RTDS Technologies

RTDS® News

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Integrated Tests of WAP Functions Using the RTDS Simulator: Guest Article (EKRA)

RTDS Technologies Reaches Milestone

RTDS Technologies Reaches Major Milestone

In July 2013, RTDS Technologies reached a substantial landmark, achieving the sale of over 1000 racks.

Both the hardware and software for the RTDS Simulator originated from a research project at the Manitoba HVDC Research Centre; a project that began when the Centre desired to have its own in-house simulator capable of studying HVDC. When it became evident that there was some outside interest in the technology, no one was willing to commercialize the product as it was perceived that the market would be extremely limited. Thus, it fell to the developers of the technology to take on the task of commercializing the RTDS Simulator. Some 20 years later, with over 1000 racks in 36 countries worldwide, RTDS Technologies has far surpassed those initial market estimates.

RTDS Technologies wishes to express their gratitude to those who supported our technology in the early days and who provided the valuable feedback needed to develop RTDS Simulator technology into what it has become today.

Integrated Tests of WAP Functions Using the RTDS® Simulator

Guest article from:

EKRA research and production enterprise

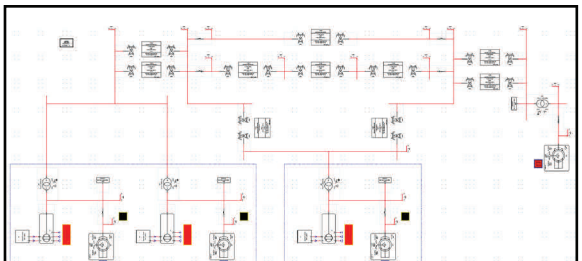

Fig. 1 The RTDS model of a multi-machine system

INTRODUCTION

A Company Standard of JSC Federal Grid Company of Unified Energy System (FGC UES) was introduced in 2012 [1] which determines the main requirements for WAP functions, devices and describes the certification test procedure. According to the Standard [1], WAP functions, such as out of step protection, overvoltage protection, underfrequency protection and others must be tested using electrodynamic models of the electrical power system, which are identical to the models used by the Joint Stock Company High Voltage Direct Current Power Transmission Research Institute: RTDS, RETOM, etc. In these circumstances, test conditions (which are as close as possible to real operating conditions) are ensured by the digital-analog-physical complex at JSC "STC UPS" (earlier JSC "NIIPT") and by a Real Time Digital Simulator (the RTDS® Simulator).

At EKRA, we have tested a number of protection functions contained in ERKA terminal 223 01, among which were ALAR-F, ALAR-T (ALAR – automatic elimination of asynchronous operation – out of step), overvoltage, line shunt reactor control, etc. These tests were carried out using the combined software and hardware solution of the RTDS Simulator from RTDS Technologies Inc., Canada. The following provides more detail regarding the out-of-step protection.

TESTING

Out-of-step operating conditions in a power system are found during the heaviest emergency conditions, causing instability during parallel operation of power plants and individual generators. For that reason, it is extremely important to provide early, selective and reliable detection of out-of-step conditions in a power system in order to provide quick elimination and restoration of normal operating conditions. In light of this, stringent requirements are set for the operation of the equipment meant for automatic elimination of out-of-step conditions.

To estimate performance of microprocessor based out-of-step protection, a power system test circuit has been developed and its physical model has been created at NIIPT. The Institute has significant experience testing multivendor out-of-step protection. This enables them to draw a conclusion that the program developed ensures detection of hardware and software mistakes, as well as makes it possible to define the area of protection device application [2].

RTDS Training Courses

We are currently accepting registrations for the following courses:

RTDS IEC-61850 ADVANCED SIMULATOR TRAINING

September 9-13, 2013 in Winnipeg, CANADA

INTRODUCTORY RTDS SIMULATOR TRAINING

October 21-25, 2013 in Winnipeg, CANADA

Email steph@rtds.com for more details.

