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# **Financial Analysis of Incentive Mechanisms to Promote Energy Efficiency: Case Study of a Prototypical Southwest Utility**

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**- Report Summary -**

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# Project Approach & Objectives

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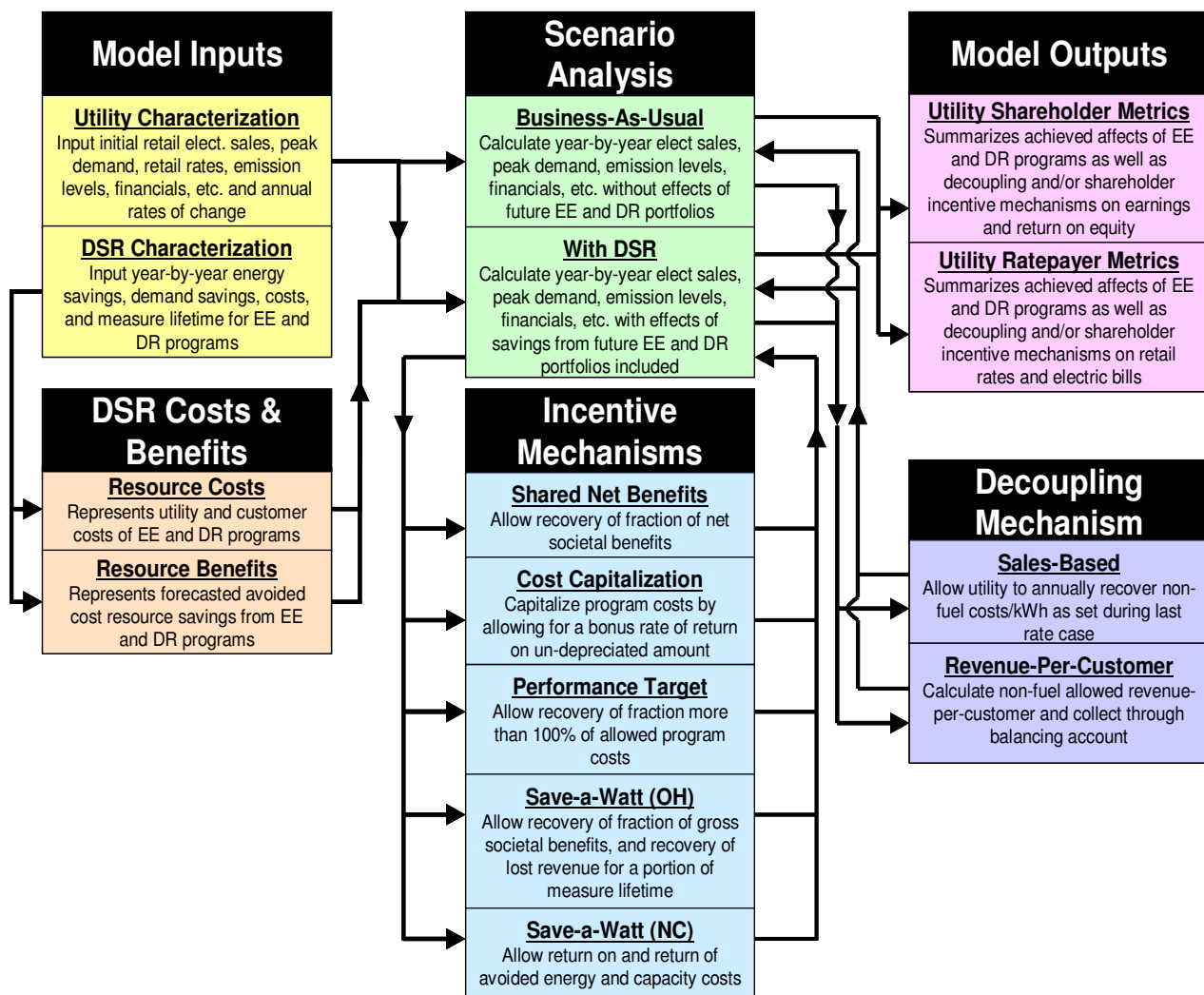
- **Background**: Current environment is one of substantially increased interest in energy efficiency and demand response
  - Policymakers want and are proposing very aggressive demand-side savings goals in many parts of the country, while a national EE resource standard is currently in proposed federal legislation
  - Policymakers want to increase utilities' motivation to achieve these goals
- **Goal**: Facilitate dialogue on various utility EE business models (i.e., shareholder incentive mechanisms and/or decoupling) by conducting quantitative financial analysis
- **Approach**: Analyze impacts of various utility performance incentives and ratemaking mechanisms on stakeholders (e.g., shareholders, ratepayers) when a prototypical, vertically integrated utility based in the Southwest implements alternative energy efficiency portfolios with varying savings goals

# Project Approach & Objectives (2)

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- **Analysis illustrates the different financial implications on stakeholders when identical levels of EE savings are achieved under different business models**
- **Caveats**
  - **We do NOT account for any potential link between the type and/or size of shareholder incentive mechanism and utility's motivation to achieve and/or increase EE goals or portfolio size**
  - **We do NOT analyze other potential non-financial motivators of utility behavior and support for EE (e.g., PUC orders, customer relations)**
  - **We do NOT perform a comparative analysis of the relative merits of utility vs. non-utility administration of energy efficiency programs**

# Analysis Method



- Used an adapted version of NAPEE Benefits Calculator, a pro-forma financial model

