IOWA PUBLIC BUILDING ENERGY BENCHMARKING PHASE II REPORT

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ABSTRACT

This report is the final report on the State of Iowa Public Building Energy Benchmarking Project – Phase II. It describes project goals and summarizes activities undertaken by the Iowa Energy Center and the benchmarking team during the grant period. The report highlights the project achievements and accomplished goals, as well as states the difficulties and lessons learned. The Iowa B3 benchmarking platform's new interface and key functions are then introduced. This report concludes with a future plan, a summary of the project achievements, and suggested future program improvements.

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1. INTRODUCTION

1.1. Background

The Iowa Energy Center (IEC) established the Iowa Public Building Benchmarking Pilot (Phase I) Program in 2010 with flow-through funding from the U.S. Department of Energy via the Iowa Office of Energy Independence (OEI, now the Iowa Economic Development Authority Energy Office.) Criteria and scope for selecting a benchmarking system for the pilot program were developed using a framework published by ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers). The Weidt Group's B3 benchmarking system was selected as the key platform through a formal request for proposal process initiated by the IEC. The B3 benchmarking system is designed specifically for statewide building benchmarking and provides an easy and systematic means for buildings to benchmark energy performance against similar minimum Iowa energy code compliant buildings. The platform determines the appropriate energy baseline, allows for peer comparisons, and when possible, an EPA Portfolio Manager score. The Weidt Group is a private software design and energy consulting firm.

The Phase I pilot program ran from 2010 until 2012 during which over 1,200 public buildings were added to the B3 benchmarking system. The Phase I project report [1] is currently available through the Iowa Energy Center website. Figure 1 illustrates the overall plan of the Iowa Benchmarking Program.

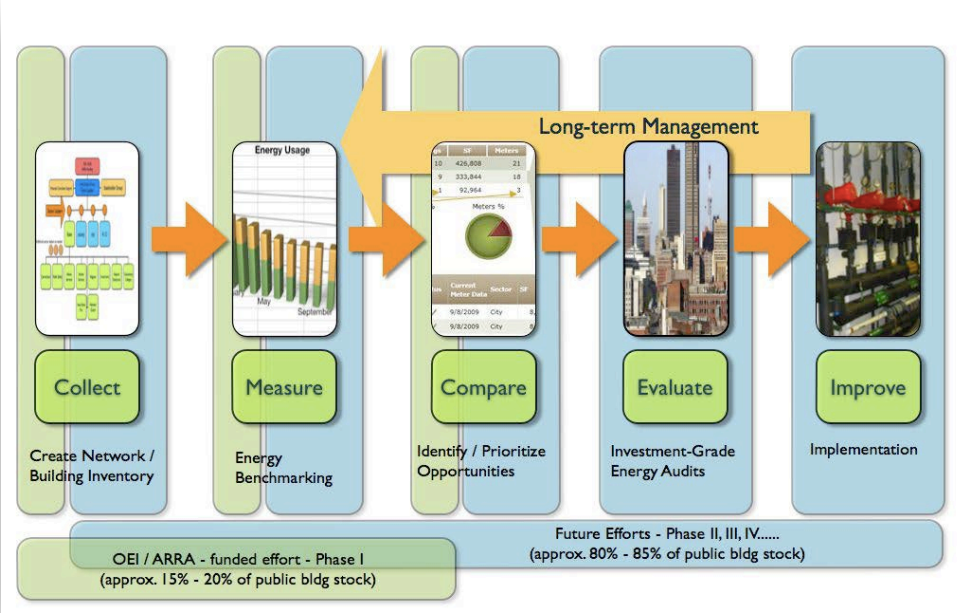


Figure 1. The State of Iowa Building Energy Benchmarking Project Overview

Through its participation in the U.S. Department of Energy's Better Buildings Challenge program, Iowa has agreed to the target of 20% energy reduction by 2020. The state is targeting public buildings' energy use through a completely voluntary benchmarking effort. Following the successful completion of the pilot program, Iowa Economic Development Authority and Iowa Energy Center analyzed the results from the Phase I, and decided to further expand the Benchmarking project to: 1) attract and enroll additional users; 2) develop more program features; and 3) to encourage users to integrate the benchmarking information in their decision-making processes for energy efficiency improvement projects. Figure 2 highlights the individual steps and flow diagram of the model presented to the Department of Energy as a proposal under the 2012 State Energy Program Competitive Awards. The Phase II project was officially awarded to IEDA by the U.S. Department of Energy in October, 2012, and Iowa Energy Center was a subcontractor to IEDA undertaking a portion of the tasks proposed. The IEDA's subcontract with the Iowa Energy Center was signed in January 2013.

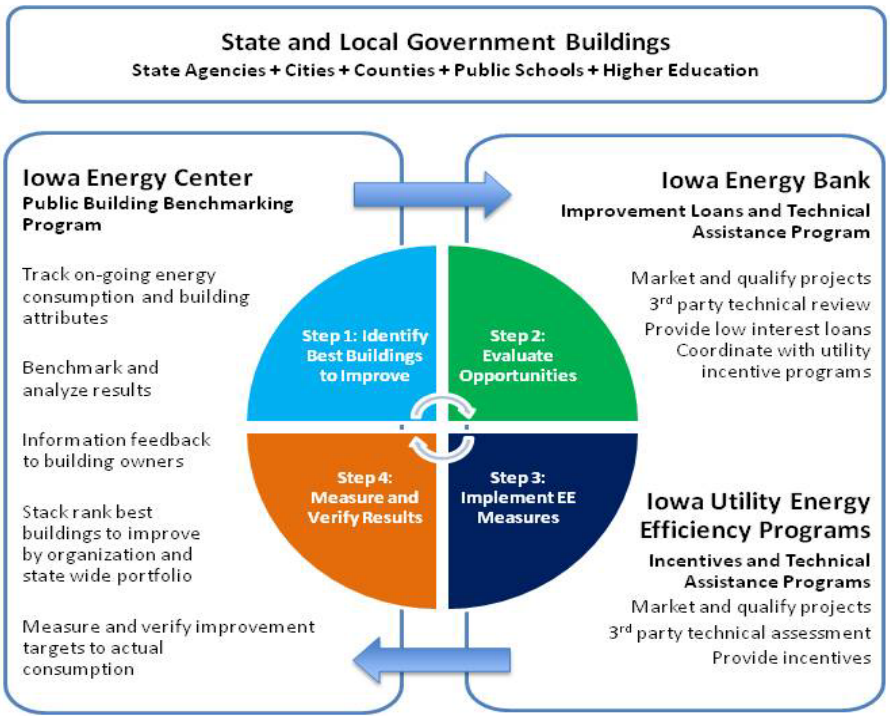


Figure 2. The State of Iowa Public Benchmarking Implementation Model in Phase II

1.2. Project Goals

The overarching project goal of Iowa benchmarking is to achieve a 20% reduction in energy consumption by 2020 compared to a 2009 baseline for those Iowa public buildings participating in the program.

The Phase II implementation model integrated the key stakeholders in the energy industry in

Iowa, namely the Iowa Economic Development Authority, the Iowa Energy Center, and the various Iowa utility providers. The Iowa Public Building Partnership team in Phase II consists of Iowa Economic Development Authority Energy Office, the Iowa Energy Center, and The Weidt Group. The University of Northern Iowa Center for Energy and Environmental Education was also a member of the Partnership for the first 14 months of the Phase II project.

The Iowa Public Building Partnership set out to:

- Strategically recruit building managers from the public sector to enroll an additional 800 buildings in the public building energy benchmarking program to bring the total to 2,000 buildings.

- Undertake outreach activities with participating organizations that could substantially benefit from potentially high return on investment energy efficiency and improvement projects.

- Measure and verify that the results from the selected showcase projects supported the savings potential provided by the B3 benchmarking tool and continue the ongoing use of the benchmarking platform.

2. ACTIVITIES UNDERTAKEN

2.1. Summary of Activities

In Phase II, Iowa Energy Center's primary role was to:

- Lead team efforts to enroll an additional 800 Iowa public buildings in the benchmarking program;
- Identify buildings that are potentially good candidates for energy efficiency and retrofit projects;
- Lead the development of additional B3 features;
- Lead user training for the B3 benchmarking system;
- Conduct individual user case studies and write a report;
- Help create an effective and self-sustaining program.

2.2. Achievements and Accomplished Goals

2.2.1. Enroll 800 additional buildings

Based on the initial success of Phase I, IEDA and IEC continued their partnership with The Weidt Group to provide the B3 benchmarking tool in Phase II. The objective of attracting more users was accomplished through a multi-pronged approach:

- Stakeholder input:

  A stakeholder meeting was held at the launch of Phase II to identify priorities of the program for two years. Members of the stakeholder group included:

  a. Utility Representatives: Alliant Energy, Black Hills Energy, MidAmerican Energy, Iowa Association of Municipal Utilities (IAMU), and Iowa Association of Electric Cooperatives (IAEC).
  b. State Agencies: Office of Consumer Advocate, Iowa Utilities Board, Iowa Board of Regents, Iowa Department of Public Safety which houses building energy code education and enforcement, Department of Administrative Services, Department of Transportation, Department of Education, Iowa Department of Public Defense (Iowa National Guard) and Iowa Economic Development Authority.
  c. State Universities: Iowa State University, University of Northern Iowa, and University of Iowa.
  d. Non-profit Education and Outreach organizations: Iowa League of Cities, Iowa Association of Counties, Energy Association of Iowa Schools, Iowa Association of School Boards.

