NASA Facilities and Real Estate

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Supporting NASA's Vision, Mission and Strategic Objectives

Mission

Drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of the Earth.

Strategic Objective

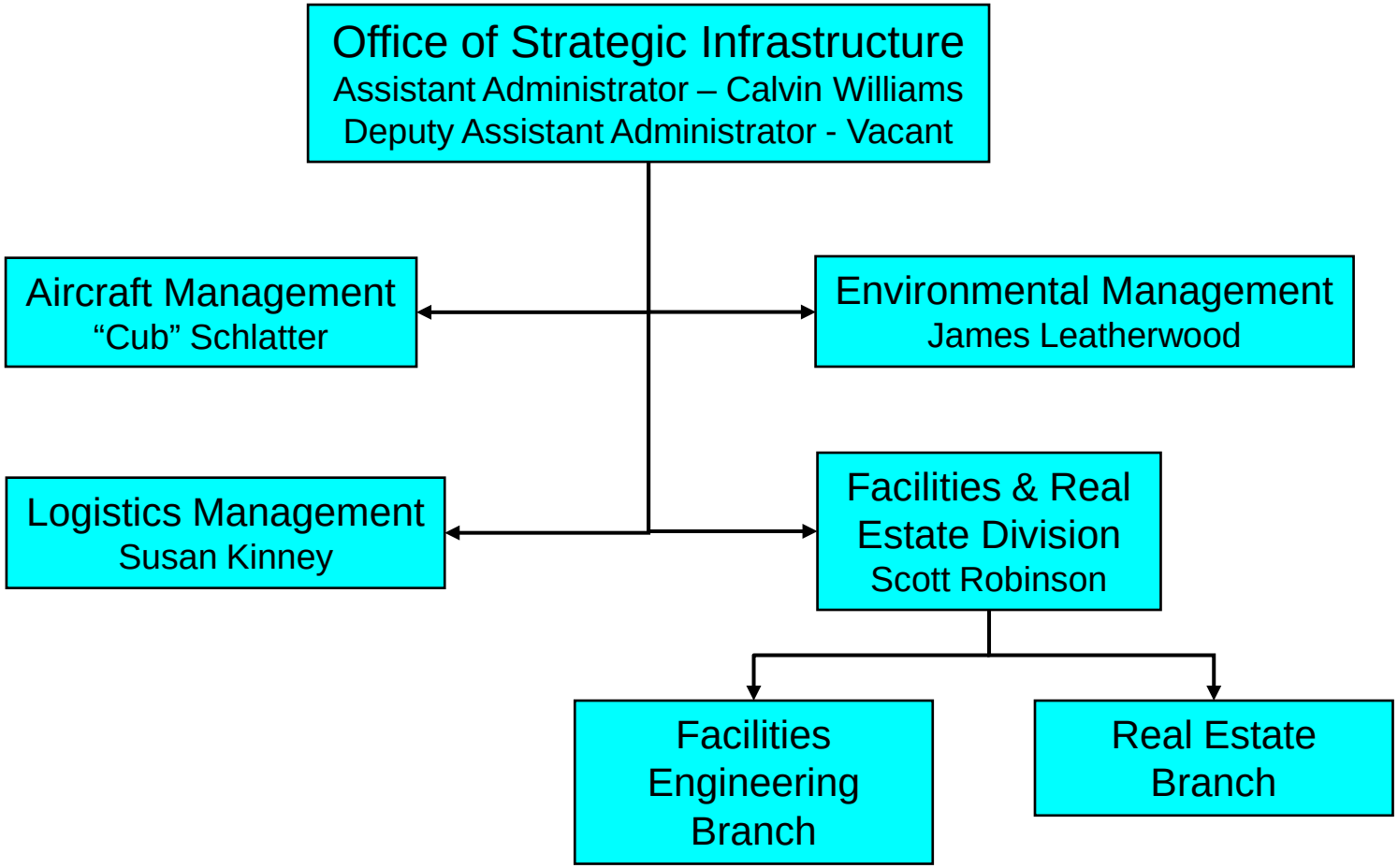
Objective 3.1: Attract and advance a highly skilled, competent and diverse workforce, cultivate an innovative work environment, and provide facilities, tools, and services needed to conduct NASA's missions.

Facilities Strategy

"*NASA will renew and modernize its facilities to sustain its capabilities, and accommodate those capabilities in the most efficient facilities set practical.*"

- Risk Reduction
- Investments in program and strategic capabilities
- Operating cost reduction

Office of Strategic Infrastructure



Effective November 2, 2014

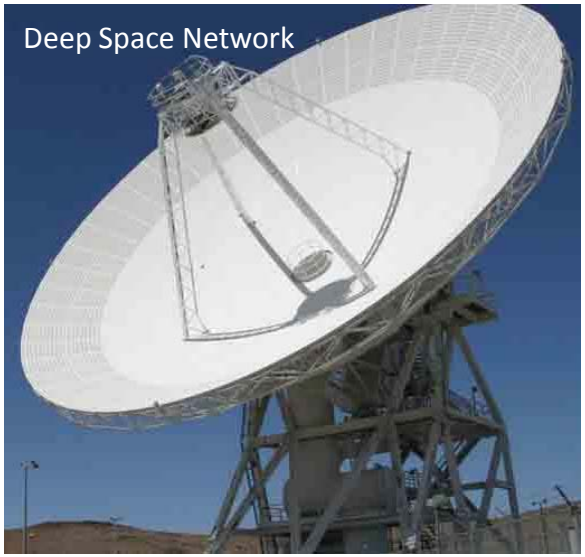
NASA Governance Structure

Major Facilities Decisions and NASA Senior Management Councils

- Executive Council:
  - Chaired by Administrator
  - Approves NASA budget, provides strategic direction, and approves NASA's largest investments ($100M or greater)
- Mission Support Council
  - Chaired by Associate Deputy Administrator
  - Approves major investments ($20M - $100M), major real estate initiatives, and master plans
- Program Management Council
  - Chaired by Associate Administrator, Alternate Chair Chief Engineer
  - Approves missions, programs, KDPs, and makes budget recommendations to EC that could influence facilities requirements.
- The Strategic Management Council
  - Chaired by Administrator
  - Discussion body to provide input to Administrator on Agency strategic direction.
- Partnership Council
  - Reviews and approves major partnering agreements. May approve agreement but investments may still need approval by other Councils

