

华电（印尼）玻雅

2×660MW 坑口电站工程项目

#1 炉吸收塔净烟道防腐询比文件

Dokumen Permintaan Penawaran (RFQ) Pekerjaan Pelapisan Antikorosi

Saluran Gas Buang Bersih Menara Absorber Boiler Unit #1

**Proyek Pembangunan PLTU Mulut Tambang 2×660MW Huadian (Indonesia)
Boya**

一、采购单位：印尼华瑞电力有限公司

Pihak Pengadaan: PT Pembangkitan Listrik Pintar Energi

二、资格条件 Persyaratan Kualifikasi

1. 报价方是印度尼西亚注册公司，具有独立的法人资格，持有有效营业执照，能够独立承担民事责任，具有独立订立合同的权利。

1. Penyedia jasa merupakan perusahaan yang terdaftar di Indonesia, memiliki status badan hukum yang berdiri sendiri, memegang izin usaha yang sah dan masih berlaku, serta mampu secara mandiri menanggung tanggung jawab perdata, memiliki kewenangan independen untuk mengadakan dan menandatangani perjanjian/kontrak.

2. 报价方自 2021 年 1 月 1 日起至投标截止日至少有 1 项 150MW 及以上机组烟道防腐作业业绩，并提供烟道防腐作业业绩的合同原件扫描件（每个原件扫描件均应包括合同封面、采购范围、签字盖章页等主要内容）。

2. Sejak tanggal 1 Januari 2021 hingga batas akhir pemasukan penawaran, peserta penawaran harus memiliki sedikitnya 1 (satu) pengalaman pelaksanaan pekerjaan antikorosi saluran gas buang (flue duct) pada unit pembangkit berkapasitas 150 MW atau lebih. Peserta wajib melampirkan salinan hasil pemindaian (scan) kontrak asli sebagai bukti pengalaman pekerjaan antikorosi saluran gas buang tersebut. Setiap salinan hasil pemindaian kontrak asli harus memuat isi utama kontrak, termasuk halaman sampul kontrak, ruang lingkup pengadaan/pekerjaan, serta halaman tanda tangan dan cap/stempel para pihak.

三、报价截止时间：2026 年 8 月 11 日雅加达时间 17:00 前。

Batas waktu penyampaian penawaran: Sebelum tanggal 11 Agustus 2026 pukul 17.00

WIB.

四、工作地点 Lokasi Layanan: PLTU SUMSEL 8 Desa Tanjung Lalang, Tanjung Agung, Kabupaten Muara Enim, Sumatera Selatan。

五、工作期限: 计划自 2026 年 11 月 1 日起至 2026 年 11 月 30 日止，计划工期 30 天。具体起始时间以采购方通知为准。

Jangka Waktu Layanan Pekerjaan: Rencana pelaksanaan pekerjaan dimulai 1 November 2026 sampai dengan 30 November 2026, dengan durasi pelaksanaan selama 30 (tiga puluh) hari. Waktu mulai pelaksanaan yang sebenarnya akan ditetapkan berdasarkan pemberitahuan resmi dari Pengguna Jasa.

六、工作内容及工作要求: 详见技术规范书。

Ruang Lingkup Pekerjaan dan Persyaratan Pelaksanaan Pekerjaan: Sebagaimana diatur secara rinci dalam Spesifikasi Teknis.

七、其他要求 Persyaratan Lainnya

1. 报价要求 Persyaratan Penawaran

(1) 本次报价为固定总价。总价包含但不限于与执行本合同有关的所有费用，如材料费、人工费、税费、利润、保险等费用。代扣代缴税由采购方代为缴纳。所有税率按适用税率执行，如遇国家税率调整，不含税价保持不变，税率、税费按新的规定执行。

(1) Penawaran dalam pengadaan ini menggunakan harga tetap (fixed lump sum). Nilai total penawaran mencakup, namun tidak terbatas pada, seluruh biaya yang timbul sehubungan dengan pelaksanaan kontrak ini, seperti biaya material, biaya tenaga kerja, pajak, keuntungan, asuransi, dan biaya-biaya lainnya. Pajak yang wajib dipotong dan dipungut akan dibayarkan oleh Pengguna Jasa sesuai ketentuan yang berlaku. Seluruh tarif pajak mengacu pada tarif yang berlaku. Apabila terjadi penyesuaian tarif pajak oleh pemerintah, maka nilai kontrak sebelum pajak (harga tidak termasuk pajak) tetap tidak berubah, sedangkan tarif dan jumlah pajak akan disesuaikan sesuai dengan ketentuan terbaru yang berlaku.

(2) 报价人递交的报价响应文件需要签字盖章，请勿重复发送，采购方只认可最后一次报价，且邮件标题名称必须为“玻雅项目 XXX 采购标段报价文件 (**公司) ”。

Dokumen tanggapan penawaran yang disampaikan oleh peserta penawaran wajib

ditandatangani dan dibubuhi cap perusahaan. Dokumen penawaran agar tidak dikirimkan berulang kali. Pihak pengadaan hanya mengakui penawaran terakhir yang diterima. Judul/subjek email wajib dicantumkan sebagai:

“Dokumen Penawaran Paket Pengadaan XXX Proyek Boya (Nama Perusahaan)”.

