

DOWNLOAD PDF PROCEDURES FOR ESTIMATING LIFE-CYCLE COSTS OF ELECTRONIC COMBAT EQUIPMENT

Chapter 1 : Welcome to L&MR

Procedures for estimating life-cycle costs of electronic combat equipment. Procedures for estimating life-cycle costs of cycle costs of electronic combat.

It takes into account all costs of acquiring, owning, and disposing of a building or building system. LCCA is especially useful when project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs, have to be compared in order to select the one that maximizes net savings. For example, LCCA will help determine whether the incorporation of a high-performance HVAC or glazing system, which may increase initial cost but result in dramatically reduced operating and maintenance costs, is cost-effective or not. LCCA is not useful for budget allocation. Lowest life-cycle cost LCC is the most straightforward and easy-to-interpret measure of economic evaluation. They are consistent with the Lowest LCC measure of evaluation if they use the same parameters and length of study period. Building economists, certified value specialists, cost engineers, architects, quantity surveyors, operations researchers, and others might use any or several of these techniques to evaluate a project. The approach to making cost-effective choices for building-related projects can be quite similar whether it is called cost estimating, value engineering, or economic analysis. Life-Cycle Cost Analysis LCCA Method The purpose of an LCCA is to estimate the overall costs of project alternatives and to select the design that ensures the facility will provide the lowest overall cost of ownership consistent with its quality and function. The LCCA should be performed early in the design process while there is still a chance to refine the design to ensure a reduction in life-cycle costs LCC. The first and most challenging task of an LCCA, or any economic evaluation method, is to determine the economic effects of alternative designs of buildings and building systems and to quantify these effects and express them in dollar amounts. Romm, Lean and Clean Management, Costs There are numerous costs associated with acquiring, operating, maintaining, and disposing of a building or building system. Building-related costs usually fall into the following categories: Costs are relevant when they are different for one alternative compared with another; costs are significant when they are large enough to make a credible difference in the LCC of a project alternative. Initial costs Initial costs may include capital investment costs for land acquisition, construction, or renovation and for the equipment needed to operate a facility. Land acquisition costs need to be included in the initial cost estimate if they differ among design alternatives. This would be the case, for example, when comparing the cost of renovating an existing facility with new construction on purchased land. Detailed estimates of construction costs are not necessary for preliminary economic analyses of alternative building designs or systems. Such estimates are usually not available until the design is quite advanced and the opportunity for cost-reducing design changes has been missed. LCCA can be repeated throughout the design process if more detailed cost information becomes available. Initially, construction costs are estimated by reference to historical data from similar facilities. Alternately, they can be determined from government or private-sector cost estimating guides and databases. Means Building Construction Cost Database. Testing organizations such as ASTM International and trade organizations have reference data for materials and products they test or represent. Energy and Water Costs Operational expenses for energy, water, and other utilities are based on consumption, current rates, and price projections. Because energy, and to some extent water consumption, and building configuration and building envelope are interdependent, energy and water costs are usually assessed for the building as a whole rather than for individual building systems or components. Energy costs are often difficult to predict accurately in the design phase of a project. Assumptions must be made about use profiles, occupancy rates, and schedules, all of which impact energy consumption. At the initial design stage, data on the amount of energy consumption for a building can come from engineering analysis or from a computer program such as eQuest. When selecting a program, it is important to consider whether you need annual, monthly, or hourly energy consumption figures and whether the program adequately tracks savings in energy consumption when design changes or different

