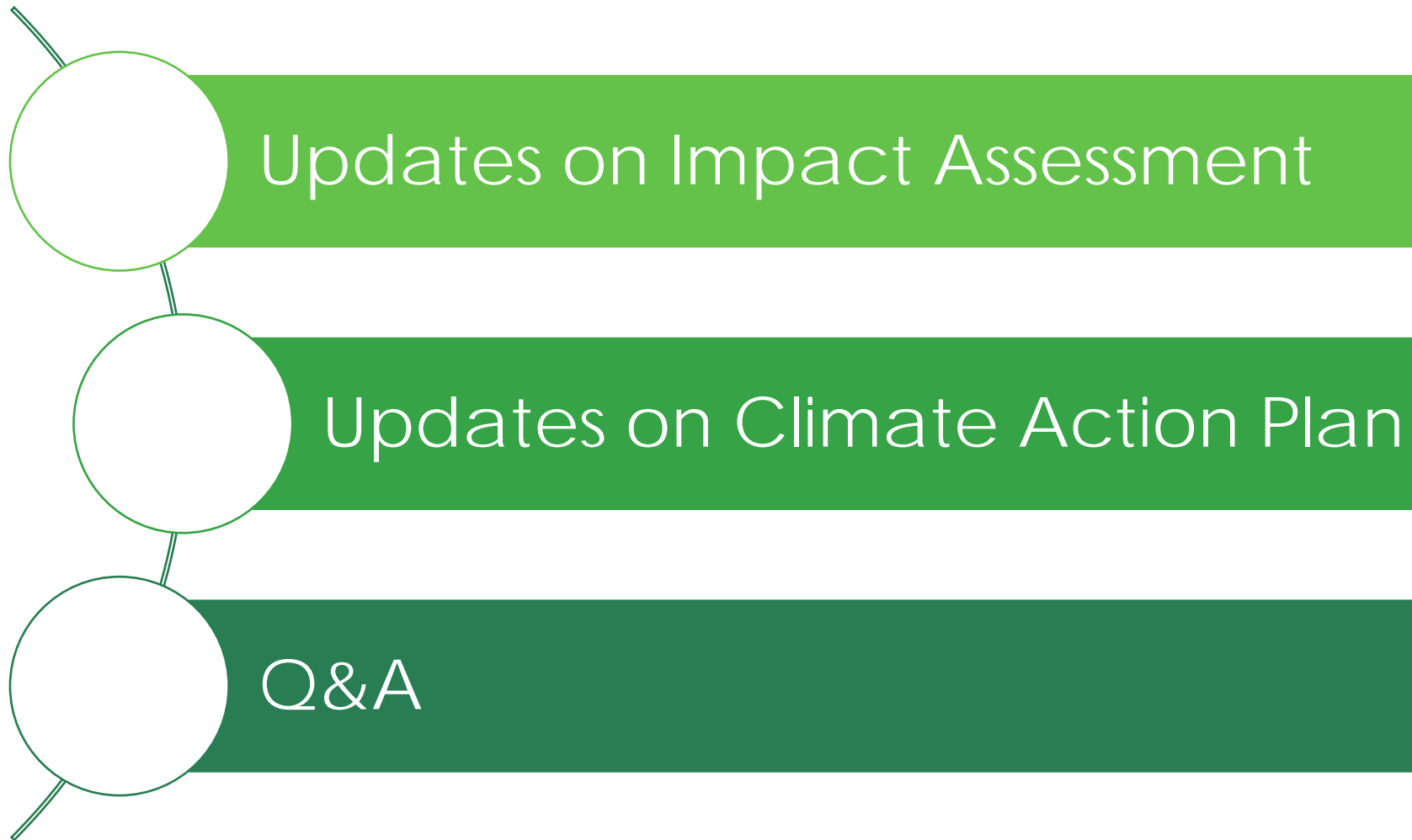


2021 Pennsylvania Impacts Assessment and Climate Action Plan

CCAC Meeting October 27, 2020

Agenda



Today's Presenters from ICF



Cassie Bhat
Impacts Assessment Lead



Deb Harris
Project Manager, CAP
Lead



Tommy Hendrickson
Deputy Project Manager,
CAP and IA Technical
Expert



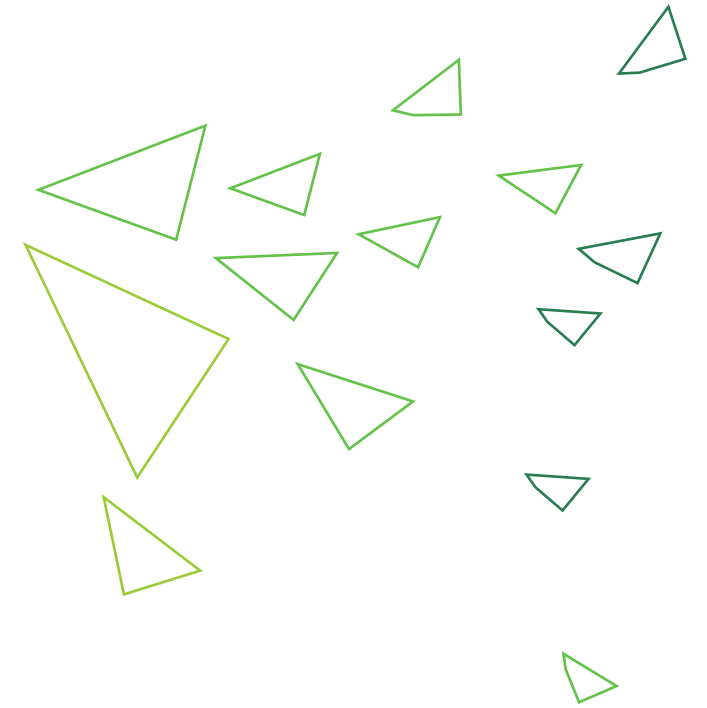
Bill Prindle
Sustainable Energy and
Climate Expert



