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Financial Impacts of Distributed Energy Resources (FINDER) Model

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Nevada E-MAP Stakeholder Workshop

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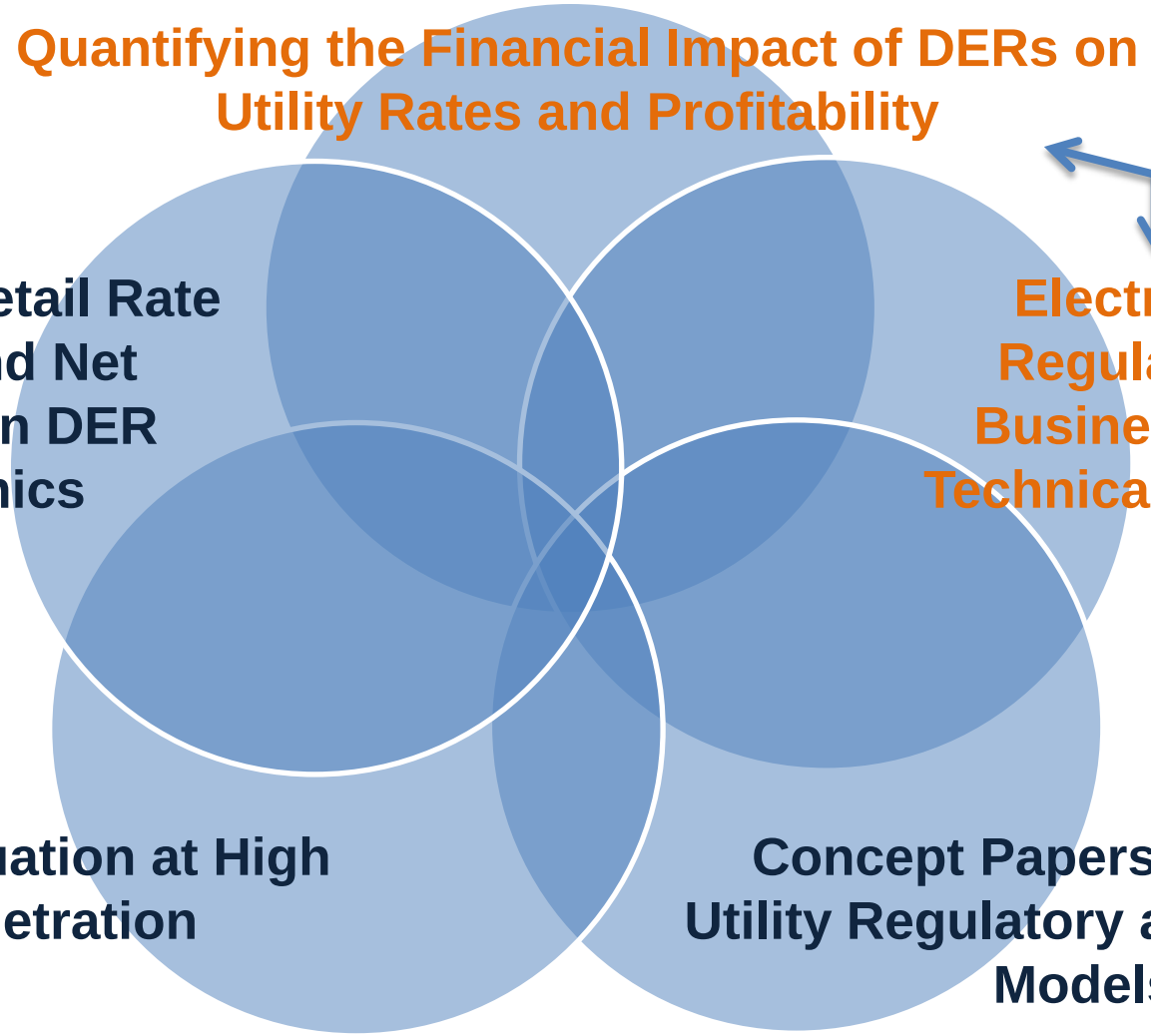
LBNL Work at the Intersection of Distributed Resources (DERs) and Utility Regulatory and Business Models