  The various stakeholders brought diverse perspectives and important insight to the Iowa Benchmarking project. The Iowa utility companies played a significant role in the benchmarking process by providing the actual building energy consumption data.

Participating state agency representatives were critical to insure their building's participation in the B3 benchmarking tool as well as provide input on the tool. Most of these were managers who oversaw the building portfolio for that agency, dealt with building energy codes, or regulated the investor-owned utilities.

State agency representatives worked hard to increase participation rates for their buildings and in offering useful input and feedback about the B3 benchmarking tool. Many of the participating agency representatives were also responsible for directly managing their agency's portfolio of buildings. They often worked with utility providers, state regulators and energy code officials.

- Marketing and Outreach:
  The Partnership worked with several stakeholder organizations to market the Iowa Benchmarking program. Organizations included the Iowa Department of Education, Iowa League of Cities, Iowa Association of Municipal Utilities, and Iowa Association of Counties. Marketing campaigns consisted of routine mass emails, monthly newsletters, and publications and presentations at annual conferences. In-person visits were also conducted to larger public building owners to encourage their participation. Other members of the stakeholder group worked closely with various public buildings owners and operators serving in advocacy/advisory roles. Quarterly stakeholder meetings were held to present progress, changes and facilitate participation.

  A public webpage on the benchmarking results was also created to share energy performance information with the public and raise awareness of the importance of monitoring building performance. Details on the benchmarking public result web page please see Section 2.2.3.

The Partnership was able to achieve its goal by adding an additional **902** buildings during Phase II of the Iowa Public Building Benchmarking Program. Table 1 shows **816** new buildings enrolled and completed in Phase II, and Table 2 shows **86** new buildings enrolled, but are incomplete as they are still collecting building information or utility data.

At the end of December, 2014, there were a total of **103** Iowa public organizations participating in the Iowa Public Building Benchmarking program with **2,176** buildings enrolled. The enrolled buildings consist of a total gross building area equal to **78,718,895** sq. ft. The program has identified a potential **1,090,398** million BTU in energy savings representing a potential **$14,175,177** annual energy cost savings. Table 3 lists the building characteristics, potential energy and cost savings by sector.

Table 1. New Buildings Enrolled and Completed in Phase II

SECTOR	ORGANIZATION	# OF BUILDINGS Enrolled and Completed
City	Ames	16
	Ankeny	17
	Belmond	7
	Bettendorf	10
	Cedar Falls	12
	Clinton	14
	Indianola	10
	Marshalltown	12
	Mason City	6
	Muscatine	2
	North Liberty*	1
	Perry	15
	Urbandale	6
	Walnut	4
County	Black Hawk	8
	Emmet	8
	Howard*	1
	Johnson	14
	Polk/ Iowa Evetns Center	4
	Scott	6
K-12 School	Alden	3
	Ballard	1
	Bettendorf	10
	Cedar Falls	17
	Cedar Rapids*	2
	Council Bluffs*	2
	Davenport	35
	Des Moines Independent	62
	East Marshall	5
	East Sac County	7
	Green County	1
	Grinnell-Newburg	6
	Iowa Falls	7
	Johnston	8
	Knoxville	9
	Linn-Mar*	1
	Rudd-Rockford-Marble Rk	1
	Sioux Center	3
	Spirit Lake	5
	Startmont	1
	Valley	1
	Washington	8
	Waverly-Shell Rock	10
State	Department of Administrative Services*	1
	Department of Public Defense*	219
	Department of Transportation*	62
	Iowa State University	91
	Univ. of Iowa	57
	Univ. Northern Iowa*	1
Community College	NWICC*	1
Other	Region XII COG	3
	Des Moines Area Regional Transit Authority (DART)	3
Total		**816**

*: Organizations joined in Phase I but add additional buildings in Phase II.

Table 2. New Buildings Enrolled but Incomplete in Phase II

SECTOR	ORGANIZATION	# OF BUILDINGS Enrolled but Incomplete
City	Indianola	1
K-12 School	Ballard	6
	Davenport	1
	Des Moines Independent	2
	Green County	1
	Ogden	3
	Washington	3
State	Department of Transportation*	13
	Department of Public Defense*	2
	Univ. of Iowa	55
Total		**86**

*: Organizations joined in Phase I but add additional buildings in Phase II.

Table 3. Phase I & II Enrolled Building Characteristics and Potential Savings by Sector

Sector	Number of Buildings	Floor Area (Sq Ft)	Floor Area (%)	Potential Energy Savings (MMBTU/YR)	Potential Cost Savings (US$/YR)
City	321	5,783,697	7.3%	103,115	$1,340,496
Community College	93	2,242,867	2.8%	5,076	$65,982
County	73	2,818,703	3.6%	52,111	$677,439
K~12 Public School	395	28,845,698	36.6%	211,451	$2,748,865
State	1288	38,754,930	49.2%	714,057	$9,282,747
Other	6	273,000	0.3%	4,588	$59,647
Total	**2176**	**78,718,895**	**100%**	**1,090,398**	**$14,175,177**

The Iowa B3 website (https://ia.b3benchmarking.com/) is the main website to direct interested organizations for program participation, training, and information.

The enrollment process is easy and direct: after expressing interest, the Partnership contacts the organization and provides them with a building spreadsheet template. The template collects the building name, address, building/data owner and contact information as well as operational information such as hours of operation, square footage, meter types and numbers, etc. The building template data is then uploaded into B3 benchmarking platform and the organization's building profile can be created.

Each participating organization must send a building authorization form which allows the Iowa Energy Center to request their utility data from their respective utility company. Once the initial paperwork is completed and returned to the IEC, utility consumption and cost data is requested to the relevant utilities gathered by the Partnership periodically. The Iowa utility companies provided tremendous support providing the data requested by the Partnership. Their involvement in the benchmarking project was crucial for successful implementation.

2.2.2. Identify showcase buildings

To assist IEDA in identifying showcase buildings, Iowa Energy Center and The Weidt Group used the Iowa B3 benchmarking tool to select buildings from each sector that demonstrated the most potential energy savings. The energy savings for each building are estimated based on the current building benchmarking ratio, which is the ratio of the actual Energy Use Index and the predicated Energy Use Index. The corresponding predicted EIU is based on the minimum Iowa Building Energy Code compliant building as well as building type.

The selected showcase building candidates were then individually evaluated by IEDA. IEDA then contacted the building owners about showcasing their buildings as examples of energy efficiency projects with impressive return on investment, energy savings and cost reductions.

The review process determined universities provided many good examples of buildings with impressive energy performance and high return on investment. However, the three state universities already have dedicated energy management systems in place and cannot easily alter their energy efficiency improvement plans. The Partnership then refocused efforts on other building sectors and contacted the respective building agents.

Prior to the program's rollout, IEDA and IEC decided to use the Iowa Energy Bank as an investment tool for the program. During the implementation of Phase II, the remaining funding for the Iowa Energy Bank was already designated and therefore IEDA was unable to market and use it as a financing strategy. The apparent funding shortfall made conversations with building owners about facilities energy improvements more challenging since IEDA couldn't offer funding to organizations struggling with budgetary and funding constraints.

The Des Moines Public Schools' Findley Elementary School was selected by IEDA to be the showcase building for Phase II. A separate report on the showcase building is being prepared by IEDA.

2.2.3. Develop new B3 features

Preliminary plans on new B3 features focused on the automatic importation of utility data from the major utility companies into the Iowa B3 benchmarking platform. Many benchmarking users do not have the necessary time or resources and so automatic updating of monthly building energy data without direct user intervention would be huge step in facilitating wider adaptation of the B3 program.

Prior to developing the new feature, The Weidt Group conducted a utility survey on Iowa benchmarking to: 1) identify methods utility companies currently utilize for data transfer to customers; 2) determine how Iowa utility companies market their demand side management (DSM) programs; and 3) learn how Iowa utility companies view

benchmarking as a potential enhancement to future marketing of DSM programs. It was discovered only a few of the key Iowa based investor owned utilities (IOUs) have the ability to electronically provide customers their utility consumption data either via websites or some other electronic data exchange method. Subsequent discussions with the utility companies revealed potential issues with the data exchange format, communication protocols and security concerns about sending user data to the Iowa B3 platform via the internet. The Partnership then decided development of a feature to automatically import utility data is premature.

