The NSF MREFC Program

Perspectives on DUSEL as a proposed MREFC project

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National Science Board

- **The National Science Board of the United States is composed of 25 members appointed by the President and confirmed by the United States Senate, representing the broad U.S. science and engineering community.**

National Science Board

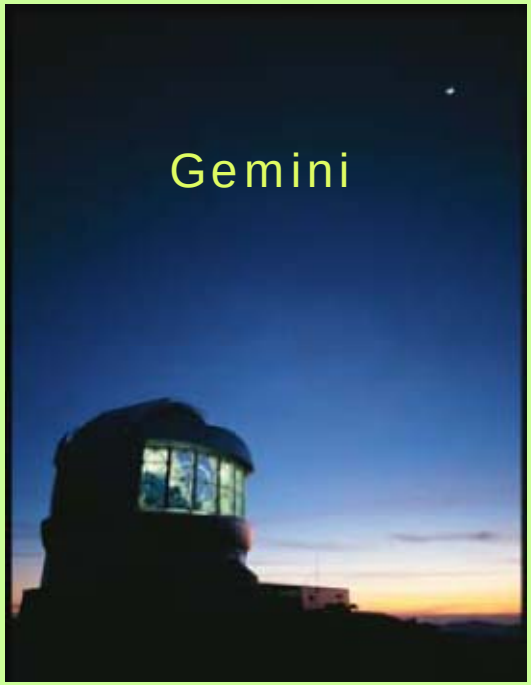
- **The Board establishes the policies of the National Science Foundation (NSF) within the framework of applicable national policies set forth by the President and the Congress.**
  - **NSF Policy:** *"Investing in the Future: NSF Cost Sharing Policies for a Robust Federal Research Enterprise."*
  - **NSF Fiduciary responsibility:** Depending on the size of the proposed award, the Board approves funding of major facilities and projects.
- **The Board also serves as an independent policy advisory body to the President and Congress on science and engineering research and education issues (examples)**
  - **Science and Engineering Indicators** (bi-annual)
  - **Policy studies: "***HURRICANE WARNING: The Critical Need for a National Hurricane Research Initiative***"**

NSF MREFC Program

early history

The MREFC program was initiated in the mid-90s for large scale science projects

The LIGO Gravitational-wave Observtory in Livingston, LA



The Gemini South telescope on Cerro Pachon in Chile

NSF MREFC Program

early history

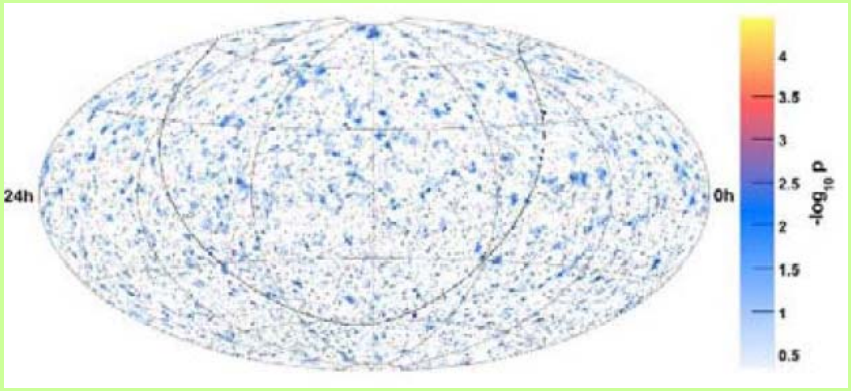
- **The MREFC program has been used for one <u>large scale infrastructure project</u>**
- **This fulfills the NSF mandate to maintain a continuous U.S. presence at the South Pole**

