option (2 written comments received).

- Decision: Added clarification to the CAP report which explains that the existing requirement is to review codes once every 3 years. Code updates are not in the BAU, since there is not a requirement to actually update the code. The text in the Building Codes strategy specifies the creation of a single stretch code for PA Department of Labor and Industry approval to allow uniform adoption across the Commonwealth.
• Feedback: There should be another version of the BAU Electricity Generation by Fuel Type graph with the proposed pathway to achieve the 80% reduction in 2050. (1 written comment received, 1 verbal comment received).

  – Resulting changes: We have included a corresponding wedge chart showing policy case electricity generation by fuel type.
• **Feedback:** Abandoned mine lands do not revert to mature forestland, they may be better suited for targeted placement of solar, which could continue to provide carbon sequestration through vegetated plantings. *(1 written comment received).*

  – **Resulting Changes:** Added more details in the discussion section of the land-use sequestration strategy that highlights DEP’s award-winning program focused on reforestation efforts on abandoned mine lands. Also added additional information on the use of lands and resilience of tree types to climate change.
Outcomes of CCAC Feb. Feedback

• Feedback: The report should reference that the PUC has issued a Secretary Letter formally soliciting comments regarding the potential ownership of storage by the EDCs. (1 written comment received).

  – Resulting Changes: Added a sentence to the “Why It Matters for Pennsylvania” section of the battery storage enabling technology that says the PUC has issued a letter soliciting comments regarding EDC battery ownership.
• **Feedback**: How is the grid defined? Specifically, what makes the grid distinct from the electricity generation sector? (1 written comment received)

  – **Decision/Note**: Generally, the grid includes the generation and delivery of electricity to consumers. Carbon Emissions Free Grid strategy section now includes a sentence that reads: “The electric grid is the network that generates and delivers electricity to consumers and includes generating stations, electrical substations, and transmission and distribution power lines.”
Outcomes of CCAC Feb. Feedback

- **Feedback:** Request to clearly label each of the GHG reduction strategies so that the reader can easily keep track of them and find the corresponding information (1 written comment received).

- **Decision:** We have updated each of the strategies to have an associated letter – they are now listed in the CAP Report starting with this letter (e.g., “A. Support Energy Efficiency Through Building Codes”). We chose to use letters because numbers give the appearance that the strategies are ranked.
Outcomes of CCAC Feb. Feedback

• **Feedback:** Clarify section that explains the process for prioritizing strategies, specifically who actually conducted the evaluation and scoring (1 written comment received).
  – **Decision:** More language was added to the CAP report to explain how and who conducted the evaluation and scored the results.

• **Feedback:** When looking at hydrogen as an enabling technology, it is important to consider not just the production side, but also what end-users will have to consider before deploying it (i.e., equipment retrofits) (1 written comment received).
  – **Decision:** Added more detail to the enabling technology section for hydrogen that explains the context around using hydrogen as a vehicle fuel, specifically related to upfront fixed costs and vehicle/equipment incremental costs (as compared to EVs).
Feedback: Suggest rewording the description of blue hydrogen because most of the public may inadvertently misinterpret this to mean that blue hydrogen contains less carbon (1 written comment received).

Decision: A text box was added to the hydrogen enabling technology section that explains key terminology including power-to-gas, blue hydrogen, and green hydrogen. Additional clarification was added within this text box.
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1. Summary of CAP Updates
2. GHG Modeling Overview and Updates
3. Draft Economic Modeling Results for GHG Reduction Strategies
4. Adaptation Pathways
5. Implementation Approach
6. Next Steps
Today’s Presenters from ICF

Cassie Bhat
Impacts Assessment Lead

Deb Harris
Project Manager, CAP Lead

Bill Prindle
Sustainable Energy and Climate Expert

Bansari Saha
Economics Expert

Adam Agalloco
Energy and Climate Expert

Logan Pfeiffer
Report Lead
Climate Action Plan: General Approach

Step 1: Update Business as Usual Scenario

Step 2a: Identify and Prioritize GHG Reduction Strategies

Step 2b: Identify and Prioritize Adaptation Strategies

Step 3a: Develop Flexible Adaptation Pathways

Step 3b: Analyze GHG reductions

Step 3c: Characterize enabling technologies

Step 4a: Evaluate the costs and benefits of adaptation strategies

Step 4b: Evaluate the costs and benefits of mitigation strategies

Step 5: Develop Implementation Steps
CAP Updates

1) Reviewed and addressed CCAC feedback as determined with DEP

2) Updated modeling for a pathway to achieve 80% GHG emission reductions by 2050, based on CCAC feedback

3) Developed economic modeling of costs and benefits of strategies

4) Developed adaptation strategy pathways for priority climate impacts identified in the IA

5) Drafted additional sections of the CAP to provide content in all sections
Remaining CAP Work to Complete

1) Collect and address feedback on the draft final plan from the CCAC

2) Complete and update Executive Summary and Appendices

3) Conduct complete final review and QC of information and modeling results

4) Editing and formatting
GHG Reduction Strategies

Updates

- GHG Modeling Overview and Updates
- Draft Economic Modeling Results for GHG Reduction Strategies
- Recommended Considerations for CCAC Review
GHG Modeling Overview and Updates

• Overall GHG Reduction Modeling Results
  o Pennsylvania will come close (25.4%) to meeting the 2025 target of reducing GHG emissions 26% below 2005 levels by implementing all modeled strategies.
  o Reaching Pennsylvania’s 2050 target of reducing GHG emissions 80% below 2005 levels will require the implementation of all recommended strategies across all sectors and may include the use of additional enabling technologies.
  o Reductions from electricity generation, transportation, and building strategies will be responsible for the greatest cumulative reductions through 2050.

