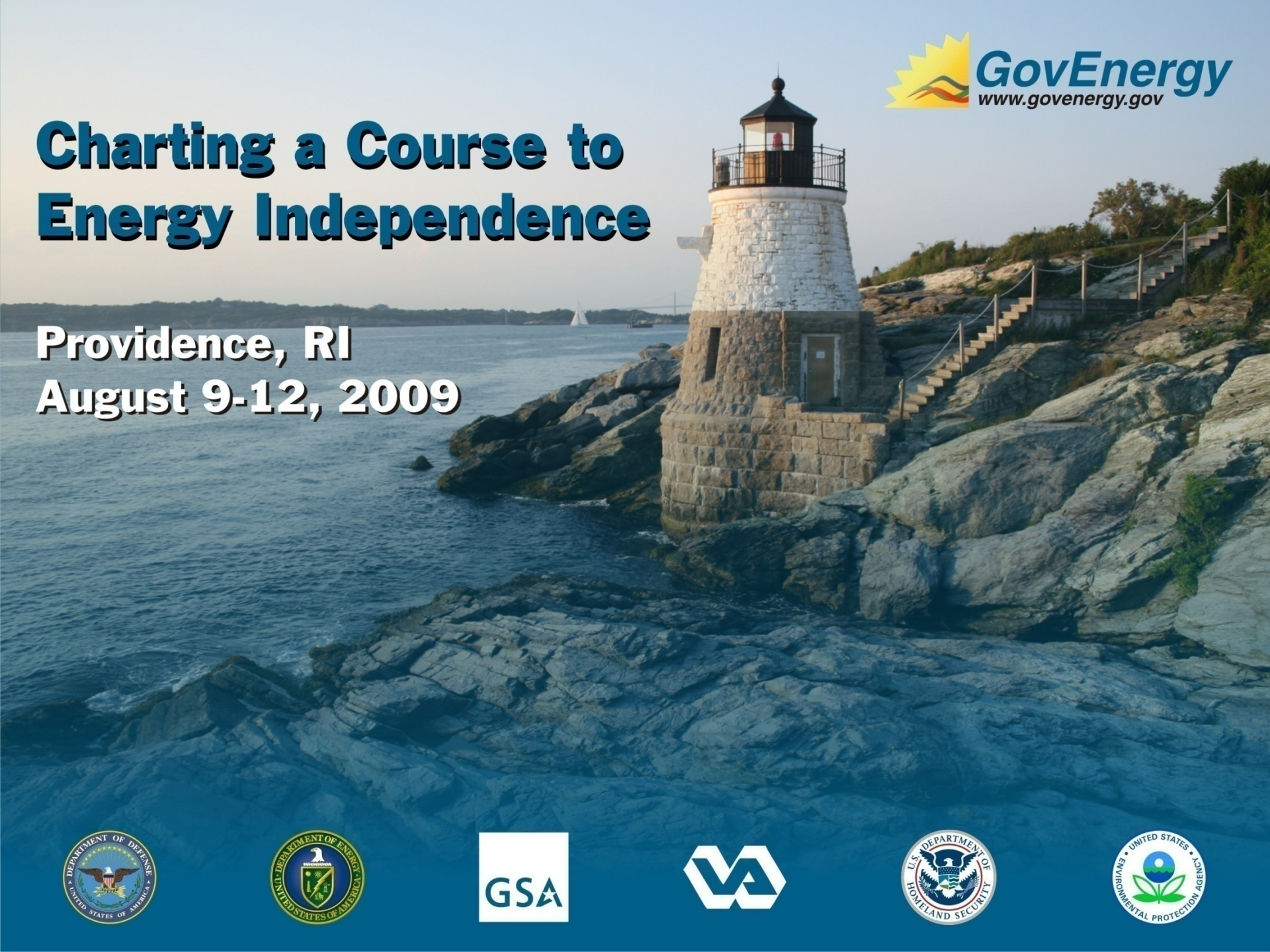
GovEnergy
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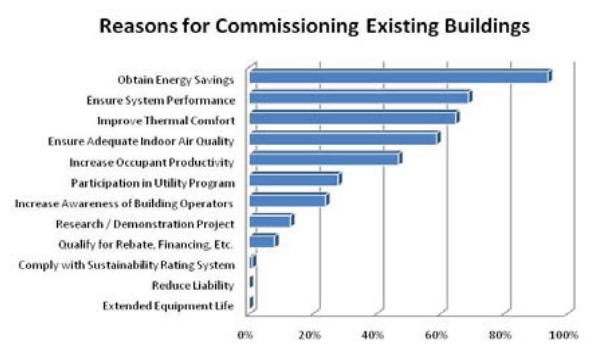
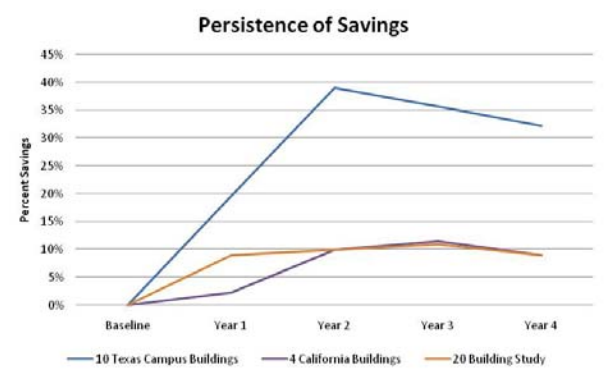
Charting a Course to Energy Independence
Providence, RI
August 9-12, 2009
GSA

