



Seminar 42 - The Rise of Building EQ: Educational Facility Case Studies in Central Florida

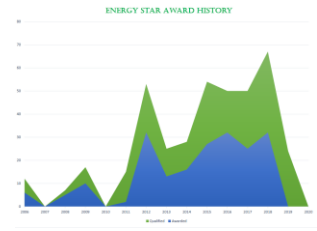
--First Step--

Building EQ Pilot Program for Brevard Public Schools

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History of BPS Energy Benchmarking

- 6 schools certified in Energy Star Portfolio Manager in 2006
- Instituted energy efficiency programs in response to Great Recession
 - 70% set point
 - 3PM-6PM shutdown in summer (seasonal TOU rates) -- save \$550,000
 - Turn off everything
- Energy Star's scores improve | Principals receive Energy Star plaques
- 66 qualified in 2018 using 2012 CBECs data base
 - Reduced to 32 in August due to 2012 CBECs database



Learning Objectives

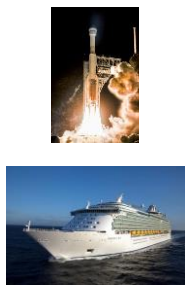
- Provide an overview of how the Building EQ Portal is utilized on facility projects.
- Understand the application of the Building EQ assessment process in education facility and campus settings.
- Communicate the value of utilizing the Building EQ program for improving the energy performance of educational facilities.
- Identify the value of Building EQ as a training tool for ASHRAE professionals to teach students how to conduct energy audits.

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Problems with Energy Star

- Manual upload of utility bills
 - Labor intensive (\$20k FTE)
 - Outsourcing quoted at \$50k/year
 - Utility declines to participate in web services data exchange
- Field audit required for all "qualified" schools
 - Labor intensive
 - Test equipment calibration
 - Only field audit "qualified" schools, ignored lower performing schools (some schools never audited for 12 years)
- Access to data
 - Energy Star website out of service during government shutdown
 - Archiving and is data secure
- Recognition but no recommendations to improve score



Brevard Public Schools (BPS) Overview

- Brevard County is 350 miles east of Orlando
 - National Space Center, Cape Canaveral Air Force Station and space rocket assembly, processing, and launch companies for government and private clients
 - Aerospace, satellite, and high-tech companies
 - Cruise Beach, inland tourism and cruise industries
- By the numbers
 - 15,000 students and 6,000 staff
 - 50th largest school district in the US
 - \$5 billion in under construction
 - 1.8M square feet
 - \$120M/year in electricity
 - 200 MW year in water/steam
 - 20 ice storage plants for air conditioning
- Most corrosive environment in US

Introduction to ASHRAE Building EQ

- Space Coast ASHRAE chapter presentation on Building EQ at Florida Institute of Technology (Florida Tech), hosted by student branch
 - Local member is Vice Chair of "Building EQ" committee
- Conversation with Student branch advisor on pilot program
- President-Elect presentation to HVAC students on Brevard School energy efficiency programs
 - Interest in Building EQ pilot program?
- Student volunteers, Florida Tech administration approval, BPS Facilities approval
- Define schools and process
 - Three neighboring schools sharing central energy plant (1300 tons)
 - Utility bill analysis
 - Field audits

Pilot Project Goals

- Evaluate ASHRAE Building EQ as a tool for BPS
 - Transition from Energy Star to Building EQ
 - Target non-"qualifying" schools
 - Additional resources for BPS staff to conduct analysis and audit
 - Second perspective on energy efficiency opportunities
- Introduce Mechanical Engineering students to HVAC
 - Hands on exposure early in college may influence career path
 - Chillers are COOL!
 - Experience with temperature, humidity, CO2 and light meters
 - Develop technical reports and recommendations using ASHRAE templates
- Introduction to ASHRAE members, engineering firms, contractors—possible internships and offers



