

Vermont Transportation Carbon Reduction Strategy

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HOUSE TRANSPORTATION COMMITTEE

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Agenda

Introductions

Project objectives and timeline

Public and stakeholder engagement

Phase 1 – evaluation of VTrans' Capital Program

Phase 2 – scenario development/analysis

Project Objectives

Support Vermont's aggressive requirements for GHG emissions reduction

- Reduce emissions 40 percent below 1990 levels by 2030
- Reduce emissions 80 percent below 1990 levels by 2050
- Transportation sector contributes to 40 percent of reduction

Support U.S. DOT requirements for each State to develop a Carbon Reduction Strategy

- Describes how new Carbon Reduction Program funding will be used

U.S. DOT Carbon Reduction Program

Infrastructure Investment and Jobs Act (IIJA)

\$32 million

\$6.3 annually over 5 years

- Public Transit
- Transportation Alternatives
- Congestion Mitigation
- Efficient Street and Traffic Lighting
- Travel Demand Management Strategies
- Deployment of Alternative Fuel Vehicles and related Infrastructure
- Carbon Reduction Strategy

Work Steps

Phase 1: Estimate GHG emissions and reductions associated with VTrans' Capital Program

- Develop methodology
- Apply to SFY 2023 and 2024 Capital Programs
- Document and train VTrans staff for future use

Phase 2: Develop Carbon Reduction Strategy

- Stakeholder and public engagement
- Gap analysis
- Strategy and scenario development and evaluation
- Carbon Reduction Strategy

Technical and Advisory Committees

Technical Committee

Agency of Transportation
Agency of Natural Resources
Chittenden County Regional Planning Comm.
University of Vermont
Vermont Climate Council
Environmental Action Network

Advisory Committee

Agency of Transportation
Agency of Natural Resources
Agency of Commerce and Community Dev.
Department of Health
Department of Environmental Conservation
Chittenden County RPC
Mount Ascutney Regional Commission
VT Public Transit Association
VT Natural Resources Council
Champlain Valley Office of Economic Opportunity
Federal Highway Administration



Project Tasks and Schedule

Phase/Task	2022				2023									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
I.I: Project Initiation	█													
I.II: Methodology Options	█		1											
I.III: Methodology Refinement and Application			█		2	█		3						
I.IV: Documentation and Training							█							
II.I: Stakeholder and Public Engagement		█												
II.II: Gap Analysis							█							
II.III: Scenario Evaluation								█	4	█		5		
II.IV: Carbon Reduction Strategy											█			6
Technical Committee	★		★		★		★		★		★		★	
Advisory Committee						★		★			★		★	
Focus Groups & Public Meetings							★				★			

Public and Stakeholder Engagement

Advisory Committee – 4 meetings

Two rounds of focus groups with up to 6 stakeholder groups (12 meetings)

- Community-based organizations, including equity/environmental justice groups
- Business community
- Transportation and freight industry
- Environmental groups
- Regional planning and public transportation
- Elected officials

Two sets of virtual public meetings

- First scheduled March 23, 12 pm & 6 pm

Project webpage and social media content



Phase 1 – VTrans Capital Program Evaluation

VTrans' Capital Program Database Includes:

429 projects

Start date 2019 – 2028

Work Description	Count
Aviation	42
Bike & Pedestrian Facilities	39
Interstate Bridges	40
Maintenance	31
Municipal Mitigation	21
Park & Ride Lots	4
Rail	109
Roadway	33
State & Town Highway Bridges	119
Traffic & Safety	31
Transportation Alternatives	37

What Did We Estimate?

