

Introduction to **Project Management** and its Conduct in the Department of Energy Office of Science

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Goal and Focus of Course

- ▶ Introduce project development and management within the Department of Energy – specifically the Office of Science – and the framework/mechanism by which it addresses this through the DOE Order 413.3B Program and Project Management for the Acquisition of Capital Assets.
- ▶ Introduce and give exposure to processes and knowledge areas applicable to the successful management of projects within a DOE/SC Laboratory (subject to DOE O 413.3B) and explore corresponding specific requirements associated with each major phase gate (Critical Decision)
- ▶ To provide the knowledge base to identify the management needs and shortcomings in the development and execution of DOE O 413.3B projects (in DOE/SC) to increase the likelihood of success of projects at SLAC

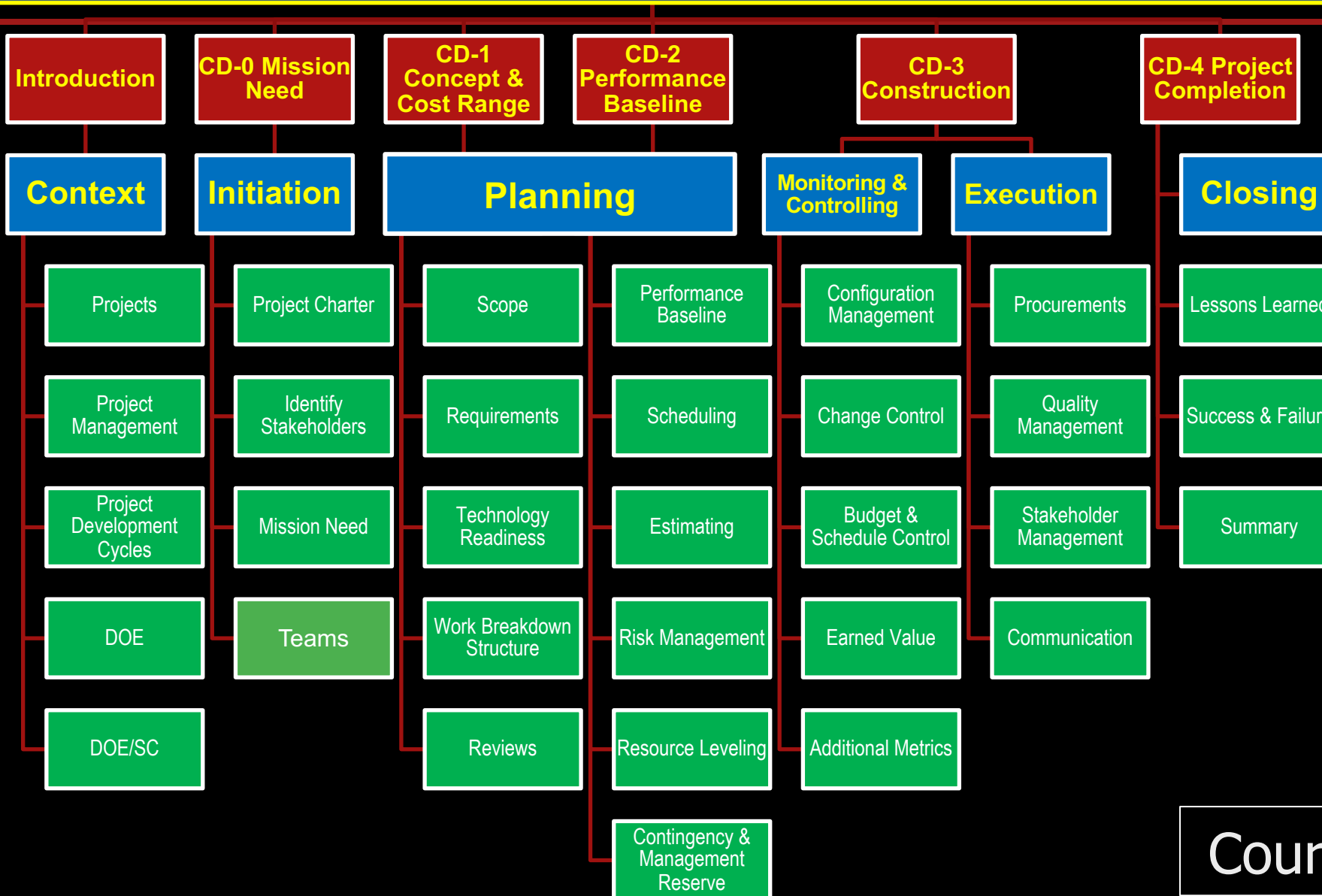
Training Course Approach

- ▶ Lectures and discussions
- ▶ Designation and development of participant project teams
 - ▶ Group exercises
 - ▶ Study project developed through various stage gates / phases
- ▶ Individual exercises
- ▶ Case studies

Global Course Outline

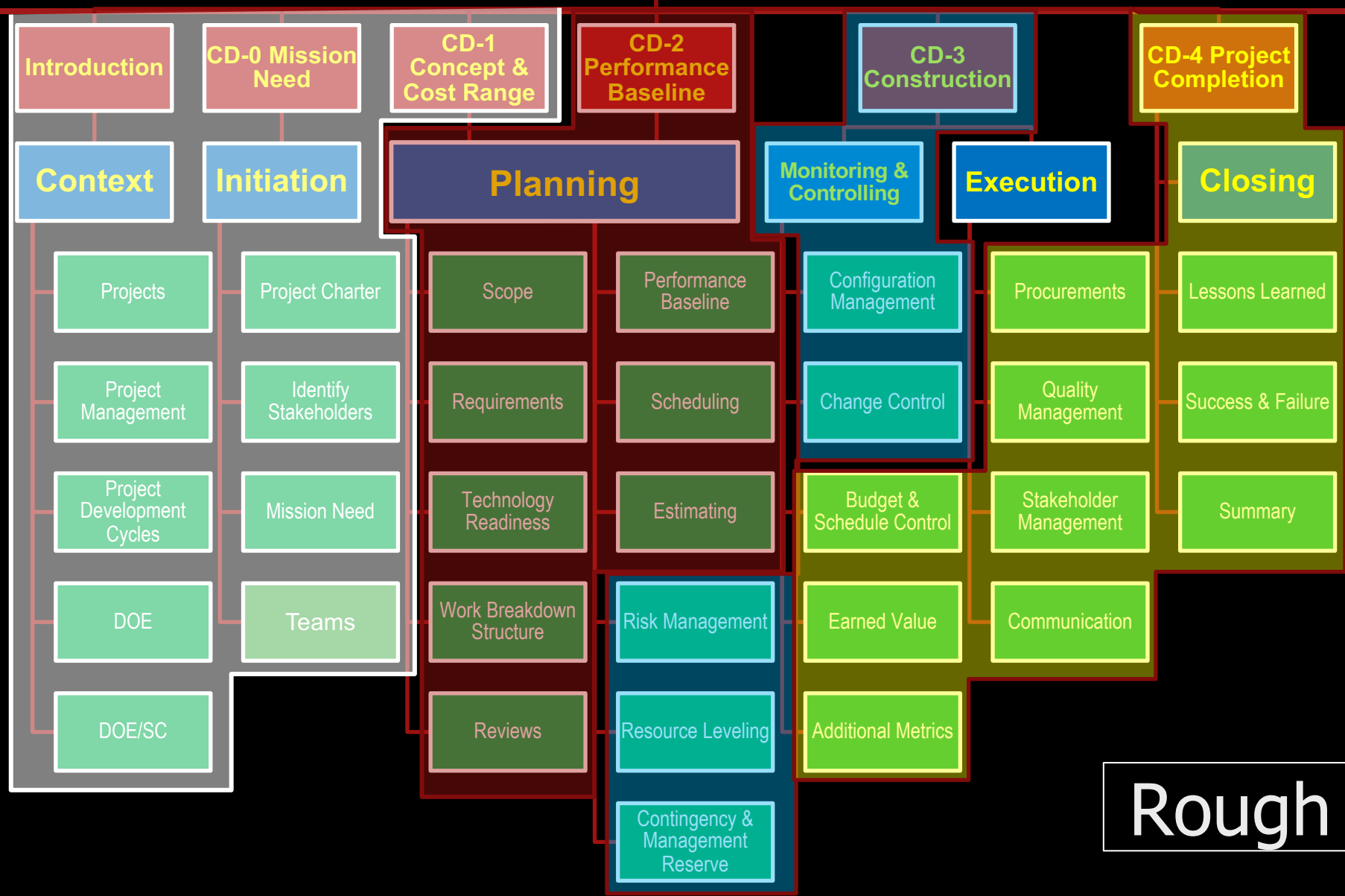
- A. Introduction & Context
 - ▶ Project & Project Management
 - ▶ DOE & Office of Science
- B. Project Initiation
 - ▶ CD-0 Mission Need
- C. Planning
 - ▶ CD-1 Concept & Cost Range
 - ▶ CD-3 Performance Baseline
- D. Monitoring & Controlling
 - ▶ CD-3 Approve Construction
- E. Execution
- F. Closing
 - ▶ CD-4 Project Closeout

Project Management within the DOE/SC



Course Outline

Project Management within the DOE/SC



Monday
Tuesday
Wednesday
Thursday

Rough Schedule

Kem Edward Robinson Ph.D, PMP

- ▶ Accelerator & laser physicist by training (Ph.D. in Physics, Stanford University)
 - ▶ Worked on first operational FEL, Storage Ring FEL
- ▶ Entire career in scientific project environment
- ▶ Joined small for-profit R&D company
- ▶ Developed FEL & Magnetics business
- ▶ Bought small for-profit R&D company
- ▶ At LBNL from February 1999 to June 2019
 - ▶ Senior Staff Physicist (now emeritus)
 - ▶ Deputy for General Sciences Projects
 - ▶ Principal Division Deputy of Accelerator & Fusion Research Division
 - ▶ Laboratory Project Management Officer
 - ▶ Director of Engineering Division
 - ▶ Acting Project Director for DUSEL for UC Berkeley through preliminary design
 - ▶ Acting Head of the Project and Construction Office
 - ▶ Organizing Interim Director of Projects and Infrastructure Modernization Division



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October 2022

Please introduce yourselves

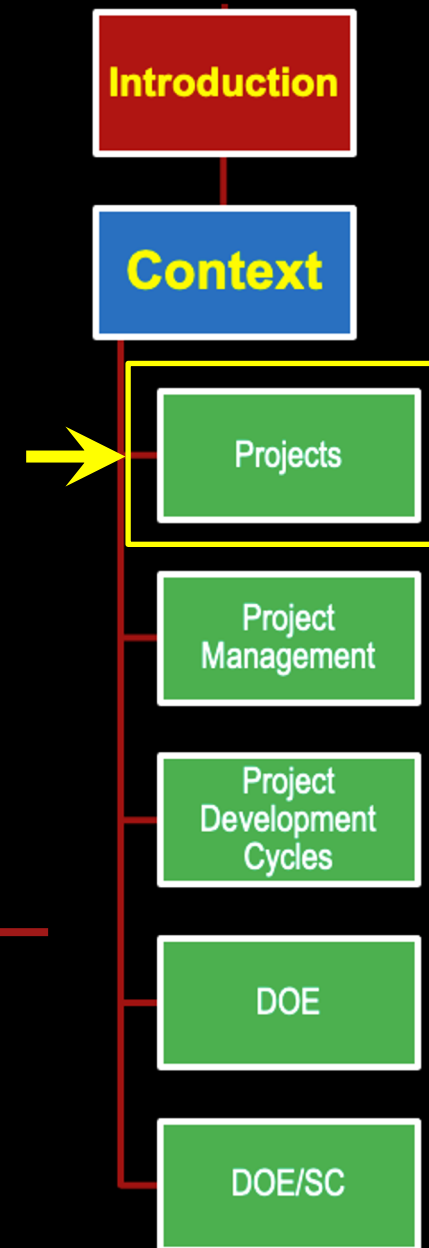
- ▶ Now your turn for introductions
 - ▶ You name
 - ▶ Your background
 - ▶ What department / area within SLAC
 - ▶ What is your experience on projects?
(What projects are you working on, have worked on, or may work on)
 - ▶ What areas of projects do you feel most confident
 - ▶ What areas of project do you feel most challenged
 - ▶ What do you wish to learn by the time we're done?

Introduction and Context

SALIENT FEATURES OF PROJECTS

If projects were that simple, they would be run by computers.

- Klaus Berkner



What is a project?

A project has an end — and a sausage has two.

...Oh, But a DOE Project has four.

- paraphrased German proverb

A **temporary** endeavor undertaken to create a **unique** product, service, or result*

- **Temporary** Has a definite beginning and end to the project work or phase of the project work, not an on-going effort. Ceases when objectives have been attained whether it be .
- **Unique** The product, service or result is different in some way from other deliverables or services. Deliverable characteristics are progressively elaborated. The project can stand alone or be part of a program or portfolio.
- **Focus:** The project work and attention is on the completion of outcome — product service or result.

*PMBOK – Guide, 7th Edition



Additional Considerations of a Project

- ▶ Since a project has a defined goal, a uniform understanding of that goal is essential
- ▶ Given that a project is a temporary endeavor, the establishment of a temporary organization is required generally pulling people and resources from different entities and functions
- ▶ Given that a project is a unique, it carries unfamiliarity, uncertainty, and risk

The 3 Dependent Variables of a Project

What are you going to do for me?

- Technical Performance (Scope)

How much money do I have to pay?

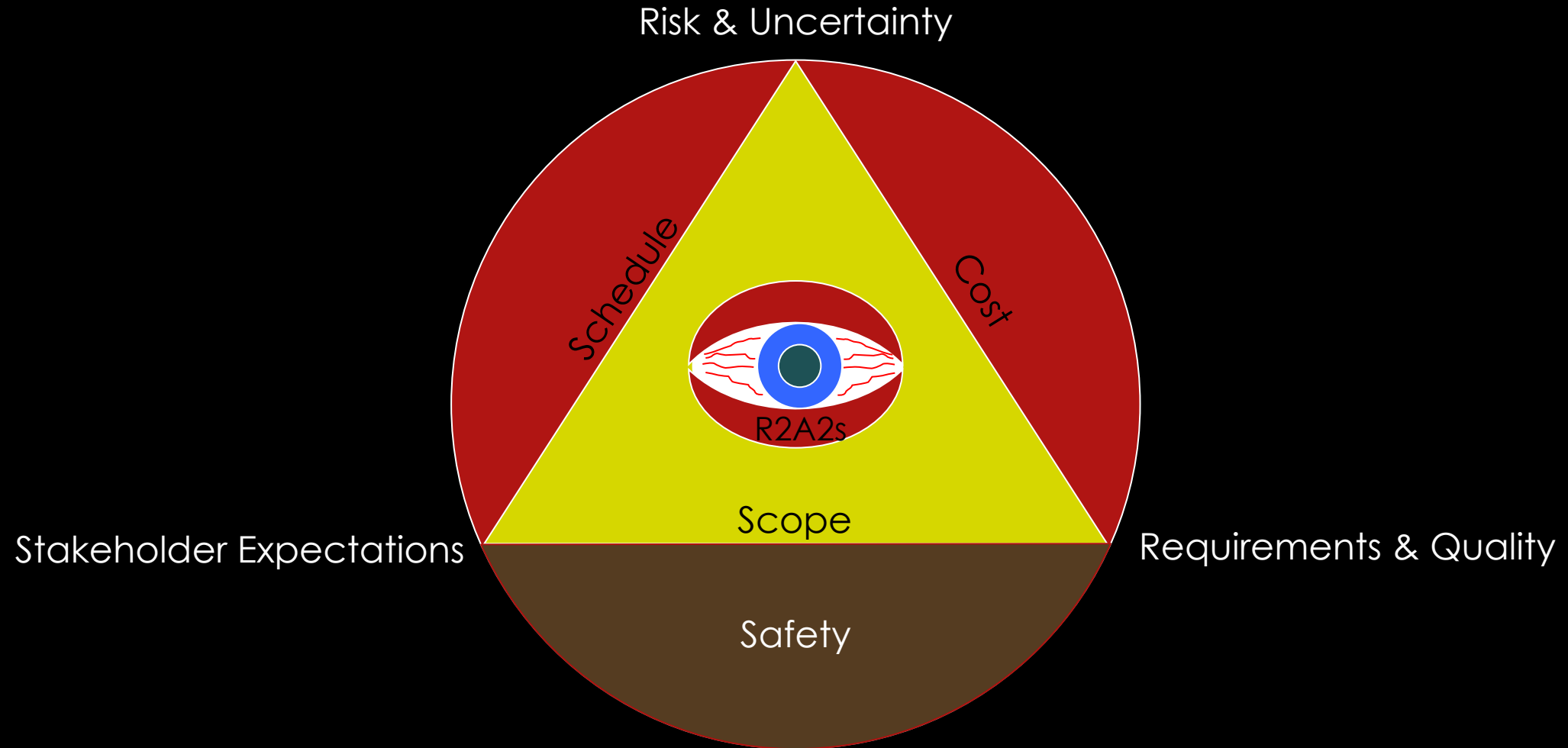
- Cost

When can I get it?

- Schedule

Germane aspects of a project within a DOE lab

Project Mnemonic Graphic #1



Are there other characteristics that you would include?

Novus Ordo Seclorum

= New order of the ages

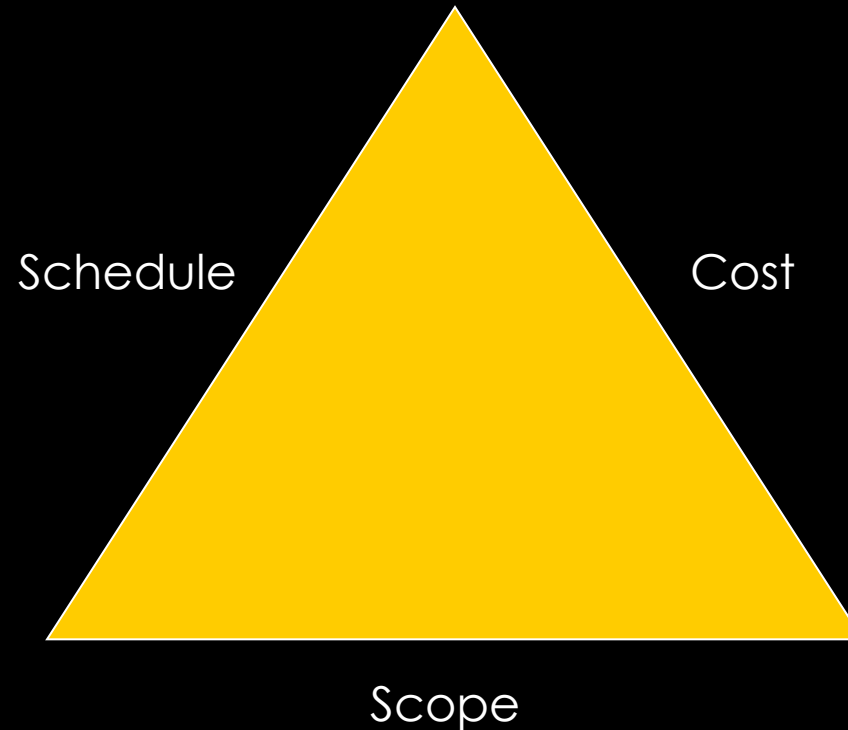
Is this DOE Order 413.3B?



