

Developing a Framework for Distributed PV Net Revenue Analysis in Thailand

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Agenda

- ▶ Case Study: Concerns for Utilities and Ratepayers in the US
- ▶ Discussion: Issues related to financial impacts of DPV in Thailand
- ▶ Analysis questions covered by US analysis
- ▶ Discussion: Appropriate analysis questions for Thailand
- ▶ Data and Proposed Framework for DPV Revenue Analysis in Thailand
- ▶ Discussion: Data and Scenario Construction
- ▶ Conclusions: Roles, policy implications, dissemination strategies

Concerns for Utilities about Net Metering for PV

- ▶ Utility concerns
 - ▶ Reduction in revenue outpaces reductions in cost
 - ▶ Rates are not updated frequently enough to consider reducing sales
 - ▶ Reduced utility earnings
 - ▶ Inefficient allocation of resources

Concerns for Ratepayers about Net Metering for PV

- ▶ Ratepayer concerns
 - ▶ Solar customers not paying their “fair share” of fixed costs, cross-subsidies
 - ▶ Potential for increased electricity rates
 - ▶ Vulnerable populations
 - ▶ Equity concerns: largest consumers are paid most for solar PV
 - ▶ Concerns about changes to rate structures resulting from utility concerns

BREAKOUT: Concerns for utilities and ratepayers from DPV in Thailand

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1. Write down individual concerns on a post-it note

2. Discuss with a partner:

If there is increasing penetrations of DPV in Thailand, what would be the most important issues that you, as an individual, would want to understand and examine?

