

Radford University

Facilities Maintenance & Operations
Energy Management Program

Building Automation System Dual Sole Source

- In 1980, Radford University added Building Automation Controls with Johnson Controls Metasys systems.
- In 2009, Radford University added an additional Building Automation system with Automated Logic WebCtrl systems.

Campus Lighting

- The campus Outside Lighting is controlled from the BAS program that calculates sun-rise and sun-set times from latitude and longitude to turn on the lights and turn them off.
- This is more efficient than the earlier photocells.
- Lights upgraded to LED



Ice Storage

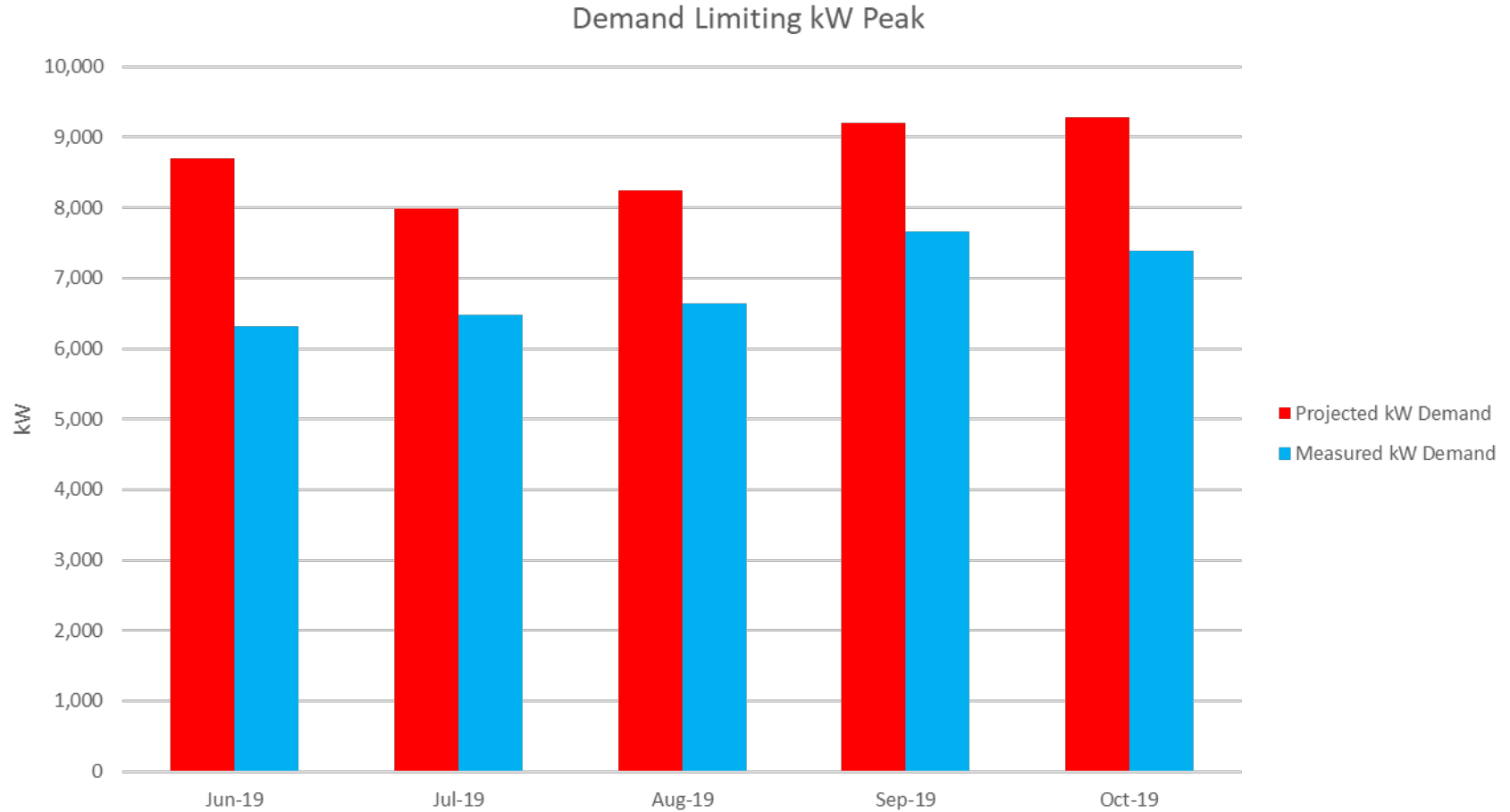
- The campus has six buildings that have ice storage with 4180 Ton/Hrs of capacity.
- During peak KW usage, the BAS Demand Limiting/Load Rolling program will raise the Chill Water Set point on the chiller to the highest setting possible which turns off the compressors and uses the ice that was built during the night to cool the building.



