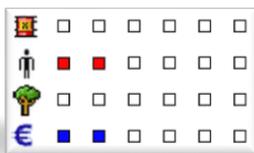


The end of the switched telephone network

In an emergency situation and primarily in the event of a power outage, only switched telephone networks (PSTN) are operational, as illustrated by the following accidents. The traditional operator's plan to abandon these networks in 5 years time in favour of VoIP solutions should be anticipated.

1st case (01/08/2008), Power outage and disruption of GSM networks (ARIA 36275):



The employees of a roof tile manufacturing plant detected smoke in an electrical room at around 11 a.m. The fire brigade and the electrical utility technicians arrived 10 minutes later. **The power was disconnected and the site locked out.** Upon entering the equipment room, the firefighters encountered a significant amount of flames and decided to extinguish the fire with carbon dioxide foam.

The incident was attributed to a direct lightning strike on the site at around 10:30 a.m. The strike was located around a lightning rod, not far from the substation. Electrical current travelling into the substation, probably through the earth conductor, set fire to a capacitor bank and caused a transformer to swell.

The consequences of the accident were quite serious. Following the lightning strike, **only three analogue phone lines remained in operation** and were very quickly saturated with incoming and outgoing calls. **The antenna of a mobile telephone operator powered by the factory was also affected.** As far as the plant's production operations are concerned, the kilns were stopped without artificial ventilation. **The site's intrusion protection system was also out of service (video surveillance, closure of gates, alarms, etc.).**

The operator had a lightning protection assessment performed on the facilities. The study concluded that the existing lightning rod was ineffective and it was determined that it had in fact been installed before several modifications were undertaken at the site. The manufacturer must modify its facilities accordingly. A global review of the location of the lightning rods, down conductor, earth connection, and the earthing network interconnection in the trench bottom must also be conducted.

The economic losses for the company were estimated at €550,000.

The switched telephone network (PSTN)

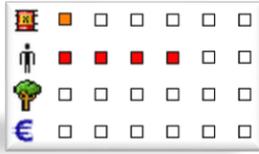


The PSTN is the historic landline telephone network, sometimes referred to as the analogue network as opposed to digital. On this network, subscribers are connected to a telephone exchange of the public network via a copper cable. In France, the golden age of this technology dates back to the 1980s, when the **Minitel** was launched. Since around 2005 and the advent of the IP protocol and the wide dissemination of 'Internet box' type Internet access offers, this is no longer the only means available for fixed line telephone services.

In 2016, approximately 13 million lines were still using the traditional switched telephone service (PSTN). However, analogue lines will no longer be marketed beginning 2018 in favour of optical fibre-based offers. The historical operator also plans to progressively phase out the PSTN by 2021.

The abandonment of the PSTN is dictated by the **ageing nature of the network and the difficulty in locating spare parts.** Furthermore, this is compounded by the fact that the technicians trained in its use are now retiring.

2nd case (15/11/1991), Chlorine leak following a voltage dip (ARIA 14438):



At 1:45 p.m., a chlorine leak occurred at a chemical plant producing titanium oxide (TiO) following an outage on the public electrical grid.

The company was operating in normal operating mode. In this mode, the gases produced by the chemical reaction (a mixture of chlorine, nitrogen, hydrochloric acid and carbon dioxide) are separated. In the event of a system failure, the gas is conveyed to a chlorine scrubbing unit via a vacuum created by two fans. At 1:40 p.m., an outage on the public grid was followed by a power failure on the company's emergency power system, causing the two fans to stop; 120 kg of chlorine gas was released at ground level. This situation occurred because the valve that directs the gases to the stack closes in the event of a power failure (safety design error).

The chlorine release went undetected, and no gas alarms were triggered because the chlorine went underneath the detection system, located at a height of 3 m. In any case, the gas detection system may have been unavailable due to the power failure.

At a neighbouring waste-disposal company, 32 employees working on the construction of an oven were overcome by a cloud of chlorine gas. The company informed the company responsible for the emission by phone. The power outage led to an overload of the telephone network, and it took 8 minutes for the company to inform the police via the chemical incident network line. Despite a chaotic evacuation process, the employees were taken hospital for medical examinations.

The operator reviewed its facilities to prevent dangerous situations in the event of a total loss of electrical power, and the steam-driven emergency generator was backed up by a diesel engine. The gas detection system was significantly improved with an additional detection system (fail-safe) and a link to the neighbouring company. The alarm procedures were also reviewed.

A few questions to consider to anticipate the end of the PSTN



Special attention should be given to industrial sites using analogue phone lines (alarm, supervision, telemonitoring, remote reading, lift emergency telephone lines, etc.).

- Is the abandonment of the PSTN anticipated?
- Has the equipment likely to be affected been identified? Is it compatible with VoIP? What are the industrial safety issues?
- Are sustainable solutions envisaged to deal with the end of the PSTN? Has risk analysis been conducted that takes the site's activities into account?
- Are the cybersecurity aspects of the facilities or their resilience to natural hazards (lightning, flood) considered?
- In the case of a solution based on IP technology, is the scenario of a total blackout with generator outage considered?
- What happens in the event of a complete communications failure at the site? Alert chain?
- In the event the PSTN is abandoned, are the new services in place sufficient to cope with the influx of calls in the event of a crisis?
- What happens in the event of a problem with the telephone operator? Is redundancy foreseen with another operator?
- Is the failure of GSM-type wireless networks considered?

For all comments/suggestions or to report an accident or incident:

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The summaries of accidents recorded in the ARIA base may be consulted at

www.aria.developpement-durable.gov.fr

