

## EXECUTIVE SUMMARY

### Evaluating the Potential Environmental and Economic Benefits and Costs of a Cap and Invest Program for Transportation Emissions in the TCI Region

The jurisdictions participating in the Transportation and Climate Initiative (TCI) have used multiple economic and public health models to understand the potential impacts of a cap-and-invest program for transportation emissions. The models were used to analyze three different cap stringency scenarios. The modeling results provide an estimate of impacts from these scenarios that will help inform decision-making but do not guarantee particular outcomes. We welcome public input on the modeling results.

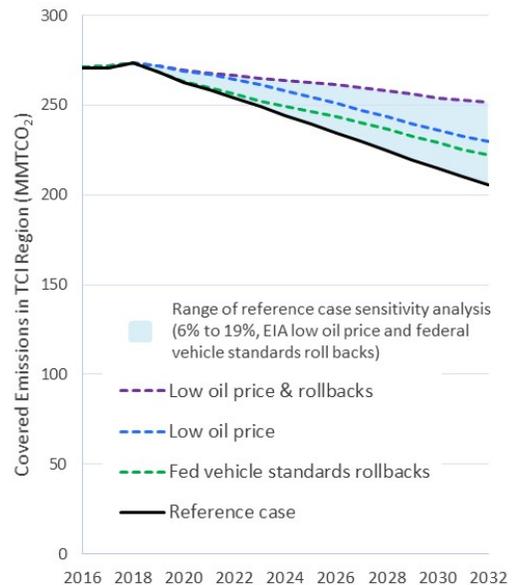
#### KEY FINDINGS

- Under all three cap reduction scenarios, the program is projected to produce positive overall environmental, health, economic and other benefits.
- A declining emissions cap could lock in decreases in carbon dioxide emissions that are expected through 2032 and potentially drive additional reductions.
- The program would enable the jurisdictions to work with communities and businesses to reduce carbon dioxide emissions through programs that expand access to clean mobility and other transportation options, spur economic growth, and improve the lives of residents.

#### Transportation Emissions under “Business as Usual” (Reference Case)

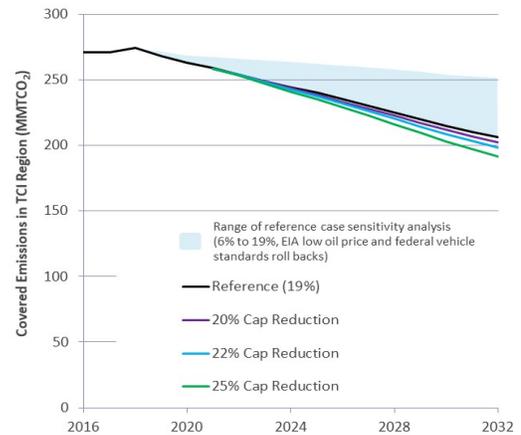
The results of the business-as-usual analysis, or Reference Case, suggest that carbon dioxide emissions from on-road transportation fuels are expected to decrease by 19 percent by 2032 compared to emissions in 2022. This decline is largely the result of improving vehicle efficiency and greenhouse gas emission standards and a shift away from internal combustion engines and toward zero emission vehicles (ZEVs). The shift to ZEVs is achieved through implementation of existing federal and state regulations, shifts in consumer preferences, and innovation that lowers technology costs.

In modeling the Reference Case, the TCI jurisdictions used the best-available projections of technology and commodity prices as well as the continuation of existing regulation. If key variables change, such as lower-than-expected oil prices or existing federal vehicle standards are rolled back, the emission reductions anticipated in the Reference Case would be significantly less (declining by as little as 6% between 2022 and 2032), as illustrated by the range of potential future emissions on the graph to the right.



## Emission Reductions under a Cap-and-Invest Program

As the TCI jurisdictions evaluate the program details that will be included in the final Memorandum of Understanding, we invite the public to provide input on the modeled cap reduction scenarios. The different cap levels lead to different projected allowance prices and proceeds to invest. These projections are detailed in the chart to the right.



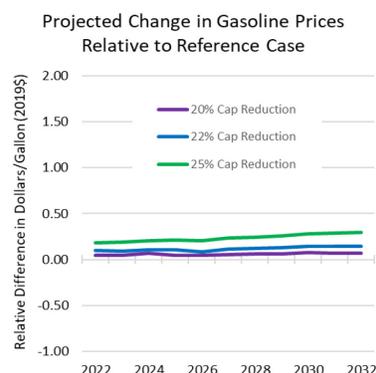
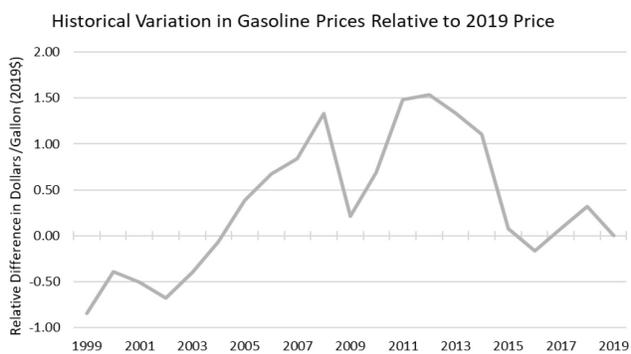
## Economic and Public Health Benefits

