

Economic and Environmental Impacts of National EV Adoption in the U.S.

Regional Economic Models, Inc.

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Agenda



Background

Simulation assumptions and input variables

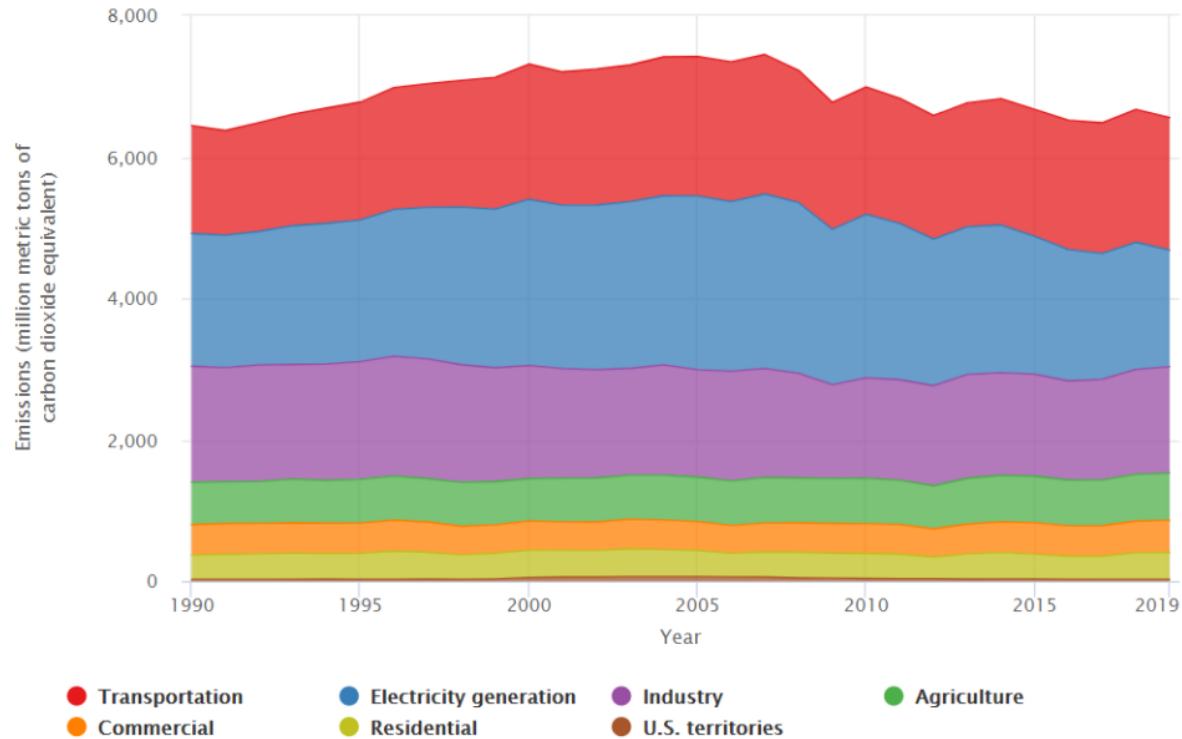
Notable results

Conclusions

*what does **REMI** say?sm*

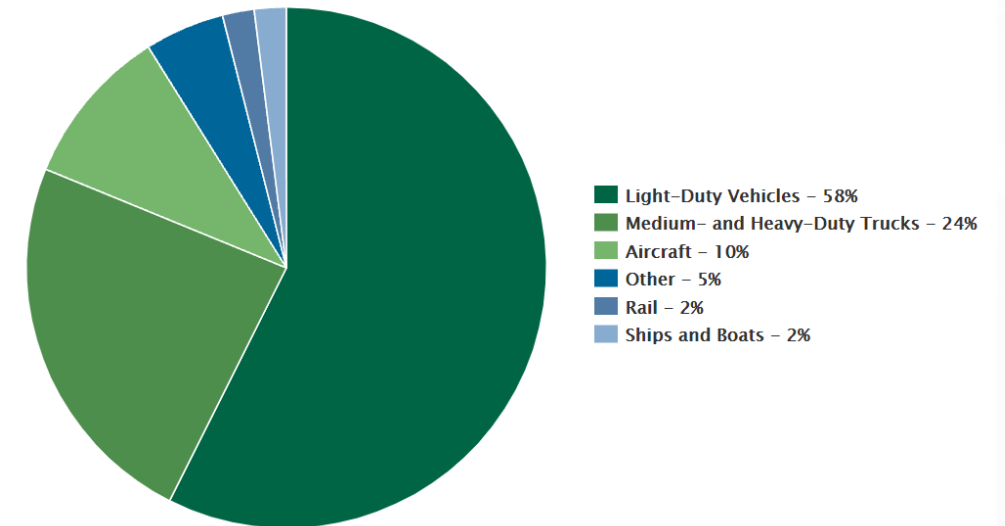
Background on EV Adoption in the U.S.

U.S. Greenhouse Gas Emissions by Economic Sector, 1990–2019



Source: [Inventory of U.S. Greenhouse Gas Emissions and Sinks | US EPA](#)

2019 U.S. Transportation Sector GHG Emissions by Source



Source: [Fast Facts on Transportation Greenhouse Gas Emissions | US EPA](#)

Background on EV Adoption in the U.S. (Cont.)

