

Data Gaps-Set – 2 – Case No. 245 of 2022

PETITION OF M/s JAIGAD POWERTRANSCO LIMITED (JPTL) for TRUE-UP OF FY 2019-20 AS PER MYT REGULATIONS 2015, TRUE-UP FOR FY 2020-21 AND FY 2021-22, PROVISIONAL TRUE-UP OF FY 2022-23 AND AGGREGATE REVENUE REQUIREMENT FOR FY 2023- 24 AND FY 2024-25 AS PER MYT REGULATIONS 2019.

Sr. No	Reference to the Petition	Description/Query
Chapter 6- Mid-Term Performance Review of FY 2023-24 and FY 2024-25		
1.	Table 92: Additional Opex incurred for FY 2023-24 and FY 2024-25 (Rs. Crores) (Page No. 83)	Petitioner should provide a detailed break up of additional Opex proposed in FY 2023-24 and FY 2024-25 along with the cost-benefit Analysis. The petitioner shall also quantify the benefits of additional OPEX in the long term period. The petitioner shall also submit the relevant regulatory provisions applicable against the claim of additional OPEX and justification for the claimed amount.
	<p><u>Reply:</u> JPTL submits that in MTR Petition in Table No. 92 has claimed additional OPEX related to New Technology – Drone Survey IT Automation and Remote Monitoring of Transmission Towers using software, in line with Regulations 61.8 of MYT Regulations 2019 for FY 2023-24 only.</p> <p><i>61.8 A Transmission Licensee may undertake Opex schemes for <u>system automation, new technology and IT implementation</u>, etc., and such expenses may be allowed over and above normative O&M Expenses, subject to prudence check by the Commission: Provided that the Transmission Licensee shall submit <u>detailed justification, cost benefit analysis of such schemes as against capex schemes, and savings in O&M expenses, if any.</u></i></p> <p>As per the Regulations, the additional OPEX can be claimed alongwith the submission of detailed justification, Cost benefit analysis and Saving in O&M expenses. The details of the same is outlined below for each OPEX schemes:</p> <p><u>A. Remote Monitoring of Transmission Towers using software:</u> In a power transmission system, asset management decisions are made on a continuous basis during the lifespan of a transmission line, with emphasis on extending the life of the assets, maintaining or improving reliability and performance, optimizing costs and ensuring safe operation of the system. Asset management is a complex task that requires quality manpower, aims to maintain availability and reliability all the time. Various technologies such as geographic information system (GIS), drones and mobile-based monitoring systems are also in use now to monitor and maintain transmission lines. To ensure effective inspection and maintenance of transmission lines, it is vital to be continually informed of the running changes in the power line corridor and their surroundings. Various tools and technologies are being used today for the monitoring of transmission lines, whereby JPTL has proposed to implement Remote Monitoring of Transmission Towers using software.</p>	

Sr. No	Reference to the Petition	Description/Query
		<p>The benefits of the implementation of the Remote Monitoring of Transmission Towers using software is outlined below:</p> <ul style="list-style-type: none"> • Optimal utilization of patrolling manpower as patrolling staff inspects the assigned towers and enter the observation after finger print authentication. • Additional information can be attached through Photographs/voice notations • Eliminates different patrolling formats. Data can be entered only in standard format. • Patrolling data is immediately passed to the server and different types of analytical reports can be generated through app using that data. (Report Generation) • Statistical master data about total locations patrolled, hours spent on patrolling, distance travelled etc. can be generated which can be used for evaluation of patrolling staff. • Patrolling schedule is auto-generated for assigning monthly patrolling section to staff. • Thus, improves authenticity & quality of patrolling data. <p>Asset monitoring has a big role to play in avoiding abnormal stress in the transmission system and in obtaining precise data essential for planning suitable maintenance (or replacement) measures before the occurrence of a failure. With advancement in technology, this is being carried out more efficiently and can led to an increase in the system availability.</p> <p>The estimated cost of the IT Automation - Remote Monitoring of Transmission Towers using software and the budgetary offer is enclosed as Annexure 1.</p> <p>B. <u>New Technology – Drone Survey:</u></p> <p>The power transmission sector has high accident field cases because of the hilly terrain areas, rainfall issues, etc. With that in mind, power line companies consider using drones for inspection purposes, which provides many benefits. Drones are highly advanced unmanned aerial vehicles (UAVs) that constantly innovate. It has features like A.I. multispectral sensors, autonomous aerial surveillance, and robust hardware for intense weather endurance. Over time, drones improved and streamlined enhanced workflow on power line inspection sites. As a result, incorporating drones into the powerline industry provides the following benefits:</p> <p>1. Drone Power Line Inspections reduces Safety Concerns</p> <p>Drones can have long flight times and can reach a maximum height. Thus, workers no longer have to explore into risky and time-consuming effort. Running diagnostic and assessment are being operated seamlessly with its multispectral sensors. Additionally, drones have a high resolution camera, allowing users to view videos and capture photos with high definition. It has improved, and many high-risk inspections have decreased due to its substitution. Drones for the Power Industry have been consistent in improving safety above all.</p> <p>2. Drone Technology Provides Efficient Power Line Inspection Results</p> <p>Drones can provide you with raw images and clips of power lines. Drones are highly advanced and have robust features. With the integration of Artificial Intelligence (A.I.), drones can have more accurate and real-time data gathering as compared to conventional monkey patrolling.</p> <p>3. Structural Fault Analysis & Detection of Anomalies</p>