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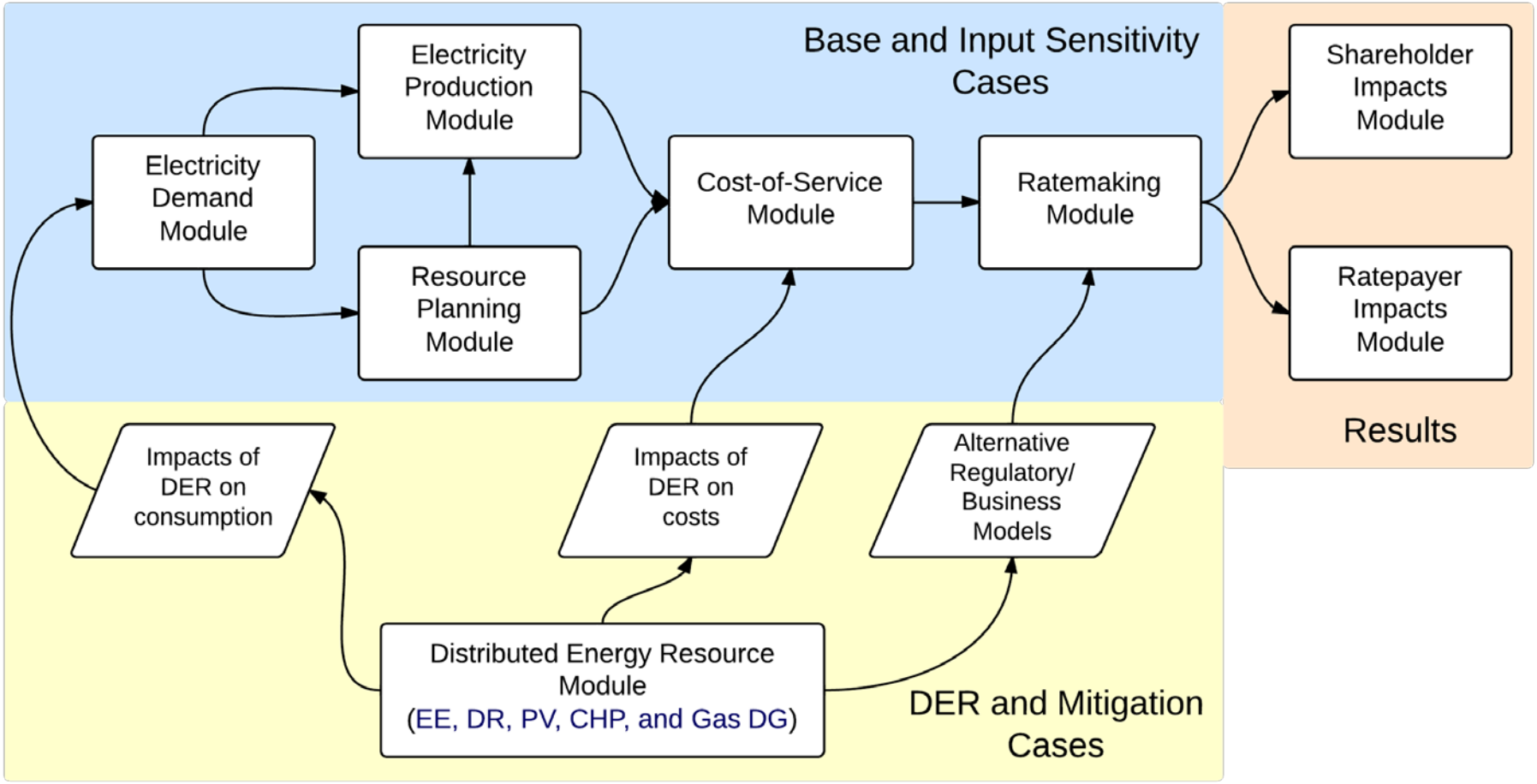
Overview of LBNL Technical Assistance on Utility Business Models and DERs

- With funding from DOE, LBNL provides technical assistance to state PUCs on utility business models **to align utility profit motivation and profit achievement with state policy goals**
  - LBNL has provided technical assistance to utility regulators in several different jurisdictions (e.g., AZ, KS, MA, IL, MO, NV)
- This effort often takes the form of **quantitative modeling** of a specific utility or amalgamation of all regulated utilities in a state and quantifying the impacts of a utility's successful achievement of aggressive energy savings goals, increasing DER penetrations, and alternative approaches to the traditional utility business model
- The outputs to the modeling effort are presented to all stakeholders in an **open forum to facilitate discussion** and explore the impacts of alternative regulatory policy options and ratemaking reforms

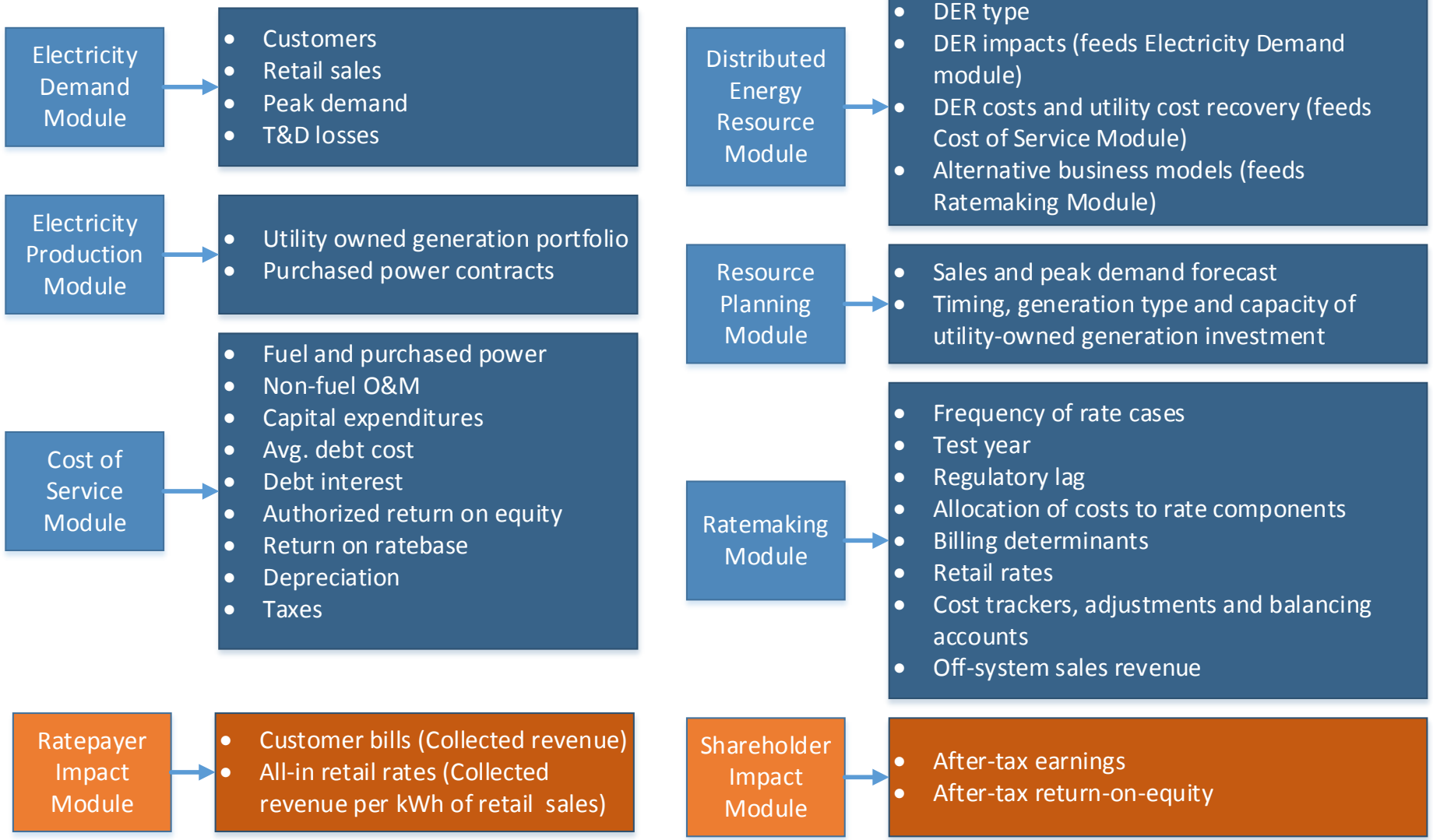
Overview and Background of the FINDER Model

