April 28, 2022

Practical Reforms for Net Metering and Rate Design

Presentation to National Academies' Committee on the Role of Net Metering in the Evolving Electricity System

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What Is “Net Metering”?

- “Traditional” net metering can evolve
- Core policy choices
  - Metering and billing framework
  - Tariff terms and conditions
  - Rate design and credit structures
- Closely related issues
  - Utility revenue requirement and cost allocation practices
  - Wholesale market structures and pricing
  - Federal and state tax credits and incentives

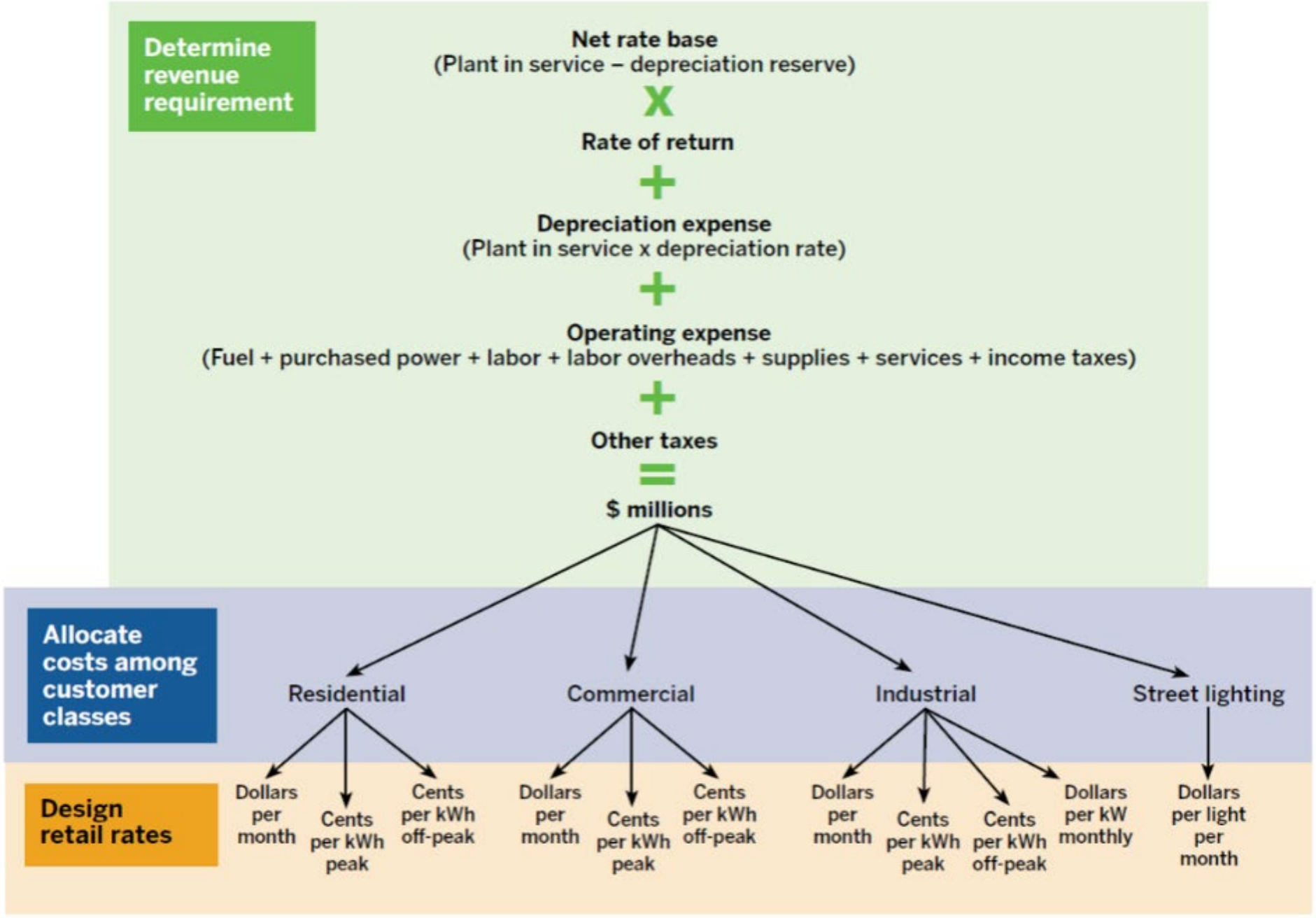
Why and How Do We Regulate Utilities?

