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AITRANS – Web Application for Training and Testing Operative Personnel in High Voltage Power Substations

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Abstract

This paper presents the web application – AITRANS – used for the periodic training and testing of operative staff in high voltage substations of the Timisoara Branch of Transelectrica, the Romanian Power Transmission System Operator. According to legislation in Romania, operative staff of the Transmission System Operator (TSO) must accomplish a given number of hours of training every semester where they will be familiarized with new and/or modified procedures and the legislation used in the operation of high voltage power system substations. After these training sessions, each person must take a test to ensure proper assimilation of the new information. To optimize the training and evaluation process, a web application was developed. With a user name and password (for user level), each member of the operative staff can log in and study the materials at any time, and also self-assess their knowledge by taking several tests. The administrator can remotely observe the training status of each person, and will also generate a final test at the end of the training period. Using the web application instead of the traditional method of training and testing proved to be very effective. The feedback from staff was positive.

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*Keywords:*web application; training; testing; power substation;

1. Introduction

During recent years, the complexity of the role of power system control centre operators has increased significantly. The nature of operating problems have changed many times, from problems concerning volt/var coordination to emergency conditions, voltage collapse, congestion management, etc. Economic factors and the

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deregulation of utilities have led both to a downsizing of the utility operating staff and the retirement of senior operators with many years of experience. Vacant positions have been filled with junior operators who have less on-the job experience. All of these factors have increased the need for system control centre operators to be trained in all phases of system operations: normal operations, emergency operations, and system restoration (Bronzini, Bruno, De Benedictis, Lamonaca, Scala, Rotondo and Stecchi, 2010). Complex technical environments depend heavily on properly-trained operators for a multitude of systems, but are often associated with high on-site training costs and safety hazards that tend to make training sessions difficult or impossible, and thereby less frequent and available to fewer individuals. When training is improper or insufficient, damage and injury to both equipment and personnel are a very real threat, ultimately impacting costs, operational efficiency and the quality of the working environment (Prais, Johnson, and Bose, Curtice, 1989; Tamt, Badrat, Marceauf, Marint and Malowanyt, 1999). The same aspects apply to Transelectrica. Transelectrica is the Romanian Transmission System Operator (TSO). Transelectrica ensures the Romanian Power System (RPS) reliable and stable operation at quality standards, while providing the national electricity transmission network under transparent, non-discriminatory and fair conditions to all market participants. Because of its mission, its operative personnel must be very well prepared both in theoretical and practical knowledge, and up to date with all changes in the regulations and national standards. According to legislation in Romania and the Transelectrica management plan (CNTEE Transelectrica 2013), operative staff of the TSO must accomplish a given number of hours of training every semester where they will be familiarized with new and/or modified procedures and legislation used in the operation of high voltage power system substations. Upon completion of each training cycle each operator must pass a test that includes questions on topics corresponding to the training cycle. Due to the nature of the role, not all operative staff are available at the scheduled training sessions. Therefore, the classic training method with a tutor at a given time is difficult to implement and the results are inadequate. Because of this, a new approach is required. For this, training information and data must be available at any time, regardless of location, so that every trained person can study, test themselves and be prepared to pass the final test with the testing supervisor. The training and testing environment must be very friendly and familiar to users. This condition was also observed in applications used for educational purposes students of power systems (Vuc, Baloi and Schiopu, 2014). Also, at any time, the training supervisor must observe the stage of training for each person and prepare the final test. For this, a web application for training and testing was developed. It is called AITRANS and was developed from an open source web application (TCExam, 2009). In chapter 2, the capabilities of the web application are presented. In chapter 3 and chapter 4 the administration section and user section are described. Finally, by analyzing results obtained from using the application, and its comparison with the classic training and testing method, a conclusion is presented in chapter 5.

2. Overview of the AITRANS web application

Before developing AITRANS, several factors had to be taken into consideration:

- The training documentation must be available at any time and at any company location during the training session;
- The operative personnel must be able to self-examine their knowledge;
- The training supervisor must have full access to training documentation and information about trained personnel: duration of training, results of self-testing, on-line users, management of user groups, users, training session topic and test topics.

The best solution for incorporating all the above requirements was to develop an online application stored on the company server, which could be accessed by any staff member with a user name and a password.Using an online platform for training and testing has certain advantages (TcExam, 2009):

- Increased delivery, administration and scoring efficiency;
- Reduced costs for many elements of the training and testing lifecycle;
- Improved test security resulting from electronic transmission and encryption;
- Consistency and reliability;
- Faster and more controlled test revision process with a shorter response time;