



About DOE Projects

Catherine James, Fermilab

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My background

- My entire career has been at Fermilab
 - Grad student, post-doc, scientific staff
 - When you work where the experiments are located, you tend to end up doing the “infrastructure and installation” stuff, as opposed to more of the fun stuff, like building a detector
 - Which leads to handling the budgets, and installation schedules
 - Which leads to becoming installation manager on a DOE Project
 - NuMI-MINOS for the Near Detector and for the beamline Decay Pipe and Absorber, at the same time
 - Which leads to more Project Management
 - MicroBooNE Project Mgr and Deputy (not at the same time)
 - Short Baseline Neutrino SBN Deputy Program Mgr

Therefore, this presentation necessarily has a Fermilab viewpoint

But all DOE labs execute work via DOE Projects

Funding HEP Activities

- Three-way division of funds
 - Operations
 - Labs and other facilities Fermilab, SLAC, Brookhaven
 - Run accelerators and support the operating experiments
 - Research
 - University base grants
 - **Projects**
 - Build new stuff

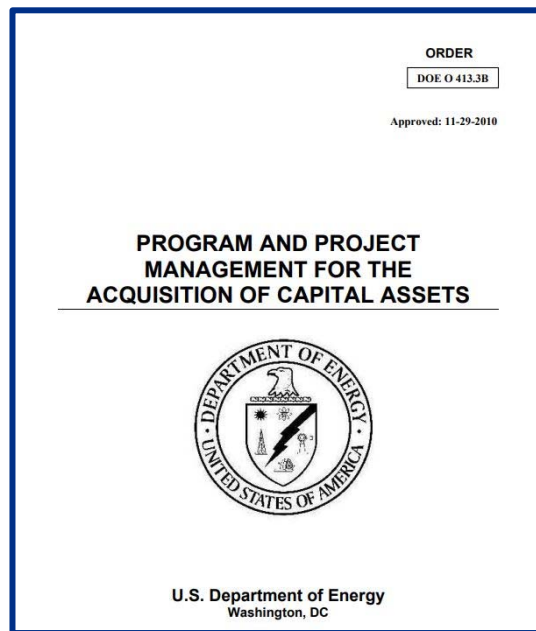
Who decides the new stuff to build?

- Snowmass – P5 process -- HEPAP
 - Input from the community
 - Build consensus, set priorities
- Fermilab Physics Advisory Committee (or similar for other Labs)
 - Experiment proposals, created and presented by scientific collaborations
 - The proposal describes the new stuff to build, and includes initial cost estimates

PAC approval required to be included in budget planning

How to fund the new stuff?

The initial budget planning discussions for your newly approved experiment will examine whether the construction should follow the process described in DOE order 413.3b



There are guidelines based mainly on the cost scale

Above \$50 million YES

Below \$10 million NO

Between negotiable

But also other criteria

Fundamental characteristics of a Project:

- **Temporary** in that it has a defined beginning and end in time, and therefore defined scope and resources
- **Unique** in that it is not a routine operation, but a specific set of activities designed to accomplish a singular goal

Current Projects at Fermilab

DOE 413.3B projects



Accelerator Controls Operations Research Network (ACORN)

- [Project website](#)
- [Reviews](#)

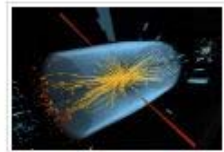
Accelerator



Mu2e

- [Project website](#)
- [Reviews](#)

Experiment



HL-LHC CMS Detector Upgrade Project

- [Project website](#)
- [Reviews](#)

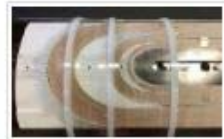
Experiment



PIP-II

- [Project website](#)
- [Reviews](#)

Accelerator



HL-LHC Accelerator Upgrade Project

- [Project website](#)
- [Reviews](#)

Accelerator



SLI-IERC

- [Project website](#)
- [Reviews](#)

Lab Infrastructure



LBNF/DUNE

- Project websites: [LBNF](#), [DUNE](#)
- [Reviews](#)

Experiment



Utilities Improvement Project (SLI-UIP)

- [Project website](#)
- [Reviews](#)

Lab Infrastructure

Other projects and programs



MAGIS-100

- [Project website](#)
- [Reviews](#)

Experiment



SBN

- [Project website](#)
- [Review](#)

