Life Cycle Cost Calculations

Life-cycle cost (LCC) analyses maximize project values. They take operating and maintenance costs into account and make the most of integrated design opportunities.

So remember to include them in your budget allocations. A very rough rule of thumb is to set aside funds equal to 0.5% of the construction budget for analysis fees.

How To Calculate LCC

Typically, there is a base case scenario against which different alternatives are weighed. The following table should be filled out for the base case, as well as each alternative. If the costs for an activity are the same across the base case and all alternatives, enter zero for that activity. See Hawaii High Performance School Guidelines for more details.

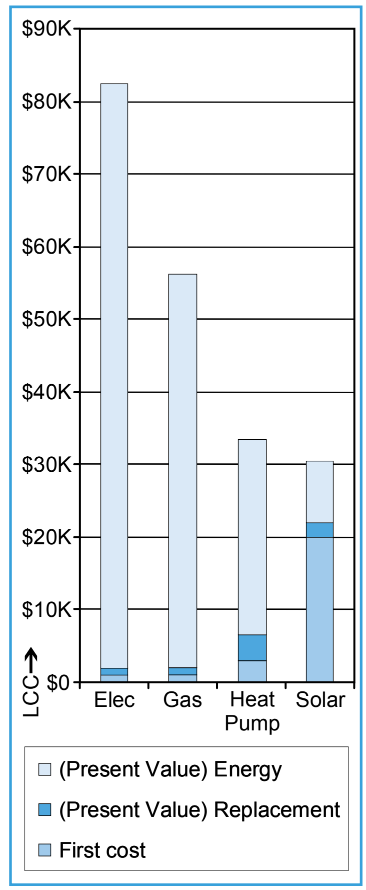
Activity	Cost	Unit		Present Value Multiplier*		Present Value
Project Administration	$	$	x	1.0	=	$
Design	$	$	x	1.0	=	$
Construction	$	$	x	1.0	=	$
Energy	$	$/year	x	19.6	=	$
Water	$	$/year	x	19.6	=	$
Sewage/Disposal	$	$/year	x	19.6	=	$
Maintenance	$	$/year	x	19.6	=	$
Replacement†	$	$	x		=	$
Residual Value‡	$	$	x	-0.41	=	$
LIFE-CYCLE COST (TOTAL)						$

* Explanation of each component of the Present Value calculation appears on page 2.

† If there is any piece of equipment with a lifespan of less than thirty years, you will need to enter how much it will cost to replace it in present value dollars. See the handy cheat sheet to the right ➔ for the present value multiplier. There may be more than one piece of equipment that will require replacement. So add as many rows here as you need, until all of your replacement costs have been entered.

‡ The residual value is the life left in the piece of equipment at the end of the project lifespan. For example, one alternative may leave the school with a piece of equipment that's good for another twenty years, while another alternative might leave the school with a piece of equipment that needs to be replaced right away. Some judgment is needed in determining this value. You could enter the cost of the equipment pro-rated based on remaining life, or you could enter the price that the used equipment could be sold for (often zero).

Year of Replacement	Present Value Multiplier
5	0.86
10	0.74
15	0.64
20	0.55
25	0.48



Water Heater Example

This graph shows components of LCC for four water heater technologies. In this example, the electric and gas options have lower first cost, but the heat pump and solar options have much lower lifecycle cost. This result shows the solar water heater to be the best investment.

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Weighing Qualitative Factors

It's not all dollars and cents with LCC analysis. Qualitative factors should also be considered. You can add to this list as needed. Assign a weight to each criterion to represent its relative importance. Then give scores for each alternative, 10 being "Excellent" and 1 being "Poor." This qualitative ranking provides a "second opinion" for comparison with the LCC result. See Making the Decision below for the final step.

Criterion	Weight (W) (1–10)	Alternative A Score (1–10)	W x A =	Alternative B Score (1–10)	W x B =
Occupant access to views					
Illumination provided by daylight					
Occupant thermal comfort					
Occupant access to operable openings					
Indoor air quality					
Compatibility with State maintenance staff capabilities					
Use of standardized parts and materials (enabling easier maintenance)					
Other:______________________________					
Other:______________________________					
		SUM A		**SUM B**	

Making the Decision

Ideally, at the end of your analysis you have a clear winner: an alternative or base case with the lowest LCC and the best qualitative score. However, it may happen that one alternative scores highest qualitatively, but does not have the lowest LCC. In such cases, a significant amount of human judgment may be needed. Even so, the LCC results are likely to be a big help in coming to the very best decision.

Components of the Present Value Calculation Explained

3% Discount Rate

You've probably heard the saying, "a bird in the hand is worth two in the bush." This is the basic concept behind discount rates. While it's true that the money you have now is worth more than the money you will have in the future, just how much more it's worth depends on your perspective. Investors with short-term outlooks tend towards higher discount rates. In contrast, a lower rate is appropriate for state projects. A 3% discount rate is a good choice for energy efficiency investments in public institutions such as schools.

Present Value

Once you have established a discount rate you can figure out how much an expense you will incur in the future costs in current dollars. The further away this expense is in time, the less its present value will be. The present value multipliers given in this quick sheet are based on a 3% discount rate.

30 Years Project Lifetime

If you don't expect a building to be around too long, it makes sense to minimize your first costs. The State of Hawaii, however, needs its buildings to last. That's why a project lifetime of thirty years is recommended for LCC analysis.

Present Value Multiplier

Takes into account the discount rate and lifetime applied to an annual cost.
The present value of $1 per year, for 30 years, at a 3% rate is $19.60.

For more details see Hawaii High Performance School Guidelines.