



Medium & Heavy Duty Electric Transportation Rate Designs at SCE

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Transportation Electrification – State Policy Direction

The California Legislature (SB350) added to Pub. Util. Code § 740.12 which includes the following directives:

“(A) Advanced clean vehicles and fuels are needed to reduce petroleum use, to meet air quality standards, to improve public health, and to achieve greenhouse gas emissions reduction goals.

(G) Deploying electric vehicles should assist in grid management, integrating generation from eligible renewable energy resources, and **reducing fuel costs** for vehicle drivers who charge in a manner **consistent with electrical grid conditions.**”

Renewable Portfolio Standard (RPS) requirements change the electricity landscape by making mid-day energy less expensive through greater supply, requiring CA IOUs to shift their Time-of-Use (TOU) periods to later in the day.

Interdependencies / Linkages of Marginal Costing

Marginal Costing

Marginal Generation Energy Costs

- Super-off peak price signal
- Relationship between Day-Ahead and Real-Time CAISO energy prices – Duck Curve
- Wider spread between high and low cost periods in future years

Marginal Generation Capacity Costs

- Marginal capacity resource given the increased need for flexible capacity to meet ramping needs
- Allocation of flexible and system capacity
- Introduction of capacity pricing in winter months

Marginal Distribution Costs

- Distribution cost of service time dependency
- Determination of avoidable cost of service
- Cost recovery through grid and peak rate components

Impact on Proceedings & Programs

TOU Period Definition

- Introduces a super-off peak period in the winter
- Concentrates high price periods in early-evening year round

Electric Transportation

- Opens opportunities for large scale electric transportation, in-transit charging of fleets, buses, trams, etc.

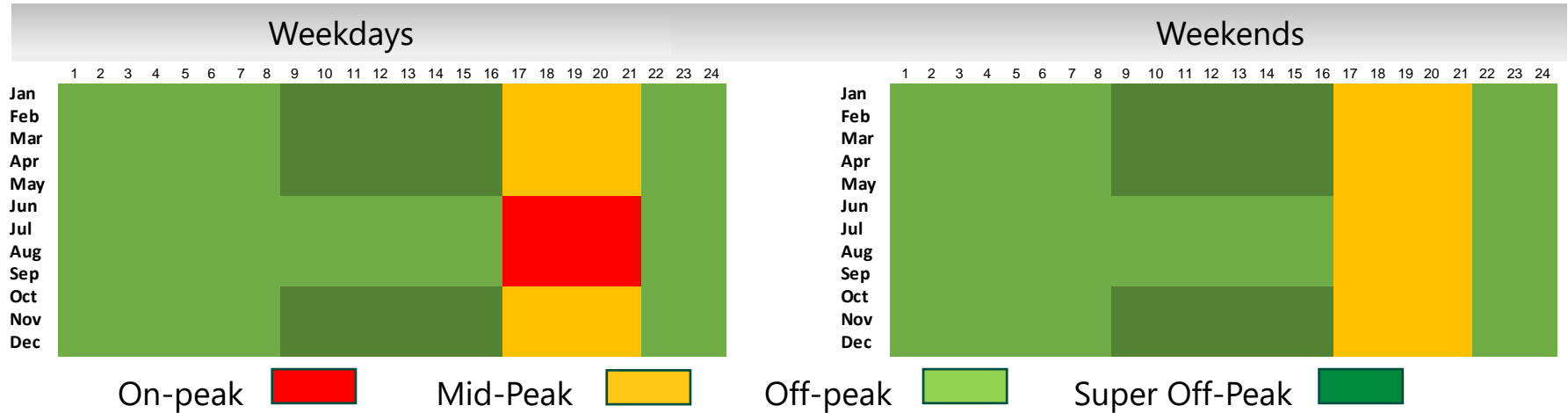
Energy Storage (ES) / Paired Storage

- ES as a means of addressing renewable generation oversupply and ramp periods (e.g., new forms of demand side management)

Demand Response

- DR program credits are based on marginal generation system capacity costs, which may be reduced/modified under a structure that includes a flexible capacity component

“Consistent with Electrical Grid Conditions”



SCE’s new TOU periods* align price signal with grid friendly charging times and incentivize customers to optimize their charging patterns to minimize electricity costs.

