

CONFIDENCE LEVELS AND ESCALATION FOR COST ESTIMATING



NATIONAL NUCLEAR SECURITY ADMINISTRATION **Office of Cost Estimating and Program Evaluation**

CONTROLLED DOCUMENT
AVAILABLE ONLINE AT:
<http://directives.nnsa.doe.gov>

OFFICE OF PRIMARY INTEREST (OPI):
Office of Cost Estimating and Program Evaluation

printed copies are uncontrolled

THIS PAGE INTENTIONALLY LEFT BLANK

CONFIDENCE LEVELS AND ESCALATION FOR COST ESTIMATING

1. PURPOSE. To establish policy for use of confidence intervals and escalation for cost estimating within the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA).
2. AUTHORITY. This NNSA Policy (NAP) is written under the Administrator's authority to set policy established pursuant to 50 United States Code (U.S.C.) 2402(d) and 2411(c).
3. CANCELLATION. None.
4. APPLICABILITY.
 - a. Federal. Applies to all federal NNSA elements.
 - b. Contractors. Does not apply to contractors.
 - c. Equivalencies/Exemptions.
 - (1) Equivalency. In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 U.S.C. sections 2406 and 2511, and to ensure consistency throughout the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate.
 - (2) Exemption. Estimates performed for direct use in contract actions under Department of Energy Acquisition Regulations (DEAR) and Federal Acquisition Regulations (FAR).
5. SUMMARY OF CHANGES. Not Applicable.
6. BACKGROUND. Legislation codified in 50 U.S.C. 2411 establishes a basis for development of policies and procedures for cost analysis and estimation by the Administration, including the determination of confidence levels with respect to cost estimates. Confidence levels and escalation used in cost estimating have a significant impact in budget planning and the determination of funding needed to execute capital asset acquisition projects and programs. The Government Accountability Office (GAO) *Cost Estimating and Assessment Guide* states: "Decision-makers choose the level of confidence at which to set the budget. Because each program is different, there are no set rules at what level of contingency is sufficient for program success."

NNSA's mission creates an environment where many capital asset acquisition projects and programs are unique within the United States. This can lead to widely varying expectations of ultimate cost. Consistent application of confidence levels and escalation in budget planning focuses attention on improving the underlying point estimate of a

project or program and ultimately aids in the reconciliation of unique NNSA cost considerations. In addition, the application of confidence levels and escalation should be viewed as refinement of the point estimate and not a substitute for the rigorous development of a credible point estimate based on reasonable and justifiable assumptions.

7. REQUIREMENTS.

- a. Confidence levels in Appendix A must be used for all cost estimates for programs and capital asset acquisition projects in accordance with the Phase X/6.X and DOE Order 413.3B, Program and Project Management for the Acquisition of Capital Assets, acquisition processes.
- b. Escalation rates in Appendix B, or from the Office of Cost Estimating and Program Evaluation (CEPE) Escalation Rate Guidance, must be used when contractual site-specific rates are unknown, indeterminable, or inapplicable.

8. RESPONSIBILITIES.

- a. Director, Office of Cost Estimating and Program Evaluation.

- (1) Determines appropriate confidence levels for use in cost estimates.
- (2) Publishes CEPE Escalation Rate Guidance based on analysis of the NNSA complex and current escalation trends.
- (3) Maintains this policy and reviews and updates Appendix A annually and Appendix B semi-annually as appropriate.

- b. Federal Program Managers and Federal Project Directors.

Apply confidence level and escalation projections in cost estimates used for program and budget planning for programs and capital asset acquisition projects in accordance with the Phase X/6.X and DOE Order 413.3B acquisition processes.

9. DEFINITIONS.

- a. Acquisition Program. A defined duration, funded effort from conceptualization, initiation, design, development, test, contracting, production, deployment, logistics support, modification, and disposal to provide a new, improved, or continuing weapon and weapon systems or other products to satisfy an NNSA mission requirement or capability gap, intended for use in, or in support of, NNSA missions.
- b. Capital Asset Acquisition Project. A project with defined start and end points required in the acquisition of capital assets. The project acquisition cost of a capital asset includes both its purchase price and all other costs incurred to bring it

to a form and location suitable for its intended use. It is independent of funding type. It excludes operating expense-funded activities such as repair, maintenance or alterations that are part of routine operations and maintenance functions and do not exceed the general plant project threshold.

- c. Confidence Level. The likelihood – expressed as a percentage – that an occurrence will be realized. The higher the confidence level, the higher the probability of success.
- d. Escalation. The provision in a cost estimate for increases in the cost of equipment, material, labor, etc., due to continuing price changes over time. This applies to a specific type of work or commodity, rather than the general market. Escalation is used to estimate the future cost of a project or to bring historical costs to the present.
- e. Inflation. A rise in the general price level over time across the entire market or economy.
- f. Total Project Cost/Total Program Cost. For projects following DOE Order 413.3B (or successor order), *Total Project Cost/Total Program Cost (TPC)* is all costs between Critical Decision (CD)-0 and CD-4 specific to a project incurred through the startup of a facility, but prior to the operation of the facility. For programs following the 6.X process, the TPC will cover all costs from phase 6.1 through phase 6.6. For other acquisition programs, the TPC is the cost of conceptualization, initiation, design, development, test, contracting, and production prior to operation and disposal.

