★ Vanderbilt University located 1 mile from downtown Nashville, TN. Founded with a $1,000,000 gift from Commodore Cornelius Vanderbilt in 1873

★ Vanderbilt is a private research university and medical center with just over 12,000 undergraduate and graduate students, a faculty and staff of 24,176. Vanderbilt is the second largest private employer in the state of Tennessee.

★ We serve 14.5 M SQFT in 153 buildings Vanderbilt Medical Center & Campus, with some combination of central plant utilities including electricity, steam, and chilled water.

★ 7M SQFT Vanderbilt Campus
Vanderbilt Utilities: Facilities Network

- Building Automation Systems
- Data Warehouse, FD&D Platform
- Power Plant Operating System
- BACnet™
- Smart Buildings
- Smart Campus
- Smart Cities
Thousands of points:
VAVs, AHUs, pumps, valves, status …
Vanderbilt Utilities: Data Warehouse & FD&D Platform

Challenges:
- 7M+ SQFT of facilities to optimize
- Manpower & Analytical Expertise

Objectives with FD&D:
- Performance Commissioning
- Consolidate and manage operational data
- Generate Actionable Intelligence

Contracted with a vendor partner to implement FD&D in a single building test application, to include the system setup and a 30-day summary report.

Implementing FD&D in (2) additional facilities approximately every (3) months.

Added a prorated service agreement for quarterly analysis, formal reports and analytical support from our vendor partner.
Vanderbilt Utilities: FD&D Implementation

... a phased approach

CHW Valve hunting

Featheringill

Poor supply air temperature control

Excellent supply air temperature versus setpoint

CHW Valve now modulates consistently between 15% and 30%

Pumps still rotate normally

Figure 14: AHU-2 Real-Time Data Example
## Scorecard View

### BuildingLogiXTM Reports

### BDX Report Selector

- **New Reports**
  - VAV Scorecard
  - MVV Scorecard
  - Fan Coil Scorecard
  - Unit Vent Scorecard
  - VRF Unit Scorecard
  - Air Handler Unit Scorecard
  - Air Cool Chiller Scorecard
  - Chill Water Duct Scorecard
  - Building Scorecard
- **Saved Reports**
  - Alumni Air System Scorecard
  - Alumni Hall Air Handler Unit Scorecard
  - Alumni Hall Building Scorecard
  - Alumni Hall VAV Scorecard
  - Alumni Hall VRF Unit Scorecard
  - Buttrick Hall AHUs
  - Buttrick Hall Basement Air System
  - Buttrick Hall Basement VAVs
  - Buttrick Hall Basement VVs_Expanded
  - Buttrick Hall Boiler
  - Buttrick Hall Fan Coils
  - Buttrick Hall Floor 1 VAVs
  - Buttrick Hall Floor 2 VVs
  - Buttrick Hall Floor 3 VVs
  - Buttrick Hall Floor 4 VVs
  - Buttrick Hall Main Air System
  - Commons Air Handler Unit Scorecard
  - Commons Air System Scorecard
  - Commons Building Scorecard
  - Commons VAV Scorecard

### Commons VAV Scorecard

<table>
<thead>
<tr>
<th>Device Name</th>
<th>Overall</th>
<th>Efficiency</th>
<th>PMU Watt Avoidance in Cooling</th>
<th>Manual Effectiveness</th>
<th>Space Temperature Control</th>
<th>Zone Minimum Airflow</th>
<th>Supply Airflow Control</th>
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</tr>
</tbody>
</table>
9% reduction in Average Electrical Consumption
26% Reduction in Total Energy
36% Shift in night setback minimum

6.25 % kWh Electric Energy Reduction
Daily Chilled Water kbtu 46% Reduction from 2017

What’s Next for Vanderbilt …..
- Continue adding FD&D to existing VU facilities
- Integrate FD&D to new facilities
- Working with our vendor partner to develop FD&D applications for chiller plants
Vanderbilt FD&D: Plant Watch, Chiller Plant Efficiency
Extras
Off Schedule Runtime: 1042.8 Hours
Potential cost savings: $2188.90

Runtime Cost:
- In Sched.: $6,724.73
- Off Sched.: $2,165.90

Electric Consumption:
- 34.23 MWh
- Electric Cost: $2,738.24

Fuel Consumption:
- 2,677.25 MMBTU
- Fuel Cost: $15,656.43

Energy Savings by Resource:
- Chilled Water: 75% 10%
- Electric: 64% 5%
- Steam Condensates: 18% 10%

The savings represents approximately $17,830.77 in reduced energy costs.

Electric Demand:
- Weekday:
  - Min: 30.48 kW 1/17/19 2:55 AM
  - Max: 75.42 kW 1/28/19 12:40 PM
  - Avg: 47.28 kW
- Weekend:
  - Min: 33.64 kW 1/17/19 3:23 AM
  - Max: 66.54 kW 1/27/19 12:45 PM
  - Avg: 45.02 kW

Usage vs. Target Performance:
- 31 out of 31 days
  - Longest winning streak: 31 days on 1/2/19
- 0 out of 31 days
  - Longest losing streak: 0 days