



Sandia National Laboratories Integrating Energy Management into the Environmental Management System



Lynnwood Dukes

EFCOG Energy Efficiency Working Group Chair



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Sandia National Laboratories

Albuquerque, NM



Kauai, HI



Pantex, TX



Livermore, CA



Tonopah, NV

Yucca Mountain, NV

Carlsbad, NM



Sandia Overview Statistics



- Sandia's facilities and infrastructure systems support a workforce of over 12,400 people, including regular employees, non-regular employees, and resident visitors

▪ Overall, Sandia's physical area encompasses over 188,000 acres of land, 49 miles of paved roads and 38 miles of unpaved roads, 6.9 million gross square feet (GSF) of owned buildings and 461,000 GSF of leased buildings totaling 7.40M GSF



Sandia's Implementation of EMS

- **Element of the Integrated Laboratory Management System (ILMS)**
- **Implemented through the Integrated Safety Management System (ISMS)**
- **Executed through the following:**
 - **Division EMS Team**
 - **Environmental Programs**
 - **The EMS Core Team**
 - **The EMS Coordination Team**



Environmental Programs



ENVIRONMENTAL MANAGEMENT SYSTEM

- Terrestrial Surveillance
- Environmental Compliance Coordinators (ECC)
- Meteorology
- **Energy Management**
- Storm Water
- Groundwater Monitoring
- Safe Drinking Water Protection
- Oil Storage
- Waste water Discharge
- Ecology
- National Environmental Policy Act (NEPA)
- Pollution Prevention (P2)
- Air Quality Compliance
- Surface Discharge
- Rad National Emission Standards for Hazardous Air Pollutants (NESHAPs)
- Long Term Environmental Stewardship (LTES)
- Hazardous Waste Permitting & Compliance



EMS Core Team

- **EMS Core Team Meets Monthly**
- **Consists of EMS Coordination Team, Owners of Significant Environmental Aspects (Fleet, Energy Management, Procurement, Pollution Prevention, Compliance Programs, NEPA)**
- **Interface between Corporate EMS and Division Implementation**
- **Participate in aspects impacts analysis**
- **Review EMS Manual and other corporate EMS documents**
- **Assist in awareness and grading of EMS Excellence award nominations**



EMS Coordination Team

- Annually review and revise the Sandia ES&H Manual to include EMS requirements,
- **Develop and issue annual SNL EMS Plan,**
- Conduct weekly Team meetings,
- **Integrates aspects of SNL EMS to ensure continuity of programs (energy, fleet, pollution prevention, etc.)**
- Conduct system self-assessments and provide leadership to the EMS,
- Assist line organizations with implementing divisional EMSs,
- Facilitate the top management review of EMS.



Division EMS Implementation

- **Division EMS Action Plan (Annually)**
- **Division-Level Aspects/Impacts Analysis (Annually)**
- **Set Divisions EMS Objectives and Targets (Annually)**
- **Track Progress toward Achieving EMS Targets (Quarterly)**
- **Provide EMS Progress Reports to division VP and EMS Coordinator (Quarterly)**
- **EMS Briefing to Division (Annually)**



EMS Scope must include Energy, Water, Sustainable Design and Fleet Operations

- **Energy Management is an Environmental Program. Its scope includes energy management, water conservation and, in concert with Environmental Planning, sustainable design**
- **Representatives from energy management and fleet operations serve on the EMS Core Team and Coordination Team**
- **The Energy Management Plan/Executable Plan is considered an element of the EMS Plan**



