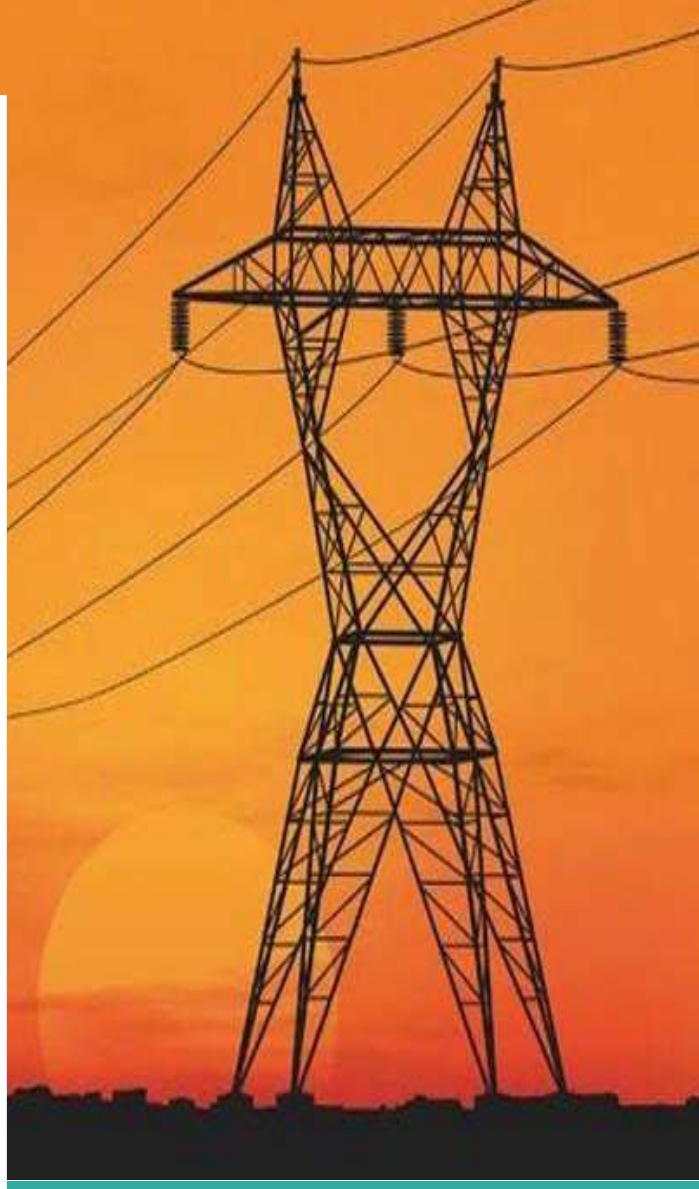

Report on Technical Due Diligence

NRSS ASSETS
400KV DC KURUKSHETRA-MALERKOTLA AND MALERKOTLA -AMRITSAR TRASMISSION LINES

11 JULY 2022

SEKURA ENERGY PVT. LIMITED

TATA
TATA PROJECTS LIMITED

TATA PROJECTS LIMITED

TECHNICAL DUE DILIGENCE REPORT

Date of issue of report : 11th July' 2022

TATA PROJECTS LIMITED

TECHNICAL DUE DILIGENCE REPORT

REPORT SUBMITTED BY

TATA PROJECTS LIMITED

(QUALITY SERVICES DIVISION)

Report No. ***177763 -141121-1 Rev-4***

TPL Team

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The Report generated by TPL is based on the documents, data, information, details and facts provided by the client to the TPL in terms of the Contract during the site visit witnessed by the TPL. The Report furnished to the client is for the purpose of guidance to the Buyer based on the study carried out by the TPL to above referred documents / details made available to him by the client, who alone is responsible and liable for the authenticity and correctness of the referred documents / details as well as for any omissions and / or deletions of any nature whatsoever including data / details which could have been availed by the Seller from any third Party as a consequence of which and / or otherwise the TPL shall not in any way be held responsible or liable for any shortcomings, errors, acts of omissions / deletions of the said Report as well as for damages, claims, monetary losses, consequential losses etc. of any kind or nature whatsoever arising out of shortcomings, errors, omissions, mistakes in the Report and / or in documents, data, information, details and facts made available to the TPL by the Seller.

INDEX

Abbreviations

AC	:	Alternating Current
AAAC	:	All Aluminium Alloy Conductor
ACSR	:	Aluminium Conductor Steel Reinforced
AIS	:	Air Insulated Substation
BOOM	:	Build, Own, Operate & Maintain
BOQ	:	Bill of Quantity
BPC	:	Bid Process Coordinator
CBIP	:	Central Board of Irrigation & Power
CoD	:	Commercial Operation Date
Ckm	:	Circuit Kilometres
Ckt	:	Circuit
CEA	:	Central Electricity Authority
CERC	:	Central Electricity Regulatory Commission
CRP	:	Control Relay Panel
CT	:	Current Transformer
CTU	:	Central Transmission Utility
DB	:	Distribution Board
DC	:	Direct Current
D/C	:	Double Circuit
DDR	:	Due Diligence Report
Discom	:	Distribution Company
DG	:	Diesel Generator
EHV	:	Extra High Voltage
EIL	:	Essel Infraprojects Limited
EPC	:	Engineering, Procurement & Construction
ER	:	Easter Region
ERLDC	:	Eastern Region Load Despatch Centre
ERSSS	:	Easter Region System Strengthening Scheme
FIPL	:	Feedback Infra Private Limited
FQP	:	Field Quality Plan
GI	:	Galvanized Iron
GIS	:	Gas Insulated Substation
GS	:	Galvanized Steel

HMI	:	Human Machine Interface
HT	:	High Tension
HV	:	High Voltage
ICT	:	Inter Connecting Transformer
IE	:	Independent Engineer
IEC	:	International Electro-Technical Commission
IEGC	:	Indian Electricity Grid Code
IS	:	Indian Standard
ISTS	:	Inter State Transmission System
JSL	:	Jyoti Structures Limited
kA	:	Kilo Ampere
kM	:	Kilometres
kN	:	Kilo Newton
kV	:	Kilo Volt
LTTC	:	Long Term Transmission Customer
LE	:	Lender's Engineer
LILO	:	line in – Line out
LT	:	Low Tension
LOA	:	Letter of Award
MS	:	Mild Steel
MQP	:	Manufacturing Quality Plan
MV	:	Medium Voltage
MVA	:	Mega Volt Ampere
MW	:	Mega Watt
NH	:	National Highway
NER	:	North Eastern Region
NR	:	Northern Region
NTPC	:	National Thermal Power Corporation Limited
OD	:	Overall Diameter
OEM	:	Original Equipment Manufacturer
OLTC	:	On Load Tap Changer
O & M	:	Operation & Maintenance
OPGW	:	Optical Fibre Ground Wire
PT	:	Potential Transformer

P&T	:	Post & Telegraph
PDC	:	Phase Data Concentrator
PGCIL	:	Power Grid Corporation of India Ltd.
PIIPL	:	Pan India Infraprojects Private Limited
PLCC	:	Power Line Carrier Communication
PMU	:	Phase Measurement Unit
POSOCO	:	Power System Operation Corporation Limited
PTCC	:	Power & Telecommunication Coordination Committee Clearance
PTW	:	Permit To Work
RFQ	:	Request for Quotation
RLDC	:	Regional Load Despatch Cell
RoW	:	Right of Way
RTU	:	Remote Terminal Unit
SAS	:	Substation Automation System
SCADA	:	Supervisory Controls & Data Acquisition System
SCOD	:	Scheduled Commercial Operation Date
SH	:	State Highway
SLDC	:	State Load Despatch Cell
SPV	:	Special Purpose Vehicle
SR	:	Southern Region
SS	:	Substation
STU	:	State Transmission Utility
TPL	:	TATA Projects Limited
TSA	:	Transmission Service Agreement
TSP	:	Transmission Service Provider
UPS	:	Uninterrupted Power Supply
UTS	:	Ultimate Tensile Strength
VEPL	:	Virtuous Energy Private Limited
VRLA	:	Valve Regulated Lead Acid.

1.0 EXECUTIVE SUMMARY

Background:

Transmission is a vital element of the power sector value chain. A well-developed transmission network helps in efficient evacuation of electricity from generating stations for transmission to the load centres. The transmission system in India is predominantly categorized into voltage levels of 220 kV, 400 kV, 765 kV in AC system and 320 kV, 500 kV and 800 kV in DC system. As per statistics by the Central Electricity Authority (CEA), India has a cumulative transmission line length of 4,48,407 ckt km[1] and a cumulative substation capacity of 10,59,391 MVA[2] as of September 2021. Growing power demand because of the Government's focus on improving the distribution sector: the last mile in power sector, addition of RE capacity and adoption of new technologies to address challenges linked to RE integration, are likely to drive growth of power transmission in India.

