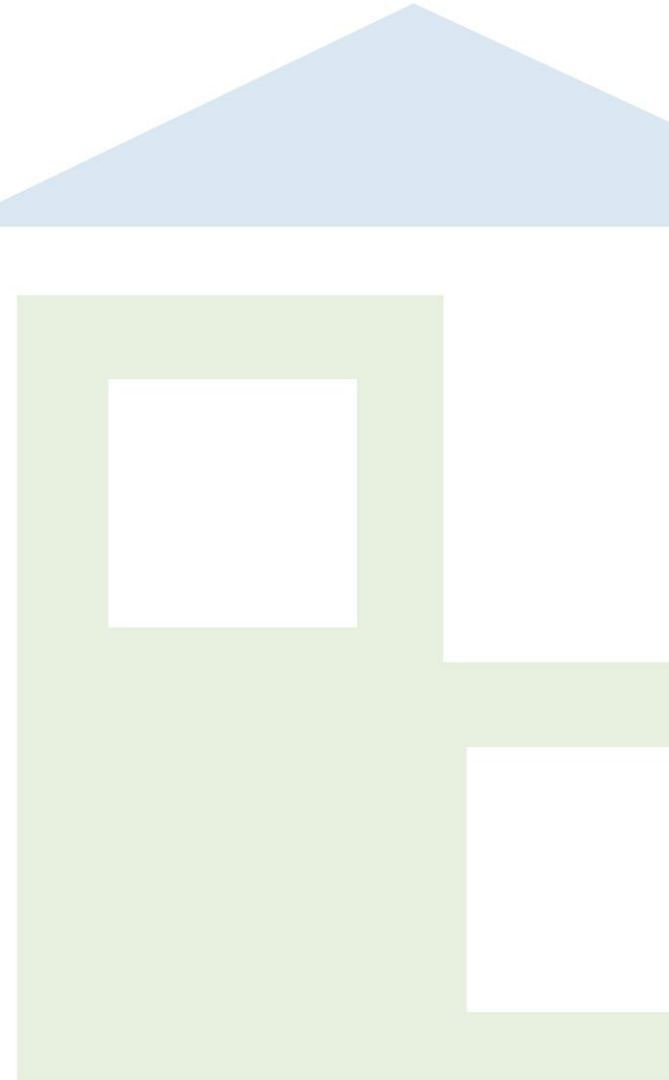


What Can Data Do For Me?

Dale Hoffmeyer

U.S. Department of Energy



Where are we going?
Are we there yet?



Why I Collect Data?

More empirical data supporting effective strategies is foundational to the development of a self-sustaining building energy upgrade market.*

Better Buildings Neighborhood Program

- 1) Data needed to monitor grantee progress
- 2) Data needed to complete program evaluation.
- 3) Data needed to demonstrate effective program designs, business models and investment decisions.

* SEE Action Residential Retrofit Working Group *Roadmap for the Home Energy Upgrade Market*
http://www1.eere.energy.gov/seeaction/pdfs/retrofit_energyupgradesroadmap.pdf

- Program and building data from 41 grantees across multiple states implementing diverse program strategies over 2½ years
 - 75,000+ Residential Single-Family Building records
 - 9,600+ Residential Multi-family Unit records
 - 800+ Residential Multi-family Building records
 - 3,500+ Commercial Building records
 - 21,000+ records with some energy consumption data, including about 5000 with 12 months of energy consumption before and after the upgrade.
- You may find the data useful to support program decisions
 - **Grantee Final Technical Reports**
 - **BBNP Process and Impact Evaluations**
 - Recovery.gov data (jobs, expenditures by recipient, sub-grants and vendor)
 - BBNP Summary of Reported Data (reports)
 - Programmatic and Building Upgrade Data (anonymized to protect privacy)
 - Will be available on BBNP Web site, DOE OSTI Web site, OpenEI, or BPD

What Can Data Do For You?