* Effective March 1, 2019

“Reducing Fuel Costs”

- TOU Periods provide low cost charging opportunities and facilitate the integration of renewable energy.
- TOU proposal includes introducing a “peak” component of distribution rates which is time-varying.
- Demand charge rate structures can result in higher average rates for low load factor customers.
 - SCE proposed a 5-year introductory period without demand charges
 - Followed by a 5-year phase-in of demand charges to facilitate this nascent industry
 - Based on findings of a 3-year pilot with a transit agency
 - Continued use of the co-location demand charge relief
- End-state TE rate structures envisioned to be consistent with remaining customers’ rate structures.

SCE's Electric Vehicle (EV) Rates

	Rate Schedule	Maximum Demand (Voltage Level)	Applicability	Features
Commercial	TOU-EV-7	≤ 20 kW	Applicable for businesses solely for the charging of EVs on a premise or public right of way where a <u>separate SCE meter</u> to serve EV charging facilities is required	<p>Years 1 – 5: Energy only; No Demand Charges</p> <p>Years 6 – 10: Phase-in Demand Charges</p> <p>Years 11+: Return to Energy + Demand Charges *</p>
	TOU-EV-8	21 -500 kW		
	TOU-EV-9	> 500 kW (Secondary, Primary, Subtransmission)		
Residential	TOU-D-PRIME	n/a	" <u>Whole-House</u> " rate designed for high energy users + EV charging	Favorable day- and night-time pricing for EV charging

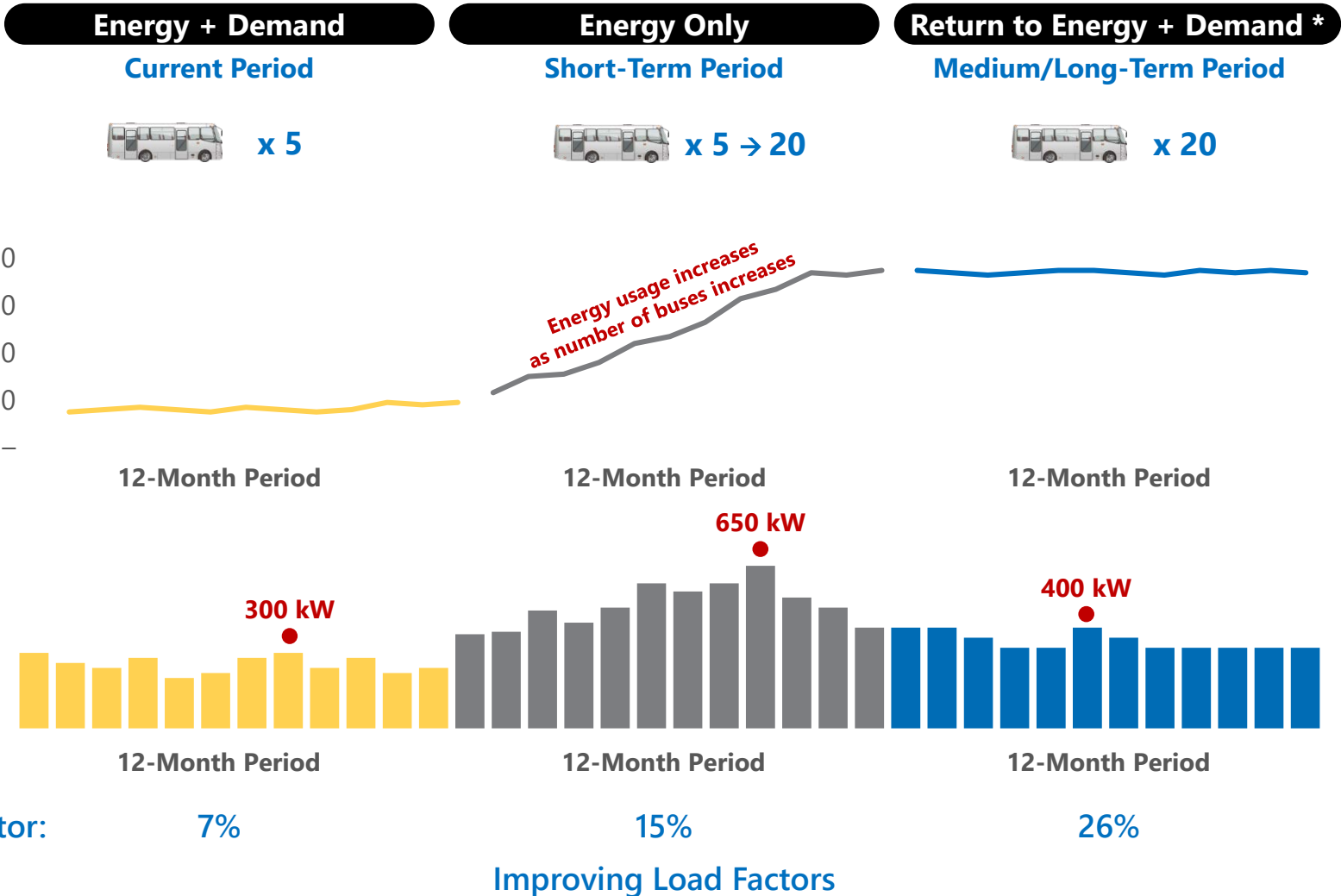
* The distribution grid component after the 10-yr period will reflect only ~60% (rather than 100%) of distribution costs, with the balance of distribution costs recovered through energy charges.

