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# **PUBLIC SERVICE COMPANY OF COLORADO**

**Economic Impacts of the Preferred Colorado Energy Plan**

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**A consulting research study conducted for Xcel Energy by the:**

**Business Research Division**  
Leeds School of Business  
University of Colorado Boulder

**June 20, 2018**



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## **DEFINITIONS**

**Employment:** Includes the number of full-time and part-time jobs (headcount) by business physical location.

**Deflators:** Measure of price changes within an industry.

**Gross Domestic Product (GDP):** Total value of final goods and services produced each year within a country or region.

**Leakage:** Economic activity that occurs outside the area of study but is driven by activity within the study area.

**Metropolitan Statistical Area (MSA):** Geographic areas with 50,000 or more population.<sup>1</sup>

**Multiplier:** Change in total economic activity driven by a change in direct economic activity.

**Output:** Total production value of goods and services, including intermediate goods purchased and value added.

**Personal Income:** Includes all sources of income, including employee compensation, proprietors' income, rental income, capital income, and transfer payments.

## **ACRONYMS**

Wind Turbine Generator (WTG)

Public Service Company of Colorado (PSCo)

Business Research Division (BRD)

Electric Resource Plan (ERP)

Colorado Energy Plan (CEP)

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<sup>1</sup>For more information, visit: <https://www.census.gov/programs-surveys/metro-micro/about.html>, retrieved May 26, 2018.

## **EXECUTIVE SUMMARY**

This report presents the results of an analysis prepared by the Leeds School of Business to quantify the net economic impacts of the Preferred Colorado Energy Plan on the state of Colorado and on Pueblo County. The proposal from the Public Service Company of Colorado (PSCo) includes reducing future generation of electricity using coal-fired resources, replaced with a cleaner energy mix through the creation of 1,100 MW of new wind capacity, 700 MW of new solar capacity, 380 MW of existing natural gas capacity, and 275 MW of battery energy storage. The purpose of an economic impact study is to identify the impacts on employment, gross domestic product, disposable personal income, and other economic metrics for those locations impacted by a change in operating expenditures, capital expenditures, and electricity rates.

The study areas include the state of Colorado and Pueblo County. The study period is 23 years, from 2018 through 2040. This period was selected to capture the near-term economic activity from changes in capital investments, as well as the long-term effects of changes in operating expenses and electricity rates.

The study examined the Preferred Colorado Energy Plan compared to the Preferred Electric Resource Plan. The Preferred Electric Resource Plan retains all coal-fired resources and adds new wind and solar power generation, existing gas generation, and some battery storage. Alternatively, the Preferred Colorado Energy Plan includes early retirement of coal-fired generation, and adds more wind, solar, existing gas generation, and significantly more battery storage. The installation and operation of wind and solar generation will be inherently local to Colorado—the project will include the creation of access roads, pouring of foundations, installation of transmission lines, and other facilities. While there are additional supply chain benefits due to some local renewable energy manufacturing, other components are not manufactured locally (i.e., solar and battery components).

At the sub-state level, Pueblo County is positively impacted by the installation of solar generation and transmission facilities; this impact is partially offset by the early retirement of the Comanche 1 and 2 coal-fired generators. Other Colorado counties—in mountain communities, the Front Range, and the Eastern Plains—benefit from the installation of additional wind and solar resources, transmission lines, and other facilities.

The research team used the REMI model for the analysis. The model was constructed specifically for the state of Colorado and Pueblo County using national and local economic and demographic data. The REMI model used for this analysis is a two-region, PI+ model 2.1.6 for the state of Colorado and for Pueblo County. The 2.1.6 model includes historical data through 2015 that the research team calibrated using updated historical and projected national economic growth from Moody's Analytics. PSCo provided data that included capital expenditures, operating expenditures, revenue requirements, and taxes for each scenario, consistent with the final Preferred Electric Resource Plan and Preferred Colorado Energy Plan as presented in the June 6, 2018 120-Day report. The research team worked under the assumption that the company provided good-faith estimates for each scenario.

To frame the analysis of this report, an increase in capital expenditures in Colorado increases economic activity in Colorado while a decrease in operating expenditures reduces economic activity in Colorado. Conversely, a decrease in revenue requirements is a reduction in costs for utility customers, thus resulting in additional spending in other industries. The data are analyzed collectively to consider if the project provides a *net* economic benefit to Colorado. The study findings show that the Preferred Colorado Energy Plan will have a net positive economic impact on the Colorado economy compared to the Preferred Electric Resource Plan. The Preferred Colorado Energy Plan results in capital expenditures of \$412 million above the Preferred Electric Resource Plan from 2018–2040; a larger share—\$563 million—directly impacts the Colorado economy as some capital spending is more local (e.g., wind turbine equipment). Related operating expenditures decrease by \$841 million compared to the Preferred Electric Resource Plan from 2018–2040 largely due to substantial decreases in out-of-state coal purchases; however, Colorado sees an increase in operating expenditures. Revenue requirements decrease by \$431.5 million, spread across Colorado’s residential, commercial, and industrial customers.

The Preferred Colorado Energy Plan will result in net economic benefits in Colorado due to the net effects of increases in capital and operating expenditures, and lower revenue requirements. Over 23 years, the Preferred Colorado Energy Plan results in 549 more jobs on average compared to the Preferred Electric Resource Plan, of which 133 are in Pueblo County. Real GDP increases by an average of \$57.8 million during the study period and an increase of \$48.2 million in disposable personal income when including the dynamic economic impact on the economy.

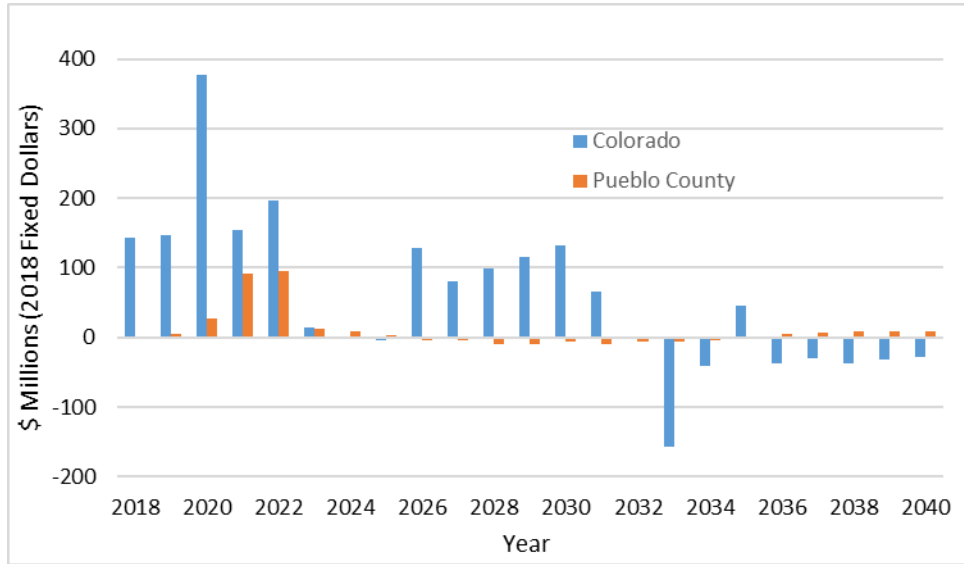
The pattern for the impact on employment and on GDP are similar; the spikes and dips in economic activity are largely due to timing—specifically the change in activity (capital expenditures, operating expenditures, and revenue requirements) compared to the baseline scenario. There are years that the Preferred Colorado Energy Plan yields economic drag for the state and Pueblo County compared to the Preferred Electric Resource Plan—primarily in the medium-term for Pueblo County and near the end of the forecast horizon for the state.

