

DOE 5700.2D
6-12-92

THIS PAGE MUST BE KEPT WITH DOE 5700.2D, COST ESTIMATING,
ANALYSIS, AND STANDARDIZATION.

DOE 5700.2D, COST ESTIMATING, ANALYSIS, AND STANDARDIZATION,
HAS REVISED DOE 5700.2C TO REFLECT ORGANIZATIONAL TITLE,
ROUTING SYMBOL, AND OTHER EDITORIAL REVISIONS REQUIRED
BY SEN-6. NO SUBSTANTIVE CHANGES HAVE BEEN MADE. DUE
TO THE NUMBER OF PAGES AFFECTED BY THE REVISIONS, THE
ORDER HAS BEEN ISSUED AS A REVISION.

U.S. Department of Energy

Washington, D.C.

ORDER

DOE 5700.2D

6-12-92

SUBJECT: COST ESTIMATING, ANALYSIS, AND STANDARDIZATION

1. PURPOSE. To establish policy and responsibilities for: (a) developing and reviewing project cost estimates; (b) preparing independent cost estimates and analyses; (c) standardizing cost estimating procedures; and (d) improving overall cost estimating and analytical techniques, cost data bases, cost and economic escalation models, and cost estimating systems.
2. CANCELLATION. DOE 5700.2C, COST ESTIMATING, ANALYSIS, AND STANDARDIZATION, of 11-2-84.
3. REFERENCES.
 - a. Office of Management and Budget (OMB) Circular A-n, "Preparation and Submission of Budget Estimates," of 7-19-83, which describes the procedures for adjusting for the effects of future inflation in the preparation of budgets.
 - b. OMB Circular A-109, "Major System Acquisitions," of 4-5-76, which establishes policies to be followed by executive branch agencies in the acquisition of major systems.
 - c. DOE 2250.1D, COST AND SCHEDULE CONTROL SYSTEMS CRITERIA, of 6-12-92, which delineates the requirements, procedures, authorities, and responsibilities for establishing, documenting, and implementing uniform Departmental standards for assessing contractor cost and schedule control systems and the definition of applications, thresholds, reporting, and analytical requirements.
 - d. DOE 4700.1, PROJECT MANAGEMENT SYSTEM, of 3-6-87, which establishes the Department of Energy's (DOE) project management system and provides implementing instructions, formats, and procedures, and sets forth the principles and requirements which govern the development, approval, and execution of DOE's outlay program acquisitions as embodied in the Project Management System (PMS).
 - e. DOE/MA-0063, DOE Cost Guides, Volumes 1 through 6, of 1982, which provide guidance for cost estimating practices in the Department. Guides are available from the Program/Project Management Division (PR-24).

DISTRIBUTION:

All Departmental Elements

INITIATED BY:

Office of Procurement, Assistance
and Program Management

4. DEFINITIONS.

- a. Cost Estimate is a statement of costs estimated to be incurred in the conduct of an activity such as a program, or the acquisition of a project or system. The estimate can be in the form of proposals by contractors or Government agencies, a response to a program opportunity notice, or a DOE estimate. Attachment 1 contains methods for preparing cost estimates.
- b. Government Cost Estimate is an estimate of costs to be incurred in the conduct of proposed activity, prepared by DOE proponent (or advocate) by the measurable and definable elements of cost, consistent with the level that a responding contractor would be required to estimate, e.g., task, subtask, line item, and work breakdown structure. It should be sufficiently documented to show clearly the rationale used in developing the quantitative elements as well as the rates. The Government cost estimate usually is used as a tool in evaluating the reasonableness of the proposal(s) for the particular procurement action. This estimate is generally performed to support negotiations or competitive bid proposals at the individual contract level rather than at the total project level.
- c. Independent Cost Estimate is an estimate developed by PR-24 (or its contractors) that has the express purpose of serving as an analytical tool to validate, cross-check, or analyze estimates developed in proponent channels. An independent cost estimate also serves as a basis for verifying risk assessments. The term "independent cost estimate" in this Order means independent of the project office or advocate. This Order does not usurp manager's prerogatives and responsibilities to direct check estimates (see below) to validate, improve, or review current project estimates.
- d. Independent Cost Analysis is a documented analysis developed by PR-24 (or its contractors) for the purpose of assessing the reasonableness of proponent cost estimates and for identifying sensitive areas of cost risk. Generally, an independent cost estimate is accomplished and is used as a tool to perform an independent cost analysis; however, an independent cost analysis may be performed without first performing an independent cost estimate.
- e. Check Estimate is a validating estimate. Its development and use is similar to an independent cost estimate (above), except it is developed by program/project or DOE Field Office personnel or their supporting contractor. A check estimate should be developed by someone who had no involvement in the original estimate, but who may be an advocate of the project.
- f. Cost Estimate Review is a review of a previous estimate for completeness, reasonableness, and consistency. The completeness relates to the inclusion of all relevant costs. Reasonableness