In India, the transmission system is a two-tier structure comprising intra-state grids and inter-state transmission system grids. Historically, transmission system was developed by central and State level utilities. As per the provisions under Section 63 of the Electricity Act, 2003 and the Tariff Policy dated 6th January 2006, the Ministry of Power (MoP) issued "Guidelines for Encouraging Competition in Development of Transmission Projects" and Tariff Based Competitive Bidding Guidelines for Transmission Services" (the "Guidelines"). These Guidelines laid down a transparent procedure for facilitating competition in the transmission sector and paved a way for wide participation in providing transmission services and tariff determination through a process of tariff based competitive bidding.

Subsequent to the above referred guidelines, the MoP has also issued standard bidding documents such as request for qualification ("RFQ"), request for proposal ("RFP"), transmission service agreements and also appointed PFC Consulting Limited (PFC) and REC Transmission Projects Company Limited (REC) as the bid process coordinators (each, a "BPC") for carrying out the bidding process.

REC, acting as the BPC, issued a RFQ dated July 31, 2013, for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish Transmission System for "NRSS" through tariff based competitive bidding (TBCB). NRSS – XXXI B was incorporated by REC as the SPV for setting up the proposed Transmission project and subsequently act as the Transmission Service Provider (TSP). In the bid process conducted for the same, Essel Infraprojects Ltd (EIL) emerged as the successful bidder and acquired NRSS for developing the proposed transmission project on a *build own operate and maintain* (BOOM) basis. NRSS – XXXI B established the Transmission System comprising the following elements.

[1] GS_TL.pdf (cea.nic.in)

[2] GS_SS.pdf (cea.nic.in)

- 400 kV D/C Kurukshetra – Malerkotla transmission line of about 139.2 kms length,
- 400 kV D/C Malerkotla – Amritsar transmission line of about 149.6 kms length.

In May 2019, NRSS XXXI B Asset was acquired by Sekura Energy Pvt. Limited (SEPL), a Portfolio Company of Edelweiss Infrastructure Yield Plus. Since then, SEPL has been managing NRSS XXXI B and carrying out the operation & maintenance of all the elements of NRSS XXXI B in an effective manner. Over the past years, NRSS XXXI B has managed to secure an average annual system availability of more than 99.75 %, which is well beyond the stipulated normative availability of 98%.

Technical Due Diligence Study

SEPL presently envisage to float an Infrastructure Investment Trust ("InvIT") and proposes to undertake a transfer of its ownership in NRSS XXXI B to the proposed InvIT. In this context, SEPL wishes to carry out an independent third party assessment of the Transmission Asset of NRSS XXXI B. SEPL through NRSS XXXI B has appointed TATA PROJECTS LIMITED (IE) to undertake the independent third-party assessment. This report elaborates the tasks carried out by the IE as part of the Due Diligence and records the findings of the Study. The scope of the engagement and activities carried out by the IE have been detailed out in this report.

Summary of Findings

Based on above study carried out, it is observed that all the project established is fully compliant to all technical, statutory, regulatory requirements and being operate & maintained with highest technical standards by competent personnel in line with all the guideline provided by regulatory authorities and best prudent industrial practices.
The detailed findings of the study have been captured in chapter [17] of this Report.

2.0 ABOUT NRSS PROJECT:

2.1 Significance of the Project

400/220kV substation of POWERGID at Amritsar is connected to Jallandhar through a 400kV S/C line. To meet its growing power demand, 1x500MVA 400/220kV ICT was also being implemented. Connectivity of 400kV to Parbati Pooling station and Makhu (PSTCL substation) was being implemented to augment power supply of Amritsar 400kV S/S. However, the power supply to Amritsar area envisaged mainly through Jalandhar 400kV substation as during winters the generation of hydro projects would reduce to very low level also in case of low generation at Talwandi Saboo TPS, Makhu S/s may draw power from Amritsar S/S, hence there was a necessity that power supply arrangement to Amritsar S/S is augmented. A HVDC station at Kurukshetra was being established for supply of power from pit head generation station of Chhattisgarh. Accordingly, for augmenting power supply to Amritsar S/S,

400 kV D/C Kurukshetra – Malerkotla and Malerkotla – Amritsar transmission line works had been approved under Transmission System associated with NRSS-XXXI – Part-B.

2.2 Tender process and Award of Project

The Government of India, Ministry of Power, vide its notification No. 15/1/2013-Trans dated 20th May 2013 had notified REC Transmission Projects Company Ltd. (REC) to be the Bid Process Coordinator (BPC) for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish transmission system for Northern Region System Strengthening Scheme, NRSS – XXXI (Part B). REC, acting as the BPC, issued a RFQ dated July 31, 2013, and subsequently RFP dated December 9, 2013, for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish Transmission System for "NRSS" through tariff based competitive bidding (TBCB). Northern Region System Strengthening Scheme Transmission Limited (NRSS XXXI (B)) (NTL) was incorporated by REC as the SPV for setting up the proposed Transmission project and subsequently act as the Transmission Service Provider (TSP). In the bid process conducted for the same, Essel Infraprojects Ltd (EIL) emerged as the successful bidder and acquired NTL for developing the proposed transmission project on a build own operate and maintain (BOOM) basis. The Letter of Intent (LOI) had been issued by the BPC to the EIL on February 26, 2014. NRSS – XXXI B established the Transmission System comprising the following elements.

- 400 kV D/C Kurukshetra – Malerkotla transmission line of about 139.2 kms length,
- 400 kV D/C Malerkotla – Amritsar transmission line of about 149.6 kms length.

(NTL Assets were later acquired by Sekura Energy Limited (SEPL), a Portfolio Company of Edelweiss Infrastructure Yield Plus in May 2019)

2.3 Transmission Service Agreement

NTL has Twenty-Four Long-Term Transmission Customers (LTTCs) which are the beneficiaries of the project. A Transmission Service Agreement (TSA) was executed on January 02, 2014, between the NTL and LTTCs for procurement of Transmission services and for development of concerned Transmission Assets. The Long-Term Transmission Customers (LTTC) as mentioned in the Agreement are:

Table 1: List of LTTCs of NRSS XXXI B

Sl. No	LONG TERM TRANSMISSION CUSTOMER (LTTC) LIST
1	AD Hydro Power Limited
2	Haryana Power Purchase Centre
3	Punjab State Power Corporation Limited
4	Himachal Sorang Power Pvt. Ltd.

5	Adani power Limited, Mundra
6	Jaipur Vidyut Vitran Nigam Limited
7	Ajmer Vidyut Vitran Nigam Limited
8	Jodhpur Vidyut Vitran Nigam Limited
9	Lanco Anpara Power Limited
10	Lanco Green Power Pvt. Limited
11	Power Development Deptt. Govt. of J&K
12	North Central Railway
13	Jaiprakash Power Ventures Limited
14	BSES Yamuna Power Limited
15	BSES Rajdhani Power Limited
16	Tata Power Delhi Distribution Limited
17	New Delhi Municipal Corporation
18	Electricity Wing of engineering Department, Union Territory of Chandigarh
19	Power Grid Corporation of India Limited
20	U.P Power Corporation Limited
21	PTC (Budhil), PTC India Limited
22	PTC (Everest), PTC India Limited
23	Uttarakhand Power Corporation Limited
24	Himachal Pradesh State Electricity Board Limited

U.P. Power Corporation Limited has been selected as Lead LTTC (Long Term Transmission Customer) amongst Twenty-Four (24) Discoms. Further, a Supplementary TSA was executed on August 04, 2016, between NRSS XXXI B and Central Transmission Utility. The said Supplementary Agreement was signed pursuant to the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses), Regulations 2010 to govern the provision of inter-State Transmission services including sharing of transmission charges and losses amongst the ISTS Customers (termed as 'Designated ISTS Customers or DICs) and disbursing the transmission charges collected by the CTU to respective ISTS Licensees. The terms of the TSA will be effective for a period of 35 years commencing from the date of scheduled COD.

2.4 Transmission Licence

The Transmission Licence has been granted by CERC to the Project Company (NRSS XXXI B) in Petition No. 90/TL/2014 vide Order dated on 25.8.2014. The present Licence is valid for an initial period of 25 years with provision of extension of Licence period for another term.

2.5 Key Statutory Clearance

NRSS XXXI B had received all necessary Statutory Clearance required for setting up and operation of the Transmission Asset. Major clearances including a) Approval under Section 68 of the Electricity Act, b) Authorization under Section 164 of the Electricity Act c) Grant of Transmission Licence by CERC, d) Route approval by PTCC, GOI e) Electricity Safety Clearance of CEA, etc., is observed to have been obtained and in place by NRSS XXXI B. The detail list of clearances has been covered in section 15 of this report.

