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AN ANALYSIS OF THE JOB CREATION AND COMMUNITY BENEFITS OF THE *GREEN FUTURE ACT*

TECHNICAL APPENDIX

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STUDY OVERVIEW

This technical appendix provides a detailed account of how the job creation and benefit estimates are calculated in *An Analysis of the Job Creation and Community Benefits of the Green Future Act.* The methodology was custom-created for H.3292, An Act achieving a green future with infrastructure and workforce investments (referred to as the "*Green Future Act*"), as filed at the beginning of the 2021-2022 session of the Massachusetts legislature.

The methods described here can be reused, with modifications, to estimate the jobs and benefits of other spending bills in Massachusetts. For more information or to request data not provided in this document, please contact the study authors.[1]

This white paper specifically models net jobs and community benefits from the *Green Future Act*. The study projects net impacts from seven years of bill implementation, from 2023 to 2030. Net jobs from the bill are a result of multiple positive and negative effects on employment, each of which are individually modeled. These four components of the *Green Future Act* are:

1. The job impacts of a carbon price on households, institutions, and businesses;
2. The jobs impacts of a new green bonding program on institutional debt;
3. The jobs impacts of new consumer spending from a new household dividend; and
4. The jobs and community benefits created by a broad set of green public investments, using capital raised from components 1 and 2 above.

Components one, two, and three of this study are modeled using IMPLAN software V.6, which is an input-output economic model that maps the transfer of capital and services across Massachusetts institutions, households, and businesses. The fourth component of this study relies on study data drawn from *Investing in a Better Massachusetts*, a report published by Climate XChange in May 2021.[2]

[1] Contact information is provided on the title page.
[2] Ruby Wincele and Jonah Kurman-Faber, "Investing in a Better Massachusetts: An Analysis of Job Creation and Community Benefits," May 2021, https://climate-xchange.org/2021/05/24/new-climate-xchange-report-investing-in-a-better-massachusetts/

Table 1. Analysis Overview

Study Component	Carbon Price	Green Bonding	→	Household Dividend	Green Investment
Impacts Modeled	**Job loss** from increased cost of fossil fuels	**Job loss** from future debt repayment	→	**Job Creation** from new household spending	• **Job Creation** from new investments • **Job creation** from long-run energy savings • **Job Loss** from decreased fossil fuel use • **Community benefits** from new investments
Modeling Method	IMPLAN		→	IMPLAN	*Investing in a Better Massachusetts* (Climate XChange, May 2021)

KEY ASSUMPTIONS AND CAVEATS

This paper relies on a series of fundamental assumptions and caveats in order to be interpreted appropriately. No model is a perfect predictor of the future, and all input-output models must rely on strong assumptions in order to provide multi-year jobs estimates. The most important finding of this study is its qualitative assertions rather than its quantitative predictions.

- The carbon price levels are assumed to be sufficient to, in concert with other policies, achieve at least a 50% reduction in greenhouse gas emissions in Massachusetts by 2030, as required by law.
- Spending behavior, technology, and the composition of the Massachusetts economy are assumed to be constant over the 7-year study period. Spending behavior and technology changes due to the bill are not modeled in this study.
- All results are combined into an average annual result. All positive and negative impacts that take place in the future are discounted to net present value (NPV).
- Any financial losses due to a carbon price are passed onto end-use consumers.
- Green bonding revenue is assumed to be borrowed revenue from future general state expenditures.
- New state revenue collected from carbon pricing or green bonding is assumed to be spent within one year.
- Green investments are spent across a broad range of projects, weighted according to *Investing in a Better Massachusetts*.

Each of these assumptions is explained in-depth in the following sections of this document.