- Public policy goals
  - Efficient competition and control of monopoly behavior
  - Safe, adequate and reliable service
  - Societal equity (e.g., universal access and affordability)
  - Administrative feasibility
  - Economic development and employment
  - Environmental and public health requirements
- Principles for setting utility prices
  - Effective recovery of revenue requirement
  - Customer understanding, acceptance and bill stability
  - Equitable allocation of costs
  - Efficient forward-looking price signals

My Guiding Principles

- Key goal is to improve efficiency of technology-neutral rates for distributed generation, storage, EVs, flexible demand resources and all other customer end uses
- Long-run marginal costs are an important part of the picture in practice
- A primary purpose of utility regulation is to protect customers from price discrimination based on lack of other choices
- Gradualism is helpful and necessary for all customers
- Every option involves trade-offs

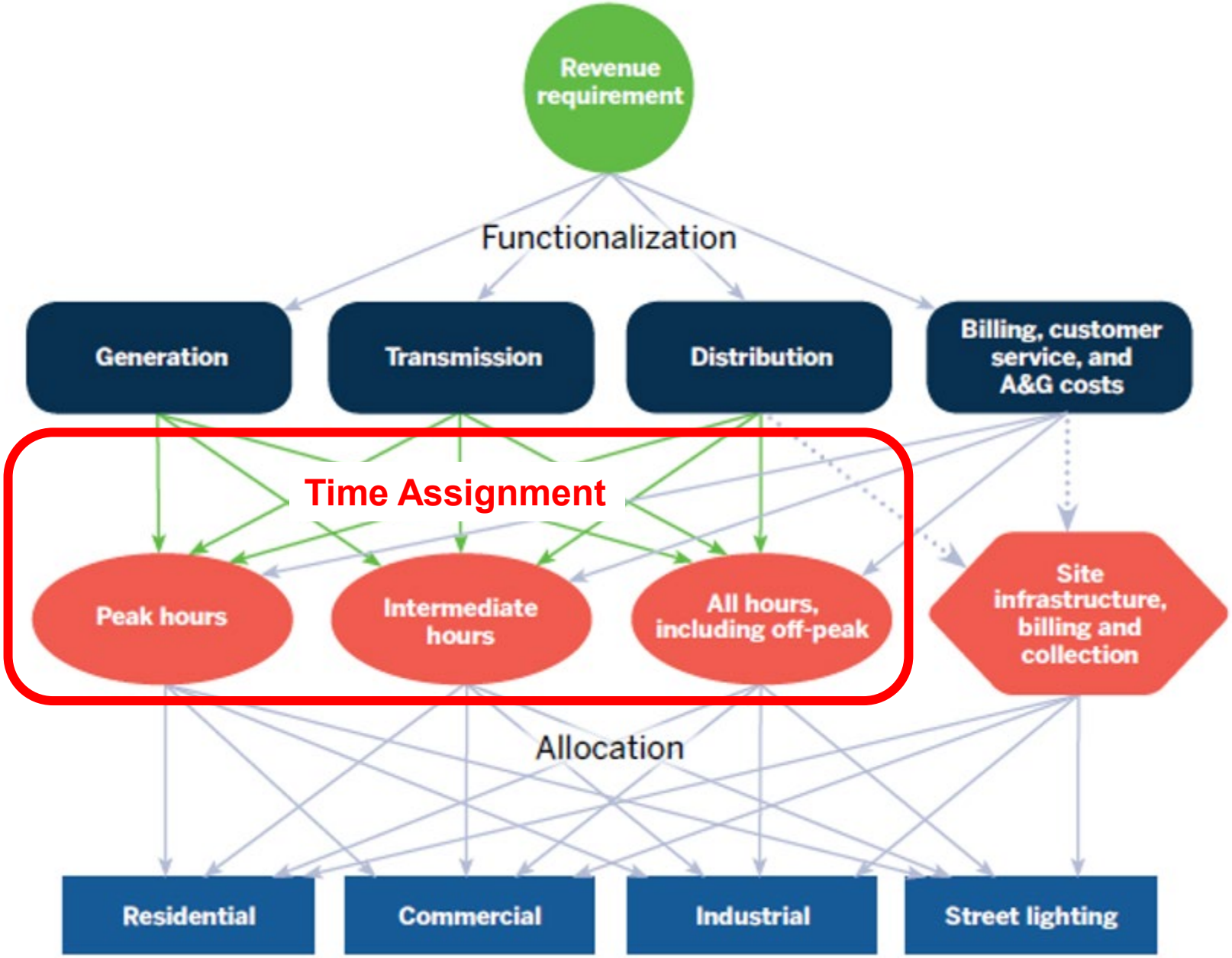
Simplified rate-making process



Data Collection, Customer Classes and Cost Allocation Reforms

- Data collection is foundational
- Potential to define new technology-neutral customer class distinctions, but comes with challenges
- New data and analytical tools enable significant reforms to currently typical cost allocation methods

Modern embedded cost of service study flowchart



Algorithm for Socially Efficient Price Signals

1. Start with short-run marginal costs where possible
2. Layer in long-run marginal costs
3. Add any unpriced externalities
4. End by allocating and pricing “residual” costs that must be recovered through rates

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

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 preexisting distributed generation customers
  - Process and administrative innovations
  - Pilot programs and tariffs

Rate Design Options

- Fixed charge options
  - Simple monthly
  - Tiered
  - System access charges
  - Minimum bills
- Demand charge options
  - Traditional noncoincident peak
