

Lab Benchmarking Symposium

Introduction



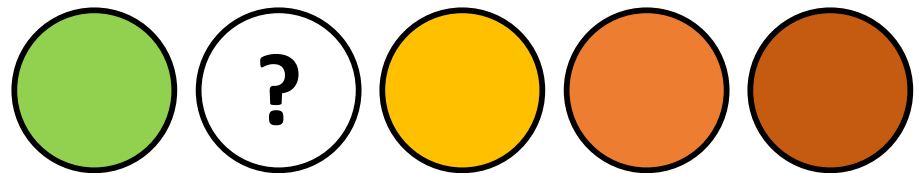
Alison Farmer

Purpose of the Symposium

- Describe state of lab benchmarking today
- Introduce the I²SL Lab Benchmarking Working Group
- Reveal latest updates to Labs21 Benchmarking Tool
- Hear **your feedback** on next steps

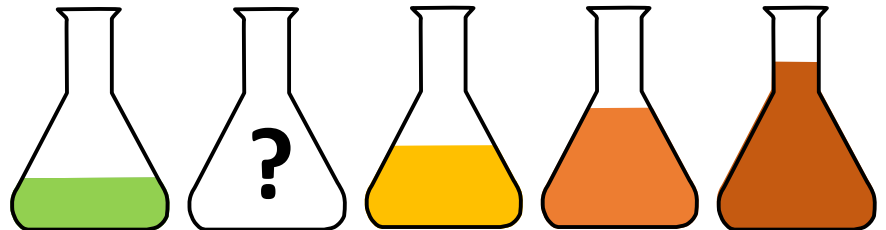
Defining Benchmarking

- Whole building energy benchmarking
- Comparing buildings' energy consumption
 - Contextualizing
 - Prioritizing
 - Ranking
 - Certifying



Benchmarking for Lab Buildings

- Important
- In demand
- Difficult!
 - Complex and varied **functional requirements**



The Labs21 Benchmarking Tool

- Online crowdsourced database:
 - Lab building energy usage
 - Lab-specific functional requirements
- Released in 2002
- Developed by LBNL for Labs21 program



- Select a peer group of buildings from database and compare energy usage

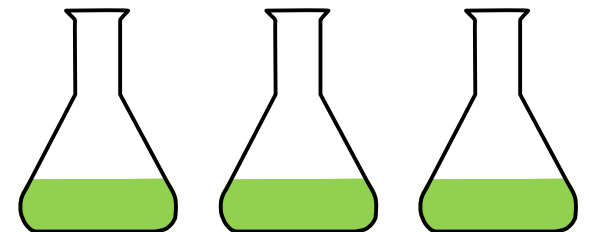
The I²SL Lab Benchmarking Working Group

- Volunteers from I²SL community
- Formed in 2014
- Mostly focused on Labs21 Benchmarking Tool
 - Preservation
 - Understanding usage and needs
 - Maintenance
 - Upgrades
- Group meeting Wednesday 1pm – all welcome



Working Group Achievements (So Far)

- Kept the lights on!
- 2015 Lab Benchmarking Survey
- New regression analysis of tool data
- Website upgrades
- Identified future potential upgrades



Thank You Working Group

Thanks to all group members!

Special thanks to:

- Presentation team: Jacob Werner, Hadley Stolte
- Website team: Hadley Stolte, David Cohen
- Regression and survey analysis: Tim Deak
- FAQs team: Michelle Ruda, David Landman
- Secretary: Michelle Ruda

- From LBNL: Paul Mathew, Travis Walter, Dan Fuller

Symposium Agenda

Jacob:

- The demand for lab benchmarking
- Lab benchmarking datasets and tools

Alison (subbing for Hadley):

- The Labs21 tool: history and data
- Industry demand for improvements
- Upgrades made so far

Alison:

- Possible next steps
- Open discussion

Symposium Agenda

Jacob:

- **The demand for lab benchmarking**
- **Lab benchmarking datasets and tools**

Alison (subbing for Hadley):

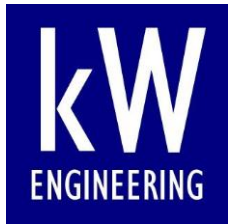
- The Labs21 tool: history and data
- Industry demand for improvements
- Upgrades made so far

Alison:

- Possible next steps
- Open discussion

Lab Benchmarking Symposium

Evolution of the Labs21 Benchmarking Tool



Alison Farmer



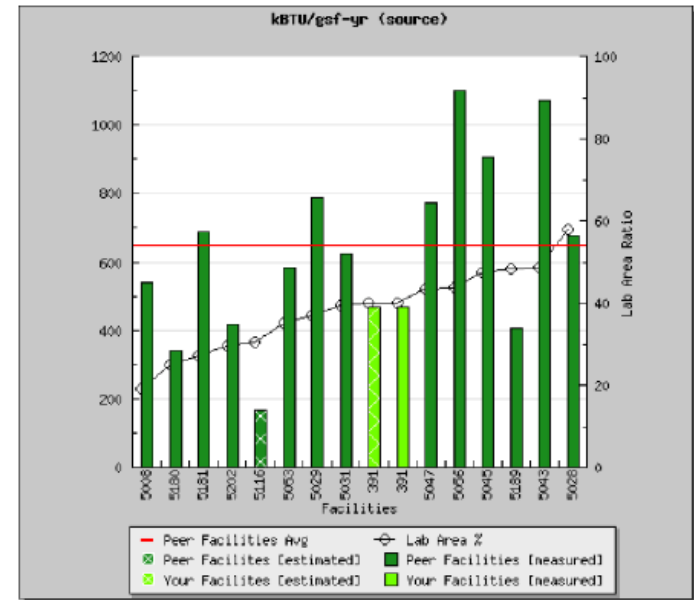
Hadley Stolte

Learning Objectives

- Describe how to access the latest lab data from the Labs21 peer group database
- Identify how to avoid the most common mistakes made by tool users
- Master the newly added features of the Labs21 benchmarking tool
- Demonstrate the benefits of the I²SL/LBNL collaborative efforts on lab benchmarking