2.6 Award of EPC Contractor

NRSS XXXI B had executed an EPC Contract with M/s. Pan India Infra Projects Private Limited (PIIPL) on 17th September 2014 for execution of the entire transmission line. The scope of work of the EPC contractor included supply, erection, civil work, Row clearances and all relevant works for execution of entire project. The Effective date of EPC Contract between NRSS XXXI B and Pan India Infra projects Pvt Limited (PIIPL) is 17th September 2014.

2.7 Project Elements and Commissioning Date

The details of Project Elements along with the Commercial Operation Dates of the Project are as follows

Table 2: NRSS XXXI B project elements & COD

Sr. No.	Transmission System for "Northern Region System Strengthening Scheme –XXXI B	
	Name of the Transmission Element	Commercial Operation Date (COD)**
1	Kurukshetra - Malerkotla 400 kV D/C line with Twin Moose ACSR Conductor	18th Jan 2017
2	Malerkotla - Amritsar 400 kV D/C line with Twin Moose ACSR Conductor	27th Mar 2017

** COD as mentioned in CERC order dated 29th March2019 in Petition No. 195/MP/2017.

2.8 Status of the project:

The project is presently commissioned is in commercial operation since date of COD.

The assets under operation in NRSS XXXI B consist of following elements.

Project 1- Haryana and Punjab (NRSS XXXI B)
Transmission Lines – 288.8 km 1. 400 kV D/C Kurukshetra – Malerkotla transmission line of about 139.2 kms length, 2. 400 kV D/C Malerkotla – Amritsar transmission line of about 149.6 kms length.

The details of various approvals received by the project related to its commissioning are as follows:

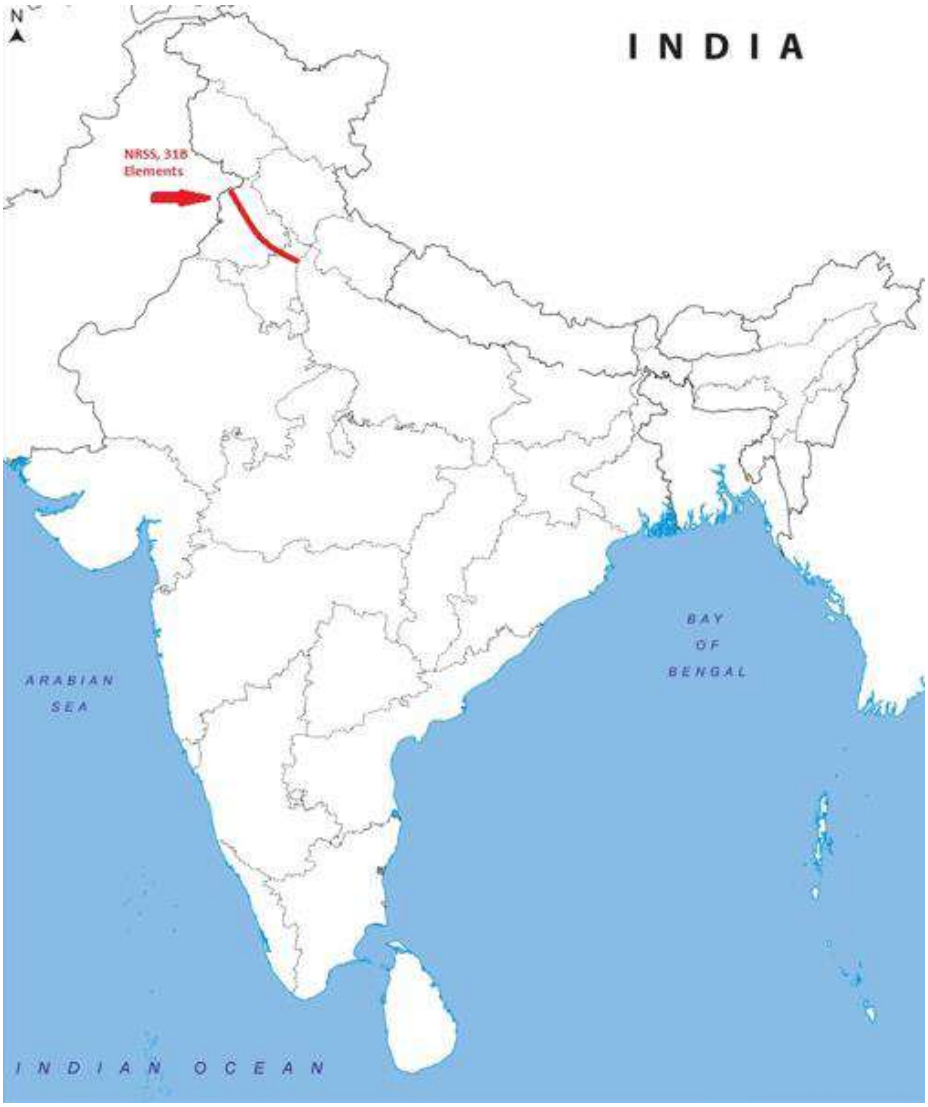
2.8.1 Commissioning details of Kurukshetra to Malerkotla 400kV D/C Line:

- COD declared by NRSS XXXIB on 18.01.2017.
- Completion Certificate issued by NRSS XXXIB to PIIPL on 20.01.2017.
- Certificate of Completion of Trial operation of Transmission Element issued on 03.02.2017 by POSOCO.

2.8.2 Commissioning details of Malerkotla to Amritsar 400kV D/C Line:

- COD declared by NRSS XXXI (B) on 27.03.2017
- Completion Certificate issued by NRSS XXXI (B) to PIIPL on 30.03.2017
- Certificate of Completion of Trial operation of Transmission Element issued on 17.04.2017 by POSOCO

The following diagram shows the project location of NRSS XXXI (B) plotted on the map.



3.0 OBJECTIVE & SCOPE OF TPL'S SERVICES

SEPL, which presently owns NRSS XXXI B envisage to float an Infrastructure Investment Trusts ("InvIT") and proposes to undertake a transfer of its ownership in NRSS XXXI B to the proposed InvIT. In this context, SEPL wishes to re-evaluate existing conditions of the Transmission Asset of NRSS and undertake a Technical Due Diligence exercise. TATA PROJECTS LIMITED (TPL) was appointed as Independent Engineer (IE) to undertake the

said Technical Due Diligence of NRSS XXXI B and to assess the existing condition of the asset. The scope of the engagement and activities carried out by the IE are as following.

3.1 Scope of TPL's Services:

The scope of work for the IE identified are as following:

- To review statutory approvals for compliance from a technical perspective.
- To visit the Project site for review and verification of various technical aspects and compliance to conditions in approvals, if required.
- To review the documents pertaining to following and report accordingly:
    1. Overall Project Status
    2. Project Design
    3. Transmission Licence
    4. Communication System
    5. Environment and Safety
    6. Quality Control
    7. Operation and Maintenance
    8. Availability of NRSS XXXI B
    9. Spare Parts Management
    10. Physical Security of Assets
    11. Cyber Security
    12. Risk Analysis
    13. Regulatory Aspects
    14. Insurance
    15. Conclusion

3.2 Services Methodology Adopted

- Off-site review of documents.
- Reporting.

This report covers the Technical assessment of the NRSS XXXI B project comprising of 400 kV D/C Kurukshetra – Malerkotla transmission line and 400 kV D/C Malerkotla – Amritsar transmission line in Haryana & Punjab which is commissioned & operational since 2017.

As a part of this exercise, IE has conducted a review of the existing project documents/Contracts, best practices, processes and has identified the risk factors involved for operating asset's lifecycle. IE has categorized these issues into different Risk Categories, details of which are elaborated in the subsequent sections.

4.0 REVIEW OF PROJECT DOCUMENTS - TRANSMISSION LINES

The IE has identified the list of documents for review to carry out technical due diligence and all the documents were provided by NRSS XXXI B for the Transmission lines and Substations. The list of project documents reviewed as part of the due diligence are as follows:

a. EPC contracts/Sub-Contracts
b. Transmission Service agreement
c. Share Purchase Agreement
d. Statutory clearance documents
e. Regulatory documents
f. Organisation structure documents
g. Insurance Documents
h. COD documents
i. O&M SOP and documents.
j. Drawings & Guaranteed Technical Parameters (GTP) of major equipment etc.

The IE has examined/reviewed all the documents in respect of their validity corresponding to relevant technical specification based on which Transmission system were constructed, Country's prevalent standards including CEA & CBIP norms, and the equipment/materials used were tested/validated with respect to Specification and Standards.

IE observed the technical parameters adopted by the Project Company are as per Specifications & Standards for the Transmission system laid down in the Transmission Agreement as well as the relevant Indian/ International Standards relevant IS Codes, CBIP Manual, CEA guidelines etc and are suitable for use on 400 kV Transmission Systems.

4.1 Review of Project Contracts

4.1.1 EPC Contract

The complete Project has been implemented on EPC Contract basis. The Project Company had awarded the EPC Contract to M/s. Pan India Infraprojects Private Limited (PIIPL) for Supply, Services & Civil Works of the Project. A summary of the finalized EPC Contract is given in Table below.

