Application 23-05-010
Exhibit No. Joint Truck OEMs-01
Witness: Diego Quevedo
Date: February 29, 2024

DIRECT TESTIMONY OF DIEGO QUEVEDO
ON BEHALF OF THE JOINT TRUCK OEMs

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1. Introduction

Q: Please state your name, position, and business address.

A: My name is Diego Quevedo. I am the Utilities Lead and Sr. Charging Infrastructure Engineer at Daimler Truck North America (DTNA) within the Zero-Emission Transformation Group at DTNA. My business address is 4747 N. Channel Ave., Portland, OR 97217.

Q: Briefly describe your present responsibilities at Daimler Truck North America.

A: I am the single point of contact for all electric utilities for DTNA. My responsibilities range from directly supporting customers and Freightliner dealers with their ongoing infrastructure deployments with their local electric utility to working directly with electric utilities to best enable them to support the zero-emission transition of the commercial transportation sector.

Q: Briefly describe your educational and professional background.

A: I graduated from Butler University and Purdue University (IUPUI campus) with Bachelor of Science degrees in Mathematics and Mechanical Engineering, respectively, in 2007. In 2013, I graduated from Northwestern University with a Master of Science, Product Design and Development Management degree. I have worked my entire 15+ year career in the medium- and heavy-duty transportation industry on issues ranging from diesel engine development to zero-emission vehicle infrastructure for the last 2.5

years. I am a regular speaker and panelist at various transportation electrification conferences like EEI's National Key Accounts workshop, NRECA's TechAdvantage, and NASEO's annual meeting. I am also a member of EPRI's EVs20Scale2030 advisory board.

Q: On whose behalf are you testifying?

A: I am testifying on behalf of the Joint Truck OEMs.

Q: Who are the Joint Truck OEMs?

A: The Joint Truck OEMs are Daimler Truck North America (DTNA), Volvo Group North America (Volvo Group), and Navistar Inc., some of the largest Original Equipment Manufacturers of medium- and heavy-duty (M/HD) vehicles in North America, representing 70% of the Class 8[1] market.[2] Together, the Joint Truck OEMs' product portfolios span numerous commercial vehicle applications including school and commercial buses, medium- and heavy-duty trucks, and tractors. Each company is offering and developing medium- and heavy-duty electric vehicles. With deployments scaling up and in anticipation of Megawatt Charging System (MCS) becoming standard in commercial vehicles, these vehicles will require dedicated direct current (DC) charging infrastructure at a scale that will require significant grid upgrades to provide

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[1] Class 8 trucks have a gross vehicle weight rating exceeding 33000 lb. Class 8 vehicles include the typical 5-axle tractor-trailer combination, also called a "semi" or "18-wheeler."
[2] https://www.nada.org/media/7122/download?inline

adequate capacity to support expected charging demand.[3]

1.1. Identify of DTNA

Q: Please describe DTNA.

A: DTNA is the largest producer of medium- and heavy-duty vehicles in North America and is fully committed to supporting the emerging zero-emission vehicle market. DTNA currently offers battery electric school buses, walk-in van chassis, medium-duty trucks, and heavy-duty tractors for sale under its Freightliner and Thomas Built Bus brands. Its fleet customers, many of whom operate in Southern California, have achieved more than three million miles of real-world driving experience with electric vehicles.

DTNA's eConsulting team has experience assisting a number of fleets undertaking electrification projects that require increased grid capacity build-outs (including in Southern California Edison's (SCE) service territory) and are participating in transportation electrification programs, such as SCE's Charge Ready Transport Program. DTNA is a partner in the Joint Electric Truck Scaling Initiative (JETSI).[4] In addition, the company has launched Greenlane™, a joint venture with NextEra Energy and BlackRock Climate Infrastructure, focused on public charging and refueling to help accelerate the deployment of infrastructure that meets the needs of medium- and

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[3] MCS is expected to operate up to 1250V and 3000A and is intended to support power demands from all heavy industry (M/HD vehicles, planes, trains, etc.); https://www.charin.global/technology/mcs/

[4] https://www.jetsiproject.com/

heavy-duty vehicles, with initial locations planned for Southern California, likely including sites in SCE's service territory.

1.2. Identity of the Volvo Group

Q: Please describe the Volvo Group.

A: The Volvo Group provides transport and infrastructure solutions, offering trucks, buses, construction equipment, power solutions for marine and industrial applications, financing and services that increase customers' uptime and productivity. The Volvo Group has spent years developing complete solutions for electromobility, and today in North America it sells five configurations of the Volvo VNR Electric truck, the Mack LR Electric waste hauler, the Mack MD Electric, five electric Volvo Construction Equipment models, and the Nova Bus LFSe+ electric bus. Both Class 8 (heavy-duty) truck models are assembled exclusively in the U.S. for the North American market.

Within the Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project in California, the Volvo Group has successfully demonstrated the viability of battery electric Class 8 trucks in real-world applications, putting 30 battery electric Class 8 trucks in commercial operations across 11 different fleets.

The Volvo Group was the first traditional truck manufacturer to sell battery electric Class 8 trucks to customers and one of the market leaders in the battery electric Class 8 truck market today.

1.3. Identity of Navistar Inc.

Q: Please describe Navistar Inc.

A: Navistar Inc. ("Navistar") is a leading commercial vehicle manufacturer. Headquartered in Lisle, Illinois, it is the manufacturer of International branded commercial trucks, proprietary diesel engines, and IC Bus branded school and commercial buses. Navistar has approximately 15,000 employees worldwide and is a subsidiary of TRATON SE, the parent and holding company of the TRATON GROUP and one of the world's leading commercial vehicle manufacturers.

Navistar has been in the vehicle manufacturing business since the beginning of the motor vehicle age. Founded in 1831, Navistar initially made agricultural equipment, then motorized farm equipment, then added trucks and buses, and then fully transitioned to trucks and buses after 1986. It is the market leader in school buses and ranks highly in the medium- to heavy-duty truck markets. Navistar currently offers commercially available battery electric medium-duty trucks and school buses, and is committed to accelerating the impact of sustainable mobility depending on the availability of charging infrastructure. Navistar has the largest dealer network in the nation, including a number of independently owned truck and bus dealerships within the Southern California region that sell electric and diesel truck and bus products.

In 2022 the Moreno Valley Unified School District approved a project to deploy 42 IC Bus electric school buses and electric vehicle (EV) charging infrastructure to support the new fleet. This represents what will be the largest electric school bus fleet in the state.

These buses will serve more than 31,000 students from 42 schools in this Southern California community, situated east of Los Angeles in Riverside County. The new electric buses will reduce more than 1.2 million pounds in carbon emissions across the Moreno Valley. The school district expects 75% cost savings on bus maintenance, fuel and operations, allowing more funding to go to classrooms.

Within the transport sector, the medium- and heavy-duty truck industry accounts for a significant percentage of total emissions. Navistar aims to bend the curve on decarbonization by driving change to advance sustainable solutions and accelerate the impact of sustainable mobility. Navistar is investing heavily in digitalization and zero-emissions product development to create new business models that benefit our customers. As part of the TRATON GROUP, Navistar is leveraging global partnerships and resources to accelerate progress on technologies that anticipate and help manage the demands of more sustainable transportation solutions.

1.4. The Joint Truck OEMs' Interest

Q: What is the Joint Truck OEMs' interest in this proceeding?

A: The Joint Truck OEMs are very concerned that the existing electric grid might not be adequate to support the charging stations that will be needed to supply the growth in electric medium- and heavy-duty vehicles required to meet the state's ambitious climate goals. The Joint Truck OEMs have an interest in this proceeding because SCE seeks authority to make investments to support grid readiness for electric commercial vehicles and to support the expected load growth generated by the widespread transportation electrification necessary to further the goals of decarbonization and enable compliance with the Advanced Clean Trucks and Advanced Clean Fleets regulations adopted by the California Air Resources Board (CARB). The Commission's approval of SCE's request to upgrade the grid to support the charging of electric M/HD vehicles is critical to ensuring that the utility has sufficient grid capacity to support the charging stations needed to fuel the deployment of medium- and heavy-duty commercial zero-emission vehicles.

Q: Why are grid infrastructure upgrades needed to support the growth of electric M/HD vehicles?