This report presents a net analysis, examining the benefits as well as the costs. The following table reports the impacts in fixed (2018) dollars.

**TABLE 1: ECONOMIC CONTRIBUTION OF PREFERRED COLORADO ENERGY PLAN ON COLORADO, 2018–2040**

Category/Units	Area	Average					2018-2040
		Year 1-5	Year 6-10	Year 11-15	Year 16-20	Year 21-23	
Total Employment	Colorado	1,987	355	471	-311	40	549
(Jobs)	Pueblo	516	62	-27	22	68	133
Private Non-Farm Employment	Colorado	1,833	227	364	-317	11	460
(Jobs)	Pueblo	477	18	-38	11	51	109
Gross Domestic Product	Colorado	\$203.6	\$43.2	\$82.6	-\$44.0	-\$32.7	\$57.8
Dollars (Real 2018, Millions)	Pueblo	\$44.0	\$3.2	-\$8.3	\$0.4	\$9.5	\$9.8
Disposable Personal Income	Colorado	\$106.2	\$32.7	\$39.6	\$11.0	\$53.2	\$48.2
Dollars (Real 2018, Millions)	Pueblo	\$21.7	\$8.6	\$2.7	\$3.4	\$5.5	\$8.6

**FIGURE 1: PREFERRED COLORADO ENERGY PLAN NET IMPACT ON GDP**



## **STUDY METHODOLOGY**

The Business Research Division at the University of Colorado Boulder was hired by Public Service Company of Colorado (PSCo) to conduct economic impact analyses on the proposed Colorado Energy Plan.

In August 2017, Xcel Energy proposed the Preferred Colorado Energy Plan, an augmentation of its current Preferred Electric Resource Plan that could result in \$2.5 billion of clean energy investments with a specific focus on the state's rural communities. The proposed plan requests the Colorado Public Utilities Commission's approval for Xcel to develop a new electricity portfolio focused on increasing renewable generation while reducing carbon emissions. Under the Preferred Colorado Energy Plan, Xcel would reduce its coal-fired power capacity by 660 MW through the retirement of Comanche 1 by 2022 and Comanche 2 by 2025. Both plants are located in Pueblo, Colorado. Furthermore, Xcel would develop a cleaner energy mix through the addition of 1,100 MW of new wind capacity, 700 MW of new solar capacity, 380 MW of existing natural gas capacity, and 275 MW of battery storage. Xcel estimates that under the Preferred Colorado Energy Plan, the share of renewable energy on the PSCo System will grow from 28% in 2017 to nearly 55% in 2026, while the share of coal-fired production will be cut almost in half—dropping from 44% to 24% over the same period. Compared to 2005 levels, the plan would result in an approximately 60% reduction in carbon emissions.

Analysis of the Preferred Colorado Energy Plan compares project expenditures to the Preferred Electric Resource Plan, which serves in this study as a baseline scenario. The Preferred Colorado Energy Plan includes erecting new wind and solar generation in the state; installing battery storage; decommissioning coal-fired generation units; constructing new roads, transmission lines, and other facilities; and changing fuel purchases. These activities add capacity to the PSCo System, and also impact revenue requirements for the company, and thus, consumers.

This analysis includes the impacts on the state of Colorado and on Pueblo County, specifically, as Comanche 1 and 2 are located in Pueblo County. Localized (sub-state) impacts will vary widely depending on the locations of the wind and solar installations (construction and operations) and component manufacturing, and the location of PSCo's residential, commercial, industrial, and government customers (rate changes). However, changes in fuel purchases, mainly coal, will have little impact on Colorado coal-producing communities as Wyoming coal (not Colorado coal) fuels the Comanche 1 and 2 generators.



Economic impact studies detail the direct spending that a company or activity has on the area of study, as well as the indirect impact, which is the ripple effect that direct spending has on other businesses in the community. This term is also referred to as the *multiplier effect*, wherein companies utilize the local supply chain. A multiplier is a numeric way of describing the full effects of money changing hands within an economy. For instance, when PSCo purchases natural gas, this affects the mining and transportation industries. This is the indirect impact. Additionally, spending by employees has an inherent effect on local communities as they purchase groceries, clothes, and gas; pay rent or a mortgage; get haircuts, etc. This is understood as the induced impact.

The research team used the REMI model version 2.1.6, build 4817 for the analysis.<sup>2</sup> Appendix 1 provides an overview of the REMI model. The REMI model is a dynamic forecasting and policy analysis model that incorporates econometric, input-output, and computable general equilibrium techniques. The model was created by REMI specifically for the state of Colorado and Pueblo County using national and local economic and demographic data. The REMI model used for this analysis is the Policy Insight (PI+) model 2.1.6 two-region model for Pueblo County and the Rest of Colorado, with 2015 data as the last historical year within the model.

PSCo defined the scenario to be examined in this study. This is described in detail in the Scenario Data and Assumptions section. The Preferred Electric Resource Plan and Preferred Colorado Energy Plan were provided by PSCo. The research team developed economic scenarios that included portfolios of spending and rate changes brought about by the two different scenarios (i.e., the Preferred Electric Resource Plan and the Preferred Colorado Energy Plan). The result is a simulated forecast of the economy under scenarios where utility rates and spending on operating and capital expenditures change. Last, the report compares the Preferred Colorado Energy Plan to the baseline Preferred Electric Resource Plan scenario to quantify the economic impacts on the Colorado economy and the Pueblo economy.

The research team collected data on PSCo estimates related to ongoing operating and maintenance expenditures, capital expenditures, and revenue requirements. PSCo provided estimates of the percentage of expenditures directly in Colorado compared to activity that occurs in other states (i.e.,

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<sup>2</sup> Contracted by the University of Colorado from REMI, Inc. in May 2018.

leakage). The timing of operating and capital expenditures is specific to each scenario (Preferred Electric Resource Plan and Preferred Colorado Energy Plan). The research team worked under the assumption that PSCo provided good-faith estimates for each scenario.

