



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.

LIST OF CONTENTS

	<u>Page No.</u>
Executive Summary	3
List of Tables	8
List of Figures	8
1. INTRODUCTION	9
2. GENERAL CONSIDERATIONS	11
2.1 Lay-up Monitoring and Maintenance	11
2.2 Start-up	12
3. BOILERS / HRSGs & FEED SYSTEMS, STEAM TURBINES & CONDENSERS	13
3.1 Reasons and Options for Storage	13
3.1.1 General	13
3.1.2 Shutdown Period	15
3.1.3 Outline of the Lay-up Options	16
3.1.4 <i>References / Bibliography</i>	17
3.2 Dry Storage	24
3.2.1 General	24
3.2.2 Complete Dry-Out	24
3.2.3 The Process Details	25
3.2.4 Other Dry Storage Methods	26
3.3 Wet Storage	27
3.3.1 General	27
3.3.2 Different Lay-up Requirements for Feed and Condensate Systems and Boilers	28
3.3.3 Volatile Chemical Wet Storage Solutions	28
3.3.4 Non-Volatile Wet Storage Solutions	29
3.3.5 Inspection and Testing	30
3.3.6 Sampling	30
3.3.7 Results and Action Required	30
3.3.8 Cold Weather Storage	30
3.3.9 Disposal of Lay-up Solutions	31
3.4 Storage Techniques for Partially Drained Plant	31
3.4.1 Nitrogen Filling	31

3.4.2	Inhibition of Retained Water by Nitrite-Borax	31
3.4.3	Inhibition of Retained Water by Tri-Sodium Phosphate (TSP)	31
3.5	Auxiliary Boiler	32
3.6	Instrumentation	32
4.	WATER TREATMENT PLANT & COOLING WATER SYSTEMS	32
5.	ROTOR BEARINGS	33
6.	TURBINE GENERATOR OIL SYSTEMS	34
7.	STEAM CONTROL VALVES	35
8.	FUEL SYSTEMS	35
9.	OTHER MATERIALS HANDLING SYSTEMS	36
10.	GAS TURBINES	38
11.	ELECTRICAL EQUIPMENT	39
11.1	Generators	39
11.2	Transformers	39
11.3	Motors	40
11.4	Switch Rooms	40
11.5	Control Rooms & Other Rooms	41
11.6	Cathodic Protection System	41
<u>APPENDIX 1:</u>	WET LAY-UP USING VOLATILE CHEMICALS	42
A.1.1	Procedures	42
A.1.2	Storage of Feedheaters and Deaerators	43
A.1.3	Cascading Blowdown	43
<u>APPENDIX 2:</u>	WET LAY-UP USING NON-VOLATILE CHEMICALS	44
A.2.1	Storage of Un-Drained or Partially Drained Plant	44
A.2.2	Disposal of Effluents	45
<u>APPENDIX 3:</u>	FILL AND DRAIN LAY-UP USING TRI-SODIUM PHOSPHATE	46
<u>APPENDIX 4:</u>	NITROGEN FILLING AND CAPPING	48
A.4.1	General	48
A.4.2	Nitrogen Filling	48
A.4.3	Nitrogen Capping	49

<u>APPENDIX 5:</u>	HUMIDITY AND DEHUMIDIFICATION	50
<u>APPENDIX 6:</u>	DRY-OUT USING CONDENSER VACUUM PUMPS	51
<u>APPENDIX 7:</u>	LAY-UP WHEN AUSTENITIC AND CUPROUS ALLOYS ARE PRESENT	52
<u>APPENDIX 8:</u>	BOILER FIRESIDE	53
	A.8.1 Fireside Corrosion Losses	53
	A.8.2 CCGT Start-up Emissions	54
	A.8.3 Stack Corrosion	54
	A.8.4 Treatment Options	55
<u>APPENDIX 9:</u>	HYDRAULIC TESTING	58
<u>APPENDIX 10:</u>	LAY-UP OF STEAM TURBINES	59
	A.10.1 General	59
	A.10.2 Short Turnaround using Hot Dry Storage	59
	A.10.3 Long-Term Lay-Up using Cold Dry Conditions	60
<u>APPENDIX 11:</u>	ALTERNATORS	61
<u>APPENDIX 12:</u>	PUMPS	62
<u>APPENDIX 13:</u>	DEAERATORS	63
<u>APPENDIX 14:</u>	CONDENSERS, HEAT EXCHANGERS AND AIR- EJECTORS	64
	A.14.1 Air-Cooled Condensers	64
<u>APPENDIX 15:</u>	POURBAIX EXPLANATION OF PASSIVATION	65
	A.15.1 Construction of a Pourbaix Diagram	65
	A.15.2 The Nernst Equation	65
	A.15.3 Applying the Pourbaix Diagrams to Iron and Copper/Brass	65
	A.15.4 Second Stage Passivation	68
	A.15.5 Chromium Steel Turbine Blades	68

LIST OF TABLES

	<u>Page No.</u>
TABLE 1: SUMMARY OF STORAGE PROCEDURES	18

LIST OF FIGURES

	<u>Page No.</u>
<i>DIAGRAM 1:</i> PRE-COMMISSIONING PLANT STORAGE	19
<i>DIAGRAM 2:</i> POST-SERVICE BOILERS AND ASSOCIATED PIPEWORK	20
<i>DIAGRAM 3:</i> POST-SERVICE FEED SYSTEMS	21
<i>DIAGRAM 4:</i> POST-SERVICE CONDENSERS AND STEAM TURBINES	22
<i>DIAGRAM 5:</i> PRE-SERVICE AND POST-SERVICE FIRESIDE	23