



Progress on Astro 2010 recommendations



Recommendation

Small scale NSF

Increase ATI to \$15M / yr
Increase AAG to \$54M / yr
Increase share of Gemini (\$2M / yr)
Augment TSIP (\$2.5M / yr)
Theory and Computation Networks

First priority

Medium Scale

CCAT \$37M + \$7.5M / yr

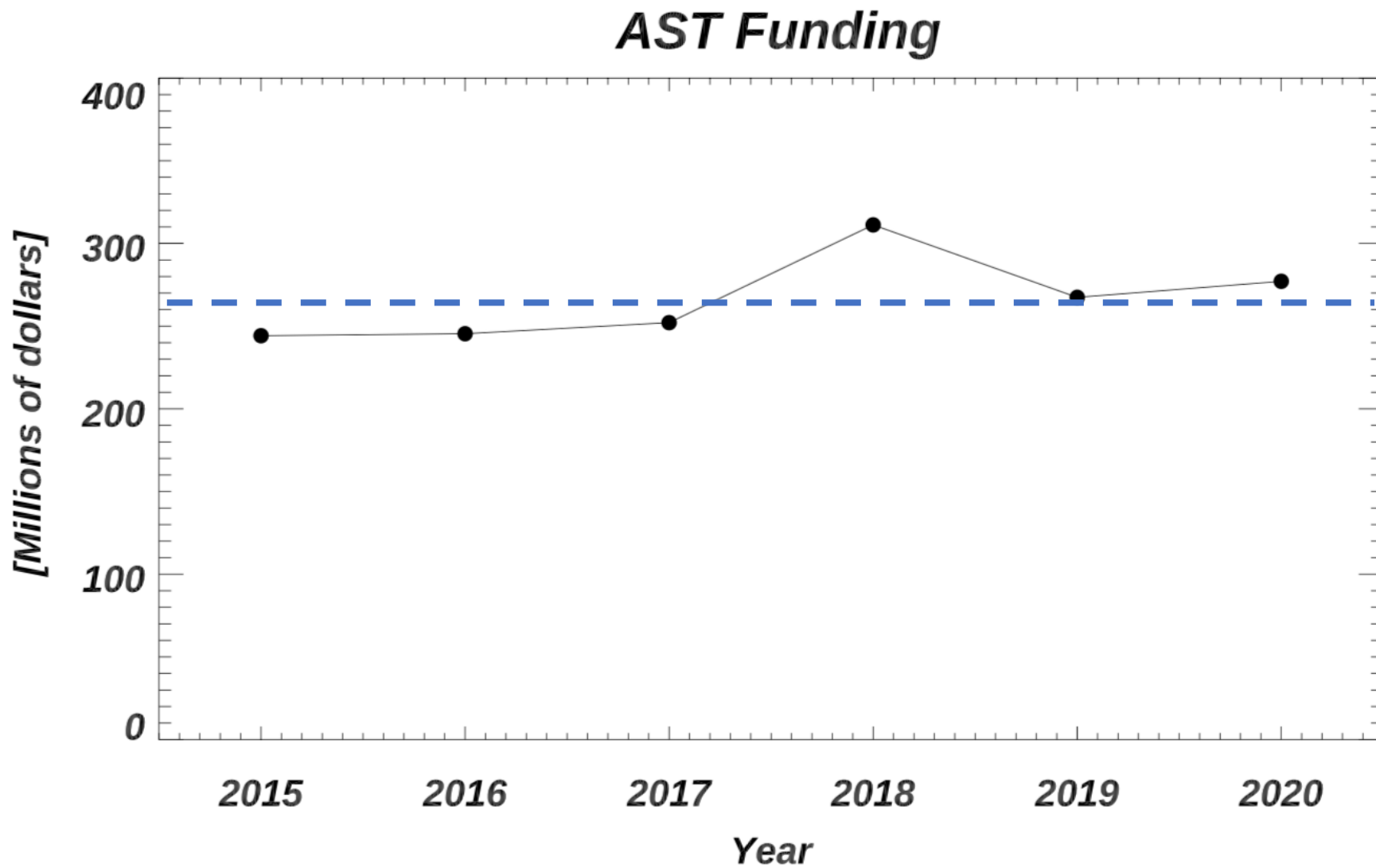
Prioritized Large Scale Ground

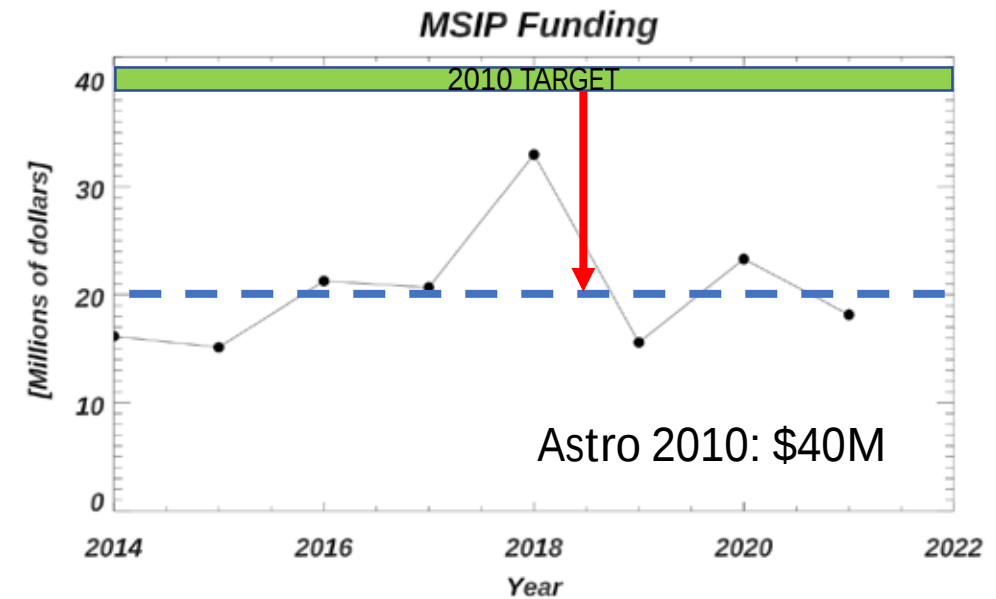
