P8 – Policy 8: Operational Training

Chapters
A. Training Programs
B. Inter-TSO training
C. Training Organization and Dispatchers Accreditation
D. Basic requirements for Dispatcher Training Simulator (DTS)

Introduction

The TSOs have the responsibility and authority to implement real time and coordinated actions in order to ensure the stable and reliable operation of the synchronized UCTE power systems. Due to the mutual influence a continuous co-ordination is needed. The national (and regional to some extent) control centres of each country or area are responsible for this coordination on the operational level. Controlling the power system requires the involvement of large groups of specialists with the support of new technologies.

Thus, bearing in mind that people in control centres are dealing with different situations / conditions and have to make decisions, it goes without saying that appropriate training of those people is a crucial element of the security of the whole power system.

With this Policy UCTE defines a standard framework for operational training in order to provide reasonable assurance that the dispatchers have and hold up the knowledge and skills to operate the power system in a safe and reliable manner under all conditions and at all time. The common framework for training of operating and supervisory personnel shall enable the building up of operational know-how in normal and insecure system conditions. It should be however noted, that due to the specificity of each control area, UCTE intends to only setup the general principles and basic requirements for training. It is the obligation of each TSO to ensure the appropriate qualification of the personnel to cope with any kind of events within its system. The training is based on the TSO-procedures. The training also gives feedback about the quality of these procedures and the skills of the dispatchers especially in case of procedures in real time operation, which are applied rarely.

History of changes

v. 1.0 – Final Policy approved by the Steering Committee on 13 March 2008

Current status

This document summarises current UCTE rules and recommendations relating to operational training in a new structure, with additional items describing today's common practice.
This version of the document (version 1.0, dated 13.03.2008) has "final" status.

A. Training Programs

Introduction

A training program is a planned, organized sequence of activities designed to prepare individuals and teams to perform their jobs and to maintain or improve their performance on the job. It describes the training process on the basis of the needed qualification (selection, activities, training requirements, etc.) and consists of an initial program and a continuous program.

The initial program is determined as an important stage of the general structured basics to its operating personnel with respect to the critical contribution to the safe and reliable operation of electric power system. The aim of the initial program is to prepare personnel to take the dispatcher position. It provides an adequate necessary level of professional knowledge in order to obtain the required qualifications. The main aim of the continuous program is to keep and extend the dispatchers' knowledge and competences

Criteria

C1.   **Dispatcher.** A dispatcher is a person with all necessary technical and non-technical skills and qualification and technical expertise to safely operate the whole system in a regional or a national control centre and to take decisions about the switching in the transmission system. A person in charge of only switching execution is not a dispatcher.

C2.   **On-the-job training.** On-the-job training is the integration of previously acquired knowledge related to routines and skills in practice under the supervision of a qualified On-the-Job instructor in a live system situation.

C3.   **Dispatcher Training Simulator (DTS).** DTS is a dedicated environment of tools incorporating detailed modelling of the reference transmission systems. The simulator sessions are based on realistic power system situations and expected transmission system response to normal and abnormal conditions.

Requirements

R1.   **Training program.** Each TSO provides its dispatchers with a structured training program that is designed to develop and improve their skills. This program includes initial and continuous parts. The training has to be permanently adapted to the operational evolutions. All the issues of the training have to be regularly checked and updated.

R2.   **Initial program.** The initial program consists of a theoretical part and on-the-job part complemented by simulator sessions.

R3.   **Continuous program**. The continuous program is applied to all dispatchers as soon as they are certified and nominated to a dispatcher position. The main aim of the continuous program is to keep and extend the dispatchers' knowledge and competences. The continuous program is established to complement the initial program with:
- advanced theoretical parts;
- learning of new rules and procedures;
- additional simulator sessions.

R4.   **English training.** Dispatchers in contact with neighbouring control areas shall have sufficient knowledge of English and operational terms to carry out their tasks, ensuring the safe and smooth flow of information in an international environment using clear expressions in order to ease an immediate understanding.

Standards

S1. **Training programs.** The initial and continuous program has to consider the relevant parts of the UCTE Operation Handbook and mutual agreements between TSOs. Each TSO defines its specific requirements for the initial program and the continuous program and their duration.

    S1.1. **Initial program**: The initial program has to include at least the knowledge of components of the power system, the operation of the power system, the tools for operation and respective on-the-job-practice.

    S1.2. **Continuous program**. The continuous program has to focus on theoretical and practical aspects of operation as well as on respective boundary conditions. The inter-TSO training as defined in chapter B is part of the continuous training.

