Project Execution Plan (PE) Workshop

Housekeeping and Logistics

- Greetings
- Session will be recorded and posted for access later.
- NSF Participant Introductions
  - Joe Whitmeyer; *Directorate for Social, Behavioral and Economic Science (SBE),* jwhitmey@nsf.gov
  - Jill Nelson; *Directorate for Education and Human Resources (EHR), jnelson@nsf.gov*
  - Richard Kazmarek *Office of Budget and Award Management, Large Facilities Office*
  - Florence Rabanal; *Office of Budget and Award Management, Large Facilities Office*
- Questions queued in Chat
- Flow (websites and slides)
- Breaks every hour but please take them as needed

Workshop Objectives and Today's Agenda

OBJECTIVES

- Introduce basic project management concepts for NSF mid-scale research infrastructure (RI) proposals.
- Bring awareness to selected key guidance documents central to preparations of mid-scale RI proposals.
- Advise on navigating information and sources.

TODAY'S AGENDA

HR2

- Introduction/Recap (20 min)
- Basis of Estimate (BOE), and Risk/Opportunity Management with Contingency/Allowances (50 min)

HR3

- Lessons Learned from Mid-scale RI Awardees (45 min)
- Project Management Controls (Performance Measurement)

HR4

- Schedule (50 min)
- Q&A and Wrap-up (10 min)

Recap: NSF PEP Workshop Session 1 (July 17, 2022)

- **Inventory of Relevant Documents and Precedence:** The NSF Research Infrastructure Guide (RIG) requirements flow from other NSF policies and statutory requirements. This hierarchy of documentation is presented in *RIG Section 1.2*.
- **NSFS RIG Lexicon:** outlines definitions of project and program management terms used the RIG Guide, as applied to NSF major facilities (and mid-scale RI projects). It is a combination of specialized terms defined by NSF and used in the management of its major facilities (and mid-scale RI projects), and terms and definitions commonly used in professional project and program management.
- **Selected Topics:** Work breakdown Structure, Dictionary, Total Project Cost (TPC), Performance Measurement Baseline (PMB), Allowability, Allocability and Cost Reasonableness

Precedence and Inventory of Relevant Guidance Materials

1. 2 CFR, part 200: Uniform Administrative Requirements, Cost Principles, and Audit Requirement for Federal Awards (Uniform Guidance).
2. The Solicitation and subsequent Award Terms and Conditions
3. **NSF Proposal & Award Policies and Procedures Guide (PAPPG):** The PAPPG is comprised of documents relating to the Foundation's proposal and award process for the assistance programs of NSF. The PAPPG, in conjunction with the applicable award terms and conditions, serves as the Foundation's implementation of the Uniform Guidance.
4. **Research Infrastructure Guide (RIG)**, formerly known as Major Facilities Guide: as referenced in the PAPPG

   "The RIG requirements flow from other NSF policies and statutory requirements. The hierarchy of documentation, in order of precedence, presented here."

   The Research Infrastructure Guide (RIG) contains NSF policy on the planning and management of major facilities and mid-scale projects through their full life cycle.1 The purpose of the Guide is to:

   Provide guidance to NSF staff on conducting oversight of major facilities and mid-scale projects and to Recipients in carrying out effective project planning and management, and

   Clearly state the required policies and procedures as well as pertinent guidance and practices at each stage of a facility's life cycle.
5. Business Systems Review (BSR) Guide