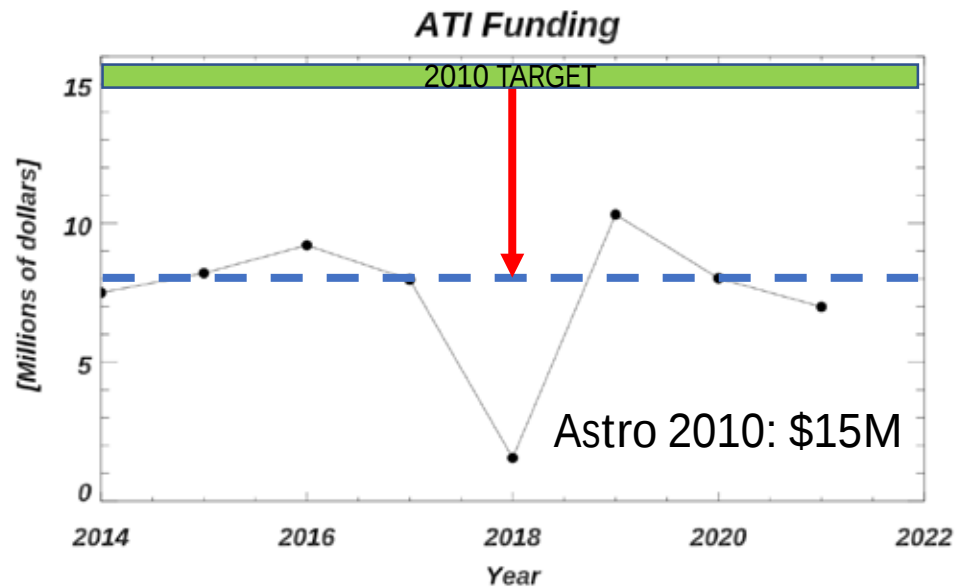
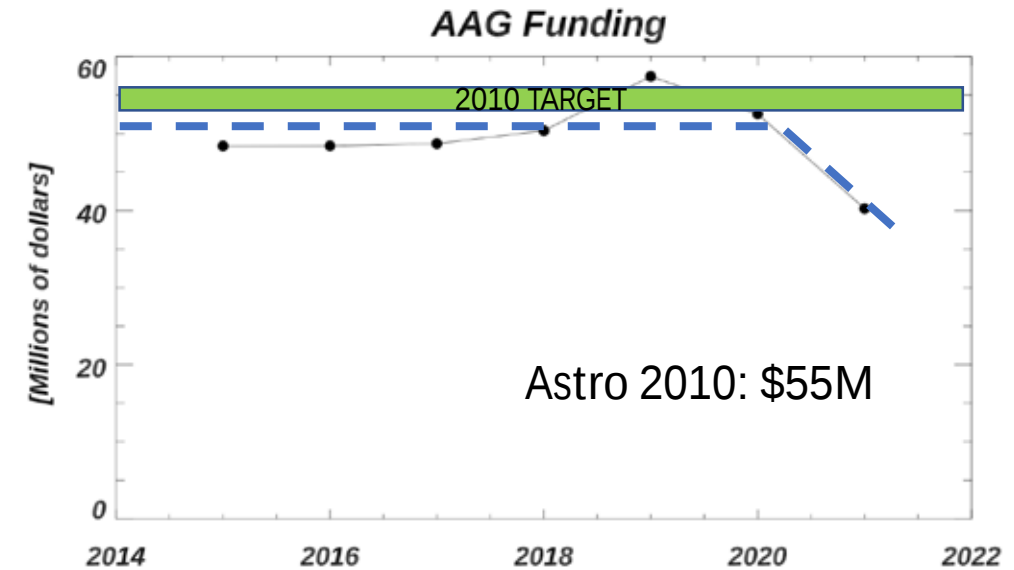
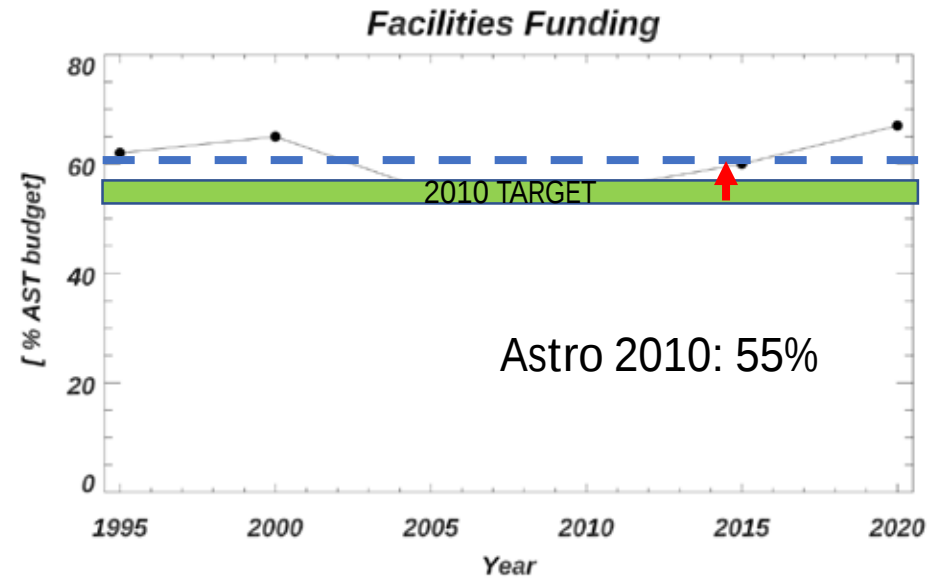
LSST (Rubin) (\$421M + \$28M / yr)
MSIP (\$40M / yr)
GSMT (~\$300M + ~\$10M / yr)
ACTA (\$100M + ?)

