



## **NNSA's Analysis of Alternatives (AoA) Methodology**

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# Agenda

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- Background
- AoA Overview
- NNSA's AoA Process

# National Nuclear Security Administration

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Protect the Nation by maintaining a safe, secure, and effective nuclear weapons stockpile

Reduce global nuclear threats



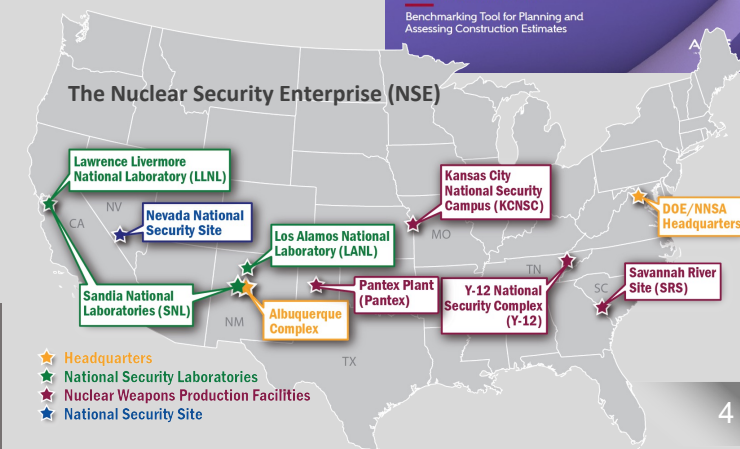
Provides the U.S. Navy with militarily effective nuclear propulsion

The NNSA is a semi-autonomous agency within the U.S. Department of Energy responsible for enhancing national security through the military application of nuclear science.

# NNSA's Office of Programming, Analysis, and Evaluation (PA&E)

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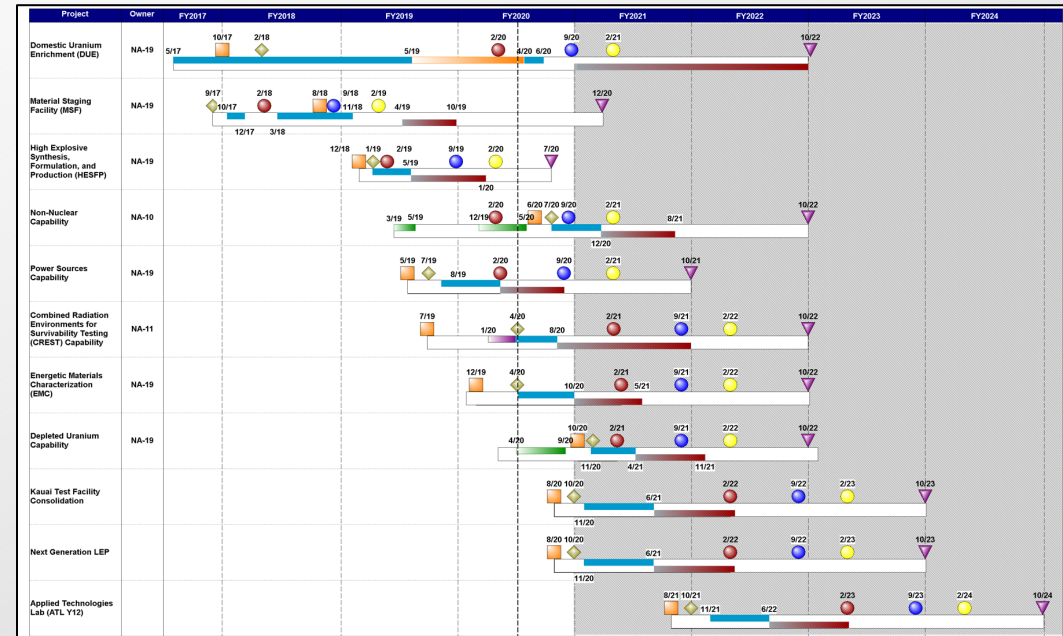
- 2011: Established to focus on cost estimating on early-stage weapons acquisitions
  - Subsequently broadened to other analytical disciplines (e.g. schedule estimating, risk analysis, etc)
- 2019: NNSA centralized cost estimating into two offices and established PA&E to lead:
  - Programmatic cost estimation
  - Execution of all Analysis of Alternatives (AoAs)
  - Programming process of annual Planning, Programming, Budgeting, and Evaluation (PPBE)
- PA&E provides analytical decision support throughout acquisition and budgeting
  - Promotes data-driven decisions and managing portfolio risk in budget-constrained environments
  - Promotes credibility in cost estimating and long-term planning through objective, unbiased, and technically sound analyses and tools.
- PA&E leads:
  - Agency's programmatic cost community which includes 8 national labs and production sites
  - Continuous improvement and innovation in analytical models, tools, and processes
  - Hosting annual Cost Estimating Community of Practice (CECOP) symposium
  - Active collaboration with external cost communities (NASA, DoD's CCRG, ICEAA, AACE, etc.)