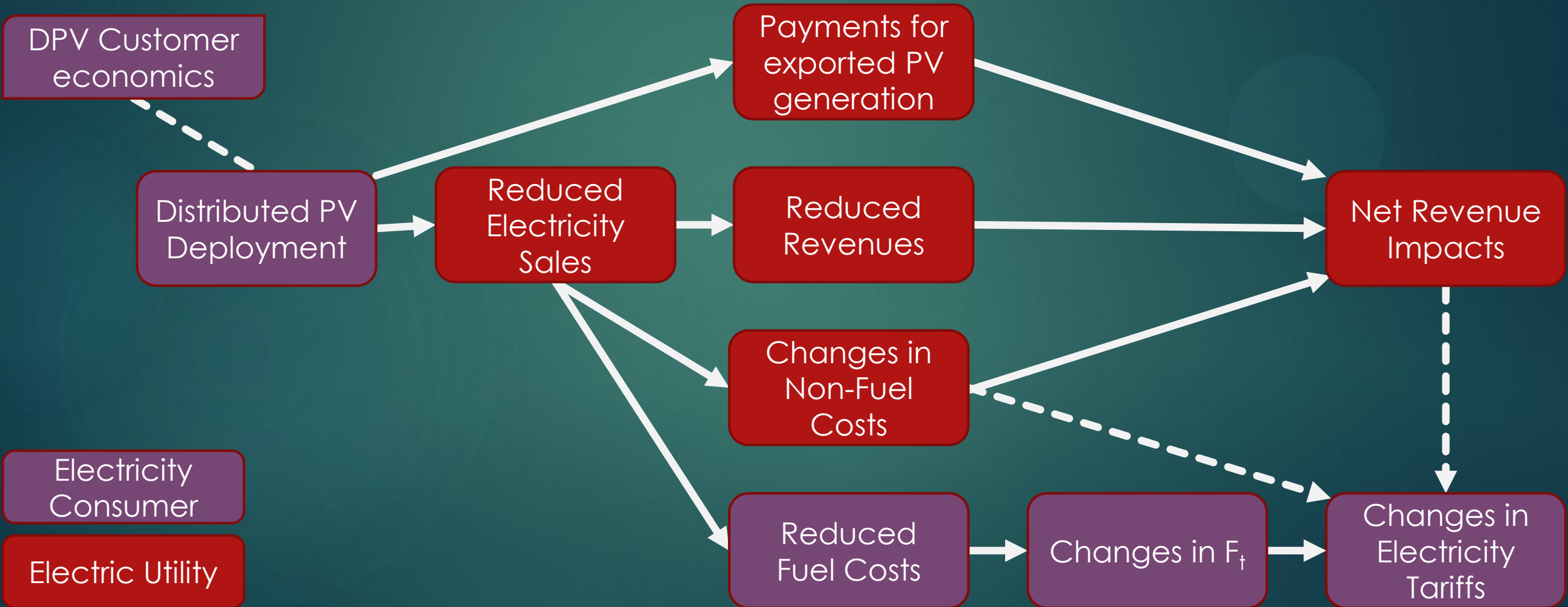
3. Discuss with breakout group

4. Moderators report to room

What are the key areas of concern to be examined?

Analysis Methodology and Walkthrough

Framework to Analyze Financial Impacts of DPV in Thailand



Customer Economics of DPV in Thailand

DPV Customer economics

- ▶ Given PV compensation mechanism and retail rates, what is the payback time and internal rate of return for various customer types?
 - ▶ Depends on load profiles, PV generation profiles, PV system size, and tariff types
 - ▶ Analyses conducted by Tongsopit et al. using NREL's System Advisor Model
- ▶ Key metrics:
 - ▶ Payback time
 - ▶ Internal rate of return (IRR)
 - ▶ Average solar self-consumption rate
- ▶ Results will help us build realistic scenarios
 - ▶ Which customer groups are most likely to install solar?
 - ▶ How large are PV systems likely to be for customers to minimize payback time?
 - ▶ How realistic are proposed solar targets given results found here?

Electricity Consumer

Electric Utility

DPV Deployment Trends

DPV Customer
economics

Distributed PV
Deployment

- ▶ How is solar being deployed?
 - ▶ WHO: What types of customers are deployment solar? What tariffs are they under?
 - ▶ HOW: What compensation schemes do they have? How large are their systems?
 - ▶ WHERE: What are the locations of the PV systems?