- Flowchart illustrates the major steps of the analysis

- Model Inputs
- Scenario analysis of alternative EE portfolios and utility business models
- Model Outputs

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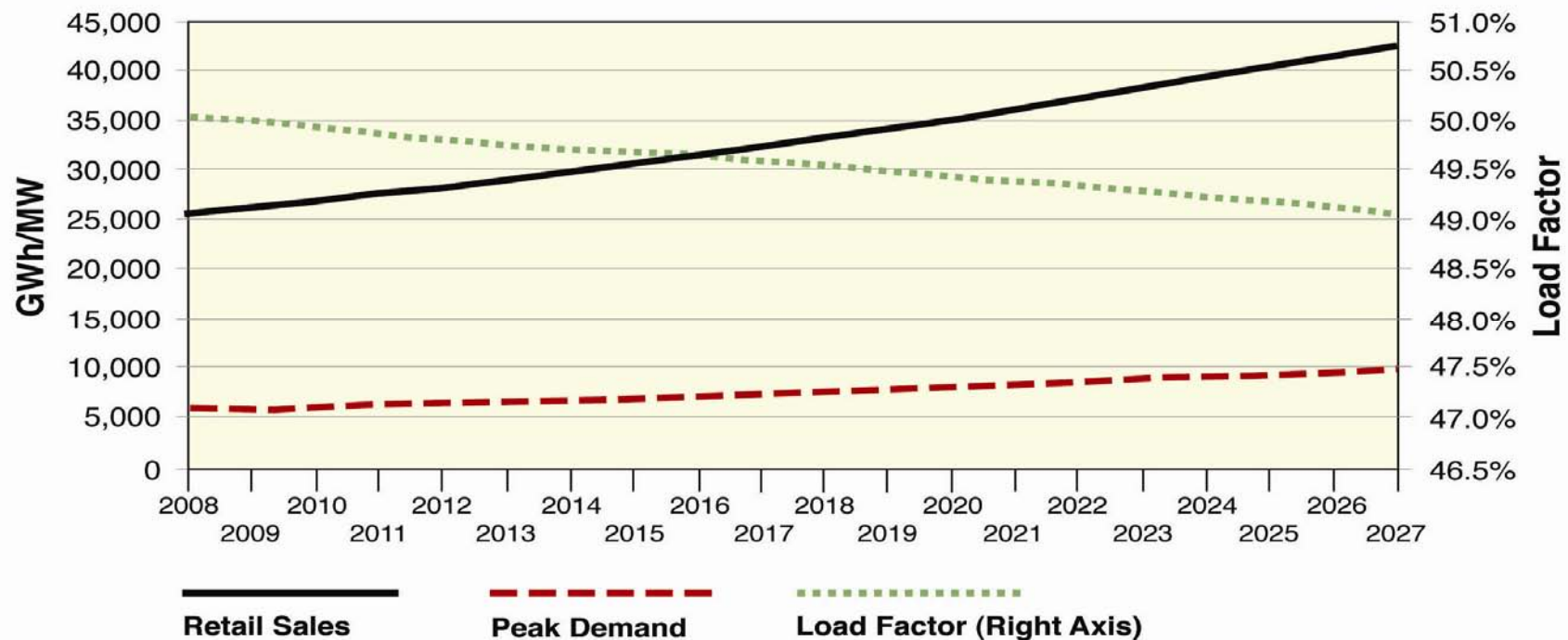
# Model Inputs

# Developing Prototypical SW Utility

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- Examined historical financial, cost and system characteristics of IOUs serving southwestern states
- Used characteristics of Arizona Public Service (APS) and Nevada Power (NP) to help develop our prototype SW utility
  - Also collected data on utility financial, system characteristics and DSM for Pacificorp, Public Service New Mexico (PSNM), Tucson Electric and Rocky Mountain Power
- Relied heavily upon publicly available data sources
  - Annual Financial Reports & 10-K filings
  - FERC Form 1
  - Integrated Resource Plan filings
  - Demand Side Management program filings
- Created “business as usual” (BAU) No EE case for prototypical SW utility
  - EE cases with varying incentive mechanisms compared to this “BAU No EE” case

# Prototypical SW Utility: Retail Sales and Demand Forecast in Business-as-Usual Case



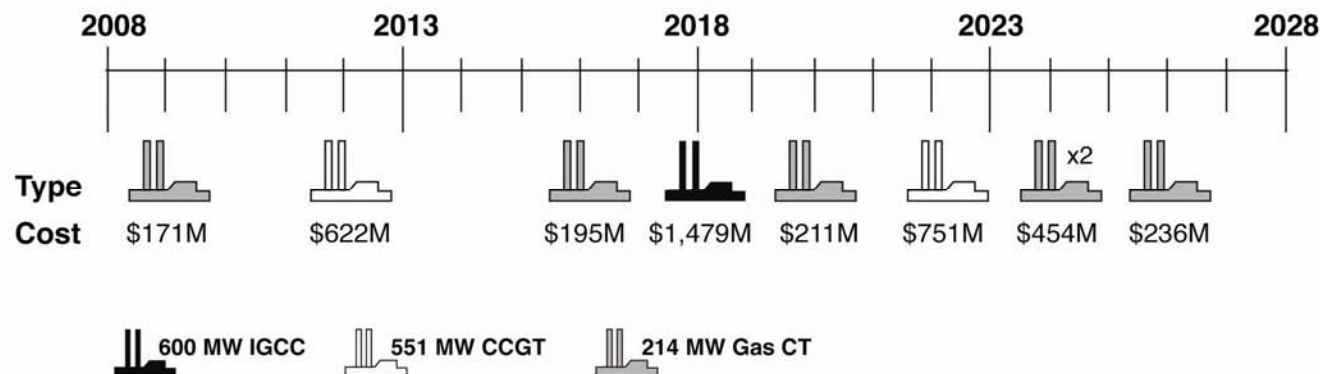
- Retail sales grow @ 2.8% annually
- Peak demand grows @ 2.9% annually
- Declining load factor at this rapidly growing utility



