NORTH LONDON WASTE AUTHORITY

ICHEME

SCHEDULE 15: TAKE OVER PROCEDURES

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1. INTRODUCTION

This Schedule describes the Take Over procedures the Contractor must follow to enable the Project Manager to issue the Take Over Certificate so that the Purchaser can Take Over the Plant. The Take Over procedures include:

1. Cold testing (section 3)
2. Hot testing (section 4)
3. Trial Operation Period with a 300 ~~hours~~hour performance test (section 5)
4. Testing of civil works and building services M&E (section 6)
5. Final inspection (section 7)
6. Take Over (section 8)

After Take Over of the Plant by the Purchaser, the Contractor shall follow the procedures below to enable the Project Manager to issue a Final Certificate:

7. Defects Liability Period (section 9)

~~8. Rectification of Defects (section 10)~~

8. ~~9. Final Take Over and~~ Final Certificate ~~Take Over~~ (section ~~11~~10)

A graphical representation of the testing and commissioning process is contained in the flow chart in Appendix A. The details of this flow chart shall not override the information contained in Schedule 13, Schedule 14, Schedule 15 and Schedule 16.

2. GENERAL REQUIREMENTS

2.1 Fuels, consumables, lubricants etc.

The Contractor shall ensure all tanks, vessels and silos are full at the start of the Trial Operation Period.

Throughout the Trial Operation Period, all fuels, consumables, lubricants and such shall be ordered and paid for by the Contractor.

2.2 Waste

Transportation and supply of ERF Contract Waste shall be organised and paid by the Purchaser in accordance with an indicative delivery schedule to be agreed between the Purchaser and the Contractor at least six (6) months prior to the planned date for completion of construction of the waste cranes as set out in the Approved Programme. The Contractor will update this indicative delivery schedule on a monthly basis in order to factor in any potential delay in commencing commissioning. It is considered that the delivery schedule will become fixed from the final one (1) month prior to the planned completion of construction for the waste cranes as set out in the Approved Programme. The Contractor shall provide updates once per week during the final month but any amendments to the waste delivery schedule shall only be minor in nature and consist of fine-tuning revisions. The Purchaser shall ensure that sufficient residual municipal solid waste within the limit of the firing diagram is available for testing of the Plant.

2.3 Residues

All transportation of all residues including but not limited to bottom ash and flue gas treatment residues shall be organised and paid for by the Purchaser.

2.4 Income

The Purchaser has the right to any and all income generated from the Plant, including income from gate fees and energy sales.

2.5 Documentation

The Parties acknowledge that the Contractor intends to perform the Works in a number of turn over packages ("TOPs") as defined in Schedule 14 *Criteria for completion of construction.* The Contractor shall, following the completion of the Contractor's design and once all P&IDs have been ~~completed and~~ approved by the Project Manager, submit a full breakdown of TOPs and the Contractor's plan for commissioning actions in relation to these TOPs to the Project Manager for ~~approval. The Contractor shall be required to obtain the Project Manager's written approval to progress the commissioning of individual TOPs of the Plant in advance of commissioning the Plant as a whole (for example, the Contractor is required to obtain the Project Manager's approval (via TOP readiness to start hot testing certificate) before moving a TOP into hot testing under section 4.2 before the rest of the Plant has completed cold testing in accordance with section 3.2).~~ review and comment.

In accordance with the reviewable Design Data in Schedule 2 *Documentation,* the Contractor shall deliver a commissioning plan for the Project Manager's review and ~~approval~~comment. The template and contents list for the commissioning plan shall be submitted for the Purchaser's and Project Manager's review *twelve (12)* months prior to the date for completion of construction of the first TOP. The Contractor shall deliver the final

commissioning plan no later than six (6) months prior to the date for completion of construction ~~set out in the Approved Programme. The Contractor shall deliver the final commissioning plan no later than three (3) months prior to the date for completion of construction set out in the Approved Programme~~of the first TOP.

Details of contents of the commissioning plan are included in the sections of this Schedule related to the respective commissioning phase (i.e. cold, hot, Trial Operation Period). For the avoidance of doubt, the Contractor may propose an alternative arrangement for construction and commissioning activities to the order indicated in the Specification. The Contractor must clearly detail all changes to the order of completion of activities as part of its preparation of the completion of construction plan (see Schedule 14 *Criteria for completion of construction*) and the commissioning plan.

Across all phases of commissioning the Contractor shall also include detail on:

a) creation, maintenance and communication of emergency procedures (including but not limited to fire, exclusion zones) during execution of testing
b) operating procedures required for commissioning and testing operations
c) arrangements for if equipment / components fail to pass tests
d) permit to work procedures in construction / commissioning handover
e) periodic safety reviews
f) phasing of commissioning
g) information on equipment under commissioning
h) interfaces management

~~The Contractor shall assist the Purchaser in submitting the commissioning plan (and other Documentation as required) to the Environment Agency for approval.~~

At the start of the Take Over procedures the Contractor shall ensure the draft Operation and Maintenance Documentation is fully compatible with (including but not limited to) the document management system (DMS), the computerised maintenance management system (CMMS), and control and monitoring system (CMS).

The Contractor shall include all commissioning and test documentation (test logs including settings applied to equipment during process commissioning and testing activities, certificates, etc.) in the final ~~operation and maintenance documentation~~Operation and Maintenance Documentation (including as built documentation).

2.6 Maintenance

During the period from commencement of construction to Take Over the Contractor shall ensure all maintenance work on the Plant is conducted according to the Operation and Maintenance Documentation. The Contractor shall keep maintenance records, which shall be available to the Purchaser, to confirm this has occurred.

The Contractor may use a recordable database for all maintenance work on the understanding that they upload all maintenance records of activities carried out prior to Take Over onto the CMMS and demonstrate the system. As per Schedule 22.3.4 *CMMS*, the Contractor shall upload all necessary data (including records of all maintenance carried out) onto the CMMS, before the ~~start~~end of the Trial Operation Period and prior to Take Over being certified.

Notwithstanding Schedule 10 *Parts with limited working life and spare parts*, the Contractor shall replace all wear and spare parts used before Take Over.

