

The value of energy data

DOE SSL Program Connected Lighting Meeting
November 16, 2015

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Lighting control past

- Focus on devices (widgets) and technologies
- Complex configuration requirements
- High total cost of deployment
- Poor user satisfaction
- Limited performance monitoring and continuous optimization
- Frequent misalignment with owner/occupant organizational maturity
- Limited interaction with non-lighting systems
- **Difficult to predict performance and energy savings**
- **Low adoption (estimated as < 1%)**

Estimating energy savings from lighting controls

Strategy	Lutron ¹	Encelium ²	LBL ³	LCA ⁴
Scheduling	10-20%	10-40%	N/A	N/A
Daylight Harvesting	25-60%	5-15%	28% (average)	40-50%
Occupancy	20-60%	25-50%	24% (average)	35-55%
Task Tuning	10-30%	5-20%	36% (average)	8-22%
Personal Tuning	10-20%	5-15%	31% (average)	6-11%
Multiple Strategies	N/A	50-75%	38% (average)	N/A

¹ http://www.lutron.com/TechnicalDocumentLibrary/Energy_Codes_and_Standards_g.pdf

² <http://www.encelium.com/en/ems/six-strategies.html>

³ http://eetd.lbl.gov/sites/all/files/lighting_controls_in_commercial_buildings.pdf

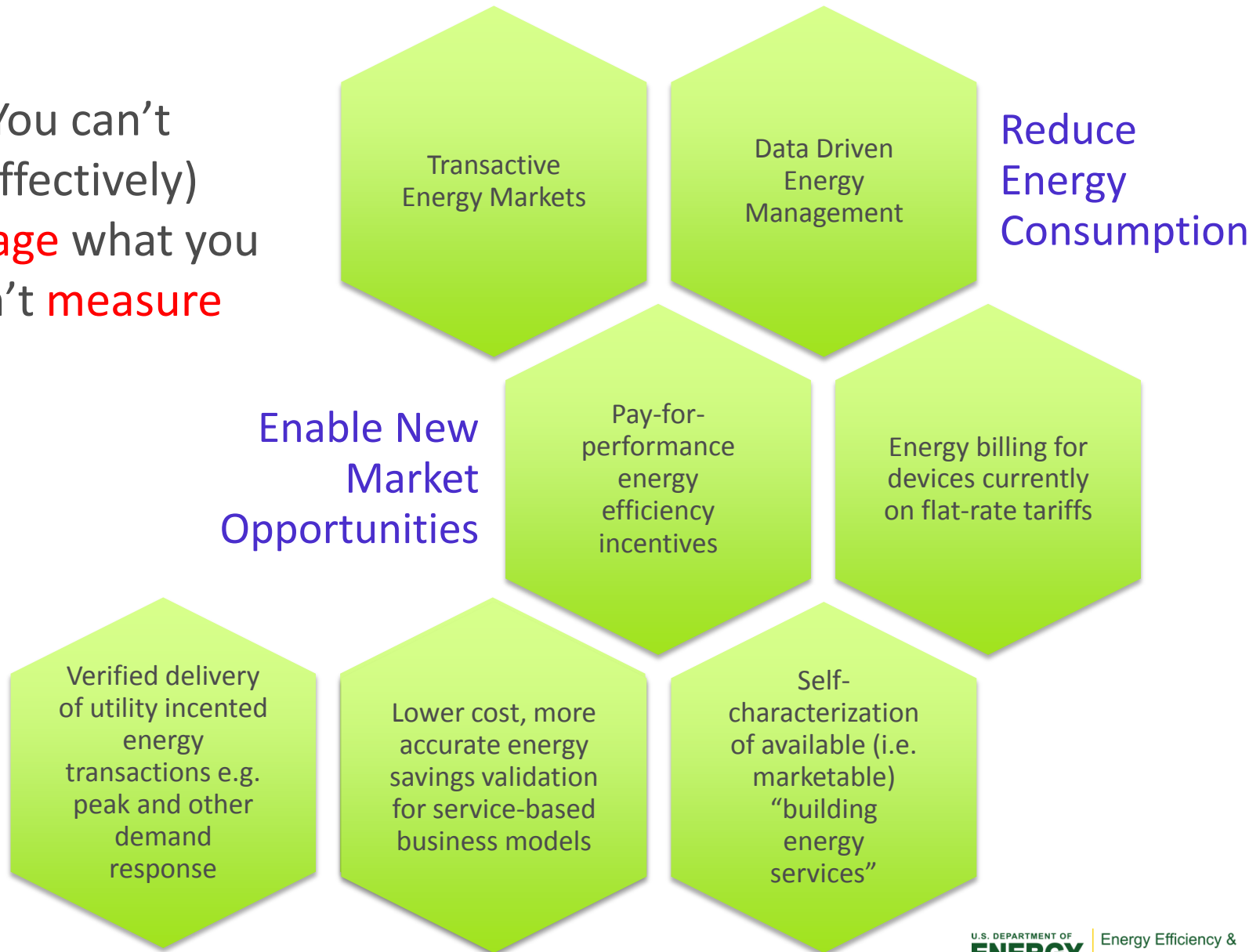
⁴ <http://lightingcontrolsassociation.org/estimating-energy-savings-with-lighting-controls/>

