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NNSA Pollution Prevention Awards Nominations for 2013

Halogen Leak Detectors at DAHRT

The Dual-Axis Radiographic Hydrodynamic Test (DAHRT) facility at LANL uses two large x-ray machines to develop three-dimensional interior images of materials. Materials used during testing undergo hydrodynamic shock to simulate the implosion process in nuclear bombs and/or the effects of severe hydrodynamic stress. Pulsed x-ray beams allow for an ultra-fast picture to be developed showing details of the process being studied in three dimensions. Test results can then be compared with computer simulations to help improve the accuracy of the computer coding.

LANL researcher Rudy Valdez spent $1000 to purchase two handheld halogen leak detectors for use with the electronic equipment at DARHT. Once the detectors arrived, LANL personnel used them to discover several leaks in the piping that delivers sulfur hexafluoride to sensitive electrical equipment at DARHT. Once the leaks were discovered, they were quickly fixed to prevent the loss of sulfur hexafluoride, which is a potent greenhouse gas, to the atmosphere. The handheld halogen detectors continue to be used to ensure the continued integrity of the piping that delivers sulfur hexafluoride.

It is estimated that this project reduced the use of sulfur hexafluoride at LANL by approximately 700lb per year. Eliminating the use of this much sulfur hexafluoride is the equivalent of eliminating over 16 million pounds of carbon dioxide emissions per year since sulfur hexafluoride has a very high global warming potential. A small investment in prevention with this project avoided a significant amount of scope 3 greenhouse gas emissions.

Replace Disposable Chevrons with Reusable Design

The LANL pyrochemistry team performs chemical and materials research, and they need specialized pyrochemistry furnaces to do their experiments.

The team uses Teflon chevrons in their pyrochemistry furnaces. Chevron sealing sets are usually multi-part sealing sets, primarily designed for valves, meters, pumps, and rotary joints. The sealing sets generally consist of a pressure ring, a support ring, and several chevron seals. The design and number of parts as well as the combination of materials are determined according to the operating conditions.

The LANL team designed, built, and tested a prototype of a one piece re-usable shaft seal for the special conditions of their pyrochemistry furnaces. The new, one-piece design replaces the previous design that has been used since the 1980s. The old design uses multiple Teflon chevrons that are machined to interlock and provide a gas seal. The old-design chevrons must be replaced after every run or 35 to 40 times per year. The old design is cumbersome to work with inside of a glovebox and takes approximately one hour to replace after every run.

The new one-piece design takes about five minutes to replace and lasts five times as long (so far) or more. Since so many fewer replacements of the chevron must occur each year, this new design will

avoid the generation of approximately 80lb of TRU waste per year. The new chevrons can be manufactured four times faster than the old-design chevrons, and the new design will avoid the need for procurement of approximately 50lb of Teflon barstock every year. Since the new chevrons can be replaced so much more quickly than the old chevrons, there is also a reduction in personnel exposure to ionizing radiation. Lower exposure is very beneficial to the workers, and this effort supports the LANL goal of having all exposure as low as reasonably achievable (ALARA).

This innovation from the LANL pyrochemistry team is estimated to save about $37000 per year, including about 150 hours of labor, waste disposal, and material procurement.

Helium Gas Recovery and Liquefaction at the NHMFL

The National High Magnetic Field Laboratory (NHMFL) at LANL allows researchers from around the world access to specialized and powerful magnets to perform a variety of research in a wide range of fields including physics, geology, materials science, engineering, chemistry, and biology. Liquid helium is used to cool some of the superconducting magnets, which operate at very low temperatures. Helium is a limited natural resource, and staff modified the NHMFL in several ways to reduce their use of helium and become a more sustainable facility.

There have been four successful helium recovery projects implemented at the NHMFL. First, a helium liquefier was installed, which has recycled over 4,100 liters of liquid helium. This reuse is estimated to have saved about $82,000. Second, a stand-alone in-situ liquefier was installed on the new 20 Tesla magnet, which will result in the savings of 5,500 liquid liters of helium a year. This improvement is anticipated to save approximately $110,000 annually. Third, a liquefier was installed on the 14 Tesla PPMS magnet, which has saved 4,000 liquid liters of helium. Using the liquefier saves an estimated $80,000. Lastly, a used liquefier from the NHMFL facility in Tallahassee, Florida is being installed. This recycles over 90% of the liquid helium normally consumed by the NHMFL at LANL. This is estimated to avoid the use of between 35,000 to 45,000 liquid liters of helium per year, which can avoid costs of up to a $900,000 per year.

The totals for all four projects are up to 72,200 liquid liters of helium recycled or reused with a predicted annual savings of over $1.01 million! Using so much less helium eliminates many shipments of this material from Texas to New Mexico, which also saves fuel and avoids the associated greenhouse gas emissions. Establishing helium reuse is timely as well since the cost of helium may increase in 2015. The Helium Privatization Act of 1996 directed the US Department of the Interior to sell off the Federal reserve of helium by 2015. Since the US government currently controls a significant portion of the world's helium supply, transferring the helium to private control will have an unknown impact on the price after 2015.