EV Rate Design Considerations

- **New TOU Periods to Send the Right Price Signals at the Right Times**
 - On-Peak period (4pm-9pm) that reflects new peak system conditions will help alleviate capacity constraints at the generation and distribution levels
 - Super-Off-Peak period (8am-4pm) in the winter months to encourage EV charging when renewable generation is high and net system demand is low
- **Load Management Plays a Key Role in Overall Benefit**
 - Gradually phasing in demand charges will allow customers to gain knowledge and experience regarding demand charges and load management
- **Rate Simplicity and Customer Understandability**
 - Rate design that does not require radical billing system changes
 - Rate design that accommodates customer transitions from discounted to regular rate structure w/o disrupting customer
 - Allows the customer to stay on same rate structure and only underlying rate will change
 - Greater customer understandability through the use of a rate structure that similar to the native load rate
- **Total Cost of Charging for Residential Customers**
 - Cost of energy, charging equipment, customer charges, and electrical work

Life Cycle Schematic of TE Rate Proposal

Illustrative



* Load management plays a part in the effective average rate.

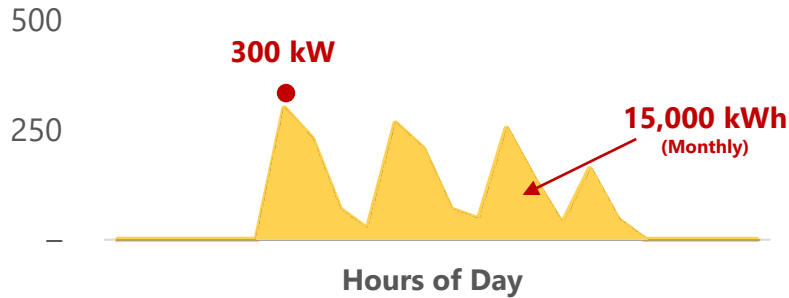
Rate Proposal

Illustrative

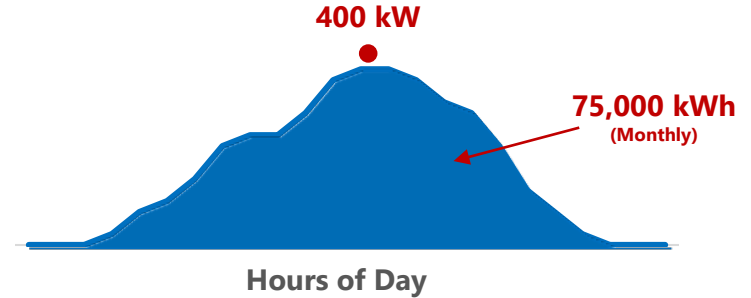
Sample Rates

	Short Term	Long Term (Cost Based)
Demand (\$/kW)	X	\$10.00
Energy (\$/kWh)	\$0.15	\$0.10