- A pro-forma financial model initially developed to better understand financial implications of energy efficiency (EE) on shareholders and ratepayers
  - Created as a deliverable ("Benefits Calculator") for the National Action Plan for Energy Efficiency (NAPEE)
- With DOE OE funds, LBNL significantly enhanced capabilities and scope of model over last 8 years
- FINDER Model is capable of modeling impacts of EE and DERs on utility costs and revenues and calculating impacts at utility- and customer class-level

FINDER Model Architecture



FINDER Model Range of Inputs and Outputs



Scoping Study on Financial Impacts of Net-Metered PV

Two "prototypical" investor-owned utilities

- Southwestern vertically integrated utility
- Northeastern wires-only utility and default service provider

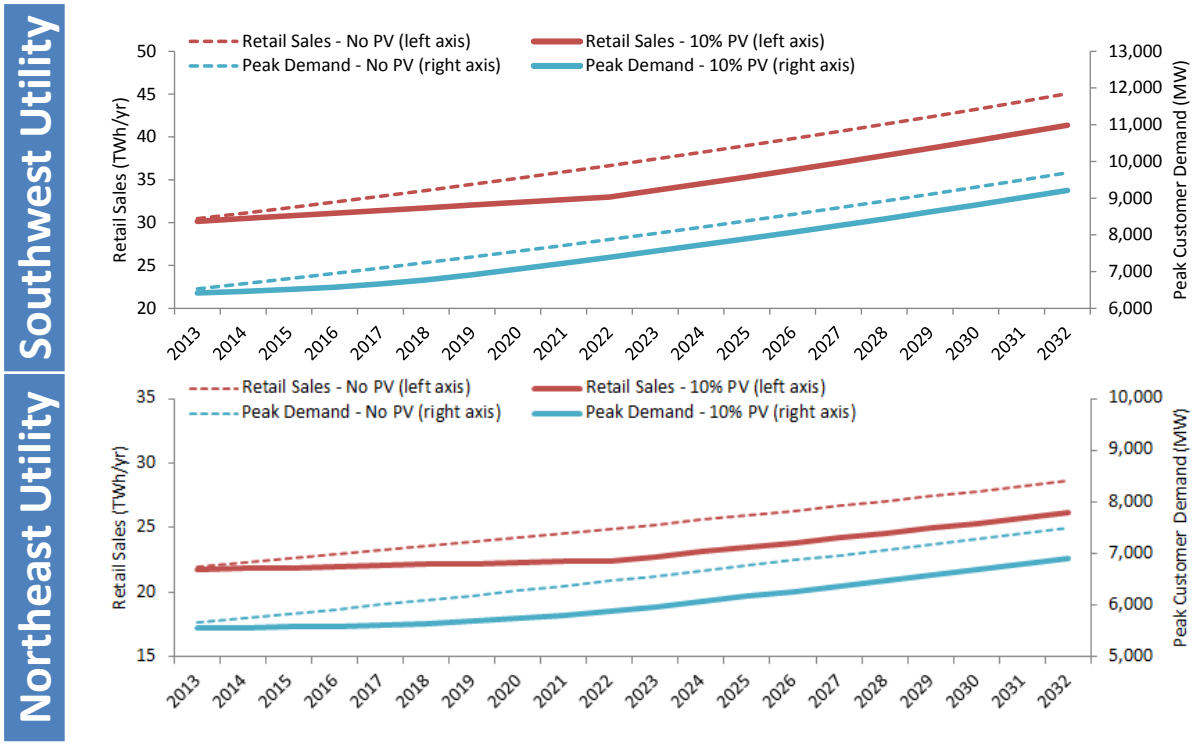
Analytical elements

- **Base case**: A reference point against which sensitivities and mitigation measures can be measured
- **Sensitivity cases**: How do the impacts of PV depend on the utility operating and regulatory environment?
- **Mitigation cases**: To what extent can the impacts of PV be mitigated through regulatory and ratemaking measures?

Dimensions of the analysis

- Customer-sited PV ramps up over 10 years, reaching 2.5% to 10% of retail sales (Sensitivity and Mitigation cases focus on 10% PV penetration)
- Utility costs and revenues modeled over 20 years to capture end-effects

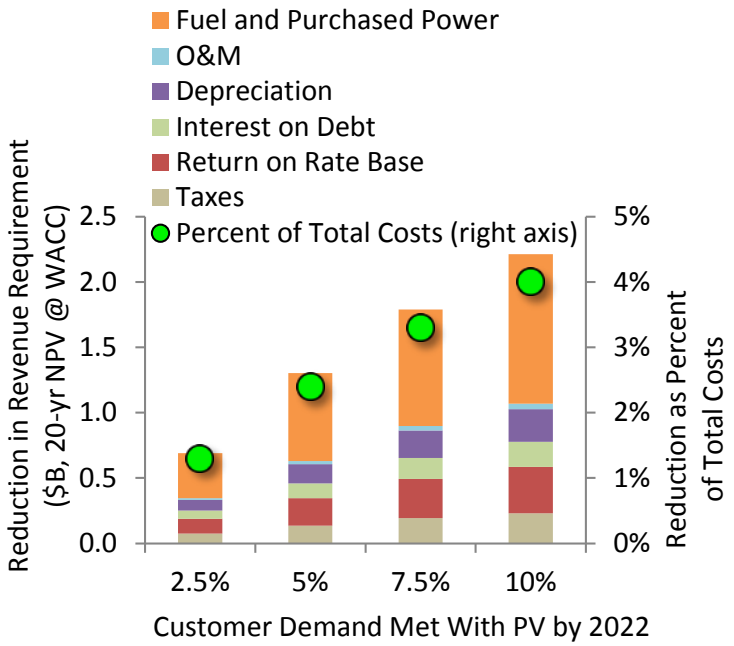
Customer-sited PV reduces utility retail sales and peak demand



