MOX FUEL FABRICATION FACILITY

NNSA National Nuclear Security Administration

Integrating Environmental Considerations into the Dominating Safety Culture during Construction of a Large Nuclear Facility

Lisa Burns

Carl Mazzola

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MOX Mission and Impact

- **Mission**
  - Convert 34 metric tons of weapons-grade plutonium to mixed oxide (MOX) fuel for use in commercial power reactors
- **Impact**
  - Removes thousands of warheads from the nuclear arsenal
  - Eliminates $500 million/year in security costs
  - Provides clean, carbon-free energy that offsets over $30 billion in imported oil costs at ~$75/barrel

MOX Safety Fuels the Future

MOX
FUEL FABRICATION FACILITY

August 1, 2007

NNSA
National Nuclear Security Administration

Start of Construction

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April 8, 2010

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Material Quantities Installed

Office Space (Completed)	340,500 ft^2
Office Space (In Process)	72,000 ft^2
Structural Concrete	72,381 yds^3
Rebar	~26,128,000 lbs
MOX Project Employment	>1,800

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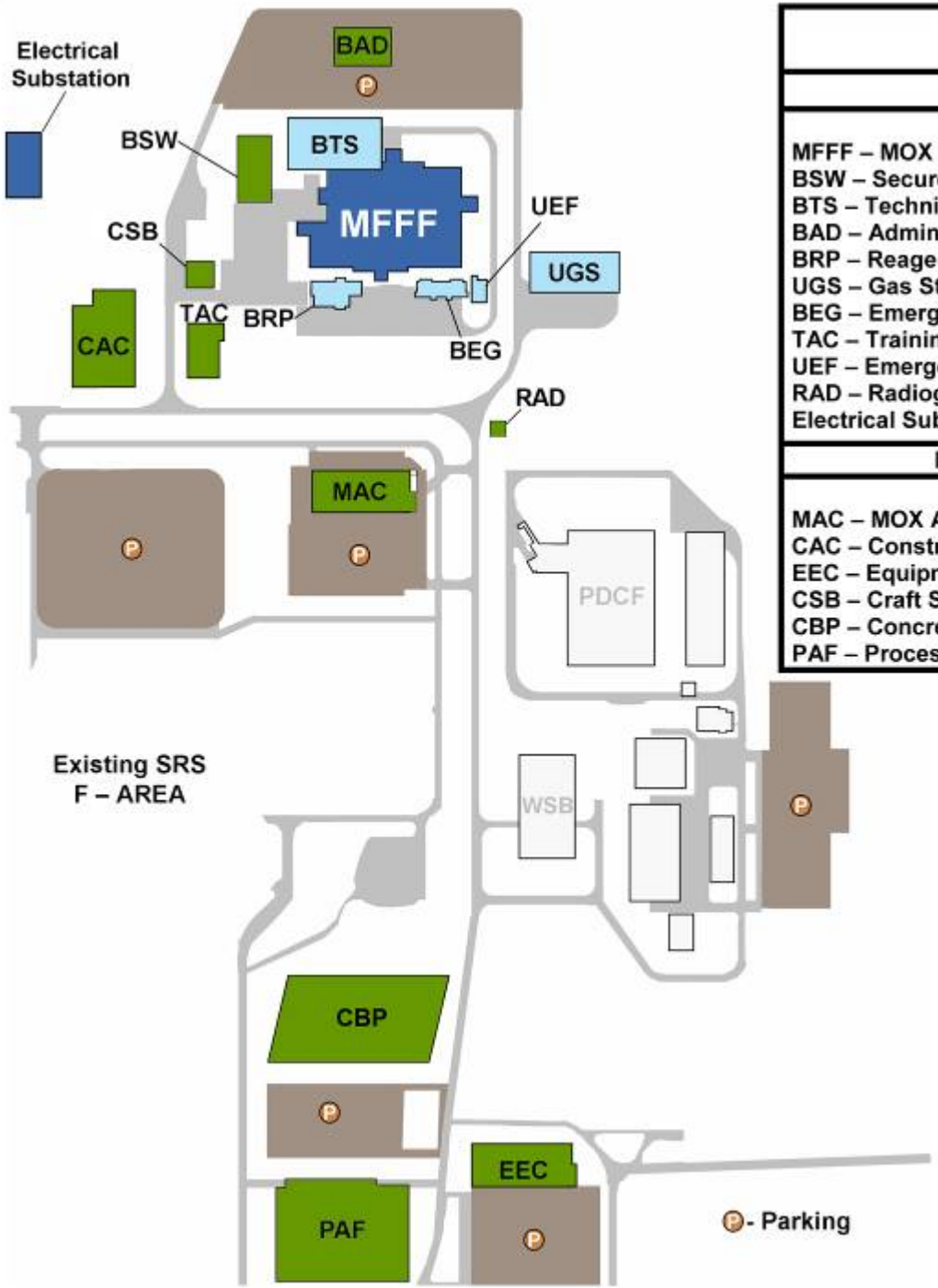

