ORNL Sustainable Campus Initiative

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ABSTRACT

The research conducted at Oak Ridge National Laboratory (ORNL) spans many disciplines and has the potential for far-reaching impact in many areas of everyday life. ORNL researchers and operations staff work on projects in areas as diverse as nuclear power generation, transportation, materials science, computing, and building technologies. As the U.S. Department of Energy's (DOE) largest science and energy research facility, ORNL seeks to establish partnerships with industry in the development of innovative new technologies. The primary focus of this current research deals with developing technologies which improve or maintain the quality of life for humans while reducing the overall impact on the environment. In its interactions with industry, ORNL serves as both a facility for sustainable research, as well as a representative of DOE to the private sector. For these reasons it is important that the everyday operations of the Laboratory reflect a dedication to the concepts of stewardship and sustainability.

In 2008, ORNL initiated the "Sustainable Campus Initiative" (SCI). The program, which has received several awards, is designed to be a campus-wide, multi-discipline effort to reduce ORNL's overall environmental footprint, while maintaining its status as a world-class research facility. SCI has specified 26 areas of focus for research and operational improvements. These include; reduction of greenhouse gas emissions, reduction of landfill waste, energy and water conservation, high performance sustainable buildings, centralized data metering and analysis systems, and human wellness. The purpose of this writing is to document current accomplishments as well as to provide some insight into future plans.

Introduction

The research facility at Oak Ridge was initially created in 1943 as an emergency pilot plant for the refinement of fissionable uranium isotopes for the war effort. At war's end, the research focus shifted to more peaceful uses of atomic energy such as power generation and the development of new isotopes for medical purposes. Over the decades that followed, the Laboratory has evolved into one of the nation's outstanding centers for energy, environmental, materials, and basic scientific research, as well as a facility for technology development. In 2003, ORNL celebrated its 60 year anniversary and while world-class research was still being conducted there, by this time much of the Laboratory's infrastructure was beginning to show its age, with many facilities approaching the end of their planned service lives. The condition of the facilities added considerably to the overhead costs of research in terms of energy consumption, increased maintenance costs, and research inefficiencies. For these reasons, in 2000 ORNL initiated the "Strategic Facilities Plan." This initiative was created as a campus-wide modernization effort designed to address issues such as campus aesthetics, building energy efficiency, occupant comfort, as well as environmental and safety issues.(ORNL 2000) During this time between 2000 and 2008, many older, obsolete facilities were demolished and an effort was made to centralize Laboratory operations to increase operational efficiency. Additionally,