NSF MREFC Program

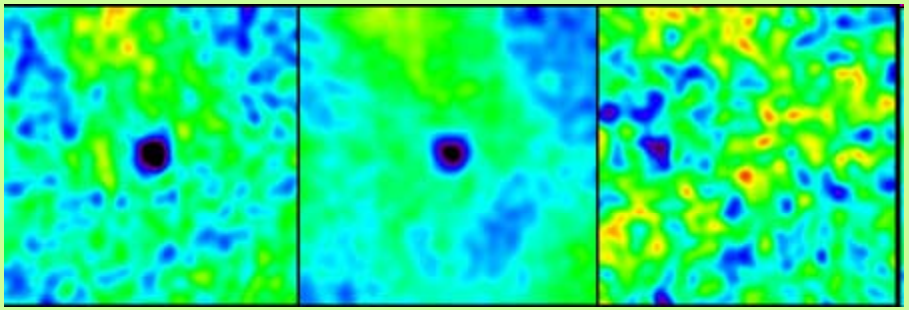
history

- **The South Pole station has <u>enabled unique and exciting science</u>**

<u>(e.g. unique astrophysics and cosmology laboratory)</u>



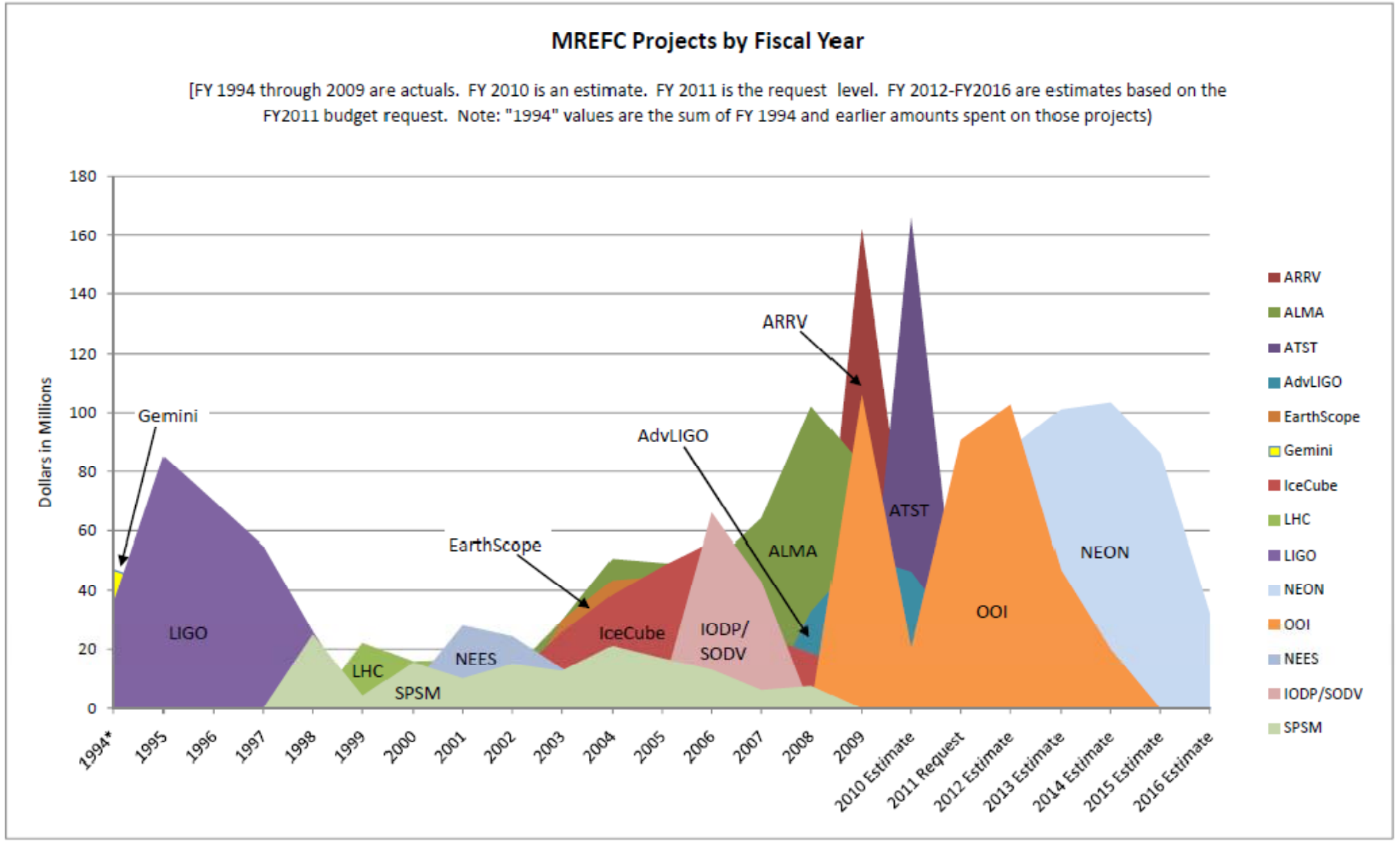
ICE CUBE sky map
detected neutrino events
(MREFC Project)



Cosmology at the South Pole
(South Pole Telescope SPT)
NSF R&RA funds

NSF MREFC Program

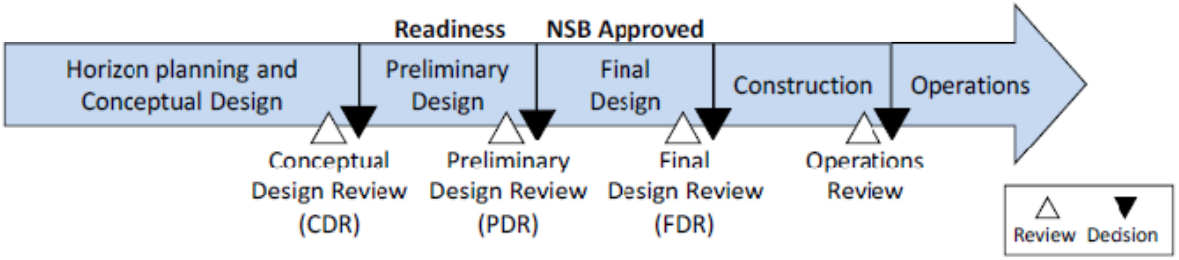
history and future obligations



MREFC Projects

project planning process

NSF's large facility project planning process



- **Review science goals**
- **Conceptual Design Stage**
  - Requirements, initial estimates of cost (including operations), risk and schedule
- **Preliminary Design ("Readiness") Stage**
  - Definition and design of major elements, detailed estimates of cost, risk and schedule, partnerships, siting
- **Final Design Stage ("Board Approved") Stage**
  - Interconnections and fit-ups of functional elements, refined cost estimates based substantially on vendor quotes, construction team substantially in place

