Nanoscale Science Research Centers (NSRC)
Lessons Learned Conference
January 13-14, 2005

PURPOSE

The purpose of the Nanoscale Science Research Centers (NSRC) Lessons Learned Conference was to share experiences and lessons learned among the five NSRC projects and Department of Energy Headquarters program managers to ensure that NSRC projects are completed safely, within costs and schedule, and meet or exceed their performance objectives. Conference participants were to share ideas and information regarding all aspects of the NSRC construction projects by identifying and resolving common issues, learning methods that work and those that do not work, exploiting opportunities for improvement, and in general, helping one other.

SUMMARY

The conference, conducted on January 13-14, 2005 in Rockville, Maryland, was planned and organized by the Office Basic Energy Sciences (BES), and was attended by 31 participants from DOE and the five NSRC projects (see Attachment A for the list of attendees). A conference overview was given by Jeff Hoy (BES) followed by a project management overview by Daniel Lehman (Director, Office of Project Assessment). The remainder of the conference was devoted to lessons learned presentations and discussions among the managers of the five NSRC projects. (See Attachment B for the conference agenda.)

The NSRC Lessons Learned Conference offered a forum for senior management from the five NSRC projects to present their individual experiences in planning, constructing, and managing a nanoscience facility, as well as to hear and compare the experiences of four similar facilities. As the conference progressed it was clear that many lessons and experiences were shared by nearly all of the projects. There was agreement that a good management team with both strong technical and project management personnel is crucial to a successful project. Projects voiced strong support for identifying dedicated ES&H and procurement staff early in the life of the project to serve in key personnel roles on the project management team. It was also deemed important to involve the scientific staff early in the project in order to ensure that all scientific requirements are incorporated in the facility design.

In the area of Design and Construction, there was a common preference among the projects for the Design-Bid-Build (DBB) contract. Compared to the Design-Build contract, the DBB better suited the complexity of the NSRC facilities, allowing for needed interaction with the scientific staff and the resulting design modifications. Projects also noted that among the greatest risks faced in the area of construction were unknown ground conditions and underground utilities.

In addition to these more common lessons shared by the majority of the NSRC projects, there were also specific experiences; site or area-specific issues; and methods/practices that were unique to a specific project team. These lessons learned benefited not only the more recent nanoscience facilities, but each project team with a desire to learn from others' successes and failures (see Attachment C for the summary lessons learned).

Attachment A

CONFERENCE PARTICIPANTS

Center for Nanophase Materials Sciences at ONRL
David Arakawa (DOE)
Linda Horton
Barry Miller
Jack Stellern
Frank Kornegay

Molecular Foundry
Kathy Johnescu (DOE)
Jim Krupnick
Joe Harkins

Center for Integrated Nanotechnologies at LANL/SNL
Frank White (DOE)
Jerry Hands
Neal Shinn

Center for Nanoscale Materials at ANL
Frank Gines (DOE)
Eric Isaacs
Derrick Mancini

Center for Functional Nanomaterials at BNL
Joseph Eng (DOE)
Bob Desmarais (DOE)
Mike Schaeffer
Marty Fallier
Steve Hoey
Dave Dale

Department of Energy Headquarters
Pat Dehmer
Jeff Hoy
Pedro Montano
Altaf Carim
Kristin Bennett
Dan Lehman
Steve Tkaczyk
Kin Chao
Steve Meador
Casey Clark
Linda Cerrone

Attachment B

DOE CONFERENCE ON NSRC PROJECT LESSONS LEARNED AGENDA

Thursday, January 13, 2004

8:00 am Opening Remarks
- BES Program Perspective ..... Dehmer/Hoy
- SC Project Management Perspective ..... Lehman

8:10 am CNMS Project Scope & Status Summary
- DOE Perspective ..... Arakawa
- ORNL Perspective ..... Horton

8:30 am CINT Project Scope & Status Summary
- DOE Perspective ..... White
- ORNL Perspective ..... Hands

8:50 am TMF Project Scope & Status Summary
- DOE Perspective ..... Johnescu
- ORNL Perspective ..... Krupnick

9:10 am CNM Project Scope & Status Summary
- DOE Perspective ..... Gines
- ORNL Perspective ..... Isaacs

9:30 am CFN Project Scope & Status Summary
- DOE Perspective ..... Eng
- ORNL Perspective ..... Hwang

9:50 am Break

10:00 am ES&H ..... **Kornegay**/Krupnick/Hands/Mancini/Hoey[1]
- Hazards Analyses & PSAD
- Construction Safety
- Commissioning Safety

12:00 pm Lunch

1:00 pm Design & Construction ..... Stellern/Harkins/Hands-Shinn/**Mancini**/Fallier[1]
- Building Design & Construction
- Clean Room Aspects
- Technical Equipment Spec Development
- Building & Equipment Integration
- Construction and Equip Vendor Oversight/QA
- Internal Reviews (Design, Constructability, etc.)