Facility	Construction Start	Construction Complete	Status
Permanent Buildings			
MFFF – MOX Fuel Fabrication Facility	Sep 2007	2014	Construction
BSW – Secured Warehouse Building	Jan 2009	Dec 2009	Complete
BTS – Technical Support Building	2010	2012	Planning
BAD – Administration	Jun 2008	Jun 2009	Complete
BRP – Reagent Processing Building	2010	2013	Planning
UGS – Gas Storage Area	2011	2014	Planning
BEG – Emergency Diesel Generator Building	2011	2013	Planning
TAC – Training Administration Complex	Jun 2007	Jan 2008	Complete
UEF – Emergency Diesel Storage	2011	2013	Planning
RAD – Radiography Building	July 2008	July 2008	Complete
Electrical Substation	Feb 2009	2010	Construction
MOX Site Infrastructure			
MAC – MOX Administration Complex	Dec 2006	Mar 2007	Complete
CAC – Construction Administration Complex	May 2007	Aug 2007	Complete
EEC – Equipment Engineering Complex	Sep 2007	Nov 2007	Complete
CSB – Craft Support Building	Mar 2008	May 2008	Complete
CBP – Concrete Batch Plant	Apr 2007	July 2007	Complete
PAF – Process Unit Assembly Building	Apr 2008	Sep 2008	Complete

Complete

Construction Ongoing

Planning

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Administration Building

57,000 ft^2

Office space for 230

"Gold" LEED certification pending

Secure Warehouse Building

21,000 ft^2

Spare parts and storage supply

"Gold" LEED certification applied for

MOX FUEL FABRICATION FACILITY

FY 2009

NNSA National Nuclear Security Administration

Physical Work

- Main structure 46% complete
- Continued pipe routing and support design
- Continued electrical, glove box, software design
- Completed permanent Administration Building
- Continued tank fabrication and installation
- Started process pipe and support fabrication
- Started glove box assembly
- Started concrete coatings

Procurement Activities

- Equipment and subcontracts committed
- Glove box shells and internals
- Process Equipment
- Electrical equipment and cable
- Valves
- HVAC Fabrication
- Major structural, HVAC installation subcontracts
- Concrete coatings subcontract

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NNSA National Nuclear Security Administration

FY 2010

Physical Work

- Continue main structure construction
- Complete glove box design, 1st glove box assembly and in-advance testing
- Continue pipe routing and support design
- Continue electrical and software design
- Complete Secure Warehouse
- Continue tank fabrication and installation
- Continue process pipe and support fabrication
- Continue glove box assembly
- Continue concrete coatings
- Start pipe and supports installation
- Start HVAC installation
- Start Tech Support Building

Procurement Activities

- Glove box shells and internals
- Lab equipment
- Process Equipment
- Electrical equipment and cable
- Pumps and valves

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MOX FUEL FABRICATION FACILITY

National Nuclear Security Administration

FY 2011

Physical Work

- Complete main structure construction
- Continue pipe routing and support design
- Continue electrical and software design
- Complete Technical Support Building
- Complete tank fabrication and installation
- Complete process pipe and support fabrication
- Continue glove box assembly
- Start glove box and process equipment installation
- Continue concrete coatings
- Continue pipe and supports installation
- Continue HVAC installation

Procurement Activities

- Glove box shells and internals
- Laboratory equipment
- Process Equipment
- Electrical equipment and cable
- Pumps and valves

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MOX FUEL FABRICATION FACILITY

MOX Project Team Values

- Quality
- Safety
- Personal Commitment
- Financial Responsibility
- Environmental Stewardship

