

Oak Ridge Climate Action Plan Progress Report

Purpose and Scope

The primary purpose of this report is to summarize progress made in meeting the greenhouse gas (GHG) reduction goals adopted by City Council in December 2010 in approving the *Climate Action Plan for the City of Oak Ridge* (CAP). Separate goals were set for the city government and the rest of the community.

If recent trends continue, Oak Ridge will meet both of the reduction goals set for 2015 in the CAP. By 2012, City GHG emissions were 6% below the 2004 baseline (See Figure 1 below, and Explanatory Note 1 at the end of this document). Community emissions for 2012 were 3% below the baseline year emissions.

The remainder of this report:

- Provides detail on City and community GHG emissions
- Highlights recent improvements in energy efficiency of municipal operations
- Describes City initiatives to encourage Oak Ridge residents and businesses to save energy and reduce GHG emissions
- Discusses the prospects for continued progress toward the CAP GHG reduction goals
- Offers recommendations for City tracking of progress toward CAP goals
- Identifies specific near-term opportunities to work toward achieving CAP goals

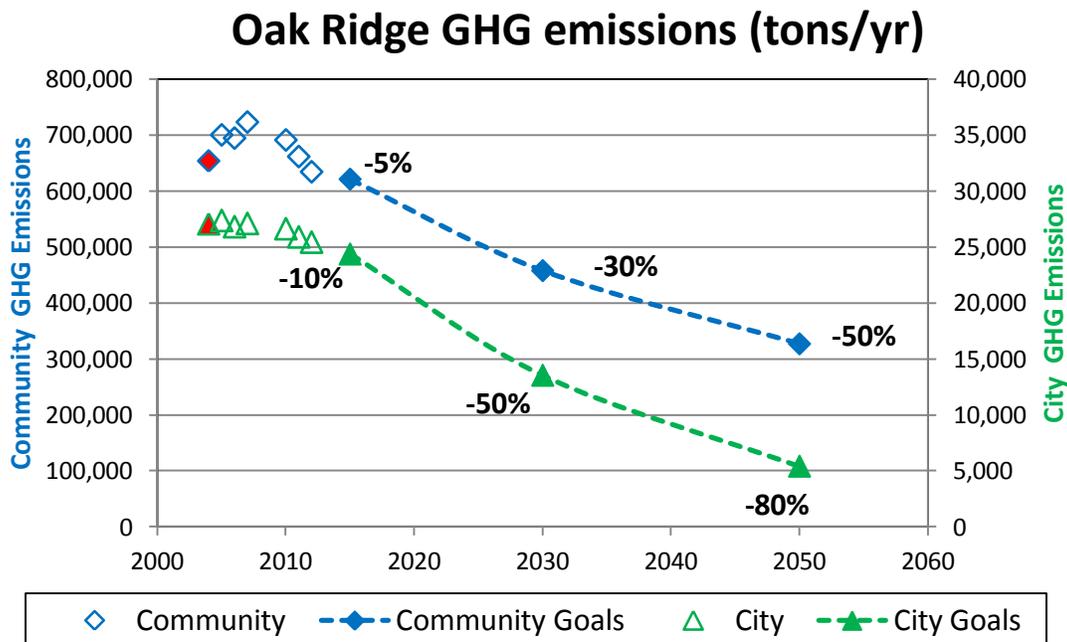


Figure 1. City and Community GHG emissions (tons/year, See note 3) and CAP goals for future reductions. Reduction goals are specified as a percentage relative to the 2004 baseline emissions (red symbols).

City Emissions

Total annual GHG emissions (note 2) for the City of Oak Ridge have decreased since the baseline year 2004 (Figure 2). On average, electricity consumption accounts for about 85% of total City emissions, while use of transportation fuels and natural gas account for 11% and 3% respectively.