A: Medium- and heavy-duty vehicles require significantly more energy to charge than passenger cars due to the higher vehicle weights, larger on-board battery sizes (500 kWh as compared to 75-100 kWh for Battery-Electric Vehicle (BEV) passenger cars), and increased utilization as measured by daily vehicle miles traveled (VMT). Unlike passenger cars, most medium- and heavy-duty commercial vehicles require DC Fast Charging, with 50 kW as a basic charging speed, and many use cases require far greater charging speeds. Furthermore, charging at these power levels is expected to require much longer times than for light-duty vehicles, so the charging stations need to be designed with significantly higher charging levels for extended durations.

Additionally, many medium- and heavy-duty vehicle models do not have onboard alternating current (AC) charging, meaning they cannot charge from a 110V wall socket like light-duty passenger vehicles. A semi tractor with a 500 kWh battery charging from a 110V or 220V single phase connection would take over a week to fully charge on 110V and over 56 hours on 220V.

Commercial vehicles are disproportionally located in concentrated urban areas, creating localized grid capacity needs in constrained spaces. Based on the Joint Truck OEMs' collective experience, it is common for commercial vehicle depots to require 2 to 5 MW of capacity to support today's deployments, and many depots are clustered together in constrained spaces on the same or neighboring distribution feeder(s).

For example, the JETSI project in SCE's service territory is designed for 4800 kW (or 4.8 MW) of load with 50 electric trucks. Existing distribution feeders along depot boundaries cannot serve load additions of this size, requiring new distribution feeder capacity, and in some cases, substation transformer capacity additions that can take 2-5 years or more to plan and construct.

Based on available data, the Joint Truck OEMs estimate approximately 288 electric Class 8 tractors have been registered in SCE service area since 2018[5]. The Joint Truck OEMs have been involved in providing electric trucks to dozens of fleets in the SCE service area, and some of these fleet customers have also participated in SCE's Charge Ready Transport programs. All three OEMs also provide infrastructure advisory services to fleets, and have observed a number of fleets that, in spite of a genuine interest in decarbonizing their fleets, ultimately decided to defer or cancel their plans to acquire

[5] https://www.spglobal.com/mobility/en/products/polk-automotive-solutions.html

zero-emission electric trucks due to uncertainties about SCE's ability to provide a firm energization date for needed grid capacity to operate the direct current fast charging (DCFC) chargers for these electric trucks.

2. Summary of Recommendations

Q: Please summarize your recommendations and conclusions.

A: SCE has undertaken a thorough consideration of medium- and heavy-duty vehicle electrification needs and made load forecasting improvements as described in its testimony to capture the impacts of M/HD vehicles. SCE's proposed transportation electrification upgrades are consistent with the state's climate and air quality goals and warrant the Commission's approval.

However, we remain concerned SCE has not included enough capacity to fully support the state's transportation electrification projections for 2030 and beyond, primarily 2035. SCE's grid is challenged today to provide service to new loads, as it currently operates at relative high capacity levels; new capacity additions, especially at but not limited to A-bank substations, are needed to meet the anticipated charging loads for 2030 and 2035 regulatory requirements. These additions typically require 10-12 year lead times and while some A-bank projects are included in SCE's proposed budget, additional capacity additions are needed to serve the vehicle volumes required under CARB's regulatory requirements by 2035 . These larger capacity addition projects will require all of the 10-12 years of lead time, and 2035 is only 10 years in the future from this test year. These projects aimed to meet 2035 regulatory requirements cannot be found in SCE's proposed budget for either the 2025 test year or the 2025-28 rate case cycle. This is a significant omission from the perspective of the Joint Truck OEMs.

Furthermore, we make the following recommendations:

- The Commission should consider CARB's regulatory actions and vehicle projections to be "investment grade" proof of need, and approve SCE's proposed capacity additions to serve the increased demand associated with these vehicle forecasts.
- SCE should update the Transportation Electrification Grid Readiness (TEGR) forecast to more accurately reflect the high-energy usage of the drayage vehicles forecasted to operate in its service territory, especially during the rate case cycle years leading towards 2030.
- The Commission should approve SCE's proposal for innovative short-term bridge solutions to address near-term gaps.

3. Significant Grid Upgrades Are Needed to Support the Electrification of Medium- and Heavy-Duty Vehicles

3.1 Key Factors Affecting Grid Upgrades Needed to Support Charging Stations

Q: How many commercial electric vehicles are impacted by CARB's regulatory requirements?

A: CARB has instituted two key M/HD vehicle regulations in the Advanced Clean Truck (ACT) and Advanced Clean Fleets (ACF) rules. Combined, they portray a statewide forecast of the number of different types of electric vehicles. SCE has taken thoughtful steps to include the vehicle forecast as a basis of its rate case proposal; however, there are specific vehicle characteristics that merit some further elaboration. In total, CARB projects 518,000 Class 2b through 8 vehicles will be affected by the operational requirements under the ACF, as shown in Figure 3 below.

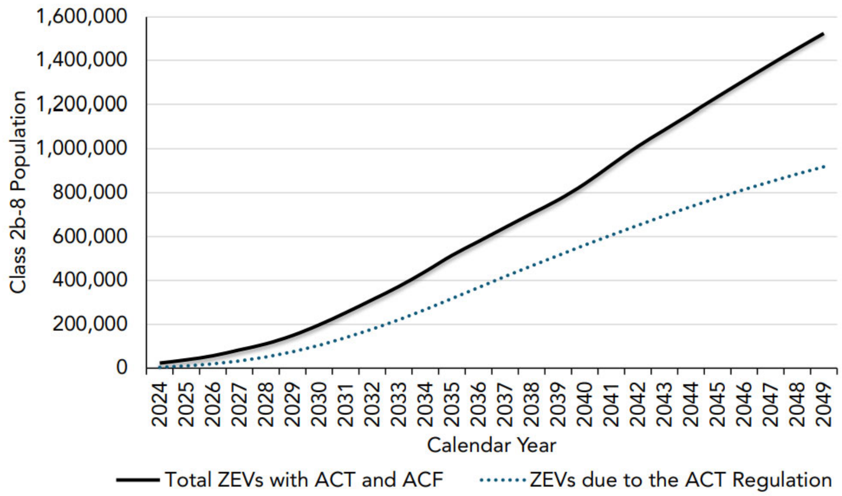
Figure 3. CARB's Breakdown of Vehicles Affected by ACF[6]

Vehicle Group	Number of State and Local Government Vehicles	Number of Drayage Vehicles	Number of High Priority and Federal Vehicles	Number of Vehicles Subject to ACF Fleet Requirements
Class 2b-3	75,000	0	72,000	147,000
Class 4-8 Vocational	64,000	0	170,000	234,000
Class 7-8 Tractor	0	29,000	108,000	137,000
Total	139,000	29,000	350,000	518,000

Additional zero-emission vehicle (ZEV) volumes will be driven by the 100% ZEV sales mandate implemented in 2036, which the Joint Truck OEMs estimate will add approximately 58,600 new Class 3 through 8 ZEVs to California's fleet annually from 2036 onward. CARB projects the ZEV volumes driven by ACF will exceed the ACT-mandated sales volumes, as shown in Figure 4, so we focus primarily on ACF forecasts for purposes of this testimony.

[6] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf

Figure 4. CARB's Statewide ZEV Forecast



Q: Aren't CARB's regulatory compliance targets (particularly the number of zero-emission vehicles) aspirational?

A: No, CARB's compliance requirements are concrete regulatory requirements that must be met by regulated entities such as OEMs (ACT) and fleets (ACF). The Joint Truck OEMs strongly encourage the Commission to treat CARB's ACT and ACF vehicle projections as "investment grade" proof-of-need forecasts. Each electric utility should forecast the likely pro-rata number of vehicles to either be based in and/or transit through its service area and build sufficient grid capacity to serve the resulting charging loads.

Q: Is there federal action that will support increased ZEV deployment?

A: Yes. In addition to the State's goals and regulations, President Biden has committed the United States to the Global Commercial Vehicle Drive to Zero. This Memorandum of

Understanding calls for 100% of new medium- and heavy-duty vehicles sold in 2040 to be zero emission, with an interim target of 30% by 2030 [7]. The US Environmental Protection Agency (EPA) has also published its draft proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3[8]. Figure 5 below summarizes EPA's proposed ZEV adoption rates. EPA's proposal would lead to approximately 1.4 million ZEVs added to the US commercial vehicle fleet through 2032.