10. REFERENCES.

- a. Federal Laws and Regulations.

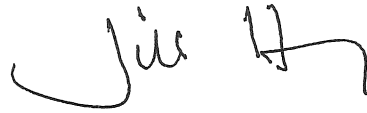
50 United States Code Section 2411, *Director for Cost Estimating and Program Evaluation*
- b. Government Accountability Office.

GAO-20-195G, *GAO Cost Estimating and Assessment Guide*
- c. DOE.

Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, dated 01-12-2021

11. CONTACT. Director, Office of Cost Estimating and Program Evaluation, 202-586-6910.

BY ORDER OF THE ADMINISTRATOR:

A handwritten signature in black ink, appearing to read "Jill Hruby", with a stylized flourish at the end.

Jill Hruby
Administrator

Appendixes:

- A. Confidence Level Guidance.
- B. Escalation Guidance.
- C. Use of Confidence Levels

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A: CONFIDENCE LEVEL GUIDANCE

1. **INTRODUCTION.** Confidence levels are the principal tool used to establish and compare risk in cost and schedule estimates. Generally, the higher the confidence level the more likely a project will be completed within the corresponding cost and schedule position, as long as the underlying point estimate is credible and it is based on reasonable and justifiable assumptions.
2. **REQUIREMENTS.** This appendix applies to cost estimates for capital asset acquisition projects and programs within the National Nuclear Security Administration (NNSA). The Office of Cost Estimating and Program Evaluation (CEPE) must review this appendix annually and update as appropriate.

Federal Program Managers/Federal Project Directors may elect to provide high, most likely, and low cost estimates without associated confidence percentile levels or S-curve as long as the risk/uncertainty methodology is clearly documented in the program or project estimate. In this case, the high, most likely, and low estimates will be treated as the confidence percentile levels stated in Section 3 of Appendix A.

The Federal Program Manager/Federal Project Director may select a different confidence percentile level for low end the cost range with documented justification and approval from the NNSA Administrator.

3. **CONFIDENCE LEVELS FOR CAPITAL ASSET ACQUISITION PROJECTS.**
 - a. **Nuclear Projects.**
 - (1) High: 85th percentile level
 - (2) Most Likely: 50th percentile level
 - (3) Low: 15th percentile level
 - b. **Non-Nuclear Projects.**
 - (1) Total Project Cost/ Total Program Cost (TPC) greater than \$100 million:
 - (a) High: 80th percentile level
 - (b) Most Likely: 50th percentile level
 - (c) Low: 20th percentile level
 - (2) TPC less than \$100 million:

- (a) High: 70th percentile level
- (b) Most Likely: 50th percentile level
- (c) Low: 20th percentile level

4. CONFIDENCE LEVELS FOR ACQUISITION PROGRAMS.

a. Nuclear weapons programs and Life Extension Programs.

- (1) High: 80th percentile
- (2) Low: 50th percentile

b. Other Acquisition Programs.

- (1) High: 80th percentile
- (2) Low: 20th percentile

APPENDIX B: ESCALATION GUIDANCE

1. **INTRODUCTION.** Escalation rates establish an expectation in the future value of funds available to complete a project. Changes in escalation can have significant impacts on budget planning and, ultimately, the success of a project. Reasonable and reliable projections of escalation rates ultimately reduce project uncertainty and improve overall project planning.
2. **REQUIREMENTS.** This appendix provides escalation guidance for capital asset acquisition projects and programs within the National Nuclear Security Administration (NNSA). This guidance and accompanying detailed Escalation Rate Guidance document must be applied for cost estimates, Analysis of Alternatives (AoAs), Independent Cost Estimates (ICEs), and Independent Cost Reviews (ICRs) and other estimates. The Office of Cost Estimating and Program Evaluation (CEPE) must review this appendix and the Escalation Rate Guidance semi-annually and update as appropriate.

Federal Program Managers/Federal Project Directors may elect to use different escalation assumptions and/or apply additional risk as long as the methodology is clearly documented in the program or project estimate.

3. **BACKGROUND AND EXPLANATION.** CEPE performed a study to analyze NNSA's escalation environment and its relationship to the wider inflationary market. This study includes a review of historical escalation for the labor, materials, and overhead markets in which the NNSA participates, focused on nuclear construction, non-nuclear construction, and weapons programs. Probability distributions of market inflation rate (referencing the Consumer Price Index for Urban workers or CPI-U) forecasts were developed using financial instruments actively traded on Wall Street, such as Treasuries and inflation derivatives (Figure 1). By combining market projections of inflation with NNSA's recent history of escalation, composite escalation indices and probability distributions for each NNSA Site and each category of program/project can be calculated. The composite indices and probability distributions are for use in cost estimates, AoAs, budget estimates, and other estimates where contractual rates have not been established.

