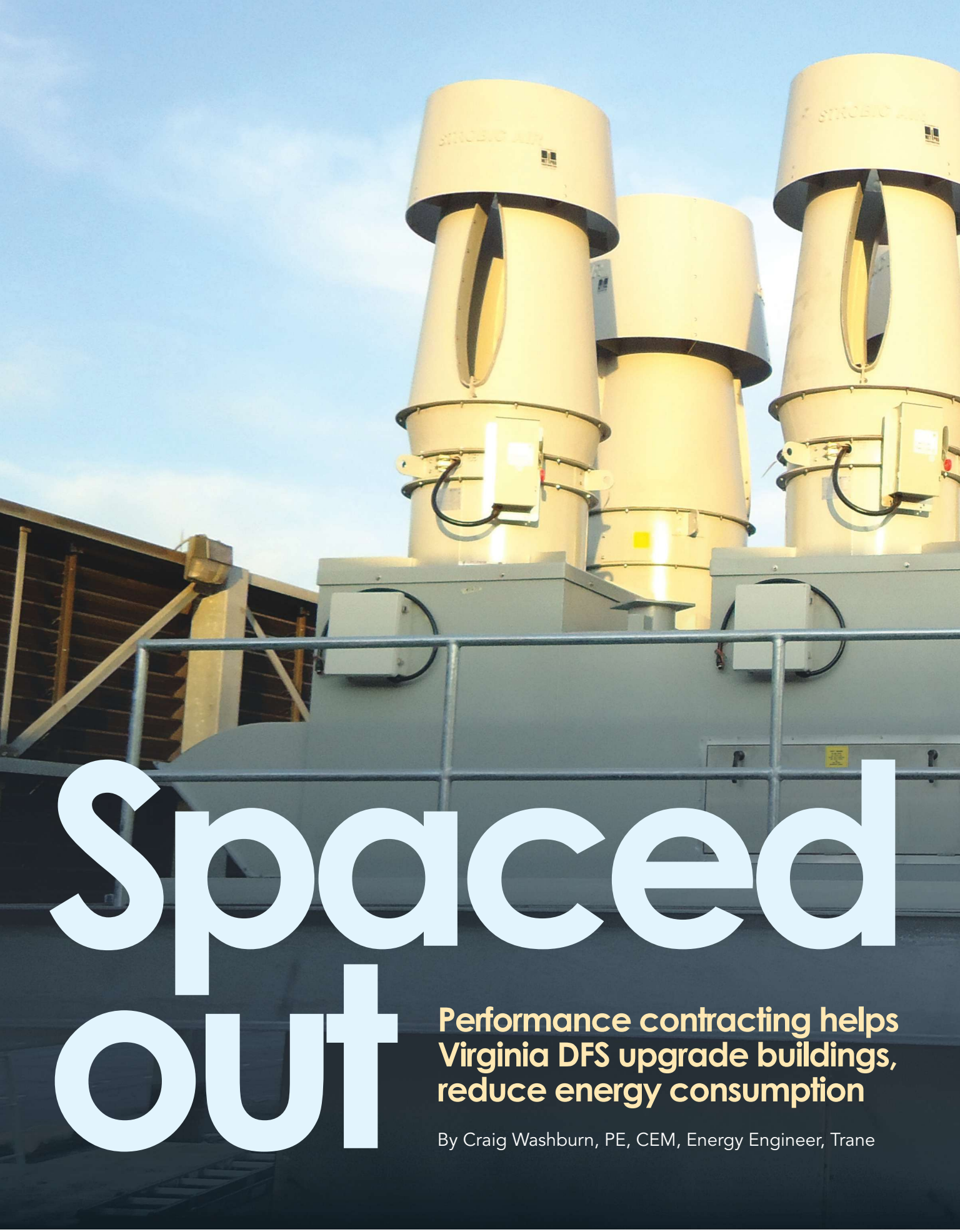

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Performance contracting helps Virginia DFS upgrade buildings, reduce energy consumption

By Craig Washburn, PE, CEM, Energy Engineer, Trane

The Virginia Department of Forensic Science (DFS) is a nationally accredited forensic laboratory system that provides forensic services to more than 400 law enforcement agencies in the state. The department has nearly 300 employees in four buildings located in Richmond, Norfolk, Roanoke and Manassas — space totaling more than 500,000 square feet.

Aging heating, ventilation and air conditioning (HVAC) systems not performing up to expectations were costing time and money, and the department faced many challenges, including multiple repairs, increasing maintenance calls and issues of occupant comfort.

DFS wanted to make upgrades to address these challenges in its four buildings. They also wanted to implement solutions to minimize energy demand and consumption in keeping with Executive Order 31 signed by Virginia Governor Terry McAuliffe, which directs state agencies to reduce electricity consumption by 15 percent in state buildings by 2017.

But like many public agencies with ever-tightening budgets, DFS did not have the funds necessary to address increasing energy costs and aging mechanical systems.

The department found a solution through performance contracting, a funding model that allowed DFS to implement building improvements expected to reduce energy consumption by about 40 percent and save more than $1 million in taxpayer dollars annually.

"The upgrades have also reduced the buildings' environmental impact while improving comfort and productivity for our staff and visitors."

– Henry Caprio, Facility Manager, Virginia Department of Forensic Science

Taking steps to improve

Upgrades were needed in the department's four buildings to minimize energy demand and consumption, to update heating plants at the Roanoke, Richmond and Norfolk facilities, and to ensure building exhaust redundancy in the Richmond facility, among other items.