relates to a balance between discernible optimism and pessimism in the estimate. Consistency relates to the general acceptability of applied ground rules or the employment of the same methods in going from one estimate to another. A review may be accomplished by comparing the estimate to an independent estimate; however, reviewers generally will not have these available. Therefore, cost reviewers generally will use such tools as historical rules of thumb to check unit prices, parametric cost estimating relationships, and sampling. Also, the estimate can be examined for internal logic, and the estimating methods can be examined for appropriateness and consistency.

- g. Total Estimated Cost is the construction costs of the project, including: the costs of land and land rights; engineering, design, and inspection costs; direct and indirect construction costs; and initial equipment necessary to place the plant or installation in operation.
- h. Total Project Cost is all generic research and development, operating, and plant and capital equipment costs specifically associated with a project. It is the sum of the total estimated cost plus all other costs identifiable to the project. Project costs are mutually exclusive; i.e., if research and development is required to complete a given project that is also supporting a second follow-on project, the cost will only be charged to the first project. If the first project should be terminated, the cumulative costs of research and development support to that point will be considered sunk costs, and all costs from that point forward would be charged to the follow-on project. In no instance should the same research and development costs be charged to more than one project.
- i. Life Cycle Cost is the total of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, deactivation, and/or disposition of a project or system over its anticipated useful life span. For example, if a demonstration project is operated beyond the demonstration period, those costs are also included in the life cycle cost estimate. Where system or project planning anticipates use of existing sites or facilities, restoration and refurbishment costs should be included.
- j. Economic Escalation is cost increase associated with unit price increase. Whereas the cost of projects can increase because of poor management, scope growth, and schedule delays, this Order is concerned only with forecasting price increases caused by general or specific dollar devaluation. This is historically caused largely by an increase in the amount of currency in circulation relative to the goods and services available.

5. BACKGROUND.

- a. There is a wide variation in methods, requirements, documentation, and quality of cost estimates from project to project within DOE. Different estimating approaches and techniques often produce inadequate estimates or estimates that are not comparable to subsequent ones or to those of other projects. The General Accounting Office (GAO) recommended that all DOE Field Offices be centrally directed to develop local cost estimating guidelines that:
 - (1) Specify what methods and procedures will be used for estimating.
 - (2) Ensure that projects are adequately defined in the conceptual design stage before the cost estimate is submitted to Congress.
 - (3) Require that realistic estimates for inflation be made and the methodology consistently followed.
 - (4) Allow for adequate provision in cost estimates for program uncertainties.
 - (5) Require complete documentation of the original cost estimate and subsequent major revisions to ensure traceability.
- b. Local cost guides have been completed and will be maintained and updated as appropriate by the DOE Field Offices. These guides generally describe how and when cost estimates will be made, who makes them, who reviews and approves them, and how they will be documented and cost estimators.
- c. A requirement for generating independent cost estimates and independent cost analyses was recognized by the Under Secretary immediately after the Department was established. These independent cost estimates and independent cost analyses, conducted outside of proponent channels, provide independent assessments of the validity and reasonableness of cost estimates. These assessments are generally performed in support of the Acquisition Executive's key decisions on major system acquisitions and in response to special requests by Assistant Secretaries and others.
- d. The Program/Project Management Division (PR-24) will:
 - (1) Perform independent cost estimates and independent cost analyses.
 - (2) Serve as a focal point for all cost estimating policy and standardization within DOE.
 - (3) Improve cost estimating techniques and practices within DOE.