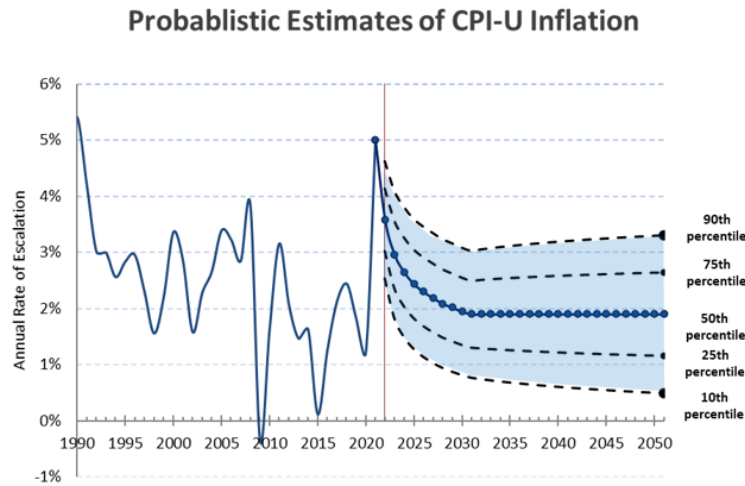


Figure 1. Projection of General Inflation and Confidence Intervals

Below are tables for the following categories of programs/projects: Nuclear Construction, Non-Nuclear Construction with Total Project Cost/Total Program Cost (TPC) greater than \$100 million, Non-Nuclear Construction with TPC less than \$100 million, and weapons programs/Life Extension Programs (LEPs). Each table contains site-specific escalation rates from fiscal year (FY) 2022 through FY 2036. For estimates extending beyond FY 2036, the FY 2036 escalation can be repeated indefinitely for future years.

Each estimate should align its escalation percentiles with the Confidence Intervals requirements in Appendix A, so the 85th percentile estimate on a Nuclear Construction project will also use the 85th percentile escalation projection. Further details and calculations for additional percentiles will be provided within the Escalation Rate Guidance document.

The process of applying escalation rates at a specific confidence level starts with the point estimate in base-year dollars followed by time-phasing across fiscal years. Then, a numerical method similar to what is described in Appendix C (e.g., Monte Carlo simulation) is used to develop a S-curve of the cost estimate outcomes. Lastly, escalation at the specified confidence level (e.g., 85th percentile) is applied to the time-phased estimate at the same confidence level (e.g., 85th percentile) by fiscal year.

4. ESCALATION RATES FOR CAPITAL ASSET ACQUISITION PROJECTS.

a. Nuclear Projects.

The following annual escalation rates should be used for nuclear construction projects.

Projected Nuclear Construction Escalation Rates by Site															as of 1/1/2022	
Site	Percentile	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LANL	85th	6.09%	5.64%	5.40%	5.24%	5.13%	5.04%	4.96%	4.90%	4.84%	4.80%	4.84%	4.87%	4.90%	4.92%	4.94%
	50th	4.92%	4.30%	3.99%	3.78%	3.64%	3.53%	3.43%	3.36%	3.29%	3.24%	3.24%	3.24%	3.24%	3.24%	3.24%
	15th	3.75%	2.96%	2.58%	2.32%	2.15%	2.02%	1.90%	1.82%	1.74%	1.68%	1.64%	1.61%	1.58%	1.56%	1.54%
SNL	85th	6.20%	5.76%	5.53%	5.36%	5.25%	5.17%	5.09%	5.03%	4.97%	4.94%	4.97%	5.00%	5.03%	5.06%	5.08%
	50th	5.01%	4.39%	4.08%	3.87%	3.73%	3.62%	3.52%	3.45%	3.38%	3.33%	3.33%	3.33%	3.33%	3.33%	3.33%
	15th	3.82%	3.02%	2.63%	2.38%	2.20%	2.07%	1.95%	1.87%	1.79%	1.72%	1.69%	1.66%	1.63%	1.60%	1.58%
SRS	85th	5.27%	4.77%	4.51%	4.32%	4.20%	4.10%	4.00%	3.94%	3.87%	3.83%	3.85%	3.88%	3.90%	3.92%	3.94%
	50th	4.26%	3.64%	3.33%	3.12%	2.98%	2.87%	2.77%	2.70%	2.63%	2.58%	2.58%	2.58%	2.58%	2.58%	2.58%
	15th	3.25%	2.51%	2.15%	1.92%	1.76%	1.64%	1.54%	1.46%	1.39%	1.33%	1.31%	1.28%	1.26%	1.24%	1.22%
Pantex	85th	5.84%	5.38%	5.14%	4.96%	4.85%	4.76%	4.67%	4.61%	4.55%	4.51%	4.54%	4.57%	4.60%	4.62%	4.64%
	50th	4.72%	4.10%	3.79%	3.58%	3.44%	3.33%	3.23%	3.16%	3.09%	3.04%	3.04%	3.04%	3.04%	3.04%	3.04%
	15th	3.60%	2.83%	2.45%	2.20%	2.03%	1.90%	1.79%	1.71%	1.63%	1.57%	1.54%	1.51%	1.49%	1.46%	1.44%
Y-12	85th	5.23%	4.73%	4.47%	4.28%	4.15%	4.06%	3.96%	3.89%	3.82%	3.78%	3.81%	3.83%	3.85%	3.87%	3.89%
	50th	4.23%	3.61%	3.30%	3.09%	2.95%	2.84%	2.74%	2.67%	2.60%	2.55%	2.55%	2.55%	2.55%	2.55%	2.55%
	15th	3.23%	2.49%	2.13%	1.90%	1.74%	1.62%	1.52%	1.44%	1.37%	1.32%	1.29%	1.27%	1.25%	1.23%	1.21%
KCNSC	85th	4.29%	3.74%	3.44%	3.23%	3.08%	2.97%	2.86%	2.79%	2.71%	2.65%	2.67%	2.69%	2.70%	2.72%	2.73%
	50th	3.47%	2.85%	2.54%	2.33%	2.19%	2.08%	1.98%	1.91%	1.84%	1.79%	1.79%	1.79%	1.79%	1.79%	1.79%
	15th	2.65%	1.96%	1.64%	1.43%	1.29%	1.19%	1.10%	1.03%	0.97%	0.93%	0.91%	0.89%	0.88%	0.86%	0.85%
LLNL	85th	6.39%	5.96%	5.74%	5.58%	5.47%	5.39%	5.31%	5.26%	5.20%	5.17%	5.20%	5.24%	5.27%	5.29%	5.32%
	50th	5.17%	4.55%	4.24%	4.03%	3.89%	3.78%	3.68%	3.61%	3.54%	3.49%	3.49%	3.49%	3.49%	3.49%	3.49%
	15th	3.94%	3.13%	2.73%	2.47%	2.30%	2.16%	2.04%	1.95%	1.87%	1.80%	1.77%	1.73%	1.70%	1.68%	1.65%
NNSS	85th	4.68%	4.15%	3.87%	3.67%	3.53%	3.42%	3.32%	3.25%	3.17%	3.12%	3.14%	3.16%	3.18%	3.20%	3.21%
	50th	3.79%	3.17%	2.86%	2.65%	2.51%	2.40%	2.30%	2.23%	2.16%	2.11%	2.11%	2.11%	2.11%	2.11%	2.11%
	15th	2.89%	2.18%	1.84%	1.63%	1.48%	1.37%	1.27%	1.20%	1.14%	1.09%	1.07%	1.05%	1.03%	1.01%	1.00%

