

NEW TOOLS TO ASSESS CRISIS IMPACTS AT ERDF

Jean-Louis PORTEBOIS
 ERDF – France
jean-louis.portebois@erdfdistribution.fr

Marc CHAPERT
 ERDF – France
marc.chapert@erdfdistribution.fr

Alain MARTY
 ERDF – France
alain.marty@erdfdistribution.fr

ABSTRACT

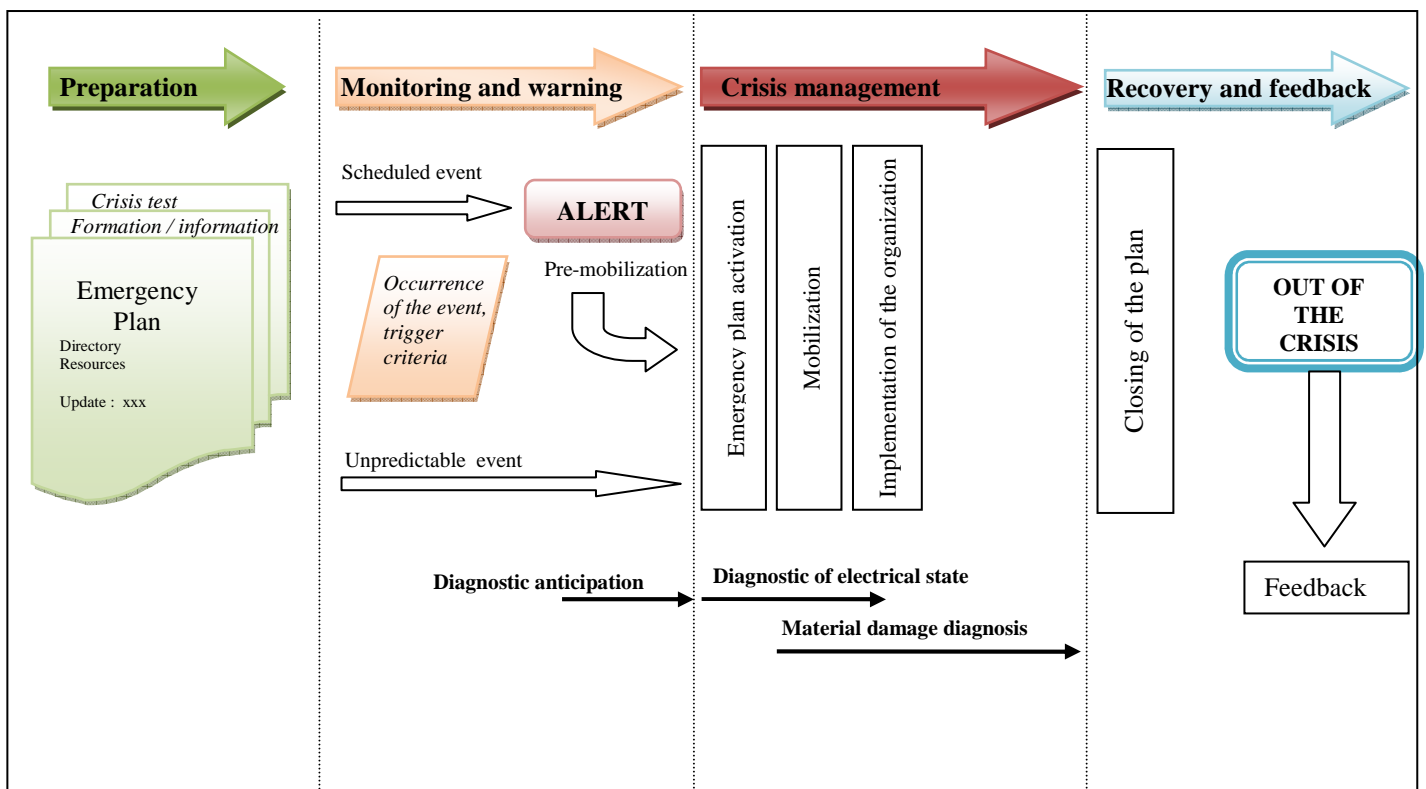
This document aims to present the main procedures in place within ERDF to anticipate and cope with major incidents on the French electricity network.

INTRODUCTION

Following a series of storms during last decade, starting with Lothar and Martin in December 1999 which had affected more than 3 million customers, ERDF has redesigned its organization in situations of extreme crisis.

To ensure a fast and efficient response to climatic events with a widespread effect on the power grids, ERDF has developed a strategy based on the following four priorities:

1. prior to the event, preparation,
2. immediately before the event, monitoring and warning procedures,
3. during the event, crisis management, and
4. after the event, recovery and feedback.



PREPARATION

Electrical Troubleshooting Action Plan

The efficiency of the power restoration process depends, first and foremost, on the Regional Directorates (RDs), which are responsible for repairing damage to the grid. Each RD develops crisis action plans according to its own specific circumstances. These plans describe the crisis management set-up, as well as the tasks and roles of those involved; they contain the contact details of all internal and external players, define the crisis management logistics and list any critical points in the grid, where the power supply must be restored first. They specify relations with the public authorities, the local authorities and the media.

Crisis exercises

At least once a year, a drill is organized to test the system and all those involved in it.