Impact Assessment

Updates

- Orientation to Initial Draft
- Timeline
- Next Steps



Key Definitions

Climate hazard

- Climate related events or indicators, such as temperature and precipitation

Risk

- The chance a climate hazard will cause harm. Risk is a function of the likelihood of an adverse climate impact occurring and the severity of its consequences

Likelihood

- The probability or expected frequency a climate hazard is expected to occur

Consequence

- A measure of the severity of impacts from a climate hazard

Impact Assessment: Status Update

- Completed the **Initial Draft**

- Further developed **risk assessment methodology** (Appendix B)

- Annotated outline** with additional details on the main report sections, adjusted based on feedback from DEP and the CCAC

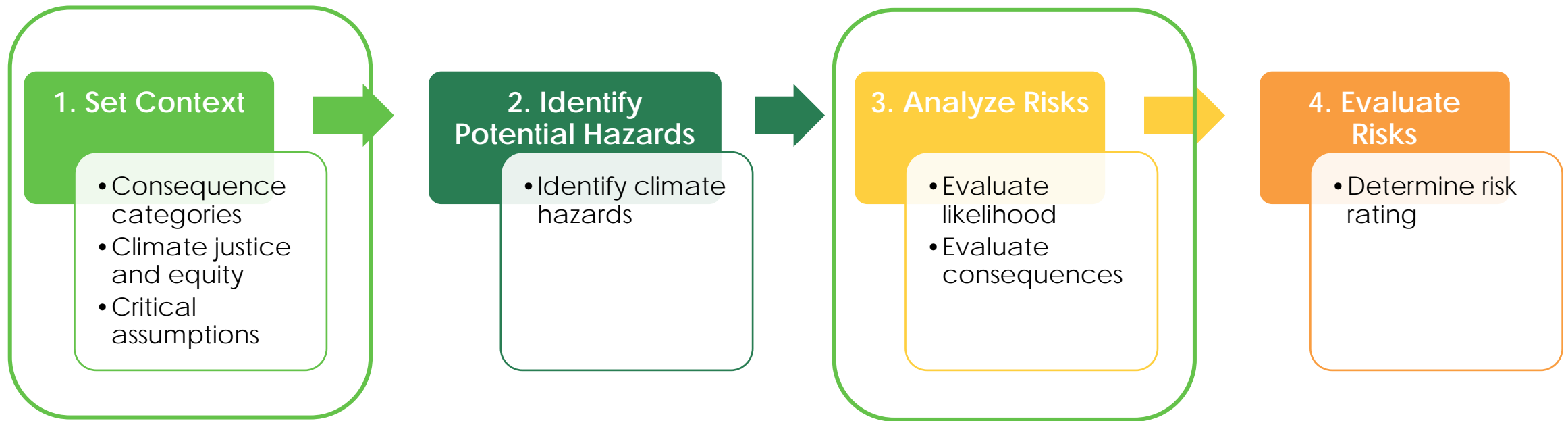


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8.1.5	Step 4 – Evaluate Risks.....

Appendix B: Risk Assessment Methodology

- Developed a detailed risk assessment methodology



Step 1: Set Context

Consequence Categories:

- Human health
- Environmental justice and equity
- Economy
 - Agriculture
 - Recreation and Tourism
 - Other economic activity (e.g., energy sector)
- Forests, ecosystems, and wildlife
- Built infrastructure

Environmental Justice and Equity

- Analysis and discussion of what drives inequitable impacts or vulnerabilities
- Overview of exposure
- Environmental justice and equity rating will capture factors that exacerbate identified vulnerabilities, or fall on already-overburdened communities

Step 3: Analyze Risks – Likelihood Rating Scale



Likelihood	Rating	Criteria for Discrete Hazards	Criteria for Ongoing Hazards
Highly Likely	4	Greater than 50% annual probability	Risk is extremely likely to cross critical threshold by the 2050s.
Likely	3	Between 10% and 50% annual probability	Risk is likely to cross critical threshold by the 2050s. It would be surprising if this did not happen.
Possible	2	Between 2% and 10% annual probability	Risk is just as likely as not to cross critical threshold by the 2050s.
Unlikely	1	Below 2% annual probability	Risk is not anticipated to cross critical threshold by 2050s.