6. POLICY. It is DOE policy that:

- a. Cost estimates be developed and maintained throughout the life of each project.
- b. Guidelines for developing project estimates be maintained by all DOE Field Offices in accord with procedures contained in this Order.
- c. Independent cost estimates and independent cost analyses be conducted outside of proponent organizations in support of Acquisition Executive key decisions, or in response to requests or recommendations by Program Secretarial Officers, and the Associate Director for Program/Project Management and Control (PR-20).
- d. Project estimates and budget requirements shall include identifiable provision for price changes due to economic inflation or deflation predicted in accord with guidance issued by PR-24 or other procedures as outlined in this Order.

7. RESPONSIBILITIES AND AUTHORITIES.

- a. Director of Procurement, Assistance and Program Management (PR-1) shall, through the:

- (1) Associate Director for Program/Project Management and Control (PR-20) shall:

- (a) Define policy and establish guidelines for the implementation of independent cost estimating and analysis in DOE. Major changes will be made in consultation with Program Secretarial Officers and field office managers.
 - (b) Organize, direct, and perform independent cost and schedule estimates, analyses, and reviews of project estimates, and provide members for independent cost estimating task groups.
 - (c) Coordinate independent estimate supporting expertise requirements with the applicable organizations.
 - (d) Conduct reviews, in coordination with the appropriate Assistant Secretary, office director, or DOE Field Office manager, of major variances between independent cost estimates and project office estimates and report the results of such reviews.
 - (e) Reconcile all independent cost estimates with program or project office estimates in order to identify and clarify differences prior to reporting the completion of the independent cost estimate.

- (f) Recommend the conduct of an independent cost estimate or independent cost analysis where major budget issues are involved.
- (g) Serve as focal point for all cost estimating policy and standardization within DOE, establish and publish procedures for standardizing cost estimating and data collection, and maintain a cost data base.
- (h) Establish, manage, and provide the chairperson for the Committee for Cost Methods Development.
- (i) Develop, and annually update, the DOE Cost Analysis Improvement Plan.
- (j) Establish policy, procedures, and responsibilities for constructing and using price change (escalation and de-escalation) forecasts in developing cost estimates and budgets.
- (k) Publish, disseminate, and maintain guidance on how to construct and use price change indices.
- (l) Develop and disseminate Departmental price change indices, as appropriate, but at least once annually, in support of the budget cycle.
- (m) Help user organizations to develop their own indices as requested.
- (n) Validate indices developed by using organizations, at least once, to assure that standard guidance is clearly understood and being used.
- (o) Provide guidance and, if required, training in the development and use of price change indices.
- (p) Develop and establish the DOE definitions of estimate components such as contingency and escalation, and how they should be estimated and treated in DOE cost estimates.
- (q) Establish and maintain a computerized cost estimating system and network.
- (r) Visit each DOE Field Office at least once every 2 years to discuss local cost problems and provide assistance.
- (s) Recommend training courses for cost estimators.

