

## EDUCATION PARTNER

### UNIVERSITY OF VIRGINIA



Photo courtesy of U. Va Media Relations

#### Implementation Model: Internally Funding Energy Efficiency with Delta Force

##### ORGANIZATION TYPE

Public University

##### BARRIER

Energy conservation projects were difficult to justify because the funding sources were rarely the same entities that captured the resulting cost savings. A mechanism was needed to create a self-funding source to fund conservation projects from realized savings.

##### SOLUTION

Implement an internal, cross-functional team (Delta Force) to perform retro-commissioning on the most energy intensive buildings.

Create a cost-recovery program akin to a revolving loan fund, so future projects can be paid for with metered savings from past and future projects.

##### OUTCOME

From FY08 through FY14, UVA invested over \$6 million in energy efficiency projects and realized nearly \$15.3 million in avoided costs. Since its inception, the program's simple return on investment is 2.4:1.

### Overview

The University of Virginia, located in Charlottesville, Virginia, serves over 39,000 students, faculty and staff and comprises over 500 buildings. Facilities Management is responsible for the stewardship of the

built environment and also serves as a utility provider to the university. They created Delta Force, U. Va.'s streamlined soup-to-nuts program for getting energy efficiency done across Grounds..

Through Delta Force, the U. Va. energy management team identifies projects that can deliver the most energy savings at the lowest cost, loans the project money from an internal bank, and in many cases completes the design and construction work with U. Va. staff. Projects pay loans back to the Delta Force account through realized energy savings. This interdisciplinary, team-based approach allows U. Va to optimize the performance and sustainability of the most energy intensive existing buildings on Grounds.

The University seeded Delta Force with \$400 thousand dollars. This funding was generated from a pilot energy efficiency project and a \$1 million line of credit from the university. The program has yet to use the line of credit, paying for all projects with cash on hand from savings from initial efficiency projects. Since 2007, Delta Force has funded over 20 projects, some encompassing many buildings, and saved the University over \$15 million in avoided energy costs. The energy management team credits lean design and construction processes and strong collaboration with building staff at each project site with Delta Force's success.

## University of Virginia's Playbook



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### Policies

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In addition to the Better Buildings commitment to reduce campus energy use by 20% over 10 years, the university has committed to reducing greenhouse gas (GHG) emissions 25% by 2025 compared to a 2009 baseline. The Board of Visitors, responsible for long-term planning at the University, has also resolved to “educate and engage its students, faculty, staff, and the larger community”. Helping to achieve these goals is vital to Delta Force's mission.

The energy management team developed a Memorandum of Understanding (MOU) with the University, which included the initial funding and a one million dollar line of credit for energy efficiency projects. Projects are expected to pay for themselves through energy savings.

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### Process

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#### Initiating Delta Force

The U. Va. energy management team approached the Vice President for Management and Budget in 2007 with a request for approval of a pilot project and a line of credit to start an internal account to fund energy efficiency improvements on grounds.

In 2008, the administration agreed to provide the metered savings from the pilot project and a \$1 million line of credit to the energy management team for this purpose. One theory holds that the reason the fund was dubbed Delta Force is because it would grow through the difference or “delta” between the original energy bill and the post-retrofit bill. The energy management team began with “low hanging fruit”, projects that were fairly inexpensive and would yield quick and significant savings, seeding the fund for future projects. This strategy has been so successful that the Delta Force account rarely dipped into deficit, funding projects with savings on hand.



## Selecting Projects

Delta Force project selection begins with prioritization of the biggest energy consumers in U. Va.'s portfolio based on building level utility metering (using total kBtu and kBtu/sf metrics). Project selections are made based on the team's current resources. As the program matures, the energy management team has begun to sync Delta Force projects with other projects such as a planned controls replacement or other upgrades.

Once a building is targeted, a Delta Force team is assigned to the building. Each building's Delta Force Team includes members of the Office for Sustainability, area maintenance staff, the building coordinator, and external support professionals with expertise in commissioning and HVAC testing and balancing. A U. Va. energy engineer engages occupants (see Outreach below) and performs an energy audit to determine which conservation measures will be most effective in the building. Most system improvements are completed in-house by U. Va.'s staff engineers, which reduces costs and shortens timelines by reducing signatures and approvals required for permitting.

The U. Va. energy management team integrates many elements into Delta Force projects such as:

- **Retro-commissioning** – Retro-commissioning air handlers and key equipment, testing and balancing, reducing air changes where feasible and replacing chilled water valves with pressure independent controls.
- **Relamping** – Distinct from changing out fixtures, U. Va. has found excellent paybacks in replacing bulbs with higher efficiency version and screw-in LEDs.
- **Insulation and windows** – Targeted improvements to building envelopes, installing insulation jackets for steam systems and repair of damaged/missing insulation throughout.
- **Optimizing control settings** – Though Delta Force funds are not typically used to fund the switch from pneumatic to digital controls, the energy management team may partner with project planned through another university entity to provide additional funding that ensures a full-featured controls upgrade to a building. Delta Force works with the Instrumentation and Controls team to ensure that all of the desired energy conservation measures are included in the initial project scope. The Delta Force Energy Engineers provide technical support and commissioning of the improved system. The Sustainability Programs Manager for Buildings and Operations, Jesse Warren says, "Our biggest opportunity is the day we switch over from pneumatic to digital controls in a building. We can implement schedules, resets, variable speed control and other energy conservation measures that are invisible to the building occupants."