Figure 5. EPA's Proposed GHG Phase 3 ZEV Technology Adoption Rates

	MY 2027 (%)	MY 2028 (%)	MY 2029 (%)	MY 2030 (%)	MY 2031 (%)	MY 2032 and later (%)
Proposal						
Vocational	20	25	30	35	40	50
Short-Haul Tractors	10	12	15	20	30	35
Long-Haul Tractors	0	0	0	10	20	25
Alternative						
Vocational	14	20	25	30	35	40
Short-Haul Tractors	5	8	10	15	20	25
Long-Haul Tractors	0	0	0	10	15	20

As vehicles routinely cross state lines, especially long-haul tractors, California could see ZEV operations exceed the ZEV volumes projected under ACT and ACF. EPA's final rule is expected to be published in Spring 2024. These regulatory actions demonstrate sufficient proof of need to spur increased investments in distribution upgrades to support the electrification of commercial transportation.

[7] https://globaldrivetozero.org/mou-nations/
[8] 2023-07955.pdf (govinfo.gov)

Q: Which comes first, electric trucks or grid infrastructure?

A: Grid infrastructure must come first. This is simply because it takes significantly longer to energize a site than to receive a truck. Trucks can be manufactured by OEMs and delivered approximately six months after receiving an order[9]. Fleets won't order trucks if they lack the confidence the utility grid infrastructure will be built and energized when the trucks are delivered. Utility grid capacity additions are taking anywhere from 7-10 years to plan, design, budget, construct and energize. Fleets need the confidence in, and assurances from, SCE that the needed distribution grid infrastructure will be available (planned, built, and energized) prior to electric trucks being delivered to the depot site. Otherwise, electric trucks become expensive stranded assets that are unable to charge and do the work for which they were purchased.

SCE's witness Eric Takayesu testified that meeting future utility customer needs in an increasingly carbon-free power system requires a reliable, resilient and ready grid.[10] The Joint Truck OEMs are particularly interested in the last item - a grid that is ready to power charging stations when fleets make the decision to switch to electricity as their fuel, and not have the interconnection or the Charge-Ready Transport program application be the initiating action item for the utility to start planning to meet that load.

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[9] https://www.freightwaves.com/news/new-class-8-truck-deliveries-fall-for-4-consecutive-months
[10] Exh. SCE-02 Vol.01 Pt. 01, page 2, lines 16-17.

3.2 The Need for Distribution Infrastructure Upgrades

Q: What are the consequences of distribution infrastructure lagging behind the zero emission vehicle deployment volumes required under the ACT rule?

A: Without upgrades to the grid infrastructure, utilities will be unable to support charging stations needed to fuel the increasing numbers of electric M/HD vehicles. Commercial vehicles are the backbone of the goods movement sector and are integral to the national economy and national security. Supply chain disruptions such as truck shortages can hinder essential goods from reaching consumers.

If the California truck market cannot absorb the required ACT ZEV percentages due to the unavailability of affordable charging infrastructure, truck manufacturers may have to comply by reducing sales of conventionally fueled product to maintain the mandated ZEV sales percentage. These volume reductions would have significant impacts on the Joint Truck OEMs, our in-state dealerships, and businesses in California serving the commercial vehicle industry, such as body builders and specialized equipment manufacturers. If a manufacturer is found to be non-compliant with the ACT, it could be subject to California Health and Safety Code section 43212 civil penalties, which in 2023 carried a maximum penalty of $45,563 per vehicle[11].

This possible reduction in total California commercial vehicle availability would have ripple effects across both the public and private sectors that rely on commercial vehicles

[11] https://ww2.arb.ca.gov/sites/default/files/2023-02/2023_Memo_Directing_Staff_to_Reference_Adjusted_Maximum_Penalties.pdf

in California. If public agencies and private companies are unable to source new conventionally fueled vehicles, or obtain timely ZEV infrastructure energization, they may be unable to serve their communities and customers, or be required to extend the life of older, higher-emitting vehicles. Critically, without adequate charging infrastructure in place, the state would be unable to realize the benefits anticipated by the Regulatory Action outlined by CARB Staff in the Initial Statement of Reasons (Section V) for the ACT Regulation[12].

Q: How will inadequate infrastructure affect commercial customers' decision on transportation electrification?

A: For commercial fleets, particularly those operating the heavier-duty Class 6-8 vehicles, the lack of adequate utility infrastructure can result in limited charging points and prolonged charging times. 50 kW charging is the absolute floor of charging power levels for these vehicles and M/HD vehicles able to charge at higher power levels (such as 750 kW or MCS) are expected to become commercially available in this rate case cycle (2025-28). Supporting M/HD charging deployments will require circuit and substation upgrades, as well as new transformers where warehouses and depots are concentrated. Insufficient power supply or outdated infrastructure to support DC Fast Charging can slow down charging processes, affecting the efficiency and productivity of commercial BEVs. Businesses rely on quick turnaround times for their vehicles to maintain operational efficiency, and a slow charging infrastructure where a truck with a

[12] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/isor.pdf

load has to wait for charging to be completed worsens vehicle economics and discourages adoption.

Additionally, the cost and time associated with upgrading utility infrastructure can pose a significant financial burden for fleets considering the switch to electric. Investments in charging stations and grid enhancements are necessary but cost and long lead-times can be prohibitive, creating a barrier to companies otherwise interested in embracing commercial BEVs.

Q: Are the impacts from transportation electrification from light-duty vehicles (LDV) different from what can be expected from medium- and heavy-duty vehicles?

A: Yes, LDV TE is fundamentally different than M/HD TE[13]. The former tends to be spread throughout the utility's service area, while the latter tends to be far more likely to occur on a localized basis where fleet operations are concentrated.

Second, while LDVs are known to be stationary (parked) up to 95% of the time, that is not the case with M/HD vehicles acquired by fleets to run business operations and meet contractual obligations to their customers. For these fleets, keeping these vehicles in operations is a must, and while charging times and amounts can be managed, they are part of an overall fleet management system where vehicle dispatches to deliver freight or perform specific duties may dictate charging to occur throughout the day to meet

[13]Exhibit SCE-02 Volume 07, page 21, lines 1-13.

overall business requirements - paraphrasing a common freight industry saying, “if the wheels aren’t turning, fleets aren’t earning”.

3.3 Upgrades to Infrastructure Are Key to a Successful Transformation of the Transportation Industry

Q: What is the relationship between infrastructure investments and the State’s carbon reduction goals?

A: The successful transition to ZEV transportation will require a three-part “transformation equation”:

Successful Transformation = Vehicle Technology x Cost Parity x Infrastructure

In this multiplication equation, the scale of the transformation is limited by any of the three factors.

Q: What is the status of the vehicle technology factor?

A: Battery electric vehicle technology has advanced quickly and the Joint Truck OEMs have BEVs available for select applications for sale today, including Freightliner’s eCascadia, eM2, and MT50e, International’s eMV and CE school bus, Mack’s LR Electric and MD Electric, Thomas Built Bus’s C2 Jouley, and Volvo’s VNR electric. In addition to investing billions of dollars to support the ZEV transition across product development and scaled production capacity, the manufacturers are also supporting infrastructure deployment. Highlighted initiatives include:

- Greenlane – $650M Joint Venture between Daimler Truck, NextEra Energy Resources and BlackRock Climate Infrastructure to design, develop, install and operate a high performance nationwide US charging network for medium- and heavy-duty ZEVs.[14]
- Powering America's Commercial Transportation (PACT) – The Joint Truck OEMs have founded a new trade association to bring together stakeholders to collaborate, educate, and shape policies that affect the timely build-out of ZEV infrastructure at scale.[15]

Q: What is cost parity and what is its status?

A: "Cost parity" refers to the total cost to operate a conventional internal combustion vehicle compared to a ZEV, and for commercial fleets, these costs include a number of variables including vehicle purchase, maintenance and refueling costs, and available incentives.

Currently, there is not cost parity between BEVs and conventional internal combustion engine (ICE) vehicles; BEVs are more expensive. While there is expected to be long-term operational cost savings when infrastructure is built out, the current upfront capital

[14] https://northamerica.daimlertruck.com/PressDetail/introducing-greenlane-daimler-truck-north-america-2023-04-27/
[15] https://www.pactcoalition.org/

cost of BEVs is too significant to reach parity. State and federal incentive programs exist to help fleets narrow the gap towards cost parity, including tax credits available under the Inflation Reduction Act, and incentive programs including California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE), and the Low-Carbon Fuel Standard (LCFS). Cost parity is expected to be achieved in future years but that is largely dependent on economies of scale, battery costs and efficient deployment of utility and charging infrastructure.

