

# **Electrifying the Downtown Denver Free MallRide Shuttle**

## Lessons Learned and the Path Forward

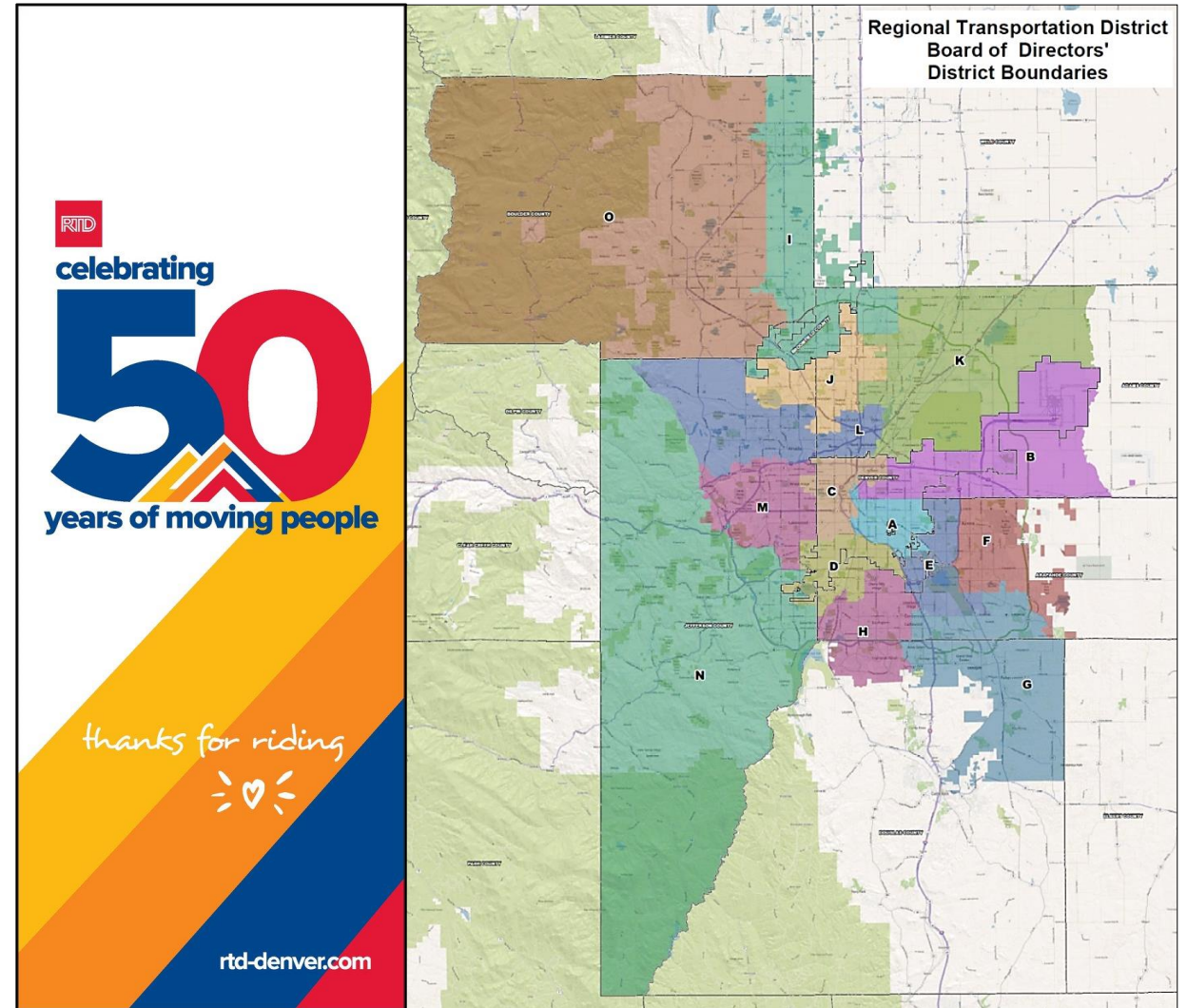
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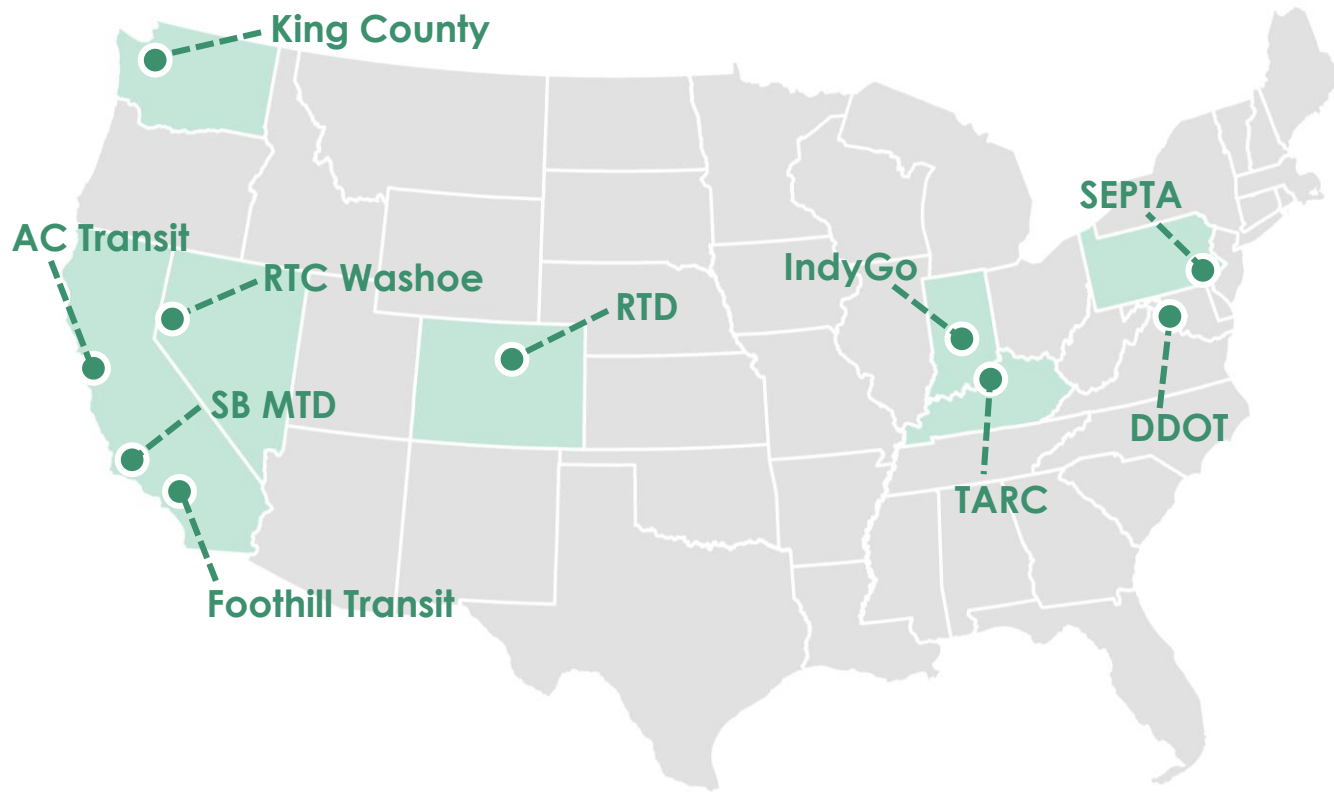