Table 3: EPC Scope of Work

Item	Scope
Supply	The scope covers the design, engineering, fabrication, Galvanizing, testing at manufacturer's works, packing, and forwarding for supply on Ex• works basis, inland

Item	Scope
	transportation, and insurance for delivery at site for all material and items required for Transmission Lines but not limited to Tower material, Bolts & Nuts, Conductor, Earthwire, Hardware Fittings, Accessories for Conductor & Earth wire, Aviation lights and Tower Accessories.
Erection	The scope of Erection work comprises of detailed survey including soil investigation, check survey, unloading of material including owner supplied material at Contractor's store, storage of all the materials including owner supplied material, transportation from main Stores to site stores/site, stub-setting, tower erection, tack welding of bolts and nuts including supply and application of zinc rich paint, tower earthing, fixing of insulator string, stringing of conductors and earth wire along with all necessary line accessories including deployment of all tools & plants,arrangement of Right of Way, Cutting of Trees and testing & commissioning of the transmission line. The arrangement of Way leave clearance is under the scope of Contractor.
Civil Works	The scope of civil work for the Project comprises of the excavation, concerting, protection of tower footing and backfilling. Foundation casting including supply of all material required for foundations viz cement, reinforcement steel, sand, aggregate, labour, deployment of all tools and plants including Total Station, mixers, vibrators, form boxes etc. and all other incidental expenses in connection with the supply of material w.r.t. civil works.

4.1.2 Contract for Owner's Engineer

NRSS XXXI B had appointed M/s Lahmeyer International India (Pvt.) Limited as the Owner's Engineer. All Design and Engineering of the entire Transmission System and substation including design of Towers and foundations have been approved by the Owner's Engineer before submitting for final approval to NRSS XXXI B.

4.1.3 Contract for PMC

PIIPL had appointed M/s Virtuous Energy Private Limited (VEPL) as Project Management Consultant. NRSS informed the IE that the Company VEPL has adopted well established mechanism for Quality Assurance, Inspections and Testing, Site supervision, Progress monitoring and Safety aspects to achieve projects goals.

4.1.3 Warranty Period / Defect Liability Period

As per the Contract, the Contractor warrants that the works shall meet the Specifications and Standards. If during the Defect Liability Period, any defect is discovered in the Works or part thereof; or the Works or any part thereof fails to meet the Specifications and Standards, the Employer will notify the Contractor of such defects or failure. Upon receipt of such notice, the Contractor shall promptly repair or replace such Work in accordance with this Agreement, Good Industry Practices and Applicable Laws. Defect Liability Period shall be for a period of 12 months calculated from the date of issuance of the Completion Certificate or 12 months from rectification of defects, whichever is later. The Final Acceptance Certificate been issued for 400kV D/C Kurukshetra- Malerkotla TL on 20.01.2017 and for 400kV D/C Malerkotla-Amritsar TL on 03.03.2017. The defect liability period is over for both the TL.

4.2 Transmission Lines - Supply

4.2.1 Transmission Line, Towers & Accessories

Below are the details of the Project transmission line elements along with the suppliers of different items used in the Project.

Name of TL- 400kV D/C Kurukshetra-Malerkotla Line	
400kV Double Circuit Dar400kV Double circuit with twin conductor:	
· Contractor	M/s Unitech Power Transmission Limited (UPTL)
· ACSR Twin Conductor:	Supplier - Sterlite Technologies Limited
· Composite Rod Insulators 120 KN & 160 KN	Supplier- Jiangsu Xiangyuan Electric Equipment Co. Ltd.
· ACSR Hardware & Accessories	M/s Mosdorfer India Pvt. Ltd.
· Tower Material Supplier	Unitech Power Transmission Ltd.

Name of TL- 400kV D/C Malerkotla-Amritsar Line	
· 400 kV D/C Line Twin Moose	
· Contractor	Jyoti Structures Ltd.

· AAAC MOOSE Conductor	M/s Sterlite Technologies Limited.
· Composite Rod Insulators 120 KN & 160 KN	Supplier- Jiangsu Xiangyuan Electric Equipment Co. Ltd.
· ACSR Hardware & Accessories (TAG)	M/s Mosdorfer India Pvt. Ltd.
· Tower Material Supplier	Jyoti Structures Ltd.

From above it is observed that the Procurement of Transmission Line materials Conductors, Insulators, hardware etc. have been done from known and reputed manufacturers/ suppliers in the country so it's a good practice adopted by the NRSS XXXI B in development of project.

4.2.2 Transmission Line, Towers & Accessories - Design

The Double Circuit 400kV Transmission system has towers with vertical conductor configuration.

The towers are self-supporting hot dip galvanized lattice type with bolted structural members, designed to carry the line conductors with insulators, earth wires and fittings under all loading conditions have been considered for the Project. The tower structural members are fully galvanized using mild steel/ high tensile steel sections. Bolts and nuts are provided with spring washers.

In general, Transmission Systems in India adopt the guidelines laid down in CBIP Transmission Line Manual while finalizing the types of Transmission Towers. Different tower types with Deviation Limits are given below in Table.

Table 4: Different Tower types & deviation limit

Tower Type	Deviation Limit	Defined Use
DA	0 deg – 2 deg	To be used on straight runs and up to 2º line deviation.
DB	0 deg - 15 deg	Small Angle tower with tension insulator string. To be used for line deviation from 0 to 15 degree.
DC	15 deg - 30 deg	Medium angle tower with tension insulator string. To be used for line deviation from 15 to 30 degree.
DD	30 deg - 60 deg	Large Angle and Dead-End Tower with Tension Insulator string. To be used for line deviation from 30 to 60 degree.

In NRSS, lattice steel towers of DA, DB, DC & DD type has been used as per IS 802 for the relevant wind zone along with the applicable adequate Reliability level. The towers have been tested at reputed tower testing stations in India. All the tower parts, stubs and pack washers are hot dip galvanized with minimum overall zinc coating as per the relevant IS code provision.

4.2.3 Line Accessories:

Insulators:

The design parameters of the insulators / Insulator strings for the project in NRSS XXXI-B 400kv lines with ACSR Twin Moose conductor are as below

Table 5: Design parameters of Insulator Strings

Type of String	Min. Creepage Distance (mm) Per Unit	Electro – Mechanical strength of Single Long Rod Insulator Unit (kN)	Mechanical Strength of Insulator String along with Hardware Fittings (kN)
Double 'I' Suspension.	13020	120	2X120
Single "I" Suspension 'Pilot' in DB, DC & DD Towers	13020	120	1X120
Double Tension Insulator String for DB, DC & DD Towers	13020	160	2X160

Type of String	Min. Creepage Distance (mm) Per Unit	Electro – Mechanical strength of Single Long Rod Insulator Unit (kN)	Mechanical Strength of Insulator String along with Hardware Fittings (kN)
Single "I" Suspension 'Pilot' in DB, DC & DD Towers	13020	120	1X120
Double "I" Suspension In DA Tower	13020	120	2X120

Quad Tension Insulator String for DB, DC & DD Towers	13020	160	4X160

IE observed the technical parameters adopted by the Project Company are as per Specifications & Standards for the Transmission system laid down in the Transmission Agreement as well as the relevant Indian/ International Standards and are suitable for use on 400 kV Transmission Systems.

Mid span compression joint for conductor/ earth wire:

Mid span compression joints suitable for conductor/ earth wires have been used for joining two lengths of conductor/ earth wires. The minimum slipping strength of the joint after compression is not less than 95% of UTS of conductor/earth wire.

Repair sleeve for conductor:

Repair sleeve to be used only for repairing conductor with not more than two strands broken in the outer layer. The sleeve is manufactured from 99.5% pure aluminium and shall have a smooth surface. It comprises of two pieces with provision of seat forsliding of the keeper piece.

Flexible copper bond for earth wire:

Flexible copper bonds are used for good electrical continuity between the earth wire and the tower. Two bonds per suspension tower and four bonds per tension tower is used.

Vibration dampers for conductor/ earth wire:

Stockbridge vibration dampers are used to reduce the maximum dynamic strain caused by Aeolian vibrations to a value of 150 micro-strains.

Spacers/ Rigid Spacer

Armour grip bundle spacer with retaining rods have been used for the line to maintain a sub - conductor spacing of 450 mm under all working conditions. Rigid spacer for jumper are used at all tension towers

B) Design Review of Fasteners, Insulator and other hardware material used in Towers

IE observed the technical parameters adopted by the Project Company are as per Specifications & Standards for the Transmission system laid down in the Transmission Agreement as well as the relevant Indian/ International Standards and are suitable for use on 400 kV Transmission Systems. Further these Transmission System are under operation for last more than 4 years which proves its operational viability, stability, and healthiness.

C) Confirm compliance of technical requirements of Tender & Final contract and its Amendments.

From the document reviewed, it is evident that the Transmission system constructed in compliance with technical requirement of specification in Tender and Contact awarded and its amendment.