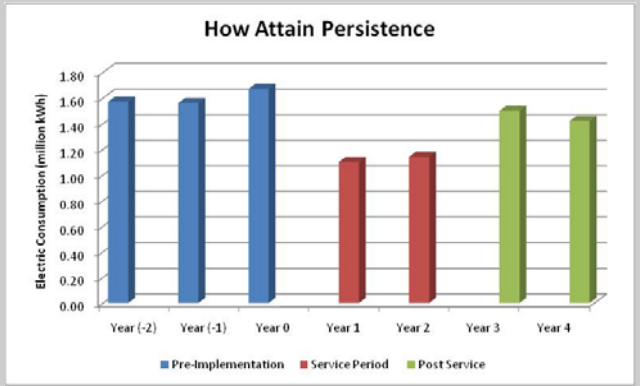
EXISTING BUILDING COMMISSIONING



Savings and Costs

Data Type	Annual Savings ($ / sf)	Implementation Costs ($ / sf)	Simple Payback (years)
Maximum	$3.23	$3.86	10.4
Top 25%	0.72	0.45	2.1
Averages	0.54	0.41	1.7
Median	0.26	0.27	0.7
Bottom 25%	0.11	0.13	0.2
Minimum	($0.13)	$0.03	n/a





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WHAT ARE WE TALKING ABOUT?

- "Existing building commissioning, also known as retro-commissioning, is an event in the life of a building that applies a systematic investigation process for improving and optimizing a building's O&M practices " ORNL
- "Re-commissioning which is sometimes referred to as "retro-commissioning" is the practice of commissioning existing buildings – testing and adjusting the building systems to meet the original design intent and/or optimize the systems to satisfy current operational needs." PNNL

SO WHAT IS IT?

- Commissioning is “a Quality-focused process for … verifying and documenting that the facility and … its systems … are planned, designed, installed, tested, operated and maintained to meet the Owner’s Project Requirements.”

ASHRAE – Guideline 0

- Existing Building Commissioning is "*commissioning applied to an existing facility, whether previously commissioned or not, to help the facility and its systems meet the Owner's current and anticipated future requirements (not necessarily original design).*"