# RTD Context

- **Service Area**
  - Denver/Boulder Metro Area
  - 2,342 square miles
  - 2.92 million population
- **Ridership**
  - 98 million Annual Boardings
- **Transit Fleet**
  - 1,035 Buses
    - 36 Battery Electric Buses
  - 172 Light Rail Vehicles
  - 66 Commuter Rail Vehicles



# State of the Industry - Deployments



*\*Based on data from APTA's 2019 Public Transportation Vehicle Database, Active vehicles only included battery electric buses & hydrogen fuel cell buses that have been deployed and reported to APTA*

Transit Agency	City/State	Active Vehicles
RTD	Denver, CO	36
Foothill Transit	West Covina, CA	26
SEPTA	Philadelphia, PA	25
King County	Seattle, WA	23
IndyGo	Indianapolis, IN	21
TARC	Louisville, KY	15
DDOT	Washington DC	14
AC Transit	Oakland, CA	13
RTC Washoe	Reno, NV	13
Santa Barbara MTD	Santa Barbara, CA	13
Battery Electric Buses & Hydrogen Fuel Cell Buses in Operation		348

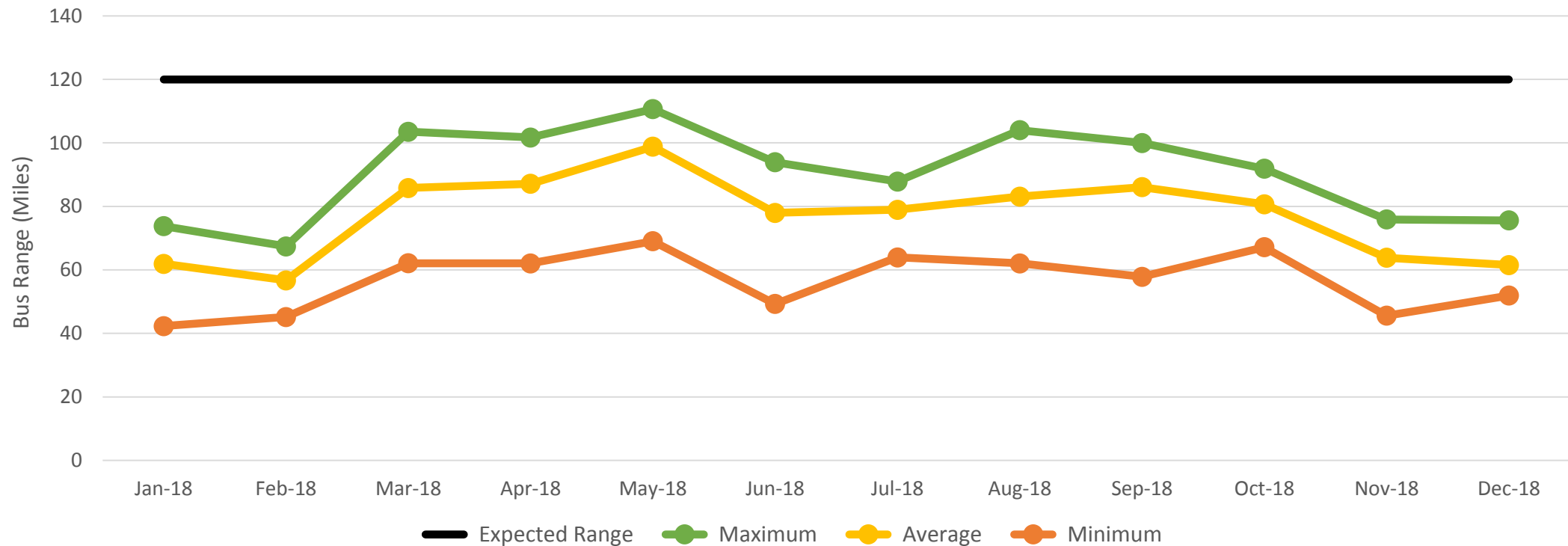
# RTD's Electric Bus Fleet

- 36 BYD Battery Electric Buses operate on the 16th Street Mall (1.4 miles)
- Free shuttle service known as "Free MallRide"
- MallRide runs 90-second headways during AM & PM peak periods
- Bus stops at every intersection
- Average weekday ridership: 44,000
- Charged overnight with 30 Depot Chargers (each 100 kW)



# RTD's Electric Bus Fleet - Range

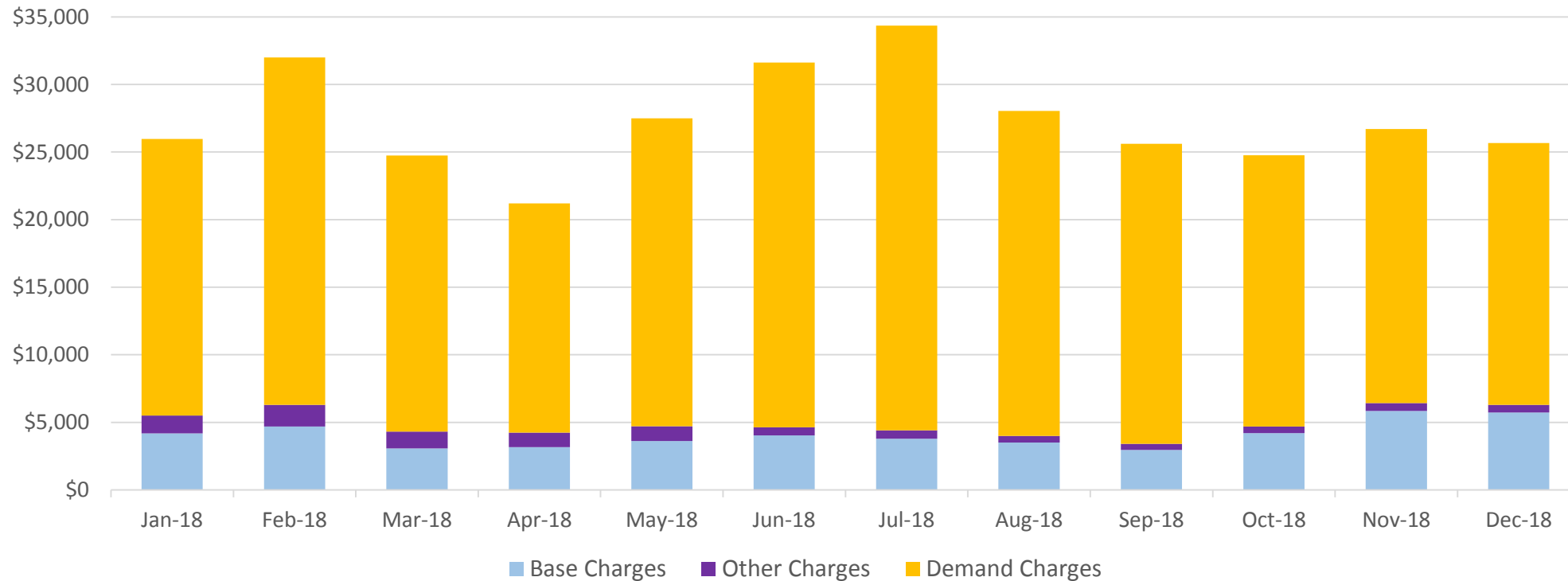
Range varies from 40 to 110 miles based on temperature/weather, passenger load, and driver behavior