Graphic #1 — What to Retain

– The Dependent Variables

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These are often referred to as constraints in PM literature, but they are more properly dependent variables with constraints imposed on them

A misconception ...

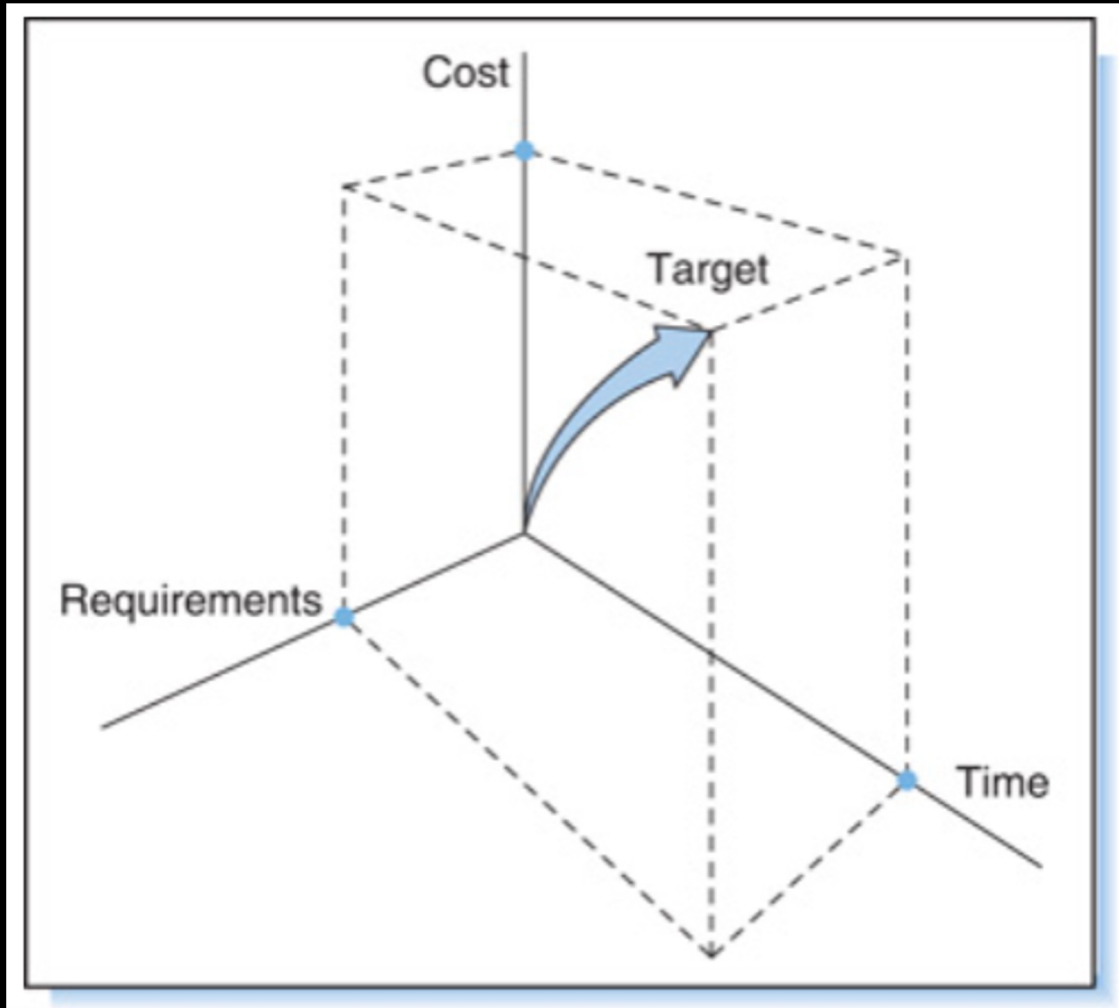
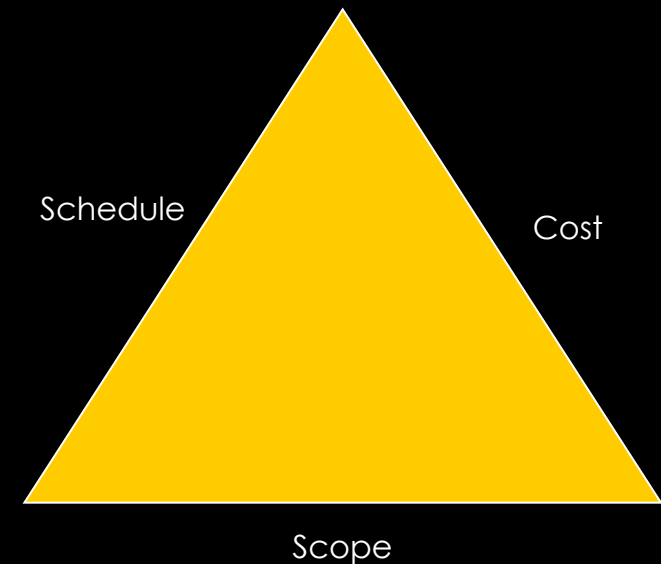


Figure 1.5 [N&S]

- ▶ Project dependent variables are **not** an orthogonal set
- ▶ You **cannot** adjust one dependent variable without impacting the others



Graphic #1 — What to Retain

– Dependent Variable Hierarchy

- ▶ There will be a hierarchy of the dependent variables imposed on the project
- ▶ All three will be important, but there must be some level of flexibility in at least one to accommodate risk and uncertainty
- ▶ It is essential that the hierarchy of the dependent variables be clearly understood from the start

Graphic #1 — What to Retain

– Risk & Uncertainty

- ▶ All projects are subject to risk and uncertainty
 - ▶ Unique nature means that previous approaches may not be adequate
 - ▶ Circumstances are uncertain and variable
 - ▶ Outcomes are not deterministic
 - ▶ Context and circumstances are not static
- ▶ Response and anticipation of risk and uncertainty are required for all projects

Graphic #1 — What to Retain

– Requirements & Quality

- ▶ All projects will have requirements, constraints, and quality expectations
 - ▶ Unique nature means that previous approaches may not be adequate
 - ▶ The source and development of requirements is necessary to clearly define scope
 - ▶ Outcomes and required quality of deliverables are not deterministic
 - ▶ Constraints impact how a project proceeds and deliverables completed
- ▶ All projects will have assumptions (something that is considered true, real, certain, without proof or demonstration)
 - ▶ All assumptions should be consciously understood, so that a project is resilient against them not being correct
- ▶ Understanding and incorporating the requirements and quality of a project (both for deliverables and conduct) is essential for success

Graphic #1 — What to Retain

– Stakeholder Expectations

Stakeholders: Individuals and organizations involved in or affected by the project activities



Medieval project manager Joan of Arc discovers too late that her project goals are not in alignment with the English stakeholders' priorities

- ▶ All projects have multiple Stakeholders
 - ▶ DOE
 - ▶ Laboratory
 - ▶ Community
 - ▶ Project team
 - ▶ Functional organizations
 - ▶ ...
- ▶ Understanding stakeholders needs and impacts on a project are key to success

Graphic #1 — What to Retain – R2A2s

– Roles, Responsibilities, Authorities, and Accountabilities

- ▶ A project is a temporary endeavor, so its team likewise is temporary
 - ▶ Who is supposed to do what?
 - ▶ Who is responsible for what?
 - ▶ Who has the authority to do what?
 - ▶ Who is answerable for the outcomes? Have they been given the means to be successful?
- ▶ Without clearly defined roles, properly delegated authorities, understood responsibilities, and knowledge of answerability for outcomes, a project will not succeed

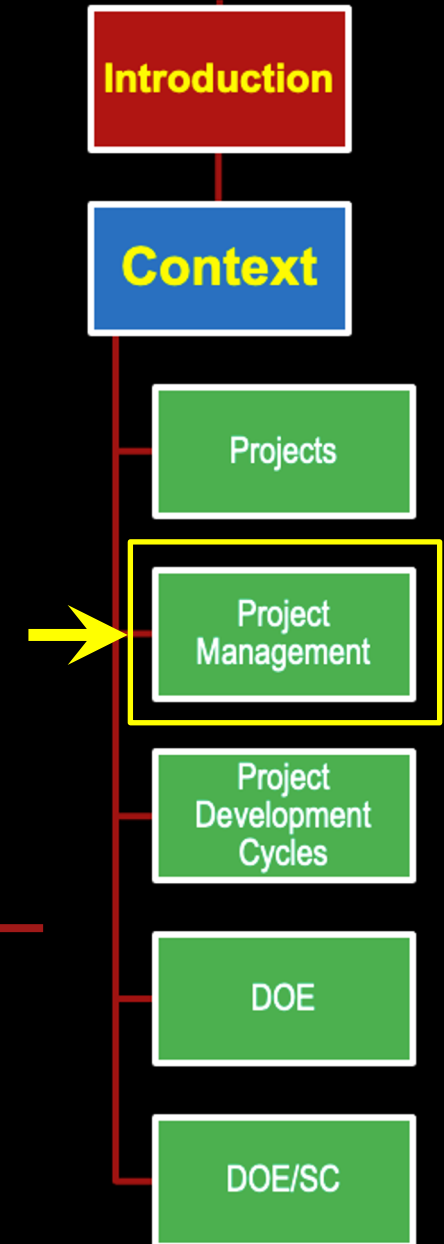
Short Exercise: What have you got (or had)?

- ▶ What projects do you presently have?
- ▶ What past projects are seared in your psyche and why?
- ▶ What are the dependent-variables hierarchies of these projects?
- ▶ For those projects that are seared in your psyche which of the dependent variables gave you grief?
- ▶ What impacts of risk and uncertainty have been present in those projects?
- ▶ Have there been issues with stakeholders, requirements, quality, or R2A2s?

Introduction and Framework

PROJECT MANAGEMENT

*We believe in crisis management
— we manage to go from crisis to crisis
- Unknown*



What is Project Management?

The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.*

What is Project Management? — The Cynic's Definition

Project Management is the art of creating the illusion that any outcome is the result of a series of predetermined, deliberate acts when, in fact, it was dumb luck.

— Harold Kerzner

Project Management Principles*

- ▶ Stewardship
- ▶ Team
- ▶ Stakeholders
- ▶ Value
- ▶ Systems Thinking
- ▶ Leadership
- ▶ Tailoring
- ▶ Quality
- ▶ Complexity
- ▶ Risk
- ▶ Adaptability & Resiliency
- ▶ Change

Project Management Performance Domains*

- ▶ Stakeholders
- ▶ Team
- ▶ Development Approach & Life Cycle
- ▶ Planning
- ▶ Project Work
- ▶ Delivery
- ▶ Measurement
- ▶ Uncertainty
- ▶ Tailoring

Project Management is a Discipline*

It is a body of theory and technique that can be studied and mastered

For example:

- ▶ Identifying **Requirements**
- ▶ Addressing needs, concerns, and expectations of **stakeholders**
- ▶ Setting up and maintaining effective **communications**
- ▶ Managing stakeholders to meet requirements and realize project **deliverables**
- ▶ **Balancing** competing constraints
 - ▶ Scope
 - ▶ Schedule
 - ▶ Budget
 - ▶ Quality
 - ▶ Risks, and
 - ▶ Resources

**A discipline is a developmental path for acquiring skills and competencies*

Comparing Functional & Project Management

▶ Functional Management

- ▶ Well-defined steady state operation
- ▶ Organized along discipline and functional lines
- ▶ Small, incremental changes

▶ Project Management

- ▶ New activity in finite duration of time
- ▶ Organization cuts across functional line
- ▶ New systems and new technology
- ▶ Unless home site, organization ends with project end

Who is a Project Manager?

You are

- There is only one *Project Manager/Director*
- However, within the Project , there are often an enormous number of smaller *projects* which need to be managed with discipline
 - In this sense, there are many *project managers*
 - Cost Account Managers, Senior Team Leaders ...
- Everything that will be presented in this course applies to people who manage projects, big or small
 - The better you get at it, the more freedom and responsibility you will be given

Project Management Process Groups*

▶ **Initiating Processes**

- ▶ Define a new project or new phase of an existing project by obtaining authorization to start the project or phase

▶ **Planning Processes**

- ▶ Establish the scope, refine the objectives, define the course or action, for the project to obtain its objectives

▶ **Executing Processes**

- ▶ Complete the work to satisfy project requirements

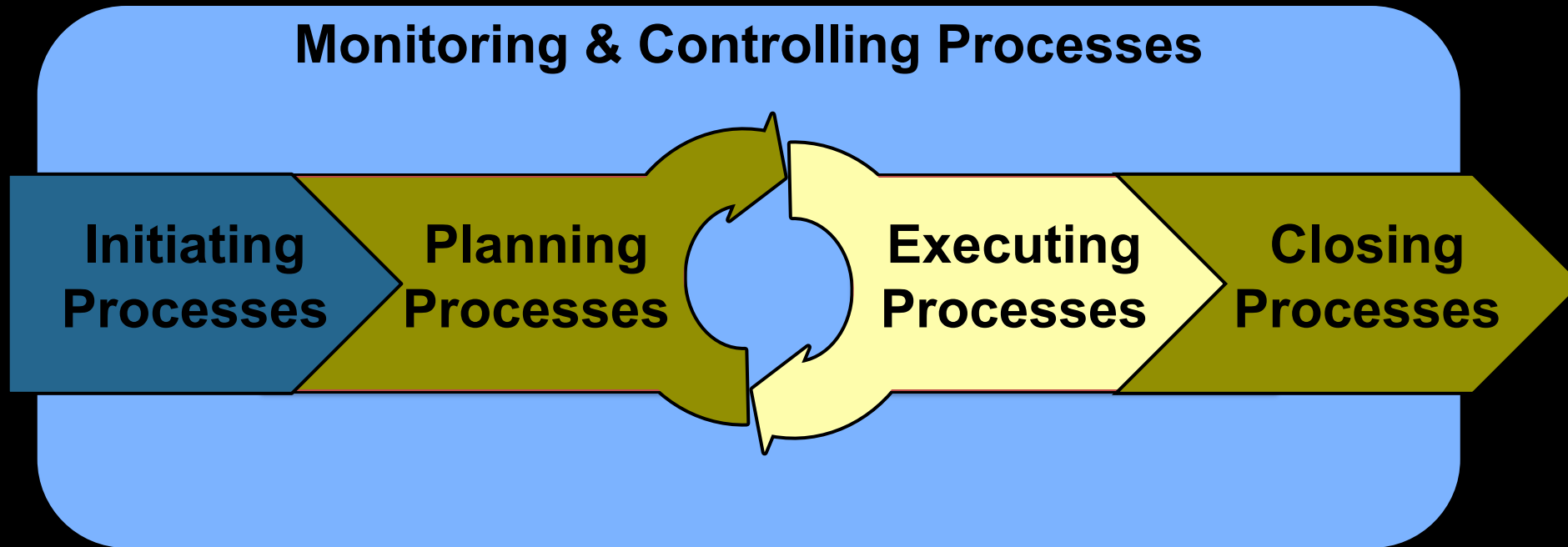
▶ **Monitoring & Controlling Processes**

- ▶ Track, review, and regulate the progress and performance of a project; identify areas where changes to the plan are required and initiate corresponding changes