The Contractor shall ensure that the Purchaser and Project Manager and the Operator may witness any maintenance and Defect / snagging rectification works. Any involvement of the

Operator in maintenance and rectification of Defects / snagging shall be agreed with the ~~Purchaser and~~ Project Manager and shall be conducted under the supervision of the Contractor.

2.7 Snagging list

The Contractor shall keep the Snagging List updated during the Take Over procedures, as the same is defined in Schedule 14 *Criteria for the completion of construction*.

2.8 Provisions for system cleaning

The Contractor shall reference Schedule 14 *Criteria for the Completion of Construction*, section 3 *Provisions for system Cleaning* which states the minimum provisions for system cleaning in the pre-commissioning phase which are highly relevant for the continued cleaning provisions required during the commissioning and Take Over procedures.

During the commissioning stage, the final cleanings of each TOP will be performed on a per TOP basis, ensuring no debris is left in the pipes.

The Contractor shall ensure that all debris, mill scale and rust is removed from the main steam pipework connected to the steam turbine, by carrying out a steam blowing process, to be agreed in advance with the Project Manager. The Contractor shall use 'Target Plates' placed in the main steam pipework in front of the steam turbine to determine the cleanliness of the main steam pipework. Final approval of the cleaning will be subject to agreement between the ~~Project Manager~~Contractor and the ~~Contractor /~~ steam turbine provider, and evidence of this approval shall be submitted to the Project Manager.

3. COLD TESTING

Once the Construction Completion Certificate has been issued for a TOP, the TOP will be passed over to the Contractor's commissioning team and the Contractor shall inform all parties who may have an interest in the ERF or the particular TOP including, without limitation, the ~~Purchaser, the~~ Project Manager, the Operator and other members of the Contractor's staff of the same through a formal Site Bulletin Information Notice.

The Contractor, through its commissioning team, will maintain and update a list of all TOPs that have received a Construction Completion Certificate and have been passed over to the Contractor's commissioning team. The Contractor will provide updated versions of this list to the Project Manager~~, the Purchaser~~ and the Operator as and when TOPs achieve construction completion and are passed over to the Contractor's commissioning team.

Following the issue of a TOP Construction Completion Certificate, no activity, other than ongoing commissioning tests, may be performed or commenced on the TOP by any party including, but not limited to the Purchaser, the Operator or any of the Contractor's staff who do not form part of the Contractor's commissioning team without the prior approval of the Contractor's commissioning team. Where the Contractor's commissioning team approve any activity, the Contractor shall issue a commissioning permit to work. The Contractor shall make its staff who do not form part of the Contractor's commissioning team aware of the requirements of this Schedule. Similarly, the Purchaser shall ensure that its staff are aware of these requirement's and shall notify the Operator of the same and shall procure the Operator's compliance with these requirements.

The activities that may require a commissioning permit to work include, but are not limited to, the following:

- Modifications for cleaning pipes & TOPs.
- Installation and removal of temporary modifications and provisional supplies.
- Correction of assembly or construction faults, not considered in the TOP Snagging List.
- Completion of construction of different points detailed in the Snagging List.
- Installation of design modifications approved by the Project Manager.
- Construction works in an area, equipment and / or system passed over to the Contractor's commissioning team.
- Construction or commissioning works close to a passed over TOP area which may affect safety due to (without limitation): projections of material to electrical cabinets, projection of sparks to oil lines or circuits, objects falling from height at work on energized equipment, etc.
- any other activities which the Commissioning Manager reasonably deems to require a commissioning permit to work.

Once a system, or sub-system is energised, and precautions applied to protect personnel, which may include, but are not limited to, lockout and tagout devices, then these measures shall not be violated.

The Contractor shall complete the cold test without media, except for water and chemicals for flushing and cleaning.

The cold testing shall demonstrate that the Plant, and every component / functional group / system therein, can operate safely and in accordance with the design, the Contract, the requirements of any Statutory Bodies, the Consents and Good Industry Practice and that the Plant is ready for hot testing.

~~In special cases where tests can only be performed with media, the use of a cold media is accepted at the sole discretion and approval of the Purchaser and Project Manager.~~

The pre-conditions for commencement of cold testing are:

1. The TOP Construction Completion Certificate completed and issued by the ~~Project~~Contractor's Commissioning Manager;
2. The commissioning plan is reviewed ~~and accepted~~ by the Project Manager;
3. Draft ~~operation and maintenance documentation in hard copies as well as in DMS is accepted~~Operation and Maintenance Documentation is reviewed by the Project Manager;
4. Detailed programme for theoretical training of Purchaser's and Operator's personnel during cold testing is subject to the approval of the Project Manager, in accordance with Schedule 9 *Training by Contractor;*
5. Safe systems of work are in place;
6. Compliance with pre-operational conditions as set out in the Environmental Permit in Schedule 22.9 *Site Conditions, Permits and Constraints.*

Where components form part of a system, then each component comprising that system shall be similarly inspected and tested prior to placing the system into service.

3.1 Procedure

The Contractor shall give a minimum of three (3) Business Days' notice to initiate each test. This notice period may be reduced at the sole discretion of the Project Manager. The ~~Purchaser,~~ Operator and Project Manager reserve the right to witness any test.

The cold testing shall include, but is not limited to:

- Electrical and Instrumentation loop checks have been executed.
- Functional testing of control loops
- Checking of set points and the action of alarm and shutdown devices
- Operation of control and shutdown valves
- Setting-up of instrumentation
- Rotation of motors, engines, checking direction of rotation of motors and drivers by conducting phase direction check.
- Cleaning and flushing lubricating oil installation
- Test of signals
- Loop testing
- Energising of electrical systems including test of earthing systems and setting of electrical protection
- Test of lockable service switches
- Test of interface between motors and MCC
- Test of interlocks and hard-wired trips
- Test of systems without pressure or temperature and before being energised with permanent power.
- Test of safety functions
- Testing of instruments
- Testing of control valves, transmitters, switches etc.
- Testing of operational control of equipment

~~• All systems cleaned internally except those which require steam.~~

- Tests and measurements of the earthing installations in accordance with BS 7430 (or equivalent) and of the lightning protection systems according to BS EN 62305 (or equivalent)
- Tests of high voltage cables in accordance with BS 923 (or equivalent)
- Testing of the weighbridges.
- The Contractor shall perform site acceptance testing (SAT) of the CMS (including but not limited to test of process screen graphics and other operation interfaces, alarms, reporting, automation level) as a continuous process during the commissioning period. The SAT of the CMS includes testing of all single functionalities, group functionalities, process system(s) and the Plant. The testing shall comprise all the functional tests carried out in the FAT together with verification of all actual interfaces and communication links, plus any additional tests/inspection checks necessary to ensure the overall integrity of the CMS.
- SAT of Continuous Emission Monitoring System (CEMS)

Followed by:

- Production of safety and fire test checks.
- Production of preliminary noise test data.
- Chemical cleaning of boiler parts as determined by the Contractor in accordance with VGB-S-513 (Internal Cleaning of Water-Tube Steam Generating Plants and Associated Pipework).

