

Hanford Site Sustainability Program, Richland, Washington – 12464

Lori Fritz*

*Mission Support Alliance, LLC, Richland, Washington 99354

ABSTRACT

In support of implementation of Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy and Economic Performance*, the Hanford Site Sustainability Plan [1] was developed to implement strategies and activities required to achieve the prescribed goals in the EO as well as demonstrate measurable progress in environmental stewardship at the Hanford Site.

INTRODUCTION

The Hanford Site Sustainability Program was developed to demonstrate progress towards sustainability goals as defined and established in Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy and Economic Performance*; EO 13423, *Strengthening Federal Environmental, Energy and Transportation Management*; and several applicable Energy Acts. Multiple initiatives were undertaken in Fiscal Year (FY) 2011 to implement the Program and poise the Hanford Site as a leader in environmental stewardship.

METHODS

In order to implement the Hanford Site Sustainability Program, a Sustainability Plan was developed in conjunction with prime contractors, two U.S. Department of Energy (DOE) Offices, and key stakeholders to serve as the framework for measuring progress towards sustainability goals. Based on the review of these metrics and future plans, several activities were initiated to proactively improve performance or provide alternatives for future consideration contingent on available funding.

RESULTS

A review of the key metric associated with energy consumption for the Hanford Site in FY 2010 and 2011 indicated an increase over the target reduction of 3% annually from a baseline established in FY 2003 as illustrated in Figure 1. This slight increase was attributed primarily from the increased energy demand from the cleanup projects funded by the American Recovery and Reinvestment Act (ARRA) in FY 2010 and 2011. Although it is forecasted that the energy demand will decrease commensurate with the completion of ARRA projects, several major initiatives were launched to improve energy efficiency.

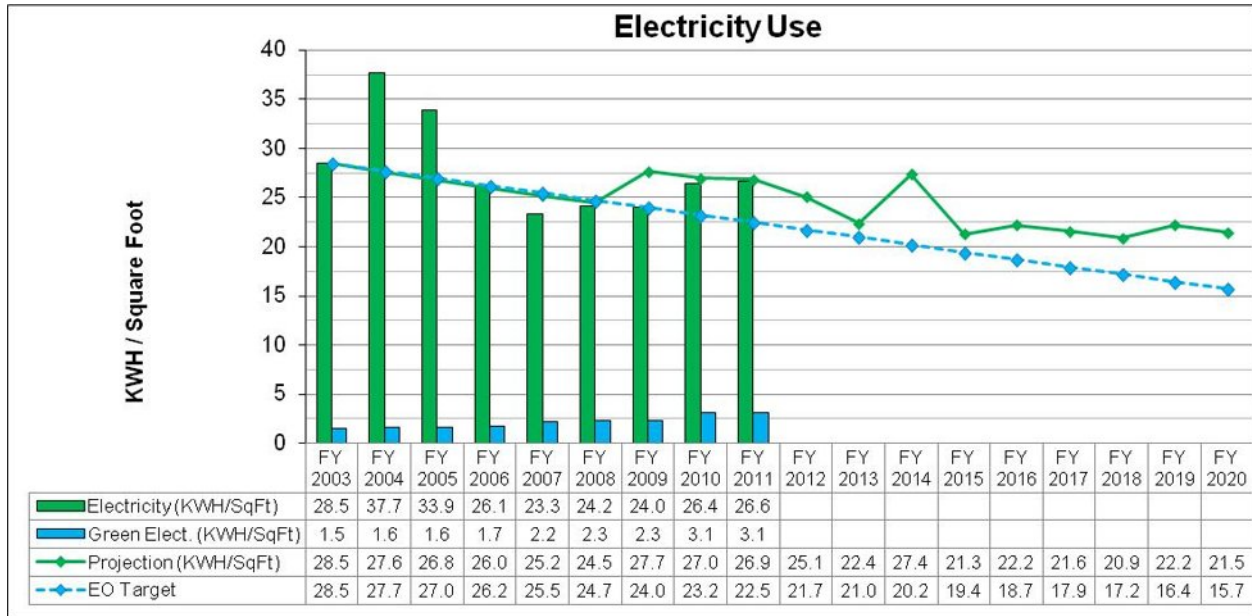


Fig. 1. Hanford energy use.

