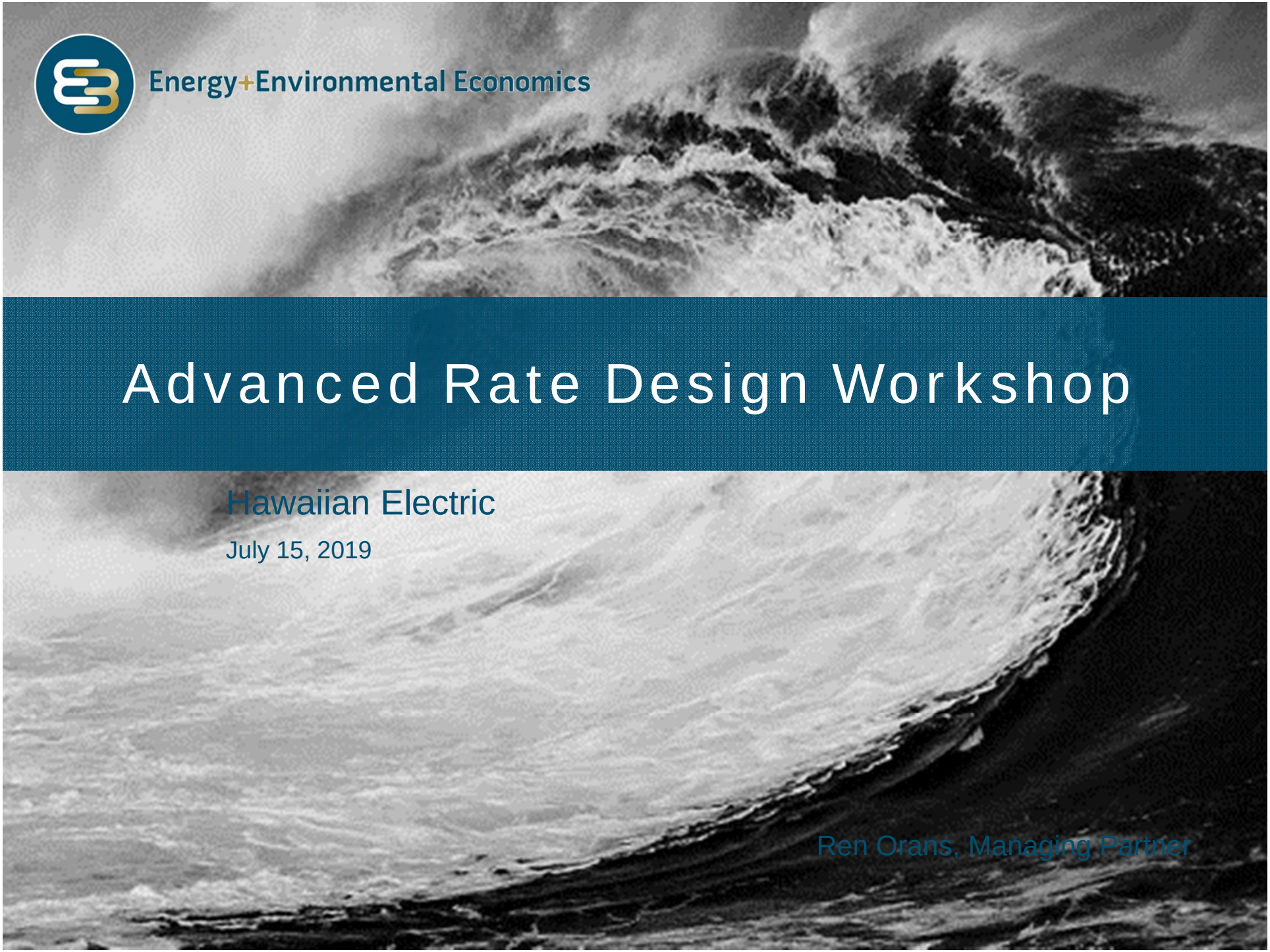

Energy+Environmental Economics
Advanced Rate Design Workshop
Hawaiian Electric
July 15, 2019
Ren Orans, Managing Partner

Introduction

Dr. Ren Orans founded E3 in 1989, a consulting firm with approximately 70 staff based in San Francisco. An economist and engineer, he has focused throughout his career facing the electricity industry.

