Power outages during periods of cold weather

Periods of cold weather are characterised by low temperatures, sometimes combined with snowfall and/or wind. Synonymous with high electricity consumption, they are often the cause of power failures and other critical systems, such as telecommunication networks, can also be affected. If energy demand is higher than production, load sharing can be implemented. But what are the risks?

1st case (04/11/2006), Flaring of process residues and atmospheric pollution (ARIA 32679):

An incident on **the German extra-high voltage network** (ARIA 32455) disrupted the power grid in Europe by generating **a low-frequency threshold.** The event resulted in the automatic shutdown of several units of a **French refinery**. Only the units powered by turbo-alternators remained in operation.

The operator **set up a crisis unit** without initiating its internal contingency plan. The Propane Deasphalting Unit (PDU), Furfural Extraction Unit (FEU) and Viscosity Breaking Unit (VBU) were restarted on a priority basis. The operator decided not to restart the other units. This **loss of power nevertheless resulted in leakage of hot oil from an exchanger**, spillage of **catalyst from** the catalytic cracking unit and **the loss of solvent which spilt onto the ground and entered the sewer system.** This accidental release resulted in the COD, **measured in the oily water around the platform,** to be exceeded for several days.

The power outage was also responsible for the **flares**. On 06/11, the air quality monitoring association's sensors recorded a **peak concentration of sulphur dioxide** in the municipality. Lastly, the shipment of butane and the supply of jet fuel from the refinery were stopped.

Load shedding

Load shedding, or load reduction, involves switching off **customers' power to prevent saturation of the network**. It notably occurs:

- When the order is given, to accommodate peaks in consumption;
- If a power or electrical current threshold is exceeded;
- When there is a deviation in the frequency of the supplied voltage. The power grid operator must thus implement load shedding;
- In case **power consumption is too high in relation to the** subscription contract.

Energy consumption rises significantly during extremely cold weather while impairing safety margins needed to cope with peak demand. Additional problems can arise such as the **availability of power generation facilities that are likely to be shut down** for maintenance activities. **Strong winds can also damage overhead power transmission lines**.

2nd case (10/10/2014), Deterioration and leaks on equipment (ARIA 46269):

From 10/10/14 to 05/01/15, 260 kg of hydrofluorocarbons (R507) were released into the atmosphere from a **refrigeration unit located on the premises of an** automotive equipment manufacturer. The release was detected on 05/01 during a maintenance operation. **The shutdown of two of the installation's compressors, following an extended power outage, was what damaged the discharge manifold flange**. The position of the leak detectors and their detection threshold are attributed to the leak going undetected.

The maintenance personnel were unaware of the leakage risk associated with an extended compressor shutdown. A specific procedure was established. The detectors were repositioned and their thresholds were lowered.

3rd case (26/11/2010), Carbon monoxide poisoning (ARIA 39367):

At around 3 p.m., a power outage in the common areas of a group of 3 residences caused a **ventilation shutdown**, **preventing the carbon monoxide (CO)** produced by the individual boilers from being discharged. The emergency services evacuated 22 people, two of whom were **in serious condition**.

4th case (10/10/2004), Effluent discharge and aquatic mortality (ARIA 28926):

Following a power failure, the water treatment facility at a cheese factory was out of service for 3 hours. This outage resulted in the release of untreated effluents which polluted the Cône River, causing **aquatic mortality stretching a distance of 3 km**.

5th case (28/09/2003), Extended outage following a "blackout" on the European power grid (ARIA 25642):

Italy was without power following a disruption in the supply of electricity purchased from France as a result of an outage in Switzerland. Within a span of 15 minutes, Italy experienced a blackout from the Alps to Sicily, except Sardinia. The power outage occurred Sunday morning at 3:20 a.m. **Four deaths were reported: Three elderly persons living alone, and a young girl who died in a traffic accident as a result of traffic light malfunction.**

A Swiss electricity supplier reported **that a strong gust of wind uprooted a tree, causing damage to a 380 kV transmission line**. Several very-high voltage power lines supplying the north of Italy were out of service for 24 minutes prior to the temporary shutdown of two French lines (domino effect). **Two days after the outage, certain regions in Italy were still without power**.

Italy blackout, 28/09/2003 (DR)

A few questions regarding the anticipation of risks

- Is a power outage considered based on an analysis of all the equipment and utility networks at the site? Is this analysis reviewed when equipment is added or if modifications are made to electrical installations?
- Is the risk of carbon monoxide poisoning considered (generating sets under greater demand than usual)?
- Is the safety of the facilities guaranteed in the event of a power outage? Are compensatory measures provided?
- Can a crisis unit consisting of several trades be assembled quickly to manage any problems resulting from the power outage?
- Does the use of generators at the site allow the electrical utility to safely intervene on their network (restoring power to the lines)?
- Are weather advisories closely monitored? Are specific actions planned according to the advisory level?

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