



Voluntary Programs and Other Opportunities: An End-Users Perspective

Raytheon Energy Team

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Raytheon Overview

RAYTHEON COMPANY – A TECHNOLOGY AND INNOVATION LEADER SPECIALIZING IN DEFENSE, CIVIL GOVERNMENT AND CYBERSECURITY SOLUTIONS THROUGHOUT THE WORLD.

- 2016 NET SALES: \$24 BILLION
- 63,000 EMPLOYEES WORLDWIDE
- HEADQUARTERS: WALTHAM, MASSACHUSETTS



Raytheon NE Energy Overview

- **Energy cost containment and predictability is a business imperative for Raytheon**
- Raytheon global utilities spend: ~\$90M/year
 - ~\$75M on electricity; Almost 800M kWh
 - Enough to power >64,000 US homes
- Raytheon in New England:
 - Presence in 10 communities (8 MA, 1 RI, 1 NH)
 - Footprint: ~4M square feet with ~11,500 occupants
 - ~\$28M utilities spend, >90% for electricity
 - >160M kWh, enough to power ~13,000 homes
- Raytheon aligned with MA DOER approach
 - Reduce and **stabilize the rising cost** of energy
 - Continue the Commonwealth's commitment to a **clean energy future**
 - Ensure that we have a **safe, reliable and resilient** energy infrastructure



Solar & Storage – Benefits & Challenges

■ Benefits

- Both offer significant cost savings and/or hedge vs. conventional energy sources
- Solar can provide environmental benefit
- Storage compliments solar to meet late PM peak demand
- Storage will become more valuable as demand charges increase in time
- Costs for both are decreasing with scale
- On-site solar & storage possible with no up front costs (PPA and/or lease)
- Off-site solar opportunities becoming more lucrative and worth exploring
- Storage demand will grow with increasing solar and wind power on grid