Preparations to Conduct Field Audit

- Contractor on sitermost comply with Jessica Lainsford Act (JLA)
 - Background check, fingerprints, ID badges
 - Not required if escorted by BPS staff
- BPS Energy Specialists calibrate test equipment
- Meeting with Florida Tech students to review policies, equipment operation, and record keeping
- Scheduling school visits is challenging
 - 6am start time for BPS Facilities staff vs student activities
- April testing month (DO Not Disturb) vs Florida Tech Finals
- ASHRAE Distinguished Lecturer to explain ice storage design



Schools in Pilot Building EQ Project

- Meadowlark Primary (Grades K-2)
 - Constructed 1990
 - 600 students
 - 113,529 square feet
- Meadowlark Intermediate (Grades 3-6)
 - Constructed in 1998
 - 800 students
 - 245,327 square feet
 - Central energy plant serving all three schools
- Central Middle (Grades 7-9)
 - Constructed in 1988
 - 1400 students
 - 100,214 square feet

Field Audit--Conflicts

- BPS emphasis on classroom condition report
 - Minimal disruption to classes
 - Temperature
 - Humidity
 - CO2
 - Light levels (SPEF > 40 footcandle)
 - Report card to area supervisor—danger open? Closed?
- Students first exposure to central energy plants
 - Two 600-ton centrifugal chillers in factory-assembled package
 - Cooling towers! Pumps! VFD's! Controls!
- Students conducting future courts



Utility Bill Analysis

- Review utility rates for each school
 - Determine \$/kWh and \$/kW
- Review other utility rates
 - Time of use
 - Seasonal Time of Use
 - Determine \$/kWh on peak, \$/kWh off peak, and \$/kW



Results—ASHRAE Level 1 Audit Report Meadowlark Primary Recommendations

- Interior LED light 2.1-year payback
- Exterior LED light 0.5-year payback
- Occupancy sensor 4.2-year payback
- Ice storage 4.5-year payback
- Solar PV 13.8-year payback

CEP Operational Challenges

- Scheduled for upgrade in 2020
- Chiller outages
 - Single phase loss
 - "Lightning alley" power quality issues
 - Vibration issues
- Cooling tower failure
- Glycol leaks
- Temporary fix—rental 500-ton air-cooled chiller and 1MW generator



Expanding Building EQ in Florida

- Presentation to Florida Schools Conservation Coalition
 - Partner with ASHRAE chapters and student branches to pilot Building EQ in Florida schools
 - FSCC meeting at BPS 6/17
- Presentation to Sustainable Brevard
 - Targeting cities and county
- Target—Building EQ study for UCF Marine Turtle Research Group new research facilities at Archie Carr National Wildlife Refuge (#2 sea turtle nesting beach in world)
- Target—Building EQ study for Port Canaveral Aquarium
- Target—Building EQ study for Brevard Zoo

BPS Energy Strategy

- 2014 Referendum upgrading facilities from 2015-2021
 - \$200M to replace failing AC components
 - Utilizing bipolar ionization to reduce ventilation (1500 ppm CO2)
 - Emphasis on replacing obsolete BAS
 - Pilot project in 2017 to convert six schools to LED lights (\$250K)
 - Security upgrades in 2018 siphon off any energy investment funds
- Preparing Phase II Referendum—2022-2032
 - Facilities Condition Assessment (roofs!)
 - Integrate LED lighting savings to pay for BAS upgrades
 - Using Florida Tech Building EQ study to validate recommendations
 - LED lighting—YES
 - Solar PV—NO



Questions?

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Next Steps

- Florida Tech Presentation to Space Coast chapter—done
- Florida Tech Presentation to BPS Facilities—done
- Florida Tech Presentation to Principals—scheduled
- Selection of Building EQ schools for 2019-20—done
 - Palm Bay HS, Merritt Island HS, two identical ES with very different Btu/sq ft
- Integrate with ASHRAE presentation to Merritt Island HS
 - STEM—Most important thing to a kid in Florida is air conditioning!
 - Tour of HVAC system—WOW factor!