# Prototypical SW Utility: Revenue Requirement and Retail Rates in Business-As-Usual Case

Utility Budget Category	2008 Level (\$B)	2017 Level (\$B)	2027 Level (\$B)	Annual Growth Rate (%)
T&D Capital Expenditure	\$0.3	\$0.5	\$0.7	5.0%
Rate Base	\$4.3	\$6.7	\$11.1	5.1%
Operations and Maintenance	\$0.4	\$0.8	\$2.0	8.8%
Fuel & Purchased Power	\$1.2	\$2.3	\$4.2	6.7%
<b>Annual Revenue Requirement</b>	<b>\$2.3</b>	<b>\$4.2</b>	<b>\$8.1</b>	<b>6.9%</b>
<i>All-In Retail Rate</i>	<i>9.1 ¢/kWh</i>	<i>13.1 ¢/kWh</i>	<i>18.9 ¢/kWh</i>	<i>3.9%</i>

- Both fuel and non-fuel costs are growing faster than sales
- Utility unable to achieve authorized ROE of 10.75%
- Utility files biennial rate cases to mitigate earnings erosion
- IRP sets out investment schedule for large new generation plant, that EE can help defer
- Retail rates double over 20-year time horizon





# Savings and Costs of Alternative Energy Efficiency Portfolios

Energy Efficiency Portfolio	Target % Reduction in Incr. Retail Sales	Ramp-Up Period (Years)	Lifetime Impacts				Program Admin. Costs (¢/Lifetime kWh)	Total Resource Costs (¢/Lifetime kWh)
			Peak Period Savings (GWh)	Off-Peak Period Savings (GWh)	Peak Demand Savings (Max MW)			
Moderate	<i>0.5%/Year</i>	2	10,452	4,479	226	1.6	2.6	
Significant	<i>1.0%/Year</i>	3	19,433	8,328	421	1.8	3.0	
Aggressive	<i>2.0%/Year</i>	5	34,314	14,706	743	2.7	4.0	

- Analyzed three energy efficiency portfolios with varying energy savings targets and costs to examine impacts of EE on utility shareholders, customers, and society
  - Assume utility delivers EE programs for 10 years
  - Assume 11 year avg. measure lifetime for all EE portfolios
  - Costs of Sig. and Agg. EE portfolios have higher costs than Mod. EE due to more expensive measures and higher customer incentives
- EE still costs considerably less than supply-side alternatives under consideration



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# Scenario Analysis & Model Outputs

# Conflict Between Shareholder and “Societal” Value of EE

Energy Efficiency Portfolio	Total Resource Benefits (\$B)	Total Resource Costs (\$B)	Net Resource Benefits (\$B)	Benefit Cost Ratio	Customer Bill Savings (\$B)	Achieved After-Tax ROE
None	N/A	N/A	N/A	N/A	N/A	10.43%
Moderate	\$0.67	\$0.26	\$0.41	2.6	\$1.10	10.39%
Significant	\$1.22	\$0.55	\$0.67	2.2	\$1.69	10.36%
Aggressive	\$2.06	\$1.20	\$0.86	1.7	\$2.37	10.32%

- **Large-scale, sustained energy efficiency efforts produce significant net resource benefits and bill savings for consumers; EE portfolios are very cost-effective**
- **However, the more aggressive the EE effort, the more such efforts will conflict with shareholders’ interest**
  - **Utility unable to achieve authorized earnings and ROE (10.75%) before EE is implemented as costs are growing faster than sales between rate cases**
    - ▼ Achieving deep and sustained EE savings exacerbates this problem
  - **EE defers need for future supply-side investments that generate earnings**
    - ▼ Replace them with EE investments that provide NO contribution to earnings

