Environmental Design Charrette Report Task 2.4

Federal Bureau of Prisons

Prepared By:

ENSAR Group, Inc.
2305 Broadway
Boulder, CO 80304
Tel 303.449.5226
Fax 303.449.5276

Prepared For:

National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401
Tel 303.275.3000

ENSAR Project # 0256

July 1, 2002

TABLE OF CONTENTS

FEDERAL BUREAU of PRISONS
WASHINGTON, D.C.

EXECUTIVE SUMMARY

Contacts:
Section Chief/Architect– Craig Forstater
(202) 514-5942
National Renewable Energy Laboratory
Senior Engineer - Andy Walker
(303) 384-7531
ENSAR Group, Inc.
Charrette Project Manager –Jason Hainline
(303) 449-5226

Project Description:
In an effort to incorporate sustainable design elements into the design and construction guidelines and practices for federal prisons, a charrette and review of the guidelines were conducted. These activities are part of the "Sustainable Federal Facilities" program funded by the U.S. Department of Energy (Federal Energy Management Program and the National Renewable Energy Lab).

PROJECT HIGHLIGHTS:

- The review of guidelines for design and construction, procurement practices, and facility management was conducted to incorporate sustainability strategies.
- A charrette, or intensive planning session, was held May 29-30, 2002. Approximately 30 individuals with diverse backgrounds participated; core leaders from multiple branches of the Federal Bureau of Prisons Design & Construction, Procurement & Construction, Facilities Management, and outside subcontractors. Three distinct areas were addressed in detail: site & water, energy and architecture (including waste and indoor environmental quality).
- National experts in these areas were chosen to facilitate the focus groups while FBoP members from specific disciplines, along with outside consultants, were asked to lead the discussions and become "champions" of the charrette results.
- The goals of this charrette were to:
  - Identify baseline conditions related to facilities development and more specifically the FBoP Technical Design Guidelines (TDG)
  - Identify shortcomings of the FBoP TDG in relation to code compliance
  - Establish first, second, and third tier improvements towards a high performance/green design approach for design as well as modifications to the FBoP TDG. Tiers were used to establish short, mid, and long-term goals
- Based on the work of the focused groups, a number of goals and objectives were generated, ultimately creating a long-range outlook of sustainable opportunities and objectives for future development. From this outlook, the FBoP can begin to review and prioritize these goals and objectives with respect to the time, personnel, and dollars available and create a long-term action plan for each of these specific areas.

PROJECT HIGHLIGHTS (cont.):

- The goals and objectives generated indicate opportunities for improvements to the Technical Design Guidelines. This creates additional opportunities for the FBoP to create "market change" with the outside subcontractors (architects, engineers, contractors, etc.) who provide services to the FBoP.
- Status of Existing Design Guidelines:
  - Energy efficiency through meeting the goals of Executive Order 13123/10 CFR 435 is identified. Minimum requirements call for ASHRAE Standard 90.1-99.
  - Water conservation beyond the Environmental Policy Act of 1992 is not required.
  - Water based finishes (i.e. paints, coats) are required without VOC limits.
  - Building materials are limited. Environmental quality (i.e. recycled content, toxicity) is not addressed.
  - Construction waste recycling is not currently addressed.
  - Site selection/impacts are minimized through minimal site attention.

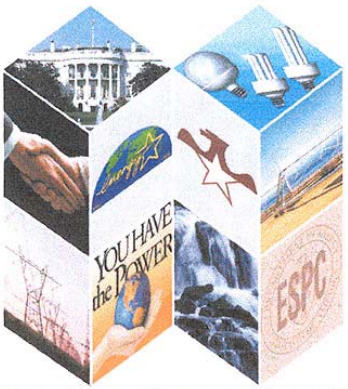
BENEFITS:

By implementing the plans created at the Charrette, the benefits for the FBoP are:

- Lower operating costs
- Enhanced security and reliability of systems
- Increased quality of life – for staff and employees (in addition perhaps contributing to inmate rehabilitation)
- Decreased impacts to site(s), and decreased emissions and environmental impacts
- Compliance with Federal legislation and Executive Orders
- Citizenship in the local community (good neighbor)

NEXT STEPS:

1. Review and revise the Technical Design Guidelines to incorporate improvements towards high performance/green design approach.
2. Review and revise the RFP for future prisons to set performance goals - include energy and resource efficiency, statement of work and selection criteria for the A/E team which optimize resource efficiency and minimize cost.
3. Use evaluation criteria such as LEED to evaluate performance.
4. Create an internal "Sustainability Task Force" to:
   a. Create a Sustainability Plan with Action Steps
   b. Establish training for FBoP staff and subcontractors
   c. Visit successful case studies
5. Engage in a Pilot Project.
6. Conduct a full "environmental audit" of the Mendota project
   a. Energy analysis
   b. Daylighting analysis
   c. Materials recommendations
   d. Indoor environmental quality assessment



Federal Energy Management Program

SUSTAINABLE DESIGN CHARRETTE PROCESS

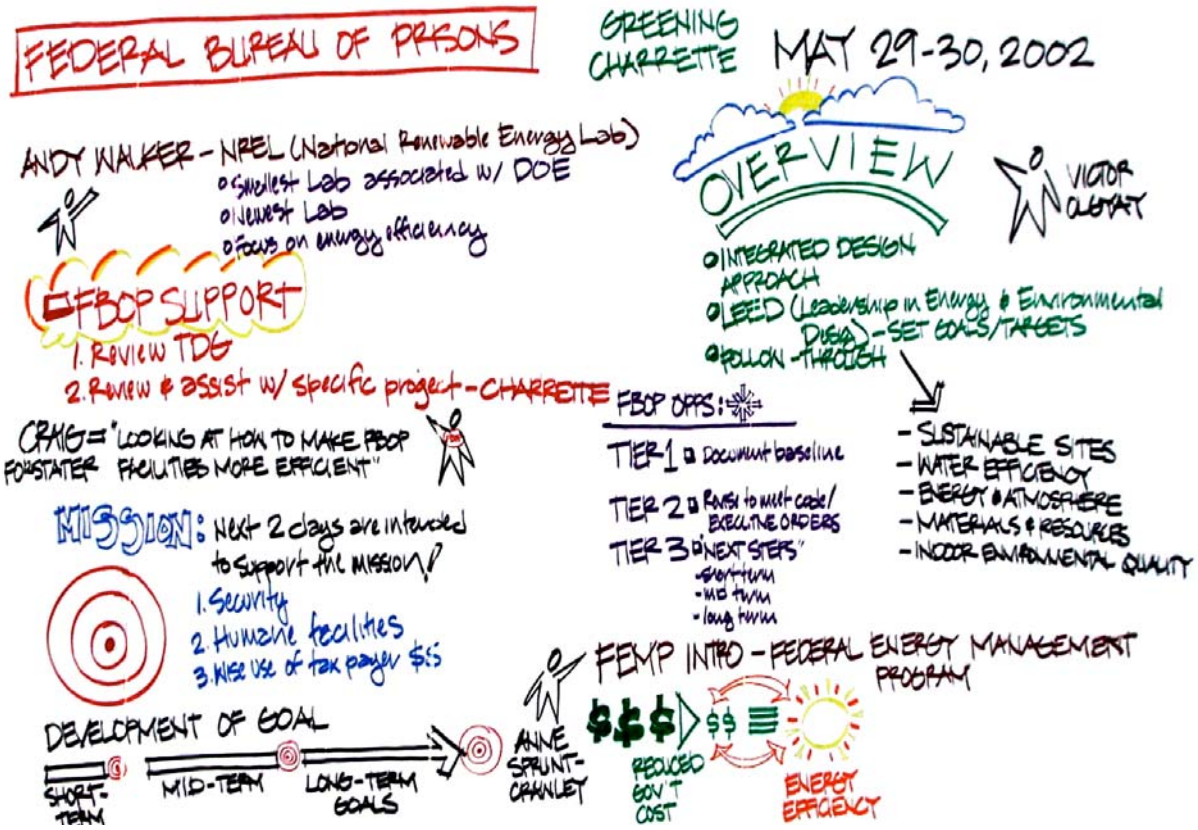
The Federal Bureau of Prisons (FBoP), with large energy intensive facilities nation wide, is an important client agency of the U.S. Department of Energy Federal Energy Management Program (FEMP). This "Sustainable Federal Facilities" Charrette was conducted near the FBoP central offices in Washington, D.C. Funding from FEMP through NREL (National Renewable Energy Lab) was dedicated to this process to support the Bureau in its efforts to meet sustainability goals set by Executive Orders.

Approximately 30 participants from various backgrounds assembled in Washington for the charrette. (A charrette is a sustained, intensive brainstorming session in consideration of a single topic or problem.) The charrette was a two day event beginning on May 29th, 2002. The charrette participants worked both as a large group and in focused break out groups the first day to look closely at the existing Technical Design Guidelines, identifying baseline conductions, assess code compliance, and develop goals to address opportunities for improvements towards a high performance/green approach. The second day focused break out groups continued by applying the first day's work to a specific future project, located in Mendota, California.

TUESDAY (May 28, 2002)
Tuesday afternoon, several of the facilitators met with Craig Forstater, FBoP Section Chief and project manager for the charrette from the bureau's side, to discuss the next two days agenda, items to focus on, goals to establish, and general direction. This meeting was very insightful from the facilitator's side as Mr. Forstater provided additional background information into the creation of FBoP facilities.

WEDNESDAY (May 29, 2002)
Victor Olgyay from ENSAR Group, Inc. opened the charrette with the morning welcome and introductions to the charrette with an overview of the charrette agenda, logistics, expectations and introductions of all the participants. Andy Walker of the National Renewable Energy Laboratory gave thanks to the FBoP for its commitment to "sustainable" design by embarking on this greening initiative. Andy also spoke about past initiatives to green federal facilities that preceded and eventually led to this charrette. Craig Forstater then gave a brief overview of the FBoP standards, issues, and goals.

Victor started the morning by presenting general review comments for consideration, which included brief points on creating high performance buildings, the LEED Green Building Rating System, 3 tiers of goals to develop for the FBoP, and Executive Orders in place that provide direction. Next came a viewing of the half-hour video, "Pennsylvania's First Green Office Building -- the Department of Environmental Protection Agency's offices in Harrisburg";



one of the first projects in the US to be rated using the US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system. The video provided a strong overview of what could be included in a green building as well as the process of designing and constructing a green facility. A description of the Department of Energy's Federal Energy Management Program (FEMP) was then presented by Anne Sprunt-Crawley from the DOE. Anne's presentation touched upon FEMP's mission within the federal sector, types of assistance that the program provides and resources offered.

Through the latter part of the morning and after lunch, the large group listened to national sustainability experts give quick overviews of individual topic areas:

- Sustainable Planning for Site Design
- Exterior and Interior Lighting
- Managing Efficiency (through mechanical systems)
- Reliability and Renewable Energy
- Form, Envelope and (architectural) Energy Strategies
- Materials/Waste/Indoor Environmental Quality

After each topic presentation, question-and-answer sessions brought insights and highlighted key concerns that would need to be addressed by the charrette participants in their focused work groups.

