RIG Revision 2024

3.6 Operations Stage Planning

The term "Science Support Program" is intended to be award instrument neutral and encompass research infrastructures (RI) in the operations stage of the life cycle. This term is intended to capture the suite of activities related to operations and maintenance (O&M) conducted under the award as negotiated with the NSF Program Office. The applicability of the sections outlined in the Annual Work Plan should be tailored and scaled to the needs of the type, size, complexity, and maturity of the award, particularly as it relates to smaller scale awards. This is intended as an outline that Program Officers may use to inform the most appropriate approach for the award.

Planning for science support programs throughout the Operations Stage, involves the provision of deliverables that address the planning and execution of operations of the research infrastructure, including the Strategic Plan, the Annual Work Plan (AWP), and the Facility Condition Assessment (FCA) (See Figure 3.6). These are differentiated from the quarterly and annual reports outlined in Section 2.7 Operations Stage Reporting and Oversight, which track performance against the AWP throughout the period of performance.

3.6.1 Strategic Plan

The Strategic Plan, or another comparable document, serves as a guiding roadmap for the Awardee to communicate strategic goals, objectives, and activities to meet the mission of the funded science support program. The Strategic Plan may be revisited as necessary at least every five years, in consultation with an external advisory body when appropriate. It serves a foundational framework aligned with the objectives that enables the effective allocation of resources and program evolution.

Strategic Plans apply to any given program or a portfolio of programs that looks at the long-term evolution of capabilities enabled by the infrastructure. The document may include a mission statement, vision, or another high-level statement of the goals of the program that may be informed, in part, by goals outlined in appropriate level strategic documentation (such as NASEM, Decadal Surveys, etc.). Further, it may present a roadmap of how the facility will support the advancement of the research landscape and scientific discoveries, its contribution to workforce development, and the development and fostering of partnerships and collaborations. Strategic goals should be selected based on priorities for the award period, and tailored to the type, size, complexity, and maturity of the science support program. This document, along with the Asset Management Plan (Sections 3.6.3.1 and 3.6.3.4), serves as a base for the development of the Annual Work Plans (AWP) (See Section 3.6.2 Annual Work Plan for details).

3.6.2 Annual Work Plan

The AWP describes what the science support program expects to accomplish in the upcoming period of performance. The science support program for operations planning requires the annual submission of a forward-looking Annual Work Plan (AWP) (also known as a Program Operating Plan – POP) that details the operational and maintenance, and education and outreach activities and deliverables, as well as management activities necessary for a science support program to fully perform to its intended scope for the upcoming period of performance. This may include annual technical, operational, managerial, and scientific goals, objectives, activities, and milestones, and performance targets, assumptions, and risks pertinent to the successful operation of the science support program and its mission. The AWP may also

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incorporate activities with completion milestones in response to annual reviews and include a detailed budget for the upcoming period of performance.

The AWP serves as the baseline for assessing differences between planned and completed activities, and management thereof, within each program, laying out metrics and/or anticipated milestones and key performance indicators, for the upcoming period of performance. The AWP enables planning for, and management of known operational risks.

The AWP is typically submitted annually for review and approval by the NSF Program Officer in consultation with the core Integrated Program Team (IPT) (see Section 2.5.1 Operations Management and Oversight for details). Submission of an AWP (that satisfies the requirements articulated above), in part, informs NSF's release of annual funding increments.

The AWP is differentiated from quarterly and annual reports (see Section 2.7 Operations Stage Reporting and Oversight) that are backward looking, and document progress against the AWP. Overall, the AWP should, in totality, describe how the Awardee will comply with the terms and conditions of the award, as well as describe their plans for the upcoming period of performance.

3.6.2.1   Assumptions
The AWP should be aligned with the strategic operations documents such as Strategic Plans or the Concept of Operations Plan if transitioning from the Construction Stage. It should be developed in communication and consultation with the NSF Program Officer. The following Section provides an overview of typical components that may be included in the plan and should be used as a guideline for structure and content. It is not intended to be prescriptive.

When writing this plan, the Awardee should ensure that it is scaled and tailored specifically to the type, maturity, and complexity of the science support program and progressive evolution should be accounted for as a program matures (see Section 3.2 Tailoring, Scaling, and Progressively Elaborating Plans for guidance).