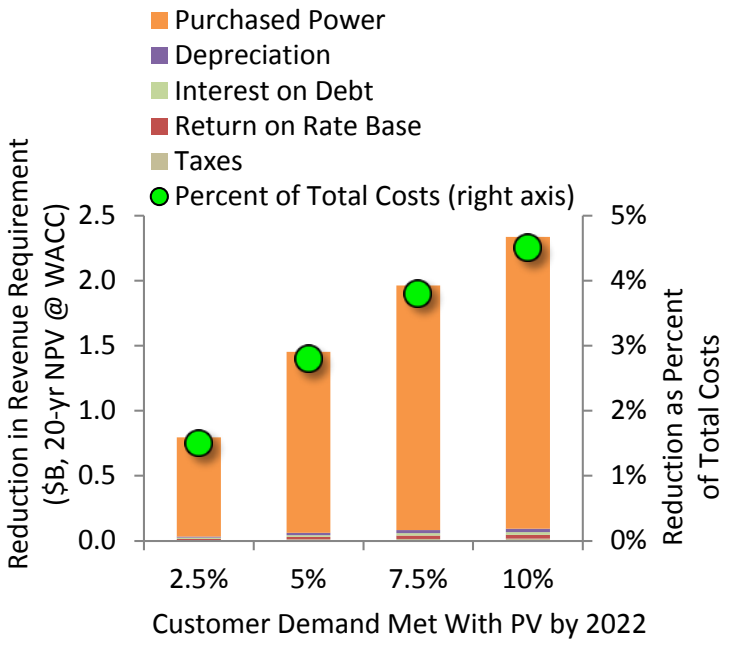
- Customer-sited PV reduces sales on a one-for-one basis, but reduces demand by less because timing of maximum PV output does not perfectly coincide with customer peak demand
- Marginal impact of PV on peak demand also declines as the timing of the net system peak shifts as PV penetration grows