Labs21 Benchmarking Tool: Purpose

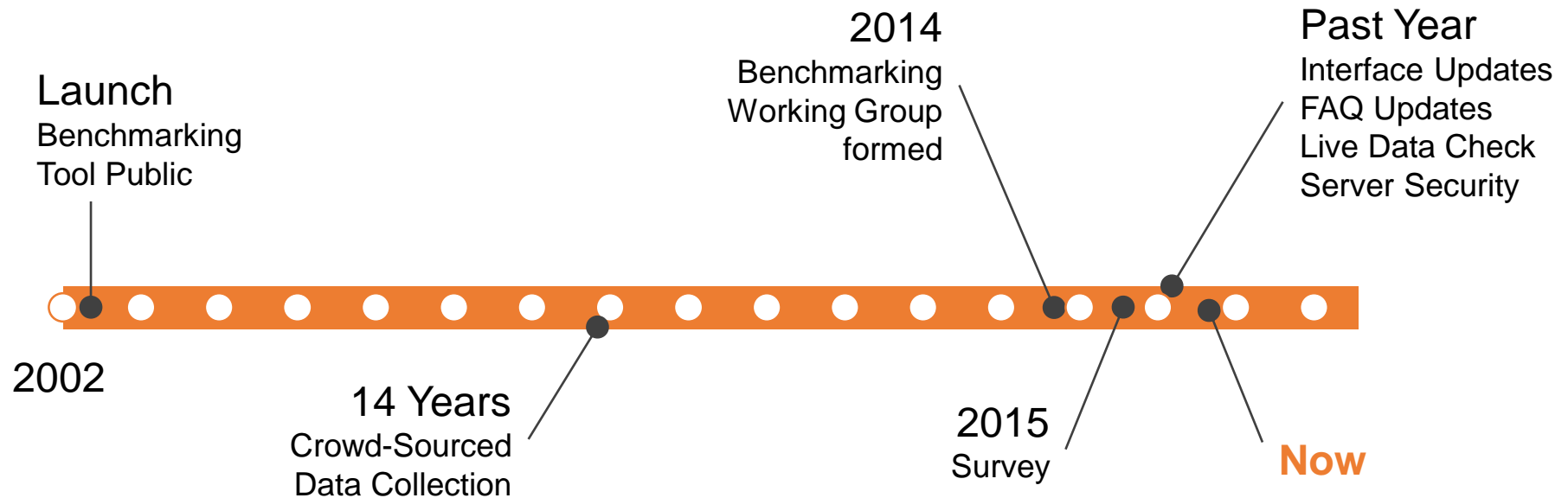
- Benchmarking by data filtering
- Select a **peer group of buildings** for comparison
 - Lab area ratio
 - Lab type
 - Lab use
 - Lab occupancy hours
 - Climate zone
- Compare **energy use intensity** with peer group



Labs21 Benchmarking Tool: History

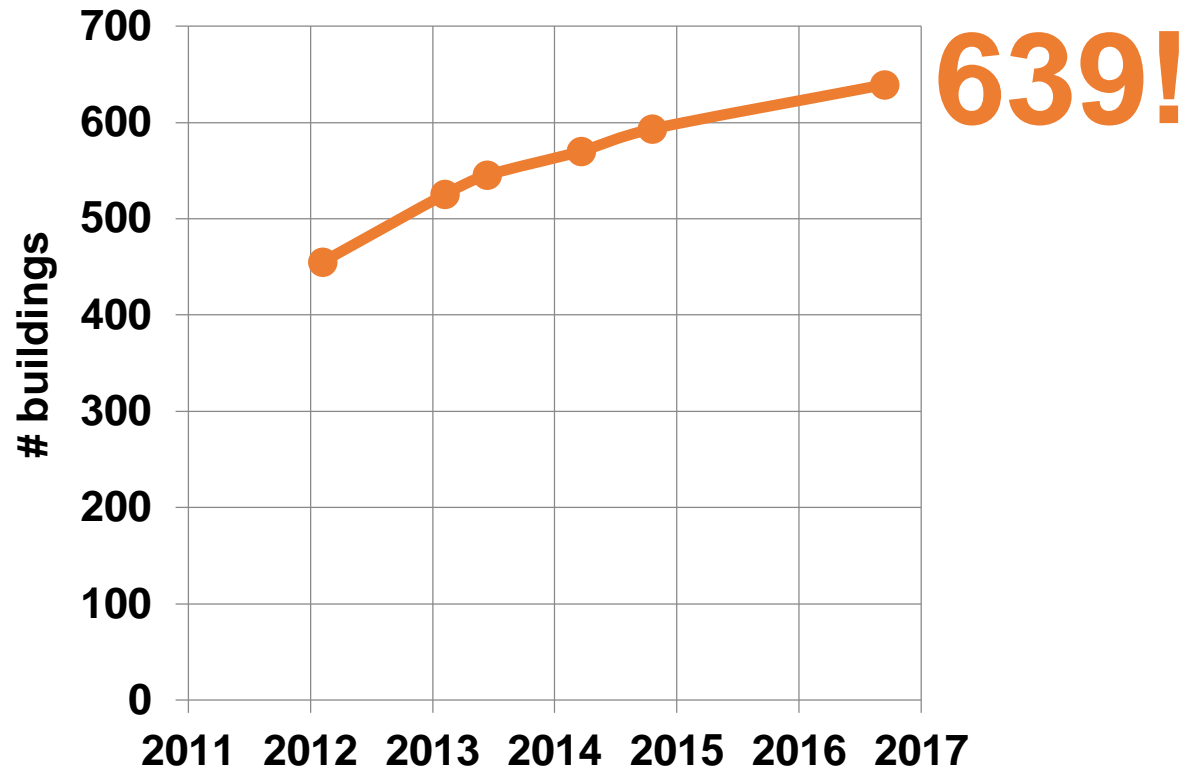
- Developed by LBNL for Labs21 program
- Public since August 2002