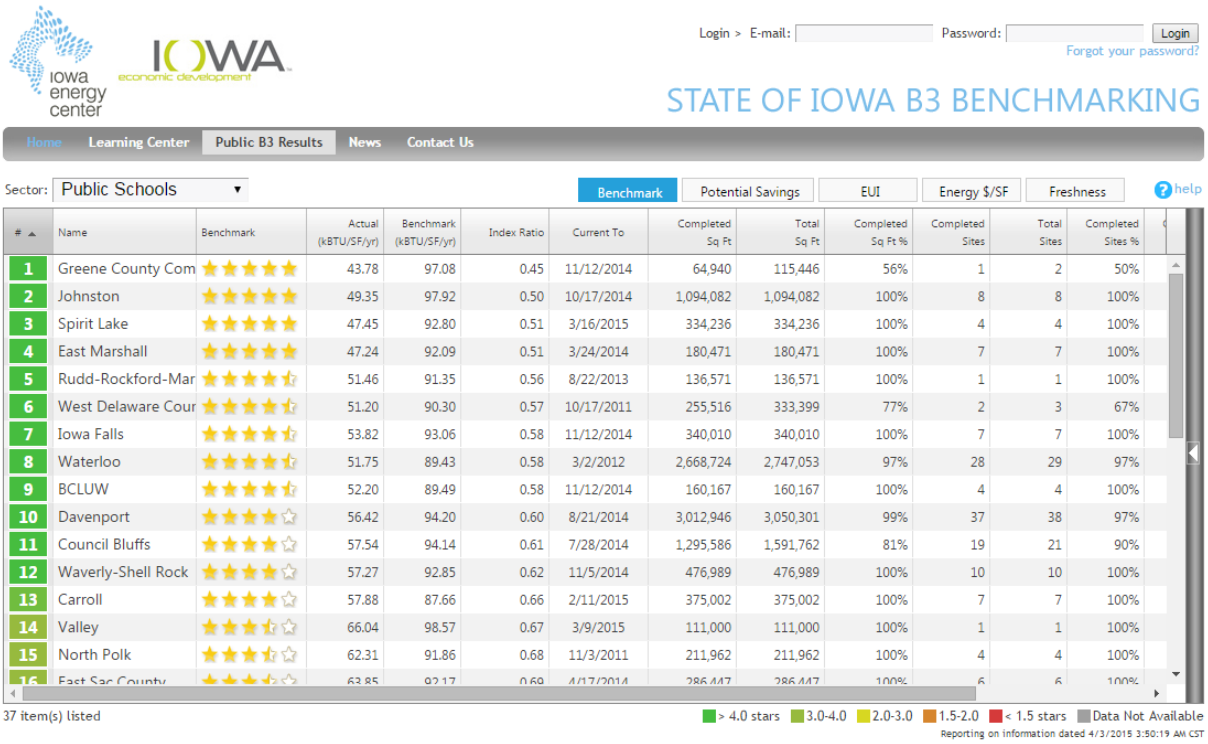
Instead, a feature allowing users to update/upload monthly energy use and cost data via Microsoft Excel was developed. In the past, users could only key in monthly data one month at a time but now multiple months and even yearly data can be imported using a spreadsheet file (Figure 3.) The spreadsheet template has greatly improved data entry efficiency and can be automatically generated by B3 to ensure proper format and compatibility.

	A	B	C	D	E	F	G
1	**City of**				Acct #:		
2	**City Hall**				Meter #:		
3	**CityHallElec**				Source:	**Electric**	
4	Alliant Energy - IPL				Internal ID:	201500001	
5	NOTE: All existing data in this spreadsheet is locked. It is intended to be used for ADDING new meter readings.						
6	Start Date	End Date	Consumption (KiloWatt-Hours)	Peak kw Demand	Demand Charge	Total Charge	
61	3/18/2014	4/2/2014	2,010.00	0.00	$0.00	$274.14	
62	4/2/2014	5/1/2014	2,130.00	0.00	$0.00	$266.37	
63	5/1/2014	6/3/2014	2,490.00	0.00	$0.00	$304.50	
64	6/3/2014	7/2/2014	2,490.00	0.00	$0.00	$337.86	
65	7/2/2014	7/31/2014	2,340.00	0.00	$0.00	$353.40	
66	7/31/2014	8/28/2014	2,490.00	0.00	$0.00	$368.85	
67	8/28/2014	9/30/2014	2,580.00	0.00	$0.00	$347.77	
68	9/30/2014	10/30/2014	2,040.00	0.00	$0.00	$242.35	
69	10/30/2014	11/26/2014	2,100.00	0.00	$0.00	$238.70	
70	11/26/2014	1/5/2015	3,150.00	0.00	$0.00	$389.46	
71	1/5/2015	1/30/2015	2,010.00	0.00	$0.00	$251.57	
72							
73							
74							

Figure 3. Sample User Data Upload Spreadsheet

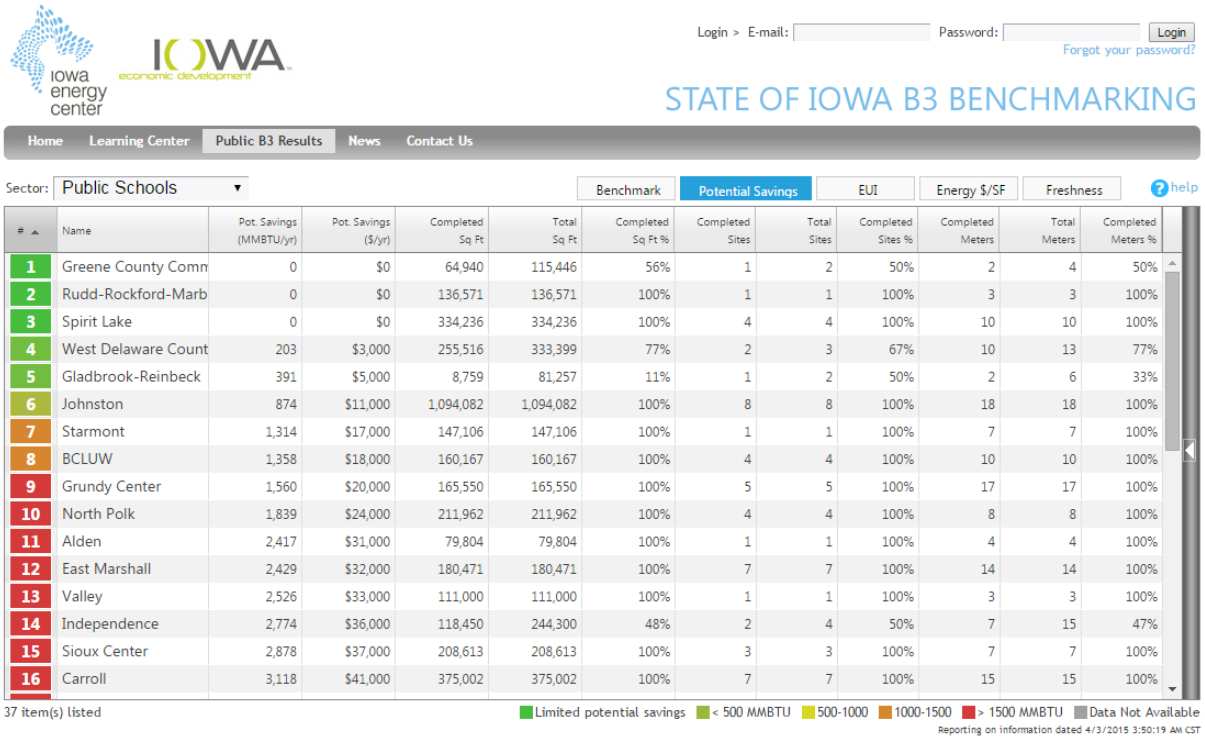
The Partnership also identified the need to publically share the Iowa Public Building Benchmarking information and raise awareness of the program. A public webpage was built to highlight the organizational level benchmarking energy performance. (https://ia.b3benchmarking.com/Report.aspx.)

The Weidt Group created a public results tab which displays overall performance, but also limits the level of detail available to the general public. The participants were allowed an opportunity to cleanup and update data prior to launching the public results tab feature. The Energy Office at IEDA also consulted with legal counsel as well as the Iowa Utilities Board to ensure the basic energy data to be released was indeed public information and could be viewed by the general public via a free and easily accessible website. The public results tab on the B3 website categorized the organizations by various sectors and was also used as a marketing tool to attract additional public organizations to participate. Figure 4~9 illustrate screenshots of the public result website.



