The Carbon and Resiliency Implications of State Policy

Zachary Schofield, Associate 1

Katy Koon, Economic Analyst

Today's Plan

- Why Economic Modeling?
- Model Tee Up
- Simulation Details
- Results
- Summary
- Q&A

Why Economic Modeling?

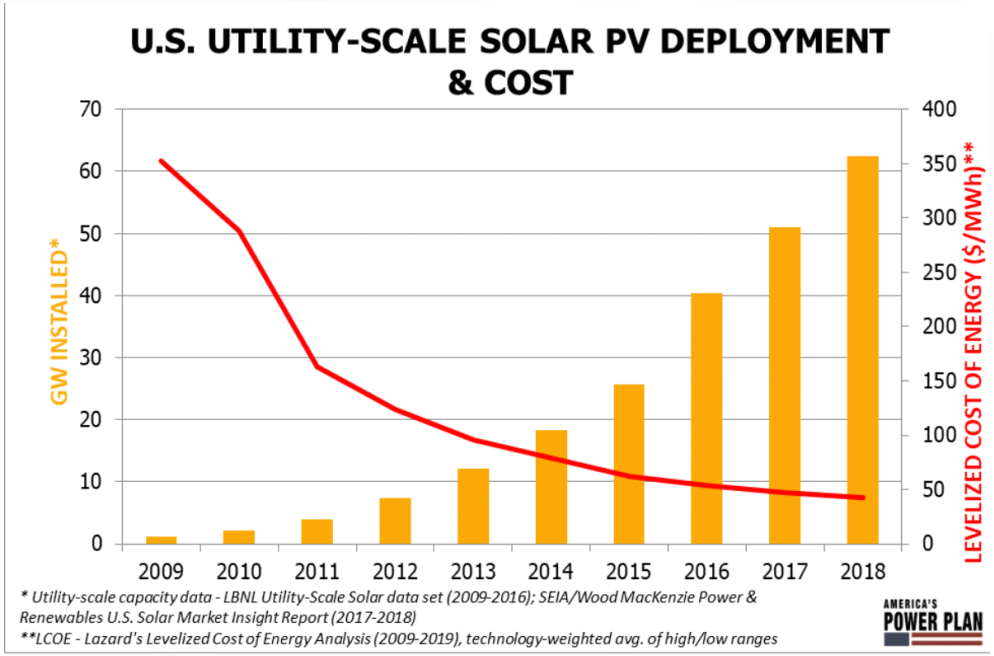
Adapting to a rapidly changing energy landscape

PERSPECTIVES BLOG

Why ExxonMobil supports carbon pricing

Darren Woods
03.29.2021

The recent steps by the American Petroleum Institute (API) to support a carbon price will contribute to advancing a lower-carbon future. For some time, we have been encouraging trade associations to support a price on carbon and promote actions that enable the goals of the Paris Agreement. We encourage Congress to adopt this market-based, national policy solution.

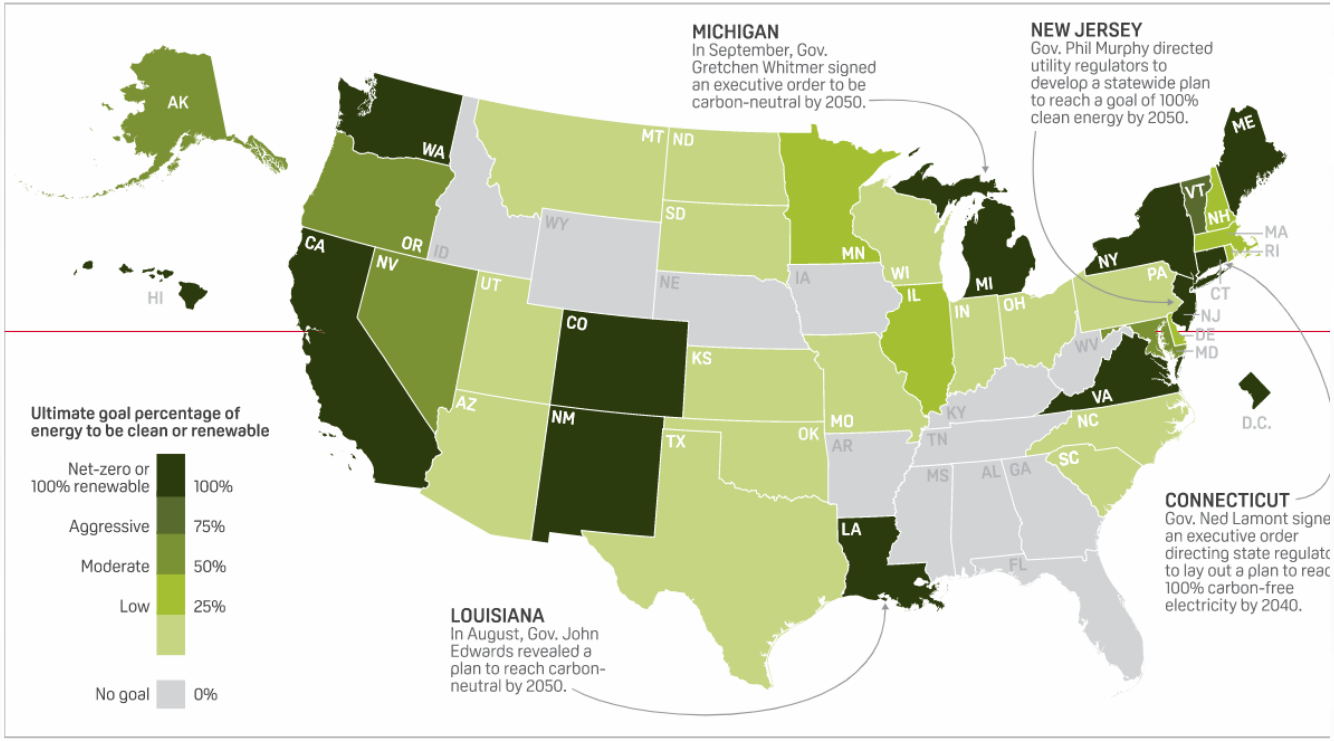


Why Economic Modeling?

Adapting to a rapidly changing energy landscape

GROWING NUMBER OF US STATES RACE TO NET-ZERO EMISSIONS, 100% RENEWABLE POWER

There are now 12 states, plus Washington DC, with 100% renewable generation or net-zero carbon emission goals or aspirations in the coming decades. The lates to join the energy transition to clean power are Louisiana, Michigan, Connecticut and New Jersey where governors announced plans or signed executive orders. They follow Colorado, which made the move in late 2019, and Virginia, which announced the change earlier this year. While many Southeast states do not have official goals, many utilities have set their own net-zero emission targets.



