Utility Planning for Electric Truck and Bus Fleets: An Overview

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Introduction

In the next few years, power demand from electric trucks and buses will become a growing concern as these loads can be large and are generally concentrated on a limited number of distribution circuits. This shift is starting with school buses, transit buses, and delivery vans, with a small but growing market share of electrified medium-duty and eventually heavy-duty trucks. This growth is driven by concerns about air quality and climate change as well as reduced operating costs. New EPA carbon dioxide emissions regulations for trucks as well as state regulations requiring increasing shares of vehicles to be zero emission (discussed below) will complement these market drivers.

Loads can range from a few megawatts (MW) per site for school bus and delivery van depots, to 20–40 MW for large truck depots and truck stops. While most vehicles currently use level 2 and level 3 chargers (the latter typically 0.15–0.25 MW per plug), larger vehicles will often use a new charger standard now being developed, with individual chargers needing 1–2 MW each. A July 2024 ACEEE analysis estimates that by 2030, new truck and bus loads may add 1,000 MW to peak electric demand in Texas and 200–700 MW in 15 other states.[1] Medium-size loads (e.g., 5 MW) may require new distribution circuits while large new loads (10 MW or more) will often require new or expanded substations. Since new and expanded substations can take five years or more to propose, design, and build, plans need to be prepared today for loads expected by 2030.[2]

Multiple new loads

Electric loads are growing rapidly in many utility service areas, driven not only by trucks and buses but also by growth in data centers and new manufacturing plants, as well as increased electrification of transportation, buildings, and industry. These changes are taking place on different timescales: Data centers and new manufacturing plants are developing now. Truck and bus loads will be substantial by 2030 in many areas, particularly within states that have made commitments to meet zero-emission vehicle sales targets. On the other hand, electrification of *passenger* vehicles and building heating is gradual; substantial additional loads from these are not likely in many regions until after 2030. For the present, new truck and bus loads, data centers, and manufacturing plants need to be incorporated in plans now.

[1] Discussed in an August 2024 ACEEE topic brief: https://www.aceee.org/topic-brief/2024/08/electric-loads-state-2030-medium-and-heavy-duty-electric-vehicles

[2] These issues are discussed in more detail in a 2023 ACEEE paper: www.aceee.org/white-paper/2023/09/electrifying-truck-fleets-utility-infrastructure-crucial.

Purpose of this toolkit

Intended for utilities and utility regulators, this toolkit outlines suggested steps utilities should take immediately to start planning for new electric truck and bus fleet loads. It proposes a seven-step planning process—a roadmap—for addressing new electric truck and bus fleet loads.

Regions that take the lead in planning will be first to see the benefits of fleet electrification: better air quality, reduced GHG emissions, and new clean energy jobs. Delays could put these benefits at risk as electric fleets will tend to locate in areas that take proactive steps to address these loads. This short toolkit, as well as the resources at the end of document and in the footnotes, provide a roadmap for proactively beginning the process to address growing electric loads to serve vehicle fleets.

Steps in the process

In this overview we discuss a recommended seven-step process for utilities to follow when planning for electric truck fleets:

1. Preliminary assessment
2. Consulting with regulators about process
3. Detailed planning
4. Community engagement and plan revision
5. Considering investment in technical assistance and make-ready infrastructure
6. Filing and proceeding
7. Regular revisions

These steps are based on what several leading utilities have done. We describe each of these steps in the following sections.

1. Preliminary assessment

To begin, utilities should conduct a very preliminary assessment of potential truck loads for their service territory. This local information on imminent loads can then inform discussions with regulators and interested parties. Below are examples of preliminary assessments:

- A summary of responses to initial service needs (as Southern California Edison has done[3])
- An assessment on a single substation known to service many fleets (this is what Consolidated Edison did[4])
- A preliminary estimate of the rough size of some of the future loads (as National Grid did[5])

The goal of this exercise is to a develop a preliminary understanding of impacts and timeframes in the local service area.

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[3] https://www.energized.edison.com/stories/leading-the-charge-for-sustainable-ports.

[4] Con Edison proactive planning case study filing.

[5] National Grid initial (www.nationalgridus.com/media/pdfs/microsites/ev-fleet-program/understandinggridimpactsofelectricfleets.pdf) and follow-up studies (www.nationalgridus.com/News/National-Grid-and-Hitachi-Energy-Transportation-Decarbonization-Study-Highlights-Path-to-Readying-the-Grid-for-Electric-Fleets/).

2. Consulting with regulators about process

Armed with preliminary information, utilities should then consult with internal regulatory staff and then public utility commission (PUC) staff about how the PUC might want to consider grid upgrades to address fleet loads. Options include

- A special docket (as Massachusetts and New York are now conducting[6]); such dockets could be limited to trucks and buses (as in New York), consider all transportation loads (as in Michigan[7]), or look at a broader array of loads (as in Massachusetts)
- Expansion of a traditional distribution planning or Integrated Resource Planning docket if the timing is right
- A rate case filing, again if the timing is right

Although the commissions will decide which path to take, utilities can suggest the paths they prefer and explain why. To better understand these issues and to explore potential routes forward, utility commissions can host one or several technical conferences on the subject, an approach that Illinois, for example, has undertaken on beneficial electrification, including electric vehicles.[8]

At this stage, or at later stages, commissions, utilities, and other interested parties should consider whether any changes to commission rules or state laws may help to address electrification loads.