EV Advances

- Total cost of EV ownership has been steadily declining; decrease in battery cost is the primary driver
- Range and usability have been steadily increasing

Government Support

- Bipartisan Infrastructure Agreement includes \$7.5 billion to build out the first-ever national network of EV chargers¹
- The agreement also invests \$5 billion in zero emission and clean buses²
- Tax incentives for EV purchase granted by federal and state governments

Environment & Energy

- Transportation sector is the largest carbon emitter in the U.S.³
- Expansion of clean electricity grid is promising due to the plummeting cost of clean energy, such as solar and wind power⁴

1. [UPDATED FACT SHEET: Bipartisan Infrastructure Investment and Jobs Act | The White House](#)
2. [UPDATED FACT SHEET: Bipartisan Infrastructure Investment and Jobs Act | The White House](#)
3. [2035 Report 2.0 | Accelerate our Clean Transportation Future](#)
4. [2035 Report 2.0 | Accelerate our Clean Transportation Future](#)

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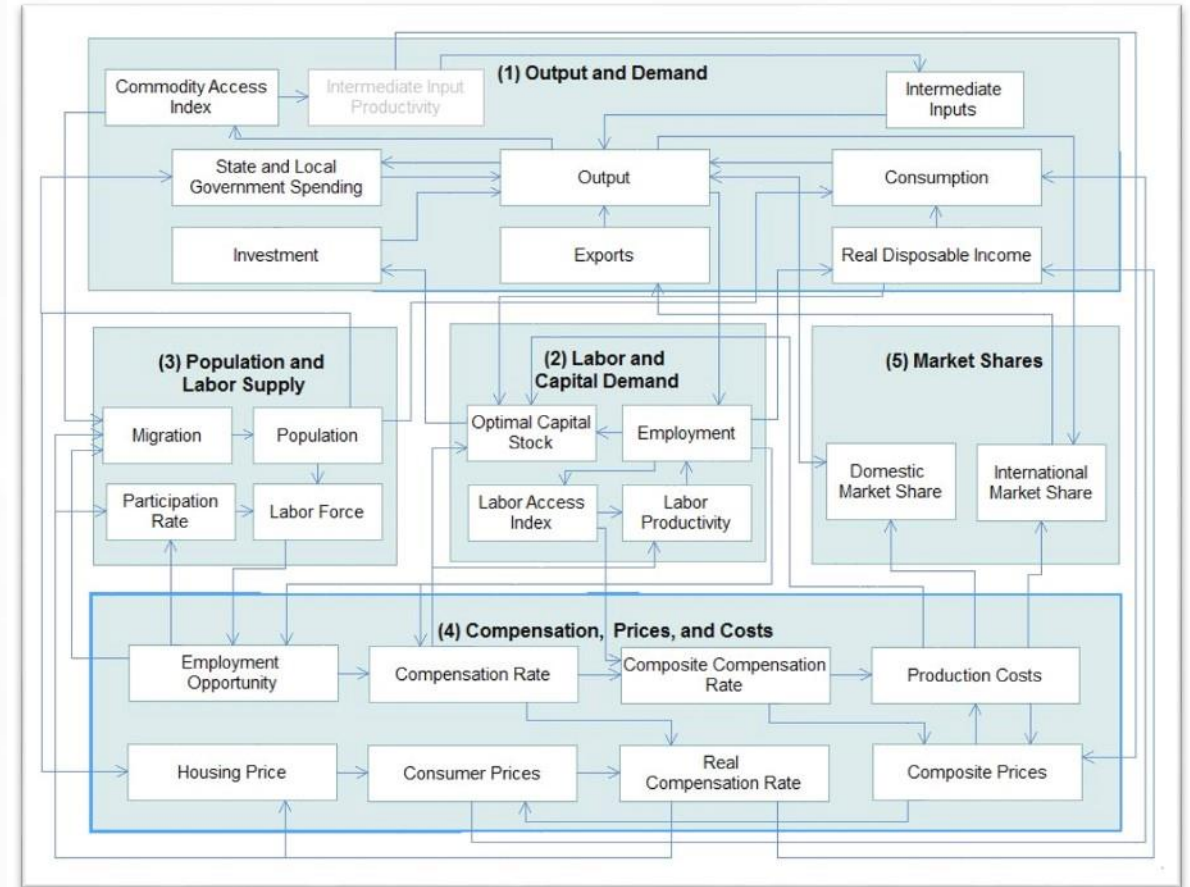
*what does **REMI** say?sm*

Model Simulation: REMI E3⁺



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.

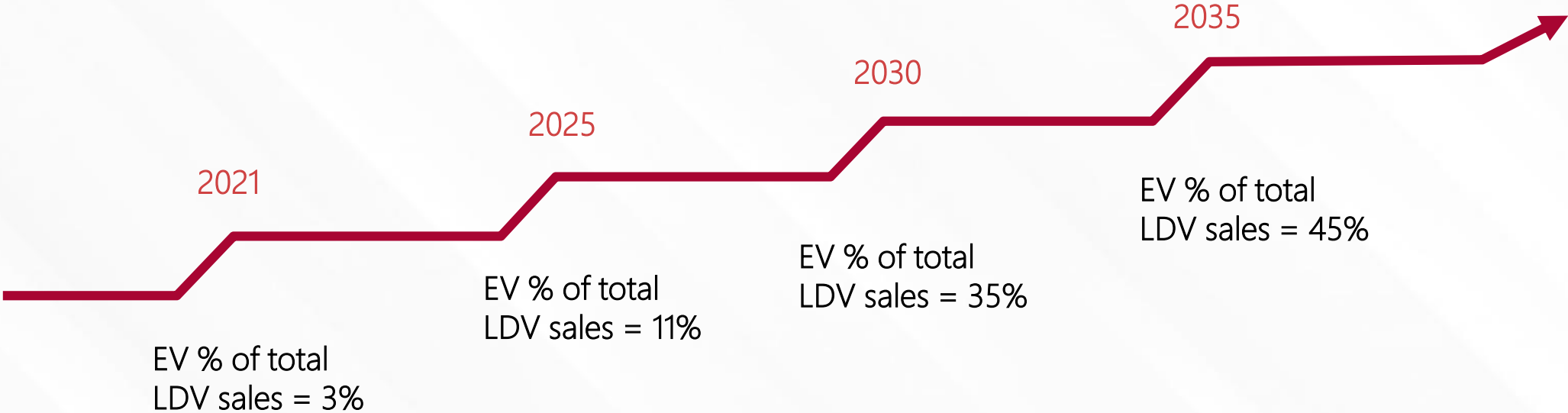


what does **REMI** say?sm

Model Simulation: EV Adoption Trend in the U.S.



Today, we focus on Light Duty Vehicles (LDV), which include passenger cars and light trucks.