The period of performance may align with the government fiscal year, the managing organization's fiscal year, or some other time frame depending on when the award was initiated. The priorities and initiatives should facilitate the delivery of the intended scope and align with the long-term Strategic Plan.

3.6.2.2   Components of an Annual Work Plan
The specific components of an AWP will be determined by the NSF Program Officer. Recommended components of the AWP are as follows with detailed guidance on each given below:

1. Overview
2. Program Management
3. Risk Management
4. Management Support Services
5. Science and Science Support
6. Data Infrastructure; Software, Data Management and Security
7. User Support: Community Education, Outreach and Engagement
8. Proposed Budget and Financial Details
9. Performance Evaluation and Measurement
10. Operations and Maintenance Plan

Depending on the scope, size, complexity, and maturity of the science support program, not all the components may be appropriate for all Operations Stage programs. The Awardee is encouraged to discuss specific requirements with their NSF Program Officer. Required sections will be specified in the funding announcement and subsequent award terms and conditions. Whenever possible, metrics or performance indicators to be used to measure progress through the year should be specified.

The AWP, informed by the Strategic Plan, will likely not change significantly from year to year other than providing updates as they relate to certain operations and maintenance (O&M) requirements to maintain a program operational. This may include, for example, work required to support and conduct research and education activities; ensure that the facility is operating efficiently and cost-effectively; and providing small- and intermediate-scale technical enhancements when needed to maintain state of-the-art research capabilities that reflect the continued relevance to the community of users. This document is not intended to be onerous, rather it is meant to provide guidance and accountability for the research infrastructure investment. The AWP should be crafted with flexibility and tailored and scaled to reflect the type, size, scope, complexity, and maturity of the program.

1) Overview

The Overview (or Executive Summary) provides an outline of the intended program outcomes for the upcoming period of performance and the planned objectives and associated activities to support them. These should be directly informed by the long-term Strategic Plan (see Section 3.6.1 Strategic Plan for details). Major challenges, risks, and opportunities should be highlighted. Changes to organizational structure and major budget issues could also be summarized.

The goals and metrics will vary from program to program and will be agreed upon between the Awardee and the NSF Program Officer. The NSF Program Officer will review the AWP goals to ensure they are aligned with the long-term scientific objectives of the program and meet the terms and conditions of the award. The annual goals of the science support program should be outlined as they relate to the delivery of the intended scope, and presented as Specific, Measurable, Attainable, Relevant, and Timely (SMART) when possible. Milestones used to reach that goal and help manage the work, where possible, should be credible, visible, and have an accountability threshold.

2) Program Management

Facility management concerns the management of scope, schedule, and cost of the SSP's operations and maintenance. The AWP addresses management approaches to the following sub-components.

a) Management & Organizational Structure

Defining operations management and illustrating the organizational structure of the science support program is an essential component of any AWP. This sub-section should provide a brief description of the leadership and management team and highlight program management practices and overall oversight of operations. If appropriate, the methodology associated with allocation of staff in a matrixed structure where staff effort is shared across programs, should be described. Existing and new tools, processes, and procedures as well as changes and improvements the Awardee plans to implement in the upcoming period of performance may also be outlined. The following sub-components should be tailored and scaled to reflect the type, size, complexity, and maturity of the program.

b) Infrastructure and Human Capital

A high-level overview of the primary physical infrastructure and human capital that enables the provision of science services to the community should be outlined and associated within the WBS. This sub-component includes milestones and anticipated outcomes with regards to human capital management and physical infrastructure maintenance. This does not, however, require the use of an Integrated Master Schedule approach. Impacts on program budgets and delivery of science services, if any, should be specified.

      i. Human Capital and Workforce Development
This section would highlight current and future workforce related needs of staff managing and operating research infrastructures, to enable completion of the funded activities, including efforts to develop the research and technical workforce. It should also articulate how the management team meets Section 4.6.6 – Awardee Personnel and Competencies.

      ii. Physical Infrastructure
This section would highlight the planned maintenance and upgrades for the upcoming period of performance of the primary physical infrastructure (including facilities, research infrastructure, etc.), used to support the funded activities of the science support program.

c) Procurement Plan

The Awardee may execute and administer subcontracts and subawards in the upcoming period of performance that are above the NSF approval thresholds given in the terms and conditions of the award. If no threshold is given, the Awardee should assume $250,000 or consult with their NSF Program Officer. Any major planned procurements should be noted in the AWP and be reflected within the WBS and budget line. It may be appropriate to include this section as an appendix.