NASA Real Property

- Inventory:
  - 2,443 Buildings
  - 2,376 “Other Structures”
  - Over $32.7 Billion Current Replacement Value (CRV)
  - 45.9 Million Square Feet
  - Over 123,000 Acres



The Challenge of Maintaining NASA's Complex Infrastructure

Facilities investments strategy

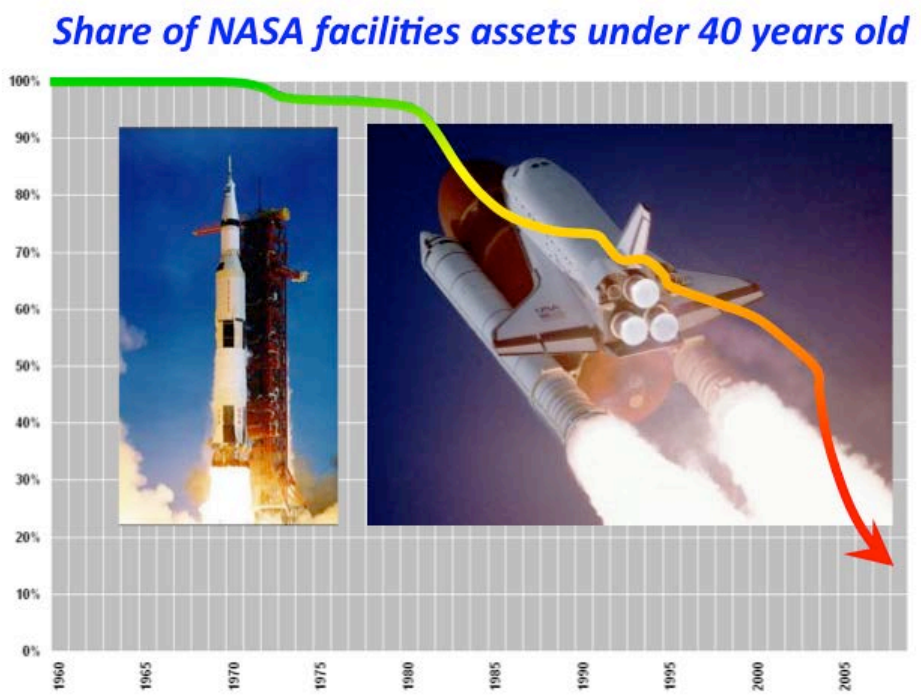
- Sustain: Maintain in working order during expected life
- Transition: Adapt to changing occupant needs
- Renewal: Rehab or replace when obsolete (~40 years)

Assets are mostly obsolete

- 80% in place before 1970
- Functional v. operational obsolescence
- Few (<5%) have ever been renewed

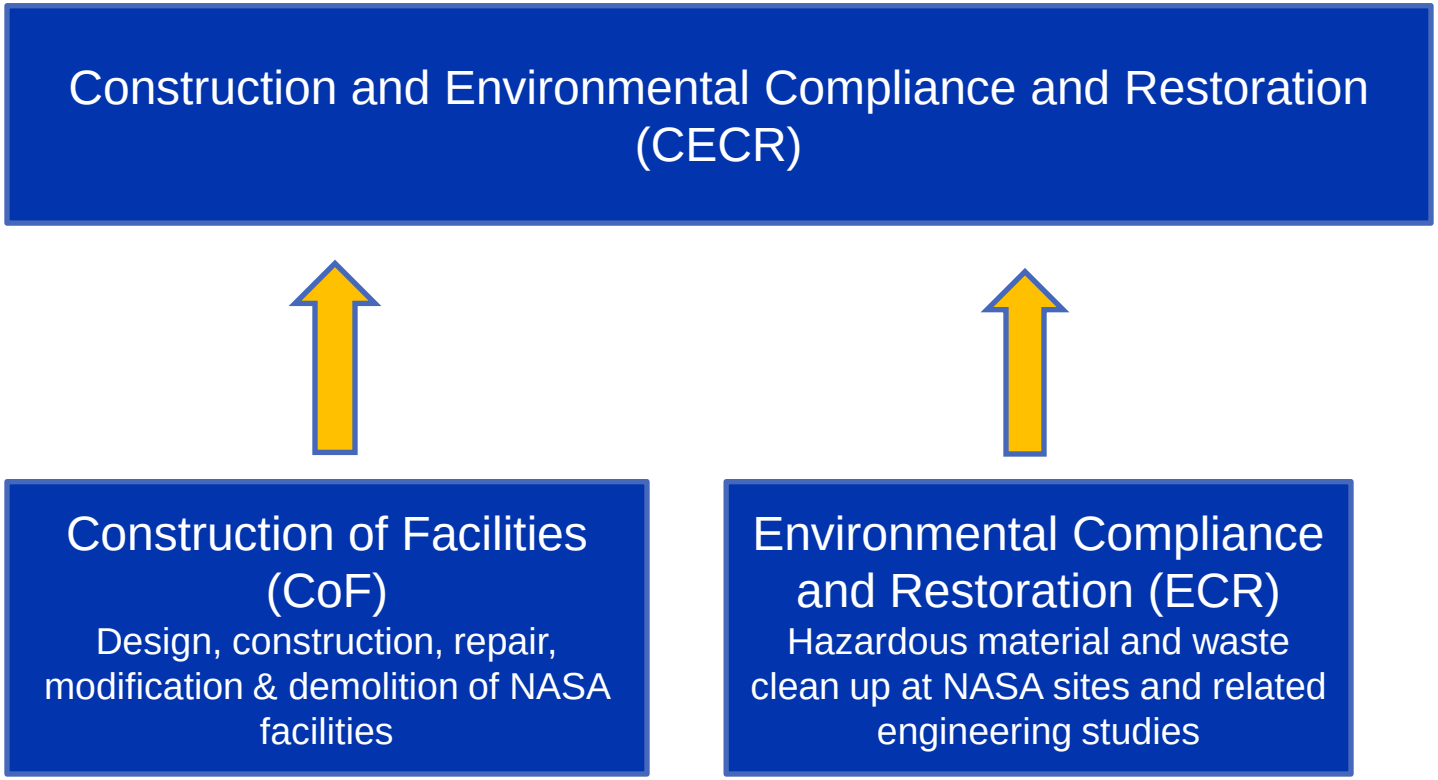
CoF and Facilities Maintenance activities are interrelated:

- Investments in CoF to reduce energy costs
- Demolish un-needed infrastructure
- Renew and consolidate to reduce future maintenance requirements.
- When maintenance is underfunded, repair needs escalate and risk of failure increases
- Additional burden on the Agency's Construction of Facilities program is produced
- Small projects that could be locally funded are left to deteriorate until costly capital repair and/or replacement is required.

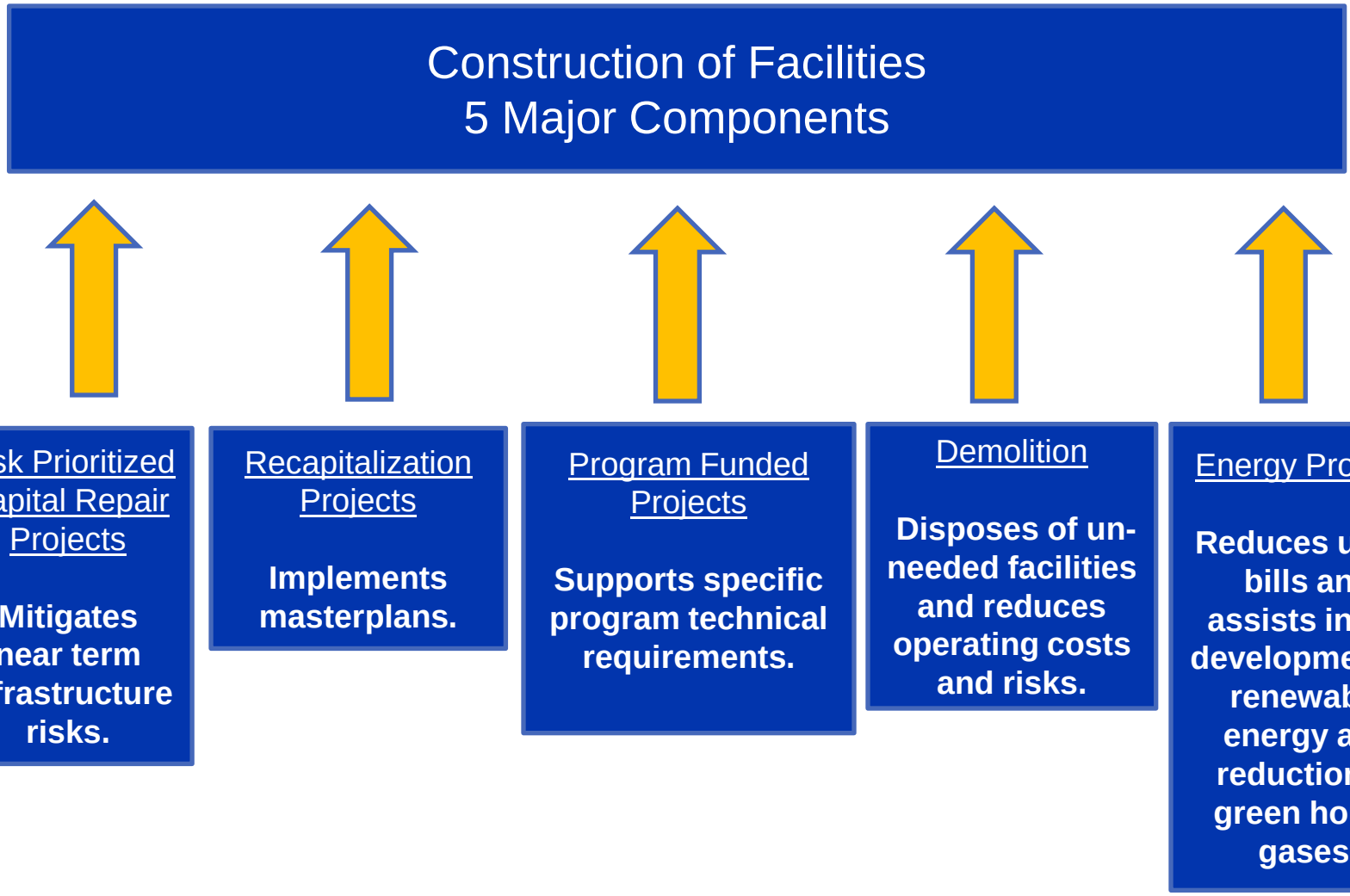


Construction and Environmental Compliance and Restoration

NASA appropriation to support environmental compliance, construction, alteration and major repair of facilities to support NASA missions.