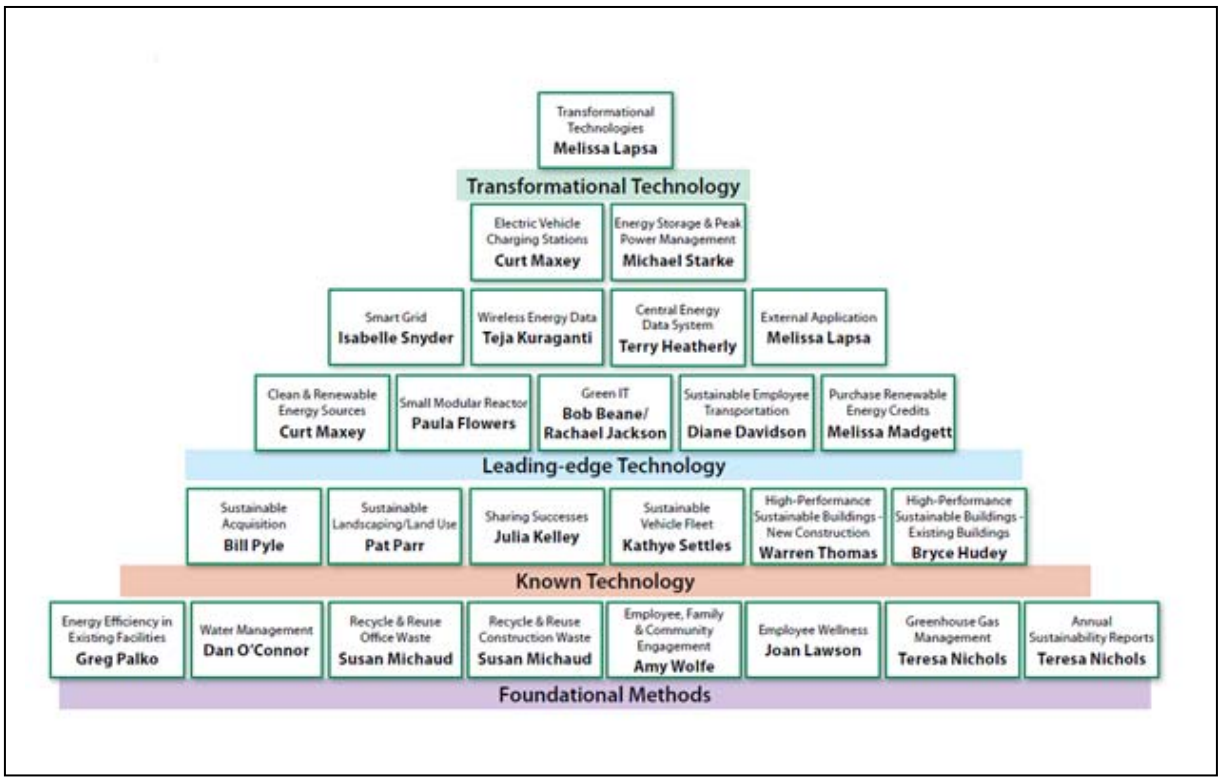
many of the existing buildings which were deemed still serviceable received extensive cosmetic and energy efficiency retrofits. This initial modernization effort has since been continued as the ORNL Sustainable Campus Initiative (SCI). This new program, seeks not only to build upon the progress made under the Strategic Facilities Plan, but to take ORNL's commitment to sustainability to the next level.

SCI was started in 2008 as a multi-discipline effort to showcase ORNL's dedication to sustainable operations while utilizing the campus as a test bed for cutting edge sustainable technologies. The program also makes significant steps in achieving the requirements set forth in the 2009 Presidential Executive Order 13514. This mandate sets significantly higher sustainability standards for government agencies over the coming years. The standards specified in the mandate include but are not limited to the following (Federal Register 2009):

- Reduce petroleum use in fleet vehicles by 30% by 2020;
- Starting in 2020, design all new federal buildings to reach net-zero energy use;
- Improve water efficiency by 26% by 2020;
- Minimize federal buildings' impact on storm water runoff;
- Recycle or divert 50% of waste by 2015;
- Meet sustainability requirements in 95% of all applicable procurements;
- Reduce greenhouse gas emissions: Scopes 1 and 2 by 28% by 2020 and Scope 3 by 13% by 2020;

The logic behind the various programs set forth in SCI goes beyond the obvious benefits to the environment and compliance with the federal mandate, in that they make sense from a business standpoint as well. Much of the current research being conducted at ORNL involves the development of new technologies related to sustainability. As a purveyor of this research, the perception of the Laboratory by potential customers in the private sector becomes that much more positive if it is actively practicing what it preaches. In addition to this, many of the projects specified in SCI have a relatively quick return on investment and in the long run will lower ORNL's operating costs. To achieve its original goals as well as to meet the new standards required by the executive order, the SCI program has developed the 26 roadmaps listed in Figure 1.

Figure 1. SCI Roadmap Owners



Source: ORNL 2012

As shown, the various roadmaps are grouped according to the level of the technology required and assigned an owner who is responsible for meeting the milestones for that particular map. The owners of each map volunteer a portion of their work schedule to oversee the projects within SCI which fit their personal interests and areas of expertise. The various roadmaps which make up SCI are sorted into four groups which arrange them based upon level of technology. These groups range from basic common sense practices which require minimal infrastructure changes or new hardware all the way to entirely new technologies which will require major changes to both of these. The individual roadmaps and their important milestones to date, as well as plans for the future are discussed in the subsequent sections of this writing.

