Unitary Air Conditioner Cost Estimator Tool

The U.S. Department of Energy's Federal Energy Management Program (FEMP) and Building Technologies Programs (BT) are cooperating with the Defense Logistics Agency (DLA) to stimulate buyer demand for a new generation of rooftop air conditioners that maximize cost effectiveness, energy efficiency, and performance. Pacific Northwest National Laboratory (PNNL) is providing technical and administrative support and promoting selection and use of these units.

In support of this effort, PNNL has developed a web-based cost estimator that compares high-efficiency rooftop air conditioners to standard equipment in terms of life-cycle cost. This electronic tool provides an alternative to complicated building simulation models, while offering more detail than simplified estimating tools that are commonly available. While simplified tools are typically based on full-load efficiencies and full-load equivalent operating hours, the estimator accommodates equipment with single or multiple cooling stages and accounts for part-load, as well as full-load efficiencies.

Features and Uses of the Cost Estimator

Whether you are buying air conditioning equipment for a new building or replacing old equipment, the cost estimator can help you select the optimal equipment by estimating different models' life-cycle cost at various efficiency levels. Other key features include:

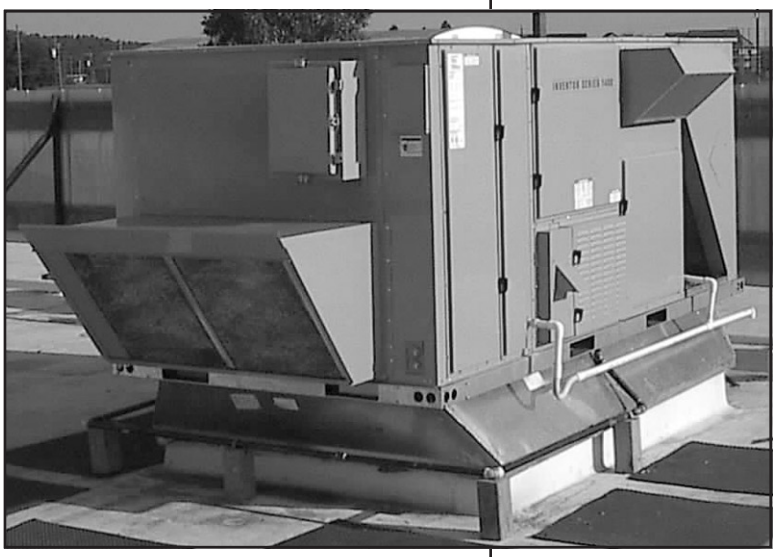
- Is fully web-based and available free at **www.pnl.gov/uac/cost-estimator.stm**
- Has an easy-to-use menu-driven format with context-sensitive help and methods explanation
- Quickly estimates life-cycle cost, simple payback, rate of return, and savings-to-investment ratio
- Accommodates equipment with one or two compressor stages and accounts for part-load, as well as full-load efficiencies
- Simulates operation under specific climate conditions at any of 237 U.S. locations
- Reflects user-specified air conditioning requirements and building use patterns
- Allows a comparison of alternative equipment choices
- Provides results as downloadable graphic files for further analysis and presentation.

The results obtained with the cost estimator will be useful to facility managers, financial officers, energy management professionals, air conditioning contractors, and other decision makers interested in maximizing the energy efficiency and cost effectiveness of cooling system investments. The tool provides energy and cost estimates for comparison purposes only, and is not designed to replace building load simulating software for heating and cooling systems design. Due to the dynamic nature of building heating and cooling, actual energy use will vary depending on the application.

DOE's Building Technologies and Federal Energy Management Programs are working together to advance clean energy technologies.

To save taxpayer dollars and to place the federal government at the forefront of energy efficiency, DOE's Federal Energy Management Program assists federal agencies to reduce energy costs.

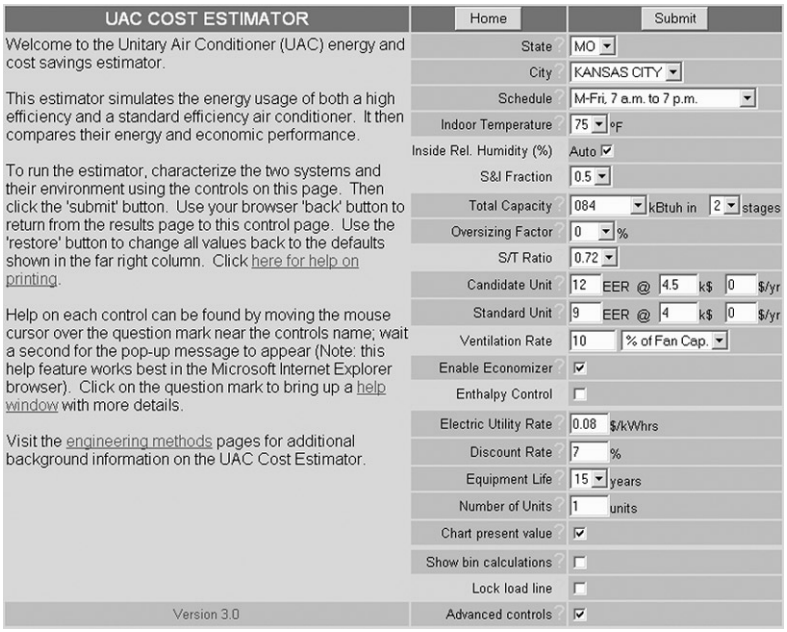
The mission of the Defense Logistics Agency is to provide best value logistics and contract management support to America's Armed Forces, in peace and war…around the clock, around the world.