METHODOLOGY

1. CARBON PRICE IMPACTS

Modeling the impacts of carbon pricing in IMPLAN falls into a few major steps:

1. Estimate the average annual carbon price for each sector
2. Estimate the percent increase in oil and natural gas costs due to a carbon price
3. Using consumption data from IMPLAN, estimate the financial loss for institutions and households in MA due to increased energy prices.
4. Using financial input data, calculate the financial costs to each industry in Massachusetts due to increased energy prices.
5. Using local commodity consumption data, estimate what proportion of financial losses from step 4 are passed onto in-state consumers vs. out-of-state consumers.
6. Add together the financial losses from steps 3 and 5 to calculate the total household and institutional losses from a carbon price in MA.
7. Run these financial losses through IMPLAN as decreased household and institutional spending to calculate the resulting job loss due to decreased demand for goods and services.

1.1 Annual Carbon Price Levels

The carbon price levels created by the *Green Future Act* are not prescriptive in the bill text. However, the bill text provides parameters that can be used to forecast a carbon price, namely:

- The carbon price must, in conjunction with other policies, be sufficient for the state to achieve its legally required greenhouse gas reduction targets.
- Each sector (buildings, transportation, and industry) have a specific date by which a carbon price must be in place.

Massachusetts currently intends to implement the Transportation and Climate Initiative Program (TCI-P) beginning in 2023, which would qualify as a transportation sector carbon price as required in the *Green Future Act*. Price levels in this study were assumed to follow the proposed minimum prices allowed in draft TCI-P design documents.

The study authors used these parameters, in conjunction with previous CXC modeling on carbon pricing,[3] to establish the following price schedule for the *Green Future Act*:

[3] August Granath and Marc Breslow, "The Greenhouse Gas Reduction Impact of a Carbon Pollution Charge in Maryland," May 2018, https://climate-xchange.org/wp-content/uploads/2018/09/MD-GHG-Report-Final-med-file.pdf

Table 2. Carbon Price Levels by Sector

Sector	Carbon Price Levels ($/short ton CO_2e)							
	2023	2024	2025	2026	2027	2028	2029	2030
Transportation	$7.17	$7.69	$8.28	$8.90	$9.55	$10.24	$10.99	$11.77
Buildings	$20	$25	$30	$35	$40	$45	$50	$55
Industry	—	—	$20	$25	$30	$35	$40	$45

This study models economic impacts of the *Green Future Act's* implementation between 2023 and 2030, however IMPLAN models economic impacts on a year-by-year level. Each sector's price schedule was converted to a weighted annual average.

This weighted average was calculated by combining the price schedule above with a trajectory in emissions for each sector, which was assumed to align with a 50% total reduction in GHG emissions relative to 1990 levels by 2030, as required by law. This revealed the following annual average price levels for subsequent steps of this study:

Table 3. Average Annual Carbon Prices

Sector	Weighted Average Annual Price (2023-2030)
Transportation	$9/short ton CO_2e
Buildings	$36/short ton CO_2e
Industry	$24/short ton CO_2e

This study does not differentiate between commercial and industrial consumers of natural gas. Prior to calculating impacts in IMPLAN, the buildings and industry average prices above were further combined into a weighted average of $33/short ton CO_2e for all non-household natural gas consumption.

1.2 Petroleum and Natural Gas Price Impacts

The percent change in petroleum and natural gas prices is based on 2019 data, to mirror the year of full IMPLAN economic data used. The price of the following fuels was sourced from the Energy Information Administration (EIA):

- Residential Natural Gas[4]
- Commercial Natural Gas[5]
- Industrial Natural Gas[6]

[4] U.S. Energy Information Administration, "Natural Gas Prices," 2021, https://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_a.htm
[5] Ibid.
[6] Ibid.

- Gasoline (all types)[7]
- Diesel[8]

Due to the limitations of IMPLAN commodity codes, natural gas consumed by businesses cannot be differentiated. Thus, the price of commercial and industrial natural gas were blended into a weighted average price using 2019 consumption data from the EIA.[9]

The percent increase in price for each fuel was calculated using CO_2 coefficients from the EIA. For easier manipulation in future steps, every fuel price change was calculated based on a $10/metric ton CO_2 price, and then subsequently scaled appropriately to the GFA.[10]

