



Alliance for
Transportation
Electrification

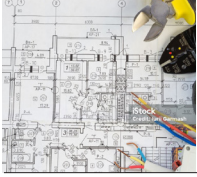


ATE: Interconnection Task Force

October 2023

Energizing EV Charging Stations: Issue Brief 2 in a Series

Supply Chain Delays and Utility Best Practices



Introduction

This is the second in a series of issue briefs, focusing on the energization of EV charging stations and the concerns, issues, and hurdles that characterize the interconnection and energization process today, along with some innovative solutions being used by utilities to expedite the process. The first issue brief focused on the overall process of energization and all the elements involved. The subsequent issue briefs will go into more detail on individual elements of the process described in that first issue brief. **This paper focuses on one of the major sources of delay in getting stations interconnected and energized – the supply chain process.** Again, we cover only the issues associated with publicly accessible commercial (non-residential) charging stations.

This paper has been developed by the Alliance for Transportation Electrification (the “Alliance” or “ATE”) under the auspices of its Interconnection Task Force, which reports up to the Policy-Regulatory Committee. The ATE is a 501(c)(6) non-profit corporation established in early 2018 and is active in many state proceedings across the country. We engage with policymakers at the State and local government level to remove barriers to EV adoption and to encourage the acceleration of EV infrastructure deployment with a particular emphasis on open standards and interoperability. We currently have about 60 members that include many electric utilities, auto and bus manufacturers, EV charging and service providers (EVSPs), and related trade associations and non-profit organizations. Much of the material in this Brief is gleaned from a series of meetings of the Interconnection Task Force from June 2022 to August 2023. While many of the recommendations come from suggestions at those meetings, we have not attributed them.

Once a contract is signed to construct a charging station, utilities need to acquire the electrical equipment that will be required. These needs vary greatly

according to the site location, current power capabilities, power level of the chargers, current equipment on site, and other factors. Many EV infrastructure sites are often likely to require new distribution transformers to provide service usually in front of the meter for the utility-side infrastructure. Utilities are also acquiring these transformers to accommodate other needs on their system, including distributed generation such as energy storage systems and normal customer growth from both commercial and residential customers. **As a result of the pandemic as well as increasing needs for transformers due to electrification initiatives at the state and federal levels, as well as limited suppliers, supply chain issues have resulted and are currently one of the major sources of delay in the energization of many charging stations.** For example, delays to obtain a 1000 kVA transformer can be up to two years and even longer.

And it is not just single phase or three-phase distribution transformers. Lead times for basic electrical panels, whether 200 or 400 amperes, lengthened significantly during the Covid-19 pandemic and economic uncertainty. Power sockets have gone from 42 weeks to 68 weeks. Switchgear has gone from three months to twelve months lead time and costs have increased four to ten times. Switchgear are also needed in data centers and other use cases beyond EV infrastructure, further putting pressure on the demand for this equipment. Recently, there is market evidence from utilities, EV service providers (EVSPs) and OEMs that the supply constraints are improving in some areas, but supply chain remains a significant barrier to efficient interconnection.

Thus, dealing with supply chain issues and trying to resolve them has become a major focus of the utility industry and EVSEs. In the following paragraphs, we discuss some of the reasons for supply shortages and some of the efforts being undertaken to resolve the issues.