(3) 报价表如下:

Daftar Penawaran adalah sebagai berikut:

报价表				
Daftar Penawaran Harga				
名称 Nama Barang	面积 m ²	单价 (Rp) harga satuan	总价 (Rp) Harga total	备注 Keterangan
#1 炉吸收塔净烟道防腐 Pekerjaan Pelapisan Antikorosi Saluran Gas Buang Bersih Menara Absorber Boiler Unit #1	105			报价包含 560kg 防磨剂、人工费用等完成工作所需的一切费用(需提供防腐耐磨材料原厂出厂证明, 具体要求详见技术规范书) Harga penawaran mencakup 560 kg bahan antiaus, biaya tenaga kerja, serta seluruh biaya lain yang diperlukan untuk menyelesaikan pekerjaan. Peserta wajib melampirkan sertifikat asli pabrik (factory certificate) untuk material antikorosi dan antiaus yang digunakan. Persyaratan teknis secara rinci mengacu pada Spesifikasi Teknis.
小计 Subtotal				
增值税 11% (PPN11%)				
合计 Total				

2. 结算付款方式 Cara Pembayaran dan Penyelesaian (Penagihan)

(1) 整体竣工验收合格并完成资料交付后, 甲方在收到双方认可后的正确、合法合规发票等资料在 30 天内进行支付。

乙方在合同签订后 30 天内向甲方提交合同额的 3%作为履约保证金, 履约保证担保的形式可以为银行保函、保险保函或电汇现金。整体竣工验收合格后若乙方采取银行保函或保险保函的形式需将履约保函更换为质保保函, 保函有效期需覆盖质保期;若为电汇现金形式则履约保证金自动转为质量保证金, 质保期自验收合格之日起两年。质保期满无遗留质量问题、无未整改事项的, 若为银行保函或保险保函的甲方可配合乙方办理退保手续(如有需要), 若质量保证金为电汇现金的乙方可向甲方提出申请退还质量保证金, 甲方确认无误后应在 14 天内无息返还。

(1) Setelah pekerjaan secara keseluruhan selesai, dinyatakan lulus pemeriksaan dan serah terima (Final Acceptance), serta seluruh dokumen telah diserahkan, Pengguna Jasa akan melakukan pembayaran dalam waktu 30 (tiga puluh) hari kalender sejak menerima faktur yang benar, sah, sesuai ketentuan peraturan perundang-undangan, beserta dokumen pendukung lainnya yang telah disetujui oleh kedua belah pihak.

Dalam waktu 30 (tiga puluh) hari setelah penandatanganan kontrak, Pihak B wajib menyerahkan Jaminan Pelaksanaan kepada Pihak A sebesar 3% (tiga persen) dari nilai kontrak. Jaminan Pelaksanaan dapat diberikan dalam bentuk garansi bank, surety bond/asuransi penjaminan, atau setoran tunai melalui transfer bank. Setelah pekerjaan secara keseluruhan dinyatakan lulus pemeriksaan dan serah terima, apabila Jaminan Pelaksanaan diberikan dalam bentuk garansi bank atau surety bond/asuransi penjaminan, maka jaminan tersebut wajib diganti menjadi Jaminan Pemeliharaan dengan masa berlaku yang mencakup seluruh masa garansi. Apabila Jaminan Pelaksanaan diberikan dalam bentuk setoran tunai melalui transfer bank, maka dana tersebut secara otomatis menjadi Jaminan Pemeliharaan. Masa garansi mutu berlaku selama 2 (dua) tahun sejak tanggal pekerjaan dinyatakan lulus pemeriksaan dan serah terima. Setelah masa garansi berakhir, apabila tidak terdapat permasalahan mutu yang masih tersisa maupun pekerjaan perbaikan yang belum diselesaikan, maka untuk Jaminan Pemeliharaan dalam bentuk garansi bank atau surety bond/asuransi penjaminan, Pihak A akan membantu Pihak B dalam proses pelepasan atau

pengembalian jaminan (apabila diperlukan), sedangkan untuk Jaminan Pemeliharaan dalam bentuk setoran tunai melalui transfer bank, Pihak B dapat mengajukan permohonan pengembalian Jaminan Pemeliharaan kepada Pihak A, dan setelah dipastikan tidak terdapat permasalahan, Pihak A wajib mengembalikan dana tersebut tanpa bunga dalam waktu 14 (empat belas) hari.

(2) 通过银行转账付款，报价人应具有银行对公账户。

(2) Pembayaran dilakukan melalui transfer bank. Peserta penawaran wajib memiliki rekening bank atas nama perusahaan (rekening korporasi).

3. 评审方式：经评审的最低价法，按照满足采购需求且报价最低原则按顺序推荐候选成交供应商。对不符合资格条件的报价人不予评审。

(3) Metode evaluasi: metode harga terendah setelah evaluasi. Evaluasi dilakukan berdasarkan prinsip pemenuhan seluruh persyaratan pengadaan dengan penawaran harga terendah, dan selanjutnya direkomendasikan secara berurutan sebagai calon penyedia yang ditetapkan. Peserta penawaran yang tidak memenuhi persyaratan kualifikasi tidak akan dilakukan evaluasi.

八、报价响应文件递交方式：纸版密封文件交至玻雅（印尼）发电公司行政办公楼二楼物资部或电子报价发送到指定邮箱 731465071@qq.com。

Metode penyampaian dokumen penawaran: dokumen cetak yang disegel disampaikan ke Departemen Material di lantai 2 Gedung Administrasi PT Huadian Bukit Asam Power, atau penawaran elektronik dikirim ke alamat email yang ditentukan: 731465071@qq.com.

