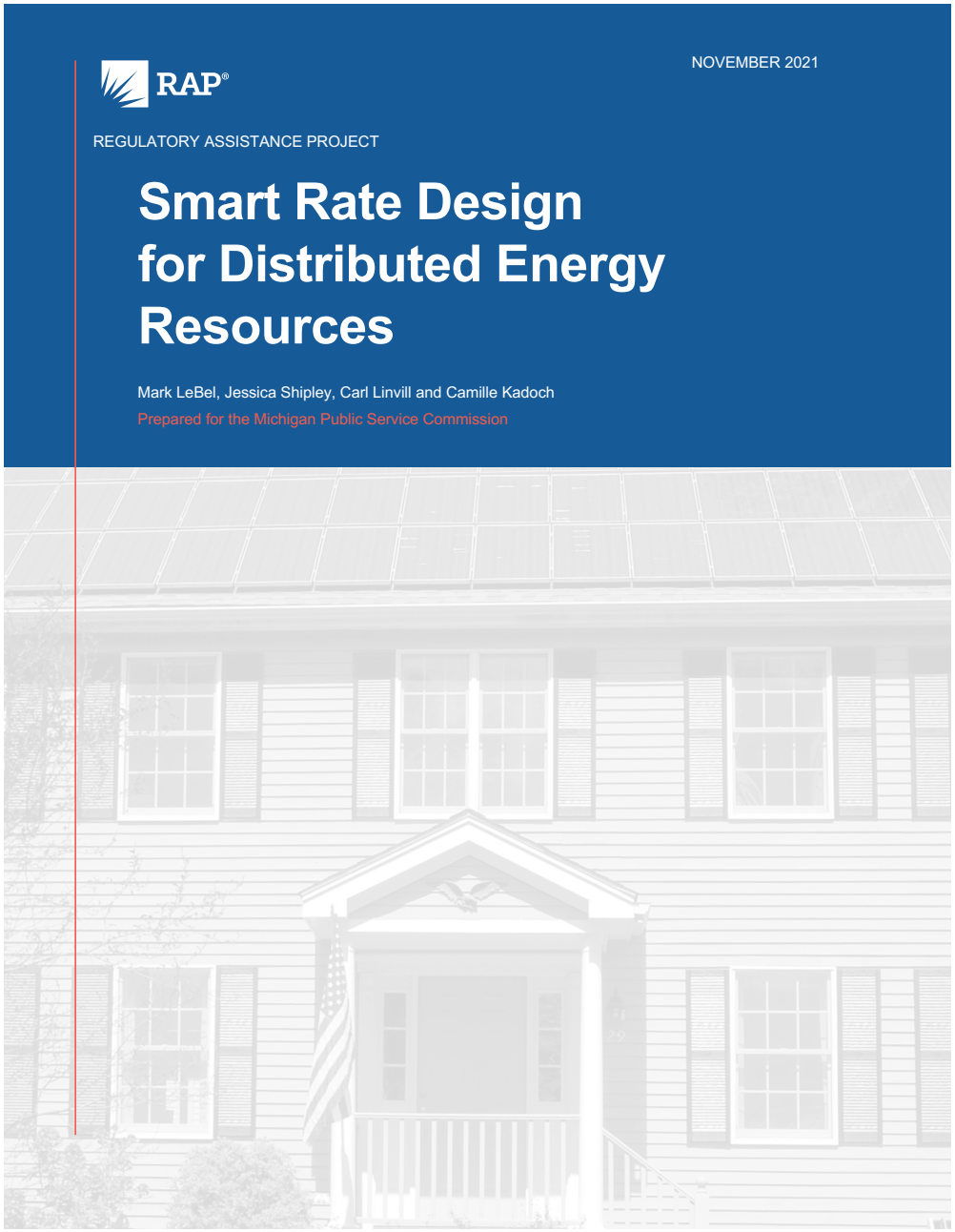
December 6, 2021

Smart Rate Design for Distributed Energy Resources

Presentation to NARUC Staff Subcommittee on Rate Design

Regulatory Assistance Project®

Mark LeBel
Associate
+802 498 0732
mlebel@raponline.org



https://www.raponline.org/knowledge-center/smart-rate-design-distributed-energy-resources-2/

Michigan PSC Order and Process

"[A] thorough exploration of how customer-owned generation and energy storage are changing the way energy customers use the grid, cost allocation, and pros and cons of various rate design options, and may include recommendations for the Commission's consideration."