NSF Facility Plan 3

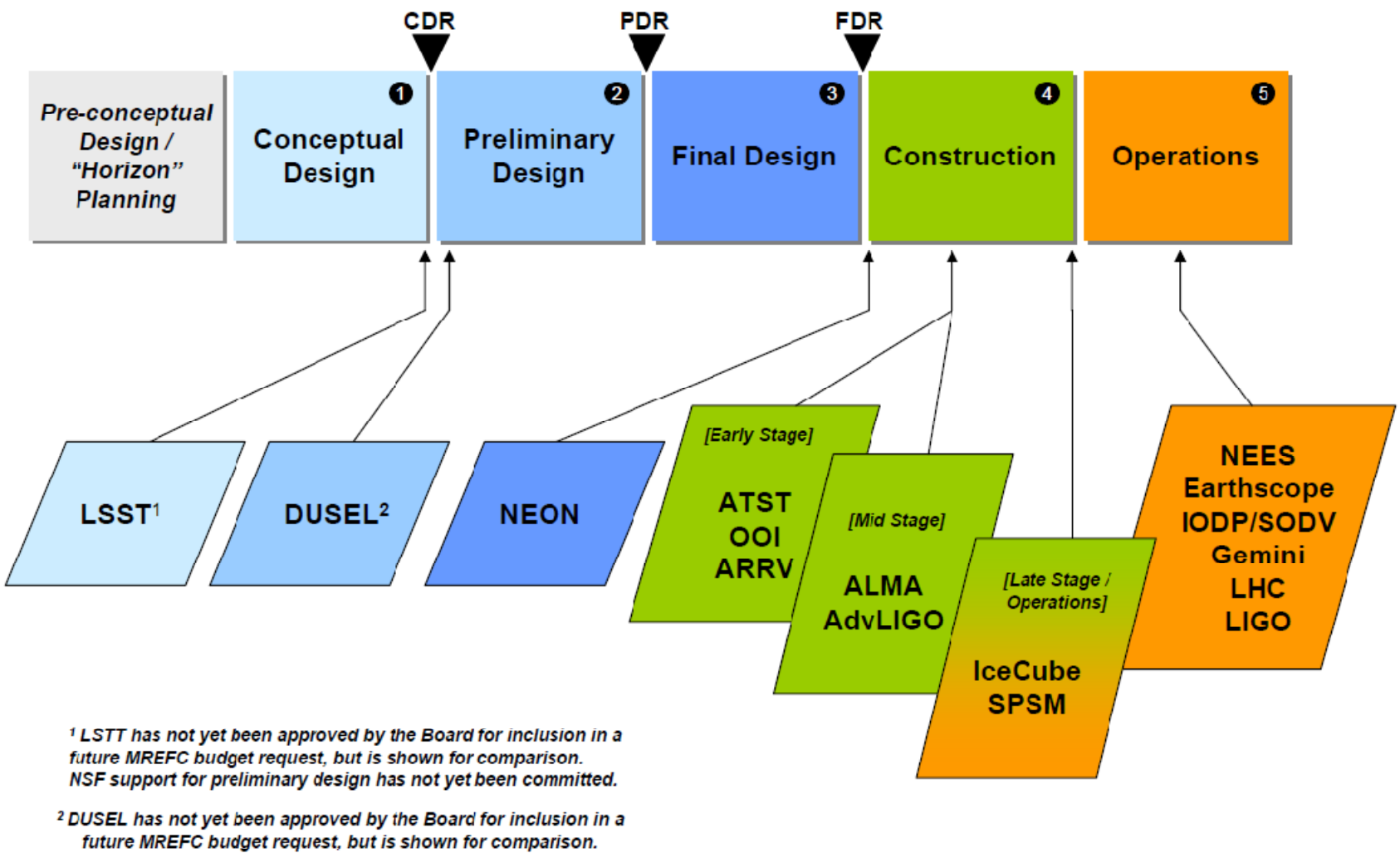
Identified MREFC 'Horizon' Projects

Jan 2010

Sponsor		Planning support to date, $M	Milestone Reviews		
			CDR	PDR	FDR
MPS	Deep Underground Science & Engineering Laboratory (DUSEL)	$25.5	Jul 2007	Expected FY 2011	Expected FY 2012
	Large-Aperture Synoptic Survey Telescope (LSST)	$26.2	Sep 2007	Planned Summer 2010	Planned Late 2010
	Energy Recovery Linac (ERL)	$23.0			
	Giant Segmented Mirror Telescope (GSMT)	$20.0			
	Square Kilometer Array (SKA)	$6.0			
OPP	Polar Research Vessel	$0.1			
	24x7 South Pole Communications (satellite)	$0.6			

MREFC Projects by Stage

ongoing and proposed

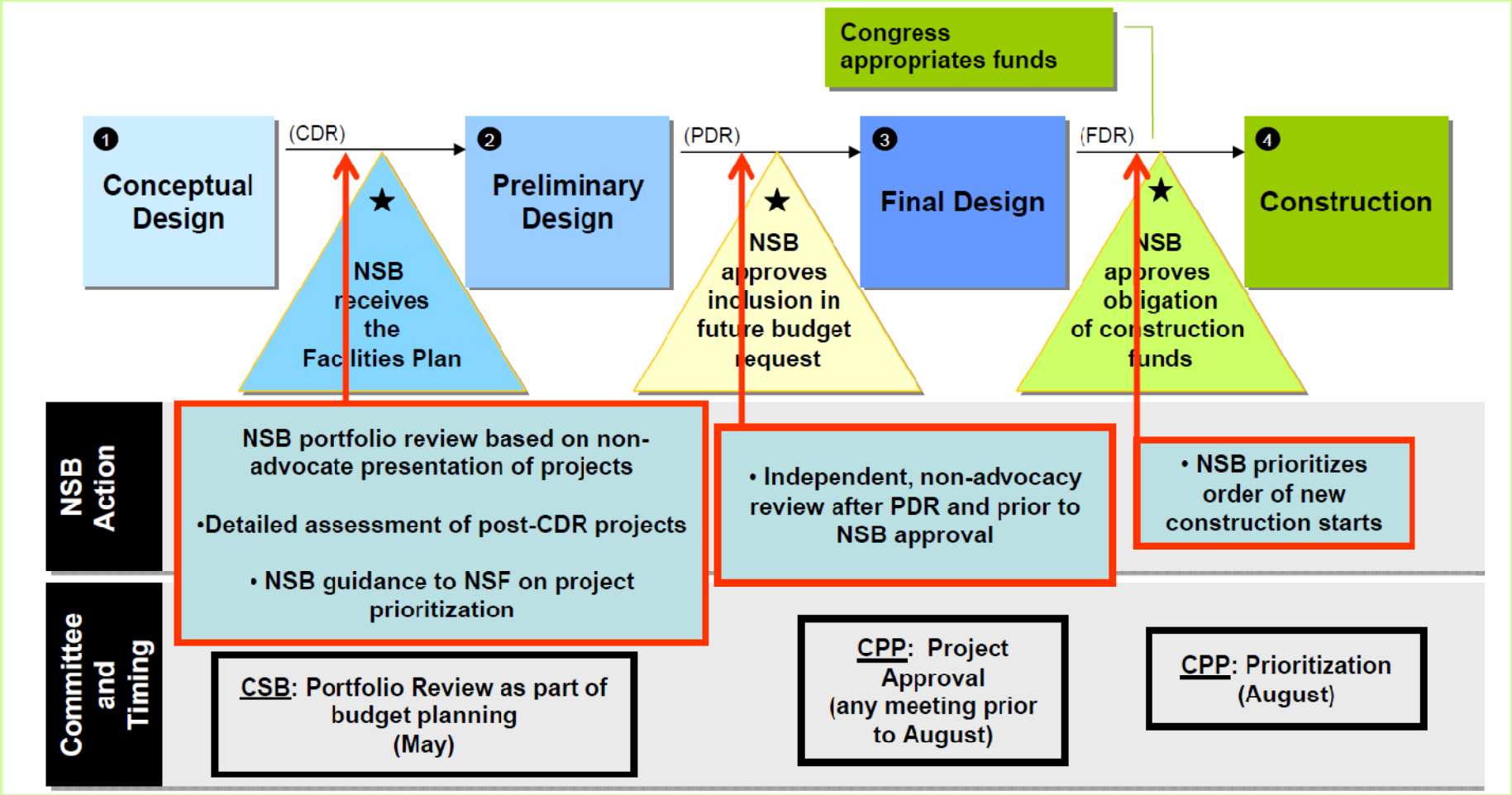


[1] LSTT has not yet been approved by the Board for inclusion in a future MREFC budget request, but is shown for comparison. NSF support for preliminary design has not yet been committed.

[2] DUSEL has not yet been approved by the Board for inclusion in a future MREFC budget request, but is shown for comparison.

MREFC Projects

NSB role in MREFC process



Annual NSF Facilities Portfolio Review

The Subcommittee on Facilities (SCF) reports to CSB and assists the Board in strategic budget planning with responsibility for the NSF-funded research equipment and facilities portfolio. SCF responsibilities include:

- Undertaking an annual review of the portfolio of all NSF-funded research facilities. This review considers projects from the Major Research Equipment and Facilities Construction (MREFC) Account, as well as large and mid-size research facilities and infrastructure funded by the Research and Related Activities (R&RA) Account. The review considers currently operating facilities, as well as those under construction and in early and late-stage planning. The review considers impacts on the long-term budgets of NSF divisions, directorates, and the Foundation as a whole and potential partnerships among NSF directorates and offices and with other organizations.