Since the issues are new and will generally apply to all utilities serving a state, in our view a statewide generic proceeding may often make sense, followed by application of general guidance in individual utility cases. We also note that because load growth has recently accelerated in many regions, standard processes may not be as frequent or nimble as needed to ensure power availability and reliability, providing a further rationale for a special process.

Ultimately, as a result of the processes discussed in the sections below, regulators need to provide guidance on two key questions: when a utility can prudently commit resources to upgrade the distribution grid for future electric vehicle load and how such costs will be allocated.

3. Detailed planning

In order to support a detailed filing for either a special or regular docket, utilities should create a detailed bottom-up forecast for new loads. The forecast should then be incorporated into distribution plans.

To forecast loads from electrification of fleet vehicles, utilities must first understand current fleets based in a service territory, the number and types of vehicles, how far they travel, and their routes. Many trucks have GPS systems that track this data. The Electric Power Research Institute (EPRI) has a tool that planners can access for initial data collection.[9] RMI is now developing a tool that uses cell phone data. In

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[6] Massachusetts proceeding information here: www.mass.gov/info-details/electric-sector-modernization-plans-esmps-information-and-recommendations . New York proceeding information here: https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=69967&MNO=23-E-0070.

[7] https://mi-psc.my.site.com/s/case/5008y000009ZFgYAAW/in-the-matter-on-the-commissions-own-motion-to-open-a-docket-for-certain-regulated-electric-utilities-to-file-transportation-electrification-plans-and-for-other-related-matters.

[8] 2021–2022 beneficial electrification workshops: .icc.illinois.gov/informal-processes/beneficial-electrification-workshops-2021-2022.

[9] www.eroadmap.epri.com/.

some cases, satellite photographs can be useful. More detailed GPS data can be purchased and analyzed, and all of these data sources should be supplemented with site visits and conversations with customers.

These data sources can support projections on loads and charging behavior if all vehicles are electrified. Timelines can be challenging to estimate: that is, which vehicles may be electrified in the next few years and which may be not be converted until the 2040s. Since many fleets do not yet have concrete plans for their electrification journeys, large uncertainties are inevitable in estimating the pace of electrification. One factor is that presently 11 states have adopted requirements that a growing percentage of new medium- and heavy-duty vehicles have zero emissions.[10] Utilities, via their customer service representatives, should talk to fleet customers about their thinking and plans on electrification. Based on these discussions as well as state policy schedules, they can assign a rating ranging from "likely to electrify soon" to "will not electrify for many years." These ratings can be used to develop an approximate forecast, by multiplying potential future loads by the probability of electrifying in, say, 2030, 2035, and 2040.

This forecast should then be mapped to the circuit and substation levels to inform and develop upgrade plans to modify the current distribution system to serve these new loads. In developing these plans, utilities should consider that often several vehicles can share a single charger.[11] They should also factor in the impacts of demand-management techniques such as time-of-use rates, managed charging, smart charging opportunities (some of which can provide automatic control), and demand-response programs, in which customers allow utilities to control exactly when a particular vehicle charges as long as the utility promises to have it fully charged by morning.[12]

While the discussion above focuses on vehicle fleets, forecasts for fleets will need to be combined with forecasts for data centers, new industrial loads and other new developments, public fast-charging stations, and gradually increasing levels of building and light-duty vehicle electrification. New generative AI data centers and some new clean technology factories can approach or exceed 1,000 MW. Eversource's Electric Sector Modernization Plan, listed in the "Resource" section at the end of this brief, illustrates an approach to consider all of these loads in parallel.

4. Community engagement and plan revision

As tentative distribution upgrade plans take shape, local communities need to be consulted. Truck fleets are rarely located in wealthy neighborhoods: They often are located along major streets, with lower-income residents nearby.[13] Residents may be concerned about increased truck traffic but may welcome quieter trucks that do not emit diesel fumes.[14] Utilities and regulators can work with local community groups to host community meetings and engage in other outreach strategies to understand community priorities for grid expansion and consider ways to address them—for example, in one case a utility

[10] A list of states with these requirements can be found on the "ACT" (Advanced Clean Trucks) tab at www.afdc.energy.gov/laws/california-standards#/tab-act.

[11] For example, two vehicles can be connected to the same overnight charger with a control switching from the first to the second vehicle when the first vehicle is fully charged.

[12] Some program examples can be found here: www.energy.gov/femp/demand-response-and-time-variable-pricing-programs-northeastern-states.

[13] www.aceee.org/blog-post/2023/12/road-less-polluted-electric-trucks-can-steer-us-toward-environmental-justice.

[14] For example, many community-based organizations have formed the Alliance for Electric School Buses in order to "make kids healthier and our communities less polluted." See: www.electricschoolbuses4kids.org/.

learned of a preference for a single-story rather than a multistory substation facility. Utilities should enter the consultation process, expecting that they may need to make changes to plans to address community input.