(2) Associate Director for Procurement, Assistance and Property
(PR-10) shall:

- (a) Establish uniform procurement requirements for Government cost estimates to support contractual actions.
- (b) Provide members for independent cost estimating activity with contract and other pricing/cost expertise.
- (c) Assist in the development and integration of historical cost data, including construction cost data.

b. Program Secretarial Officers shall:

- (1) Recommend the conduct of an independent cost estimate for those systems, projects, or other cost sensitive items within their programs or areas of responsibility, including those in laboratories, energy technology centers, or other field elements under their cognizance that they deem appropriate.
- (2) Provide points of contact for independent cost estimating task groups upon request.
- (3) Recommend dispositioning actions to project managers after major variations between an independent cost estimate and project office estimate have been identified and analyzed.
- (4) Approve corrective actions regarding major variances which would entail changes in or to the project cost estimate.

c. Heads of Headquarters Elements shall:

- (1) Ensure that their respective cost estimates and budgets are developed using either those price indices developed by PR-24 or the appropriate using organization, and that Departmental price change guidance is being followed.
- (2) Assign representatives, as required, to the Committee for Cost Methods Development.
- (3) Recommend agenda items for action or review by the Committee for Cost Methods Development.
- (4) Advise on matters before the Committee for Cost Methods Development and make recommendations and responses thereto.
- (5) Assure that responsible organizations follow Departmental policies involving cost estimating.

- (6) Provide for a continuing liaison with the Committee for Cost Methods Development through the assigned representative(s).
- d. Chief Financial Officer shall provide current OMB and Departmental information on economic escalation allowances for use in developing budgets.
- e. Managers of DOE Field Offices shall:
 - (1) Develop and maintain local cost guides that outline cost estimating procedures to be used by operating contractor and DOE personnel while performing and reviewing cost estimates.
 - (2) Forward copies of the cost guides to PR-24 to ensure they satisfy GAO recommendations and the minimum criteria outlined in Attachment 2.
 - (3) Elect to develop local price change indices if they believe them to be more appropriate for their region than those developed by PR-24. Such indices shall be developed in accordance with instructions included in the Departmental price change guidance.
 - (4) Forward any locally-produced indices to PR-24 to ensure that current guidance is understood.
 - (5) Ensure that their respective estimates and budgets are developed using either those price indices developed by PR-24 or the appropriate using organization, unless overridden by OMB or the Chief Financial Officer requirements contained in the annual budget guidance.
 - (6) Construct separate price indices for construction, operating expenses, and capital equipment categories if local indices are developed.
 - (7) Forward any unusual price change phenomena to the Independent Cost Estimating Staff for dissemination to all interested users.
 - (8) Assign representatives as required to the Committee for Cost Methods Development.
- f. Committee for Cost Methods Development Representatives shall:
 - (1) Serve as official members of the committee.
 - (2) Participate in committee business activities.
 - (3) Assist in preparation and dissemination of Departmental cost estimating guidance as requested.

8. PROCEDURES AND REQUIREMENTS.

- a. Cost estimates shall be developed and maintained throughout the life of each project. The project manager is responsible for the official baseline estimate, and should ensure that adequate design has been accomplished on which a credible estimate can be performed, before the project enters the budget process.
- b. Local cost guides shall state when estimates are required, how and who will perform and review them, and how they will be documented and stored. These guides must meet the minimum criteria shown in Attachment 2.
- c. All sequential cost estimates shall be reconciled and kept on file with previous estimates until the project is completed, thereby ensuring traceability from project start to completion. estimate documentation file shall also include the basis for the estimate, show how the estimate was performed, and contain a contingency analysis. All estimates shall be performed in constant-year dollars and then escalated into year-of-expenditure (generally fiscal year) dollars. Both the estimates and the escalation rates used will be kept on file until the project is completed.
- d. Check estimates are recommended for validating project estimates. Check estimates can be made by the project engineer/manager or by any qualified DOE or support contractor personnel. It is highly desirable that the check estimate be made by someone other than those who performed the original estimate. The check estimate may utilize any of the estimating methods shown in Attachment 1.
- e. DOE Field Offices shall record actual cost while projects are being constructed, and maintain the data in some usable form, either at the subelement level or at a higher (macro) level. Whereas this data will be used primarily to support cost estimating on new, local projects, it would be highly desirable for it to be exchanged with other offices, where desired and when useful.
- f. The Committee for Cost Methods Development shall function under the guidance of the Director of PR-24, who will be the Chairperson. The working body of the committee will be its assigned representatives, although ad hoc members may be added from time to time. The committee shall meet periodically to study and develop Departmental improvements as required. Steering committees and other ad hoc groups shall be established as appropriate or necessary. For example, the committee currently has steering committees on contingency and on data base development. The primary function of the Committee for Cost Methods Development is for its members to pool their knowledge and skills in developing tools to improve all