Upcoming Events

CIGRE Canada
Calgary, CANADA
September 9-11, 2013
Booth 13

ISGT Europe
Copenhagen, DENMARK
October 6-9, 2013

NASPI Work Group Meeting
October 22-24, 2013
Rosemont, UNITED STATES

IEEE IECON
November 10-13, 2013
Vienna, AUSTRIA

The qualification test program for out-of-step protection specified in Standard [1] contains a test circuit similar to the one worked out in NIIPT. When carrying out tests in the research and production departments at EKRA, the above-mentioned test circuit was implemented on the RTDS Simulator (shown in fig. 1). Available disturbance records received from the digital-analog-physical complex made it possible to set up various normal and emergency operating conditions in order to carry out tests on the RTDS Simulator. In fig. 2, for example, one can see a comparison of the disturbance records obtained with the digital-analog-physical complex model and the RTDS Simulator model.

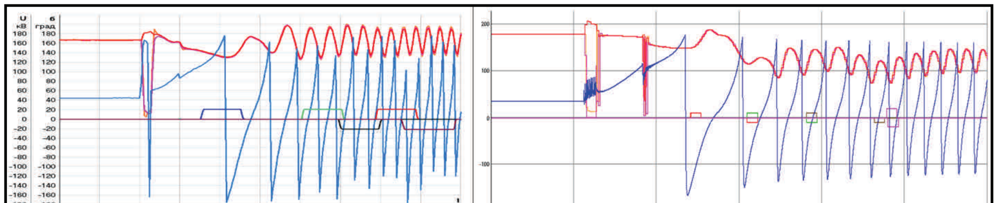

Fig. 2   Disturbance records for double phase-to-ground faults with successful three-phase autoreclosing received from: a) digital-analog-physical complex; b) RTDS Simulator.

While testing out-of-step protection algorithms, all the WAP functions contained in WAP terminal were put into operation. Two terminals were simultaneously used in tests. Outputs from the protection devices (ie. breaker trip signals) were connected to the RTDS Simulator making it possible to illustrate selectivity of out-of-step protection devices. With proper calculations, it is possible to test first and second load shedding or generator overexcitation, in order to provide resynchronization conditions.

CONCLUSION

The RTDS Simulator based out-of-step protection functions tests using EKRA 223 01 relay protection and automation terminals have proven that all the functions operate correctly, in accordance with Standard [1] requirements. Models of test power systems put together using the RTDS Simulator allow for full-scale integrated tests of out-of-step protections to be carried out. Accurate simulation of emergency conditions using the RTDS Simulator has been proven by the world-wide long-term service experience of such simulators, in addition to the close agreement of the disturbance records obtained with the ones from the digital-analog-physical complex at NIIPT.

REFERENCES

[1] Стандарт организации ОАО «ФСК ЕЭС». Аттестационные требования к устройствам противоаварийной автоматики (ПА). СТО 56947007-33.040.20.123-2012. Дата введения: 24.05.2012.

[2] А.А.Кузьминова, Д.А.Кабанов. Испытания цифровых устройств автоматики ликвидации асинхронного режима на цифро-аналого-физическом комплексе. Известия НИИ постоянного тока. Научный сборник № 64. Санкт-Петербург – 2010.

What Our Clients are Saying: FURNAS Testimonial

"FURNAS purchased the RTDS® Simulator in the mid 1990's in order to improve the system representation of our HVDC Transient Network Analyzer (TNA). Since then, the RTDS Simulator has been used to evaluate and enhance the performance of the HVDC control system and, due to its flexibility, it has also been used to test other controllers and protection systems. The performance of the RTDS Simulator and the trust we put in it has surpassed our expectations. Furthermore, RTDS Technologies has provided excellent technical and commercial support over the years. We have expanded our RTDS Simulator throughout the years and continue to upgrade, benefitting greatly from the hardware exchange program."

- Victor Alexandre Belo França, on behalf of FURNAS

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RTDS Technologies Inc., 100-150 Innovation Drive, Winnipeg, MB R3T 2E1 CANADA
Phone: +1 204 989 9700 Fax: +1 204 452 4303 Email: rtds@rtds.com Website: www.rtds.com