



Siemens Transformers – Case Study

Enabling resilience: Mobile resilience transformers

Mobile, fast, and environmentally friendly

The challenge

Energy security is an important issue in the US. The Department of Energy (DOE) launched a partnership program to put this topic at the top of the priority list for utilities. The threat of emergency due to natural catastrophies, physical attacks, or cyberattacks might become a local, regional, or even national issue, and thus investment in the resilience of the transmission grid is sought after.

Just imagine: after a storm, hurricane, or major substation event there is a power outage. The effects would be tremendous. The customer, Con Edison, New York City's energy utility, decided to prepare for such a scenario. They wanted to invest in the reliability of their grid. The request was to have a spare power transformer that was

» *We are really proud to have teamed up with Siemens and developed this one-of-a-kind resilience transformer from concept to product in such a short timeframe. This is a truly game-changing product that can really help us restore service and/or mitigate risk for our customers in an extremely efficient manner. The lessons from this unique and innovative design are also being applied to other transformers purchased by Con Edison to better suit our reliability and cost control needs of today and in the future.*«

Sanjay Bose, Vice President Central Engineering, Con Edison

Con Edison

For more than 180 years, Con Edison has been supplying the energy that powers New York City. Consolidated Edison Company of New York (Con Edison), a regulated utility, provides electric service in New York and most of Westchester County. Con Edison is a subsidiary of Consolidated Edison, Inc. [NYSE: ED], one of the nation's largest investor-owned energy companies, with approximately \$12 billion in annual revenues and \$40 billion in assets.

mobile, versatile in its applicability, and at the same time quick to install and environmentally conscientious in order to restore power within a few days instead of weeks.

The solution

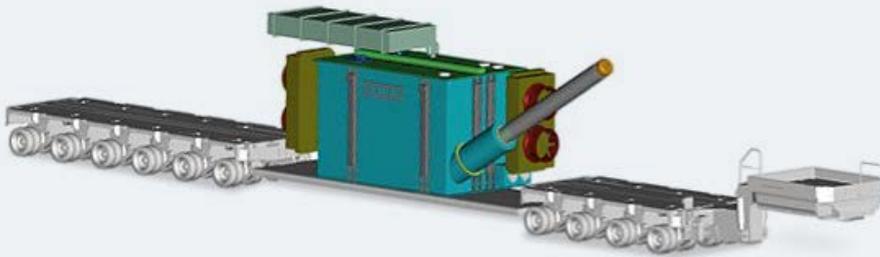
The idea was to have a power transformer that the utility could move, install, and energize in less than 24 hours. So, the power transformer needed to be as lightweight and compact as possible so it could be moved to the site of the emergency quickly.

To contribute to the speed of grid restoration, the installation of the units needed to be quicker than usual. In an emergency, there simply is no time to install accessories and adjust dozens of bolts and nuts as accurately as is normally needed. The connection to the grid also needed to be approached differently: an emergency unit had to be set up apart from the main equipment and connected by long cables.

The third demand was even harder to tackle: the units needed to be versatile. Several spare units for each voltage level could be used, but that would mean using conventional transformers, which have their disadvantages: big, heavy, and very specialized for the task they were designed for.

In the end, together with Con Edison, Siemens developed a power transformer that could be likened to a multi-functional pocket knife: compact, lightweight, easy and quick to install, and versatile in high and low voltage. Plus: economically friendly because of its ester filling.

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



Transport of the mounted mobile resilience transformer on a truck



Illustration of the mobile resilience transformer with plug-in bushings.

» These mobile and flexible transformers are an innovative product that shows our commitment to grid resilience. This offer is backed by an attractive service portfolio ranging from maintenance and repair to financing.«

Dr. Beatrix Natter, CEO Siemens Transformers (Siemens AG)

Technical features

1. Factors for easy and fast transportation

The dimensions were kept as compact and lightweight as possible. Instead of one 3-phase unit, three 1-phase units were designed. Coolers and conservator are specifically designed to keep dimensions compact. With 41'x10'7x113'104 m (lxbxh) they can easily be transported to the requested site. Including oil, the weight of one fully assembled and oil-filled unit is 95 metric tons, so it can be transported oil-filled.

2. Quick and easy installation

In order to ensure speed and ease in installation, the mobile resilience transformers are equipped with two-part plug-in silicone-shielded bushings. They can be connected without draining the main tank and the transformer can also be moved with the bushing installed. To ensure compactness and easy installation, there are plug-in connectors and cables with an ESF bushing on the end. An external plug-in cable connects the TW Delta. Units can therefore be connected to the grid within one day on-site.

3. Versatile operation possibilities

The mobile resilience units cover two different ratings and operate under two configurations, enabling reconnection to the 335/136 kV system (300 MVA) or the 132/68 kV system (150 MVA) within less than 2 hours with no oil handling. A load tap changer in the main tank allows for $\pm 12\%$ adjustments. However, the change between the systems requires off-circuit tap changers besides the OLTC.

The impedances range is between 6.9% and 19.3% with a special winding arrangement, depending on the 300 MVA or 150 MVA rating for parallel operation with existing units.

4. Additional features

All units are filled with environmentally friendly ester oil, which makes transportation, operation, and eventual disposal of the product easy. They are low maintenance and can be stored fully assembled, ensuring that they are ready for operation at any time. Additionally, they are low noise; under no-load as well as under-load the 75dB limit is never exceeded.

How can we help you ensure grid resilience?

Our portfolio for grid resilience includes condition monitoring and bullet resistant paneling, as well as GIC-safe solutions and mobile resilience transformers – your assurance in case of emergency. Contact us if any of the following situations apply to you:

- What happens if the next storm/hurricane hits our substation?
- How can I prepare for a potential physical attack against our investments?
- I would like to buy spare units, but do not want to invest in several different transformers.
- I need a versatile power transformer.
- I need a transformer that is easily transportable and quickly installed.
- My company would like to have an ace up their sleeve in case of an emergency.

Talk to us!

We care about the resilience of your grid as much as you do!

Talk to us!

A resilience strategy consists of several facets. The first priority is to ensure that the fleet is working with as few risks as possible. Second, operators have to safeguard their equipment to help protect against disasters and attacks. Finally, if those measures fail, it's critical to have a response plan in place that allows the utility to respond as quickly and safely as possible.

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