

Workshop on Design of the Standard Offer Program (SOP) Pilot
Organised by the Thai-German Programme on
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Session B2:
Setting SOP Incentive Levels

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Background

- SOP is similar in some ways to a Feed-in-Tariff (FiT) for energy efficiency

HOWEVER,

- Unlike a renewable energy FiT, the SOP incentive is typically paid in just the first year
- KMUTT study recommended an SOP incentive level of THB 1.59/kWh

KMUTT Methodology

- **Calculated total avoided cost**
 - EGAT avoided cost of non-firm SPP power (THB 3.31/kWh)
 - GHG impact (envir. externality) (THB 0.22/kWh)
 - Health externality (THB 0.71/kWh)
 - **TOTAL = THB 4.24/kWh**
- Total Resource Cost (TRC) calculation
 - TRC = 75% x (total avoided cost)
 - = THB 3.18/kWh**
- SOP incentive = THB 3.18/kWh x 50%
 - = THB 1.59/kWh**

Design of Incentive Levels: Important Terms

Element	Definition
Avoided Costs	The forecasted economic benefits of energy savings. These are the costs that would have been spent if the energy efficiency had not been put in place.
Energy Savings	The energy savings estimated as a result of the energy efficiency measure/project implemented.
Demand Savings	The demand savings estimated as a result of the energy efficiency measure/project implemented.
Capital Cost	The cost to the customer to implement the energy efficiency measure/project.
Net Present Value	The value of a stream of cash flows converted to a single sum in a specific year, usually the first year of the analysis. It can also be thought of as the equivalent worth of all cash flows relative to a base point called the present.
Discount Rate	A measure of the time value of money. The choice of discount rate can have a large impact on the cost-effectiveness results for energy efficiency.

Basic Steps in Process

- **Step 1: Gather Basic Data on Measure**
 - Identify energy and demand savings associated with the implemented measure.
 - Understand the capital cost associated with the implemented measure.
- **Step 2: Utility Perspective**
 - Determine the avoided costs for the measure.
 - Calculate the avoided cost benefit in terms related to the energy savings of the measure being implemented.
- **Step 3: Customer Perspective**
 - Calculate the capital cost benefit of the measure related to the energy savings of the measure being implemented.
- **Step 4: Set Ceiling and Boundaries**
 - Set the incentive *ceiling* based on *Avoided Costs* and then *boundaries* based on *Capital Costs*, in order to establish a range of reasonable incentive levels

Two Examples

- LED replacement of CFLs
- AC replacement



LED Example

- Replace 13W CFLs with 5W LEDs (100 lamps)
- Replace 24W CFLs with 9W LEDs (100 lamps)
- Baseline data
 - Annual use per lighting fixture = 2,000 hrs/yr
 - Lifetime of LED lamp = 30,000 hrs
 - Lifetime of LED lamp = 15 yrs
 - Incremental Costs
 - 13W CFL to 5W LED = THB 80 - THB 180 = **THB 100**
 - 13W CFL to 5W LED = THB 270 - THB 500 = **THB 230**
 - Average electricity tariff = THB 3.5/kWh
 - Utility avoided cost = THB 3.31/kWh

Step-Wise Process: LED Example

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	4,600	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	16,100	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	33,000	THB	Incremental cost to purchase the EE equipment

Step-Wise Process: LED Example

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	4,600	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	16,100	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	33,000	THB	Incremental cost to purchase the EE equipment
2	UTILITY PERSPECTIVE			
	3.1. Determine the avoided costs for the measure (based on utility's avoided cost per kWh)	130,327	THB	This is the utility benefit: NPV of avoided costs over lifetime
	3.2. Calculate the avoided cost benefit as related to the energy savings of the measure being implemented	28.3	THB/kWh (first-year savings)	This is the NPV of the utility benefit per kWh saved

Step-Wise Process: LED Example

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	4,600	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	16,100	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	33,000	THB	Incremental cost to purchase the EE equipment
2	UTILITY PERSPECTIVE			
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	3.2. Calculate the avoided cost benefit as related to the energy savings of the measure being implemented	28.3	THB/kWh (first-year savings)	This is the NPV of the utility benefit per kWh saved
3	CUSTOMER PERSPECTIVE			
	4.1 Calculate the capital cost benefit of the measure related to the energy savings of the measure being implemented.	7.2	THB/kWh (first-year savings)	

Step-Wise Process: LED Example (2)

Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
	<ul style="list-style-type: none"> Absolute Ceiling based on UTILITY Avoided Cost Benefit 	28.3	THB/kWh (first-year savings)	Equal to what EGAT would pay to an SPP for "non-firm" energy resources. This is the MAXIMUM that the govt. should pay for the SOP resource.

