MINNESOTA ENERGY POLICY SIMULATOR

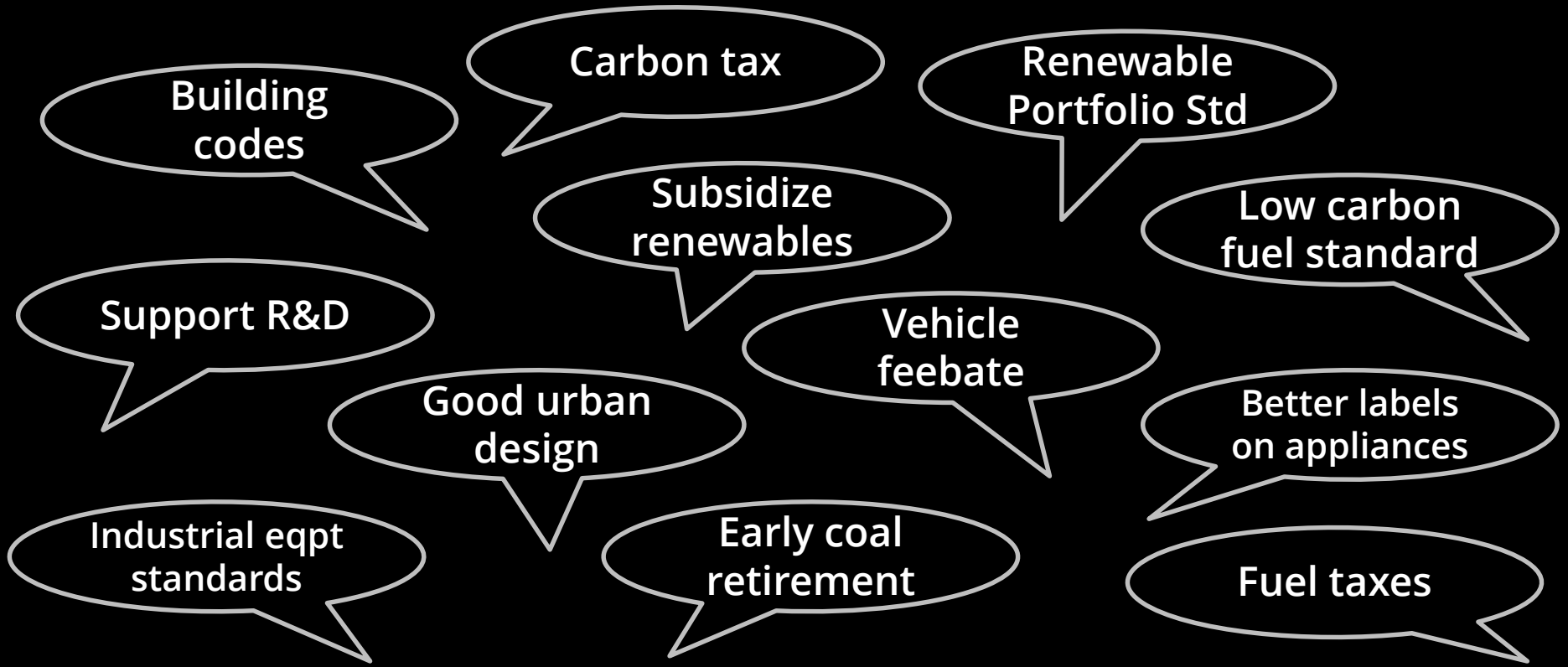
Robbie Orvis

ENERGY INNOVATION
POLICY & TECHNOLOGY LLC

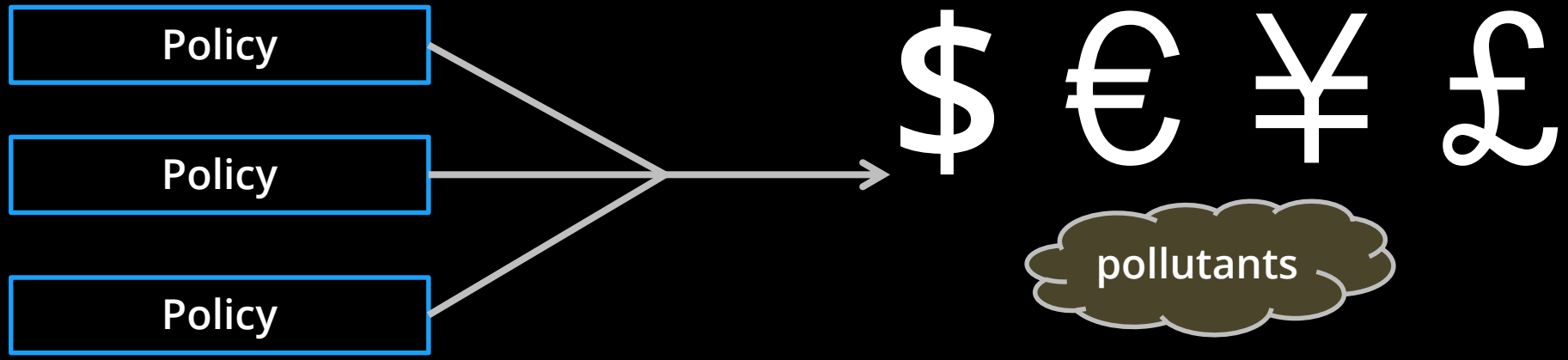
THE ENERGY POLICY SIMULATOR HELPS POLICYMAKERS…

- Understand impacts of energy and environmental policies