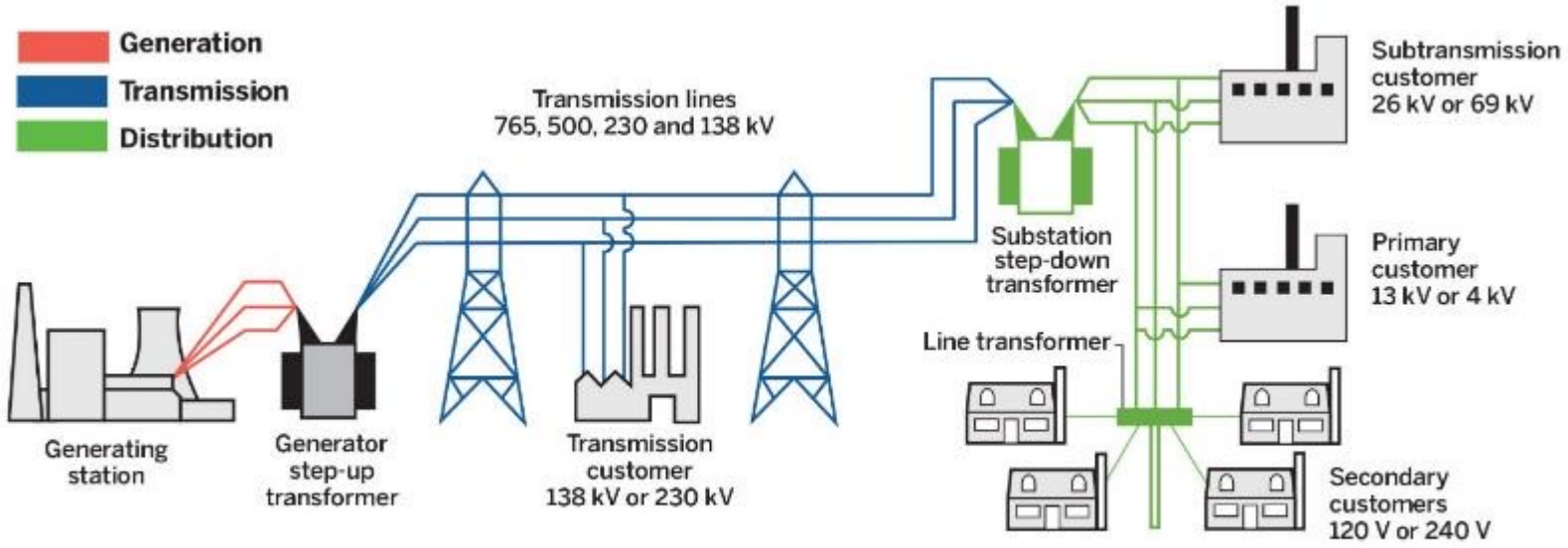
- Stakeholder Meeting – March 9, 2021
- Draft Report – September 1, 2021
- Stakeholder Meeting – September 8, 2021
- Legislative Hearing – September 14, 2021
- Public Comments Due – September 22, 2021
- Final Report – November 1, 2021

Outline for Today

- The Evolving Electric System
- Michigan Regulatory Policies and Context
- Examining DER Rate Design from Every Angle
- Options for Rate Design and Other Program Features
- Potential Pathways for Residential DER Rate Design