Data were provided in nominal dollars, quantified in the year of expected impact. The impacts are presented in fixed, 2018 dollars and discounted by the model using industry price deflators.

Costs were entered into the REMI model based on total activity expenditures. For expenditures, a positive (negative) number reflects an increase (decrease) in spending under the Preferred Colorado Energy Plan compared to the Preferred Electric Resource Plan. For revenue requirements, a positive (negative) number reflects higher (lower) electricity costs to residential, industrial, commercial, and government customers. The researchers deferred to the model for the industry intermediate inputs and local purchasing coefficients for intermediate inputs, and for the proportion of spending devoted to capital and labor. The local purchasing coefficients within REMI change over time based on changing demand.

## **ECONOMIC MODEL AND THE COLORADO ECONOMY**

The REMI model used for this analysis is the two region, PI+ model 2.1.6 for the state of Colorado and for Pueblo County. The REMI model includes an input-output table, industry spending patterns, and local purchasing coefficients, in addition to the underlying economic and demographic data for the study regions.

The Colorado Demography Office estimated Colorado's population at 5.5 million in 2016; Pueblo's population totaled 165,109, or 3% of the total, ranking it the 10th-largest county in the state. Data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) show the state recorded 2.6 million total nonfarm covered employees in 2017; Pueblo County represented 2.4%, or 60,809 of the total.<sup>3</sup> During the last recession (2007–2009), the state and the county lagged the United States entering the recession—employment peaked in Pueblo in May 2008 and in Colorado in June 2008 versus January 2008 for the nation. The state also led the nation in the recovery from the recession, but

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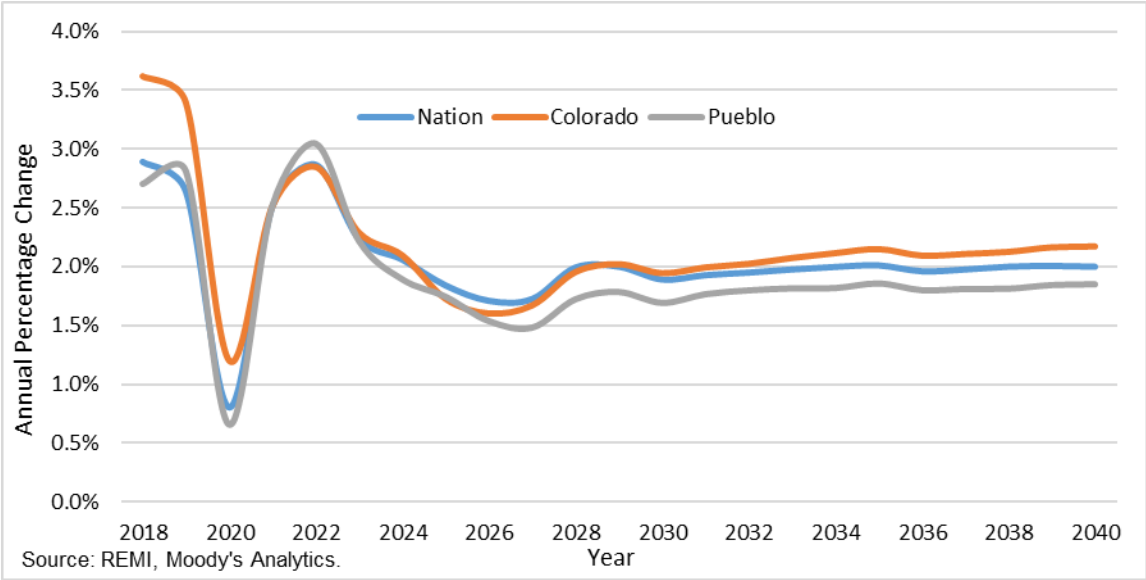
<sup>3</sup> At time of publication, 2017 data were the most current full-year Quarterly Census of Employment and Wages data published by the Bureau of Labor Statistics and the Colorado Department of Labor and Employment.

Pueblo County lagged in the recovery (the nation recovered in May 2014, Colorado in June 2013, and Pueblo in September 2014).

Data from the Bureau of Economic Analysis show Colorado GDP of \$323.8 billion in 2016 and \$342.7 billion in 2017 (current dollars); Pueblo’s GDP totaled \$4.9 billion in 2016, or 1.5% of the state total.<sup>4</sup> Pueblo real GDP outperformed the state in 2016, growing 3.5% versus 1.4%, respectively, in 2016. Per capita personal income for the state was \$52,097 in 2016 and \$53,504 in 2017, while Pueblo’s per capita personal income was \$36,148 in 2016—31% below the state average and 26% below the national average.

The REMI standard regional control calibrated with a forecast from Moody’s Analytics to reflect the current economic environment and expectations. The Moody’s Analytics baseline forecast places the U.S. economy on a growth trajectory throughout the analysis horizon, with faster rates of growth in the short term followed by slower growth (Figure 2). In the REMI model, Colorado and Pueblo County follow a similar path as the U.S. economy, but Colorado tends to outperform the United States while Pueblo County underperforms.

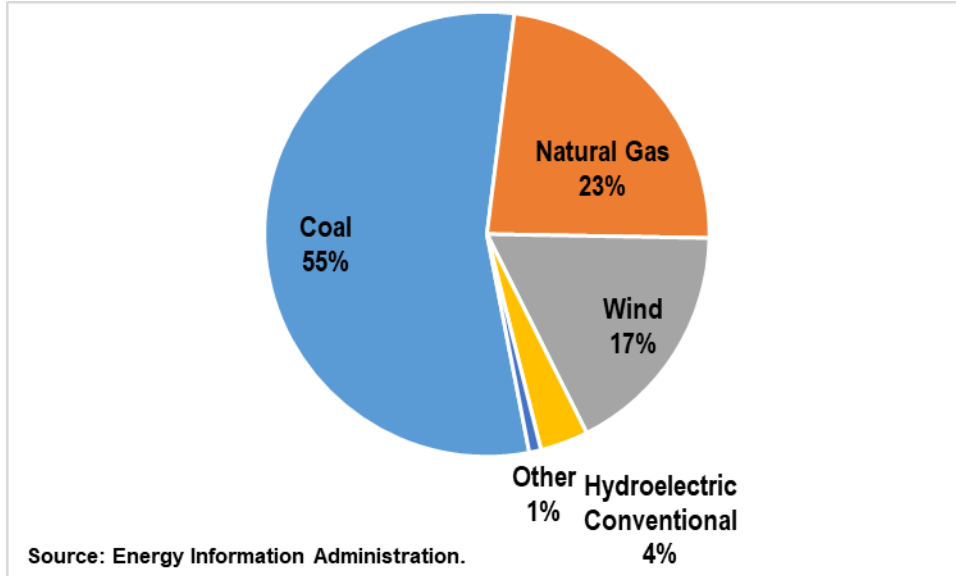
**FIGURE 2: NATIONAL BASELINE FORECAST, 2018–2040**



<sup>4</sup> GDP by metropolitan area lags statewide and national reporting. At the time of this report, 2016 data were the most current available for the Pueblo MSA.

