

# DOE Sustainability Dashboard



U.S. DEPARTMENT OF  
**ENERGY**



**DOE Sustainability Performance Office**  
**December 7, 2017**



- Sustainability management at DOE
- Dashboard implementation
- Dashboard tools
- Challenges and benefits
- Future enhancements

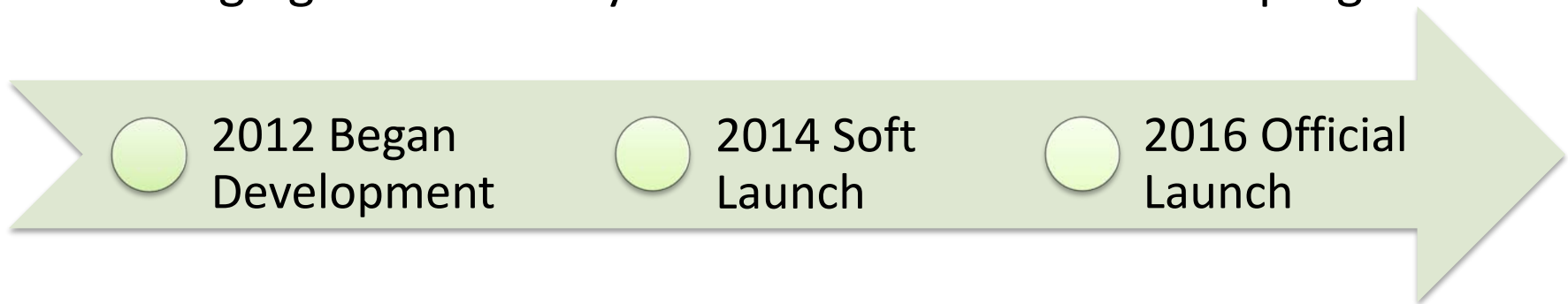
- DOE has had a headquarters energy management program since 1978
  - Over the years the organization has changed and its efforts for conservation and efficiency have expanded beyond energy
  - In 2011 the Sustainability Performance Office (SPO) was established as the DOE lead for sustainability, including energy, water, waste, and other related issues
- Several tools were used to collect sustainability data
  - Energy Management System 4 (EMS4), a database for collecting energy, water, and non-fleet fuel consumption from 1985 to 2010
  - Excel files that supplemented EMS4

With the expansion of responsibilities to sustainability management, the SPO needed to optimize its resources for maximum impact and benefit to the Department...It needed a tool that could:

- Automate data aggregation from laboratories and sites
- Calculate goal progress at different organizational levels
- Improve data quality
- Be easily accessible
- Provide analytics and standard reports
- Be compatible with existing systems

After considering several systems and testing an out-of-box system, the decision was to build a custom system. The DOE Sustainability Dashboard (Dashboard) has been built to serve several functions for DOE sustainability reporting:

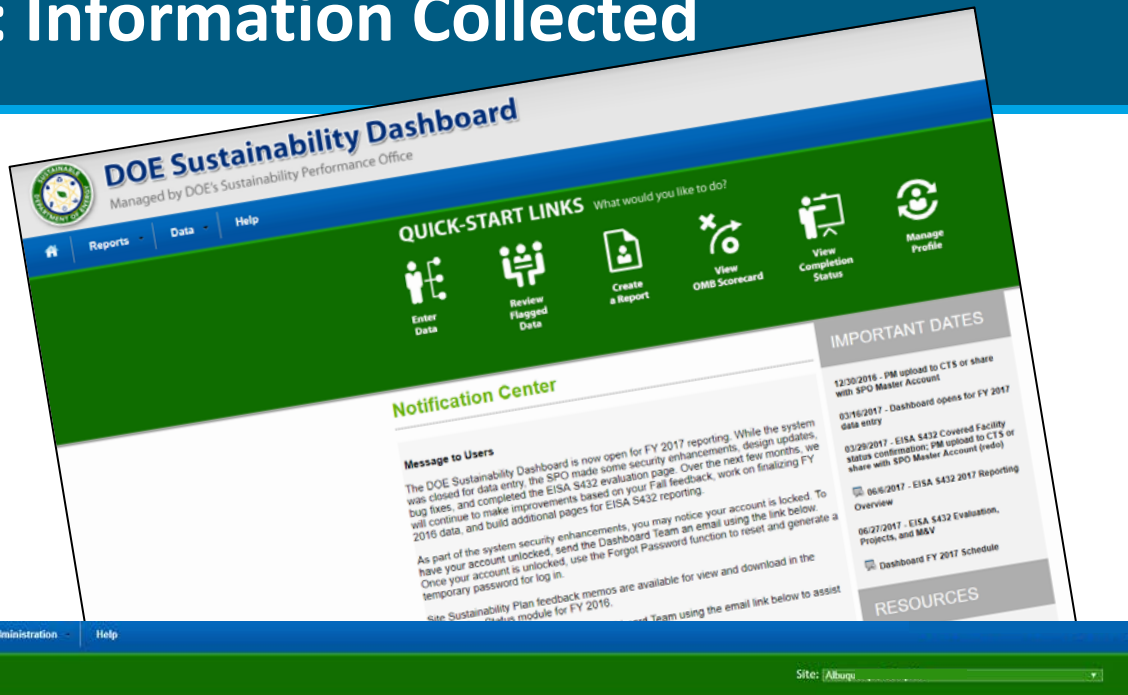
- Maintain historical data sets.
- Collect current year data and plans for each site and national laboratory.
- Analytics to provide DOE sustainability personnel with tools for managing sustainability at their site or within their program.



- Programming language is SQL.
- The application resides on DOE servers maintained by DOE OCIO at the Germantown location.
- System successfully completed DOE OCIO's Security Assessment & Authorization process.
- It is an internet based application that is accessible to DOE users, including off-site DOE M&O contractor teams. Currently there are over 400 users.
- 4 types of user roles, ability to distinguish between Federal or contractor employment type, and flexibility with access rights (read, write, approve).

- System service life is projected to be 20-25 years.
  - EMS4, the predecessor database, was functional for nearly 25 years
  - Enhancements and updates can be easily implemented
- Departmental-wide annual savings estimated at \$500K based on streamlined reporting and analyses
- Total system development cost including advanced analytics is estimated at \$2.6M.
  - Actual FY 2013 to FY 2016 cost of \$1.3M
  - Projected FY 2017 to FY 2019 estimated cost of \$1.3M or less
- Based on preliminary departmental-wide cost saving estimates the simple payback of a fully functional Dashboard is less than five years.
- Over the estimated service life of the system, the cost of the Dashboard is 1/5 of the tested out-of-box subscription system.

# Tools: Information Collected



The Dashboard collects 25 types of data sets and pulls 4 from other systems to provide a holistic picture of sustainability progress for all of DOE.



# Tools: Information Collected

## Data Category Menu

Site: Demo Site <<< View Full QA/QC

### Facilities Energy Consumption and Cost

Site: Demo Site

PSO: D-Program

Site #: 1

Category: -- Choose One --

Subcategory: -- Choose a Category --

Main Site Zip Code: 11111

Square Feet:

Purchased or On-Site Generated Non-Renewable: Purchased

Fuel/Material: -- Choose a Category --

Data Entry Period Type:
   
 Fiscal Year by Quarter
   
 Fiscal Year by Month

Fiscal Year: 2017

Usage Unit: Choose a Category first

Q1 (October - December) Amount: 0      Q1 Cost (1,000 \$): 0

Q2 (January - March) Amount: 0      Q2 Cost (1,000 \$): 0

Q3 (April - June) Amount: 0      Q3 Cost (1,000 \$): 0

Q4 (July - September) Amount: 0      Q4 Cost (1,000 \$): 0

Billing Reference (Optional):

Additional Information (Optional):

**Save Energy Consumption and Cost Data**

By clicking this button you will no longer be able to add/edit anything from this category, and this data will be marked to go to a higher level for review.