Demand Limiting/Load Rolling

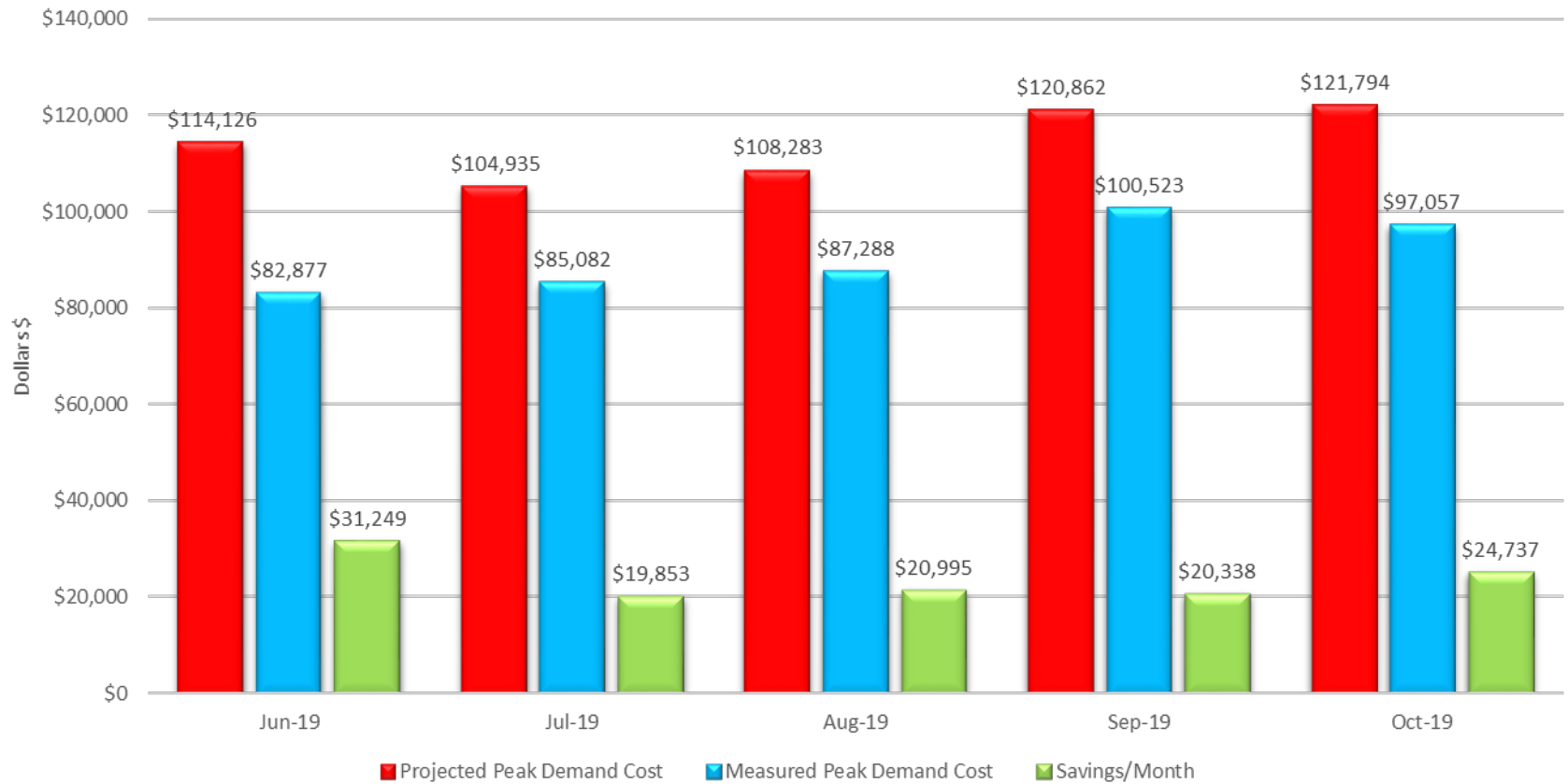
- Radford Uses Demand Limiting and Load Rolling to lower the KW (electrical demand) on campus. We have a “target” setpoint and when the campus KW meter nears that setpoint, the Building Automation System starts using ice in the six ice-storage buildings that we have on campus. If that doesn’t lower the KW below target, the system will start changing the chiller chill water setpoints up gradually. If that doesn’t lower the KW below target, the system will start resetting setpoints for Air Handling Units where possible.