Source: S&P Global Platts, National Conference of State Legislatures, ERCOT, Cal-ISO, other associated sources for individual states and territories

Why Economic Modeling?

Adapting to a rapidly changing energy landscape

Carbon ambitious states have emissions reductions goals, but need a blueprint to realize those goals

Energy industry intensive states need tools to respond to shifts in federal policy, technological change and private sector pivots

Utilities need independent capability to project the economic gains and losses of carbon related policies

Why Economic Modeling?

Adapting to a rapidly changing energy landscape

Environment , Energy and Economy are interwoven

Without an understanding of these linkages, effective policy will remain elusive

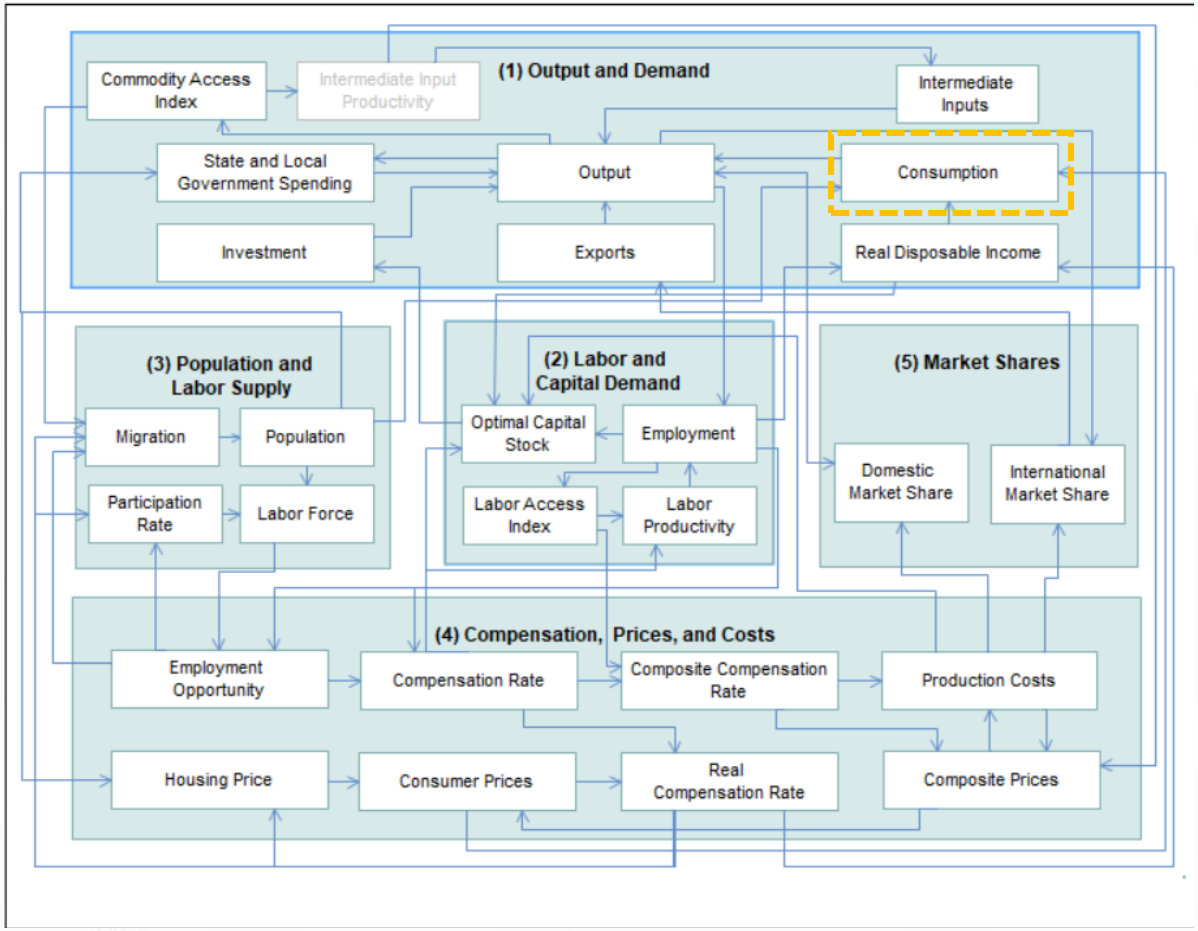
Model Tee Up

REMI E3⁺ is the premier software solution for analyzing the macroeconomic and demographic impacts of any initiatives related to the energy and environmental sectors.

Decision-makers depend on E3⁺ to provide comprehensive evaluations of:

- ✓ The total economic impact of altering electric rates
- ✓ Introducing new power sources
- ✓ Investing in the production of energy
- ✓ And other policy changes

Model Tee Up



One drop in a still pond

REMI Model Simulations

Simulation Details:

Colorado Pursues Energy Efficiency

Colorado Fast Facts:

Indicator	Time Period	Value
Average GDP	2010 – 2020	4.2%
Average Unemployment	2010 – 2020	5.5%
Population	July 2019 Census est.	5,758,736
Average CO2 Emissions	2009-2018	91.1 MMT
Economic Drivers	Strong manufacturing, mining and agriculture industries	

Carbon Reduction Goal: 90% of 2005 levels by 2050

Simulation Details:

Colorado Pursues Energy Efficiency

Compare two Energy Efficiency Policy options

- Residential Target
- Industrial/commercial Target

This comparison highlights the need for rigorous modeling

Residential Target

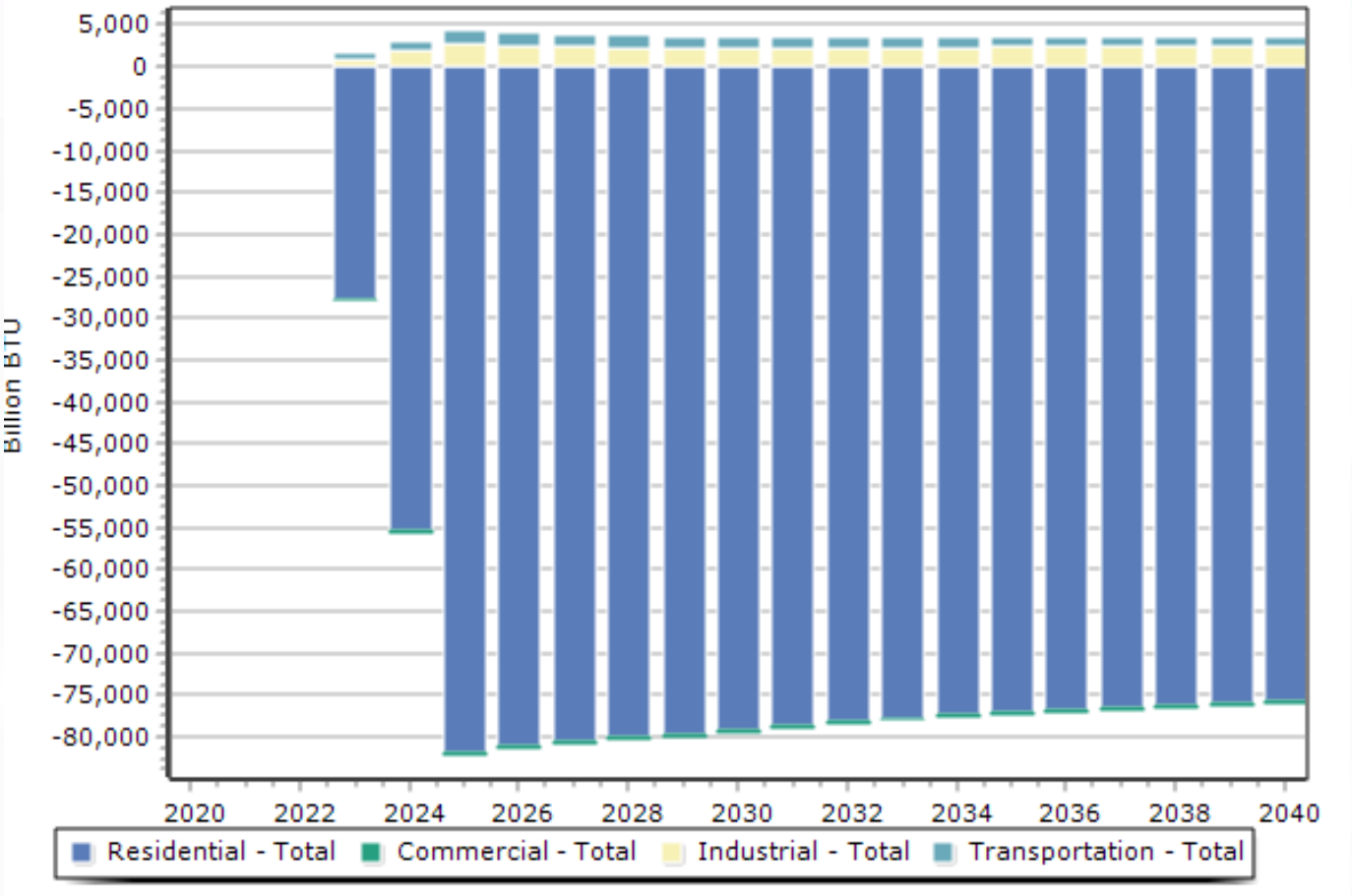
Simulation Details:

Energy Efficiency Scenario

Variables:

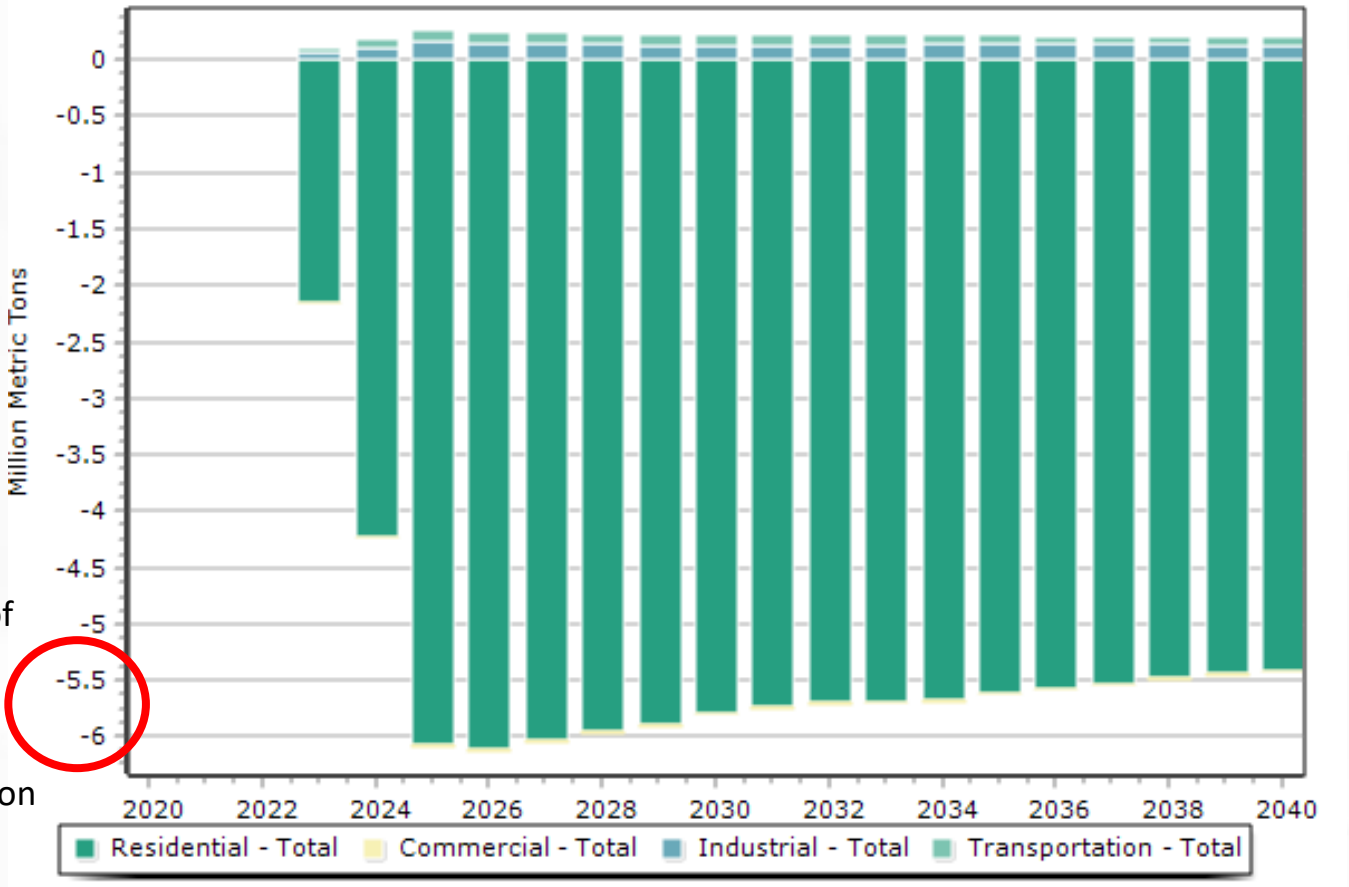
- -$2 Billion decrease in Consumer Spending
  - Electricity
  - Natural Gas
  - Reduction in spending is reallocated to all other spending categories
- Phased in from 2022 to 2025 and persistent through 2040