Roadmaps and Highlights

ORNL's ever changing mission as well as its dedication to its roles as stewards of the environment and representatives of the U.S. DOE are reflected in all of the changes made to the Laboratory since 2000. For this reason, the milestones discussed in this writing include both the accomplishments of SCI as well as work performed prior to 2008 under the Strategic Facilities Plan. It is a logical step to discuss the two projects together since, although technically they are separate initiatives, much of the work which was performed under SCI builds directly on the accomplishments of the initial modernization effort started in 2000.

Building Renovation and New Construction

The building stock at ORNL is diverse, with a mix of new and old buildings whose occupants have widely different needs. Since 2000, ORNL has added 1.2 million square feet of new, energy efficient laboratory and office space to the campus while modernizing the serviceable existing structures. This represents an overall increase in square footage of 33% with a corresponding increase in energy use of only 5%. By 2012 ORNL's energy use per square foot had dropped by 19.6% (compared to the 2003 baseline) or well over halfway to the DOE goal of a 30% reduction by 2015. (ORNL 2012) Among ORNL's new campus buildings, several have garnered Leadership in Energy and Environmental Design (LEED) awards (three Gold, one Silver, and four Certified designations). This translates into over one million square feet of space which carry the LEED endorsement. The LEED program promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. The system awards points to buildings for innovations in these areas and awards them a grade (Platinum, Gold, Silver, and Certified) based upon a 100 point maximum. Figure 2 shows the locations and LEED ratings of six of the completed new structures on the ORNL main campus.

Figure 2. LEED Building Locations on ORNL Campus

Source: ORNL 2012

Over the next several years, the Laboratory will be working towards the goal of LEED Gold status for all new buildings. One example of this is ORNL's Maximum Building Energy Efficiency Laboratory (MAXLAB). This new facility will serve as both office and lab space and will include a high bay for testing large building components and a low bay with test chambers for the optimization of heating, cooling, and ventilation equipment. This research, which is part of ORNL's Building Technologies Research and Integration Center, will identify products and methods which will allow buildings to become more energy efficient. As complement to the MAXLAB facility, two light commercial building, flexible research platforms (FRPs) are being

constructed simultaneously. These facilities consist of the steel skeletons for two representative light commercial buildings with the necessary data acquisition infrastructure. The platforms will serve as a test bed where a variety of energy saving envelope and equipment options can be installed and studied by ORNL's industry partners, allowing these new technologies to be brought to market with speed and scale. The facility is expected to be completed in December 2012 and, like all new construction at ORNL, the MAXLAB building will be submitted for LEED certification. Figure 3 shows the MAXLAB building and the two FRPs under construction.

Figure 3. MAXLAB and FRPs Under Construction

Source: Hughes 2012

Another of the new LEED Gold buildings on campus is the ORNL Guest House. This building, constructed as on site lodging for ORNL visitors, achieved its LEED rating through a number of innovative methods. The Guest House, which is the first LEED Gold hotel in the state of Tennessee, is constructed using 26% recycled material with 76% of the construction waste being recycled as well. It also utilizes high efficiency heating and air conditioning equipment as well as a high performance building skin which help to reduce its energy use by 21% compared to similar sized buildings. All paints, adhesives, sealants and carpet used in the construction of the facility are 100% VOC free. In addition to the methods used in its construction, use of the guest lodge promotes sustainable transportation practices by eliminating unnecessary travel to and from the campus by ORNL visitors (ORNL Guest House 2011)

In addition to the new construction, the Laboratory has enacted a policy of aggressive energy saving renovations for its existing buildings as well. An example of this is Building 1059 on the west end of the Laboratory. This building, constructed in 1993, is one of several standard office buildings located on this part of campus. The sustainable features added during the retrofit include enhanced lighting and building controls, roofing upgrades, low flow plumbing, exterior site upgrades, finish materials upgrades as well as electronics energy usage enhancements. These improvements have allowed this structure to earn a LEED Gold certification for existing buildings. An important point to mention is that Building 1059 is one of 15 identical buildings

located on the ORNL campus. Because of this, now that a working strategy has been developed for upgrading Building 1059, this same strategy can now be easily applied to upgrade these other buildings as well.