■ Challenges

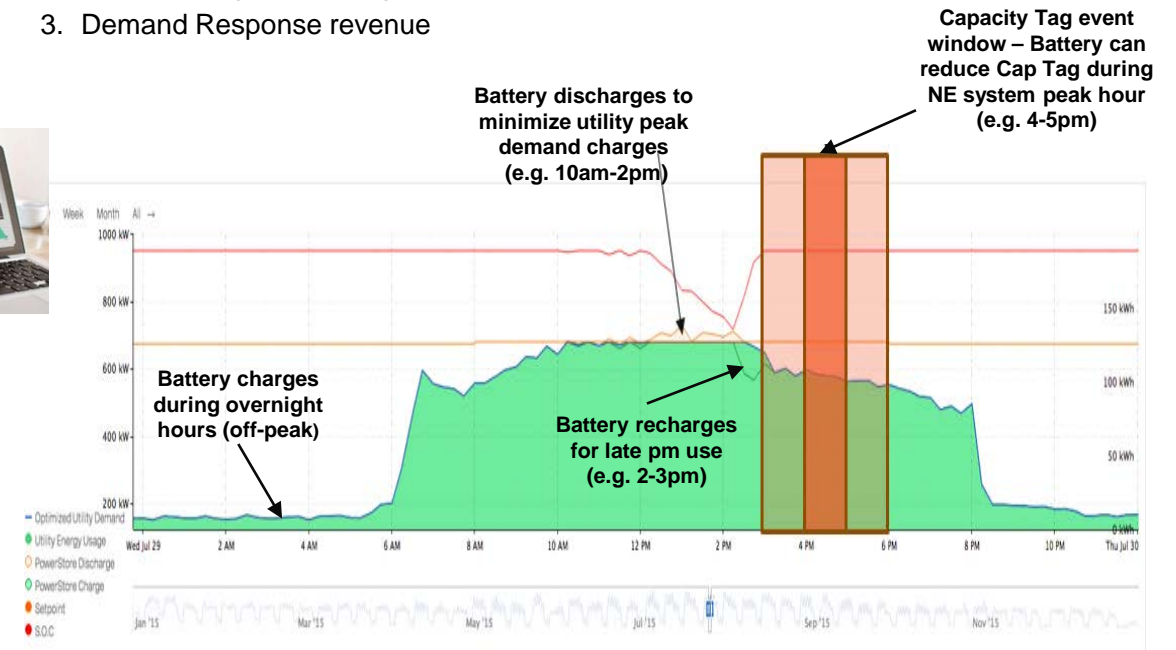
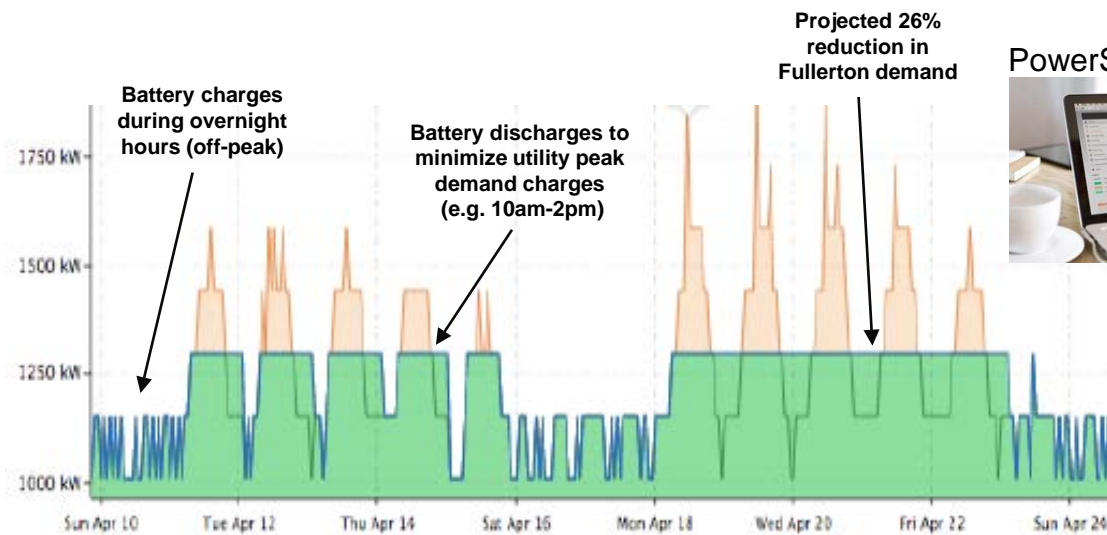
- Limited energy reductions
 - Solar doesn't mean your site uses less energy
 - Storage inefficiencies => more energy used
 - Thermal storage can save energy
- Both can require long-term commitments
 - 10-20 years for solar, 5-10 years for storage
- Both can require significant investment
 - Business case often difficult vs. efficiency
- On-site solar more intrusive vs. off-site
 - However, off-site typically has less \$ benefit
- Solar & storage often perceived as “new”
- Business case can be more confusing
 - Storage savings requires simulations
 - kW savings calculations not simple like kWh

Raytheon Battery Storage Projects

- Fullerton, CA 1950 kW / 3060 kWh
- Outdoor installation
- Tesla batteries (Lithium Ion)
- Big utility incentives – LCR programs
- > 500% ROI expected on lease costs
 1. Monthly peak kW demand cost savings
 2. Demand Response revenue



- Woburn, MA 100 kW pilot
- Outdoor installation
- Lithium Manganese Oxide (LMO)
- >90% ROI expected on lease costs
 1. Monthly peak kW demand cost savings
 2. Capacity Tag cost savings
 3. Demand Response revenue



Both Targeted for Q2'18 Completion

Other Raytheon Energy Initiatives

■ Energy & Cost Savings

- Strategic Energy Management with National Grid, Columbia Gas & Eversource (MA/RI)
 - Memorandum Of Understanding (MOU) required with three year plan
 - Multi-site plan of projects to achieve 10% energy reduction goal from 2015-2020
 - Enhanced incentives available
- HVAC & Lighting Optimization
 - Smart Campus technology
 - Utilizing “Internet of Things”
 - Multi-site, multi-year initiative