3) *Risk Management*

NSF expect Awardees to engage in routine risk assessment and management throughout the duration of the award to enhance program success by decreasing the likelihood of threats. The level of formality and detail will depend on the type, size, complexity, and maturity of the program being supported. The Awardee's approach to risk management, as outlined in the Risk Management Plan, should be summarized in the AWP, with top risks reported annually and, in some cases, quarterly (see Section 2.7 Operations Stage Reporting and Oversight for details) as determined by the NSF Program Officer and required per the terms and conditions of the award.

Contingency planning entails developing a reliable course of action to address known events that are likely to present risks to successful operations. Such planning is intended for responding to threats and opportunities and implementing mitigation strategies to prevent an incident or limit its impact on operations should a risk be realized. Realized risks are handled differently in Operations Stage awards than Construction Stage awards. (See RIG Section 4.2.5 for risk handling during Construction). Operations Stage awards generally use the following mechanisms to address the impacts of realized risks in the following order:

- Routine risk impacts are included in the BOE as part of the most likely cost.
- Re-budgeting authority is used by the Awardee per the award terms and conditions.
- The Awardee reduces the level of science support effort (with NSF approval if significant).
- The Awardee requests supplemental funding; assuming proper justification, availability of funds and recommendation by the NSF Program Officer.

A separate budget contingency may be proposed for Operations Stage awards to handle known risks in aggregate for either the entire award or components of the award by WBS. For example, a separate contingency budget may be advantageous if the AWP includes a significant upgrade that should be managed as a separate sub-project. That said, proposing budget contingency carries additional management and oversight responsibilities for the Awardee and NSF, respectively. Any request must utilize a formal risk management approach that is tied to a Risk Register and the WBS (See Section 4.8 Contingency Estimating and Management for details). If funded, and based on the type, size, complexity, and maturity of the program, thresholds for NSF approval on contingency use and periodic reporting may be given in the terms and conditions of the award based on the Risk Management Plan, including reporting actual costs against the proposed budget by WBS. Award of budget contingency is subject to NSF approval. Given the additional requirements with developing and managing budget contingency, other mechanisms listed above may be sufficient to manage the impacts of known operational risks.

Funding and use of budget contingency must comply with the award instrument used. In addition, since "contingency" has a specific meaning under the Uniform Guidance and the Federal Acquisition Regulation, and "management reserve" cannot be held by the Awardee under financial assistance awards, these terms should not be used in the BoE.

4) Management Support Services
a) Quality and Performance Management

In consultation with the NSF Program Officer, quality management and performance management activities that are planned to take place in the upcoming period of performance, including performance metrics, should be outlined. Processes in place to execute verification and validation of appropriate and intended systems requirements of science support program operations, including data product and service delivery to the user community, may be highlighted in this component. These should be tailored and scaled to reflect the type, size, complexity, and maturity of the science support program.

i) *Quality Management*: The Awardee should already have policies and procedures in place. This section may provide measurable metrics and standards (possibly in tabular format) as they pertain to, for example, updates in document control management, risk management, training, travel, business continuity, and upcoming inspections and audits.

ii) *Performance Management:* This section would address the approach to monitoring, management, and optimization of the science support program's performance in meeting its goal. Key performance indicators used to measure the results should be presented.

b) Asset Management

To preserve the long-term operational integrity of a science support program, the Awardee should outline activities to be performed in the upcoming period of performance for tracking, maintaining, and maximizing the value of the science support program's physical assets including preventative and predictive maintenance and technology refreshes (see Section 3.6.3. Facility Condition Assessments and Section 3.6.3.1 on the Asset Management Plan for details).

c) Shared Business Services

Where applicable, the Awardee should describe any key administrative needs and services that are shared across multiple organizations, whether funded by NSF or other sources, which may be needed to complete the scope for the upcoming period of performance.

d) Environment, Safety, and Health

The Awardee should have in place a plan for the execution, management, and compliance verification processes to ensure facilitation of environment, safety, and health in support of research. Based on the award type, size, complexity, and maturity, in this section of the AWP, the Awardee may detail how they will comply with the award requirements for the upcoming period of performance as specified in the terms and conditions.