After the presentations, the large group split into three focused work groups – Site, Energy and Architecture. The group sizes ranged from approximately six to eight participants and worked out smoothly in terms of diversity and leadership in each group. The groups quickly determined

how they would address the following issues (related to the Technical Design Guidelines) in their assigned topic areas during the condensed work period of one day:

- Baseline Conditions
- Code Compliance
- First Tier Improvements towards a high performance/green approach
- Second Tier Improvements towards a high performance/green approach
- Third Tier Improvements towards a high performance/green approach

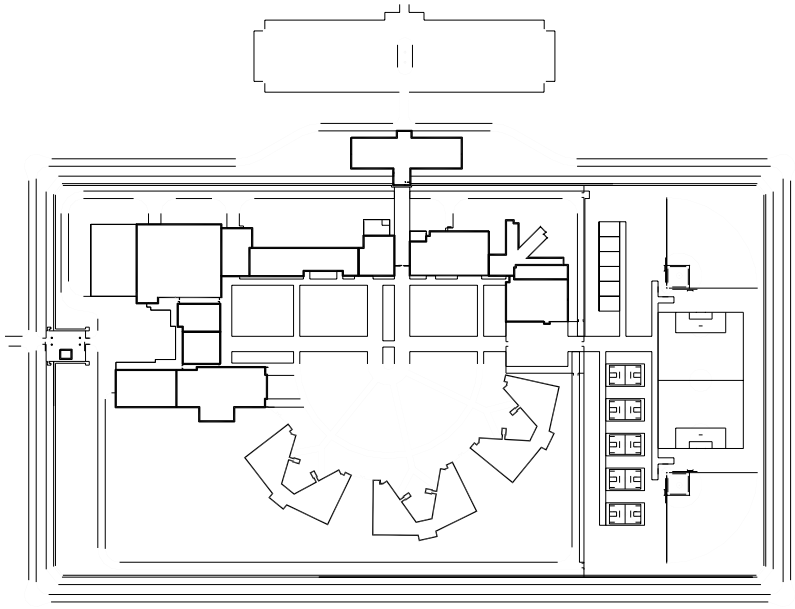
For each breakout group, a large format pre-drawn graphic "game plan" sheet was used to systematically record the following:

(1) Team members
(2) Targets, Objectives, and Mission
(3) Stages and Tasks
(4) Success Factors
(5) Challenges

Each group could record information in a consistent fashion that was easily read and share with others.

At the end of the first day of the charrette each topic group selected a spokesperson or spokespersons to review what their group had accomplished. It was impressive what each group was able to accomplish in the time allotted. Each group completed their assigned tasks and presented well thought-out "gameplans".

THURSDAY (May 30, 2002)



Victor Olgyay opened the morning session by going over the day's agenda and goals. Craig Forstater then gave the group a brief overview of the Mendota project as a sample project. The breakout groups reconvened and began by discussing how the strategies discussed could apply to the Mendota project, as well as other future undefined projects. After lunch the groups used the LEED checklist to identify how the applicable strategies added up. The groups then went on to discuss primary strategies for the FBoP in general, and broke those strategies down into short, mid, and long-term goals. Wherever possible these goals included specific recommendations for the FBoP Guidelines. Toward the end of the day the group was joined by additional members of the FBoP team, the NREL team, and the ENSAR team. Each breakout group presented the top five short term goals to the entire room, with a general overview of the direction of the discussion and overall goals.

After a brief question and answer period, every person in the room spoke about their experience at the charrette. Comments included:

- "I found this charrette to be very informative and I think we generated a lot of good ideas."
- "The Federal Bureau of Prisons is committed to energy efficiency and I think we can and should go for LEED silver or gold."
- "Some of the issues discussed here are more practical than others, but overall it has been a valuable experience which can only benefit the bureau."
- "We should aim high, then at least we will get somewhere with all of this."

The group adjourned at 3:15pm.

TOPIC AREAS AND GOALS FOR BREAK OUT GROUPS

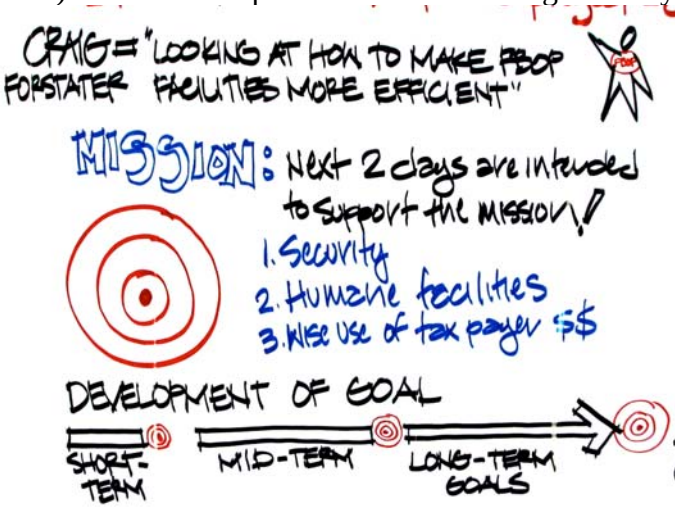
The topic areas for break-out groups consisted of three groups of approximately 6-10 participants in each group. The groups were as follows:

SITE: (Roger Courtenay and Lauren Yarmuth –facilitators)
Site planning, transportation, stormwater, landscaping, exterior lighting, etc.
ENERGY: (Ron Perkins and Phil Voss – facilitators)
HVAC/ mechanical/ natural heating and cooling systems, renewable energy sources, daylighting, lighting, plumbing systems, etc.
ARCHITECTURAL: (Jason Hainline, Victor Olgyay and Andy Walker – facilitators)
Materials, waste reduction, indoor environmental quality, envelope, glazing, etc.

The site and architecture groups combined into one group during the second day.

Day 1 Goals:
Each break-out group to review FBoP guidelines, concepts, and standards -- Identify:

1) Baseline conditions
2) Baseline conditions that do NOT meet current codes and standards
3) First tier improvements towards a high performance/green approach that would be realistically achievable within 1 year
4) Second tier improvements towards a high performance/green approach that could be realistically achieved in 2-5 years
5) Third tier improvements for the long-term 5 years+



Day 2 Goals:
Each break-out group to review the Mendota project information and identify the following:

1) Team members
2) Short, mid, and long-term goals for the project
3) Obstacles/barriers that the design team may encounter
4) Overall project targets and long-term vision
5) Success factors

PARTICIPANT LIST

Design & Construction Branch
Federal Bureau of Prisons
Design & Construction Branch
320 1st Street NW, 5008
Washington DC 20534
(202) 514-5942 tel
(202) 616-6167 fax

Kathy Chan	Civil / Structural Engineer	kchan@bop.gov
Alfred Cypress	Section Chief / Architect	axcypress@bop.gov
Craig Forstater	Section Chief / Architect	cforstater@bop.gov
Jon Gomberg	Section Chief / Architect	jgomberg@bop.gov
Annette Kim	Sr. Electrical Engineer	akim@bop.gov
Chuck Procaccini	Construction Management Coordinator	cprocaccini@bop.gov
Diane Vaughn	Project Manager / Architect	dlvaughn@bop.gov
Scott Higgins	Branch Chief / Architect	shiggins@bop.gov
John Seeley	Deputy Branch Chief	jseeley@bop.gov

Procurement & Construction Branch
Federal Bureau of Prisons
Procurement & Construction Branch
320 1st Street NW, 5006
Washington DC 20534
(202) 307-0954 tel
(202) 616-6055 fax

Tracey Boyd-Vega	Contract Specialist	tboydvega@bop.gov
Ann Davis	Contract Specialist	a2davis@bop.gov
Dee Smith	Branch Chief	dfsmith@bop.gov

Facilities Management Branch
Federal Bureau of Prisons
Facilities Management Branch
320 1st Street NW, 5008
Washington DC 20534
(202) 514-6652 tel
(202) 514-8848 fax

Enrique Avalos	Energy Coordinator / Western Reg. Office	eavalos@bop.gov
Noel Fenlon	Energy Program Manager	nfenlon@bop.gov
Marie Ferritto	Physical Plant Review Programs Mgr / Arch.	mferritto@bop.gov
Robert Scinta	Environmental Program Manager	rscinta@bop.gov
Wilburt Smith	Electrical Eng. / Mid-Atlantic Reg. Office	w3smith@bop.gov
Ramin Zandpour	Life Safety Program Manager	rzandpour@bop.gov
Paul Keller	Branch Chief	pkeller@bop.gov
Valerie McDonald	Section Chief, Facilities Programs	vmcdonald@bop.gov

The Louis Berger Group, Inc.
1819 H Street NW, Suite 900
Washington DC 20006
(202) 331-7775 tel

Craig Sutton	Energy Services Engineer	csutton@louisberger.com

National Renewable Energy Laboratory (NREL)
1617 Cole Boulevard
Golden, CO 81611
(303) 384-7531 tel

Andy Walker	Sr. Engineer, Energy/Mechanical Systems	andy_walker@nrel.gov
Phil Voss	Sr. Project Leader	phil_voss@nrel.gov
Karen Thomas	Sr. Project Leader	karen_thomas@nrel.gov

U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
(202) 586-5772 tel
(202) 586-1628 fax

Beth Shearer	(final presentation only)	elizabeth.shearer@ee.doe.gov
Anne Sprunt Crawley	(final presentation only)	anne.crawley@ee.doe.gov
Schuyler (Skye) Schell	(final presentation only)	schuyler.shell@ee.doe.gov

ENSAR Group, Inc.
2305 Broadway
Boulder, CO 80304
(303) 449-5226 tel
(303) 449-5276 fax

Jason Hainline	Sustainable Design Consultant	jason@ensargroup.com

Victor Olgyay	Energy/Sustainable Design/Architect	victor@ensargroup.com
Lauren Yarmuth	Sustainable Design Consultant	lauren@ensargroup.com
Greg Franta	(final presentation only)	greg@ensargroup.com

Clanton & Associates
4699 Nautilus Court South, Suite 102
Boulder, CO 80301
(303) 530-7229 tel
(303) 530-7226 fax
Dave Nelson — Architect/Lighting Design/Engineer
david@clantonassociates.com

EDAW
601 Prince Street
Alexandria, VA 22314
(703) 836-1414 tel
(703) 549-5869 fax
Roger Courtenay — Planner / Landscape Architect — CourtenayR@edaw.com

Supersymmetry USA, Inc.
22154 W. Magnolia Forest
Navasota, TX 77868
(800) 755-2819 tel
(409) 894-3124 fax
Ron Perkins — Mechanical Engineer/Energy Consultant
ronaldperkins@email.msn.com

SITE GROUP

Participants

Roger Courtenay
Lauren Yarmuth
Dave Nelson
Noel Fenlon
Kathy Chan
Ann Davis
Tracey Boyd-Vega

Objectives

- **Reduce water use by 30%.** Through design specification. Specification sections that could be modified to meet water reduction potential include irrigation, plant materials, topsoil renovation and conditioning, dust control, erosion control and stormwater management.
- **Reduce construction and demolition waste by 75%.** Areas of potential during landscape construction include erosion control, stockpiling and on-site movement of topsoil and other bulk landscape areas.
- **Goal of 50% recycled materials**. Focus will be primarily on path and roadway materials, using recycled asphalt, asphalt additives and recycled content/aggregate
- **Meet goals of Executive Order 13123.**
- **Design to meet LEED goals.** For landscape these will focus on water use conservation, re-use of on-site plant materials, soil, and natural topography for stormwater drainage. Other potentials exist in design of administrative office and maintenance areas, where line-of-sight security issues are less stringent, to plant significant shade trees so as to create a reduction in the heat island, lower heating and cooling costs in the building complex. Additional gains could be made if hedgerow plantings could be developed to modify air movement and micro-climate.
- **Design integration.** One of the key opportunities for design integration begins with site planning. The laying out of facilities with sensitivity to climatic and physical site properties offers many opportunities for more efficient buildings and site development. Heat island, vehicular circulation, sheltering and appropriate solar orientation is typical elements.
- **Least environmental impact.** Objectives will focus, for prison environments, on minimizing site disturbance. Key factors here minimizing cut and fill, stockpiling topsoil to maintain viability, and layout of the facility to optimize internal roads and pathways.
- **Maximization of water conservation.** Both during the construction period and after the landscape offer many opportunities for water conservation. Use of drought-tolerant plants, non-broadcast irrigation, and design of stormwater systems on the surface in order to provide ancillary watering are typically used techniques.
- **Watershed responsibility (volume and quality).** Stormwater management is control of water falling on the site. Volume, or quantity, and quality are facets of stormwater management. Retention and detention facilities, open infiltration swales rather than in pipes, and green roofs are typical areas for study. Stormwater management planning

starts with the site planning process as an integral element of decision making, balancing cut and fill, topsoil impact and vegetation impact with program objectives to create least impact alternatives.

