Technical Specifications for 765 kV D/c Transmission line stringing through Application of Drone, Advanced Tools & Machineries.

1.0 General Intent of Technical specifications:

The application of drones in transmission line construction is an emerging and innovative technology that offers significant value addition in stringing operations. The use of drones enables paying out of platina/pp ropes through advanced rollers/running blocks without manual intervention thereby enhancing safety, efficiency, and productivity. Conductor stringing through advanced tools & machinery.

POWERGRID proposes to undertake the stringing of 765 kV transmission lines using drone assisted technology along with advanced tools and machinery. This approach aims to optimize execution time, reduce manual effort, and improve overall quality and safety in transmission line construction.

The present specification outlines the broad technical and performance parameters for drone-assisted stringing operations with advanced tools and machinery. The focus is on defining the desired performance standards, productivity benchmarks, and requirements for technology demonstration under specified site and operational conditions.

2.0 Scope of Work:

The scope of work shall encompass complete end-to-end conductor stringing activities using drone assisted technology and associated advanced tools & machineries. The scope includes, but not limited to, the Aviation operations through deployment of drones for Prepilot paying out activities involve pulling of platina/pp rope of suitable size and breaking capacity before steel pilot wire paying out , Conductor pulling using controlled Tension Stringing Equipment (TSE), puller machines, Rough sagging and final sagging of conductor , Clipping of conductors, installation of Jumpers, spacers, dampers, and associated hardware, any other allied activities required for complete end to end stringing Conductor, OPGW & Earthwire . Advance tools and machinery include but not limited to Drones, Rollers/running blocks capable (without manual intervention) for platina/pp rope passing by Unmanned Aircraft System/Drone, tools and system for paying out of Platina/PP rope , Pilot steel wire and Conductor through multiple continuous sections comprising both manual and TSE sections in a single stretch/operation , Controlled tensioner & puller machines ,advance lifting arrangements to keep conductor clear of ground to avoid damage to the crops, interference free communication devices etc.

The scope shall be inclusive of all resources and activities necessary to complete the conductor, OPGW & Earth wire stringing work in all respects as specified in detailed technical specifications under section 3.0, in accordance with specified performance, safety, and quality requirements.

3.0 Detailed Technical Specifications:

i) Name of the Transmission line proposed: 765 kV Mandsaur Indore Double Circuit line.

ii) Stringing length: 21.16 KM.

iii) Conductor details – Hexa Zebra, Material - AL59

iv) Stringing Section offered: AP41- AP50A

v) Detailed technical inputs such as visual charts, tower schedule, section details, profiles, and sag & tension data shall be provided by POWERGRID to facilitate planning and execution of the work.

vi) The deployment of manpower, materials, and machinery shall be planned for simultaneous/multiple stretches, as directed by the POWERGRID Engineer-in-Charge. Project Incharge of 765 kV Mandsaur Indore Double Circuit line will be the Engineer-in-Charge from POWERGRID.

vii) Although the identified stretch is from AP41 to AP50A of proposed 765 kV Mandsaur Indore D/c line for 21.16 km, in case the section is not available due to unforeseen constraints or RoW issues alternate equivalent stretches shall be offered. The contractor shall mobilize resources in consultation with the POWERGRID Engineer-in-Charge, accordingly.

viii) Site access shall be facilitated by the POWERGRID Engineer-in-Charge.

ix) All drones deployed shall be type-certified/registered as per DGCA (Directorate General of Civil Aviation) norms or equivalent statutory guidelines. The drone system shall be equipped with required sensors and safety features compliant with regulatory requirements.

x) The contractor shall provide all necessary certifications, approvals, and documentation required under prevailing drone regulations, including UAV registration, Remote Pilot Licenses, Flight permissions, etc.

The contractor shall be responsible for coordination and processing of Remote Pilot Licenses. Required documents from POWERGRID shall be provided. However, documentation related to drones, sensors, payload, etc., shall be arranged by the contractor.

xi) **Vegetation Clearing, Access & Temporary works**.

a) Clearing of vegetation along access tracks and tower locations.

b) Tree cutting is strictly limited to requirements for stringing work.
c) Construction/repair of temporary access roads/tracks.
d) Site preparation including clearing and leveling.
e) Excavation in soil/rock as required.
f) Installation and dismantling of Deadman anchors.
g) Trenching, anchor installation, guy wire placement, backfilling, and compaction.
h) Compliance with all project specifications and requirements.

xii) **Overhead Stringing works:**

a) Provision of plant, machinery, manpower, consumables, temporary works, site establishment and required facilities to complete the Work.
b) Contractor shall submit detailed stringing program to POWERGRID Engineer In-charge encompassing planned works for stringing of conductor, OPGW and earthwire.
c) The preparation of stringing plan ensure consideration of all parameters viz Electrical clearances (Conductor, OPGW, Earthwire), tower configurations, Drum lengths, Terrain and accessibility deviations, Elevation difference, Line-of-sight requirements for drone operations, Crossing locations (roads, lines, etc.), Hazard identification, OPGW joint box locations etc.
d) Installation of temporary anchors and stays.
e) Contractor shall be responsible for transportation of materials from POWERGRID store to site yard**,** proper storage, safe custody, and loss of damage of all Employer's supplied items for incorporation in the line stringing work and shall maintain and render proper account of all such materials at all times.
f) Temporary barricading, signage, and safety arrangements.
g) Earthing of all stringing equipment.
h) Installation of safety measures for crossings.
i) Hoisting of Insulators.
j) Prepilot work involve paying out of Platina/ PP rope having suitable size and breaking capacity pulling by aviation operations through deployment of Drone. The Rollers/running blocks shall be advanced type so that no manual intervention involved for passing of Platina/ PP rope through it.