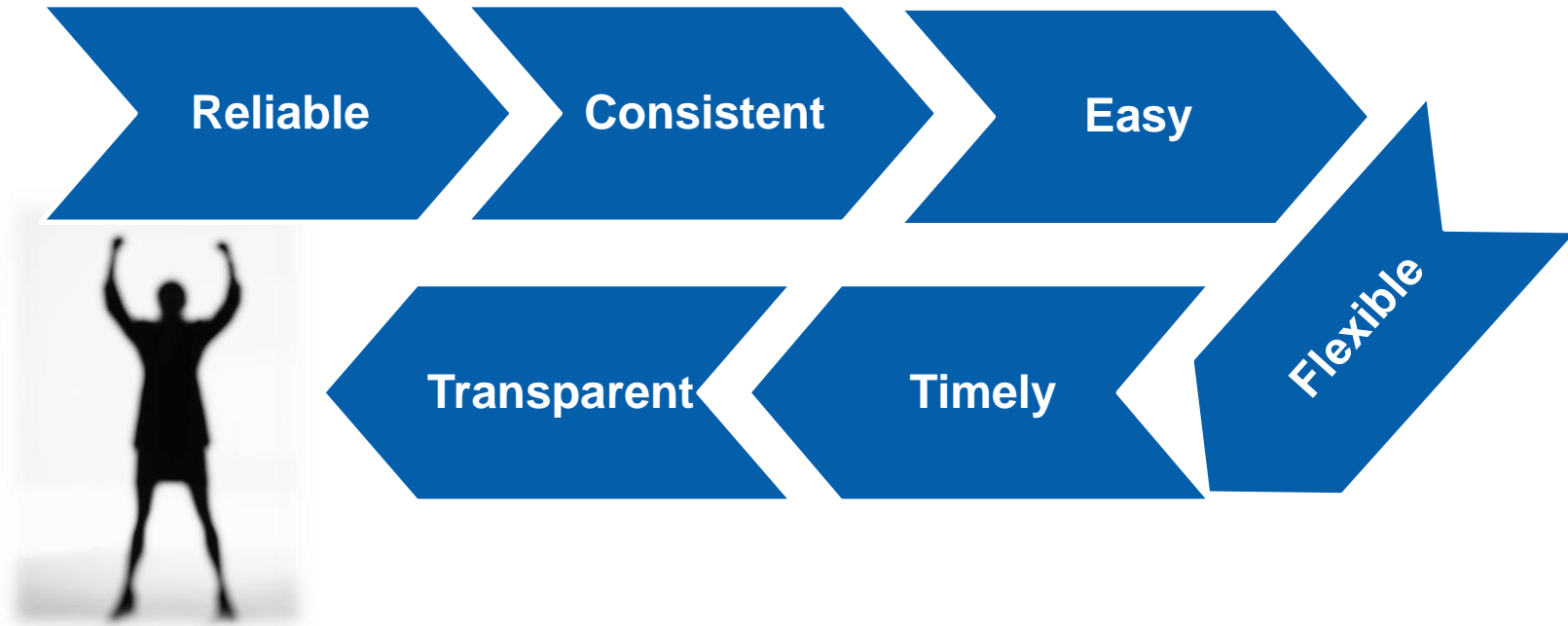
1. Set goals
2. Communicate progress toward your goals
3. Assess when and how to make program design changes to achieve your goals
4. Justify continued or additional investment to achieve your goals