Ren is a longtime advisor to policy makers and executives in every corner of the electricity arena: regulators, utilities, system operators, independent power producers, environmental groups, and investors.

Ren has been actively working in Hawaii for more than 20 years.

Education:

PhD, Civil Engineering, Stanford University
BA, Economics, University of California, Berkeley

Ren Orans, PhD

Managing Partner

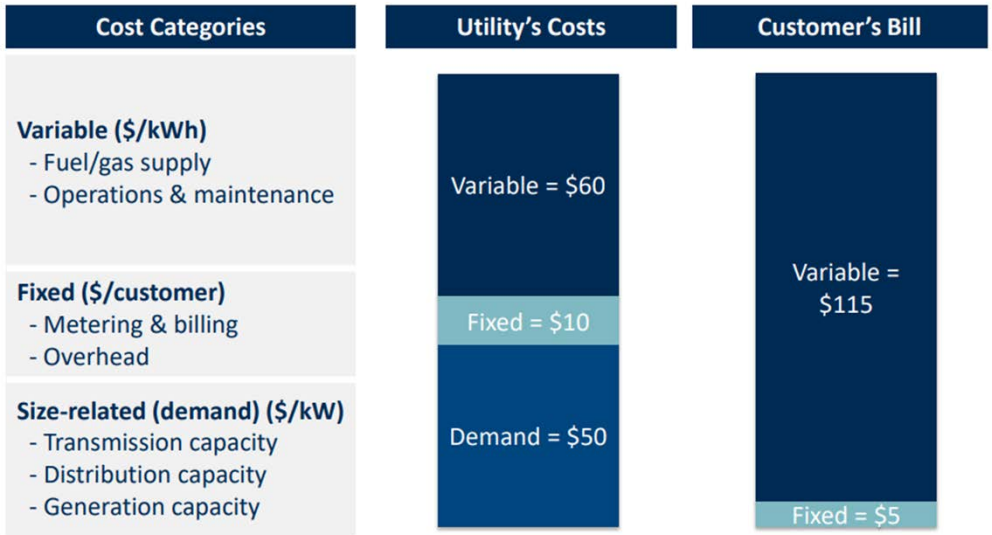
Energy+Environmental Economics

Outline

- **Recap of Presentations**
  - Ahmad Faruqui, Brattle
  - Jim Lazar, RAP
  - Travis Kavulla, R Street
  - Chris Yunker, Hawaii DBEDT
  - Jennifer Davidson, SMUD
  - Cyndee Fang, SDG&E
- **Summary and Key Takeaways**

Ahmad Faruqui, Brattle

- **Smart appliances, sensors/communications, and DERs and changing the way customers interact with utilities**
- **The existing paradigm of small fixed charges and flat energy charges is not suitable to this and needs to be updated**
- **Rate designs should mirror the utility's cost of generating and delivering electricity**
  - Fixed: $/customer
  - Demand: $/kW
  - Variable $/kWh with TOU
- **Benefits of a 3-part advanced rate design**
  - More customer control
  - Minimization of cross-subsidies
  - Reduced long-run costs due to more efficient investments/behavior/peak reduction



- **Customer considerations should be taken into account to balance other objectives – should roll out gradually with pilots**
- **Many utilities are moving in this direction and adopting TOU, demand charges, and DER-specific rates**

Jim Lazar, RAP

+ Key rate design principles

- A customer should be allowed to connect to the grid for no more than the cost of connecting to the grid
- Customers should pay for power supply and grid services in proportion to how much they use, and when they use it
- Customers delivering power to the grid should receive full and fair value – no more and no less

+ Other industries have significant fixed costs but recover costs primarily through variable charges

