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Submissions for the 2016 NNSA Pollution Prevention Awards

Change Agent: An individual (or group of individuals) who takes the initiative to foster behavior change in his or her immediate work environment, organizational unit and/or site. Recognition will focus on efforts, large or small in scope, that advance one or more of the goals identified in the SSPP.

Change Agent: Championing Sustainability in a Rural Scientific Environment

In the 21st century, I think the heroes will be the people who will improve the quality of life, fight poverty and introduce more sustainability: Bertrand Piccard

Mike Shepherd has made a career of integrating sustainability into his work since he started at Los Alamos National Laboratory in 1989, first as a subcontractor and then as an employee. He is a forward-thinking manager whose focus has been on property management, fleet management and recycling, all of which are relevant to meeting the DOE Site Sustainability goals. He incorporated the three cornerstones of sustainability into his daily work starting in the early days as these concepts were being developed: social, economic and environmental. Sustainability is not part of his core job responsibilities, but he is a sustainability change agent at heart and by action. His accomplishments are not result of prompting or slavishly adhering to requirements; he does them because he understands the importance of sustainability and how it can be achieved in his particular area of responsibility. He demonstrated this in a number of initiatives through his career including:

- Achieved a 78% recycling rate while managing the LANL recycling program through 2003. These activities included outreach, vigilant program oversight, and the innovative Truck Turnaround Program which inspected trucks carrying dirt, asphalt and concrete to ensure materials were clean enough for recycling. This effort resulted in very clean recycling streams and raised the awareness of maintenance workers, etc. management of materials to increase their recyclability.
- Restructured LANL's Information Technology systems destructions and recycling program (computers, tablets, laptops, phones, cameras, etc.) to meet all security requirements, while ensuring e a 100% recycle rate. He selected an electronics recycling service provider that was a charter member of E Stewards Program to ensure that LANL's materials were sustainably managed and recycled when they were not longer needed by LANL or other Federal agencies. In 2015, 97metric tons of electronics were donated through LANL's Laboratory Equipment Education Program and 168 metric tons of electronics were recycled. The Laboratory reached a 100% score on electronics management in support of DOE's SSP goals through Mike's efforts.
- Worked with LANL's Fleet Management team over the last three years to increase alternative fuel usage from Zero to an average of 67K gallons a year, replaced or downsized approximately 100 vehicles a year, including acquiring Low Green House vehicles. The alternative fuel service provider is the local Native American Nambe Pueblo.

- Spearheaded the economic development initiatives that integrated the economic aspect of sustainability into recycling and property management with a strong environmental justice aspect. As is true with entrepreneurial pursuits, some of these initiatives are no longer active as time and funding changed, but they demonstrated the commitment to sustainability and economic development in the surrounding community:
    - Provided construction oversight and daily management of a 15,000 square foot, $2,300,000 office complex in Española, New Mexico, which provided office space for more than 15 start-up businesses, including a commercial kitchen.
    - Created and constructed a 2,500 square foot, $335,000, recycle center in the Pueblo of Nambe industrial park, located in northern New Mexico.
    - Developed the Otra Vez program, to distribute LANL's excess property to a non-profit community-based organization, which trains rehabilitated residents and dropout students to refurbish office furniture and computers.
    - Elected Chairperson for the Northern Area Local Workforce Board, which is comprised of a 30-member board with a $7,000,000 annual budget servicing local Hispanic, Native American and mixed cultural residents in skills assessments and training.
    - Developed and orchestrated a public firewood giveaway program that distributed firewood to over 3,500 homes, including a special distribution to 20 home-bound residents during the 2002 holiday season.
    - Served as primary team member in the creation and implementation of LANL's Laboratory Equipment Education Program, which gifts millions of dollars' worth of excess equipment annually to schools, universities, and educationally based non-profit organizations each year
    - Expanded LANL excess property and customer service programs to enhance greater reutilization by local pueblos, New Mexico state agencies, and non-profit organizations.