D) Statutory Clearances:

Forest clearances, NH clearances, Railway clearances, PTCC clearances, Airport Authority clearances have been verified and detailed in the report at point 15.2.

4.3 Protection & Control

4.3.1 Protective Relaying System

The Protection Relay System have been provided for Transmission Lines at all the three Substations (Kurukshetra, Malerkotla & Amritsar of PGCIL, for protection of the Equipment in case of any faults in the system.

4.3.2 Protection on Transmission Lines

400 kV lines have Main-I Protection with Numerical Distance Protection Scheme as Three Zone Distance type with Carrier aided Inter-Tripping feature. 400 kV Lines have Main-II Protection with Numerical Distance Protection Scheme like Main-I but of different make. All 400 kV Lines are provided with two (2) stage Over Voltage Protection.

4.4 Communication System

In NRSS, in both of the lines, Earth wire has been installed for both circuits and the communication is through the PLCC on the 2 lines in NRSS.

These transmission lines are using Power Line Carrier Communication (PLCC) equipment for Speech communication, Line Protection signal and data transmission of Transmission Lines and duly have been provided on each 400 KV substation of PGCIL.

As per Indian Electricity Grid Code (IEGC) sub-stations have to provide real time data and voice from their stations to RLDC for efficient grid management. Also, as per the Technical Standards for Communication System in Power System Operations, the communication system shall be formed by a wideband network.

5.0 Transmission Licence

As per article 3.1.3 of the TSA the TSP has to obtain the Transmission Licence from respective commission within 6 months of the effective date. In compliance of the same NRSS filed a petition under section 14 read with Section 15(1) of the Electricity Act, 2003 for grant of Transmission Licence to Northern Region System Strengthening Scheme, NRSS

– XXXI (Part B) with Central Electricity Regulatory Commission, New Delhi vide Petition No. 90/TL/2014 CERC. CERC after due hearings granted transmission licence bearing Licence No 29/Transmission/2014/CERC vide order dated 25.08.2014 to undertake the business of establishing of the transmission system for "Northern Region System Strengthening Scheme NRSS-XXXI (Part B)" (hereinafter referred to as "Transmission System")' on„ Build, Own, Operate and Maintain" (BOOM) basis, comprising the following Elements.

S. No.	Transmission elements	Conductors per Phase	Completion Target
1	Kurukshetra-Malerkotla 400 kV D/C transmission line-135.15 kms (Approx.)	Twin Moose ACSR or equivalent AAAC	28 months from the effective date
2	Malerkota-Amritsar 400 kV D/C transmission line-147.01 kms (Approx.)	Twin Moose ACSR or equivalent AAAC	28 months from the effective date

The grant of transmission licence to the petitioner had all the subject conditions as laid down by the commission. However major highlighting points are:

- The transmission licence shall, unless revoked earlier, remain in force for a period of 25 years.
- Since the expiry date as per the TSA is 35 years from the scheduled COD of the project, the petitioner may make an application, two years before the expiry of initial licence period, for grant of licence for another term in accordance with Regulation 13 (2) of the Transmission Licence Regulations which shall be considered by the Commission in accordance with law.

5.1 Extension of Licence

As per Section 15 of the Electricity Act:

(8) A licence shall continue to be in force for a period of twenty- five years unless such licence is revoked'.

These 25 years are counted from the date of grant of Licence that includes construction period as well. However, the tenure of Transmission Service Agreement to operate the assets is for 35 years from the date of commercial operation. Therefore, to cover the gap it has been specifically provided in the license that, 'since the expiry date as per the TSA is 35 years from the scheduled COD of the project, the petitioner may make an application, two years before the expiry of initial licence period, for grant of licence for another term in accordance with Regulation 13 (2) of the Transmission Licence Regulations which shall be considered by the Commission in accordance with law.

Regulation 13(2) of the CERC Transmission Licence Regulations states,

'(2) If the useful life of the transmission asset for which transmission licence has been issued extends beyond the period of 25 years, the Commission may consider on merit of each case to grant licence for another term for which the licensee may make an application in accordance with Regulation 7 two years before the expiry of the initial period of licence: Provided that when the licensee does not make an application for grant of licence beyond the initial period of 25 years, the Commission may, to protect the interest of the consumers or in public interest, issue such directions or formulate such schemes as it may deem necessary for operation of the transmission assets for the remaining part of its useful life'.

As a general practice observed in the industry and considering the performance of the company since COD, there is no risk of non-extension of license after initial period 25 years.

5.2 Terms of Revocation of Licence

Section 19 of the Electricity Act stipulates the terms on which license may be revoked. The reasons and process of revocation of Licence as specified is follows:

Section 19.

19. If the Appropriate Commission, after making an enquiry, is satisfied that public interest so requires, it may revoke a licence in any of the following cases, namely:

(a) *Where the licensee, in the opinion of the Appropriate Commission, makes wilful and prolonged default in doing anything required of him by or under this Act or the rules or regulations made thereunder;*

(b) *Where the licensee breaks any of the terms or conditions of his licence the breach of which is expressly declared by such licence to render it liable to revocation;*

(c) *Where the licensee fails, within the period fixed in this behalf by his licence, or any longer period which the Appropriate Commission may have granted therefore*

(i) To show, to the satisfaction of the Appropriate Commission, that he is in a position fully and efficiently to discharge the duties and obligations imposed on him by his licence; or

(ii) To make the deposit or furnish the security, or pay the fees or other charges required by his licence;

(d) *Where in the opinion of the Appropriate Commission the financial position of the licensee is such that he is unable fully and efficiently to discharge the duties and obligations imposed on him by his licence.*

(e) *Where in its opinion the public interest so requires, the Appropriate Commission may, on application, or with the consent of the licensee, revoke his licence as to the whole or any part of his area of distribution or transmission or trading upon such terms and conditions as it thinks fit.*

(f) *No licence shall be revoked under sub-section (1) unless the Appropriate Commission has given to the licensee not less than three months' notice, in writing, stating the grounds on which it is proposed to*

revoke the licence, and has considered any cause shown by the licensee within the period of that notice, against the proposed revocation.

(g) *The Appropriate Commission may, instead of revoking a licence under subsection (1), permit it to remain in force subject to such further terms and conditions as it thinks fit to impose, and any further terms and conditions so imposed shall be binding upon and be observed by the licensee and shall be of like force and effect as if they were contained in the licence.*

(h) *Where the Commission revokes a licence under this section, it shall serve a notice of revocation upon the licensee and fix a date on which the revocation shall take effect.*

(i) *Where the Appropriate Commission has given notice for revocation of licence under sub-section (5), without prejudice to any penalty which may be imposed or prosecution proceeding which may be initiated under this Act, the licensee may, after prior approval of that Commission, sell his utility to any person who is found eligible by that Commission for grant of licence'.*

In view of above, it is most likely that license of the Company shall be extended in accordance with law.

6.0 ENVIRONMENT AND SAFETY

Project company has adopted and implemented well defined Safety, Health, Environment and Quality Policy in line with its commitment towards safety, health, environment, and quality. Project company aims to ensure implementation of good industry practices, procedures and processes across its corporate offices, and operational areas to ensure safe, sustainable operations & maintenance and performance of assets across technical and financial parameters. In order to achieve the objectives, set out in the SHEQ Policy, the Company has issued several Standard Operating Procedures (SOP) in line with good industry practices and implemented best practices such as lock-out & tag-out, arc flash protection, chemical safety, fall protection, safety signages, dangerous zones marking, spill control, waste management etc. Performance statistics are also tracked on a regular basis to ensure measurement and accountability. Various trainings programmes were conducted at corporate office and at Operating Sites to educate and train the employees and build a culture that understands, appreciates, and values the importance to matters pertaining to safety, health, and environment.

To benchmark its process and practices with best practices in the industry, the Company and its two subsidiaries viz; DMTCL and NRSS pursued independent accreditation and as an outcome, ***The Management System of Sekura Energy Ltd., and its subsidiaries DMTCL and NRSSXXXIB have been approved by Lloyd's Register to: ISO14001:2015*** (Environment Management System)***, ISO 45001:2018*** (Safety Management System).

Transmission line projects are environment friendly and do not involve any disposal of solid effluents and hazardous substance in land, air, and water. Transmission line projects are not included in the list of project activities that require

prior Environmental Clearance as per the notification issued by MoEF on 14th September 2006. Therefore, no Environmental Clearance is applicable for this project.

Forest Clearance under Forest (Conservation) Act, 1980 from Ministry of Environment Forests and Climate Change (MoEFCC) is a mandatory requirement wherever transmission line involves forest area. Due care and process has been followed by the Licensee in taking Forest approvals from the respective department of Environment and Forests and is summarised as under.

