



# NSF Division of Astronomical Sciences Perspective and Response to Questions

Decadal Survey Committee Meeting  
5 October 2009

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# Outline

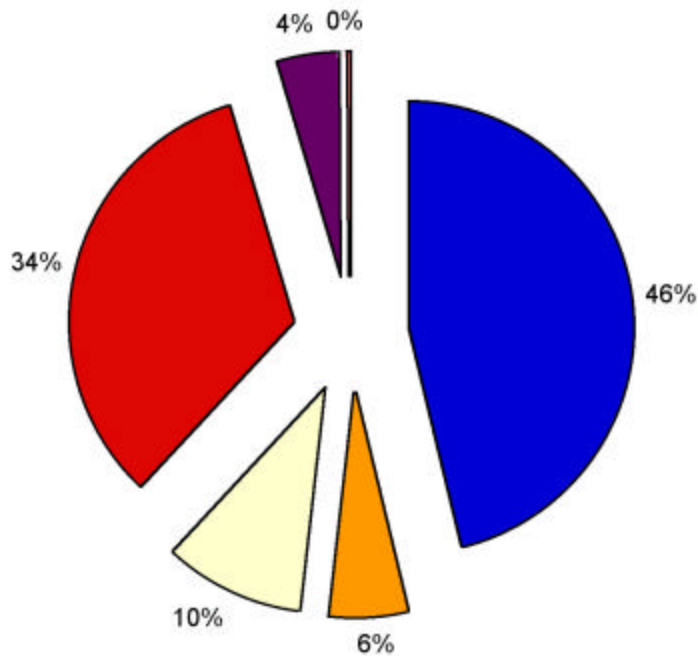
- Context
- FY 2009 spending, FY 2010 budget
- Budget projections
- MREFC process
- Senior Review and Advisory Mechanisms
- Other questions, with answers
- Further questions?

# Context

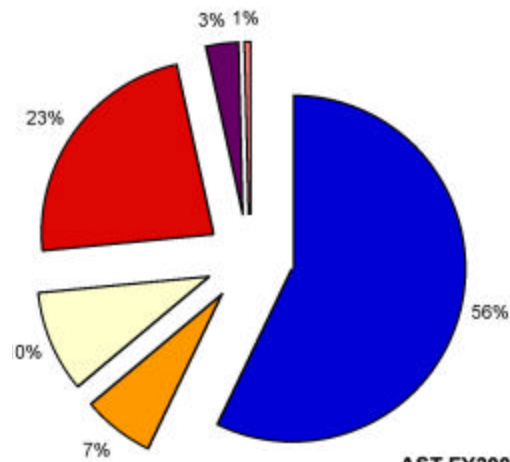
- FY2009 was a remarkably unusual year
- The Division of Astronomical Sciences has been without a full-time Division Director for 18 months (Dr Craig Foltz has moved from Acting DD, which is a limited duration appointment, to Temporary DD)
- We have been without an Executive Officer (now Deputy DD) for 4 months
- We are short arguably 3-4 Program Officers, with one more leaving this month
- Interviews for DD and DDD are later this month but the most optimistic start is January 2010, probably significantly later
- One PO hiring has closed, and one is now open (until November 20), but we do not have permission for the others we need
- New management can change the division's direction
- Limited staff lack the leisure for planning

