



Y-12 SITE SUSTAINABILITY PLAN

FY2012

Sustainability: "...to create and maintain conditions, under which humans and nature can exist in productive harmony..."

—EXECUTIVE ORDER 13514

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Y-12 NATIONAL SECURITY COMPLEX
2012
SITE SUSTAINABILITY PLAN



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December 8, 2011

Date

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ACRONYMS, ABBREVIATIONS, AND INITIALISMS

AFV	alternative fuel vehicles	P2	Pollution Prevention
ARRA	American Recovery and Reinvestment Act	PSF	production support facility
AVID	Accelerated Vendor Inventory Delivery	PUE	power usage effectiveness
BIM	Building Information Management	REC	Renewable Energy Certificate
CRC	Community Relations Council	SSPP	Strategic Sustainability Performance Plan
CRT	cathode ray tube	TP3	Tennessee Pollution Prevention Partnership
CW	chilled water	TVA	Tennessee Valley Authority
DOE	U.S. Department of Energy	UPF	Uranium Processing Facility
ECM	energy conservation measure	USGBC	U.S. Green Building Council
EISA	Energy Independence and Security Act	VAWT	vertical-axis wind turbine
EMBOS	Electronic Medical Business Operations Systems		
EMIP	Energy Market Integration Project		
EPA	Environmental Protection Agency		
ESPC	Energy Savings Performance Contract		
EUI	energy use intensity		
FAST	Flow and Analysis System for Transportation		
FEC	Federal Electronics Challenge		
FYNISP	Future Years Nuclear Security Plan		
GHG	greenhouse gas		
GP	Guiding Principle		
HEMSF	high energy mission specific facilities		
HPSB	high performance and sustainable building		
HVAC	heating, ventilating, and air-conditioning		
ILA	industrial, landscaping, and agricultural		
IT	Information Technology		
JCC	Jack Case Center		
LEED	Leadership in Energy and Environmental Design		
LTO	Linear Tape-Open		
NC	New Construction		
NEPA	National Environmental Protection Agency		
NNSA	National Nuclear Security Administration		
OHS	Occupational Health Services		
ORNL	Oak Ridge National Laboratory		



Oak Ridge was founded by visionaries. Long before this area became Oak Ridge, John Hendrix had a vision of “a city on Black Oak Ridge,” and “a factory in Bear Creek Valley that would help win the greatest war there will ever be” (Y-12 produced the uranium for Little Boy, the first atomic bomb used in warfare, which helped win World War II). Albert Einstein, Jack Case, Leslie Grove, and many others were visionaries who have shaped Y-12 into the leading manufacturing center of today, and it is this same visionary concept that is defining the future of sustainability and energy use for the Y-12 plant of tomorrow. Zero-energy buildings, zero-net waste, solar arrays, wind turbines, and high performance and sustainable buildings (HPSBs): these are all visions for a sustainable future at Y-12.

In order for Y-12 to keep up with the vision and fulfill the requirements of U.S. Department of Energy (DOE) order 436.1, *Departmental Sustainability*, significant changes must be implemented in site-wide energy use, employee awareness, and facility function. A step in the right direction is to define where we want to be, when we need to be there, and what incremental steps are required along the way. This plan is a road map for each element of sustainability to guide us to the transformed end state to achieve the energy and environmental vision.

SITE MANAGEMENT VISION

The accomplishments to date and the long-range planning of the Y-12 Energy Management and Sustainability and Stewardship programs support the DOE and the National Nuclear Security Administration (NNSA) vision for a commitment to energy efficiency and sustainability and to achievement of the Guiding Principles. Specifically, the Y-12 vision is to support the Environment, Safety and Health Policy and the DOE Strategic Sustainability Performance Plan (SSPP) while promoting overall sustainability and reduction of greenhouse gas (GHG) emissions. Table ES.2 gives a comprehensive overview of Y-12’s performance status and planned actions. B&W Y-12’s Energy Management mission is to incorporate renewable energy and energy efficient technologies site-wide and to position Y-12 to meet NNSA energy requirement needs through 2025 and beyond.

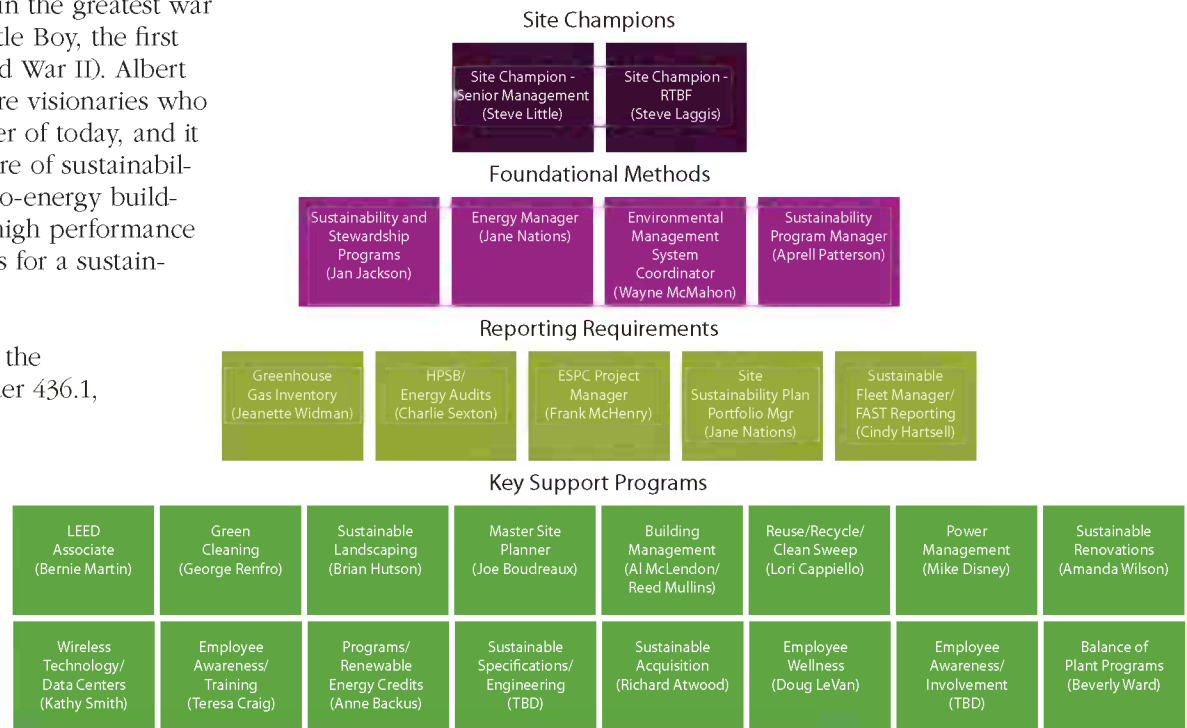


Fig. ES.1. Y-12 sustainability team serves as an information exchange mechanism.

During FY 2011, the site formed a sustainability team (Fig. ES.1). The sustainability team provides a coordinated approach to meeting the various sustainability requirements and serves as a forum for increased communication and consistent implementation of sustainability activities at Y-12.

The sustainability team serves as an information exchange mechanism to promote general awareness of sustainability information, while providing a system to document progress and to identify resources. These resources are necessary to implement activities that support the overall goals of sustainability, including reducing the use of resources and conserving energy. Additionally, the team's objectives include:

- Foster a Y-12-wide philosophy to conserve resources
- Reduce the impacts of production operations in a cost-effective manner
- Increase materials recycling
- Use a minimum amount of energy and fuel
- Create a minimum of waste and pollution in achieving Y-12-strategic objectives
- Develop and implement techniques, technologies, process modifications, and programs that support sustainable acquisition
- Minimize the impacts to resources, including energy/fuel, water, waste, pesticides, and pollution generation
- Incorporate sustainable design principles into the design and construction of facility upgrades, new facilities, and infrastructure
- Comply with federal and state regulations, executive orders, and DOE requirements.

Y-12 is working to communicate its sustainment vision through procedural, engineering, operational, and management practices. The site will make informed decisions based on the application of the five Guiding Principles for HPSBs to the maximum extent possible.

MAJOR ASSUMPTIONS

Y-12 is committed to achieving the sustainable energy and transportation goals established in Executive Orders 13423 and 13514. Although complete accomplishment of the current 2015 goals exceeds existing funding levels, Y-12 will continue to execute energy projects as funding

becomes available or as they can be accomplished incrementally within existing funding profiles. All efforts will be made to integrate energy initiatives with ongoing site mission objectives.

Several FY 2011 initiatives are assisting Y-12 with accomplishment of the goals:

- The site joined the U.S. Green Building Council (USGBC) and the Green Building Certification Institute during FY 2011 (Fig. ES.2). These memberships allow employees to seek Leadership in Energy and Environmental Design (LEED) Green Associate/Accredited Professional training and provides a way to pursue LEED certification for the Uranium Processing Facility (UPF) as well as existing buildings.
- The UPF project is currently seeking LEED certification on all three facilities.



Fig. ES.2. The site joined USGBC in FY 2011.

- Sustainability projects are included in the FY 2012 funding profiles for common site support, utilities, balance of plant facilities, and Operations of Facilities. The planning efforts for the Capabilities Based Facilities and Infrastructure program also includes a large element of sustainability.
- The plant is diligently working towards the HPSB goals by incorporating the Guiding Principles into activities associated with Jack Case, Building 9113, and Building 9119 specifically for FY 2012. Performance-based incentives have been established against these projects to encourage achievement and move the site towards completion of this goal.

Energy-saving efforts at Y-12 are contingent upon an efficient integration between the modernization strategy under way and the identification of energy-efficient approaches in planned facilities. Many of the large Manhattan Project-era facilities on the Y-12 Site will continue to consume high amounts of energy until a funding source can be identified to perform decontamination, deactivation, and eventual demolition of these, sometimes process-contaminated facilities.

SUCCESSSES AND CHALLENGES

Y-12 has met seven of the twenty goals; an additional nine goals are on track and are fully expected to be met prior to the deadlines established. A number of initiatives have contributed to the current successes, and continued expansion of employee awareness and incorporation of sustainability into all programs will ensure the site continues to progress towards meeting the remaining goals.

Some of the ongoing Y-12 initiatives that have helped reduce energy intensity during the past few years include:

- consolidation and demolition of underutilized facilities;
- sustainable acquisition practices;
- employee energy awareness and training;
- temperature setbacks during off-shifts and weekends;
- repair and replacement of disabled heating, ventilation, and air conditioning (HVAC) controls;
- sustainability and energy management integration into the Y-12 Environmental Management System;

- formation of a cohesive site sustainability team to further support efforts;
- ongoing Energy Savings Performance Contract (ESPC) initiatives, which has provided four energy conservation measures (ECMs) that reduced energy intensity and cost savings (Table ES.1); and
- a 48% petroleum reduction within four years, surpassing the requirement for the 2%-per-year reduction and has been very successful in achieving the goals for alternative fuel usage and fleet reduction.

Table ES.1. Energy savings performance contract

ECM	Status
ECM 7.2. Steam Trap Replacement	760 traps/58 vacuum breakers: complete
ECM 7.1. Condensate Return System	3,000-ft pipe, return units, tanks, instrumentation: 99% complete
ECM 16.1. New Demineralized Water System	Facility 99% complete - PM analysis
ECM 2.1. Chiller System Controls	Pumps, variable frequency drives, controls, interconnect 2 chiller buildings: <ul style="list-style-type: none"> • 9767-13: 95% complete • 9767-11: 85% complete • 9767-11/8: connections, complete • 9767-8: 80% complete
Project acceptance January 2012	

Several initiatives at Y-12 during FY 2011 are helping push the site in the right direction for sustainability. A few of the efforts include:

- meeting water intensity reduction goal (-33.8%);
- meeting energy reduction goal (-22.8%);
- meeting electronic stewardship goal (100%);
- meeting pollution prevention goal (57%);
- meeting goal for alternative fuel usage (342% increase);
- safely deactivating the old, coal-fired steam plant and putting in cold shutdown;
- demolishing 182,000 ft² of facilities, further reducing energy and water;
- reducing inflow/infiltration by smoke and flow testing the sanitary sewer system to identify areas of increased flow during rain events.

The effort identified process flow, broken laterals, roof drains, and cross connections that were repaired;

- capping the coal pile;
- using a non-hazardous solvent that quickly dissolves coatings and other materials, which was developed at Y-12 and has been commercialized. This solvent will help industry reduce hazardous waste generations, air emissions, and safety concerns associated with the use of solvents;
- more than 6,100 pounds of employee-owned electronics were collected for reuse by local charities and recycled at a Personal Electronics Collection Event;
- more than one million pounds of materials were recycled or reused by American Recovery and Reinvestment Act (ARRA) Projects;
- integrating sustainable acquisition requirements into procurements;
- fully implementing a green cleaning program into the maintenance/janitorial areas;
- Submitting HPSB candidates into the Environmental Protection Agency (EPA) Portfolio Manager – candidates for Energy Star® ratings include 9113/9119;
- implementing sustainable paving techniques, such as the use of warm-mix asphalt and the reuse of 7,000 tons of milled asphalt;
- Benchmarking innovative renewable ideas at the Oak Ridge National Laboratory (ORNL), Pantex, Nevada National Security Site, and the Cincinnati Zoo;
- investigating renewable energy options, including solar array and a vertical-axis wind turbine;
- implementing a “green bank” to support EISA 438 and incorporating requirements into paving and demolition projects;
- installing lighting retrofits and developing a lighting standard for replacement of incandescent and fluorescent interior fixtures and parking lot lighting, including several successful installations;
- installing two each high-pressure sodium, LED, and induction streetlights as a pilot program. Meters are installed and light output and energy efficiency are being monitored;
- completing guiding principle points for Jack Case Center to become an HPSB, per NNSA. Initiatives included occupant sensors, “smart” plug strips, and aggressive night/weekend setbacks;
- LEED-compliant coatings and pervious concrete have been installed on several paving projects;

- recycling concrete. Concrete from sidewalk replacements is being crushed and recycled;
- completing infrastructure projects. Renovations within facilities are using recycled content and sustainable products for restrooms, flooring, and furniture;
- partnering with Ijams Nature Center to assist with the development of a sustainability road map. Ijams is providing assistance to Y-12 to develop green areas and nature trails to provide a more environmentally friendly workplace;
- installing new metering devices. The Energy Modernization Implementation Program (EMIP) infused the plant with much needed funding for metering. Approximately 100 meters will be installed in FY 2012; and
- installing white roofs. Over 375,000 ft² of cool roof replacements have been installed site-wide.

The overall success of these initiatives enabled the 3% reduction in electricity usage for FY 2011. Clearly, the smallest of efforts is contributing to the overall success of the site. Although a much greater impact could be achieved with increased emphasis on sustainability projects, the site continues to make progress.

Issues that could prevent achievement in all areas of the Guiding Principles and energy goals include:

- energy reduction. Continued success is contingent on future demolition and new construction, including UPF. Although the site is currently meeting this goal, post-2015 reductions may be at risk until energy consumption is fully understood for UPF.
- pursuing HPSB status. Many of the Y-12 facilities are aging, and energy improvements beyond incremental successes will require complete replacement of components and significant funding, which is currently above Future Years Nuclear Security Plan (FYNSP) base-line projections.
- renewable energy. The current cost of electricity for Y-12 is \$0.06 per kWh. This very low cost for electricity renders any renewable energy initiatives as not cost-effective. However, the site will continue to pursue renewable energy installations in an effort to support this goal.

- GHG reductions. Scope 2 and 3 GHG reductions will be difficult for the site to achieve. With minimal mass transportation and its rural location, Y-12's efforts to incorporate alternate transportation initiatives are difficult. Additionally, the geographic location dictates the electricity transmission and distribution, which impacts the predominant GHG contributor.

Y-12 is currently evaluating future project requirements to meet the remaining goals, as well as continue the forward progress currently achieved. Although funding requirements have not been fully evaluated, it is clear that additional funding is required beyond FYNSP targets in order to meet all goals by the specified deadline.

