

ESIG Panel

**Session 7: Closing Plenary Session:
Scale, Speed, and Supply Chains**

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T&D Equipment Supply Chains are Experiencing a Variety of Challenges

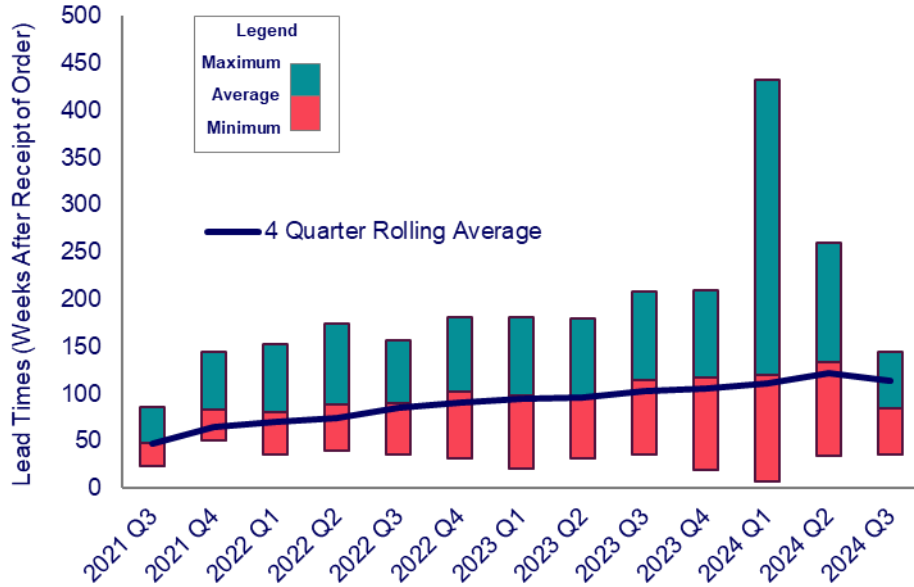
Manufacturing disruption, policy shifts, and a large market imbalance headline the challenges facing the industry.

Challenge	Description	Risk
Supply-demand imbalance for key T&D equipment	A confluence of demand drivers have pushed the market for key T&D equipment including transformers and switchgear into a market deficit.	● ● ●
Impending tariffs on US imports and policy shifts	The new US administration has made sweeping policy changes including reduced renewable energy support, and the implementation of new tariffs which will push the prices of key equipment higher.	● ● ●
Volatile commodity prices straining manufacturing costs	Key commodities used in the manufacturing of T&D equipment have experienced significant price volatility, pushing up domestic manufacturing costs.	● ● ○
Shortage of technical manufacturing labor	An increasing shortage of skilled manufacturing workers is straining domestic operations, especially in technical processes like transformer production.	● ○ ○
Shipping bottlenecks globally and volatile prices	Ongoing geopolitical issues are disruption key shipping lanes including the Suez Canal as the Houthi threat in the region continues to deter travel.	● ○ ○

Supply Side Challenges: High Demand / Limited Supply – Lead Time Increases

Lead times for virtually every critical piece of electric equipment have been rising steadily since the pandemic. However, some more easily inventoried items such as pad/pole-mount transformers have seen improvements.