- Providing to CSB and the Board a clear assessment of the impact that specific projects and the overall facilities portfolio will have on long-term budget planning at NSF. This includes consideration of whether existing facilities continue to be the best use of NSF's limited resources given alternative potential uses of funding for research facilities and individual investigator-led research.

- Recommending to CSB and the Board guidance to be provided to NSF management on the prioritization of all projects that have completed a Conceptual Design Review (CDR) and are being considered for further funding to develop Preliminary Designs.

MREFC

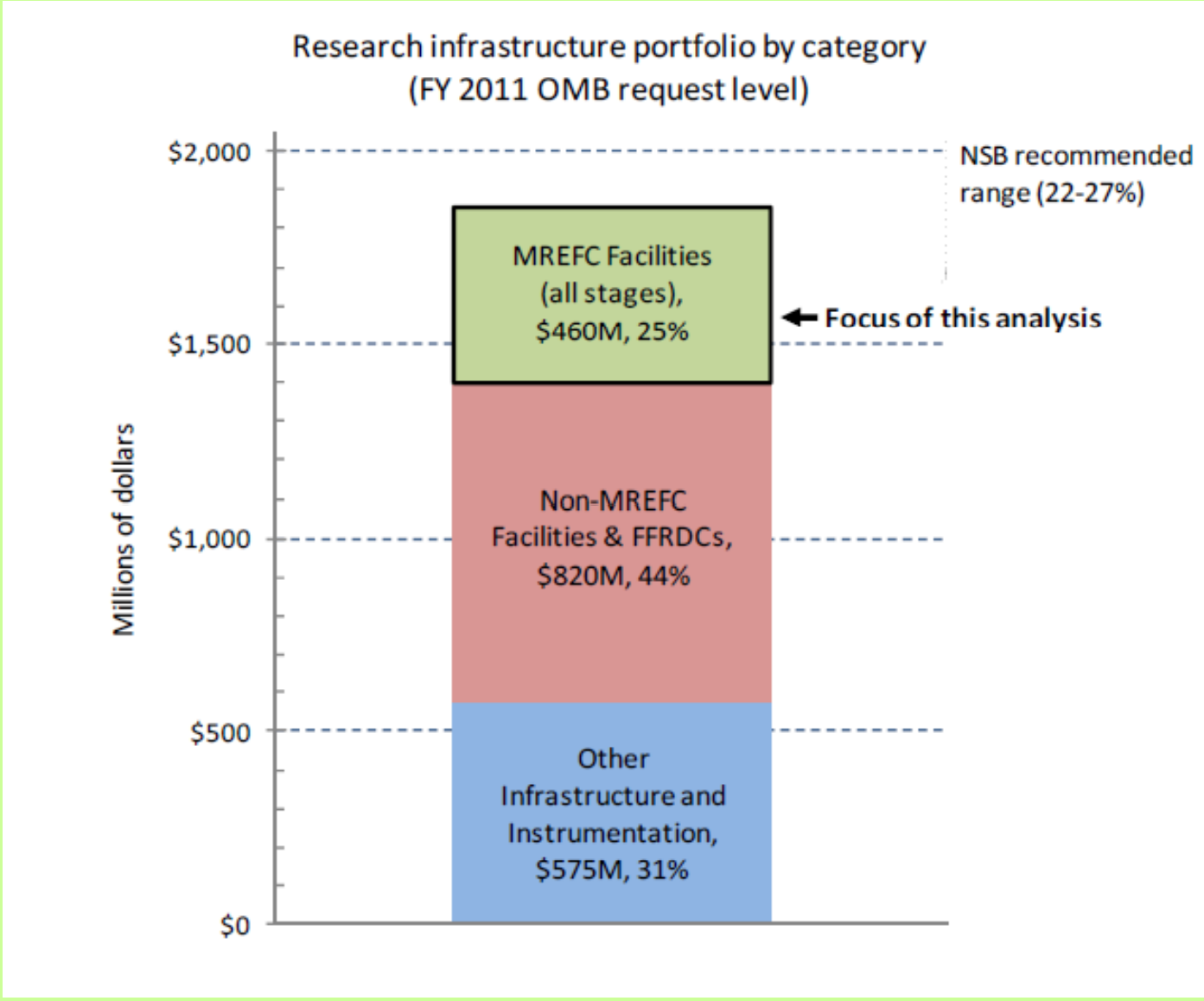
FY 2010 OMB Budget Submission

(Dollars in Millions)

	FY 2008 Actuals	FY 2009 Request	FY 2010 OMB Submission
Ongoing Projects			
AdvLIGO	$32.75	$51.43	$46.30
ALMA	102.07	82.25	42.76
EarthScope	4.21	-	-
IceCube	18.74	11.33	0.95
NEON	-	-	-
SODV	0.02	-	-
SPSM	7.57	-	-
ARRV	1.48	-	65.00
ATST	-	2.50	31.51
OOI	-	-	50.00
MREFC Total	$166.85	$147.51	$236.52