Reasons for Supply Delays



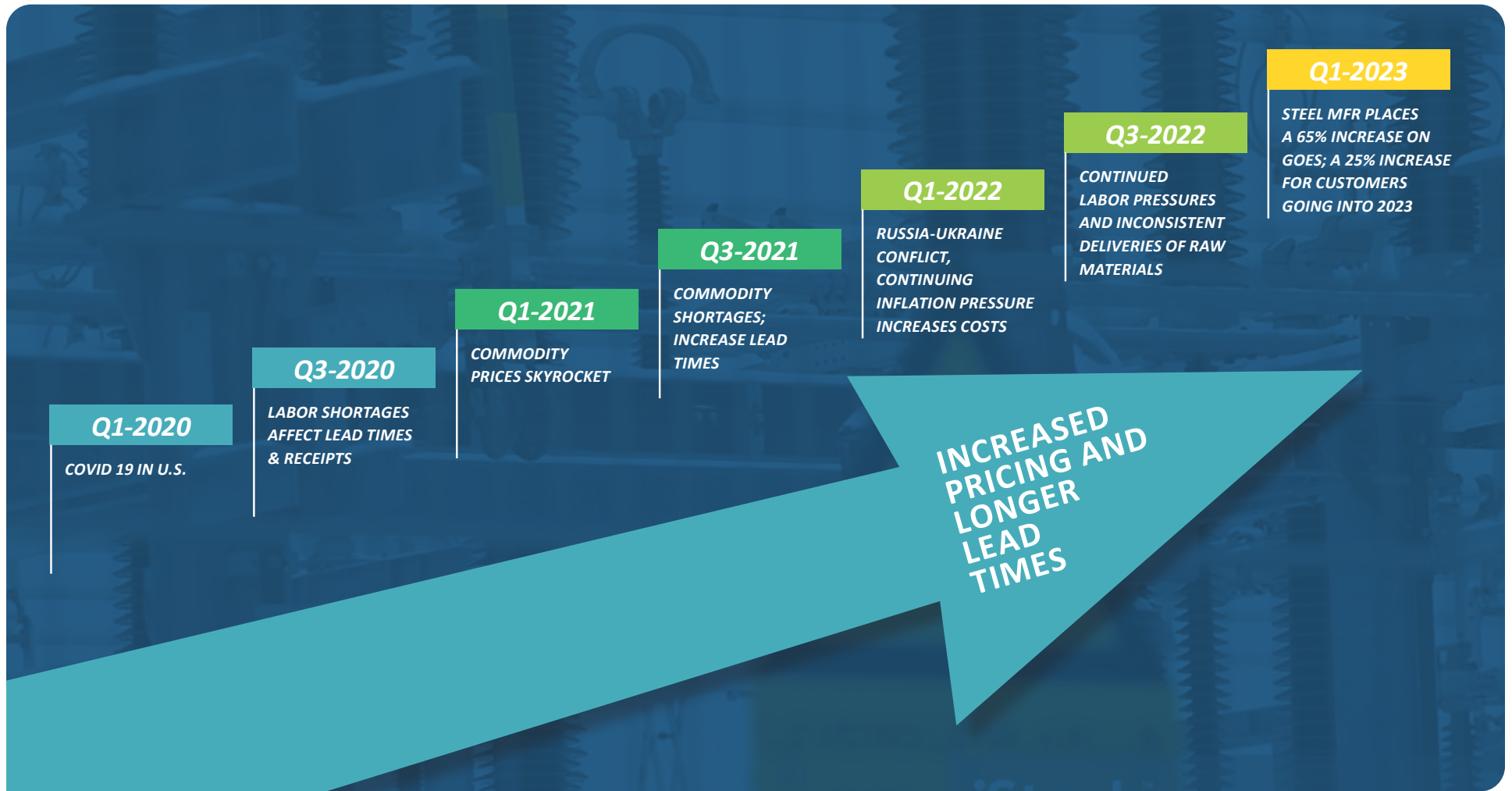
There are multiple reasons for supply shortages in the electrical equipment industry, but a major cause was the Covid-19 pandemic and the factory shut-downs and worker shortages it caused amid continually increasing demand caused by the uptake in EVs, increasing needs for distributed generation, grid hardening projects to provide storm resilience, growth of data centers, and continued general growth in demand. Manufacturers are just beginning to overcome the problems that occurred during this period. There were also historic hurricanes between 2020 and 2022 that contributed to shortages. And transportation bottlenecks limited import capability. In addition, with respect to transformers, there is and always has been limited domestic manufacturing capability for the steel required. Cleveland Cliffs is the only domestic manufacturer of Grain-Oriented Electrical Steel (GOES) which is required for distribution and power transformers. All other manufacturers are in the Asia-Pacific region. A former supplier, Allegheny, went out of business and ABB stopped production. The other type of steel used for electrical purposes is known as NOES or Non-Oriented Electrical Steel, and is used primarily in motors, including the electric motors used in the propulsion systems of electric vehicles (such as AWD, all-wheel drive vehicles). But the GOES specialty steel,

which is unique for the precise way in which the inner layers of transformers are manufactured faces unique headwinds. Cleveland Cliffs is already operating at capacity but considering expansion of production capacity depending on sufficient demand.