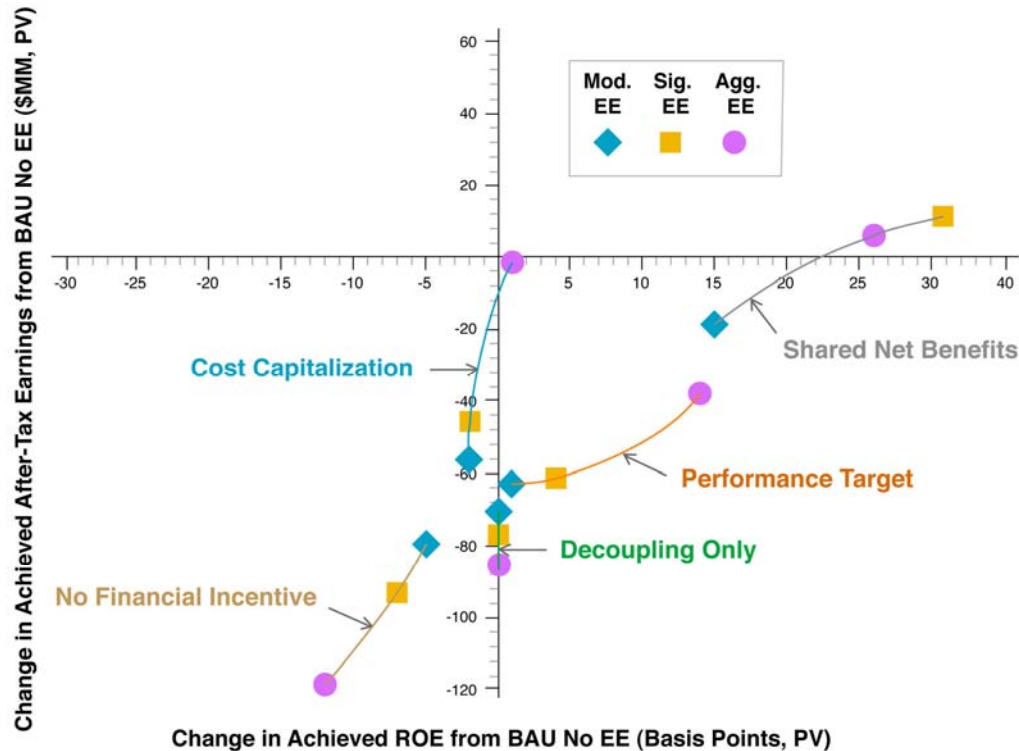


# Application of Decoupling or Shareholder Incentive Mechanisms

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- **Revenue-per-Customer (RPC) Decoupling**
  - Full-decoupling of non-fuel expenses between rate cases
- **Performance Target**
  - Utility receives performance-based incentive of an additional **10% of program costs** if it achieves EE portfolio goals, while program costs are expensed
- **Shared Net Benefits** (similar to approach used in CA and MN)
  - Utility retains **15% of the PV of TRC net benefits** from the portfolio of EE programs, while program costs are expensed
- **Cost Capitalization** (similar to approach used in NV)
  - Utility capitalizes the annual program costs over **first 5 years** of the installed measures at **authorized ROE (10.75%) + 500 basis points**

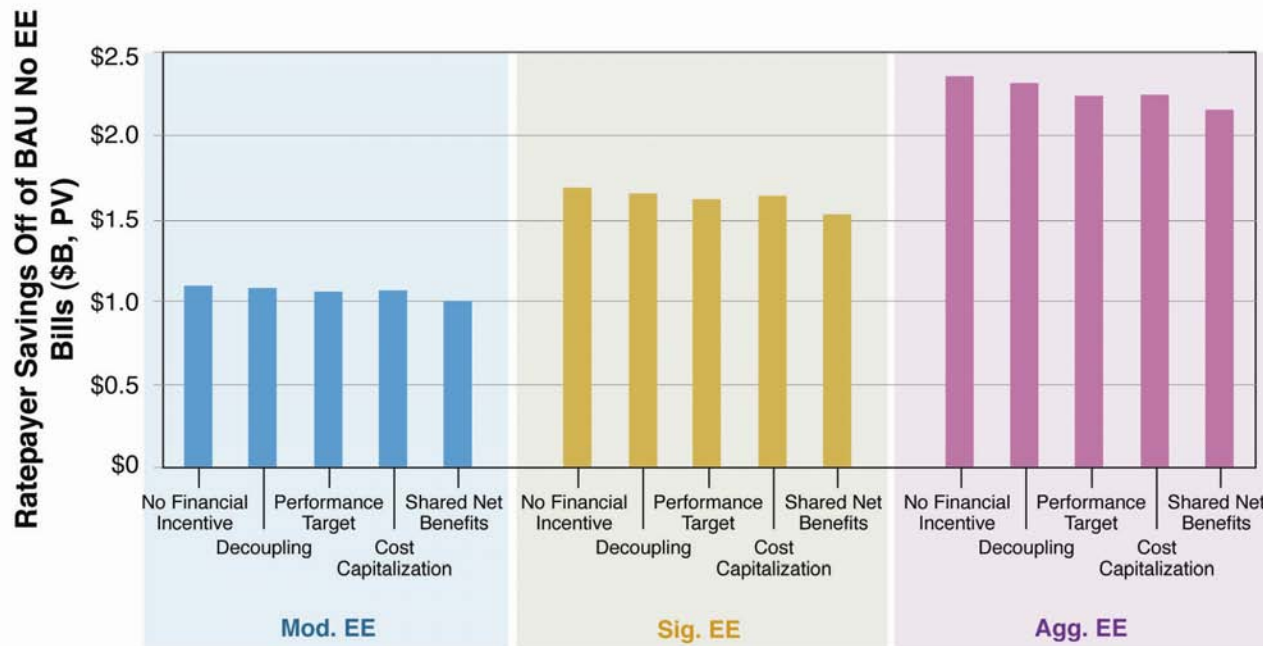
# Effect of Decoupling or Shareholder Incentives on Utility ROE and Earnings



- Application of full RPC decoupling entirely removes short-term disincentive from any reduction in sales between rate cases, but does not improve earnings opportunities
- Performance Target and Shared Net Benefits are only mechanisms that produce positive change in ROE for all EE savings levels if implemented alone
- Increase in earnings with Shared Net Benefits increase in Sig. and Agg. EE case compared to BAU No EE case