The New Requirements

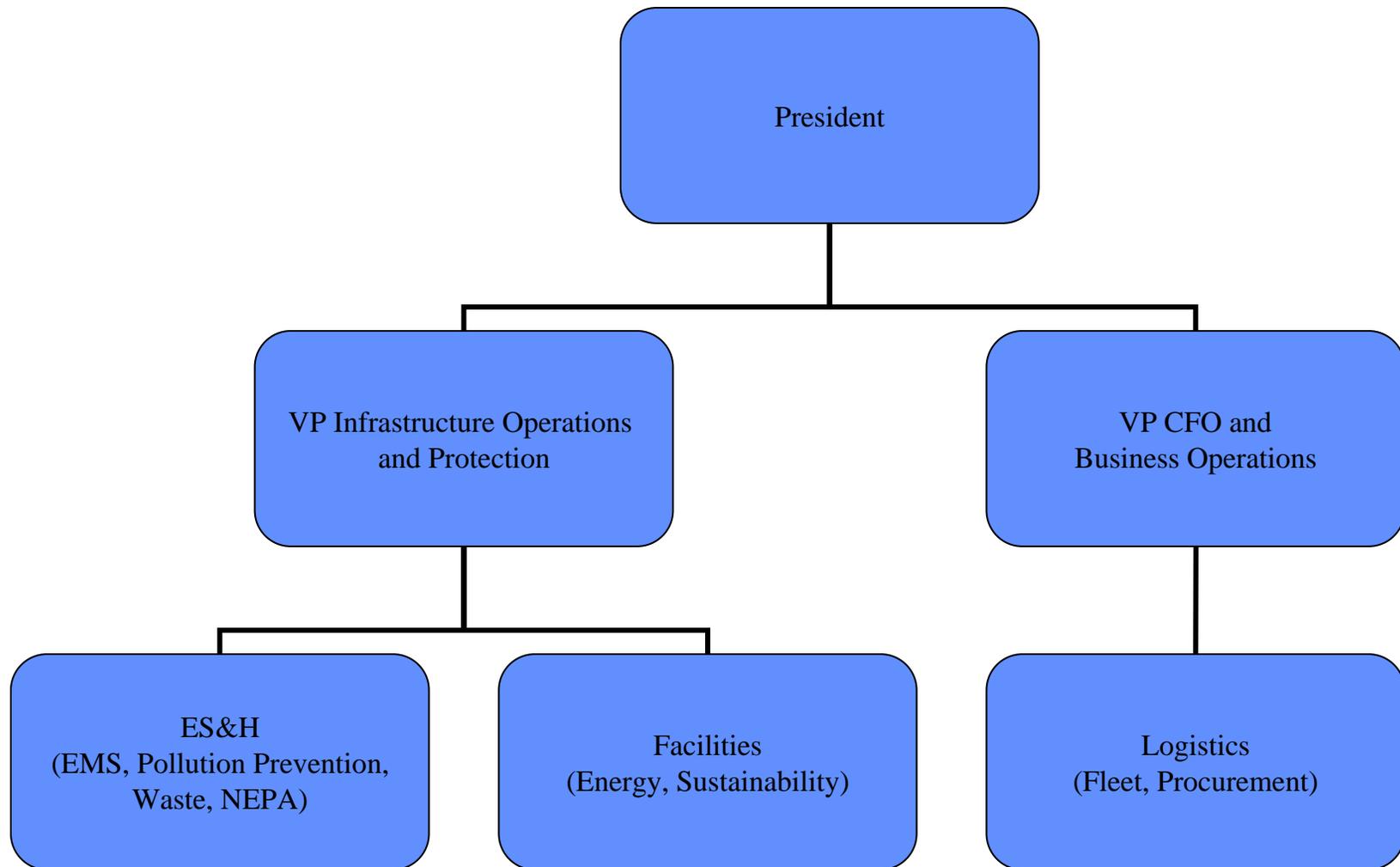
- Executive Order 13423
- DOE Order 450.1a
- DOE Order 430.2b

1. Requires independent validation of EMS consistent with the ISO14001 standard
2. Requires a verifiable compliance management approach
3. Increases scope of EMS to include energy, water, sustainability and fleet operations
 - a. Reduce water use 2% per year (16% total)
 - b. Reduce energy 3% per year (30% total)
 - c. Increase green buildings to 15% of total building stock
 - d. Fleet goals include: right-sizing; alternative fuel and AFV use.
4. Compliance to DOE O 450.1b by 6/30/2009





Sandia EMS Organization





Energy Management Program

- **Facilities accountable for Corporate Energy Management.**
- **Four part-time staff manage program by focus areas (water, electricity, gas, sustainability/LEED)**
- **Annual Plan developed and approved by Sr. Manager.**
- **Space chargeback funds utilized to pay for investments and program requirements (\$500k).**
- **Fund initiated through electric savings from relamping program.**



Plan

- The EMS Manual identifies resource use (including water and energy) as a significant environmental impact. The Energy Management Program is responsible for identifying objectives and targets to mitigate this aspect.
- The Energy Management Plan scope includes:
 - Promoting and implementing energy conservation, water conservation, sustainable design, sustainable construction, sustainable operations, and environmental preferable purchasing
 - Performance targets for greenhouse gas emissions, energy intensity, water consumption, sustainable design, renewable energy, and electrical reliability
 - Executable actions based on available funding for energy reduction, water usage, greenhouse gas reduction, sustainable design, metering, awareness/communications, commissioning, ozone depleting substances/chillers, energy star procurement, benchmarking and audits.
 - Attachments for Energy Curtailment, Drought Management, Energy and Water Conservation Assessment Plan, and Site Metering.



