cenovus ENERGY

ECONOMIC IMPACTS AND CONTRIBUTIONS OF REFINERY OPERATIONS ON THE STATE OF OHIO

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vestian

Robey Analytics

Research Team

Vestian Global Solutions
Dennis Burnside, Executive Managing Director
Philip Lombardo, Analytics Associate
www.vestian.com

Robey Analytics
Jim Robey, PhD, Principal
www.robeyanalytics.com

Project Contact
Jim Robey, PhD
Robey Analytics
Mattawan, MI
Phone: 440-666-0641
Email: *jim@robeyanalytics.com*

DISCLAIMER - This report, prepared by Vestian Global Solutions and Robey Analytics, analyzes the economic impacts and contributions of Cenovus Energy's refinery operations in Ohio. Data provided by Cenovus Energy was used as the primary source for this study.

Economic estimates were generated using a custom model based on Regional Economic Models, Inc. (REMI) data, covering Allen County, Lucas County, Franklin County, and the Rest of Ohio (ROO). The model accounts for both regional and state-wide impacts from trade flows and economic activities.

This analysis focuses solely on economic impacts and contributions and does not consider social or environmental factors. It should not be viewed as a cost-benefit or environmental impact assessment.

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Economic Impacts and Contributions of Refinery Operations on the State of Ohio

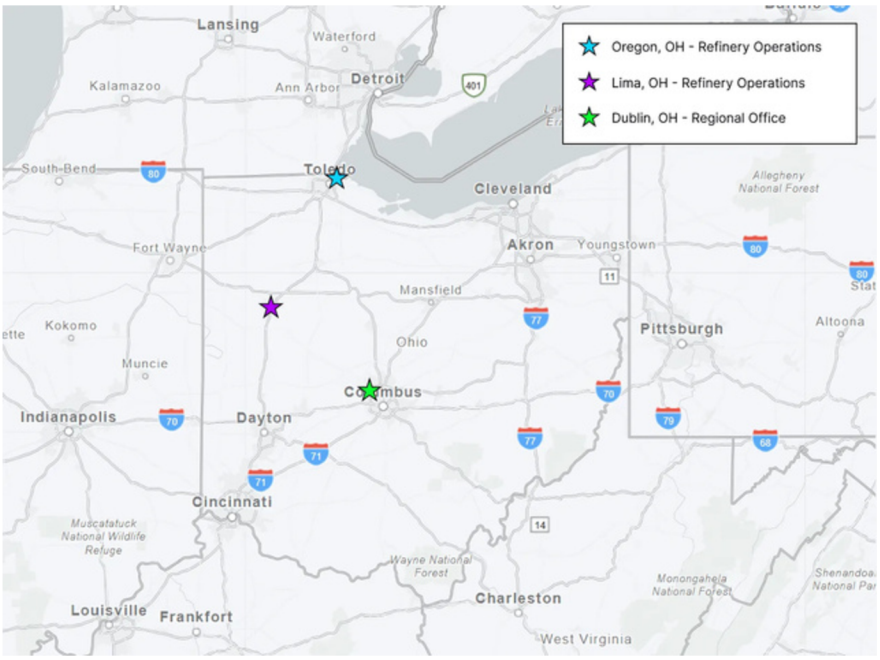
Introduction

An Ohio-based group of companies collectively referred to as Cenovus Energy engaged the team at Vestian Global Solutions to estimate the economic impacts of company operations on the state of Ohio. Cenovus is a Canadian-based integrated energy company with headquarters in Calgary Alberta[1] (Canada). Along with an office location in Dublin, Cenovus has two refinery operations in the state of Ohio, one in Lima and one in Toledo (see Map 1 below).

The Lima Refinery, which opened in 1886, "produces low-sulfur gasoline, gasoline blend stocks, ultra-low sulfur diesel, jet fuel, petrochemical feedstock and other byproducts. Pipelines and rail cars transport the company's refined products to its primary markets in Ohio, Illinois, Indiana, Pennsylvania, and southern Michigan.