Several Virginia governors have supported performance contracting as a way for state agencies to reduce energy consumption without the need to invest significant capital dollars. With performance contracting, agencies receive funding to upgrade building infrastructure and achieve the measurable results they're looking for — and use existing operational dollars to finance the improvements.

incorporate current efficiency and sustainability technologies without sacrificing performance, and without expanding our operational budget."

Trane engineers conducted a high-level energy analysis of one DFS building to show the possibility for savings. Based on those results, the department was convinced of the opportunity and put out a request for proposals (RFP) for the project. After Trane was selected in the RFP process, engineers conducted an in-depth energy audit of all four DFS buildings.

"We hoped that this project would allow us to incorporate current efficiency and sustainability technologies without sacrificing performance."

– Linda Jackson, Agency Director, Virginia Department of Forensic Science

For example, if improvements are projected to save 30 percent on a utility bill, the agency receives a loan for the upgrades and uses the savings to pay it back over time. The operational budget of the agency does not increase, but rather a portion is redirected. So, in addition to being stewards of the environment, it allows public bodies to be good stewards of taxpayer dollars.

Virginia DFS reached out to Trane, a leading global provider of indoor comfort solutions and services and a brand of Ingersoll Rand, to determine if the performance contracting option made sense to meet the department's needs.

"Laboratories struggle with maintaining energy efficiency without a loss in operational effectiveness," says agency director Linda Jackson. "We hoped that this project would allow us to

Based on that detailed information, energy engineers developed a list of possible solutions, along with the associated energy savings and costs to determine the payback and timeline to complete the work. Working through those energy conservation measures (ECMs) together, Trane and DFS determined the priorities for the project.

"In evaluating potential partners for this project, we looked for a company that envisioned a team approach," says Henry Caprio, facility manager for the department. "Trane's project team members had just that approach, understanding the need to work with agency staff so that the project could progress with as little disruption to agency operations as possible."

The Virginia Department of the Treasury funded the improvements through a loan from a private lender, with technical

assistance and approval from the Virginia Department of Mines, Minerals and Energy. This funding scheme allowed DFS to use future energy and operational savings to finance the infrastructure improvements upfront.

Solutions improve efficiency and performance

A wide range of solutions were chosen to help DFS reach its efficiency, sustainability and occupant comfort goals in several phases of the project. Upgrades to the buildings included:

- **Airflow rebalancing to ensure that the laboratories were not over-ventilated and wasting energy to heat and cool the excess air.** A safety consultant helped determine that ventilation rates could be safely reduced in the labs without affecting indoor air quality or occupant health and safety.

- **Fume hood retrofits for the installation of high-performance, constant-volume hoods in the labs.** The previous hoods required more airflow to operate effectively, while the new hoods operate more efficiently.

- **Optimization of existing controls systems in each building.** These changes to how the heating and cooling systems operated help improve efficiency and reduce energy consumption when the buildings are empty.

- **New heating plants in the labs in Richmond and Norfolk facilities,** along with a new summertime boiler in the Roanoke lab, to improve heating plant efficiency and performance and reset the life cycle.

- **Installation of a new Trane water-cooled chiller at the Richmond laboratory.** The facility previously required two 650-ton chillers running at near maximum capacity on hot summer days. With the project upgrades, the building cooling load was reduced from 1,300 tons to 900 tons, allowing for installation of a new 270-ton Trane centrifugal chiller with adjustable frequency drive (AFD) to handle the cooling load during milder parts of the year when the existing machines would be too large to operate without excessive cycling. An AFD also was installed on one of the existing chillers to allow it to run at lower loads more effectively and improve overall efficiency.

- **Installation of two new Trane chillers at the Norfolk facility to reflect the significantly reduced cooling load in the building.** The smaller chillers effectively meet the new cooling requirements and incorporate variable speed pumping into the plant.

- **Reverse osmosis water purification upgrades at the Richmond and Norfolk facilities.** The new systems provide greater efficiency and require less electricity and water to provide the same amount of purified water.

To help make sure that updated systems continue to run at optimal efficiency, DFS also incorporated Trane Intelligent Services offerings that paired expertise from a Trane services team with ongoing data monitoring. This process monitors and analyzes data from approximately 100 sub-meters across the DFS asset portfolio, so the facilities team can be informed when systems need attention.

Significant savings result

Once the first phase of the project was complete, measurement after the first year of operation verified that the changes saved DFS $1 million on its energy spend — or 36 percent of the utility budget. That savings was even greater than the $800,000 in annual energy savings that Trane guaranteed as a result of the energy audit.

Results were so successful that DFS implemented a second phase of the project and is now considering a third phase of improvements. In total, the department expects to reduce energy consumption by more than 40 percent and save more than $1 million annually.

Leveraging the performance contract model allowed DFS to address energy and sustainability issues and upgrade building systems and equipment — all without taking on financial risk or stretching the existing budget.

"We are extremely proud of the fact that our energy performance contracts have allowed for good stewardship of taxpayer dollars and significant energy savings," Jackson says.

In addition to the reduced energy consumption and resulting savings, the solutions also helped improve the safety and comfort of DFS employees.

Leveraging the performance contract model allowed DFS to address energy and sustainability issues and upgrade building systems and equipment — all without taking on financial risk or stretching the existing budget.

"The Trane project team delivered results that not only reduced our utility spend, but greatly enhanced the reliability and efficiency of our physical plants," Caprio says. "The upgrades have also reduced the buildings' environmental impact while improving comfort and productivity for our staff and visitors." FC