Sr. No	Reference to the Petition	Description/Query
	<p>Structural Fault Mapping of towers and Infrastructure helps in the detection of potential faults early. Timely detection of Anomalies helps in Prognosis of the Assets. Drone can fly extremely close to the power lines, and as a result provide high-resolution images and data, useful in the optimization of maintenance plans.</p> <p>4. Optimize Human Resources with Drone Integration</p> <p>Can benefit from using drones for inspection, monitoring, and data gathering. With only limited trained staff controlling the UAV, the need to engage several workforces for inspection at the site may not be as essential compared to a traditional method, the workforce can be effectively utilized for other priority works especially during tripping patrolling.</p> <p>5. Drone Utilization Grants a Cost-Effective Power Line Inspection Approach</p> <p>Conducting a transmission line inspection is challenging task, as it requires tedious operations. It is time-consuming and needs expense, and thus, this work process involves higher emergency contingency. The site in charge also have to consider the well-being of their workers, providing benefits that would add up to their expenses. Although manual inspections are still ongoing, integrating drones can reduce these risks and high figures in modern ways.</p> <p>The estimated cost of the IT Automation – Drone survey and the budgetary offer is enclosed as Annexure 1.</p> <p><u>Cost benefit analysis</u></p> <p>JPTL submits that the above cost though are one time in nature but is incurred as a proactive maintenance cost and hence claimed under additional OPEX. The resultant output is that the interruption time may reduce due to such proactive maintenance and identification of probable threats through drone surveying helps in achieving higher transmission availability. JPTL would like to mention that such implementation of new technology will not result in reduction in man-power but will help in fault identification with a reasonably less time as compared to existing conventional practices.</p> <p>With drone technology, you can do the survey in minutes and get the data back in real time.</p> <p>Therefore, Quantifying the value of a system can be difficult as the same relates to the quality of the power in nature such as grid reliability, proper system availability, proactive maintenance, etc. also, there may be a marginal decrease in R&M expenses due to proactive maintenance and in A&G cost due to resultant lower travelling and conveyance cost of the patrolling of lines. However, at present, the same is difficult to quantify.</p>	
2.	<p>Para 6.4.6: Insurance Claim and Para 7.1.1: Prayers of JPTL (Sr. No. R)</p>	<p>The petitioner shall justify the prayer for insurance policy expense w.r.t. the following:</p> <ol style="list-style-type: none"> 1. CEA Guidelines or norms for insurance of transmission assets 2. Practices followed by PGCIL and other transmission licensees for insurance and its claim in regulatory proceedings 3. Practice followed by MSETCL for insurance 4. Applicable regulations under which insurance of transmission assets is covered. 5. Details of the coverage under the proposed insurance premium. (Does it covers all towers or only vulnerable towers, other equipment of the transmission system)
	<p><u>Reply:</u></p> <p>JPTL submits the rationale behind seeking the additional insurance cost of the transmission towers as outlined below:</p>	

Sr. No	Reference to the Petition	Description/Query
		<ul style="list-style-type: none"> ● JPTL would like to reiterate the principle behind the Insurance, which is a mechanism for the transfer of risk, here measured directly or indirectly in financial terms, which permits an insured party to replace the uncertainty of possible future losses with a certain payment of a known, fixed amount. ● Indian Electricity Sector constituents e.g., Generation, Transmission and Distribution are part of critical infrastructure and thus entitled to be classified under Critical Infrastructure Protection. While ascertaining the critical infrastructure status, both the physical and cyber security aspects has been taken due consideration. The basic tenet of insuring assets are randomness of loss occurrence and uncorrelated potential loss due to loss of assets. ● Further , as per CERC IEGC Regulations, 'security' for electric entities had two general meanings: 1) physical security for equipment and facilities – the proverbial gates, guards, and guns; and 2) system operating security – the ability to continue serving customers during natural disasters, equipment failures, and people-caused events. <p>JPTL humbly submit that the collapse of transmission tower and transmission lines has severely interrupted the power flow at MSETCL substation at Karad and New Koyna affecting the power supply to various districts of the State. This is to be noted that the subject transmission tower is located at Sahyadri hills in proximity to Koyna wildlife area. The tower is erected over hill edge benched area with one side deep valley and to another side having sharp hill edges and the region has not witnessed any such heavy rainfall and landslide in past before.</p> <p>As per reports, the root cause analysis is pivoted towards extended monsoon due to tree cutting in the region and this randomness has led the petitioner to take consideration of system operating security in consideration and accordingly opting for insurance of transmission tower.</p> <ol style="list-style-type: none"> 1. As per information sought by this Hon'ble Commission and as per information received, it is submitted that CEA do not prescribe any specific norm towards commercial operational aspect of power system. 2. With respect to the insurance coverage undertaken by PGCIL or other licensee: <ol style="list-style-type: none"> a. As per information received, PGCIL do undertake insurance of its HVDC assets only under mega insurance policy (please refer to www.shorturl.at/gsUY0 for details). There is no information available yet to share on similar provisions on HVAC assets. b. The general utility practices undertaken by the transmission licensee is to take insurance for critical equipment's and preferably substation / bays etc and transmission / lines in vulnerable area. 3. As per information received, MSETCL do undertake insurance of its transmission asset of 500kV HVDC only and no insurance has been considered for assets below that level. 4. JPTL submits that though the definition of the O&M expenses as Regulations 2 (63) of MYT regulations 2019 includes insurance expenses. <p><i>(63) "Operation and Maintenance expenses" (or "O&M expenses") in respect of a Generating Company means the expenditure incurred on operation and maintenance of the Generating Station or Unit of a Generating Company, or part thereof, and includes the expenditure on manpower, repairs, spares, consumables, insurance and overheads, but excludes fuel expenses; and, in respect of a Licensee, means the expenditure incurred on operation and maintenance by a Transmission Licensee or Distribution Licensee, or part thereof, and includes the expenditure on manpower, repairs, spares, consumables, insurance and overheads;</i></p> <p>JPTL would like to submit that the definition clearly indicates that the O&M expenditure includes such head and such expenses incurred</p>

Sr. No	Reference to the Petition	Description/Query																								
5.	<p>shall be accounted under O&M expenses. However, JPTL submits that in past, it has not incurred any such expenditure and hence has not included in O&M expenses. Since the same was not the part of O&M expenses in the past, the same is proposed to be claimed under the additional O&M expenses so that the base O&M cost of JPTL is rationalized. Also, proviso to Regulations 61.1 of MYT Regulations 2019 clearly states that the allowable O&M expenses shall be the norms as specified in the Regulations. Also, the norms are determined without such insurance cost and hence is claimed separately.</p> <p>Also, internationally and private players operating transmission assets in the country itself opt for insurance and pay insurance premium.</p> <p>In lieu of the above submission, JPTL are seeking this as relief under Regulations 105 – “Power to Relax” of MYT Regulations 2019 and request the Hon’ble Commission to kindly consider allowing insurance of transmission towers and lines as additional O&M expenses to avoid future cost pass through burden on the end consumers.</p>																									
	<p>JPTL submits that the coverage under the proposed insurance premium is for all towers / transmission system and the quotation of the same sought at the time of tower collapse is enclosed as Annexure 2.</p> <p>Also, JPTL would like to submit that at present the replacement cost of all towers under JPTL is around Rs. 726 Crores, the details of which is outlined in the table below. Against which the Contribution to Contingency Reserves as per Regulations 35 of MYT Regulations 2019 is limited to 5% of the original cost of fixed assets which will results in cumulative Reserve amount of Rs. 27.59 Crs (5% of Closing GFA of FY 2021-22). Hence the Contingency Reserves won’t be adequate enough to meet such type of force majeure event and hence to subdue the impact, it is proposed to take insurance of the transmission towers.</p>																									
	<p>Table : Exposed Financial Risk and Replacement cost of Tower (Rs. Crores)</p>																									
	<table><tr><th>Particulars</th><th>Jaigad - Karad</th><th>Jaigad - New Koyna</th><th>Total</th></tr><tr><td>No. of Towers</td><td>300</td><td>151</td><td>451</td></tr><tr><td>Replacement Cost per Tower (incurred in FY 2020-21)</td><td>1.61</td><td>1.61</td><td>1.61</td></tr><tr><td>Total Replacement Cost</td><td>483</td><td>283</td><td>726</td></tr><tr><td>Contingency Reserve [5% of project cost]</td><td></td><td></td><td>28</td></tr><tr><td>Exposed financial risk</td><td></td><td></td><td>698</td></tr></table>		Particulars	Jaigad - Karad	Jaigad - New Koyna	Total	No. of Towers	300	151	451	Replacement Cost per Tower (incurred in FY 2020-21)	1.61	1.61	1.61	Total Replacement Cost	483	283	726	Contingency Reserve [5% of project cost]			28	Exposed financial risk			698
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	Exposed financial risk			698																						
3.	Impact of the APTEL Judgement on the Appeal No.108 of 2022 on dated 31 st Oct 2022	JPTL has submitted the reply for the query raised in data gaps set 1 with the impact of APTEL Judgement on the Appeal No.108 of 2022 on dated 31 st Oct 2022 and computation of carrying cost. However, this computation would change the form and formats submitted in the original petition. Accordingly, JPTL should submit revised MTR petition along with a revised form and formats.																								
	<p>Reply: The revised petition alongwith the computation with respect to Hon’ble APTEL order is included in the revised MTR Petition.</p>																									