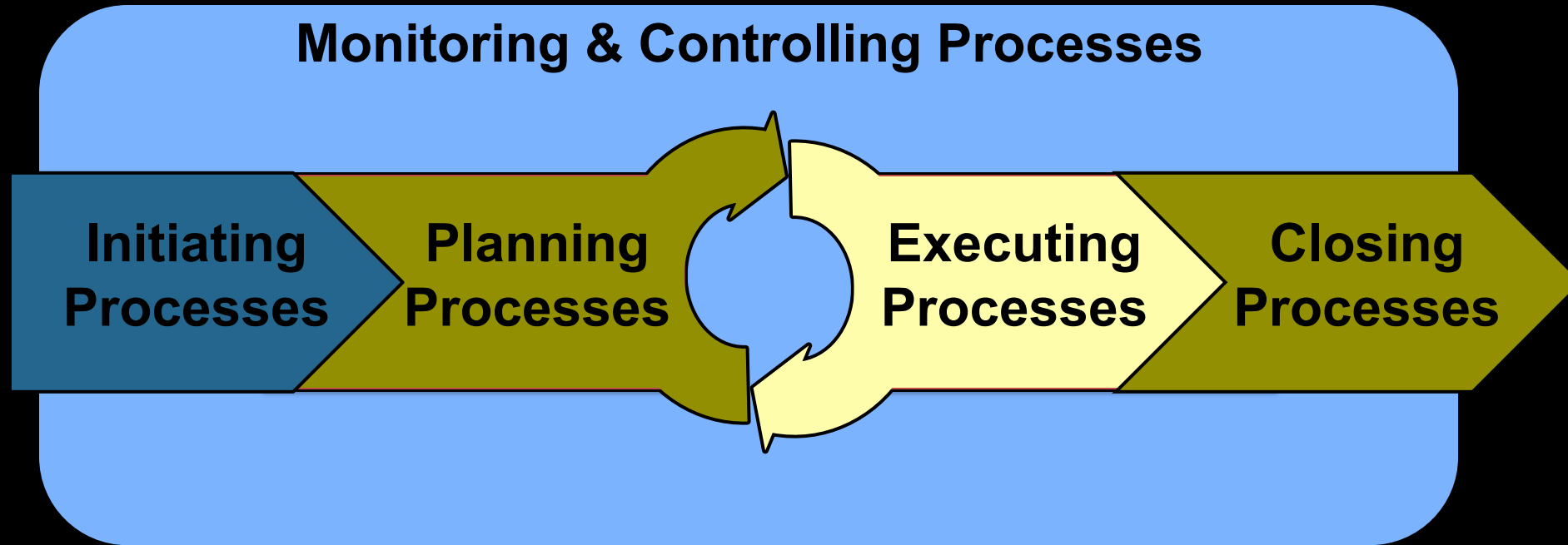
▶ **Closing Processes**

- ▶ Formally complete, or close the project, phase, or contract

Project Management Processes

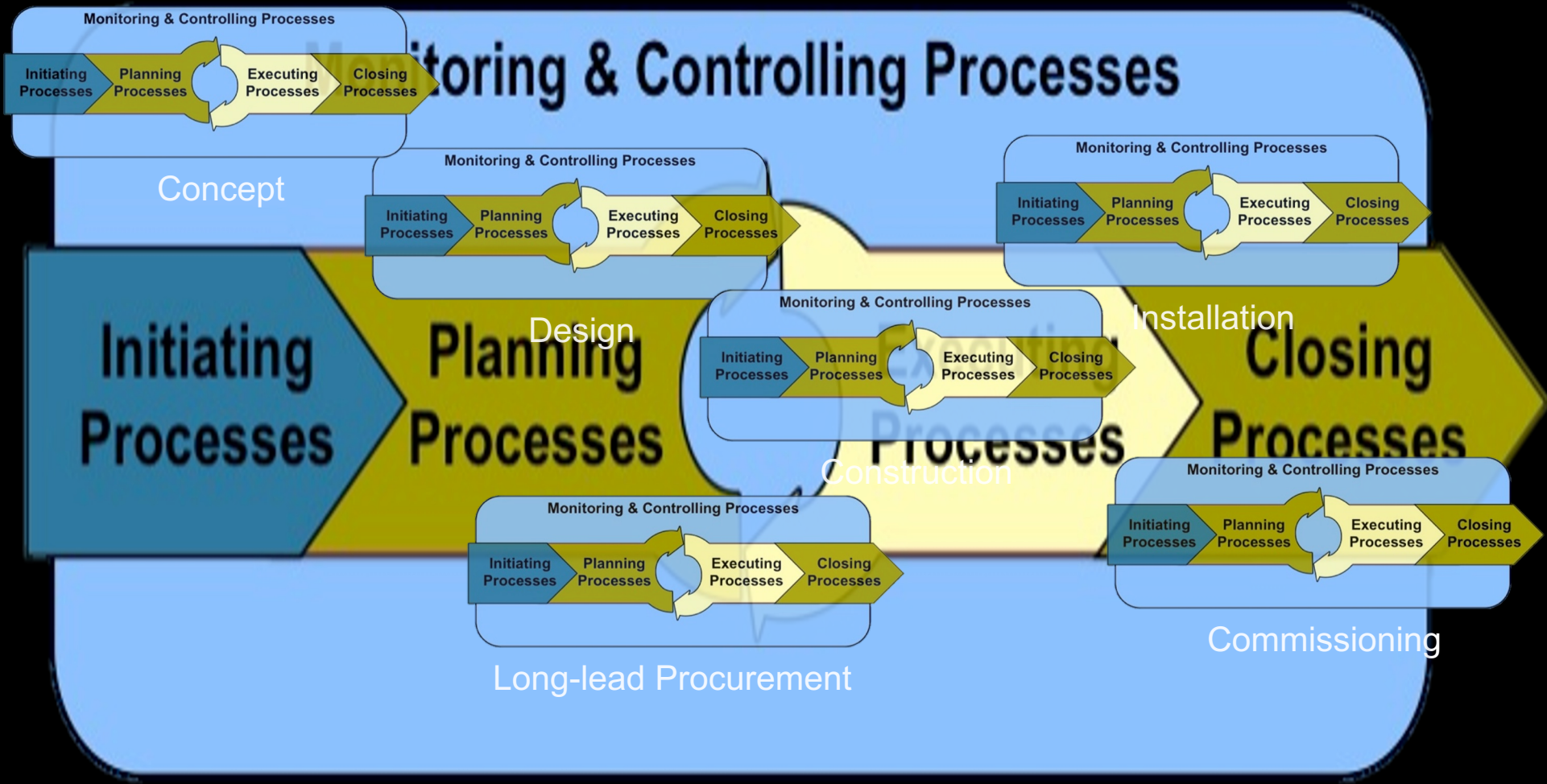


Simple projects may have only one set of PM processes within it



- Simple projects
 - Don't have multiple phases
 - Generally smaller teams
- Example:
 - Replace klystron on RF system

Larger Projects likely have multiple phases with concurrent processes



A Note of Caution:

PM processes used to be incorrectly called phases

- ▶ Many project phases have similar names to PM process groups
 - ▶ Initiation phase ≠ Initiating processes
 - ▶ Closeout phase ≠ Closing processes
 - ▶ ...
- ▶ This led to an unconscious impression that during a particular project phase only those PM processes with the same name were needed
- ▶ This misconception leads to gaps in management of projects and is dangerous
- ▶ *In practice every phase of a project will use PM processes from all process groups*

Project Management Knowledge Areas*

Integration Management

Scope Management

Time Management

Cost Management

Quality Management

Human Resource Management

Communications Management

Risk Management

Procurement Management

Stakeholder Management

Integration Management

- ▶ Processes and activities to identify, define, combine, unify, and coordinate various processes and activities
- ▶ Within management of the project
 - ▶ Project Charter
 - ▶ Management Plan
 - ▶ Direct and manage project work
 - ▶ Monitor and control project work
 - ▶ Integrated change change control
 - ▶ Project or phase closeout
- ▶ Within technical aspect of project
 - ▶ Ensures that whole is more than sum of the parts
 - ▶ Integration and interface of systems, phases

Scope Management

- ▶ The processes required to ensure the project includes all of the work required, **and only** the work required to complete the project successfully
 - ▶ Scope management plan
 - ▶ Collecting requirements
 - ▶ Defining scope
 - ▶ Creating the Work Breakdown Structure
 - ▶ Validating scope
 - ▶ Controlling scope

Time Management

- ▶ Processes concerning timely completion of the project
 - ▶ Schedule management plan
 - ▶ Defining activities
 - ▶ Sequencing activities
 - ▶ Estimating activity resources
 - ▶ Estimating activity durations
 - ▶ Developing schedule
 - ▶ Controlling schedule

Cost Management

- ▶ Processes involved in planning, estimating, budgeting, financing, funding, managing and controlling costs so that project is completed within approved budget
 - ▶ Planning cost management
 - ▶ Estimating costs
 - ▶ Determining budget
 - ▶ Controlling costs

Quality Management

- ▶ Processes and activities involved in assuring that project will meet its objectives
 - ▶ Planning quality management
 - ▶ Performing quality assurance
 - ▶ Controlling quality

Human Resource Management

- ▶ Processes that organize and manage a project team
 - ▶ Planning the management of human resources
 - ▶ Acquiring a project team
 - ▶ Developing a project team
 - ▶ Managing a project team

Communications Management

- ▶ Processes concerning the timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring and disposition of project information
 - ▶ Planning communications
 - ▶ Managing communications
 - ▶ Controlling communications

Risk Management

- ▶ Processes concerned with managing risk on a project
 - ▶ Planning risk management
 - ▶ Identifying risks
 - ▶ Analyzing qualitative risk
 - ▶ Analyzing quantitative risk
 - ▶ Planning risk responses
 - ▶ Controlling risks

Procurement Management

- ▶ Processes that purchase or acquire services, products, or results
 - ▶ Planning procurement management
 - ▶ Conducting procurements
 - ▶ Controlling procurements
 - ▶ Closing procurements

Stakeholder Management

- ▶ Processes that identify stakeholders, their expectations and impacts on the project and managing through communication and engagement
 - ▶ Identifying stakeholders
 - ▶ Planning stakeholder management
 - ▶ Managing stakeholder engagement
 - ▶ Controlling stakeholder engagement

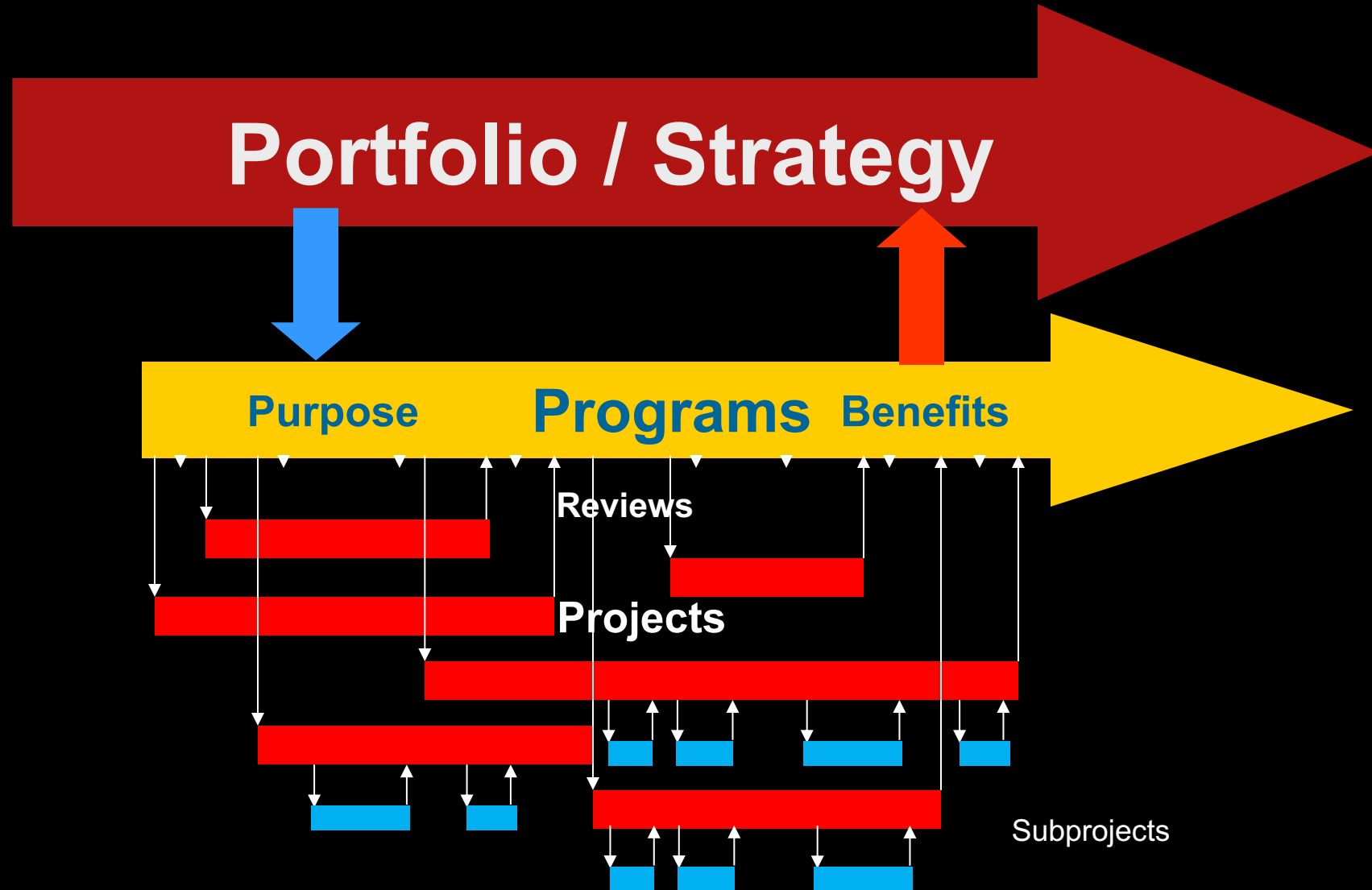
The projection of process groups to knowledge areas

| Knowledge Areas Processes | Integration | Scope | Time | Cost | Quality | Human Resource | Communication | Risk | Procurement | Stakeholder Management |
|------------------------------|-------------|-------|------|------|---------|-------------------|---------------|------|-------------|---------------------------|
| Initiating Process | ✓ | | | | | | | | | ✓ |
| Planning Process | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Executing Process | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Monitoring and Control | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Closing Process | ✓ | | | | | | | | ✓ | |

Look to where these appear within the DOE Framework

Remember: Process Group ≠ Project Phase

From Portfolio To Projects

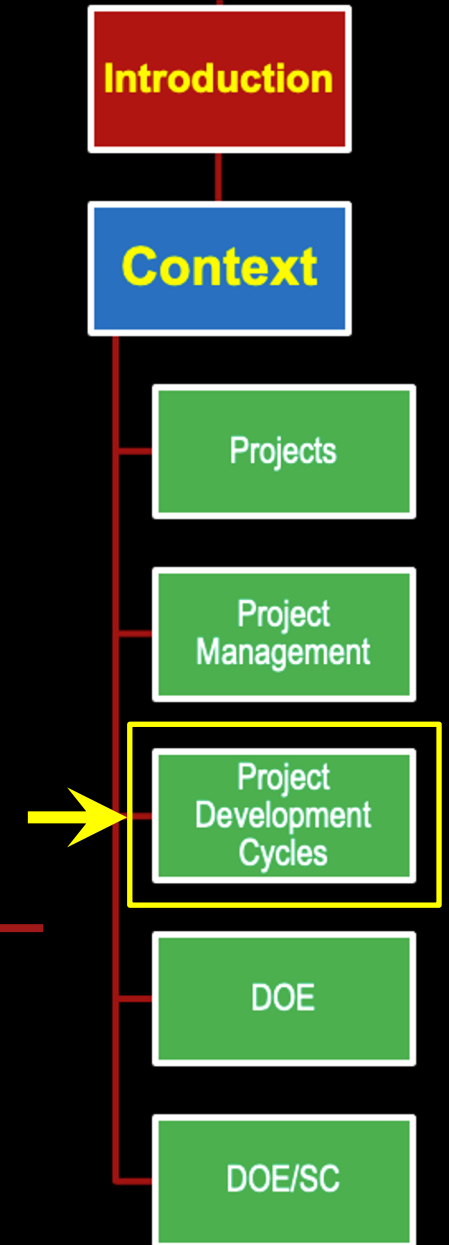


Related Endeavors

- ▶ **Strategy:** A framework guiding those choices that determine the nature and direction to attain an objective through programs and projects within an organization
- ▶ **Program:** Consists of a group of projects supporting broad, general goals and managed in a coordinated way so as to achieve a set of defined objectives, giving effect to various (and often overlapping) initiatives and/or implementing a strategy
- ▶ **Subproject:** A distinct group of activities that comprise their own project which in turn is a part of a larger project

Project Development Cycles

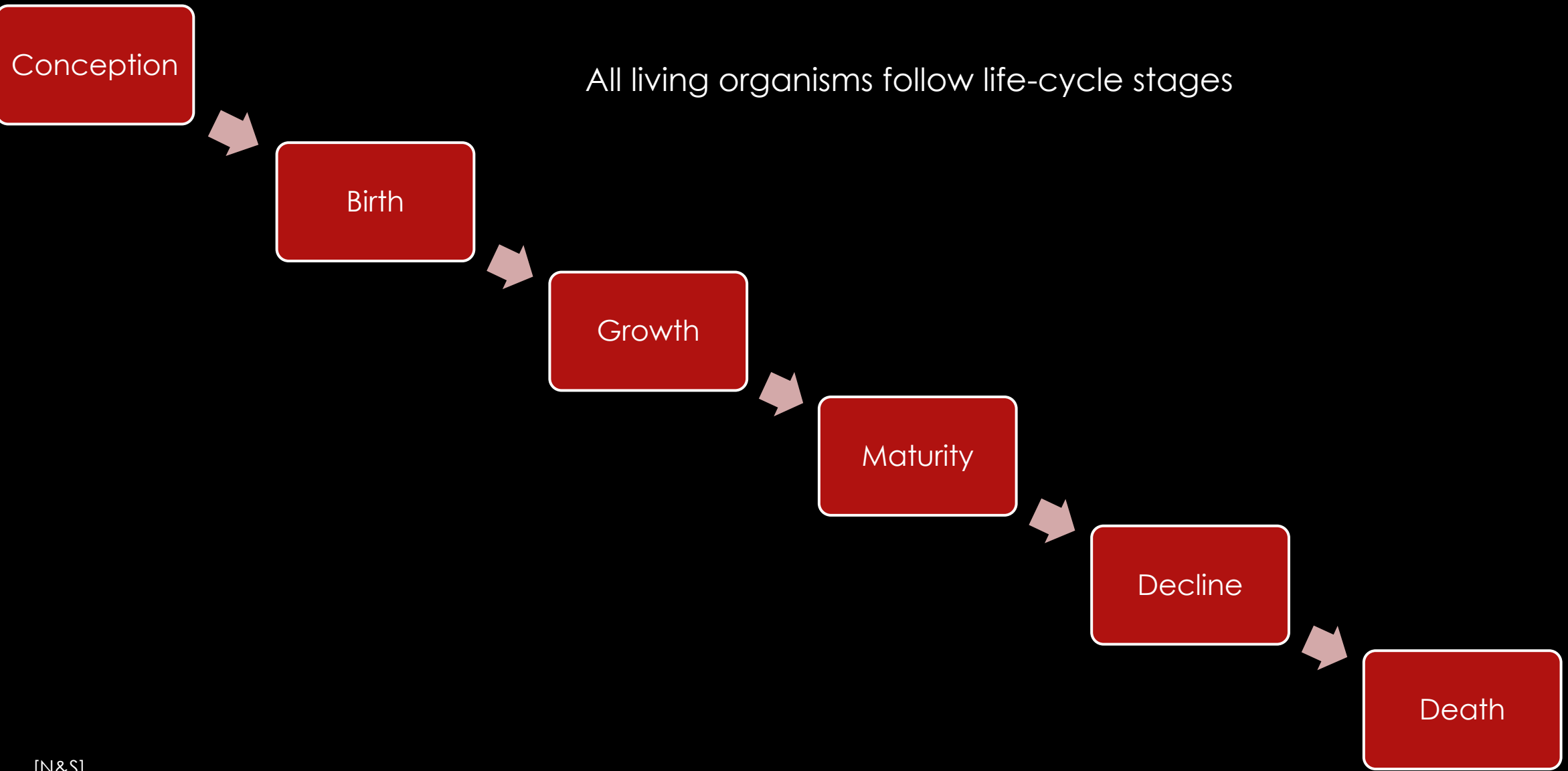
SALIENT FEATURES OF PROJECTS



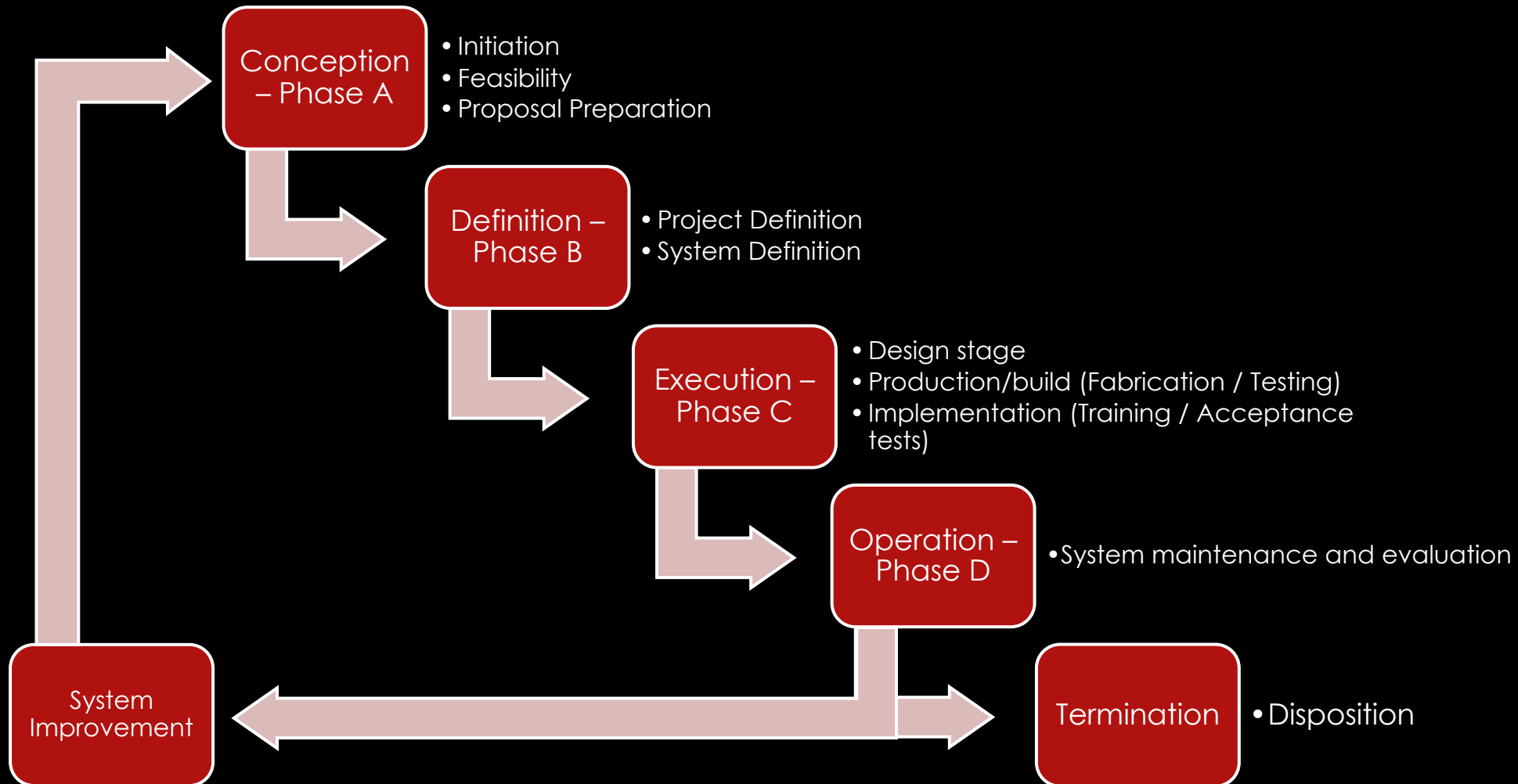
Life Cycle Stages: Natural Organisms

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All living organisms follow life-cycle stages



