Rickenbacker
Study Area

Energy Analysis & Recommendations

June 2018

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Disclaimer

The analysis contained within this document has been conducted by MORPC and is consistent with the methodologies used to attribute energy consumption and expenditures in the Franklin County Energy Study (2018) (http://www.morpc.org/wordpress/wp-content/uploads/2018/06/2018-Franklin-County-Energy-Study.pdf) and the analysis that was provided to Smart Columbus for their Performance Evaluation Plan. Values are rounded to the nearest unit. Questions regarding this document and the analysis may be emailed to Jon-Paul d'Aversa at jpdaversa@morpc.org.

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EXISTING RESOURCES

INFRASTRUCTURE

The Rickenbacker Study Area (RSA) has sufficient energy capacity for current uses with room for expansion as energy needs grow.

- 18 substations (multiple sizes)
- Multiple transmission lines
- Buckeye Pipeline (Hydrocarbon gas liquids)
- Marathon Pipeline (Petroleum products)
- Dominion Pipeline (Natural gas)
- Columbia Gas of Ohio (Natural gas)

PRODUCTION

The RSA is not currently producing a significant amount of natural gas, petroleum products, or electricity.

Installed Solar Generating Capacity

Currently, there is 429 kW of solar generating capacity in the Rickenbacker Study Area representing 0.3% of all solar capacity in the State of Ohio. Over half of the installed solar capacity is residential rooftop-mounted.

2017 Solar Capacity (kW)	Residential	Commercial	Grand Total
43103	23	0	23
43110	35	18	54
43123	109	146	255
43125	6	0	6
43146	91	0	91
Grand Total	265	164	429

Solar Generating Potential

The area holds the potential to generate over 400 watthours per square foot of solar panel per day, which is typical for most areas in the State.

ALTERNATIVE FUEL

In early 2018, the majority of Interstate 71 and all of I-270 were designated by the Federal Highway Administration as Alternative Fuel Corridors, having fit the requirements for fueling station signage for both electric vehicles and compressed natural gas. I-70 from Columbus to Indiana is also signage-ready for compressed natural gas. This designation allows for strategic funding opportunities to develop more alternative fuel stations and the signage necessary to alert drivers to their proximity to

the highway. There are fourteen publicly available alternative fuel stations located in the Rickenbacker Study Area.

Stations within the Rickenbacker Study Area

Fuel Type	Station Name	Street Address	City
CNG	Quasar	2506 Jackson Pike	Columbus
	IGS CNG Services - Duchess BP	3909 Alum Creek Dr	Obetz
E85	Kroger Fuel Center #815	3637 S High St	Columbus
	Kroger Fuel Center #842	5965 Hoover Rd	Grove City
	Meijer Gas #246	7685 Kings Crossing	Canal Winchester
	Meijer Gas #234	2859 London-Groveport Rd	Grove City
	Speedway #1204	6399 Refugee Rd	Canal Winchester
	Thorntons #500	3898 Alum Creek Dr	Columbus
Electric	Ricart Nissan	4255 S Hamilton Rd	Groveport
	Ricart Ford	4255 S Hamilton Rd	Columbus
	Derby Square Shopping Center - Tesla	2221 Stringtown Rd	Grove City
	Best Western Executive Inn - Tesla	4026 Jackpot Rd	Grove City
	City of Grove City - Public Parking	4069 1st St	Grove City
	Grove City Police Department	3360 Park St	Grove City

Regulations/Programs

Property Assessed Clean Energy (PACE)

PACE is a financing method for efficiency improvements and renewable energy that has been adopted in many municipalities across the nation. In Franklin County, property owners may finance qualifying measures through future property tax payments. PACE's low-cost long-term financing options alleviate issues that hinder the adoption of advanced energy solutions, such as up-front costs and the ability to secure loans through traditional financing methods.

Utility Incentive Programs

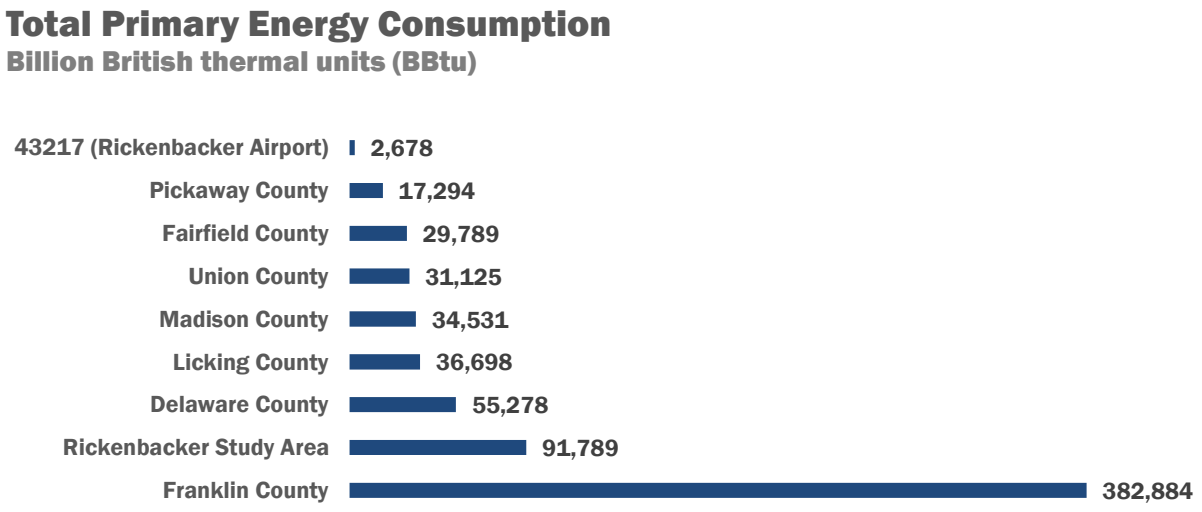
There are three main utilities in the Rickenbacker Study Area: AEP Ohio, Columbia Gas of Ohio, and South Central Power. All three offer incentive programs to assist residents and businesses with their energy consumption.