• Updates to Modeling Results
  o Updated BAU analysis for electricity sector.
  o Added electricity generation categories for small-scale solar, broken out by residential and commercial (i.e., distributed on-site solar).
  o Low Carbon Fuel Standard (LCFS) strategy was updated to show zero GHG reductions in 2050 as the carbon intensity goal is achieved by 2050 from electrification in other transportation strategies.
  o Corrected a data pull/population error for BAU electricity generation emissions.
Electricity Generation Mix Under the BAU and 80x50 Scenarios

- Adjusted BAU to reflect the requirement for in-state Tier II generation and to reflect a waste coal set aside.
- These changes results in some economic changes within the model, including increased RGGI prices.
- Given how sensitive nuclear is – how on the margin – these resulting economic changes were sufficient to keep the nuclear units online.
Increase Distributed Onsite Solar

<table>
<thead>
<tr>
<th>Description</th>
<th>Key Assumptions</th>
</tr>
</thead>
</table>
| Includes the installation of onsite distributed solar in both the residential and commercial sectors. To maximize the benefits of this strategy, additional efforts will be needed, such as actions to expand the development of solar across the Commonwealth, legislation to help develop a robust solar industry at the distributed level, and strategies that increase the value of solar renewable energy credits (SRECs). | • Used IPM to determine the distributed solar generation through 2050, in alignment with Strategies N and O (outlined below). The modeling resulted in a clean grid (100% AEPS requirement by 2050), based on the following constraint:  
  • The solar carve out is assumed to be in line with the Finding Pennsylvania’s Solar Future Plan initially, and then will go beyond it in 2030 through 2050. This included a carveout to allow for at least 20% of the total solar to come from distributed solar resources. |

| Reductions from BAU in 2050 | 5,819,168 MTCO2e  
Replaces 21,581 GWH of grid-supplied electricity |

*GHG emissions associated with decreased electricity consumption from this strategy are not included in totals – a generation-based GHG accounting approach is used in line with the state inventory.*
GHG Reductions from 2005 to 2050 (MMTCO$_2$e)

Note: Increased emissions are expected from Waste due to population growth driving higher emissions from MSW and wastewater. Increased emissions from LULUCF are due to a decline in net carbon sequestration, mainly from reductions forest land sequestration and agricultural soil carbon.
GHG Reductions from Strategies in 2025, Compared to BAU in 2025 (MMTCO$_2$e)

- Reduce Methane from Oil and Gas Systems
- Increase Industrial EE and Fuel Switching
- Land Management and Urban Green Space
- Residential and Commercial EE
- Increase Adoption of Light Duty Electric Vehicles
- Incentivize and Increase Use of RNG
- Implement a Low Carbon Fuel Standard
- Reduce VMT and Increase Fuel Efficiency
- Incentivize Building Electrification
- Implement the MHDV MOU
- Create a Carbon-Free Grid
- Trainings and Tools for Agricultural Best Practices
- Incentivize and Increase use of Distributed CHP
- Energy Codes
- Increase Energy Efficiency for Agriculture
- Distributed onsite solar

- Note that this chart excludes strategies for which emissions reductions are not estimated.
- Reductions associated with electricity consumption are not included.
- Onsite solar will reduce 0.000296 MMTCO$_2$e in 2025
GHG Reductions from Strategies in 2050, Compared to BAU in 2050 (MMTCO$_2$e)

- Create a Carbon-Free Grid: 55.7
- Increase Industrial EE and Fuel Switching: 25.8
- Increase Adoption of Light Duty Electric Vehicles: 23.8
- Incentivize Building Electrification: 12.3
- Incentivize and Increase Use of RNG: 10.5
- Reduce Methane from Oil and Gas Systems: 8.8
- Implement the MHDV MOU: 7.4
- Distributed On-site Solar: 5.8
- Residential and Commercial EE: 4.3
- Land Management and Urban Green Space: 2.9
- Reduce VMT and Increase Fuel Efficiency: 2.8
- Incentivize and Increase use of Distributed CHP: 0.9
- Trainings and Tools for Agricultural Best Practices: 0.2
- Energy Codes: 0.2
- Increase Energy Efficiency for Agriculture: 0.003
- Implement a Low Carbon Fuel Standard: 0.0

- Note that this chart excludes strategies for which emissions reductions are not estimated. Reductions associated with electricity consumption are not included.
- The LCFS strategy reduces emissions prior to 2050, but the carbon intensity goal is achieved by 2050 (due to electrification from other transportation strategies), so there are no reductions expected in 2050 from the low carbon fuel standard.
Note that this chart excludes strategies for which emissions reductions are not estimated. Reductions associated with electricity consumption are not included.
• The reductions estimate represents a potential pathway or options to reduce emissions by 80% from 2005 in 2050; these are not the only options to reduce GHG emissions.