Electricity
Consumer

Electric Utility

Revenue Loss is a Combination of Sales Reductions and Payments

DPV Customer economics

Distributed PV Deployment

Reduced Electricity Sales

Payments for exported PV generation

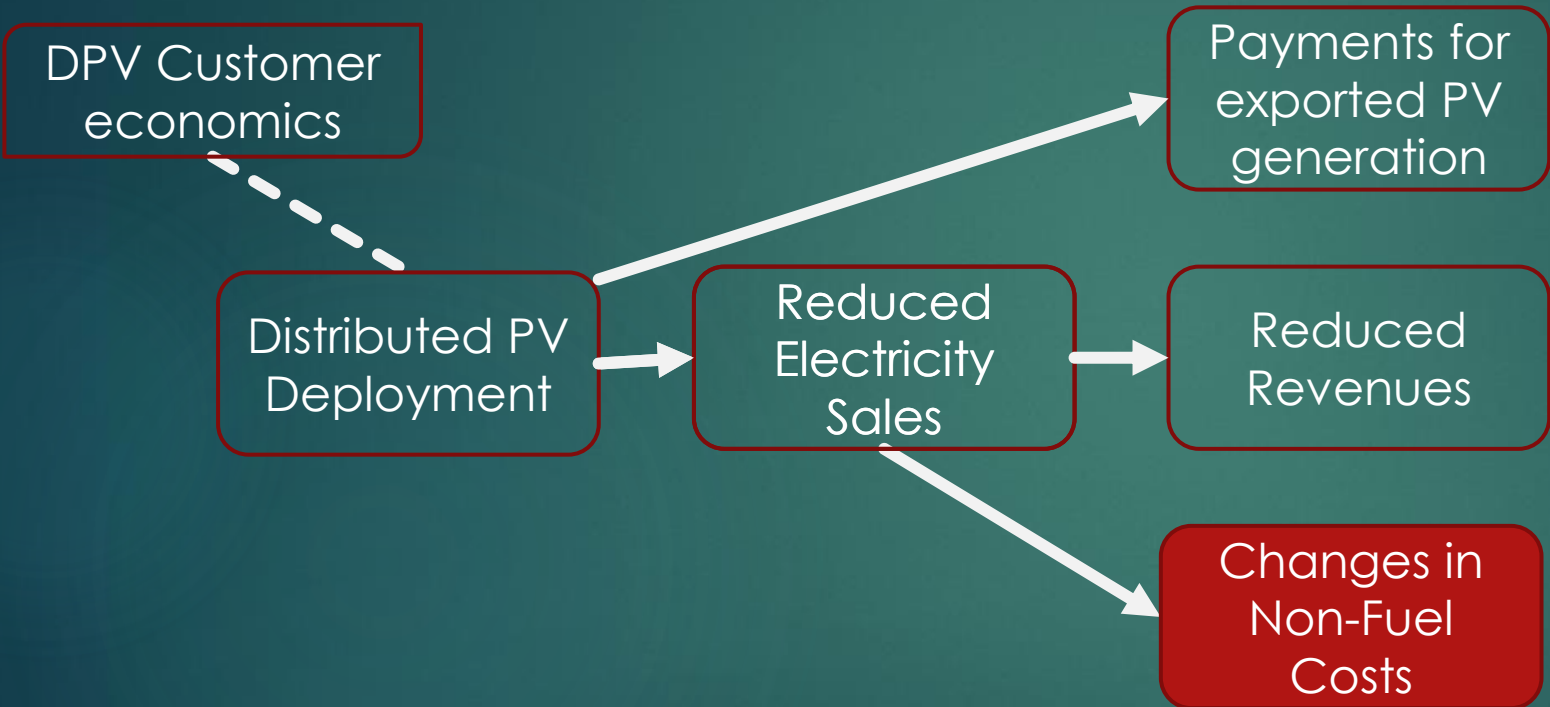
Reduced Revenues

Electricity Consumer

Electric Utility

- ▶ How much PV generation is self-consumed versus exported by customers?
- ▶ For self-consumed electricity, what tariff is being avoided?
- ▶ For exported electricity, what rate is it being compensated at?
- ▶ What is the total reduction in revenue from reduced sales?
- ▶ Is the re-sale of exported DPV electricity profitable or a loss?

What are the Other Changes in Non-Fuel Costs?

