EQUITY RESEARCH · PRODUCT CAPABILITY ANALYSIS

Hindusthan Insulators

Mandideep, Madhya Pradesh

Product Capability Report

Visual analysis of factory product mix mapped to NEP 2023–32 and the upcoming HVDC capex cycle

LISTED ENTITY	Hindusthan Urban Infrastructure Limited (BSE: 539984)
MANUFACTURING BRAND	Insulators & Electricals Company (IEC)
PLANT LOCATION	Mandideep Industrial Area, Madhya Pradesh
CURRENT CAPACITY	16,500 MT/yr dispatchable
POST-EXPANSION (DEC 2026)	36,000 MT/yr dispatchable
TECHNOLOGY PEDIGREE	RWI GmbH, Germany (collaboration)

Prepared from public-domain factory photographs, ELECRAMA 2025 trade show imagery, and Hindusthan Urban Infrastructure Annual Reports for FY23, FY24 and FY25.

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2026

Sector: Power · T&D Equipmer
Coverage: Hindusthan Insula

SECTION I

Executive Summary

This report analyses Hindusthan Insulators' (IEC Mandideep) actual product capabilities through factory floor and trade show photographs sourced from the public domain. Each insulator product category is mapped to its application in the Indian power transmission system, and to the demand drivers under the National Electricity Plan 2023–32 and the upcoming HVDC investment cycle.

The factory images reveal a more substantive UHV manufacturing operation than the company's annual reports describe. While the FY24 annual report mentions "successfully developed 765 kV 31 mm/kV Solid Core Post Insulators" almost as a footnote, the visual evidence shows commercial-scale batch production of these products as of March 2025. This gap between disclosure tone and operating reality is itself a meaningful insight for an investor.

Headline findings

The product portfolio spans the full porcelain insulator range from 11 kV distribution products to 765 kV class solid core post insulators, with German RWI technology pedigree underpinning the higher voltage capability.

Approximately 60–70% of revenue is concentrated in NEP-aligned product categories — solid core post insulators, hollow insulators for substation apparatus, and long-rod insulators for transmission lines. These are the categories that will benefit most from the 2,342 GVA transformation capacity buildout and the 9 new HVDC corridors.

Disc insulators (cap-and-pin) remain a meaningful volume contributor and will face structural pressure from composite substitution over the medium term, but in the immediate 3–5 year window the shortage cycle and project pipeline keep this segment supportive.

The hollow insulator category — used in transformer bushings, circuit breaker housings, current/voltage transformers, and lightning arresters — is the single most NEP-leveraged product. Lead times in this category have stretched to 12–16 months industry-wide, validating the capacity expansion logic.

The report is organised by product category. Each section explains what the product is, where it is used in the power system, what the IEC factory images reveal about manufacturing capability, and how the category maps to NEP 2023–32 and HVDC demand drivers.

SECTION II

How to Read This Report

Insulators are classified along three axes: by dielectric material (porcelain, glass, composite/polymer), by voltage class (distribution at 11–33 kV, sub-transmission at 66–132 kV, high voltage at 220–400 kV, extra-high voltage at 765 kV, and ultra-high voltage at 1200 kV / 800 kV DC), and by application (transmission line, substation apparatus, railway traction, distribution). IEC operates entirely in the porcelain dielectric category, with capability across all voltage classes up to 765 kV AC and product breadth covering transmission lines, substation apparatus and railway traction.

For each product category, we apply a consistent five-part framework:

What it is — physical description and key technical characteristics.

Where it is used — application in the power system and which customers buy it.

What the images reveal — capability evidence from factory and trade show photographs.

NEP and HVDC alignment — assessment of demand outlook over FY26–FY32.

Capability rating — qualitative assessment of IEC's competitive position in the category.

Capability rating scale

Strong	Genuine differentiation; hard for new entrants to replicate within 5+ years.
Solid	Credible commercial operation in line with Tier-1 Indian peers.
Adequate	Functional capability but no obvious competitive advantage.
Limited	Not a focus area or below industry standards.

01

Category one · Highest NEP leverage

UHV Solid Core Post Insulators

VOLTAGE CLASS	400 kV AC and 765 kV AC
CAPABILITY RATING	Strong
EST. % OF REVENUE	15–25%
NEP/HVDC FIT	High

What they are

Solid core post insulators are vertical, tall porcelain cylinders manufactured as a single piece from a continuous porcelain body. Unlike disc insulators, they bear both compressive and bending mechanical loads and provide electrical isolation between energised conductors and earthed structures. The defining technical challenge is firing a single-piece porcelain body of 3+ metres without internal cracks, warping, or dimensional drift — a process that places demanding requirements on raw material consistency, kiln temperature uniformity, and forming tolerances.

At 400 kV and 765 kV class, the units are typically 3 to 4.5 metres tall with deep alternating shed profiles to maximise creepage distance per unit length. They carry aluminium top fittings (the silver star-shaped caps visible in the images) for connection to busbars and grading rings to control corona discharge.

Where they are used

UHV solid core post insulators are the structural backbone of high-voltage substation switchyards. They support busbars, isolate disconnect switches, and carry instrument transformer assemblies in 400 kV and 765 kV substations. Every new EHV/UHV substation in India requires hundreds of these units. The customers are Power Grid Corporation of India (PGCIL) for inter-state transmission system substations, state transmission utilities for intra-state substations, and private transmission companies (Adani Energy Solutions, Sterlite Power, Tata Power) for tariff-based competitive bidding (TBCB) projects.

What the images reveal

Figure 1.1

Two single-piece solid core post insulators on the Mandideep production floor. Anti-fog deep-shed profile suitable for high-pollution operation. White grading ring (top) is a corona-control feature standard for 400 kV-plus apparatus.

The two columns in the foreground are estimated at 3.5 to 4 metres tall, with shed counts and base diameters consistent with 400 kV or 765 kV class. Critically, both units are single-piece porcelain bodies — there are no joins or coupling flanges in the middle. Manufacturing single-piece UHV solid cores is a small club globally, requiring kiln, forming, and quality-control capability at a level that differentiates Tier-1 producers from generic manufacturers.