Step 3: Analyze Risks – Consequence Rating Scale

	Human Health	Environmental Justice & Equity	Economy			Forests, Ecosystems, and Wildlife	Built Infrastructure
			Agriculture	Recreation and Tourism	Other (e.g., Energy)		
4 – Catastrophic	1000+ people potentially affected; high number of deaths or injuries possible; long duration of impact	Percent of population in EJ areas that is exposed is > 2x the average percent of population exposed statewide	Severe, disruption to multiple industries and employment lasting months to years Over \$1 billion in potential annual losses	Severe disruption to multiple seasons or employment Over \$1 billion in potential annual losses	Severe, disruption to multiple industries and employment lasting months to years Over \$1 billion in potential annual losses	Irreversible damage to a significant natural asset	Over 50% of infrastructure in affected area damaged, destroyed or completely shut down; long duration impact for critical facilities (30+ days), or potential for at least impact across >50% of the state
3 – Critical	100-1000 people affected; multiple deaths, sicknesses, or injuries possible; moderate to long duration of impact	Percent of population in EJ areas that is exposed is 1.5-2x the average percent of population exposed statewide	Moderate, disruption to multiple industries and employment; or severe impacts to one industry lasting months to years \$100 million to \$1 billion in potential annual losses	Severe disruption to one season or employment \$100 million to \$1 billion in potential annual losses	Moderate, disruption to multiple industries and employment; or severe impacts to one industry lasting months to years \$100 million to \$1 billion in potential annual losses	Widespread damage to a natural asset Recovery would take years to decades	More than 25% of infrastructure in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week., or potential for at least moderate impact across > 25% of the state
2 – Limited	10-100 people affected; minor injuries only; brief to moderate duration of impact	Percent of population in EJ areas that is exposed is 1-1.5x the average percent of population exposed statewide	Moderate, weeks- to months-long disruption to multiple industries and employment; or severe short-term impacts to one industry \$10 million to \$100 million in potential annual losses	Moderate disruption to multiple seasons or employment; or severe weeks-long disruption to one season \$10 million to \$100 million in potential annual losses	Moderate, weeks- to months-long disruption to multiple industries and employment; or severe short-term impacts to one industry \$10 million to \$100 million in potential annual losses	Localized, significant damage to a natural asset Recovery would take years to decades	More than 10% of infrastructure in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.
1 – Minor	Very low potential for health impacts; very few injuries, if any; brief duration of impact	Percent of population in EJ areas that is exposed is equal to or less than the average percent of population exposed statewide	Moderate-to-minor disruption to industries and employment Or < \$10 million in potential annual losses	Moderate disruption to one season or employment Less than \$10 million in potential annual losses	Moderate-to-minor disruption to industries and employment Or < \$10 million in potential annual losses	Localized, moderate damage to a natural asset Recovery would take months to years	Only minor property damage. Temporary shutdown of critical facilities.

Step 4: Evaluate Risks



Risk Rating Matrix

Likelihood	Consequence			
	Minor	Limited	Critical	Catastrophic
Highly Likely	4	8	12	16
Likely	3	6	9	12
Possible	2	4	6	8
Unlikely	1	2	3	4

Risk Rating Rubric

Risk Score (low end inclusive)	Rating
1 - 2	Low
3 - 9	Medium
6 - 9	High
12+	Extreme

Impact Assessment: Status Update

- Completed the **Initial Draft**
- Further developed **risk assessment methodology** (Appendix B)
- **Annotated outline** with additional details on the main report sections, adjusted based on feedback from DEP and the CCAC

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Report Section 3. Expected Climate Changes in Pennsylvania

- Key findings related to climate change in Pennsylvania and notable changes from the last IA



- Localized Constructed Analogs (LOCA) downscaled data – 1/16 degree
- 32-model ensemble, presenting values for 10th, 50th, and 90th percentile across models
- RCP 4.5 (late-century) and RCP 8.5 (mid- and late-century)
- Key time periods:
 - Baseline: 1981-2000
 - Present: 2011-2040
 - Mid-century: 2040-2070
 - Late-century: 2070-2099

Report Section 4. Summary of Overall Climate Risks

- Summary of highest priority risks based on relative likelihood and consequence
- Prioritized ranking of climate risks per consequence category
- Overview of potential economic impacts and economic opportunities created by potential need for greenhouse gas mitigation strategies

Increased
average
temperature



Heat Waves



Heavy
precipitation and
inland flooding



Landslides



Sea level rise



Severe tropical
and extra -tropical
cyclones



Report Section 5. Risk Summaries by Hazard

Increased average temperature



Heat Waves



Heavy precipitation and inland flooding



Landslides



Sea level rise



Severe tropical and extra-tropical cyclones



Likelihood

- Current climate conditions
- Downscaled climate projections for mid-century
- Trends beyond 2050

Consequences

- Human health
- Environmental justice and equity
- Agriculture
- Recreation and tourism
- Other economic activity
- Forests, ecosystems, and wildlife
- Built infrastructure
- Potential economic opportunities

Overall Risk

- Overall risk rating (low, medium, high) for present day and mid-century

Likelihood	Consequence			
	Minor	Limited	Critical	Catastrophic
Highly Likely	4	8	12	16
Likely	3	6	9	12
Possible	2	4	6	8
Unlikely	1	2	3	4

Example Risk Summary Table

Likelihood

Timeframe	Rating	Justification	Confidence
Current	2	...	High
2020-2050	3	...	High
Beyond 2050	...		Medium

Consequence

Category	Rating	Justification	Confidence	Differential Impacts
Human health	3	... (e.g., hundreds of people could be exposed)	High	Areas in flood zones may face more severe flooding.
Environmental justice and equity	2	...	Low	
Economy: Agriculture	2	...	Low	Areas in flood zones may face more severe flooding. Southeastern Pennsylvania may be hit severely where flooding is exacerbated because of proximity to the coast.
Economy: Recreation and tourism	2	...	Low	
Economy: Other (e.g., energy)	2	...	High	
Forests, ecosystems, and wildlife	1	...	Low	
Built Infrastructure	2	...	High	Southeastern Pennsylvania may be hit severely where flooding is exacerbated because of proximity to the coast.