Table ES.2. Goal performance review and plans

SSPP Goal	DOE Goal	Performance Status	Planned Actions and Contributions	Risk of Non-attainment
1.1	28% Scope 1 & 2 GHG reduction by FY 2020 from an FY 2008 baseline	At risk – Scope 1 & 2 emissions decreased by 12%, (Scope 1 decreased 27%, but Scope 2 actually increased by .01% due to the Emission Factor revision).	Continue to identify methods for reduction of GHG; further emphasize energy reductions.	Medium
1.2	30% energy intensity reduction by FY 2015 from an FY 2003 baseline	On track – the site has achieved a 22.8% reduction from the 2003 baseline.	Continue implementation of planned reduction initiatives.	Low
1.3	Individual buildings or processes metering for 90% of electricity (by October 1, 2012); for 90% of steam, natural gas, and chilled water (by October 1, 2015)	Making progress – EMIP project will provide metering for electricity, natural gas, and steam.	Complete analysis of chilled water system; develop plan for installation of CW and PW meters.	Electricity: Low Steam: Medium Natural Gas: Low Chilled Water: Medium
1.4	Cool roofs, when economical, for roof replacements unless project already has CD-2 approval (new roofs must have thermal resistance of at least R-30)	On track – Investments in roofing have resulted in cool-roof technology since 2008.	Future roofing projects will continue to use cool roofs where practical, with 181,739 ft ² planned for FY 2012.	Low
1.5	7.5% of a site's annual electricity consumption from renewable sources by FY 2013 and thereafter (5% in FY 2010-2012)	On track – Y-12 purchased Green-e certified Renewable Energy Credits (RECs) in the amount of 21,000 MWh per year. At risk – if it is determined RECs are not suitable, Y-12 will not meet this goal.	If an agreement is reached that sites can use RECs to satisfy this goal, Y-12 will make the purchase and the goal will be blue. The site is investigating the feasibility of installing solar arrays and also a vertical-axis wind turbine. Although these systems will not meet the 7.5% requirement, they are a step forward.	Without RECs: High With RECs: Low
1.6	10% annual increase in fleet alternative fuel consumption by FY 2015 relative to an FY 2005 baseline	Goal has been met – Y-12 has achieved a 342% increase in alternative fuel consumption within six years.	Additional measures are being evaluated for continued improvement beyond the goals.	Low
1.7	2% annual reduction in fleet petroleum consumption by FY 2020 relative to an FY 2005 baseline	Goal has been met – Y-12 has achieved the petroleum reduction goal with a 48% reduction within six years.	Additional measures are being evaluated for continued improvement beyond the goals.	
1.8	75% of light-duty vehicle purchases must consist of alternative fuel vehicles (AFVs) by FY 2015 and thereafter	Goal has been met – Y-12 purchases only AFVs for the on-site fleet.	Future vehicle purchases will only include AFVs.	Low
1.9	Reduce fleet inventory by 35% within the next three years relative to an FY 2005 baseline	Making progress – NNSA has implemented a 4%-per-year reduction target for the complex.	Based on revised goal, Y-12 will evaluate the existing inventory and develop a path forward.	Low
2.1	13% Scope 3 GHG reduction by FY 2020 from an FY 2008 baseline	At risk – Site Scope 3 emissions have increased by 3%.	Site will improve teleconference and webinar capabilities to reduce business travel and benchmark other sites.	Medium
3.1	15% of existing buildings larger than 5,000 GSF compliant with the Guiding Principles (GPs) of HPSB by FY 2015	Making progress – the site focused on meeting HPSB compliance for JCC – although the facility gets us yellow for GSF, still red for building count.	Y-12 will continue to implement initiatives to meet HPSB compliance as funding and resources allow.	Medium

SSPP Goal	DOE Goal	Performance Status	Planned Actions and Contributions	Risk of Non-attainment
3.2	All new construction, major renovations, and alterations of buildings greater than 5,000 GSF must comply with the GPs and, where the work exceeds \$5 million, each are LEED® - NC Gold certification or equivalent	On track – the UPF project is seeking LEED certification for the new construction projects.	The UPF project team will continue efforts towards LEED certification.	Medium
4.1	26% water intensity reduction by FY 2020 from an FY 2007 baseline	Goal has been met – the site has achieved a 33.8% reduction from the baseline.	Water conservation measures will continue to be implemented on a building-by-building basis in support of the HPSB initiative.	Low
4.2	20% water consumption reduction of industrial, landscaping, and agricultural (ILA) water by FY 2020 from an FY 2010 baseline	On track – Y-12 will be implementing efforts to eliminate ILA water usage prior to FY 2013.	Y-12 recently recognized that both the Jack Case and New Hope Centers consume potable water for irrigation purposes. Both of these practices are easily correctable, and efforts are underway to eliminate the ILA usage.	Low
5.1	Divert at least 50% of nonhazardous solid waste, excluding construction and demolition debris by FY 2015	Goal has been met – Over 50% of non-hazardous waste diverted from landfill.	At least one new recycle material stream is added to the recycling program each fiscal year to further increase the diversion rate.	Low
5.2	Divert at least 50% of construction and demolition materials and debris by FY 2015	Goal has been met – Over 57% of construction and demolition waste diverted from landfill.	At least one new recycle material stream is added to the recycling program each fiscal year to further increase the diversion rate.	Low
6.1	Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year)	Goal has been met – Sustainable acquisition clause has been included in procurements.	Site will continue to evaluate new sustainable products for use.	Low
7.1	All data centers are metered to measure a monthly power utilization effectiveness (PUE) (100% by FY 2015)	Making progress – electric meter installations are planned for these facilities in FY 2012.	Data centers are currently planned for consolidation. The site will monitor each consolidation to ensure metering is effectively measuring the PUE.	Low
7.2	Maximum annual weighted average PUE of 1.4 by FY 2015	At Risk – The PUE is currently estimated at lower than 1.4. However, this value is based solely on electricity usage and does not account for chilled water energy intensity.	Chilled water and electrical metering are planned for this facility. This data will verify the PUE; it is not known at this time what actions are required.	High
7.3	Electronic stewardship – 100% of eligible personal computers, laptops, and monitors with power management actively implemented and in use by FY 2012	Goal has been met – The Y-12 IT organization has taken aggressive steps to implement power management for all eligible devices (except those that must be excluded for legitimate business reasons like cyber-security, machine controllers, etc.).	Continue active implementation of power management of computing devices.	Low

1. Goal Performance Review and Plans

1.1 SCOPE 1 & 2 GREENHOUSE GAS

The Y-12 Complex seeks to support the Greenhouse Gas (GHG) reduction targets to the fullest extent possible. The overall goal of 28% reduction (from an FY 2008 baseline) by FY 2020 has been established by DOE for Scope 1 and 2 emissions. As Fig. 1.1 shows, Y-12 reduced Scope 1 and 2 emissions by 12% in FY 2011, and has made good progress toward meeting the goal of a 28% reduction primarily due to decreased Scope 1 emissions from steam generation.

PERFORMANCE STATUS

Table 1.1 presents the FY 2011 Scope 1 and 2 GHG emissions compared to the FY 2008 baseline. With an FY 2011 reduction of 27% compared to baseline, the Scope 1 emissions are well ahead of schedule for meeting the 28% reduction goal by 2020. However, despite incremental reductions in energy intensity and electricity consumption (discussed in Section 1.2), Scope 2 electricity purchases resulted in a slight increase in Scope 2 GHG emissions. Future reductions in purchased electricity may be at risk due to the potential peak in energy intensity with the con-

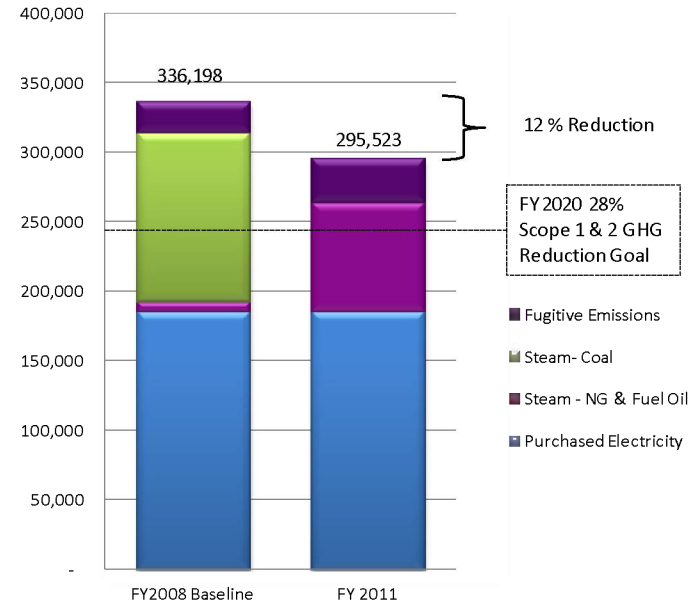


Fig. 1.1. Y-12 reduced Scope 1 and 2 emissions by 12% in FY 2011.

struction of UPF, minimal renewable energy projects, limited funding for high performance and sustainable building (HPSB) initiatives, and lack of funding for demolition of antiquated production facilities (requiring ongoing energy expenditures to maintain buildings in cold stand-down status awaiting final demolition).

Table 1.1. Y-12 FY 2011 Scope 1 and 2 GHG emissions compared to baseline

GHG Metric Ton CO ₂ e/yr				
Scope	GHG Emission Source	FY 2008	% Change	FY 2011
1	Steam- (Coal, Natural Gas, Fuel Oil)	128,654	-39%	78,404
1	Fugitive Emissions (SF ₆ , Vertrel, Others)	22,549	42%	32,097
1	Total Scope 1 (No Fleet Data)	151,203	-27%	110,502

GHG Metric Ton CO ₂ e/yr				
Scope	GHG Emission Source	FY 2008	% Change	FY 2011
2	Purchased Electricity	184,995	0.01%	185,021
1 & 2	Total Combined Scope 1 & 2 (No Fleet Data)	336,198	-12%	295,523
2020 Goal Year Target for 28% Reduction		242,063		
Additional Scope 1 & 2 Reduction Required to Meet Target		53,460		

The following changes to facilities and improvement initiatives contributed significantly to Scope 1 and 2 GHG emissions:

- Scope 1 GHG emissions from steam generation decreased dramatically (39%) due to modernization of the steam plant and conversion from coal to natural gas, and continued building demolitions and efficiency improvements that reduced requirements for steam generation (discussed in Section 1.2). FY 2011 was the first full year of operating the steam plant without coal, and site transition demolition projects removed more than 182,000 ft² of building footprint.
- Scope 2 GHG emissions from purchased electricity increased slightly in 2011 despite a 3% decrease in energy consumption due to numerous successful energy reduction initiatives and HPSB improvements completed in FY 2011 (described in Section 1.2). The increase in this GHG emission was due to changes to the emission factor assigned to estimate CO₂ emissions from regional electrical utilities (the emission factor for purchased electricity was 0.689 mtCO₂e/MWh in FY 2008 but increased to approximately 0.700 in FY 2011).
- Fugitive emissions increased 42% in FY 2011 primarily due to full implementation of a new non-ozone depleting machine tooling solution (Vertrel), which increased HFC-43-10mee GHG emissions by more than 13,000 metric tons CO₂e/yr. The process has been optimized to minimize use and loss of the Vertrel cleaning solution. However, this system was only partially converted to Vertrel in FY 2008, which resulted in a lower baseline usage and therefore a lower fugitive emission baseline. Y-12 has identified a non-GHG emitting replacement for Vertrel that is discussed in the section on Projected Performance.
- Sulfur hexafluoride (SF₆) emissions were reduced by 59% in FY 2011 (compared to baseline). Y-12's capture program includes sealed gas circuit systems at the ELZA switchyard and engineered controls and

interlocks that minimize leaks from the neutron generator and linear accelerator dome on X-ray machines used for non-destructive testing. The neutron generator/X-ray systems have been evaluated, and identified leaks have been repaired. No future actions are planned. Continued use of SF₆ is planned in UPF, but the system design process prioritizes minimization of leaks and emissions.

- Continued progress in management of the Y-12 vehicle fleet to maximize fuel efficiency and alternative fuel use and to streamline fleet vehicle numbers resulted in a moderate decrease in vehicle GHG emissions. Continued reduction in fuel use and improved efficiencies of the Y-12 fleet are expected to go beyond achievement of department-level Strategic Sustainability Performance Plan (SSPP) goals for fleet petroleum use and alternative fuels (Sections 1.6-1.9)

PROJECTED PERFORMANCE

Purchased electricity (Scope 2) is by far the biggest contributor to Y-12's GHG footprint, accounting for 63% of all Scope 1 & 2 GHG emissions. As shown in Table 1.1, Y-12 must eliminate nearly 53,500 metric tons of CO₂ emissions to meet the 2020 Scope 1 and 2 GHG performance goal, which is equivalent to reducing more than 75,000 MWh of purchased electricity. While opportunities for reducing Scope 1 fugitive emissions (by replacing Vertrel with a non-GHG emitting solution) will make a significant contribution toward reaching the goal, Y-12 needs a multifaceted approach, with reduced electricity consumption as a key focal point, to achieve a 28% reduction by 2020. Figure 1.2 demonstrates that energy reduction efforts must include major initiatives involving production facilities and utility infrastructure, since more than 57% of Y-12 electricity usage and associated CO₂ emissions are consumed primarily in these areas. The site transformation plan currently includes many elements that will reduce the number of operating facilities and utility infrastructure. This effort will, in turn, also reduce the electricity demand and GHG emissions. However, without significant funding for transformation and demolition, very little impact to energy intensity and Scope 2 GHG emissions can be implemented within these areas. Although construction will not be complete until after 2020, UPF will allow for a significant portion of the production facilities to be deactivated and eventually demolished, further reducing GHG emissions.

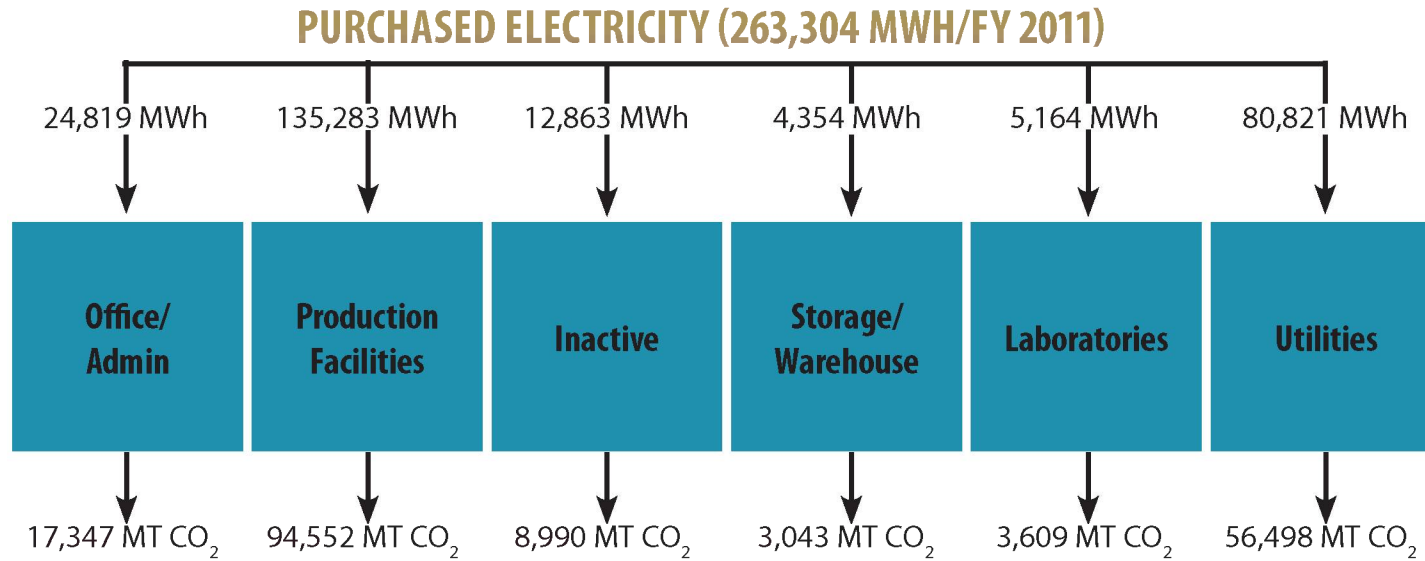


Fig. 1.2. A multi-faceted approach to reduce purchased electricity is needed to fulfill GHG footprint goals.