“..achieving energy savings estimates in practice may require commissioning, including a written controls narrative, verification equipment is installed and aimed in accordance with approved documents, programming and calibration, functional testing, Systems Manual, end-user training and a plan for periodic recalibration.”

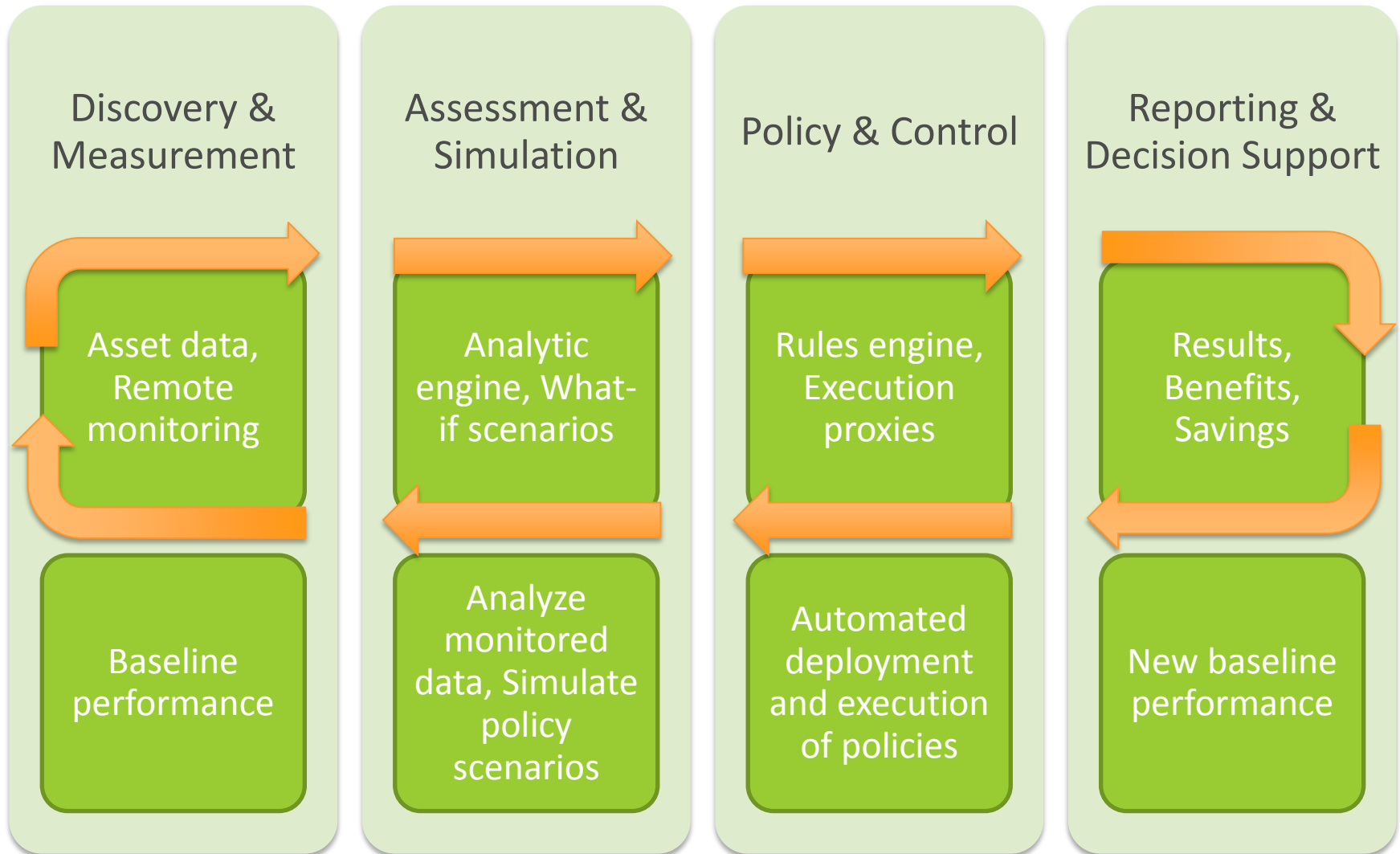
<http://lightingcontrolsassociation.org/estimating-energy-savings-with-lighting-controls/>

Why focus on energy reporting?