九、联系人及联系电话 **Narahubung dan Nomor Kontak**

商务部分 Bagian Komersial: 张郡书 Zhang Junshu 085373257862

技术部分 Bagian Teknis: 胡立刚 Hu Ligang 082186588476

十、异议提出渠道和方式：澄清专用邮箱：731465071@qq.com。采购过程中若有疑问可发送至该邮箱，否则不予回复，且邮件标题名称必须为“玻雅项目 XXX 采购标段投标疑问（**公司）”。

Saluran dan tata cara penyampaian keberatan/pertanyaan: klarifikasi hanya dapat disampaikan melalui alamat email khusus klarifikasi, yaitu 731465071@qq.com. Apabila dalam proses pengadaan terdapat pertanyaan, peserta dapat mengirimkan ke alamat email tersebut; pertanyaan yang disampaikan melalui saluran lain tidak akan

ditanggapi. Judul/subjek email wajib dicantumkan sebagai:

“Pertanyaan Tender Paket Pengadaan XXX Proyek PLTU Sumsel-8 (**Nama Perusahaan**)”.

十一、采购监督投诉受理邮箱 Alamat Email Penerimaan Pengaduan Pengadaan:chdptlpe@gmail.com。

印尼华瑞电力有限公司

PT PEMBANGKITAN LISTRIK PINTAR ENERGI

#1 炉吸收塔净烟道防腐

#1 Boiler Corrosion Protection of Clean Smoke Ducts

技术规范书

Technical Specification

批准

Approved by:

审核

Reviewed by:

编写

Prepared by:

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1.总则 General provision

1.1.本技术规范书适用于印尼华瑞电力有限公司 2×660MW 燃煤机组#1 炉净烟道防腐材料供货及施工，对脱硫管道防腐具体工作要求，供货进度、施工进度、防腐工期、验收标准等方面技术要求。

This technical specification applies to the supply and construction of anti-corrosion materials for the #1 flue gas duct of Huadian Bukit Asam Power 2×660MW coal-fired power unit. It specifies the technical requirements for anti-corrosion work of desulfurization pipelines, including supply schedule, construction schedule, anti-corrosion period, and acceptance standards.

1.2 本技术规范书所提及的要求都是最低限度的要求，并未对一切技术细节作出规定，未充分详述有关标准和规范的条文，服务方应保证提供符合本技术规范书文件和工业标准的性能齐全的优质产品及其相应服务。

The requirements stated in this technical specification are the minimum requirements and do not cover all technical details, nor do they fully elaborate on the relevant standards and codes. The service provider shall ensure the provision of fully functional, high-quality products and corresponding services that comply with this technical specification and applicable industrial standards.

1.3 从签订合同之后至服务方开始工作之日期间，采购方有权提出因规程、规范和标准发生变化而产生的一些补充修改要求，服务方应遵守这些要求。

From the date of contract signing until the commencement of work by the service provider, the purchaser reserves the right to propose additional modifications due to changes in procedures, codes, or standards, and the service provider shall comply with these requirements.

1.4 服务方须执行本规范所列标准。有矛盾时，按较高标准执行。本技术规范书中未提及的内容均应满足或优于本规范所列的国家标准、电力行业标准和有关国际标准。

The service provider must comply with the standards listed in this specification. In the event of any discrepancies, the higher standard shall prevail. Any content not specified in this technical specification shall meet or exceed the relevant national standards, electric power industry standards, and applicable international standards.

服务方对华电（印尼）玻雅 2×660MW 燃煤机组#1 脱硫吸净烟道防腐材料供货及施工，对供货及施工具体工作要求，施工进度、施工工期、验收标准、调试配合工作质量负有全责。

The service provider is fully responsible for the supply and construction of anti-corrosion materials for the #1 desulfurization and flue gas duct of Huadian Bukit Asam Power 2×660MW coal-fired power unit, as well as the specific requirements for supply and construction, construction progress, construction period, acceptance standards, and the quality of commissioning coordination.

1.6 在签订合同之后，服务方因规范标准和规程发生变化而产生的一些补充要求，具体项目由甲乙双方共同商定。但合同价格不会因这些补充要求而有任何增加。

After the contract is signed, any additional requirements arising from changes in specifications, standards, or procedures shall be agreed upon by both parties. However, the contract price shall not be increased due to these additional requirements.

1.7 华电（印尼）玻雅发电公司 2×660MW 燃煤机组于 2023 年 10 月 7 日双机投入商业运行，服务方在现场执行防腐修补工作时，充分考虑现场情况，并做好成品保护措施。

The Huadian Bukit Asam Power 2×660MW coal-fired units commenced commercial operation with both units on October 7, 2023. The service provider shall fully consider the site conditions when performing anti-corrosion repair work on-site and take appropriate measures to protect the finished products.

1.8 采购方不组织现场踏勘，需要现场踏勘服务方自行负责。

The purchaser will not organize site inspections. If a site inspection is required, it shall be the service provider's responsibility to arrange and conduct it.

1.9 本技术规范为合同的附件，与合同正文具有同等效力。

This technical specification is an annex to the contract and holds the same legal effect as the main contract.

