

Chapter One: Understanding Regional Assets and the Economy

Columbus Regional Profile

The Columbus Region consists of a 12-county area in Central Ohio. It includes the City of Columbus and the surrounding commuter shed. The Columbus Region has a population of roughly two million people and the region is home to 15 Fortune 1000 company headquarters. Overall, the regional economy is diversified and no single industry sector represents more than 17 percent of employment.

At the region's center, the City of Columbus is a 220 square-mile metropolis. Columbus is the 15th largest city in the nation and has a population of 800,000. For comparison, Columbus is approximately the same physical size as Chicago, but with less than one-third the population. While the Central Business District is dense, much of the city has suburban density and land use, with employment centers hugging the major highway corridors. In addition, the region has a number of other small urban nodes. Suburbs dot the area, either as communities directly connected to Columbus or as county seat cities that anchor commerce in the more rural counties.

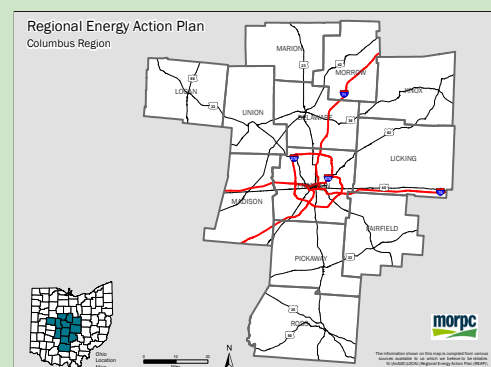
The Columbus Region is the national headquarters of Nationwide Insurance, Wendy's, Limited Brands, Scotts Miracle-Gro and Big Lots. In addition to universities, several renowned research institutions including Battelle Memorial Institute, Edison Welding Institute (EWI), the Online Computer Library Center (OCLC) and Chemical Abstracts are based here.

Demographically, the region has been the most rapidly growing area in Ohio for several decades. Representing less than one-quarter of Ohioans in 1980, it is now home to one third of the state's population. Additionally, the Columbus Region is experiencing an increased level of racial and ethnic diversity. For example, over the past ten years, the number of Hispanics has more than doubled to approximately 65,000 people.

The region has also historically been relatively young, owing in part to the presence of 54 colleges and universities totaling approximately 150,000 students, including The Ohio State University, one of the largest universities in the country. The Columbus metropolitan statistical area has a median age of 35 years (the national average is over 37 years, and the Great Lakes region is over 38 years). However, like the rest of the nation, the region is aging, and will face extraordinary challenges in the future as baby boomers leave the workforce and move toward retirement.

Columbus Region Snapshot²

- 12 counties
- 2 million people, growing 1.3 percent annually
- Driver of Ohio's population and economic growth
- 54 college and university campuses, with 147,000 college students
- 15 Fortune 1000 headquarters
- State Capital and largest city in Ohio
- 15th largest city in the U.S.
- Within 500 miles of 45 percent of U.S. population, higher than other major distribution centers in the U.S.



The percentage of adults over the age of 25 with a bachelor’s degree is roughly 31.3 percent—higher than the national average (28.2 percent) and significantly higher than Ohio in general (24.6 percent). Per capita income, unemployment and the poverty rates vary across the region’s counties, though as a whole, the Columbus Region is competitive with both the state and the nation.