The Evolving Electric System

Traditional Electric System

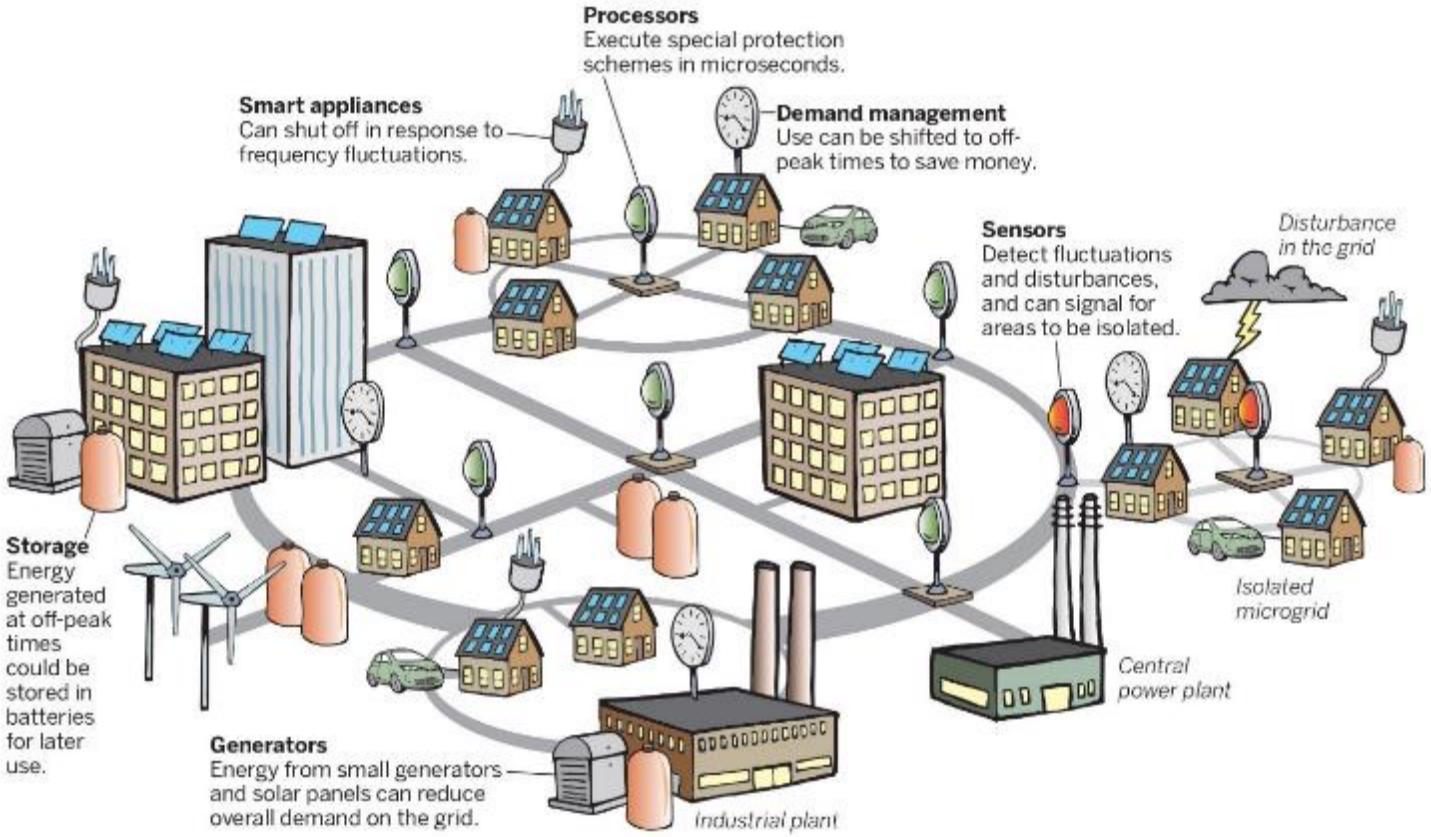


Source: Adapted from U.S.-Canada Power System Outage Task Force. (2004). *Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*

Technology Changes

- Wind, solar and storage
- Customer-sited generation
- Energy efficiency
- Demand response
- Smart grid
- Electrification of transportation and heating

Electric System of the Future



Source: Adapted from U.S. Department of Energy. (2015). *United States Electricity Industry Primer*