Program Category	AEP Ohio	Columbia Gas of Ohio	South Central Power
Advanced Metering	✓		✓
Appliance Incentives	✓	✓	✓
Audit	✓	✓	✓
Demand Response	✓	n/a	✓
Low-Income/Senior Assistance	✓	✓	
Industry Specific Incentives	✓	✓	✓

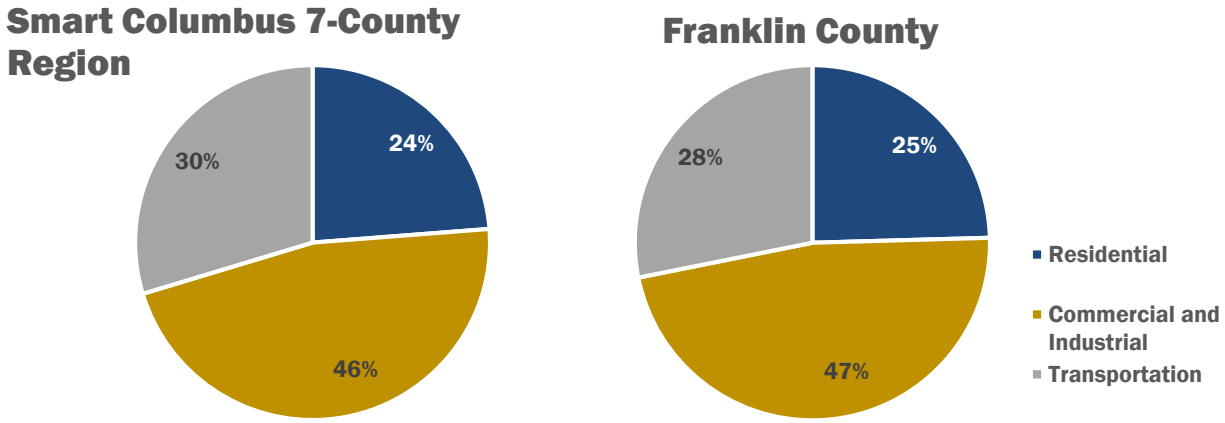
ENERGY BASELINE DEVELOPMENT

TOTAL PRIMARY ENERGY CONSUMPTION

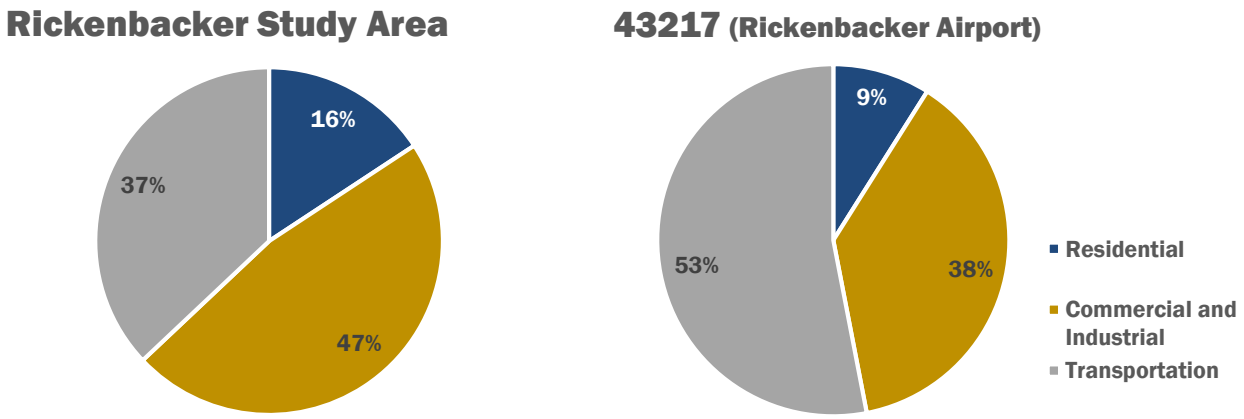
The Rickenbacker Study Area (RSA) accounts for 16% of the energy consumed in the Smart Columbus 7-County Region (Delaware, Fairfield, Franklin, Licking, Madison, Pickaway and Union) and 24% of energy consumed within Franklin County. This is primarily due to the large portion of commercial and industrial activity that occurs in the RSA. Operations within ZIP Code 43217 (Rickenbacker Airport) represent only 3% of the energy consumed within the RSA. Energy expenditures totaled $1.02 billion dollars in 2015.

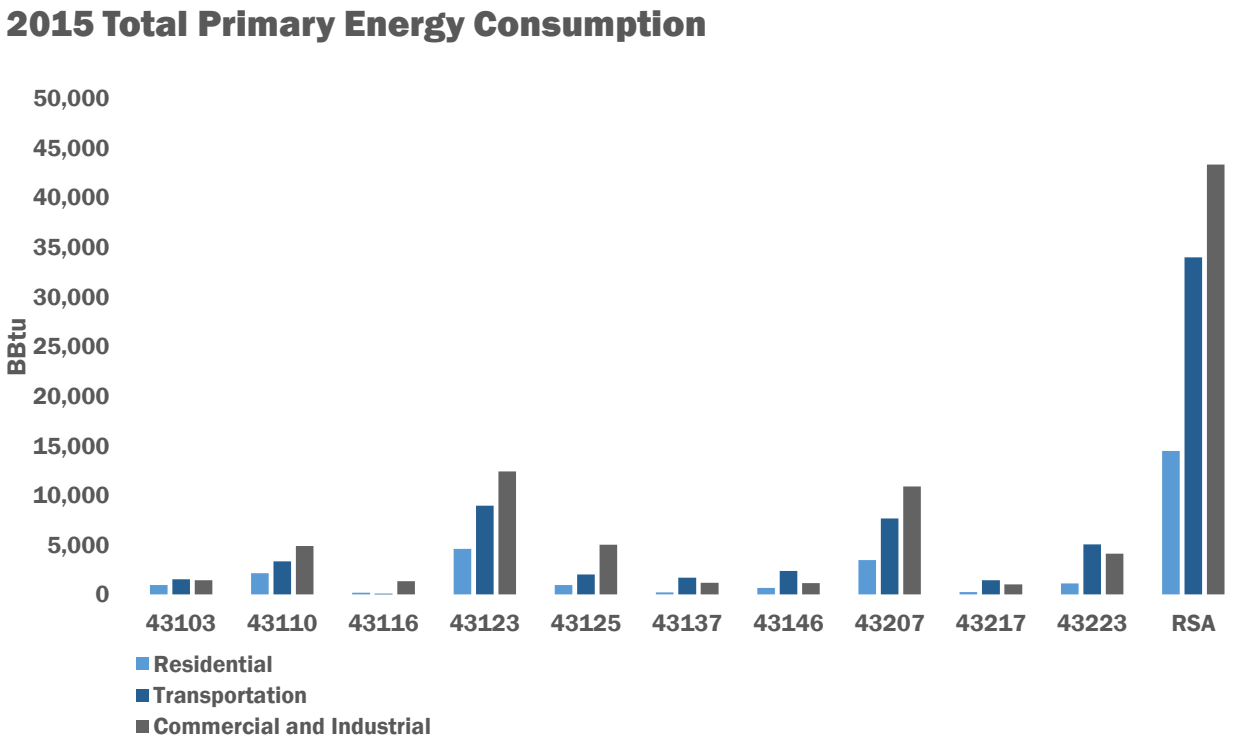


How energy is being used within the RSA is a direct reflection of sectoral activity within the region. When considering primary energy (which includes losses occurring during the generation, transmission and distribution of electricity), Franklin County consumes energy between sectors (residential, commercial, industrial and transportation) in a profile similar to that of the Smart Columbus 7-County Region.



