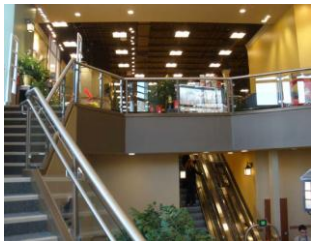


Commercial Building Partnership (CBP)

Adam Hirsch

National Renewable Energy Laboratory

Email: Adam.Hirsch@nrel.gov

Phone: (303) 384-7874

Wednesday, April 3 2013

Brief History

- 2008: NREL + PNNL selected partner companies and technical consultants and won joint solicitation
  - Collaborators selected based on commitment to hitting project goals and likelihood of success
- Projects began in 2009 with aim of 3-5 year completion
  - National labs play integral role advising design teams
  - Full management plan with off ramps
- In 2010 ARRA funding used to start new set of 3 year projects
  - Owners, technical teams, and measurement teams all selected by competitive solicitation
  - National labs play more supervisory role
- Overall goals:
  - show that 50% savings in new construction and 30% savings in existing buildings is possible within Partner's business models
  - encourage replication by making this level of savings standard practice

Problem Statement

- The DOE Commercial Building Partnership (CBP):
  - Addresses energy-related challenges, barriers, and knowledge gaps building owners face ***in all phases of new construction and retrofit projects***
  - Specific examples include, but are not limited to:
    - setting measurable energy goals
    - evaluating and implementing promising new technologies
    - using whole building energy modeling to increase confidence when making design and business decisions
    - selecting building control algorithms that save energy
    - commissioning the whole building based on measurements
    - creating the business case for efficiency measures (EEMs) across climate types
  - Generate high quality data needed to get efficiency projects approved

Impact of Project

- CBP has:
  - Changed the workflows of nationwide companies and design consultants to solve the barriers listed above
  - Confirmed energy savings and replication within company building portfolios
- CBP inspires other building owners and consultants to achieve similar results using:
  - Case studies proving deep savings is possible within existing business models
  - Procedures for building owners, building managers, and designers to follow which will achieve similar results
  - Market-facing resources documenting the design, measured energy savings, and lessons learned by Partners

Project Focus

- *"Work with the commercial building industry to accelerate the uptake of energy efficiency technologies and techniques in both existing and new commercial buildings."*
- Help meet the BTO goal to reduce energy consumption by at least 1,600 TBtu/yr using measurable results
- Test solution sets from the DOE Advanced Energy Design and Retrofit Guide series in the field
- Build the capability of design consultants to use BTO tools effectively
- Leverage the Better Building Alliances to share results and lessons learned
- Provide tested solutions for meeting the Better Buildings Challenge portfolio-wide 20% savings commitment

Approach

- DOE, represented by the national labs, was involved in project design teams from conceptual design through post-occupancy monitoring
- This structure allowed DOE to:
  - Make design and building control suggestions
  - Provide energy modeling expertise to assess designs
  - Capture the decision making process
  - Measure energy performance of EEMs
- DOE engaged Better Building Alliance “National Accounts” companies with the following criteria:
  - Track records as industry efficiency leaders willing to share results
  - Capital budgets for construction and innovation
  - Standardized building designs
  - Centralized decision making
  - Millions of square feet of existing buildings to deploy solutions