2nd priority



		Recommendation	Progress	Comment
		Small scale NSF		
First priority	{	Increase ATI to \$15M / yr		Budgetary limitations reduced to \$8M every other year
		Increase AAG to \$54M / yr		Dropped to \$42M in FY13, recovered to \$51M in FY18
		Increase share of Gemini (\$2M / yr)		Gain increased when the UK withdrew
		Augment TSIP (\$2.5M / yr)		Subsumed in MSIP (LCO, ZTF)
		Theory and Computation Networks		Joint w/NASA then AAG. Opportunities w/CISE (HDR)
		Medium Scale		
		CCAT \$37M + \$7.5M / yr		NSF awarded Cornell \$1.3M for part of Prime-Cam Atacama at Fred Young Sub-mm Telescope
		Prioritized Large Scale Ground		
2nd priority	→	LSST (\$421M + \$28M / yr)		90% complete, operations begin FY23, O&M funds?
		MSIP (\$40M / yr)		budget + priority: \$15M alternate years; \$25M in FY18, MSRI-1 and 2: agency wide
		GSMT (~\$300M + ~\$10M / yr)		Recent: \$20M to GMT for AO, Mauna Kea meetings
		ACTA (\$100M + ?)		Funding for some technology development







To address implementation of NWNH, given anticipated budget constraints, NSF

- Conducted Senior Review of AST portfolio prior to mid-decadal. AST Portfolio Review (2012).
- Review of U.S. ground-based O/IR system (Elmgreen committee)
- Conducted mid-decadal progress study on implementation of Astro2010 recommendations (w/NASA and DOE). NWNH: A Midterm Assessment.



AST Portfolio Review

2012 PFR: recommendations for divestment to preserve ability to carry out the first-priority “LSST” or Rubin (no new starts w/o closures).

- Arecibo management by UCF
- WIYN support through NN-Explore
- Mayall operations through DOE
- KPNO 2m
- McMath solar telescope
- NSO / Sac Peak
- GBO split off and reduced NSF contributions.

The community has lost at least some share of public access to these facilities. Some repurposed through partnerships.



Optimizing Ground-based O/IR

For O/IR telescopes > 2m, 76% of time is at private facilities.

Private facilities don't have resources they need and are open to sharing.

Recommendations:

1. Telescope and data access exchange (superTSIP)
2. Community planning (critical instrument needs)
3. Wide-field MOS for LSST follow-up
4. Science return with LSST: event brokers, enhance coordination for follow-up with Gemini, Blanco, SOAR
5. Invest in one or both GSMTs
6. Development of critical instrument technologies (detectors, optics, PRV, ATI)
7. Support training networks

High level conclusion: MSIP needs to be structured to support strategic decisions and increase funding.



NWNH: A Midterm Assessment

Successes:

- Completion of ALMA array in 2015 (MREFC)
- construction of DKIST (MREFC)
- good progress with “LSST” (MREFC)
- some enabling funds for technology development for ACTA (now CTA)
- MSIP is now a completed program

Challenges:

- AST budget flat in real-year dollars (NWNH assumed doubling); more funding needed for investigator grants to make use of facilities
- NSF has not been able to contribute to GMT or TMT
- Continue with divestment recommendations of the 2012 PFR



NSB: [Study of O & M costs for NSF Facilities](#) May 2018

Recommendation 1: NSB and the NSF Director should continue to enhance agency-level ownership of the facility portfolio through processes that elevate strategic and budgetary decision-making.