The yearly exercise aims to:

- allow everyone to take ownership of their role in the system, by placing them in situation,
- Test the plan : check the directories accuracy, evaluate the resilience and reactivity of the logistical procedure,
- ensure its consistency and operability within the internal organization and regulation which are subjects to regular changes,
- improve it thanks to post exercise feedback sessions.

PROCEDURES

By anticipating events and forecasting their potential impact on the grids, ERDF has more time to prepare its response and to take the appropriate decisions. ERDF has developed the following tools for this purpose:

Warning system

It provides information on weather conditions likely to cause widespread power outages, one or two days before they occur. To do so, it translates the usual weather forecasts - regarding wind, sticking snow and ice - into "industry-specific" data (50, 10 or 5 years storm.).

Damage & resources evaluation

A computer program provides an assessment of damage to the grids, according to the type of weather event, environmental data and experience of the past. As a result, ERDF is able to pre-determine the number of outages in the zone, with a reasonable degree of precision, and thus estimate the resources needed to bring the situation back to normal within a specific timeframe.

The information provided by these tools, which supplements the operator's knowledge of previous crises, enables the management to mobilize people and equipment as necessary 24h before the event even occurs.

Overall organisation

This takes place on three levels, reflecting the organization of the public authorities:

1. Regional : the RDs, which liaise with district crisis units (District Operational Centres);
2. Interregional: interregional directorates (IRDs), which liaise with defence area authorities (Defence Area Operational Centres);
3. National: ERDF's crisis unit, which liaises with government crisis units (Departments of the Ministries of the Interior and Environment, cross-ministries units).

The national crisis unit organizes cooperation between the IRDs and the RDs - sharing of resources (ERDF personnel and contractors), of generating sets and of equipment - and ensures the coherency of ERDF communications.

Rapid Intervention Force for the Electricity Network (FIRE)

ERDF set up the concept of "FIRE" after the storms in 1999. As a result, a rapid intervention force of over 2,000 fully-trained volunteers can be mobilized in less than 24 hours. FIRE provides back-up for local crews operating within the affected RDs. Therefore, counting ERDF personnel and contractors, up to 6,000 people can be mobilized.

In addition to these human resources, the teams on the ground must have fast access to all the technical and logistical resources that they need. ERDF's logistics procurement service provides generating sets, support structures, cables and network equipment via its logistics platforms, which are strategically located across France.

- 2,000 generating sets are kept in running order 24/7 in 3 logistics platforms. ERDF also has contracts with companies that rent out generating sets, so that it has access to 800 additional sets.
- 100 equipment kits are kept in reserve at SERVAL's eleven platforms for MV, LV overhead lines, and connections. In addition, 124 "flood" kits have been put together specifically for cleaning underground installations after a flood.

RECOVERY AND FEEDBACK

Immediately after the crisis, each level of authority (RD, IRD and national) provides its feedback with a view to identifying best practices and defining improvement objectives.

The action plans resulting from this feedback build on and enhance the crisis action plans developed by the RDs; they enable ERDF to capitalize on past experience and to approach the next crisis in a better prepared and more competent manner.

LAST MAIN EVENTS : LOAD RESTAURATION



TOOLS FOR RESSOURCES ASSESSMENT

Expected scale of the damages

ERDF has developed a tool to estimate the expected number of faults on MV and LV networks based on the number of MV lines impacted. Indeed, depending on the type of event (ice, snow, wind) and level of scarcity (occur in average annual, biennial, every five years etc.), it is possible to establish correlations and predict the extent of damage with a good level of accuracy.

The model then calculates the resources needed to repair the grid and to reconnect all the customers within a predefined deadline: the number of MV and LV teams, the number of generators to install ... It takes into account the operational complications (e.g. access to sites in case of snow storm) and severity of the damages (number of poles potentially destroyed)

Prospects for improvement

To better anticipate and improve responsiveness, ERDF continues to dig in two directions:

Enrich the existing warning system

By comparing the 10-year historical weather data and

historical MV incidents data, ERDF studies the possibility to improve the accuracy of the forecasted number of MV cables damaged, for every major weather event. The temporal mesh used for the study is the day the geographical mesh is the department.

Build a reliable diagnostic anticipation

The main idea is to consider the structure of networks and their environment (wooded areas or not) to calculate the expected number of MV incidents.

Whatever the method used, the results are then fed into the module resource assessment presented above.

ERDF objective - which is to anticipate the deployment of its resources on areas likely to be impacted by the event to improve its responsiveness - becomes achievable with acceptable reliability.

Implementation example

January 31, 2012, South east of France suffered a heavy snowfall which caused electrical outages for 130,000 customers. 49 MV lines were affected. The situation was completely restored February the 2nd, after almost three days of work.

The table below compares the real and forecasted situations:

Reconciliation	Real situation	Forecasted situation
Number of MV faults	123	123
Number of LV faults	161	157
Broken poles	53	56
Total workforce used (man day)	453	355
Number of generators connected	27	20

Forecasts accuracy proved to be excellent in the evaluation of the number of faults. The difference of the resource estimate is due to particularly difficult conditions of access to the intervention sites

CONCLUSION

The continuous search for improvements, especially based on past experiences, ensure to ERDF a strong position to meet its commitments: restore electrical power supply at least for 90% of its customers within 5 days in case of exceptional climatic event.