Year: 2017 Reset Options

To view details of an entry or request change(s), click Select in the table below. Note in some instances when directed here from the full QA/QC, the system cannot preselect and show details of the information in the data entry section.

| Has Comments | Subcategory | Category                              | Purchased/Fuel/Units             | Usage | Cost     | GHG    | T&D       |
|--------------|-------------|---------------------------------------|----------------------------------|-------|----------|--------|-----------|
| Select       | Diesel      | Target Goal Subject Buildings         | Purchased<br>1,000 Gallons       | Q1    | 2,000.00 | \$0.00 | 20,483.01 |
| Delete       |             |                                       |                                  | Q2    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q3    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q4    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Total | 2,000.00 | \$0.00 | 20,483.01 |
| Select       | Electricity | Target Excluded Buildings<br>Grid     | Purchased<br>Megawatt Hour (MWh) | Q1    | 2.00     | \$0.00 | 0.00      |
| Delete       |             |                                       |                                  | Q2    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q3    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q4    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Total | 2.00     | \$0.00 | 0.00      |
| Select       | Electricity | Target Goal Subject Buildings<br>Grid | Purchased<br>Megawatt Hour (MWh) | Q1    | 123.00   | \$0.00 | 46.57     |
| Delete       |             |                                       |                                  | Q2    | 521.00   | \$0.00 | 197.24    |
|              |             |                                       |                                  | Q3    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q4    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Total | 644.00   | \$0.00 | 243.81    |
| Select       | Natural Gas | Target Goal Subject Buildings         | Purchased                        | Q1    | 250.00   | \$0.00 | 13.62     |
| Delete       |             |                                       |                                  | Q2    | 0.00     | \$0.00 | 0.00      |
|              |             |                                       |                                  | Q3    | 1,200.00 | \$0.00 | 65.39     |

Sample data entry screen. Can enter data by quarter or month. The table on the left provides a summary of information entered. Ability to save and when fully done select complete for start of approval process.

# Tools: Information Collected



In addition to data, the Dashboard collects narratives with focus on successes, challenges, and plans for meeting sustainability goals. The system will generate a report, has the capability to format text and add graphics.

## Site Sustainability Plan Home

| Categories               | Add custom category | Complete SSP | Last Updated   |
|--------------------------|---------------------|--------------|--|
| Executive Summary        |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |
| Energy Management        |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |
| Water Management         |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |
| Waste Management         |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |
| Fleet Management         |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |
| Clean & Renewable Energy |                     |              | <input type="checkbox"/> Mark Complete 11/27/2017 by don.sanchez |

## Energy Management

+ Add Custom Section Save All Sections Select Tables/Charts

### Performance Status

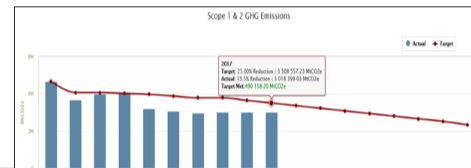
Discuss current FY performance by describing major initiatives or changes to missions or facilities that impact goal performance in significant ways along with other relevant information and details. Share success stories, accomplishments, lessons learned, and best practices.

No Update (status quo) Check this box if current FY performance data is consistent with the performance of prior years, is following the same trend as it has in prior years (no unusually large increases or decreases in performance of goals associated with the category), and the site has had no major initiatives or changes to missions relating to this category.

