

Kansas Department of Transportation's Enterprise Energy and Carbon Accounting and Utility Usage Research Phase 1B: Embodied and Operational Energy and Carbon in Buildings and Vehicles

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District 1 Office. Photo by Larry Katsbulas.

Introduction

Many organizations have become concerned about the environmental impact of their facilities and operations. In order to lessen environmental impact, quantitative assessment of practice based on improvements from a baseline condition is needed. The Kansas Department of Transportation (KDOT) has determined that the establishment of a carbon footprint baseline for its building and vehicle fleets will aid in prioritizing limited renovation funds and purchasing decisions. The procedure for establishing the embodied and operational carbon footprint baseline for KDOT building utility use is documented. A methodology for estimating the energy and carbon emissions for building energy use with some unavailable data also was developed, and presented as tools (that are not attached to this report).

While the Kansas State University report (K-TRAN: KSU-11-1) highlights the numbers of carbon emissions for buildings, this report from KU highlights three points: (1) the energy and carbon performance of KDOT buildings are much compared to the rest of the country (using the Energy Information Administration or EIA database), except for those buildings where laboratories are located; (2) the embodied carbon consumed by KDOT can be reduced using the table that this project develops; and (3) the energy and carbon performance from KDOT vehicles are generally acceptable, but the research team sees opportunities to correct the current trend of reliance on diesel (due to regional climate).

Project Objective

The project will develop methods for KDOT to measure its carbon and energy baseline, develop carbon accounting capabilities, and solutions to reduce the agency's carbon emissions. These efforts are extensive and cannot be completed in the time given for this project; thus, it has been divided into three phases. The first phase aims to establish the carbon emission baseline for all KDOT assets. The carbon emission baseline will be developed from existing KDOT assets. The baseline will help KDOT establish the standards to document, measure, and track carbon emission reductions. The second phase will be to develop solutions for potential carbon emission reductions. The final phase will be to develop a complying carbon footprint accounting and reporting system.

Project Description

Data was collected from KDOT and its utility providers. KDOT supplied data on vehicle types, types of fuels used by vehicles, building blueprints, and campus blueprints. The utility companies supplied data for natural gas, electricity and water used by KDOT. The data is categorized according to the needs of KDOT. Energy use and carbon emissions will then be compared with comparable industry standards from the Energy Information Administration's Commercial Building Energy Consumption Survey (CBECS) database. CBECS is done every four years to gather information on the energy use of commercial buildings in the United States. The survey targets a large number of buildings to better understand the energy use based upon the day-to-day operations of buildings. There are 140 variables that determine the national averages of various building types. CBECS is a very useful way of comparing KDOT buildings with the rest of the buildings in the U.S. It highlights where KDOT stands compared with the rest of the buildings in the country and determine if KDOT needs to improve the efficiency of their buildings. The calculations and comparisons are made for both the direct and embodied energy and carbon emissions.

Project Results

The key findings are:

1. Embodied Carbon: The database use to calculate the total amount of embodied energy consumed by and carbon emitted by KDOT affect the calculated outputs. There is no way to draw conclusive evidence to benchmark KDOT embodied energy and carbon and compare them with the national average.
2. Operational Energy: Most buildings that KDOT operates consume significantly lesser than other similar buildings in the country, except for those that contain large amount of laboratory equipment. This suggests that KDOT footprint is significantly smaller than other states.
3. Vehicular Energy: The study shows that KDOT has increased its diesel consumption and reduced its bio-diesel consumption. This may reflect the potential problem of bio-diesel use in KDOT vehicles during the winter months.

Report Information

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