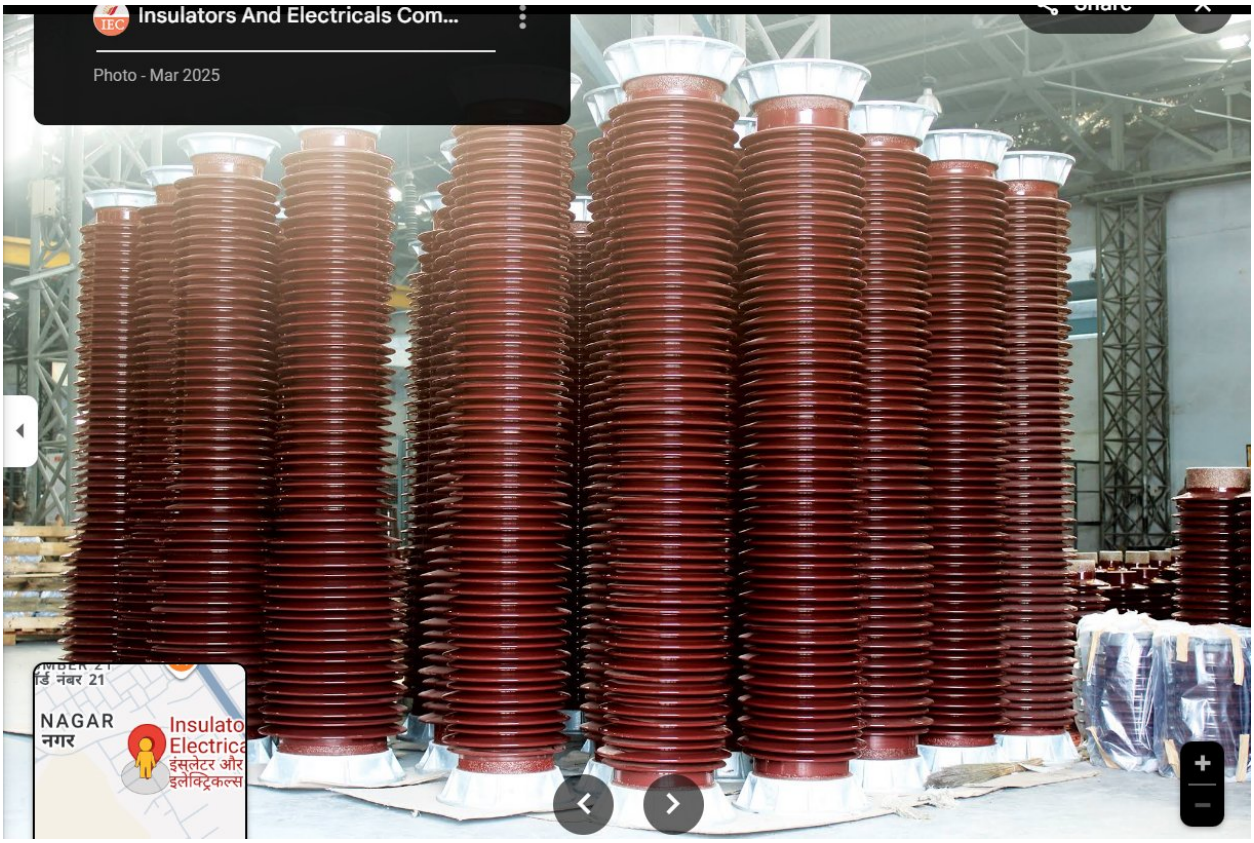

Figure 1.2 · March 2025

Batch of 12-plus UHV solid core post insulators on the production floor, all carrying identical aluminium top fittings — indicating a single customer order. Packed and wrapped units bottom right indicate dispatch in progress.

This image is the single most commercially significant piece of visual evidence in the set. We see at least 12 UHV solid core posts being produced in a single batch, all with identical aluminium star-cap fittings. Date-stamped March 2025, this is recent and represents commercial-scale production rather than engineering prototypes. This level of batch consistency at UHV class is not what you would expect from a marginal player; this is production by a credible Tier-1 supplier.

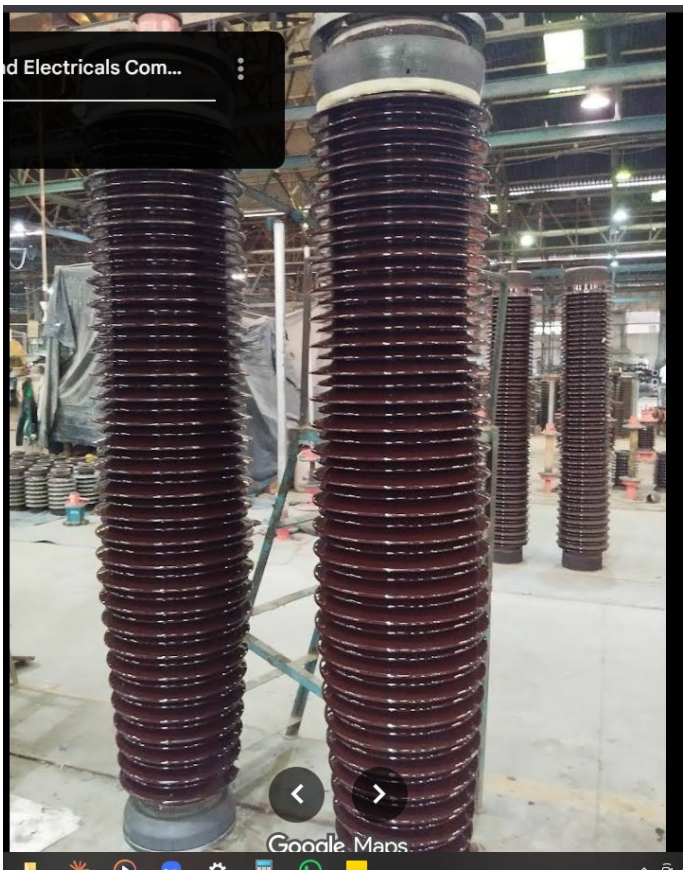

Figure 1.3

Additional view of UHV solid core inventory on the factory floor, with smaller-class post insulators visible in the background. Multiple voltage classes run through the same facility — useful for utilisation flexibility.