Table 1.2 presents conservative preliminary estimates of potential GHG savings from a combination of planned and proposed (currently unfunded) initiatives that address:

- Scope 1 fugitive emissions by implementing a safe substitute to Vertrel for machine tooling operations and
- Scope 2 emissions from purchased electricity by implementing site consolidation activities, including building demolitions and deactivation of 1940s-era production facilities.

Based on the estimates presented in Table 1.2, Y-12 has identified projects that, if fully funded and implemented, will result in GHG savings within a few thousand metric tons of the 53,460 metric ton reduction goal. However, the estimate is complicated by the lack of meters and data to accurately predict reductions, the timing of UPF startup and deactivation of facilities that take place in 2020 (the final goal year), and an unknown projected spike in energy intensity during UPF startup.

It is also possible that the additional reductions necessary to reach the target reduction could be achieved through energy reduction initiatives described in Sections 1.2–1.5 and HPSB activities in Section 3, which are not included in Table 1.2. A funded infrastructure reduction to eliminate some of the 1940s-era buildings would significantly improve Y-12 GHG emissions and would ensure achievement of the Scope 1 and Scope 2 GHG performance goal. Other initiatives that would further improve the goal include:

- assessing feasibility and funding opportunity for implementation of Vertrel substitute in Production.
- initiating plans (or determining feasibility) for evaluating data from newly metered buildings to generate information that will help to inform future estimates for “projected performance” of purchased electricity and Scope 2 GHG reductions.

Table 1.2. Potential GHG savings from improvement initiatives

Improvement Initiative	Timing	Potential Savings (mtCO ₂ e/yr)	Status
Scope 1 Fugitive Emission Reduction - Vertrel substitution in current machining processes (by 2014) and UPF processes (by 2020)	2020 (or 2014*)	28,000	Substitute has been identified and is planned for UPF project (2020). <i>*Additional funding is required for testing and implementation in the current process.</i>
Scope 2 Reductions - Site transformation plan building consolidation, closures and deactivation of production facilities (buildings cold and dark; production facilities not decontaminated but shut down and maintained in safe condition)	2012-2019	4,000	Continued funding for planned site transformation initiatives (savings estimated based on assumed 30% reduced energy intensity in 1.16 million ft ² during deactivation period)
	2020	19,000	
UPF Startup Operations - Estimated at 31.733 MWh/yr energy use (per the Y-12 2012 CEDR) (additional process loads are anticipated during startup due to concurrent operations)	2020	-22 [†]	Continued UPF project funding required
Net Reduction by 2020	2020	51,000*	<i>*Savings may be less than estimated due to additional process loads expected during UPF startup.</i>
Scope 1 & 2 Reductions - Demolition and removal of old 1940s-era production facilities during and after UPF startup.	2020-2021	53,000 [‡]	Funding required for demolition. There is no congressional funding for demolition and removal of large process facilities.
Overall Reduction with UPF and Removal of all deactivated 1940s-era facilities	>2021	>104,000	

† Additional process loads not included in estimate

‡ This is an additional savings beyond savings from initial closure, assuming 1.16 million ft² is removed from utilities.

Scope 1 Fugitive Emission Reduction: The Vertrel process is the source of a large fugitive GHG emission (HFC-443-10mee), which is dependent on production rates. Y-12 used 49,000 pounds of Vertrel last year with most lost to evaporation (approx. 28,900 metric ton CO₂e emissions). Y-12 Production operates a system to reclaim and reuse Vertrel, but the product is used in large open vats, which allows significant evaporation as it is processed. Y-12 Technology Development has completed studies to identify an alternate material that is targeted for implementation in UPF. This new cleaning process is described in the Y-12 development report, “*Machine Chip and Part Cleaning Alternatives (September 2011)*,” report #- Y/DZ-3310. This new process is being considered to replace Vertrel in the current plant operation. Additional funding is required to fully test and complete the conversion in current operations.

Scope 2 Reductions through Site Transformation: Current site transformation plans call for deactivation or removal of over 1.16 million ft² of buildings by 2020. Nearly 1 million ft² of this footprint is attributed to deactivation of production facilities 9204-4 and 9201-3. Full decommissioning and demolition of these facilities is unfunded, so current plans and funding levels include only cleaning out these large 1940s-era buildings to a level that will allow them to be deactivated and maintained in cold stand-down mode awaiting final remediation and demolition. This will require continued climate control and related steam and energy use to maintain the facilities in safe condition. Due to the lack of metering on many buildings slated for consolidation or removal, the emission savings under cold and dark shutdown/deactivation mode cannot be confidently predicted. The 23,000 metric ton savings shown in Table 1.2 is a preliminary estimate based on an assumed 30% reduction in energy intensity that could occur as a result of the consolidation and deactivation. The majority of the deactivations are planned for final disposition in 2020, making it possible that not all energy savings from these deactivations will be realized in the final goal year of FY 2020. A fully funded program to decontaminate the 1.16 million ft² of structures would significantly reduce GHG emissions by another 53,000 metric tons CO₂e/yr for a total reduction of more than 76,000 metric tons CO₂/yr (energy savings estimated at more than 100,000 MWh).

Once in full operational mode, energy requirements for UPF is estimated at 31.7 MWh, which equates to 22 metric tons of GHG emissions.

As shown in Table 1.2, Vertrel substitution combined with the current site transformation plan building closures and consolidations will contribute significant savings that may approach or even achieve the 53,640 metric tons of reductions needed to reach the performance goal target. However, funding issues will need to be solved in order to ensure these GHG savings are realized before the 2020 deadline. If no funding is available to implement the Vertrel replacement in the current manufacturing process, this initiative may not take effect until after UPF startup, which may limit the actual reductions realized in 2020. Additional funding to implement the Vertrel replacement in current processes will be needed to maximize the GHG savings.

Apart from the lack of meters to generate confident energy reduction estimates, future reductions from site transformation activities are difficult to estimate due to a projected increase to the site energy intensity during UPF startup. Current projections indicate increases may occur once UPF goes on-line, but it will again be reduced when funding is obtained for an infrastructure reduction program that will enable decontamination and demolition of remaining facilities in the site transformation plan. Once all processes are switched over to UPF and old buildings are demolished, electric, steam, and chilled water requirements would decrease significantly, with similar reductions in Scope 1 and 2 GHG emissions.

1.2 ENERGY INTENSITY

Y-12 is meeting the reduction goal and has achieved a 22.8% reduction in energy intensity from the 2003 baseline (Fig. 1.3). Overriding goals in this area include:

- reduce energy intensity 30% by 2015;
- continue energy reduction to facilitate GHG reduction by 2020;

- identify and reinvest cost savings in additional energy projects where appropriate; and
- create employee awareness by implementing smart meter technology and web-based energy metrics.

PERFORMANCE STATUS

Based on FY 2011 data, energy use at Y-12 is 2.14×10^{12} BTUs. The square footage is 7,143,781; therefore the FY 2011 estimated energy intensity is 323,004 BTUs/GSF (Fig. 1.4), which represents a 6.7% reduction compared to FY 2010. When compared to the baseline year of FY 2003, this represents a 22.8% reduction. The site has made good progress in implementing several energy reduction initiatives. Night setbacks were implemented on HVAC systems in several buildings last year. The energy usage reflected the reductions related to this effort almost immediately. Several of these same HVAC systems also underwent refurbishment, including new variable frequency drives and filter change-outs. Lighting upgrades also were installed in several locations. Although Y-12 is looking to implement LED lighting in more locations,

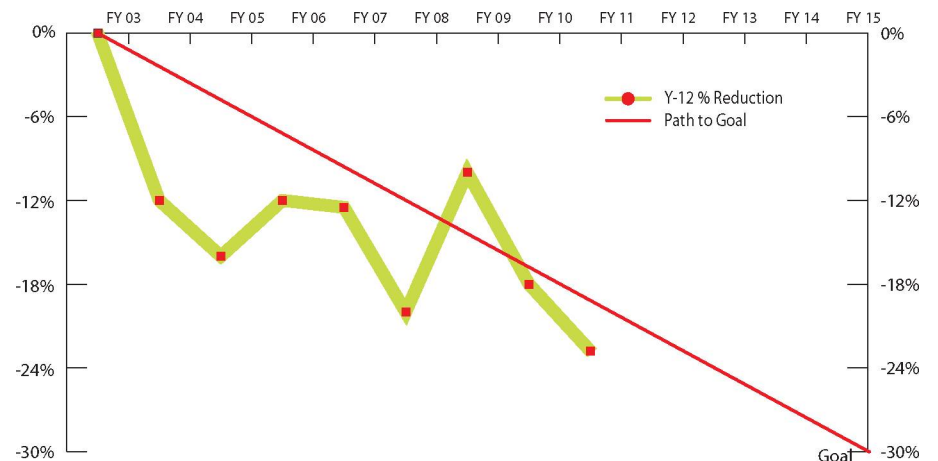


Fig. 1.3. Y-12 is meeting the reduction goal and has achieved a 22.8% reduction in energy.

several recent installations of the more efficient T-8 lighting have proven beneficial. Incandescent lighting is also being replaced with CFL lamps in several locations. A parking lot pilot project was initiated to study LED, induction, and high-pressure sodium lighting applications. Results so far indicate that LED lighting is the most efficient, followed closely by induction lighting. Additional data is still forthcoming, but the site is looking at increasing use of LED lighting in many applications.

In order to attain HPSB compliance, occupant sensors and WattStopper® smart strips were installed in the Jack Case Center. Although the sensors have just been installed, the energy reductions achieved from the installations should prove beneficial. Additional measures will include installation of setback timers on the 400-gallon water heaters for the cafeteria, an increase of the night and weekend HVAC setback to +/- 10 degrees, and building sub-metering. Similar measures will be implemented in Buildings 9113 and 9119 during FY 2012.

As Fig. 1.5 shows, the site has made incremental improvements in reducing energy consumption since 2003. Future reductions may be challenging due to a projected increase to the site's energy intensity. Current projections indicate increases may occur once UPF goes on-line but will again be reduced when an infrastructure reduction program can demolish the remaining facilities in the site transformation plan.

PROJECTED PERFORMANCE

The following efforts are planned to ensure continued site success for energy reduction.

- pursue ESPC
- consolidate data centers
- install advanced metering
- implement building retro-commissioning
- continue implementation of cool roof applications

Energy initiatives are also planned for several existing buildings.

- An intensive consolidation effort is underway in support of the site transformation plan. This will move personnel and processes into a more controlled environment and allow buildings to become cold and dark awaiting demolition.

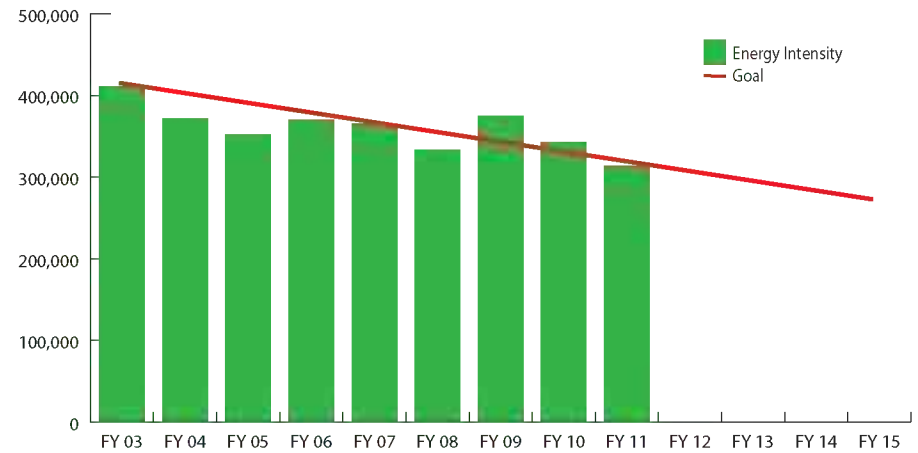


Fig. 1.4. The FY 2011 estimated energy intensity represents a 6.7% reduction compared to FY 2010.

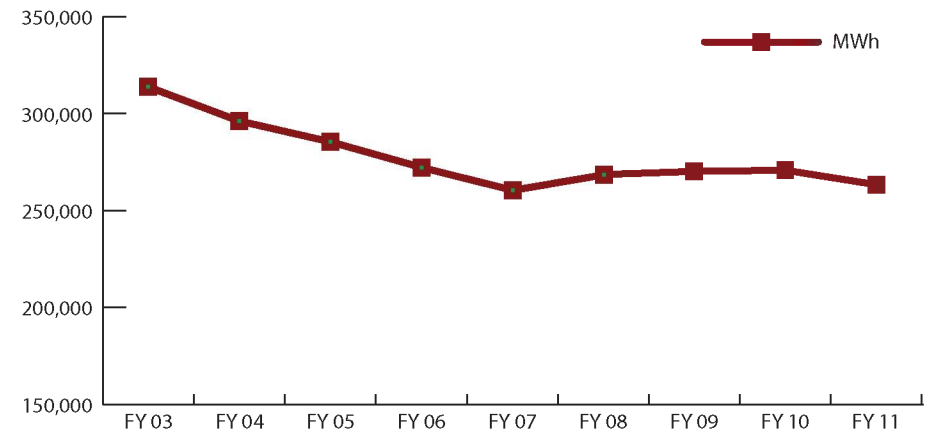


Fig. 1.5. The site has made incremental improvements in reducing energy consumption since 2003.

- HVAC units beyond design life are planned for replacement in several facilities. These replacements support the HPSB goal and ensure plant personnel are in environmentally friendly offices. This effort will also reduce maintenance efforts to keep the units functional.
- Lighting upgrades are planned to include LED low-bay fixtures in several areas that currently have high pressure sodium or metal halide fixtures. Although the initial investment may be greater than like-for-like replacement, the potential energy savings and return on investment make the lights the best choice.
- Occupant sensors will be installed in several HPSB candidate facilities. The sensors should help in the overall reduction of energy for the facilities and the plant.

Energy savings will be tracked on all the projects, and proven reductions may be reinvested for funding new energy projects. The impact of this analysis is not currently known, so actual reinvestments cannot be fully understood at this time. Both production and balance of plant facilities are funded under the Readiness in Technical Base and Facilities Operations of Facilities plan. Current budgets through FYNSP do not support minimum operations, which places energy projects at risk for dedicated funding. However, energy projects are included in outyear planning for the site and, where possible and with adequate return on investment, will be funded.

EISA ASSESSMENTS

Since Y-12 did not perform EISA assessments prior to FY 2011, an approach was presented to the Y-12 Site Office in November 2010 to begin implementation of EISA assessments. The list of selected facilities was based on a desire to evaluate potential energy savings within the chilled water process system and various distributed facilities (Table 1.3). The intent is to have 75% of metered electricity consumption completed by the end of FY 2012.

Table 1.3. EISA assessments

Property ID	Property Name	GSF	% of Plant Electricity Consumption
9103	Computing Facility	110,248	
9113	Office Building	59,299	0.25%
9119	Office Building	73,381	0.40%
9767-04	Utilities	6,893	5.91%
9117	Computing Facility	19,648	
9767-10	Chiller Building	12,000	8.96%
9767-13	Chiller Building	20,724	10.90%
9767-12	Chiller Bldg., 9737	3,089	
9201-03	Office Building	191,978	
9201-01	Production (Alpha 1)	270,988	2.30%
9215	Production	188,729	7.31%
9201-05N	Production (Alpha 5N)	78,049	1.84%
9201-05W	Machine Shop	70,005	2.02%
9114	Office Building	36,901	0.37%
9998	Maint., Machine Shops	152,134	5.89%
9401-07	Steam Plant	19,200	1.40%
9204-02	Production (Beta 2)	324,085	6.64%
9733-05	Technical Support Facility	13,322	
9767-08	Chiller Building	4,847	3.14%
9767-11	Chiller Building	4,880	2.11%
9204-02E	Production (Beta 2E)	172,892	2.46%
9115	Office Building	16,415	
9116	Office Building	16,415	
9202	Dev. Labs. & Offices	157,228	0.67%
9212	Production	442,317	17.13%
9203	Dev. Labs. & Offices	31,107	

Property ID	Property Name	GSF	% of Plant Electricity Consumption
9995	Plant Laboratory	81,655	3.16%
9737	Laboratory/Office	98,017	0.13%
9723-27	Changehouse	11,670	
9723-28	Changehouse	10,252	
9723-31	Changehouse	27,532	
9723-33	Changehouse	10,771	
9723-34	Changehouse	6,700	
9710-03	Guard Headquarters	41,496	

CERTIFIED ENERGY MANAGER

The current Y-12 energy manager is not certified. The certification is included in the training plans for FY 2012, as is LEED green associate training for the energy manager and several other employees. At present, there is one certified energy manager at Y-12 (not currently working in the program) and four LEED-accredited professionals.

