



Clean Energy for the 21st Century

The Office of Building Technology, State and Community Programs and the Federal Energy Management Program 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.



Buildings that are more energy-efficient, comfortable, and affordable...that's the goal of DOE's Buildings for the 21st Century Program, which accelerates the development and wide application of energy efficiency measures.



Office of Building Technology,
State and Community Programs

HIGH-PERFORMANCE COMMERCIAL ROOFTOP AIR CONDITIONERS

Overview

Cooling and heating energy accounts for more than half of the total energy operating cost for commercial and government buildings. Packaged rooftop air conditioning units dominate the market for small and medium size, low-rise buildings, accounting for 60% of cooling energy and nearly one-third of total heating and cooling energy – over one quadrillion Btus per year. Rooftop units are often purchased and installed to minimize first cost; once in place they often receive little maintenance until a breakdown occurs.

To address these problems, the U.S. Department of Energy's Federal Energy Management Program (FEMP) and Office of Building Technologies, State and Community Programs (BTS) are now planning a project to stimulate buyer demand in both government and private sectors for a new generation of rooftop units that feature significantly lower energy consumption. The project will encourage manufacturers, suppliers, and installers to respond to buyer-defined requirements with new products that use state-of-the-art mechanical components and built-in design features to improve lifetime cost-effectiveness.

Due to their low first cost, simple design, and ability to be roof-mounted, packaged systems are used in two-thirds of all commercial floor space in the United States. The most common capacities of commercial packaged units range from 65,000 Btu/h to 240,000 Btu/h.

Examples of federal and non-federal facilities that use commercial rooftop air conditioners include: small office buildings, clinics and medical care facilities, hotels, college dormitories, military barracks, retail stores, schools and universities, laboratory and light industrial buildings, prisons, and warehouses.

The principal barrier to adoption of high-performance packaged systems is first cost; units are often specified and purchased by builders, developers of leased space, and others primarily interested in minimizing first cost, rather than by the eventual occupants, who will pay higher operating and maintenance costs as a result.

Objectives

The objective of DOE's Technology Procurement for high performance commercial rooftop air conditioners is to help commercialize a new generation of equipment to provide customers energy and peak power savings through:

- ✓ Higher overall efficiency,
- ✓ Lower energy consumption over the range of temperatures encountered in typical applications,
- ✓ Improved humidity control, and
- ✓ Lower initial cost compared to other high-efficiency units.

Standards

Federal efficiency standards for packaged rooftop air conditioners were established by Congress in the Energy Policy Act of 1992 and will



COMMERCIAL ROOFTOP AIR CONDITIONERS

For more information about DOE Building Technology and Federal Energy Management Programs, contact:

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be re-evaluated by DOE now that the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) has recently revised its voluntary efficiency standard (ASHRAE Standard 90.1). Also, the Consortium for Energy Efficiency (CEE), a non-governmental organization set up to coordinate utility and other market transformation efforts, is promoting an efficiency criterion for use by design assistance and incentive programs. (See table below.) FEMP currently recommends that federal buyers meet or exceed CEE Tier 1 EER levels. Approximately 14% of commercially available models already meet the CEE Tier II levels.

Technology Improvements

A number of technologies are currently available to improve the energy and non-energy performance of roof-top air conditioners, such as more efficient components (heat exchangers, etc.). Others are not yet commercial for rooftop units, but may be readily adaptable from other applications of compressor-based refrigeration. Many of these options involve little or no technical risk, although increased first cost and marketability must be carefully considered in consultation with both buyers and suppliers.

Procurement Approach

To achieve these improvements, DOE and PNNL propose to issue a competitive Request for Proposal (RFP) on behalf of the federal government and other buyers for rooftop air conditioners in the 65,000 Btu/h to 135,000 Btu/h range. They will select as winners those units that minimize life-cycle costs, taking into account electric energy consumption required to cool commercial buildings under typical climate conditions, and meet prescribed reliability and performance criteria.

Life-cycle cost will be based on initial price and operating costs estimated from manufacturers' performance data by a simulator developed by Pacific Northwest National Laboratory (PNNL). Buyers will be able to order winning units through a basic ordering agreement specifying prices, warranties and other terms.

How you can get involved:

As a market-leading buyer –

if you are a buyer, user, or specifier of air conditioning systems, help DOE establish performance and cost specifications for a new generation of rooftop air conditioners to better meet your needs, and then buy the units when they become available.

As a manufacturer, supplier, or installer –

participate as a prospective partner in advising DOE and its buyer group in defining performance criteria, and then preparing to manufacture and market next-generation rooftop units.

As a utility or ESCO –

work with DOE to bring this new technology procurement opportunity to the attention of your major customers, and help provide technical advice and/or project financing to those who want to participate.

As a government agency or

non-governmental organization –

join DOE in helping to identify interested buyers and suppliers to develop a viable commercial market for high-performance rooftop air conditioners.

DOE is developing this Technology Procurement to complement existing programs such as Rebuild America, FEMP's energy-efficient federal purchasing initiative, and the joint DOE/EPA ENERGY STAR® program, while extending existing relationships with both private and public sector partners.

Comparison of Efficiency Criteria

Size Range (kBtu/hr)	ASHRAE 90.1-1989 (1992 Fed. Standard)		ASHRAE 90.1-1999 (Effective 10/29/2001)		Consortium for Energy Efficiency		
	Full-load (EER)	Part-load (IPLV)	Full-load (EER)	Part-load (IPLV)	Efficiency Level	Full-load (EER)	Part-load (IPLV)
65 – 135	8.9	8.3	10.3	10.6	Tier I	10.3*	10.6
	—	—	—	—	Tier II	11.0	11.4
135 – 240	8.5	7.5	9.7	9.9	Tier I	9.7*	9.9
	—	—	—	—	Tier II	10.8	11.2

EER—Energy Efficiency Rating

IPLV—Integrated Part-Load Value

*FEMP Recommendations