

Executive Summary on virtual Phase Shifting Transformer pilot phase experience

1. vPST mechanism

This report presents the assessment of the pilot phase for the virtual Phase Shifting Transformer (vPST) mechanism, carried out jointly by 50Hertz and PSE, lasting from 8 January until 30 April 2013.

The basis for the vPST mechanism is the “Agreement on vPST on the profile Germany–Poland” concluded between 50Hertz and PSE on 18 December 2012. vPST is a special cross-border redispatch regime aimed at limiting unplanned cross border power flows between Germany and Poland, to ensure secure interconnected system operation and to provide commercial transfer capacities on the Polish import profile strengthening cross border power trade. vPST complements the measures of the existing System Operation Agreement between 50Hertz and PSE.

vPST measures can be activated in situations when all of the three following trigger criteria are fulfilled:

- Physical power flows on the interconnection lines from Germany to Poland exceed the predefined threshold. This threshold was set at 1,600 MW from 8 January to 9 April, and at 1,500 MW from 10 April to 30 April.
- Net Scheduled Flow on the Polish synchronous profile in import direction is lower than the agreed threshold. This import threshold was set at 200 MW in January, at 350 MW in February and at 500 MW in March and April.
- The secure operation of PSE’s transmission system is endangered as declared by PSE.

2. Goals of the vPST pilot phase

The main goals of the vPST pilot phase were as follows:

- Test the effectiveness of vPST mechanism to ensure secure operation of the German and Polish power systems, as well as to allow for increased import capacities in the direction from Germany to Poland,
- Test the technical redispatching capabilities of both Polish and German power systems as well as the neighbouring systems,
- Test the planning and activation procedures for the redispatching measures,
- Assess the costs of redispatching measures
- Allow for preparing the vPST operational phase based on lessons learned.

3. Main findings from the vPST pilot phase

In total, vPST measures were activated on 14 days during 132 hours. The measures amounted to about 60 GWh of redispatching between the TSOs involved. The maximum volume of hourly redispatching was experienced on 25 March and reached 1,600 MW.

While vPST measures kept the physical flow at an average of 1,485 MW, hence 115 MW below the agreed limit until 10 April, in 31 hours (23 % of all hours of activated vPST measures) the flow limit was exceeded. The maximal recorded power flow between Germany and Poland reached 2,152 MW.

During the pilot phase, next to vPST measures both TSOs also applied standard remedial actions foreseen in current System Operation Agreement, such as topological measures and other non-costly remedial actions like so called DC loopflow procedure.

There were two days (i.e. 25 and 26 March 2013) where the (N-1)-secure operation of the Polish power system was violated for several straight hours and activated vPST measures were either insufficient or unable to improve the situation. On one of these days, namely on 25 March, redispatching measures in Poland, Germany, Austria and Czech Republic were exhausted (no generating capacity for up regulation available anymore after 1,600 MW curative redispatch with the help of Polish and Austrian power plants), putting the interconnected power systems at significant risk of an cascading tripping had an unforeseen outage taken place at that time. Apart from the Polish power system, (N-1)-secure operation of the German power system was also violated for several hours on that day.

In the framework of vPST, PSE was able to increase day-ahead import capacities offered on the synchronous profile by more than 50 % compared to the same period of the previous year. Nearly all of the offered capacities were allocated. During the pilot phase the share of electricity trade from Germany to Poland increased with a strong tendency in March and April.

The average activation time of vPST measures was between 30 and 45 minutes from the moment of PSE's request. This includes the phone conversation between the dispatchers, exchange of the necessary documents, discussions with the concerned power plant operators and the time to ramp up/down the generation plants.

The total costs of vPST measures reached about 3 m€. During the pilot phase, all costs were borne by 50Hertz.

Comparing the period from 8 January to 30 April 2013 with the corresponding periods of the years 2011 and 2012, it can be noted that 2012 was exceptionally windy, whereas in 2011 and 2013, wind was on a normal level. Hence, in 2013 less remedial actions were required than in 2012.

4. Conclusions from the vPST pilot phase

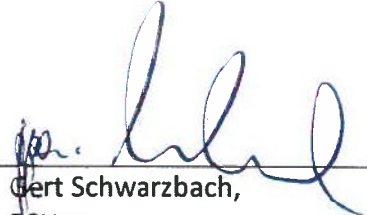
50Hertz and PSE agree that vPST pilot phase was an enriching experience and a helpful tool to deal with unplanned flows. At the same time, the pilot identified important limitations of an approach based only on curative redispatching measures. Redispatch measures are not unlimited and can be exhausted. This actually occurred during the pilot phase on 25 March, resulting in long-lasting (N-1)-violations in 50Hertz' and PSE's control areas.

Given the likelihood that such situations could happen more often in the future due to foreseen further growth of renewables feed-in, 50Hertz and PSE consider vPST as insufficient to ensure secure operation of the interconnected power systems at all times. Hence, in the view of 50Hertz the experience of the pilot phase confirms the requirement of installing Phase Shifting Transformers (pPSTs) at the German-Polish border. PSE shares this opinion. Moreover, performance of pPST is superior in terms of availability and speed of reaction. As agreed before, Operational Phase of vPST mechanism should be implemented until pPST devices are installed. Optimizing the size of the pPST, redispatch measures could be seen as a complementary mechanism to be used when the technical regulation abilities of the pPST are exhausted. This will allow to further increase the reliability and secure operation of the interconnected power systems and increase cross-border capacities between Germany and Poland offered for cross-border trade.

The vPST pilot phase showed that there is room for improvements in operational procedures for planning and activation of vPST measures. Both 50Hertz and PSE see the need to integrate vPST procedures into the European TSO Security Cooperation (TSC) processes, so that the operational planning processes developed under the TSC initiative (e.g. Day-Ahead Congestion Forecast DACF, Intraday Congestion Forecast IDCF) could improve the use of vPST measures as well as future pPST operation. Proper DACF process allows for relevant unit commitment decisions taken day-ahead while proper IDCF process allows to take final decisions on applying redispatching (or in the future finding the optimal PST settings) just one hour before the (N-1)-unsecure operation is expected.



Konrad Purchała,
PSE



Gert Schwarzbach,
50Hertz