ANNEX 1. OVERVIEW OF ORGANISATION OF TRAINING AT TSOS

January 2010

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VERBUND - AUSTRIAN POWER GRID

APG Training Rules for Dispatchers (in APG: *System Operator*)

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Introduction:

The APG Training Rules comprehend all relevant aspects that are related to training including all qualifications/steps required for a System Operator. The overall goal is to determine the whole process for every relevant qualification in APG. Thus, the rules cover:

- Qualifications related to grid operation
- Training procedures with respect to the qualification
- Responsibilities with respect to the training
- Theoretical and practical content of the initial training
- Organisation of the training
- Evaluation
- Validity of the qualifications
- Concept of the continuous training
- Detailed description of the training modules/procedures for initial and continuous training
- Trainer's selection
- Trainer's concept, Train-the-Trainer program
- Regular evaluation of the rules and update of the relevant scripts

Qualifications:

Currently there exist in total five qualifications related to grid operation in APG:

1) Verfügungsberechtigung……..for working on lines
2) Schaltberechtigung……..for switching in the substations
3) Steuerberechtigung…….....for remote switching
4) Regelzonenführerberechtigung Grid…....for Grid Operator
5) Regelzonenführerberechtigung System….for System Operator

Qualifications 3, 4 are precondition to apply for qualification 5 that is required for a System Operator. This qualification implies full responsibility for grid operation in APG including:

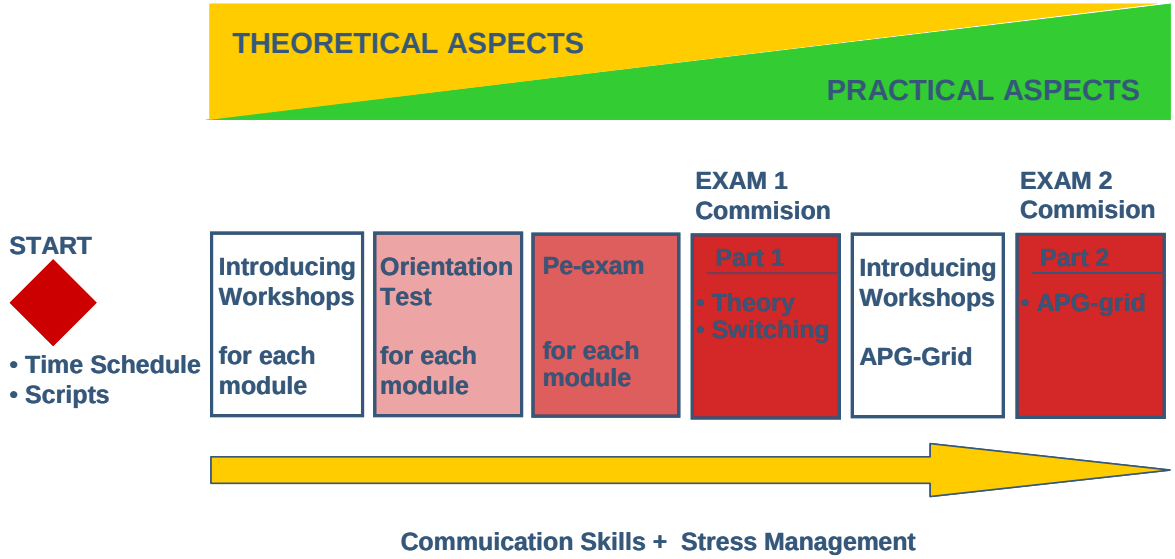
- Network control of the total APG-grid

- Network monitoring (observance of limits of grid parameters, etc.) - observance and interpretation of alarm indicators
- Online calculations (load flow, (N-1)-security)
- Congestion management
- Disturbance management, emergency and restoration control
- Management of transmission services (e.g. imports/exports)
- Remote switching and switching commands respectively
- Optimisation of voltage/reactive power and losses
- Power control (Monitoring of ACE)
- Forecast and order of needed Tertiary Control

Training procedures with respect to the qualification
Organisation of the training:

Required education for a candidate is a graduation of the *Federal Secondary College of Engineering* (a specific technical education in Austria) or a University graduation. The training begins with an official start, where the Training Coordination Manager, the trainee and his line manager agree upon the time schedule. Furthermore the line manager appoints a mentor (a System Operator) to support the trainee during the initial training.

The first qualification (*Steuerberechtigung*) requires a training period of 12 months. The graph below demonstrates the general process.



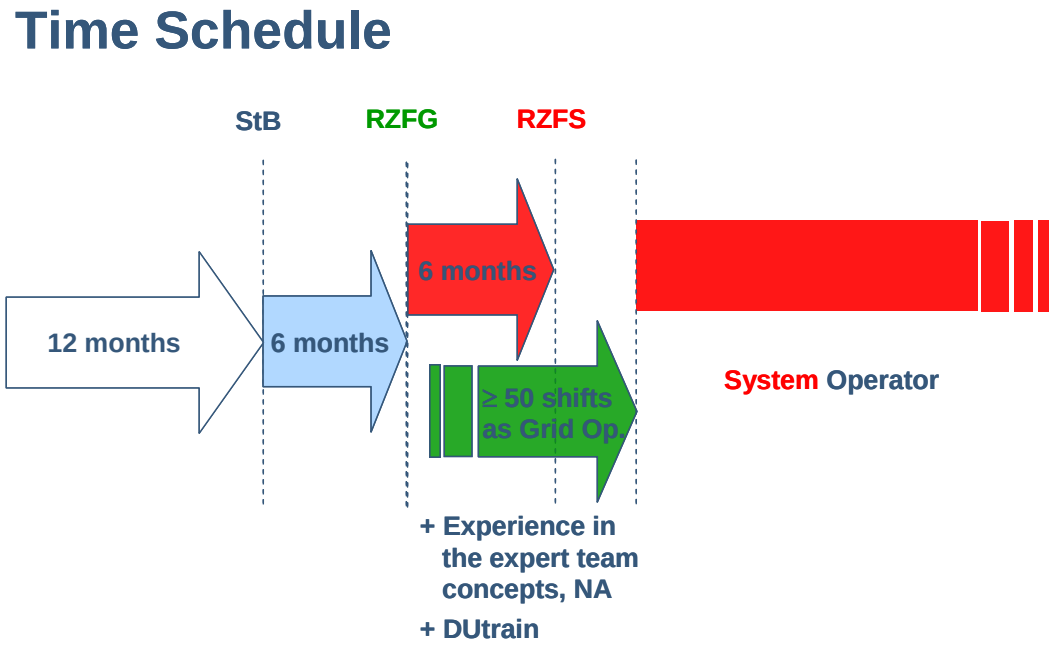
After having obtained this first qualification the trainee starts a similar training for the second qualification (*Regelzonenführerberechtigung Grid*) needed for the *Grid Operator*, who assists the *System Operator*.

Finally – as the third step – the trainees continues with the third and final qualification (*Regelzonenführerberechtigung System*).
In addition (timely overlapping) to the formal qualifications the trainee needs:

- 1-2 months experience in the expert team which organises operation concepts and network analysis
- a minimum of 50 shifts as a Grid Operator (assistant to the *System Operator*)
- simulator training with DUtrain

The whole process is supervised by the Training Coordination Manager. All relevant information concerning the individual training is archived. The status is regularly updated.

The following graph demonstrates the overall time schedule



Once a trainee has finished qualification and is appointed as a *System Operator* the continuous training starts.

Responsibilities with respect to the training

The rules define clearly the responsibilities of the Training Coordination Manager, the trainees and the trainers. E.g. the trainees have to organise their workshops and exams with the respective trainers autonomously under the supervision of the Training Coordination Manager. This approach should support self-employment of the trainees. On the other hand the trainers have to support the trainees as good as possible and provide high quality training. Part of this obligation is the elaboration of detailed scripts.

Theoretical and practical content of the initial training

The training includes

- A comprehensive theoretical background:
  - Organisational aspects (EU, national and international law and relations, APG organisation)
  - Technical basics
  - Generation and transport of electric energy
  - Components in the grid
  - Grid Operation
  - Operational rules
  - Security
  - Protection, data processing, accounting
  - Market
  - Personal training
  - Tools and APG switching simulator
  - APG grid
  - International aspects, rules, agreements

  The content of the theoretical training is coordinated by the trainers and the Training Coordination Manager

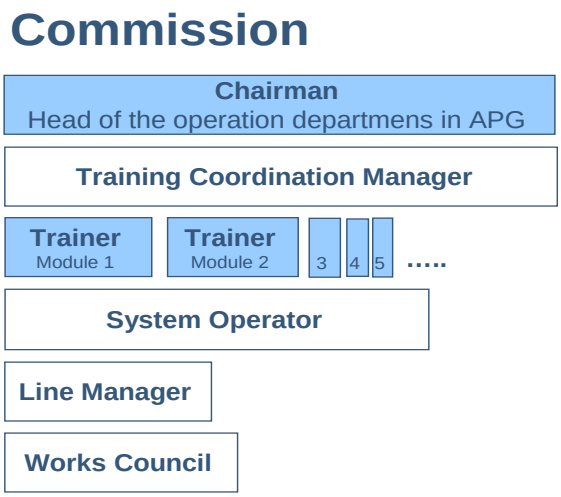
- Practical knowledge:
  - on-the-job-training
  - DUtrain simulator sessions
  - practical experience with the experts for NA and concepts

  The practical training within APG is organised by the line manager together with the trainee and his mentor depending on the planned assignment of the trainee.

  The simulator training with DUtrain is coordinated by the APG simulator specialist together with the Training Coordination Manager within the frame of the regular training sessions (see also next paragraph).

Evaluation

The evaluation procedure starts with separate detailed pre-exams for each module where only the trainer and the trainee take part. These pre-exams give the possibility for detailed questions that cover the whole subject matter of the training. The pre-exams normally take half a day each.
After having successfully completed all pre-exams there is a commission exam, where all trainers and additional members of APG take part:



The exam for gaining a qualification normally takes from half a day up to one day, depending on the respective qualification (see above: there are three commission exams required for System Operators). In case of unanimous positive decision of each member of the commission the candidate passes the exam and receives a certification.

The line manager activates the certification by appointing the candidate as a System Operator.

Validity of the qualifications

The gained certification of a System Operator remains only valid as long as the respective employee can prove a minimum of 20 shifts (with 12 hours each) a year and regularly attends the continuous training (including simulator sessions). In case these requirements cannot be fulfilled the employee looses the activation of his qualification. Re-activiation requires a further exam - its comprehension is decided by the line manager and the Training Coordination Manager.

Concept of the continuous training

The continuous training consists of:

- Operational Center Workshops (jour fixe) every two months, where e.g. specific operational problems (national/internal, international), new rules, etc. are discussed
- Grid Workshops once a year (reflexion of the last year, forecast of the following year including new grid elements)
- Simulator Sessions with DUtrain once a year (see also next paragraph)
- Crisis Management on demand
- Professional training on demand

- English lessons (30 hours a year)
- Team training every two years

Simulator training with DUtrain

Every year the System Operators have to pass an external simulator training. The simulator sessions take normally 1-2 days and focus alternately (with a two years cycle each) on:

- Restoration of the APG grid (the teams include also representatives from generating companies)
- Network Operation under stressed grid conditions

Trainer's selection

The trainiers are in general employees of APG (exceptions: e.g. psychological training). They are officially nominated by the CEO and responsible for the respective education/training sessions within the framework of the education/training process.

The trainers are responsible for
- scripts/documentation
- workshops/presentation
- examination

The requirements include both hard skills (expert knowledge, knowledge of the internal processes, organisational and legal guidelines, etc.) and soft skills (communication, experience with knowledge transfer and presentation, etc.)

Considering these requirements a train-the-trainer program is offered that comprises common basic training as well as individual courses

Regular evaluation of the rules and update of the relevant scripts

The Training Coordination Manager and his evaluation team is responsible for regular evaluation and adaption of the rules and relevant scripts.

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Overview of the training system; description of the general situation and the ongoing revision and training

TIWAG-Netz AG (TNE) is a small TSO and in the course of an international blackout would be only affected, but would definitely not be an originator. In the control area of TNE, within the Alpine region, typically there are high-capacity pump-storage hydropower plants, which are able for black start and isolated operation.

Relevant units are equipped with an additional control facility, called “Düsenvoröffnung” (DVÖ) in German, which means nozzle-preopening with jet-deflectors in operation. This is very advantageous for high load switching during grid restoration with isolated operation, allowing local/regional re-energizing within a few hours of a worst case international blackout.

This is of political importance to the Federal government of Tyrol. It has been necessary therefor to develop a special ongoing annual training for the shift personnel and emergency staff. The main parts of which are:

- Revision of all relevant basic circuit arrangements and switching procedures
- Alarmsystem for key personnel and call out of the emergency staff
- Cooperation with dispatching/control centers of the relevant GenCos
- Cooperation with the emergency staff. Staff is in operation at the latest one hour after occurrence of disturbance
- Run through the first four hours after blackout under almost real conditions (we use a self-developed power plant-simulation program to check out frequency characteristics): particularly execution of restoration concept and considering observation of the isolated grid-frequency in cooperation with GenCo-power plant control centers. False estimation leads inevitably to next blackout.
- Training of critical grid situations, caused by relevant power plants. Manual load shedding according to specified rules and by means of our online-cover calculation (estimation of energy capacity of power plants). Transmission grid operator and power plant operator are

using the above mentioned frequency simulator, which simulates real conditions of relevant power plants at isolated operation (at regular control and in case of DVÖ).

- Last years we expanded the training. After modification/adaption of control units we test in reality the performance of power plants in a test grid, separated from the UCTE grid. Thus we proof the ability of synchronization and the operation at frequency deviation by -1/+2 Hz from standard frequency. Load steps are tuned with pumps and turbines, subsequent relevant generators have to compensate load steps. So we train under almost real conditions the cooperation between control area operator and the main GenCos in our control area. Those real isolated grid tests are the base for correct parameterization of the frequency simulator.
- Training of cooperation with the neighbour TSO, subordinated distribution system operators, authorities and so on.
- Training of communication in case of disturbance by means of telephone conference.
- Training and test of our self developed remote alert system (alert of other distribution system operators within our control area).

Training sessions - overview

2005	Testgrid; restoration procedures to re-create an energized network backbone,of Osttirol (change of strategy) 23.9. Testgrid; program with GenCos to re-create an energized network backbone in Nordtirol and reconnection of the first load embedded in a simulation game; training of alert system, shift personal, emergency staff, communication 12.11. Scale exercise with EON (BUKA of "Deutsche Bahn"),, international guests; Real training of the first 3 hours of the network restoration after an international blackout Furthermore emergency staff training in 3 units
2006	7. 3. Scenario "April Weather" Training of critical grid situations, caused by relevant power plants. Manual load shedding according to specified rules and by means of our online-cover calculation (estimation of energy capacity of power plants). 4. 11. Scenario "Viribus Unitis" Common test program with shift personal of TIWAG-Netz, other staff responsible for electric system control and operators responsible for operation in generation, transmission and distribution 4.11. 22:10; Low frequency alarm; activation of the emergency staff Furthermore shift personal training in 3 units
2007	Cancellation of the planned test program in the grid of Osttirol instead alerting training with grid operators and major consumers Furthermore emergency staff training in 3 units
2008	Experience with Salzburg AG Scenario Osttirol Training of critical grid situations, caused by relevant power plants. Manual load shedding according to specified rules and by means of our online-cover calculation (estimation of energy capacity of power plants). Training alert system, communication Furthermore shift personal training in 3 units

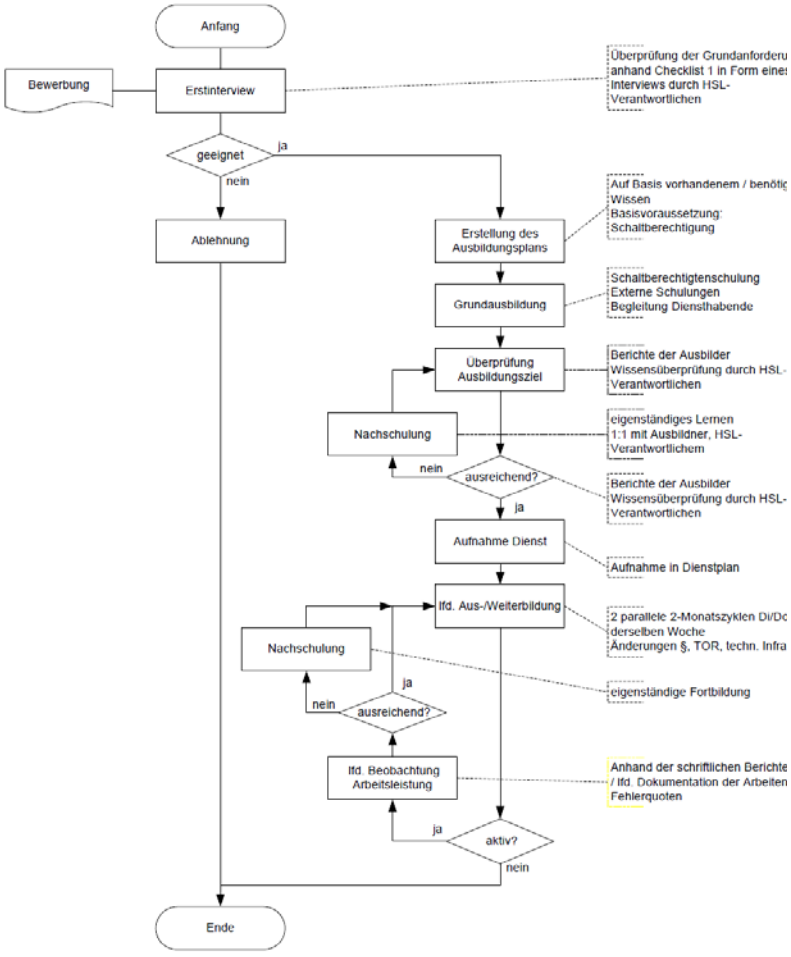
VKW-NETZ AG

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *VKW-Netz AG*
Country: German control block (Austria)

Chapter A: Training Program

The following chart gives a short overview of the selection and the training process of a dispatcher applied by the VKW-Netz AG. To give a deeper understanding the main steps followed throughout this process are described afterwards.



If due to normal fluctuation or additional needs a dispatcher position becomes vacant first an internal and if needed followed by an external recruitment process gets started.

Suitable candidates are invited to a job interview which is held by the head of the net control center (HSL Bregenz) or the head of the transmission division.

Based on a checklist and personal experiences this manager selects the most promising candidate. The checklist includes non- and technical skills which are necessary to run the transmission and distribution system operated by the VKW-Netz AG safely: basic electrical and power engineering, network control and network maintenance (procedures/regulations), communication skills and stress resistance.

The result of this assessment is the basis for the decision whether a candidate is suitable for the dispatcher job at all. Based on this result the individual course of the dispatcher candidates training is defined.

During his training each dispatcher candidate

A. has to acquire the “Schaltberechtigung” (permission to perform switching operations within the grid operated by the VKW-Netz AG).
The theoretical part of this training consists of following chapters:
    1. construction of HV-Installations
    2. HV-Infrastructure elements
    3. structure and construction of grounding systems
    4. Transformers (types, operational specifies)
    5. Grid Security (operational, technical standards and legal regulations; compliance rules)
    6. Protection systems
    7. Operation of high and highest voltage grids
    8. Operation of mid voltage grids
    9. Operation of substations
    10. Disturbance repair (small – large scale concepts)

    These chapters are presented to the candidates by several technical experts with competent knowledge (mostly internal and if necessary external experts). The presentation of the theoretical part itself does not include the training of electrotechnical basics. The knowledge of this is a prerequisite of being a candidate for the course.

    Aside this, an internal training program exists for the trainers of the dispatcher candidates.

B. obtains answers to the practical questions arising in day to day operations during his “on the job training” in the control center in which he is accompanied by an senior dispatcher; during this phase he will learn also
    - the basic design of the grid (including relevant parts of adjacent TSOs)
    - the topology of the grid (including relevant parts of adjacent TSOs)
    - the generation capacities installed and
    - the communication procedures (internal, neighboring TSOs, third parties)

C. has to learn how to perform security calculations using the instruments provided to dispatchers by VKW-Netz AG (e.g. N-1 calculation previous to each switching operation in the HV grid or the used SCADA system). In this stage the candidate will acquire the skills to forecast loadflows in the grid operated by VKW-Netz AG in order to be in the position to justify grid security affected by planned switching operations.

After finishing the theoretical and the practical training the dispatcher candidate is invited to a second interview which ends the initial training stage. The duration of this stage is mainly depending on the dispatcher candidate availability. During this second interview the initial gap analysis is redone. If the candidate meets the requirements he becomes operative and is included into the shift-work tables of the control center. If again a gap is located, he gets the opportunity to close it in a predefined time. The second interview is repeated afterwards.

Each member of the dispatcher team of the VKW-Netz AG is obliged to participate in a continual at least bimonthly information cycle. To enable this, there are two information cycles with an offset of approx. two days installed. During these ½ - 1 day meetings

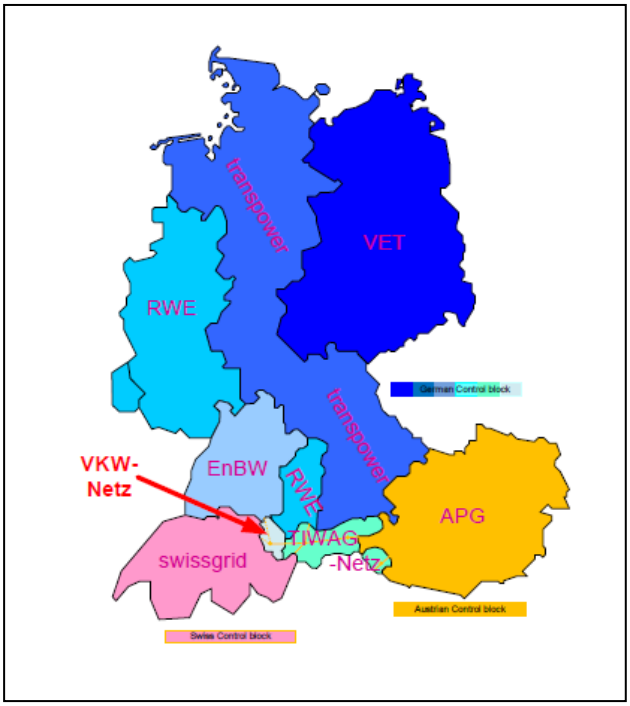
modifications in the procedures to operate the grid are discussed and/or reviewed. (e.g. changes of the grid topology, requirements originating from different policies of the UCTE Operation Handbook).

Alongside, a broadly structured English training program was implemented. The aim of this action is to guarantee the availability of at least one dispatcher in each shift with an English language level which allows him to communicate also in abnormal operational circumstances clearly. Arising from this, the P8-A-S2 has been translated into the German language. The vocabulary needed is part of the English language training.

Furthermore, simulator trainings are performed using a DUTrain-system, which is installed at a site within the illwerke vkw group. The topology of the HV-grid operated by the VKW-Netz AG has been implemented into this system as well as characteristics of the main generation units within the region.

Chapter B: Inter-TSO training

As a member of the German control block the VKW-Netz AG is situated just in the center of the so called “D-A-CH region”.
Due to the natural resources of the Federal State of Vorarlberg several pump storage hydro-power plants have been build and are connected to the HV-grids in south Germany (EnBW, RWE).



Switching operations in the HV-grid operated by VKW-Netz are coordinated by EnBW TNG with adjacent TSOs affected..

With all adjacent TSOs (swissgrid, EnBW, RWE, TIWAG-Netz and APG) an information exchange is exercised by active participation in relevant regional (e.g. D-A-CH) and international initiatives (e.g. TSC).

In addition a yearly meeting between all TSOs of Austria, Switzerland and Germany is held, where operational questions, tackling more than two TSOs are discussed (e.g. planning).

Information exchange between dispatchers of the day to day operation is performed via telephone whenever it is necessary.

With all adjacent TSOs a more structured information exchange is envisaged by VKW Netz AG and under discussion (P8-G3.2 for APG, RWE, TIWAG; P9-G3.1. with swissgrid and EnBW TNG). Efforts into this direction are delayed at the moment due to lack of available capacity.

A DUTrain simulator training supporting multi-TSO operation is currently discussed with EnBW TNG, swissgrid and VKW-Netz.

Chapter C: Training Organization and Dispatchers Accreditation

Implicitly the organization of the dispatcher training and accreditation is part of the job description of the head of the control center.

The head of the control center is normally also a senior dispatcher. Based on his experience a checklist of the needed operative, technical and inter-human skills was developed. The assessment of candidates, initial and continuous training are based on this list.

Although the course of the training itself is predefined (general training schedule), the head of the control center forms a specific course according to the already available skills of each individual trainee. This individual course, timetable, milestones, expectations of the company are developed in cooperation with each trainee.

Supportive materials as scripts, lectures, manuals, norms, legal material, references to literature and so on are distributed to the dispatcher(-candidate) whenever necessary.

The training course is adapted individually if necessary. A master copy of all material distributed to trainees is filed.

The initial training is finished with a second interview based on the competence/knowledge gaps listed prior to the initial training. In the course of this second oral testing the trainee has to prove his knowledge (all described fields of knowledge are covered). If he passes the interview, a formal accreditation certificate is handed over to him and he will be included into the time-shift tables of the control center by the head of the control center.

During the course itself the trainee will be trained by approximately twelve trainers, which are all explicit long year experts within the field they are representing. Their expert-knowledge is subsidized additional by a “how to train efficiently”-knowledge, provided by experts internally or externally. All trainers have to show strong pedagogical and organizational skills.

The participants continually evaluate the quality of the courses (oral and written feedback to the trainers and to the manager in charge of the trainings). Based on these feedbacks and the stated needs by the manager responsible for operation of the control center and the dispatchers working there, the training schedules are adapted. Additionally if the evaluation of a trainer leads to a founded assumption like “this trainer lacks some trainer prerequisites” the trainer will be replaced or a specific additional training will be suggested to the specific trainer.

After a dispatcher candidate becomes operative, he is obliged to participate in the bimonthly information exchange already described above.

Chapter D: Basic requirements for Dispatcher Training Simulator (DTS)

There is an integrated DTS software available at the control center to perform basic security analysis. The database implemented covers the actual infrastructure as it is (1:1 copy of SCADA data base).

The HV-grid operated by the VKW-Netz AG is implemented into the internal installation of the DUTrain software (ETS-Software).

“black start capability”: Dispatchers of the net control center and dispatchers of the main IPP control center can be trained at the same time (DUTrain simulation).

ELIA SYSTEM OPERATOR SA

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *ELIA*
Country: Belgium

Chapter A: Training Programs

The training of the Elia national dispatchers (System Engineers) is divided in two structured paths: the initial training path and the continuous training path.

Initial training path

Our initial training program (training path) has a structure with 12 modules: some of them are pure theoretical, other mix theory and practice and other are pure "on-the-job" training. Depending on the experience and on the background of the candidate, the initial training path lasts 6 to 9 months. It is assumed that the candidate is graduated in electrical engineering (master in engineering, civil engineer, industrial engineer) or has a long experience in the electrical field (like regional senior dispatchers).

The initial training program includes, amongst others, a module over power system theory at the University, the learning of the relevant parts of the UCTE Operational Handbook (Policies 1,3,4,5...), knowledge of the neighboring TSO grids and simulator sessions on our DTS. The use of the NCC IT-tools is also trained and tested. On-the-job practice is a mandatory and complementary way to experiment these theoretical and practical topics.

The length of the languages module is related to the initial skills of the candidate in French, Dutch and English. All our dispatchers need to speak and understand these three languages. The language skills of candidates are tested at the beginning and an improvement of their level (technical terms) is part of the initial training path. Experienced dispatchers can also always (if asked by them or by the management) follow English improvement lessons (part of the continuous training program). For instance, in 2008, all of them followed these lessons.

Please find hereunder a table with an overview of the modules and an indicative idea of their length.

Content	Length
THEORITICAL TRAINING	**+/- 17 weeks**
Languages Courses	(variable)
Electricity Sector	(variable)
High Voltage Grid	7 days
Load-Flow	1 day
SCADA & EMS	7 days
Power System Theory (grids and production units)	5 days
Operational System Security	18 days
Ancillary Services	13 days
Regional grids	15 days
Neighboring foreign grids	3 days
Emergency Plans & Procedures	14 days
DTS sessions	10 days
INTERNSHIP - On the job	**at least 12 weeks**

Each of these 12 modules is sub-divided in smaller sub-modules with specific topics and a choice of trainers or experts depending on these topics. For each new System Engineer candidate, we update the initial training path in accordance with the operational evolutions.

Continuous training path

The continuous part of our training program is applied to all of our (accredited) national dispatchers. The continuous training path is by definition permanently adapted to stay in line with the operational changes and challenges. The global structure of the continuous training program is divided in 4 parts:

- Theoretical Parts
- Practical Parts
- Simulator Sessions
- Inter-TSO Training

For each of these topics, the continuous training path includes the details about the recurrence of the training, the content, the training method and the specific trainers.

Theoretical parts are given during dedicated training sessions or during the monthly team meetings. The topics covered by these parts are new or adapted grid elements or topology, security standards, System Services contracts, market concepts… Other general trainings like languages courses or stress management are also included in these theoretical parts. Depending on the topic, these training sessions are mainly common, sometimes individual.

Practical parts are mainly related to two kinds of changes: new or adapted IT-tools and new or adapted procedures. These trainings are organized by experts during practical sessions with exercises in simulation environment. These sessions are mainly attended by small groups of System Engineers.

The simulator training sessions are also part of the continuous training program. Every System Engineer has to do minimum one DTS session every year. A session lasts 2 or 3 days and contents exercises related to usual operations and incidents, severe incidents, blackouts and reconstruction. New scenarios for simulator exercises are also engineered every year in order to stay in line with new network conditions and to continuously train the experienced dispatchers. More details about our DTS can be found in the explanations related to chapter D - Basic requirements for Dispatcher Training Simulator (DTS).