Table 4. Fossil Fuel Price Changes Under a Carbon Price

Fuel	2019 Price	$10 carbon price impact	Percent change in price
Natural Gas (Residential)	$ 14.72/Mcf	$ 0.53/Mcf	3.6%
Natural Gas (Commercial and Industrial)	$ 10.92/Mcf	$ 0.53/Mcf	4.9%
Gasoline	$ 2.65/gallon	$0.09/gallon	3.4%
Diesel	$ 3.13/gallon	$0.11/gallon	3.5%

Gasoline and diesel are not differentiated in IMPLAN. Thus, prior to calculating economic impacts, the price changes of gasoline and diesel are blended into a weighted average price using 2019 consumption data from the EIA.[11]

1.3 Direct Institutional and Household Impacts

The direct impact on institutions and households was calculated using the percent change in petroleum and natural gas prices from the prior section. IMPLAN provides detailed annual expenditure data for institutions (organized by government type) and households (organized by annual income), in a dataset called a "Commodity Balance Sheet".

The commodity balance sheets for the following two commodities was downloaded and modified for this study:

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[7] U.S. Energy Information Administration, "Weekly Retail Gasoline and Diesel Prices - New England (PADD 1A)," 2021, https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_r1x_a.htm
[8] Ibid.
[9] U.S. Energy Information Administration, "Natural Gas Consumption by End Use - Massachusetts," 2021, https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_SMA_a.htm
[10] Marc Hafstead and Paul Picciano, *Resources for the Future*, "Calculating Various Fuel Prices under a Carbon Tax," November 2017, https://www.resources.org/common-resources/calculating-various-fuel-prices-under-a-carbon-tax/
[11] U.S. Energy Information Administration, "Prime Supplier Sales Volumes - Massachusetts" 2021, https://www.eia.gov/dnav/pet/pet_cons_prim_dcu_SMA_m.htm

- 3048 - Natural gas distribution
- 3154 - Refined petroleum products

To calculate the financial impact of carbon pricing, the annual expenditure of each institution on these commodities was multiplied by the percent increase in their price calculated in step 3. This reveals the direct financial impact of the *Green Future Act* on fossil fuels consumed by institutions and households.

As electricity is exempt from the *Green Future Act*, any institutional codes related to electricity generation were exempted from any price increases.

1.4 Indirect Institutional and Household Impacts

There is a significant amount of fossil fuels consumed by private industries in Massachusetts as well. These fossil fuels increase in price due to the *Green Future Act*, which businesses then are assumed to pass along to final consumers or subtract from proprietor income. Calculating this pass-through financial impact in IMPLAN requires the following assumptions:

- Businesses pass along 100% of the cost of carbon pricing equally to all end consumers of their product or service, whether in Massachusetts or outside of the state. Thus, the entirety of carbon price impacts in IMPLAN are to be expressed as changes in institutional or household spending.
- Businesses are assumed in this study to make no technological or expenditure changes in direct response to the carbon price, such as more efficient energy consumption or relocation.

Initial Industry Impact
With these assumptions established, the initial impact of carbon pricing is calculated using the Commodity Balance Sheet in IMPLAN, which details the dollar expenditures of each industry in Massachusetts on both natural gas and petroleum.

Similar to the previous step, the financial impact on each industry is calculated by multiplying the total annual expenditures of that industry on each fossil fuel by the percent increase in fossil fuel prices expected due to the *Green Future Act*.[12]

This financial impact is divided by the total economic output of each industry to calculate the percent increase in prices that a business would have to impose to cover the cost of new carbon prices. For example, if industry A expects to pay $1 in carbon price payments in a year, and has annual economic output of $100, then we would expect the price of their products to rise by 1% to pass carbon pricing onto consumers.

Pass-Through to Consumers
IMPLAN also houses data on Government and Household Local Consumption, which is the dollar expenditures that in-state consumers spend on in-state industries.

[12] Any industry codes related to electricity consumption were exempt from this step.

This is the underlying data used to calculate what costs are passed onto in-state consumers. To calculate the financial impact on consumers, each institution or household's annual spending on local industries is multiplied by that specific industry's expected increase in prices.