FOREST STRETCH IN LINE ROUTE AND APPROVALS				
Sl. No.	**Description**	**Area in Hectares**	**Stage -I Approval**	**Stage -II Approval**
1	Amritsar, Jalandhar, Ludhiana & Sangrur Forest Division (for Malerkotla-Amritsar Transmission Line).	5.0056	Received	Received
2	Kurukshetra, Karnal & Kaithal Forest Division (for Malerkotla-Kurukshetra Transmission Line).	2.1247	Received	Received
3	Patiala & Sangrur Forest Division (for Malerkotla-Kurukshetra Transmission Line).	3.3083	Received	Received

Further there is no requirement for Approval for the River Crossings in this project as the rivers in this project are not identified as Navigable Rivers.

The safety requirements during the operation and maintenance of electric lines are defined in the CEA regulations 2011. (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines).

Standard procedures for safety are followed during construction, testing, operation, and maintenance. Tower earthing, earth wire is provided for protection of transmission lines against lightening. Strict safety procedures for isolation, and permission to work protocols are in place.

From above it is visible that all standard procedures for safety are followed during construction, testing, operation, and maintenance of all the elements. Strict safety procedures for isolation, and permission to work protocols are in place.

7.0 QUALITY CONTROL:

In order to ensure quality of Contactor supplied Materials, the Project Company informed that proper MQP (Manufacturer Quality Plan) and FQP (Field Quality Plan) have been implemented and were practiced. Field Quality Assurance and Standard Field Quality Plans (SFQP) and transmission lines, standard formats and guidelines are part of the Technical Specification. The field quality plan covers all aspects during construction and erection of transmission lines and substations.

To ensure compliance to technical requirements as stipulated in the RFP and also conforming to CEA regulations for construction of sub-stations, all the equipment were tested as per relevant Indian (BIS) and international Standards (IEC). The equipment suppliers furnished the reports for type tests as per technical specification. These type tests are conducted in accredited laboratories or witnessed by Central, State, or other reputed Indian Utilities. Routine and Acceptance tests were conducted as per relevant IS/IEC during manufacturing stage. Comprehensive Manufacturing Quality plans covering quality of raw materials, bought-out items, Type, Routine/Acceptance tests and Final inspection procedure as per best industry practices were finalized by Contractor's Engineers and respective OEM's which were further reviewed by M/s Feedback Infra Private Limited, the Owner's Engineer for this project.

The Field Quality Plan for Erection works following industry's best practices & relevant standards were prepared by the EPC contractor/ Sub-contractor and further reviewed and approved by M/s Lahmeyer International India (Pvt.) Ltd., the Owner's Engineer. The Field Quality Plan for Civil works was prepared by the EPC contractor/sub-contractor as per best practices of the industry and as per relevant IS and CPWD specifications and further reviewed & approved by M/s Feedback Infra Private Limited, the Owner's Engineer for this project.
IE reviewed the MQP of various equipment and the FQP for the project. The MQP and FQP are in line with the industry practice. Additionally, it was found that the test results/ certificates for various equipment, reviewed by the IE were in line with the standards/ benchmarks stated in the MQP/ FQP.

8.0 OPERATION AND MAINTENANCE

A general O&M set up for transmission line includes SPV In-charge, line in-charge (SPV In-charge), a transmission line maintenance engineer and a team of junior engineers, technicians, and fitters. The team composition is flexible and is augmented/ strengthened based on requirements at the site.

8.1 Organogram for O&M of Transmission Lines:

O&M of all the elements are being regularly monitored through CAC by Senior Management at corporate office Mumbai, who interacts with O&M team of SPV for ensuring timely compliance to preventive maintenance schedule, sharing of best practices followed in industry, providing opportunity for learning and development. On ground, transmission lines are being managed by SPV In charge. They are supported by One Line In charge NRSS XXXI B.

They both are supported by O&M Supervisors. each, who are further supported by the O&M fitters and helper's staff. The O&M team comprising of engineers, Fitters/ technicians and storekeepers who are responsible for the O&M activities of both the lines.

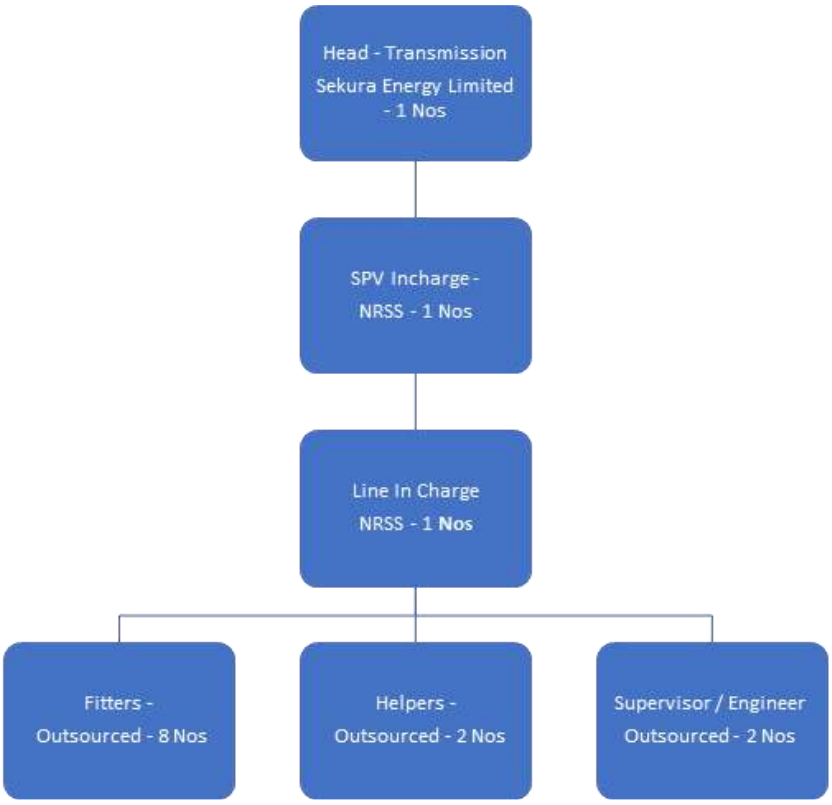


Figure 1: Organogram for O&M of NRSS XXXI B

From the organization chart it can be seen that the O&M manpower is sufficient for maintenance of the assets created.

8.2 Maintenance of Transmission lines

Routine and preventive maintenance of transmission lines is being carried out as per defined/ standard schedules for transmission lines; and best practices in O&M such as regular patrolling of lines, periodic removal of vegetation, thermo-vision scanning, online insulator puncture detection etc. have been adopted. Trained in-house manpower/ hired manpower on contract basis has been identified to swiftly attend any unforeseen eventualities/ natural calamities.

8.2.1 Patrolling

Monthly patrolling: There are rented vehicles which are used for patrolling of both the Transmission lines.
The O&M team has identified some critical towers in both the lines like Railway crossing, River crossing, Major/minor road crossing, line crossing.

- Line 1: 400 KV Kurukshetra to Malerkotla (139.2km having total 375 nos of towers): 57 nos. critical tower locations are visited every month by O&M team and the remaining towers are visited in three months.
- Line 2: 400 KV Malerkotla to Amritsar (149.6km having total 413 nos of towers): 56 nos. critical tower locations are visited in every month by NRSS team and the remaining towers are visited in three months.
- The O&M team is maintaining a check list format for monthly patrolling. Sample checklist was verified by the IE.
- It has also concluded that none of the tower locations are inaccessible

As per CBIP manual, following is the patrolling schedule for different voltage class transmission lines.

Table 6: Patrolling Schedule as per CBIP manual

Type of patrolling	Schedule
Ground Patrolling-400 kV Lines	Six Monthly
Ground Patrolling-765 kV Lines	Four Monthly
Ground Patrolling- Critical locations	Three Monthly
Emergency patrolling	Immediate

As against the above-mentioned patrolling schedule, NRSS XXXI B carries out the patrolling activities as per below schedule.

Table 7: Patrolling schedule by NRSS XXXI B

Patrolling activities by NRSS XXXI B for 400 KV D/C Transmission Lines	Frequency of activities carried out by NRSS XXXI B Team
Thermo vision scanning	Annually
Tower Footing Resistance (TFR)	Annually
Clearances at all important crossings	Six Monthly
Ground Patrolling of lines	Every tower is covered in three months once as against six

Patrolling activities by NRSS XXXI B for 400 KV D/C Transmission Lines	Frequency of activities carried out by NRSS XXXI B Team
Tower top patrolling	Every tower is covered in Six months once
Critical locations patrolling	covered on monthly basis
Emergency patrolling	Immediately as per the site requirements

Patrolling for 400 KV Transmission Lines towers is six monthly as per CBIP manual while NRSS XXXI B team is carrying out the patrolling every three months.

