

## Introduction

This memorandum describes the methodology employed by FTI Consulting, Inc. (“FTI”) to measure the economic impacts of electrical equipment manufacturers on the U.S. economy, state economies, and the economies of Congressional districts using third-party data and IMPLAN.

## Economic Impact Analysis

- FTI worked with NEMA to define a range of North American Industry Classification System (“NAICS”)<sup>1</sup> that would reasonably define electric equipment manufacturers in the U.S. as conceptualized by NEMA. NAICS is the standard used by federal statistical agencies for the classification of business establishments for collecting their data.
- The eventual range decided upon, as defined by IMPLAN sectors, included these –

*Figure 1 – NAICS range included in the economic impact analysis*

<b>IMPLAN Sector</b>	<b>NAICS Code</b>
<b>Pharmaceutical preparation manufacturing</b>	325412
<b>Copper rolling, drawing, extruding, and alloying</b>	331420
<b>Speed changer, industrial high-speed drive, and gear manufacturing</b>	333612
<b>Other communications equipment manufacturing</b>	334290
<b>Electromedical and electrotherapeutic apparatus manufacturing</b>	334510
<b>Automatic environmental control manufacturing</b>	334512
<b>Electricity and signal testing instruments manufacturing</b>	334515
<b>Irradiation apparatus manufacturing</b>	334517
<b>Electric lamp bulb and part manufacturing</b>	335110
<b>Lighting fixture manufacturing</b>	335121
<b>Lighting fixture manufacturing</b>	335122
<b>Lighting fixture manufacturing</b>	335129
<b>Power, distribution, and specialty transformer manufacturing</b>	335311
<b>Motor and generator manufacturing</b>	335312
<b>Switchgear and switchboard apparatus manufacturing</b>	335313

<sup>1</sup> <https://www.census.gov/naics/>

<b>Relay and industrial control manufacturing</b>	335314
<b>Storage battery manufacturing</b>	335911
<b>Primary battery manufacturing</b>	335912
<b>Other communication and energy wire manufacturing</b>	335929
<b>Wiring device manufacturing</b>	335931
<b>Wiring device manufacturing</b>	335932
<b>Carbon and graphite product manufacturing</b>	335991
<b>All other miscellaneous electrical equipment and component manufacturing</b>	335999

- FTI then queried the Dun & Bradstreet (“D&B”) database for businesses operating across the NAICS range decided upon for Figure 1.<sup>2</sup> D&B is a leading provider of analytics and intelligence on a firm-by-firm and branch-by-branch<sup>3</sup> basis across the U.S. economy. FTI extracted the following information specifically describing these businesses:
  - **NAICS Code**
  - **Eight-Digit SIC Description**
  - **Company Name**
  - **Address, City, State, and ZIP Code**
  - **Onsite Employees<sup>4</sup>**
  - **Location Status** – *either a single-location company, a headquarters with subordinate branches attached to it, or a branch location*
- FTI analyzed the results of the query and took several steps to transform the findings into inputs for the IMPLAN model. First, FTI and NEMA refined the filtering of the businesses from the NAICS range down to the eight-digit SIC description.<sup>5</sup>
- SIC stands for “Standard Industrial Classification,” which was the predecessor system to the NAICS codes before its replacement in the late 1990s.<sup>6</sup> SIC descriptions still have some legacy applications, however, such as providing a description of the products produced by businesses at a higher resolution of detail than the NAICS codes on their own.

<sup>2</sup> <https://www.dnb.com/>

<sup>3</sup> A “branch” is D&B terminology is an operating location for a business, such as a headquarters, factory, or sales office

<sup>4</sup> The number of employees with their employment attached to that site

<sup>5</sup> <https://www.dnb.com/utility-pages/dnb-demographic-firmographic-code-tables.html>

<sup>6</sup> While NAICS is the newer system, there was significant carryover between the version updates