This leaves a significant amount of carbon pricing payments that are not paid by in-state consumers, because the businesses in question sell a large portion of products to out-of-state consumers. In these cases, the carbon price is expected to be either passed on to other states, or subtracted from the industry's proprietor income.

1.5 Final Job Losses in IMPLAN

The total financial impact of the carbon price on in-state institutions and households is calculated as the sum as steps 3 and 4 of this section. The direct and indirect impacts that are realized by in-state consumers together constitute what will finally be run in IMPLAN to calculate job losses from carbon pricing.

These job losses are run in IMPLAN as a decrease in institutional or household spending. This is predicated on the assumption that any increased costs incurred by an institution or household must be paid by decreasing their expenditures in other categories. For example, if Massachusetts households at a given income level are expected to incur $10 in total carbon pricing impacts in each year, they are expected to spend $10 less in other spending categories. This leads to a reduction in employment, due to reduced demand for local services and products.

After modeling a decrease in institutional and household spending, IMPLAN provides a quantity of reduced employees for each industry in Massachusetts. The employees lost in each industry are converted into full-time equivalent (FTE) jobs using coefficients provided by IMPLAN,[13] and then totaled together. As a result, without accounting for green bonding, household dividends, or investments, the carbon price is expected to result in 3,009 lost FTE jobs per year, or 24,075 FTE jobs between 2023 and 2030.

2. GREEN BONDING

Green bonding, as written in the *Green Future Act*, generates revenue for investment by borrowing against future government spending. Thus, in order to calculate the net job impacts of the *Green Future Act*, future government spending impacts must be incorporated into this analysis.

The negative employment effects of government debt are modeled in this study as a scheduled reduction in future institutional spending. This is calculated in the following steps:

First, the annual green bonding revenue of $500 million in the bill is converted into future debt. This is done by applying a discount rate of 7% over a 30 year repayment period. As a result, this study finds that a given year's investment of $500 million sustains a debt impact of $211,102,983 in net-present value.

[13] IMPLAN Group, "IMPLAN to FTE & Income Conversions," https://support.implan.com/hc/en-us/articles/115002782053-IMPLAN-to-FTE-Income-Conversions

Second, this debt is run in IMPLAN as a reduction in state government spending. This reduction in spending is split amongst the following IMPLAN spending codes in the following manner, to reflect typical yearly spending patterns of the Massachusetts state government:

Table 5. Green Bonding IMPLAN Inputs

IMPLAN code	2019 total spending	Green Bonding debt impacts (IMPLAN inputs)
State/Local Govt Other	$24,382,782,697	-$83,851,235
State/Local Govt Education	$23,861,566,590	-$82,058,798
State/Local Govt Hospital & Health Services	$2,378,799,155	-$8,180,578
State/Local Govt Investment	$10,762,687,582	-$37,012,373
Total	$61,385,836,025	-$211,102,983

When these reductions in spending are run through IMPLAN, they result in a decrease in jobs due to decreased government employment and decreased demand for other businesses in the state. These job reductions represent the future job losses expected when the state enacts new bonds to spend today and to be repaid later by the state government. Without accounting for the benefits of investment, the future debts of green bonding from the *Green Future Act* result in 1,975 lost FTE jobs per year, or 15,803 jobs over the first seven years of bill implementation.[14]

3. HOUSEHOLD DIVIDENDS

As written in the *Green Future Act*, a portion of revenue raised from carbon pricing is returned progressively back to Massachusetts households to create net positive financial impacts. In order to calculate these impacts, this study assumes:

- Household dividends are implemented such that households with annual income in the bottom two quintiles (40%) come out even or ahead on net financial impacts from the bill.
- The administration distributes the lowest dividends possible to achieve such an outcome.
- Household dividends are spent diffusely across the typical annual expenditures of each household income level.

As a counterpart to the carbon price impacts section, household dividends are run through IMPLAN as an increase in household spending equal to the direct and indirect financial impacts of carbon pricing calculated in prior steps:

[14] While the study period of this report is between 2023 and 2030, the negative impacts of employment from green bonding take place over 30 years. 15,803 jobs are not lost within seven years — rather, should the *Green Future Act* be implemented as expected between 2023 and 2030, those 15,803 jobs will be lost slowly over 30+ years.