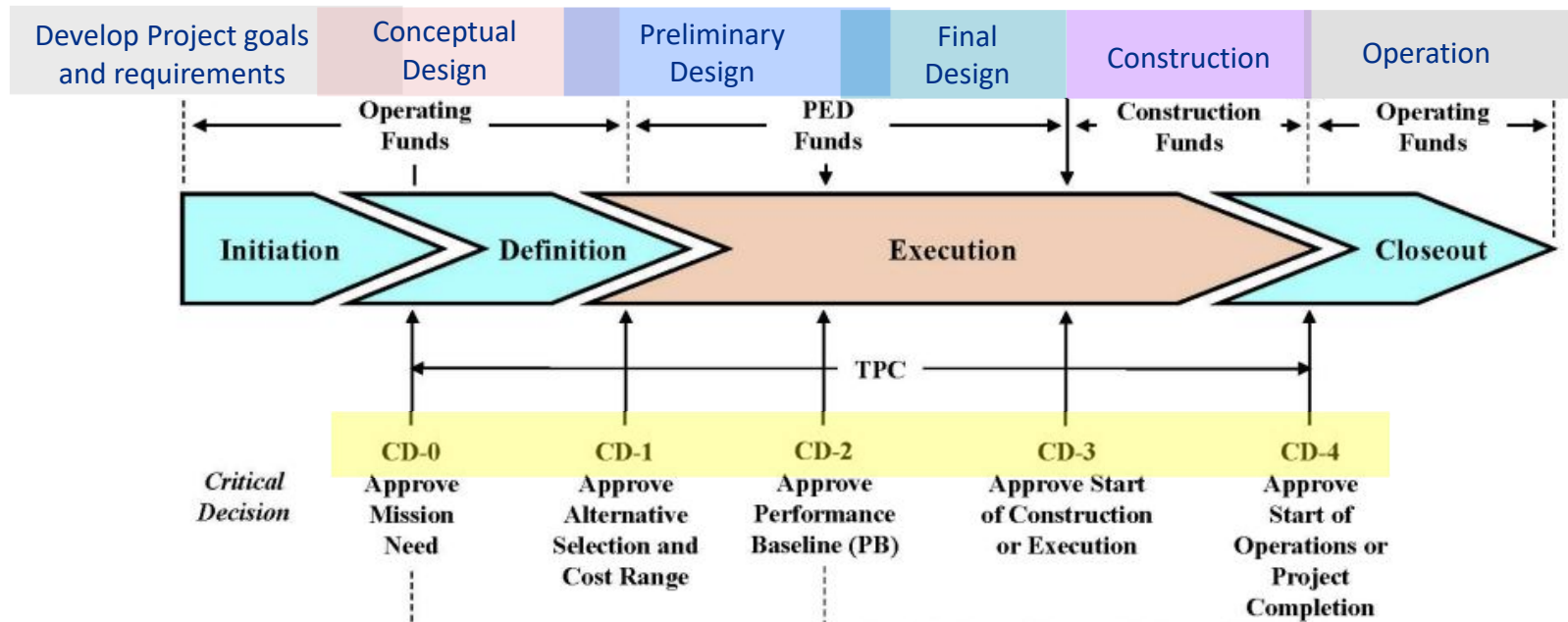
Experiment

The Project Process

Distinct stages, each gated by approval of a Critical Decision **CD Process**

To get an experiment from proposal to “ready for data”, it goes through design phases (conceptual, preliminary, final) and construction phases (procurement, fabrication, assembly, installation) which map to the CD process stages.

DOE 413.3b lists the items to prepare for each CD (e.g. design reports, cost estimates, schedule, management plan). A Review is held at each CD, and approval from DOE is necessary for the release of the funding needed to proceed with the next phase

