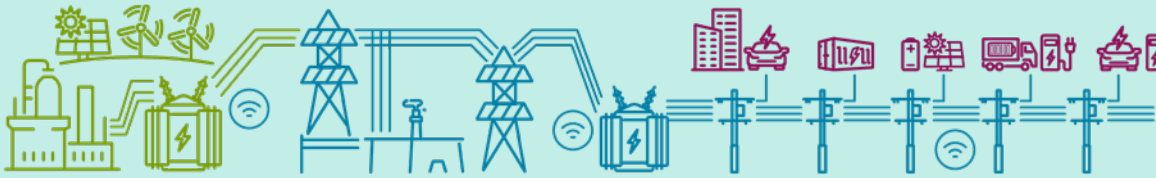
Decarbonized | Reliable | Resilient | Cost-effective



EVGrid Assist Webinar Highlights

U.S. DEPARTMENT OF ENERGY EVGrid Assist ACCELERATING THE TRANSITION

Rates and Incentives

As millions of dollars of new electric vehicle (EV) charging infrastructure is being integrated into the grid, utilities need to find ways to pay for the equipment and the electricity to power it. New rates and incentives are being established, presenting several ideas that range from the simple to the complex.

EV rates serve two purposes. One is to help utilities collect revenue to cover the costs of producing and delivering electricity to consumers across the user base. The other purpose is to achieve policy and regulatory objectives. They can be used as to signal consumer behavior, discouraging electricity usage during peak hours or encouraging it during off-peak hours, enabling more efficient use of grid assets.

More sophisticated rate designs can offer more targeted control over charging, which can mean increased grid integration and coordination, which could provide greater value to both utilities and consumers. More sophisticated rate designs, however, can also add complexity. It's imperative that any added complexity adds value to the system and not just more hoops to jump through. It's also important to ensure that any additional complexity is transparent to consumers.

Cost of Service Regulation

Establishing rates that pay for the critical service of electricity and the capital-intensive infrastructure needed to deliver it is the job of regulators and not the market. In the early history of the industry, state legislators decided utilities should operate as de facto monopolies because allowing multiple firms to compete would result in higher overall costs due to redundant systems and infrastructure. Lacking a competitive market to set prices, regulators oversee utilities' activities and enforce economic efficiency, which includes approving the rates a utility may charge for its services.

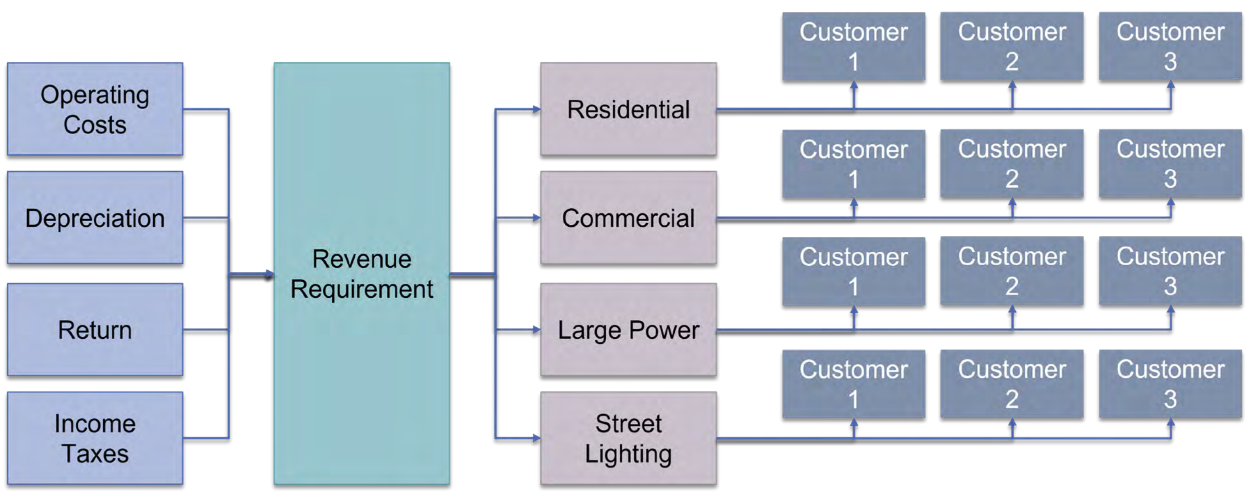
Regulators require that all utility investments are used and useful in order to include them in electric rates. This poses a challenge when dealing with EV charging infrastructure as utilities must anticipate a future need. By the time EVs are mainstream enough to have an impact on the grid, it's too late to start building the needed infrastructure to address that impact. Instead, lines, transformers, and other equipment that can take years to build and implement must be planned – and may sit idle – long before they are needed.