+ Recommendations

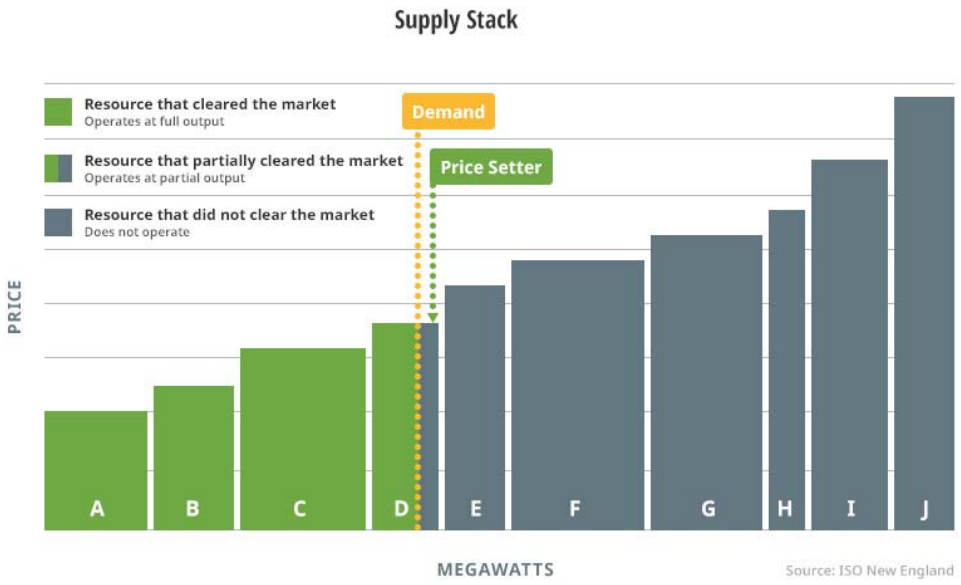
- Divide residential class between single-family and multi-family
- Move toward residential TOU rates
- Limit non-residential demand-charge to site infrastructure only and use TOU principles to recover grid coincident peak costs

Impact of 0 kWh Solar Customer with TOU NEM

Rate Element	Amount	Unit	Period	Usage kWh	PV kWh	Net kWh	Billed Amount
Customer	$ 11.50	Month		1			$ 11.50
Off-Peak	$ 0.153	kWh	9 AM - 5 PM	195.3	477	(281.70)	$ (43.10)
Mid-Peak	$ 0.345	kWh	All Other	198.6	42	156.60	$ 54.03
On-Peak	$ 0.436	kWh	5-10 PM	140.1	15	125.10	$ 54.54
				534	534	0.00	$ 76.97

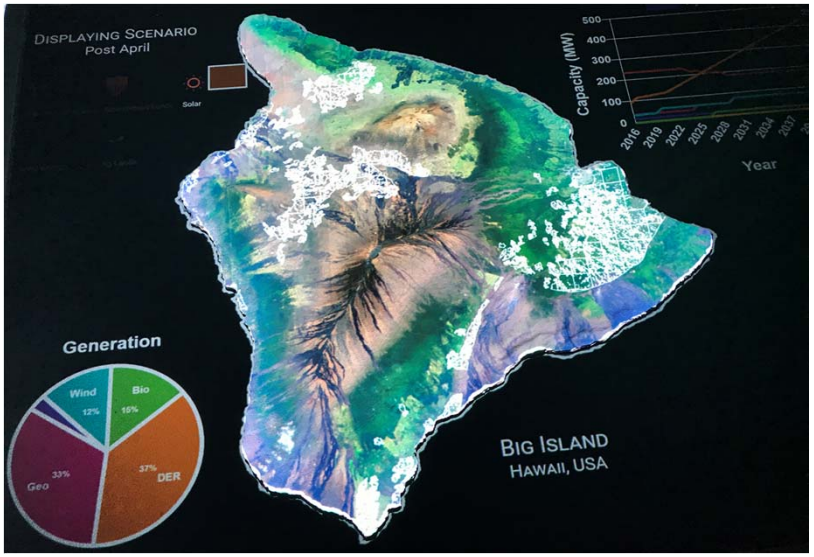
Travis Kavulla, R Street

- **Rate design should align individual incentives with utility/societal costs**
- **Utility variable costs are decreasing and fixed costs are increasing as Hawaii moves toward 100% renewable**
- **Hawaii can create a cost-based market to determine locational marginal price of grid-delivered energy**
  - Customers buy a baseline quantity of energy and then can use more or less by paying/being credited at the marginal cost
  - Will required adaptation in a 100% renewable system with "no" variable costs
- **Regulatory flexibility is key – don't be overly prescriptive and allow special rates to match a customer's peculiar situation**



