POWER GENERATION APPLICATIONS

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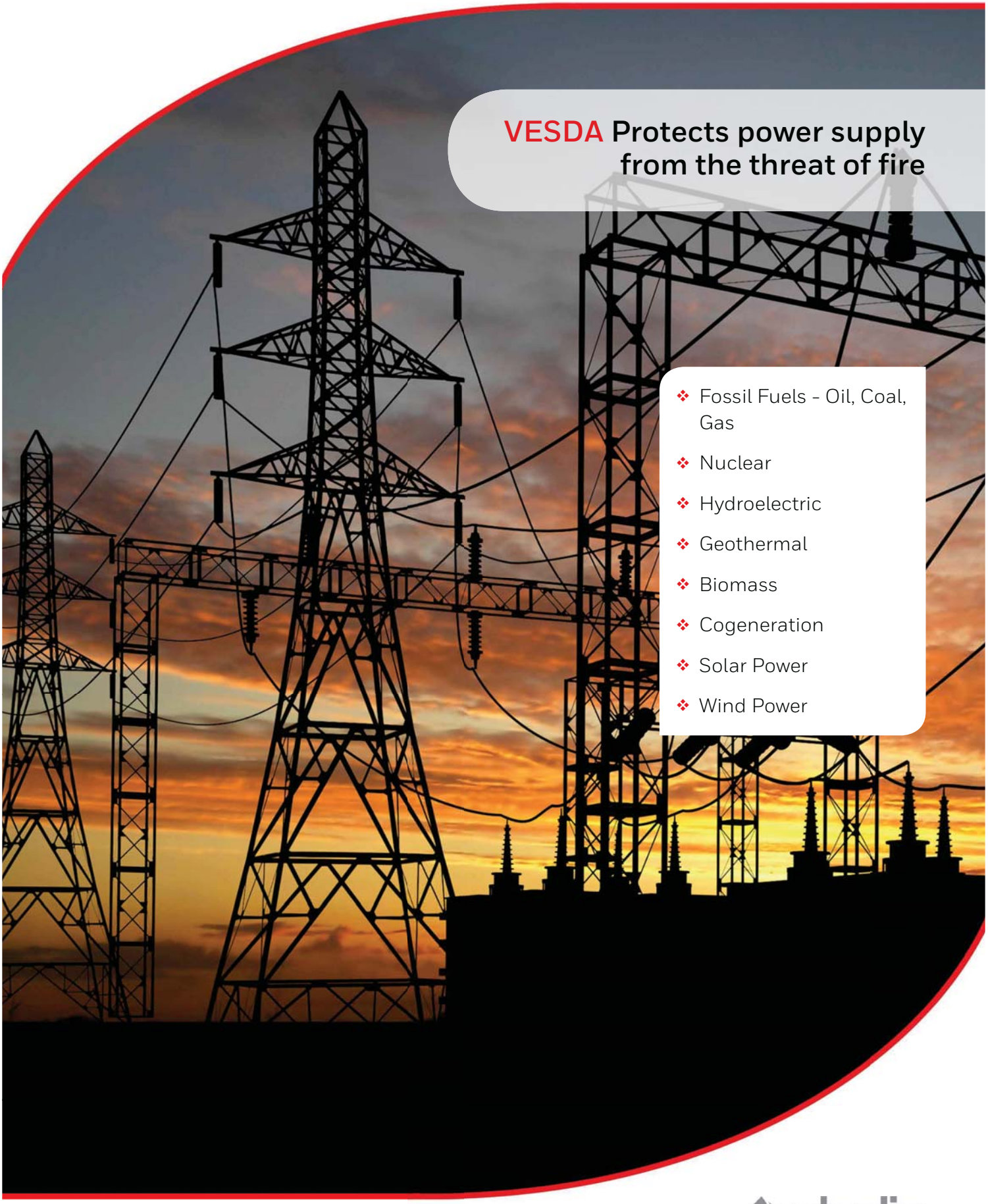

VESDA Protects power supply from the threat of fire

- Fossil Fuels - Oil, Coal, Gas
- Nuclear
- Hydroelectric
- Geothermal
- Biomass
- Cogeneration
- Solar Power
- Wind Power

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The constant generation and the continuous supply of electricity to all sectors of the community is critical and cannot be compromised by the risk of an undetected fire.