# PA&E's Studies at a Glance

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- Expertise in executing multidisciplinary analyses
  - AoAs (required)
  - Business case analyses
  - Planning studies
- Studies often include sub-teams
  - Cost
  - Schedule
  - Risk
  - Effectiveness
  - Equipment/facility sizing



Snapshot of monthly tracking & planning

- 4-6 studies at a time
- 20+ completed to date

PA&E's capability includes executing high-quality, timely studies in support of acquisition milestones, annual budgeting process, and program planning.

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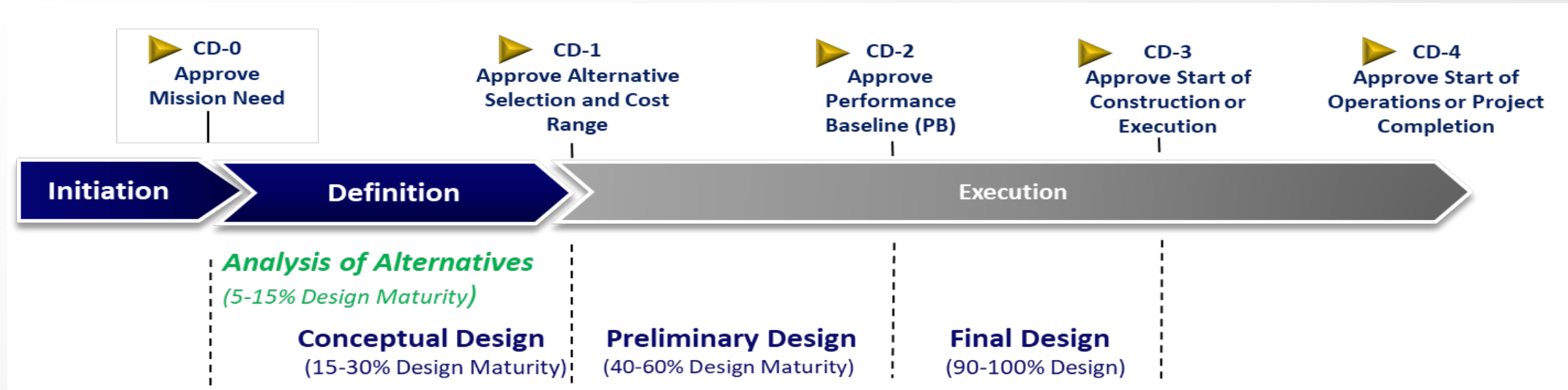
# Purpose of an AoA

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- **Definition:** A study to support a *capital acquisition decision* by providing *objective* analytical products to meet an *established mission need*.
  - Investigate enterprise-wide alternatives
  - Document screening of non-viable alternatives
  - Final analytical products include quantitative and qualitative assessments:
    - Cost: Total project cost (“TPC” through CD-4) as well as life cycle cost estimates (“LCCE” includes operations and disposal)
    - Schedule: Comparative timelines to completion (CD-4 and startup)
    - Risk: Assess technical, programmatic, and operational risks
    - Effectiveness: Assess qualitative criteria, such as performance trade-offs
    - Facility Sizing: (if applicable)
- Capital acquisition policy requires it
  - DOE O 413.3B – Requires an Analysis of Alternatives before CD-1 for capital acquisition projects over \$50M
  - SD 413.3 – Policy for how to perform an AoA (updated June 2021)

