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Forest Service

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Greenhouse Gas Inventory Report



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Introduction



With the signing of [Executive Order 13514](#), titled “*Federal Leadership in Environmental, Energy, and Economic Performance*,” President Barack Obama directs Federal agencies to cut greenhouse gas (GHG) emissions by 20 percent from 2008 levels by 2020. This is the first ever, comprehensive, agency-wide GHG inventory for Forest Service operations, and the 2008 inventory, completed concurrently with the 2010 inventory, represents our baseline for meeting this goal. It is by far the most sweeping energy and environmental assessment required of Federal agencies to date and has called for extensive collaboration and integration across Deputy Areas to complete.

All employees must take on the significant task of changing our behaviors, in both ordinary and bold ways, so that we can reduce emissions and reach our goals. I appreciate your current efforts and proudly share the results and analysis of our first report which highlights where we can and must do more. As we work to improve and streamline future reporting of GHG emissions from our operations, we must be mindful of our everyday decisions and actively promote a culture of sustainability that supports our mission.

Charles Myers
Deputy Chief Business Operations

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Acronyms

BOC	Budget object code	GHG	Greenhouse gas
BTU/GSF	British thermal units per gross square foot	GSA	General Services Administration
CH ₄	Methane	IT	Information technology
CIO	Chief Information Office	kWh	Kilowatt hours
CNG	Compress natural gas	LPG	Liquid petroleum gas
CO ₂	Carbon dioxide	MTCO ₂ e	Metric tons of carbon dioxide equivalents
EPAct	Environmental Policy Act	MWh	Megawatt hours
EPEAT	Electronic Product Environmental Assessment Tool	N ₂ O	Nitrous oxide
FAST	Federal Automotive Statistical Tool	NFC	National Finance Center
FTE	Full-time employee equivalent	USDA	U.S. Department of Agriculture
FY	Fiscal year	VPN	Virtual Private Network
GGE	Gasoline gallon equivalent	VTC	Videoconference

Purpose of a Greenhouse Gas Inventory

All efforts to reduce negative environmental impacts are important, but working on everything at once is not always possible. A greenhouse gas (GHG) inventory can help an organization prioritize efforts to become more environmentally and financially efficient. By looking at the sources of GHG emissions as well as expenditures, the organization is able to focus on the most effective efforts to reduce consumption of energy, resources, and water. If, for example, a forest's GHG emissions average 3 metric tons of carbon dioxide equivalents (MTCO₂e) per employee annually in fleet and 1 MTCO₂e per employee annually in building energy, the forest manager may decide to work on making the fleet more efficient before increasing building efficiency. By the same token, if GHG emissions from buildings average 3 MTCO₂e per employee annually in some regions and less than 1 MTCO₂e per employee in others, agency leaders may decide to fund building efficiency projects in the former region first.

Results of GHG inventories are expressed in MTCO₂e. This unit represents emissions of the three most common GHGs (CO₂, CH₄, and N₂O), which are normalized to a common unit. This normalization allows managers to make direct comparisons between inventories.

Why 2008 and 2010?

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, requires all federal agencies to set goals for reducing GHG emissions by fiscal year (FY) 2020 based on a FY 2008 baseline. The executive order also requires each agency to report FY 2010 GHG emissions. This way, agencies will see trends in their emissions data and can focus energy and resources on appropriate emissions categories.

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Be cautious about drawing conclusions from comparisons between the FY 2008 and FY 2010 GHG inventories for several reasons. Some of the categories (fugitive emissions, onsite wastewater treatment, and employee commuting) in the FY 2008 inventory are simply percentage calculations based on the difference in agency-wide full-time employee equivalents (FTEs) between FY 2008 and FY 2010. Numbers used for FTEs were 31,305 for FY 2008, and 43,804 for FY 2010. Another reason to be cautious about comparisons between FY 2008 and FY 2010 data is that there are different levels of completeness for some categories, such as other vehicle and equipment mobile emissions, due to issues with data availability.

Inventory Structure

The GHG inventory divides emissions into three categories, or scopes:

Scope 1 – emissions directly from operations, such as from mobile emissions sources, building energy (other than purchased electricity), on-site wastewater treatment, and other fugitive emission sources;

Scope 2 – indirect emissions from utility purchases, such as electricity purchased for buildings; and

Scope 3 – indirect emissions related to goods or services purchased by the Forest Service, such as contracted wastewater treatment and waste disposal, employee air and ground travel, employee commuting, and electricity transmission and distribution losses.

In addition, the GHG inventory protocol excludes emissions from emergency tasks such as law enforcement and fire fighting.

Reduction goals set by the U.S. Department of Agriculture (USDA) are 21 percent for Scope 1 and 2, and 7 percent for Scope 3 by FY 2020 compared to FY 2008 emissions.

Emissions Sources

For both fiscal years, mobile emissions are the largest source of GHG emissions. In FY 2008, this category was a little less than half of total emissions (45.7 percent), and in FY 2010, it was just over half (51.5 percent). This change may be partially due to differences in available data and in tracking methods between the years.