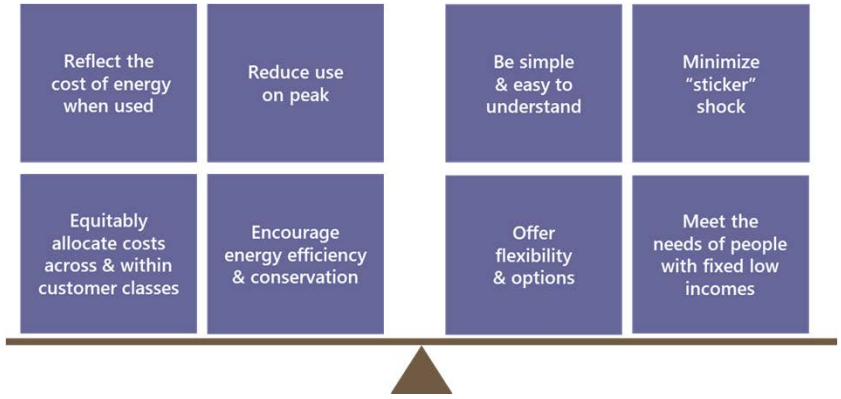
Chris Yunker, Hawaii HSEO

- **DER will play a significant role in Hawaii's renewable energy future due to land constraints**
- **Rates will play a significant role in the customer decision to adopt DER**
- **Rates should not incentivize customers to defect from the grid which would result in a utility "death spiral"**
- **Each island is unique – should rate offerings reflect these differences?**



Jennifer Davidson, SMUD

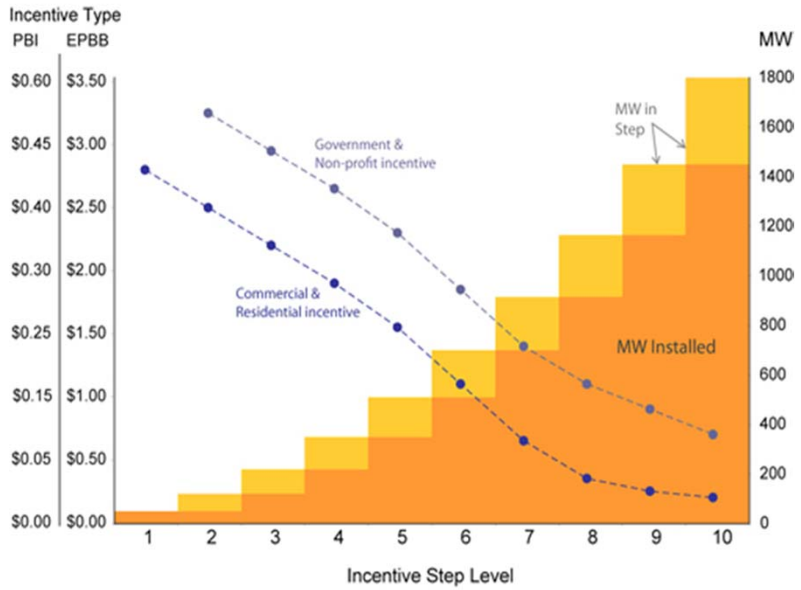
- **Establish rate design principles that must be balanced when setting rates**
- **Urgent need for rate structures to evolve due to widening gap between cost causation and revenue collection**
- **SMUD experience:**
  - Increase fixed charge: $7/mo → $20/mo
  - Changed tiered rates to time-of-day rates
  - Overhaul of low-income rates to provide benefits to those most in need
  - SmartPricing pilot: 95% of customers satisfied



Cyndee Fang, SDG&E

- Hourly dynamic rate can create many opportunities for low-cost hours
- Misalignment between circuit peaks and system peaks must be considered
- There is no “average” customer: must design rates to treat all customers fairly
- Solar customers are unique and most have significantly higher peak demand than non-solar customers
- Rate design must balance competing objectives/principles
- Sustainable policy subsidy is direct and transparent and declines as policy objectives are achieved