Using the Demand Limiting to shave the Peak Demand



Shaving the Peak Demand Cost and Savings

Peak kW Cost and Savings





Waldron and Cook Education Buildings Ice Tanks

There are four tanks for Waldron College Building and three tanks for Cook Hall.

Dormitory Controls

- We have occupancy sensors and window contacts in place for ten of the dorms on campus.
- If the window is opened, it opens the contact from a magnet on the window and changes the room set points to unoccupied settings of 78 cooling and 65 heating.
- The same occurs when the room is unoccupied as sensed by the infrared occupancy sensor.



Magnet on Window

The magnet is located on the window. When the window is opened, the contact becomes open back to the controller.



Magnet wiring.

The wire for the magnet goes through the wall at the window and back to the controller in the Fan Coil Unit.



Infrared Occupancy Sensor

ESCO – DMME

Performance Contracting 2006

- In 2006, as part of an ESCO project, Performance Contractors added insulation to mechanical rooms and attic spaces on campus.
- Weather-stripping was added to mechanical room doors and exterior doors.



Insulation added at Cook Hall

The performance contractor added board insulation with blown in insulation around the panels for the attic area of Cook Hall.



Weather Stripping added at Mechanical Room Doors.

The performance contractor added weather stripping at all Mechanical Room doors.

ESCO-DMME

Performance Contracting 2010

- In 2010, we did another ESCO project with DMME. The vendors did not find anything from “low hanging” projects as we already do those ourselves.
 - They proposed a COGEN operation as a means for campus savings

Lighting Upgrade

- In 1995, we began changing light fixtures to T8 Electronic Ballast.
- Compact Fluorescent Light bulb's (CFL's) have been installed on campus.
- We are in the process of changing desk lamps to CFL's using bulbs provided by DMME.
- As Facilities Planning and Construction do new construction and/or renovations, LED lighting is used in the buildings.

We are using VFDs and Energy Efficient Motors for pumps and fans.



Motion Sensors

- Motion Sensors have been installed in Restrooms, Classrooms, Conference Rooms and Large Assembly Rooms on campus that control the lighting and HVAC equipment.
- We have motion sensors to control lighting in corridors

Motion Sensor



Economizer with CO2 Sensor

- Economizer Air Handling Units have been changed to Demand Response with CO2 sensors in the Return Air Duct or Zones to control the amount of Outside Air intake/Free cooling instead of Outside Air Temperature set points.
- This cuts down on heating/cooling at the AHU's in summer and winter.

VAV Air Handlers Reset

- We reset the Discharge Air and Mixed Air Set points based on Outside Air Temperature and Zone Temperatures.
- This reduces the amount of reheat used in the building.

Chill Water and Hot Water Reset

- Chill Water and Hot Water Reset from Outside Air Temperature.
- Chill Water Pumps, Chillers, and Hot Water Pumps are brought on by Outside Air Set points.

Scheduling of Equipment

- Schedules are used to take the equipment unoccupied at night with lower heating and higher cooling set points.
- We also use optimal start/stop which determines from the Outside Air Temperature and Zone temperatures when to bring equipment on to have the space temperature at set point when occupants arrive.

Steam Driven Condensate Pumps

- We have started to convert electric condensate pumps to steam driven pumps.

Continuous Re-Commissioning

- As funds become available we institute Continuous Re-Commissioning for the campus.
- The Department of Energy estimates a 20-35% savings from doing this.
- We will work with a test and balance company to reevaluate building operation to make sure we are as efficient as we can be.
- FEMP (Federal Energy Management Program) guidebook for Continuous Commissioning.

Trap Survey

- We do steam trap surveys each year to find all problems with the steam flow system on campus.
- The amount of energy lost through bad traps is substantial.

Energy Star

- So far, RU has six buildings that have qualified for Energy Star Ratings.
- You need sub metering in place to have the documentation needed to apply for Energy Star.
- RU has a combination of kw meters, steam meters, water meters, energy meters and condensate meters in all buildings.
- Once you have at least a year's worth of data you can apply online.