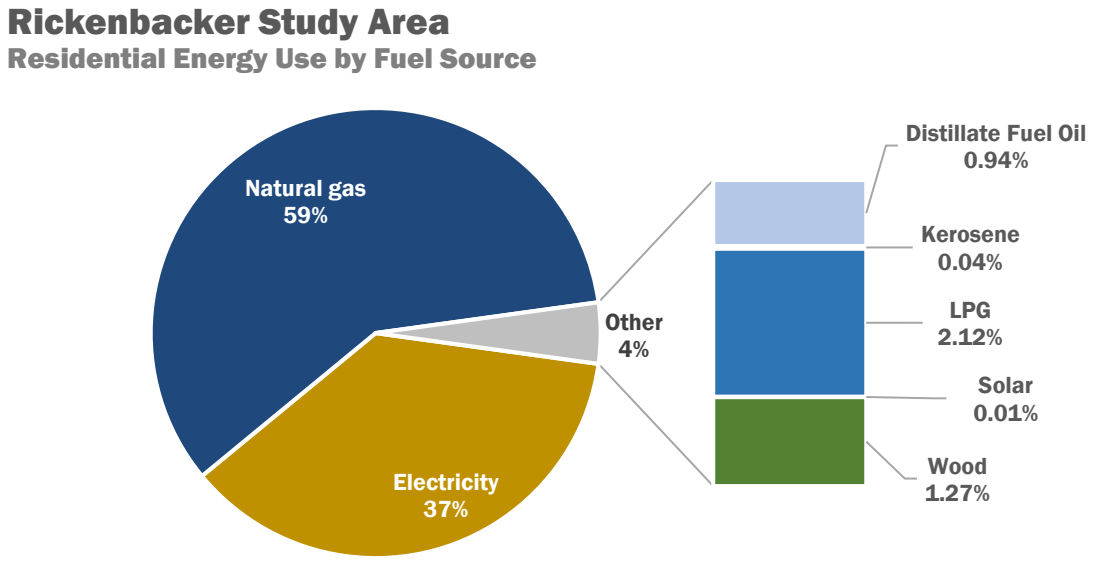
Within the RSA, 47% of energy is consumed by the commercial and industrial sectors. Transportation accounts for 37% of energy use while the residential sector accounts for the remaining 16%. Within the 43217 ZIP Code, the largest consumer of energy is the transportation sector that accounts for 53% of all energy use. This can be attributed to the industries specific to this ZIP Code.



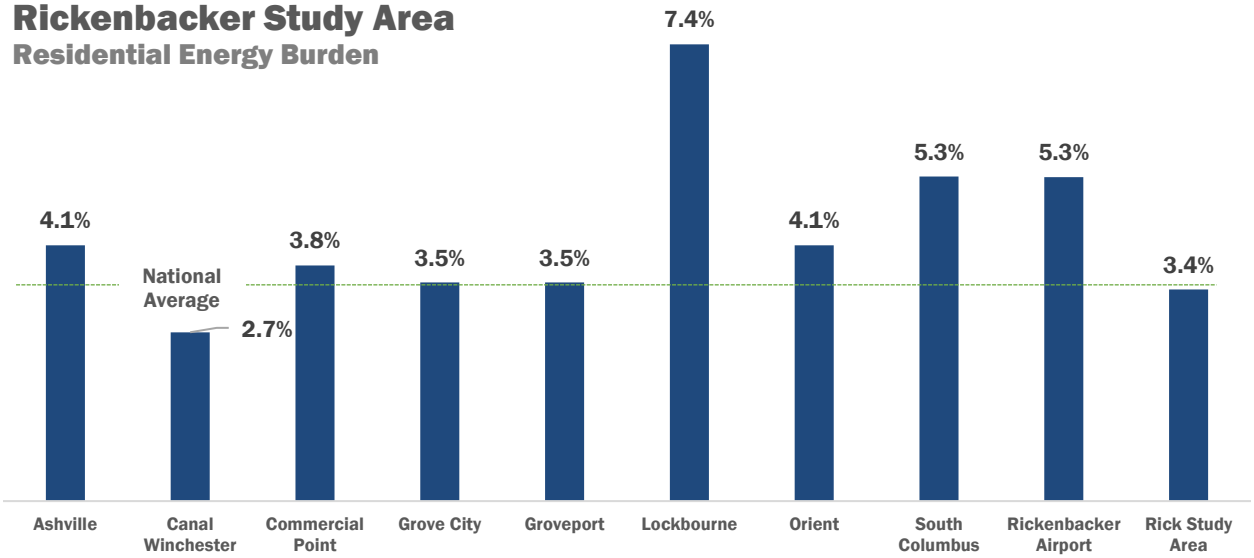


Residential Sector

The majority of residents live within the 43123 and 43207 ZIP Codes. Correspondingly, these areas make up the majority of residential energy consumption. The primary source of energy is natural gas (62%) and electricity (34%). Propane, wood, oil, kerosene and solar make up just over 4% of home energy fuels.