Success Factors
The following benchmarks were identified as indicators of improving sustainability practices:

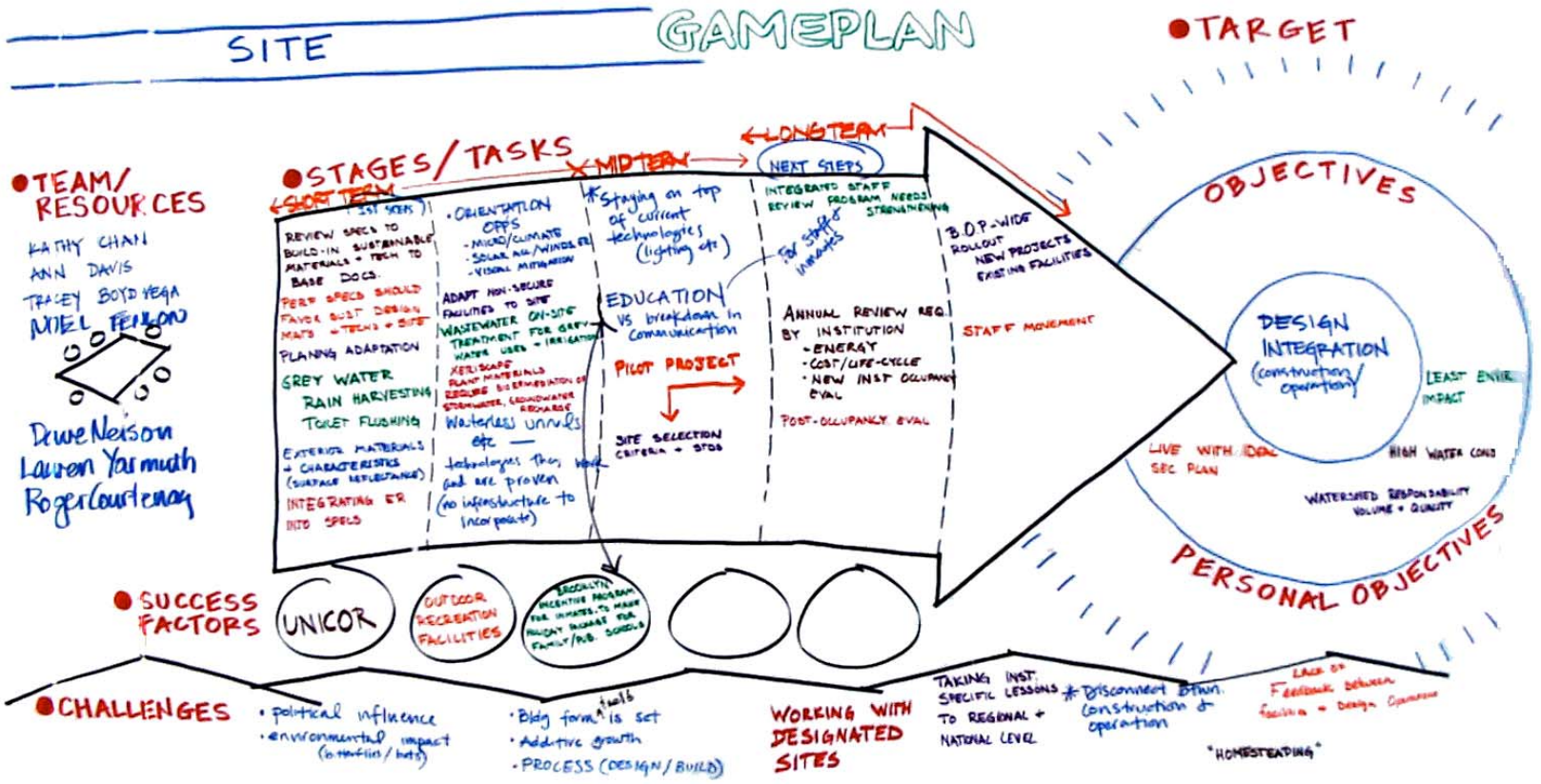
- Use of recycled content concrete, asphalt, and other major site and building material components.
- Brooklyn program has incentives for inmates who contribute to facility work. This program has potential expansion into site maintenance and into programs that incentivize suggestions which cut water and energy use.
- Outdoor recreation facilities (farms, athletic areas). These areas, subject to use by inmates and/or personnel, offer, as intensive exterior use facilities, focus design opportunities. Water conserving techniques have great potential for application on farms and athletic fields. The use of more drought-tolerant turf grasses for athletic fields, organic composting and farming techniques are other opportunities.

Challenges
The following challenges were identified as obstacles to successful implementation of sustainability practices:

- "Country club" appearance
- Limited materials used
- Political site selection
- Proven and set design
- Education
- Increased first costs
- Additive growth
- Design/build process

Short Term Goals:

- **Review and revise the Technical Design Guidelines** to upgrade site work specifications to integrate green technologies, techniques, and materials.
- **Revise RFP** to include performance/goals.
- **Modify proposals** to either "as-is specifications", or FBoP does research on workable alternatives and changes specifications.
- **Require recycled content** in asphalt/concrete (e.g. petroleum and aggregate components, high flyash content).
- **Require topsoil stockpiling** for viability protection and re-use.
- **Require cut and fill modeling** to optimize balancing objective with minimization of soil profile and vegetative cover impacts.
- **Require development of stormwater infiltration systems**, and habitat-friendly detention and retention impoundments, all focused on open-air facility design.
- **Use "white light" sources** such as metal halide, compact fluorescent and induction lamps
- **Phase out all high pressure sodium light sources.** 50-70% reduction with white light for equivalent and improved visibility.


SITE
GAMEPLAN
TARGET
TEAM/ RESOURCES
KATHY CHAN
ANN DAVIS
TRACEY BOYD VEGA
MIEL FERGON
Drue Nelson
Lauren Yarmuth
Roger Courtenay
STAGES/TASKS
SHORT TERM
MID TERM
LONG TERM
NEXT STEPS
REVIEW SPECS TO BUILD-IN SUSTAINABLE MATERIALS + TECH TO BASE DOCS.
PERF SPECS SHOULD FAVOR BEST DESIGN, MATS + TECHS + SITE
PLANNING ADAPTATION
GREY WATER
RAIN HARVESTING
TOILET FLUSHING
EXTERIOR MATERIALS + CHARACTERISTICS (SURFACE REFLECTANCE)
INTEGRATING ER INTO SPECS
ORIENTATION OPPS
-MICRO/CLIMATE
-SOLAR AIR/WINDER
-VISUAL MITIGATION
ADAPT NON-SECURE FACILITIES TO SITE
WASTEWATER ON-SITE TREATMENT FOR GREY WATER USES + IRRIGATION
XERISCAPE PLANT MATERIALS REQUIRE BIOREMEDIATION OF STORMWATER, GROUNDWATER RECHARGE
Waterless urinals etc —
technologies that work and are proven (no infrastructure to incorporate)
Staying on top of current technologies (lighting etc)
EDUCATION vs breakdown in communication
PILOT PROJECT
SITE SELECTION CRITERIA + STDS
INTEGRATED STAFF REVIEW PROGRAM NEEDS STRENGTHENING
for staff & inmates
ANNUAL REVIEW REQ. BY INSTITUTION
-ENERGY
-COST/LIFE-CYCLE
-NEW INST OCCUPANCY EVAL
POST-OCCUPANCY EVAL
B.O.P.-WIDE ROLLOUT NEW PROJECTS EXISTING FACILITIES
STAFF MOVEMENT
OBJECTIVES
DESIGN INTEGRATION (construction/ operation)
LEAST ENVIR. IMPACT
LIVE WITH IDEAL SITE PLAN
HIGH WATER COND
WATERSHED RESPONSIBILITY VOLUME + QUALITY
PERSONAL OBJECTIVES
SUCCESS FACTORS
UNICOR
OUTDOOR RECREATION FACILITIES
SECURITY/INCENTIVE PROGRAM FOR INMATES TO MAKE PHONE PACKAGE FOR FAMILY/PUB. SCHOOLS
CHALLENGES
• political influence
• environmental impact (to textiles / bats)
• Bldg form is set
• Additive growth
• PROCESS (DESIGN / BUILD)
WORKING WITH DESIGNATED SITES
TAKING INST. SPECIFIC LESSONS TO REGIONAL + NATIONAL LEVEL
Disconnect betwn. construction & operation
Lack of Feedback between facilities + Design Community
"HOMESTEADING"

- **Control unwanted brightness and glare.** Eliminate all unshielded floodlighting such as wall packs and stanchion mounted equipment. Typically glare is difficult to control with "security" style luminaries. Specify alternative equipment with internal and/or external shielding, or provide architectural shielding wherever possible.

Mid-Term Goals:

- **Plan** for solar orientation.
- **Explore the incorporation of green roofs** to contribute to stormwater management strategies, promote habitat, and reduce heat island affects.
- **Consider grey water use** (rain harvesting etc.).
- **Adapt non-secure facilities to site** in ways not possible with secure facilities, where line of sight and control design criteria do not allow. Site planning, human comfort out-of-doors, energy conservation, planting plans, and the array of green design opportunities can be examined for usefulness.

- **Consider on-site wastewater treatment** for potable supply, irrigation etc.
- **Xeriscape** is the name for the design of landscapes using techniques that conserve water- stormwater drainage, low emittance irrigation, plant selection, soil design are the major components. More information can be obtained from the National Xeriscape Association.
- **Use high-albedo (light colored/high reflectance) surface materials** for all exterior materials such as sidewalks, paths, drives, and parking lots.
- **Minimize light pollution.** Develop criteria to minimize light trespass.

Long-Term Goals:

- **Establish education programs** for staff/ integrated staff review program.
- **Post-Occupancy Green Evaluation Program**:
  - Conduct Annual Institution Review(s) to incorporate further opportunities.
  - Strengthen Integrated Staff Review process, and incorporate review of green issues: Involve grounds maintenance staff, peer review, and integrate review of operations and maintenance, and procurement of landscape-related materials, costs, energy usage, and 'lessons learned' into the 'Green Review' process.
  - Communicate and provide for implementation of Institution-specific successes at regional and national level.
- **Roll out pilot project** and green design successful strategies FBoP-wide for new projects and existing facility upgrades/renovations/additions.
- **Institutionalize formal communication process** between 1. Design & Construction and 2. Facilities Management, arms on green issues (energy, post-occupancy evaluation, architecture, site, etc.).
- **Pursue LEED Silver Certification** (or higher) for all FBoP facilities.

ARCHITECTURE GROUP

Participants

Andy Walker
Jason Hainline
Victor Olgyay
Roger Courtenay
Scott Ashliman
John Gombero
Dinae Valishn
Walbert Smith
Bob Scinta

Objectives

- **Reduce water use by 30%.**
  Through design specification. This may include low-flow fixtures such as faucet aerators, waterless urinals and appliances.
- **Reduce construction and demolition waste by 75%.** A construction/demolition waste management plan should be implemented; outlining goals for waste reduction and a recycling plan for on-site. This may require some basic education of construction/demolition crews.
- **Goal of 50% of materials incorporating high recycled content.** Recycled materials may be used in both interior and exterior applications; they can have great durability and meet most architectural needs without design or cost implications. Recycled materials should be specified where applicable.
- **Meet/exceed goals of Executive Order 13123.**
- **Maximize whole building bioclimatic design.** Building design should respond as much as possible to the local climate to reduce energy loads and enable systems efficiency. This may include attention to orientation, mass walls, ventilation strategies, mechanical systems, etc., as well as modifying the building process to be more responsive to local climate.
- **Design building and site to meet LEED goals.** LEED can and should be used as a benchmark as well as a certification process. Guidelines for site, water, energy, materials, and indoor environmental quality should be cohesive and designed to improve environmental performance.
- **Design integration**. Communication among the entire design team is critical to identify opportunities for systems and design efficiency, and/or redundancies which can save money and enhance the total building performance. This type of design integration can occur through regular meetings with the entire team present.

