Light Commercial Air Conditioning: Moving the Market toward High Efficiency

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ABSTRACT

A number of organizations employing various program strategies work harmoniously to promote the same levels of high-efficiency air conditioning equipment. These efforts contribute to increased equipment acquisition, product availability and consumer acceptance of higher-efficiency heating ventilating and air conditioning (HVAC) equipment. The combination of these diverse market intervention strategies is expected to cause a lasting increase in consumer demand and energy-efficient product availability.

This paper presents an overview of the light commercial air conditioning market, reviews the various market intervention strategies underway and measures progress of the increasing high-efficiency product market[1]. Featured program strategies include those of the Cool Choice Initiative (sponsored by members of the Northeast Energy Efficiency Partnerships), the ENERGY STAR® Light Commercial HVAC labeling program and the Department of Energy's Technology Procurement Effort. The High-Efficiency Commercial Air Conditioning specification developed by the Consortium for Energy Efficiency (CEE) – serving as the common element across these strategies – will be discussed. Individual goals, successes and challenges of these efforts will be explored – as well as the expected synergistic effects on the market.

Overview of the Light Commercial Air Conditioning Market

More than 4.6 million[2] commercial buildings in the United States occupy 62.8 billion square feet of commercial floor space (DOE 2001)[3]. The commercial sector accounts for one quarter of all electricity consumed in the US. Of that quarter, space cooling represents 15.4 percent of the electricity used in the commercial sector, the second largest end-use (DOE 2001)[4]. In 1999, electric space cooling produced 27.4 metric tons of carbon emissions (DOE 2001).

[1] For the purposes of this paper, light commercial air conditioners will be defined as unitary, packaged three-phase equipment up to 240,000 Btu/h.
[2] Commercial buildings consist of business establishments and other organizations that provide services, such as retail and wholesale stores, hotels and motels, restaurants, hospitals, public schools, correctional institutions, and religious and fraternal organizations. Excluded are goods-producing industries: manufacturing, agriculture, mining, forestry and fisheries, and construction. As defined in Commercial Buildings Energy Consumption Survey (CBECS), 1995.
[3] In 1999, commercial buildings consumed 3.7 quadrillion BTUs of electricity or 1080 tWh (DOE, 2001).
[4] Space cooling alone consumed .57 quads of electricity or 167 tWh (DOE, 2001).

High-efficiency unitary commercial air conditioners can reduce energy use, peak demand and pollution. Peak demand has become more important in recent years in California and other regions with supply shortages. Space cooling contributes to a significant amount of energy use. The use of high-efficiency air conditioners over standard models could significantly alleviate pressures for increased capacity. In the western region of North America, for example, completely displacing the current stock of unitary equipment with high-efficiency models offers the potential to save 682 MW during summer peak or 1.65 tWh annually[5] (CEE, 2001).

How much can efficiency improvements reduce the 167 terawatt-hours per year devoted to commercial space cooling? An analysis of two product categories (accounting for approximately half of the total consumption) provides an illustration.

In 2000, the US Department of Energy conducted a screening analysis to evaluate the nationwide energy consumption for each class of HVAC equipment covered by the Energy Policy Act of 1992 (EPAct). This study analyzed equipment at various times in the future, reflecting assumed alternative efficiency levels for products sold after a new efficiency standard might take effect (DOE, 2000). The graph on the next page shows the relationship between estimated nationwide primary energy consumption and the energy-efficiency ratios (EER) for the two size ranges of air-cooled air conditioners covered by EPAct. The curves are based on figures in the report for the year 2020, when new products subject to a new standard would have already largely saturated the market.

This analysis shows that each unit of increase in EER results in approximately 10 percent reduction in energy use. Higher efficiencies could yield significant energy savings – as much as 16 percent, or 26.2 tWh per year – with 12.5 EER equipment in sizes from 65,000 to 240,000 Btu/h. This is equivalent to the amount of electricity the state of Nevada consumes in a year. Even greater savings could be achieved by using currently available equipment with higher EERs.

The HVAC equipment market is on the rise in the US. In 1994 there were 3.8 million shipments of unitary air conditioners in the US and in 2000, there were more than 5 million. Since the unitary air conditioning market is growing and the potential energy and peak demand savings are large, the current market presents a major opportunity for the use and support of high-efficiency unitary air conditioners.