Early Deployment Stage



Full Deployment with Load Management



Monthly Bill

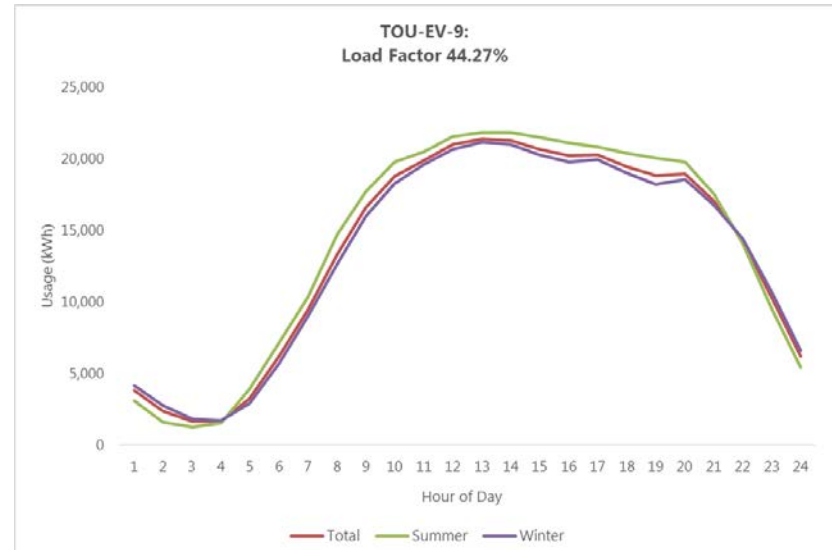
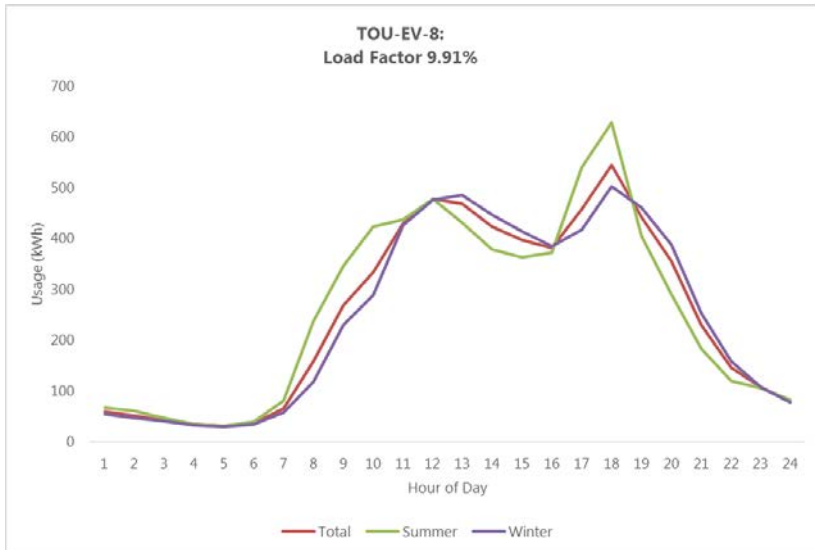
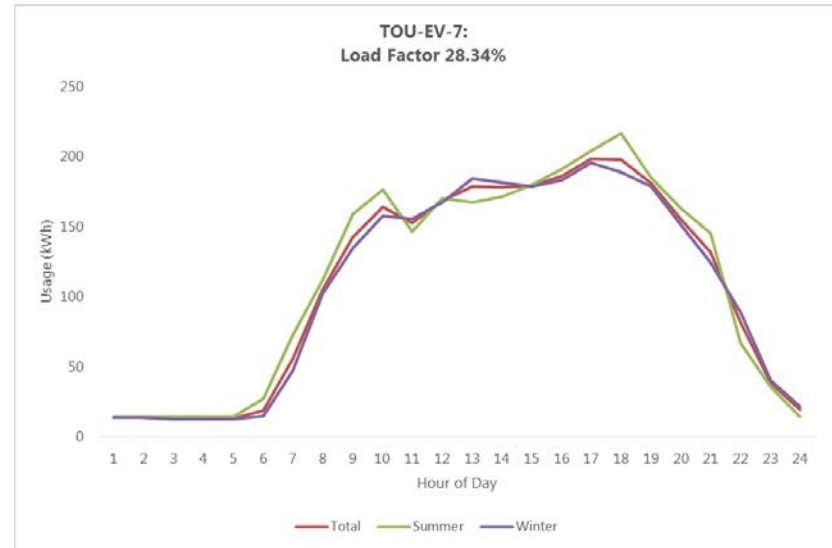
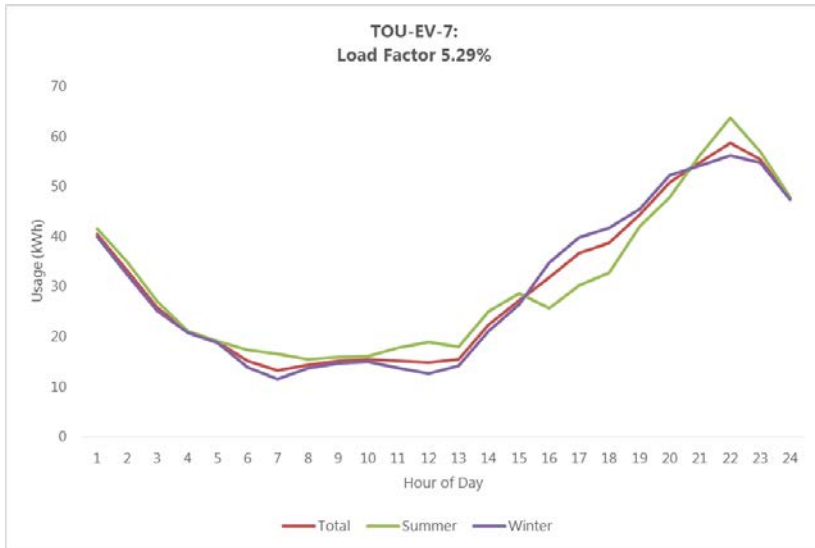
	Short Term	Long Term
Demand Charge	X	\$3,000
Energy Charge	\$2,250	\$1,500
	\$2,250	\$4,500