- **Least environmental impact**. This is an overarching goal that should be reiterated wherever possible and made true in the design, construction, and operation of all federal prison buildings.

Success Factors
The following benchmarks were identified as indicators of improving sustainability practices:

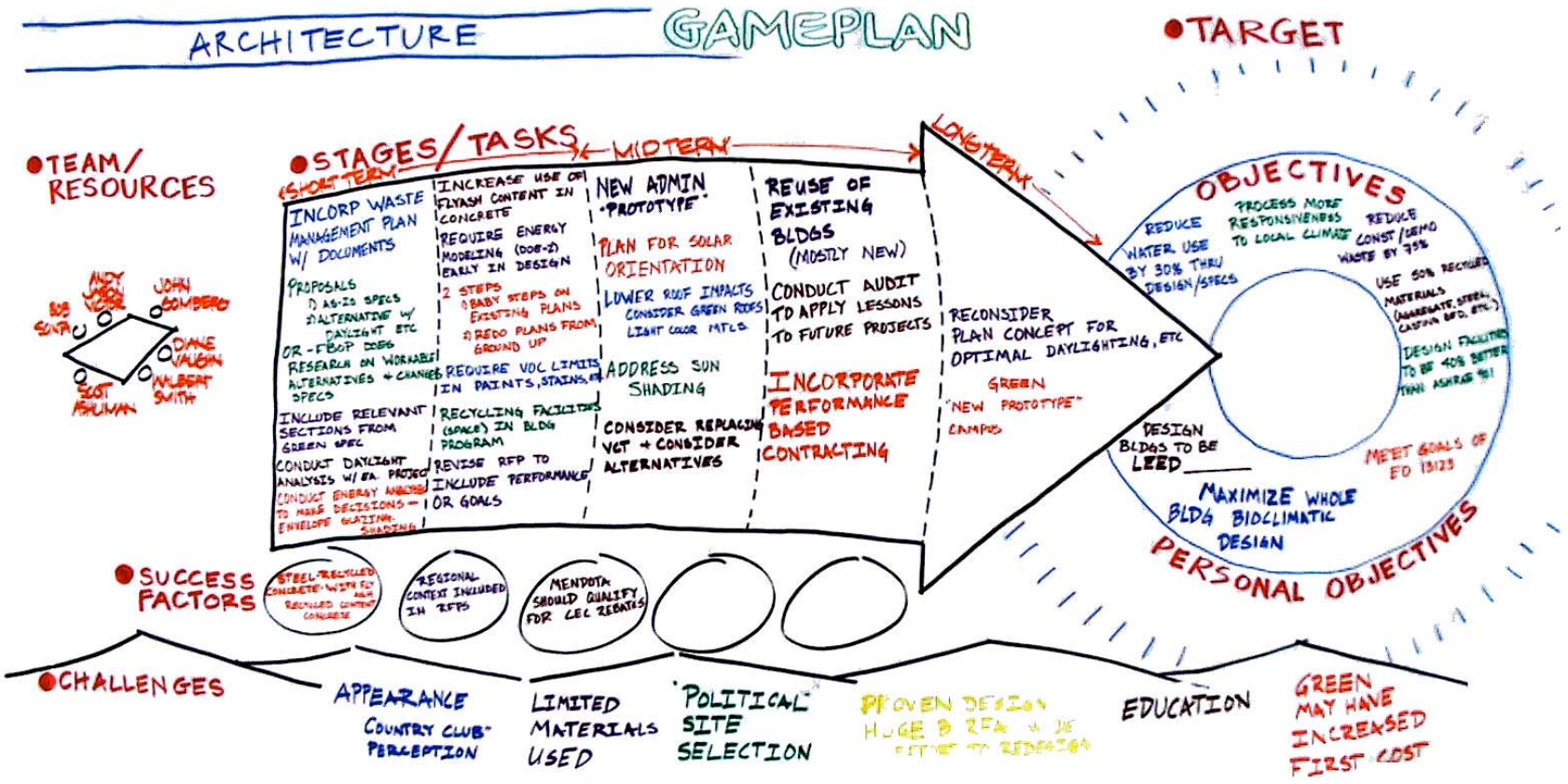
- Use of recycled content concrete, asphalt, and other major site and building material components.
- Brooklyn program has incentives for inmates who contribute to facility work. This program has potential expansion into site maintenance and into programs that incentivize suggestions which cut water and energy use.
- Outdoor recreation facilities (farms, athletic areas) These areas, subject to use by inmates and/or personnel, offer, as intensive exterior use facilities, focus design opportunities. Water conserving techniques have great potential for application on farms and athletic fields. The use of more drought-tolerant turf grasses for athletic fields, organic composting and farming techniques are other opportunities.

Challenges
The following challenges were identified as obstacles to successful implementation of sustainability practices:

- "Country club" appearance. As a correctional institution, the impression cannot communicate too harsh or too comfortable of an environment.
- Limited materials currently allowed for within the specifications. The primary building elements include concrete and steel. There are very few finish materials.
- The selection of site is a largely political process, and does not consider environmental impacts or appropriateness.
- The current design strategy "works", so there is little incentive to fix or change it.
- There is a fundamental lack of education with regard to these issues.
- Any increase in first costs will be a barrier.
- The design process is additive, there fore integration and systems efficiencies are difficult given that paradigm.
- It is currently a design/build process, which further eliminates opportunities for innovation.

Short Term Goals:

- **Review and revise the Technical Design Guidelines** with efficiency, indoor environmental quality, and limited environmental impacts in mind.
- **Revise RFP to include performance/goals.** This will require consultants to consider environmentally efficient design and construction practices, and will provide an opportunity for innovation and further savings.
- **Do a pilot project** to set precedent, educate the design and construction team, and establish a baseline for efficiency practices.
- **Create a "sustainability task force"** (or utilize existing team) and visit case studies to get the team on board and educated as to the possibilities that are out there.


ARCHITECTURE GAMEPLAN
TARGET
TEAM/ RESOURCES
STAGES/TASKS
SHORT TERM
MIDTERM
LONG TERM
INCORP WASTE MANAGEMENT PLAN W/ DOCUMENTS
PROPOSALS
1) AS-IS SPECS
2) ALTERNATIVE W/ DAYLIGHT ETC
OR - FBOP DOES RESEARCH ON WORKABLE ALTERNATIVES & CHANGES SPECS
INCLUDE RELEVANT SECTIONS FROM GREEN SPEC
CONDUCT DAYLIGHT ANALYSIS W/ EA. PROJECT
CONDUCT ENERGY ANALYSIS TO MAKE DECISIONS — ENVELOPE GLAZING SHADING
INCREASE USE OF FLYASH CONTENT IN CONCRETE
REQUIRE ENERGY MODELING (DOE-2) EARLY IN DESIGN
2 STEPS
1) BABY STEPS ON EXISTING PLANS
2) REDO PLANS FROM GROUND UP
REQUIRE VOC LIMITS IN PAINTS, STAINS, ETC
RECYCLING FACILITIES (SPACE) IN BLDG PROGRAM
REVISE RFP TO INCLUDE PERFORMANCE OR GOALS
NEW ADMIN "PROTOTYPE"
PLAN FOR SOLAR ORIENTATION
LOWER ROOF IMPACTS
CONSIDER GREEN ROOFS
LIGHT COLOR MTLS
ADDRESS SUN SHADING
CONSIDER REPLACING VCT + CONSIDER ALTERNATIVES
REUSE OF EXISTING BLDGS (MOSTLY NEW)
CONDUCT AUDIT TO APPLY LESSONS TO FUTURE PROJECTS
INCORPORATE PERFORMANCE BASED CONTRACTING
RECONSIDER PLAN CONCEPT FOR OPTIMAL DAYLIGHTING, ETC
GREEN "NEW PROTOTYPE" CAMPUS
OBJECTIVES
REDUCE WATER USE BY 30% THRU DESIGN/SPECS
PROCESS MORE RESPONSIVENESS TO LOCAL CLIMATE
REDUCE CONST/DEMO WASTE BY 75%
USE 50% RECYCLED MATERIALS (AGGREGATE, STEEL, CASTING MTLS, ETC.)
DESIGN FACILITIES TO BE 40% BETTER THAN ASHRAE 90.1
MEET GOALS OF EO 13123
DESIGN BLDGS TO BE LEED ____
MAXIMIZE WHOLE BLDG BIOCLIMATIC DESIGN
PERSONAL OBJECTIVES
BOB
ALEX
JOHN COMBERG
DIANE VAUGHN
WILBERT SMITH
SCOTT ABRAHAM
SUCCESS FACTORS
STEEL-RECYCLED CONCRETE-WITH FLY ASH RECYCLED CONTENT CONCRETE
REGIONAL CONTEXT INCLUDED IN RFPS
MENDOTA SHOULD QUALIFY FOR CEC REBATES
CHALLENGES
APPEARANCE
COUNTRY CLUB" PERCEPTION
LIMITED MATERIALS USED
"POLITICAL" SITE SELECTION
PROVEN DESIGN
EDUCATION
GREEN MAY HAVE INCREASED FIRST COST

- **Audit a sample project** (Mendota?) including full environmental and daylighting analysis, materials, etc. This will help establish a base case for energy use.
- **Incorporate waste management plans with documents.** Set a goal of waste reduction and educate the entire team of those goals and how to meet them.
- **Modify proposals** to either "as-is specifications", or FBoP does research on workable alternatives and changes specifications.
- **Utilize existing resources** (such as GreenSpec) to modify specifications. This will outline specific materials and processes for green construction.
- **Conduct energy analysis** (DOE-2) early in the design phase to inform decisions regarding envelope, glazing, shading, etc.
- **Increase use of fly-ash content in concrete**. Fly-ash is a by-product of coal fired electric generating plants and can increase the strength and performance of concrete. Additionally, the use of fly-ash will re-direct the material from the land-fill.
- **Require limits on Volatile Organic Compound (VOC)** in paints, stains, adhesives, carpets, and composite wood products to improve indoor environmental quality.
- **Establish recycling program/ facilities.** These facilities should be located throughout the building(s) for ease of use.
- **Take baby steps to modify existing plans.**
- **Provide a layered lighting system: ambient, task and accent.** Ambient lighting systems are designed to meet the minimum light level requirements for the visual tasks within the space. Task lighting is designed to provide flexibility in location and lighting level. Users have control over task lights as visual needs vary.
- **Light surfaces.** Locate lighting only where it is needed, lighting ceilings and walls surfaces. Specify light colored surfaces. The ceiling should have a high reflectance (min. of 85%).

Mid-Term Goals:

- **Develop a new administrative/facilities center prototype**, to address office, maintenance and other related non-inmate accessed buildings and areas.
- **Lower roof impacts**, consider green roofs and/or light colored/high albedo materials to reduce heat island effect and provide stormwater management.
- **Consider replacing Vinyl Composite Tile (VCT)** floor products for alternatives such as linoleum.
- **Reuse existing buildings** where possible. The reuse of existing buildings will save valuable resources.
- **Incorporate performance-based contracting** to encourage architects, engineers, and consultants to move above and beyond as if *high performance* was the base case.