1.3 METERING

In order to comply with EAct05, advanced meters are planned for installation on all enduring buildings greater than 5,000 GSF (Table 1.4). Priority installation of advanced meters will be given to those facilities that constitute 75% of plant energy consumption. Following the installation of the 75% metering, Y-12 will begin assessing the remaining facilities to determine the path forward for 90% compliance, with the focus on HPSB facilities. Most of these facilities are simpler in regards to feeder location and accessibility and, in most cases, will only require installation of a single meter.

Y-12 currently has in place numerous standard metering systems located on many major facilities throughout the plant as well as in various switchgear and secondary locations. The actual electricity costs for the plant are based on total energy consumption as defined by the Tennessee Valley Authority (TVA) revenue meters in the ELZA I substation. Electrical usage and cost are not dependent upon individual facility meters and are not further distributed to facilities or cost centers within Y-12. Monitoring of the ELZA I substation electricity usage is used to ensure accurate billing from TVA, identify potential energy conservation projects, and develop the annual utilities budget.

Y-12 recently received funding from the Energy Modernization Implementation Program (EMIP) to install meters throughout the plant. Y-12 intends to first focus on meter installations to comply with 2012 regulatory requirements. The EMIP program is also providing funding for natural gas, steam, chilled water, and potable water meters.

PERFORMANCE STATUS

An analysis of the Y-12 metering system was completed in December 2010. There are 203 meters installed on-site. Of these, 74 meters are installed on buildings, and 107 are installed on 13.8-kV and 480-V switchgear circuit and feeder meters. Prior to FY 2011, a minimal number of meters were read on a monthly basis. A performance based incentive was initiated to read all meters during FY 2011. During July, an intensive effort was made to identify and read all working meters in the plant.

PROJECTED PERFORMANCE

Meter installation plans are being developed to satisfy the requirement to meter HPSB and EISA facilities. Additional facilities may be considered for meter installations, but the current focus is to ensure compliance with the statutory requirements.

Table 1.4. Metering performance status

SSPP Metering Stretch Goals	FY 2011 Performance Status	Planned Actions and Key Issues
Install electricity meters on individual buildings or processes at each site so that these individually metered buildings and processes account for at least 75% of the site's total electricity use by October 1, 2011, working toward a goal of 90% by October 1, 2012.	75% by 2011 stretch goal: 68%	Based on current meter readings, Y-12 is metering and reading 80% of electricity consumption. However, several facilities are currently read as one value at the 13.8kV switchgear (Area 5). The EMIP project will provide separate metering of these facilities
	90% by 2012 stretch goal: 100%	Implementation of the EMIP project data sheets will complete the 90% stretch goal for electricity consumption by 2012 and will provide separate metering for the Area 5 facilities. This goal is currently on track.
Install natural gas, steam, and chilled water meters on individual buildings or processes so that these individually metered buildings and processes account for at least 10% of the site's natural gas, steam, and chilled water use by October 1, 2011, (10% for each utility) and 90% by October 1, 2015, (90% for each utility)	Natural Gas	
	10% stretch goal: 25%	A totalizing meter is installed on the steam plant, and each boiler is individually metered. In totality, the entire natural gas system is metered, with 100% of the gas flowing through these five meters.
	90% stretch goal: 100%	Three steam meters will be installed during FY 2012 to separately meter the remaining consumers of natural gas downstream of the steam plant. This will accomplish 100% metering for natural gas at the building level.
	Steam	
	10% stretch goal: 13%	Steam meters were installed on one facility during FY 2011. The analysis of the steam system is underway and a path forward is being developed. Depending on final cost of meter installations, funding may be an issue for fully executing the planned steam meter installations as defined in the EMIP project.
	90% stretch goal: 100% (not fully evaluated)	An analysis of the steam system is currently underway; it is possible, with adequate funding, Y-12 could meet the 90% goal by 2015 once the steam allocation is better understood and a plan has been developed.
	Chilled Water	
	10% stretch goal: Not fully evaluated	Y-12 has minimal chilled water meters installed, and none are planned under the EMIP project. An analysis of the chilled water system is underway to determine where metering should be installed and will be included in future updates to this plan. Funding may be an issue for fully executing the planned chilled water meter installations.
90% stretch goal: Not fully evaluated	An analysis of the chilled water system is underway; it is possible that Y-12 could meet the 90% goal by 2015 once chilled water allocation is better understood and a plan has been created.	
Independently meter 40% of agency data centers by October 1, 2011, working toward a goal of 100% by October 1, 2015	40% by 2011: 0%	Y-12 will not have any data centers metered by FY 2011. Meters are scheduled for installation on these facilities during FY 2012, achieving 90% compliance
	100% by 2015: 100%	Small data centers are located within facilities across the plant. A plan is being developed to identify enduring locations of data centers, which are dependent on a consolidation plan for data centers. Those identified as enduring will require building sub-metering to achieve the 100% target.

ELECTRICITY METERING

Electricity metering will be the primary focus of meter installations during FY 2012. The electricity metering goals are shown in Table 1.5. Meter installations identified for FY 2012 will complete all HPSB candidate facilities. The FY 2012 plan will also complete meter installations on the main data centers at Y-12. The primary funding source for meter installations is the EMIP program. Fifty-four facilities have been identified for meter installations. These buildings account for the EISA-covered facilities as well as the HPSB candidate facilities. Please note that the project data sheets for EMIP indicate a greater number of meter installations than are listed below as metered buildings. Many of the EISA-covered

facilities have numerous power feeds to the facility, which necessitates additional meter installations to adequately capture all energy usage for the building.

Once the FY 2012 meter installations are completed, Y-12 will evaluate the remaining facilities and determine the appropriate path forward for additional meter installations. This plan will be compared to the Master Plan and Ten-Year Site Plan to determine if the facilities are still on the enduring facility list and to verify if metering is cost effective.

Table 1.5. Electricity metering fiscal year comparison

Fiscal Year	Standard Meters			Advanced Meters			Appropriate Buildings	
	Cumulative Number of Buildings Metered	Cumulative Electricity Metered (kWh)	Cumulative % of Electricity Metered	Cumulative Number of Buildings Metered	Cumulative Electricity Metered (kWh)	Cumulative % of Electricity Metered	Number of Appropriate Buildings for Metering	Cumulative % of Appropriate Buildings Metered **
2010 Report	45	257,168,139	97%	6	22,371,312	2%	75	68%
2011 Report	45	257,168,139	98%	6	22,371,312	2%	75	68%
2012 Planned	23	37,223,749	14%*	52	253,311,984	79%*	75	100%
2013 Planned	19	22,635,893	8%*	85	269,304,306	96%*	75	139%
2014 Planned	19	22,635,893	8%*	106	270,343,370	96%*	75	167%
2015 Planned	19	22,635,893	8%*	106	270,343,370	96%*	75	167%
FY 2011 Total Site Electricity Consumption (KWh):				2,653,304,245				
Progress Towards FY 2011 SSPP 75% Stretch Goal:				68%				

*Estimated by recommended energy use intensity (EUI) method; generated total site energy consumption greater than site usage in FY 2010.

**Appropriate buildings, as defined by the calculation spreadsheet, does not necessarily correspond to the site requirement to install meters. In many cases, although not cost effective as determined by the calculation, it is in the best interest of the site to install meters.

NATURAL GAS METERING

Natural gas is currently consumed in three production facilities, as well as the Y-12 Steam Plant. The natural gas metering goals are shown in Table 1.6. Meters are currently installed at the Station C reduction station on Bethel Valley Road, on each boiler within the steam plant, at 9204-02, and at Area 5 (not facility specific). This existing metering configuration surpasses the 10% and 90% requirements for EPAAct05. However, the meters are not advanced and currently not read, so installation of

advanced gas meters is planned to meet the full intent of the goal. Current plans include installation of an advanced gas meter at the Steam Plant to capture total consumption, as well as at each separately identified facility:

- 9212,
- 9215,
- 9204-02, and
- 9401-07.

Table 1.6. Natural gas metering fiscal year comparison

Fiscal Year	Standard Meters			Advanced Meters			Appropriate Buildings	
	Cumulative Number of Buildings Metered	Cumulative Natural Gas Metered (BTU ^o)	Cumulative % of Natural Gas Metered	Cumulative Number of Buildings Metered	Cumulative Natural Gas Metered (BTU ^o)	Cumulative % of Natural Gas Metered	Number of Appropriate Buildings for Metering	Cumulative % of Appropriate Buildings Metered
2010 Report	0	0%	0%	1	0	100%	4	0%
2011 Report	1*	987,111.917	100%	1	0	100%	4	25%
2012 Planned	0	0%	0%	4	1,233,889.896	100%	4	100%
2013 Planned	0	0%	0%	4	1,233,889.896	100%	4	100%
2014 Planned	0	0%	0%	4	1,233,889.896	100%	4	100%
2015 Planned	0	0%	0%	4	1,233,889.896	100%	4	100%
FY 2011 Total Site Natural Gas Consumption (BTU ^o):				1,233,889.896				
Progress Towards FY 2011 SSPP 10% Stretch Goal:				25%				

*Multiple buildings metered together

STEAM METERING

Steam is vital to the operation of the Y-12 Complex. It is the primary source of building heat, both for personnel comfort and for equipment freeze protection. Freeze protection includes protection of critical services, such as fire systems and heat tracing of outdoor above-ground water systems. Other uses of steam in support of the production mission include the regeneration of dehumidification systems and the operation of steam-powered ejectors. Y-12 generates steam from the new natural gas fired steam plant (9401-07); the site does not separately purchase steam from a commercial utility district. As a result, there is no cost involved with steam other than from natural gas. However, the site realizes that some savings can be achieved from steam production by understanding the consumption and implementing potential energy saving initiatives.

No steam meters have been installed at the point of use. Some facilities have a pass-through installation within other facilities. This significantly complicates the ability to separately meter some areas. As the site continues analyzing the system, we will focus on installation of steam meters to comply with the 2015 goals (Table 1.7). Due to future transformation of the plant, not all facilities that currently use steam will be considered. Only those facilities determined to be enduring will be considered for meters. Additionally, steam heating continues to be a maintenance concern within many office facilities. Contaminates within the hot water loop have caused failures in valves and steam coils. As a result, the HPSB candidate facilities are being evaluated for replacement of HVAC units with another heat source. In those cases, metering will not be installed.

Table 1.7. Steam metering fiscal year comparison

Fiscal Year	Standard Meters			Advanced Meters			Appropriate Buildings	
	Cumulative Number of Buildings Metered	Cumulative Steam Metered (BTU ⁶)	Cumulative % of Steam Metered	Cumulative Number of Buildings Metered	Cumulative Steam Metered (BTU ⁶)	Cumulative % of Steam Metered	Number of Appropriate Buildings for Metering	Cumulative % of Appropriate Buildings Metered *
2010 Report	0			1	12,356		16	6%
2011 Report	0			2	125,925	1%	16	13%
2012 Planned	0			12	4,878,207	37%	16	75%
2013 Planned	0			16	5,936,870	45%	16	94%
2014 Planned	0			23	6,097,759	46%	16	119%
2015 Planned	0			27	6,118,527	47%	16	138%
FY 2011 Total Site Steam Consumption (BTU ⁶):				13,144,555				
Progress Towards FY 2011 SSPP 10% Stretch Goal:				13%				

*Appropriate buildings, as defined by the calculation spreadsheet, does not necessarily correspond to the site requirement to install meters. In many cases, although not cost effective as determined by the calculation, it is in the best interest of the site to install meters.

POTABLE WATER METERING

Y-12’s potable water system supplies sanitary water to 65 Y-12 facilities. The potable water system supports:

- fire protection systems, including sprinkler systems and fire hydrants, and emergency fire-fighting water storage;
- sanitary water systems, including emergency showers and eyewash stations, personnel decontamination facilities, drinking fountains, restrooms, changehouses, and the cafeteria;
- process water systems, including feedwater for the steam plant and demineralizer, makeup water for cooling towers, process cooling, cleaning and decontamination systems, chemical makeup systems, laboratories, and other miscellaneous needs; and
- 16-in. emergency backup water feed for Oak Ridge National Laboratory (ORNL).

Meters are installed on the potable water tanks and on various facilities within the plant. A minimal number of the meters within the facilities are currently read, and a verified location listing does not currently exist. The metering plan will include advanced meter installations for all enduring facilities as applicable to comply with the 2015 goal (Table 1.8). Additionally, new advanced meters will be installed on the potable water tanks, as the existing meters are flow meters, rather than totalizing meters.

Table 1.8. Potable water metering fiscal year comparison

Fiscal Year	Standard Meters			Advanced Meters			Appropriate Buildings	
	Cumulative Number of Buildings Metered	Cumulative Water Metered (Gal)	Cumulative % of Water Metered	Cumulative Number of Buildings Metered	Cumulative Water Metered (Gal)	Cumulative % of Water Metered	Number of Appropriate Buildings for Metering	Cumulative % of Appropriate Buildings Metered *
2010 Report	3	3,797	>1%	2	245		17	29%
2011 Report	3	3,797		2	245		17	29%
2012 Planned	3	3,797	>1%	24	477,910	48%	17	159%
2013 Planned				39	525,812	53%	17	229%
2014 Planned				49	580,244	58%	17	288%
2015 Planned				49	580,244	58%	17	288%
FY 2011 Total Site Water Consumption (Gal):				997,204				
Progress Towards FY 2011 SSPP 75% Stretch Goal:				29%				

*Appropriate buildings, as defined by the calculation spreadsheet, does not necessarily correspond to the site requirement to install meters. In many cases, although not cost effective as determined by the calculation, it is in the best interest of the site to install meters.

CHILLED WATER METERING

Chilled water is generated within Y-12 rather than provided from an outside source. There have previously been no attempts to capture or monitor total chilled water generated or amounts distributed to facilities. BTU meters are currently installed in 9767-08, 9767-11, 9767-13, and 9720-82 but do not capture all output from the facilities. Additional BTU meters are planned for chiller buildings, production buildings, and other known large consumers of chilled water. Y-12 fully understands the need to meter chilled water consumption within facilities for total energy use, but meters are not included in the FY 2012 metering plan. The chilled water system and distribution is being analyzed to determine the path forward for metering of facilities in future years. At this time, the site does not have enough available data to fully populate the table.

DATA CENTERS

Y-12 has two main on-site data centers. At present, they are both included in the FY 2012 EMIP metering plan.

1.4 COOL ROOFS

The Y-12 Site is meeting the requirements for cool roof implementation. Since 2002, more than \$30.1 million of Y-12 support funding has been invested in roofing replacements, which has resulted in more than 20 acres of new roofing across the Y-12 Complex (Table 1.9). This has increased the average remaining roof life to 10.42 years, which is above the 10-year industry standard.

The cool roof technology began full implementation at Y-12 in FY 2008, and all future roof replacements will use this roofing technique where practicable and economically feasible (Fig. 1.6).

PERFORMANCE STATUS

All roofing replacement work at Y-12 is being performed under the Roof Asset Management Program. Y-12 investments in roofing have resulted in more than 20 acres of new roofing across the complex; 15% of Y-12's total roof areas consist of cool roof applications (379,913 GSF), with ad-



Fig. 1.6. All future roof replacements will use the cool roof technology.

ditional cool roof projects being implemented as funding becomes available. The buildings in Table 1.9 show the current status of cool roofs at Y-12.