Power Transformers Lead Times

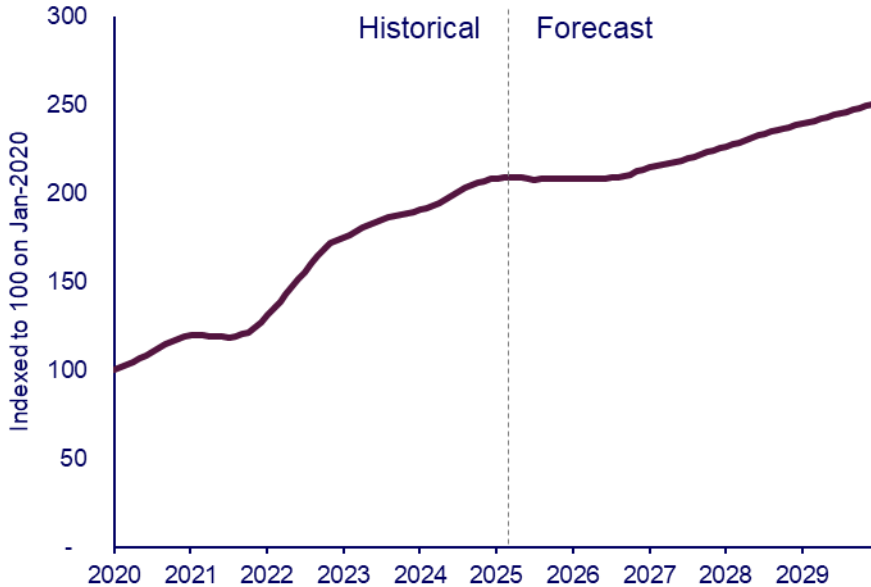


Equipment	Lead time change (2022 Q1 – 2024 Q4)
Circuit Breakers	+140%
Switchgear	+85%
Pad Mount 1 Phase	-50%
Pad Mount 3 Phase	-35%
Pole Top	-40%
Medium Power Transformer	+35%
Generation Step Up	+200%
Wire & Cable	+5%

Supply Side Challenges: High Demand / Limited Supply – Cost Increases

In addition to lead times, prices have increased significantly since the pandemic, beyond what pure commodity and labor increases would suggest. In an inelastic market, margins have expanded.

Power Transformers Price Trends

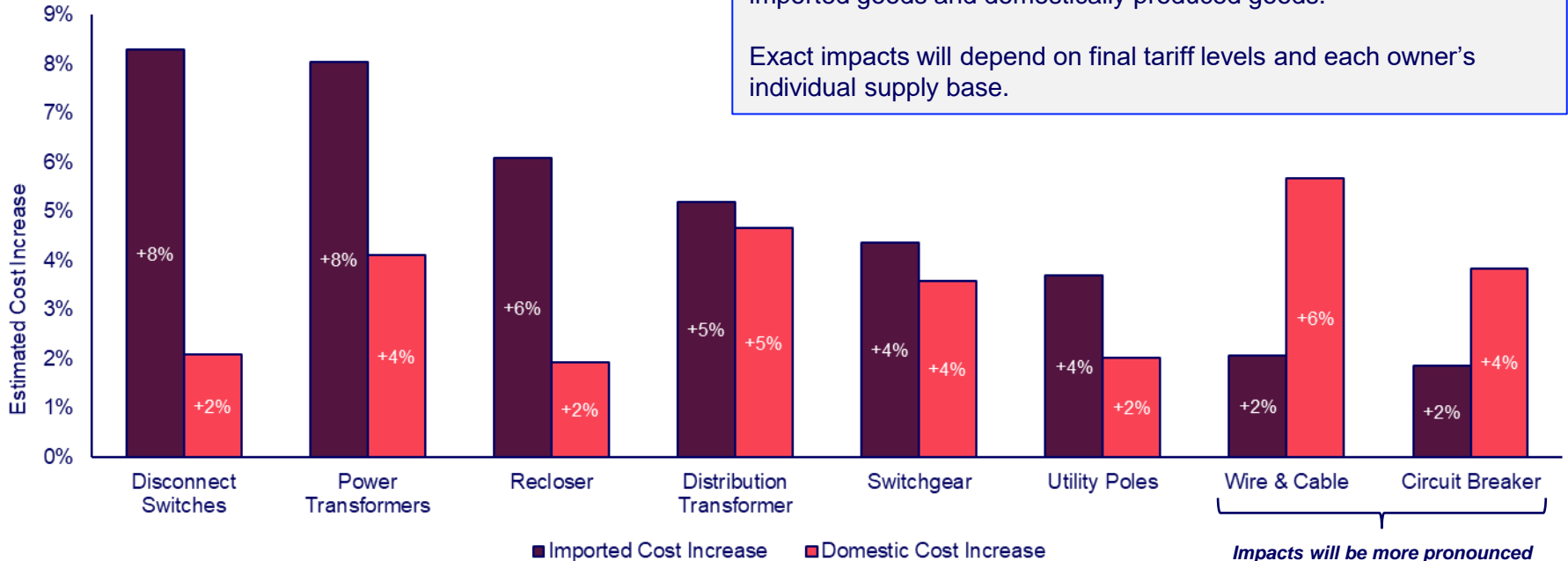


Equipment	Price change (2022 Q1 – 2024 Q4)
Circuit Breakers	+40%
Switchgear	+45%
Pad Mount 1 Phase	+45%
Pad Mount 3 Phase	+50%
Pole Top	+40%
Medium Power Transformer	+50%
Generation Step Up	+45%
Wire & Cable	+20%

Tariffs will impact prices of both imported goods and those domestically produced

Price impacts will vary by equipment type depending on exposure to new tariffs.