In both years' inventories, the second largest source of emissions is purchased electricity (35 percent in FY 2008; 30 percent in FY 2010). Building energy (other than purchased electricity) consumption is the third largest source at 11 percent for both years (see, Chart 1, Chart 2, and Chart 3).



Pilot readies a U.S. Forest Service Cobra helicopter outfitted with video and infrared cameras. The two-seat helicopter flies above fires and beams real-time images of forest terrain and 'hot spots' to fire commanders. (AP Photo Jae C. Hong)

Emissions Totals

While agency total emissions increased from 259,000 MTCO₂e in FY 2008 to 325,000 MTCO₂e in FY 2010

for a total increase of 66,000 MTCO₂e, the data shows a decrease in GHG emissions per FTE. In 2008, agency-wide emissions were 8.3 MTCO₂e per FTE, while in 2010 it was 7.4 MTCO₂e per FTE. The data suggests that by becoming more efficient, the Forest Service actually avoided emitting 38,000 MTCO₂e in FY 2010.

Mobile Emissions

Mobile emissions are divided into 1) Fleet vehicles, and 2) Other vehicles and equipment. Fleet vehicles include highway vehicles, both Forest Service-owned and leased from GSA. Other vehicles and equipment include off-highway vehicles, project equipment, and other mobile sources not reported through FAST, the annual fleet data reporting tool.

In FY 2008, mobile emissions for other vehicles and equipment used only data for jet fuel and aviation gasoline. In FY 2010, data included jet fuel, aviation gasoline, and gasoline and diesel from off-highway equipment. In addition, aircraft fuel data was more complete for FY 2010 than for FY 2008, due to changes in tracking this information. However, it is likely that the FY 2010 aviation fuel data is overestimated; some aircraft owned by other agencies appear to be included in the Forest Service report. This is an area where a revision to the baseline is likely once errors are corrected.

In FY 2008, alternative fuels—biodiesel, E85, and compressed natural gas (CNG)—comprised 0.02 percent of the Forest Service's emissions from mobile sources; gasoline and diesel represented the rest. In FY 2010, alternative fuels comprised 0.04 percent of the Forest Service's emissions from mobile sources and included liquid petroleum gas (LPG) as an alternative fuel type (see Chart 4 and Chart 5). At the

The data suggests that by becoming more efficient, the Forest Service actually avoided emitting 33,000 MTCO₂e in FY 2010.

same time, alternative fuels dropped from 0.8 percent of the gasoline gallon equivalents (GGE) of mobile source fuel in FY 2008 to less than 0.3 percent in FY 2010. For this comparison of alternative versus gasoline and diesel fuel use, only fuel data reported through FAST has been used.



One of several hundred hybrid vehicles purchased in the past few years

Green Purchasing

In FY 2010, the USDA evaluated 35 projects valued at more than \$85,700,000 for meeting sustainability, or “green purchasing” guidelines. Of those, 19 were Forest Service projects estimated at a value of \$10,000,000. Projects received a sustainability rating of 1 to 5, with 5 as the highest rating, meaning the project is as “green” as possible. Five of the Forest Service projects received sustainability ratings of 4 or higher. Projects included new facilities, parking lots, and recreation site rehabilitations; a significant number of the projects focused on purchasing bio-based products for custodial needs.

Waste and Recycling

The Forest Service made significant strides in waste reduction in FY 2010. Nine Forest Service buildings were chosen as a sample to monitor for solid waste disposal and recycling. In FY 2008, the nine buildings disposed of 328 tons of waste and recycled 104 tons, which represents a 24 percent rate of recycling. In FY

2010, the sample buildings disposed of 300 tons of waste and recycled 161 tons, resulting in a 35 percent recycling rate (see Chart 5).

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GHG emissions from waste were reported by the USDA and are not available for the Forest Service alone. For that reason, they are not included in this summary.

Building Energy

Building energy emissions from other-than-purchased electricity sources result from the consumption of coal, fuel oil, LPG, gasoline, and natural gas. The GHG inventory results show that emissions from fuel oil decreased by 19 percent from FY 2008 to FY 2010 while natural gas emissions increased by 6 percent (see Chart 6).

Purchased Electricity

The National Finance Center (NFC) provided purchased electricity data used in the GHG inventories. FY 2010 electricity consumption data was compiled by zip code across the country; GHG emissions were calculated using e-GRID information.

(Click [here](#) to learn about e-GRID.) As recommended by the Council on Environmental Quality and the USDA, regional distribution of FY 2008 purchased electricity was assumed to be the same as FY 2010.

Data from forests and districts that do not pay utility bills through the NFC was not included.

From FY 2008 to FY 2010, emissions from purchased electricity increased by 8 percent, while FTEs rose by 28 percent.

According to cost data for purchased electricity, identified by budget object code 2311, the Forest Service paid on average approximately \$0.10 per

Employees connect their Forest Service laptops through Virtual Private Network (VPN) connectivity and have full access to shared drives, resulting in fewer cars on the road and lower carbon emissions.

kilowatt-hour (kWh) in FY 2008, and \$0.11 per kWh in FY 2010.



