Meeting the “Applied” Accuracy Needs of Energy Metering

Brent Protzman, Ph.D.

Manager – Energy Information & Analytics

Lutron Electronics

What is “Applied” Accuracy?

- NOT worst case accuracy of meter
- NOT the accuracy as a function of input value

Working definition:

Average accuracy a user can expect to achieve on the desired measurement that includes common load types, typical input values, and aggregation across time and measurements

- Desired measurement could be:
  - Building **Energy**
  - Area or Room **Energy**
  - Fixture **Energy**

Power vs Energy Measurement

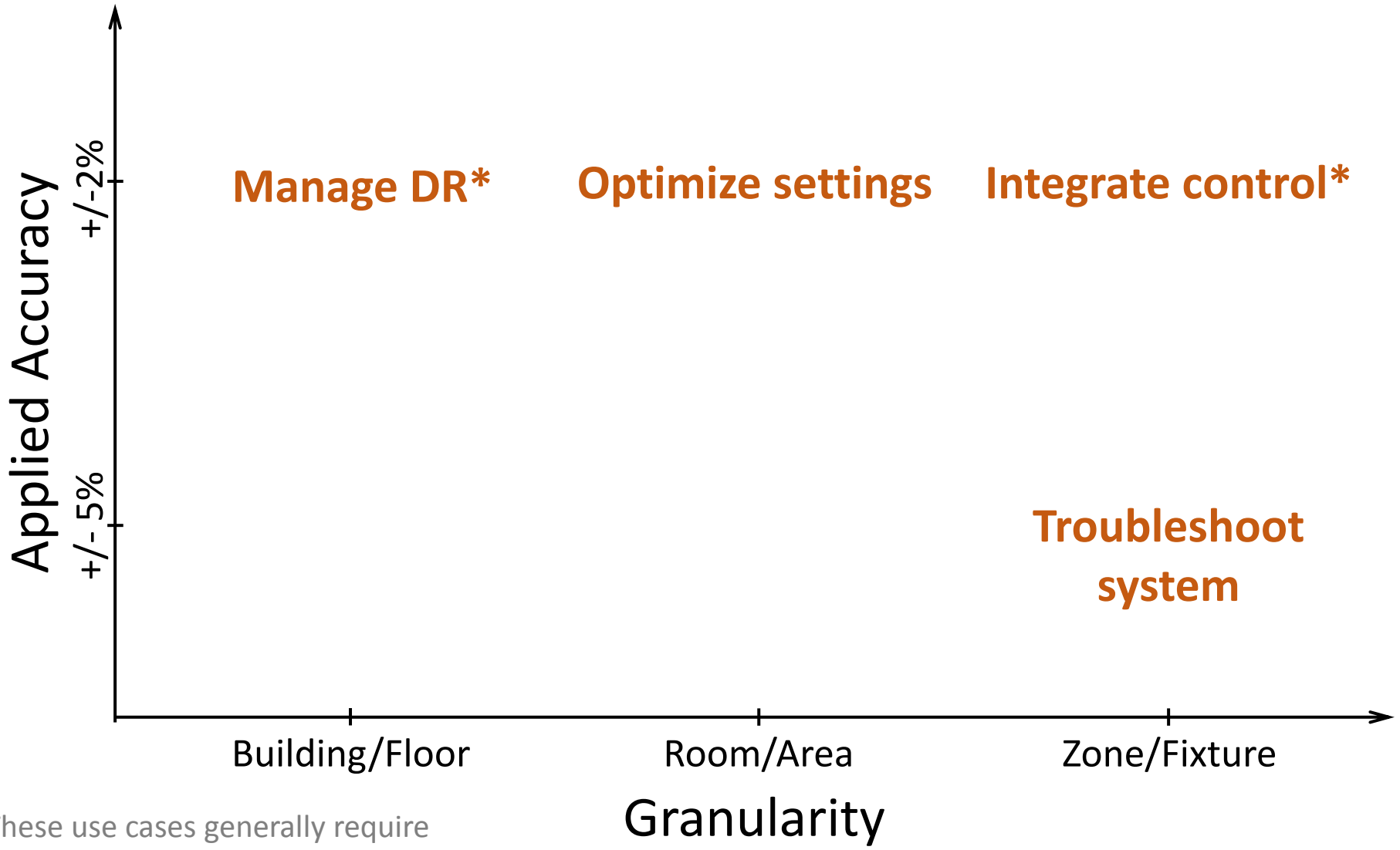
Power Measurement

- Instantaneous
- Modify control of system
- Highly usage dependent
- “OFF” state errors has moderate impact on applicability