NEP and HVDC alignment

Demand outlook — Strong. The NEP 2023–32 plans to expand transformation capacity from 1,251 GVA to 2,342 GVA — approximately 1,090 GVA of new substation capacity, with each new 400 kV or 765 kV substation requiring 200–400 solid core post insulators. The 9 new HVDC corridors (33.25 GW total) require dedicated converter station switchyards, all of which are populated with solid core post insulators.

Pricing and margin — Premium. Realisation per metric tonne for 400 kV and 765 kV solid core post insulators is typically 2 to 3 times that of 132 kV class products and 4 to 6 times that of distribution-class disc insulators. Gross margins are correspondingly higher. This is a category where pricing power exists when supply is constrained — and supply is constrained today.

Competitive moat — Genuine. Type-test approvals from PGCIL and major state transcos, the German RWI technology pedigree visible in IEC's marketing material, and the demonstrated commercial-scale UHV production all combine to make this a category where new entrants cannot threaten incumbents within a 5–7 year window.

Capability rating · Strong

IEC has demonstrated commercial UHV solid core post production at 400 kV and 765 kV class, with batch consistency and customer-specific fittings indicating real order book conversion rather than sample production. This is among the most NEP-leveraged categories in the company’s portfolio.

02

Category two · Most NEP-leveraged

Hollow Insulators (Substation Apparatus Housings)

VOLTAGE CLASS	Up to 800 kV (joined configurations)
CAPABILITY RATING	Strong
EST. % OF REVENUE	20–30%
NEP/HVDC FIT	Highest of any product category

What they are

Hollow insulators are tubular porcelain bodies with an open interior, fitted with aluminium or galvanised iron flanges at top and bottom. The hollow space inside is filled with the active electrical components of substation apparatus — SF6 gas in circuit breakers, transformer coils in current/voltage/inductive transformers, oil and condenser elements in transformer bushings, and zinc oxide blocks in lightning arresters. The porcelain shell provides external electrical insulation, mechanical protection, and pollution resistance.

Hollow insulators are technically more demanding to manufacture than solid core posts at the same voltage class, because the shell must be uniformly thick (uneven walls cause stress concentration and electrical weak points), pressure-tight (for SF6 gas containment), and dimensionally precise to mate with the flange seal. Diameters at 400 kV class can reach 600 mm with heights of 2.5 metres in single-piece form, and joined/stacked configurations extend to 5 metres for 800 kV applications.

Where they are used

Hollow insulators are the workhorse product of substation apparatus manufacturing. Every transformer needs bushings (one per phase plus one for neutral, so typically 4 hollow insulators per power transformer); every circuit breaker uses hollow insulators as the SF6 gas containment housing; every current transformer (CT) and voltage transformer (CVT/PT) is built around a hollow insulator housing; every lightning arrester (LA) uses one as its outer envelope. The customers are not directly the utilities but the apparatus original equipment manufacturers (OEMs) — Hitachi Energy India, GE T&D India, Siemens Energy, CG Power, BHEL, Transformers & Rectifiers India, and electrostatic precipitator manufacturers for thermal power plants.

What the images reveal

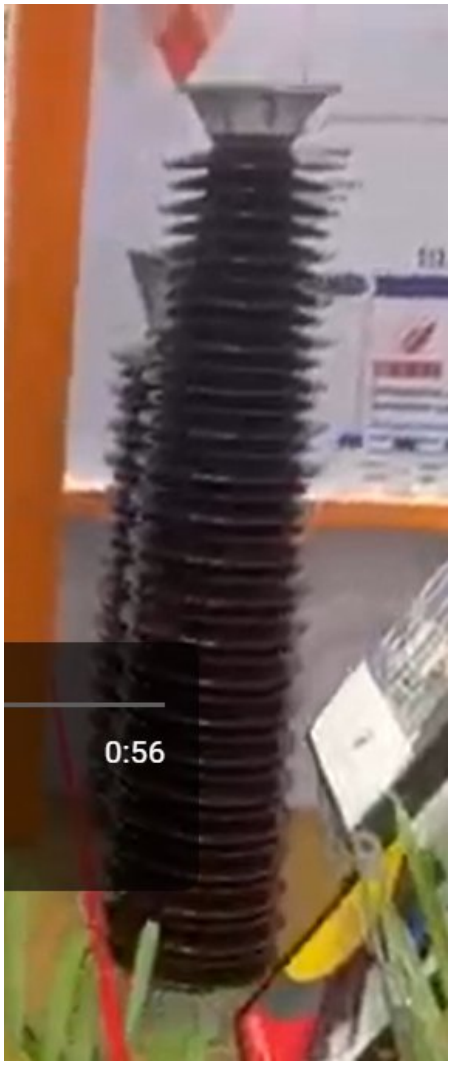

Figure 2.1

Hollow insulator in mid-production. Open top with metal flange characteristic of apparatus housing units. Wide diameter and substantial height suggest 245–420 kV range.

The open-top construction, large flange interface, and substantial diameter mark this as a hollow insulator destined for a circuit breaker, transformer bushing or instrument transformer application. The matte/unfinished texture on parts of the surface suggests this unit is captured between production stages — likely post-firing and pre-glazing.

Figure 2.2 · March 2025

Mixed display of hollow and solid core insulators of varying voltage classes. The single grey-coloured unit on the right is technically distinctive — possibly an HVDC application unit or RTV-silicone-coated porcelain.

