

Pursuit of a MREFC at NSF

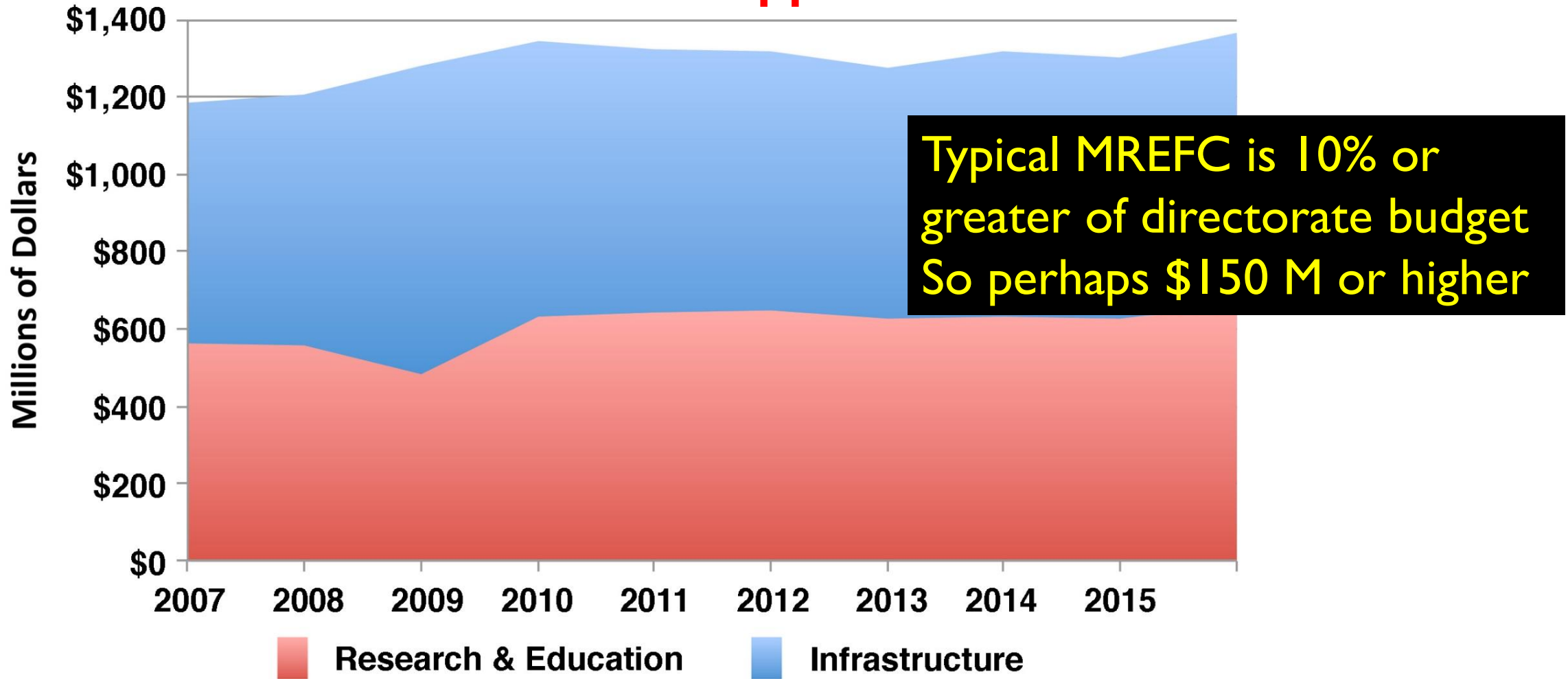
or really,

Yes, it can be done!