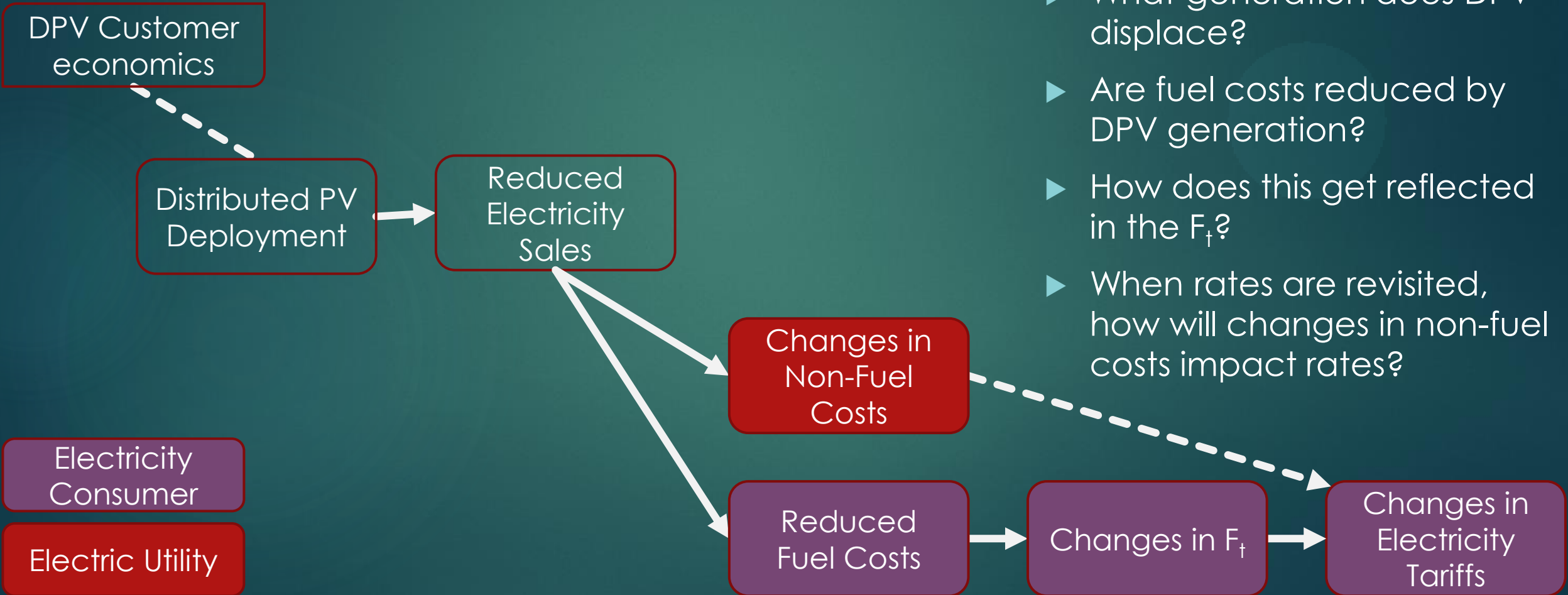


Electricity Consumer

Electric Utility

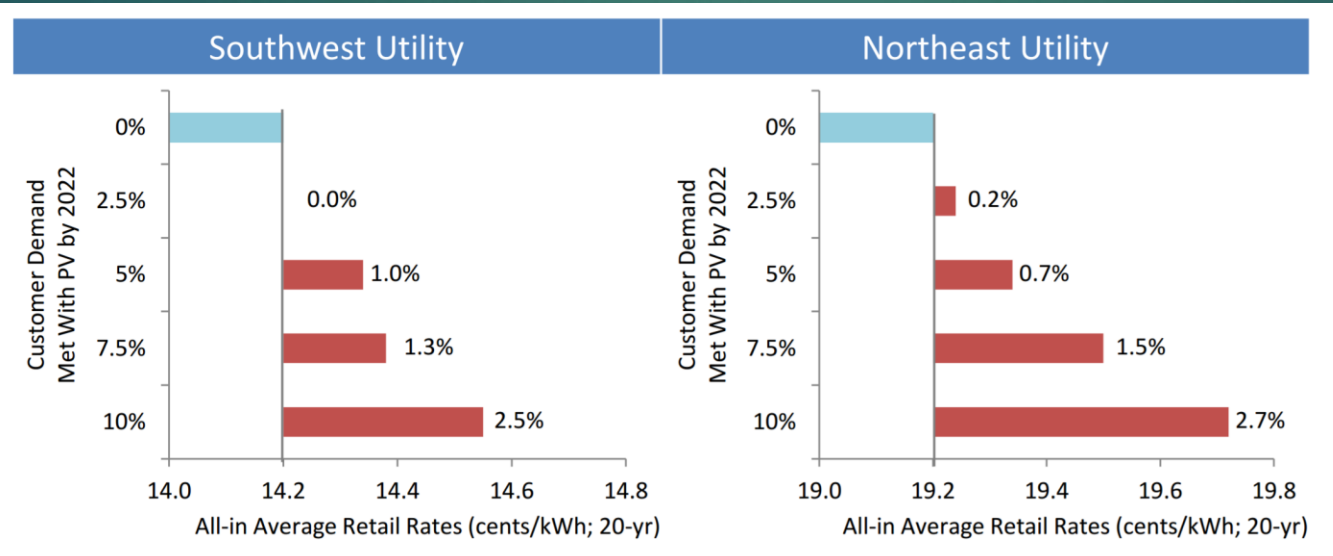
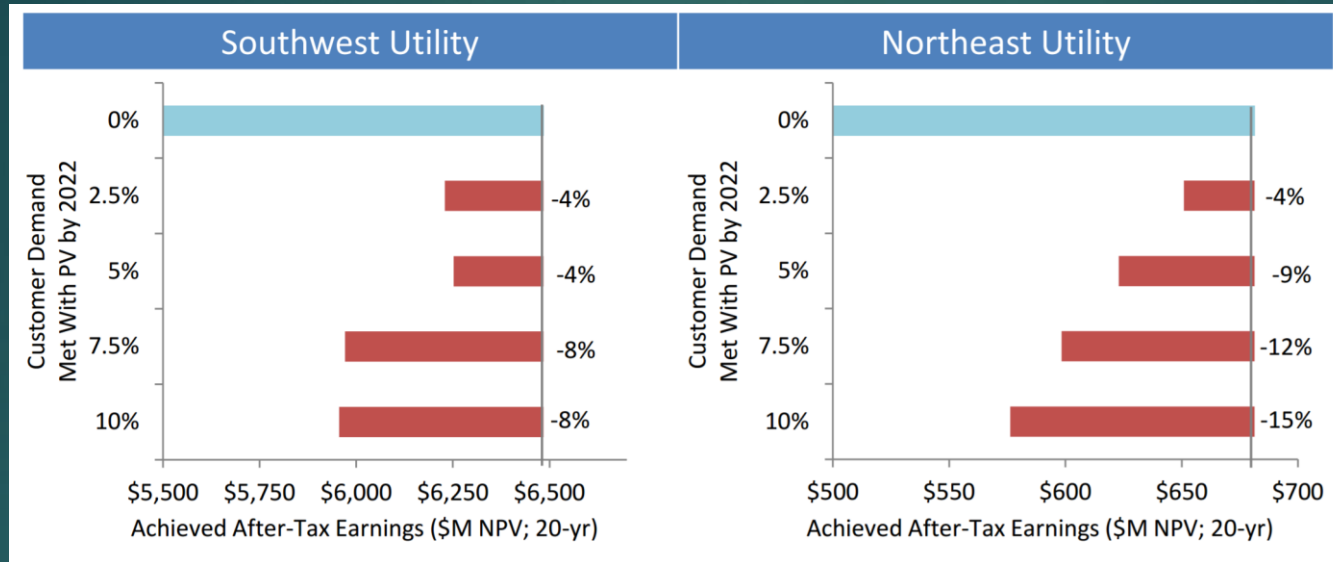
- ▶ **EXAMPLES:**
 - ▶ Variable: Administration; Line Loss Reductions;
 - ▶ Fixed: T&D capacity (+/-)
- ▶ **KEY QUESTION:**
 - ▶ How do costs not related to fuel usage change?
 - ▶ Do they change by customer type or location?