• The reductions estimated do not represent specific policy recommendations. Instead, a suite of options are presented that together reduce emissions from 2005 by 80% in 2050, and that contain a lot of the components needed for deep reductions.

• Like many other studies and the growing consensus, a decarbonized grid and energy supply, along with fuel switching, are large potential drivers of reductions, but a full suite of options is needed.

• The electricity generation mix is projected to become less dependent on fossil fuels over time if the strategies described in the CAP are implemented.
Initial Insights

- 30% of the total reductions from 2005 to 2050 are driven by reductions seen in the BAU, mainly from the shift from coal to natural gas electricity generation and increased efficiency in buildings and cars seen in earlier parts of the time series.
- 70% of total reductions from 2005 to 2050 are a result of actions between 2018 and 2050.
- Deep reductions are needed across all sectors (see table).
  - Energy supply needs to be decarbonized, both through low or no carbon gases and carbon-free electricity.
  - Efficiency needs to be a part of the solution.
  - Innovation and changes in the industrial sector are required.
  - Fuel switching (e.g., fuel oil to gas or electrification), particularly for transportation and the buildings sector plays a major role in reductions.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Modeled Reductions (2005-2050)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>76%</td>
</tr>
<tr>
<td>Buildings</td>
<td>81%</td>
</tr>
<tr>
<td>Electricity Generation</td>
<td>95%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1%</td>
</tr>
<tr>
<td>Fuel Supply*</td>
<td>87%</td>
</tr>
<tr>
<td>Industrial</td>
<td>29%</td>
</tr>
<tr>
<td>LULUCF**</td>
<td>-6%</td>
</tr>
</tbody>
</table>

*Includes RNG
**Represents a 6% decrease in sequestration.
Investments in electric energy efficiency result in both positive and negative economic impacts:

- Positive impacts: Increases in manufacturing and construction (installation) jobs, as well as increasing residential disposable income and commercial expenditures directly resulting from bill savings.
- Negative impacts: Opportunity costs of investment and impacts to power generators from lost revenues.

### How to Interpret Economic Modeling

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Present Value*</td>
<td>-$4.91 billion</td>
</tr>
<tr>
<td>Cost/(Benefit) per ton of GHG Reduced</td>
<td>$50.55 MTCO₂e</td>
</tr>
<tr>
<td>Average Annual GSP*</td>
<td>$344.65 million</td>
</tr>
<tr>
<td>Average Annual Disposable Income*</td>
<td>$121.39 million</td>
</tr>
<tr>
<td>Average Annual Employment</td>
<td>4,118 jobs</td>
</tr>
</tbody>
</table>

\*negative NPV indicates costs are greater than savings; \*assuming a 1.75% discount rate
How to Interpret GSP, Disposable Income, and Employment

• Modeling completed with REMI
  • REMI is a dynamic macroeconomic forecasting and policy analysis model
  • Projects distributional changes on the economy based on shocks to employment, investments, prices, production costs, wages, etc.
  • Combines aspects of Input-Output modeling with Computable General Equilibrium techniques
  • “Hybrid” macro-econometric model
  • Model can evaluate economic changes over time, allowing changes driven by inputs from one year to carry through multiple years
  • Estimates distributional impacts on sectors and/or regions

• Key outputs of the REMI model include:
  • Gross State Product (GSP): market value of goods and services produced by labor and property within PA
  • Disposable Personal Income (DPI): total after-tax income received by individuals; it is the income available to persons for spending or saving.
  • Employment (jobs and job-years): estimate of total employment impacts (full-time plus part-time). Annual employment results presented as jobs; cumulative employment results presented as job-years.
GHG Reduction Strategies Key Economic Insights

• Overall, if the recommended GHG reduction strategies are implemented, they would:
  • Create over one million cumulative job-years in the Commonwealth by 2050, with an annual average of roughly 38,000 jobs per year, an increase of about 0.46% in average annual terms.
  • Result in a slight decrease in the average annual gross state product (GSP) for the entire modeling time horizon.
    • Average annual GSP decreases by 0.02%, but trends positive in later years with a GSP increase of 0.13% by 2050. However, the Pennsylvania economy continues to grow at a robust pace even with these strategies in place.
  • Decrease disposable personal income (DPI) slightly.
    • The average annual DPI decreases by 0.10%, but trends positive in later years with a DPI increase of 0.14% by 2050. Disposable income continues to grow in the Commonwealth but at rates marginally lower than under the BAU baseline.
  • All strategies are estimated to be cost-effective on a cost per MTCO2e reduced basis. Additionally, most strategies result in co-benefits such as improved air and water quality, improved health outcomes, increased energy security, and improved equity and environmental justice outcomes.
Summary Employment Impacts
Comparison of Employment Levels under the BAU and the Policy Scenarios

![Graph showing employment levels from 2022 to 2050 under BAU and Policy scenarios. The BAU scenario shows a steady increase, while the Policy scenario shows an even steeper increase, reaching approximately 8,700,000 by 2050.](image-url)
Disposable Income Summary Impacts

DPI Levels (Million)
GSP Summary Impacts

GSP Level ($Million)

BAU  Policy

2022 2026 2030 2034 2038 2042 2046 2050
• Most of the modeled strategies are cost-effective compared to the social cost of carbon benchmark.