Heroes rarely seek to be heroes – we only recognize them by their actions. Mike Shepherd's actions are all the more noteworthy because they were not part of his job assignment, but sprang from a commitment to improving operations that meet our sustainability goals within his sphere of influence.

Green IT.

Abstract: **Consolidating thousands of data servers into a private cloud service saves over 10 million kilowatt hours**

Los Alamos National Laboratory's ServeIT and Oracle Cloud are on-site private cloud service offerings free to all Laboratory users. The service is designed to promote site-wide datacenter consolidation and sustainability as well as workforce agility. Consolidating over 1500 individual servers and server rooms, energy savings are estimated to be over 10 million kilowatt hours. The objective for the ServeIT project is to consolidate and virtualize inefficient physical servers in far-flung server rooms into dense, efficient, well managed datacenters. Thus, providing streamlined, electronic processes for automated server request, approval and delivery while also dramatically reducing energy requirements to power servers and refrigerate server rooms.

Examples and Results

Infrastructure on Demand

The objective of the project was to provide infrastructure on demand by utilizing a private cloud environment on the Laboratory's intranet, a central point where users can consolidate their systems into centralized data centers, reducing energy cost from disparate data centers. ServeIT uses highly dense blade servers to consolidate and virtualize systems. Each rack can run 600 to 1000 workloads compared to only 20-40 systems in a rack if the workload were all physical. The result is big savings in both energy and money.

Energy savings calculations from the VMware Green Calculator, (http://download3.vmware.com/media/calculator/green_calculator_640x500.swf) estimate the total environmental savings for the 1550 virtual servers in 2015 as compared to if they were physical to be approximately 10,247,147 kWh of server and cooling energy which translates to approximately 16,221,234 pounds of carbon dioxide emissions.

Power Management and Datacenter Sustainability

The datacenter footprint reduction consolidated over 1300 @2U servers for Infrastructure on Demand and another 250 @4U servers for Oracle enterprise operations. In 2015, over 1550 virtual systems and associated storage were hosted in nine datacenter racks. If these systems were physical, they would have required about 100 datacenter racks. That conversion eliminated 91% of the datacenter footprint along with a commensurate amount of power and cooling savings.

Acquisition Efficiency and Reduction of Waste

An automated web request process with workflow allows for a new system to be requested, approved and delivered in minutes. The entire process is digital and paperless. In 2015, 480 new virtual systems were requested and delivered with an average service delivery time of 30 minutes after manager approval of the request.

A big part of conversion is what to do with the decommissioned of systems. Since 220 of the decommissioned legacy systems were virtual, these were retired with zero waste

Also in 2105, 64 physical servers hosting about 620 virtual workloads were retired and salvaged as part of a hardware lifecycle refresh. Compared to running these workloads in a purely physical environment, the project realized a 90% reduction in compute waste.

Project Process and Funding Efficiencies

Since centralized virtual systems are subsidized by the Chief Information Office, customers are incentivized to adopt this more efficient infrastructure and retire their physical systems. This strategy was successful in 2015 resulting in a 52% increase in consumption of private cloud services

By selecting highly standardized infrastructure, large heavily discounted leasing contract vehicles for computers and storage were established. The costs for procuring new equipment for lifecycle refresh or expansion can now be spread over five years at no additional cost. Funding the service offering is now sustainable because instead of having to make large scale capital expenditures every 5 years, the Laboratory is able to use a lower yearly operating expense model. This model also allows for lean capacity management: equipment can be purchased in smaller increments, when needed, to match growth in demand.

Continuous Improvement in Chemistry Research

Abstract: Ning Xu of the Chemistry Division at the Los Alamos National Laboratory has put together a string of successive accomplishments that have resulted in not only minimizing difficult to manage waste streams, but have also completely eliminated some of them through source reduction.

In the complicated world of weapons science, it is not common to find a culture of continuous improvement. Highly radioactive work conducted under stringent quality control requirements coupled with other regulatory requirements can make even small changes difficult to achieve. Ning Xu is one of those exceptional scientists who strives for improved performance in terms of reduced waste generation accompanied with increased productivity. Additionally, these process improvements have resulted in significant reductions in personnel exposure to ionizing radiation, as well as reducing or eliminating exposure to numerous hazardous laboratory chemicals.