Systems Development Cycle



Phase A: Conception

- ▶ Perceived need or problem
- ▶ Initial investigation and project feasibility
- ▶ Request for proposal
- ▶ Project approval or denial, contract agreement

Phase B: Definition (“Birth”)

- ▶ Specify requirements in detail:
 - ▶ User requirements
 - ▶ System requirements/
system specifications
- ▶ Define project to produce end-item/deliver requirements:
 - ▶ Project master plan

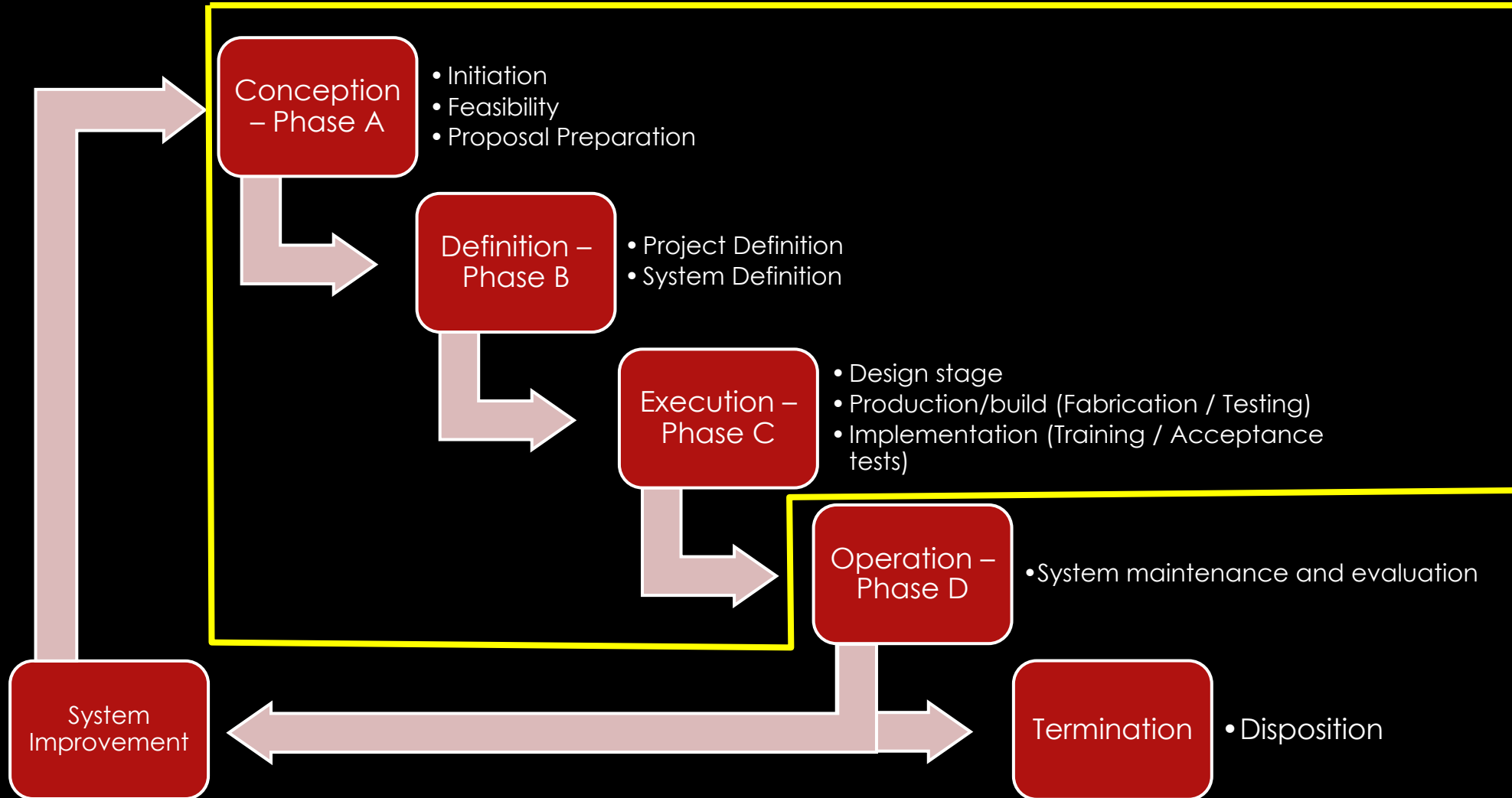
Phase C: Execution (“Growth”)

- ▶ Design/development
- ▶ Procurement/fabrication
- ▶ Production/building
- ▶ Installation

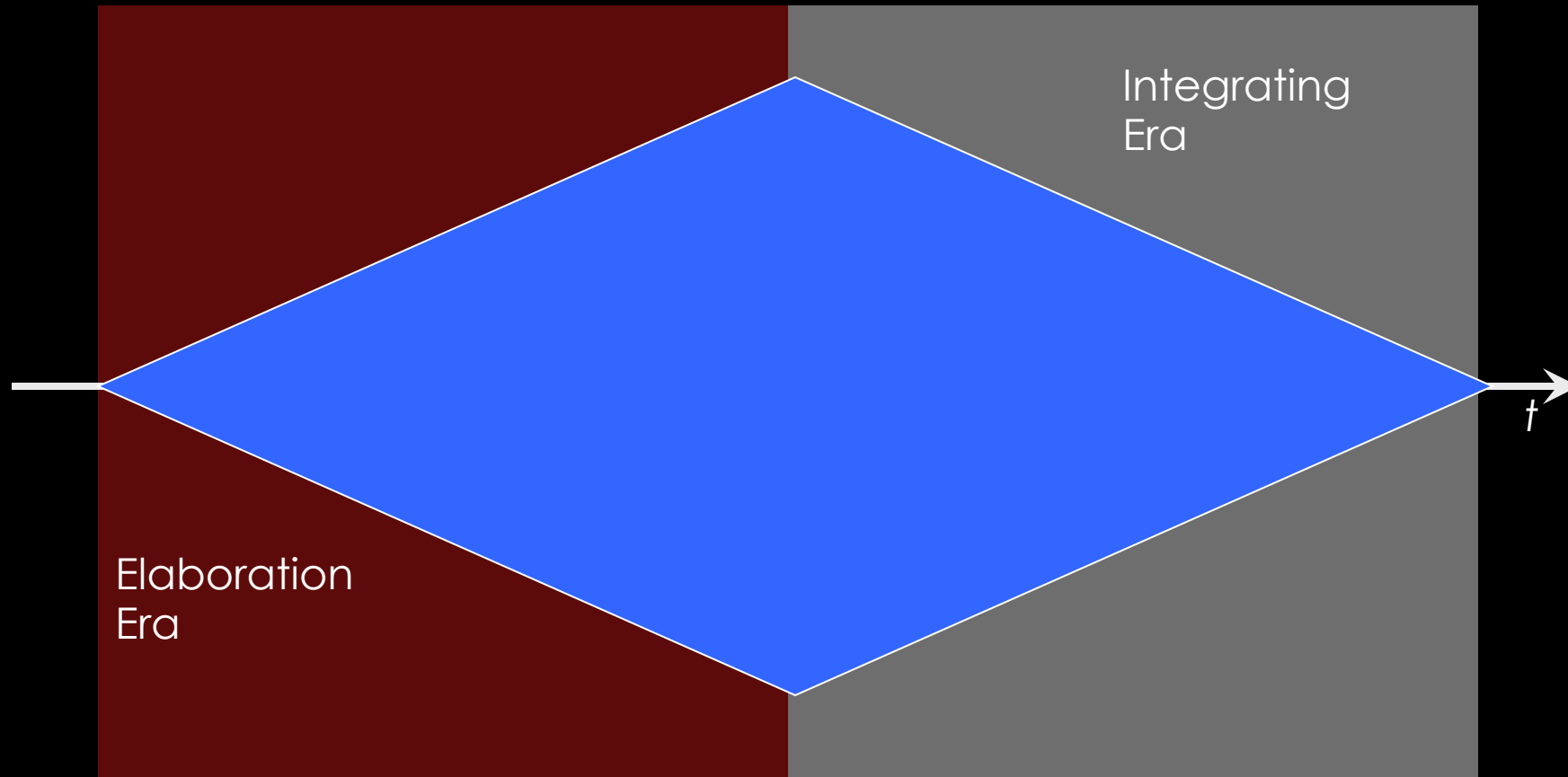
Phase D: Operation (“Maturity”)

- ▶ Customer gains control
- ▶ System developer might remain involved with system/customer through:
 - ▶ Maintenance
 - ▶ Evaluation
 - ▶ Enhancement
 - ▶ Replacement

Phases A, B, C are “Project Life Cycle”

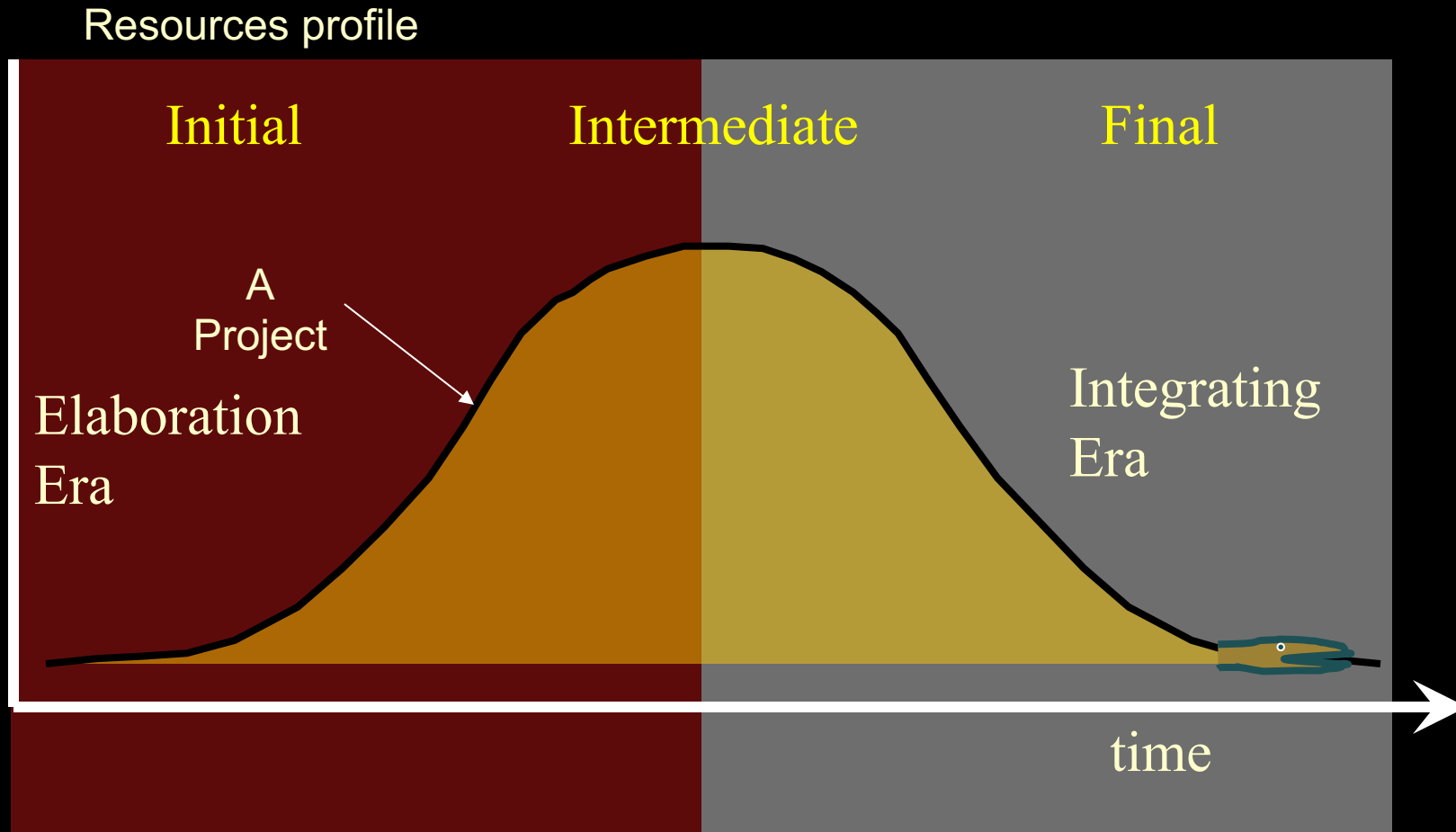


Project Life Cycle Mnemonic Graphic #2



Project Life Cycle Mnemonic Graphic #2

Variation A — The Pig in the Boa



What to Retain from Graphic #2

- ▶ All projects will go through an *era of progressive elaboration* (post "*big bang*")
- ▶ All projects will go through an *era of integration* (the "*big crunch*")
- ▶ Each *era* has specific ramifications on the management of the project

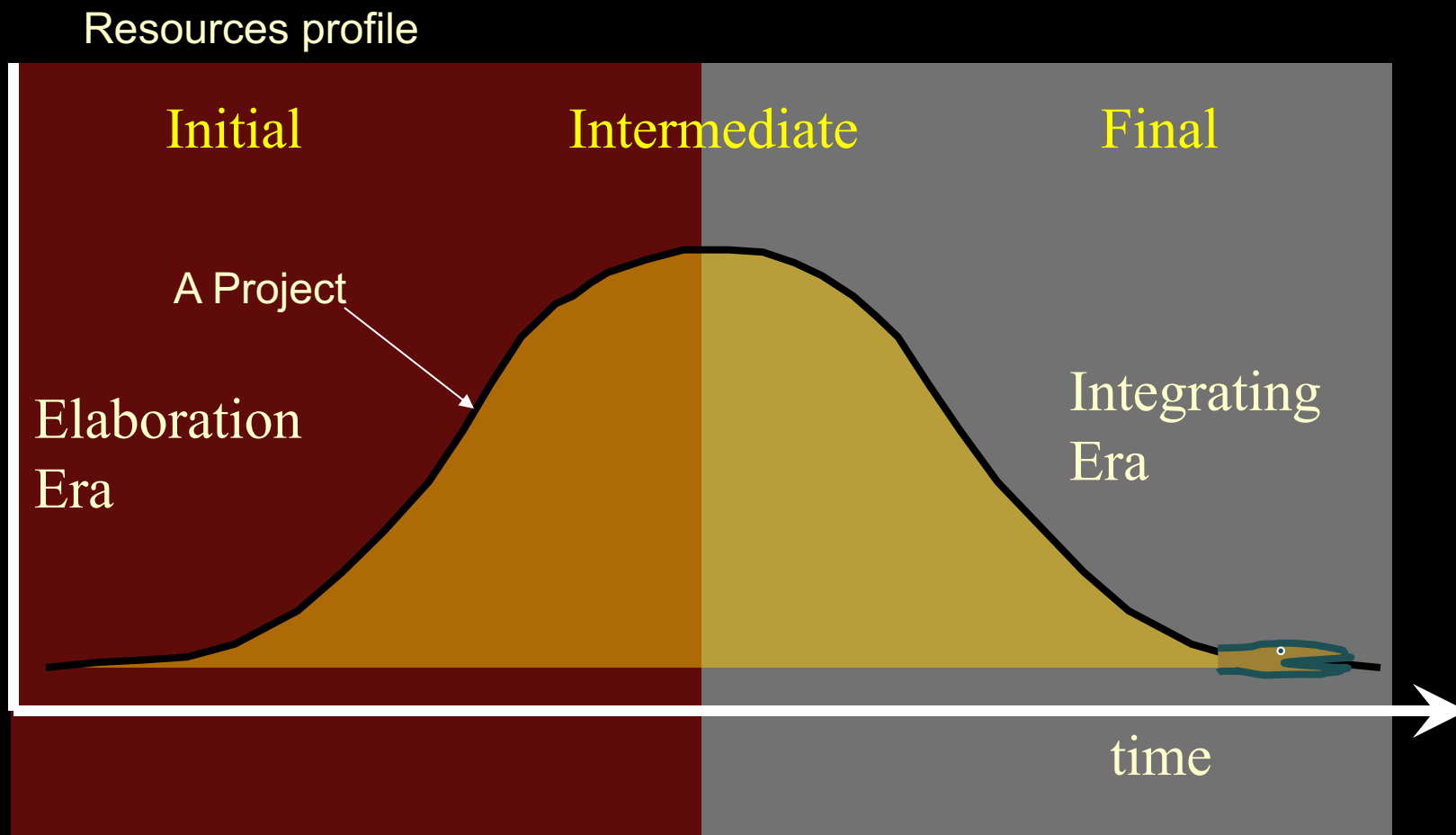
Characteristics of Development Life Cycle

- Defines the beginning and end of the project
- Deliverables usually approved before work starts on the next phase
- Sometimes a subsequent phases is begun prior to approval of the previous phase. This is called *fast tracking* or *concurrent phasing*.
 - Advantage: shortens project duration
 - Disadvantage: increases risk
- Defines technical work and implementers

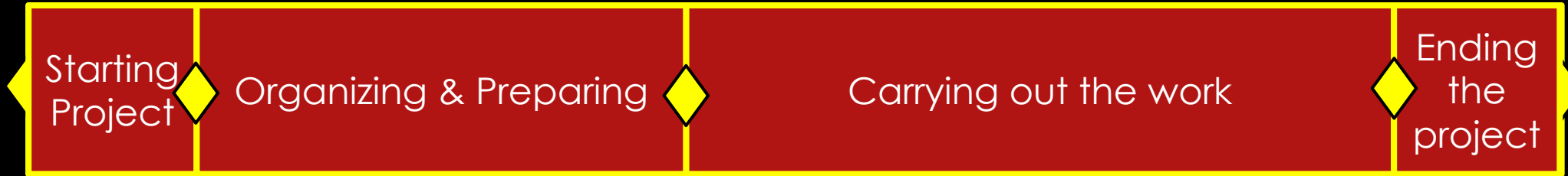
Characteristics of Life Cycle (cont.)