Overall Risk

Current	4 Medium
2050s	6 High

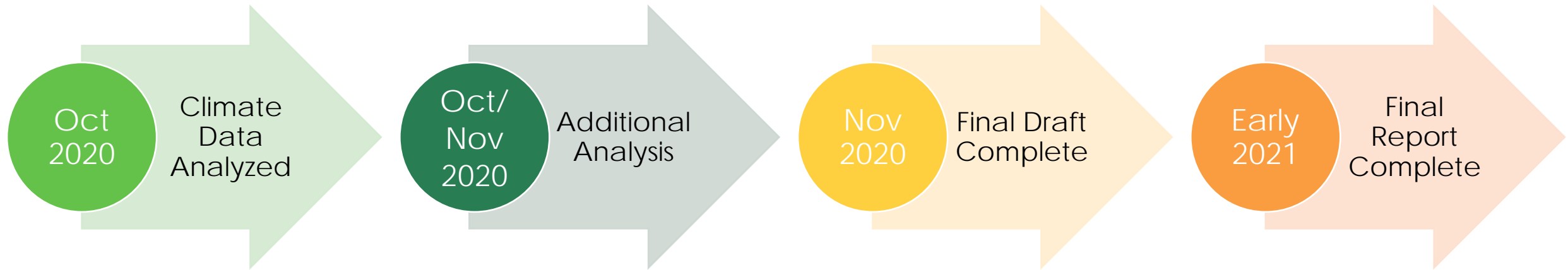
Next Steps

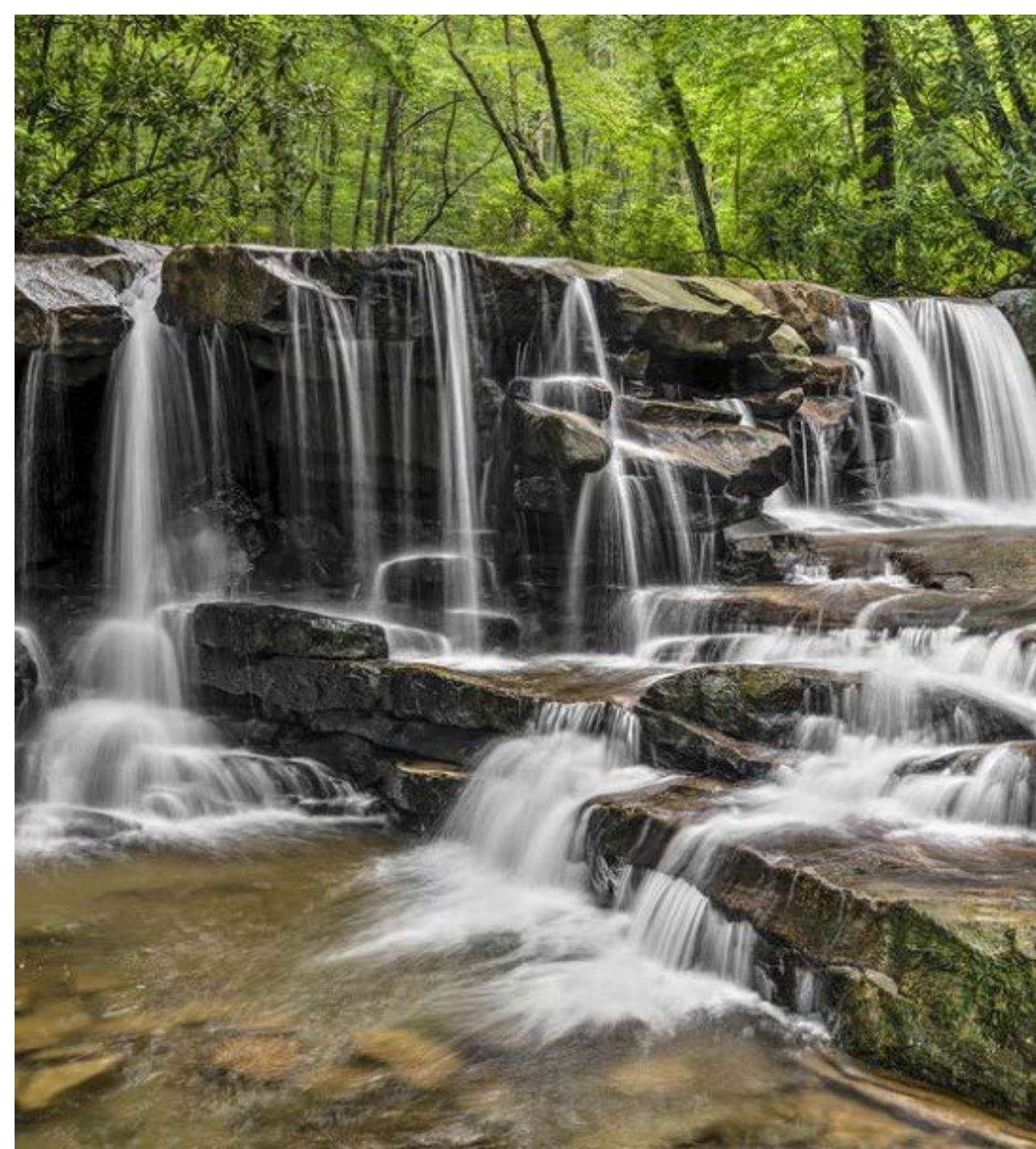
1) Prepare and analyze downscaled climate projections