ANNEXURE – 1

Additional OPEX

IT Automation - Remote Monitoring of Transmission Towers using software				
Sr No	Description	Qty	Unit	Estimated cost
1	Development App & installation	1	LS	1020000
2	3 years support	1	LS	550000
3	Travel & accomodation	1	LS	50000
4	Onsite services of technicalresource person	8	Manday	100000
5	Reccuring cost for servcer	1	Yearly	300000
6	Hardware cost	1	LS	100000
		Basic estimated cost		2120000
		incl GST 18%		2501600

New Technology – Drone Survey				
Sr No	Description	Qty	Unit	Estimated cost
1	Conducting Videography / RGB + Thermal Inspection / Survey of the two Transmission lines of 110 KM and 55 KM each	1	Per Tower	2796200
2	Mobilization - Demobilization	1	LS	20000
		Basic estimated cost		2816200
		incl GST 18%		3323116



BUDGETARY PROPOSAL

Drone-based Solution for Inspection of 400kV
Transmission Lines

Prepared for:
JSW - JAIGAD POWER TRANSCO LTD

Prepared by:
AERODYNE INDIA VENTURES PVT. LTD.

Proposal No.:
AIV/ TORRENT / C-055

19-Sep-22

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1.Introduction

This document contains **Aerodyne India Ventures'** (hereinafter referred to as "AIV") Budgetary Proposal for Drone-based Solution for Inspection of 400kV Transmission Lines to support **M/s JSW - Jaigad Power Transco Ltd** (hereinafter referred to as "JSW - Jaigad" and/or "Client").

Service Model

Drone + Software + AI as-a-Service as-a-Service as-a-Service

- Operation Planning & Management
- Flight Operation

- Data Management Processing & Analytics
- Deep Domain Analysis
- Verticality Asset Management
- ERP Integration

- Model development
- Scalability
- Deep Integration
- Platform agnostic

Full Lifecycle Service Model



01 Solution Centric AI Applications

Increased accuracy, faster deliveries and enhanced optimisation



02 Managed Services With Integrated Full Stack Technology Offerings

From hardware to data acquisition to infrastructure to platform and analytics in one integrated optimised system



03 Integrated Analytics and Delivery Platform

Integrated data capture and delivery, analytics, dashboard and intervention in one platform



04 Proven DaaS Methodology And Scalability

Matured DaaS platform and system & Proven scalability in 4 short years



05 Faster, Better, Cheaper & Safer

Aerodyne solutions are up to 400% faster, up to 50% cheaper and minimise risk to personnel

B. Key Sectors of Industry which we serve:

Key Focus Areas



Power Transmission & Distribution

- ✓ Site Feasibility study
- ✓ Project Monitoring
- ✓ Asset Inspection
- ✓ RoW Analysis
- ✓ Hotspot Detection
- ✓ Vegetation Encroachment

Sector Impact



Telecommunications

- ✓ Site & Tower Inspection
- ✓ Structure & Foundation Analysis
- ✓ 360 degree site tour
- ✓ EMF Survey
- ✓ Line of Sight Survey

Sector Impact



Renewable Energy - Wind & Solar

- ✓ Pre feasibility study
- ✓ Health monitoring & inspection of assets
- ✓ Defect marking & Identification
- ✓ Predictive maintenance & preventive solutions

Sector Impact



Infrastructure – Roads, Railways, Ports etc

- ✓ Site Feasibility study
- ✓ Condition-based monitoring & inspection of assets
- ✓ Digital Twins & Digital Transformation
- ✓ Project Monitoring
- ✓ Road Surface Analysis
- ✓ RoW Analysis

Sector Impact



Mining

- ✓ Condition-based monitoring & inspection of assets
- ✓ Visual, thermal and LIDAR inspections in GPS denied, confined environments
- ✓ Stockpile Analysis, Haul Road Analysis etc
- ✓ Mine planning & monitoring
- ✓ Security & Surveillance

Sector Impact



Oil & Gas

- ✓ Predictive condition-based monitoring & inspection of assets
- ✓ Visual, thermal & LIDAR inspections in GPS denied, confined & inaccessible environments
- ✓ Reduced maintenance costs and downtimes

Sector Impact



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Key Focus Areas



Power Generation & Industrial Applications

- ✓ Predictive condition-based monitoring & inspection of assets
- ✓ Visual, thermal & LiDAR inspections in GPS denied, confined & inaccessible environments
- ✓ Reduced maintenance costs and downtimes

Sector Impact

YOKOGAWA



Project Monitoring – MyPrism

- ✓ Construction monitoring
- ✓ Accurate Inspection & Audit Reporting
- ✓ Live Video streaming integration
- ✓ HSE Audit Compliance

Sector Impact



Security & Surveillance

- ✓ Our partnerships with Skydio & ACSL
- ✓ Visual, thermal and night vision imaging in GPS denied environments
- ✓ Skydio's X2, 2 and Drone-in-a-Box Solution revolutionising the drone industry world-wide
- ✓ Real-time Analytics

Sector Impact



Agriculture

- ✓ Precision agriculture resulting to increased yield production
- ✓ Visual, multi-spectral & LiDAR survey of large fields
- ✓ Effective crop-spraying, predictive analysis of crop health, crop counting & yield analysis.