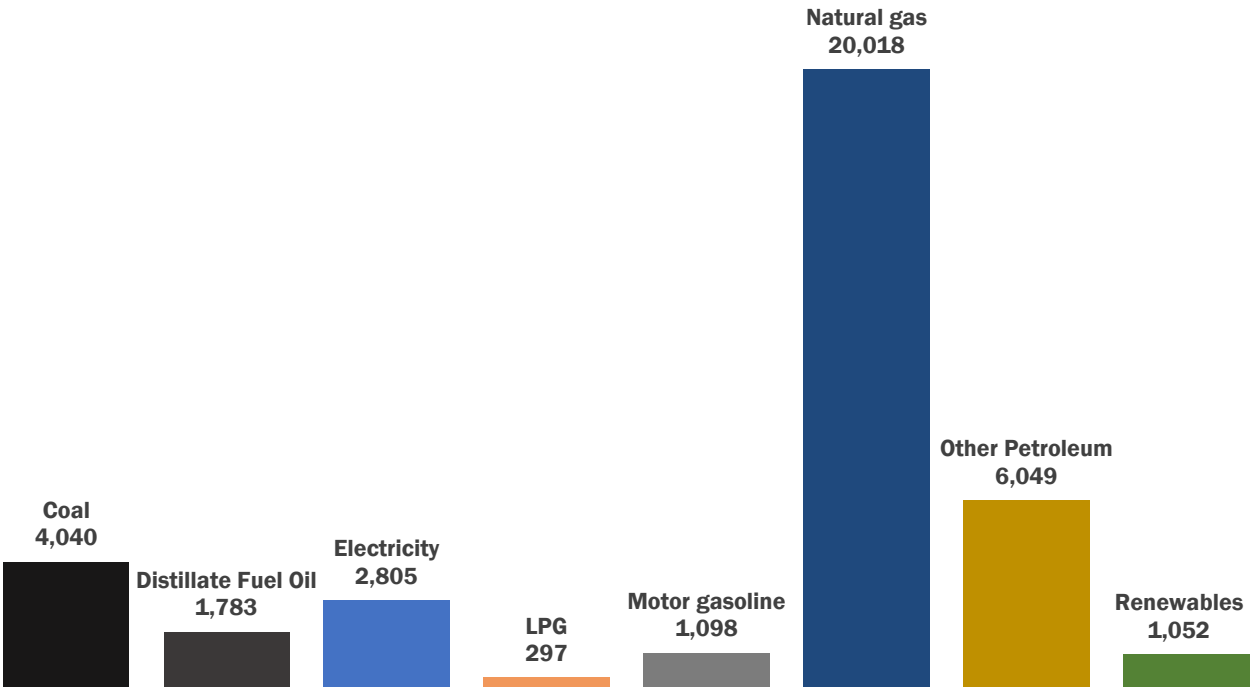
The average residential energy burden in the United States hovers around 3.5%. Above 6% is considered unaffordable, and above 10% is considered energy poverty. Within the RSA, only Lockbourne has an energy burden over 6%, although the South Columbus portion of the Study Area is at 5.3% and the Rickenbacker Airport Area is also at 5.3%. $161 million was spent on energy for the residential sector in the RSA. As a comparison, Franklin County has an average energy burden of 4%.



COMMERCIAL & INDUSTRIAL SECTORS

Since commercial and industrial customers are defined differently by the utilities and by NAICS Codes, the commercial and industrial sectors were combined in order to avoid inaccuracies. In both the commercial and industrial sectors, natural gas accounts for the majority of energy consumption (46%). In both sectors, electricity and losses account for 20% of energy consumption with the RSA. Coal accounts for 9% of energy consumption in the industrial sector (coal is not typical consumed in the commercial sector). Commercial and industrial activities spent $323 million dollars on energy in 2015.

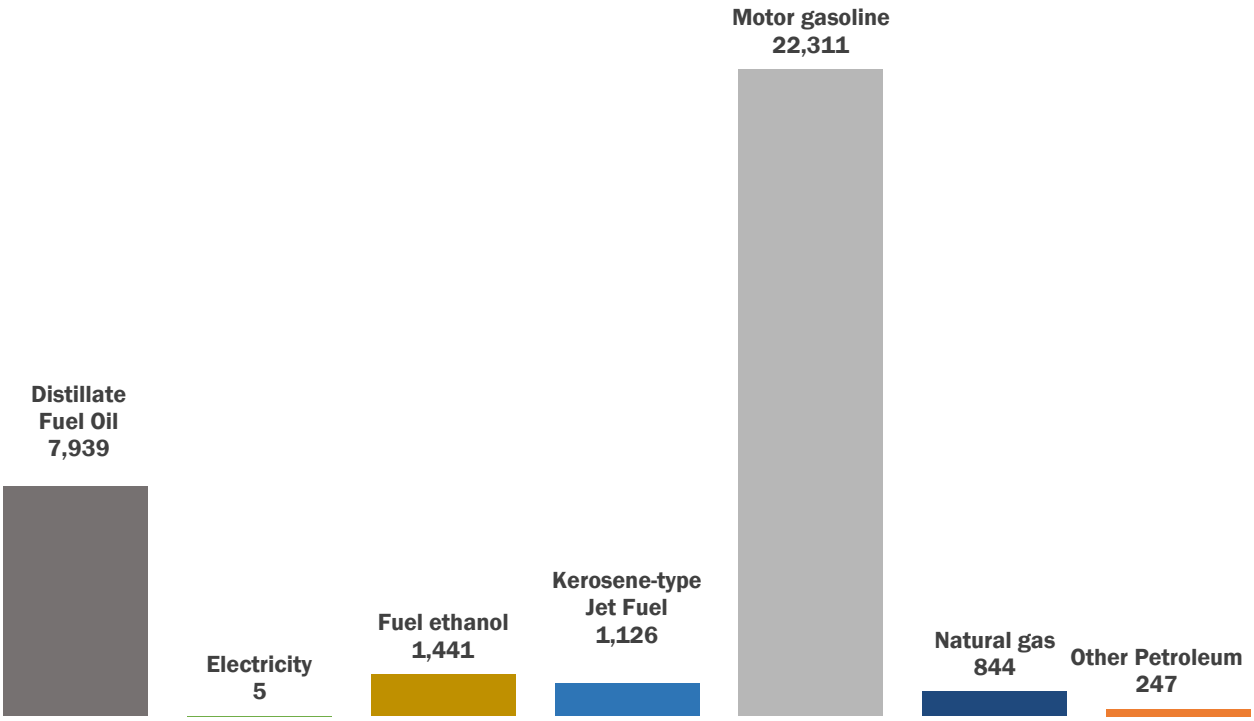
Rickenbacker Study Area
Commercial and Industrial End-Use Energy Consumption by Fuel in BBtu



