

NOTHING BUT THE GREEN TRUTH:

EPA's Environmental Technologies Verification Program

What is perceived by healthcare administrators to be innovative, provide lower energy costs, produce faster patient recovery, improve air quality, and lower operating costs? Green buildings are perceived to provide those benefits and more, according to the latest research from McGraw-Hill Construction. Their research, outlined in the 2007 *Health Care Green Building SmartMarket Report*, predicts the healthcare construction sector to be the fifth fastest growing market for green building. The number of hospitals very dedicated to green building – defined as greening more than 30% of their portfolio – has more than tripled in 2008 compared to previous years.

The most important obstacle to healthcare green building cited in the survey was lack of knowledge about product information and product availability. The U.S. Environmental Protection Agency (EPA) recognizes that lack of independent, credible performance data is a major impediment to the use of innovative environmental technology, not just in healthcare construction but in all commercial construction markets. To overcome this barrier, EPA established a program to accelerate the implementation of environmental technology through objective verification and reporting of technology performance. Established in 1995, the EPA Environmental Technology Verification (ETV) Program develops testing protocols and verifies the performance of innovative technologies that have the potential to improve protection of human health and the environment.



Environmental Technology Verification Program

The ETV Program operates as a public-private partnership mainly through cooperative agreements between EPA and private nonprofit testing and evaluation organizations. These ETV verification organizations work with EPA technology experts to create efficient and quality-assured testing procedures that verify the performance of innovative technologies. ETV now operates six centers which cover a broad range of environmental technology categories. Vendors and others in the private sector, as well as federal, state and local government agencies, cost-share with EPA to complete priority ETV protocols and verifications. In 2005, a new element of ETV was initiated, Environmental and Sustainable Technology Evaluations (ESTE), in which the most important technology categories for meeting EPA needs are verified through contracts with verification organizations.

Since its inception, ETV has verified almost 400 technologies and developed more than 85 protocols. In 2006, EPA published a two-volume set of 15 case studies which document actual and projected outcomes from verifications of technologies in 15 technology categories (EPA/600/R-06/001 and EPA/600/R-06/082). Seven types of outcomes are described; some examples include pollutant emission reductions, technology acceptance and use, scientific advancement, and human health impacts.

Performance Verification Objectives and Reporting

Like ENERGY STAR, ETV is a voluntary program that makes objective performance information available to



help decision making. However, ETV does not rank technologies, label or list technologies as acceptable or unacceptable, determine “best available technology,” or approve or disapprove technologies. Verification activities are announced in relevant publications, and on the ETV Web site (www.epa.gov/etv) and ETV listserv. Appropriate quality assurance procedures are incorporated into all aspects of the process and all reports are subjected to peer review. Verification statements based on the performance data in the reports are signed by EPA and the verification organization, and are posted on the ETV Web site.

Nine Green Building Technologies Verified

For healthcare facilities considering energy-related green building technologies, the ETV Program has verified two fuel cells and six micro-turbine/combined heat and power (CHP) technologies that generate energy at the point of use, and one ground-source heat pump for onsite water heating (See Tables 1, 2, 3). Full reports on each of these technologies can be found at www.epa.gov/nrmrl/std/etv/vt-ggt.html. ETV has also signed contracts with three vendors to verify mold resistant wallboard and recently updated the protocol for biological and aerosol testing of ventilation air cleaners, in preparation for testing in this area.

