How Economic Impact Analysis Models Equip the **Utility Industry**

REMI Webinar February 16, 2022



Jim Robey, PhD Principal **Robey Analytics**

Pat Kelly **Director, Economic Development FirstEnergy**





Chris Judson Managing Economic Associate REMI



About FirstEnergy

- Headquartered in Akron, Ohio
- Among the largest investor-owned electric systems in the U.S. based on 6 million customers served
- Approximately 12,000 employees
- More than \$45 billion in assets
- Approx. \$11 billion in annual revenues
- 3,580 megawatts of regulated generation capacity
- 10 electric utility operating companies in 6 states
- 65,000-square-mile service territory
- 24,000 miles of transmission lines and 272,000 miles of distribution lines



Data as of Dec. 31, 2021



POPULATION	17,906,2
LABOR FORCE	8,805,8
INDUSTRY ESTABLISHMENTS	48.9









Leading Industries in the FirstEnergy Region

- Shale Gas
 - In the FirstEnergy region, shale gas is not only a fuel and energy source. It is also a fundamental building block in the chemical and plastics industries.

Automotive

In the FirstEnergy region, you will find several well-established automotive clusters, with \bullet an experienced workforce, as well as nearby suppliers and prospective customers.

• Chemicals

• The chemical industry has a large presence in each of the five states. Most of the FirstEnergy region is located over major shale formations, providing a ready supply of feedstock.

Data Centers

• The data center market continues to grow because of high demand in the FirstEnergy region. Also, real estate is competitively priced, as compared to Chicago and New York.

Metals Producing and Fabricating

- The concentration of metal producers and fabricators in the FirstEnergy region can be attributed to a superior infrastructure, experienced workforce and the well-established supply chain.

2021



Shale Gas Is Closely Tied to Chemical and Plastics Industries; Experts See Supply Extending 30-50 Years



Shale Gas in the FirstEnergy Region Shale gas production is concentrated over the Marcellus, Utica and Rogersville formations, which correspond to northern Ohio, western Pennsylvania and northern West Virginia. Total shale gas GDP in the FirstEnergy region is \$33.9 billion.

Shale Gas GDP by State (In the FirstEnergy region only) PENNSYLVANIA17,700,000,000 OHIO12,200,000,000 WEST VIRGINIA3,900,000,000 **NEW JERSEY34,000,000** MARYLAND200,000

Chemical Industry Thrives in the FirstEnergy Region, Supported by Shale Gas and Network of **Related Industries**



The Chemical Industry in the FirstEnergy Region The chemical industry has strong clusters in southeastern Pennsylvania and New Jersey, as well as Northeast Ohio, but all five states in the FirstEnergy region have a significant number of chemical companies. Total chemical industry GDP in the FirstEnergy region is \$42 billion.

Chemical Industry GDP by State (In the FirstEnergy region only) NEW JERSEY14,200,000,000 PENNSYLVANIA14,000,000,000 OHIO9,100,000,000 MARYLAND3,080,000,000 WEST VIRGINIA1,600,000,000

Over \$1B

Data Centers Discover Competitively Priced Real Estate, Reliable Energy in the **FirstEnergy Region**

Data Center Clusters in the FirstEnergy Region The data center industry has well-developed clusters in New Jersey and southeastern Pennsylvania with additional clusters in Cleveland, Columbus and Pittsburgh. Total data center GDP in the FirstEnergy region is \$8.1 billion.

Data Center GDP by State (In the FirstEnergy region only) NEW JERSEY3,000,000,000 PENNSYLVANIA2,500,000,000 OHIO1,800,000,000 WEST VIRGINIA191,000,000 MARYLAND582,000,000

• \$125M - \$250M - \$500M - \$500M - \$125M \$500M - \$1B Over \$1B



2021



From Custom Compounding to Consumer Products, Rübber and Polymer Manufacturing Prospers in the FirstEnergy Region



Rubber and Polymers Industries in the FirstEnergy Region

The rubber and polymer industries are strong in northern Ohio and Columbus and in parts of western Pennsylvania. Another large cluster prospers in southeastern Pennsylvania and New Jersey. Total rubber and polymer GDP in the FirstEnergy region is about \$8.9 billion.

Rubber and Polymer Industry GDP by State (In the FirstEnergy region only) OHIO3,500,000,000 PENNSYLVANIA3,900,000,000 NEW JERSEY1,040,000,000 MARYLAND242,000,000 WEST VIRGINIA230,300,000

The FirstEnergy region is an attractive destination for businesses in a range of industries, from manufacturing to life sciences and data centers. It is a large and diverse geography, with different combinations of assets, depending on a company's individual needs.