5) Science and Science Support

a) Scientific Research

For science support programs that have an embedded program that directly supports scientific research, for example if investigators at the facility undertake research activities using the research infrastructure that are funded through operations and maintenance (O&M), anticipated scientific highlights for the period of performance should be summarized, as appropriate. Accordingly, the metrics and milestones being used to assess the scientific impact of the science support program described should be presented and used to track progress. Additional specific requirements that may be in place for the award, would also be presented in this section.

b) Science Services

Science support activities facilitate the collection and delivery of high-quality data and samples through the provision of services and support to science, engineering, and cyberinfrastructure processes. This subsection may include activities implemented to meet the intended science services that will be delivered to the community in the upcoming period of performance.

c) Research Support Services

Research support services facilitate the accessibility, usability, and interoperability of data and infrastructure delivered and provided by the science support program. Any support services that will be available to the community in the upcoming period of performance, such as assignable asset programs, research coordination, instrumentation loans etc. (if applicable and not described elsewhere in the AWP), should be briefly outlined in this section.

6) *Cyberinfrastructure and Information Management*

Approaches to software and data collection and management, including pipelines, science platforms, and infrastructure, are a central component of most science support programs. In this section of the AWP, the Awardee may discuss any operations activities, and updates and changes to cyberinfrastructure and information assurance that would be implemented in the upcoming period of performance to meet the scientific data management needs, and to maximize the production, delivery, accessibility, and usability of the science support program infrastructure and data products and, ultimately, the scientific impact.

Owing to NSF's commitment to open science and public access to the results of federally funded research, cyberinfrastructure and information assurance management activities that will be implemented in the upcoming period of performance to increase the protection of information and information systems from cyber threats, should be presented.

Performance metrics for data quality and delivery (such as completeness, conformity, validity, and integrity) should be outlined to inform operations and maintenance needs, and outreach strategies, and can be used to monitor the cost-for-effort of data products and associated infrastructure.

a) Data Management: Pipelines for Acquisition, Processing, and Delivery

Data management is a particularly fluid activity that is essential to the operations of any science support program. Activities related to the development and maintenance of tools for data management in the upcoming period of performance would be outlined and, where applicable, challenges faced and risks being mitigated may be articulated, and updates to practices and procedures highlighted. Performance metrics may include uptime, processing efficiency, pipeline performance, etc.

b) Cyberinfrastructure Management

NSF requires a cyberinfrastructure (CI) plan (*note: this is pending*) for each life cycle stage of a Research Infrastructure, outlining the strategy and approach for CI management (refer to Section 5.2 Cyberinfrastructure & Information Management for details and a suggested outline). In this section of the AWP, objectives and activities outlined in the plan that will be implemented in the upcoming period of performance, would be articulated, as should risks and challenges to continued operations (See Section 5.2 Cyberinfrastructure & Information Management for details and a suggested outline).

c) Information Assurance

Maintenance and development of information assurance objectives and activities to be implemented in the upcoming period of performance would be articulated in the AWP, including risks and challenges to continued operations. Independent of the AWP, the Awardee should maintain a modern and comprehensive plan for information assurance management, with updates to practices and procedures highlighted in the AWP (see Section 5.3 Information Assurance for details).

7) User Support: Community Education, Outreach, and Engagement

A community engagement, education and outreach plan informs goals to facilitate and empower the community's use and understanding of the data products, ensuring diversity and inclusion around accessibility and usability of the data products, services, and facilities. In this section of the AWP, the Awardee would describe new objectives and activities to be implemented in the upcoming period of performance related to how they may monitor the community's scientific publications and users of the facilities' data and infrastructure, the scientific productivity of the observatory, and degree of community outreach, to ensure that data use is equitable across the user community. Performance metrics of the user support activities should be included, where applicable, and reflect the type, size, complexity, and maturity of the program.

a) Education

The Awardee, where applicable, would describe ongoing and new educational objectives and activities aimed at the community and to be conducted during the upcoming period of performance, with performance metrics clearly articulated.

