PURDUE INNOVATES | Office of Technology Commercialization

# DC Resilient Transformer

**Hybrid permeability core improves transformer resilience to geomagnetic disturbances at moderate cost.**

Transformers are an integral component of the power grid. Solar activity can induce fluctuations in earth surface potential, causing geomagnetically induced currents (GICs) that can result in transformer lifespan reduction or failure. To address this, researchers at Purdue University have developed a design topology for a transformer that uses both low and high permeability materials. In comparison, conventional transformer designs exclusively use high permeability materials. With Purdue's solution, resilience to GICs can be significantly improved with only moderate cost increases. This technology has applications in the design of transformers to mitigate the risks of solar flares on the power grid.

### Advantages

-Improved resilience of transformers

-Uses combination of high and low permeability materials

### Applications

-Design of Transformers

-Grid Modernization

-Electrical Engineering

### Technology Validation:

This technology has been validated using a time stepping 2D FEA simulation which showed that small changes in the transformer core geometry has significant impact on transformer resilience.

Related Publications:

A. Prasad, S. D. Sudhoff, T. C. Monson and G. Subramania, "Metrics and Strategies for Design of DC Bias Resilient Transformers," in IEEE Open Access

**Technology ID**
2023-SUDH-70179

**Category**
Energy & Power Systems/Grid Modernization & Smart Grids

**Authors**
Scott D Sudhoff

**Further information**
Parag Vasekar
psvasekar@prf.org

**View online**

Journal of Power and Energy, vol. 10, pp. 528-538, 2023, doi: 10.1109/OAJPE.2023.3303781.

**TRL:** 3

**Intellectual Property:**

Provisional-Gov. Funding, 2024-01-04, United States

Utility-Gov. Funding, 2025-01-03, United States

**Keywords:** Electrical Engineering, GIC, grid modernization, power failure, power grid, power outage, resilience, solar flares, Transformers