Sector Impact



500%
Productivity
Increment

ZERO
Capex



BVLOS Operations

- ✓ Healthcare - Medical Delivery
- ✓ Oil and Gas - Pipeline Inspection
- ✓ Defense - Border Patrol
- ✓ Disaster management - Emergency Response
- ✓ Logistics - Cargo Delivery

Sector Impact



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C. AIV's Capabilities for Mapping Solutions:

Grid Asset Inspection and Management Solutions



- UAV Specialist with experience of inspecting over 380,000 kms of power line
- Perfected SOP | Quick inspection and quality results
- Regulatory Compliance and Highest HSE Standard
- End-to-end managed solutions service for critical assets in the power generation, transmission & distribution industries.
- Precise UAV inspection of assets combined with AI driven analytics and deep domain knowledge allow for the generation of actionable data for prescriptive and predictive reporting of asset health.

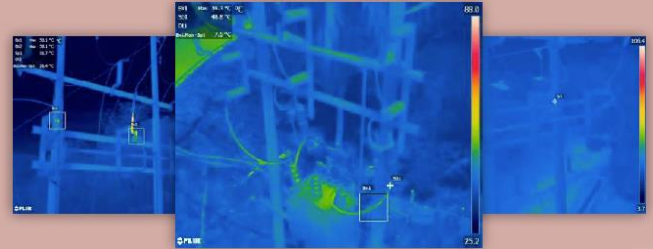


Scope of Association

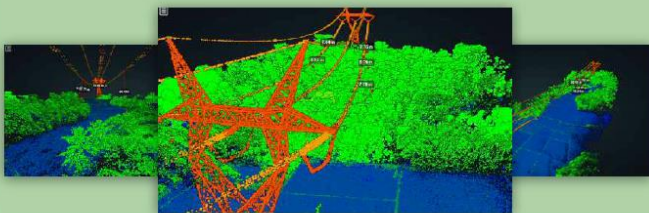
Visual Inspection



Multispectral (Thermal & Corona) Inspection



Vegetation Management Inspection



ROW Inspection



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Modus Operandi - RoW Inspection

Visual RoW Monitoring

- **Functionalities**
 - Provide high resolution video of inspection analysis and findings on the asset Right-of-Way (RoW).
 - Quickly identify obstruction along the transmission line for further close-up inspection and rectification.
- **Capabilities**
 - UAV is equipped with high-resolution RGB camera.
 - Able to cover up to 15 to 20 towers per day per team depending on transmission tower height.
- **Flying procedure (General)**
 - Team of 2 (pilots and co-pilot) is deployed for each mission.
- **Deliverables**
 - Secured-cloud based platform, vertikaliGRID and exportable analysis report.

Quick Reporting

Improve Visualisation
on the Asset

Georeferenced

Improve Efficiency in
Rectification Works



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Modus Operandi - Tower, Span & Interconnections

Close-Up Visual Inspection

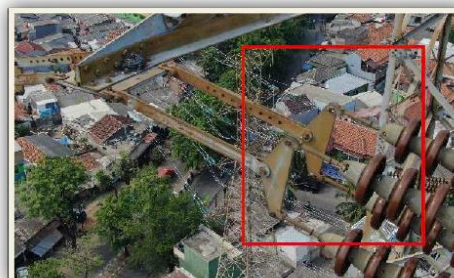
- **Productivity (with multi-rotor)**
 - **Transmission Line:** ~ 10 towers per day per team
- **Capabilities**
 - Multi-rotor equipped with high resolution camera with zooming capabilities.
 - Quickly identify defects along the power line for further rectification.
- **Flying procedure (General)**
 - Team of 2 (pilots and co-pilot / thermographer) is deployed for each mission.
 - UAV height is determined from the resolution requirement.
- **Deliverables**
 - Secured-cloud based platform, vertikaliGRID and exportable analysis report.

Quick Reporting

Improve Visualisation
on the Asset

Geo-referenced

Improve Efficiency in
Rectification Works



Missing arching horn



Broken strand

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Modus Operandi - Tower, Span & Interconnections

Thermal Inspection

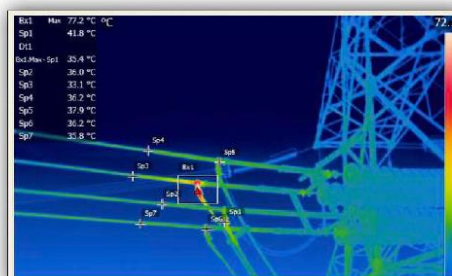
- **Productivity**
 - **Transmission Line:** ~10 towers per day per team
- **Capabilities**
 - Multi-rotor equipped with high resolution thermal camera
 - Quickly identify loose connections, load imbalances, corrosion and other defects causes the temperature to increase and result in possible power outages
- **Flying procedure (General)**
 - Team of 2 (pilots and co-pilot/ thermographer) is deployed for each mission.
 - UAV height is determined from the resolution requirement.
- **Deliverables**
 - Secured-cloud based platform, vertikaliGRID and exportable analysis report.

Quick Identification
& Reporting

Detailed Insight of
Electrical Temperature

Reduce Cost
of Maintenance

Turn Drone Data
to Actionable Data



Hotspot detected at the tension clamp connection bare wire area



Hotspot detected at pin insulator connection

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Modus Operandi - Tower, Span & Interconnections

LiDAR Mapping

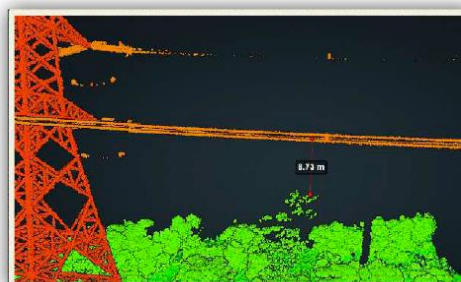
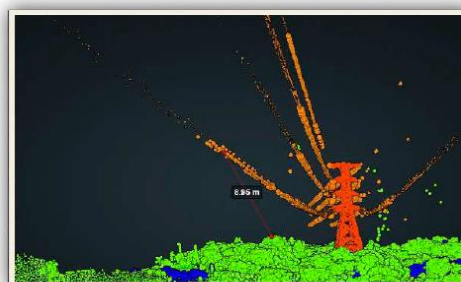
- **Functionalities**
 - ▶ Generate highly density 3D point cloud for advance vegetation analysis.
 - ▶ Accuracy bare earth surface covered under tree canopy.
 - ▶ Identify abnormalities along the transmission line
- **Capabilities**
 - ▶ UAV is equipped with high-performance LiDAR device.
 - ▶ Able to cover up to ~10 towers per day per team depending on transmission tower height
 - ▶ LiDAR data acquisition speed of up to 6,00,000 points/sec & 12,00,000 points/sec in dual return mode.
- **Flying procedure (General)**
 - ▶ Team of 2 (pilots and co-pilot) is deployed for each mission.
- **Deliverables**
 - ▶ Secured-cloud based platform, vertikaliGRID and exportable analysis report.