b) Outreach

Similarly, outreach activities with the scientific user community but also the general public to be implemented in the upcoming period of performance would be articulated along with the associated performance metrics. This section may include initiatives and activities that enhance the usability of the data being collected, democratize the science being served, increase the diversity of the user base, and support historically underserved user communities.

c) Engagement

Additional engagement activities in the form of collaborations and partnerships, and long-term efforts to build sustainable relationships with the scientific and community at large would be highlighted along with the associated performance metrics.

d) Diversity, Equity, and Inclusion

The Awardee of Operations Stage awards must be able to demonstrate prior experience and current capabilities in, or have a plan for employing best practices in, broadening participation in science and engineering. This section of the AWP should highlight objectives and activities that will help in complying with any award terms and conditions on demonstrating capabilities in broadening participation in the upcoming period of performance.

8) Proposed Budget and Financial Details

To aid in NSF's evaluation of the proposed budget, monitor progress, and facilitate discussions with NSF on rebudgeting (if needed), the budget must be presented in a Work Breakdown Structure (WBS) format that is tailored and scaled to the type, size, complexity, and maturity of the science support program. The number of levels in the WBS depends on a program's complexity and risk. The Work Breakdown Structure needs to be expanded to a level of detail that is sufficient for planning and successfully managing all the proposed activities as negotiated with the NSF Program Officer, in consultation with the NSF IPT in alignment with the terms and conditions of the award.

The AWP should include the approved budget amounts by WBS and in the NSF approved budget format, in alignment with the terms and conditions of the award. Any shared costs or matrixed services should be articulated, and indirect cost rates summarized, noting how these apply to program budgets. For ongoing operations, any forecast carry-forward from the previous year should be clearly presented. A summary of how the carry-forward funds will be utilized should also be included in the AWP, as applicable. The Awardee should consult Section 4.2 – Cost-Estimating for in-depth guidance.

9) Performance Evaluation and Measurement

It is essential that the Awardee have in place a process for evaluating and tracking their performance in delivering on program and scientific goals and objectives, and in supporting and meeting the user community needs. The performance metrics outlined in the AWP should link to the goals set forth in the Strategic Vision and a performance evaluation and measurement plan, so as to inform the science support program's forward looking and retrospective annual reporting. While objectives and activities for the upcoming period of performance are not likely to change significantly from year to year, any proposed new approaches, initiatives, and efficiencies should be captured in the performance evaluation and measurement plan and activities highlighted in the AWP in order to reflect the evolution of the science support program.

Where applicable, updates to the performance evaluation and measurement plan should be captured annually in the annual progress report and be reviewed in conjunction with the AWP for the upcoming award year. The scope of performance evaluation and measurement should be tailored and scaled to reflect the type, size, complexity, and maturity of the program and in alignment with the terms and conditions of the award.

Key performance indicators (KPIs) and metrics should be clearly described in the performance and evaluation plan and used to track progress in annual (and if appropriate, quarterly) reports, and reflect the intended goals and objectives of the science support program. Whenever possible, the metrics should be quantifiable (SMART) so that progress can be clearly tracked. It is important that current performance is compared to the previous year's performance, and where applicable, historical performance. All aspects of management, and operations, scientific output, and education, outreach, DEI, and workforce development efforts, should be included where applicable.

10) Operations and Maintenance Plan

The Operations and Maintenance Plan may be included as part of the AWP for awards with smaller complexity, but it may be submitted as a separate document, particularly for larger and more complex awards, in consultation with the NSF Program Officer. It formally describes, in depth, strategies and approaches used to operate and maintain the science support program and ensure it delivers its intended scope. Typically, the plan includes the day-to-day operations of the program, and planning, management, and execution of operations, maintenance, change management, and improvement needs. While this plan is likely not to change much from year to year, it details the primary management components that are responsible for delivery of the program activities funded under the award. The Facility Condition Assessment Report (FCAR) and the Asset Management Plan (AMP) (see Section 3.6.3 for further details), which are based on the periodic Facility Condition Assessment, may be either included, or referenced, here.

3.6.3 Facility Condition Assessment of a Major Facility

A Facility Condition Assessment (FCA) is an evaluation of capital assets requiring significant expenditures for periodic replacement or refurbishment and having a lifetime longer than the usual five-year award cycle. An Asset Management Plan (AMP), a strategic plan for dealing with these issues, accompanies the FCA and informs NSF and the facility management of anticipated major and infrequent maintenance expenses that cause a significant departure from the routine funding profile.