This is a talk about the mechanics of
getting a MREFC award within NSF

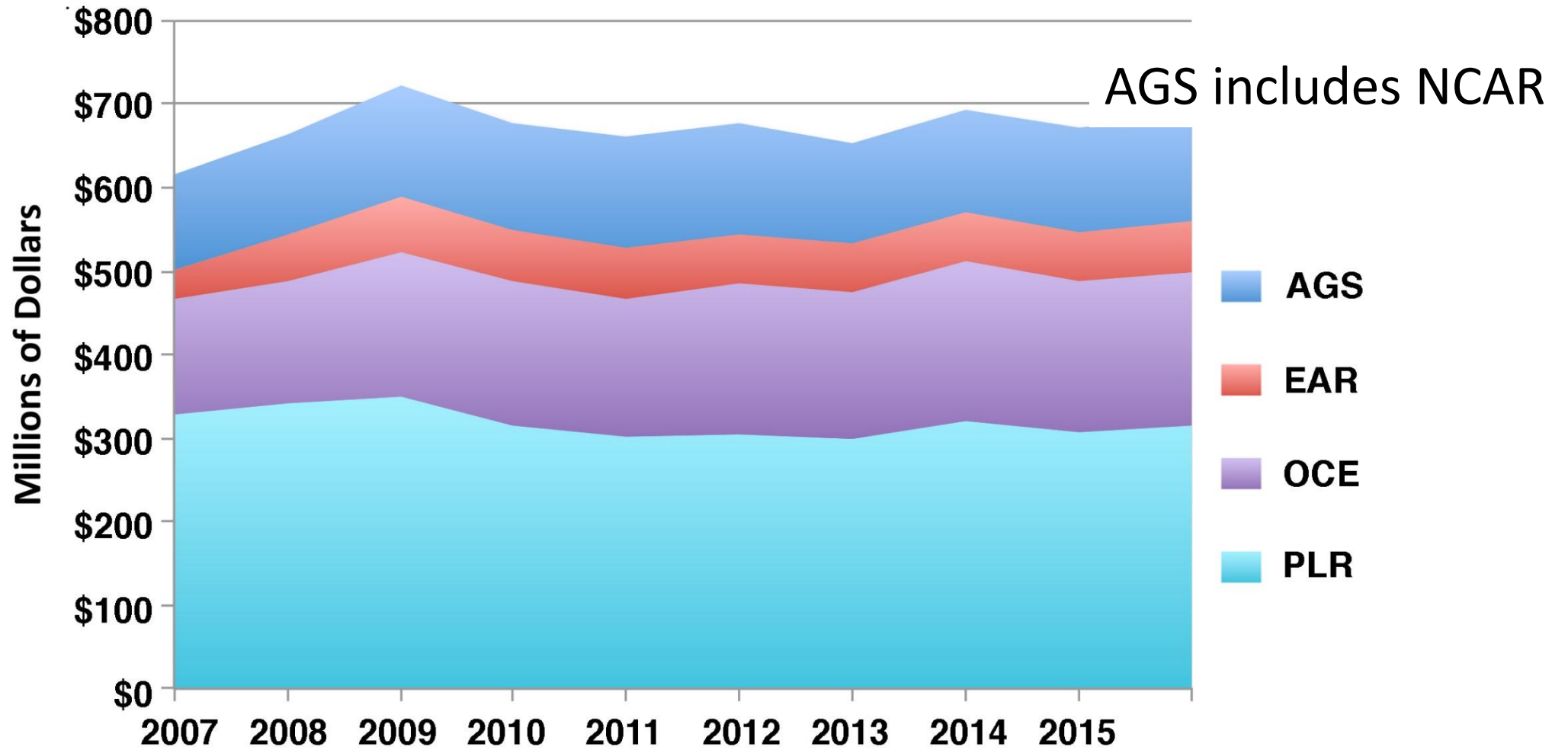
Setting the stage for our discussion

Infrastructure Support in GEO



Support for infrastructure stable: 51% - 54% of total, 51.4% in 2016 Request

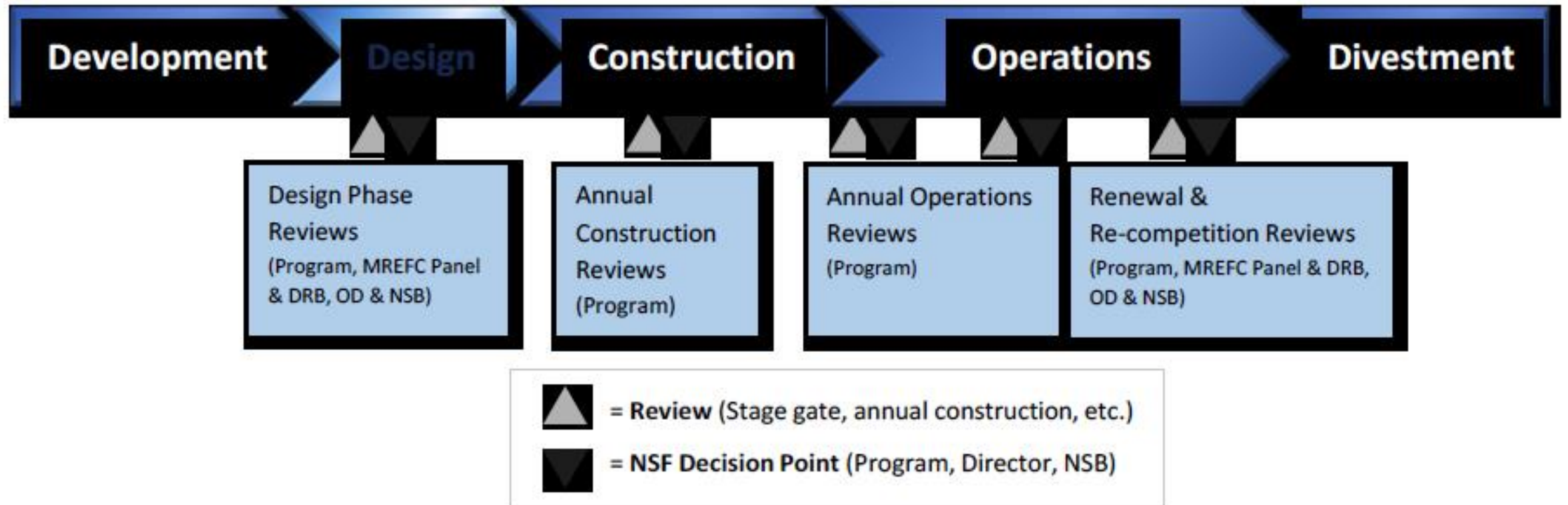
GEO Infrastructure- further breakdown re divisions