In a meeting with ATE's Interconnection Task Force Cleveland Cliffs suggested that the shortage of GOES for transformers resulted from the pandemic and worker shortages. But Cleveland Cliffs has been investing substantially, using idled equipment, and hiring more workers and believes that the availability of steel is no longer an issue. The Company suggests that worker shortages for transformer manufacturers may be a lingering cause of supply chain problems. There are also material shortages. A limited supply of core steel is affecting manufacturers, and there is uncertainty about steel and aluminum shipments to electrical equipment manufacturers. And major storms and other natural disasters re-prioritize shipments to customers. Moreover, further industry consolidation may create further delays creating even more concerns from EV-related customers.

Southern Company identified a timeline that describes what they see as the factors leading to supply chain delays that have added up over time.

Events Disrupting Southern Company's Supply Chain



Source: Lauren Lee. Southern Company. Presentation to ATE Interconnection Task Force, February 27, 2023

Southern Company estimates that lead times for distribution transformers have increased by over 400% between 2020 and 2023.

Distribution transformers are the most obvious supply chain backlog, but switchgear and control panels are also in short supply. Switchgear is usually customized to its planned use and standardization requires time and planning. Control panels utilize low voltage components that can have manufacturing delays and longer lead times.

These supply chain challenges and unprecedented lead times are impacting large investor-owned utilities and smaller municipal and cooperative utilities alike, the situation for smaller public power and cooperative utilities is even worse. When project needs cannot be met, they are delayed or cancelled. A 2022 American Public Power Association member survey on distribution transformers found that production is not meeting demand with public power utilities experiencing increasing lead times, a lack of stock supply, and numerous project deferrals. Average lead times for distribution transformers between 2020 and 2022 rose 429% for the 95 respondents, with some utilities citing lead times of more than three years. The survey also found that one in five projects were deferred or cancelled because of the distribution transformer shortage.¹

There is another looming concern that will likely worsen supply chain constraints. The U.S. Department of Energy has proposed efficiency standards for distribution transformers.² Detailed comments on that proposal are beyond the scope of this paper, but many stakeholders are expressing concern that current problems could be exacerbated. The proposed timeline is tight, especially given current shortages, and existing timelines for procuring transformers are likely to be negatively impacted in the short and mid-term. The proposal may force manufacturers to divert attention from increased output to instead focus on retooling their factories to use a new kind of core material. Furthermore, industry analysts believe that transformer costs will increase as well. In response, the three major industry trade associations for utilities (EEI, APPA and NRECA) and other associations weighed in with comments in opposition to this rulemaking, especially at this unprecedented time of supply constraints and the increasing demands of end-use electrification.³

The push for electrification economywide is a huge driver to today's supply chain constraints. Almost every utility is ordering the same type of equipment needed for charging stations, distributed generation, and normal local load growth. Some of the factors causing increased demand include the Infrastructure Investment and Jobs Act, the Inflation Reduction Act, and the CHIPS and Science ACT all contributed to demand for the type of distribution equipment needed by charging stations. Utility and state-level electrification initiatives are also creating increased demand. And the increasing frequency and severity of storms means a continuing requirement for replacement equipment. Thus, overall, the industry is caught in a bind with increased demand for transformers and other distribution equipment while manufacturers are constrained in ramping up output due to limited workforce availability.



