

The background of the entire page is a long-exposure photograph of a city skyline at dusk. The sky is a deep, dark blue with some light clouds. The city buildings are illuminated with various lights, and some have construction cranes on top. In the foreground, there are light trails from cars on a highway and a bridge. The Siemens logo and tagline are in the top left corner.

**SIEMENS**

*Ingenuity for life*

## Grid resiliency solutions for power transformers

Prevent – Protect – React

[siemens.com/pretact](https://www.siemens.com/pretact)

*“Mobile and flexible transformers are an innovative product that shows our commitment to grid resiliency. This offer is backed by an attractive service portfolio from maintenance and repair up to financing.”*

## Prevent operational risks



- Transformer Lifecycle Management
- Condition Monitoring
- Repair and Retrofit
- Prevent component failures (e.g. Bushing service)
- Long Term Program (LTP)

## Protect against vandalism and excessive heat



- GIC\*-safe transformers**
- Avoid critical heating
  - Up to 200 A extra DC-capacity
  - Non-magnetic steel inserts prevent overheating

\* Geomagnetically Induced current

- Bullet resistant transformers**
- Special shielding with bullet-proof materials up to Cal.50 Ball M2 for new transformers and as an upgrade for existing units

## React to emergencies

### Mobile



Compact & lightweight design

### Versatile



Covering different ratings

### Rapid installation



Plug & play connections and bushings

Long term service agreements for storage, transport and maintenance of spare units.

### Ester insulation as a resiliency-feature

Siemens has a broad and deep experience with ester insulation as an alternative to mineral oil. These fluids, no matter if synthetic or natural, provide additional safety and lower fire and explosion risks in any transformer.

A high flame and flash point keeps risks at a minimum. This leads to lower fire prevention restrictions, so that ester-filled units can be placed in protected environments just as well as urban areas. Security distances may be reduced and constructions like fire walls partly be eliminated with those units, which saves time and space.

Additionally, operators benefit from a longer transformer lifetime or better cooling characteristics of these fluids.

### How to achieve peace of mind in grid resiliency

The key word of today in U.S. energy is grid resiliency; especially when it comes to power transformers. Starting with the big blackout in Canada 1989 it was realized that power transformers are a crucial part of the network. A real eye-opener for this issue was hurricane Sandy that caused a blackout in Manhattan in 2002. Being a partner of the U.S. energy industry since decades, we know about the challenges of an ageing infrastructure and having to invest in resiliency. Together with known customers based in the U.S. we have developed products and services that are at the same time reliable and flexible and provide any transformer operator peace of mind for their network.

With our cutting edge technologies, grid resiliency becomes a clear vision for the future of the U.S. energy industry. No matter if the grid you are responsible for is huge and urban or small and rural – our concept and its solutions are adaptable for any utility. It offers solutions for all three groups of risk factors:

- Operational issues (network failures, aged fleet)
- Natural disasters (earthquakes, hurricanes, geomagnetic storms)
- Attacks (physical or cyber attacks)

Let grid resiliency not be the nightmare-scenario of vast blackouts. Make it your passion to propose peace of mind to your customers and company together with us.

### PREVENT operational risks

A large portion of the installed fleet of power transformers in the U.S. were installed in the 1950s, 60s and 70s and are now reaching the end of their projected service life. As a result, power outages in the U.S. are becoming increasingly more frequent and it is feared that the number of outages will continuously increase as equipment ages.

To prevent operational risks, Siemens Transformers offers a wide range of services to keep your aged transformers in shape. Condition monitoring identifies the weakest parts of your grid and can tell you where immediate action is needed. Repair and retrofit solutions can be helpful to lower operational risks and get critical transformers back on the grid faster and less expensive than ordering a new unit. Component failures (e.g. bushings) can be prevented with the equipment being replaced or maintained in time. Our long term program (LTP) helps you to make sure your power transformer fleet works reliably and efficiently at any time.

### PROTECT against vandalism and excessive heat

There are various examples for transformer failures that were caused either by physical attacks or natural effects like geomagnetic storms. A repetition of the famous Carrington Event in 1859 missed Earth closely in 2012 when enormous sunstorms threatened to cripple our energy networks.



**GIC-safe power transformers**

Our know-how and expertise, and especially our dedicated staff, that know their products by heart, have developed measures how to protect these strategic nodes of the grid. Knowing that sunstorms can lead to geomagnetically induced current (GIC), our key experts in transformer design have analyzed that phenomenon. We have developed algorithms to avoid critical heating in power transformers with up to 200 A extra DC-capacity. Non-magnetic steel inserts in power transformers prevent overheating and make power transformers GIC-safe.

**Bullet-resistant power transformers**

Another risk factor for power transformers is human attacks, for example by bullets. Cases of power transformer failures caused by vandalism are well-known in the U.S. and the only protection for a long time had been a large concrete wall built around the entire substation. This is a tedious and expensive way to protect a transformer according to our experts. We have tested materials and have come up with the innovation of a bullet-resistant power transformer. A special shielding with bullet-resistant materials up to Ca. 50 Ball M2 is available for new transformers and as an upgrade for existing units.

**REACT in case of an emergency**

We have worked hard on improving our service to cope with the needs for grid resiliency and to develop cutting edge technologies. However, our passionate

employees did not stop at that point.

We want to give our customers real peace of mind, which means they need an ace up their sleeve, just in case all of the measures taken could not ultimately avoid a blackout. This is why we have teamed up with known U.S. utilities to drive grid resiliency one step further with mobile resiliency units. Those power transformers are at the same time

- mobile
- versatile
- can be rapidly installed

We have put all our expertise into designing the most lightweight and compact units that can be transported without special approvals on standard trucks. Upon customers' request, those units can even be transported oil-filled to save oil-handling time and efforts on site. Our mobile resiliency transformers are even covering different ratings – that means it is not necessary to get a spare unit for each and every transformer in the grid. And they can be easily installed because they are equipped with plug & play connections and bushings. Thus, the installation time can be cut down to a few days instead of weeks, and the affected substation can get back to the grid in just a week if anything unforeseen occurs. Even as a team, Siemens Transformers and our customers might not be able to rule out all the blackouts that could occur. But we can give you a solution that is right up your alley when it comes to unforeseen emergencies.

**Additional services for grid resiliency**

In addition to the three main parts of our resiliency concept, we offer a broad range of services to assist our customers in achieving resiliency.

Whether it be financing solutions for the investments needed or storage, transport or maintenance of spare units – Siemens Transformers offers attractive solutions at the high-quality level we are known for.

No matter what your challenges are – Siemens Transformers and our dedicated staff is at your side to meet those challenges and assist you to get to a robust, safe and reliable energy grid.

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