- Find the best way to meet their climate, financial, and other goals
- Make policy decisions that are unbiased and data-supported

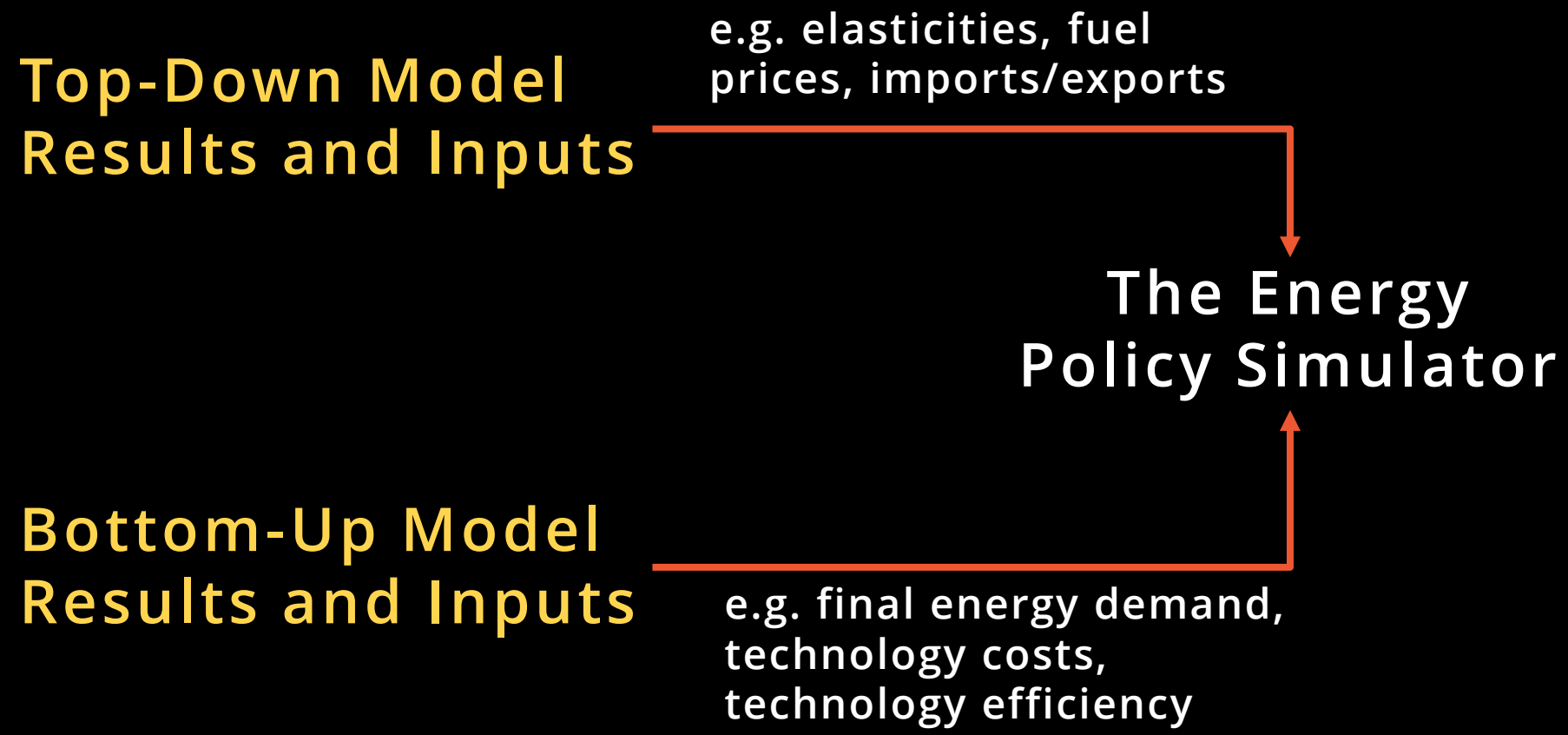
There are many policies we might consider that affect energy use and emissions.