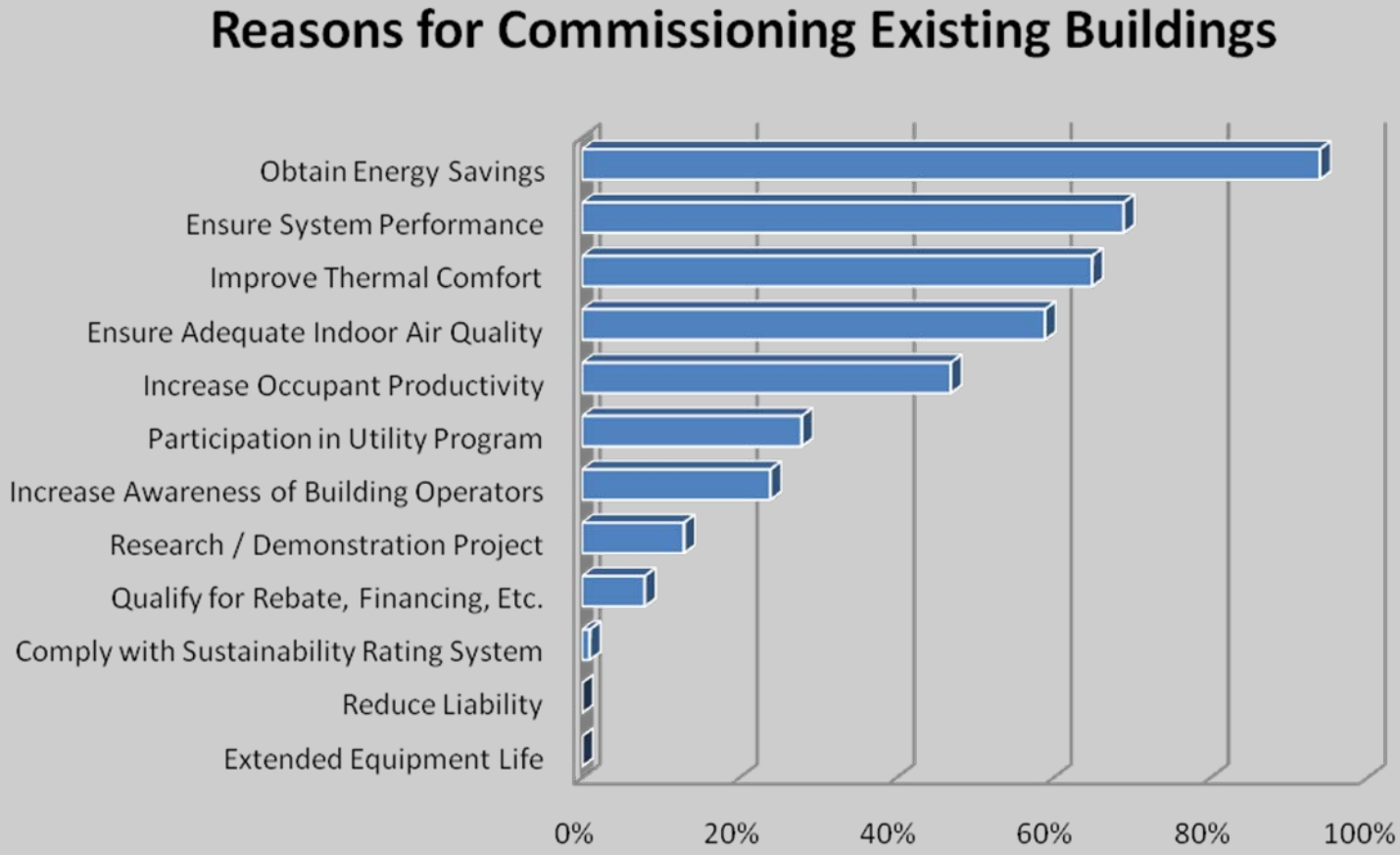
- Recommissioning is an “application of the commissioning process to a facility and its systems that were delivered using commissioning.”
- Retrocommissioning is “commissioning applied to an existing facility that was not previously commissioned.”

ASHRAE – Guideline 0

WHAT ARE WE COMMISSIONING TO?

- Owner's Project Requirements (OPR)
  - A written document that details the functional requirements of a project and the expectations of how it will be used and operated.
- Current Facility Requirements (CFR)
  - *A written definition of the goals, objectives and limitations of the project that account for the current and evolving needs of all of the stakeholders associated with the building (i.e. owner, manager, maintenance personnel, occupants).*

BENEFITS



Mills et al, LBNL, PECI and Energy Systems Lab, Texas A&M University System

SAVINGS AND COSTS

Building Type	No. of Buildings	Annual Savings ($ / sf)	Implementation Costs ($ / sf)	Simple Payback (years)
Hospitals	6	$0.43	$0.47	1.1
Lab Buildings	7	1.26	0.37	0.3
Classroom Buildings	5	0.43	0.23	0.5
Offices	8	0.22	0.33	1.5
Schools	2	0.17	0.34	2.0
Averages	28	$0.54	$0.36	0.7

Lui, et al Energy Systems Lab, Texas A&M University System and University of Nebraska

SAVINGS AND COSTS

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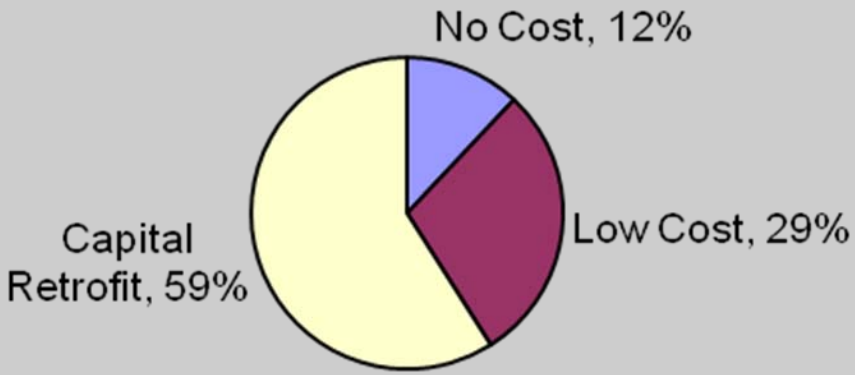
LBNL