Results: Energy Consumption



Predictable response

Results: Carbon Dioxide Emissions



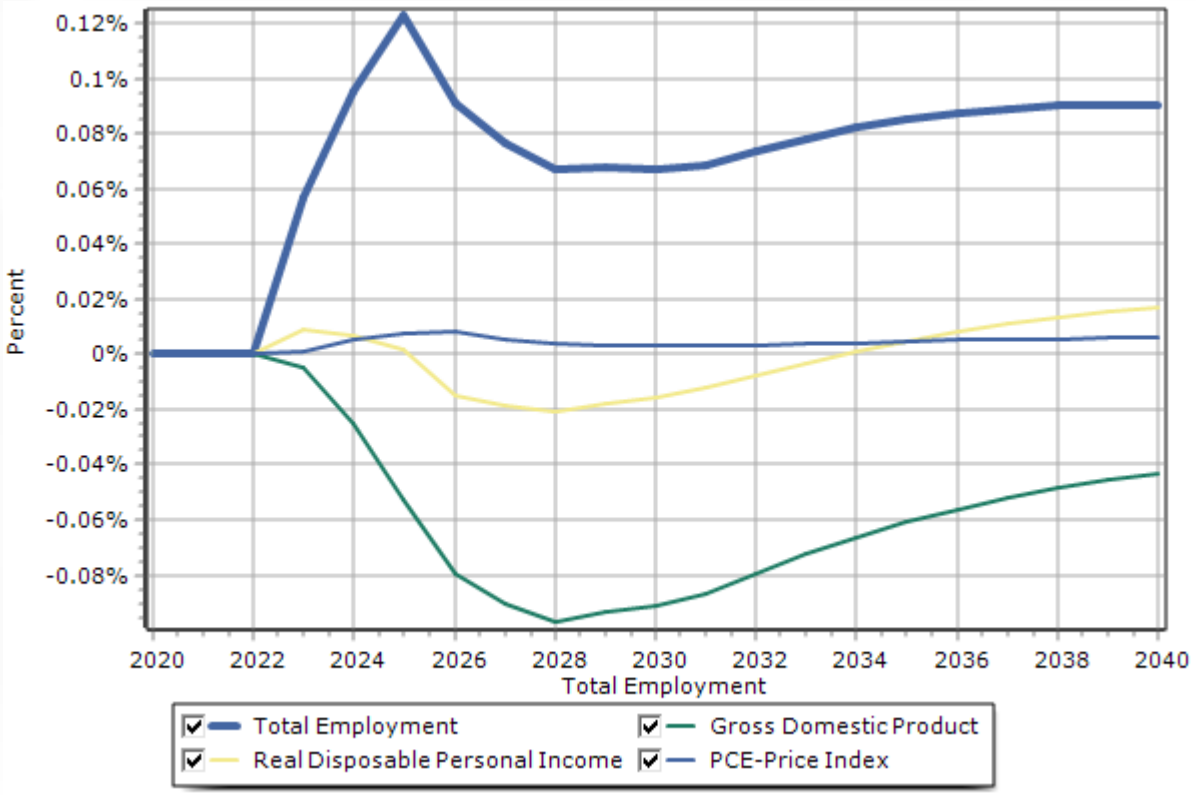
Appx 5.5 MMT of carbon avoided every year

Appx 6% reduction

Results: Carbon Dioxide Emissions

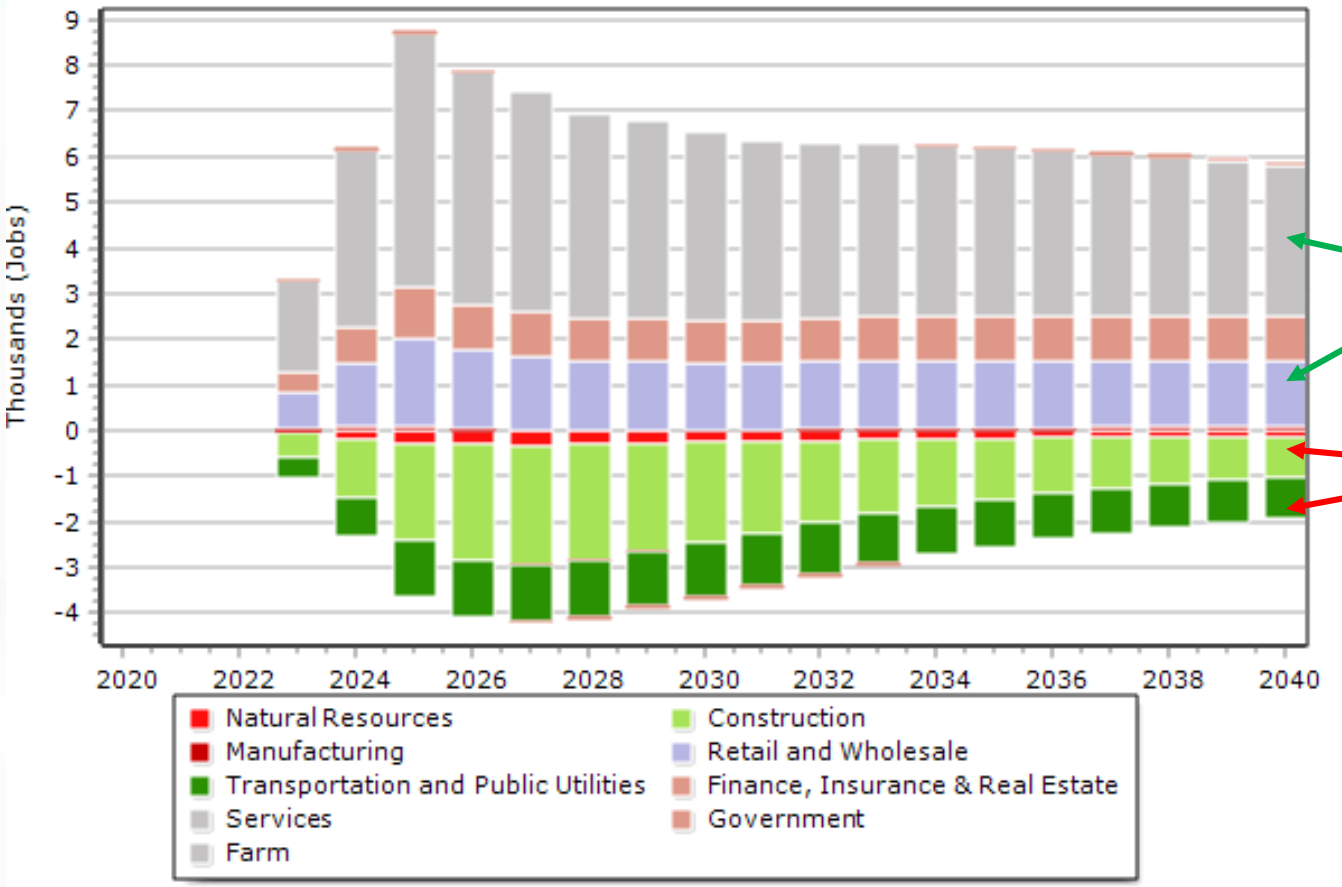
- Emissions reductions are straight forward and predictable
- Magnitude of Emissions drop has implications for carbon neutrality goals
  - 5.3 MMT average annual CO2 reduction
  - 91 MMT average emissions in the past decade
- Magnitude of energy consumption drop has implications for utilities