Gain a new perspective

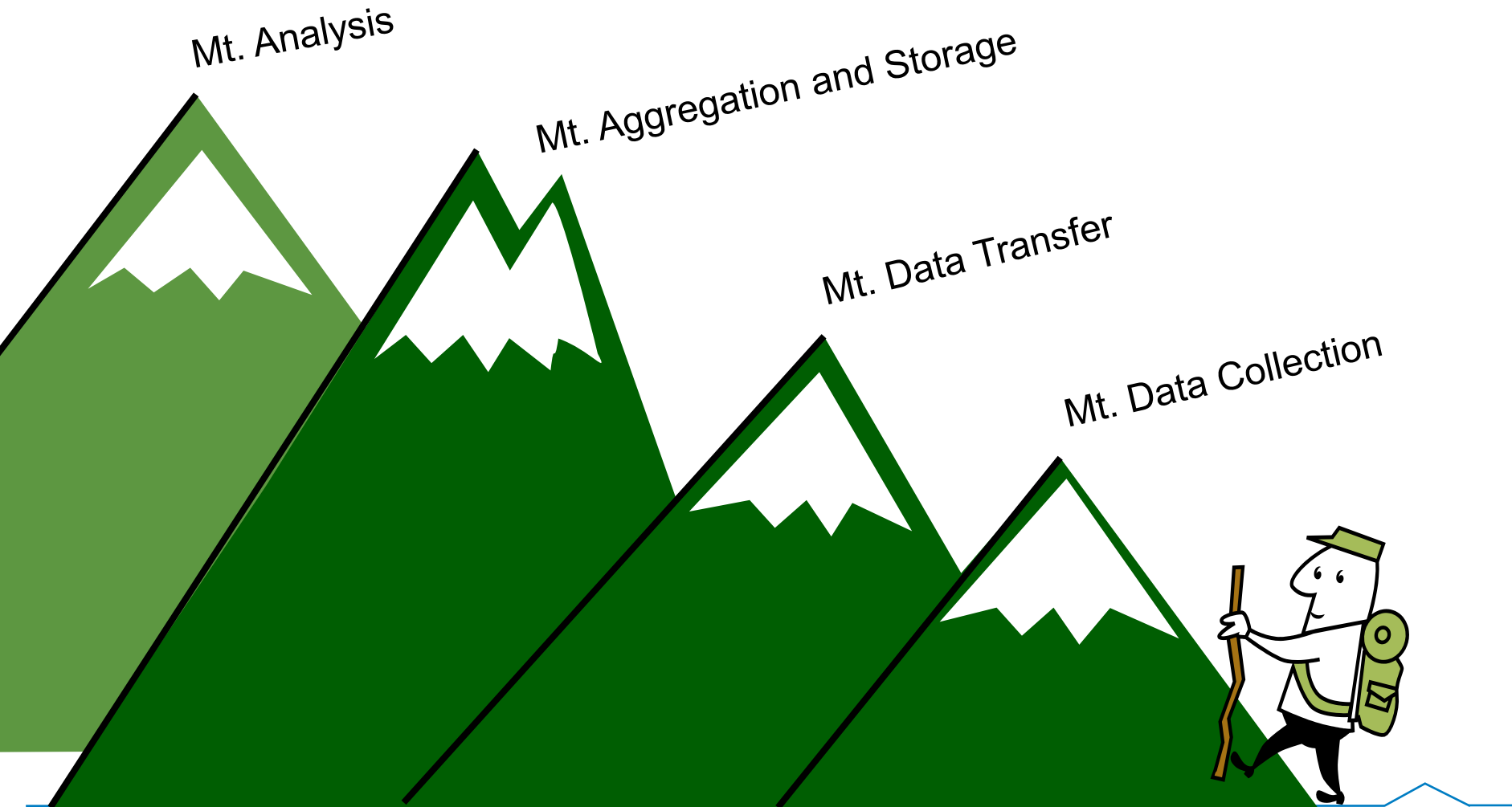
Means to An End

Reaching your goal is your objective. An efficient data process minimizes the cost to measure progress toward your goal.



Creating an efficient/effective process....is a hike in the Data Highlands .