In addition, the Contractor shall resolve all outstanding health and safety issues including, but not limited to, escape routes, fire sectioning, handling and storage of consumables and residues before the completion of cold testing. Moreover, within this period all category B Snagging List items shall be cleared (as defined in Schedule 14 *Criteria for Completion of Construction*).

The Contractor shall manage the plans and protocols for testing the function groups. In these protocols the Contractor shall confirm that the function sequences, signals and graphic displays are in full working order.

3.2 TOP Readiness to start hot test certificate

The Contractor shall submit a cold-testing report on a weekly basis showing the cold testing status of all TOPs within the cold testing period, whereby a detailed status for all test activities shall be described documenting the readiness to start hot test in accordance with the commissioning protocols.

The Contractor shall deliver the final report to the Project Manager after completion of all cold test activities. The Contractor shall submit a “TOP Readiness to Start Hot Test ~~Certificate~~Report” to the Project Manager once the cold test of the TOP is completed.

The ~~Purchaser~~Contractor’s Commissioning Manager shall complete and issue a “TOP Readiness to Start Hot Test Certificate”, when:

1. The Contractor has successfully completed all ~~agreed~~ tests ~~to the reasonable satisfaction of the Project Manager~~ and documented this using test data, calculations, reports and other Documentation (see Schedule 2 *Documentation*) of the pertinent TOP;
2. The Contractor has rectified items on the Snagging List to be completed before the start of hot testing of the pertinent TOP; and
3. Any issue related to health and safety is resolved to the approval of the Project Manager.

In addition, the Contractor shall ~~submit for Project Manager and Purchaser's review and approval~~ensure that, before the last TOP Readiness to Start Hot Test Certificate is signed off, the following ~~information~~steps have taken place:

4. A detailed programme for practical training of Purchaser's personnel during hot testing is ~~agreed with~~reviewed by the Project Manager; and
5. The updated commissioning plan is reviewed ~~and accepted~~ by the Project Manager (if changes are introduced during cold testing).

4. HOT TESTING

The Contractor shall complete the hot testing with all media required for full and complete operation of the Plant.

The hot test shall demonstrate, as specifically described in this section, that the Plant, and every component/functional group/system therein, can operate safely with full functionality in all load cases in accordance with the design, the Contract, Statutory Body requirements, the Consents and Good Industry Practice and the Plant is ready to start Trial Operation.

The pre-condition for the commencement of hot testing is that the "TOP Readiness to start Hot Test Certificate" has been completed and issued by the ~~Project~~Contractor's Commissioning Manager.

Hot testing can be performed on a TOP basis, for example, air compressors can be running meanwhile the turbine has not been cold tested completed.

4.1 Procedure

The Contractor shall give a minimum of three (3) Business Days' notice to initiate each test. This notice period may be reduced at the sole discretion of the Project Manager~~,~~ and the Operator ~~and Purchaser~~ reserves the right to witness any test.

The hot testing shall include, but is not limited to:

- Pressurising of compressed air systems
- Testing of pumps to BS 5316 (or equivalent) (provided provisions are made to protect components requiring presence of media).
- Functional testing of the weighbridges to ensure they function in accordance with the Weights and Measures Act.
- Production of safety and fire test certificates
- Drying out of refractory
- Test of fire detection and firefighting system
- Commissioning of waste reception, incinerator/boiler, flue gas treatment and auxiliary systems.
- Verification of the quality of water for water/steam cycle
- Commissioning of turbine/generator
- Trimming of Plant
- Functional tests
- Environmental tests
- Test of emergency equipment and black out tests
- Electrical island mode tests
- Power system shall be tested and demonstrated in compliance with British Regulation for thermal power station units
- Test of safe vehicle movement on Site

~~• Chemical cleaning and steam blowing~~

- Cool down procedures

The tests of systems shall include, but is not limited to:

- Test of the performance and functions of all water and air systems and complete function test of all sub-systems (dry running)

- Repeated start / stops of independent electric motors; this shall include, testing of emergency stops, local control panels and other control and safety devices
- EMC (electromagnetic compatibility) test by an independent ~~third party~~third-party institution approved by the Project Manager and monitored by the ~~Purchaser and~~ Project Manager as mentioned in EN 61000-6-2 and EN 61000-6-4
- Test of sequences of operation of all automatics and all components, and all safety systems and interlocks
- Test of all instrumentation and control systems that are not bound to the thermal process plant, such as the communication systems, CCTV and filing of operational data
- Any other tests required to check the proper functioning of the supplied installation, including, but not limited to:
    - adjusting of limit switches
    - setting of speed monitors/regulators
    - setting of set point for switches
    - checking of all parameters for the electrical, measurement and control system
    - those that may be directed by the Project Manager or any other tests required by a statutory inspectorate or body.

The Contractor shall perform the hot testing in at least the following steps:

- Preparation, i.e. filling up the boiler and consumables storage tanks and silos
- Commissioning waste handling, the flue gas treatment, combustion air systems, incineration, ash removal and other subsystems
- Drying of the refractory, by operating at the temperatures prescribed in the refractory curing curve
- Chemical cleaning (including flushing and passivation) shall be carried out several times ~~in accordance with the Approved Programme~~.
- Commissioning of the feed water tanks and feed water pumps
- Blow-out of the live steam system up to the turbine inlet. Blow-out is repeated until the cleanliness level is accepted by the turbine supplier / Subcontractor. When ~~blowing-out~~blowing has been completed, the headers, feed water and condensate tanks are cleaned. Steam blowing shall only be performed during daytime.
- First waste fire
- Trimming of the boiler until the steam quality is in accordance with requirements
- Commissioning and testing of the turbine bypass systems
- Testing of the district heating system with system in normal operation and in full condensing turbine (power-only) mode
- Trimming of the Plant components and system to achieve stable operation, to meet the functionalities and the guarantees given.