AGS – Atmospheric & Geospace Sciences
EAR – Earth Sciences

OCE – Ocean Sciences
PLR – Polar Programs

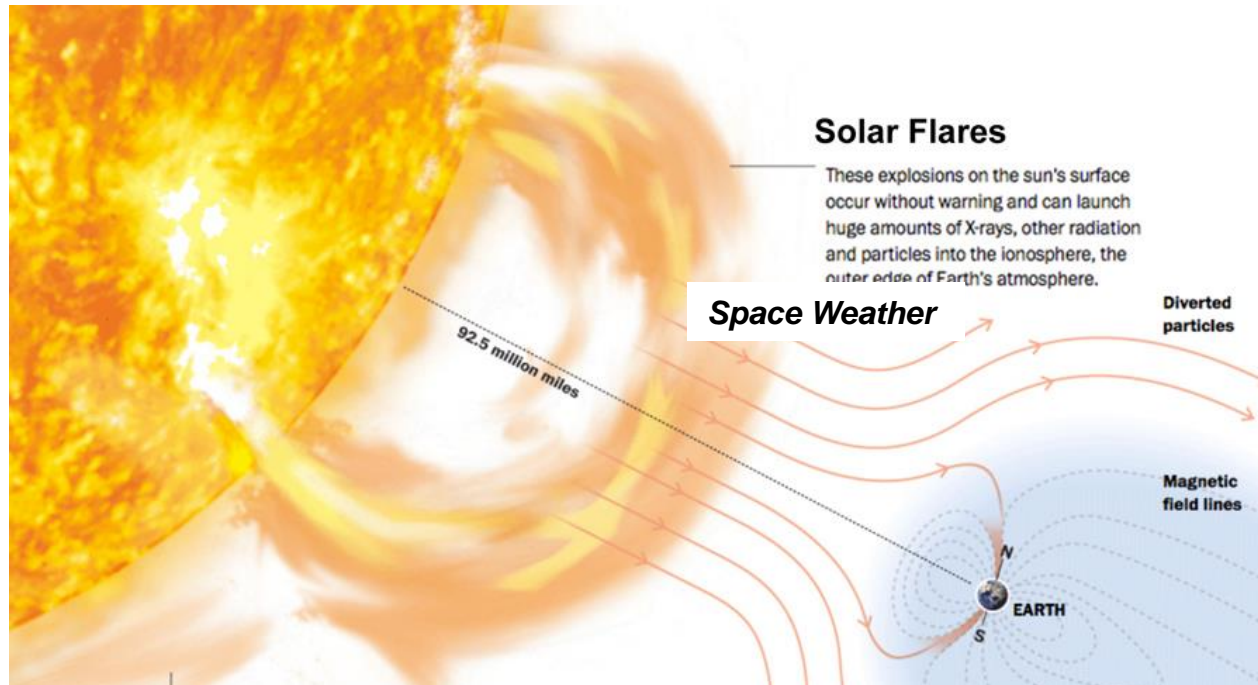
Figure 2.1.3-1 Progressive Steps in the MREFC Life Cycle, Showing Review and Decision Points for Exit and Entry into Each Stage. The Design Stage is highlighted to indicate that it is further broken down into phases