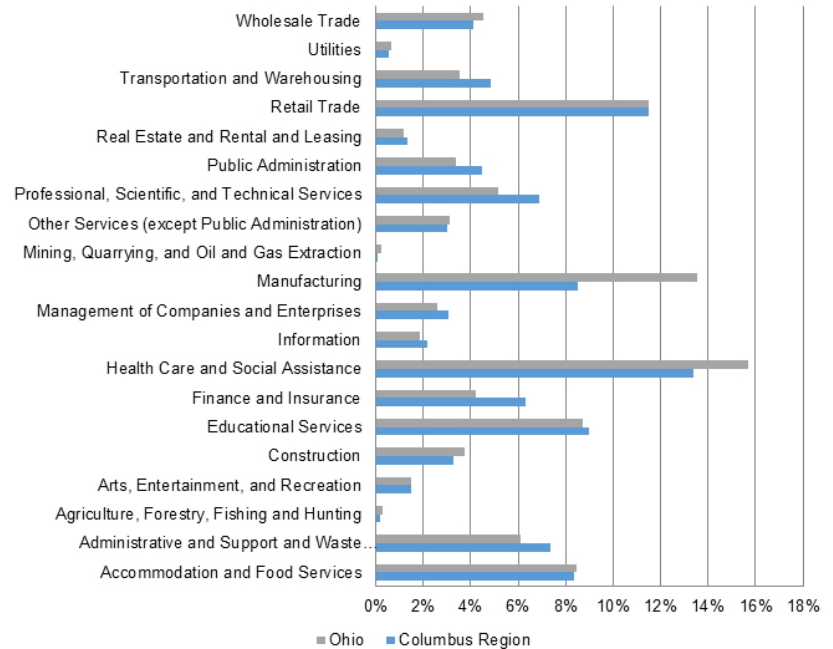
With more than one million jobs, the Columbus Region represents nearly 18 percent of Ohio’s workforce. It has grown more than 25 percent in the past 20 years. Employment is spread across a broad array of sectors with no single industry playing a predominant role. Figure 1 is a display of workforce distribution in various industries. In contrast to the traditional economies of Ohio cities, manufacturing is not a primary element of the Region’s economy. Additional regional demographic and employment data is available in the Appendix C.

The Columbus Region is part of the powerful Great Lakes mega-region (Figure 2). A mega-region includes clusters of metropolitan areas linked through transportation and economic ties.

With some exceptions, the Columbus “industrial” economy primarily comprises warehousing and distribution. Columbus is the heart of Ohio, which is at the crossroads of the Eastern U.S. and the Midwest. Consequently, the Columbus Region has maintained its position as a fulcrum for goods distribution. Regional infrastructure is expansive and the terrain is relatively flat, allowing for free movement of freight by rail and road. Freight leaving Columbus can reach approximately 44 percent of the U.S. and Canadian populations within one day’s travel. Major interstate routes intersect in downtown Columbus. In addition, the intermodal yard located just south of the city lies on the Heartland Rail Corridor, which was recently rebuilt to accommodate increased freight traffic expected to link the Norfolk, VA harbor to Asia due to a widening of the Panama Canal. This international freight highway is expected to further accentuate the Columbus Region’s role as an international distribution hub.

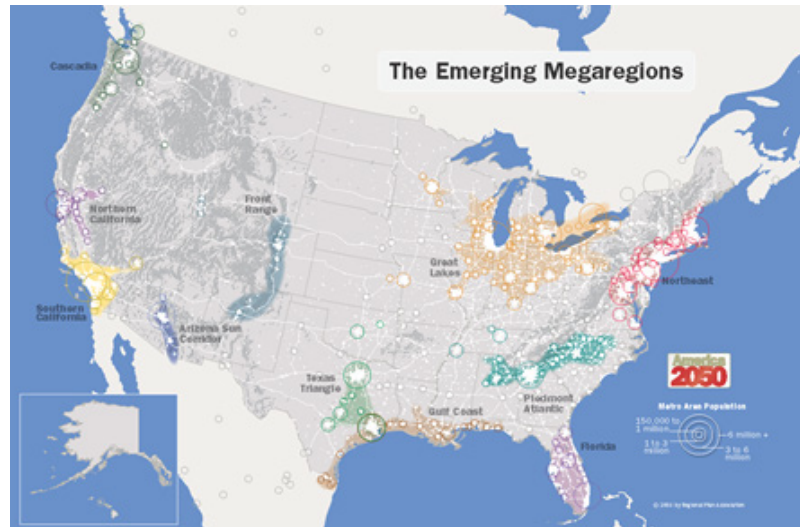
As part of an Ohio Department of Transportation (DOT) Freight Impacts on Ohio’s Roadway System report, a case study was completed for the MORPC transportation planning area. The study found that Franklin County surpasses all other Ohio counties in system annual truck ton-miles, daily Vehicle Miles Traveled (VMT), and annual value-miles for both 1998 and planned 2020 growth. The Ohio DOT study also found that interstates 71 and 70, which intersect in the middle of Central Ohio, carried 20.5 percent and 13.3 percent respectively of the state’s freight truck daily VMT in 1998.