Applying for Energy Star

- Energy Star Web Page: ≥ 75 to Qualify

Portfolio Manager - Building View - Windows Internet Explorer

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=buildg_view_bldg_info

Building ID: 1532970
Level of Access: Building Data Administrator

Electric Distribution Utility: City of Radford ([change](#))
Regional Power Grid: [RFC West](#)
[Select my Power Generation Plant](#) to calculate my electric emissions rate
Electric Emissions Rate (kgCO₂e/MBtu): 205.5 ([what is this?](#))

[Generate a Statement of Energy Performance](#) for uses other than applying for the ENERGY STAR.

Year Built: 1964	
Property Type: Single Facility	
Facility is part of Campus: Radford University	
Baseline Rating: 73	Current Rating: 77

Eligibility for the ENERGY STAR
Not Eligible: Less than one year since the period ending date of the last ENERGY STAR application. Eligible again on 11/30/2009

Facility Performance [Set Baseline Period](#) | [Set Energy Performance Target](#)

Select View: Summary: Energy Use [Create View](#) | [Edit View](#)

12 Months Ending	Current Rating (1-100)	Current Site Energy Intensity (kBtu/Sq. Ft.)	Current Source Energy Intensity (kBtu/Sq. Ft.)	Change from Baseline: Energy Use Intensity (kBtu/Sq. Ft.)	Change from Baseline: Adjusted Energy Use Intensity (kBtu/Sq. Ft.)	Energy Use Alerts
August 2009 (Current)	77	45.3	130.3	-5.7	-8.7	
December 2007 (Baseline)	73	51.0	146.2	0.0	0.0	
Change	-4	5.7	15.9	N/A	N/A	

REFRESH VIEW

Energy Use Index (EUI)

- Radford uses the meters in all buildings to track building performance using the Energy Use Index.
 - Used to determine retro-commissioning needs
 - Track performance for better maintenance scheduling
 - Flag anomalies as they occur

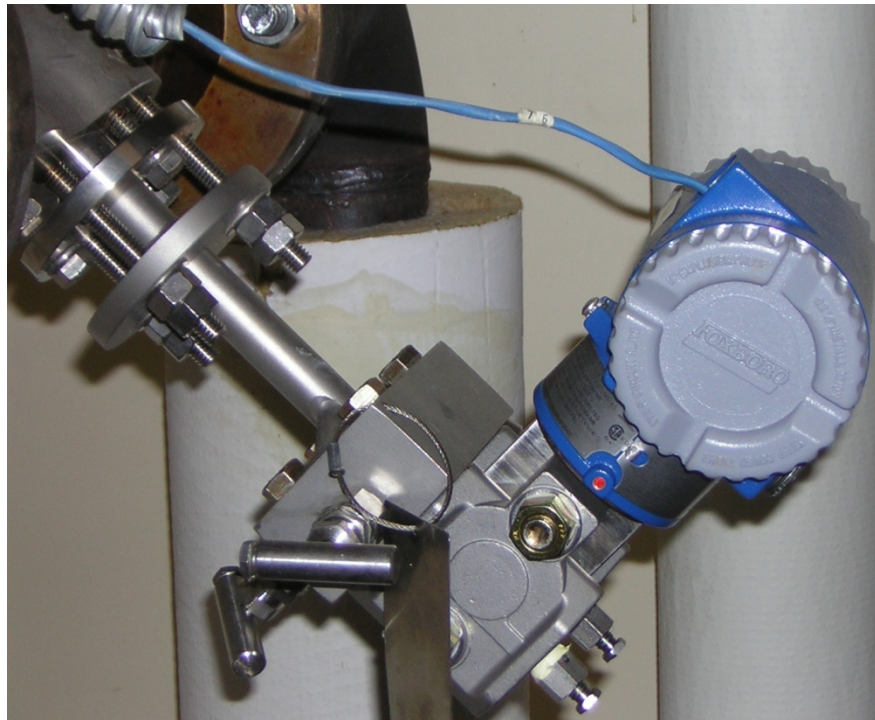
Radford University Metering

- Individual Building
 - Electrical meters
 - Steam meters
 - Water meters
 - Energy meters (BTU) for chill water/hot water usage
 - Condensate meters for steam usage calculations

KW Meter



Steam Flow Meters



Water Meter



BTU/Flow Meter



Water and Steam Sensors

- Radford University uses steam pressure sensors in numerous buildings
 - Alarms for low/high steam pressure
 - Shared with Boiler Plant operators and operational personnel
- Radford University uses water pressure sensors in numerous buildings
 - Alarms on low/high water pressure
 - Shared with Radford City Water Department