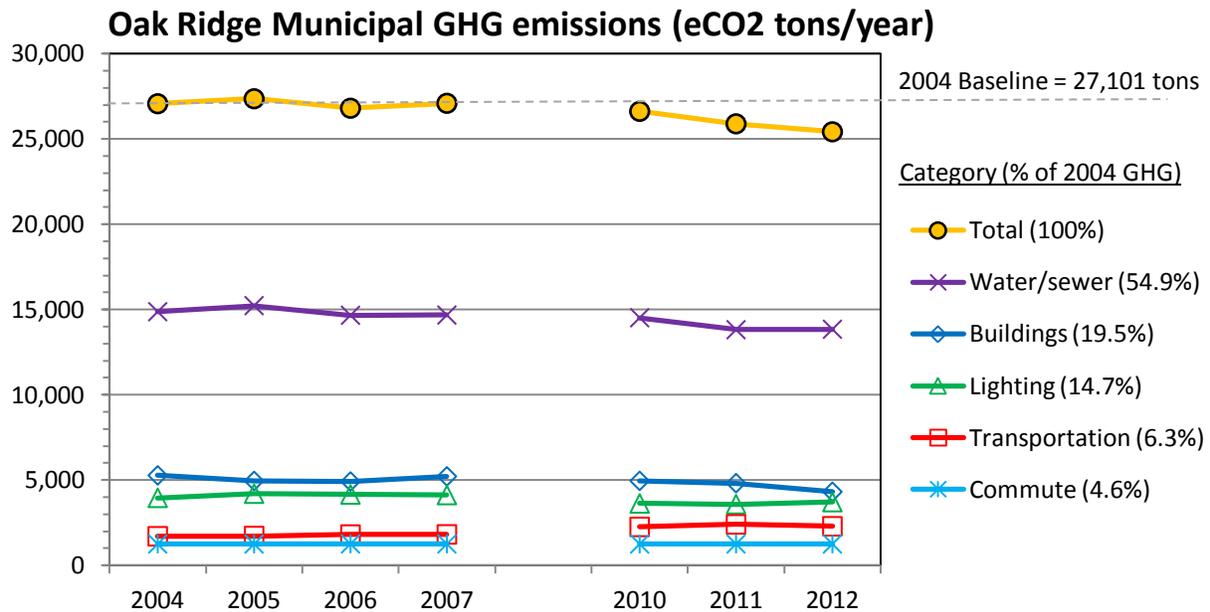


Figure 2. City GHG emissions by sector. (see note 3) Electric power for water and sewer systems is the biggest contributor of city GHG emissions.

Changes in City GHG emissions since 2004

- Total City GHG emissions for 2012 were 6% lower than for the 2004 baseline year.
- GHG emissions associated with pumping water and wastewater decreased by 7%
- GHG emissions associated with energy used in City buildings decreased 20%.
- GHG emissions associated with electricity for traffic signals decreased by about 60% as a result of transition to Light Emitting Diodes.
- GHG emissions associated with electricity for street lights increased by 12%
- GHG emissions associated with use of city vehicles increased by over 34%

Measures that are reducing City emissions

- Improvements to Municipal Buildings: Recent renovations such as installation of digital controls for heating and cooling systems at the Central Services Complex have been effective in reducing energy use. For the years 2010 through 2012, average electric power consumption at the Central Services Complex, Civic Center, Library, and Municipal Building combined was 22% less than the 2004 baseline. These four facilities account for around 85% of all electricity used in City buildings.

A current project to upgrade lighting at the Municipal Building, Civic Center, and Public Library will provide additional GHG reductions and cost savings. These upgrades will be funded in part by the Tennessee Clean Energy Grant Program.

- Traffic signals and street lights: Since the adoption of the CAP, the City has replaced 82% of the traffic lights with energy efficient light-emitting diodes (LED). This decreased power use for traffic signals by almost 60%.

In contrast, the number of City street lights has increased by 9% since 2004, and electric power for street lights accounts for over 14% of all municipal electric power use. There are plans for experimental use of high efficiency, dark-skies compliant LED street lighting in selected locations. If the test is successful and LED street lighting is adopted citywide, energy savings of 40-50% may be possible.

