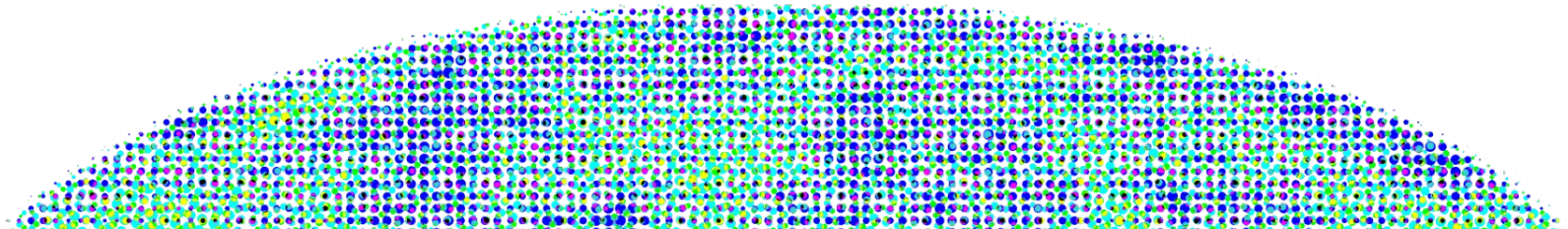




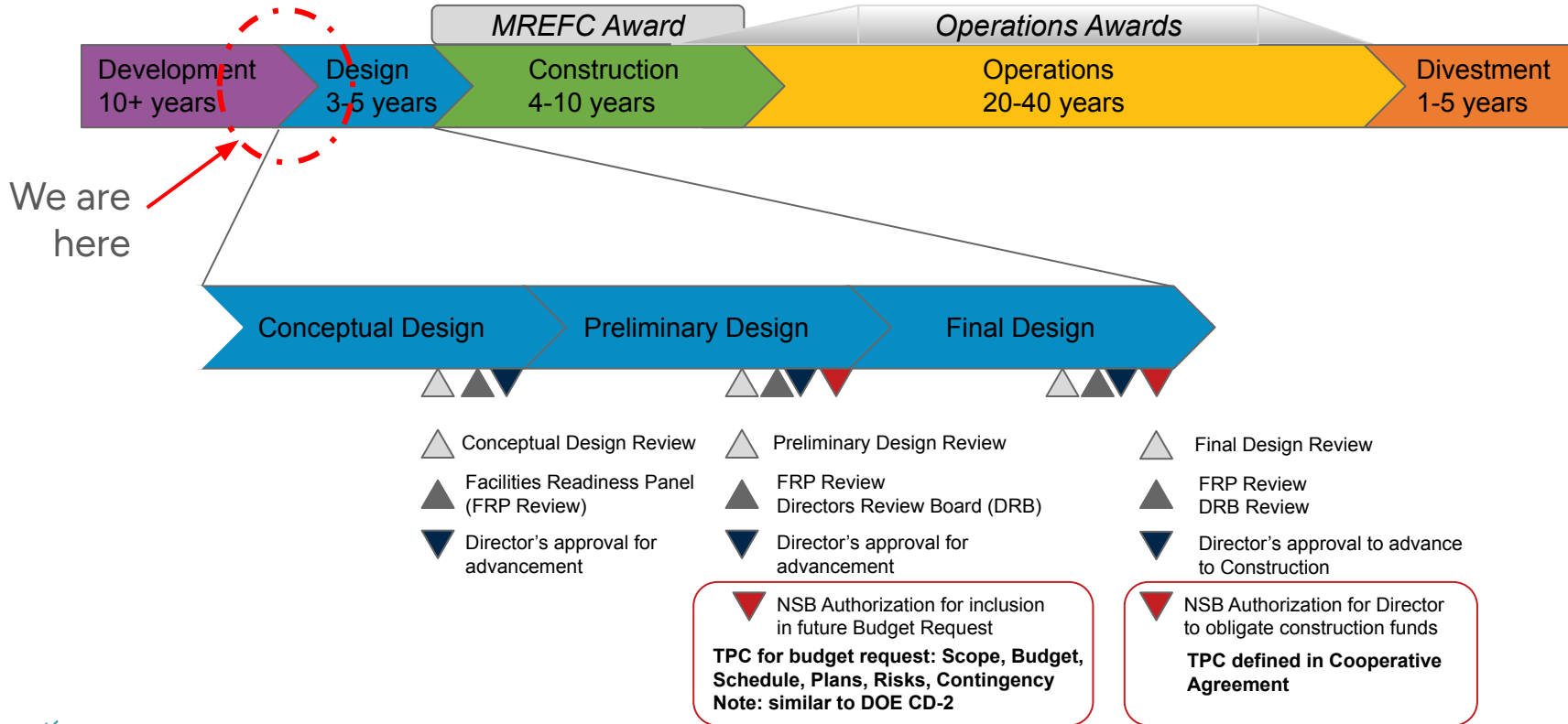
NSF Project Management Topics

Jeff Zivick

1 May 2024



NSF Major Facility Life Cycle



Exit from Development to Design

(this transition is imminent for CMB-S4)

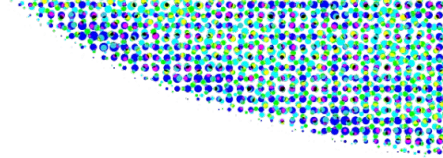
- Formal start of the Design Stage for a major facility project occurs following a recommendation by the Chief Officer for Research Facilities (CORF) with input from the Facilities Governance Board (FGB) and other senior agency officials and written approval by the NSF Director is received. This process is initiated by a request from the Sponsoring Organization to the Director's Office once a project is determined to be ready.
- Based on the CORF's recommendation and any further examination, the Director then approves (or disapproves) the project entering the Conceptual Design Phase as a *Candidate* project. Note that no NSF commitment is implied beyond support for the development of a Conceptual Design.

Conceptual Design Review

(per NSF RIG)

- **Description of the research infrastructure and technical requirements needed to meet the science**, including a definition and relative prioritization of the research objectives and science questions the proposed facility will address. **Technical requirements must flow down from the science requirements.** This description may be site-independent or site-specific depending on the nature of the project;
- **System-level design**, including definition of all **functional requirements** and **major systems**;
- Concept of operations including an estimate of annual operations and maintenance costs, staffing levels, and other activities;
- **Initial risk analysis and mitigation strategy for construction**, identifying enabling technologies, high-risk or long-lead items, and research and development (R&D) needed to reduce project risk to acceptable levels;
- Potential **environmental and safety impacts** to be considered in site selection;