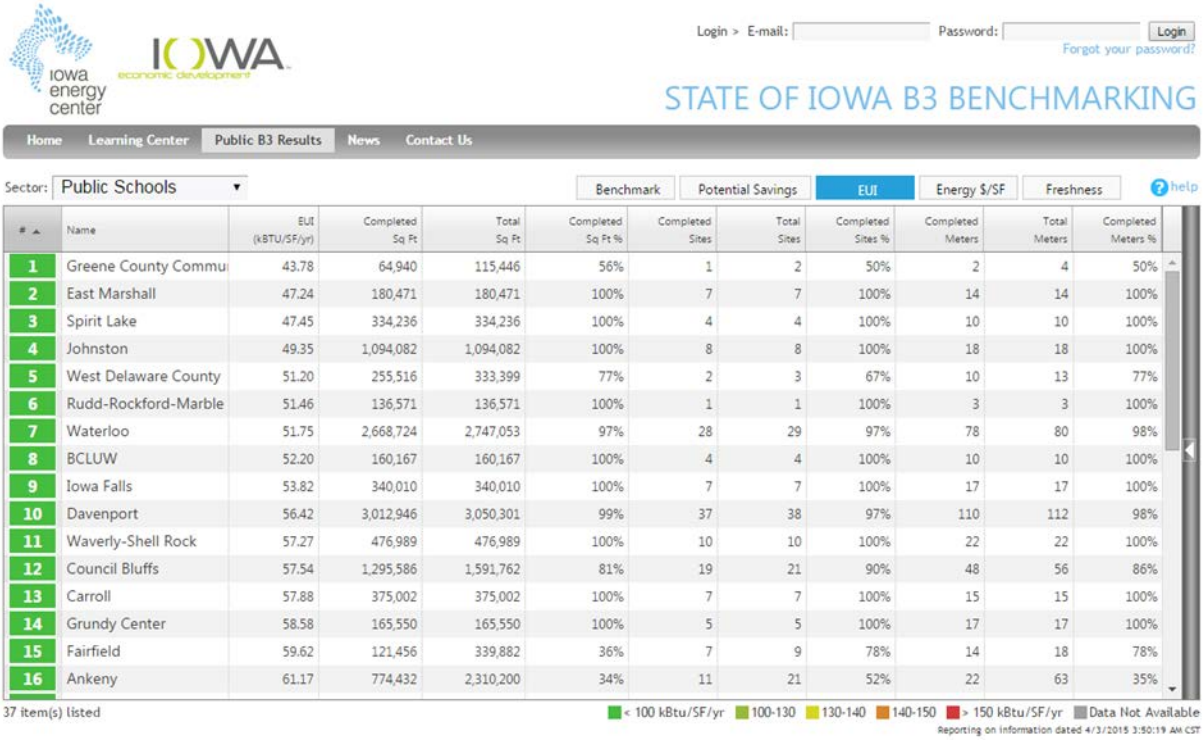
#	Name	Benchmark	Actual (kBTU/SF/yr)	Benchmark (kBTU/SF/yr)	Index Ratio	Current To	Completed Sq Ft	Total Sq Ft	Completed Sq Ft %	Completed Sites	Total Sites	Completed Sites %
1	Greene County Com	★★★★★	43.78	97.08	0.45	11/12/2014	64,940	115,446	56%	1	2	50%
2	Johnston	★★★★★	49.35	97.92	0.50	10/17/2014	1,094,082	1,094,082	100%	8	8	100%
3	Spirit Lake	★★★★★	47.45	92.80	0.51	3/16/2015	334,236	334,236	100%	4	4	100%
4	East Marshall	★★★★★	47.24	92.09	0.51	3/24/2014	180,471	180,471	100%	7	7	100%
5	Rudd-Rockford-Mar	★★★★½	51.46	91.35	0.56	8/22/2013	136,571	136,571	100%	1	1	100%
6	West Delaware Cour	★★★★½	51.20	90.30	0.57	10/17/2011	255,516	333,399	77%	2	3	67%
7	Iowa Falls	★★★★½	53.82	93.06	0.58	11/12/2014	340,010	340,010	100%	7	7	100%
8	Waterloo	★★★★½	51.75	89.43	0.58	3/2/2012	2,668,724	2,747,053	97%	28	29	97%
9	BCLUW	★★★★½	52.20	89.49	0.58	11/12/2014	160,167	160,167	100%	4	4	100%
10	Davenport	★★★★☆	56.42	94.20	0.60	8/21/2014	3,012,946	3,050,301	99%	37	38	97%
11	Council Bluffs	★★★★☆	57.54	94.14	0.61	7/28/2014	1,295,586	1,591,762	81%	19	21	90%
12	Waverly-Shell Rock	★★★★☆	57.27	92.85	0.62	11/5/2014	476,989	476,989	100%	10	10	100%
13	Carroll	★★★★☆	57.88	87.66	0.66	2/11/2015	375,002	375,002	100%	7	7	100%
14	Valley	★★★½☆	66.04	98.57	0.67	3/9/2015	111,000	111,000	100%	1	1	100%
15	North Polk	★★★½☆	62.31	91.86	0.68	11/3/2011	211,962	211,962	100%	4	4	100%
16	East Sac County	★★★½☆	63.85	92.17	0.69	4/17/2014	286,447	286,447	100%	6	6	100%

Figure 4. Sample B3 Public Result Page – Benchmark View



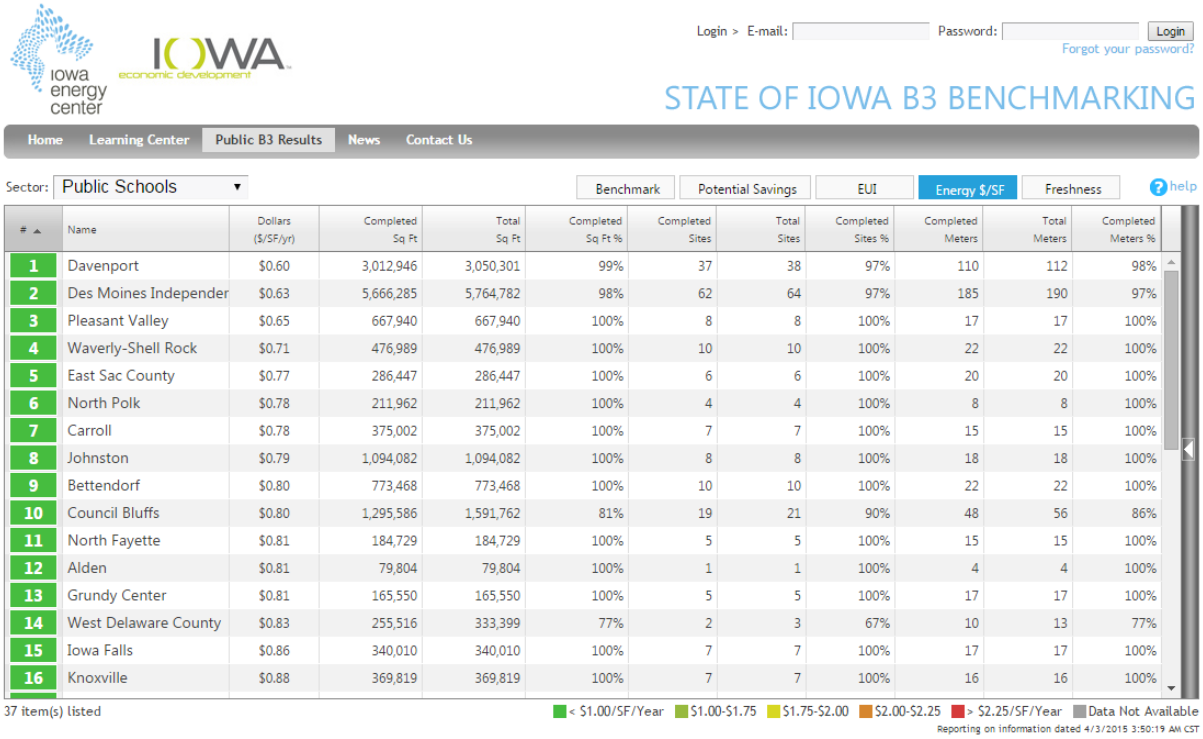
#	Name	Pot. Savings (MMBTU/yr)	Pot. Savings ($/yr)	Completed Sq Ft	Total Sq Ft	Completed Sq Ft %	Completed Sites	Total Sites	Completed Sites %	Completed Meters	Total Meters	Completed Meters %
1	Greene County Comm	0	$0	64,940	115,446	56%	1	2	50%	2	4	50%
2	Rudd-Rockford-Marb	0	$0	136,571	136,571	100%	1	1	100%	3	3	100%
3	Spirit Lake	0	$0	334,236	334,236	100%	4	4	100%	10	10	100%
4	West Delaware Count	203	$3,000	255,516	333,399	77%	2	3	67%	10	13	77%
5	Gladbrook-Reinbeck	391	$5,000	8,759	81,257	11%	1	2	50%	2	6	33%
6	Johnston	874	$11,000	1,094,082	1,094,082	100%	8	8	100%	18	18	100%
7	Starmont	1,314	$17,000	147,106	147,106	100%	1	1	100%	7	7	100%
8	BCLUW	1,358	$18,000	160,167	160,167	100%	4	4	100%	10	10	100%
9	Grundy Center	1,560	$20,000	165,550	165,550	100%	5	5	100%	17	17	100%
10	North Polk	1,839	$24,000	211,962	211,962	100%	4	4	100%	8	8	100%
11	Alden	2,417	$31,000	79,804	79,804	100%	1	1	100%	4	4	100%
12	East Marshall	2,429	$32,000	180,471	180,471	100%	7	7	100%	14	14	100%
13	Valley	2,526	$33,000	111,000	111,000	100%	1	1	100%	3	3	100%
14	Independence	2,774	$36,000	118,450	244,300	48%	2	4	50%	7	15	47%
15	Sioux Center	2,878	$37,000	208,613	208,613	100%	3	3	100%	7	7	100%
16	Carroll	3,118	$41,000	375,002	375,002	100%	7	7	100%	15	15	100%