Implementation RF UHF Telemetry for Transmission of Storm Water Data from Remote Locations

The LANL Surface Water Program currently operates a network of up to 50 stream discharge and rain gage stations across the Pajarito Plateau. The gage network provides environmental data that allows LANL to remain compliant under an EPA NPDES Stormwater Individual Permit, the MSGP NPDES permit, the Buckman Direct Diversion Early Notification System, and the New Mexico Environment Department (NMED) Order on Consent. It is critical that the stream discharge and rain gage environmental data be transmitted from the field stations in real time so that LANL management can make immediate decisions about flood events. Historically, analog cellular modems were used to retrieve data from remote stations, which frequently failed and resulted in field visits to physically download data. This process was labor intensive and required extra resources to perform the work.

To address the problem, the LANL Surface Water Program has installed and activated Ultrahigh frequency Radiofrequency (UHF RF) telemetry for retrieving environmental data from remote stream gage and rain gage monitoring stations. Program personnel upgraded data loggers and installed new UHF RF modem radios operating in the 400 MHz band at approximately 50 remote telemetry units (RTUs) across the Pajarito Plateau. A UHF RF repeater was installed at the LANL communications tower on Pajarito Mountain, retrieves data from the RTUs, and sends the data to the master base station at LANL. The upgraded, green information technology system provides real time data acquisition, reduces time spent in the field, and will save the program approximately $1.2 million dollars through 2018.

In addition to the monetary benefits, using the new information technology saves a significant amount of labor and has other benefits as well. The new gage stations use standardized configuration and parts. The old gage stations had been repaired and modified over time using different parts, different configurations, and software. The new telemetry system and standardizing the gage stations has freed up over 2000 man hours per year, which allows the field crews to focus time on other work scope. The analog cell phones at the old gage stations caused a constant drain on the batteries. Now the batteries last longer and the gage stations have less downtime with the new telemetry system.

Field crew personnel found it difficult to troubleshoot problems in the field and often had to come back to the office to research the problem, which required another trip back into the field to complete repairs to the gages. Since the field crews can determine exactly which stream gages have collected water samples, they can now prioritize which samples should be collected first, thus better managing their time and addressing NMED and Buckman Direct Diversion programmatic priorities.

The cycle time for collecting samples has decreased since field crews know exactly which gages have collected water samples. This allows LANL staff to not exceed the holding time requirements for the samples. Field crew personnel indicated they feel less pressured, frustrated, and stressed in the field now that they know which samples to retrieve, rather than spending their time looking in gages where no samples were collected and on activities that will not produce results. Schedulers can better plan how many field crew personnel will be needed to collect samples since they know exactly how many and where the samples are located that need to be retrieved.

This new gage stations reduced the number of times the field crews have to drive into the field during the storm water monitoring season when there are rain events. In rainy weather, the dirt roads can become difficult and sometimes impossible to drive on. Driving trucks over the muddy roads causes the roads to become rutted. More maintenance is required both for the roads and trucks when more driving on wet roads occurs. Greenhouse emissions from trucks are reduced from fewer trips into the field.

Field crews are more efficient in performing maintenance on the gages. In the past, data could be lost because a flow event or lightning might have damaged the gage. With the old process, the field crews might not know that the gage was damaged until they performed the routine maintenance weeks later. During this time, the damaged gage did not collect a sample if there is a flow event. With the new telemetry system, the field crews know immediately if a gage has been damaged and is not transmitting data. For example, one gage station was recently destroyed by a falling tree. Telemetry information immediately alarmed staff that something was drastically wrong, and a field visit to the station was initiated to investigate.

Workers are relieved not to hear the constant dial-up modem sound, a type of noise pollution, when calling the cell phones at the old gage stations to downloaded the data. Additionally, the green information technology was installed not long before the provider of the monthly cell phone service stopped supporting analog cell phones, meaning that the stream gage stations would no longer be able to transmit data over the dial-up modems. If the new gage stations had not been installed, this change would have required the field crews to manually check and collect water samples from all of the stream gage stations until a new system could be installed. Using this new information technology system has been beneficial from so many aspects.

Improving the Efficiency of LANL's Fleet

President Obama issued Executive Order "Promoting Efficient Spending" on November 9, 2011, which directed all federal agencies and their subcontractors to take aggressive steps to ensure the government is a good steward of taxpayers' money. The areas targeted were travel, information technology, printing, executive fleet efficiencies, and promotional items. The fleet efficiencies requirements was a follow-up to the President's May 24, 2011 Federal Fleet Performance memorandum, which directed agencies to improve the performance of the Federal fleet by increasing the use of vehicle technologies, optimizing fleet size, and improving fleet management practices.

In response, representatives from LANL developed and implemented a fleet right-sizing plan that began in FY13 and will run through FY18. The fleet right-sizing initiative was based on a two-fold approach.

1) Return GSA vehicles that had not meet utilization standards for the last 12 months, unless an adequate justification was provided by the line organization.

2) Downsize SUVs and heavy pickup trucks to more cost effective and fuel efficient sedans and light duty trucks. It is important to note that the only time LANL can turn in or exchange one vehicle for another is during GSA's annual vehicle replacement process from October through December and can only include vehicles that have met GSA's lease mileage or age replacement criteria.