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Do

- **The Energy Management Plan contains Targets, funding levels and methods, roles and responsibilities, assessment plan, action item list for each element (energy, water, sustainability, outreach, benchmarking, commissioning)**
- **Operational accountability is assigned to the customer teams, comprised of Operations Lead, Project Lead, Operations Technician, Operations Engineers.**

APPENDIX B

Summary of FY08 Activities for Sandia's Energy Management Program

FOCUS AREA	ACTIVITY	ESTIMATE D COST	PLAN REF.	PROJECT(S)/STATUS
Greenhouse Gas Emissions Reduction	Update Greenhouse Gas Emissions Report	100K	3.1.2	4th Quarter
	Purchase renewable energy certificates (REC) – 3% in FY2007			Contract in place
	Investigate the use of off-grid renewable generation systems			Ongoing
	Investigate new renewable energy opportunities			Ongoing
	Investigate use of net metered renewable energy opportunities			Ongoing
Energy Use Reduction in Regular Buildings	Utilize Sustainable Design practices when designing, constructing, and operating new buildings and renovations.	150K	3.2 2	Continued work with IBL. Preparing documentation for LEED EB
	Track the energy intensity of regular buildings to verify short term energy reduction goals and report energy use index as required.			Ongoing
	Promote the energy efficiency of O&M Restoration Projects			<ul style="list-style-type: none"> •Ongoing re-lamping from T12 to T8 across SNLCA site as ballasts fail. •HVAC controls renovation project C964 •Lighting retrofits in NM.
	Seek an annually recurring source of funding for low cost energy projects and energy studies.			Investigate ESPC IP.
	Implement annual energy savings projects			877, 879 solar hot water and energy star projects, 878 VFD, 956 PV roof



Check

- **Annual tracking and trending of energy intensity use and water use. Reported in annual performance review process. Expect to agree on sustainability and renewable energy goals this year.**
- **Operations teams accountable for energy assessments, tracking customer use by building, executing action items per plan, providing energy use data to customers and suggesting savings opportunities.**



Act

- **Quarterly and Annual review of Energy Plan performance targets and reporting.**
- **Annual update of Energy Plan and approval by management.**
- **EMS Management Review**
 - **NM**
 - **Quarterly status of objectives and targets for both Sandia corporate and divisions**
 - **Annual approval of EMS Manual**
 - **Semi-annual EMS review meeting with Sandia management and DOE**
 - **CA**
 - **Semi-annual management reviews formed around the ISO standard**



Independent Validation of EMS

- **Sandia, CA**
 - ISO 14001 Certified
 - Performance Track Partner
- **Sandia, NM**
 - Pursuing ISO 14001 Certification (target date is Feb. 2009)
 - Performance Track Application (Fall 2008)
 - Waste Wise Partner
- **EMS implementation and validation at Sandia's smaller sites is accomplished by division implementation**

