



An Energy Efficiency Workshop & Exposition

Palm Springs, California

Setting Sustainable Goals Using LEED

Jack Mizner, P.E.

Sandia National Labs

Shaw Environment and
Infrastructure



SD CHRONOLOGY AT SANDIA

- E2, P2, W2 working diligently, on their own
 - Water conservation initiative - W2 met P2
 - Quantifying energy and environmental benefits at PETL - E2 met P2
- Green Conference Room, Bldg. 836
- Design Criteria for JCEL - 1998 and 2000, Currently in Design-Development
- Testing Center - SD complete, under construction
- MESA - CDR, Energy Programming Workshop, SD Charrette, Schematic Design
- Other projects

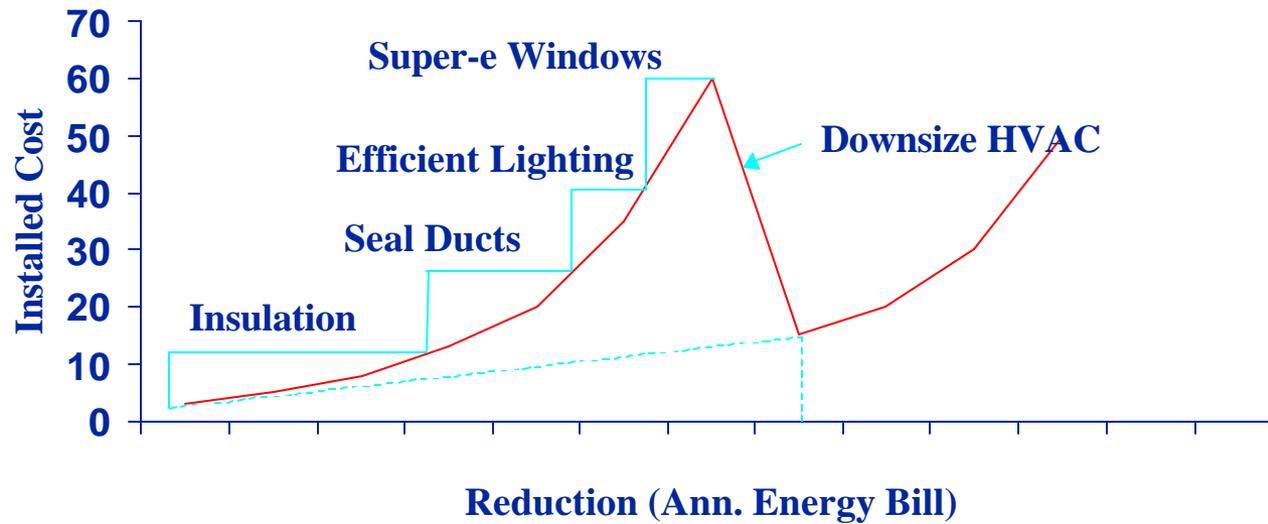


Whole-Building, Integrated Design Approach

- Individuals involved in the use, design, construction and operation are engaged and try to understand the issues and needs of all parties.
- Design team members look at the materials, components and systems from different perspectives and work together for the optimum solution:
 - quality of workplace, first cost, future flexibility
 - efficiency, overall environmental impact, life cycle cost
 - productivity and creativity