RELIABLE POWER

An upgraded east-to-west transmission system ensures that this region is serviced with the most reliable technology and competitive cost structures.



SKILLED LABOR

Well-funded public and private colleges and universities, from Penn State to Princeton, provide an abundance of science and technical programs.

The Right Mix of Assets

BUSINESS FRIENDLY

Interstate highways, rail and ports enable quick access to major U.S. and International markets. Pro-business governments have a history of fair taxes and local incentives.



QUALITY OF LIFE

Major league and college sports teams, international cuisine, trendy neighborhoods, museums and national and state parks create the right environment for a balanced life in these five states.



FirstEnergy – A Valued Resource on Your Journey

Site Location Assistance

services, fair tax rates, a trained workforce and a competitive energy plan.

Customized Energy Plan

plan that they need, including renewable components.

Secure Transmission

problems early.

• With access to extensive data about the five-state region, FirstEnergy can help businesses find that winning combination of assets, including market access, suppliers nearby, transportation

• FirstEnergy operates 10 distribution utilities and a secure transmission system that spans five states. With these resources, the company can provide businesses with the specialized energy

• FirstEnergy has invested more than \$5 billion in new equipment and technology along a fivestate transmission system, one of the largest in the nation. The upgrades include built-in redundancies that keep the power flowing, as well as diagnostic equipment that detects







Why Does FirstEnergy Subscribe to REMI?

- region we are privileged to serve.
- Capital investments are driven by data and strong business cases.
- of these capital investments.
 - Dynamic modeling
 - Customized for our service territory
 - Future focus-Shocks
 - Consultant is a thought leader in economic impact analysis

We are a forward-thinking electric utility centered on integrity, powered by a diverse team of employees committed to making customers' lives brighter, the environment better and our communities stronger

FirstEnergy's Economic Development group is not selling electrons but rather helping promote the communities and

REMI is an important tool to help both FirstEnergy, our communities and customers understand the economic impacts



Why REMI?

• There are other models:

- IMPLAN
- RIMS
- EMSI

• What REMI does better

- Custom configured multi-region model
- More current baseline data
 - pandemic using CBO and University of Michigan's RSQE forecasts
- Dynamic modeling based on trade flows and economic geography concepts
- Time series over the event horizon
- Quality support and consulting included with the models

REMI has updated the national and so the regional baselines throughout the

Utility Applications for Economic Impact Analysis

- Economic Development
- Energy Efficiency
- Energy Generation
- Grid Reliability and System Resiliency
- Operational Footprints
- Rate Changes
- Renewable Energy
- **Resource Constraints**
- Transmission, Pipelines and Distribution
- Water Utility Investments



About the FirstEnergy REMI model

- The model evolved from a regional EDO
- The model has evolved to 13 regions
 - Including in some cases, the rest of the United States
- The configuration varies
 - Based on the timing
 - And needs
- Consultants have more than 25 year of experience in impact modeling

FirstEnergy and REMI

Internal uses

- Understanding the value of a headquarters
- Estimating the impacts of infrastructure investment
- Comparing the impacts of alternative sites on the company
- Estimating the impacts of investment outside of the FE footprint

• Working with partners

- Children's hospital
- University
- Mixed use development

Estimating the value of an HQ

- Study goal: what is the impact of HQ location?
- Need good establishment data
- Determine functionality of the site
- May need to break down internal functions to better understand how they relate to
- Incomes
- Supply chain
- Unit on analysis matters: city, county or region



Estimating the value infrastructure investment

- Study question: What is the impact of investment in transmission lines over an event horizon?
- It can be useful to think about how the investment breaks down: think about the RPCs and how they might match
 - Labor and wages
 - Materials/supply chain
 - This may move some estimates from indirect to direct
 - May need to turn off intermediate and investment responses
 - Are dollars in nominal or real?
 - Is the pro forma detailed?
- Unit on analysis matters: county, defined region, state?