¹ <https://www.publicpower.org/periodical/article/appa-survey-members-shows-distribution-transformer-production-not-meeting-demand>

² <https://www.energy.gov/sites/default/files/2022-12/dt-ecs-nopr.pdf>

³ <https://www.nahb.org/-/media/NAHB/advocacy/docs/industry-issues/doe-transformer-letter-021523.pdf>



Possible Solutions Being Discussed

MANUFACTURERS

Manufacturers can take action to improve supplies. Hiring, retaining, and growing a skilled labor workforce remains the top challenge. For example, some manufacturers are paying bonuses based on how long employees stay. They are also looking at new sources for hiring, and in some cases using lists of retired utility or related industry employees. They are going into high schools and colleges for workers. Some have even gone to immigration offices trying to find skilled workers. Some are providing housing near the factory. Working conditions are also being improved. Manufacturers suggest that they are doing as much as possible to ensure sufficient workers to meet demand.

FEDERAL GOVERNMENT

The federal government can also take actions to help ease supply shortages. The federal government and the Department of Energy (DOE) need to prioritize addressing supply chain problems or risk delayed realization of the administration's electrification goals. The Electricity Subsector Coordinating Council's Supply Chain Tiger Team made several recommendations to the federal government after a year-long effort to examine the industrywide constraints. The proposed DOE efficiency standards are expected to worsen the situation.

Some of the suggestions made include:

- Increased dialogue among utilities, manufacturers and the federal government to identify issues and seek solutions;
- Grants to programs providing workforce training and placement
- Pull back the proposed transformer efficiency rules in light of supply chain shortages as permitted by statute;
- Grants and/or tax breaks to provide more domestic manufacturing capability; and,

- Possible use of the Defense Production Act (DPA) to increase the supply of distribution transformers, switchgear, and control panels.

We believe the federal government needs a government-wide approach to solving these issues which are both near- and long-term and extend across multiple agencies' jurisdictions. Failure to act may delay meeting the Administration's clean energy targets and may result in delays to implement vital legislation that was recently enacted into law.

STATE GOVERNMENT

State governments may also take actions to try to mitigate delays from supply chain problems. Some states are establishing workforce training programs in cooperation with utilities to improve workforce availability for manufacturing.

In California, various bills have been proposed to set reasonable timelines for the interconnection process, which would put additional pressure on utilities to resolve supply chain delays. For example, SB 410 (Becker) sets up a tighter set of timelines and criteria for the utilities to review in their energization schedules, and the Commission's review, specifically:

- The Commission shall...establish reasonable average and maximum target energization time periods. The targets shall ensure that work is completed in a manner that minimizes delay in meeting the date requested by the customer to the greatest extent possible.
- Establish requirements for an electrical corporation to report to the commission, at least annually, so that electrical corporation can be tracked and improved. . .
- Establish a procedure for customers to report energization delays to the commission.

This bill (SB 410) recently passed the California legislature (as of September 15 sine die adjournment) and has been sent to the Governor for his review and signature.⁴

Similar bills are being supported by NGOs, charging companies and others in many states. We believe such legislation would penalize utilities for factors, such as supply chain delays, that are beyond their control and don't address the sources of the problems delaying interconnection.

UTILITY BEST PRACTICES

There have also been multiple proposals, pilots, and utility programs for dealing with supply chain issues. These include efforts at **standardization of transformers needed, sharing equipment amongst utilities where possible, refurbishing distribution transformers, ordering equipment in advance of need, establishing zones of “no regret” which could be built up in advance of need, identifying and using new suppliers (perhaps foreign), changing internal processes, and providing power alternatives or offering limited power to charging stations** at least on a temporary basis.

One best practice that has been suggested by many is to standardize the distribution transformers or other equipment used for charging station installations. Right now, utilities may change or customize the specifications for either single-phase or 3-phase transformers depending on the unique needs of their distribution systems. While such customization may have made sense during a more “normal” period of relatively low electrical load growth and limited emerging end-use technologies, the environment has clearly changed in the past few years, particularly with growing use of EVs, battery storage, and distributed energy resources. We believe that there is an urgent need now for the industry to revisit these issues of standardization. The Edison Electric Institute (EEI) has implemented a “tiger team” of chief procurement officers to address some of these issues. Standardization would make it easier for utilities to develop and maintain inventories. However, standardization is not a panacea – it may make equipment more efficient to produce but if the problem is workforce or mate-

rials, it won't help. Some have suggested that utilities make their transformer inventories transparent, but there are associated security concerns that weigh against such transparency. Switchgear, another item of concern and delay, needs more standardization as it is usually designed to be specific to the site where it will be deployed. However, the industry should consider some standardization for switchgear as well.