Step-Wise Process: LED Example (2)

Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
	<ul style="list-style-type: none"> Absolute Ceiling based on UTILITY Avoided Cost Benefit 	28.3	THB/kWh (first-year savings)	Equal to what EGAT would pay to an SPP for "non-firm" energy resources. This is the MAXIMUM that the govt. should pay for the SOP resource.
	<ul style="list-style-type: none"> Upper Boundary based on CUSTOMER Capital Cost Benefit 	7.2	THB/kWh (first-year savings)	This is the incremental cost paid by the customer for the EE equipment divided by the annual energy savings

Step-Wise Process: LED Example (2)

Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
	<ul style="list-style-type: none"> Absolute Ceiling based on UTILITY Avoided Cost Benefit 	28.3	THB/kWh (first-year savings)	Equal to what EGAT would pay to an SPP for "non-firm" energy resources. This is the MAXIMUM that the govt. should pay for the SOP resource.
	<ul style="list-style-type: none"> Upper Boundary based on CUSTOMER Capital Cost Benefit 	7.2	THB/kWh (first-year savings)	This is the incremental cost paid by the customer for the EE equipment divided by the annual energy savings
	<ul style="list-style-type: none"> Mid-point based on 50% of Capital Cost Benefit 	3.6	THB/kWh (first-year savings)	This is equal to 50% of incremental cost paid by customer
	<ul style="list-style-type: none"> Lower boundary based on 25% of CUSTOMER Capital Cost Benefit 	1.8	THB/kWh (first-year savings)	This is equal to 25% of incremental cost paid by customer

AC Example

- Replace 20 x 13,000 BTU air conditioners (ACs) with high-efficiency units
- Baseline data
 - Annual use per unit = 2,000 hrs/yr
 - Lifetime of unit = 10 yrs
 - Costs
 - Cost of Baseline unit = THB 22,000
 - Cost of High-Efficiency unit = THB 29,000
 - Increment cost of High-Efficiency unit = THB 7,000
 - Average electricity tariff = THB 3.5/kWh
 - Utility avoided cost = THB 3.31/kWh

Step-Wise Process: AC Example (1)

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	8,075	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	28,261	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	140,000	THB	Incremental cost to purchase the EE equipment

Step-Wise Process: AC Example (1)

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	8,075	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	28,261	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	140,000	THB	Incremental cost to purchase the EE equipment
2	UTILITY PERSPECTIVE			
	3.1. Determine the avoided costs for the measure (based on utility's avoided cost per kWh)	189,633	THB	This is the utility benefit: NPV of avoided costs over lifetime
	3.2. Calculate the avoided cost benefit as related to the energy savings of the measure being implemented	23.5	THB/kWh (first-year savings)	This is the NPV of the utility benefit per kWh saved

Step-Wise Process: AC Example (1)

Step	Task	Amount	Unit	Comment
1	GATHER BASIC DATA			
	1.1. Identify energy savings associated with the implemented project	8,075	kWh/yr	Annual electricity savings
	1.2. Identify energy cost savings associated with the implemented project	28,261	THB	Annual electricity cost savings
	1.3. Understand the capital cost associated with the implemented project.	140,000	THB	Incremental cost to purchase the EE equipment
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	3.1. Determine the avoided costs for the measure (based on utility's avoided cost per kWh)	189,633	THB	This is the utility benefit: NPV of avoided costs over lifetime
	3.2. Calculate the avoided cost benefit as related to the energy savings of the measure being implemented	23.5	THB/kWh (first-year savings)	This is the NPV of the utility benefit per kWh saved
3	CUSTOMER PERSPECTIVE			
	4.1 Calculate the capital cost benefit of the measure related to the energy savings of the measure being implemented.	17.3	THB/kWh (first-year savings)	

Step-Wise Process: AC Example (2)

Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
	•Absolute Ceiling based on UTILITY Avoided Cost Benefit	23.5	THB/kWh (first-year savings)	Equal to what EGAT would pay to an SPP for "non-firm" energy resources. This is the MAXIMUM that the govt. should pay for the SOP resource.

