

The Rooftop Unit Comparison Calculator is a web-based screening tool that compares life-cycle cost of high-efficiency rooftop air conditioners to that of “standard” equipment.

### Facility and Activity Overview

In the United States, packaged rooftop air conditioners and heat pumps (RTUs) consume over 1.3 quads of energy; they are used in 46% (2.1 million) of all commercial buildings, and serve over 60% (39 billion square feet) of all commercial building floor space.<sup>1</sup> Older, inefficient commercial RTUs are common and can waste from \$1,000 to \$3,700 per unit annually, depending on the building size and type. By replacing or retrofitting them, you can save money, improve energy efficiency, make your building more comfortable, and help the environment.

Because of the wide use of RTUs and their huge energy impact, the U. S. Department of Energy’s (DOE’s) Building Technologies Office developed the rooftop unit comparison calculator (RTUCC) - a tool to help with decisions regarding the purchase or replacement of packaged RTUs by estimating a product’s lifetime energy-cost savings at various efficiency levels.

### What is the RTUCC?

The RTUCC is a screening tool that compares the annual energy consumption and life-cycle cost of RTUs. It provides energy and cost estimates suitable for comparison purposes, though it is not designed to replace building load simulating software for heating and cooling systems design.



The first RTU Challenge Unit recognized the DOE.  
Photo Courtesy of: Daikin Applied Air

The RTUCC has the capability to do both simple queries and more sophisticated comparisons depending on the level of detail the user wants to input.

Simple Queries	Advanced Comparisons
Building type and location	Staged and variable capacity condensers
Occupancy schedule	Variable-speed fans
Equipment size, efficiency, and lifetime	Power split between fans, compressors, and auxiliaries
Electric rates, RTU price and maintenance costs	Three specific high-performance RTUs
Temperature and setback settings	Detailed performance specification
Economizer use	Equipment degradation factor
Oversizing factor	Ratio of sensible to total capacity

<sup>1</sup> EIA 2003 - <http://www.eia.gov/consumption/commercial/data/2003/>

## Users

The RTUCC was designed for facility managers, financial officers, energy management professionals, air conditioning contractors, building owners, and other decision makers interested in maximizing the energy efficiency and cost-effectiveness of RTUs.

The calculator was developed to be used by both a technical audience and the general public so all users can make informed RTU investments and justify purchasing the most energy-efficient RTU that fits their specific needs. Users can choose between simple and advanced queries.

*The tool remains impressive, and the upgrades each are beneficial. We see that it is best suited for engineers to use, which typically for us means the larger HVAC mechanical firms that have dedicated design and installation departments.*

*-Edward Smyth, KEMA Services Inc.*

## RTUCC Features

- The calculator is fully web-based.
- Clickable links provide detailed explanations on all inputs.
- RTUCC quickly estimates energy consumption, life cycle cost, simple payback, return on investment, and savings-to-investment ratio.
- It supports 14 different building types and 237 locations.
- It reflects user-specified air-conditioning requirements and building-use patterns.
- Results are easily downloaded as graphic files and tables.

### Learn More about the Comparison Calculator

Visit [www.pnnl.gov/uac/](http://www.pnnl.gov/uac/)

Contact information: [rtucc@pnnl.gov](mailto:rtucc@pnnl.gov)

## Outcomes

In addition to a financial analysis, the RTUCC calculates run time and energy use of evaporator fans, condenser fans, and compressors as affected by building type, system type, control strategies, occupancy schedules, and various weather, mixed-air and outdoor-air conditions. Its simplified modeling approach enables complete annual energy-performance and economic analysis in less than a minute. Results can be downloaded for further analysis and presentations.

## Enhancements

Since its inception, the RTUCC has been upgraded many times to achieve the usability and functionality it has today. A few recent enhancements are listed below:

- enhanced user interface
- improved output reporting
- capability to support three specific high-performance RTU systems
- more help topics and a Quick-Start user guide

## What's Next?

Consider joining the Advanced RTU Campaign (ARC), an initiative supported by the DOE that encourages commercial building owners and operators to replace their old RTUs with more efficient units or to retrofit their RTUs with advanced controls. ARC provides building owners and operators with access to information and expertise to lower facility operating costs while maintaining or improving building occupant comfort. The RTUCC is just one of the innovative tools available through the ARC. Learn more at <http://www.advancedrtu.org/>.