Arial, sans-serif 11pt Bold Italic Underline Text Color Background Color Bulleted List Numbered List Indent Left Indent Right Link Unlink

### Scope 1 & 2 Greenhouse Gas Emissions

X continues to make significant improvements in the reduction of GHG Scope 1 & 2 from the established 2008 baseline by FY2025. Current FY performance reflects a reduction of MtCO<sub>2</sub>e by 35.5% from the established 2008 MtCO<sub>2</sub>e baseline. This is a direct result based on innovative ways to maximize existing space, utilize natural light when practical, and maximizing alternative work schedules. Additionally X management is taking a proactive approach by executing energy efficient projects to replace high energy consuming HVAC and boiler units with energy efficient units in our larger facilities. Figure 2-1 represents this fiscal year performance relative to GHG emission reduction.



Design HTML Preview

### Plans and Projected Performance

Discuss plans and expected impact on future FYs along with other relevant information.

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### Scope 1 & 2 Greenhouse Gas Emissions

Construction of a new facility designed to meet the intent of EO 13693, the GPs, and LEED Gold Certification. Disposition of current building inventory either by demolition and or transfer to another federal agency is part of the transition planning. Additionally a list of the FY 2017 completed projects, and projects recently awarded are included in Appendix B.

### Scope 3, Greenhouse Gas Emissions

X continues to encourage and supports use of, public transportation; teleworking as appropriate; technology to reduce travel; energy efficient equipment; recycling; and locally-sourced products.

### Goal 2.2 & 2.3 EISA 432 Energy and Water Evaluations

Currently there is not planned action to perform energy and water audits. Long term (within 5 years) is to construct new and demolish existing and or transfer to other federal agency. Construction of the new facility will be individually metered for electricity, water, and natural gas.

Design HTML Preview

# Tools: Analytics

The Dashboard provides two types of scorecards, OMB style and comprehensive with details for all sustainability goals.



## Facilities

**Energy Intensity**  
Goal: The latest energy intensity reduction goal, requires a reduction in energy intensity for goal subject facilities by 25 percent by FY 2025 relative to FY 2015 baseline. The prior goal, required a 30 percent reduction by FY 2015 relative to FY 2003 baseline. Interim Target (FY 2016): -2.5 %  
Current Performance: **-13%**

|                              | FY 2010       | FY 2016       | % Change |
|------------------------------|---------------|---------------|----------|
| Purchased Utilities (MMBtu)  | 17,382,271.8  | 14,282,265.4  | -17.7%   |
| Purchased Renewables (MMBtu) | 0.0           | 527,848.7     | NA       |
| Goal-Subject GSF             | 109,727,704.0 | 107,858,831.0 | -1.6%    |
| Energy Intensity (Btu/GSF)   | 157,857.4     | 137,373.2     | -13.0%   |

**Clean Energy**  
Goal: By FY 2025, use 25 percent renewable energy as a percentage of overall facility electric and thermal energy use. Interim Target (FY 2016): 10.0 %  
Current Performance: **31%**

|                               | FY 2016 Energy Consumption | FY 2016 Clean Energy of Renewables | % of Total |
|-------------------------------|----------------------------|------------------------------------|------------|
| Grid Electricity              | 18,008,710                 | 0.00                               | NA         |
| Non-renewable Thermal Energy  | 7,051,173                  | 0.00                               | NA         |
| On-Site Renewable Energy      | 2,330,373                  | 4,858,290                          | 169.8%     |
| Purchased Green Electricity   | 527,847                    | 1,048,699                          | 198.3%     |
| Renewable Energy Certificates | NA                         | 2,812,816                          | NA/NA      |
| Total (MMBtu)                 | 26,918,146                 | 8,317,896                          | 31.4%      |

**Industrial, Landscaping, Agricultural Water**  
Goal: Reduce industrial, landscaping and agricultural water use by 30 percent by FY 2025 relative to FY 2010 baseline. Interim Target (FY 2016): -12.0 %  
Current Performance: **-51.1%**

|                                 | FY 2010 | FY 2016 | % Change |
|---------------------------------|---------|---------|----------|
| Industrial                      | 3,171.9 | 1,399.3 | -56.0%   |
| Landscaping                     | 142.3   | 105.6   | 10.3%    |
| Agriculture                     | 0.0     | 58.3    | NA       |
| Total I/L/A Water (million gal) | 3,314.6 | 1,822.2 | -51.1%   |