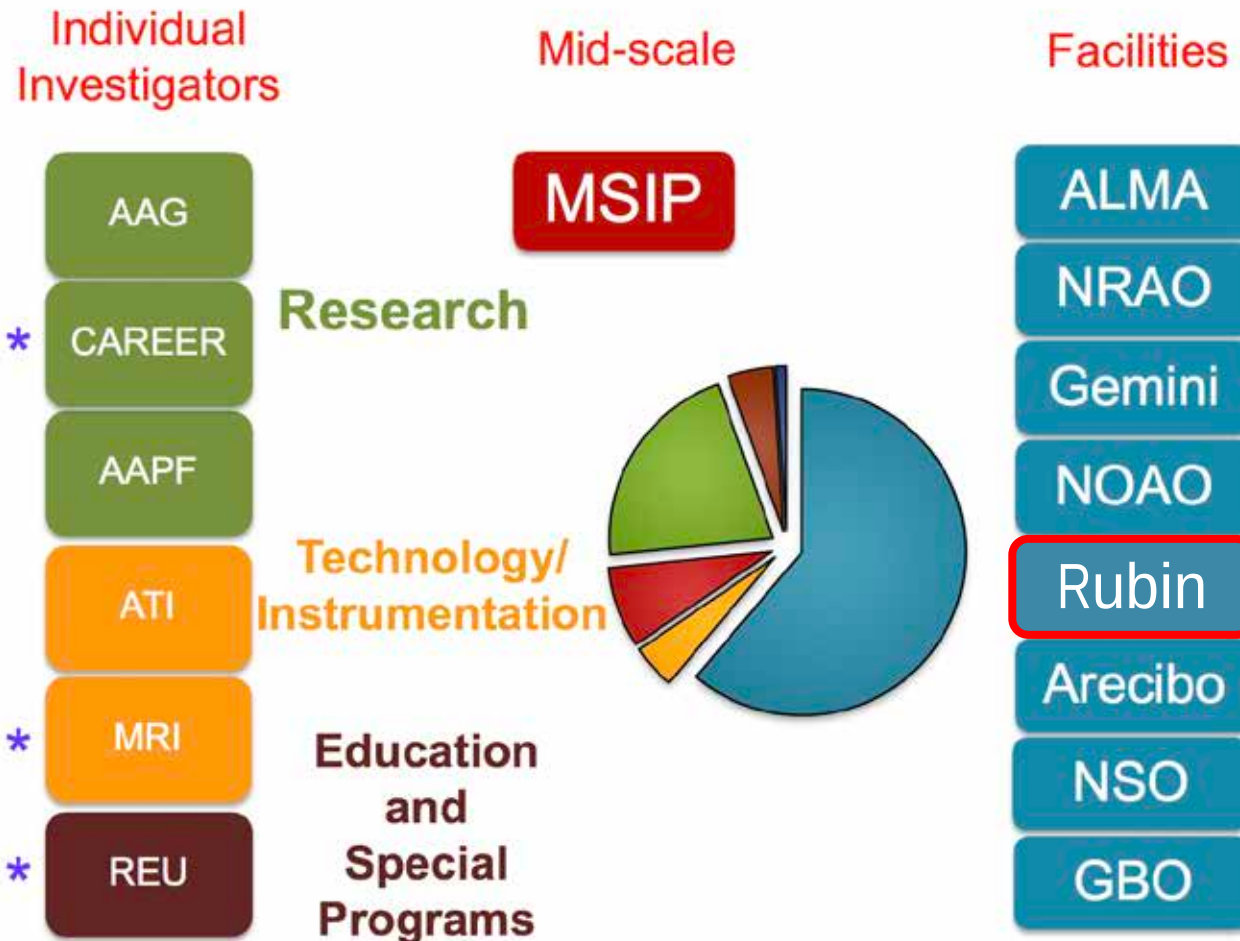
...a scientifically robust Foundation-wide strategy that is both transparent and fiscally responsible is critical.

Planning horizons that are longer than the current 5-year projections required by statute could inform this strategy. The Department of Energy's Office of Science has found notable success using a 10-year planning model.

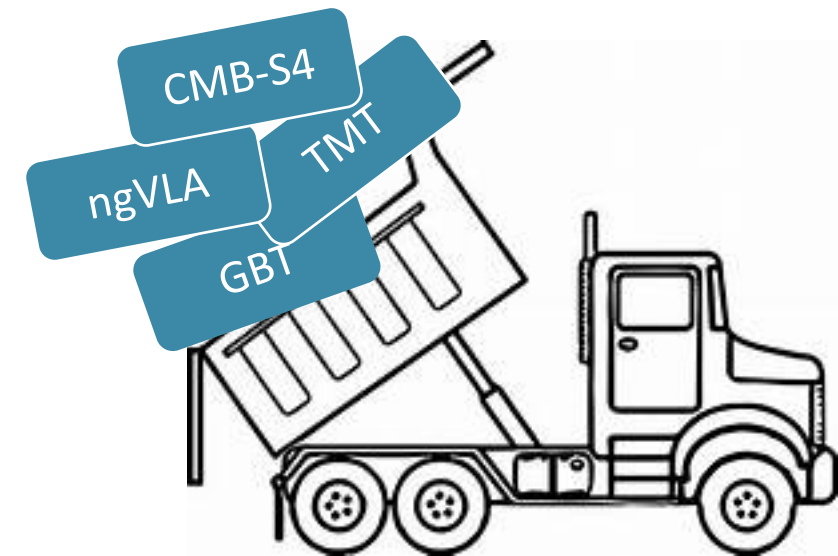
While NSB does not believe that it is necessary to establish a central O&M account at this time, greater flexibility in use of the MREFC account would enhance visibility and agency-level ownership.

Various options are being explored; no good solution yet. Agency ownership of facilities would be a double-edged option – opening competition for O&M funds to other directorates.