In operation for more than 100 years (opened in 1919), the Toledo Refinery has the capacity to process up to 160,000 barrels per day, which includes 90,000 barrels of heavy oil. More than 3 million gallons of gasoline can also be produced daily at the Toledo refinery, as well as 1.3 million gallons of diesel fuel and 600,000 gallons of jet fuel.

In Ohio, the company significantly contributes to the state's economy. Cenovus spends $505 million annually on contractors and vendors, supporting a wide range of businesses. The company also paid a total of $227 million in salary and benefits last year, and donates $2.7 million annually to support local organizations and initiatives. The company has more than 1,200 employees and more than 800 contractors collectively across its three operational sites in Ohio.



Map 1: Cenovus locations in Ohio

[1] See more at https://www.cenovus.com/Our-company

Methodology

In estimating the economic impacts and contributions of Cenovus on the state of Ohio, the Vestian team used a custom designed model built to create the estimates from Regional Economic Models, Inc (REMI, www.REMI.com). The model is dynamic in that it not only creates estimates based on each study area, but also the impacts of economic changes on other places using trade flows of goods, services, and workers between places. The model used in this study was designed to use inputs based on the location of economic activity. The REMI model divides Ohio into four study regions. The study regions included are Allen County, Lucas County, Franklin County, and a single region that includes the rest of Ohio (ROO). The inclusion of the ROO region is essential on both the input into the model and in estimating the results and contributions. While the operations and turn around components will "shock" the economies of their respective counties, the ROO region is essential to creating the refined products estimates. All estimates of impacts and contributions data are reported for the state of Ohio.

Inputs

Within this study, there are three distinct types of activities conducted by Cenovus in Ohio. The first is operations, which includes refinery activities at the Lima Refinery and the Toledo Refinery as well as the office location in Dublin. The second distinct set of activities are the "turnarounds" at the Lima and Toledo refineries. The final set of activities are the refined products delivered to users across the state of Ohio. In all the activity sets, data used as inputs in the REMI model were in either dollars or workers and were provided by Cenovus.

The input data for the study are from 2023 and 2024. For consistency and comparability, all data are modeled and estimates created using 2024 assumptions in the REMI model. The last history year for the model used Is 2023 and there is likely little variation in modeling the shocks to the respective economies relative to findings. Outputs using 2024 as the base year help to create a consistent and comparable set of estimates.

Operations

Cenovus has three places of operations in Ohio. Two are refineries and one is an office location. The refineries are located in Lima and Toledo and the office is outside of Columbus in Dublin.

Almost all economic models use "industry homogeneity," which assumes "that all firms in an industry have similar production processes."[3] Through discussion with Cenovus staff, it was decided that the three operations are unique enough that a different approach would be used. This was particularly important when looking at the impacts from the Dublin location. While there is an industry code for headquarters for use in the REMI model, the mix of actual activities at HQs can vary widely. The effect of the variation in activities can affect the estimates in their level of accuracy and reliability.

[3] See page 16 of The Economic Impacts of the Superior Refinery on St. Louis and Carlton Counties, Minnesota, and Douglas County, Wisconsin. October 2024.

To overcome the potential issues of activities in Dublin varying from the baseline in the model, Cenovus supplied the Vestian team with data on employment by function and activity for the Dublin office as well as for the Lima Refinery and the Toledo Refinery. Employment for each activity is then applied to the most appropriate industry in the model. Examples of industries used at the Dublin site include Administrative and Support Services, and Professional, Scientific and Technical Services. The benefit of this approach is that it better captures the earnings of employees that affect regional personal consumption as well as the supply chains needed for each activity to function. This is applicable to both office operations and refinery operations.

The Toledo and Lima refineries used the same approach as for the office location. Worker data were supplied by the company. These data included staff, union, and contractors at each refinery site. Workers were assigned to an industry using an array of classification data from "Job Family" through "Supervisory Org." The employment was used as an input to the model in the respective study area. The Dublin workers were assigned to Franklin County, the Lima Refinery workers were assigned to Allen County, and the Toledo Refinery workers were assigned to Lucas County.