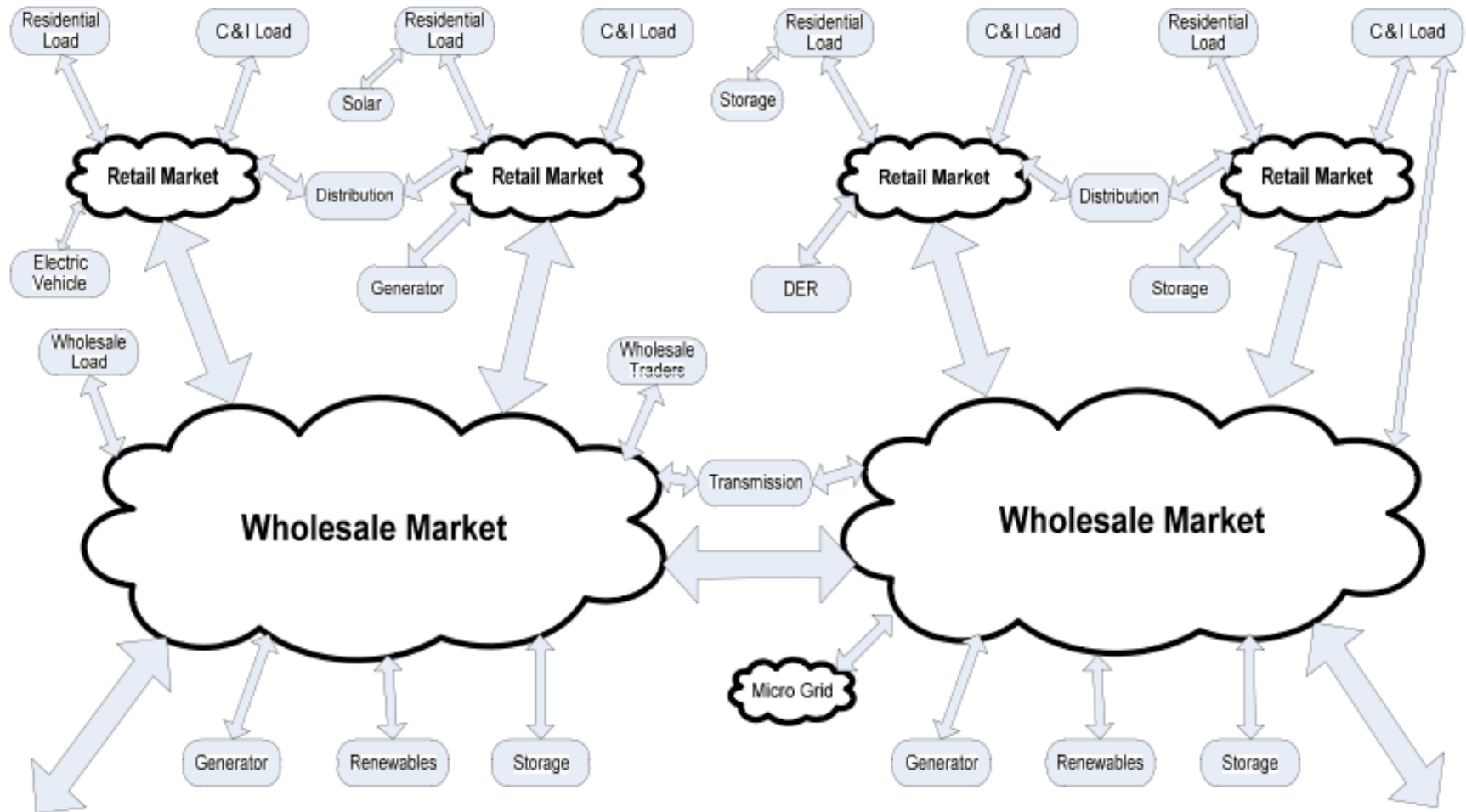
You can't
(effectively)
manage what you
can't **measure**