Step-Wise Process: AC Example (2)

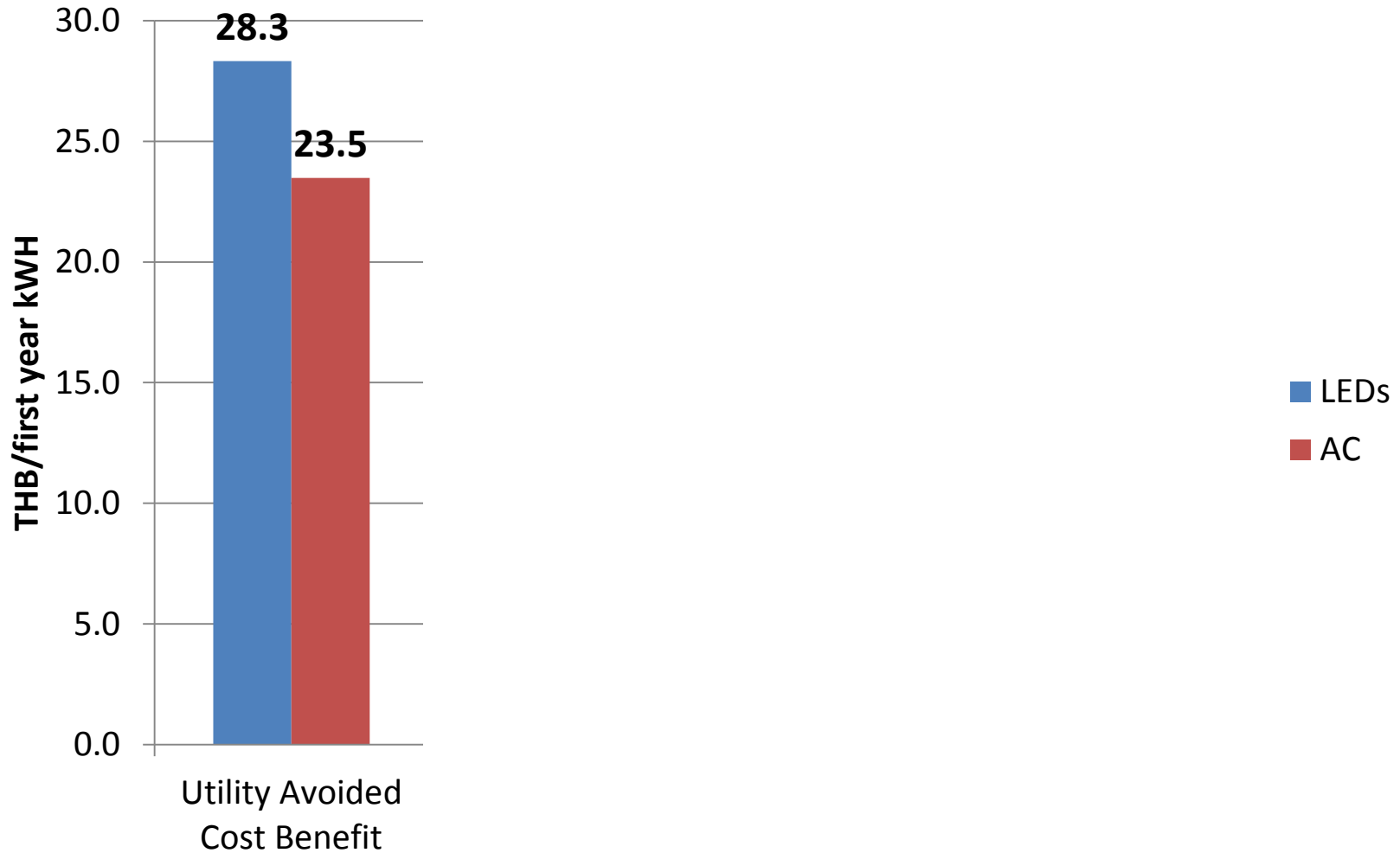
Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
	•Absolute Ceiling based on UTILITY Avoided Cost Benefit	23.5	THB/kWh (first-year savings)	Equal to what EGAT would pay to an SPP for "non-firm" energy resources. This is the MAXIMUM that the govt. should pay for the SOP resource.
	•Upper Boundary based on CUSTOMER Capital Cost Benefit	17.3	THB/kWh (first-year savings)	This is the incremental cost paid by the customer for the EE equipment divided by the annual energy savings

Step-Wise Process: AC Example (2)