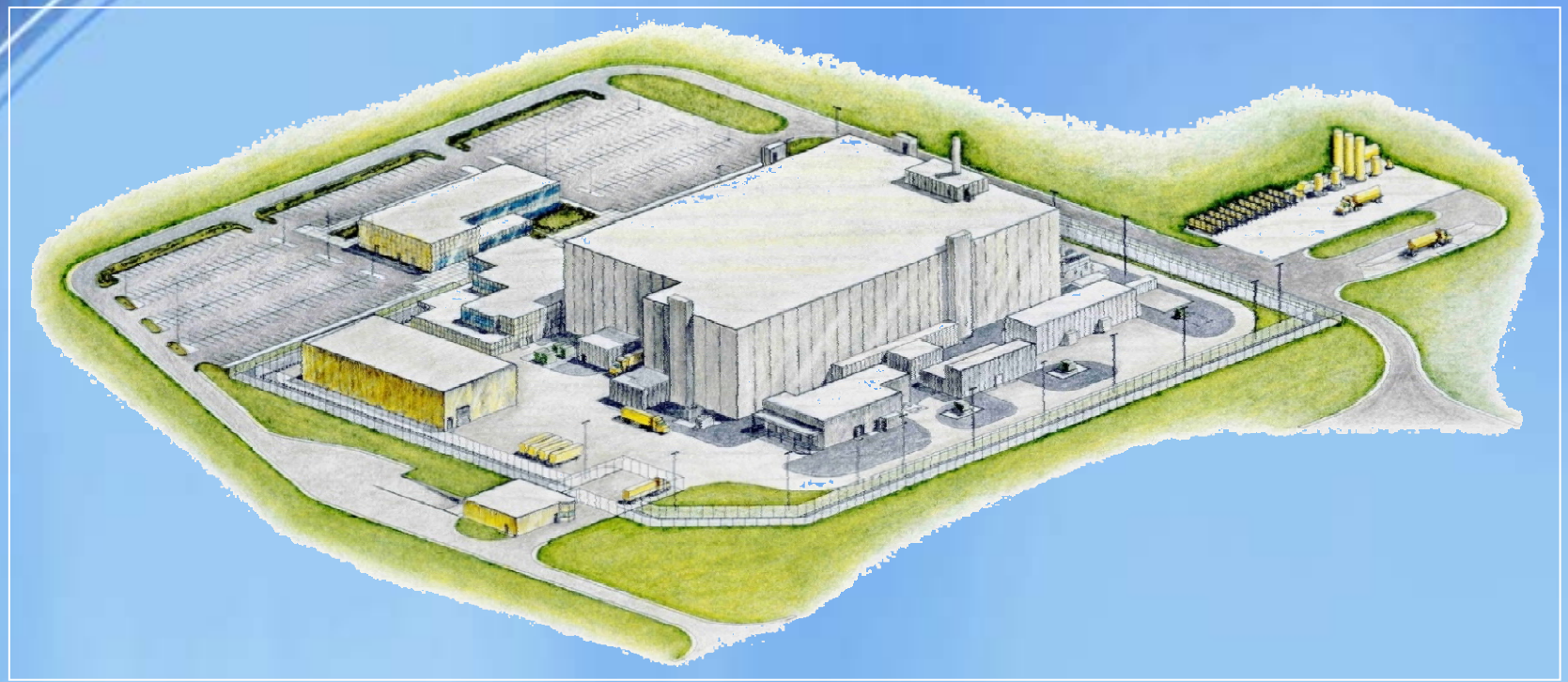
MOX Safety Fuels the Future

MOX Environmental Overview

- **Over 50 active environmental permits being managed**
  - No permit violations since start of construction: 2/06
  - Construction permit (stack, diesel generator, and diesel fuel tanks)
  - Renewal of Concrete Batch Plant Bureau of Air Quality (BAQ) permits (includes diesel generator): 12/11
  - Pre-operational environmental monitoring: 10/12-10/14
  - Operating permits to be in place by Hot Start-up: 6/15
    1. Storm Water NPDES (will not release process fluid effluents)
    2. Title V Air Permit (MFFF stack)
- **Implementation of a DOE 450.1A-compliant Environmental Management System (EMS)**