Colorado is an energy-producing state. It ranked 7th in the nation in total energy production and 34th for total energy consumption per capita in 2015, according to data from the Energy Information Administration.<sup>5</sup> Colorado ranked 30th in 2018 for total electric power generation.<sup>6</sup> As shown in Figure 3, approximately 55% of energy generated in the state came from coal-fired power plants, and an additional 23% was produced by natural gas plants in 2016. Colorado ranked 8th in wind-generated electricity in 2016.

**FIGURE 3: COLORADO ELECTRICITY GENERATION, SHARE OF MWH GENERATION, 2016**



### SCENARIO DATA AND ASSUMPTIONS

This study analyzes the net economic impact of the Preferred Colorado Energy Plan, which includes investments in 1,100 MW of new wind capacity, 700 MW of new solar capacity, 380 MW of existing natural gas capacity, and 275 MW of battery energy storage, and the decommissioning of two coal-fired generators. Pueblo County is directly affected by the shutdown of Comanche 1 and Comanche 2, but the Preferred Colorado Energy Plan calls for offsetting investments in solar generation and transmission. Other counties on Colorado’s Eastern Plains will benefit from investments in wind generation, transmission, and related investments and operations well above those in the Preferred Electric Resource Plan. Other benefits stem from local supply of wind generation equipment in Colorado, including equipment constructed in Pueblo.

<sup>5</sup> Total Energy Production, 2015 (trillion Btu) and Total Energy Consumer per Capita, 2015 (million Btu).

<sup>6</sup> Net Generation by State by Type of Producer by Energy Source, Megawatt-hours.

PSCo provided the research team with capital expenditures, operating expenditures, and revenue requirements for the Preferred Electric Resource Plan and the Preferred Colorado Energy Plan. The timing of operating and capital expenditures is specific to each scenario. The research team worked under the assumption that the company provided good-faith estimates for each scenario. For modeling purposes, cost assumptions were provided in nominal dollars.

Nominal costs were entered into the REMI model based on total activity expenditures in Colorado and in Pueblo County. The researchers deferred to the model for the local purchasing coefficients for intermediate inputs, and for the proportion of direct spending attributable to labor and capital. The local purchasing coefficients within REMI change over time based on changing demand.

### *Capital and Operating Expenditures*

#### Capital

The Preferred Colorado Energy Plan incurs capital expenditures of \$412 million above the baseline Preferred Electric Resource Plan scenario from 2018–2040. The capital activities include the purchase and installation of solar panels and wind turbines, balance of plant, extension of transmission lines, construction of switching stations, payment of land leases, decommissioning of Comanche 1 and Comanche 2, and other utility and related construction. Conversely, PSCo will forego investments in generic combined cycle turbines that otherwise would have been necessary to meet demand in the Preferred Electric Resource Plan. Compared to the Preferred Electric Resource Plan, an increase in net capital spending occurs within the first five years during project installation, while the remaining 18 years net a decrease in capital spending. Colorado nets an increase of \$563 million in capital expenditures—greater than the total increase—as investments become more localized compared to the Preferred Electricity Resource Plan (e.g., decommissioning power plants, constructing wind and solar infrastructure, purchasing manufactured wind equipment, etc.).

The Preferred Colorado Energy Plan calls for the purchase of existing gas generators. While plan capital and operations are included in the analysis, the capital asset purchase is not included in the economic impact because the transaction of the transfer of the asset has little economic value outside the transaction costs (i.e., the true capital investment of building the plant has already occurred).

## Operating Expenditures

The higher capital costs are partially offset by lower long-term operating costs, which includes fuel costs. While the change in capital spending is front-loaded in the first five years, the change in operating expenditures begins to be realized post-installation as coal and natural gas purchases decrease substantially over the 23-year analysis period. The net decrease in coal purchases total \$932 million over the 23 years; the Powder River Basin in Wyoming bears all of the decrease in coal purchase, while Colorado coal purchases actually increase by \$0.5 million over the horizon as PSCo rebalances system operations. Natural gas purchases decrease by \$37.4 million.

While Pueblo is adversely impacted by the decommissioning of Comanche 1 and Comanche 2, the county benefits from the installation of a large solar generation facility, transmission facilities, and other operating expenditures. PSCo estimates that Pueblo County will see a net *increase* in property taxes by \$21.9 million over the 23 years due to the Preferred Colorado Energy Plan after accounting for Colorado statute 39-4-102; Colorado property taxes increases by \$84 million over the 23 years.

Overall, operating expenditures decrease by \$841 million, but Colorado in-state operating expenditures *increase* by \$186 million. This is largely due to the substantial decrease in out-of-state coal purchases and the increase in ongoing in-state operating expenditures.

**TABLE 2: NET CAPITAL AND OPERATING EXPENDITURES (NOMINAL DOLLARS), 2018–2040**

CEP-ERP	Total (\$ Millions)	Percentage Change	Colorado (\$ Millions)
Capital Expenditures	\$412	14.6%	\$563
Operating Expenditures	-\$841	-4.9%	\$186
Total	-\$429	-2.1%	\$748

## Revenue Requirements

Based on the level of operation and capital expenditures detailed in this report, PSCo estimated the Preferred Colorado Energy Plan will decrease revenue requirements (included in electricity rates for electric customers) when compared to the Preferred Electric Resource Plan. This effectively isolates the revenue requirements (and the electricity rate impact) for the alternative scenario.<sup>7</sup> Revenue requirements are not equal to the sum of operation and capital expenditures because capital expenditures are recovered over the life of the asset. Therefore, revenue requirements occur over the

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<sup>7</sup>Electricity costs were entered as fuel cost variables: “Electricity (Commercial Sectors) Fuel Cost (amount)” and “Electricity (Industrial Sectors) Fuel Cost (amount)” for nonresidential sectors, and “Consumer Price (amount)” for the residential sector.”

life of the asset and include both a return of and a return on capital. The capital and operating expenditure assumptions also reflect spending only in the state of Colorado. The revenue requirements estimate the change in electric revenues that would be recovered from customers for the Preferred Colorado Energy Plan, despite the location of the supply chain for operating and capital purchases. The reduction in revenue requirements of \$431.5 million was applied to residential, commercial, and industrial customers in Colorado based on company revenue by customer class (see Table 4).