• Other cost-effectiveness measures like NPV and macroeconomic effects like jobs and GSP should also be considered. Additionally, unquantified effects like increased equity and co-benefits should be qualitatively assessed to inform a more holistic evaluation of cost-effectiveness.
Suggested Review Considerations for GHG Reduction Strategies in the CAP

• Varying levels of information are provided for strategies across categories (e.g., social and health benefits). Is there a strategy write up that you suggest is the appropriate level of information to provide that we should use as the preferred model for all other strategies? Or are you OK with varying levels of information?

• Are there any gaps in the information provided for strategies that you suggest be filled?

• Do you have any suggested improvements or additional information that you recommend including in the report to help reader understanding or provide a richer discussion?

• Do the results make sense, or do you have questions/suggestions for clarifications?
Adaptation Pathway

- Adaptation Pathway
- Recommended Considerations for CCAC Review
Begin adaptation planning in the CAP

- IA identified “priority areas” for adaptation – high-risk combinations of hazard(s) (e.g., flooding) and sectors (e.g., build infrastructure)
- In the CAP, we developed “adaptation strategy pathways” for each priority impact area.
- Each pathway includes:
  - Foundational strategies
  - Strategy categories
  - Example strategies
  - Example progression of strategies
  - Key actors
  - An overview of cost and benefits
  - A case study
- Strategies were gathered from a range of resource and then synthesized into example pathways

**Priority areas identified for adaptation:**
- Heat and Flooding Impacts on Health
- Heat and Flooding Impacts on Overburdened and Vulnerable Populations
- Increasing Average Temperatures Impacts on Forests, Ecosystems, and Wildlife
- Warmer and Wetter Climate Impacts on Agriculture
- Increasing Average Temperatures Impacts on Recreation and Tourism
- Flooding Impacts to Built Infrastructure
- Landslides Impacts to Built Infrastructure
Understanding Adaptation Strategy Pathways

**Foundational Strategies**
mechanisms to enable understanding of impacts and adaptive management over time (e.g., assessing/prioritizing risks, mainstreaming, monitoring)

**Strategy Categories**
General approaches to tackling impacts in each priority area

**Specific Strategy Examples**
Examples of specific strategies under each category
Understanding Adaptation Strategy Pathways

- Foundational Strategy
- Strategy 1
- Strategy 2
- Strategy 3

What? Who? When?
Addressing the Impacts of Increasing Heat and Flooding on Health

Types of Foundational Actions to Understand and Prepare to Address Impacts and Vulnerabilities

- Identify range of infrastructure opportunities and actors needed to mitigate climate and health risks
- Establish metrics and key actors/ responsibilities for tracking health data
- Identify education and trainings needed for climate and health awareness and action
- Identify coordination & partnerships needed to achieve public health goals
- Identify key plans, policies, regulations to address public health needs
- Identify opportunities for improving baseline health

Approaches to Reduce Vulnerabilities and Manage Impacts

- Educate health-care professionals and the public on climate-related health risks
- Increase access to resilient infrastructure and invest in nature-based solutions, particularly in high-risk communities
- Local health depts and community organizations develop risk mitigation plans
- State revise policies to support health given projected increased heat and flood risks

Example Strategies: temperature, flooding

- Fund and support school programming for education on heat-related risks (e.g., ticks, heat stroke) and how to avoid them
- Retrofit cooling shelters, incentivize urban greening for builders/in zoning, and prioritize supporting areas with high UHI effects
- State provide funds, technical support for heat wave plans: show commitment to community organizations
- Review worker safety guidelines to identify workers with greatest heat risk: revise guidelines to protect health

- Train local health dept staff to assess capacity to integrate flood risks into existing plans and operations
- Fund flood mitigation grants, prioritizing vulnerable populations and locations at particular risk to flooding
- State provide funds, technical support for flood risk mitigation plans and post-disaster programs
- Review zoning codes, create system to update to reflect climate projection data

Monitor climate and health metrics; Identify priorities from data; publicize and act on findings

Update community health assessments to include climate change and health data

Increase access to healthy and local food, and support local farmers and food network
**Addressing the Impacts of Increasing Heat and Flooding on Health**

<table>
<thead>
<tr>
<th>Foundational Strategy Type: Identify key plans, policies, regulations to address heat and health risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example(s):</strong> State and local health departments identify: a) community needs by partnering with community organizations and b) business priorities by working with representatives, and then collectively work to strengthen policies and plans to protect public health throughout the Commonwealth</td>
</tr>
<tr>
<td><strong>Actors:</strong> State Department of Health, local health departments, community organizations, business representatives</td>
</tr>
<tr>
<td><strong>Timing:</strong> As soon as possible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approach: Revise policies to support health given projected increased heat and flood risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy:</strong> Review worker safety guidelines to identify workers most at risk; revise guidelines as needed to protect health</td>
</tr>
<tr>
<td><strong>Actors:</strong> State Department of Health, local health departments, community organizations, business representatives</td>
</tr>
<tr>
<td><strong>Timing:</strong> As soon as possible</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Approach: Revise policies to support health given projected increased heat risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy:</strong> Local health departments hold workshops with local community organizations to identify types of jobs where heat risks are greatest, opportunities for increased safety, and potential barriers to implementation or effectiveness</td>
</tr>
<tr>
<td><strong>Actors:</strong> Local health departments, community organizations</td>
</tr>
<tr>
<td><strong>Timing:</strong> After guidelines are reviewed</td>
</tr>
</tbody>
</table>