The Data Highlands



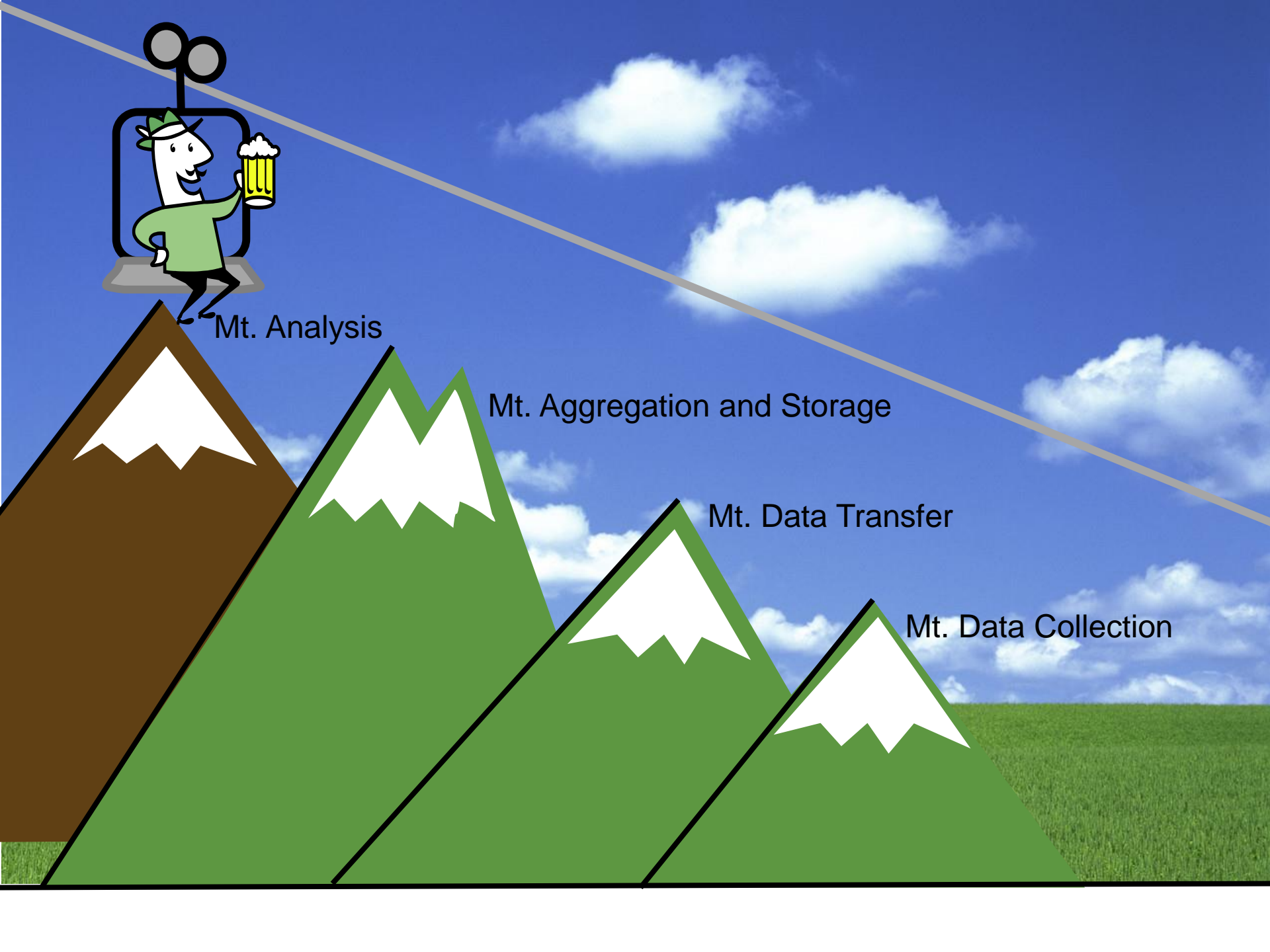


Mt. Analysis

Mt. Aggregation and Storage

Mt. Data Transfer

Mt. Data Collection



The Challenges

Mt. Data Collection - Individuals collecting or providing the data may not see value for their immediate goals.

Mt. Data Transfer – Collecting and compiling paper forms is time consuming and expensive.

Mt. Data Aggregation and Storage - Data may be difficult to interpret and consolidate from different data structures

Mt. Data Analysis - Program cost and outcomes may not align. Many different kinds of errors can invalidate results.





Oh, let's just see how far we can go.

What's our goal today?