  - “Peak window”
  - Contract
  - Daily-as-used
  - Standby charges
- Energy charge options
  - Flat volumetric
  - Time-of-use
  - Critical peak pricing
  - Variable peak pricing
  - Peak-time rebates
  - Real-time pricing
  - Distribution flow charge

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
  - Market price options
- Credit application, rollover and cash-out

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?

Smart Rate Design for Today

	Residential	Medium C&I
Customer charge ($/month)	Multifamily: $7 Small single-family: $10 Large single-family: $15	$100
Site infrastructure ($/kW)	N/A	$2
Off-peak (cents/kWh)	12 cents	10 cents
Mid-peak (cents/kWh)	18 cents	16 cents
On-peak (cents/kWh)	25 cents	24 cents
Critical peak (cents/kWh)	75 cents (peak-time rebate)	75 cents

Volumetric components reflect both import charges and export credits, which should be netted by TOU period

Peering Over the Horizon

- **Technology-neutral time-varying rates of increasing complexity**
  - Assigning costs to time periods for rate design is similar to the traditional cost allocation challenge
- **Increasing importance of incorporating short-run marginal cost pricing**
  - Particularly if policymakers want to rely on demand side for generation resource adequacy or other grid needs
- **As pricing becomes more granular, the class load profile is less relevant**
  - Instead of accounting for cost differences at the cost allocation stage, it is done automatically in the rate design stage!
- **The problem of residual costs gets harder**
  - As electric system cleans up, marginal emissions rate likely goes down
  - With high penetrations of DER, traditional billing determinants stagnate, and price elasticity will likely increase across multiple dimensions

Resources From RAP

- Smart Rate Design for Distributed Energy Resources
- Electric Cost Allocation for a New Era: A Manual
- Smart Rate Design for a Smart Future
- Demand Charges: What are They Good For?
- Smart Non-Residential Rate Design
- Electricity Regulation in the U.S.: A Guide