Figure 5. Sample B3 Public Result Page – Potential Savings View



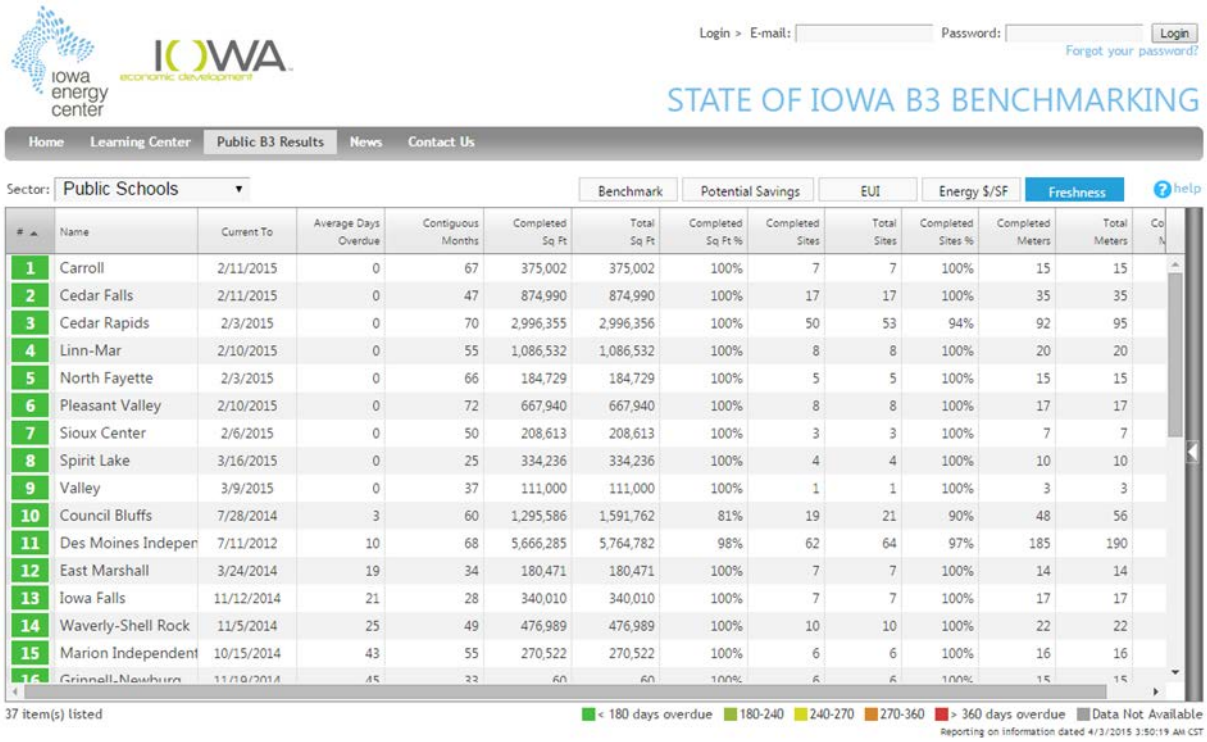
#	Name	EUI (kBTU/SF/yr)	Completed Sq Ft	Total Sq Ft	Completed Sq Ft %	Completed Sites	Total Sites	Completed Sites %	Completed Meters	Total Meters	Completed Meters %
1	Greene County Commu	43.78	64,940	115,446	56%	1	2	50%	2	4	50%
2	East Marshall	47.24	180,471	180,471	100%	7	7	100%	14	14	100%
3	Spirit Lake	47.45	334,236	334,236	100%	4	4	100%	10	10	100%
4	Johnston	49.35	1,094,082	1,094,082	100%	8	8	100%	18	18	100%
5	West Delaware County	51.20	255,516	333,399	77%	2	3	67%	10	13	77%
6	Rudd-Rockford-Marble	51.46	136,571	136,571	100%	1	1	100%	3	3	100%
7	Waterloo	51.75	2,668,724	2,747,053	97%	28	29	97%	78	80	98%
8	BCLUW	52.20	160,167	160,167	100%	4	4	100%	10	10	100%
9	Iowa Falls	53.82	340,010	340,010	100%	7	7	100%	17	17	100%
10	Davenport	56.42	3,012,946	3,050,301	99%	37	38	97%	110	112	98%
11	Waverly-Shell Rock	57.27	476,989	476,989	100%	10	10	100%	22	22	100%
12	Council Bluffs	57.54	1,295,586	1,591,762	81%	19	21	90%	48	56	86%
13	Carroll	57.88	375,002	375,002	100%	7	7	100%	15	15	100%
14	Grundy Center	58.58	165,550	165,550	100%	5	5	100%	17	17	100%
15	Fairfield	59.62	121,456	339,882	36%	7	9	78%	14	18	78%
16	Ankeny	61.17	774,432	2,310,200	34%	11	21	52%	22	63	35%

Figure 6. Sample B3 Public Result Page – Energy Use Index View



#	Name	Dollars ($/SF/yr)	Completed Sq Ft	Total Sq Ft	Completed Sq Ft %	Completed Sites	Total Sites	Completed Sites %	Completed Meters	Total Meters	Completed Meters %
1	Davenport	$0.60	3,012,946	3,050,301	99%	37	38	97%	110	112	98%
2	Des Moines Independer	$0.63	5,666,285	5,764,782	98%	62	64	97%	185	190	97%
3	Pleasant Valley	$0.65	667,940	667,940	100%	8	8	100%	17	17	100%
4	Waverly-Shell Rock	$0.71	476,989	476,989	100%	10	10	100%	22	22	100%
5	East Sac County	$0.77	286,447	286,447	100%	6	6	100%	20	20	100%
6	North Polk	$0.78	211,962	211,962	100%	4	4	100%	8	8	100%
7	Carroll	$0.78	375,002	375,002	100%	7	7	100%	15	15	100%
8	Johnston	$0.79	1,094,082	1,094,082	100%	8	8	100%	18	18	100%
9	Bettendorf	$0.80	773,468	773,468	100%	10	10	100%	22	22	100%
10	Council Bluffs	$0.80	1,295,586	1,591,762	81%	19	21	90%	48	56	86%
11	North Fayette	$0.81	184,729	184,729	100%	5	5	100%	15	15	100%
12	Alden	$0.81	79,804	79,804	100%	1	1	100%	4	4	100%
13	Grundy Center	$0.81	165,550	165,550	100%	5	5	100%	17	17	100%
14	West Delaware County	$0.83	255,516	333,399	77%	2	3	67%	10	13	77%
15	Iowa Falls	$0.86	340,010	340,010	100%	7	7	100%	17	17	100%
16	Knoxville	$0.88	369,819	369,819	100%	7	7	100%	16	16	100%

Figure 7. Sample B3 Public Result Page – Energy $/SF View



#	Name	Current To	Average Days Overdue	Contiguous Months	Completed Sq Ft	Total Sq Ft	Completed Sq Ft %	Completed Sites	Total Sites	Completed Sites %	Completed Meters	Total Meters
1	Carroll	2/11/2015	0	67	375,002	375,002	100%	7	7	100%	15	15
2	Cedar Falls	2/11/2015	0	47	874,990	874,990	100%	17	17	100%	35	35
3	Cedar Rapids	2/3/2015	0	70	2,996,355	2,996,356	100%	50	53	94%	92	95
4	Linn-Mar	2/10/2015	0	55	1,086,532	1,086,532	100%	8	8	100%	20	20
5	North Fayette	2/3/2015	0	66	184,729	184,729	100%	5	5	100%	15	15
6	Pleasant Valley	2/10/2015	0	72	667,940	667,940	100%	8	8	100%	17	17
7	Sioux Center	2/6/2015	0	50	208,613	208,613	100%	3	3	100%	7	7
8	Spirit Lake	3/16/2015	0	25	334,236	334,236	100%	4	4	100%	10	10
9	Valley	3/9/2015	0	37	111,000	111,000	100%	1	1	100%	3	3
10	Council Bluffs	7/28/2014	3	60	1,295,586	1,591,762	81%	19	21	90%	48	56
11	Des Moines Indepen	7/11/2012	10	68	5,666,285	5,764,782	98%	62	64	97%	185	190
12	East Marshall	3/24/2014	19	34	180,471	180,471	100%	7	7	100%	14	14
13	Iowa Falls	11/12/2014	21	28	340,010	340,010	100%	7	7	100%	17	17
14	Waverly-Shell Rock	11/5/2014	25	49	476,989	476,989	100%	10	10	100%	22	22
15	Marion Independent	10/15/2014	43	55	270,522	270,522	100%	6	6	100%	16	16
16	Grinnell-Newburg	11/19/2014	45	33	60	60	100%	6	6	100%	15	15