Regulators strive to approve rates that reflect the cost incurred to service the utility's customers. A Cost of Service (COS) study acts as a basis for the utility to develop updated rate proposals for regulators to consider. A utility must make a case that assets included in the costs are going to be useful and not sitting idle, and that the proposed rates are prudent, reasonable, and will allow the utility the opportunity to recover its incurred costs while earning returns comparable to what a similarly situated utility would achieve.

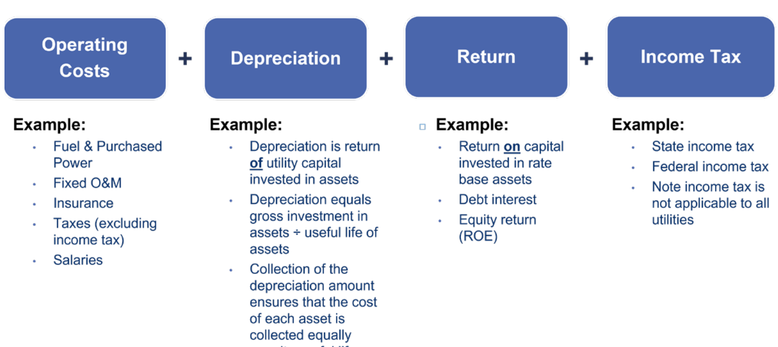
A COS study is part of the clear and transparent process for identifying the utility cost for providing service. Utilities undertaking such a study must identify three elements:

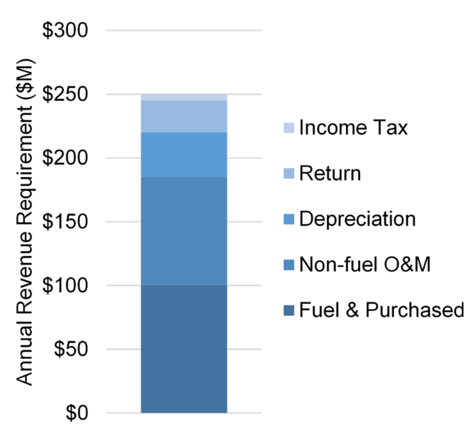
1. **Determine the annual cost of serving all the utility's retail electricity customers.** This is known as the revenue requirement, which includes operating costs, taxes, and other expenses.
2. **Allocate the cost responsibility for each customer class.** Utilities may identify their customer classes differently, but must ultimately determine what percentage of the revenue requirement is needed to serve each segment. This is known as the cost responsibility. For example, commercial consumers may represent a larger percentage of the costs than residential customers, and those levels of cost imposed on the utility should be reflected in the proposed rate.
3. **Design rates that collect class-level revenue requirement for all customers in the class.**

Elements of a Cost of Service(COS) Study



Components of Revenue Requirement (RR)





Principles of Rate Design

There's no specific formula for designing precise rates for each customer class, but there are some guidelines that can help. The Bonbright Principles, first laid out in *Principles of Public Utility Rates* in the 1960s, are still commonly employed by rate designers today. They suggest that rates should:

- Be understandable to customers
- Be easy for the utility to implement
- Recover the utility's cost of service
- Represent a fair apportionment of costs among consumers
- Avoid undue discrimination

In addition to meeting these guidelines, rate design typically involves prioritizing policy objectives as well. These will likely vary depending on region but might include such goals as sending economically efficient price signals, achieving greenhouse gas (GHG) targets, and enabling or promoting the adoption of distributed energy resource (DER) technologies. The balancing of these priorities with the recovery of the revenue requirement is the essence of retail rate design.

COMMON RATE COMPONENTS

Typically, retail rates are comprised of three elements:

Volumetric Energy Charge: This is the flat rate charged per kilowatt hour (kWh), reflective of the amount of electricity consumed by the customer during the billing period.

Volumetric Demand Charge: This represents any additional charge to cover infrastructure costs to deliver power to meet a customer's peak demand.

Customer Charge: This reflects a flat fee to cover the cost of connecting a customer to the grid, such as metering, billing, and accounting costs, and may vary by customer class and size.

Each of these, as applied to EV rates, can affect EV adoption and penetration.

Designing Rates for EV Charging

Electric vehicles are one of many technologies motivating retail rate reforms. Motivations include the deployment of advanced metering infrastructure (AMI), growing DER adoptions, fair and equitable compensation for net electricity export, among other factors.