Energy Measurement

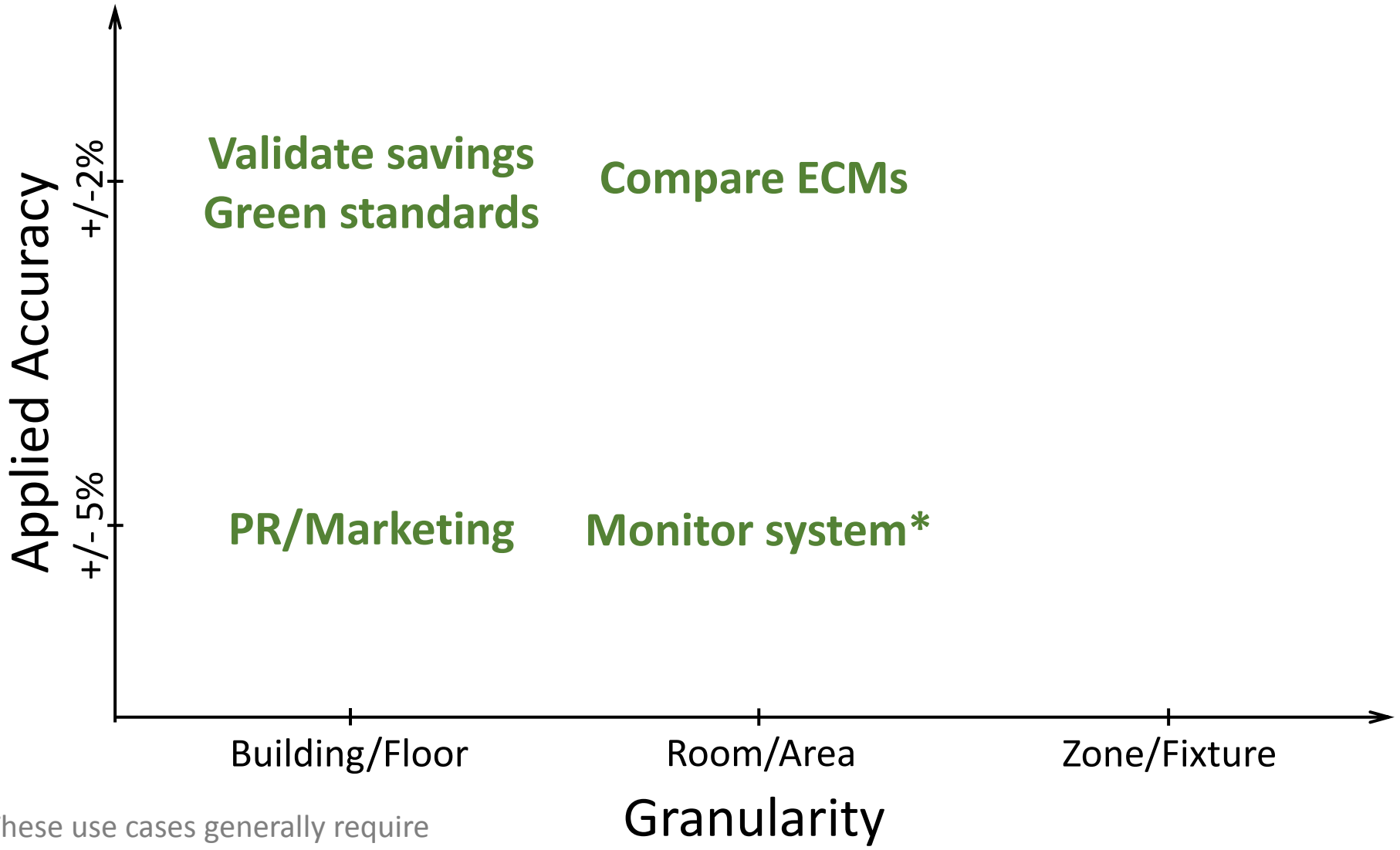
- Time aggregated
- Validate conservation measures
- Somewhat usage dependent
- “OFF” state error has very small impact on applicability