New, high-efficiency unitary air conditioners cut energy use by up to 20%.

Data Inputs and Results

Through drop-down menus, users enter data specific to the equipment being evaluated for a selected location. The estimator compares the performance of two different candidate units in meeting a load that matches the total capacity specified by the user. A sample data input screen is shown below.



UAC COST ESTIMATOR | Home | Submit

Welcome to the Unitary Air Conditioner (UAC) energy and cost savings estimator.

This estimator simulates the energy usage of both a high efficiency and a standard efficiency air conditioner. It then compares their energy and economic performance.

To run the estimator, characterize the two systems and their environment using the controls on this page. Then click the 'submit' button. Use your browser 'back' button to return from the results page to this control page. Use the 'restore' button to change all values back to the defaults shown in the far right column. Click here for help on printing.

Help on each control can be found by moving the mouse cursor over the question mark near the controls name; wait a second for the pop-up message to appear (Note: this help feature works best in the Microsoft Internet Explorer browser). Click on the question mark to bring up a help window with more details.

Visit the engineering methods pages for additional background information on the UAC Cost Estimator.

Version 3.0

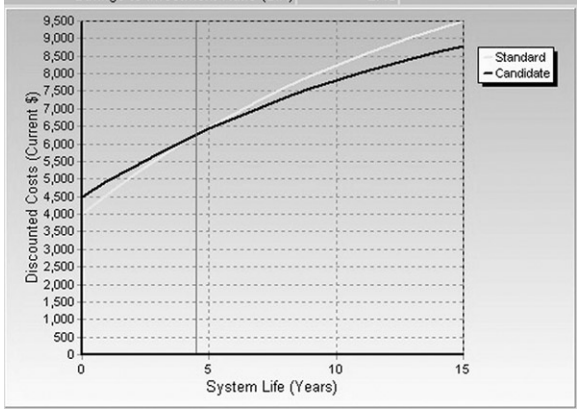
State	MO
City	KANSAS CITY
Schedule	M-Fri, 7 a.m. to 7 p.m.
Indoor Temperature	75 °F
Inside Rel. Humidity (%)	Auto ☑
S&I Fraction	0.5
Total Capacity	084 kBtuh in 2 stages
Oversizing Factor	0 %
S/T Ratio	0.72
Candidate Unit	12 EER @ 4.5 k$ 0 $/yr
Standard Unit	9 EER @ 4 k$ 0 $/yr
Ventilation Rate	10 % of Fan Cap.
Enable Economizer	☑
Enthalpy Control	☐
Electric Utility Rate	0.08 $/kWhrs
Discount Rate	7 %
Equipment Life	15 years
Number of Units	1 units
Chart present value	☑
Show bin calculations	☐
Lock load line	☐
Advanced controls	☑

The estimator uses the data inputs to produce side-by-side comparative figures for annual operating cost and life-cycle cost. It also provides simple payback and rate of return for an investment in high-efficiency air conditioning equipment. Results are displayed in the format below.

In addition to user-specified parameters, the results of the model are driven by the following methodologies and assumptions.

- Unit performance is modeled using the DOE-2 equipment performance curves and specific characteristics supplied by selected manufacturers.
- Binned temperature and humidity conditions for each location are taken from TMY (typical meteorological year) data.
- The building is assumed to be 100% loaded at the TMY 97.5 percentile temperature.
- Building loading is assumed to be a linear function of outdoor temperature.

RESULTS	Candidate	Standard	Savings
Annual Energy Consumption (kWhrs)	5,879	7,549	1,669
Annual Operating Cost ($)	470	604	134
15 Year Life Cycle Cost ($)	8,784	9,500	716
Annualized Cost ($)	964	1,043	79
Net Present Value ($)	716		
Payback (yrs)	4.5		
Rate of Return (%)	25.86		
Savings to Investment Ratio (SIR)	2.43		



For Program Information on the Web:
http://www.buildings.gov

For Program and Product Information on the Web:

www.pnl.gov/uac

www.eren.doe.gov/buildings/emergingtech

www.eren.doe.gov/femp

www.dscp.dla.mil/gi/mro

For Program Information:
Douglas Steinmetz
Phone: **(215) 737-7940**
dsteinmetz@dscp.dla.mil
or
Chet Evanitsky
Phone: **(215) 737-8048**
cevanitsky@dscp.dla.mil
Maintenance Repair and Operations Services
Defense Supply Center Philadelphia

Brad Hollomon
Pacific Northwest National Laboratory
Phone: **(202) 646-5043**
hollomon@pnl.gov

Alison Thomas
U.S. Department of Energy
Phone: **(202) 586-2099**
alison.thomas@ee.doe.gov

Richard Orrison
U.S. Department of Energy Building Technologies Programs
Phone **(202) 586-1633**
richard.orrison@ee.doe.gov

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy

PNNL-SA-40252
November 2003

Printed with soy ink on recycled paper