SDP Capital Works
Project Summary

Project Title / Asset	Switchroom Fire Suppression
Project Driver	Safety / Obsolescence

Purpose

The purpose of this document is to provide a high-level overview for major projects, further detailed information is available on request. Major projects have been defined as any capital expenditure that includes the addition of new assets to the Sydney Desalination Plant (Plant).

Information/justification on other elements of the proposed capex program (e.g. refurbishments and replacements of existing assets) are available on request.

Project Background

Pyrozone low pressure carbon dioxide (CO_2) gas extinguishing systems are installed in the thirteen electrical switch rooms throughout the Plant . The function of the Pyrozone system is to discharge CO_2 in the electrical switch room and underfloor as a means of suppressing and potentially extinguishing any fire source within the room by diluting the oxygen concentration to levels that cannot sustain a fire.

There have been several historical failures of the existing Pyrozone systems leading to uncontrolled CO_2 releases (both with and without warning). Uncontrolled releases pose a significant safety risk to personnel as breathing oxygen depleted air caused by high CO_2 concentrations can lead to death by suffocation. The systems are no longer preferred and as a result there is a decline in support and industry capability to continue maintaining these systems. An upgrade of the entire Pyrozone systems has been identified by the Operator as a safety and environmental improvement opportunity, whilst also addressing growing obsolescence issues.

Asset Details

Asset	All plant electrical switchroom fire suppression systems
Asset durability/ design intent/ asset management Strategy	The Pyrozone system was designed and intended to operate for a period of 25 years. The system can continue to be used, however both the Australian Standards, suppliers and insurers advise against using a CO_2 system unless a comparable alternative firefighting method cannot be found for the fire source.
Asset Function/ Subsystem/ System	The Pyrozone units act as a gas suppression fire system to extinguish or minimise fire spread in each of the existing 13 switch rooms. This also enables adequate time for first responders to get to the scene to further assess and control any fire damage.

Asset Failure and its consequence	If the Pyrozone units fail to discharge in the event of a fire, the fire may spread uncontrolled and cause far greater damage then it would have otherwise. This is likely to result in increased downtime resulting from fire damage for the Plant. As these systems are installed in all (excluding the Drinking Water Pump Station (DWPS)) switch rooms on site, fire damage to any one of these switch rooms is likely to result in significant process failure. This could result in significant periods of time that the Plant would be unable to process water. Should the gas suppression systems activate in an uncontrolled discharge (without warning) whilst personnel are occupying the room, the consequence will likely result in loss of life.

Justification

The consensus in the fire protection industry is that CO_2 systems no longer constitute good industry practice. Such systems are being phased out with alternate technologies now preferred, CO_2 systems are no longer typically being installed. This is a particular concern to the existing low pressure CO_2 system as it approaches its end of working life. Furthermore, if a new low pressure CO_2 system were able to be acquired, complications will arise in the longer term with finding contractors qualified for the maintenance of these systems and suppliers for the procurement of replacement parts.

Pyrozone Australia has advised that new Pyrozone cylinders can no longer be purchased due to their manufacturing facility in Singapore not being re-opened following the shutdown at the start of the COVID-19 pandemic. This means the existing Pryozone system is now obsolete.

A key driver for replacement is the safety risk that these systems pose. The systems target CO_2 concentrations higher than 30% for fire suppression. However, CO_2 is an asphyxiant and at as low as 7.5% concentration can cause issues with breathing and is considered hazardous to humans. Concentrations of 17-30% can rapidly cause unconsciousness, coma and death.

While CO_2 systems have safety features such as delays to activation, alarms and isolation requirements for when personnel access areas in which these are installed, the controls are engineering, administrative or personal protective equipment (PPE) based only. It is reasonably practicable to substitute or eliminate the hazard through newer technology using inert gasses that do not pose a risk.

Given the system is becoming obsolete, is becoming difficult to maintain and it is reasonably practicable to install a system that is safer to personnel, it is considered prudent to explore alternatives.

Options Considered

Arup were engaged to summarise the available fire suppression systems for the 13 electrical switch rooms and server room at the Plant. The technical note outlines the latest gas fire suppression technologies readily available and includes an options summary accompanied by a switch room schedule to provide a breakdown of the fire suppression requirement within each switch room. A detailed description of each fire suppression option is outlined including the costs and spatial requirements for each system.

The options considered include:

- Synthetic – FK-5-1-12 (Novec 1230)
- Inert Gas – IG-541 (IG55)
- Alternate – IG-01 & IG-100. HFC-227ea & HFC-125.

Full details can be seen in Arup Technical Note "Switch Room Fire Suppression Study".

Proposed Scope

The final scope for these works has not yet been determined by SDP. We are still evaluating the most prudent and efficient options that will provide the most suitable safety and environmental outcomes, along with efficient whole of life costs.

The current proposal is based on the Arup technical note, who believe the most suitable agent to use for the switch rooms would be the IG-541 inert gas system. From a fire suppression methodology standpoint, it is almost identical to the current low-pressure, pure CO_2 fire suppression system but without the significant health and safety risks posed to staff by a CO_2 system. From a storage space perspective, the switch from low pressure CO_2 gaseous fire suppression to high pressure IG-541 will also result in slight space savings, allowing for the addition of a weatherproof enclosure with doors to improve durability of the new system.

Cost Estimate

The estimated budget price for the works is [redacted].

Pricing is based on high level cost estimates from suppliers and standard industry rates. Full details can be seen in Arup Technical Note "Switch Room Fire Suppression Study".

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Proposed Layout (Example for SWR11900 – largest switch room onsite)