SOURCES OF SAVINGS

- Scheduling HVAC Systems
- Adjust Outside Air Flow to Current Needs
- Mitigate Simultaneous Heating and Cooling
- Oversized Pumps
- Supply Air Reset
- Re-enable Economizer Controls
- Adjust Economizer Setpoints
- Lighting Controls Bypassed
- Static Pressure Reset
- Electric Duct Heater Controls
- Schedule DX Equipment
- Schedule Lights

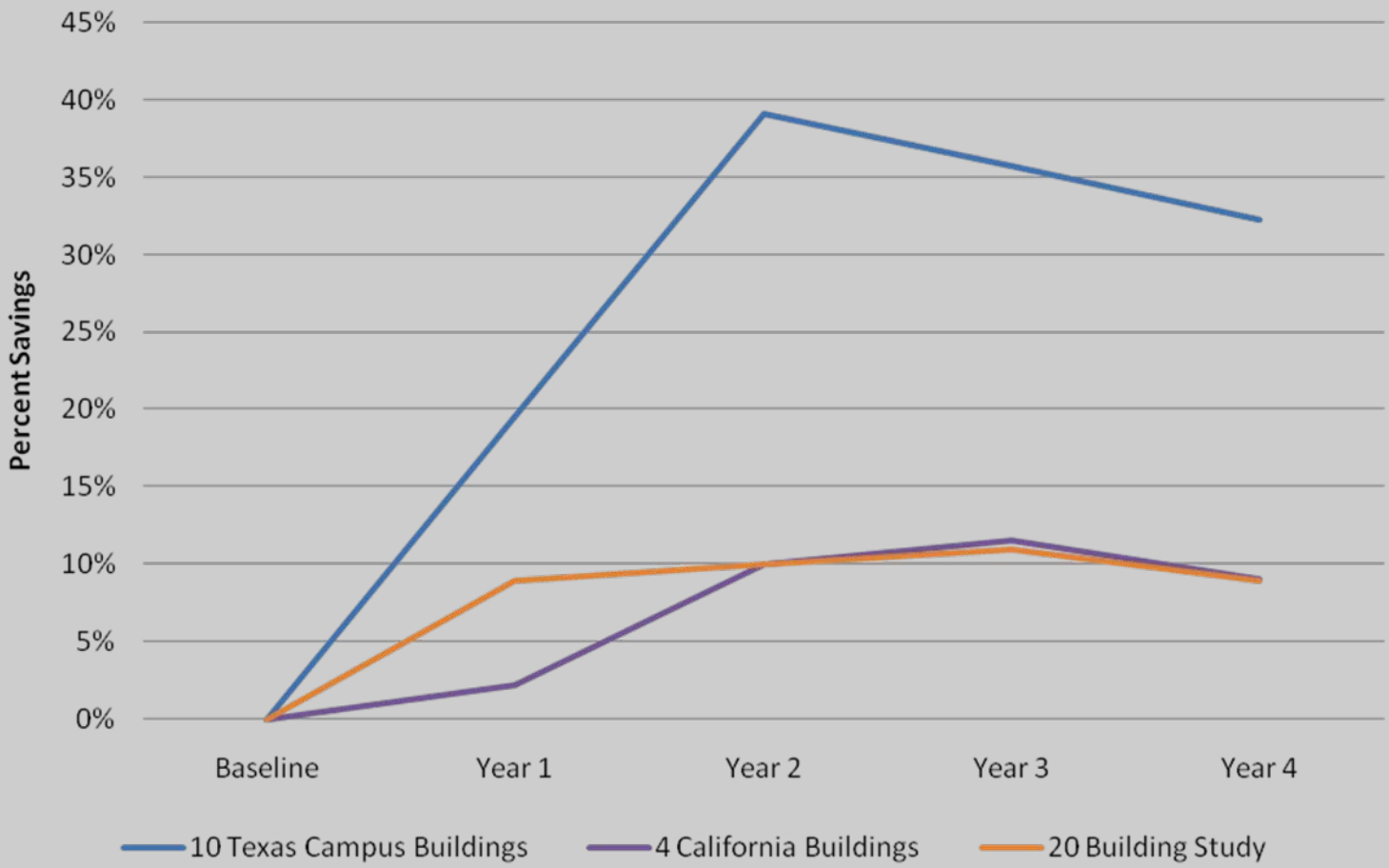
SOURCES OF SAVINGS



SOURCES OF SAVINGS

- Equipment running unnecessarily
- Adjust HVAC system start-up times
- Control outside air flows
- Mitigate simultaneous heating and cooling
- Adjust supply air temperature setpoints
- Properly control economizers
- Control lights consistent with occupancy needs
- Control garage lighting and ventilation
- Clean, align and maintain HVAC systems
- Adjust space temperature setpoints
- Stage chillers properly

