



Transformer Shortages Threaten Progress in Electrification

The shortage of electrical transformers is stalling growth across sectors, impacting commercial and housing developments as well as AI data centers. Without coordinated action from industry and government, this supply gap is poised to deepen.

Transformer Supply Challenges and Industry Responses

Transformer production lead times have dramatically increased over the past two years, rising from an average of 50 weeks in 2021 to around 120 weeks currently. For large transformers, such as substation power and generator step-up transformers, lead times now range from 80 to 210 weeks, as noted by Wood Mackenzie. Additionally, large power and distribution transformer costs have surged by 80% between 2020 and 2024 (St. Louis Federal Reserve Bank).

Key Causes of Transformer Supply Shortages

1. **Electrification Trends:** Increased adoption of electric vehicles, expansion of data centers, and the shift from fossil fuels to electricity have driven up electrical load growth, raising the demand for transformers.

2. **Renewable Energy Generation:** Renewable energy sources, which typically have lower capacity factors than fossil fuel generation, require more transformer capacity to deliver equivalent energy output.
3. **Economic Recovery and Demand Surge:** The COVID-19 pandemic disrupted global supply chains, and the ensuing economic recovery has led to a sharp increase in demand for transformers.
4. **Aging Infrastructure:** The U.S. Chamber of Commerce reports that, as of 2020, the average age of large power transformers in service is 38 years, surpassing their expected useful lifespan. With over 60 million transformers across the U.S. grid (DOE), the natural retirement of older units is creating a continuous demand for replacements.
5. **Labor Shortages:** U.S. transformer manufacturers cite workforce shortages as a major constraint on production expansion.
6. **Lack of Equipment Standardization:** Custom design requirements from many utilities further complicate manufacturing processes and increase lead times.
7. **Limited Domestic Supply of Electrical Steel:** Electrical steel, essential for transformer cores to reduce power losses, has been challenging to source domestically.

Impact on Local Development

Due to these shortages, local developments are facing delays. For instance, CPS Energy in San Antonio and Portland General Electric in Oregon have informed developers of potential project delays until transformer availability improves.

Industry Recommendations

To address the supply issues, the National Infrastructure Advisory Council (NIAC) has proposed several measures, including:

- Federal policies and incentives to increase domestic transformer production.
- Establishing a strategic reserve of transformers to manage supply disruptions.
- Promoting the standardization of transformer designs to streamline production.

These recommendations aim to enhance the resilience of the U.S. power grid and mitigate future supply chain risks.

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This is the fifth in a series of posts on Green Tech Infrastructure.

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