Results: Economic Summary

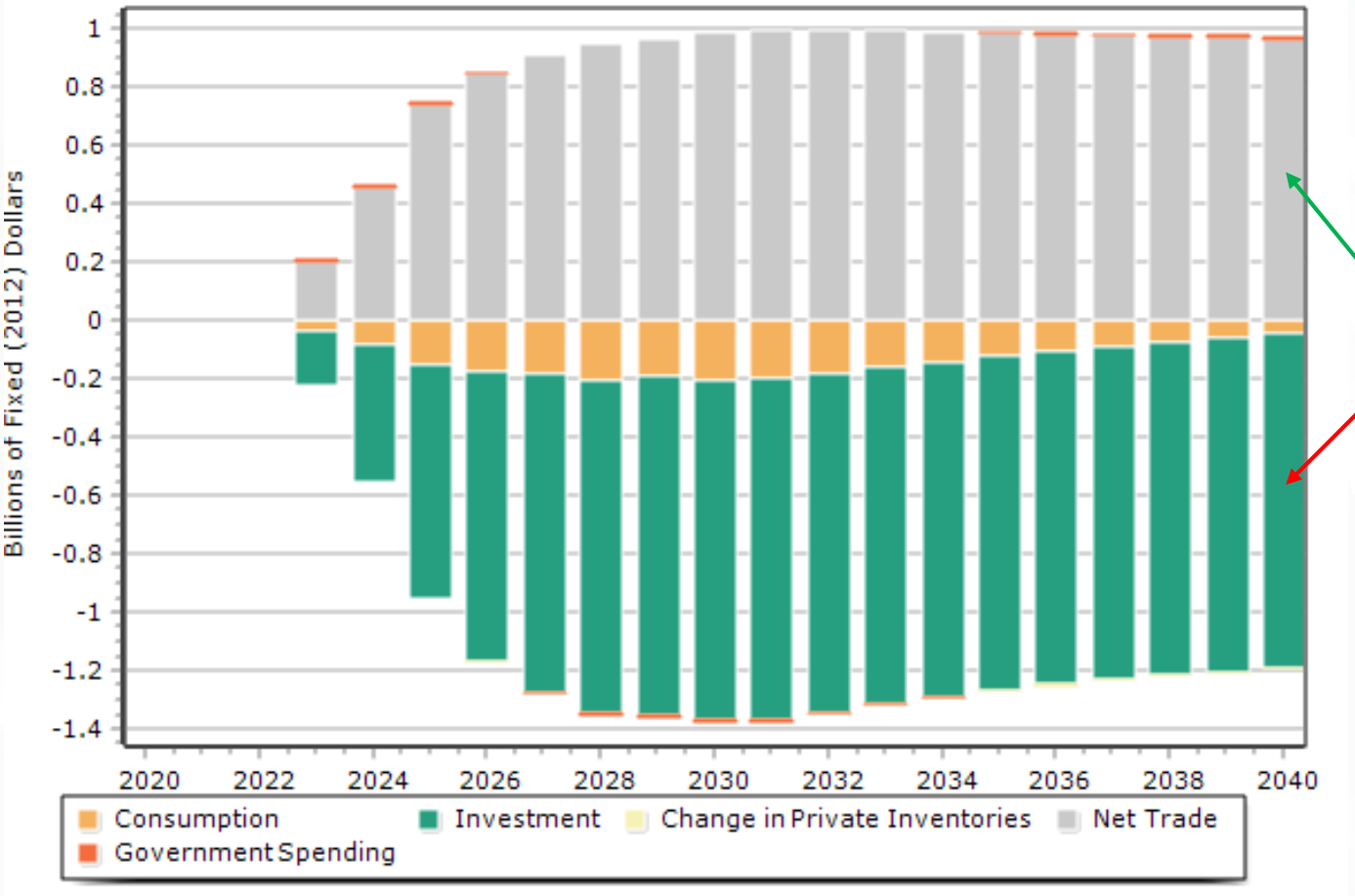


Why does GDP fall as employment rises?

Results: Employment



Results: GDP by Sector



Loss in Investment overpowers gain in trade

Results: Economic

- Economic Results are mixed
  - 3,490 Jobs created per year
  - -0.06% average GDP change
- Reallocation of spending from capital intense firms to labor intense firms:
  - More jobs needed
  - Less investment needed