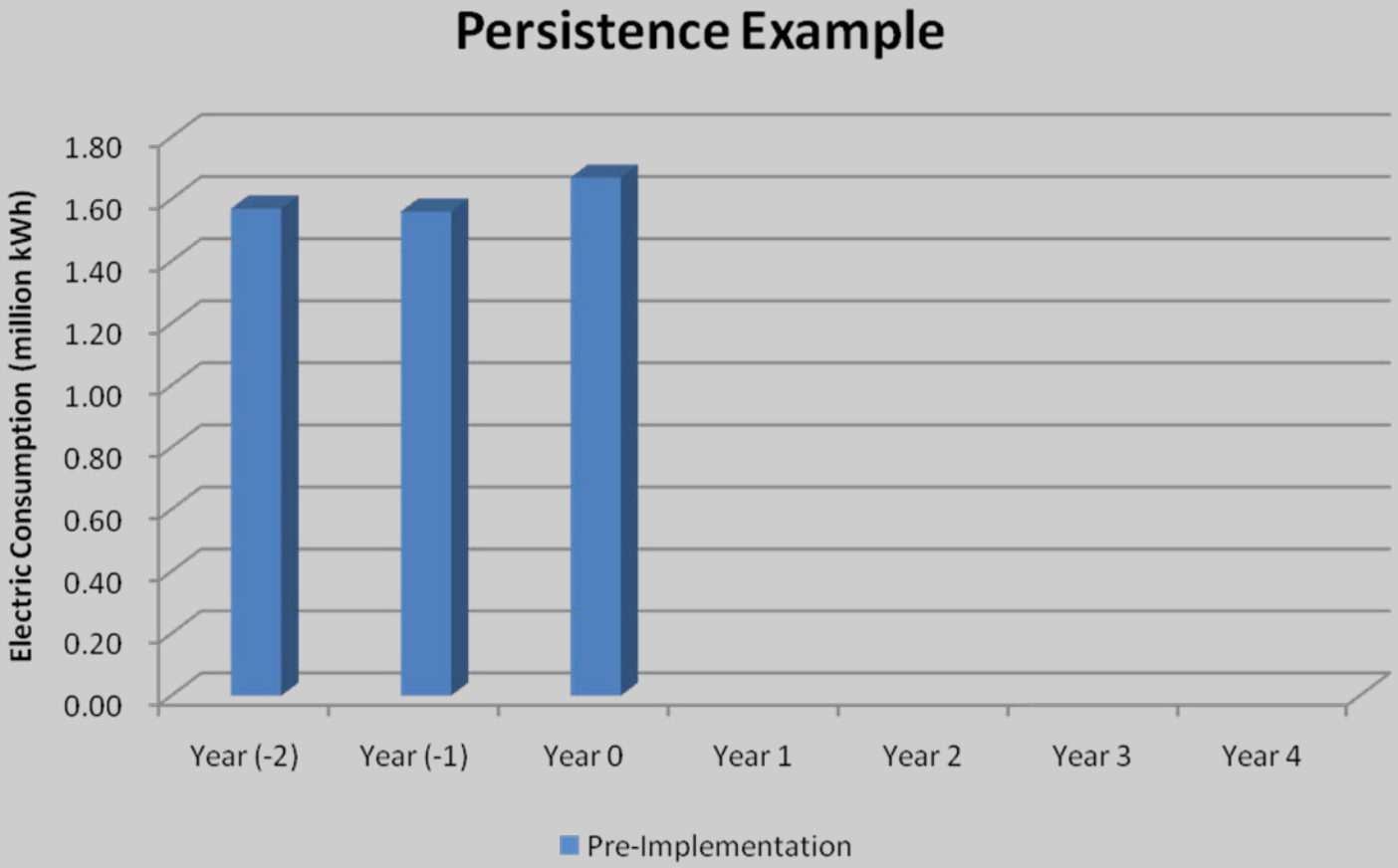
PERSISTENCE OF SAVINGS

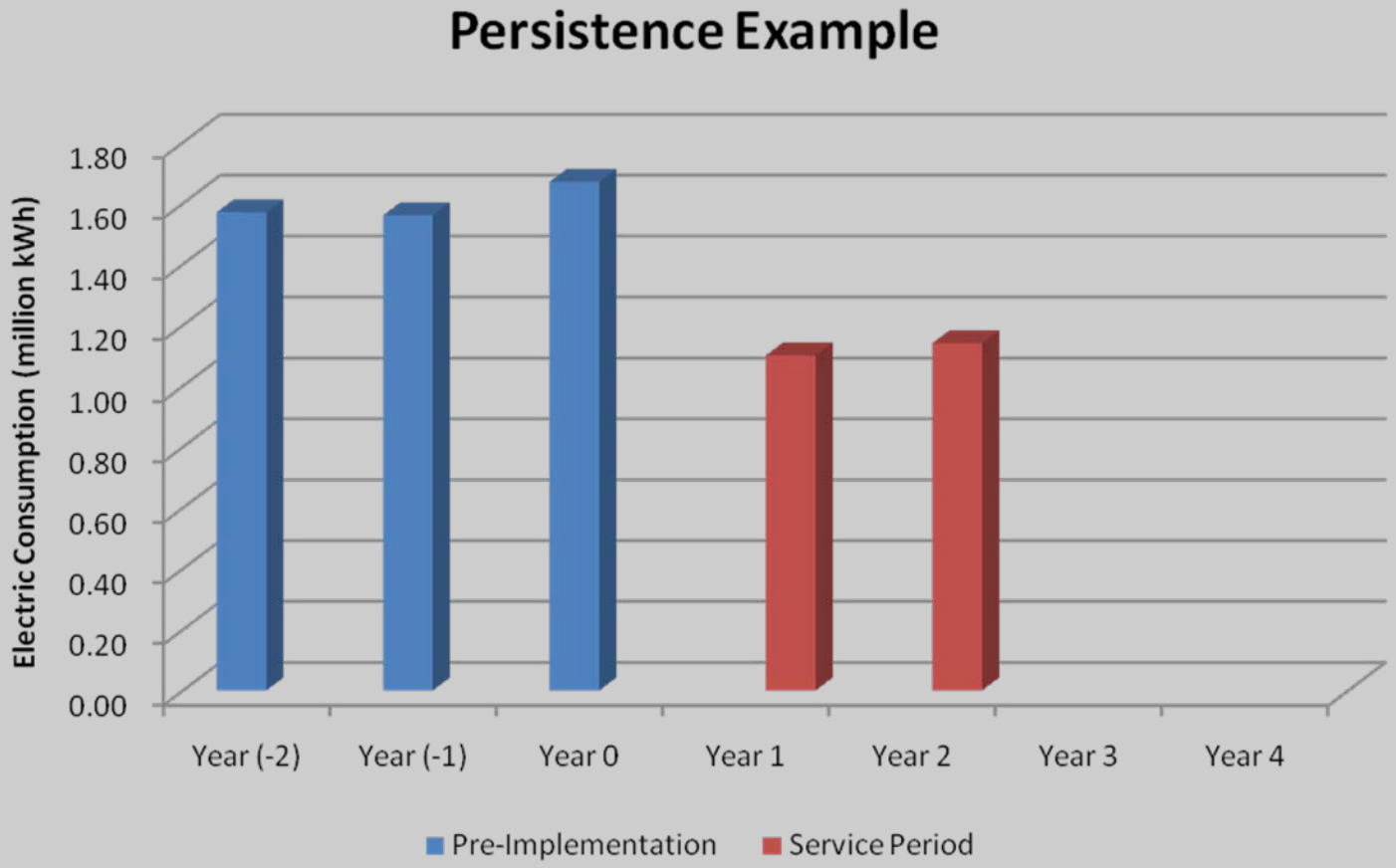


Compilation of multiple sources – Energy Systems Lab, Texas A&M University and LBNL

REASONS FOR DEGRADATION

- Equipment and controls malfunctions
- Changes to EMCS control settings
- Personnel turnover / Lack of ongoing training
- Service contractor change
- Lack of tools / budget to track performance