TRANSPORTATION

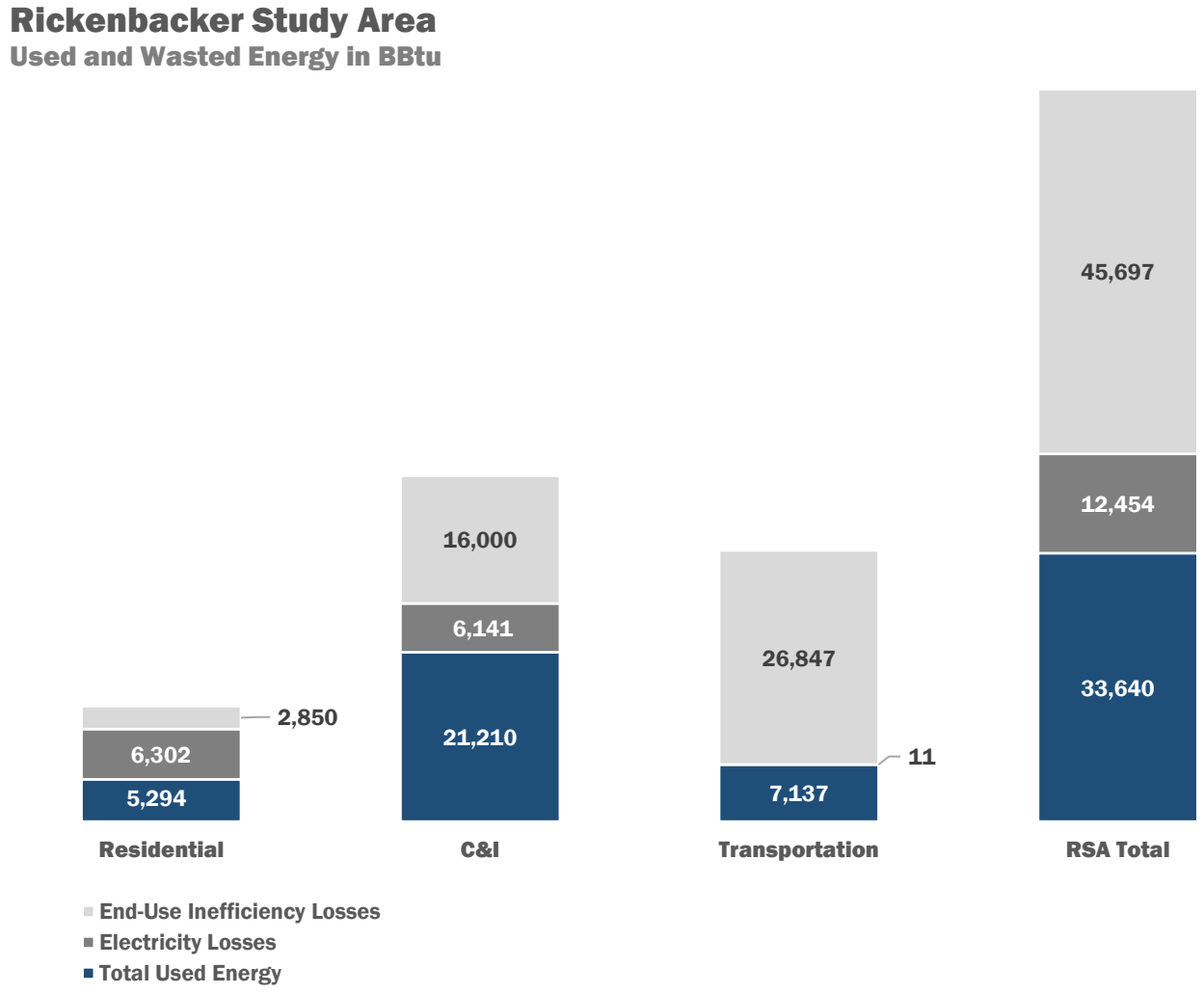
Gasoline accounted for 70% of energy consumption in the transportation sector (inclusive of ethanol), followed by diesel fuel (23%). Both kerosene-type jet fuel and natural gas play a significant role in the transportation sector (3% and 2%, respectively). In 2015, $567 million was spent on energy in the transportation sector.

Rickenbacker Study Area
Transportation End-Use Energy Consumption by Fuel in BBtu