# FY2009 spending (including American Reinvestment and Recovery Act, ARRA)

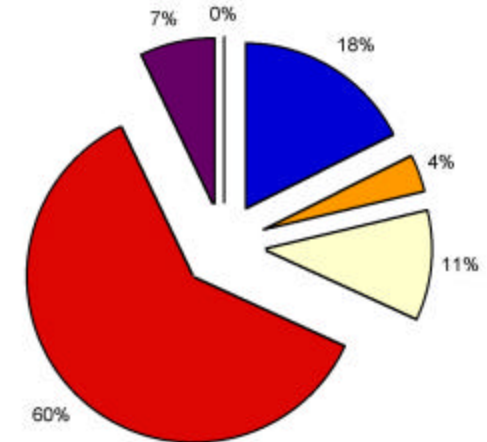
AST FY2009 combined \$316m



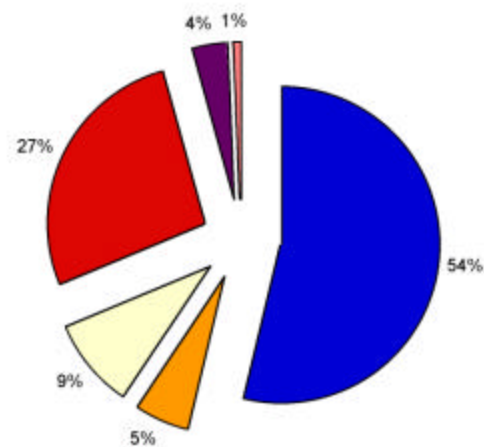
AST FY2009 \$228m



AST FY2009 ARRA \$88m



AST FY2008 \$219m



## Q: spending of ARRA funds and mitigation of future risk

- As shown, roughly 2/3 for grants and 1/3 for facilities
- Quite strong restrictions, some suggested spending not permitted
- Success rate in research grants program (AAG) rose from last year's 21% to a healthy 36%
- Risk exaggerated: even if all awards were 3 years (they weren't) and all of them came back in exactly 3 years (which they won't), only a 15% increase, which we have seen and handled before
- Yes, the funding rate will not be this high in future
- Increases for CAREER (low success rate anyway)
- Increase in postdoc support (no risk)

# FY 2009 Budget Plan & FY 2010 Budget Request

## Mathematical and Physical Sciences Funding (Dollars in Millions)

	FY 2008	FY 2009	FY 2009	FY 2010	Change Over	
	Actual	Current Plan	ARRA Estimate	Request	FY 2009 Plan Amount	FY 2009 Plan Percent
Astronomical Sciences	\$217.90	\$228.62	\$85.80	\$250.81	\$22.19	9.7%
Chemistry	194.62	211.35	103.00	238.60	27.25	12.9%
Materials Research	262.55	282.13	106.90	308.97	26.84	9.5%
Mathematical Sciences	211.75	226.18	98.00	246.41	20.23	8.9%
Physics	251.64	274.47	96.30	296.08	21.61	7.9%
Office of Multidisciplinary Activities	32.67	33.21	-	39.13	5.92	17.8%
<b>Total, MPS</b>	<b>\$1,171.13</b>	<b>\$1,255.96</b>	<b>\$490.00</b>	<b>\$1,380.00</b>	<b>\$124.04</b>	<b>9.9%</b>

# FY 2010 Budget Request

AST Total: \$250.8 M (increase of 10% over FY 2009)

- Facilities: \$141 M
  - Gemini - \$19.1 M
  - NAIC - \$8.4 M
  - NOAO - \$27.5 M
  - NSO - \$9.1 M
  - NRAO - \$67.1 M
  - UROs - \$10 M
- Research and Education Grants: \$110 M total
  - Roughly \$45M for AAG;
  - \$37 M for instrumentation & future developments (ATI, TSIP, GSMT, LSST, 'mid-scale')
  - \$25 M for special programs (AAPF, CAREER, REU, Cyberinfrastructure (VAO), NSF-wide, etc)

# Budget Projections?

Administration, congressional support for NSF budget doubling over 10 years

How will AST fare in this growth?

Administration priorities not well aligned with AST:

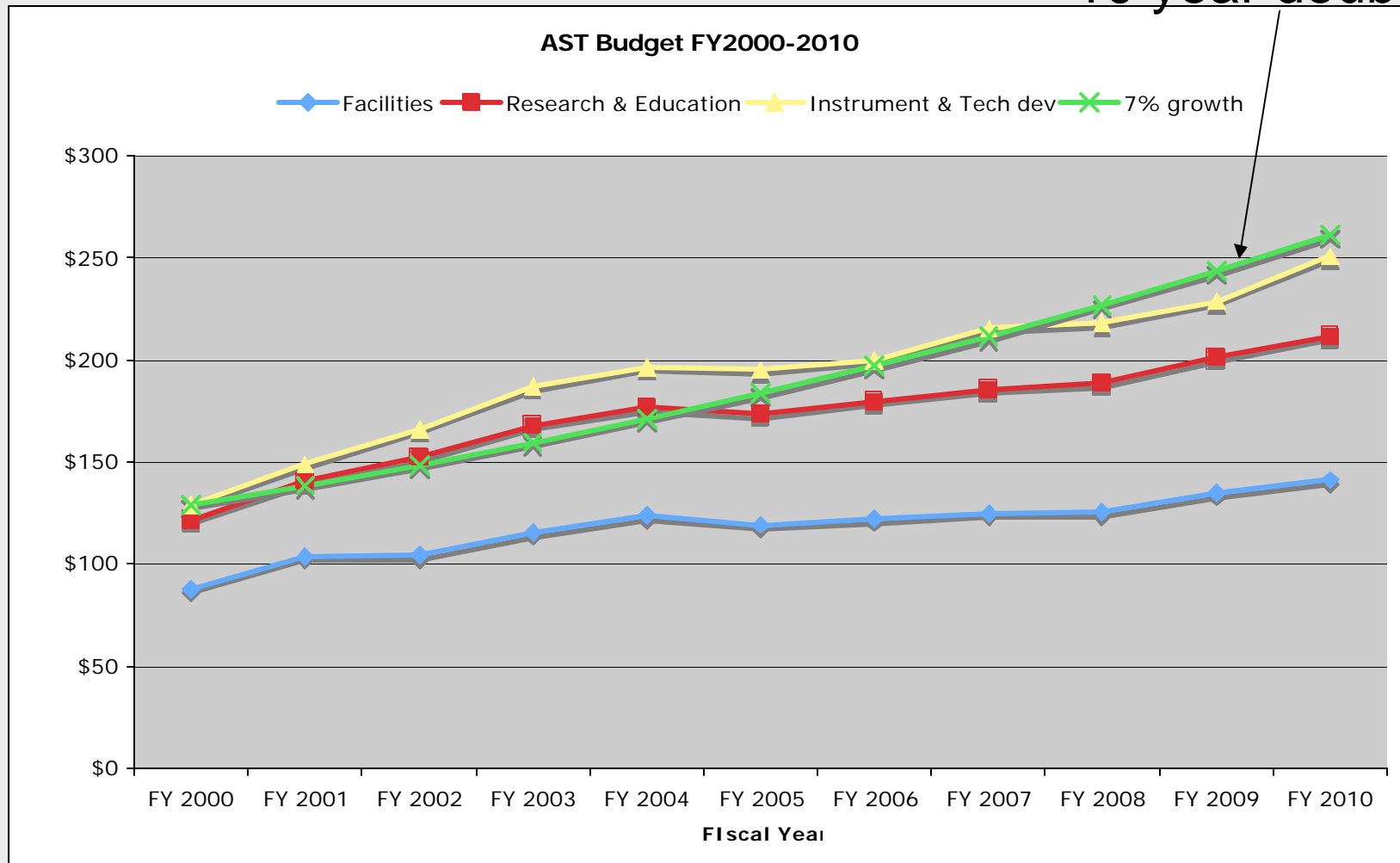
- “Green” energy
- Climate change
- Short term economic recovery