2. 电厂概况 Power Plant Overview

2.1 厂址 Plant site

厂址位于印度尼西亚苏门答腊岛 MUARA ENIM 县以南 Darmo 镇东南约 3.5km 处。

The plant is located approximately 3.5 km southeast of Darmo Town, south of Muara Enim County, on Sumatra Island, Indonesia.

2.2 设备概况 Equipment Overview

华电（印尼）玻雅发电公司 2×660MW 燃煤超临界机组脱硫系统为一炉一塔，设旁路烟道、原烟道、净烟道。

The desulfurization system for Huadian Bukit Asam Power's 2 × 660 MW coal-fired supercritical units employs a "one furnace, one tower" configuration, featuring a bypass flue, an original flue, and a clean flue.

3. 防腐范围、采购数量、防腐施工技术规范

3. Anti-corrosion scope, procurement quantity, anti-corrosion construction technical specifications.

3.1 采购项目 Procurement projects:

3.1.1 防腐耐磨材料供货数量 Quantity of anti-corrosion and wear-resistant materials supplied

备件名称 Name of spare parts	型号 model number	单位 Unit	数量 Quantity	备注 Remark
碳化硅防磨剂 Silicon carbide anti-friction agent	速康固 RTNM-202	公斤/kg	560	提供防腐耐磨材料原厂出厂证明，派遣满足施工要求人员到现场

备件名称 Name of spare parts	型号 model number	单位 Unit	数量 Quantity	备注 Remark
				施工 Provide the original factory certificate of anti-corrosion and wear-resistant materials. Dispatch personnel to the site to meet the construction requirements

3.1.2 碳化硅防磨剂材料性能要求 Silicon carbide anti-friction material performance requirements

序号 Number	项目 Project	单位 Unit	数据/要求/备注 Data/requirements/remarks
1	涂层类型 Coating type		高分子复合碳化硅 Polymer Composite Silicon Carbide
2	防腐涂层性能指标 Performance index of anti-corrosion coating:		
2.1	耐冲击强度 impact strength	J/c m ²	≥0.80
2.2	拉伸强度 tensile strength	MPa	≥24.5
2.3	弯曲强度 bending strength	MPa	≥55
2.4	硬度 hardness BARCOI	HBa	>60 (GB/T 3854-2005)
2.5	附着力 (拉伸剪切) Adhesion (tensile-shear test)	Mpa	10
2.6	耐酸性 (25%硫酸溶液, 23℃浸泡 168h) Acid resistance (25% sulfuric acid solution, 23 °C immersion) (168h immersion)	/	无裂纹、起皮、分层、气泡等现象 No cracking, peeling, delamination, bubbles, etc.
2.7	耐碱性 (25%氢氧化钠溶液, 23℃浸泡 168h) Alkali resistance (25% sodium hydroxide solution, 23°C) (immersion 168h)	/	无裂纹、起皮、分层、气泡等现象 No cracking, peeling, delamination, bubbles, etc.
2.8	耐磨性 (GB/T1768-2006) Abrasion resistance (GB/T1768-2006)	mg	≤100mg
2.9	耐候性 weathering resistance/		耐候性好, 使用温度至少满足: -20℃~180℃能安全可靠运行。Good weather resistance, the use of temperature to meet at least: -20 °C ~ 180 °C can be safe and reliable operation. 180°C can operate safely and reliably.

序号 Number	项目 Project	单位 Unit	数据/要求/备注 Data/requirements/remarks
2.10	设计寿命 Design life	年	5
2.11	涂层外观 Coating Appearance	/	平整 Smooth
2.12	电火花测试 Electrical Spark Test	/	无漏点 no leakage (3000V)
2.13	粘接剂主料 (环氧树脂) Bonding agent main material (epoxy resin)	%	>60%
2.14	含固量 solid content	/	≥80%
2.15	颗粒成分 Particle Composition	/	碳化硅含量≥70% Silicon carbide content ≥70%

3.2 脱硫净烟道底部面积(含立面一侧高 0.5 米，一侧高 1 米)。3.2The bottom area of the desulfurization flue duct (including a vertical section with one side 0.5 meters high and the other side 1 meter high).

The bottom area of the desulfurization flue (including the height of 1 meter on both sides). 序号 Number	部位 Unit	数量 Quantity	面积 Size (m ²)	备注 Remark
1	面积长 14 米宽 *7.5 米 Area: 14 meters long x 7.5 meters wide	560	105	
施工面积约 Construction area approx.			105	

3.3 脱硫净烟道防腐施工技术规范

Technical Specifications for Corrosion Protection Construction of Desulfurization Flue

现场施工简易流程： 施工前准备→设备检查→基体处理、喷砂或者打磨→底涂和耐磨层施工、找补→检查验收（电火花检测 1500V/mm 全覆盖）→检查验收（ 表观目测）→防腐区域清理。

Simple On-site Construction Procedure: Preparation before construction → Equipment inspection → Substrate treatment, sandblasting or grinding → Primer and wear-resistant layer application, touch-up → Inspection and acceptance (1500V/mm full-coverage holiday test) → Inspection and acceptance (visual inspection) → Cleaning of anti-corrosion area.

3.3.1 为保证修复质量和使用寿命，防磨涂层要求采用复合碳化硅材料进行修复，碳化硅材料必须选用速康固品牌，需在投标时提供厂家授权及联系方式。

To ensure the quality and service life of the repair, the anti-wear coating shall be repaired using composite silicon carbide materials. The silicon carbide material must be of the Sukanggu brand. Manufacturer authorization and contact information must be provided at the time of bidding.