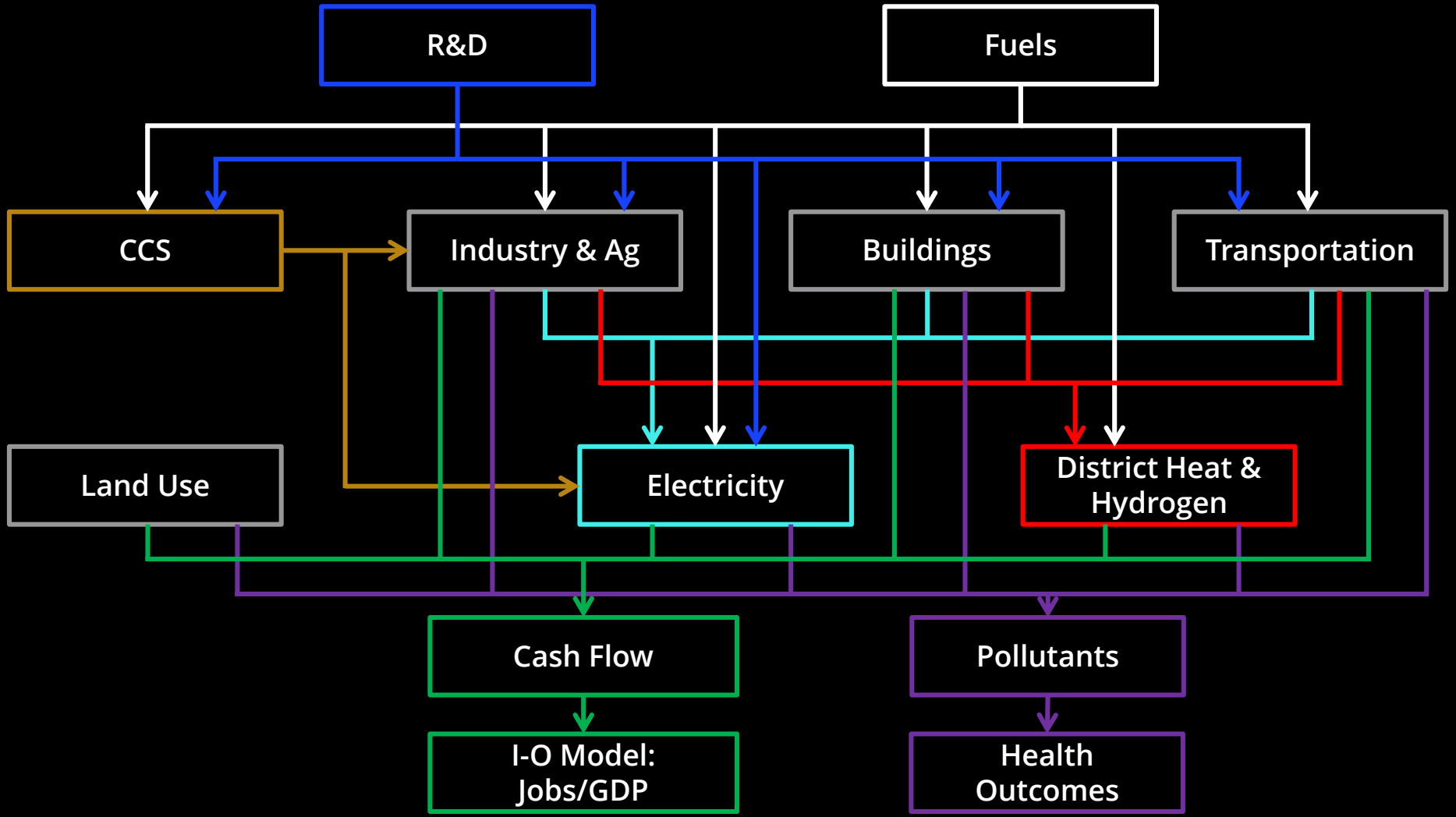


A System Dynamics model allows us to predict the combined effects of packages of policies.



HOW THE EPS FITS IN




R&D
Fuels
CCS
Industry & Ag
Buildings
Transportation
Land Use
Electricity
District Heat & Hydrogen
Cash Flow
Pollutants
I-O Model: Jobs/GDP
Health Outcomes

MODEL SUBDIVISIONS VARY BY SECTOR

Buildings

- Heating
- Cooling and ventilation
- Envelope
- Lighting
- Appliances
- Other energy-using components

In

- Urban residential buildings
- Rural residential buildings
- Commercial buildings

Industry & Ag

- Cement
- Natural gas & petroleum
- Iron and steel
- Chemicals
- Coal Mining
- Water & waste
- Agriculture
- Other industries

MODEL SUBDIVISIONS VARY BY SECTOR

Electricity Supply

Nonrenewables

- Hard Coal
- Lignite
- Natural gas (nonpeaker)
- Natural gas (peaker)
- Crude oil
- Heavy or residual fuel oil
- Other petroleum
- Municipal solid waste
- Nuclear

Renewables

- Hydro
- Onshore Wind
- Offshore Wind
- Solar PV
- Solar thermal
- Biomass
- Geothermal

MODEL SUBDIVISIONS VARY BY SECTOR

Transportation

Passenger Modes

- Cars and SUVs
- Buses
- Passenger aircraft
- Passenger rail
- Passenger boats
- Motorbikes

Freight Modes

- Light trucks
- Medium and heavy trucks
- Freight aircraft
- Freight rail
- Freight shipping

Vehicle Technologies

- Gasoline engine vehicle
- Diesel engine vehicle
- LPG vehicle
- Natural gas vehicle
- Battery electric vehicle
- Plug-in hybrid vehicle
- Hydrogen vehicle

EXTERNAL REVIEWERS, ADVISERS, AND CONTRIBUTORS

National Labs

Argonne NATIONAL LABORATORY

BERKELEY LAB

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Universities

Massachusetts Institute of Technology

THE UNIVERSITY OF CHICAGO

LELAND STANFORD JUNIOR UNIVERSITY
DIE LUFT DER FREIHEIT WEHT
1891

Global Partners

WORLD RESOURCES INSTITUTE

PEMBINA institute

KAPSARC
مركز الملك عبدالله للدراسات والبحوث البترولية
King Abdullah Petroleum Studies and Research Center