Replication

Broader Design Community

Participation and review

- EEM Packages
- How-to details
- Code impact

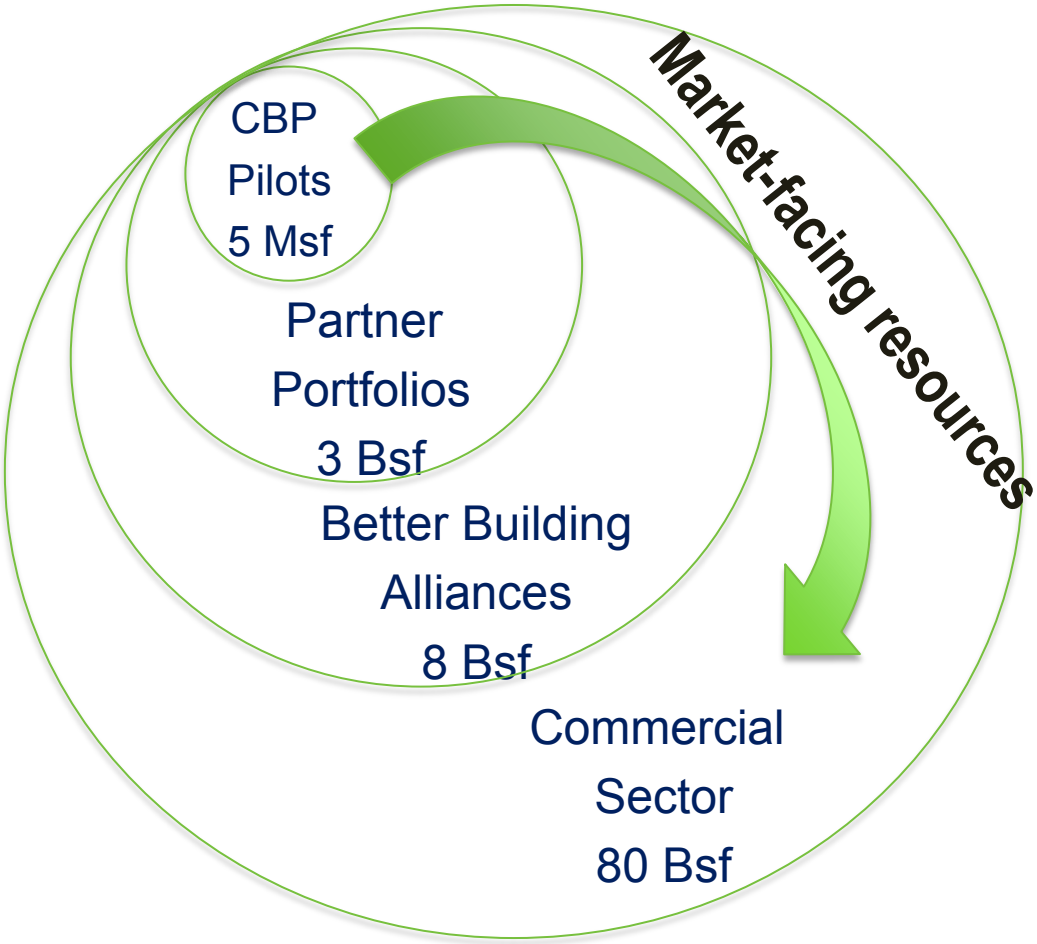
AEDG/AERG

- EEM Packages
- Integrated Design

- Validation
- Case studies
- Best Practices

CBP

(+ direct impact through CBP participation and resources)



Key Issues

- Continuity increased the likelihood of success
- Hard to implement 5 year projects due to issues with funding consistency
- EEM cost information is often considered business sensitive in the retail sector
- Private sector development can be unpredictable
  - Recession significantly impacted partners
- 3-5 year payback criteria for many retail partners
- Pioneers reduce the risks for later adopters
- Regular communication essential to good outcomes

Distinctive Characteristics

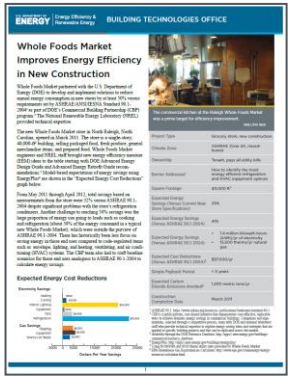
- Level of savings targeted
- Close collaboration between DOE (via the Nat'l Labs), building owners, architects, and engineers
- Scope of projects, stretching from conceptual design through regular operation
- Energy modeling used to inform design, not post hoc
- Whole-building focus
- Measured performance in multiple building types and climates
- Partner's business model served as reality check

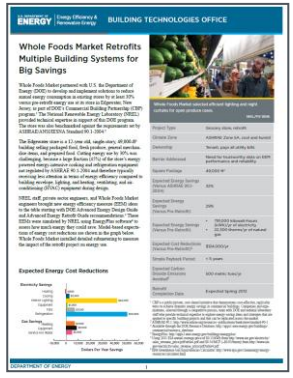
Accomplishments and Progress

- 35 projects expected to go to completion within program timeframe
- 26 case studies published to date
- Directly touched 5 million square feet
- 27 out of 35 project designs (77%) expected to hit savings targets
- 5 out 8 projects with 12 months of data have hit the goal (2 were not expected to)
- Office, Mercantile, Food Sales, Education, Lodging, Warehouse and Storage building types represented
- Savings is significant; for example, in a Target retrofit, measured annual electricity savings amounted to more than 1 million kWh
- EEMs like daylighting, efficient lighting, doors on refrigerated display cases, variable speed HVAC fans have become standard features
- Improved EnergyPlus

Case Studies

- Concise, consistent, and comparable
- Focus on savings, decision making, lessons learned
- Connected by Sector Overview documents





Success Stories

"…we went through the learnings of NRL [North Raleigh, a Whole Foods Market New Construction CBP project] and went line by line each EEM as well as overall strategy ahead of time with a smaller "task force" including one region's engineering team, an engineer we use on almost all projects for design peer and several leaders from various regions around the country plus our GVP of Development. ***We all agreed on replicating design process and bid process for major refrigeration and HVAC systems as was done in NRL for everything moving forward***, understanding that the climate may require different outcomes. Then we brought that to Toronto where all regions were represented at the meeting and discussed together. All regions are on board."