MOX Safety Fuels the Future

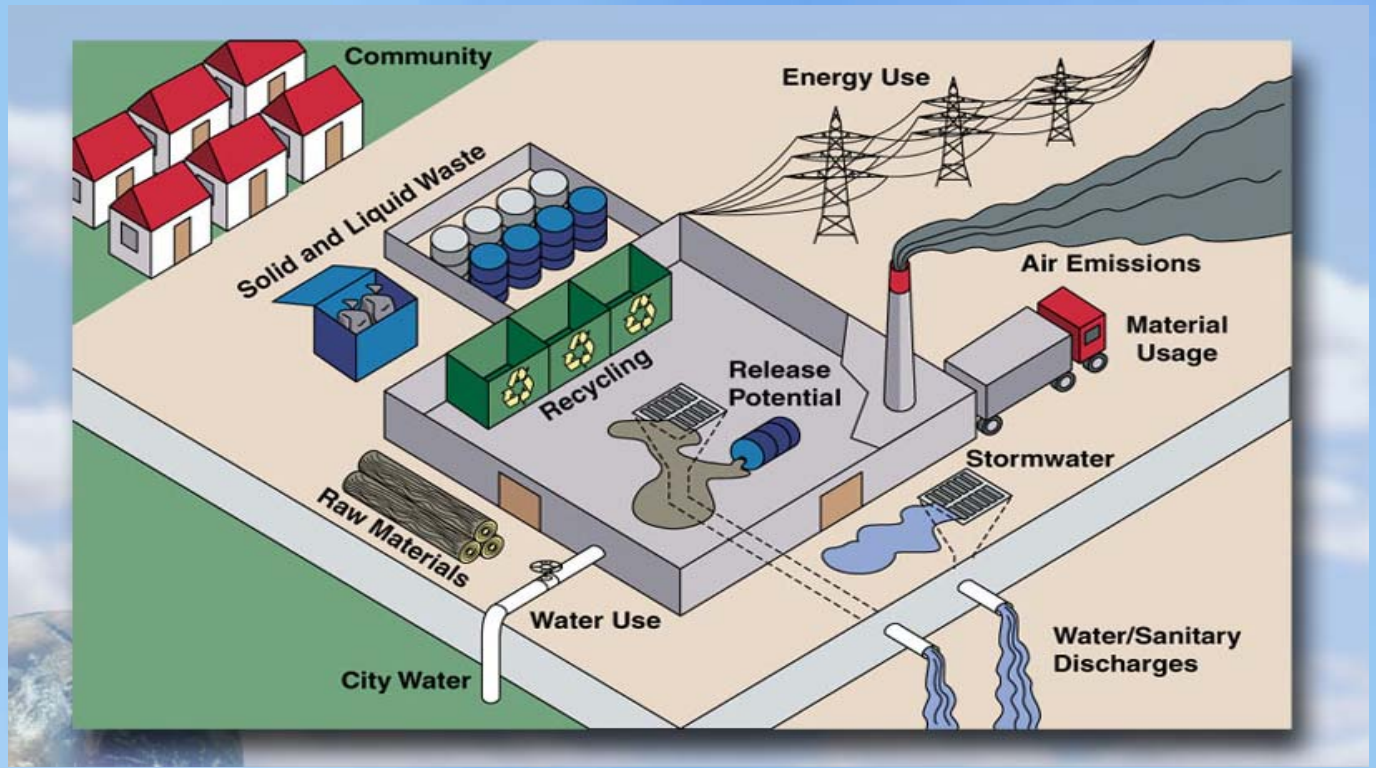
MOX FUEL FABRICATION FACILITY
Environmental Management System (EMS)



What is an EMS?

Management approach to determine, prioritize, implement, and improve on environmental issues; leading to **sustainable environmental stewardship** and integrated into safety management

Since MOX construction activities continually interact with the environment, MOX Services has committed to using resources efficiently to minimize environmental impacts



Environmental Regulatory Drivers

Federal Laws	Pollution Prevention Act Resource Conservation & Recovery Act Clean Air Act Clean Water Act Safe Drinking Water Act Emergency Planning and Community Right-to-Know Act Energy Policy Act EPAct of 2005
Executive Orders	E.O. 13423 – Strengthening Federal Environmental, Energy and Transportation Management E.O. 13514 – Federal Leadership in Environmental, Energy, and Economic Performance
DOE Orders	DOE Order 450.1A – Environmental Protection Program DOE Order 430.2B – Energy Efficiency

DOE Order 450.1A Requirements

- Designed to implement sound stewardship practices protective of air, water, land, and other natural and cultural resources impacted by DOE operations in a cost-effective manner

- Includes requirements for following programs:

Pollution prevention	Surface water protection
Groundwater protection	Natural resource protection
Cultural resource protection	Air quality protection
Environmentally-preferable purchasing	Environmental monitoring
Life-cycle assessment	Energy efficiency
Hazardous materials	Ozone Depleting Substances
Surplus and excess property	PPOAs