- ▶ Cost and staffing levels are low at the start, highest towards the middle, and drop as project closes
- ▶ Probability of project success is low at the start of the project and gets progressively higher as the project continues
- ▶ Cost of changes and of error correction generally increases as the project continues
- ▶ The type of development cycle that a project follows depends upon the nature of the **risk, uncertainty**, clarity of **requirements**, and **stakeholder expectations**

Project Lifecycle — The Pig in the Boa



Projects have a Development Approach (Lifecycle)



- ▶ Predictive Approach

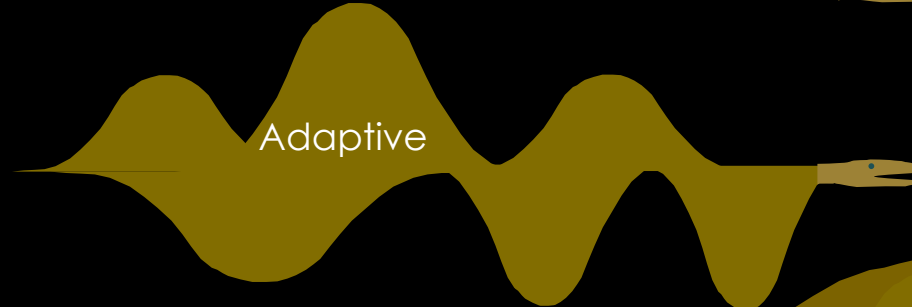


- ▶ Iterative

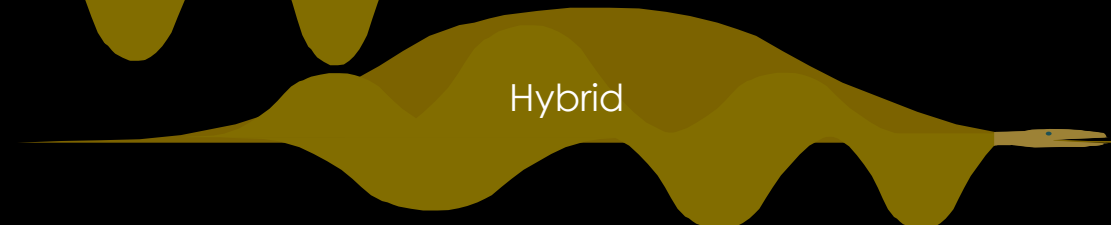


- ▶ Incremental

- ▶ Adaptive, change driven (Agile)



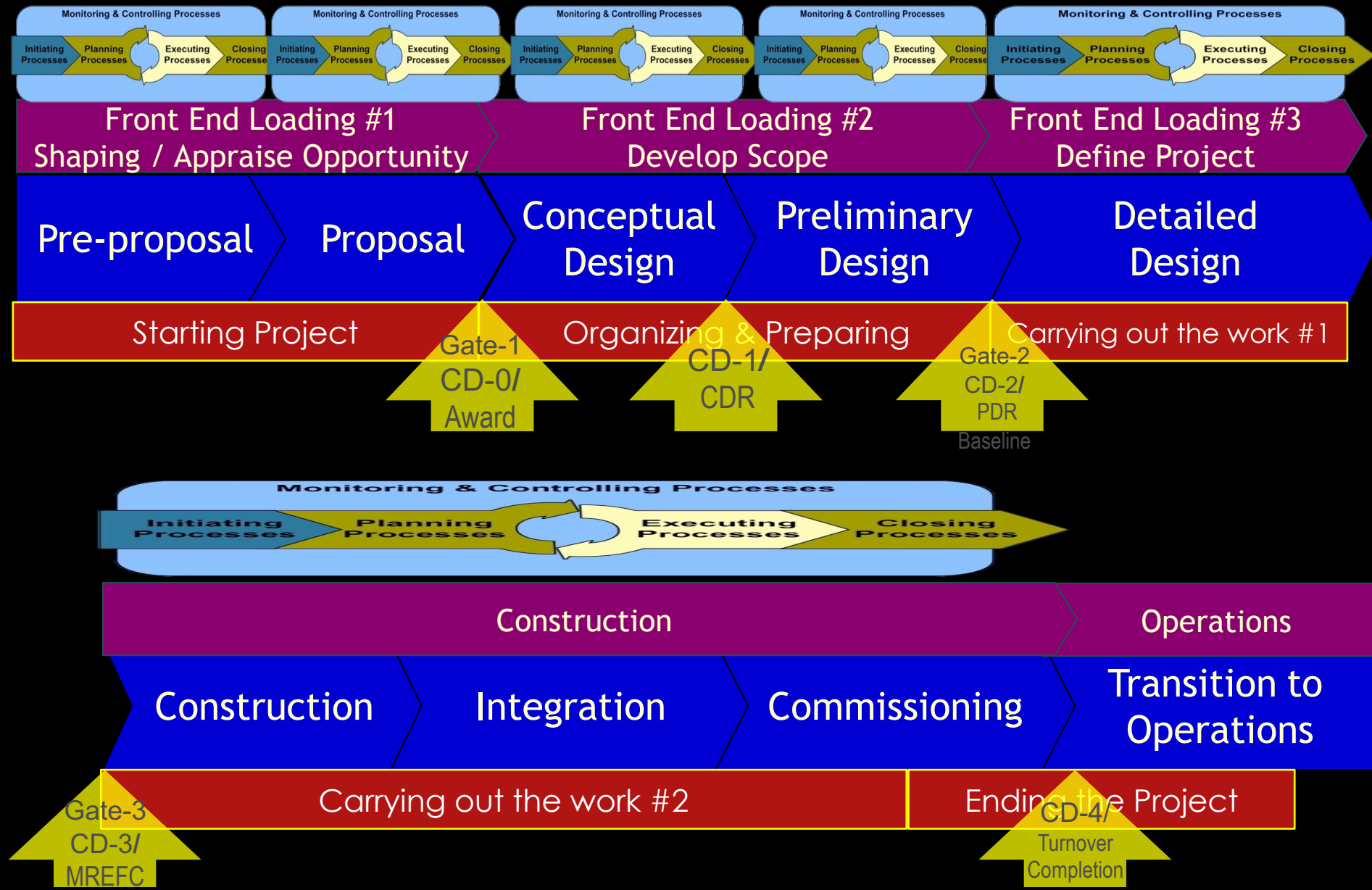
- ▶ Hybrid



Typical Scientific Project Phases:

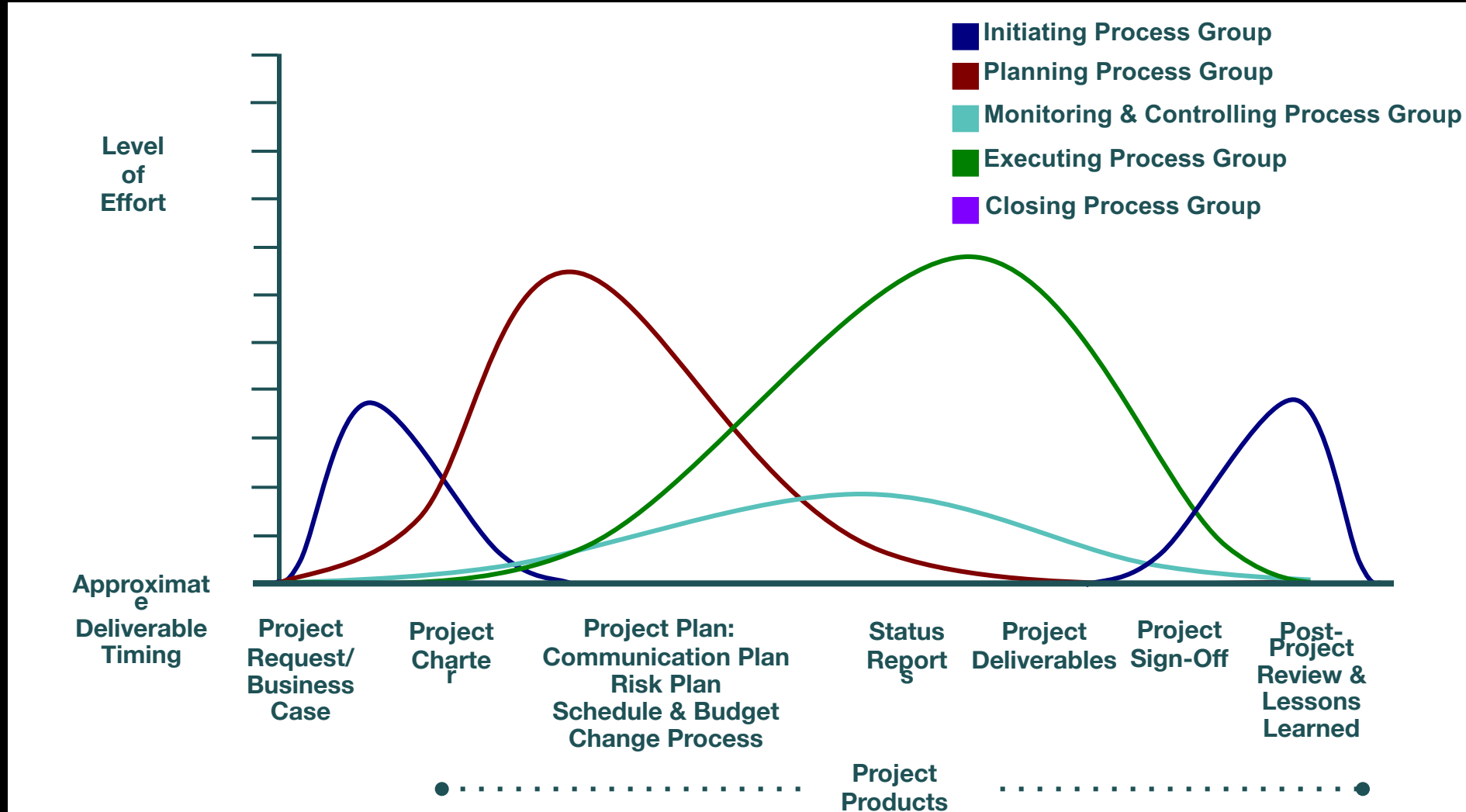
DOE/NSF, Megaprojects, PMI

PM
65



Activity levels and focus change throughout project phases

Nature and participant emphasis change with phases



Adapted from ANSI/PMI 99-001-2017 Fig. 1-5

Resources during Project Phases

- ▶ If a project is properly planned, resource expenditures should:
 - ▶ Gradually build up in Phase 1 (Conception), Phase 1b (Definition and Organization), and (Phase 1c (Start-up)
 - ▶ Reach their peak levels during Phase 3 (Main Execution)
 - ▶ Gradually wind down during Phase 4 (Phase-out)
- ▶ Always keep in mind the total life cycle when planning and performing the project
- ▶ Carefully manage the transition from one phase to the next

Phase Characteristics

- **Deliverables**
 - Tangible, verifiable work products
- **Reviews**
 - Evaluation of deliverables and project performance
- **Phase Exit Criteria**
 - Measurements used to determine if a project should go into next phase

Phases are not always *cut and dried* —
phases and issues can overlap

The Bad News:

Projects can fail more easily than succeed

- ▶ The bigger the project the greater the likelihood of failure
- ▶ Projects have the greatest risk of failure at the beginning and decreases over time
- ▶ Most failed projects are planned for failure from the start

Seven Key Mistakes of Megaprojects (Morrow – 2011)

1. Unbalanced Agreements

"I want to keep it all!"

2. Project schedules imposed before developed

"I want it now!"

3. Agreements not finalized early enough

"Don't worry; we'll work out the details later."

4. Inadequate up-front planning

"Why do we have to spend so much time up front? Let's get on with it!"

5. The project is under budgeted

"We need to shave 20% off that number."

6. Inappropriate isolation or transfer of risk

"The contractors should carry the risk; they're doing the project!"

7. Improper accountability

"Fire those #\$@\$^! project managers who overrun our projects!"

Summary (1)

Being unique and temporary, all projects are subject to risk and uncertainty

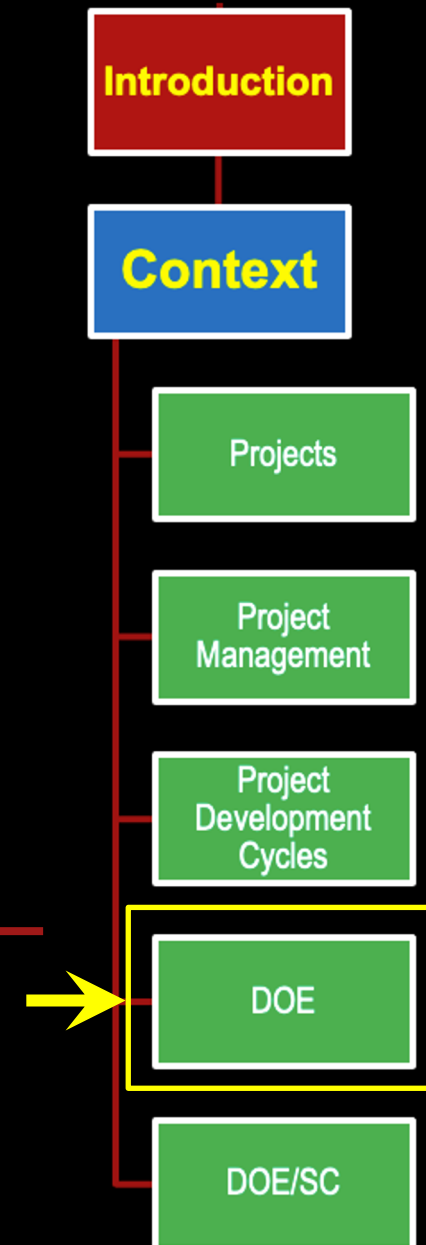
- ▶ Hierarchy of dependent variables
 - ▶ Cost
 - ▶ Schedule
 - ▶ Scope
- ▶ Organization & team
- ▶ Stakeholder expectations
- ▶ Requirements, Assumptions, Constraints and Quality
- ▶ Change

Summary (2)

All Project Management is focused on addressing the risk & uncertainty of projects

- ▶ Complexity
- ▶ Development Approach and Live Cycle
- ▶ Tailoring
- ▶ The 5 process groups
 - ▶ Initiating
 - ▶ Planning
 - ▶ Executing
 - ▶ Monitoring & Controlling
 - ▶ Closing

DOE Context



DOE of necessity relies on projects to survive

But DOE was doing so badly that Congress intervened in 1997-1999 and convened an NRC Study

“Of the 80 major [DOE] systems projects initiated between 1980 and 1996, only 15 were completed, many of them behind schedule and over cost; 31 were terminated before completion.”

“DOE WM projects cost an average of 48 percent more than comparable projects performed by industry and other government agencies; and DOE ER projects cost about 33 percent more.

“DOE WM projects took an average of three times longer to complete them comparable projects by industry and other government agencies, and the original schedules slipped an average of “about 22 months, or 52 percent”, compared to an average of 17 percent in industry.”

DOE Order 413.3 was the response to this study

What is DOE Order 413.3B? (1)

- ▶ Defines a process framework for managing projects that includes
 - ▶ Stage gates of a project
 - ▶ Documents required at each stage gate
 - ▶ Funding to be used at each stage gate
 - ▶ Monitoring and control processes
 - ▶ Who will approve each stage gate
 - ▶ and much more (refers to many guides)

What is DOE Order 413.3B? (2)

- ▶ Designed acquisition of capital assets
- ▶ Establishes the program and project management direction
- ▶ Goal of delivering projects within the original performance baseline (PB)
 - ▶ Cost and schedule
 - ▶ Meeting mission performance and other related requirements.
- ▶ Organized by
 - ▶ Project phases
 - ▶ Critical Decision points (CDs)
- ▶ Sets up roles and responsibilities
 - ▶ Approvals – Project Management Executive (PME)
 - ▶ Oversight
 - ▶ Reporting

- ▶ Mandatory for all DOE Offices (unless exempted) for all capital asset projects having a Total Project Cost (TPC) greater than or equal to the construction thresholds
- ▶ Pertains to acquisition of capital assets
 - ▶ Land, structures, equipment and intellectual property, which are used by the Federal Government and have an estimated useful life of two years or more.