Source: [2035 Report 2.0 | Accelerate our Clean Transportation Future](#) and REMI assumption

Model Simulation: Key Assumptions



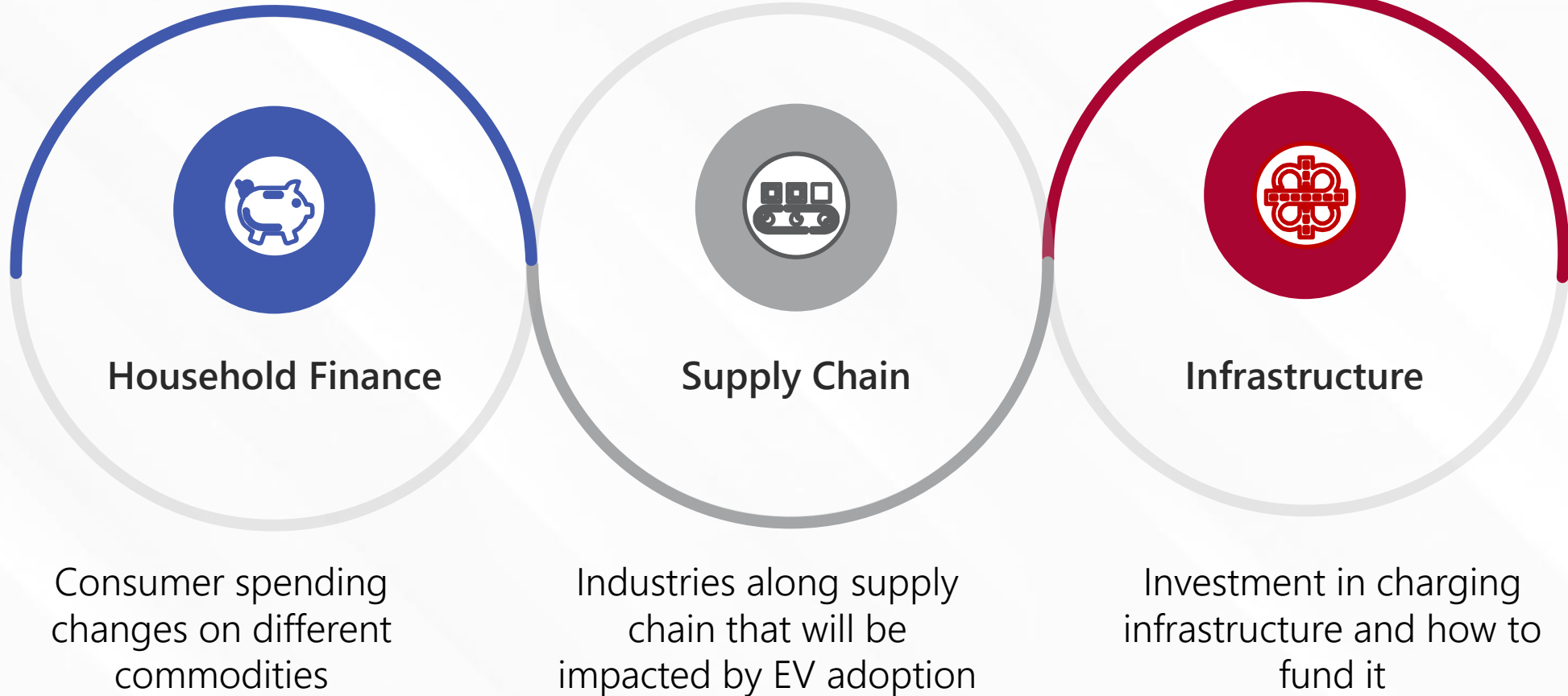
Study subject: Light Duty Electric Vehicles (passenger cars + light trucks)

Study period: 2022-2030

Assumptions

- Total demand for LDVs will keep the same as the baseline forecast
- Average vehicle miles traveled (VMT) for light duty electric vehicles is 12,000 miles/year
- Average useful life of light duty electric vehicles is 12 years

Model Simulation: Variables – Overview



Model Simulation: Variables – Consumer Spending



New Motor Vehicle

- Assume during 2022-2025, the net price differential between EVs and ICE vehicles are \$500 (\$8k price differential - \$7.5k tax incentives)
- Assume price parity will be achieved by 2025, and after 2025, the price differential will be zero

5. Source: [EV Ownership Cost Final Report \(consumerreports.org\)](https://www.consumerreports.org/ev-ownership-cost-final-report)

6. Ibid



Motor vehicle maintenance and repair

- EVs have much fewer moving parts than ICE vehicles; thus, EV requires less maintenance and repair⁵
- EV owners' average saving on vehicle maintenance and repair is \$0.03/mile⁶



Motor vehicle fuels, lubricants, and fluids

- Spending saving on motor vehicle fuels is calculated by *Motor fuel price*energy efficiency*average VMT per year*new EVs on roads from 2022*
- Data source: U.S. Energy Information Administration (EIA) [Annual Energy Outlook 2021 \(eia.gov\)](https://www.eia.gov/annual-energy-outlook/)



Electricity

- Increase in electricity spending is calculated by *Electricity price*energy efficiency*average VMT per year*new EVs on roads from 2022*
- Data source: EIA [Annual Energy Outlook 2021](https://www.eia.gov/energy_outlook/annual/) ([eia.gov](https://www.eia.gov/))



Consumption Reallocation

- Sum up all the consumption changes listed above; people will save money by owning EVs instead of ICE vehicles
- Assume the total consumption keeps the same as baseline forecast; then the saved money from EV ownership will be reallocated to all the other commodities

Industry Output Change

Battery Industry



- Along with EV adoption, battery industry sees a rapidly rising demand



- Increased demand for battery industry from EVs is calculated by *Battery Price * Battery Size * EV sales*



- Data source: [2035 Report 2.0 | Accelerate our Clean Transportation Future](#) by Goldman School of Public Policy

Motor Vehicle Parts Industry



- EVs have much fewer moving parts than ICE vehicles; motor vehicle parts industry will be impacted negatively