3.3.2 供货方负责对脱硫净烟道进行防腐施工，要求如下：

The supplier is responsible for the anti-corrosion construction of the desulfurization flue gas duct, with the following requirements:

3.3.2.1. 底涂施工：底涂施工前，将烟道底部氟塑料剥开，对烟道底部进行打磨，预埋螺丝钉（不锈钢 C276 M10*30）根部用角磨机打磨，漏出金属表面。打磨烟道金属表面粗糙度达到 50-80 μ m，目的是清洁、增强表面粗糙度，增加粘结力。Primer Application: Before primer application, peel off the fluoroplastic lining at the bottom of the flue and grind the flue bottom. Grind the roots of pre-embedded screws (C276 stainless steel M10*30) with an angle grinder to expose the metal surface. The roughness of the ground metal surface of the flue shall reach 50-80 μ m to clean the surface, raise surface roughness and improve adhesion. For worn parts of the flue, the Purchaser shall carry out repair welding or cut-out patching. Welds shall be uniform and smooth without welding defects such as slag inclusions and blowholes.

3.3.2.1.1 根据环境条件，确定固化体系加入量，以适合施工环境要求；

Determine the amount of curing system added according to the environmental conditions to suit the construction environmental requirements;

3.3.2.1.2 取规定量底涂料液，加入现场确定量的固化剂量，充分搅拌均匀。

Take the specified amount of primer liquid, add the amount of curing agent determined on site and mix well.

3.3.2.1.3 将配制好的底层胶液，均匀的喷涂在待衬施工面上，一次施工厚度不宜超过 0.5mm。不得有流淌、气泡等，在混合料及涂敷过程中，施工面始终保持清洁无尘、无溶

剂、无水污染。

The prepared base adhesive solution should be evenly sprayed onto the surface to be lined. The thickness of a single application should not exceed 0.5mm. There should be no dripping or bubbles. During the mixing and application process, the construction surface must always be kept clean, free of dust, solvents, and water contamination.

3.3.2.1.4 一次配制底涂料使用时间为 30~40min。混料时，应设专人掌握配料量。

The usage time for a single batch of base coating is 30–40 minutes. During mixing, a designated personnel should strictly control the dosage of each ingredient.

3.3.2.2. 陶瓷耐磨层施工：材料施工可通过用刮板或抹灰刀来完成。一次施工厚度约为 1 mm，未凝胶前粘贴网格布，要求平整。接着再次施工，施工厚度约为 1mm，总厚度 ≥ 2 mm。若现场操作温度低于零上 10 摄氏度或者高于零上 40 摄氏度，或湿度大于 80%，应根据现场条件进行调整，保证施工工艺质量。施工时具体应按下列规定进行：

Construction of the ceramic wear-resistant layer: The material can be applied using a scraper or a plaster knife. The thickness of one application is approximately 1 mm. Grid mesh should be applied before the material sets, and it must be smooth. Subsequent applications follow, with a thickness of approximately 1 mm. The total thickness should be ≥ 2 mm. If the operating temperature on-site is below 10°C above freezing or above 40°C above freezing, or if the humidity is greater than 80%, adjustments should be made according to the site conditions to ensure the quality of the construction process. Specific procedures for construction should be followed as follows:

3.3.2.2.1 按比例 3:1 称取耐磨层料，经飞机钻或搅拌机充分搅拌均匀，均匀的标志为混合料颜色均匀一致。每次混料量根据施工面积及人员定，避免浪费；

Weigh out the wear-resistant layer material in a ratio of 3:1. Mix it thoroughly using an aircraft drill or mixer, and ensure uniformity by checking that the mixture has a consistent color.

The amount of material to be mixed each time depends on the construction area and personnel involved, to prevent waste.

3.3.2.2.2 将调制好的混合料铲到托板上，用刮板或抹灰刀尽可能均匀的将其刮到待衬表面上，一次刮抹宜 1mm 左右。

Scoop the prepared mixture onto the support board, and use a scraper or a plaster knife to apply it as evenly as possible onto the surface to be coated. Apply it in thin layers, about 1 mm at a time.

3.3.2.2.3 尽快刮平，减少来回刮的次数，过多次数的刮抹或者停顿一段时间再刮，会造成表面油面流淌。

Try to smooth it out as quickly as possible by reducing the number of times you need to scrape back and forth. Excessive scraping or pausing for an extended period before continuing can cause the oil on the surface to flow.

3.3.2.2.4 在混合料及涂敷过程中，要求施工面始终保持清洁无尘、无溶剂、无水污染，若有流淌、滴痕或凸起物，应打磨平整；

During the mixing and application process, it is essential to ensure that the construction surface remains clean, free of dust, solvents, and water contamination. Any drips, streaks, or raised areas should be smoothed out.

3.3.2.2.5 在涂抹中，若两区域施工时间间隔长，其完成施工端已凝胶，需通过斜面搭接保证端面质量。

When applying the material, if the time interval between the construction of two areas is long, the completed section may have already set into a gel state. To ensure the quality of the end surface, a sloping joint must be used.²

注意：内衬陶瓷修复施工完成后的正常养护时间至少为 10-12 小时，在此期间不允许投入使用。养护期间避免重物对防磨蚀衬层的敲击。

Note: The normal maintenance time after the construction of ceramic lining repair is at least 10-12 hours, during which it is not allowed to put into use. During the maintenance period to avoid heavy objects on the anti-abrasive liner knocking.