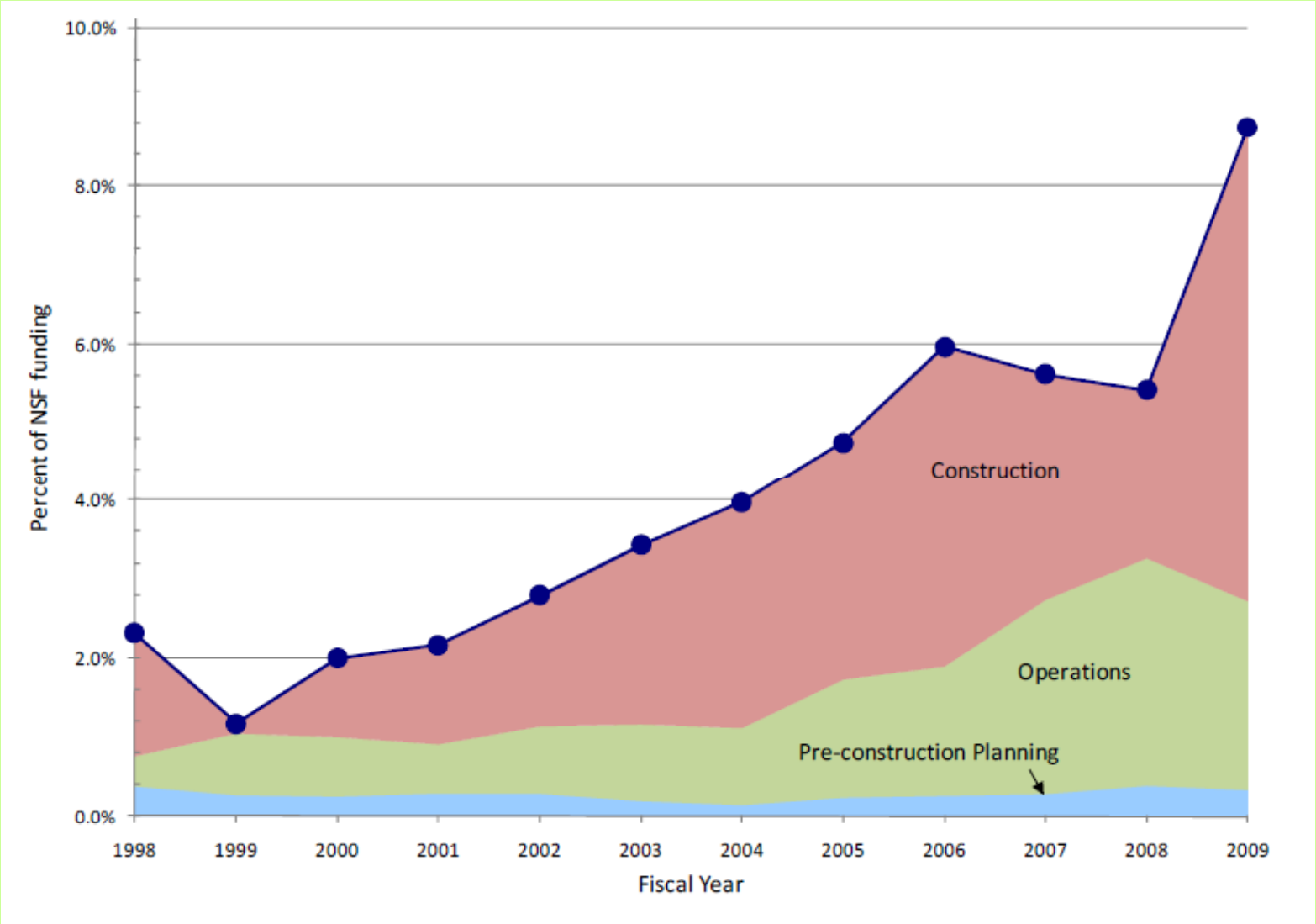
NSF Research Infrastructure

FY11 request by category



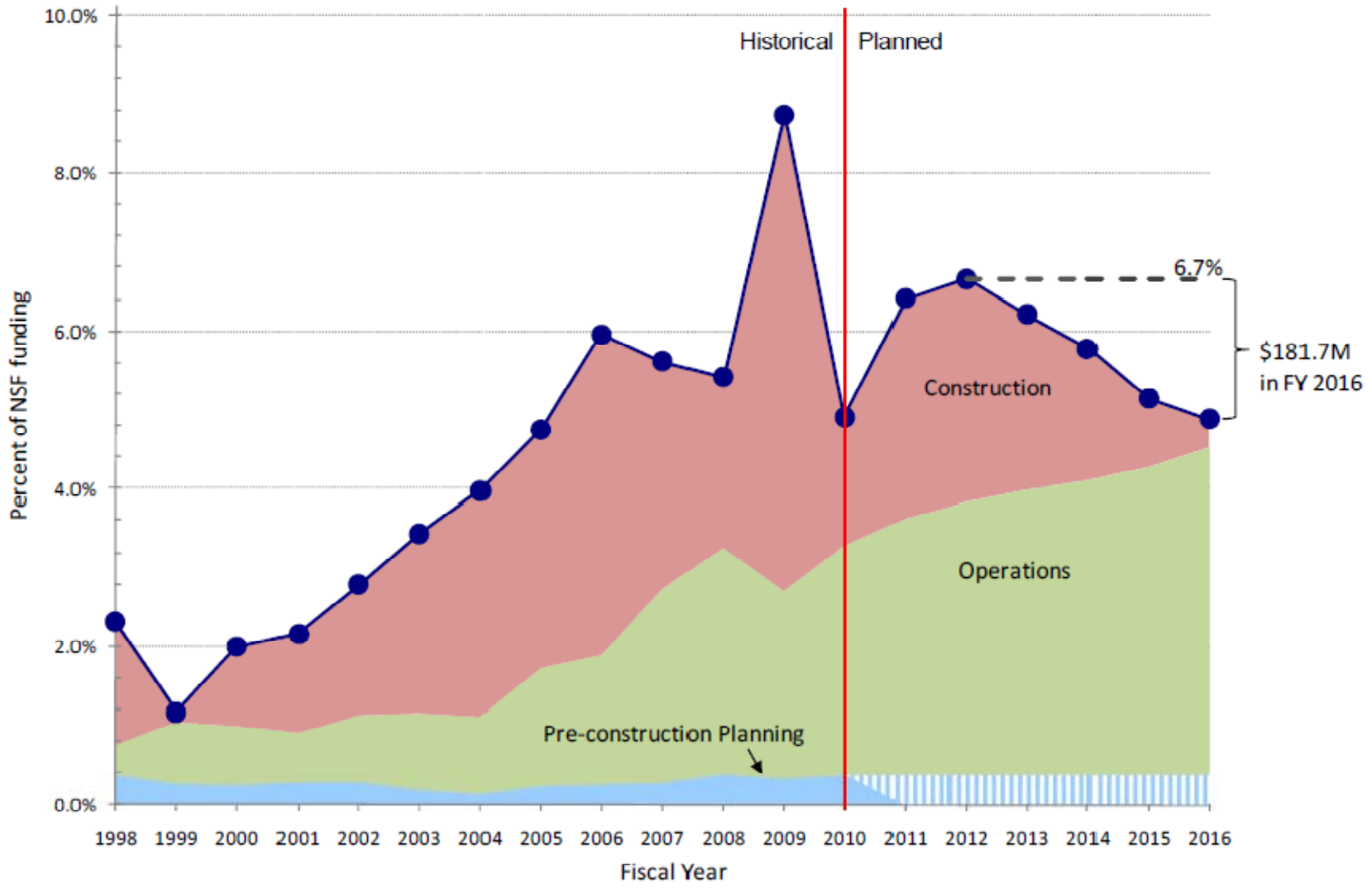
MREFC

total cost history by category