Figure 8. Sample B3 Public Result Page – Data Freshness View

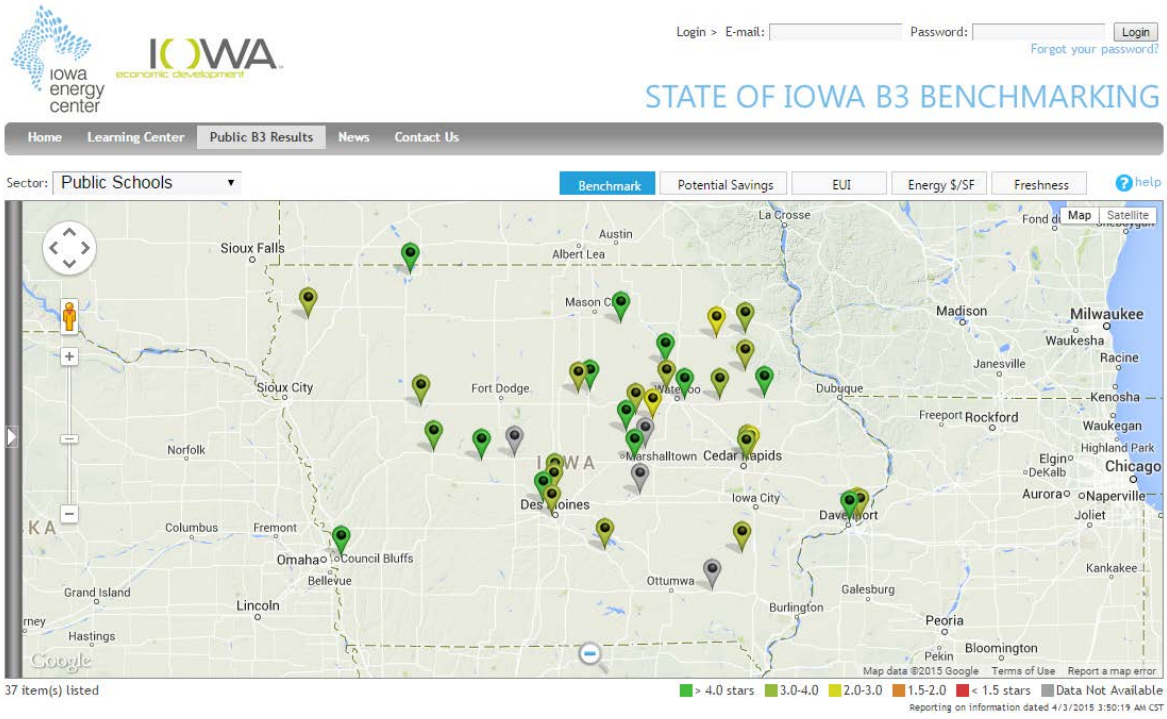


Figure 9. Sample B3 Public Result Page – Benchmark Map View

2.2.4. Conduct B3 benchmarking training

The Iowa Energy Center led training efforts to increase building owner/operator interest and to demonstrate the value and usefulness of the B3 tool. Training goals were: 1) introduction and overview of the Iowa Public Building Benchmarking Program; 2) introduction to the B3 tool; 3) step-by-step procedure on completing a building template; 4) introduction to Iowa benchmarking public site and interpreting public results; 5) how to use the new data importing tool; and 6) how to use the B3 reporting function.

Most of the training was conducted via webinar, and many were recorded and are publically available on the Iowa B3 website under the Learning Center (https://ia.b3benchmarking.com/Overview.aspx.) Training sessions were conducted by both the Iowa Energy Center and The Weidt Group. The Weidt Group developed a series of training videos, embedded as YouTube videos, to address frequently asked questions and common concerns. The videos are available on their website and are only visible to registered users. Training sessions were held approximately once a month during Phase II.

2.2.5. Conduct user case studies

Due to unavailable Energy Bank funding, the Iowa Public Building Benchmarking Partnership decided to conduct user case studies focused on the participating organizations who were using the B3 benchmarking tool regularly and had well performing buildings. The main purpose of the user case study was to summarize user experience and collect user feedback for future program marketing and improvements.

The Iowa Energy Center interviewed nine Iowa public organizations from different sectors for the case study. The sectors were state agencies, including higher education, counties, cities, community colleges and public schools. A user case study report was written and published by the IEC and presented the general background of the Iowa Public Building Energy Benchmarking project, a description of the case study process and introduction to the B3 tool features and functions.

The key sections of the report are the nine individual user case studies. Each individual study summarized the user's building inventory, their public level performance metrics, as well as methodologies and processes for evaluating and utilizing their respective benchmarking results. Of particular interest was whether the benchmarking tool is useful in the decision making process of identifying and implementing building energy efficiency projects. The case studies also included the user's commentary on likes and dislikes, suggestions for improvement, long term availability and overall opinion of the benchmarking tool. The case study report is available on the Iowa Energy Center website.

2.2.6. Create an effective and self-sustaining program

A major achievement for the Phase II project is the Partnership created an effective and self-sustaining Iowa public benchmarking program that can continue without federal grant support, and is still available for Iowa public organizations for free. The Iowa Energy Office at IEDA held multiple stakeholder meetings with the Iowa Energy Center

and the Iowa utility companies discussing the future of the Iowa Benchmarking Program. After months of negotiations, a new partnership agreement is being finalized. Under this new agreement, the utilities, along with IEDA, and IEC will leverage their financial and technical resources to utilize the B3 benchmarking tool and work with their customers to make building energy efficiency improvements. What emerged from this process was to successfully integrate the B3 benchmarking tool into the delivery model the utility companies use in their energy efficiency programs.

All the challenges were met, excluding the financing by the Iowa Energy Bank, and the Partnership was able to demonstrate the usefulness of a benchmarking tool to both the building owners and the utilities. All the participants are now able to access the necessary building energy data to make initial decisions and target buildings that would benefit from energy efficiency improvements. This integration will save time and money for both the building owners and the utilities and also deliver the greatest return on investment.

2.3. Difficulties

In Phase II, the Partnership faced difficulties with marketing and outreach, data collection, and developing an auto-importing feature for the B3 benchmarking tool.

In Iowa, there is no official policy requiring building benchmarking and transparency for public commercial buildings; therefore, the Iowa public building benchmarking program is completely voluntary. Many Iowa public organizations interested in building benchmarking and energy efficiency enrolled in the program during Phase I. The success of Phase I has essentially reduced the number of available public buildings making it more difficult to attract additional Iowa public entities to enroll during Phase II. The partnership increased its outreach and marketing efforts; however, it is especially difficult getting responses and interest from organizations in the County, City, and Community College sectors. This is because many of Iowa's counties and cities are smaller, more disperse and have limited resources with respect to dedicated staff, funding, and time. Iowa community colleges typically have one main utility meter for the entire campus and the individual buildings are not sub-metered. As a result, building benchmarking can only be accomplished at the site level thereby reducing the usefulness of the program.

During the building data collection process, some of the users reported having difficulty providing the benchmarking team accurate building information and data. Compiling information such as building gross square footage, building types and functions, utility meter and account numbers, etc. is challenging and time consuming to these participants. The partnership used webinars to instruct users on effective data collection and building template setup and also provided assistance resolving issues and discrepancies. The utility companies generally provided strong and timely support fulfilling batch utility data requests from the Iowa Energy Center. However, there were a few instances of data requests requiring a few months to complete primarily due to the limited availability of the technical support staff.

An auto-importing utility data feature for the B3 benchmarking platform was not developed

due to the difficulty of picking a standardized electronic data interchange protocol and security concerns raised by some of the utilities for using online data exchange.

2.4. Lessons learned

- The statewide public building benchmarking effort is a long process and needs significant, coordinated effort from all stakeholders including government, utilities, building owners and facility managers, etc.
- It takes considerable commitment from all stakeholders especially when there is no official public policy requiring building benchmarking and transparency.
- Additional outreach and encouragement is needed for organizations from smaller counties, cities, and community colleges.
- Currently over 2,000 Iowa public buildings have enrolled in the program representing approximately more than 35% of all Iowa public buildings.
- Gradually, some users have started using the B3 benchmarking tool in their planning and monitoring of building energy efficiency improvements projects.
- Participating Iowa utilities also have access to building benchmarking information and can integrate the tool with their own energy efficiency programs.
- The new partnership will include utilities providing financial support and overseeing the program direction in the future.

3. INTRODUCTION TO THE NEW B3 BENCHMARKING

3.1. Introduction

The Iowa Public Building Energy Benchmarking Program utilizes the web-based B3 benchmarking tool and allows participating users to benchmark, monitor and analyze their building's energy consumption. The Iowa B3 benchmarking system continues to evolve with new interface, features, and functionalities since 2010. In this chapter, the latest version of the Iowa B3 interface, features and functionalities is introduced.

Upon the completion of initial user/organization setup, authorized users can log in via https://ia.b3benchmarking.com/ and see detailed building level results and reports. The web site has an informative home page, with additional web pages for a learning center, news, and public results. High-level benchmarking results for the participating organizations are updated daily.

The B3 benchmarking tool can present energy consumption results in multiple ways and uses monthly utility billing information and basic facility and building data:

- The **Benchmarks** view displays whether the building is consuming more or less energy than a comparable, minimum Iowa Energy Code compliant building.
- The **Peer Comparison** view shows if the building is consuming more or less energy than a peer type building located in the Midwest.
- The **ENERGY STAR** view highlights the comparison to a similar building type located nationwide.
- The **Baselines** view displays the energy consumption as it relates to the user selected baseline year.

3.2. Summary View

The summary view displays high-level organizational information including benchmarking completeness and data freshness. Incomplete means either the site is a non-building, i.e. a tennis court, an open garage, etc. or there are incomplete/missing building/utility data.