Industrial and Commercial Target

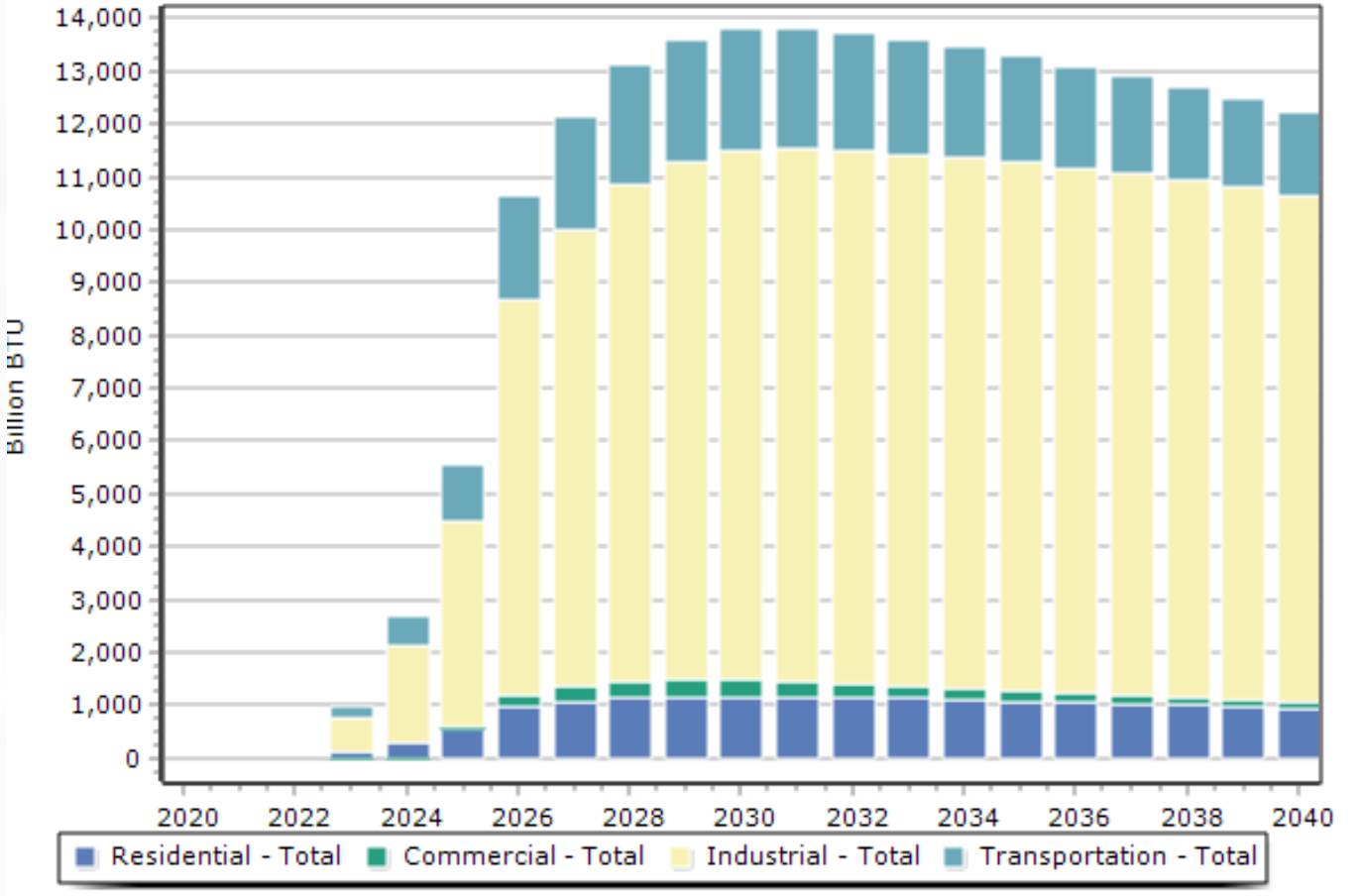
Simulation Details:

Colorado Pursues Energy Efficiency

Variables:

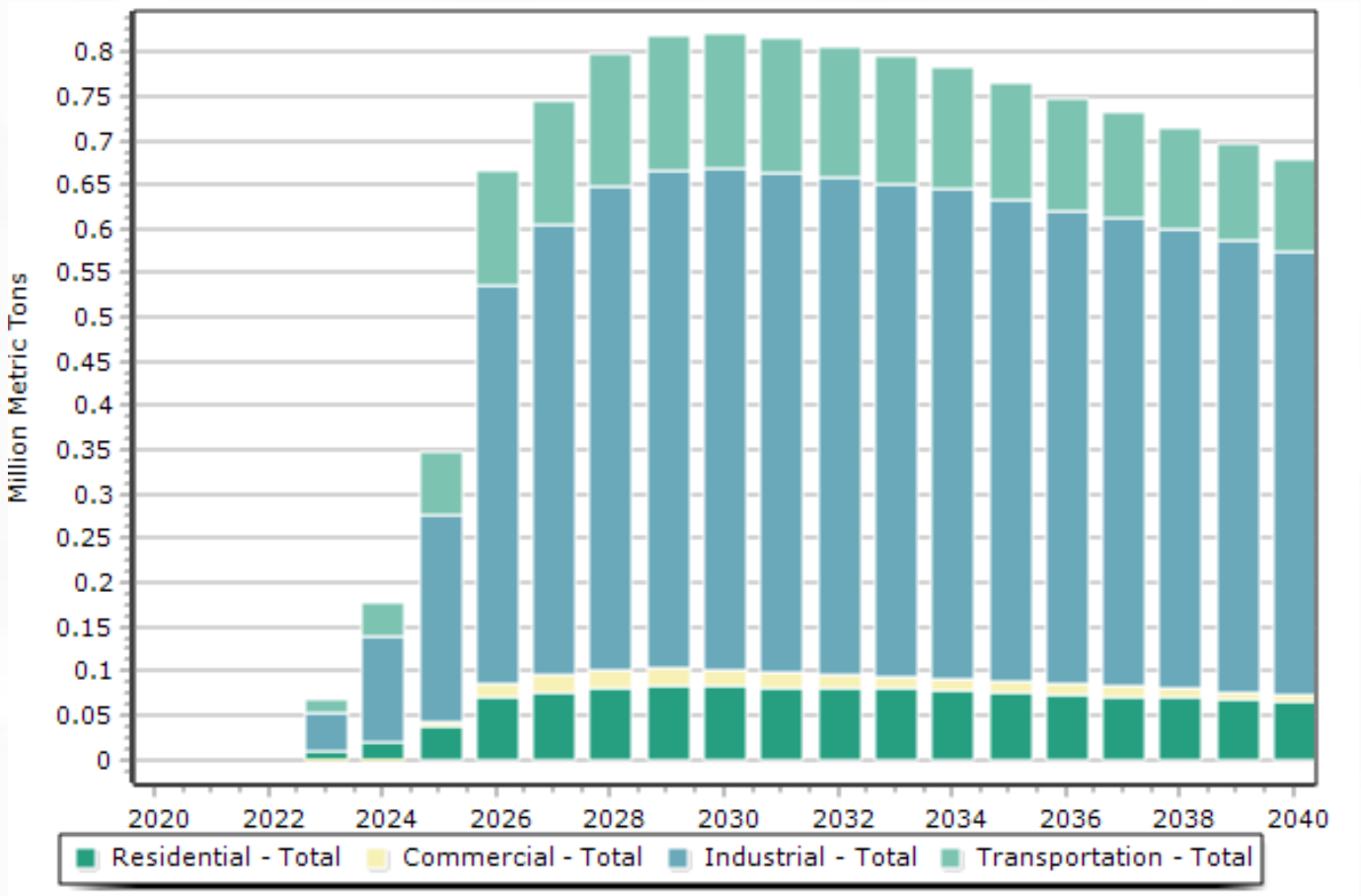
- -$2 Billion in Fuel Cost
  - Electricity
  - Natural Gas
- -$2 Billion in Industry Sales
  - Electric Power Generation
  - Natural Gas Distribution
- Phased in from 2022 to 2025 and persistent through 2040

Results: Energy Consumption



Increase in Energy Consumption?