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

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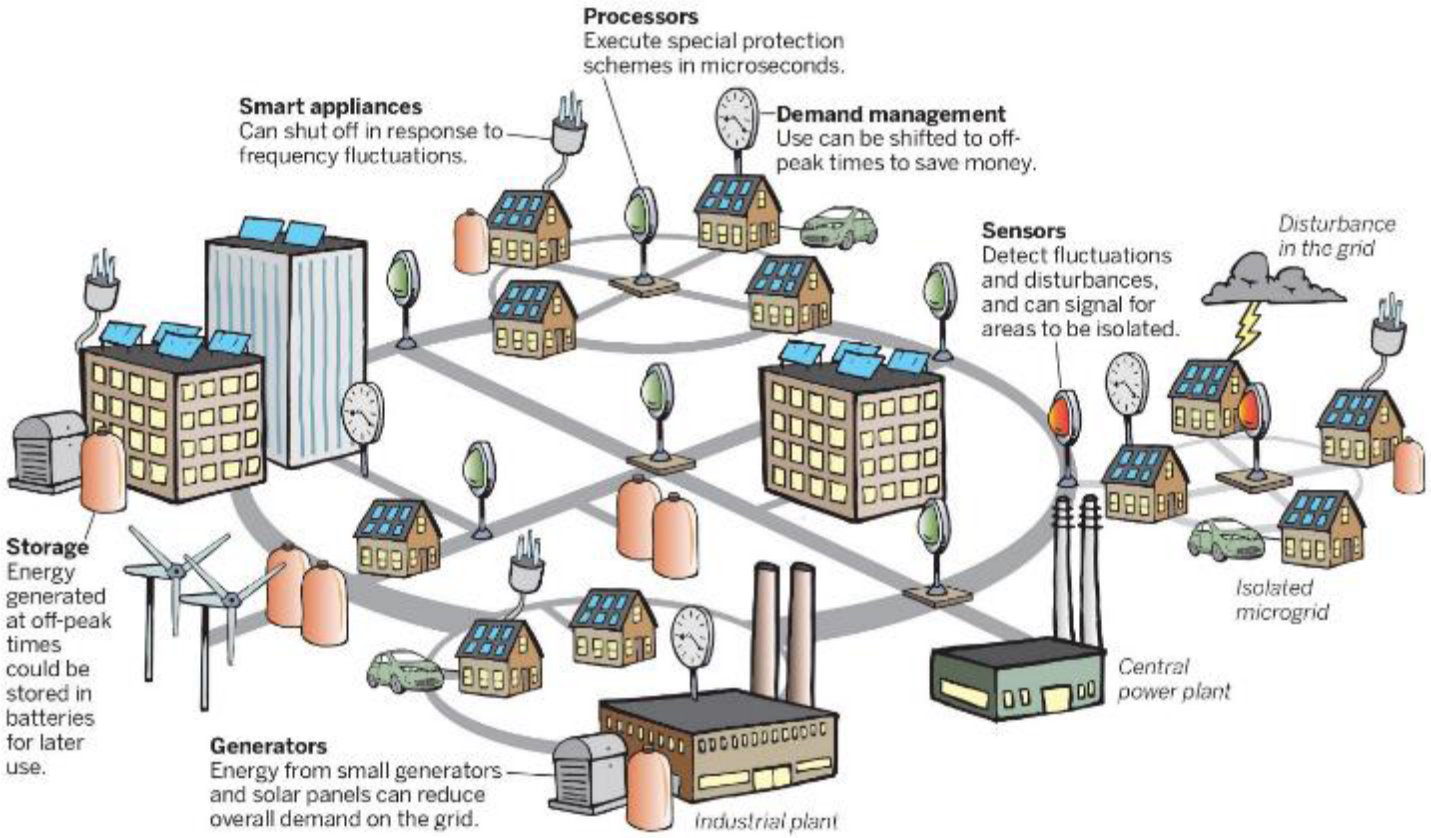
Appendix

Technology Changes

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

Modern Grid is Built for Flows



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

Cost Causation

- Shared electric system costs are driven by the collective patterns of customers
- 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

Minimum System Fallacy

- Shared distribution system expenses, such as primary conductors, poles and substations, do not meaningfully depend on the **number** of customers
  - A building can be one hotel or 100 apartments.
- The cost of a “minimum system” does not vary with the number of customers, but rather area/miles spanned

Advanced Residential Rate Design

Cost Recovery Only	
Basic Customer Charge ($/mo.)	$10
Site Infrastructure Charge ($/individual NCP kW)	$1
Distribution Flow Charge (Cents/kWh on imports and exports)	2 cents

Symmetric Charges and Credits	
Off-peak (cents/kWh)	10 cents
Mid-peak (cents/kWh)	22 cents
On-peak (cents/kWh)	35 cents
Critical peak (cents/kWh)	75 cents