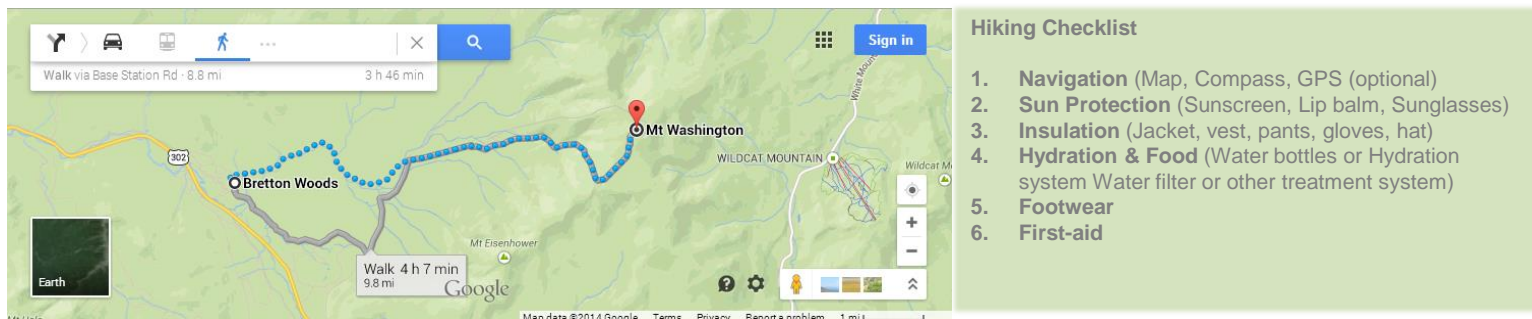
Did we bring enough water?

Assessment of feasibility, burden, and cost informs goal setting

- What is feasible to measure?
- Could a representative sample be measured instead?
- What would be less of a burden to measure?
- Is an alternate goal or proxy meaningful?
- How much budget is reasonable to spend to measure your goal?

Develop a Data Highlands Plan

- Identify what data will be collected and why
 - Defining use cases and data dependencies ensures the list of data elements is both necessary and sufficient.
- Map the inputs, outputs and steps to collect, transfer, store, and analyze data and who is responsible
- Identify common errors and steps to minimize or eliminate them
- Identify how you will communicate your Plan, any changes to your Plan, and the final results



The image shows a Google Maps interface with a hiking route highlighted in blue. The route starts at Bretton Woods and ends at Mt Washington. A search bar at the top shows "Walk via Base Station Rd - 8.8 mi" with a duration of "3 h 46 min". Another search bar shows "Walk 4 h 7 min 9.8 mi". A "Hiking Checklist" is overlaid on the right side of the map, listing six items: 1. Navigation (Map, Compass, GPS (optional)), 2. Sun Protection (Sunscreen, Lip balm, Sunglasses), 3. Insulation (Jacket, vest, pants, gloves, hat), 4. Hydration & Food (Water bottles or Hydration system Water filter or other treatment system), 5. Footwear, and 6. First-aid.

Ask Data Owners for Directions

- Ask Data Owners: (e.g. Contractors, Utilities, Finance Partners) for suggestions on where to simplify and streamline the process?
- Engage them early in your process to develop data collection and data transfer.
- Clearly communicate the value of each data element you are asking them to provide.
- Compile program performance metrics monthly or quarterly and share with data owners. Present totals by data owner so that they see how they contribute to the success of the program.



Common Errors

- Non-response - the upgrade project or metrics are not reported or available. Program impact is under estimated.
- Incorrect responses - incorrect information reported because requested information is misunderstood, lack of attention to detail, or intentional misrepresentation. Program impact is over or under estimated.
- Processing errors – errors introduced during data capture, transfer, cleaning, or storage. Errors introduced during database queries and data analysis. Program impact is over or under estimated.



Steps to Manage Data Quality

- Define and specify format and validation rules for each data element.
 - Use common specifications (e.g. HPXML, BEDES, and Green Button)
 - Use a standardized data collection instrument to minimize data input errors.
 - Clearly define and standardize formats and rules for data entry and transfer especially related to percent values, dates and zip codes and rounding.
 - Include automatic validation checks within the data collection instrument so that data can be checked and corrected if needed at the time of input. (e.g. range checking, totals and subtotals or other calculations)
 - Duplicate lookup for names (e.g. contractors, software, utility)
 - Consider adding a "data source" field for key data fields to help with auditing data quality. (e.g. reported by contractor, reported by utility, measured by contractor, estimated by software, software default)
- Train everyone that has a role.
- Provide a process for editing/correcting data that has been submitted.