AST Division Programs

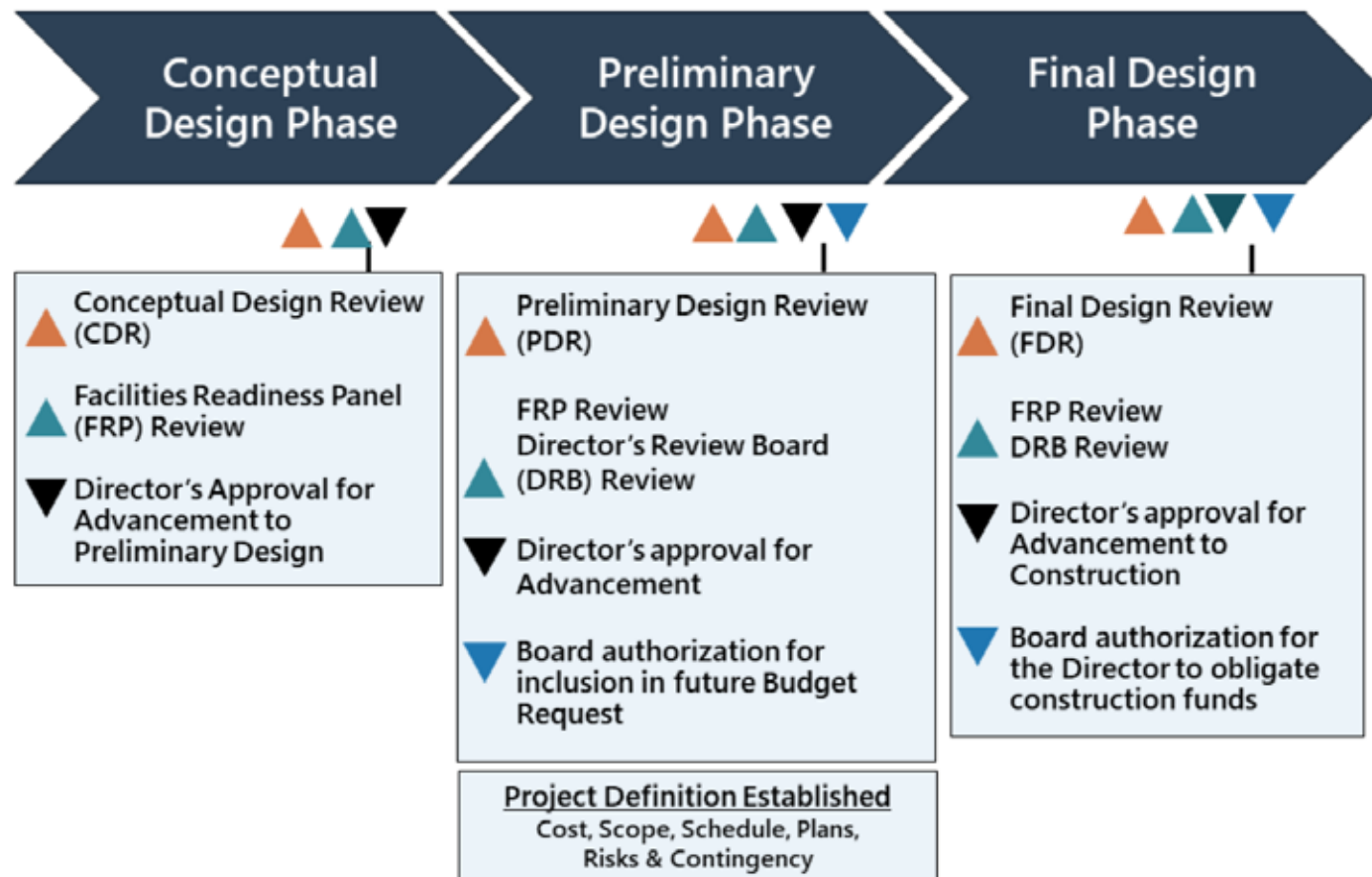


Astro 2010 recommendation:
Facilities: 55% of the AST budget (60%)
AAG: 25% of the AST budget (20%)



* NSF Wide

Construction: MREFC Process for Major Facilities (>\$100M)



- Projects can enter at any point before PDR
- OMB must approve inclusion in Budget Request
- Congress provides authorization & appropriation