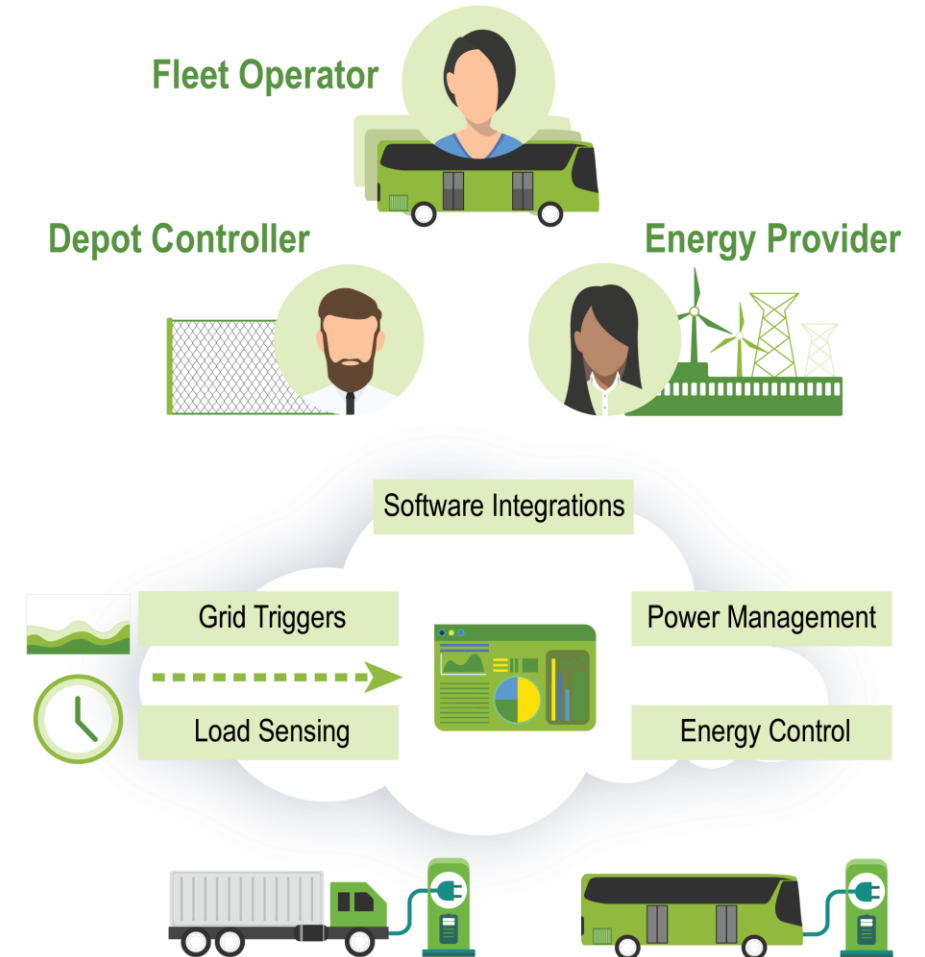
# Electricity Costs: Existing Condition

About 80% of RTD's monthly electric bill is from demand charges



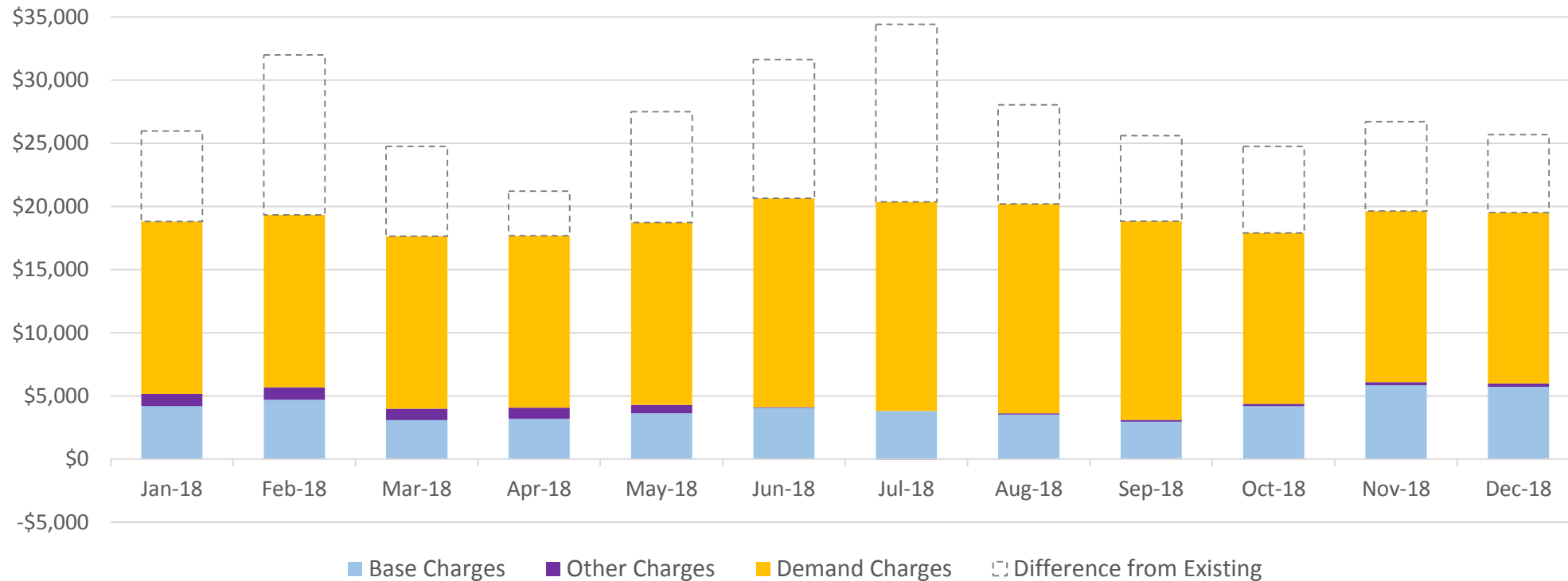
# Implementing Smart Charging

- RTD is implementing a Smart Charging System
- This system will balance energy usage, while ensuring that each bus is fully charged when it leaves the depot
  - Since each bus only takes 3-4 hours to charge, the system can minimize the number of buses charging at the same time
- This will help minimize RTD's demand charges



# Electricity Costs: Smart Charging

RTD could cut existing costs by an average of 30% by using a Smart Charging System





# Summary of Lessons Learned

- Infrastructure
  - Significant infrastructure improvements required
- Range
  - Lower range than expected due to heating in the winter and air conditioning in the summer
- Demand Charges
  - Higher electricity costs than expected due to demand charges



# External Stakeholder Working Groups

- Governor Polis aims to expand EV adoption in Colorado
  - First Executive Order – Support Transition to Zero Emission Vehicles
- Colorado Electric Vehicle Coalition (CEVC)
- Colorado Association of Transit Agencies (CASTA) Fleet Electrification Workshop
- Colorado Public Utilities Commission (PUC) Electric Vehicle Working Group
- Xcel Energy Colorado Transportation Electrification Workshops