Another existing building worthy of mention is Building 3156, located on the north end of the ORNL campus. Before retrofit, this all electric building consumed 100MWh of energy per year. This usage was reduced to 60 MWh/year through the implementation of cost-effective energy conservation measures. These include: replacing old through-the-wall heat and air-conditioning units with high-efficiency heat pumps; the addition of a digital energy management and control system; installation of occupancy sensors to control exhaust fans and lighting, as well as new power controls for computers and other office equipment. To make this building a true net-zero energy facility, a 65-MWh/year, grid-integrated photovoltaic array has been added. Figure 4 shows the PV array across the road from Building 3156.

Figure 4. 65-MWh/year PV Array

Source: ORNL 2012

Recycling and Waste Prevention

ORNL's Sustainable Campus Initiative has established aggressive goals for reducing the amount of waste that is sent to the landfill. To determine ways of improving the Laboratory's recycling program, a series of "dumpster dives" were conducted which sorted two days of garbage from campus office buildings. These dives revealed that Laboratory employees were throwing away a large amount of material which could have been recycled with 20% of it being recyclable paper. Divers also discovered additional materials such as packaging peanuts and bubble wrap which were suitable for recycling. In response to this, segregated bins were issued to every Laboratory employee. The pollution prevention staff has also established programs to implement recycling in less routine occurrences. For instance, when an employee changes office locations, there is often a large volume of paper waste and other office wastes associated with the move. Employees who are relocating can now access from the ORNL internal website a "how do I move?" link that provides instructions on how to segregate and recycle these types of waste. Programs such as these have helped ORNL divert 27% of its solid municipal waste in 2010.

In addition to the reduction of municipal waste going to landfills, ORNL is actively seeking ways to divert much of its construction and demolition waste. As part of the campus modernization effort, approximately 70 outdated facilities, totaling more than 200,000 gross

square feet, have been demolished. Hazardous materials, including asbestos and radioactively contaminated items, are removed or abated before demolition begins to reduce risks to people and the environment. After the demolition, some construction materials are literally returned to the earth. Gypsum wallboard waste is donated to local farmers or used on-site to amend the soil. Other components are also recycled or reused with 85% of solid construction and demolition waste diverted from landfills. (ORNL 2012)

Along with the diversion of waste materials from landfills, ORNL has also established policies to ensure that other items such as computer components and lab equipment are not simply thrown out when they become unneeded or obsolete to a specific individual or department. The excessing and property sales group is responsible for the disposition of ORNL's surplus property. The reuse of assets saves ORNL money by avoiding the time and cost involved for new acquisitions. Items can be claimed through the property shop from the excessing warehouse and through transfer from other federal agencies to ORNL. Items which cannot be used by the Laboratory are often donated to non-profit organizations, including state agencies, public schools, and universities. Donation programs include "Computers-For-Learning", which offers computer items to schools, and the "Energy-Related Laboratory Equipment" program, which donates laboratory equipment to colleges and universities. From FY 2005 to FY 2009, the Laboratory donated more than $10 million in computers and laboratory equipment. Items that remain after being offered through reutilization, transfer, and donation are then sold through property sales in the most cost-effective manner possible.

Water Conservation and Management

The Laboratory's water conservation measures involve reducing both domestic and process water usage. To reduce domestic water use, water-saving plumbing fixtures have been installed in 65 existing buildings. These upgrades included faucet aerators, faucet flow restrictors, low-flow showerheads, urinal flush valves, and low-flow toilets. This has resulted in an annual water savings of 12.3 million gallons.