For the 5-year plan to be effective, it required the assistance and cooperation of the line organizations and their assigned vehicle coordinators. As a result of these efforts, 20 vehicles were not reordered and 34 SUVs were either not replaced or replaced with a smaller vehicle. The cost savings were approximately $159,000. In addition, LANL's FY13 GSA-leased vehicle replacement order included 89 low greenhouse gas vehicles (sedans and similar low fuel usage vehicles).

Tracer FIRE Virtual Workshop

Tracer FIRE (Forensic Incident Response Exercise) is a four-day event that aims to empower cyber security responders with skills and techniques to recognize nefarious network activity and malicious software. The annual FIRE events include parallel lab-oriented training tracks followed by a capture-the-flag contest to exercise newly acquired skills and knowledge in a challenging and motivating environment. Tracer FIRE events provide hands-on computer security workshops to strengthen the community of cyber defenders in DOE and other government agencies. These workshops build a distributed team of cyber defenders with the latest skills necessary to respond to cyber intrusions.

Tracer FIRE was a workshop created by LANL and held physically in New Mexico for four years, bringing together folks from DOE, other government agencies, and strategic commercial partners to attend joint training and work on select cyber security problems. In August 2012, LANL began to transform this workshop into an on-line video conference. A number of reasons colluded in the decision to move Tracer FIRE 5 to an online event. The first was that strict travel restrictions began in mid-2012. The organizer was worried that the smaller DOE sites might lack the funding or resources to file all the new paperwork required to attend the event. Additionally, with sequestration on the horizon, the team was concerned that cost-cutting measures were going to prevent people from attending.

By late January 2013, Tracer FIRE 5 was successfully converted to an online venue. The team decided to encourage "regional hubs" so that population centers could combine organizations into a single space, so that some social connections could still be made. For example, the FBI and Navy joined together in San Diego; DOE and DHS joined together in DC; and several universities partnered with national labs in their areas. Coordinating these hubs proved to be difficult. The team scheduled several planning conference calls with the hubs to answer any questions, plan for the event, and address any problems in advance.

The courses were taught in a classroom style. Since the team did not know in advance what technologies would work best, each instructor chose something different. The team used GoToMyWebinar, Microsoft Lync, and YouTube for presentation of course materials. The YouTube

method required a lot of up-front work to record concise videos to accompany the lab exercises, but this proved to be the most reliable method to transmit information since Google had already solved technical issues with almost every potential setup. Class attendees used an online, text-based chat to ask questions, which served to help form social connections within the group. After classes filled up, people were placed in the YouTube-based class. Every class had about twice as many students as in prior years, and the YouTube-based class had over four times as many students.

The exercise was modified such that everything consisted of a problem set that players would download and examine on their local computer. This distributed approach resulted in a massive reduction of load on the server since it only had to provide static content and verify answers. Players interacted via online chat. Overall, participants were very positive about the experience. The team had multiple people request that the event occur more frequently, and people continue to join the announcements list about the 2014 event.

Other than labor, Tracer FIRE 5 was a zero-cost event with no travel costs or registration fees. Reducing the cost barrier for attendance allowed the Tracer FIRE workshop to grow from 80 participants in 2012 to about 600 in 2013. Having an online venue avoided travel costs of an estimated $300,000. In addition to avoided travel costs, fuel was saved by avoided air and ground travel of approximately 960,000 miles by the participants. One of DOE's significant contributors to scope 3 greenhouse gas emissions is air and ground travel, and this effort helped to reduce greenhouse gas emissions in those categories from LANL and other sites across the DOE complex. This one effort avoided the generation of over 250 metric tons of carbon dioxide. Additionally, these savings are sustainable since all future Tracer FIRE events will be held on the internet due its success and the attendance explosion.

A TRU Story: The 3706 Waste Campaign

In 2011, the Las Conchas fire roared through the mountains of northern New Mexico, consuming more than 150,000 acres and coming to within 3-1/2 miles of Area G, Los Alamos National Laboratory's waste disposal site. The wildfire's proximity to Area G garnered national media attention.

After the fire, New Mexico Governor Susana Martinez asked the Department of Energy to make removing the combustible and dispersible waste stored above-ground at Area G its highest environmental priority. As a result, DOE's National Nuclear Security Administration and the New Mexico Environment Department forged a Framework Agreement that required the Laboratory to remove 3,706 cubic meters of waste stored aboveground at Area G by June 30, 2014.

It's a demanding goal to ship decades' worth of nuclear waste to WIPP and other disposal facilities. Because much of the waste dated from as far back as the 1970s, it had to be repackaged to fit the Waste Isolation Pilot Plant's stringent permit requirements.

The LANL TRU Program (LTP) found ways to categorize and process the waste efficiently, and the results have been remarkable. The goal for the 2012 fiscal year was to make 184 shipments to the Waste Isolation Pilot Plant (WIPP), and the program made 230. The pace of shipments broke all previous records for the TRU program during 2012, and LTP plans to remove more than twice as much waste in 2013.

The accelerated pace was achieved without cutting corners or compromising safety or security, a priority that has been paramount since day one of operations. The accelerated shipping campaign also reduced the material-at-risk (MAR) level at the waste storage area by 27,859 PE-Ci.