Twenty-panel 4 kW grid-tied system at the Pintler Ranger Station in Phillipsburg, MT, installed in 2009. This system is expected to produce a total of 5,500 kWh and prevent the release of 5,000 lbs of greenhouse gas into the atmosphere annually.

Chief Information Office

Technology is an essential component of the agency's energy consumption; it enhances the ability of the agency to be a leader in land management. The Chief Information Office (CIO) is focused on providing technology solutions to Forest Service employees to improve the agency's sustainability and efficiency of operations.

CIO initiatives directly contribute to the following key focus areas for Sustainable Operations:

Green Purchasing - In accordance with green purchasing, the CIO endorses and follows USDA's Environmental Stewardship Policy, which requires

that 95 percent of information technology (IT) products purchased be Electronic Product Environmental Assessment Tool (EPEAT) certified. A large percentage of existing Forest Service inventory meets Energy Star specifications, including approximately 33 percent of desktops and laptops; approximately 20 percent of plotters; and roughly 25 percent of monitors.

Energy Conservation - The CIO aims to increase energy savings by reducing the number of servers agency-wide. Currently, 138 servers in 69 locations (cells) have been shut down. Shutting down just one server saves 43.2 kWh per day (enough energy to power 720 60-watt bulbs for 24 hours, or nearly 3,000 compact fluorescent bulbs). The daily energy savings attributable to consolidating servers is almost 6 megawatt-hours (MWh) per day. In addition, about 30 percent of remote sites use solar power exclusively for radio towers. Goals for FY 2011 include further reducing the number of servers agency-wide and consolidating them at the Kansas City and Albuquerque Data Centers using "green" best practices.

Waste Prevention and Recycling - The CIO supports and endorses the use of the GSA's Computers for Learning Program; excess computers go to classrooms, not landfills. To support Sustainable Operations in the Forest Service, the CIO offers a contract for green recycling of eligible electronic (IT) equipment. In August 2010, the Forest Service began a contract for IT equipment recycling in partnership with StrongTech Asset Management Services, a vendor certified to evaluate and determine if equipment can be reutilized or disposed of using Environmental Protection Agency-recognized e-waste disposal methods. In FY 2010, the Forest Service recycled about 18,000 electronic items.

Fleet and Transportation - The CIO provides underlying infrastructure that makes telework feasible. Employees connect their Forest Service laptops through Virtual Private Network (VPN) connectivity

and have full access to shared drives, resulting in fewer cars on the road and lower carbon emissions.

The CIO also provides video teleconferencing (VTC) functionality, which reduces the need for face-to-face meetings. For example, in FY 2009, by using VTC, the Forest Service saved an estimated \$6 million dollars on travel. This translates to a conservative reduction of 7,500 metric tons of CO₂ emissions in just air travel for the agency. Estimated savings of \$12.8 million in FY 2010 agency travel expenditures were primarily from avoided flights and passenger car trips.



Dr. Les Groom explains the energy conversion process of a gasification unit while standing on a pile of wood chips (biomass).

Sustainability Leadership

Forest Service staff members are making efforts to refocus Forest Service outreach to include sustainability concepts and messaging to foster the next generation of environmental stewards. Through the Adopt-A-School effort, employees work with students, educators, and communities to promote sustainable practices. The Forest Service hires, trains, and places summer students to further the agency's sustainability goals.

Conservation Education has leveraged unique partnerships and used new media to reach the next generation of conservation leaders. PollinatorLIVE is a partnership between USFS, Project Learning Tree (PLT), National Science Teachers' Association

(NSTA), Canon Envirothon, and the Prince William County (VA) Public Schools. PollinatorLIVE is a series of webinars and podcasts that promote the development of schoolyard pollinator gardens, reaching educators across the country. In May 2010, over 2,000 visitors logged on to a single podcast. At an estimated 99 participants per individual log-in, this event reached a potential audience of 202,000 teachers and students.

Every year Google recognizes marketing campaigns that represent the combination of creativity and Google technology products in a publication they call Google Creative Canvas. Conservation Education's website 'Discover the Forest,' developed with the Ad Council, was selected for its innovative combined use of a database with Google Maps. As part of their Re-connecting Kids with Nature campaign, the Ad Council and the Forest Service used Google Maps to create a tool to help users find urban and national parks and forests near them so they can get back into nature.

Social media efforts reach internal and external audiences through Twitter, YouTube, and Idea Share. Ongoing and innovative communications through the Open Mic webinar series, held the third Wednesday of each month, bring together champions across the agency in meaningful dialogue and best practices sharing.

A robust and growing awards and recognition program honors and supports employees in their efforts to improve agency business practices. And, Forest Service Senior Executives address sustainability elements in their yearly performance evaluations. To learn more, please visit the Sustainable Operations website [here](#).