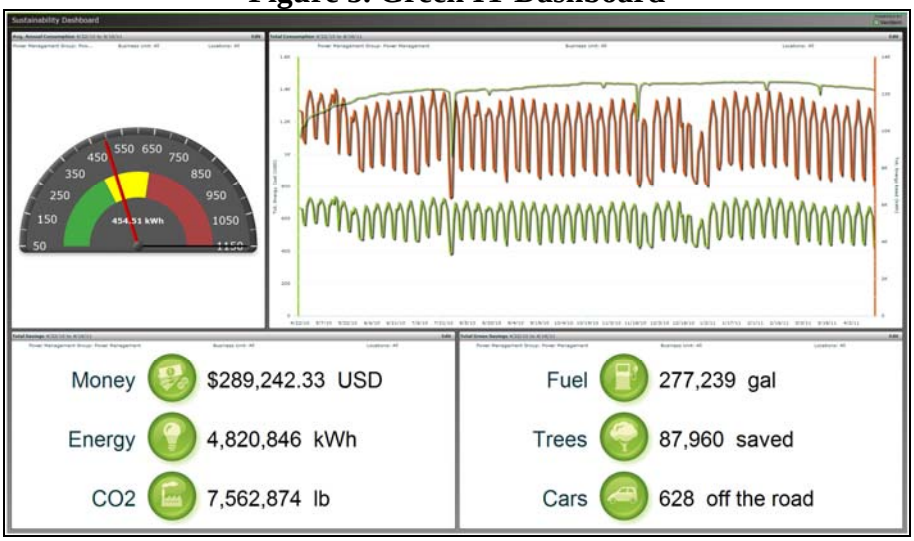
To reduce water use for lab processes, the once through water cooling system for ORNL's central compressed air system was replaced with a closed loop cooling tower arrangement. Switching to the new closed loop from the old system (where the water used to remove the excess heat was discharged to a stream) saves ORNL 145.6 million gallons of water annually. This reduction is expected to increase further as once through water cooling systems are eliminated for other lab processes.

In addition to these measures, in 2008, ORNL contracted with New York Leak Detection to identify and quantify problems in the Laboratory's aging water distribution system. A number of leaks were found in the piping and since this time, four of the larger ones have been repaired, resulting in an annual water savings of 42.2 million gallons. After these initial repairs another company, American Leak Detection, was contracted to find additional leaks in the system. This work has discovered several more leaks, in the distribution system as well as some large leaks found in the buildings themselves. Resolution of these issues brings the total water savings from the repair effort to 155 million gallons per year. (ORNL 2012)

Computers and IT

ORNL currently has approximately 8,000 Windows systems, 1100 Macintosh systems, and 1500 UNIX systems on site. In June 2009, the Laboratory's IT department was approached by the SCI committee to establish an IT roadmap for sustainability. The initial pilot program involved the development of computer power management schemes to accompany the energy conservation renovations performed on Buildings 3147 and 3156 which were mentioned earlier. These two buildings were used as a test case for energy saving technologies which were candidates for later, larger-scale testing. Data collected during the preliminary test period demonstrated a computing load energy savings of 50% when power conservation hardware and software were used in these buildings. Later that year, a larger scale test involving 450 PCs showed an annualized savings of 34% over the baseline case. (ORNL Green IT) Based on what was learned from the pilot program, ORNL has deployed the Verdiem Surveyor software package for all of the Laboratory's Windows based machines. This software enforces a set of energy management policies through ORNL's central IT system based upon a user-selected work day while also providing detailed feedback and reports on energy use, and areas of potential savings. During low-use intervals, all monitors will be remotely powered down to stand-by status and computers to sleep mode status. Peripherals such as printers and scanners, which are not directly controlled by the computer power policy, will utilize "Smart power strips". These devices, which also serve as surge protectors, sense when the computer goes into its sleep mode and kill AC power to the peripheral devices connected to it. To monitor use and savings, ORNL's IT department has created the dashboard shown in Figure 5.

Figure 5. Green IT Dashboard



Source: ORNL Green IT 2012

As shown, the GUI displays estimates of daily cost, power usage, as well as estimates of the savings over the baseline numbers. The estimated energy savings for the period of April 2010 to April 2011 is 4.8 million kWh. This savings is expected to increase as similar energy savings methods are applied to the Laboratory's non-Windows based machines.

Landscaping

The modernization of the ORNL and its focus on conservation has included not only the indoor laboratory and administrative spaces but also the surrounding outdoor area. ORNL is located in the heart of the eastern deciduous forest eco-region. This area contains wetlands, prairies, streams, reservoirs, and other uncommon habitats in addition to upland mixed forests. Since the inception of the Sustainable Campus Initiative, the landscaping around the ORNL campus has been a major focal point for the program and the efforts being made reflect a desire to return much of the land to the state which existed prior to the Manhattan Project to the greatest extent possible. These efforts include the widespread use of native vegetation and local materials, management of runoff, control of erosion as well as reducing the use of noxious chemicals.