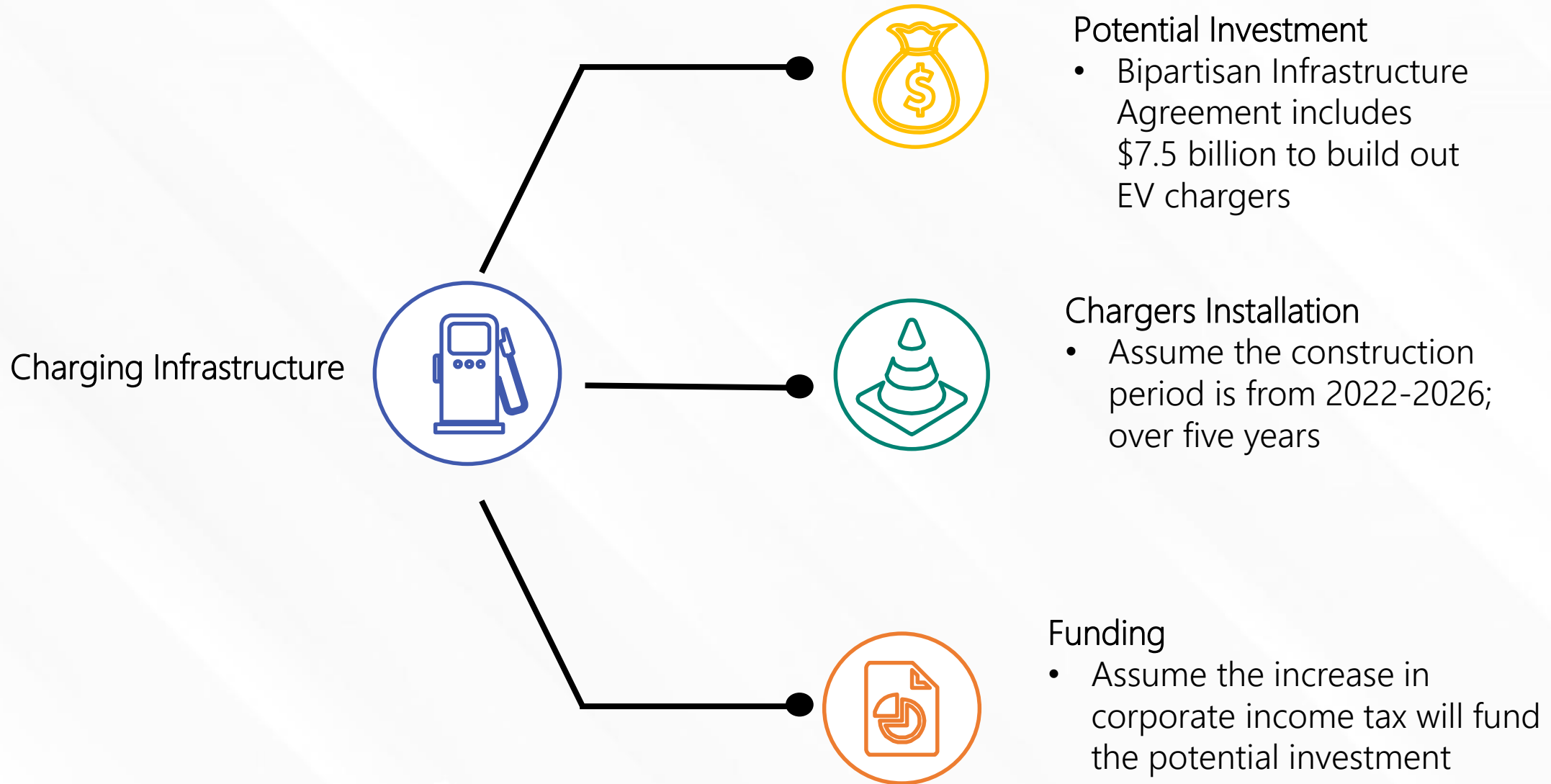


- Decreased demand for motor vehicle parts industry is calculated by *% of demand decrease in vehicle parts per vehicle * EV sales*



- Data source: [Merge ahead: Electric vehicles and the impact on the automotive supply chain \(pwc.com\)](#)