Sustainability is not a separate Forest Service initiative or program. Instead, it is an integral part of every program and each employee's responsibility. The Western Collective is a great example of how a

group of people with the right mix of commitment and skills can lead a change effort. Combining talent and resources from regions 1, 2, 3, 4, 6, and 10, as well as the Rocky Mountain Research Station, the Western Collective is piloting Sustainable Operations efforts and projects, developing tools, sharing best practices, and leading the way for the rest of the agency to integrate sustainability into daily decisions.

Annual Energy Report Findings

Energy

Data in the annual energy report included NFC

In FY 2010, new sources located on National Forest System land generated approximately 1,500 MWh of renewable electrical energy.

financial data as well as results of a data call to Regional Foresters, Station Directors, Area Directors and Deputy Chiefs. The energy consumption total listed in the FY 2010 report includes recreational sites.

For FY 2010, energy intensity for the Forest Service was equivalent to 40,000 British thermal units (BTU) per gross square foot (GSF). The data represents a reduction of 38 percent in energy intensity compared to the agency's FY 2003 baseline of 64,000 BTU/GSF. Energy intensity reduction far exceeded the 15 percent goal set for FY 2010.



Solar Expansion Project at the Wayne National Forest Headquarters building (Photo by Alex Snyder)

In FY 2010, new sources located on National Forest System land generated approximately 1,500 MWh of renewable electrical energy. This energy totaled 0.8 percent of all electrical energy consumed in FY 2010, considerably less than the 5-percent goal. Although the Forest Service fell short of the FY 2010 goal, the total is more than twice the 661 MWh total reported from FY 2009.

Many renewable energy projects are being implemented or continued across the nation on National Forest System land. In FY 2009 and FY 2010, the Forest Service planned to obligate \$77,925,000 of American Recovery Reinvestment Act funds toward renewable energy projects. One outstanding example comes from the Wayne National Forest. At the Nelsonville Headquarters building, 252 new solar panels installed on the roof now generate over 30 percent of the building's electricity.

Vehicle Fuel Use

The annual energy report also contains fuel consumption data for both fleet and non-fleet vehicles and equipment. Emissions from this fuel consumption are discussed under Mobile Emissions.

The following methods and strategies were undertaken in FY 2010 to reduce fuel use:

- Distribution, through websites, of fuel-saving tips for vehicle use;
- Preparation of training materials to support fuel conservation;
- Pilot project with Kiwi fuel gauge; and
- Completion of fleet tool to help fleet managers size their fleets based on projected vehicle use.

Wider distribution of fuel-saving tips in FY 2011 will help further reductions. Communication methods such as Twitter feeds @ gogreenfs, YouTube videos on the Forest Service YouTube channel, Open Mic information sharing sessions, and the Sustainable Operations web page will be used to raise awareness.

Water

FY 2010 Forest Service estimated water consumption was 235,000,000 gallons at a cost of \$11,300,000. This estimate was based on an informal data call sent out to field engineers who provided a sample of facilities and included information on FTEs and gallons of water consumed at each facility. From this data, gallons of water per FTE was estimated and then multiplied by the total FTEs to determine agency-wide use (see Chart 7).



One of two composting toilet systems installed by Clivus New England, Inc., at the new White Mountain National Forest Headquarters, saving an estimated 70,000 gallons of fresh water annually, producing no methane GHGs, and ultimately making fertilizer. (Photo by Bill Dauer)

Accuracy of water consumption data is impacted by the fact that some forests use water pumped from agency-owned wells, many of which do not have meters or have meters that are not monitored. These agency-owned wells are not included in billed utilities and therefore not tracked through NFC. Accuracy is also affected by instances where water is billed with other utilities, such as trash and sewer services, and not reported by quantity. Projects are planned to add water meters to high-use, unmetred facilities, thereby raising the accuracy of water consumption data for the future.

Electrical Metering

Approximately 3,300 agency facilities are currently metered for electricity either internally or by the local utility with standard meters. Advanced electrical meters have been installed on 104 buildings, which marks a significant increase over the 30 advanced meters reported in FY 2009. Although this number represents a small percentage of the total meter inventory, the Forest Service plans to install advanced meters on those buildings either indentified as high energy users or that exceed 10,000 GSF.

As the metering program is being implemented, field units are working to minimize energy use. The most effective first step a unit can take is to evaluate energy use through reviewing utility bills. This step informs decision-makers of the total costs and locations of high-energy intensity, and highlights inconsistencies such as incorrect rates and sites not used by the agency. It also establishes an accurate baseline against which to measure reduction successes.

New Construction

Since FY 2007, 57 new buildings have at least started the design process. Of these, 49 are expected to meet the Environmental Policy Act (EPA) requirement to be 30 percent more energy efficient than relevant code, where life-cycle cost effective. The new designs not meeting the EPA requirement include barracks, warehouses, fire stations and barns for which energy performance is difficult to quantify and measure.