**Renewable Electricity**  
Goal: By FY 2025, use 30 percent renewable energy as a percentage of overall facility electricity use. Interim Target (FY 2016): 10 %  
Current Performance: **26%**

|                               | FY 2016 Electricity Consumption | FY 2016 Renewable Electricity w/ Biomass | % of Total |
|-------------------------------|---------------------------------|--|------------|
| Grid Electricity              | 4,741,786                       | 0.00                                     | NA         |
| On-Site Renewable Energy      | 114,373                         | 228,199                                  | 4.8%       |
| Purchased Green Electricity   | 194,763                         | 208,587                                  | 8.1%       |
| Renewable Energy Certificates | NA                              | 105,714                                  | 15.3%      |
| Total (MWh)                   | 5,010,862                       | 1,300,837                                | 26.0%      |

**Potable Water Intensity**  
Goal: Reduce potable water intensity by 36 percent by FY 2025 relative to FY 2007 baseline. Interim Target (FY 2016): -18.0 %  
Current Performance: **-25%**

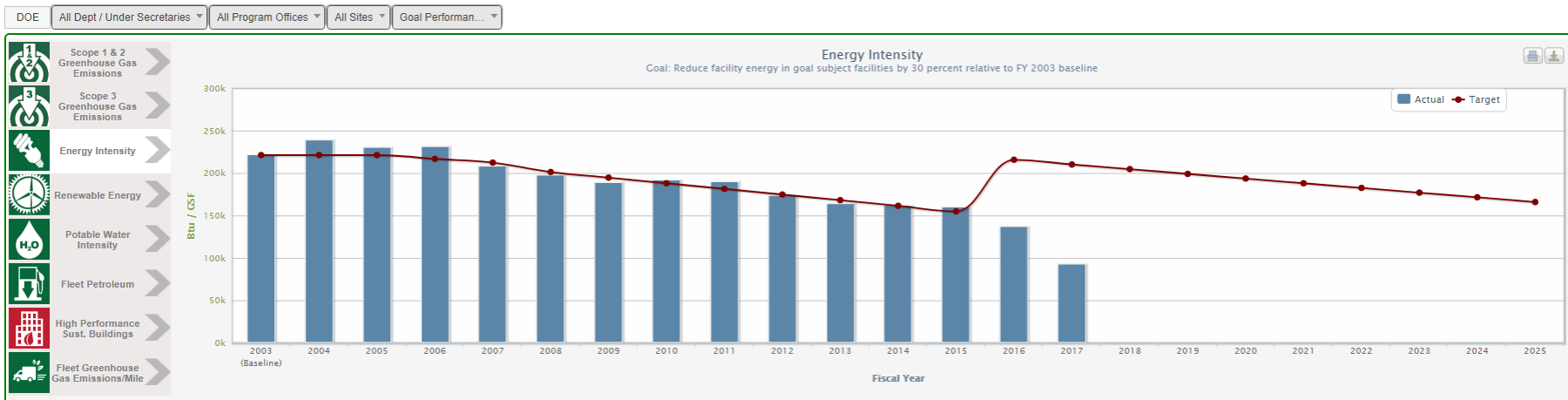
|                                 | FY 2007       | FY 2016       | % Change |
|---------------------------------|---------------|---------------|----------|
| Water Consumption (million gal) | 8,888.9       | 6,882.5       | -22.6%   |
| Aquifer Recharge (million gal)  | 322.1         | 354.5         | 10.2%    |
| Total GSF                       | 122,410,890.0 | 127,959,952.0 | 4.5%     |
| Water Intensity (Gal/GSF)       | 68.3          | 51.8          | -25.3%   |

**High Performance Sustainable Buildings**  
Goal: Ensure 15 percent by building count comply with the Guiding Principles for sustainable buildings by FY 2025. Interim Target (FY 2016): 15.0 %  
Current Performance: **7.3%**