# When to Do an AoA? Context of Entire Acquisition Process

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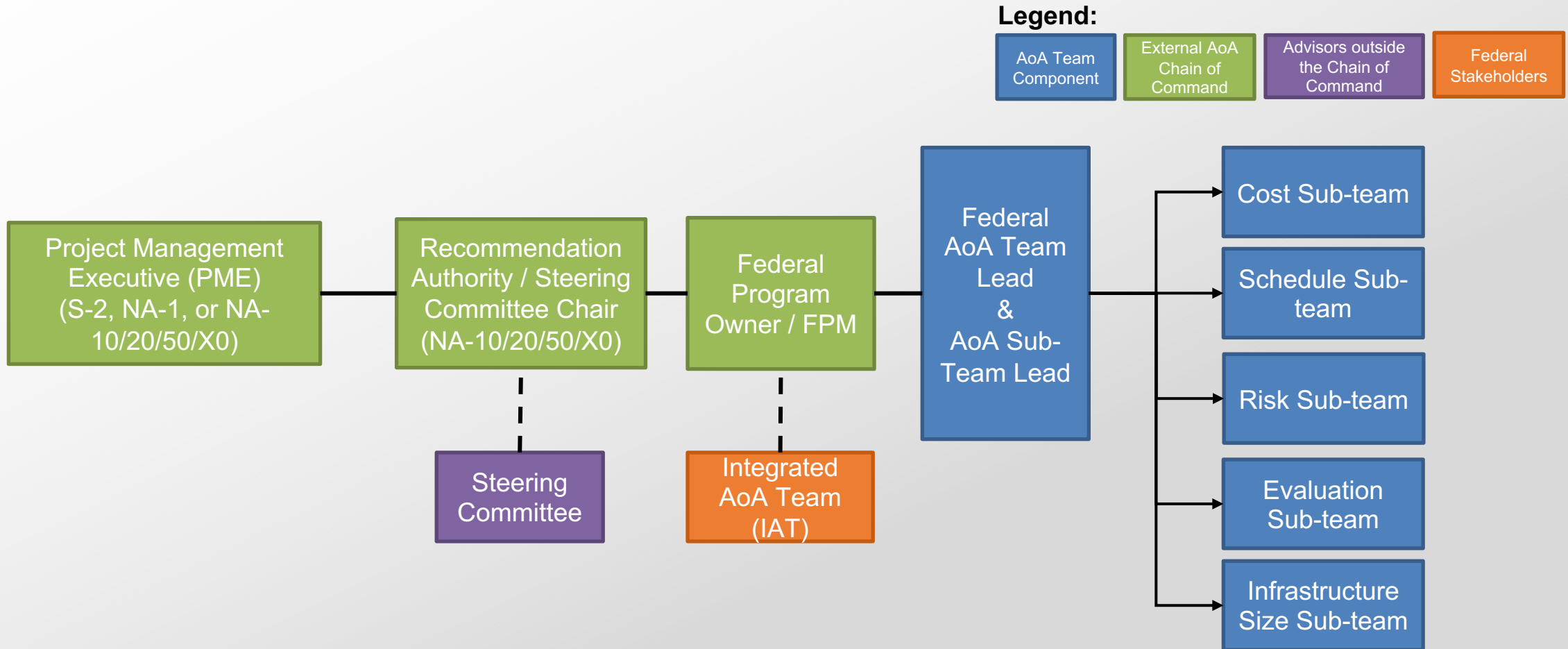


- AoAs are very early stage (pre-conceptual design, 5-15% design maturity)
- Primarily meant as *comparative* analysis so leadership can understand cost, schedule, and risk tradeoffs before making down-select decision



# NNSA's AoA Teams

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# Who's Involved in the AoA?

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- NNSA has unique arrangement where AoAs are centralized and led by analytical support group (PA&E)
  - PA&E “owns” the AoA analytical products, and is responsible for timely, consistent, defensible analyses
  - Programs heavily involved and “own” the alternative selection and long-term fate of the project
- Decision maker is Program sponsor (typically Deputy Administrator or delegate)
  - Ensures programs are heavily involved and viewed as customer
- Steering Committee advises decision maker and includes membership from various federal offices\*:
  - Program office (requirements, mission need)
  - Project management
  - CEPE (adherence to AoA best practices)
  - Budgeting
- Integrated Analysis Team advises the AoA team and includes membership from the above and additional federal offices\*:
  - General counsel
  - Safety and infrastructure
  - Security
- While federally led, AoAs also include inputs from site experts who\*\*:
  - Provide technical information and subject matter expertise about how technical project processes work
  - Provide insights, advice, and historical data on alternatives and metrics
  - Review assumptions for reasonableness and materials for factual accuracy