Links

[EO13514](#)

[Federal Energy Management Program](#)

[E-GRID](#)

[Council on Environmental Quality](#)

[PollinatorLIVE](#)

[Strong Tech](#)

[EPEAT](#)

Acknowledgments

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Chart 1. Comparison of FY 2008 and FY 2010 total emissions by category

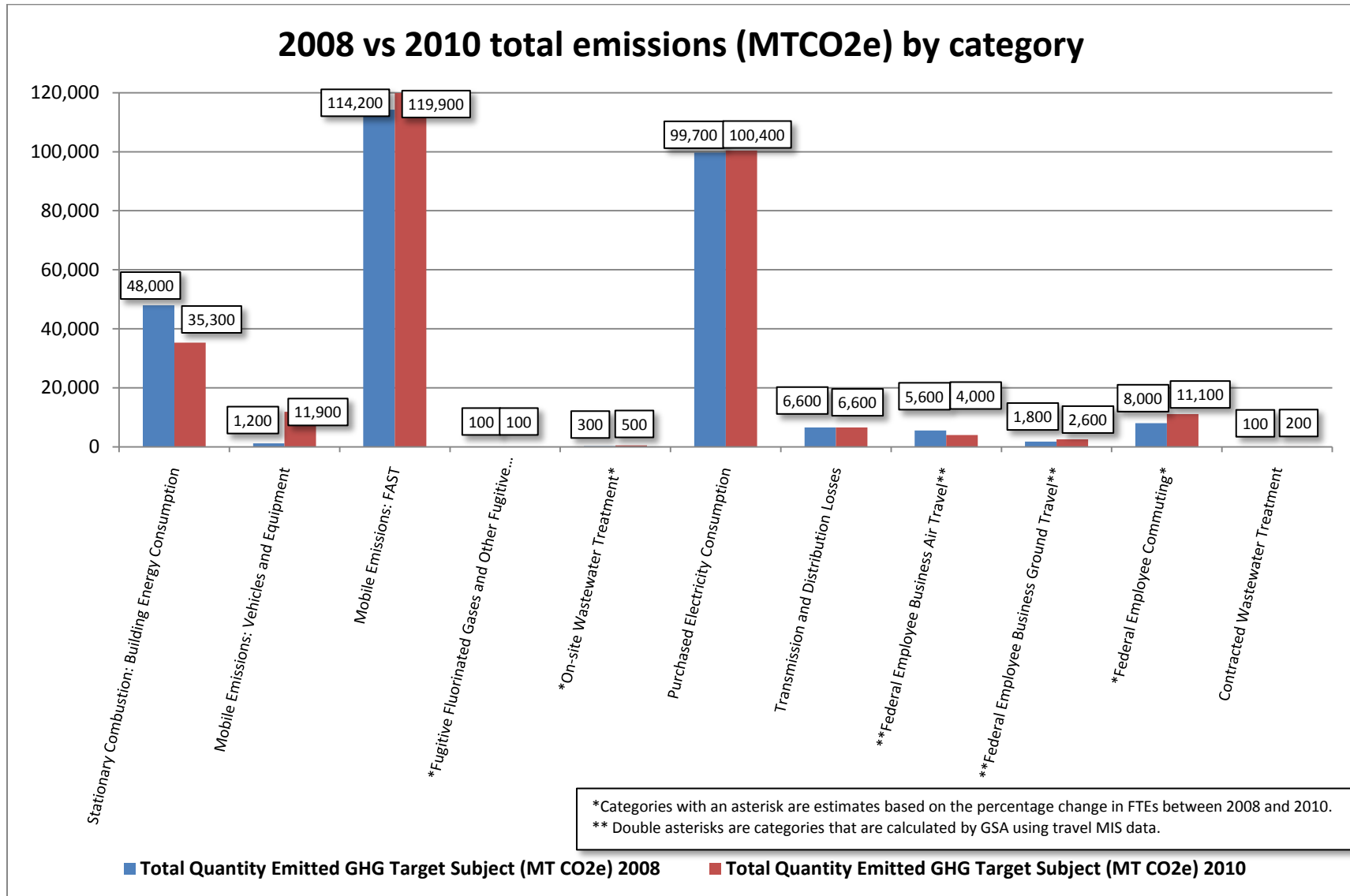


Chart 2. FY 2010 total emissions (MTCO₂e) by category

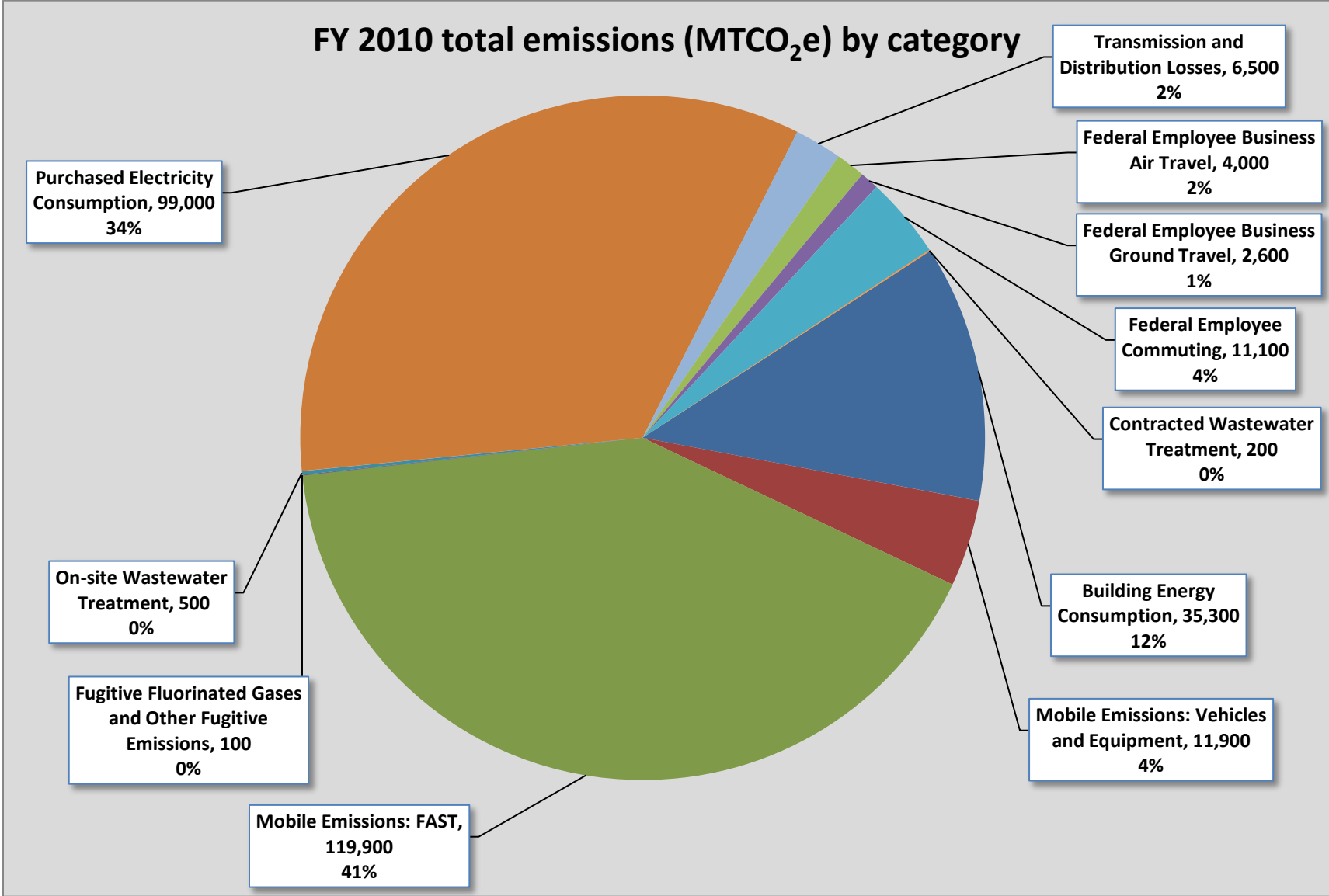


Chart 3. Comparison of FY 2008 and FY 2010 gas and diesel emissions (MTCO₂e)