Green in Three

The “Green in Three” Information Technology (IT) initiative was adapted beginning in FY 2007 to reduce energy consumption from aged IT facilities and equipment through consolidation and centralization activities. Green-in-Three reflects the three elements of the process that make Green IT a reality; (1) Facilities, (2) Equipment, and (3) Culture. Culture means to change the mindsets to manage and engineer with green in mind. Facilities are making IT data centers, equipment housings, hubs, towers, and office space greener. Equipment is to purchase energy efficient IT products and use environmentally friendly disposal processes

For facilities, one of the key consolidation projects completed over the course of two years was the collapsing of 13 data centers into 2, resulting in the repurposing of over 3,000 square feet of facility space (Figure 2). Concurrently, the Hanford Site’s carbon footprint diminished through the conversion to 208-volt power and the transition to virtualized servers, yielding a 50% reduction in energy use at the primary data center and the excess of 9 metric tons (10 tons) of legacy server equipment. In 2011, The Green IT strategy included three heating, ventilation, and air conditioning units being replaced in the data centers. The project reduced grey water output by up to 227 L/hr (60 gal/hr), reduced maintenance costs by an estimated \$40,000 per year, and will reduce power consumption by approximately 60,000 kWh/yr. Across the Hanford Site data center power use has fallen from 100 to 60 kW.



Fig. 2. Data center consolidation.

For equipment, a major project associated with the “Green in Three” initiative was the completion of the Voice over Internet Protocol (VoIP) project to converge voice and data traffic onto a single network. Results from the completion of this project were the repurposing of over 6,300 square feet of facility space as the IT infrastructure footprint was reduced to five buildings and the reduction of energy consumption by approximately 900,000 kWh/yr from a 2009 baseline, as shown by Figure 3. Additionally, by leveraging VoIP technologies, the Hanford Site was able to remove 2,871 kg (6,330 lb) of lead acid batteries. Of the 2,871 kg (6,330lb), 2,000 kg (4,410 lb) were recycled and 871 kg (1920 lb) were disposed of appropriately on-site.

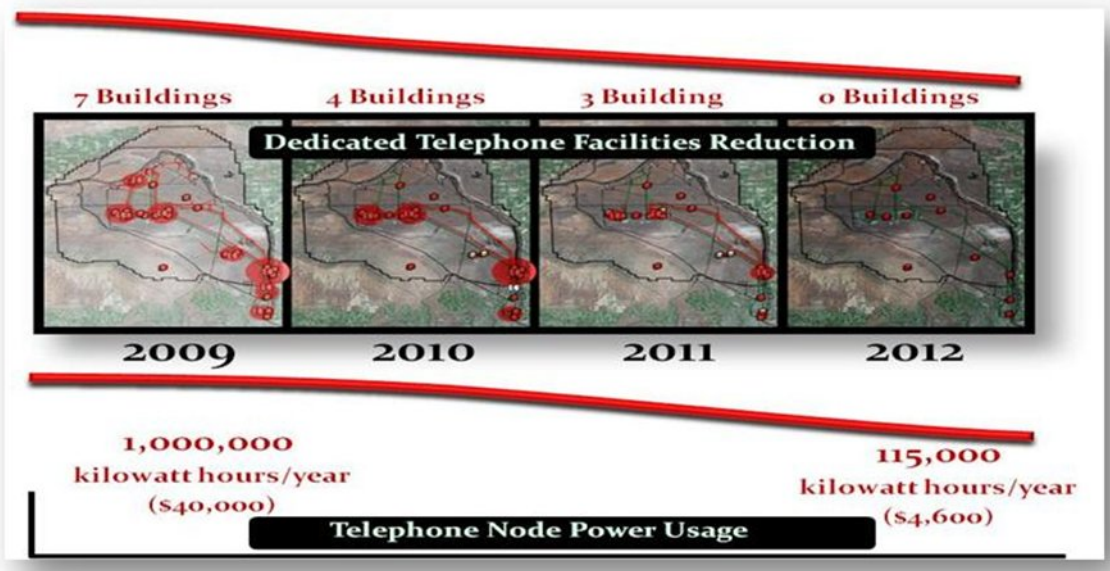


Fig. 3. Telephone facility energy reduction.