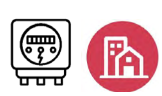
Five policy-driven objectives may be used as the basis for EV rates design:

- **Promotion of EV Adoption**
- **Grid Management**
- **System Economic Efficiency**
- **Decarbonization**
- **Equity**

These can be considered individually but are often interrelated. For example, a utility may seek to promote EV adoption to meet decarbonization goals or may want to manage the grid in an equitable and economically efficient manner.

EV METERING OPTIONS

One of the primary rate design decisions is how to measure and meter EV consumption. Three approaches are illustrated here:



1) Measure EV usage along with all other loads at the location with the premise meter (often referred to as a whole home rate).

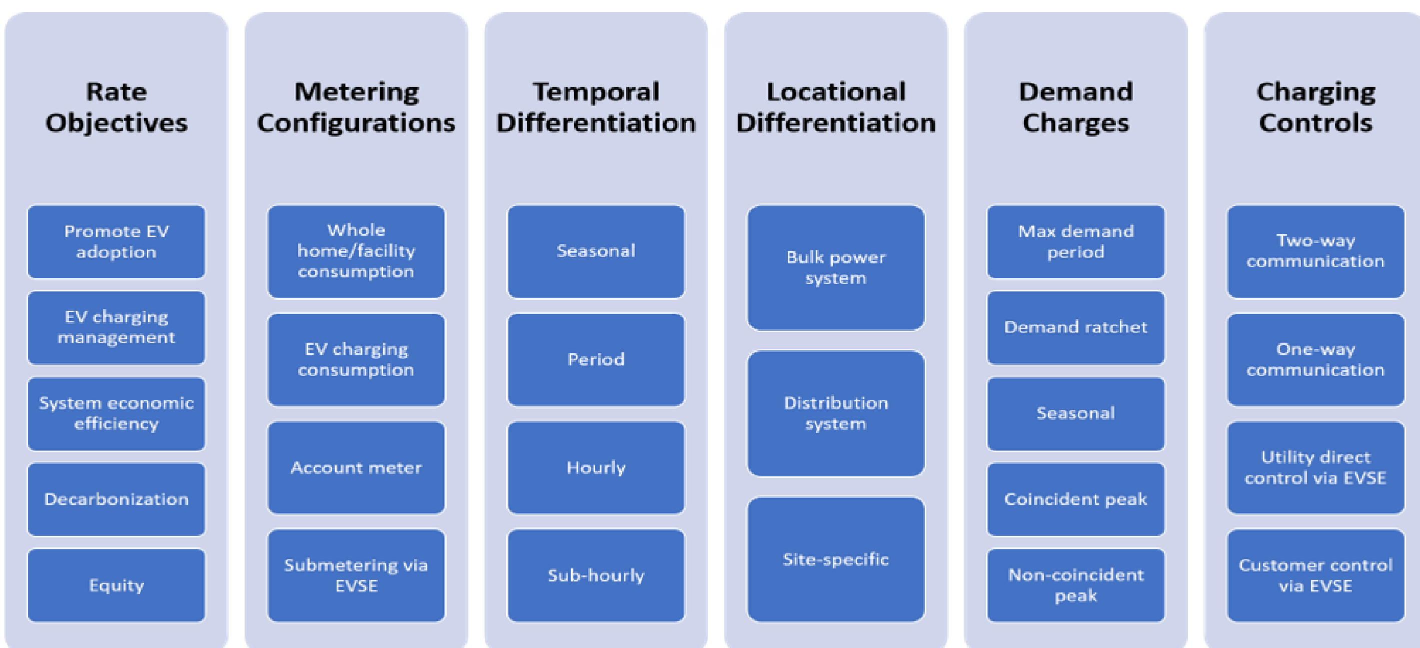
2) Install a second utility meter that measures only the EV consumption.

3) Use submetering that measures EV consumption through the EV supply equipment or vehicle.

The rates being designed are typically comprised of five components:

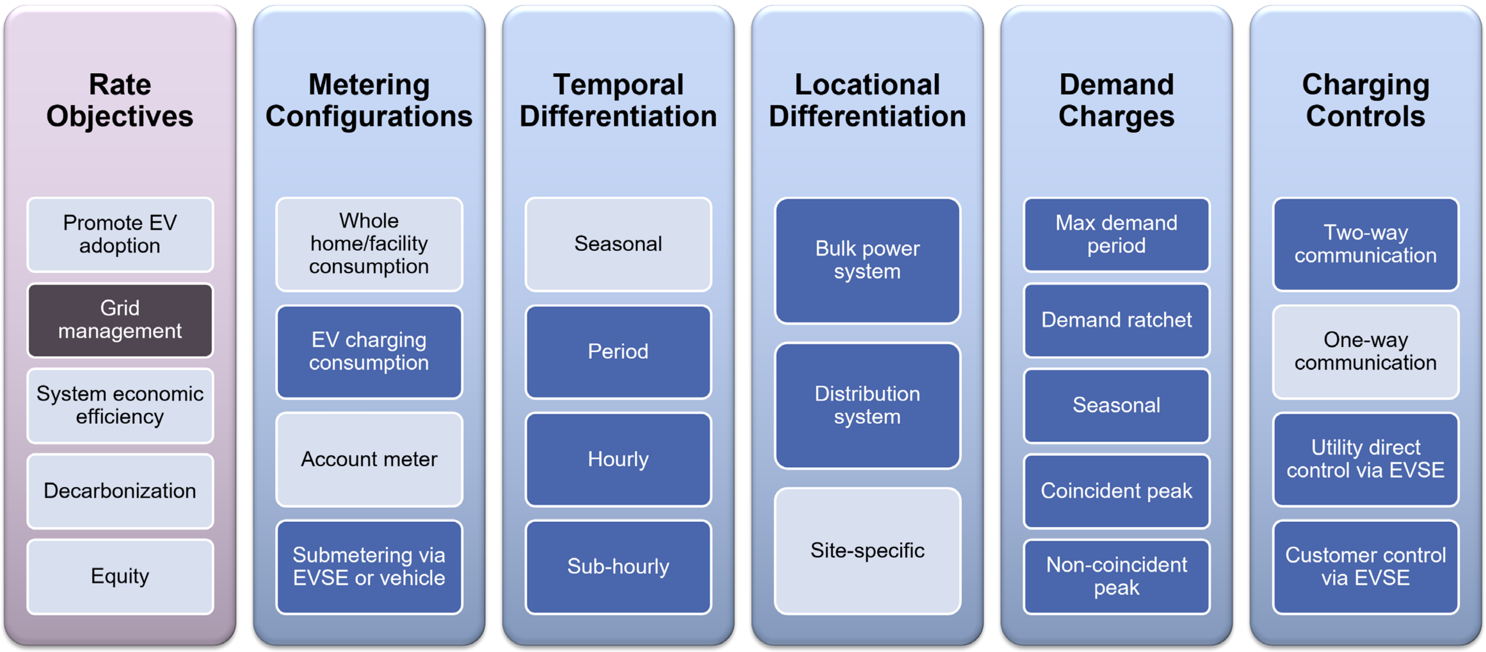
- **Metering Configurations** – How will EV consumption be measured? A separate meter? Submetering via the charger or the vehicle itself? And will charging just be part of the home/facility load as a whole?
- **Temporal Differentiation** – Electricity rates can change depending on the time of consumption. This can vary by season, by time of day, even hourly, with the goal being to encourage charging at cheaper, off-peak times and discourage it during periods of peak demand.
- **Locational Differentiation** – Charges may vary based on where the EV is charging on the grid. This can be defined at the bulk power system level, the distribution level, or even at specific sites.
- **Demand Charges** – Additional charges can be applied to customers based on their maximum demand during a billing period, sometimes in relation to other customers or to the customer's previous peak demand in other months.
- **Charging Controls** – Charges may vary based on who has control over when and how much charging occurs, or an EV rate may simply require a customer to allow the utility to control charging directly through communication with the customer's vehicle or charging station.

All five components must be considered for a comprehensive rate design, and the choices will be constrained by the desired rate objective. The components can be utilized in a variety of combinations based on the objectives a utility aims to achieve.



Example: Designing an EV Rate to Prioritize Grid Management

A rate aiming to maximize grid management is intended to avoid or minimize distribution or bulk power system impacts. The design choices shown above will make this goal achievable. Grid system conditions can be communicated using a price or load signal, and rates will fluctuate frequently with various demand charge options. Submetering will likely be needed to separate EV charging from other premise loads, and ideally, two-way communication will enable greater management of the loads.



Other objectives will require focus on different components. This webinar's discussion of design choices aimed at achieving the five different objectives is available at www.energy.gov/evgridassist.

Resources for Further Information

- https://escholarship.org/uc/item/99f5x0sj
- https://evtransportationalliance.org/wp-content/uploads/2022/02/ATE-Rate-Design-Principles-Final-July-202194.pdf
- https://evtransportationalliance.org/wp-content/uploads/2022/06/Phase-1-Rate-Design-paper-July-2021.pdf
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