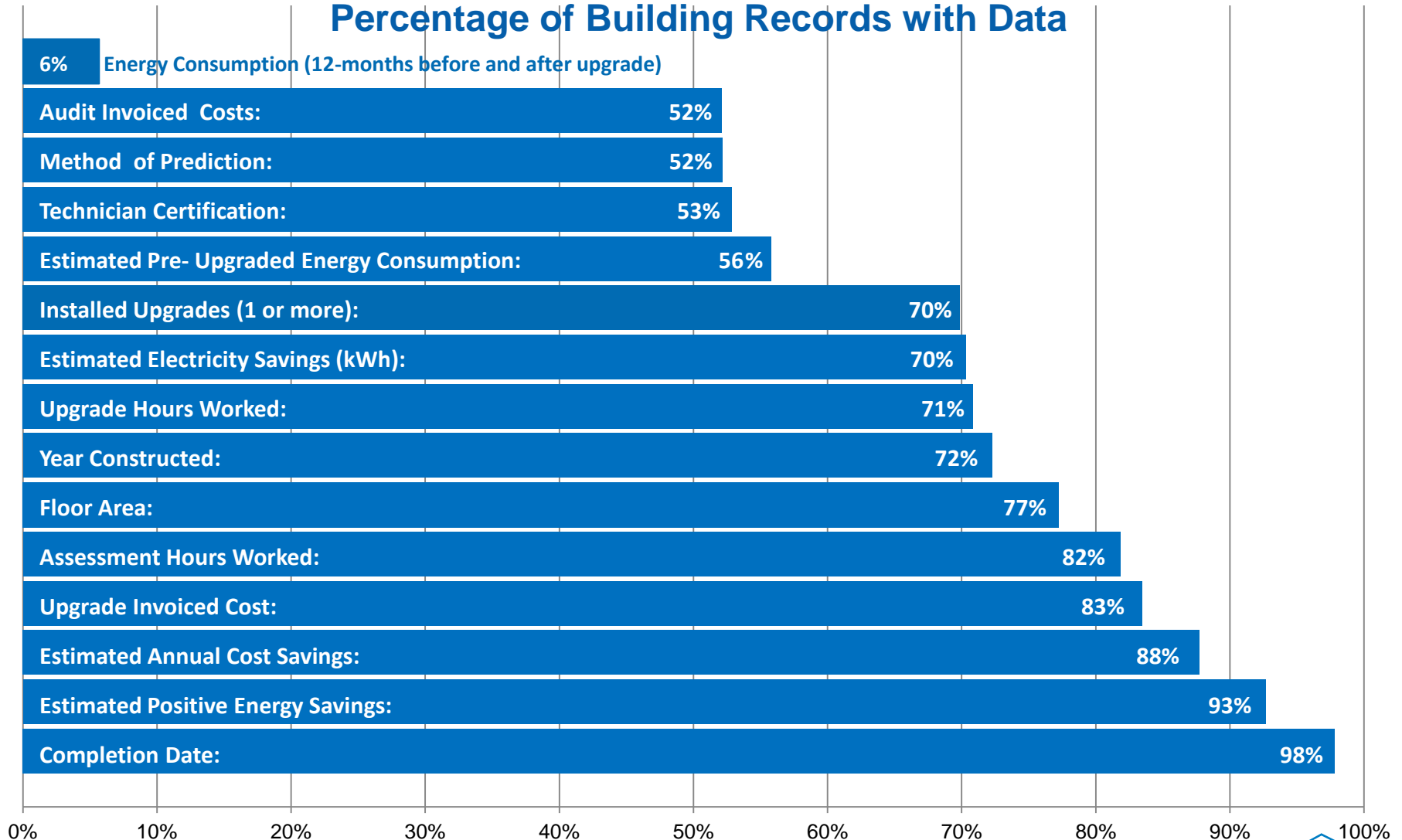
Data Statistics can help you keep data quality on course.