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<tr>
<th>Approach: Revise policies to support health given projected increased heat risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy:</strong> Local health departments connect with business representatives to identify priorities for supporting workers, potential compliance challenges, and goals for promoting worker safety</td>
</tr>
<tr>
<td><strong>Actors:</strong> Local health departments, business representatives</td>
</tr>
<tr>
<td><strong>Timing:</strong> After guidelines are reviewed and community workshops are held</td>
</tr>
</tbody>
</table>
### Addressing the Impacts of Increasing Heat and Flooding on Health

#### Examples of additional strategies (in Appendix C)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase access to resilient infrastructure and invest in nature-based solutions, particularly in communities at high risk for infrastructure-related health risks (e.g., flood risks from poorly protected infrastructure at low elevation)</td>
<td>State agencies, municipalities</td>
</tr>
<tr>
<td>Retrofit cooling shelters, incentivize urban greening for builders/in zoning, and prioritize supporting areas with high UHI effects</td>
<td>State agencies, municipalities</td>
</tr>
<tr>
<td>Fund flood mitigation grants, prioritizing vulnerable populations and locations at particular risk to flooding</td>
<td>State legislature</td>
</tr>
<tr>
<td>Develop local, community-informed risk mitigation plans</td>
<td>Municipalities, community-based organizations</td>
</tr>
<tr>
<td>State provide funds and technical support for heat wave plans and flood risk mitigation and post-disaster programs show commitment to community organizations</td>
<td>State legislature, state agencies</td>
</tr>
<tr>
<td>State revise policies to support health given projected increased heat and flood risks</td>
<td>State legislature</td>
</tr>
<tr>
<td>Review worker safety guidelines to identify workers with greatest heat risk, revise guidelines to protect health</td>
<td>State agencies, municipalities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Actor</th>
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</thead>
<tbody>
<tr>
<td>Review zoning codes, create system to update to reflect climate projection data</td>
<td>State agencies, municipalities, researchers</td>
</tr>
<tr>
<td>Strengthen climate change public health messaging and outreach (methods, content, and target groups and events)</td>
<td>State agencies, County and Municipal Health Departments, municipalities, community-based organizations</td>
</tr>
<tr>
<td>Engage vulnerable groups through existing community networks to conduct outreach and education on climate and health risks, understand concerns, and solicit potential solutions</td>
<td>Municipalities, County and Municipal Health Departments, State Health Centers, community-based organizations</td>
</tr>
<tr>
<td>Coordinate on health and emergency efforts across sectors</td>
<td>State agencies, municipalities</td>
</tr>
<tr>
<td>Require that emergency preparedness plans include coordination and communication among critical stakeholders. These stakeholders may include community organizations, local businesses, local health departments, hospitals and other healthcare delivery facilities, utilities, and local government</td>
<td>State legislature, state agencies, municipalities</td>
</tr>
</tbody>
</table>
Case Study: Implementing Strategies at PennDOT to Manage Flood Risks, with Health and Safety Benefits

- **Key health risks associated with extreme flooding involve transportation:** 1) physical safety risks from floodwaters or limited access to critical services, and 2) road accidents due to reduced visibility and hazardous driving conditions

- **PennDOT has conducted a vulnerability study and identified resilience strategies,** such as:
  - **Maintenance and Inspections:**
    - Improve maintenance procedures and armoring of stream banks to prepare for potential increased flooding events in the future;
    - Continue to expand and improve methods and procedures for pre- and post-flood inspections of roadways, bridges & streams;
    - Plan for increasing redundancy at roadway locations that may be impacted by storms (ensure secondary roads are maintained and available for use).
  - **Design:**
    - Identify updates to PennDOT design manuals based on national research and other university studies;
    - Program projects to improve stormwater capacity, reduce impermeability and ensure adequate maintenance of infrastructure;
    - Work with municipalities to identify the impacts of development on stormwater management; and Identify facilities requiring design upgrade in advance of funding requests.
Addressing the Impacts of Increasing Heat and Flooding on Overburdened and Vulnerable Populations

Types of Foundational Actions to Understand and Prepare to Address Impacts and Vulnerabilities

- Establish metrics and actors responsible for tracking equity of impacts and solutions
- Identify opportunities for community capacity-building
- Identify key policies and plans to incorporate environmental justice
- Identify vulnerable communities and community-based groups to partner with
- Identify trainings needed to address equity risks
- Convene key actors around equity goals

Approaches to Reduce Vulnerabilities and Manage Impacts

Types of Approaches

- Invest in community capacity-building
- Support vulnerable populations when integrating climate risks into key plans
- Improve infrastructure in vulnerable communities to reduce impacts
- Develop and implement trainings and education

Example Strategies: temperature, flooding

- Create grants for community-based resilience projects (e.g., flood-protected community center with roof garden)
- Study informal heat wave event coping practices; support in emergency plans, given warming projections
- Plant trees and create cooling shelters in areas with many low-income families
- Increase flood mitigation grant funds and reduce application barriers

Ongoing Strategies

- Develop, maintain, and analyze metric-tracking databases
- Train homeless shelter staff on heat hazards; provide supporting supplies (e.g., tick repellant)
- Provide homeless shelter staff and faith leaders with resources on flood risks
- Establish programs or funding streams to implement strategies
- Regularly update climate hazard resource hub for non-expert audiences
Case Study: A Community-Driven Approach to Tackling Heat in Philadelphia

- In 2018, the Philadelphia Office of Sustainability (OOS) launched the “Beat the Heat” initiative to support communities disproportionately exposed and vulnerable to environmental stressors like extreme heat.