Terms and Definitions, July 15 ver1.1

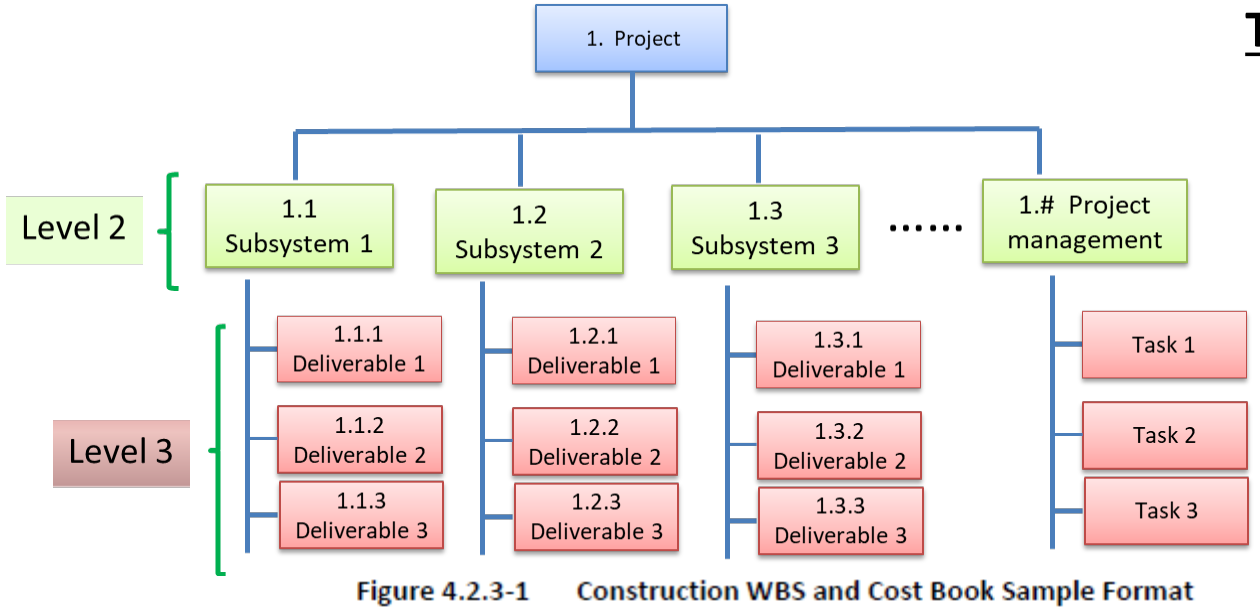


Figure 4.2.3-1 Construction WBS and Cost Book Sample Format

1.0 Project Administration and Management Office
- 1.1 Project Management Office
- 1.2 Site Office
- 1.3 Science Office
- 1.4 Education and Public Outreach
- 1.5 Safety and Environmental Assurance

2.0 Facility Infrastructure and Civil Construction
- 2.1 Sub-element X
- 2.2 Sub-element Y
- 2.3 Sub-element Z

- **Work Breakdown Structure (WBS).** A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables
- **WBS Dictionary.** WBS Dictionary. A document that provides detailed deliverable, activity, and scheduling information about each component in the work breakdown structure
- **Scope Baseline.** The approved version of a scope statement, work breakdown structure (WBS) and its associated WBS dictionary, which can be changed only through formal change control procedures and is used as a basis for comparison.

Notes:
*Work Packages to Level 3
*Product oriented
*Potential components of construction WBS

TRANSITON to Rich's slides:
BASIS of ESTIMATE, RISK/OPPORTUNITY MANAGEMENT, including COST UNCERTAINTY

Project Management Controls (Performance Measurement and Management)

- A mid-scale project should follow project planning and management practices that suit the project while supporting sound performance measurement and management needs. The project management controls should identify the methods and quantitative measures to compare the technical progress and costs during execution to the planned schedule and budget.
- The scope and complexity of a project should be assessed to determine if the project can benefit from the earned value principles for performance management. NSF does not require earned value management implementation for mid-scale projects. NSF has established a scaled earned value management approach (if used) with reduced administration burden

Project Management Controls (Performance Measurement and Management), cont.

As described in RIG PEP Table, 3.4.4-1

- **Project Management Control Plan:** Description of the project management organization and processes
- **Earned Value Management System (EVMS) Plan:** Description of the EVMS plans, processes, software, and tools OR

  - (Section 5.0) methods and quantitative measures to compare the technical progress and costs during execution to the planned schedule and budget

- **Financial and Business Controls:** Description of Financial and Business processes and controls.

Project Management Controls: Sample Method and Quantitative Measure

- (Section 5.0) methods and quantitative measures to compare the technical progress and costs during execution to the planned schedule and budget

-Milestones, units completed, start/finish (percent of progress)