Project History Overview:

- 2008
  - ***Utilization of Commercially Available Resin for Plutonium Removal Chromatography***
  - ***APEX Sample Introduction System for ICP-MS to Reduce LLW Generation and Increase Analytical Sensitivity***

    These two projects were identified in 2008 as key contributors to efforts to reduce waste generation, including transuranic (TRU) waste, by $5m^3$ per year. The first project reflects the effort of reducing low level waste (LLW) generation by replacing a process material with the one that consumes less acid and water. Nitrate resin (AG MP-1) is required for the chromatography separation during the determination of plutonium metal impurity. Since the resin procured from BioRad is in chloride form, chemists had to convert it to nitrate form with ten liters of high purity 25% nitric acid for each liter of resin. Ning and LANL scientists collaborated with BioRad to produce a modified version of AG MP-1 resin which is already in the nitrate form. This way, only two liters of acid are required to clean up the resin, saving 80% of the acid and water, and thus, reducing 80% of the LLW generation, since all liquid waste in nuclear facility is discharged to the radioactive liquid waste (RLW) drain line.

    The second project employed a novel sample introduction system to minimize the instrument rinsing and reduce the TRU waste generation. An APEX sample introduction system was integrated to the existing inductively coupled plasma-mass spectrometer (ICP-MS) instrument for plutonium impurity measurements.

This add-on equipment allows for less rinsing time while increasing the analytical sensitivity. The reduced rinsing time results in less acid consumption, and therefore less TRU waste generation.

- 2010
  - ***Direct Solid Analysis Using DC Arc Spectrometry***

    Plutonium-238 is the fuel that powers the deep space NASA mission equipment. Since it is high-fired above 1600° Celsius, there is no easy way to dissolve it into aqueous solutions. The trace impurities in the fuel must be analyzed directly in its solid form utilizing direct current (DC) arc spectrometry. The plasma spectrometry team at the Chemistry Division-Actinide Analytical Chemistry (C-AAC) group originally used an out-of-date DC arc spectrometer to analyze the trace elements. The operation required developing photographic plates on which the spectra are recorded. This developing process generated 16 liters of mixed LLW waste (50 milligrams/liter silver) and used approximately 3,000 gallons of water annually. Realizing the need for modern DC arc instrumentation, Ning collaborated with Teledyne Leeman Labs to develop a new kind of DC arc spectrometer. This state-of-the-art DC arc spectrometer uses a solid state detector instead of photographic plates, and this eliminates 100% the generation of the mixed LLW that was previously generated, silver RCRA waste, and avoids the consumption of a large quantity of water.

    In FY2010, installation of the instrument was completed successfully. The new DC arc instrumentation has improved the sample throughput from 20 samples per week to one sample per minute! This new capability benefits an array of projects requiring semi-quantitative direct solid analysis across the Laboratory, as it is the quickest and the most direct way to identify material composition without wet chemistry sample preparation. Elimination of the wet chemistry preparation process eliminates digestion, column separation, and TRU waste disposal. The new DC arc instrument is a significant technical advance for LANL and is furthermore a contribution to the field of chemistry instrumentation development. More than fifty units have been sold all over the world since then.

  - ***Direct Analysis of Neptunium in Plutonium Metal Sample Matrix Using ICP-MS***

    Trace neptunium in plutonium metal was analyzed traditionally with an alpha counting method, and this required dissolving a metal sample, separating the matrix with a single-use chromatography column, extracting neptunium with organic solvent, and finally fixing the sample on a counting plate with a propene flame torch. Ning initiated an effort to include the neptunium analysis in the

measurement of a suite of trace elements by the ICP-MS method. This simple change streamlined the analyses by eliminating significant extra sample preparation and subsequent measurement while improving the analytical accuracy. In addition to eliminating a TRU waste stream (organic solvents, column resin, and lab ware), the new process also significantly increased worker safety by eliminating a flammable gas operation in a radiological enclosure and reducing dose exposure to radioactive substances.