Vendors Wanted

A survey of participating vendors completed in 2001 showed overwhelming support for the ETV Program. Responses indicated that 73 percent of the vendors

Table 1. Verified Green Building Energy Technologies	
Microturbines and CHP Systems	Electricity Generating Capacity (kW)
Mariah Energy Corporation Heat PlusPower™ System ^A	30
Ingersoll-Rand Energy Systems IR PowerWorks™ 70 kW Microturbine System ^A	70
Honeywell Power Systems, Inc. Parallon® 75 kW Turbogenerator	75
Honeywell Power Systems, Inc. Parallon® 75 kW Turbogenerator with CO Emissions Control	75
Capstone Turbine Corporation 30 kW Microturbine System ^A	30
Capstone Turbine Corporation 60 kW Microturbine CHP System ^A	60
Fuel Cells	Electricity Generating Capacity (kW)
Plug Power SU1 Fuel Cell System	6
UTC Fuel Cells, LLC PC25™ Fuel Cell ^B	200
Ground-Source Heat Pump Water Heating System	Rated Performance & Heating Capacity
ECR Technologies, Inc. EarthLinked® Water Heating System	36,000 Btu and 60 gallons/hour ^A

A Includes heat recovery for CHP

B UTC Fuel Cells, LLC was known as International Fuel Cells Corporation when it was verified in 1998. The technology has since been renamed as the PureCell™ 200.

Table 2. Performance of Verified Energy Technologies		
Parameters	Fuel Cells	Microturbines
Power Production^A		
Electrical efficiency	23.8% to 38.0%	20.4% to 26.2%
Potential thermal efficiency	56.9% ^B	7.2% to 47.2% ^C
Potential total system efficiency	93.8% ^B	33.4% to 71.8% ^C
Emissions Rates		
CO ₂ , lbs/kWh ^D	1.31 to 1.66	1.34 to 3.90
NOX, lbs/kWh ^D	NA	4.67 x 10 ⁻⁵ to 4.48 x 10 ⁻³

- A At full load, under normal operation.
 B The potential for heat recovery was verified in one of the three tests.
 C For the four systems with heat recovery
 D lbs/kWh = pounds per kilowatt-hour


Table 3. Performance of Verified Ground-Source Heat Pump Water Heating System	
Thermal	
Water heating capacity ^A - Low temperature short-term test- Elevated temperature short-term test	35100 + 1300 Btu/h 32300 + 1100 Btu/h
Coefficient of Performance	
Coefficient of performance- Low temperature short-term test- Elevated temperature short-term test- Long-term in-service test ^B	3.58 + 0.12 2.7 + 0.1 4.43 + 0.09
Change in average system efficiency ^{B,C}	3.00 + 0.07%
Change in electrical power consumption ^C	75 + 6%
Emissions	
CO ₂ emissions reductions, lbs/kWh ^C	1390
NOX emission reductions, lbs/kWh ^C	2.96

- A Results are not adjusted to account for the average standby heat loss, 490 + 90 Btu/h.
 B Coefficient of performance only looks at the performance of the device under testing, while average system efficiency characterizes the performance of the whole system.
 C Long-term test result. *Source:* Southern Research Institute, 2006.

were using ETV information in product marketing, and 92 percent of those surveyed responded that they would recommend ETV to other vendors. To date, more than 65 vendors have had multiple products verified by ETV.

Verification has led to improvements in sales. For example:

- Over 1,300 heavy-duty diesel vehicles (often school buses) have been retrofitted with ETV-verified devices using federal and state grants.
- Sales of verified microturbines have increased since verification, resulting in an additional 190 to 220 installations.
- Business tripled for a residential technology vendor after his technology was verified, one third of which the vendor attributed to verification.

Applications are now being accepted for verification of technologies associated with distributed electrical generation and advanced energy technologies that produce or use renewable energy sources. To have your greenhouse gas technology considered, complete the application at http://www.sri-rtp.com/application_for_testing.pdf. 

Clark Reed is the Director of the Healthcare Facilities Division for ENERGY STAR at the U.S. EPA. In 2006, ENERGY STAR helped Americans save enough energy to power 26 million homes, reducing greenhouse gas emissions equivalent to that of 25 million cars — all while saving consumers \$14 billion. To join, visit ENERGY STAR's website or contact the author at the U.S. Environmental Protection Agency - MC 6202J, 1200 Pennsylvania Ave NW, Washington, D.C. 20460. Email: reed.clark@epa.gov Phone: 202-343-9146.