Utility cost reductions from PV

Southwest Utility

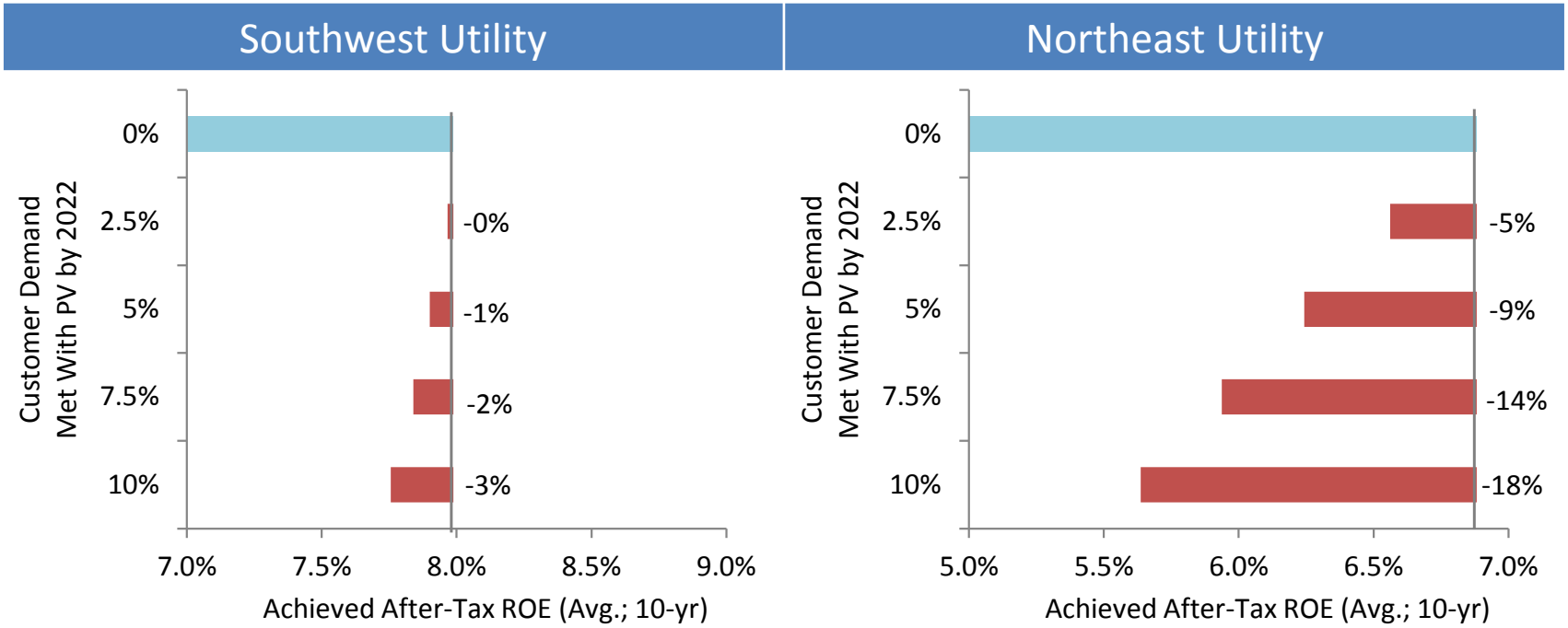


Northeast Utility



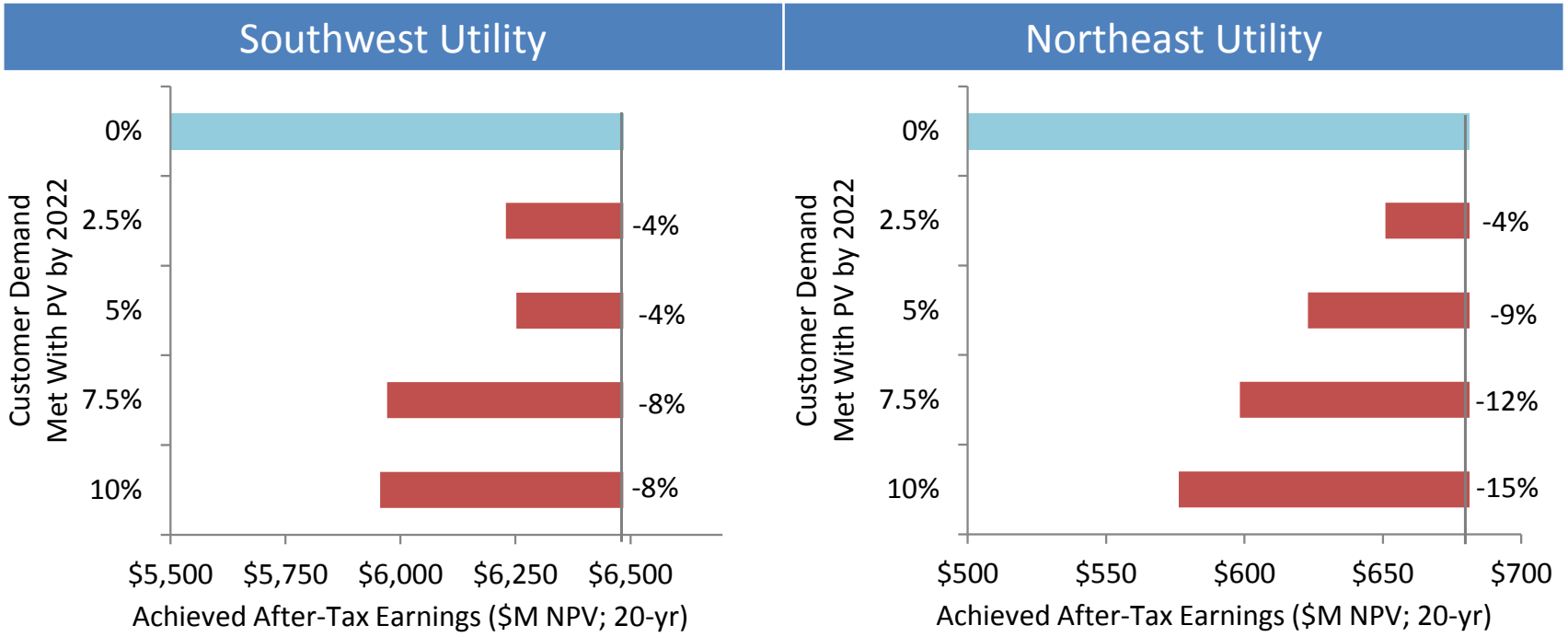
- Differences in composition of cost reductions between utilities are due to their differing cost structures: i.e., SW Utility owns generation while NE Utility procures all generation requirements via purchased power
- Assumptions related to deferral of generation and T&D investments, and to fuel and purchased power costs, are explored further in sensitivity analysis

Under base-case assumptions, PV reduces achieved ROE



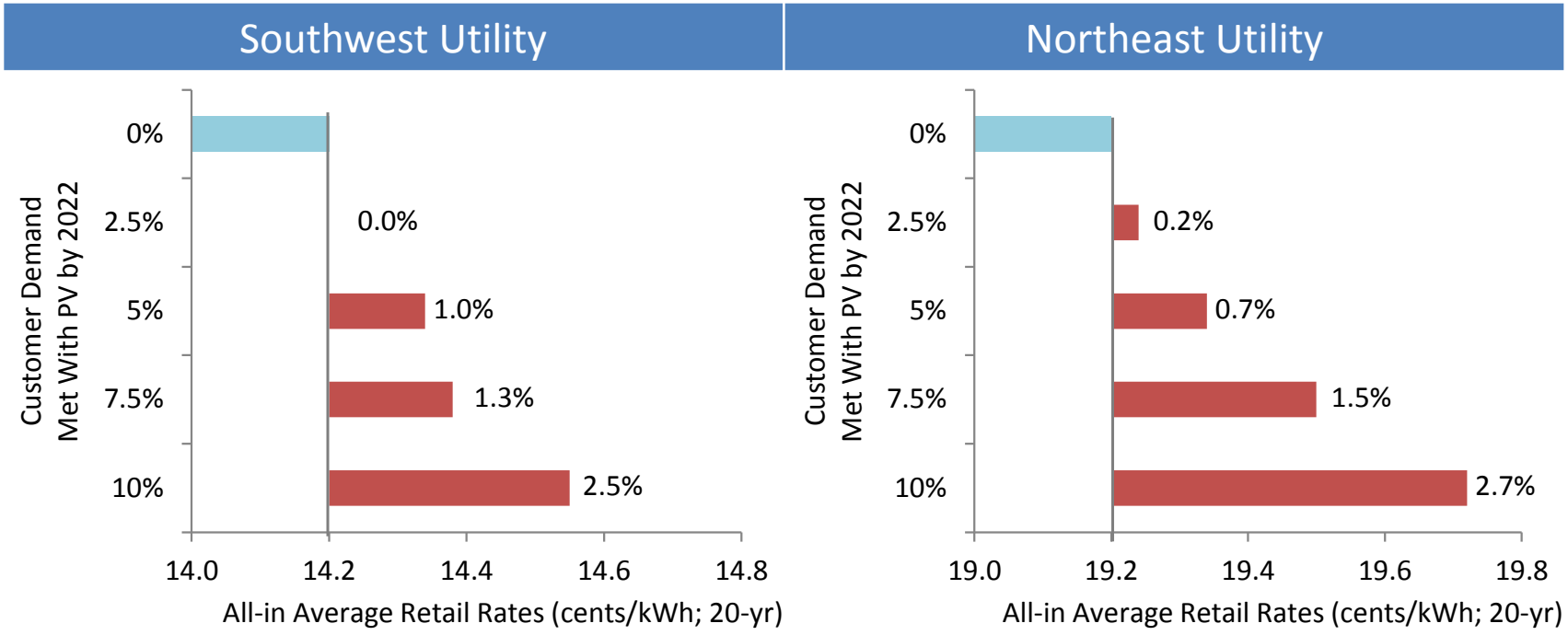
- Customer-sited PV reduces revenues by a greater amount than it reduces costs, leading to reduction in ROE ("revenue erosion effect")
- Impacts are larger for the NE utility, because of its higher assumed growth in fixed costs and its proportionally smaller rate base