- ***TRU Waste Reduction Using Gas Pressurized Extraction Chromatography (GPEC) for Plutonium Removal***

  A gravity flow technique used to separate plutonium for trace impurity measurement was improved by reducing the sample size and decreasing the amount of acid and water used in the process. This new technique employed a capillary column that is one-tenth of the size used in the previous method. The new method eliminated 90% of the TRU liquid waste and 100% of the TRU solid and LLW generation. Moreover, the new method is amenable to other actinide sample preparation activities. This project also contributed to successful resolution of longer-term issues with space allocation and radiological material limits in the LANL Chemistry Metallurgy Research Replacement (CMRR) facility. The gas-pressurized extraction chromatography pilot project avoided 0.7 m^3 of TRU waste per year. This highly successful project has realized even greater rewards in terms of wider applications across the Laboratory.

- 2012
  - ***Automated Plutonium Separation System to Reduce TRU Waste***

    While the manual GPEC system has been proven successful in waste reduction, it does require an operator to reach into the glove box to turn the valves on and off manually every 7 minutes. It takes 50 minutes to finish one sample, which hinders the possibility of its implementation at a production scale. Ning designed an automated version of the GPEC, called automated multi-column actinide separation system (AMCASS, patent pending approval). She collaborated with an industrial partner to fabricate the automated apparatus, which consists of four columns to perform separations simultaneously. This way, processing a batch of 10 samples can be completed in 2 -3 hours compared to 10 hours using the manual system. This technical innovation has enhanced production throughput tremendously while reducing the workers dose exposure at the same time.

- 2013
  - ***DC Arc Analytical Capability Transitioned to PF-4***

    Due to the upcoming decommissioning of the aged CMR nuclear facility, plutonium-238 fuel analytical capabilities, including the DC arc spectrometer for trace impurity determination (described in a previous paragraph), have to be transitioned to LANL's plutonium facility. The merits of the new generation DC arc instrument include a small footprint, state-of-the-art detector, and simple operation without hazardous waste generation, and these benefits have made this transition possible. The successful implementation of the new DC arc instrument in the plutonium-238 production area led Ning and her team to win the prestigious LANL Distinguished Performance Award for a small team in recognizing their effort to accomplish a top priority mission at the Laboratory.

  - ***Champion the Green is Clean (GIC)***

    In the radiological controlled area (RCA) of the CMR nuclear facility, there used to be only two waste categories: TRU waste and LLW, which both are costly to dispose. In answering the call from the LANL Pollution Prevention program to reduce Lab-wide waste disposal cost, Ning championed a *GIC* activity in the CMR where plutonium samples are processed and analyzed. The workers collect low-density waste, like PPE, that is not expected to be radiologically contaminated, in special LANL *GIC* waste container, and this material is double checked by X-ray machines at a different location before being disposed as industrial waste, avoiding a third of the total volume of solid LLW that would otherwise be generated.

- 2014-2015
  - ***Reduce Mixed LLW Generation by Reducing Instrument Sample Requirement***

    Taking the advantage of a recent development in sample introduction by ESI Corp., which allows for much less sample consumption, Ning spearheaded the project of integrating this new technique into the ICP instruments at LANL's newly built Radiological Laboratory Utility Office Building (RLUOB). This change has demonstrated a 90% reduction in sample size compared to the same type of instruments in CMR facility. Currently, this methodology is undergoing validation with plutonium samples. The success of this integrated system will result in a reduction of raw material used by a minimum of 90%, and mixed LLW

by approximately 50%. At the current rate, ICP instrument generates 100 m^3 of LLW, and a 50% reduction is expected for LLW as well. Another cost-effective factor is the high purity acids. To analyze for trace elements in plutonium materials, high purity nitric acid and hydrofluoric acids are required. These acids cost $900 per bottle and approximately 20 bottles are consumed each year. A 90% sample volume reduction can also avoid more than 90% of the acid consumption, which saves about $16,000 per year.