2) Draft risk profiles based on projected likelihood and consequence of impacts

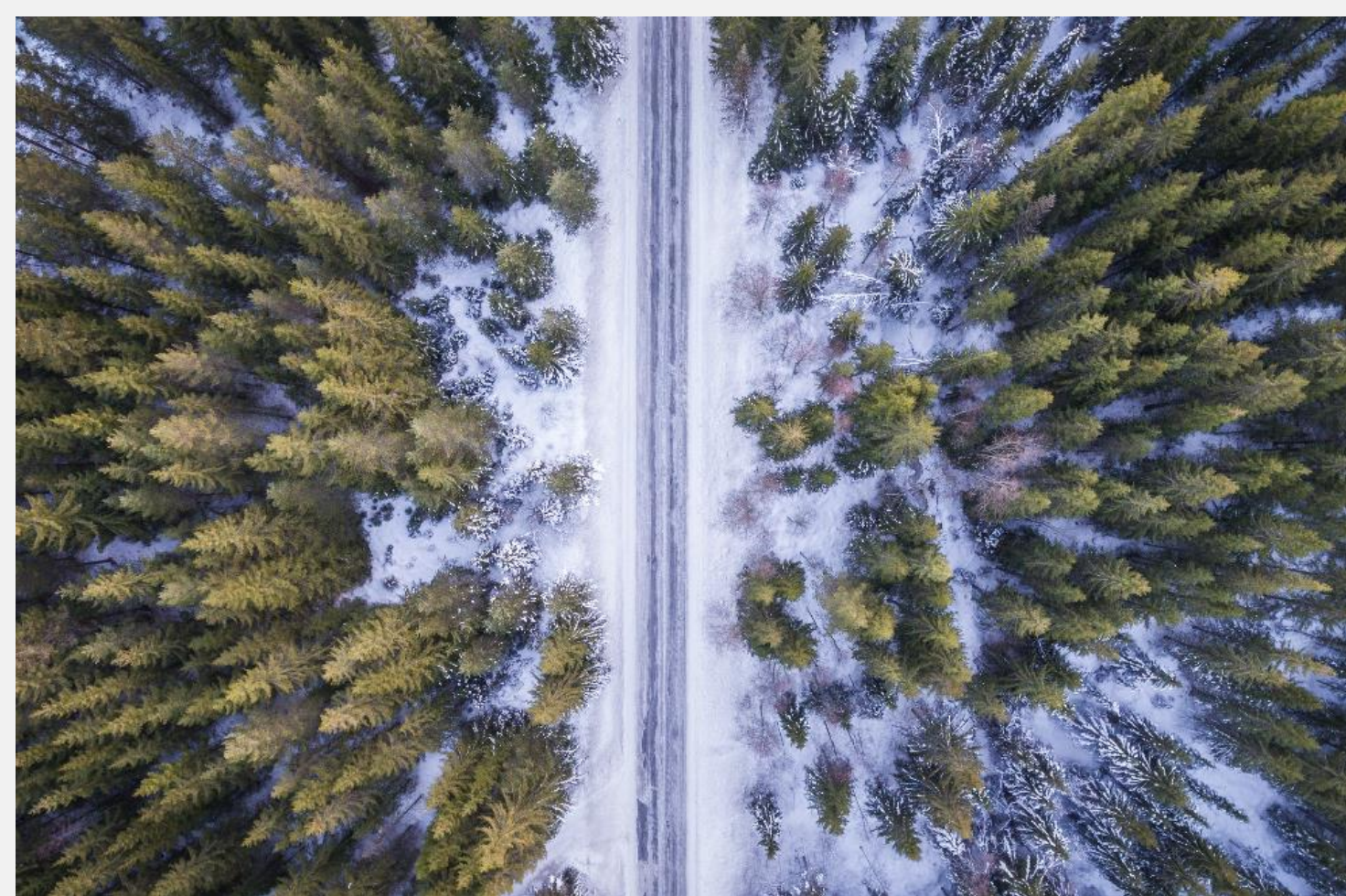


Impact Assessment Timeline





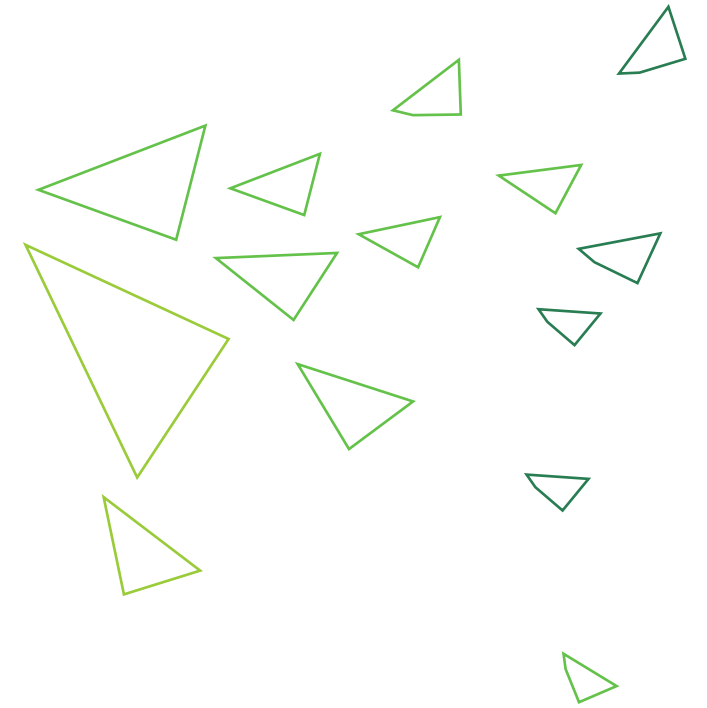
Discussion



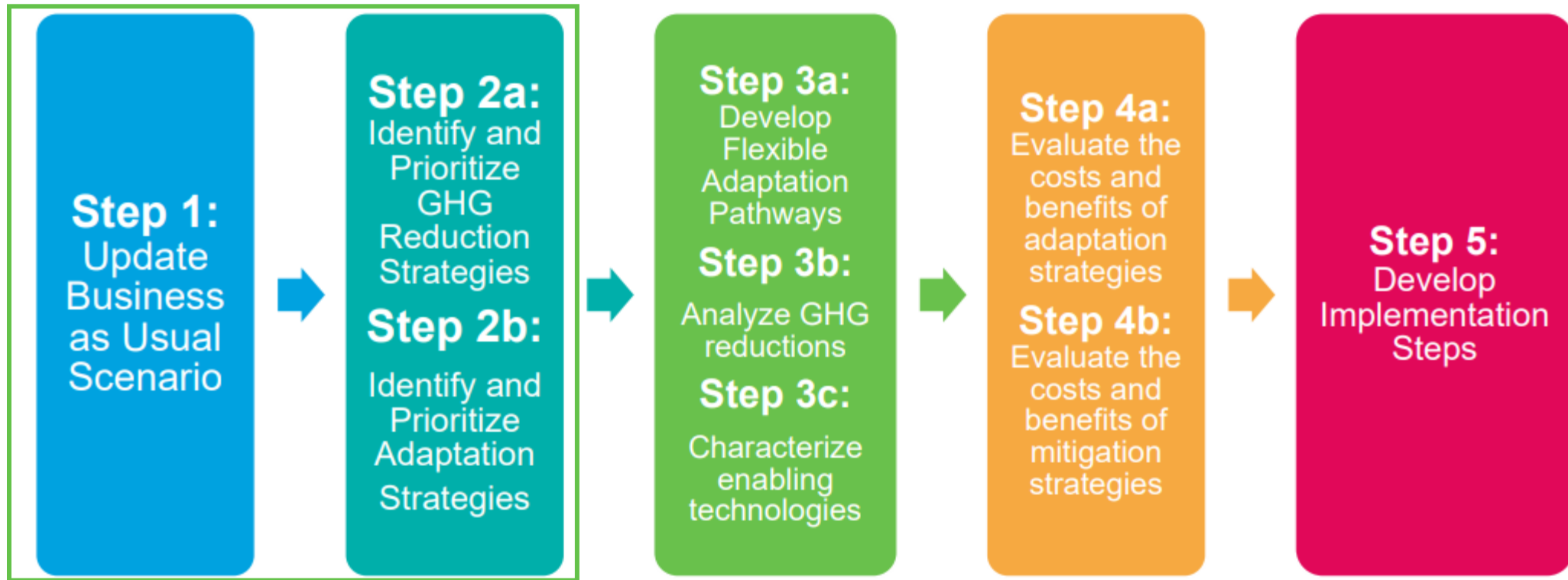
Climate Action Plan

Updates

- Overview of Updates
- BAU
- GHG Reduction Strategies



Climate Action Plan: General Approach



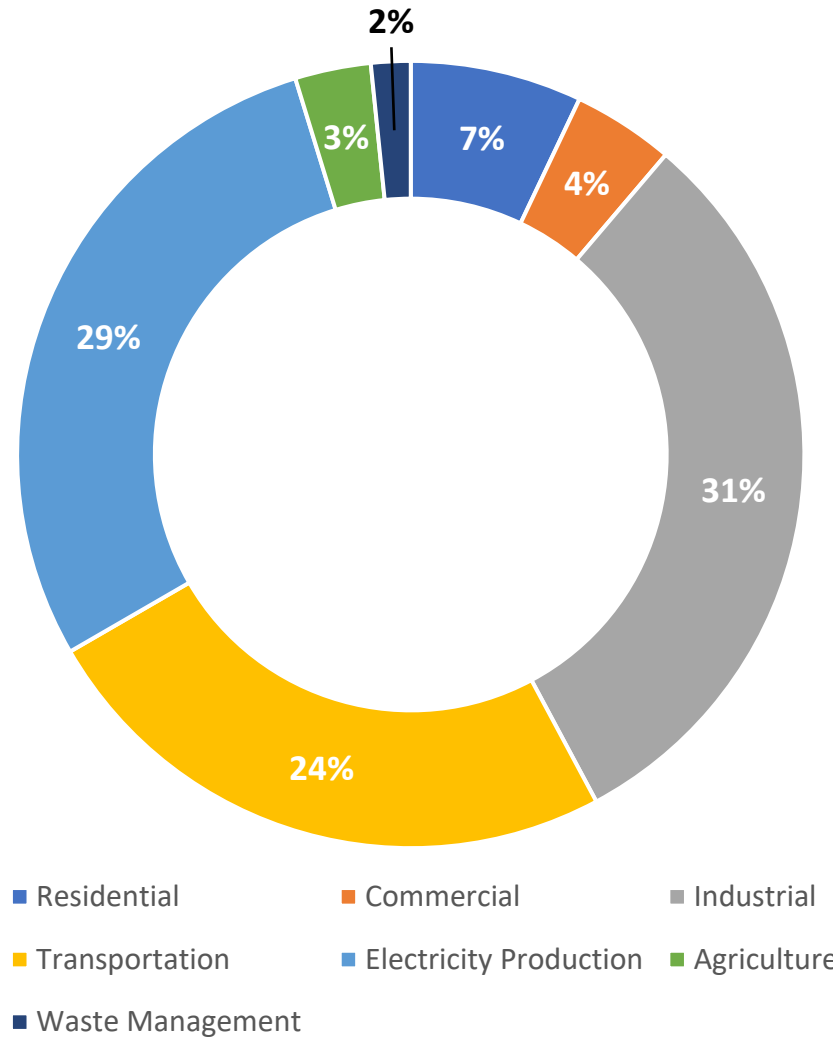
Overview of Updates

- Have begun updating the BAU scenario (Step 1)
 - Identified data sources and scope
 - Have begun documenting the methodology used to create the BAU
- Have identified potential GHG reduction strategies and begun prioritizing them based on screening criteria
 - Identified potential strategies
 - Identified prioritization criteria for potential strategies
 - Prioritized strategies and selected which to model
- Have drafted an outline of the CAP and begun annotating it to build it out



GHG Inventory

Pennsylvania 2017 GHG Emissions



BAU: Scope (Step 1)

- The BAU model will begin in 2005, as this is the baseline year for the Commonwealth's 80x50 goal
- The BAU scenario will incorporate activity data and emissions projections through 2050
- Sectors include:
 - Transportation
 - Residential and Commercial Buildings (reported for informational purposes)
 - Industrial
 - Oil and Gas Systems
 - Electricity Generation
 - Waste and Wastewater
 - Agriculture
 - LULUCF
- Annual projections for the BAU will begin in 2018 and continue up to and including 2050
- Projections will be summarized in 5-year increments
- Historical data will be based on the state inventory

BAU: Methodology (Step 1)

Data: Historical energy and emissions estimates will be compiled using data primarily from:

1. EPA's State Inventory Tool (SIT)

