

KFTC Electricity Energy Burden Analysis Tech Doc

Purpose: The purpose of this document is to provide detailed context of and methodology for the KFTC Electricity Energy Burden Analysis, conducted in Summer 2018. Any questions about the analysis and its processes can be directed to lauragreenfield@kftc.org.

The final map produced from this analysis is available for public view at www.kftc.org/energy-democracy/power-maps and in web map form at <https://kftc.github.io/utility/>.

What is an Electricity Energy Burden Analysis?

We are working for a day when all Kentuckians have access to affordable and efficient energy. A common way to measure energy affordability is to conduct an Energy Burden analysis which measures the percent of a household's yearly income spent on energy, including electricity, transportation, and heating of the home. This research is powerful. A 2016 report by the [American Council for an Efficient Economy](#) found that households with lower incomes tend to live in less energy efficient housing. Furthermore, Elevate Energy, an organization in Michigan, found that "energy burden disproportionately impacts low-income families with children, racial-ethnic minorities, and seniors" and that "most families with children experiencing energy burden live in poverty...and they are disproportionately African-American and/or renters" (read their report [here](#)).

This means that the folks who are already more likely to be struggling to pay the bills are vulnerable to even higher electricity costs. As property taxes, rents, mortgages, and electricity costs continue to rise, it's important to look at this issue in our state.

Last year, we conducted an analysis to start exploring energy affordability in Kentucky. Our study began by examining electric energy burden, meaning it focuses on electricity bills and excludes other energy costs like transportation and heating a home. It describes how large a

bite electricity bills take, on average, from an area's median annual household income in Kentucky.

Average electricity bills were calculated for each electric utility in Kentucky. The estimated customer bill is defined as the total residential revenue (reported by the electric utility in 2016) divided by the number of residential customers (also reported by the electric utility in 2016). Household income is defined as the average of median incomes reported on the census tract level for all the census tracts within an electric utility boundary.

Why this analysis is important:

Energy burden and, in this case, electricity energy burden, is related to a lot of different issues: housing affordability, poverty, and utility rates and structures, and availability of energy efficiency programs. These are issues that Kentuckians experience across our state.

Research shows that households that experience high energy burdens are more likely to accumulate utility debt, inadequately heat or cool the home, or use alternative heating sources such as electric space heaters, which can be potentially dangerous. Households with severe energy burden are forced to make tough decisions between paying for energy, rent, food, or medicine. These households are more likely to experience electricity shutoffs, material deprivation, and eviction. The long-term consequences of high energy burden include financial burden from utility debt, extreme stress, and increased risk of illness from alternative heating sources or inadequate heating/cooling of the home.

Looking at Kentucky, we want to use this analysis to deep deep into these questions:

- How do electricity energy costs and rates and average monthly electric bills vary across the state?
- Where are Kentuckians bearing a heavy burden of electricity bills?
- Are there certain utilities (cooperatives, municipals, or investor owned) that are better or worse in supporting energy affordability with their customers?

Methodology:

1. Data Collection

a. Calculate average yearly electric bill for customers of each Kentucky electric utility.

i. Download U.S. Energy Information Administration (EIA) [Form 861](#) which provides totals for each electric utility residential customer count and residential revenue for 2016. Each year, electric utilities report these totals, and more, to the EIA.

ii. Calculate average yearly electric bill per utility:

$$\text{Avg. yearly electric bill} = 2016 \text{ residential revenue} / 2016 \text{ residential customers}$$

b. Download 2016 household income data.

i. Via the [Census Bureau's American FactFinder](#), download 2016 annual median household income per Kentucky census tract

2. Geoprocessing

a. Join datasets

i. Create electric utilities map layer with electric bill data.

1. Download the KY electric providers shapefile, available via the Kentucky Geography Network [here](#). Static maps and more information about Public Service Commission GIS can be found [here](#).

2. Join utilities polygon shapefile to delimited file containing average yearly electric bill (calculated in Step 1)

ii. Create census tracts map layer with income data.

1. Download Kentucky census tracts shapefile available via [Tiger/Line](#).

2. Join tracts shapefile to delimited Census file containing annual median household income.

b. Assign each census tract in Kentucky to its electric utility based on spatial location.

- i. The shapefile download from Tiger Line will be census tracts as polygons. In a digital mapping software, convert these polygons to centroids.
- ii. Overlay KY Electric Providers map layer and census tract centroid layer
- iii. Each centroid falls within a utility's boundary. Assign each centroid to a utility.

NOTE: In cases where a census tract polygon was crossed by two or more utilities polygons, the tract was assigned to the utility its centroid fell into. This means that there are occasions where a tract is assigned to a utility (and avg. yearly bill, electricity burden, etc.) that may not be 100% accurate to its true utility.

- iv. Re-join centroids to census tract polygon layer. Each tract in the polygon layer will now:
 1. Be associated to an electric utility
 2. Contain a value for the estimated average yearly electric bill for that tract, based on its electric utility

3. Analysis

- a. For each census tract in Kentucky, calculate average yearly electric bill as percent of annual median household income. This percentage is the electricity energy burden for that tract, i.e. how big a bite electric bills take, on average, from households.

*Electricity energy burden = (average yearly electric bill / annual median income) * 100*

Notes about our analysis:

- This analysis is limited to averages. We are working with average consumption of electricity, average electric bill, and average household income.
- It's important to note that actual energy burden experienced by households will be higher than the percentage found in this analysis because energy burden represents more than just electricity bills. So, when we see areas of our state with high electricity energy burden, these are areas susceptible to higher overall energy burdens, as well.
- We also collected additional data for all electric utilities in Kentucky, including most recent energy charge, base fee, whether or not they offer an on-bill financing program, and more. This data enables us to look at each utility individually.

- 6% is a common benchmark to define “energy affordability.” i.e. energy is affordable when all household energy needs (electricity, gas, etc.) amount to less than 6% of total income. So, any electric energy burden close to 6% has already reached that threshold and, therefore, overall energy burden for those areas is unaffordable, as well.

Additional Resources:

- Union of Concerned Scientists blog post: [“The Energy Burden: How Bad is it and How to Make it Less Bad.”](#) Feb 26, 2019. *This article shares an analysis and map visualizing energy burden across the country and dives into why energy burden is complicated to look at and analyze. It also links to this incredibly interesting [National Renewable Energy Laboratory \(NREL\) web map which focuses on Solar Potential](#) in the United States and provides supplemental data, like health indicators, energy efficiency potential, and more available for download.*
- Union of Concerned Scientists blog post: [“How Affordable is Your Electricity? Comparing Electric Rates, Bills, and Burden.”](#) Oct 26, 2018. *This article does a great job explaining why we need to re-frame how we look at energy affordability: looking at the rates (how much energy costs per kWh) isn’t enough, we need to look at how households experience these rates differently, based on income and some other factors.*
- Study from the American Council for an Energy-Efficient Economy: [“The US Low-Income Energy Affordability Landscape: Alleviating High Energy Burden with Energy Efficiency in Low-Income Communities.”](#) *This research report provides a solid definition and analysis of energy burden which is great reference material and also walks through some strategies to increase low-income energy efficiency programs.*
- See more data-driven projects that support KFTC’s New Energy Transition and Energy Democracy work at <http://kftc.org/energ-democracy/power-maps>.