Turnarounds

Refineries regularly go through cycles of updates to plants and equipment called "turnarounds." The Lima Refinery and the Toledo Refinery have both recently undergone turnarounds. While the operation estimates are based on worker data, the turnarounds are based on spending data so dollars are used as inputs. Similar to creating the estimates of operations, the impacts for turnarounds were estimated using 2024 as the base year.

The data for the turnarounds supplied by Cenovus included vendor names and invoice amounts. The spending data included the purchases of both goods and services needed for the turnaround.

The North American Industrial Classification System (NAICS) is the "standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy."[4]

Using Dun and Bradstreet data (www.dnb.com), vendors were assigned a NAICS code. REMI system of inputs also used NAICS codes to identify industries. The NAICS code was then used in the REMI model to assign spending to the appropriate industry. When a vendor had multiple locations, a "best fit" approach is utilized to identify a location whose NAICS and functions appear to be consistent with products produced that support the turnaround. The dilemma with using the home location of the company is that the location of production, whether goods or services, is unknown.

To create estimates using vendor spending from unknown locations, the regional purchase coefficient, or RPC, within the REMI model was used. RPCs are the share of each dollar spent in an industry that is spent locally. As a dynamic model, REMI estimates trade flows between the study regions, the rest of the United States, and the rest of the world. Using Ohio as the reporting unit of analysis allows for the self-supply of goods and services to go beyond the respective supplies in the individual counties.

[4] See more at https://www.census.gov/naics/

Refined Products

This study focuses on Ohio, but Cenovus delivers refined products from the Midwest to the Mid-Atlantic and into Ontario (Canada). These products include gasoline, jet fuel, and asphalt. The deliveries of all types of products into Ohio are quite large in dollar value. It is important to note that all products delivered in Ohio may not be produced in the state and products produced in Ohio may also be exported out of the state. The implication of importing and exporting refined products does not allow a direct relationship between refinery output and consumption in Ohio.

While billions of dollars of refined products are delivered in the state of Ohio, it is beyond the scope of this study to identify each product and its associated users. To estimate the impacts of refined products delivered to users in Ohio, including Cenovus intracompany transactions, the REMI model's input-output (I-O) table is used to allocate sales to industries. I-O tables can "show flows of final and intermediate goods and services defined according to industry outputs (industry × industry tables)."[5] In this case the value of refined products delivered in Ohio is applied on a shared basis to users. These users may be industrial, including services and wholesale trade, and retail purchasers including end-users such as households.

Estimating Economic Impacts: Measures

The Vestian Team used a model customized for the study provided by Regional Economic Models, Inc. (www.REMI.com). The model, PI+, is a dynamic model that allows estimates of economic impacts to be created for Allen, Lucas, and Franklin counties as well as the rest of the state of Ohio. The results show the impacts to the state when the regions are combined. The model used was version 3.2.0 Build 6711.

- As with most economic impact studies, this study focuses on four main economic outcome variables, which are generated by the REMI model based on agreed-upon inputs:
  - Jobs created or retained
  - Change in gross domestic product
  - Change in income
  - Change in output

Estimating Economic Impacts: Jobs Created or Retained

There are caveats to the estimated number of jobs created or retained by economic investment and activities. The first is that these jobs are simply "jobs" as counted by the U.S. Bureau of Economic Analysis (BEA) and can be either full- or part-time positions. Second, these jobs are likely distributed across several industries. Third, in any given industry, a "job" may represent a summation of positions across several industries in which each industry has less than one complete position. The impact study may report one "job" but the spending patterns in the study may generate positions in three industries; however, each industry may require only one-third of a person. In this case, the three industries that employ one-third of a person each to meet demand would sum to one "job" in the REMI model.

[5] See more at https://www.oecd.org/en/data/datasets/input-output-tables.html

Employment is comprised of three elements:

- ***Direct***: The employment created by actual investment, growth, or change
- ***Indirect***: Employment created by the need of a firm to purchase goods and services, essentially the local supply chain
- ***Induced***: The household that supplies goods and services to the workers in the prior two elements. Examples include education, dry cleaners, accountants, gas stations, lawyers, and grocers.

