

Case study

Harmonic filter banks for PSE, Poland

Making Polish power grid more resilient

High-end solution in compliance with the Polish national power grid code regarding permitted harmonics at 110 kV.

Customer challenge

The Polish Power Grid Company, PSE experienced disturbances in power distribution during the particularly hot summer of 2007. High consumption, partly related to air conditioning use, led to shortages in the northern part of the country.

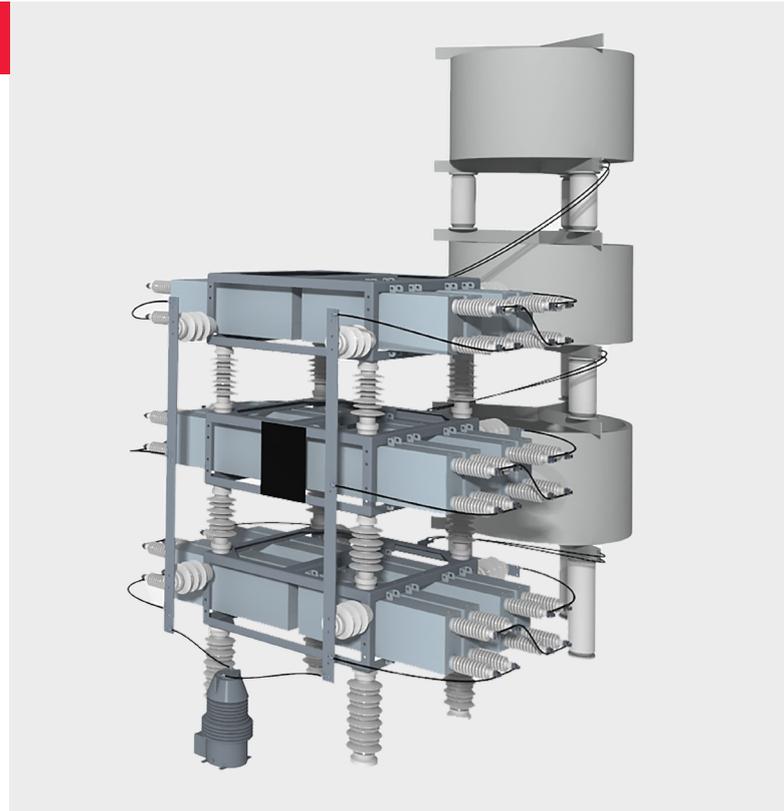
To strengthen the grid, the decision was made to install filters at the 110 kV level. This project was the first filter installation for PSE at 110 kV. The goal of the installation was to relieve the load on the distribution line, raise the voltage and minimize losses in the network.

Hitachi Energy solution

Hitachi Energy quoted and installed three band-pass filters in the Wloclawek, Torun and Narew substations. The filters were tuned to the 5th harmonic so as to reduce the harmonic to this level. Each filter produces 50 Mvar at 110 kV.

The main task of the Hitachi Energy filter solution is to provide reactive power. This stabilizes the grid and also fulfills the requirement for allowed distortion levels at 110 kV.

The PSE contract stipulated that measurements at each connection point of the grid were to be made before finalization of the solution. These measurements were made by Hitachi Energy. In-depth analyses of the measurements made by Hitachi Energy showed that there could be a problem in connecting a filter with a true BP configuration at one of the substations. This substation is situated at the end of a transmission line, and resonance could occur between the grid and the filter at this point. The final solution was due to the analyses modified from the first suggestion by Hitachi Energy, and a resistive element was added into the filter circuit. The filter became a damped one, which minimized the risk for resonance with the net.



This was a turnkey delivery and included other Hitachi Energy equipment, such as circuit breakers, Switchsync™ controllers, VTs/CTs and surge arresters from Hitachi Energy plants in Sweden and Poland.

The three filters are in operation, doing the job they were intended for – strengthening the Polish power grid.

Facts

Country	Poland
Customer	Polish Power Grid Company (PSE Operator S.A.)
PSE net	750 / 400 / 220 / 110 kV
Location of project	Wloclawek, Torun and Narew
Scope of delivery	3 units, band-pass filters
Year of delivery	2009
Engineering and construction of installation	Hitachi Energy Poland Sp. z o.o.



01 The filters installed and energized during 2009.

Customer benefits

- A solution that took consideration to the actual situation in the grid and eliminated grid resonance
- Optimized filter components for a small installation footprint
- Execution of a complete, tailor-made, turnkey project
- Short design and delivery times

A complete program with comprehensive support

Hitachi Energy in Sweden has more than 70 years of experience in developing and manufacturing power capacitors. Hitachi Energy's capacitors and their applications are used both in transmission and distribution grids.



We have delivered filter components, shunt- and series-compensating gear and HVDC and FACTS transmission systems to power companies and industries all over the world.

There is potential for efficiency gains in most grids and our capacitors and filters are key components in achieving them.

As an Hitachi Energy customer, you gain access to an all-embracing line of capacitors as well as complete support in the form of analyses, calculations and suggestions on custom solutions for generation of reactive power and harmonic filtering. Solutions that make it possible to increase active power and reduce disturbances.

Hitachi Energy Sweden AB
 High Voltage Products
 SE-771 80 Ludvika, Sweden
 Phone: +46 (0)240 78 20 00
 Fax: +46 (0)240 78 36 50

www.hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.