During the transformation of the ORNL campus, wherever possible, areas were landscaped using plants which are native to the Eastern Tennessee area. The use of these native species allows the Laboratory to not only highlight their beauty and educate staff and guests about them, but also provides a unique look for ORNL. Additionally, these plants support native birds, insects and other wildlife, some of which are dependent on specific plant species for food and reproduction. By definition, native plants are better adapted to local environmental conditions and thrive where more traditional landscaping solutions would require help in the form of water, pesticides, mowing, etc. One example of this is the transformation of a detention basin, created in 2005 to control sediment runoff from the construction of the new conference center parking lots. Initially it was planned that the vegetation cover for the basin would be non-native fescue grass mix. After much thought and debate, however, it was decided that native species should be used instead. The goal was to create a wetland area using indigenous plants that would be similar to those which occur naturally in the area. In addition to requiring less maintenance than the originally planned cover vegetation, the indigenous plants serve to provide a habitat structure for native animals. This has resulted in much higher wildlife diversity in the area while having the additional advantage of filtering sediment and contaminant runoff from the parking lot more efficiently than would a fescue-based cover. Planting began in early 2006 with both plants and seeds purchased from local sources as well as plant transfer from some of the other wetlands on the Oak Ridge Reservation. In 2007, native shrubs were also added and since this time, the area has required very little maintenance. Figure 6 shows the basin before and after these efforts.

Figure 6. ORNL Detention Basin Before (left) and After Restoration

Source: Ryon 2011

Another landscaping feature being championed by SCI on the ORNL campus is the use of riparian buffer areas around streams. A riparian buffer is a vegetated area located on the bank of a stream which reduces erosion, as well as filtering the rainwater discharges into the stream. The use of these natural barriers has the potential to improve water quality, and minimize the effects of day-to-day lab operations on these ecosystems. In addition to being beneficial to the environment, these buffer areas are aesthetically pleasing and serve to showcase the natural beauty of the Oak Ridge area.

Transportation

Establishing a sustainable campus at ORNL includes the creation and implementation of transportation action programs involving smarter employee commute options and the conversion of the ORNL vehicle fleet to contain more alternatively-fueled vehicles. Recent laws and executive orders now require that ORNL reduce its annual use of petroleum and increase its use of alternative fuels, as well as reduce greenhouse gas emissions. To this end, ORNL uses electric, gasoline/electric hybrid, or alternative fuel (E85 biodiesel) vehicles whenever possible. The Laboratory's current fleet is made up of approximately 251 alternative fuel vehicles, 36 hybrids, as well as 38 low speed electric vehicles. (ORNL 2012)

In addition to the existing fleet, the Lab is installing electric vehicle charging infrastructure for research and, later, operational use. This study includes the design and construction of a 25 station, solar-assisted, electric vehicle charging facility and the installation of distributed non-solar stations. Industry partners for this project include Nissan, ECOtality, Electric Power Research Institute (EPRI), Tennessee Valley Authority (TVA), as well as the State of Tennessee. The on-campus charging system utilizes 2kW of photovoltaic generation per parking space as well as battery storage to partially offset grid load during peak periods. The outdoor batteries will initially be conventional lead-acid batteries but may also provide future opportunities to reuse electric vehicle batteries that are no longer ideal for vehicles but will still hold a reduced charge. The initial 25 station facility, shown in Figure 7, is part of a larger effort to provide the infrastructure required for widespread use of plug-in electric vehicles on campus.

Figure 7. Electric Vehicle Charging Station

Source: ORNL 2012

The upgrades to the ORNL fleet and its infrastructure are complemented by other campus initiatives designed to minimize fossil fuel consumption and greenhouse gas emissions by offering easy access to alternative transportation as well as providing parking incentives for carpooling employees. ORNL's "Bike it Green" program provides one hundred on-site loaner bicycles at many locations across campus. These bikes are available for use to all ORNL staff and visitors upon completion of the safety training course. The program is based upon the "Copenhagen loaned model" where a specific bicycle is not assigned to an individual but instead is checked out at one location and dropped off at another where it can then be checked out by another person and ridden to another destination. Since its inception in 2008 the program has proven to work quite well and has the added benefit of promoting employee fitness and well-being.