Estimating Economic Impacts: Measures in Dollars

There are three elements to assessing an economic impact:

- ***Output***: Gross output includes both gross domestic product (GDP) and expenditures on intermediate inputs. In that way, it is considered double counting but is an essential statistical tool to understand the interrelationships between industries. Gross output is principally a measure of an industry's sales or receipts. For the purposes of the model, the sales and receipts are aggregated at the national level.
- ***Gross Domestic Product/Value-Added***: GDP is an economic measure of the value of goods and services produced within the study region. It is the broadest measure of economic activity within a region or country. GDP consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. It does not include intermediate inputs; thus, it is a measure of the value of labor and capital contributing to production.
- ***Income***: Income is the goods and services produced by residents (i.e., gross national product) minus the consumption of fixed capital (i.e., depreciation). This is essentially what people earn for their labor.

Definitions of Impacts and Contributions

Economic impacts are when dollars, either through operations and/or investment, occur in unique firms that could be located outside the study region – in this case Ohio.

Economic contributions occur when the employment or spending could be "substituted" by alternative firms.

When measuring impacts versus contributions :

- **Impacts**
  - Refinery operations
  - Turnaround activities
  - Dublin Office
- **Contribution**
  - Retail and wholesale products delivered in Ohio

Estimating Economic Impacts: Findings

The following section contains the estimates of economic impacts and economic contributions of Cenovus Energy on the state of Ohio. Impacts are estimated using data supplied by the company for operations and turnarounds. Economic contributions to the state of Ohio are estimated using data on product delivered in the state and supplied by the company.

Estimates of Operations: Toledo

Input: 1,034 Workers

Metric	***2024***
Total Employment	9,312
Private Non-Farm Employment	8,365
Output (Mil$)	$10,800.00
Gross Domestic Product (Mil$)	$3,355.00
Personal Income (Mil$)	$950.00
Total Employment	***9,312***
Direct Employment	***1,034***
Indirect Employment	***2,215***
Induced Employment	***6,063***

Estimates of Operations: Lima

Input: 965 Workers

Metric	***2024***
Total Employment	13,741
Private Non-Farm Employment	12,581
Output (Mil$)	$20,146.00
Gross Domestic Product (Mil$)	$6,013.00
Personal Income (Mil$)	$1,028.00
Total Employment	***13,741***
Direct Employment	***965***
Indirect Employment	***3,624***
Induced Employment	***9,152***

Estimates of Operations: Dublin

Input: 106 Workers

Metric	***2024***
Total Employment	374
Private Non-Farm Employment	347
Output (Mil$)	$84.28
Gross Domestic Product (Mil$)	$50.25
Personal Income (Mil$)	$33.51
Total Employment	***374***
Direct Employment	***106***
Indirect Employment	***37***
Induced Employment	***231***

Estimates from Turnaround: Toledo

Input: $339.4 Million in Expenditures

Metric	***2024***
Total Employment	1,554
Private Non-Farm Employment	1,467
Output (Mil$)	***$319.51***
Gross Domestic Product (Mil$)	***$182.02***
Personal Income (Mil$)	***$112.96***

Estimates from Turnaround: Lima

Input: $306.6 Million in Expenditures

Metric	***2024***
Total Employment	1,492
Private Non-Farm Employment	1,429
Output (Mil$)	***$291.97***
Gross Domestic Product (Mil$)	***$164.62***
Personal Income (Mil$)	***$105.49***

Estimates* from Delivered Product in Ohio

*Input: $17.6 Billion in Delivered Product (*These estimates are contributions to Ohio's economy.)*