This image shows the breadth of the hollow insulator portfolio. The brown units in the foreground are transformer bushing housings of various designs and voltage classes, while the larger units behind appear to be circuit breaker or instrument transformer housings. The single grey-coloured insulator on the right is technically interesting — grey porcelain colour is unusual and could indicate either a HVDC application unit (where pollution-control glaze formulations differ from AC applications), an RTV silicone-coated unit (a pollution-mitigation technique used by PGCIL on existing infrastructure), or a different glaze for export markets. Each interpretation carries positive implications for capability.

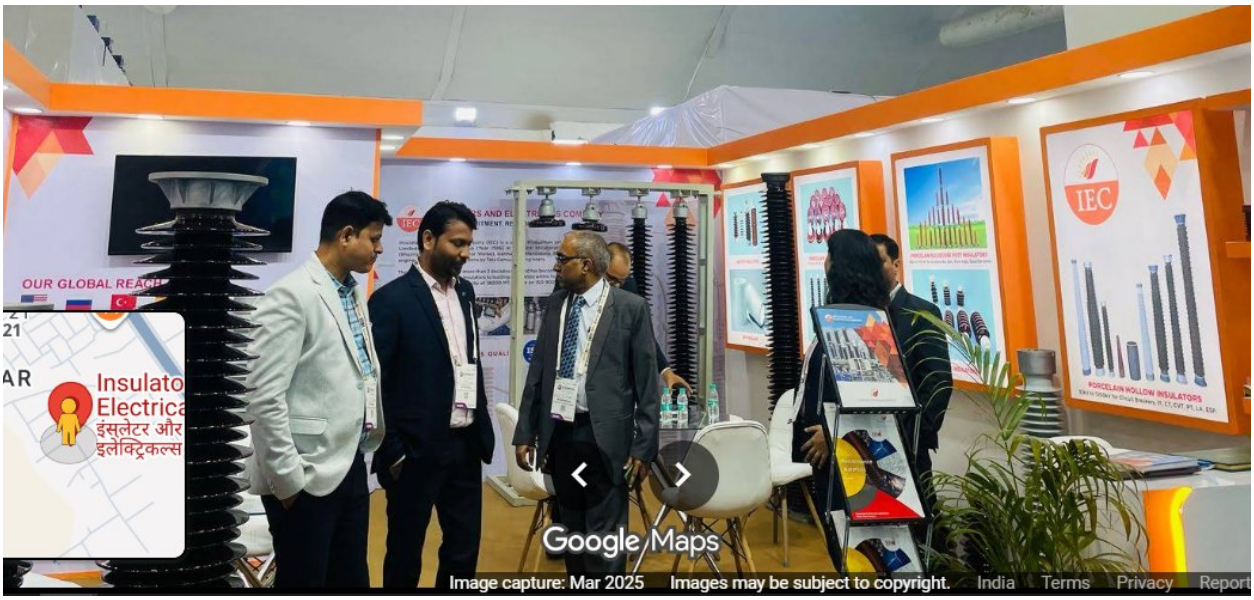

Figure 2.3 · ELECRAMA 2025

IEC trade show booth. Visible posters reference SF6 circuit breakers, IT (instrument transformers), CT, CVT, IPT (inductive PT), LA (lightning arresters), and ESP (electrostatic precipitators) — the full apparatus application range.

The marketing material on the booth wall confirms the company explicitly markets hollow insulators across the full apparatus range: SF6 circuit breakers, instrument transformers, current transformers, capacitor voltage transformers, inductive PTs, lightning arresters, and electrostatic precipitators. This breadth indicates the company has type-test approvals for hollow insulators specific to each apparatus type — these approvals are not interchangeable between OEMs and applications.

NEP and HVDC alignment

Demand outlook — Strongest of any product category. The transformation capacity expansion of 1,090 GVA implies thousands of new transformers and reactors, each requiring hollow insulator bushings. The 9 new HVDC corridors require converter station bushings and wall bushings — the most demanding application of all. Industry concall transcripts (HEC Infra, Quality Power) cite lead times of 12–16 months for hollow insulators, confirming acute shortage.

Pricing and margin — Highest in the porcelain product spectrum. Hollow insulators for 400 kV transformer bushings can sell at 4–5 times the per-MT realisation of disc insulators, and 800 kV DC HVDC wall bushings command an even higher premium when type-test qualified. Gross margins of 30–50% are achievable in this segment versus 12–18% in disc insulators.

Competitive moat — Strong but with caveats. The OEM type-test approval process is bureaucratically slow and represents a real moat against new entrants. However, the long-term substitution risk from composite hollow-cores (silicone rubber bonded to fibreglass tube) is genuine. Aditya Birla Power Composites Ltd has commissioned a Composite Hollow Core Insulator plant at Halol with German Maschinenfabrik Reinhausen technology — IEC's pure porcelain stance leaves a long-term hedge gap. Within the 5–7 year horizon, however, porcelain remains the dominant hollow-core material at EHV/UHV.

Capability rating · Strong

IEC’s portfolio breadth, OEM-specific type-test approvals across SF6 CB / CT / PT / LA / ESP applications, and the visual evidence of varied product designs all confirm a credible Tier-1 hollow insulator capability. This is the company’s single most NEP-leveraged product category and the one most exposed to current shortage-driven pricing power.

03

Category three · Growing

Porcelain Long Rod Insulators (Transmission Line)

VOLTAGE CLASS	132 kV through 765 kV
CAPABILITY RATING	Solid
EST. % OF REVENUE	5–10%
NEP/HVDC FIT	Medium

What they are

Long rod insulators are single-piece tension insulators designed for use on transmission line towers as an alternative to disc insulator strings. Where a 400 kV disc-string assembly typically uses 23–28 cap-and-pin discs cemented end to end, a long rod insulator achieves the same electrical and mechanical performance in a single porcelain body 2–3 metres long with helical sheds. The advantage is fewer joints, lower failure probability, easier installation, and cleaner aerodynamic profile.

Long rod is a more modern porcelain format that competes more effectively against silicone composite long-rods than traditional disc strings do. It is the porcelain industry’s response to the composite substitution threat on transmission lines.