Life cycle of a MREFC facility

Imperatives & Frontiers

- IMPERATIVES are GEO's highest priorities
- FRONTIERS are emerging areas of opportunity and critical for possible future science emphasis



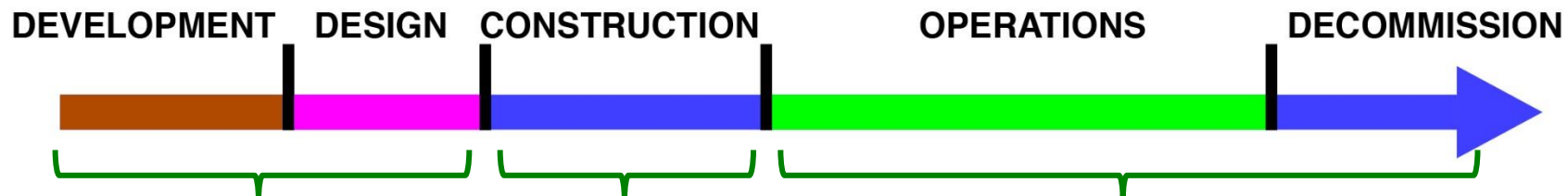
In our case, space weather is the motivating theme

Imperatives motivating GEO MREFC initiatives

1. **Research** (potentially transformative)
2. **Community Resources & Infrastructure**
(presently limited due to sparseness)
3. **Education & Diversity**
(STEM magnet attracting strong students)
4. **Data & Cyber-infrastructure**
(How to get the data products from the sensor to the central depository for ingestion into Space Weather models
Sun to Earth in one snapshot)

Examples of MREFCs facilities within GEO

MREFC Timeline



Specific Examples



RCRV
Regional Class Research Vessel



Sikuliaq



IODP
Intern. Ocean Discovery Prog.



NCAR
National Center for Atmos. Res.