The Inter-TSO training consists at the moment in on-site cross visits, common workshops and on-shift cross periods. The length, the recurrence and the detailed content of these activities are determined in coordination with the neighboring TSOs (our direct neighbors RTE and TenneT, but also German TSOs). More details about inter-TSO training can be found in the explanations related to chapter B – Inter-TSO training.

Chapter B: Inter-TSO training

The learning of the neighboring TSO grids is part of the initial training path for System Engineers. The Elia SCADA system gives a very broad view on neighboring 380 kV grids (UCTE – CWE region). But to really improve the mutual knowledge of neighboring grids and particularities, specific inter-TSO initiatives are also part of the continuous training path for accredited System Engineers.
The type, the length, the recurrence and the detailed content of inter-TSO activities are determined in coordination with the neighboring TSOs.

With RTE, we experience since 2007 on-site cross visits: every month, 2 French dispatchers come to our National Control Center in Belgium and 2 Elia operators go to the Centre National d'Exploitation du Système of RTE in France. Every cross-visit lasts 2 days. During the first of these 2 days in the CNES, our System Engineers follow courses on French grid, operational constraints, regular critical situations, best-practices, market aspects… The second day is dedicated to on-shift period in the CNES control room in order to improve the understanding of RTE's system. During the hosting of RTE dispatchers by Elia, the visit also includes a common simulator training session to enhance dispatcher collaboration in stressful conditions. Begin 2009, all our System Engineers (national dispatchers, in charge of grid security) and our System Operators (responsible for balancing and market-related tasks) had participated to these exchanges.

With TenneT, we started common training workshops. In the beginning of 2009, a workshop was held in Elia's National Control Center. After a global presentation of the 2 TSOs, specific topics were exposed and discussed during this workshop: market rules, system services, grid security calculations and N-1 limits/criteria, regular critical situations, emergency plans,…

In 2009, a second common training workshop is foreseen in June with TenneT but also with RWE and E.ON dispatchers. This will be an opportunity for Elia operators to increase their knowledge of the German grids. Even if Elia is not a direct neighbor of these TSOs, more and more grid security issues are handled at the Central West Europe (UCTE-CWE) level.

Amongst other recent activities, some of our System Engineers also attended another common workshop dedicated to training aspects and UCTE Policy 8 topics. This was done in 2008 with RTE, Terna and E.ON.

Besides the business-related aspects, these inter-TSO initiatives give also the opportunity to dispatchers to know each other on a personal level. This gives also clear benefits in terms of future collaboration between the neighboring dispatchers.

Chapter C: Training Organization and Dispatchers Accreditation

The coordination of the dispatchers training is managed by the training coordinator, working close to the dispatching room. In 2008, this job was considered within Elia as a full-time job. An important project was started end 2007 to refresh and update the structure of the training programs for dispatchers. Two independent elements triggered this decision: the perspective of recruiting new System Engineers in 2008 and the arrival of the new UCTE Policy 8.

This project was managed by the dispatchers training coordinator with the input of several experienced System Engineers. Their task was to challenge the existing training program and to fundamentally update the contents of the training. For each of the 12 modules of the initial training program, an experienced System Engineer was in charge of completing or adapting the topics, of selecting the trainers for each sub-module, of defining the way of evaluation…

The output of this project is now:

- a well structured initial training path divided in 12 modules;
- for each sub-module, a detailed description with the topic, the selected trainers, the length of the training, the supports for the courses, the type of evaluation…;
- a clear planning for new candidate System Engineers (order and length of the courses, evaluations,…);
- for every candidate, a personal file with all evaluation forms and a clear overview of the training for the management;
- a new process for accreditation (first delivery and renewal of accreditation)
- a well structured continuous training path divided in 4 parts;
- a clear distinction between the dispatchers training coordinator's tasks and the Elia Education Center's role.

The Elia Education Center is responsible for all the technical trainings for Elia (also for grid maintenance operators). The Education Center gives a support to organize the trainings of dispatchers, but the dispatchers training coordinator works near the dispatching room, close to the System Engineers.

This new initial training path was successfully tested in 2008 and 2009 with new candidates System Engineers.

Now that the project is closed and that the related workload has decreased, the role of dispatchers training coordinator was transferred to the management of the National Control Center.

The accreditation process is described in a specific document. The accreditation itself is delivered after the initial training program is completed. After having considered his technical and non-technical skills, qualification and technical expertise, the Head of National Control Center decides to deliver the accreditation to the candidate.

Each System Engineer needs this written accreditation that authorizes him to perform his job in the control room and to take the necessary decisions.

An accreditation is valid for a period of 3 years. The renewal of the accreditation is issued in the context of the continuous training program.

A dedicated register gives also an overview of all the dispatchers of the National Control Center of Elia for which an accreditation has been delivered.

Chapter D: Basic requirements for Dispatcher Training Simulator

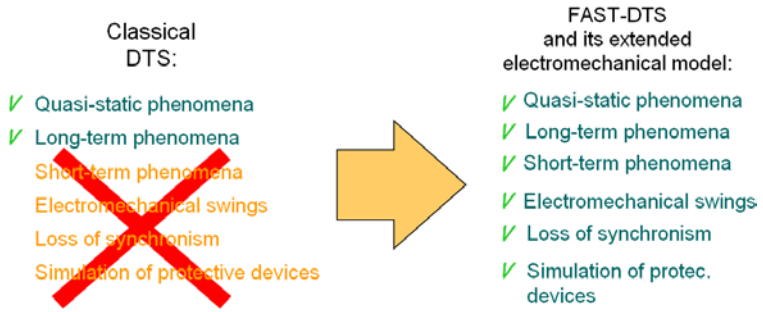
FAST-DTS

Beside the classical real-time simulation tools in the control rooms (Internal DTS in EMS), Elia has since 2004 its own (External) DTS to train dispatchers to enhance their skills in handling emergency situations on the grid and to understand in depth the physical behavior of the system during large incidents (beyond what is visible on a regular SCADA system).

Elia made the choice to develop a FAST- DTS in order to meet three main characteristics:

- Replica of daily use environment for operators (same SCADA and EMS screens as in control room)
- Real time simulation (± 6800 differential equations integrated and solved 50 times a second)
- Dynamic phenomena (thanks to extended electromechanical modeling)

The electromechanical modeling of our FAST-DTS simulator gives the opportunity to simulate a very large range of scenarios (see hereunder).



The model includes 900 busbars, 3000 lines and transformers, 175 generators, 17500 breakers and switches, 6200 protective devices,…

Simulation scenarios

Different scenarios are continuously developed in close collaboration with ELIA Senior System Engineers. The range of scenarios is covering different degrees of complexity. Some scenarios are taken (or adapted) from reality and others, like system restoration, are prepared completely off-line.

Due to its dynamic modeling, our FAST-DTS is able not only to play classical scenarios such as load increase, switching between busbars,… etc. but also more stringent or even catastrophic scenarios like voltage collapse, inter area oscillations, frequency collapse, cascading effects, black-outs, black-starts, loss of synchronism, breaker failure, protective device tripping, power swing,… etc.

In order to stay in line with new network conditions and to continuously train the experienced dispatchers, Elia's goal is to build up to 3 new scenarios each year globally covering:

- Local incidents in the three regional areas (North, South, Centre)
- Network restoration
- Use of emergency codes
- Loss of a nuclear unit with stressed network

- On line Active and Reactive Power Management

The Training Sessions

Simulator training sessions are part of the initial training path for System Engineers candidates. 10 days of different scenarios are included in this initial training.
Of course, simulator training sessions are also part of the continuous training program for System Engineers. The actual continuous program consists of (at least) one session by year and by dispatcher.
Our FAST-DTS is also used for the training of regional dispatchers from our 3 regional control centers.

The content of a classical session includes 1 day with a training on local incident and 2 days for common training (for example: lost of a nuclear power plant in stressed situation + use of reconstruction code: South).

A maximum of 4 dispatchers is allowed by session. National and regional dispatchers are mixed in order to enhance collaboration but also to exchange mutual knowledge and experience. The sessions are also open to Crisis Team members and to the management teams of the Elia control centers.

Elia has a dedicated training room for the simulator sessions: one desk is for the trainer (controlling the "outside world": incidents, production, etc…) and 2 separate desks are respectively for national and regional dispatchers. The SCADA-EMS screens are exactly the same than in the control rooms and the dispatchers also have telephones to communicate between regional and national level.

To manage these training sessions, a team of 4 instructors gives around 60 training days by year.

ELECTROENERGIEN SISTEMEN OPERATOR EAD

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *ESO EAD*
Country: Bulgaria

Chapter A: Training Programs

ESO EAD is aware of the utmost importance of dispatcher training. In order to be compliant with Policy 8 of the Operation Handbook, we've created a working group, which is responsible for "Organization of training of the dispatchers in National Dispatching Center". This working group includes specialists, who were involved in the dispatchers training and operation of the Dispatcher Training Simulator (DTS), since it was introduced, together with TELEGYR 8000 system. This working group is responsible for the overall process of training: design of training programs, preparation and updating of the implemented model of the power system, preparation of base cases and scenarios for simulator sessions, carrying out the simulator sessions, etc.

The candidates to perform a dispatcher job are trained by a program (syllabus) which contains all the relevant topics. It is approved by the Director of National Dispatching Center (NDC). This initial program specifies the criteria for the candidates: theoretical knowledge, needed for dispatchers; knowledge about transmission system; knowledge of the components and operation of the power system; knowledge about SCADA/EMS system TELEGYR 8000; knowledge of instructions and regulations. It consists of both theoretical part and on-the-job part, and also includes simulator sessions for familiarizing with the Man Machine Interface (MMI) of TELEGYR 8000. The initial programs on-the-job part lasts about 3 months.

Dispatchers who are already employed and take dispatcher position continue their training by program, that includes advanced topics such as: introduction to the work of the Automatic Generation Control (AGC) system; system automatic devices; operating real time applications – Network Analysis in process mode, Contingency analysis, Load Forecast, Hydro-Thermal Coordination, Unit commitment; operation in a common system of UCTE, etc. Training with simulator for all dispatchers is carried out on every 6 months, according to a instruction and a schedule by the Director of NDC and Training Coordination Manager. It is focused mainly on scenarios for restoration after blackout.

Teaching of new rules and procedures, and operating under new conditions affecting network operations, is permanent and is performed immediately after they are accepted.

All of the dispatchers in NDC have good knowledge of English. Their English language skills are regularly trained and tested every 2 years.

Dispatchers in NDC are familiar with the bilateral operational agreements with other TSOs, as well as with single policies in Operation Handbook, some of which (including Glossary) are available to them in Bulgarian translation.

Chapter B: Inter-TSO training

There are requirements of common training, set in the operational agreements of ESO with neighboring TSOs. ESO try to organize common training each year.

The last dispatcher meeting was in September 2008 for experience exchange, in compliance with guideline P8-B-G3.2 of Operation Handbook. It was arranged by Transelectrica, with participation of dispatchers of all neighboring TSOs.

Chapter C: Training Organization and Dispatchers Accreditation

The Republic Dispatcher is appointed as Training Coordination Manager by special order of Director of ESO. He is responsible for the organization of the training.

The Training Coordination Manager composes the requirements to candidates for the dispatcher position, designs the training programs and supervises their execution.

The initial program for the candidates to perform a dispatcher position ends with a test in front of an examining committee, which evaluates their knowledge. This committee appoints by special order and gives first accreditation to new dispatchers. It decides the period of new dispatchers to be an understudy and the time they will be permitted to operate on their own in the control room.

The trainers, appointed from ESO EAD, participate in designing of the training programs together with lecturers from the Technical University of Sofia, under supervision of Training Coordination Manager. Their responsibility is the preparation of the implemented model of the power system and keeping it actual. They are also preparing the base cases and scenarios for simulator sessions and are supporting carrying out of training with DTS.

Each trainer has a profile according to his experience, responsibility and qualification in NDC. The trainer's individual programs are based on self training with the user manuals of DTS and of single subsystems of TELEGYR 8000 as well as on suggestions by Technical University of Sofia. Some of appointed trainers have no pedagogical preparation and this is one of the reasons lecturers from the Technical University of Sofia to be involved.

Chapter D: Basic requirements for DTS

The Dispatcher Training Simulator of ESO EAD is integrated. It is a part (subsystem) of the SCADA/EMS TELEGYR 8000 system.

Our DTS runs on a separate server, which is exact copy of the real time servers. It is installed on the same hardware platform (Alpha 4000) as the real time and is connected in a common network (LAN) with them.

The implemented model of the power system includes all important generating units as well as the bigger part of the transmission system (HV). All substations and lines at voltage level 400kV and 220kV are modeled, as well as the significant part of 110kV. There are also some parts of the neighboring TSOs networks, included in the model, that have influence over our own network operation. The topology and the network components parameters are exact and are kept actual by regular import of changes that appear in the network, into the model.

The DTS database is comprehensive. It is copy of real time data base. The preparation of base cases is performed mainly by taking a snapshot of the real time situation in a given moment, which is a function of MMI.

Our DTS covers all the aims as defined in the guidelines in Chapter D: with it the dispatchers are learning to solve situations in power system operation (in normal state and especially restoration after a blackout), as well as training to SCADA, power applications, MMI, N-1 calculations, local switching procedures for maintenance activities in the network and testing of EMS a sub-applications.

Through MMI the trainer is capable to create, save, select, edit and retrieve base cases and training scenarios; modify the input data (load data, unit data, etc.); set DTS clock speed (fast, slow, normal); control the execution (start, pause, resume, take snapshot, terminate the training session); perform the outside personnel and system functions; demand immediate execution of an event; change protective relay status; analyze the training session and review the trainee's performance. Through the MMI the trainee uses the same displays, as the real time displays to: perform supervisory control to trip/close a device or to raise/lower an analog point; change the status of a point or an RTU; manually replace a status point, an analog point and / or its limits; alarm handling (acknowledging, inhibiting, deleting and establishing alarm limits); perform device tagging; perform different AGC functions; run different power system study functions; data trending.

SWISSGRID AG

CHAPTER A: TRAINING PROGRAMS

Introduction

With the start of swissgrid, the single point of contact for the Swiss grid is established in Laufenburg.

The National Control Centre (NCC) is responsible for managing the Swiss transmission system and the interconnections. The operators manage the power system in compliance with the security rules determined by swissgrid, the Swiss law and fixed within the UCTE OH.

swissgrid National Control Room includes 3 operators on shift 24h, 7 days per week:

- one system operator in charge of real-time operation of the 380/220 kV network, including interconnectors.
- one system coordinator in charge of real-time scheduling balance and coordination with the Swiss DSOs and with the Swiss power plants.
- one ancillary services coordinator in charge of supplying the adequate availability of ancillary services.

One additional system operator is on duty 7*24 h. He can be called by telephone 24 hours a day when tense situations (difficulties to comply with the rules) occur.

Day Ahead Congestion Forecast is done daily by a planning engineer. He is in charge of the outage planning and the NTC determination.

Day Ahead Scheduling is daily done by the scheduling department.

Five Regional Control Centres (RCC) are in charge of switching. Switching orders are given from the NCC to the RCC by telephone.

In declared critical situations the NCC is enpowerd to give orders to the power plants.

Initial training

swissgrid has taken over experienced dispatchers from its predecessors, EGL and Etrans. swissgrid has only recently needed to train new dispatchers.

The initial training program for the candidate who became a dispatcher is based on his personal knowledge. It included a theoretical part and on-the-job training. The tainer for this candidate was the former Head of Grid Operations supported by high skilled dispatchers. The duration of the initial training program was 6 months.

swissgrid will establish a detailed national dispatcher education program by the end of 2009. (Addendum P8-C-S2)

Continuous training

swissgrid has taken over high skilled dispatchers from regional control centers. There are continuous theoretical and practical trainings, but there is no defined long term training program. swissgrid will establish a detailed national dispatcher education program at the end of 2009. (Addendum P8-C-S2)

swissgrid organized the following training for dispatchers of the National Control Centre and Regional Dispatching Centers:

- several instruction-meetings with informations about new rules and changes in general framework of the swissgrid operational handbook.
- swissgrid instruction-meeting in May 2008. This meeting contained a theoretical part with disturbances and "almost" disturbances and informations about new conditions affecting network operation. In addition it contained aspects in Human behavior.
- swissgrid organized a dispatcher Training in April 2008 with a simulation of a System Restoration after collapse. This training involved the National Control Centre and Regional Control Centers.

swissgrid organizes the following training for dispatchers of the National Control Centre:

- Dispatcher workshops which include theoretical parts and learning of new rules and procedures. These workshops take place twice a year, each for two days.
- Dispatcher instructions with the main aim to keep and extend the dispatchers knowledge and competences continuously. These instructions take place once a month.
- Last written test of dispatchers took place in November 2007

English training

The precondition for a candidate to apply for a dispatcher job is to have a good knowledge of English language. The dispatchers in contact with neighboring control areas have sufficient knowledge of English and operational terms to carry out their tasks. English courses are provided in house. Dispatchers whose knowledge of English is unsatisfactory are obliged to attend English courses.

CHAPTER B: Inter-TSO training

swissgrid exchanges operational experience with its neighboring TSOs. This is done by participation in several meetings, such as:

- "DACH"-meetings are attended to exchange the operational experience with RWE, EnBW, APG and VKW.
- With RTE and Terna meetings are held to exchange the operational experience.

Following cross-visits have been held or are being scheduled

- With Terna the program also included the period of a night shift.
- With RWE cross-visits are hold.
- With RTE and EnBW Cross visiting is to be scheduled in 2009.

At the present there is no common training between swissgrid and VKW/APG implemented. This is to be introduced by the end 2011

CHAPTER C: Training Organization and Dispatchers Accreditation

At present, the Organization of the Swiss TSO is changing due to the new legislation "Federal Electricity Supply Act". swissgrid in the past did not have the authority for the training of the regional control centres. The dispatchers of the regional centers are neither trained nor accredited by swissgrid. However, there are some continuous theoretical and practical trainings of those dispatchers, but there is at present no defined long term general training program for them.

Therefore, the following Addenda to Policy 8 have been submitted:

Standard 2 Organization;

Establishment of a detailed national dispatcher education program, to be completed by the end 2009.

Standard 3 Evaluation;

Implementation of a test after passing the initial program for candidates to perform a dispatcher, to be completed by the end 2010.

Standard 4 First accreditation;

Accreditation of dispatchers of Swiss TSO, to be completed by the end 2010

Accreditation of dispatchers of the regional control centers if necessary, to be completed by the end 2011.

Standard 5 Trainers' selection;

Selection and training of trainers, to be completed by the end 2009.

ČEPS A.S.

Overview of CEPS' training system

A. raining Programs

Naturally, CEPS is aware of the necessity to provide the systematic high-quality training to their dispatchers in order to improve their skills – both technical and soft ones. In order to perform this task, the dispatchers are trained strictly according to the training programs. The composition of the programs is tailored to achieve given goals and it is based on the long-lasting best practice of the Dispatch Control Department and building on the cooperation with the other related departments and partners.

The **initial program** is applied on everybody who is considered to become a new dispatcher. This program consists of two main parts: theoretical lessons and on-the-job part. The total length of the initial program is individual - but at least 4 months, whereas the on-the-job part takes 2 months or more. The period of on-the-job part is modified with regard to the number of scheduled outages in the transmission system (depending on the annual seasons), to the personal abilities and the previous working experience of the candidate. The on-the-job part itself is performed by the real dispatcher's work job in the control room, of course, under the supervision of the 'grey-headed' staff.

There is no inter-TSO training associated with the initial program. The initial program focuses on the global overview of the own national electricity environment, knowledge of power system elements and its operation.

The candidates are introduced to reasons and purposes of international agreements within the framework of initial program. The parts of OpHB are introduced here too (relevant passages of Policy 1, 3, 4, 5 and Appendix 8).

The **continuous programs** are organized in order to keep and deepen the dispatchers' skills. All nominative dispatchers attend the advanced theoretical lessons within a year. The new courses are focused on the new rules and procedures besides the repeating themes. The dispatchers are continuously prepared for facing the recently occurring operational circumstances (e.g. new procedures, new network elements and their operation, commissioning of the new units, influence of wind production, market development, cooperation and coordination with international partners in accordance with the respective agreements).

The continuous program includes the regular inter-TSO training parts (see chapter B), discussion of international agreements (their impacts on real time operation); the relevant parts of OpHB are analyzed during workshops with experts, sharing of the real operational experience is welcomed.

The training programs (both initial and continuous part) are complemented by the **simulator sessions**. Nowadays we attend 2 foreign DTS. The basic network manipulations are trained in VUJE Trnava DTS (Slovakia). The DUtrain DTS (Germany)

is used for advanced operation practice (e.g. system restoration). The dispatchers visit one of them annually.

Our own DTS is being prepared hitherto (see chapter D), its capacity will be exploited as much as possible after it will be finished (09/2009 is expected).

CEPS ensures the **English training** for its dispatchers. This training is done by means of the English courses attendance. These courses are regular and intensive (2 full days each month, 2-4 dispatchers in a class). The English lessons are focused on technical issues. More than one half of dispatchers take part in these courses, so that at least one English speaking person is present in each shift. Each half-year is ended with an exam, unfortunately, not proving the ability to speak fluently nowadays. With respect to our direct neighbors, the ability to speak any of their mother tongues is welcomed as well. A lot of our dispatchers prefer German language while they are talking with E.ON Netz, VE Transmission or Verbund-APG and Russian language for PSE-Operator or MAVIR colleagues.

CEPS has prepared the vocabulary of technical terms – the reference list of English technical terms (Policy 8 – Appendix) is translated to Czech language. This bi-directional vocabulary is available both in printed and electronic forms.

The CEPS‘ **training programs** are applied on all dispatchers at all positions. All new phenomena arising in the dispatch control sphere are included into training programs immediately. Updating of training programs is done as neccessary always when the new request for dispatchers‘qualification improvement occurs. This way is more flexible than the one with the fixed updating period. The successful coverage of all expected situations

arising from the real-time operation is used as a criterion of the training programs adequacy.

B. Inter-TSO training

In behalf of making the Inter-TSO coordination easy in case of need, CEPS participates in Inter-TSO training joint actions. The purposes of such actions are namely better comprehension of adjacent TSOs systems, related problems and applied measures, sharing of the real operational experience, practice of the common procedures and building of the personal contacts. The evens which CEPS organizes or in which takes part are mentioned in follows tables:

Inter-TSO training - Past events

Date	Convener	Other participants	Venue	Type (P8-B reference)	Topics/Comment
6/2008	CEPS	E.ON, VE-T	Prague (CZ)	G3.1	
9/2008	PSE-O	CEE region TSOs	Belchatow (PL)	G3.1	annual workshop of CEE TSOs
11/2008	CEPS	SEPS	Prague (CZ)	G3.1	
12/2008	CEPS	SEPS	Prague (CZ)	G3.1	

Inter-TSO training - Future events

Date	Convener	Other participants	Venue	Type (P8-B reference)	Topics/Comment
6/2009	E.ON	CEPS, APG, VE-T	Munich (D)	G3.1	staffs familiarization, operational issues

9/2009	VE-T	CEPS	Berlin (D)	G3.1/G3.2	visit of dispatch centre, staffs familiarization, communication improvement, wind farm connection, legislative and operational issues
09/2009	E.ON	CEPS, VE-T, APG	Munich (D)	G3.2	company organisation,- grid situation during high wind power infeed, possible counter measures, influence of bordering grids on own grid, restoration plan, mutual help and expectations, outlook on future developments, discussion (e.g. about a common DTS training sessions)
10/2009	VE-T	CEE region TSOs	Cottbus (D)	G3.1	annual workshop of CEE TSOs
12/2009	PSE	PSE-O, VE-T, CEPS	Duisburg (D)	G3.4	TSO cooperation – facing to unscheduled flows caused by wind farm production

The Inter-TSO training in terms of Policy 8, B–G3.4 has not been considered to be arranged yet. Gained benefit is not adequate to the exertion.

C. Training Organization and Dispatchers Accreditation

It is obvious that the care of the **coordination** of the methodical dispatchers' training brings inconsiderable workload. Bearing in mind the obligation resulting from Policy 8, CEPS established the new dedicated position of Training Coordination Manager on 01/03/2009, although the bulk of its workload was covered by the head and experts of

Dispatch Control Department until that time. The new Training Coordination Manager was appointed to exercise the following activities:

- performance and implementation of the internal directive describing the methodology of training assurance and dispatchers' proving and the accreditation rules setting,
- working out description of qualification requirements demanded from the dispatcher staff,
- designing of the general contents of dispatchers' training and its updating process,
- individual training programs composition,
- training process supervision,
- evaluation of candidates,
- 1st accreditation delivery,
- providing of courses for dispatchers – for both initial and continuous part,
- inter-TSO training organization,
- trainers selection,
- putting CEPS' DTS into operation,
- CEPS' DTS training organization.

Organization, evaluation, accreditation and trainers selection:

There is a list of qualification requirements defined for each dispatchers' position. These requirements are transformed in detail into thematic groups. Training comprises of two main parts – initial and continuous. The preparation includes written documents, links

and theoretical courses. The important part of the training is the operational experience gaining and the personal contact building (visits of electricity facilities – substations, power plants, regional and distribution dispatch centers, etc.). The dispatchers/candidates for a new position have to attend the DTS sessions too. The whole training fully follows the schedule approved and it is constantly checked. The training of the candidate for the new position is finished with the exam which consists of theoretical and practical parts. The examining board members are: Director of the Dispatch Control Section, Head of Dispatch Control Department, Training Manager, one of the Shift Leaders and guests – experts in related spheres. The test report is issued after the exam, in case of success the candidate is considered as capable and ranked among the staff and he/she starts working, supervised by more experienced colleagues. There is not any formalized accreditation process in CEPS yet, but the new accreditation methodology will be launched by 10/2009 and all dispatchers (both new and current) will have to be re-examined, the successful ones will be delivered 1st accreditation. The trainers assigned to perform the courses have to be genuine experts in their field, with long-lasting practical experience; the pedagogical skills are also appreciated. They are usually recruited from CEPS' employees, mostly they are exceptional experts.

D. Basic requirements for Dispatcher Training Simulator (DTS)

CEPS puts emphasis on DTS utilizing. We have used "outside" DTS training DUtrain (Duisburg Germany) and VUJE Trnava (Slovakia) so far. We developed our own DTS last year and it is being commissioned at the present time.

We have the integrated DTS. It truly simulates handling of the control system and behavior of electrical system. DTS is located in CEPS Central Dispatching Center building.

DTS includes comprehensive database of internal networks and necessary data from neighboring networks at a sufficient level. DTS enables to carry out (N-1) security analysis.

DTS enables training under all conditions: normal state operation, defense against serious disturbance and their spreading, restoration of the system after Black-out.

DTS allows training EMS power application, testing EMS sub-applications, local switching procedures, network calculation software (N-1, redispatch, reconfiguration,..) and analysis of past events through using simulations.

DTS has powerful tools for following tasks: easy downloading requested data from the real time system, efficient data imputing, data accessibility, the data are accessible and simple data handling.

All system components in the operation areas are modeled exactly.

DTS monitors low/high voltage, over-current and multi-island-operation in the networks.

Our dynamic model of the system supports calculation of the electro-mechanic transient phenomena (swinging of system, processes after short circuit, dynamic stability calculation, etc.).

Trainee and trainer can influence the process through MMI tools during the whole session.

A trainer can use MMI tools to prepare and apply base cases and training scenarios.

Each session ends with a final report providing data for trainees' evaluation.

We can restore a simulated system; we can use historical data of our system (e.g. different topology).

External data in *.raw format are needed so that they can be implemented.

AMPRION GMBH

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *RWE TSO*
Country: Germany

Chapter A

Training Programs

At RWE Transportnetz Strom GmbH (RWE TSO Strom) the Dispatcher Training Program consists of two parts, beginning with an initial program that is followed by a continuous coaching program.
The work of the Transmission System Operation within RWE TSO is divided into grid and system management related tasks. Responsibilities of the system management (system engineer) are i.e. the Load-Frequency Control and all intra-day market related activities (scheduling, etc.). The grid management (grid engineer) is responsible for the security of the 380- and 220-kV grid (i.e. analysis of grid security, congestion management, etc.). For this reason the initial program to become a system engineer and the initial program to become a grid engineer are described separately.
The prerequisite to become a grid/system engineers in the main control centre of RWE TSO is the Master degree (Dipl.-Ing.) in Engineering (preferential Electrical Engineering).

Initial Program

In the following sections, the initial program to become a system engineer and the initial program to become a grid engineer are described.

System Engineer

Each new (intern or extern employed) engineer in the Transmission System Operation of RWE TSO is first educated as a system engineer. The initial program consists of a theoretical part and an on-the-job training complemented by simulator sessions.
From the beginning the new engineer accompanies a shift team. To guarantee a continuous education, the new engineer is mentored by an experienced qualified system engineer, who serves as an individual mentor during the whole education. This program normally takes 9-12 months.
Besides the on-the-job-training the operator takes part in technical seminars – depending on the individual previous knowledge.

During the initial program, a first level of competencies in the operation of the power system is achieved. The following base topics are proficiently covered:

- Network behaviour and network operation;
- Balancing (primary, secondary and tertiary reserve): market organization and operation;
- Overview on grid components of particular interest for dispatchers of RWE TSO;
- Overview on types of power plants and their operational characteristics;
- Network structure and network operation of RWE TSO, subordinated DSOs and adjacent TSOs;
- Knowledge of operational tools i.e. SCADA systems: Collecting, transferring & processing of data, computers configuration, remote control, MMI functionalities;
- Voltage and reactive power control and optimization;

- Basics of Interconnected operation, introduction to UCTE and overview of UCTE OH rules;
- Remedial actions in alert and emergency situations (TSO-DSO, TSO-IPP & TSO-TSO), restoration actions after black-out;
- Crisis management;
- Studies of special grid phenomena;
- Knowledge of domestic and international regulation and relevant market rules (Energy Industry Act, grid code, UCTE rules, etc.); et al.