Utilities can use these same community forums to explain why distribution systems need to be expanded, potential benefits to the community, and options to achieve the needed expansions.[15] Several options should be presented to communities, along with advantages and disadvantages of each—giving a community the opportunity to weigh in and share insights can have positive impacts for both the community and the utility project speed and outcome.

5. Considering investment in technical assistance and make-ready infrastructure

In addition to planning for fleet electrification, utilities can also offer programs to assist with electrification. Though not part of the grid-planning process—the focus of this toolkit—these programs can be a useful complement. Such programs can provide information to fleet owners on electric vehicle options, charging options, and steps to take in order to consider fleet electrification. Utilities can provide electrification studies and technical assistance, and can even help pay for vehicles, chargers, and electric service upgrades, particularly on the utility side of the electric meter—sometimes called *make-ready infrastructure*. Such programs can also provide utilities with early intelligence on fleet electrification plans. Information on several such programs and the lessons they teach is provided in a 2023 ACEEE paper on *Electrifying Truck Fleets* (listed in "Resources" at the end of this paper). Likewise, utilities should use demand-response rates and programs to push charging loads out of periods with high electric demand.[8]

6. Filing and proceeding

A formal filing in an appropriate docket can then be made, a stakeholder engagement process undertaken, hearings held, and so on. A sample filing (from Eversource) is listed in the "Resources" section. Since planning for fleet electrification will be new for most stakeholders, and because extensive investments may be involved, commissions should proceed carefully; utilities should not expect quick decisions. In states such as Massachusetts and New York, the process for developing a new regulatory framework for these loads is taking on the order of two years, with additional decisions deferred to follow-up proceedings. Regulators should consider ways to facilitate utility proposals for time-sensitive investments in parallel with framework development in order to address the most urgent needs.

Note that at this stage, commissions will generally weigh the costs of grid expansions, potential strategies for managing these costs, and how best to cover these costs through rates. This may involve exploring such considerations as general versus special rate classes and the balance among energy, demand, and fixed charges—which in turn will generally lead to delving into such issues as cost causation, protection of low- and moderate-income customers, and ensuring that rates are designed in ways that reflect the costs/uses within a class of customers and are not subsidizing other customer classes.

[15] A guide to community engagement can be found here: www.aceee.org/topic-brief/2023/02/improving-process-enabling-communities-engage-local-electricity-system-planning. A sample presentation by one utility can be found here: [waiting to get from Eversource].

7. Regular revisions

Given the uncertainty surrounding many of the assumptions needed to predict new fleet loads, forecasts and plans will need to be regularly revised. Some leading utilities recommend annual updates to distribution plans; others think biennial updates will be adequate. Regular revisions must also keep up with the rapid evolution in electric truck availability and economics and customer electrification plans. Alongside fleet load, other growing loads need to be tracked and considered, including data centers, buildings, industry, and light-duty vehicle electrification.

Conclusions

Buses and medium-duty trucks are starting to electrify, placing growing loads on electric grids. Utilities and regulators can proactively understand and address these loads using our seven-step process. These strategic steps can support improved local air quality, reduced greenhouse gas emissions, and new green jobs. In the absence of such steps, fleets may choose to locate in areas that are better prepared.

Resources

ACEEE. *Peak Electric Loads by State in 2030 from Medium- and Heavy-Duty Electric Vehicles*. https://www.aceee.org/topic-brief/2024/08/electric-loads-state-2030-medium-and-heavy-duty-electric-vehicles

ACEEE. *Electrifying Truck Fleets: Utility Infrastructure Is Crucial*. 2023. www.aceee.org/white-paper/2023/09/electrifying-truck-fleets-utility-infrastructure-crucial.

ACEEE. *Electrifying Trucks: From Delivery Vans to Buses to 18-Wheelers*. 2021. www.aceee.org/research-report/t2102.

Advanced Energy United. *On the Road to Fleet Electrification*. 2024. www.advancedenergyunited.org/hubfs/2024%20Folders/2024%20-%20Reports/On%20the%20Road%20to%20Fleet%rev20Electrification.pdf.

Energy Systems Integration Group. *Charging Ahead: Grid Planning for Vehicle Electrification*. 2024. www.esig.energy/grid-planning-for-vehicle-electrification/.

Eversource. *Electric Sector Modernization Plan*. 2024. www.eversource.com/content/residential/about/sustainability/renewable-generation/electric-sector-modernization-plan.

NARUC workshops on preparing for medium and heavy vehicles: https://pubs.naruc.org/pub/814C355F-FE07-730C-2AD9-49306B4003BB and https://pubs.naruc.org/pub/3FDF8A8A-F9AF-FF84-4986-88F682C01A43?_gl=1*1rjkq20*_ga*NDg1NzM0ODA2LjE2NzgyMTE5MzQ.*_ga_QLH1N3Q1NF*MTcyMDc5MjUwNi43NDguMS4xNzIwNzkyNjM5LjAuMC4w.

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