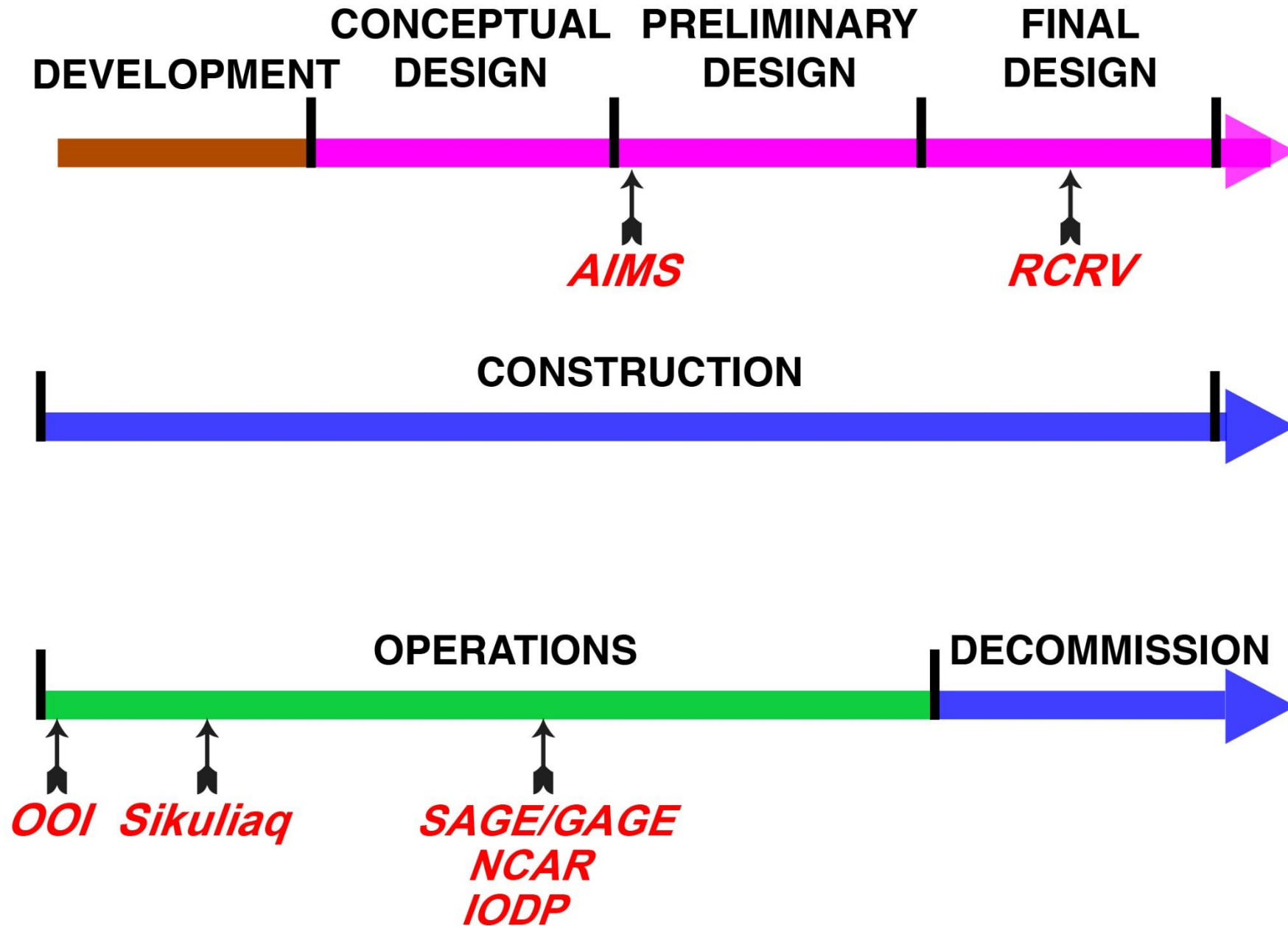
OOI
Ocean Observatories Initiative

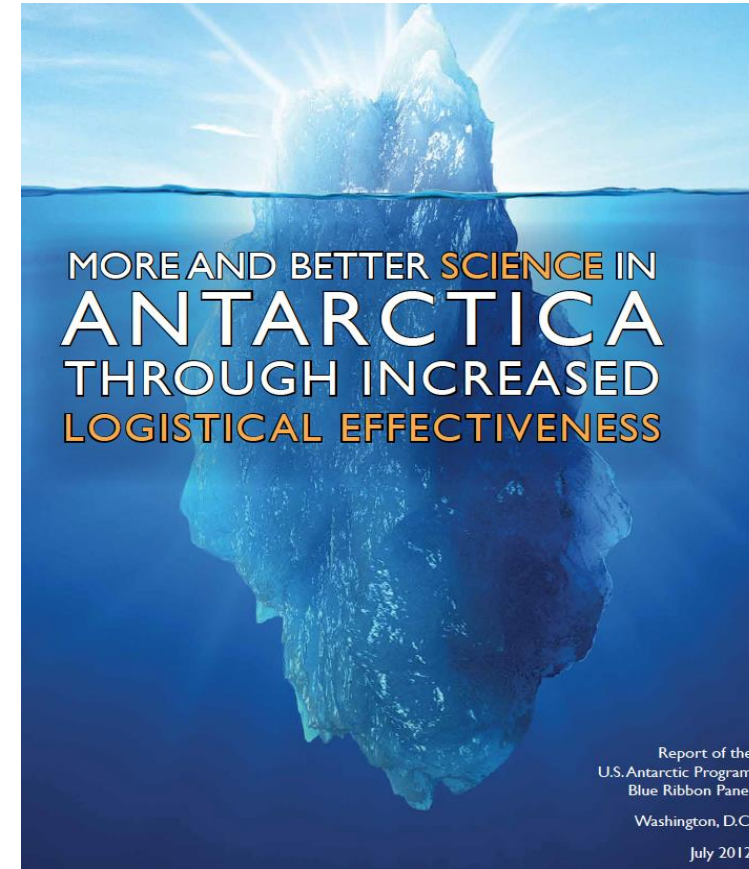
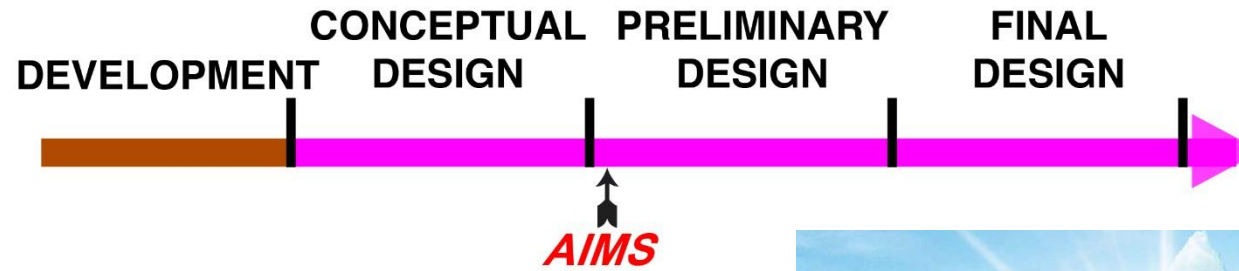


