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BUILDING TECHNOLOGY
STATE AND COMMUNITY PROGRAMS

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DOE/EERE Emerging Technologies Program Overview

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Program Technology Scope

- New and emerging technologies to **improve energy efficiency in buildings**
 - **not yet commercialized**, but could be commercialized within three years with DOE assistance
 - **or are commercialized**, yet still in need of further refinement, performance verification, and support



Program Approach Scope

All approaches whose purpose is to speed the commercial introduction and early market acceptance, including:

- Field performance evaluation and verification
- Technology demonstrations
- Technology procurements
- Technical information and education projects



Technology Procurement

- Organize target large volume buyers and market influencers (such as utilities)
- Acquire their intentions to purchase new products meeting technical specifications developed in collaboration with buyers and manufacturers
- Issue an RFP to potential suppliers, requesting bids for new products meeting those specifications
- Select one or more winners, followed by promotions to maximize the purchase of the newly available products



Technology Procurement (cont.)

By working closely with potential buyers, technology procurement greatly increases the likelihood that products brought to market will be well-received by buyers. And by organizing large volume buyers for new products, technology procurement reduces the risks to manufacturers of new product introduction, and allows them to introduce products at more competitive prices.



Technology/Project Selection

No single process; selected through combination of :

- Opportunities identified in strategic planning
- Projects proposed by manufacturers
- Opportunities identified through special studies and reviews
- Technology improvements requested by major buyers in key market sectors

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Examples of Past Projects

- Sub-CFL Technology Procurement
- High-Efficiency Washer Field Evaluation
- Super-Efficient Apartment Size Refrigerator
- Commercial Laundry Waste Water Recycling and Heat Recovery System Project
- GFX Field Evaluation

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Sub-CFL Technology Procurement

- Intended to speed commercial introduction of smaller, less expensive compact fluorescent lamps (sub-CFLs)
- Led to development and market introduction of 16 new sub-CFLs
- Exceeded goal of 15 W lamp smaller than 5 inches
- Exceeded goal of one million sales (3.2 million at project close [May 2001])



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High Efficiency Washers Performance Verification

- Field performance verification of high efficiency Maytag clothes washers in Bern, Kansas
- Verified large energy and water savings.
- Received extensive major national media coverage, and laid groundwork for rapid growth in sales of high efficiency washers



Super-Efficient Apartment Size Refrigerators

- Project with NYPA and CEE led to development of new-to-market refrigerator
- Unit 30% better than DOE standards at no incremental cost
- Sales exceeding 100,000 units to housing authorities and other multi-family housing
- Also caused early retirement of over 60,000 inefficient refrigerators



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Commercial Unitary Air
Conditioner Technology
Procurement



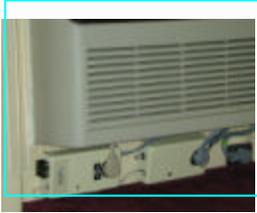
Recessed Downlights
Technology
Procurement

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Development and
Testing of
Residential HPWH



Development and
Testing of
Controller for
Hotels

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Current Projects (cont.)

Portable Lamps
Design
Competition &
Technology
Procurement



CFL Reflector
Lamp
Technology
Procurement



Demand Hot Water
System Field
Evaluation

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Focus on Commercial Unitary Air-Conditioners (UACs) Project



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The Market for Commercial UACs

- Packaged cooling systems serve about 15 Billion ft²
- 2 million out of 4.6 million air-conditioned buildings in the U.S.
- Sales in the 65-135 kBtu/hr capacity range totaled approx. 200,000 units in 2000



Commercial UAC Opportunity

- Annual energy use: approx. 700 trillion Btu (70 Terawatt-hours)*
- Manufacturers indicate that EER 13 to 14 is possible if significant numbers of buyers are serious about minimum life-cycle cost

* DOE Energy Policy Act Screening Analysis:
65-240 kBtu/h



The High Cost of Low Efficiency

- About 14% of available equipment models are considered high efficiency (EER >11.0)
- Most buyers opt for lower efficiency models with lower first cost
- Owners or occupants pay the higher operating costs, which exceed the incremental cost of more efficient equipment over time



High Efficiency Packaged HVAC Incremental Cost

| Unit Size | Energy Efficiency Ratio (EER) SEER <5 ton | | | Incremental Cost \$/ton* | |
|--------------|--|--------|--------|-----------------------------|--------|
| | Base Unit | Tier 1 | Tier 2 | Tier 1 | Tier 2 |
| <5 ton | 10.0 | 12.0 | 13.0 | \$60 | \$92 |
| 5 to 10 ton | 8.9 | 10.3 | 11.0 | \$41 | \$73 |
| 10 to 20 ton | 8.5 | 9.7 | 10.8 | \$46 | \$79 |
| >20 ton | 8.5 | 9.7 | 10.8 | \$53 | \$79 |

*Source: Adapted from Northeast Utilities "Cool Choice" Program



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Technology Options for Improving Commercial UACs