- **Redevelop plans from ground-up.** An entirely new design scheme may be a more efficient process then trying to retrofit the existing design. A new design scheme might consider; proper orientation for optimized natural lighting, passive solar and natural ventilation.
- **Consider grey water use** (rain harvesting etc.). Water is an expensive and valuable resource. Opportunities may be incorporated into the design to collect water on-site and use it in the building.
- **Adapt non-secure facilities to site.** The development of a site-wide master plan will reduce the impact on the site and facilitate more pedestrian access by employees.
- **Consider on-site wastewater treatment** for potable supply, irrigation etc. There are many technologies such as living machines which treat wastewater through a series of wetland-type ponds. This can be a very cost-effective and environmentally responsible treatment option.
- **Stay on top of current technologies** with integrated training and review programs for project managers and construction personnel.
- **Revise method of procuring A&E services:**
    - State clear and quantitative energy goals along with other goals in the building program. Other goals relate to functionality, number of square feet, security, safety, reliability, comfort and health (temperature, humidity, indoor air quality, quality of light).
    - Adopt a definition of what is sustainable (from LEED as one example)
    - Minimizes life-cycle cost through efficiency and renewables.
    - Establish performance goals (Btu/sf/year, $/year, LEED rating,)
    - Follow architectural guidelines regarding sustainability
    - Document energy related needs of users in the building program, and challenge the design/build team to address these needs in the most efficient (minimize life cycle cost) way possible.
    - Revise selection criteria for design/build teams to emphasize sustainability. Successful applicants should:
        - State commitment to superior energy performance
        - Propose a team that demonstrates capability to respond to energy targets set in program documents
        - Include an energy / sustainability expert on design team
        - Propose a team that responds to energy analysis results by communication and decision making authority
        - Demonstrate familiarity with new energy technology
        - Demonstrate familiarity with analysis tools
        - Demonstrate understanding of code requirements
        - Cite completed (& measured) successful green building projects (LEED rated as an example)
    - Revise statement of work for teams to:
        - include quantitative performance goals (LEED rating or other, btu/sf, $/year etc)
        - Use energy modeling to investigate strategies early in design and maintain on-going energy analysis of the evolving design and evaluate alternatives for envelope, mechanical, daylighting, etc.

- Include regular meetings to communicate energy use and cost implications among designers and recommend alternatives.
- Investigate utility rates and programs
- Compile building commissioning handbook

Long-Term Goals:

- **Establish education programs** for staff/ integrated staff review program
- **Annual review** requirement by institution for energy, cost/life cycle cost, new institution occupancy evaluation, etc.
- **Pursue LEED Silver Certification** (or higher) for all FBoP facilities.

ENERGY GROUP

Participants

Ron Perkins
Lauren Yarmuth
David Nelson
Phil Voss
Ramin Z.
Enrique Avalos
Marie Ferrito
Annette Kim
Craig Sutton

Objectives

- **Increase electric motor efficiency standards to minimum 92%**
  The current specifications allow smaller motors with efficiencies down to 85%. The DOE motor master program shows small motors (>5HP) with efficiencies as high as 92%. A further analysis of data shows no correlation between efficiency and price when all manufacturers are considered. *mm3.energy.wsu.edu/mmplus*
- **Reduce major water consumption to 100 gallons/inmate/day (half of current use)**
  Current FBoP experience with waterless urinals (in test case) indicates that 200 k Gallons per day of water can be saved by this device. Designing landscape with indigenous species will almost eliminate the need for irrigation water (even though irrigation and landscape design is not included in current projects, each prison plants and maintains their sites with local resources.
- **Specify high efficiency cooling systems**
  Current specifications require only meeting ASHRAE standards. Existing technology applied to right- sized cooling and heating systems can double the system efficiency without increasing while reducing life cycle costs.
- **Beat ASHRAE 90.1 by 40% overall**
  Implementing the above item will exceed ASHRAE standards by at least 40%.
- **Require third party commissioning on all projects**
  Integrating commissioning into the design process by carefully measuring an archetypical base case project and using this data to set performance goals early in the design process will vastly improve the finished product and provide continuity of purpose and clear consistent communication between design team members, client and users.
- **Expand the use of lighting controls**
  Through proper design, lighting for visual quality, and the incorporation of daylighting/electric lighting controls, energy use will be dramatically reduced. Commissioning will be key to proper control operation.

Challenges

The following challenges were identified as obstacles to successful implementation of sustainability practices:

- Contracting officer not enforcing specifications

- Designers do not have enough voice or authority
- Too much reliance on first cost
- No coordination between design and operation

Short Term Goals:

- **Review and modify guidelines** (division 16, 15, 2, 13 etc., technical specs and solicitation) for sustainable opportunities. These guidelines are a good start but need to provide higher expectations of performance and be more specific in defining performance criteria.
- **Continuously monitor existing buildings** (power, kW/ton, Btu/SF) to ensure that buildings are operating as intended, as well as to provide data on energy use. It's difficult to develop meaningful goals and plans of action until you know your present position in terms of energy use. A careful, accurate end use power study of a typical existing facility will set the benchmark for improvement and place your goals in context with known conditions.
- **Model an existing facility (DOE-2) to establish energy baseline.** This should take place in various climates to optimize overall efficiency and move towards more climate based design. Using the data from the activity above, we can model the facility and tune the computer simulation with actual energy use data. This provides us a tool to compare existing facilities performance to proposed project designs and gives us the confidence in the simulation model to make hard design decisions on future projects
- **Require modeling at phase 2 proposal and final design.** These are key points in the design process when modeling will be most effective to the overall design. Modeling competing design solutions and benchmarking against existing facilities will improve the quality of the decisions.
- **Revise RFP to award projects based on best value, schedule AND incorporating energy/resource efficiency** (includes evaluation criteria). It is very important to communicate to bidders that performance is a high priority and using metrics like kBtu/gsf/year will remove any ambiguity as to how performance will be judged.
- **Incorporate water conserving technologies.** Shower heads, low flush toilets, and waterless urinals are simple, low cost methods to reduce water use without reducing level of service or serviceability.
- **Use firing range for a pilot project** for renewable energy. The firing range would be a relatively low cost area and would serve to educate the team and test the technology for FBoP use.
- **Consider requiring LEED certification** for all projects. LEED certification provides a good background and check lists for resource efficiency. The commissioning requirements for LEEDS will help communicate goals and articulate action plans and finally measure and verify to results of the completed project's conformance to requirements.

- **Require energy efficiency devices** to reduce energy use (light sensors, motion detectors, digital thermostats and control systems, etc.) The cheapest and best way to improve efficiency is to reduce loads first! Increasing component efficiency will reduce the need to add resources to serve loads. After loads are reduced, then apply the most efficient means to serve the remaining loads.
- **Incorporate performance based specifications** for lamps, ballasts and controls, etc. Lighting provides one of the best opportunities to reduce cooling loads and improve visibility inside and outside spaces.
- **Specify IESNA guidelines** for efficient and effective lighting design.

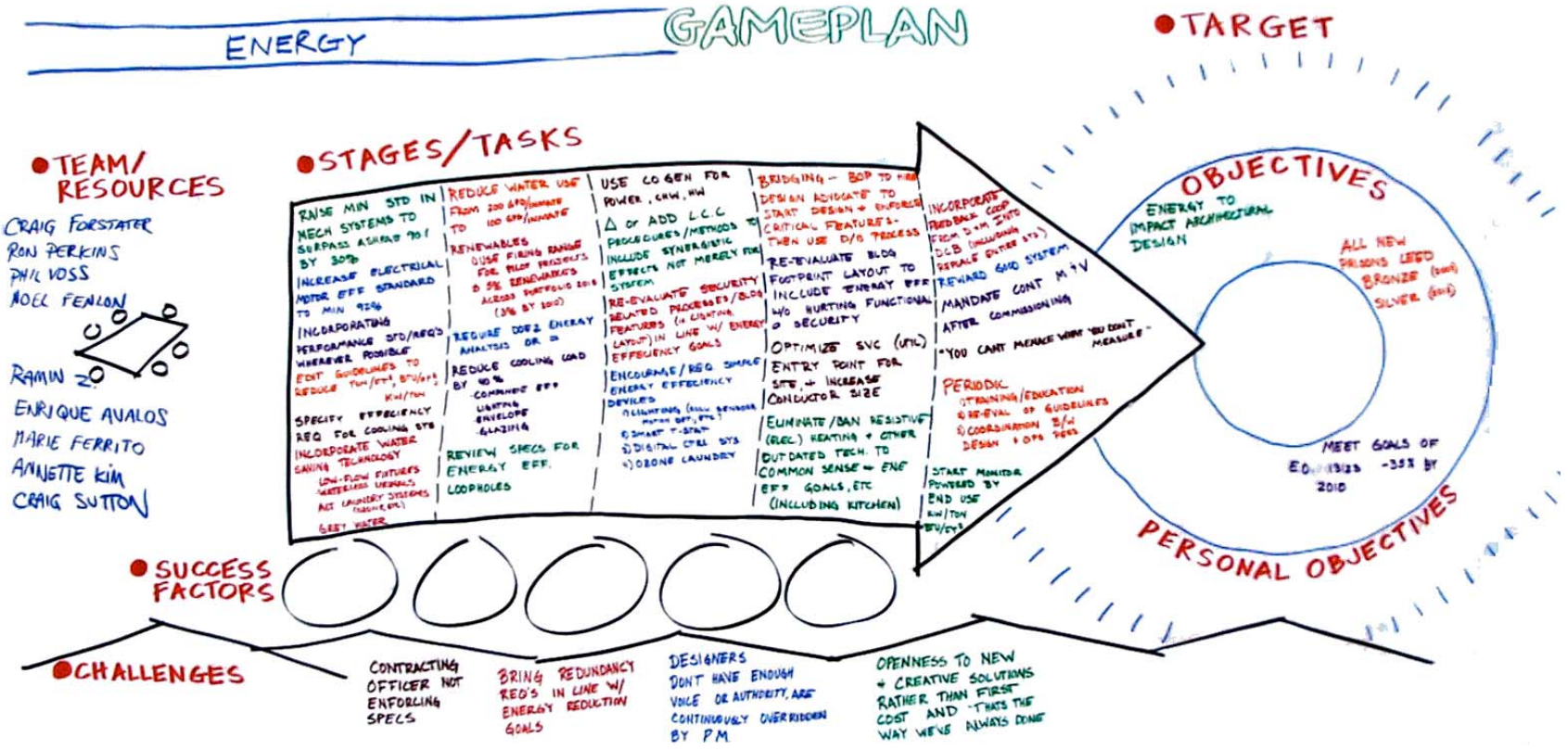
Mid-Term Goals:

- **Monitor power continuously by end use.** This will provide more data on actual energy use for potential savings. Including power monitoring into building design reduces the cost of monitoring and provides valuable feedback as to how and when the building uses power. This information is the basis for a roadmap to current and future savings potential.
- **Outsource utilities and/or consider co-generation power.** Since these facilities operate 24 hours a day, 365 days per year, they are good candidates for co-generation. Generating power creates more heat than power and using the "waste" heat to serve space, water heating and cooling loads in the facility makes best use of the primary fuel(s). The economics of such an approach is very attractive to lowering overall operating costs by up to 20%. There are many "third party" agents that would like to own and operate the near or on site utility and provide low cost electricity, heat and chilled water.
- **Eliminate electric resistant heat.** Using electricity to create heat is like using a chain saw to cut butter. It is a shame to convert a highly refined energy source such as electricity into what the utility threw away in the generating process in the first place, heat. Only 25% of the primary energy content of fuel reaches the site in the form of electricity, the rest is wasted out the cooling towers of the generating station.
- **Establish 65' TDH allowable pressure drop for chilled water.** The energy required to pump water is roughly proportional to the inverse fifth power of pipe or duct diameter. A little increase in pipe size results in a great reduction in pumping power. Large pipes, small pumps are a winning design strategy.
- **Consider heat recovery chillers.** Most facilities have a year cooling load, even during the heating seasons. If you need chilled water and hot water at the same time, a chiller fitted with a heat recovery bundle is a good way to serve these loads. If you co-generate, then using the waste heat is a better option.
- **Increase energy performance (efficiency) by 30% over existing facilities.** Using "best practice" lighting, envelope and mechanical measures will result in at least a 30% improvement in site performance. Forty and 50% improvements is not uncommon.
- **Base lighting criteria on visibility (not foot candles).** The current standard is not the most effective means of lighting for safety or efficiency. Optimal visibility is of primary importance to all involved. Intensity does not equal visibility and indirect/direct lighting designs provide better visual acuity with much less energy density (watts per square foot) while reducing resultant cooling loads.
- **Design to 1 watt/SF or less for interior lighting (connected load)**