SAGE/GAGE
Seismological Facil. for the Advancement of Geo. & EarthScope
Geodesy Advancing Geo. & EarthScope



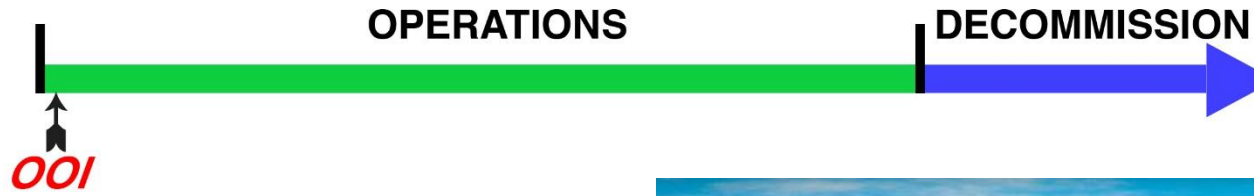
AIMS
Antarctic Infrast. Modernization for Sci.



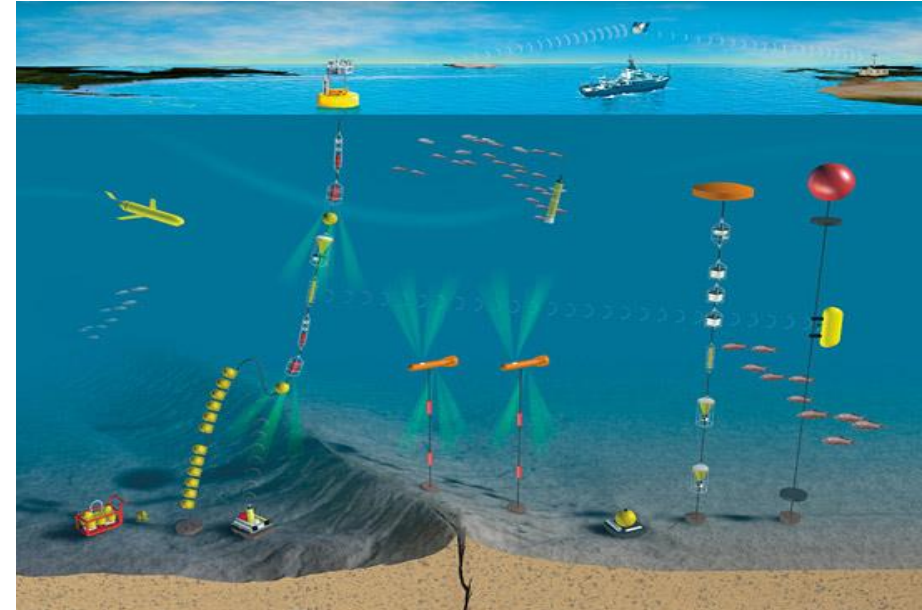


AIMS -

- **Conceptual Design Review April 2015**
- **Preliminary Design Phase October 2015**
- **4 Board members visited Antarctica in early November**
- **Additional discussion in Joint CPP/SCF closed session**



Networked infrastructure of science-driven sensor systems to measure the physical, chemical, geological and biological variables in the ocean and seafloor.