Model Simulation: Variables – Charging Infrastructure



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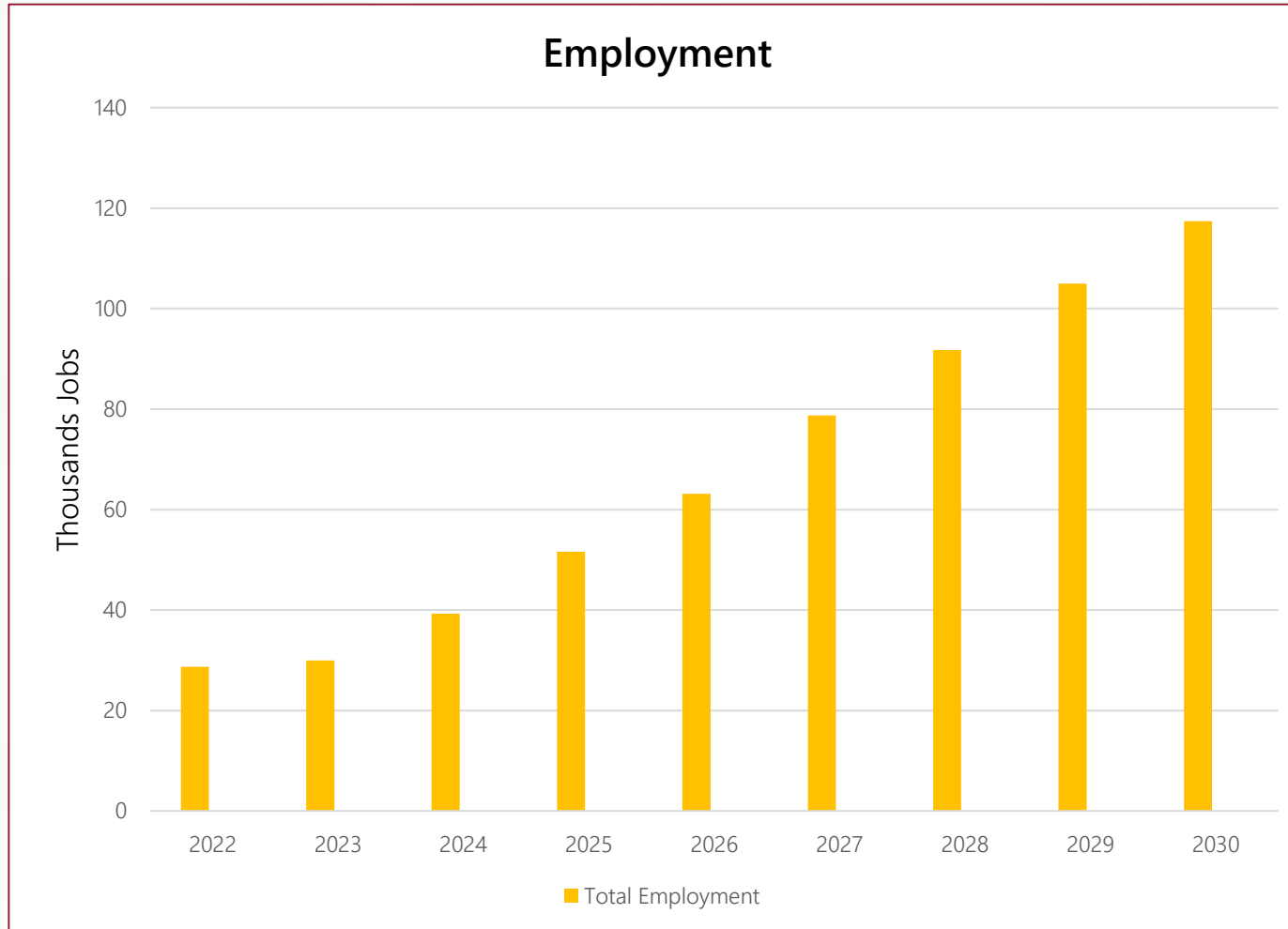
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Simulation Results: Employment



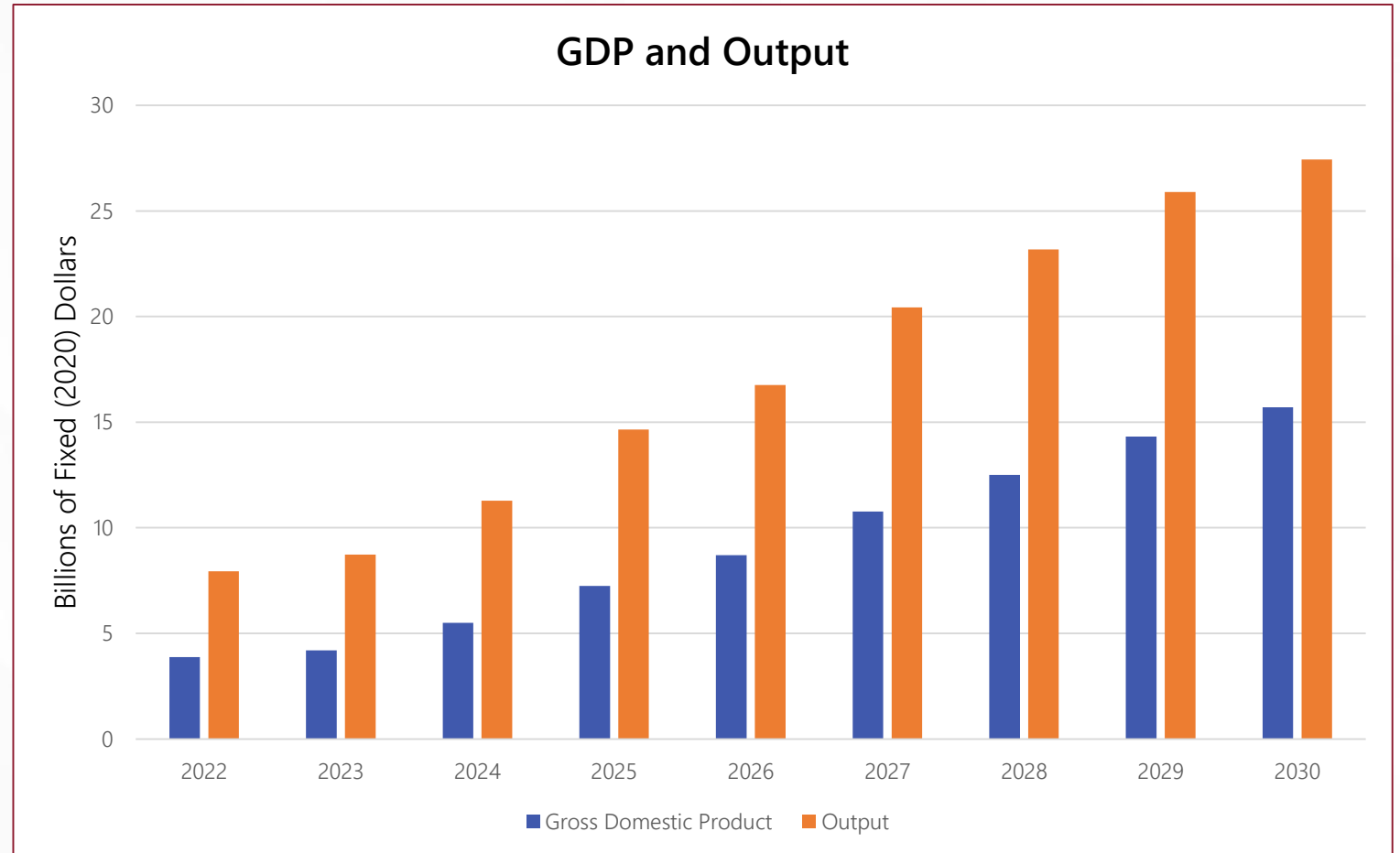
By 2030, over 117,000 jobs will be created across the U.S.