Achieved earnings reduced by lost future investment opportunities



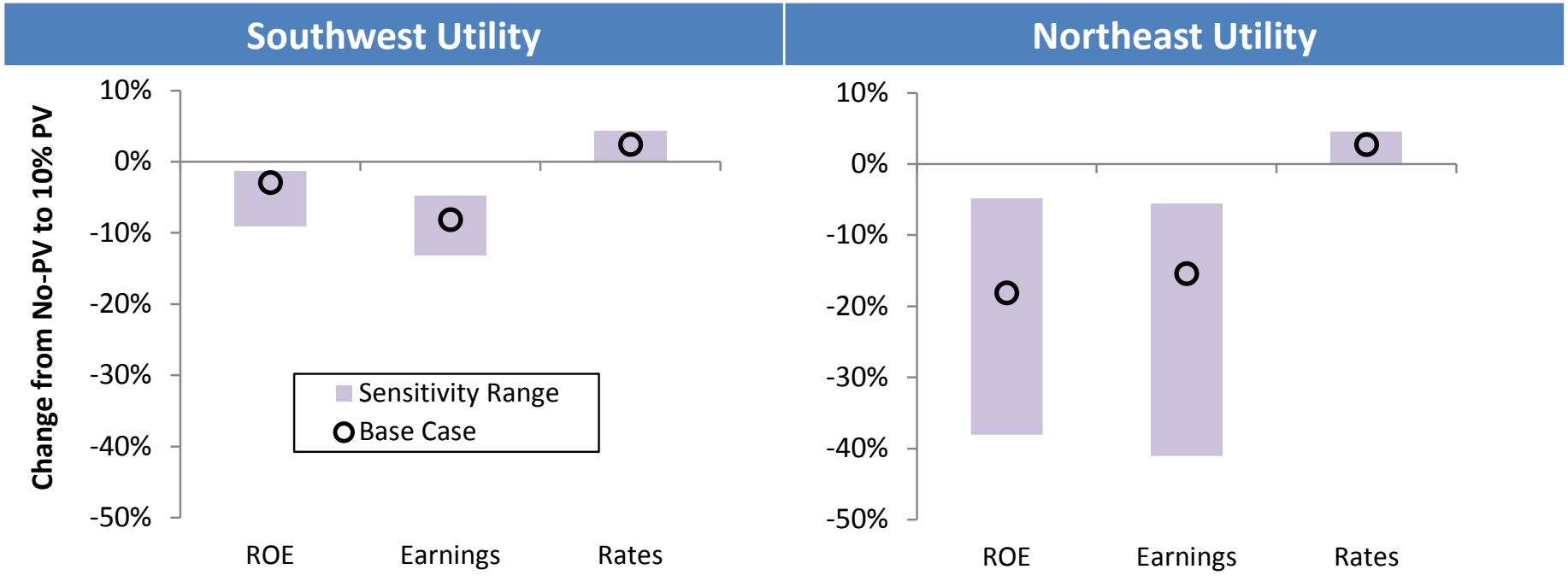
- PV reduces earnings as a result of both revenue erosion and also deferred capital investments ("lost earnings opportunity effect")
- Earnings impacts from deferred capital investments are most relevant to the SW Utility, which owns generation and transmission, though both utilities also experience earnings erosion from deferred distribution investments (in the base case)

Average customer rates increase slightly under base case assumptions



- Under base case assumptions, PV reduces sales and peak demand by a greater amount than it reduces costs, which causes average retail rates to increase
- Note, though, that these estimated rate impacts represent average impacts across all customers, thus do not directly measure cost shifting between PV and non-PV customers or for any individual customer class

Sensitivity analysis summary



**All sensitivity cases focus on impacts under 10% PV trajectory for illustrative purposes*

- Impacts are directionally consistent, but their magnitude varies widely
- Shareholder impacts (ROE and earnings) are particularly sensitive to utility operating and regulatory environment, especially for NE Utility
- Greatest sources of sensitivity vary by metric and utility: e.g., for NE utility, choice of test year and load growth causes large swings in shareholder impacts, but value of PV is key for ratepayer impacts

Mitigation analysis overview

Objective: Explore the efficacy and potential tradeoffs associated with regulatory and ratemaking measures for mitigating the impacts of PV