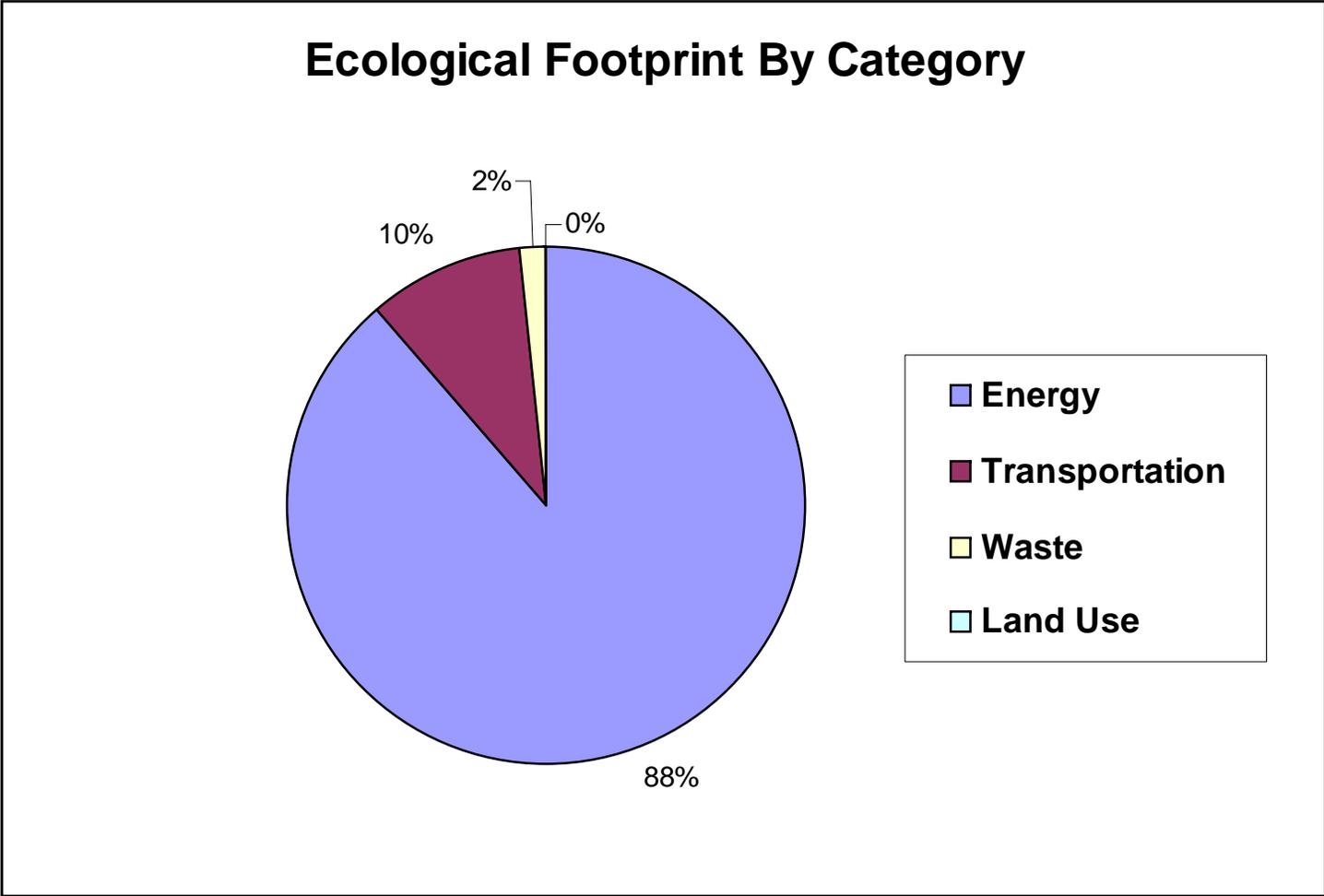


Communications

- **Newsletters**
- **Lecture Series**
- **EMS Excellence Awards**
- **Energy Conservation Week**
- **Earth Day**
- **Internal and External Websites**
- **Conferences (Earth, Wind and Sun)**
- **Youth Education (Youth Conference & Education models)**
- **Internal Publications (Cafeteria Events, Daily News, Porcelain Press, Lab News)**



GRAPH OF ECOLOGICAL FOOTPRINT





Energy Management Program

- **Energy usage – 285,000 MWh in 2007**
- **\$11.7m electric bill (\$41/MWh now, expect >\$75/MWh starting Jan. 09)**
- **Water usage – 501 Mg 2007 (\$2/1000gal)**
- **Energy intensity in regular buildings reduced by 39% since 1985.**



Activities to Reduce Energy and Water Use

- **Shutting down and decentralizing steam plant and distribution system.**
- **Optimizing chiller systems through district chilled water systems to increase efficiency.**
- **Complete lighting retrofit project.**
- **Centralized Irrigation System**
- **Elimination of once-through cooling systems.**
- **Recycling of water into cooling towers.**
- **VFD installation**
- **Metering**