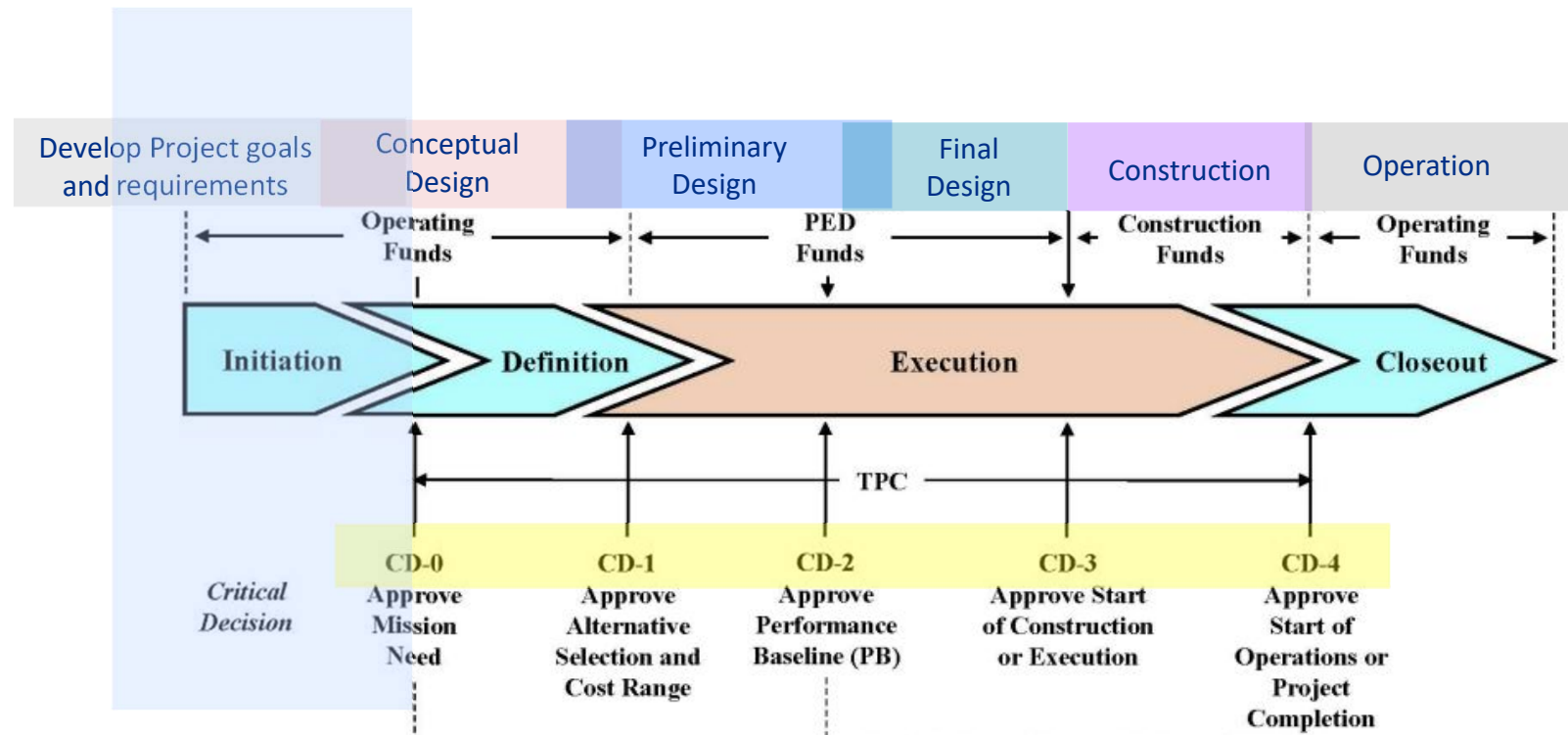


The Project Process **CD-0**

Develop the Mission Need, which documents the arguments that a new investment must be made to meet a scientific goal.

Begin to define what “Project Complete” means (see tracks? or simply complete installation?). The definitions become KPP – Key Performance Parameters. At CD-4, you must show these performance parameters are achieved, so give it some careful thought!

The collaboration members who oversee sub-systems organize into the Project team; work on R&D and conceptual design in parallel with cost and schedule estimates for their sub-systems.