There are a number of primary energy sources used to generate electricity including: coal, water, nuclear, natural gas, oil, bio-fuels, wind, solar, tidal and geothermal all of which are unique to themselves but, share a common vulnerability to disruption caused by a fire. VESDA Aspirating Smoke Detection (ASD) can help prevent the disastrous consequences by detecting the fire before it escalates enabling intervention and suppression before it causes damage to processes or equipment or ultimately the loss of life.

Heating and hot work equipment are the two largest sources of fires — in particular, heat from equipment that is not installed, operated, and maintained properly. Additionally, any mechanical equipment can become a fire hazard due to the frictional heating that occurs between the moving parts. This risk can be brought down to practically zero simply by following recommended cleaning and maintenance procedures, including lubrication.

Electrical malfunctions are also one of the top root cause of fires in Power generation facilities. Indeed, overloaded outlets and circuits, static discharges, arcing, generating sparks can cause severe damages to production/storage/distribution facilities by creating an ignition source for combustible dust, as well as flammable liquids and gasses.

A fire originating from a ruptured seal in the bearings of a turbine can cause damages of up to 25% of the turbine generator's cost

A FIRE DISASTER CAN ALWAYS OCCUR

The Connecticut power plant explosion occurred at the Kleen Energy Systems power station in Middletown, Connecticut (United States) in February 2010.

The blast blew out a wall of the gas-fired station, sending flames and black smoke into the sky and shook houses several miles away. The explosion occurred at the rear of the largest building, the turbine hall, which was destroyed. According to the Fire Marshal, the explosion may have been caused by a spark reaching a propane heater. The explosion killed 5 workers and injured at least 50 people. The plant required extensive repairs and operations were interrupted for more than one year.

CONSEQUENCES OF SMOKE OR FIRE IN A POWER GENERATION PLANT

Maintaining the highest supply levels and protecting staff and assets in a cost-effective way is a critical challenge within Power Stations. Fires can compromise life safety, operational continuity and holdings with severe consequences, and may:

- Endanger the lives of staff and surrounding population
- Cause severe damage to equipment including smoke contamination within electrical equipment
- Create large environmental pollution by the release of oil or other gas leakage
- Generate down-times that suspend or delay energy supply
- Destroy the whole facility and/or adjacent private properties
- Lead to service penalties for failing to meet contractual service agreements
- Create negative publicity that will affect revenue and lead to potential litigation
- Lead to long and costly prosecutions if staff are injured or killed and the environment is polluted

According to EIA (U.S Energy Information Agency), downtime at a large natural gas power plant can cost $11,000 (10 000 €) an hour, that makes $264,000 (240 000 €) a day

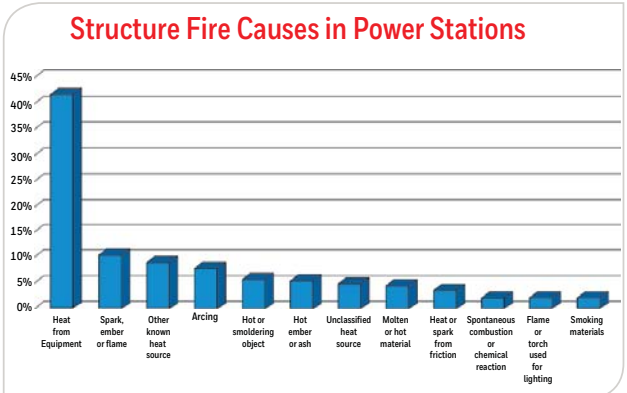
RISKS AND CHALLENGES

As it has often been demonstrated, power plants have the potential to create large-scale accidents which can lead to severe consequences to the life and health of workers and neighbours, pollution of the environment, loss of business leading to direct and indirect economic losses, and disruption of energy supply.