OOI -

- Commissioning and Science Trials in November 2015
- On budget (\$386.4M) & 8 months behind schedule. CI issues addressed and will fully function as a network by the end of the year
- 99% hardware delivered (sans one buoy system)
- Release re-compete solicitation Spring 2016/Proposals due Fall 2016
- **NSB action item May 2017 for a new O&M award**
- New award June 2017
- “Sea Change” – Reduce O&M \$55M ➡ \$44M will be specified in the solicitation

Eligibility for MREFC Funding

Comments from “Large Facility

Manual”

- To be eligible for consideration for MREFC funding, each candidate project should represent an outstanding opportunity to enable research and innovation, as well as education and broader societal impacts.
- Each project should offer the possibility of transformative knowledge and the potential to shift existing paradigms in scientific understanding, engineering processes and/or infrastructure technology.
- Moreover, each should serve an urgent contemporary research and education need that will persist for years beyond the often lengthy process of planning and development.
In other words both intellectual merit and broader impact both matter!

- MREFC must have received strong endorsement of the appropriate science and engineering communities, based upon a thorough external review, including an assessment of

(1) Scientific and engineering research merit

(2) Broader societal impacts

(3) Importance and priority within the relevant Science and Engineering communities,

(4) Technical and engineering feasibility, and

(1) Management, cost, and schedule issues;

All issues must be addressed

The large facility manual provides a summary matrix of the steps required.

FIGURE 1
Conceptual Design Phase

Preliminary Design (Readiness) Phase

Final Design (Board Approved) Phase

Construction

Operations

Preconstruction Planning Funded via R&RA and EHR funds

MREFC funds

R&RA, EHR funds

Develop construction budget based on conceptual design
Develop budget requirements for advanced planning
Estimate ops \$

Expend ~5-25% of construction cost on planning & design activities
Construction estimate based on prelim design
Update ops \$ estimate

Final design over ~ 2 years
Construction-ready budget & contingency estimates
Update ops \$ estimate

Expend budget & contingency per baseline
Refine ops budget

Yearly budgets with out-year projects

Formulate science goals; define requirements, prioritize, review
Develop conceptual design; identify critical technologies, high risk items
Formulate initial risk assessment
Develop top-down parametric cost and contingency estimates
Initial proposal submission to NSF
Initial Project Execution Plan (PEP)

Proponents development strategy defined in Project Development Plan

Develop site-specific preliminary design, environmental impacts
Develop enabling technologies
Bottom-up cost and contingency estimates, updated risk analysis
Develop Project Management Control System
Develop preliminary operations cost estimate
Update PEP

Develop final construction-ready design & PEP
Industrialize key technologies
Refine bottom-up cost and contingency estimates
Finalize Risk Assessment & Mitigation, Management Plans
Complete key staff recruitment

Construction per baseline and PEP

Annual Work Plans with goal setting
Annual Reports that track progress relative to goals

NSF oversight defined in Internal Management Plan, updated by development phase

Merit review, apply 1st and 2nd ranking criteria
MREFC Panel recommendation → Director approval for CD start
Develop Internal Management Plan (IMP), est. PD costs, timeline
Establish interim review plan and competition milestones
Forecast international and interagency participation, issues
Initial analysis of NSF opportunities, risks
Conceptual Design Review (CDR)

NSF Director approves PD phase

NSF Director approves PD start, Internal Mgmt Plan (IMP)
Approve Project Development Plan (PDP) & budget
Evaluate design costs, schedules; and ops costs est.
Forecast external partner decision milestones
Preliminary Design Review (PDR) & integrated baseline review, cap total project budget
NSF Director requests NSB approval for MREFC request
NSB prioritization

NSF approves submission to NSB

OMB/Congress negotiations on proposed project and budget profile
Semi-annual assessment of baseline and projected ops budget for projects not in construction
Finalization of interagency and international requirements, agreements
Final Design Review (FDR), fix baseline

Congress appropriates funds

Congress appropriates MREFC funds & NSB approves obligation
Periodic external review during construction
Review of project reporting
Site visit and assessment

Annual or regular reviews of operations
Preparation for facility re-competition, renewal or disposal/divestment

Complicated but doable!