Employment increase in EV related industries outweighs the job loss in ICE vehicle related industries

Simulation Results: GDP and Output

- Increase of over \$82 billion (fixed 2020 dollars) in GDP over nine years
- Addition of over \$156 billion (fixed 2020 dollars) in economic output over 2022-2030
- Growth in GDP and economic output is driven by the expansion of EV related industries, investment in charging infrastructure, as well as other induced economic activities



Simulation Results: Output by Industry

Five most positively impacted industries by EV adoption

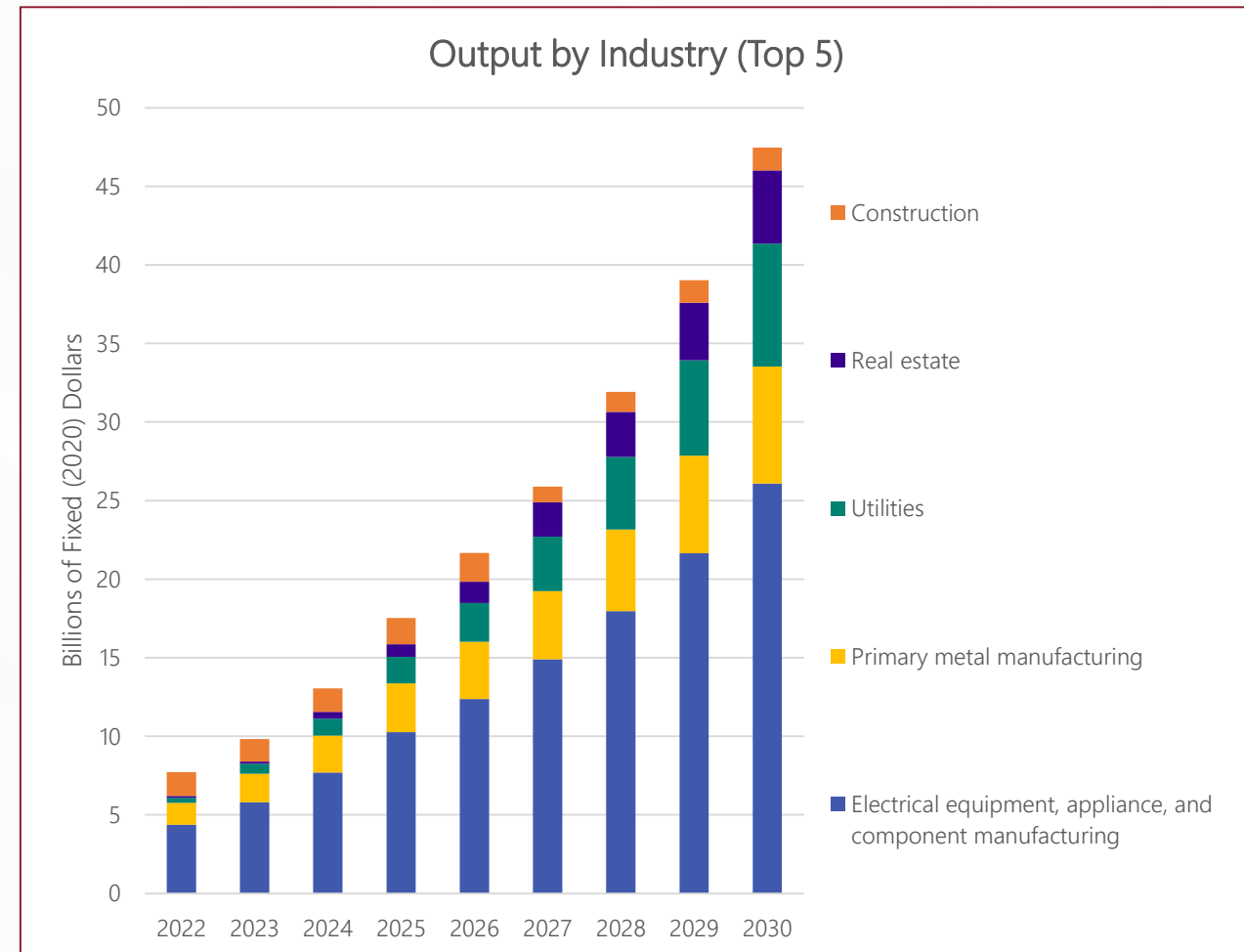
1. **Electrical equipment, appliance, and component manufacturing industry:** includes storage battery industry, wiring device industry, and etc.

2. **Primary metal manufacturing industry:** provides intermediate inputs to EV and battery related industries

3. **Utilities industry:** covers electricity generation, transmission, and distribution

4. **Real estate industry:** is driven by economic growth and personal income increase, thus demand for housing and commercial real estate increases