- For instance, while the query described in Figure 1 includes NAICS 325412 for pharmaceutical preparation manufacturers, few of the products produced by that sector would be relevant to NEMA as electrical equipment. NEMA only requested that NAICS include manufacturers of radioactive diagnostic substances, such as technetium-99m,<sup>7</sup> which certain medical devices use to help image the inside of the body for diagnosis and treatment.
- The D&B query returns 6,750 branches across the U.S. involving pharmaceutical preparation manufacturing. Of those, only 31 produce radioactive diagnostic substances. The vast majority (more than 95% of the sample) produce pharmaceutical products unrelated to NEMA and electrical equipment. Therefore, when developing IMPLAN inputs, FTI filtered to include only the relevant subcategory for radioactive diagnostic substances.
- FTI repeated this exercise for all the NAICS codes in Figure 1. The 23 NAICS codes included 582 subcategories, and 420 were eventually included. The full query included about 25,000 branches while the included list included about 15,000.
- FTI then geocoded the approximately 15,000 branches to include based on their addresses, cities, states, and ZIP codes. FTI used Geocodio for this.<sup>8</sup> Geocodio outputs the latitude and longitude of the branches and assigned them to their congressional district using the districts underlying the 117<sup>th</sup> Congress – the one in session between early 2021 and early 2023 and using the districts defined after the completion of the 2010 Census.
- While most ZIP codes are part of only one congressional district, many ZIP codes in denser urban and suburban environments include two or more districts. This makes the geocoding necessary to ensure no branch is assigned to the wrong congressional district based on a simpler allocation using only the ZIP codes but not precise locations.<sup>9</sup>
- FTI then aggregated the 472,161 jobs of onsite employment to be included in the economic impact analysis from the query as inputs into IMPLAN. FTI “tagged” each of these jobs with their IMPLAN sector (the left column in Figure 1 plus the IMPLAN sector for “management of companies and enterprises”)<sup>10</sup> and with their congressional district.
- FTI made one further adjustment during this step. For locations marked as “Headquarters” in the D&B query, they were tagged to be inputted as part of the management sector in the IMPLAN inputs and not as one of the manufacturing sectors in Figure 1. This would allow the

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<sup>7</sup> <https://www.iaea.org/topics/diagnostic-radiopharmaceuticals>

<sup>8</sup> <https://www.geocod.io/>

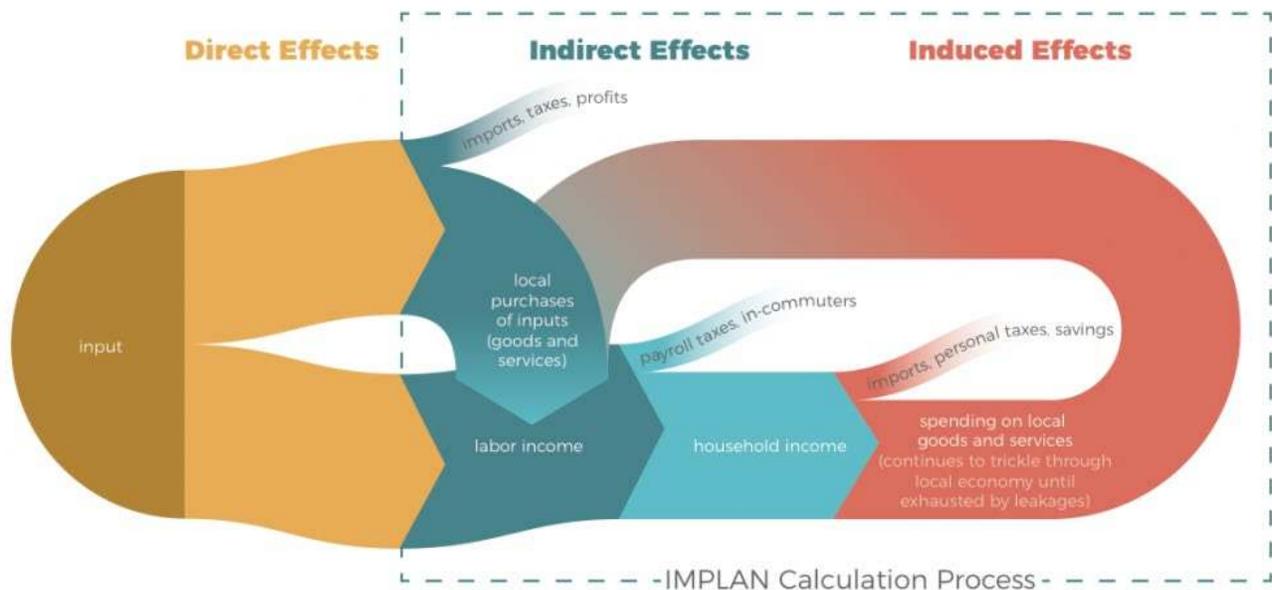
<sup>9</sup> Such as ZIP code 60089 in Buffalo Grove, Illinois which, according to the U.S. House of Representatives, is represented through Illinois District 8 and Illinois District 10