Current project (2016)

- ***Reducing TRU Waste Generation from ICP-MS Process***

  ICP-MS generates liquid TRU waste that contains plutonium during the analysis of trace impurities in plutonium samples. The liquid TRU waste is solidified and for disposal at WIPP. The recent WIPP accident necessitates the urgent need to reduce TRU generation. The ESI sample introduction system described in a previous paragraph allows for much less sample consumption, and a 90% reduction of sample volume can be achieved if we couple this novel technique to the newly installed ICP-MS at RLUOB. This will result in a reduction of raw material consumption and liquid TRU waste generation by a minimum of 90%, in addition to the approximately 50% reduction in the mixed LLW.

  For FY 16, Ning's team plans to procure an ESI *microFAST* sample introduction system and a low-flow nebulizer to enhance the sample reduction. The team plans to (1) interface the apparatus to one of the ICP-MS instruments at RLUOB to demonstrate its ability to reduce sample consumption; (2) develop a chemistry method to prove that both TRU and mixed LLW waste can indeed be reduced; (3) propose to the Plutonium Sustainment Program for implementation of this technique.

- ***Green Chemistry for Nuclear Material***

  Green chemistry is one of the most important components in pollution prevention. It eliminates the utilization of hazardous chemicals and prevents the subsequent hazardous waste generation up front. This is especially important when evaluating an in-field detection capability that performs chemistry analysis on-site. In a post-detonation nuclear event or at an on-site facility inspection by the International Atomic Energy Agency (IAEA), efficiency is vital. In-field pre-screening will either provide immediate information on the nuclear fuel type, such as high or low enriched uranium and the presence of plutonium, or aid the decision making on

whether a treaty has been violated. Yet in-field detection is largely hindered currently by sample dissolution methods using corrosive acids.

Ning's team has demonstrated in a preliminary study that less hazardous chemicals such as sodium carbonate (Na_2CO_3), hydrogen peroxide, and ammonium bifluoride (ABF) are capable of dissolving uranium oxides (UO_2, and U_3O_8). These chemicals are available from either grocery stores or hardware stores, and can therefore be easily obtained or transported during an in-field application. Ning and her team are working to optimize the dissolution conditions such as chemical concentration, stirring rate, and heating time and temperature to obtain the highest dissolution rate. The proposed green chemistry method will be applicable to not only nuclear safeguards such as IAEA, but also to nuclear forensic post-detonation investigations and non-proliferation, all of which are directly related to the Lab missions on global security and threat reduction.

As can be seen in the flow of projects, Ning Xu has constantly tried to improve processes and reduce or eliminate waste. Her willingness to push the performance envelope has resulted in tremendous improvements to highly regulated analytical processes, achievement of waste elimination, improved analytical results, and a safer workplace for everyone. For her sustained efforts and accomplishments, the LANL P2 organization enthusiastically nominates Ning Xu for recognition as a Sustainability Champion.

Hazardous Waste Reduction with a Planetary Mill

Abstract: A team in the Shock and Detonation Physics group at the Los Alamos National Laboratory has reduced the amount of hazardous waste generated and new chemicals procured through the installation of a planetary mill. The planetary mill can grind solid materials into tiny particles so that reactions can occur with much smaller quantities of chemicals and also less hazardous chemicals. Annual costs avoided from waste disposal and chemical procurement are in excess of $10,000, and using about 3000 staff hours more productively has a far greater value.

A team in the Shock and Detonation Physics group at the Los Alamos National Laboratory has reduced the amount of hazardous waste generated and new chemicals procured through the installation of a planetary mill. The planetary mill can grind solid materials into tiny particles so that reactions can occur with much smaller quantities of chemicals.