Part of the legacy of 70 years of weapons research and development are stores of TRU waste that were generated prior to 1994. This so-called legacy waste is not so straightforward to process. Waste containers that have been sealed for decades frequently have a buildup of hydrogen gas, which is a safety hazard, or an unknown breakdown of chemical constituents. Before being shipped to WIPP, each legacy container is assessed and, if necessary, vented. Also, if necessary, containers may be opened to remove items such as aerosol cans and then repackaged in compliance with WIPP disposal criteria.

At present, most of the Laboratory's legacy waste is stored in aboveground, metal-framed, fi re-resistant containment domes that reside atop an isolated mesa at LANL. The Las Conchas wildfire prompted LANL's accelerated TRU shipment campaign, an effort known as the "3706 TRU Campaign." Removal of the TRU waste from Area G increases safety for the public, workers and the environment. If another forest fire threatens LANL, then the risk to the public and the environment will be greatly reduced.

The success of the 3706 TRU Campaign required a rapid shift of environmental priorities and creation of a number of collaborative relationships with key partners. LANL created collaborative relationships with the New Mexico Environment Department, WIPP, and the DOE Los Alamos Field Office built on trust and a shared objective. Working together, this collaboration has resulted in an unprecedented working relationship and confidence that the 3706 TRU Campaign will be completed during the timeframe requested by the governor. The exemplary relationship between the state and LANL was exemplified on June 26, 2012, when Governor Susana Martinez was the keynote speaker at a ceremony celebrating the Laboratory's 1,000th shipment of waste to WIPP. The ceremony coincided with the first anniversary of the Las Conchas fire.

To engage local community members, the 3706 TRU Campaign was unveiled at a meeting of the Northern New Mexico Citizens Advisory Board on January 5, 2012. Periodic updates and presentations from project management on the campaign's status have kept the group informed both at live meetings and through an external website (http://www.lanl.gov/community-environment/environmental-stewardship/cleanup/sites-projects/3706-tru-campaign.php). LANL maintains an internal website on this project as well.

To communicate the campaign's progress to key stakeholders, neighbors and the public, the Laboratory created a comprehensive communications campaign that incorporated key messages. A commitment to transparent communications and respect for stakeholders have resulted in support for the project from

such diverse audiences as neighboring tribes and pueblos, anti-nuclear activists, state officials, and residents in surrounding communities.

LANL developed a number of communications tools for its outreach campaign, including a brochure, a 12'x12' pop-up display used at public meetings, posters, and presentations. These 3706 TRU Campaign materials received a Platinum Award in 2012 from the Association of Marketing and Communications Professionals in international competition.

To keep the general public informed about the project's progress, LANL also provided the news media with periodic updates. News releases related to this effort include:

- March 7, 2013 - Los Alamos National Laboratory opens waste repackaging facility;
- October 3, 2012 - LANL shatters records in first year of accelerated shipping effort ;
- August 6, 2012 - LANL sets waste shipping record for fourth consecutive year;
- June 26, 2012 - Los Alamos National Laboratory celebrates 1000th transuranic waste shipment;
- March 26, 2012 - Lab ahead of schedule processing waste in large boxes;
- February 9, 2012 - New facility boosts Lab's ability to ship transuranic waste; and
- January 9, 2012 - Lab outlines priority cleanup goals.

The 3706 TRU Campaign also has provided anti-nuclear activists with accurate information about the amount of waste stored at LANL, the status of the campaign, and future plans for disposition of below-ground waste. This has been accomplished through periodic face-to-face meetings and has resulted in support for the project from activists. In addition, the LANL TRU Waste Program provided tours of Area G for key stakeholders, including San Ildefonso Pueblo Governor Terry Aguilar, Senator Martin Heinrich, executives from DOE headquarters, and members of the Northern New Mexico Citizens Advisory Board. The tours include visits to the waste packaging operations, the area where waste is stored, and the shipping facility.

Early in 2013, a team from LANL, the DOE Los Alamos Field Office, the Carlsbad Field Office, the NMED Secretary, and the Northern New Mexico Citizens Board presented a well-attended panel discussion about the 3706 TRU Campaign at the annual Waste Management Conference in Arizona. This presentation exemplified the partnership efforts that have helped make the 3706 TRU Campaign a success.

Bioassay Sample Analysis Process Improvement

The Nuclear and Radiochemistry group at the Los Alamos National Laboratory provides vital radiochemical and analytical capabilities to a wide range of programs. The LANL Bioassay Program is the cornerstone of LANL's radiation worker safety program, providing final evidence of the efficacy of

workplace safeguards against worker exposures to radionuclides. Those enrolled in the Bioassay Program are monitored for potential internal exposure to radionuclides from their work environment.

The team analyses the in-vitro bioassay samples by electroplating the samples onto an apparatus made of rhenium ribbon supported by stainless steel posts. About 2500 such samples are analyzed each year. Prior to sample analysis, the filament assembly was cleaned with water and then acetone, and the resulting liquid was handled as mixed low-level waste (MLLW). Once used, the spent assembly was handled as low-level waste (LLW).

The bioassay samples have very low, environmental levels of radioactivity. The sample analysis team documented in the new waste profile that the very low level of radioactivity in the samples was insufficient to contaminate the water and acetone rinse. The rinsing technique is performed in a non-radioactively controlled building, and the water and acetone rinse is not radioactive.