Load Research & Data Collection

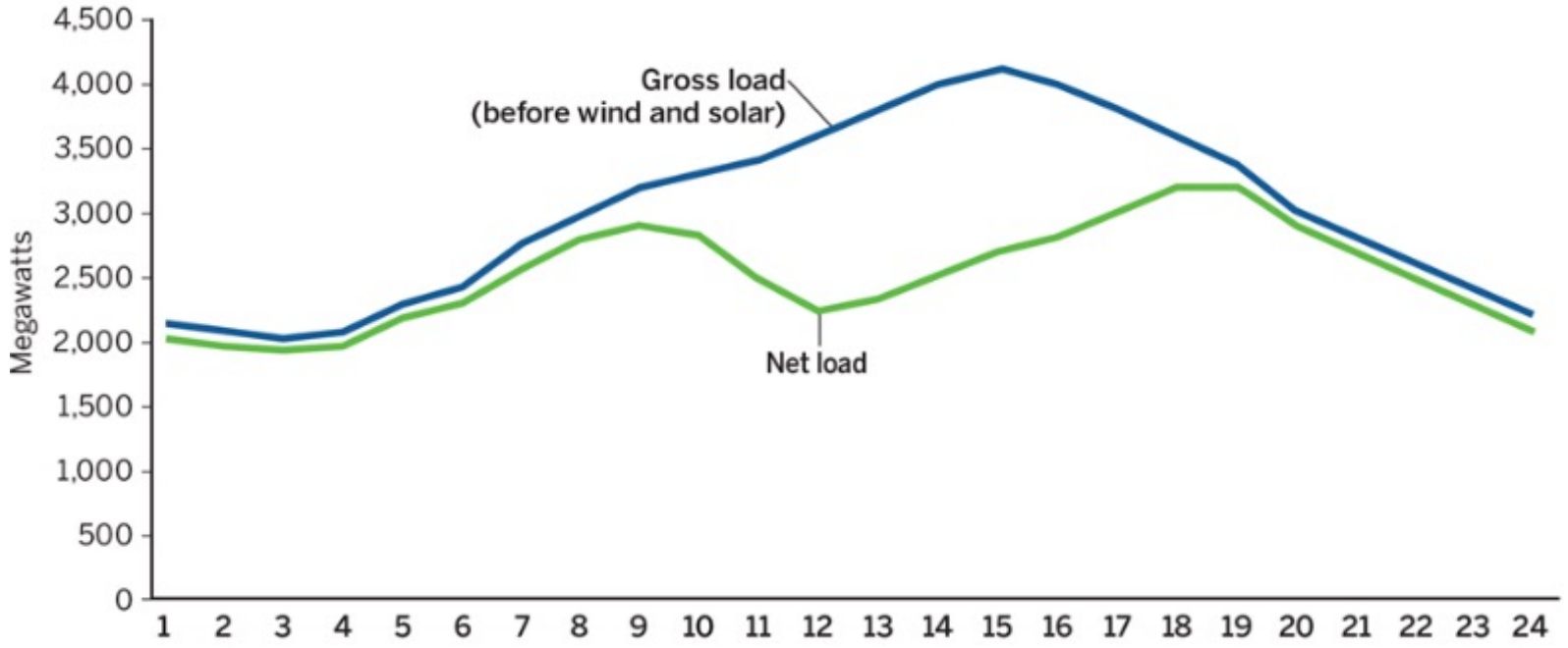
Then

- Sampling
- 10% error band

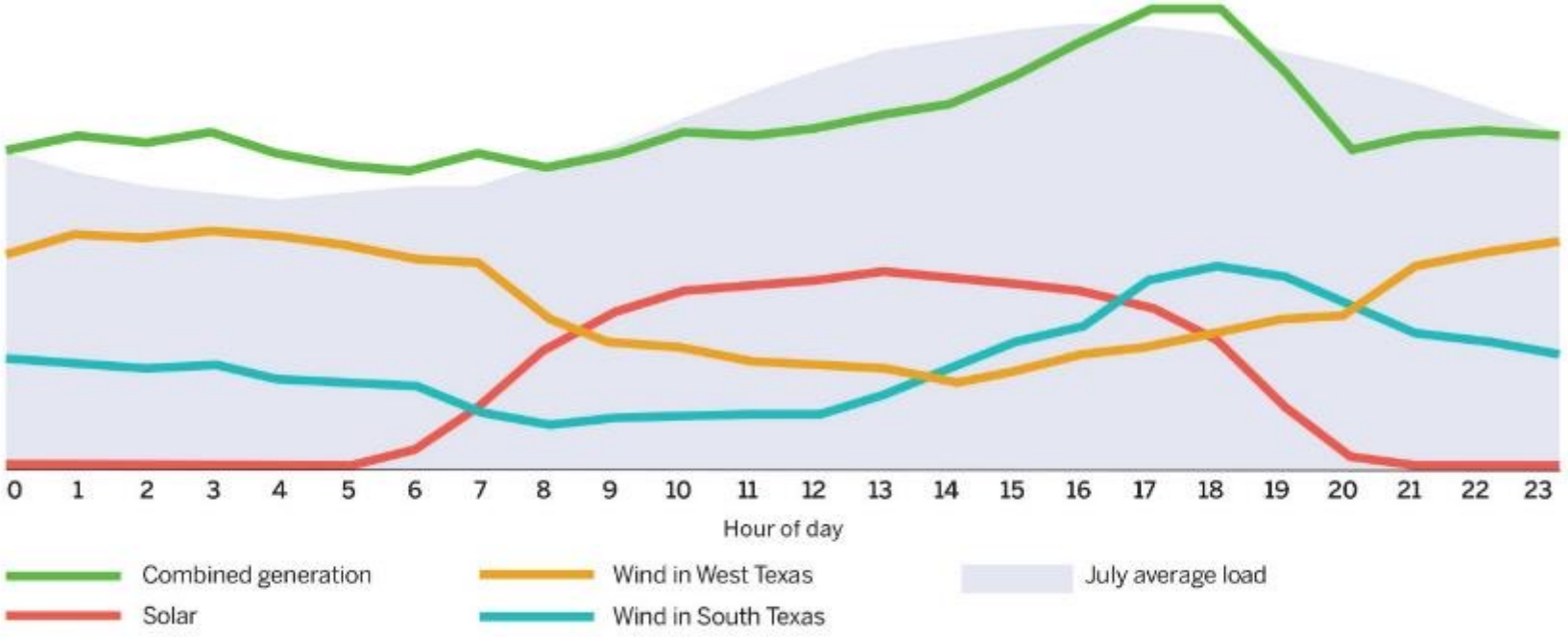
Now

- All customers
- Granular data
- Location-specific

Illustrative Example of Gross vs. Net Load



Overall resource mix matters!



