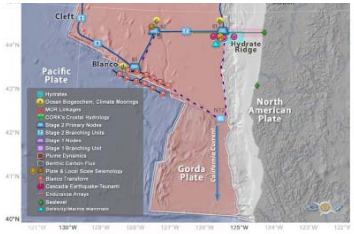
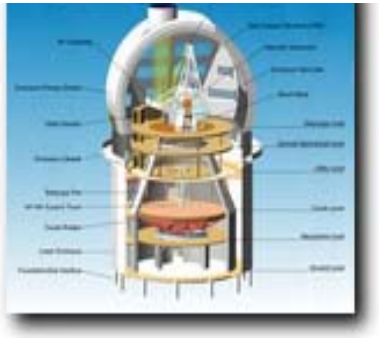
Large Facilities at NSF

- Major component of the science and engineering enterprise
- Enable and transform scientific research and education
- Our responsibility at NSF to oversee, manage and support them
- We have a large variety of facilities and they are at different lifecycle stages…..

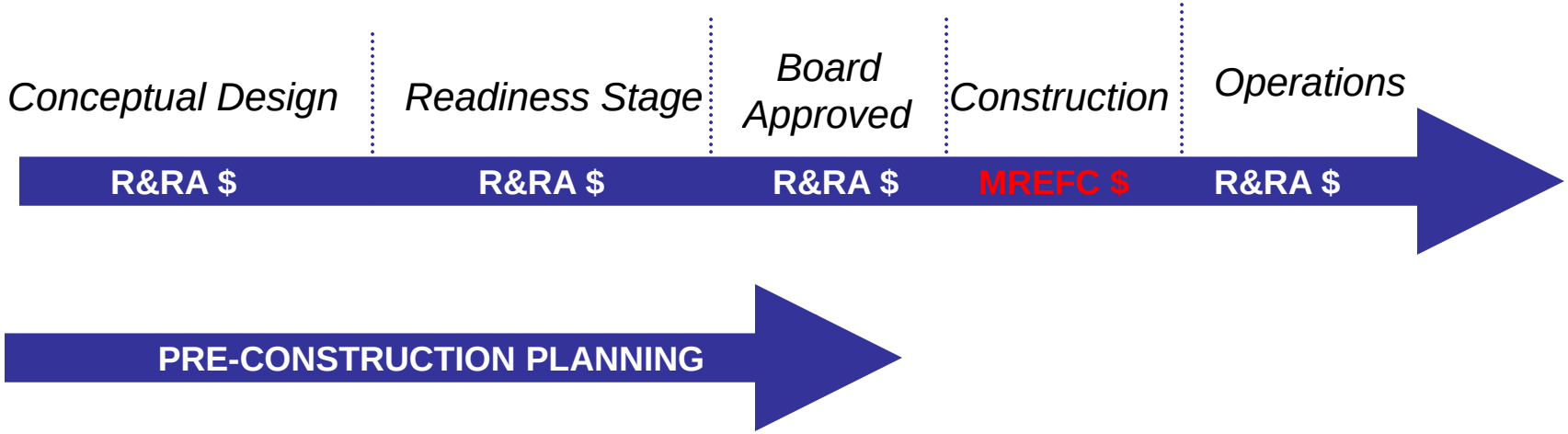




Major Research Equipment and Facilities Construction (MREFC) Process

- Synchronizes the technical and administrative development of a project with NSF processes and funding qualification

- Candidate projects progress through a series of defined facility lifecycle stages:



Summary of Project Evolution

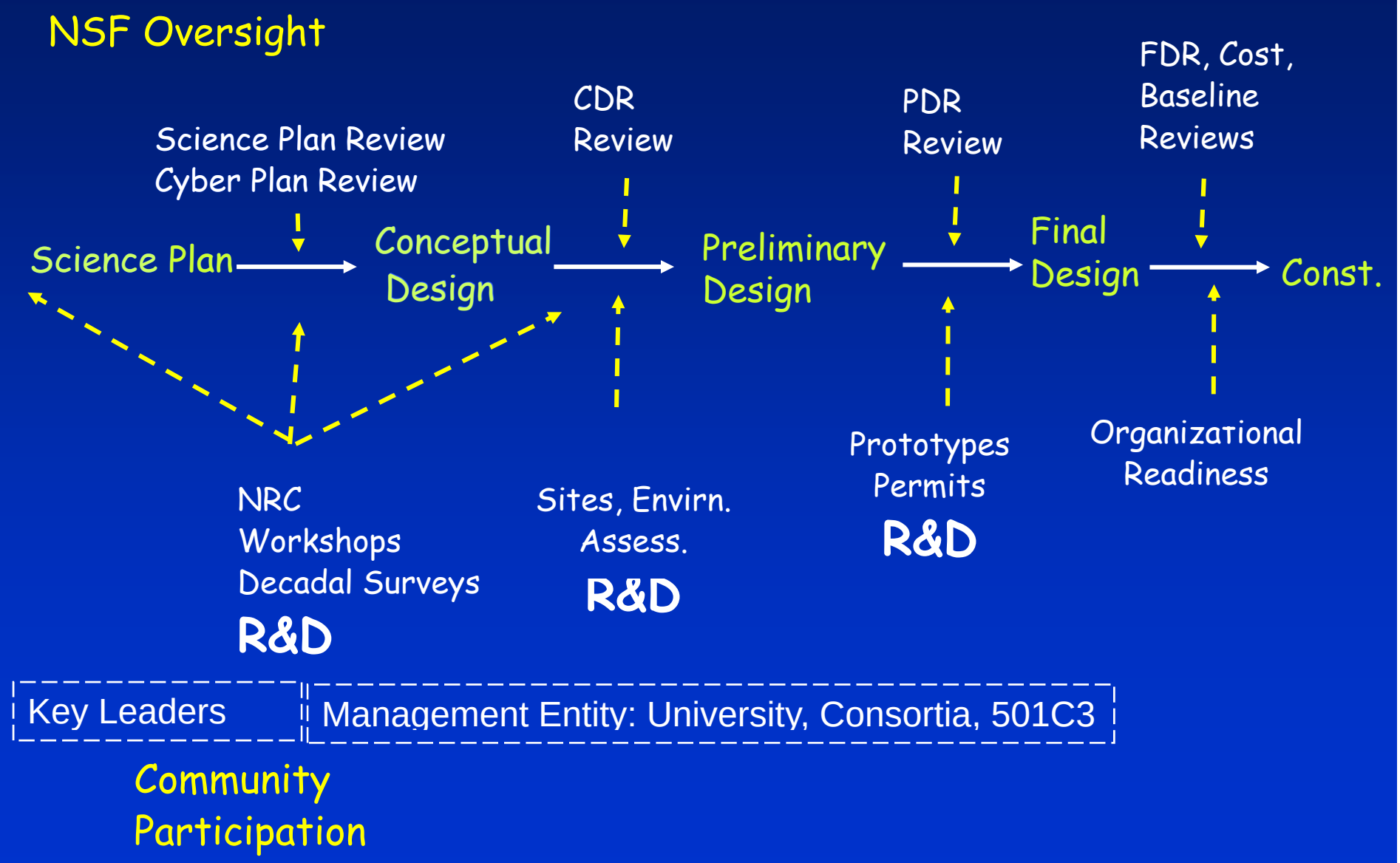
Extremely resource intensive	Planning is expensive – 10-20% of total project cost
	Project Team development challenges
	Time intensive – planning can take 10 years

Rigorous review process	At the end of Conceptual Stage - CDR
	At the end of Readiness Stage - PDR
	At the end of Final Design (FDR) – BASELINE

Site Selection and Federal Compliance is a huge planning factor
Partnerships and project coordination are challenging

A credible plan and risk adjusted cost are essential to future success

"Typical" MREFC Process



NSF Oversight Evolution – Key Issues

Proposal review and proposal response planning
R&D and technology maturity
Project Safety considerations
Risk Management for NSF – Are there key decision points??
Project Development (CDR to PDR to FDR)
Environmental Compliance and site selection
Data Management and IT Security
Partnership coordination
Lifecycle management and termination liabilities
Financing the lifecycle of a Facility
Reporting requirements for NSF Facilities

NSF Large Facilities Manual and associated modules

Internal Management Plan (IMP) – authored by Program Officer

NSF Large Facilities Manual (LFM)

- LFM and associated modules reviewed and approved in May 2007.

- LFM does not replace *Proposal and Award Policies and Procedures Guide* formal award procedures

- NSF Large Facilities Manual (LFM) created to:

1	Clearly state policies, requirements and recommended procedures for NSF Large Facilities Projects
2	Provide step by step project planning, management and oversight guidance for NSF staff, awardees and scientific communities
3	Enable NSF Program Officers and staff to ensure accountability and carry out responsibilities effectively

NSF Internal Oversight Process

NSF Oversight Entities

Priority for Program & Directorate

MREFC Facilities Panels

NSB DRB MREFC

OMB NSB DRB MREFC

OMB NSB DRB MREFC

Science Plan → Conceptual Design → Preliminary Design → Final Design → Const.

