BEFORE

THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

APPLICATION FOR MODIFICATION OF

GENERATION LICENSE NO.IGSPL/05/2006 DATED JUNE 06, 2006 ON BEHALF

OF

SAPPHIRE ELECTRIC COMPANY LIMITED (SECL)

PURSUANT TO REGULATION 10(1A) OF THE NEPRA (APPLICATION, MODIFICATION, EXTENSION AND CANCELLATION) PROCEDURE REGULATIONS, 2021), READ TOGETHER WITH THE REGULATION OF GENRATION, TRANMSIOSION AND DISTRIBUATION OF ELECTRIC POWER ACT,1997ANDAll OTHER ENABLING PROVISIONS OF LAW

Dated 03 December 2025

7-A/K, Main Boulevard, Gulberg-II,
Lahore (Pakistan).
UAN: + 92 42 111-000-100 Fax: +92 42 35758783, 35713753

Sapphire Electric Company Limited

The Registrar
National Electric Power Regulatory Authority (NEPRA)
NEPRA Tower, Ataturk Avenue (East)
G-5/1, Islamabad

Date: **December 03, 2025**
Ref: SECL-NEPRA-LPM-3627

Subject: **Application for Modification of Generation License for Sapphire Electric Company Limited under Regulation 10of the NEPRA Licensing (Application, Modification, Extension & Cancellation) Procedure Regulations, 2021**

Dear Sir,

Pursuant to **Regulation 10** of the NEPRA Licensing (Application and Modification Procedure) Regulations, 2021, Sapphire Electric Company Limited ("SECL") respectfully submits the enclosed License Proposed Modification ("LPM") for updating/incorporating the operational parameters of its generation facility in Generation License, specifically with respect to:

1. **The Gas Turbine Start-Up Sequence (Staggered Synchronization Order); and**
2. **Revised grid synchronization timelines based on OEM-mandated thermal stress limitations and plant configuration constraints.**

This request is supported by the following technical documents:

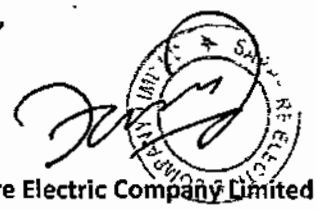
- **OEM Start-Up Sequence and Recommendation Letter (GE Vernova)** – *Annexure A: OEM recommendations for SECL complex start-up*
- **HRSG Preservation Guidelines (Wet and Dry Preservation Requirements)** – *Annexure B*

The proposed modification is **necessary, operationally justified, and consistent with prudent utility practice**, as it is derived from operational requirements of the SECL Complex, established industry norms for combined-cycle operations, and OEM recommendations. Incorporating these revisions into the Generation License will ensure that the license accurately reflects the plant's operational requirements, in line with NEPRA's approach to similar OEM-driven technical adjustments.

Additionally, I, **Faisal Zia Siddiqui**, being the duly authorized representative of Sapphire Electric Company Limited by virtue of the Board Resolution dated **October 25, 2025**, hereby apply to the National Electric Power Regulatory Authority for the modification of our **Generation License No. IGSPL/05/2006 dated June 06, 2006** ("Application").

A pay order No. 1001135 dated 03-12-25 issued by United Bank Limited, Lahore Branch, in the sum of PKR 2,473,627 (Pak Rupees Two Million Four Hundred Seventy-Three Thousand Six Hundred and Twenty-Seven Only), being the non-refundable license application fee after deduction of withholding tax at the rate of 15% i.e. PKR 436,522 on the total fee of PKR 2,910,149, calculated in accordance with Schedule II to the NEPRA Licensing (Application and Modification Procedure) Regulations, 2021, is attached herewith.

Truly Yours,



For Sapphire Electric Company Limited
Faisal Zia Siddiqui (Director Energy Business)

1. Pay order # 100135 Dated December 03, 2025 from United Bank Limited
2. Affidavit
3. Extract of Board Resolution
4. Licensed Proposed Modification (LPM) Application
5. Copy of Generation License

7-A/K, Main Boulevard, Gulberg-II,
Lahore (Pakistan).
UAN: + 92 42 111-000-100 Fax: +92 42 35758783, 35713753

Sapphire Electric Company Limited

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED BY CIRCULATION OF THE BOARD OF DIRECTORS
OF SAPPHIRE ELECTRIC COMPANY LIMITED
DATED OCTOBER 25, 2025

UNANIMOUSLY RESOLVED that the Application for Modification of Generation License No. **IGSPL/05/2006** in respect of the **212.107 MW thermal power generation facility** (the "Project") (the "**Application**") is hereby approved for submission by the Company to the National Electric Power Regulatory Authority (**"NEPRA"**).

FURTHER RESOLVED THAT **Mr. Faisal Zia Siddiqui, Director Energy Business,** be and is hereby singly given the mandate and authorized to:

I review, execute and submit the Application or any other related document, including any contracts, affidavits, statements, documents, powers of attorney, letters, forms, applications, deeds, guarantees, undertakings, approvals, memoranda, amendments, letters, notices, certificates, requests, statements and any other instrument of any nature whatsoever, to NEPRA, for and on behalf of the Company, and to proceed with and make any corrections and amendments, if required, in finalizing the Application or any other related document;

ii. attend, represent and participate in all meetings, negotiations, hearings and conferences of whatsoever nature before NEPRA or any other regulatory authority or official or person in connection with the submission and approval of the Application and pay the necessary fees, for and on behalf of the Company; and

iii. do all such acts including but not limited to delegation of any of the powers granted herein to any other director or officer of the Company, singly or jointly, and submit all such documents as may be necessary in respect of the foregoing resolutions.

FURTHER RESOLVED THAT any and all actions of **Mr. Faisal Zia Siddiqui, Director Energy Business,** in pursuance of, or in furtherance of the intent and purposes of the foregoing resolutions, are hereby in all respects adopted, approved, confirmed and ratified as the valid and subsisting acts of the Company.

Company Secretary

E-STAMP

E-Stamp ID: **PB-LHR-5F86314215326518**
PSID: **App-40172512014484035**

Stamp Type: **Low Denomination**
Amount: **Rs 300/-**

Description	: AFFIDAVIT - 4
Applicant	: Faisal Zia Siddiqui [34101-2489463-7]
Representative From	: Director Energy Business Sapphire Electric Company
Agent	: Faisal Zia Siddiqui [34101-2489463-7]
Address	: 7 A/K Main Boulevard Gulberg II
Issue Date	: 01-Dec-2025, 03:52:05 PM
Delisted On/Validity	: 8-Dec-2025
Paid Through Challan	: 2025744F6EACA3F2
Amount in Words	: Three Hundred Rupees Only
Reason	: AFFIDAVIT BEFORE THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

RAJA ZULFIQAR AHMAD ADV.B.A.LL.B OATH COMMISSIONER DISTT. COURT LAHORE

نوٹ: یہ ٹرانزیکشن تاریخ اجراء سے سات دنوں تک کے لیے قابلِ استعمال ہے۔ ای اسٹامپ کی تصدیق بذریعہ ویب سائٹ۔ کیو آر کوڈ سے کی جا سکتی ہے۔

AFFIDAVIT
BEFORE THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

I, Faisal Zia Siddiqui, son of Zia Ullah Siddiqui, CNIC No. 34101-2489463-7, Director Energy Business, Sapphire Electric Company Limited, having its registered office at 7 A/K Main Boulevard Gulberg II, Lahore (the "**Company**"), being duly authorized through the Board Resolution dated October 25, 2025, do hereby state on oath as under:

1. That I am the authorized representative of Sapphire Electric Company Limited, the holder of Generation License No. IGSPL/05/2006 in respect of its 212.107 MW thermal power generation facility at Muridke, District Sheikhupura, Punjab (the "**Project**"), and am fully conversant with the facts relating to the Licensee Proposed Modification (LPM).

2. That I solemnly affirm that the contents of the statements and information furnished therewith are true and correct to the best of my knowledge and belief.

1. DETAILS OF THE PETITIONER

1.1 Name and Address

Name: Sapphire Electric Company Limited (SECL)
Address: 7-A/K, Main Boulevard, Gulberg-II, Lahore
Phone: +92-42-111000100
email: fzsiddiqui@secl.pk, umar.rahi@secl.pk

1.2 Particulars of Authorized Representative

Name:	Mr. Faisal Zia Siddiqui
Designation:	Director Energy Business
Authority:	As authorized by Board Resolution dated October 25, 2025.

1.3 Background

SECL owns and operates a 225 MW Combined Cycle Power Plant using two Gas Turbines (GTs), two HRSGs (without diverter dampers) and one Steam Turbine (ST). Due to the non-availability of diverter dampers, the Complex can only operate in **Combined Cycle** Mode, and therefore, the **start-up sequence, GT staggering, and synchronization timings are dependent on OEM-recommended operational requirements and HRSG preservation limitations.**

SECL was granted Generation License No. IGSPL/05/2006 dated June 21, 2006. The "Generation License" under section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power ACT. 1997.

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2. PROPOSED MODIFICATION

In accordance with Regulation 10(1) of the NEPRA 2021 Regulations, SECL applies for modification of the synchronization sequence and start-up parameters under Schedule-I of its Generation License.

2.1 Type or Category of Licence proposed to be Modified: Generation Licence

2.2 Text of the Proposed Modification: Start-Up Sequence (GT Staggering / Synchronization Order)

SECL proposes that the following OEM-recommended Gas Turbine (GT) Sequence (Staggering) be incorporated into Schedule-I to ensure reliable plant start-up and to maintain thermal integrity across the Complex. As per OEM guidance, the start-up process begins with the synchronization of 1st GT, allowing the unit to reach a stable operating state. Once 1st GT is synchronized, corresponding 1st HRSG initiates the production of high-pressure (HP) and low-pressure (LP) steam required for downstream operations. After achievement of required steam parameters in compliance with the OEM's thermal stress limitations, the steam is admitted to **Steam Turbine (ST).**

SAPPHIRE ELECTRIC COMPANY

Following the load requirements of Power Purchaser, 2nd GT is started, synchronized and its corresponding 2nd HRSG initiates production of HP and LP steams. This staged approach allows the bottoming cycle to be properly established before latching of 2nd HRSG once its respective steam parameters are aligned within the acceptable limits.