<sup>10</sup> NAICS 55 for “management of companies and enterprises” allows federal statistical agencies and IMPLAN to describe branches where white-collar management work occurs rather than manufacturing/production

modeling to reflect accurately the differences in the economic and fiscal impacts between a manufacturing or production facility and a white-collar headquarters.

- FTI then simulated the economic impact of electrical equipment manufacturers using the IMPLAN model.<sup>11</sup> IMPLAN is an input-output (“IO”) model of regional economies in wide use throughout academia, consulting firms, and government. The underlying methodology to IMPLAN earned Wassily Leontief the 1973 Nobel Prize in economics.<sup>12</sup>
- Figure 2 shows the calculation process of the IMPLAN model, including the direct, indirect, and induced effects, which are defined in more detail after the figure:

Figure 2 – IMPLAN flowchart



- IMPLAN works by relating different types of economic activity to one another through the industrial supply chain, the labor market, consumer expenditures, tax revenues, and public expenditures. IMPLAN organizes these into three categories described as:
  - **Direct Impacts** – *The direct impact includes the business or economic sector under consideration. For this research, this would include the NAICS range described within Figure 1 filtered by the eight-digit SIC codes and geocoded by congressional district. Direct impacts stimulate the indirect and the induced impacts.*
  - **Indirect Impacts** – *Indirect impacts stem from the supply chain relationships between industrial sectors. For instance, electric equipment manufacturers require inputs to*

<sup>11</sup> <https://implan.com/>

<sup>12</sup> <https://www.nobelprize.org/prizes/economic-sciences/1973/press-release/>

*produce in the form of intermediate components, equipment, materials, and services (such as the legal services of attorneys specializing in intellectual property). Thus, the existence and operations of electric equipment manufacturers support other sectors throughout the economy, which IMPLAN calls the indirect impact.*

- **Induced Impacts** – *Induced impacts follow from the impact the direct impact and the indirect impact has on labor. Employees of electrical equipment manufacturers and employees of their suppliers receive compensation for their work in the form of wages, salaries, and fringe benefits. This compensation becomes part of their households' income and supports the consumer economy, including such sectors as real estate, healthcare, education, retail, transportation, and entertainment.*
- IMPLAN calculates the economic impact for four macroeconomic statistics: employment, output,<sup>13</sup> GDP,<sup>14</sup> and labor income. IMPLAN also calculates the “fiscal impact,” or the quantity of tax revenues supported by economic activity, for the federal government (mostly through income and payroll taxes) and for state and local governments.
- FTI simulated the impacts on the level of congressional districts. To create state results, FTI aggregated the constituent districts of a state to a state total.<sup>15</sup> FTI treated the District of Columbia as a *de facto* district/state for the purposes of the impacts even if the District of Columbia does not have any House or Senate seats allocated to it.<sup>16</sup> The results for the U.S. economy are the total aggregation of the districts of the states.

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<sup>13</sup> The sum of business sales **without** adjusting for intermediate inputs

<sup>14</sup> Also known as value-added, equal to sales **with** an adjustment for intermediate inputs

<sup>15</sup> Except states with only a single at-large district, such as Wyoming

<sup>16</sup> Adding the District of Columbia to the 435 seats in the House means the study included 436 regions