*\*Other organizations as appropriate*

*\*\*Sites provide technical expertise but are excluded from evaluating alternatives, estimating costs or schedules, developing recommendations, or writing AoA briefings or reports.*

# Growing Pains and Resolutions

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Growing pain #1: Programs uncomfortable with PA&E leading “their” project

Resolved by:

- Top-cover support from senior leadership on importance of quality
- PA&E collaborating closely with programs and viewing them as customers

Growing pain #2: Sites uncomfortable with lack of involvement

Resolved by:

- Sites allowed to review materials for reasonableness and factual accuracy
- Heavy involvement on scope development (e.g. equipment needs or facility sizing)
- Sites continue to provide data to support AoA

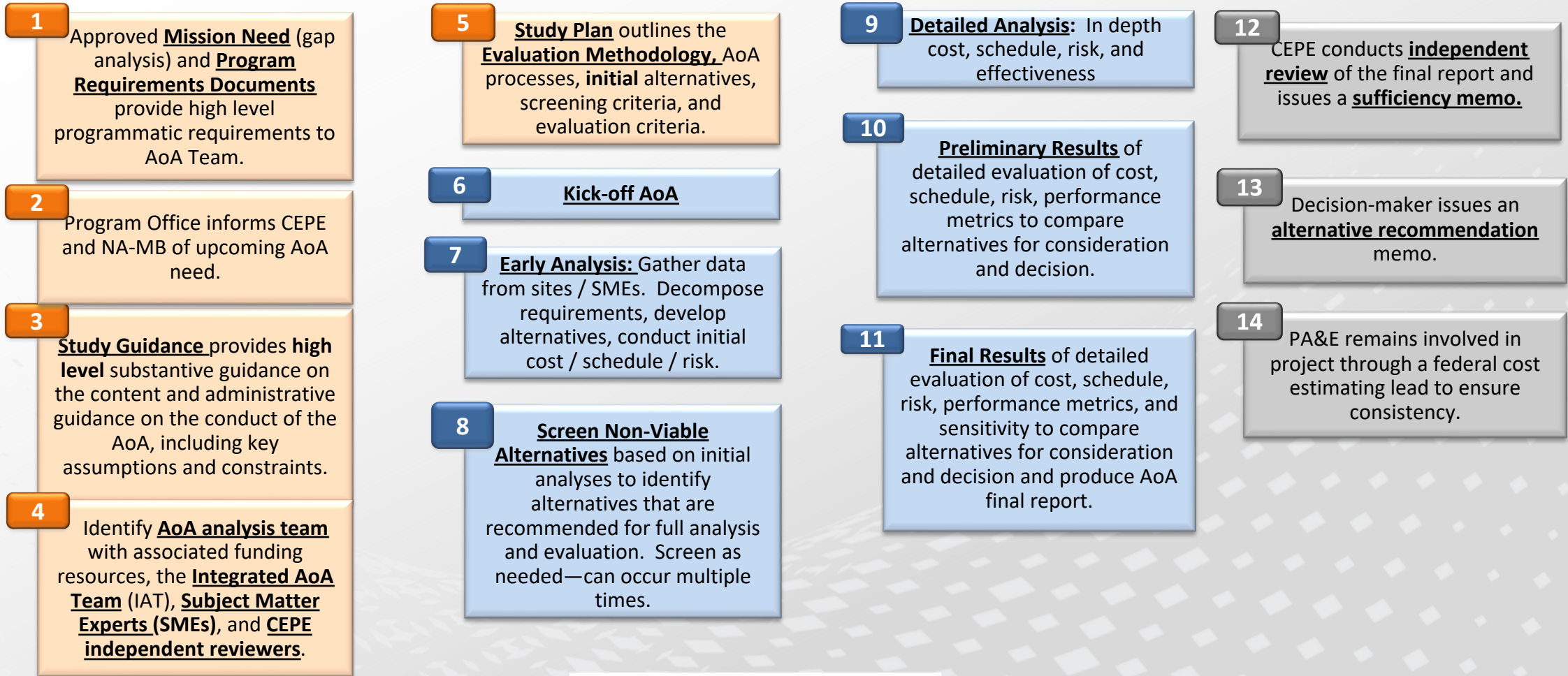
Growing pain #3: Transition issues when PA&E “gives project back” at end of AoA

Resolved by:

- PA&E staff added to project teams after AoA to maintain continuity

# Major AoA Process Steps

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Document Lessons Learned Throughout

Pre-AoA

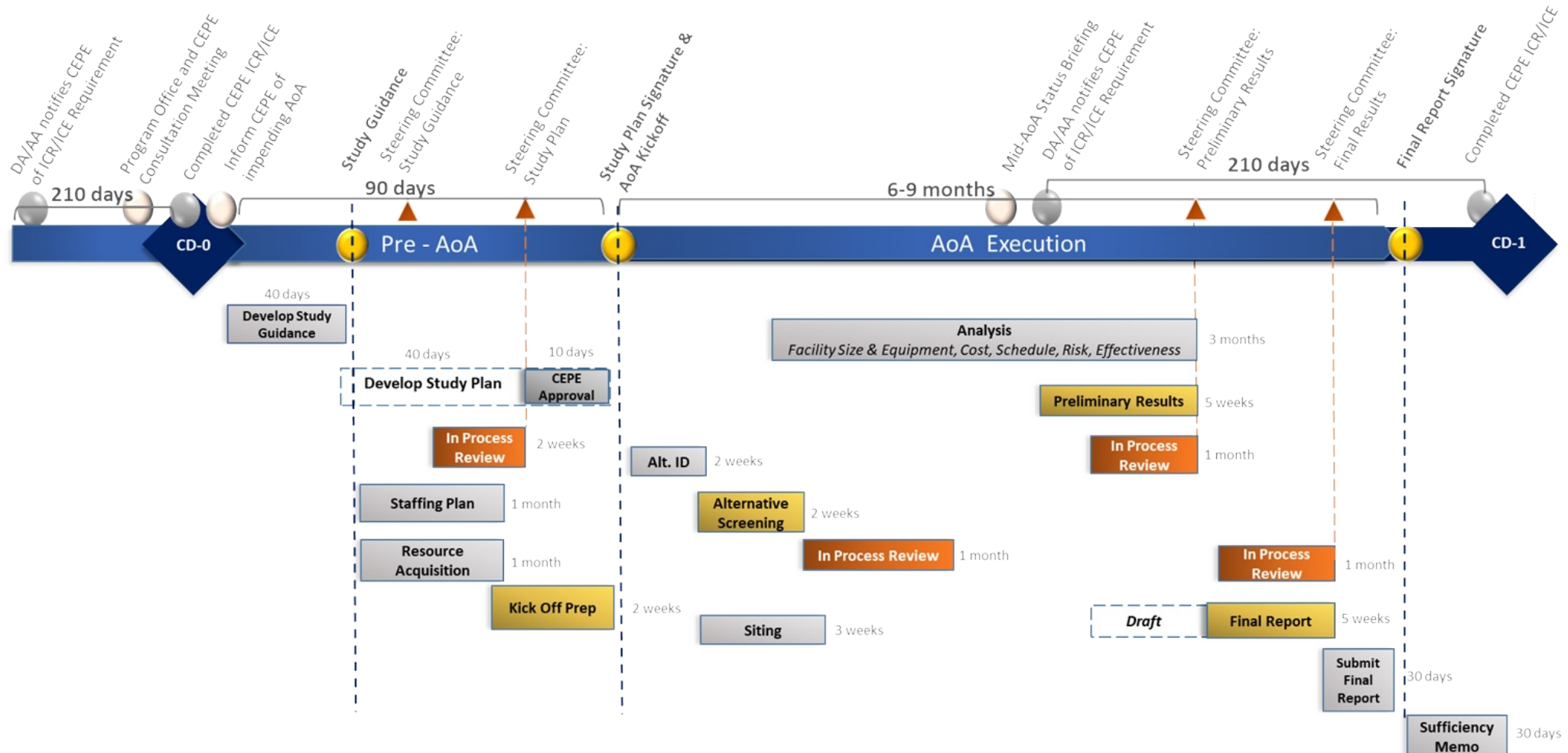
During AoA

Post-AoA

# Standard AoA Timeline

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- PA&E's standard AoA timeline is 6 months (is tailored based on complexity and urgency)



# Analysis Steps: Developing Alternatives Thought Process Example

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- What technologies can do the job?
- Where can it be done?
  - *Are existing facilities or sites a better fit for this?*
- Make versus buy
  - *Can commercial vendors meet some or all requirements?*
- Non-material solutions
  - *Can a policy change solve the problem?*
- Making alternatives apples-to-apples
  - Must include all support infrastructure
  - Alternatives that don't meet requirements may be supplemented or combined to create a full capability
- How many alternatives do we need? (Greater than 2 but probably less than 20)

**Goal:** Avoid pre-determined solutions and capture full solution space for AoA. Screen alternatives early and often to maximize time spent studying the best alternatives.