Where they are used

Long rod insulators are used on transmission line towers from 132 kV through 765 kV class as suspension insulators (vertical hanging position) and tension insulators (horizontal load-bearing position at angle towers and dead-end towers). Customers are state transmission utilities (MSETCL, OPTCL, RRVPNL, JUSNL), PGCIL, and EPC contractors building transmission lines (KEC International, Kalpataru Projects, Tata Projects, L&T).

What the images reveal

Figure 3.1

Long rod insulator crated for shipment. Helical shed profile and robust metal end fittings on both ends — characteristic of tension long-rod design for 400 kV class transmission line application.

The unit is fully crated and packed with both end fittings already attached, indicating it is ready for despatch to a customer. The diameter and shed depth are consistent with 400 kV class. The robust metal end fittings on both ends are characteristic of tension long-rod design — these connect to the tower cross-arm at one end and to the conductor clamp at the other, bearing the full tension load of the conductor span.

This is exactly the product category that the FY24 annual report mentions: “Approx. 7.50 Cr worth of orders have already been executed to MSETCL in the last F.Y.” — and the visual evidence confirms commercial-scale production rather than prototype activity. Long rod is also a recently-introduced product for IEC; the company received its first utility approvals (MSETCL and OPTCL) in FY23 and has been working through additional utility approvals since.

NEP and HVDC alignment

Demand outlook — Moderate to strong. Transmission line additions of approximately 1.6 lakh circuit kilometres under NEP 2023–32 will use a mix of disc strings, long-rods and composite long-rods. Long-rod has been gaining share within the porcelain category as utilities specify it for new lines, but composite long-rods are the more aggressive substituent. Within the porcelain market, long rod is the growth segment.

Pricing and margin — Premium to disc strings on a per-string-equivalent basis. A single 400 kV long rod replaces 23+ disc insulators and is priced and margined as a premium product. However, this category faces head-to-head competition with composite long-rods from peers such as Aditya Birla and BHEL, which limits pricing power.

Competitive moat — Building. Two utility approvals (MSETCL, OPTCL) is a starting position rather than a defensible moat. The category requires PGCIL approval and approvals from larger state transcos (TANTRANSCO, KPTCL, GETCO, UPPTCL) before becoming a meaningful revenue contributor.

Capability rating · Solid

IEC has demonstrated production capability and has secured initial utility approvals, but the segment is in early commercialisation. The structural composite-substitution headwind on transmission lines means this category will not become a dominant revenue driver, but it should grow through FY27–28 as additional utility approvals come through.

04

Category four · Volume contributor

Disc Insulators (Cap-and-Pin Strings)

VOLTAGE CLASS	132 kV through 765 kV (string-assembled)
CAPABILITY RATING	Solid
EST. % OF REVENUE	25–35%
NEP/HVDC FIT	Low to Medium

What they are

Disc insulators are the classic cap-and-pin design that has dominated transmission line insulation for over a century. Each disc is a small porcelain body about 280 mm in diameter, with a metal cap on top and a metal pin underneath, joined to other discs through the cap-pin interface to form a string. A 400 kV transmission line uses approximately 23–28 discs per phase per insulator string.

Disc insulators are categorised by mechanical strength rating in kilonewtons (kN) — 70 kN, 90 kN, 120 kN, 160 kN, 210 kN, 320 kN. Higher kN ratings are used at heavier mechanical loads such as long spans, river crossings, and dead-end towers.

Where they are used

Disc insulators remain the standard choice for transmission line insulation across 132 kV through 765 kV class, although composite long-rods have been steadily taking share. Customers are transmission line EPCs (KEC, Kalpataru, Tata Projects, L&T, Sterlite Grid), PGCIL, state transcos, and private transmission developers. Higher kN classes are also used in railway traction electrification and special crossings.