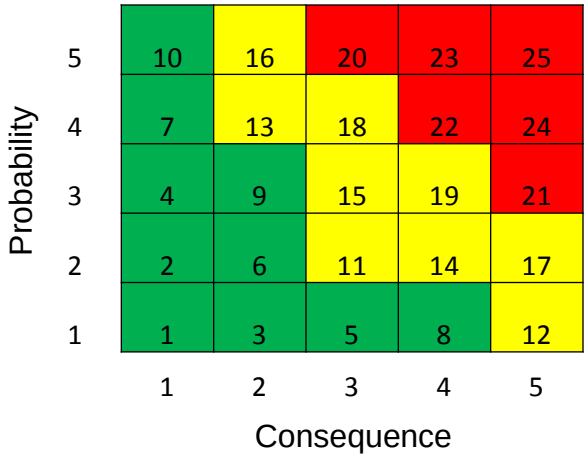


Construction of Facilities



Risk Prioritized Projects

- Approximately $130 million
- Prioritized based on mitigation of greatest mission and operations risks
- Centers use risk scenarios to assess top safety, technical, cost, & schedule risks to missions and operations (NPR 8000.4A)
- Centers submit top risks
- Risk assessments normalized across the Agency
- 60 – 65 projects ($300 million or more) submitted with risk assessments
- Approximately 20 projects funded/ year



Recapitalization Projects

- Varies by project budget with a target of approximately $120 million
- Renew/ replace/ refurbish facilities supporting core capabilities
- Replace major distribution systems (distributed infrastructure)
- Consolidate, reduce footprint (supports Freeze the Footprint)
- Reduce life cycle & operating costs
- Scheduled from 5 year Recapitalization Plan (approved by MSC)
- Implement all approved Center master plans at approximately the same rate
- Recapitalization program not shown as a separate budget line

JSC Human Health and Performance Laboratory

Program Funded Projects

- Budget determined by a transfer of budget ceiling from program into CECR based on program needs
- Projects modify, construct or otherwise make ready facilities that directly support program technical requirements
- Projects selected by the program based on trade studies and technical requirements
- Business case required (review of alternatives) life cycle cost must be considered
- Projects must comply with “Freeze the Footprint” (offset of any infrastructure addition and preference for re-use of existing)

34 Meter Beam
Waveguide Antenna

Demolition Projects

- $15 million
- Demolishes facilities approved for disposal
- Inactive and abandoned facilities
- Implements studies such as: “Need Don’t Need List,” Shuttle Transition and Retirement, other studies/ decisions identifying facilities for disposal
- Annual Center requests
- Demolition to facilitate recapitalization
- Updated at least annually
- Demolition requirements have been identified through 2018

F1 Engine Test Stand, MSFC

Energy Savings Investments

- $12 million
- Goal is to reduce center operating costs
- Prioritized based on utility saved/ dollar and other factors
- Also supports economically feasible projects such as renewable energy projects
- Can support third party financed energy projects in some limited cases

KSC Solar Plant
Partnership with Florida Power and Light

CoF Budget

Budget Authority (in $ millions)	Request 2015	FY 2016	FY 2017	FY 2018	FY 2019
Institutional CoF	299.7	302.7	305.7	308.8	311.8
Exploration CoF	52.3	0.0	0.0	0.0	0.0
Space Operations CoF	18.6	0.0	0.0	0.0	0.0
Science CoF	0.0	0.0	0.0	0.0	0.0
Total Budget	**370.6**	**302.7**	**305.7**	**308.8**	**311.8**

From NASA 2015 Budget Request

- Focuses on essential infrastructure repair and revitalization activities and repair by replacement of facilities.
  - Planned projects are consistent with Master Plans
  - Repair and revitalization projects are prioritized agency-wide based on risk to the mission
- Reduces infrastructure by disposing of unneeded facilities, and to demolish unneeded infrastructure.
- Implements energy saving investments to reduce utility costs and consumption
- Programmatic CoF supports Human Exploration and Space Operations missions.

FY 15 Institutional Discrete (≥ $10M)Projects

Center	Project Title	Project Budget ($ millions)
LaRC	Construct Measurements Science Laboratory *(Submitted as an Opportunity Growth and Security Initiative Project)*	93.7
JSC	Construct Human Health and Performance Laboratory	52.0 (57 total)
SSC	Replace Sanitary Sewer System	10.0
MSFC	Repair by Replacement Building 4221	39.8
GSFC	Repair Airfield Wallops Flight Facility	19.5
KSC	Power Systems Safety & Reliability Upgrade (Ph 1 of 5)	15.0
LaRC	Replace Compressors #1,2 & 3	15.0

FY 15 Institutional Minor Projects

Center	Projects	Budget ($ million)
ARC	Replace Varnished Cambric Cables Restore Electrical Systems Agency Telecommunications Gateway	10.0
AFRC	Repair Electrical Substation #3 Repair Communications Building Electrical Systems Revitalize Industrial and Potable Water System	16.9
GRC	Repair Electrical Distribution System Ph 2 Repair Steam Distribution System	14.1
GSFC	Replace Island Fire Station, Wallops Island	6.7
JPL	Fortify Security Gates	4.5
KSC	Revitalize Water and Waste Water Systems Outfitting for Central Campus Building	8.0
MSFC	Revitalize Central Chilled Water Facility Electrical Systems Revitalize Building 4708 Electrical Systems	15.4
SSC	Replace Cathodic Protection Systems	3.5