Step	Task	Amount	Unit	Comment
4	SET CEILING AND BOUNDARIES			
	4.1. Estimate 'boundaries' around the performance-based incentive value from Step 4 and Step 5.			
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	•Upper Boundary based on CUSTOMER Capital Cost Benefit	17.3	THB/kWh (first-year savings)	This is the incremental cost paid by the customer for the EE equipment divided by the annual energy savings
	•Mid-point based on 50% of Capital Cost Benefit	8.7	THB/kWh (first-year savings)	This is equal to 50% of incremental cost paid by customer
	•Lower boundary based on 25% of CUSTOMER Capital Cost Benefit	4.3	THB/kWh (first-year savings)	This is equal to 25% of incremental cost paid by customer

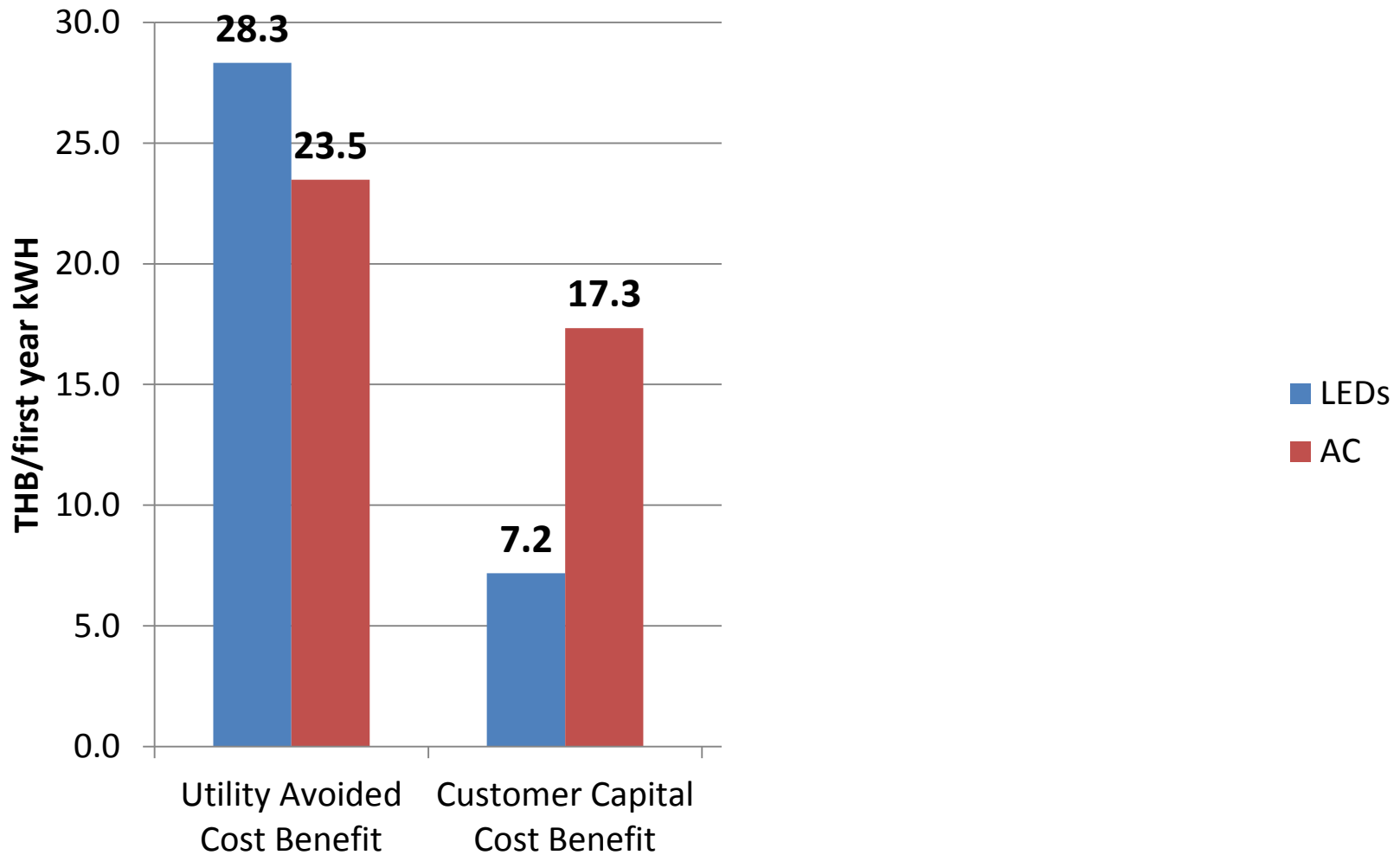
Summary of Two Examples

(Note: units are in THB per FIRST YEAR kWh savings)