- For the Initiative’s pilot, the City convened an interdisciplinary Heat Team to work with community leaders and residents in Hunting Park, one of Philadelphia’s “hottest and most heat vulnerable” neighborhoods, to identify root causes of heat disparities and support “community-driven decision-making about how to reduce these inequities.”

- Example strategies that emerged as next steps include:
  - Implementing cooling measures such as tree plantings and green stormwater infrastructure
  - Reviewing city policies related to land use, green infrastructure, transportation, and outreach to consider how they might address heat
  - Identifying better ways to communicate about heat and cooling resources
Addressing the Impacts of Increasing Average Temperatures on Forests, Ecosystems, and Wildlife
Case Study: Identifying Species Vulnerable to Climate Change to Inform Adaptation Planning

- DCNR and Western Pennsylvania Conservancy launched the Pennsylvania Natural Heritage Program (PNHP), which collects actionable data on the State’s ecological resources to help ensure the biological diversity in the Commonwealth as the climate changes.
  - Statewide corridor analysis
  - Monitor climate impacts to at-risk species like the snow trillium flower
- WPC is using PNHP findings to reshape its conservation planning process
  - Protected 90 acres of land in the Laurel Highlands

Climate Change Connectivity Priority Scores identified in the PNHP study.
Addressing the Impacts of Warmer and Wetter Climate on Agriculture

Types of Foundational Strategies to Understand Impacts and Vulnerabilities

- Improve access to agro-meteorological data
- Model agricultural changes under future climate scenarios
- Improve monitoring for pests and invasive species

Approaches to Reduce Vulnerabilities and Manage Impacts

<table>
<thead>
<tr>
<th>Types of Approaches</th>
<th>Example Strategies</th>
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</thead>
<tbody>
<tr>
<td>Update equipment and land use practices</td>
<td>Purchase wetland easements to buffer productive lands from flood events</td>
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<tr>
<td>Expand regional planning and coordination</td>
<td>Develop agricultural security zones</td>
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<tr>
<td>Education and outreach</td>
<td>Climate change education for agricultural producers</td>
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<tr>
<td>Increase access to financial supports</td>
<td>Provide incentives for farmers to increase storage capacity</td>
</tr>
<tr>
<td>Promote best agricultural management practices</td>
<td>Provide incentives such as reduced agricultural insurance rates</td>
</tr>
<tr>
<td>Improve research and analysis</td>
<td>Research strategies for improved water management systems and design</td>
</tr>
<tr>
<td>Provide decision support tools and technical assistance</td>
<td>Develop and disseminate seasonal climate forecasts</td>
</tr>
</tbody>
</table>

Ongoing Strategies

- Update resources and tools for agricultural producers
- Monitor and disseminate risks from pests and extreme weather
Case Study: USDA Northeast Climate Hubs

- USDA’s climate hubs provide a wide array of information and resources on climate impacts to agriculture and adaptation opportunities.
- The Northeast Hub highlights opportunities from partner agencies and research findings and tools from universities.
  - Highlighted NRCS’s funding opportunities for improving soil management practices
  - Advanced its partnership with Penn State. The Hub is supporting Penn State researchers as they investigate cropping practices that can be used on dairy farms to reduce erosion and minimize the need for fertilizers and pesticides.
Addressing the Impacts of Increasing Average Temperatures on Recreation and Tourism

**Types of Foundational Strategies to Understand Impacts and Vulnerabilities**

- Monitor changing weather and ecological conditions
- Research changing weather and ecological conditions

**Approaches to Reduce Vulnerabilities and Manage Impacts**

<table>
<thead>
<tr>
<th>Types of Approaches</th>
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<tr>
<td>Alter existing recreation spaces to mitigate heat</td>
<td>Increase trees and vegetation cover to expand shade</td>
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<tr>
<td>Increase awareness of climate change impacts in recreational areas</td>
<td>Educate and outreach to recreational fishermen about ecosystem health</td>
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<tr>
<td>Provide assistance to affected recreation industries</td>
<td>Establish a grant fund to help businesses shift from winter to summer activities</td>
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<tr>
<td>Develop best practices</td>
<td>Review existing maintenance schedules (watering, mowing, etc.)</td>
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<tr>
<td>Coordinate efforts between stakeholders</td>
<td>Establish a working group of stakeholders</td>
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Case Study: Transforming Winter Ski Resorts

- Ski resorts and winter recreation areas are deploying snowmaking and snow storage techniques to keep skiing seasons viable.
  - Many have invested in snowmaking technologies.
  - Other innovative techniques like snow storage could also be explored.
- Ski resorts have started investing in services for year-round recreation.
  - E.g., Seven Springs Mountain Resort and Blue Mountain Resort offer dozens of mountain biking trails.
  - E.g., Montage Mountain Ski Resort developed a zip line and outdoor water park to mitigate reductions in winter activity.