Figure 1: Employment Sectors, Ohio and the Columbus Region, 2012



Source: QCEW, averaged over four quarters from 2011-2012

Figure 2: Great Lakes Mega Region Shown in Orange



Source: Regional Plan Association

Emerging and Current Energy-Related Sectors for Further Study

Energy Storage Technology

Ohio investments in advanced energy storage leverage Ohio's considerable public and private sector assets in advanced battery technologies, applied engineering, and unique testing capabilities that are well-positioned to meet the research and development, technology commercialization, product validation and advanced systems integration and controls needs of automotive, industrial, academic and military customers. The Columbus Region has an impact on everything from electric vehicles to grid storage to military applications.

American Electric Power (AEP) Ohio is demonstrating a network of more than 110,000 digital electric smart meters for business and residential customers in 15 local communities in the northeast central area of Franklin County. The smart meters allow two-way communication for real-time readings of customer's electric usage and improves AEP Ohio's ability to detect power outage and remote meter readings. These meters may also allow customers to integrate other technologies, such as plug-in electric vehicles and "smart" appliances that will enhance the benefits of the smart grid.

The Columbus Region is home to The Ohio State University and its many materials labs; the OSU Center for Automotive Research (CAR) and its advanced hybrid and electric powertrain engineering and test facilities; CAR Technologies, one of the largest original equipment manufacturer focused battery testing and engineering facilities in the country; EW1, an organization that meets the special joining and manufacturing technology needs of the energy industry, and; Battelle, an energy solutions company that also operates many of the nation's national energy laboratories. This unique energy cluster forms a public-private support chain where leadership from world-class universities, commercial enterprises, and government-connected organizations can help private industry deliver the next generation of safe, reliable and lighter weight energy storage systems for the advanced automotive, industrial and defense industries.

Information and Data Warehousing

The Columbus Region is also advancing its reputation as a hub for the information and data warehousing sector. These include a new IBM data center in southern Delaware County, along with J. P. Morgan Chase; OCLC, which develops tools for connecting research materials from libraries around the world; and Chemical Abstracts, an international repository for information about chemicals form the nucleus of an energy-intense data cluster. Information and data warehousing demands cheap abundant energy and produces a large amount of waste heat. The capture and recycling of this waste heat can improve energy efficiency.

IBM has partnered with the Syracuse University to develop an on-site data center which uses gas-powered micro-turbines to generate power. During the winter, the 585 degree F (307 C) exhaust from the micro-turbines flows through heat exchangers to produce hot water, which is then piped to a nearby office building to be reused in the building's heating system. This is one example of technology being used to produce energy onsite. IBM's Elisabeth Stahl noted the benefits of using the data center as an energy producer in a recent *Industry Perspectives* column: "Through adopting this final level of the IT [information technology] energy efficiency hierarchy, we can build a scalable, flexible, and green data center that is dynamic in its infrastructure. Through this 'self-actualization' we can potentially save on energy costs; as a producer we might also even be able to make money as well."³

Building Efficiency

During 2012, residential and commercial buildings accounted for nearly 40% of the total U.S. energy consumption.⁴ In light of this, the efficiency potential of the Columbus Region's building stock deserves further evaluation. Businesses and residents are occupying spaces without realizing their full efficiency potential, and as a result they are spending money on utility bills and building operations that can otherwise flow into the local and regional economy.

Ohio ranks 11th in the nation for LEED (Leadership in Energy and Environmental Design) commercial buildings, and Columbus is reported as one of the top 40 cities in the country for the most LEED project activity.⁵ The Columbus Region also has a strong U.S. Green Building Council (USGBC) Central Ohio Chapter, which provides education and training opportunities for green building professionals. There is a growing presence of trained green building professionals across the state to support the market opportunities introduced by LEED certification, as well as other green building programs such as Energy Star and Green Globes.

The green building supply chain is another area of economic opportunity for the Columbus Region to explore.

Manufacturers are making building products that apply to energy efficient buildings in general. For example, Replex Plastics in Mt. Vernon makes advanced skylights, in addition to solar concentration mirrors. Exterior Portfolio in Columbus makes insulated siding. In addition, the Owens Corning Science & Technology Center is located in Granville, the world's largest manufacturer of fiberglass and related products.