Table 6. Household Dividend IMPLAN Inputs

Household Annual Income	Direct Carbon Price Impact	Indirect Carbon Price Impact	Total (Household Dividend)
Lower than $15k	$11,027,418	$1,952,406	$12,979,824
$15k to $30k	$16,662,433	$2,646,422	$19,308,855
$30k to $40k	$12,021,039	$2,199,770	$14,220,809
$40k to $50k	$12,755,024	$2,178,724	$14,933,749
$50k to $70k	$24,462,017	$4,974,803	$29,436,819

These household dividends create additional demand for businesses and services in the IMPLAN model, which calculates a corresponding increase in employment. Household dividends, in their minimally assumed form, create 584 FTE jobs annually, or 4,669 jobs between 2023 and 2030.

4. INVESTMENTS

4.1 Revenue Estimates

This study estimates annual revenue raised from the carbon prices established by H.3292 in the transportation, buildings, and industrial sectors. Calculating this estimate requires the following assumptions:

- The carbon prices by sector follow the schedule outlined in Table 2 in Section 1.1.
- Massachusetts meets its legally required 2030 greenhouse gas reduction target of a 50% reduction relative to 1990 emissions levels. Transportation emissions decrease according to the TCI-P CO_2 budget for Massachusetts to achieve a 30% reduction by 2032 as outlined in the TCI-P Memorandum of Understanding (MOU).[15] Emissions in the buildings and industrial sectors decline linearly every year to achieve the emissions reductions outlined in the Governor's Draft 2030 Clean Energy and Climate Plan (CECP).

With these assumptions established, the annual revenue in each sector is calculated by multiplying the carbon price ($/short ton CO_2) by the estimated emissions in each year. For example, in 2023, Massachusetts' TCI-P emission budget is 22.2 million tons of CO_2, and the price is expected to be $7.17 per short ton of CO_2, which results in $159 million of revenue raised from the transportation sector.

Total annual revenue is calculated by adding up each year's revenue in the transportation, buildings, and industrial sectors, as shown in Table 7.

[15] Transportation and Climate Initiative, "Transportation and Climate Initiative - Elements of Program Design," December 2020, https://www.transportationandclimate.org/sites/default/files/TCI-P_EPD_12-21-2020.pdf

Table 7. Annual Revenue Raised by Carbon Prices

Sector	Total Revenue ($M)							
	2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Industrial	$0	$0	$66	$82	$98	$114	$129	$144
Transportation	$159	$165	$171	$178	$184	$189	$195	$200
Buildings	$279	$332	$379	$419	$452	$480	$500	$514
Total	**$438**	**$497**	**$617**	**$679**	**$734**	**$782**	**$824**	**$858**

4.2 Net Job Creation

Modeling the impacts of climate investments in IMPLAN falls into a few major steps:

1. Estimate the average annual gross job creation from a portfolio of 29 climate investment projects in IMPLAN.
2. Using individual project data, calculate the expected decrease in fossil fuel consumption per $1 million invested in each project.
3. Using the U.S. Energy Information Agency's *Annual Energy Outlook*, translate energy and fuel reductions into dollar amounts for each project to estimate the financial losses to the fossil fuel industry.[16]
4. Run these financial losses through IMPLAN as decreases in commodity output to calculate the resulting job loss due to decreased demand for fossil fuel energy.
5. Add together the financial losses from steps 1 and 4 to calculate the total net job creation from climate investments in Massachusetts.

Gross Job Creation Analysis Overview

Our analysis of H.3292 assumes that investments made through the Statewide Green Infrastructure Fund and municipal Local Climate Crisis Funds align with the "Green Investment Portfolio" analyzed in the Climate XChange report *Investing in a Better Massachusetts: An Analysis of Job Creation and Community Benefits*.