- **Limit air side total static pressure drop to 1.2".** The same physical law concerning pumping water mentioned above applies to air (a fluid) also. Increasing the surface area of cooling and heating coils, filters, duct work and air handling units will reduce the pressure require to transport the air through the system. Lowering the total static pressure by half will reduce fan energy by about eight times (1/8).
- **Consider pressurized plenums** to eliminate ducts or include large round duct in plenum space. A good way to reduce static pressure in air systems is to use supply plenums when possible instead of duct work. This technique reduces cost and energy.
- **Incorporate demand based ventilation.** The prison population moves from area to area during the day and occupancy in a space varies from time to time. Outside air is introduced to meet minimum ventilation standards of 20 cfm per person in enclosed (conditioned) spaces. Using CO2 sensors to modulate variable speed fans will greatly reduce heating and cooling loads by changing the ventilation rate to match the occupant load of each space.
- **Require CO2 monitoring** and tie into the energy management system to provide feedback on space ventilation performance.
- **Conduct periodic training(s)/education for all staff.** Training and education programs keep staff up to speed on current technologies/strategies. It is important that the staff is trained in the design intent, operation and maintenance of the building systems. As new staff members join the project, periodic training will ensure all personnel have the knowledge to operate and maintain the systems efficiently.
- **Conduct regular re-evaluation of the Technical Design Guidelines.** As needs and technology change over time, the guidelines should be re-evaluated to incorporate changes. Feed back from measuring operating facilities will allow designers to fine tune the guidelines and keep them current for the task at hand.
- **Meet/exceed goals established in Executive Order 13123.**

Long-Term Goals:

- **Specify 5% renewable energy across portfolio.** The future security and quality of life of our nation will depend on alternate sources of energy. The prison system provides a good platform for alternative energy generating systems including photovoltaic and wind and solar thermal power.
- **Add life-cycle analysis procedures and methods** to include synergistic effects. Existing life cycle costing procedures are measure specific and do not include synergistic benefits. Grouping measures into strategies will incorporate system effects into the equation and improve the equality of the answers.
- **Re-examine building footprint for energy efficiency.** Consider site selection, orientation, horizontal/vertical layout, envelope, etc. Using the computer simulation models mentioned above will allow designers to evaluate the effect of building orientation and aspect ratio in terms of energy impact. Typically the most efficient configuration is also the most cost effective from a 1st cost standpoint.
- **Re-evaluate security related processes/building features** (lighting, layout, etc.) for possible efficiency opportunities.
- **Incorporate feedback loop from O&M to into DCB.** It is important to close the design loop by communicating the performance and maintenance experience to the designers.


ENERGY GAMEPLAN
TARGET
OBJECTIVES
ENERGY TO IMPACT ARCHITECTURAL DESIGN
ALL NEW PRISONS LEED BRONZE (min) SILVER (goal)
MEET GOALS OF EO 13123 -35% BY 2010
PERSONAL OBJECTIVES
TEAM/ RESOURCES
CRAIG FORSTATER
RON PERKINS
PHIL VOSS
NOEL FENLON
RAMIN
ENRIQUE AVALOS
MARIE FERRITO
ANNETTE KIM
CRAIG SUTTON
STAGES/TASKS
RAISE MIN STD IN MECH SYSTEMS TO SURPASS ASHRAE 90.1 BY 30%
INCREASE ELECTRICAL MOTOR EFF STANDARD TO MIN 92%
INCORPORATING PERFORMANCE STD/REQ'S WHEREVER POSSIBLE
EDIT GUIDELINES TO REDUCE Ton/SF, BTU/SF, KW/Ton
SPECIFY EFFICIENCY REQ FOR COOLING SYS
INCORPORATE WATER SAVING TECHNOLOGY
LOW-FLOW FIXTURES
WATERLESS URINALS
HOT LAUNDRY SYSTEMS (WASHER/EXT)
GREY WATER
REDUCE WATER USE FROM 200 GPD/INMATE TO 100 GPD/INMATE
RENEWABLES
DUSE FIRING RANGE FOR PILOT PROJECTS
5% RENEWABLES ACROSS PORTFOLIO 2016 (3% BY 2010)
REQUIRE DOE2 ENERGY ANALYSIS OR =
REDUCE COOLING LOAD BY 10%
-COMMISSION EFF
-LIGHTING
-ENVELOPE
-GLAZING
REVIEW SPECS FOR ENERGY EFF.
LOOPHOLES
USE CO GEN FOR POWER, CRW, HW
Δ OF ADD L.C.C PROCEDURES/METHODS TO INCLUDE SYNERGISTIC EFFECTS NOT MERELY FOR SYSTEM
RE-EVALUATE SECURITY RELATED PROCESSES/BLDG FEATURES (i.e LIGHTING LAYOUT) IN LINE W/ ENERGY EFFICIENCY GOALS
ENCOURAGE/REQ SIMPLE ENERGY EFFICIENCY DEVICES
1) LIGHTING (OCC SENSOR MOTION DET, ETC.)
2) SMART T-STAT
3) DIGITAL CTRL SYS
4) OZONE LAUNDRY
BRIDGING - BOP TO HQ
DESIGN ADVOCATE TO START DESIGN + ENFORCE CRITICAL FEATURES - THEN USE D/B PROCESS
RE-EVALUATE BLDG FOOTPRINT LAYOUT TO INCLUDE ENERGY EFF W/O HURTING FUNCTIONAL & SECURITY
OPTIMIZE SYC (UTIL) ENTRY POINT FOR SITE + INCREASE CONDUCTOR SIZE
ELIMINATE/BAN RESISTIVE (ELEC.) HEATING + OTHER OUTDATED TECH. TO COMMON SENSE = ENE EFF GOALS, ETC (INCLUDING KITCHEN)
INCORPORATE FEEDBACK LOOP FROM 3 yrs INTO DCD (INCLUDING REPLACE EVERY 3 yrs)
REWARD GOOD SYSTEM
MANDATE CONT M + V AFTER COMMISSIONING
"YOU CAN'T MANAGE WHAT YOU DON'T MEASURE"
PERIODIC (TRAINING/EDUCATION 1) RE-EVAL OF GUIDELINES 2) COORDINATION B/W DESIGN + OPS TEAMS
START MONITOR POWERED BY END USE KW/TON BTU/SF
SUCCESS FACTORS
CHALLENGES
CONTRACTING OFFICER NOT ENFORCING SPECS
BRING REDUNDANCY REQ'S IN LINE W/ ENERGY REDUCTION GOALS
DESIGNERS DON'T HAVE ENOUGH VOICE OR AUTHORITY, ARE CONTINUOUSLY OVERRIDDEN BY PM
OPENNESS TO NEW + CREATIVE SOLUTIONS RATHER THAN FIRST COST AND "THAT'S THE WAY WE'VE ALWAYS DONE

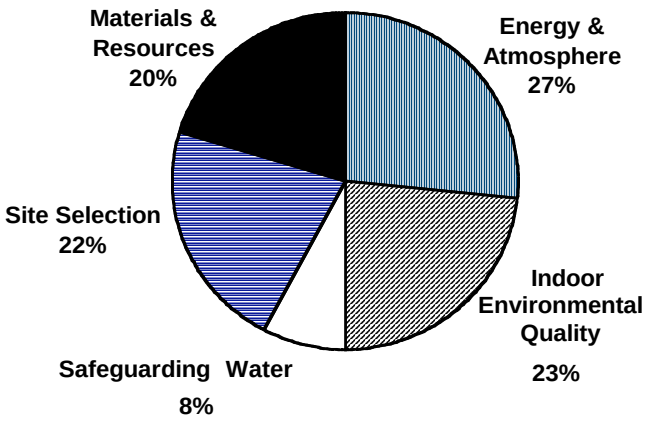
LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

The Leadership in Energy and Environmental Design (LEED™) program was created in 1994 by the USGBC, a committee of more than 40 experts in the field of sustainable design. The committee consists of product manufacturers, architects, engineers, environmental groups, building owners, utilities, state and local governments, research institutions, professional societies and colleges and universities. Leadership in Energy and Environmental Design (LEED) 2.0 green building rating system is based on accepted energy and environmental principles and strikes a reasonable balance between known effective practices and emerging concepts. This consensus-based committee has created a national LEED™ green building rating system with the objective of accelerating the development and implementation of green building practices. Its goals are to define what constitutes a green building and to raise the consciousness of consumers by awarding certifications for highly sustainable building practices. LEED 2.0 is relatively new - the first one version was released publicly in 1998 and the second version in May 2000.

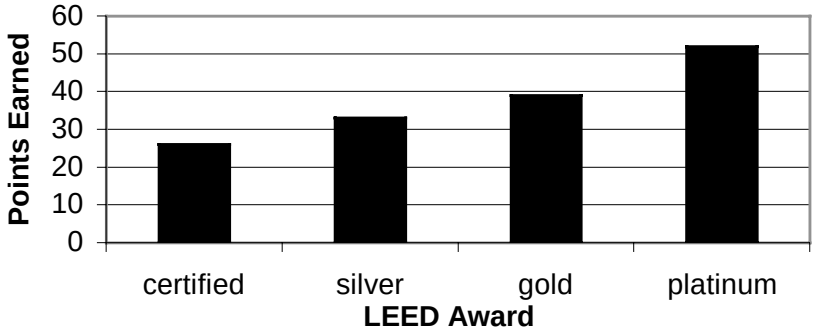
The rating system includes both "prerequisites" and "credits". Prerequisites must be met by all projects. Designers may choose which credits to earn, based on the total credit target specified for an individual project. Documentation must be submitted to support all compliance claims. Specific documentation requirements are described along with each prerequisite and credit.

This is the first green rating system developed on a national scale. The US rating system, while developed independently, was not the first nationally accepted rating system. England was the first country to develop and implement a green building rating system on a national scale, Building Research Establishment (BRE)'s Environmental Assessment Method (BREEAM) in 1990, and since then many other countries have followed suit – Norway, Sweden, Canada, Taiwan, the United States, and others. BREEAM has been successfully adopted in England. In the first seven years since it was launched BRE estimates that between 25 to 30% of new office space was assessed; and versions of BREEAM have been developed for new offices, superstores, homes, industrial units, and existing offices.

The LEED™ certifications are based on the number of points earned for implementing a diverse set of environmental goals ranging from sustainability site selection, to water efficiency, to energy, to the atmosphere, to materials and resources, to indoor environmental quality. In the development of LEED™, each category is allocated to a subcommittee of experts. Then a certain number of points are given, based on the relative importance of each criterion within the category to the subcommittee members. These credits embody weights for different criteria. As shown in Figure 11, for LEED™, the energy and atmosphere and indoor environmental quality categories account for half of the total possible credits.



LEED™ certification is awarded on one of four levels. After complying with 7 prerequisite measures, points are assigned according to 31 criteria within the 5 categories described in the figure above. The complete LEED™ document is provided in LEED™ certification is awarded on one of four levels. The first rung is certification itself with 26 out of 64 possible points. Then, for those projects with exceptional green-building qualities, a silver award for 33 points, a gold award for 39 points or a platinum award for 52 points is awarded.