Steam Generation and Distribution

ORNL uses 670 million pounds of steam annually for process and space conditioning. The plant which generates this was originally built in 1947 and consisted of three coal fired boilers with a combined capacity of 150,000 lbs/hr with a fourth coal fired boiler being added in 1956. These four boilers were reconfigured for natural gas and fuel oil, and de-rated to 25,000 lbs/hr each in the late 1950s. A fifth and sixth boiler were added in the early 60s and 1990s respectively. These were both natural gas fired with the final capacity for the plant rated at 300000 lbs/hr. With over 60 years of use, the original four boilers were well past their design life, and in 2011 work commenced on replacing the oldest units with a 60,000 lbs/hr biomass gasification plant. The plant was constructed as part of an $89 million dollar energy savings performance contract between DOE and Johnson Controls Inc. (JCI) and is shown under construction in Figure 8.

Figure 8. Biomass Steam Generation Plant Under Construction

Source: ORNL 2012

Biomass gasification is the process of heating any biomass fuel in a low oxygen environment. The product of this starved air combustion is a low particulate fuel known as syngas. This fuel can then be burned to fire a conventional boiler for steam production. It is estimated that the conversion will save ORNL 8 million dollars per year in operating costs resulting in a simple payback time of 11 years. This savings is actually guaranteed to ORNL through its energy savings performance contract with JCI. Through this agreement, the initial capital investment for the plant is being provided by JCI with ORNL repaying the loan with the money saved in operating costs. In addition to the financial benefits to the Laboratory, the new plant will reduce on site fossil fuel consumption by 77% while decreasing the steam plant's greenhouse gas emission by an estimated 20,000 metric ton per year based upon the 2008 baseline. (ORNL 2012) The use of locally sourced wood waste as fuel supports the local economy and the ash generated by the plant can be used as fertilizer. Additionally, the biomass steam plant is an excellent example of the partnership between ORNL's operations and research divisions. The new plant will provide space for biomass and gasification related research as well as a working laboratory for those wishing to study the contrast of biomass and conventional boilers. The plant is currently being commissioned and will be ready for production in 2012.

The renovation of ORNL's aging steam system also includes improvement to the distribution infrastructure. An initial feasibility study showed that 30% of the steam energy in a system is lost due to faulty traps in the distribution system. To address this issue, ORNL has repaired or replaced the faulty traps in the Laboratory's over 12 miles of piping. To prevent failed steam traps from going unnoticed for long periods the lab has fitted over 30 of the traps with wireless sensors to detect problems and transmit their data to a central location. This effort, being performed in cooperation with JCI, will eventually incorporate a much larger number of sensor points, effectively allowing any faulty trap in the system to be identified and repaired immediately resulting in a substantial savings of energy, water and money.

Mission Specific Purchased Power

Executive order 13514 mandates a 28% reduction in greenhouse gas emissions scopes 1 and 2 for government agencies by the year 2020. In compliance with the order ORNL has cataloged its carbon emissions as specified by the EPA. For fiscal year 2010, the Laboratory's total CO_2e emissions were 469,562 metric tons, with 72% (338,085 metric tons) of this being indirect emissions from purchased electricity. Of this amount, 104,505 metric tons were related to electricity purchased for conventional facilities. As was discussed in previous sections, ORNL has already substantially reduced its power use for these types of facilities with this trend predicted to continue. In spite of this reduction, the largest portion of ORNL's overall carbon footprint comes from power purchased for mission specific activities. In 2010, power purchased for this purpose generated 232,413 metric tons of CO_2e, with this number expected to continue to rise over the coming years. It is predominately this usage which will continue to define the carbon footprint of the Laboratory. After much discussion, it was concluded that the only feasible way for ORNL to be able to comply with the executive order without impacting growth of its mission specific facilities was for the Laboratory's electrical power to be supplied using a small modular nuclear reactor (SMR) (ORNL 2010).