<http://labs21benchmarking.lbl.gov>



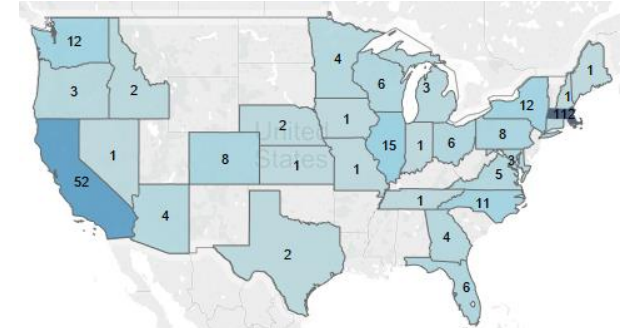
Labs21 Benchmarking Tool: Dataset

- Currently ~40 new buildings per year
- Half of data is less than 5 years old

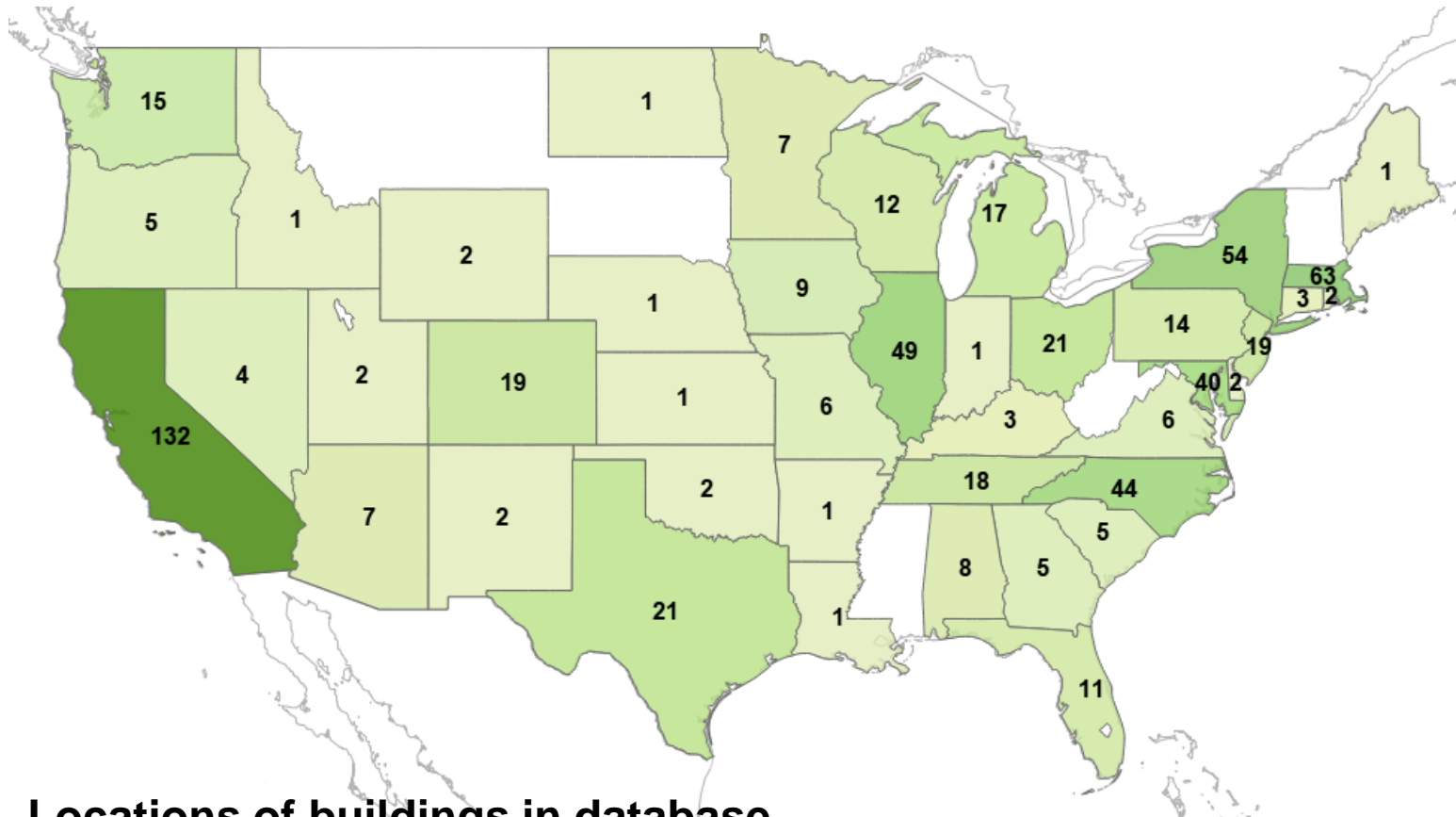


Labs21 Benchmarking Tool: Dataset

- Spread across country
- The usual concentrations
- 6 from Missouri!



(survey respondent locations)