1. Agency-generated emissions attributable to:

- construction of assets*
- maintenance of assets*
- operation of assets (including transit and rail)*
- Changes from baseline due to mitigation strategies*

2. Changes in system user emissions associated with projects affecting GHG emissions, such as:

- VMT change / mode shift
 - bicycle/pedestrian investments
 - transit investments
 - TDM programs
- Operational efficiency
 - Roadway expansion / capacity increase
 - Roundabouts, intersection reconfiguration, signal re-timing, etc.
- Technology
 - Electric/alternative fuel vehicle infrastructure

Tools Used

Baseline projections

- Vehicle-miles traveled (VMT), fuel efficiency, and electrification assumptions based on VT Climate Action Plan and U.S. DOE Annual Energy Outlook

Agency generated emissions

- Construction and maintenance: FHWA Infrastructure Carbon Estimator (ICE)
- Transit operations: National Transit Database and operator data + emission factors

Change in system user emissions

- GHG sketch analysis spreadsheet tool – provides rough estimates of GHG reductions based on type/context of project

Baseline Assumptions

Key Parameters	2025	2030	2050
Passenger Car Fuel Economy (mpg, non-EV)	40.3	40.2	38.9
Passenger Car Electrification (with ACT2)	2.4%	26.6%	93.3%
Electricity Grid Emissions (g CO2/kwh)	50.9	40.7	0
VMT (million miles, all)	7,653	7,779	8,489

Bicycle & Pedestrian Projects

Bicycle and Pedestrian Facilities				
<i>Units: Miles of facility</i>	Population Density			
Facility Type	Core (>10,000 ppsm)	Urban (4,000 - 10,000 ppsm)	Suburban (500 - 4,000 ppsm)	Rural (<500 ppsm)
New shared-use path	0.0	0.5	4.6	5.6
Resurface shared-use path	0.0	0.0	0.0	47.8
New bicycle lane	0.0	0.0	0.4	0.8
new separated bike lane	0.0	0.0	0.0	0.0
New/improved sidewalk	0.0	0.0	0.5	5.4
New Complete Streets treatment	0.0	0.0	0.3	
Widened shoulder			13.0	445.0

Example Calculation: New Bike-Lanes (Suburban)

Step 1: Calculate Avoided VMT

Input from Capital Program

0.4

25

60%

2.3

Miles of facility * New Daily Cyclists per facility-mile * Prior Mode Share * Average Trip Length

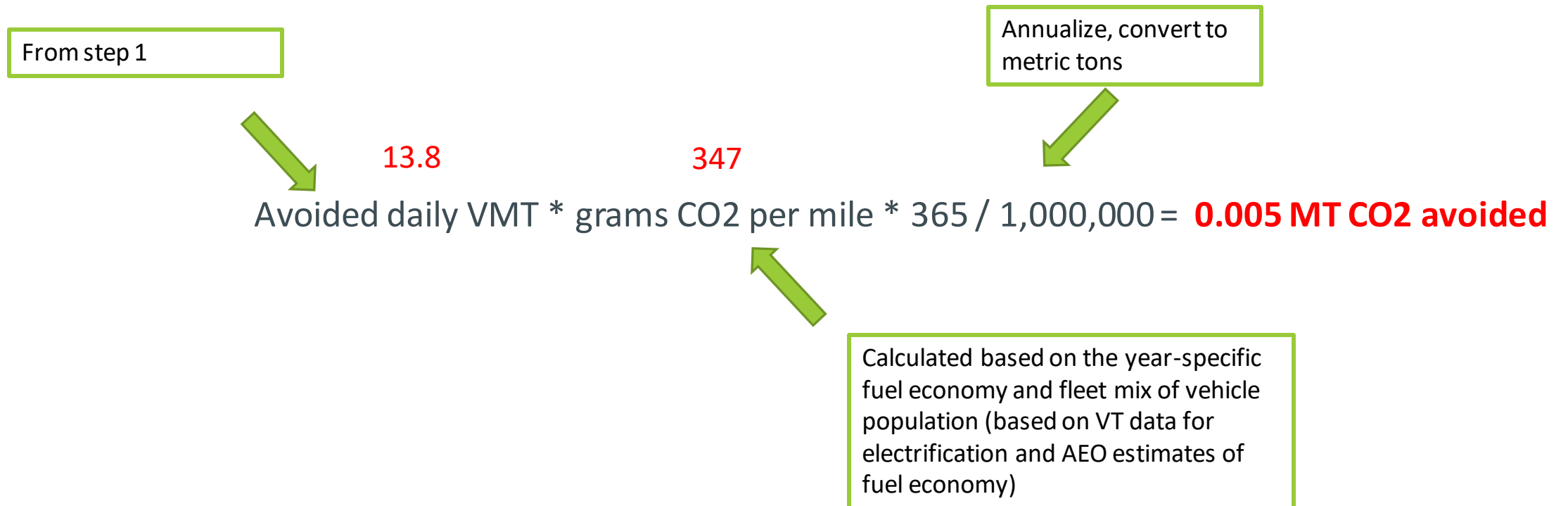
Factor developed for TCI tool based on literature; broken out by area type
e.g. in "suburban" area type, 25 new cyclists