- **Description of the proposed construction performance baseline (scope of work, budget, and schedule)** needed to evaluate readiness and continue planning in preparation for the Preliminary Design Phase. This includes budget and contingency estimates appropriate to a Conceptual Design level and based on the initial Risk Analysis and initial projections for the construction and commissioning schedule;
- Description of proposed **Educational Outreach and Broader Societal Impact**, included in the proposed scope of work, budget and schedule.

Excerpts from a CDR panel Charge for a previous NSF MREFC project



1. Review the Conceptual Design level “Project Execution Plan” (PEP) that will be used during construction against NSF’s Large Facilities Manual Section 3.4.1.
 - a. Evaluate the Science Requirements and advise NSF regarding its adequacy in defining quantitative technical requirements that guide the overall technical design and that inform a flow-down to a system level description of the technical scope to be undertaken, including descriptions of major functional elements comprising the scope proposed for construction funding by NSF. (NSF expects to see a clear requirements matrix that traces the NSF Science Goals to a set of quantitative science requirements that flow down to define scope and cost estimates.)
2. Examine the technical scope of each top-level WBS element proposed for MREFC-funded construction:
 - a. Advise NSF regarding its completeness, as documented in the project’s Cost Book, at a Conceptual Design level of maturity. Examine the WBS dictionary defining the scope of each of the elements. Do the top-level WBS categories encompass all of the major functional elements of the proposed project, as well as other necessary activities such as project management, Systems Engineering, QA, ES&H. If not, what’s missing?
3. Examine the construction schedule.
 - a. Advise NSF regarding the realism of the estimated project duration
4. Risk
 - a. Examine the major contributors to the initial budget contingency estimate and advise NSF on which ones may have a high degree of correlation that should be considered in future bottom-up confidence level estimation (i.e. the risk factors are not independent of one another).