b. Non-Nuclear Projects.

- (1) The following annual escalation rates should be used for non-nuclear construction projects with TPC greater than \$100M.

Projected Non-Nuclear Construction Escalation Rates by Site, TPC > \$100 million																as of 1/1/2022
Site	Percentile	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LANL	80th	5.44%	4.94%	4.68%	4.49%	4.37%	4.27%	4.18%	4.12%	4.05%	4.01%	4.03%	4.06%	4.08%	4.09%	4.11%
	50th	4.56%	3.94%	3.63%	3.42%	3.28%	3.17%	3.07%	3.00%	2.93%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
	20th	3.68%	2.94%	2.59%	2.35%	2.19%	2.07%	1.96%	1.88%	1.81%	1.75%	1.73%	1.71%	1.69%	1.67%	1.65%
SNL	80th	5.56%	5.07%	4.81%	4.63%	4.51%	4.41%	4.32%	4.26%	4.20%	4.15%	4.18%	4.20%	4.22%	4.24%	4.26%
	50th	4.66%	4.04%	3.73%	3.52%	3.38%	3.27%	3.17%	3.10%	3.03%	2.98%	2.98%	2.98%	2.98%	2.98%	2.98%
	20th	3.77%	3.02%	2.66%	2.42%	2.26%	2.14%	2.03%	1.95%	1.87%	1.81%	1.79%	1.77%	1.75%	1.73%	1.71%
SRS	80th	4.96%	4.43%	4.16%	3.96%	3.83%	3.73%	3.63%	3.57%	3.50%	3.45%	3.47%	3.49%	3.50%	3.52%	3.54%
	50th	4.16%	3.54%	3.23%	3.02%	2.88%	2.77%	2.67%	2.60%	2.53%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%
	20th	3.36%	2.64%	2.30%	2.07%	1.92%	1.80%	1.70%	1.63%	1.56%	1.51%	1.49%	1.47%	1.45%	1.43%	1.42%
Pantex	80th	5.62%	5.13%	4.87%	4.69%	4.58%	4.48%	4.39%	4.33%	4.27%	4.22%	4.25%	4.27%	4.29%	4.31%	4.33%
	50th	4.71%	4.09%	3.78%	3.57%	3.43%	3.32%	3.22%	3.15%	3.08%	3.03%	3.03%	3.03%	3.03%	3.03%	3.03%
	20th	3.81%	3.06%	2.69%	2.46%	2.29%	2.17%	2.06%	1.98%	1.90%	1.84%	1.82%	1.80%	1.78%	1.76%	1.74%
Y-12	80th	5.44%	4.93%	4.67%	4.49%	4.37%	4.27%	4.17%	4.11%	4.05%	4.00%	4.03%	4.05%	4.07%	4.09%	4.11%
	50th	4.56%	3.94%	3.63%	3.42%	3.28%	3.17%	3.07%	3.00%	2.93%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
	20th	3.68%	2.94%	2.58%	2.35%	2.19%	2.07%	1.96%	1.88%	1.81%	1.75%	1.72%	1.70%	1.68%	1.66%	1.65%
KCNSC	80th	4.09%	3.52%	3.22%	3.00%	2.86%	2.75%	2.64%	2.56%	2.49%	2.43%	2.45%	2.46%	2.47%	2.48%	2.49%
	50th	3.43%	2.81%	2.50%	2.29%	2.15%	2.04%	1.94%	1.87%	1.80%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
	20th	2.77%	2.10%	1.78%	1.57%	1.43%	1.33%	1.24%	1.17%	1.11%	1.06%	1.05%	1.03%	1.02%	1.01%	1.00%
LLNL	80th	5.72%	5.24%	4.98%	4.80%	4.69%	4.59%	4.50%	4.45%	4.38%	4.34%	4.37%	4.39%	4.41%	4.43%	4.45%
	50th	4.80%	4.18%	3.87%	3.66%	3.52%	3.41%	3.31%	3.24%	3.17%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%
	20th	3.87%	3.12%	2.76%	2.51%	2.35%	2.22%	2.11%	2.03%	1.96%	1.90%	1.87%	1.85%	1.82%	1.80%	1.79%
NNS	80th	4.42%	3.87%	3.58%	3.37%	3.24%	3.13%	3.02%	2.95%	2.88%	2.82%	2.84%	2.86%	2.87%	2.88%	2.90%
	50th	3.71%	3.09%	2.78%	2.57%	2.43%	2.32%	2.22%	2.15%	2.08%	2.03%	2.03%	2.03%	2.03%	2.03%	2.03%
	20th	2.99%	2.31%	1.98%	1.77%	1.62%	1.51%	1.42%	1.35%	1.28%	1.23%	1.22%	1.20%	1.19%	1.17%	1.16%