Additional DOE O 450.1A Requirements

- Reflect E.O. 13423 requirements in EMS
- Coordinate DOE O 430.2B requirements into EMS
- Reflect framework defined in ISO 14001:2004
- Primary management approach for addressing site environmental aspects
- Include specific compliance management elements (audit program)
- Ensure full integration with ISMS (DOE O 450.4)
- Conduct formal audit by qualified party outside control or scope of EMS before declaring initial implementation and every 3 years thereafter

DOE Order 450.1A Goals

Five Performance-based Sustainable Environmental Stewardship Goals

- Reduce or eliminate generation and/or toxicity of waste at source through pollution prevention
- Reduce or eliminate purchase, use, and release of toxic and hazardous chemicals and materials
- Maximize purchase and use of environmentally-preferable products
- Reduce or eliminate environmental impacts of electronic assets
- Recycle post-consumer material

14 Benefits of an EMS

- Improves environmental performance based on a defined internationally-accepted system
- Provides standardization among sites
- Involves documented and defined practices
- Heightens worker awareness of environmental issues
- Installs a “preventative” attitude
- Is IMPACT-driven NOT requirement-driven
- Provides a decision-making tool for prioritizing tasks

14 Benefits of an EMS (Continued)

- Reduces risks and liabilities from hazards
- Reduces reporting and permitting
- Reduces resource usage and increases conservation efforts
- Minimizes wastes, energy, and water usage
- Reduces overall process and project costs
- Monitors performance effectively
- Increases efficiencies – SMART business!

ISO 14001 EMS Overview

Policy 4.2

Planning 4.3

- 4.3.1 Environmental Aspects
- 4.3.2 Legal and Other Requirements
- 4.3.3 Objectives, Targets and Programs

Implementation & Operations 4.4

- 4.4.1 Structure and Responsibility
- 4.4.2 Training, Awareness, and Competence
- 4.4.3 Communication
- 4.4.4 EMS Docu-mentation
- 4.4.5 Document Control
- 4.4.6 Operational Control
- 4.4.7 Emergency Preparedness and Response

Checking & Corrective Action 4.5

- 4.5.1 Monitoring and Measurement
- 4.5.2 Evaluation of Compliance
- 4.5.3 Non-conformance and Corrective and Preventive Action
- 4.5.4 Control of Records
- 4.5.5 Internal Audit

Management Review 4.6

MOX Services Environmental Sustainability Policy Statement

SHAW /AREVA MOX SERVICES

ENVIRONMENTAL SUSTAINABILITY POLICY STATEMENT

Shaw /AREVA MOX Services is committed to excellence and leadership in protecting the environment within our site and our community. It is the policy and practice of MOX Services to conduct all construction activities and day-to-day operations in a manner that protects human health and the environment, and to be in full compliance with environmental laws, regulations, and other relevant requirements. MOX Services accomplishes this policy by systematically and fully integrating environmental considerations into the planning and execution of work at all levels and by effectively interfacing with the Savannah River Site (SRS) infrastructure so that the MOX Services mission is successfully accomplished for the benefit of the public, all SRS workers, and the environment.

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, assigns responsibility to the head of each Federal agency to ensure the appropriate integration of environmental accountability into day-to-day decision-making and for long-term planning. Additionally, NNSA has made it clear that protection of the environment, the workers, and the public is of paramount importance by requiring the integration of environmental programs into all work activities.

Accordingly, through employee involvement and management commitment to environmental excellence, MOX Services and its subcontractors will:

- Comply with all environmental laws and regulations and incorporate waste reduction and recycling principles into all daily operations to achieve the lowest possible life-cycle cost.
- Control construction and operations in a manner that minimizes environmental impacts associated with the work being performed and utilizes sustainable practices to improve the MOX Services environmental posture.
- Evaluate projects using up-front job hazard analyses to identify potential environmental impacts, manage these impacts through engineering design and controls, and reduce or eliminate these impacts using waste minimization and pollution prevention methodologies.
- Manage wastes generated from daily activities in a safe, compliant, and cost-effective manner. Establish and communicate environmental responsibilities, provide training, and implement controls to mitigate hazards.
- Involve workers in the development and execution of environmental management programs and fully communicate environmental information to all employees, stakeholders, and the public.
- Conserve natural resources and energy usage by reusing and recycling materials and by purchasing and using environmentally-preferable products.
- Integrate sustainability principles into the design and construction of new facilities and ensure energy efficiency is integrated into each MOX Services project and/or activity.