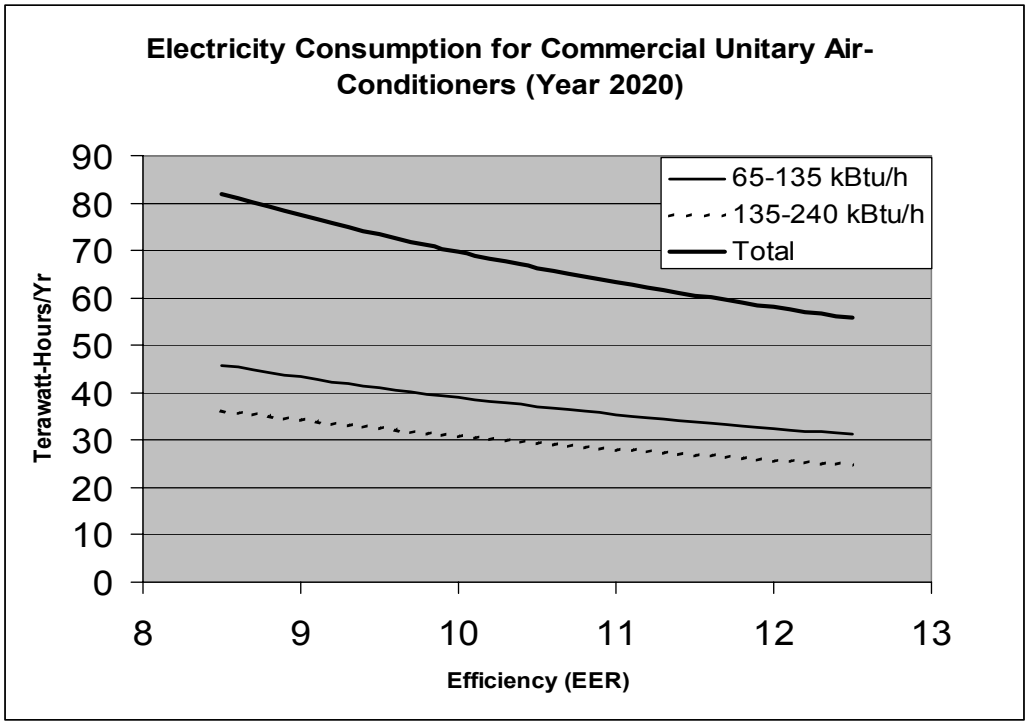
Product Availability

There are close to 70,000 models of unitary, commercial air conditioners available on the market (ARI 2001). Of that total, close to 50 percent meet the new 90.1-1999 standard set by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). Since sales data for high-efficiency equipment is not publicly available, product availability – a less accurate indicator – is used to measure movement in this market. Since 1997, there have been consistent increases in product that meets the ASHRAE standard or is high-efficiency equipment. In 1997 there were 18,274 high-efficiency models available on the market; in 1999 the number of models increased to 27,566 and in 2001 there were 30,597 models available. Increases in product availability combined with the state codes and federal

[5] The western region of North America, as defined by on the North American Electric Reliability Council's (NERC), includes Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Alberta and British Columbia.

equipment standard changes discussed below, this trend is expected to continue until the ASHRAE standard is the minimum efficiency available in the market. Voluntary energy-efficiency programs, such as ENERGY STAR and the Consortium for Energy Efficiency (discussed later) help prime the market by focusing market actors on a new level of high efficiency.

Figure 1. Electricity Consumption for Commercial Unitary Air-Conditioners



Source: DOE 2000

There are 10 major unitary equipment manufacturers, which account for 97 percent of the equipment market. Of these top makers, six constitute the principal producers of models that meet or exceed ASHRAE 90.1-1999.

While equipment less than 65,000 Btu/h is the vast majority of the market, only a small percentage of that equipment is for commercial applications (three-phase). The bulk of the commercial air conditioning market lies in 65,000 to 135,000 Btu/h. For single packaged air conditioning equipment in this size range, ratings range from 8.9 to 11.6 EER, with the highest number of models at 9 EER. There is significant, and somewhat equal, distribution of EERs at 9.1, 10.3, 11.0 and 11.5 EER. Integrated Part Load Value (IPLV) in this size category ranges from 8.5 to 12.4 IPLV, with the majority clustered between 9.0 and 9.5 IPLV.