High Point
Density Accuracy

Improve Visualisation
on the Asset

Measurable Content for
Encroachment Analysis

Data Optimization for
Operational Excellence



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Modus Operandi - Tower, Span & Interconnections

Corona Inspection - Ground Based

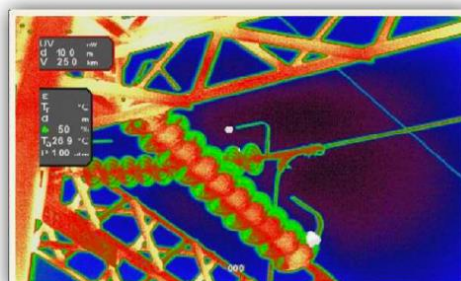
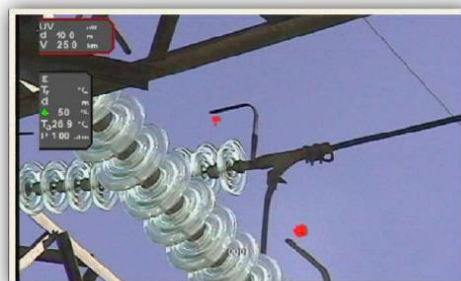
- **Productivity**
 - ▶ Transmission Line: ~10 towers per day
- **Capabilities**
 - ▶ A combination of ground based, hand-held thermal IR, solar blind corona and video camera.
 - ▶ Co-location of electrical discharges and hot spots give the inspector more insight into the cause of a fault.
 - ▶ Observations at a range of ~100 m can be taken.
- **Deliverables**
 - ▶ Secured-cloud based platform, vertikaliGRID and exportable analysis report.

Time & Cost Saving

Detailed Insight of
Asset Health

Predictive Maintenance

Turn Drone Data
to Actionable Data



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AI Defect Identification

List of Sample Defects

Sample Data

VISUAL DEFECTS

1. Broken Insulator
2. Creepers
3. Line Sagging
4. Animal Colonies (Bird nest, Monkey)
5. Clearance Right-of-Way (RoW)
6. Tower Structure
7. Corrosion
8. Missing Components
9. Foreign Object
10. Broken Strand
11. Foundation - slope
12. Isolator Misalignment

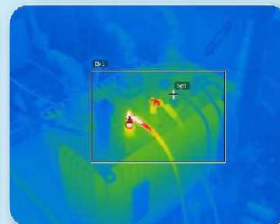
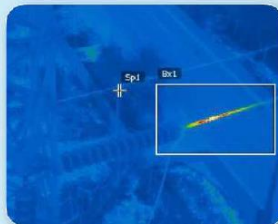
Non-exhaustive list



THERMAL DEFECTS

1. Clamp
2. Cable Jumper
3. Disc Insulator / pin
4. Switch Link
5. Load Break Switch
6. Midspan Joint
7. Cable
8. Shield Wire
9. Earth Wire
10. Lightning Arrestor
11. PG Clamp
12. Arching Horn
13. Termination

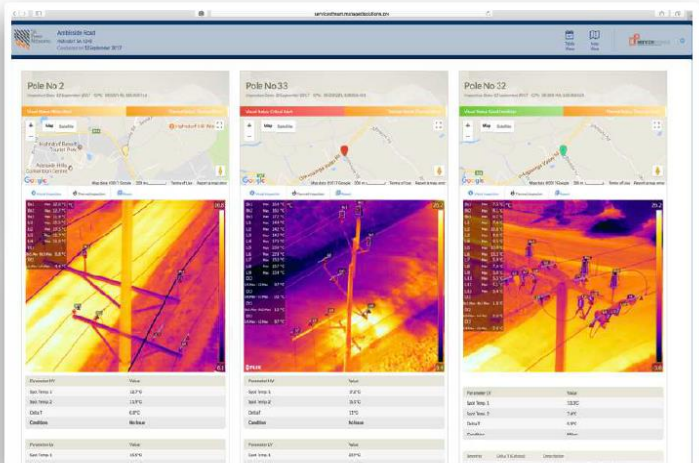
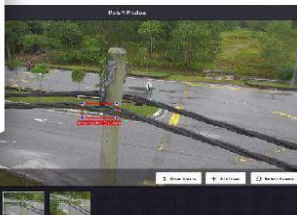
Non-exhaustive list



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AI Solutions for Defect Detection and Thermal Image Analysis

- Aerodyne's AI solutions allows for automatic detections of defects and non-compliances on the electrical units, bringing down the time and cost required to manually detect the defects and minimise the human error during the detections
- Our own in-house thermal imaging solutions allows for the integration of Infrared thermography into the system. Hotspot (which is not visible with naked eyes), shall be detected in early stages, hence reduces the rate of unexpected breakdown or malfunction



Using AI to accelerate manual process from 5 minutes down to 5 secs

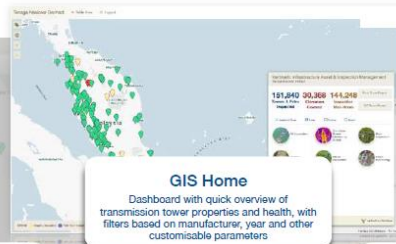
vertikalitiGRID

Cloud-based Data Management Platform



Table View
Quick overview of issues or defect for each tower. Complete with report generation, sortable table, and filtering.