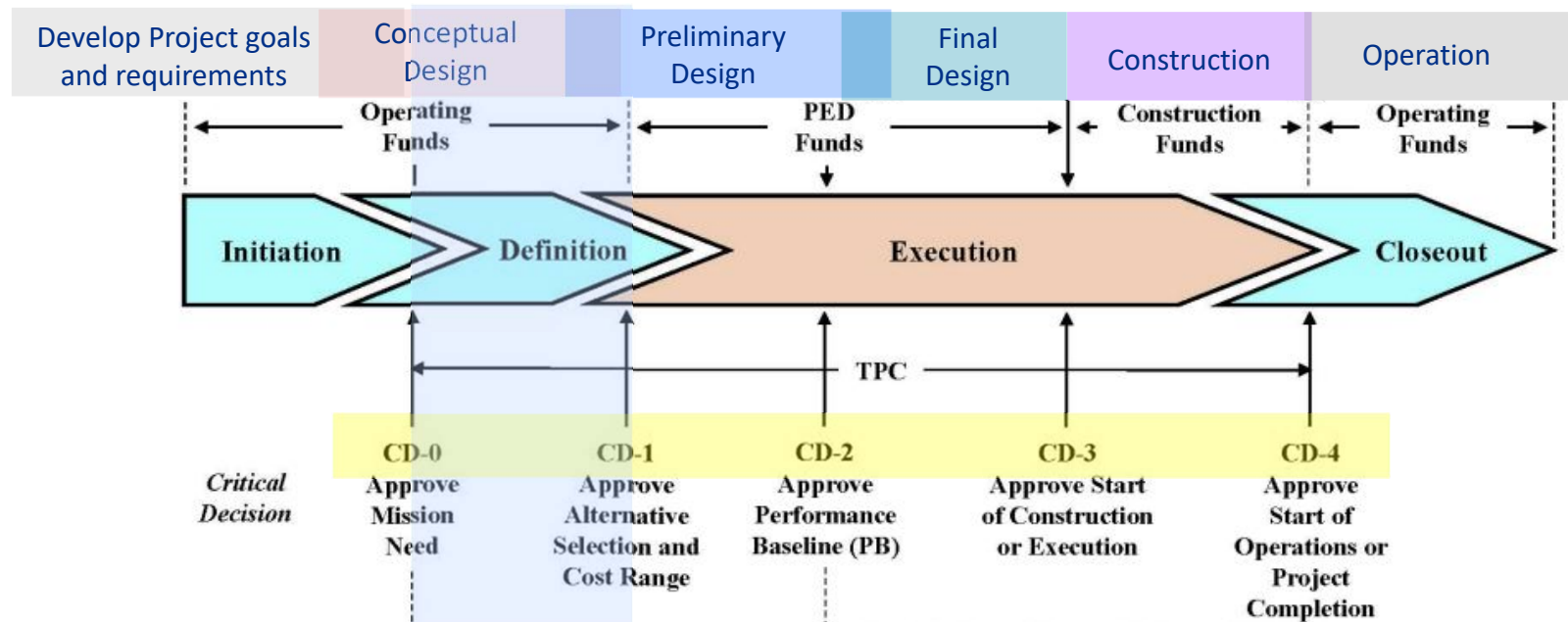


The Project Process CD-1

Alternative Selection – if there was more than one hardware option under development, then by CD-1 the down-select is performed and shown to be the optimal choice to meet the Mission Need from CD-0.

“R&D” becomes more “D” and less “R” as designs advance. A Conceptual Design Report is written. Cost and schedule are supported by a resource-loaded schedule (RLS) and a collection of Basis of Estimate documents. The RLS provides a cost profile which can be compared to, and provide input for, the funding profile.

Many management documents are prepared (e.g. Project Execution Plan, Risk Mgmt Plan, risk assessments and Register, QA Plan)