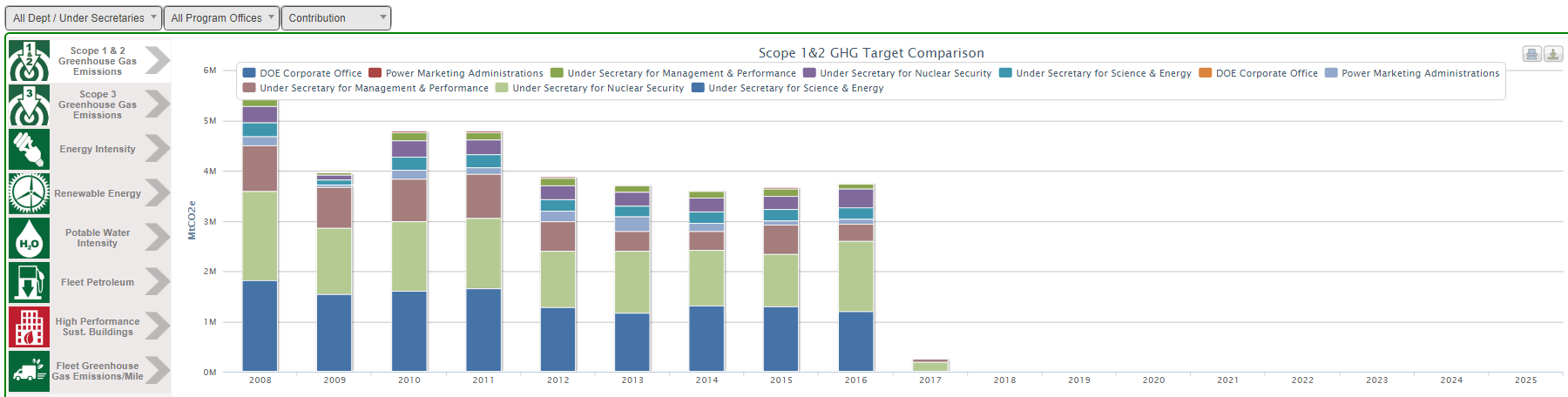
|                              | Building Count | GSF        |
|------------------------------|----------------|------------|
| Guiding Principles Compliant | 188            | 7,894,817  |
| Total Applicable*            | 2,575          | 87,135,877 |
| Performance (%)              | 7.30%          | 8.14%      |

\* Applicable means buildings and facilities that are DOE owned or DOE managed and the corresponding GSF is greater than 1,000.