How do Changes in Costs Affect Electricity Tariffs?



- ▶ What generation does DPV displace?
- ▶ Are fuel costs reduced by DPV generation?
- ▶ How does this get reflected in the F_t ?
- ▶ When rates are revisited, how will changes in non-fuel costs impact rates?

Sample outputs



(Satchwell et al. 2014)

Questions or reactions to methodology?

What other financial questions can be evaluated?

BREAKOUT #2:

Scenario Construction

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► What scenarios are most important to consider?

Input	Example
PV Deployment	1%, 5%, 10% PV penetration (by energy or # of customers), OR 10, 50, 100 MW capacity
PV generation self-consumed vs. exported	100% self-consumed, 0% exported, OR 50% self-consumed, 50% exported
Compensation Scheme	Net billing vs. net metering
Compensation level	If net metering, full retail rate If net billing, export rate = 0,1,2,3 baht/kWh
Customer Types (by tariff)	25% Residential, 25% Small General Service, 25% Medium General Service, 25% Large General Service
Geographic Distribution	75% MEA, 25% PEA, OR Distribution by region
Other	Future regulatory paradigms

Data: Customer Load and PV Generation Profiles

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- ▶ MEA and PEA load data
 - ▶ 15 min resolution
 - ▶ by day type by month
 - ▶ By tariff class (residential <150 kWh, >150 kWh, TOU rate, General Service, etc.)
- ▶ Detailed tariff data for MEA and PEA
 - ▶ By tariff class
- ▶ PV Generation Profiles
 - ▶ By location, panel orientation

POTENTIAL DATA NEEDS

Conclusions

- ▶ Wrap up discussion
- ▶ Summary of next steps
- ▶ Dissemination and public tool?
- ▶ Follow-up workshop?