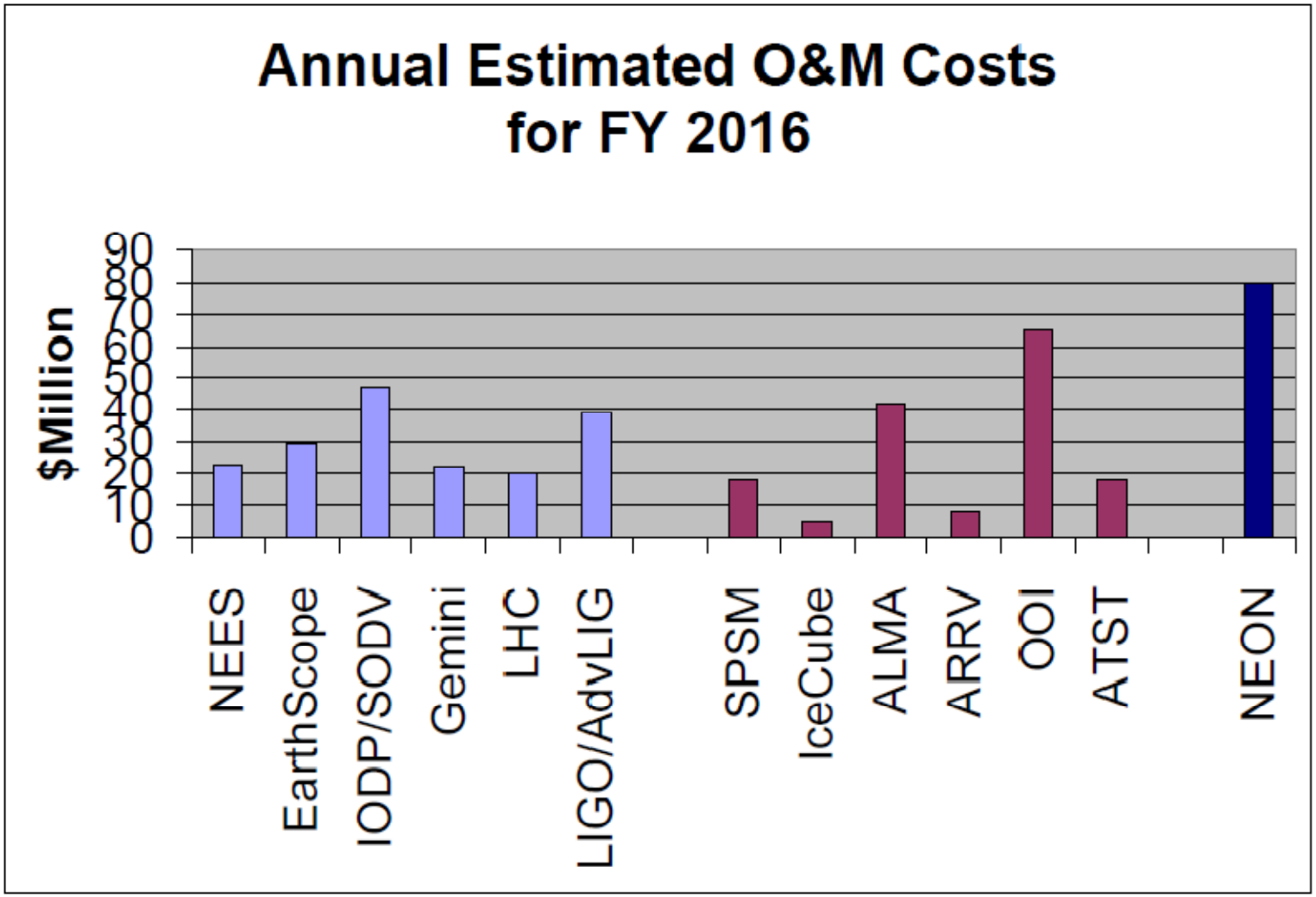
MREFC

operating costs becoming increasing burden



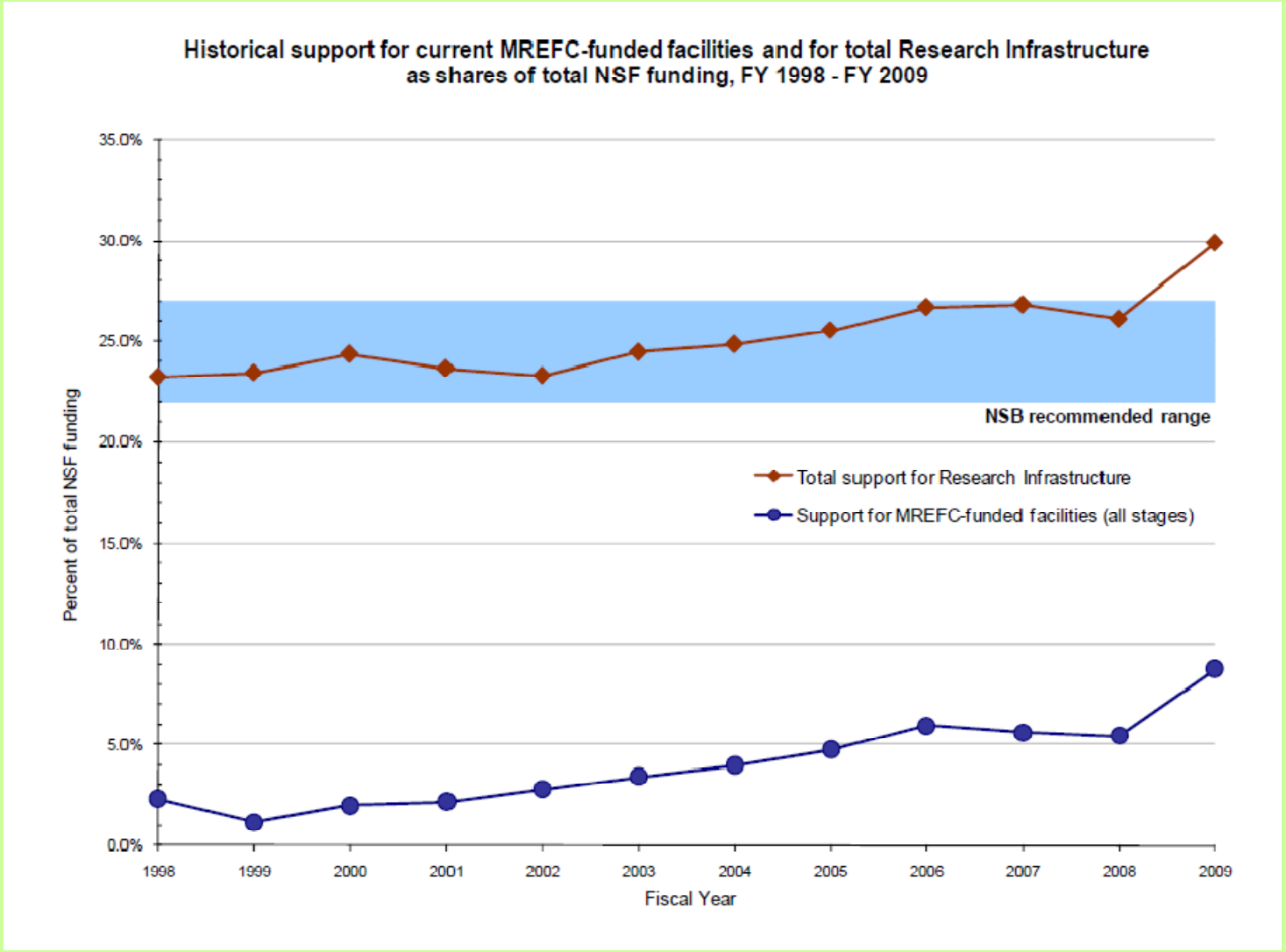
MREFC

operating costs becoming increasing burden