■ Cost Savings Only

- Solar Net Metering (SNM) Agreements
 - Over \$100K savings during 2017
 - Projected \$5M savings over 20 years
 - SNM credits/payments managed by CES
- Fuel Cells & Cogeneration
 - Evaluating Andover opportunities
- Thermal Energy Storage
 - Considering opportunities to replace Marlboro & Andover backup chillers
- On-site Solar Photovoltaics
 - Considering ground mount, car port & roof top installations

Take advantage of ever-improving energy programs & incentives in NE states!

What is an ENERGY STAR Partner?

ENERGY STAR partners agree to measure, track, and benchmark energy performance; develop and implement a plan to improve energy performance, adopting the ENERGY STAR strategy; and educate staff and the public about their partnership and achievements with ENERGY STAR.



Voluntary partnership that requires a non-binding online agreement

ENERGY STAR

- ENERGY STAR is

- Low-risk, simple and cost effective

- Key Tools

- Portfolio Manager
 - ENERGY STAR Energy Management Assessment Matrix
 - ENERGY STAR Treasure Hunt Guide: Simple Steps to Finding Energy Savings
 - Off-the-shelf building improvement tools and resources
 - Networking & Training
 - Meetings
 - Webinars
 - Recommendations/best practices
 - Communication
 - Material to motivate



ENERGY STAR® Energy Management Assessment Matrix				
	Little or no evidence	Some elements	Fully implemented	Next Steps
Make Commitment to Continuous Improvement				
Energy Director	No central or organizational resource Decentralized management	Central or organizational resource Not empowered	Empowered central or organizational leader with senior management support	
Energy Team	No company energy network	Informal organization	Active cross-functional team guiding energy program	
Energy Policy	No formal policy	Referenced in environmental or other policies	Formal and active EE policy endorsed by senior mgmt	
Assess Performance and Opportunities				
Gather and Track Data	Little metering/tracking	Local or partial metering/tracking/reporting	All facilities report for central consideration/analysis	
Normalize	Not addressed	Some unit measures or weather adjustments	All meaningful adjustments for organizational analysis	
Establish baselines	No baselines	Various facility-established	Standardized organizational base year and metric established	
Benchmark	Not addressed or only same site historical comparisons	Some internal comparisons among company sites	Regular internal & external comparisons & analyses	
Analyze	Not addressed	Some attempt to identify and correct spikes	Profiles identifying trends, peaks, valleys & causes	
Technical assessments and audits	Not conducted	Internal facility reviews	Reviews by multi-functional team of professionals	
Set Performance Goals				
Determine scope	No quantifiable goals	Short-term facility goals or nominal corporate goals	Short & long-term facility and corporate goals	
Estimate potential for improvement	No process in place	Specific projects based on limited vendor projections	Facility & organization defined based on experience	
Establish goals	Not addressed	Loosely defined or sporadically	Specific & quantifiable at various	



LIVE AND RECORDED TRAINING SESSIONS

Click here to view and register for live or recorded ENERGY STAR training.

ENERGY STAR communications toolkit

There are a ton of compelling reasons to include robust communications efforts in your organization's energy management program. Here are just a few:

Changing the behaviors of your tenants, employees, and customers can help you save energy and money.

Raytheon ENERGY STAR Overview

- Joined ENERGY STAR voluntary partnership in late 1999
- Started with pilot program in one business unit (C3I) during 2000
- Expanded program in 2001 to include all Raytheon businesses
- Established Enterprise Energy Team (EET) in 2004
 - Utilized ENERGY STAR Guidelines for program direction
- Shared Best Practices and hosted several partners for benchmarking
- Participating in Aerospace Industry Focus Group
- ENERGY STAR Recognition:
 - ENERGY STAR Honorable Mention 2001, Partner of the Year 2003, 2007
 - ENERGY STAR POY Sustained Excellence Awards 2008-2017



Maturing Our Company-Wide Program

How Raytheon's Facilities Organizations are meeting the Challenge.