-Variance = the amount of change from the original plan

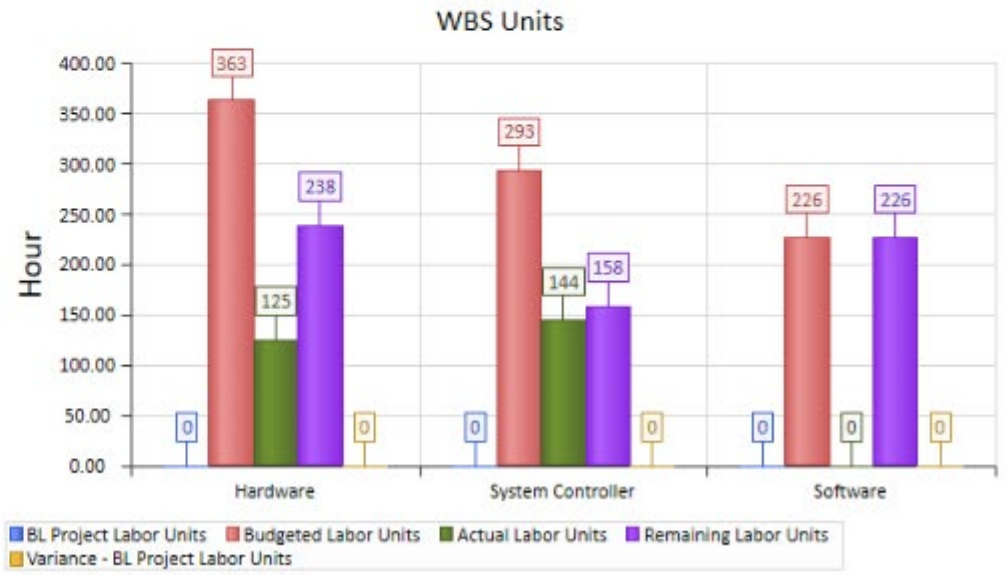
Type of Cost	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planned Cost	50	100										150
Actual Cost	100											100
Value Difference	50	-100	0	0	0	0	0	0	0	0	0	-50

Project Management Controls: Sample Method and Quantitative Measure, cont.

WBS Code	WBS Name	BL Projec...	Budgete...	Actual La...	Remainin...
MFG00659	Deerfield - Autom...		0h	0h	0h
MFG00659.Sys-Eng	System Engineering		960h	962h	0h
MFG00659.Hard	Hardware		363h	125h	238h
MFG00659.Hard....	Temperature Cont...		725h	762h	0h
MFG00659.Hard....	Robot Controller		158h	106h	59h
MFG00659.Hard....	System Controller		293h	144h	158h
MFG00659.Soft	Software		226h	0h	226h
MFG00659.Train	Training		0h	0h	0h
MFG00659.Train....	Manuals		25h	0h	25h
EC00515	City Center Office ...		0h	0h	0h
EC00515.Mechan...	Mechanical/Electri...		0h	0h	0h
EC00515.Ex-Finish	Exterior Finishes		0h	0h	0h
EC00515.Int-Finish	Interior Finishes		422h	0h	422h
EC00515.D&E	Design and Engine...		1330h	1952h	0h
EC00515.Found	Foundation		4339h	305h	3994h
EC00515.Structure	Structure		3878h	0h	3878h
EC00515.Int-Finis...	Plumbing and Light...		154h	0h	154h
EC00515.Ex-Finis...	Doors and Windows		115h	0h	115h
EC00515.Int-Finis...	Floor and Carpeting		2893h	471h	2527h
EC00515.Int-Finis...	Paint		96h	0h	96h
EC00515.Int-Finis...	Carpentry		384h	0h	384h

WBS Units

WBS Units report informs you about the current units of each WBS segment that is part of the project plan.



Earned Value Management (EVM)/Scaled EVM

- **EVM:** a technique for performance measurement and management.
- **Scaled EVM:** NSF recognizes that the full implementation of 32 EVMS guidelines may add unnecessary administrative burden." …. NSF established the framework of scaled EVM for smaller scale and less complex projects." Under NSF Scaled EVMS framework, the wide range of scalability allows extending the practices of EVM basic principles to a project without adding extra burden.

".. a scaled EVMS recognizes that smaller or less complex projects do not require the same level of data detail and/or the same level of control rigor that are needed for large, complex projects."

Earned Value Management (EVM)

- **RIG Section 6.8:** Seven Basic Principles of EVMS A project's EVMS should adhere to the seven basic principles outlined in the EIA-748[1] Standard for EVMS:

    1. Plan all the project's work scope to completion using discrete work packages and planning packages.
    2. Break down the project work scope into finite pieces that are assigned to a responsible person or organization for control of technical, schedule and cost objectives.
    3. Integrate project work scope, schedule, and cost objectives into a performance measurement baseline plan against which accomplishments are measured. Control changes to the baseline.

[1]Electronic Industries Alliance (EIA) standard EIA-748, Earned Value Management Systems (EVMS), is the standard for DoD Earned Value Management programs.

Earned Value Management (EVM), cont.

RIG Section 6.8

4. Use actual costs incurred and recorded in accomplishing the work performed.

5. Objectively assess accomplishments at the work performance level.

6. Analyze significant variances from the plan, forecast impacts, develop corrective actions, and prepare an estimate at completion based on performance to date and the remaining work to be performed.