3:00 pm Break

[1] **Bolded** names indicate Session Moderator assignments

Thursday, January 13, 2004 (Continued)

3:15 pm Management & Communication.....**Horton**/Krupnick/Hands/Isaacs/Shaeffer[1]

- Organization & Interfaces
- Communication & Reporting
- Cost Estimating, Risk/Contingency Analysis, & Value Engineering
- Scheduling & BA Management
- Risk & Contingency Management
- EVMS & PARS
- Change Control & Configuration Management

5:15 pm Adjourn

Friday, January 14, 2004

8:00 am Procurement.....Horton/**Harkins**/Hands-Shinn/Mancini/Dale[1]

- Overall Procurement Strategy & Planning
- Source Selection Criteria & Evaluation
- Contracting Methodologies
- Contract Management
- Import Duties & Currency Exchange Rates

10:00 am Break

10:15 am Comm & Trans to Ops.....Stellern/Krupnick/**Hands-Shinn**/Mancini/Fallier[1]

- Building & Clean Room Acceptance/Commissioning
- Equipment Acceptance/Installation/Commissioning
- CD-4a/b Criteria
- Readiness Reviews

12:15 pm Wrap-Up .....Dehmer/Hoy/Bennett/Carim + Discussion

12:45 pm Adjourn (Take-away Lunch Provided)

[1]**Bolded** names indicate Session Moderator assignments

Attachment C

SUMMARY OF NSRC PROJECTS LESSONS LEARNED

ENVIRONMENTAL, SAFETY and HEALTH (ES&H)

- Integrated Safety Management program is key for construction, installation, and operation
- Dedicated ES&H professionals should be identified from the beginning and be part of the Project management team, as key personnel
- Identify and document roles, responsibilities, authority, accountability, and training requirements of staff, Subject Matter Experts, subcontractors and all other participants
- Select contractors with solid corporate safety commitment and results
- Understand and document standards, requirements, and success criteria
- The ES&H Plan, and other standards and codes should be part of every bid package and pre-award discussions, so the bidders understand the project expectations.
- ES&H issues and staff should be included in work planning and task discussions.
- Recognize and accommodate potential language barriers of laborers
- Incentives and celebration of good ES&H performance enhance program success
- Plan transition to installation and operations early in the project

DESIGN and CONSTRUCTION

- Design-Bid-Build contracts are preferred and likely produced better result than Design-Build, due to the complexity of the facilities and the need to interact with scientific staff and the resulting design modifications.
- Unknown ground conditions and underground utilities tend to be the greatest site risks
- Value Engineering (VE) is critical during the design phase to achieve performance objectives and to stay within costs. Secondary VE activities are common when estimates come in higher than expected.
- Design-to-Cost contracts are useful in committing the A/E to meet specified estimated construction cost.
- Coordination with the site's ongoing laboratory activities (e.g., construction projects, road maintenance, etc.) is important to avoid conflicts and safety concerns.
- Technical Equipment specifications should come from a unified and a well-defined process that is developed early in the project by Subject Matter Experts, ES&H, and procurement; reviewed by peers and thrust/theme leaders; and approved by NSRC management.
- Obtaining accurate and timely information from vendors on sizes, delivery, and installation requirements was a challenge, but required to avoid change orders.

COMMISSIONING and TRANSITION to OPERATIONS

- Most projects see using an independent commissioning agent for Leadership in Energy and Environmental Design (LEED) certification is worth the $200K-$300K investment.
- Use other projects, including NSRCs, to benchmark the Transition to Operations Plan.
- Readiness Assessments should be conducted as special equipment becomes available for startup and Readiness Assessment should be complete at CD-4a.

MANAGEMENT and COMMUNICATION

- The Federal Project Director is a key member of the team
- The project team is critical to project success and all project management skills and experience must be present within the team
- Scientific staff must be part of the team to insure that scientific requirements are met including defining building requirements early and continuously during design to avoid changes during construction
- Involve support organizations including ES&H and procurement leadership early. Also, have both a lead and a back-up to ensure that all expertise is available for critical meetings
- Occurrences should be communicated upward from the project to DOE upper management, and not the other way around
- Learn from other projects and reviews
- Have experienced staff for Earned Value Management System and PARS. Always review the data to ensure its accuracy
- Risk management should begin as early as possible. Risk management involves continual identification of specifics, unbiased assessments, and aggressive mitigation of risks.

PROCUREMENT

- Need dedicated procurement personnel on the integrated project team
- Always request exemptions from import duties
- Ensure buy-in of technical equipment specifications by stakeholders
- Have strict qualification criteria for prospective bidders
- Pre-qualify General Contractors (GCs)
- Scrutinize (and minimize) sole source procurements.
- For best value selections the project will need knowledgeable evaluators
- Clearly identify key procurement dates on the project schedule
- Have incentive plans for construction contracts and share incentives with CM and GC