Tariff Price Impact by Equipment Type

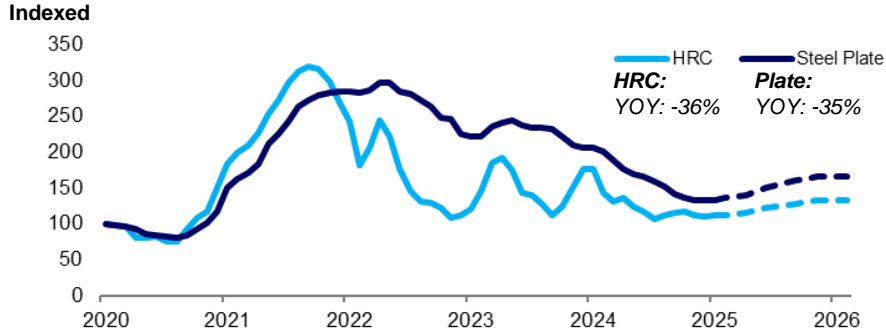


Overall price impacts will likely fall in-between the expected impact on imported goods and domestically produced goods.
 Exact impacts will depend on final tariff levels and each owner's individual supply base.

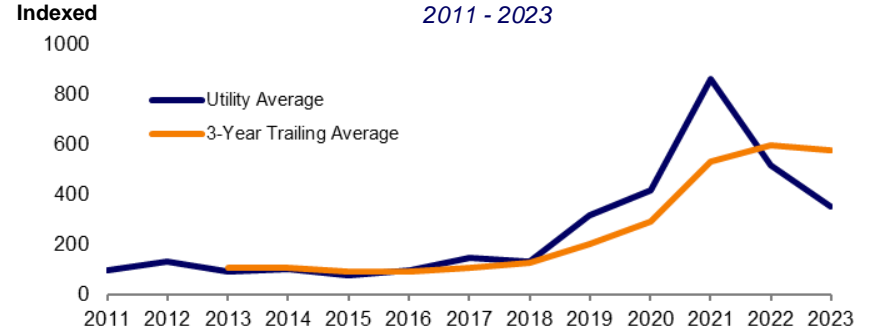
Impacts will be more pronounced for domestic manufacturing due to higher commodity costs.

Supply Side Challenges: Commodity Volatility, Shipping Costs, and Storm Frequency

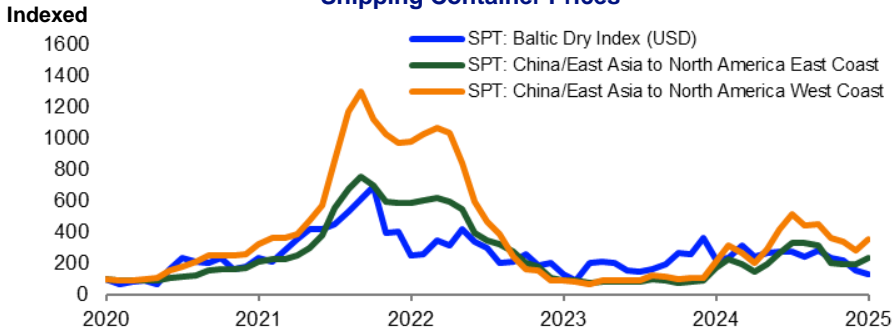
Steel Commodity Prices



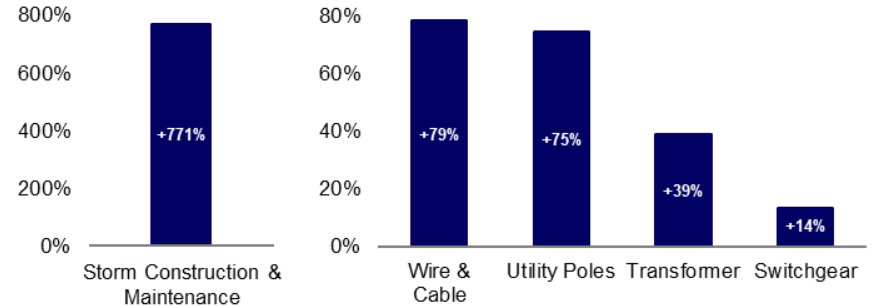
Utility Storm Restoration Spending 2011 - 2023