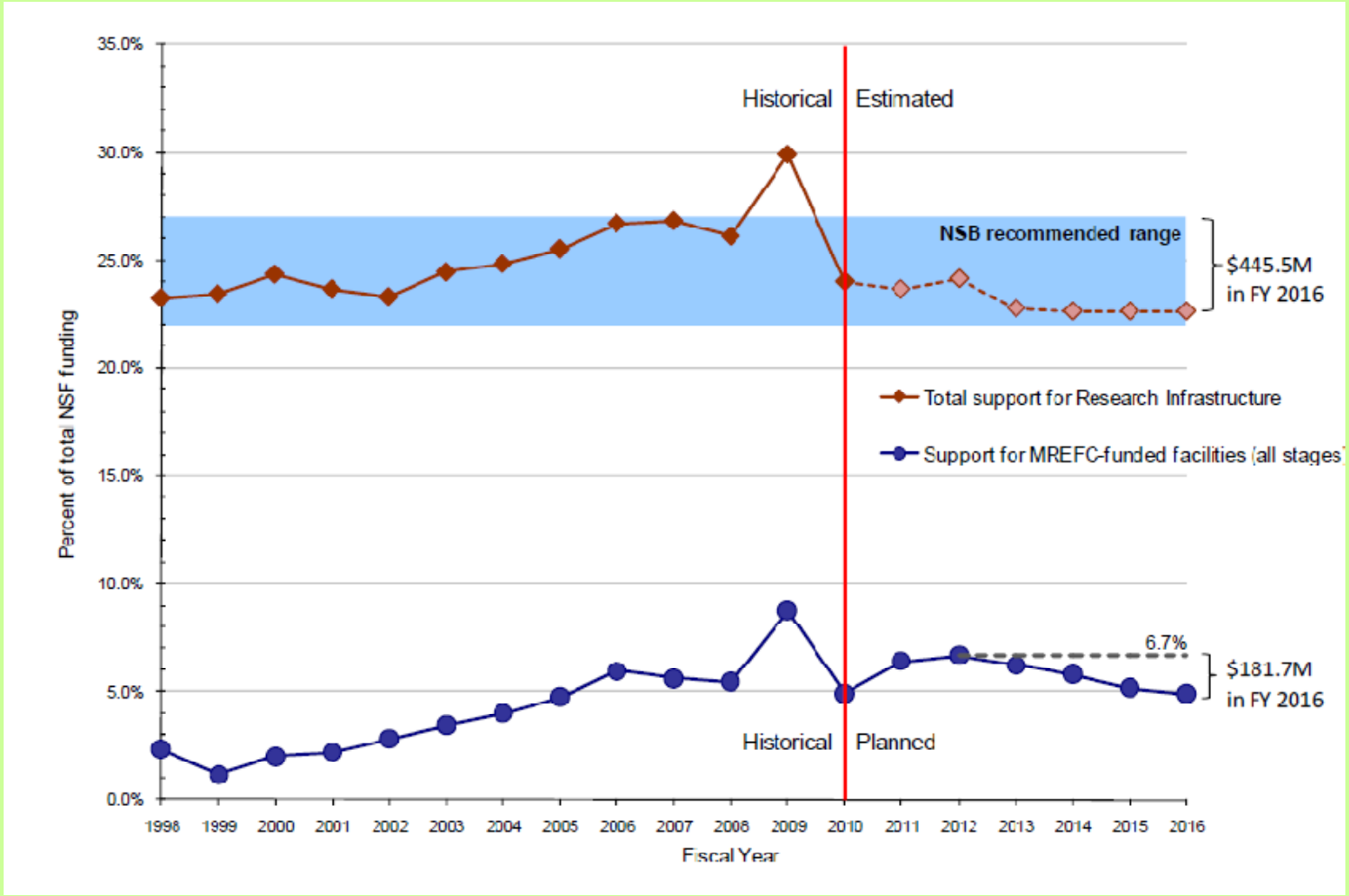
NSF Research Infrastructure

historical and recommended level



NSF Research Infrastructure

future infrastructure funding?