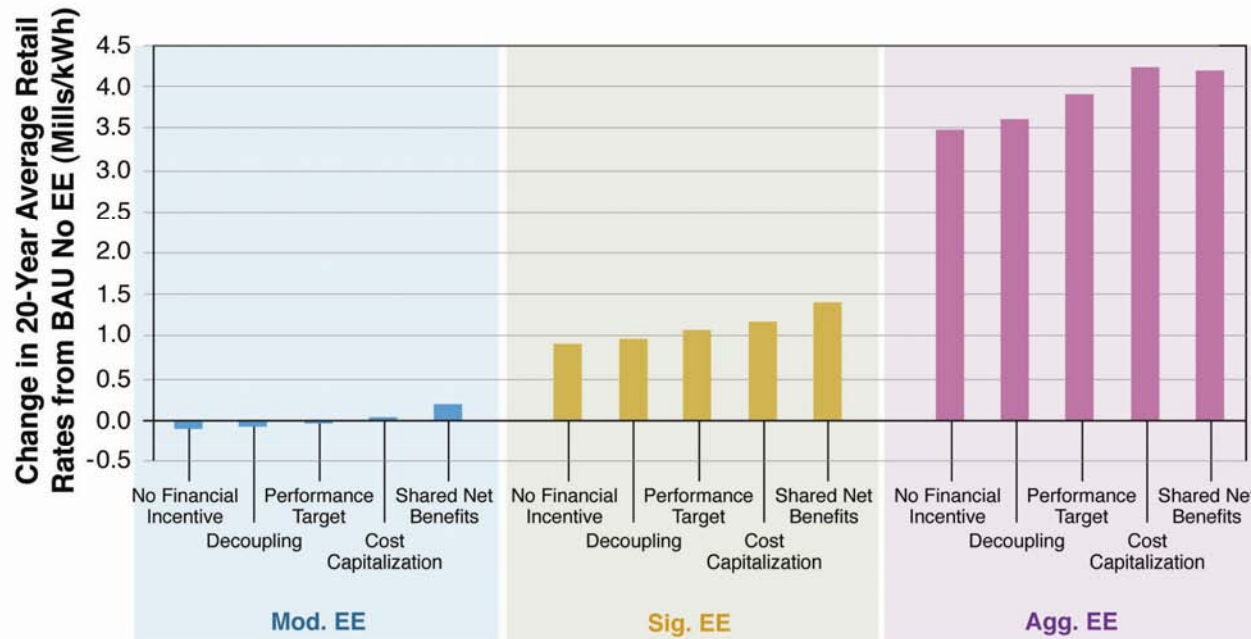
Finance theory suggests that preferred metric to assess value to shareholders of alternative investment options is impact on earnings per share (EPS) on a risk-adjusted basis; not total earnings. ROE is a good proxy for this when no additional equity is issued.

# Effect of Decoupling or Shareholder Incentives on Customer Bills



- Deferral value of EE to ratepayers increases with deeper savings levels
- In EE case without financial incentives, customers capture 77-90% of utility non-fuel cost savings due to frequency of rate cases (i.e. biennial)
- Ratepayers see total bills drop by ~3-6%, even with decoupling or shareholder incentives applied; bill savings increase with level of EE

# Effect of Decoupling or Shareholder Incentives on Customer Rates



- With EE and no incentives, small retail rate decrease in Mod. EE case ( $\leq 0.1\%$ ); modest rate increases (1-2%) for Sig. and Agg. EE portfolios (~1.0 – 3.5 mills/kWh)
- Additional cost of decoupling (~0.1 mills/kWh) or shareholder incentives (0.7 mills/kWh or less) increases rates minimally

# Combined Lost Fixed Cost Recovery and Shareholder Incentive Mechanisms

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- **Business case for EE also considered:**
  - **Joint application of an RPC decoupling mechanism and one of the three shareholder incentives discussed (i.e., Performance Target, Cost Capitalization, and Shared Net Benefits)**
  - **Duke Energy's proposed Save-a-Watt approach in NC and OH, which combines cost recovery, lost margin (i.e., lost fixed cost) recovery and positive incentive into a single mechanism**