In Power generation facilities, there are a number of smoke detection challenges. A delayed detection of smoke can lead to a number of significant consequences including: the ability to evacuate personnel and neighbours safely, environmental impacts, protection of assets and possible disruption to both domestic and international supply.

The main hazards include:

Hot-work in enclosed spaces, high voltage cable networks, mechanical wear and high heat loads, arcing and static electrical charge, high pressure hydraulic systems, high fuel load, and other lightning strikes.



More than 1,300 fires occurred in the US Power Industry between 2009 and 2013.
Source: Fires in Industrial or Manufacturing Properties (US 2016) – NFPA




WHY USE A VESDA ASPIRATING SMOKE DETECTION SYSTEM?

There are a number of risks and challenges to consider when designing and installing a smoke detection system:

- The dusty environment in a coal bunker makes it difficult to detect smoke and may lead to the contamination of traditional detectors, resulting in false alarms and reduced sensitivity
- The large open spaces in generator and nuclear spent fuel halls causes smoke dilution, limiting the effectiveness of traditional detection systems
- Smoke originating from within electrical equipment or mechanical systems is difficult to detect and can cause extensive damage
- The large quantity of stored fuel and combustible materials are catalysts for the rapid spread of an undetected fire
- Corrosive environments where humidity makes detection difficult, maintenance access issues in areas with restricted, or problematic access
- Remote facilities with minimal staff can increase the time it would take for a fire to be controlled

Since pioneering aspirating smoke detection (ASD) technology over 30 years ago, VESDA has been recognized as the best in the world by providing the earliest possible warning of a potential fire hazard.

Aspirating smoke detection system features provide the designer flexibility by meeting the design requirements of prescriptive codes as well as facilitating the use of today's performance-based fire engineering methods. VESDA detectors buy time to respond to a fire threat, minimizing damage and business downtime. The key advantages are:

- Superior performance in harsh or toxic environments and a high resistance to contamination through the use of a unique clean air barrier technology that protects the detection chamber
- The ability to locate sampling holes where smoke will travel and to position the detector in a location that is easily accessible for maintenance
- The installation of sampling points in or near critical equipment, providing the earliest possible warning of a threat
- The wide sensitivity range of a VESDA detector ensures the earliest possible warning of a fire caused by an electrical fault
- The multiple configurable pre-alarms to provide, for example, very early warning for investigation and subsequent warnings to initiate automated fire department notification, evacuation and suppression
- The capability of remote monitoring and configuration for detectors in unmanned sites

VESDA PROVIDES DEPENDABLE SMOKE DETECTION IN POWER GENERATION STATIONS

Xtralis protects Power generation facilities around the world by offering an actively monitored sampling system, detection performance and reliability, sensitivity consistency over time and efficient response to ineffective detection solutions. Reliable smoke detection in industrial applications has been a challenge due to various background pollution issues, smoke and airborne particles, extreme temperatures, corrosion, plant wash-down and other influences. Unwanted alarms and costs associated with service/maintenance and detector longevity also are critical considerations when selecting appropriate smoke detection.

VESDA VLI 	Maximum area coverage of 2,000 m² (21,520 sq. ft.) Up to 4 inlet pipes Total pipe length 360 m (1,181 ft.) Maximum single pipe length 120 m (394 ft.) Absolute smoke detection Clean air barrier for optics protection Patented fail safe intelligent filter Air flow continuous monitoring Patented In-field Clean Air Zero Auto learn smoke levels & thresholds IP66 ABS enclosure Conformal coating for improved corrosion resistance NEC 500 Class I Division II - Class A, B, & C fires SIL 2 rated according to IEC 61508
VESDA ECO 	Multiple gas-sampling points for better area coverage Use of the existing VESDA ASD pipework Catalytic beads (flammable gas or vapour) Electrochemical cells (toxic gas and oxygen) Non Dispersive Infrared (Carbon dioxide) Direct interface to FACP, HVAC and BMS using relays, 4-20 mA and Modbus outputs PC (Polycarbonate) / ABS IP54 enclosure NEC 500 Class I Division II - Class A, B, & C fires (ECO-EX only) SIL 2 rated according to IEC 61508 (SIL 1 for Electrochemical cell)
VESDA VLC-EX 	Maximum area coverage of 800m² (8,600 sq. ft.) Up to 2 inlet pipes Total pipe length 2 x 50 m (2 x 538 ft.) or 1 x 80 m (860 ft.) Absolute smoke detection Clean air barrier for optics protection Air flow monitoring Auto learn smoke Rugged industrial IP54 high impact resistance design Corrosion resistant stainless steel 304 enclosure NEC 500 Class I Division II