Q: What is the status of the infrastructure needed to support the transformation to BEVs?

A: While adequate infrastructure is a key pillar of the State of California's support for transportation electrification, its factor in the transformation equation remains effectively zero, with long lead times for distribution system upgrades threatening to jeopardize the transition in both the near- and long-term. The rapid adoption of commercial ZEVs envisioned by the California Zero-Emission Vehicle Market Development Strategy[16] is hindered by inadequate utility infrastructure. The development of adequate infrastructure will play a pivotal role in the widespread acceptance of BEVs, especially for commercial M/HD fleets.

[16] https://business.ca.gov/wp-content/uploads/2021/02/ZEV_Strategy_Feb2021.pdf

Q: What is your assessment of the current state of the "transformation equation"?

A: Inadequate utility infrastructure creates substantial barriers for the adoption of commercial M/HD electric vehicles, impacting range confidence and charging speeds, and imposing financial challenges on businesses aiming to make the transition to a more sustainable transportation model. In this proceeding, the Commission can take tangible and substantial steps to strengthen the third part of this transformation equation and enable the state, and SCE's commercial customers to meet its carbon reduction goals.

4. Responses to SCE's Proposals and Testimony

Q: Do you concur with Mr. Takayesu's testimony summarizing California's rapid, economy-wide policies promoting accelerated decarbonization, resulting in driving a significant shift in electricity consumption and grid operations?

A: Yes. Load growth in this rate case cycle (2025-2028) is likely to be robust, and far greater than historic load growth rates experienced in the past several decades. The "just-in-time" approach of adding distribution grid capacity to meet increased electricity use in recent years will need to be amended. Mr. Takayesu notes utility infrastructure upgrades historically have taken an average of 7-10 years to plan, design, license/permit, and construct. When load increases were associated with new developments comprising mostly of buildings, that timeline could be accommodated, but for upgrades needed for transportation electrification, “the timeline surrounding adoption and interconnection is significantly shortened.”   We agree. Joint Truck OEMs, for example, can generally deliver a custom Class 6-8 electric truck within 6 months of receiving an order.

Q: What is TEGR?

A: The Transportation Electrification Grid Readiness forecast (TEGR) is a supplemental load-modifier approach utilized in SCE’s analysis to capture the incremental transportation electrification load, and is additive to the base load forecasts prepared by the utility using standard load forecasting methodologies. SCE’s TEGR considers the state’s regulatory actions, including the adoption of the Advanced Clean Fleets regulation, which was not in effect at the time of the California Energy Commission’s (CEC’s) Integrated Energy Policy Report (IEPR) 2022 forecast.

Q: Is the TEGR approach to forecasting future M/HD transportation electrification loads reasonable?

A: Yes, the TEGR is a prudent overall approach to forecast future charging loads, particularly for medium- and heavy-duty zero-emission vehicles. Incorporating vehicle telematics data (movements, start/stop locations, travel distances, stop durations, etc.) is a more accurate approach to forecasting M/HD charging loads, capturing factors that were never considered in traditional distribution load forecasting methodology, which relied mostly on trending or extrapolating 3-5 year historic load growth rates into the future, and adjusting for known load losses and load additions.   Since transportation electrification loads are new and are not contained in the historical load data, the traditional methodology cannot quantify future loads from M/HD vehicle electrification.

Q: Are there other factors that merit inclusion in the TEGR forecast?

A: The TEGR forecast had to be prepared early in the GRC preparation process, and new developments have occurred in the meantime. In order to improve the TEGR forecast, we recommend SCE include a further breakdown of the M/HD vehicle forecast by Vehicle Class (for example, Class 6, 7 and 8) and specific use cases for each class (for example, drayage, regional deliveries, long-haul). While SCE has made some references to updating their TEGR load forecast in response to a one party's data request, the timing of when such an update will occur is not clear.

This granularity will allow for specific assumptions on key parameters such as daily VMT, days of operation annually, and electricity usage per mile for that particular use case for that vehicle class.

The key load forecasting equation for M/HD vehicles is:

Electricity Use = Number of Vehicles x Daily VMT x Days of Operation Annually x Electricity Use (per mile)

Q: Do you agree with the number of M/HD ZEVs SCE is forecasting in California?

A: We generally support the number of M/HD vehicles SCE has forecasted in the TEGR analysis. Mr. Esguerra's testimony (Exh. SCE-02 Vol. 7, p. 21 (Figure II-9)) highlights the need for the TEGR to account for the additional ZEV volumes driven by regulatory actions that were not in effect at the time the 2022 IEPR forecast was developed.

However, the Joint Truck OEMs note that SCE's forecast shown in Figure II-9, approximately 375,000 ZEVs in 2035, does not align with the over 500,000 vehicles CARB is projecting, shown in Figure 4. The magnitude of this discrepancy appears to be consistent with the 147,000 Class 2b-3 ZEVs driven by ACF. While CARB considers these vehicles in the medium- and heavy-duty regulations, the CEC typically accounts for Class 2b in light-duty electrification scenarios, but includes Class 3 in M/HD. This discrepancy in vehicle accounting between state agencies has led to significant confusion about vehicle forecasts.

In the TEGR analysis, it appears SCE has removed the Class 2b-3 volumes. It is unclear if Class 3 has been included in a light-duty vehicle forecast. Overall, SCE's vehicle forecast appears to be aligned with the state's regulatory requirements and projections for Class 4-8 vehicles.

Q: How many M/HD ZEVs are expected to operate in SCE's service area?

A: Rapid growth in charging demand will occur in SCE's territory as this area sees some of the highest concentrations of freight traffic in the nation. The Port of Long Beach and Port of Los Angeles are major economic drivers locally, regionally, and nationally. Nearly 1 out of every 5 containers moving through U.S. ports moves through the Port of Long Beach[17], and the Port of Los Angeles sees 37% of the nation's imports

[17] https://polb.com/port-info/port-facts-faqs/#facts-at-a-glance

and 21.7% of exports[18]. Freight traffic flows in and out of the ports 24/7 and into the surrounding areas, most notably the Inland Empire, where an estimated 40% of the nation's goods pass through[19].

SCE assumes 33% of the state's M/HD vehicles will be located in its service area.[20] In the 2023 IEPR AATE-3 forecast, the California Energy Commission (CEC) forecasts a similar proportion, resulting in 51,349 battery-electric M/HD vehicles for 2030 and 115,753 vehicles in 2035[21]. Based on an analysis of available data, this forecast of total ZEVs operating in SCE's service territory based on ACT and ACF seems reasonable.

A significant portion of these early deployment ZEVs will be Class 8 drayage trucks. The Port of Long Beach indicates it is currently served by 22,000 drayage trucks[22]. CARB forecasts that approximately half of this population will turnover to ZEVs by 2030, demonstrating concrete need in SCE's service territory.[23]

Since SCE's service area experiences extensive freight movements by vehicles registered elsewhere in the state and country, SCE is encouraged to develop a detailed understanding of the ZEV vehicle stock residing in, and passing through, its service

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[18] https://www.portoflosangeles.org/tariffshurt
[19] https://www.saferoutespartnership.org/blog/transportation-goods-movement-and-environmental-justice-inland-empire
[20] SCE used a 33% assumption. *See* Attachment D.
[21] Bailey, Stephanie, Jennifer Campagna, Mathew Cooper, Quentin Gee, Heidi Javanbakht, and Ben Wender. 2023. 2023 Integrated Energy Policy Report. California Energy Commission. Publication Number: CEC-100-2023-001-CMF. Page 237, Figure 28.
[22] https://polb.com/environment/clean-trucks/#program-details
[23] Initial Statement of Reasons, Proposed Advanced Clear Fleets Regulation (Aug. 30, 2022), p. 15 (Figure 5).

area in order to capture the pertinent hourly charging load shapes foundational to the TEGR load forecast.

Q: Do you agree with SCE's assumptions of Daily VMT, Days of Operation Annually, and Electricity Use (per mile) in the TEGR?

A: SCE's assumptions seem sound, with the exception of the conservative assumptions around daily VMT and operations for Class 8 drayage operations. Drayage operations are 24/7 business activities, and this use case is expected to rapidly expand during this rate case period (2025-2028) under CARB's ACF Drayage regulation. These trucks accrue high daily VMT in the 160-252 mile range as noted in CARB's Advanced Clean Fleets Total Cost of Ownership Discussion Document[24] and the San Pedro Bay Ports 2021 Drayage Trucks Feasibility Assessment[25]. This is a considerably greater daily VMT than overall average VMT assumptions in use today. For example, CEC's 2023 IEPR AATE-3 forecast assumes 77 miles/day for a typical Class 8 truck in California.