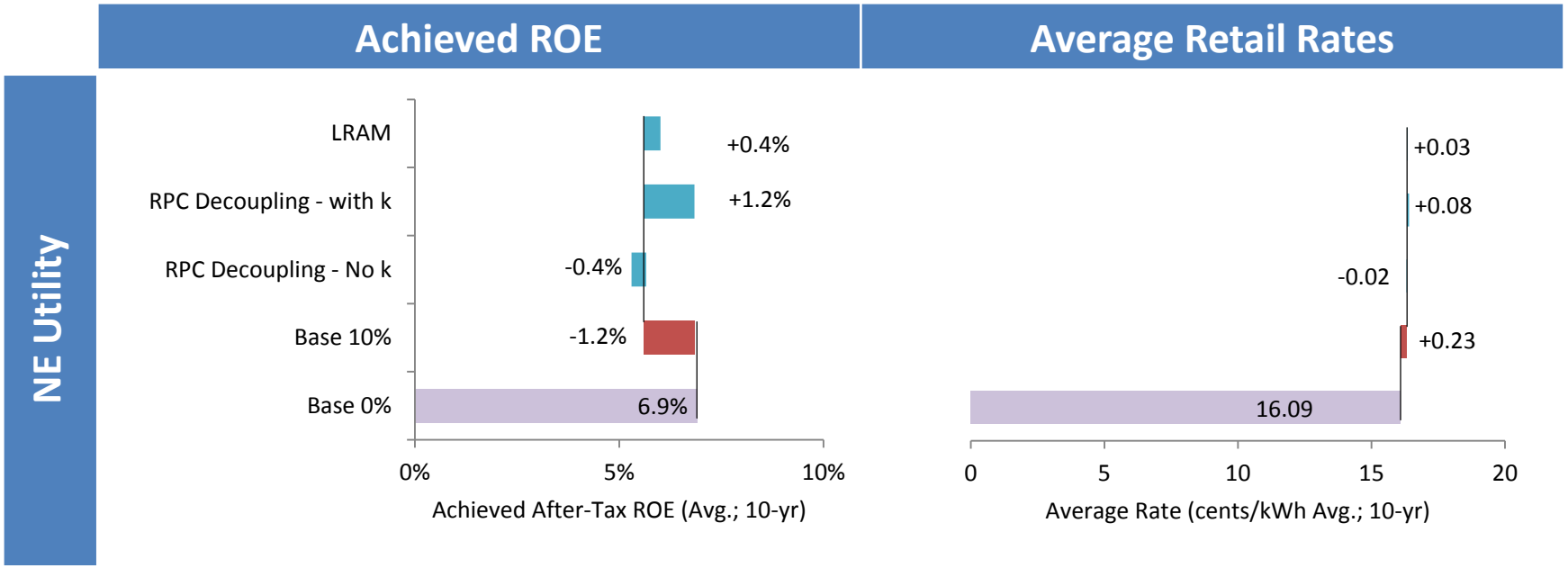
Mitigation Measure	Revenue Erosion	Lost Earnings Opportunities	Increased Rates
Revenue-per-Customer (RPC) Decoupling	●		○
Lost Revenue Adjustment Mechanism (LRAM)	●		○
Shareholder Incentive		●	○
Shorter Rate Case Filing Frequency	●		○
No Regulatory Lag	●		○
Current & Future Test Years	●		○
Increased Demand Charge & Fixed Charge	●		○
Utility Ownership of Customer-Sited PV		●	○
Customer-Sited PV Counted toward RPS			●

Example results

● Primary intended target of mitigation measure
○ May exacerbate impacts of customer-sited PV

- Mitigation scenarios borrow from measures implemented with energy efficiency programs, though are not an exhaustive set of options
- Mitigation analysis focuses on impacts under 10% PV trajectory, for illustrative purposes

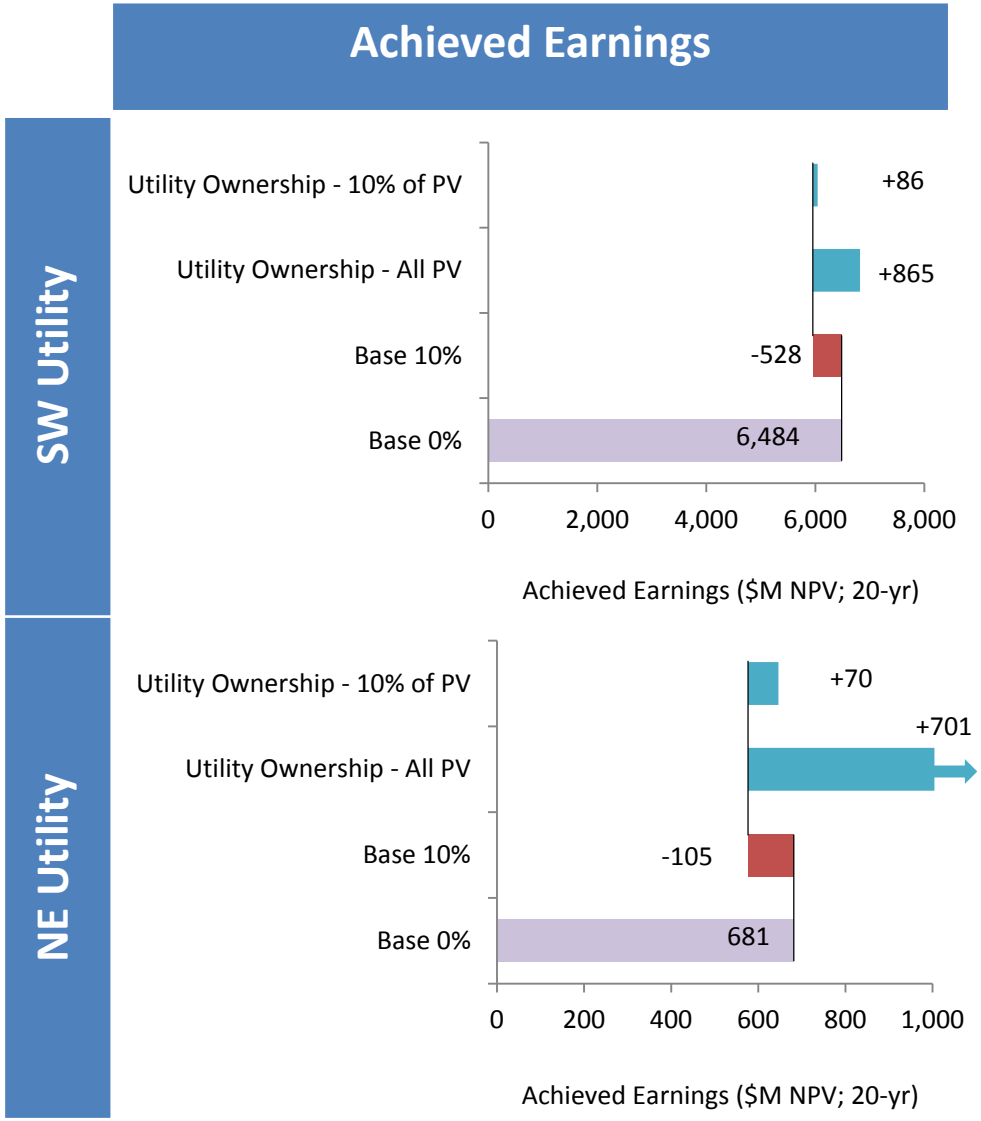
Decoupling and LRAM mitigate revenue erosion effect