The process of rinsing the samples was changed such that excess water was shaken off the filament assemblies prior to cleaning with acetone. With less water on the filaments, now such a small volume of acetone (<2ml) is required that it evaporates before any liquid can be collected. In the current rinse operation, less water is used to rinse salts from the filaments that contain the environmental samples. The water is captured on cleaning cloths, which are disposed of in the sanitary waste stream. The amount of waste avoided by this process and waste profile change is approximately 50L of MLLW per year.

The spent filament assemblies used to be entirely handled as LLW. The team changed the process to remove the rhenium ribbon from the stainless steel posts. This way the stainless steel posts can be recycled, and now only the rhenium ribbon with the electroplated sample needs to be handled as LLW. The rhenium ribbon is less than 2% of the total weight of the assembly. This process improvement avoids the generation of approximately 25lb of LLW per year.

The cumulative changes in the sample analysis process are estimated to avoid costs of over $90,000 annually. Shaking water off the assemblies before use and taking them apart after use only takes about 15 seconds each, and there has been no decrease in the number of samples analyzed annually.

Energy Management and Experimentation at the NSSB

An important goal of the Sustainability Program within Utilities and Infrastructure (UI) at LANL is to not only increase the efficiency of building energy use but also to understand how we can manage our energy resources more intelligently. At nearly 300,000 square feet, the National Security and Sciences Building (NSSB) has provided a great opportunity for energy savings and Smart Grid Demand-Response experiments. While this building does have high computer use it is primarily an office building with fairly predictable energy use, not subject to programmatic energy loads as many others among the LANL campus. Therefore, much of what we have learned at the NSSB can be used at other office buildings at LANL.

Throughout 2012 we have implemented many energy conservation measures (ECMs) aimed primarily at the HVAC system that have resulted in an energy use reduction of close to 13% (Figure 1). Placing the building automation system (BAS) on night setback has resulted in the majority of the energy savings by greatly reducing the runtime of the heating and cooling system during hours that the building is unoccupied. Similarly, narrowing the available thermostat range from a high of 76F to a low of 68F keeps the HVAC system from working hard just to heat or cool a few outlier spaces. Additional savings was achieved by optimizing the heating and cooling system by closely matching the supply air temperature and pressure to the building heating and cooling loads. An additional benefit of the HVAC system operating at an increased efficiency is that the tenants are less likely to use electric space heaters, further reducing the energy consumption of the building.