Table 1.9. Cool roof status

Property ID	Building GSF	Total Roof Projected Area (GSF)	Reflective Area (GSF)	Total Cool Roof Area (GSF)	Planned Complete Cool Roof Dates
9113	59,299	21,021	21,021	21,021	Complete
9117	19,648	19,680	19,680	19,680	Complete
9203	31,107	25,323	13,060	13,060	Complete
9212	442,317	157,733	95,300	95,300	Complete
9998	152,134	48,300	48,300	48,300	Complete
9201-01	270,988	71,309	52,000	52,000	Complete

Property ID	Building GSF	Total Roof Projected Area (GSF)	Reflective Area (GSF)	Total Cool Roof Area (GSF)	Planned Complete Cool Roof Dates
9201-5W	70,005	48,000	48,000	48,000	Complete
9225-03	9,260	9,260	9,260	9,260	Complete
9712-01	4,697	4,697	4,697	4,697	Complete
9712-1N	10,509	10,509	10,509	10,509	Complete
9712-01S	9,319	9,319	9,319	9,319	Complete
9723-34	6,700	6,700	6,700	6,700	Complete
9733-05	13,322	13,327	13,327	13,327	Complete

PROJECTED PERFORMANCE

As indicated in Table 1.10, cool roof projects have been identified for completion in 2012 that began in 2011. Other cool roof projects have been identified and are to begin in the spring of 2012. There are approximately 13 additional buildings that have been identified for FY 2012 as candidates for cool roofs as funding becomes available.

Table 1.10. Planned cool roof activities

Property ID	Building GSF	Total Roof Projected Area (GSF)	Reflective Area (GSF)	Total Cool Roof Area (GSF)	Planned Complete Cool Roof Dates
9103	110,248	39,288	38,291	38,291	2012
9119	73,381	18,345	18,345	18,345	2012
9202	157,228	20,200	5,600	5,600	2012
9203	31,107	26,208	4,643	17,703	2012
9215	188,729	45,900	17,000	17,000	2012
9204-2E	172,892	66,869	56,311	56,311	2012
9201-03	191,978	70,582	41,549	41,549	2012
9201-01	270,988	140,145	2516	TBD	Future

Property ID	Building GSF	Total Roof Projected Area (GSF)	Reflective Area (GSF)	Total Cool Roof Area (GSF)	Planned Complete Cool Roof Dates
9201-5W	70,005	45,099	3,170	TBD	Future
9105	7,667	4,362	4,362	TBD	Future
9202	157,228	69,121	6,566	TBD	Future
9710-02	27,673	19,191	3,640	TBD	Future
9404-10	3,380	3,334	3,334	TBD	Future
9995	95,373	44,796	1,595	TBD	Future
9727-04	1,752	1,752	2,801	TBD	Future
9723-25	18,974	18,974	7,956	TBD	Future
9815	1,752	1,722	695	TBD	Future
9204-02	324,085	324,085	6,384	TBD	Future
9616-07	26,054	26,054	2,180	TBD	Future
9212	442,317	442,317	1,379	TBD	Future

1.5 RENEWABLE ENERGY

Due to the purchase of Renewable Energy Certificates (RECs), the Y-12 site is meeting the 7.5% electricity consumption goal for FY 2010, 2011, and 2012. The Green-e certified RECs in the amount of 21,000 MWh/yr support wind energy generated at Pioneer Prairie Wind Farm I in Iowa.

PERFORMANCE STATUS

Y-12 uses small photovoltaic panels to supply power to water sampling equipment and the Y-12 Complex flagpole light. While these do not approach the 7.5% electricity requirement, they demonstrate a sustainable mind-set, and the site is actively pursuing larger projects for possible installation.

PROJECTED PERFORMANCE

Although it is doubtful the site would ever achieve the 75% initiative, Y-12 is investigating three renewable energy installations: vertical-axis wind turbine (VAWT), solar parking array, and steam station generator.

VERTICAL AXIS WIND TURBINE

The site is actively working with a vendor to collect data related to wind speed at Y-12. Anemometers have been installed on the south ridge and on top of 9201-03 to determine if the average wind speed will support the VAWT installation. If the data supports the installation, a 10kW VAWT would be installed; if the project is successful, additional installations may follow.

SOLAR PARKING STRUCTURE

Several locations have been identified as ideal candidates for a solar parking structure. Although initial installations would be small, the long term plans would be to install several structures to eventually attempt to provide a zero-energy facility. Both the north portal parking lot and the New Hope Center have been identified as good candidates for the installation. Although funding is an issue, the project is being included in the site planning to ensure renewable energy is included in the prioritized project plan.

STEAM STATION GENERATOR

Although currently only in the investigation phase, a steam station generator could be an ideal renewable source for Y-12. The generator acts as a pressure-reducing station in a steam line. "Pressure energy normally dissipated by reducing steam pressure through a pressure-reducing valve is instead converted to power by channeling that steam through a patented radial outflow turbine. The Microsteam turbine then generates electricity that can be used in the building." (Carrier 2009)

1.6 TRANSPORTATION AND FLEET

Each year, the size of the fleet has been reduced as the site transforms to a smaller footprint. Shared vehicle pools are used at various facilities; this has enabled the site to reduce the total number of vehicles required to support the population. Additional measures are also being reviewed, including adjusting the shuttle routes to maximize the most benefit from the mass transit of personnel. Currently, all vehicle acquisition activities are directly related to replacement of existing inventory and are not additions to the fleet.

PERFORMANCE STATUS

The Y-12 site has already surpassed the petroleum reduction goal by achieving a 48% reduction within 5 years. Furthermore, the site has achieved a 342% increase in alternative fuels from the 2005 baseline. The site continues to assess ways to reduce fuel consumption, and the use of hybrid and electric vehicles is being evaluated.

PROJECTED PERFORMANCE

Actions are planned for continued progress in fleet management.

- Increase the use of hybrid electric vehicles as they become available (Fig. 1.7)
- Develop and implement a plan for installing electric charging stations throughout the plant. Y-12 is working with EcoTotality to possibly install Blink charging stations at Jack Case and New Hope Centers
- Evaluate a "preferred parking" initiative for energy-efficient and/or electric vehicles

1.7 FLEET PETROLEUM REDUCTION

In accordance with the 2005 baseline of fuel usage, the site has exceeded the goal for petroleum reduction by 48%. Table 1.11 is a Y-12 fuel statistic pulled from the Flow and Analysis System for Transportation (FAST) Data Consistency Report, showing the goal will be reached through 2018.



Fig. 1.7. Electric carts are used within the protected area of Y-12.

Table 1.11. Fleet petroleum reduction statistics

2005 baseline	2011 data	% increase/decrease	E.O. 13423 Goal
160,126 gal	82,928 gal	48% decrease	2%-per-year decrease

PERFORMANCE STATUS

Shared vehicles have been distributed to large groups in facilities that house multiple and/or large organizations. Shuttle buses run throughout the day in the various areas of the plant. While there is pressure to reduce miles, there is equal pressure to ensure vehicles are driven

a designated number of miles per month. Although this may seem contradictory, the plan is to actually reduce the total number of vehicle holdings based upon the actual number of miles that a vehicle runs. If a vehicle does not achieve the minimum number of required miles, it will be pulled and either excessed or reassigned, depending on site demand and requirements.

NON-FLEET VEHICLE AND EQUIPMENT FUEL USE

Non-fleet fuel usage (Table 1.12) is closely tied to the fleet management program, as alternative fuels are brought into use for future vehicles. However, the non-fleet equipment is a variety of types and ages. This wide-ranging category includes lawnmowers, forklifts, buggies, loaders, air compressors, generators, and tractors. This equipment is used relatively infrequently and is costly and difficult to replace. The fuel consumption of non-fleet vehicles and equipment is approximately 12% that of fleet vehicles and is tracked in a similar manner. As non-fleet equipment is phased out, future equipment purchases will consider energy use in accordance with sustainable acquisition guidance. Newer equipment will most likely be more energy efficient.

Table 1.12. Non-fleet petroleum reduction statistics

2005 baseline	2011 data	% increase/decrease	E.O. 13423 Goal
14,378 gal	9,844 gal	32% decrease	2% per year decrease

1.8 ALTERNATIVE FUEL VEHICLES

In accordance with the 2005 baseline of fuel usage, the site has already exceeded the alternative fuel usage goal.

PERFORMANCE STATUS

Since there is a ready supply of E-85 fuel on site, all AFVs use the fuel 100% of the time. Biodiesel was introduced to the site in 2007. In 2008 the increase in the cost of biodiesel versus the benefits was measured and determined to not be cost-effective. Therefore, ultra-low diesel was purchased and used throughout 2011. All diesel vehicles were required to use the ultra-low fuel.

Table 1.13 presents a Y-12 fuel statistic pulled from the FAST Data Consistency Report, showing that the goal has been reached through the year 2020.

Table 1.13. Alternative fleet usage statistics

2005 baseline	2011 data	% increase/decrease	E.O. 13423 Goal
4,801 gal	21,236 gal	342% increase	10%-per-year increase

PROJECTED PERFORMANCE

Overall, it will be very difficult for the site to continue to reduce fuel consumption by 2% per year and to increase non-petroleum consumption by 10% annually. However, based on the 2005 baseline of fuel consumption and alternative fuel use, the site has already achieved the goals. Due to the fact that the fleet program procures vehicles through GSA auctions as required, this restricts the opportunity to improve alternative-fuel use. The vehicles procured are available “as is,” which means they may or may not be an AFV. Without additional funding for bringing in newer, more fuel-efficient vehicles and for replacing unleaded vehicles with E-85, electric, or hybrid models, Y-12’s future opportunities are scarce.

Consideration of funding source options for vehicle replacements continue. Funds would be collected into a single account useable by Fleet Management to fund the acquisition of new and replacement vehicles, as appropriate.

1.9 REDUCE FLEET INVENTORY

The NNSA’s fleet reduction goal for FY 2011 is 4% based on the 2005 inventory baseline. The reduction percentages for FY 2012 and FY 2013 will be determined at a later date.

PERFORMANCE STATUS

Since 2005, in support of the NNSA reduction goal, Y-12 has reduced its fleet four of the six years. The two years of increases in fleet inventory were due to mission requirements for special projects such as HEUMF, ARRA, and UPF. Over the past six years, there has been an overall reduction of 4%.

PROJECTED PERFORMANCE

Y-12 will continue to monitor vehicle usage and redistribute or remove vehicles from the fleet as needed. As replacements are needed, purchases will consider energy use in accordance with Environmentally Preferable Procurement guidance and will be more energy-efficient. Vehicle sharing has been expanded to larger groups in facilities that house larger concentrations of workers and shuttle buses run throughout the day in various areas of the plant to accommodate employees.



2. Scope 3 GHG

Y-12 is not currently meeting the Scope 3 GHG emissions goal against the 2008 baseline (Table 2.1). Y-12's Scope 3 GHG emissions have increased by 3% since FY 2008. This increase is proportional to the increase in site population due to mission activities, including ARRA projects.

Table 2.1. Y-12's GHG emissions

Scope 3 GHG Emission Source	FY 2008 Baseline (mt CO ₂ e)	FY 2011 Results (mt CO ₂ e)	% Change
Employee Commuting	17,447	18,209	+3.3%
Business Ground and Air Travel	2,251	2,517.5	+11.8%
Transmission and Distribution Losses	12,185.8	12,122.2	-0.5%
Contracted Off-Site Wastewater Treatment	30.4	31.4	+3.3%
Contracted Off-Site Municipal Waste Disposal	N/A	N/A	N/A
Total:	31,914.2	32,880.1	+3%

PERFORMANCE STATUS

EMPLOYEE COMMUTING

While overall Y-12 commuting GHG emissions have increased by 3.3% since the 2008 baseline, the commuting emissions have decreased 2.9% since 2010. Y-12 has used a multi-pronged approach to reduce the impacts of Y-12 employees' commute to work each day and has a well established carpooling/ride share program since there are minimal public transit options available to Y-12 employees.

The majority of Y-12 operations transitioned to a 4/10 work week prior to 2008. This saves transportation costs for employees, cuts down on vehicle emissions, and reduces Y-12's natural gas and electricity needs.

BUSINESS GROUND AND AIR TRAVEL

The business ground and air travel GHG emissions increased significantly in FY 2011 due to an increase in overseas travel by Y-12 employees. While employees need to occasionally travel as part of their jobs, Y-12 strongly supports the use of webinars and conference calls to avoid business travel. If travel is required to support mission needs, Y-12 strongly encourages its employees to use available shuttles and mass transit rather than renting a car once they reach their destination.

TRANSMISSION AND DISTRIBUTION (T&D) LOSSES

TVA includes any transmission losses at Y-12 in its rates, stating in Transmission Service Guidelines that TVA Transmission System average losses "shall be three (3) percent."

CONTRACTED (OFF-SITE) WASTEWATER TREATMENT

The increase in contracted off-site wastewater treatment GHG emissions is proportional to the increase in plant population. Y-12 is continuing modernization efforts to reduce the amount of water that requires off-site treatment. The addition of the new Steam Plant has reduced the quantity of water from steam production that requires off-site treatment.

CONTRACTED (OFF-SITE) MUNICIPAL WASTE DISPOSAL

The Y-12 Complex does not send any municipal waste off-site for disposal. All municipal waste generated at Y-12 is sent to the on-site landfill.

PROJECTED PERFORMANCE

It will be difficult for Y-12 to meet the reduction goal for Scope 3 GHG emissions without the addition of public transit to the Oak Ridge area and/or a telecommuting program. To further reduce employee commuting, Y-12 will continue to encourage the use of the Y-12 carpooling and ride share programs. Y-12 has recently added bike lanes to facilitate commuting by bike and will continue the 4/10 workweek. To assist with business travel reduction, Y-12 will continue to promote the use of teleconferences and mass transit while on business travel, and is evaluating methods to enhance teleconference and webinar capabilities to reduce the need for travel.

Y-12 is continuing modernization efforts related to the wastewater system. An example of the modernization efforts includes the reduction of stormwater infiltration into the sanitary sewer system via infrastructure upgrades and ongoing preventive maintenance activities. Y-12 plans to benchmark the Scope 3 GHG emission reduction activities at other DOE facilities.



3. High Performance and Sustainable Buildings

Y-12 is diligently working to meet the HPSB goal. Successful achievement of the Guiding Principles is contingent on sufficient funding and resources to implement identified projects.

3.1 EXISTING BUILDINGS

Sufficient funding is required for Y-12 to meet the HPSB goal. Candidate buildings that will meet the Guiding Principles are aged and approaching end of life, and although projects are identified for the buildings, the effort is beyond anticipated funding levels.

Incremental steps will be taken each fiscal year to incorporate sustainability replacements into the budget profile. Until a definitive funding source is identified, it is doubtful that Y-12 will achieve the FY 2015 targets as identified.

PERFORMANCE STATUS

Y-12 was challenged to make the Jack Case Center (JCC) an HPSB and Guiding Principle compliant during FY 2011. The facility was construct-

ed in 2007 and was designed to be LEED compliant. The design team opted to not seek LEED certification, but the facility was built to energy efficient standards. The challenge in meeting the Guiding Principles after construction is the 20% energy reduction requirement. When the effort began, JCC showed a 7% reduction from the 2007 baseline as noted in the EPA Portfolio Manager. Initiatives to reduce energy were implemented, including:

- night and weekend HVAC setbacks,
- occupant sensors,
- WattStopper smart strip installation, and
- modifications to cafeteria operations.

By December, the facility was showing a 14% reduction from the baseline. However, this did not include the installation of occupant sensors, plug-load smart strips, HVAC setbacks, and associated energy reduction initiatives. It is anticipated that the December meter data will reflect the 20% reduction to achieve HPSB status for Jack Case.

One of the goals at Y-12 is consolidation of operations and personnel to meet the transformation plans outlined in the Ten-Year Site Plan and Master Plan. This consolidation will allow the site to maximize cold shutdown of older buildings and invest in enduring facilities to support HPSB requirements. Ninety-eight buildings have been identified in the Facility Information Management System that meet the 5,000 GSF and enduring status. The 15% building count requirement indicates 12 buildings must be targeted for HPSB compliance (Table 3.1). The site currently has one LEED facility and one that has met the HPSB criteria. Y-12 will focus on the following facilities this year:

- JCC
- 9113
- 9119
- 9201-03

The HPSB surveys for Y-12 facilities were completed in FY 2010. Data was migrated to the EPA Portfolio Manager training during FY 2011. The site is using this method to track progress in achieving the Guiding Principles.