After his accreditation (see chapter C) the new system engineer works continuously as a relief system engineer ("jumper") in the main control centre. As soon as a position of a system engineer in a shift-team becomes vacant, this position is to be filled seamless by the most experienced relief system engineer. To be announced for being in a fixed shift-team, the system engineer starts his education as grid engineer.

Grid Engineer

Only experienced system engineers are employed as grid engineers at RWE TSO. These experienced system engineers have already successfully completed the below mentioned and described initial training program. A lateral entry is not intended.

At all time at least 10 employees are educated as grid engineer to work in shift-teams. If there is the need to educate a new one (retirement of an old one, job change) the most experienced relief system engineer begins automatically the education as a grid engineer.

Similar to the initial program of the system engineer the candidate accompanies a shift-team - fulfilling the task of grid engineer. During this period he is released from his work as a system engineer to allow full concentration on the training. This on-the-job part is also complemented by a theoretical part and simulator sessions. To guarantee a continuous education, the candidate is guided / mentored by an experienced grid engineer, who serves as an individual mentor during the whole education (similar to the system engineer education). This initial program normally takes approx. 18 months. Besides the shift work, the candidate regularly has the possibility to analyse together with his mentor particular grid situations (i.e. critical grid situations), using the on- or off-line system.

During the initial program, besides the above mentioned topics (system engineer), the following topics are covered:

- Methods of network calculation (on-off line), state estimation, load flows, etc.;
- Network security concept (limited short circuit power, n-1, congestion management);
- Online network analysis (state estimation, load flows, n-1-calculation, short-circuit calculation, study cases);
- Basics of network protection;
- Regular switching operations (TSO-DSO, TSO-IPP & TSO-TSO);
- Disturbance management, statistics & supporting systems (PSR, lightning location system, etc.);
- Power system components: i.e. types of overhead lines; et al.

After his accreditation (see chapter C) the grid engineer returns to the system engineer tasks and works at regular intervals as a relief grid engineer (see Continuous Training Program). As soon as position of a grid engineer becomes vacant, this position is filled seamless by the most experienced system engineer.

Continuous Program

In order to preserve and to enhance the expertise of the accredited grid/system engineers, a continuous training program exists. The system engineer, educated as a grid engineer (see Initial Program), works at regular intervals as a relief grid engineer. Thereby he gathers experiences of grid situations, enhances his grid related knowledge continuously and is available to change over to the grid engineer position on demand (i.e. substitution or replacement of a retired grid engineer).

For all grid/system engineers the continuous training program consists of advanced internal training, theoretical sessions and simulator sessions.
Each grid/system engineer periodically takes part at technical (i.e. network protection, etc.) or non-technical (i.e. stress management seminar, etc.) seminars. An extensive archive of technical documents (i.e. books about electrical engineering, technical documentations of power plants, etc.) gives always the possibility for self-studies. Furthermore for each grid/system engineer a continuous English training is obligatory. The lessons are held by a native speaker. In addition to the English training sessions a reference list of technical terms, according to the appendix of OH Policy 8, former UCPTE reference list “UCPTE Terminology for the Operation of the Interconnected Transmission Systems”, is provided to all dispatchers.

In order to share the knowledge about important aspects of network operation in different system states, information about the network conditions (i.e. new network elements in the own or adjacent grid), information about new rules or procedures and to analyse critical grid situations or special phenomena in the grid, regularly meetings of the shift engineers take place.
Furthermore each grid/system engineer analyses regularly particular grid situations (i.e. critical grid situations) using the on- or off-line system.

To train critical grid situations, workshops and simulator sessions are held. In these simulator sessions, situations with insecure and emergency scenarios and the restoration of the network after disturbances are trained. These simulator sessions and workshops are performed with the internal regional control centres of RWE TSO as well with external bodies like DSOs, power producers, and adjacent TSOs (see chapter B “Inter-TSO training”). The simulator sessions (see chapter B, D) take place at the Independent Training & Service Centre for Power System Control of the DuTrain GmbH in Duisburg, Germany.
These workshops and simulator sessions are obligatory for all grid/system engineers. By repetition of the sessions each grid/system engineer is trained, shift-team by shift-team approx. every 2 years.

Chapter B

Inter-TSO training

The operation of the grid is strongly influenced by the generation/load pattern and the topologies of the neighbouring systems. Thus, RWE TSO has established an inter-TSO training with each adjacent TSO. The level of inter-TSO training is chosen depending on the mutual level of risks for secure system operation with each individual neighbouring TSO.
With all adjacent TSOs an exchange of operational experience is organized (i.e. weekly conference calls, regional groups and committees, etc.). Moreover RWE TSO has committed itself to implement inter-TSO training sessions in the bilateral agreements with the adjacent TSOs. The exchange of the operational experience is obligatory for each grid/system engineer of RWE TSO.

At RWE TSO the common training is implemented in the following ways:
- Cross visits between neighbouring TSO dispatchers (P8-B-G3.1.),
- Common training workshops (P8-B-G3.2.),
- Common DTS training sessions (P8-B-G3.4.).

Cross visits in combination with workshops
In collaboration with the adjacent TSOs, RWE TSO organizes regular exchange visits in combination with common inter-TSO training workshop. Approximately once a year, grid/system engineers of each TSO meet for 2-4 days at a control centre in a rotative way. During these exchange visits the grid/system engineers present the individual TSO organization and exchange knowledge about their grid. The visit at the control centre gives the opportunity to get an impression of the neighbouring environment and to know each other on a personal level and introduce a more collaborative atmosphere between the grid/system engineers who have frequent contact.
Furthermore the grid/system engineers exchange their experiences and knowledge on dedicated subjects of common interest like coordinated implementation of remedial actions at the borders, operational concepts on thresholds and alarms, individual risk management or concepts for network analysis.
Such kinds of exchange visits in combination with workshops are performed with almost every adjacent TSO and additionally with some further TSOs: i.e. EnBW TNG, E.ON Netz, VE-T, TIWAG Netz, Cegedel Net, RTE, swissgrid and TenneT. We are in a dialogue with APG and VKW Netz to implement actions like cross visits or common workshops (P8-B-G3.1., G3.2.) till middle of 2010.

In 2003 a specific inter-TSO training workshop took place for two days. TSOs from Germany (E.ON Netz, RWE TSO, EnBW TNG), Austria (APG, TIWAG-Netz, VKW-Netz) and Switzerland (ETRANS, NOK) presented their individual concepts for power system restoration. The coordinated power system restoration after a major blackout was trained by map exercise. Currently EnBW TNG is organizing a similar follow-up.

Common DTS training sessions in combination with workshops
All German TSOs organize a common training on emergency procedures and power system restoration (so called „Systemführer-Kolloquium“). These training sessions take two days and consist of a theoretical part and a simulator session. The simulator sessions (see chapter D) take place at the

Independent Training & Service Centre for Power System Control of the DuTrain GmbH in Duisburg, Germany.
The workshops and simulator sessions are obligatory for any grid/system engineer and organized continuously. By repetition of the sessions, all grid/system engineers are trained - shift-team by shift-team - approx. every 2 years.
The theoretical part encompasses current operational issues, approaches on disturbance management, power system restoration and the analysis of significant recent disturbances.
The simulator sessions encompass regional disturbance scenarios affecting several TSOs like separation of the interconnected grid into islands or black-outs. This kind of training enhances the grid/system engineers to analyse the grid situation and develop cross-border actions in a coordinated way. One further focus is the training of remedial actions according to German Energy Industry Act, § 13.

The DTS training sessions are performed regularly with all German TSOs: EnBW TNG, E.ON Netz and VE-T.

Chapter C

Training Organization and Dispatcher Accreditation

At RWE TSO an experienced grid engineer is appointed as a training coordination expert. The whole operational training program is coordinated by the head of the main control centre, assisted by this training manager.
An official job description with a definition of the required qualification criteria for system and grid engineers at RWE TSO is given. The prerequisite to become a grid/system engineer in the main control centre of RWE TSO is the Master degree (Dipl.-Ing.) in Engineering (preferential to Electrical Engineering). Each new (intern or extern employed) engineer in the Transmission System Operation of RWE TSO is first educated as a system engineer. Only experienced system engineers are educated and employed as grid engineers at RWE TSO.
A reference list of topics for the training program is given by user manuals, advices for grid and system operation in a dedicated handbook and other descriptions of important system and grid management processes (i.e. C-Function determination). These documents are also used to educate and train all grid/system engineers continuously. Furthermore the manager of the department continuously improves the training program i.e. due to new regulatory or market rules.

The internal trainer (mentor) of new grid/system engineers is chosen individually by the manager of the department. All internal trainers are experienced system or grid engineers who are still active grid/system engineers. To guarantee an intensive mentoring of the candidate, the internal trainer (mentor) is responsible for not more than one new candidate at any one time.
The training coordination expert is responsible for the organization of the cross visits with neighbouring TSOs, common training workshops and the DTS training sessions (see chapter B). This expert is nominated for a longer duration to guarantee a continuous training of the grid/system engineers.

The simulator sessions take place externally at the Independent Training & Service Centre for Power System Control of the DuTrain GmbH in Duisburg, Germany.

The internal trainer and the training coordination expert take part in the normal internal and external continuous training program. Special needs for individual training sessions for the trainers are taken into account.

Dispatcher Accreditation

At the end of the education phase (initial training program), when the new grid/system engineers can operate all tasks independently, an assessment of the grid/system engineer´s capabilities through an interview together with the individual mentor, the head of the main control centre and the head of system operation takes place. In case of a successful assessment, a written endorsement in form of a formal internal certification is written and signed by all interview participants. This certification authorizes the new grid/system engineers to perform his job in the main control centre. The accreditation information is also sent to all partners like TSOs, DSOs and power plants.

Chapter D

Basic requirements for Dispatcher Training Simulator (DTS)

The simulator sessions take place at the Independent Training & Service Centre for Power System Control of the DuTrain GmbH in Duisburg, Germany (external DTS).

DUtrain developed a training simulator to train system operation under normal system state, emergency situation and system restoration after a black-out. The DTS includes a comprehensive database with respective data from the own and neighbouring networks at a sufficient level (load, network model, generation, external feed-in) and a (n-1)-security analysis. DuTrain provides an adequate realistic control room environment. Several control centres can be represented in parallel which allows multi area training.
All the original system components of the TSOs are modelled. Functional requirements like low/high voltages, over-current and multi-island-operation are fulfilled. Monitoring and control options for the trainer to influence the training process deliver realistic training scenarios.

All scenarios and actions are reported. Thereby all actions are evaluated and discussed jointly by the trainer and the participating dispatchers at the end of the training session.

ENBW TRANSPORTNETZE AG

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *EnBW Transportnetze AG*
Country: Germany

At EnBW TNG the department TNG EBS is responsible for the operation of the control area and the grid of EnBW TNG. TNG EBS is divided into the control centre with its two tasks of 380/220 kV network control and system balance and the back office performing planning and organizational tasks.
13 dispatchers work in the control centre. They are organized into 6 permanent shift teams and one additional spare dispatcher who primarily works in the back office. All dispatchers are educated to fulfil both tasks of 380/220 kV network control and system balance. They change tasks regularly every week.

Chapter A

The Dispatchers Training Program of EnBW TNG consists of an initial program and a continuous one.

Initial Dispatchers Training Program

Each new Dispatcher has to pass the Initial Dispatchers Training Program guided by an experienced Dispatcher. It takes 6 months in principle. Based on the knowledge of the structure of the EnBW AG Group and its Transport System Operator EnBW Transportnetze AG the Initial Dispatchers Training Program consists essentially of the two pillars “Expert Knowledge Grid” and “Expert Knowledge System Balance” providing the theoretical knowledge. This is the base on which practical operational know how is built up by on-the-job education and internal simulator sessions. The latter is used for training of regular switching operations. Accompanying the dispatcher will complete his knowledge by information on-site in the respective departments or external units with relation to his future work (please refer to figure 1). Depending on the individual previous knowledge of the entrant the Initial Dispatchers Training Program can be adapted.

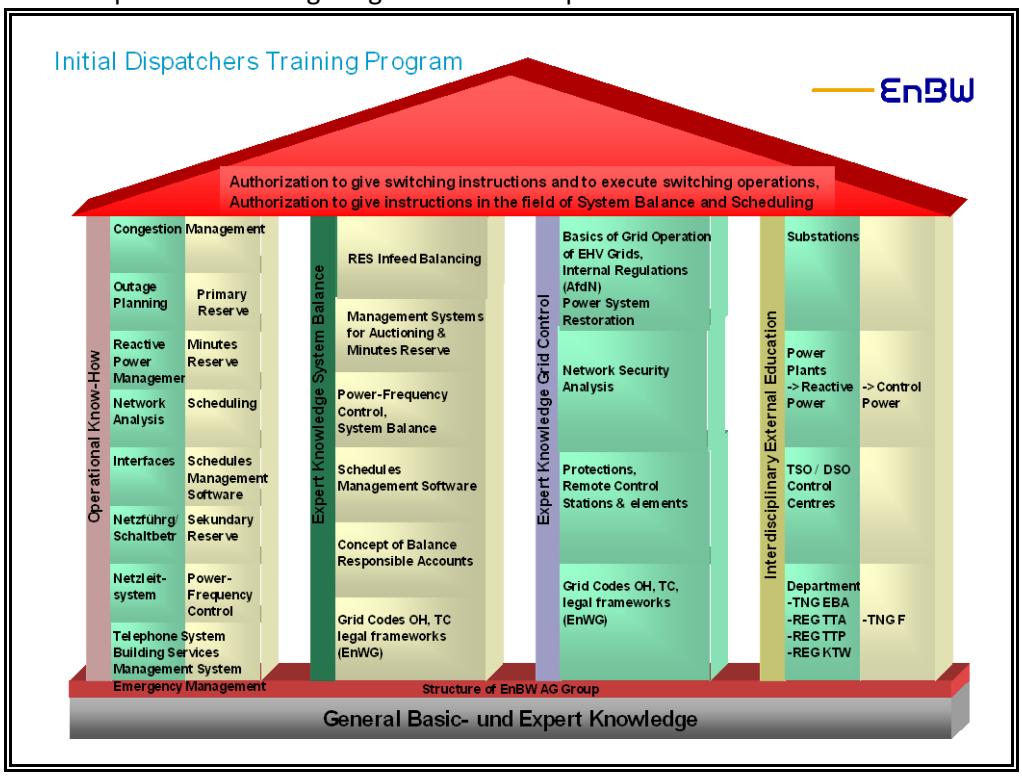


Figure 1: Structure of Initial Dispatchers Training Program

Selected important subjects covered by the Initial Dispatchers Training Program are as follows:

- Overview on grid components as of interest for dispatchers of EnBW TNG
- Overview on types of power plants connected to CA EnBW, interrelation TSO-IPP
- Network structure and network operation of EnBW TNG, subordinate DSOs and adjacent TSOs
- SCADA: Collecting, transferring & processing of data, computers configuration, remote control, MMI functionalities
- Voltage and reactive power control and optimization
- Network security concept (limited short circuit power, n-1, congestion management)
- Online network analysis (state estimation, load flows, n-1-calculation, short-circuit calculation, study cases)

- Grid protection systems (basics and concept of EnBW TNG)
- Basics of Interconnected operation, introduction to UCTE and overview on UCTE OH rules
- Regular switching operations (TSO-DSO, TSO-IPP & TSO-TSO)
- Remedial actions in alert and emergency conditions (TSO-DSO, TSO-IPP & TSO-TSO), restoration actions after black-out
- Disturbance management, statistics & supporting systems (PSR, IAP, lightnings location system)
- Crisis management
- Operational planning (capacity determination, planning & coordination of outages, DACF)
- German market rules, concept of BRP and scheduling
- Balancing (primary, secondary & tertiary control, emergency reserves), organization & operation
- RES, concept for balancing
- Scheduling system and related supporting software
- Management Systems for Auctioning, Minutes Reserves & Forecasts for System Services

Continuous Dispatchers Training Program

In order to preserve and to enhance the expertise of all the accredited dispatchers EnBW TNG has set up the Continuous Dispatchers Training Program. In this frame the dispatchers are periodically trained by internal and external (inter-TSO) training sessions.

Alongside the overall general training program of EnBW AG Group for individual advancement of staff (e.g. stress management) internal training sessions encompass workshops for the preservation and enhancement of expert knowledge (so called competence workshops) and external simulator sessions at the facilities of the DUtrain Training Centre in Duisburg.

For the education and training of interconnected operation dispatchers take part at additional inter-TSO workshops offering the opportunity of cross visits and exchange of operational know-how with dispatchers of neighbouring TSOs as well as inter-TSO simulator sessions at the facilities of the DUtrain Training Centre in Duisburg.

Selected important subjects covered by the Continuous Dispatchers Training Program are as follows:

- Analysis of critical situations and disturbances
- Recapitulation of important aspects of grid operation and technical knowledge
- New conditions affecting grid operation
- New rules and procedures following changes in law or in technical framework
- Training of operational (inter-TSO) procedures in normal, emergency and blackout state
- Network structure and network operation of EnBW TNG, subordinate DSO and adjacent TSOs

Acknowledging the fact that the operational work of its dispatchers is more and more influenced by international cooperation EnBW TNG offers its operational staff an English training, which accounts for the linguistic skills of the dispatchers´ daily work. In addition to the English training sessions a reference list of technical terms has been provided to the dispatchers basing on the appendix of OH Policy 8, former UCPTE reference list “UCPTE Terminology for the Operation of the Interconnected Transmission Systems” and individual experience of back office staff involved in the international business.

Chapter B

Basically EnBW TNG has committed itself to organize inter-TSO training sessions with neighbouring TSOs in the bilateral contracts. This affects all the adjacent TSOs E.ON Netz, RTE, RWE TSO, swissgrid and VKW-Netz.

EnBW TNG exchanges operational experience regularly with its neighbouring TSOs by participating in a variety of multilateral for a such as:

- "DACH"-meetings, coordination of TSOs from D, A and CH
- TSO Security Panel, operational experts forum of the TSC initiative
- Meetings of German TSOs on the coordination of operational work
- Operational Meetings with RTE and RWE TSO

EnBW TNG has determined the level of inter-TSO training with its neighbouring TSOs depending on the individual mutual level of risk for secure system operation and the extent of mutual interdependency of grid operations. Hence inter-TSO training sessions are organized as follows:

<u>EnBW TNG, E.ON Netz, RWE TSO, Vattenfall Transmission: Common DTS training sessions (so called „Systemführer-Kolloquium“)</u>

German TSOs organize every 2 years a common training on emergency procedures and power system restoration for their dispatchers. The training sessions take 2 days and consist of a theoretical part and a simulator session. By repetition of the sessions all dispatchers are trained, team by team. The trainings are held at the facilities of the DUtrain Training Centre in Duisburg.

The theoretical part encompasses current operational issues, approaches on disturbance management and power system restoration and the analysis of significant recent disturbances.

The simulator sessions encompass regional disturbance scenarios affecting several TSOs like disintegration of the interconnected grid into islands or extensive black-outs. By working in a group the dispatcher teams analyze and clarify the situation in the grid and develop strategies for trouble shooting or system restoration respectively. Another focus is laid on the implementation of remedial actions according to § 13 of German Energy Industry Act.

<u>EnBW TNG, E.ON Netz, RWE TSO, Vattenfall Transmission, VKW-Netz, TIWAG-Netz, swissgrid: Common training workshop on scheduling (so called „FPM-Kolloquium“)</u>

Aforementioned TSOs organize yearly one common training workshop on scheduling which lasts 2 days. The training sessions encompass the presentation of new developments in the field of scheduling. Furthermore dispatchers have the opportunity to exchange their experience in the respective field and to get into contact and exchange their views with a representative of a trading company.

<u>EnBW TNG, RTE, RWE TSO: Cross visits in combination with common training workshop</u>

In collaboration with RTE and RWE TSO EnBW TNG organizes a regular common inter-TSO training workshop once a year. Dispatchers of each TSO meet for 4 days at a control centre in a rotative way. There they have the opportunity to learn more about the individual structures of the organization and to get an impression of the dispatchers facilities of the hosting TSO. Furthermore dispatchers exchange their experiences and knowledge on dedicated subjects of common interest like coordinated implementation of remedial actions at the borders, operational concepts on thresholds and alarms, individual risk managements or concepts for network analysis.

<u>EnBW TNG, RWE TSO, Verbund APG, VKW-Netz, TIWAG-Netz, swissgrid: Common training workshop</u>

In 2003 a 2 day inter-TSO training workshop took place at which TSOs from Germany (E.ON Netz, RWE TSO, EnBW TNG), Austria (APG, TIWAG-Netz, VKW-Netz) and Switzerland (ETRANS, NOK)

participated. Then the individual concepts for power system restoration were presented and the coordinated power system restoration after a major blackout was trained by map exercise. Currently EnBW TNG is working on the organization of similar regular follow-ups.

Chapter C

EnBW TNG has nominated a training coordination manager for the coordination of the Dispatchers Training Program. Advancement, adaption and improvement of the Dispatchers Training Program is done based on the feedback of trained staff and according to recent operational evolutions influencing the occupation of a dispatcher.

Principally the trainers are chosen from the senior experts of the operational department, from other expert departments as required by the subject to be dealt with or from experienced dispatchers.

Training of trainers is organized based on the overall general training program of EnBW AG Group for individual advancement of staff according to the agreement between the head of TNG EBS and the staff.

The prerequisite for becoming a dispatcher in the control centre of EnBW TNG is the qualification of an engineer (so called Dipl.-Ing. or Dipl.-Ing. (FH)). Electrical engineers are favorized. Entrants as well as engineers from EnBW AG Group or from other companies experienced in electrical engineering are potentially qualified for the occupation of a dispatcher.

New dispatchers pass the Initial Dispatchers Training Program (for content and structure please refer to chapter A). The education of the new dispatcher is supervised by an experienced dispatcher who serves as a coach and mentor and accompanies the new dispatcher through the initial training program. The coach is in charge of organizing the various education steps with the respective senior experts of the various expertises and departments contributing to the training program. Parts of the training program are undertaken by the coach himself.

For instruction and documentation of the education progress a training manual has been developed. It includes the listing of all the topics the new dispatcher has to deal with during his training program. Additionally the manual includes links to documents providing detailed information.

Finally the coach participates in the continuous verification of the level of knowledge of the new dispatcher and of his capability to perform his tasks on his own responsibility. The competence of the new dispatcher is assessed separately and consecutively for the two tasks of 380/220 kV network control and system balance. Therefore dedicated interviews are held by the coach, the head of TNG EBS and additional trainers if required.

By granting the “Authorization to give Instructions in the field of System Balance and Scheduling” and the “Authorization to give Switching Instructions and to execute Switching Operations” the new dispatcher is enabled to act on his own responsibility. He becomes an adequate member of the shift team. Relevant internal departments and neighbouring TSOs are informed of the accreditation of the new dispatcher. The validity of the accreditation is not limited.

Figure 2 shows the course of action of the Initial Dispatchers Training Program. The Initial Dispatcher Training Program is based on the hitherto existing general basic and expert knowledge of the entrant. After an introductory orientation phase the new dispatcher gets a first picture on his future occupation while accompanying the shift teams within the following two weeks. Afterwards periods of theoretical education, on-site visits of substations, external departments and control centres of adjacent TSOs and periods of practical on-the-job training as 3rd engineer on shift alternate.

On two due dates spread over the initial training period the new dispatcher has to reflect the precedent education section and has to present his level of knowledge. Thereto he has to attend an interview with the head of TNG EBS, selected trainers and his coach. After having succeeded in the second assessment the new dispatcher is granted the “Authorization to give Instructions in the field of System Balance and Scheduling”. At that time he is able to act on his own responsibility in the task of System Balance. However before the finalization of his training program the new dispatcher will only work in individual cases as regular 2nd engineer on duty being responsible for System Balance. After the second assessment the new dispatcher will continue his education as 3rd engineer on shift with the main focus on Grid Control.

At the end of the training period the new dispatcher has to reflect his initial training in a final assessment together with selected trainers, his coach and the head of TNG EBS. If the new dispatcher is able to proof his competence and assesses himself ready for the acceptance of responsibility he will acquire the “Authorization to give Switching Instructions and to Execute Switching Operations”. Starting from this point of time the new dispatcher is entitled to work on his own responsibility on both tasks in the control centre. The new dispatcher is assigned to a senior dispatcher to form a new shift team.

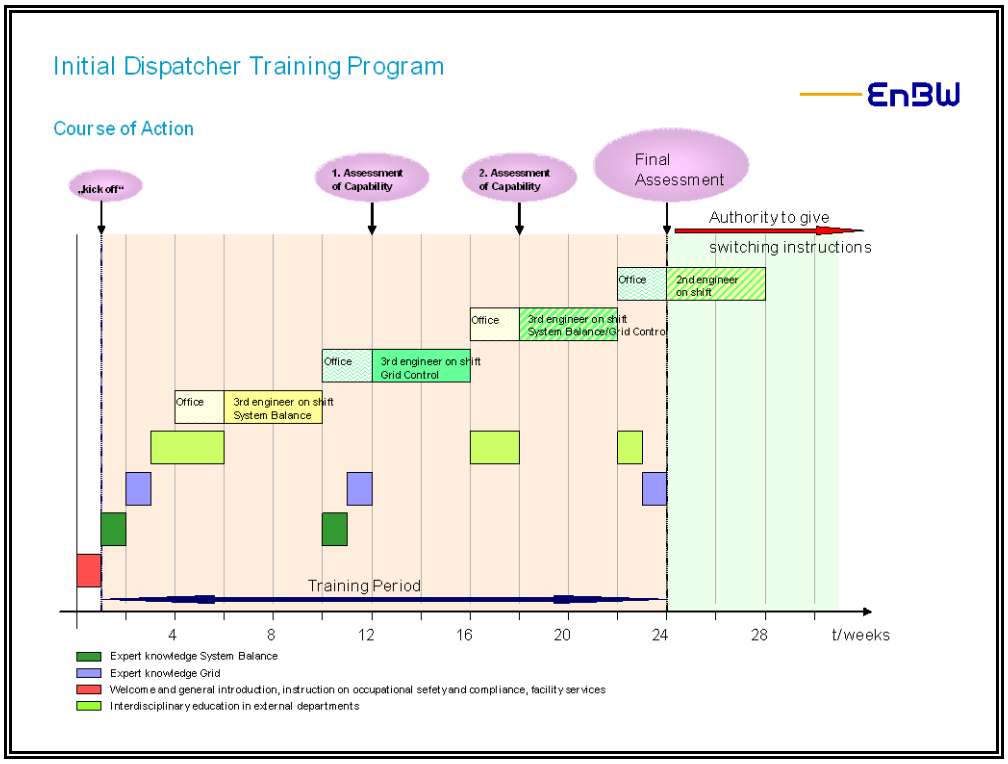


Figure 2: Course of Action of the Initial Dispatcher Training Program

In the frame of the Continuous Dispatcher Training Program EnBW TNG offers internal training sessions (so-called competence workshops), external simulator sessions and inter-TSO training (for the latter please refer to chapter B) to all accredited dispatchers.
Competence workshops are held about 3-5 times a year taking half a day and being repeated once or twice to train all the dispatchers. They cover up to two topics from a topic list administered by the head of TNG EBS. The training sessions are held by the experts responsible for the respective subjects. In the training sessions new procedures are presented, existing ones or dedicated technical aspects are repeated and are compared to the operational reality (for details please refer to chapter A). Additionally the dispatchers have the opportunity to exchange their experience on the respective subject.
Apart from that information and instruction of dispatchers is provided in the frame of the regular meetings of the shift team and of the operational department. Both are held on one dedicated day every 6 weeks.
In collaboration with the DUtrain Training Centre in Duisburg a simulation environment for the grid of EnBW TNG has been developed. The Centre enables the dispatchers to train emergency processes and power system restoration together with their colleagues from the DSOs and the IPPs under realistic dynamic grid conditions. Due to the realistic grid model and the isolation of the work stations stress situations are simulated and communication by phone can be trained. Training

sessions are offered every two years. The individual training sessions are repeated 7 times to educate all the dispatchers.

Chapter D

For providing simulator sessions EnBW TNG makes use of the services provided by the DUtrain Training Centre in Duisburg. Alongside the external training centre of DUtrain the grid control system of EnBW TNG provides an internal DTS, too.

External DTS of DUtrain Training Centre, Duisburg

For practical exercises DUtrain uses an especially designed training system used for hands-on operator training under normal, emergency and restoring operating conditions. Models covering load, network, power plant, external infeed and related equipment performance and phenomena simulate a realistic performance of the complete power system. The flexible set up of the training system allows DUtrain to provide training for individuals as well as cross-training simultaneously for teams of dispatchers from different companies representing several control centres in parallel and all using a replica of their networks.

The supervisor desks are set up according to the specifications of the operational tasks and training needs whereas the supervisor can use all simulation facilities and has full control over all performed actions. Powerful tools for base-case and scenario definition and -setting in real-time on the one hand limit the time for training preparation and on the other hand allow realistic and “lively” training sessions modelling the extreme conditions of network and power plants with sufficient precision and displaying their performance with operative realism on the different surfaces.

Internal DTS of EnBW TNG

The internal DTS of EnBW TNG is a DTS providing the standard functionality of the grid control system of EnBW TNG in a separated simulation environment (excluding LFC functionality). Due to reasons of efficiency and limited manpower the internal DTS is basically not used for advanced simulator sessions.

Today the internal DTS is used for internal training of SCADA functionalities and regular switching procedures in the frame of the Initial Dispatchers Training Program, for maintenance activities in the grid and testing of EMS sub-applications.