**TABLE 3: CHANGE IN REVENUE REQUIREMENTS FOR COLORADO CUSTOMERS (NOMINAL), 2018–2040**

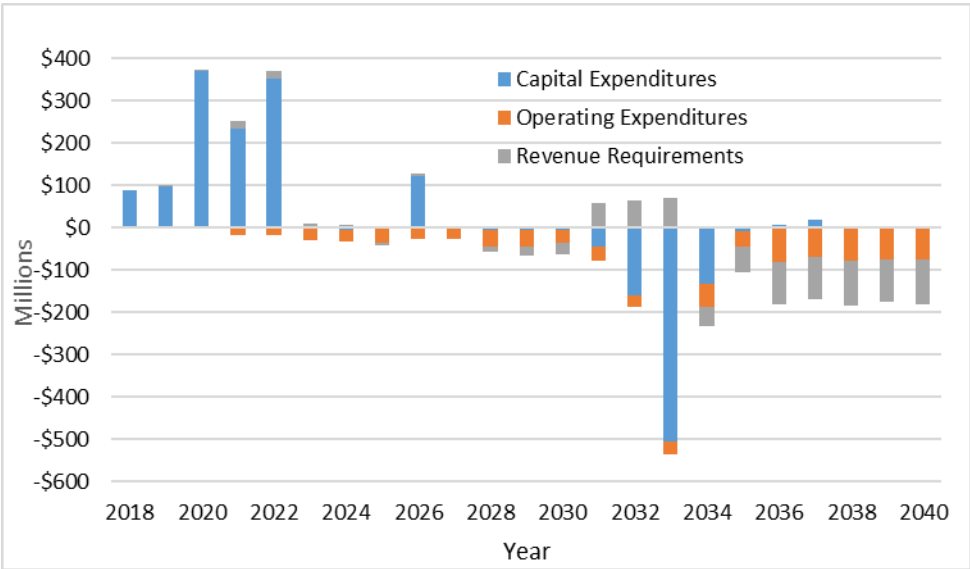
CEP-ERP	Change (\$ Millions)	Percentage Change
Revenue Requirements	-\$431.5	0.8%

**TABLE 4: PSCO ELECTRIC REVENUES, 2017**

Customers	\$ Thousands	Percentage
Residential	\$1,033,324	34%
Large C&I	\$421,068	14%
Small C&I	\$1,227,886	41%
Public Authorities	\$52,834	2%
Wholesale	\$167,971	6%
Other	\$100,725	3%
Total	\$3,003,808	100%

Source: PSCo Form 10-K.

**FIGURE 4: NET EXPENDITURES AND REVENUE REQUIREMENTS BY YEAR**



### *Enterprise Zone Investment Tax Credits*

Electric generation investments in Colorado may be eligible for either the enterprise zone investment tax credit or the renewable energy enterprise zone investment tax credits. According to the Colorado Department of Revenue publication on the Investment Tax Credit, 3% of investments may qualify for tax credits if the plant is in a Colorado enterprise zone. Tax credits are available if the company has not reached the maximum amount of credits per company. Enterprise zone and renewable energy enterprise zone tax credits are each limited to a maximum of \$750,000 per year per company. The renewable energy enterprise zone investment tax credit is refundable, whereas the enterprise zone investment tax credit is not. Both can be carried forward. The economic impact study did not account for these credits because many of the chosen projects were in both the Preferred Colorado Energy Plan and the Preferred Electric Resource Plan. As well, some of the proposal companies have already reached the maximum amount of credits. However, multiple projects from one company in the Preferred Colorado Energy Plan and not the Preferred Electric Resource Plan may be eligible for renewable energy enterprise zone investment tax credits of \$750,000 per year over the study period beginning in 2022. It is estimated that these tax credits will max out at \$6.9 million over 9 ¼ years. A \$750,000 reduction in taxes was modeled as a \$750,000 reduction in state and local government spending per year. In the model, this results in an average decrease in Colorado employment of 14 jobs and an average decrease in GDP of \$1.2 million over the 9 ¼-year period (from 2022–2031). However, PSCo does not currently know if the tax credits will be utilized as such; the renewable energy enterprise zone investment tax credits for the Preferred Colorado Energy Plan may or may not result in a reduction in public revenue compared to the Preferred Electric Resource Plan.

### **RESULTS**

The Preferred Colorado Energy Plan will result in net economic benefits in Pueblo and in the overall Colorado economy. These benefits are the result of a net increase in capital expenditures and operating expenditures in Colorado and a decrease in revenue requirements. Over 23 years, these result in an average of 549 more jobs compared to the baseline resource plan scenario, of which 133 more jobs are in Pueblo County. The greatest economic benefits occurs in the first five years—the most capital intensive period of the Preferred Colorado Energy Plan; the largest economic costs occur in years 14–23 with the foregone combined cycle capital investments and the trailing associated operating costs. Real GDP increases by an average of \$57.8 million per year during the study period and an increase of \$48.2



million in disposable personal income per year—a nominal (0.01%) impact in Colorado’s \$343 billion economy.<sup>8</sup>

The impact on Pueblo County’s GDP averages \$9.8 million over the 23-year horizon, or 0.16% of total GDP in Pueblo County. The impact on Pueblo County is registered primarily in the first five years, followed by 18 years of relatively little change, positive or negative.

Given that this is a net analysis, the growing demand for energy and plant energy output is controlled by comparing the economic impacts of the Preferred Colorado Energy Plan to the Preferred Electric Resource Plan. This section reports the impacts in fixed (2018) dollars, and the following paragraphs summarize the economic impacts by scenario.