k) The paying-out of the Platina/PP rope , Pilot Steel wire and conductor shall be carried out through multiple continuous sections comprising both manual and TSE sections in one stretch / operation. The cumulative line deviation angle across all such sections shall be maintained during paying out within the permissible limits of the tower design, hardware ratings, and stringing methodology to ensure safe and reliable execution of stringing work.

l) Conductor pulling using controlled tension stringing equipment (TSE), puller machines and advance lifting arrangements in place of conventional methods to keep conductor clear of ground to avoid damage to the crops.

m) All dead-end fitting, make-up, final sagging, clipping-in shall be performed aloft at cross arm level. Sagging, cutting and termination shall be performed aloft to keep conductor clear of ground. The required tools & safety arrangements suitably arranged by contractor.

n) Use of Tractor shall not be permitted.

o) Installation of Jumpers , Spacers, dampers, Bird guard and accessories.

p) Use of interference free communication devices if applicable.

q) For crossing of 33kV/11kV/LT lines during stringing, shut down (if required) shall be obtained by the contractor. Suitable support, documents, etc. for obtaining shutdown shall be provided by the employer. However, contractor shall be required to arrange bypass arrangement for such lines with suitable LT/HT power cables whenever shutdown cannot be arranged during stringing.

The bypassing work shall be executed with suitable 33kV/11kV/LT cables, following all electrical guidelines and proper safety measures in co-ordination with concern DISCOM/agency/authority. However, the healthiness of cables shall be ensured by the contractor before installation at each crossing. The 33kV/11kV/LT line shall be restored after the completion of stringing work, with confirmation from Employer. The work shall be carried out as per the direction of the Engineer-in-Charge

The bypassing work inclusive of suitable cables and all necessary items/arrangements/works required for successful bypassing of existing 33kV/11kV/LT lines that includes de-stringing of existing 33kV/11kV/LT conductors and their restoration after completion of stringing.

r) Crossing works viz EHV lines, Railway, National/State Highway , Expressway, River, canals etc. shall be in the scope of contractor. Shut down (if required) shall be obtained by

the contractor. Suitable support, documents, etc. for obtaining shutdown shall be provided by the employer.

s) Forest works required clearances shall be arranged by POWERGRID if any. Necessary compliances as per forest norms shall be in the scope of contractor.

t) Necessary arrangement required for stringing over specific crops identified by statutory bodies shall be in the scope of contractor.

u) The contractor shall be entirely responsible for any damage to the towers during stringing.

v) The contractor shall take adequate safety precautions and fully responsible to protect personnels during stringing work.

w) Other items not specifically mentioned in this Specification but are required for the successful completion of scope of work and commissioning of transmission line shall be in the scope of contractor.

x) The Contractor shall additionally comply with the requirements stipulated in Section-IV C (Volume-II), Rev. 7 (December 2023) of the Standard Specifications for Transmission Lines, particularly pertaining to stringing works, in the respective existing awarded package for completion of the balance scope of work.

xiii) **OPGW / Earthwire Installation:**

a) Installation of temporary earthing arrangements.

b) Transportation of OPGW/Earthwire drums from PG store to site yard.

c) Drum inspection and pre-installation testing.

d) Platina/PP rope /pilot wire passing by unmanned aircraft system/Drone etc.

e) Stringing, final sagging of OPGW/Earthwire shall be performed aloft to keep conductor clear of ground.

f) Clipping and termination.

g) Installation of down leads and joint boxes.

h) Installation of Jumpers , dampers, Bird guard and accessories.

i) Splicing, termination, testing, demonstration for acceptance & commissioning as well as documentation.

j) Other items not specifically mentioned in this Specification but are required for the successful completion of scope of work and commissioning of transmission line shall be in the scope of contractor

k) The Contractor shall additionally comply with the requirements stipulated in Section-IV C (Volume-II), Rev. 7 (December 2023) of the Standard Specifications for Transmission Lines, particularly pertaining to stringing works, in the respective existing awarded package for completion of the balance scope of work.

4.0 Regulatory compliance:

All drones deployed alongwith sensors, cameras, and analytics software shall comply with DGCA or other government agencies applicable regulatory requirements, including Type certification, Geo-fencing capability, Flight permissions, All costs related to UAV registration, Pilot licensing, Regulatory approvals shall be borne by the contractor. Necessary documentation from POWERGRID will be provided as required.

5.0 Safety Requirements:

a) All activities shall be carried out with highest priority to safety, health, and environmental protection.
b) The contractor shall maintain detailed records of Safety procedures, Construction activities, Quality assurance.
c) Implementation of Safe Work Method Statements (SWMS), Standard operating procedures, Regulatory safety compliance.
d) Deployment of qualified personnel including: Safety Officers, Execution Engineers, Planning Engineers.
e) Contractor will be responsible and shall comply all statutory requirements towards workmen compensation policy , loss of items, damage , insurance and others if any.