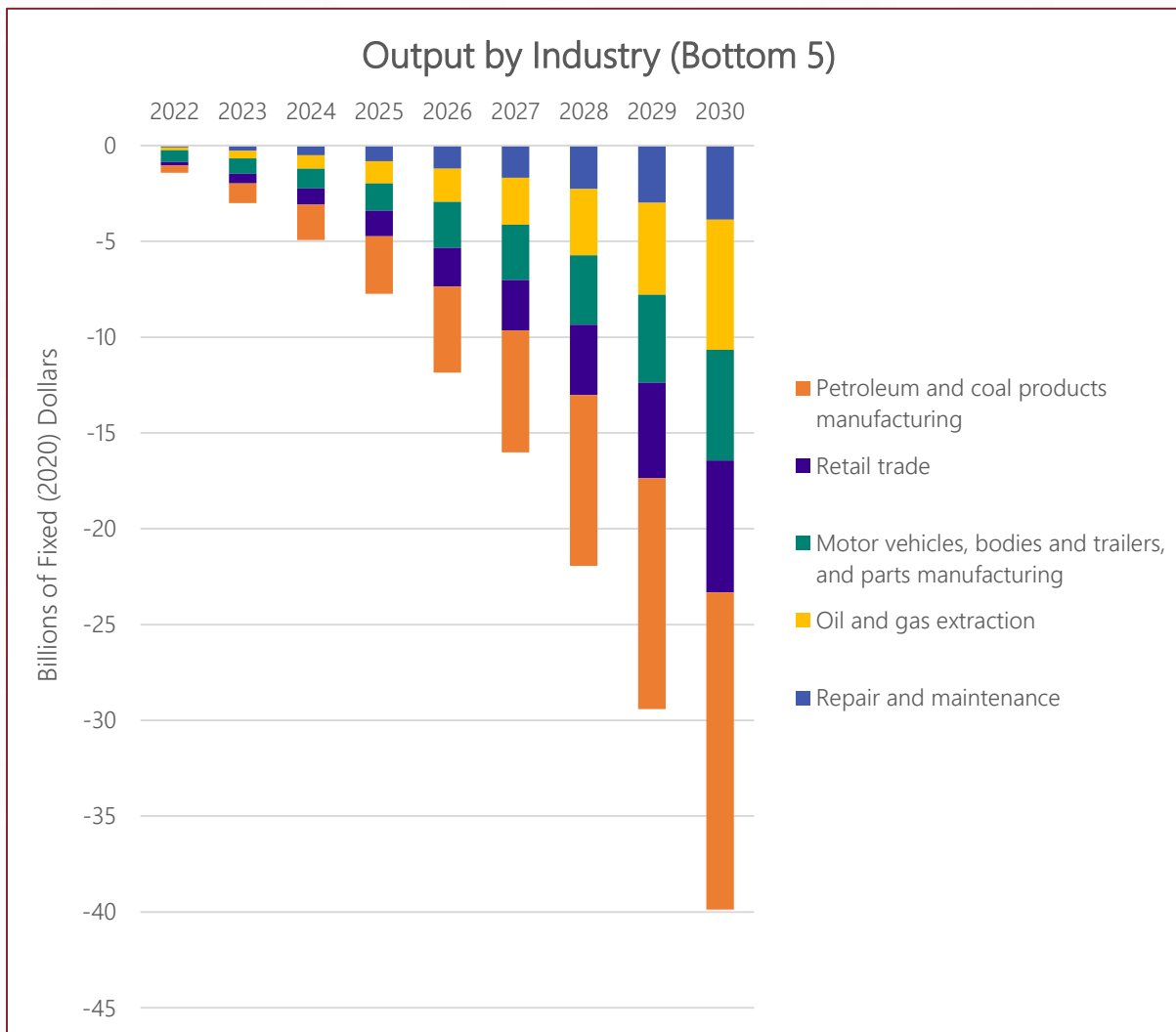
5. **Construction industry:** represents the demand for building charging infrastructure and other induced investment activities



Simulation Results: Output by Industry (Cont.)

Five most negatively impacted industries by EV adoption

1. **Petroleum and coal products manufacturing Industry:** is mainly driven by demand decrease in motor vehicle fuels, lubricants, and fluids
2. **Retail trade industry:** is negatively impacted mainly by the price increase in commodities, which is the result of corporate income tax increase
3. **Motor vehicles, bodies and trailers, and parts manufacturing industry:** sees output decrease mainly because EV needs fewer parts
4. **Oil and gas extraction industry:** is also negatively impacted by lower demand for motor vehicle fuels, lubricants, and fluids
5. **Repair and maintenance industry:** output decrease is due to less repair and maintenance demand from EV owners



Simulation Results: Personal Income

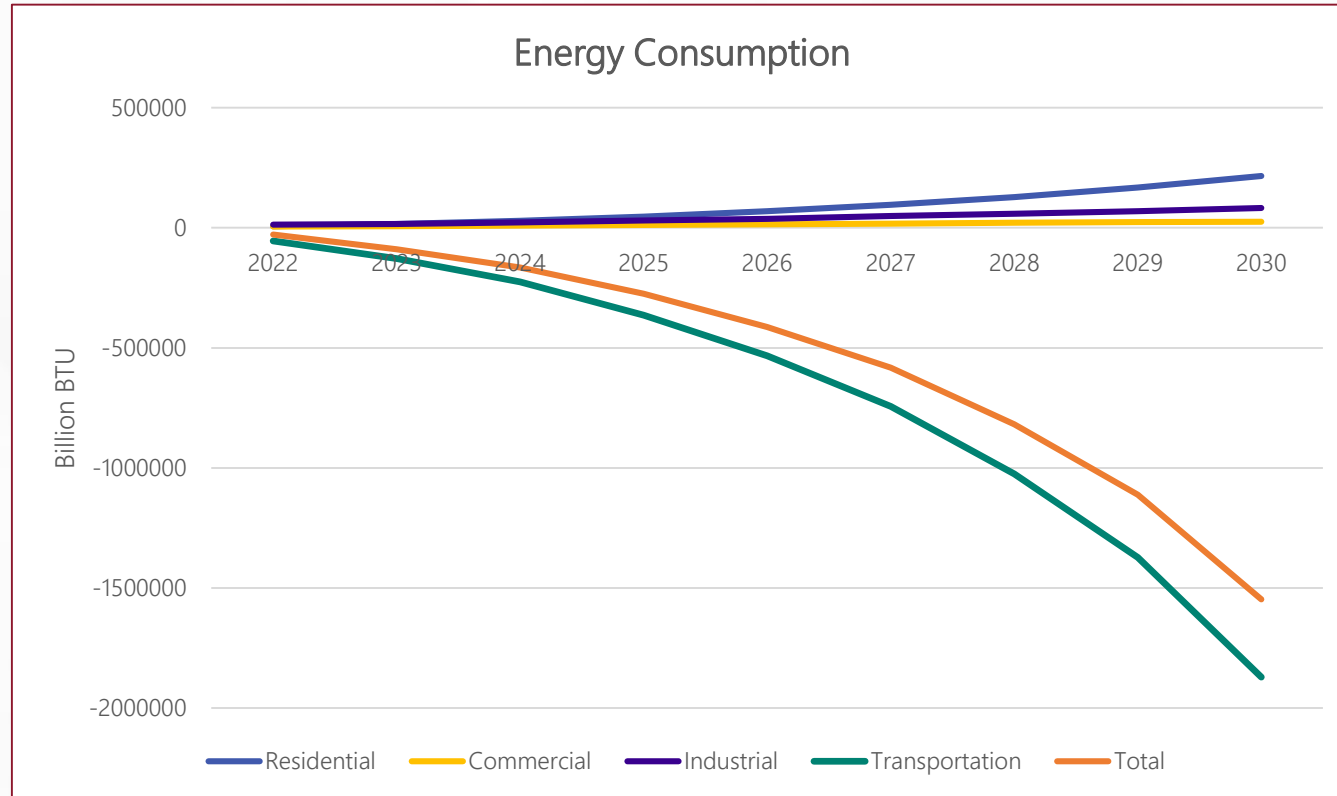


By 2030, an addition of almost \$50 billion (fixed 2020 dollars) personal income will be generated