Shipping Container Prices



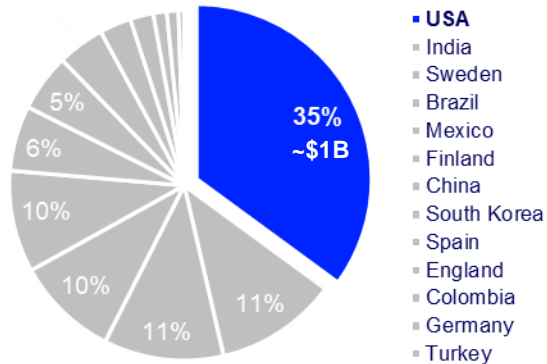
Average Spend Change: 3-Months Before vs. 3-Months After Storm



Tracking Manufacturing Investments: Transformers

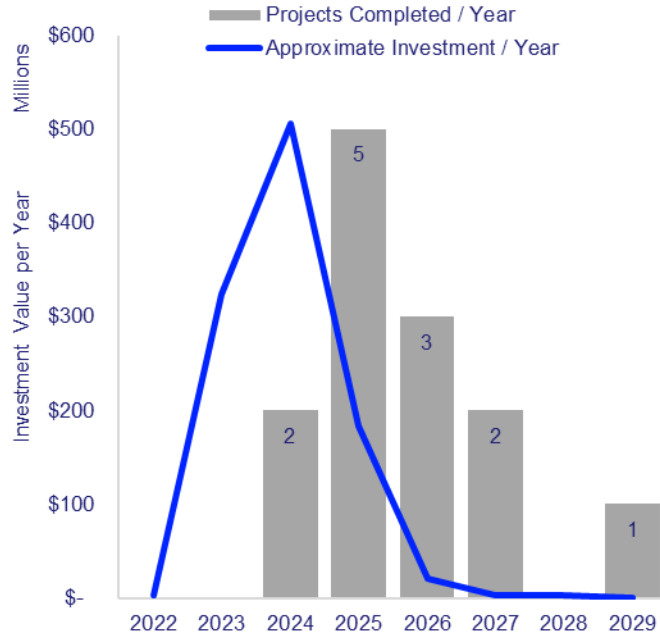
Announced USA transformer manufacturing investments have surpassed \$1B but with projects just now being completed, it will be years before added capacity alone impacts markets as demand continues to be robust.

Investment by Region
2023 – 2030 Completion Dates



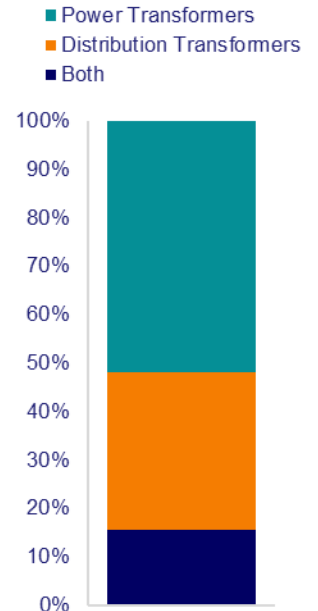
Top 10 US Manufacturers	Investment Amount
Eaton Corporation	\$500M
Cleveland Cliffs	\$150M
Siemens AG	\$150M
Central Moloney Inc	\$50M
Hitachi Global	\$36M
Remaining US Manufacturers	\$157M

Investments & Project Completions per Year, USA



Annual investments based: total investment value, announcement, and completion dates. Approximate.

Global Investment Breakdown



The electric industry sits at the center of national security, economic growth, and decarbonization priorities – brought into the spotlight after decades of low growth.

Utilities are having to navigate these complex operational challenges while also managing headcount and costs. They are asked to do more with less and must do it quickly to meet load growth demands.

What Can Supply Chain / Procurement Do About It?

1. **Directly? Optimize Procurement Practices:** execute procurement with best-practices fit for the world we currently operate in – what worked 5 years ago will likely not work now.
2. **With Cross-Function Collaboration? Look Inward to Optimize Operations:** price can only be optimized so far – after that, utilities must go a level deeper to review processes, execution models, specifications, etc., ultimately finding operational changes to improve timelines, spend more efficiently, and get more done within the bounds of today's market.

Mitigation Strategies – Materials

Utilities and OEMs can collaborate using key strategies to mitigate electric material risks.