Agriculture

Given the abundance of water and fertile low, flat land, agriculture is a fundamental element of the Central Ohio regional economy and landscape, even though agricultural employment is relatively low. Approximately 78 percent of the 6,000 square miles of Central Ohio was dedicated to agricultural uses in 2010. Agriculture is energy intensive and, according to a 2010 report analyzing energy use in the U.S. food system, "use of energy along the food chain for food purchases by or for U.S. households increased between 1997 and 2002 at more than six times the rate of increase in total domestic energy use. This increase in food-related energy flows is over 80 percent of energy flow increases nationwide over the period. The use of more energy-intensive technologies throughout the U.S. food system accounted for half of this increase."⁶ More efficient use of energy in Columbus Region agriculture can reduce the region's overall annual energy consumption.

According to David Pimentel, Professor of Ecology and Agricultural Sciences at Cornell University - Farming, the portion of the agricultural/food system in which food is produced requires about seven percent; food processing and packaging consume seven percent; and transportation and preparation use five percent of total energy in the United States. He proposes solutions to cut down on the high use of fossil fuels and increase energy efficiency in agriculture. Increasing efficiency in water use and pumping for irrigation, better soil management, shortening the distances producers drive products to distribution centers, decreasing the overall size of farm equipment, and, in the extreme, returning to the use of horses and mules in production can have a significant impact in lowering energy use and cost. Agriculture can also play a significant role as a local energy producer through solar, wind and anaerobic digester installations.

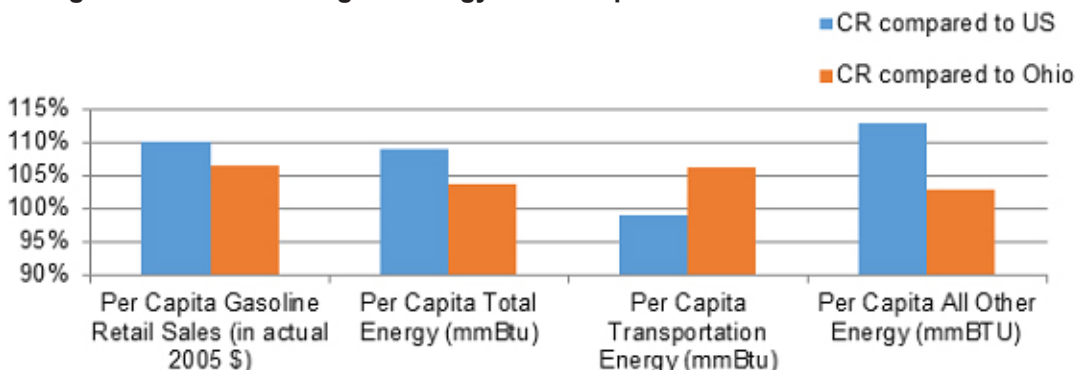
Columbus Regional Energy Economy

Energy consumption and production significantly influences regional economic success. Traditional economic models do not capture the regional benefits that accrue due to smart energy decisions at the local level. Routine planning exercises around transportation, development, housing and water do not often include energy data. A new planning paradigm is needed and new data needs to be created and/or collected. An important piece of the energy planning effort in the Columbus Region was to assess economic impacts of the Columbus Region's energy profile. To maintain and increase regional economic productivity, the cost of energy must be minimized. The Project Team believes that if Central Ohio continues on its current energy trajectory, the economic success and competitiveness of the region will underperform its potential.

Energy Use

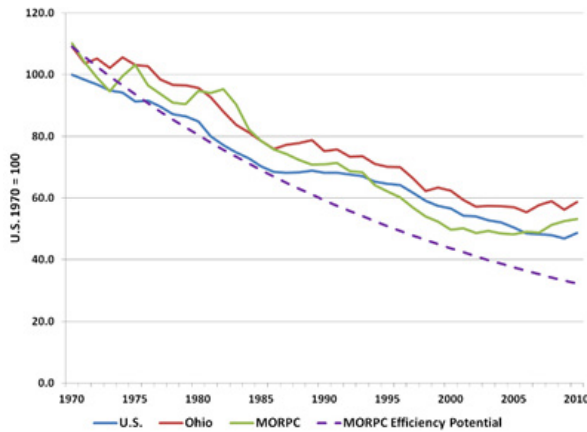
Columbus residents use eight percent more energy than the typical American, and three percent more than the typical Ohioan.⁷ The reasons for this are numerous, including low energy prices, inefficient housing, inefficient appliances and a low level of implementation of efficiency gains still achievable in the industrial, commercial and institutional (including local government) sectors. On a per capita basis, the Columbus Region is not as energy efficient as the nation or the state. Had the Columbus Region been invested in more energy-efficient building, industrial, and transportation technologies and infrastructure (highlighted by the trajectory shown in the dashed purple line in Figure 4), the energy intensity of the economy would have been about 40 percent