3.3.2.3. 服务方提供现场技术方案:技术方案中须明确施工区域划分和分段验收计划,经确认后方可实施,每一道工序要经验收合格签字后,方可进行下一道工序。在施工的任何阶段,未经采购人验收合格擅自进行下一道工序,必须重新返工。

The supplier to provide on-site technical program: technical program must be clear construction area division and section acceptance plan, after confirmation before implementation, each process should be accepted and signed before the next process. In any stage of construction, without the purchaser acceptance of the next process without authorization, must be reworked.

3.3.2.4. 在每道工序的分段验收中,随机抽查 50%的点,对达不到质量要求的,必须重新返工。

此技术要求为最基本要求,供货方修复采购方设备时工艺及标准不得低于该要求。

In the segmental acceptance of each process, 50% of the points are randomly sampled, and those that fail to meet the quality requirements must be reworked.

This technical requirements for the most basic requirements, the supplier to repair the purchaser's equipment process and standards shall not be lower than the requirements.

3.3.3 质量要求及保证 Quality Requirements and Assurance:

3.3.3.1 陶瓷材料制作涂层外观及内表面质量要求。

Quality requirements for the exterior and interior surfaces of coatings made of ceramic materials.

3.3.3.1.1 制作外观表面应光滑平整致密,无机械损伤、锐器划伤等伤痕。

The surface of the fabrication shall be smooth, flat and dense, free from mechanical

damage, scratches from sharp instruments and other scars.

3.3.3.1.2 外表面应平整、光滑，凹凸度不大于 0.5mm，接缝处无缝隙；各接口处表面错位不大于 2mm。

The outer surface shall be flat and smooth, with concavity and convexity not more than 0.5mm, and no gaps at the joints; the surface misalignment at each interface shall not be more than 2mm.

3.3.3.1.3 陶瓷材料配比：在配比范围内复合陶瓷材料要固化度不小于 90%。

Proportioning of ceramic materials: composite ceramic materials to be cured to a degree of not less than 90% within the proportioning range.

3.3.3.1.4 衬瓷总厚度应保证 $\geq 2\text{mm}$ 。

The total thickness of the lining ceramic should be at least 2 mm.

3.3.3.2 涂层外观、内外质量要求。

Coating appearance, internal and external quality requirements.

3.3.3.2.1 采用目测法，表面光滑平整，确保密封。

Using visual inspection, the surface is smooth and flat to ensure sealing.

3.3.3.2.2 衬瓷修补面无鼓泡、异物、脏物，外观无硬化不良、无空鼓等异常未粘接情况。

Porcelain-lined repair surfaces are free of blisters, foreign matter, dirt, and have no appearance of poor hardening, hollowing, or other abnormal unbonded conditions.

3.3.3.2.3 涂层尺寸及偏差：采用游标卡尺、钢卷尺和钢直尺测量。涂层厚度偏差控制在 $\pm 10\%$ 以内。

Coating size and deviation: Measure by vernier caliper, steel tape measure and steel straightedge. The deviation of coating thickness shall be controlled within $\pm 10\%$.

3.3.3.2.4 防腐完成后，施工方需把之前的氟塑料恢复，恢复所需要材料由采购方提供

（包含但不限于聚四氟乙烯衬板、螺栓、螺母、底胶等材料）。

After the corrosion protection is completed, the constructor shall restore the previous fluoroplastics. All materials required for restoration shall be provided by the purchaser (including but not limited to PTFE lining plates, bolts, nuts, base adhesive and other materials).

3.3.3.5 质量保证

Quality assurance (QA):

3.3.3.5.1 质保期：2 年

Warranty: 2 years。

3.3.3.5.2 质保期内，在使用过程中如果发生故障，服务方接到采购方通知后，应及时与采购方沟通，给出处理方案。

During the warranty period, if a malfunction occurs during use, the supplier, upon receiving notification from the owner, shall promptly communicate with the owner and provide a solution

3.4 阶段验收：分货物入厂验收及施工验收两阶段，采购方签字确认。

Stage acceptance: acceptance of goods into the factory and construction acceptance of the two stages, signed by the purchaser to confirm.

3.5 最终交付：服务方工作结束后应提供以下文档：施工方案、三级验收单、施工记录。

Final Delivery: The following documentation shall be provided by the Service Provider upon completion of the work: construction program, Level 3 acceptance sheets, and construction records.

4.服务期限及承包形式 Duration of service and form of contracting

4.1 服务时间：计划自 2026 年 11 月 01 日起至 2026 年 11 月 30 日止（具体起始日期以采购人通知的日期为准），计划工期 30 天，具体工期以满足采购方现场检修设备停运时间要求为准。

4.1 Service Duration: The planned service period is from [year] [month] [day] to [year]

[month] [day] (the specific start date shall be based on the date notified by the purchaser). The planned duration is 30 days, and the actual duration will be based on the requirements for the downtime of the equipment during the purchaser's on-site maintenance.