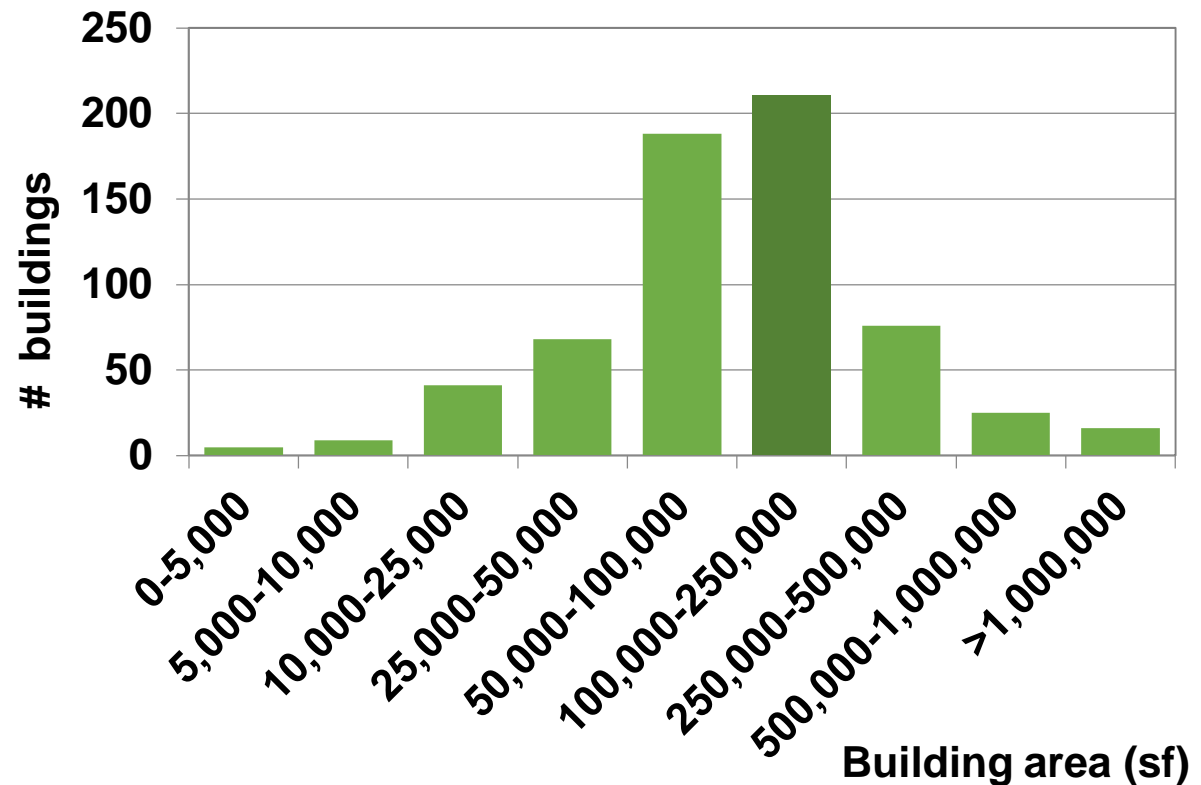


Locations of buildings in database

Labs21 Benchmarking Tool: Dataset

- 122 million sf of buildings
- 58 million sf of lab space

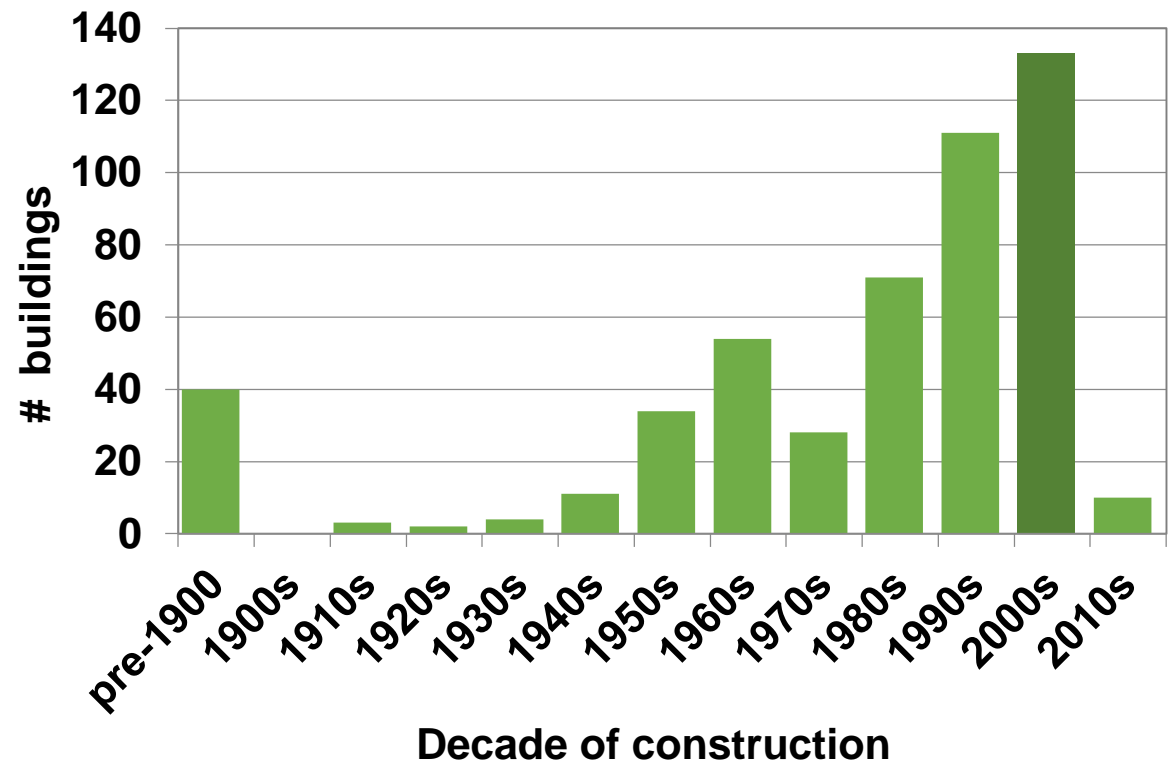
5-10% of total!



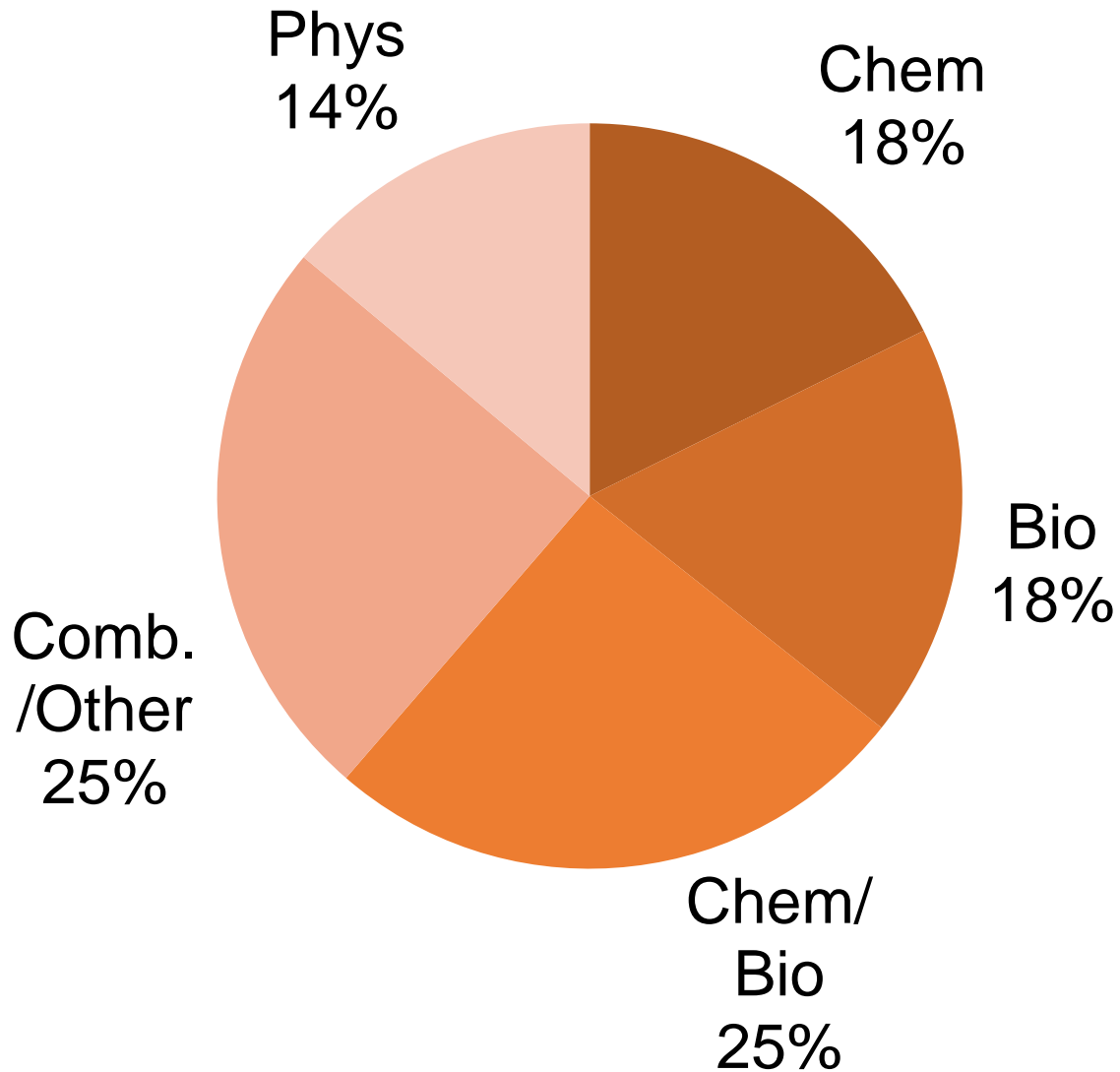
Labs21 Benchmarking Tool: Dataset

- 122 million sf of buildings
- 58 million sf of lab space

5-10% of total!

