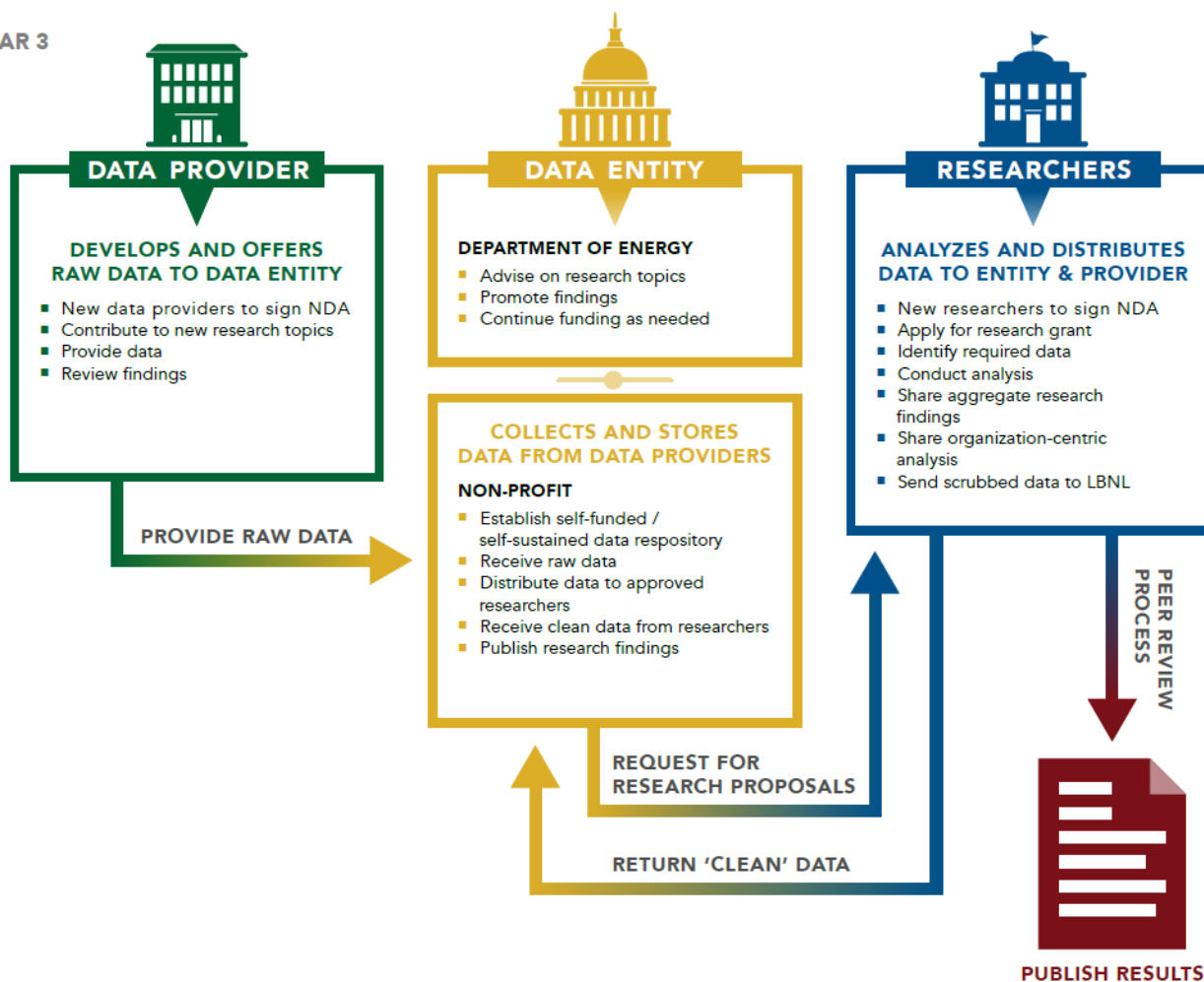


Financial Performance of Energy Efficient Buildings

2017 Building Technologies Office Peer Review

YEAR 3



Project Summary

Timeline:

Start date: **November 2014**

Planned end date: **Ongoing**

Key Milestones

1. Literature Review; February 2015
2. Research Design, Agenda, and Data Lab Concept; June 2015
3. Strategic Plan for Market Intervention; October 2016
4. First Working Group Meeting; March 2016
5. Data Lab Concept and Pilot Research Report; October, 2016
6. Pivoted Data Lab Structure; January 2017

Project Outcome:

Support the Commercial Buildings Integration (CBI) Program (BTO MYPP Section 4.0) and reduce hurdles that currently inhibit research regarding the relationship between energy efficiency and financial performance of commercial real estate (CRE) by:

- Engaging stakeholders to identify data security protocols and logistics of sharing
- Developing supporting resources to promote and enable data sharing
- Conduct a pilot research study to demonstrate efficacy of the proposed structure and procedures
- Recruit data providers and researchers to facilitate launch of an aggregated Data Lab

Budget:

Total Project \$ to Date:

- DOE: \$276,364
- Cost Share: \$0

Total Project \$:

- DOE: \$289,946
- Cost Share: \$0

Key Partners

Academic

- Central Michigan University
- Cleveland State University
- Indiana University
- University of California, Berkeley
- University of North Carolina
Chapel Hill

Advisory

- Building Owners and Managers Association (BOMA)
- ICF International
- Institute for Market Transformation (IMT)
- Lawrence Berkeley National Lab
- Global Real Estate Sustainability Benchmark (GRESB)
- U.S. Environmental Protection Agency (EPA) ENERGY STAR

Potential Data Providers

- BuildFax
- CB Richard Ellis
- Colliers International
- Cushman & Wakefield
- Principal Real Estate Investors
- Real Capital Analytics
- Related Companies
- Tishman Speyer
- Trepp
- United States Green Building Council (USGBC)
- View Glass
- Washington REIT
- Xceligent
- Yardi Systems

Purpose and Objectives

Problem Statement:

CRE researchers face data challenges when attempting to quantify the financial benefits of high-performing, energy-efficient buildings

- Access to critical data is extremely limited
- Struggle to replicate results and methodologies
- Matching property level records requires significant time and expense
- Difficult to isolate and control moderating factors to identify the specific drivers behind improved financial performance

Project Objectives:

- Improve access to critical data sources
- Enable large-scale, longitudinal, repeatable analyses of relationship(s) between energy efficiency and financial performance of assets
- Encourage energy efficiency investment amongst leaders
- Explore potential financial and secondary benefits of energy efficiency and high-performance buildings in the commercial real estate market

Purpose and Objectives (cont'd)

Target Market and Audience:

- Commercial buildings account for approximately:
 - 18% of total U.S. energy consumption
 - 36% of U.S. electricity consumption
 - 18% of the nation's carbon dioxide emissions
- Commercial office buildings alone represent nearly 16 billion square feet of U.S. real estate.
- This initiative is intended to reach the stakeholders with the ability to generate insights on significant portions of the U.S. market:
 - Owners
 - Investors
 - Data collectors
 - Academic and industry researchers

Purpose and Objectives (cont'd)

Impact of Project:

- **Project Intent:** catalyze the availability of data and proliferation of research that explores the links between sustainability, building performance, and financial benefits
- **Anticipated Result:**
 - Generate a body of peer-reviewed research describing connections (or the lack thereof) between energy efficiency and financial performance
 - Empirical evidence can provide a market incentive for additional (or reduced) investment in energy efficiency and energy efficient technologies.

Objectives

2017

- Data aggregation, matching, and cleaning in preparation for analysis
- Longitudinal analysis to understand the impact of green certification or retrofit events
- Lease-level analysis to examine impact of green events on tenant decisions

2018

- Growth of the data lab to include additional data providers
- Published, peer-reviewed findings resulting from the aggregated dataset

2019+

- Build a self-sustaining data lab where providers regularly (i.e., annually) contribute data
- Generate a body of peer-reviewed research describing connections (or the lack thereof) between energy efficiency and financial performance

Approach

- **Literature Review** of existing industry research to understand gaps and potential generating new insights
- **CRE Working Group**, leveraging Better Buildings Commercial Real Estate Steering Committee and other industry leaders
 - Debated key challenges
 - Determine data requirements and taxonomy
 - Discussed data sharing and security concerns
 - Developed data lab structure and roles
 - Began recruiting potential data providers
- **CRE Data Provider Recruitment** efforts focused on industry networks, working group members, and real estate data service providers.