S2. **TSO reference list of English technical terms.** Each TSO makes available a reference list of technical terms in English with translation to the mother language of dispatchers for operation and for training based on the existing UCTE reference list (see Appendix 8).

Guidelines

G1. **Duration of initial program.** The initial program should last at least 6 months for trainees without any experience of power system operation, neither in real time nor in operational planning, including a minimum of three months for on-the-job and simulator training.

G2. **Initial program.**

    G2.1. **Theoretical program structure.** The structure of the theoretical part of the initial program should provide a first level of competencies on the following main topic categories:

    G2.1.1. **Power system components.** General description and analysis of all network components including national and international technical specifications as follows:

    - Types of overhead lines, underground and submarine cables with their components;

    - Different types of HV and EHV substations, HV DC converters, with their entire components as types of breakers, isolator-ground switches, power transformers, measurement-protection transformers, tap changers, reactors, capacitors, phase shifter transformers, other electronic regulators (SVCs, FACTS, etc.), telecommunication systems, protection relays, other auxiliaries etc.;

    - Types of power plants (fossil fuel, nuclear, oil, gas turbine, combined cycle - CCPP, integrated gasified combined cycle - IGCC, hydro, wind, renewable sources etc.) and their components like turbines, generators, etc. with respect to their operational characteristics e.g. response times.

    G2.1.2. **Operation of the power system.** This will include all relevant domestic and international regulations and market rules as well as the knowledge and analysis of the necessary conditions for safe and reliable operation. (e.g. under Normal, Alert, Emergency, Blackout and Restoration conditions, as they are determined by UCTE rules). This category might include courses on the following aspects:

      - Network behaviour and network operation (power flows and system frequency);

      - Basics of network protection;

      - Voltage and reactive power control;

      - Balancing (primary, secondary and tertiary control), Automatic Generation Control, organization and operation;

      - Other internal rules (e.g. relevant market rules, organizational and technical) described by each TSO;

- Introduction to UCTE and other TSO organizations;
- UCTE rules (Operation Handbook, etc.) and other international regulations;
- Crisis management;
- Manual or automatic remedial actions in alert or emergency situations (e.g. load shedding)
- Restoration actions after black-out;
- Basic methods in network calculation (on-off line), state estimation, load flows, etc;
- Limiting short-circuit power until maximum capacity of the network components;
- Special phenomena such as frequency oscillations (slow = subsynchronous, higher-order harmonics = oversynchronous) in the national and UCTE networks;
- Special phenomena such as local (in the national networks) and global (in the UCTE network) collapses (voltage, frequency, angular), etc.

G2.1.3.   **Knowledge of operational tools.** Dispatchers are trained about:
- Collecting, transferring data signals, computers configuration, SCADA systems etc.;
- Remote control technology;
- Implemented model for state estimation, for network topology, for contingency analysis, for offer-demand balancing, for automatic generation control, for load forecast, etc.
- Interpretation of calculation results;
- Operator's MMI (Man Machine Interface), etc.;
- Other internal operational tools (e.g. scheduling system).

G2.2. On the-job-part/on simulator part. The theoretical part of the initial program should be supported by the practical experience, which plays crucial role in the education procedure. For this purpose respective on-the-job sessions as well as additional simulator sessions has to be provided.

G2.2.1.   **On-the-job part.** On-the-job part has to consider future position and responsibilities of the candidate and should cover all relevant operational aspects related to this position. The on-the-job part puts in practice all the professional actions in real time operation, using appropriate tools. The trainees should be guided by experienced personnel in respective position. On-the-job education should take into account all topics of the theory part.

G2.2.2.   **Simulator part.** On-simulator sessions are performed during which the trainees experience normal and insecure situations.

G3.   Continuous program. Each TSO should define a continuous program designed with two main stages:

G3.1.   Theoretical part. It provides advanced knowledge on the following main topics:
- Analysis of disturbances and "almost" disturbances;
- Technical knowledge (recapitulation of important aspects of network operation in normal, alert, emergency and black-out conditions);
- Information about new conditions affecting network operation (e.g. new network elements, new power units);
- Information about new rules and procedures following changes in general framework;
- Human behaviour aspects (analysis of human factors).

G3.2.   Simulator session. The **"DTS"** - Dispatcher Training Simulator should simulate situations with insecure and emergency scenarios, complemented by the restoration of the network after disturbances / black-outs. It should also include inter-TSO disturbances.

> **G3.3. Stress management**. Dispatchers should be informed on methods to manage the stress.