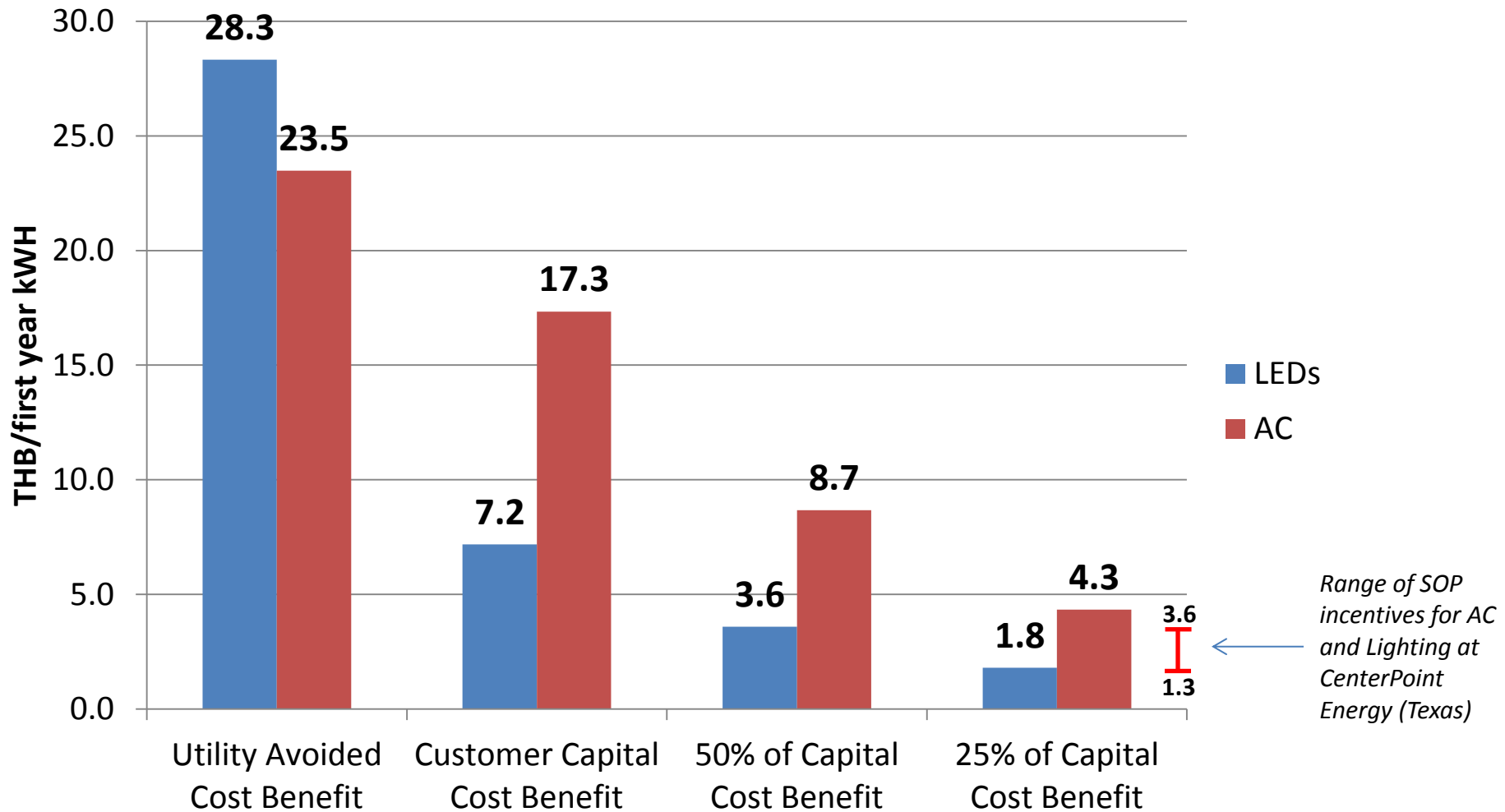
Summary of Two Examples

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Summary of Two Examples

(Note: units are in THB per FIRST YEAR kWh savings)



Deciding on Incentive Levels

- Key Issues to Consider:
 - SOP is typically not a multi-year Feed-in-Tariff
 - one time payment based on first year savings
 - Avoided Cost Benefits (to UTILITY)
 - Capital Cost Benefits (to CUSTOMER)
 - Incremental cost of EE vs. Baseline equipment
 - Important to set CEILINGS and BOUNDARIES
 - Ceiling is the MAXIMUM the govt. should pay for the SOP resource
 - Boundary is a way of comparing the SOP incentive to the customer EE investment

Thank you