The ~~Purchaser,~~ Operator and Project Manager shall be entitled to inspect the refractory lining and the scrubbers including demisters, after drying-out. The Contractor shall include such inspection in its commissioning programme.

The pre-condition for the commencement of first waste fire is that a “Readiness to Receive Waste Certificate” has been issued by the Project Manager. The Project Manager shall issue a Readiness to Receive Waste Certificate when:

1. ~~First waste fire shall only commence once the~~The Contractor has demonstrated to the reasonable satisfaction of the Project Manager that the ~~above /~~ preceding cold and hot

tests of the TOPs necessary to perform such activity~~,~~ have been passed successfully ~~and all~~ ;

2. All other systems, such as fire detection and firefighting, waste cranes, grate, air systems, ash and IBA conveyor systems, conveyance of consumables, measuring systems, CMS are working correctly;
3. ~~. Furthermore, the~~The parts of the flue gas cleaning, which are necessary for cleaning the flue gasses in accordance with the environmental guarantees, ~~shall be~~have been commissioned and are in operation ~~before first waste fire~~. The Contractor shall pay special attention to the avoidance of build-up of memory effect of dioxins and furans~~.~~;
4. Safe systems of work are in place;
5. The waste delivery schedule during commissioning and testing is confirmed as fixed by the Contractor at least one (1) month prior to the planned date for first waste fire. The arrangements between the Purchaser and the Contractor for the transportation and supply of ERF Contract Waste are described in section 2.2, including the submission of previous versions of the waste delivery schedule.

As part of the hot testing, the Contractor shall operate under conditions relevant for testing safety (safety systems, interlocks), and all components are to be checked to ensure that they are functioning properly and safely.

During the hot testing, the Operator shall attend testing activities and be involved in operation of the Plant after first waste fire. The full responsibility for operations and maintenance remains with the Contractor until Take Over.

The Contractor shall not be entitled to reduce the number of its own personnel on Site during the hot testing.

Before completion of the hot testing, it shall be possible to operate all process control systems in automatic operation without ~~fault~~critical alarms. The Contractor shall optimise the Plant to meet all functional, environmental and guarantee requirements before commencement of the Trial Operation Period. Throughout the duration of the Trial Operation Period, the Contractor shall further optimise the process control to ensure the best possible performance of the Plant.

The hot testing completion criteria include, but are not limited, to:

1. The start-up and shut down of the individual components and the Plant itself have been successfully completed on three consecutive occasions
2. All components have been continuously and successfully operated without problems or Defects, that would result in a hindrance, limitation or hazard to normal operation
3. All control loops, alarms, trip settings, interlocks and safety devices have been set and successfully tested, and all temporary commissioning measures and settings in the CMS have been removed
4. Quality Assurance Level (QAL) 2 of the Continuous Emission Monitoring Systems (CEMS) has been carried out and reported successfully
5. The Plant is ready for secure, faultless and continuous operation in ~~full automatic mode~~ in accordance with the Contract.
6. The proper and complete functioning of the Plant has been demonstrated and during this period normal operation is not hindered, fundamentally limited or places the installation in danger
7. The Plant must have operated for 48 hours without ~~intervention by the Contractor and without~~ critical alarms; and during this time continuous production of energy is maintained corresponding to the nominal thermal load with waste as the fuel. ~~Within the Schedule, and for the sake of evaluating the requirements in relation to numbers~~

~~of alarms, the following criticality levels and their integration in the definitions of "critical alarm" and "process alarm" must be considered. For the avoidance of doubt, the Contractor is free to adopt these levels in the project, as long as the requirement in the Specification is achieved. Levels 1-3a are considered as "critical alarms" and levels 3b, 4 and 5 are considered to be less critical. Any alarm fulfilling Levels 1-5 and related to the process category in accordance with Good Industry Practice shall be considered a "process alarm":~~

- ~~Level 1 - Where a very critical component has failed and a trip will occur if no urgent operator intervention is made;~~
- ~~Level 2 - Where a critical component has failed and where a plant trip is likely to happen if no operator intervention is made relatively quickly;~~
- ~~Level 3 - Where a component failure often caused by exceeding an engineering threshold does not immediately cause the Plant to trip or to lose production but will over time require operator intervention. The nature of the Level 3 alarms shall be proposed to the Project Manager for approval during detailed design stage;~~
    - ~~Level 3a alarms: Where a critical component failure, caused by repeatedly exceeding any allowable limitation in an equipment or system, doesn't immediately cause the plant to trip but will over time require operator intervention or otherwise it may likely affect the ability of the plant to:~~
        - ~~Operate safely~~
        - ~~Satisfy the environmental requirements~~
        - ~~Operate without risk to significant harm to plant integrity~~
    - ~~Level 3b alarms: any other alarm level 3 not contained in Level 3a.~~
- ~~Level 4 - Where an external failure causes the component to stop working i.e. cabling / pipe failure;~~
- ~~Level 5 - Where intervention from the operator has to be made.~~

8. The Contractor shall have no standing critical alarms on the alarm list at the end the hot test.
9. Environmental guarantees are fulfilled. The Contractor shall ensure the environmental guarantees are documented as fulfilled in due time before the start of Trial Operation to give the Project Manager sufficient time for evaluation of the data prior to starting the Trial Operation Period.
10. Black out test and CMS safety system modes are proven through necessary tests, both on auxiliary fuel (natural gas and / or diesel) and waste. The results of the tests shall be evaluated by all parties involved and shall be subject to ~~approval~~review and comment by the Project Manager before continuing to an island mode test.
11. Island mode is successfully tested. The test shall be carried out with operation in island mode according to the requirements of the relevant authorities and DNO; however, a minimum operation of 240 minutes must be demonstrated, unless otherwise agreed by the Project Manager. The Contractor shall not carry out the test without the prior approval of the Project Manager. The test shall ensure the turbine is proven to operate on the low demand of expected parasitic load only and the Contractor shall therefore submit a list of all power consumers operating during the test for agreement by the Project Manager. For the avoidance of doubt, the island mode test shall be completed with minimum non-typical parasitic loading present and with one boiler in operation only unless otherwise agreed by the Project Manager.
12. Additional test from cold start-up for the emergency generators
13. Noise, odour, and dust emissions are continually within contractual requirements