Shaw AREVAMOX Services seeks to demonstrate its corporate and environmental citizenship by continuously improving it's commitment to the environment, now and for generations to come. Reaching this level of environmental accountability is dependent upon the collective commitment and contribution of each employee. We count on your support to achieve the level of environmental excellence that our policy demands.

David Stinson
President, Shaw/AREVA MOX Services

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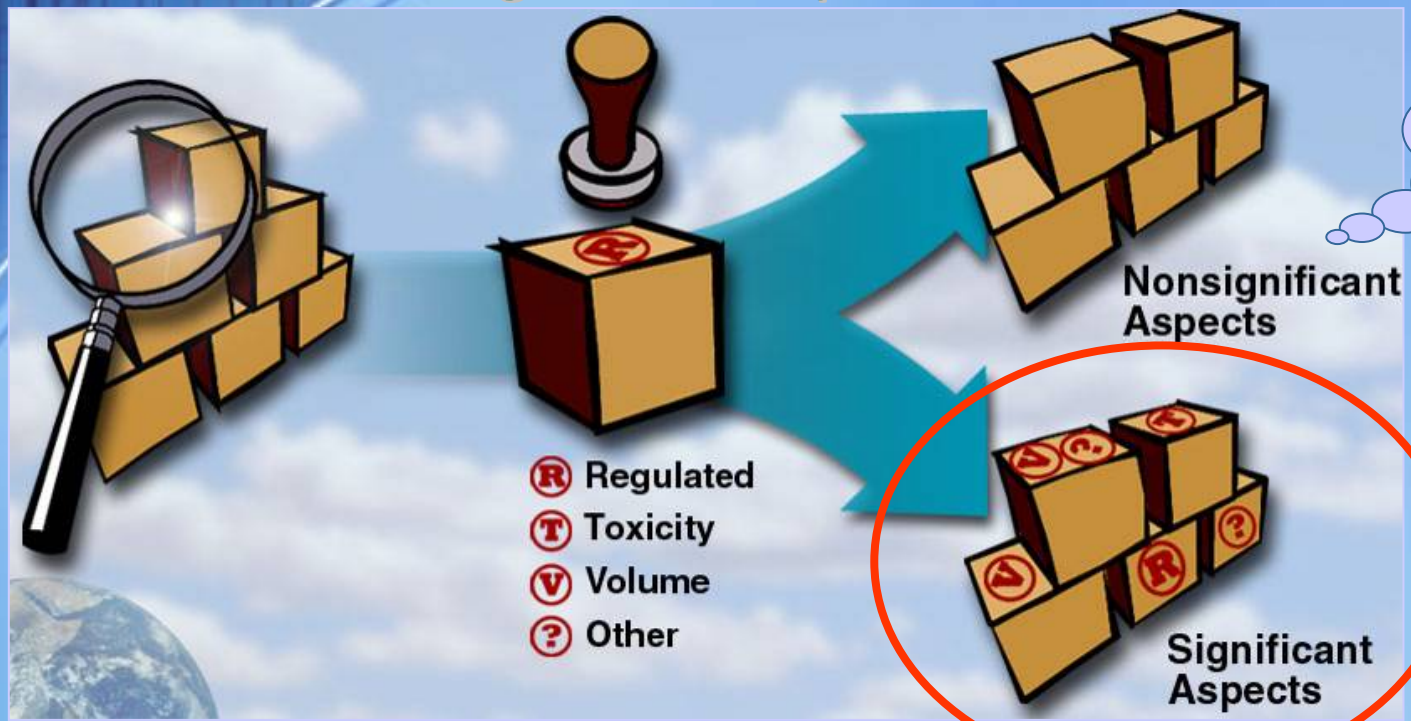
Significant Environmental Aspects
Prioritizing What's Important for the Environment



Do Not consider further

Focus of the EMS

Consider if each aspect has attributes that would make it "significant" (environmentally important), then rank to prioritize

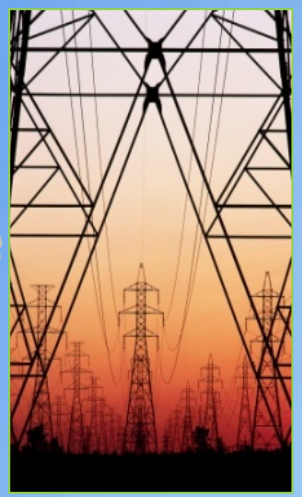
Consider: Toxicity, resource consumption, regulated/controlled/enforcement, potential for released, specification, frequency of episode, volume or mass amounts, severity of impact