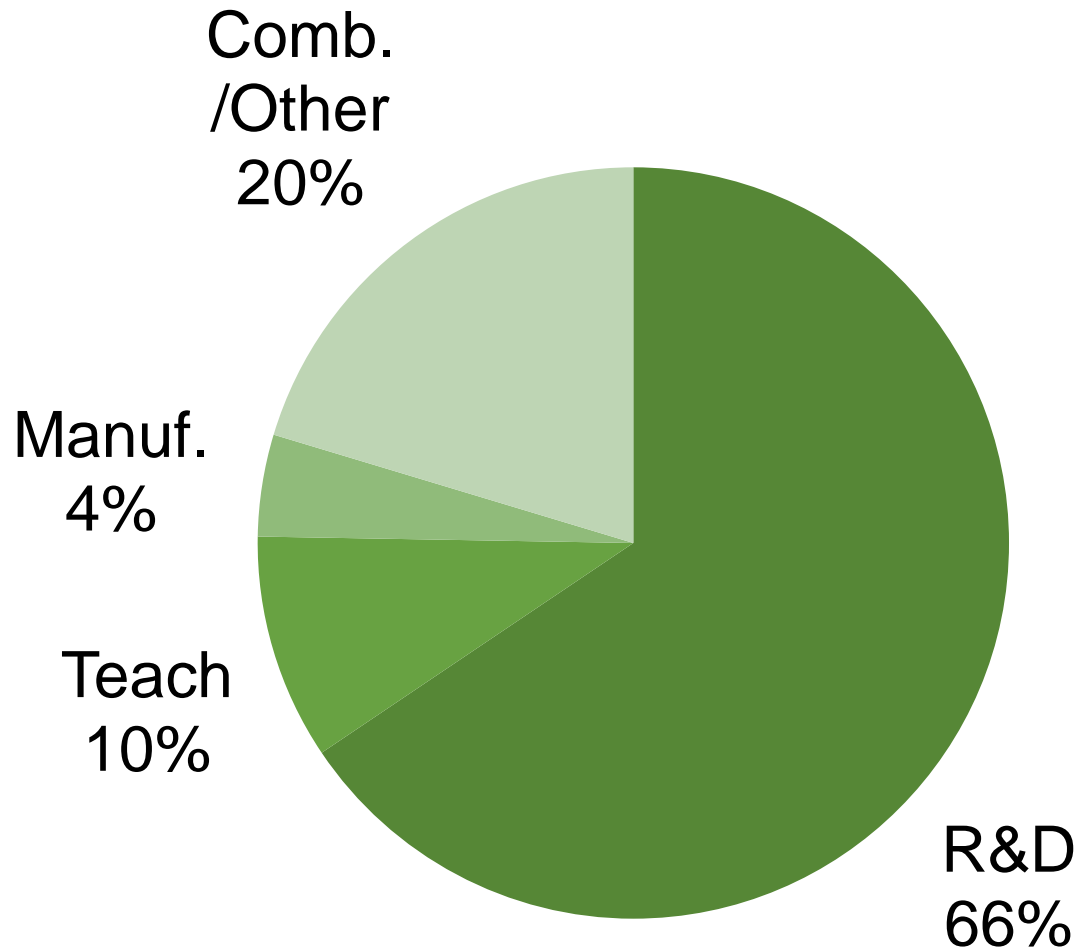


Labs21 Benchmarking Tool: Dataset



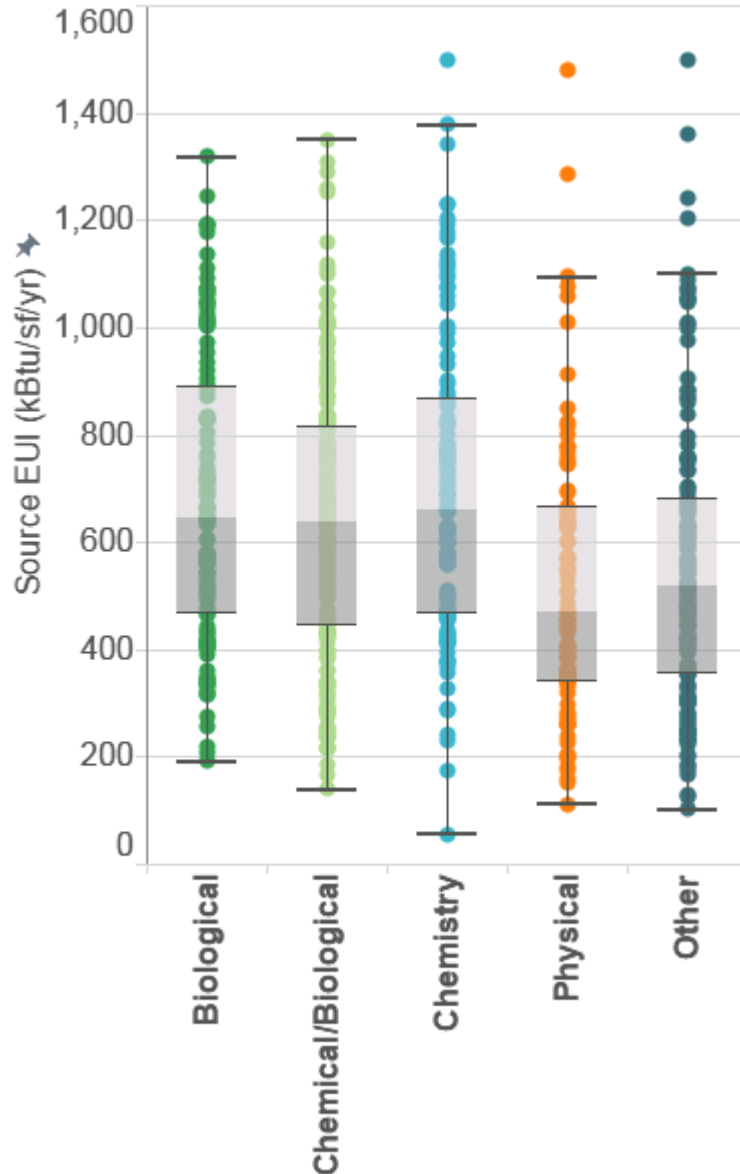
Lab Type

Labs21 Benchmarking Tool: Dataset



Lab Use

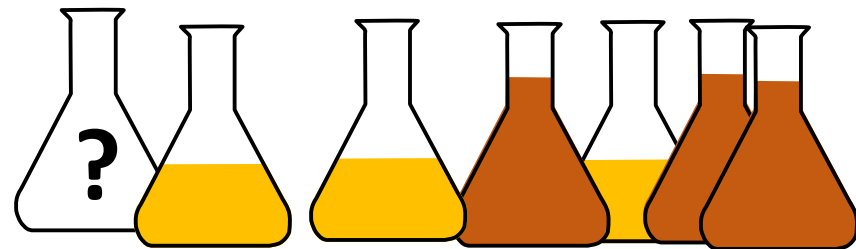
Labs21 Benchmarking Tool: Dataset



- Large spread of energy intensity
- Average source EUI: 630 kBtu/sf/yr
- Average site EUI: 319 kBtu/sf/yr
- Median lab area: 41%

Labs21 Benchmarking Tool: Summary

- Rich dataset
- Unprecedented in size
- Enormous potential
- But not perfect...