(2) The following annual escalation rates should be used for nuclear construction projects with TPC less than \$100M.

Projected Non-Nuclear Construction Escalation Rates by Site, TPC < \$100 million															as of 1/1/2022	
Site	Percentile	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LANL	70th	5.11%	4.56%	4.28%	4.09%	3.96%	3.86%	3.76%	3.70%	3.63%	3.58%	3.60%	3.61%	3.63%	3.64%	3.65%
	50th	4.56%	3.94%	3.63%	3.42%	3.28%	3.17%	3.07%	3.00%	2.93%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
	20th	3.68%	2.94%	2.59%	2.35%	2.19%	2.07%	1.96%	1.88%	1.81%	1.75%	1.73%	1.71%	1.69%	1.67%	1.65%
SNL	70th	5.22%	4.68%	4.40%	4.21%	4.08%	3.98%	3.89%	3.83%	3.76%	3.71%	3.73%	3.74%	3.76%	3.77%	3.78%
	50th	4.66%	4.04%	3.73%	3.52%	3.38%	3.27%	3.17%	3.10%	3.03%	2.98%	2.98%	2.98%	2.98%	2.98%	2.98%
	20th	3.77%	3.02%	2.66%	2.42%	2.26%	2.14%	2.03%	1.95%	1.87%	1.81%	1.79%	1.77%	1.75%	1.73%	1.71%
SRS	70th	4.66%	4.09%	3.81%	3.61%	3.47%	3.37%	3.27%	3.20%	3.13%	3.08%	3.10%	3.11%	3.12%	3.13%	3.14%
	50th	4.16%	3.54%	3.23%	3.02%	2.88%	2.77%	2.67%	2.60%	2.53%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%
	20th	3.36%	2.64%	2.30%	2.07%	1.92%	1.80%	1.70%	1.63%	1.56%	1.51%	1.49%	1.47%	1.45%	1.43%	1.42%
Pantex	70th	5.28%	4.74%	4.46%	4.27%	4.15%	4.05%	3.95%	3.89%	3.82%	3.78%	3.79%	3.81%	3.82%	3.83%	3.84%
	50th	4.71%	4.09%	3.78%	3.57%	3.43%	3.32%	3.22%	3.15%	3.08%	3.03%	3.03%	3.03%	3.03%	3.03%	3.03%
	20th	3.81%	3.06%	2.69%	2.46%	2.29%	2.17%	2.06%	1.98%	1.90%	1.84%	1.82%	1.80%	1.78%	1.76%	1.74%
Y-12	70th	5.10%	4.56%	4.28%	4.08%	3.95%	3.85%	3.76%	3.69%	3.63%	3.58%	3.59%	3.61%	3.62%	3.63%	3.64%
	50th	4.56%	3.94%	3.63%	3.42%	3.28%	3.17%	3.07%	3.00%	2.93%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
	20th	3.68%	2.94%	2.58%	2.35%	2.19%	2.07%	1.96%	1.88%	1.81%	1.75%	1.72%	1.70%	1.68%	1.66%	1.65%
KCNSC	70th	3.84%	3.25%	2.95%	2.73%	2.59%	2.48%	2.37%	2.30%	2.23%	2.17%	2.18%	2.19%	2.20%	2.21%	2.21%
	50th	3.43%	2.81%	2.50%	2.29%	2.15%	2.04%	1.94%	1.87%	1.80%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
	20th	2.77%	2.10%	1.78%	1.57%	1.43%	1.33%	1.24%	1.17%	1.11%	1.06%	1.05%	1.03%	1.02%	1.01%	1.00%
LLNL	70th	5.38%	4.84%	4.56%	4.37%	4.25%	4.15%	4.05%	3.99%	3.93%	3.88%	3.90%	3.91%	3.93%	3.94%	3.95%
	50th	4.80%	4.18%	3.87%	3.66%	3.52%	3.41%	3.31%	3.24%	3.17%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%
	20th	3.87%	3.12%	2.76%	2.51%	2.35%	2.22%	2.11%	2.03%	1.96%	1.90%	1.87%	1.85%	1.82%	1.80%	1.79%
NNSC	70th	4.15%	3.58%	3.28%	3.07%	2.93%	2.82%	2.72%	2.65%	2.58%	2.52%	2.54%	2.54%	2.55%	2.56%	2.57%
	50th	3.71%	3.09%	2.78%	2.57%	2.43%	2.32%	2.22%	2.15%	2.08%	2.03%	2.03%	2.03%	2.03%	2.03%	2.03%
	20th	2.99%	2.31%	1.98%	1.77%	1.62%	1.51%	1.42%	1.35%	1.28%	1.23%	1.22%	1.20%	1.19%	1.17%	1.16%

