Advice for

POWER PLANT OPERATORS

Volcanic ashfall can quickly lead to the widespread loss of electricity

General Impacts

> Flashover: Ash contamination of station and line insulators leading to flashover is the most common impact at power plants.

> Step/Touch Potential: ash may reduce the resistivity of ground gravel cover, reducing tolerable step and touch voltages.

> Disruption to Control Systems: ash ingress into heating, ventilation and air-conditioning (HVAC) systems can block intakes leading to reduced performance, and affecting dependent systems.

> Structural damage: Very thick ash deposits (>100 mm or 4 in) may create excessive loads on structures.

> Long span, low pitched roofs are typically the most vulnerable.

> When ash is wet, static loads may increase by up to 100%.

> Internal gutters: may block with ash, potentially leading to water ingress to indoor electrical equipment.

HYDROELECTRIC POWER STATIONS

> Ash suspended in intake water can cause accelerated wear of hydroelectric turbines (e.g. runner blades, labyrinth seals, cheek plates and wicket gates).

> Hazard depends on volume of ash deposited in catchment, reservoir size, settling rate of ash, abrasiveness of ash.

> Even HEPs designed to cope with large volumes of sediment favor the bypass of ash-laden waters over continued operation of the plant, which involves the risk of damaging their turbines.

> Ash may also fill rain gauges in climate stations throughout river and reservoir catchments.

THERMAL POWER STATIONS

> Ash may block air intakes for gas turbines and boilers, or sub-aerial condenser systems causing blockages, abrasion and creating cleaning difficulties (Ashfalls have created airborne particle concentrations of up to 9 g/m3, several times higher than dust- or sand-storms).

> Mechanical seals may be vulnerable to abrasion and corrosion by ash.

> Fine ash ingested into gas turbines may cause accelerated wear or melt on turbine surfaces (similar to an aircraft turbine).

> Ash may contaminate exposed surface water cooling reservoirs, potentially blocking heat-exchange

WHERE TO FIND WARNING INFORMATIONC (ASH CLOUD FORECAST)

The Volcano Ash Advisory Centre (VAAC) or the USGS Volcano Observatories will issue volcanic advisories and graphics forecasts on ash in the atmosphere affecting aviation.

Current Volcanic Ash Advisories – Washington VAAC http://www.ssd.noaa.gov/VAAC/messages.html

Current Volcanic Ash Advisories – Alaska VAAC http://vaac.arh.noaa.gov

Current Alerts for U.S. Volcanoes - USGS https://volcanoes.usgs.gov/vhp/updates.html

FEMA

Institute for Hazard Mitigation Planning and Research

URBAN DESIGN & PLANNING

Advice for

POWER PLANT OPERATORS

The most common disruptor of power at generation sites is controlled shut-down of HEP turbines to avoid accelerated wear of submerged components such as runner blades, labyrinth seals, wear rings, band seals, cheek plates and wicket gates.

HOW TO PREPARE

At-risk power generation facilities should develop operational plans for ash fall events, including:

> Install turbidity monitoring instrumentation at intake and identify threshold for intake closure

> Priority schedule for inspecting/cleaning essential sites and components

> Site cleanup may be required following an ash fall.

> Standardised ash fall clean-up procedures, suitable to your local conditions and site

> Stock or have access to sufficient supplies and equipment for cleaning;

> Clean up and additional maintenance can create significant additional labour and resource demands

> Insulators usually require cleaning

> Field crews should use safe operating procedures when operating in an 'ashy' environment. See www.IVHHN.org for guidelines for protecting people from ash hazards

> Transmission/distribution lines feeding the generation site may be disrupted and require additional planning

> Hydroelectric plant (HEP) facilities may consider hardening turbines during design and refurbishment programmes

HOW TO RESPOND

> Consider increased inspection and preventative maintenance

> Seal key facilities to limit ash ingress.

> Clean up site to reduce remobilisation of ash and thus recontamination of energised components. Use dry methods where possible

> Remove ash from gutters to avoid localised flooding

> Internal gutters may require suction cleaning

> Be aware of increased electrocution hazard if ash covers the ground. Isolate and earth energised apparatus before entering site

> Hydroelectric Power Plants : Monitor the suspended solid load in water intakes. Be mindful of volcanic debris flows (lahars). Consider by-passing turbines, if necessary

> Geothermal/thermal: assess ash hazard and consider shut-down if necessary.Accelerate filter change; use pre-filters.

ADDITIONAL INFORMATION

> https://volcanoes.usgs.gov/ash/index.html

> http://www.ssd.noaa.gov/VAAC/messages.html

> Primary source: https://volcanoes.usgs.gov/volcanic_ash.html

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