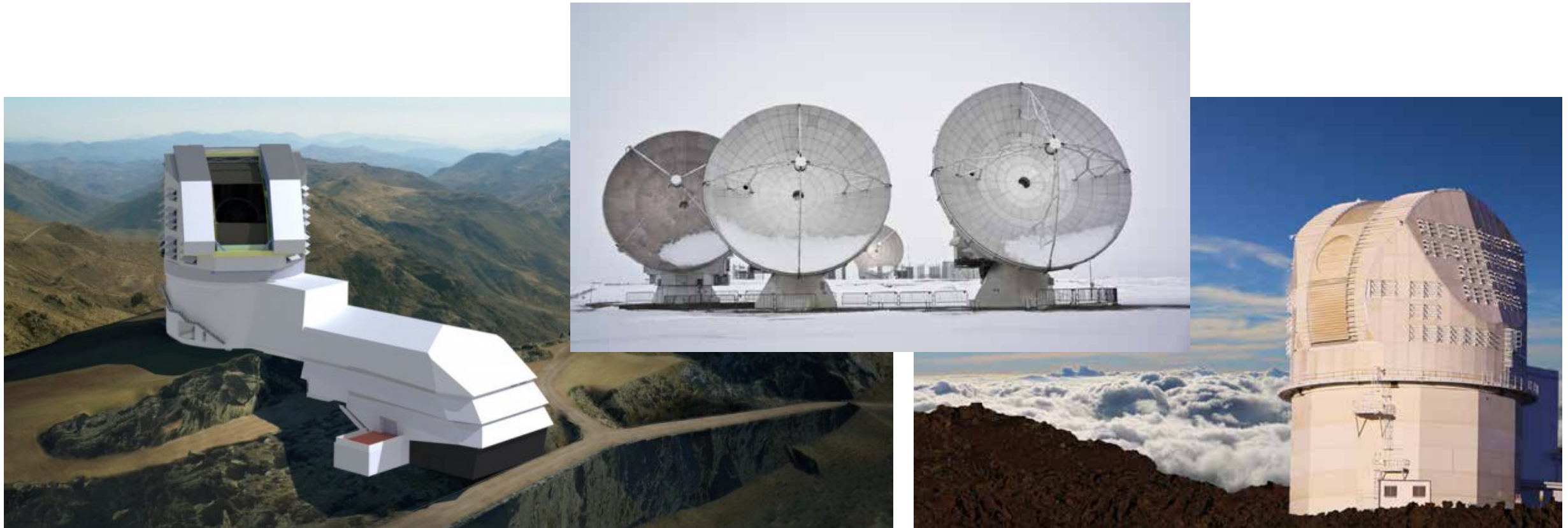


Other Recommendations & Conclusions

- ✓ International Matters: **collaboration, coordination; open skies**
- ✓ Stewardship of the Survey: **independent, strategic advisory group**
- ✓ Benefits to the Nation: **STEM literacy; technology spin-offs; citizen science**
- ✓ Astronomers: **career mentoring; demographics; public policy**
- ✓ Computation and Data: **archive and curate data**
- ✓ Laboratory Astrophysics: **support at current or higher levels**
- ✓ NSF/AST Senior Review: **conduct early in decade**
- ✓ NOAO and Gemini: **explore management and operations consolidation**
- ✓ Solar Astronomy: **maintain multidisciplinary ties**
- ✓ Radio Astronomy: **SKA pathfinder opportunities**

Despite the budget constraints, there has been steady progress. Smaller, older facilities have evolved through partnerships into special purpose labs (NNExplore/NEID, DES/DECam, DESI).

Rubin emerged from Astro2010 and state of the art operations ongoing at Gemini, ALMA, GBO, VLA, VLBA



I am thinking about (and would value CCA input):

1. How to increase renewable energy at facilities (reduce carbon footprint, provide energy security, save tens of millions long term)? If we don't address this, we risk losing research capacity (observatories, lost nights, seeing) in coming decades.
2. How do we manage O&M of existing facilities and still maintain investigator awards?
3. How we can improve the proposal process to be more efficient for proposers and program managers?
4. How do we secure funding to phase in new initiatives (GMT, TMT, CMB-S4, ngVLA)? How do we respond to cultural concerns with Mauna Kea?
5. What is the plan for Rubin after the 10-year survey?
6. We are losing expertise in instrumentation for our field – how to respond? How do we protect critical technology (detectors, gratings)?
7. How do we foster new partnerships (private-public, international) that are more than the sum of the parts? How do we weight or integrate priorities from decadal studies of other countries (e.g. Mauna Kea Spectrum Explorer at CFHT)?
8. How do we maximize the potential with existing partners (AURA, AUI)?