Preservation Guidelines for CCGT & Conventional Power Plant during Short- and Long-Term Shutdowns

(*Acronym*: **Power Plant Preservation**)

Final Report/ Guidelines

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Executive Summary

In recent years, the rapidly increasing price of natural gas, overbuilding of new generating capacity and increasing contribution of renewable energy have been forcing more and more Combined Cycle Gas Turbine (CCGT) and Conventional Power Plant (CPP) units to be operated in cycling mode or to be shut down for extended periods of up to several months or more. The major issue with long periods of inactivity is prevention of corrosion damage during the shutdown period, thereby minimizing the impact on the plant's reliability during the re-commissioning phase and subsequent service. Failure to apply proper lay-up or preservation techniques during the shutdown period will result in significant corrosion damage to plant equipment during the shutdown period, and damage accumulation during operation will be exacerbated.

It is important when planning a lay-up to consider the whole unit and not just the obvious components such as the boiler. There are many areas of plant to be considered. For a conventional station the items may include the plant areas shown below.

a. Fuel systems
b. Boiler water-side
c. Boiler gas-side
d. Steam turbine – steam-side
e. Steam turbine – oil system and periodic rotation of rotors
f. Generators
g. Condensers
h. Feed water systems
i. Cooling water systems
j. Water treatment plant and water storage
k. Transformers
l. Switchgear
m. Ash systems
n. Dust systems
o. Flue gas treatment systems.

Excluding the fuel / ash and dust systems, and with the obvious addition of the GT and replacement of a boiler by the HRSG, the plant areas listed above also cover CCGT units.

As conventional stations are usually fired by heavy fuel oil or coal then these fuel systems will need some preparation and care during a lay-up. Similarly coal-fired stations have ash and dust removal systems. Some have flue gas treatment systems (such as flue gas desulphurisation), all of which need some work for lay-up.

Many of the lay-up procedures are designed to avoid corrosion of metal components with all of the subsequent issues that this can bring. For corrosion to take place it is generally necessary to have moisture and oxygen present. Removing either the moisture or the oxygen will significantly reduce if not totally eliminate corrosion.

The length of the lay-up and the climate (atmospheric conditions) will both have a very significant impact on the lay-up methods used and potential problems to be faced both during the lay-up and upon return to service. In general, 'wet lay-up' is preferred for short shutdown periods and 'dry lay-up' is preferred for longer periods, although the choice may be complicated by various factors. Lay-ups will in some situations be determined by grid demand with little or no prior notice and, similarly, the likely duration of the lay-up will be unknown

with only a short notice period prior to return to service. The confidence of the estimation of the length of the lay-up or the desire to retain the ability to return the plant quite quickly to service may influence some of the methods used.

This study covers the *preservation techniques used for CCGT and CPP units that will be shut down for short or extended periods*, i.e. both the wet and dry storage methods. Information on lay-up practices and preservation techniques has been brought together from published and unpublished sources and critically analysed by ETD preservation experts and in addition a survey of plant operator experience was carried out to examine the preservation procedures that have been/ are being used by some of the participating utilities. Further to critically analysing and putting together above knowledgebase and experience, the experience of ETD's own experts in power plant chemistry, corrosion and operation/ maintenance of mechanical plant and electrical equipment played a crucial role in formulating these guidelines.

To make it easier for the power plant engineers and management to implement these Guidelines a Summary Table and a set of Diagrams/ Flow Charts have been produced. Furthermore, a set of fifteen Appendices has been provided to help the user in implementing various procedures described in the Guidelines.

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