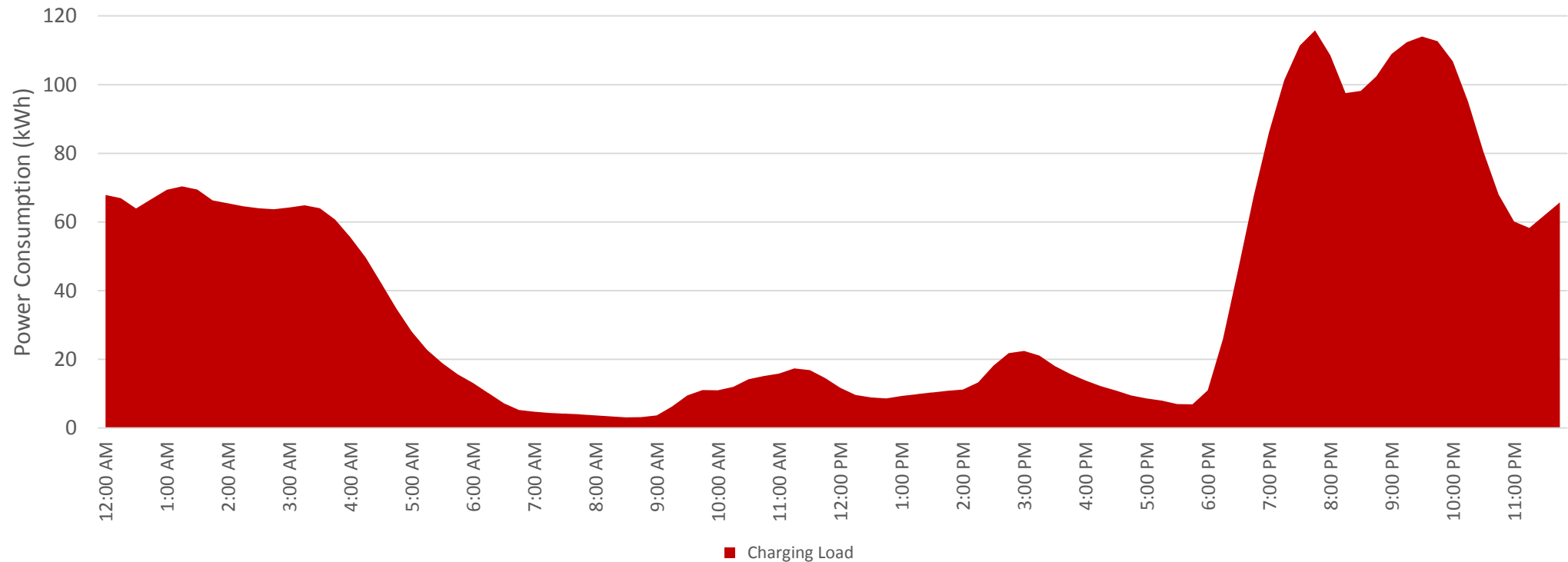
# PUC Hearing for Proposed Xcel EV Rate



- RTD is collaborating with our local utility Xcel Energy
  - RTD is currently one of Xcel's largest EV customers
- RTD has given feedback on Xcel's EV rate which is being evaluated by the Colorado Public Utilities Commission (PUC)
- This Time of Use (TOU) rate will decrease energy costs during the off-peak period for the grid (at night from 9 PM – 9 AM)
- RTD has requested and been accepted as an "intervener" in the PUC hearing

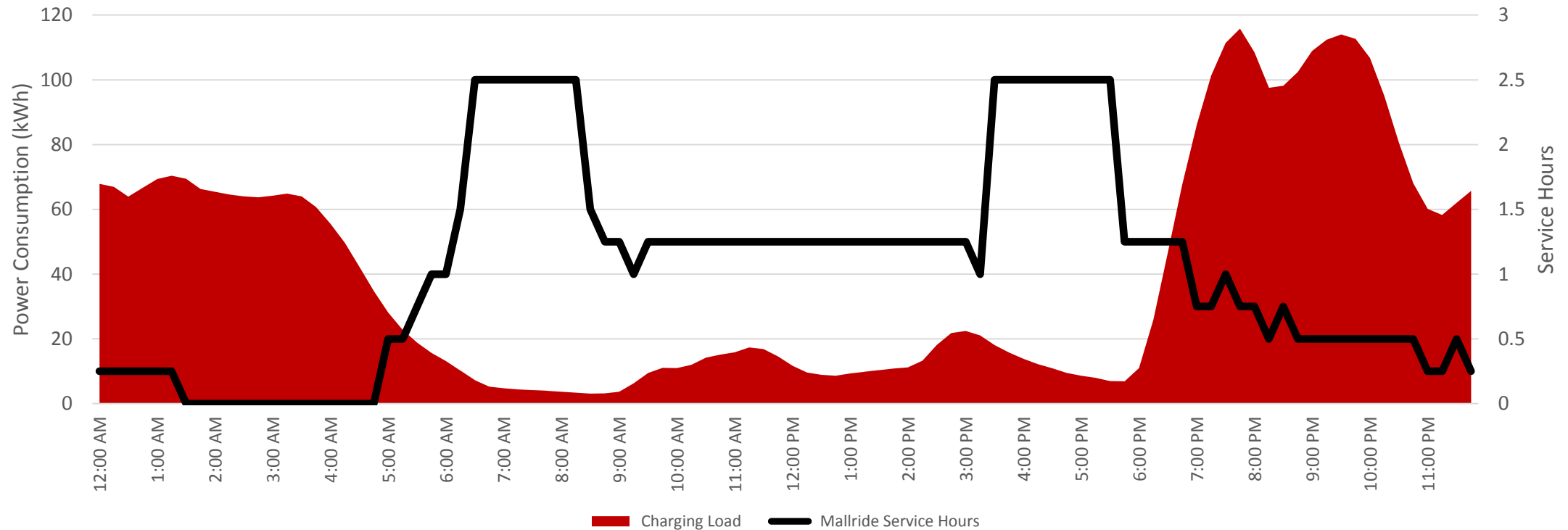
# RTD Electric Bus Charging Behavior

Although the new EV rate will lower costs, RTD will have to change existing charging behavior to completely minimize costs