Results: Carbon Dioxide Emissions

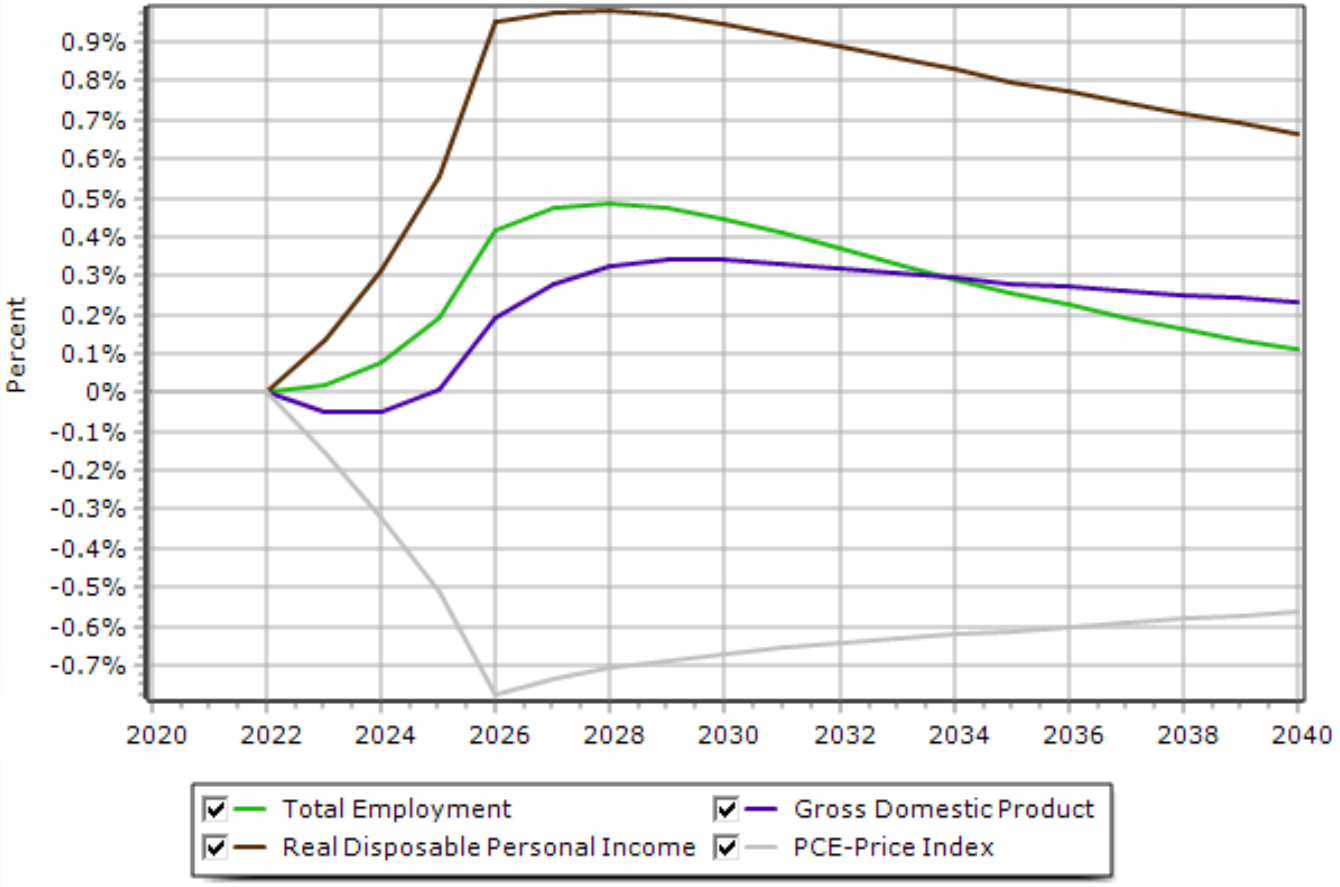


Increase in Carbon Emissions?

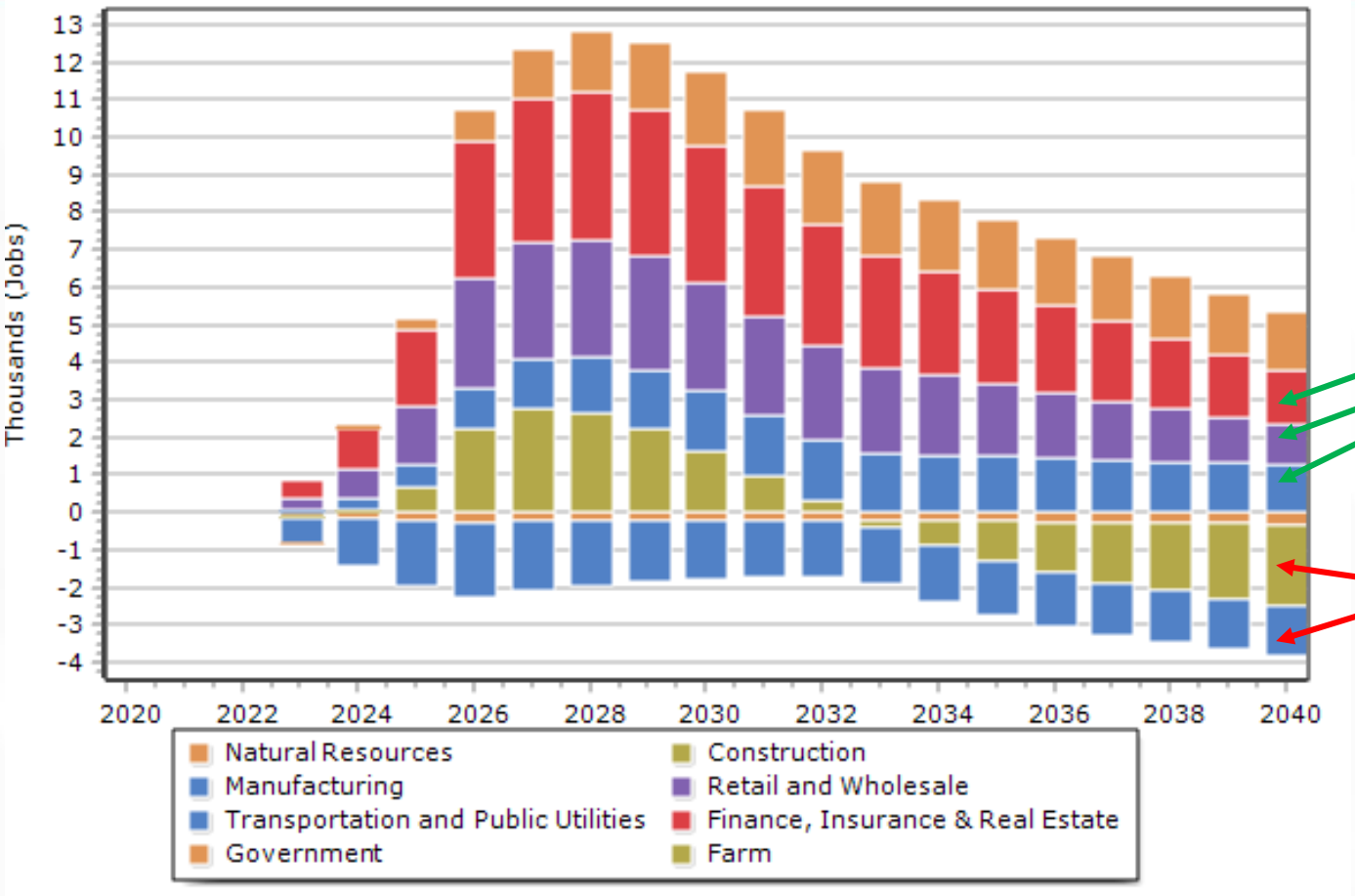
Results: Carbon Dioxide Emissions

- Emissions increases are counter-intuitive
  - Average +0.67 MMT of CO2 per year
- Energy ***increase*** has implications for utilities
- Emissions ***increase*** has implications for carbon neutrality goals