- Total # of building records (i.e. upgrades)
- Median, Mean, Min and Max for each data element (e.g. loan amount, energy savings, invoiced cost, floor area) and the Number of records
- Data Segmentation
 - Sector (e.g. single-family, multi-family unit, etc.)
 - Location - (e.g. zip code, state, climate zone)
 - Vintage (i.e. year built)
 - Loan or no loan
 - Contractor
 - Audit software
 - Measure (or combination of measures) installed



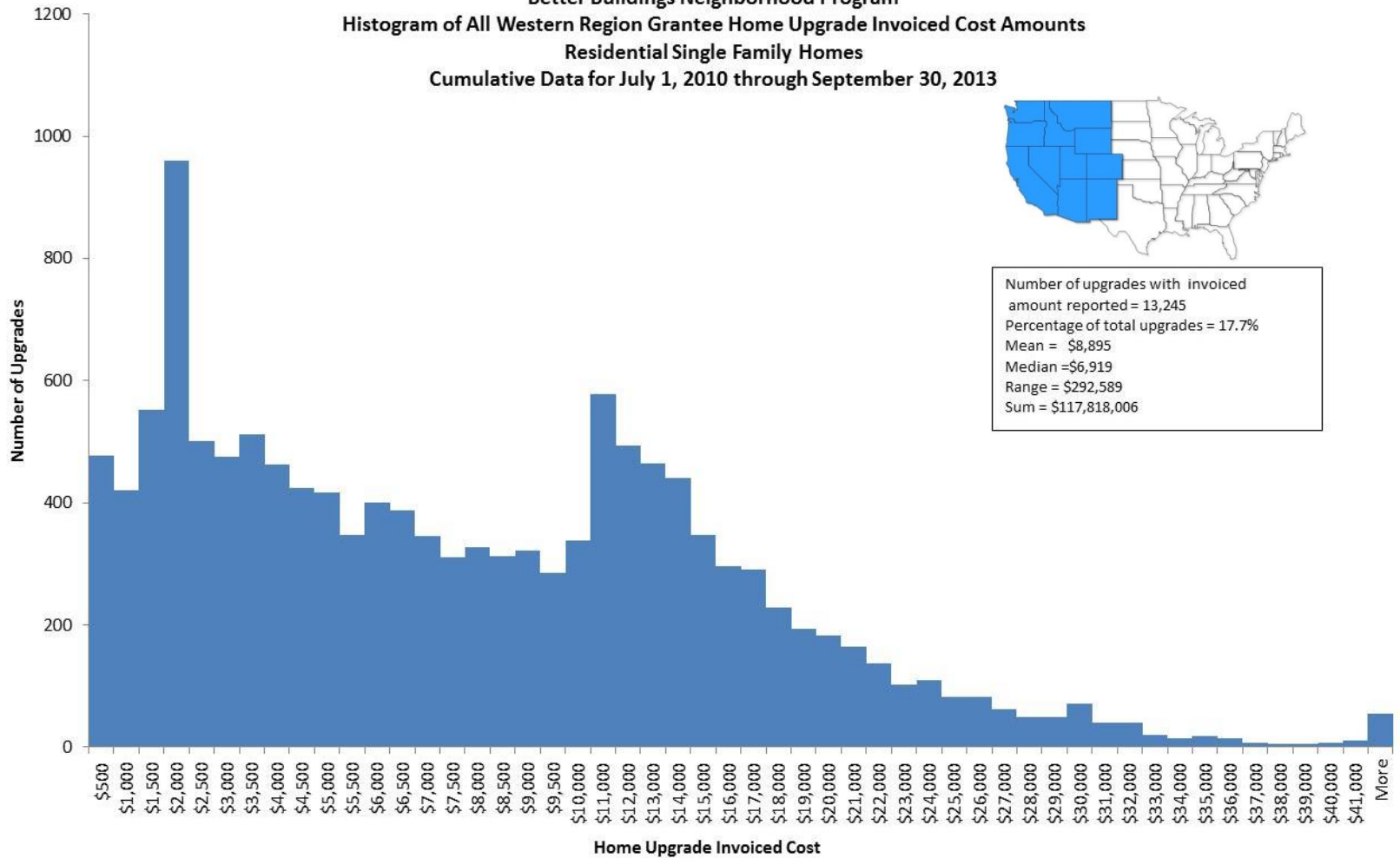
Example: Buildings Data Completeness

Percentage of Building Records with Data



Example: Invoiced Cost

Better Buildings Neighborhood Program
Histogram of All Western Region Grantee Home Upgrade Invoiced Cost Amounts
Residential Single Family Homes
Cumulative Data for July 1, 2010 through September 30, 2013



- The bin increment is \$500 between \$0 to \$10,000, after which the bin size increases to \$1000.
- 55 projects or .4% of Invoice Costs were more than \$41,000.
- Los Angeles County has 613 projects between \$2,000 and \$2,500, 146 projects between \$11,000 and \$12,000, 118 projects between \$12,000 and \$13,000, and 143 projects between \$13,000 and \$14,000.
- Portland has 208 projects between \$10,000 and \$11,000, 161 projects between \$12,000 and \$13,000, and 154 projects between \$13,000 and \$14,000.