TOWER ID	TOWER NAME	INSPECTION DATE	COORDINATE	AMBIENT TEMPERATURE	WEATHER	STATUS
1001	Double-Circuit Steel Lattice Tower	24/9/2020	101.123456	28 °C	Sunny	Good
1002	Double-Circuit Steel Lattice Tower	24/9/2020	101.123456	28 °C	Sunny	Good
1003	Double-Circuit Steel Lattice Tower	24/9/2020	101.123456	28 °C	Sunny	Good



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Sample Reports



CONDITION BASED MONITORING (CBM)

TOWER NAME	8	TOWER TYPE	Double-Circuit Steel Lattice Tower
INSPECTION DATE	24/9/2020	COORDINATE	
TIME	9:12 AM	AMBIENT TEMPERATURE	28 °C
HUMIDITY	45%	WEATHER	Sunny

VISUAL INSPECTION			
CONDUCTOR	Broken strand	SUPPRESSION CLAMP	Good
INSULATOR	Broken strand	SPACER	Good
ANCHORING HARD	Good	STRUCTURE	Good
CORONA RING	Good		

VISUAL IMAGE



VISUAL ANALYSIS

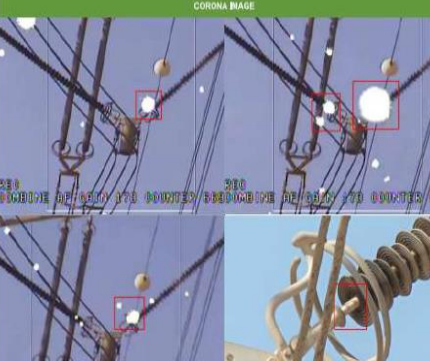
Broken strand problem detected. It might be caused by lightning strike or wear and tear issue.

CONDITION BASED MONITORING (CBM)

TOWER NAME	9	TOWER TYPE	Double-Circuit Steel Lattice Tower
INSPECTION DATE	24/9/2020	COORDINATE	
TIME	9:12 AM	AMBIENT TEMPERATURE	28 °C
HUMIDITY	45%	WEATHER	Sunny

CORONA INSPECTION	
CORONA RING	Corona discharge activity

CORONA IMAGE



CORONA ANALYSIS

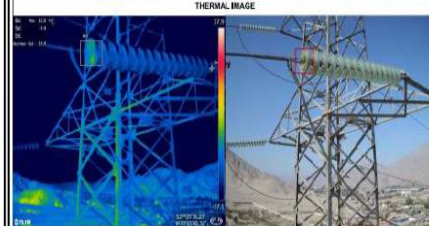
Partial discharge activity detected at polymer insulator near the corona ring.

CONDITION BASED MONITORING (CBM)

TOWER NAME	87	TOWER TYPE	Double-Circuit Steel Lattice Tower
INSPECTION DATE	02/10/20	COORDINATE	
TIME	09:41:00	AMBIENT TEMPERATURE	21 °C
HUMIDITY	24.00%	WEATHER	Sunny

THERMAL INSPECTION			
PHASE	Phase 1	STATUS	Critical
PHASE	Phase 2	FORMULA	$\Delta T = \text{Max Temp} - \text{Min Temp}$
SPOT 1 / BK 1	10	SPOT 2 / BK 2	-0.4
		DELTA T (°C)	19.4

THERMAL IMAGE



THERMAL ANALYSIS

Abnormal hotspot (AT 15.4°C) detected at incoming circuit 1 phase 2. The insulator area discharge activity was clearly visible - will affect efficiency of disc insulator. It might be due to aging or gap between conductor and iron cap. Recommend that an engineering inspection is to be carried out and advise to monitor status of the pin-disc insulator condition promptly. (Phase check disc insulator installation. If necessary replace the disc insulator within safe time given).

3.Scope of Work

This being a Budgetary Proposal, AIV offers entire gambit of its Transmission / GRID solutions. Detailed scope of work based on the method of inspection / survey are as below:

Videography / RGB:

- Georeferenced video file
- Raw data
- Visual Report

Thermal:

- Raw Data
- Thermal Report

LiDAR:

- Raw Point Cloud
- Classified LAS
- Report

Platform:

- Data Hosting
- Visualization
- Analytics
- Asset Insights

4. Commercial

S. No.	Description	UOM	Rate (INR)	Duration for Data Capture (Months)	Teams Deployed (Nos)
FOR RGB ONLY					
1	Mobilization - Demobilization	LS	20,000/-	~ 3	01
2	Conducting RGB Inspection / Survey of the two Transmission lines of 110 KM and 55 KM each	Per Tower	3,500/-		
FOR THERMAL ONLY					
1	Mobilization - Demobilization	LS	20,000/-	~ 3	01
2	Conducting Thermal Inspection / Survey of the two Transmission lines of 110 KM and 55 KM each	Per Tower	3,500/-		
FOR RGB + THERMAL ONLY					
1	Mobilization - Demobilization	LS	20,000/-	~ 5	01
2	Conducting RGB + Thermal Inspection / Survey of the two Transmission lines of 110 KM and 55 KM each	Per Tower	6,200/-		
FOR LiDAR ONLY					
1	Mobilization - Demobilization	LS	20,000/-	~ 1	01
2	Conducting LiDAR Inspection / Survey of the two Transmission lines of 110 KM and 55 KM each	Per KM	6,800/-		
vertikalitiGRID – Platform					
1	Platform Development and Data Hosting for 1 st year	LS	4,00,000/-	< 1	NA

Notes:

- Above Rates are based on the fact that Quantum considered is **165 KM (~495 nos. of Towers)** in total.
- Data Processing would take approx. 15 days from the date of last data capture.
- The above rates are based on standard conditions i.e. clear weather days for flying and plain terrain.
- In case Client wants Portal for Data hosting, rate for the above are duly mentioned. Portal rates include **Platform development and data hosting with three (03) Login IDs for a time period of one (01) Calendar year**. Annual maintenance post 1st year would be at 18% of the quoted rate.

5. Terms & Conditions

- a) Payment Terms: 30% Advance. Rest of the Payment Terms to be discussed and mutually agreed upon.
- b) The rates mentioned above are exclusive of GST and same shall be paid extra at prevailing rates, currently @18%.
- c) Project Schedule & Delivery period as per mutually agreed upon.
- d) Quotation Validity: Above mentioned quotation is valid for 30 days from the date of submission.
- e) Team(s) shall be mobilized within 10 -15 days from the issuance of Work Order and notice for mobilization.
- f) Permits, Permissions, Approvals required for Flying to be provided by Client.
- g) Client coordinator required for handling ROW issues to be provide clear ROW.
- h) Client to provide KML of site.

End of Document

Ref: BIP/2020/JUN/05

Date:04/08/2020

To,

Mr. Vaibhav Sansare

Jaigad Power Transco Ltd.,

1st Floor Jeevan Jyothi Complex,

Off Mumbai-Goa NH-66, Shivaji Nagar,

Chiplun, Maharastra-415605

Sub: Budgetary offer for the scheme of Remote Monitoring of Transmission Towers.

Ref:

1. Discussion held with Mr. Soumen Sekhar Sarangi, Mr. Mihir Kumar Dash on 10-07-2020
2. Demonstration of the product on 10-07-2020 over Microsoft Teams with officers, Vaibhav Sansare, Ankit Saha, Manish Kilekar, Anand Vaidya
3. Receipt of changes required by JPT in the questionnaire by e-mail dated 25-07-2020

Dear Sir,

We M/s BIPROs would like to thank you for the opportunity given and propose a budgetary offer for the scheme of remote monitoring of Transmission towers based on the operational parameters provided by JPT during our discussion and demonstration of the product.

