NASA Ames Research Center

Utility Energy Services Contract
Project Overview


Federal Utilities Partnership Working Group
Philadelphia, PA
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Today's Discussion

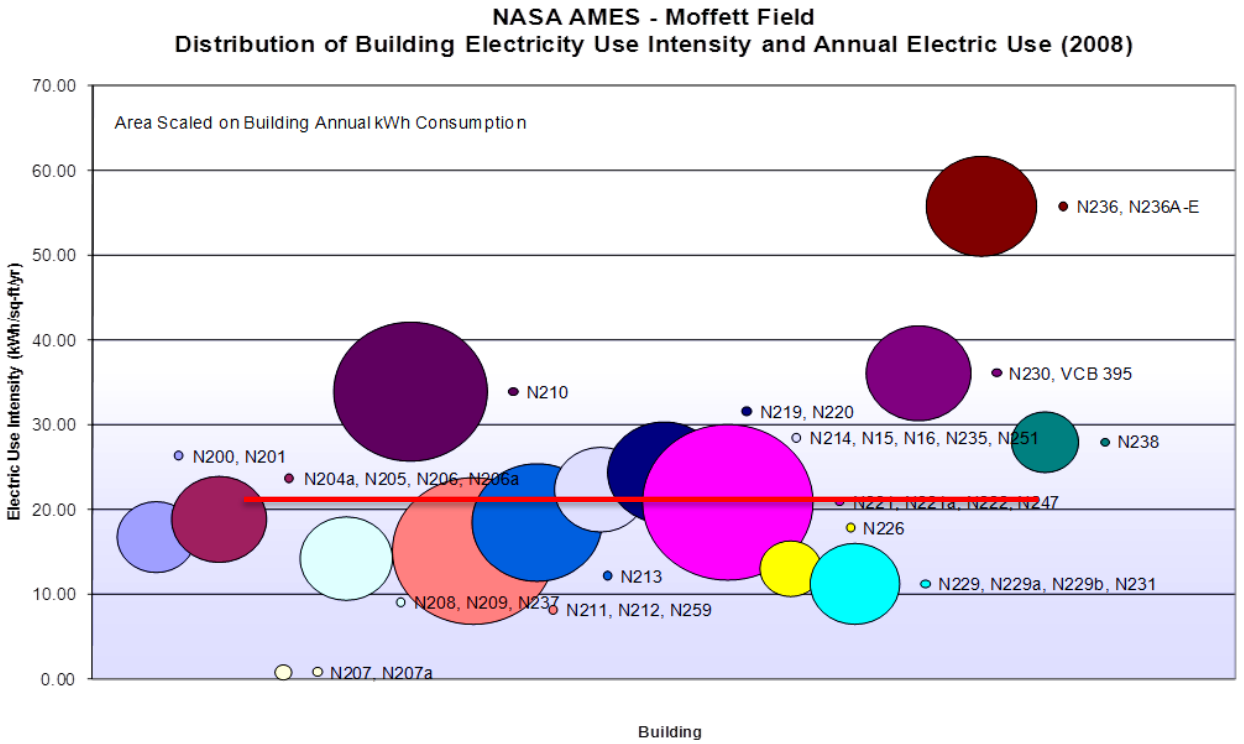
- NASA Ames Research Center (ARC) Energy Challenges
- UESC Project Goals
- Energy and Water Conservation Projects
- Project Benefits and Results
- Q&A

NASA's Energy Challenges

- Compliance with federal mandates - EISA, EPAct, Executive Orders (prior to UESC ARC was behind all of its goals)
- Very low electric cost (<$0.05/kWh)
- Not eligible for electric incentives through local utility (ARC purchases power from WAPA)
- Aging mechanical and electrical infrastructure requiring significant capital investment
- Many renewable projects not economically viable due to low electric cost

NASA's Energy Challenges

High energy intensity at many of the center's key buildings



- Median energy intensity for typical bldg. similar to ARC's (mix of lab and office) is 21.2 kWh/SF*yr (red line on charts above).
- Average Energy intensity at ARC was 45.7 kWh/SF*yr.