Comparing alternate sites

- Study goal: estimate the impact on the company for alternative sites in the manufacturing sector in two states
- The model must be configured with the right regions
- Use custom aggregations to ease harvesting the output
- Place matters.
 - Even close places are different.
 - Impacts vary due to relatively local labor markets, distance to supply chains, and regional economic conditions

Estimating impacts from investment outside of the operating footprints

- Study goal: estimate the impact on the company for investment outside of their operating company footprint
- The model must be configured with the right regions
 - This is where a "rest of" region can be helpful
 - Examples include rest of region, rest of the state, and rest of United States
- Use custom aggregations to ease harvesting the output
- Place matters.
 - REMI uses trade flows, and prices to do dynamic modeling rather than a static I/O



Partner investment: Hospital

- Study goal: estimate the impact on a region of a children's hospital
 - Most hospitals don't have an impact due to substitution \bullet effect
 - But the mix of services coupled with the notion that children can't be treated as "little adults" changes the equation
 - The hospital had data scientists on staff to help with:
 - Sources of revenue used to drive expenses
 - Where patients came from
 - Types of services required—acuity
 - Had a great partner in a local university



https://www.pexels.com/photo/ambulance-architecture-building-business-263402

Partner investment: Mixed use development

- Study goal: estimate the impact on a place of a recreational asset
- Comprehensive team is needed:
 - Land use: what can happen?
 - Economic developers: what are the partnerships to make this work?
 - Location decision specialists: what investment can be drawn into the corridor?
 - Local stakeholders: what should happen to benefit community?
- Think about unit of analysis and substitution effect



Source: https://www.nps.gov/cuva/planyourvisit/ohio-and-erie-canaltowpath-trail.htm

Partner investment: University economic impact

- Study goal: estimate the impact of university on a place
- Does being private matter?
- Sources of revenues drive expenses
 - Need to account for the substitution effect so unit of analysis matters
 - A good working relationship with CFO and their staff matters
- The ability to work with REMI to reconfigure the model matters \bullet



Impacts Based on Capital Investments: State of Ohio



- Investment on food processing plant ullet



• Estimates created using REMI model supplied by FirstEnergy to regional partner

Impact of Labor Force Training

The National-Level Economic Impact of the Manufacturing Extension Partnership (MEP) - W.E. Upjohn Institute for Employment Research, March 2017

Forecast	Jobs	GDP	Output	\$ Personal Income	Returns to Treasury	Return on Investment
Unconstrained Model Using Industry Variables	575,870	\$63.04*	\$130.15*	\$34.64*	\$4.66*	35.8:1
Constrained Model Using Firm Variables	142,381	\$15 . 40*	\$29.89 *	\$8.44*	\$1.13 *	8.7:1
11.5% Solution Using Firm Variables	16,532	\$1.79 *	\$3.46*	\$.98 *	\$.132 *	1:1

Ran three different simulations in REMI to evaluate impacts on performance indicators. Sensitivity analysis provided: 1) best case scenario assuming no competition (unconstrained) net new growth; 2) constrained scenario assuming some crowding out would occur and 3) level of economic activity needed to breakeven.

*Dollars in billions

Energy Efficiency Program Evaluation

Macroeconomic Impact Analysis of New York's Energy Efficiency Programs NYSERDA, 2011 and ongoing

Net cumulative Jobs added through 2010: 10,000 Net cumulative Job Years added through 2010: Net cumulative Job Years added through 2024: Estimated Job Impacts by Year 8,000 6,000 4,000 2,000 0 -2,000 1999 2003 2001 2005 2009 2007 2011 -4,000

Employment Impacts of New York Energy \$mart^{s™} Estimated Job Impacts due to Program Spending through 2010(1)

Notes:

- (1) Efficiency measures are assumed to carry a 15 year life. Results are truncated to end within 15 years after program spending stops.
- (2) Includes program spending for the the full portfolio of New YorkEnergy \$martSM programs but does not take account for all possible program benefits.



Employment Demand from Capital Investments

Industry

Construction

Retail trade

Ambulatory health care services

Food services and drinking places

Administrative and support services

Real estate

Professional, scientific, and technical se

Membership associations and organiza

Wholesale trade

Personal and laundry services

	Employment
	2,563
	278
	113
	100
	82
	71
ervices	68
ations	47
	42
	41

Occupations in Demand from Capital Investment

Occupations

Construction trades workers

Other installation, maintenance, and rep

Supervisors of construction and extracti

Retail sales workers

Other office and administrative support

Secretaries and administrative assistants

Business operations specialists

Other management occupations

Helpers, construction trades

Top executives

	Employees
	1,349
pair occupations	191
ion workers	158
	152
t workers	117
S	110
	109
	102
	90
	88



Information is Power

Thank You



Comments and Questions?



Contact information

Jim Robey, PhD

jim@robeyanalytics.com

440-666-0641

Robeyanalytics.com