- Increased effective heat transfer surface area
- Increased effective heat transfer coefficient
- Improved compressor efficiency
- Improved fan efficiency
- Improved capacity control
- Electronic expansion device
- Liquid overfeed technology



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Buyers

Interest in purchasing or promoting higher-efficiency equipment expressed by:

- National accounts (Wal*Mart, 7-Eleven, McDonalds)
- Armed services (Defense Logistics Agency)
- ESCO's (Siemens, Enron Energy Services)
- Energy efficiency/market transformation programs (NY State Energy R&D Authority, Consortium for Energy Efficiency)



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Request for Proposals

- Drafted RFP in consultation with Defense Logistics Agency and other buyers
 - Detailed minimum specifications
 - Life-cycle cost formula and simulator
- Issued, January 2002
- Proposals received March 29, 2002
- Currently negotiating ordering agreements with winners



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Evaluation Criteria

- Equipment must meet Consortium for Energy Efficiency (CEE) Tier II levels:
 - Min. EER 11.0
 - Min. IPLV 11.4
- Winners selected based upon minimum life cycle cost

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[HTTP://WWW.PNL.GOV/UAC](http://www.pnl.gov/uac)



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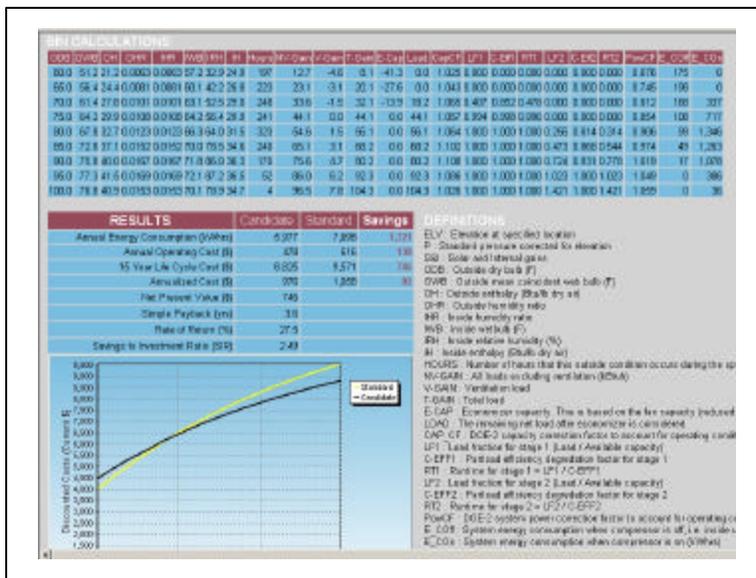
UAC Cost Estimator: Basics

- Web-based at <http://www.pnl.gov/uac>
- For 1-stage or 2-stage equipment
- Based on specific climate conditions for 237 US cities
- Takes part-load efficiency into account
- Relatively simple, non-technical inputs
- Estimates LCC, simple payback, rate of return, savings-to-investment ratio

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Data Input Form

| UAC COST ESTIMATOR | | Units | Labels | Factors |
|--|-------------------------------------|-------------------------------------|----------------------|---------|
| <p>Welcome to the Unitary Air Conditioner (UAC) energy and cost savings estimator.</p> <p>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.</p> <p>To use 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.</p> <p>Help on each control can be found by moving the mouse cursor over the question mark near the controls name. Note: this help feature works best in the Microsoft Internet Explorer browser.</p> | Date | MO | MO | |
| | City | KANSAS CITY | Kansas City | |
| | Schedule | M-F, 7 am to 7 pm | M-F 7am-7pm | |
| | Indoor Temperature | 75 °F | 75 °F | |
| | Enable Economizer | <input checked="" type="checkbox"/> | Economizer enabled | |
| | Total Capacity | 34 kBTU/h | 34 kBTU/h 2 Stages | |
| | Operating Factor | 0 % | 0% | |
| | Candidate Unit | 12 EER @ 45 Btu/h | 12 EER @ 14.00kwh | |
| | Standard Unit | 9 EER @ 41 Btu/h | 9 EER @ 14.00kwh | |
| | Electric Utility Rate | 0.09 \$/kWh | 0.09 \$/kWh | |
| | Annual Discount Rate | 0 % | 0.0 % | |
| | Evolution Rate | 0 % | 0.0 % | |
| | Equipment Life | 15 years | 15 years | |
| | Number of Units | 1 units | 1 unit | |
| | Show in calculations | <input checked="" type="checkbox"/> | Show in calculations | |
| Cost present value | <input checked="" type="checkbox"/> | Cost present value | | |





UAC Plans for the Future

- Sign agreements with winners in June 2002
- Expect to begin sales at most six months later
- Defense Logistics Agency to list winners, promote them through maintenance repair and operations program, and offer leasing
- Consortium for Energy Efficiency to consider new efficiency level for utility incentives based on procurement
- Possible Phase II RFP for more advanced equipment



Contacts for More Information:

<http://www.eren.doe.gov/buildings/emergingtech/>

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