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Power System Resiliency: Weather Patterns Linked to Transmission and Distribution Outages

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Weather hazards are the leading cause of power outages in the U.S. and a major contributor in Europe. Transmission lines are commonly impacted by wind and winter storms, and substations, which regulate voltage levels across the grid, are susceptible to outages caused by flooding. Recent research has begun to quantify the failure probability of power infrastructure against different weather hazards. Building on these established relationships, we seek to understand how future weather patterns will impact transmission and distribution outages in the United States. We do this by examining the weather patterns that have historically caused large-scale outages and determining how these will evolve under different climate scenarios. Additionally, forecasted outages will be compared to predicted demand to determine if there will be sufficient transmission and distribution capacity. Our results highlight locations particularly susceptible to weather-driven outages, which can help drive resilience planning as U.S. power infrastructure begins to reach the end of its lifespan.