FY 15 Remaining Institutional Budget Lines

Budget Line	Project Budget ($ millions)
Energy Savings Investments	12.0
Demolition	15.0
Facilities Planning and Design	36.6

FY 15 Program Funded Projects

Program Line	Project Title	Project Budget ($ millions)
Exploration	Modifications to Launch Complex 39B	33.1 (85 total)
Exploration	Repairs and Modifications to VAB	15.2 (148 total)
Exploration	Minor Revitalization (at KSC)	4.0
Space Operations	Construct 34M Beam Wave Guide Antennas Canberra	2.8 (84.5 total)
Space Operations	Construct 34M Beam Wave Guide Antennas Madrid	4.1 (57.75 total)
Space Operations	Minor Revitalization (KSC & JPL)	11.7

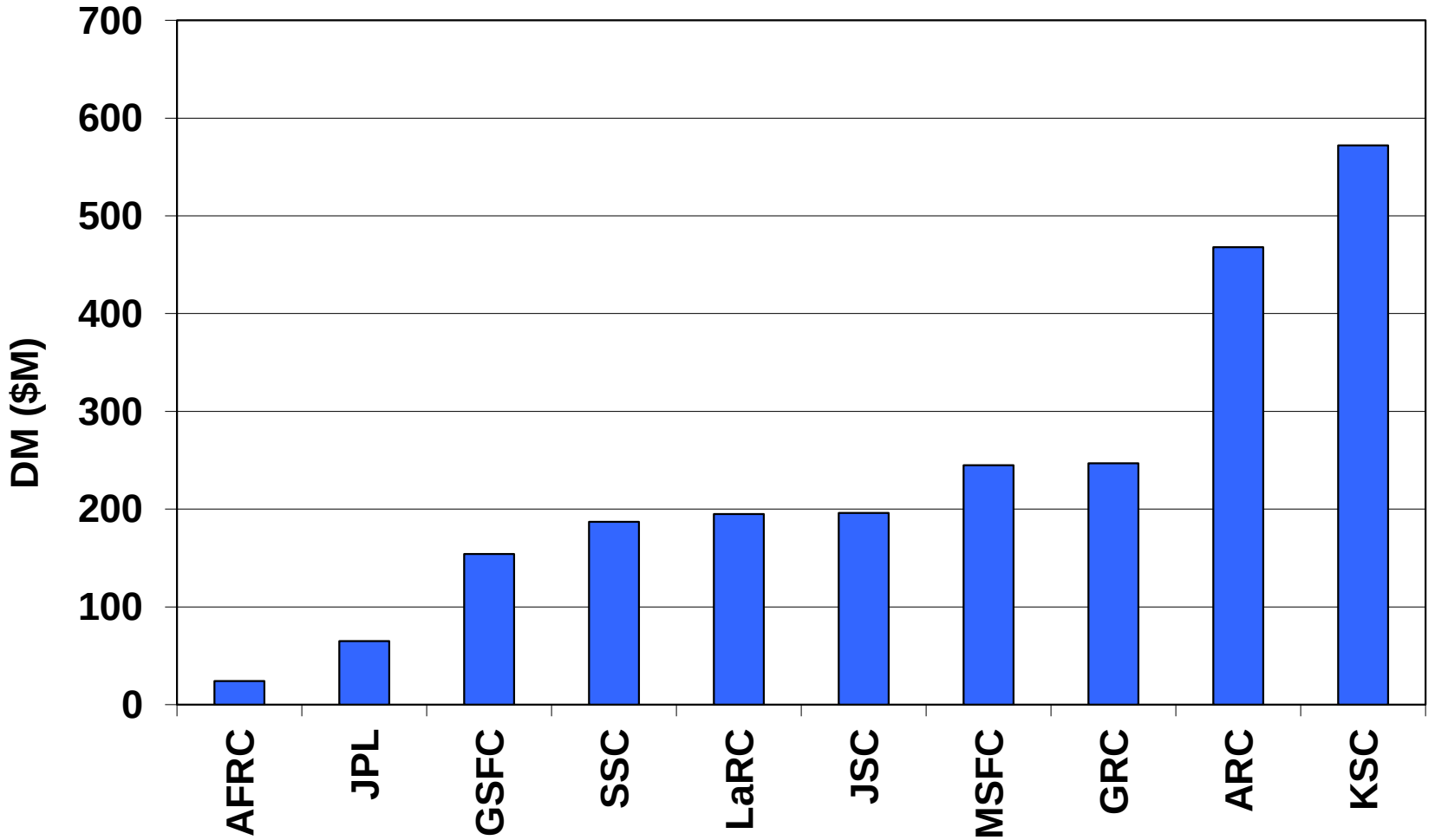
Maintenance and Condition

- Currently 83% of NASA facilities are older than 40 years.
- Mission critical facilities have higher deferred and a greater percentage over 40 than NASA average.
- NASA monitors condition of its facilities through an annual assessment of every field facility.
- Condition is rated on a 0 – 5 scale (Facility Condition Index, FCI).
- Rating of 4 or better means the facility requires routine maintenance and occasional repairs.
- Rating below 4 means the facility is in fair condition, requires some major repairs, and sometimes can not function as intended.
- In addition, the assessment team estimates deferred maintenance on the facilities.
- Deferred maintenance is the estimated liability associated with required repairs or poor condition systems that need to be replaced.