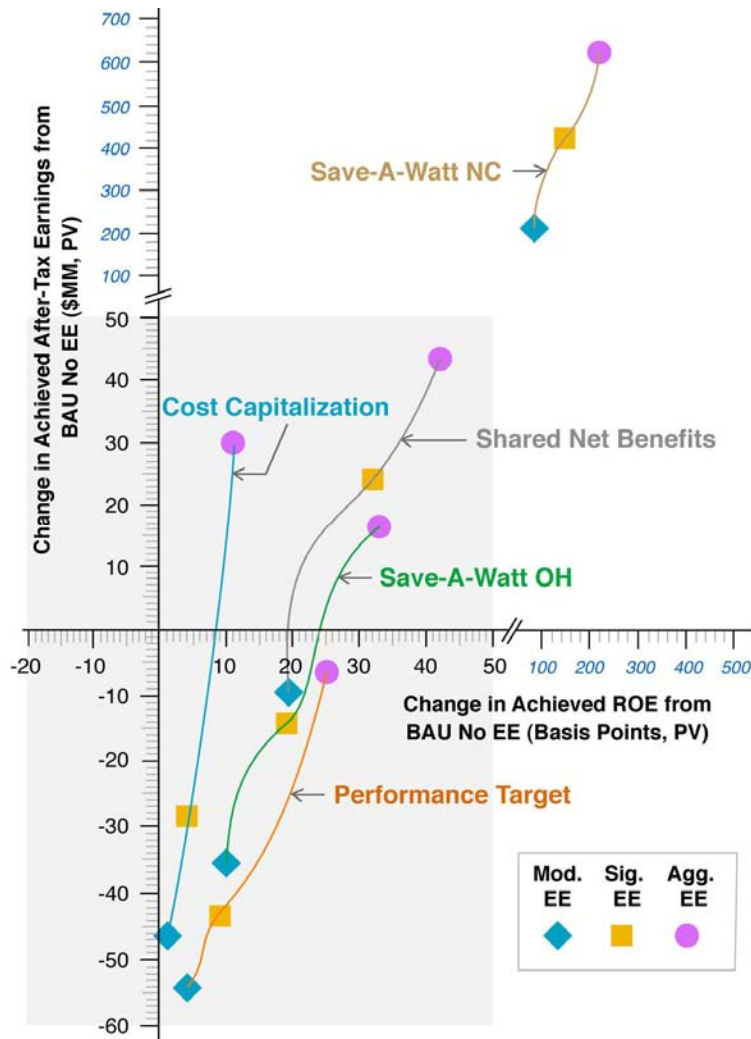


# Combined Lost Fixed Cost Recovery and Shareholder Incentive Mechanisms (2)

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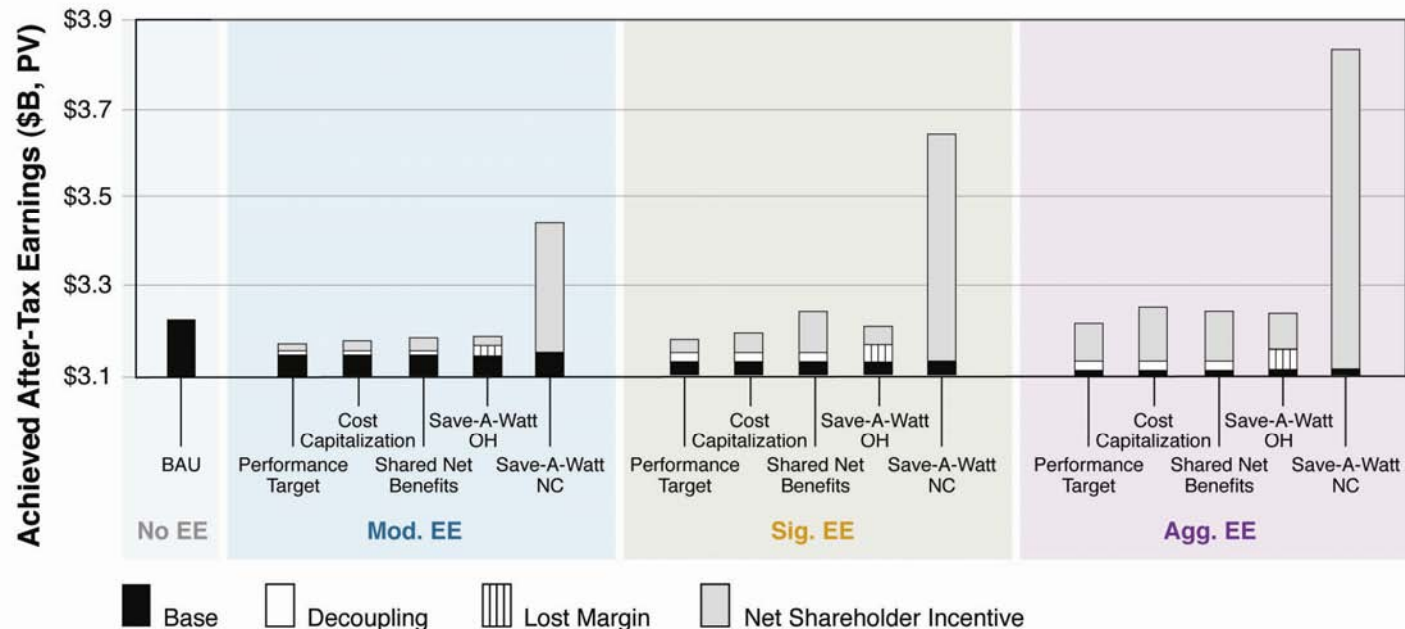
- Save-a-Watt North Carolina (NC)
  - Utility capitalizes 90% of the PV of avoided cost of energy and capacity over the lifetime of the installed measures at the utility's after-tax equity-weighted ROE, but program costs are not explicitly recovered
- Save-a-Watt Ohio (OH)
  - Utility retains 50% of the PV of TRC gross benefits from the portfolio of EE programs and receives a lost margin on every unit of energy saved at existing non-fuel retail rate for the lesser of 3 years or up to next rate case, but program costs are not explicitly recovered