Data driven performance management



Transactive energy markets



Energy billing for devices currently on flat-rate tariffs

Existing (HPS)

- Photo-controlled: 4.8315¢ per kWh
 - Dusk to dawn Mon-Sun for all calendar months
- Continuous Burn: 5.5270¢ per kWh
 - 24 hours a day Mon-Sun for all calendar months
- Part Night
 - Dimmed or off for some period each night
 - Rate somewhere in between the photo-controlled and continuous burn

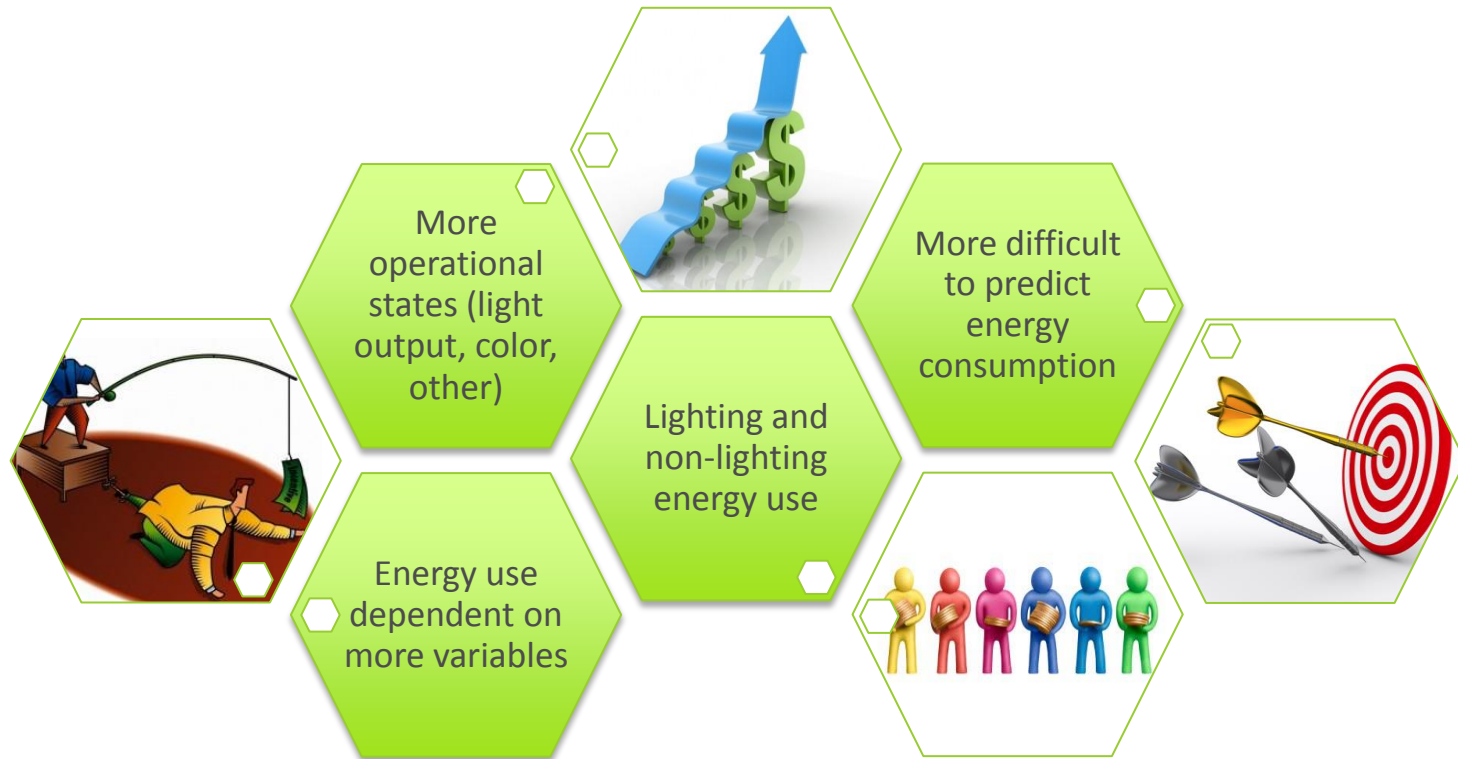
New (LED)