Background

The budgetary offer is based on following outcome as agreed upon by JPT Engineering/O&M team and BIP Technical Team in a meeting held over Microsoft Teams on 10th July, 2020.

1. The Remote Monitoring of Transmission Towers system comprising of a web application integrated and augmented with a Mobile App developed by BIP, called Patrosoft was evaluated for the purpose of JPT.
2. The salient features, dashboard, reports and system navigation, developed, implemented, tested and further improvised by BIP over the last 30 plus months for Powergrid Corporation of India was evaluated to fit well, without any gaps for the purpose of JPT.
3. The Master Data / Configuration required to launch Patrosoft for JPT in line with what is available in digital format with JPT.
4. It was formalised that the data pertaining to Transmission Tower Line, individual Tower Details, Monitoring workforce personnel and their Supervising Authorities, available in SAP can be ported and synchronized with Patrosoft.
5. Over the last 30 months, more than 600 questions / data capture items for Transmission Tower Monitoring, Maintenance and shutdown Repairs are developed by BIP and they vary by Tower Types and other relevant configuration of the individual towers and lines.
6. Above mentioned questions / data capture items were found to be more than sufficient for the purposes of JPT. JPT has already provided their changes and requirement.

7. JPT will have option to select the Tower Types, Tower Phases and LILO configurations those are pertinent to JPT
8. No 3rd party software or 3rd party software license thereof, required for Patrosoft system to function as demonstrated.
9. The software will be installed on your premises.

Budgetary Provisions

1. Further the budgetary offer is customized to meet JPT's long term vision to reduce total cost of ownership (TCO) and to control future (licensing and support) price escalations. Accordingly, an onetime commercial procurement provision is adopted in the offer.
2. The budgetary offer is made economical, reasonable and competitive. In addition, the offer is made more competitive considering two equivalent PSUs namely APTRANSCO and Powergrid Corporation of India. The offer is significantly discounted when the price considered for PGCI accounts for only the Odisha Region, otherwise the total cost incurred by PGCI as a single entity is significantly higher.

Commercials and Notes:

1. Patrosoft Web cum Mobile App, Piloting, Training, Installation on your premises, Production Support for four years (one year free service and 3 years of support) from completion of deployment.: Rs. 10,20,000 /- (for four years) excluding GST.
Break up:
Development & installation - Rs 10,20,000 /-
3 years support - Rs. 5,50,000 /-
2. Any onsite travel request for training or support purposes, JPT will provide accommodation and travel cost on actual
3. Daily cost per BIP technical resource onsite will be Rs. 12,500/- for 8 hours of work.
4. System changes are to be requested as written Change Request (format to be provided). It will be reviewed mutually to understand the scope of change. It will be estimated accordingly for effort required in design, development and testing, which needs to be approved by JPT before change request is developed. The approval will mean the approval for JPT to pay for the estimated effort charges determined transparently.
5. Any additional customization required by JPT will be estimated and charged at Rs. 8000 per day for the development, testing and deployment.

Responsibility of BIP

1. Pilot and Demonstrate the results as designed in Patrosoft
 - a. Collect required master data for a line with all its towers in that line in a prescribed format
 - b. Configure Mobile App for 5 patrolling personnel.
 - c. Consecutive two days onsite Piloting, Review onsite pilot data on Web System and Training about the system functionalities
 - d. Data for pilot must be provided accurately in the prescribed format within 3 days and accordingly the onsite pilot must be completed within 10 working days of receipt of the work order from JPT.
 - e. Encourage JPT to adopt a Train the Trainer model. Such that they can minimize the cost to provision onsite travel, boarding and service time of BIP personnel.

- f. Support the trained JPT IT personnel in loading all line data onto system and configure all users remotely for 3 months
- g. Provision for production support for 4 years from the deployment and configuration of Patrosoft.
- h. Production support will include fixing any system software issues (not functioning as designed, configured, and demonstrated) that are reported by authorized JPT personnel, backed by screen shots and in writing
- i. Provision for any onsite training and support that may be asked for by authorized personnel from JPT. In such cases, JPT will provision for travel, accommodation and daily service fee of the requested BIP resource as per the rates mentioned in budgetary offer below.

Responsibility of JPT

- 1. Cooperate in providing correct and accurate master data and configuration data in formats prescribed by BIP.
- 2. Provision for Piloting and plan for completing them on time as stipulated above
- 3. Provision for BIP resource onsite travel post the first onsite visit for pilot, that needs to end within the first 10 working days of work order from JPT.
- 4. The software will be hosted in the JPT premises. The required configuration of servers for the application is available in annexure – 1.
- 5. JPT will provision the required server and maintain the same.
- 6. Android devices required for using the Patrosoft Mobile application will be provided by JPT.
- 7. BIP will be provided appropriate access to install and maintain (as called for) to the server, which will be documented and in case the access being revoked or altered by JPT, BIP will not be held responsible for support.
- 8. JPT will enable the users with PCs/mobiles/tablets of given specification in Annexure-2.

Sincerely,

Mehar Kumar Dash

Mihir Kumar Dash

Director

Cc to: Director, BIPROS



Annexure – 1

H/W & S/W requirement

In order to implement the s/w we will need two servers. One server will be dedicated to host the web application and the other one will be holding database. The specification of those are given below.

Specification	Application Server	Database Server
OS	windows server 2016/19 with hyper V	windows server 2016/19 with hyper V
RAM	DDR4 32 GB ECC RAM	DDR4 16 GB ECC RAM
Processor	intel Xeon e5 2620 v4 4 core processor, 20 MB SmartCache	intel Xeon e5 2620 v4 4 core processor, 20 MB SmartCache
HDD	256 SSD and 1TB HDD	256 SSD and 1TB HDD
Application	IIS 10	MySQL 5.7.27 64 bit



Annexure – 2

Technical Specification for Mobile device

Desktop/Laptop (specification) for Web application	Mobile Device (specification) for Mobile applicaiton
Make:- Any	Make:- Any
OS: Windows (64 bit)	OS: Android only (Version on or later 9.0)
RAM: 4GB	RAM: 4GB and above
Processor: i3 onwards	Internal storage: 32 GB and above
Had Drive: 500 GB	Network: 4G and above
Internet: Better Bandwidht	Screen Size: As per the user convenience