"The C3 Energy Cooperative under development is intended to provide a model for other business units to replicate within the company."
 Frank Marchiana
 President C3

ACTIVE C3 PARTICIPANTS:

- Marlboro Massachusetts
- Falls Church Virginia
- Landover Maryland
- Fort Wayne Indiana
- St. Pete/Largo Florida
- Garland Texas
- Fullerton California
- Denver Colorado

Near Term Objectives

- Establish C3 Energy Cooperative
- Announce Energy Star Partnership
- Establish Energy Metrics

Mid Term Objectives

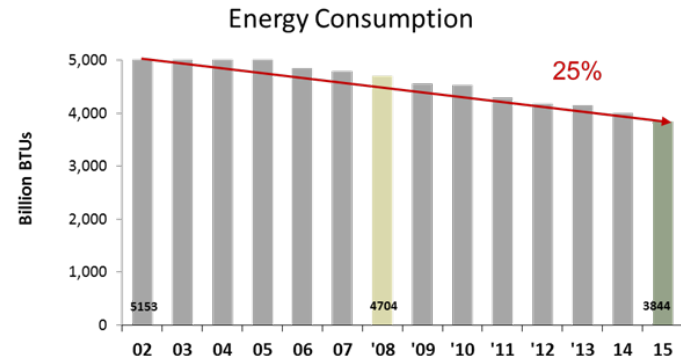
- C3 Energy Star Web Site
- Develop Site Specific Action Plans
- Report Energy Consumption/Cost Reduction

Long Term Objectives

- Demonstrate Energy Reduction on Annual Basis
- Communicate Success
- Company -Wide Implementation
- Benchmark Energy Consumption and Costs

For more information visit the Web Site: <http://www.us.com/energyefficiency>

Pilot to Enterprise



Roadmap

Raytheon Energy Program Roadmap

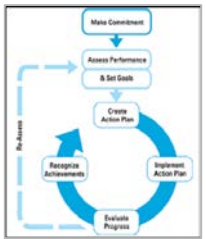
Conserving Raytheon Energy and Water (CREW) Team

2016 2017 2018 2019 2020

Achieve 10% Energy Reduction by 2020 →

- Upgrade Real Estate:** Footprint Consolidations/ Upgrades, New Site Energy Reviews, New Site Design Principles
- Optimize Infrastructure:** Energy Project Identification, Site Audits, Multi Year Investment Plan, Leverage SAFE Initiative, SMART Building Initiative, Robust Commissioning
- Integrate Energy Consumers:** Data Center Improvements, Manufacturing Workshops/ Communication, Laboratory Analytics
- Finance Focus:** ROI Knowledge - Selling the projects, Comprehensive Procurement Strategy, Peak Demand Management
- Technology Focus:** Improved Energy Metering Systems, Integrated Renewables Strategy, Energy Storage Pilots
- Partnerships/ Resources:** NUS/Enablon Integration, EPA, ENERGY STAR Program, Aerospace Focus, Regional Partnerships, DOE Better Plants, Gov Relations Strategy

Grey: Initiatives require partnership outside of CREW Team
Updated 5/3/2017



Employee Energy Quiz/Raffle

Continuous Improvement!

What is the Better Buildings Initiative?

Better Buildings is a U.S. Department of Energy initiative to improve the lives of the American people by driving leadership in energy innovation in the nation's homes, commercial and public buildings, and industrial plants

Done through multiple initiatives to engage the owners/managers of a variety of energy consuming buildings.