- Water and wastewater infrastructure: Water and wastewater operations account for roughly 65% of all municipal electricity consumption. Pumping water from Melton Hill Lake to the City water treatment plant accounts for almost 20% of total municipal electric use. For 2010-2012, GHG emissions due to using electricity in water and wastewater operations were 7% below 2004 levels. Electricity use for drinking water and wastewater pumping increased, probably because of new residential subdivisions, but large decreases in lake water pumping after 2010 resulted in an overall decrease in electric use and associated GHG emissions.

Replacement of older, inefficient pumps, motors, and control systems provides gains in energy efficiency and system reliability. Ongoing work to decrease stormwater inflows to the sanitary sewer collection system and to accelerate the replacement of wastewater pumping facilities will also save energy in the coming years. Similarly, a planned project to replace the raw water intake motors and booster pumps that serve the city water treatment facility will provide significant energy savings.

- Fuel efficiency of City vehicles: With funding assistance from a joint program of the US Department of Energy, Electric Power Research Institute, and Tennessee Valley Authority, the Electric Department is acquiring a plug-in hybrid bucket truck and a plug-in hybrid pickup truck that will help reduce City GHG emissions.
- Municipal recycling: Most City facilities now participate in the Oak Ridge single stream recycling program, thereby reducing the demand for energy to produce new products (e.g. aluminum cans and paper products) from virgin materials.

Community Emissions

Community GHG emissions were unusually low in the baseline year of 2004 (Figure 1, note 4), in part because of a relatively cool summer that year. Total emissions for 2012 were 3% below these 2004 baseline levels following a period of somewhat higher emissions (Figure 3). The recent downward trend in GHG emissions results from a combination of two factors: (1) decreasing electricity demand and (2) a decrease in the carbon intensity (GHG per kWh generated) of TVA power since 2010 (note 5). Meeting the CAP 5% reduction goal for 2015 will depend on both of these factors. Annual electricity use by the average Oak Ridge household has been decreasing by about 95 kWh per year (on average) over the last 11 years (2003-2013, note 6), and estimated community energy use for transportation (note 7) is down by about 7% since 2004.

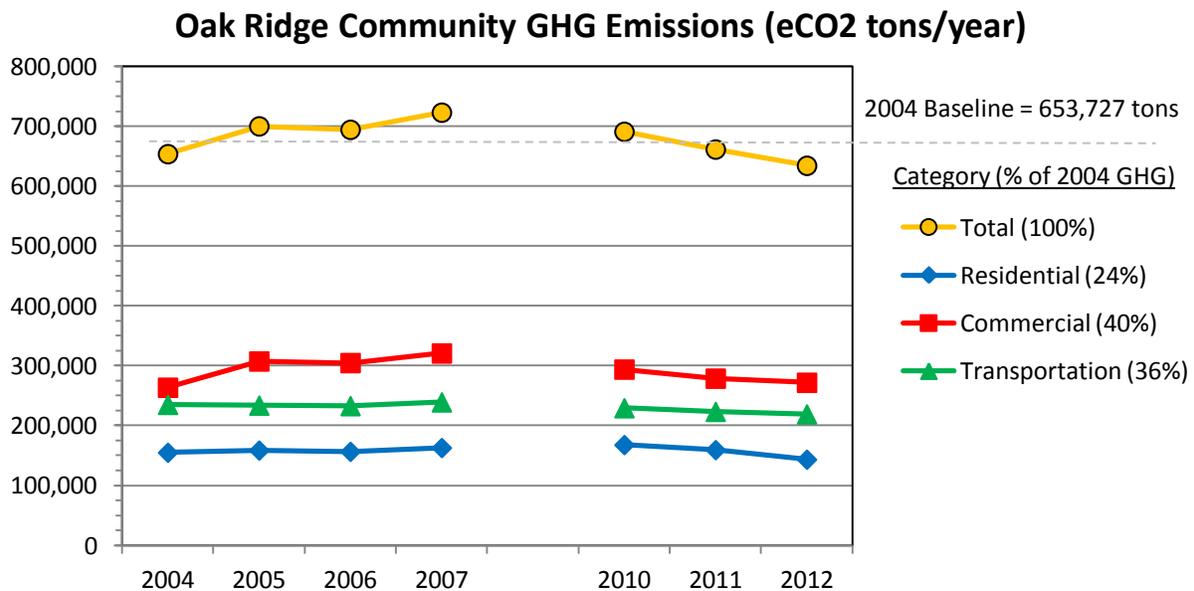


Figure 3. Community GHG emissions by sector (see note 3).