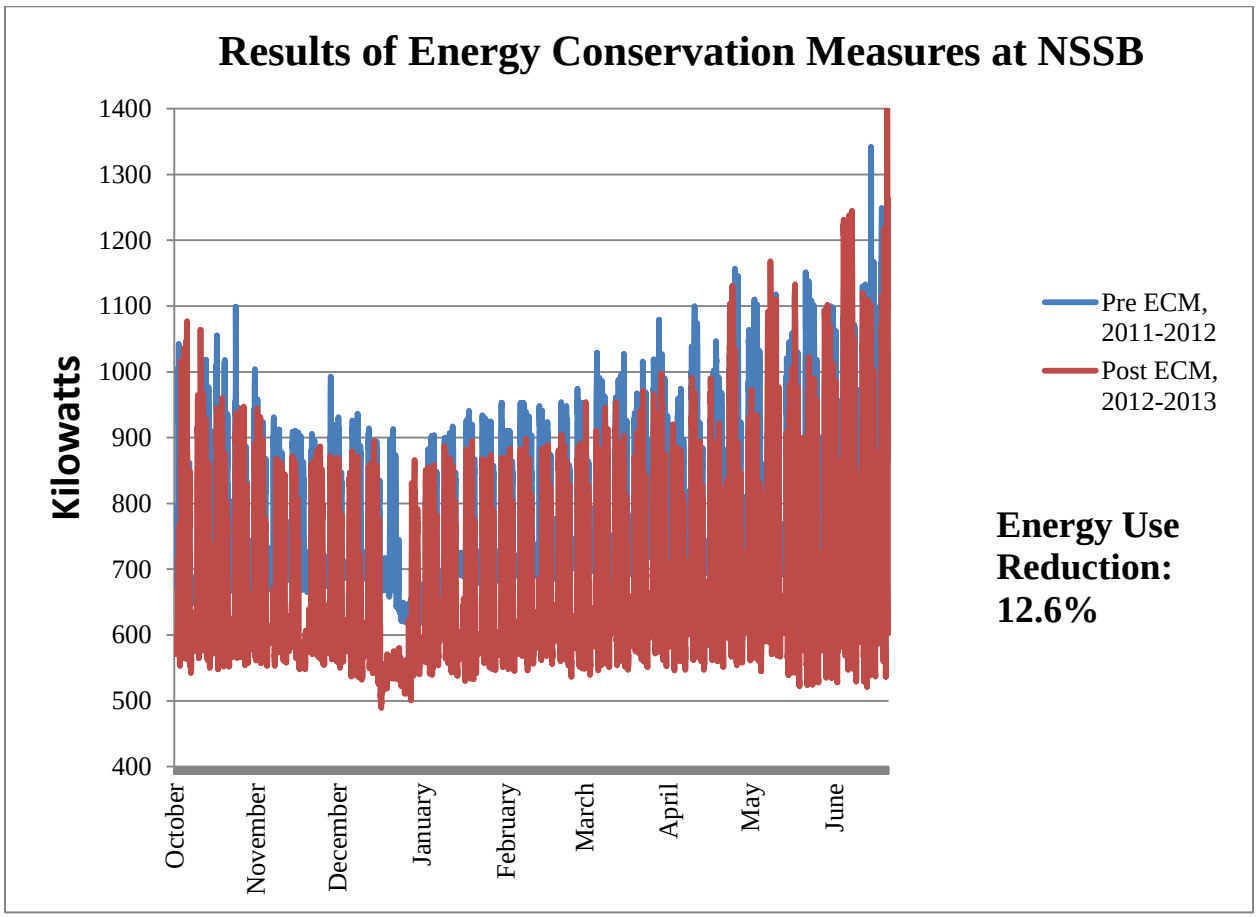

Figure 1. NSSB ECM Results

Due to its large square footage and predictable power consumption, the NSSB has also provided a platform for Smart Grid experiments in Demand Response. In collaboration with Japan's New Energy and Industrial Technology Development Organization (NEDO), Los Alamos County, and Scott Backhaus – an experimental physicist at the lab, the Sustainability Program has implemented a control code in the BAS of the NSSB that provides direct control over changes in the HVAC power consumption on a 15

minute time scale. This control scheme is able to respond to changes in the generation of power from the nearby one megawatt photovoltaic (PV) array installed by NEDO. Power generation at the PV array may be reduced due to short or long duration cloud cover. During the peak cooling season, this demand response resource can provide up to 150 kilowatts of generation-following capability. While the local PV array has on-site battery storage to respond to fluctuations in generation, these results of these experiments have the potential of providing an inexpensive and robust source for energy storage for utilities and electrical coops were large scale battery storage may not be feasible.

The control algorithm used in the NSSB BAS works on global thermostat resets that shift the current thermostat set point for each variable air volume (VAV) unit that serves multiple office spaces. Large commercial HVAC systems, such as the NSSB, can have hundreds of VAVs that control the flow rate of air delivered to each conditioned space. During the cooling season raising the set point of the thermostat effectively closes down the VAV air damper to the spaces. The BAS senses the cumulative increase in pressure from these closed dampers and reduces the speed of the supply air fans to a minimum, thereby reducing power consumption. With a reduced call for cooling, the chillers that supply cold water to the heat exchangers in the supply fan duct also reduce their output of cold water, reducing power consumption even further. The initial fan response is on the order of a few minutes, while the chiller response may take up to ten minutes to reduce the stages of cooling.

Figure 2 shows the results of a day of experimentation in late summer 2012. The majority of the thermostats in the NSSB were increase by two degrees Fahrenheit for thirty minutes, then return to the normal set point, then decreased by two degrees. The KW output of the fans, chillers and total electrical consumption of the building were recorded. Note the increase in response during the peak cooling period of the day (12pm to 4pm).

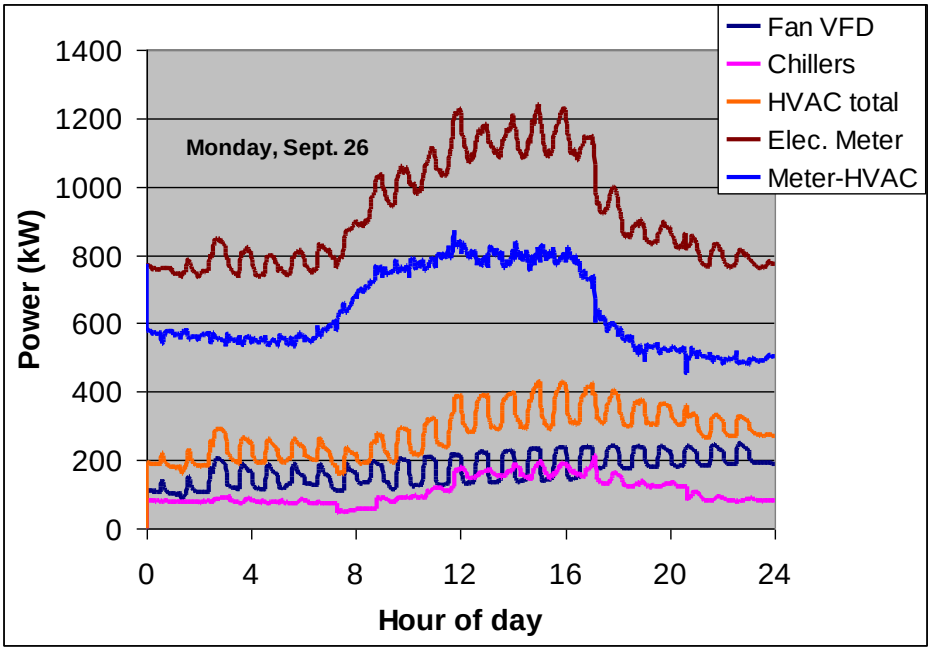

Figure 2. Global Thermostat Reset and Response

This level of demand response can be helpful on a short term basis, such as an isolated cloud passing over the PV array, or in the case of long duration cloud cover, the reduction of building energy for up to a half an hour can allow other power generation sources to be brought on-line for longer term generation-following. The experiments at the NSSB have shown that the small temperature increases in the office spaces have not had a noticeable impact on tenant comfort.