What the images reveal

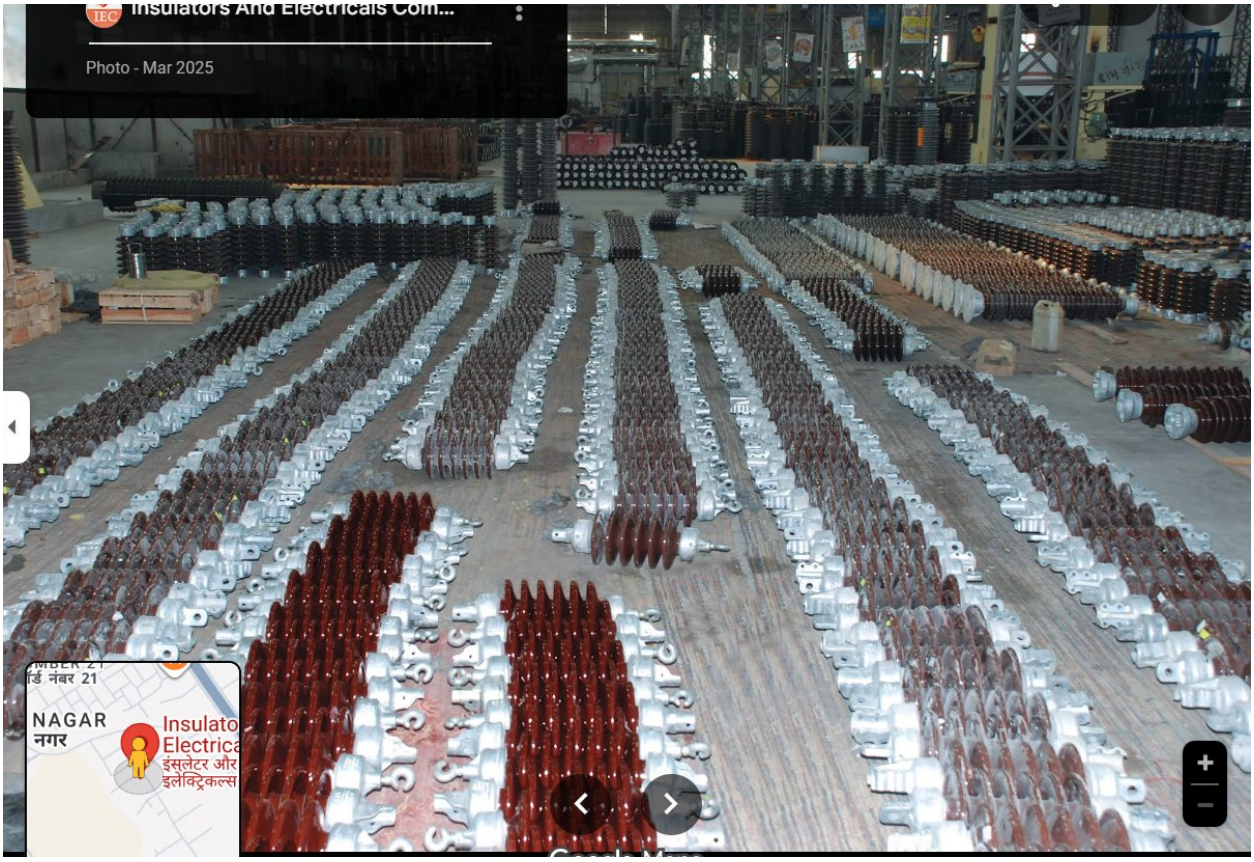

Figure 4.1 · March 2025

Disc and post insulator yard at Mandideep showing thousands of units in inventory. Foreground rows are cap-and-pin disc insulators with metal end fittings already crimped — likely 70 kN through 120 kN class.

This image is the visual confirmation that disc insulators remain a meaningful volume contributor. The depth and breadth of the yard, with multiple hundreds of units visible, indicates this is a mass-volume business segment. The middle and back rows show smaller pin-and-post insulators and larger station post insulators respectively, demonstrating that disc production runs alongside other categories rather than being the sole focus.

The FY24 disclosure mentions IEC "taken up the development of 210 KN & 320 KN Porcelain Disc Insulators" — the higher mechanical-strength variants used at heavy-tension towers and special crossings. These are higher-margin products within the disc category, used selectively rather than in volume.

NEP and HVDC alignment

Demand outlook — Mixed. New transmission line additions under NEP 2023–32 will use disc insulators alongside long-rods and composites, but the share of discs is declining. The replacement market for existing disc strings on the in-service 4.85 lakh ckm of transmission lines remains substantial. Within porcelain manufacturers, disc volumes will continue but at a slower growth trajectory than hollow or solid core post categories.

Pricing and margin — The most commoditised segment within porcelain insulators. Per-MT realisations are the lowest in the product portfolio, and gross margins are correspondingly thin (typically 12–18%). The 210 kN and 320 kN variants carry higher margins as a value-added sub-segment.

Competitive moat — Limited. Disc insulators are the most commoditised porcelain product, with multiple Tier-1 and Tier-2 manufacturers in India producing standard 70–120 kN units. Type-test approvals are still required, but they are easier to secure than for UHV solid core or apparatus hollow-cores. This is a category where IEC competes on cost, delivery and quality rather than on technical differentiation.

Capability rating · Solid

IEC has clear volume manufacturing capability and is moving into higher-kN value-added variants, but this is a structurally low-margin commoditised segment. Strategically, the case for keeping disc insulators in the product mix rests on capacity utilisation and customer relationship breadth rather than profit contribution.

05

Category five · Steady volume

Station Post and Sub-Transmission Post Insulators

VOLTAGE CLASS	33 kV through 245 kV
CAPABILITY RATING	Solid
EST. % OF REVENUE	10–15%
NEP/HVDC FIT	Low

What they are

Station post insulators are smaller cousins of UHV solid core post insulators, used at lower voltage classes from 33 kV through 245 kV. They are typically 0.5 to 1.5 metres tall with simpler shed profiles and proportionally smaller mechanical strength ratings. Pin insulators (used on cross-arms of distribution and sub-transmission lines) and line post insulators (horizontally mounted on poles) are related products in this voltage band.

Where they are used

Station posts at 33–245 kV are used in distribution-class substations, secondary sub-transmission substations, and in 33 kV / 132 kV switchyards of industrial captive power plants. Pin insulators and line post insulators are used on distribution feeders by state DISCOMs (UPPCL, MSEDCL, BESCOM, TANGEDCO) and on sub-transmission lines.