The TEGR forecast underestimates the energy needs associated with Class 8 drayage trucks, 11,000 of which we forecast will be in operation in SCE's service area in 2030, based on CARB's turnover projection and the volume of trucks reportedly serving the Port of Long Beach.

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[24] https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf , p. 15.
[25] https://cleanairactionplan.org/download/240/trucks/5186/draft-drayage-truck-feasibility-assessment-update_v20_-final-for-public-posting_july-21-2022-1.pdf , pp. 18-19.

Additionally, the fleet industry is learning a tremendous amount from the initial electric M/HD truck deployments, mostly in California. Of particular note are the findings from the North American Council for Freight Efficiency (NACFE)'s Run-on-Less project: these electric trucks made more round-trips daily than previously expected, and traveled longer distances on a daily basis. The early data from the Run-On-Less project shows these electric trucks are driven well in excess of 77 miles/day. For example, Schneider averaged 175 miles/day with its two Class 8 drayage eCascadias trucks[26]. As the ZEV value proposition often lies in lower-fuel-costs-per-mile to offset higher upfront purchase costs, it stands to reason many ZEV fleets will seek to maximize their vehicles' daily utilization.

Q: What unique drayage truck characteristics merit further consideration, and what near-term impacts will they have on SCE's grid?

A: Four key characteristics should be considered for drayage electrification, which will have major near-term impacts through 2030:

First, high vehicle miles traveled (250 miles/day and 300 days/year suggests 75,000 annual miles), or 150,000 kWh of electricity used per Class 8 electric truck;

Second, 24/7 operations. The Ports of LA and Long Beach for example, are 24-hour operations. Twenty-four hour operation will likely require these trucks to

[26] https://results-2023.runonless.com/truck/?day=1&depot=schneider&truck=sch_ecascadia_2&units=imperial

charge at a number of different locations during their typical day, including opportunity charging[27].

Third, drayage operations are dominated by independent owner-operators, who typically do not own commercial facilities to store and charge their trucks, requiring access to convenient on-demand, public charging; and

Fourth, concentrated traffic will originate at the Ports of LA/Long Beach and end in the Inland Empire, roughly 50 miles away.

Because of these unique operational characteristics, the Joint Truck OEMs believe SCE is underestimating the grid impacts of near-term drayage truck electrification.

Q: Is SCE's TEGR load forecast reasonable [28]?

A: The TEGR forecast as submitted in direct testimony is generally a conservative[29] one, and the utility should be planning for much higher transportation electrification loads during this rate case period and subsequent periods.

SCE forecasts 1,500 GWh of electricity usage by medium- and heavy-duty vehicles in its service area in 2030[30]. This forecast is reasonable for those M/HD electric vehicles

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[27] Opportunity charging is a charging use case where a vehicle isn't going out of the way to charge. The best example is when a tractor is waiting for a trailer to be unloaded/loaded. If there a charger as the same location, the tractor can take the opportunity to charge during this time window.

28 SCE indicates it is in the process of updating its TEGR analysis for Planning Year (PY) 2024 cycle. We look forward to seeing this update, but until that is released, we stand by these comments. *See* Attachment B.

[29] SCE indicates that the TEGR forecast as submitted in direct testimony is "likely still on the conservative side." *See* Attachment C.

[30] Attachment E and WP SCE02V07BkA, page 95, Table 1: Comparison between 2020 IEPR and SCE Supplemental forecast.

expected to meet compliance requirements with California's ACT rule (which was in effect when this forecast was prepared), but is not enough to support the additional ACF volumes, particularly the energy needs of the projected Class 8 drayage volumes.

The Joint Truck OEMs estimate that medium- and heavy-duty vehicles in the volumes projected will require 2,342 GWh in SCE's service territory in 2030. This projection is inclusive of Class 4 through 8. We project half of this electricity usage is necessary to support drayage operations alone. Further, the Port of Long Beach (POLB) projected that under certain scenarios, its current coincident peak load could increase more than tenfold from 50 MW to 581 MW by 2030[31]. SCE's ZEV projections, energy forecasts, and proposed upgrades are consistent with the state's regulatory requirements and climate goals, but SCE is underestimating the near-term energy needed to support the vehicle deployments required under ACT and ACF.

Q: What are your views on the Maximum Electrification Potential Screening Review?

A: SCE conducted a Maximum Electrification Potential Screening review at distribution B-Bank substations, for inclusion of specific projects in the GRC testimony. This review assumes fleets will have a 50% adoption level at selected locations[32]. The Joint Truck OEMs concur with SCE that additional concerns will arise "if sites and customers accelerate adoption even faster than expected"[33]. There are risks associated with this

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[31] Exh. SCE-02 Vol.. 01 Pt. 01, p. 4, fn. 18.
[32] Exh. SCE-02, Vol. 07, pp. 33, 58.
[33] Exh. SCE-02, Vol, 07, p. 34, lines 6-7.

assumption: even though fleets may indeed adopt a fewer number of vehicles, there is an offsetting possibility that fleets will put these M/HD BEVs to higher VMT uses, increasing the energy demands placed on SCE's grid. Given the Total Cost of Ownership economics fleets adopting electrification face, this is a very likely possibility, as seen in NACFE's Run-for-Less project findings.

As part of the Maximum Electrification Potential Screening review, SCE focused on identifying where additional land may be required to deploy future electrical infrastructure.[34] It is imperative for SCE to not only identify this land now for future B-bank and A-bank substations, but also to kickoff the activities required to (i) secure the land necessary, and (ii) begin the permitting process to have this necessary electrical infrastructure available during the 2030 – 2035 timeframe.

Mr. Esguerra's testimony (Table II-17) summarizes SCE's A-Bank substation capacity projects needed to serve the base case TEGR needs.[35] All these substations have an operation date of June 2031, which is outside this rate case cycle, but the work to secure land and start permitting to have those projects completed by June 2031 needs to start now. For example, SCE identified four A-Bank projects with a cost of $430.438 million for 2023-2028[36], and further identifies 2025-2028 costs of $652.145 million for projects that come online after 2028[37]. The total cost for these projects is $3.74 billion. We urge the Commission to approve funding for TE projects with scheduled on-line

[34] Exh. SCE-02, Vol. 07, p. 33, ll. 17-24.
[35] Exh. SCE-02, Vol. 07, p. 80.
[36] Exh. SCE-02, Vol. 07, p. 81, ll. 3-6.
[37] Exh. SCE-02, Vol. 07, bottom of p. 81.

dates beyond this rate case cycle in order to facilitate the transition to a zero-emission transportation industry.

Q: What additional assumptions in the TEGR forecast merit further review?

A: SCE expects the majority of M/HD BEV charging will occur at the customer/fleet charging depot premises after 9 pm[38]. While this may be a reasonable assumption for certain vehicle classes (usually smaller vehicles) and certain use cases (urban or regional deliveries consisting of one round-trip daily from a depot, returning to that depot for charging), that may not be the case for high VMT, 24/7 use cases such as drayage. M/HD vehicles often make time-sensitive deliveries, or perform tasks on specific schedules, and may need to make planned or unplanned charging on peak - fleets must meet their commitments to their customers to deliver freight.

In the 2022 Third-Party Evaluation Report prepared by the Cadmus Group and Energetics Incorporated of utility transportation electrification programs (including SCE's Charge Ready Transport program), the authors report the majority of fleet operators are not actively employing load management.[39] Across all utilities, only nine of the 94 observed sites in the program to date exhibit the use of load management. Those nine sites show sharp increases in load beginning after 9 pm, while 20% to 37% of all fleet charging took place between 4 pm and 9 pm on a monthly basis. While the Joint Truck OEMs are making every effort to advise their fleet customers of the advantages of load

[38] Attachment A.
[39] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/sb-350-te/publicjoint-iou-annual-srp-and-ab108283-evaluation-report-for-py-2022.pdf, p. 5.

management and charging after 9 pm, charging is only one of a myriad of fleet management challenges, including traffic conditions, driver availability, driver rest requirements, total number of on-duty hours before mandatory rest periods, etc. Load management is often not the priority among these many factors that fleet operators and drivers must juggle on a real-time basis.

We believe it is prudent to encourage M/HD vehicles to charge at times of excess energy availability at lower prices, as a result of the expansion of solar energy in the state. Charging during times of surplus energy would be a good use of available resources with a lower carbon footprint.