Although there continues to be conflicting guidance regarding the 2015 goal, Y-12 has identified buildings for best application of the Guiding Principles. Once the site meets the goal of 15% compliance, Y-12 will continue assessing and renovating enduring buildings to reach 100% Guiding Principle compliance. See CEDR Worksheet 5.3, “Existing Buildings HPSB,” for additional information. FY 2011 initiatives that contributed to the sustainability of facilities and aided in progress toward achieving the Guiding Principles include the following:

- Energy reduction initiatives in JCC.
- Retro-commissioning and HVAC improvements in Buildings 9737, 9203, 9119, and 9710-03.
- Chiller efficiency (ESPC efforts).
- Reconnecting of HVAC controls to Utility Management System.
- Off-shift temperature setbacks.
- Steam trap replacements.
- Lighting fixture upgrades.
- Steam meter installation.
- EMIP funding for advanced metering.

Y-12 continues to make incremental progress within budget constraints.

PROJECTED PERFORMANCE

The site has to meet HPSB criteria in an additional 12 buildings to meet the FY 2015 goal. Y-12 is incorporating cost-effective, innovative building strategies, such as cool roofs, low-flow fixtures, advanced metering, and retro-commissioning, to minimize the consumption of energy, water, and materials. Planned activities include replacing outdated equipment and furnishings, upgrading to energy-efficient and sustainable building components, and updating obsolete equipment to current technology. Projects identified to meet site FY 2012 goals are funded; however, all new project starts are on hold pending sufficient funding. Although out-year projects are above FY 2013/2015 baseline budgets, the site will continue to execute energy projects as funding becomes available or as they can be accomplished incrementally within existing funding profiles.

Table 3.1. HPSB targets

Building	Name	GSF	Year Target
602 SCA	New Hope Center	137,758	
301 BCR	Jack Case Center	411,837	2012
9113	Office Building	59,299	2012
9119	Office Building	73,381	2012
9225-03	Production Facility	9,260	2013
9401-07	Steam Plant	19,200	2013
9720-82	Storage Building	153,001	2013
9733-05	Office Building	13,322	2013
9106	Offices	15,990	2014
9109	Offices	9,788	2014
9114	Office Building	36,901	2014
9115	Office Building	16,415	2014
9116	Office Building	16,415	2014
9117	Central Computing	19,648	2014
9103	Central Computing	110,248	2014

As funding and resources allow, additional facilities may be refurbished toward HPSB compliance (Table 3.2).

Table 3.2. Additional HPSB targets

Building	Name	GSF
9624	Environmental Support Facility	37,372
9737	Laboratory/Office	98,017
9201-03	Office Building (Alpha 3) Maintenance	191,978
9712-1N	North Garage Bay	10,509
9712-1S	South Garage Bay	9,319

Building	Name	GSF
9720-94	Record Storage Facility	9,437
9723-27	Changehouse	11,670
9723-28	Changehouse	10,252
9723-31	Changehouse	27,532
9723-33	Changehouse	10,771
9723-34	Changehouse	6,700

3.2 NEW CONSTRUCTION

The planned UPF is an integral part of Y-12's long-range transformation plan to consolidate and enhance production operations. The UPF project team is committed to sustainable design strategies not only to meet HPSB requirements but also to incorporate LEED as a means of monitoring the achievement of the sustainable goals for the project. The current scope of the UPF project is based on LEED New Construction (NC) v2.2, with a goal of achieving enough LEED credits to gain a LEED Silver rating. The UPF project team has been requested to utilize LEED 2009 and is pursuing certification by USGBC to align more closely with the sustainability goals for the Y-12 site.

PERFORMANCE STATUS

An integrated project team representing architecture, engineering, construction, procurement, and project management has been established. Team members with HPSB experience, including a LEED accredited professional, have identified LEED credits that could be pursued for the UPF project that would also support HPSB Guiding Principles. The sustainable goals for the UPF project have been documented on a separate LEED scorecard for the administration building, production support facility (PSF), and the UPF main building to record the LEED prerequisites that will be achieved and the LEED credits that will be pursued for each building.

The project team identified and incorporated cost-effective life cycle energy, water, materials, site, and indoor environmental quality principles into the design and will track and maintain these features throughout construction and life of the complex. The production and maintenance of a 3D Building Information Management (BIM) model for the project is instrumental for project planning, integration, and design.

PROJECTED PERFORMANCE

The UPF complex will include innovative design features to reduce and improve energy efficiency beyond requirements of current energy codes. Insulation provided for external walls and roofs will exceed minimum requirements. Reflective roofing materials will be used to reduce the heat-island effect. Highly efficient windows for fenestration will exceed requirements for solar heat-gain reduction and overall heat-transfer coefficients. Heating and cooling loads will be reduced by incorporating these features and providing an efficient building envelope. Windows with sunshades and light shelves and highly efficient insulated skylights will be used to bring natural light into the occupied spaces and reduce the interior lighting load. Low power-consuming LED and/or fluorescent lighting also will be incorporated to further reduce the amount of energy required for lighting interior spaces. LED task lighting controlled by occupancy sensors will be provided at all gloveboxes to further optimize energy performance. The HVAC systems will use high-efficiency fan motors and variable speed drives to reduce energy consumption. The HVAC systems selected for the UPF complex will eliminate emission compounds that contribute to ozone depletion and global warming. Waste heat from the instrument air compressors will be used to supplement heating the PSF.

Landscaped areas at the administration building will include native and climate-tolerant plants and be mulched to conserve moisture by preventing evaporative water loss. Landscaping is not planned for the PSF and main UPF building due to security concerns. Potable water will not be used to irrigate landscaping. The UPF project will employ strategies that will collectively reduce domestic water consumption by 37% for the PSF and 43% for the administration and main UPF buildings. Using efficient low-flow toilets and urinals throughout the entire complex will provide significant, long-term cost and environmental savings. Reducing the

amount of potable water used will also decrease the amount of waste that enters the wastewater systems.

The UPF project will divert a minimum of 50% of construction waste from the landfill by reusing or recycling demolition debris and construction materials. Existing asphalt that will be demolished will be reused to pave the new access road and other areas around Y-12. Existing power poles to be demolished will be reused for new and temporary lighting. Reusing these materials on-site not only diverts waste from the landfill but also decreases the environmental impact of transporting the material off-site. Other construction waste, including packaging materials, will be recycled to the greatest extent possible. The 3D BIM model may be used to help reduce and quantify construction waste.

The UPF project will maximize use of materials that reduce detrimental environmental effects, including using regional materials, bio-based materials that contain recycled content, and products made from rapidly renewable content when appropriate. Materials and finishes specified for interior use will be low or no VOC-emitting products, which will provide a safe, healthy, and productive environment. The 3D BIM model will be used wherever possible to manage the environmental impact of materials.

4. Water Intensity

Y-12 is currently meeting the water intensity reduction goals and storm water initiatives. Y-12's reduction in water intensity exceeds the FY 2016 target of 16% as well as the FY 2026 target of 26%. Prior to FY 2011, Y-12 had stated that the site did not use industrial, landscaping, and agricultural (ILA) water. However, the site was required to begin including leased facilities into the sustainability goals in FY 2010. The site recognized this year that both Jack Case and New Hope Centers have irrigation, and should be included in this category.

4.1 POTABLE WATER REDUCTION

All potable water consumed at Y-12 originates from Melton Hill lake as raw water and is pumped across the ridge to the City of Oak Ridge water treatment plant, which is located within the Y-12 boundary. Y-12 purchases both potable and raw water from the city for all domestic and industrial applications. Raw water is currently used to augment the flow of Bear Creek in order to meet the Tennessee Department of Environmental Compliance permitting.

A number of water conservation measures have been identified for the plant. These have resulted from both internal and Federal Energy Management Program assessments.

PERFORMANCE STATUS

By the end of FY 2011, the site has achieved a 33.8% reduction in potable water use since the baseline was established (Fig. 4.1). During FY 2011, the site noted a reduction of 7%. Actions that contributed to the reduction included:

- Cooling Tower retrofits included in the ESPC contract.
- Steam Trap repairs and improvements.
- Condensate return repairs and reroutes.
- Clean out and shutdown of 9201-05, 9204-04, and 9401-03.

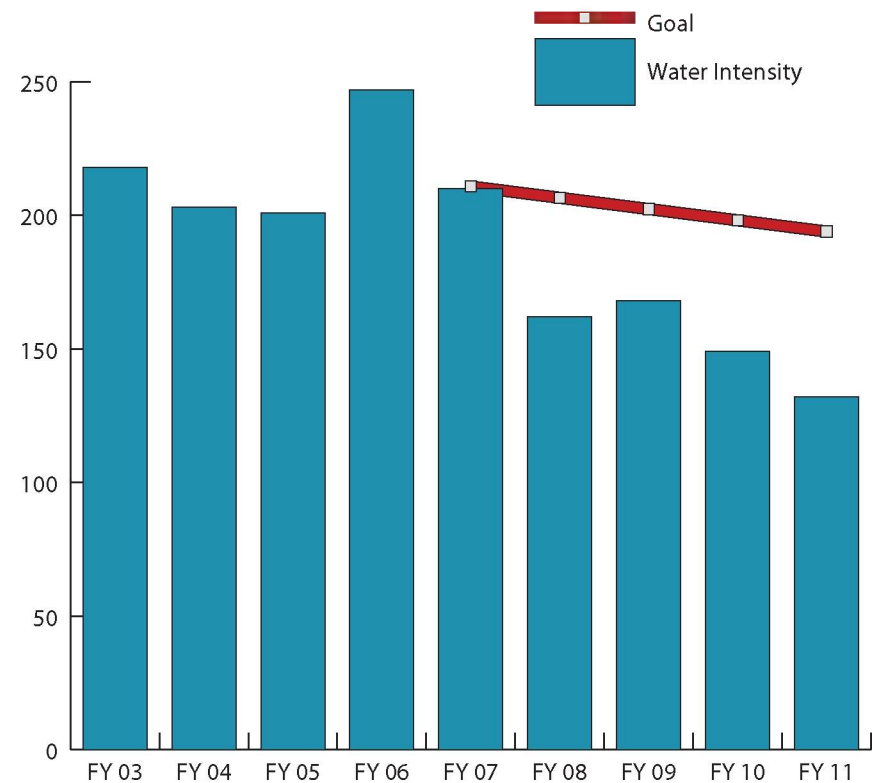


Fig. 4.1. Y-12 is currently meeting the water intensity reduction goals.

PROJECTED PERFORMANCE

Continued reductions in water usage will be incorporated into ongoing facility repairs and renovations as funding becomes available. These efforts will include:

- Upgrading toilets and urinals to low-flow, hands free units.
- Installing flow restrictors on faucet and shower heads.
- Modifying cafeteria components including high-efficiency dish washer with Opti-Rinse technology and in-line flow restrictors on garbage disposal and tray conveyor trough nozzle supply lines.
- Repairing condenser loop connections so that all condenser water is returned to the cooling towers.
- Replacing existing water-cooled air conditioning system with air-cooled equivalents.
- Installing advanced potable water meters.
- Incorporating additional condensate recovery projects to include further end-use capture sites for condensate return.

Many of the domestic upgrades are identified in the Balance of Plant Plan for implementation on a building-by-building basis as funding allows.

Similarly, many of the cooling tower upgrades are prioritized in the Utilities Migration Plan and will be evaluated accordingly for implementation as funding permits

4.2 INDUSTRIAL, LANDSCAPE, AND AGRICULTURAL WATER

The goal criteria for ILA water consumption is a 20% reduction by FY 2012 from a 2010 baseline. As mentioned, Y-12 noted this year that both Jack Case and New Hope Centers consume potable water for irrigation purposes. Although the systems are not currently metered, specific steps are being taken to reduce and eliminate this consumption.

PERFORMANCE STATUS

New Hope Center was constructed with a rainwater capture system for irrigation purposes. However, during periods of draught, the irrigation system is augmented by potable water.

Jack Case uses potable water for all irrigation, with no augmentation of any type.

PROJECTED PERFORMANCE

The Jack Case irrigation system was identified during FY 2011 as a needed reduction to meet the Guiding Principles. The system has been shut down for the winter, and a project is being developed to transfer the system from potable water to the site raw water system. This conversion will take place prior to April 2012.

The New Hope Center will be evaluated to identify an alternate source of water for augmentation. Once an alternate source is identified and Jack Case is converted, this will effectively eliminate the ILA water consumption at Y-12.



5. Pollution Prevention

The Y-12 Pollution Prevention (P2) Program is designed and implemented to fully comply with state, federal, DOE, and NNSA requirements concerning pollution prevention as well as to identify and assist with the implementation of sustainable, technically-feasible, and cost-effective pollution prevention activities.

The Y-12 P2 Program provides technical assistance to employees and organizations at the Y-12 Complex. This assistance includes identifying ways to eliminate waste streams; changing waste generator processes to reduce the volume or toxicity of waste streams; and segregating waste streams to allow for efficient reuse, recycle, or treatment for storage or disposal. The P2 Program conducts Pollution Prevention Operational Assessments to evaluate Y-12 processes and operations for potential opportunities to apply P2 techniques to implement sustainable practices, conserve resources, and reduce waste generation.

Based on preliminary data in FY 2011, Y-12 has implemented more than 112 pollution prevention initiatives, with an anticipated reduction of more than 23 million pounds and a projected cost avoidance of more than \$5.2 million.

Y-12's transformation efforts are expected to continue to have an overall positive impact on recycling and should ultimately reduce waste generation. Y-12's Pollution Prevention Program has been integrated into construction and D&D activities to ensure all materials are recycled or reused where possible. More than 1 million pounds of materials were recycled by Y-12's ARRA projects. The P2 Program reviews project waste management plans and National Environmental Protection Agency (NEPA) checklists to ensure pollution prevention techniques such as reuse/recycling and sustainable acquisition have been incorporated into each project.

Initiation, expansion, or end of composting programs and the expected impact on waste stream

Y-12 is currently evaluating the feasibility of off-site composting of food waste. The Y-12 cafeteria has implemented methods to reduce the quantity of food waste generated.

Reducing printing paper use and acquiring uncoated printing and writing paper containing at least 30% post-consumer fiber

Y-12 is continuing to efforts to reduce paper usage. Y-12 purchases paper with at least 30% post-consumer fiber in support of sustainable acquisition requirements. Copiers at Y-12 have been set to duplex printing as the default. Over 90% of printers with a duplex unit on the print server have been set to duplex printing as the default. Y-12 is taking steps to reduce the need to use paper where possible. Y-12 has implemented a digital signature program to reduce the need to use paper documents and improve processing time for commonly used documents/forms.

Occupational Health Services (OHS) has implemented a system for electronic medical records named the Electronic Medical Business Operations Systems (EMBOS). EMBOS has streamlined the management of employee medical records and resulted in a significant paper reduction for Y-12. EMBOS allows employees to update their medical history online. OHS employees can electronically schedule appointments, access patient information, and track test results due to EMBOS's streamlined functionality. EMBOS was specifically designed to meet DOE requirements related to medical records. EMBOS contains features that are not available in commercial electronic medical records products. EMBOS is currently being pilot tested at the Savannah River Site.

Increasing use of acceptable non-toxic or less toxic alternative chemicals and processes while minimizing acquisition of hazardous chemicals and materials

Traditionally, toxic and hazardous solvents such as methylene chloride, xylene, and toluene are used for removing epoxy and polyurethane adhesives and for stripping paint. Y-12 research chemist Ron Simandl and laboratory assistant John Brown developed a non-hazardous solvent blend that can effectively soften polyurethane adhesives, enabling workers to separate parts more quickly and with less effort (Fig. 5.1). Other solvents took much longer to soften the adhesives and did not completely strip them, leaving workers to chisel and scrape off remaining adhesives to get the job done. Word of the new solvent's effectiveness spread, and workers started requesting it by the inventors' names, asking for "the RonJohn blend." RonJohn can completely strip adhesives and finishes from a variety of surfaces with advantages not afforded by commercially available solvents. RonJohn is a versatile, environmentally friendly solvent blend that has replaced traditional solvents in various site operations. RonJohn has gained site-wide acceptance due to its lower safety hazard rating and ability to quickly dissolve coatings and other materials. B&W Y-12 and RockinBoat, LLC have signed an agreement giving RockinBoat, a South Carolina startup technology company, sole commercial rights to manufacture and market RonJohn. Through the development and commercialization of RonJohn, Y-12 has reduced hazardous waste generation, air emissions, and safety concerns from the use of solvents.