For culture, the creation of a robust wireless network to allow field forces to have site-wide access to sufficient bandwidth for voice, data, and video requirements. The wireless network utilized 21st Century technology (WiMAX) to provide high-speed wireless coverage to approximately 368 km² (335 mi²) of the Hanford Site. This changed the end users behaviors by allowing:

- Field personnel have access to information at the point of performance, reducing travel time to and from facilities when new information is required.
- Remote monitoring, telemetry, and/or video can be conducted using the wireless network, reducing travel time for field inspections.
- Emergency personnel have access to critical information at the incident site.
- The cost to deploy voice, data, and video services to remote cleanup areas is faster, less disruptive to the environment, and less expensive.

Services to the field are delivered in days instead of months and information is being delivered to and from the point of performance. The outcome is the Projects have access to information when and where they need it, allowing them to be more efficient and effective yet reduce work force travel time on the job, which in turn contributes to lowering the carbon footprint on the Hanford Site.

Clean Energy Assessment

The Hanford Site and surrounding region have the potential to become a national leader in renewable energy production and sustainability. Several interrelated drivers propel the analysis of commercial development feasibility for clean energy resources: the DOE Asset Revitalization Initiative; the need for an additional 60 megawatts in near-term demand for startup of the Waste Treatment Plant; and the Mid Columbia Energy Initiative established by the Tri-City Development Council to leverage local resources and expertise to enable development of a regional energy industry.

Mission Support Alliance has performed a study for the DOE Richland Operations Office (RL) intended to provide a base of information needed by RL and local authorities to maximize benefit of the significant available assets of the Hanford Site (land, infrastructure, specialized workforce, and robust community support) and to promote commercial development of renewable energies on the Hanford Site and the region. The assessment will be used to provide a near- and long-term planning basis including both the economic and technical considerations for deployment of clean energy to address long-term regional energy needs and to support regional energy economic decision-making.

The assessment focused on relevant forms of clean energy available in the region, local resources, and other pertinent economic and business related considerations. The study included analysis of solar, biomass/biofuels, wind, geothermal, and municipal waste reuse processes. The study provided a system-engineered body of knowledge to help inform decision making on development of commercially viable low-greenhouse-gas-producing energy generation capabilities to meet the needs of DOE and the U.S. Department of Defense.

The results of the assessment provide the following:

- Economic and technical analysis of available clean energy supply chains.
- An effective approach that addresses alternatives to bio or waste resources, preferred crops, transport and processing, integration of renewable resources with other energy sources such as natural gas, and potentially profitable commercial development business cases.
- The potential for coordination of operations with wind resources in order to more efficiently integrate wind power onto the existing grid system.

The findings of the feasibility study are that certain select clean energy technologies have potential to be cost competitive at the Hanford Site with reasonable returns on investment, in particular with the planned and well-executed integration of local resources with conventional energy sources. The study has shown the presence of necessary resources in the region to meet DOE renewable energy needs while also forming a foundation for a future commercial industrial base for commercial production. It has also highlighted several business development conditions necessary to support creation of an economically viable industrial base. Finally, it has revealed several separate but mutually supporting value propositions to be considered by potential developers and investors:

- The Hanford Site has access to significant quantities of renewable energy sources (wheat straw and municipal solid waste) that may be profitably converted into jet fuel, high value chemicals, and electricity with natural gas providing the backup source.
- The opportunity to produce clean energy and green end-products is facilitated by the many Hanford resources and strong regional economic development support.

Efforts to Reduce Greenhouse Gas Emissions

A review of the key metrics associated with greenhouse gas (GHG) emissions from the Hanford Site also correlated with the increased work volume associated with ARRA cleanup work in FY 2010 and 2011 as noted in Figure 4. Similar to the increased energy consumption, it is anticipated that the GHG directly attributed to cleanup operations will decrease commensurate with the completion of ARRA projects.