Applied Accuracy Needs of Power Use Cases



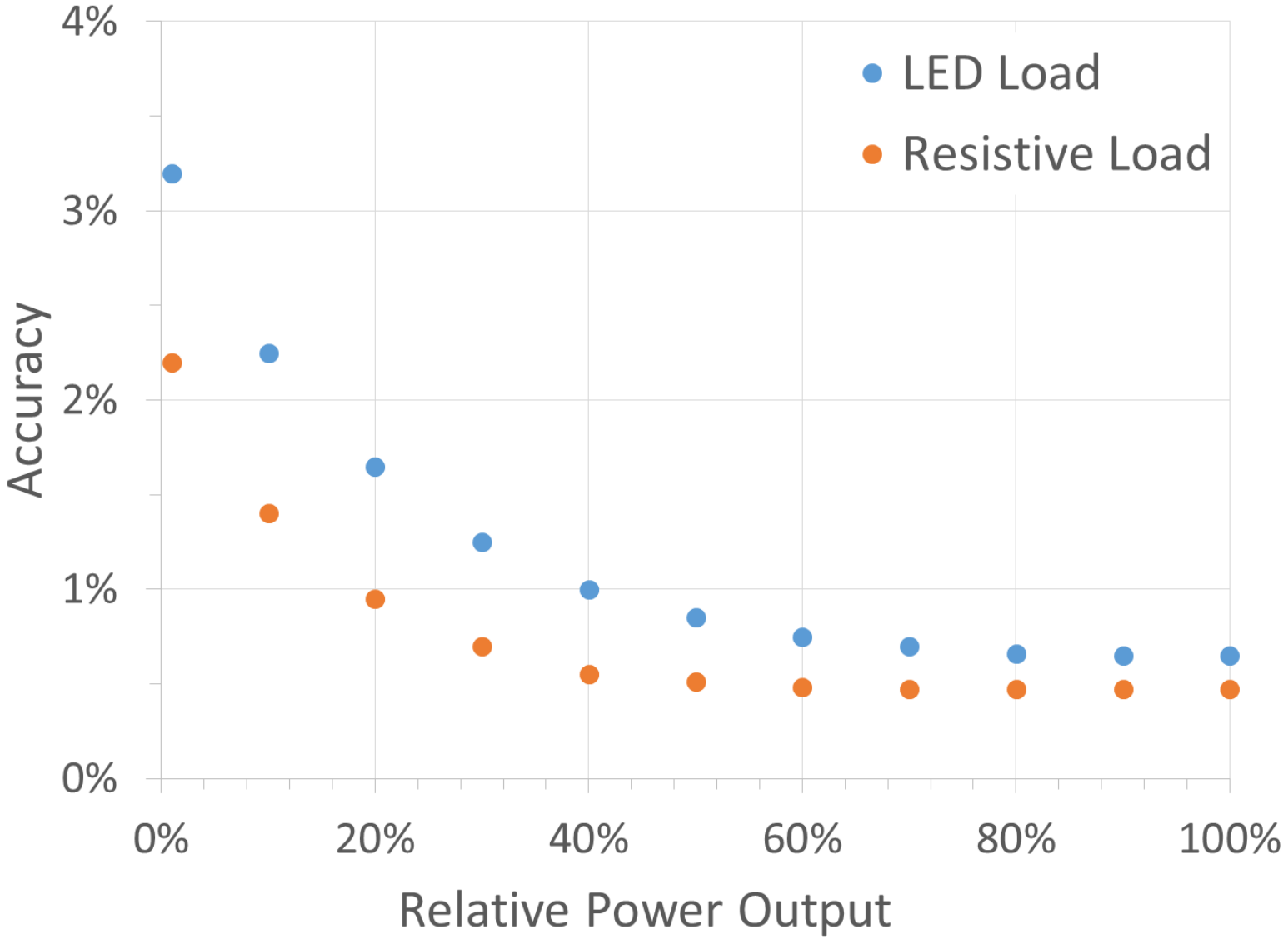
*These use cases generally require aggregation of information across multiple building systems (e.g. HVAC).