What the images reveal

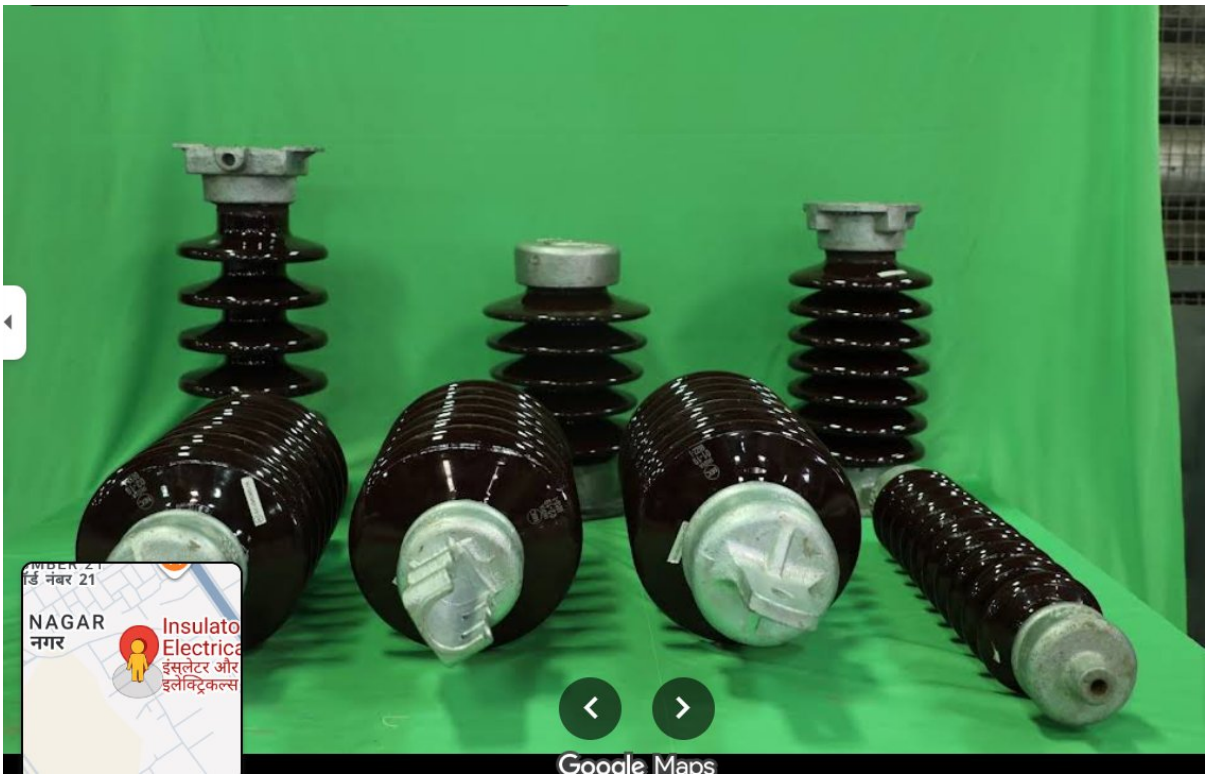

Figure 5.1

Studio shot of IEC's pin and post insulator product range, showing distribution-class solid core posts, pin insulators, and station post insulators — the broader voltage-class portfolio.

This image showcases the lower-voltage portfolio: the upright units on the left are likely 11–66 kV solid core posts, the smaller barrel-shaped horizontally-laid units are pin and cap-pin insulators in the distribution range, the central stacked unit is a 132 kV station post, and the right-most slim unit appears to be a railway insulator type. This breadth confirms that IEC participates in the distribution-class business alongside the EHV/UHV business.

NEP and HVDC alignment

Demand outlook — Steady. Distribution and sub-transmission infrastructure is being expanded through schemes such as Revamped Distribution Sector Scheme (RDSS) and ongoing rural electrification. This drives a steady but unspectacular volume of 33–132 kV insulator demand. Not directly leveraged to NEP 2023–32 transmission spending or HVDC, but provides a stable baseline.

Pricing and margin — Modest. Distribution-class products carry thin margins similar to disc insulators. Sub-transmission station posts (132–245 kV) have somewhat better economics than 33 kV distribution products.

Competitive moat — Limited. Highly fragmented competitive landscape including Tier-2 and Tier-3 manufacturers and SME-scale producers. IEC's advantage is brand recognition, established relationships with state utilities, and quality consistency rather than technical differentiation.

Capability rating · Solid

Functional and complete portfolio in this voltage band, contributing volume rather than premium margin. Strategically useful for customer relationships and capacity absorption.

06

Category six · Niche participant

Railway Traction Insulators (25 kV AC OHE)

VOLTAGE CLASS	25 kV AC traction
CAPABILITY RATING	Adequate
EST. % OF REVENUE	5–10%
NEP/HVDC FIT	Low

What they are

Railway insulators are specialised products designed for the 25 kV AC overhead equipment (OHE) used by Indian Railways for electric traction. The product family includes cantilever insulators (supporting the contact wire), section insulators (electrically segmenting OHE feeding sections), bracket insulators, and various pin and post insulators in railway-specific designs. Railway insulators must withstand mechanical vibration from passing trains, contact arc damage, and weather exposure on viaducts and at outdoor installations.

Modern Insulators Limited (MIL) is the dominant supplier in this category, supplying approximately 80% of Indian Railways' annual requirement. IEC participates in this segment but at a smaller scale.

Where they are used

All electrified Indian Railways routes use 25 kV AC OHE insulators, both for new electrification and for replacement on existing electrified routes. Indian Railways has targeted 100% electrification by FY26, which has driven elevated demand. The customer is essentially a single buyer — Indian Railways through its zonal railways and approved EPC contractors. Metro rail systems and dedicated freight corridors also use related products.

What the images reveal

The factory and trade-show images do not specifically isolate railway insulators, although Figure 5.1 (the studio shot in Category 5) likely includes some railway-specific products at the right edge. The annual reports explicitly list "Railway Insulators" as one of the four core product categories. Without specific railway-product images, we rely on the textual confirmation that this is a meaningful product line.

NEP and HVDC alignment

Demand outlook — Moderate but plateauing. Indian Railways electrification is approaching completion, which means new-route demand will moderate after FY26. Replacement demand will continue. Not leveraged to NEP 2023–32 transmission expansion or HVDC.

Pricing and margin — Moderate. Indian Railways procurement is rate-contract driven with multi-vendor allocations, which limits pricing power. Margins are decent but not premium.

Competitive moat — Limited at IEC's scale. MIL's dominant 80% share reflects deep relationships and economies of scale that IEC has not built in this category. IEC participates as a secondary supplier rather than a primary one.

Capability rating · Adequate

Functional capability but a small share of the railway insulator market. Not a strategic priority and not aligned with the NEP/HVDC investment thesis.

07

Category seven · Margin contributor

ESP and Speciality Insulators

APPLICATION	ESP, custom industrial, export-spec
CAPABILITY RATING	Solid
EST. % OF REVENUE	5–10%
NEP/HVDC FIT	Indirect

What they are

Electrostatic Precipitator (ESP) insulators are specialised hollow porcelain insulators used in pollution control equipment at thermal power plants, cement plants, and steel plants. The application is electrically charging particulate matter in the flue gas and collecting it on grounded plates — a process that uses high-voltage DC. ESP insulators must operate continuously in high-temperature, high-particulate, corrosive environments.

Beyond ESP, the speciality category includes any non-standard insulator manufactured to customer-specific design, such as custom-shaped insulators for special applications, transformer bushings for unusual voltage classes, and export-specification products meeting ANSI/IEEE standards (such as the TR Series Solid Core Insulators IEC has developed for the US market).