14. All training of the Purchaser's and Operator's personnel has been completed

Within this Schedule, and for the sake of evaluating the requirements in relation to numbers of alarms, the following alarm prioritisation shall be considered. The Contractor is required to comply with IEC 62682 (Management of alarm systems for the process industries) and the recommendations of EEMUA 191 (Alarm systems - a guide to design, management and procurement) as set in Section 3.6.4 of Schedule 22.1.6.

Priority	**Category**	**Consequence of No Operator Action**	**Allowable Response Time**	**Normal Operation Status**
P1	Critical Safety Alarm	Risk to personnel, major environmental release, fire, explosion, catastrophic equipment damage	< 1 minute	Not Permitted
P2	Critical Process / Asset Alarm	Plant trip, major production loss, significant equipment damage	1 to 5 minutes	Not Permitted
P3	High Priority Alarm	Serious process deviation that requires prompt operator action to prevent escalation	5 to 15 minutes	Permitted temporarily during upset conditions or adjustments
P4	Medium Priority Alarm	Moderate process deviation requiring operator attention and corrective action	15 to 60 minutes	Permitted during normal operation
P5	Low Priority Alarm	Advisory, warning, maintenance, or diagnostic information	> 60 minutes	Permitted during normal operation

Priorities P1 and P2 are considered as "critical alarms". Priorities P3, P4 and P5 are considered "non-critical" and are permitted during normal operation.

- P1 and P2 alarms shall not be present during normal steady-state operation. Any active P1 or P2 alarm should be treated as an abnormal operating condition requiring immediate attention.
- P3 alarms may occur temporarily during process adjustments, startups, shutdowns, or upset recovery.
- P4 and P5 alarms are considered operational alarms and may be present during routine plant operation, provided alarm performance targets are maintained.

4.2 Readiness to start Trial Operation

The Contractor shall submit a draft "Readiness to Start Trial Operation" report to the Project Manager updated on a weekly basis during the hot test period, whereby a detailed status for all test activities shall be described documenting the readiness to start Trial Operation in accordance with the commissioning protocol.

The Contractor shall deliver to the Project Manager the final report after completion of all hot test activities.

The Project Manager shall issue a Readiness to ~~start~~Start Trial Operation Certificate~~,~~ when:

1. The Contractor has successfully completed all hot testing activities to the reasonable satisfaction of the Project Manager and documented this using test data, calculations, reports and other documentation
2. The Contractor has rectified items on the Snagging List to be completed before the start of Trial Operation
3. The updated commissioning plan (if changes are introduced during hot test) is reviewed ~~and accepted~~ by the Project Manager
4. The Contractor has submitted all necessary evidence to the relevant UK Approved Body and can demonstrate to the ~~Purchaser~~Project Manager that the Plant meets the requirements for the issue of the declaration of conformity, in compliance with Legislation
5. The CMMS is populated with all necessary data for starting the testing period. The Contractor will ensure all maintenance records of activities carried out prior to Take Over are uploaded.
6. Any issues related to health and safety are resolved to the satisfaction of the Project Manager
7. All wear and strategic spare parts are delivered to the Purchaser's stock.

5. TRIAL OPERATION PERIOD

The Trial Operation Period shall demonstrate the Plant can maintain secure, faultless and continuous operation in accordance with guarantee requirements, the environmental requirements and the functional requirements in the Contract.

The Trial Operation Period shall last at least 90 days during which the Plant is operated by the Operator's personnel, but under the management, supervision and responsibility of the Contractor.

During the Trial Operation Period and until Take Over, the Contractor shall ensure that the necessary personnel and Materials are present at the Site for carrying out all activities including, but not limited to, operation, maintenance, testing, rapid fault corrections work or any other measures to complete the Works in accordance with the Contract.

The following constitutes the Trial Operation Period:

1. A 300 hours performance test as described in section 5.2
2. Tests of the civil works and building services described in section 6.
3. Final Inspection described in section 7.
4. Concluded by Take Over as defined by the issue of the Take Over Certificate described in section 8.

5.1 Procedure

During the Trial Operation Period, the Contractor shall not allow the Plant to be out of operation due to faults and subsequent repair on more than three "approved" occasions. All stoppages need to be pre-agreed with the Project Manager to be considered "approved". The Plant shall be operated with a set point of 100% load at all times (with the exception of proving start up / shut down and load variation tests as detailed below and pre-approved by the Project Manager). Operation at part load will normally not be accepted and shall be subject to approval by the Project Manager. Each "approved" operational stop shall be a maximum duration of 24 hours net (i.e. not including time for cooling down and starting up of the Plant in the 24 hours limit).

For the avoidance of doubt, 72 hours is the maximum allowable duration permitted for "approved" operational stoppages, provided that the time period is split across no more than three separate "approved" outages and no single "approved" stop is greater than 24 hours net.

If, for reasons attributable to the Contractor, one or more of these "approved" operational stops exceeds 24 hours in duration, or if more than three stops occur, the Trial Operation Period shall be extended by seven (7) days plus the duration of any stoppages not pre-approved by the Project Manager. If further stops occur during this extended Trial Operation Period, the Trial Operation Period shall be extended again according to the same rules.

In the case of a single unapproved operational stop where the Plant can within two hours, be reset and thereby ready to start again, then the Trial Operation Period shall continue. If the same unapproved operational stop occurs more than two times, then the Project Manager shall have the right to extend the Trial Operation Period for the total period of time of the three or more repeated unapproved operational stops.

In the case of an unapproved operational stop where the Plant cannot be reset and restarted within two hours, the Project Manager has the right to extend the Trial Operation

Period by the duration of the operational stoppage including the time required bring the Plant back to full load.