Align Program Cost and Outcomes

- Cost vs Outcome metrics will be more difficult to calculate if costs are not aligned with outcomes.

Example cost categories

- Customer Rebates/Incentives
 - Marketing and Outreach
 - Program Administration
 - Research and Evaluation, Measurement & Verification (EM&V)
- Also consider how frequently data is compiled
 - daily, weekly, monthly or quarterly
 - Current accounting systems may need to be adjusted for alignment

Communicate Your Results

- Analysis synthesizes lines and lines of data and presents it in a way that is useful for making decisions.
- Visualization helps communicate program progress and impact.
 - Identifies trends or outliers
 - Easy for everyone to quickly understand
- Analysis Examples
 - Energy Savings realization rates
 - Present Value of Lifetime savings
 - Time series (cost per output over time)
 - Estimated energy savings (distribution)



- Better Buildings Residential Network (BBRN) is developing a Guide for optional Residential Program Progress Benchmarking
- The Guide will include:
 - Information on the value and uses of benchmarking, and how it fits into broader program planning
 - Action steps and templates for developing and implementing a Benchmarking Plan
 - Information on useful outcome metrics
 - Definitions and protocols for measuring
 - Uses and value of each metric
 - Challenges of collecting data
 - Examples of benchmarks from current programs
- BBRN members have been invited to participate in Guide's development



Guide Development Plan

Task

Draft list of proposed benchmarks

Brief BTO Residential Team on proposed benchmarks

Comments on benchmarks to include in Guide Outline

Guide Outline

Webinar on Development of Guide (present outline and plan)

Drafting Guide

Draft Guide Comment Period

Webinar on Draft Guide

Pilot Test Guide and Example Benchmarks with up to 9 Programs

Revised Guide



We are drafting the Guide

Introduction

- 1. Use Program Goals to Guide Benchmark Planning**
- 2. Identify Potential Metrics in Support of the Goals**
- 3. Determine How You Will Collect the Information**
- 4. Assess Level of Effort and Finalize Metrics**
- 5. Put the Process in Place and Get Started!**
- 6. Share Results Effectively**
- 7. Consider Benchmarking Against Peer Programs**

Additional Resources and References

Appendix A: Recommended Benchmarking Metrics

Appendix B: BBNP Peer Group Benchmarking Examples

Seeking Programs to Test the Guide

- Volunteers will
 - Attend webinar about the guide and pilot (est. 1 hour).
 - Review the guide, provide comments using a template form. We are especially interested in your feedback on the list of metrics. (est. 3 hours)
 - Identify metrics listed in the guide most valuable to your program (est. half hour)
 - Estimate how much effort is needed to compile each metric for your program
e.g. available/can provide today, doable/take a day or two to pull together, not available/can't provide (est. 1 hour)
 - Provide program metrics where available. (est. 2 – 10 hours)
 - Participate in a one-on-one call (or webinar) with guide developers to share comments and experience. (est. 1.5 hour)
- The pilot will inform improvements to the guide and development of a BBRN member-wide optional initiative
- If you are interested please contact: dale.hoffmeyer@ee.doe.gov

A scenic view of Old Rag Summit. In the foreground, several large, grey, rounded boulders are scattered across the rocky terrain. A group of about a dozen hikers, dressed in various colors, are gathered on the rocks, some sitting and some standing, looking out over the landscape. The middle ground is filled with rolling hills and valleys covered in dense forest with vibrant autumn foliage in shades of orange, red, and yellow. In the far distance, more mountain ranges are visible under a bright blue sky with scattered white clouds. The overall atmosphere is bright and clear, suggesting a sunny day.

Happy trails finding a new perspective