KAPE

IESR

European Climate Foundation

centro mario molina

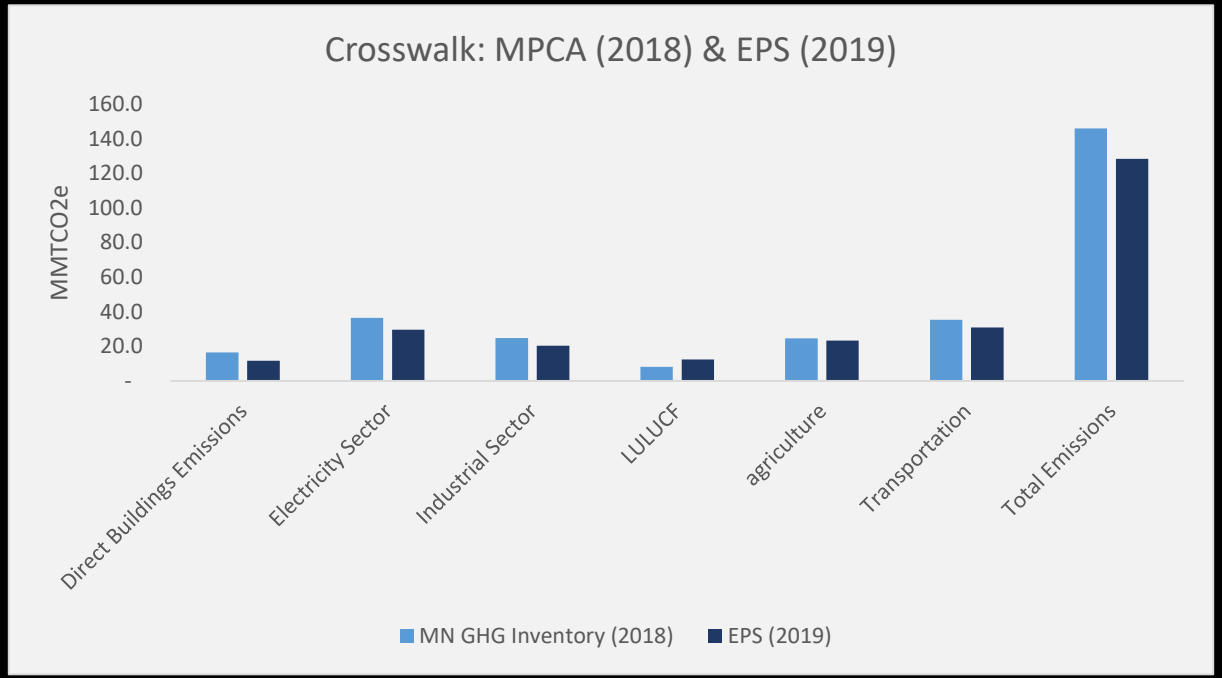
NCSC 国家应对气候变化战略研究和国际合作中心
National Center for Climate Change Strategy and International Cooperation (NCSC)

WEB TOOL

https://minnesota.energypolicy.solutions

Sector	BAU Scenario	Reference Scenario
Electricity	•From EIA's Annual Energy Outlook and NREL •Includes Minnesota's Renewables Portfolio Standard •Assumes all currently planned retirements are completed on time (incl. Sherco 1 by 2025, Sherco 2 by 2022, Sherco 3 by 2034) •Assume existing nuclear power plants are retired at the time their current permits expire (Monticello 2030 and Prairie Island 2033/34)	Nuclear power plants extended add'l 10 years: Monticello through 2040, Prairie Island through 2043 (Unit 1) and 2044 (Unit 2) Retire 2 coal units early: King in 2028, Sherco 3 in 2030 Assume 1500 MW demand response by 2034 above the BAU case Capacity additions of 1200 MW wind by 2034, 4000 MW of solar by 2034
Buildings	•From EIA's Annual Energy Outlook and NREL •Assumes some equipment performance improvements over time, based on market data (described in EIA documentation)	Energy efficiency savings included in Xcel's IRP
Industry	•From EIA's Annual Energy Outlook and NREL •Assumes equipment performance improvements over time (described in EIA documentation) •Does not include implementation of Kigali Amendment to the Montreal Protocol.	Energy efficiency savings included in Xcel's IRP
On-Road Transportation	•From EIA's Annual Energy Outlook and NREL •Includes 2012 Federal Corporate Average Fuel Economy Standards (CAFE) standards •Federal EV subsidies •Economic adoption of EVs	Same as BAU
Land use/Agriculture	•Agriculture, biomass, and forestry projections	Same as BAU