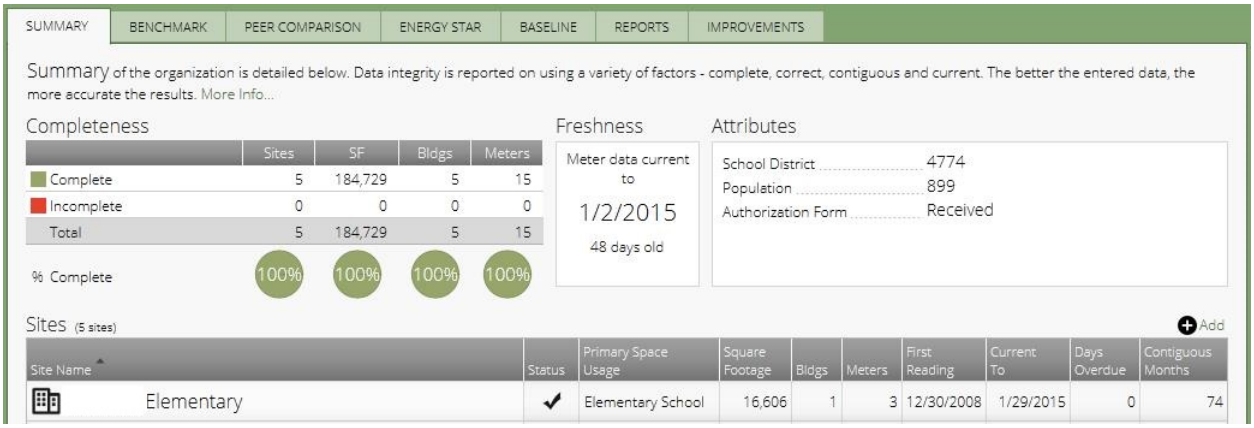


Figure 10. B3 Benchmarking Tool Sample Summary View

3.3. Benchmark View

The Benchmark view shows how a specific user's building compares with a similar building type that meets the minimum design requirements of the Iowa Building Energy Code.

The **Benchmark Index Ratio** is the actual 12-month meter consumption per unit area in kBTU/SF/Year divided by the predicted consumption from a standard building energy model. The unit of measure kBTU is defined as 1,000 British-Thermal-Unit and is equivalent to 293 Watt-Hours. A benchmarking ratio of 1.0 means the building's energy use equals the *predicted* energy consumption of an Iowa Building Energy Code minimum compliant building with the same size, building type and function, and location. Buildings with lower Benchmark Ratios are more energy efficient and those with ratios greater than 1.0 are considered less energy efficient. For example, a building with a 0.85 benchmark ratio indicates a 15% improvement over a similar Iowa Building Energy Code minimum compliant building.

The Benchmarking view also has the **B3 Star** rating which is a simple visual scale based on an increasing performance measure of 1 to 5 stars. The B3 ratings and rankings are available on both the organization and building level.

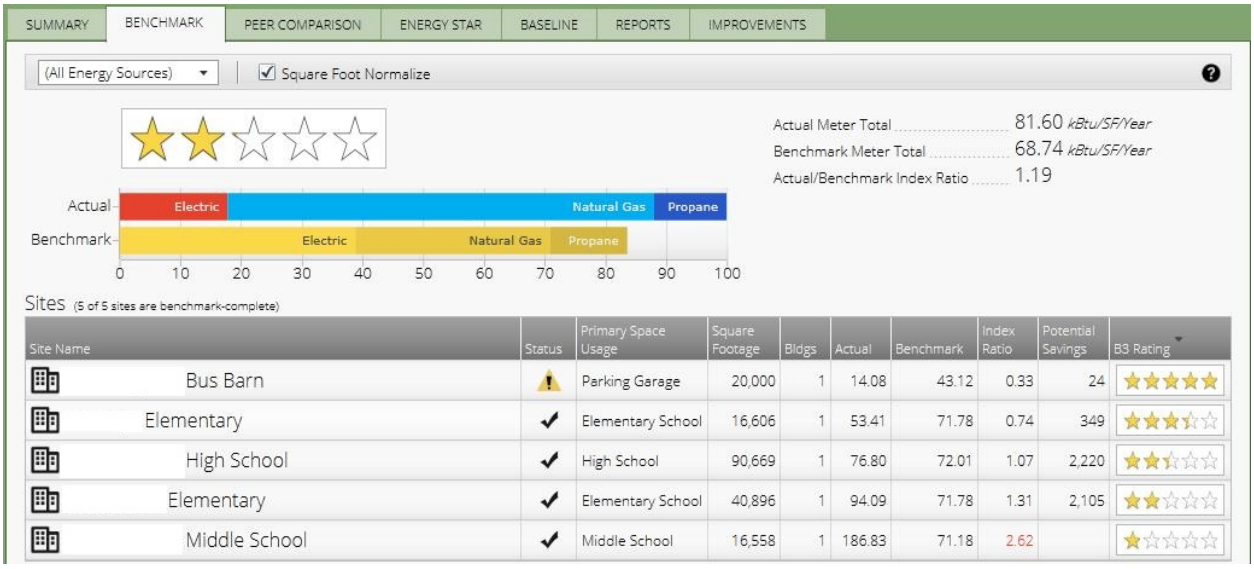


Figure 11. B3 Benchmarking Tool Sample Benchmark View

3.4. Peer Comparison View

The Peer Comparison view displays how a site compares to another similar usage site within the B3 database. Most peer sites are comprised of buildings in Minnesota and Iowa and if there are not enough similar sites, a peer comparison rating may not be available. Peer Ratings are only available for individual buildings.

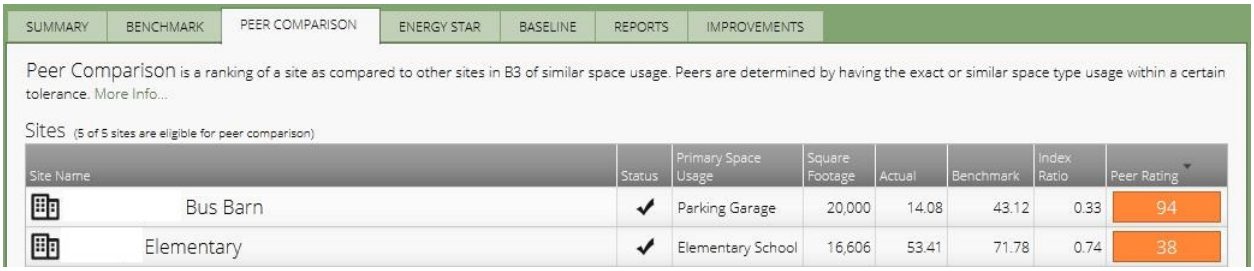


Figure 12. B3 Benchmarking Tool Sample Peer Comparison View

3.5. ENERGY STAR View

The ENERGY STAR view allows one to obtain an ENERGY STAR rating for eligible sites. ENERGY STAR ratings are only available for individual buildings of certain types.

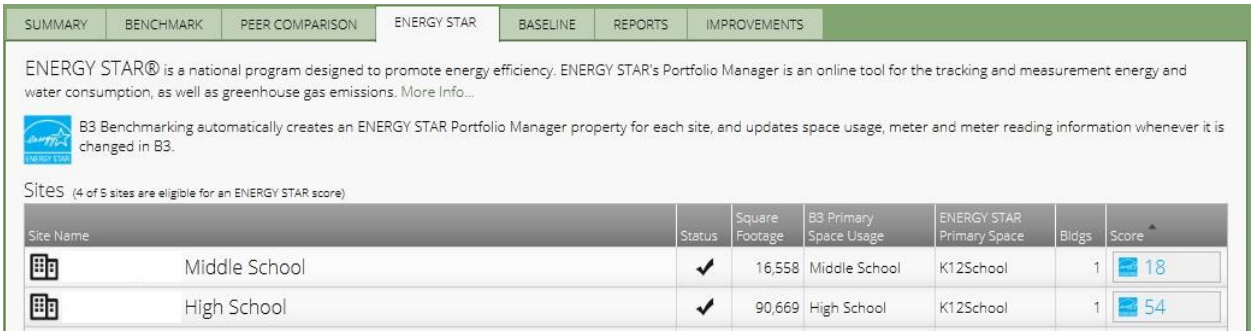


Figure 13. B3 Benchmarking Tool Sample ENERGY STAR View

3.6. Baseline View

The Baseline view allows users to rank their building portfolio and highlight a building's energy consumption compared to a specific baseline year. The results show the most recent continuous 12 month period as it compares to a user selected baseline year. Establishing a baseline year allows users to easily track and quantify energy savings from energy improvement projects.

Figure 14. B3 Benchmarking Tool Sample Baseline View

3.7. Reports View

The Reports view allows users to visualize the annual energy performance per square foot of area for an organization, or a specific site with all fuel sources, in dollars, carbon dioxide emissions, native units, and kBTUs. The default report is the Total Energy Dashboard although there are additional reports and options to compare current, baseline and target consumption metrics.

