

SITE ACCEPTANCE AND GUARANTEE TEST OF THE GENERATOR COMMISSIONING OF THE UNIT



SITE ACCEPTANCE TEST

Electrical Engineering Institute Nikola Tesla a. d. Belgrade (Institute) has decades of experience in conducting acceptance tests of synchronous generators (generators) in the space of the generator Purchaser, i.e. in the power plant where the generator is installed. (Site Acceptance Test - SAT).

After complete or partial revitalization of the synchronous generator or delivery of a new synchronous generator, acceptance tests are performed in the power plant (SAT). The scope of acceptance tests is defined by the Contract between the Purchaser, usually the owner of the production capacity and the Supplier of goods and services. The Institute has such professional and technical capacities that it can meet the specific requirements of the Purchaser and conduct generator tests using the test procedures defined in the international standards from the group IEC 60034.

In the basic division, entrance examinations consist of:

Tests of generator electrical insulation system

- Testing of basic properties and characteristics of generators
- Vibration tests
- Heating generator tests, heat runs

Based on the results of acceptance tests, a decision is made to put the generator into operation.

COMMISSIONING

Acceptance tests of the generator in the power plant (SAT) take place in parallel with the commissioning of the generator. The commissioning of the generator, in the broader sense commissioning of the unit, is performed in several phases. The transition from one to the next phase of commissioning of the unit is conditioned by the results of acceptance tests of parts that are integral part of the unit.

The commissioning of the generator and the production unit as a whole, implies coordination between different parts of the main and auxiliary equipment of the unit and the system of protection of the unit. It also implies coordination with the execution of all acceptance tests on parts of the main and auxiliary equipment of the unit. Commissioning of the unit means that all main and auxiliary systems of the generator and turbine have been tested to the level required for each phase of the commissioning process and that they have proper functionality. Systems like:

- Hydro-mechanical protection system of the unit,
- Electrical protection systems of the generator,
 - Unit emergency stop system,
 - Turbine governing system,
 - Excitation system,
 - Unit control system,
 - Unit cooling system,
 - Hydraulic pressure unit,
 - Compressed air system,
 - Fire protection systems, etc.

must be tested and functionally ready and mutually harmonized and coordinated. Our experts have extensive experience in performing such a complex and responsible task as putting a new unit into operation after complete or partial revitalization. The Institute can provide you with the services of acceptance tests of generators and commissioning of units, that are practically inseparable from each other and form the basis for trial run of the unit.



GENERATOR EFFICIENCY

One of the most important features of the generator as a basic part of the production unit is its efficiency. The efficiency of a generator is a measure of its usefulness during electromechanical energy conversion. When determining the generator efficiency by applying the procedure of measuring of separate losses, the following are measured and determined:

- Friction and ventilation losses
- Losses in the magnetic core, iron losses
- Coil losses, Joule losses in copper
- Additional losses due to stray flux
- Losses in the excitation system
- Losses in bearings

These losses are measured directly from electrical quantities or by applying a calorimetric method when measuring the power of losses which are taken away by coolant.

The Institute provides the service of determination of the generator efficiency by applying test procedures described in the standards IEC 60034-1, 60034-2-1, 60034-2-2, 60034-4, taking into account the procedure and test conditions agreed between the Purchaser and the Supplier. When conducting tests, the Institute uses its own test equipment and technical capacities.

So far, the Institute's experts have successfully determined the efficiency of generators from several world-renowned manufacturers as a part of the tests which were conducted during preparation for the revitalization of the unit or as part of a tests which were conducted with the aim of determining fulfilment of contractually guaranteed properties and parameters of the generator.

GUARANTEE / PERFORMANCE TEST

After the expiration of the trial operation of the unit it is usual to test the properties and parameters of the generator and compare them in qualitative and quantitative terms with the properties and parameters specified in special technical conditions which are an integral part of the contract between Purchaser and Supplier.

The scope of guarantee test is significantly wider than the scope of acceptance tests. The scope of test as well as the conditions for execution of test are defined by the contract between the Purchaser and the Supplier. The applied test equipment must be calibrated and with appropriate metrological characteristics and appropriate accuracy.

All applied test procedures must be in accordance with the international technical standards from the family of standards IEC60034.

Both the Purchaser and the Supplier must agree with all procedures and with the schedule of the guarantee test. Also, during the test, the presence and testimony of the representatives of both contracting parties is usually obligatory.

Guarantee test of generators due to its specificity, testing properties and parameters of generators that have a long-term impact on the quality and durability of generator operation, and in this regard direct or indirect financial consequences for the Purchaser and / or Supplier, is very complex test that require exceptional test equipment and engineers who possess significant experience, skill, and unquestionable impartiality.

The Institute has engineers who meet the above criteria. Our experts can provide you with a complete service of guarantee test quality assurance. Our experts can provide you with consulting services during formation of special technical conditions which are part of tender documents that are binding on the Supplier. During formation of special technical conditions, all properties and parameters of the generator are defined, allowed deviations of measured and determined properties and parameters from the guaranteed ones are defined, and very importantly, the scope of guarantee test and conditions under which test will be performed are defined. Finally, our experts will conduct guarantee test, provide you with all the necessary information before, during and after the test and will prepare a detailed report with the test results, which is an ID card of the generator and a reference document for future operation of the generator.

REFERENCES (*last 10 years)

- HPP „Đerdap 1“ A6 211MVA – Site Acceptance Test of the generator and Commissioning of the unit after revitalization, 2011. god.
- HPP „Đerdap 1“ A4 211MVA – Site Acceptance Test of the generator and Commissioning of the unit after revitalization, 2013. god. Guarantee test of the generator, 2014. god.
- HPP „Đerdap 1“ A5 211MVA – Site Acceptance Test of the generator and Commissioning of the unit after revitalization, 2015. god.
- HPP „Zvornik“ A1 37,5MVA – Guarantee test of the generator, 2016. god.
- TPP „Nikola Tesla B“ B2 727,5MVA– Guarantee test of the generator, 2016. god.
- HPP „Đerdap 1“ A1 211MVA - Site Acceptance Test of the generator and Commissioning of the unit after revitalization, 2017. god.
- HPP „Zvornik“ A2 37,5MVA – Guarantee test of the generator, 2017. god.
- HPP „Đerdap 2“ A7 27,6MVA – Testing before revitalization, fingerprint test of the generator 2018. god.
- HPP „Zvornik“ A3 37,5MVA – Guarantee test of the generator, 2018. god.
- HPP „Đerdap 1“ A1 211MVA - Site Acceptance Test of the generator and Commissioning of the unit after revitalization, 2019. god.
- HPP „Zvornik“ A4 37,5MVA – Guarantee test of the generator, 2019. god.