2014 Deferred Maintenance Assessment

- Deferred Maintenance (DM) increased between 2013 and 2014 from $2.3 billion to $2.35 billion.
- Deferred maintenance reduced slightly in the past few years but increased slightly in 2014.
- Facilities remained rated at 3.7 out of 5. "Fair" condition. – Sometimes facilities and systems do not function as required. Some major repairs required.
- Electrical systems, structures and HVAC have the highest deferred maintenance values.
- The last few surveys, cited NASA's recapitalization and demolition programs as important factors in stemming an increase in deferred maintenance.

2014 Deferred Maintenance by Center



Deferred Maintenance Five Year Trend

NASA	FY10	FY11	FY12	FY13	FY14
FCI	3.6	3.7	3.7	3.7	3.7
DM (B)	$2.553	$2.472	$2.330	$2.295	$2.353
CRV (B)	$29.18	$30.18	$31.49	$31.76	$32.66
DM as % of CRV	8.75%	8.19%	7.40%	7.22%	7.20%

Annual Maintenance

- NASA's maintenance funding levels are not sufficient to provide appropriate routine maintenance.
- Maintenance funding is part of the Center maintenance and operations budget and therefore must compete against other priorities needed to operate the Center.
- Recent NASA facilities studies indicate that funding levels should be much higher than current NASA funding.
  - Baseline services study in 2010 recommended maintenance funding of $308 million (1.0% of facility value) for FY 2012 with escalation. FY 2015 facility maintenance funding estimate is $222 million (0.7% of facility value).
  - NASA 2013 maintenance requirements study recommended annual maintenance funding at 1.6% - 2.4% of value based on facility type.
- Difficult to estimate maintenance funding contribution from programs, reimbursable funding, etc.
- Centers exploring tiered maintenance, remote sensing and conditioned based maintenance to focus on critical systems.
- Maintenance funding may be improved through leveraging practices such as Enhanced Use Leasing, Leases authorized by National Historic Preservation Act and other agreements that defray costs.

Annual Maintenance

- In 2013 NASA's unplanned maintenance was 36% of total maintenance. Over 1/3 of maintenance funding was for un-expected repairs.
- Aging systems are impacting missions and resources for planned maintenance.
  - Motor failure at 14x22 Wind tunnel – Ongoing research testing suspended.
  - Transformer failures – Wind tunnel testing suspended for 9 months.
  - Central Compressor failures – Compressed air supply for wind tunnel testing at LaRC limited. Air is rationed weekly, delaying some tests.
  - Sanitary sewer failures – Shut down SSC cafeteria operations for several months.
  - Water system failures – Operations at KSC suspended for 3 days. Drinking water purity concerns at some sites.
  - Aging electrical systems – Increased arc flash and ground fault risk impacting worker safety.
- NASA has set a goal to reduce unplanned maintenance to 33.8% by the end of 2016 and further reductions of 2% per year.
- Net Proceeds from Enhanced Use Leasing can be used to maintain, repair and improve infrastructure at Centers. NASA estimates $9.4 million in net proceeds in 2015 that will be used for facilities maintenance or energy projects.

Energy and Utilities

The goal is to reduce energy consumption and increase use of renewable energy to reduce NASA's overall utility costs.

- CECR Energy Savings Investments - Implements projects focused on reducing utilities cost and consumption.
- Energy Savings Performance Contracting and Utility Energy Service Contracting – Long term agreements that allow projects to be funded from savings in utility bills in lieu of up front funding. Financing fees are applied. There is an increased emphasis on utilizing ESPCs to meet federal energy goals.
- Enhanced Use Lease (EUL) Proceeds – 35% of EUL proceeds are used to fund energy savings and renewable energy projects.
- Net Zero Energy – By 2020 all Agencies will be required to design buildings to Net Zero Energy standards, producing as much renewable energy as the building consumes.
- Renewable Energy – By 2020 20% of electricity at federal sites must be from renewable sources.