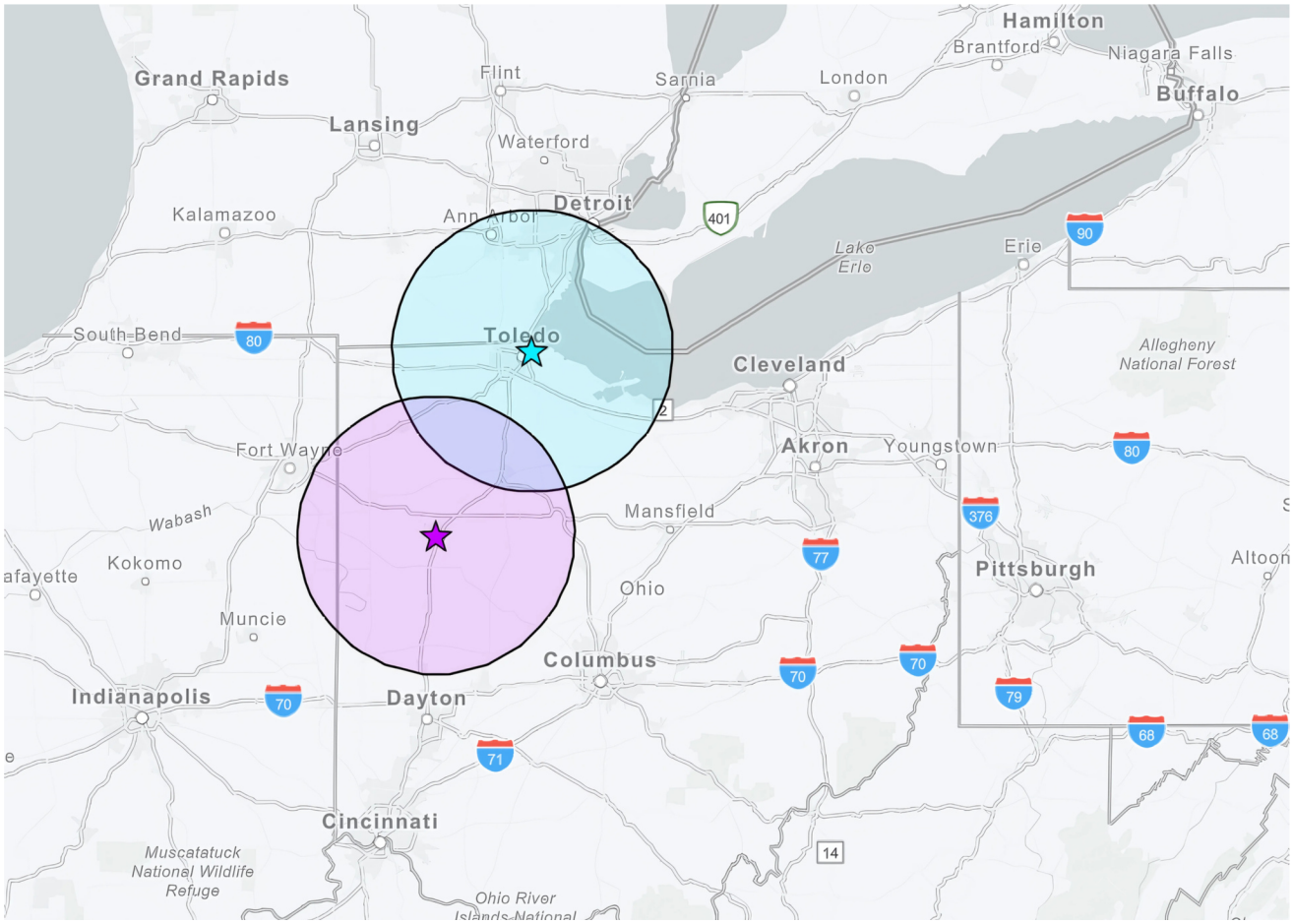
Metric	***2024***
Total Employment	52,475
Private Non-Farm Employment	46,831
Output (Mil$)	***$30,149.51***
Gross Domestic Product (Mil$)	***$15,085.40***
Personal Income (Mil$)	***$3,747.04***

Why are Estimates from Lima Bigger than from Toledo?

Employment is higher at the Toledo versus the Lima refinery. In most cases, the bigger place would have bigger impacts. But the location of operations and supply chains matter. As shown in the following maps, Manufacturing and Business Services are more concentrated in Ohio and Michigan than in Indiana. Supply chains for Lima are more likely to come from Ohio, while Toledo's proximity to Michigan makes it more likely that supply chains from both Ohio and Michigan will support Toledo (see Map 2).