4.2 具体起始日期以采购方通知的日期为准。

4.2 The exact date of commencement shall be the date notified by the purchaser.

4.3 责任划分：服务方负责#1 脱硫净烟道防腐材料供货及施工工作。采购方提供现场条件支持及验收。施工用材料由服务方提供，工器具、劳保及安全防护用品自理，施工用水电由采购方负责，采购方可免费提供临时住宿场所，伙食自理。

Division of Responsibilities: The service provider is responsible for the supply and construction of anti-corrosion materials for the #1 desulfurization flue. The purchaser will provide on-site support and acceptance. Construction materials will be provided by the service provider; tools, labor protection equipment, and safety protection supplies are the responsibility of the service provider. Water and electricity for construction will be provided by the purchaser. The purchaser may provide temporary accommodation free of charge; meals are the responsibility of the service provider.

5.资质要求 Qualification Requirements

5.1 服务方资质要求

Service Provider Qualification Requirements.

5.1.1 服务方为印度尼西亚境内合法注册的独立企业法人或其他组织，具有独立承担民事责任能力，具有独立订立合同的权利。

The Supplier shall be a legally registered independent legal entity or organization in Indonesia, capable of independently undertaking civil liabilities and concluding contracts.

5.2 服务方业绩 / Performance Requirements

自 2021 年起至投标截止日至少有 1 项 150MW 及以上机组烟道防腐作业业绩。

From 2021 to the bid closing date, there should be at least 1 project of 150MW or above chimney anti-corrosion work.

6.遵循规范及要求 Compliance with specifications and requirements

本技术规范书提出的是最低限度的技术要求，并未对一切技术细节作出明确规定，也未充分引述有关标准和规范的条文。服务方应遵守规程、规范的规定，并以本技术规范书所确定的招标范围、内容和条件编写投标书面文件。应遵循国家、相关行业现行规程规范有：

This technical specification outlines the minimum technical requirements and does not provide explicit details on all technical aspects, nor does it fully reference relevant standards and regulations. The service provider shall comply with the provisions of the following regulations and standards, and prepare the bid documents in accordance with the scope, content, and conditions defined in this technical specification. The service provider should adhere to the current national and relevant industry regulations and standards, which include:

DL/T 869-2021 《电力发电厂焊接技术规程》《Technical Regulations for Welding in Electric Power Plants》

DL/T 679-2012 《焊工技术考核规程》《Regulations for the Examination of Welders' Skills》

DL/T 868-2004 《焊接工艺评定规程》《Welding Process Evaluation Regulations》

Q/CHD85.1-2024 《电业安全工作规程》《Safe Working Procedures in the Electricity Industry》（热力和机械部分）（Thermal and mechanical components）

GB/T 37187-2018 《脱硫烟囱用防腐蚀材料技术要求》GB/T 37187-2018 "Technical Requirements for Anti-corrosion Materials Used in Desulfurization Chimneys"

GB/T 41761-2022 《湿法脱硫系统耐蚀材料全生命周期技术要求》GB/T 41761-2022 "Technical Requirements for Corrosion-resistant Materials throughout the entire life cycle of wet desulfurization systems"

7.技术要求

Technical requirement

7.1 安全与环保要求

Safety and environmental requirements

7.1.1 检修工器具工作前到达现场，并向采购方提供检修工器具清册、检查检验报告，接受采购方检查、抽查。

Arrive at the site before the work of overhauling work equipment and provide the purchaser with an inventory of overhauling work equipment, inspection and test reports, and accept the purchaser's inspection and random check.

7.1.2 作业人员持证上岗，穿戴防护装备。

Operators are licensed and wear protective equipment.

7.1.3 办理工作票及机械隔离工作票，系统泄压至零。

Process work tickets and mechanical isolation work tickets, and relieve the system to zero pressure.

7.1.4 施工区域设置硬质围栏，作业人员穿戴防护服、面罩等。

The construction area is fenced off with rigid fencing, and operators wear protective clothing and face masks.

7.1.5 动火作业需办理许可证，配备消防器材及专职监护人员。

Permits are required for fire fighting operations, with fire fighting equipment and full-time supervisors.

7.1.6 密闭空间内工作应进行 10 分钟自然通风或 5 分钟机械通风。在清除有害气体或残留物资后，方可进入容器内。监护人应站在能看到或听到容器内工作人员的地方，且 2 人在外监护，并测量氧气含量在 19.5-21%。

Work in confined spaces should undergo 10 minutes of natural ventilation or 5 minutes of mechanical ventilation. Personnel may enter the container only after harmful gases or residual materials have been cleared. The supervisor should stand in a position where they can see or

hear the workers inside the container, with two additional supervisors outside. The oxygen content should be measured and maintained between 19.5% and 21%.

7.1.7 搭设合格的脚手架、并验收合格。 使用合格双钩安全带，严禁低挂高用。

Set up qualified scaffolding and acceptance. Use qualified double-hook safety belts and strictly prohibit low hanging and high use.

7.1.8 施工现场铺设彩条布，保持场地环境整洁，通道畅通，避免破碎树脂洒落地面造成人员滑跌摔伤。施工设备、材料摆放有序。

Pave the construction site with colorful strips of cloth, keep the environment of the site neat and tidy, and keep the passageway free, so as to avoid the spillage of broken resin on the ground, which will cause the personnel to slip and fall and get hurt. Construction equipment and materials are arranged in an orderly manner.

7.1.9 因跑、冒、滴、漏影响工作环境及现场卫生后，必须及时清理。

Due to run, risk, drip, leakage impact on the working environment and site health, must be cleaned up in a timely manner.