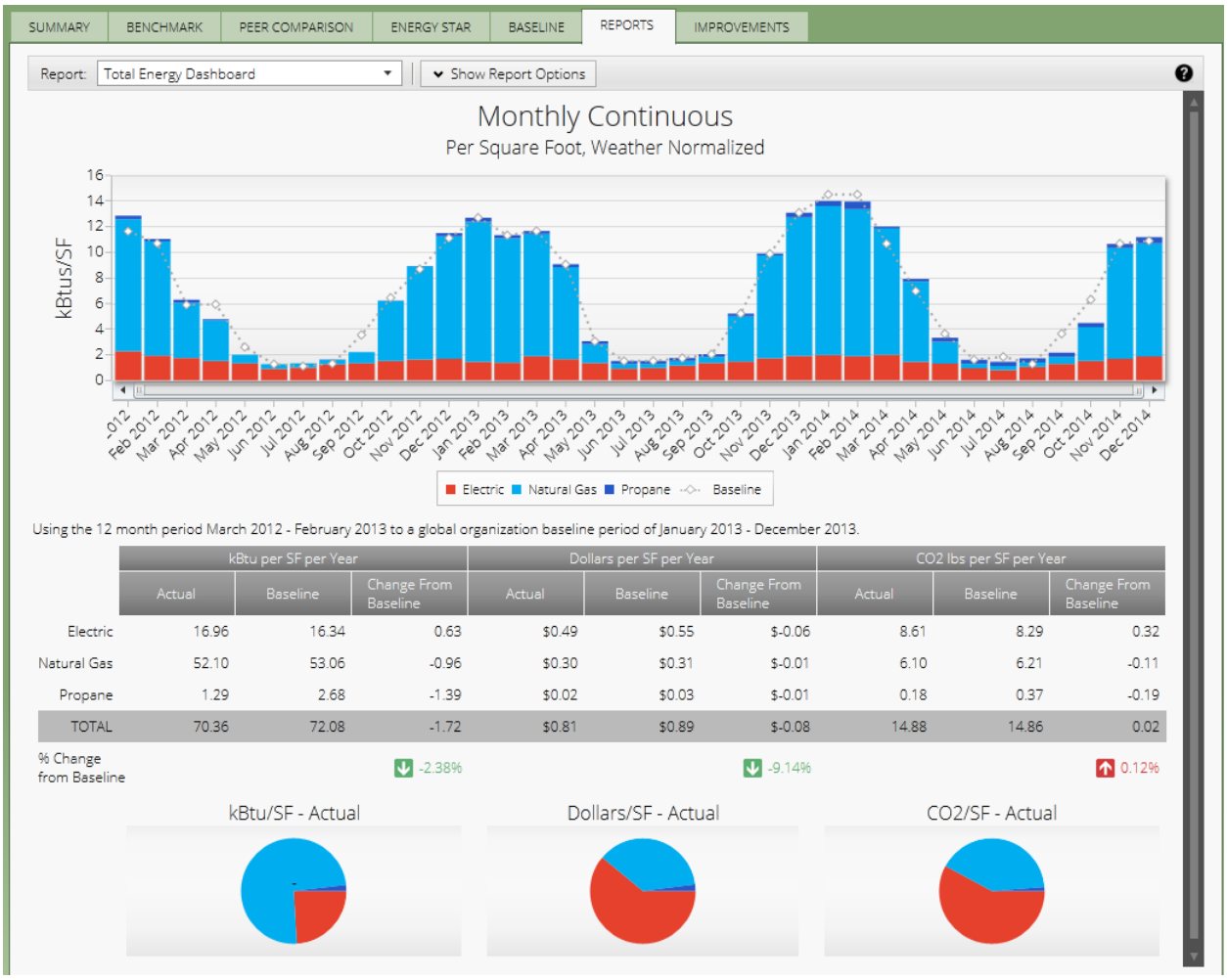


Figure 15. B3 Benchmarking Tool Sample Reports View

3.8. Improvements View

The Improvements view allows one to set relative and absolute goals for the organization and sites. The following table illustrates how to define the targets. After targets are defined, one can compare against the actual energy consumption on the Reports tab.

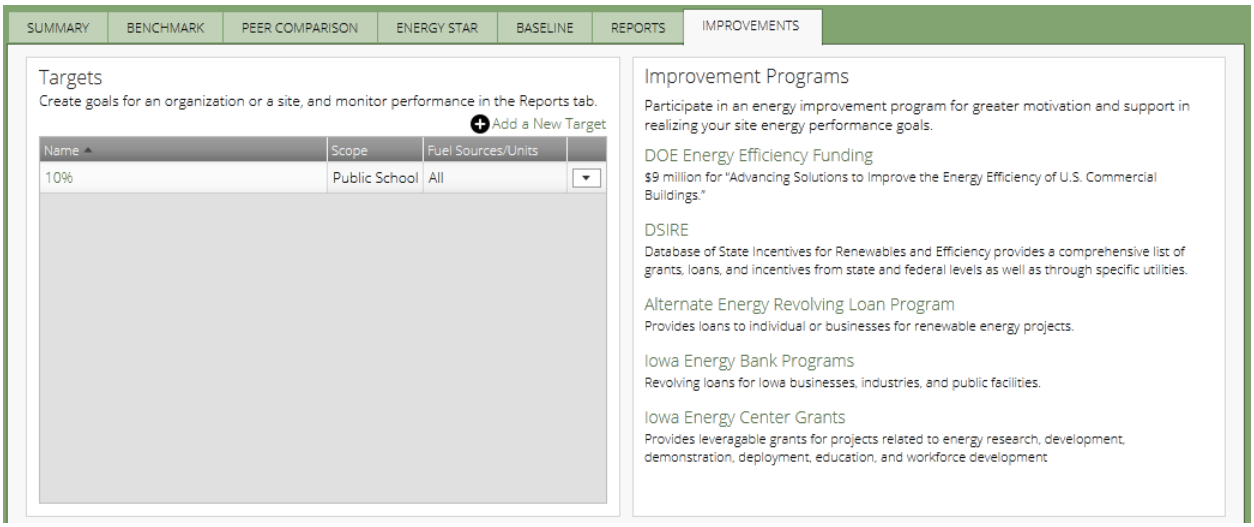


Figure 16. B3 Benchmarking Tool Sample Improvements View

4. NEXT STEPS

4.1. Future of the Iowa Public Building Benchmarking

After the success of Phase I and Phase II projects that were mainly funded by the U.S. Department of Energy, the program is now creating a new partnership that involves IEDA, IEC, state government agencies (IUB & OCA), and key Iowa based utility companies. The new partnership will continue financial support of the program and provide direction for the program in the future. The B3 benchmarking tool will continue to be available without interruption and will be free to the Iowa public organizations already enrolled in the program. The program will also be open to new participation requests. Currently the new Partnership is working on an agreement to set up the new partnership structure and detail the responsibilities. After the new partnership agreement is signed, an announcement will be made to the public on the future plans of the Iowa Public Building Benchmarking program.

4.2. Funding for continued work

The funding for the continued work will come from the new partnership. The main cost of the program is the annual software licensing fee to The Weidt Group as the platform vendor. The new Partnership will provide the necessary funding to continue the program and to support marketing and outreach activities to attract even more participants. The utility companies will also be involved by integrating the B3 tool into their own energy efficiency programs in the future.

5. CONCLUSIONS

During Phase II of the Iowa Public Building Energy Benchmarking project, Iowa Energy Center successfully:

- Led the enrollment of an additional 902 Iowa public buildings in the benchmarking program and 816 of those building completed the enrollment process. Overall, by the end of December, 2014, 103 Iowa public organizations have participated in the program and comprise 2,176 buildings and 78,718,895 sq. ft. of gross building area. The enrolled buildings represent a potential annual energy savings equal to 1,090,398 million BTU or a potential annual cost savings equal to $14,175,177.
- Identified several buildings in each sector as potential DOE showcase buildings. A typical showcase building is one that has displayed impressive energy and cost savings as a result of completing a building energy improvement project. The Des Moines Public Schools' Findley Elementary School was selected by IEDA to be the DOE showcase building for Phase II.
- Led the development of additional Iowa B3 features that include a batch data importing function (at the user end) utilizing Microsoft Excel, and a public result web page displaying organization level building energy performance metrics for participating organizations.
- Led user training for the B3 benchmarking system. The IEC and The Weidt Group conducted multiple comprehensive webinar training sessions on implementing and using the Iowa B3 benchmarking tool.
- Conducted interviews with nine Iowa public organizations and wrote a user case study report summarizing their building inventory, public view performance metrics as well as their methodologies and processes for evaluating and utilizing their respective benchmarking results. The report also discussed the usefulness of the benchmarking tool in their decision making process of identifying and implementing building energy efficiency projects, provided commentary on likes and dislikes, suggestions for improvement, long term availability and overall opinions of the benchmarking tool.
- Helped IEDA creating an effective and self-sustaining program. The Iowa Economic Development Authority led team efforts in working with key Iowa utility companies to integrate the B3 benchmarking tool into their own energy efficiency programs. The goal is an effective and self-sustaining long term program. Currently, a new partnership agreement is close to being finalized, and it is expected the benchmarking program will remain available without interruption so public building owners can continue using the B3 benchmarking tool to plan, monitor, and benchmark buildings energy use and performance.

These accomplishments are another step forward in reaching the overarching goal of achieving a 20% reduction in energy consumption by 2020 for Iowa public buildings. The Iowa B3 benchmarking tool provides a common building benchmarking platform for Iowa public building owners and Iowa utility energy efficiency program managers. An effective and self-sustaining program will make the original vision and overall plan of the Iowa Benchmarking Program a reality. Future collaborated efforts are still needed among all stakeholders, and statewide public policy requiring building benchmarking and transparency would be necessary in getting all Iowa public buildings enrolled in the program. Additional outreach and encouragement is needed for organizations from smaller counties, cities, and community colleges.

REFERENCES

[1] Iowa Energy Center, 2012, *Building Energy Benchmarking Final Technical Report*, http://www.iowaenergycenter.org/wp-content/uploads/2012/05/OEI-Benchmarking-Pilot-Project-Final-Technical-Report-Revised.pdf.