- Kathy Loftus, global leader of sustainable engineering and energy management, Whole Foods Market Corporation

"Long after the Thornton renovation is complete, ***this collaboration will help us save energy in stores across our portfolio***."

- Scott D. Williams, Group manager of mechanical engineering, Target Corporation
- Design replicated in 12 retrofits in 2012

More Success Stories

"We are seeing immediate benefits***...The whole-building energy modeling detailed the costs and made rolling some of these in time into the prototype and other branches a no brainer.*** *For instance, LED lighting and envelope research started out as measures under consideration for the net-zero building and are being rolled into all new branches*."

– Jim Kroner, PNC Senior Project Manager

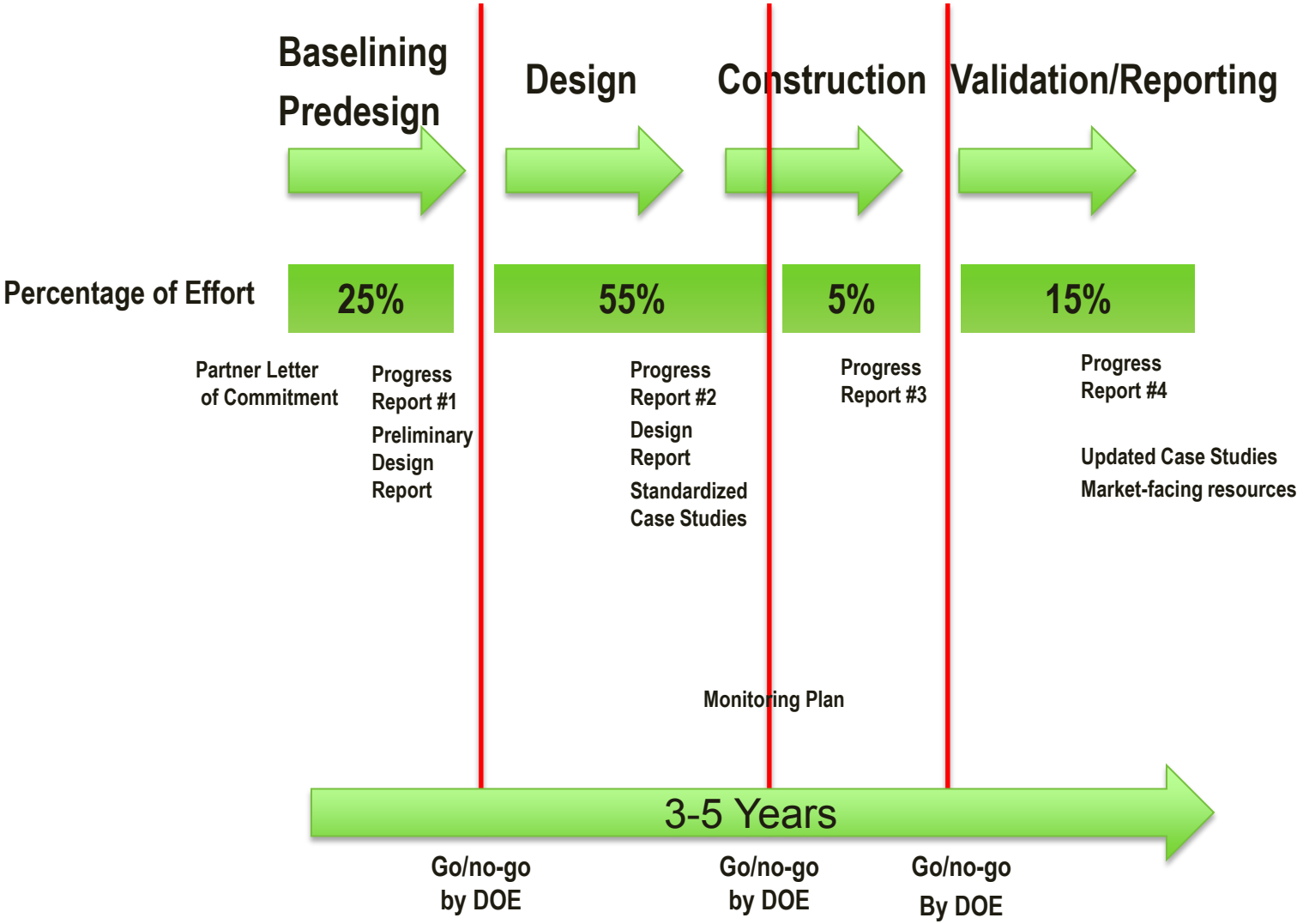
"The CBP partnership ***helped us solidify our understanding of what energy efficiency measures were technically and financially feasible, and practical,*** given the building type and scope of control as a landlord."