TRANSPOWER STROMÜBERTRAGUNGS GMBH

April 28, 2009

Overview of training programs at E.ON Netz, Germany

E.ON Netz has fixed a description of the required dispatcher qualifications. The dispatchers training program of E.ON Netz has been deducted from these qualifications. It consists of an initial and a continuous part. Both initial and continuous program consider the internal rules of E.ON Netz and reflect the requirements given by the operation handbook. Both experienced dispatchers and senior experts of the respective departments are chosen as trainers. Advancement, adoption and improvement of the dispatchers training program base on the feedback of trained staff. Actual developments in grid operation are considered as far as they influence dispatchers' tasks.

Participating in the initial program requires a technical basic education, i.e. university studies in electrical engineering or equivalent skills. The initial dispatchers' training program of E.ON Netz aims to create knowledge about

- switching in general
- voltage control
- congestion management
- restoration after blackout
- signal registration
- protection
- scheduling management
- tools for grid operation
- special topics.

New dispatchers, so called trainees have to pass these subjects during the initial training program. The initial part consists of both theoretical lectures and on-the-job practice. Theoretical lectures are given by experts employed in the control centers and experts of other departments. On-the-job practice mainly takes place in the control centre in which the trainee is employed. A longer visit of the other E.ON Netz control centre is obligatory during on-the-job training. Additionally, trainees attend a simulator session at DUtrain. The duration of the initial program depends on the success of education and the measurable skills of the trainee. The objective of the initial part is to get a switching license for 380/220 kV grids.

The topics taught during the continuous dispatchers' training program are determined by the team leaders. The continuous part consists of both training workshops and lessons about new topics, i.e. the new restoration plan. Furthermore, team meetings and simulator sessions at DUtrain are part of the continuous program. External simulator sessions are offered once every two years.
Inter-TSO training is also part of the continuous dispatchers' training program. The tasks for the grid operation are split into the two control centers Dachau and Lehrte. In order to achieve synergy, several back-office jobs are either done in Lehrte or Dachau. The dispatchers' training programs are adapted to this organizational structure.

For obtaining full accreditation as dispatcher the newcomer has to proof his competence in an interview. The interview partners are his team leader and the head of both control centers. In advance

experienced dispatchers are asked to give their impression of the trainee's development within the on-the-job training periods.

If the new dispatcher succeeds the interview he obtains the "Authorization to give Instructions in the field of System Balance and Scheduling" and/or the "Authorization to give Switching Instructions and to Execute Switching Operations" depending on the working place he will be employed. A protocol of the interview including the given questions is distributed to all participants.

Additionally, E.ON Netz offers general trainings, i.e. an English course and an online tool to improve the dispatchers' language skills. All dispatchers employed by E.ON Netz are able to speak English sufficiently in order to meet their challenges in an international environment. A reference list of technical terms has been provided to the dispatchers basing on the appendix of OH Policy 8 and individual experience of back office staff involved in the international business.

50HERTZ TRANSMISSION GMBH

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Vattenfall Europe Transmission GmbH*
Country: *Germany*

Introduction

Due to the economic relevance of the security and reliability of supply the management and operation of the power system are very important. Therefore special requests to the dispatcher of transmission control centre exist. At VE Transmission the department VE-T-S is responsible for the grid and system operation. It is divided into the three parts: system control including the transmission control centre, control area processing and control area cooperation. In the transmission control centre actually in each case 7 shift leaders, shift engineers and shift foremen, organized in 7 shifts teams of three persons, work permanently on balancing of the control area (task of the shift leader) and on supervising and managing of the 380/220-kV-network, respectively. The three workspaces have different requires and are organized hierarchically. If necessary the dispatcher can work at the subordinated position, too.

The tasks of shift foremen require wide experience in the structure of the grid. For this reason, only experts of transformer stations are used for this position. All foremen need a authorization for switching operation (for shift foremen), but no special initial education. Shift leader are special shift engineers. There are special requirements to the character and the leadership of them. There is no special further education for shift leader, but special individual trainings are offered. Shift leader are officially nominated by the management of the department. The initial dispatcher training program, described on the following pages, reverse to shift engineers of the transmission control centre.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Vattenfall Europe Transmission GmbH*
Country: *Germany*

Chapter A – Training Programs

The dispatcher training program of VE Transmission consists of an initial and a continuous part for shift engineers.

Initial Dispatcher Training Program

Each new dispatcher has to pass the Initial Dispatcher Training Program of VE Transmission. There is a fixed experienced dispatcher / mentor for each candidate during the whole training. The education is divided into two parts, which together takes about 12 to 16 month. The Initial Dispatcher Training Program ends with the verification of the switching operation authorization for shift engineers. Additionally to the standard authorisation for switching operation, this authorisation includes the definition of switching states and activities for system balancing.

The initial program at VE Transmission starts with a practical education and training in transformer stations and power plants. The second part consists of an education in all tasks of the transmission control centre. It includes theoretical descriptions and their practical application. Furthermore, operational tasks (outage planning, scheduling, system balancing,…) are included. Concerning to their future tasks, the engineers get a special education, in important parts of the company (power system planning, grid protection,...). In the third part, the candidate is educated practically in the transmission control centre under the guidance of an experienced dispatcher. All tasks of the two workspaces for grid control are erudite. This is the base on which practical operational know how is build up by training-on-the-job. Special English training is a permanent element of the whole education. The initial program is adapted individually according to the previous knowledge of the candidate.

Selected important subjects covered by the Initial Dispatchers Training Program are as follows:

- Overview on grid components as of interest for dispatchers of VE Transmission
- Overview on types of power plants
- Network structure and network operation of VE Transmission, subordinate DSO and adjacent TSO
- SCADA: Collecting, transferring & processing of data, computers configuration, remote control, MMI functionalities
- Voltage and reactive power control and optimization
- Network security concept (limited short circuit power, n-1, congestion management)
- Online network analysis (state estimation, load flows, n-1-calculation, short-circuit calculation, study cases)
- Grid protection systems (basics and concept of VE Transmission)
- Basics of interconnected operation, introduction to UCTE and overview on UCTE OH rules
- Regular switching operations (TSO-DSO, TSO-power plants, TSO-TSO)

- Grid restoration
- Remedial actions in alert and emergency conditions (TSO-DSO, TSO-power plants, TSO-TSO), restoration actions after black-out
- Disturbance management, statistics & supporting systems
- Crisis management
- Operational planning (capacity determination, planning and coordination of outages, DACF)
- German market rules

Continuous Dispatcher Training Program

There is a regular program for the further education of the dispatcher each week. This part of the Continuous Dispatcher Training Program consists of an evaluation of the past system operation. Special events are reviewed with the involved TSO and DSO. Furthermore, these sessions are used to instruct the dispatcher verifiable in new rules and guidelines.

Alongside there is a general training program for individual advancement of staff (e.g. stress management). Internal and external training sessions encompass workshops for the preservation and enhancement of expert knowledge (so called competence workshops) and external simulator sessions at the facilities of the DUtrain Training Centre in Duisburg are used additionally for the continuous training.
For education of interconnected operation, dispatchers take part at additional inter-TSO workshops. In addition, inter-TSO simulator sessions at the facilities of the DUtrain Training Centre in Duisburg are arranged for the dispatcher.

Selected important subjects covered by the Continuous Dispatchers Training Program are as follows:

- Analysis of critical situations, disturbances and strong wind situations
- Recapitulation of important aspects of grid operation and technical knowledge
- New conditions affecting grid operation
- New rules and procedures following changes in law or in technical framework
- Training of operational (inter-TSO) procedures in normal, emergency and blackout state
- Network structure and network operation of VE Transmission, subordinate DSO and adjacent TSOs

The verification of the switching operation authorization has to be repeated by all shift foremen and shift engineers / leader after four years.

Acknowledging the fact that the operational work of its dispatchers is more and more influenced by international cooperation VE Transmission offers its operational staff an English training. The topics of the weekly lessons depend on the individual level of the participants. If necessary the contract with the training company is renewed each year. In addition to the English training sessions a reference list of technical terms has been provided to the dispatchers basing on the appendix of OH Policy 8, former UCPTE reference list “UCPTE Terminology for the Operation of the Interconnected Transmission Systems” and individual experience of back office staff involved in the international business.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Vattenfall Europe Transmission GmbH*
Country: *Germany*

Chapter B – Inter-TSO training

VE Transmission has organized inter-TSO training with neighbouring TSO regularly, except with CEPS (training is planned in the autumn 2009). The kinds of training are specified in the system operational agreements. The training is adapted to the individual mutual level of risk for security system operation and the extent of mutual interdependency of grid operations.

EnBW TNG, E.ON Netz, RWE TSO, VE Transmission: Common DTS training sessions (so called „Systemführer-Kolloquium")
German TSO organize every 2 years a common training on emergency procedures and power system restoration for their dispatchers. The training sessions take 2 days and consist of a theoretical part and a simulator session. By repetition of the sessions, all dispatchers are trained, team by team. The trainings are held at the facilities of the DUtrain Training Centre in Duisburg.
The theoretical part encompasses current operational issues, approaches on disturbance management and power system restoration and the analysis of significant recent disturbances.
The simulator sessions encompass regional disturbance scenarios affecting several TSO like disintegration of the interconnected grid into islands or extensive black-outs. By working in a group, the dispatcher teams analyze and clarify the situation in the grid and develop strategies for trouble shooting or system restoration respectively. Another focus is laid on the implementation of remedial actions according to § 13 of German Energy Industrial Act.

EnBW TNG, E.ON Netz, RWE TSO, VE Transmission, VKW-Netz, TIWAG-Netz, swissgrid: Common training workshop on scheduling (so called „FPM-Kolloquium")
Aforementioned TSOs organize yearly one common training workshop on scheduling which lasts 2 days. The training sessions encompass the presentation of new developments in the field of scheduling. Furthermore, dispatchers have the opportunity to exchange their experience in the respective field and to get into contact and exchange their views with a representative of a trading company.

Additionally, there are workshops / meetings with the dispatcher of CEE - TSO. Special workshops are arranged to exchange information about specific items, problems and evolutions in any part of the system operation.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Vattenfall Europe Transmission GmbH*
Country: *Germany*

Chapter C – Training Organization and Dispatcher Accreditation

VE Transmission has nominated a training coordination manager for the coordination of the Dispatchers Training Program. Advancement and improvement of the Dispatchers Training Program are done based on the feedback of trained staff and according to recent operational evolutions influencing the occupation of a dispatcher.

Principally the trainers are chosen from the senior experts of the operational department, from other expert departments as required by the subject to be dealt with or from experienced dispatchers. Training of trainers is organized based on the overall general training program for individual advancement of staff according to the agreement between the head of VE-T-S and the staff. The prerequisite for becoming a shift engineer / leader in the transmission control centre of VE Transmission is the qualification of an engineer (so called Dipl.-Ing. or Dipl.-Ing. (FH)). Electrical engineers are favoured. Entrants as well as engineers experienced in electrical engineering are potentially qualified for the occupation of a dispatcher.

New dispatchers pass the Initial Dispatchers Training Program (for content and structure please refer to chapter A). The education of the new dispatcher is supervised by an experienced dispatcher who serves as a coach or rather mentor and accompanies the new dispatcher through the initial training program. The coach is in charge of organizing the various education steps with the respective senior experts of the various departments contributing to the training program. Parts of the training program are undertaken by the coach himself.

For instruction and documentation of the education progress a training manual has been developed. It includes the listing of all the topics the new dispatcher has to deal with during his training program. Additionally the manual includes links to documents providing detailed information. Finally, the coach participates in the continuous verification of the level of knowledge of the new dispatcher and of his capability to perform his tasks on his own responsibility.
The Initial Dispatcher Training Program is based on the existing general basic and expert knowledge of the entrant. After an introductory orientation phase the new dispatcher gets a first picture on his future occupation while accompanying the shift teams. The education itself starts with theoretical and practical training in transformer stations and power plants. This period takes about three month. Afterwards periods of theoretical and practical education in tasks of the system operation in the transmission control centre and in several other departments alternate. During the third period, the participant takes part at a training-on-the-job in the transmission control centre of VE Transmission.

During the initial training period, the new dispatcher has to reflect two times the precedent education section and has to present his level of knowledge. Thereto he has to attend an interview with the head of System Control, selected trainers and his mentor. At the end of the training period, the new dispatcher has to reflect his initial training in a final assessment together with selected trainers, his mentor and the head of System Control. If the new dispatcher is able to proof his

competence and assesses himself ready for the acceptance of responsibility, he will acquire the authorization for switching operations. Starting from this point of time the new dispatcher is entitled to work on his own responsibility as shift engineer in the transmission control centre. By granting the authorization for switching operations, the new dispatcher is enabled to act on his own responsibility as a shift engineer. Relevant internal departments and neighbouring TSOs are informed of the accreditation of the new dispatcher. The validity of the accreditation is limited to four years.

In the frame of the Continuous Dispatcher Training Program VE Transmission offers internal training sessions (so-called competence workshops), external simulator sessions, and inter-TSO training (for the latter please refer to chapter B) to all accredited dispatchers.

The training sessions are held by the experts responsible for the respective subjects. In the training sessions new procedures are presented, existing ones or dedicated technical aspects are repeated and are compared to the operational reality (for details please refer to chapter A). Additionally the dispatchers have the opportunity to exchange their experience on the respective subject.
Apart from that information and instruction of dispatchers is provided in the frame of the weekly meetings of the shift team and of the operational department.

In collaboration with the DUtrain Training Centre in Duisburg a simulation environment for the grid of VE Transmission has been developed. The Centre enables the dispatchers to train emergency processes and power system restoration together with their colleagues from the DSO and the IPP under realistic dynamic grid conditions. Due to the realistic grid model and the isolation of the work stations, stress situations are simulated and communication by phone can be trained. Training sessions are offered every two years.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Vattenfall Europe Transmission GmbH*
Country: *Germany*

Chapter D – Basic requirements for Dispatcher Training Simulator (DTS)

For providing simulator sessions VE transmission uses the service provided by the DUtrain Training Centre in Duisburg. Alongside the external training centre of DUtrain the grid control system of VE Transmission provides an internal DTS, too.

External DTS of DUtrain Training Centre, Duisburg
For practical exercises, DUtrain uses an especial designed training system for hands-on operator training under normal, emergency and restoring operating conditions. Models covering load, network, power plant, external infeed and related equipment, performance and phenomena simulate a realistic performance of the complete power system. The flexible set up of the training system allows DUtrain to provide training for individuals as well as cross-training simultaneously for teams of dispatchers from different companies representing several control centres in parallel and all using a replica of their networks.
The supervisor desks are set up according to the specifications of the operational tasks and training needs whereas the supervisor can use all simulation facilities and has full control over all performed actions. Powerful tools for base-case and scenario definition and -setting in real-time on the one hand limit the time for training preparation and on the other hand allow realistic and "lively" training sessions modelling the extreme conditions of network and power plants with sufficient precision and displaying their performance with operative realism on the different surfaces.

External Training at Qualification Centre of Vattenfall Europe in Lübbenau
Verification of the switching operation authorization by all shift foremen and shift engineers / leader after four years (3 daily training course).

Internal DTS of VE Transmission
The internal DTS of VE Transmission is a DTS providing the standard functionality of the grid control system of VE Transmission in a separated simulation environment (excluding LFC functionality). Due to reasons of efficiency and limited manpower the internal DTS is basically not used for advanced simulator sessions.
Today the internal DTS is used for internal training of SCADA functionalities and regular switching procedures in the frame of the Initial Dispatchers Training Program, for maintenance activities in the grid and testing of EMS sub-applications.

ENERGINET.DK

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Energinet.dk*
Country: Denmark

Chapter A: Training Programmes
Initial programme
Energinet.dk's initial programme is based on a theoretical part and an on-the-job part. The total duration of the training is five months; three of which will be on-the-job training. The initial training includes power system handling, balance handling and market knowledge.

In connection with its implementation of a new SCADA system, Energinet.dk has bought a Dispatchers Training Simulator (DTS). This will be implemented at the end of 2009 and will be operational in mid-2010. The DTS will be implemented in the initial programme to give new dispatchers the chance to gain experience in handling both normal and insecure situations. It also will improve the dispatchers' stress-management skills.

The initial programme is documented in various plans for the training in topics such as power system handling, balance handling and market knowledge. The plans are built up as checklists, and a responsible person has been assigned to each of the issues for which training is provided. This person is obliged to confirm that the new dispatchers have completed the training course and to make relevant comments. This documentation also serves as basis for evaluating training course and new dispatcher performance.

Good English skills are required when recruiting dispatchers.

Energinet.dk's theoretical programme provides training in:

- Power system components:
  - Substations incl. components and structure
  - Lines and cables
  - Transformers, incl. tap changers and phase-shifting transformers
  - Reactors, capacitors and SVCs
  - HVDC converters, stations and connections
  - Power plant
  - Generators and turbines (wind, CHP, etc.)
  - Neighbouring TSO grids.

- Power system operation:
  - Grid behaviour and operation under normal conditions
  - Grid behaviour and operation under abnormal conditions such as overload, short circuiting, voltage collapse, galloping lines, ice load, restoration after black-outs, etc.
  - Voltage and reactive power control
  - Balancing
  - Market rules
  - UCTE and Nordel rules and regulations.

- Operational tools:
    - SCADA system
    - Basic grid calculations methods (N-1, Power flows, State estimation, etc.)
    - Scheduling and balancing systems.

The on-the-job part of the training at Energinet.dk includes all the topics of the theoretical part in real- time operation. The new dispatcher will be guided by experienced, talented dispatchers in the various positions (system, balance and market operation). The new dispatcher will learn all necessary operational skills within real-time in a professional and active way, using all necessary operational tools for operating the power system in a safe and reliable manner.

Continuous programme
The procedure used in Energinet.dk's continous training programme is informal and carried out when needed. The continuous programme will ensure that dispatchers are always updated and aware of any changes implemented in the power system and the operational tools. The continuous training programme focuses on:

- Follow-up and repetition of the topics from the initial programme
- Training and instruction when new operational topics, new rules or regulations and new tools are introduced into the system
- Follow-up and analysis of disturbances
- Courses in stress-management methods
- Voluntary courses in English and German
- Simulator sessions: In connection with its implementation of a new SCADA system, Energinet.dk has bought a DTS. This will be implemented at the end of 2009 and will be operational in mid-2010. The DTS will be used for continuous training in the handling of insecure and emergency situations and for exercises in new features and operational topics. It also will be used for exercises in stress management.

Chapter B: Inter-TSO training
Transpower, VET and Energinet.dk have launched common training sessions in the form of workshops, and the first one will be carried out in autumn 2009. This workshop addresses:

- Tasks and responsibilities
- Market rules and reserve market
- Restoration plans and strategies
- HVDC and wind
- Critical grid situations, bottlenecks, n-1 security.

Furthermore, Transpower and Energinet.dk arrange two-day cross visits. Those visits will take place in the control centres and give the dispatchers the opportunity to gain knowledge of the neighbouring operational environment and meet on a personal level.

Energinet.dk has conducted common training sessions with the neighbouring TSOs in the Nordic System for many years. These sessions comprise:

- Knowledge of the power system
- DTS training
- Cross visits
- Workshops

Chapter C: Training Organisation and Dispatcher Accreditation
A training organisation has been set up, and a training coordination manager has been appointed. Ensuring full implementation of the training organisation and preparing a final description of all training processes are ongoing processes that are expected to be finalised in mid-2010. The training coordination manager is responsible for designing, following up on and updating the complete training process, which includes:

- Training procedures
- Dispatcher competencies
- Rules for dispatcher accreditation
- Policy for selecting and training trainers.

The checklists in the initial programme as well as the confirmation of training completed and comments from the responsible person serve as basis for evaluating training course and new dispatcher performance. This documentation is supplemented with:

- 'Reports' from on-the-job trainers
- Oral test performed by group leader.

When the initial programme has been completed by the new dispatcher and evaluated, the group leader will sign a document giving the new dispatcher accreditation as a 'switching engineer', and he will subsequently be allowed to work as system operator.

Chapter D: Basic requirements for Dispatcher Training Simulator
In connection with its implementation of a new SCADA system, Energinet.dk has bought a DTS. The DTS will be implemented at the end of 2009 and will be operational in mid-2010. Training involving the DTS will be incorporated into both the initial and continuous training programmes. The DTS will be used for training new and experienced dispatchers in handling insecure and emergency situations and for exercises in new features and operational topics.

The DTS is composed of three functional parts:

- A copy of the SCADA/EMS, used in the control centre. This gives the possibility of training normal and insecure conditions in a realistic environment and using all SCADA/ EMS functions available in the real time system, such as HVDC, AGC, Available Transmission Capacity and Contingency Analyses.

- A simulator which reproduces the behaviour of the power system. This includes a grid power flow solution, simulation of turbine-generator dynamic models such as steam and wind turbines and a relay simulation module, simulating relays such as voltage relays, frequency relays and etc.

- A set of instructor facilities for control of the simulation session and preparation of event scenarios. Events can be deterministic, conditional and probabilistic. The instructor can direct actions on the power system, such as tripping a line, changing a breaker state, chancing load, chancing the local/AGC status of a unit etc.

RED ELÉCTRICA DE ESPAÑA S.A

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *RED ELECTRICA DE ESPAÑA*
Country: ESPAÑA

1. Operation School's Targets

The objectives of the REE Operation School are:

2. **System operation staff continuous training:**
   - System operation tools training: Energy Management System and other operation support systems.
   - Electrical system operation basics.
   - Electrical system monitoring and control.
   - Practical approach to operation policies under extreme conditions and restoration exercises.
   - Electrical system components knowledge.
3. **Performance analysis**, for that purpose, a periodical evaluation of dispatchers is performed.
4. **Knowledge management.**
5. **R+D**
   - Development and test of new operation policies.
   - Development and test of new operation support system.

Within the several proved benefits of the Operation School, the next could be underlined:

- Reduction of the risks derived from real time system operation.
- System Operation effectiveness increase.
- Core business knowledge management. Operation School allows the implementation of professional paths for our core business specialists.
- Standardization of key knowledge, allowing:
  - ✓ Real operational experiences interchange.
  - ✓ Effective solution comprehension.
  - ✓ Best practices documentation.

6. Training program development methodology

Training program for dispatchers has been developed once analysed:

- Different dispatchers functions: shift coordination, system operation dispatcher and network control dispatcher.
- Activities performed by every function.
- Specific training requirements of every activity.
- Difficulty, periodicity and impact level of every activity.

Two different training programs have been designed:

- Initial training for new dispatchers.
- Continuous training for experienced dispatchers.

Several training methodologies are being used:

- In-room courses.
- Laboratories.
- Installation approach (travels).
- Workshops.

- Training simulator sessions.
- On duty guided training.
- E-learning.

The proposed training-ship takes part of a University post-graduate program.

7. Training assessment methodology

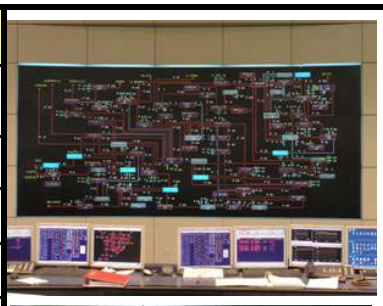
Finally, trainees' **assessment** is being done, checking:

- Knowledge transfer (written test).
- Attitude assessment (2 different test methodologies could be used):
  - Individual continuous assessment. Instructor continuously checks trainee competences by individual monitoring of:
    - Malfunctions: symptoms, causes and corrective actions.
    - Alarm monitoring.
    - Network supervisory control.
    - Operation policies appliance.
    - Available documentation use.
    - Electrical system knowledge.
  - Final team assessment, by checklist monitoring:
    - Normal operation tasks performed.
    - Operation tasks under malfunctions.

8. Simulator based training

Simulator based training courses are:

Training objectives	Initial Training	Continuous training
EMS functions knowledge.	YES	When system changes
Electrical system knowledge	YES	NO
Voltage Control	YES (BASIC)	YES (ADVANCED)
Load-frequency control.	YES (BASIC)	YES (ADVANCED)
Usual control tasks.	YES	NO
Unusual or complex control tasks.	YES	YES
Usual problems solving	YES	NO
Unusual or new problems solving.	NO	YES
Restoration exercises.	YES (BASIC)	YES (ADVANCED)



The REE DTS (Dispatcher Training Simulator) characteristics are:

- Electrical system real time simulation (EPRI model).
  - Mechanical power balance simulation (1 cycle every second).
  - Electrical balance simulation for slow transient modelling (1 cycle every 5 seconds).
- Control centre model: SIEMENS Spectrum EMS.

- RTU and data acquisition simulator.
- Real time alarm processor.
- Network colouring.
- SUPY Control system.
- Active & Reactive Power monitoring system.
- Network Application programs (state estimation, real time load flow, security analysis, OPF and voltage scheduler).

The DTS includes a wide and accurate network model, which allows to simulate complex events, and includes AGC simulation (including UCTE and Magreb reduced models):

- Complete model for REE & REN systems (from 400 to 132 kV).
- Reduced RTE & ONE systems model.
- Full power plant modelling (over 10 MW).
- Load curve modelling.
- Conforming and non conforming loads.
- Cold load model.
- Basic protective relays modelling:
  - Overload, inverse time relays for transmission lines and transformers.
  - Voltage relays for busbars.
  - Frequency relays for power plants and loads (feeders).
  - Automatic load and generation shedding schemes.

9. 2007-2008 Data and relevant facts

- 6th initial training cycle completed.
- Continuous training program review.
- Regional black start exercise performed with concerned Spanish utilities y Portugal.
- IESOE workshop on dispatcher training.
- Post-graduates open course (jointly with ICAI)
- Tailored courses for third parties.

Dispatchers training	hr /FTE
CECOEL & CECORE (Ntnl)	**54**
Canary system dispatchers	**166**
Balear system dispatchers	**32**
Average	**68**

Dispatchers Training Report (2008)

Training activities	attendance	courses	trainign hrs	trained employees
Continuous training	561	116	9.094	176
Initial training	684	46	7.319	16
Total	**1.245**	**162**	**16.413**	**192**

Operation School Report (2008)

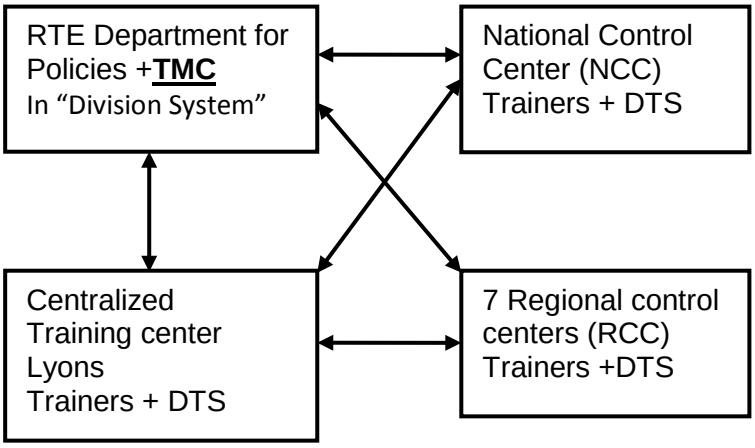
RÉSEAU DE TRANSPORT D´ELECTRICITÉ

UCTE Compliance Monitoring Process 2009
Overview of RTE's training system

JYD – 17/04/2009

TSO: *RTE*
Country: France

Chapter A: Training Programs



- **Slide 1**

- **A – 1. Monitoring training of dispatchers and trainers (slide 1&2). RTE Training prescription and reference documents for training**

A specific Department of RTE is in charge of all the policies for the security of system operation. The Department for operational policies issues regularly an up-dated reference library of prescription with competence referential.
One training manager (chief of the department policy of RTE Division System) supervises all training activities through a **Training Management Committee – TMC, with sub-committees**. It monitors all the activities related to training, to the permanent RTE trainers activities of the centralized training center for dispatchers of Lyons (10 permanent trainers with a chief), of the the National Control Center (NCC) of St Denis and of the 7 Regional Control Centers (RCC), both with permanent full time trainers.

- Program for real time operation by job position in control room (5 desks positions in NCC, 3 or 4 in RCC)
- Programs for operational planning

TMC role: identify new needs, road maps for training, checks of centralized vs. decentralized activities coherence, adherence of training to needs and up-dates of policies and cursus, monitoring the network of trainers, professionalisms of trainers, follow-up of synthesis of training sessions and dispatchers accreditations, identification of deviations compared to decided action plans and monitoring the evolutions of IT tools. NCC and 7 RCC area equipped with DTS.
Internal agreements are signed between Division System Operation (TMC at Head quarter) with centralized training center and also between NCC & RCC with centralized training center
Training sessions linking referential documents (**Master plan**) are applied by the centralized dispatchers training center of Lyons, by the National Control Center (NCC) and by the 7 Regional

Control Centers (RCC), with details of initial and continuous training programs for dispatchers and of trainers selection (initial but no continuous training for trainers). The activities of the NCC and RCC are complementary of those managed by Lyons center. All of the referential related to training is accessible for each employee on the intranet of RTE

Inside the NCC and the 7 NCC additional local subsidiary training procedures are developed and carried out, based on national RTE rules and on UCTE policies.
A Charter of the Training Management Committee does exist: concerns all jobs related to System operation and dispatchers with one designated permanent pilot assisted by a devoted engineer (both inside Department Policy).
Since the 1st May 2003, the training of dispatchers (and other operators acting around the control rooms) at RTE in the Division « System Operation » is ruled by a national reference document with the training **Master plan** in its Chapter 6.1 dealing with references policies for the skills/ training for jobs related to system operation.

The training master plan is organised around mandatory training sessions related to on the one hand the NCC (for each of its 5 on-shift positions) and on the other hand to the RCCs:
- centralised and decentralised teaching modules (lectures in a class room),
- on-the-job training periods for initial training,
- training sessions on a simulator (DTS) in the centralized training center of Lyons) and on site (in NCC or in the 7 RCC) for initial, complementary and further continuous training sessions.