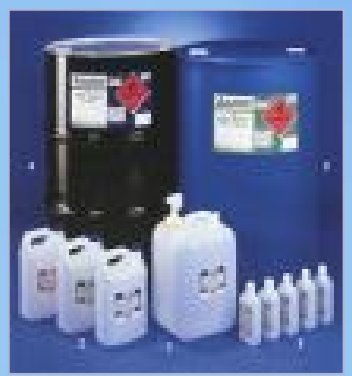
Determining Significance

- Regulatory – Laws, Regulations, Executive Orders, DOE Orders
- Overall expense - energy or fuel costs
- High volume of waste generation
- No treatment or disposal pathway for waste
- Accident potential
- Health and safety concern
- Site mission
- Community and stakeholder concerns
- Schedule delays

MOX Services Significant Environmental Aspects

1. Storm Water Runoff
2. Petroleum/Oil Spills
3. Land Disturbance
4. Hazardous Material Use/Storage
5. Wastewater
6. Waste Generation
7. Energy Consumption
8. Procurement





Objectives, Targets & Programs—What ISO Requires

- *Identify objectives (goals) and targets at relevant functions and levels*
- *Measurable where practicable*

Objectives & Targets require the consideration of specific attributes

Promotes good business planning

- *Establish programs for achieving objectives and targets*
- *Define responsibilities, means, and time-frame*

MOX Services Environmental Objectives

MOX Services has established achievable and measurable objectives and targets to continually assesses environmental and waste management performance

1. Minimize storm water runoff
2. Minimize oil spills
3. Control fugitive dust emissions
4. Control hazmat use and storage
5. Properly manage wastewater
6. Minimize waste generation
7. Reduce energy consumption
8. Purchase environmentally-preferred products

Minimize Storm Water Runoff

Erosion Control Matting at Detention Pond

- Insert pic 0182

Erosion Control – Rock Check Dam and Matting

- Insert pic 0188

Erosion Control – Silt Fence

- Insert pic 0201

Erosion Control – Permanent Vegetation after Sodding

- Insert pic 0746

Erosion Control – Silt Fence Failure

- Insert slide 0173 here

Erosion Control – Trapped Sediment

- Insert slide 0179

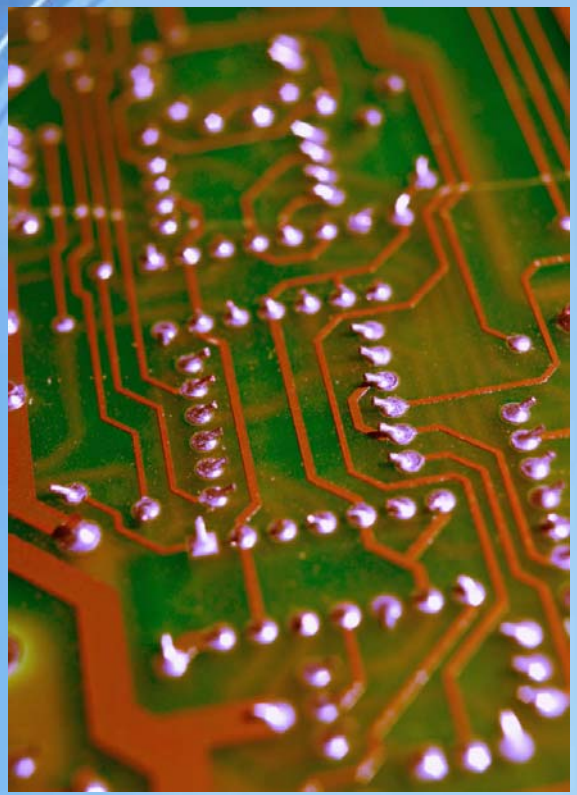
Minimize Generation of Waste

Segregate Scrap Metal for Recycle

- Insert pic 0881

ELECTRONIC WASTE (EW)

The IT Department generates EW during construction. To manage EW, IT shall:



- Collect unused electronic equipment
- Determine if the unused electronic equipment is EW and has no further use
- Work with Property Management Group to send Oak Ridge National Recycle Center

OFFICE WASTE

- MOX personnel places office waste in provided receptacles

- Janitorial services collect office waste from the trash receptacles and transfer it to dumpsters
- Dumpsters emptied weekly and transported to the Material Recovery Facility (MRF)
- At MRF, recyclable materials are separated from the trash and recovered