# Analysis Steps: Screening Examples

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ID	Screening Criteria					Result	Rationale
	1	2	3	4	5		
1	Meets	Meets	Meets	Meets	Meets	Retain	Meets All Criteria.
2	Meets	Does not Meet	Meets	Meets	Meets	Retain	Evaluate cost and schedule if no capital acquisition is taken.
3	Does not Meet	Meets	Meets	Meets	Meets	Retain	Will have appropriate requirement when complete.
4	Meets	Meets	Meets	Meets	Meets	Retain	Meets All Criteria
5	Does not Meet	Meets	Meets	Meets	Meets	Retain	Evaluate cost, schedule, and risk for construction and equipment installation outside security, but in a newer facility
6	Does not Meet	Meets	Meets	Meets	Meets	Screen	High programmatic risk with no discernable offsetting benefit compared to other areas.
6	Does not Meet	Meets	Meets	Does not Meet	Meets	Screen	High programmatic risk with no discernable offsetting benefit compared to other areas. Significant need for additional infrastructure
7	Does not Meet	Meets	Meets	Does not Meet	Meets	Screen	High programmatic risk with no discernable offsetting benefit compared to other areas. Significant need for additional infrastructure

- Alternatives are assessed against requirements / screening criteria
  - Alternatives which do not meet criteria are either recommended for screening or combined
- Screening recommendations provided to Steering Committee chair for final decision



# Analysis Steps: Reporting Results Examples

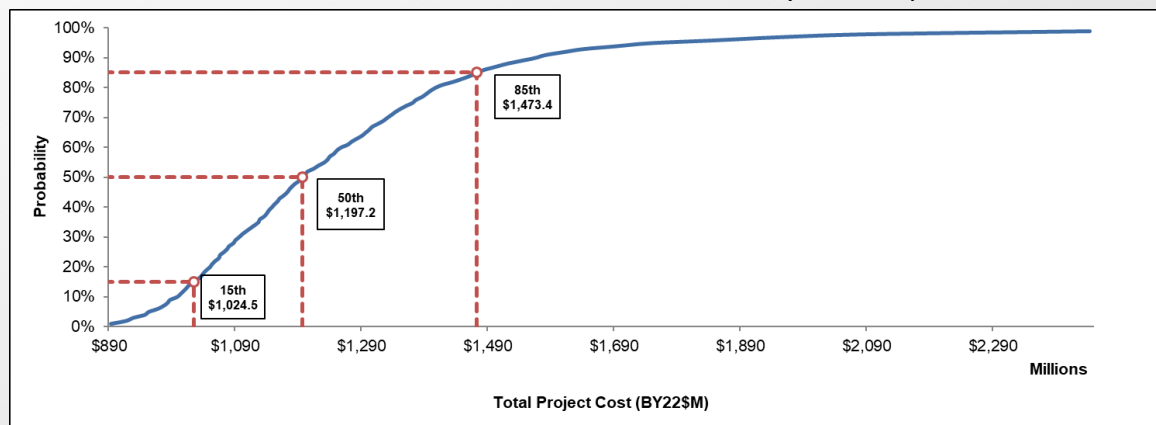
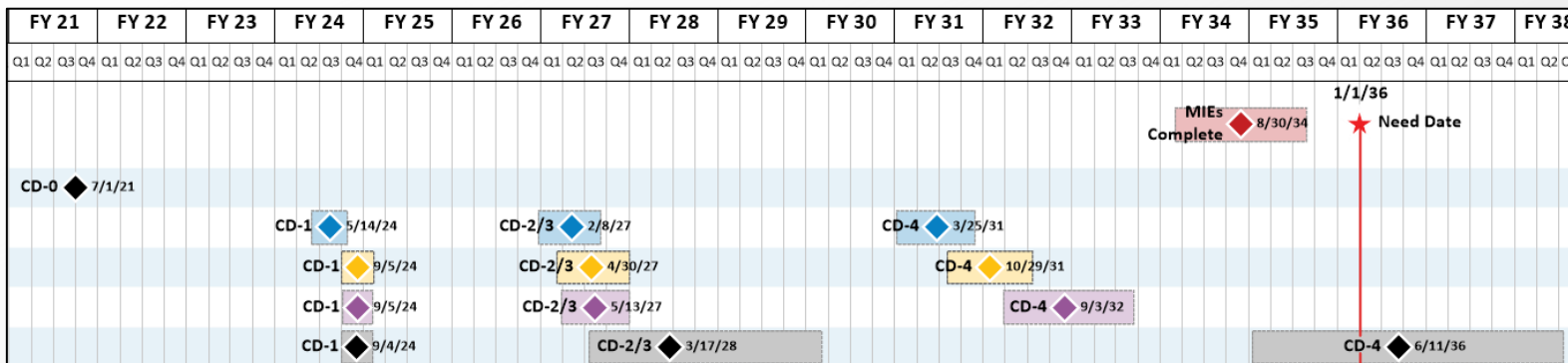
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- Standardized results format helps leadership quickly assess lots of information