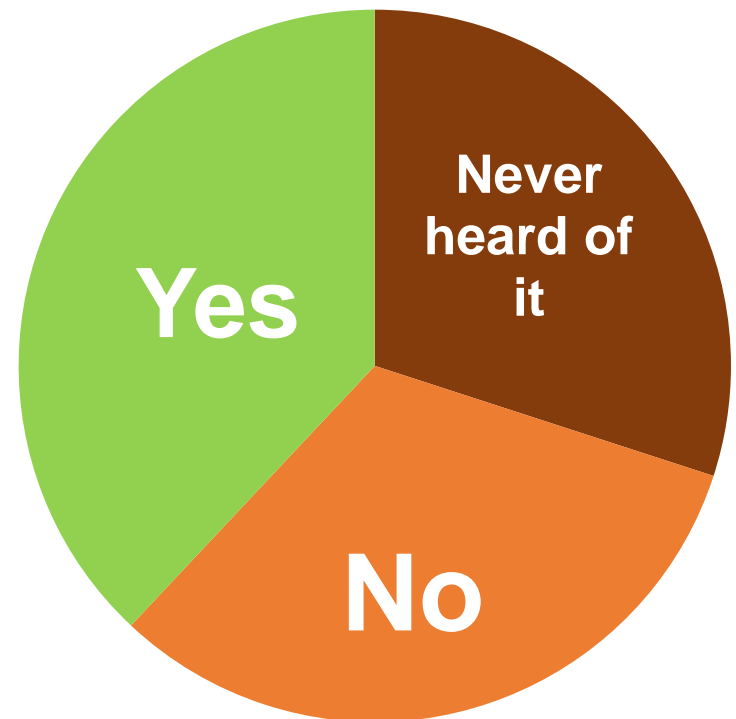


Survey Results: Complaints

Many have used the tool at least once

Common reasons for not using tool:

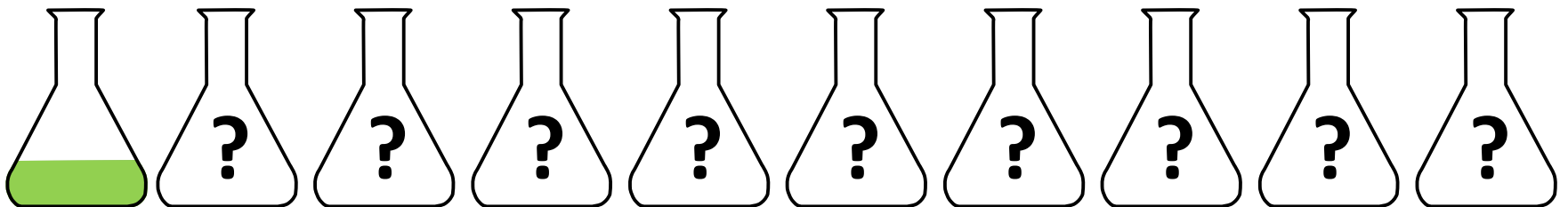
- Unaware of existence
- Confusing interface and output
- Data perceived to be limited and old
- NMJ



Survey results: Complaints

Only 10% of those with data submit it

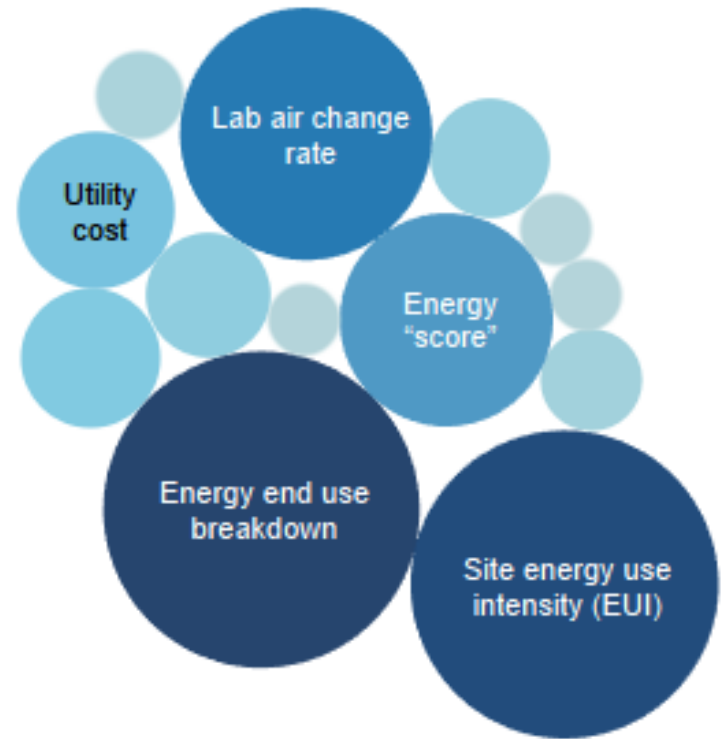
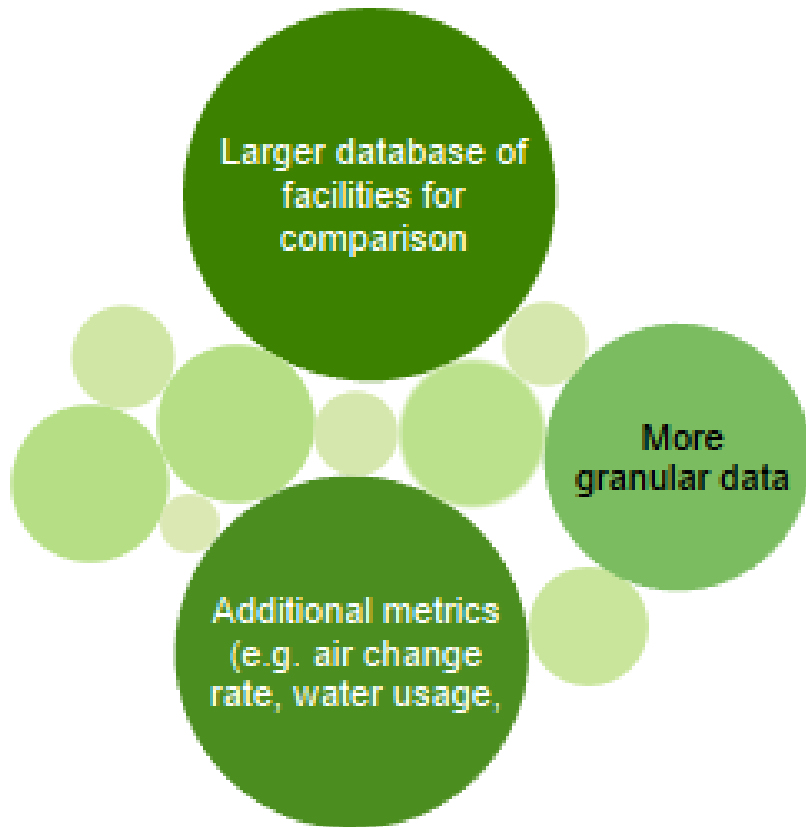
- No time
- No permission
- Unaware of tool
- NMJ
- Dataset not worth it