The reach of DOE Order 413.3B

- ▶ All DOE Elements and NNSA
- ▶ All capital asset projects >\$50M* total project costs (TPC)
- ▶ *The principles* apply to minor construction projects
- ▶ All subject projects must report on PARS-II
- ▶ All subject documentation submitted to PMOA
- ▶ Cooperative agreements are not subject to it
- ▶ High Performance Computing projects have specific relief from elements

*For Nuclear and complex 1-of-a-kind projects can be reduced to \$10M
(The Office of Science has not raised its thresholds – \$10M)

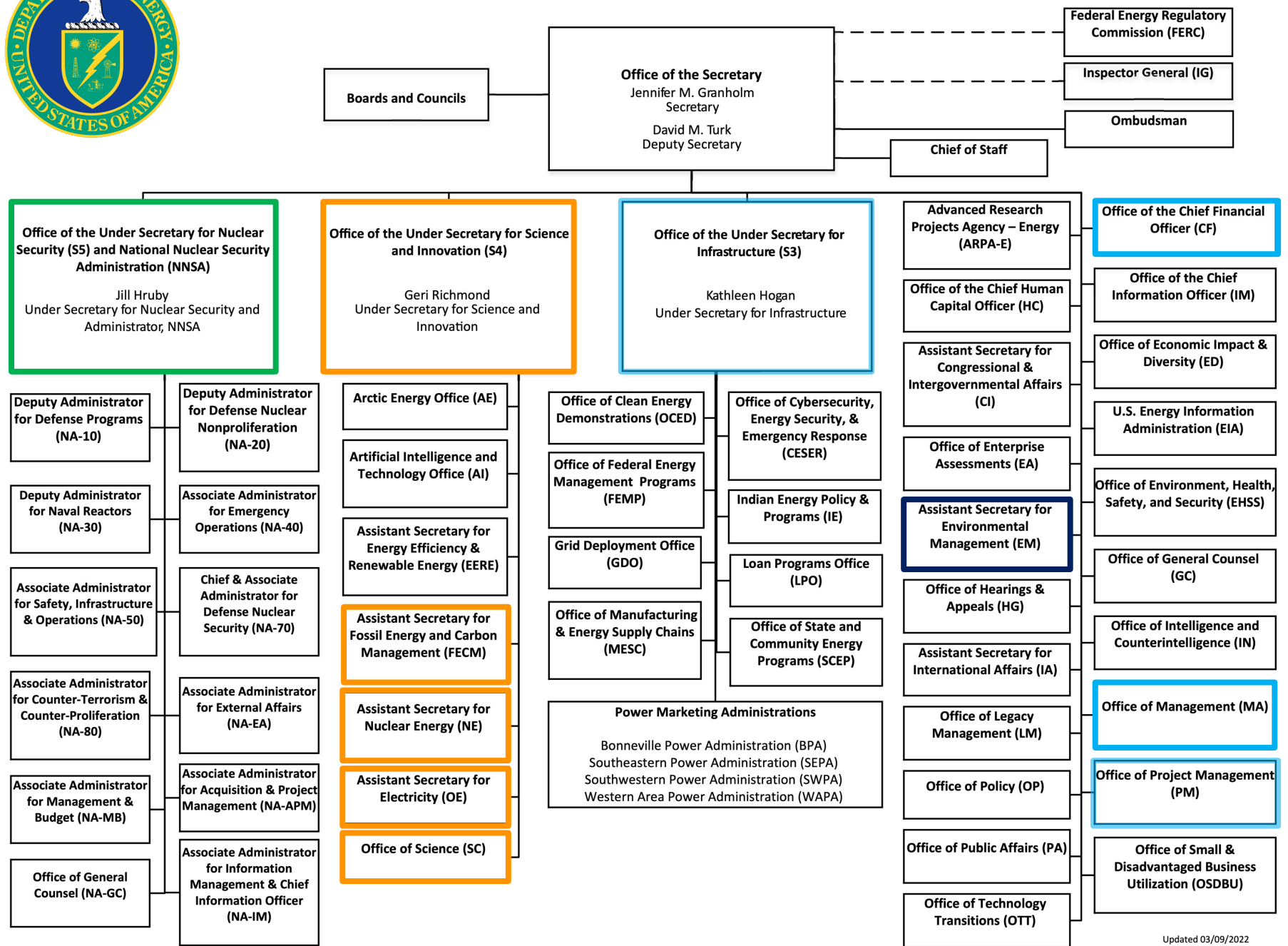
Department of Energy

Project Management within DOE-HQ

- Office of Field Management (DOE-CF <2000)
- Office of Engineering & Construction Management (DOE-CF 2000-2005 (DOE-MA 2006-2014)
- Office of Project Management Oversight & Assessments (DOE-S3 2015-2021)
- Office of Project Management (DOE-PM 2022-Present)

Projects within DOE

- Environmental Management (EM)
- National Nuclear Security Administration (NA)
- Fossil Energy & Carbon Management (FECM)
- Nuclear Energy (NE)
- Office of Electricity (OE)
- Office of Science (SC)





August 2022 Data

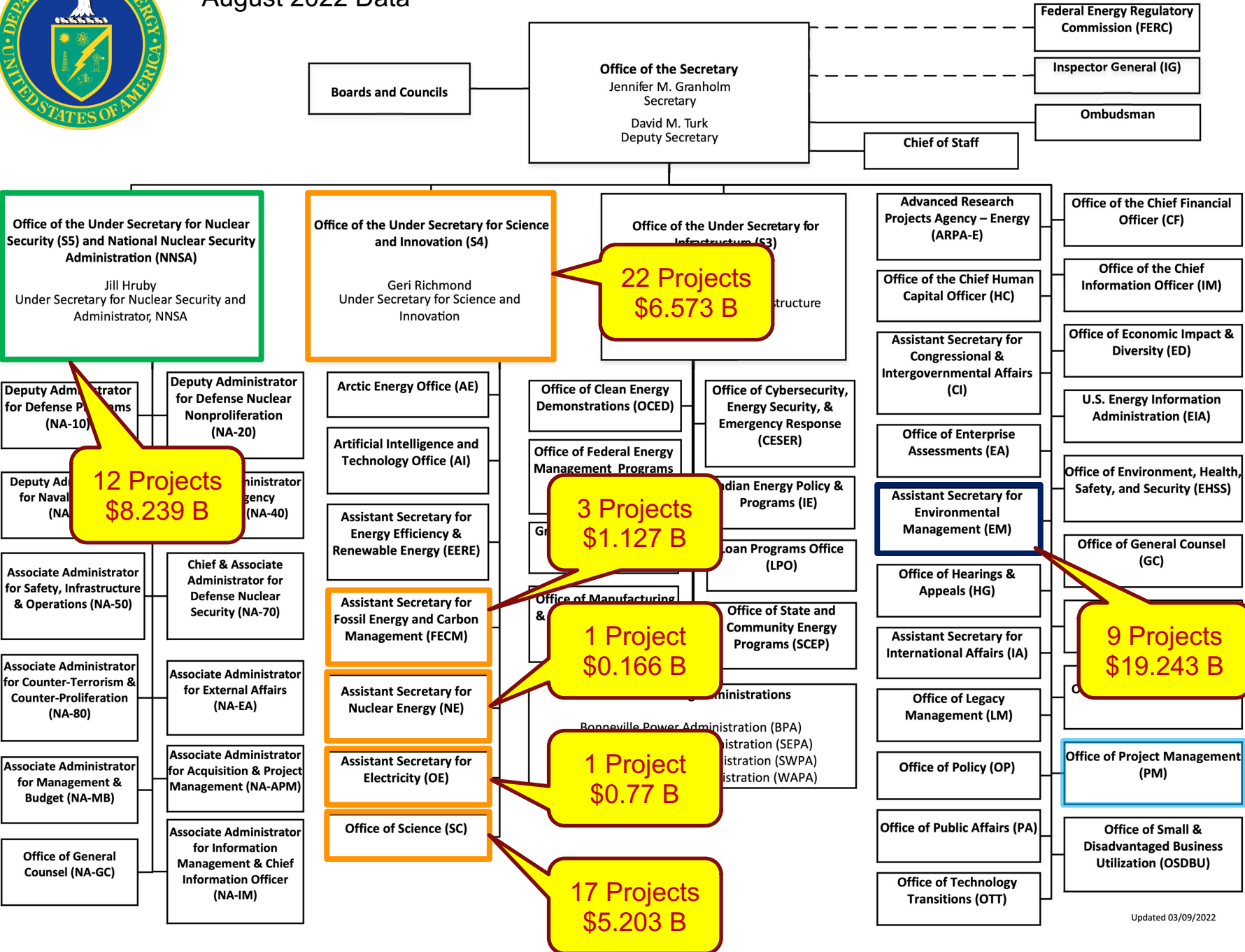
Department of Energy

Project Management within DOE-HQ

- Office of Project Management (DOE-PM 2022-Present)

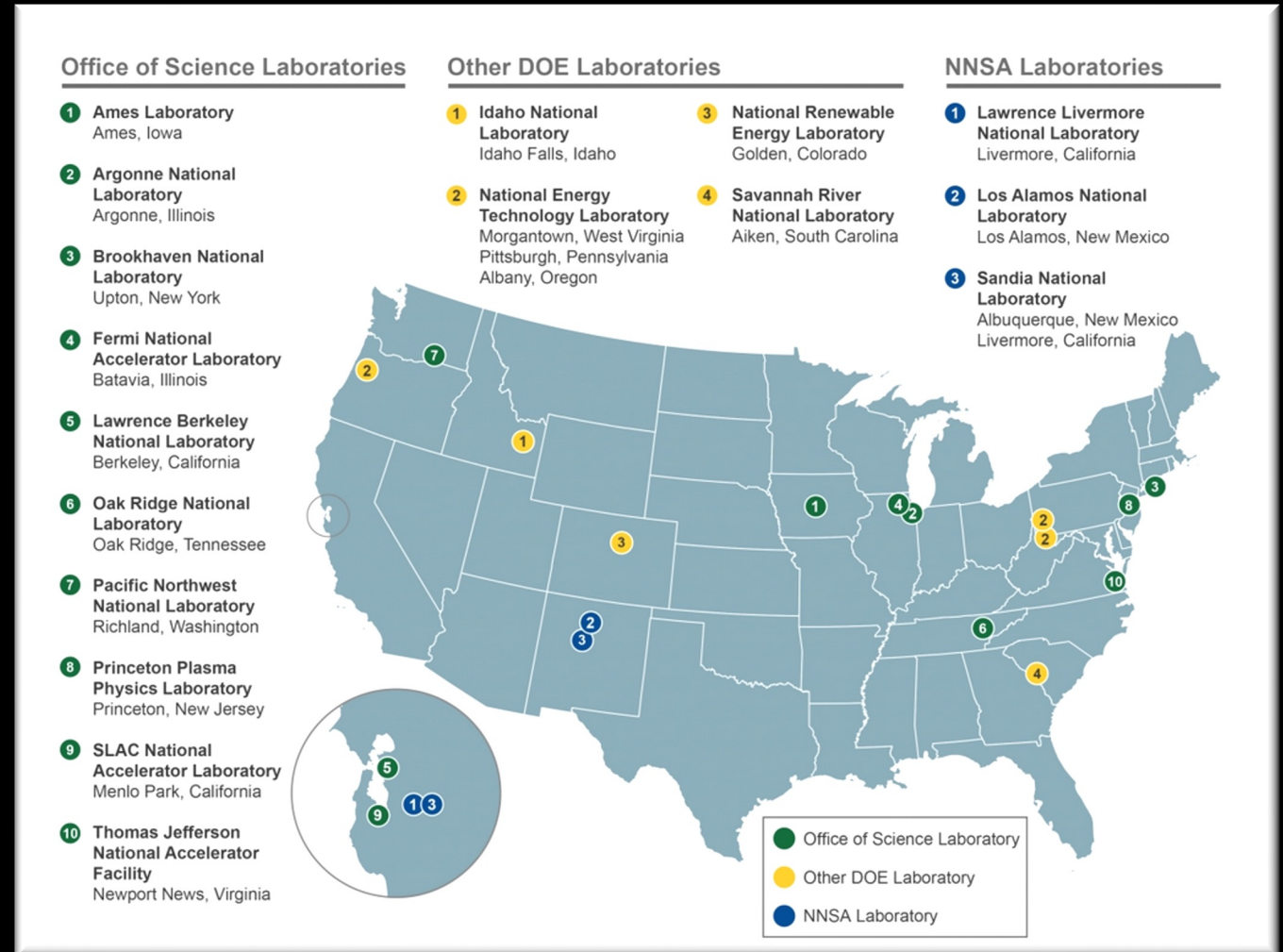
Projects within DOE

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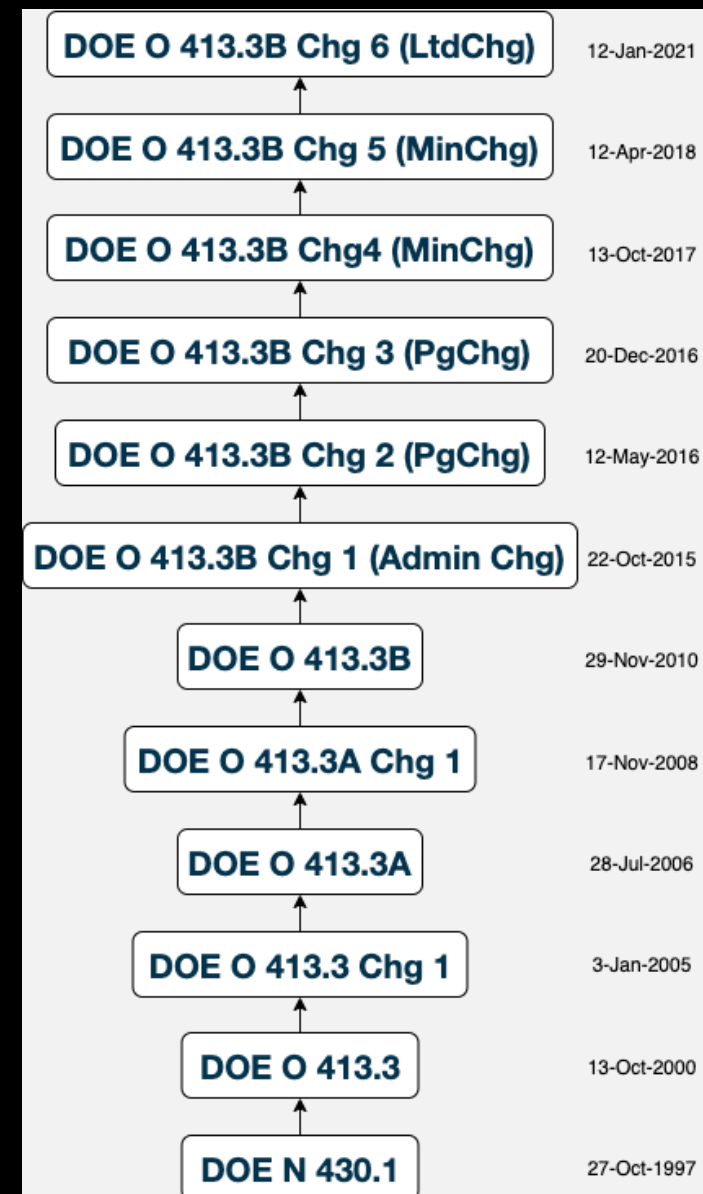
There are specific DOE Offices / Terms that are helpful to know

- ▶ **GAO:** U.S. Government Accountability Office
- ▶ **OMB:** Office of Management and Budget
- ▶ **SPE:** Senior Procurement Executive
- ▶ **PSO:** Program Secretarial Officer
- ▶ **PMOA (PM):** Office of Project Management Oversight and Assessment (DOE-HQ)
- ▶ **DOE/SC:** Office of Science Program Offices
- ▶ **OPA:** Office of Project Assessment (DOE/SC)
- ▶ **ESAAB:** Energy Systems Acquisition Advisory Board
- ▶ **PMRC:** Project Management Risk Committee (HQ)
- ▶ **PME:** Project Management Executive (DOE/SC)
- ▶ **PME:** Contracting Officer
- ▶ **FPD:** Federal Project Director (PSO)
- ▶ **IPT:** Integrated Project Team



Issuing the Order wasn't the end of the story

- ▶ DOE Order 413.3 has gone through a number of changes
- ▶ DOE success on projects has been somewhat rocky during this time
- ▶ Initial issue of a Policy, Order, Manual, Guides
- ▶ Multiple NRC follow up reports after 2000
- ▶ Major resets in DOE Project Management
 - ▶ 2008
 - ▶ 2014



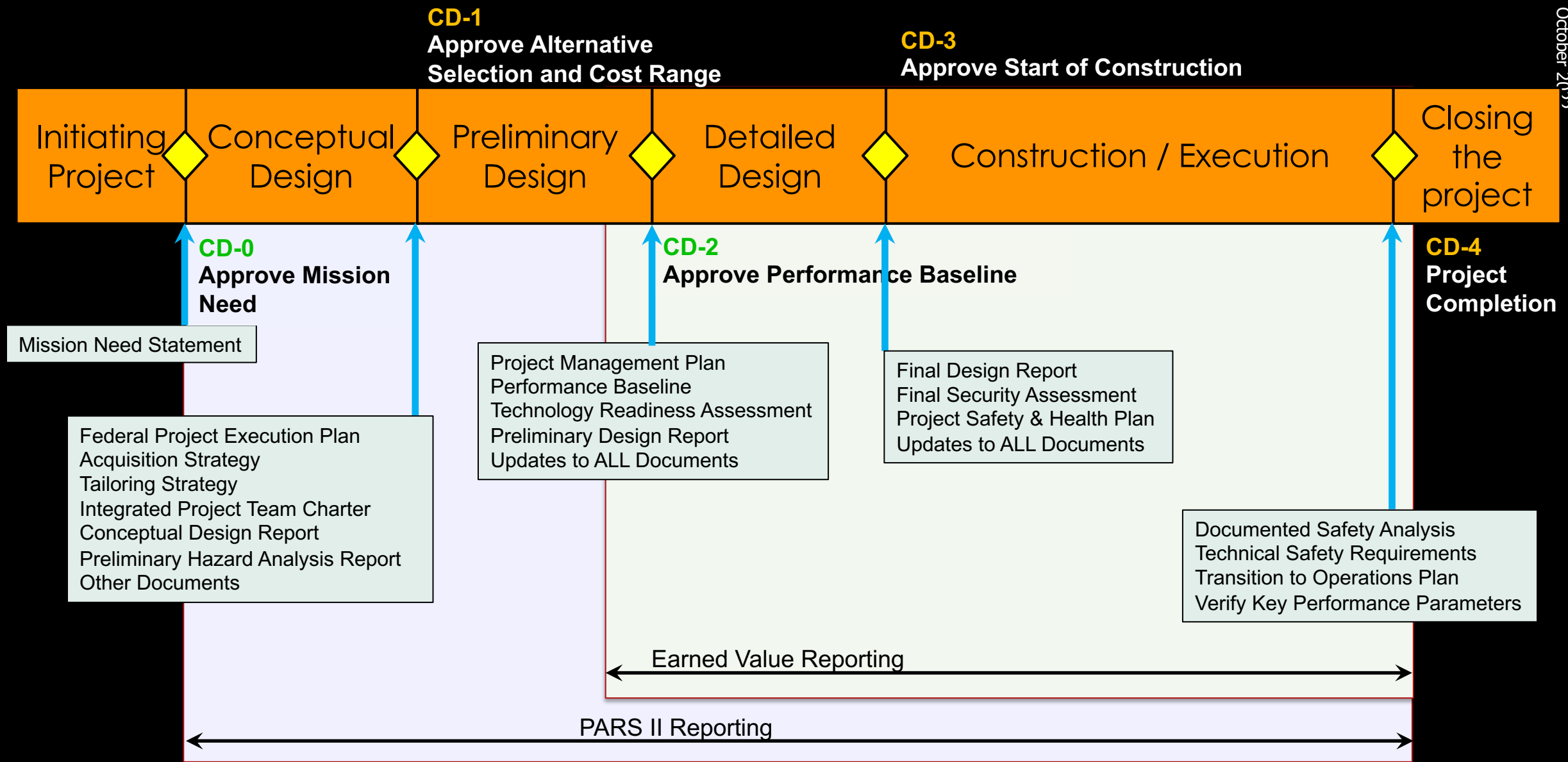
Current DOE Order and Related Guides

| DOE O 413.3B Chg 6 Program and Project Management for the Acquisition of Capital Assets | | |
|---|--|--------------|
| DOE G 413.3-1 Chg 1 | Systems Engineering Guide | Oct 22, 2015 |
| DOE G 413.3-2 Chg 1 | Quality Assurance Guide | Oct 22, 2015 |
| DOE G 413.3-3A Chg 1 | Safeguards and Security Guide | Oct 22, 2015 |
| DOE G 413.3-4A Chg 1 | Technology Readiness Assessment Guide | Oct 22, 2015 |
| DOE G 413.3-5A Chg 1 | Performance Baseline Guide | Oct 22, 2015 |
| DOE G 413.3-6B | High Performance Sustainable Building Guide | Apr 05, 2020 |
| DOE G 413.3-7A Chg 2 | Risk Management Guide | Nov 22, 2021 |
| DOE G 413.3-9A | Project Reviews for Capital Asset Projects Guide | Sep 14, 2018 |
| DOE G 413.3-10B | Integrated Project Management Using the Earned Value Management System | Apr 20, 2022 |
| DOE G 413.3-12 Chg 1 | Project Definition Rating Index Guide | Oct 22, 2015 |
| DOE G 413.3-13 Chg 1 | Acquisition Strategy Guide for Capital Asset Projects | Oct 22, 2015 |
| DOE G 413.3-15A | Project Execution Plans Guide | Sep 14, 2018 |
| DOE G 413.3-16A Chg 1 | Project Completion/Closeout Guide | Oct 22, 2015 |
| DOE G 413.3-17 Chg 1 | Mission Need Statement Guide | Oct 22, 2015 |
| DOE G 413.3-18A Chg 1 | Integrated Project Team Guide | Oct 22, 2015 |
| DOE G 413.3-19 Chg 2 | Staffing Guide for Project Management | Oct 22, 2015 |
| DOE G 413.3-20 Chg 1 | Change Control Management Guide | Oct 22, 2015 |
| DOE G 413.3-21A | Cost Estimating Guide | Jun 06, 2018 |
| DOE G 413.3-22 | Analysis of Alternatives Guide | Jun 06, 2018 |
| DOE G 413.3-23 | Nuclear Facilities Commissioning | Aug 30, 2019 |
| DOE G 413.3-24 | Planning and Scheduling | Apr 08, 2022 |
| DOE G 430.1-1 | Cost Estimating Guide | Mar 28, 1997 |