MPCA (2018) AND EPS (2019)

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THANK YOU
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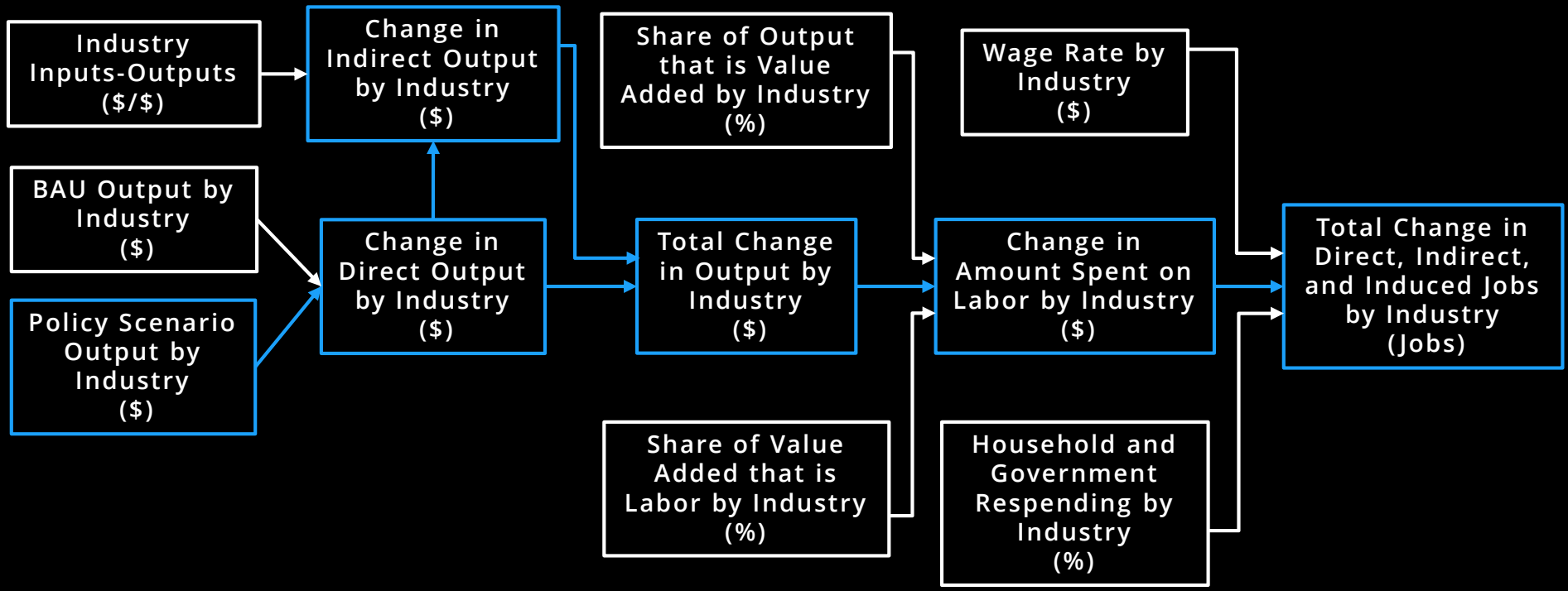
CALCULATING JOBS AND GDP

EPS-INTEGRATED INPUT-OUTPUT MODEL



EXAMPLE OF ALLOCATION