5. ESCALATION RATES FOR ACQUISITION PROGRAMS.

a. Nuclear weapons programs and Life Extension Programs.

The following annual escalation rates should be used for LEPs and other nuclear weapons work.

Projected Acquisition/Life Extension Programs Escalation Rates by Site																as of 1/1/2022	
Site	Percentile	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
LANL	80th	5.13%	4.62%	4.35%	4.15%	4.03%	3.93%	3.83%	3.77%	3.70%	3.65%	3.68%	3.70%	3.71%	3.73%	3.75%	
	50th	4.30%	3.68%	3.37%	3.16%	3.02%	2.91%	2.81%	2.74%	2.67%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%	
	20th	3.48%	2.75%	2.40%	2.17%	2.02%	1.90%	1.80%	1.72%	1.65%	1.60%	1.57%	1.55%	1.54%	1.52%	1.50%	
SNL	80th	5.91%	5.43%	5.19%	5.01%	4.90%	4.81%	4.72%	4.66%	4.60%	4.56%	4.59%	4.61%	4.64%	4.66%	4.68%	
	50th	4.96%	4.34%	4.03%	3.82%	3.68%	3.57%	3.47%	3.40%	3.33%	3.28%	3.28%	3.28%	3.28%	3.28%	3.28%	
	20th	4.00%	3.24%	2.87%	2.62%	2.46%	2.33%	2.21%	2.13%	2.05%	1.99%	1.96%	1.94%	1.92%	1.90%	1.88%	
SRS	80th	4.99%	4.46%	4.19%	3.99%	3.87%	3.76%	3.66%	3.60%	3.53%	3.48%	3.50%	3.52%	3.54%	3.56%	3.57%	
	50th	4.18%	3.56%	3.25%	3.04%	2.90%	2.79%	2.69%	2.62%	2.55%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	
	20th	3.38%	2.66%	2.32%	2.09%	1.94%	1.82%	1.72%	1.64%	1.57%	1.52%	1.50%	1.48%	1.46%	1.45%	1.43%	
Pantex	80th	6.01%	5.53%	5.29%	5.12%	5.00%	4.92%	4.83%	4.77%	4.71%	4.67%	4.70%	4.73%	4.75%	4.77%	4.79%	
	50th	5.04%	4.42%	4.11%	3.90%	3.76%	3.65%	3.55%	3.48%	3.41%	3.36%	3.36%	3.36%	3.36%	3.36%	3.36%	
	20th	4.07%	3.30%	2.92%	2.68%	2.51%	2.38%	2.27%	2.18%	2.10%	2.04%	2.01%	1.99%	1.96%	1.94%	1.92%	
Y-12	80th	4.95%	4.42%	4.14%	3.95%	3.82%	3.72%	3.62%	3.55%	3.48%	3.43%	3.45%	3.47%	3.49%	3.51%	3.52%	
	50th	4.15%	3.53%	3.22%	3.01%	2.87%	2.76%	2.66%	2.59%	2.52%	2.47%	2.47%	2.47%	2.47%	2.47%	2.47%	
	20th	3.35%	2.64%	2.29%	2.07%	1.91%	1.80%	1.70%	1.62%	1.55%	1.50%	1.48%	1.46%	1.44%	1.43%	1.41%	
KCNSC	80th	5.07%	4.55%	4.28%	4.09%	3.96%	3.86%	3.76%	3.70%	3.63%	3.58%	3.60%	3.62%	3.64%	3.66%	3.67%	
	50th	4.25%	3.63%	3.32%	3.11%	2.97%	2.86%	2.76%	2.69%	2.62%	2.57%	2.57%	2.57%	2.57%	2.57%	2.57%	
	20th	3.43%	2.71%	2.37%	2.14%	1.99%	1.87%	1.76%	1.69%	1.62%	1.56%	1.54%	1.52%	1.51%	1.49%	1.47%	
LLNL	80th	6.69%	6.25%	6.03%	5.87%	5.77%	5.69%	5.61%	5.56%	5.50%	5.47%	5.50%	5.53%	5.56%	5.58%	5.61%	
	50th	5.61%	4.99%	4.68%	4.47%	4.33%	4.22%	4.12%	4.05%	3.98%	3.93%	3.93%	3.93%	3.93%	3.93%	3.93%	
	20th	4.53%	3.73%	3.33%	3.07%	2.89%	2.75%	2.63%	2.54%	2.45%	2.39%	2.36%	2.33%	2.30%	2.27%	2.25%	
NNSC	80th	4.54%	3.99%	3.71%	3.50%	3.37%	3.26%	3.16%	3.09%	3.01%	2.96%	2.98%	3.00%	3.01%	3.03%	3.04%	
	50th	3.81%	3.19%	2.88%	2.67%	2.53%	2.42%	2.32%	2.25%	2.18%	2.13%	2.13%	2.13%	2.13%	2.13%	2.13%	
	20th	3.07%	2.38%	2.05%	1.83%	1.69%	1.58%	1.48%	1.41%	1.34%	1.29%	1.28%	1.26%	1.25%	1.23%	1.22%	