The research staff at REMI concur with the fact that the REMI model captures trade and in-flows and out-flows of other economic activity between regions, rest of nation, and rest of world. Border regions such as Toledo have inherently higher leakage due to cross-border economic interactions, particularly if there is supporting supply chain services, residential and related consumer services located in surrounding regions. This can result in differences in multipliers and related economic impacts when comparing similar operational spending in different regions.

Both the Toledo and Lima operations have profound effects on the Ohio economy. There are many similarities and some differences in the economic contribution of the two facilities and related operations. There are some differences in the operations profiles and regional economic structure of where the plants are located.



Map 2: 50 mile radius of Toledo Refinery and Lima Refinery operations

Manufacturing Companies within 50 Miles of Refinery Operations

Metric	*Count*	*Share*
Total Manufacturing Companies within 50 Miles of Oregon Refinery	***6,976***	***100.0%***
Companies in Ohio	2,276	32.6%
Companies in Michigan	4,700	67.4%
Total Manufacturing Companies within 50 Miles of Lima Refinery	***2,620***	***100.0%***
Companies in Ohio	2,359	90.0%
Companies in Indiana	261	10.0%

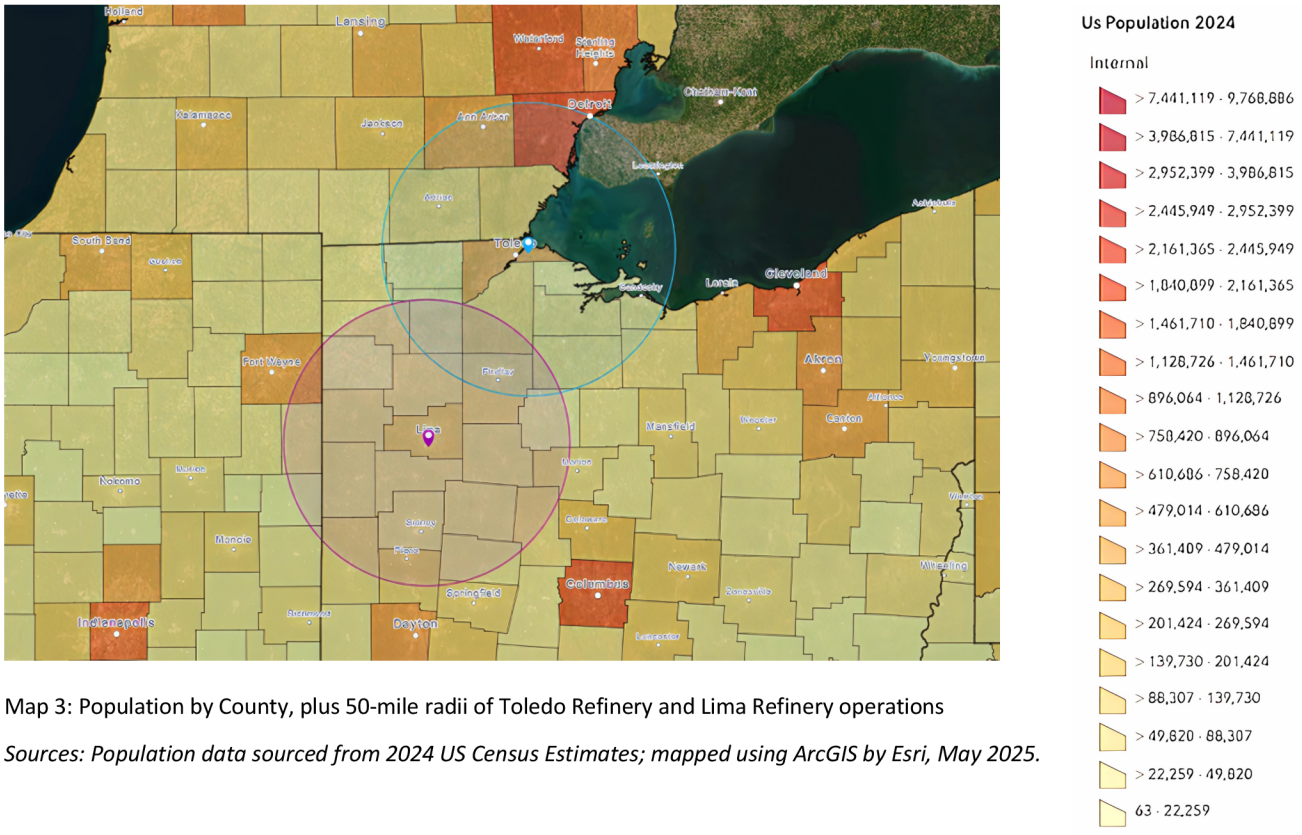
Sources: ZoomInfo, cross-referenced against ArcGIS Business Analyst; visualized using ArcGIS by Esri, May 2025.