Survey results: Desires

More Data

- More buildings
- More detail / metrics

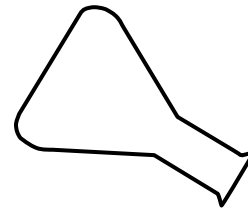


Favorite metrics

- Site EUI
- End use breakdown
- Air change rate

Other Issues

- Spoiled data entries
 - Unit conversion errors
 - Misunderstandings
 - Data rejected from peer group
- Hosting and funding



Issues Addressed

Issues

Solutions

Perception of age

Interface upgrade

Perception of limited data

Display # buildings

Confusing interface

Improved FAQs

Frustrating interface

Live data checks

Data submission errors

Select all climate zones

Data quality issues

WG could validate data

Funding gaps

Outreach and promotion

Aging servers

Server upgrades



The New Look

“2002”



“2016”



benchmarking

Introduction

The purpose of this benchmarking database tool is to allow laboratory owners to compare the performance of their laboratory facilities to similar facilities and thereby help identify potential energy cost savings opportunities. The tool will allow benchmarking with energy use metrics (e.g. BTU/sf/yr) as well as system efficiency metrics (e.g. W/cfm).

To benchmark a facility, you will need to input facility characteristics (e.g. lab type, gross area) and energy use data (e.g. annual electricity use). Although measured data is preferred, estimated data may also be provided. The data you provide will remain anonymous to other users of the database.

Note: You will be prompted for a username and password in order to enter data and benchmark your lab. You may input data over multiple sessions. If you only wish to view the data, without inputting data for your lab, login is not required.

- [Acquire a username and password, or edit your existing profile](#)
- [Bulk data input spreadsheet \(to input 5 or more facilities\)](#)
- [Guidance on how to use this tool for LEED-EB](#)

[Frequently Asked Questions](#)

[Benchmark Your Lab \(login req'd\)](#)

[View Data \(as guest user\)](#)

BENCHMARKING



Welcome to the Labs21 Benchmarking Tool!

Use this tool to compare the energy use of your lab buildings with that of similar facilities in the US. The tool's database contains owner-submitted data from an ever-growing number of lab facilities.

Buildings in database: 639

Last database update: July 2016

Enter Data

Enter your data into the database.
Your facilities appear in output reports.
Username and password required.

View Data

View data already in the database.
Output reports show database facilities only.
No login required.



Live Data Checks

Gross Area (sq. ft.)*



Lab Area (sq. ft.)*

(Area requiring 100% outside air)



% Biological



% Chemical



% Physical



% Other



Continue

labs21benchdev.lbl.gov says:

Lab area entered is less than 100 square feet. Please verify lab area

OK

Peer Group Selection: Before

4. Lab Use

- Research/Development
- Manufacturing
- Combination/Others
- Teaching

5. Climate [Climate Code, Climate Type, Representative City]

[\(Click here to see map of climate zones\)](#)

- 1A, **Very Hot - Humid** (Miami, FL)
- 2B, **Hot - Dry** (Phoenix, AZ)
- 3B, **Warm - Dry** (El Paso, TX)
- 4A, **Mixed - Humid** (Baltimore, MD)
- 4C, **Mixed - Marine** (Salem, OR)
- 5B, **Cool - Dry** (Boise, ID)
- 6B, **Cold - Dry** (Helena, MT)
- 8, **Subarctic** (Fairbanks, AK)
- 2A, **Hot - Humid** (Houston, TX)
- 3A, **Warm - Humid** (Memphis, TN)
- 3C, **Warm - Marine** (San Francisco, CA)
- 4B, **Mixed - Dry** (Albuquerque, NM)
- 5A, **Cool - Humid** (Chicago, IL)
- 6A, **Cold - Humid** (Burlington, VT)
- 7, **Very Cold** (Duluth, MN)

6. Measured and Estimated data

- Measured
- Estimated

Reset Values

Continue...

Peer Group Selection: After

4. Lab Use

- Research/Development
- Manufacturing
- Combination/Others
- Teaching

5. Climate [Climate Code, Climate Type, Representative City]

[\(Click here to see map of climate zones\)](#)

- All Climate Zones
- 2A, Hot - Humid (Houston, TX)
- 3A, Warm - Humid (Memphis, TN)
- 3C, Warm - Marine (San Francisco, CA)
- 4B, Mixed - Dry (Albuquerque, NM)
- 5A, Cool - Humid (Chicago, IL)
- 6A, Cold - Humid (Burlington, VT)
- 7, Very Cold (Duluth, MN)
- 1A, Very Hot - Humid (Miami, FL)
- 2B, Hot - Dry (Phoenix, AZ)
- 3B, Warm - Dry (El Paso, TX)
- 4A, Mixed - Humid (Baltimore, MD)
- 4C, Mixed - Marine (Salem, OR)
- 5B, Cool - Dry (Boise, ID)
- 6B, Cold - Dry (Helena, MT)
- 8, Subarctic (Fairbanks, AK)