Under each cap reduction scenario modeled, regional gross domestic product (GDP), disposable personal income (DPI), and jobs are projected to increase modestly. A preliminary region-wide analysis conducted by Cambridge Systematics projected that cleaner air, improvements in safety, and more physical activity would result in significant net public health benefits for residents of the region. For illustrative purposes, the table on the right illustrates some of these projected benefits in the year 2032. In the spring of 2020, a multi-university team led by Harvard C-CHANGE will complete detailed modeling and mapping of the health consequences of county-level changes in air pollution and physical activity across the entire region for multiple cap reduction scenarios.

Economic and Health Indicators, in 2032	20% Cap Reduction	22% Cap Reduction	25% Cap Reduction
% increase in GDP growth, from Reference Case	0.01%	0.03%	0.05%
% increase in DPI growth, from Reference Case	0.01%	0.02%	0.04%
% Increase in Jobs, from Reference Case	0.004%	0.01%	0.02%
Reduced asthma symptoms/exacerbation	338	673	1,366
Deaths and premature deaths avoided	307	610	1,014
Total monetized public health benefits (Billions of 2017\$)	\$3	\$6	\$10

## Estimated Changes in Fuel Prices

Gasoline and diesel prices vary widely over time due to a variety of global factors. If the regulated entities in the petroleum industry choose to pass the costs of compliance with a cap and invest program on to consumers, our modeling estimates an incremental price increase in 2022 of \$0.05, \$0.09 or \$0.17 per gallon in the 20%, 22% and 25% Cap Reduction Scenarios, respectively. These changes would be well within the range of historical variability. The goal of a regional cap-and-invest program would be to use the proceeds to invest in clean transportation options, reducing the exposure of our economy to these oil market price fluctuations. Complementary programs that reduce fuel consumption, such as



more ambitious federal and state vehicle emissions standards, would be expected to moderate costs further.

## Targeted Investments

Cap-and-Invest programs inherently leverage market dynamics to achieve guaranteed emissions reductions at relatively low costs for consumers and businesses. When auction proceeds are invested in low-carbon transportation programs, it makes it easier to meet the emissions cap in any given year. This is particularly true when investments are targeted toward the most cost-effective strategies – i.e., solutions that reduce more tons per dollar invested. When a regional cap and invest program is implemented, each participating TCI jurisdiction will determine how to invest its share of the proceeds. For comparison, the table below summarizes three hypothetical investment scenarios that were modeled with a 25% Cap Reduction scenario and the figure on the right illustrates allowance prices that result from the analysis.

Low-Carbon Transportation Investment Strategies	Illustrative Investment Portfolios		
	A	B*	C
Electric cars, light trucks and vans	5%	30%	54%
Low & zero-emission buses and trucks	21%	23%	27%
Transit expansion and upkeep	35%	18%	-
Pedestrian and bike safety, ride sharing	16%	14%	10%
System efficiency	7%	8%	8%
Indirect/ Other	17%	8%	-



## Background Information on the Modeling Approach

Economic, transportation, and public health modeling tools provide information to help policy makers and the public understand what trends—such as changes in VMT<sup>1</sup> and emissions—we can expect in transportation and other sectors of the economy. Typically, a modeling analysis begins with the question, “What can we expect in the future without new policy, if the future is business as usual?” Next, policy scenarios are added to the model to test how the policies could affect future trends. By comparing the business-as-usual, or “Reference case,” projections with those that result from new policies, one can better understand the potential impacts of proposed policies like the TCI cap-and-invest program.

The modeling analysis presented here is derived from a few different models.<sup>2</sup> The National Energy Modeling System, developed and maintained by the U.S. Energy Information Administration, was modified for use in the TCI region (i.e., TCI-NEMS) and used as the primary modeling tool to better understand trends in both the transportation and electricity sectors with and without a new TCI cap-and-invest program. An investment strategies modeling tool developed for the states was used to estimate the effect of investing auction proceeds in a wide variety of low-carbon transportation technologies and programs, and those effects were fed back into the TCI-NEMS model. This tool, in combination with the World Health Organization’s HEAT model, was also used to provide preliminary estimates<sup>3</sup> of the health benefits provided by investments through cleaner air and increased use of active transportation options (walking and biking). The REMI model<sup>4</sup> was used to project macroeconomic impacts, including changes in economic growth, income and employment.

<sup>1</sup> Vehicle miles traveled (VMT) measures the total distance traveled by all vehicles in a geographic region over a given period of time, typically 12-months.

<sup>2</sup> For more information regarding modeling tools and methods, please go to [this link](#).

<sup>3</sup> More detailed and comprehensive health benefit analysis is underway and will be completed in early 2020.

<sup>4</sup> The REMI model is a dynamic forecasting and policy analysis tool commonly used to evaluate the macroeconomic effects of energy and environmental policies.