One of the custom materials that was required for a project (1-H-4,5-dicyano-2-nitroimidazole, or NDCI) was produced using the planetary mill, and the savings are significant. The mill eliminates the need for solvent, and with it, various other chemicals that were necessary to effect the same reaction. Thus, 0.38g of sodium hydroxide, 6.34g of sodium bicarbonate, 27 mL of acetone, 180 mL water, 2.3g of sodium sulfite, and 77.6 mL of 1M hydrochloric acid are no longer used for *each gram* of NDCI made. In addition, there is an enormous time savings, as 2 grams of NDCI took 6 hours to produce via the old solvent-based method, and now it only takes 10 minutes in the mill, providing a time savings of 175 minutes per gram of NDCI made. Considering that nearly 1kg of NDCI was required for this particular project, this improvement allowed nearly 3000 hours of staff time to be used more productively.

The team has been successfully using the planetary mill already for other reactions as well, having eliminated the need for about 500mL of concentrated trifluoroacetic acid and 25mL of 70% hydrogen peroxide per month so far. The planetary mill eliminates the need for pressure reaction vessels, which are not only expensive but are potential pressure hazards to workers as well.

The mill deposits energy more efficiently into a reaction than standard solution chemistry, so it reduces the reaction times dramatically, and it eliminates solvent usage altogether from many reactions. The team has plans to expand the use of the planetary mill to many other reaction applications as well to save time for more productive activities and reduce chemical purchases and hazardous waste generation. The team expects to avoid the use of several hundred gallons of various solvents annually as well as a few gallons of acutely toxic chemicals. Annual costs avoided from waste disposal and chemical procurement are in excess of $10,000, and using so many hours more productively has a much greater value.

ABSTRACT: A Modern Strategy for An Aging Campus

Los Alamos National Laboratory (LANL) has developed and implemented a Long-Range Infrastructure Development Plan that supports a sustainable future by reducing the footprint of aging and inefficient facilities, recapitalizing older but enduring facilities to increase their efficiency, upgrading contemporary facilities to newer standards and planning for the campus of the future. Since the inception of this plan in 2011 over 70,000 square feet of modern laboratory space has been created, interior improvements have upgraded a minimum of 50,000 square feet per year, and recapitalization of building equipment and systems has occurred in 15 to 20 facilities each year. This work in conjunction with the Footprint Reduction program (an even longer running LANL program) has eliminated nearly 1.6 M square feet of obsolete energy inefficient facilities, and helped to drive LANL toward a more sustainable campus. With new construction funding at a premium, the LANL approach has significantly furthered the goals of the Site Sustainability Plan within the constraints of a large, non-consolidated campus with facilities dating from the Manhattan Project to the present day. Such integrated long-range planning requires the close cooperation of mission research and development organizations, infrastructure development staff, utilities and infrastructure organizations and site planners.

Text

Los Alamos National Laboratory (LANL) is committed to a providing a vibrant research and development infrastructure that is both efficient and sustainable. The site faces a situation not unique in the DOE complex: modern requirements pitted against an aging and inefficient infrastructure.

The Los Alamos Site has evolved with major facilities being constructed in every decade since the days of the Manhattan Project. Most of these facilities are still in operation today with only 15% being constructed from 2003 to 2012, when modern sustainable building standards became the norm. The older facilities at LANL include several key nuclear and high explosives research and development facilities that consume an inordinate share of energy and maintenance resources.

To address this challenging situation LANL has developed and implemented a Long-Range Infrastructure Development Plan that supports a sustainable future in a three-pronged approach. First; by targeting the most aging and inefficient facilities for mission work relocation, these facilities can be moved to shutdown status and eventual demolition. Second; by identifying that portion of the current operating portfolio of newer construction and satisfactory condition, a sustainable maintenance approach can be

applied. Third; by investing / recapitalizing aging (but enduring) facilities needed for mission execution, operability, energy efficiency, and utilization are all improved.

By eliminating the most inefficient buildings through the Footprint Reduction program, funding can be freed up from maintenance and energy budgets to reinvest in the maintenance and sustainability of the remaining facility portfolio. By recapitalized major plant and equipment systems within the older enduring facilities, payback is achieved through energy and maintenance cost reduction, while operational reliability is enhanced.

