The transition to vehicle electrification is well underway. As the cost of battery-powered transportation continues to fall, technology advances are extending vehicle range and overall performance.

Widespread fleet electrification, however, will be disruptive and inevitably present a new set of challenges for bus fleet operators and the power grid alike.

Bus transit agencies would be well served to adopt a holistic power-supply approach. For many, strategic electrification may involve leveraging modular and scalable distributed energy resources.

“As fleets shift to become increasingly electric, dispatchable generation and stationary battery electric storage systems can be deployed in a hybrid configuration, supplementing available grid power.”

As fleets shift to become increasingly electric, dispatchable generation and stationary battery electric storage systems (BESS) can be deployed in a hybrid configuration, supplementing available grid power.

**Electric Buses Will Fuel Load Growth**

In response to the growth of battery electric buses (BEBs), electric utilities anticipate that entirely new distribution substations, feeders and other infrastructure reinforcements will be needed to support load growth.

New infrastructure needs go beyond power distribution. In California, for example, planners expect the transition to electric vehicles will require an
additional 10,000-12,000 MW of electric generation. This represents a roughly 25-percent increase relative to the state’s 2019 peak demand of 44,300 MW.

Many power distribution networks within high-density, urban areas are at or near capacity. Expensive grid upgrades risk slowing down efforts to electrify fleet vehicles, or at the very least, may make electrification efforts cost prohibitive.

In New York City, growth in power demand is historically problematic. Large substations regularly strain to meet the needs of millions of customers. These concerns will intensify if fleet operators choose to secure new service or if Con Edison, the local utility, increases the capacity of an existing feeder.

Given these issues, it is no wonder a recent survey of fleet owners and operators found that the need for expanded infrastructure, including power supply, is the most concerning hurdle they face — above cost and other factors.

**Alternatives to Large Grid Expansions**

Recognizing these infrastructure limitations and the high cost of meeting peak demand, regulators are increasingly requiring utilities eschew business-as-usual solutions.

New feeders or bigger substations are solutions of the past. Instead, transit agencies and utility operators should consider alternative, more dynamic approaches to augment grid capacity.

Deploying power generation or battery electric storage at or adjacent to loads can help mitigate the need for costly new conventional grid infrastructure and systems. Yet this is only one of the benefits.

Dispatchable generation provides energy reliability and resilience, serving as a backup to the grid. Loss of power to a charging station, disrupting the ability for BEBs to complete their route, would be a nightmare scenario for any transit agency.
Additional benefits of on-site generation include:

- Battery storage can be called on to meet peak demand, providing load shifting, arbitrage and power quality.

- Renewable energy from a solar photovoltaic (PV) system can, where feasible, integrate in a rooftop application or as a canopy to provide low-cost, zero-carbon energy on an intermittent basis. The solar array would charge the BESS or, where net metering is permitted, return power to the grid during times of excess generation.

- Distributed energy resources are assets that could, depending on the local utility or regional power market, provide ancillary services and emergency demand response support back to the grid — earning transit agencies new revenue streams.

- Dispatchable generation and BESS hybrid solutions are charging technology and vendor agnostic. Modular design concepts are future-proofed, providing flexible scalability to accelerate the BEB transition.

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**New Technologies Give Rise to New Business Models**

Budget-constrained public entities who can monetize BESS or dispatchable generation will have opportunities to develop new business models. For example, a hybrid approach can leverage private capital and technical
expertise to minimize risk in a performance-based public-private partnership.

These partnerships are formed where a third party incurs part or all of the up-front capital cost to develop the electrical and make ready infrastructure or to purchase the BEBs. The third party recoups their capital through a long-term agreement to provide “charging as a service.”

Indeed, several bus transit agencies are already pursuing just such a commercial alternative. The Des Moines Authority Regional Transit announced last fall a seven BEB pilot.

To fund their pilot, the Iowa transit agency received a Federal Transit Administration Low or No Emission Bus Program grant as well as matching funds from MidAmerican Energy, the regional electric utility.

As large numbers of electric vehicles are added to the grid, the cost and location of necessary infrastructure upgrades are unpredictable, varying by region and by the extent of new demand required.

The Electrification Transition Is Coming

Electric vehicles including battery-powered buses are destined to dominate the roadways of the future, and that future is fast approaching. Battery technology advances, together with ever-growing economies of scale, continue to drive down the total cost of BEB ownership while simultaneously improving vehicle performance and range.

However, major challenges exist. Major investments are needed in order to build out critical vehicle charging equipment and infrastructure, to increase and reinforce electrical distribution systems, and to make sure adequate power is available to support new and often large loads.
Adding power supply and electric distribution capacity in a business-as-usual approach stands to lengthen the transition to vehicle electrification, increasing costs to ratepayers and commuters, while delaying the environmental benefits of electrified transportation.

Instead, as bus fleets transition over time to become fully electrified, agencies who opt for modular, distributed energy resources can future proof and scale power supply to match increasing loads. Hybrid resources can be designed to provide resilience and grid-independent operation to ensure buses are powered up and ready to roll during an inevitable power outage.

Hybrid energy electric recharging and resilience systems can be designed and deployed to augment existing power infrastructure and to provide an integrated energy technology platform. Once adopted, these systems will help transit agencies transition reliably, resiliently and cost-effectively to BEBs.

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