Smart Electric Power Alliance

Tariff Design & the Importance of DCFC Load Modeling

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U.S. utilities need to plan for hundreds of thousands of DC fast charging (DCFC) ports to meet the energy needs of over 26 million electric vehicles (EVs) by 2030. Many of these charging stations will be publicly available, and the economics of EV charging will be heavily influenced by regulated tariffs. Designing fair, affordable, and effective tariffs will be a continuing and upcoming objective for many utilities. As part of designing new tariffs, or modifying existing ones, it is important for regulators and utilities to understand how load profiles and tariffs influence a site's final monthly bill. SEPA's newest report "Exploring DC Fast Charging Load Profiles: Implications for Utilities, Operators, and Regulators",[1] identifies key takeaways for regulators and local governments:

1. Components of Tariff Design

Existing EV tariffs have three primary components: a demand pricing mechanism, volumetric pricing, and/or fixed charges. While fixed charges are fairly straightforward, demand pricing and volumetric pricing tend to be more variable across tariff structures. Table 1 outlines six utility tariffs with different component mixes.

2. Tariff Design & Affordability

Seasonal demand changes and occasional event-based demands (i.e., influx of customers due to holidays, evacuation events, sporting events, etc.) heavily influence public charging (Figure 1).[2] The cost per mile of charging for these public sites often vary depending on the site's monthly peak demand and its overall energy consumption. Oftentimes, the cost per mile of charging decreases as site utilization increases; however, sites that have high demand rates can experience cost increases if their peak demand increases significantly (Figure 2, Table 2). In this illustrative scenario, a rural highway stop experiences both seasonal demand changes (i.e., transitioning from an off-peak tourism season to a peak tourism season) and event-based demand changes (i.e., experiencing holiday weekends during peak tourism season). The seasonal demand changes help drive down the per mile charging cost due to the increase in load consumption. In contrast, the holiday event increases the peak and increases the overall per mile charging cost for the peak season.

The impacts of consumption and peak demand differ depending on the site's utility tariff (Figure 2). EV Tariff 1 illustrates a tariff that is relatively inflexible to consumption and peak demand changes; EV Tariff 4 illustrates a tariff that fluctuates based on consumption and peak demand; and General Commercial Tariff 1 illustrates a tariff more heavily impacted by consumption changes. Site economics will be greatly influenced by the utility territory. Regulators should consider designing flexible tariffs that fluctuate with the seasons and include provisions that account for extreme events, such as evacuations, to promote affordable public charging options and favorable economic conditions for site owners.