This sequence ensures optimal thermal management, minimizes stress on critical equipment, and aligns with industry best practices for combined-cycle operations.

Afterwards, Complex is loaded to Base Load as per NPCC demand

(Reference: GE Letter dated November 26, 2025- – SECL Complex Start-Up Sequence) "Annexure A"

(HRSG Preservation Guidelines (Wet and Dry Preservation Requirements) – *"Annexure B"*

2.2 Modification – Start-Up / Synchronization Timelines

Based on OEM Start-Up Timetable and HRSG Preservation Requirements (Annex-1, GE Start-Up Table)

SECL Complex Startup (the following revised synchronization times are proposed):

	Length of Shutdown	Notice required synchronizing				Complex Full Load (Minutes) after 1st GT Sync
		Removal of HRSG Preservation (Minutes)	1st GT Sync after Removal of HRSG Preservation (Minutes)	2nd GT Sync after Sync of 1st GT (Minutes)	ST Sync (Minutes) after 1st GT Sync	
i	Not more than 2 hours	0	26	26	42	60
ii	More than 2 hours but less than 8 hours	0	26	26	52	70
iii	More than 8 hours but less than 32 hours	0	31	31	80	155
iv	More than 32 hours but less than 150 hours	20	31	31	90	165
v	More than 150 hours	20	36	36	130	320

2.3 Basis for Modification

These values replace the earlier **generic synchronization times** submitted at the time of Power Purchase Agreement, which were **indicative** and **not based on actual OEM-validated operations.**

The modification reflects:

- thermal stress limitations
- Absence of diverter dampers (Combined Cycle only)
- HRSG preservation requirements (wet/dry preservation timelines)
- Real operational data
- GE-approved start-up curves

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3. REASONS IN SUPPORT OF THE MODIFICATION

3.1 Technical Rationale

a. SECL HRSGs lack diverter dampers, requiring full combined-cycle synchronization sequence; GTs cannot be started and synchronized in open cycle mode.

b. GE OEM explicitly recommends staggered start-up sequence due to thermal integrity and steam quality requirements (Annexure A & OEM Letter).

c. Sequential heating of steam lines, HRSG drums, and ST rotor is required to prevent thermal shock.

d. Synchronization timings are dependent on HRSG preservation removal, steam purity development, matching of steam parameters, and system stabilization.

e. Real-time start-up events confirm that earlier license timelines are technically unachievable and unsafe.

f. GE's Start-Up Tables and HRSG Preservation Guidelines (Wet/Dry) dictate the time required to reach acceptable steam conditions before synchronization.

Need for this modification has intensified recently due to gradual but fundamental change in plant dispatch pattern. Plant was designed to operate in base load conditions largely under FCBL mode, requiring limited start-stop cycles and stable thermal profiles. However, post 2015 capacity additions, dispatch has dropped sharply causing frequent start-up and shutdown events under peaking conditions. These rapid cycling conditions directly impact the thermal integrity of the Plant, making strict adherence to OEM-prescribed start-up sequencing and synchronization timelines technically mandatory. Accordingly, these material changes in operational regime require alignment of the Generation License with the actual technical limits of the plant.

3.2 Safety and Reliability

The modification ensures:

- Protection of GT, HRSG & ST assets
- Prevention of thermal fatigue and stress failures
- System reliability
- Compliance with OEM requirements and international best practices

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4. STATEMENT OF IMPACT

4.1 *Impact on Tariff*

SECL confirms that it continues to operate under the NEPRA-approved tariff framework, and the proposed modification does not lead to any change or adjustment in the applicable tariff. Accordingly, there is no tariff-related impact arising from this modification.

4.2 *Impact on Quality of Service*

The proposed change enhances the overall quality of service by strengthening start-up reliability. By following the recommended sequence, the operational life cycle of the HRSGs and the Steam Turbine is better protected, as thermal stress is minimized and equipment is operated within safe OEM recommendations. This approach also contributes to a reduction in forced outage risks, thereby improving plant availability and system dependability. Importantly, the modification poses no adverse impact on the power system or NPCC operations.

4.3 *Impact on Obligations under Generation License*

The modification:

- Ensures compliance with OEM instructions
- Aligns plant operations with actual technical design
- Enables SECL to discharge obligations of safe generation and continuous availability

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5. PRAYER

In light of the foregoing submissions and the technical justification provided, SECL most respectfully seeks the Authority's approval for the proposed modification to its Generation License concerning the Gas Turbine Sequence (Staggering) and the associated start-up and synchronization timelines. SECL further requests that the OEM-validated synchronization sequence, along with the corresponding timelines, be formally incorporated into Schedule-I of the Generation License to ensure clarity, operational consistency, and regulatory alignment.

SECL also humbly prays that this request be considered on a non-discriminatory basis, in line with the treatment accorded to similar matters previously adjudicated by NEPRA. Additionally, SECL seeks any further relief or directives that the Authority may deem just, equitable, and appropriate in the circumstances.

6. ANNEXURES

- **OEM Start-Up Sequence and Recommendation Letter (GE Gas Power)** – *Annexure A: OEM recommendations for SECL complex start-up*
- **HRSG Preservation Guidelines (Wet and Dry Preservation Requirements)** – *Annexure B*

ANNEXURE
"A"

GE VERNOVA

GE Vernova International LLC
Level 12, Arfa Software Technology Park
346-B Ferozpur Road, Lahore 54660,
Pakistan
T +92 42 35 989 701

Date. 26th November 2025

Subject: Sapphire Electric Company Limited ("SECL") Complex start up

Dear Mr. Shahid,

Based on GE's experience as the O&M Contractor for the SECL Complex, as well as our broader operational experience as OEM of similar power plants, we have observed that achieving the technical time required for synchronizing the Generating Unit(s) can be challenging under the default plant configuration, particularly when Heat Recovery Steam Generators (HRSGs) lack diverter dampers and the SECL Complex is limited to operating in Combined Cycle Mode.

Drawing on industry best practices and our operational experience, GE Vernova recommends to synchronize one Gas Turbine (GT) first during complex start-up operations, followed by the synchronization of the Steam Turbine (ST) or the second GT. This sequence is important because of the bottoming cycle, which includes the ST and HRSG, begins its key operational processes after the first GT is synchronized.

Additionally, maintaining the integrity of the HRSGs after warm conditions is essential to ensure the reliability and safety of all associated components. This critical requirement has been clearly outlined in the start-up timetable.

Given these considerations and historical operational patterns, we have made necessary clarifications in the Complex Start-Up Timetable, which is attached as Annexure-1. We have also included real-time data charts illustrating start-ups under various modes as Annexures-2 to 6 for your reference.

Sincere regards,

GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012985

Country Service Director,

GE Vernova Gas Power,

Middle East and North Africa Services ITR

Annex-01:

Start-up timetable:

	Length of Shutdown	Notice required synchronizing				Complex Full Load (Minutes) after 1st GT Sync
		Removal of HRSG Preservation (Minutes)	1st GT Sync after Removal of HRSG Preservation (Minutes)	2nd GT Sync after Sync of 1st GT (Minutes)	ST Sync (Minutes) after 1st GT Sync	
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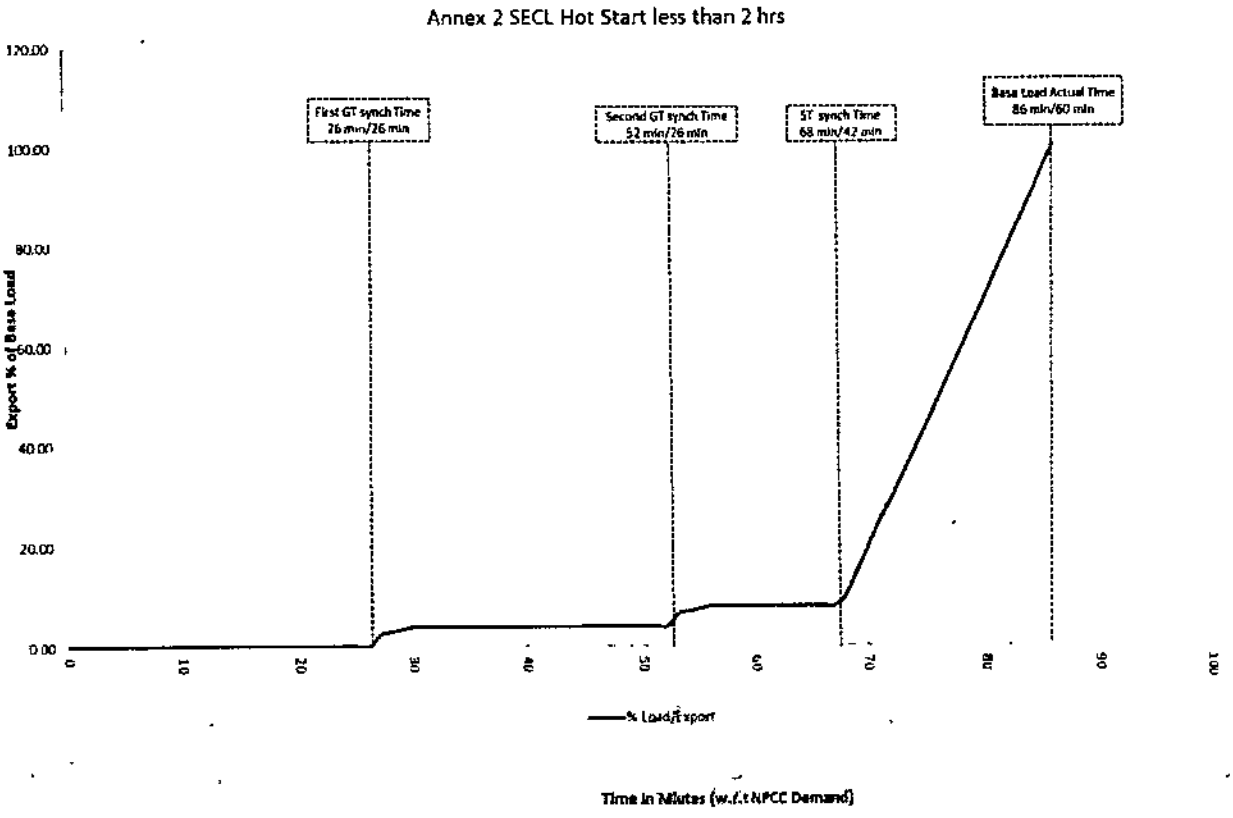
v	More than 150 hours	20	36	36	130	320

GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012985

ELECTRIC COMPANY LIMITED

Annex-02:



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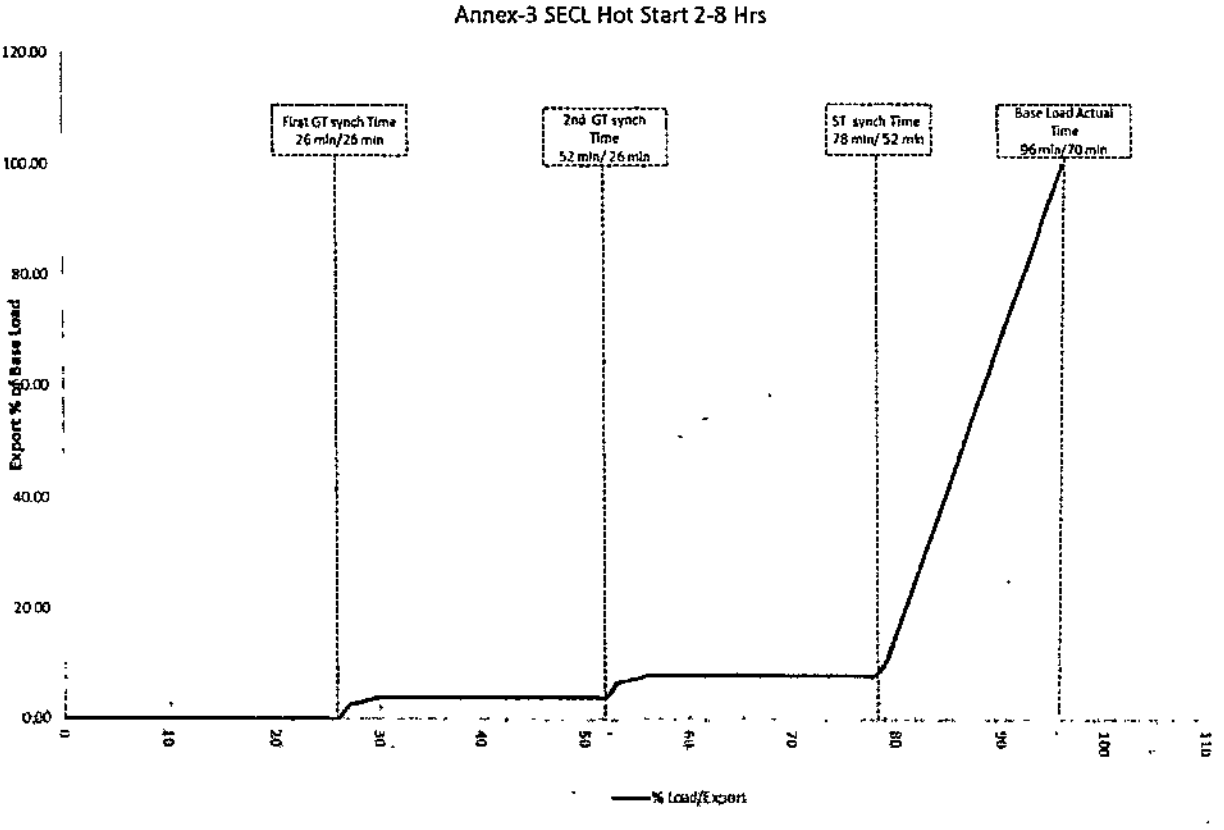
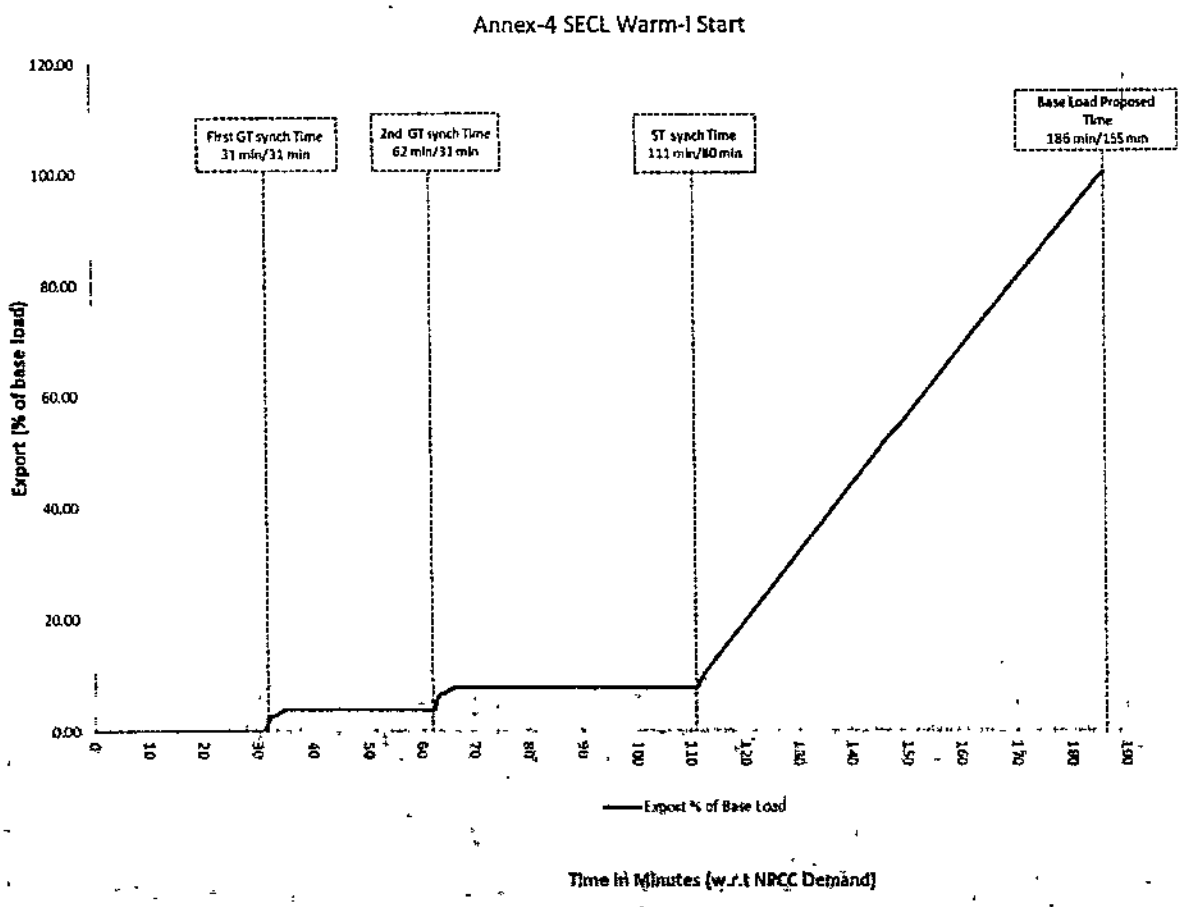
Annex-03:


Annex-3 SECL Hot Start 2-8 Hrs
First GT synch Time 26 min/26 min
2nd GT synch Time 52 min/ 26 min
ST synch Time 78 min/ 52 min
Base Load Actual Time 96 min/70 min
Export % of Base Load
120.00
100.00
80.00
60.00
40.00
20.00
0.00
0
10
20
30
40
50
60
70
80
90
100
110
% Load/Export
Time in Mfutes (w.r.t NPCC Demand)

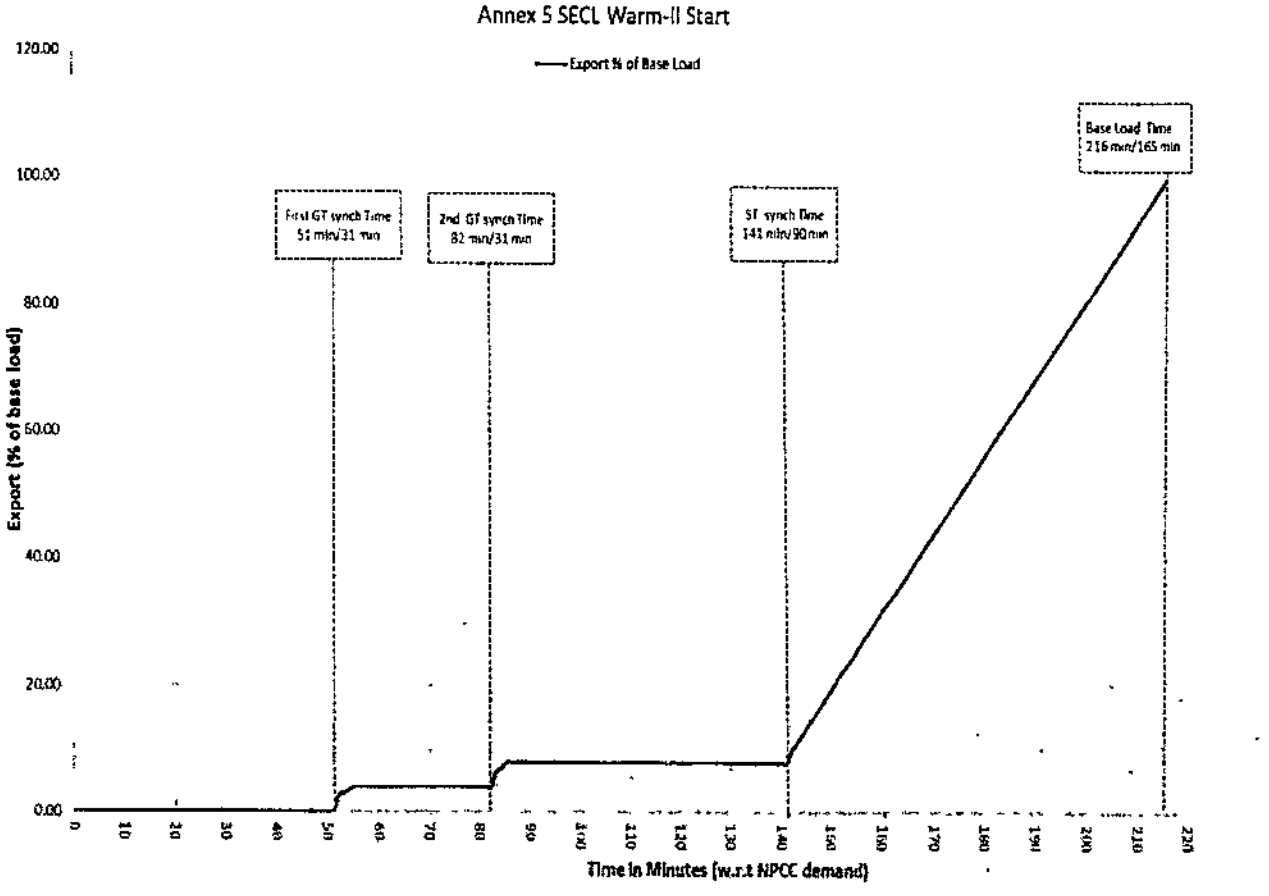

GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012985

Annex-04:



GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012885

Annex-05:



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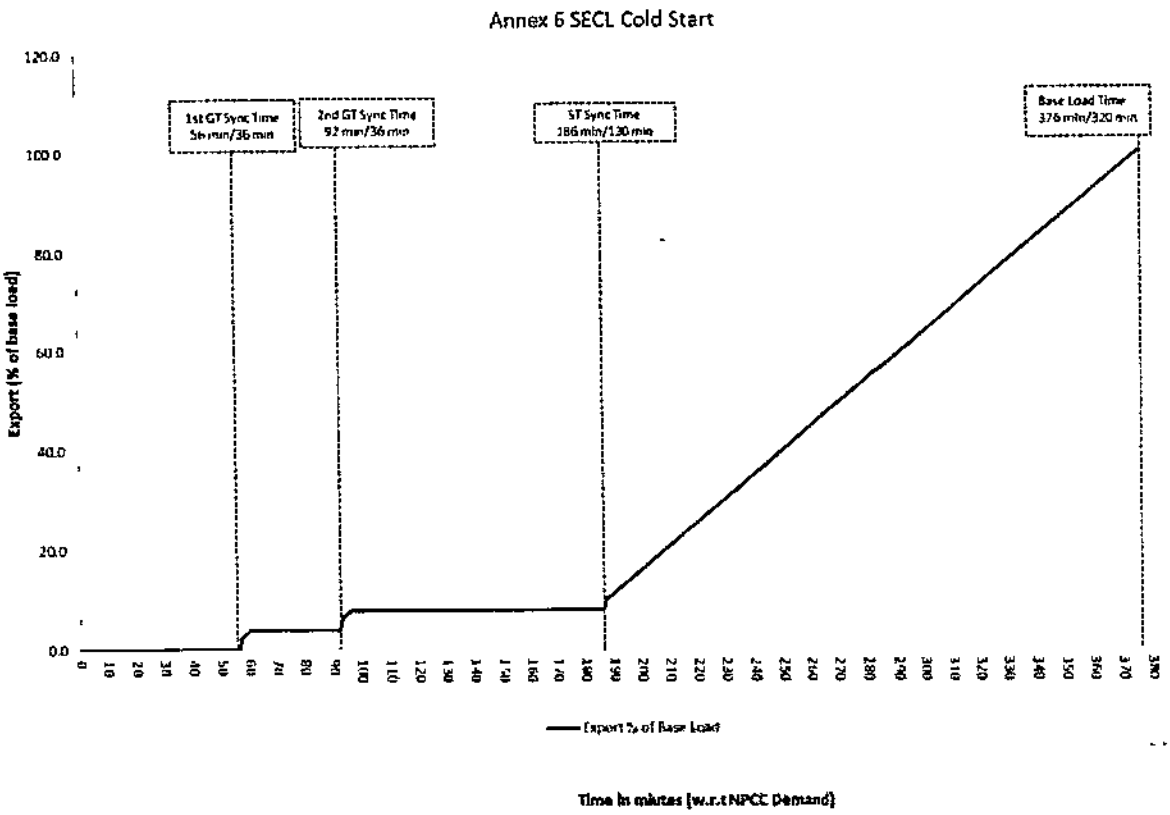
Licence / Registration No: 0012985

Annex-06:



GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012985

ELECTRIC COMPANY LIMITED

ANNEXURE

"B"

General Electric International Inc
Arfa Software Technology Park
12th Floor, 346-B, Ferozpur Road,
Lahore- Pakistan.

April 13, 2021

Attention: Sapphire Electric Company Limited
7 A/K, Main Boulevard, Gulberg II,
Lahore

Subject: HRSGs OEM Guidelines for preservations.

This refers to OEM recommendations for preservation of HRSGs during stand by period, as attached Annexure-B.

Best regards,

Farrukh Raees Ahmad,
Service Director,
GE Power Services-Pakistan
On behalf of
General Electric International, Inc. & GE Energy Parts, Inc.
O&M Contractor - Sapphire Electric Company Limited

GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012995

SAPPHIRE ELECTRIC COMPANY LIMITED

Annexure B

OEM's recommendations For HRSG,s

1. Minimum safe exhaust flue gas temperatures on gas & HSD fuel, at which sulfur dew point can be avoided.
   For NG operation, temperature in FW tank should be 105 C & Pressure 1.2bara.
   Stack tempreture should be 120C.(105+15 or 20).
   For HSD operation, temperature In FW tank should be 130C & Pressure 2.7bara.
   Stack tempreture shoud be 150C.
   Dew point curve has been provided & check the Sulphur content in NG & HSD for set point of FW tank & stack temperature.
2. How to achieve / maintain the minimum safe exhaust flue gas temperature when operating on gas fuel.
   set point for pressure in FW tank on value 2,7 bara for HSD operation.
   set point for pressure in FW tank on value 1.2 bara for NG operation
   NPSHr for LP FW pump to be checked from pump performance curve & revise set point for LP FW pump.
3. Either we have to adopt oxidizing or reducing treatment along with mechanical de-aeration.
   There is no difference for oxygen treatment of FW! The contend of Oxygen in FW shall be under 20 ppb independent of fuel. The type of fuel has no impact to internal Corrosion of pressure parts. Oxygen scavenger should by apply during cold starts (FW tank is not pressurized).For cold start Oxygen scavenger is dosed & for Normal Operation only thermal treatment is required.
4. OEM to clarify about two different limits for dissolved oxygen mentioned in the manual with respect to the fuel.
   The content of Oxygen in FW shall be under 20 ppb independent of fuel
5. When HRSGs are out of service, how to preserve feed tank & pipes, as we have to dose the chemicals at suction of feed pumps. What is the opinion of OEM about the requirement to change the location of dosing point?
   For short down (less than 10 days) for the preservation of FW tank motorized valve must be installed at DA vent line to avoid ingress of air,OEM suggested no need to change location of chemical dosing.
6. OEM to approve the HRSG preservation methods under different scenarios.
   OEM recommend the following methods of preverservation.

- <u>Wet Preservation (Stand By position up to 30 days):</u>

For this it was advised by the OEM to keep the level at normal and apply the nitrogen capping at positive pressure. However whenever water level goes down, fill it up with the non-de-aerated demineralized water along with excessive dosing of chemicals like carbohydrazide and neutralizer.
OEM advise is required regarding how much pH and oxygen scavenger contents are required to maintain during this situation for the proper preservation in stand by position for 30 days.
OEM adviced to keep PH & Oxygen scavenger should be maintained as during normal operation.

Dry Preservation (For more than 30 days):

It was also suggested that when complex is on shutdown for more than 30 days, then go for dry preservation without placing the hygroscopic material. As per OEM for dry preservation fill up the boiler with demineralized water up to maximum level along with excessive dosing of chemicals for oxygen scavenging. Meanwhile apply the nitrogen capping to avoid air ingress. In the second step start the draining of the boiler by regulating positive nitrogen pressure over the water bed to avoid air ingress from atmosphere until the completion of draining. After that maintain the positive nitrogen pressure over the period of preservation.
OEM to indicate that how much positive pressure should be managed at minimum level during the period of preservation.
Just to keep the slightly positive N2 pressure than atmospheric pressure.

Bilfinger (BBCZ)	SECL	GE (O&M)
Jan Dvorak Rostislav Parizek Jaroslav Kollner	Sohail Khan	Naveed Javed

04/03/14

GE VERNOVA INTERNATIONAL LLC
Licence / Registration No: 0012985

1.7.4.4 Types of preservation

1.7.4.4.1 Preservation of the boiler pressure system with nitrogen cushion

It is advisable to perform the preservation of the boiler pressure system with a nitrogen cushion at the scheduled shutdown in duration from 14 days to 1 month. This preservation is based on the filling of the inner steam spaces of the drums, superheaters, saturated steam piping and steam pipelines with inert gas. Evaporators and economizers are filled with water and drums are filled up to the standard level.
For the needs of this preservation it is necessary to ensure a sufficient amount of N_2 for HP and LP steam spaces, namely some 18 Nm^3. Within the preservation itself it is necessary to observe the relevant safety instructions for nitrogen handling.

The performance proper of the preservation of the steam spaces

Shutdown boiler is the condition for the start of preservation process; namely all the valves at boiler shall be in their start-up positions according to the chapter 1.4.2.2, with the exception of the stop valves for extraction of samples, which shall be closed.
In the event that the overpressure in the HP (LP) drum 1(2) HAD20 CP001 – CP003, or 1(2) HAD20 CP501 (1(2) HAD70 CP001 or 1(2) HAD70 CP501) during boiler shutdown decreases to ca. 3 bar(g), the nitrogen supply can be connected. The valves 1(2) HAH10 AA030 (1(2) HAH70 AA030) in the nitrogen admission line to the HP (LP) saturated steam piping are opened. When the boiler further cools down the internal pressure is maintained the same as pressure of nitrogen system, consequently, the boiler will be automatically filled with nitrogen.
In the course of preservation the nitrogen overpressure should not get below 0.1 bar(g). That means that operating personnel can close the valves 1(2) HAH10 AA030 (1(2) HAH70 AA030) and check occasionally if internal pressure is above 0.1 bar(g), or they can let them open.