Strategy	Actions
<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 10px;">Level of Effort</div> <div style="font-weight: bold; margin-right: 10px;">Low</div> <div style="border-left: 2px solid black; height: 100%; margin-left: 10px;"></div> </div> <p>Long-Term Contracts</p>	<ul style="list-style-type: none"> • Establish 3–5-year agreements to create stable and mutually beneficial relationships to ensure steady supply of critical electric materials • Ensure contracts have clear and equitable price modification formulas (index based) that accurately reflect market movements
<p>Diversified Supply Base</p>	<ul style="list-style-type: none"> • Identify and qualify multiple suppliers for each critical material/component to reduce dependency on a single source and increase capacity • Source from different geographic regions to mitigate risks related to regional disruptions (i.e. tariffs)
<p>Utility/Supplier Relationship Management</p>	<ul style="list-style-type: none"> • Organize collaborative planning sessions to engage in open communication on future project needs and OEM expansion plans • Solicit two-way feedback (Utility / OEM) to proactively find solutions to pain points • Incorporate continuous improvement to share new innovations / best practices
<p>Forecast & Demand Planning</p>	<ul style="list-style-type: none"> • Utilize advanced forecasting tools to build multi-year demand plans to allow for improved capacity planning, share demand forecasts and production schedules to better align supply and demand
<p>Alternate Materials & Technologies</p>	<ul style="list-style-type: none"> • Invest in R&D together to solicit alternative parts and components that meet the same requirements providing new materials / technologies to improve product performance (or reduce reliance on scarce resources)
<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 10px;">Level of Effort</div> <div style="font-weight: bold; margin-right: 10px;">High</div> <div style="border-left: 2px solid black; height: 100%; margin-left: 10px;"></div> </div> <p>Standardization</p>	<ul style="list-style-type: none"> • Develop / align with industry standards to allow for more readily available materials and components • Reduce need for custom solutions to streamline production processes and enhance efficiency • Find opportunities for SKU reduction

Procurement strategies may need to shift as utilities and vendors work to access a constrained equipment and labor market

Strong relationships with suppliers (particularly domestic) will matter more in a supply-constrained future and relationship development should begin now to improve supply surety.

Procurement Strategy	Advantages	Disadvantages	Usage Today	Effectiveness Under Supply Constraints
Frequent RFPs	Typically results in lowest price	Administratively cumbersome and time consuming for both utility and vendor	High	Low
Long-Term Alliance Agreements, Contractors of Choice, A few strategic RFPs every 4 – 5 years	Reduces supply chain burden, leverages economies of scale, allows for relationship development	Limits options compared to bidding process, requires vendor management and better demand planning	Moderate – mainly in key categories with repeat demand	Moderate - High
Bilateral Partnerships between Utility and Supplier	Builds trust and aligns incentives to encourage efficiencies and value-creation Can allow for investment in production & preferred queue slots	Limits options compared to bidding process, Can be more expensive if not properly managed, Requires cross-functional and leadership alignment within utility to put in place	Low	High , particularly in key areas such as domestic and/or emerging renewable production

Operational Efficiencies – Doing More With Less

Operational Efficiencies are more difficult to achieve but can be a significant contributor to cost management. Maybe most importantly, they can be achieved even in times of inflation and funding/policy uncertainty.

Productivity Improvement

Example: Analyze labor usage and historical productivity to inform optimal crew compositions for high-cost centers such as vegetation management

Make vs. Buy Arbitrage Opps

Example: Recognize areas where operational costs are high; pursue outsourcing non-strategic functions or insourcing costly activities with internal expertise

Value Engineering

Example: Partner with strategic suppliers to explore alternative materials, ways of manufacturing, ways of delivering service to understand what may be possible

Process Optimization

Example: Redesign crew deployment process for storm restoration to ensure lowest cost crews are deployed first – using technology to calculate optimal vendor for region of call out and number of crews needed






Specification Standardization

Example: Partner with Engineering and Standards to consolidate distribution transformer SKUs and streamline OEM production

Project Cost Benchmarking

Example: Perform root cause analysis for below-benchmark performance and address gaps (e.g., high engineering change orders require change in controls)

The Path Forward

-  The electric industry sits at the center of national security, economic growth, and decarbonization priorities
-  Affordability of everything, including energy, is a central political issue utilities will have to grapple with
-  Supply chain management will only increase in complexity as companies navigate new geopolitical tensions, trade disruptions, and tariff uncertainty
-  A stressed market, new tools, and need to meet demand offers a substantial opportunity for innovation in the utility sector, if utilities embrace it
-  Utilities upskilling their procurement practices, engaging transparently with vendors, and looking internally to increase operational efficiencies can drive change