- Super Off-Peak: 3.3225¢ per kWh
 - 11:00 PM–7:00 AM, Mon-Sun for all calendar months
- Off-Peak: 8.1538¢ per kWh
 - Weekends, holidays and any day in Oct–May: 7:00 AM–11:00 PM
 - June–Sept (Mon–Fri): 7:00 AM–2:00 PM & 7:00 PM–11:00 PM
- On-Peak: 9.4595¢ per kWh
 - 2:00 PM–7:00 PM, Mon–Fri, June–Sept (Summer)
 - Excludes Independence Day and Labor Day

[http://www.georgiapower.com/pricing/files/rates-and-schedules/outdoor-lighting/9.30 TOU-EOL-1.pdf](http://www.georgiapower.com/pricing/files/rates-and-schedules/outdoor-lighting/9.30%20TOU-EOL-1.pdf)

Pay-for-performance energy efficiency incentives

Traditional lighting energy efficiency incentive approaches are **not compatible** with Connected Lighting Systems.



DLC Commercial Advanced Lighting Control (CALC) project is developing an **incentive framework** for energy efficiency programs that could include pay-for-performance

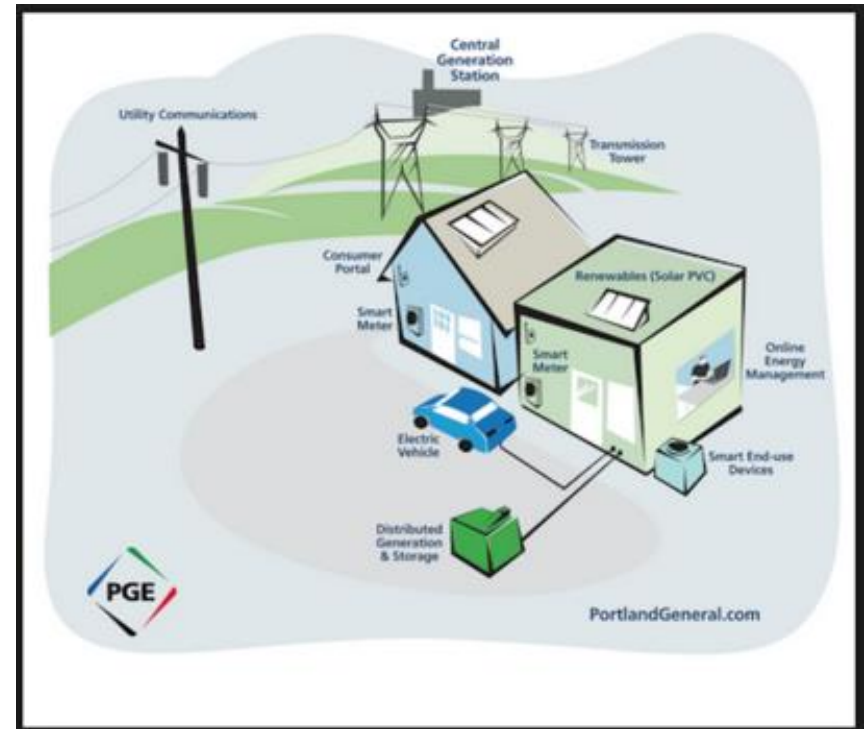
Energy savings validation for service-based business models

Lower cost, faster, more comprehensive (and therefore more accurate) than traditional post-install M&V



Self-characterization of available “building energy services”

- Marketable capabilities
 - Intelligent, controllable end-use devices
 - Generation
 - Storage
- Capable of delivering value to various entities
 - End users
 - Energy markets
 - The grid
 - Society
- Verified delivery of utility incented energy transactions
 - Peak
 - Other demand response



Indoor lighting system energy reporting is available today

enlightened



DIGITAL
LUMENS

Harvard



DaintreeNetworks

OSRAM
SYLVANIA 



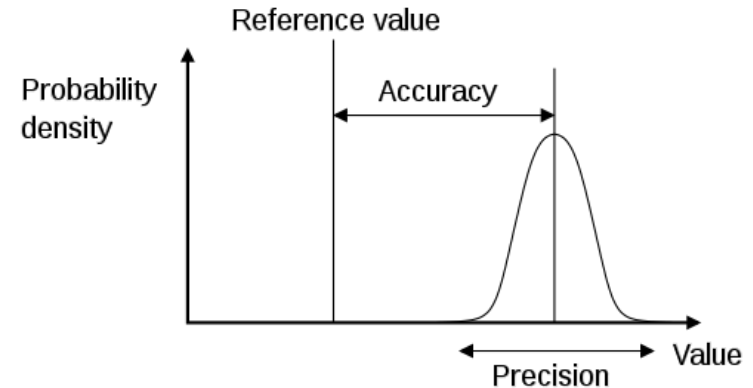
redwood[®]