b. Other Acquisition Programs.

All other acquisition programs should use the LEPs escalation table.

APPENDIX C: USE OF CONFIDENCE LEVELS

1. **INTRODUCTION.** Confidence levels are a statistical concept and can be difficult to understand if one is unfamiliar with the underlying mathematics. This appendix provides a brief introduction and overview of these concepts for a general audience.
2. **REQUIREMENTS.** This appendix applies to cost estimates for capital asset acquisition projects and programs within the National Nuclear Security Administration (NNSA). The Office of Cost Estimating and Program Evaluation (CEPE) must review this appendix annually and update as appropriate.
3. **BACKGROUND.** Prior to completion, all projects and programs carry some amount of risk and uncertainty. This risk and uncertainty are even greater early in project or program development when conceptual design and planning decisions have not been finalized. While expected value, or point, estimates are frequently calculated using standard cost estimating methodologies, the point estimates themselves do not give an indication of the underlying risk and uncertainty in a project or program.

Risk and uncertainty are treated as statistical concepts in cost estimating. Risk tells us there is some probability an event will occur that will either increase or decrease the cost and schedule of an undertaking, and uncertainty tells us that there are fundamental inaccuracies and imprecisions in the information available about cost and schedule that can only be fully resolved at the time of completion.

All risks and uncertainties are assumed to have an underlying probability distribution function (PDF), which provides information on the likelihood of a specific cost and schedule outcome that affects the overall cost and schedule for the project or program. PDFs can have different shapes when plotted. The shape of a PDF is developed by the plotting of data collected on actual outcomes of events and activities that have characteristics of the risk or uncertainty an estimator is interested in. Ideally, the shape of the PDF is identifiable with known mathematical functions, such as the Normal distribution (a.k.a., Gaussian distribution), and the Weibull distribution (Figure 1). In cases where there is limited data, the triangular distribution is frequently used unless there are qualitative reasons to use a different distribution.

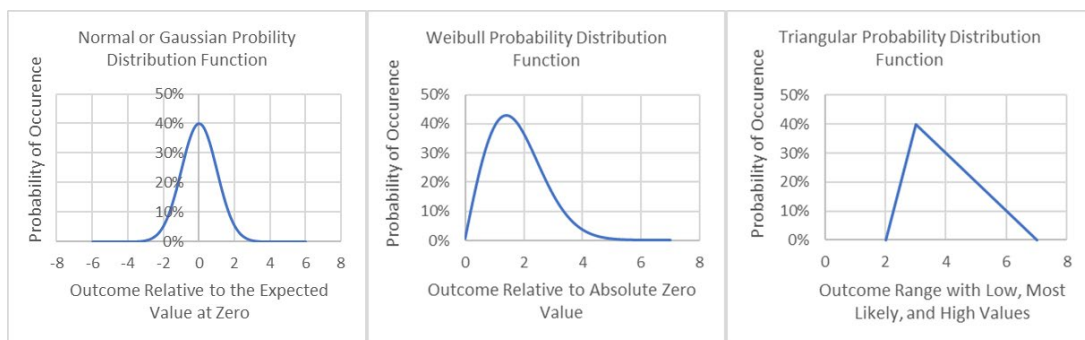


Figure 2. Probability Distribution Function (PDF) Examples

An S-curve is the cumulative distribution function (CDF) for the risk or uncertainty being considered. Typically, to develop an S-curve, the respective PDF probabilities for a risk or uncertainty is summed from left to right of the PDF plot. The resulting S-curve increases from left to right from an initial value of 0 percent to final value of 100 percent. The underlying PDF shape can significantly affect the shape of the CDF (Figure 2).