For air conditioners, single packaged from 135,000 to 240,000 Btu/h, the EERs range from 8.5 to 11.5, with approximately half the equipment rated at 9 EER or less. The remaining half are distributed in small clusters rather evenly across the remaining EER range. The IPLV with most frequency is 8.5.

This market data illustrates that while equipment is available at higher efficiency levels the majority of the models available in the marketplace fall in the lower end of the efficiency range.

Key Events Affecting the Market

Several key events over the past few years (and others expected to occur in the near future) are increasing the market for high-efficiency air conditioning equipment. They include:

1. Revisions to the ASHRAE standards 90.1-1999;
2. Increases in the federal minimum manufacturing standards;
3. Adoption of the revised ASHRAE 90.1-1999 standards into state building codes; and
4. Promotion of voluntary common specifications in energy-efficiency programs.

Standards

The American Society of Heating, Refrigeration and Air Conditioning Engineers, which sets professional standards for the HVAC industry, developed a new standard (ASHRAE 90.1-1999), which became effective in 2001. The standard, specific to commercial unitary air conditioners, is approximately 12 percent more efficient than the prior ASHRAE standard.

The impact of this revision is significant since ASHRAE standards are often adopted into state building codes. The state of Washington adopted the ASHRAE standard for its state building code, and California, Oregon and Massachusetts are expected to follow soon. More far reaching, however, is a mandate that requires the Department of Energy to revise the federal minimum equipment-manufacturing standard within 24 months, whenever ASHRAE develops a new standard. The new federal standard must be equal to or more stringent than the efficiency levels set by ASHRAE.

DOE has adopted the ASHRAE standard for small commercial packaged water cooled, evaporatively cooled and water source air conditioners and heat pumps <135,000 Btu/h and for large commercial packaged water and evaporatively cooled air conditioners >135,000 Btu/h. The standard will go into effect for the small sized equipment Oct. 29, 2003 and Oct. 29, 2004 for the larger equipment. DOE, however, is currently assessing whether more stringent standards are warranted for small commercial, air-cooled, packaged air conditioners 65,000 – 135,000 Btu/h and for large commercial, air-cooled packaged air conditioners 135,000 – 240,000 Btu/h. If DOE determines higher standards are warranted, a final rule is expected in 2004 and the standards may take effect in 2008.

Market Intervention Strategies

Developing High-Efficiency Equipment Specifications

The use of common specifications across various energy-efficiency programs sends a consistent message to manufacturers and other market actors as to what constitutes high efficiency. In turn, these programs increase awareness of high-efficiency technology and

stimulate product sales. Developing a common set of efficiency levels – for use nationally – helps amplify individual efforts to stimulate the market. The Consortium for Energy Efficiency (CEE) developed a set of specifications for commercial air conditioning in 1993. These equipment specifications were developed for inclusion into energy-efficiency programs. The EPA/DOE ENERGY STAR program, which partners with manufacturers and promotes energy- efficient equipment to consumers, recently adopted the CEE equipment specification for its national label. These efforts are discussed below.

Energy-Efficiency Programs

CEE works with utilities and other energy-efficiency organizations to promote high-efficiency HVAC equipment. CEE's High-Efficiency Commercial Air Conditioning and Heat Pump Initiative (HECAC) was launched in 1994 to encourage the widespread use of high-efficiency unitary central air conditioning and heat pump equipment. Working with member organizations, CEE developed two levels of specifications for use in public benefit energy-efficiency programs.

Member organizations include utilities, statewide and regional market transformation administrators, environmental groups, research organizations and state energy offices. These organizations use CEE specifications to define high efficiency for their energy-efficiency programs. There are 28 organizations currently promoting high-efficiency commercial HVAC equipment that meets the CEE specifications. These participants include organizations in California, 22 member utilities of the Northeast Energy Efficiency Partnerships (NEEP) and the New York State Energy Research & Development Authority (NYSERDA). For a complete list of program participants see Appendix A.

CEE serves as a clearinghouse for its members and initiative participants by developing and providing:

- common specifications
- information on initiative and participant progress
- relevant industry, market and legislative information

This information is provided through quarterly meetings (that provide a forum for stakeholders), Update newsletters and CEE's Web pages.