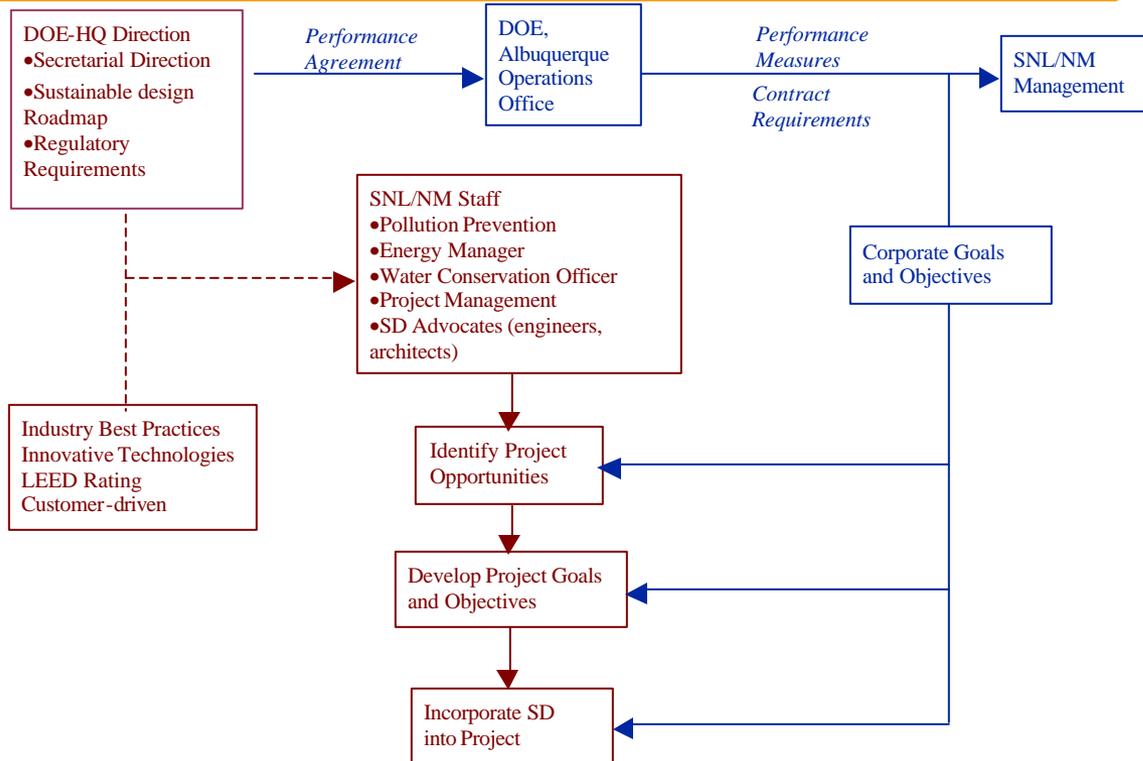


Discontinuities in Cost Curve





The Process - Big Picture





The Process for projects

- Add appropriate language in project documents (CDR, DC, RFP).
- Conduct Sustainable Design Charrette, using LEED as an ideas and evaluation tool.
- Become part of the review team.
- Sustainable Design Report is a project deliverable.



Project Documents

□ Project Description

- XXXX will be designed, constructed and operated using the latest, green building technologies and integrated sustainable design approaches. The completed facility will provide a healthful, resource-efficient and productive working environment, and serve as a model facility for DOE and other governmental agencies.

□ A/E Services

- XXXX will be designed to provide a safe, non-toxic, productive working environment that incorporates green building design concepts where possible. Green building (also referred to as “sustainable”) design incorporates healthful Indoor Air Quality (IAQ), minimizes water and energy use, selects building products based on resource efficiency criteria and handles construction and demolition work in a resource-conserving manner.



Project Documents

- Sustainable Design and Development
 - Designing, constructing, and operating facilities in an efficient and environmentally sound manner is important to Sandia.
 - The U. S. Green Building Council's Leadership in Energy and Environmental Design (LEED), Rating System, version 2.0, (<http://www.usgbc.org>) will be used to ensure that sustainable elements are incorporated into the facility design.
 - Specific items are referenced by discipline in other sections of the design criteria. Key concepts and components of sustainable design, and suggested elements for consideration, are described below. The A/E is encouraged to propose other measures and shall conduct cost-benefit analyses of proposed options.
 - It is essential to evaluate these items from a whole building (integrated) design approach. Whole building design looks at how materials, systems and products of a building connect and overlap, and how the building and its systems can be integrated with supporting systems on its site and in its community.