7. Use the EVMS information in the project's management processes

Schedule Development

RIG Section 4.3

- A schedule is a management tool used for planning and executing work during any Stage of a Facility's life cycle. Schedules address both how and when the work is to be performed by identifying the activities needed to accomplish the scope of work and by time-phasing these activities with durations and schedule logic. Time-phasing involves identifying the key relationships between activities to determine the proper sequence necessary to accomplish the work.
- A project schedule, also referred to as a schedule model, identifies the necessary activities with interdependencies along a timeline to complete a specific deliverable or defined scope of work with a beginning and an end. Project schedules are typically used to manage work during the Design and Construction Stages of a Facility's life cycle. While NSF does not have a no schedule overrun policy similar to the "No Cost Overrun" policy (NCOP), a reliable schedule is critical for the Construction Stage

Schedule Development, cont.

- The total project duration defined in the construction award as two components - the performance measurement baseline (PMB) schedule duration and the schedule contingency
- The process to develop a reliable schedule would generally follow the steps described below. First, a project would select schedule method, technique(s), and tool(s). *For major facility projects, the critical path method, rolling wave planning, Monte Carlo simulations and Primavera scheduling software tool are commonly used.*

Schedule Development, pt. 3

Step 1. Define the total scope of work into deliverables and manageable parts or phases.

Step 2. Identify project goals, major internal and external interfaces.

Step 3. Develop schedule activities and technical milestones

Step 4. Determine durations for each activity.

Step 5. Logically sequence activities.

Step 6. Define and assign resources to activities

Step 7. Perform schedule calculations. (software)

Step 8. Review and analysis.

Step 9. Assign risk-based schedule contingency.

The schedule should include a sufficient number of milestones to manage decision points and interfaces (internal and external) and to monitor technical progress at different levels of the project. External milestones may be associated with collaborative partnership efforts, reviews, funding, facility operations, etc. Typically, external milestones are constrained within the scheduling tool. The Recipient should consult with the NSF Program Officer (PO) to identify programmatic milestones and high-level milestones for reporting to NSF. Lower-level milestones will facilitate more frequent tracking of the project's progress. Milestones should be coded to reflect their level of significance.

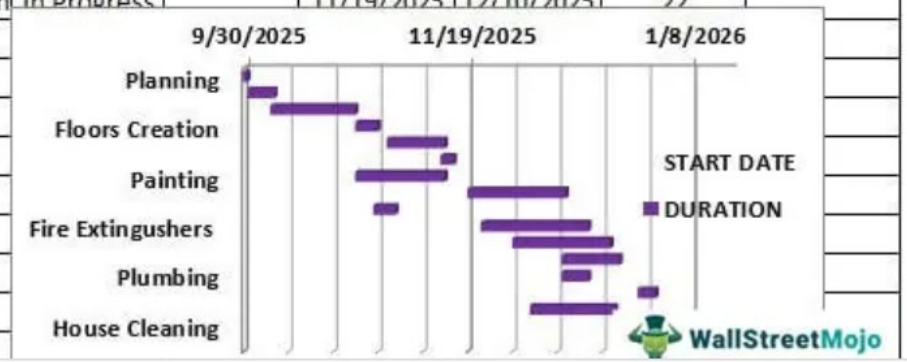
Schedules, selected examples

Construction Schedule Template

Project Name: Strart Date: Total Duration:

Project Manager: End Date:

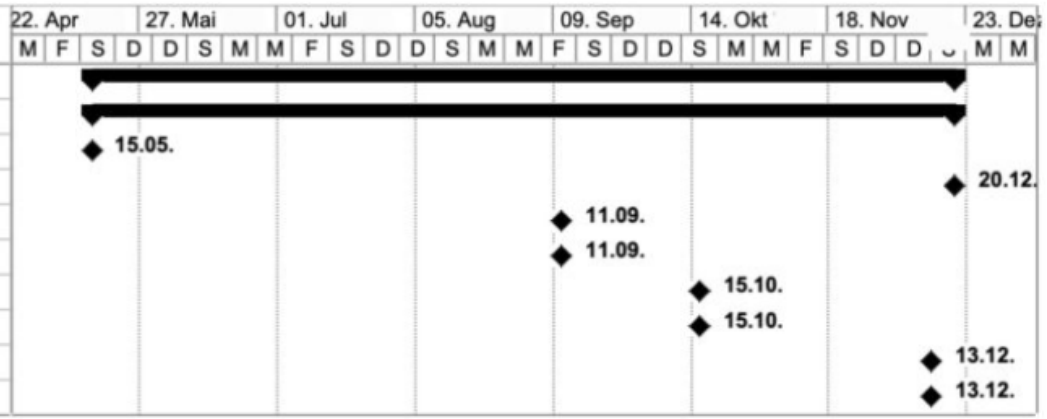
TASK DESCRIPTION	STATUS	ASSIGNED	START DATE	END DATE	DURATION	COMMENTS
Planning	Complete		9/21/2025	9/30/2025	10	
Raw Material Accumula	Complete		10/1/2025	10/6/2025	6	
Basement Creation	Complete		10/6/2025	10/24/2025	19	
Floors Creation	Complete		10/25/2025	10/29/2025	5	
Light Fittings	Complete		11/1/2025	11/13/2025	13	
Sewage Pipelines	Complete		11/13/2025	11/15/2025	3	
Painting	In Progress		10/25/2025	12/5/2025	20	
Accessories Installation	In Progress		11/19/2025	12/10/2025	22	
AC Installation						
Fire Extingushers						
Parking Space						
Appliances						
Plumbing						
Final Inspections						
Wrap up						
House Cleaning						
Complete						