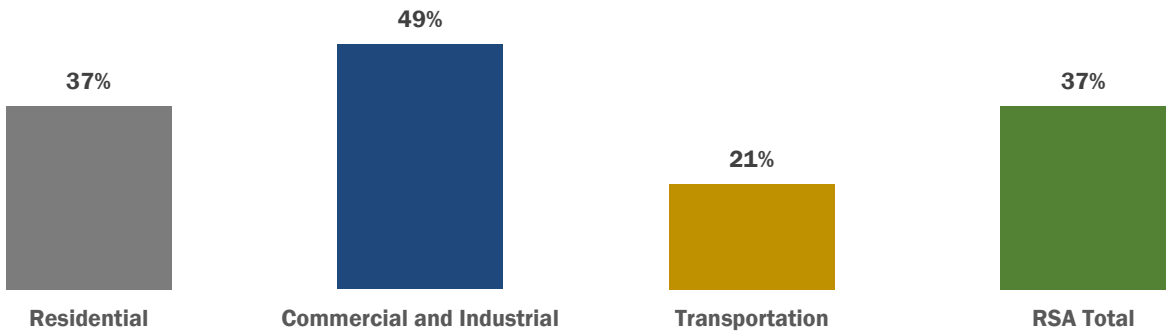


WASTED ENERGY

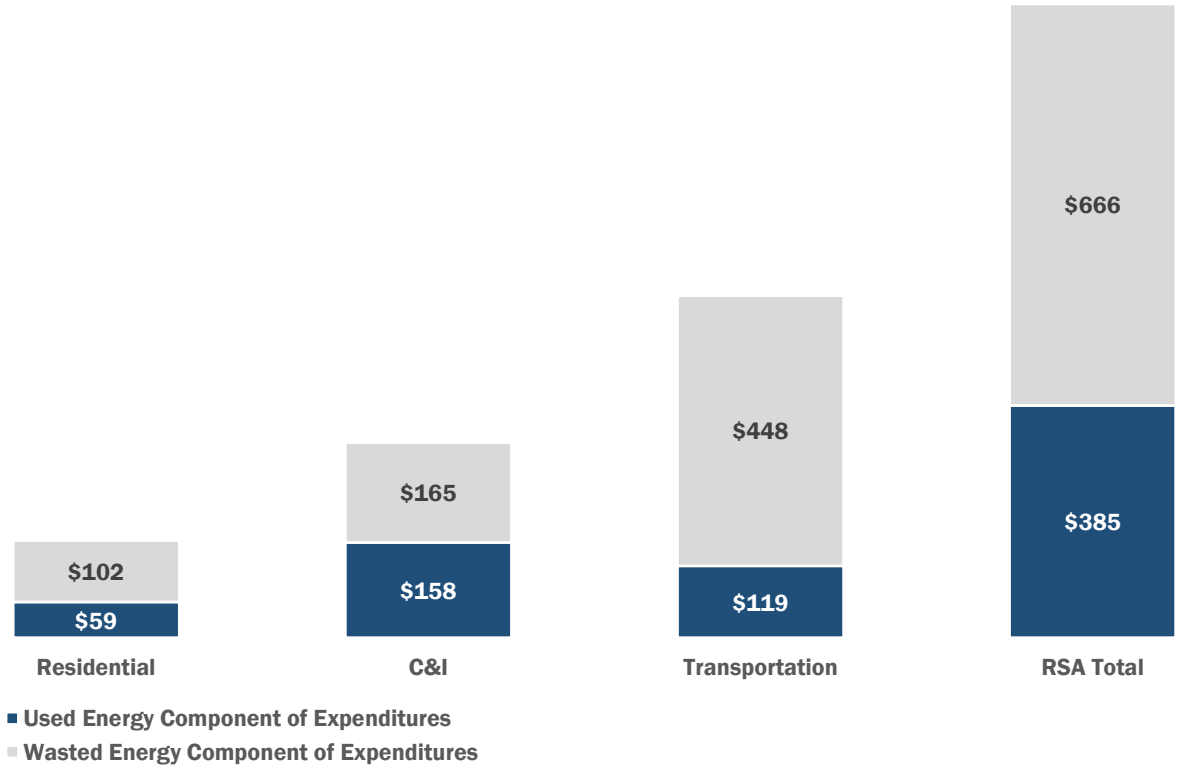
Energy losses occur both before the meter (at generation and through transmission and distribution), and after the meter (inefficient heating, lighting, appliances, and vehicles). Electricity losses represented 41% of total energy used in the residential sector, 47% in the commercial sector, 29% in the industrial sector, and less than 1% in the transportation sector (due to minimal electricity being used for transportation, and also accounting for this use which typically occurs in the residential sector totals, eg. home charging). End-use inefficiencies accounted for 21% of total energy used in the residential sector, 19% in the commercial sector, 36% in the industrial sector, and 79% in the transportation sector. The exceptional amount of wasted energy in the transportation sector is due exclusively to the reliance on the internal combustion engine.