DOE cost estimating. Improvements of the cost estimating policies, practices, procedures, and methodologies will be disseminated to the Department's cost estimating and analysis community. The standing membership shall consist of representatives of:

- (1) Assistant Secretary for Environmental Restoration and Waste Management.
- (2) Assistant Secretary for Nuclear Energy.
- (3) Assistant Secretary for Fossil Energy.
- (4) Assistant Secretary for Conservation and Renewable Energy.
- (5) Assistant Secretary for Defense Programs.
- (6) Assistant Secretary for Environment, Safety and Health.
- (7) Director of Energy Research.
- (8) Director of Civilian Radioactive Waste Management.
- (9) Director of Procurement, Assistance and Program Management.
- (10) Chief Financial Officer.
- (11) Managers of DOE Field Offices.

BY ORDER OF THE SECRETARY OF ENERGY:



DONALD W. PEARMAN, JR.
Acting Director
Administration and Human
Resource Management

METHODS FOR PREPARING COST ESTIMATES

1. The techniques used for preparing cost estimates will necessarily vary with: the project's phase of acquisition and degree of definition; the state-of-the-art of the project; the availability of data bases, cost estimating techniques, time, and cost estimators; and the level of detail or work breakdown structure required in the estimates. A study of the item or task, in light of the degree of estimating difficulty, should indicate the method or combination of methods to be used in estimating the cost of that particular item or task, as follows:
 - a. Bottoms-Up Technique Generally, a work statement and set of drawings or specifications are used to "takeoff" material quantities required to perform each discrete task performed in accomplishing a given operation or producing an equipment component. From these quantities, direct labor, equipment, and overhead costs are derived and added thereto.
 - b. Specific Analogy Technique Specific analogies depend upon the known cost of an item used in prior systems as the basis for the cost of a similar item in a new system. Adjustments are made to known costs to account for differences in relative complexities of performance, design, and operational characteristics.
 - c. Parametric Technique Parametric estimating requires historical data bases on similar systems or subsystems. Statistical analysis is performed on the data to find correlations between cost drivers and other system parameters, such as design or performance parameters. The analysis produces cost equations or cost estimating relationships which can be used individually or grouped into more complex models.
 - d. Cost Review and Update Technique An estimate is constructed by examining previous estimates of the same project for internal logic, completeness of scope, assumptions, and estimating methodology. The estimating approaches.
 - e. Trend Analysis Technique A contractor efficiency index is derived by comparing originally projected contract costs against actual costs on work performed to date. The index is used to adjust the cost estimate of work not yet completed.
 - f. Expert Opinion Technique May be used when other techniques or data are not available. Several specialists can be consulted reiteratively until a consensus cost estimate is established.

2. Cost estimates can be developed for many purposes: comparative studies, trade-off studies, funding decisions, program changes, cost-benefit analyses, procurement support, and for independent review or analysis of another estimate for a test of reasonableness. Cost estimates will include all relevant costs depending on the purpose of the estimate (e.g., total life cycle costs or components thereof, such as research, development, production, commercialization, and operating, support, and decommissioning costs, as appropriate).