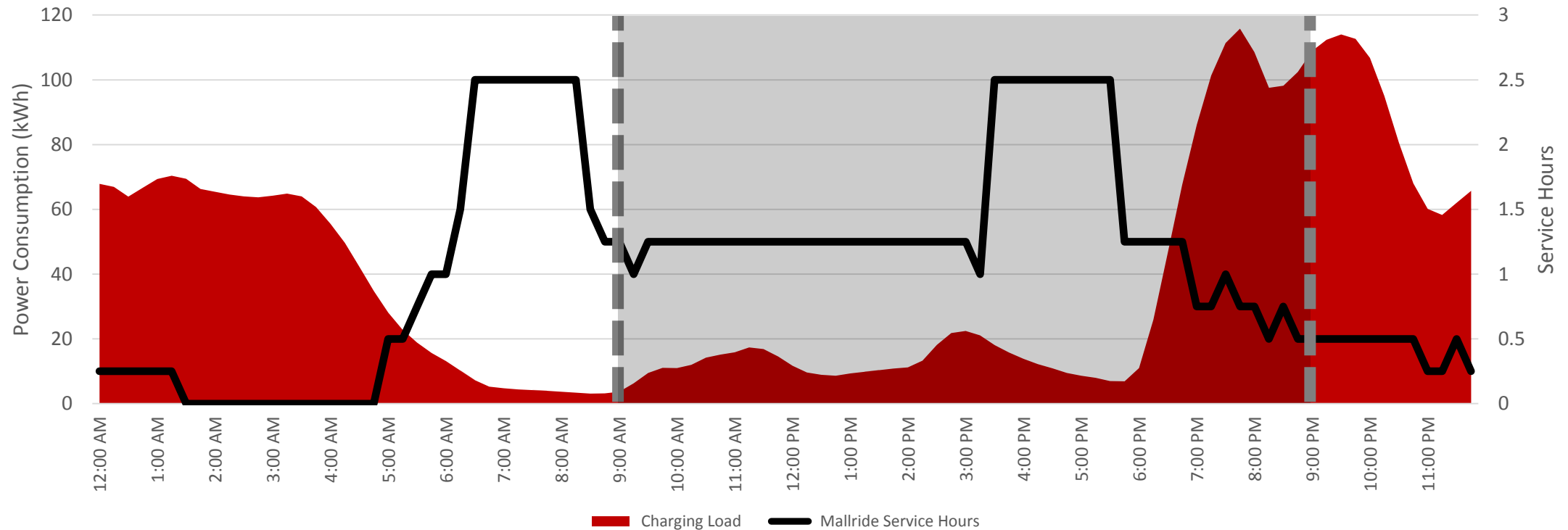
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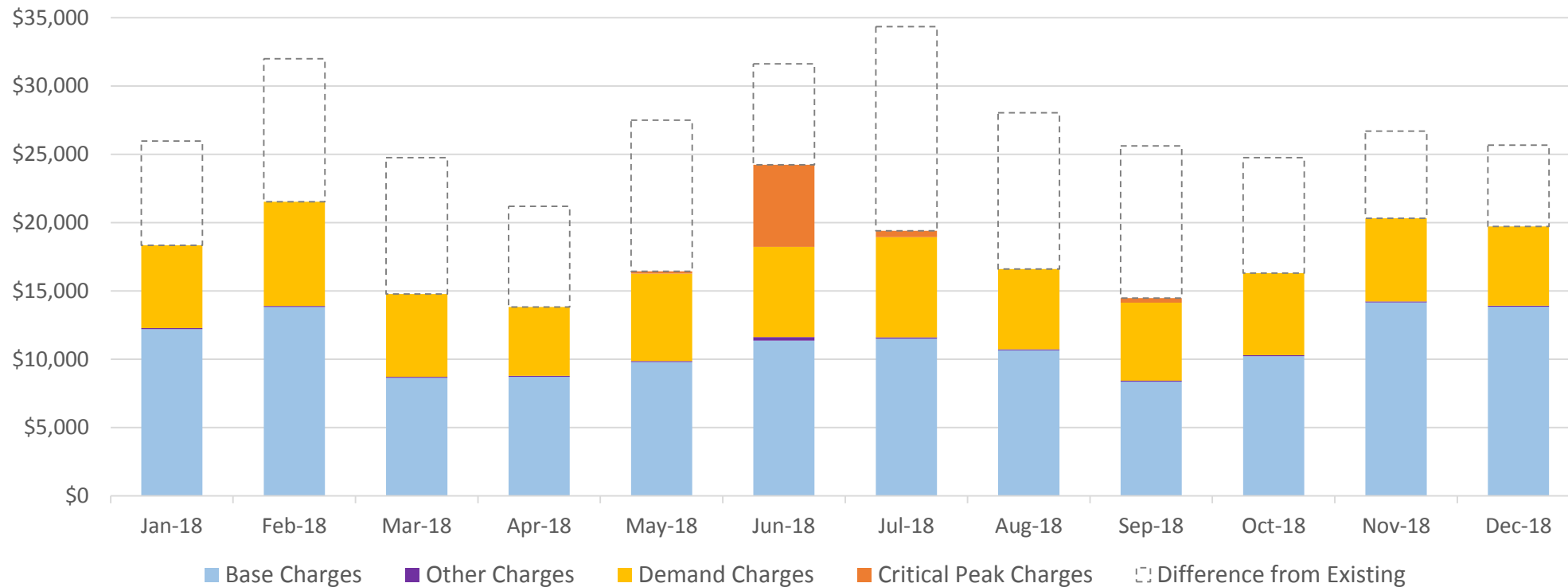
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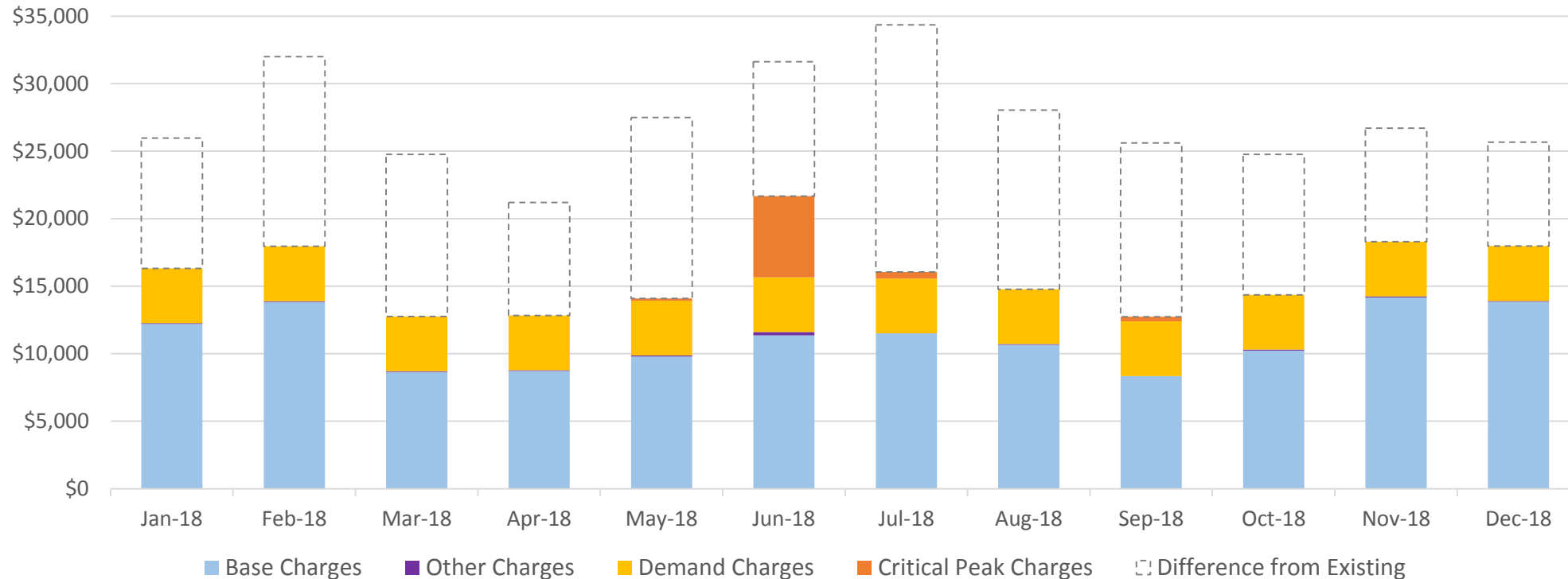
# Electricity Costs: Time of Use (TOU) Rate

RTD could cut existing costs by an average of 34% with a TOU Rate



# Electricity Costs: TOU + Smart Charging

With a TOU Rate & Smart Charging, RTD could save 42% per month on average



# Next Phase of RTD Fleet Electrification

- RTD will be purchasing 16-17 battery electric buses with grant funding assistance
  - FTA Low-No Grant: \$2.6 million
  - VW Settlement: \$8.5 million
- Buses will be deployed on a variety of fixed routes
  - Assess the effects of route characteristics on range
- RTD will study the feasibility of large-scale fleet electrification as part of the upcoming RTD Comprehensive Plan




# Internal Stakeholder Working Group



- RTD has formed an Internal Fleet Electrification Task Force
- This group discusses:
  - Challenges & solutions for our current fleet
  - Best practices & next steps for future deployments
- Brings together representatives from several departments
  - Operations, Planning, Engineering, Facilities, Asset Management, IT, Safety, Communications
- This variety of perspectives ensures that our agency is considering all aspects of each challenge and opportunity





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