Sources: Adapted from Slusarewicz, J., and Cohan, D. (2018). *Assessing Solar and Wind Complementarity in Texas* [Licensed under http://creativecommons.org/licenses/by/4.0]. Load data from Electric Reliability Council of Texas. (2019). *2018 ERCOT Hourly Load Data*

Michigan Regulatory Policies and Context

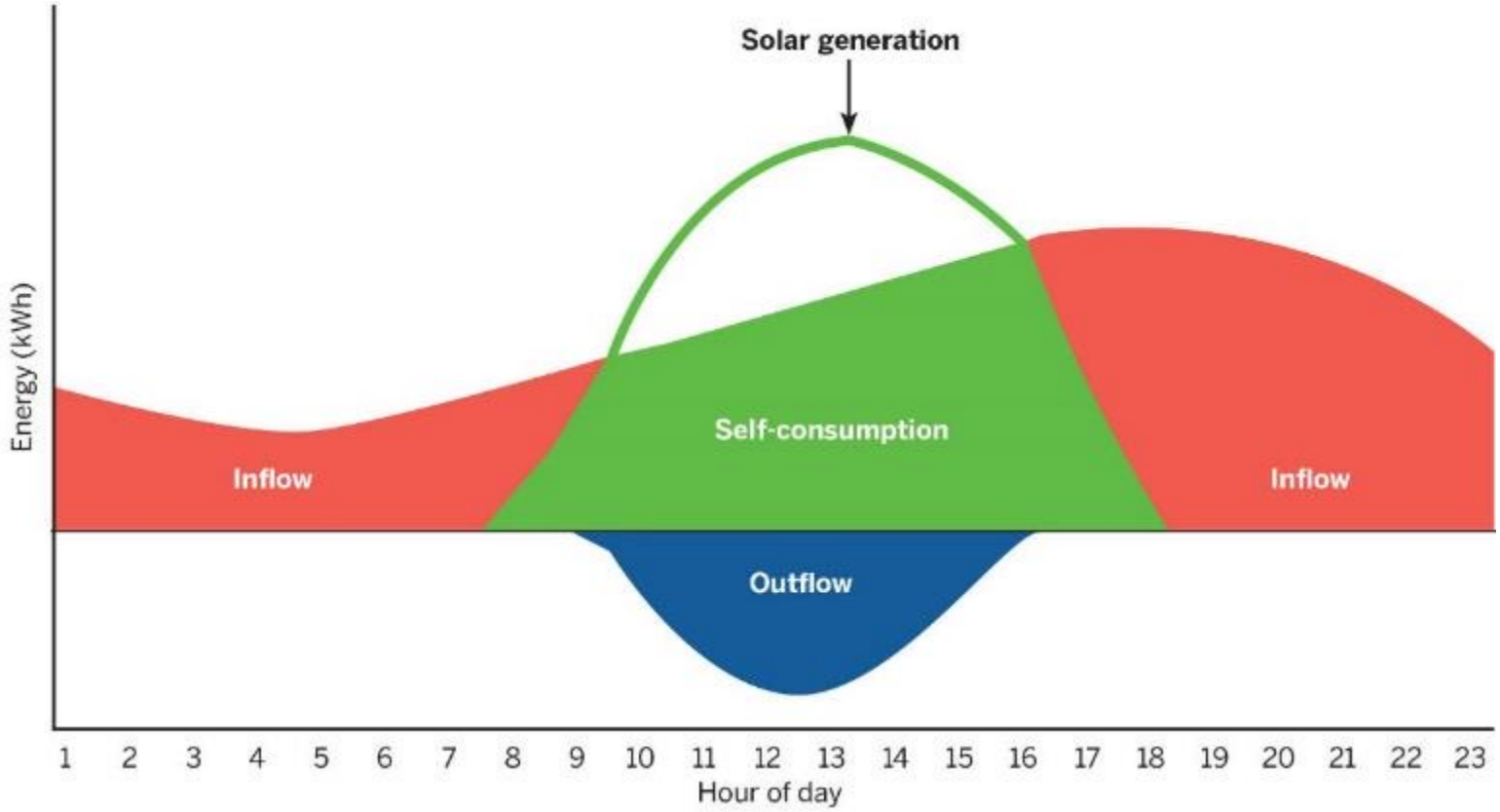
Electricity Market Structure and Utility Regulation in Michigan