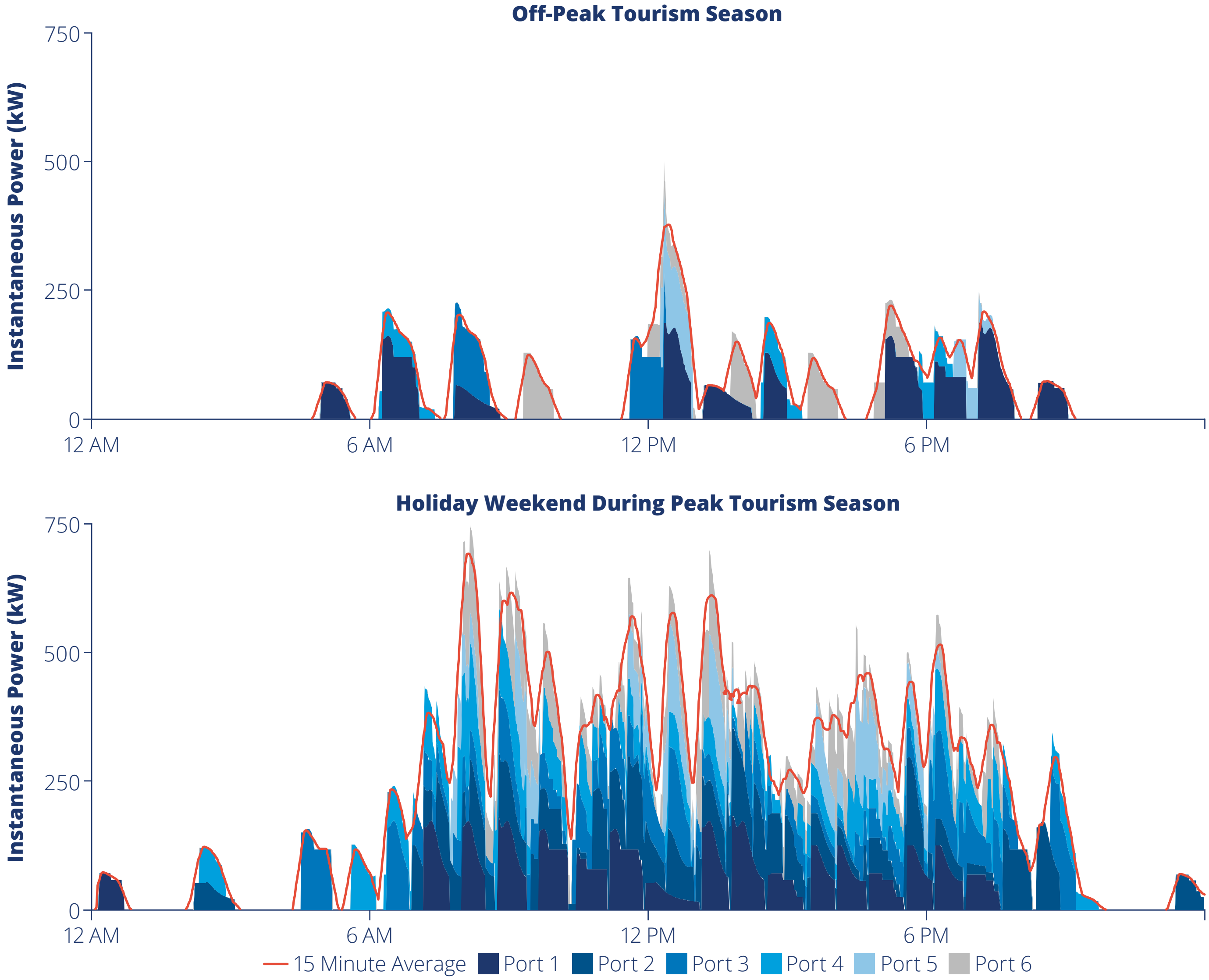
Table 1. Existing Utility Tariffs for Public EV Charging

Tariff Type	Demand Pricing Mechanism	Volumetric Pricing	Fixed Charges
EV Tariff 1	None	ToU Delivery & ToU Generation	Medium
EV Tariff 2	Subscription Blocks	ToU Delivery & ToU Generation	None
EV Tariff 3	None	ToU Bundled	Low
EV Tariff 4	Demand Based Tiered kWh Pricing	ToU Generation	High
General Commercial Tariff 1	Demand Charge	ToU Delivery & Flat Generation	High
General Commercial Tariff 2	Demand Based Tiered kWh Pricing + Demand Charge	Tiered Volumetric	Low

Source: SEPA, 2023.

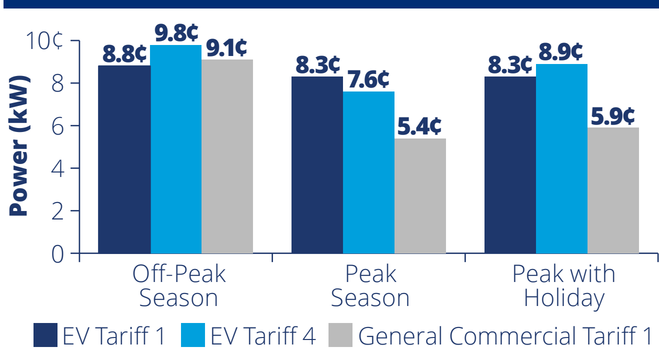
1 The full version of this report is available for free by the Coordinating Research Council (CRC).
2 These are illustrative scenarios with hypothetical load profiles and peak demand.

Figure 1. Influence of Seasonal Customer Demand on Site Load Profiles



Source: SEPA, 2023. Based on 350 kW per port capacity and current vehicle charging curves.

Figure 2. Rural Highway: Cost Per Mile Comparison for Two Utility Tariffs



Source: SEPA, 2023. Based on 350 kW per port capacity and current vehicle charging curves.

Table 2. Rural Highway: Consumption & Demand

Scenario	Consumption (kWh/month)	Peak Demand (kW)
Off-Peak Tourism Season	39,300	375
Peak Tourism Season	76,300	490
Peak Tourism Season with Holiday	81,600	700

Source: SEPA, 2023. Based on 350 kW per port capacity and current vehicle charging curves.

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