Sustainable Design at Sandia to Date

- **Almost 10% of SNL/NM S.F. is/will be LEED certified by end of 2008**
- **SD has been applied to Line Items, GPPs, Major Renovation, Restoration and M&O**
- **More certified buildings than any other NM entity**
 - **4 LEED NC certified buildings**
 - **WETL, JCEL, CINT, MESA Fab**
 - **2 LEED NC registered buildings**
 - **MESA MicroLab & WIF**
 - **1 LEED building in design**
 - **IBL**
 - **1 LEED EB registered building**





Q & A



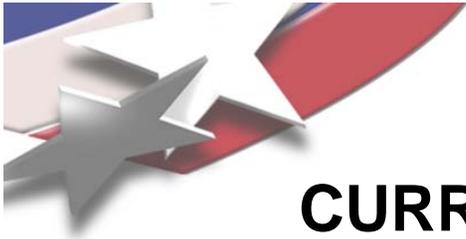
Backup slides



Energy Management Program

CURRENT ACTIVITIES and ACCOMPLISHMENTS

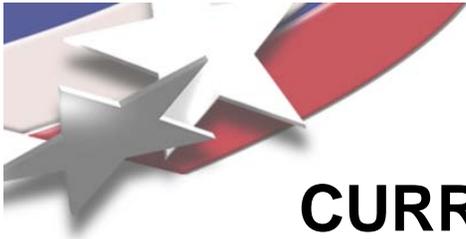
- CICS (Central Irrigation Control System)
 - Through multiple weather stations, irrigation is controlled by weather conditions. CICS is saving approx. 8 million gallons of water per year.
- District Chilled Water Cooling
 - The project has been instituted in phases. The goals of the project are to increase overall delta T across the system, increase reliability, decrease maintenance intensity and operate an optimal number of chillers. Energy savings will be realized due to chiller optimization and decreased pumping energy.



Energy Management Program

CURRENT ACTIVITIES and ACCOMPLISHMENTS

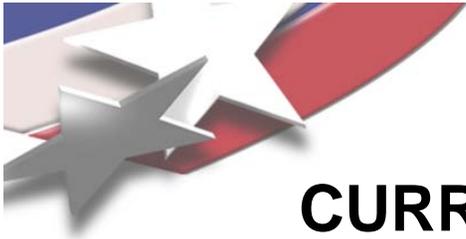
- Metering and Energy Reporting
 - Metering is necessary to track, report energy use and validate savings. 95% electrical submetered, 100% of water is site metered.
 - Reporting – Since 1985 electrical intensity has been reduced by 40%, due to reporting criteria requirements of 430.2A).
- Lighting Retrofits
 - Over 90% of site square footage has been retrofit. Lighting retrofits so far have resulted in estimated annual savings of \$352K
- VFD Installation
 - Numerous VFD installations throughout Sandia have resulted in significant energy savings. As a rule of thumb, a 20% decrease in fan speed results in a 50% decrease in required power.



Energy Management Program

CURRENT ACTIVITIES and ACCOMPLISHMENTS

- Chemical-Mechanical-Polishing (CMP) Water Recycling
 - The project takes waste process water that was once sent to the sanitary sewer and processes it for use in cooling towers and fume scrubber systems. The project is currently saving 28 million gallons of water per year.
- Thermostat Setback
 - As part of the 2005 President's Directive on Energy and Fuel Conservation, HVAC temperature set points were adjusted to float between 68 and 78 degrees (DDC controlled bldgs only). Energy saving results based on modeling are 2.39×10^9 BTUs based on 30 buildings. This is a hard one to actually measure!



Energy Management Program

CURRENT ACTIVITIES and ACCOMPLISHMENTS

- Energy Awareness
 - Provide weekly energy/water conservation E-Tip for the SDN.
 - Energy Nag: Organize contests where occupants compete to reduce building energy consumption.
 - Earth Day: Participate in activities such as funding speakers and providing information on energy and water conservation.
 - Lights Out Campaign: The campaign, was the first campaign of this kind at Sandia, which took place 3 days in the summer of 2007. On those dates, all Sandians and contractors were encouraged to turn off all non-essential, non-critical plug-loads during the non-standard hours.

- Solar
 - One parking lot has been constructed using new lights powered by PV. One parking lot has been retro-fitted using PV.
 - A 3.15kW PV shade structure for the Innovation Corridor was successfully implemented in January 08.