G4. **Languages of neighbouring countries.** TSOs should maintain the existing skills of dispatchers to speak languages of neighbouring countries in addition to English.

G5. **English training.** A set of English exercises incorporating UCTE operational terms (see P8-A-S2) may be used to reflect the realities of every day procedures and emergency situations in order to improve:

 - the ability to produce clear messages in unusual situations;
 - the ability to communicate in plain language even under stress;
 - understanding of and appropriate answering to foreign dispatchers;
 - the resolving of misunderstanding in communication.

B. Inter-TSO training

Introduction

The operation of the national networks near interconnections with bordering TSOs is strongly influenced by the generation/load pattern and the topologies of the first or further neighbouring systems.

This circumstance is true in normal and insecure conditions, when a violation of the N-1 security arises, but is particularly critical during the Emergency Operation state (see Policy 5).

Thus, it is of utmost importance to develop a framework for joint training actions focusing on specific situations for the most critical boundaries and involving mainly experienced dispatchers.

Requirements

R1.   **Experience exchange**. TSOs have to exchange the operational experience with their neighbours in order to cope with normal and abnormal situations in a coordinated way.

Standards

S1.   **Common training.** Each TSO implements at least one of the four actions defined in guidelines P8-B-G3 to improve communication and coordinated measures between neighbouring TSO dispatchers. The actions taken have to be chosen depending on the mutual level of risks for secure system operation with the first (or further) neighbouring TSO.

Guidelines

G1.   **Inter-TSO common training agreement**. TSOs can sign bilateral/multilateral agreements of cooperation for common training as defined in P8-B-S1; these issues can be included in general operational agreements.

G2.   **Content of inter-TSO training program.** It should include:
- a necessary knowledge of the neighbouring TSOs network;
- awareness of coordinated actions in normal operational conditions in order to ensure the best operational conditions of the common network area;
- awareness of coordinated remedial actions in case of security violations, in order to avoid the deterioration of the operational conditions towards emergency;
- awareness of remedial actions in case of emergency and restoration after black-out conditions.

G3.   **Inter-TSO common training.** The common training can be implemented in the following ways:

   G3.1.   **Cross visits between neighbouring TSOs dispatchers.** During cross visits the characteristics of the network and operational constraints of a TSO organization are presented. A cross visit intends to give the opportunity to operators, who have frequent contacts,to know each other on a personal level and introduce a more collaborative atmosphere between the dispatchers and to provide a global overview of the neighbouring TSO network to TSO dispatchers.

   G3.2.   **Common training workshops.** In these common workshops participants are informed about the specific items, problems, evolutions, etc. in the different networks and they can exchange experience on system operation at boundaries.

These workshops aim at providing the same set of information to all involved dispatchers (common knowledge) with a view to better understand the problems of the neighbouring systems and the content of existing procedures in normal and abnormal system states. During the workshops, exercises can be carried out (e.g. tests of communication procedures on borders, where detailed arrangements between TSOs exist).

G3.3. **On-shift cross periods.** On-shift cross periods mean the visiting of neighbouring dispatchers for spending full real-time shifts at the hosting TSO. During on-shift cross periods in the respective control rooms, the dispatchers will enhance the mutual knowledge of neighbouring operational environment. The on-shift cross periods aim at improving in depth understanding and interpersonal communication between neighbouring TSOs dispatchers and at reinforcing the knowledge level of the neighbouring TSOs systems.

G3.4. **Common DTS training sessions.** Common DTS training sessions ensure a better coordination of neighbouring dispatchers' actions in normal and abnormal conditions. They can be organized on a bilateral or multilateral level. Main focus of the sessions for the TSO dispatchers should be the training of inter-TSO disturbances with the goal that the TSO dispatchers act in a coordinated way in stressful conditions (e.g. to exchange efficient information, to apply relevant rules and procedures, to order cross-border actions after mutual evaluation or to take any remedial actions).

C. Training Organization and Dispatchers Accreditation

Introduction
It is of utmost importance that is assured that the dispatchers have knowledge and skills to operate the power system. In this chapter the organisation of dispatcher accreditation is described to reach this goal.

Criteria
C1. **Qualification.** Qualification comprises required knowledge and skills (education, experience, training and any special requirements necessary to perform the assigned responsibilities).

C2. **Accreditation.** Accreditation means a written endorsement of the proved qualifications of a person for the position of a dispatcher.

Standards
S1. **Coordination of the training.** TSO appoints a training coordination manager responsible for training organization: designing, following-up and updating the full training process.