This analyzes 29 different public investment projects that were combined into 18 investment "programs," that cover transportation, housing, clean energy, grid modernization, and natural resource conservation. These programs were subsequently weighted into the Green Investment Portfolio, which was constructed to align with the Governor's Draft 2030 Clean Energy and Climate Plan (CECP).[17]

Twenty-nine individual projects in Massachusetts were deconstructed into line-item expenditures and coded into IMPLAN. Each dollar invested in IMPLAN ripples throughout the state economy and measures resulting employment, output, labor income, and other fiscal impacts.

[16] EIA, "Annual Energy Outlook 2020 New England Energy Prices by Sector and Source." https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2020&region=1-1&cases=ref2020&start=2018&end=2050&f=A&ctype=linechart&sourcekey=0

[17] For a more detailed explanation of the modeling and data sources used to construct the "Green Investment Portfolio," see the Technical Appendix from the report. https://climate-xchange.org/wp-content/uploads/2018/08/Technical-Appendix-Investing-in-a-Better-Massachusetts.pdf

The projects modeled boost the state economy in two ways. First, each program requires upfront capital which boosts demand for various goods and services in order to carry out the given investment, which we refer to as the "upfront capital investment." Second, the investment itself creates long-run cost savings for households, businesses, and institutions once implemented, which increases the spending power of consumers, which we refer to as the "energy cost savings."

Investing in a Better Massachusetts analyzes the job creation potential of every $1 million invested in the Green Investment Portfolio, broken down into the upfront capital investment and the energy cost savings.

Gross Job Creation from Investments
CXC finds that the Green Investment Portfolio creates 14 jobs per $1 million invested. Breaking this into its two measured impacts, upfront capital investments create 9.3 jobs and longer-term energy cost savings create 4.7 jobs for every $1 million invested.

Using these $1 million "multipliers" and the estimated revenue H.3292 raises described in Section 4.1 of this document, we calculated the gross number of jobs created by state and local investments. Investments made with revenue raised by the *Green Future Act* will create 15,533 new FTE jobs per year — 10,292 jobs from upfront capital investments and 5,241 jobs from energy cost savings per year.

Based on our calculations that H.3292 will raise $8.8 billion between 2023 and 2030 for investments, this amounts to 124,263 new FTE jobs — 82,337 new jobs from upfront capital investments and 41,926 new jobs from energy cost savings. These values do not take into account job losses from reduced fossil fuel consumption, and only reflect *gross* job creation from investments.

Energy and Fuel Savings Impacts
Investing in a Better Massachusetts measures the *gross* job creation of the Green Investment Portfolio. In this analysis, we calculate the *net* job creation from the Green Investment Portfolio, which includes job losses due to decreased demand for fossil fuels in the state as a result of climate investments.

Seventeen of the 29 projects in the Green Investment Portfolio result in measurable reductions in fossil fuel energy consumption, outlined in the *Investing in a Better Massachusetts Technical Appendix*.[18] In order to estimate the economic impacts of these projects, these fuel savings were converted from units of energy to dollar amounts ("energy cost savings"), using data from the U.S EIA's *Annual Energy Outlook*. This analysis uses average 2020-2030 energy prices in New England for each type of fuel by sector.

These savings were discounted over the lifetime of a project, which range from 10 years to 50 years, using a three percent discount rate, before modeling the financial impacts in IMPLAN.

Job Losses in IMPLAN
Once the dollar amounts of energy cost savings were calculated, these estimates were run in IMPLAN to calculate the job impacts from decreased fossil fuel consumption. This requires the following assumptions:

[18] Ibid.

- Households, businesses, and institutions experience 100% of energy cost savings. These are run through IMPLAN as increases in household income, or lower production costs for businesses. These impacts are described in the "Job Analysis Overview" section above.
- Utilities and the fossil fuel industry recover 50% of lost revenue for all projects,[19] so 50% of total energy cost savings for each project is run in IMPLAN as a reduction in commodity or industry output for fossil fuel distribution and generation commodity and industry codes.