The Project Manager has the right to terminate the Trial Operation Period in cases where the Trial Operation Period needs to be extended for more than 21 days over its original duration, for reasons attributable to the Contractor.

In the Trial Operation Period no more than sixty (60 ~~process critical alarms~~) non-critical alarms (Priorities P3, P4 and P5 as described in section 4.1) per day are permitted. If more than the agreed limit of alarms ~~are~~is sounded, the Project Manager has the right to prolong the Trial Operation Period. A list of alarms shall be maintained by the Contractor during Trial Operation and shall be included as part of the Snagging List. At Take Over the Plant shall show no standing critical alarms (Priorities P1 and P2 as described in section 4.1) considered under the control of the Contractor (at the Project Manager's agreement) during any 24-hour rolling period.

If problem(s) are identified during the Trial Operation Period which, in the opinion of the Project Manager, prevent secure, safe, consistent, and reliable operation, the Project Manager has the right either to suspend or terminate the Trial Operation Period and, once the problem(s) have been rectified, either continue the Trial Operation Period or to require a new Trial Operation Period to be commenced. The Project Manager can terminate the Trial Operation Period, if he can reasonably demonstrate that continuation would result in safety concerns, danger to human life, injury to personnel, risk of Environmental Permit breach, or risk of damage to the Plant.

The Trial Operation Period under the Contract will include tests to show that:

1. The Plant can be started and shut down, in a controlled manner, using the methods described in the draft operating manual
2. The Plant can be shut down satisfactorily under emergency conditions using the methods described in the draft operating manual
3. The Plant can be operated continuously in compliance with Minimum Performance, and environmental requirements, in accordance with the operational and maintenance procedures, and within the area limited by the lines through load points 1-3-6-7-8-9 and 1 in the Capacity Diagram set out in Schedule 22.1.8 *Process and Design Data*.
4. The Plant can be operated with short peak thermal load variation within the thermal tolerance area limited by the lines through load points 1-3-4-5 and 1 in the Capacity Diagram
5. The Plant can be operated with short peak mechanical load variation within the mechanical tolerance area limited by the lines through load points 1-9-10-5 and 1 in the Capacity Diagram
6. The steam turbine and generator can process the steam flow at nominal thermal load (see Schedule 22.1.8 *Process and Design Data* and reference to correction curves in Schedule 16 *Performance tests and procedures)*
7. The Contractor shall propose the duration of operation in each area of the Capacity Diagram for the Project Manager's approval before commencement of the Trial Operation Period.
8. The flue gas emissions meet the emissions limits set in the Plant's Environmental Permit, as far as measurable with installed equipment
9. Water level in IBA is within required tolerance
10. IBA loss during start up is within required tolerance
11. Levels of metal within IBA is within required tolerance

A 300 hours performance test shall begin within 30 days after the start of the Trial Operation Period. The test shall demonstrate that the Minimum Performance and environmental requirements are fulfilled. Reference is made to Section 5.2 and Schedule 16 *Performance tests and Procedures*.

"Minimum Performance" means the minimum compliance levels of the guarantee levels stated in Schedule 17 *Performance guarantees and damages for failure* following the testing procedures as detailed in Schedule 16 *Performance tests and procedures* such as:

- 95% of waste thermal input included in Schedule 17, table 2.5
- 90% of net power production included in Schedule 17, table 2.5 for case 1 and case 3 representing operation of both lines, without and with district-heating offtake, respectively.

Should it be specified in the Contract that further tests are to be carried out prior to Take Over, the ~~Purchaser and~~ Project Manager shall be notified 10 Business Days in advance of such tests, so that participation in such tests is possible. The Contractor shall prepare and submit test logs from such tests in accordance with Schedule 6 *Quality assurance and validation*.

5.2 300 hours performance test

The 300 hours performance test is further described in the following section.

A minimum of 300 hours of continuous operation is required for the 300 hours performance test, which shall not be interrupted by any form of stops or adjustments. The Plant shall not be trimmed during the entire 300 hours performance test period. If the Plant is stopped or if any of the operational results do not fulfil the environmental requirements or the Minimum Performance a new test of 300 hours must be carried out. During the test the Plant shall be operated by the Operator, but the Contractor shall be available in the Central Control Room.

The Contractor shall register and document all guarantee and environmental values as well as consumption of consumables stipulated in the Contract including measurements not appearing directly from the CMS. These are read at level meters or similar on tanks or containers as agreed with the Project Manager. The results shall be presented clearly in a report. This report shall be available not later than 21 days after the end of the test. The basis for calculation of the results of the 300 hours performance test shall be based on the same procedures to be applied for a performance guarantee test. The procedure for a performance guarantee test is described in Schedule 16 *Performance tests and procedures*.

The instrumentation and measuring equipment of the Plant shall be used to verify that all requirements are complied with during the 300 hours test, except for environmental guarantees where third party measurements are required. If the Project Manager requires further assurance about the fulfilment of Minimum Performance or environmental requirements in the period from the end of the 300 hours performance test until the Take Over (e.g. there is a disagreement between the two parties about whether or not the Minimum Performance or environmental requirements are fulfilled) then the Contractor shall perform additional suitable performance guarantee tests as may be required according to the procedure described in Schedule 16 *Performance tests and procedures*.

5.2.1 Before start of 300 hours performance test

The Contractor shall prepare and issue to the Project Manager a detailed test plan and include the parameters which it intends to document during the performance test no later than 30 days prior to the start of testing. The plan shall include a description of the

methodology for measurement and documentation of the individual parameters. The Contractor's test plan shall be approved by the Project Manager before the 300 hours performance test can commence. Where the Project Manager has not approved, conditionally approved (noting the elements which are conditional) or rejected the Contractor's test plan within 10 Business Days after the submission by the Contractor for approval, then the Contractor's test plan shall be deemed to have been approved.

The Contractor shall be responsible for extraction of all necessary data from the CMS for its own use and reporting during the test and shall make all necessary preparations for this.

The Contractor shall ensure that all instruments reporting to the CMS are calibrated prior to the beginning of the 300 hours performance test.