	Short Term	Long Term
Demand Charge	X	\$4,000
Energy Charge	\$11,250	\$7,500
	\$11,250	\$11,500

**50% Energy Bill Savings
on Short Term Energy Only Rate**

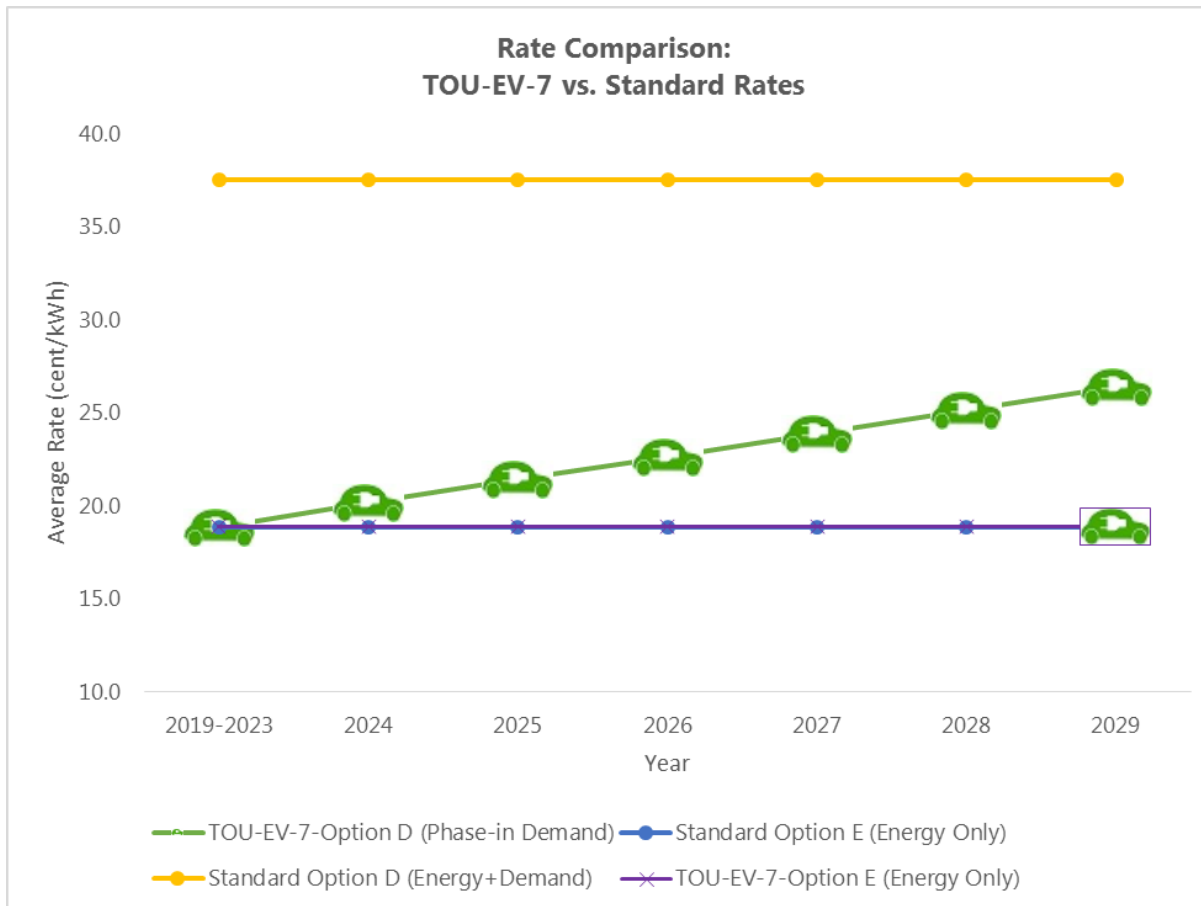
**Customer will be indifferent as higher
load factor (flatter load curve) is achieved**