Recapitalization of building HVAC systems, electrical distribution systems, fire protection equipment, roofing, plumbing, structural deficiencies, etc., has resulted in multiple benefits for the same investment dollar.

SOME EXAMPLES:

- Recapitalization of boiler systems in TA48-1 provided an opportunity to replace aging steam boilers with hot water technology and updated controls. This not only resulted in improved operability of the facility, but also provided significant reduction in energy and maintenance life cycle costs.
- Testing and maintenance of electrical distribution systems in older facilities has enabled improved documentation of existing systems and provided opportunity to upgrade equipment prior to failure with more energy efficient alternatives. The payback achieved has been improved reliability of the facilities, while reducing energy costs and improving worker safety.

In summary, meeting sustainability goals is not a separate, stand-alone activity at LANL. By integrating sustainability principles into infrastructure operations it is possible to make significant progress within a constrained system.

Water Management at LANL

Abstract:

Water Management project at LANL is nominated for its results, listed below:

- Potable water reduction
- LANL water balance model
- Unknown category reduction

LANL exceeded the FY2015 target and achieved a 17% reduction in potable water intensity, compared to FY 2007, due to the focused attention on a water model developed for LANL by Pacific Northwest National Laboratory (funded by the DOE Sustainability Performance Office) that LANL took over in FY2015, operations at the Sanitary Effluent Reclamation Facility (SERF), and targeted improvements to facilities.

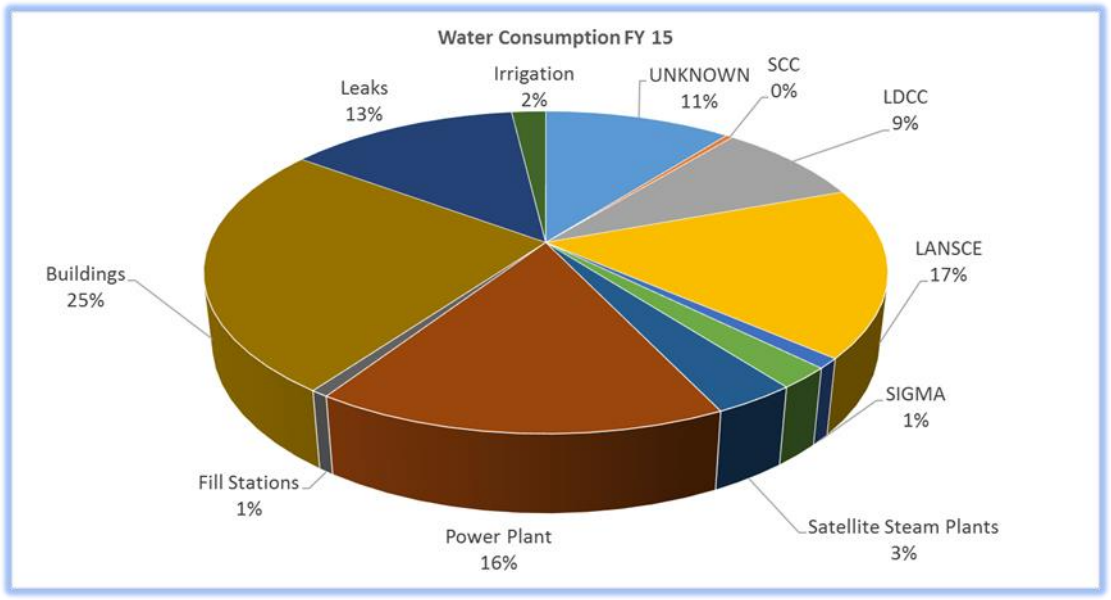
Description:

In FY 2015, LANL took over the operation of the water consumption model first developed for the LANL site by Pacific Northwest National Laboratory (PNNL). In order to get a realistic water balance, LANL refined the model in the following ways:

- Leak rate: LANL adopted a 12% leak rate target based on the American Water Works Association recommendations for a 40-50 year old water system.
- Building usage: to obtain the water usage for buildings the blow-down from two of the LANL's cooling towers that discharge to the sanitary system is subtracted from the total amount of water that arrives at the waste water plant.