# Effect of Lost Fixed Cost Recovery & Incentive Mechanisms on Utility ROE and Earnings



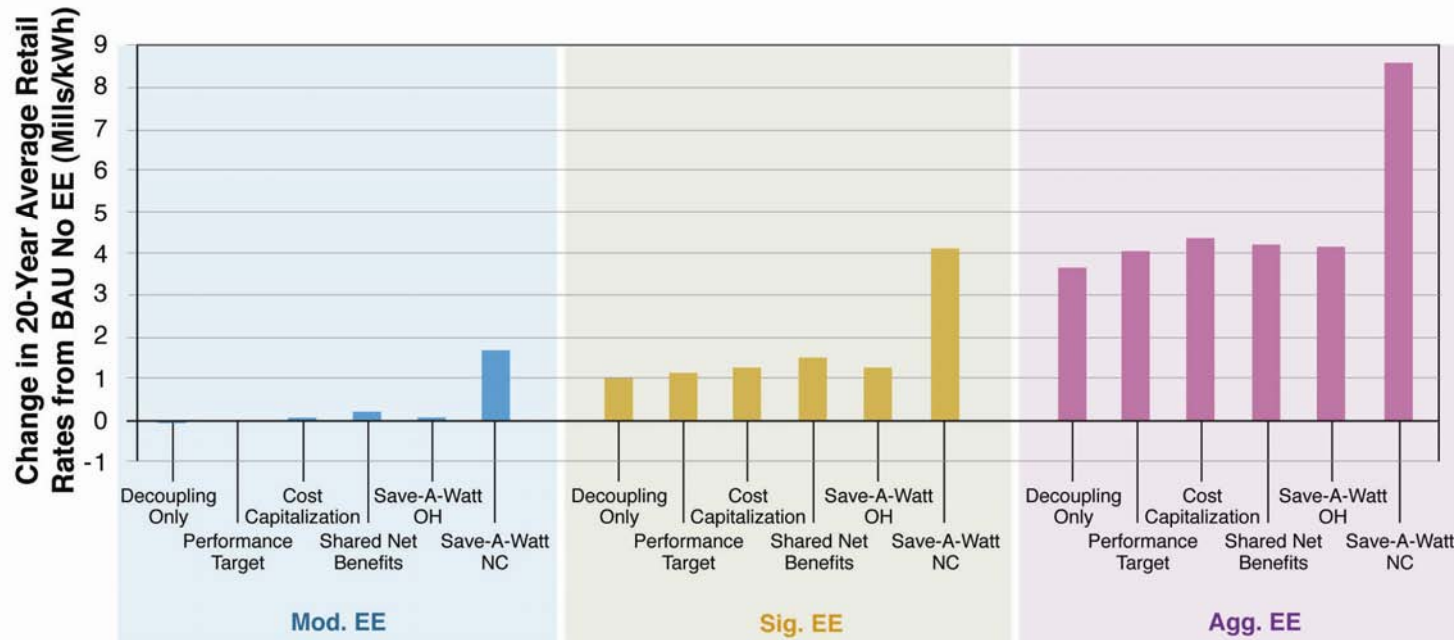
- EE more likely to be “profit center” for utility if combine mechanisms
- ROE of SW utility always increases if combine decoupling & incentive mechanism, compared to BAU No EE case
- Earnings generally increase only in the Agg. EE case
- Save-A-Watt (NC) provides utility with opportunity for much higher earnings and ROE if achieve EE savings targets

# Effect of Lost Fixed Cost Recovery & Incentive Mechanisms on Utility Earnings



- Decoupling and lost margin mechanisms provide smaller contribution to earnings than shareholder incentive mechanisms
- SaW lost margin provides larger boost to earnings than does RPC decoupling mechanism
  - In Agg. EE case, SaW OH produces 35% of its incremental earnings from lost revenue mechanism, while decoupling provides 22-29% of incremental earnings for other combined options

# Effect of Lost Fixed Cost Recovery & Incentive Mechanisms on Retail Rates



- Average retail rates are about 1- 4 mills/kWh higher over 20 years compared to BAU No EE case, except for SaW NC
- SaW NC raises rates by 2 – 8 times more than SaW OH or any combined decoupling/incentive mechanisms

# Lost Fixed Cost Recovery & Shareholder Incentives: “Front page” test

Incentive Mechanism	Ratepayer Share of Net Resource Benefits			Fixed Cost Recovery and Pre-Tax Incentive as % of Program Cost		
	Mod. EE	Sig. EE	Agg. EE	Mod. EE	Sig. EE	Agg. EE
Performance Target	90%	88%	79%	26%	25%	23%
Cost Capitalization	90%	89%	80%	24%	23%	21%
Shared Net Benefits	72%	72%	70%	70%	58%	33%
Save-a-Watt OH	81%	79%	72%	49%	43%	30%
Save-a-Watt NC	-8%	-14%	-23%	271%	232%	133%

- **Ratepayer share of net resource benefits is high for cost-based mechanisms (i.e., Perf. Target, Cost Cap.) for all EE portfolios; increases acquisition cost of EE by only 21-26%**
- **Mechanisms tied to benefits (i.e., SNB, SaW OH, and SaW NC) have highly variable (and greater) impacts on cost of EE resources**
- **SaW NC provides an earnings opportunity for the utility that represents a very high share of program costs and does not provide resource benefits to customers from societal perspective (given our assumption regarding customer cost contribution)**