The decision to consider nuclear power to reduce the Laboratory's carbon emissions is not taken lightly. The possibility of using solar and wind was thoroughly investigated but was found to be impractical on the scale necessary due to the terrain and climate of Eastern Tennessee. These technologies will continue to be implemented by ORNL wherever possible but due to the ever increasing, mission critical power demands of the Laboratory and the aggressive GHG reduction policies required, their role will need to be supplementary in nature.

The proposed plant would be constructed and operated by TVA with a DOE power purchase agreement as security for a TVA/Industry consortium investment, potentially with DOE funding a portion of the first-of-a-kind costs. It is estimated that the plant would reduce the Laboratory's CO_2e emissions by 550,000 metric tons per year, allowing ORNL to comply with the federal mandate without impacting its ability to fulfill its mission. (ORNL 2010)

Conclusions and the Future of SCI

ORNL's Sustainable Campus Initiative has evolved from the basic need to modernize the Laboratory to reflect its changing role as a state-of-the art research facility. Since its inception, the program has earned several prestigious awards for its demonstration of leadership in various areas. Examples of these include the following;

- 2007 WasteWise Gold Achievement
- 2009 DOE "Best in Class" Award for the zero energy building 3156
- 2010 Federal Energy and Water Management Award
- 2010 DOE Management Award
- 2010 White House Closing the Circle Award
- 2011 E-Star Award for Building 1059
- 2011 Tennessee Chamber of Commerce and Industry Award for Comprehensive Environmental Excellence
- 2011 DOE E-Star Award for Energy and Fleet Management
- 2011 DOE E-Star Award for LEED Existing Buildings

- 2011 East Tennessee USGBC—Green Light Award for Exemplary Contributions to Sustainability in the Built Environment

These awards, serve as testament not only to the hard work and dedication of the SCI team members, but also to ORNL's desire to align itself with the policy of its governing agencies.

Over their first decade, the programs implemented in SCI and the original campus modernization project have taken great strides to ensure that the Laboratory can continue to fulfill its role as a center for world class research as well as an example of how mission and sustainability goals can complement one another. During this time ORNL has continued to demonstrate its commitment to sustainability by significantly reducing its direct carbon emissions as well its indirect emissions through programs such as "Bike it Green" and "Green IT." While CO_2 emissions from power purchased for mission specific purposes have continued to increase, a plan has been developed to reduce this over the coming years, allowing the emissions goals specified by the Executive Order to be met while also reducing dependency on fossil fuels. Other aggressive programs enacted under SCI have resulted in reductions in water and energy use, and have diverted significant portions of ORNL's construction and other waste from landfills. Older inefficient buildings and landscaping have been replaced by modern energy efficient structures which appear to exist in harmony with their surroundings while providing a positive environment for employees and guests. Mandatory LEED certification for new construction serves to showcase ORNL's commitment to sustainability in buildings while projects such as MAXLAB continue to drive the technology forward allowing SCI to continue to change to take advantage of these new discoveries. The net results of these and other programs created under SCI can be summarized as follows;

- 19.6% reduction in energy use per square foot
- 27% of solid municipal waste diverted from landfills
- 85% of construction waste diverted from landfills
- Water waste reduction of 155 million gallons per year
- 77% reduction in on-site fossil fuel consumption
- Restoration of several wetland areas on campus
- Promotion of employee health and well being

At the dawn of the 20th century, few people could have predicted the changes that would come to this region of Eastern Tennessee, and the vital role it would play in world events. Throughout its history, the mission of the Laboratory has continued to evolve in response to this ever changing world. It is this ability to change which ensures that the research conducted at ORNL is as relevant today as it was during the war years. The progress made under SCI is a primary example of this ability, and as the world continues to change, it is certain that the program will continue to evolve to address new problems as well as to utilize new solutions.

Acknowledgements

Funding for this project was provided by field work proposal under the Department of Energy Building Technology Activity Number BT0201000. Oak Ridge National Laboratory is managed by UT-Battelle, LLC, for the U.S. Dept. of Energy under contract DE-AC05-

Disclaimers

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