Exit from CDR & Entry into Preliminary Design Phase

- Scope of CDR is set in the Review Panel Charge, the NSF RIG is used for guidance in developing the charge.
- NSF will subject the Conceptual Design package to external review, applying standard NSF criteria (Intellectual Merit and Broader Impacts) as well as other programmatic and technical criteria as given in the original solicitation and the panel charge.
- NSF Division of Institution and Award Support (DIAS), Division of Acquisition and Cooperative Support (DACCS), and the Large Facilities Office (LFO) will jointly conduct a Cost Analysis following NSF internal operating guidance. Guidance on refinements to the Recipient's Cost Book will be provided as necessary in preparation for the Preliminary Design Phase

Updating & reviewing required documents

NSF Research Infrastructure Guide Component	CMB-S4 Document(s)
1. Introduction (Science/Infrastructure)	CMBS4-doc-716 Preliminary Baseline Design Report CMBS4-doc-608 Project Execution Plan
2. Organization (Internal/External/	CMBS4-doc-608 Project Execution Plan
3. Design and Development	CMBS4-doc-608 Project Execution Plan
4. Construction Project Definition	CMBS4-doc-716 Preliminary Baseline Design Report CMBS4-doc-608 Project Execution Plan CMBS4-doc-686 Work Breakdown Structure CMBS4-doc-715 CMB-S4 WBS Dictionary Scope Management Plan (in development) CMBS4-doc-636 Cost Estimating Plan CMBS4-doc-683 Schedule Estimating Plan <i>Preliminary Baseline budget & Cost Book (in development)</i> <i>Preliminary Baseline schedule - (in development)</i>
5. Staffing	<i>Staffing plan in development, resources identified in P6</i>
6. Risk & Opportunity Management	CMBS4-doc-505 Risk Management Plan Jira Risk Registry 2023-10-30 CMBS4-doc-626 NSF Contingency Management Plan CMBS4-doc-773 Scope Contingency Estimates
7. Systems Engineering	CMBS4-doc-520 Systems Engineering Management Plan CMBS4-doc-671 Program Level Requirements JIRA System/Subsystem Requirements - Controlled in JAMA Connect Multiple ICDs in various stages of development CMBS4-doc-602 Quality Assurance Plan CMBS4-doc-738 CMB-S4 Chile Quality Assurance Plan
8. Configuration Control	CMBS4-doc-238 Configuration Management Plan

NSF Research Infrastructure Guide Component	CMB-S4 Document(s)
9. Acquisitions	CMBS4-doc-608 Project Execution Plan
10. Project Management Controls	CMBS4-doc-608 Project Execution Plan CMBS4-doc-614 Project Management Controls Plan
11. Site & Environment	CMBS4-doc-696 Chile Site Master Plan CMBS4-doc-725 CMB-S4 Chile Site Requirements and Selection CMBS4-doc-697 CMB-S4 Chile Site Construction Plan CMBS4-doc-699 Chile Site Environmental Impact Evaluation Report CMBS4-doc-701 South Pole Site Plan CMBS4-doc-703 South Pole Site Shipping Plan CMBS4-doc-706 South Pole Site Environmental Evaluation
12. Cyberinfrastructure	<i>To be developed</i>
13. Environmental, Safety, & Health	CMBS4-doc-687 Chile Safety Health & Environment Plan CMBS4-doc-743 CMB-S4 Chile Site Hazard Identification Analysis CMBS4-doc-735 Chile Workplace Regulations CMBS4-doc-705 South Pole Site Safety and Health Plan
14. Review & Reporting	CMBS4-doc-608 Project Execution Plan CMBS4-doc-614 Project Management Controls Plan
15. Commissioning	CMBS4-doc-303 CMB-S4 Concept of Operations CMBS4-doc-730 Chile & South Pole Integration & Commissioning Plan for LAT CMBS4-doc-729 South Pole Integration & Commissioning Plan for SAT CMBS4-doc-704 South Pole Operations Plan CMB-S4 System Commissioning Plan to be developed CMBS4-doc-694 Segregation of Funding Policy
16. Project Close-out	Project Close-out plan to be developed in concert with Commissioning plans