Rickenbacker Study Area
Sector Efficiencies

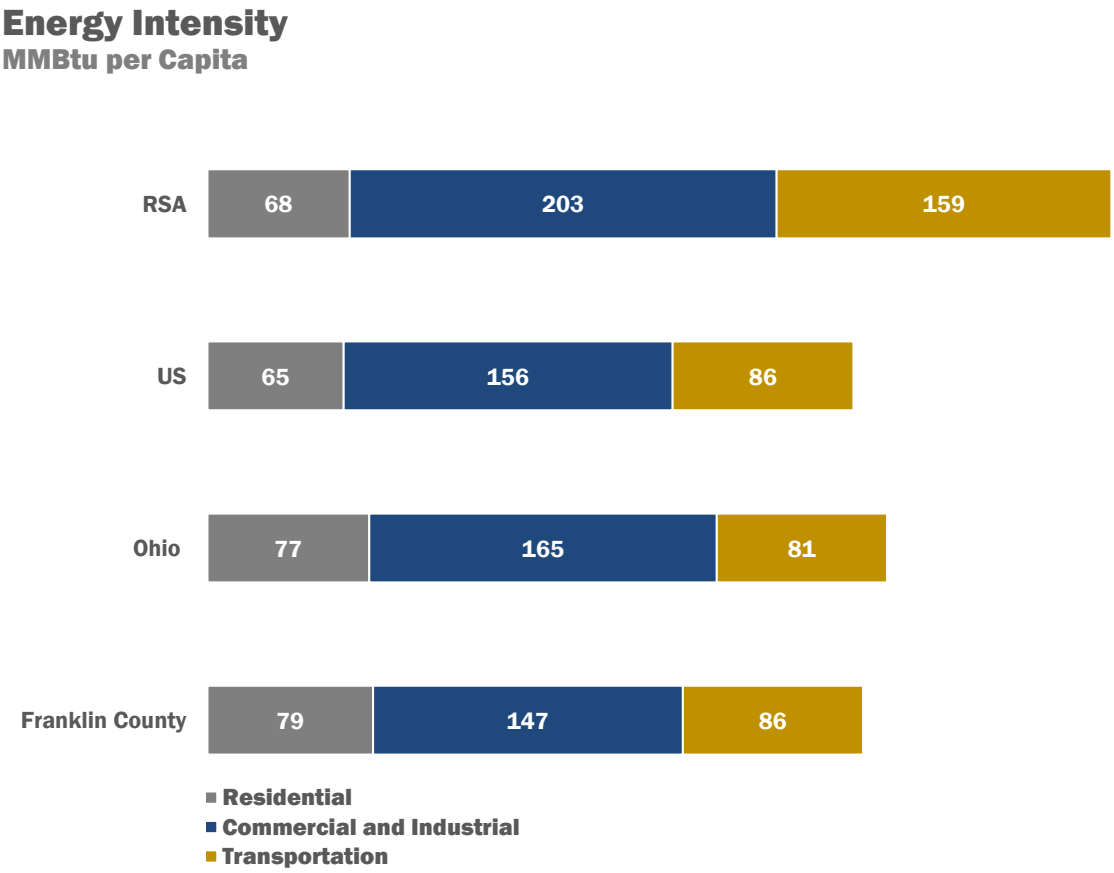


Rickenbacker Study Area
Energy Expenditures in Million 2015$



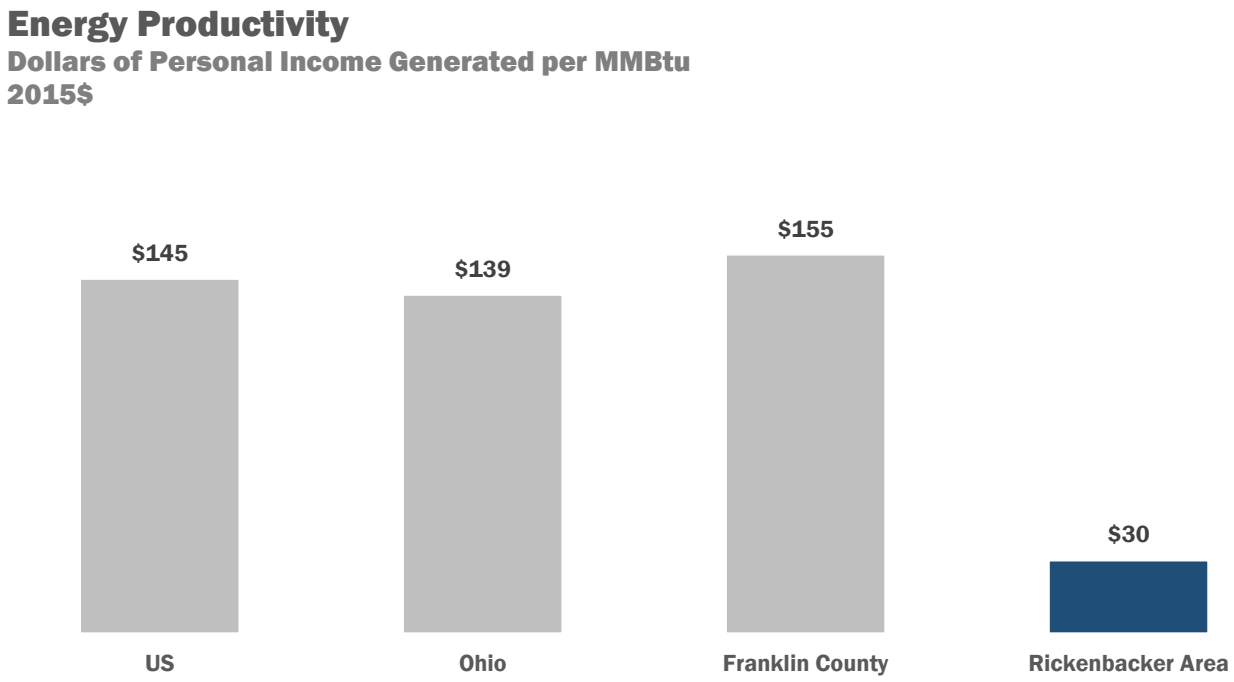
Energy Intensity

Energy Intensity (EI) is typically a measure of the efficiency of an area, but to compare EIs, it is essential that each area have similar economic profiles. The Rickenbacker Study Area is one that is primarily composed of industrial and transportation activities. These activities, such as shipping and warehousing, are the energy intensive aspects of commercial operations that are occurring outside of the RSA. In addition, the RSA has proportionally fewer residents than other areas. The EI metric should be understood within this context. The EI metric is still useful in order to develop efficiency programs geared towards specific industries at specific economies of scale.



ENERGY PRODUCTIVITY

Similar to Energy Intensity, Energy Productivity is a metric of the efficiency of energy in an area to create economic activity (represented by personal income). Again, however, the RSA is comprised of energy-intensive industries that are essential to the economies of other parts of the state and country. Additionally, as warehousing and transportation activities are support services, much of the value-added from these activities may be being recorded at other points of industry (e.g. regional offices, headquarters, wholesaler, retailer). This metric can be used to guide the overall portfolio of economic activity in the RSA.



Data Tables

Residential Consumption

Energy Consumption (BBtu)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	0	0	0
Asphalt and road oil	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	8	19	0	23	5	3	11	8	0	0	77
Electricity	208	392	32	949	210	59	193	595	25	323	2,987
Electricity Losses	434	756	99	1,905	370	95	269	1452	139	784	6,302
Fuel ethanol, excluding denaturant	0	0	0	0	0	0	0	0	0	0	0
Geothermal	2	7	0	13	3	0	2	10	0	0	38
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	1	0	1	0	0	0	0	0	0	3
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	0	0	0
LPG	33	20	1	42	16	14	34	10	1	0	172
Lubricants	0	0	0	0	0	0	0	0	0	0	0
Motor gasoline	0	0	0	0	0	0	0	0	0	0	0
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	0	0	0	0	0	0	0	0	0	0	0
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	235	923	40	1,635	348	14	114	1,380	75	0	4,764
Other petroleum products	0	0	0	0	0	0	0	0	0	0	0
Petroleum Coke	0	0	0	0	0	0	0	0	0	0	0
Residual Fuel Oil	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0
Special Napthas	0	0	0	0	0	0	0	0	0	0	0
Still Gas	0	0	0	0	0	0	0	0	0	0	0
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	21	13	0	30	6	1	19	12	1	0	103
Waste	0	0	0	0	0	0	0	0	0	0	0
Waxes	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0
Total	**942**	**2,132**	**172**	**4,599**	**958**	**187**	**641**	**3,468**	**240**	**1,107**	**14,446**

Residential Expenditures

Expenditures (Million 2015$)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	0	0	0
Asphalt and road oil	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	0	0	0	0	0	0	0	0	0	0	1
Electricity	8	15	1	36	8	2	7	22	1	12	112
Electricity Losses	0	0	0	0	0	0	0	0	0	0	0
Fuel ethanol, excluding denaturant	0	0	0	0	0	0	0	0	0	0	0
Geothermal	0	0	0	0	0	0	0	0	0	0	0
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	0	0	0	0	0	0	0	0	0	0
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	0	0	0
LPG	1	1	0	1	0	0	1	0	0	0	4
Lubricants	0	0	0	0	0	0	0	0	0	0	0
Motor gasoline	0	0	0	0	0	0	0	0	0	0	0
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	0	0	0	0	0	0	0	0	0	0	0
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	2	8	0	15	3	0	1	12	1	0	42
Other petroleum products	0	0	0	0	0	0	0	0	0	0	0
Petroleum Coke	0	0	0	0	0	0	0	0	0	0	0
Residual Fuel Oil	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0
Special Napthas	0	0	0	0	0	0	0	0	0	0	0
Still Gas	0	0	0	0	0	0	0	0	0	0	0
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	1
Waste	0	0	0	0	0	0	0	0	0	0	0
Waxes	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0
Total	**11**	**24**	**2**	**52**	**12**	**3**	**9**	**35**	**2**	**12**	**161**