Program Documents

□ Sustainable Design Charrette

- Conducted at the beginning of the Programming Phase; encourages cross-fertilization; product is a roadmap for incorporating sustainable design and development into the project.
- Deliverables
 - A list of sustainable energy design measures that will be incorporated in XXXX's design.
 - Establishment of sustainable design targets and goals.
 - A list of sustainable design measures for which the A/E will determine their life-cycle costs. These measures will be incorporated in XXXX's design if cost effective and within project budget constraints.
 - Establishment of Performance Metrics.
 - A summary report that provides direction for the design team.



Program Documents

□ Sustainable Design Report

- Initiated during the programming phase, and viewed as a decision making tool, so that it will be a value added function of the design process.
- This report will contain an analysis of sustainable design issues, organized according to the LEED rating categories.
- Addresses the following elements
 - Sustainable Sites
 - Water Efficiency
 - Energy Efficiency
 - Materials and Resources
 - Indoor Environmental Quality



SD Project Results - Similarities

- Sustainable Site Planning
 - Xeriscaping
 - Rainwater harvesting system
 - Heat island reduction
 - Pervious paving areas
- Improving Energy Efficiency
 - Building envelope – whole building integrated design
 - Life Cycle Cost Analysis on major engineering systems



SD Project Results - Similarities

- Safeguarding Water
 - Exceed 1992 Energy Policy Act requirements for plumbing fixtures
 - Minimize parking
 - Water harvesting for native plants



SD Project Results - Similarities

- Conserving Materials and Resources
 - Emphasize local and environmentally favorable materials
 - Implement construction management plan to recycle construction debris
- Indoor Environmental Quality
 - IAQ management plan to ensure removal of contaminants
 - Specify Low VOC paints, sealants and adhesives
 - Architectural entries to remove particulates



Model Validation Testing Center

- 20,000 ft.² rehabilitated building that upgrades ability to monitor, analyze and view remote testing
- Performance-based, design-build contract
- Program of Requirements included an SD section - part of contractor selection.
- SD Charrette was incorporated as part of design process - established the roadmap for SD
- Whole building approach used during Schematic Design.



MVSCTC - SD Approach

DESIGN CHARRETTE

- Background information on requirements
- Whole group discussions
- Sub-Group discussions (Architecture, Lighting, Mechanical)
- Evaluation using Energy-10
- Evaluation using LEED criteria
- Summary report for use in Design



DESIGN-BUILD SCHEDULE

- Sept. 21-25, 1999 Team building and discussion of program requirements
 - Sept. 28- 29, 1999 Sustainable Design Charrette
- Design Reviews, including separate SD submittal (LEED scoring)
 - Feb. 2000, Fixed Price Design and Construct
- Waste Management & IAQ Plans; review of submittals

June 2-5, 2002

www.energy2002.ee.doe.gov

15



MVSCTC - Summary of SD elements



- Energy, 30% less than Code; emphasis on daylighting
- Construction waste management plan 66% recycling of C&D waste
- 20 - 50% recovered material content; recycling center

- Water harvesting & native plants
- LEED Certification, if submitted
- Within original project budget



June 2-5, 2002

www.energy2002.ee.doe.gov

16



MVSCTC- SUSTAINABLE SITE PLANNING



- Rehabilitate Building (70%)
- Local, drought tolerant landscaping
- Minimize site disturbance, preserve vegetation, restore disturbed areas
 - Demolition plan limited scope of site disturbance
- Carpool and bicycle spaces
 - Showers included for employees
- Environmentally friendly roof
 - R30 roof insulation
 - TPO membrane roof – white color
- Comply with IESNA requirements
 - Minimum watt lamps for exterior lighting
 - Comply with New Mexico night sky pollution policy
 - Exterior uplights include articulating arms to aim light at building