April 11, 2012

Environment Virginia symposium in Lexington Virginia

- Governor's Environmental Excellence Award
 - Bronze award
 - Magnetic Bearing Chiller installation/operation
 - Honorable mention
 - Campus Conservation Nationals

Governor's Environmental Excellence Award 2012



Facilities Planning and Construction

- Radford University has achieved LEED Gold/Silver for new construction and renovations.
 - College of Business and Economics (Kyle Hall)
 - Center for the Sciences
 - Student Recreation and Wellness
 - Whitt Hall
 - College of Humanities & Behavioral Sciences
 - Residence Halls
 - Pocahontas, Bolling, Draper, Madison, Moffett, Jefferson

LEED Gold

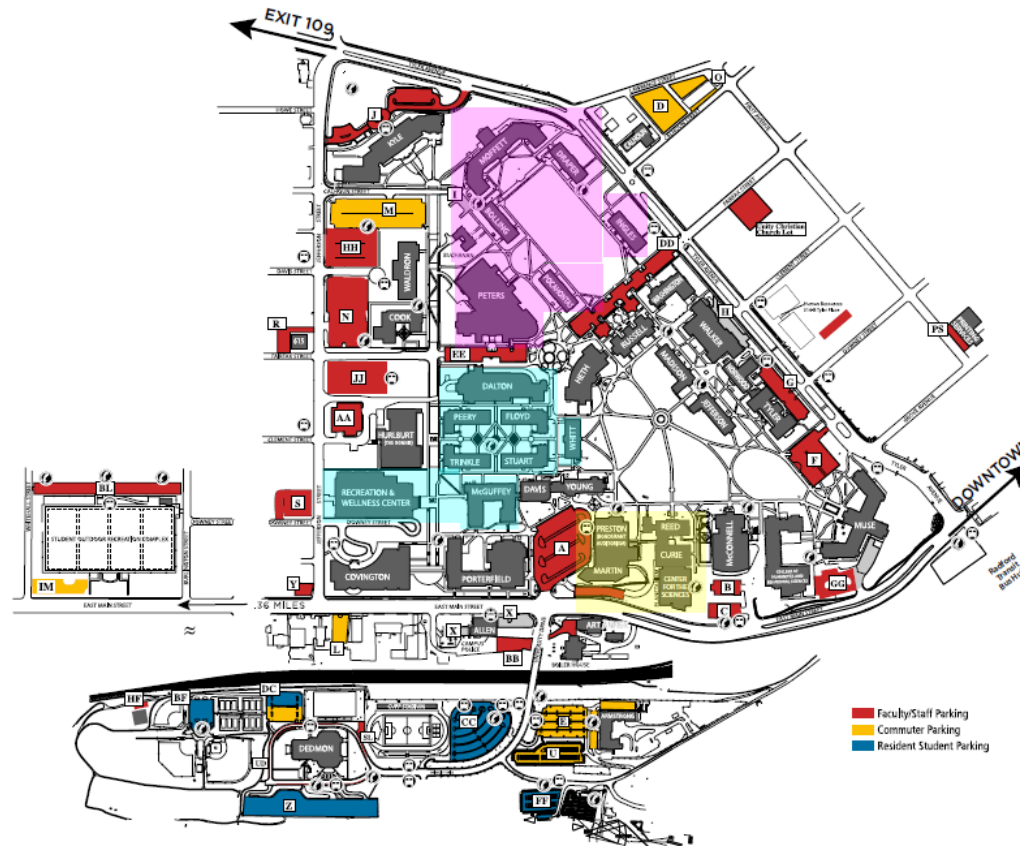


LEED Gold and Energy Star



Regional Chill Water Loops

RADFORD UNIVERSITY



Chill Water Loops

- Radford Currently has four regional chill water loops.
 - Governors Quad has seven buildings served from one chill water loop
 - Preston/Martin, Reed/Curie and Artis Center for the Sciences are served from one chill water loop
 - Moffett Quad has six buildings served from one chill water loop
 - Waldron and Cook are combined for a common chill water loop

Chill Water Loops

- Flexibility of Chiller combinations for efficient operation – water cooled/air cooled
- Redundancy for mechanical failures
- Reduction in electrical costs
- Efficient operation of Magnetic Bearing Chiller operation
- “Free cooling” from cooling towers for cooling needs in winter months

Waldron and Cook Chill Water System



Free Cooling Heat Exchanger