Preliminary LEED Assessment for Mendota, California project

Y	?	N			
6	2	6		**Sustainable Sites**	Possible Points 14
X			Prereq 1	**Erosion & Sedimentation Control**	
		N	Credit 1	**Site Selection**	1
		N	Credit 2	**Urban Redevelopment**	1
		N	Credit 3	**Brownfield Redevelopment**	1
		N	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
		N	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Y			Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
		N	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
Y			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
	?		Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
Y			Credit 6.1	**Stormwater Management**, Rate and Quantity	1
Y			Credit 6.2	**Stormwater Management**, Treatment	1
	?		Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
Y			Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
Y			Credit 8	**Light Pollution Reduction**	1

Y	?	N			
3	2	0		**Water Efficiency**	Possible Points 5
Y			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Y			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	?		Credit 2	**Innovative Wastewater Technologies**	1
Y			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	?		Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Y	?	N			
6	3	7		**Energy & Atmosphere**	Possible Points 17
X			Prereq 1	**Fundamental Building Systems Commissioning**	
X			Prereq 2	**Minimum Energy Performance**	
X			Prereq 3	**CFC Reduction in HVAC&R Equipment**	
YY			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
YY			Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
YY			Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
		NN	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
		NN	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
	?		Credit 2.1	**Renewable Energy**, 5%	1
		N	Credit 2.2	**Renewable Energy**, 10%	1
		N	Credit 2.3	**Renewable Energy**, 20%	1
		N	Credit 3	**Additional Commissioning**	1
	?		Credit 4	**Ozone Depletion**	1
Y			Credit 5	**Measurement & Verification**	1
	?		Credit 6	**Green Power**	1

Y	?	N			
5	**3**	**5**	**Materials & Resources**	Possible Points	**13**
X			Prereq 1	**Storage & Collection of Recyclables**	
		N	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	**1**
		N	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	**1**
		N	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	**1**
Y			Credit 2.1	**Construction Waste Management**, Divert 50%	**1**
	?		Credit 2.2	**Construction Waste Management**, Divert 75%	**1**
		N	Credit 3.1	**Resource Reuse**, Specify 5%	**1**
		N	Credit 3.2	**Resource Reuse**, Specify 10%	**1**
Y			Credit 4.1	**Recycled Content**, Specify 25%	**1**
	?		Credit 4.2	**Recycled Content**, Specify 50%	**1**
Y			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	**1**
Y			Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	**1**
	?		Credit 6	**Rapidly Renewable Materials**	**1**
Y			Credit 7	**Certified Wood**	**1**

Y	?	N			
6	**2**	**7**	**Indoor Environmental Quality**	Possible Points	**15**
X			Prereq 1	**Minimum IAQ Performance**	
X			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	
	?		Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	**1**
		N	Credit 2	**Increase Ventilation Effectiveness**	**1**
Y			Credit 3.1	**Construction IAQ Management Plan**, During Construction	**1**
Y			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	**1**
Y			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	**1**
Y			Credit 4.2	**Low-Emitting Materials**, Paints	**1**
		N	Credit 4.3	**Low-Emitting Materials**, Carpet	**1**
Y			Credit 4.4	**Low-Emitting Materials**, Composite Wood	**1**
		N	Credit 5	**Indoor Chemical & Pollutant Source Control**	**1**
		N	Credit 6.1	**Controllability of Systems**, Perimeter	**1**
		N	Credit 6.2	**Controllability of Systems**, Non-Perimeter	**1**
		N	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	**1**
		N	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	**1**
Y			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	**1**
	?		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	**1**

Y	?	N			
1	**4**	**0**	**Innovation & Design Process**	Possible Points	**5**
	?		Credit 1.1	**Innovation in Design**: Specific Title	**1**
	?		Credit 1.2	**Innovation in Design**: Specific Title	**1**
	?		Credit 1.3	**Innovation in Design**: Specific Title	**1**
	?		Credit 1.4	**Innovation in Design**: Specific Title	**1**
Y			Credit 2	**LEED™ Accredited Professional**	**1**

Through this preliminary assessment, 26 are probable with minimal impact to the current design/schedule. An additional 16 points are possible with some design/cost/schedule implications.

Preliminary LEED Assessment for general future FBoP projects.

Y	?	N			
4	8	2		**Sustainable Sites**	Possible Points 14
X			Prereq 1	**Erosion & Sedimentation Control**	
	?		Credit 1	**Site Selection**	1
	?		Credit 2	**Urban Redevelopment**	1
	?		Credit 3	**Brownfield Redevelopment**	1
		N	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
		N	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Y			Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
	?		Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	?		Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
	?		Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
Y			Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	?		Credit 6.2	**Stormwater Management**, Treatment	1
	?		Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
Y			Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
Y			Credit 8	**Light Pollution Reduction**	1

Y	?	N			
3	2	0		**Water Efficiency**	Possible Points 5
Y			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Y			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	?		Credit 2	**Innovative Wastewater Technologies**	1
Y			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	?		Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Y	?	N			
7	3	7		**Energy & Atmosphere**	Possible Points 17
X			Prereq 1	**Fundamental Building Systems Commissioning**	
X			Prereq 2	**Minimum Energy Performance**	
X			Prereq 3	**CFC Reduction in HVAC&R Equipment**	
YY			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
YY			Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
YY			Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
		NN	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
		NN	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
	?		Credit 2.1	**Renewable Energy**, 5%	1
		N	Credit 2.2	**Renewable Energy**, 10%	1
		N	Credit 2.3	**Renewable Energy**, 20%	1
		N	Credit 3	**Additional Commissioning**	1
	?		Credit 4	**Ozone Depletion**	1
Y			Credit 5	**Measurement & Verification**	1
	?		Credit 6	**Green Power**	1

5	6	2	Materials & Resources	Possible Points	13
Y	?	N			
X			Prereq 1	**Storage & Collection of Recyclables**	
	?		Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
	?		Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	1
	?		Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
Y			Credit 2.1	**Construction Waste Management**, Divert 50%	1
	?		Credit 2.2	**Construction Waste Management**, Divert 75%	1
		N	Credit 3.1	**Resource Reuse**, Specify 5%	1
		N	Credit 3.2	**Resource Reuse**, Specify 10%	1
Y			Credit 4.1	**Recycled Content**, Specify 25%	1
Y			Credit 4.2	**Recycled Content**, Specify 50%	1
Y			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
	?		Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
	?		Credit 6	**Rapidly Renewable Materials**	1
Y			Credit 7	**Certified Wood**	1

9	3	3	Indoor Environmental Quality	Possible Points	15
Y	?	N			
X			Prereq 1	**Minimum IAQ Performance**	
X			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	
Y			Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
Y			Credit 2	**Increase Ventilation Effectiveness**	1
Y			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
Y			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
Y			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
Y			Credit 4.2	**Low-Emitting Materials**, Paints	1
		N	Credit 4.3	**Low-Emitting Materials**, Carpet	1
Y			Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
Y			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
		N	Credit 6.1	**Controllability of Systems**, Perimeter	1
		N	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
	?		Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	?		Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
	?		Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
Y			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

1	4	0	Innovation & Design Process	Possible Points	5
Y	?	N			
	?		Credit 1.1	**Innovation in Design**: Specific Title	1
	?		Credit 1.2	**Innovation in Design**: Specific Title	1
	?		Credit 1.3	**Innovation in Design**: Specific Title	1
	?		Credit 1.4	**Innovation in Design**: Specific Title	1
Y			Credit 2	**LEED™ Accredited Professional**	1

Through this preliminary assessment, 29 are probable with minimal impact to the current design/schedule. An additional 26 points are possible with some design/cost/schedule implications.

APPENDIX

Charrette Agenda

FEMP Background

Sustainability References

Speakers and Facilitators

PowerPoint Presentations

Guidelines Overview

Victor Olgyay, ENSAR Group, Inc

FEMP Overview

Anne Sprunt-Crawley, NREL

Sustainable Planning for Site Design

Roger Courtenay, EDAW

Managing Efficiency

Ron Perkins, Supersymmetry USA

Sustainable Lighting Design

Dave Nelson, Clanton & Associates

Reliability and Renewable Energy

Andy Walker, NREL

Form, Envelope and Energy Strategies

Victor Olgyay, ENSAR Group, Inc.

Materials/Waste/IEQ

Jason Hainline, ENSAR Group, Inc.

CHARRETTE AGENDA

Day 1: Review of FBoP Design Guidelines and Standard Practice
(Note: Coffee, drinks, and snacks will be provided throughout the day)

Wednesday, May 29, 2002

8:00 am **Welcome/Introductions/Goals**
Victor Olgyay and Andy Walker

8:30 am **Overview of FBoP Standards, Issues, and Goals**
Craig Forstater

8:45 am **General Review Comments**
Victor Olgyay
(based on draft review of FBoP Guidelines, concepts and standard practice)

9:30 am **FEMP/DOE Mission and Goals**
Anne Sprunt-Crawley

9:45 am *Break*

10:00 am **Review Comments and Discussion by Specific Topics**
Roger Courtenay, Andy Walker, Ron Perkins, Dave Nelson, and Jason Hainline
(Note: Roger will be arriving late and may have to present in the afternoon if he misses his spot on the agenda)

11:30 pm *Lunch*

12:30 pm **FBoP Opportunities: Breakout Groups**
Specific Discussions of Topical Areas in Breakout Groups
Group Facilitators and Support: Roger Courtenay, Lauren Yarmuth, Andy Walker, Dave Nelson, Jason Hainline and Victor Olgyay
Roamers: Craig Forstater

3:00 pm **Group Report-outs and General Discussion**
Victor Olgyay

3:30 pm *Adjourn*

Day 2: Project Opportunities
(A specific project will be used to develop FBoP opportunities)
(Note: Coffee, drinks, and snacks will be provided throughout the day)

Thursday, May 30, 2002

8:00 am	**Goals for the Day** *Victor Olgyay*
8:30 am	**Overview of FBoP Project** *Craig Forstater*
9:00 am	**Development of FBoP Opportunities and Strategies for Sustainability** *Victor Olgyay*
9:30 am	**Define the Process and Goals** *Jason Hainline*
10:00 am	*Break*
10:15 am	**Development of FBoP Opportunities and Strategies for Sustainability: Breakout Groups** *Group Facilitators and Support: Roger Courtenay, Lauren Yarmuth, Andy Walker, Dave Nelson, Jason Hainline and Victor Olgyay* *Roamers: Craig Forstater*
11:30 pm	*Lunch*
12:30 pm	**Continue Development of FBoP Opportunities and Strategies for Sustainability: Breakout Groups**
1:45 pm	*Break and Facilitator Preparation*
2:00 pm	**Group Report-outs, General Discussion and Next Steps** *Victor Olgyay*
3:00 pm	*Adjourn Whole Group*
3:00 pm	**Debriefing for Facilitators/FBoP** *Victor Olgyay, Greg Franta, Jason Hainline, Lauren Yarmuth, Andy Walker, Roger Courtenay, Dave Nelson, Ron Perkins, Craig Forstater*
4:00 pm	*Adjourn*

Building Green/Environmental Building News (http://www.BuildingGreen.com)
Includes material from EBN, bibliography and other resources, calendar of events, ordering information for GreenSpec, Green Building Advisor, and other resources

NREL (http://www.nrel.gov/highperformance)
Includes case studies and information on energy efficient strategies

U.S. Department of Energy (http://www.eren.doe.gov/buildings)
Software tools, case studies, other resources
High performance buildings initiative and case studies
(http://www.highperformance.buildings.gov)

Federal Energy Management Program, U.S. Department of Energy
(http://www.eren.doe.gov/femp)
Information on alternative financing, case studies, training opportunities, resources; includes *Greening of Grand Canyon* and other Greening reports and *Greening Federal Facilities Guide*

U.S. Green Building Council (http://www.usgbc.org)
Information on the Council and the LEED™ Rating System, including reference materials and training on the LEED™ Rating System

Whole Building Design Guide (http://www.wbdg.org)
Good overall site for sustainable building information. Energy issues are covered extensively; it is quickly being updated for materials and other sustainable considerations. Also, the site has information on productivity.