The Operations Stage for a Major Facility typically lasts 20-40 years. NSF expects that upgrades, refurbishment, and renewals of various components will be necessary over time in order to support the evolving scientific mission. The FCA assists with planning of these activities, including such as replacing obsolete instruments, refurbishment, or renewal of structural components, electrical and cooling systems or upgrading cyber-infrastructure and data storage/distribution networks. In general, these routine upgrades, refurbishments and renewals will be funded as part of the Operations Stage award, either from a portion of the operating funds intended for routine maintenance purposes or from separate equipment and instrumentation budget lines (See Section X.X Operational WBS for details).

Funding for more significant upgrades may be proposed separately, as Mid-scale upgrades or as projects that exceed the Major Facility threshold and require the same approval process as for a new Major Facility project (see Section X.X.X on project proposal process for details).

As part of periodic Operations Stage reviews, NSF will use the outputs from the FCA process to evaluate the condition of each Major Facility to help inform long-term budgetary planning (see Section 3.6.3.1 Facility Condition Assessment Components for details).

Facility Condition Assessments (FCAs) shall be conducted in accordance with the terms and conditions of the award. In general, they are conducted every five (5) years, except for the first five (5) year period following construction and should encompass both critical support infrastructure and scientific components, including risks and mitigations associated with resilience to climate change and the resulting natural hazards. FCAs can be conducted more frequently based on risk and NSF's oversight needs.

3.6.3.1 Facility Condition Assessment Components

The Facility Condition Assessment process includes two main components:

1. **Facility Condition Assessment Report (FCAR):** An evaluation of the condition of all capital assets requiring significant expenditures for periodic replacement or refurbishment. Capital assets include land, structures, equipment (including portable equipment such as vehicles, ships, and aircraft) and intellectual property (including software) that have an estimated useful life of two years or more which exceeds the typical O&M award duration.

2. **Asset Management Plan (AMP):** Elaboration of the proposed strategy for addressing the issues identified in the FCAR specifying the corresponding timeline and resources needed.

The FCAR and AMP informs NSF and the facility management team of anticipated major and infrequent maintenance expenses that may cause a significant departure from the routine funding profile and

should therefore be addressed proactively and sometimes separately (See Section 2.X.X Methods for Addressing Re-capitalization Needs).

The timely identification of needs, and subsequent planned renewal and modernization of capital assets is essential to supporting the scientific mission. Well-maintained Major Facilities have a positive impact on working conditions and reflect NSF's commitment to the scientific endeavor. Proper long-term maintenance can have measurable improvements in operational performance criteria such as ensuring scientific excellence, improving uptime, reliability, equipment availability, and downtime due to corrective maintenance. Renewals may also result in facility wide energy efficiency improvements and associated reduction in annual operating costs and carbon footprint.

Finally, a well-executed FCA process will contribute to the protection of the health and safety of employees and of members of the public from hazards and to minimize danger to life and property, including resilience to natural hazards.

Because resources are always limited, the FCAR and AMP should be compiled using a priority ranking based on risk that would include the health and safety of personnel, sustainment of operations, and enhancement of the scientific mission.

3.6.3.2   Scope of the Facility Condition Assessment

In accordance with the terms and conditions of the award, and in collaboration with the NSF Program Officer, the FCA must include the federally owned/awardee-titled property and capital assets necessary to support the Major Facility's mission under the award.

The FCA shall use industry standard practices,[1] as appropriate, but should be tailored to the specialized technical nature of the Major Facility and cover both the supporting infrastructure (i.e., substructure, shell, interiors, HVAC, electrical, plumbing, site, etc.) and, if not addressed separately, the major scientific instrumentation.

The specific scope of the FCA and the timing of the submittal, including submittal of any assessments conducted by other entities, will be determined in collaboration with the NSF Program Officer to support agency oversight of the award.

3.6.3.3   Conducting Facility Condition Assessment of a Major Facility

The steps to conduct an FCA are presented as follows:

1) **List of Capital Assets:** The Major Facility will provide a list of the capital assets to be included in the FCA process. For most Major Facilities these can be separated in three main categories:

   I.   Science Support Equipment and systems
   II. Infrastructure (non-science equipment and systems; for example: specialized cranes and safety equipment, specialized environmental conditioning, vacuum systems, power conditioning, control and communication systems).
   III. Buildings and building systems, including grounds, roads, fences, flood control etc.