# Designing Shareholder Incentives to Produce Sustainable EE Business Model

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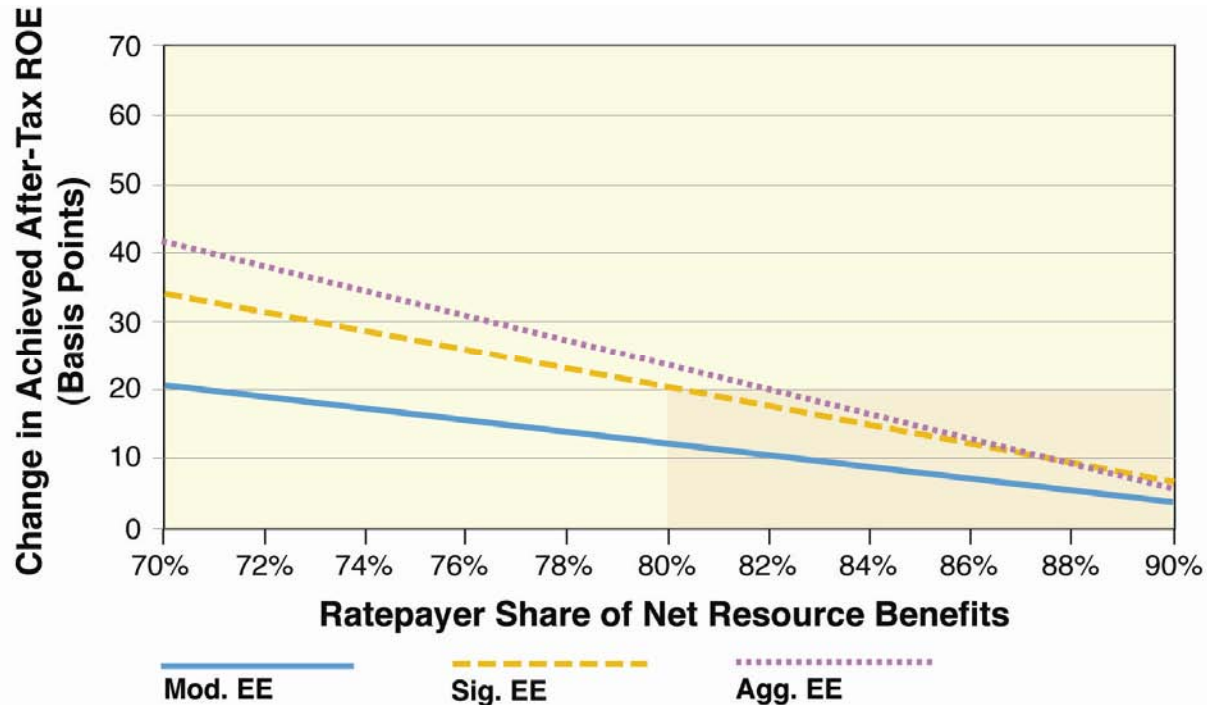
- Results illustrate how existing and/or proposed designs of shareholder incentives can significantly influence a mechanism's value to shareholders and ratepayers
- In assessing relative merits of proposed incentive mechanisms, PUCs should consider and analyze quantitative metrics that reflect these differing interests and viewpoints
- Such an approach provides insights on mechanism designs that produce more sustainable EE business models for both utilities and ratepayers

# Targeted Design for Shareholder Incentive Mechanisms

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- **Illustrative example: PUC decides EE shareholder incentive mechanism should provide “fair share of benefits” to ratepayers and opportunity for a significant reward to utility for superior performance:**
  - **Ratepayers retain 80% of net resource benefits**
  - **Utility shareholders have opportunity to see after-tax ROE increase by at most 20 basis points**
- **Approach provides implicit determination by a PUC of “how much is enough”:**
  - **To motivate utility managers to achieve superior performance**
  - **To gain support of customer and other stakeholder groups for utility EE business model by putting upper bounds on financial and rate impacts**

# Targeted Design of Shareholder Incentive Mechanisms: EE Savings Impact



- In Moderate EE case, not possible to meet PUC criteria of “fair share of benefits” to ratepayers AND provide utility with opportunity for 20 basis point increase in ROE
- In Sig. and Agg. EE cases, possible to construct incentive mechanism that both rewards the SW utility financially for superior performance and provides ratepayers with significant share of net resource benefits (80% of more)



# Targeted Design of Shareholder Incentive Mechanisms: Earnings Basis

	Ratepayer Share of Net Resource Benefits	Change in After-Tax ROE from BAU No EE (Basis Points)	Incentive as % of Total EE Program Costs	Shareholder Incentive Mechanism Earnings Basis Level		
				Performance Target	Shared Net Benefits	Save-a-Watt NC (Revised)
<i>Earnings Basis</i>				<i>% of Program Cost</i>	<i>Utility % of Net Benefits</i>	<i>% of Avoided Costs</i>
<i>Original Design</i>				10.0%	15.0%	90.0%
Moderate EE	N/A	N/A	N/A	N/A	N/A	N/A
Significant EE	80%	20	41%	25.3%	12.4%	36.1%
Aggressive EE	82%	20	19%	12.1%	11.2%	43.7%

- **With our Target Design approach and criteria, earnings basis for Shared Net Benefits comparable to Original Design and does not change much between Sig. and Agg. EE case**
- **Earnings basis for Performance Target and SaW NC changes significantly if EE savings targets are increased from 1 to 2% of retail sales**
- **SaW NC: Earnings basis would be set at ~40% of avoided costs to produce comparable earnings to other mechanisms: much lower than 85-90% originally proposed by Duke Energy**

# Summary and Conclusions

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- **Achieving deep and sustained energy efficiency savings is beneficial for ratepayers, but conflicts with shareholder's financial interest**
- **Full decoupling can remove the short-term (between rate cases) disincentives associated with EE, while shareholder incentives also can positively contribute to increased earnings and ROE (in some cases substantially) to offset the longer-term disincentives to EE**
- **For prototypical SW utility, average bills reduced by 3-6% with decoupling and three shareholder incentive mechanisms, with relatively minimal increases in retail rates**

# Summary and Conclusions (2)

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- **Successful “business models” for EE will depend primarily on extent to which they *accommodate, balance, and align* distinct interests of utility, ratepayers, and regulators in pursuit of the public interest**
- **In order to design sustainable business models for EE, must also address equity and fairness issues; PUCs should consider:**
  - **Define and reward only “superior” performance**
  - **Link target increases in utility ROE to ratepayer retention of significant portion of net resource benefits**
  - **Altering earnings basis of mechanisms with level of EE savings targets or only offer incentives if utility achieves Significant or Aggressive EE goals**

# For More Information...

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## **Download the Report:**

**<http://eetd.lbl.gov/ea/emp/ee-pubs.html>**

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