Y-12 has established mechanisms for internal and external transfers of chemicals for reuse in order to minimize the quantity of chemicals acquired, used, and disposed of. The Product Exchange system provides



Fig. 5.1. Y-12 research chemist Ron Simandl and laboratory assistant John Brown developed a non-hazardous solvent blend (RonJohn Blend) that can effectively soften polyurethane adhesives, enabling workers to separate parts more quickly and with less effort.

a means for employees to post information concerning excess chemicals that are available for on-site reuse.

Integration of pest management and landscape management practices

Y-12 has an integrated grounds pest management program to manage specific insects, such as wasps. Pest management within buildings is managed by the building managers to ensure each facility's needs are

met. Y-12 has pilot tested ultrasonic rodent repellents for rodent control to be used in place of traditional rodenticides or traps. The use of the ultrasonic rodent repellents will be expanded based upon the successful pilot test results. Y-12 also utilizes P2 techniques in landscape management practices. The site is working to control invasive foliage through targeted herbicide use and reintroduction of native grass species.

Clearance of property procedures

Y-12 has completed an evaluation of its clearance of property procedures for disposition of excess materials. As a result of the evaluation, Y-12 has implemented continuous improvement activities such as a “Stuff I Want to Get Rid Of” website and a central telephone number (574-JUNK) to provide employees easy access to information and assistance related to the proper methods for disposing of excess materials.

5.1 SOLID WASTE

At Y-12, unneeded materials are not automatically assumed to be wastes requiring disposal. Y-12 utilizes a systematic disposition evaluation process. The first step in the disposition process is to determine if the items can be reused at Y-12. Items that cannot be used at Y-12 are evaluated for use at other DOE facilities or government agencies. Items are then evaluated for potential sale, recycle, or, as a last resort, disposal as waste.

PERFORMANCE STATUS

Diverting at least 50% of non-hazardous solid waste, excluding construction and demolition debris, by the end of FY 2015



Figs. 5.2 and 5.3. Approximately 1500 yd³ of mulch was created from trees and brush that were cleared during construction of a new bypass road. This mulch was then put inside fabric bags for use as erosion control devices. This project illustrates the reuse of natural resources in order to protect other natural resources.

Y-12 is currently meeting this goal. In FY 2011, more than 50% of non-hazardous solid waste was diverted from the landfill through reuse and recycle. This has been achieved due to implementation of the systematic disposition evaluation process.

The site has transferred materials to the Department of Defense, Department of Homeland Security, and ORNL for reuse. A glovebox was transferred off-site for reuse at a Department of Defense facility to support research, development, and production activities. A firetruck and two ambulances were transferred to Homeland Security.

Y-12 encourages employees to recycle at work and home. The site hosted an employee-owned electronic equipment collection event. Over 6,100 pounds of electronics were collected to be either reused by local charities or recycled.

PROJECTED PERFORMANCE

Y-12 adds at least one new recycling stream to the Recycle Program each year to continue to increase the waste diversion rate. Y-12 will continue to focus on source reduction to facilitate the reduction in the total quantity of waste materials generated. Increasing employee awareness continues to be a key focus for waste reduction activities.

5.2 CONSTRUCTION AND DEMOLITION

PERFORMANCE STATUS

Diverting at least 50% of construction and demolition materials and debris by the end of FY 2015

Y-12 is currently meeting this goal. In FY 2011, more than 57% of construction and demolition materials and debris were diverted from the landfill through reuse and recycle.

In FY 2011, Y-12 constructed a new bypass road and applied an innovative reuse technique to prevent landfill waste and stormwater erosion. Approximately 1,500 yd³ of mulch was created from the trees and brush that were cleared for the new road. This mulch was then placed inside fabric bags, filled in 10-ft sections, that were used in place of traditional

silt fencing for erosion control. The bags were found to be very effective. Once the project was completed and the vegetation was established, the bags were opened and removed while the mulch was spread for use in the area. The project illustrates the reuse of natural resources in order to protect other natural resources (Figs. 5.2 and 5.3).

In FY 2011, Y-12 diverted more than 733 tons of wood materials from the solid waste stream; this represents an increase of approximately 102% in overall wood diversion since FY 2010. More than 62 tons of utility poles were diverted from the solid waste stream and transferred to the Tennessee Forestry Service for reuse. The removal of the poles assisted Y-12's efforts to improve the reliability of the site's power grid (Figs. 5.4 and 5.5).

As mentioned previously, Y-12 implemented energy saving paving techniques such as the use of warm mix asphalt. Approximately 7,000 tons of asphalt that were removed to allow for repaving were diverted from the landfill and reused to surface other roads and areas at Y-12.

PROJECTED PERFORMANCE

Construction and demolition projects will continue to utilize the expanding Y-12 recycling program to ensure that project materials are reused or recycled as appropriate.



Figs. 5.4 and 5.5. In FY 2011, Y-12 diverted more than 733 tons of wood materials from the solid waste stream; this represents an increase of approximately 102% in overall wood diversion since FY 2010. More than 62 tons of utility poles were diverted from the solid waste stream and transferred to the Tennessee Forestry Service for reuse. The removal of the poles assisted Y-12's efforts to improve the reliability of the site's power grid.



6. Procurement and Acquisition

Y-12 is currently meeting the procurement goals through the implementation of the Y-12 Sustainable Acquisition Program.

6.1 SUSTAINABLE ACQUISITIONS

PERFORMANCE STATUS

The sustainable acquisition requirements of Department of Energy Acquisition Regulation clause 952.223-78 were incorporated into Y-12 procurement clauses in FY 2011.

Sustainable acquisition requirements are included in all Accelerated Vendor Inventory Delivery (AVID) preferred vendor contracts. As a part of the subcontract, AVID vendors are required to sign an annual Sustainable Acquisition Program certification statement that states they will provide Y-12 with products that meet requirements for recycled content, bio-based content, Energy Star®, WaterSense, alternative fuels, and the Electronic Product Environmental

Assessment Tool, as applicable. For example, approximately 96% of all purchases met the requirements for recycled content in FY 2011.

Also in FY 2011, Y-12's Building Services Group implemented a green cleaning program (Fig. 6.1). The group worked with its existing supplier to find alternate green cleaning products to replace traditional cleaning products. The supplier provided on-site training to the janitorial staff to teach them the correct methods to use with the new products and address their concerns related to the changes. The group then implemented a new ordering process that limited who could place requisitions for products to prevent the traditional products from being ordered. Ninety percent of the products in use by the group are considered sustainable.



Fig. 6.1. In FY 2011, Y-12's Building Services Group implemented a green cleaning program, working with their existing supplier to find alternate green cleaning products to replace traditional cleaning products. 90% of the products in use by the group are considered sustainable.

PROJECTED PERFORMANCE

Due to the inclusion of the sustainable acquisition requirements in all site procurement clauses, future procurement activities should contain the sustainable acquisition requirements. Y-12's cross-functional Sustainable Acquisition Team identifies and tests alternative products and chemicals for use at Y-12 in support of sustainable acquisition. Y-12 will continue efforts to expand the use of sustainable products.



7. Data Centers/ Electronic Stewardship

Y-12 has made significant progress toward the electronic stewardship goals outlined in the Executive Order. Although the site is not currently using the Data Center Pro (DCPRO) Tool Suite, consideration will be given to incorporating it as needed in the future. The site continues toward consolidation of data centers and use of thin-client and virtual server technology through the implementation of thin/thick client appliances in the unclassified desktop environment. Y-12's Information Technology (IT) organization has taken many significant actions to enhance the electronic stewardship of our data centers in support of the Y-12 Site Sustainability Plan and DOE Order 436.1. These actions include initiatives in the areas of server virtualization, virtual desktop infrastructure, procurement of energy-efficient computing equipment, reuse and recycle of computing equipment, replacement of aging computing equipment with more energy-efficient equipment, and reconfiguration of data centers to achieve more energy-efficient operations.

7.1 DATA CENTER METERS

At present, none of the site data centers are individually metered.

PERFORMANCE STATUS

The EMIP project was implemented in 2011 and will install meters on Buildings 9103 and 9117 to ensure metering of the data centers.

PROJECTED PERFORMANCE

At present, only building-level meters will be installed. Future consolidation efforts for the site data centers will be evaluated and sub-level metering may be installed in coordination with that effort to effectively capture the data center energy usage.

It is also not known what impact the chilled water (CW) cooling has on the power utilization effectiveness for the data centers. Plans are being developed to more fully understand the CW usage and to install metering where applicable. It is highly likely that the data centers will be good candidates for CW meter installations.

7.2 POWER UTILIZATION EFFECTIVENESS

Y-12 is replacing physical servers with virtual servers as existing physical servers reach end-of-life or as new servers are needed. Y-12 had deployed approximately 220 virtual servers on 50 physical hosts by the end of FY 2011 and plans to continue deploying virtual servers to the maximum extent practicable. Assuming a reasonable 5-to-1 virtual-to-physical ratio (5 virtual servers per physical server on average), energy usage will be four times as efficient using virtual servers as compared to the old paradigm of using only physical servers. This should save a significant amount of electricity.

PERFORMANCE STATUS

Y-12 has taken steps to reduce power consumption pursuant to data backup and recovery. The IT organization installed several Linear Tape-

Open (LTO) libraries in FY 2011 to consolidate numerous older tape drives and libraries.

The IT organization has started a program to reconfigure, over time, Y-12's data centers to reduce power consumption over the current configuration. Servers are being placed back to back, for example, to implement the "hot aisle, cold aisle" paradigm whereby servers are dispersing hot air into alternating aisles, which can have cooling directed there, leaving every other aisle relatively cool.

Y-12's IT organization has issued internal guidance to Procurement to require computing equipment with Energy Star® features be delivered with these features enabled. It has also issued internal guidance to Desktop Support and Maintenance Procurement for configuration of computing equipment so Energy Star® features are enabled, unless a justifiable exception exists (e.g., a conflict with cyber-security policies).

Y-12 has implemented policies requiring recycled printer paper and toner cartridges. The Y-12 IT organization has implemented policies encouraging usage of shared network printers with duplex capabilities enabled. During FY 2011, the default for all networked printers with duplexers was changed to duplex instead of simplex, except for documented exceptions based on articulated business needs.

PROJECTED PERFORMANCE

Y-12 is deploying Citrix PVS, XenServer, and XenApp to enable a virtual desktop infrastructure. This infrastructure will allow the replacement in the near term of 300 PCs with more energy-efficient thin clients, which will save an estimated 500,000 KWh of electricity per year. Citrix XenApp Power and Capacity Management will also allow Y-12 to power off Citrix servers when not in use, saving electricity in the data center.

7.3 ELECTRONIC STEWARDSHIP

In FY 2012, Y-12's IT organization plans to continue its actions to enhance the electronic stewardship of the site's data centers in support of the Y-12 Site Sustainability Plan and DOE Order 436.1. IT plans to

continue to expand on the initiatives already underway in the areas of server virtualization and virtual desktop infrastructure.

Y-12 employs a computing equipment recycling program, developed by IT and Waste Management personnel, to recycle all components of computing equipment except for a very small amount that is not allowable because of cyber-security requirements.

Recycling facilities are reviewed and approved by Y-12 environmental compliance personnel prior to use for Y-12 materials.

PERFORMANCE STATUS

Y-12 joined the Federal Electronics Challenge (FEC) in FY 2008 and won the FEC Bronze award in 2009. Y-12 built on that foundation and won the FEC Silver awards in 2010 and 2011 and will apply for the FEC Gold award in FY 2012. Y-12's computing equipment recycling program was one important aspect of meeting the FEC's rigorous rating criteria.

The IT organization has been proactive and aggressive in replacing older cathode-ray tube (CRT) monitors with newer flat-panel monitors that are much more energy efficient. Hundreds of CRT monitors were replaced during FY 2010, resulting in a substantial percentage energy reduction.

99.8% of all computer desktops, laptops, and monitors purchased or leased during FY 2011 were EPEAT-registered products. Y-12's standard desktop configuration specifies the procurement of EPEAT-registered and Energy Star®-qualified products.

PROJECTED PERFORMANCE

IT is making plans for FY 2012 to transition to disk-to-disk backups in the unclassified domain, which are expected to eliminate dozens of tape drives and libraries and several dedicated backup servers, which collectively back up all central Windows and Unix servers.



Regional and Local Planning

Since we all share our environment, the actions and efforts—or lack thereof—of any community can directly impact communities and constituencies beyond its own borders. Issues of transportation and land use, open space, storm water, energy and water, and materials procurement can either serve as a benefit to the community or be obstacles to its current and future well-being.

The Y-12 Complex recognizes its potential impact on the local communities and their environments and is committed to keeping the community informed in areas of operations, environmental concerns, safety, and emergency preparedness. Y-12 has formed strong partnerships with several businesses in both the private and public sectors through regional-level organizations that work to provide solutions to many of the nation's transportation and energy security challenges and goals.

In addition to the corporate donations and sponsorships Y-12 provides, its employees are committed to serving in the communities where they live.

PERFORMANCE STATUS

The following are examples of how Y-12 is meeting the required regional and local planning goals:

- The Y-12 Site-wide Environmental Impact Statement identifies and analyzes the impacts from energy usage on the various alternatives within the defined regions of influence.
- Y-12 participated in an Energy Efficiency Forum held at Oak Ridge Associated Universities and hosted by the Community Reuse Organization of East Tennessee.
- Y-12 is a member of the Oak Ridge Energy Corridor. The overarching goal of this diverse group is to show how new technologies—



Fig. RLP.1. Y-12 has formed a partnership with Ijams Nature Center. The site is assisting Ijams with development of a sustainability plan, and they in turn are working with Y-12 to develop greenways, nature trails, and an environmentally friendly site.

and close cooperation between public and private sectors— can reduce a region's carbon footprint.

- Y-12's NEPA reviews require that energy usage, alternative energy sources, and pollution prevention techniques are identified and analyzed for new or expanded facilities.
- Y-12 is involved in the Oak Ridge Reservation contract interface team. This program provides for services on the reservation, including natural resource management, forestry management, environmental sampling, and road and bridge repairs.
- To facilitate communication between the company and the community, a Community Relations Council (CRC) was formed in 2002. The CRC provides feedback to the company regarding Y-12 operations and ways to enhance communications and involvement with the community and public at large.
- Y-12 has formed a partnership with Ijams Nature Center (Fig. RLP.1). The site is assisting Ijams with development of a sustainability plan, and they in turn are working with Y-12 to develop greenways, nature trails and an environmentally friendly site.

B&W Y-12 works collaboratively with the local Chamber of Commerce to identify properties that can be utilized for mission needs. This includes considering sites that are pedestrian friendly, near existing employment centers, emphasize the existing town center, and that promote a livability of the communities in which B&W Y-12 is located. B&W Y-12 continues to make responsible choices with acquiring leased facilities, striking the appropriate balance among cost, security, and sustainability, while meeting the mission need and ensuring competition.

Y-12 has been a member of the Tennessee Pollution Prevention Partnership (TP3) since 2002. TP3 members include households, schools, government agencies, organizations, businesses, and industries who promote sustainable activities throughout the state. Through Y-12's TP3 efforts, the site completes environmental mentoring and outreach activities for employees, students, community members, and other industries.

B&W Y-12 is identifying cost-effective strategies to optimize sustainable space, including consideration of relevant requirements or selection fac-

tors that strengthen the vitality of the surrounding community. Moreover, maximum use of existing federal facilities has been a priority of more effective space utilization. For instance:

- T-2 Warehouse Road and Office of Scientific and Technical Information, both DOE facilities, house over 70 thousand ft² of leased space for B&W Y-12. This federal space was re-utilized and sought first before procuring new commercial leased space acquisitions.
- New Hope and Jack Case Centers partnered with the local government to ensure financial participation in both county and city levels.
- Newly leased facility 2410 Cherahala considered the town center of Oak Ridge as an integral part of the acquisition of leased space.
- Consideration was also given to other city centers with space availability within close proximity of Oak Ridge and Knoxville.

These are among some of the careful considerations given to mission needs, community involvement, and local economic partnerships that provide sustainable space here in the Oak Ridge and Knoxville communities.

PROJECTED PERFORMANCE

Future Energy Efficiency Forums will be conducted to share expertise, knowledge, and lessons learned with regional organizations. Y-12 will continue to perform NEPA reviews, as required, and will seek opportunities to participate in community-wide planning.



