



PRESS RELEASE

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Interim Report¹ of the Investigation Committee on the 28 September 2003 blackout in Italy

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Brussels - Grid operators of the five countries involved in the blackout (Austria, France, Italy, Slovenia and Switzerland) released a joint Interim Report investigating the reasons why the sequence of events evolved from a single line trip in Switzerland into the impossibility for the Italian system to operate separately from the European network.

The Committee was set up within UCTE, the association of transmission system operators for the coordination of the electricity interconnection in mainland Europe. The blackout is the main incident UCTE had to face since its creation in 1951.

The Investigation Committee

In the immediate aftermath of the 28 September 2003 blackout in Italy, Transmission System Operators' (TSO) executives of the five involved countries (Austria, France, Italy, Slovenia and Switzerland) met within the framework of UCTE and decided to set up an independent UCTE Investigation Committee that was given the mission to bring a transparent and complete explanation of the blackout to the national and European authorities and to the general community.

It was agreed that all required data would be provided by the operators of the five countries to the Committee that should operate in full transparency. The Committee, with the full cooperation of these operators, comprised, apart from representatives of the involved countries, experts from Belgium, Germany, the Netherlands and Spain.

The interim report gives a factual description of the sequence of events, followed by a technical analysis and the Committee's findings on the main causes of the incident. Several issues are listed that will be further investigated.

¹ The interim report is available on www.ucte.org (Publications)



Context

It must be emphasized that the original function of the interconnected systems is to form the backbone for the security of supply and to reach its required high level at reasonable costs. To this aim the system has been developed in the past 50 years with a view to assure mutual assistance between national subsystems including common use of reserve capacities and, to some extent, to optimize the use of energy resources by allowing exchanges between these systems. Today's market development with its high level of cross-border exchanges was out of the scope of the original system design. It has led the TSOs to operate the system close to its limits as allowed by the security criteria. The blackout must be seen in this general context.

Nevertheless, the transmission system operators have in the last few years steadily improved the capability of the existing infrastructure to allow cross border exchanges; by using several measures such as, for example, computerised control and data acquisition, phase shifting transformers, coordination mechanisms and electronic data exchange between operators.

Sequence of events

The sequence of events was triggered by a trip of the Swiss 380 kV line Mettlen-Lavorgo at 03:01 caused by tree flashover. Several attempts to automatically re-close the line were unsuccessful. A manual attempt at 03:08 failed as well.

Meanwhile, other lines had taken over the load of the tripped line, as is always the case in similar situations. Due to its proximity, the other Swiss 380 kV line Sils-Soazza was overloaded. This overload was acceptable in such emergency circumstances, according to operational standards, for a short period. The allowable time period for this overload was about 15 minutes according to calculations by the experts.

At 03:11, a phone conversation took place between the Swiss co-ordination centre of ETRANS in Laufenburg and the Rome control centre of GRTN, the Italian transmission system operator. The purpose of the call was to request from GRTN countermeasures within the Italian system, in order to help relieving the overloads in Switzerland and bring the system back to a safe state. In essence, the request was to reduce Italian imports by 300 MW, because Italy imported at this time up to 300 MW more than the agreed schedule.

The reduction of the Italian import by about 300 MW was in effect 10 minutes after the phone call, at 03:21, and returned Italy close to the agreed schedule.

This import reduction, together with some internal countermeasures taken within the Swiss system, was insufficient to relieve the overloads.

At 03:25, the line Sils-Soazza also tripped after a tree flashover. This flashover was probably caused by the sag in the line, due to overheating of the conductors.



Having lost two important lines, the then created overloads on the remaining lines in the area became intolerable. By an almost simultaneous and automatic trip of the remaining interconnectors towards Italy, the Italian system was isolated from the European network about 12 seconds after the loss of the line Sils-Soazza.

During these 12 seconds of very high overloads, instability phenomena had started in the affected area of the system. The result was a very low system voltage in northern Italy and consequently, the trip of several generation plants in Italy.

Countermeasures were implemented within Italy in order to face a disconnection of the country and sudden loss of the import, for example automatic shedding of parts of the load. These measures were automatically activated, but, due to the loss of generation plants, it was impossible for the Italian system to operate separately from the UCTE network. About 2 minutes and 30 seconds after the disconnection of the country, the black-out was an unavoidable fact.

Security and reliability standards – safety of the system

The operation of the European interconnected electricity system is subject to security and reliability standards set within the framework of the UCTE cooperation.

A main principle underlying these standards is, that the system must be operated in such a way, that any single incident, for example the loss of a line, should not jeopardize the security of the interconnected operation. This is called the N-1 rule.

This rule also states that in case of loss of N-1 security the system must not only withstand the situation, but it is supposed to return to the N-1 secure state as soon as possible to resist a possible new event.

It implies that countermeasures must be identified and prepared at each moment and for each single incident, enabling the system to be brought back to a safe state when an incident occurs.

The Committee examined the state of the system just before the occurrence of the first event and the countermeasures that had been identified and prepared to tackle the loss of the Mettlen-Lavorgo line. The Committee's finding in this respect is that the system was complying with the N-1 rule at this time, ETRANS taking into account countermeasures available outside Switzerland.

In this specific case, the appropriate countermeasure for the loss of the line was the shutting down of the pumps in the pump storage plants in Italy, which are located close to the connection points of the Swiss tie-lines to Italy and therefore have a high influence on their loading. The pumping load in Italy amounted to about 3500 MW.

Shutting down the pumps in mutual support, when requested under emergency conditions by ETRANS, is operational practice, although there is no official procedure or special agreement between ETRANS and GRTN on this subject.



The Committee identified 4 main reasons for the fact that things did not go as foreseen.

Main reasons for the blackout

1. Unsuccessful re-closing of the Mettlen-Lavorgo line because of a too high phase angle difference

Due to the high loads on the remaining lines, an automatic device, aiming at protecting the equipment, blocked, according to its design settings, the possibility of restoring the line back into service.

2. Lacking a sense of urgency regarding the Sils-Soazza line overload and call for inadequate countermeasures in Italy

The operators were unaware of the fact that the overload on Sils-Soazza was only sustainable for about 15 minutes. A single phone call by ETRANS took place 10 minutes after the trip of the first line. ETRANS asked for the imports to be decreased by 300 MW. This measure was completed by GRTN within 10 more minutes. Even together with the Swiss internal countermeasures, it was insufficient to relieve the overloads.

3. Angle instability and voltage collapse in Italy.

As explained in the sequence of events, this was the reason why the Italian system collapsed after its separation from the UCTE system. It was not the cause of the origin of the event.

4. Right-of-way maintenance practices.

Tree cutting, to maintain safe distances regarding flashover, is subject to national regulation. Therefore, the Committee did not examine these practices.

Further work of the Committee

Several issues are listed in the report, which will be examined in the next stage.

Apart from the measures to be undertaken as a result of the lessons drawn from the blackout, further investigation will go into the issues dealt with in this report.

Attention will also be given to the not yet fully investigated phases of the blackout: the period between disconnection and blackout in Italy and the behavior of the UCTE system outside Italy.

Moreover, lessons learnt and action to be undertaken after the blackout will be part of the already ongoing work of the various working groups of UCTE.