CRITERIA FOR LOCAL COST ESTIMATING GUIDES

1. While it is recognized that local conditions will influence the content of local cost guides to some degree, these guides must, at minimum, include the following items:
 - a. Types of Cost Estimates. List and define the seven types of cost estimates shown in DOE Cost Guide DOE/MA-0063 Volume 6. "Cost Estimating Methods and Techniques," of 5-82.
 - b. Basis for the Cost Estimate. Establish and document the basis for the estimate. The basis for the cost estimate must describe the purpose of the project, general design criteria, stage of design at the time of the estimate, significant features and components, proposed methods of accomplishment, proposed construction schedule, research and development requirements, and any other pertinent facts that may impact costs. (See Chapter 3 of DOE Cost Guide DOE/MA-0063 Volume 6.)
 - c. Planning for the Estimate. Describe the need for planning the approach and selecting the cost methods that will be used. Determine the type of estimate to be performed and the level of detail desired. (See Chapter 4 of DOE Cost Guide DOE/MA-0063 Volume 6.) Also, show such items as the basis for estimating quantities of materials not yet detailed on drawings, and for wage rates, productivity factors, and installation unit man-hours.
 - d. Performing the Estimate. List the steps to be followed in performing a cost and schedule estimate and show the categories of cost that must be included. (See Chapter 4 of DOE Cost Guide DOE/MA-0063 Volume 6.)
 - e. Cost Codes of Account. The cost codes of account in Chapter 6 of DOE Cost Guide DOE/MA-0063 Volume 6 should be used for the estimates. If sufficient reasons exist, local cost codes may be developed and used.
 - f. Contingency. A contingency analysis shall be required on all construction project estimates, and the analysis shall become and remain part of the estimate documentation. This section will also show how to estimate contingency. (See Chapter 8 of DOE Cost Guide DOE/MA-0063 Volume 6.)
 - g. Inflation (or Economic Escalation). All construction projects will be estimated in constant-year dollars in the year the estimate is performed. The constant-year cost will then be spread over the years in which costs will be incurred and each year's cost will then be escalated using an appropriate escalation index. The

constant-year estimate, escalated estimate, and indices used will remain on file for future reference. For methods of constructing and using indices, see DOE Cost Guide DOE/MA-0063 Volume 5, "How to Construct and Use Economic Escalation Indices," of 5-82.

- h. Cost Estimate Reviews. Procedures will be established for reviewing all cost and schedule estimates including: (1) when reviews will be made; (2) how they will be made; (3) who will make them; and (4) how and where the reviewer's comments and signature will be repositied. Cost review procedures will require all cost estimates to be reviewed by someone other than the estimator. Precaution will be taken to ensure there is no conflict of interest when operating contractors (or other non-DOE personnel) are reviewing estimates.
 - i. Traceability. A life cycle cost and schedule estimate file will be maintained on all projects. This file will contain all cost and schedule estimates from the beginning to the end of project construction. Significant variances between subsequent estimates must be explained and kept on file so that traceability can be maintained throughout the project's life. Changes in scope, escalation assumptions, estimating methods, contingency, and schedule shall be explained, recorded, and tracked from one estimate to the next, and kept on file.
 - j. Documentation. All estimates shall be documented and the documentation file shall be kept current. Documentation shall include: (1) the purpose and basis of the estimate; (2) a technical description and the scope of the project being estimated; (3) all ground rules, constraints, and assumptions; (4) a detailed traceable recording of how the estimate was performed (e.g., quantity takeoffs, price sources, factors, cost estimating relationships, commercial cost manual, and in-house data base), and who performed it; (5) a contingency analysis; (6) a schedule; (7) a spread sheet showing funding requirements by year in both constant-year and escalated dollars; and (8) escalation rates used, and how they were obtained and applied.
 - k. collecting Actual Cost Data. Actual cost data will be collected as the project is being built for both project control and for local cost data banks. Cost estimating guides will describe how the data will be collected, normalized, stored in the data bank, and be made available to cost estimators.
2. The above criteria will be reviewed annually and updated, as appropriate.