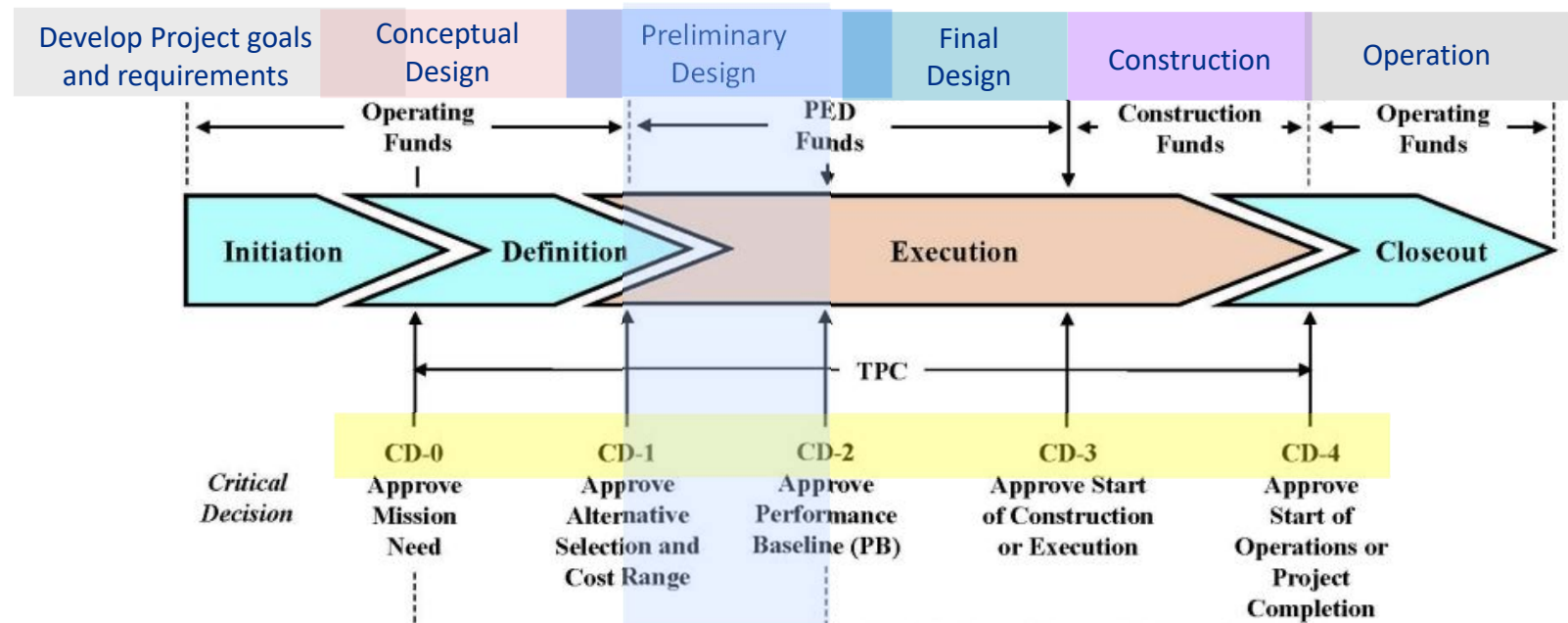


The Project Process **CD-2**

CD-2 is the most important review and requires the most work to prepare for.

The design has advanced to where the full scope of the Project is known (which might not include every sub-system if some collaborators have other grants to provide them). A Technical Design Report is written.

Cost and schedule are “baselined”. The Total Project Cost (TPC) is set, and the calendar date of CD-4 is set. As work moves forward, the progress and cost of the work is compared to the fixed baseline; “earned value performance metrics” are used to track progress against the baseline. Project success is based on finishing all work before CD-4 and spending no more than the TPC, as well as delivering a detector which works.

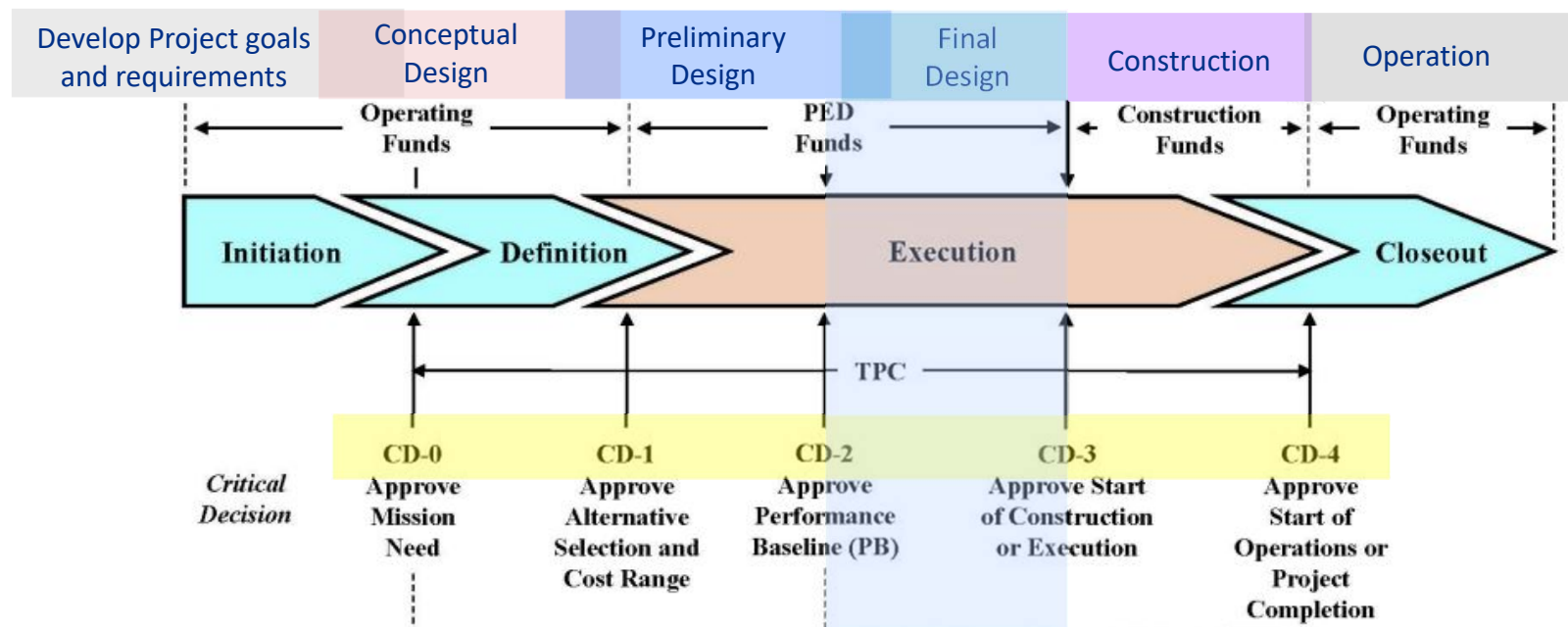


The Project Process **CD-3**

For CD-3 the final design is reviewed and approved. This does not mean all sub-system designs must be fully completed, but design should be mature enough to allow procurements to begin with confidence. For example advanced prototyping for design validation or performing pre-production to verify fabrication steps can be performed after CD-3 approval.