While these experiments have demonstrated that the thermal capacitance of a building can be used as a demand response system on a short to medium time scale, more work needs to be done to offset the need for large scale battery storage systems that mitigate the intermittency of renewable energy systems. To adequately follow the generation of the NEDO PV array a one megawatt of response is needed. We are currently working on building a network of similarly controlled office buildings throughout the LANL campus to achieve that goal.

Saving water in Northern New Mexico – LANL's Sanitary Effluent Reclamation Facility

Los Alamos National Laboratory (LANL) uses over 1 million gallons of water each day to support operations as NNSA's preferred site for plutonium research, development and manufacturing, nuclear weapons design and engineering, and supercomputing. During the past few years, water use on the 40 square mile site amounts to about 430 million gallons each year. LANL is currently exceeding the water use intensity baseline by 26% due to facility and equipment cooling demands. Furthermore, LANL is expected to require an additional 200 million gallons of water per year by 2020. LANL has several large cooling tower systems which account for 30% of the total water use. In order to reduce withdrawals of potable water from the regional aquifer and meet the EO 13514 water use intensity goal, a strategic plan to reduce water-related facility and equipment cooling demands was developed. This strategy centers on the expansion and operation of the Sanitary Effluent Reclamation Facility (SERF) via providence of reclaimed sanitary effluent (grey water) for re-use within co-incidental hydronic systems such as cooling towers. To take full advantage of SERF-related water savings, the discharges from several cooling towers required re-routing to the Sanitary Waste Water System (SWWS; sewage treatment plant) and subsequent modification to operations at the SWWS. Beginning in October 2012, SCC used reclaimed water from SERF on a trial basis, in part to determine the minimal level of chemical additives necessary to treat the water and offer corrosion protection to the SCC's cooling tower equipment. By minimizing chemical additives in the water treatment, potential environmental effects are reduced, too.

SERF supplies all of the necessary water to the Strategic Computing Complex (one of the Laboratory's major data centers) – approximately 80 million gallons/year. Currently SERF operates 24 hours a day, seven days a week. Completion of the SERF project to meet discharge permit requirements was a major accomplishment in 2012. Now, LANL is focused on improving water reuse opportunities. SERF is but one piece of the water puzzle, but a big, complicated piece.

The SERF expansion project was completed on schedule and on budget. Completion of the SERF project was a significant accomplishment for the Laboratory.

Sustainability is in his DNA: Dr. Dennis Hjeresen

This award nomination is for Dr. Dennis Hjeresen who has demonstrated a deep understanding of sustainability and has implemented innovative approaches to sustainability over his entire career at Los Alamos National Laboratory, and nationally and internationally through the Green Chemistry Institute and work on water issues and green technology development.

Dr. Dennis L. Hjeresen currently serves as Senior Advisor for the Principle Associate Directorate for Business Services and Operations at Los Alamos National Laboratory. He is responsible for integrating environmental responsibility and sustainability into all aspects of Los Alamos National Laboratory operations.

Dr. Hjeresen previously served as Division Leader for Environmental Protection where he was responsible for regulatory compliance, permitting and risk reduction programs and interactions with State and Federal regulatory agencies. As Division Leader, he championed innovation in communication and public engagement in regulatory proceedings. This effort was successful in dispelling misconceptions about the impacts of Laboratory operations to the environment and garnered public support for LANL operations, giving voice to those who support the Laboratory's mission but were not typically active in public participation processes. He advocated for a prevention-first approach to all compliance programs and championed the Zero Liquid Waste Strategy to reduce outfalls from 114 to 11. He was also responsible for the initial development of the Long Term Strategy for Environmental Stewardship and Sustainability (formerly known as the Fifty Year Plan for Environmental Stewardship) under the direction of the Los Alamos Field Office. This strategy established seven sustainability-based Grand Challenges that are endorsed by the Laboratory Director and the Los Alamos Field Office Manager. The Strategy has a strong public outreach element. Dr. Hjeresen continues to support implementation of this strategy in his role as Senior Advisor in the Principal Associate Directorate for Business Services and Operations.

Grand Challenges:

- Remove or stabilize pollutants from the Manhattan Project and Cold War Eras
- Protect water resource quality and reduce water use
- Eliminate industrial emissions, discharges, and releases to the environment
- Protect human and environmental health by managing and restoring lands
- Produce zero radioactive, hazardous, liquid or solid wastes
- Use energy efficiently while creating sustainable energy sources

- Collaborate with our stakeholders and tribal governments to ensure that LANL's impact on the environment is as low as reasonably achievable.