The specifications consist of two efficiency levels, Tier I and Tier II. Tier I was designed to specify equipment at performance levels approximately 12 percent more efficient than the federal standard. Tier I was also based on a draft specification developed by ASHRAE. Tier II is approximately 10 percent more efficient than Tier I.

Since the inception of the program, participants have widely promoted the CEE specifications. Their efforts have helped increase the demand and widen the acceptance of this high-efficiency equipment. Refer to Appendix B for the Tier I and II specifications.

The majority of the participants are promoting Tier I and II efficiency levels in their programs, or exclusively Tier II. Given the changes in the market, Tier I is expected to be eliminated by the end of the year, placing primary focus on promoting Tier II equipment.

Product Labeling

ENERGY STAR is a voluntary labeling program created by EPA/DOE to identify and promote energy-efficient products. ENERGY STAR-labeled products help consumers identify equipment or buildings that deliver better performance while saving energy and money. In addition, ENERGY STAR works with manufacturing partners to promote the manufacture of energy-efficient equipment.

In October 2001, ENERGY STAR finalized a new specification for light commercial HVAC. ENERGY STAR, which creates a national symbol and definition of energy efficiency, adopted CEE's Tier II levels for its commercial air conditioner specification. The ENERGY STAR specification can be viewed on the Web at http://yosemite1.epa.gov/ESTAR/consumers.nsf/content/lighthvac.htm#status. In 2002, ENERGY STAR will promote its Light Commercial HVAC label nationally, heightening awareness and subsequently increasing the demand for this high-efficiency equipment.

Incentive Programs

High-efficiency equipment is typically more expensive than standard-efficiency equipment. In an industry that is extremely cost driven, many efficiency programs provide incentives to consumers or contractors to lower the cost of the higher-efficiency model.

In conjunction with the Cool Choice initiative, a survey was conducted to determine the added cost of high-efficiency packaged HVAC units in the Northeast. Table 1 shows the incremental costs – on a per-ton basis – between an ASHRAE-1989 baseline and Tier I or Tier II. For Tier I, the added costs ranged from $41-60; for Tier II, incremental costs ranged from $73-92[6].

The incremental cost covered by CEE member rebate programs ranges from 30-100 percent, with 60 percent the most common target. These rebate levels are designed to result in a payback period of 2-5 years.

Table 1. Cool Choice Incremental Costs for the Northeast

Unit Size	Base Unit	Tier I	Tier II	Incremental Costs ($/ton)	
				Tier I	Tier II
<5 ton	10.0 SEER	12.0 SEER	13.0 SEER	$60	$92
5 to 10 ton	8.9 EER	10.3 EER	11.0 EER	$41	$73
10 to 20 ton	8.5 EER	9.7 EER	10.8 EER	$46	$79
>20 ton	8.5 EER	9.7 EER	10.8 EER	$53	$79

Source: Cool Choice Working Group. 1998, updated 2000.

All organizations participating in the CEE initiative specify one or both of CEE's tiers to define high efficiency. These programs provide varied offerings. Some incentives

[6] The Cool Choice study used ASHRAE 90.1-1989 units as a baseline and compared costs (dollars per ton) with units qualifying at CEE Tier I and Tier II levels. Results of the survey were averaged and smoothed to account for the variety of makes, models and availability, and costs are updated to reflect current market conditions. The research was complicated by the fact that "street price" diverged in a variety of ways from the "catalogue price." The researchers are confident that their results are the "best available" cost information.

differ by size category or tier, while others have a constant dollar-per-ton rebate. However, there is a general range of incentives, running from $19-60 per ton for Tier I and from $34-120 per ton for Tier II. Between 2000 and 2001 CEE participating organizations provided rebates for at least 7,500 units of high-efficiency equipment[7].

Table 2. Utility Rebates by CEE Tier

CEE Efficiency Level	<5 tons	5 to 10 tons	>10 tons
Tier I	$27-60 /ton Avg. $45 /ton	$19-60 /ton Avg. $38 /ton	$21-60 /ton Avg. $40 ton
Tier II	$42-120 /ton Avg. $76 /ton	$34-120 /ton Avg. $68 /ton	$36-120 /ton Avg. $70/ton

While incentives to customers and contractors increase the product demand, high-efficiency equipment has not always been available through local retailers to meet the demand. Since a significant part of the market is equipment replacement, where time is of the essence, standard-efficiency equipment is likely to be installed if high-efficiency equipment is not available locally. To increase the equipment availability, two organizations – the New York State Energy Research and Development Authority (NYSERDA) and NEEP – have offered promotions to equipment retailers to stock high- efficiency equipment that meets CEE specifications.