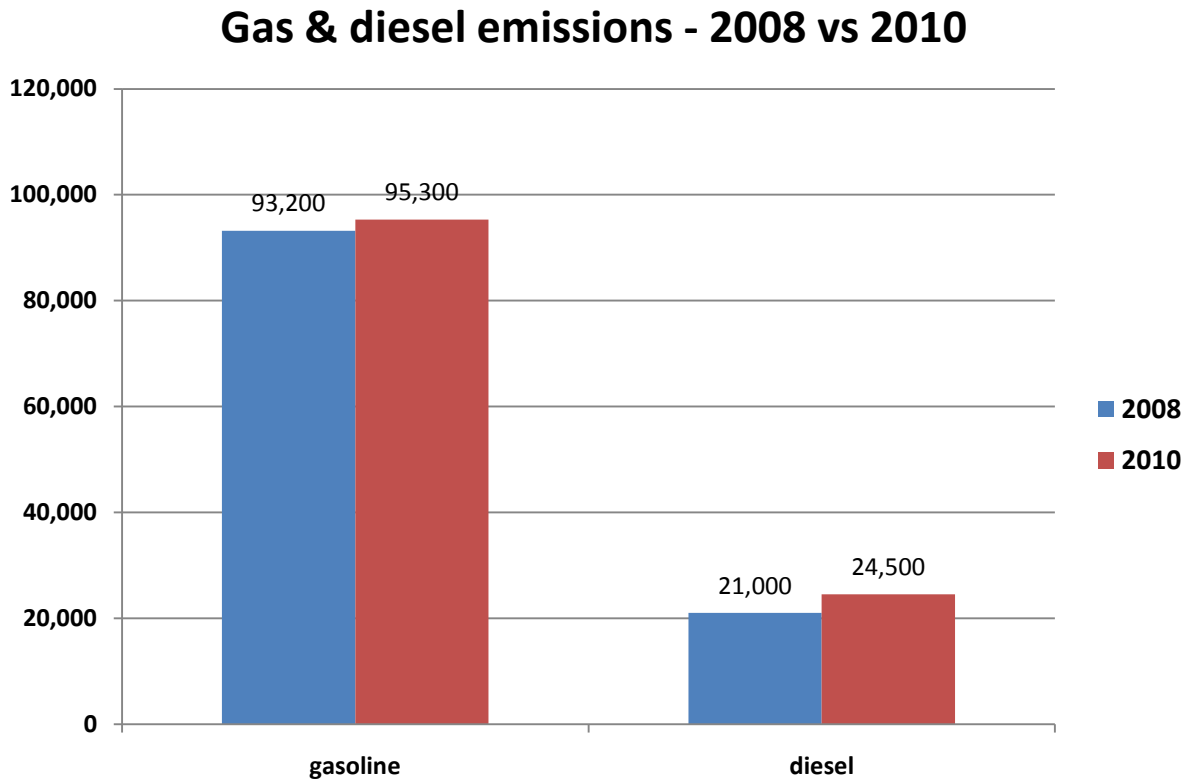


Chart 4. Comparison of FY 2008 and FY 2010 alternative fuel emissions (MTCO₂e)

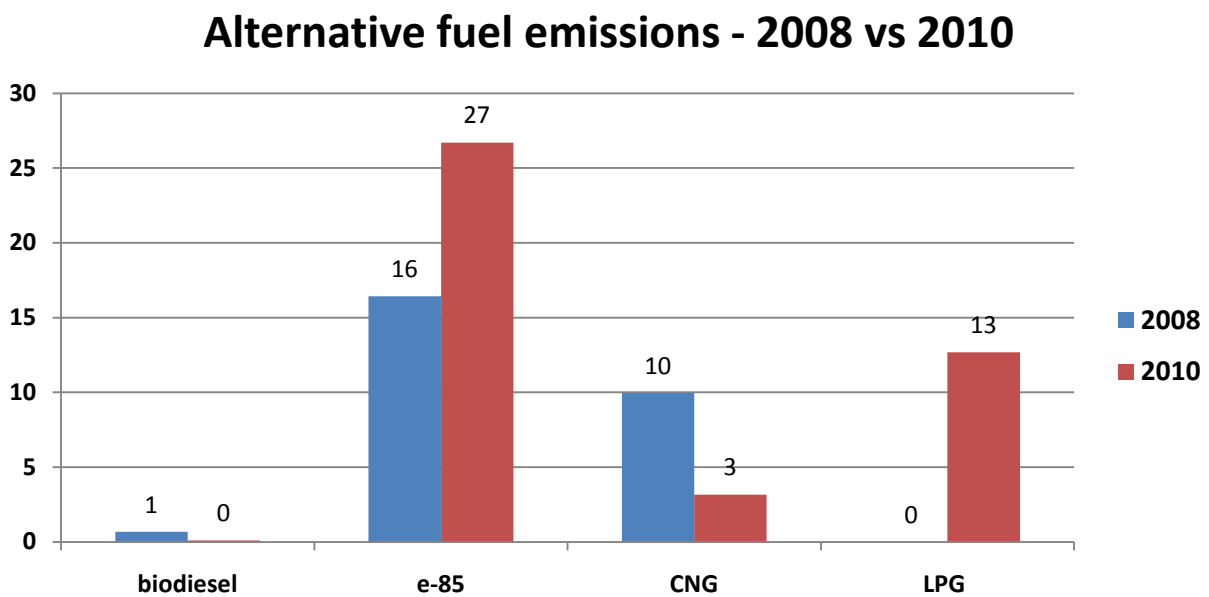


Chart 5. Comparison of FY 2008 and FY 2010 waste and recycling from sample of buildings