## Funding Projects from the Delta Force Account

The U.Va energy management team selects, approves, and funds projects directly from the Delta Force account. This autonomy reduces administrative costs and total project time allowing the Facilities Management team to manage the financing for projects without burdening the specific department or individual building staff. In most cases, the energy management team has data from previous projects which it can use to estimate savings for future projects.

## Implementing Delta Force Projects

Delta Force projects typically cost between \$100,000 and \$600,000 and last no more than two years. A U Va. Energy Engineer oversees the process to ensure work quality. All projects require the assistance of other mechanical trades. Larger projects will embed HVAC technicians, pipe fitters or electricians into the project team. U. Va. contracts out most re-lamping projects in order to complete the work as quickly as possible with minor interruption, often at night.

During retro-commissioning, U. Va staff including, one or two controls and Testing and Balancing (TAB) technicians support the testing and repair of building systems. U. Va. also staffs the instrumentation and controls team which consists of three engineering technicians and several controls technicians to complete upgrades to pneumatic and digital building controls and perform maintenance in-house. This team can also re-program or add points to existing building controls systems or install a new system.

### **Paying Back a Delta Force Loan**

Once a project has progressed far enough to generate savings, the energy management team compares (non-weather normalized) pre and post retrofit energy use data to calculate the energy savings from each project on a monthly basis. Savings are then allocated to pay off the internal loan on the project. Savings are allocated until the loan has been paid at 125% of the original cost of the project. The additional 25% covers soft costs and seeding future projects. Once the project is paid off, the cost recovery is released and the building sees lower utility bills.

### **Attracting and Retaining a Qualified Energy Management Staff**

One side benefit of the Delta Force program has been its appeal to qualified energy management staff. The revolving fund allows the energy management team to be nimble and largely autonomous in their efforts to improve efficiency on grounds. This positive work environment attracts good staff. While many universities struggle to find and keep energy management professionals, losing well-qualified staff to the private sector and larger salaries, Delta Force has helped to retain a strong energy management team at the university.



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## Outreach

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### **Working with Building Staff**

Because Delta Force strives to engage occupants in sustainability, outreach is vital to its success. Every building has a Customer Service Representative at U. Va. The representative is a member of the Facilities Management staff and serves as a liaison to the building occupants. Buildings also have a Facility Coordinator, typically part of an academic department's staff, who deals with day-to-day building issues. The energy management team works with both the Customer Service Representative and the Facility Coordinator on each project to communicate to occupants over the course of an upgrade project.

Delta Force projects include a kick-off event, which may include a small or large group of building occupants and details on the scope and timeline for the project, the expected benefits for building occupants, and information about who to contact with questions or concerns. The conclusion of each project includes a celebration with food and drink, and visuals describing the work completed and energy savings achieved.

The energy management team considers Facility Coordinators to be particularly important to project success, since they communicate directly with building occupants throughout the year and can act as the advocates for energy efficient behavior. The energy management team engages Facility Coordinators at an annual event to provide information and resources on promoting energy efficiency in their buildings.

Additional outreach initiatives that have arisen out of the Office for Sustainability include energy efficiency signage (e.g. "Flip the Switch"; "Shut the Sash") and energy competitions between various buildings.

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## Measuring Success

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The University tracks the energy, carbon, and cost savings associated with all projects. The impact of the program is evaluated based on the reductions achieved. Delta Force strategy and analysis is conducted on a monthly basis by a team of project managers and facilities management staff. Monthly metering is monitored by a single staff analyst in order to track savings, validate, and monitor building energy reduction.

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## Outcomes

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From FY08 to FY14, almost \$6.4 million was invested in the Delta Force retro-commissioning initiative. To date, over 20 projects have been implemented. Some projects include multiple buildings. With an avoided cost to date of nearly \$15.3 million, the simple return on investment is 2.4:1 since the program's inception. The table below details a few recently funded projects.

Project	Description	Building size (sq. ft.)	Project Cost	Average Annual Savings (kWh, \$)	Simple Payback (years)
<b>Observatory Hill Dining Hall</b>	Year Built: 2005 Building Type: Dining Hall/Mixed Use ECM Opportunity: adjusting kitchen fume hoods	69,876	\$515,233	\$99,000	5.2
<a href="#"><u>Campbell Hall</u></a>	Year Built: 1969 Building Type: Classroom and Architectures Studio Space ECM Opportunity: lighting retrofit	138,977	\$336,409	\$97,000	4.7
<b>Biomedical Engineering &amp; Med Science Bldg</b>	Year Built: 2002 Building Type: Medical Research ECM Opportunity: converted HVAC to VAV	164,206	\$358,675	\$198,000	1.8
<b>Thornton Hall</b>	Year Built: 1936 Building Type: Classroom and Offices (UVA Engineering School) ECM Opportunity: modernizing and fine tuning HVAC	159,384	\$302,620	\$144,000	2.1

As the data show, Delta Force work yields a wide range of savings. Each project is a special case that takes into consideration the building type, typical occupant behaviors, type of system and age of building.