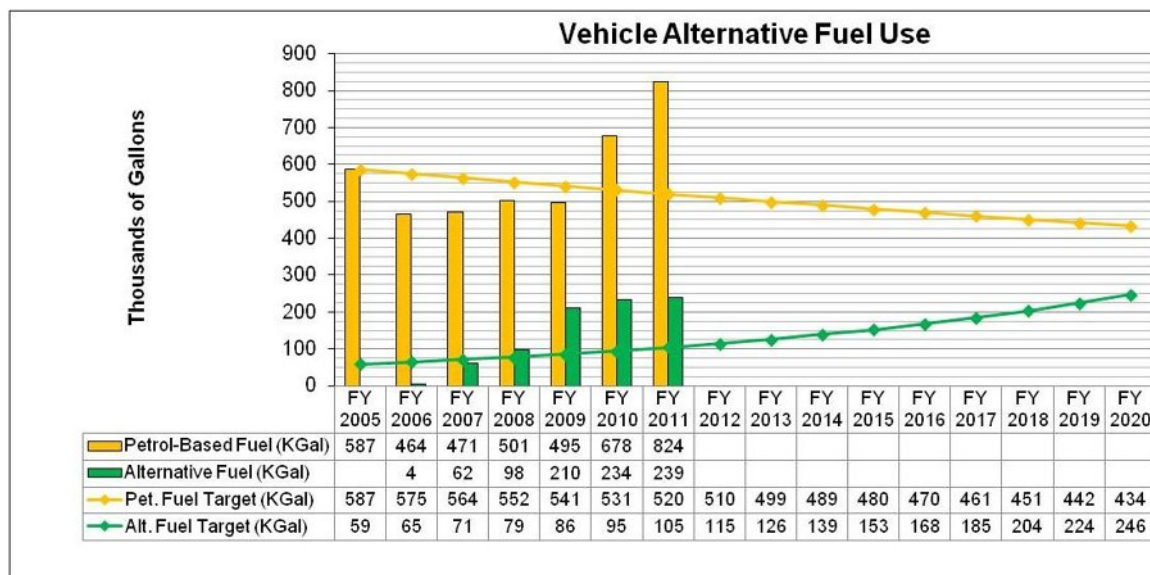


Fig. 4. Hanford fuel use.

In response to new requirements to decrease GHG emissions, several significant fleet management initiatives were implemented in FY 2011. Hanford replaced unleaded fuel with alternative fuels such as E85 and E10, resulting in a decrease of 1,856 metric tons of carbon dioxide equivalents. Additional fleet management actions included the reduction of the overall fleet by 200 vehicles and the acquisition of 149 light and medium duty alternate fuel and 36 hybrid vehicles, equating to 43% of the Hanford fleet comprised of alternate fuel vehicles. Finally, two electric vehicle charging stations were installed and one new plug-in electric vehicle, a Nissan Leaf, was ordered. This progress is illustrated in Figure 5.

In addition to the fleet management actions previously described, a comprehensive feasibility study was completed to baseline GHG emissions from employee commuting and develop strategies to reduce this emission source. The primary objective of the study was to identify appropriate commute alternatives for Hanford Site workers that would reduce GHG emissions 13% below a 2008 baseline by year 2020. Secondary objectives of the study included improving worker safety through reduced traffic congestion, improved worker satisfaction through reduced commute time, and demonstrating environmental stewardship. The study was conducted using a cross functional team representing various Hanford contractors and DOE. The team developed and distributed an employee commuter survey to all Hanford workers to establish an initial baseline.

In order to develop strategies to reduce Scope III GHG emissions from employee commuting, the variables comprising the emission profile used in the study were reviewed (e.g., Vehicle Miles Traveled, Vehicle Fuel Efficiency, and Fuel Type). The ability to influence the vehicle fuel efficiency and fuel type used by Hanford employees is limited; as a result, the study focused on identifying possible strategies to reduce vehicle miles traveled by site employees. A series of transportation alternatives were identified and the potential GHG emission reductions per person per alternative were calculated, with the results illustrated in Figure 5.

Results of the study indicated that commuter travel contributes over 83% to Hanford Site Scope III GHG emissions. Nearly 91 million vehicle miles are traveled annually by employees commuting to the Hanford Site, with nearly 76 million miles traveled by single occupant vehicles.

This situation results in approximately 34,000 metric tons of carbon dioxide equivalent GHG emissions from employee commuting, the majority of which is from single occupant vehicles.