- Used for non-energy projections
- Provides a combination of population-based forecasts and other state-specific data

2. State Energy Data System (SEDS)

- Used to provide activity data at the state-level and can be disaggregated by sector
- Data is incorporated in the SIT

3. Energy Information Administration (EIA)

- Used for projections of future emissions
- Supplemented with input from ICF's Integrated Planning Model (IPM)

4. State-specific data sources

- Data such as standards set by Act 129 and the AEPS will also be considered in BAU projections

Notes:

- The BAU assessment will follow the GHG accounting methods applied within the existing state GHG inventory
- The BAU will incorporate policies on the books as of September 2020
- Sector-specific approaches are being developed to identify the most appropriate data sources and methods

GHG Reduction Strategies: Methodology (Step 2a)

Developed potential strategies

- DEP and ICF developed a list of potential GHG reduction strategies to include in the CAP.
- Feedback was received on the strategies from the CCAC in August and September.
- Strategies were further refined, consolidated, and defined based on feedback.



Developed scoring criteria

- DEP and ICF used 7 criteria to score and prioritize the strategies with varying weights:
 - GHG reduction magnitude
 - Ease of implementation (legal, institutional)
 - Initial investment required
 - Cost effectiveness
 - Air quality benefits
 - Public health benefits
 - Resilience benefits
 - Environmental justice and equitable implementation benefits



Selected initial reduction strategies

- Based on the results of the scoring, DEP preliminarily selected certain strategies to include in the CAP, as well as a subset of actions to model.