Green Building Challenge (http://www.greenbuilding.ca)
Information on an international effort to develop a method for assessing "green-ness" of buildings

U.S. Environmental Protection Agency (http://www.epa.gov)
Includes information on statutes and regulations, indoor air quality, environmental databases (see, for example, Surf Your Watershed)

U.S. EPA New Building Design Guidance and Target Finder
(http://www.energystar.gov Search: New Building Design)
Energy Star tools and resources Target Finder and New Building Design Guidance assist users with setting energy targets, enhancing the conventional design process, and moving toward energy performance goals

Environmentally Preferable Purchasing Program/EPA
(http://www.epa.gov/opptintr/epp/)

Includes "how to" information and resources, including EPP guidelines

General Services Administration/Planet GSA (http://www.gsa.gov/planetgsa)
Another government agency resource, includes case studies, resources

REDI Database (http://www.oikos.com)
A searchable database with up-to-date information on products/materials

Sustainable Sources (http://www.greenbuilder.com/general/BuildingSources.html)
Includes materials from the Austin, Texas, Green Builder Program and other resources

Greenbuilding Discussion Group
(http://www.crest.org/sustainable/greenbuilding-list-archive)
Active, wide-ranging discussion of green building issues and ideas

White House Publications/Executive Orders (http://www.pub.whitehouse.gov)
Contains downloadable versions of all executive orders

Rocky Mountain Institute (http://www.rmi.org)
Includes resources and information, ordering information for publications

Commonwealth of Pennsylvania/Building Green (http://www.gggc.state.pa.us)
Includes information on Pennsylvania's green building activities, an extensive list of library holdings (bibliography), *Guidelines for Creating High-Performance Green Buildings*, and an order form for the free video of the Department of Environmental Protection office building.

City of New York, Department of Design and Construction
(http://www.ci.nyc.ny.us/nyclink/html/ddc/home.html)
Contains downloadable High Performance Building Guidelines including useful appendices

AIA Committee on the Environment
(http://www.AIATopTen.org)
Includes top green projects for the last approximately five years

Videos:

1) **Greening the Red, White, and Blue Video and DOD Energy 10 Video:**
   Contact: Sandy Cannon-Brown
   VideoTakes, Inc.
   1521 N. Danville St.
   Arlington, VA 22201
   Phone: (703) 276-7077
   Fax:(703) 276-7079 – fax
   E-mail: Sandy Cannon-Brown <sandy@videotakes.com>
   www.VideoTakes.com
   OR Allen Bryant @ Naval Facilities Engineering Command in Norfolk
   Phone: (757) 322-4202
   E-mail: <BryantAG@efdlant.navfac.navy.mil>

2) **Pennsylvania's "Lessons Learned" CD and "The Story of Pennsylvania's First Green Building: DEP South Central Office Building" Video**
   Contact: Pennsylvania Department of Environmental Protection
   P.O. Box 2063
   Harrisburg, PA 17105
   Call: (717) 787-4190 or go to the website: www.dep.state.pa.us

3) **Chesapeake Bay Foundation "Growing Smart" Video**
   Contact: Chesapeake Bay Foundation
   Philip Merrill Environmental Center
   6 Herndon Avenue
   Annapolis, MD
   Call: (410) 268-8816 or go to the website: www.savethebay.cbf.org

SPEAKERS & FACILITATORS

Victor W. Olgyay, AIA
ENSAR Group, Inc.
2305 Broadway
Boulder, Colorado
Ph: 303 449 5226 Fax: 303 449 5276
E-mail: victor@ensargroup.com

Victor W. Olgyay, AIA is a Vice President and Architect with ENSAR Group, Inc. located in Boulder, Colorado He has performed Architectural Design, Planning, Environmental Systems, Acoustical, Lighting and Daylighting Consultation on a wide variety of projects internationally, with an emphasis in the areas of bioclimatic, ecologic and low energy design. His experience at ENSAR includes performing as a sustainability consultant for the American University in Cairo (New Cairo, Egypt), daylighting and envelope consultant for the Interface Weave 2 factory renovations (Elkin, NC), sustainability consultant for the National Marine Fisheries Service Laboratory Renewal Project (Honolulu, Hawaii), LEED consultant for the Dallas Police Headquarters (Dallas, Texas), master plan development for the Esalen Institute (Big Sur, CA), and daylighting consultant for the Iselin Recreational Center (Aspen, Colorado). Victor is a LEED 2.0 Accredited Professional.

He has worked as an architect and consultant independently and with several private and state firms doing programming, post occupancy evaluations and design guidelines for which he was awarded two 1990 Progressive Architecture Research Citations. He is active in lecturing and has numerous published research papers as well as being a primary writer and researcher with W.M.C.Lam of Sunlighting as Formgiver for Architecture (VNR 1986), and co-author of Architectural Lighting (McGraw Hill, 2002) with David Egan. He was recently a featured speaker at the Third International Humane Habitat Conference in Bombay, India.

Victor has taught at the University of Hawaii since 1992 as an Associate Professor of Architecture and Environmental Control Systems. He has also taught at the Boston Architectural Center, Roger Williams College and Tufts University. He was named Director of Research at the UH School of Architecture in 1993 and has overseen numerous energy, environmental and lighting research projects under contract to various state and federal agencies. He was Chairman of the AIA Honolulu Energy and Environment Committee since 1995, and in 1998 he was named a Dana Fellow of the Joslyn Castle Institute for Sustainable Communities.

Jason Hainline
ENSAR Group, Inc.
2305 Broadway
Boulder, Colorado
Ph: 303 449 5226 Fax: 303 449 5276
E-mail: jason@ensargroup.com

Jason Hainline is a Vice President and Sustainable Design Consultant with ENSAR Group, Inc. located in Boulder, Colorado. His experience in various environmentally sustainable projects

focuses on design, material selection, lighting and energy efficiency, as well as site and landscape planning. His experience with ENSAR includes such projects as environmental optimization of the master plan and design guidelines for the American University in Cairo (New Cairo, Egypt), daylighting and envelope consultant for the Missouri Department of Natural Resources (Jefferson City, MO), sustainable design and LEED coordination for the University of Denver's new College of Law, master plan development/design for the Esalen Institute (Big Sur, CA), energy analysis for a new emergency operations facility for Zion National Park (Zion, UT), and sustainable design consulting for Navy Recruit Barracks at Great Lake Naval Training Center (Great Lakes, IL). Jason is a LEED 2.0 Accredited Professional.

Jason has been involved in-depth with the Department of Energy's Federal Energy Management Program's (FEMP) Greening of Federal Facilities coordinating and facilitating charrettes for numerous military instillations such as NSA Mid-South Navy Base (Millington, TN), Marine Corp Base Hawaii (Honolulu, HI), and Ft. Carson (Ft. Carson, CO). Additional projects under this program include as the Task Force Team for The Greening of The Grand Canyon, The Greening of The Presidio & The Greening of Yellowstone.

Lauren Yarmuth
ENSAR Group, Inc.
2305 Broadway
Boulder, Colorado
Ph: 303 449 5226 Fax: 303 449 5276
E-mail: lauren@ensargroup.com

Lauren has experience in sustainable and energy efficient design, daylighting, material selection, policy, and urban planning. She has served as a facilitator, consultant and architectural designer on projects ranging from large scale institutional and commercial to local residential. Previously Lauren worked with Rocky Mountain Institute collecting data on green development projects from around the world, and developing a cohesive resource for the building industry. She has been involved with a number of municipal and state green building efforts, including extensive work with the Rhode Island Senate to develop green building guidelines and policy. Lauren is a LEED 2.0 Accredited Professional.

David J. Nelson, AIA
Clanton & Associates
4699 Nautilus Ct. South Suite 102
Boulder, CO 80301
Ph: (303) 530-7229 Fax: (303) 530-7227
E-mail: david@clantonassociates.com

David Nelson, a Principal with Clanton and Associates, Inc., establishes the firm's design direction and oversees the management of projects and personnel. David began professional practice in 1982 and at Clanton and Associates has been responsible for the lighting design of many published and award winning projects. The focus of the work, whether interior or exterior, places a strong emphasis on architectural design aesthetic and energy efficiency. Some of his recent projects include: The Monsanto Company Corporate Headquarters, The State of Texas

Department of Health Building, Bass Pro Shops Outdoor World, a Lighting Master Plan for The University of Colorado and lighting ordinances for Eagle and Castle Rock, Colorado.

David is an active member of the American Institute of Architects Committee on the Environment and the US Green Building Council. He currently serves on the Technical Advisory Committee for the US Green Building Councils' LEED Green Building Rating System. He has a Bachelor of Architectural Engineering, with an emphasis on Illumination and Electrical Systems, from the University of Colorado. He has a Masters of Architecture from the Massachusetts Institute of Technology. David speaks to national conferences, professional organizations, and educational institutions and has served as a visiting design critic at the Massachusetts Institute of Technology.

Ron Perkins
Supersymmetry USA, Inc.
22154 W. Magnolia Forest
Navasota, TX 77868
Ph: 936-894-2819 Fax: 936-894-3124
E-mail: ronaldperkins@email.msn.com

Ron Perkins has been involved in the design, construction and operation of commercial and light industrial facilities for the past 25 years. He has a BS in Industrial Arts from Sam Houston State University with a minor in Mathematics. He has worked for Todd Shipyards Corporation, Offshore Power Systems, Texas Instruments, Inc. and Compaq Computer Corporation.

For eight years, ending in July 1990, Ron Perkins held the position of Facilities Resource Development Manager at Compaq Computer Corporation. He managed a 50 member design team of architects, engineers, contractors and scientists designing over 3,000,000 square feet of state of the art, commercial office and factory space, housing Compaq Computer Corporation's World Headquarters in Houston, Texas. Perkins formed a team, to research and apply energy efficient technologies. As the result of the team's efforts, Compaq's new buildings cost less to build and were 30% more efficient. Recent projects include Montana State University EPI Center, UT Houston Health Science Center, NOKIA Mobile Phones (factory), Fort Worth, Texas, Interface Carpet Company, Rocky Mountain Institute, BNIM Architects Sustainable Design Projects, Oberlin College Environmental Studies Center, SGS/Thompson Worldwide Resource Efficiency Project, Rio Grande Birding Center Visitors Centers, Bernheim Forest Visitor's Center, and the Dallas Zoo Visitor's Center.

Andy Walker
Senior Engineer
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 81611
Ph: 303-384-7531
E-mail: andy_walker@nrel.gov

As a Senior Engineer at the National Renewable Energy Lab, Dr. Walker currently supports the US DOE Federal Energy Management Program Technical Assistance Task, conducting integrated engineering and economic analysis of energy efficiency and renewable energy projects in Federal buildings. He also teaches several energy-related classes at the Mechanical and Architectural Engineering Departments at the University of Colorado at Boulder and at the Colorado School of Mines in Golden. He serves as an Associate Editor for the ASME Journal of Solar Energy Engineering. Prior to joining NREL, Dr. Walker worked as the Renewable Energy Coordinator for the Colorado Office of Energy Conservation where he promoted implementation of cost-effective renewable energy applications. He served as a Research Associate at the Solar Energy Applications Laboratory at Colorado State University, conducting research on two-phase heat transfer and solar water heating. As a Peace Corps Volunteer math and science teacher in Nepal, Dr. Walker built a passive solar school dormitory and a village-scale biogas generator and taught the construction of fuel-efficient wood stoves. He has conducted solar thermal and photovoltaics training for developing countries for the U.S. Agency for International Development. Walker's credentials include a B.S., M.S., and Ph.D. in Mechanical Engineering, and he is a registered Professional Engineer in the State of Colorado.