However, the utility should plan on a certain amount of "on-demand" charging during non-peak hours, including situations such as delivery of essential services, charging at public hubs for longer-haul freight traffic, and charging to gain sufficient state-of-charge (SOC) to complete a journey.

In addition to M/HD vehicle use cases that are regional movements in their nature, there are a number of public charging hubs proposed or under construction in Southern California to serve the long-haul electrified freight applications. These are likely to include many high-powered chargers[40] at a single location (first starting with 350 kWx10 chargers, or a 3.5 MW load in one location) and increasing to 23.5 MW (1 MW x 20 chargers, plus the original 350 kW x 10 chargers) when the Megawatt Charging

[40] West Coast Clean Transit Corridor Initiative (I-5 Report), available at https://westcoastcleantransit.com

Systems standard is expected to be commercially available in the 2027-28 timeframe - clearly within this rate case cycle. A number of such projects and proposals have been made public, including WattEV (multiple locations)[41][42], TeraWatt[43], Forum Mobility[44], ProLogis[45], Greenlane[46], and others.

Q: Could an electric truck change its electricity usage quickly and significantly?

A: Yes. A Class 8 electric tractor (owned by the same fleet owner, domiciled at the same depot) could be assigned to a new route based on business conditions and have significantly different electricity requirements. For example, that truck could perform one round-trip with multiple stops for a 75-mile route using overnight, off-peak charging at the depot, and the next day, that same tractor could be doing a 150-200 mile (or longer) route with one or more charging events at non-depot locations during the day, and could end up at the originating depot, or another depot, for overnight charging.

The freight transport industry is characterized by multiple short-term contracts with customers, often 6-12 months in duration. Fleet managers operate their businesses by managing this portfolio, and with a change in contract terms, a Class 8 tractor could be put into a very different operating use case, on very short notice. In the case of M/HD

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[41] https://www.wattev.com/post/wattev-breaks-ground-on-21st-century-truck-stop

[42] https://www.wattev.com/post/wattev-secures-record-breaking-75-6-million-in-federal-grants-to-expand-west-coast-electric-truck-c

[43] https://terawattinfrastructure.com/ideas/terawatt-developing-i-10-electric-corridor-the-first-network-of-electric-heavy-duty-charging-centers/

[44] https://www.prnewswire.com/news-releases/forum-mobility-announces-new-charging-depot-for-electric-drayage-trucks-in-the-port-of-long-beach-302001230.html

[45] https://www.prologis.com/news-research/press-releases/prologis-announces-major-ev-truck-installations-southern-california

[46] https://www.drivegreenlane.com/

BEVs, electric vehicles can double or even triple their electricity usage from one day to the next, without any change to the vehicle itself[47].

Utilities and their regulators are accustomed to thinking about electricity-using appliances in “average annual use” terms (think refrigerators - their power consumption does not vary all that much from customer to customer). This model is vastly different from the usage patterns of commercial vehicle operations. As fleets get increasingly more comfortable with electric drive technology, economics will push fleets to operate these trucks for higher VMT to capture the fuel cost advantage over diesel. The Joint Truck OEMs believe VMT assumptions should increase from 2030 to 2035 and beyond.

This is not to say the Joint Truck OEMs advocate for a “maximum possible VMT” number to be the basis for SCE’s TEGR forecast. Instead, we highlight the risks associated with a single VMT per truck assumption, and suggest a more nuanced, portfolio approach to forecast the amount of electricity that will be required to achieve the State of California’s policy goals of shifting to a zero-emissions transportation future with medium- and heavy-duty vehicles.

Q: Do the Joint Truck OEMs support SCE’s capacity addition plans outlined in its testimony?

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[47]Assuming a typical Class 8 electric truck requires 2 kWh/mi, the difference in electricity use between a 75-mile and a 200-mile route is 125 kWh/day, or 37,500 kWh per year (assuming 300 operational days).

A. Yes. We support the types of upgrades presented in SCE's TE Grid Readiness forecasts[48]. SCE proposes a portfolio of projects, including a mix of: (a) near-term distribution upgrades that will need to come online during this rate case cycle; and (b) larger projects with longer lead times (such as substations) where detailed planning and design work must begin during this rate case cycle, and the project will come online in a subsequent GRC cycle.

Q: What are your thoughts on SCE's proposal to include innovative short-term infrastructure bridge solutions?

A: SCE's innovative short-term infrastructure bridge solutions, as proposed in its testimony[49], represent one of the best opportunities to allow customers to interconnect in advance of, or in parallel with, constructing the more permanent distribution grid upgrades. We support SCE having a broad set of "interim power options" at its disposal to meet fleet customers' charging needs, whether at privately-owned depots or at public charging hubs. These solutions are particularly needed to meet near-term needs in the 2025-2035 timeframe, as the more permanent grid capacity additions are built out.

Based on the Joint Truck OEMs' recent experience with SCE and fleet customers' acquisition of electric trucks, getting charging infrastructure installed where there is insufficient distribution grid capacity initially to meet all the expected loads is a critical near-term issue. The Joint Truck OEMs have urged SCE to explore any number of

[48] SCE's TEGR forecasts are presented in tables in Exh. SCE-02, Vol. 07, pp. 57-82.
[49] Exh, SCE-02 Vol. 01 Pt. 01, p. 17, ll. 14-20.

interim infrastructure solutions to enable even a few of these electric trucks to be deployed, to allow fleets to utilize the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) vouchers they've qualified for (instead of turning them back in due to the lack of electric grid capacity), and for the fleets to gain experience operating them - a key to gaining confidence in the technology, the performance of the vehicles, and a more applied understanding of utility rate schedules and pricing plans.

The Joint Truck OEMs support SCE's proposal for a coordinated suite of solutions from the utility - ranging from additional substations or substation transformers, new or additional distribution feeders (to the Point of Interconnection) approved only in GRCs, and for Rule 29 and Charge Ready Transport (or TE Program make-ready) incentives that address costs and installations of charging infrastructure for both sides of the revenue meter. We also support maximizing existing infrastructure utilization, such as switching loads from one feeder to another on a temporary basis, while the more permanent grid capacity additions are being built.

We further support new approaches such as scenario planning are being deployed through SCE's Grid Modernization Engineering & Planning Software Tools to assist SCE in understanding the different potential future needs and solutions. This can also help in solidifying ways to respond quickly when customer requests occur and the utility does not have sufficient capacity to serve that new load fully. Even having a cap on grid capacity availability (typical feeder loadings are often much lower than peak loading levels), otherwise known as non-firm distribution capacity, would be a viable option to fleets.

We support Mr. Takayesu's testimony[50] for the need to bring these new approaches all together into a continuum of bridge solutions, particularly for the near-term, but for the medium-term (5-10 years) as well.

Q: Will Charging Loads for M/HD Vehicles will be disproportionally concentrated in specific locations?

A: Unlike light-duty vehicles (passenger cars) which will be located and likely to be charging throughout a utility's service area, depots where M/HD vehicles deliver and pick up freight are typically concentrated in urban business parks along major freight corridors. Public charging hubs for long-haul traffic will also be concentrated along major freight corridors, in both urban areas and more predominantly in rural areas such as truck stops today (for diesel refueling). Dense urban settings present a higher level of design reviews and siting concerns, which result in longer times to obtain approvals from local governments than for construction and energization of needed electrical facilities. Rights-of-Way are particularly difficult to secure, and often involve considerable delays.