**TABLE 5: ECONOMIC CONTRIBUTION OF THE CEP ON COLORADO, 2018–2040**

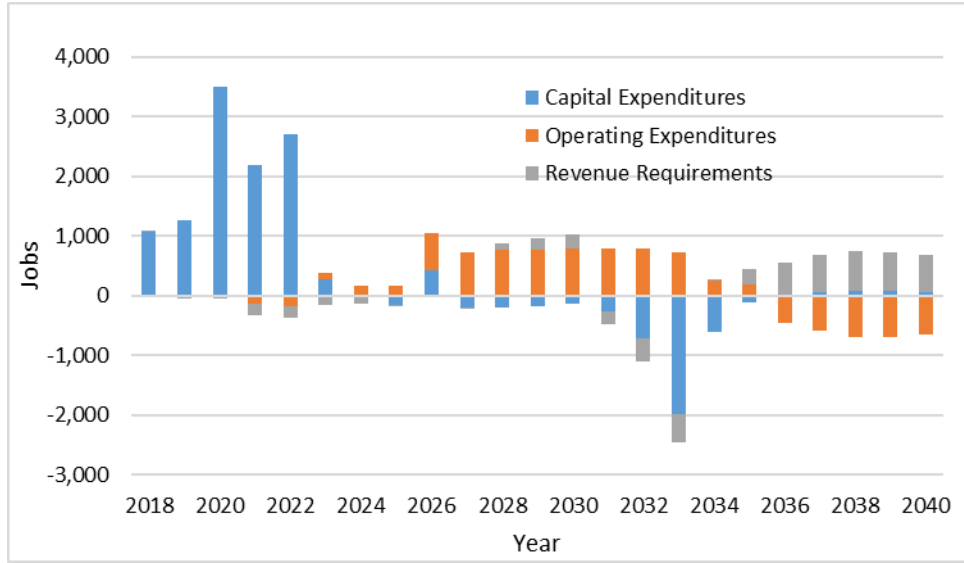
Category	Units	Average					2018-2040
		Year 1-5	Year 6-10	Year 11-15	Year 16-20	Year 21-23	
Total Employment	Jobs	1,987	355	471	-311	40	549
	<i>Percentage Change</i>	0.05%	0.01%	0.01%	-0.01%	0.00%	0.01%
Private Non-Farm Employment	Jobs	1,833	227	364	-317	11	460
	<i>Percentage Change</i>	0.05%	0.01%	0.01%	-0.01%	0.00%	0.01%
Gross Domestic Product	Dollars (Real 2018, Millions)	203.6	43.2	82.6	-44.0	-32.7	57.8
	<i>Percentage Change</i>	0.05%	0.01%	0.02%	-0.01%	-0.01%	0.01%
Disposable Personal Income	Dollars (Real 2018, Millions)	106.2	32.7	39.6	11.0	53.2	48.2
	<i>Percentage Change</i>	0.04%	0.01%	0.01%	0.00%	0.01%	0.01%

**TABLE 6: ECONOMIC CONTRIBUTION OF THE CEP ON PUEBLO COUNTY, 2018–2040**

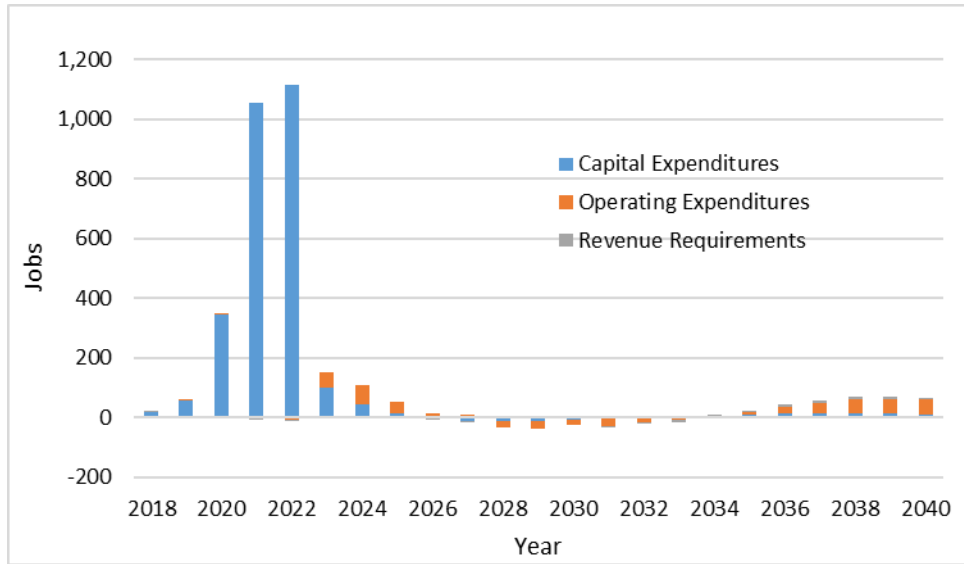
Category	Units	Average					2018-2040
		Year 1-5	Year 6-10	Year 11-15	Year 16-20	Year 21-23	
Total Employment	Jobs	516	62	-27	22	68	133
	<i>Percentage Change</i>	0.62%	0.07%	-0.03%	0.02%	0.08%	0.16%
Private Non-Farm Employment	Jobs	477	18	-38	11	51	109
	<i>Percentage Change</i>	0.70%	0.03%	-0.05%	0.02%	0.07%	0.16%
Gross Domestic Product	Dollars (Real 2018, Millions)	44.0	3.2	-8.3	0.4	9.5	9.8
	<i>Percentage Change</i>	0.73%	0.05%	-0.12%	0.00%	0.11%	0.16%
Disposable Personal Income	Dollars (Real 2018, Millions)	21.7	8.6	2.7	3.4	5.5	8.6
	<i>Percentage Change</i>	0.37%	0.14%	0.04%	0.05%	0.07%	0.14%

<sup>8</sup> For reference, Colorado’s economy was estimated at \$342.8 billion in 2017 (nominal dollars). The \$57.8 million presents and average annual change over 23 years, 2018–2040.