Load Patterns



Average Rate Comparison

- Illustrative TOU-EV-7 vs. Standard Rates



- TOU-EV-7 offers two different rate options:
 - Option E (energy charges only for life)
 - Option D (energy + demand charges)
- Based on the current customer population, the TOU-EV-7 Option E and Standard Option E rates are indifferent.
 - Vast majority served on this rate are destination charging customers
- As charging moves to lowest cost period (super-off-peak and off-peak), the TOU-EV-7 Option E is expected to show an advantage.

Average Rate Comparison

- Illustrative TOU-EV-8/-9 vs. Standard Rates



- Based on the current population, a vast majority served on this rate are DC fast charging customers
- When compared to Standard Option E, TOU-EV-8 provides about a **30% bill savings in the 5-year introductory period w/o demand charges**, followed by an average bill savings of 17% in the subsequent years of the program.

- Based on the current population, a vast majority served on this rate are DC fast charging customers
- When compared to Standard Option D, TOU-EV-9 provides about a **24% bill savings in the 5-year introductory period w/o demand charges**, followed by an average bill savings of 19% in the subsequent years of the program.
 - Standard Option E limited to customers w/ qualifying technologies who meet sizing requirements*

* Available to DERs including storage; 250 MW customer participation cap for DER customers; customers' annual peak demands cannot exceed 5 MW

Appendix

Illustrative Rates: TOU-EV-7

TOU-EV-7							
Year	2019-2023	2024	2025	2026	2027	2028	2029+
<u>Energy Charge - ¢/kWh</u>							
Summer On-Peak	38.9	37.6	36.3	35.0	33.8	32.5	31.2
Mid-Peak	29.0	27.7	26.4	25.2	23.9	22.6	21.4
Off-Peak	14.0	13.8	13.6	13.4	13.1	12.9	12.7
Winter Mid-Peak	30.7	29.5	28.2	26.9	25.7	24.4	23.1
Off-Peak	13.3	13.1	12.9	12.6	12.4	12.2	12.0
Super-Off-Peak	8.1	8.1	8.1	8.0	8.0	7.9	7.9
<u>Customer Charge - \$/month</u>	\$11.00	\$11.00	\$11.00	\$11.00	\$11.00	\$11.00	\$11.00
<u>Facilities-Related Demand (FRD) - \$/kW</u>	\$0.00	\$0.90	\$1.79	\$2.69	\$3.58	\$4.48	\$5.37
% of Final FRD	0%	17%	33%	50%	67%	83%	100%
YOY Change	-	17%	17%	17%	17%	17%	17%

Illustrative Rates: TOU-EV-8

TOU-EV-8							
Year	2019-2023	2024	2025	2026	2027	2028	2029+
<u>Energy Charge - ¢/kWh</u>							
Summer On-Peak	46.3	44.9	43.6	42.3	41.1	39.8	37.5
Mid-Peak	25.2	23.8	22.5	21.3	20.0	18.7	16.5
Off-Peak	12.0	11.7	11.5	11.3	11.1	10.8	10.4
Winter Mid-Peak	28.9	27.4	26.1	24.9	23.6	22.4	20.1
Off-Peak	12.9	12.6	12.4	12.2	11.9	11.7	11.3
Super-Off-Peak	7.4	7.4	7.3	7.3	7.2	7.2	7.1
<u>Customer Charge - \$/month</u>	\$125.25	\$125.25	\$125.25	\$125.25	\$125.25	\$125.25	\$125.25
<u>Facilities-Related Demand (FRD) - \$/kW</u>	\$0.00	\$1.23	\$2.46	\$3.69	\$4.92	\$6.14	\$7.37
% of Final FRD	0%	17%	33%	50%	67%	83%	100%
YOY Change	-	17%	17%	17%	17%	17%	17%