In terms of disposable personal income, there will be an increase of around \$40 billion (fixed 2020 dollars) over 9 years

Simulation Results: Energy Consumption

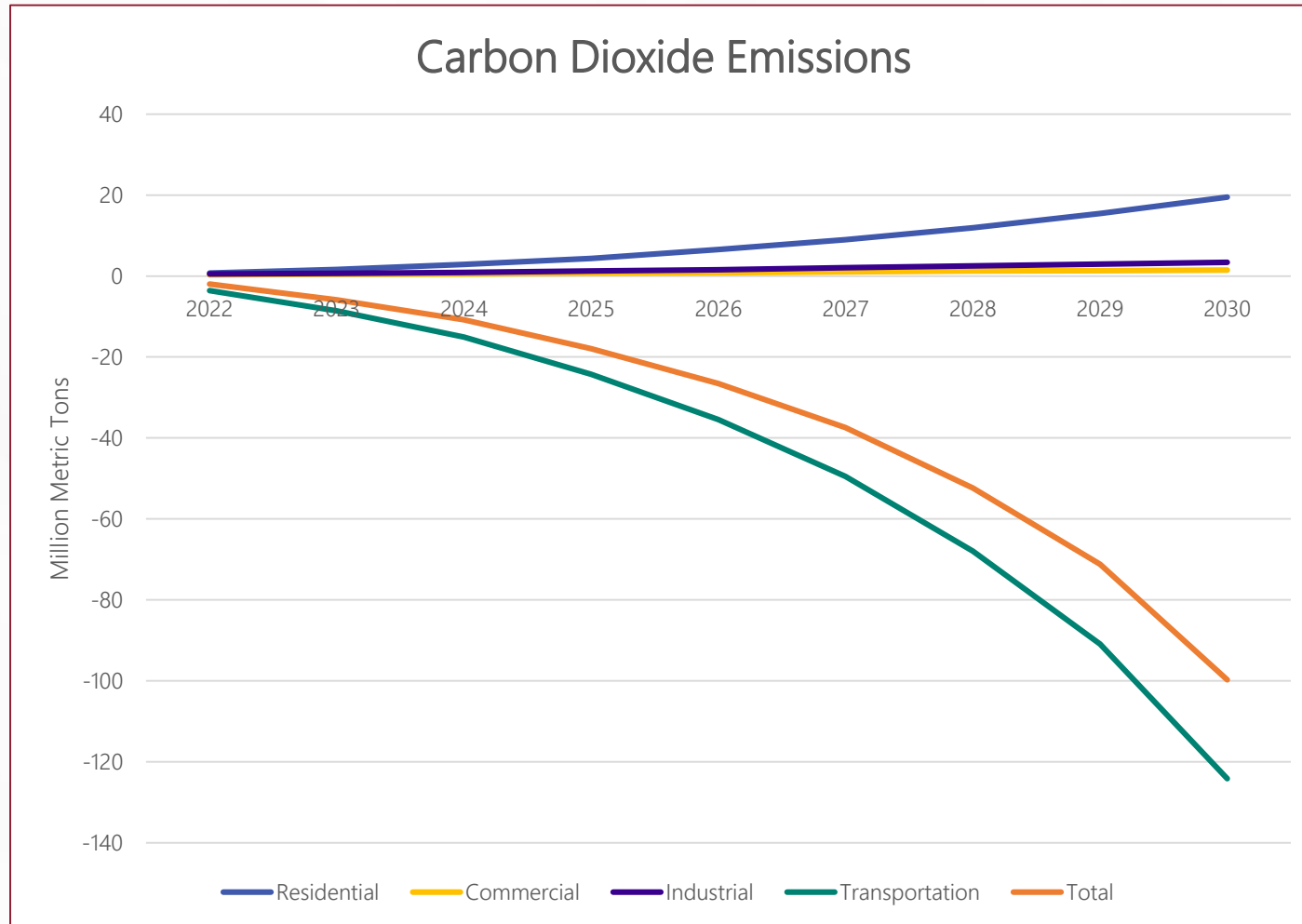


Transportation sector contributes to the decline in total energy consumption



Energy consumption increase in the other three sectors (residential, commercial, and industrial) can be explained by charging needs, EV related industries expansion, infrastructure investment, and induced economic growth

Simulation Results: Carbon Dioxide Emissions



Although carbon dioxide from residential, commercial, and industrial sectors will increase because of economic activity expansion and EV related infrastructure investment and manufacturing needs; total carbon dioxide emissions will drop due to a cleaner transportation sector

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Economic Impacts

- Cheaper EV ownership provides consumers additional purchasing power
- The expansion of EV related industries outweighs the contraction of ICE vehicle related industries in terms of GDP and employment

Environment Impacts

- EV adoptions will reduce the total energy consumption due to better fuel economy of EVs
- Less carbon dioxide emissions are expected due to EV adoption

Other Factors

- Opportunities to develop domestic battery industry and AI technology in cars
- Potential auto industry market share changes in the global market

Longer-term

- Potential of technology progress in battery and clean energy generation will further lower the price of EVs and generate larger positive impacts on the economy and environment
- Future of auto industry: robotic rideshare; self-driving vehicles

Thank you for attending!

For more information, please contact
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