A cyclist mountain biking at Blue Knob State Park. The park provides year-round outdoor recreation activities including winter sport opportunities (e.g., skiing) as well as a wide array of summer opportunities (e.g., mountain biking).
Addressing the Impacts of a Changing Climate on Built Infrastructure

Types of Foundational Strategies to Understand Impacts and Vulnerabilities

- Identify assets and systems in flood risk or flood prone areas
- Evaluate and prioritize vulnerable assets and systems
- Map vulnerable regions and infrastructure
- Improve preparedness and early warning systems

Approaches to Reduce Vulnerabilities and Manage Impacts

- Harden, protect, or relocate at-risk assets
- Encourage utilities to assess vulnerable assets
- Implement new or modified land use policies and practices
- Education and outreach
- Stakeholder engagement and collaboration
- Improve preparedness and early warning systems
- Encourage adoption of adaptive design and flood management practices
- Provide decision support tools and funding opportunities

Example Strategies

- Purchase wetland easements to buffer productive lands from flood events
- Support a regional evaluation of utility networks vulnerable to storm surge to determine weak links
- Encourage reduction of impervious surfaces and implement green infrastructure
- Educate property owners about flood inundation levels
- Work with local jurisdictions to incorporate flooding into ongoing land use planning efforts
- Increase the accuracy and technological capabilities of flood forecasting
- Update flood proofing construction requirements
- Develop decision tools to evaluate replacement, modification, and design life for infrastructure

Ongoing Strategies

Collect and gather data on flooding and at-risk areas before and after flooding events
Case Study: Reducing Flood Hazards in New York City

The Hurricane Sandy Rebuilding Task Force (Task Force) and U.S. Department of Housing (HUD) launched the “Rebuild by Design” competition as part of the Hurricane Sandy recovery process.

- This competition crowd-sourced innovative design solutions to promote resilience in the areas impacted by Hurricane Sandy.

One of the winning projects, “The Big U”, proposed building “10 continuous miles of protection” along the impacted coast in New York City.

- The project proposes segmenting the coast into sections, with each area identifying specific infrastructure and social community planning goals.
- An “integrated flood protection system” is planned to reduce flood risk, including floodwalls and flood gates, a raised bulkhead and underground seepage barrier, and elevated parks along the East River.

“The Big U” Vision.
Addressing the Impacts of Landslides on Built Infrastructure

Types of Foundational Strategies to Understand Impacts and Vulnerabilities

- Systematically identify and map landslide-prone areas
- Include landslide risk in planning

Approaches to Reduce Vulnerabilities and Manage Impacts

**Types of Approaches**
- Reduce vulnerability or relocate critical assets
- Education and outreach
- Update landslide management practices
- Improve collaboration between stakeholders
- Deploy various policy tools to encourage smart development
- Increase support for landslide mitigation

**Example Strategies**
- Relocate substations to more protected areas under current and future conditions
- Conduct trainings for municipal staff about climate-resilient land use
- Develop an asset management framework that considers routes’ potential for failure
- Develop a strategy to coordinate emergency responses to landslide events
- Limit development in high-risk areas through zoning and overlay controls
- Provide funding for municipalities pursuing slope stabilization projects

**Ongoing Strategies**
- Maintain and update landslide maps
- Monitor at risk areas for possible stresses (e.g., heavy rainfall) that might precede landslides
Case Study: Predicting and Mapping Landslides in Allegheny County

- In 2018, Allegheny County experienced landslides that amounted to an estimated $40 million dollars in damage. In response, the County created a Landslide Task Force.
  - The Task Force coordinates both county departments (e.g., Emergency Services, Public Works, Budget) and external stakeholders (e.g., Carnegie Mellon, PEMA, National Weather Service, PennDOT, DEP, utilities)
  - The County also developed a Landslide map tool, which identifies sites with recent or historic landslides, and highlights areas with landslide risks.
Suggested Review Considerations for Adaptation Strategy Pathways in the CAP

• Are there any gaps in the information provided that you suggest be filled?
• Do you have any suggested improvements or additional information that you recommend including in the report to help reader understanding or provide a richer discussion?
• Are there other examples or information that you think would be relevant to add?
Implementation Considerations

• Approach
• Recommended Considerations for CCAC Review
Implementation Approach

Challenges and opportunities
Implementation Principles
Equitable and beneficial implementation
Monitoring and Evaluation
Key stakeholders
Implementation Approach: Challenges and Opportunities

Challenges

• Costs:
  • Some mitigation and adaptation actions will have high costs, especially upfront costs
  • Securing funding can be difficult and piecemeal
  • Stakeholders should consider holistic accounting of costs, including costs of inaction, future cost savings, and the value of co-benefits

• Political will and resistance to change:
  • The actions proposed in the CAP will create change in people’s lives and work, and change can be hard
  • Political views on climate change, energy, transportation and other topics may delay or prevent action on certain strategies in the CAP
  • Education and outreach, and careful program design can help alleviate these concerns
Opportunities

• **Increase jobs and expand business:**
  - As new technologies and policies are implemented, job and business opportunities increase.
  - Clean energy jobs are one of the fastest growing sectors.
  - Potential revenue from RGGI could be invested in businesses or programs that help decarbonize the economy.