Persistence Example
Electric Consumption (million kWh)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Year (-2)
Year (-1)
Year 0
Year 1
Year 2
Year 3
Year 4
Pre-Implementation



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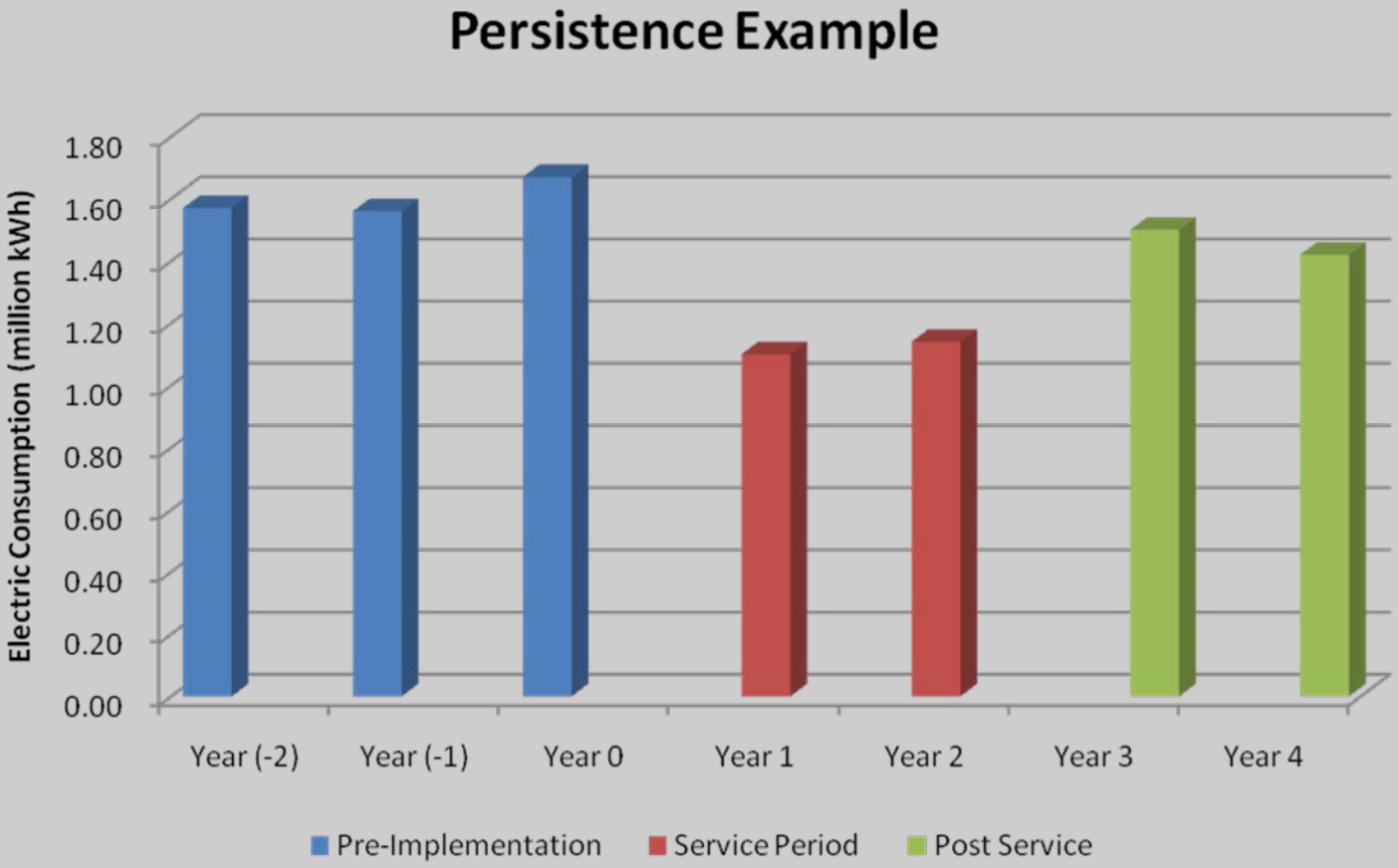
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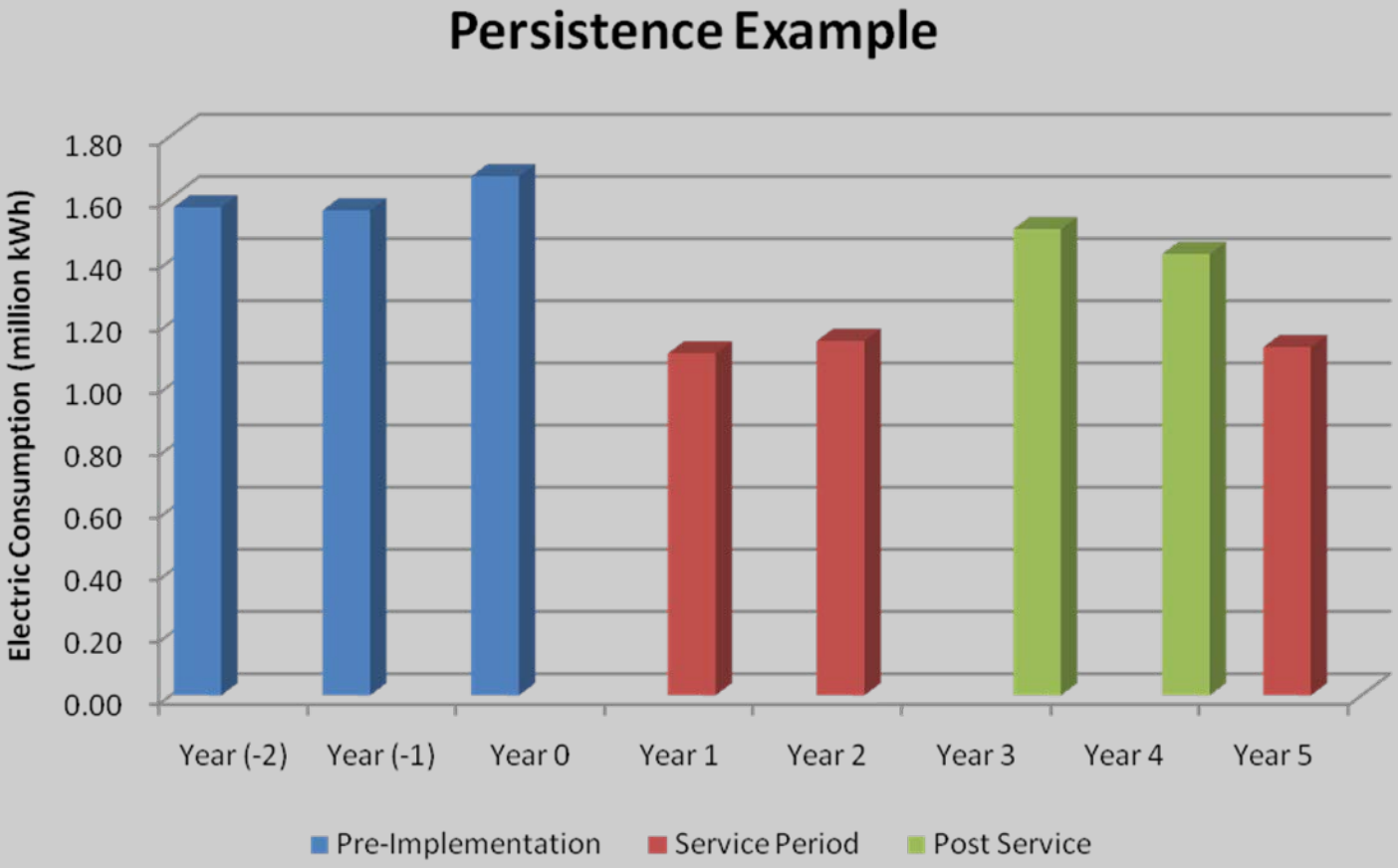
0.20
0.00
Year (-2)
Year (-1)
Year 0
Year 1
Year 2
Year 3
Year 4
Pre-Implementation
Service Period
Post Service


Persistence Example
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1.00
0.80
0.60
0.40
0.20
0.00
Year (-2)
Year (-1)
Year 0
Year 1
Year 2
Year 3
Year 4
Year 5
Pre-Implementation
Service Period
Post Service

HOW MAINTAIN SAVINGS

- Identify a Champion
- Define O&M Procedures and Schedules
- Continually Update Documentation
- Ongoing Training
- M&V (e.g. IPMVP)

SUMMARY

- Existing Building Commissioning works
  - On average saves about $0.26 to $0.54 per sf
  - On average costs about $0.27 to $0.41 per sf
  - On average results in 0.7 to 1.7 year payback
- Benefits can persist
  - Requires a champion
  - Requires ongoing M&V
  - Requires ongoing training

EXISTING BUILDING COMMISSIONING

WHO HAS THE FIRST QUESTION?

GovEnergy
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James Poulos