CSI Incentives Declined as the Program Progressed

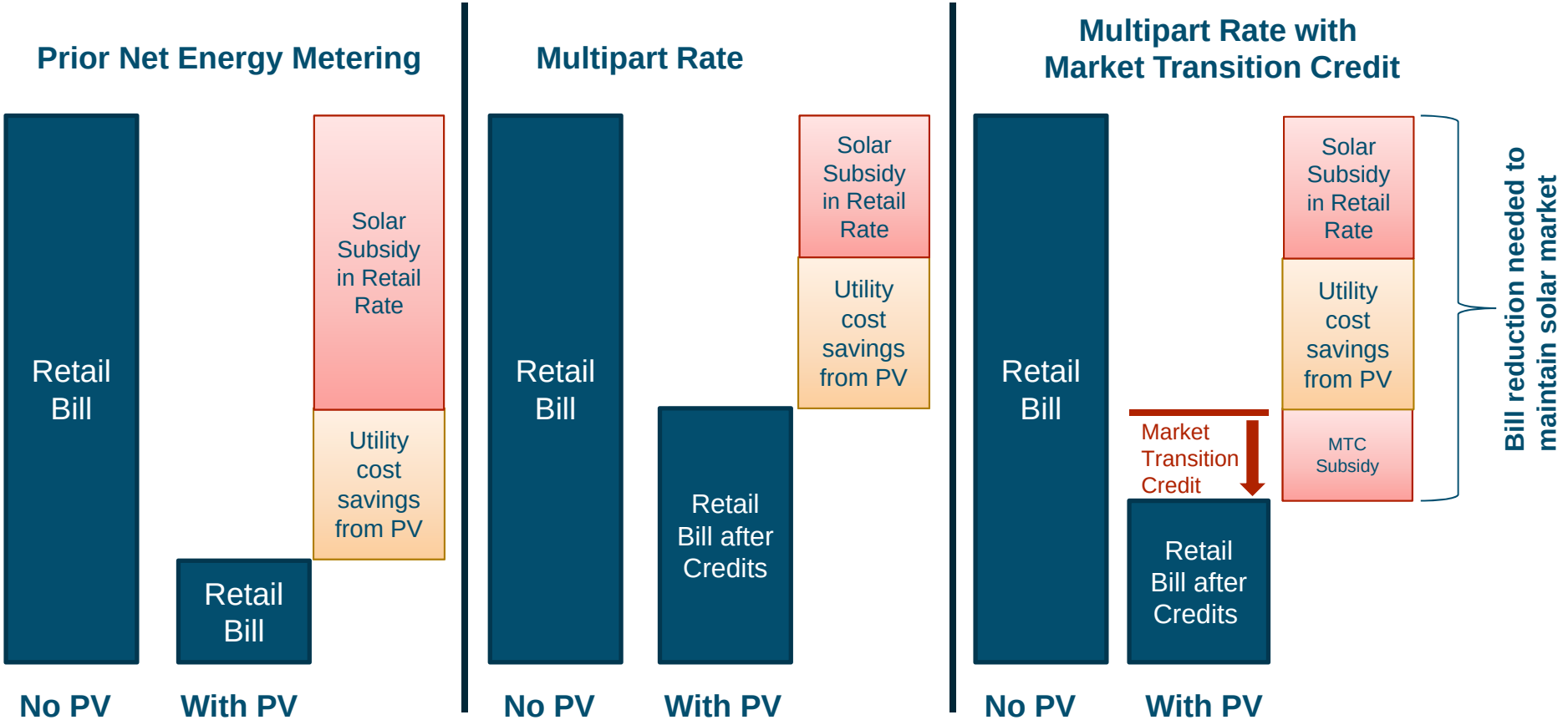


PBI: Performance Based Incentive, paid over 5 years, in $ / kWh
EPBB: Expected Performance Based Buydown, paid upfront, in $ / W