Another best practice is for utilities to order transformers and other equipment in short supply in advance of need. The idea is that utilities would forecast the growth of charging stations in their service area and pre-order to meet those needs. This is an easier task if the equipment is standardized because this allows more options to use equipment on different projects. EVSEs have argued that utilities should maintain an inventory of transformers rather than having them ordered one at a time. Some utilities are already ordering in advance of need – Salt River Project and CenterPoint Energy, for example. But forecasting needs is not easy to accomplish, as EVSPs, fleets, transit systems, and MHD vehicle OEMs seldom know their plans more than two to three years in advance, and even those plans change frequently. And utilities are of course reluctant to invest substantial sums in equipment for future use without some assurances from public utility commissions that such costs will be recoverable. Some utilities are using forecasts to order equipment in advance of need.

Utilities can and should make requests for advance cost recovery approval to their PUCs. **PUCs should review and approve requests for pre-ordering supplies that are in shortage when the need for future equipment is demonstrated to a reasonable extent.** And along the same lines, utilities should seek approval of installing equipment at EVSP sites for futureproofing. With sufficient data and credible load forecasting, the utilities should coordinate more closely with Commission staff in order to meet these needs of future expansion in a cost-effective way. Most utilities file asset management plans, for both transmission and distribution infrastructure, on a regular basis with the Commissions either separately or as part of a general rate case (GRC). Such reporting mechanisms should be strengthened and highlighted for the emerging needs of infrastructure for transportation electrification.

⁴ https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB410



Establishing “zones of no regret” is another potential best practice that some stakeholders have suggested. Utilities would upgrade distribution and add equipment in areas where there is evidence of expected activity which could include airport rental car centers, major fleet depots, large parking garages, NEVI proposed sites, and others. By pre-planning such areas, the utility could direct charging stations to those areas and minimize the need for further investment.

Identifying and using new suppliers, and in some cases even providing them with assistance to expand output is an emerging best practice. For example, while there is only one domestic supplier of GOES for distribution transformers, some utilities are looking at foreign suppliers. Southern Company, for example, is actively engaging with foreign manufacturers to source transformers as are many other utilities.

Oncor Energy in Texas provides a good case study of an innovative approach used to improve the transformer supply chain. Oncor was faced with a crisis when a major supplier of tens of thousands of distribution transformers cut off supply. Oncor did an RFP to identify potential new suppliers domestically and internationally and found themselves with elevated risk. Oncor decided to approach a smaller supplier that had limited capacity and provided them with an interest-free loan allowing them to add a third shift. Oncor gave the company four months to order materials, find the people, and prepare for the added capacity. The arrangement for directly contracting both for supplies and additional labor shifts worked well and allowed Oncor to source its lost supply.

In another case, Oncor purchased raw materials for a supplier, which was deducted from the cost of the transformers purchased.

Changing internal processes to help ease shortages and prioritize use of existing inventories. SCE, for example, has formed a task force of field offices to allow them to redistribute available transformers according to where the need is greatest. The task force has focused on sharing information among field offices and recirculating existing inventory according to priority needs. Edison found that better understanding their own inventory and having visibility into it was an important internal step. Edison is trying to make these practices standard.

Southern Company is repurposing a refurbishing facility so that they can receive transformers even if they are missing certain components – allowing them to receive and process them faster. Any transformer that they or a third party can repair, they are doing so. Southern Company is also looking at idle transformers already in the field, such as at neighborhoods that were started and paused – and pulling and refurbishing them.