Factor developed based on literature; broken out by area type
e.g. in "suburban" area type, 60% of new cyclists trips would have been from a car

Sourced from National Household Travel Survey
e.g. average bike trip = 2.3 miles

Example Calculation: New Bike-Lane

➤ Step 2: Calculate Avoided Emissions



Transit and Travel Demand Management Projects

- TDM – GO! Vermont program data
- FTA-funded transit operations
- CMAQ-funded new transit services

Grantee	Service Description	FY'22 Ridership	FY'25 Projected Ridership	FY'30 Projected Ridership	FY'35 Projected Ridership
AT	Orange Line Expansion	1253	1378	1447	1520
CCTA	Milton Commuter	11390	12529	13155	13813
CCTA	Additional Montpelier LINK Run #86	3508	3859	4052	4254
CCTA	Route 116 Commuter	1782	1960	2058	2161
GMCN	Wilmington to Bennington	1370	1507	1582	1661
GMT Rural	US2 Commuter Montpelier - St J	524	576	605	635
MVRTD	South Route Extension	20563	22619	23750	24938
RCT	St. J to Lyndonville	8498	9348	9815	10306
RCT	US 14/15 Commuter	1013	1114	1170	1229
RCT	US2 Commuter Montpelier - St J	6391	7030	7382	7751
RCT	New seasonal Burke service (May to Oct)	115	750	1150	1500
SEVT	Bennington to Wilmington	1905	2096	2200	2310
TVT ACTR	Route 116 Commuter	5132	5645	5927	6224
TVT ACTR	Saturday Burlington LINK Expansion	771	848	891	935
TVT ACTR	Tri-Town Shuttle Expansion	6914	7605	7986	8385
TVT ACTR	Middlebury Shuttle Expansion	11090	12199	12809	13449
TVT STSI	89er North Commuter	242	266	280	293
TVT STSI	89er South Commuter Expansion	1769	1946	2043	2145
TVT STSI	Thetford Connector Service Expansion	768	845	887	931

Emissions Summary - Baseline

Baseline Emissions (metric tons CO2e)	2022	2025	2030	2050
Direct emissions from vehicles				
On-road vehicles (except public transportation)	2,907,048	2,442,275	1,836,103	189,804
Public transportation (bus and demand response)	32,857	29,336	23,469	0
Passenger and Freight Rail	7,372	7,713	8,302	10,890
Upstream emissions from vehicles				
On-road vehicles (except public transportation)	681,034	573,399	434,525	51,413
Public transportation (bus and demand response)	8,243	7,360	5,888	0
Passenger and Freight Rail	1,548	1,620	1,743	2,287
Electricity generation emissions				
On-road vehicles (except public transportation)	3,603	18,657	53,136	0
Public transportation (bus and demand response)	0	233	497	0
Passenger and Freight Rail	0	0	0	0
Construction & maintenance activities				
Maintenance of existing system	32,447	30,856	26,483	4,988
Total Emissions	3,665,233	3,102,116	2,380,101	246,206
Avoided Emissions from Ongoing Activities				
Transit	9,838	8,217	6,707	0
Passenger and Freight Rail	14,429	15,695	16,516	0
TDM	210	176	143	0