Applied Accuracy Needs of Energy Use Cases

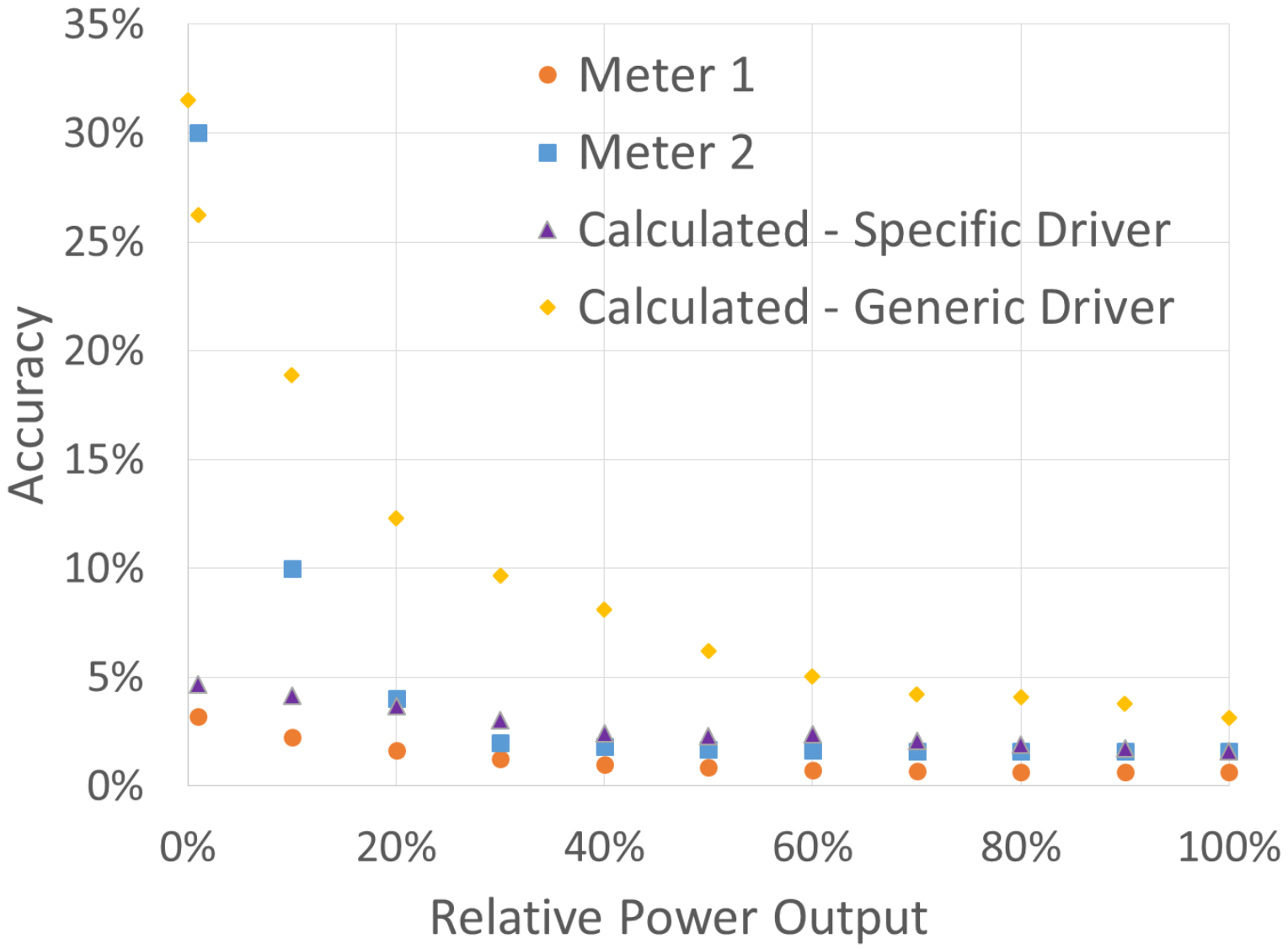


*These use cases generally require aggregation of information across multiple building systems (e.g. HVAC).