ANNEXURE – 2

Insurance

Insured Name	JAIGAD POWERTRANSCO LIMITED
Mailing Address	TBA
Risk Location	<p>1. Jaigad- Karad Line:- Start Point Address: Jaigad Address:- 400 Kv JSWEL Switchyard, Village- Nandiwade, Post, Jaigad, Dist, Ratnagiri - 415614, Maharashtra India End Point Address: Karad Address:- 400KV MSETCL Swtichyard, Vijaynagar, Post - Supane, Tal - Karad, Dist - Satara-415114 Maharashtra India</p> <p>2. Jaigad-New Koyna Line:- Start Point Address: Jaigad Address:- 400 Kv JSWEL Switchyard, Village- Nandiwade, Post, Jaigad, Dist, Ratnagiri - 415614, Maharashtra India End Point Address: New Koyna Address:- 400KV MSETCL Swtichyard, A/P- Pimpili (Bk), Tal.- Chiplun, Dist:- Ratnagiri- 415605 Maharashtra India</p>
Policy Period:	12 Months from the inception of the policy
Occupancy	Electric Transmission / Distribution Lines
Policy Type:	SFSP

SFSP Policy			
Description	Sum Insured (Rs.)	Rate	Premium
SI	5,817,900,000		
Total SI	5,817,900,000		
EQ	5,817,900,000		
STFI	5,817,900,000		
Omission to Insure additions, alteration or extensions	290,895,000		
Architects, Surveyors and Consulting Engineers Fees (in excess of 3% claim amount)	5,000,000		
Removal of Debris (in excess of 1% claim amount)	5,000,000		
Damage due to Landslide/Rockslide			
Designation of property clause			
Agreed Bank Clause			
Local/Civil authorities clause			
72 Hours clause covered only for AOG perils			
No other interest			
Net Premium for MD Section		Total	16,930,089

Total of all Policies	
Total Premium	16,930,089
Add: GST (18%)	3,047,416
Total Gross Premium	19,977,505

18%

SFSP Conditions	
Communicable Disease Exclusion Clause attached	
Loss Limit - 50 Cr (AOA and AOY)	
Exclusions -	
Terrorism (as the same will be covered through GIC pool)	
Business Interruption	
Coverage of sub-stations	
Collapse coverage	
Public Liability	
Internal Roads	
Removal of foreign debris	
Deductibles -	
5% of claim amount subject to minimum of INR 20 Lacs for NAT CAT perils	
5% of claim amount subject to minimum of INR 10 Lacs for other perils	

Quote Conditions	
The quote is subject to NIL claims since last 3 years. In case of claims deterioration, the quote needs to be reworked.	
The quote is as per the details/information shared in the RFQ any material change in the information sared in the RFQ will lead to change in the quote.	
The validity of quote is 15 days.	

QUOTESLIP FOR T&D LINES

Insured	JAIGAD POWERTRANSCO LIMITED
Insured's Business	Power Transmission & Distribution lines including substations
Situation/Risk Location	Two Different T&D Lines Start & End point Detail address: 1. Jaigad- Karad Line:- Start Point Address: Jaigad Address:- 400 Kv JSWEL Switchyard, Village- Nandiwade ,Post. Jaigad ,Dist. Ratnagiri - 415614, Maharashtra India End Point Address: Karad Address:- 400KV MSETCL Switchyard, Vijaynagar, Post - Supane, Tal - Karad, Dist - Satara-415114 Maharashtra India 2. Jaigad-New Koyna Line:- Start Point Address: Jaigad Address:- 400 Kv JSWEL Switchyard ,Village- Nandiwade, Post. Jaigad,Dist. Ratnagiri - 415614, Maharashtra India End Point Address: New Koyna Address:- 400KV MSETCL Switchyard, A/P- Pimpili (Bk), Tal.- Chiplun, Dist:- Ratnagiri- 415605 Maharashtra India
Policy Period	12 months
Scope of Cover / Policy Form	SFSP cover
Total Sum Insured	INR 581.79 Crores
Loss Limit	SFSP cover for T&D lines with Loss limit of Rs. 50 Crs. (AOA) & (AOY)
Annual Premium:	Rs. 1,83,03,113 + Rs. 32,94,560 (GST @ 18%) = Rs. 2,15,97,674/-
ADD ON COVERS / Warranties and clauses / Terms & Conditions	
1. Earthquake (Fire and Shock) 2. STFI 3. Designation of property clause 4. Agreed Bank Clause 5. Local/Civil authorities' clause 6. Removal of Debris (In excess of 1% of claim amount) - Up to Rs. 50 lacs 7. 72 Hours clause covered only for AOG perils 8. Omission to Insure: 5% of sum insured excluding Cash, Portable EE, Building and Leasehold improvement 9. Architecture, Surveyors & Consulting Engineers Fees : up to Rs. 50 lacs	
Exclusions: <ul style="list-style-type: none"> Terrorism (as the same will be covered through GIC pool) Business Interruption 	

- Coverage of sub-stations
- Collapse coverage
- Public Liability
- Internal Roads
- Removal of foreign debris

Deductibles:

MD – 5% of claim amount subject to minimum of INR 20 Lacs for NAT CAT perils

MD- 5% of claim amount subject to minimum of INR 10 Lacs for other perils



SURAKSHA AUR BHAROSA DONO

Insured	JAIGAD POWERTRANSCO LIMITED
Insured's Business	Power Transmission & Distribution lines including substations

TERMS:

MD coverage only - Limit of **INR 50 cr** for Total TSI (₹581.79 crores) subject to no other interest.

Other terms and conditions are as below: -

Sum Insured (Rs.)	5,817,900,000
Loss Limit (Rs.)	500,000,000
Premium (Rs.) excluding brokerage & ST	18,678,521

P.S: The above premium is excluding brokerage and ST which please note.

- Deductibles: MD – 5% of claim amount subject to minimum of INR 20 Lacs for NAT CAT perils
– 5% of claim amount subject to minimum of INR 10 Lacs for other perils
- Architecture, Surveyors & Consulting Engineers Fees: up to Rs. 5,000,000/-
- NKORL till inception

Add on coverages as below:

1. Earthquake (Fire and Shock)
2. STFI
3. Damage due to Landslide, Rockslide
4. Designation of property clause
5. Agreed Bank Clause
6. Local/Civil authorities' clause
7. Removal of Debris (In excess of 1% of claim amount) - Up to 50 lac
8. 72 Hours clause covered only for AOG perils
9. Omission to Insure: 5% of sum insured excluding Cash, Portable EE, Building and Leasehold improvement

Exclusions:

- Terrorism (as the same will be covered through GIC pool)
- Business Interruption
- Coverage of sub-stations
- Collapse coverage
- Public Liability
- Internal Roads
- Removal of foreign debris

Validity of quotes till 31st December subject to no change in information provided.