Organizations such as the Electric Research Power Institute (EPRI) have completed studies that identify demand from commercial electric vehicles at a granular level

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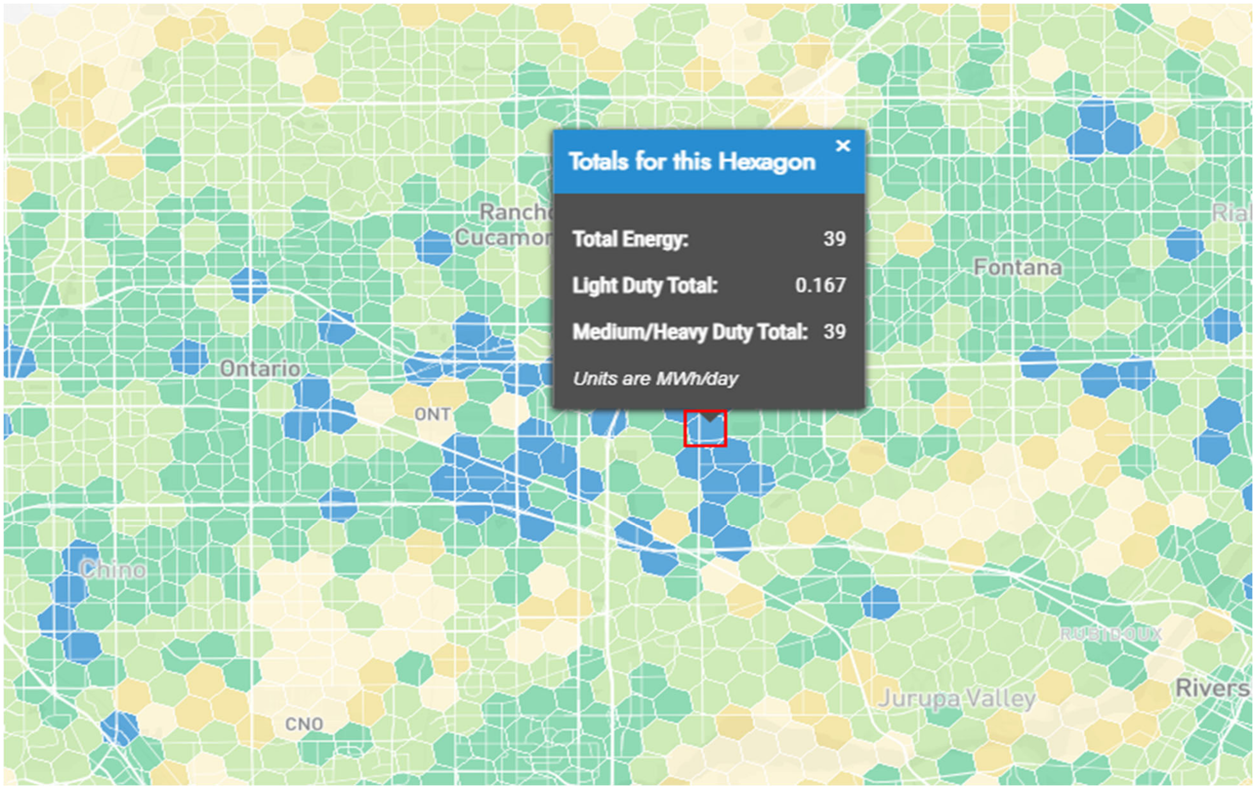
[50] Exhibit SCE-02 Volume 01, Chap. III, p. 19 lines 21 through p. 20 line 4

through their eRoadMap efforts[51]. All three Joint Truck OEMs provided class 8 tractor vehicle telematics data to EPRI for the development of the eRoadMap tool. The highest levels of demand will be needed to support heavily freight trafficked areas at locations such as ports, railyards and warehousing districts. In Southern California, heavy traffic flowing to and from the Ports of Los Angeles and Long Beach to the Inland Empire will create high demand on SCE's system. Operations like municipal fleets or city buses are likely to drive concentrated need in densely populated urban areas.

Figure 6 below shows concentrated need in the Ontario/Rancho Cucamonga area in EPRI's 2030 scenario, with a single Res8 Hex[52] location requiring 39 MWh/day for M/HD vehicles, compared to only 0.167 MWh/day for light duty passenger vehicles. SCE is proposing to add capacity in appropriate locations, which we support.

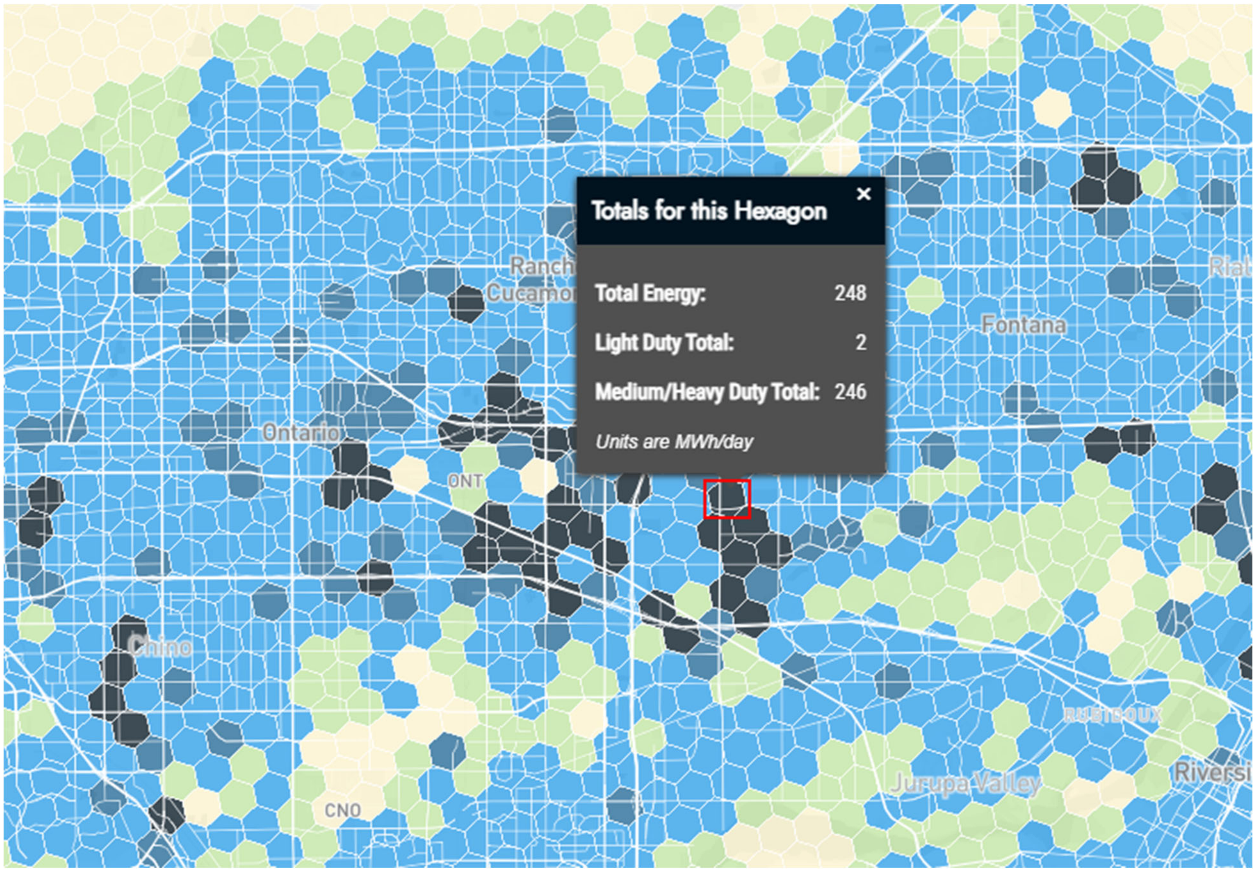
[51] https://eroadmap.epri.com/
[52] Hex 8 resolution is equal to 0.28 square miles: https://www.uber.com/blog/h3/

Figure 6. Screenshot from EPRI's eRoadMap 2030 Scenario



The daily energy demands in this same area increase exponentially under EPRI's "full electrification" scenario, shown in Figure 7 below. The same hexagon increases to 246 MWh/day to support M/HD vehicles. These future highly concentrated energy demand locations require long term planning work to start during this GRC cycle.

Figure 7. Screenshot from EPRI's eRoadMap Full Electrification Scenario



5. Conclusion

Q: What are your conclusions?

A: SCE's proposed transportation electrification upgrades are consistent with the state's climate and air quality goals. The Commission should approve SCE's proposed investments to support transportation electrification. The Commission should also approve the short-term bridge solutions proposed by SCE.

The Joint Truck OEMs remain concerned SCE has not proposed enough additional capacity to fully support the state's transportation electrification goals, particularly for 2030 and 2035 in those locations where concentrated M/HD vehicle charging is expected to occur. At a very minimum, the CPUC should additionally approve funding in this GRC of grid capacity addition projects identified by SCE to be energized in the next rate case cycle.

Q: Does that complete your testimony?

A: Yes.