Business Services Companies within 50 Miles of Refinery Operations

Metric	*Count*	*Share*
Total Business Services Companies within 50 Miles of Oregon Refinery	***10,216***	***100.0%***
Companies in Ohio	2,602	25.5%
Companies in Michigan	7,615	74.5%
Total Business Services Companies within 50 Miles of Lima Refinery	***2,797***	***100.0%***
Companies in Ohio	2,590	92.6%
Companies in Indiana	207	7.4%

Sources: ZoomInfo, cross-referenced against ArcGIS Business Analyst; visualized using ArcGIS by Esri, May 2025.

Population Heatmap by County



Map 3: Population by County, plus 50-mile radii of Toledo Refinery and Lima Refinery operations

Sources: Population data sourced from 2024 US Census Estimates; mapped using ArcGIS by Esri, May 2025.

Findings

Cenovus Energy is a Calgary-based company with three locations in the state of Ohio. The company engaged the team at Vestian Global Solutions to estimate the economic impact of these locations and their associated activities on the state of Ohio. Two of the three locations are refinery operations in Lima and Toledo, and the third is an office location in Dublin. The study estimates the economic impacts of all operations and turnarounds at refineries on the state of Ohio. The study also estimates the economic contributions of delivered products in Ohio.

The combined operations component – at the refineries and the Dublin office – of Cenovus supports employment of just over 2,100 people, including regular, union, and contract workers. The estimates of impacts include all types of Cenovus workers, supply chains estimated to be in Ohio, and workers from households supplying goods and services to operation employees. The supply chain employees add to the impacts and are commonly referred to as the indirect effect, while the impacts from households are commonly referred to as the induced effect. Using the REMI model, with employment obtained from Cenovus for the three operations locations, the estimated economic impact is 23,427 jobs to the state of Ohio. These workers, including those that are company-related, suppliers, and households, add over $2 billion in personal income to the state.

Findings (continued)

Turnarounds happen on a regular basis and account for significant reinvestment in the two refineries. Turnarounds do not occur each year and, for purposes of this study, both the Toledo and Lima turnarounds were modeled in the same year so that the estimates are comparable. The combined investment in turnarounds was about $646 million. Using vendor-based data and the Regional Purchase Coefficients in REMI, the Vestian Team estimated that the two turnarounds, when combined, add an estimated 3,046 jobs in the state. Those jobs add $218 million in personal income to Ohio's economy.

The estimates of impacts from delivered products in Ohio are better described as "contributions" to the state economy. If Cenovus wasn't supplying these products, it is likely that another vendor would supply them, or at least most of them. In 2024, Cenovus delivered $17.6 billion in products within the state benefitting users, including businesses and residents. The delivery of products to users contributed 52,475 jobs to the state and nearly $3.75 billion in personal income. Note that not all products delivered in Ohio were produced in the state, and that not all products produced in Ohio were delivered in the state.

It is important to note that the estimates for both operations and delivered products occur in a single year and recur annually. When mixing impacts from operations with contributions from delivered products, Cenovus Energy's activities support 75,609 workers and almost $5.76 billion in personal income in the state of Ohio on an annual basis.