



INDIANA UNIVERSITY

Economic, Fiscal, and Social Impacts of the Transition of Electricity Generation Resources in Indiana

Study Methods, Data, and Assumptions

January 17, 2020

The 2019 House Enrolled Act (“HEA”) 1278 in part created Ind. Code § 8-1-8.5-3.1(b), directing the Indiana Utility Regulatory Commission (“IURC”) to conduct a comprehensive study of the statewide impacts, both in the near term and on a long term basis, of: (1) transitions in the fuel sources and other resources used to generate electricity by electric utilities; and (2) new and emerging technologies for the generation of electricity, including the potential impact of such technologies on local grids or distribution infrastructure on electric generation capacity, system reliability, system resilience, and the cost of electric utility service for consumers (the “Comprehensive Study”).

In addition to the Comprehensive Study, subsection (c) requires the IURC to issue a final report (“Final Report”) containing the Commission’s findings from the Comprehensive Study. This report is due to the Governor, the Legislative Counsel, and the 21st Century Energy Policy Development Task Force established by Ind. Code § 2-5-45-2 by July 1, 2020.

As part of this effort, the IURC approached Indiana University to prepare an analysis of local economic, fiscal, and social impacts of the transition in generation resources, particularly on rural communities. This work is being conducted by a team made up of researchers from the IU Public Policy Institute, the Indiana Business Research Center, and the IU O’Neill School of Public and Environmental Affairs. The project period is September 1, 2019 to March 30, 2020.

REPORT ELEMENTS

The research team will produce a final written report that is comprised of the following sections:

1. Introduction
2. Summary of the current electric generation portfolio and planned builds and retirements
3. Impacts of transitioning coal-fired generation to alternate sources
 - a. State and local impacts of near-term retirements of coal-fired generation
 - b. The state and local economic potential of replacement generation: natural gas, wind, and solar
 - c. The experience in other states
4. Implications for Indiana
5. Appendix: Methodology

RESEARCH ELEMENTS

The research team will perform six research activities, including:

1. Summary of the current electric generation portfolio and planned builds and retirements
2. Literature review
3. Economic impact analysis (EIA; input-output modelling)
4. Supplemental economic, fiscal, and social analyses—Coal-fired generation
5. Economic fiscal, and social analyses—Replacement generation—natural gas, wind, and solar
6. Case studies
7. Findings and observations

Each of these activities is described below including relevant data, as well as any assumptions and limitations.

Summary of the Current Electric Generation Portfolio and Planned Builds and Retirements

Activity: The research team will describe briefly Indiana’s current generation portfolio and planned builds and retirements.

Data: The research team will utilize data published in utility Integrated Resource Plans and other public data for this activity.

Methods: The team will use a variety of methods, including academic indexes and web searches to identify relevant academic and trade research.

Assumptions/Limitations:

This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.

Literature Review

Activity: The research team will conduct a literature review on the economic, fiscal, and social impacts of the transition of electric generation resources. This activity will provide researchers with valuable information about the impacts experienced in other states.

Methods: The team will use a variety of resources, including academic indexes and web searches to identify relevant academic and trade research.

Assumptions/Limitations:

This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.

Economic Impact Analysis (EIA; input-output modelling)

Activity: The research team will conduct an economic and fiscal analysis to assess the macro-effects of coal-fired generation plant closures on employment and taxes. The team will model the impacts of up to four retiring coal-fired generation facilities. Outputs will be generated for the county in which each facility is located, surrounding counties, and for the state.

Methods: The principal tool to accomplish this activity is IMPLAN, a platform for input-output modeling. The program uses inputs to estimate employment changes that are directly associated with plant closures/openings, as well as the ripple effects on employment in the region and state based on historical quantitative relationships not associated with the price of electricity. The IMPLAN method provides estimates of changes in taxes at the local, state and federal level.

“IMPLAN is a platform that combines a set of extensive databases, economic factors, multipliers, and demographic statistics with a highly refined modeling system that is fully customizable.”

(<http://blog.implan.com/what-is-implan>). IMPLAN is built on a mathematical input-output (I-O) model that expresses relationships between sectors of the economy in a chosen geographic location. In expressing the flow of dollars through a regional economy, the input-output model assumes fixed relationships between producers and their suppliers based on demand. It also omits any dollars spent outside of the regional economy—say, by producers who import raw goods from another area, or by employees who commute and do their household spending elsewhere.

The idea behind input-output modeling is that the inter-industry relationships within a region largely determine how that economy will respond to economic changes. In an I-O model, the increase in demand for a certain product or service causes a multiplier effect, layers of effect that come in a chain reaction. Increased demand for a product affects the producer of the product, the producer’s employees, the producer’s suppliers, the supplier’s employees, and so on—ultimately generating a total effect in the economy that is greater than the initial change in demand. For instance, say demand for a local window company’s wood window products increases. Sales grow, so the company has to hire more people, and the company may buy more from local vendors, and those vendors in turn have to hire more people ... who in turn buy more groceries. The ratio of that overall effect to the initial change is called a regional multiplier and can be expressed like this:

$(\text{Direct Effect} + \text{Indirect Effects} + \text{Induced Effects}) / (\text{Direct Effect}) = \text{Multiplier}$

Multipliers are industry- and region-specific. Each industry has a unique output multiplier, because each industry has a different pattern of purchases from firms inside and outside of the regional economy. (The output multiplier is in turn used to calculate income and employment multipliers.)