By promoting uniform specifications, these programs increase aggregate demand for high-efficiency products and send a clear message to manufacturers and retailers that the products are in demand.

NEEP: *Cool Choice*

The Northeast Energy Efficiency Partnerships, a HECAC participant, includes 22 member organizations throughout eight states. The Cool Choice Initiative is a wide-ranging marketing initiative in the Northeast designed to increase energy efficiency of space conditioning in commercial buildings. The initiative's focus is "packaged HVAC" systems, up to 30 tons cooling capacity. These systems are mostly "rooftop units," prevalent in commercial buildings of all sizes, shapes and uses. Cool Choice's goal is to transform the HVAC market through a strategy of education and awareness, technical resources and customer rebates. The initiative uses CEE's Tier I and Tier II efficiency specifications to define "qualifying" high-efficiency equipment for its promotions.

The sponsors of Cool Choice are electric utilities and other organizations representing New England and New Jersey. NEEP organized the sponsors, some of whom were already implementing HVAC efficiency programs. The 12 sponsors agreed on common goals, strategies and tactics to make Cool Choice a single marketing effort throughout the region.

The sponsors engaged a contractor to be their principal resource for program implementation. Cool Choice's primary route to influencing the HVAC market is through the region's 2,000 HVAC installation contractors, on whom customers rely when selecting new and replacement equipment. Cool Choice's field technicians make personal contact with the contractors and equipment distributors. The field technicians provide marketing

[7] Not all programs track number of rebates; of those that do, this is the total reported.

materials, information fliers, presentations, customer rebate applications, Web resources and personal assistance to help contractors recommend qualifying equipment to their customers.

This regional approach works for Cool Choice since the sales territories for contractors and distributors tend to overlap state and utility boundaries. A single message – with a single set of materials – simplifies the promotion and strengthens the overall effect. Customers don't need to consider where they are or who serves them. Through programs like Cool Choice, customers are able to learn and understand the message, select qualifying equipment, apply for any rebates – all through the installation contractor.

Cool Choice promotes equipment and practices specified in CEE's programs. Packaged units (split and unitary) in size categories split at 5, 10 and 30 tons have efficiency levels specified at Tier I and Tier II levels, with rebates structured to cover 100 percent of incremental cost. Rebates apply to AC systems, air-source heat pumps and water-source heat pumps. In 2002, "dual-enthalpy economizer controls" were added to the application. This measure is not part of CEE's initiative, but works particularly well in the Northeast climate, where there are a significant additional number of hours where the economizer can work if there are both outside and exhaust enthalpy sensors. In addition to promoting efficient equipment, Cool Choice's consumer information materials are consistent with CEE's *Installation Guidelines for Commercial HVAC Equipment*. Cool Choice's marketing materials include a spreadsheet savings calculator, which compares annual operating costs of optional rooftop packaged HVAC units based on equivalent full-load operating hours. The tool, accessible at www.coolchoice.net, uses customer input to determine the size and efficiency of base and optional units. It then uses local electric rates in the Northeast to derive a dollar figure of savings per year, which the customer can compare to the added cost of a high-efficiency unit. The calculator is also offered on diskette by Cool Choice field representatives as a sales tool for installation contractors and customers. Through printed fliers, presentations and Web references, customers are encouraged to manage their installation for quality and high-efficiency operation.

In 2001, Cool Choice contacted more than 2,000 contractors in the region with direct mail, advertising and personal visits. Cool Choice's four field technicians make periodic visits to HVAC contractors, either in response to inquiries or in scheduled "sales" calls. They build service relationships with the contractors, providing marketing support, information, program materials, rebate forms and training. In 2001, 350 contractors actively participated, processing rebates for 2,400 rooftop units. The result was $1.3 million in customer rebates for qualifying units. Cool Choice achieved growing recognition and response in the HVAC community among installers, distributors, trade associations and customers.