Program Officer Assign
Planning Award
R&D Awards

Internal Management Plan
Oversight Committees
PAT, BOT, EA.....
Internal Partnerships (GEO, BIO)
External Partnerships (MOUs)

Envir. Assess.
Organizational Readiness

Standing Army Award
Construction Award
Research Awards
M&O Awards

	Concept Design Stage	Readiness Stage	Board Approved Stage	Construction
Budget evolution	Concept development – Expend approximately 1/3 of total pre-construction planning budget Develop construction budget based on conceptual design Develop budget requirements for advanced planning Estimate ops $	Preliminary design Expend approx 1/3 of total pre-construction planning budget Construction estimate based on prelim design Update ops $ estimate	Final design over ~ 2 years Expend approx 1/3 of total pre-construction planning budget Construction-ready budget & contingency estimates	Expenditure of budget and contingency per baseline Refine ops budget
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		Proponents development strategy defined in Project Development Plan		Described by Project Execution Plan
	NSF oversight defined in Internal Management Plan, updated by development phase			
Oversight evolution	Merit review, apply 1st and 2nd ranking criteria MREFC Panel briefings Forward estimates of Preliminary Design costs and schedules Establishment of interim review schedules and competition milestones Forecast international and interagency participation and constraints Initial consideration of NSF risks and opportunities Conceptual design review	**MREFC Panel recommends and NSF Director approves advance to Readiness** NSF Director approves Internal Management Plan Formulate/approve Project Development Plan & budget; include in NSF Facilities Plan Preliminary design review and integrated baseline review Evaluate ops $ projections Evaluate forward design costs and schedules Forecast interagency and international decision milestones NSF approves submission to NSB	**NSF approves submission to NSB** Apply 3rd ranking criteria NSB prioritization OMB/Congress budget negotiations based on Prelim design budget Semi-annual reassessment of baseline and projected ops budget for projects not started construction Finalization of interagency and international requirements	**Congress appropriates funds** Final design review, fix baseline Congress appropriates MREFC funds & NSB approves obligation Periodic external review during construction Review of project reporting Site visit and assessment

Oversight Conceptual Design Stage (1 of 2)

Review and Approval of the Conceptual Design	PO & DDLFP collaborate on charge and panelists
	Jointly conduct Conceptual Design Review (CDR)
	Receive Report, assess project

Directorate Assessment and Prioritization of Project	Review & apply ranking criteria #1 & #2
	IMP review and sign off (budget, oversight, risk, partners)
	Assessment of not-to-exceed const. & ops costs

MREFC Panel Formal Recommendation of support for exit	Review CDR eval, PDP, IMP, Facility Panel memo
	PO/AD assures strong community support/priority
	Project meets NSF Facility Plan Objective(s)

Oversight Conceptual Design Stage (2 of 2)

The Director
• Evaluates the IMP to ensure that the resources NSF proposes to commit towards further development are adequately matched to the anticipated scope of work, risks, partnering possibilities and other considerations related to further development.
• If satisfied, the Director approves the Preliminary Design Stage IMP and then decides which projects should move into this stage.
• These projects are then included in the *Facility Plan*, which is released annually.

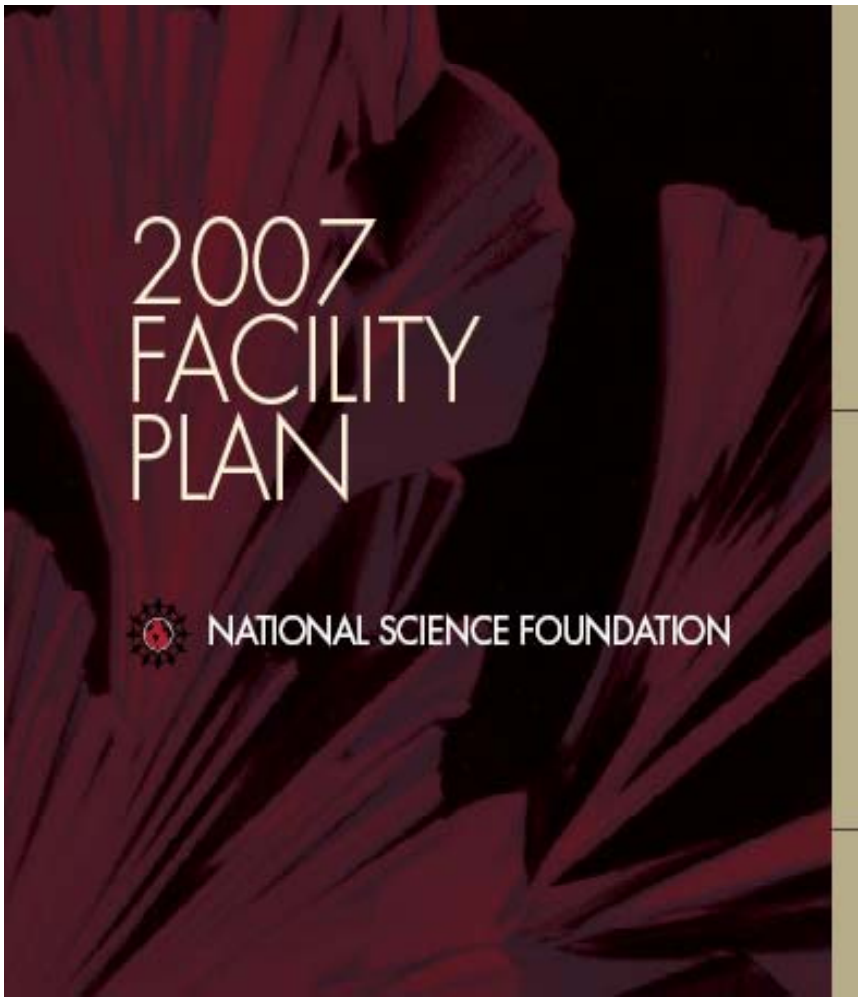
The NSB is asked to concur with the Director's decisions by approving the annual *NSF Facility Plan*.