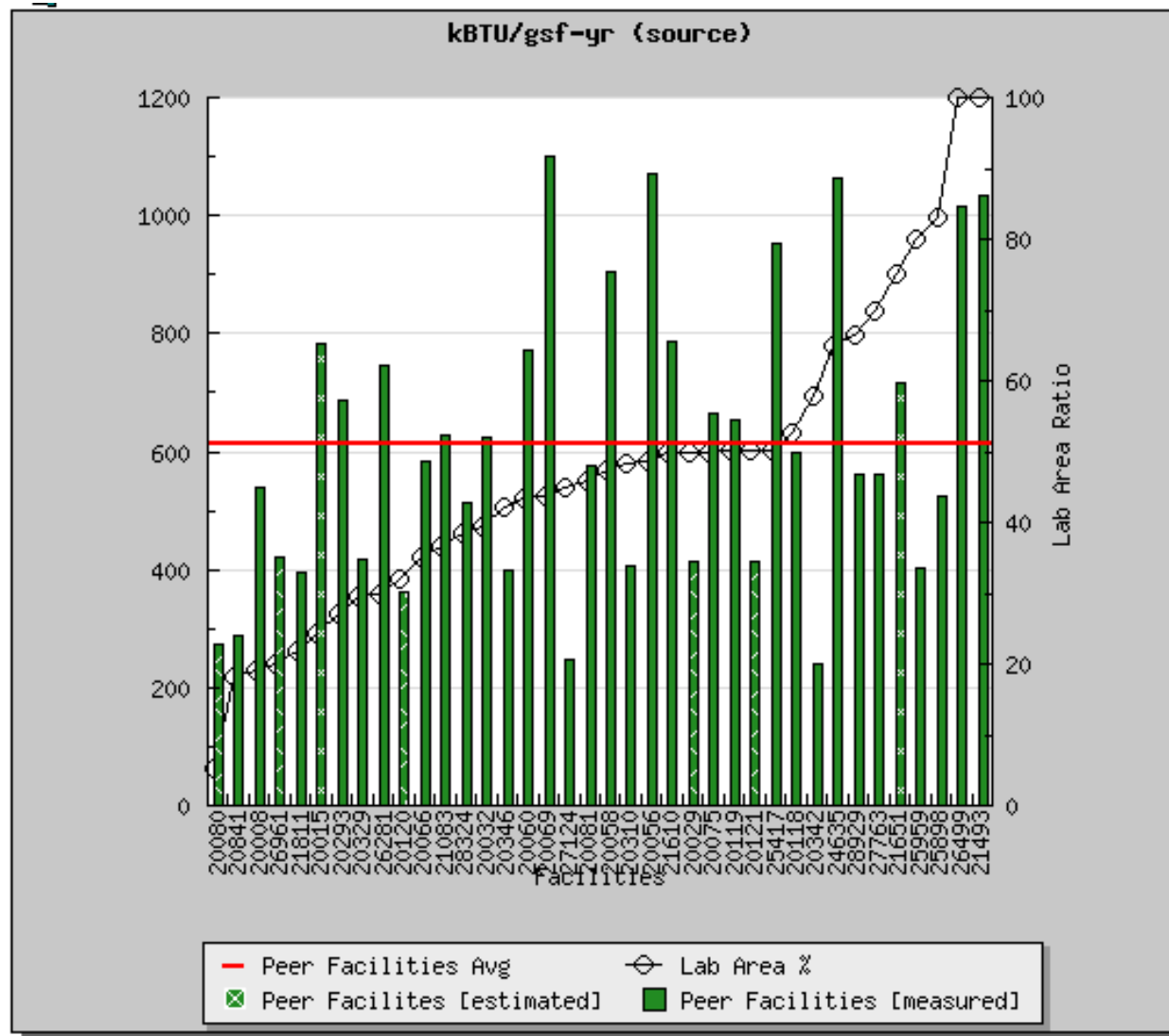
6. Measured and Estimated data

- Measured
- Estimated

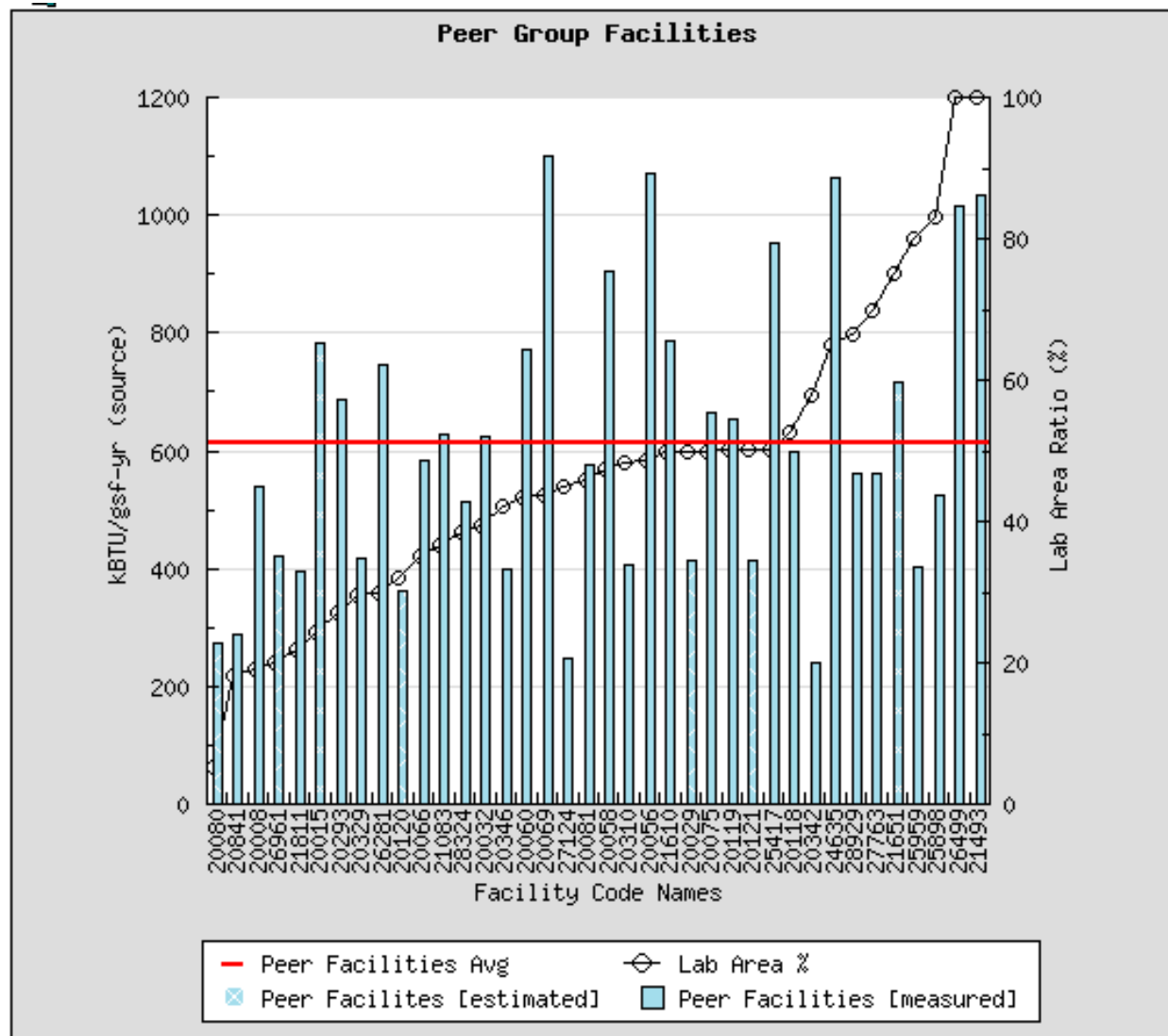
Reset Values

Continue

Output Plot: Before



Output Plot: After



Summary

- Labs21 tool is a unique, valuable, and **free** resource
- Updates and upgrades:
 - Successful collaboration between I²SL and LBNL
 - More work is needed!

BENCHMARKING