If there are high-value or complex procurements, then written procurement plans are presented as part of the review.

CD-3 approval results in release of the construction funds - - - which is most of the funding! All those reviews (whew!) and finally you can build stuff.



Are DOE Projects always done through Labs?

- Yes
 - DOE Project funds go to a DOE Lab
- but
 - The Project funds can pay for work performed at collaborating institutions if they are designing and fabricating a sub-system from their location
 - The Project work can be performed anywhere.
 - Generally a MoU (general collaboration agreement) and SoW (specific tasks and their cost) are used to define responsibilities and deliverables
 - SoW gets attached to a PO; university sends invoices to Lab for payment

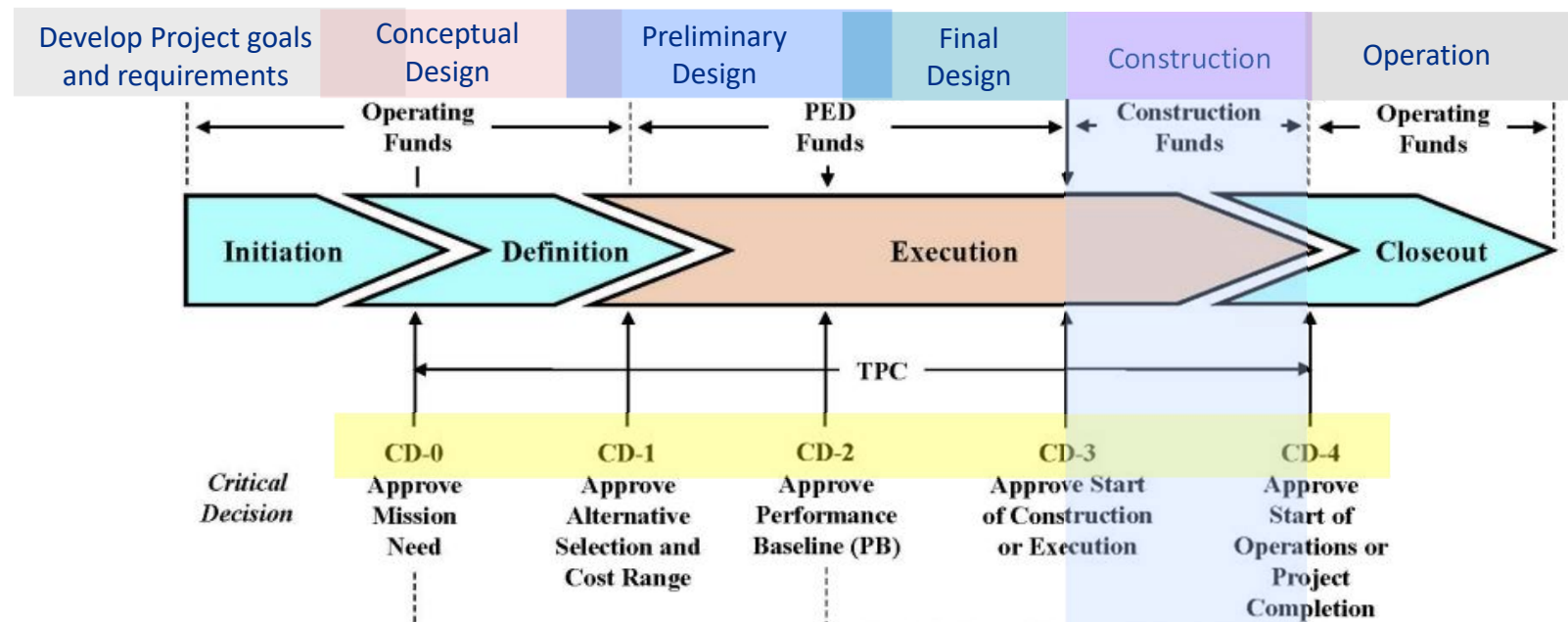
The Project Process **CD-4**

CD-4 provides recognition that the Project's goals are met.

The "review" is often smaller and less formal than for the other CDs.

The Project provides evidence that all KPPs, which are the criteria for technical success, have been met. Lessons Learned are provided, both successes and opportunities for improvement.

At Fermilab, before CD-4, the Lab holds an Operations Readiness Review where the collaboration demonstrates its preparedness to take over after the Project is completed.