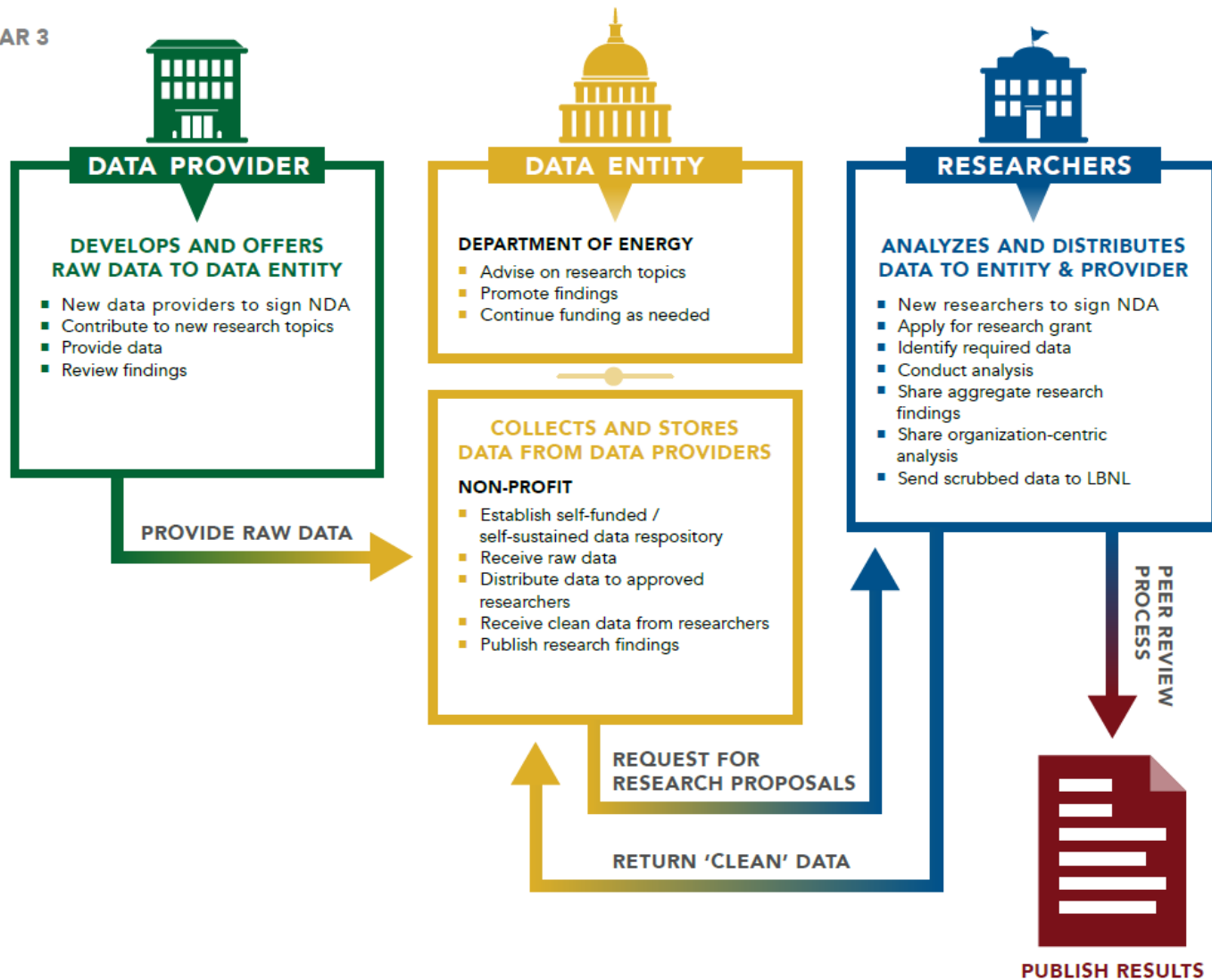
Approach & Objectives: Data

Distinctive Characteristics: Prior research data collection efforts have not engaged directly with ownership groups to capture and analyze lease-level information.

Building Information	Leasing Information	Financial Information
Location: <ul style="list-style-type: none">▪ Building Zip Code▪ MSA	Monthly occupancy/vacancy rate	Rental rates per lease, per property
Gross floor area	Absorption rates	Net operating income
Rentable square footage	Rent concessions	Annual operating expenses
Utility consumption data	Tenant retention/renewal rate	Utility expenses
Green certifications, level and year(s) certified under: <ul style="list-style-type: none">▪ LEED▪ ENERGY STAR▪ BOMA 360▪ Other	Leasing velocity	Property value: <ul style="list-style-type: none">▪ Year end, at minimum▪ Date of other valuations