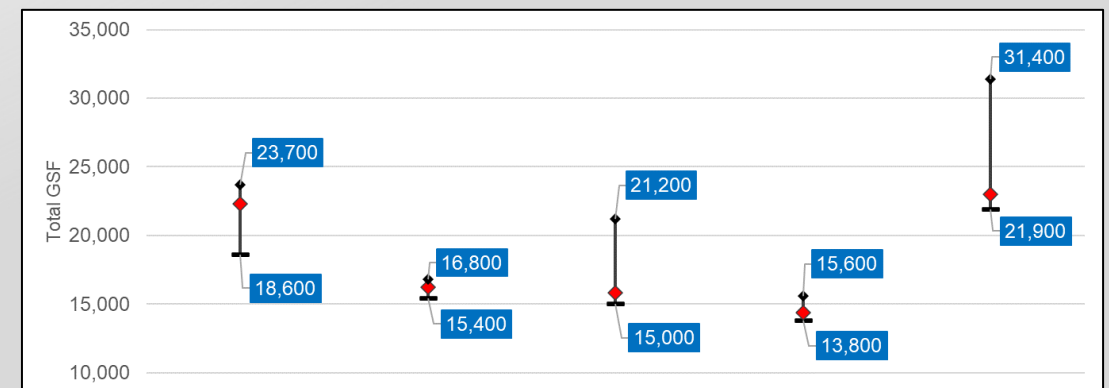
Risk analysis example

#	Average Score	Average Score	Average Score	Average Score	Average Score	Average Score
	Programmatic Risks	Operational Risks	Technical Risks	Logistical Risks	External Risks	All Risks
	(1-25)	(1-25)	(1-25)	(1-25)	(1-25)	(1-25)
1	6.6	9.3	5.3	9	5.7	7.5
2	6.2	8.6	4.3	6	4.7	6.5
3	4.8	7	9	6	4.7	6.3
4	5.2	6.3	4.7	4.5	4.3	5.3
5	7.4	6.6	9	6	4.7	6.8
6	7	6.1	4.7	4.5	3.7	5.6
7	4.8	5.9	3.7	3.5	5	4.9

Schedule analysis example



Cost analysis example



Facility size results example

# Sensitivities Around an AoA

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- AoA analysis information is embargoed prior to the completion of the final report and alternative selection by decision-maker
- Significant congressional interest since AoA decisions can:
  - Move capabilities between sites
  - May significantly modify existing projects
  - Have significant budget impacts to congressional districts
- Sites and external stakeholders may use mechanisms (lobbying, congressional representatives) to try and influence the decision

# Benefits of Standardized Process

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## NNSA centralized AoA execution in PA&E

- Promotes analytical improvement over time, limits pre-defined or biased outcomes.

## Standard process reduces churn and allows focus to remain on the analysis

- Requirements validation occurs before the AoA
- AoA Study Plan includes leadership expectations and is finalized before the analysis
- Designated AoA Operations Lead manages team tempo and external communications
- Standard templates for staffing plan, study plan, comments resolution, briefings, etc
- Collaboration site (MAX.gov) used to share collected data with independent reviewers, stakeholders, and SMEs
- Lessons learned documented throughout and reviewed with program customer at end

# Questions?



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