Tailored CDs

- The DOE process allows combining or splitting CDs
 - Splitting CD-3 → CD-2/CD-3a and CD-3b allows long-delivery items to be purchased after CD-2 approval, and not wait for the time when other sub-systems are ready for their CD-3
 - If all designs advance quickly, a combined CD-2/3 is possible

Main Theme of the DOE CD process

CONTROL

- But not “control” in, like, directing the actions or decisions of the project or collaboration
- “control” as in keeping on track – stay focused on the project’s goals
 - The emphasis is on making a plan - - define the Scope, determine the cost and schedule required to deliver that Scope
AND THEN STICK TO IT
- As such, DOE Projects are not a good venue for open-ended R&D
 - The Work performed within Project Scope must be (relatively) predictable

Another Theme of the CD process

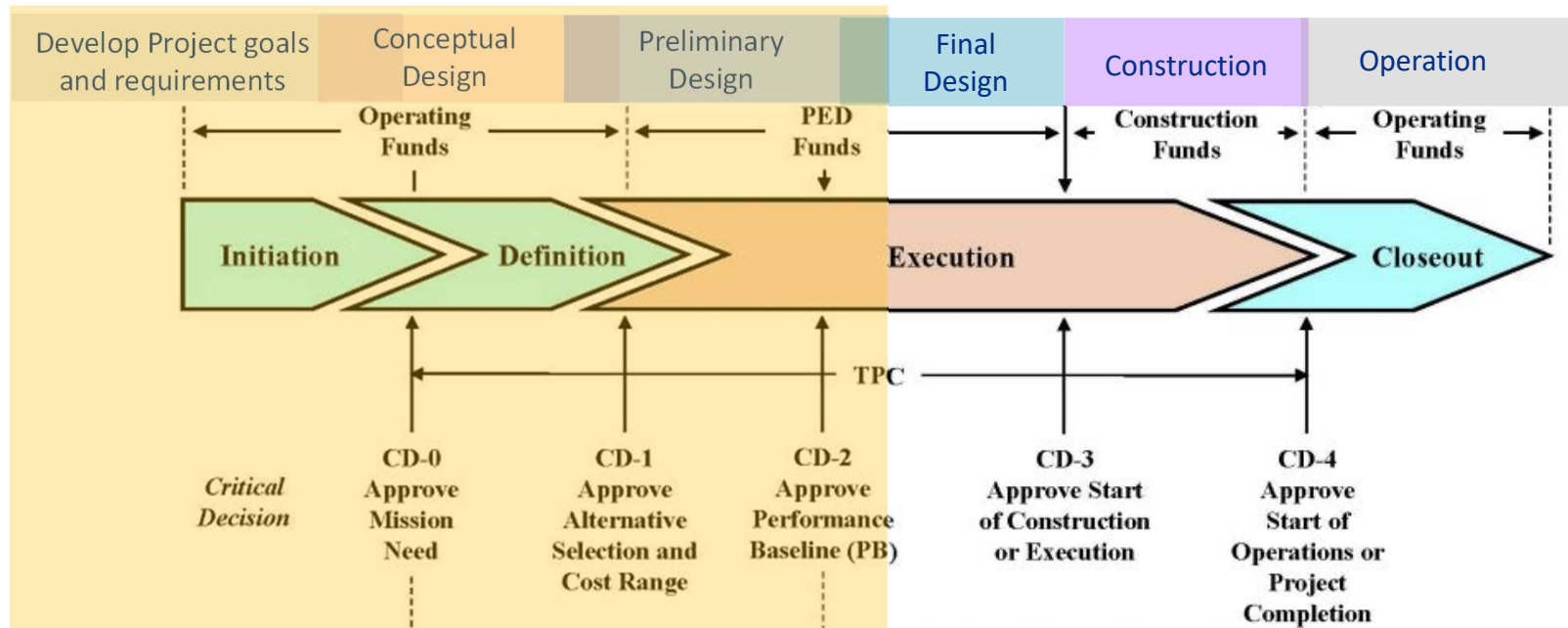
- It takes TIME
 - It's great when your experiment proposal is approved. But even if the Lab and DOE think your experiment is the best thing since sliced bread, their budget process takes time. You may not get any significant funding for a year or more after the proposal is approved (*this happened to MicroBooNE*)
 - Negotiating the “boundary conditions” for CD-0 is a different process compared to pitching the scientific capability of your experiment proposal to the PAC. *Requires a bit of a conceptual pivot*
 - The bigger the scope and cost of a Project, the longer it all takes (*remind me, how many CD-1's has LBNF had??*)

ECA contributing to DOE Projects

Yes, there have been Early Career Award recipients who applied their award towards a DOE Project. Clearly the optimal timing is to get involved early, anytime after the Proposal is approved and up to CD-2 (or so). Any Project will be happy for contributions to detector sub-systems which are “free” to the Project.