S2. **Organization.** The training coordination manager determines appropriate procedures for the training organization. These procedures shall cover:
- a description of the dispatchers required qualifications (knowledge and skills);
- a reference list of topics for training programs linked to the dispatchers required qualification;
- the processes for the initial and continuous programs including scripts/documents; of the theoretical sessions, time-schedules, supervision, tools, support for trainees, evaluation/validation and continuous improvement of the programs
- the process of dispatchers accreditation;
- trainers selection and training of trainers.

S3. **Evaluation.** The initial program has to be completed by an evaluation in which the knowledge and capabilities of a candidate to perform a dispatcher job are tested. This evaluation is performed by the trainers; a relevant document is forwarded to the manager of the candidate.

S4. **First accreditation.** The TSO has to deliver a first accreditation to the dispatcher candidate that authorizes him to perform his job in the control room. The first accreditation is attributed according to defined criteria for a duration decided by the TSO as in below-mentioned guidelines.

S5. **Trainers' selection.** TSOs have to determine the profile of trainers with regards to their respective tasks and responsibilities in the training programs. Trainers are selected internally (experienced dispatchers) or from external bodies.

S6. **Training of trainers.** Depending on education and previous experience, an individual training program is defined for each trainer; it can be provided by internal sessions or by outsourced training sessions.

Guidelines

G1. **Training Management Committee (TMC).** Each TSO can establish a training management committee supporting the training coordination manager (see P8-C-S1). Its composition and functioning are defined by an official internal procedure. Each (national, if relevant regional) control center can be represented in the TMC composition. TMC is responsible to supervise the training process with respect to:
- the training procedures;
- the dispatchers competences;
- the rules for dispatchers accreditation;
- the policy of trainers selection and trainers training.

G2. **Criteria for first accreditation delivering.** The delivering of the first accreditation can be based on the following criteria:
- content of the evaluation document;
- on-the-job session reports;
- simulator session reports, when existing;
- assessment of the dispatcher's capabilities through an interview at the end of the initial training program.

G3. **Renewal of accreditation.** The renewal of accreditation can be based on following criteria:
- confirmation of presence to the theoretical part of the continuous program
- simulator sessions reports
- assessment of the dispatcher capabilities through an interview.

G4. **Validity duration of accreditation.** The validity duration of the accreditation (the first one and the further ones) is left to the appreciation of TSOs.

G5. **Pedagogical training for trainers.** To hold lectures for the trainees, oral examination or personal coaching, a pedagogical basic education is desirable. Pedagogical courses should be proposed to them, based on essential issues such as:
- basics of pedagogy;
- leading a training session;
- leading a debriefing;
- evaluation of a training session;
- carrying out a pedagogical file;
- basics for management of dispatchers stress.

D. Basic requirements for Dispatcher Training Simulator (DTS)

Introduction
The Dispatcher Training Simulator (DTS) is a powerful tool to simulate the dynamic behaviour of the transmission system. This chapter gives an overview concerning requirements for DTS.

Criteria
C1. **Integrated DTS.** The integrated DTS is based on the EMS in the dispatching centre or on a dedicated modelling of the real time network.
C2. **External DTS.** The external DTS is an independent simulator, which can be used for joint extended training including multi areas.

Guidelines
G1. **DTS training tool.** DTS should include a comprehensive database with respective data from neighbouring networks at a sufficient level and a (n-1) security analysis. In any case DTS should provide an adequate realistic control room environment.
G2. **Primary aims of DTS.** The general aim of a DTS training is to learn solving situations that occur in the power system operation, including:
- operation during the normal state;
- defence of the system against a serious disturbance;
- restoration of the system starting after a blackout.
G3. **Other aims of DTS**:
- training to SCADA and/or to other power applications of the dispatching tool (EMS);
- training to the MMI (Man Machine Interface) of the local dispatching tool (EMS) in case of integrated DTS;
- testing of the EMS sub-applications, e.g. SCADA and AGC (case of integrated DTS);
- training to local switching procedures for maintenance activities in the network;
- training to N-1 calculation software;
- analyzing the past events through simulations.
G4. **Functional requirements of DTS:**
- efficient data input, data accessibility and data handling;
- modelling of all the system components in the operational areas;
- including low/high voltages, over-current and multi-island-operation;
- optional modelling of (sub)transient behaviour of the system;
- monitoring and control options for the trainee and trainer to influence the process, through the MMI;
- MMI function to prepare and apply base cases and training scenarios for the trainer;
- providing report after a training session with the view of evaluation;
- restoring of the simulated system;
- combining sets of data of the different control areas.