Cross Walk between DOE 413.3b Guides & PMI Knowledge Areas

[illegible]

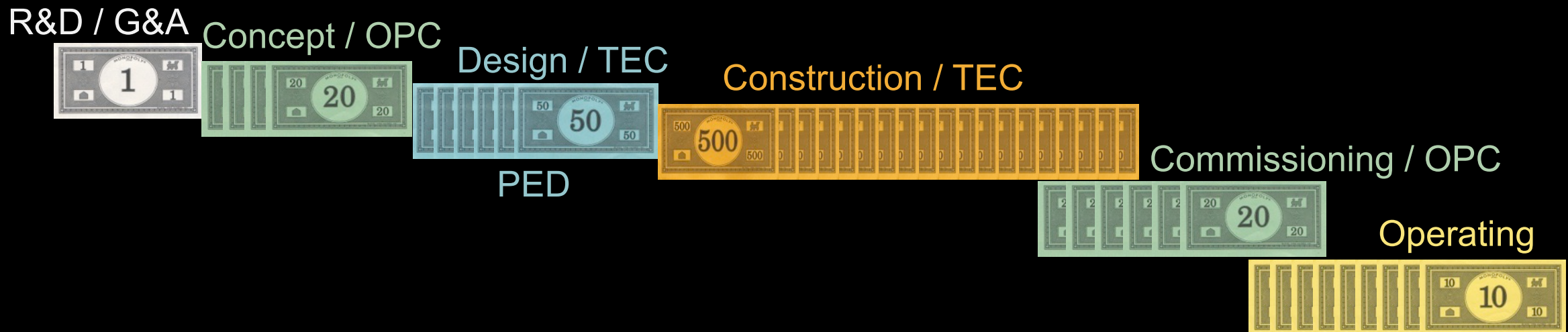
Project Timeline in DOE 413.3B



Colors of money have constraints, and they cannot be mixed

- ▶ Institutional: G&A for strategic planning planning, General Plant Projects
- ▶ Operating: Program base budgets / facilities operating funds
- ▶ In-Kind: Non-DOE funding (foreign or other entity) funding – must be clearly separate from any DOE funding. May also be non-costed effort

- ▶ **TEC:** Total Estimated Costs
 - ▶ Preliminary / Detailed design & Construction/Fabrication
- ▶ **OPC:** Other Project Costs
 - ▶ Conceptual design, Commissioning & startup
- ▶ **TPC:** Total Project Costs = **TEC** + **OPC**



DOE O 413.3b Definitions Concerning Money

Total Estimated Cost (TEC). All engineering design costs (after conceptual design), facility construction costs and other costs specifically related to those construction efforts. TEC will include, but is not limited to: project, design and construction management; contract modifications (to include equitable adjustments) resulting in changes to these costs; design; construction; contingency; contractor support directly related to design and construction; and equipment rental and refurbishment.

Other Project Costs (OPC). All other costs related to a project that are not included in the TEC. OPCs will include, but are not limited to: research and development; conceptual design and conceptual design report; startup and commissioning costs; NEPA documentation; PDS preparation; siting; and permitting requirements.

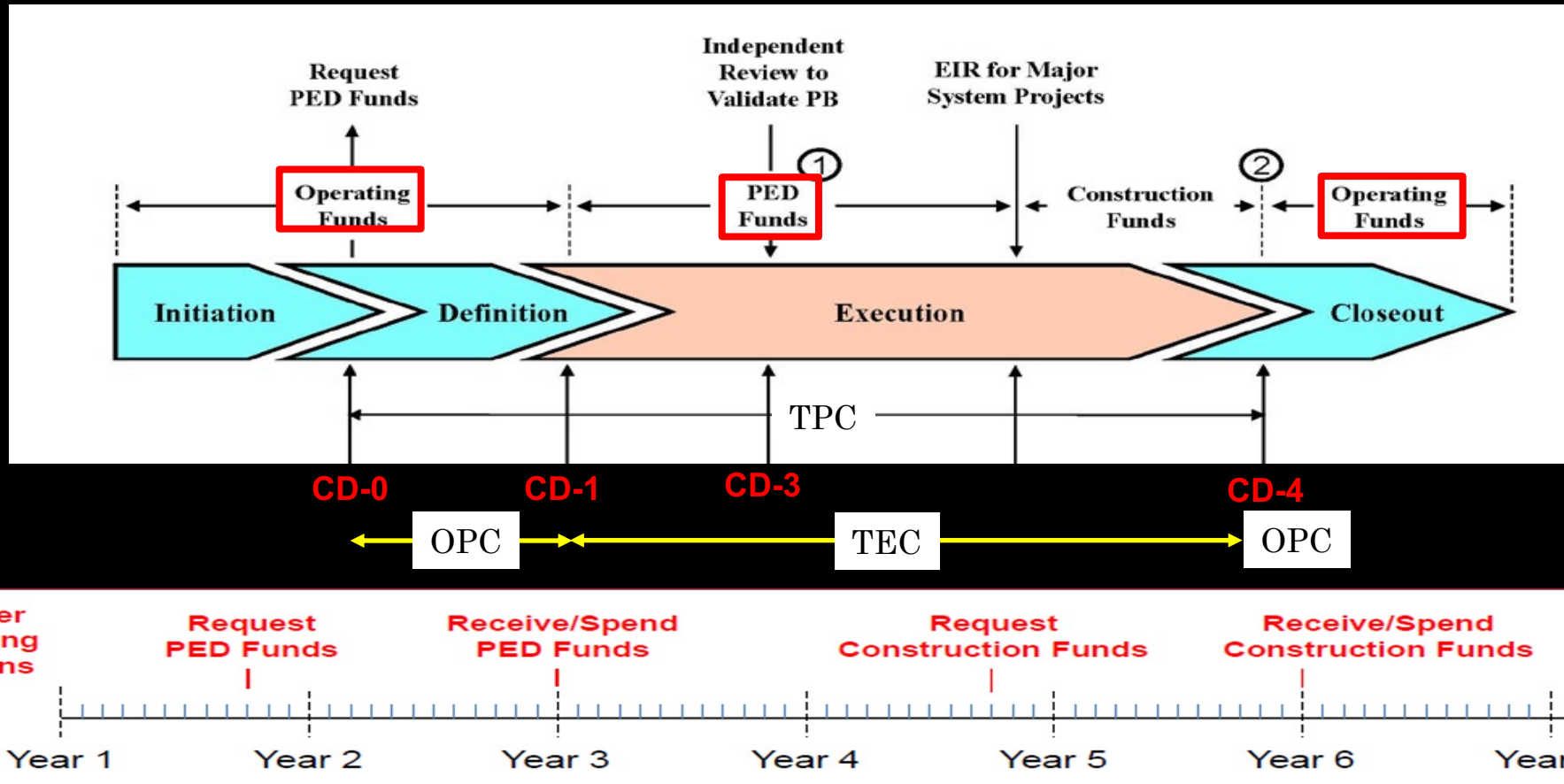
Total Project Cost (TPC). All costs between CD-0 and CD-4 specific to a project incurred through the startup of a facility, but prior to the operation of the facility. Thus, **TPC includes TEC plus OPC.**

Project Engineering and Design (PED). Design funds established for use on preliminary design. Typically, PED funds are used for preliminary and final design and related activities for design-bid-build strategies, and for preliminary design and related costs in design-build strategies. It is also analogous with a project phase that includes preliminary and final design and baseline development.

Contingency. The portion of the project budget that is available for risk uncertainty within the project scope, but outside the scope of the contract. Contingency is budget that is not placed on the contract and is included in the TPC. Contingency is controlled by Federal personnel as delineated in the PEP.

Line-Item Capital Projects –

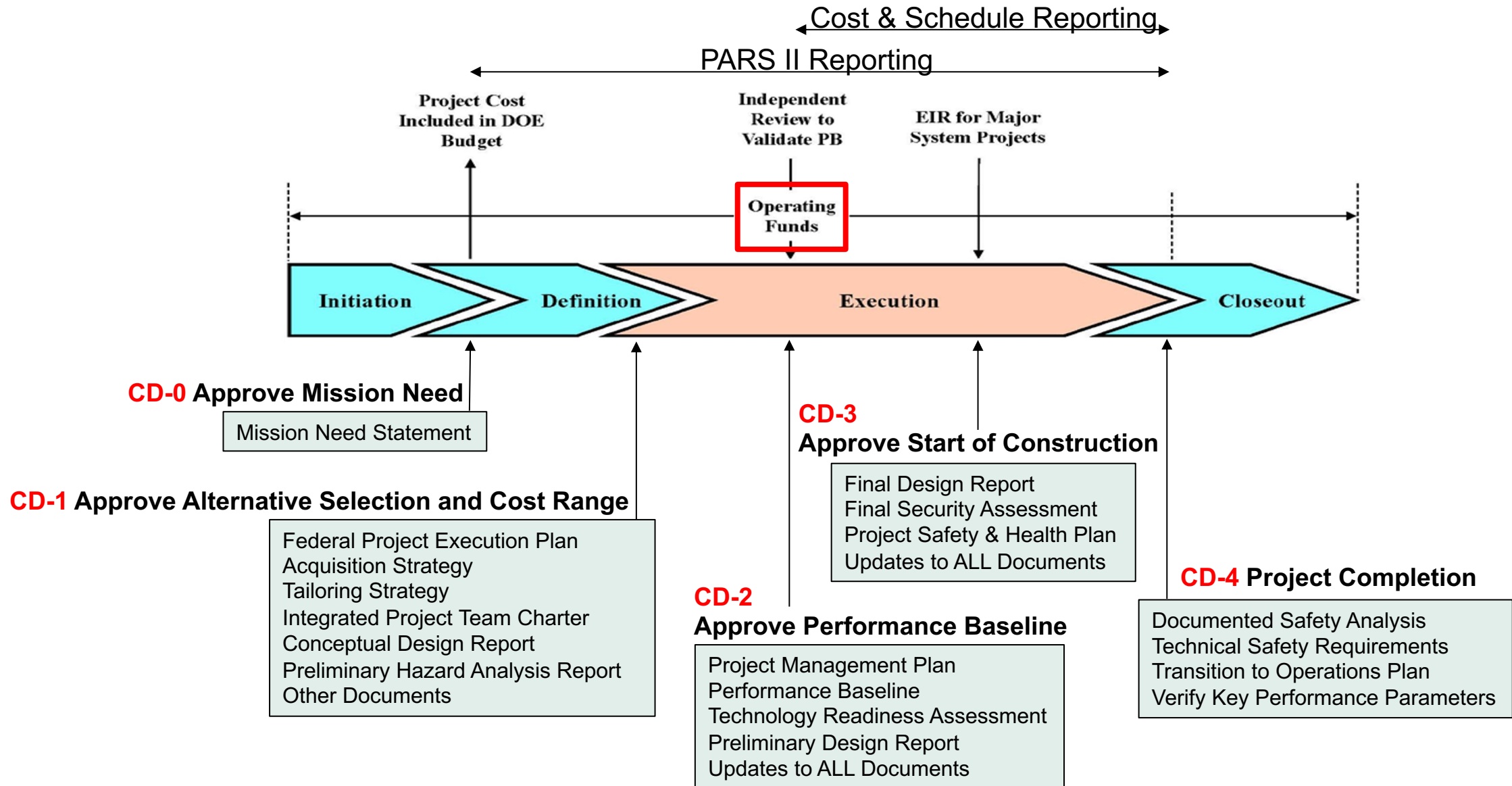
Timescale typically several years – funding source procedures



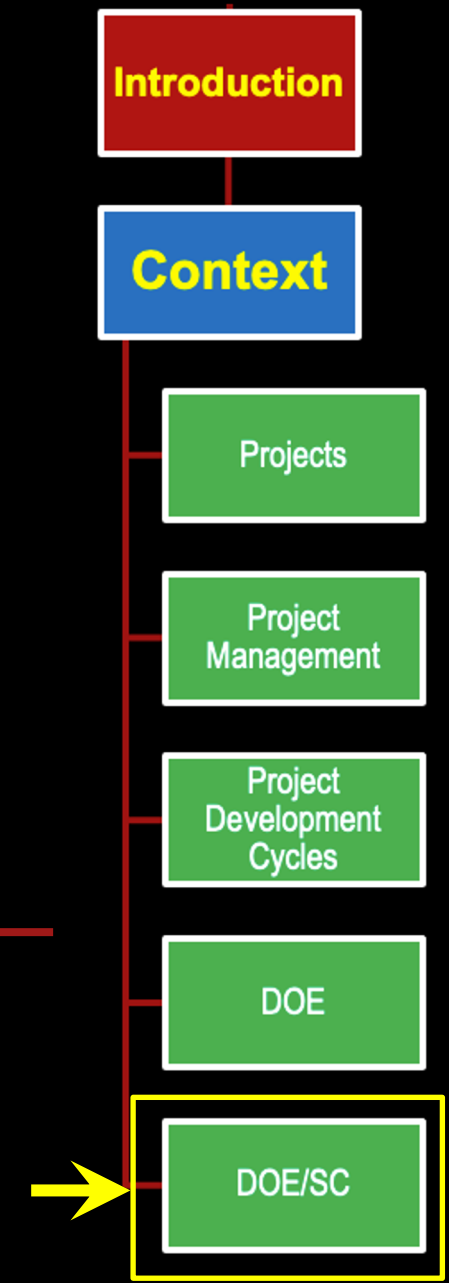
(1) PED funds may be used after CD-3 for design

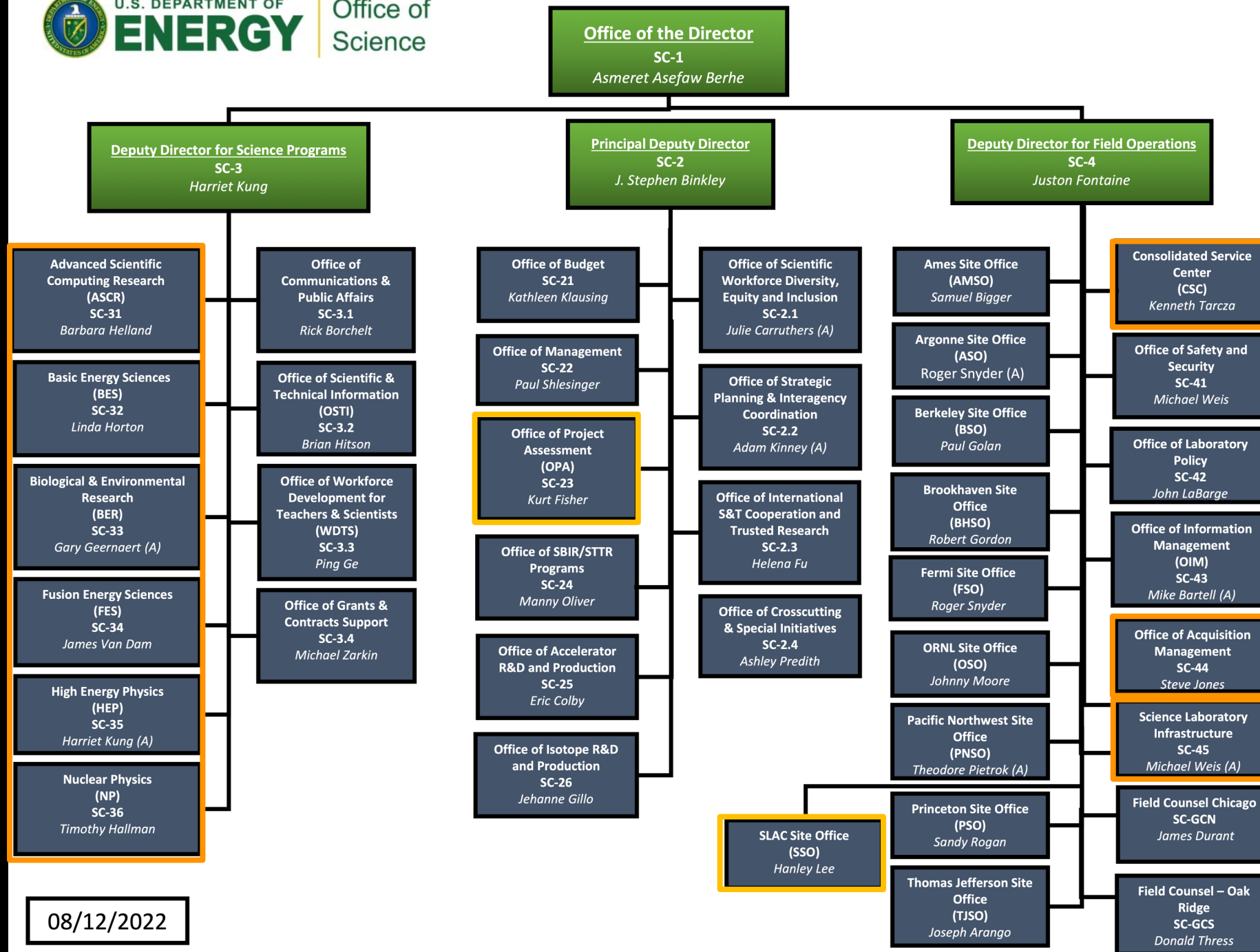
(2) Operating funds may be used prior to CD-4 for transition, startup, and training costs

Operating Expense Capital Asset Projects



Office of Science Context





08/12/2022

But doesn't Office of Science have an exemption to DOE 413.3B?

Yes, and mainly no.