There are some complaints that utilities are not fully transparent to customers regarding the availability and timeline for transformers, switchgear, and control panels. Some of this reluctance to share information is due to concerns both for cyber and physical security from hackers or malicious actors. But utilities are often in the dark themselves regarding when orders might be delivered. Initial lead times quoted by the manufacturer may be adjusted one or more times. The industry may wish to reconsider how transparency might be increased with ap-

propriate security protocols. But lack of knowledge of manufacturing timelines and delivery dates will be difficult to overcome and will require cooperation of manufacturers.

Utilities should also be working with their state's Departments of Transportation to gain an understanding of what needs are likely to arise under the federal NEVI and CFI (Charging and Fueling Infrastructure programs) with funding from the Bipartisan Infrastructure Law (BIL). States should be flexible in project milestones to account for extended and changing lead times. The earlier utilities can understand where NEVI chargers are likely to be sited, the earlier they can begin to study those areas and determine what new equipment may need to be ordered. Again, however, ordering equipment in advance of a formal request may raise questions with the regulatory Commissions, questions that should be resolved in advance of either deployment or a filing. By the same token, customers should be discussing their needs as far as possible in advance again to give utilities the opportunity to order equipment as early in the process as possible.

Providing limited power at sites while waiting for equipment needed to provide full power is being considered by utilities in many instances. It may be the case that a site can provide limited power but needs a transformer or other equipment to provide the full power requested by the site host. In such cases, utilities can monitor and place limits on the power uptake of the station. It's also possible that the utility could add on-site storage on a temporary (or permanent basis) to serve the site while waiting for equipment. Renewable power located by customers at sites needing additional power is another short- or long-term solution. Utilities might also think about utilizing on-site storage and renewable generation in locations where power supply is tight. SCE, for example, has a mobile energy storage program which allows it to offer a phased-in process for customers. On-site storage can also be used to help the customer avoid demand charges. The Sacramento Municipal Utility Program has such a program for its customers called My Energy Optimizer which offers rebates while requiring customers to sign up for a unique rate design (solar and storage rate).⁵

⁵ <https://www.smud.org/en/Going-Green/Battery-storage/Homeowner>





Summary

The shortage of distribution level equipment for providing service to EV chargers is not only affecting the ability of utilities to meet the demand for new charging stations, but these shortages and procurement challenges are affecting a broad range of issues in the utility and energy delivery industry including:

- responding to increasing needs for clean energy;
- providing hardening of the grid to provide resilience;
- having adequate resiliency capabilities to recover from hurricanes, wildfires and other natural disasters;
- meeting the increasing needs of all customers for electrification of loads, both residential and commercial; and,
- being able to meet normal load growth.

Utilities and equipment manufacturers are taking measures, extraordinary in some cases, to try to deal with the problem. In this paper, we have presented some of the measures that utilities are taking along with the manufacturers. Such measures should be adopted and expanded throughout the industry.

This ATE task force supports additional action by the federal government, particularly in attempting to cure labor and raw materials shortages. Partnerships between the government and industry are critical. Funding made available by the IIJA, the IRA, and the CHIPS and Science Act, as well as the authorities vested in the Defense Production Act (DPA) can all be used to provide financial incentives, loan guarantees, and labor incentives to help meet demand. The federal government should also remove barriers to expanding the size of the labor pool for manufacturing jobs.

This paper is a product of the ATE Interconnection Task Force, which is co-chaired by Melodee Black of SCE and Kathy Knoop of GM. The Task Force was established in the spring of 2022 to assess the broad range of issues that contribute to the long lead times often needed for energization of public charging stations. The Task Force, through its first Energizing EV Charging Stations: Issue Brief 1 - Overview of the Interconnection Process paper published in March 2023 and this Issue Brief, also intends to share the results of Task Force discussions with a broader audience to offer suggestions on making the process more efficient for the EV ecosystem. The facilitators and principal authors of this consensus-based document are Philip B. Jones, Executive Director, and Bruce Edelman, Senior Advisor of ATE. Please visit our web site for more information – <https://evtransportationalliance.org>, or contact: phil@evtransportationalliance.org

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