Approach & Objectives: Data Lab

YEAR 3



Key Challenges

- **Obtaining commitments from data providers**
 - Owners are hesitant to submit proprietary information, in spite of data security standards
 - Third party property managers need consent from individual ownership groups
 - Potential solution: purchase information from key databases
 - BuildFax, Real Capital Analytics, Trepp, Xceligent
- **Gathering sufficient data for a longitudinal study**
 - To understand the impacts of energy performance over time
 - Investment holding periods vary amongst owners
 - Difficult to analyze and control decision-making over multiyear lease-turn lifecycle
- **Conducting a natural experiment**
 - Comparing financial metrics before and after an energy efficiency retrofit or certification event
 - Necessary for proving **causality**

Accomplishments

- Developed data security, sharing, and anonymity protocols
- Created a “Benefits to Data Providers” presentation for recruiting
- Targeted a dozen potential data providers
 - Finalizing NDA’s with two data providers
- Pivoted strategy: identified 5-6 potential alternative data sources to supplement recruiting efforts
- Completed Pilot Research Study, results to be published

Logistics of Providing Data: Security

- DOE will not receive or handle data at any point
- Non-Disclosure Agreements (NDAs)
 - Between the data entity and approved researchers prior to providing data access
 - Researchers shall undergo a comprehensive screening and selection process
- All data shall be stored on encrypted, secure servers
- Results will be published only if:
 - At least 10 data points
 - At least 3 data providers
 - Data from one provider cannot exceed 70% of total



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Benefits for Data Providers



- Brand and publicize your leadership in advancing research and tackling “Big Data” challenges
- Act early with advanced notification and progress reports regarding research findings
- Make better informed decisions to get ahead by implementing analysis of CRE investment and sales cycles
- Compare your portfolio to the industry at large using new metrics
- Enhance your services and tools with new insights and knowledge gained by participating in the entity

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Market Impact

- **Pilot research study:**
 - Data provided by one institutional owner
 - Analyzed 130 office properties representing nearly 22 million sq.ft.
 - Publishing and promotion anticipated: April 2017
- **Recruiting:**
 - Verbal agreements with two CRE owners (including pilot data provider)
 - Additional industry leaders interested in contributing to research efforts and organizing data tracking systems for potential future contributions
 - Prominent academics and research groups interested in collaboration
- **Expectations vs. Reality**
 - Recognition that deeper analyses of larger data sets are critical for understanding the relationship between energy and financial performance
 - Progress slower than expected due to data acquisition challenges
 - Strategic pivot: purchasing data and revising potential research questions

Lessons Learned

- Proponents of the program and market leaders still struggle to obtain internal approvals necessary to share data
 - Time constraints and legal hurdles for sustainability/research departments
- Owners do not currently track lease-level data in a consolidated manner that lends itself to sharing and analysis
- CRE leaders often do not trust information within existing databases
- Some databases contain information in unworkable formats
- Market often perceives research results as market- or firm-specific
 - Conduct market-specific analyses controlling for location, age, & amenities
- Need for common taxonomy and calculations for key variables such as NOI
 - Variations between different firms and funds
 - Proxies or raw data may suffice, but require additional processing effort

Project Integration and Collaboration

Project Integration:

- Over 25 industry experts from Better Buildings CRE Steering Committee, leading CRE firms, industry organizations, and prominent universities

Partners, Subcontractors, and Collaborators:

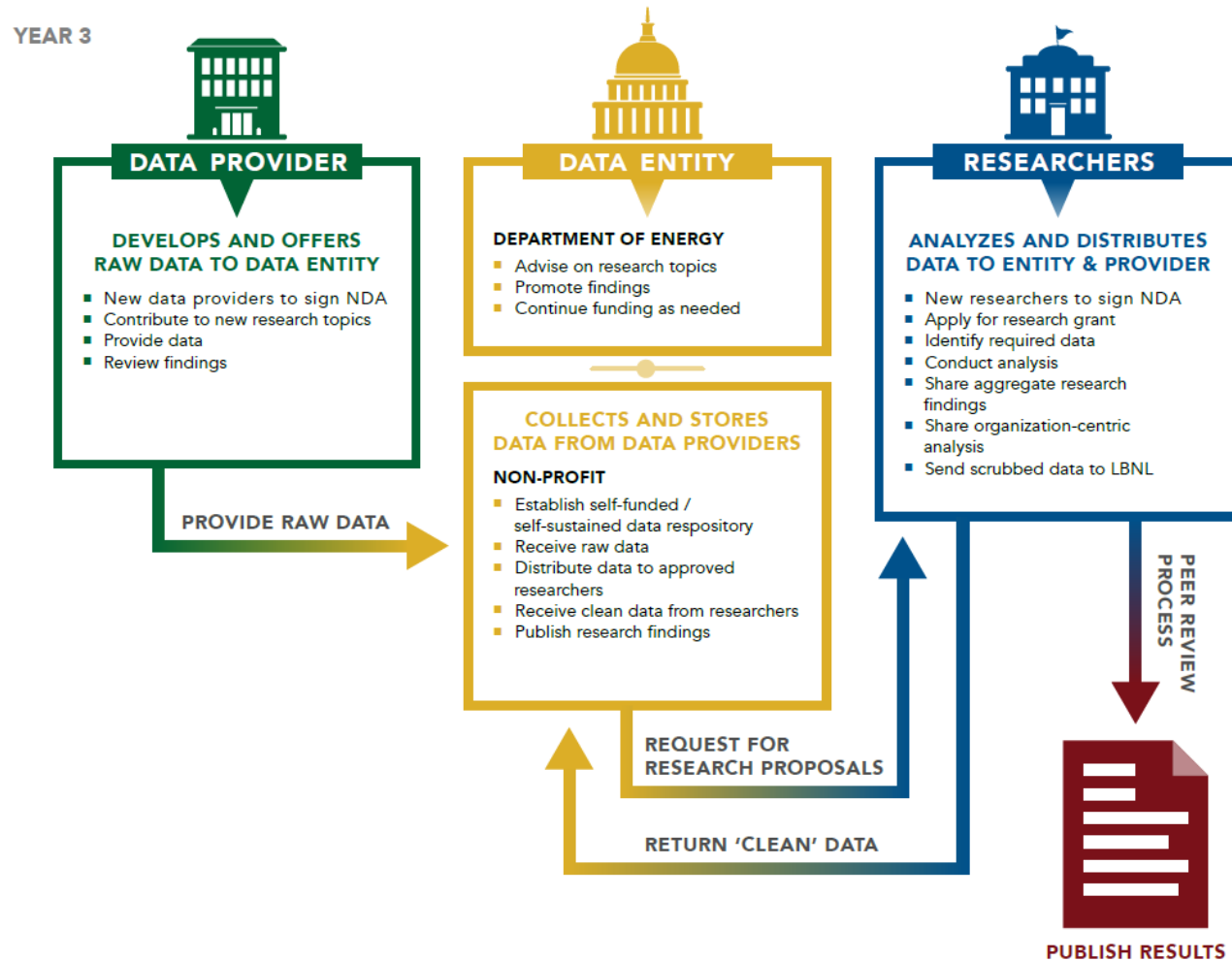
- JDM Associates, a commercial real estate and program design expert, provided support to DOE.
- The Data Lab infrastructure and data collection efforts are now led by LBL.
- Input from a diverse working group of more than 25 industry professionals representing leading CRE firms, industry organizations, and leading researchers

Communications:

- UNC Real Estate Research Conference; Oct. 2016
- Better Buildings Alliance, Market Solutions Update Webinar; January 2017
- BOMA International Conference; June 2017
- Greenbuild; Nov. 2017 **(TBD)**
- Communications plan to promote pilot research and the Data Lab; Q2-Q3

Next Steps and Future Plans

- Promote pilot research findings
- Data Lab recruitment
- Data acquisition, cleaning, and matching
- Preliminary data analysis
- Draft reports with initial findings
- Review, publish, and promote findings
- Hand off Data Lab administration to LBL



REFERENCE SLIDES

Project Budget

Project Budget:

- FY 2015: \$129,414
- FY 2016: \$146,950
- FY 2017: \$13,582

Variances: Not applicable.

Cost to Date: Spend to date is \$276,364 of \$289,946

Additional Funding: Not applicable

Budget History

FY 2015 & FY 2016 (past)		FY 2017 (current)		FY 2018 – TBD (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$276,364		\$13,582		TBD	

Project Plan and Schedule

		Milestone/Deliverable (Originally Planned) use for missed milestones											
		Milestone/Deliverable (Actual) use when met on time											
		FY2015				FY2016				FY2017			
Task		Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)
Past Work													
Q1 Milestone: Literature Review													
Q2 Milestone: Research Design													
Q3 Milestone: Research Strategy													
Q4 Milestone: Strategic Plan													
Q1 Milestone: Invite data providers to working group													
Q2 Milestone: Convene working group													
Q3 Milestone: Develop Data Lab solutions													
Q4 Milestone: Conduct Pilot Research													
Current/Future Work													
Q1 Milestone: Recruit data providers													
Q2 Milestone: Collect data, preliminary analysis													
Q3 Milestone: Review and publish findings													
Q4 Milestone: Execute partner handoff													

All Deliverables and milestones met on time.