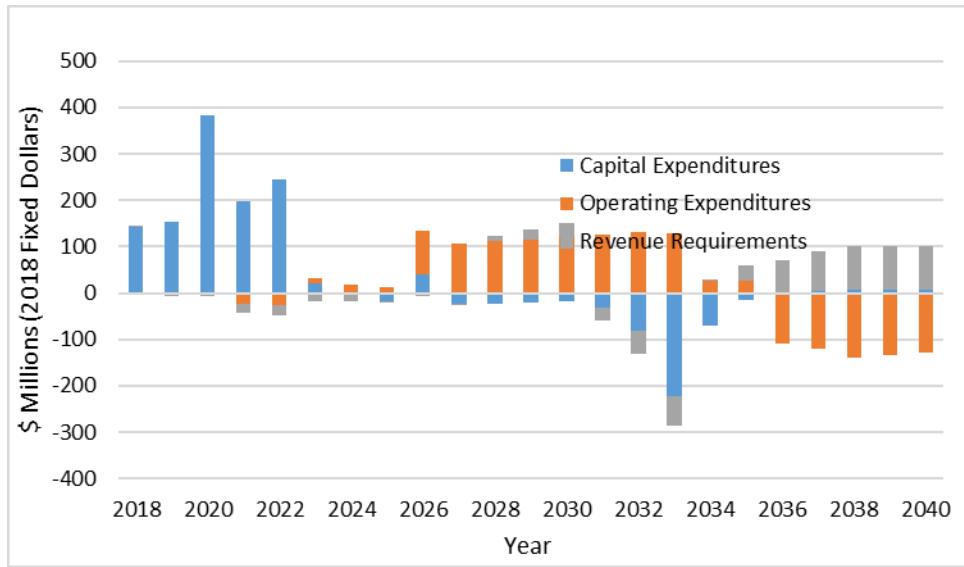
**FIGURE 5: PREFERRED COLORADO ENERGY PLAN IMPACT ON COLORADO EMPLOYMENT**



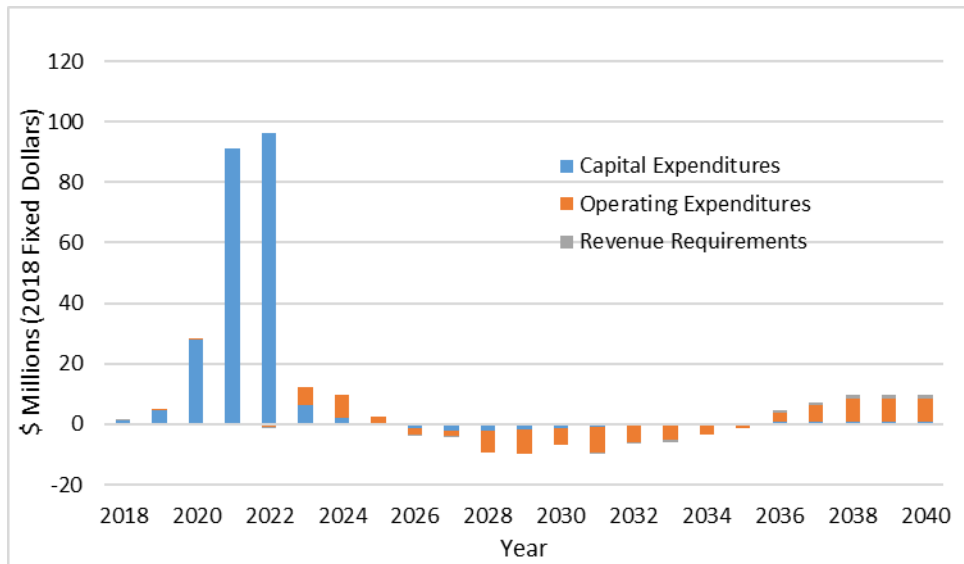
**FIGURE 6: PREFERRED COLORADO ENERGY PLAN IMPACT ON PUEBLO EMPLOYMENT**



**FIGURE 7: PREFERRED COLORADO ENERGY PLAN IMPACT ON COLORADO GDP**



**FIGURE 8: PREFERRED COLORADO ENERGY PLAN IMPACT ON PUEBLO GDP**



The greatest increase in economic benefits occurs early in the project—the first five years. This is the period of intensive capital investment—Colorado capital spending in the Preferred Colorado Energy Plan exceeds the Preferred Electric Resource Plan spending by \$1.1 billion during this five-year period. Direct capital impacts stem from decommissioning Comanche 1 and Comanche 2, and purchasing and installing wind and solar generation, transmission, and storage. Of the remaining 18 years within the analysis period, 4 years have increased planned investments compared to the Preferred Electric Resource Plan and 14 years have decreased planned investments. Decreases in the investments are attributed mostly

to the foregone investments in Comanche 1 and 2, as well as decreases in generic combined cycle investments to meet long-term utility demand.

Operating and maintenance costs were lower under the Preferred Colorado Energy Plan than under the Preferred Electric Resource Plan for the entire forecast horizon when including fuel costs (i.e., natural gas and coal and related transportation). While Colorado has abundant indigenous fossil fuel resources, the Comanche generators run off Power River Basin coal from Wyoming; Colorado coal purchases actually increase modestly under the plan. Overall, the Colorado economy benefits from the net increase in in-state operating and maintenance expenditures compared to the Preferred Electric Resource Plan due to more localized spending. Compared to the front-loaded capital expenditure impacts in the first five years of the study horizon, 95% of the impacts from the change (decrease) in operating and maintenance expenditures are realized in the last 18 years of the study horizon.

Changes in expenditures are effectively passed along to rate payers either through increases or decreases in revenue requirements. Revenue requirements increase for 11 of the 23 years analyzed and decrease for 12 of the 23 years. Overall, revenue requirements decrease. The sum of the changes in revenue requirements totals -\$431.5 million. These savings were assigned to residential, commercial, and industrial customers. Xcel only has one (industrial) customer in Pueblo; thus, the benefit of lower revenue requirements is largely borne by Colorado customers outside of Pueblo County.

## CONCLUSION

This paper provides an analysis of the economic impact of the Preferred Colorado Energy Plan in comparison to the Preferred Electric Resource Plan. This report finds the costs associated with an increase in capital investments for wind, solar, and storage are more than offset by the benefits of lower operating costs and lower revenue requirements.

This analysis uses data on operations, maintenance, capital expenditures, and revenue requirements provided by PSCo on the current Preferred Electric Resource Plan and on the alternative resource plan—the Preferred Colorado Energy Plan.

Overall, the study found the following:

- Compared to the Preferred Electric Resource Plan, the Preferred Colorado Energy Plan will result in comparatively greater growth within the Colorado and Pueblo economies from 2018–2040 in terms of:
  - Employment (549 jobs on average; 133 in Pueblo County),
  - GDP (\$57.8 million on average; \$9.8 million in Pueblo County), and
  - Real disposable personal income (\$48.2 million on average; \$8.6 million in Pueblo County).
- These changes are a relatively small percentage of the overall Colorado economy. The changes in employment, GDP, and income represent no change (0.01%) from the Preferred Electricity Resource Plan projections, and the impact on Pueblo County represents about a 0.16% increase.
- The Preferred Colorado Energy Plan will result in lower revenue requirements of \$431.5 million, mostly due to the net decrease of \$970 million in lower fuel costs—a benefit to Colorado customers.
- The Preferred Colorado Energy Plan capital and operating investments are more localized compared to the investments included in the Preferred Electric Resource Plan, leading to a net increase in local spending.