Boiler start-up after nitrogen-cushion preservation

Before restarting the boiler the valves of nitrogen supply 1(2) HAH10 AA030 (1(2) HAH70 AA030) must be closed. The boiler will be restarted from cold state. Manual reopening of the boiler water and steam sampling valves shall not be forgotten.
Nitrogen, which is present in the boiler steam spaces, is expelled during the start-up via the exhaust of start-up lines and through drain of superheaters and steam pipelines and herewith handling shall be observed on putting the boiler in operation.

1.7.4.4.2 Preservation of the whole boiler pressure system with nitrogen

It is suitable to perform the nitrogen preservation of all the internal spaces of the boiler pressure system during arbitrary long outage and also as prolongation of originally scheduled medium-long outage with employment of preservation with nitrogen cushion.

This preservation consists in filling of all the internal spaces of the HRSG boiler pressure system. Sufficient quantity of nitrogen shall be provided for the needs of this kind of preservation, namely 56 Nm^3 at least.
Respective safety regulations for nitrogen handling shall be observed when the preservation proper is performed.

The course of preservation of the boiler whole pressure system

The condition for start of this kind of boiler preservation is that the boiler has already been preserved by way of nitrogen cushion and standard water charge (see paragraph 1.7.4.4.1). If this is not the case, the preservation of the whole boiler pressure system shall be started according to the paragraph 1.7.4.4.1.

Once all the steam spaces have been filled with nitrogen, the drain valve outlet in the drain header and its discharge into the blow-down tank and the nitrogen overpressure penetrating into the boiler pressure system forces out the whole water charge from the boiler. Drain valves of superheaters and steam pipelines are not handled. Operating personnel watches the water flow leaving the drain of the header into the blow-down tank and as soon as he is sure that nitrogen is flowing out, he opens the valves 1(2) HAN80 AA620 (1(2) HAN75 AA620) in the HP (LP) drain header to sewerage and when no water is going outside, the valves are closed. Residual humidity that may remain in the boiler is not harmful since without the presence of atmospheric oxygen there is no corrosion hazard.

Nitrogen overpressure in the pressure systems shall not get below 0.1 bar(g) in the course of preservation.

Boiler start-up after nitrogen preservation

Before restarting the boiler the valves of nitrogen supply 1(2) HAH10 AA030, 1(2) HAH70 AA030 must be closed and boiler refilled with feed water (to the condition before the boiler starting). The boiler will be then restarted from cold state. For operator safety we recommend to deaerate the boiler during the boiler filling only using the vent valve from HP (LP) outlet steam piping 1(2) HAH18 AA710 (1(2) HAH18 AA710). We recommend opening the venting valves in pipelines of economizer deaeration only at the end of boiler filling with water in order to verify that the economizer has been filled with feed water.
The nitrogen, present in the internal pressure spaces of the drums, steam pipelines and superheaters not filled with water, is expelled in the course of the starting proper via the exhaust of the vent valve from HP (LP) outlet steam piping 1(2) HAH18 AA710 (1(2) HAH18 AA710) and from drain of superheaters and steam pipelines and consequently via the exhaust of the start-up blow-down tank.

1.7.4.4.3 Dry manner of preservation during a long-term boiler outage

This manner of preservation is based on the fact that if steel is stored in the air (max. humidity 70 %) it resists the corrosion for a long time.

The heat accumulated during the boiler shutdown is used for drying of the pressure systems. As the water content is discharged, the dry preservation is advantageous for a long-term preservation of pressure systems (1 – 2 months) and, furthermore, there is no danger of the boiler freezing.

Preservation process

Preservation is done during the shutdown of the boiler. Its principle is fast and complete evacuation of water from the pressure systems by residual gauge pressure from the shutdown boiler. Internal surface of so far hot boiler is dried by residual heat.

Opening of the drain piping to blow-down tank will start as soon as pressure in the pressure system measured in the boiler HP (LP) drum 1(2) HAD20 CP001 ÷ CP003 or 1(2) HAD20 CP501 drops to ca. **16 bar(g)** (1(2) HAD70 CP001 or 1(2) HAD70 CP501 drops to ca. **4 bar(g)**). This pressure must be minimally 2 ÷ 5 bar(g) and with it corresponding water temperature 120 ÷ 150°C.
Before the start of the preservation is assumed that the valves in the boiler are in their positions for the start-up acc. to chapter 1.4.2.2.
Drain of the boiler must be - if possible - quick, so as the water can evaporate and the internal surface of the pressure unit of the boiler to dry by means of residual heat.

Maintenance personnel manipulate with the valves in the following way:

HP system

- To close the FW isolation valve 1(2) HAC10 AA010.
- To close the steam isolation valve 1(2) HAH18 AA010 and 1(2) HAH18 AA011.
- To open the drain valve from the drain header to BD tank 1(2) HAN80 AA610,620.
- In the first stage it is necessary to open drain valves in the feed water piping and from economizers "D1 – 1(2) HAC10 AA610,620, "D2" – 1(2) HAC13 AA610, 620, 630, 640, 660, 1(2) HAC12 AA610, "D3" – 1(2) HAC14 AA610, 620, 630, 640, "D4" - 1(2) HAC14 AA650, 1(2) HAC15 AA610, 620, 630, 640, 650 and "D6" - 1(2) LAE10 AA610. By this will occur the efficient warming-through and subsequent discharging and drying in the system of economizers. Minimal period before the opening of further valves is ca. 7 min.
- In the next stage open drain valves from evaporator "D5" – 1(2) HAD11 AA610 and continuous blow-down valve from drum 1(2) HAN20 AA210 (valve 1(2) HAN20 AA010 is opened too).
- Valves of emergency discharges from the drum 1(2) HAN10 AA110, AA211 must be opened at the very end of the discharging so as not to release too quickly pressure and heat from the pressure system.
- In the last stage open drain valves 1(2) HAN80 AA620 from the drain header to sewerage, all vent valves „V1 to V7 and V9". vent valve from HP outlet steam piping 1(2) HAH18 AA710 and drain valves from superheaters 1(2) HAH11 AA110, AA610, 1(2) HAH18 AA120, AA620 and drain valves from outlet steam 1(2) HAH18 AA130, AA610.
- Behind 2-4 hours (after fall of temperature 1(2) HAC14 CT001 on 60-40°C) HP system close.

LP system

- To close the FW isolation valve 1(2) HAC70 AA005.
- To close the steam isolation valve 1(2) HAH78 AA010 and 1(2) HAH78 AA011.

- The degree of drying can be checked by measuring the humidity of the drawn-in air at the vent outlet that should not be higher than 50 %.

- It is recommended that a verification test of the air humidity in the boiler pressure system should be performed approximately after two months. The humidity should not exceed 50%.

- Dry preservation can be extended to arbitrary long period of time providing that all the inner spaces of the boiler pressure system are filled with nitrogen as per paragraph 1.7.4.4.2.

Boiler start-up after dry preservation

Boiler start-up after dry preservation is the same as that performed from its cold state including the boiler filling.

1.7.4.4.4 Wet manner of preservation

It is suitable to perform this manner of the boiler pressure system preservation during an outage scheduled for 1 to 2 months. This preservation is based on filling of the whole inner space of the boiler pressure systems with treated deaerated water. Sufficient quantity of deaerated feed water (namely some 56 m^3 for the HP and LP pressure system) shall be provided for the needs of this kind of preservation.

The wet manner of preservation is suitable in the event of supposed impairment of the protective magnetite layer in the boiler steam space if the boiler operators do not decide to keep the boiler preserved with a nitrogen cushion.

It is possible for the user to flood the whole internal volume of the already shutdown, pressure-free, boiler, i.e. including its inner steam spaces and to close the pressure systems in this condition without building up an overpressure in it.

This preservation entails no safety hazards for operators, however it is necessary to remember that the boiler can be threatened by freezing during the periods when the ambient temperatures can get below the freezing point.

Preservation procedure

The preservation is performed at the boiler shutdown. Operator blow-off within shut down of the boiler (see paragraph 1.6.2.2.2.d). The boiler may be filled only with deaerated feed water. HP and LP inner spaces of boiler will fill in by HP and LP feed water pump with minimal rpm and maximal dose of ammonia. Filling of HP superheaters perform through injection piping. The level of the internal pressure is recommended not to be higher than approx. 10 bar(g) for HP system (3 bar(g) for LP system) measured in the boiler HP (LP) drum 1(2) HAD20 CP001 + CP003 and/or 1(2) HAD20 CP501 + (1(2) HAD70 CP001 and/or 10 HAD70 CP501).

National Electric Power Regulatory Authority
Islamic Republic of Pakistan

2nd Floor, OPF Building G-5/2, Islamabad
Tele: 9206500, Fax: 9210215
E-Mail: info@nepra.org.pk

Registrar

No. NEPRA/R/LAG-81/5290-91 21·06·2006

Mr. Shahid Abdullah
Director
Sapphire Electric Company Ltd.
7-A/K, Main Boulevard,
Gulberg-II, Lahore

Subject: **Grant of Generation Licence IGSPL/05/2006**
Licence Application No. LAG-81
M/s. Sapphire Electric Company Ltd. (SECL)

Please refer to your application No. nil dated 06.02.2006 to NEPRA for a Generation Licence.

2. Enclosed here is Generation Licence No. IGSPL/05/2006 granted by the Authority to M/s. Sapphire Electric Company Ltd. The Licence is granted to you pursuant to Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997).

3. Please quote above mentioned Generation Licence No. in your future correspondence with the Authority.

DA/as above.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY * NEPRA * REGISTRAR

21.06.06.
(Mahjoob Ahmad Mirza)

Copy for information to Director General, Pakistan Environmental Protection Agency, 44-E, Office Tower, Blue Area, Islamabad.

SAPPHIRE ELECTRIC COMPANY LTD.