Figure 3: Columbus Region Energy Use Compared to U.S. and Ohio



Source: Mid-Ohio Energy Stress Test, John A. Laitner, Economic and Human Dimensions Research Associates

**Figure 4:
Trends in the Regional Energy Intensity Index**



Source: QCEW, averaged over four quarters from 2011-2012

less than it was in 2010. This would have saved the regional economy between \$1 to 2 billion annually.

Energy Demand and Price

Cheap energy prices contribute to increased demand. For example, Natural Gas Monthly reports the average price of natural gas in Ohio is almost 20 percent below the national average (Energy Information Administration [EIA], July 2013). In addition, Ohio ranked fifth in the nation in 2010 in energy consumption by the industrial sector, and third in manufacturing employment, with 5.4 percent of manufacturing jobs (EIA, 2013). The prevalence of jobs tied to energy-intensive sectors explains some of this high energy use in the region.

GDP and Productivity

Despite energy inefficiency, the Columbus Region has a high Gross Domestic Product (GDP). Regional productivity is also expected to continue at a higher level than both the U.S. and

the state over the next three decades. As shown in the table below (Figure 5), the Columbus Region has strong per capita income compared to the U.S. and to Ohio as a whole. Given the productive strength of the region and expected growth, implementing smart energy policy will propel the region to higher levels of success through energy cost savings and more efficient use.⁸

Figure 5: Economy-Wide Productivity Improvements for U.S., Ohio, and MORPC

Indicators	U.S.	Ohio	MORPC
<i>Economic (from Woods and Poole)</i>			
Growth in Per Capita GDP 1970-2010	1.50%	1.30%	1.66%
Growth in Per Capita GDP 2010-2040	1.28%	1.58%	1.44%

Source: Mid-Ohio Energy Stress Test, John A. Laitner, Economic and Human Dimensions Research Associates

Energy Consumption

The Columbus Region also appears to have greater 2010 per capita energy consumption (344 million Btu), compared to the rest of Ohio (332 million Btu) and the U.S. (316 million Btu). This appears to be both the result of lower energy costs, which drives up energy use, together with less-efficient housing and economic infrastructure (including both the transportation and industrial sectors). While energy consumption has remained flat since the 1970s for the U.S. and Ohio, total energy consumption in the region is increasing, which may be a significant problem for the region if not abated.

Economic Outcomes

Analysis prepared for this Report suggests that energy plays a far greater role in maintaining robust and resilient local economies. The Columbus Region's economic future is solid, but the growth in economy-wide productivity is slowing. The inefficient use of energy combined with rising energy costs can strip the region's ability to make the investments necessary to provide future jobs in the Columbus Region.⁹ Throughout the remainder of the *Report*, the Project Team focuses on outlining the economic opportunities inherent in the Columbus Region's energy policy framework and current energy initiatives coupled with existing regional energy assets in the region. This *Report* marks an important first step toward outlining the changes that must take place if the Region is to truly engage in regional energy planning.

Figure 6: Table of Key Results of U.S., Ohio and MORPC Energy Use in 2010

Key Indicators	U.S.	Ohio	MORPC
<i>Economic (from Woods and Poole)</i>			
Per Capita GDP (in actual 2005 \$)	40,947	35,592	40,775
Per Capita Gasoline Retail Sales (in actual 2005 \$)	1,294	1,340	1,425
<i>Energy (from EIA)</i>			
Per Capita Total Energy (mmBtu)	316	332	344
Per Capita Transportation Energy (mmBtu)	89	83	88
Per Capita All Other Energy (mmBtu)	227	249	256

Source: Mid-Ohio Energy Stress Test, John A. Laitner, Economic and Human Dimensions Research Associates