ATTACHMENT A

Southern California Edison
A.23-05-010 – SCE 2025 GRC

DATA REQUEST SET T e r a W a t t - S C E - 0 0 2

To: TeraWatt
Prepared by: Muhammad Dayhim
Job Title: Data Science Advisor
Received Date: 12/15/2023

Response Date: 1/8/2024

Question 2.1:
Referring to SCE's Prepared Testimony at Exh. SCE-02 Vol. 7 at p. 26, lines 19-25, please explain why SCE's Supplemental Transportation Electrification Grid Readiness ("TEGR") forecast "incorporates [transportation electrification] load profile assumptions that closely resemble a time-of-use rate responsive load profile, which models a form of managed charging or load management."

Response to Question 2.1:

Currently, the data is limited for medium- and heavy-duty charging; SCE expects that the majority of medium- and heavy-duty EV charging will occur at the customer/fleet charging depot premises after 9 P.M. This is driven by minimum impact to customers' operations, as this charging period is anticipated to be after the customers' operating hours, as well as SCE's time-of-use rates which allow customers to benefit from the relatively lower rates after 9 P.M. SCE also benchmarked these shapes against ICF's most recent study, "Comparison of Medium- and Heavy-Duty Technologies in California", Part 2 Appendix B p. 49, December 2019, (available at: https://caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf). If charging load shifts more to daytime, it would require additional investment and impact the grid build out needs and timing, as noted in SCE's testimony. SCE did perform a sensitivity analysis on this topic and more details are provided in responses to TeraWatt-SCE-002 question 2.3.

ATTACHMENT B

Southern California Edison
A.23-05-010 – SCE 2025 GRC

DATA REQUEST SET T e r a W a t t - S C E - 0 0 2

To: TeraWatt
Prepared by: Christopher Ohlheiser
Job Title: Senior Manager
Received Date: 12/15/2023

Response Date: 1/9/2024

Question 2.6:
Referring to SCE's Prepared Testimony at Exh. SCE-02 Vol. 7 Bk. A at pp. 91-106, please explain whether the TEGR forecast represents SCE's most up-to-date projection of transportation electrification load growth over the period included in the TEGR forecast as of December 1, 2023.

Response to Question 2.6:
SCE is in the process of updating our TEGR analysis for our Planning Year (PY) 2024 cycle. As part of this analysis, SCE will expand the TEGR forecast from the selected TEGR analysis locations used in the TY 2025 GRC to SCE's entire service area. This forecast will be made public in SCE's PY 2024 GNA/DDOR and DRPEP publication.

SCE's GRC analysis is a point-in-time exercise, which utilizes the information available at the time of its development. SCE regularly receives customer energization requests that augment our view of future electrification needs, which help to refresh our forecast that is developed annually as part of our standard distribution planning process.

As a result, SCE's load growth and TEGR request within the GRC is a request that aligns with the information available at the time of its development. The GRC capital request is focused on the operating period of 2025-2028. SCE believes that this GRC period is a critical timeframe to make significant progress in readying the grid for the electrification we expect to see over the coming years, as many of the large, long lead-time projects will be key building blocks to serve capacity in further out years from the investments we make today. This is why SCE's TEGR request was focused on the key, most likely areas of significant TE growth and on initiating the long-lead-time projects (i.e., substations), after the construction of which, subsequent, smaller & shorter-lead-time projects (i.e., circuits) can be constructed to deliver the full capacity. As a result, SCE performed analyses as described in the location selection workpaper to identify those areas of our system most likely to be impacted by a forecast that exceeds the forecast provided by the CEC. By focusing the TEGR request on those high likelihood areas, SCE identified least-regrets investments to support the coming TE transformation. SCE believes that continued enhancement of the system-planning process and associated load growth forecasts are needed to ensure that the forward progress of our request in this GRC is continued and that the full grid buildout required can be achieved in subsequent GRC applications.

ATTACHMENT C

DATA REQUEST SET T e r a W a t t - S C E - 0 0 2

To: TeraWatt
Prepared by: Jun Wen
Job Title: Senior Advisor
Received Date: 12/15/2023

Response Date: 1/9/2024

Question 2.7:
Referring to SCE's Prepared Testimony at Exh. SCE-02 Vol. 7 Bk. A at pp. 91-106, if the answer to TeraWatt to SCE 2.6 is no, please explain whether the TEGR forecast either overestimates or underestimates likely transportation electrification load growth and what intervening statute,regulations, requests for new service, reports, or other factors have impacted the accuracy of the TEGR forecast since its submission in this docket. As part of your response, please provide any updated TEGR forecasts in SCE's possession.

Response to Question 2.7:
Consistent with forecast ratemaking, the TEGR forecast filed in the GRC was done at a point in time and represented SCE's view at the time of reasonably expected TE growth with lack of actual TE applications beyond the first 2-3 years of the 10-year planning window. Since the TEGR forecast was completed around Aug-Sep 2022, close to 500 projects that are larger than 500 kW each have been received by SCE, totaling over 1400 MW. This growth trend confirms SCE's TEGR forecast as submitted in direct testimony in this GRC is very much needed and likely still on the conservative side.

As noted in our response to TeraWatt-SCE-002-Q2.6, SCE is in the process of updating our TEGR analysis for our Planning Year (PY) 2024 cycle. As part of this analysis, SCE will expand the TEGR forecast from the selected TEGR analysis locations used in the TY 2025 GRC to SCE's entire service area. This forecast will be set forth in SCE's PY 2024 GNA/DDOR and DRPEP publication.

ATTACHMENT D

Southern California Edison
A.23-05-010 – SCE 2025 GRC

DATA REQUEST SET TeraWatt-SCE-002

To: TeraWatt
Prepared by: Muhammad Dayhim
Job Title: Data Science Advisor
Received Date: 12/15/2023

Response Date: 1/8/2024

Question 2.8:
Referring to SCE's Prepared Testimony at Exh. SCE-02 Vol. 7 Bk. A at pp. 91-106, please explain how SCE incorporated the impact of the (1) Advanced Clean Trucks, Cal. Code. Regs. tit. 13 § 1963.1, and (2) Advanced Clean Fleets, Cal. Code. Regs. tit. 13 §§ 2013-2016, rules into the TEGR forecast.

Response to Question 2.8:

SCE developed its supplemental forecast, which incorporates CARB's rules, by leveraging the existing CARB 2020 Mobile Source Strategy forecast at statewide (available at: https://ww3.arb.ca.gov/planning/sip/2020mss/draft_META.zip) and applying a percentage to derive the number of vehicles in SCE's service area. SCE estimated that 35 percent of statewide light-duty EV population would occur in SCE's service area starting in 2023 and increasing to 37 percent in year 2030. SCE notes that current light-duty EV adoption data provided by EPRI indicates that SCE's total vehicle (all fuel) share was around 39 percent by the end of 2022. For medium- and heavy duty vehicles, SCE applied an approximately 33 percent factor, which is SCE's estimated load share in California. This percentage was used due to lack of data availability for MDHD EVs.

ATTACHMENT E

Southern California Edison
A.23-05-010 – SCE 2025 GRC

DATA REQUEST SET TeraWatt-SCE-002

To: TeraWatt
Prepared by: Muhammad Dayhim
Job Title: Data Science Advisor
Received Date: 12/15/2023

Response Date: 1/8/2024

Question 2.16:
Referring to SCE's Prepared Testimony at Exh. SCE-02 Vol. 7 Bk. A at p. 95, Table 1, please explain how SCE calculated expected usage for the "TE (Medium- and Heavy Duty)" row. As part of this answer, please explain if and how SCE made assumptions about the peak demand and usage of charging stations, and how it utilized those assumptions in calculating the SCE Supplemental usage figure of ~1,500 GWh.

Response to Question 2.16:

SCE developed the supplemental forecast, which incorporates CARB's rules, by leveraging the existing CARB's 2020 Mobile Source Strategy forecast at statewide (available at: https://ww3.arb.ca.gov/planning/sip/2020mss/draft_META.zip) vehicle count and applying a percentage to derive the number of vehicles in SCE's service area. For medium- and heavy-duty EVs, SCE applied approximately 33 percent, which is SCE's estimated load share in California. Then SCE multiplied the number of vehicles per class by the kWh per vehicle class to derive the annual GWh. The kWh per vehicle class data source is CEC's 2020 IEPR. This methodology led to 1,500 GWh for SCE's service area. SCE then disaggregated the 1,500 GWh medium- and heavy-duty EV-related energy to SCE's circuits, as described in WP SCE-02 Vol. 7 Bk. A pages 98-102. In order to estimate the peak load, SCE applied the load shapes provided in response to TeraWatt-SCE-002 question 2.13 to medium- and heavy-duty annual energy for each circuit to derive the hourly energy for each circuit.