Voluntary partnerships and initiatives

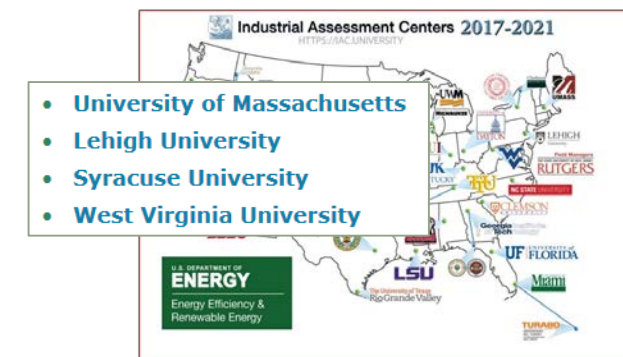
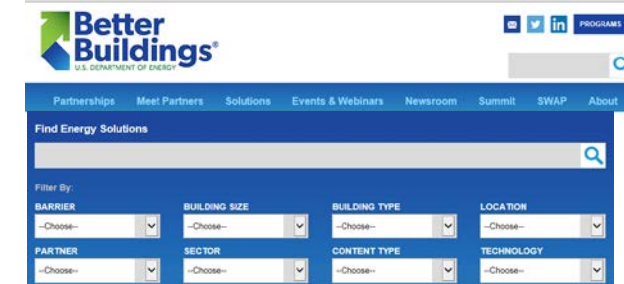
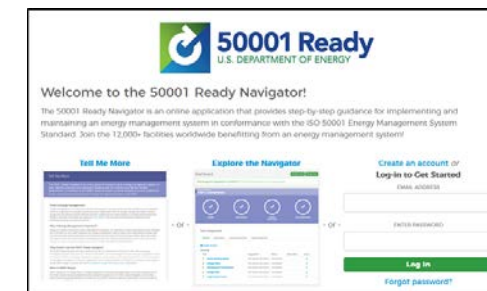
U.S DOE Initiatives

- Partnerships:
 - Better Buildings Challenge
 - Better Buildings Accelerator
 - Better Communities Alliance
 - Better Plants Program
 - Better Buildings Alliance
 - Better Buildings Challenge SWAP
- Networking:
 - Better Buildings Summit
 - Better Buildings Residential Network
- Certifications and Ratings:
 - 50001 Ready
 - Home Energy Score
 - Superior Energy Performance
 - Zero Energy Homes



U.S DOE Tools and Resources

- 50001 Ready
 - 50001 Ready Navigator online tool for self-declared Implementation of ISO 50001
 - 25 tasks divided into 4 sections
 - Extensive guidance available in each module
- Solution Center
 - online access to solutions by topic, building type, solution type, building size, sector, technology, location, and more.
- Financing navigator
 - Navigator helps you cut through this complexity to secure financing that works for you.
- Peer-to-Peer Networking Opportunities
- Online Tools & Webinars
 - Tools: MotorMaster+, Steam System Modler, Compressed Air System Cheatsheet...
 - Webinars
- Industrial Assessment Centers – with requirements
- Better Plants
 - Technical Account Manager
 - In-Plant Trainings



Energy Learning/Training Opportunities

■ Conferences/Forums

- AEE local & national events
 - AEE NE monthly meetings
 - GlobalCon, Boston – March 21-22
 - WEEC, Charlotte – October 17-19
- Utility sponsored events
 - Eversource & NGrid event dates TBD
- Other regional energy events
 - MA CEC tracks numerous events
<http://www.masscec.com/events>
- National event calendars
<https://energy.gov/eere/calendars/events-calendar>
<https://aceee.org/conferences-events/events-calendar>

■ Training

- Building Operator Certification (BOC)
<http://www.theboc.info/>
- MA Energy Efficiency Partnership
<https://maeep.org/>
- Northeast Energy Efficiency Partnerships
<http://www.neep.org/about>
- MA CEC Training & Education Directory
<http://cleanenergyeducation.org/>
- Northeast Clean Energy Council
<http://www.necec.org/about/career-workforce-development.html>
- MassSave Calendar
<https://www.eventbrite.com/o/energy-code-technical-support-6683649323>

Lots of resources out there to increase your knowledge and network!