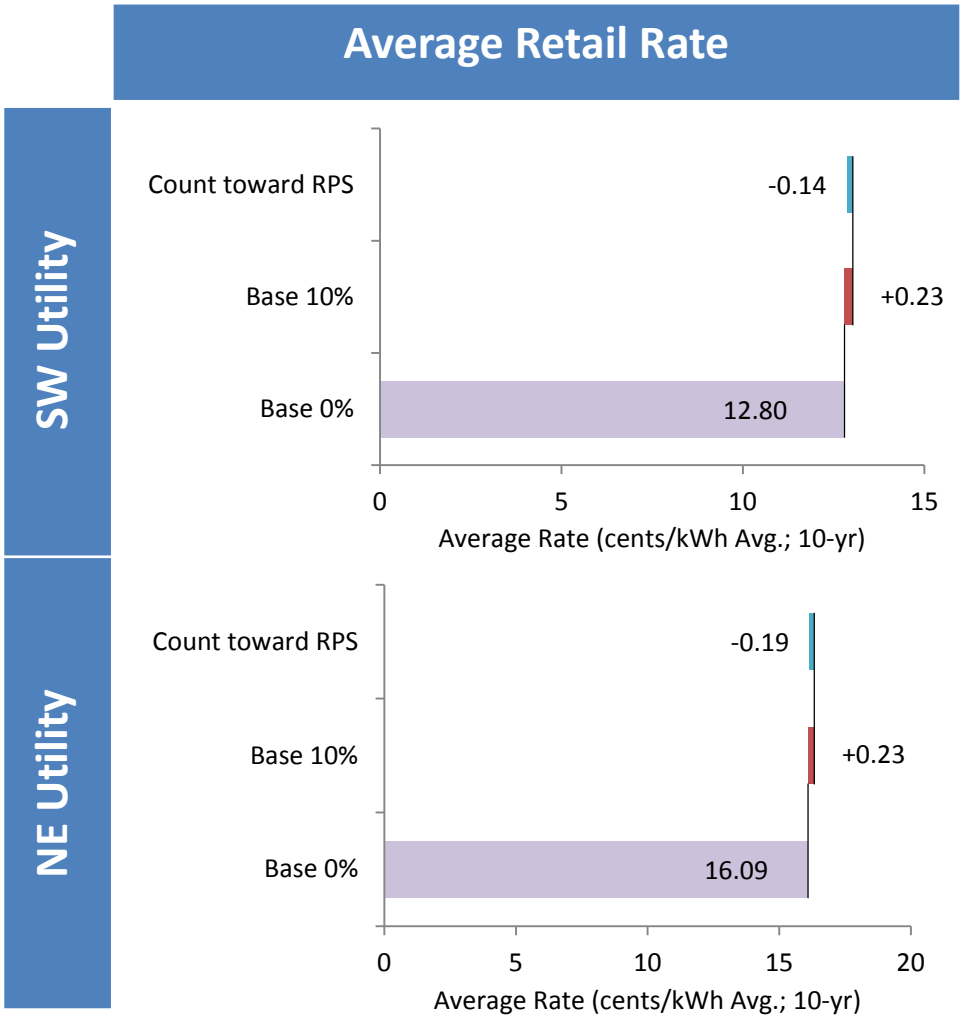
- RPC decoupling and LRAM mitigate revenue erosion impacts from customer-sited PV, thereby improving ROE, but degree of mitigation varies by utility and depends on design (e.g., k-factor)
- Mitigation of shareholder impacts in these cases necessarily entails an increase in average retail rates, illustrating one form of tradeoff

Utility ownership of PV may provide substantial earnings opportunities offsetting the impacts

- Utility ownership and capitalization of customer-sited PV provides increased earnings, offsetting most or all the financial impacts to shareholders
- NE Utility could see substantial increases in earnings by investing in customer-sited PV especially given otherwise limited opportunities for capital investment
- Utility ownership or financing of customer-sited PV may raise significant policy and/or regulatory issues around risk sharing, competition, and generation asset ownership



Counting customer-sited PV towards utility RPS compliance mitigates rate impacts



- Applying renewable energy certificates (RECs) generated by customer-sited PV to utility RPS compliance reduces a portion of RPS compliance costs and reduces average retail rates
- There is no change in shareholder impacts as RPS compliance costs are a pass-through to customers (and RECs do not offset investments in renewable generation)

Conclusions

- Even at penetration levels significantly higher than today, the impacts of customer-sited PV on average retail rates may be relatively modest (though we stress that our analysis does not isolate cost-shifting per se)
- In comparison, impacts on utility shareholders are potentially much more pronounced, though they depend highly upon the specifics of the particular utility
- Various “incremental” changes to utility business or regulatory models (as opposed to wholesale paradigm shifts) can mitigate the impacts of customer-sited PV on utility ratepayers and shareholders
- However, those measures generally entail important tradeoffs, either between ratepayers and shareholders or among competing regulatory and policy objectives

Future Research Topics and Model Enhancements

What are the combined impacts of EE and PV?

What are the participant and non-participant impacts of EE and PV, and are they different?

What is the impact of electric vehicles on utility earnings and ROE?

What is the efficacy of and implications for utility ownership of customer-sited DERs?

Questions?

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Publications:

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