• **Build resiliency:**
  - Resilient infrastructure and energy systems and greater energy security are increasingly important as the climate changes and becomes more variable and extreme.
  - Industries and local governments can adopt plans to adapt their systems and infrastructure to ultimately reduce or eliminate risks of their vulnerable assets, which can be supported by FEMA Building Resilient Infrastructure Communities (BRIC) funding.
Implementation Approach: Challenges and Opportunities

• Increase equity:
  - GHG reduction and climate resilience strategies should be designed to ensure equity and to protect all communities, especially the most vulnerable.
  - Improving equity can overlap with job growth opportunities—job training and advancement programs should be focused on low-income and marginalized individuals so that they can participate in the clean energy economy.

• Increase environmental and health benefits:
  - With the reduced combustion of fossil fuels, the Commonwealth would see a sharp decrease in air and water pollutants, improving the health of Pennsylvanians.

• Optimize land use:
  - The recommended strategies provide opportunities to optimize land use (e.g., suitable locations for solar, public transit-oriented development).
  - Optimal land-use also presents a prime opportunity to implement both GHG reduction and climate adaptation strategies in concert.
Implementation Approach: Principles

• To effectively implement the CAP and the strategies proposed within it, strategy implementation will be guided by the following principles:
  • Enhance collaboration between government and stakeholders.
  • Consider the needs of vulnerable communities and the effects of actions on equity, access, and inclusion.
  • Conduct monitoring and evaluation (M&E) assessments of strategies.
Implementation Approach: Equitable and Beneficial Implementation

- Designed to equitably and beneficially improve the lives of Pennsylvanians.
- Both the benefits and costs of implementing the CAP should be equitably distributed.
- Some primary ways to design for equitable and beneficial outcomes include:
  - Developing equity indicators,
  - Identifying areas or communities with low equity outcomes,
  - Assessing the causes of inequity and the needs of different communities, and
  - Developing implementation methods that reduce the causes of inequity.
Effectively implementing the CAP will require many stakeholders and leaders including:

- Citizens
- Businesses and industries
- State legislature
- State government agencies
- Local government
- Utilities
- Public Utilities Commission
- Federal government

Each group of stakeholders will play a unique but vital role, and all will be needed to most effectively implement the CAP.
Implementation Approach: Monitoring and Evaluation (M&E)

• M&E is a framework for effective strategy implementation.
• M&E is used to track and assess the performance of strategies over time with the goal of improving current and future performance.
• Depending on the indicators and interim evaluations, strategies can be corrected to improve future outcomes.
• M&E does require additional resources, but the potential cost savings and long-term improvements in performance typically offset resource costs.
• Evaluation findings can be used to raise awareness of and to promote effective strategies, attract investments, and provide accountability and transparency.
Next Steps
Climate Action Plan Timeline

Early May
Address CCAC comments & finalize economic modeling

Late May
Draft Final CAP, including editing and formatting, Executive Summary, and Final Appendices

June
Present Final CAP to CCAC
Next Steps

• Please review these slides and the latest CAP document. Then submit any written feedback to lbyron@pa.gov by May 11, 2021.
• Please consider the recommended questions in this presentation as you are reviewing, but as usual, all comments and feedback are welcome.
• Suggested sections for providing comments, based on the amount of new content:
  • Section 3: Opportunities for Reducing GHG Emissions in PA
  • Section 4: Opportunities to Adapt to the Impacts of Climate Change in PA
  • Section 5: Implementing Climate Action in PA
• DEP and ICF will review feedback and incorporate it into the CAP development process.
• Next CCAC meeting is June 27, 2021.
  • Will share the final CAP and request CCAC letters.
Thank You
Agenda

- Introduction
  - Approval of February minutes
- Summary of CCAC Feedback
- ICF Presentation on 2021 CAP
  - **2021 CAP discussion**
- Break
- Public Comment
- Updates
- New Business
- Next Steps/Next meeting
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Public Comment (15 min)
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Updates

- Membership Update
- RGGI status
- AEPS 2020 Annual Report
- GreenGov 2020 Annual Report
- Gov. Wolf’s 3/22 Solar Announcement
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# Tentative 2021 IA/CAP Review Timeline

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<thead>
<tr>
<th>Meeting Date</th>
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<th>Shared w/ CCAC</th>
<th>Feedback Requested</th>
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| **2/23/2021** | - Final IA with refined findings  
- Updated Draft CAP with supporting analysis information incorporated (GHG mitigation results, enabling technologies, adaptation pathways)  
- Initial economic and co-benefits information, as available | 2/9/2021       | 3/2/2021          |
| **4/27/2020** | - Draft Final CAP and supporting analysis information, including all near final economic and co-benefits analyses | 4/20/2021      | 5/11/2021         |
| **6/22/2021** | - Final CAP from ICF                                                      | 6/15/2021      | TBD (letters)      |
2021 Regular Meeting Dates:
• **Tuesday February 23**
• **Tuesday April 27**
• **Tuesday June 22**
• Tuesday August 24
• Tuesday October 26
• Tuesday December 14