Places DOE-SC under *partial governance* of O413.3B

- Delegates CD authority to SC offices
- Delegates oversight roles to SC-OPA from DOE-PM
- DOE-PM retains important role
 - All reporting requirements remain to DOE-PM
 - Baseline Changes submitted to DOE-PM
 - All CD documents submitted to PMOA
 - PMOA still conducts independent cost reviews and estimates
- SC must maintain
 - >10 projects / year
 - > 90% success rate



Department of Energy
Office of Science
Washington, DC 20585

Office of the Director

February 2, 2011

MEMORANDUM FOR OFFICE OF SCIENCE ASSOCIATE DIRECTORS

FROM: 
W. F. BRINKMAN
DIRECTOR, OFFICE OF SCIENCE

SUBJECT: Office of Science is Exempt from DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*

DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets* was approved by the Deputy Secretary of Energy on November 29, 2010. The Order establishes new project management requirements including Critical Decisions (CD) approval authorities. In addition, DOE Order 413.3B provides criteria that allow a Program Secretarial Office to be exempt from its requirements.

The Office of Science (SC) currently satisfies all the criteria, and on January 19, 2011, the Deputy Secretary of Energy approved the SC request for exemption (see attached approval memorandum). The newly delegated SC Acquisition Executive authority and SC project management requirements are outlined in the attached matrix. These requirements are effective immediately and will remain in force until rescinded.

This exemption is a direct result of our past and current project performance. It provides SC with significant benefits in overseeing our projects. Failure to retain this hard won exemption would not only tarnish SC's reputation—it would place burdens on future projects that would take precious time and resources away from delivering on our critical science missions. Therefore, I want to underscore my expectation that you will continue to work not just to maintain, but improve upon, the SC track record of project success.

If there are any questions, or further assistance is needed, please contact Daniel R. Lehman, Director, Office of Project Assessment (SC-28).

Attachments

cc:
P. Dehmer, SC-2
G. Malosh, SC-3
J. Salmon, SC-4
K. Klausning, SC-41

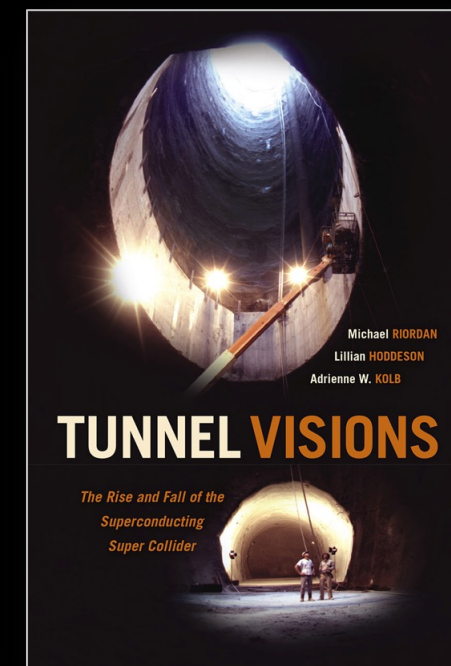
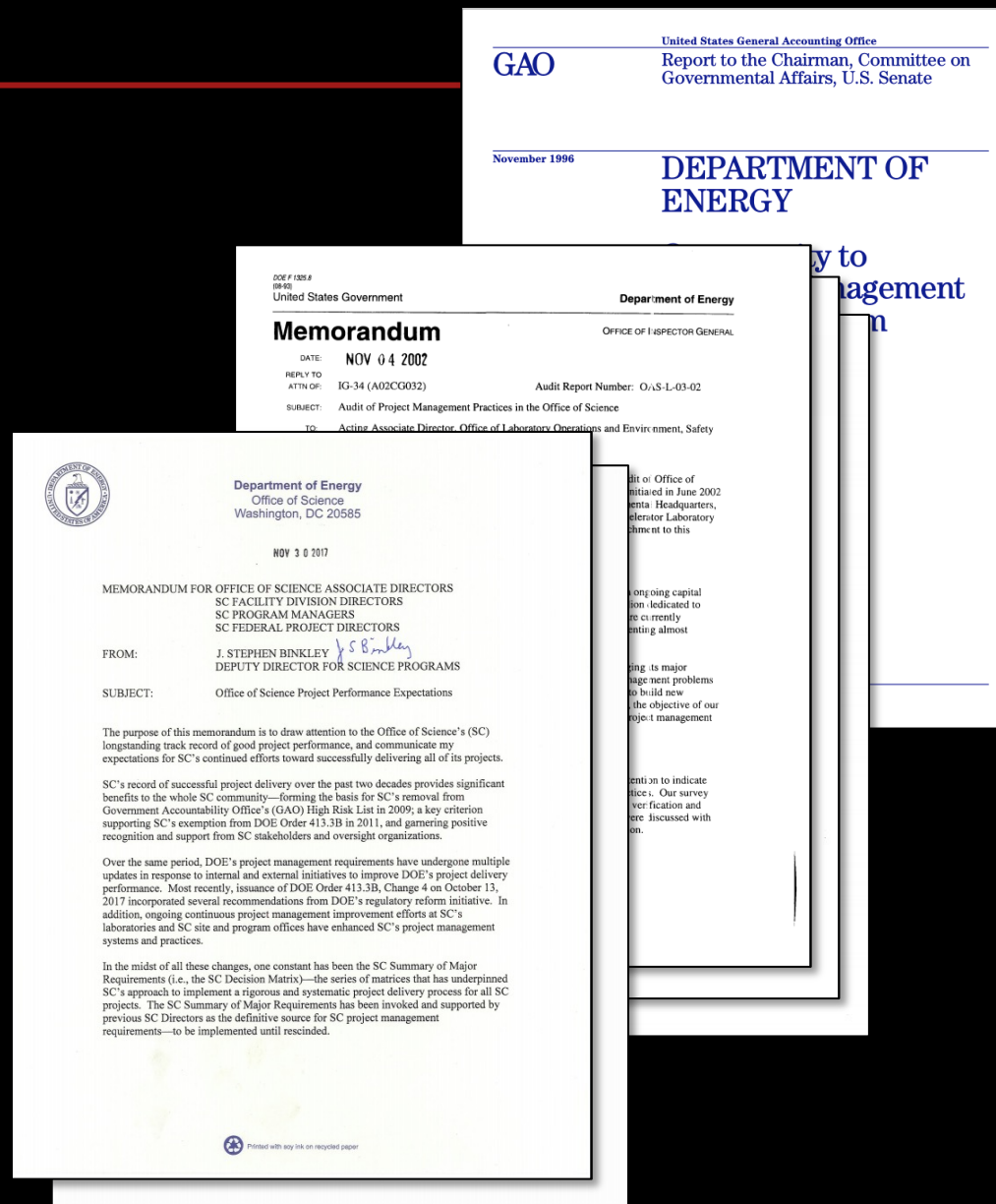


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Office of Science's exemption came at a price dearly paid

SC guards it jealously

- **1993** The Superconducting Super Collider (SSC) was cancelled for several reasons, but its cost ballooned several times over
- **1996** GAO DOE Major Acquisition Study
- **2002** SC PM practices audited and found sound
 - Cost estimating a minor concern
- **2009** Removal from GAO High Risk List
- **2017** Binkley memo reiterates importance of SC practices



Office of Science projects and its social context

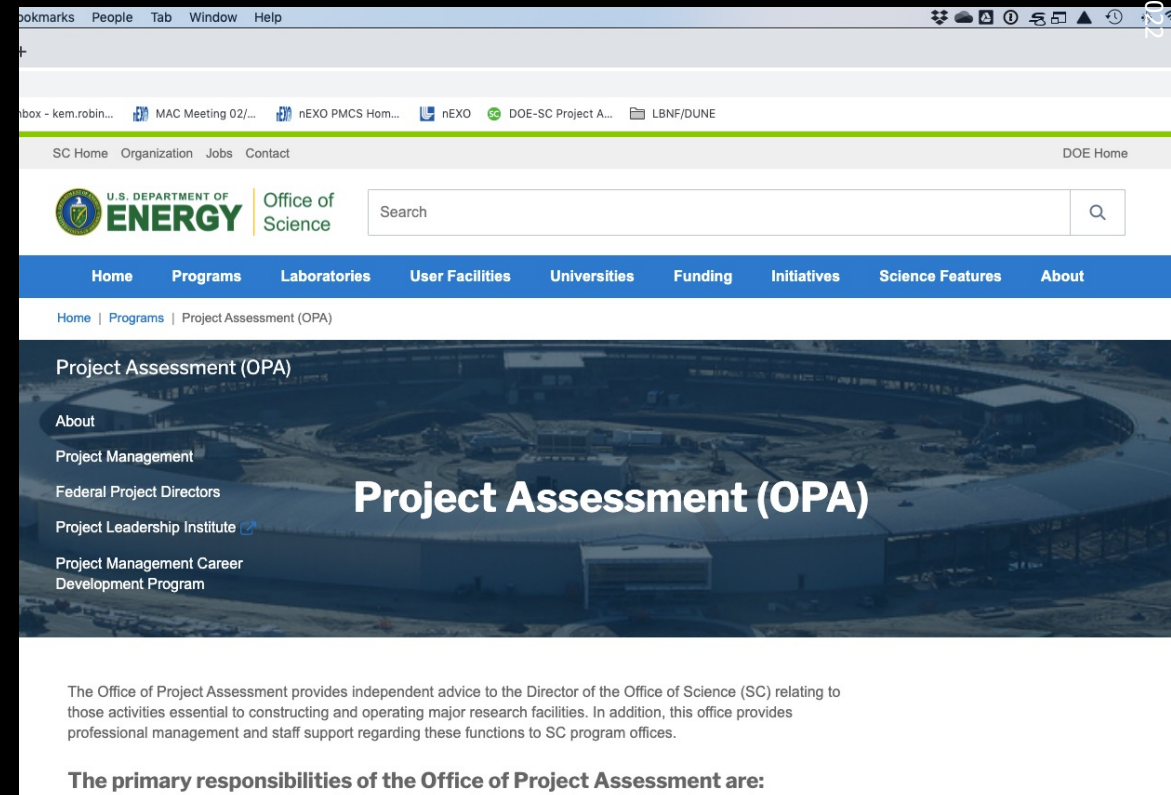
- ▶ Projects within SC must be assumed to be *fixed price*
- ▶ The hierarchy of the dependent variables is
 - ▶ Cost
 - ▶ Schedule
 - ▶ Scope
- ▶ Scope Contingency and contingent *buy backs* are essential parts of a project
 - ▶ Need to be fully developed, understood, and *time-phased triggered*
 - ▶ All focused on the fact that **Cost** is the highest element in the hierarchy
- ▶ A *technically-limited schedule* is never achieved on an SC project
 - ▶ Project budgets are *only* provided annually
 - ▶ Federal budget cycles are notoriously unreliable
 - ▶ Baseline assumption: minimum 3-month continuing resolution

DOE-SC OPA are the stewards of O413.3b in SC

DOE/SC Office of Project Assessment (DOE/SC-OPA or SC-28)

Advises with regard to

- ▶ Planning, design, construction, fabrication, commissioning, operation, and decommissioning of research/conventional facilities and devices required to support the SC program offices
- ▶ Provides independent advice to SC-1
- ▶ Conducts technical, cost, schedule and management peer reviews ("Lehman" reviews) of SC construction projects and large experimental equipment
- ▶ Directs and supervises development, initiation, and implementation of policies, plans and procedures
- ▶ for Represents SC-1 in meetings with DOE, OMB, Congress, and other oversight or investigatory bodies
- ▶ Acting as the SC Secretariat for the Energy Systems Acquisition Advisory Board (ESAAB) and the Project Baseline Change Control (BCC) process.
- ▶ Provides professional management and staff support regarding these functions to SC program offices.



<https://science.osti.gov/opa>

<https://science.osti.gov/opa/Project-Management>

DOE/SC-OPA has distilled DOE O 413.3b

– The Project Decision Matrix

- ▶ Distills everything into a compact matrix
 - ▶ Authorities
 - ▶ Approvals
 - ▶ Applicability
 - ▶ Responsibility
- ▶ A very good checklist once a basic understanding is in place

The image shows a stack of Project Decision Matrix documents. The top document is clearly visible, showing the 'Summary of Major Requirements' and the 'Decision / Requirements / Approval' table. The table is organized by 'TOTAL PROJECT COST (TPC)' and 'DECISION / REQUIREMENTS / APPROVAL'.

| | | Summary of Major Requirements | | | | | | |
|------------------------------------|---|--|--|--|--|--|--|--|
| | | \$750M or more | Less than \$750M to \$400M | Less than \$400M to \$100M | Less than \$100M to \$50M | Less than \$50M to \$20M | Less than \$20M to \$10M | Less than \$10M to \$10M* |
| DECISION / REQUIREMENTS / APPROVAL | | Delegation Allowed | Delegation Allowed | Delegation Allowed | Delegation Allowed | Delegation Allowed | Delegation Allowed | Delegation Allowed |
| CENTRAL DECISIONS | Prior to CD-0, Approve Mission Need Statement | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 |
| | Prior to CD-1, Approve Acquisition Strategy | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 (SC-28) Approved by SC-1 |
| | CD-0-APPROVE MISSION NEED | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| | CD-1-APPROVE ALTERNATIVE SELECTION AND COST RANGE | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| BASELINE MANAGEMENT | CD-2-APPROVE PERFORMANCE BASELINE | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| | CD-3-APPROVE START OF CONSTRUCTION | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| | CD-4-APPROVE START OF OPERATIONS OR PROJECT COMPLETION | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| | CD-5-APPROVE PERFORMANCE BASELINE | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 | SC-1 |
| REVIEW | Design Review Prior to CD-1, CD-2, & CD-3 | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project |
| | Conduct Independent Project Review or External Independent Review prior to CD-4 to 5 | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project |
| | SC-AD Request Annual Peer Reviews by PMSO Post CD-2 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 |
| | Performance Baseline Deviation Reviews after CD-2 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 |
| REPORTING | EWMS Review-Certification Prior to CD-3 & Bi-annual Surveillance (annual by contractor) | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 | SC-28 |
| | ORRRA-Operational Readiness Review/Readiness Assessment Prior to CD-4 | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project | Team External to Project |
| | Technology Readiness Assessment (TRA) prior to CD-2 and 3 by SAE or AS | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Project Definition Rating Index (PDRI) by PM | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

https://science.osti.gov/-/media/opa/pdf/processes-and-procedures/project_decision_matrix.pdf

DOE/SC Project Decision Matrix – Approvals

| TOTAL PROJECT COST (TPC) | | | \$750M or more | Less than \$750M to \$400M | Less than \$400M to \$100M | Less than \$100M to \$50M* | Less than \$50M* to \$20M | Less than \$20M to \$10M** |
|--|---|-----------------------------------|---|---------------------------------------|---------------------------------------|--|--|--|
| DECISION / REQUIREMENTS ¹ / APPROVAL ² | | | | | | | | Delegation Allowed |
| Prior to CD-0, Approve Mission Need Statement | | | Reviewed by SC-28 (SC-28) Approved by SC-1 | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-AD |
| Prior to CD-1, Approve Acquisition Strategy | | | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-1 | Reviewed by SC-28 Approved by SC-2 | Reviewed by SC-28 Approved by SC-AD | Reviewed by SC-28 Approved by SC-AD | Reviewed by SC-28 Approved by SC-AD |
| CRITICAL DECISIONS | CD-0--APPROVE MISSION NEED | | S-2 (CD-1 to 4 delegated) | SC-1 | SC-1 | SC-AD | SC-AD | SC-AD |
| | CD-1--APPROVE ALTERNATIVE SELECTION AND COST RANGE | | S-4 | SC-1 | SC-1 | SC-AD | SC-AD | SC-AD |
| | CD-2 --APPROVE PERFORMANCE BASELINE | | S-4 | SC-1 | SC-2 | SC-AD | SC-AD | SC-AD |
| | CD-3--APPROVE START OF CONSTRUCTION | | SC-1 | SC-1 | SC-2 | SC-AD | SC-AD | SC-AD |
| | CD-4--APPROVE START OF OPERATIONS OR PROJECT COMPLETION | | SC-1 | SC-1 | SC-2 | SC-AD | SC-AD | SC-AD |
| BASELINE MANAGEMENT | Changes to TPC | Deviations | If performance, scope, schedule, or cost baseline at CD-2 cannot be met, then SC-1 and SC-2 must be notified & a determination made to terminate the project or establish a new performance baseline. | | | | | |
| | | New Performance Baseline Approval | S-4 | SC-1 | SC-2 | SC-2 | SC-2 | SC-2 |
| | | Directed Change | Project changes caused by Policy Directives that have the force and affect of law and regulation, or Regulatory, or Statutory action and are initiated by entities external to the Department. | | | | | |
| | No TPC Change | Routine Project Changes/Control | Program | SC-AD | SC-AD | SC-AD | SC AD | SC AD |
| | | | Project | Prog. Mgr., SOM or FPD | Prog. Mgr., SOM or FPD | Prog. Mgr., SOM or FPD | Prog. Mgr., SOM or FPD | Prog. Mgr., SOM or FPD |
| | | | Contractor | Contractor | Contractor | Contractor | Contractor | Contractor |

*For projects with TPC <\$50M only the principles of DOE O 413.3B apply, but projects will submit approved CD or equivalent documents into PARS-II. Project performance will be tracked for all projects >\$10M.

**For project with TPC <\$10M DOE O 413.3b does not apply; project is not entered into PARS-II and performance is not tracked by PM

| Key: | Position within DOE |
|-------|--|
| S-2 | Deputy Secretary |
| S-4 | Under Secretary |
| SC-1 | Director of Office of Science |
| SC-2 | Deputy Director of Office of Science |
| SC-AD | DOE/SC Associate Director (Program Office) |
| SC-28 | DOE/SC Office of Project Assessment |
| SOM | Site Office Manager |
| FPD | Federal Project Director |











What's needed for each?



Project Management Processes and Procedures:

- Department of Energy
- Office of Science
- Various Project Management Reports

Most Requested Documents:

- Memorandum from J. Stephen Binkley: 171130 Binkley SC PM Expectations , November 30, 2017
- Project Scope Definition: Spares 
- DOE/SC Energy Systems Acquisition Advisory Board (ESAAB) Process , June 2013
- DOE/SC Independent Project Review Process , January 2012
- SC Template for Closeout Report, March 2012
- SC Template for Mission Need Statement, March 2012
- SC Template for Acquisition Strategy, April 2012
- SC Template for Project Execution Plan, May 2018
- SC Template for Lessons Learned, March 2012
- SC Template for BCPs, February 2013
- DOE Guide 413.3-21: Cost Estimating 
- FAQ for DOE Order 413.3B , December 2018
- SC Project Decision Matrix , October 2019
- Memorandum from W.F. Brinkman: SC is Exempt from DOE Order 413.3B , February 2, 2011
- Approval by Daniel B. Poneman, Deputy Secretary: SC Exemption from DOE Order 413.3B , January 2016
- DOE Order 413.3B: Program and Project Management for the Acquisition of Capital Assets , December 2016