Large-Scale Procurements with Aggressive Specifications

The program strategies described so far would gradually become victims of their own success without new technology to increase the efficiency of available air conditioners and provide the foundation for future specifications. There is little doubt that the demand created by incentive and labeling programs encourages manufacturers to develop and introduce improved products. Bringing new technologies into the marketplace, however, requires significant investment, and market risk is an important factor in manufacturers' decisions to proceed.

To offset this risk, and accelerate the introduction of new efficiency technology to the market, the US Department of Energy sponsors a program to identify and organize prospective purchasers interested in buying new, highly efficient products in substantial numbers (provided manufacturers make them available at acceptable prices). Balancing the needs and preferences of the buyers with the technological capabilities of producers, the program develops aggressive, but achievable, specifications and uses them as the basis for competitive procurements on behalf of the buyers. The objective is to stimulate introduction of new products to meet buyers' needs by increasing the manufacturers' confidence that someone is prepared to buy them in sufficient numbers.

Discussions with researchers, manufacturers and buyers identified light commercial unitary air conditioners as a promising target for this approach. The federal government, a major buyer of air conditioners, had received executive orders, notably Executive Order 13123, requiring agencies to purchase efficient equipment and thereby minimize life-cycle cost (EO 13123 1999). Manufacturers indicated that if significantly more buyers based their purchasing decisions on life cycle cost, rather than first cost, they could improve the efficiencies of the products they offered for sale, especially if partial-load performance were taken into account. Among the technology options were several ways to increase heat-transfer surface area, heat-transfer coefficients, and compressor and fan efficiency, as well as to improve capacity control, utilize electronic expansion devices, and employ liquid overfeed technology.

In consultation with the Federal Energy Management Program (FEMP), the Defense Logistics Agency, several energy service companies and other national air conditioner buyers, the program developed a set of product specifications and a simple method of estimating life-cycle cost. The cost estimation method, presented in a spreadsheet, takes into account hourly temperature and humidity conditions, and reflects energy consumption by a given air conditioner corresponding to those conditions throughout a typical year. The consumption data can then be combined with applicable electric rates and the unit's initial price to derive its life-cycle cost. These specifications and the cost estimator form the core of a request for proposal (RFP) for unitary packaged air-conditioners between 65,000 Btu/hour and 135,000 Btu/hour, issued on behalf of the Department of Energy and the Defense Logistics Agency in January of this year. Proposals were due at the end of March, and to qualify, efficiencies had to exceed CEE Tier II levels. Winners, selected according to the evaluation criteria, will be awarded basic ordering agreements, allowing buyers to acquire the units at an established price and on delivery terms offered by the bidders.

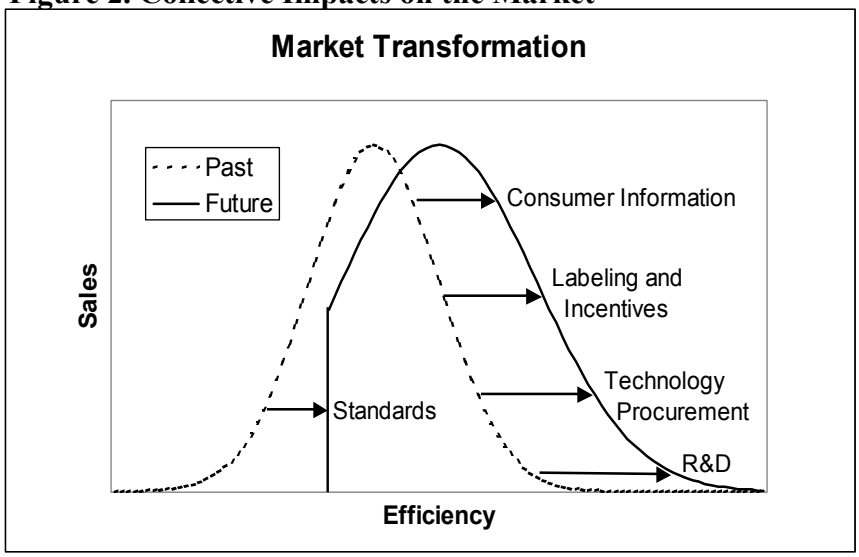
DOE is also making information and analytical information available for installers and buyers; this includes a Web-based cost estimator tool that is slightly more complicated than the one offered by the Cool Choice initiative (available at www.pnl.gov/uac). In general, the DOE Web site emphasizes product features, including elements of design and fabrication that lend themselves to reliably efficient operation over time. Cool Choice covers similar material with more detail on utility rates in the Northeast and sound product choices for specific buildings and correct installation practices. The DOE cost estimator, an outgrowth of the selection criterion for the procurement project, is designed to help users select optimal equipment by comparing the life-cycle costs of models with different efficiency levels under typical hourly temperature and humidity conditions at any one of 237 US locations.