But historically AST has tracked NSF R&RA quite well



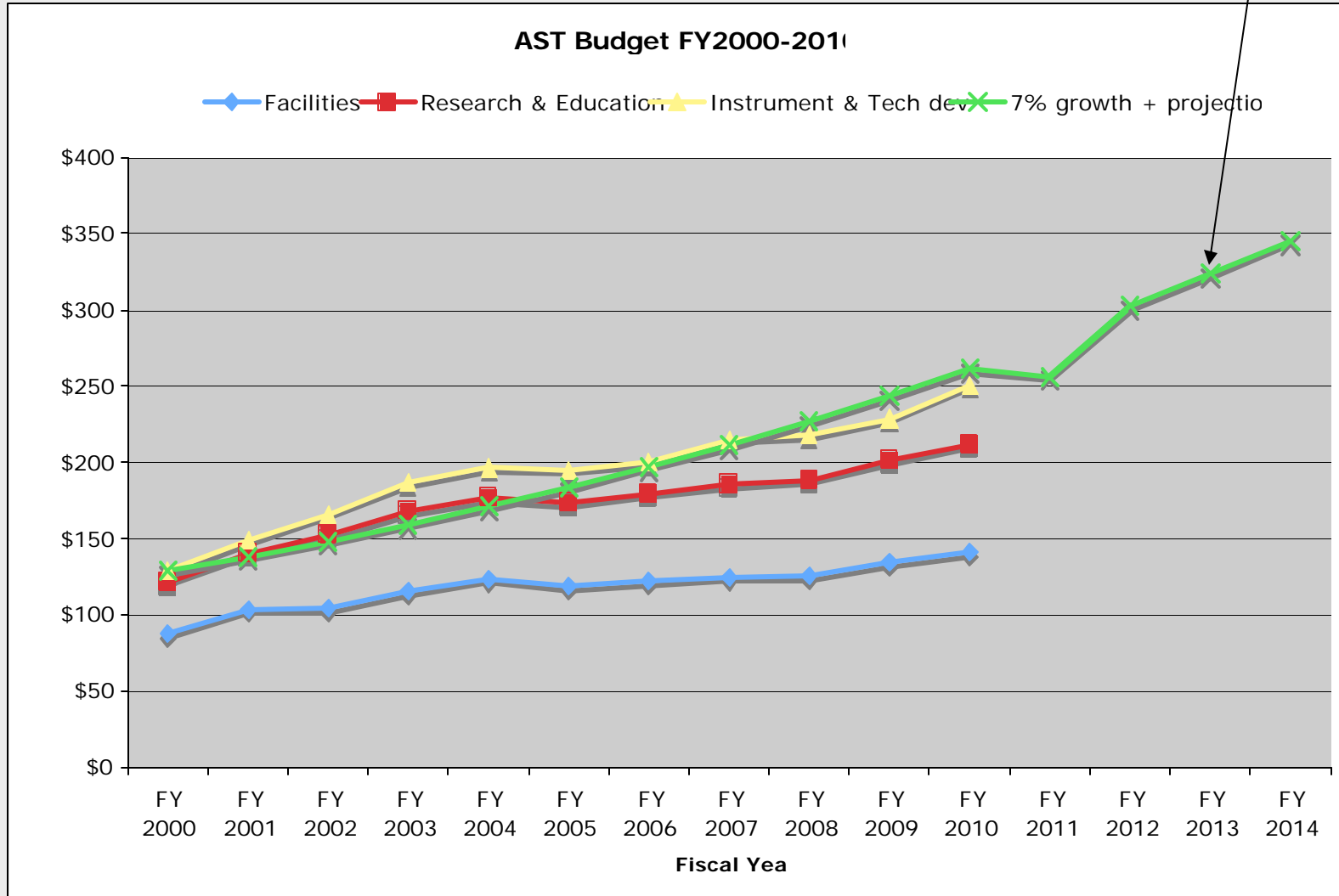
# AST Budget trends

10 year doubling



# AST Budget trends

NSF projection



# Budget Speculation

- Expect AST to rise as NSF does, but perhaps not fully doubling even if NSF does, in years 2010 - 2019
- “New start” money has come from a) adjustments in facility budgets to allow contributions (resources, funding), and b) specific reviewed development proposals
- Assume, subject to advice, that AST keeps its current balance among facilities (~55%), instrumentation (~10%), grants (~25%), and future facilities (~5%)
- Thus, roughly 5% of the budget goes to development of new projects, with some funds (not tracked very well) in facilities and grants
- BUT - new facilities, notably ALMA and ATST, and new capabilities at existing facilities, markedly increase the maintenance and operations budget
- Existing support costs need to rise with inflation, at least (3%)
- Whatever the budget, new opportunities MUST be carefully and appropriately ranked
- Critical community advice

# Major Research Equipment Facilities Construction (MREFC) at NSF

- Established in FY 1995 as a capital asset account to fund 'big ticket' items:
  - avoids distorting the base program funding in the Research & Related Activities (R&RA) Account
  - funding restricted to construction, acquisition & commissioning of capital assets
  - no funding for pre-construction planning, **operations & maintenance, research utilization**, education outreach activities
- Projects with construction costs exceeding 10% of the annual budget of a particular directorate
  - *Mathematical & Physical Sciences 2009 Budget = \$1.26B*



# MREFC FY 2010 Budget Request

## MREFC Account Funding (Dollars in Millions)

	FY 2008 Actual	FY 2009 Current Plan	FY 2009 ARRA Estimate	FY 2010 Request	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate
<b>Ongoing Projects</b>									
AdvLIGO	\$32.75	\$51.43	-	\$46.30	\$20.96	\$23.58	\$15.17	\$14.68	\$0.24
ATST	-	7.00	146.00	10.00	20.00	15.20	8.30	12.70	17.00
ARRV	1.48	-	148.07	-					
ALMA	102.07	82.25	-	42.76	13.91	3.00	-		
EarthScope <sup>1</sup>	4.21	-	-	-					
IceCube	18.74	11.33	-	0.95	-				
NEON	-	-	-	-					
OOI	-	-	105.93	14.28	110.70	82.80	46.80	20.00	-
SODV <sup>1</sup>	0.02	-	-	-					
SPSM <sup>1</sup>	7.57	-	-	-					
Judgment Fund	-	-	-	3.00					
<b>MREFC Account Total</b>	<b>\$166.85</b>	<b>\$152.01</b>	<b>\$400.00</b>	<b>\$117.29</b>	<b>\$165.57</b>	<b>\$124.58</b>	<b>\$70.27</b>	<b>\$47.38</b>	<b>\$17.24</b>