VESDA®

APPLICATIONS THAT OFFER A PARTICULAR STRONG SOLUTION-FIT

Power generation applications are wide and varied and present various challenges to effective and reliable smoke detection and on-going maintenance.

Applications	Causes	Consequences	Detection Challenges
Control rooms	Large amount of equipment and cabling installed in very compact spaces and concealed areas	Injury and loss of life from smoke exposure	Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems. A fire may also rapidly spread due to the presence of large amounts of combustible materials
Telecommunication & Instrument & Computer rooms	Electronic equipment, electrical and electronic switching devices, underfloor cabling	Injury and loss of life from smoke exposure, loss of high value assets, long time to replacement	High air movement, caused by air-conditioning dilutes and disperses the smoke. In-cabinet fires that have long incipient smouldering stages
Switch rooms	Electrical arcing and the build-up of static electrical charge within equipment, overheating of electrical control equipment, switchgear and cabling	Injury and loss of life from smoke exposure, loss of high value assets, long time to replacement	Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems, open fires. In-cabinet fires that have long incipient smouldering stages
Substations	Electrical arcing and the build-up of static electrical charge within equipment, overheating of electrical control equipment, switchgear and cabling	Injury and loss of life from smoke exposure. Fire can spread to other critical installations. Loss of high value assets, long time to replacement	Incipient slow-growth fires, low smoke levels diluted at source by high airflow HVAC systems. High levels of background pollution present in these areas especially in cable trenches
Pumping stations	Large amount of equipment and cabling, high pressure equipment. Large open spaces	Injury, impact on critical operational functions. Fire can spread to other critical installations	Highly condensing environment, harsh temperature for electronics
Battery rooms	Uninterrupted power supply areas may become explosive from the build-up of high concentrations of hydrogen gas	Injury and loss of life from smoke/ gas exposure, explosion due to high concentration of gas, Impact on operational function given that chain events might occur	Potential explosive atmosphere due to hydrogen
Generator halls	High-current electrical equipment and faults, arsons, mechanical failures within windings, rotors, turbines and other mechanical parts creating frictions	Injury and loss of life from smoke exposure. Loss of high value assets, long time to replacement. Critical impact on operational functions that may lead to chain events	High level background fumes and vapours, humidity and high airflows, reliability, temperature, high maintenance
Cable tunnels and chambers	Large amount of cabling installed in very compact spaces	Injury and loss of life from smoke exposure	Incipient slow-growth fires. High levels of background pollution present in these areas especially in cable chambers

ABOUT XTRALIS

Xtralis® is the leading global provider of converged solutions for the early detection and remote visual verification of fire, gas and perimeter threats. Our technologies prevent disasters by giving users time to respond before life, critical infrastructure or business continuity is compromised. We protect high-value and irreplaceable assets belonging to the world's top governments and businesses. Our brands include the VESDA-E – the next generation of aspirating smoke detection technology; VESDA® – the world's No.1 very early warning aspirating smoke detection (ASD) systems; ICAM™ for flexible ASD; ECO™ – Gas detection & environmental monitoring modules for VESDA & ICAM systems; OSID™ – easy to use smoke detection for open areas.

To learn more, please visit us at **www.xtralis.com**

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