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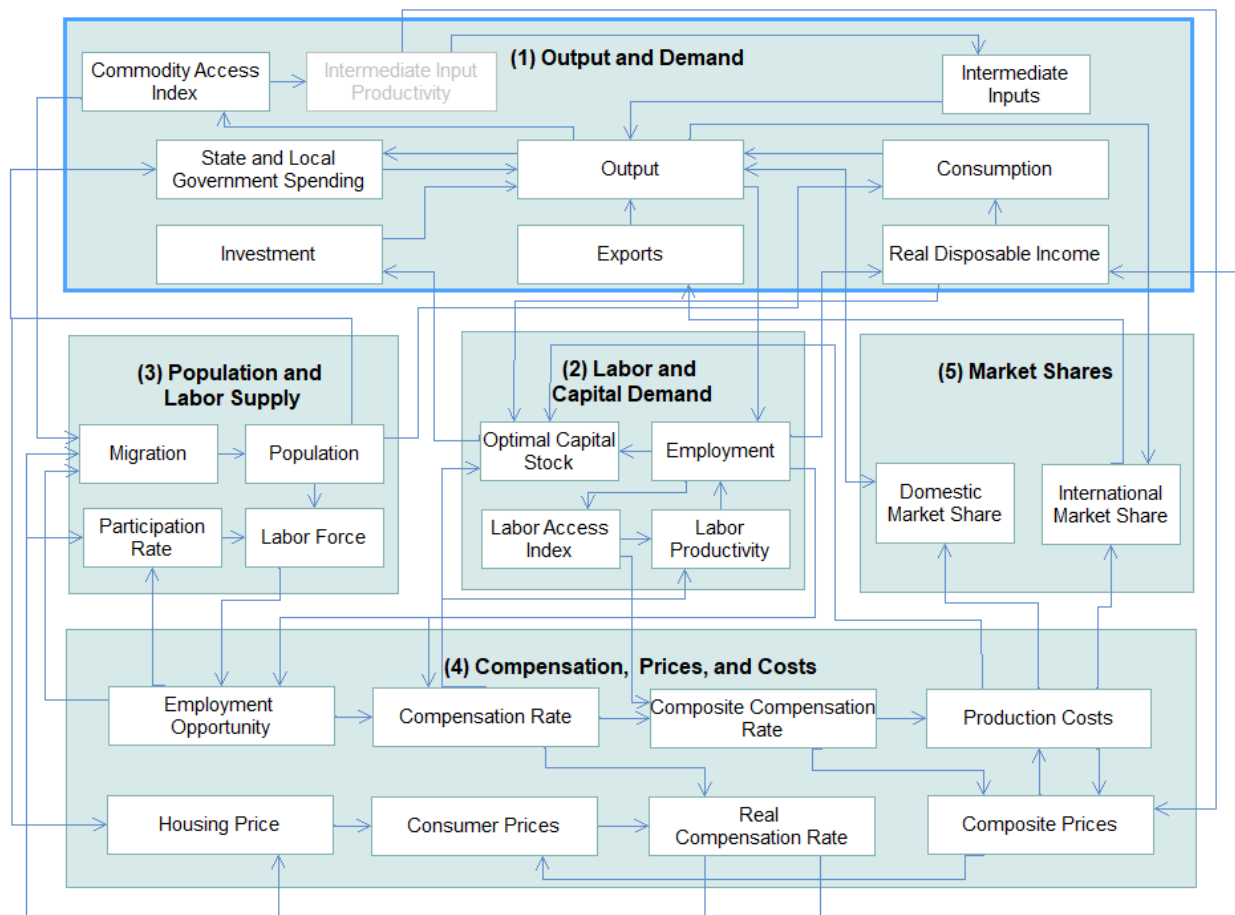
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## APPENDIX 1: OVERVIEW OF REMI POLICY INSIGHT

This summary was provided by REMI, Inc.

Policy Insight is a structural economic forecasting and policy analysis model. It integrates input-output, computable general equilibrium, econometric, and economic geography methodologies. The model is dynamic, with forecasts and simulations generated on an annual basis and behavioral responses to wage, price, and other economic factors.

The REMI model consists of thousands of simultaneous equations with a structure that is relatively straightforward. The exact number of equations used varies depending on the extent of industry, demographic, demand, and other detail in the model. The overall structure of the model can be summarized in five major blocks: (1) Output and Demand, (2) Labor and Capital Demand, (3) Population and Labor Supply, (4) Compensation, Prices and Costs, and (5) Market Shares.



### Block 1. Output and Demand

This block includes output, demand, consumption, investment, government spending, import, product access, and export concepts. For each industry, demand is determined by the amount of output,



consumption, investment and capital demand on that industry. Consumption depends on real disposable income per capita, relative prices, differential income elasticities and population. Input productivity depends on access to inputs because the larger the choice set of inputs, the more likely that the input with the specific characteristics required for the job will be formed. In the capital stock adjustment process, investment occurs to fill the difference between optimal and actual capital stock for residential, non-residential, and equipment investment. Government spending changes are determined by changes in the population.

### **Block 2. Labor and Capital Demand**

The Labor and Capital Demand block includes the determination of labor productivity, labor intensity and the optimal capital stocks. Industry-specific labor productivity depends on the availability of workers with differentiated skills for the occupations used in each industry. The occupational labor supply and commuting costs determine firms' access to a specialized labor force.

Labor intensity is determined by the cost of labor relative to the other factor inputs, capital and fuel. Demand for capital is driven by the optimal capital stock equation for both non-residential capital and equipment. Optimal capital stock for each industry depends on the relative cost of labor and capital, and the employment weighted by capital use for each industry. Employment in private industries is determined by the value added and employment per unit of value added in each industry.

### **Block 3. Population and Labor Supply**

The Population and Labor Supply block includes detailed demographic information about the region. Population data is given for age and gender, with birth and survival rates for each group. The size and labor force participation rate of each group determines the labor supply. These participation rates respond to changes in employment relative to the potential labor force and to changes in the real after tax compensation rate. Migration includes retirement, military, international and economic migration. Economic migration is determined by the relative real after tax compensation rate, relative employment opportunity and consumer access to variety.

### **Block 4. Wages, Prices, and Costs**

This block includes delivered prices, production costs, equipment cost, the consumption deflator, consumer prices, the price of housing, and the wage equation. Economic geography concepts account for the productivity and price effects of access to specialized labor, goods and services.

These prices measure the price of the industry output, taking into account the access to production locations. This access is important due to the specialization of production that takes place within each industry, and because transportation and transaction costs of distance are significant. Composite prices for each industry are then calculated based on the production costs of supplying regions, the effective distance to these regions, and the index of access to the variety of output in the industry relative to the access by other uses of the product.

The cost of production for each industry is determined by cost of labor, capital, fuel and intermediate inputs. Labor costs reflect a productivity adjustment to account for access to specialized labor, as well as underlying compensation rates. Capital costs include costs of non-residential structures and equipment, while fuel costs incorporate electricity, natural gas and residual fuels.

The consumption deflator converts industry prices to prices for consumption commodities. For potential migrants, the consumer price is additionally calculated to include housing prices. Housing price changes from their initial level depend on changes in income and population density.

Compensation changes are due to changes in labor demand and supply conditions and changes in the national compensation rate. Changes in employment opportunities relative to the labor force and occupational demand change determine compensation rates by industry.

### **Block 5. Market Shares**

The Market Shares equations measure the proportion of local and export markets that are captured by each industry. These depend on relative production costs, the estimated price elasticity of demand, and effective distance between the home region and each of the other regions. The change in share of a specific area in any region depends on changes in its delivered price and the quantity it produces compared with the same factors for competitors in that market. The share of local and external markets then drives the exports from and imports to the home economy.

The Labor and Capital Demand block includes labor intensity and productivity as well as demand for labor and capital. Labor force participation rate and migration equations are in the Population and Labor Supply block. The Wages, Prices, and Costs block includes composite prices, determinants of production costs, the consumption price deflator, housing prices, and the wage equations. The proportion of local, inter-regional and export markets captured by each region is included in the Market Shares block.