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Budget evolution

Project evolution

Program & Oversight evolution

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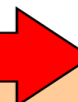
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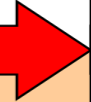
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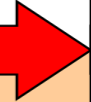
Talk to Director at NSF

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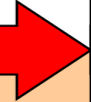
Flesh out conceptual design with site-specific preliminary design

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Talk to NSF Director again

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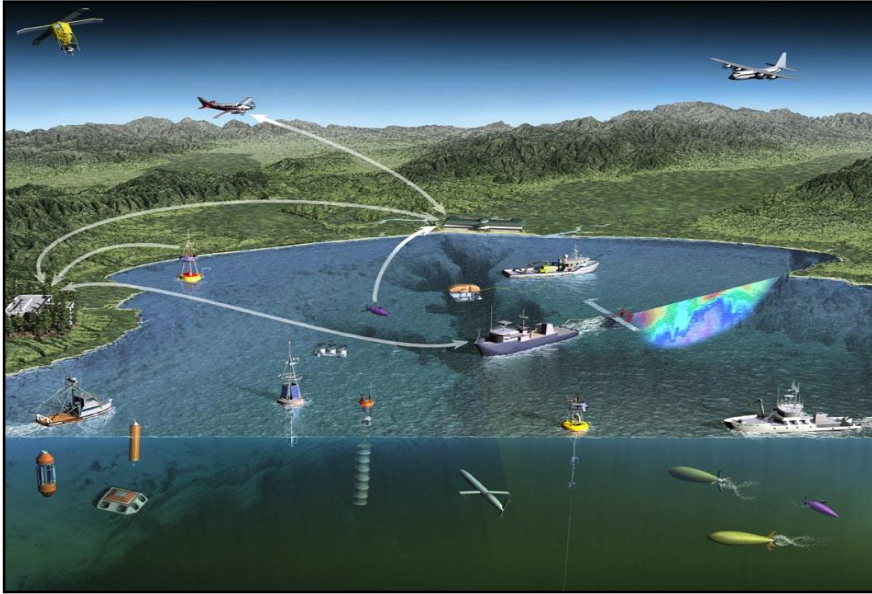
Talk to National Science Board

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But in the end, Congress decides.

Further example:

OOI Development Activities



- Ocean Community observing planning efforts 1988-2004
- ORION Community meeting January 2004
- Project Office awarded March 2004
- Review of community Request for Assistance proposals September 2005
- Design and Implementation workshop March 2006
- Science and Design Reviews June-August 2006
- Award of Implementing Organizations March-August 2007
- Adaptation of Network Design in response to community comments August-October 2007
- Science and Design Reviews October-December 2007





~~Ocean Observatories Initiative~~

Space Weather Observing System

OOI Scientific Drivers

- Ocean's role in storing anthropogenic carbon
- Impact of increased atmospheric CO₂ on ocean chemistry and ecosystems
- Impact of climate change and human activity on coastal ecosystems
- Impact of storms on exchanges of heat, gases and nutrients
- Importance of microbial activity in the ocean and in the sub-seafloor biosphere
- Processes controlling the size and frequency of earthquakes

SWOS Scientific Drivers

?

AER-MAG-STR communities need to fill in the blanks
other communities also: **AST and MPS and ENG**



~~Ocean Observatories Initiative~~

Space Weather Observing System

OOI Research Themes

- Climate Variability, Ocean Food Webs, and Biogeochemical Cycles
- Coastal Ocean Dynamics and Ecosystems
- Global and Plate-Scale Geodynamics
- Turbulent Mixing and Biophysical Interactions
- Fluid-Rock Interactions and the Sub-Sea-floor Biosphere

SWOS Research Themes

?

More blanks

• Notice no single focus but a broad profile of issues

Space Weather Observing System

OCB Priorities

- Ocean acidification
- Ocean carbon uptake and storage
- Terrestrial/coastal carbon fluxes and exchanges
- Climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles
- Mesopelagic ecological and biogeochemical interactions
- Benthic-pelagic feedbacks on biogeochemical cycles

SWOS Priorities

?

Conceptual design needs to be innovative, imaginative, bold, and outreaching to public and educational interests

- Thus, you folks need to make a plan!

but



- **Keep working the plan!**

Finally, one caveat – Congress is in the midst of changing the rules to achieve more oversight re auditing MREFC expenditures.