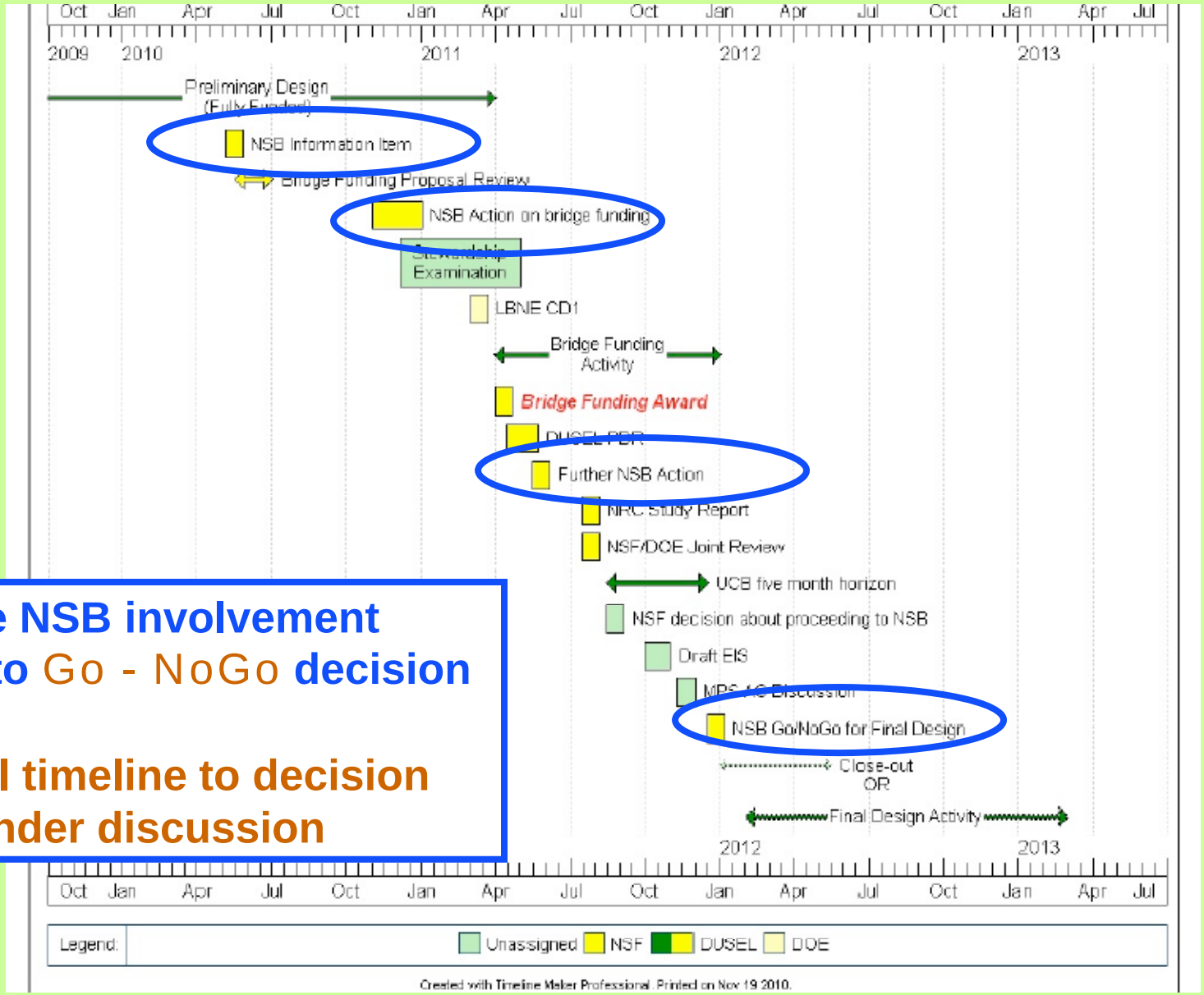


DUSEL

NSB Perspective

- **DUSEL has been presented to the NSB as an information item several times**
- **NSB Action items: only funding proposals for planning and design toward preliminary design have been considered *(e.g. > 13.6M$ award)***
- **Several critical issues have been raised:**
  - **Assessment of science opportunities?(NRC STUDY)**
  - **NSF / DoE partnership and stewardship (The NSB feels the current stewardship model is unacceptable)**
  - **Reliable Costing: Both for NSF MREFC construction and for long-term operations?**
  - **What will be needed, in order for NSB to make an informed GO - NOGO decision?**

Proposed DUSEL Decision Timeline



Active NSB involvement prior to Go - NoGo decision

Actual timeline to decision still under discussion

NRC Statement of Task

The committee will undertake an assessment of The proposed DUSEL program, including:

- **An assessment of the major physics questions that could be addressed with the proposed DUSEL and associated physics experiments,**
- **An assessment of the impact of the DUSEL infrastructure on research in fields other than physics,**
- **An assessment of the impact of the proposed program on the stewardship of the research communities involved,**
- **An assessment of the need to develop such a program in the U.S., in the context of similar science programs in other regions of the world,**
- **An assessment of broader impacts of such an activity, including but not limited to education and outreach to the public.**

NSB Perspective on Statement of Task

- **An assessment of the major physics questions that could be addressed with the proposed DUSEL and associated physics experiments,**
  - » **How important is the science? What is the discovery potential and what is required to address the key science goals?**
  - » **NRC study should make an objective assessment of the science opportunities, relative to other possible investments in the field**
  - » **NRC study should make a realistic assessment of the competitiveness of DUSEL, regarding its discovery potential, compared to the other underground initiatives worldwide**

NSB Perspective on Statement of Task

- **An assessment of the impact of the DUSEL infrastructure on research in fields other than physics,**
  - » **DUSEL is being treated at NSF and by the NSB as primarily a physics initiative having some opportunities in other fields. As a broad science agency, NSF should and can exploit the broader opportunities.**
  - » **Are you aware of any important or compelling science opportunities in fields other than physics that should be considered by the NSF and NSB**

NSB Perspective on Statement of Task

- **An assessment of the impact of the proposed program on the stewardship of the research communities involved,**
  - » **What will be the projected overall impacts of DUSEL on the relevant science fields: in terms of long term science opportunities; in terms of US leadership, in terms of supporting long-term priorities for the field, etc?**

NSB Perspective on Statement of Task

- **An assessment of the need to develop such a program in the U.S., in the context of similar science programs in other regions of the world,**
  - » **Do we need a laboratory in the U.S. to best serve the U.S. underground science community, or can they be well-served as users at facilities in other countries (especially considering that available U.S. resources could be more concentrated in doing science).**

NSB Perspective on Statement of Task

- **An assessment of broader impacts of such an activity, including but not limited to education and outreach to the public.**
  - » **Are there special features of having an underground laboratory in South Dakota that could be exploited to serve the country's best interests?**
  - » **Would DUSEL in South Dakota present special opportunities for education and outreach?**

Conclusions

- **The NSF MREFC program expands the scope of the NSF research program to include large facilities.**
  - » **AdLIGO, South Pole Station, Ocean Observatory, NEON, ATST, etc**
- **A procedure, including MREFC annual Portfolio Reviews, CDR, PDR, FDR etc, has been put into place. BUT, one size doesn't fit all!**
- **The perspective for future MREFCs include:**
  - » **Much competition; uncertain budgets; rising operating costs**
  - » **First criteria: SCIENCE OPPORTUNITIES**
- **DUSEL**
  - » **Need an understanding of the realistic science opportunities, especially relative to the worldwide program (NRC panel)**
  - » **DoE/NSF partnership; design; construction costs; operating costs; safety; risks, etc must be determined for PDR**
- **NSF / NSB key decision will be after PDR, whether to proceed to FDR?**