Illustrative Rates: TOU-EV-9 (Secondary)

TOU-EV-9 (Secondary)							
Year	2019-2023	2024	2025	2026	2027	2028	2029+
<u>Energy Charge - ¢/kWh</u>							
Summer On-Peak	41.2	40.1	39.0	37.8	36.7	35.6	34.5
Mid-Peak	21.8	20.7	19.6	18.5	17.4	16.2	15.1
Off-Peak	10.2	10.1	9.9	9.7	9.5	9.4	9.2
Winter Mid-Peak	25.0	23.9	22.7	21.6	20.5	19.4	18.2
Off-Peak	10.7	10.6	10.4	10.2	10.0	9.9	9.7
Super-Off-Peak	6.7	6.6	6.6	6.5	6.5	6.5	6.4
<u>Customer Charge - \$/month</u>	\$450.75	\$450.75	\$450.75	\$450.75	\$450.75	\$450.75	\$450.75
<u>Facilities-Related Demand (FRD) - \$/kW</u>	\$0.00	\$1.38	\$2.77	\$4.15	\$5.54	\$6.92	\$8.30
% of Final FRD	0%	17%	33%	50%	67%	83%	100%
YOY Change	-	17%	17%	17%	17%	17%	17%

Illustrative Rates: TOU-EV-9 (Primary)

TOU-EV-9 (Primary)							
Year	2019-2023	2024	2025	2026	2027	2028	2029+
<u>Energy Charge - ¢/kWh</u>							
Summer On-Peak	38.0	37.0	36.0	35.0	34.0	33.0	32.0
Mid-Peak	19.8	18.8	17.8	16.8	15.8	14.8	13.8
Off-Peak	9.4	9.2	9.1	8.9	8.8	8.6	8.5
Winter Mid-Peak	22.8	21.8	20.8	19.8	18.8	17.8	16.8
Off-Peak	9.8	9.6	9.5	9.3	9.2	9.0	8.9
Super-Off-Peak	6.2	6.2	6.2	6.1	6.1	6.0	6.0
<u>Customer Charge - \$/month</u>	\$240.25	\$240.25	\$240.25	\$240.25	\$240.25	\$240.25	\$240.25
<u>Facilities-Related Demand (FRD) - \$/kW</u>	\$0.00	\$1.36	\$2.73	\$4.09	\$5.46	\$6.82	\$8.19
% of Final FRD	0%	17%	33%	50%	67%	83%	100%
YOY Change	-	17%	17%	17%	17%	17%	17%

Illustrative Rates: TOU-EV-9 (Subtransmission)

TOU-EV-9 (Subtransmission)							
Year	2019-2023	2024	2025	2026	2027	2028	2029+
<u>Energy Charge - ¢/kWh</u>							
Summer On-Peak	27.2	27.1	27.0	26.9	26.8	26.7	26.6
Mid-Peak	10.9	10.8	10.6	10.5	10.4	10.3	10.2
Off-Peak	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Winter Mid-Peak	14.0	13.9	13.8	13.7	13.6	13.5	13.4
Off-Peak	7.6	7.6	7.6	7.6	7.6	7.5	7.5
Super-Off-Peak	5.3	5.3	5.3	5.3	5.3	5.3	5.3
<u>Customer Charge - \$/month</u>	\$1,594.25	\$1,594.25	\$1,594.25	\$1,594.25	\$1,594.25	\$1,594.25	\$1,594.25
<u>Facilities-Related Demand (FRD) - \$/kW</u>	\$0.00	\$0.14	\$0.28	\$0.42	\$0.56	\$0.69	\$0.83
% of Final FRD	0%	17%	33%	50%	67%	83%	100%
YOY Change		17%	17%	17%	17%	17%	17%