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efficiency levels are simulated. Quotes of current energy prices from local suppliers should take into account the rate type, the rate structure, summer and winter differentials, block rates, and demand charges to obtain an estimate as close as possible to the actual energy cost. Energy prices are assumed to increase or decrease at a rate different from general price inflation. This differential energy price escalation needs to be taken into account when estimating future energy costs. Water costs should be handled much like energy costs. There are usually two types of water costs: DOE does not publish water price projections. Operating schedules and standards of maintenance vary from building to building; there is great variation in these costs even for buildings of the same type and age. It is therefore especially important to use engineering judgment when estimating these costs. Supplier quotes and published estimating guides sometimes provide information on maintenance and repair costs. Some of the data estimation guides derive cost data from statistical relationships of historical data Means, BOMA and report, for example, average owning and operating costs per square foot, by age of building, geographic location, number of stories, and number of square feet in the building. The Whitestone Research Facility Maintenance and Repair Cost Reference gives annualized costs for building systems and elements as well as service life estimates for specific building components. Replacement Costs The number and timing of capital replacements of building systems depend on the estimated life of the system and the length of the study period. Use the same sources that provide cost estimates for initial investments to obtain estimates of replacement costs and expected useful lives. A good starting point for estimating future replacement costs is to use their cost as of the base date. The LCCA method will escalate base-year amounts to their future time of occurrence. Residual Values The residual value of a system or component is its remaining value at the end of the study period, or at the time it is replaced during the study period. Residual values can be based on value in place, resale value, salvage value, or scrap value, net of any selling, conversion, or disposal costs. As a rule of thumb, the residual value of a system with remaining useful life in place can be calculated by linearly prorating its initial costs. Other Costs Finance charges and taxes: For federal projects, finance charges are usually not relevant. Non-monetary benefits or costs: Non-monetary benefits or costs are project-related effects for which there is no objective way of assigning a dollar value. Examples of non-monetary effects may be the benefit derived from a particularly quiet HVAC system or from an expected, but hard-to-quantify productivity gain due to improved lighting. By their nature, these effects are external to the LCCA, but if they are significant they should be considered in the final investment decision and included in the project documentation. To formalize the inclusion of non-monetary costs or benefits in your decision making, you can use the analytical hierarchy process AHP, which is one of a set of multi-attribute decision analysis MADA methods that consider non-monetary attributes qualitative and quantitative in addition to common economic evaluation measures when evaluating project alternatives. Parameters for Present-Value Analysis Discount Rate In order to be able to add and compare cash flows that are incurred at different times during the life cycle of a project, they have to be made time-equivalent. To make cash flows time-equivalent, the LCC method converts them to present values by discounting them to a common point in time, usually the base date. The discount rate for federal energy and water conservation projects is determined annually by FEMP; for other federal projects, those not primarily concerned with energy or water conservation, the discount rate is determined by The Office of Management Budget. These discount rates are real discount rates, not including the general rate of inflation. Cost Period s Length of study period: The study period begins with the base date, the date to which all cash flows are discounted. The study period has to be the same for all alternatives considered. The service period begins when the completed building is occupied or when a system is taken into service. This is the period over which operational costs and benefits are evaluated. In FEMP analyses, the service period is limited to 40 years. It starts when the project is formally accepted, energy savings begin to accrue, and contract payments begin to be due. The contract period generally ends when the loan is paid off. All single amounts e. Constant-dollar analyses exclude the rate of general inflation, and current-dollar analyses include the rate of general inflation in all dollar amounts, discount rates, and price escalation rates. Both types of calculation result in identical present-value life-cycle costs. The constant-dollar

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method has the advantage of not requiring an estimate of the rate of inflation for the years in the study period. Alternative financing studies are usually performed in current dollars if the analyst wants to compare contract payments with actual operational or energy cost savings from year to year. Life-Cycle Cost Calculation After identifying all costs by year and amount and discounting them to present value, they are added to arrive at total life-cycle costs for each alternative: They are sometimes needed to meet specific regulatory requirements. Some federal programs require a Payback Period to be computed as a screening measure in project evaluation. All supplementary measures are relative measures, i. Uncertainty Assessment in Life-Cycle Cost Analysis Decisions about building-related investments typically involve a great deal of uncertainty about their costs and potential savings. Performing an LCCA greatly increases the likelihood of choosing a project that saves money in the long run. Yet, there may still be some uncertainty associated with the LCC results. LCCAs are usually performed early in the design process when only estimates of costs and savings are available, rather than certain dollar amounts. Uncertainty in input values means that actual outcomes may differ from estimated outcomes. There are techniques for estimating the cost of choosing the "wrong" project alternative. Deterministic techniques, such as sensitivity analysis or breakeven analysis, are easily done without requiring additional resources or information. They produce a single-point estimate of how uncertain input data affect the analysis outcome. Probabilistic techniques, on the other hand, quantify risk exposure by deriving probabilities of achieving different values of economic worth from probability distributions for input values that are uncertain. However, they have greater informational and technical requirements than do deterministic techniques. Whether one or the other technique is chosen depends on factors such as the size of the project, its importance, and the resources available. Since sensitivity analysis and break-even analysis are two approaches that are simple to perform, they should be part of every LCCA. Sensitivity Analysis Sensitivity analysis is the technique recommended for energy and water conservation projects by FEMP. Sensitivity analysis is useful for: To identify critical parameters, arrive at estimates of upper and lower bounds, or answer "what if" questions, simply change the value of each input up or down, holding all others constant, and recalculate the economic measure to be tested. Break-even Analysis Decision-makers sometimes want to know the maximum cost of an input that will allow the project to still break even, or conversely, what minimum benefit a project can produce and still cover the cost of the investment. To perform a break-even analysis, benefits and costs are set equal, all variables are specified, and the break-even variable is solved algebraically. Design and Analysis Tools The use of computer programs can considerably reduce the time and effort spent on formulating the LCCA, performing the computations, and documenting the study. Listed below are several LCCA-related software programs: Application LCCA can be applied to any capital investment decision in which relatively higher initial costs are traded for reduced future cost obligations. It is particularly suitable for the evaluation of building design alternatives that satisfy a required level of building performance but may have different initial investment costs, different operating and maintenance and repair costs, and possibly different lives. LCCA provides a significantly better assessment of the long-term cost-effectiveness of a project than alternative economic methods that focus only on first costs or on operating-related costs in the short run.

Chapter 2 : Life-Cycle Cost Analysis (LCCA) | WBDG Whole Building Design Guide

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