

AABC Commissioning Group AIA Provider Number 50111116

Development of an Energy Roadmap for Orlando International Airport

Course Number: CXENERGY1718

Nate Boyd, P.E., Hanson Professional Services Inc. Jeff Daniels, Orlando International Airport April 26, 2017



Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request. This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Course Description

A large airport authority sought to develop an "energy roadmap" for its growing campus. Gathering the requisite information, establishing benchmarks and targets, and performing condition assessments and audits were critical steps; along with collaborating to forecast demands, costs, budgets and goals. Since these were phased efforts, it was vital to establish the sequence and prioritize the steps. This presentation will examines the development of the roadmap and how it will be used and periodically re-evaluated.



Learning Objectives

At the end of the this course, participants will be able to:

- 1. Learn the essential steps and sequences associated with creating an energy roadmap.
- 2. Learn how to use the roadmap to establish policies and procedures for an organization's employees.
- 3. Lean the necessary elements of and calculations for creating an energy forecast.
- 4. Learn to develop a plan to implement the energy roadmap into a sustainability management plan.



About the Presenter

- Nate Boyd, P.E. Mechanical & Energy Engineer
- ASHRAE Certified Commissioning Process Management Professional (CPMP)
- USGBC LEED Accredited Professional
- Bachelor of Science, Mechanical Engineering University of Central Florida
- 19 Years experience in Building Automation & Controls
- Energy Manager City of Orlando, 2010 2015







About the Presenter

- Jeff Daniels, FMA, CEM, CEA, CBCP, LEED AP
- GOAA Assistant Director, Maintenance Operations
- AEE Certified Energy Manager, Certified Energy Auditor, Certified Building Commissioning Professional
- USGBC LEED Accredited Professional
- 30 Years Experience in Facilities and Energy Management







Energy Roadmaps – A Holistic Approach

- Begin with the end in mind
- "10,000 foot view" of your energy footprint
- Solid, repeatable step-wise approach



- Energy Roadmaps vs ESCO's the business case for embarking on an internal strategic approach
- "Living Document" continuously updated plan

Orlando International Airport Energy Roadmap

- Energy Forecasts
- Energy Analysis of Existing Assets
- Energy Audits
- Retro-commissioning Plans
- BAS & EMS Analysis
- Integration with Sustainability Master Plans

Energy Forecasting

Current Utility Providers

- OUC: Power & Water
- TECO: Natural Gas (Tenants only)

Projections Regarding Utility Pricing

- Power: 2.5% annual escalation beyond 2016
- Water: 5% Increase in 2016

Legislation Affecting Utilities

- EPA Clean Power Plan (CPP)
- Florida Solar Ballot Initiative

Security Concerns

- Multiple substations & separate distribution systems
- Onsite Standby Generation

Rebates and Incentive Programs

- Prescriptive Rebates
- Custom Incentive Program: \$250/kW Summer Peak Shaving

Source EUI Trend (kBtu/ft²)





Energy Analysis

Current Consumption & Demand

- Consumption: \$11.4M, 167M kWh
- Demand: \$3.1M, 51.4 Megawatt peak

Benchmarking

– 85.5% of GOAA Utilities Benchmarked

Targets for Reduction

- Goal: 10% reduction
- \$1.46M annual savings target
- 5 year payback criterion

Projected Growth Scenarios

- South Airport Complex: 16,000 kVA service
- Increase of 56M kWh, 9.3 MW Peak demand
- Anticipated Utility Budget Impact of SAC: \$4.5M/year







MCO Campus kW Fees

Energy Audits

ASHRAE Energy Audits

– Airside Terminals 1, 2 & 3

Evaluation and ranking of ECMs

- 52 Energy Conservation and Facility Improvement Measures recommended

Cash flow analysis of ECM projects

- Measurement & Verification of ECM projects

Future Energy Related Projects

Photovoltaic Study – North Parking Lot

Persistence Strategies

- Benchmarking & Energy Audits
- Retro-commissioning
- "Enterprise" advanced metering
- Fault Detection & Diagnostics platform



ECM #	Energy System Type	Recommended Change	Description	Cost	Priority	Estimated Savings by System	Estimated Savings by Building	ROI	IEQ Impact
1	HVAC & Lighting	Retro- commission	Retro-commission all BAS integrated HVAC and lighting systems	High	High	High	High	Fast	Large
2	HVAC & Lighting	FDD Platform	Integrate Fault Detection & Diagnostics (FDD) enterprise level software platform to detect HVAC & lighting system anomalies to allow for monitoring- based Cx	High	High	High	High	Fast	Large
3	HVAC	DDC Controls	Implement supply static pressure trim-and-respond reset routine based on VAV damper position feedback	None	High	Medium	Low	Fast	Small
			Implement demand						-