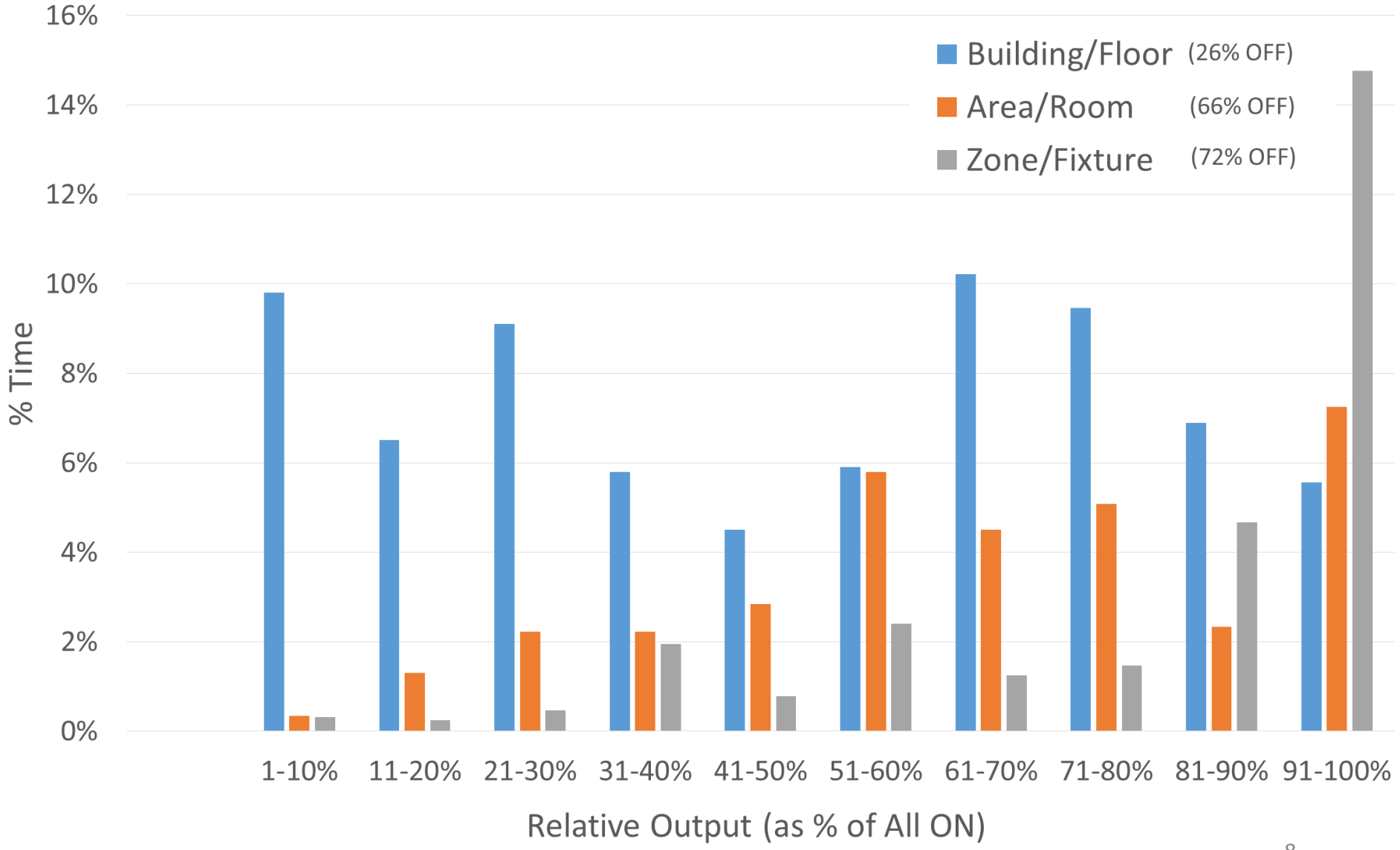
Accuracy based on True Load Types



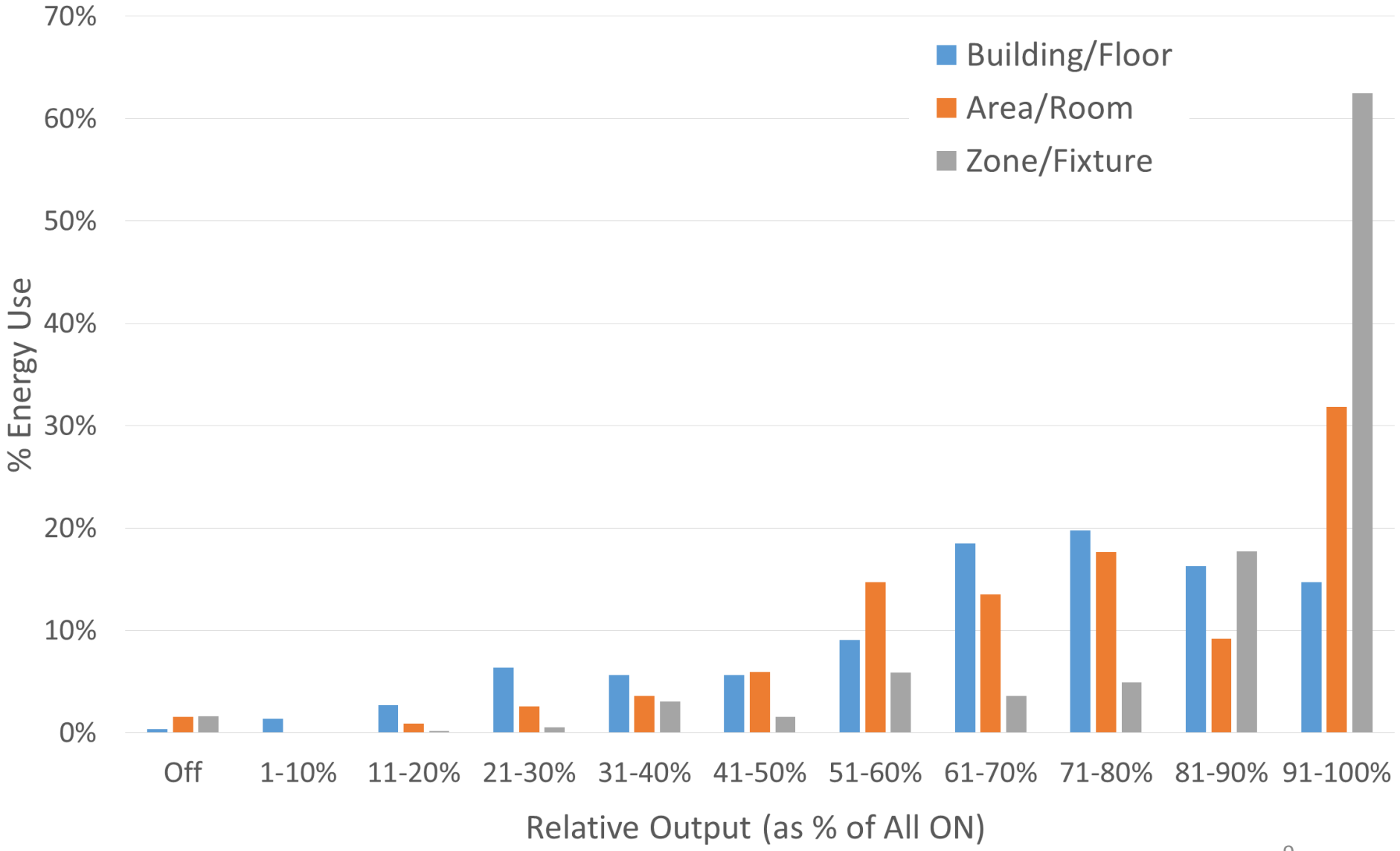
Accuracy based on True Load Types



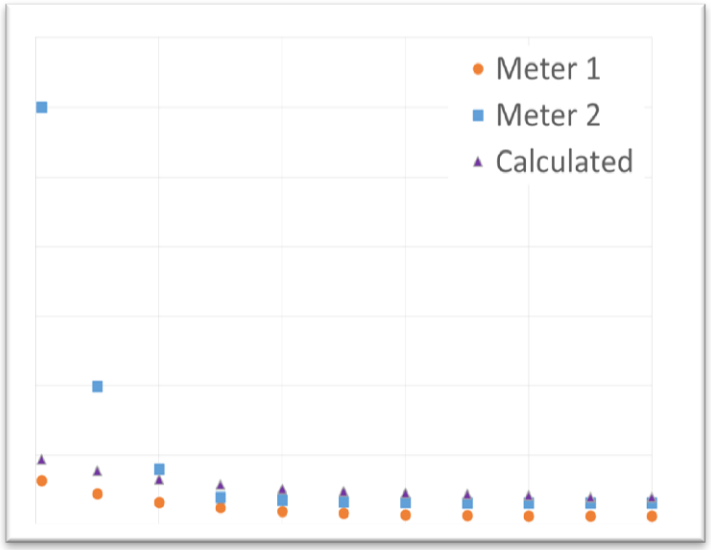
Typical Power Output of Lighting Systems



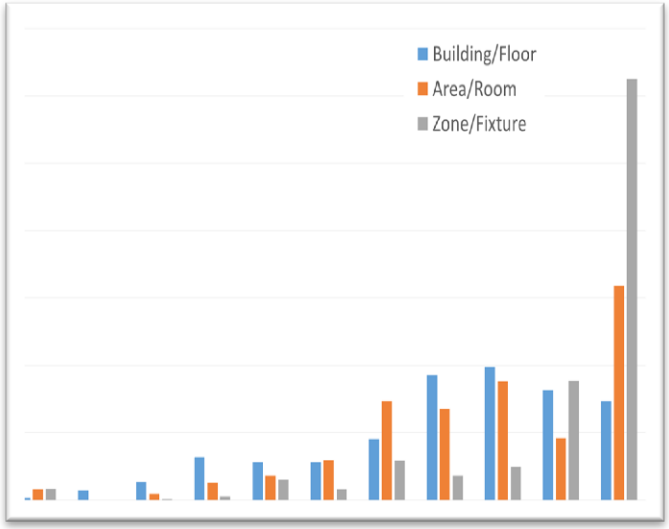
Relative Energy Use (based on power level)



Achieving Applied Accuracy: Methodology



✖



= ± X%

True Load Accuracy Distribution

Typical Use

Applied Accuracy

Applied Accuracy Cost: Fixture Meter Example

	Added Fixture Cost	Applied Accuracy
Meter 1	$5.00 per fixture	0.8%
Meter 2	$2.00 per fixture	2.1%
Calculated (specific driver)	$0.00 per fixture	2.0%
Calculated (generic driver)	$0.00 per fixture	4.9%

High applied accuracy: 2%
Low applied accuracy: 5%

Accelerating Adoption of Meters

- Standards for validating metering accuracy including:
  - What load type(s) used in testing
  - If/how to weight by applied power level usage
  - When can calculated values be allow (e.g. known ballast curve?)
- Methods for labeling applied meter performance
- Sub-metering requirements for existing buildings
- Case studies of usage of metered data

Accelerating Adoption of Connected Lighting

- Tiered rebate/incentive programs for systems
  - Advanced (basic energy strategies)
  - Networked (metering, easy system modifications, etc.)
  - Integrated (multi-system performance optimization)
- Drive Networked and Integrated standard/code requirements
- Case studies of integrated building systems
  - Energy performance
  - **Operational efficiencies**
  - **Occupant well being**

Summary

- Different end uses have different accuracy needs
- Load type matters in meter testing
- Accuracy rating does not indicate accuracy in operation
- Calculated power/energy can be fairly accurate when done right
- Standards are needed to validate metering capabilities