NASA


NASA

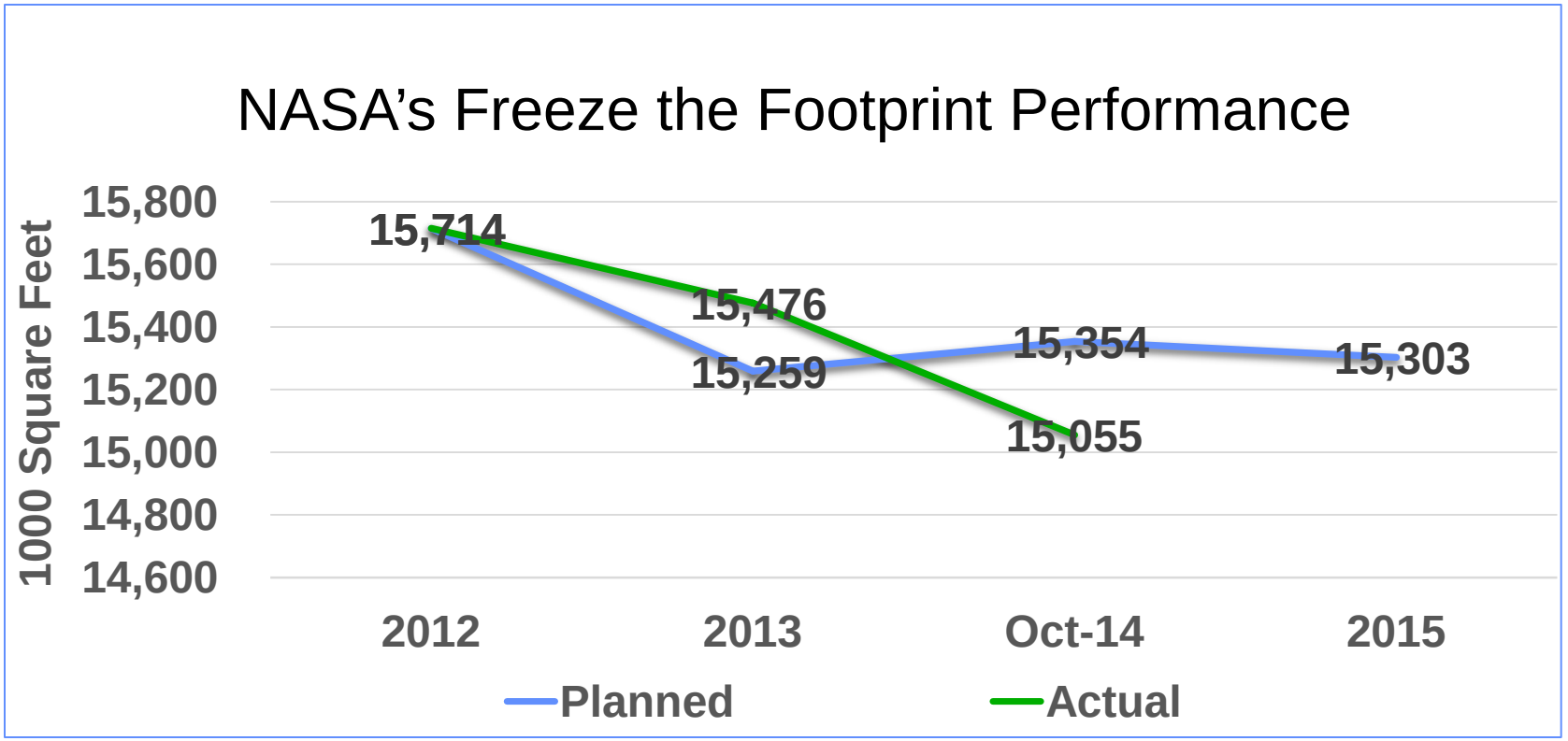
Right Sizing

- NASA has been on the forefront of right-sizing federal facilities.
- Demolition program established 2004.
- Site disposals include – Palmdale facility, White Sands Space Harbor, GRC North Campus, Santa Susanna Field Laboratory, Crows Landing, Camp Parks, Airfield at Goldstone.
- Current policy requires demolition offset for any new construction.

Fiscal Year	Buildings Demolished	Buildings Demolished (SF)	Buildings Constructed	Buildings Constructed (SF)	Transfers (SF)	Other Disposals (SF)
2012	34	378,000	13	211,000	10,000	7,000
2013	55	259,000	12	165,000	19,000	222,000
2014	32	326,000	5	163,000	0	120,000
TOTAL	178	1,204,000	59	777,000	29,000	354,000

Right Sizing

In an effort to reduce the cost and risk associated with federal facilities, President Obama issued a presidential memo requiring Agencies to freeze their facility footprint. OMB is monitoring growth of administrative and warehouse space square footage.

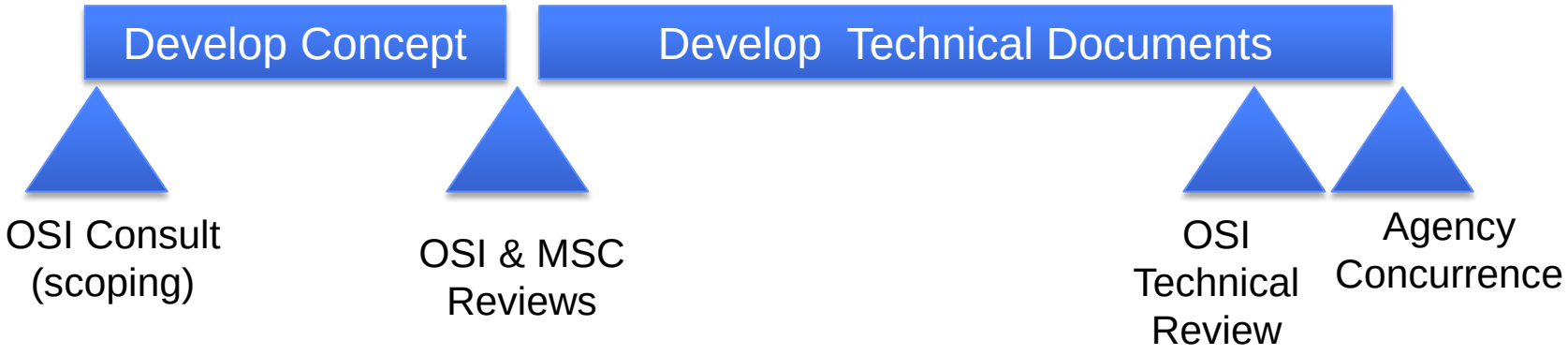


Leveraging

- Leasing at ARC
  - Enhanced Use Leases support collaboration and provide net proceeds to support facilities.
  - MFA lease facilitates restoration of historic Hangar 1, maintains federal use of federal airfield and eliminates airfield operating costs.
- KSC Spaceport
  - Agreements for OPFs, SLF, LC 39A, VAB and multi user spaceport and rail system facilitate commercial access to space and offset infrastructure operating costs.
  - KSC exploring possibility of transferring some roads and bridges to Florida to support public transportation plans and reduce operating costs.
- SSC Federal City
  - Host tenant agreements with several agencies offset infrastructure operating costs at SSC and support several national objectives in science, research and defense.
- WFF Launch Range
  - Agreements with Mid-Atlantic Regional Spaceport and Navy has increased utilization of the Mid-Atlantic Range.
  - Navy agreement for airfield use for carrier qualifications provided repairs and improvements to runway.