BAS & EMS Analysis

- Trend logs
- Environmental Parameters
- Sequences of Operations
- Schedules & Setpoints
- GUI Analysis of Controls Front-end
- ECMs Available within the BAS Environment





Energy Conservation Measures

- HVAC
- Lighting
- Plug & Process
- Envelope
- Data Management
- Holistic approach not just the ECMs



СМ #	System Type	Recommended Change	Description	Cost	Priority	Estimated Savings by System	Savings by Building	ROI	IEQ Impac
7	HVAC	DDC Controls	Install CTs on kitchen equipment (hoods, fans, ice machines) to record energy usage and equipment failures in the BAS	Medium	Medium	High	Low	Fast	Mediu
8	HVAC	Replace AHUs	Replace deteriorating AS 1 AHUs 5,13,14,38, 39, AS3 AHU-12, 22, 25	High	High	High	Medium	Long	Large
9	HVAC	Install VFDs	Convert remaining constant volume AHUs to VFD control (AS1 AHU-8, 9, 10, AS3 OA booster fans, AHU-18, 37)	High	High	High	Medium	Medium	Large
10	HVAC	Bi-polar ionization	Install bi-polar ionization filtration in all AHU's to improve IAQ and reduce minimum OA CFM requirements	High	High	High	Medium	Fast	Large
11	HVAC	DDC Controls	The pneumatic VAV controllers in wing 1 should be upgraded to DDC. This would allow for the shutdown of the air compressor and line dryer systems	High	High	High	Medium	Medium	Large
12	HVAC	OA/RA conversion	Convert 100% OA AHUs that feed the hub areas and AHUs that used to feed smoker's lounge areast o mixed RA/OA (all airside terminals)	High	Medium	High	Medium	Medium	N/A
13	HVAC	Install VFDs	Convert all remaining FCUs to VFD or ECM motor control, allow for fan to shut off when no cooling is needed in IT & Elecrooms	High	Medium	High	Low	Medium	Smal
14	HVAC	Right-size AHUs	AHU's observed to be running at 60Hz outside of peak operating hours should be evaluated for replacement with right- sized equipment. (AS1 AHU-60, 31, AS2 AHU-10, 12, 17, 18, 19, 20, 33, AS3 AHU-12, 23, 24, 33)	High	Medium	Medium	Medium	Long	Large
15	HVAC	DDC Controls	Upgrade select zone controllers to increase point density, install occupancy sensors for HVAC setpoint control AS1 Business waiting lides	High	Low	High	High	Fast	Mediu

Retro-Commissioning

- ASHRAE & ACG Standards and Guidelines
- Planning
- Assessment
- Investigation
- Implementation
- Measurement & Verification
- Ongoing Commissioning





Persistence Strategies

- Continuously update design standards
- Full project commissioning
- Benchmarking
- Energy use tracking
- Public awareness and education
- Trend data analysis (FDD)
- Building documentation
- Operator training
- Retro-commissioning



Roadmap – Looking Forward

- Identify ECMs for level 2 or 3 energy audits
- Implement ECMs from Phase 1
- Benchmark remaining 15% of power use
- Energy audits: Landside & Airside 4
- Refine SAC energy impacts
- Engage airlines, tenants & partners
- Cx & RCx Programs
- Software-as-a-Service (SAAS) FDD dashboard



Integration with Sustainability Master Plans Sustainability Program Pillars

Tenant & Airline Interaction

- Public Relations Outreach
- Interactive Sustainability Messaging

Greenhouse Gas Emissions Reporting

Green Building Labels, Awards, & Recognition



Long-Term Benefits of a Comprehensive Approach to Energy Management

- Energy Management planning/road mapping and implementation are now "Federally Eligible" for AIP grant or PFC participation
- Energy impacts due to asset degradation average 4-8% each year after building start up. RCx projects return those assets to optimal operating conditions and typically have a 6-18 month payback. Energy efficiency improvements typically range from 5%-30% following RCx completion
- A comprehensive energy management approach: supports your long term sustainable operations approach and sustainability goals; supports your "planned vs. reactive" asset management goals; and will deliver a lower cost per enplanement to your airline partners
- Energy project pipelines are clearly established and complimentary in nature: prioritizing projects into logical, repeatable and measurable tasks
- The GOAA Experience: Our analytics have been shown to reduce utility and maintenance costs by 5-20% annually. Implementation of just the analytics and RCx programs alone will exceed GOAA's 10% energy reduction goal.

This concludes The American Institute of Architects Continuing Education Systems Course

nboyd@hanson-inc.com

jdaniels@goaa.org