CISCO[™]

 LUTRON[®]

Energy reporting needs

- Identification of major energy data use cases
- Consideration of implementation cost vs. performance trade-offs
- One or more sets of accuracy, precision requirements that meet use case needs
- Standard accuracy classes, test & measurement methods, pass/fail criteria



High Accuracy
High Precision



Low Accuracy
High Precision

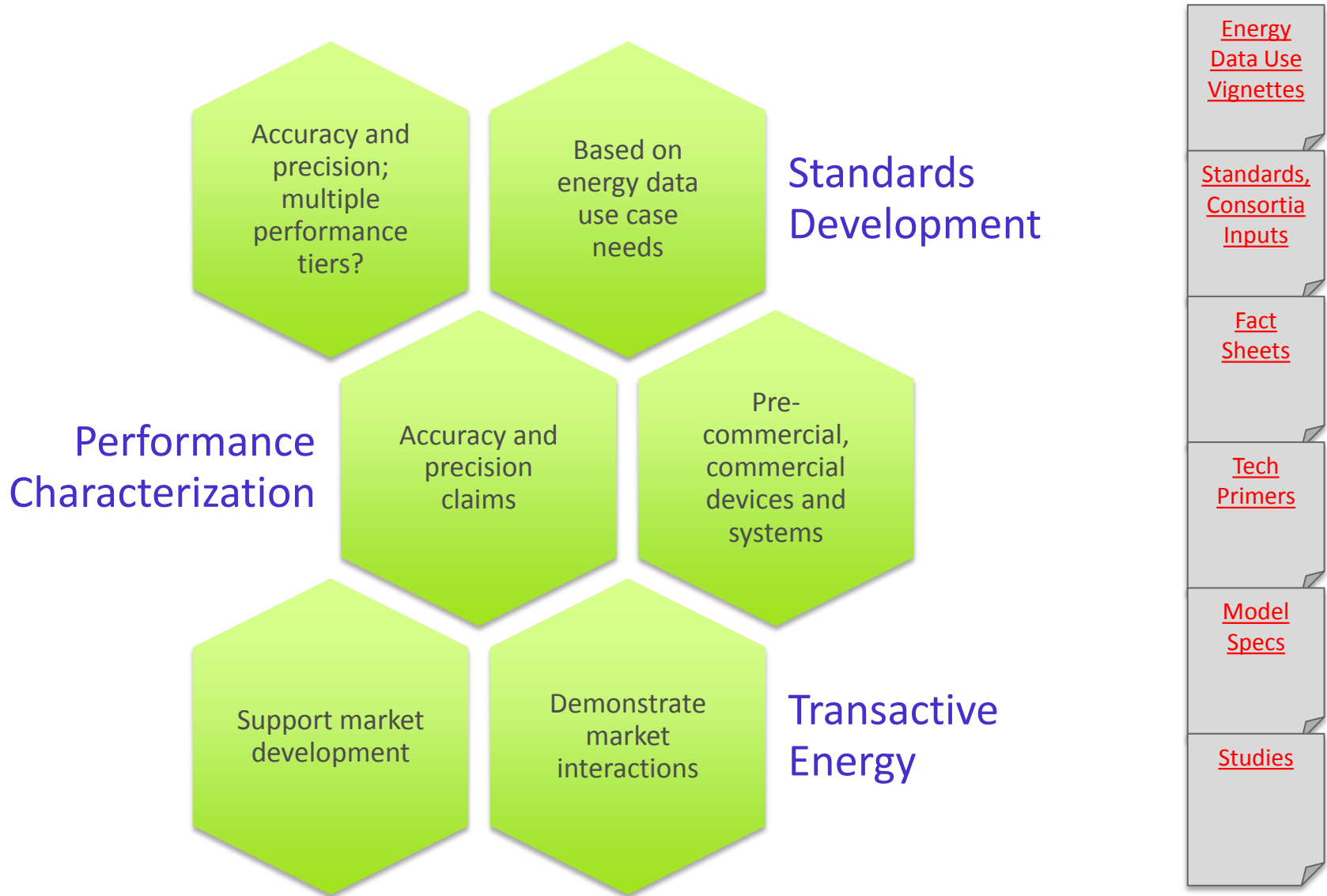


High Accuracy
Low Precision



Low Accuracy
Low Precision

DOE SSL Program activities: energy reporting



Thank you

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