National Electric Power Regulatory Authority
(NEPRA)
Islamabad – Pakistan

GENERATION LICENCE

No. IGSPL/05/2006

In exercise of the Powers conferred upon the National Electric Power Regulatory Authority (NEPRA) under Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997), the Authority hereby grants a Generation Licence to:

M/s Sapphire Electric Company Limited
(Installed Capacity: 235 MW ISO Gross)

For its Plant at Sheikhopura-Muridke Road

Incorporated under the Companies Ordinance, 1984
Under Certificate of Incorporation

No. 0000000 4173/20050101 Dated January 18, 2005

to engage in generation business subject to and in accordance with the Articles of this Licence.

Given under my hand this 21st day of JUNE, Two Thousand & Six, and expires on 27th day of FEBRUARY, Two Thousand & THIRTY NINE

Registrar

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA ISLAMABAD

Article 1
Definitions

1.1 In this Licence

(a) "Act" means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997);

(b) "Authority" means the National Electric Power Regulatory Authority constituted under section 3 of the Act;

(c) "Licensee" means M/s Sapphire Electric Company Limited

(d) "Rules" mean the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000.

1.2 Words and expressions used but not defined herein bear the meaning given thereto in the Act or in the Rules.

Article 2
Application of Rules

This Licence is issued subject to the provisions of the Rules, as amended from time to time.

Article 3
Generation Facilities

3.1 The location, size (capacity in MW), technology, interconnection arrangements, technical limits, technical functional specifications and other details specific to the power generation facilities of the Licensee are set out in Schedule-I to this Licence.

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3.2 The net capacity of the Licensee's generation facilities is set out in Schedule-II hereto.

3.3 The Licensee shall provide the final arrangement, technical and financial specifications and other details specific to generation facilities before commissioning of the generation facilities.

Article 4
Term

4.1 The Licence is granted for a term of 30 years after the commercial Operation date.

4.2 Unless revoked earlier, the Licensee may ninety days (90) days prior to the expiry of the term of the Licence, apply for renewal of the Licence under the Licensing (Application and Modification Procedures) Regulation, 1999

Article 5
Licence fee

After the grant of the Generation Licence, the Licensee shall pay to the Authority the Licence fee, in the amount and manner and at the time set out in National Electric Power Regulatory Authority (Fees) Rules, 2002.

Article 6
Tariff

The licensee shall charge from its consumers only such tariff which has been approved by the Authority.

Article 7
Competitive Trading Arrangement

7.1 The Licensee shall participate in such measures as may be directed by the Authority from time to time for development of a Competitive Trading Arrangement. The Licensee shall in good faith work towards implementation and

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operation of the aforesaid Competitive Trading Arrangement in the manner and time period specified by the Authority. Provided that, any such participation shall be subject to any contract entered between the Licensee and another party with the approval of the Authority.

7.2 Any variation or modification in the above-mentioned contracts for allowing the parties thereto to participate wholly or partially in the Competitive Trading Arrangement shall be subject to mutual agreement of the parties thereto and such terms and conditions as may be approved by the Authority.

Article 8
Maintenance of Records

For the purpose of sub-rule (1) of Rule 19 of the Rules, copies of records and data shall be retained in standards and electronic form and all such records and data shall, subject to just claims of confidentiality, be accessible by authorized officers of the Authority.

Article 9
Compliance with Performance Standards

The Licensee shall conform to the relevant NEPRA rules on Performance Standards as may be prescribed by the Authority from time to time.

Article 10
Compliance with Environmental Standards

The Licensee shall conform to the environmental standards as may be prescribed by the relevant competent authority from time to time.

Article 11
Provision of Information

11.1 The obligation of the licensee to provide information to the Authority shall be in accordance with Section 44 of the Act.

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NEPRA

11.2 The licensee shall be subject to such penalties as may be specified in the relevant rules made by the Authority for failure to furnish such information as may be required from time to time by the Authority and which is or ought to be or have been in the control or possession of the licensee.

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SCHEDULE-I

The location, size (capacity in MW) technology, interconnection arrangements, technical limits, technical functional specifications and other details specific to the Generation Facilities of the Licensee.