- MPSC has jurisdiction over seven investor-owned electric utilities, with core authority over:
  - Generation resource adequacy
  - Retail rates
- MISO oversees wholesale generation markets and transmission

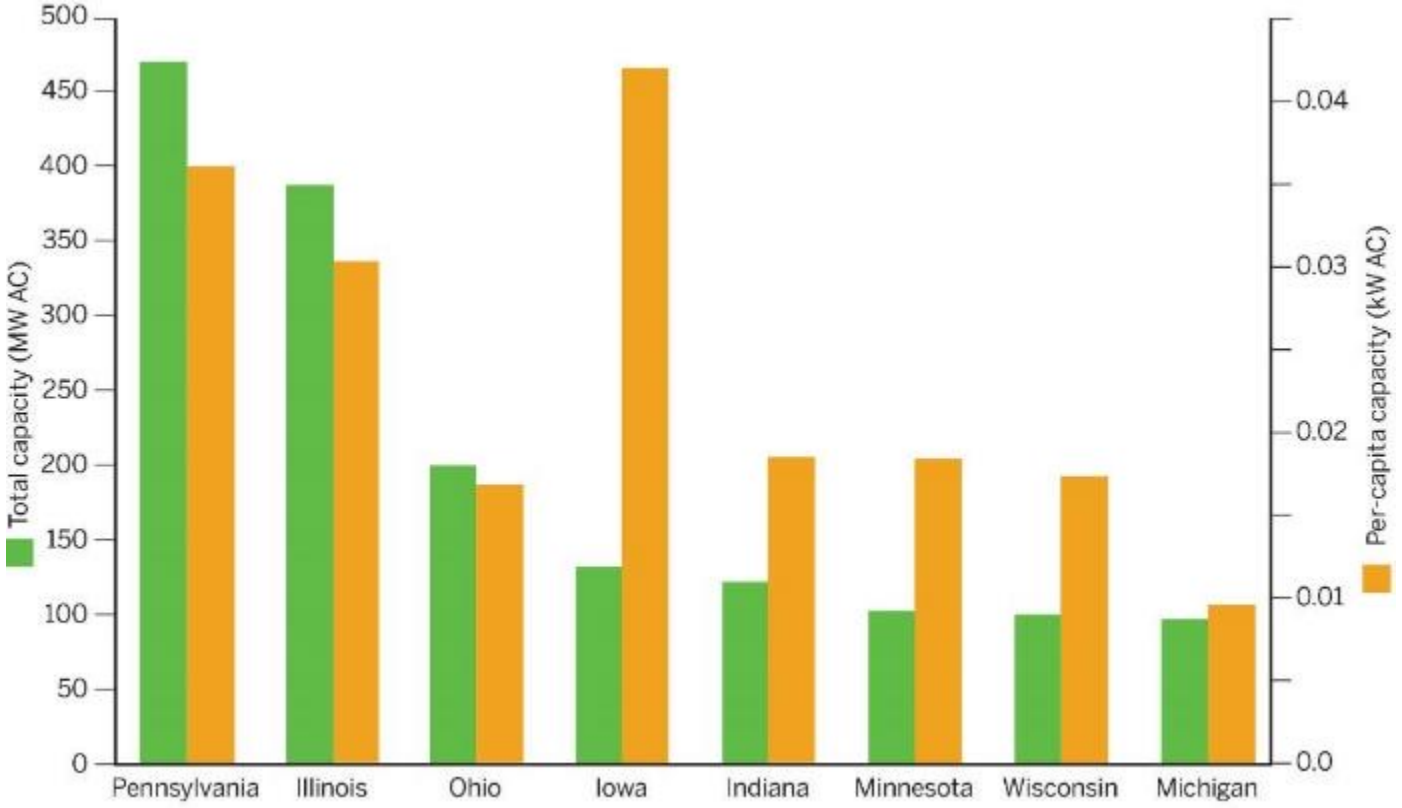
DER Compensation and Rate Design in Michigan

- Net metering policies first established by statute in 2008
  - “True” and “modified” net metering
- 2016 statute provided for reforms, which led to inflow/outflow framework
  - Key implementation steps from 2018 to 2020
- Core residential rate design is moving towards TOU rates