Much of the impetus for issuing the RFP, and incentive for responding to it, arose from the Defense Logistics Agency's plans to offer the winning units for sale to both military and civilian federal agencies. Additional inducement came from private sector buyers, who expressed interest in purchasing winning units, and DOE's articulated plans to publicize the availability of the units through its efficiency programs. Finally, CEE's HECAC Committee expressed interest in using efficiency levels of the winning units as the basis of a future efficiency specification tier for its programs.

Anticipated Collective Impacts on the Market

Figure 2. illustrates how the several types of transformation measures discussed in this paper move the market toward higher efficiencies. For a given product, each curve represents the distribution of unit sales over the range of possible efficiencies at different points in time. Research and development extends the range of what is technically and economically feasible, and technology procurement brings products embodying new technology into the marketplace. Labeling existing products at the upper end of the range, providing incentives to buy them, and informing consumers about the cost of energy consumption at all efficiency levels serve to move sales in a positive direction. A common specification, or set of target energy-efficiency levels, is necessary, however, to maximize the effectiveness of each of the efforts and to take full advantage of the synergistic effects in the market. Finally, government and industry minimum standards remove the lowest-efficiency products from the market.

Figure 2. Collective Impacts on the Market



Appendix A. CEE Commercial Air Conditioning Program Participants

City of Palo Alto Utilities
Conectiv Power Delivery
Connecticut Light & Power
Efficiency Vermont
Federal Energy Management Program
Fitchburg Gas & Electric
GPU Energy
Granite State Electric
Hawaiian Electric Company*
Long Island Power Authority
Massachusetts Electric
Narragansett Electric
Northeast Energy Efficiency Partnerships
NSTAR Electric
NYSERDA
Pacific Gas & Electric
Pacific Northwest National Lab
Public Service Electric & Gas
Public Service of New Hampshire
Sacramento Municipal Utility District
San Diego Gas & Electric
Southern California Edison
State of California*
State of Oregon (tax program)
United Illuminating
US Environmental Protection Agency
Western Massachusetts Electric
Wisconsin Public Service
Xcel Energy**
*program expected in 2002
** Tier I program only

Appendix B. CEE Commercial Air Conditioning Specification[8]

Minimum Equipment Efficiencies for *Unitary Commercial Air Conditioners*				
Equipment Type	**Size Category**	**Sub-Category**	**ASHRAE/ CEE Tier I Efficiency**	**CEE Tier II Efficiency**
Air Conditioners, Air Cooled (Cooling Mode)	<65,000 Btu/h	Split System	12.0 SEER	13.0 SEER
		Single Package	11.0 SEER	13.0 SEER
	≥65,000 Btu/h and <135,000 Btu/h	Split System and Single Package	10.3 EER 10.6 IPLV	11.0 EER 11.4 IPLV
	≥135,000 Btu/h and ≤240,000 Btu/h	Split System and Single Package	9.7 EER 9.9 IPLV	10.8 EER 11.2 IPLV
	>240,000 Btu/h	Split System and Single Package	9.5 EER 9.7 IPLV	10.0 EER 10.4 IPLV
Air Conditioners, Water and Evaporatively Cooled	<65,000 Btu/h	Split System and Single Package	12.1 EER 11.2 IPLV	14.0 EER
	≥65,000 Btu/h and <135,000 Btu/h	Split System and Single Package	11.5 EER 10.6 IPLV	14.0 EER
	≥135,000 Btu/h	Split System and Single Package	11.0 EER 10.3 IPLV	14.0 EER

[8]The full CEE specification includes several categories of heat pumps. To view the whole CEE specification, visit www.cee1.org/com/hecac/hecac-tiers.pdf

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