GHG Reduction Strategies: Selected Strategies

Electricity Generation

- Implement policy to maintain nuclear generation at current levels
- Increase AEPS Tier 1 targets and the solar share (e.g., carbon free grid)

Waste

- Reduce food waste
- Reduce waste generated by citizens and businesses and expand beneficial use of waste

Buildings

- Expand Act 129 and incentivize/educate via programs like LIHEAP/WAP
- Support EE through building codes
- ★ Introduce state appliance efficiency standards
- Take actions to promote and advance C-PACE financing and other tools for NZB and high-performance buildings
- ★ Incentivize building electrification

Fuel Supply

- Increase production of bio/renewable gas
- Incentivize and increase use of distributed CHP and consider combining with microgrids
- Implement policies and practices to reduce methane emissions across oil and gas systems

Industrial

- Increase industrial EE by expanding energy assessments and providing trainings e.g., E4

Transportation

- Reduce VMT for single-occupancy vehicles via travel demand strategies
- Increase adoption of alternative fuel vehicles
- ★ Implement MHDV MOU (net zero tailpipe emissions from MHDVs by 2050)
- ★ Implement a Low Carbon Fuel Standard

Agriculture

- Provide trainings/tools to implement best practices (e.g., no till)
- ★ Offer programs, tools, and incentives to increase EE for ag. end uses

LULUCF

- ★ Expand forest and crop lands (soil) and sequester carbon naturally, and increasing urban green space

★ Starred actions indicate new or expanded strategies compared to the 2018 CAP

GHG Reduction Strategies: Strategies to Model

Electricity Generation

- Implement policy to maintain nuclear generation at current levels
- Increase AEPS Tier1 targets and the solar share (e.g., carbon free grid)