Inflow/Outflow Model



Distributed Solar PV Adoption



Data sources: U.S. Energy Information Administration. (2021). *Form EIA-861M (Formerly EIA-826) Detailed Data;* U.S. Census Bureau. (2021, April 26). *2020 Census Apportionment Results*, Table 1

Examining DER Rate Design from Every Angle

Key Principles and Policy Goals

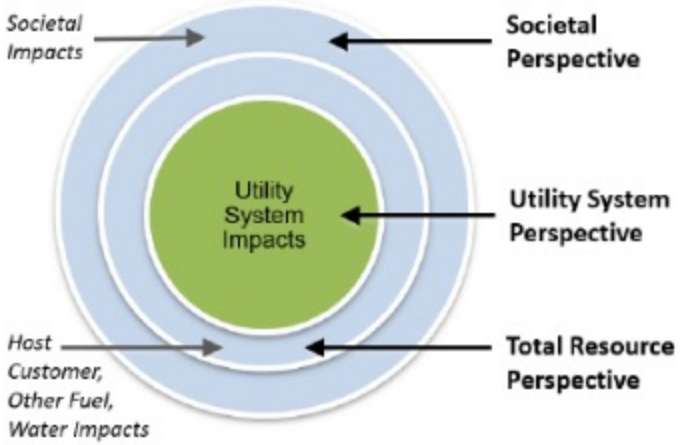
- Key ratemaking principles
  - Effectiveness in yielding total revenue requirements
  - Customer understanding and acceptance
  - Equitable allocation of costs and avoidance of undue discrimination
  - Efficient price signals that encourage optimal customer behavior
- Policy goals of utility regulation
  - Competition within the electricity system and across fuels
  - Provision of reliable service
  - Societal equity
  - Administrative feasibility
  - Clean energy and DER-focused employment
  - Public health and environmental protection

Cost Causation

- Shared electric system costs are driven by collective patterns of customer usage
- Lower load diversity at customer end of distribution system
  - E.g., service drops, secondary lines and line transformers
- Billing and customer service costs may vary by type of customer
- Administrative and general costs are driven by size of the business
- Public policy programs reflect a mix of motivations
  - Electric system benefits
  - Broader societal goals

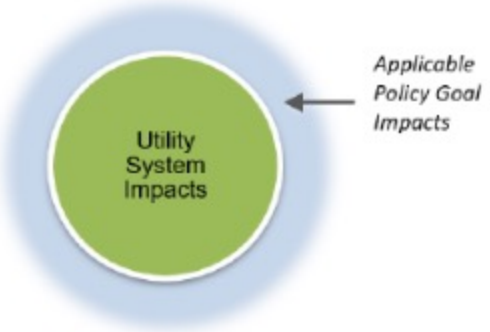
Benefit-Cost Analyses

Traditional Perspectives



- Three perspectives define the scope of impacts to include in the most common traditional cost-effectiveness tests.

Regulatory Perspective



- Perspective of public utility commissions, legislators, muni/coop boards, public power authorities, and other relevant decision-makers.
- Accounts for utility system plus impacts relevant to a jurisdiction's applicable policy goals (which may or may not include host customer impacts).
- Can align with one of the traditional test perspectives, but not necessarily.

Source: National Efficiency Screening Project. (2020). National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources: Summary, (August 2020), P. V, https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-Summary_08-24-2020.pdf

Cost Allocation Frameworks

- Embedded cost allocation techniques date back to early 20th century in many cases
- Marginal cost allocation techniques developed in 1970s and 1980s
- Pros and cons to both frameworks
  - Embedded is often simpler mechanically, but forces square pegs into round holes
  - Marginal is theoretically better but has many practical difficulties

What is a cost shift?

- Embedded cost definitions focus on changes in cost allocation determinants and rate levels from rate case to rate case
- Marginal cost definitions compare the value of the resource with the compensation levels
- Residual cost definitions look at additional customer contributions to utility revenue after considering a particular marginal value for a resource or customer action

Options for Rate Design and Other Program Features

Metering and Billing Frameworks

- Customer netting options
  - Monthly netting
  - Instantaneous netting (inflow/outflow)
  - Time of use netting
  - Granular netting options with advanced metering
- Other structures
  - Buy-all/credit-all
  - Stand-alone distributed generation and virtual crediting
  - Options that require advanced inverter functionality