Center Master Plans

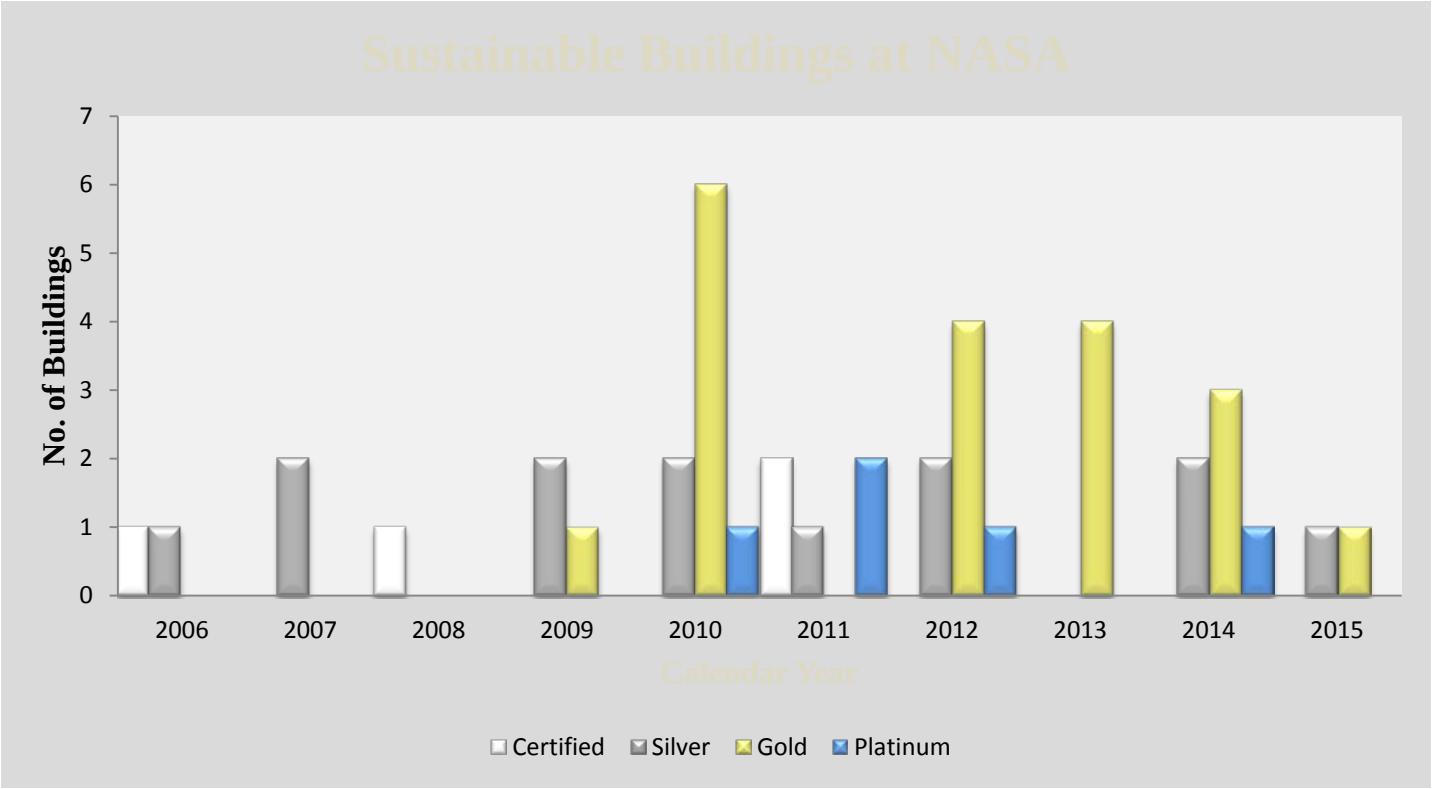
- Master plans establish 20-year land use and constructed asset strategies
- Align facilities with program, institutional needs
- Include readiness, rightsizing, energy metrics
- Basis for 5-year Recap and annual CoF planning
- Validated or updated every 5 years or less
- Center develops; Headquarters concurs
- Per NPD/NPR 8800, plans are developed as follows:



Sustainability

- NASA's sustainability policy began in 2004.
- NASA's first LEED certified building was MSFC building 4600, opened 2006.
- NASA has 40 LEED buildings. 2.4 million SF
  - 4 Certified (plus HQ building)
  - 13 Silver
  - 18 Gold
  - 5 Platinum
  - 1 Net Zero Energy
- Current policy is LEED silver (plus a few mandatory points) and above silver when life cycle cost effective.
- Using Post Occupancy Evaluations to assess performance and improve next generation designs.
  - Energy savings 14% - 34% (98% for net zero energy building)
  - CO2 emissions reduced by 29% - 48% (98% for net zero energy building)
  - Water savings 49% - 89%
- Exceed OMB's building SF requirement but only meet yellow for building count.
- NASA is among top 3 most sustainable Agencies.

NASA Sustainable Facilities



Strategic Capabilities Assets Program

SCAP ensures that select critical test capabilities (facilities + workforce) are in a state of readiness. SCAP maintains the skilled workforce and performs essential preventative maintenance to keep these capabilities available to meet program requirements.

- Large thermal vacuum chambers
- Simulators
- Arc Jet Facility
- High End Computing Capability within SCAP, managed by SMD.

- Some sustainment funding but insufficient for upgrades, modernization, etc.
- Working to improve utilization forecasts
- Working to develop improved portfolio management models within SCAP

Questions?