Results: Economics Summary



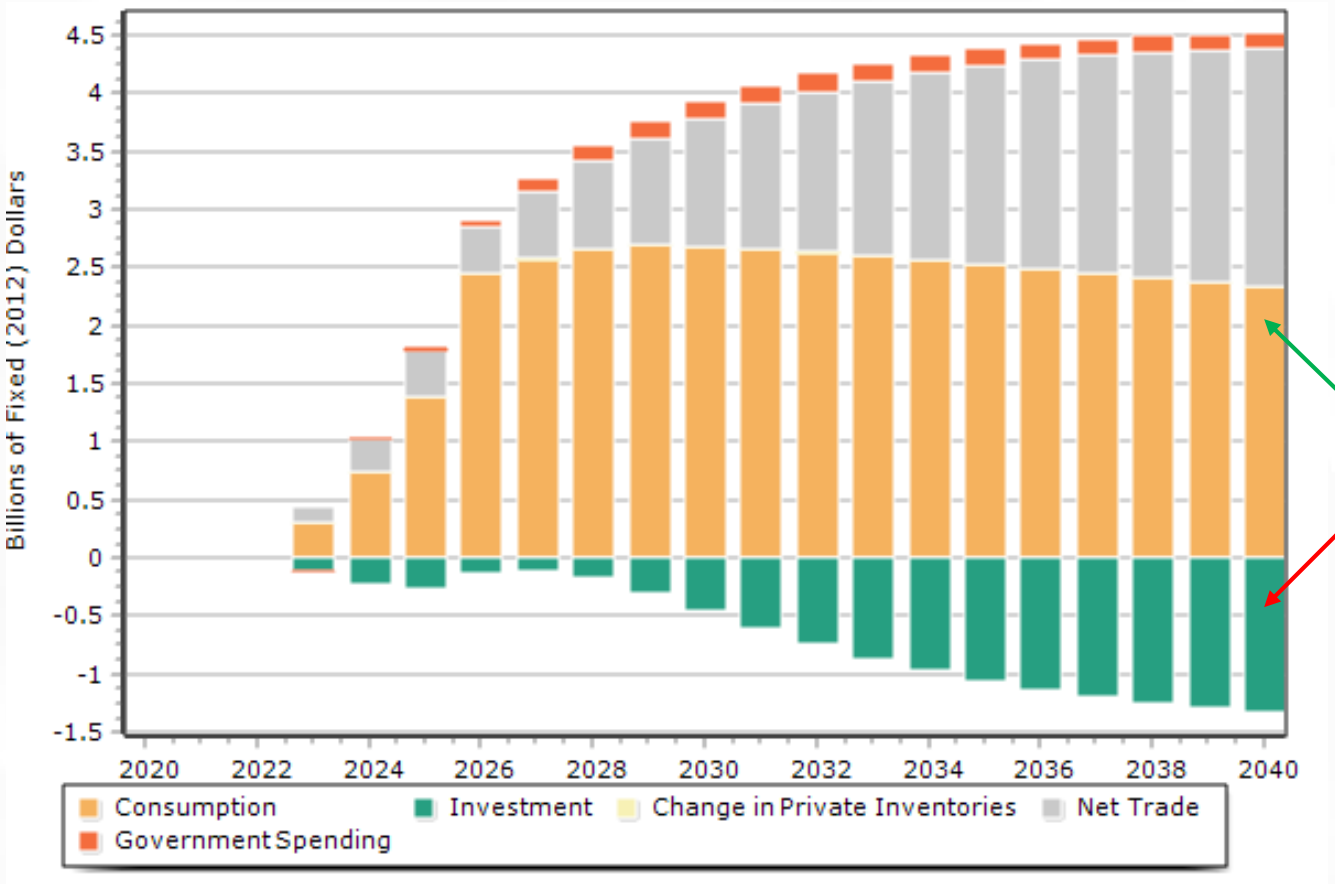
Results: Employment



Gains in Manufacturing, Retail and financial service

Losses in Utilities and Construction

Results: GDP by Sector



Gain in Trade and Consumption overpower loss in Investment

Results: Economic

- Employment and GDP grow together
  - Average 5,735 Jobs created annually
  - Average +1.06% change in GDP

- GDP Shift
  - Investment drops similarly to the residential scenario
  - this is overwhelmed by more profitable companies

Summary

Summary

Key Take-Aways

1. Emissions Reduction is not guaranteed
2. Economic losses are not guaranteed

	Emissions 2022- 2040	Emissions Per Year	Employment 2022-2040	Average Jobs Per Year	Average GDP Change
Residential	-94.51 MMT	-5.25 MMT	62,820 Jobs	3,490 Jobs	-0.06%
Commercial/ Industrial	11.97 MMT	0.67 MMT	103,222 Jobs	5,735 Jobs	+1.06%

Summary

- **The Energy Landscape is changing rapidly**
- **Environmental, Energy and Economic factors are best evaluated together**
- **Rigorous economic analysis is increasingly important**
- **REMI provides a powerful tool to evaluate the environmental and economic impacts of climate policy**

REMI and Modeling

- **Current Clients include:**
  - **University of Colorado Boulder**
  - **Los Angeles County Metropolitan Transit Authority**
  - **Tampa Bay Regional Planning Council**
  - **Deleware Department of Transportation**
  - **Dozens of legislatures, MPOs, and Universities**

- **Other features of the model include:**
  - **Energy Generating Facility construction/decommission**
  - **Pollution Controls' affect on the economy**
  - **Benefit of natural disaster preparation**

- **Rigorous economic analysis**
  - **Since 1980**
  - **Peer Reviewed**
  - **Public Data**
  - **Public Equations**

Q & A

Zachary Schofield, Associate
Zachary.Schofield@remi.com

Katy Koon, Economic Analyst
Katy.Koon@remi.com