Schedules, selected examples, cont.

Milestone plan					26.11.2020	03.12.2020	10.12.2020	17.12.2020	24.12.2020	31.12.2020	07.01.2021	14.01.2021	21.01.2021	28.01.2021	04.02.2021	11.02.2021	18.02.2021	25.02.2021	04.03.2021
Code	**Work package name**	**Scheduled Deadline**	**Adapted Deadline**	**Actual Deadline**	**Week 46**	**Week 47**	**Week 48**	**Week 49**	**Week 50**	**Week 51**	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Week 9**
1.1.1	Project launched	03.12.2020	03.12.2020	03.12.2020															
1.2.5	As-is analysis completed	04.01.2020	15.01.2020	17.01.2020															
1.3.5	Rough concept created	23.01.2020	29.01.2020																
1.4.5	Detailed concept created																		

Nr.	PSP-Code	Vorgangsname
1	**1**	**Project 001**
2	**1.1**	**Project Management**
3	1.1.1	Project launched
4	1.1.2	Project finished
5	**1.2**	**Technical Architecture**
6	1.2.1	Decision Application Software
7	**1.3**	**Implementation planning**
8	1.3.1	Implementation planning completed
9	**1.4**	**Presentation CEO**
10	1.4.1	Decision by CEO



GAO Best Practices, Proposed Budgets

- "..must comply with the applicable federal regulations, as implemented by NSF in the RIG, the Proposal and Award Policies and Procedures Guide (PAPPG) or the Guide to the NSF Contracting Process. Recipients are required to follow the steps and best practices within the Government Accountability Office (GAO) Cost Estimating and Assessment Guide , taking into consideration NSF policy and practice as provided in this Guide. "
- These NSF and GAO Guides are intended for all Stages in a facility's life cycle. However, portions of these Guides may be tailored depending on what is relevant to the particular facility estimate. Accordingly, Recipients must note any departures from these NSF and GAO Guides and explain their rationale in the Cost Estimating Plan (CEP). Additional guidance on how to apply the relevant practices from the GAO Cost Guide and examples of potential deviations are provided in Section 4.2.2.3.

GAO Best Practices, Schedules

- The GAO Schedule Assessment Guide is intended for project schedules and identifies ten best practices associated with creating and maintaining reliable critical path method (CPM) schedules. Refer to the GAO Schedule Assessment Guide for discussion of concepts associated with CPM and the specifics of each best practice.
- The GAO Schedule Assessment Guide identifies four characteristics of a high-quality, reliable schedule – (1) comprehensive, (2) well-constructed, (3) credible, and (4) controlled. Each of the GAO ten scheduling best practices aligns to one of these four characteristics.
- Recipients are required to utilize the GAO Schedule Assessment Guide in the development of Construction Stage schedules [for major facility projects, as defined in Section 1.4 of the RIG], regardless of the award instrument employed.

Wrap-Up

- THANK YOU!
- Recordings for Session and slides available upon request. Check back for postings to the NSF website.
- Copies of the references NSF Policy and Procedures documents available on the NSF website>> Document Library>>Search Title, NSF - National Science Foundation
- Questions
  - Send to jwhitmey@nsf.gov and jnelson@nsf.gov
- Note (Potential) Future Mid-scale RI1 Program Webcast
- 2022 Research Infrastructure Workshop, Boulder CO; September 13-16th Research Infrastructure Workshop - NSF Research Infrastructure Outreach