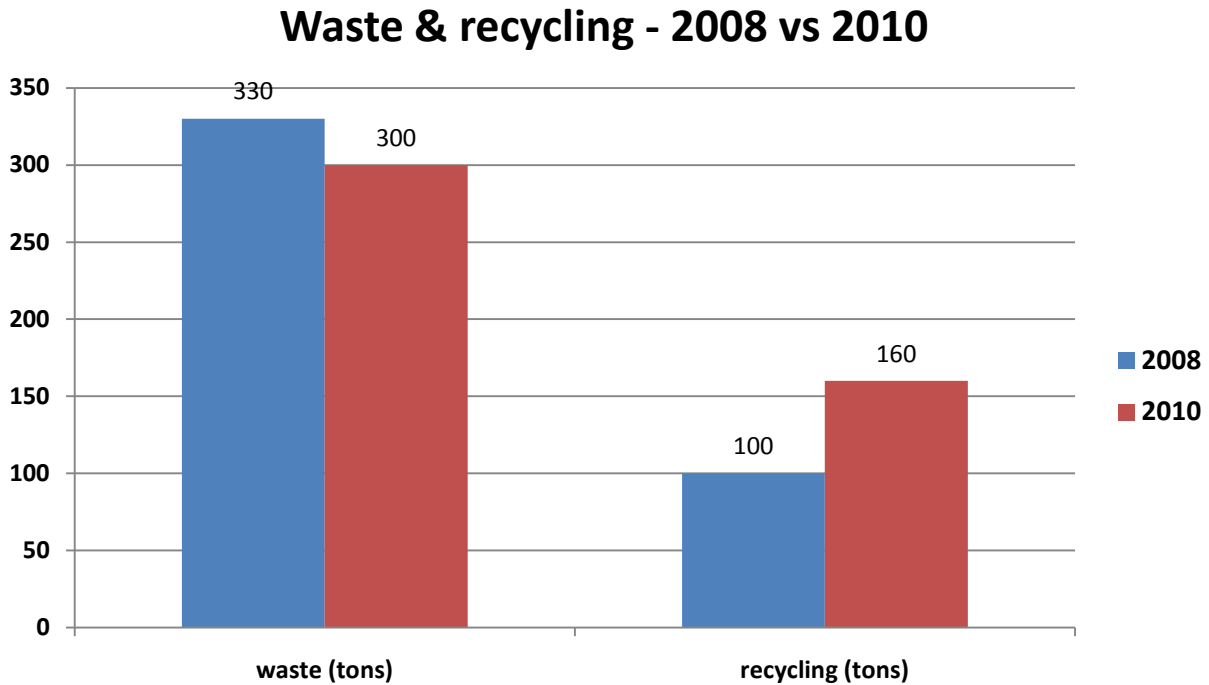


Chart 6. Comparison of FY 2008 and FY 2010 building energy emissions

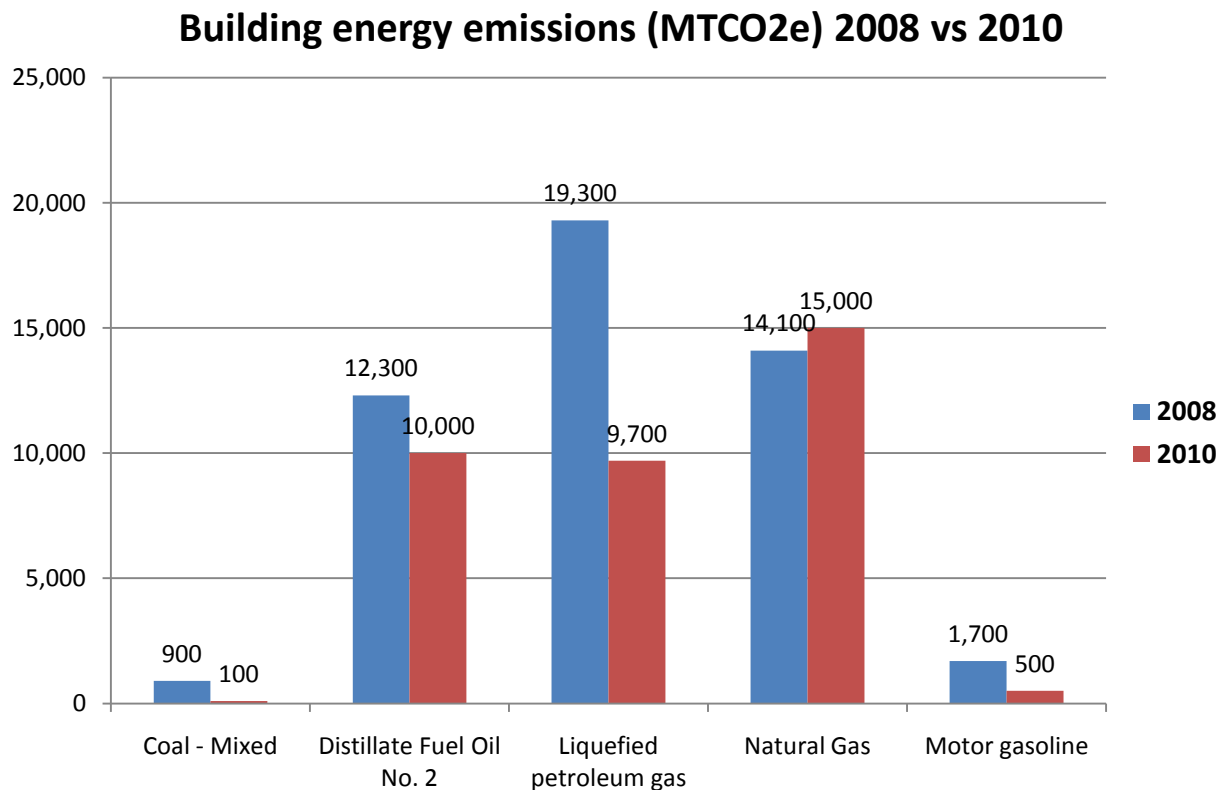


Chart 7. Comparison of FY 2008 and FY 2010 water consumption (thou gal)