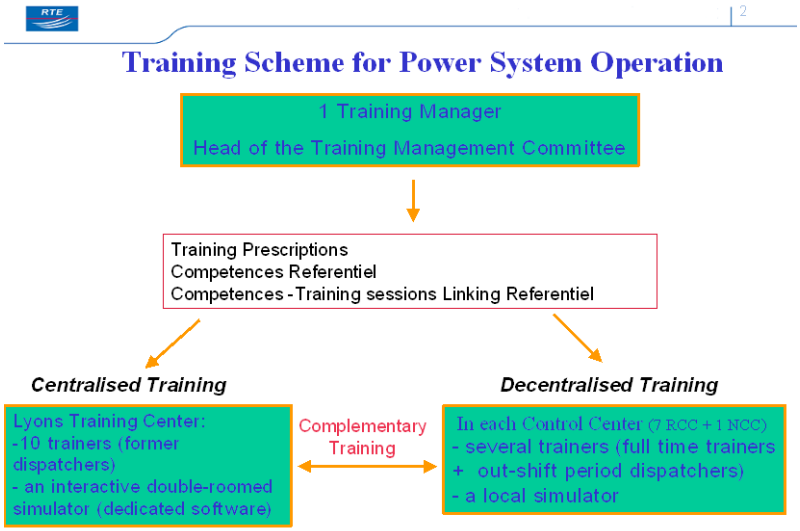
Main elementary sessions/modules

- A01 : Initial training of dispatcher
- A02 : continuous training with focus on emergency situations (mainly in DTS)
- A03 : further continuous training of dispatchers in team (mainly in DTS)
- A05 : Initial training of chief of of NCC control room
- AS01 to AS03 : simulations models and advanced functions for N-1 simulations.
- A60D : dynamic functionning of the power system
- ERSO : Electrotechnics learnings de réseau
- EXSE : Operation of power system learnings
- GP01 : Methodology to launch and achieve N-1 simulations and for scheduling maintenance of the grid
- TECO : technico-économical management of the power system
- URCX : Simulation Models in voltage and in reactive
- ASR/GSR : N-1 simulations modules included in AS01 (initial), AS02 (continuous) et AS04 (expert)
- Pedagogical sessions: professionalism of permanent trainer and on-the-job trainers

The main principles for training of operators/dispatchers are described as a whole in the "RTE memento of power system reliability" in its chapter 4.2:
http://www.rte-france.com/htm/an/mediatheque/telecharge/memento_surete_2004/memento_surete_2004_complet__.pdf
There is no obligation by the french law to train dispatchers.

A – 2. Training program for dispatcher

A training plan (list of issues to be taught with the corresponding behaviours[1]) is established for each new dispatcher taking into account the dispatcher assignment (dispatchers future tasks) and the experience of the new appointed dispatcher, based on the master plan.
Training programs consist on modules (e.g."A0n", n=1to 8) adapted to NCC or RCC dispatchers. Some modules are common, mainly in the initial training



Slide 2

- **A – 3. Initial programs**

A – 3.1. "Typical course for the initial training of dispatchers" includes

- **Phase n° 1**
  Acquisition of prerequisites (2 weeks). Getting acquainted with one's environment
- **Phase n° 2**
  Centralised 4-weeks training and assessment of acquired knowledge, with DTS simulation.
  Learning about and knowing how to apply the basic principles of System control
- **Phase n° 3**
  Local training in NCC and RCC and stand-in apprenticeship lasting about 12 weeks
  Learning about and knowing how to control the network under one's future responsibility
- **Phase n° 4 (First stage of accreditation)**
  Assessment of acquired knowledge / authorisation
  Proving one's capacity on a set of simulations
- **Phase n° 5**
  Carrying out of the control activity
  Exercising control responsibility
- **Phase n° 6 (Second stage of accreditation as "experienced dispatcher"** after 6 to 14 months **)**
  2-week centralised training. Further training –Assessment of acquired knowledge

[1] Dispatcher's behaviour teaching and checks: preparation of operations, survey-checks- full identification, action/communication, ex-post analysis, complementary/transversal issues.

- **A – 3.2. Duration of the initial training cycle: a minima 18 weeks (till approximately 6 months)**

The duration of the initial training depends on the experience of each trainee. It can last 4 or 6 months.

- **Theoritical parts** (2 weeks)

Basics on the electrotechnics and behaviour of the power system are taught, with a first approach of N-1 rules and of different causes of collapse, with critical experiences on the RTE system or on the UCTE system.

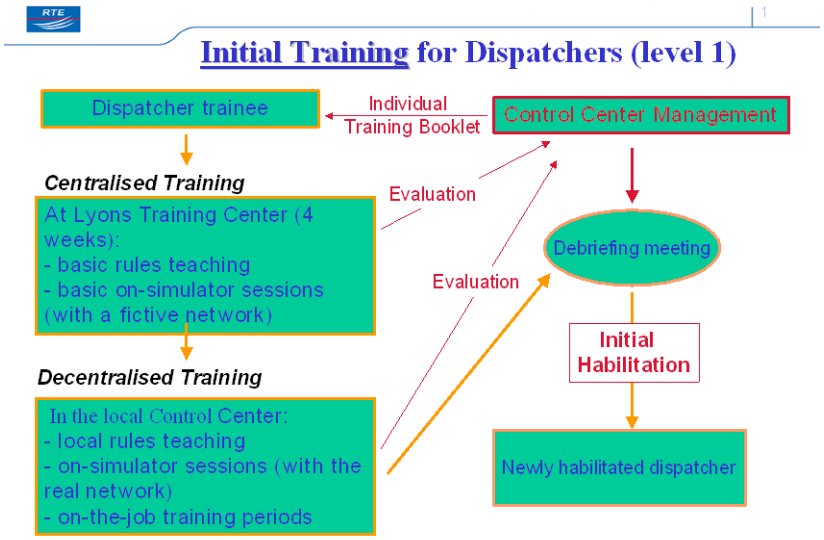
On-the-job training (at least 12 weeks in NCC and RCC)

The on-the-job training is used to teach the trainee how to operate using real-time components and to check to what extent the capacity acquired in training is expressed in professional behaviour in work situations. It helps assess in real time a number of skills that the dispatcher had never been dealt with before, or others items, which had been solely validated on a simulator.

DTS – Training simulator sessions (4 weeks)

For the 4-week period mandatory in the first cycle for accreditation (phase 2 of the initial program), regular and multi-weekly sessions are organized in the DTS of the centralized training center of Lyons. The most significant incident are simulated

Additional 1 day sessions take place yearly in the NCC and RCC.



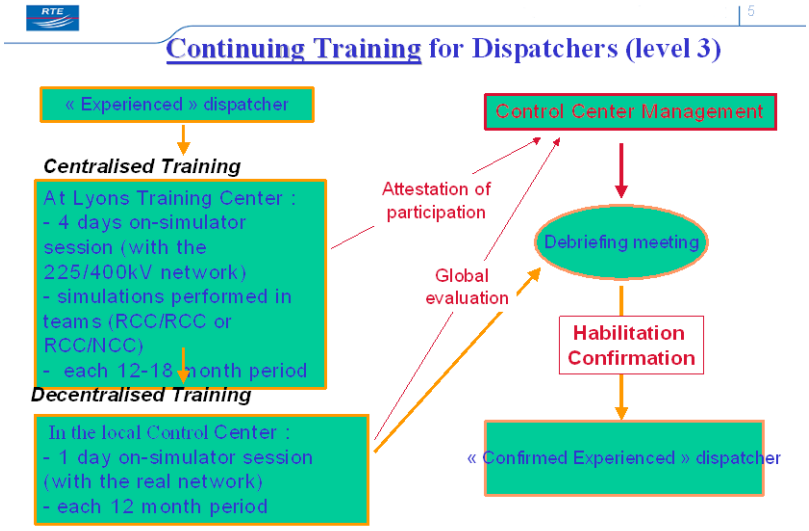
Slide 3

- **A – 4. Teaching modules**

Centralised training (in the RTE centralized training center of Lyons equipped with DTS) is focused on the basics of the activity, as well as on the strategic aspects of System control. It contributes to developing a common national/regional culture absolutely essential for System control. Confirmed experienced trainers who have a broad view of the System and the principles of its organisation and operation are the teachers. They make use of a dedicated network DTS simulator for training.

Decentralised training (in each NCC or RCC, all of them equipped with DTS simulators) is focused on validating the know-how acquired and on controlling phenomena on the regional network under the responsibility of the dispatcher. It is dispensed by trainers appointed within the Power System Units and relies on pedagogy based on situations actually experienced at the regional level. It includes the operational agreements with neighbours. It makes substantial use of a site simulator, making it possible to simulate the behaviour of the regional network by calling upon real-time situations drawn from the control system.
Moreover dispatchers are trained to IT tools for N-1 security calculations

Slide 4



Slide 5

A – 5. Complementary/further continuous programs of training:
Complementary training: 2 weeks in Lyons after 6/14 months (slide 4 – "experienced accreditation")
Further continuing training: DTS session of 4 days in Lyons after around each 12/18 months (Slide 5 – "confirmed experienced accreditation")

As soon as a dispatcher is accredited, he enters into a continuous program with theoretical and on simulator parts which are obligatory in the perspective of renewing accreditation (experienced and, later, confirmed experienced).
For the first stage of continuous program (slide 3), advanced teaching on theoretical parts concerning frequency and voltage control, defence plans, separated grid operation, and grid restoration, and RTE procedures/rules with UCTE relevant rules for critical states are provided to trainees associated with DTS sessions (collapse, blackout + restoration).

The complementary and further continuous programs are based on DTS sessions in Lyons. During these DTS sessions, the dispatcher copes with collapse, and with network restoration after total blackout.
These sessions in DTS are performed in teams (RCC/RCC or RCC/NCC) and also between RTE/Terna teams.

A – 6. UCTE policies included into training programs
The teaching program includes an overview of UCTE reference rules, but the focus of training is more oriented to the RTE procedures that are based on these reference rules.
The UCTE Policies are not a full part of the class-room sessions for the dispatchers.

A – 7. Information to dispatchers when new procedures
Each new or up-dated procedure is individually presented by oral or by mail for all the dispatchers, mainly in case of complex procedures. Each three months meeting of the department Operation of the NCC puts in its agenda such items to draw attention.

A – 8. Training to English
At present, lots of dispatchers are graduated engineers (equivalent of 5 years in University), even in the regional control centers, where we find also dispatchers very used to speak the language of their neighbouring TSOs.
For the NCC, for each on-shift period, and inside the control room, we have simultaneously more than two people they speak correctly English. For the RCC the skills in English is not followed like in the NCC
A teacher in English provides lectures (coming regularly in the premises of the NCC) destinated to operators/dispatchers and other workers to improve their language skills. Sessions of conversation on phone are also organised.
Following the individual training plan that exists for each employee, the dispatcher after discussions with his chief can follow a complementary training in English.
The UCTE english glossary with translation in French is put at disposition of and known by dispatchers. It is included in the documentation of the control room and is complemented by lots of other technical terms and related market words

Chapter B: Inter-TSO training

UCTE OH Policy 8 rules for inter-TSO training in A-S1 an obligation to apply at least one of the four following guidelines:
G3.1 : "cross-visits between neighbouring TSOs dispatchers"
G3.2 : "cross training workshops"
G3.3 : "on-shift cross-periods"
G3.4 : « common DTS training sessions »

B – 1. Inter-TSO coordination with participation of dispatchers

Presently regular meetings for coordination take currently place with neighbouring TSOs either by the team of NCC or by the teams of RCC, where normal and critical operational situations are analysed together. That complies with the Requirement R1. Some experienced and confirmed experienced dispatchers take part systematically to the coordination meetings with neighbours bringing their feed-back of experienced operation situations.

B – 2. Cross-meetings of dispatchers/dealing with neighboring agreements.

In addition to the above-mentioned normal regular operational cross-border meetings, specific meetings exclusively between RTE dispatchers and neighboring dispatchers (mix of dispatchers from NCC and RCC) take place and deal mainly about operational experience and about common procedures/agreements with neighbours. These are a source of procedures evolving. Minutes or main conclusions are available. Each dispatcher has visited at least one neighbour.

B – 3.Inter-TSO summary of actions (for National Control Center - CC and Regional Control Center - RCC)

The summary of actions related to guidelines of B-G3 is resumed here-below.
RTE has organized since 2007 more and more regular inter-TSOs training actions with neighbours. The distribution of inter-TSO trainings is not the same with each neighboring TSO. At least one action listed in B-G3 has been achieved with each neighbour. National CC and Regional CCs are involved in this inter-TSO training.

Units	Elia	EnBW	RWE-	Swissgrid	Terna	REE
NCC - CNES	G3.1, G3.3,	G3.2,	G3.2,	G3.4 being to be Scheduled 1st semester 2009	G3.1, G3.3, G3.4,	G3.1 & 3.4 being to be scheduled 2nd Semester 2009
RCC -SENE (borders with BE+UK)						
RCC - SEE (borders with BE, DE, CH)		G3.2,	G3.2,			
RCC - SERAA (borders with IT)						

RCC - SESE (one line with IT)						
RCC - SESO (border with SP)						
RCC - SEO (West) and SENP (Paris) Not concerned						

With Elia, we hold G3.1 and G3.3 actions
With EnBW and RWE together, we hold G3.2
With terna, for many years we have developed common action G3.1, G3.3 and also G3.4 with common DTS sessions In Lyons center.
With Swissgrid (G3.4), it is being to be scheduled in the 1st semester 2009 they attend to a DTS training sessions in order they learn how that runs with a view to discuss about an extension of the common DTS training RTE-TERNA to Swissgrid or another solution.

With REE (G3.1 & G3.4) following a common workshop having dealt among others with how to extend cooperation on training of dispatchers, it is being to be proposed in the 2nd semester 2009 a common session involving dispatchers with a potential road map for common DTS training (involvement of NCC and regional neighbouring RCC).

B – 4. Inter-TSO DTS training. It is to mention intensive common DTS training at present with Terna and Elia in Lyons.

B – 5. Inter-TSO training as a part of the training program.
The practice proves that most of all the NCC dispatchers have today visited at least one or two of their neighbours, in their period of either initial or continuous training.
But in the RTE reference documents for training and in the master plans, there is no rule at present committing to include the inter-TSO training as a mandatory step of the initial or continuous training.
Common training agreements with Terna and Elia

Chapter C: Training Organization and Dispatchers Accreditation

C - 1. General organisation (refer to A – 1.)

C – 2. RTE Master Plan

The chapter references policies for the skills/training for jobs that is regularly up-dated contents items as follows:

1 « **coordination** » : The chief of the department «DPSAR" supervises all training issues, this department in charge of policies, is the monitor the needs for the jobs « Power System operation »

2 « **organisation** » : Plateforms for training are available in each dispatching and in a centralized common training center located in Lyons. DPSAR makes available a data base that encompasses reference documents for training (Objectives and road map, pedagogical documentation, detailed reference documents for each job, etc.).

3 « **evaluation** » : After the training sessions so-called "A0n" (Cf. A-2), the centralized training center of Lyon assesses the evaluation of knowledges for individuals or for teams (case of teams in the simulator).

4 : « **first accreditation** » : the first capability certificate is issued based on the evaluation of the acquired knowledges and and after a debriefing with the manager, all of that being written in formal documents (mandatory tagging for ach individual trainee).

5 « **trainers selection** » : the trainers are always chosen among the confirmed experienced dispatchers.

6 « **training of trainers** » : All the trainers follow a program of professionalism including issues for:

- acquiring pedagogical skills,
- accompanying and/or guiding training sessions,
- evaluating the trainee (progress of the trainee after a training session)
- preparing and leading a debriefing,
- elaborating the pedagogical documentation,

and specific skills to monitor the local DTS (of NCC or of RCC).

Dedicated training sessions so-called "ASn" (n=1to5) are planed in coordination between the TMC and control centers. External outsourcing can be used for human behaviour of trainers.

C – 3. Training Programs in Lyons, in NCC and in 7 RCC

Training programs are managed in Lyons centralized training center , in NCC and in RCC
Local logbooks tag all the activities of training: by dispatcher they show vindividual program, followed sessions with synthesis of behaviour during training sessions, date of accreditation (comments on each trainee), etc.
At the upper RTE coordination level (RTE Training Committee), it is ensured supervision, needs for improvements of programs and of IT tools.

- **C – 4. Accreditation levels of dispatchers**

The RTE skills reference guide distinguishes three levels of professionalism accreditation:

• **Level 1 (slide 3)**: "Newly dispatcher accreditation" after the set of initial training sessions at Lyons and in each Dispatching (that lasts around 18 weeks), with 4 weeks in the RTE centralized training center of Lyons), before any position as dispatcher on shift;

• **Level 2 (slide 4)**: "Experienced dispatcher accreditation" at the end of around one year (from 6 to 14 months depending on the skills predispositions of the dispatchers) based on a 2-weeks sessions in Lyons including DTS intensive training;
• **Beyond level 2 (slide 5)**: accreditation of "confirmed experienced dispatcher" renewed each year (NCC) or 18 months (RCC) proving expertise increases with a very good mastering of critical situations, including restoration of the power sytem, this after a 4 days session in DTS Lyons.
The decisions of accreditation is finalized always by a large debriefing with the trainers and the manager. The accreditation is the result of the behaviour in the training sessions and of this summary discussions between trainers, trainee and the chief of dispatcher. The decision of accreditation is taken in common, also the refusal.
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C – 5. Debriefing and training booklet for each dispatcher.
Templated documents of appreciation are fulfilled for each dispatcher, with their behaviour during DTS sessions, their easiness of difficulties met during training sessions. Each year trainees are refused after their initial sessions, and they are due to increase their knowledge before having a new examen.

Skills are measured based on Exercises : the appreciation of the skills of dispatcher trainees is based on
- Reactions to face Real time situations
- Training under specific situations
- Behaviour estimation in critical contexts
The test of the knowledge of dispatcher candidates is a combination of the behaviour in the control room and this when training sessions in Lyons.

- **Training booklet by dispatchers**
For each dispatcher there is a training booklet with information as the position, the training sessions and general comments by trainers and his direct management, and the level of accreditation with its renewals.

C – 6. Checks and up-dates of training programs
The training programs, monitored by the devoted department of Policy for system operation of RTE (DPSAR) are regularly followed-up and checked in the different RTE internal bodies/groups either in dispatchings, or in the RTE centralized training center of Lyons, the coordination between all of these bodies being permanent.
The training is organised as a successions of lectures or sessions of simulations, with a progressive level of requested skills.
Based on the most recent incidents, the training evolves, mainly for the part related to critical issues, with implementations of the incident simulated in the DTS. The theoretical part takes also into consideration the lessons learned from these incidents for operation, and additional modules are added by the bodies in charge of the training programs and their evaluation.

C – 7. Logbook of action plan for a discrepancy between operational practices and training program.
A logbook of synthesis of each training sessions and conclusions and related action plan is available. The follow-up is coordinated with the Department policy.

In the frame of the ISO certification, the review each of the training component is achieved at least every three years a minima, with the relevant up-date of the (whole if needed) documentation. External bodies in charge to certify that RTE respects fully its procedures for training of dispatchers check all the chain at least once for three years that contributes to renew the "ISO certification 9001-2000"

C – 8. Profiles of permanent trainers

In the centralized training center of RTE in Lyons and in the NCC and in the 7 RCC, the trainers are a mix of confirmed experienced dispatchers from NCC and RCC:
- In Lyons a permanent team of 10 trainers play the role of teachers
- In the National Control center, one full time permanent trainer highly experienced with 25 years of shift is fully devoted to training assisted by others on shift dispatchers (in their out of shift periods)
- In the 7 RCC, at least one permanent confirmed experienced dispatcher is fully devoted to training assisted by others on shift dispatchers (in their out of shift periods).

There is no step of renewal of accreditation of the trainers. There are appointed once for all.
The fact that all the trainers come from control rooms is an a priori insurance against non competence.
But due to the fact that more and more dispatchers at RTE are not anymore very old experienced dispatchers, the TMC has started a reflection to appoint as trainers the most skilled dispatchers they could stay out of shift for long periods.
The trainers follow regular sessions to keep competence, that are organized by the Lyons centralized training center. Based on the individual yearly appreciation of the employees, the chief of the trainer can decide together that the trainer will follow a continuous training (one shoot by one shoot when needed and for the issue needed).

- **C – 9. Training session for the "on-the-job training**

A specific training module is followed by experienced dispatchers to train new comers.

C – 10. Outsourcing for training

Except for English language and for training of trainers, no external body is appointed/contracted to carry out any training of dispatchers.

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- **C – 11. Miscellaneaous**
  - **Each Year training**

    30 000 hours of training for dispatchers and other operators around control rooms (15000 hours for dispatchers in the centralized training center of Lyons)
  - **Requested profile of dispatchers**

    For RCC dispatcher: high school graduation
    For NCC dispatcher: young engineer with sufficient experience in the RCC
    Young dispatchers are recommended to leave the shift after a 3-5 years period.

Chapter D: Basic requirements for Dispatcher Training Simulator

D – 1. Simulation tools and up-dates

The efficiency of control operators, in the face of situations featuring a disturbed network or a widespread incident, is mostly based on the experience acquired in similar circumstances. Fortunately, these major disturbances seldom occur and it means supplementing the small number of real experiences with simulator training sessions. Two types of simulation tools are currently used for supplementary purposes:

• the **national simulator** for dispatcher training, installed at the national training centre, which serves to reproduce normal and disturbed operating situations on the national network and on a "regional school grid" representing the principal specificities of all the regions;

• **on-site simulators**, present in each of the Regional Control Centres and at the National Control Centre, which serve to deal with real incident situations reproduced, at the regional or national level, on the basis of real-time data stored in the control tool.

Simulations are continuously **up-dated** (monitoring by Training Management Committee - TMC) that take into account new evolutions of operational rules (UCTE+RTE declinations) and technics in operational fields as well as new versions of softwares/models available.

- D – 2. DISPATCHING TRAINING SIMULATOR –DTS so-called « SIDERAL »

IT Tools so-called « SIDERAL » for training of dispatchers

- A tool to training of dispatchers for operation of the power system, with real situations
- DTS with « Slow Dynamcs » of events of the power system.

Dispatchers put in real conditions thanks to :

- Reproduction of real environment of operation.
- Fictive grid, but based on real configuration and events simulated that he will face. Storage of reference incidents

Used in :

- Each regional control center,
- Centralized training center of RTE,
- National control center.
- Also for islands of EDF

- D – 3. General DTS characteristics of the centralized training center (Lyons)

- Centralized (1 DTS for 1 TSO) or local (1 DTS for 1 control center)
- With a “real network” or with a “school network” (the network is fictive but represents all the specificities encountered in the real network)
- DTS interface man-machine has to be very similar to RCC or NCC interface man-machine (in displays vizualisation, in alarms management, in remote control)
- Response time very short (if possible < 5 seconds)
- If possible, energy management software (EMS) are directly connected to DTS calculation results (real time snapshots used for N-1 calculations)
- With a realistic modellisation of electric phenomenas (tap changers, units, phase shift transformers, load-shedding, …)
- Data base & electric phenomenas modellisation areregularly updated by a specific developping team
- Trainees are in isolated rooms - alone- in usual team (2 to 4 persons)

- DTS sessions can be
  - single : 1 trainees team in 1 room
  - double: 2 trainees teams from 2 different control centers in 2 independant rooms
- one dedicated trainers team to carry out DTS scenarios and lead DTS sessions

Simulations can be organized with different training teams RCC/RCC or NCC/RCC and possibly RTE/TERNA simulations

Miscellaneous: RTE Reference Documents for Dispatchers Training

"Lists of involved people" : phone lists of all training responsibles (TMC, Lyons, NCC, RCC) and all trainers with IT responsibles for tools developments (DTS)

Reference documents (the most relevant general documents). All the reference documents are accessible to each employee of RTE – can be up-loaded from an intranet Website

- Mission letter to the the Training Pilot for RTE (signed by CEO)
- General orientations for training (Chapter 6.1 of the RTE operational security referential – Training and skills for jobs) involving the Lyons centralized training center (70 training of which 10 for dispatchers) and NCC and RCC for decentralized training
  - Training Monitoring Committee mission (head quarter level – Department Policies of RTE) and role of Lyons, of NCC and of RCC with coordination
  - General programs with three stages (A01 –Initial , A02 - complementary, A03- continuous) and a specific additional module (A05) for offer-demand issues
  - Personal training booklet for each trainee (with followed training sessions and accreditation levels)
- Missions/activities and related training for on shift populations related to system operation
- Skills referential with job/training general programs (Detailed referential with profile of skills for each population)
- Three years plan for training for each population of NCC and RCC in the control room (that includes non only all the evolutions of rules for operation of power system, but also evolutions of protocols with Producers and DSOs and also main Control Command evolutions)
- Detailed plans for NCC and for RCC populations, job by job (corresponding to each desk of the control rooms of NCC and RCC)
- RTE Charter of Training and agreements/procedures between the Pilot for training (Head of TMC) and the centralized training center

Mandatory training program for chiefs of NCC control room (A05)

Particular programs for electrotechnics of grids (ERSO), system operation (EXSE), technico-economical management of the power system (TECO), reactive power (URCX), security studies (ASR-GSR), dynamic behaviour of system (A60D), etc.

HELLENIC TRANSMISSION SYSTEM OPERATOR S.A.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: ***HTSO S. A***
Country: **GREECE**

Chapter A: TRAINING PROGRAMS

Provided training program

Initial program: The training program applied by HTSO consists of two parts initial and continuous ones. Initial program is aimed to prepare personnel to take the dispatcher position. These personnel could be a new employee or an employee from another department of HTSO or from Public Power Corporation S.A. (PPC traditional old power company).

The educational level of this personnel, that have to man our National and three Regional Control Centers must be, according to our regulations, university engineering level and technological engineering level. The very good knowledge of English language is a prerequisite at least for university level engineers. Regardless of their educational level each candidate for dispatcher job has to follow a period of initial training. The first stage of initial training starts with a theoretical presentation-analysis of Greek system components as they are described in P8-A-G2.1.1. This part of the initial training is done mainly with the support of Training Department of PPC. After the completion of this first stage the initial theoretical training is continued with a second stage on issues mostly included in "Operation of the power system (P8-A-G2.1.2.)" and "Knowledge of operational tools (P8-A-G2.1.3.)". In this case trainers are mainly experienced engineers on the above aspects as well as older experienced dispatchers.

This initial theoretical training lasts three to six weeks. After the successful completion of it, an On-the-job training period starts. Each candidate joins a shift group of older more experienced dispatchers. During the On-the-job training period candidates have to be involved gradually in all activities of dispatcher's position, always under the supervision of the others experienced dispatchers. The On-the-job training period is complemented with visits to high voltage substations, power stations and other installations of power grid.

Due to absence of a simulator (DTS) tuned for dispatchers training, the real energy management system in study mode is used for analyzing normal and insecure states of operation.

Continuous program: The continuous training program provided by HTSO concerns the already authorized dispatchers and is aimed to improve their efficiency by helping them into theoretical and practical level.

Continuous training is organized in two parts: periodical and additional training.

Periodical training:

The regular meetings of the dispatchers of our National and Regional Dispatching Centers are organized every month. System disturbances or other significant system events or modifications

happened during the previous period are analyzed, as well as changing of legislation and internal acts are presented to dispatchers and any other subjects which are interested for dispatchers are discussed at these meetings.

The duration of these dispatcher's regular meetings is usually two days and all available dispatchers have to attend them.

Additional training:

Additional training is provided usually in the following situations:

There are new conditions in the power system;

Advanced theoretical issues are analyzed, usually after system disturbances which are not easily understood by dispatchers;

Significant changes of the previous operational rules and procedures as well as implementation of new operational tools or updated ones are supplemented by extra training;

Dispatcher is not familiar with some parts of initial training;

Dispatcher makes mistakes performing his/her tasks;

Dispatcher didn't work as a dispatcher for a longer period of time;

Instead of simulator sessions, due to absence of a simulator (DTS) tuned for dispatchers training, the real energy management system in study mode is used for additional training.

Expert engineers of HTSO and other experts coming from external bodies (University, companies supplying software tools etc.) are selected as trainers.

English training:

Since the good knowledge of English language is prerequisite for supervisors engineers of National Control Center only teaching of the updated list of English technical terms are included in continuous training.

Since the improvement of English skills for all employees is always supported by HTSO, dispatchers are always encouraged to attend English courses in relevant schools and institutions. After the successful termination of an English course the relative fee is covered by HTSO.

Chapter B: INTER-TSO TRAINING

Inter-TSO training is part of our continuous training program. A necessary knowledge of the neighbouring TSOs network as well as special operational characteristics of our interconnections, coordinated remedial actions in case of emergency conditions, are provided for every individual interconnection during our initial and continuous training program.

We implement cross visits between neighbouring TSOs dispatchers as inter-TSO training procedure. Cross visits between ESO EAD's and MEPSO's dispatchers have been done in the past.

Due to positive evaluation this procedure will be extended to all our neighbouring TSOs and will be continued in a regular basis in the future.

During September 2008, HTSO's dispatchers visited Rumanian National Control Center participated in the inter-TSO common training organized by TRANSELECTRICA (Rumanian TSO).

Recently (March 2009) eight Turkish dispatchers from TEIAS (Turkish TSO) visited our National Control Center, after TEIAS request and got a five days training.

Bilateral agreements are already signed between HTSO – ESO EAD (Bulgarian TSO) and HTSO – TERNA (Italian TSO). These agreements currently concern mainly interconnection's operational and market issues. Mutual training issues currently are not included into these agreements.

It's HTSO's decision that any new or updated bilateral agreement is going to be signed between HTSO and neighbouring TSOs, will include inter – TSO common training like cross visits between neighbouring TSOs dispatchers or any other way described in P8-B-G3.

Chapter C: TRAINING ORGANIZATION AND DISPATCHERS ACCREDITATION

HTSO's organizational structure includes a Training sector. A coordination manager, head of this Training sector is appointed for establishing and monitoring of dispatchers training procedure.