City actions that are reducing community emissions

City-supported programs/projects that are helping reduce community emissions include:

- **Bike and pedestrian enhancements**: The various transportation enhancement projects to improve bicycle and pedestrian safety that have been completed since 2011 encourage human-powered travel and reduce automobile emissions.
- **Economic development and community revitalization**: Efforts to make Oak Ridge a better place to shop and work also help reduce GHG emissions because they reduce residents' travel for shopping and commuting. Thus, City efforts that encourage new retail development and City support for preservation and redevelopment of the Alexander Inn and Jackson Square are contributing to meeting the goals of the CAP.
- **Recycling**: Curbside single-stream recycling for Oak Ridge households reduces the amount of waste we send to the landfill and can reduce GHG emissions by decreasing energy used to produce new products (e.g. aluminum cans and paper products) from virgin materials (note 8).

- Promotion of green power: The City Electric Department and TVA developed a direct-mail promotion of the TVA Green Power Switch program, which allows City utility customers to purchase electric power from renewable sources. Participation in this voluntary program has increased steadily since 2004, with residential purchases of Green Power increasing 25% by 2013 and commercial purchases increasing tenfold. Recently, the City has received a leadership award from the TVA for outstanding participation in the Green Power Switch program.
- Home energy efficiency: The home energy efficiency demonstration project that the City is conducting on Lansing Road in anticipation of the TVA Extreme Energy Makeover grant program will be a model for energy improvements in many Oak Ridge homes. The City's Extreme Energy Makeover grant proposal, if successful, will provide energy makeovers for targeted groups of less energy efficient homes in older Oak Ridge neighborhoods, thus reducing GHG emissions (and energy bills) for some residents and helping other property owners see how they can achieve similar results.
- DOE Electric Vehicle Project. The City took advantage of this DOE program and installed electric vehicle charging stations at 5 public locations around the city, reducing vehicle emissions by encouraging use of electric vehicles.
- Urban forest management. The City is working with faculty and graduate students from the University of Tennessee to conduct a municipal tree inventory. This inventory of trees in the right-of-way along major road corridors and in parks and other public spaces will be a useful tool for development of an urban forest management plan. Trees help offset community GHG emissions by storing atmospheric carbon, as well as providing shade and other benefits.

Factors Affecting Continued Progress in Reducing Emissions

Future progress in reducing municipal GHG emissions will depend on concerted City efforts to improve energy efficiency as the City grows and municipal services expand. The City can also encourage private-sector efforts to save energy and reduce GHG emissions through such measures as public education, demonstration projects, and public recognition of successful private initiatives. City and community GHG reductions will be aided by continued improvements in vehicle technologies and any additional shift in the mix of TVA power sources away from coal and toward cleaner natural gas, nuclear and renewable options (note 9). The effectiveness of state and federal programs dealing with energy and greenhouse gases will also influence the success of Oak Ridge's future efforts to reduce emissions.

Recommendations

To aid in future tracking of climate action progress, as well as to raise consciousness about opportunities to reduce GHG emissions, ***EQAB recommends that the City track and report annual municipal and community energy use, including the following specific activities:***

- Inter-link municipal system information management systems (e.g. sewer information management system, new utility billing system, updated accounting software, etc)
- Implement a vehicle inventory and maintenance information system that assigns a unique identifier for each vehicle, and track fuel use and mileage for all municipal vehicles
- Record units of energy consumption (e.g., kWh, ft³ natural gas, gallons of fuel) in City financial accounting systems.
- Estimate total annual employee commuting distance based on employee residency.