Construction Rubble

- Insert pic 0885

Reduce Energy Consumption

Administration Building (BAD)
LEED GOLD

Sustainable Features of BAD

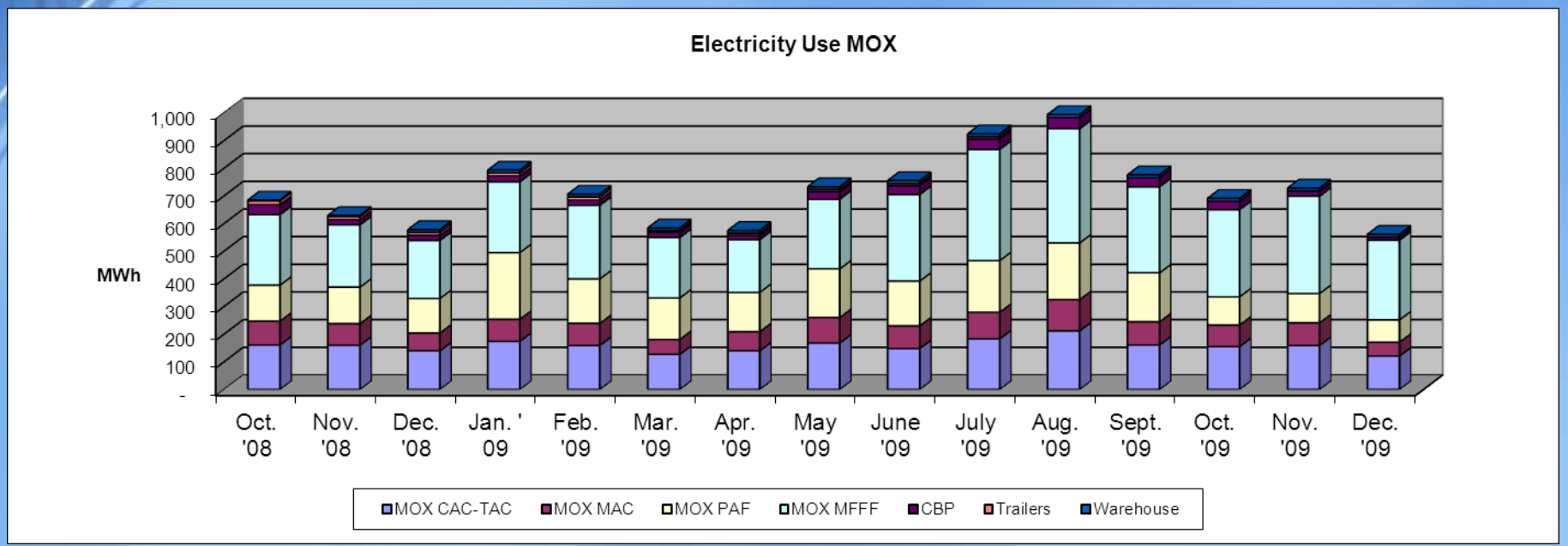
Exterior Site Upgrades

- Native Landscaping requires no irrigation; used adapted plant materials and native trees; rainwater retention tank installed
- Alternative transportation – bike racks; changing rooms, parking space for car pools and van pools; parking for E85 and fuel efficient vehicles
- Motion-detected faucets, urinals and toilets

- No Freon-based units in BAD
- Highly efficient HVAC system installed
- Enhanced Lighting Control
  - Occupancy Sensors
  - Task lighting for work surfaces

  Energy efficient fluorescents (T-8)
- Building Automation System
  - A network of sensors and controls allow modulation of heating, ventilation and air conditioning to maximize efficiency
  - Trending the total electricity consumption of the building

MOX Energy Consumption Tracking



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MOX Energy Awareness Activities

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MOX Services EMS Program Plans

- Pollution Prevention/Waste Minimization Sustainability Plan
- Ozone Depleting Substances Management Plan
- Waste Management Plan
- Cultural Resource Management Plan
- Storm Water Pollution Prevention Plan
- Chemical Management Plan
- Oil Removal Contingency Plan
- Energy and Water Conservation Management
- Environmentally-Preferable Purchasing Plan

MOX Services EMS Program Procedures

- Erosion and Storm Water Compliance Inspection
- Spill Response
- Chemical Commodity Management
- Managing Nonhazardous Solid Waste During Construction
- Management of Used Oil
- Managing Wastewater During Construction
- Managing Hazardous Waste
- Managing Universal Waste
- Ozone Depleting Substances Management
- Chemical Storage

QUESTIONS?