Training procedures of HTSO have two main goals:

-Provide all necessary initial professional knowledge needed in order a new candidate to posses the dispatcher position

-Maintaining and improving of dispatcher's knowledge and professional experience

In order these goals to be achieved, a sequence of appropriate procedures are determined by coordination manager. These procedures determine the frame for the initial and continuous training. A reference list of topics as well as time tables of relative training programs linked to the dispatchers required qualification, are provided.

The procedures of the initial training program include the evaluation of each candidate by trainers. After the successful termination of the initial training period the training manager issues a document with a positive suggestion to candidate's manager. Then candidate's manager, after the final evaluation of candidate's personality delivers the first accreditation to the dispatcher candidate.

This first accreditation document authorizes new dispatcher to perform the dispatcher job for the next five years. After this five year validation period has expired, a second evaluation of dispatcher's accreditation is done by dispatcher's manager. Participation of the dispatcher in the continuous training program and the positive suggestions of trainers are helping for maintaining dispatcher's job.

For carrying out the training procedures in our Regional Control Centers, located in central and northern part of Greece, a responsible person for coordination of training is determined in each one of these Regional Control Centers.

Currently the determined appropriate procedures cannot be fulfilled in full extent, due to existing internal organizational and financial difficulties for development of required training material and for realization of all training procedures. For this reason HTSO has declare no compliance with some standards (see HTSO's MLA non-compliance with P8.C.S2 and P8.C.S6).

Chapter D: Basic requirements for Dispatcher Training Simulator (DTS)

Energy Management System (EMS) of HTSO initially was equipped with a Dispatcher Training Simulator (DTS) system. This DTS system was integrated into the EMS installed in our National Control Center.

DTS functional abilities covered almost all applications of our EMS system. Actually it was functioning as a "copy" of the real EMS system.

A model of our power system with some equivalent models of neighbouring systems was implemented in DTS. With the appropriate tuning, DTS was a powerful training tool for dispatchers training on power system operation as well as on almost all EMS applications.

For some years it was operated as an integrated part of our EMS system running on the main computers of National Control Center. Gradually new applications concerning the operation of real power system were added into EMS and then overloading problems of main computers aroused, affecting the normal operation of them.

After that DTS was removed from main computers and loaded to another smaller one with the model of a very small part of our system.

Since that period the DTS is used as a software test platform for the new applications that have to be installed in the EMS and not as a training tool for the dispatchers.

Due to absence of DTS, the EMS in study mode is used as a training tool during initial and continuous training.

Currently a new project is under development, concerning the total replacement of our EMS with a newer one. The new EMS will implement a new integrated DTS.

HEP-OPERATOR PRIJENOSNOG SUSTAVA D.O.O.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: ***HEP- OPS***
Country: **Croatia**

Chapter A: Training Programs

Introduction

Dispatchers of HEP-OPS are provided by a structured training program that includes initial and occasional continuous parts, which are regularly checked and updated.

The aim of the initial program for HEP-OPS dispatchers is to prepare personnel to take the dispatcher position by providing an adequate necessary level of professional knowledge. The main aim of the continuous program is to keep and extend the dispatchers' knowledge and competences (knowledge of network, information about new conditions affecting network operation, usage of operational tools etc.).

A shift in HEP-OPS control center is composed of two equal dispatchers, but according to their operational tasks they are generally divided into a dispatcher responsible for grid and into a dispatcher responsible for production. Duration of shifts in our control room is 12 hours (day shift and night shift).

Provided training program a minimum of three months

- Initial Program

  Initial program in HEP-OPS control center lasts 12 months for trainees without any experience of power system operation, neither in real time nor in operational planning, including a usual period of six months for on-the-job training. If a trainee has some knowledge of our power system, e.g. if he had worked in operational planning, initial program could last at least 9 months, also including the period for on-the-job training.
  The structure of the theoretical part of the initial program includes following main topics:
  - Power system components. General description and analysis of all network components: • Overhead lines and cables with their components;
    • HV substations, their entire components as types of breakers, isolator-ground switches, power transformers, measurement-protection transformers, tap changers, reactors, capacitors, phase shifter transformers, telecommunication systems, protection relays etc;
    • Thermal power plants plants (oil, coal, nuclear, gas turbine, combined cycle - CCPP) and their components with respect to their operational characteristics (e.g. response times);

• Hydro power plants plants and their components (turbines, generators, etc.) with respect to their operational characteristics (e.g. response times).

- Operation of the power system. This includes all relevant regulations and market rules as well as the knowledge and analysis of the necessary conditions for safe and reliable operation. The following aspects are included:
  - Network behaviour and network operation (power flows);
  - Basics of network protection;
  - Voltage and reactive power flows;
  - Balancing (primary, secondary and tertiary control), Automatic Generation Control, Organization and operation;
  - Other internal rules (e.g. relevant market rules, organizational and technical);
  - Introduction to UCTE and other TSO organizations (e.g. regional organizations);
  - UCTE rules (Operation Handbook);
    - Crisis management;
    - Manual or automatic remedial actions in alert or emergency situations (e.g. load shedding);
    - Restoration actions after black-out (basic methods);
  - Basic methods in network calculation (on-off line), state estimation, load flows, etc;
  - Special phenomena such as local (in the national networks) and global (in the UCTE network) collapses (voltage, frequency, angular), etc.

- Knowledge of operational tools. Dispatchers are trained about:
  - Collecting, transferring data signals, SCADA systems etc.;
  - Remote control technology;
  - Implemented model for state estimation, for network topology and for automatic generation control;
  - Other internal operational tools (e.g. scheduling application etc.).

On-the-job part of the initial program in HEP-OPS lasts usually six months. On-the-job part of the initial program of a candidate in control room is guided by two experienced dispatchers in shift, and it fully considers future dispatcher position and responsibilities of the candidate and covers all relevant operational aspects related to the dispatcher position. During on-the-job part a candidate performs all the professional actions in real time operation that he will perform in his future dispatcher position, using appropriate tools, but always under supervision of the dispatchers in shift.

Since DTS is not installed yet, simulator sessions are not part of the initial program in HEP-OPS so far.

- Continuous program in HEP-OPS consists mainly of the theoretical part that 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.

Simulator sessions and stress management are not part of the continuous program in HEP-OPS so far.

Languages of neighbouring countries

In our region languages of four neighbouring TSOs (HEP-OPS, ISO BiH, EMS and ELES) are pretty similar, so dispatchers of HEP-OPS can easy communicate with three neighboring TSOs without using English; exception is communication with MAVIR where English has to be a communication language.

English training.

All dispatchers of HEP-OPS have sufficient knowledge of English and operational terms to carry out their tasks. They are able to exchange information in an international environment safely and smoothly. In HEP-OPS National Control Center the required minimum of English knowledge is the fourth basic level which is even more than sufficient for required tasks:

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

Chapter B: Inter-TSO training

Cross visits of dispatchers (one of the inter-TSO common training actions defined in P8-B-G3) are fully applied only with ELES at the moment. This year cross visits of dispatchers were organized in a way that six of dispatchers of one TSO (a half of their total number) visited neighbouring TSO. During the cross visits between ELES and HEP-OPS dispatchers, the characteristics of the network and operational constraints of a TSO organization were presented. Those cross visits gave 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.
Furthermore, HEP-OPS dispatchers participate in the regular annual international dispatcher meeting in MAVIR, which could be defined (in a way) as the action P8-B-G3.2 (Common training workshop), although it is not fully in accordance with the definition in P8-B-G3.2.

Concerning MAVIR, HEP-OPS dispatchers regularly participate in the regular annual international dispatcher meeting organized by MAVIR, which could be defined as the action P8-B-G3.2 (Common training workshop), although it is not fully in accordance with the definition in P8-B-G3.2. Two of HEP-OPS dispatchers regularly participate in this meeting (together with more than eight other TSOs). That international dispatcher meeting is organized once a year.

The actions (inter-TSO common training) defined in P8-B-G3 are not applied with ISO-BiH and EMS at the moment, but during this year there are various contacts and discussions with EMS and ISO-BiH about that issue. There are also some contacts with MAVIR about possible cross visits of dispatchers in the future.

Chapter C: Training Organization and Dispatchers Accreditation

Coordination of the training

HEP-OPS has appointed a person considered as a training coordination manager, since he is responsible for training organization: designing, following-up and updating the full training process.

Organization of the training

The training coordination manager determines appropriate procedures for the training organization. In our case these procedures have covered currently:

- a description of the dispatchers recommended qualifications (recommended faculty is: Faculty of Electrical Engineering and Computing, where recommended departments are: Department of of Power Systems or Department of Electric Machines, Drives and Automation; acceptable are also other similar electrical engineering faculties)
- a reference list of topics for training programs
- 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 is also applied.

However, trainers selection and training program defined for trainers are not applied yet.

Evaluation and the first accreditation of a dispatcher

In HEP-OPS the initial program is completed by an evaluation in which the knowledge and capabilities of a candidate to perform a dispatcher job are tested. For a dispatcher candidate in the end of his training (on-job-practice), there is the final internal exam (final evaluation), in which his knowledge and capabilities to perform a dispatcher job are tested, performed by his mentor (manager) and three experienced dispatchers (his training team). A relevant document is forwarded to the mentor (manager) of the candidate. When a candidate for dispatcher passes the final internal exam, he signs a declaration of passing the final exam and that he is capable and ready to perform the dispatcher job. Since this declaration authorizes him to perform his job in the control room, it is considered as the "First accreditation" in P8-C-S4. This declaration is also signed by his mentor (manager) and by his training team (those three experienced dispatchers).

Validity duration of accreditation

In HEP-OPS the validity duration of the first accreditation to the dispatcher candidate is not limited.

Chapter D: Basic requirements for Dispatcher Training Simulator

In HEP-OPS Dispatcher Training Simulator is not installed yet. However, Dispatcher Training Simulator as defined in this chapter will be implemented as an important part of the new ICT project by the end of the year 2011.

Until the implementation of DTS, as a substitution for DTS, we apply appropriate EMS functions to complement on-the-job part of initial program of the dispatcher training.

MAVIR MAGYAR VILLAMOSENERGIA-IPARI ÁTVITELI RENDSZERIRÁNYÍTÓ ZÁRTKÖRŰEN MŰKÖDŐ RÉSZVÉNYTÁRSASÁG

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *MAVIR*
Country: Hungary

Chapter A
TRAINING PROGRAMS

How to became a dispatcher

New applicants for dispatcher position have to be graduated in relevant technical field. The initial program lasts for about 9 months but adjusted to the actual progress of the applicant. Issues to be trained are particularly prescribed in a knowledge requirement list and regularly updated according to the relevant improvements. Main topics of theoretical part include: relevant codes and rules; principles and procedures of system operation; network structure, elements and procedures; power plant operation and procedures; computer functions. After about 3 months a basic exam on theoretical part (with prescribed knowledge requirements on power system) is taken. Then the applicant may start the on-the-job training: as fourth person in shift (there are regularly 3 persons in a shift) all the practical issues are trained. The applicant spends one week also with Network Operation Planning Service, Resource Planning Service and Market Operation Department, respectively. On-the-job training is complemented by power plant and substation visits, furthermore, DTS sessions, as well.
Process to be continued in Chapter C.

How to improve accredited dispatchers' skills

Diploma is delivered to students in Hungary only if a proficiency exam in English language is taken. No further exam is prescribed for dispatchers, however, improvement of language skills is supported by the company. Dispatchers may attend English, German and Russian courses on demand, since also German and Russian are commonly known among the dispatchers of neighbouring (and other contacted) TSOs. In each shift there should be at least one dispatcher with good English skills. There is an English-Russian-German-Hungarian phrase-book compiled and available for dispatchers.
There are 1-2 day DTS sessions each year for each dispatcher team (working usually together) in order to train e.g. congestion management, system restoration. Personal DTS session is also organized, if needed. Furthermore, extra DTS sessions are organized before commissioning of new relevant network elements, in order to train the new circumstances.
There are occasional theoretical trainings with teachers of Budapest Technical University. Issues trained, e.g. theory of voltage-reactive power regulation, synchronization of power systems, short-circuit calculation, protection system and equipment of the Hungarian power system.
There are regular refreshing trainings in order to practice rarely used EMS/SCADA functions. Moreover, there are occasional training each time, if new tools, rules, procedures, functions are introduced.
Communication and team work trainings are also organized occasionally for dispatchers.
After an occasional long absence from dispatcher work, the accredited dispatcher shall attend shifts as fourth person (like during the initial program) till the new improvements are learned and the practice is got again.

Applicant for shift leader dispatcher position is trained based on an individual program. Knowledge requirements (more extended than the one for dispatchers) are prescribed, as well.

Chapter B
INTER-TSO TRAINING

There is a 3-4 day international dispatcher meeting each year organized by MAVIR. Two dispatchers from each neighbouring TSOs, including Ukrenergo WPS (Ukraine, synchronously inteconnected, non-UCTE member neighbouring TSO) and ELES (Slovenia, electrically not neighbouring TSO but geographically), furthermore one from Brauweiler (control block leader of MAVIR) are invited. According to the availabilities, at least half of MAVIR dispatchers attend these meetings. During the meetings dispatchers inform each other about improvements of their power system and system operation in common workshops, and technical visits are organized. Additionally, there are social programs in order to facilitate the personal contacts and communication between dispatchers. Usually two MAVIR dispatchers take part in similar meetings organized by neighbouring TSOs (e.g. Transelectrica, Ukrenergo WPS, ELES). Each MAVIR dispatcher attends dispatcher meetings organized by other TSOs once in 2-3 years.

Chapter C
TRAINING ORGANIZATION AND DISPATCHERS ACCREDITATION

How to became a dispatcher
Process continuing from Chapter A:
When the applicant is considered to be properly prepared for the dispatcher position, an exhaustive exam has to be taken. Discussion with the examing body on theoretical part covers each point of the prescribed list of knowledge requirements of initial program and lasts for about 7 hours. Exam on on-the-job part (usage of EMS/SCADA system) also covers each related point of the prescribed list and lasts for about 2 hours. Minutes of exam is recorded including each question and evaluation of answers. After a successful exam the applicant gets the accreditation for dispatcher position. Examing body consists of the Head of National Dispatch Service and shift leader dispatchers.

How to became a shift leader dispatcher
Applicant for shift leader dispatcher position has to have dispatcher practice (at MAVIR) of at least 5 years. Exam has to be taken again, similarly to the exam for dispatcher position, according to the more extended knowledge requirements complemented by deeper explanations and problem solving exercises. The exam lasts for two days, 7 hours each day).Examing body for shift leader dispatcher is attended by the Director for System Operation, as well.

Training organization
Training and exam are organized by the National Dispatch Service. There is a training coordination manager (one of the shift leader dispatchers) and a full-time instructor (former shift leader dispatcher) appointed.
Training procedures are prepared annually. Issues are determined according to the actual demands with target setting. Expected outcome of training in continuous program is defined but there is no qualification for dispatchers. These trainings are only for practicing the managing of defined situations.
Trainers are selected on individual considerations. Main aspects: professional skill of dispatcher "science", experience, tool knowledge, pedagogical sense, reputation. There are supporting external

bodies for trainings: Budapest Technical University in technical field, a consultant company in pedagogical field.
Trainers are trained occasionally by teachers of Budapest Technical University (theory) and in international courses (theory, practice).

Chapter D
BASIC REQUIREMENTS FOR DISPATCHER TRAINING SIMULATOR (DTS)

MAVIR operates a Dispatcher Training Simulator near the control room. It is an integrated DTS made by Siemens and based on the real-time EMS/SCADA system. It meets all the related guidelines of UCTE OH (P8-D-G1 - G4).
Main parts of DTS: Control Centre Model (CCM), Power System Model (PSM), trainer's and trainee's subsystem. HW and MMIs are identical to the ones of real-time system, furthermore, MMIs of DTS can be switched to real-time system, as well. (Due to the realistic visualization, DTS pictures on the screen are marked with coloured frame, in order to avoid confusion.)
Applications of CCM are identical to the ones of real-time system, modified applications of real-time system can be easily copied to DTS. Any snapshots made in the real-time system can be uploaded to DTS and serve as a base case for further usage. Main applications of CCM: Real-time sequence (model update (MU), state estimation (SE), contingency analysis (CA), security dispatch (SD), voltage scheduler (VS), fault calculation (FC)); Load Frequency Control (LFC), Economic Dispatch (ED); Alarm processing; Supervisory control.
PSM is identical to the one of real-time system. It contains the relevant parts of the surrounding systems.
Load-flow is calculated in 2 second cycles.
Frequency simulation: Consumption of modelled network is abt. 70 GW, however modelled spinning mass is similar to the one of UCTE. Modeling of transient behaviour is not feasible, but swingings. Frequency is calculated in 170-200 ms cycles.
Protection modelling: inverse-time relay, over/under voltage relay, over/under frequency relay, frequency depended load shedding.
RTU modelling: faulty, not renewing, outaged measurements.

TERNA - RETE ELETTRICA NAZIONALE SPA

OVERVIEW ON TERNA OPERATIONAL TRAINING FOR DISPATCHERS

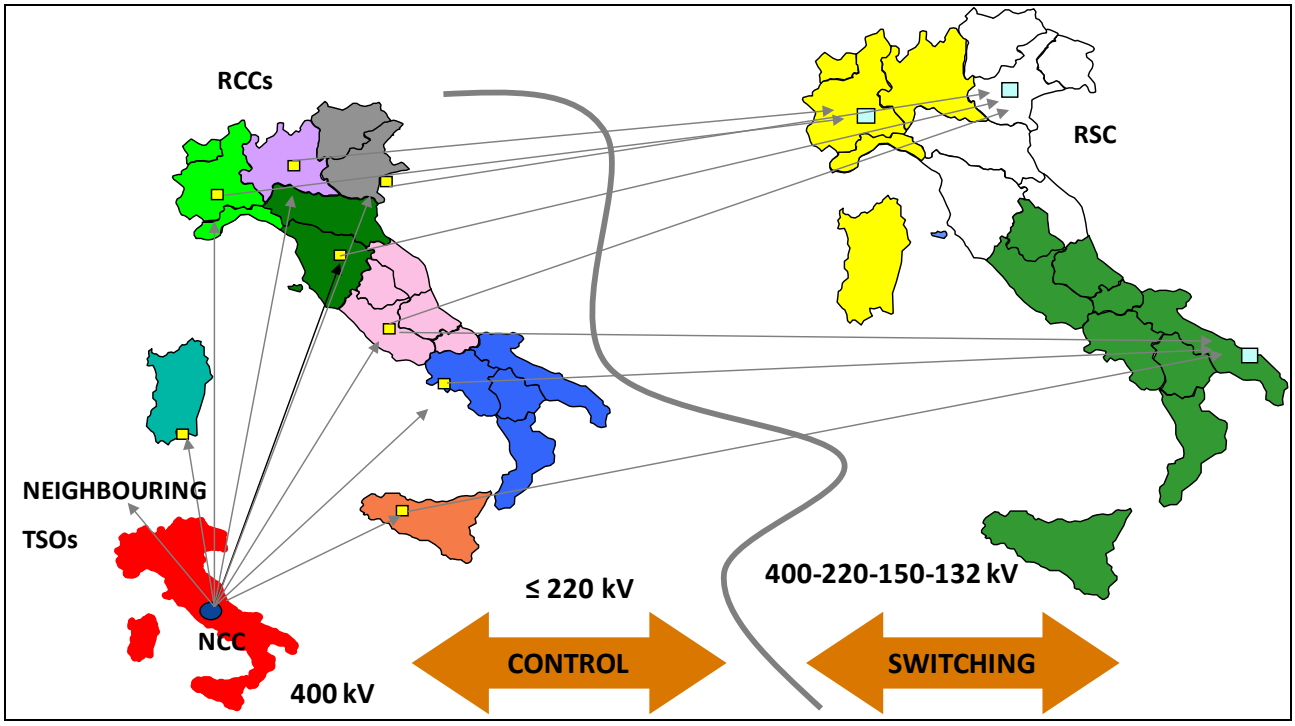
REAL TIME CONTROL ORGANIZATION AT A GLANCE

The layout of real time control at Terna consists in one National Control Centre (NCC) and eight Regional Control Centers (RCC). The switching of network elements is carried out by three remote-control centers, whose training program is out of the scopes of Policy 8.

The NCC is in charge of the control of 400 kV transmission grid and of the whole interconnection, despite of the voltage level, and is in charge of the generation unit balancing for the system adequacy and for the load-frequency control.

The eight RCCs are responsible of the security of the 220/150/132 kV networks and in some particular cases (Sardinia, Sicily when the cable with the Continent is open for maintenance) operate the balancing in derogation.

The layout of control organization is below reported:



The composition of the teams in shift for real time control is the following:

Operational Room	Positions	Short description
NCC	Head-shift	Responsible of the whole activity
NCC	Network security assistant	Network security assessments
NCC	Offer-demand balance assistant	Balancing orders to the generation units
NCC	Interconnection security assistant	Contact with bordering TSOs, security assessments of the relevant network for interconnection
RCC	Head-shift	Responsible of the whole activity
NCC	Assistant	Support to head-shift for decision making

DISPATCHERS SELECTION AND TRAINING

The candidates for the position of dispatcher are usually employees working in other areas of the Dispatching Department (i.e. operational planning), dispatchers coming from other positions (i.e. RCC dispatchers moving to the NCC), assistants moving to the head-shift position or young engineers.

The requested pre-requisites may differ depending on the position which will be occupied: i.e. for the interconnection assistant position a sufficient knowledge of

spoken and written English is requested. The language skills will afterwards be enforced by means of dedicated periodical courses.

The candidates are examined by a commission composed by the responsible of the Real Time Control Department, of the NCC or of the involved RCC and by a representative of the Human Resources Department.

Once the candidate is appointed for the dispatcher position, he/she has to attend the initial program which manly consists in:

1. a theoretical part inside and outside the control room;
2. in a on-the-job part working on shift beside an experienced dispatcher.

The initial program duration depends on the profile of the new dispatcher; it typically lasts 6 months – 1 year for the new employees without any experience.

The initial program includes elements related to the system operation, power system characteristics and components, procedures and operational instructions, visits to other Terna operational departments, visits in the other control rooms (i.e. new RCC dispatchers visit the NCC and work in shift for some days), international contest and parts of the Operational Handbook, tools adopted for security assessment, energy market rules, DTS simulations.

The on-the-job part is the final segment of the initial program and, at the end of the training, the responsible of the NCC/RCC verifies the attitudes of the new dispatcher together with one or two experienced dispatchers.

The accreditation is carried out by means of an official letter which appoints the candidate to the dispatcher position. If necessary, the on-the-job part is prolonged of a sufficient period.

The continuous training is carried out at a yearly level and has a duration of two days. The continuous program agenda is yearly re-designed according to the needs and typically consists in a theoretical part (new network component and devices, new market rules for the forthcoming year) and in an interactive part consisting in the analysis of a network incident, the discussion about the in force procedures and rules and in a DTS session.

In addition to the continuous program, the dispatchers attend the presentation of new procedures or new tools once they enter into force or are adopted by Terna.

English training is regularly carried out for the NCC and for the dispatchers of RCCs bordering with foreign TSOs. The lessons are in charge of specialized schools with mother language teachers who are supported by Terna experts in the definition of the glossary to be adopted for ad-hoc technical lessons.
Moreover, the dispatchers are included in a periodical training program carried out in collaboration with the Human Resources Department, aimed to enforce the so called "soft-skills" (problem solving, decision making, communication, etc.).

INTER-TSO TRAINING

The inter-TSO training is not a part of the initial program, since the dispatchers need a minimum level of experience in order to better understand the characteristics and the constraints of the neighboring systems. Inter-TSO training is so dedicated to dispatchers with a sufficient level of experience.
Terna carries out the "cross-visits" program with Swissgrid, RTE and ELES. The program consist in:

- a general presentation of the company organization and of the power system characteristics;
- a stage inside the bordering TSOs control centre aimed to the illustration of the operational organization and of the system constraints.

Terna (GRTN) and Swissgrid (ETRANS) carried out also a "on the shift training" program, immediately after the blackout of September 2003 in order to enforce the level of mutual understanding and collaboration.
The duration of the cross-visits training is two days.
In addition to the cross-visits, Terna carries out a DTS based common training with RTE. The training sessions take place in Lyon, were the RTE specialized training structure is located. The scenarios consist in the management of critical and emergency conditions and the application of the agreed procedures for the common interconnection.
With reference to APG, no special training is carried out. Dispatchers are, when possible, involved in the operational meetings, but no structured program has been

achieved so far, due to the weakness of the interconnection (a single 220 kV line, most of the time operated in a radial scheme with an Austrian hydro power plant).

TRAINING ORGANIZATION

The dispatchers operational training is coordinated by the training manager, who is the responsible of the real time control department. The training manager defines the yearly training programs for the continuous training and the initial program for just appointed dispatchers, supported by a team of experts composed by the NCC and RCCs managers and off-line experts in different issues.

The formal responsible for training is the Human Resources Department which, in any case, does not interfere with the definition of technical aspects of the training, but supports the training committee mainly concerning pedagogical aspects. Moreover, the Human Resources Department registers the attendance of dispatchers to all the training sessions and inserts them in a central database in order to take trace of the training paths of all the operators.

The trainers for technical matters are internal experts working in Terna different areas. In other words, lessons and lectures about substation layouts and design are in charge of experts of the Substation Engineering Department, the ones concerning the defense plans are carried out by the experts in charge of the project and of the tests of Italian defense plan, and so on.

With reference to pedagogical skills of internal trainers, the Human Resource Department supports them by means of ad hoc lessons on the topic.

Due to the specificity of the subject, Terna does not rely on external trainers for technical specific matter.

On the other hand, for the “soft-skills” and the language courses, Terna relies on external specialized schools and institutes.

DTS SIMULATOR

The DTS simulator has been internally developed with the collaboration of CESI (the ex research department of ENEL, now acting as independent company).

Terna had developed the Human-Machine Interface (HMI) while CESI has carried out the calculation core of the tool. This calculation core simulates the steady-state, the transient-state of the power system and the evolution in time of its characteristic variables (load profile, generation pattern).

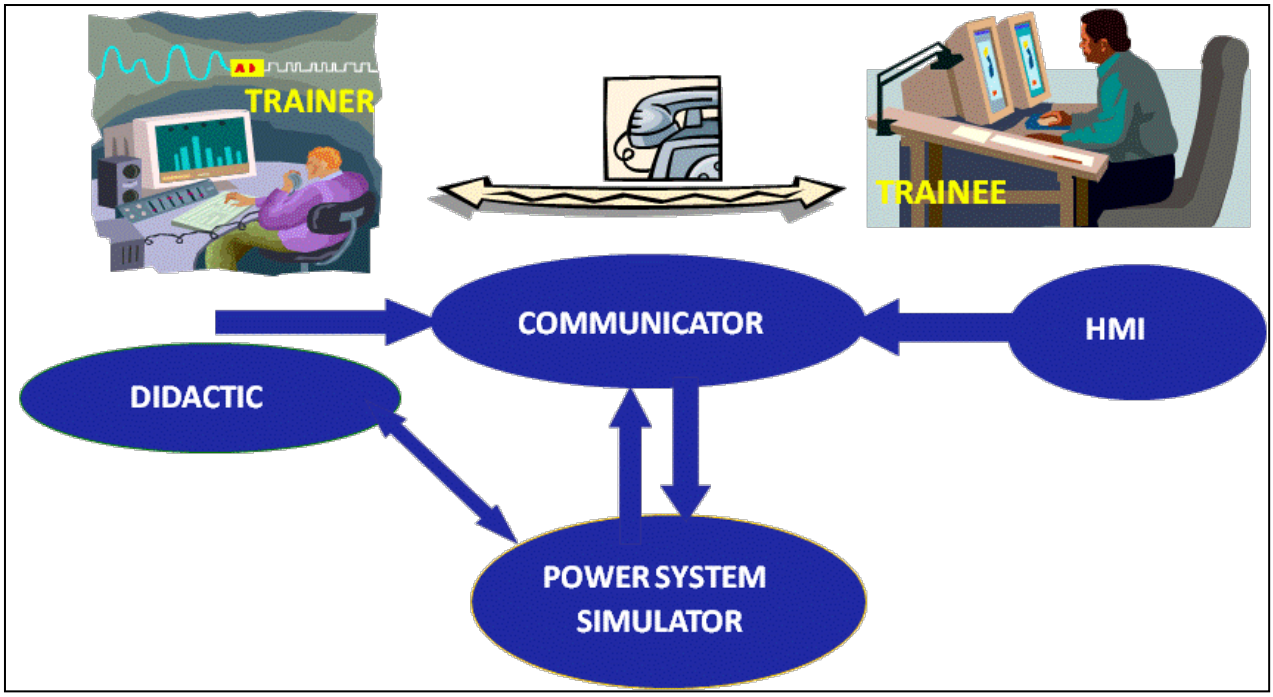
The HMI perfectly reproduces the control system adopted in real time by the operators, it communicates with the trainers' workstation by means of a communicator link.

The DTS allows the trainer to introduce faults and perturbations on the power system by means of the trainers' interface, while the trainees utilizes the HMI for the power system control, as it happens in reality.

Dispatchers are typically trained on emergency situations, black-out and system restoration, critical N-1 security conditions.

The normal operation is not a usual scenario for the training sessions addressed to experienced dispatchers. DTS is used to show the normal operational conditions mainly to the new dispatchers during the initial training.

The following scheme shows the DTS architecture:



The scenario can be created on the base of actual snapshot extracted from the real time state estimator archive.

The DTS provides to the trainees the possibility to create a library of different scenarios, based on the different system conditions with the possibility to schedule a list of events or to manually apply them during the simulation.

The didactic includes a set of typical tense conditions for the system (i.e. high voltage situation, heavy flows between network areas, etc.) and permits the creation of thematic training sessions.

CREOS LUXEMBOURG S.A.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *company name: Cegedel Net*
Country: Luxembourg

Chapter A Training Programs

The training programs applied to the dispatchers are well adapted to the operational tasks that our dispatchers have to fulfill in the grid to assure reliable system operation.