Other Program Features and Processes

- Program features
  - Programs and tariffs may vary by size, capabilities, customer type and control
  - Renewable energy credit treatment
  - Recovery of non-bypassable charges
- Implementing changes over time
  - Treatment of pre-existing DG customers
  - Process and administrative innovations
  - Pilot programs and tariffs

Fixed Charge Options

- Monthly customer charge
- System access charges
- Minimum bills

Energy Charge Options

- Volumetric rates
- Time-of-use rates
- More granular time-varying rates
  - Critical peak pricing
  - Peak-time rebates
  - Variable peak pricing
  - Real-time pricing
- Bidirectional kWh charge/distribution flow charge

Demand Charge Options

- Traditional NCP demand charges
- “Peak window” demand charges
- Contract demand charges
- Daily demand charges
- Standby charges

Credit Design Options

- Volumetric versus monetary crediting
  - Trend is toward monetary crediting
- Monetary export credit options
  - Retail rate linked options
  - Value-based options
  - Comparative resource option (AZ)
  - Market price options
- Credit application and rollover

NY VDER Tariff

- VDER credit is the sum of:
  - An hourly wholesale energy rate
  - A generation capacity value
    - Pricing structure depends on technology
  - An avoided delivery cost credit
    - General value and location-specific value
  - An environmental value credit
    - Only for eligible technologies in exchange for RECs
  - Community credit for community DG
- Applies to larger C&I projects and community DG

Potential Pathways for Residential DER Rate Design

Key Evaluation Criteria

- Fair cost allocation
  - Do customers contribute to system and program costs that they use and benefit them?
- Efficient customer price signals
  - Does customer behavior help lower future system costs?
- Customer understanding and acceptance
  - Can customers manage their bill?
  - Can they understand why they are paying a different amount than their neighbor?
- Administrative feasibility
  - What are the incremental costs for new analysis, new proceedings, and new education efforts?

Data Collection, Customer Classes and Cost Allocation Reforms

- Data collection is foundational and getting the right data can enable further reforms
- Potential to define new technology-neutral customer distinctions, but comes with challenges
- New data and analytical tools enable significant reforms to traditional embedded cost allocation methods

Gradual Evolution Pathway

- New DG customers, and any new storage/V2G customers who wish to export, are placed on year-round time-of-use rates by default
- Inflow/outflow framework is maintained, as well as export credits defined by supply rate
- Rate design reforms
  - Default TOU rate design for new DG customers includes supply and distribution
  - Tiered customer charge adders for site infrastructure costs for all residential customers
- Pros
  - Modest improvements to pricing efficiency and cost allocation
  - Little new administrative burden
- Cons
  - Improvements are modest
  - Potential data collection issues for tiered customer charge adders

Advanced DER Rate Design Pathway

- Move broad subset of residential customers to more efficient and granular time-varying kWh charges and credits to use as resource and lower system costs
  - Customers with DG, EVs, storage and/or high usage
- Inflow/outflow mechanism would be replaced by demand charge for site infrastructure and distribution flow charge
- Pros
  - Major leap forward in customer pricing efficiency
- Cons
  - Increased complexity for customers and implementation

Customer Options and Stability Pathway

- Two choices for new DG customers
  - Choice A: buy-all/credit-all with value-based credits
  - Choice B: monthly netting with value-based credits for net excess generation, with grid access charge
- Rate and credit design
  - Flat kWh credit values for solar PV and other nondispatchable technologies are set administratively every two years based on an estimated long-term value of the resource.
    - Customers can elect to lock in credit value or have it updated
    - Environmental value for eligible technologies requires transfer of RECs
  - Under Choice B, grid access charge ($/kW installed capacity) is designed to recover equitable share of distribution and nonbypassable costs
- Pros
  - Easy to understand for customers, while providing choices that are fair to all parties
- Cons
  - Significant new effort to determine and administer credit values
  - Some practical details, such as integration of storage, would need to be worked out

Key Takeaways and Ideas

Key Takeaways

- Electricity system of the future will be different than the past and regulatory innovations will be necessary to achieve optimal results
- DER rate design will inevitably involve tradeoffs among key ratemaking principles and policy goals
- Understanding tradeoffs to manage them intentionally is important to policy design and implementation

Ideas to Consider

- Two or more reforms packaged together can balance impacts
- Future grid built for bidirectional flows leans toward pricing on that basis
- Residential customer class can be segmented but it should be done thoughtfully

Related RAP Publications

- Electric Cost Allocation for a New Era: A Manual
- Smart Rate Design for a Smart Future
- Smart Non-Residential Rate Design
- Designing Distributed Generation Tariffs Well

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

Mark LeBel
Associate
+802 498 0732
mlebel@raponline.org