ATST construction start with major ARRA funding



# MREFC process at NSF

## Review Process

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- **Review of Science Goals**
  - What science goals motivate a potential new facility?
- **Conceptual Design Stage**
  - Description of functional requirements needed to achieve goals, top-down parametric cost estimates, rules of thumb for risk and schedule estimation, first estimates of operations \$
- **Preliminary Design Stage (or “Readiness Stage”)**
  - Site-dependent description of all major functional elements, bottom-up cost estimates, algorithmic risk assessment, schedule derived from Project Mgt Control System, partnerships, refined ops \$ est.
- **Final Design Stage (or “Board Approved Stage”)**
  - Interconnections and fit-ups of functional elements, refined cost estimates based substantially on vendor quotes, construction team substantially in place

# FY 09 Budget Request Introduced New Change to MREFC Process

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- “No cost overrun” policy:
  - Requires that the cost estimate at PDR have adequate contingency to cover all foreseeable risks, and any cost increases not covered by contingency be accommodated by scope reduction

## Q: modification of MREFC process and typical timeframe?

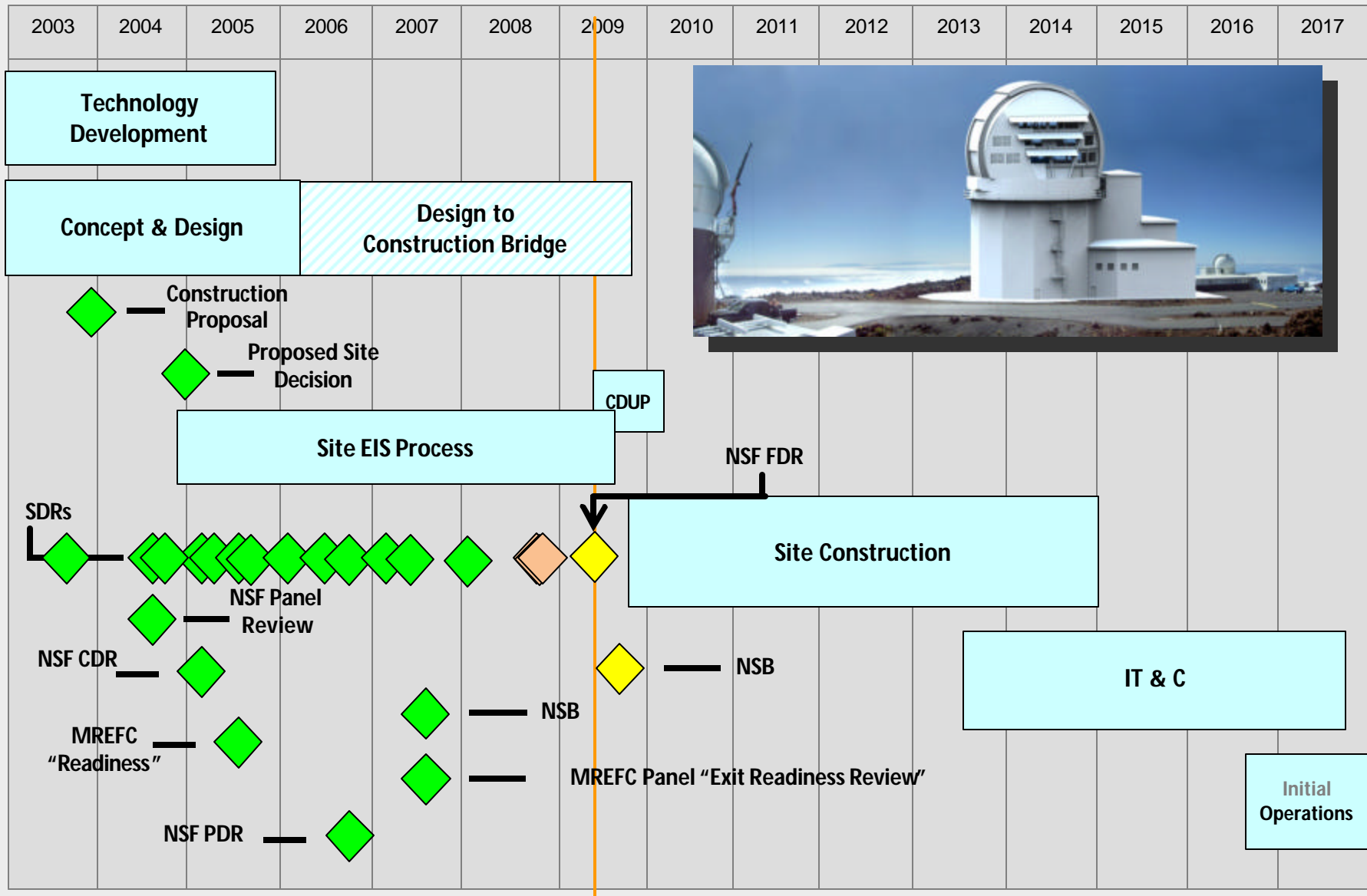
- Always under discussion due to continued perceived problems with current process
- Notable difficulties with design & development, maintenance & operations, research use, and education & training
- The “no overruns” policy may seem like a small change but it made a significant difference to pending and hopeful projects
- No really representative projects - ATST is very much the first test case of the current process
- Somehow, all MREFC projects seem to be anomalous and not representative of the timeline any other project should anticipate
- Look at ATST anyway