By calibrating the model, LANL got a reasonably close to meter data what allows to track the water consumption of the principal consumers monthly so any abnormal behavior can be detected.

According to the FY 2015 water balance, LANL had an 11% of unknown use, a marked improvement from the performance of the model in FY 2014 when this category reached 22% of the total water billed.



LANL's total potable water consumption for the FY2007 baseline year, was about 335 million gallons. LANL total consumption for FY2015 was about 262 million, saving 73 million gallons. The Laboratory worked to reduce water use in the following areas:

- Reuse of processed waste water
- Conservation efforts at the steam plants
- Lower use in the buildings due to employee awareness
- The ongoing leak detection and repair effort for the distribution system
- Closer coordination with Los Alamos County DPU in finding and addressing billing anomalies.

LANL's efforts will continue to focus on small, targeted water conservation measures that dovetail with the site infrastructure upgrades. LANL will also place emphasis on energy efficiency to reduce the lab's regional impact on water use associated with energy generation. In addition, this site plans to work to expand the use of reclaimed waste water in cooling towers and steam plants.

In FY 2016 and 2017 LANL is planning to install 'zone' water meters that will segment the campus into six zones of approximately equal consumption along with up to 65 building water meters using funding that is anticipated as part of the proposed DOE settlement with the State of New Mexico. Our long-term plan is to use the zone consumption data as input to a real time monitoring system that will more quickly identify water main breaks or unusual building usage.

2016 Sustainability Awards submission

Sustain*ABLE* Communications: Recognizes successful and innovative communication and marketing strategies that promote sustainability goals, successes and best practices. Nominations should focus on effective and unique outreach programs that engage stakeholders and discuss the benefits of sustainability.

Abstract:

#mysmall act goes all the way to the top.
Catching DOE workers performing acts of sustainability

Starting in 1995, Los **Alamos National Laboratory (LANL) employs an annual theme for its Earth Day observance. In 2013, the Laboratory joined this century by celebrating participants annually on video and in 2015, the LANL theme, #mysmallact, was used all the way through the DOE complex up to Secretary Moniz.**

Text:

Every year, an ad hoc Earth Day committee comprised of committed LANL staff at all levels creates a series of events around a central theme to celebrate an Earth Day month worthy of a national laboratory. Using video better communicates both the commitment of individuals and the progress of big pollution prevention projects.

Catching stewardship on video

The first celebration video, "How do you preserve and conserve the earth" was produced in 2013 by LANL staff and features LANL workers from all walks describing what they do personally at work and at home to preserve and conserve. http://www.youtube.com/embed/LPqzxLFg7tg

The initiative became a tradition: to choose a theme then to catch workers and managers sustaining the earth. In 2014, the theme was "Breaking the Green Barrier in Your Life." Environmental managers challenged other Laboratory managers to try out sustainable transportation to get from one meeting to the next, and to work in the morning.
https://www.youtube.com/watch?v=_rzE523Zi5s&feature=youtu.be

In 2015, the Laboratory launched #mysmall act which features sequences of LANL workers declaring what they've done. https://www.youtube.com/embed/uUMXeZF30d0 **This included some pretty impressive projects:**

- **Reducing the energy used in a single server room by 20,000 kWh per month**
- **Consolidating servers across the Laboratory to save on cooling and materials**
- **Starting a recycling program for Type 5 plastics**
- **Fixing the setting on building heating and cooling systems to cut energy use in half**
- **Changing the washing process in a chemistry lab to replace hazardous chemicals with recyclable ones.**

Sharing it around the complex

Additionally, individuals submitted a photograph participating in their #mysmallact both at work and at home demonstrating small to wide sweeping stewardship. The hashtag caught on until, in his Earth Day tweet and Facebook feed Secretary Moniz shared his small act an invited other to share theirs.