PAYBACK TIME

HOW TO PREDICT SAVINGS AND PAYBACK TIME FOR CAMPUS PROJECTS

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Payback for Energy Efficiency Upgrades

"The payback period is the amount of time it takes for an environmental project to pay back the money invested in it. For example, a new piece of resource-efficient equipment could pay for itself over a number of years through reduced bills for energy or other resources.

To calculate the payback period, you need to compare the total cost of the proposed investment with the projected annual savings the new equipment will generate:

Total upgrade cost (including purchase price and installation) / Expected annual savings = payback period in years

Working out the total cost of the proposed investment should be straightforward. To arrive at a figure for the expected annual savings, you will need to establish:

- what the cost per unit of the resource in question is
- how much your current equipment consumes per day
- how much the new equipment would consume per day
- what the difference between these two consumption figures is
- what the reduction in units consumed would translate to in financial terms"

*Excerpt from "**How to calculate the payback period for environmental projects**"*
http://www.businesslink.gov.uk/bdotg/action/detail?type=RESOURCES&itemId=1079422198

To figure out your annual savings from an efficiency upgrade, one can use the online tools on the next page, or use this formula:

Cost per unit of resource * (Annual resource consumption for old equipment – annual resource consumption for new equipment) = **Expected annual savings**

This figure is what you need for the payback formula, listed above. The resources listed below are a great place to start, for approximate estimates of savings from different retrofit projects.

Tools to Estimate Energy Savings from Efficiency Upgrades

Lighting: Commercial Energy Calculator
http://coastepa.apogee.net/comcalc/default.aspx

This tool allows you to input a specific building type, square footage, hours of operation, and basic categories of lighting equipment (such as T12 or T8 fluorescent bulbs). This provides a "base value" for energy use in the building, and then you can alter the lighting type to see estimated savings on energy costs. This calculator also has the ability to compare gas and electric systems for heating and water heating, if needed.

It is also often simple to estimate energy savings from lighting upgrades by getting figures on light bulb energy use from the manufacturer (on the box, or their website) and then multiplying it by the hours of operation.

Insulation: Build It Solar Insulation Upgrade Cost Saving Calculator
http://www.builditsolar.com/References/Calculators/InsulUpgrd/InsulUpgrade.htm

This tool helps you calculate energy savings from different kinds of insulation upgrades. First, you put in the size of the building in square feet. Then, it helps you factor in the climate of your specific area and the changes in efficiency from different kinds of insulation upgrades.

Small Buildings and Residences: Lawrence Berkeley Lab Home Energy Saver
http://hes3.lbl.gov

This website has a wide array of calculators for energy savings in every part of a residential small building. It is built for home auditing, and is not always suitable for predicting results from retrofits in a large educational buildings. However, many of the calculators--particularly windows and doors--are useful to find an approximate figure for savings on a larger scale.

Incentives for Upgrades: Database of State Incentives for Renewable Energy
http://www.dsireusa.org/

This online tool allows you to explore the variety of state and local incentives for energy efficiency and renewable energy upgrades, available to you.

Payback for Renewable Energy Projects

Finding the payback from installing renewable energy generators on campus should be a similar process, with **annual energy generated equivalent to the annual energy saved by a retrofit.**

Payback Period Equation:

Total upgrade cost (including purchase price and installation) / Expected annual savings = **payback period in years**

Annual Savings Equation:

[Cost per unit of electricity * (Annual electricity generated by the equipment)] - Annual Operations and Maintenance Costs = **Expected annual savings**

Figuring all this out requires a good understanding of:

- The **efficiency of the equipment** you're considering (which the manufacturers should list).
- Specific **local conditions**, such as wind velocity or hours of sunlight per year.
- The annual maintenance and **operations costs** for the equipment. You can find this out by consulting the firm you plan to contract for upkeep work, or possibly the manufacturer.
- Local or federal **incentives** which may cut the purchase price of the upgrade.

But don't worry, it's not that tough! There's a long list of online tools below to help you get started. If you prefer using a book, an excellent reference for the calculations on wind and solar generation is the book Renewable and Efficient Power Systems (Wiley InterScience: New York), by Gilbert Masters. Another great text resource, for finding out the life cycle cost of this equipment based on the initial and upkeep costs, is the book Introduction to Engineering & the Environment (2001, McGraw Hill: New York, NY) by Edward Rubin.

This is material routinely taught in starting-level energy economics and engineering classes, and if your campus has these classes, these audits are a great way to involve more students into the technical work of your campaign.

Tools to Estimate Proceeds from Renewable Energy Projects:

Solar Electric (PV): Texas State Energy Conservation Office's Photovoltaic System Economics Calculator
http://www.infinitepower.org/calc_pv.htm

This tool provides an excellent, simple-to-use calculator for the proceeds and savings from installing a solar photovoltaic energy system. You will need specific information on your local amount of sunlight and your

Solar Water Heating: Department of Energy Solar Thermal Guide
http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12910

This website shows all the calculations you need to figure out the annual costs and the payback for a solar thermal system. However, you will need details on the size of your water heating system and the proposed upgrade.

Wind: Windustry's Wind Project Calculator
http://www.windustry.com/your-wind-project/community-wind/community-wind-toolbox/chapter-3-project-planning-and-management/wi

This calculator focuses on community-scale wind generation projects, with only a few, relatively small turbines. Specific information about the area and the turbines you are considering is needed, but the site provides many useful links to other calculators and resources. To help figure out the level of wind resource in your area, you may want to consider checking out an "anemometer" from a US Department of Energy program, available in many states, with a website at http://www.windpoweringamerica.gov/anemometer_loans.asp

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HAVE MORE QUESTIONS?

Campus InPower wants to provide all the consulting we can for your projects.
For any questions about energy audits or upgrade calculations, please contact:
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