Once negotiated with the PO, the list of capital assets will serve as a baseline for the FCA scope.

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[1] For example, ASTM standard (E1557-09 (2015)) Uniformat II Classification for Building Elements - classifying building specifications, cost estimating, and cost analysis.

2) **Establish Process to determine Asset Condition:**

The process to compile information for the Facility Condition Assessment Report (FCAR) and Asset Management Plan (AMP) will be established by the awardee and agreed by the Program Officer. This process by which the Major Facility will conduct the FCA on the agreed list of capital assets could include:

    I.   Gather information that is already available through regular inspection reports conducted by the host institutions, local, state, or federal entities.
    II.   Conduct on-site inspections and evaluations by qualified outside contractors.
    III.   Conduct on-site inspections and evaluations by the Major Facility maintenance team.
    IV.   Have an independent entity evaluate the full package of available information before submittal to NSF for review.

The FCAR shall use industry standard practices, where appropriate, to break down the elements into major components common to most buildings and sites. Regardless of the standard used, a "systems" approach should be employed that uses a hierarchical structure of cost elements and assets.

The FCAR and AMP should provide documentation to include, but are not limited to:

    I.   When the asset was put into service and estimated remaining useful life of the asset.
    II.   The estimated full replacement cost of the asset.
    III.   Current and projected maintenance requirements and effectiveness of past maintenance performance.
    IV.   A determination of requirements (i.e., an emergent scientific need or a deficient condition that should be addressed), including deferred maintenance, code issues, functional requirements, repair, partial replacement, full replacement, and/or capital investment or further in-depth study, analysis, or specialized inspection.
    V.   A recommended action for each requirement, which is a remedy for the condition that includes itemized cost estimates.
    VI.   For each requirement, an asset level estimation of annual asset repair or renewal or replacement funding needs projecting over the expected life of the Major Facility, or various components required to support the evolving scientific mission, and at a minimum covering the next 5, 10 and 15-year intervals.
    VII.   Estimate of energy efficiency improvements and associated reduction in annual operating costs and carbon footprint associated with renewal and modernization of significant facility assets.

3.6.3.4 Creating the Asset Management Plan

The AMP is the elaboration of a strategy for addressing the issues identified in the FCAR by specifying the corresponding timeline and resources needed. The Awardee can use data from the FCAR for future maintenance management, capital planning, and budgeting and report generation.

The steps to create an AMP are as follows:

    1)   **Analyze and Prioritize:** The baseline FCAR list assumes all requirements are equally important with equal weight, so further refinement is needed to develop a meaningful plan. The items should be prioritized based on urgency and the need to complete within certain timescales (i.e., in 1 year, 2-3 years, 5 years)

2) **Weight and Rank:** With the time priorities developed, refine a model that weights and ranks requirements to be adjusted in alignment with the scientific mission of the Major Facility. Safety, impact on science mission and sustainment of essential operational activities should have the highest weightings.

3) **Project Strategy:** Facility Management Team will develop and mature a strategy for addressing the ranked requirements specifying the corresponding timeline and resources needed and, by design, be managed to de-conflict with science mission and essential operations.

4) **Funding needs**: Identify the annual cost of executing the AMP projecting over the expected life of the Major Facility and at a minimum covering the next 5, 10 and 15-year intervals.

5) **Deferred maintenance.** The Facility Management Team will keep an updated list of deferred maintenance. These are considered FCA requirements that are not yet projectized and scheduled.

The AMP, along with the FCAR and supporting maintenance documents, will be reviewed as part of regular external panel reviews so that priorities can be established, and potential funding avenues identified. The Program Office may choose to have the documents peer reviewed and vetted by maintenance professionals from other Major Facilities.

Once agreed upon, the AMP Work Breakdown Structure (WBS) element costs having a sound, fully justified, and documented, and sufficiently detailed Basis of Estimate, and the planned refurbishment and preventative maintenance projects will be incorporated into the Annual Work Plan (see Section 3.6.2 Annual Work Plan for details).