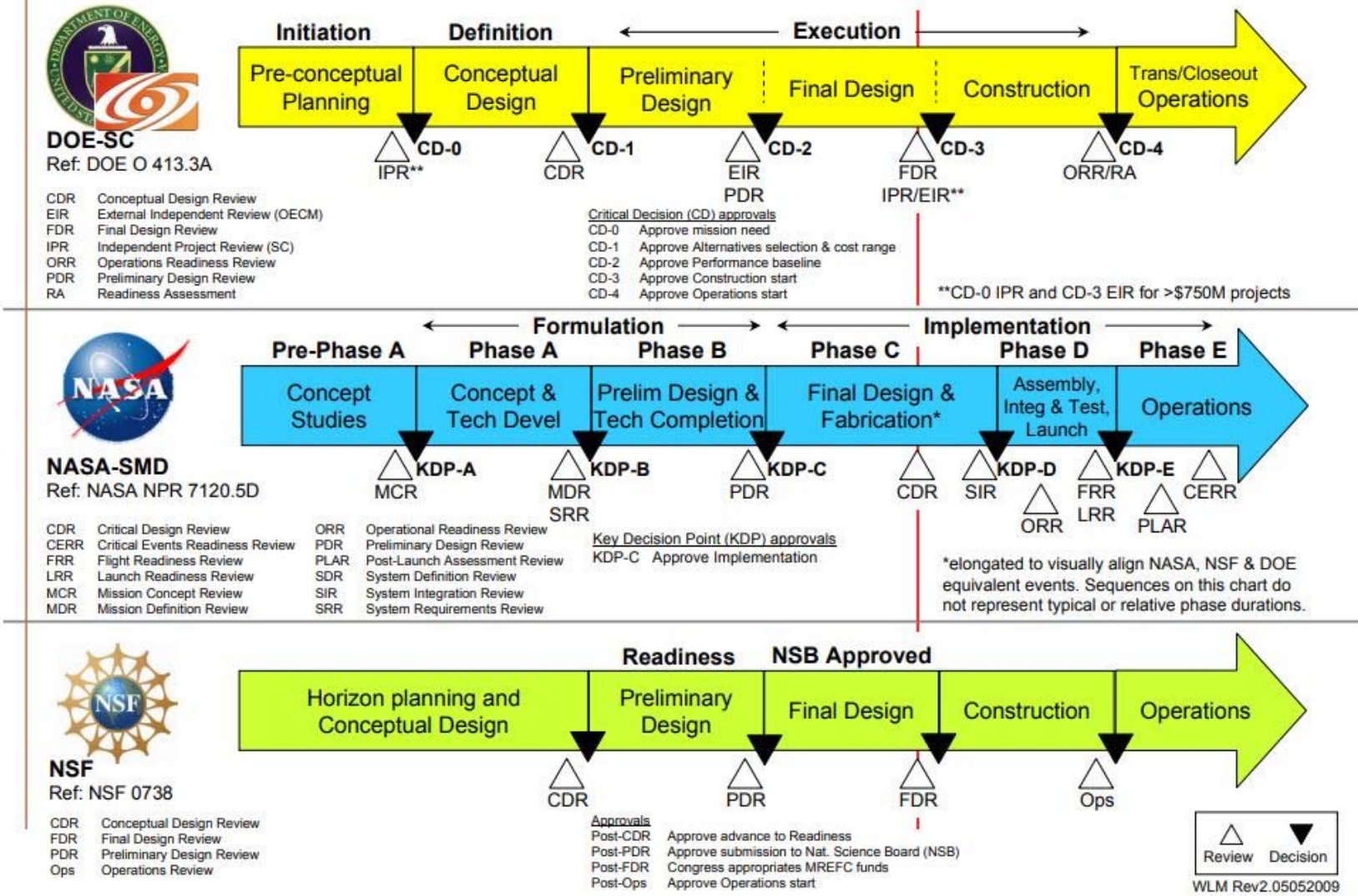
Once past CD-2 it gets harder to “jump in”, because most of the scope is set in place. Most Projects won’t want to introduce something new at that point which may have ripple effects on other sub-systems.

Harder but not impossible. Need to talk it through with your collaborators and project Mgmt



Other Agencies have similar processes

Development processes: alignment and terminology



Fermilab provides support for its Projects



Office of Project Support Services OPSS

– <https://opss.fnal.gov/Office of Project Support Services>

Requires Fermilab Services / computing account

References & links to DOE documents

Guidelines and Templates for project management documents

Training sessions for WBS managers in their DocDB

Not to mention arranging Director's Reviews prior to every DOE Review

double the reviews

Fermilab won't let a Project go into a DOE review if it appears they are not ready



Thank you!

looking forward to the Workshop discussions