Emissions Summary – Impact of Capital Program

Emissions Change Related to Capital Program (metric tons CO ₂ e)		2025	2030	2050
Direct emissions from vehicles				
On-road vehicles (except public transportation)		-2,660	-1,877	-268
Public transportation (bus and demand response)		0	0	0
Upstream emissions from vehicles				
On-road vehicles (except public transportation)		-638	-450	-64
Public transportation (bus and demand response)		0	0	0
Electricity generation emissions				
On-road vehicles (except public transportation)		-20.4	-52.4	0.0
Public transportation (bus and demand response)		0	0	0
Construction & maintenance activities				
Construction & maintenance of funded projects		0	0	0
Total Change in Emissions		-3,319	-2,380	-332

Percent Change in Emissions from Baseline		2025	2030	2050
Direct + upstream emissions from vehicles				
On-road vehicles (except public transportation)		-0.11%	-0.10%	-0.14%
Public transportation (bus and demand response)		0.00%	0.00%	0.00%
Electricity generation emissions				
On-road vehicles (except public transportation)		-0.11%	-0.10%	0.00%
Public transportation (bus and demand response)		0.00%	0.00%	0.00%
Construction & maintenance activities				
Construction & maintenance of funded projects		0.00%	0.00%	0.00%
All Emissions Sources		-0.11%	-0.10%	-0.13%

Emissions Summary – Strategy Analysis

Emissions Changes by Strategy		2025	2030	2050
Bicycle and Pedestrian		-565	-460	-56
Roadway Expansion		0	0	0
Traffic Operations		-2,591	-1,779	-259
Transit		-15	-19	-2
Travel Demand Management		0	0	0
Park and Ride		-144	-117	-14
Total Change in Emissions		-3,315	-2,375	-331

Summary of Capital Program Findings

Construction & maintenance and transit operations each comprise ~1.0% of total statewide on-road emissions

Current programmed projects in the capital budget will have a small impact (<0.10%)

Higher electrification from ACC2/ACT reduces impact of VMT measures and traffic operations (as measured in tons GHG)

Demonstrates limitations of current suite of VMT/operations-based measures, particularly in the Vermont context (rural, low transit usage) to meaningfully reduce emissions

VMT and congestion reduction is still important for variety of other reasons (mobility, safety, economy, quality of life, etc.)

Implications for Capital Programming?

Revisit project prioritization criteria to include/place more weight on GHG emissions?

Some types of projects may be more effective than others at reducing GHG emissions. Should that affect prioritization in any way?

How can projects be designed to maximize GHG benefits?

- E.g., electric vs. diesel buses for new service

What new types of projects can/should be included or considered?

- E.g., EV infrastructure, clean vehicles
- Low-carbon materials and construction methods

Capital Program Evaluation - Questions, Comments, & Discussion

Are you surprised by the findings about Capital Program impacts?

Do you feel the analysis adequately captures the impacts of VTrans' programs? If not, what's missing?