Please note that up to now, Cegedel Net has no direct responsibility for load frequency control. This task was historically given to the System Operator RWE Transportnetz Strom [DE] to which our grid is interconnected in radial and who operates the large pump storage power plant located in Luxembourg.
Another CCGT power plant also located in Luxembourg is operated by ELIA [BE] as it is connected to a part of the grid of Cegedel Net operated in radial to the ELIA zone.
Some smaller power plants are located in our grid but they don't contribute to the load-frequency control.

So far, our dispatchers are not required to manage load-frequency control tasks.

Nevertheless they must have basic knowledge also of these themes in system operation in order to understand activities and to have dialog with the neighboring dispatchers.

The initial training program:

The minimum qualification requested to become dispatcher is a degree of "Technician in Electro". During at least one year a dispatcher candidate will do the following additional in-house training:

- Acquire a more theoretical knowledge of grid operation and behavior and see the/some specificities of our grid. This includes loading and load flow knowledge, different short circuit currents, …
- Learn standard used vocabulary, security procedures, switching and earthing procedures, overloading characteristics, frequency behavior, …
- Learn more about internal design of grid elements, like power transformer characteristics, neutral earthing, switchgear operation, parallel line behavior, generator characteristics and power plant characteristics…
- Accompany our craftsmen team to work in substations and on overhead lines in order to get also some practical knowledge of the grid, protections and the signaling during disturbances.
- Accomplish a parallel phase with experienced dispatchers in the control room.
- Take part in DTS sessions in order to gain experience in normal practice and some abnormal situations in the grid (malfunctioning of protections, non selective switching of lines,). These sessions will also allow for the trainer to get a feeling for the candidate reactivity capacity.

At the end of this initial training the dispatcher candidate has to pass successfully an examination covering all the proposed themes before he will be appointed as dispatcher.
See part C for more details.

The continuous training program:

The Dispatcher is working on-shift. During of-shift periods, he will contribute to other tasks in and around the control center in order to give him the possibility to deepen his knowledge in grid operation.

Starting this year (2009) and in order to comply to the requirements of the UCTE OH all our dispatchers will follow a training offered by an Independent Training & Service Center for Power System Control. Several sessions for different themes are foreseen in this program. Each session will be composed of a theoretical part and of a simulator part.
The theoretical part covers generator characteristics and behavior whilst the practical part simulated grid restoration by different solutions. These trainings will be continued and expanded in the future. A final test and examination will close the training session.

Our SCADA/EMS system allows also in-house simulation training through:

- Recording and replay of past real situations encountered in the grid.
- Based on a snapshot from reality we can simulate different critical situations and see how the trainee will react.
- Simulating abnormal stressed grid situations through faulty behavior of grid apparatus like breaker failure, protection malfunction (over- and/or under-functioning), abnormal load situations, different fault current simulations, grid separation and restoration, and others.
- Operation planning and simulation.

These continuous training sessions will not end with a real examination but will allow detecting lack of knowledge and doing of the participants and allow for offering enhanced training courses (in-house or external) where necessary.

Chapter B Inter-TSO training

We cultivate good relations to our neighboring TSO that will end up also in cross visits of people of the dispatching centers. In these visits different themes are treated like:

- Exchange of information of the grid topology and status
- Critical grid situations that may appear
- Discussing grid restoration philosophies
- Analyzing critical situations that happened
- Possible back up strategies and mutual (in our case more unilateral) exchange of emergency power reserves.

In the past these relations happened most in theoretical offline discussions. Today evolved SCADA/EMS technology and available DTS (external or internal) will allow also for practical training sessions covering these themes. We are in contact with an external DTS body in order to have a participation in a future inter TSO training session, but we will first complete our individual training sessions with this DTS body foreseen by 2009/2010.

We have had some common information sessions in real operational environment, organized between RWE TSO and Cegedel Net with the participation of all our dispatchers, where relevant operational experience was exchanged. These cross visits not only allow for better knowing each other on a more personal level but also gave mutual information about specific grid and other operational constraints.

Chapter C Training Organization and Dispatchers Accreditation

The required basic qualification for a dispatcher is defined by the job description for this employment. The minimum educational level is set to “Technician in Electro” which equals a final secondary-school examination especially for technical branches.

In addition to his basic knowledge in general electro-techniques the dispatcher candidate has to follow-up an internal training course:

- first to get the authorization for doing general grid operations like all other craftsmen in grid operation must have,
- followed by special training sessions designed to give him further knowledge of system characteristics needed in his further employment as of a Dispatcher.

The first part for doing general grid operations covers:

- Knowledge of the specific grid topology and infrastructure.
- Security related items and rules.
- Special knowledge of grid physics (load flow and short circuit currents, voltage levels, overload capacity, …)
- Practical working in operating switches and isolators in substations.
- Special vocabulary and communication principles used in grid operations.

In the second part of the training that covers special items needed for dispatchers he will learn:

- Operating the SCADA system with all menus, lists and procedures for switching execution and reporting
- Become familiar with signaling/alarming from substations
- Extended knowledge of grid physics (reactive power, frequency control, load shedding possibilities, protection tripping and automatic re-closing …)
- Increase knowledge of grid topology, grid behavior and grid infrastructure, of our own grid as well as parts of our neighboring grids.
- Accomplish training sessions in the DTS part of our SCADA system
- Become familiar with all supplementary tasks a dispatcher has to fulfill on shift, like balance management, reporting, …
- Follow the daily operation of the dispatcher’s task as supplementary person in the control room.

During this training period, the dispatcher will accompany our craftsmen teams to learn about reality of the grid in fault finding, maintenance operations and building tasks.

After this training period that normally will last for one year, the candidate will be evaluated by an examination performed by the trainer and covering the theoretical part as well as the practical part.

In a positive result case of these tests, the candidate will obtain his accreditation for a dispatcher.

The trainer himself is the responsible person for the control center who has good experiences in grid operations. He will himself participate to training sessions organized outside our company by external bodies.

Renewal of accreditations is not a formal process but in case of necessity supplementary DTS sessions for all dispatchers are organized and recommendations are given that can even lead to a revocation of a dispatcher accreditation.

Chapter D Basic requirements for Dispatcher Training Simulator (DTS)

Our TDS module is directly integrated-in in the SCADA/EMS System. By that, each operator interface may be switched from his active status in a simulation status by a menu command. All the HMI-interfaces like pictures, menus, procedures, lists a.s.o. remain the same as in the active status, except that the background color of the menu bar and the display will switch to another color. The signaling and alarming as well as the commands to and from the trainee operator will be switched from the real process to a training simulator process.

The trainer-trainee system will allow for:

- Creating snapshots of the real operation process
- Play back at the same speed as well as deferred and/or in a step by step operating mode of real encountered operations.
- Build new critical situations based on a snapshot of reality or on a virtual built situation.
- Replay in a deferred mode all training sessions.
- Simulate real grid behavior by grid calculations and modeling of switching equipment, protection equipment and measuring equipment.
- Simulate critical grid situations by inhibiting tripping signals to breakers or presetting overloading situations in the grid.

The DTS-System accesses the same database as the operational system while interferences from DTS mode to real mode are not possible.

During a DTS Session, the trainer from his MMI can modify online the grid behavior parameters or simulate abnormal signaling from the grid in order to test the trainee reaction to unexpected situations.

MACEDONIAN TRANSMISSION SYSTEM OPERATOR AD

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *MEPSO*
Country: Macedonia

Chapter A

Training program includes initial and continuous parts. An initial program takes 8 months and contains theoretical and on-job parts. Sufficient knowledge of English and operational terms are requested. List of English technical terms are integral part of the Training program.
Initial program is in a line with Energy Law, secondary legislation, UCTE Operational Handbook, internal procedures. The program contains technical characteristic of the power system, use of the tools for operation, bilateral agreements between TSO. If there are any change of the low, OH or articles of the bilateral agreements, which is influent of the dispatchers job, the program is review and upgrade and those news are integrate into program.
MEPSO has training simulator like a part of its SCADA system, but it is not function because we do not have observability of all SS in our network.

Chapter B

Inter TSO visits are organized between neighboring TSOs. During the visits, Dispatchers visit the Dispatcher center, the SS that on the first loop on the interconnections, and other objects of the HV net. On those visits, Dispatchers exchange experience, describe the situations, problems, what measures they used for solve the problem and ctr.

Chapter C

In accordance with training program, candidate is educating on the different departments with experts employed in MEPSO. Coordinator of the training program is Main Dispatcher. After finishing the training, the candidate has to have the exam. Commission is setting-up and organizes exam for candidate. After finishing the exam, the candidate receive minutes of the exam, and in accordance with the minutes from the exam, dispatcher candidate pass the exam, and allow him to work as a dispatcher.

MEPSO has no selection of trainers, no training program and pedagogical program for trainers.
MEPSO hasn't appoint external bodies for training
MEPSO use experience and the best practice of our experienced dispatchers and our experts (employed in MEPSO) from different department

Chapter D
…….
…….
…….

TENNET TSO B.V.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

Version 2

TSO: *TenneT TSO*
Country: The Netherlands

Chapter A Training Programs

For our dispatchers we have developed an initial program and a continuous program.

The initial program

The initial program last 9-12 months and consist of the following parts:
. introduction TenneT
. context and role of TenneT in relation to UCTE, DSO's en producers.
. process description and learns operating procedures including NEN 50110 (personal switching safety)
. learn to work with the applied tools
. training on the job

Every trainee has assigned an experienced mentor. The initial program is mostly executed by colleagues, process-experts and application (it) experts. At the end of the initial program there is a assessment of the dispatchers capabilities based on the current operational challenges.

The continuous program:

The continuous program consists of :

- internal workshops concerning new rules and procedures and new installations
- simulator sessions regarding defence- and restoration operations simultaneous together with de DSO's and generation companies with units > 60 MW, and contracted companies. This training is performed by a training institute with a large experience with defence- and restoration operation training with black- or brownstart generation facilities
- we organize workshops simultaneous together with Elia, Eon Netz en RWE-TSO, These workshops are executed fully in the English language. All the operators are individually monitored, so that the first accreditation and the re-accreditation is guaranteed.

Chapter B Inter TSO-training

This training consist of:
. cross visits between neighbouring TSO dispatchers of EON Netz, RWE TSO and Elia and Statnett
. inter-TSO workshops with EON Netz, RWE-TSO and Elia
. national simulator training regarding defence and restoration processes.
In this training the neighbour-TSO's are simulated by the trainers.

Chapter C Training Organization and Dispatchers Accreditation

We have appointed 2 training coordinators. These persons coordinate the training for the operators. With respect to the content of the training we have appointed process-owners is responsible of the result of the training and process-managers, these persons are responsible for the content of the training.
For new dispatchers as well as experienced operators we apply an accreditation process.
The program has several milestones with qualification-sessions for the concerned dispatcher.
The program is completed with a qualification-session and accreditation determination under responsibility of the concerned manager (process owner).
For defense and restoration operation we have a Training Management Committee also with members of external DSO's and Production Companies.
Every 3 years there is a re- accreditation for the experienced operator (only for the switching process). The responsible manager decides if the re-accreditation is delivered to the operator.

Chapter D Basic requirements for Dispatcher Training Simulator

For local training purposes we have an DTS running on our EMS.
For defence- and restoration trainings we use the simulator of DUtrain.
This simulator has an general MMI. Despite of this, the simulator fits with the goal of covering all the defence and restore phenomena.

PSE OPERATOR S.A.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *PSE Operator S.A.*
Country: *Poland*

Chapter A – Training Programs

Dispatchers of Polish TSO work in National Control Centre (NCC, located in Warsaw) and in five Regional Control Centres (RCCs, located in Warsaw, Bydgoszcz, Poznan, Radom and Katowice).

The initial training program is organized on request for preparing the candidates for NCC/RCC dispatcher position. This program is developed by dedicated trainer for the candidate. Basically the initial training program covers at least 2-month learning of work performed by operation planning units, which directly cooperate with the control room personnel, training in EMS calculation and analysis, acquiring knowledge concerning important (from power system point of view) HV substations, thermal and pump-storage power plants. The initial training program also includes on-the-job practice at the future dispatcher position.

The continuous training program is performed according to the yearly training schedule. Following types of trainings are organized: internal NCC workshops, central workshops, regional workshops, technical visits, simulator sessions, and inter-TSO workshops (see chapter B).

The internal NCC workshops are organized for NCC dispatchers and took place once a month (except holiday period). The workshops concern the most important issues resulting from changes in system operation procedures and market rules.

The central workshops are organized for NCC and RCCs dispatchers and take place four times a year. The workshop subjects relate to the performance of the whole national power system and mainly include: analysis of the important past events (disturbances, emergency situations, etc.), main results from system operation assessment in the planned normal network operating conditions for the next season (including foreseen remedial measures), description of current rules for voltage and reactive power control, description of power system defense and restoration plans, and utilization of remote control systems for the power system components.

The regional workshops are organized for NCC, RCC, power plant and DSO personnel and take place twice a year in each region. Workshop contents includes the same topics as listed above for central workshops but related to the events and performance of this regional part of national power system where the training is organized by respective RCC. Additionally, it includes specific topics for the regional 110 kV network and issues important for power plant dispatching centre (e.g. technical constraints of generating units for active and reactive power generation) and for DSO control centres (e.g. 110 kV network development plans, load-shedding protection)

The technical visits for dispatchers are organized according to needs. The visits focus on getting practical knowledge of new or modernized power system components or facilities.

The simulator sessions for NCC and RCC dispatchers are organized and conducted by external party (DuTrain). They started in 2008 (three sessions) and continuation is planned in the forthcoming years. The sessions have been devoted so far mainly to system restoration issues where the restoration scenarios are prepared for this part of network for which the participating dispatchers are responsible at work.

Chapter B – Inter-TSO training

NCC dispatchers participate in the Inter-TSO workshops, which are organized according to the ad hoc agreements with other participating TSOs. Both bilateral and multilateral workshops took place in 2008. So far, the Inter-TSO trainings were organized in the form of workshops, but in year 2009 the first Inter-TSO simulator sessions are planned.

There were two bilateral Inter-TSO dispatcher workshops that took place in 2008 i.e. in January with Svenska Kraftnat dispatchers, and in May with Vattenfall Europe Transmission dispatchers with the main aim to exchange operational experience and discuss bilateral operational procedures.

In October the CEE Regional Dispatcher Workshop with participation of 8 TSOs from CEE region, RWE TSO and WPS was organized by PSE Operator S.A. (as a continuation of former CENTREL TSOs dispatcher's workshops) aiming at exchanging operational experience following recent changes in system operating conditions with a special attention on regional awareness system.

Chapter C – Training Organization and Dispatchers Accreditation

The dispatchers trainings and accreditations are organized and performed in PSE Operator S.A. in accordance with the internal document "System of qualification improvements of TSO operational staff".

For each year the schedule for dispatchers trainings as well as their contents are planned in advance.

The are two levels of accreditation for NCC dispatchers:
- lower level for dispatchers responsible for balance control (Position II)
- higher level for dispatchers responsible for system management (Position I - shift leader)

To become a dispatcher the candidate should fulfill specific requirements which are checked during the accreditation exam. The requirements are as follow:
- higher education in electrical power engineering,
- sufficient work experience (see description below),
- working knowledge of English language,
- knowledge of dispatcher's dedicated IT supporting systems,
- knowledge of dispatcher's instructions and agreements with neighbouring TSOs,
- completed initial training program, including on-the-job part, confirmed by dedicated trainer responsible for preparing the candidate to the accreditation exam (see chapter A),
- valid psycho-physical exam,
- valid certificate of inspection and operation of electrical devices,
- medical certificate showing no objection for work as a dispatcher.

After receiving accreditation the dispatcher still works under supervision at his new position (on-the-job work) until the supervisor decides to let him work on his own.

Usually, the candidates for dispatcher positions have work experience in NCC/RCC. For applying for the dispatcher Position II in NCC the candidate should work at least 2 years in NCC control room as a person responsible for monitoring, data collection and analysis of power plants operation or in NCC operation planning units or work several years as RCC dispatcher and complete at least 1-year internship in NCC operation planning units. Applying for the dispatcher Position I requires at least 2-year work experience at dispatcher Position II.

For external candidate (not from NCC or RCC), that would like to apply for dispatcher position, an individual initial training program has to be developed according to qualifications, work experience and knowledge of the candidate.

Chapter D – Basic requirements for Dispatcher Training Simulator (DTS)

Currently PSE Operator S.A. uses external service provider (DuTrain) for simulator sessions.

REDE ELÉCTRICA NACIONAL, S.A.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *REN – Rede Eléctrica Nacional*
Country: Portugal

Introduction

REN –Rede Eléctrica Nacional is the entity responsible for performing the Transmission System Operation in Portugal. The company is organized into several divisions, each one focused in specific areas namely, among others, network planning, construction, maintenance and System Operation.

The System Operation Division is organized into 3 small departments:

- The Control Centre, formerly known as the National Dispatch, composed by 16 people, one chief, 2 staff and 13 people on shift, to ensure the permanent presence of two people in the National Control Room located in Lisbon suburbs.
- The COR (Centro de Operação da Rede) where switching operations are performed, composed by 15 people, one chief, 2 staff and 12 people on shift, to populate also permanently the two working places in the Switching Operations Control Room located in Porto suburbs, 300 km to the north of Lisbon.
- The Studies and Development department, composed by 8 people, one chief and 3 staff. This team keeps the SCADA and EMS database and displays updated, detects and supports the EMS supplier in fixing software bugs. They also develop small new applications found to be needed by the dispatchers, whenever the problem is too specific to be outsourced. They do studies on their own initiative and/or on request by other company departments or by external authorities. They are also in charge of organising DTS sessions.
- The division has one chief and one secretary, giving a total of 41 people.

There is another division within REN, called "Market Operation" dealing with System Services market, with Statistics, Accounting and Settlement. As an oversimplification we use to say that while this division is concerned with Euros, the System Operation Division is concerned with the MWs and the kVs.

We have started this overview by describing the size of our organization to give a first idea of our operational context.

Chapter A - Training Programs

In our first EMS computer system, running from 1988 to 2000, we had an application called DTS but which was really a record and replay facility for incidents. The EMS system kept a circular buffer with all received messages for the last 15 minutes and on operator request was able to send all that data to a magnetic tape and keep sending all data to that tape till the operator stopped the recording. Afterwards we were able to replay the tape and see the event as many times as required. Everything was rather slow and difficult to operate and the facility was mainly used to assess the non delivered energy associated with an incident, by observing the power flow going out at the feeders before they had tripped.

We have installed our first DTS (Dispatcher Training Simulator) in the year 2000, together with the installation of a new EMS system. We have strongly stressed to REN board of directors that in order to have a functioning DTS there is the need for some staff to build the scenarios, otherwise it would be pointless to spend the extra money in this facility, and till now we have had enough resources. However these resources are not enough to set up, for example, training programs for other TSOs, that would require a much more complex organization.

We have initial program training for new dispatchers, built mainly around a set of training manuals written by retired dispatchers and updated as the need arises. Concerning the continuous training we try to keep 2 DTS exercises per year for every dispatcher and every switching operator. For every exercise we run 6 sessions of two days each, in order to train all persons in shifts.

Before starting to use DTS we contracted a session with the company Dutrain in Germany, to get a more detailed idea of how the DTS exercises should be run.

We have used as scenarios every big incident we have had in our network, we have invented total blackouts and we have also built future scenarios to prepare the operators to major changes in our network like, for example, when a new intertie with Spain is built or when a transformer phasor has been introduced. Sometimes (hopefully most of the time, otherwise the usefulness of the investment could be doubted) these new elements create very different power flows and we find it useful to train the dispatchers on these new flow patterns.

Chapter B – Inter-TSO Training

I have extracted the text within quotes from the file REN sent to UCTE (CMEP_2009_REN_additional questions_reply.doc) in the e-mail 2009-07-15, to give the context of our Inter-TSO training

«
The Portuguese network is connected currently by 7 tie-lines to the Spanish network, we have modelled it from the boundary till Madrid, whereas the REE EMS models the entire 400 and 220 kV Portuguese network, along with some 150 kV elements. So, both countries are very much aware of the electrical existence of the neighbour and of the need to know the neighbouring system, in order to manage the own system in a proper way.

That is why we have for several times mutually participated in DTS (Dispatcher Training Simulator) exercises of the neighbour.

We have frequent conversations between the dispatchers (several times a day) and, as the Portuguese and Spanish languages are similar we do not have to resort to English to understand each other, we use “spanguese” (Spanish+Portuguese).

REE has conducted in Nov/2007 a major exercise, simulating a regional blackout in northern parts of Spain and Portugal, where they have invited all GenCos and DSOs of the Spanish system together with the Portuguese TSO to actively participate in the exercise, by making manoeuvres and making requests by the phone as in a real situation. We have participated in the exercise with 8 people.
In this context of permanent dialogue, we have not felt the need to establish a formal agreement between the two TSOs concerning inter-TSO training.

»

In the year 2006 we had assistance of Spanish dispatchers in all 6 sessions of one DTS exercise in Lisbon. This participation has followed another visit of REE people to a previous DTS session in our premises.

We also had two IESOE (Regional organization including France, Spain, Portugal and Medelec countries) Worshops, in 2004 and 2005, attended by a couple of dispatchers.

Chapter C – Training Organization and Dispatchers Accreditation

We transcribe here once more the text within quotes from the file REN sent to UCTE (CMEP_2009_REN_additional questions_reply.doc) in the e-mail 2009-07-15,

first regarding the Organisation (S2):

«
Currently we have one training coordinator manager and one trainer, these two elements were selected internally in accordance with their profile. The manager is the head of the studies and development department, inside System Operator division, and the trainer was dispatcher for about seven years. The manager is also a teacher at a Lisbon University, and the dispatchers have enjoyed the previous exercises.
Despite not having a formal training of trainer plans, the company provides internal and external workshops in order to improve their knowledge.
»

and then the Evaluation (S3)
«
We require a university degree in electrical engineering but do not specify in detail which subjects are supposed to exist in the university course.
We do not have specified training procedures, we only have a set of topics to be covered, supported by appropriate documents and we are happy with the way the trainers carry out their job.
We do not have a formal process of dispatchers' accreditation but the trainer does an evaluation at the end of the training period and in the past we have had some people not being admitted in function of this evaluation.
Actually the main trainer of the new elements is the manager of the team on shift. We admit on average less than one element per year for work on shifts and we find that some aspects of this standard only make sense for systems much bigger than the Portuguese one …
»

We believe that the standards of Policy 8 for Chapter C are geared for much bigger organizations than REN. For example in S3-Evaluation it is required that the "trainer" forwards a relevant document to the manager of the candidate, whereas in our company the main trainer of the new element is the manager itself.

We rely on University degrees for the basic electrical engineering skills but we consider that, as the tasks performed by the dispatchers are so uncommon, there is not enough know-how about these

issues in other Portuguese organizations and, within REN, where there is no department specialized in internal training, the teaching must be done by people belonging to the System Operation Division.

In Chapter C we consider to follow the spirit of the Policy 8. Whenever we hire a new element he gets the training we consider adequate and observe its progresses. When the trainer/manager finds he is apt to start shifts accompanied by an accredited dispatcher he starts to do them and at the end of this phase the trainer/manager makes an evaluation to assess whether he will be able to do the job. Whenever the manager/trainer finds the person is capable of doing the job he makes the proposal to the board of directors. This is equivalent to a first accreditation since there have been cases where after the training we decided that the person was not fit for being a dispatcher. These situations are rare because we start from university graduates with good classifications, they pass through an interview where we try to eliminate the less promising ones and individually observe the trainee during its training period. Even after starting working as a dispatcher, there are a couple of periods where the contract is limited in time. Only afterwards we celebrate a contract without time limit. Any way the person may always be removed from the job, whenever the manager finds reason for it.

Chapter D – Basic Requirements for Dispatcher Training Simulator (DTS)

Our DTS is based on the EMS system and provides a user interface identical to the one used at the Control Rooms.

Before doing the switching operations in only one place for all Portugal we had 2 control rooms, one for the North and another for South. As the southern one was discontinued, we are using it for the DTS sessions. It may also provide a first backup for the National Control Room, which is locate nearby.

Since our system is rather small and strongly influenced by the network of Spain we had a strong incentive to exchange real-time data with our neighbor, for the running success of our Contingency Analysis. We have installed our first computer-to-computer link between the Lisbon and the Madrid dispatches in 1991, already 18 years ago, first with a proprietary protocol, running over a 2400 bit/s link, then changed to ELCOM-90 over a 9600 bit/s link in the year 2000, and more recently to TASE.2 over a 2 Mbit/s link, part of the Electronic Highway. So we have no problems with modeling the neighbor network.

Since we have some local automatisms in our substations, for example we automatically open all breakers of one substation whenever the voltage approaches zero (in order to speed up the restoration process), we have asked the DTS supplier to emulate those automatic functions, in order to maintain the realism of the simulations without too much work on scenario building.

So, generally speaking the representation of our system, together with the one from our neighbor is rather accurate.

We have had good feedback from the trainees after each session. The sessions have been deemed very interesting by them. They face there very rare situations for which they like to be prepared.

Lisbon, 18th of July of 2009
José Amarante

C.N. TRANSELECTRICA S.A.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: **TRANSELECTRICA S.A.**
Country: **ROMANIA**

Chapter A (Training Program)

Romanian TSO's training program = in compliance with OH/Policy 8, comprising initial training program and continuous training program.

Initial training = knowledge based instruction + on-the-job training + simulation sessions.

Continuous training = knowledge based instruction (advanced) + simulation sessions.

Preliminary actions and conditions: operators' selection, psycho-physiological testing

Training Program Stages:

A. *Preparatory stage* – for non-operator candidates only (non-operator candidates can be selected only for the Regional Dispatching Centers; for the National Control Center are selected existing operators only).

This stage = job orientation and introduction to the Company + educational/professional development. The future operator achieves basic theoretical instruction and introduction to the system operation; have to understand organizational structure of the power entities within power sector but the corresponding operational principles and rules too. He must to award basics for all equipments and system knowledge (power plants, network, substations, SCADA and communications etc.). This stage prolongs the length of the initial training program with 2 month minimum.

B. *The initial training proper part* (for existing operator)

Final goal = Operational job building-up and first certification acquiring.

B1. Theoretical part = advanced knowledge and operational rules based instruction + detailed equipments & system acquaintance = training modules (classical documentation/procedures & lectures) about facilities: network, generation, protection & automation/SPS, EMS/SCADA & telecommunication; power system operation and controls - principles, controls (f, V), reserves' management, maneuvers, disturbances analysis, generation scheduling, outage scheduling, electrical safety principles and system stability, system losses, balancing market etc.; operating under abnormal conditions - principles of power system dynamics, power system stability, power system in emergency, restoration.

this part = represents the beginning stage of the initial training and includes theoretical but practical awareness (short time of probations with power plants and/or transmission substations + on-site visits) → in compliance with Grid Code initial training statement.

B2. On-the-job training part = skills based instruction and behavior acquiring

An experienced dispatcher is nominated to be "tutor/mentor" of the candidate (the candidates have the possibility to choose one of recommended operators by operational

manager). Finally, the tutor has to issue a report about candidate's training and his conduct.

„On-the-job" time-period threads four stages:

- attendding the tutor's shifts and looking at his actions and decisions, learning from and helpping him („tutor's coupling shifts");
- attending the others operators' shifts and doing like („coupling shifts") = learning and memorising actions, speakings and operational behaviors from all the colegues;
- attendding the tutor's shifts and having the right to retail operational speaking without rights of deciding or resolving (this right is kept by tutor);
- post-exam stage = job under instruction = after the first certificate exam passing, the new operator has the right for deciding and resolving but under the inspection and control of the control room's manager (day-shifts only) – minimum two weeks, the manager can prolong this stage.

B3. Simulation sessions by DTS = Operator team-training (a team = shift leader + network dispatcher, randomly coupled);

For normal state – simulating switching sequences and maneuvers, testing EMS applications and AGC;

For abnormal condition - simulating "n – 1" criteria, analyzing the relevant past events by simulations, disturbances and restoration;

Simulation sessions for initial training and for continuous training are identical. A new candidate has to perform minimum one simulation session within initial training time period.

B4. Additional training part = in case of exam failure - preparing the re-examination for certification.

C. *Continuous training parts* = Periodic/Refresher training

Training methods and actions:

C1. Monthly training sittings (all the operators) = theoretical courses following a yearly curriculum + operational activity and performance analysis, event analysis, managers recommendations, operators requests for explanations etc.;

C2. Yearly courses = thematic and dedicated issues (i.e. controls, automations & protections, SPS, English Language, electricity market, stress management) - mainly updating knowledge – organized by training dedicated subsidiary of TRANSELECTRICA; the lectors can come from inside of the company, from outside (universities, others training companies) but there are specialized lectors too = employees of the training subsidiary;

C3. Practical equipment and system knowledge = by on-site visits: substations, power-plants, hydropower systems, distribution networks, important consumers, new equipments

(provided 10 days/year, operators are free to make their own yearly travel program feeling their needs and weakness);

C4. Additional training part = in case of exam failure = preparing the re-examination for certification → the weakness of the candidates only; the weakness are issued by the examining body and training coordination manager + self appreciated and requested by the candidate.

C5. Simulation sessions by DTS → see initial training (identical sessions)

D. *Internal operators' meetings*: Central CCs ↔ Regional CCs (usual/yearly) + Distribution Operators/Producer Operators/Consumer Operators (unplanned, programmed and organized by mutual agreements);

Chapter B (Inter-TSO training)

Precursory actions done:

- Within both initial training and continuous training, awareness of basic characteristics of the neighboring power systems, their topology (transmission network), communication and control systems and operational agreements are compulsory.
- After UCTE resynchronization (October 2004), basic theoretical instruction of the initial training and yearly curriculum of the continuous training were restructured having respect to UCTE Operational Handbook Policies;

From the guidelines P8-B-G3 are implemented G 3.1 = Cross visits between TSOs dispatchers and G 3.2 = Common training workshop.