9.0 BEST PRACTICES BY NRSS XXXI B

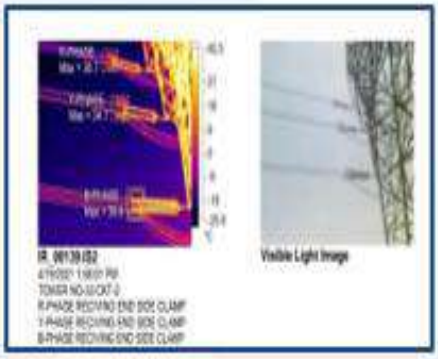
It is observed that NRSS XXXI B has implemented various aspects of improvement required for safe, secure, and sustainable operation & maintenance of all the elements of its assets. As a part of improvement action, following actions are observed to have been initiated and implemented in addition to standard O&M practices:

1) Pre & Post monsoon Drone survey of Transmission lines to promptly identify & initiate actions on all the areas of concerned.
2) Implementation of ISO-14001 for Environment Management System and ISO-45001 for Occupational Health & Safety Management and ISO 55001 for Asset Management System and ISO 27001 for Provision of IT services to Operational and maintenance of transmission lines and substation.
3) Establishment of Centralized Analytics Center (CAC) at Mumbai which monitors all operations and maintenance w.r.t to PM schedule and routine maintenance through maintenance management software installed at CAC.
4) Currently NRSS XXXI B has 1 Lead Auditor in its team available to lead the process of ISO 55001 along with 14 others Lead auditors in SEPL.
5) NRSS team is following stringent compliance to all their SOPs for O&M, SHE. It is also observed that the risk & compliance, learning & development, and compliance to SHE practices are being monitored by using various tools and applications like a) Komrisk, b) RAPL and c) Gensuite, by all DMTCL employees on regular basis.

With the implementation of all the above, NRSS XXXI B has been able to minimize undue trippings/break down and has achieved highest availability for its assets.

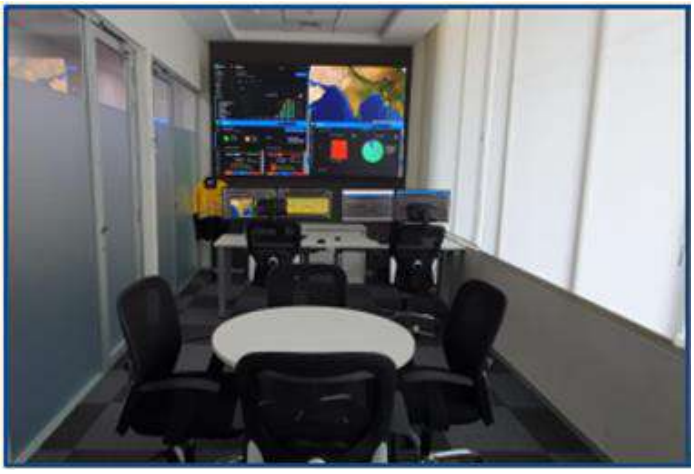
Some of the project elements and practices in NRSS XXXI B are as shown below:

Physical (using App) and drone-based tower inspections



Line condition monitoring

Foundation and tower design sufficiency



Remote Control & Analytics Centre (CAC) located in Head Office, Mumbai**

*** Photos are provded by NRSS.*

10.0 AVAILABILITY OF ASSET

Calculation of availability of the projects acquired through TBCB mechanism is carried out as stipulated in the respective TSA. The outage data of the company is submitted to respective RLDC(s) for checking. Based on the certified outages by RLDC(s), the RPC(s) issues the availability certificates.

Table 8: Transmission System Availability

Availability of NRSS XXXI(B) TRANSMISSION LIMITED Certified by NRPC	
FY 2019-20	
Month	**Monthly Availability (%)**
Apr-19	100.00
May-19	100.00
Jun-19	99.51
Jul-19	100.00
Aug-19	100.00
Sep-19	100.00
Oct-19	99.97
Nov-19	99.83
Dec-19	100.00
Jan-20	100.00
Feb-20	100.00
Mar-20	100.00

FY 2020-21	
Apr-20	100.00
May-20	99.98
Jun-20	99.88
Jul-20	99.96
Aug-20	100.00
Sep-20	99.92
Oct-20	99.88
Nov-20	100.00

Dec-20	100.00
Jan-21	100.00
Feb-21	100.00
Mar-21	100.00

FY 2021-22	
Apr-21	100.00
May-21	100.00
Jun-21	99.78
Jul-21	100.00
Aug-21	100.00
Sept-21	100.00
Oct- 21	100.00
Nov -21	100.00
Dec -21	99.80
Jan -22	100.00
Feb- 22	99.66
March -22	100.00
Sept-21	100.00
For Assessment of recent performance, the availability of preceding 02 Financial years has been considered.	

FY 2022-23	
Apr-22	100.00
May-22	99.77
Jun-22*	100.00*

*(Number based on internal calculation of Availability & submission to NRPC. This is subject to issuance of final availability certificate.)

As per TSA, the target availability for the project is 98%. The company is entitled to receive incentive/ required to pay penalty based on the annual transmission system availability.

From the availability certificates provided, it is observed from the availability certificate that the average availability of elements from date of COD is more than 99.75% and this thus is beyond normative availability of 98% enabling full revenue recovering and incentive.

11.0 SPARE PART MANAGEMENT:

Necessary spares for Transmission line are procured by NRSS. The list of the same is given as under. All mandatory spares are kept in stock. Fast delivery of spares from works is possible since almost all suppliers have works or sales offices in India. So, spares are available for both TL. However whenever necessary spares are procured to replenish the stocks.

As per the inventory list of the spares provided by the utility It can be observed that almost all the necessary spares are maintained by the developer.

SEPL has made a contract with a reputed Tower manufacturing Indian company which can provide the towers within 30 days of the order on as and when required basis.

12.0 PHYSICAL SECURITY OF ASSET:

12.1 Security of Transmission Line:

As we know that the Transmission lines are spread across the country and no exclusive security can be deployed for that. The only measure available as on date with the Owners is regular patrolling of the transmission line which is normally scheduled in such a way that every tower of the line is checked at least three times in a year for 765 kV/ critical / vulnerable locations and at least two times in a year for 400 kV lines. In case of any theft in transmission line the issue is taken-up with local authorities. However, in NRSS XXXI B even though the assets comprise of 400kV but still every tower is covered in patrolling every three months.

The main objectives achieved by implementation of Security Management Plan are:

- Strengthening of physical measures with trained security guards at stores
- Prevention of loss /Theft of material from the site with adequate procedural safeguards

- Restrict complicity of security personnel or nexus between workers and outsiders
- Restrict interference of unauthorized persons at project site
- Better control on inward and outward movement of materials owned by SPV /Contractors / any others

13.0 CYBER SECURITY:

The Assets under operation for NRSS XIII B do not have any Operational Technology (OT) systems installed. The IT assets viz laptops, printers used by personnel adhere to the information security standards as specified by ISO 27001 standard and framework specified under Information Technology Act, 2000.

14.0 RISK ANALYSIS:

In any asset, post the development of the project there are various risks which an asset could encounter during the operation period of the assets. The operating risk due to transient faults, earthquake, short circuit, falling or touching of trees, lightning strike, travelling wave wind, storm, rain, hailstorm, cyclone, flood, over loading etc are part of operations. This can be taken care of by the design, compliance with technical standards, quality plan, inspection, and testing. This seems to be taken care of as seen from the good availability since commissioning of the project. Sound operation and maintenance practices, adequate qualified/ skilled manpower, preventive maintenance, diagnostic testing, protection audits, healthy work culture, good T&P would ensure reliable operation of the scheme for decades to come. All mandatory spares are kept in stock and spare management ensures timely availability of required spares.

Operation of Assets beyond TSA period:

As per the RFP document and CERC order granting transmission Licence, the assets have been created by the company on Build, Own, Operate and Maintain (BOOM) basis. The Right of Way (not ownership but limited to related construction and O&M activities) and other statutory approvals belong to the Company.
Though the Transmission Licence is granted for a period of 25 years initially, it can be extended as per various provisions of TSA and CERC Regulations.

The transmission lines are designed to provide a service life of more than 35 years. Though the transmission charges are to be quoted by the Bidders under the TBCB process for a period of 35 years, the useful life can be extended even beyond 50 years, by carrying out regular maintenance, and inspection. The first 400 kV line built in early 1970s is still in service. Further, many assets of POWERGRID which have completed 30 years and more have been performing well in terms of availability.

While not necessarily relevant to NRSS XXXI B, from a sector perspective, the transmission lines associated with hydro projects may well be required beyond 50 years depending on evolution of the grid. If there is a grid, the 765 kV and 400 kV lines are indispensable. The right of way is always valuable and even after 50 years lines are usually refurbished, sometimes the voltage is stepped up, sometimes, multi-circuit patches are added.

In view of above analysis, the technical life of transmission line can be considered up to 50 years.

Regarding the life of asset beyond the tariff period, the TSA provides for the following:

Subject to Article 2.2.2 and Article 2.4, this agreement shall continue to be effective in relation to the Project until the Expiry Date, when it shall automatically terminate unless extended by the Appropriate Commission for such period and on such terms and conditions as the Appropriate Commission may specify in this regard in terms of the procedures laid down by the Appropriate Commission for such matters.