Commercial and Industrial Consumption

Energy Consumption (BBtu)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	0	0	0
Asphalt and road oil	34	110	61	289	120	30	42	283	14	106	1,089
Coal	127	414	221	1,080	441	111	154	1,045	50	396	4,040
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	58	209	64	526	180	48	57	434	22	185	1,783
Electricity	102	303	10	763	549	89	20	720	89	161	2,805
Electricity Losses	213	583	33	1,531	964	143	28	1,757	501	389	6,141
Fuel ethanol, excluding denaturant	2	9	1	22	6	2	1	14	1	7	65
Geothermal	2	7	0	17	4	1	1	11	1	6	50
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	0	0	1	0	0	0	1	0	0	3
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	0	0	0
LPG	10	37	8	92	29	8	8	70	4	32	297
Lubricants	12	38	21	100	42	10	15	98	5	37	379
Motor gasoline	37	148	15	361	100	29	26	247	14	121	1,098
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	3	11	6	28	11	3	4	27	1	10	104
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	653	2,450	586	6,116	1,964	532	588	4,761	248	2,119	20,018
Other petroleum products	59	191	106	499	207	52	73	489	24	184	1,882
Petroleum Coke	22	72	40	188	78	20	27	184	9	69	709
Residual Fuel Oil	3	8	5	21	9	2	3	21	1	8	81
Solar	0	1	0	3	1	0	0	2	0	1	9
Special Napthas	12	40	22	104	43	11	15	102	5	38	391
Still Gas	43	141	78	368	153	38	54	361	17	136	1,390
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	21	74	27	189	68	18	22	163	8	67	657
Waste	10	34	17	88	35	9	12	84	4	32	326
Waxes	1	2	1	6	3	1	1	6	0	2	23
Wind	0	1	1	3	1	0	0	2	0	1	10
Total	**1,424**	**4,882**	**1,324**	**12,396**	**5,009**	**1,156**	**1,152**	**10,884**	**1,017**	**4,107**	**43,350**

Commercial and Industrial Expenditures

Expenditures (Million 2015$)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	0	0	0
Asphalt and road oil	0	1	1	4	1	0	1	4	0	1	13
Coal	1	2	1	4	2	0	1	4	0	2	17
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	1	3	1	7	3	1	1	6	0	3	25
Electricity	3	8	0	19	14	2	0	18	2	4	70
Electricity Losses	0	0	0	0	0	0	0	0	0	0	0
Fuel ethanol, excluding denaturant	0	0	0	0	0	0	0	0	0	0	0
Geothermal	0	0	0	0	0	0	0	0	0	0	0
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	0	0	0	0	0	0	0	0	0	0
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	0	0	0
LPG	0	1	0	2	1	0	0	1	0	1	5
Lubricants	0	1	1	3	1	0	0	3	0	1	13
Motor gasoline	1	3	0	7	2	1	1	5	0	2	22
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	0	0	0	0	0	0	0	0	0	0	1
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	4	13	3	34	11	3	3	26	1	12	110
Other petroleum products	0	1	1	4	2	0	1	4	0	1	15
Petroleum Coke	0	0	0	0	0	0	0	0	0	0	0
Residual Fuel Oil	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0
Special Napthas	0	0	0	1	0	0	0	1	0	0	4
Still Gas	1	2	1	6	3	1	1	6	0	2	23
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	1	0	0	0	1	0	0	3
Waste	0	0	0	0	0	0	0	0	0	0	2
Waxes	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0
Total	**11**	**37**	**10**	**93**	**40**	**9**	**9**	**80**	**5**	**30**	**323**

Transportation Consumption

Energy Consumption (BBtu)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	5	0	5
Asphalt and road oil	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	296	492	7	2,221	359	396	870	1,898	128	1,272	7,939
Electricity	0	1	0	1	0	0	0	1	0	1	5
Electricity Losses	1	1	0	3	1	1	1	2	0	2	11
Fuel ethanol	70	164	3	388	95	74	86	332	9	218	1,441
Geothermal	0	0	0	0	0	0	0	0	0	0	0
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	0	0	0	0	0	0	0	0	0	0
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	1,126	0	1,126
LPG	3	8	0	19	5	4	4	16	0	11	70
Lubricants	9	15	0	68	11	12	26	58	2	39	240
Motor gasoline	1,091	2,541	49	6,007	1,473	1,153	1,337	5,140	144	3,376	22,311
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	0	0	0	0	0	0	0	0	0	0	0
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	42	102	2	226	58	44	45	193	5	127	844
Other petroleum products	0	0	0	0	0	0	0	0	0	0	0
Petroleum Coke	0	0	0	0	0	0	0	0	0	0	0
Residual Fuel Oil	0	0	0	0	0	0	0	0	0	0	1
Solar	0	0	0	0	0	0	0	0	0	0	0
Special Napthas	0	0	0	0	0	0	0	0	0	0	0
Still Gas	0	0	0	0	0	0	0	0	0	0	0
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0
Waste	0	0	0	0	0	0	0	0	0	0	0
Waxes	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0
Total	**1,513**	**3,324**	**62**	**8,933**	**2,001**	**1,684**	**2,370**	**7,641**	**1,421**	**5,045**	**33,994**

TRANSPORTATION EXPENDITURES

Expenditures (Million 2015$)	43103	43110	43116	43123	43125	43137	43146	43207	43217	43223	RSA
Aviation gasoline	0	0	0	0	0	0	0	0	0	0	0
Asphalt and road oil	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0
Crude Oil	0	0	0	0	0	0	0	0	0	0	0
Distillate Fuel Oil	6	7	0	30	5	5	12	25	2	17	106
Electricity	0	0	0	0	0	0	0	0	0	0	0
Electricity Losses	0	0	0	0	0	0	0	0	0	0	0
Fuel ethanol, excluding denaturant	0	0	0	0	0	0	0	0	0	0	0
Geothermal	0	0	0	0	0	0	0	0	0	0	0
Hydropower	0	0	0	0	0	0	0	0	0	0	0
Kerosene	0	0	0	0	0	0	0	0	0	0	0
Kerosene-type Jet Fuel	0	0	0	0	0	0	0	0	13	0	13
LPG	0	0	0	0	0	0	0	0	0	0	1
Lubricants	1	0	0	0	0	0	0	0	0	0	0
Motor gasoline	22	50	1	119	29	23	26	102	3	67	441
Motor gasoline blending components	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous petroleum products	0	0	0	0	0	0	0	0	0	0	0
Natural gasoline	0	0	0	0	0	0	0	0	0	0	0
Natural gas	1	1	0	1	0	0	0	1	0	1	5
Other petroleum products	0	0	0	0	0	0	0	0	0	0	0
Petroleum Coke	0	0	0	0	0	0	0	0	0	0	0
Residual Fuel Oil	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0
Special Napthas	0	0	0	0	0	0	0	0	0	0	0
Still Gas	0	0	0	0	0	0	0	0	0	0	0
Unfinished Oils	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0
Waste	0	0	0	0	0	0	0	0	0	0	0
Waxes	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0
Total	**29**	**58**	**1**	**150**	**34**	**28**	**38**	**129**	**18**	**85**	**567**


morpc
Mid-Ohio Regional
Planning Commission