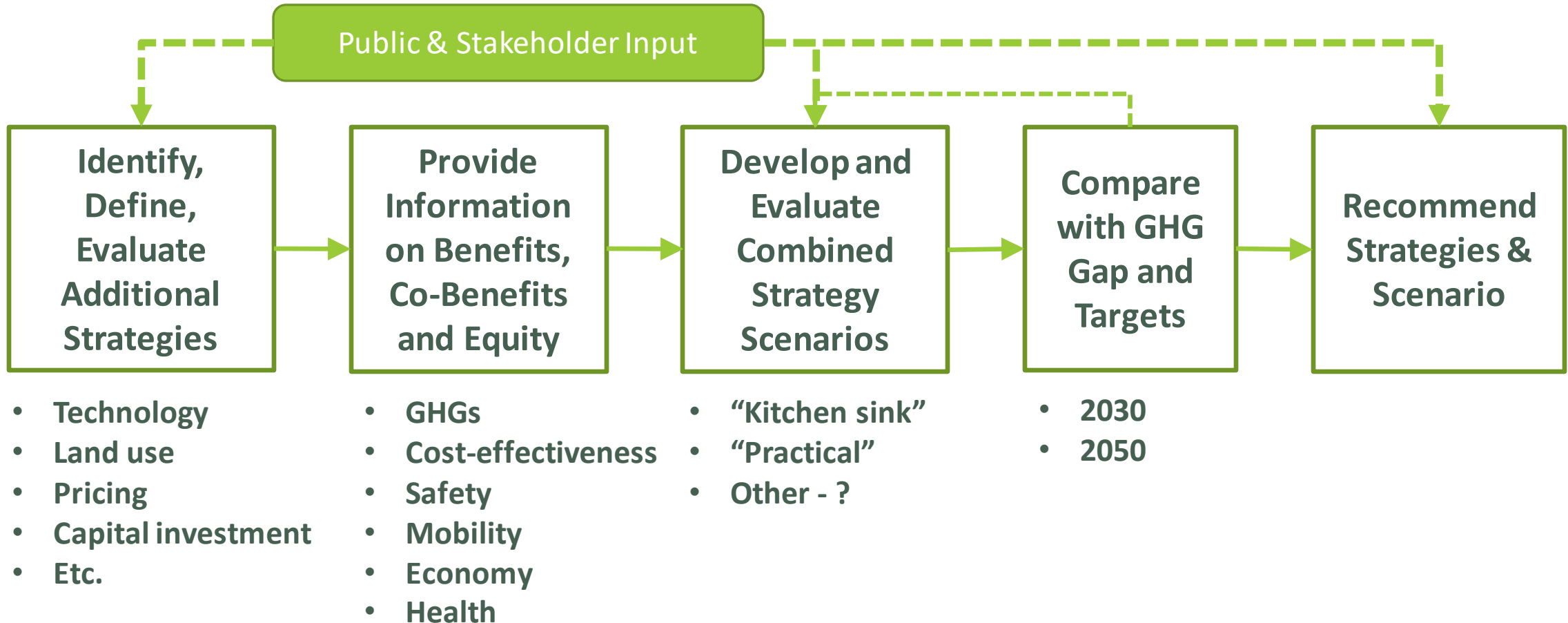
Would you suggest any changes to the project prioritization and evaluation process to better capture and consider GHG effects?

Gap Analysis and Scenario Development

Gap Analysis



Strategies and Scenario Analysis



Additional Strategies?

Mode shift

- Ped/bike infrastructure
- Transit (scheduled, on-demand/ microtransit)
- Micromobility/incentives
- Freight rail
- Travel demand management

Traffic efficiency

Clean car/truck incentives, e.g.

- Electrification incentives
- Feebates

Additional clean car/truck requirements, e.g.

- Advanced Clean Fleets
- Ban on ICEs after 20XX

Land use/smart growth

Low-carbon fuels standard/Clean Transportation Standard

Cap-and-trade/cap-and-invest

Carbon pricing

Road pricing

Advanced-technology rideshare/high-occupancy vehicles/CAVs

Tele-travel substitution

Low-carbon infrastructure (construction & maintenance)

Potential Scenarios

Traditional transportation infrastructure and services

Policy and regulatory measures

Combinations

Carbon Reduction Strategy Outline

Purpose of Strategy

Approach

- Technical methods
- Engagement

Evaluation of Scenarios

Proposed/Recommended Scenario

Use of Carbon Reduction Program Funds

Scenario Analysis and Strategy - Questions, Comments, & Discussion

Are there strategies missing from the list that should be considered?