Estimating a multiplier is not the end goal of IMPLAN users. For the current project, the IMPLAN platform and specific facility inputs are used to estimate employment changes that are directly associated with plant closures/openings, as well as the indirect (ripple) effects on employment in the region and state based on historical quantitative relationships not associated with the price of

electricity. The IMPLAN platform also will generate estimates of changes in taxes at the local, state and federal level.

IMPLAN constructs its input-output model using aggregated production, employment and trade data from local, regional and national sources, such as the U.S. Census Bureau's annual *County Business Patterns* report and the U.S. Bureau of Labor Statistics' annual report called *Covered Employment and Wages*. In addition to gathering enormous amounts of data from government sources, the company also estimates some data where they haven't been reported at the level of detail needed (county-level production data, for instance), or where detail is omitted in government reports to protect the confidentiality of individual companies whose data would be easily recognized due to a sparse population of businesses in the area.

Data: The planned inputs for modelling are: annual operating expenditures, employee compensation, capital spending, and number of employees. This activity will utilize data provided directly by each utility. Utilities were asked to provide 5 years of data when available. The research team anticipated evaluating information regarding the source of coal for each facility and considering adjustments to the regional purchase coefficients (RPC) within the IMPLAN model.

Assumptions/Limitations:

1. This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.
2. The IMPLAN platform does not discriminate among generation fuels. In other words, that is, the fuel type of the generation plant closure/construction has no bearing on the estimated employment of a generation plant. In other words, the employment component of electricity production/generation function in IMPLAN is the same irrespective of fuel types. Fuel source location—the supply of local or out of state coal—can be adjusted and the employment ripple effects for Indiana coal versus Powder Basin coal would be different.
3. Care should be taken in comparing IMPLAN results for similar scenarios at varied geographic scales. Scale affects relationships/interactions within the model.
4. For coal-fired generation, the study covers generally retirements planned between now and 2030 based on projections made by each utility in their Integrated Resource Plans filed with IURC.
5. Generation units generally are treated in the aggregate by site. For example, if there are four coal-fired generating units projected for closure at a common site, the analysis addresses them together rather than individually. In cases when the planned closures are partial, net generation by unit will be used to parse facility data.
6. In a few cases, data provided by utilities have been classified as confidential. These data will be used to complete the analysis but will not be documented specifically in the report.

Supplemental Economic, Fiscal, and Social Analyses—Coal-fired Generation

Activity: The research team will conduct additional local analyses—for up to four retiring coal-fired generation facilities—to further contextualize local economic, fiscal, and social effects.

Methods: The research team will use excel and geographic information systems to analyze the local data.

Data: This activity will utilize aggregated data as described above in *Economic Impact Analysis (EIA) and Fiscal Analysis* as well as additional disaggregated data by location (county or zip code) and employment by type of job as well as employee gender, race, and age provided directly by each utility. Also local purchases of goods and services. The research team also will utilize property tax data collected from county assessors for operating and recently retired plants.

Assumptions/Limitations:

1. This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.
2. See items 3–6 in the similar section of *Economic Impact Analysis (EIA) and Fiscal Analysis*.
3. All results for this activity will be nominal; no statistical testing.

Economic, Fiscal, and Social Analyses—Replacement Generation—Natural Gas, Wind, & Solar

Activity: The research team will analyze the likely economic, fiscal, and social effects of three types of replacement generation—natural gas, wind, and solar.

Methods: The research team will use excel and geographic information systems to analyze local data.

Data: The resource team will utilize data provided by relevant Indiana facilities, including but not limited to: aggregate employment; aggregate wages and compensation; purchased goods and services by type, including capital costs; source of coal; and the generation capacity and net capacity factor. Utilities have been asked to provide five years of data when available. The research team also will utilize property tax data collected from county assessors when available.

Assumptions/Limitations:

1. This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.
2. Generation units generally are treated in the aggregate by site. For example, if there are several phases of wind or solar generating units co-located, they are addressed as a single unit in the analysis.
3. The data we expect to use for the effects of solar generation will be based on projections for projects that are not yet installed.
4. A greater proportion of the data regarding wind and solar projects provided by utilities/companies are expected to be confidential. As such, data for individual projects will not be reported directly. Rather, these data will be used to create ranges or averages for relevant local effects.
5. All results for this activity will be nominal; no modelling or statistical testing will be performed.

Case Studies

Activity: The research team will create two detailed case studies for retiring coal-fired plants.

Methods: The research team will synthesize literature, modelling, and the supplemental impact analysis with input from local elected, business, economic development, and workforce leaders.

Data: This activity will utilize data described in previous activities. Research team members also will collect insights through interviews with local elected, business, economic development, and workforce leaders in plant locations and the surrounding counties.

Assumptions/Limitations:

This research activity relies on third party data. Errors or omissions in those data may affect the accuracy of study results.

Findings and Observations

Activity: The research team will synthesize the work described above in a set of findings. The research team also will provide observations about ways in which utilities and policymakers can provide support to communities facing transition, and resources available for assistance.

Methods: This activity will draw upon the methods utilized for all other activities.

Data: This activity will draw on the data collected for all other activities.

Assumptions/limitations:

This research activity relies on third party data from all other activities. Errors or omissions in those data may affect the accuracy of study results.