Calibration of weigh cells on the waste cranes shall be carried out before the start of the 300 hours performance test. The weigh cells must be calibrated with two test weights of known weight corresponding to approximately a full grab load and half a grab load respectively.

The Contractor shall ensure that where wastes with various / differing heating values are available in the bunker, they shall be mixed and used as required to test Plant performance at all load points on the Capacity Diagram in Schedule 22.1.8 *Process and Design Data.* During the 300 hours test, the Plant is allowed to deviate from the requirement of operation at 100% load to allow testing all load points in the Capacity Diagram.

5.2.2 During the 300 hours performance test

The Contractor shall measure and document all consumption of energy, water and chemicals during the test period.

The Contractor shall measure and document Minimum Performance or environmental requirements values regarding emissions, consumptions and productions. Guarantee values for emissions must be documented by environmental reports complemented by third party measurements where required.

The Contractor shall use manual measurements and / or values extracted from the CMS to document consumptions of gas, diesel, oil, chemicals etc.

Relevant energy and mass balances shall be extracted from the CMS as a part of the 300 hours performance test documentation.

Trend curves showing relevant energy and flue gas parameters such as electricity production, emissions, flows, temperatures, pressures extracted from the CMS shall be printed every third hour during the performance test. Each trend curve must show one-minute mean values with a 4-hour time axis.

Each day a daily report shall be prepared and submitted by the Contractor to the Project Manager. The daily report shall as a minimum include all data on hourly average, trend curves, operators log including registration of any changes made and alarm list. The exact form of the daily report shall be agreed between the Contractor and the Project Manager during the planning of the 300 hours performance test. The daily report shall be discussed at morning meetings held each day during the test period and be the basis for the decision to continue the test period should the operation fulfil the necessary requirements.

5.2.3 After 300 hours performance test

The Contractor shall document and promptly issue to the Project Manager the 300 hours performance test results in a report describing the operation and the performance of the

Plant. The report shall be based on calculations and corrections in accordance with the procedures stated in Schedule 16 *Performance tests and procedures* and correction curves issued by the Contractor to the Project Manager.

The report(s) shall include the following chapters:

1. Review of health and safety performance
2. Preconditions and progress during the 300 hours performance test
3. Documentation indicating the level of fulfilment of guarantee values (including but not limited to consumption of energy, water, chemicals and other consumables, emissions, production of electricity and district heating). The Contractor shall provide Documentation demonstrating how it complied with Minimum Performance and environmental requirements. This shall include a detailed assessment of the 300-hour performance test results. For the sake of clarity, during the 300-hour performance test, the Plant shall achieve the Minimum Performance and environmental requirements. The accurate assessment of other performance guarantees shall be carried out during the Performance Test Period in accordance with Schedule 16 and Schedule 17.
4. Relevant heat and mass balances
5. Relevant correction curves issued by the Contractor
6. Relevant trend curves
7. Comments and conclusion to the 300 hours performance test

5.3 Completion of Trial Operation Period

The Trial Operation Period is completed, when:

1. the Trial Operation Period has lasted 90 days plus possible extensions due to operational stops attributable to the Contractor; and
2. all the further tests to be carried out as specified in the Contract must have been carried out satisfactorily in accordance with the Contract; and
3. the 300 hours performance test is successfully completed and documented by the Contractor in a test report which has been accepted by the Project Manager; and
4. the training of the Purchaser's and Operator's personnel have been successfully completed in accordance with Schedule 9 *Training by the Contractor*; and
5. the operation is secure, faultless, continuous and in full / automatic mode according to the Contract Specification as demonstrated by the compliance with limb 1 above; and
6. the Minimum Performance and environmental requirements specified in the Contract are fulfilled.

If not, the Trial Operation Period shall be extended until fulfilment of (1) to (6) above have been demonstrated.

The Trial Operation Period shall end when the Take Over Certificate is issued by the Project Manager. Subject to the Contractor meeting all of the other pre-conditions for Take Over referred to in section 8 of this Schedule and subject to Sub-clause 33.17 of the Conditions of Contract, once the conditions required in this section 5 are fulfilled, the Project Manager shall issue the Take Over Certificate within ten (10) Business Days.

6. TESTING OF CIVIL WORKS AND BUILDING SERVICES M&E

The testing and commissioning of civil works and building services shall demonstrate compliance with the design, the Contract, authority requirements, the Consents and Good Industry Practice and readiness for Take Over.

The testing and commissioning of building services M&E shall be in accordance with all relevant British Standards CIBSE commissioning codes, BS 7671:2018 Part 6 – Inspections and testing, BS 5839:2107, building regulations, statutory body requirements and normal accepted best practices for construction industry.

The building services M&E systems shall be tested and commissioned as described in Schedule 14 *Criteria for completion of construction*.

The Contractor shall demonstrate that the buildings, buildings services and infrastructure elements are tested to verify that they meet the Contract and relevant performance requirements including health, safety, environmental and quality standards. This shall include but not be limited to doors, windows, gates, barriers, signs, lighting, power points, IT systems, security, alarms, rain water goods (e.g. gutters, downpipes), fire systems, CCTV, water points and wash down facilities, air lines and HVAC. The tests shall take place over a minimum of a 48 hour period to demonstrate day and night time performances where appropriate. Conditions in each room including all offices, welfare, technical rooms and Plant areas shall be recorded every three (3) hours and include readings of temperature and humidity.

The Contractor shall demonstrate that all noise limits (as detailed in Schedule 22.1.12 *Acoustic Noise and Vibrations*) are being achieved in all areas and under all operating scenarios, using recognised methods and in accordance with EU / UK standards and Guidance.

The Contractor shall make suitable provisions for the ~~Purchaser,~~ Project Manager and its representatives to be present for an agreed period during the commissioning to verify that the civil works and building services mechanical and electrical systems conform to the Contract. These provisions shall be presented to the Project Manager for review and approval, comment or rejection at least six (6) months prior to commencement of such commissioning. The Contractor shall demonstrate that dust and odour levels are within the limits prescribed in the Environmental Permit and Consents. In particular, the Contractor shall ensure the carbon filtration system remains engaged and in full operation during all instances of Plant outage. Measurements shall be taken and recorded in accordance with recognised EU / UK standards and Guidance. In particular dust levels will be established including those at potential sources of dust emissions such as conveyors, powder handling systems, waste tipping points.

