

The Supply Chain Crisis Facing the Nation's Electric Grid

In June of 2022, President Biden issued determinations authorizing the use of the Defense Production Act Title III to accelerate the domestic production of electric grid transformers and grid components. DOE conducted extensive outreach and gathered industry feedback that shows there is a supply and demand mismatch in the electric grid component market, resulting in an ongoing shortage of transformers and other grid components. Action is needed to ensure that the Nation's electric grid can continue to drive our economy and national security, and that utilities in rural, urban, and suburban areas can provide reliable electricity to homes and businesses.

Major Challenges

1. Over 70% of transmission and power transformers in the **U.S. energy infrastructure are 25+ years old.**
2. **Increasing demand requires 60% expansion** of U.S. transmission systems by 2030 and 3x by 2050.
3. **Frequent and extreme weather events** (e.g., hurricanes and wildfires) threaten reliability and resilience.
4. There is currently **insufficient manufacturing capacity to meet demand for grid transformers and component parts in the U.S.**
5. Heightened potential for **physical attacks on the power grid can lead to power outages** in communities.
6. The U.S. also faces electric grid component supply chain challenges from **reliance on foreign suppliers, pandemic-related shortages, and Russia's war in the Ukraine.**

Distribution Power Transformers (DPTs) and Large Power Transformers (LPTs)

- Utilities are reporting a 4x increase in average time it takes to receive new DPTs, from 3-6 months before 2022 to 1-2 years currently.

- Average time it takes to receive new LPTs is often more than two years.
- More than 90% of the Nation's consumed power passes through an LPT.
- Approximately 82% of LPTs installed in the U.S. in 2019 were imported.

Transformers & Grid Components

- Grain-Oriented Electrical Steel (GOES) is a critical component for DPTs, LPTs, and many other key grid components.
- The U.S. is unable to meet domestic demand for new LPTs with only one domestic GOES manufacturer.
- U.S. shortages of amorphous steel as well as aluminum and copper, which are all key grid components, also contribute to electric grid supply chain challenges.

DOE Outreach and Industry Feedback

Recognizing the supply chain challenges facing the Nation, DOE is working with the Electricity Subsector Coordinating Council (ESCC), in partnership with electric utilities and trade associations, to discuss current supply constraints and possible remedies. Additionally, DOE and the National Economic Council gathered information from distribution transformer manufacturers, representing the vast majority of market suppliers, through surveys and one-to-one meetings to better understand supply constraints they are facing and potential solutions. DOE has also consulted many companies, labor unions, NGOs, and other stakeholders through meetings, as well as a Request for Information asking stakeholders to identify highest priority uses for potential Defense Production Act funding to address supply shortages for grid components, among other technologies.

Key Take-Aways

- Manufacturers report challenges with workforce availability and increasing **difficulty in attracting and retaining a sufficient labor force**.
 - Many labor unions report that **labor availability depends strongly on the quality of jobs**, the level of compensation, and, for manufacturing work, on the ability of the employer to offer appropriate training. Both employers and unions express interest in addressing worker recruitment and training.
- Many manufacturers are unwilling to take expansion investment risk without medium or long-term **financial support and assurances**.
- **A diverse and increasingly domestic set of electrical quality steels and other components** are needed to bolster supply chain for electric grid transformers.
- **Many national trade associations and companies representing the electric and building sectors have requested federal support to address labor and material shortages**.

Potential Solutions to Help Address Grid Supply Chain Crisis

Defense Production Act (DPA)

DPA authorizes the President to create, maintain, protect, expand, or restore domestic industrial base capabilities essential for the national defense, which includes “programs for military and energy production or construction” as well as certain emergency preparedness and response efforts for “vital utilities and facilities.” In the DPA, Congress supported the strengthening of the domestic industrial base through augmentation of energy supplies with “more efficient energy storage and distribution technologies.” The President has delegated DPA authority to federal agencies, including DOE. DOE currently does not have funding to execute its DPA authority for grid components.

Based on DOE analysis and stakeholder input, DOE has developed initial options for how new Congressional investment in DPA could be used to support domestic production of grid components (LPT, DPTs, GOES, HVDC cable, and more) by, for example:

- Standing up **new manufacturing facilities** or new manufacturing lines in existing facilities.
- Creating a virtual reserve mechanism by having the federal government serve as a **purchaser of last resort** for grid components.
- Enhancing **workforce development** efforts.

New Congressional funding can address the supply chain crisis for grid components, while reducing reliance on foreign suppliers and lowering energy costs to American households and businesses consumers.

Additional Strategies & Market Signals

DOE has received feedback on the potential for other strategies that could help with the supply chain crisis through additional resources, including:

- Technical and financial assistance to industry partners to coordinate bids in international markets.
- Technical assistance on project prioritization given certain constraints, the benefits of reconditioning, and reusing/recycling of used assets.
- Supporting workforce development through relocation and recruitment incentives, training efforts, and focus on underserved communities while exploring key regulatory barriers to hiring.



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