## Performance Graphs: Goal Performance



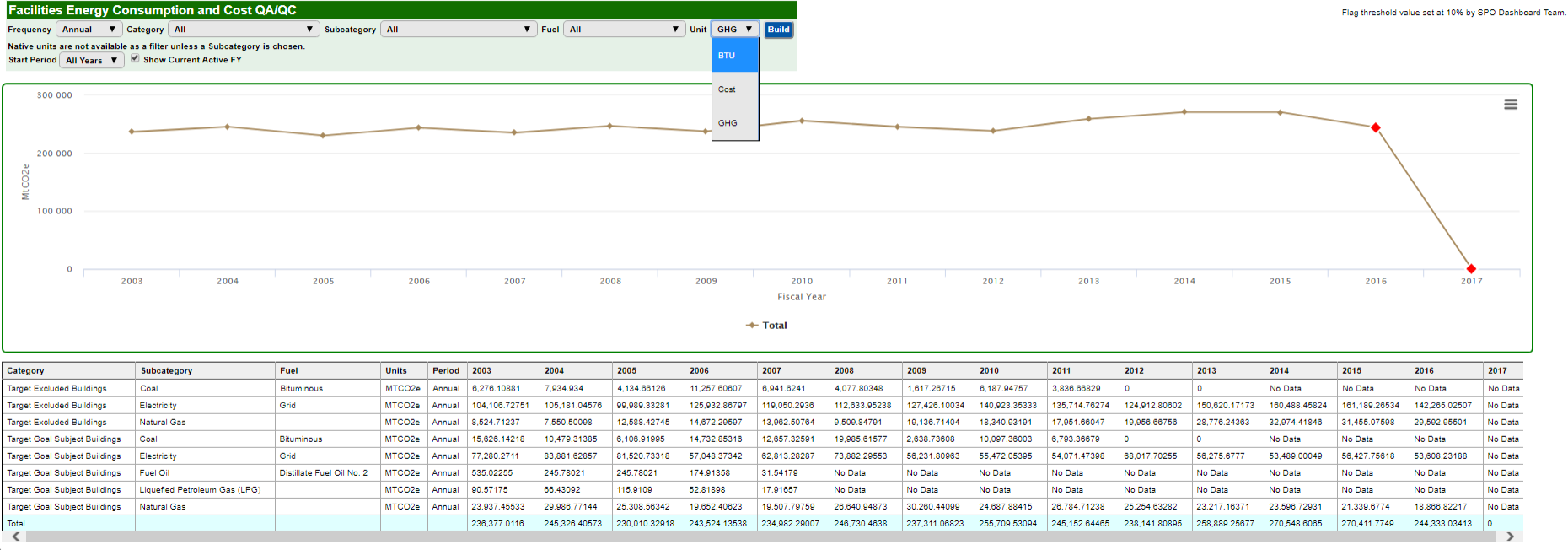
## Performance Graphs: Contribution to Goal





## Data Category Menu

Site:  Hide QA/QC >>>



QA/QC trend graphs and tables that display historical data, allow for maintenance of data, and can be adjusted for view by category, units, and years. Flagging capability with notices and justification or correction process.

# Tools: Approval Process

Data review and approval tracker that is customized based on program process. As well as provide assurance that the information is accurate and reviewed by management.

## Completion Status

Select Site:  Reporting Period: FY

The current fiscal year completion status for each data category is displayed in the table below. To review data, select the data category name and you will be directed to the full QA/QC Module to review historical data trends for approval or rejection. For additional details, select the data point in the table below the QA/QC graph. Once you approve or reject a data category you will be redirected back to the completion status page. Approved data will advance to the next level of review and rejected data will be returned to the data author for revisions.

- Dashboard Data Accuracy Self-Certification Letter  
- Excluded Buildings Self-Certification Letter  
- Site Sustainability Plan  [Download Site Sustainability Plan](#) 
- SPO Feedback Memo  [Download SPO Feedback Memo](#) 

| Category                       | Last Update                            | Input Status                 | Manager Review              | Site Office Review                              | DOE HQ Program Review                            | SPO Dashboard Team Review |
|--------------------------------|--|------------------------------|-----------------------------|---|--|---------------------------|
| <b>Facilities</b>              |  |                              |                             |   |  |                           |
| Energy                         | Dec 5 2016 12:21PM<br>by Greg Collette | Completed Nov 15 2016 2:54PM | Approved Nov 17 2016 5:49PM | Approved Dec 5 2016 12:21PM<br>by Greg Collette | Waiting Review <input type="checkbox"/> Approve? |                           |
| Water                          | Dec 5 2016 12:21PM<br>by Greg Collette | Completed Nov 15 2016 2:55PM | Approved Nov 17 2016 5:49PM | Approved Dec 5 2016 12:21PM<br>by Greg Collette | Waiting Review <input type="checkbox"/> Approve? |                           |
| Renewables                     | Dec 5 2016 12:21PM<br>by Greg Collette | Completed Nov 15 2016 2:55PM | Approved Nov 17 2016 5:54PM | Approved Dec 5 2016 12:21PM<br>by Greg Collette | Waiting Review <input type="checkbox"/> Approve? |                           |
| Facility Goal Category         |  |                              |                             |   |  |                           |
| Facility Metering Status       |  |                              |                             |   |  |                           |
| Green Buildings                |  |                              |                             | No Approval Needed                              |  |                           |
| EISA S432 Benchmarking         |  |                              |                             |   |  |                           |
| EISA S432 - Covered Facilities |  |                              |                             |   |  |                           |
| EISA S432 - Evaluations        |  |                              |                             |   |  |                           |
| Building Inventory Change      |  |                              |                             |   |  |                           |
| Site Level Policy Tracker      |  |                              |                             | No Approval Needed                              |  |                           |