Prior to being Division Leader, Dr. Hjeresen served as LANL's Director of the Office of Risk Reduction where he was responsible for implementation of a preventive strategy to achieve regulatory compliance. He was instrumental in the establishment of the Laboratory's ISO 14001 registered Environmental Management System (EMS). It is notable that Los Alamos National Laboratory was the first NNSA site to receive third party certification for its EMS. The LANL EMS has been recognized with three Department of Energy "Best-in-Class" awards and has also received P2 Star and DOE's prestigious E STAR awards. He ensured a strong connection between pollution prevention and the EMS with regulatory programs. The pollution prevention program thrived under his leadership resulting in tens of millions of dollars in avoided costs while reducing impacts and supporting mission accomplishment. Under his leadership, the Pollution Prevention Program worked to reduce influent to the Radioactive Liquid Waste Treatment facility. These efforts resulted in a 75% reduction in discharge from the facility, with a reduction from 20 million liters to less than 4 million liters per year. These improvements and additional upstream improvements reduced the footprint for a proposed replacement facility. More importantly, this reduction in influent coupled with additional upstream pollution prevention projects enabled the facility and the mission-critical operations it supports to continue through operational challenges.

Dr. Hjeresen has always been mindful about mentoring staff in the area of sustainability. His active involvement of staff and students in sustainability projects has resulted in a cadre of sustainability experts who incorporate green approaches in their different work roles at the Laboratory.

In terms of promoting sustainability nationally and internationally, Dr. Hjeresen is a co-founder of the Green Chemistry Institute (GCI) and served as Director of the Institute from 1999-2003. Dr. Hjeresen also served a three-year term as Chair of the Industrial & Engineering Chemistry Division of the American Chemical Society. He currently chairs the Environmental Subgroup of the Energy Facility Contractors Group (EFCOG). He has also served as a member of the editorial or advisory boards for the Journal of Green Chemistry, the Journal of Environmental Science and Technology and the Journal Clean Products and Environmental Policy.

Earlier in his career, as a Program Manager at Los Alamos, Dr. Hjeresen has actively supported environmental technology development, transfer and commercialization and has received an R&D 100 Award, Popular Sciences "Best Environmental Technology Award, and DOE's Technology Commercialization Award. Dr. Hjeresen has taken Los Alamos science from basic research to commercial products, managing the entire life-cycle.

On scientific loan from Los Alamos, Dr. Hjeresen also served as director of the US/China Water Resources Management Program for the White House, coordinating the activities of 11 USG agencies, the private sector and NGO's as they relate to water in China. Within government, Dr. Hjeresen has been a key initiator of prevention and environmental science programs including the DOE Environmental Management Science Program.

Dr. Hjeresen began his career as a Director's Fellow in the Life Sciences Division under Morton Bradbury. His interdisciplinary research program combined neurobiology with high-energy physics to understand biological impacts of electromagnetic fields.

Dr. Hjeresen received his M.S. in Neuroscience (Physiological Psych) in 1982, and his Ph.D. in Neuroscience (minor in Ecology) in 1984, both from the University of Washington in Seattle. He is a Certified Environmental Management Professional (National Registry of Environmental Professionals) and a Certified Project Management Professional. His research career focused on biological effects of environmental pollutants and includes an extensive list of peer-reviewed publications and a history of professional service.

Andrew Erickson

Andrew Erickson is the Division Leader for Utilities and Institutional Facilities for Los Alamos National Laboratory. In this position, Andrew is the lead manager responsible for meeting the DOE sustainability goals. He has been responsible over the past three years with for the establishment and implementation of a sustainability program at the Laboratory. Andrew has spent the last 4 years steering, and oftentimes driving, a growing team of engineers and data analysts toward a more sustainable campus environment. He is successfully leading this team, swerving in and out of lanes, but somehow always under control. He is also responsible for over four million square feet of facilities and the site's utility and road infrastructure across 43 square miles of the site in support of the Laboratory's broad missions.

Andrew not only maintains and manages a combination of diverse energy sources, he is constantly searching for ways to make these systems more reliable, more diverse, and supportive to the research and development environment we work in. For example, Andrew was one of the leading forces that combined a team of high-powered engineers to use the Laboratory's main administration building, the local Los Alamos County utility, the townspeople, and Japan's New Energy and Industrial Technology Development Organization (NEDO) to develop a smart grid solution to make the energy grid more cost effective and compatible with renewable energy sources. This project included computer simulation tools to help control, in real time, a community-scale smart grid demonstration that includes a significant amount of power from a large solar photovoltaic (PV) array.

In addition, Andrew was one of the main leaders at the Laboratory that worked on the expansion and operation of the Sanitary Effluent Reclamation Facility (SERF) via providence of reclaimed sanitary effluent (grey water) for re-use within co-incidental hydronic systems such as cooling towers. This project is now saving the Laboratory 80 million gallons of water each year. The SERF expansion project was completed on schedule and on budget. Completion of the SERF project was a significant accomplishment for the Laboratory. Andrew has over 20 years of experience successfully operating and

maintaining complex systems in US Navy nuclear, Department of Energy, and Western Electric Coordinating Council (WECC) regulatory environments. Mr. Erickson has proven leadership and management skills in line management at the group and division level combined with project management experience. Mr. Erickson is currently serving as the Division Leader and Facility Operations Director for the Los Alamos National Laboratory (LANL) Utility and Institutional Facility Division. He has over ten years facility management experience at LANL overseeing and implementing improved formality of operations, which includes conduct of engineering, maintenance, and operations, for facility and utility operations.

Andrew is always out in front of employees, taking the right risks, and jumping at the right time. Although working for Andrew can be tiring, it is rewarding, challenging, and inspiring. He is an admired change agent.