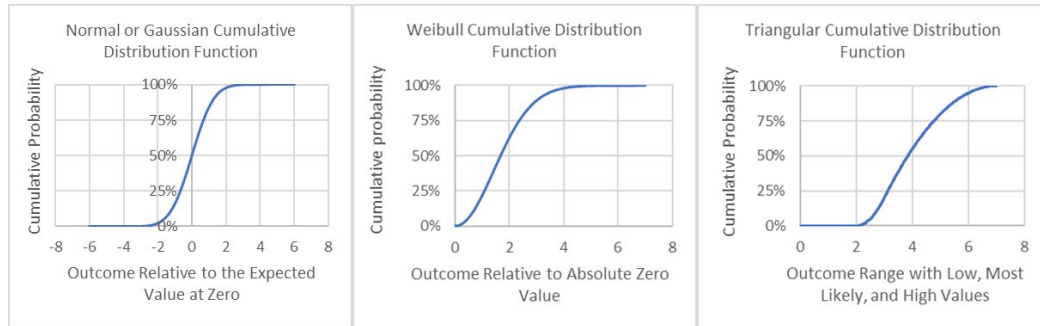


Figure 3. Cumulative Distribution Function (CDF) Examples

The confidence level associated with an outcome (x-axis value) is the cumulative probability value (y-axis value). Since the CDF increases from left to right, and the values of the outcomes also increase from left to right, a lower confidence level will correspond to a lower valued outcome, and a higher confidence level will correspond to a higher value outcome. This means that the specification of low and high confidence levels provides a low to high range of expected outcomes.

The PDFs associated with risk and uncertainties can be combined to form new PDFs. The mathematics for this operation can become cumbersome, so numerical methods using Monte Carlo simulation are generally used to combine PDFs associated with specific risk and uncertainties (Figure 3). Most professional estimating software can perform Monte Carlo simulation to combine PDFs.

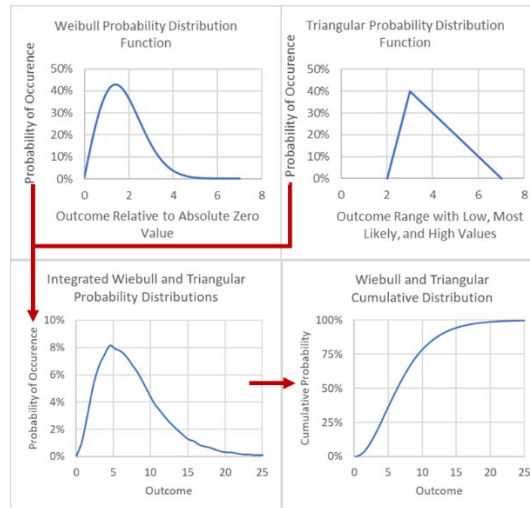


Figure 4. Combining Distributions Example

Most cost estimates consist of calculable elements broken down into some cost structure or work break down structure where each element can be assigned a PDF. These individual PDFs can then be combined using Monte Carlo simulation techniques into a single PDF for the entire estimate. This PDF can then be converted into a CDF, which is the S-curve for the estimate.

As shown in Figure 4 below, the CDF probabilities are equivalent to the confidence levels associated with the estimate. The confidence levels are associated with specific outcomes.

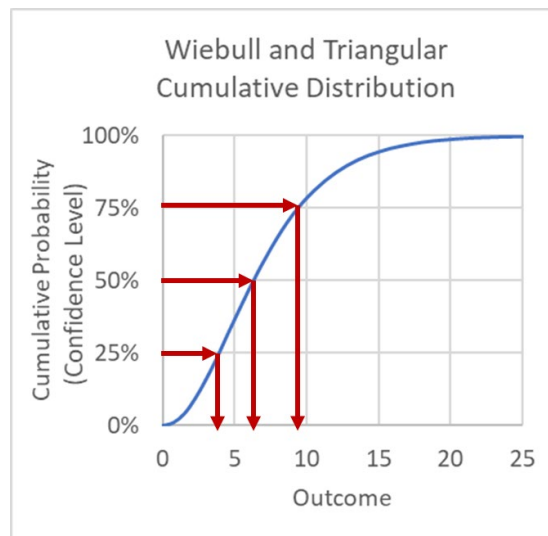


Figure 5. Relationship of Confidence Levels to Expected Outcomes

The S-curve of the outcomes as well as the value of the outcomes are usually unique to the underlying estimate. A project or program can have many different estimates developed by separate organizations reflecting different interpretations of scope, different

available data, and different assumptions and considerations. Reconciliation is the process by which these estimates are compared. Comparison of estimates at commonly used levels of confidence provides a basis for understanding fundamental differences between estimates.

4. APPLICATION. For NNSA cost estimates, the use of confidence levels as a basis of comparison to develop ranges and budget estimates is required with specific ranges for projects and weapons programs given in Appendix A.

While specific cost estimating techniques frequently vary, the expectation is for the calculations and expected values for point estimates to be determinable and identifiable, the estimate follows some structure that can be understood in terms of the scope of work to be performed along with the resources required, and for probability distributions to be used to develop an overall estimate of risk and uncertainty. The estimate with risk and uncertainty included should be representable with an S-Curve, and actual cost and schedule data from past performance be incorporated into the estimate.

Generally, the elements of the estimate should convert into a representation of expected cost for work scope (with program management, program support, design, engineering, craft labor, construction, procurement, and material costs identifiable), sunk costs, escalation, other project costs for the contractor, other direct costs for the government, manage reserve based on known and unknown risks, and federal contingency.

Federal contingency, in principle, is determinable by comparison of the project cost estimate and the federal independent cost estimate at the high end of the confidence range; but this is not universally true and may not be immediately determinable prior to reconciliation.

Further information on different techniques and can be found in the GAO *Cost Estimating and Assessment Guide* (GAO-20-195G).