NSF Facility Plan

- Description of the frontier science and engineering goals & opportunities that provide context and a compelling need for major facilities

- Status of MREFC projects that are in various lifecycle stages including:

1. Transition to Operations Stage
2. Construction Stage
3. New Starts per fiscal year – ie ARRV is an 07 new start
4. Possible new starts
5. Readiness Stage Projects – stage prior to National Science Board Approved (not yet in budget submission process)
6. Horizon Projects (those in conceptual development



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Oversight Readiness Stage (1 of 2)

Review and Approval of the Preliminary Design	PO & DDLFP jointly conduct PDR
	DDLFP concurs with PDR
	CFO certifies project budget is adequately defined

Directorate Assessment	Asserts high scientific merit and project priority
	Sound financial plan for project development
	Sound plan for operations costs

MREFC Panel Forwards Recommendation to Director	PDR eval, PDP, IMP (Facility Panel approved)
	Applies ranking criteria for Project across NSF
	Project rationale clear in NSF Facility Plan

Oversight Readiness Stage (2 of 2)

The Director
•Is satisfied that external participation in all phases of the project (other agencies, international and/or private sector entities, etc.) is well planned
• NSF approves submission to NSB , if approved, budget process
• These projects are then included in the *Facility Plan*, released annually.

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Board Approved Stage

- NSF coordinates project into budget
- Project proceeds to Final Design – Final Baseline
  - Semi-annual assessment of budget/project
- PO & DDLFP coordinate FDR
- DACS and PO coordinate Cooperative Agreement terms and conditions
- Congress appropriates & Director recommends award to NSB
- NSB approves obligation
- Project proceeds in accordance with Final Baseline

Baseline & Earned Value Management

- Baseline
  - The Performance Measurement Baseline (PMB) is established at FDR and placed into the CA as part of the PEP
  - The baseline is the basis for measuring Earned Value Management reporting

- Earned Value Management
  - Objective, quantifiable measurement of project performance
    - Performance Measurement Baseline (PMB) is reference
    - Planned Value (PV) – Value of the planned work
    - Earned Value (EV) – Projects define earning rules that quantify the accomplishment of work complete on project
    - Actual Cost (AC)

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MREFC Panel recommends and NSF Director approves advance to Readiness

NSF approves submission to NSB

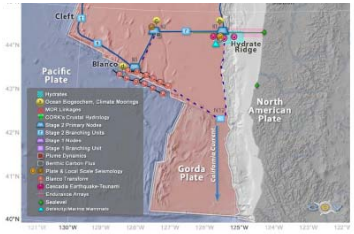
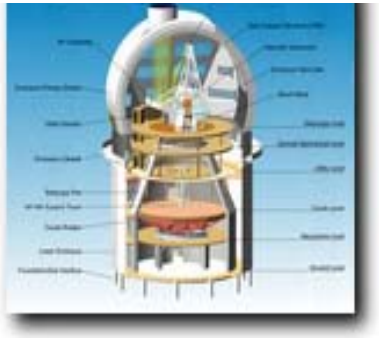
Congress appropriates funds

Construction

- Construction proceeds per the CA and baseline
- Construction reviews (joint between DDLFP& PO)
- Projects report monthly (Earned Value Management EVM)
- DDLFP provides monthly report to the Director (This is for all stage projects)
- Projects provide Estimates to Complete
- REBASELINING requires NSB approval
  - 20% cost overrun from NSB approved cost or 10M, whichever is greater
- NSF provides oversight and manages partnerships

Operations

- Operations proposal reviewed per NSF guidelines
- Typically awardee operated (not Antarctic facilities)
- Awards are renewed or terminated as planned. Typical operation awards are 3-5 year durations
- Facilities operate to measurable outcomes and objectives defined as part of the Cooperative Agreement

Large Facilities at NSF

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