A.) G 3.1 = Cross visits between TSOs dispatchers:

A.1.) G 3.1→ Romanian TSO organises every year (september, usually) an international dispatchers meeting inviting 2 operators from every neighboring country (power system) and others in region: Bulgaria, Croatia, Greece, Hungaria, Serbia, Slovenia, Ukraina – Lvov (for Burstyn island) + Ukraina – Kiev and Republic of Moldavia (UCTE integration candidates).

Goals: operators' mutual knowledge; participants' power systems/networks knowledge and on the whole regional system view; operational principles for every participant.

Issues and discussions:

- power system and network descriptions for every participant; Grid Code statements;
- tie-lines and mutual agreements presentations;
- operational principles and rules awareness for various present countries; common rules, differences and peculiarities;
- operational principles and rules for power systems in emergencies/restoration for every country; experience exchanges;
- restoration solutions and capabilities for each power system; help possibilities and interconnection based restoration rules – discussion and case studies;

- specific operational problems for every power system and informal description of the operational job/activity;
- efficient interaction and oral communication and information exchange between operators;
- professional English Language practicing;
- socializing and mutual professional understanding between different operators.

A.2.) G 3.1 → Romanian dispatchers attend all the similarly meetings organized by other TSOs. There are 2 participants usually: one shift leader + one network dispatcher.

Generally, the goals and subjects are the same, but there are other issues too and different approaches for the same problems and operational activities.

B.) G 3.2 = Common training workshop:

Starting with 2009 the Romanian international dispatcher meeting includes a thematic workshop; duration = 1 or 2 days (the meeting will be with 1-2 days longer).

The topic: Discussions about Romanian operational procedure *„OPERATIONAL ACTIONS OF THE NDC OPERATORS IN CASE OF MAJOR PERTURBATION IN UCTE INTERCONNECTION" (code: TEL – 07.III AV-DN).*

Goals:

- mutual operational awareness for the present TSOs;
- to compare the similarly procedures, principles and rules for regional NDCs;
- experience exchanges about;
- to find out the common principles and to analyze the necessity and possibility to agree common rules and actions for regional power systems in emergencies;
- to find out the restoration modalities in each power system and to identify possible common solution for helping and supporting in case of;
- improving interaction and oral communication and information exchange between operators;
- to agree common professional English vocabulary/language for such situations;
- to create basic understandings for future common training.

Intention: every year another topic, but there is the possibility to keep this topic for the next 1 – 2 years (the neighboring/regional TSOs feed-back is very important, the necessity to develop the subject in detail will lead to the topic's maintaining).

Chapter C (Training Organization and Dispatchers Accreditation)

July 2008 – within operational management department the training coordination job position was created and a shift leader operator was appointed training coordination manager.

Main objectives: to coordinate the training processes for all operational staff and to put in operation the AREVA – DTS.

Starting with 2009 the training organization was upgraded including DTS simulations.

A new appropriate revision of training operational procedure was issued.

It was proceeded both initial training and continuous training observing the Grid Code statements but in compliance with OH – Policy 8 too.

The theoretical/knowledge curriculum was upgraded taking in account the training structure stated by Policy 8 (the minimal topics list and bibliography, new topics, the topics thread, the timetable, responsible persons and lectors).

The simulation sessions were included in the training program and the simulation instruction process started. The simulation training is performed every three month (in these month simulation session replaces theoretical/traditional meetings).

The evaluation exam for first certification and for yearly examinations was kept likewise but the examining board structure was re-manned with training coordination manager. The training coordination manager has responsibilities for:

- To readjust training program and timetable having respect of candidates needs;
- Intermediate exams of the candidate (within initial training time period), if necessary or if requested by candidate;
- First certification exam preparation (pipe opening) for the candidates;
- To issue the exam protocol paper, containing the results and the recommendations for the new operator but for operational manager too (based on the ascertained new operator's strength and weakness): knowledge and skills to develop, issues to deeply aware, practices to perform for skills, competences and experience gain, equipments and power system body parts to know more in detail etc.

The dispatching job requirements were subjoined to training operational procedure and were correlated with the job description paper, comprising:

- Job experience, emphasizing operational experience (system knowledge & operator functions and activities identifications and performance);
- Professional and technical knowledge and competence level;
- IT/PC skills (especially EMS/SCADA systems);
- English Language skill;
- Personal psycho-temperamental profile: logical/reasoned, orderly and self – consistent habit of mind and ideation, well communication ability, high decision-making capability and stress stamen, nerveless and non–emotional (if possible).

The initial training is anteceded by a recruitment and selection process based on above dispatcher required qualifications. A psycho physiological test is effectuated every 2 years.

The dispatchers' accreditation has annually validity and is renewed every start of the year (Grid Code statements).

For training coordination manager job requirements were defined and job description was issued; the job requirements are related to: professional knowledge, experience and competence; job experienced = enough utilities experienced + a long time experienced on

operator position (network dispatcher + shift-leader dispatcher); IT/PC skills (above average); English Language good skill; well communication ability and pedagogical skills (clearly and methodic ideation and speaking); nerveless, fair and impartial.

In 2009 a pedagogical program for training coordination manager started, including a trainer psycho-pedagogical module and a competence evaluation module.

Chapter D (Basic requirements for DTS)

The Romanian EMS/SCADA system is an AREVA system, based on E-terra Energy Management Platform.

Consequently, the training simulator is an integrated DTS, based on the EMS applications provided by the E-terra – AREVA software platform (the DTS environment can be thought of as being similar and parallel to the EMS environment).

Data bases for EMS applications and DTS are the same. In addition, DTS works with a dedicated relay data base (overcurrent, overpower, voltage, frequency, generic frequency and synchronism relays). The neighboring networks data base are included in compliance with UCTE OH – second loop for every neighbor.

The DTS possibilities for run simulations:

- operation during normal states, simulating outages, faulted events, “n-1” criteria simulation, frequency control and slow dynamic of power units, load shedding etc.;
- operations in case of emergencies situations - severe and extended disturbances and blackout preventive actions;
- restoration;

DTS can be used in an experimental and investigatory manner to re-create past actual operational scenario and to study the behavior of the actual system, as well as, to study the behavior of EMS functions under those circumstances.

DTS application is used for off-line studies and power application running (closed-loop test bed for enhancements to EMS functions or for AGS tuning).

The DTS may also be used to perform operations planning and programming studies and for train dispatchers to use this studies during the operational activity.

JP ELEKTROMREŽA SRBIJE

JP EMS

Chapter A: Training Programs

Initial training

The structure of the training program is defined in the document "Instructions for the Dispatcher's Training". In this document it is defined how to perform both initial and continuous training for dispatchers. The translation of the reference list of English technical terms to Serbian language is a part of the document "Instructions for the Dispatcher's Training". Duration of the initial training program by each topic is shown in the table below.

Name of the subject	Duration (in work days)
Electricity Sector – Legislation Frame	5
Structure of the Electricity Sector	10
Power System Technical Characteristics	5
Power System Control	175
Coordinated Disconnection Planning	10
N-1 Security Analyses	5
Daily Power System Schedule	10
Interconnection	10
NTC calculation	5
Telecommunication System	5
Preconditions for Connection to Transmission System	2
Power System Development	3
Electricity market	5
English language	if needed
	∑ 250

Initial training includes both theoretical and on-the-job part. On-the-job part is implemented in the shift, where trainees work under the supervision of the shift-leader and senior dispatchers. DTS is integrated in SCADA/EMS system, but simulator sessions are not a part of the dispatcher's training because DTS is not fully operational yet. We expect DTS to be fully operational by the end of 2009, and after that simulator sessions will be a part of both initial and continuous training. Initial training lasts one year and it is organized by Training Manager who is responsible for implementation of all aspects of the training.

Continuous training

Continuous training in JP EMS is organized in two parts: periodical and additional training.

Periodical training

The regular meetings of dispatchers of National Dispatching Centre are organized every 2 months. The events in the previous period are analyzed, amendments of legislation and internal acts are presented to dispatchers, and any other subjects which are interested for dispatchers are discussed at these meetings.

Periodical training with dispatchers of Regional Dispatching Centres is organized annually. Every dispatcher of National Dispatching Centre and Regional Dispatching Centres must attend this two-day training.

Trainings with dispatchers of neighbouring TSOs are organized periodically, as work-shops or cross visits.

Testing is performed periodically, every 5 years.

JP EMS is aware that dispatcher's job is very stressful. The 'Study on dispatcher job characteristic', evaluating impact on human health, was done, and as a result of this study dispatchers in National Dispatching Centre of Serbia work 36h per week (other employees in JP EMS work 40h per week).

Stress management sessions are also periodically performed by relevant institutions.

Additional training

Additional training is performed in these situations:

- There are new circumstances in the power system;
- New procedures or new technologies are implemented in the operational management of power system;
- Dispatcher is not familiar with some parts of initial training;
- Dispatcher makes mistakes performing tasks;
- Dispatcher has not been working for a longer period of time.

Testing is organized after performing the additional training.

English training

The precondition for a candidate to apply for a dispatcher's job is to have good knowledge of English language. English courses are organized for all employees in relevant schools and institutions periodically. Dispatchers can voluntary join the courses in order to improve their knowledge of English. Dispatchers whose knowledge of English is unsatisfactory are obliged to attend the English courses.

Chapter B: Inter-TSO Training

Inter-TSO training agreements

Bilateral Agreements concluded between JP EMS and adjacent TSOs do not consider common training, except the one with EPCG, but this does not means that inter-TSO training is not carried out.

JP EMS is aware that inter-TSO training is an important part of the training process for each dispatcher. We think that knowing each other on personal level enables dispatchers to have easier communication. Also, having knowledge of neighboring networks makes understanding of problems and providing mutual help easier. Practice of cross-visits and dispatcher's work-shops was established in JP EMS long ago.

Implementation of common training program (neighbor by neighbor)

Dispatchers of JP EMS attend the work-shops that are organized annually by MAVIR and Transelectrica. We plan to organize a dispatcher's work-shop in 2009 and after that to establish regular procedure every two years. Cross-visits will not be neglected after establishing work-shops, but for TSOs with many borders, like JP EMS, is difficult to organize cross-visits for every dispatcher and for every adjacent TSO.

After inter-TSO training is performed, the participant is obliged to pass all relevant information to other dispatchers.

JP EMS - EPCG

Cross-visits are implemented as inter-TSO training between JP EMS and EPCG. There is also practice for dispatchers trainees of EPCG to spent one week on-shift period in National Dispatching Centre of Serbia.

JP EMS - MEPSO

Cross-visits are implemented as inter-TSO training between JP EMS and MEPSO.

JP EMS - ISO-BiH

Cross-visits are implemented as inter-TSO training between JP EMS and ISO-BiH.

JP EMS - ESO-EAD

Cross-visits are implemented as inter-TSO training between and ESO-EAD. We meet each other at work-shops organized by Transelectrica, as well.

JP EMS - Transelectrica

Dispatchers of JP EMS regularly attend dispatcher's work-shops that are organized by Transelectrica annually. We meet each other at work-shops organized by MAVIR, as well.

JP EMS - MAVIR

Dispatchers of JP EMS regularly attend dispatcher's work-shops that are organized by MAVIR annually. We meet each other at work-shops organized by Transelectrica, as well.

JP EMS - HEP-OPS

There is no common training between dispatchers of JP EMS and HEP-OPS. Dispatchers of JP EMS and HEP-OPS meet each other at work-shops in MAVIR and Transelectrica. Cross-visits will be established in 2009.

Content, frequency and duration of inter-TSO training sessions (neighbor by neighbor)

ALL ADJACENT TSOs

Contents of dispatcher inter-TSO training usually cover the following topics:

- Power System characteristics
- Bilateral Agreements and relevant internal procedures
- Analyses of major disturbances
- Coordinated Power System restoration.

Inter TSO trainings are held at least once in two years. Duration is 2 - 5 days.

Report of JP EMS - Chapter C: Training Organization and Dispatchers Accreditation

Coordination of the training (Training Coordination Manager)

JP EMS appointed a training coordination manager in 2008. Candidates for this job have to be familiar with every aspect of dispatcher's work. In our opinion experienced dispatchers are the most suitable for the position of a training coordination manager. We also recognize that pedagogical skills are necessary for trainers to implement all aspects of training and to translate their knowledge to students. The current training coordination manager in JP EMS has 22 years' experience of working in the shift (he worked 14 years as a dispatcher and 8 years as a shift leader). He also possesses pedagogical skills (finished pedagogical course) and proved himself by successful training of many dispatchers while he worked as a shift leader.

Organization of the Training

The first precondition for candidates to apply for a job of a dispatcher is to have a degree of Faculty of Electrical Engineering. Principal subjects required for the dispatcher's job such as relay protection, power system analysis, power plants, electricity market, etc. are learned at the Faculty of Electrical Engineering, departments of Electrical Power Systems or Electrical Machinery. The second precondition for candidates is to have a good level of knowledge of English language. The English test is performed for all candidates. All candidates must be familiar with computers. Before becoming the trainees, the psychological condition of chosen candidates is checked in the corresponding institution.

Initial training lasts one year. The list of topics for the initial training with duration of each topic is shown in Chapter A. At the start of the training process each trainee gets the training program. Training coordination manager is responsible for designing, following-up and updating the training process. He is also responsible to provide all necessary documents to trainees. Documents required in the initial training are:

- Legislation in energy sector
- Technical characteristics of generators in Serbian power system
- Technical characteristics of lines and transformers in Serbian transmission system
- Organization of generation and distribution companies
- Relay protection (including all types of protection systems for lines, transformers and some generator protections)
- Grid Code
- UCTE Operation Handbook
- Bilateral Agreements with adjacent TSOs
- Emergency energy agreements with adjacent TSOs
- Market Code
- Contracts for system services

- Instructions regarding authorities of National and regional dispatching centers with category of 400 kV, 220 kV and 110 kV elements of the transmission system
- Under-frequency protection plan
- Load shedding plan
- Restoration plan
- Overloading protection plan for lines
- Operational instructions for 400 and 220 kV transmission facilities
- SCADA/EMS manual
- Internal procedures in National dispatching centre

Training coordination manager is responsible to organize lectures for each part of the initial training. For some parts experts in specific fields are engaged to present lectures to trainees.

Every three months training coordination manager performs testing for trainees and makes evaluation of their improvement. After finishing the training program trainees are examined by Commission which evaluates the knowledge and skills of trainees and their ability to become dispatchers. If trainee passes the exam Commission issues the license to work as a dispatcher. At least the next two years new dispatcher has to work in the shift only with senior dispatchers.

Validity duration of dispatcher's licenses is not legally limited, but regular exams, in order to confirm the license, have to be organized every 5 years. Renewing dispatcher's licenses is not a practice in JP EMS, but for dispatchers who have not been working for a longer period of time, or for those who make mistakes performing their tasks, the additional training is organized. After performing the additional training testing is obligatory.

REPORT OF EMS - Chapter D: Basic requirements for Dispatcher Training Simulator (DTS)

DTS is integrated in SCADA/EMS system. The EMP DTS is an off-line environment that:

- Emulates an energy control centre's EMS;
- Simulates the physical power system.

DTS uses the same interfaces and, in fact, is composed of much of the same software as the real-time EMS. The DTS uses the same power system applications, displays, and controls as the dispatcher uses in the energy management system.

The major DTS applications are:

- DTSPSM - Power system Model;
- DYNAMICS - Simulates prime movers and relays;
- POWER FLOW - Calculates power flow solution;
- INSTRUCT - Provides simulation control and event scheduling;
- SCADA - Supervisory control and data acquisition;
- RTGEN - Automatic generation control and scheduling;
- ALARM - Alerts the operator for abnormal conditions.

Primary use of DTS is the training of dispatchers for normal and emergency scenarios in a controlled, safe off-line manner.

Other uses of DTS are:

- Real-Time predictive and analysis tool;
- Engineering tool for operations planning;
- Tuning of EMS applications;
- Test-bed for new EMS functions;
- Check of databases before on-lining;
- Demonstrations.

DTS Power flow calculates the state of the electrical network based on:

- Network topology changes;
- Load schedules;
- Prime mover mechanical power.

The network evaluation is done as follows:

- The simulator updates mechanical power input from the prime movers to the generators once every integration time step;
- Power flow typically runs every 8 to 10 seconds for large systems. However, it can be varied by the instructor;
- Voltage and over-current relays are evaluated after each Power flow solution;
- Frequency relays are evaluated after each DYNAMICS solution;

The DYNAMICS function simulates prime movers and relays, and calculates island frequencies. Long-term dynamic models are used. Transient responses and intermachine oscillations are not modelled.

The Instructional Subsystem provides means for the instructor to:

- Load and initialize DTS databases in the DTS environment;
- Save, retrieve, and remove DTS savecases;
- Start, stop, or pause the simulation;
- Set or reset simulation time;
- Define and modify event scenarios.

The instructor sets up scenarios including such events as:

- Equipment outages
- Relay actions
- Unit output changes
- Communication failure.

Using these predefined events the instructor can simulate the actions of:

- Power plant and substation operators;
- Neighbouring utility dispatchers;
- Emergency operations;
- Acts of nature implementer.

Dispatcher trainees learn how to respond to these actions while the instructor evaluates their progress.

ELEKTRO SLOVENIJA D.O.O.

UCTE Compliance Monitoring Process 2009
Overview of the TSO's training system

TSO: *Elektro-Slovenija, d.o.o. - ELES*
Country: Slovenia

Chapter A: Training Programs

Training is organized and performed according to internal regulation "Usposabljanje operativnega osebja, OP K 7.5.3".

Initial training program
It is composed of the theoretical part and on-the-job part where the candidate combines the already gained theoretical knowledge with practical experiences. The initial training program is complemented also by Dispatcher Training Simulator (DTS) sessions.
During the initial training the candidate gains the following knowledge:

- General knowledge of the organizational structure of the company
- Perfect knowledge of electric power system of Slovenia
- Operation conducting of electric power system of Slovenia and the Control Block SLO-HR-BIH (Slovenia, Croatia, Bosnia and Herzegovina)
- Communication and cooperation with partners
- Conducting of operation documentation (Operation logbook, Dispatch book, elaboration of daily reports and reports of special operational events)
- Basic documents of ELES company (Collective agreement of Elektro-Slovenija, Act of the company Elektro-Slovenija, d.o.o. about systemization of working place, Document on formation of inner revision service within the public enterprise Elektro-Slovenija, d.o.o., Regulations on organization of Elektro-Slovenija, d.o.o., Statute of Elektro-Slovenija, d.o.o., Order on transforming the public enterprise of Elektro-Slovenija, p.o., into the public enterprise Elektro-Slovenija, d.o.o., Price list)
- Law frames which define the functioning of the electric power system (UCTE Operation Handbook, Energy Act – EZ, Grid Code for Slovenian power system – SONPO, Decree on the method of performing of business public duty Transmission System Operator, Decree on limiting of consumption of electrical energy in the electric power system)
- Mutual agreements with the neighboring TSOs and contracts for assuring of system services
- Operation instructions for lines and measures of operator in case of appearance of signals from 400, 220, 110 kV substations
- Introduction with software used in National control center:
    - Energy Management System Siemens Sinaut Spectrum (including SCADA, Automatic Generation Control, State Estimator),
    - NEPLAN – for load flow calculations,
    - VULCANUS,
    - ETSO – Scheduling Client,
    - ETSO – Vista,
    - Wide Area Measurement System;
- Introduction with software used in Regional control centers:

- Energy Management System Siemens Sinaut Spectrum (including SCADA, State Estimator).

A candidate/probationer, after the concluded one-year trainee period under the conduction of his mentor who instructs him at work, performs an internal test in front of three-member expert commission. It estimates if the candidate has achieved the estimated extent of theoretical and practical knowledge and if he has the adequate personal features which are necessary for the successful work (determination, communication). After the successfully performed trainee exam the candidate continues with the initial training which lasts one year more. If the candidate is not a probationer and he already has working experiences in the electric engineering he performs the first test of knowledge after five months.
After completed initial training the candidate performs the internal expert examination in front of the three-member commission which estimates if during the initial training the candidate has achieved all the necessary knowledge for the independent work as a dispatcher in the control center.

External training program
The candidate for operator in the control centre has in accordance with the energetic law following "The Rules on expert education, working experiences and compulsory training as well as the manner of the knowledge test of workers which perform the works and duties of energetic device conducting (Gazette of the Republic of Slovenia nr. 30/83, 31/84 and 1/87, Gazette of the Republic of Slovenia nr. 79/99 and 51/04)" to perform the first and periodical tests of knowledge for performing the works and tasks of "Electric power dispatcher" in front of the commission of the "Zveza društev energetikov Slovenije" which is nominated by the "Ministry of economy" from the following areas:

- Functioning of the electric power system,
- Electric power devices and electrical measurements,
- Technical normative and standards,
- Law settlement of energetic,
- Protection and information systems,
- Security at work,
- Security from fire,
- Environmental protection.

Training before performing the examination is organized and performed by the "Izobraževalni Center Elektroenergetskega Sistema – ICES" and lasts 35 hours. The candidate, who passes the examination, receives from the expert commission the certificate on national professional qualification on efficiency for performing the work and tasks of "Electric power dispatcher" with the time of validity of five years.

Continuous training program
It is applied to all dispatchers who have successfully performed the initial training program and have started with the independent performance as dispatcher in the control center.
The purpose of the continuation of education is to complement and to renovate the knowledge, gained by the initial training program. It is composed of additional theoretical knowledge and instruction hours on a Dispatcher Training Simulator where different scenarios are being trained.
The advanced theoretical part is provided for example in case of installation of new equipment (such us pumped storage power plant, wind power plant, new type of protection relay, special topology scenarios) in the Slovenian and adjacent TSO's electrical power systems.
At least once per year dispatchers are trained also on Dispatcher Training Simulator where on the simulated special operational event renew and upgrade their knowledge. Furthermore, DTS is used also for training of use of EMS, Neplan, WAMS functionality etc.

Dispatchers are informed about new rules and procedures and also about any changes in the existing ones.

Learning of foreign languages
A good knowledge of English is necessary to be accepted for the dispatcher in National control center. If it is evident that a dispatcher has problems in communication with the neighboring operators, he is recommended to attend the language course. During the period of initial training the candidate for the dispatcher learns also the necessary technical terms in English. All dispatchers in the National control centre speak and write in English fluently.
The reference list of technical terms (appendix 8 – Terminology) in English with translation to Slovenian language is available in the National control center.
In the National control center and in Regional control centers dispatchers speak also Croatian in communication with HEP-OPS dispatchers.
In the Regional control centre of Nova Gorica dispatchers also speak Italian in communication with TERNA dispatchers.

Chapter B: Inter-TSO training

Every year dispatchers perform at least one of inter TSO activities according to Policy 8.

Cross visit between ELES and TERNA dispatchers
It was going on in the period from September to December 2006. Two days program included all the dispatchers from both sides who in six groups alternatively visited the premises of ELES and TERNA.
The program included:

- presentation of basic features of the company,
- presentation of basic features of the electric power system,
- presentation of the organization of the electrical energy market,
- visit of the National control center,
- meeting and making acquaintance with dispatchers,
- exchanging of operational experiences,
- expert discussion on common problems.

Cross visit between ELES and SWISSGRID dispatchers
In the year 2007 in the month of April ELES and SWISSGRID performed a common expert visit of five-member group of representatives of dispatchers.
The two-days program included:

- presentation of basic features of the company,
- presentation of basic features of the electric power system,
- presentation of the organization of the electrical energy market,
- visit of the National control center,
- meeting and making acquaintance with dispatchers,
- exchanging of operational experiences,
- visit of pumped storage power plant Wehr 4 x 250 MW.

Common training workshop: CEE regional dispatchers workshop

In September 2008 two ELES's dispatchers attended the first common training workshop of dispatchers in the CEE region of 8 TSO's (ELES, APG, MAVIR, SEPS, PSE-O, VE-T, EON, ČEPS), organized by the Polish TSO PSE-O, which was held in Belchatow in Poland. Two representatives from each TSO participated at the workshop.

Two days program included:

- presentation of basic features of the company,
- presentation of basic features of the electric power system,
- presentation of actual experiences in the use of the CEE Regional Awareness System,
- meeting and making acquaintance with dispatchers,
- exchanging of operational experiences,
- expert discussion on common problems,
- visit of thermal power plant Belchatow 4000 MW.

Expert visit ELES in NOS-BiH

In October 2008 seven-member delegation of dispatchers from ELES visited the enterprise NOS-BiH.

Two days program included:

- presentation of basic features of the company,
- presentation of basic features of the electric power system,
- visit of the National control center,
- meeting and making acquaintance with dispatchers,
- exchanging of operational experiences,
- visit of hydro power plant Rama 2 x 80 MW.

Cross visit between ELES and HEP-OPS dispatchers

In April 2009 an eight-member delegation of dispatchers from HEP-OPS visited the enterprise ELES.

A one-day program included:

- presentation of basic features of the company,
- presentation of basic features of the electric power system,
- visit of the National control center,
- meeting and making acquaintance with dispatchers,
- exchanging of operational experiences,
- presentation of scheduling department,
- visit of dispatcher training simulator premises.

In May 2009 a cross visit of ELES dispatchers at HEP-OPS is anticipated.

Chapter C: Training Organization and Dispatchers Accreditation

The head of the Department for training of operators is responsible for the training organization, preparation of program and testing the qualification of dispatchers and trainers. He cooperates with the nominated members of the working group for preparation and performing of the training program for dispatchers.

Before the training the list of the necessary knowledge from different areas that the dispatcher has to be familiar with, is prepared in advance.

The evaluation of the dispatcher's knowledge and qualifications is carried out according to the internal rules.
Experts from different areas that are being trained within work are nominated into the working group for preparation and performing of training program for dispatchers. The experts for specific application attend individual outsourced courses and workshops on mutual communications, relations with employees and motivation.
At the end of the whole year of the probation period, a probationer performs the first examination of knowledge in front of the expert commission. After the successfully performed examination he continues with the initial program. The candidate who already has experience in electrical engineering performs the first examination of knowledge after five months. After finishing the initial training the candidate performs another internal examination of knowledge in front of an expert commission.
After the internal expert examination and gaining of the national qualification, the candidate is certified as dispatcher. Minutes of the meeting of internal examination and the national qualification are forwarded to the Personnel service.
ELES uses also outsourcing for education performed by "Izobraževalni center energetskega sistema - ICES" as described in chapter A.

Chapter D: Basic requirements for Dispatcher Training Simulator (DTS)

ELES's Dispatcher Training Simulator is integrated as a part of Energy Management System Siemens Sinaut Spectrum.
EMS applications in DTS system are exactly the same as basic EMS applications used in real-time. User interfaces and procedures (issuing commands, changing of settings) are the same as for real-time operation.
DTS simulator is used for periodical training of dispatchers from National control center and Regional control centers - simulation of different phenomena (every day and abnormal operational state).
Beside simulation of normal operational conditions also the following extreme operational conditions is possible to simulate on DTS:

- island operation,
- system collapse (partial or complete),
- system restoration after collapse – black start,
- house load operation of units,
- cascade loss of network elements,
- frequency drop/increase,
- voltage collapse,
- loss of network elements due to electrical protection activation,
- circuit breaker failure,
- normal/abnormal operation: communication subsystems, individual RTU's, individual process points (measurements, switching statuses, alarms and messages).

In the DTS premises there are two user interface workstations for EMS, one for trainee (dispatcher) and the other for trainer, and one small video wall. There are also computer with Neplan program for load flow and n-1 calculations, computer with Wide Area Measurement System and telecommunication infrastructure (telephones, fax) in order to provide realistic control room environment and conditions as much as possible.

SLOVENSKA ELEKTRIZACNA PRENOSOVA SUSTAVA, A.S.

CMEP 2009

A. Overview of SEPS training system

B. Training programs

SEPS provides SEPS dispatchers a structured training program. The program consists of an initial program with minimal duration of 6 months, a continuous program and English courses.

For a dispatcher position there are prescribed basic requirements. A dispatcher candidate has to be a graduate of a proper technical university and has to speak English. Dispatcher candidates are duly selected with a special commission.

After being selected a dispatcher candidate has to attend an initial training program. The initial training program consists of theoretical part focused on power system operation, computer control system and relevant legislation. Theoretical part is completed by exam. Duration of the theoretical part is 3 months.

After the theoretical part, a candidate has to attend 2 weeks of simulator training. Currently, SEPS utilizes an external simulator in the NPP research institute. Training on simulator is focused on switching procedures.

After the simulator training part, training on the job follows. A candidate works in a dispatcher team together with experienced dispatchers to gather basic practical experience. Training on job runs from 2 to 3 months.

A candidate finishes the initial program with a special commission exam. After this exam, a candidate may work in a dispatcher position.

SEPS organizes a continuous program. Lectures on important hot topics are organized with an external relevant lecturer. All dispatchers meet monthly on a regular dispatcher meeting, where current operational aspects and new rules are analysed and discussed. The continuous program is going to be improved from 2010. Continuous training will be performed at least every 2 years with 40 hours duration with DTS session.

Ability to speak English is a basic requirement for dispatchers. Therefore English advanced courses are organized for dispatchers.

C. B. Inter-TSO training

Regular yearly dispatcher meetings are organized in CEE region. SEPS dispatchers take part in these meetings. These meetings have common training workshop form.

D. C. Training organization

A head of the dispatchers and an executive director for system control are directly responsible for dispatcher training coordination and organization. Organization of training in SEPS respects the most parts of the standards defined in Chapter C. Trainers are the head of dispatchers and the most experienced dispatchers.

E. D. Basic requirements for DTS.

A project of implementation of DTS started in 2008. The aim of the project is implementation of fully functional integrated DTS and overall procedures for dispatcher training in SEPS.

Overall procedures for dispatcher training were already worked out in a document "Professional training system for dispatchers". These procedures are worked out fully respecting Policy 8 and will be implemented in SEPS internal regulations during 2009. Functional DTS will be available in 2010.