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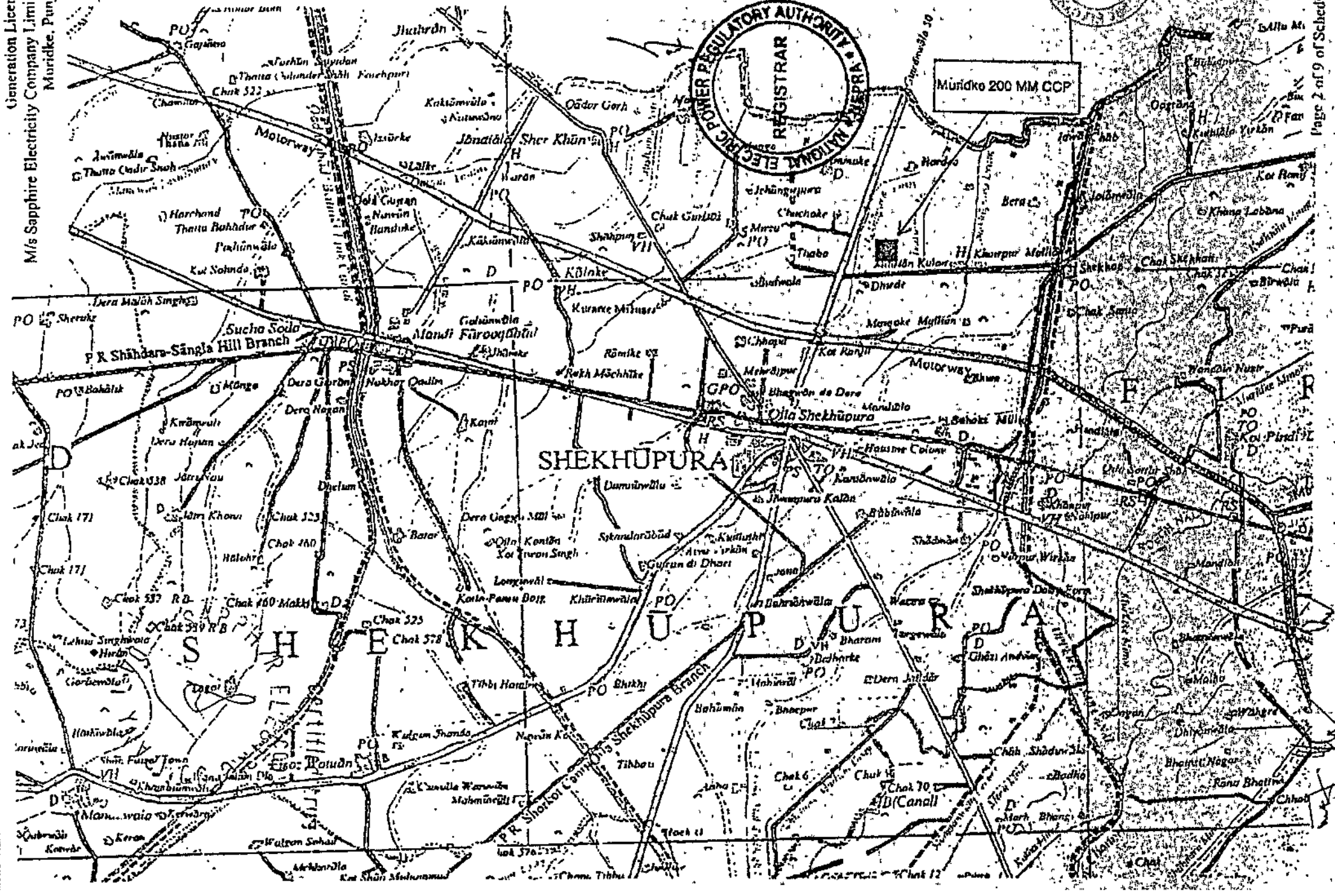
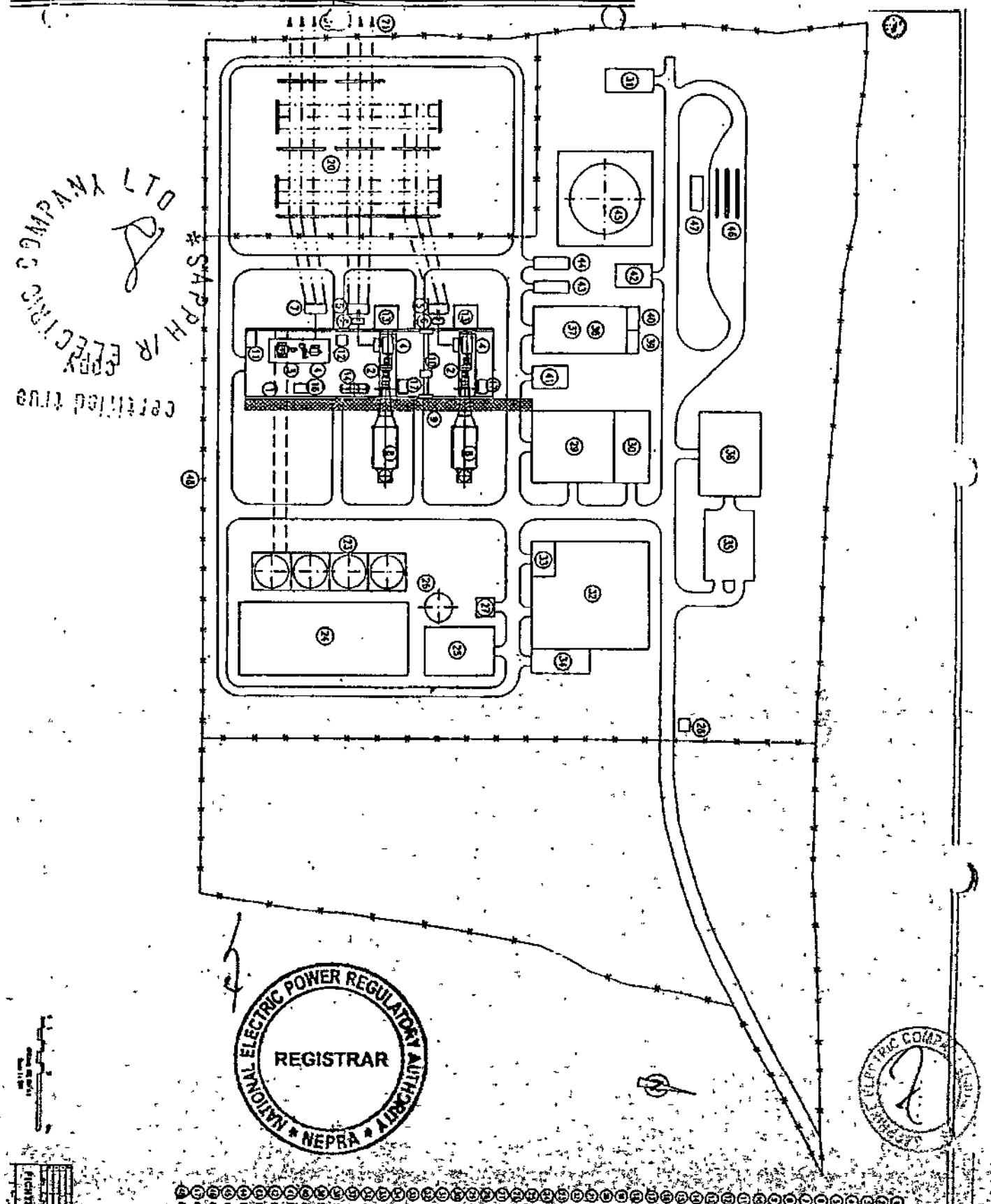
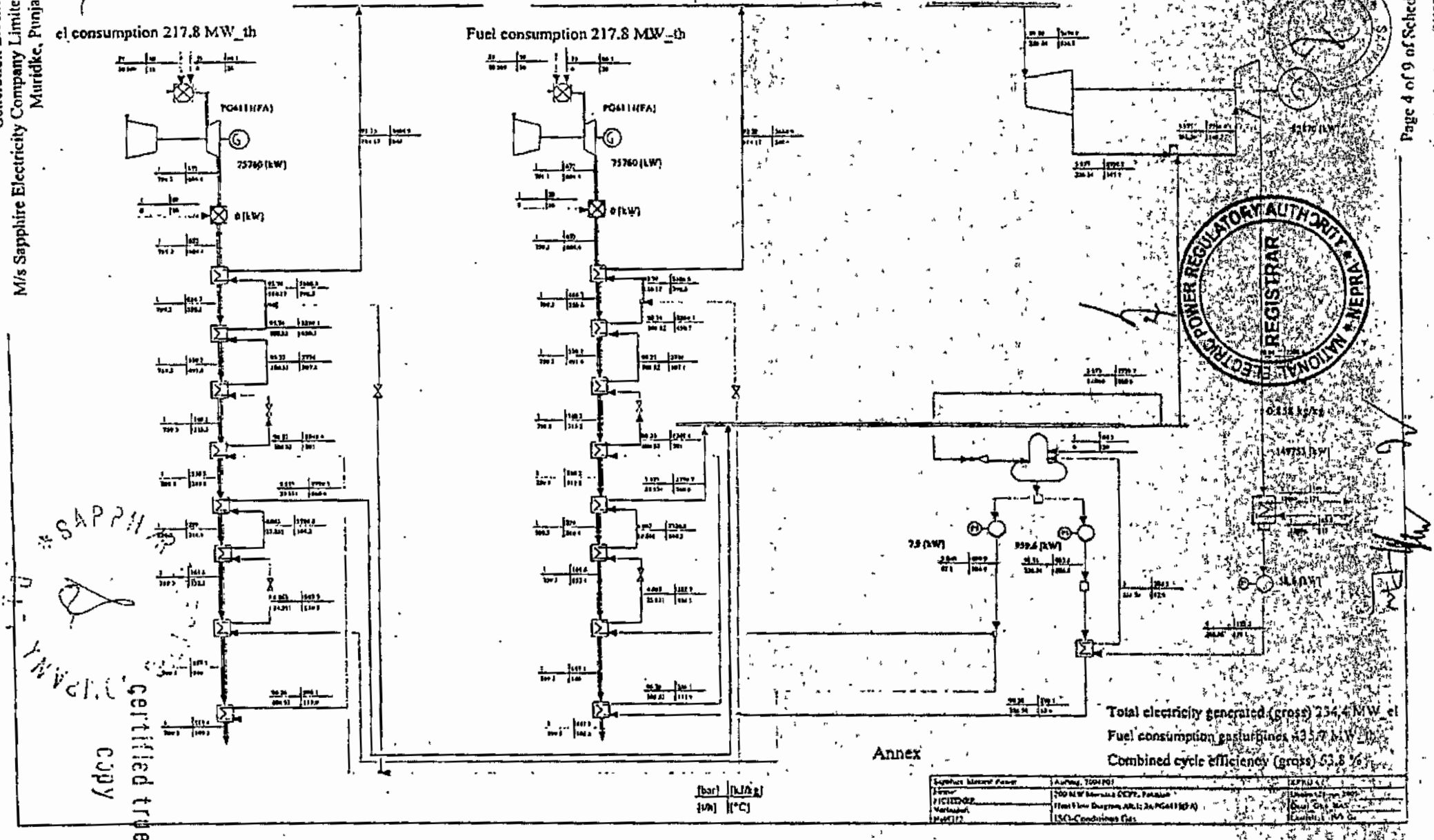
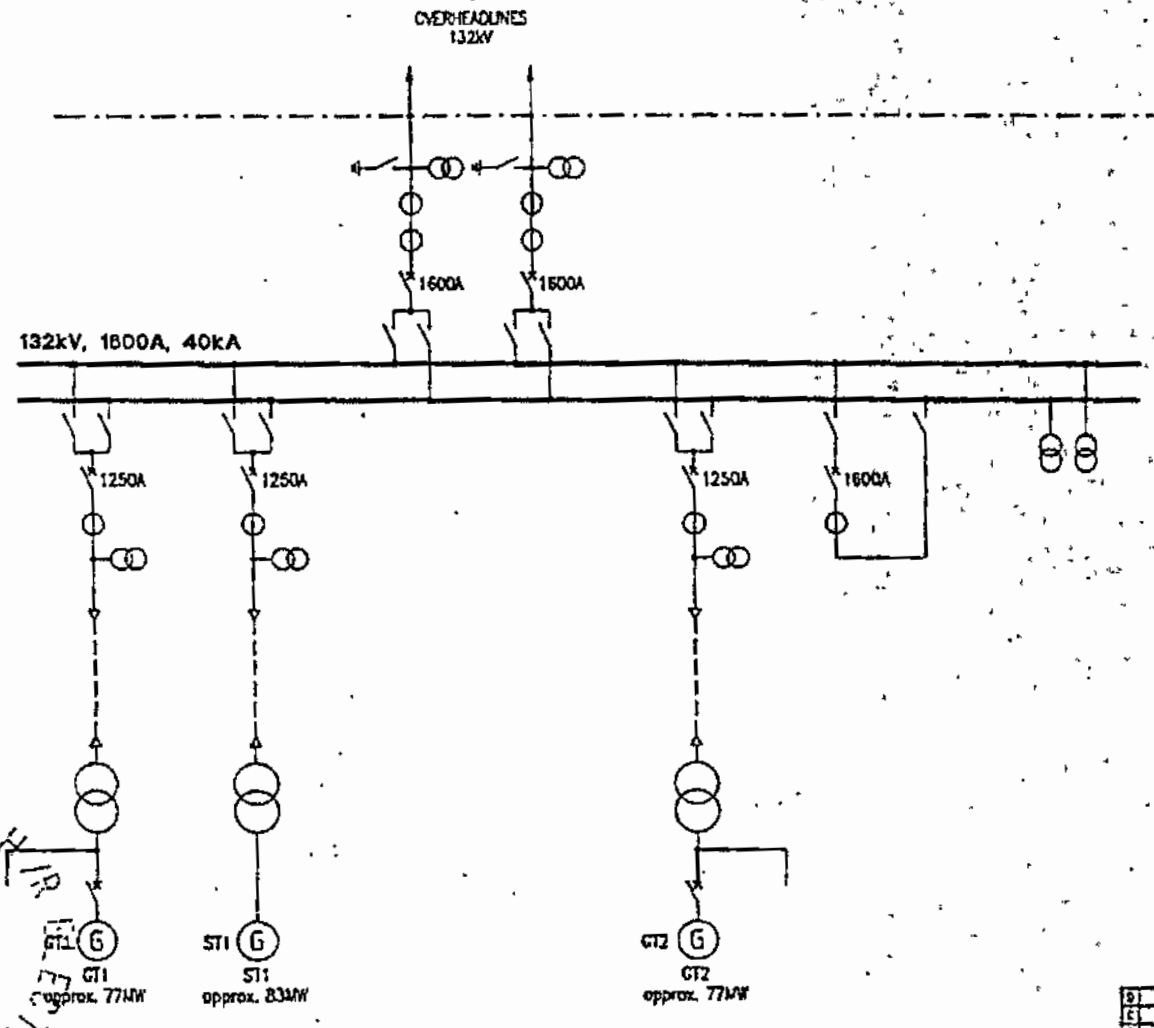
Generation Licence
M/s Sapphire Electricity Company Limited
Muridke, Punjab

Muridke 200 MM CCP









REFER TO:
PRINCIPLE SINGLE LINE DIAGRAM
GENERATING UNITS
FILE No.: FIACAD_004

LEGEND:

GT GAS TURBINE
ST STEAM TURBINE
* VOLTAGE LEVEL FORMALLY STILL TO BE CONFIRMED

D			
C			
B			
A			
	Date	Name	

FICHTNER

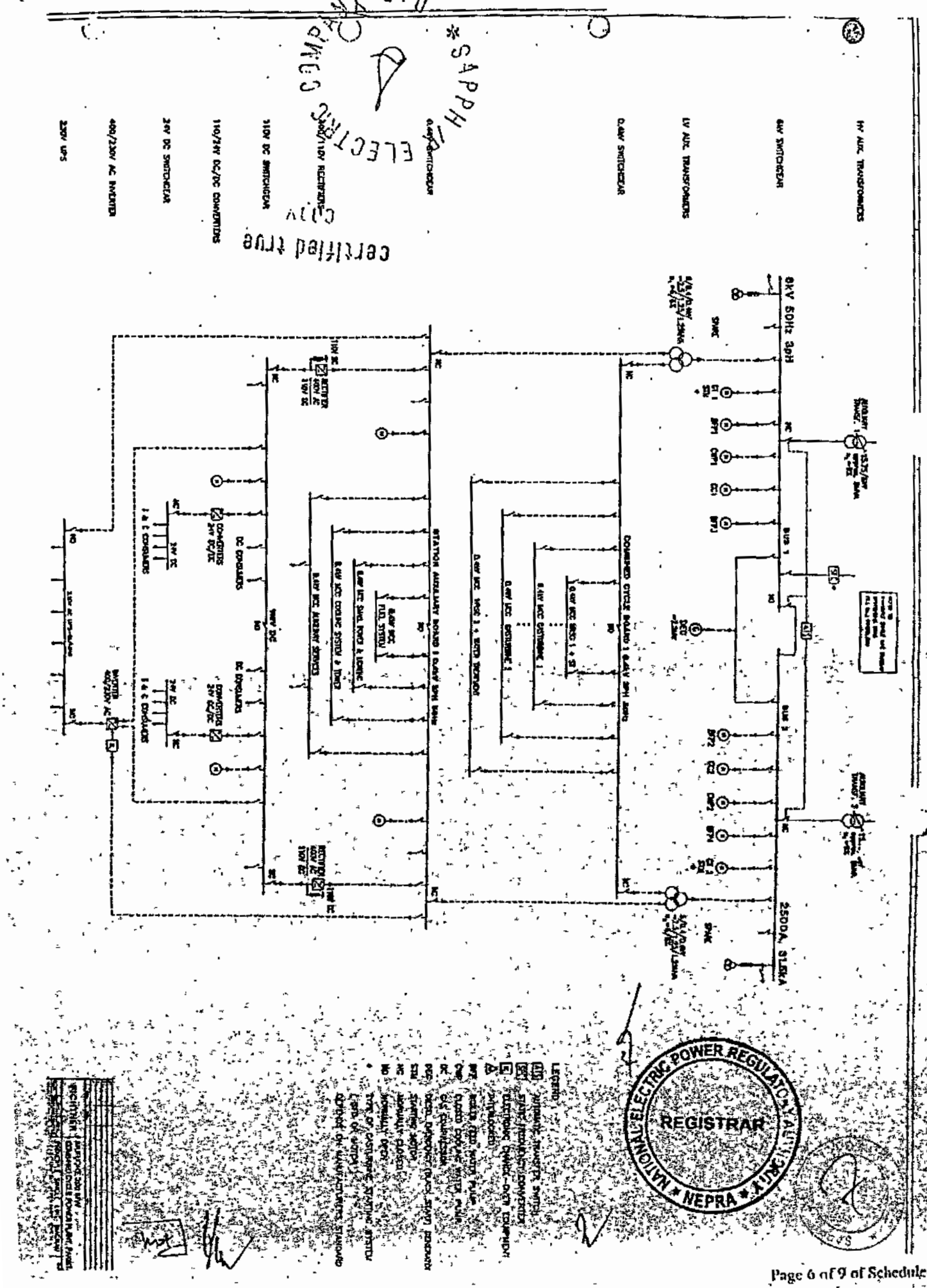
MURIDKE 200 MW
COMBINED CYCLE POWER PLANT, PAKISTAN

PRINCIPLE SINGLE LINE DIAGRAM
132kV GRID CONNECTION
ALTERNATIVE 2+1

	Date	Name
Drawn	04.05.05	RUEHLE
Checked		
Supervised		
Approved by		

Size A2 Project No. 7004P01 File FIACAD_004

Page 5 of 9 of Schedule-I



certified true

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Plant Details

General Information

1.	Name of Applicant	M/s Sapphire Electric Company Limited
2.	Registered Office	270, Sector I-9, Industrial Area, Islamabad
3.	Business Office	7-A/K, Main Boulevard, Gulberg-II, Lahore
4.	Plant Location	Near Village Dir Da Doghran on Sheikupura-Muridkee Road, Distrcit Shekupuara, Punjab
5.	Type of Generation Facility	Thermal (Combined Cycle)

6. Plant Configuration

i.	Plant Size Installed Capacity Gross ISO	235 MW
ii.	Type of Technology	Combined Cycle Technology
iii.	Number of Units/Size	2 x 76 MW (Gas Turbines) 1 x 83 Mw (Steam Turbine)
iv.	Unit Make & Model	Gas Turbine (G.E.)/ PG 6111 (FA) Steam Turbine (G.E.)
v.	De-rated Capacity at site conditions	213 MW (Gross Site Condition) 209 MW (Net Site Condition)
vi.	Auxiliary Consumption	4 MW
vii.	Commissioning date	February 2009 (Anticipated)
viii.	Expected Life of the Facility from Commercial Operation Date	30 Years

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7. Fuel Details

i.	Primary Fuel	Natural Gas
ii.	Alternative Fuel	HSD
iii.	Back-up Fuel	HSD
iv.	Fuel Source (Imported/Indigenous)	Indigenous
v.	Fuel Supplier	Sui Northern Gas Pipelines Limited (SNGPL)
vi.	Supply Arrangement	Through an pipeline having an approximate length of almost 0.50 Kilometer.
vii.	No. of Storage Tanks for backup fuel	2
viii.	Storage Capacity of Tanks for backup fuel	15 days of backup fuel

8. Emission Values

i.	SO_x	Gas 0.053t/d
ii.	NO_x	125mg/Nm^3
iii.	PM_{10}	50mg/Nm^3

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9. Cooling System

i.	Cooling Water Source/Cycle	Well water/Closed Circuit (water used for make up only)

10. Project Cost (As per application)

i.	Total (U.S. $)	181.52 Million
ii.	Debt (U.S. $)	136.140 Million
iii.	Equity (U.S. $)	45.380 Million

11. Plant Characteristics

I.	Generation Voltage	-
ii.	Frequency	50 Hz (with 5% tolerance)
iii.	Power Factor	Preliminary 0.8-0.9 (To be discussed as part of PPA)
iv.	Automatic Generation Control	To be discussed as part of PPA
v.	Ramping Rate	To be discussed as part of PPA
vi.	Time required to Synchronize to Grid and loading the complex to full load	To be discussed as part of PPA

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SCHEDULE-II

The net capacity of the Licensee's Generation Facilities

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SCHEDULE-II

1.	Installed Capacity Gross ISO	235 MW
2.	De-rated Capacity at Site Conditions	213 MW
3.	Auxiliary Consumption	4 MW
4.	Net Capacity of the Plant at Site Conditions	209 MW

Note

All the above figures are indicative as provided by the Licensee. The Net Capacity available to NTDC for dispatch and other purchasers will be determined through procedures contained in the Agreements or Grid Code.

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INTERCONNECTION SCHEME FOR THE POWER DISPERSAL OF THE PLANT

The power of the power plant shall be dispersed to system directly within LESCO and GEPCO load center at 132 KV voltage level as follows

1. A new 132 KV Grid station (Muridke) about 22 Km from the proposed site of Sapphire Electric Power Plant.

2. Two (2) new 132 KV D/C Transmission Lines each with a length of approximately 22 Km on Lynx Conductor from Sapphire Electric Power Plant to New Muridke Grid Station.

3. 132 KV D/C Transmission Line on Lynx Conductor for making Double In-Out of 132 KV D/C Kala Shah Kaku-Kamoki/Tatlay Ali Transmission Line at 132 KV new Muridke Grid Station.

4. 132 KV D/C Transmission Line on Lynx Conductor for making In-Out of 132 KV S/C Kaka Shah Kaku-Narang Transmission Line at 132 KV new Muridke Grid Station.

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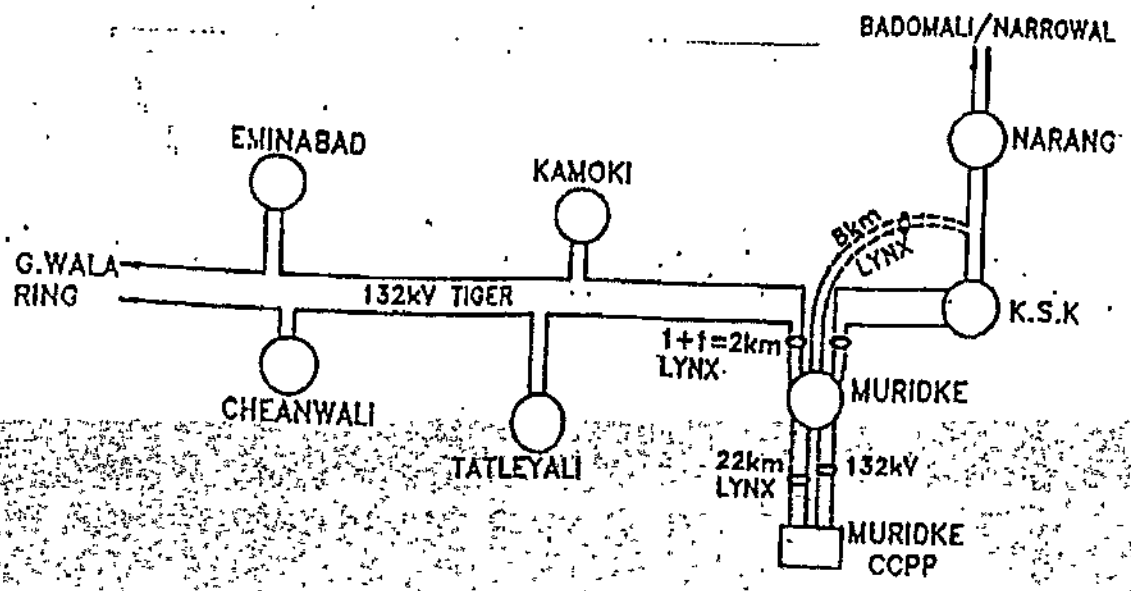

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