– Mark Peternell, Vice President of Sustainability, Regency Centers

"The Lodi store has become ***our showcase for energy efficiency and a great test-bed of energy performance for the company***."

– David Oshinski, Director of Construction at The Home Depot

Project Plan & Schedule



Project Budget

Project Budget:

CBP I (FY09-FY13 = 5 years, 20% cost share):

$ 5,743,768 (NREL)
$ 6,199,000 (PNNL)
$ 11,942,768 (Total)

CBP II (FY10-FY14 = 5 years, ARRA Funded, 20% cost share):

$ 6,845,000 (NREL)
$ 6,945,000 (PNNL)
$ 6,845,000 (LBNL)
$ 20,635,000 (Total)

CBP III (FY10-FY14 = 5 years, 20% cost share):

$ 978,000 (LBNL)

Variances: N/A

Cost to Date:

CBP I: 97% spent
CBP II: 62% spent
CBP III: 98% spent

Additional Funding: N/A

Project Collaboration

Partners (35) including:
Bank of America, Best Buy, Hines, Intercontinental Hotel Group, JCPenney, Kohl's, Massachusetts Institute of Technology, NASA, New York Times, PNC Financial Services, Prologis, Regency, SUPERVALU, Target, The Home Depot, University of California at Merced, University of Hawai'i at Manoa, University of South Carolina, U.S. Army – Ft. Bragg, Walmart, Whole Foods Market

Subcontractors and Collaborators (50) including: Architectural Energy Corporation, ARUP, CTA Architects Engineers, CTG, Eaton, EMC Engineers, Gilbane Building Co/SMG, GBD Architects, Glumac, McKinstry, HOK, Johnson Controls, KJWW Engineering Consultants, LendLease, NorthWrite, Rafael Vinoly Architects, SERA Architects, Solarc Architecture/Engineering Corp., Stantec, Steven Winter Associates, Taylor Engineering, Viridian, WD Partners, The Weidt Group

Communications

- 14 industry presentations
- 11 peer reviewed papers
- 20 technical reports
- 26 case studies

Technology Transfer Example

- Through the Partnership, CTA has gained:
  - An opportunity to validate and quantify many long-standing assumptions of energy measures
  - A deeper understanding of interactions between measures and building systems through modeling, improving design integration
  - An understanding of magnitude of indirect savings
  - An enhanced design process beyond traditional “design day” calculations to include yearly operation profiles

Deployment & Impact Example

- CTA has enhanced its work process by:
  - Challenging and improving long-held design processes by reevaluating theoretical basis
  - Testing rules of thumb with specific project modeling and measurement
  - Understanding perspective of all stakeholders, including owners, operators, and occupants, to make informed recommendations

Next Steps and Future Plans

Next Steps and Future Plans:

- Complete monitoring of active projects and include measured performance in project reports
- Distill and communicate the key features of the process from conceptual design to performance monitoring needed to achieve CBP levels of energy savings, in a form that the industry can use to take action
- Follow-on project to assess replication success and market impact

Thank you!

- Adam Hirsch: Adam.Hirsch@nrel.gov 303-384-7874
- Eric Nelson: ericnelson@ctagroup.com 208-577-5661
- Shanti Pless: Shanti.Pless@nrel.gov 303-384-6365

The authors would like to acknowledge the work of the CBP teams at NREL, PNNL, and LBNL, especially Michael Baechler and Rosemarie Bartlett (PNNL) and Cindy Regnier (LBNL) who contributed material for this presentation. We thank DOE for CBP funding and management.

Project Collaboration (Full List)

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Partners (35): Alliance for Sustainable Development Colorado, Bank of America, Best Buy, Bryan Cave HRO, Bullitt Foundation, Defense Commissary Agency, Department of Labor – Job Corps, Fox Studios, General Services Administration, Grand Valley State University, Hines, Intercontinental Hotel Group, jcpenney, John Deere, Kohl's, Long Beach Gas & Oil, Mesa Lane Partners, Massachusetts Institute of Technology, NASA, New York Times, Oregon BEST, PNC, Prologis, Regency, Shy Brothers Farm, SUPERVALU, Target, The Home Depot, University of California at Merced, University of Hawai'i at Manoa, University of South Carolina, University of Utah, U.S. Army – Ft. Bragg, Walmart, Whole Foods Market

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