EPO and Broader Impacts

- 2023 Directors Review correctly assessed we did not include a Plenary presentation of CMB-S4 EPO and Broader Impacts.
- Juliet Crowell had already started developing a CMB-S4 Broader Impacts Plan as of the award of the NSF Continuing Design cooperative agreement.
- Each L2 subsystem is not required to develop their own Broader Impacts plan, slightly different than the DR panel report was interpreted.
- However, Juliet may be contacting some L2 leads to see if there are opportunities to contribute to the goals laid out in the Broader Impacts Plan.

CMB-S4
CMB-S4 Broader Impact Plan

Doc: CMB-S4-doc-xxx-vx
Date: xx/xx/xx
Status: Draft
Page 1 of 13

CMB-S4
BROADER IMPACT PLAN
CMB-S4-doc-xxx-vx

Author(s)	Role/Organization	Date
Juliet Crowell	EPO Manager	

REVISION HISTORY

Version	Revision Date	Description of Changes
v1	xx/xx/xx	description

EPO and Broader Impacts

3 CMB-S4 Outreach Scope

3.1 Educational Space Science Resources for K-12 Teachers and Learners

- 3.1.1 Elementary School Students (K-5) and Teachers
- 3.1.2 Middle School Students (6-8) and Teachers
- 3.1.3 High School Students (9-12) and Teachers

4 Middle Girls And Stem Identity Development

5 Out of School Learning Resources

5.1 STEM Career Pathways Development

- 5.1.1 Workforce development
- 5.1.2 CMB Analysis School
- 5.1.3 Mentorship for Early Career Scientists
- 5.1.4 Access for Minorities Underrepresented in CMB-S4 Careers
- 5.1.5 Vocational & Training Programs
- 5.1.6 Public Programs

6 International Initiatives

- 6.1 Chile Museums and Exhibits Programming
- 6.2 Chile Educational Resources

5.1.3 Mentorship for Early Career Scientists

A priority for the CMB-S4 collaboration and project is to help develop early-career scientists, postdoctoral fellows, and students.

- CMB-S4 scientists will develop a mentorship program for early career scientists.
- CMB-S4 scientists will provide grand writing workshop for early career scientists.

5.1.4 Access for Minorities Underrepresented in CMB-S4 Careers

The CMB-S4 efforts for increasing diversity in the CMB-S4 program includes reaching out to STEM students at Historically Black Colleges and Universities (HBCUs), members of the National Society of Black Physicists (NSBP), members of the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and other institutions primarily serving underrepresented minorities. We plan to develop relationships with them and other minorities serving institutions to forge pathways for minority students to participate long-term in CMB-S4 research.

- CMB-S4 will introduce faculty and STEM Scholars (students) at HBCUs and MSI to the collaboration research and develop ways that they can get involved and engage with science.
- CMB-S4 will support minority students' application for membership and attendance of annual CMB-S4 collaboration meetings.

5.1.5 Vocational & Training Programs

Summer 2024 CMB-S4 Scientists and EPO Manager will be piloting a summer Research Experience for Undergraduate (REU) for Joliet Junior STEM Scholars. These students will join the UChicago REU program and will be provided a unique research practicum experience at the research facilities on campus.

- CMB-S4 scientists will develop a robust REU program to support local and national junior college students.
- CMB-S4 will develop an REU program that will train junior college students for vocational career opportunities within the CMB-S4 project.



We can do this!