NASA's Energy Challenges

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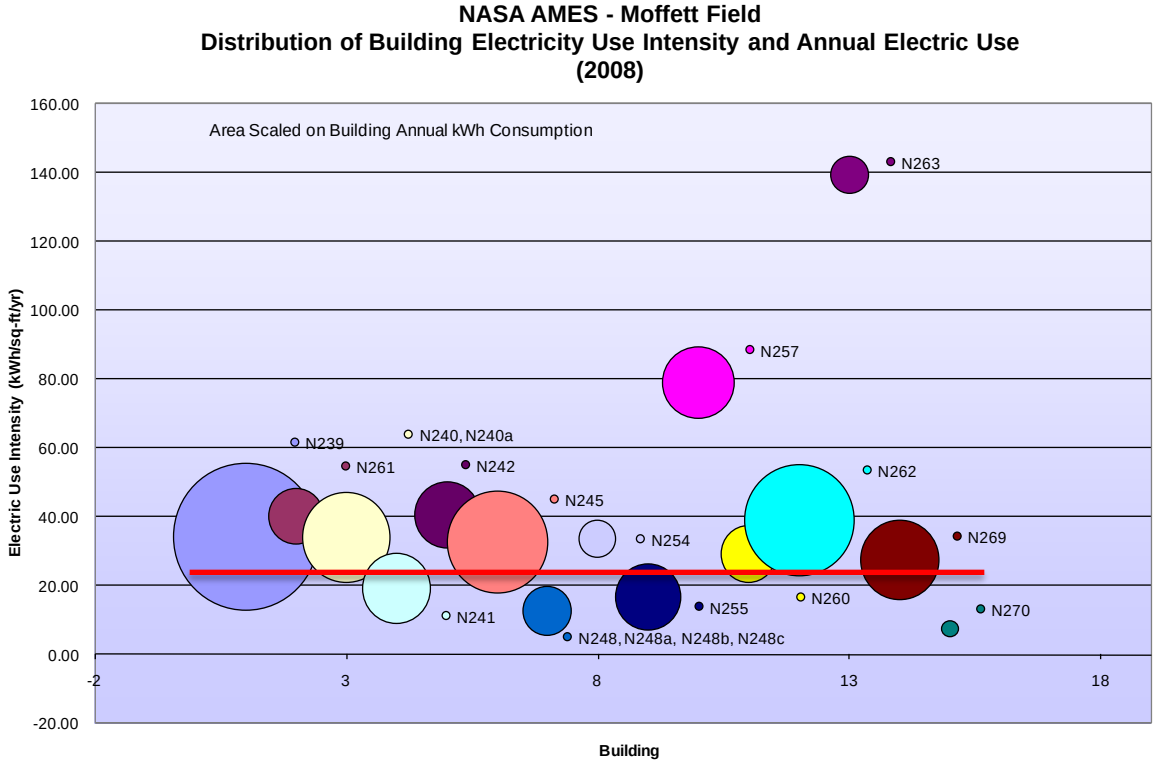

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UESC Project Goals

- Identify economically viable projects that when implemented will help ARC achieve its energy efficiency goals.
- Install a roof mounted photovoltaic system on ARC's new net-zero administration building.
- Replace inefficient boilers throughout the facility that do not meet South Bay Area Quality Management District standards (32 boilers).
- Expand and upgrade the existing Facility Management Control System (FMCS) & implement Retro-Commissioning strategies.
- Procure maximum available utility incentives

Energy & Water Conservation Projects

ECM 1 – Base-Wide Inlet Guide Vane (IGV) to Variable Frequency Drive (VFD) Retrofits

- Replace less efficient IGV airflow control with more efficient VFD control
- Integrate new VFD into existing base-wide FMCS
- Implement VAV optimization sequences of operation

ECM 2 – Upgrade Indoor Lighting

- Replace existing 1000 W high-bay HID fixtures in buildings 211, 248, and 246 with new energy efficient fluorescent T-5 fixtures
- Retrofit fluorescent T-12 fixtures in buildings 246, 262, with new energy efficient T-8 fixtures equipped with electronic ballast and high efficiency reflectors.
- Install dual technology occupancy sensors to control new high-bay T-5 fixtures and indoor T-8 fixtures.

ECM 3 – Upgrade Outdoor Lighting

- Retrofit existing high pressure sodium street light fixtures with new energy efficient Lumecon LED kits.

Energy & Water Conservation Projects

ECM 4 & 5 – Base-Wide Boiler Replacements

- Replace existing less efficient boilers (>2,000 MMBH) that do not meet South Bay Air Quality Management District standards with new high efficiency modular boilers equipped fully modulating gas valves and advanced FMCS controls interface.

ECM 6 – Steam Plant Retrofits

- De-comission two large steam plants and install new high efficiency hot water boiler plants at buildings / near loads.