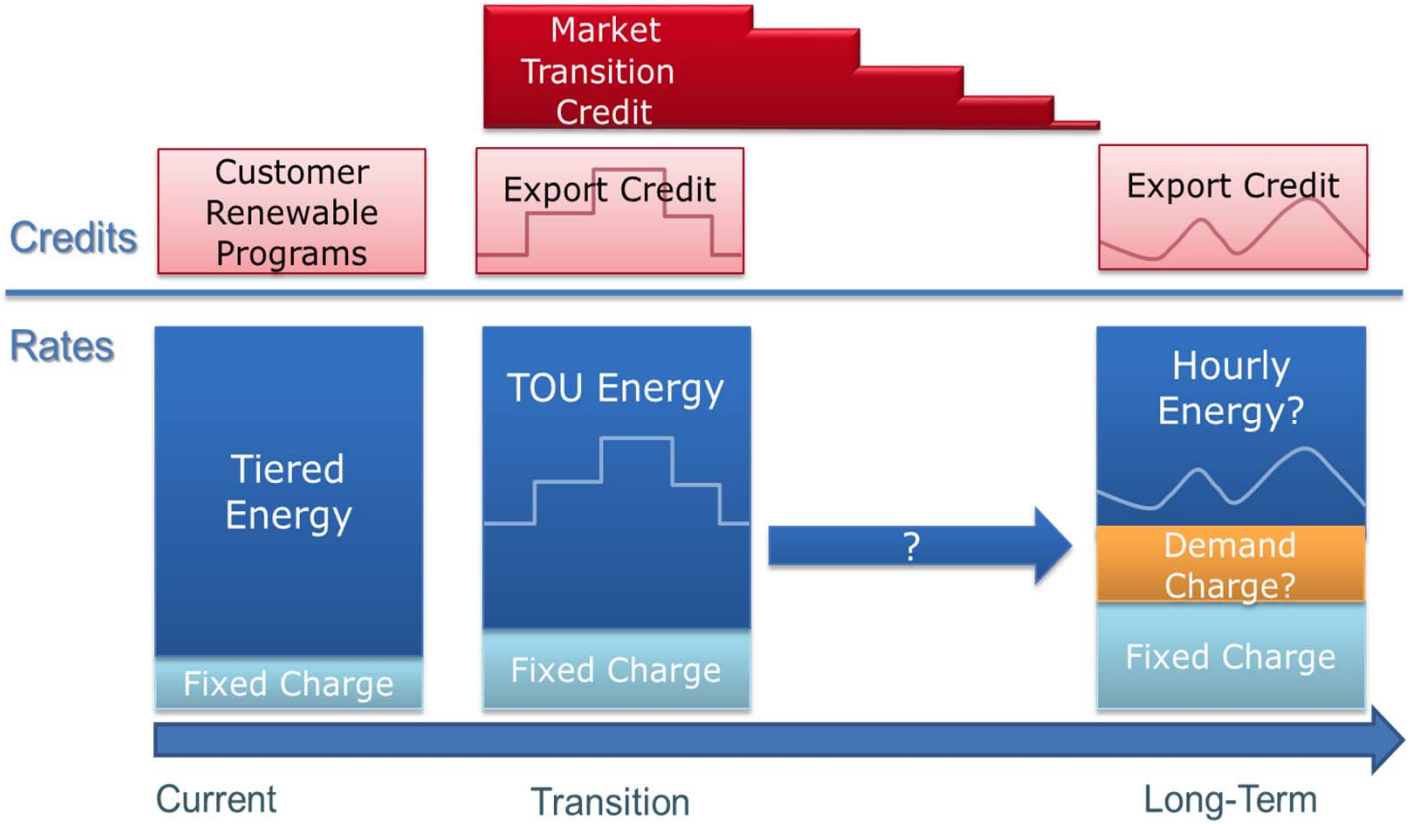
Summary and Key Takeaways

- **Long-term advanced rate design answer is clear:**
  - Dr. Faruqui described the efficient, fair design of a 3 part rate structure
- **Key question is how does HECO get to a multipart efficient rate design and encourage the right amount of DER with a healthy grid.**
  - Jim Lazar is right that utility costs must be collected in a way that is stable, understandable, and acceptable to customers and in alignment with cost causation
  - Jennifer Davidson says to balance the design objectives, you have to have a roadmap that gradually phases into the higher fixed charges.
  - Travis Kavulla tells us to be flexible and continually adjust incentives to achieve your targets
  - Chris Yunker highlights the important role of DER in meeting Hawaii's renewable energy goals due to land constraints which rate design will play a key role in achieving
  - Cyndee Fang has a very interesting idea that really fits what HECO is trying to do with DER, which is to adjust the incentive over time to generate the amount needed and that fits with the overall system plan