Key challenges that had to be accounted for:

- Different operational methods and hierarchy for each site, national laboratory, and program.
- Numerous sustainability requirements and goals set by legislation, regulations, policy, orders.
- Several reporting systems and need for interoperability for a holistic view of status.
- Balancing short term reporting needs with longer term Dashboard development.
- Managing different components including finalizing development, fixing bugs, and providing training for users.

The Dashboard has been beneficial in many ways:

- Enhanced accessibility and visibility of data and goal performance through the web interface and capability for access by multiple users.
- Streamlined data collection, improved data quality with instant data anomaly identification.
- Secure repository of information along with supporting documents that is backed up regularly.
- Integration of information from other systems for one stop shop through upload templates.
- Develop and disseminate useful information with data analysis and performance metric calculations.



The Dashboard has aided in saving time which has improved efficiency and effectiveness:

- Reduced time spent on data collection and aggregation.
- Streamlined data review and correction.
- Eliminated need to manually reproduce key reports.
- Increased time for specialized data analysis.
- Provided more time for strategizing and decision making with better data.



“Overall, the Dashboard seems to be working well and continued improvements should make it even better for future reporting. **Maintaining 100% Dashboard next year is a good idea.** The CEDR was not only inefficient but also largely confusing, hard to read, etc. Being able to see data graphed in various more friendly ways, and being able to download that data and graphs is a great benefit now. **I am planning on doing away with our internal scorecard and just point to the Dashboard for ongoing status/data checks, etc.**” –Program Dashboard User

“...Each group responsible of entering data has one or more than one accounts and can enter data independently of other groups and even at the same time **which saves time and effort.** The tool is **easier to use** than the excel version of the CEDR (More visual). The tool **displays the graphs almost automatically** once the data is entered and it's easy to compare results with previous years. The status of each of the sections is easy to track.” –Site Dashboard User

“Best thing for me was the concise summary of all the goals on the Comprehensive Scorecard with last year’s data right there for ease of comparison. Same thing for the data tabs which has the historical data compiled as QA/QC graphics and tables has been **very useful for reporting and doing sanity checks when entering current data.**” –Site Dashboard User

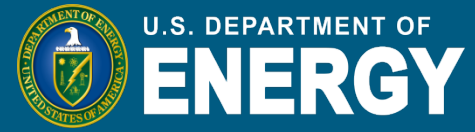
Since both the historical and current data are summarized in a user friendly format, I don't have to hunt around in a spreadsheet and find specific columns of data. Also I don't have to guess which data to include in some of the calculations since the Dashboard already does the calculations and has the correct units (i.e.) Scope 2 and Scope 3 GHG emissions are **less confusing to calculate since the Dashboard** pulls all the relevant data from the data tabs to do the calculations..." -Site Dashboard User

"Templates to enter/upload data... Custom reports let you select the "categories" you want to see and the multiple years in one excel export... **Nice to be able to see the OMB Scorecard in real time...** Completion Status module is pretty helpful for **at-a-glance status of each section** and for keeping track of what's left to do." –Site Dashboard User

Dashboard enhancements will continue into the future and will include:

- Improve functionality reducing errors/glitches along with overall operations.
- Refactoring of code for ease of use, update, and transfer to other developers.
- Additional standard reports with specialized analysis or tailored for external reporting.
- Transparency of calculation methodology and associated factors.

# Thank You



Contact us at ***Sustainability@hq.doe.gov***