ECM 7 – Base-Wide Retro Commissioning and FMCS Upgrades

- Upgrade and expand the existing FMCS to allow for more granular zone control and for the implementation of advanced FMCS control sequences.
- Implement base-wide retro commissioning strategies.
- Develop and implement a Monitoring Based Commissioning (MBCx) program.

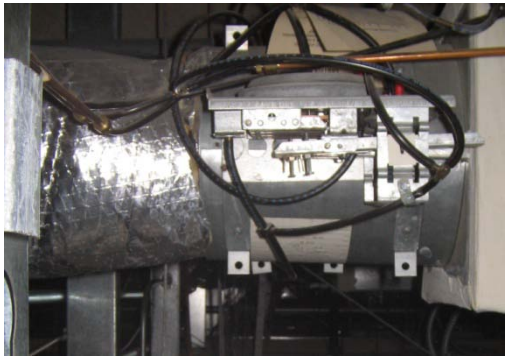
Energy & Water Conservation Projects

ECM 8 – Bldg. 239 VAV & Central Chilled Water Plant Upgrades

- Convert existing constant volume laboratory ventilation system to VAV operation.
- Upgrade existing FMCS to accommodate VAV operation and to maintain life safety standards.
- Implement a chilled water plant optimization strategy that minimizes overall plant energy consumption.

ECM 9 – Bldg. N258 Chilled Water Plant Optimization

- Optimize AHU operation
- Implement demand control ventilation
- Upgrade FMCS controls



Energy & Water Conservation Projects

ECM 10 – Bldg. N233 Multiple Measures

- Replace less efficient chillers with new high efficiency machines equipped with VFD's and advanced controls.
- Replace oversized condenser water pumps.
- Implement a chilled water optimization control strategy for the central chilled water plant.
- Upgrade the existing FMCS to accommodate the new chillers and optimization control strategies.
- Remove existing fan coils above stairwells and replace with new roof mounted DX units.

ECM 11 – Bldg. N233A Multiple Measures

- Remove existing 3-way valves and re-circulation pumps on existing air handling units (AH-1, 2, and 3).
- Replace existing inefficient boiler with new high efficiency modular boiler.
- Implement a chilled water optimization control strategy for the central chilled water plant.
- Upgrade the existing FMCS to accommodate the new boilers and CHW & HHW plant optimization control strategies.

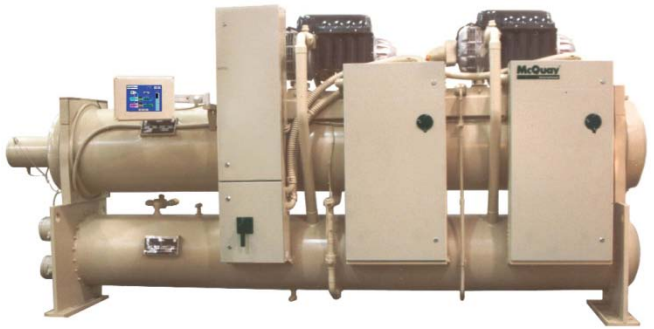
Energy & Water Conservation Projects

ECM 12 – Bldg. N232 Photovoltaic System

- Install new 108 kW Sun Power roof mounted PV system.
- Install (2) new inverters.
- Install new Data Acquisition System (DAS).

ECM 13 – Bldg. 245 Chilled Water Plant Upgrades

- Install new high efficiency Turbocor chiller
- Convert pumping to variable flow operation
- Upgrade FMCS



ECM 14 – Base-Wide Domestic Water Fixture Upgrades

Estimated Project Benefits and Costs

Note: The project is currently in construction with an expected completion date of April, 2012

Energy Savings				Annual O&M Savings	Annual Utility Cost Savings	Estimated Incentive	Construction Cost
Demand (kW)	Electricity (kWh)	Nat. Gas (Therms)	Water (kgal)	$ (000)	$ (000)	$ (000)	$ (000)
957.4	9,095,382	1,291,757	15,779	328	1,648	715	23,865

Project Benefits & Expected Results

- ARC will exceed its mandated energy efficiency goals by 10%.
- 15% reduction in annual energy and operational costs.
- ARC will have new mechanical, lighting, and domestic water fixtures throughout the facility resulting in significant cost savings and avoided future capital costs.
- ARC will have an upgraded FMCS that is expandable and will allow the center to perform proactive energy management and on-going commissioning.
- The new PV system installed as part of this UESC will allow building N232 to attain LEED Platinum status.

Questions & Answers

Thank You

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