# Status of Advanced Technology Solar Telescope (ATST)

- Design and Development funding began in 2001.
- Approved for inclusion in a future budget by the NSB in August 2007.
- Construction funding initiated in FY 2009 Omnibus at \$7M + \$146M in ARRA (MREFC).
- Final Design Review held, report favorable.
- Risk-adjusted total project cost now ~\$290M.
- Environmental and Cultural/Historic compliance nearing completion. Final EIS completed; record of decision near.
- Approval to spend received from NSB.
- Early science in 2017.

# ATST Schedule Overview FY2010 Start



# MREFC Projection?

- How many MREFC projects can NSF support?
  - Wide range, ~\$100M to ~\$500M+
  - Budget varies, ~3% of total NSF budget
  - Balance across disciplines
- How many AST projects will NSF support?
  - One likely, two possible staggered, more unlikely
  - Context of MPS (DUSEL, light source), other disciplines
  - Development, design, and operations come from R&RA budget

## Q: a second Senior Review?

- Implementation of the current SR recommendations is well under way
- One of the recommendations was to do it again (with other people)
- Change in division management
- Context of decadal survey: mid-decade or continual course correction might removed need for SR2
- Need to assess progress, adjust expectations, understand context
- In other words, there will be an SR2 if and when it's needed

## Q: community advice to MPS?

- Advice to agencies is strictly controlled by the Federal Advisory Committee Act (FACA) and structures cannot easily be changed
- The MPS Advisory Committee covers the directorate, charges Committee of Visitors reviews of divisions and programs, and can set up specific sub-committees for specific issues (e.g. the Senior Review)
- There are no plans to change this mechanism

# Other questions

- Q: Gap between MRI and MREFC grants?
  - We have an AST-specific mid-scale program, under much the same pressure as everything else. We are still trying to address this MPS-wide but as always change is slow. PIs should continue to ask us.
- Q: AST interaction with private observatories and foundations
  - The NOAO-led O/IR System initiative seems to have been very successful. We see no reason to change that. The RMS system is less well advanced, partly due to the very different public-private balance in RMS capabilities. We welcome advice.
- Q: international collaboration
  - Astronomy has a strong record of international cooperation and collaboration, and certainly AST has always welcomed this (Gemini, ALMA, etc.) while recognizing the very difficult problem of different funding processes and timescales. There seems little alternative to continuing the current case-by-case approach.
- Q: collaboration on future medium to large programs
  - Given the complexities, there seems little alternative to the current case-by-case approach.

## Other questions (2)

- Q: interaction with the international SKA organization
  - Although we're not quite sure which organization that is, AST staff continue to participate in international planning efforts and in meetings and activities of a group of funding agencies interested in potential involvement with the SKA.
- Q: changes in AST's stewardship of solar physics
  - Studies involving the Sun are currently funded both in AST and in AGS, the Division of Atmospheric and Geospace Sciences in the Directorate for Geosciences (formerly ATM, the Division of Atmospheric Sciences). AGS has space weather and Sun-Earth connection programs; AST supports "Sun as a star" studies, helioseismology, NSO and ATST. There has been discussion about consolidating these programs under a single division, but this is still very speculative, there are as yet no decisions, and any change would likely not be soon. Since the decadal survey is not advisory to any specific NSF directorate or division, the possibility of internal NSF changes in programmatic responsibilities in no way affects the survey charge.

Thank you

Any further questions ?