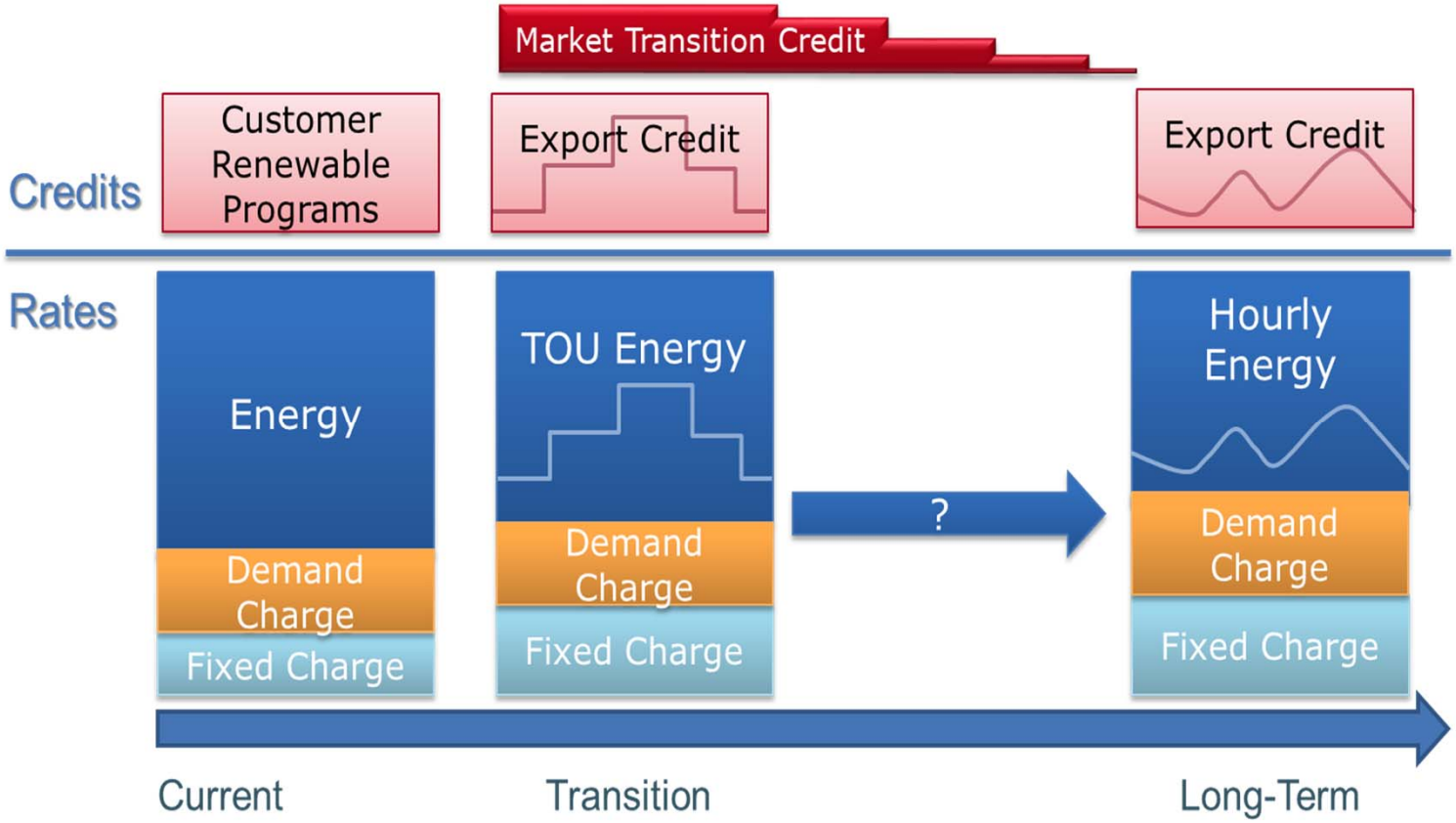
Flexible Incentive for DGPV



Residential and Small Commercial Transition Structures



Medium and Large Commercial Transition Structure



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Thank You

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