If an investment project reduced overall electricity, natural gas, diesel, gasoline, and/or heating oil consumption, we reflected the dollar amount in IMPLAN as a reduction in commodity output for the following commodity codes:

- 3047 - Electricity transmission and distribution
- 3048 - Natural gas distribution
- 3154 - Refined petroleum products[20]

If fossil fuel-powered electricity was replaced with renewable sources, those impacts were modeled as a reduction in industry output for the following industry code:

- 40 - Electric power generation - fossil fuel

Economic impacts in IMPLAN scale linearly, so a $1 million decrease in commodity or industry output was run for each of the four codes above to calculate the economic impact of lower fossil fuel consumption in Massachusetts.

Table 8. FTE Job Loss per $1 million Decrease in Fossil Fuel Output

IMPLAN Code	FTE Jobs per $1 million decrease in output
3047 - Electricity transmission and distribution	-1.49
3048 - Natural gas distribution	-3.99
3154 - Refined petroleum products	-1.20
40 - Electric power generation - fossil fuels	-2.46

These $1 million multipliers were multiplied by the proportion of losses in each commodity or industry for each project, then weighted according to the Green Investment Portfolio to calculate the portfolio job losses from energy savings.[21]

In total, longer-term energy savings from climate investments are expected to result in 645 lost FTE jobs per year, or 5,158 FTE jobs between 2023 and 2030.

[19] ACEEE, "Saving Energy, Lowering Bills, and Creating Jobs: An Economic Impact Analysis of Two Statewide Energy Efficiency Program Portfolios" 2014, https://www.aceee.org/files/proceedings/2014/data/papers/8-756.pdf

[20] Refined petroleum products include heating oil, gasoline, and diesel.

[21] For more information on portfolio weighting, see the *Investing in a Better Massachusetts* Technical Appendix. https://climate-xchange.org/wp-content/uploads/2018/08/Technical-Appendix-Investing-in-a-Better-Massachusetts.pdf

Net Job Creation from Investments

The net total economic impact of climate investments is calculated as the sum as steps 1 and 3 of this section. As a result, the *Green Future Act* will create a net 14,866 FTE jobs per year, or 118,924 net FTE jobs with revenue raised between 2023 and 2030.

4.3 Investment Benefits

The report *Investing in a Better Massachusetts: An Analysis of Job Creation and Community Benefits* also calculated six measurable benefits of the Green Investment Portfolio: energy cost savings, travel time savings, air pollution health benefits, physical activity health benefits, traffic fatality prevention, and climate benefits.[22]

Following the assumption that investments funded by H.3292 revenue align with the Green Investment Portfolio, we used the total benefits of the portfolio to estimate the total of *Green Future Act* investments.[23] These investments create $2 million in energy cost savings, travel time reductions, and public health benefits for every $1 million invested. Based on the projected revenue raised through 2030, the *Green Future Act* will create $17.7 billion in benefits.

Table 9. *Green Future Act* Investment Benefits

Measured Benefits	Description	Annual Average	2023-2030
Energy Cost Savings	The gasoline, diesel, and natural gas costs avoided by reducing energy use or switching away from fossil fuel sources	$830 million	$6.6 billion
Congestion time savings	The travel time savings from lower traffic congestion and/or switching to other modes of transportation	$220 million	$1.7 billion
Air Pollution Health Benefits	The saved lives and avoided illnesses from reducing air pollution	$140 million	$1.1 billion
Physical Activity Health Benefits	The saved lives and avoided illnesses from increased walking, cycling, and other forms of active mobility	$980 million	$7.8 billion
Traffic Accidents Avoided	Avoided traffic accident fatalities or injuries from reduced personal vehicle use	$59 million	$470 million
Total Benefits		**$2.2 billion**	**$17.7 billion**

[22] For a more detailed explanation of the health benefits and energy cost and time savings, as well as the data sources used to calculate each benefit, see the Technical Appendix.
[23] Total benefits in this analysis are calculated using revenue raised through 2030 from H.3292. Investments with this revenue can be funded later than 2030, and benefits accrue on different timelines, based on investment lifetimes, however the $17.7 billion in total benefits reflects investments made with revenue raised through 2030.