



# Smart Scrubbers for HVAC Load Reduction

## What is this Technology?

This heating, ventilation, and air conditioning (HVAC) load-reduction technology reduces the volume of outside air required to maintain indoor air quality (IAQ) by using absorbent materials to selectively remove contaminants from HVAC airflow. Indoor-generated molecular contaminants, such as carbon dioxide (CO<sub>2</sub>) and volatile organic compounds (VOCs), are too small to be captured by traditional HVAC filtration. Instead, current best practice is to dilute their concentration by adding outside air, which can involve replacing all the air in a building between 10 and 20 times a day. This HVAC load-reduction technology uses an absorbent material to “scrub” the air of molecular contaminants, thereby diminishing the need for outside air and reducing energy costs. Control software constantly monitors indoor air and optimizes operations. The technology is modular and attaches to individual zones or air handlers. It can be retrofitted onto existing HVAC systems or incorporated into new systems, and enables downsizing of chillers and supporting infrastructure.

## Why is GSA Interested?

Before the advent of central HVAC systems, the buildup of molecular contaminants was a non-issue—outside air was available by simply opening a window. But in contemporary sealed commercial structures, HVAC systems are responsible for IAQ. Reducing the need for outside air to maintain IAQ could provide GSA with average annual HVAC energy savings of 20%. Additional savings are anticipated due to reduced cooling tower use and associated water and sewage use.



**ENERGY EFFICIENCY** Typically, 80% or more of outside air intake can be eliminated by this technology, resulting in average annual HVAC energy savings of 20%. A preliminary demonstration in 2013 resulted in a 40% reduction in peak summer cooling energy.



**COST-EFFECTIVENESS** Cost-effectiveness will depend on baseline building efficiency, climate, and the local cost of energy. Assuming 20% annualized savings, the manufacturer estimates payback in under 3 years. The technology will be most cost-effective in warmer and humid climates where cooling costs are high, or, conversely, in extremely cold climates.



**OPERATIONS & MAINTENANCE** Maintenance is minimal, requiring annual replacement of sorbent cartridges. Because the technology reduces the load on HVAC equipment, it has the potential to extend HVAC operational life as well.



**DEPLOYMENT POTENTIAL** This technology could potentially benefit all GSA buildings that rely on central HVAC systems, particularly those in hot, humid climates and in locations with high energy costs.

*The Green Proving Ground program has commissioned the National Renewable Energy Laboratory to perform real-world measurement and verification of smart scrubbers for HVAC load reduction in a pilot installation in a federally owned building within GSA's inventory.*



The Green Proving Ground program leverages GSA's real estate portfolio to test innovative building technologies. The program helps GSA meet its sustainability goals by providing actionable data that informs investment decisions targeted at energy-use reduction.