15.0 PERMITS AND CLEARANCES:

15.1 Regulatory Clearances:

Table 10: Regulatory Clearances

S. No.	Event	Approving Authority	Approval Status
1	Transmission Service Agreement (TSA)	PFC Consulting Limited (PFCCL) as Facilitator/BPC	Signed on 02.01.2014
2	Transmission Licence	Central Electricity Regulatory Commission (CERC)	Granted on 25.08.2014
3	Tariff Adoption (Transmission Charges)	Central Electricity Regulatory Commission (CERC)	Granted on 07.082014
4	Approval under Section 68 of Electricity Act, 2003	Ministry of Power, Govt. of India	Permission issued on 16.09.2013
5	Approval under Section 164 of Electricity Act, 2003	Ministry of Power, Govt. of India	Granted on 15.10.2014

15.2 Statutory Clearances:

Table 9: Other Statutory Clearances

Sr. No.	Event	Approving Authority	Approval Status
1	Power & Telecommunication Coordination Committee Clearance (PTCC)	GOI, Ministry of Power (MOP)	Approval Received for both Malerkotla-Amritsar & Kurukshetra -Malerkotla Transmission Line
2	Road (SH/NH) Crossings	National Highway /	National Highway Crossing:

Sr. No.	Event	Approving Authority	Approval Status
		State Road Department	For both Malerkotla-Amritsar & Kurukshetra -Malerkotla Transmission Line approvals received.
			State Highway Crossing:
			Clearance for Kurukshetra element is received.
3	River Crossing	Navigational Authority	Not Applicable
4	Railway Crossing	Ministry of Railways	Approval Received for both Malerkotla-Amritsar & Kurukshetra -Malerkotla Transmission Line
5	Power Line Crossings	Concerned State Power Utilities/ PGCIL	Approval Received for both Malerkotla-Amritsar & Kurukshetra -Malerkotla Transmission Line
6	Civil Aviation Approval (CAA)	Airport Authority of India, Govt. of India, Ministry of Civil Aviation	Approval received for both Malerkotla-Amritsar & Kurukshetra -Malerkotla Transmission Line
7	Défense	Directorate Operation (ATS), Air HQ	Approval Received for Kurukshetra -Malerkotla and Malerkotla-Amritsar Transmission Line.
8	Approval for Energization of the System	CEA	Approval Received Malerkotla-Amritsar TL – 17/03/17
			Kurukshetra -Malerkotla TL- 02/01/17
9	Certificate for completion of Trial run	POSOCO	Kurukshetra- Malerkotla Transmission Line on 03.02.2017
			Amritsar-Malerkotla Transmission line on 17.04.2017
10	COD		Kurukshetra- Malerkotla Transmission Line on 18.01.2017
			Amritsar-Malerkotla Transmission Line on 27.03.2017
11	CEIG Approval	Chief Electrical Inspector General of India	For both Malerkotla-Amritsar Transmission Line on 17.03.2017 & Kurukshetra-Malerkotla Line approval on 02.01.2017
12	Forest Clearance	State Govt./ MOEF	Stage-I & Stager-II Approval received for following:
			i. Amritsar, Jalandhar, Ludhiana & Sangrur Forest Division (for Malerkotla-Amritsar Transmission Line)

Sr. No.	Event	Approving Authority	Approval Status
			ii. Kurukshetra, Karnal & Kaithal Forest Division (for Kurukshetra- Malerkotla Transmission Line)
			iii. Patiala & Sangrur Forest Division (for Kurukshetra - Malerkotla Transmission Line)

15.3 CEA / CEIG Safety clearances and approvals:

Table 10: Safety Clearances and approvals

Sr. No.	Type of Approval	Element	Issuing Authority
1	400 kV D/C (Twin) Malerkotla-Amritsar line [Line Length-149.67 km] Approval for Energisation Under Regulation 43 of CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended)] (Valid for 2 years from the date of issue of the letter).	NRSS XXXI B TL element	Initial Approval: NRIO/NRSSXXXI(B)-1/MET-ASR/TL/400KV/PB/17/1338 Dated: 17.03.2017NRIO/NRSS XXXI(B)-2/MET-ASR/TL/400KV/HR/19/503 Dated: 06.12.2019 Latest Approval: CEI/2//EI/RIO(N)/Insp./2022/391 Dated: 24.06.2022
2	400 kV D/C (Twin) Kurkshetra-Malerkotla line [Line Length-140 km] Approval for Energisation Under Regulation 43 of CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended)] (Valid for 2 years from the date of issue of the letter).	NRSS XXXI B TL element	Initial Approval: CEI/7/INSP/N/E/NE/2017/3 Dated: 02.01.2017 NRIO/NRSS XXXI(B)-2/MET-KUR/TL / 400KV/HR/19/502 Dated: 06.12.2019 Latest Approval: CEI/2//EI/RIO(N)/Insp./2022/391 Dated: 24.06.2022

It is observed that all major approvals have been received by the Project Company. Regulatory Clearances like Transmission Service Agreement, Transmission Licence, and approval for Transmission Charges as well as approval under Sections 68 and 164 of the Electricity Act 2003 have been received by the Project Company.

Statutory Clearances like Power & Telecommunication Coordination Committee Clearance (PTCC), Roads, Railway and Power Line Crossings have been received for both the transmission line elements. For the forest area found in the Transmission Line Routes during execution of project, the Project Company has received Stage I and Stage II approval from MoEF for both the lines. River Crossings is not required from Navigation Authorities in this project as the rivers in this project are not identified as Navigable Rivers. It is understood that adherence to compliance is regularly reviewed and tracked by the company and its management through the KOMRISK application and reported to the Board, which is a good practice.

16.0 INSURANCE:

IE has reviewed all the insurance policies for NRSS XXXI B and found that insurances are in accordance with the provisions of TSA and has been timely renewed for the period 15th-Feb-2022 to 14th-Feb-2023, in order to cover the risks during the ongoing operating period. As transmission lines falls under the linear asset category for which getting insurance covering complete reinstatement value is difficult and unviable. NRSS XXXI B transmission lines are covered for loss limit of 75 Cr. Additionally, NBTL has also taken Burglary and Theft, RSMD and Terrorism policies which combined seems sufficient under the present market scenario and industry practice. Copies of the Insurance policies has been shared with Lead LTTC after renewal. The list of insurances taken are as below:

Table 13: Insurance Policies

S. No	Coverages	Policy Period
1	SFSP policy	15th-February-2022 to 14th -February-2023
2	Burglary and Theft Policy for Transmission lines	15th-February-2022 to 14th -February-2023
3	RSMD policy including Terrorism coverage	10th-Jun-2022 to 09th-Jun-2023.

17.0 CONCLUSION:

- The company has obtained all necessary statutory clearances like, approval under Section 68 of the Electricity Act, Authorization under Section 164 of the Electricity Act, Grant of Transmission Licence by CERC, Route approval by PTCC, Electrical Safety Clearance of CEA for construction, commissioning, and operation of the

assets at its rated voltage. The company has a robust system of tracking compliances through the Komrisk application and regular review of the same by the Management.

- All the major equipment for the Transmission lines are procured from reputed manufacturers having good credentials.
- As per the information provided by the Project Company, it has been understood that there is no navigable river for which approval is required for crossing. Hence, River crossing approval is not envisaged for this project.
- The system has been constructed as per CEA and relevant Indian Standards.
- The selection of towers for the various crossings is generally found to be in order as per the standard industry practices.
- Mandatory spares for transmission lines are maintained by NRSS. In case of consumption of spares, the same are being replenished by NRSS. Also, in case of requirement, NRSS can request POWERGRID for ERS towers and depending on availability, it can be provided on chargeable basis. This ensures that there is no need to block capex on ERS.
- Prudent procedures and good practices for safety are followed during construction`, testing, operation, and maintenance. The company has benchmarked its standards with global best practices by securing ISO14001 and ISO 45001, ISO 27001 & ISO 55001 accreditations.
- The availability of NRSS has been reviewed and it has been observed that NRSS has managed to secure an average availability of more than 99.75% during FY 2019-20, FY20-21 & for FY 21-22, the average availability has been more than 99.94%. As per TSA, the target availability for claiming full transmission charges is 98% and maximum permissible limit for availing annual incentive is 99.75%.
- As per TSA, the life of the project is required to be 35 years. However, with proper maintenance, the life of project can be extended up to 50 years.
- Well documented SOPs which are implemented by competent team of NRSS under supervision and guidance of Senior Management team has ensured continued reliable asset management.

Based on above study, it is observed that all the project established is compliant to all technical, statutory, regulatory requirements and being operate & maintained with highest technical and safety standards by competent personnel in line with statutory requirements and regulations and as per good industrial practices.