7.1.10 施工现场拆下的设备零部件，必须按要求对零部件进行标识，且摆放整齐，并妥善保管。

Equipment parts removed from the construction site must be labeled as required and neatly arranged and properly stored.

7.1.11 施工现场设立专门的废弃物临时贮存场地，废弃物应分类存放，对有可能造成二次污染的废弃物必须单独贮存，设置安全防范措施且有醒目标识。

construction site to set up a special temporary storage site for waste, waste should be categorized and stored, may cause secondary pollution of waste must be stored separately, set up safety precautions and conspicuous signs.

7.1.12 施工人员要做到工完料净场地清，防腐材料的运输确保不散撒、不混放，送到

指定场所进行处理、消纳，避免造成环境污染。

Construction workers should do the work of material clean site clear, anti-corrosion material transportation to ensure that not scattered, not mixed, sent to the designated place for processing, elimination, to avoid causing environmental pollution.

7.2 人员及防腐队伍要求

Personnel and corrosion prevention team requirements

7.2.1 服务方工程技术人员和施工作业人员的素质符合本项目性质要求，服务方所有人员应具备一定的安全基础知识，能独立完成招标方组织的各项培训、考试。

The quality of the engineering and technical personnel and staff of the service provider meets the requirements of the nature of the project, and all personnel of the service provider shall have a certain basic knowledge of security and be able to independently complete the various trainings and examinations organized by the bidding party.

7.2.2 服务方明确工作负责人及施工人员、人力资源配置，报采购方审批。

The service provider specifies the person in charge of the work and the allocation of construction personnel and human resources, and submits them to the purchaser for approval.

7.2.3 服务方施工人员数量必须满足现场工作需要。施工人员应具有丰富施工经验，掌握相关施工标准。

The number of construction personnel of the service provider must meet the needs of on-site work. The construction personnel shall have rich construction experience and master the relevant construction standards.

7.2.4 参加施工的人员应为相关专业技术的熟练焊工、起重工，并提供人员构成情况表，特殊工种人员应附资质证书。

The personnel participating in the construction shall be skilled welders and heavy workers with relevant professional skills, and provide the personnel composition table, and the

personnel of special trades shall be accompanied by qualification certificates.

7.2.5 从业施工人员:男 55 周岁以内、女 50 周岁以内、登高作业人员年龄不超过 50 周岁。

Construction workers: men within 55 years of age, women within 50 years of age, and those working at heights not older than 50 years of age.

8.管理及考核 Management and Evaluation

8.1 服务方施工人员常驻现场，采购方提供办公、检修及临时住宿场所，伙食等由服务方自行解决。

The construction personnel of the service party shall be stationed on site. The purchasing party shall provide office, maintenance and temporary accommodation places, and the service party shall solve the catering issues by itself.

8.2 服务方应服从采购方现场（安全文明施工、施工工艺质量、工期控制、人员供应）管理，因服务方管理不善或因服务方员工违章操作造成的人身伤害，由服务方自行处理并承担全部责任；因服务方员工人为原因造成的设备损坏由服务方承担由此引发的一切赔偿责任。

The service provider shall comply with the purchaser's on-site management requirements (including safety and civilized construction, construction quality, schedule control, and personnel supply). Any personal injury caused by poor management or violation of regulations by the service provider's employees shall be handled by the service provider, who will bear full responsibility. Any equipment damage caused by human error by the Service Provider's employees shall be the responsibility of the Service Provider, including all compensation liabilities resulting from such damage.

8.3 服务方在工作中不服从采购方的管理和工作安排，由此而影响现场正常维护工作的正常开展，视情节轻重每次考核 Rp1,000,000-Rp10,000,000。

If the Service Provider fails to comply with the purchaser's management and work arrangements during the job, causing disruption to the normal on-site maintenance work, a penalty will be imposed based on the severity of the situation, ranging from Rp 1,000,000 to Rp 10,000,000 for each instance.

8.4 服务方严格按本规范要求配置管理人员，每少一人按 Rp1,000,000/天考核，并责令改正。

The Service Provider shall strictly follow the requirements of this specification to allocate management staff, and every person less shall be assessed at Rp1,000,000/day and ordered to be corrected.

8.5 检修结束做到工完料净场地清，不合格之处每处考核 Rp3,000,000。

At the end of the overhaul, make sure that the work is finished, the material is clean and the site is clear, and assess Rp3,000,000 for each unqualified place.

8.6 施工材料如钢板、钢丝绳、手拉葫芦不准乱堆乱放，影响他人施工、堵塞通道的每处考核 Rp2,000,000。

Construction materials such as steel plates, steel wire ropes and trolley hoists are not allowed to be piled up indiscriminately, affecting other people's construction and blocking the passageway. They will be assessed at Rp2,000,000 per place.

8.7 施工中发生质量问题，自行处理并掩盖的，每次考核 Rp2,000,000。

Rp2,000,000 will be assessed for each time a quality problem occurs during construction, which is handled and covered up on its own.

8.8 现场施工因措施不当、发生火灾、跑水、跑气现象，每项考 Rp4,000,000。

Rp4,000,000 per item for fire, water and gas escape due to improper measures in on-site construction.

8.9 施工方在施工中如损坏设备、元件、仪表、仪器、电缆、电线等，每项考核

Rp4,000,000.

The builder shall be assessed Rp4,000,000 per item for any damage to equipment, components, meters, instruments, cables, wires, etc. during construction.