TRANSNATIONAL ACCESS
USER PROJECT FACT SHEET

USER PROJECT	
Acronym	**EPB**
Title	**Ensto Phase Balancer**
ERIGrid Reference	02.009-2017
TA Call No.	2

HOST RESEARCH INFRASTRUCTURE			
Name	**Power Network Demonstration Centre**		
Country	**Scotland**		
Start date	**11.12.2017**	**Nº of Access days**	**20**
End date	**16.02.2018**	**Nº of Stay days**	**10**

USER GROUP	
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1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)

In three phase electric grid system the load unbalance should be rectified as soon as possible. The fact is that unbalance situations cause great harm to the electric grid. Normally harmful effects e.g. high neutral current, voltage imbalance and power losses are ignored which leads to poor utilization of the electric power.

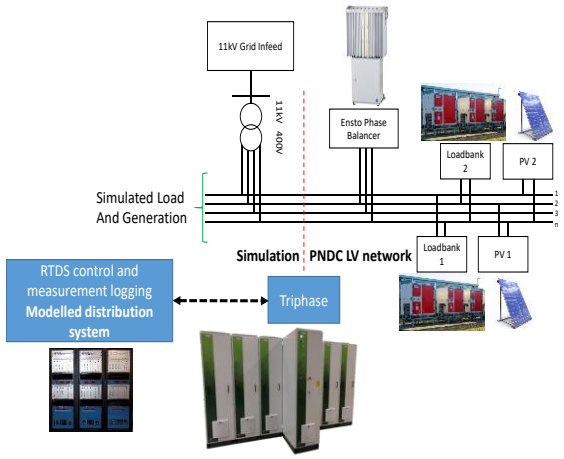

Fig 1. PNDC LV Network

This project deals with the operation analysis and evaluation of Ensto Phase balancer in a three phase system installed at the Power Network Demonstration Center in Glasgow Scotland. In this context, the specific TA project aims at evaluating the performance of Ensto Phase Balancer under various operating scenarios. Basic functionality test are designed to test normal performance of the Ensto Phase Balancer. The test is carried out by using loadbanks, resistors and photovoltaic inverters parallel to the balancer. Measurements results will be reported in case when Ensto phase Balancer is in ON and OFF-position. The results of measurements %PVUR, %LVUR and %VUF index are calculated using different load conditions.(%PVUR = Phase Voltage Unbalance Rate, %LVUR = Line Voltage Unbalance Rate, %VUF = Voltage Unbalance Factor). During the testing there was used different lengths of cabelling: 0.01km, 0.3km 0.6km and 1.0km. Used cable 95mm2 ABC-cable.

In addition to studying basic functionality, the balancer's impact on other most commonly used electrical quality problems was also studied. In Standard EN50160 several voltage parameters are defined and the most important are: Voltage unbalance, supply voltage, flicker and harmonic voltages. The purpose of flicker index and THD (total harmonic distortion) measurement test is to determine the impact of the balancer on LV-network induced by switching of single phase loads.

Measurement of the unbalance requires the use of Triphase network simulation system together with loads e.g. load banks, resistors and photovoltaic system. The increase in the number of renewable energy products has also posed problems for the overall electricity quality, for example in overvoltage problems. The purpose of the project was also to research the effect of Ensto Phase Balancer on the low voltage network connected to a single phase renewable energy supply.

The purpose of this project is to test the effect of Ensto phase Balancer on load in simulated environment. The specific setup is illustrated in fig. 1.

2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)

By comparing the results when Ensto Phase Balancer is ON- and OFF-position we realized that the device behaved as expected. The balancer has a clear impact on the loading on the low voltage network.

The most significant impact on Ensto Balancer was in the situation where the length of the low-voltage cable is significant. As a result, the most common specifications of the EN50160 electrical quality standard improved significantly.

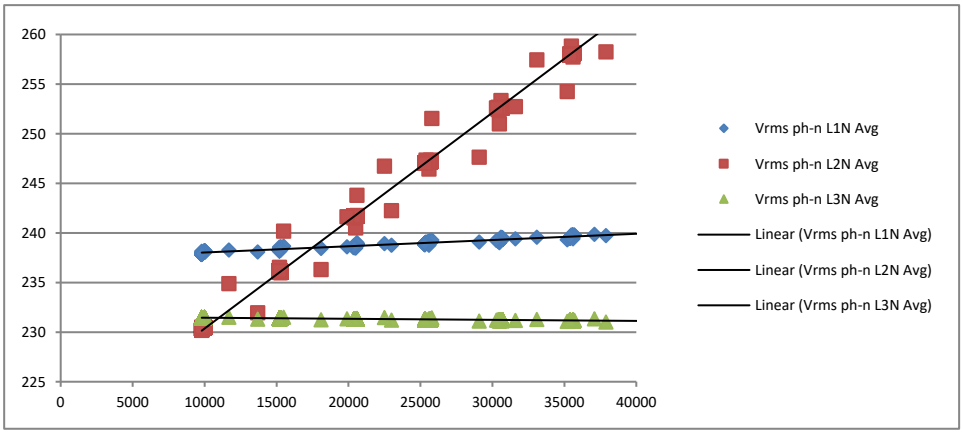

Fig. 2. unbalance before phase rebalancing

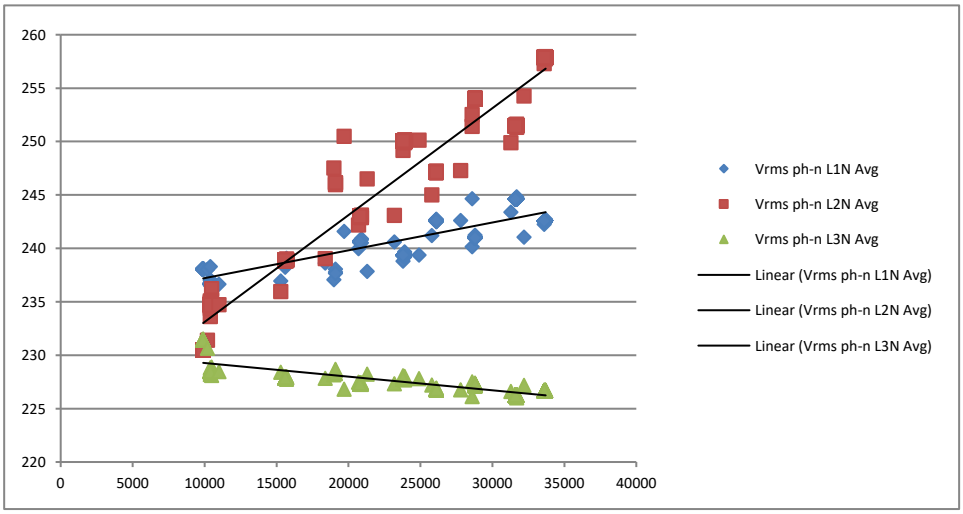

Fig. 3. Unbalance after phase rebalancing

3. PLANNED DISSEMINATION OF RESULTS (journals, conferences, others)

The dissemination plan of the Ensto Phase Balancer project (02.009-2017) includes submission of one conference paper. It will be submitted to the EA technology PLANTX 2018. Conference (EA Technology Chester Racecourse, Chester CHI12LY 6 th June 2018).

The other paper that regards the testing will be part of technical test report and will be part of the type test report.