Site Innovation and Government-Wide Support

Y-12 employees have benchmarked several sites this year in an effort to gain an understanding of existing programs, apply lessons learned, and improve current methodology. Employees participated in a number of headquarters-sponsored programs, including Energy Facility Contractors Group, GovEnergy, and GreenGov. Technology development is partnering with LED America to develop a high bay fixture utilizing graphite foam technology developed at ORNL.

Y-12 is exploring many initiatives to reduce energy consumption while encouraging employee interest in sustainability. Specific innovative projects under consideration include:

- Ongoing lighting upgrades in the manufacturing and process buildings.
- Support of TVA's development of a Small Modular Reactor for reducing GHG emissions.
- Installation of a solar array to offset facility energy use.
- Installation of a VAWT.
- Installation of a steam generated turbine.
- Development of a central energy data center, which will allow all employees to access energy consumption for site-wide and facility-specific meters.

- Investigation of work-from-home opportunities to reduce employee commuting.
- Further development of the Site Sustainability Team to include opportunities to increase employee awareness and site-wide initiatives for learning and participation.
- Continuation of road and grounds planning for new parking lots and road construction using porous pavement, warm mix asphalt, and rolled compacted concrete as sustainable options (Fig. SIGS.1).
- Implementation of a "green bank" to incorporate requirements for EISA 438 into construction and demolition projects.
- Investigation of landscaping opportunities to incorporate native plantings for more sustainable, water efficient soft-scaping.



Fig. SIGS.1. The site continues road and grounds planning for new parking lots and road construction using porous pavement, warm-mix asphalt, and rolled compacted concrete as sustainable options

B&W Y-12 has received more than 83 Pollution Prevention awards from external agencies since 2001, including:

- Tennessee Chamber of Commerce and Industry 2011 Hazardous Waste Management Award - Y-12's Environmentally Friendly Solvent Blend
- Tennessee Chamber of Commerce and Industry 2011 Water Quality Award - Y-12's Sustainable Design Practices Reduce Environmental Impacts
- Tennessee Chamber of Commerce and Industry 2011 Solid Waste Management Certificate – Y-12's Comprehensive, Cost-Effective Recycling Program
- Tennessee Chamber of Commerce and Industry 2011 Air Quality Certificate – Y-12's ARRA Initiatives Reduce Greenhouse Gas Emissions
- 2011 Federal Electronics Challenge Silver Award
- FY 2011 Department of Energy Pollution Prevention E-Star Award for FY 2010 Activities – Cradle to Cradle Category - Waste Not Want Not, Y-12 Comprehensive, Cost-Effective Recycling Program
- FY 2011 Department of Energy Pollution Prevention E-Star Honorable Mention Award for FY 2010 Activities – Greenhouse Gas Management Category - Y-12 Clean Steam Team
- FY 2010 National Nuclear Security Administration Pollution Prevention/Sustainability Award for FY 2010 Environmental Stewardship Best in Class Award – Cradle to Cradle Category - Waste Not Want Not, Y-12 Comprehensive, Cost-Effective Recycling Program
- FY 2010 National Nuclear Security Administration Pollution Prevention/Sustainability Award for FY 2010 Environmental Stewardship Best in Class Award – Living Laboratory Category - Y-12's Innovative Lab Method Answers Be or No Be Question Faster, Safer and Sustainably
- FY 2010 National Nuclear Security Administration Pollution Prevention/Sustainability Award for FY 2010 Environmental Stewardship Best in Class Award – Health and Environment Category - Y-12's Sustainable Recovery and Transformation
- FY 2010 National Nuclear Security Administration Pollution Prevention/Sustainability Award for FY 2010 Environmental Stewardship Best in Class Award – Greenhouse Gas Management Category - Y-12 Clean Steam Team



“The very goal of sustainable living is a moving, changing target, to be defined as part of a process and refined as more experience pours in.”

Climate change is a debatable topic in terms of impacts to East Tennessee and the Y-12 site. Based on the 1895–2010 data available, it is unlikely that Tennessee will experience increased warming relative to the global average. As an inland state, Tennessee will not be directly influenced by sea level rise. Additionally, much of the state’s economy is based on the service sector, most of which is not directly linked to climate. Evidence is not available that supports negative impacts due to climate change. For planning purposes, however, the following topics have been assessed and potential impacts to the site are considered (Karetinkov et al. 2008).

- **Water Resources and Quality:** Water quality is closely monitored at Y-12. Flooding and flow rates on Bear Creek could be impacted by increased/decreased rainfall.
- **Infrastructure:** More sporadic rainfall could impact facilities due to flooding and roof leakage. Additionally, energy demands are likely to rise with increases in temperature. Hydroelectric power, which accounts for 10 percent of the Tennessee Valley Authority’s energy production, may also struggle amid periods of drought (TVA 2007).
- **Tornadoes and Hurricanes:** East Tennessee has experienced tornadoes and increased rainfall due to hurricanes. The indirect impact of such damages on the economy includes disruption of business, supply chains, and overall demand for products and services because resources are funneled to address climate impacts.

- **Health Impacts:** The EPA projects that Tennessee’s environment may become more hospitable to disease-carrying insects, including those with malaria, Lyme disease, and dengue fever. East Tennessee may be further impacted by poor air quality and an increase in respiratory diseases and heat-related health issues (Barker 2003).
- **Temperature Extremes:** Higher temperatures and heat waves will likely increase the number of heat-related deaths and illnesses. Temperature increases will be higher in urban areas as a result of heat island effect. Higher temperatures will also increase demand for water supplies used for both drinking and irrigation.

The following information was used in developing this narrative. Based on the data provided, no clear conclusion was drawn regarding global warming, drought or other inclement trends for Tennessee (SPPI 2010).

Seasonal temperatures (Figs. CC.1-5): There are no long-term seasonal trends. Instead, year-to-year and/or decade-to-decade variability is most evident. In no season do recent temperatures appear unusual compared with observed temperature history. There is no evidence of “climate change.”

Precipitation (Fig. CC.6): There is also no statistically significant trend in precipitation levels and, again, the record is dominated by large interannual variations—ranging from as much as 66.68 inches of rain in 1979 to as little as 35.67 inches in 1941. Certainly, 2007 stands out as a very dry year, but there is no drying trend; 2007 merely reflects natural variability.

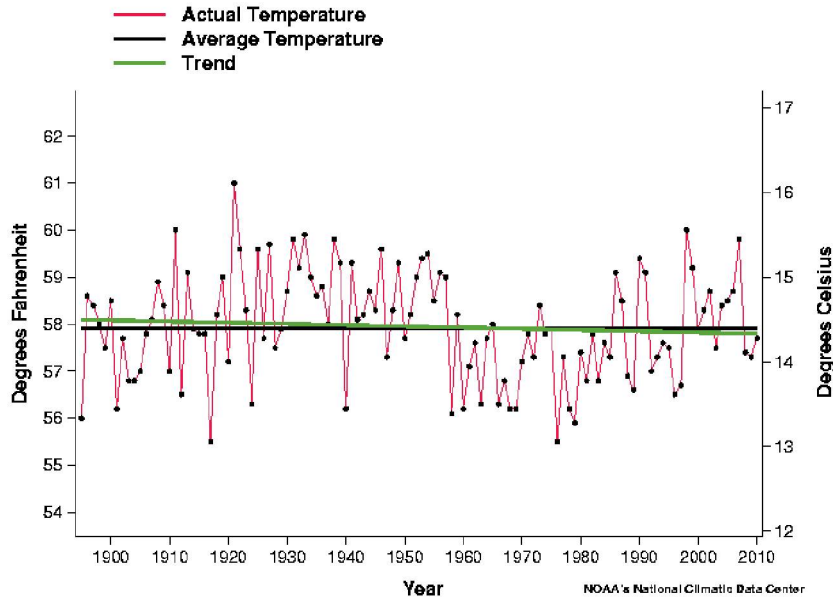


Fig. CC.1. Annual Temperature Range (January 1895 - 2011 Trend = -0.23 degF / Decade)

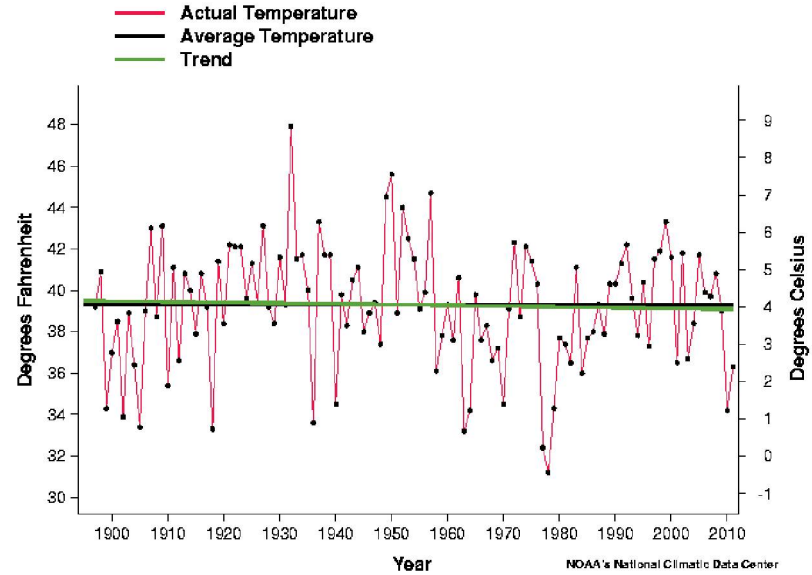


Fig. CC.2. Winter Temperature Range (Winter (Dec-Feb) 1895 - 2011 Trend = -0.03 degF / Decade)

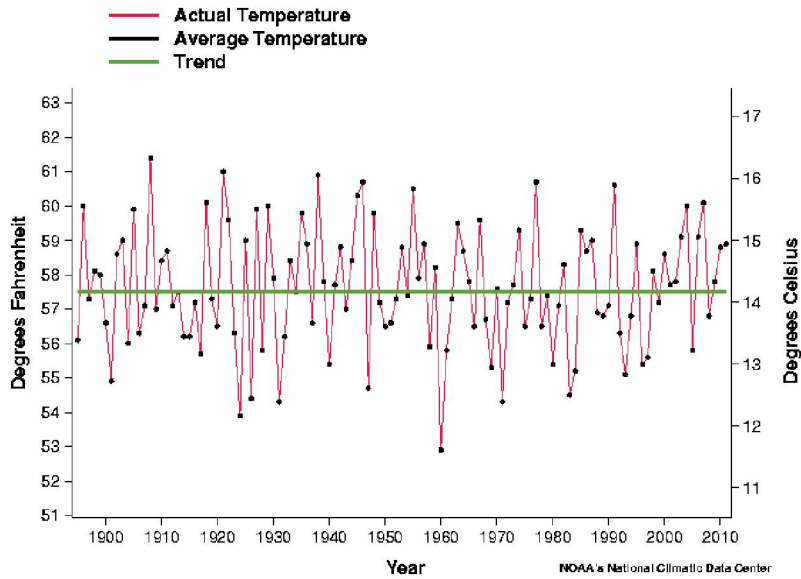


Fig. CC.3. Spring Temperature Range (Spring (Mar-May) 1895 - 2011 Trend = 0.00 degF / Decade)

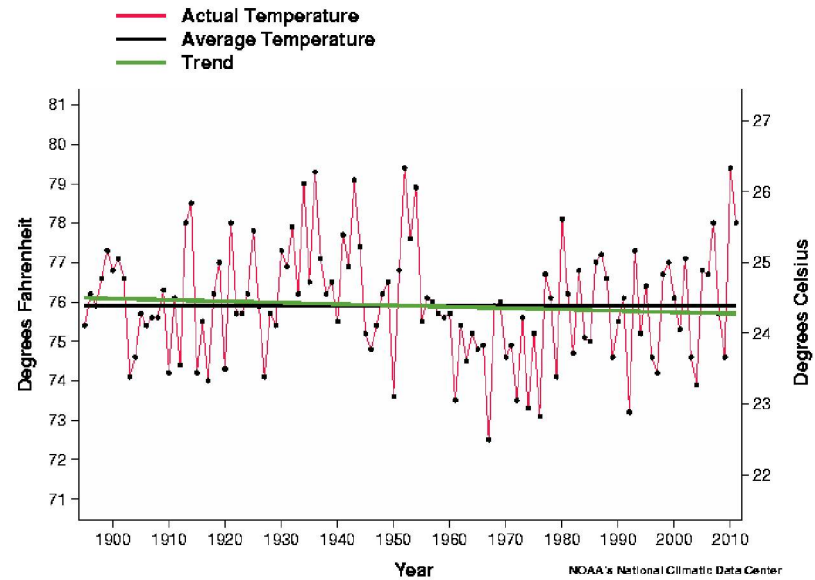


Fig. CC.4. Summer Temperature Range (Summer (Jun-Aug) 1895 - 2011 Trend = -0.03 degF / Decade)

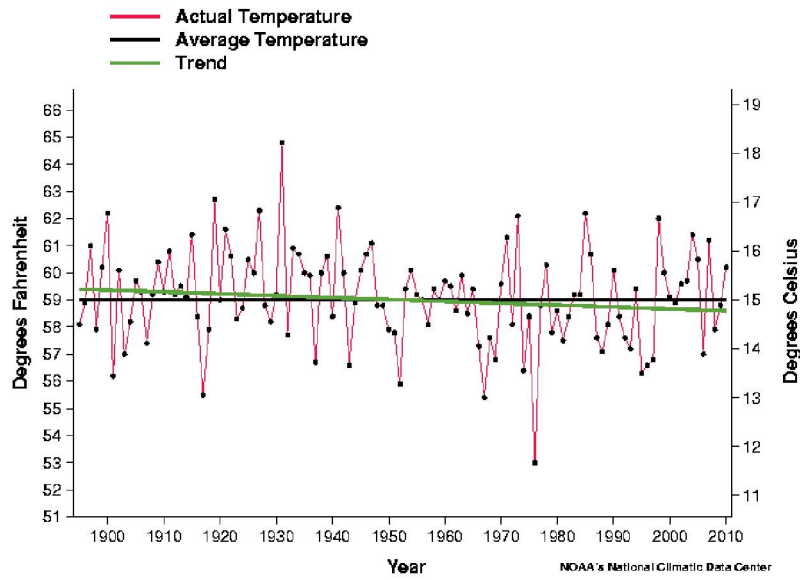


Fig. CC.5. Fall Temperature Range (Fall (Sep-Nov) 1895 - 2010 Trend = -0.07 degF / Decade)

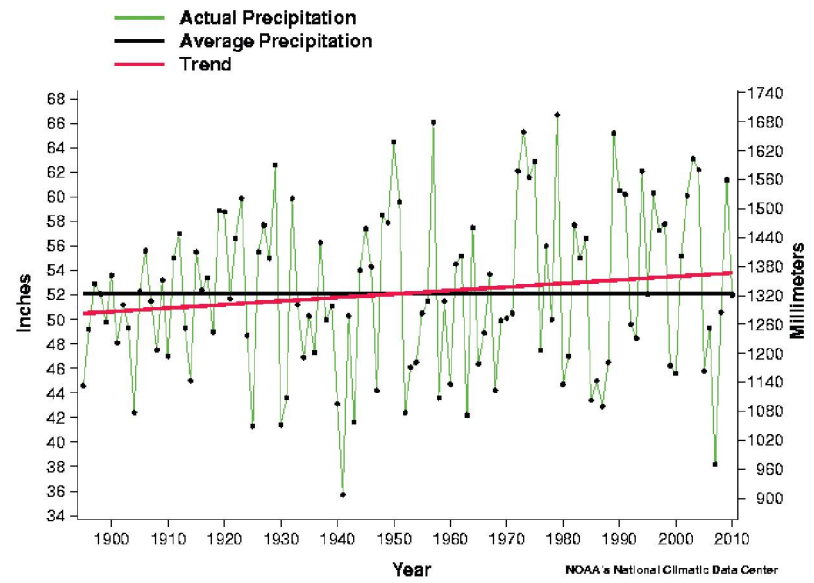


Fig. CC.6. Annual Precipitation Totals (Annual 1895 - 2010 Trend = 0.29 Inches / Decade)

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