Which strategies should be prioritized for consideration?

How would you recommend combining or bundling strategies?

How should the State consider synergies or tradeoffs between GHG emissions reduction and other benefits and impacts?

Contact

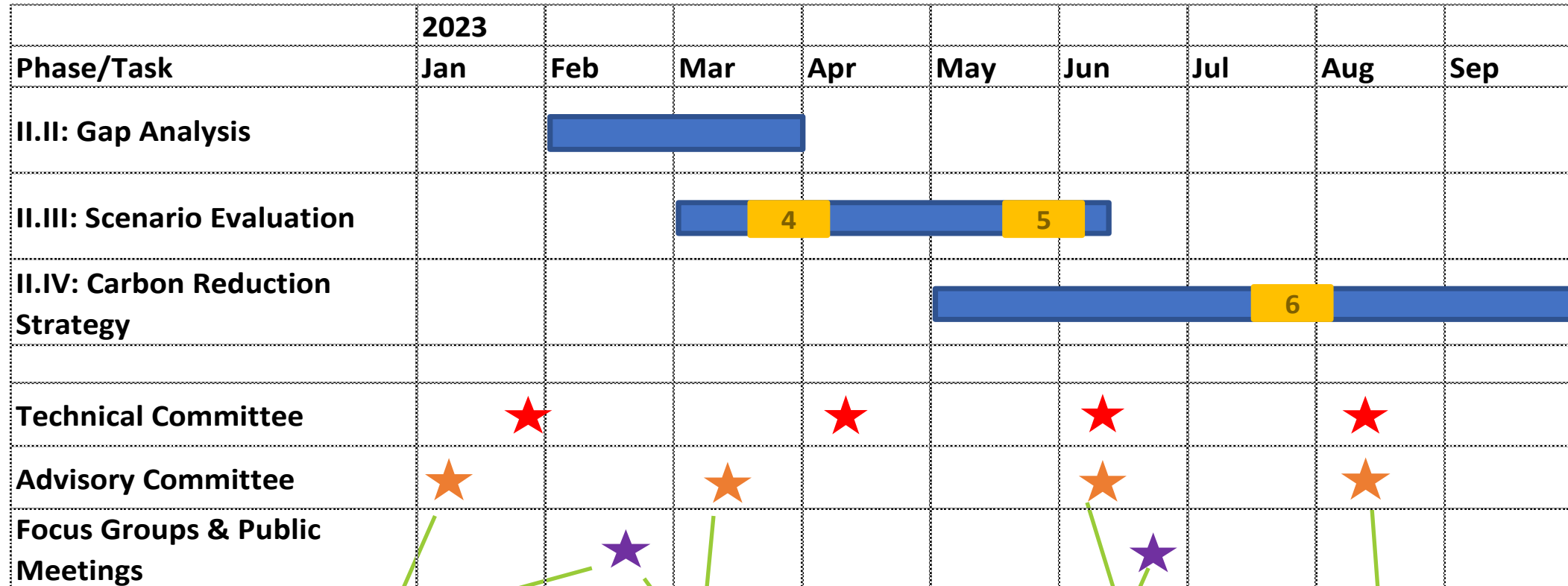
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Additional Slides

Engagement Schedule



- Plan goals

- Input to scenario development

- Review scenario results and recommendations

- Review draft Carbon Reduction Strategy

Traffic Operations and Park and Ride Projects

Traffic Operations - Intersection						
<i>Units: Number of improvements</i>	Facility + Area Type					
Improvement Type	PA - Urban	PA - Rural	MA - Urban	MA - Rural	Coll - Urban	Coll - Rural
New or retimed signals	38	1	1	4	2	3
New roundabouts	1	1	0	0	0	0
Reconfigured intersection/interchange	5	6	3	2	1	2

Park and Ride	
New Spaces	147