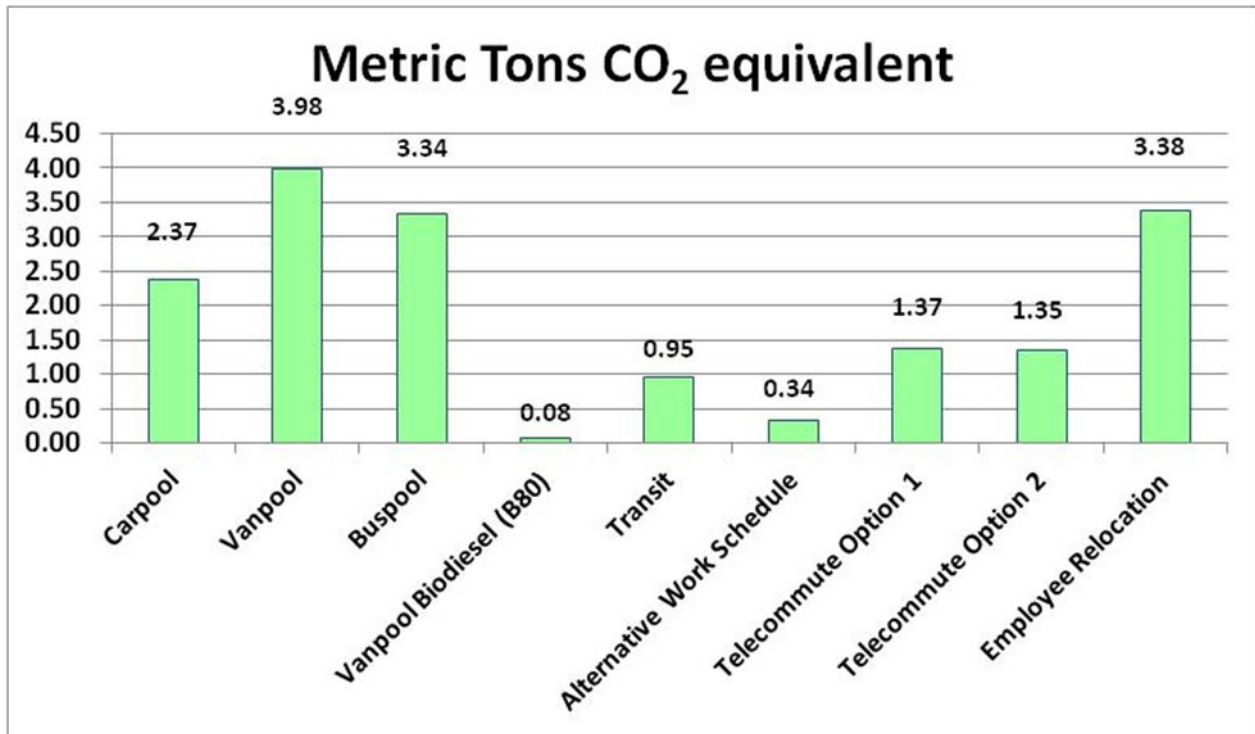


Figure 5. Greenhouse gas emission reductions per person per alternative.

A decision matrix was developed to rank all alternatives, including factors such as GHG reduction, cost, schedule, and work preference. Based on the application of the decision process, employee relocation from site to town facilities, use of van pools, and telecommuting were identified as the top three alternatives, with a total GHG emission reduction of approximately 48%.

Results of the feasibility study were presented to DOE for consideration and it is anticipated that one of the alternatives will be implemented in FY 2012, contingent on available funding.

CONCLUSIONS

The Hanford Site has made significant progress in the area of environmental stewardship through multiple initiatives to reduce energy consumption and GHG emissions, despite increased demands in those areas due to accelerated cleanup work driven by ARRA funding. Future plans, contingent on available funding, include additional enhancements in the areas of fleet management, including installation of additional charging stations and continued acquisition of alternate fueled vehicles, implementation of one or more of the recommendations from the Feasibility Study on reducing GHG emissions from employee commuting, and potential diversion of solid waste from on-site landfills.

REFERENCES

1. *Hanford Site Sustainability Plan*, 2012, Mission Support Alliance, LLC, Richland, Washington.
2. *Hanford Site Commute Alternatives Feasibility Study*, 2011, Vista Engineering, Richland, Washington.