



ES Phasor

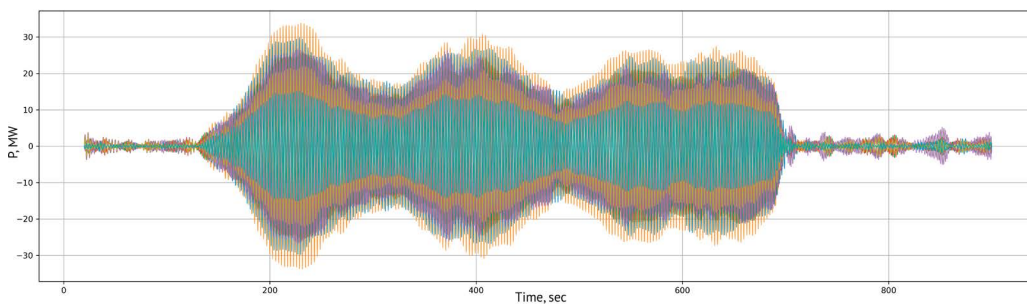
low-frequency oscillation
monitoring software

The synchrophasor measurement technology helps system operators to accomplish tasks of large-scale analysis.

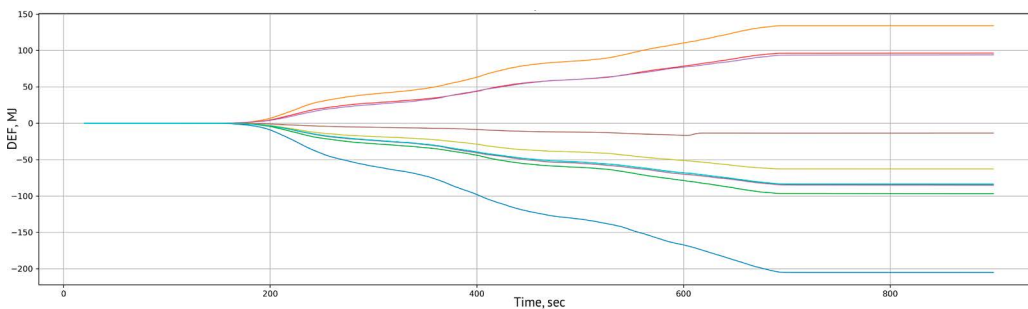
One of such tasks is monitoring and source detection of the low-frequency oscillations (LFO). If left uncontrolled, LFO develop to reduce the efficiency of the power system operation which may lead to dangerous consequences.

To solve this problem, ES Phasor performs comparative analysis, calculating amplitude-phase characteristics of oscillatory components (modes) for the input signals, and evaluates the oscillatory energy using the dissipation energy flow (DEF) method.

The current and voltage synchrophasors, frequency, active and reactive power are the input data needed for LFO analysis.



The active power oscillations for one of the large-scale LFO cases.

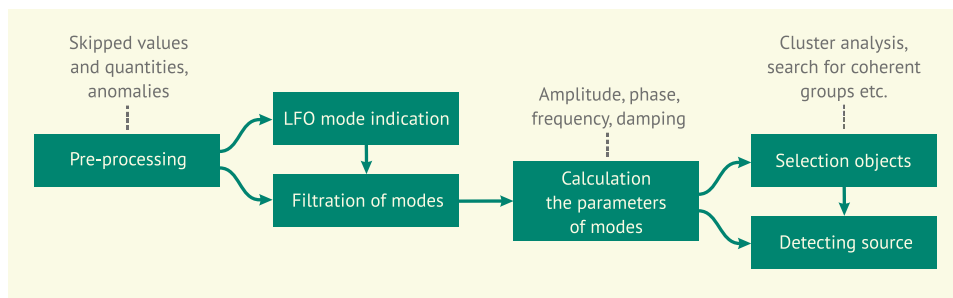


The results of calculations with the DEF method.

ES Phasor can deal with both online and archive data. High-performant online processing provides results at a given accuracy. With the archive data, the detailed research is possible.

A large amount of data is required to perform the analysis.

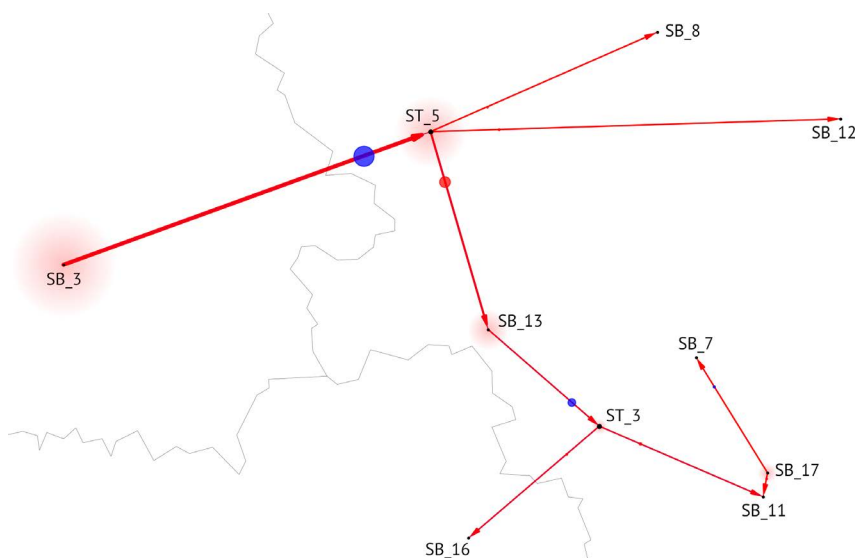
ES Phasor allows its users to fully optimize the process by selecting the «performers» for each stage of the calculation plan which is presented as a generalized scheme. By such scaling of computing resources, ES Phasor performs fast processing of synchrophasor measurement data.



Generalized computing scheme in ES Phasor.

ES Phasor provides a map of the monitored generation facilities and high-voltage power lines for visualization of incoming and outgoing energy flows and their parameters.

ES Phasor is a part of the Wide-area Monitoring System (WAMS) based on synchrophasor measurements.



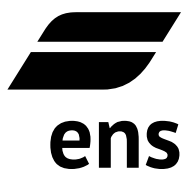
The result of the LFO source detection analysis by ES Phasor is shown on the left. The locations of the graph vertices follow the geographical coordinates of the monitored objects. Blue circles indicate incoming energy flows, red – the outgoing ones, and the size of the circles is proportional to the amount of energy. The glow indicates the total outgoing oscillation energy at the observed points. The arrows show the direction of the LFO propagation.

The WAMS uses the ENIP-2 PMU devices for synchrophasor measurement and the ES-PDC data concentrator, as well as the ENCS-2 sync module providing the synchronization of the built-in clock for the PMUs with the accuracy required.

The ENMV-3 analog signal input module is used for monitoring the excitation parameters of power generators.

The ENMI-6 display module serves as a diagnostic panel for all the WAMS elements.

PMU Live! is a web page demonstrating the operation of ENIP-2 PMUs installed at different geographical locations.



enip2.com