The Contractor shall provide the Project Manager with all relevant commissioning documentation including the commissioning procedures and test results within 7 days of completion of the tests. Reports shall also be presented at the monthly meetings in accordance with the provisions of Schedule 2 *Documentation* of the Contract.

The Contractor shall allow for re-testing and commissioning all building services within the process areas during the 300 hour test process so that any systems that are affected by the higher temperatures arising from the operation of Process Plant can be adjusted and recommissioned so that they comply with the requirements of the Contract.

7. FINAL INSPECTION

Within the last 21 Days of the Trial Operation Period, and before the Take Over, the Contractor shall perform a final inspection of the Plant in conjunction with the ~~Purchaser,~~ Operator and Project Manager.

The Contractor shall provide for ~~the approval of the~~review and comment to the Project Manager a detailed plan on inspections to be performed at the stop no less than 7 days before the final inspection. The inspections must as a minimum include all vital Materials as well as systems exposed to wear and tear according to the Contractor's experience.

The Contractor shall carry out these inspections and record any Plant Defects. The ~~Purchaser,~~ Project Manager and its representatives shall be permitted to witness any inspections carried out.

The inspection will be passed when there is / are no observations of conditions that may affect Plant safety, performance or reliability in the present or future as included in (but not limited to) the list below:

1. Undue erosion or corrosion
2. Unexpected stains, leaks or residues
3. Unforeseen / significant build-up of deposits or blockages
4. Signs of mechanical or thermal stress
5. Abnormal wear, damage or cracking
6. Misalignment or distortion of components and fittings
7. Faults or malfunctions
8. Unsafe items or hazards

Within 7 Days of the inspection the Contractor shall prepare and submit a report to the Project Manager describing findings during the inspection, including rectification initiatives with time schedules for rectification works. Furthermore, the Contractor shall describe what influence the Defects have on its fulfilment of the guarantees and the functional and environmental requirements.

Whilst items and equipment will be examined, components and equipment will not be dismantled unless the ~~Purchaser,~~ Project Manager or the Contractor has reasonable grounds to do so. There shall be no restriction on access and all doors and removable panels, guards, covers and ports shall be made safe to open during the inspection.

8. TAKE OVER

Take Over is conditional upon:

1. The Works fulfilling all the Contract requirements including health, safety, environmental and quality standards
2. The Trial Operation Period, including 300 hours performance test, has been completed and approved by the ~~Purchaser~~Project Manager
3. ~~The~~All testing and commissioning of ~~civil works and building services M&E~~the Works has been completed ~~and approved by the Purchaser~~
4. The final inspection has been conducted and the report ~~accepted by~~submitted to the Project Manager
5. The Works are complete and in a thoroughly clean condition in relation to Good Industry Practice
6. The construction Site including Laydown Areas used by the Contractor is clean and completely cleared
7. The ~~operation and maintenance documentation~~Operation and Maintenance Documentation (including as built documentation) is available in a form approved by the Project Manager

~~8. Including the requirements as defined in Schedule 19 *Terms of payment*~~

8. ~~9.~~ The CMMS is fully implemented and in operation

Prior to Take Over, the Contractor must complete a clean of the entire Works, particularly all permanent assets. ~~If the final clean is not completed to the satisfaction of the Project Manager, the Contractor shall at its own cost clean any further areas identified. The final clean must be completed to the Project Manager's satisfaction before the Take Over Certificate is issued.~~

9. THE DEFECTS LIABILITY PERIOD

During the Defects Liability Period, the Contractor shall perform regular visits, at a maximum interval of 90 days, and when called in by the Project Manager~~, the Purchaser or its operating and maintenance staff~~ acting reasonably.

During the Defects Liability Period the Contractor shall attend Defects and performance review meetings as deemed appropriate but anticipated to be quarterly at least.

The Contractor shall participate in the inspections at all the planned Plant ~~shut downs~~shutdowns during the Defects Liability Period.

During the Defects Liability Period, the Contractor shall document faulty operations or faulty use of the Plant of which they are aware and inform the ~~Purchaser and~~ Project Manager forthwith.

The Contractor shall assist in planning the guarantee tests and be present and available during the testing period.

10. FINAL CERTIFICATE

Prior to the issue of the Final Certificate, a review of the Plant, including an evaluation of the condition and state of the Materials and equipment, shall be carried out by the ~~Purchaser and~~ Project Manager. The Contractor or its authorised representative shall be obliged to participate in the review.

The issue of the Final Certificate is conditional upon:

- The Plant having met the conditions in the Contract;
- the Operating and Maintenance Documentation being available, up to date and ~~approved~~reviewed by the Project Manager, and including documentation covering adjustments and changes that have been incorporated during the course of the Defects Liability Period.

For the Defects Liability Period, and any extension thereof, the Materials, equipment and other items shall be checked and an evaluation of the condition of Materials, equipment and other items concerned shall be made at the end of the Defects Liability Period or extension thereof. The Contractor shall prepare a plan for these checks and evaluations prior to completion of construction ~~which shall be subject~~. Such plan is submitted to the Project ~~Manager's approval~~Manager for review and comment. The results of the checks and evaluations shall be set out in a report prepared by the Contractor for the ~~Purchaser and~~ Project Manager and submitted to them within 10 days of the end of the Defects Liability Period or any extension thereto.

APPENDIX A - COMMISSIONING PROCESS FLOW CHART

Summary report: Litera Compare for Word 11.9.0.82 Document comparison done on 12/11/2026 16:24:03	
Style name: Default Style	
Intelligent Table Comparison: Active	
Original filename: NP-RUK-41XX-XXX-SP-TA-090015_IChemE Schedule 15 Take Over procedures_Ver54.docx	
Modified filename: SVA 3_Schedule 15 Take Over Procedures_CLEAN and FINAL.docx	
Changes:	
Add	77
~~Delete~~	107
~~Move From~~	0
Move To	0
Table Insert	1
~~Table Delete~~	0
Table moves to	0
~~Table moves from~~	0
Embedded Graphics (Visio, ChemDraw, Images etc.)	0
Embedded Excel	0
Format changes	0
Total Changes:	185