Agriculture

- Provide trainings/tools to implement best practices (e.g., no till)
- Offer programs, tools, and incentives to increase EE for ag. end uses

Buildings

- Expand Act 129 and incentivize/educate via programs like LIHEAP/WAP
- Support E2 through building codes
- Incentivize building electrification

LULUCF

- Expand forest and crop lands (soil) and sequester carbon naturally, and increasing urban green space

Fuel Supply

- Increase production of bio/renewable gas
- Incentivize and increase use of distributed CHP and consider combining with microgrids
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- Reduce VMT for single-occupancy vehicles via travel demand strategies
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Enabling Technologies List

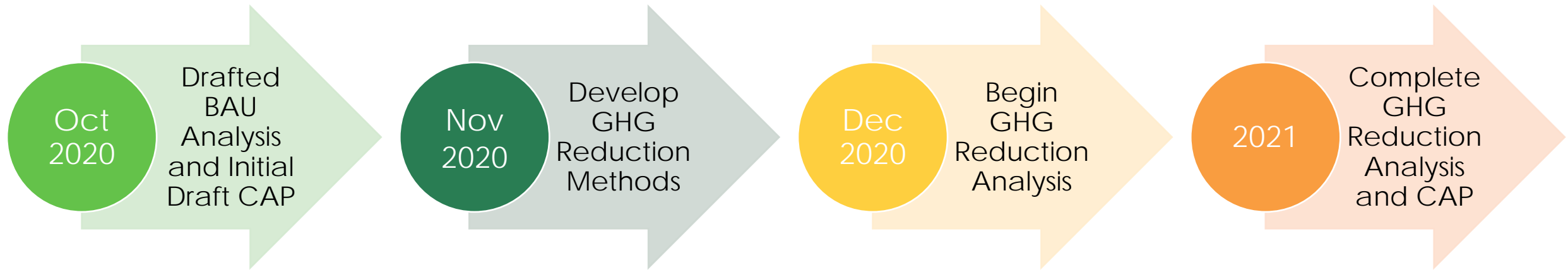
- Encourage and incentivize battery storage at grid level
 - This enabling technology discussion would be paired with the AEPS
- Analyze the potential role of P2G and hydrogen (blue and green) across sectors in meeting PA's goals
- Analyze the potential role of carbon capture, use and geologic sequestration in meeting PA's goals
- Implement peak load and balancing strategies
 - Behind the meter storage, building load flexibility, plug load flexibility, dual fuel heat pumps, TOU rates
- Provide resources and education on Direct Air Capture
- Analyze the potential role of carbon offsets in meeting PA's goals
- Provide resources and education on disruptive digital technologies

Feedback and Discussion

- Is there a reduction strategy that is not included that you believe should be in the CAP?
- Do you want to make comments about the application or specificity around each strategy?
- Do you agree with the actions proposed for modeling? Why or why not?
- Are there any assumptions you think should be applied to the strategies being modeled? And do you think they should be more aggressive or more relaxed?
- Which actions do you believe should be top priority actions to implement?
 - Take 5 minutes to write down 3-5 reduction strategies you think should be prioritized.
 - Note the level of effort you believe should be applied to implement the priority action, (e.g., aggressive effort, moderate effort, minimal effort).

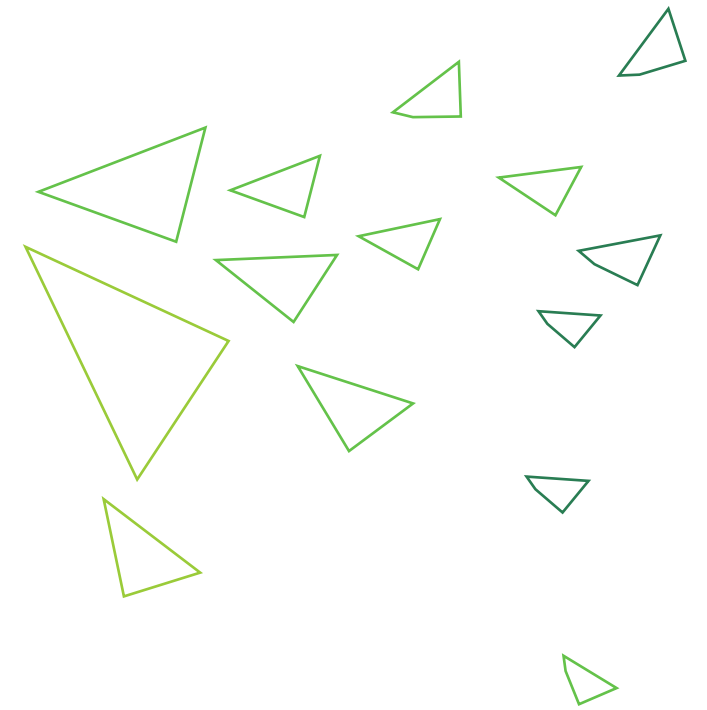
Please share your thoughts with the group today and document them in written feedback for DEP and ICF.

Climate Action Plan Timeline





Next Steps



Next Steps

- Please submit any written feedback to lbyron@pa.gov by November 3rd
- DEP and ICF will review feedback and incorporate it into the IA and CAP development process
- Next CCAC meeting is December 2020
 - Will share latest updates, including:
 - Refined impacts and risk analyses
 - Rough order of magnitude of the costs of direct impacts of climate
 - BAU Analysis
 - Final list of GHG reduction strategies and methods
 - A characterization of enabling technologies



Thank You