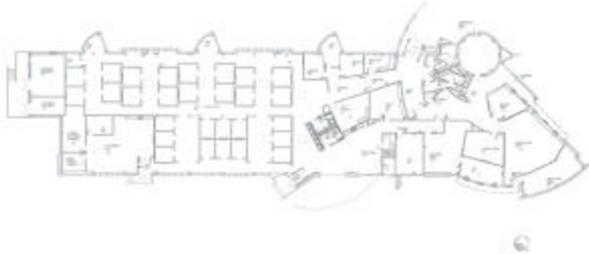


MVSCTC - SAFEGUARDING WATER

- Exceed 1992 Energy Policy Act requirements for plumbing fixtures
- Minimize parking areas; use pervious surfaces
- Water harvesting for native plants
- Site irrigation system is a drip system for use during the establishment period.
- Water usage will be metered and compared to the project requirements.



MVSCTC- IMPROVING ENERGY EFFICIENCY



- Lighting
 - Maximized daylighting opportunities and integrated daylight controls for electric lighting
 - Ambient, task and accent lighting
 - Dimming systems
 - EMCS interlock with occupancy sensors
 - Bi-level switching
 - Commissioning – BPA guidance
- Building Envelope - whole building integrated design
 - High performance, low-e glazing in thermally broken frames
 - Wall and roof insulation
 - LCA for HVAC system
 - Staged air cooled chillers
 - Selected system had 2nd lowest initial cost and 2nd lowest LCC
 - VFDs
 - On demand water heating



MVSCTC - CONSERVING MATERIALS AND RESOURCES



- Local and environmentally preferable materials (40 CFR 247 and beyond) - no CFCs or halons
- Construction management plan to recycle construction debris
- Wood products from sustainable forests
- Recycle/Reuse building materials
 - Electrical components that were reused
 - Some existing raceways in building
 - Main building power transformers
 - Some existing communications equipment
 - Recycled construction materials
 - Site Materials
 - Demolished CMU to Kirtland landfill for stabilization project
 - Reused existing fire protection piping



MVSCTC - INDOOR ENVIRONMENTAL QUALITY

- IAQ management plan to ensure removal of contaminants
 - 2 week building flush-out
 - Replace filtration media
 - Finish installation of offgassing products prior to installing absorptive materials
- Low VOCs for paints, sealants, adhesives
 - Green Seal Paints
- Evaluated permanent air monitoring system
 - CO2 monitoring system to be used in presentation room
- Architectural entries to remove particulates
- Natural light to enhance worker morale
 - Strategically located skylights
 - Clerestories at interior office walls



Joint Engineering Computational Laboratory

- 55,000 ft.² top secret facility to support Weapons program
- Met with project design team early
- SD experience included in A/E evaluation
- Included Sustainable Design Report as part of project deliverables
 - LEED rating is a requirement, submittal by A/E
- Design Charrette included mutual agreement on performance metrics



JCEL - SD Approach



DESIGN CHARRETTE

- SD Awareness meeting held to review SD needs and requirements
- Week long Charrette with integrated focus on SD and building design
- Preliminary and revised LEED scoring



June 2-5, 2002

www.energy2002.ee.doe.gov

23



JCEL - SD Summary



- LEED Silver rating
- Brownfield Remediation
- Retain all stormwater on site through the use of landscaping features
- Energy Goal: 20 - 30% better than ASHRAE 90.1 – 1999 (ECB modeling process)
- Maximize daylight opportunities
- Demonstration PVs
- Commissioning PECCI guidelines
- Integrated high-efficiency lighting



KEYS TO SUCCESS

- Partnerships and buy-in from SNL architects and project managers
- Start with specific projects
- SD advocates included on design team
- Combined P2/ E2/W2 into sustainable design requirements
- Worked with contracted A/E firms for mutual benefit



CHALLENGES

- Unfamiliarity or inexperience
- Overcoming mindset
 - not practical, high first cost
- Typical design fees don't recognize extra time that's necessary
- Goals - good; requirements - better