EQAB also recommends that the City develop and implement a broad environmental management / sustainability program that covers all aspects of local government and municipal operations. An essential component to include is a standard set of procedures for program tracking and evaluation, such as the International Organization for Standardization (ISO) 14001 standards. Elements of a City sustainability program could include, for example: public outreach and education, annual progress reports, green purchasing and contracting policies, facility energy audits, etc.

City and Community Opportunities

The CAP recommended a number of climate action measures that are unlikely to be implemented soon. There are, however, several near-term opportunities for the City and community to further reduce our greenhouse gas impacts:

- Solicit energy efficiency audits of City facilities (and operations) that can lead to energy savings performance contract arrangements which pay for efficiency improvement projects with the resulting energy savings. For example, the Anderson County School system has recently initiated this type of energy retrofit project for their facilities.
- Explore options for encouraging community recycling such as providing recycling containers at apartment complexes and in City parks.
- Establish a community-supported tree planting and urban forest conservation program to highlight potential benefits such as reduced heating and cooling costs, stormwater runoff control, and enhanced carbon sequestration.
- Encourage and support community gardens and local farmers' markets to emphasize the benefits of consuming locally grown food
- Encourage and support redevelopment strategies that emphasize reuse of existing facilities, building sites, and infrastructure, and the use of sustainable development techniques and green building practices.

Explanatory Notes

- 1:** In this report, GHG emissions are given in units of carbon dioxide equivalents (eCO₂); or the mass of CO₂ that would produce the same degree of radiant energy climate forcing (greenhouse effect) as the sum of all GHG emissions (i.e. CO₂ plus other GHG, such as methane). GHG Emissions were estimated on the basis of energy use data provided by the City of Oak Ridge (electric and municipal transportation fuel consumption) and the Oak Ridge Utilities District (natural gas consumption). Community vehicle emissions were based on Tennessee Department of Transportation (TDOT) data (see note 7). GHG emissions were modeled with the Clean Air and Climate Protection (CACP) software package.
- 2:** Quantities reported include direct GHG emissions from electric power sources and City vehicles only and do not include GHG emissions arising from the production and transport of products purchased by the city government.
- 3:** Data for 2004-2007 were collected during the development of the CAP. To use city resources efficiently and better focus our efforts, only data for 2010-2012, which were deemed representative of usage trends since finalization of the CAP, were collected and evaluated for this progress report.
- 4:** Commercial power consumption in 2004 was considerably lower than in previous years, as the number of large commercial customers (> 50kW) dropped from 421 to 383 in that year. (Oak Ridge Electric Dept. Memorandum 14-04, February 19, 2014)
- 5:** The average grid electricity coefficients (e.g. lbs CO₂/MWh) for the Southeastern Electric Reliability Council (excluding Florida) were selected as the basis for estimating GHG emissions associated with electric power use in the CACP model. The carbon intensity of this power generating base decreased from 1464 lbs CO₂/MWh in 2004 to 1402 lbs CO₂/MWh in 2012 (a reduction of 4.2%)
- 6:** Oak Ridge Electric Dept. Memorandum 14-04, February 19, 2014
- 7:** Community vehicle emissions were based on TDOT annual estimates of daily vehicle miles traveled (VMT) for the urbanized areas of Anderson County. Estimated VMT for this region have decreased steadily since 2002.
- 8:** The net impact of recycling on GHG emissions depends on a number of factors including the amounts and types of materials recycled, the distances to disposal and recycling facilities, and whether landfill gas is recovered and used as an energy source.
- 9:** The actual carbon intensity of TVA-generated power is almost certainly lower than the Southeastern Electric Reliability Council rates used in the CACP model to estimate GHG emissions. TVA local distributor as-delivered rates (as calculated by TVA using industry standard carbon accounting practices) are less than 1200 lbs CO₂/MWh since 2009. EPA-provided TVA rate estimates for 2004-2007 range between 1300 and 1400 lbs CO₂/MWh. As a result, the GHG estimates provided in the CAP and in this progress report are conservative (likely to be higher than actual) estimates.