Where they are used

ESP insulators are sold to thermal power plant operators (NTPC, state generation companies, private IPPs), cement manufacturers (UltraTech, Shree Cement, Ambuja), and steel plants (Tata Steel, JSW, SAIL). Speciality insulators are sold globally to industrial customers, often through direct OEM relationships.

What the images reveal

Figure 7.1 · ELECRAMA 2025

Trade show display of solid core post insulators, including units that may be configured for export markets such as the US (TR Series).

The export-spec products visible at the trade show, combined with the annual report disclosure that IEC has developed "TR Series Solid Core Insulators" specifically for the US market, indicate active speciality and export-spec product development. The US market entry is explicit in the FY25 export country list. The trade-show booth also explicitly lists ESP as an application for porcelain hollow insulators (see Figure 2.3).

NEP and HVDC alignment

Demand outlook — Niche but stable. ESP demand is driven by emission control regulations on thermal power plants and industrial facilities — Flue Gas Desulphurisation (FGD) and ESP retrofit programs. Not directly NEP-leveraged but a defensive cash-flow product. Speciality and export products are upside optionality, particularly given India's geopolitical tailwind in the US market versus China.

Pricing and margin — Premium. ESP insulators are higher-margin than standard porcelain due to specialised design and limited competition. Export speciality products carry strong margins when they qualify for premium markets like the US.

Competitive moat — Niche-specific. Few Indian manufacturers serve the ESP segment effectively, giving IEC a defensible position. Export-spec capability requires international type-test approvals and quality certifications that are time-consuming to build — IEC's 33-country export footprint is a meaningful credential.

Capability rating · Solid

Niche but defensible product positioning, with clear export-market upside. Not the largest category by volume but a useful margin contributor and a hedge against domestic-only revenue concentration.

SECTION III

Portfolio Summary

The following matrix summarises each category's NEP/HVDC alignment, capability rating, estimated revenue contribution, and outlook over the FY26–FY32 period.

Category	NEP fit	Capability	% revenue	FY26–FY32 outlook
UHV Solid Core Post	**HIGH**	**Strong**	15–25%	Strong growth from 1,090 GVA substation buildout
Hollow Insulators	**HIGHEST**	**Strong**	20–30%	Acute shortage; 12–16 month lead times; HVDC bushing demand peaks FY27–30
Porcelain Long Rod	**MEDIUM**	**Solid**	5–10%	Growing as utility approvals mature; faces composite competition
Disc Insulators	**LOW–MED**	**Solid**	25–35%	Stable volume; structural composite-substitution headwind
Station / Sub-Trans Post	**LOW**	**Solid**	10–15%	Steady distribution / sub-transmission demand
Railway Traction	**LOW**	**Adequate**	5–10%	Plateauing post-FY26 electrification completion
ESP and Speciality	**INDIRECT**	**Solid**	5–10%	Niche margin contributor; export upside via US TR Series

Note: Revenue percentage estimates are inferred from product portfolio breadth, factory image evidence, and industry-typical mixes. Actual segment-wise revenue is not disclosed in IEC's annual reports. The hollow insulators row is highlighted because this category is the single most NEP-leveraged and most shortage-exposed in the portfolio.

The NEP and HVDC demand map

Of the seven product categories, three are directly leveraged to the NEP 2023–32 transmission and substation buildout. These three cumulatively represent approximately 50–60% of IEC's revenue:

Hollow Insulators — the single most NEP-aligned product. The 1,090 GVA transformation capacity addition, the 9 new HVDC corridors, and the offshore wind / green hydrogen evacuation systems all consume hollow insulators at higher rates than any other porcelain product. The current 12–16 month lead times in this category translate directly to pricing power for capable suppliers like IEC.

UHV Solid Core Post — strongly leveraged to substation buildout. Every new 400 kV and 765 kV substation in the NEP plan requires hundreds of these units. The visual evidence of commercial-scale UHV production in

March 2025 confirms IEC is capturing this demand.

Porcelain Long Rod — moderately leveraged to transmission line additions. Growth potential exists but the category competes with composite long-rods, limiting upside. IEC's utility approvals pipeline is the gating factor here.

The remaining four categories (disc insulators, station posts, railway, ESP/speciality) are not directly NEP-leveraged but provide volume utilisation, cash flow stability, and margin diversification.

SECTION IV

Capacity Expansion Scenarios

The 210 crore capacity expansion taking dispatchable capacity from 16,500 MT to 36,000 MT by December 2026 is the central operational event for the company over the next 24 months. The key question for investors is which product categories will absorb the additional 19,500 MT of dispatchable capacity. Three plausible scenarios exist:

Bull case · Mix shift to premium

Substantial proportion of new capacity is allocated to hollow insulators and UHV solid core posts (the high-margin, NEP-aligned categories). Realisation per MT improves significantly, and the EBITDA margin profile expands meaningfully. This scenario is supported by the visible UHV production evidence in March 2025 batch images and the trade-show emphasis on apparatus hollow insulators.

Base case · Proportional expansion

Capacity is expanded across the portfolio in roughly current proportions. Realisation per MT remains broadly stable, but volume growth drives revenue expansion. Margins remain at current levels rather than expanding meaningfully. This is the scenario consistent with the historical product mix.

Bear case · Volume absorption

New capacity is heavily allocated to commoditised disc and distribution-class products to absorb volume quickly. Realisation per MT may actually fall, and margin pressure persists. This scenario is unlikely given management's stated focus on "high-performance, technologically advanced insulators" but cannot be entirely ruled out.

The mix decision on the new 19,500 MT dispatchable capacity is the single most important strategic question for an investor in this name. Direct discussion with management — or close monitoring of the customer concentration disclosed in coming annual reports — is the way to resolve which scenario plays out.

SECTION V

Conclusion: What the Images Tell Us

Visual evidence of a manufacturing operation is often more revealing than written disclosures, and in IEC's case the gap is significant. The annual reports describe the company in modest, almost defensive language — "Insulator Division reported a loss before interest and tax of 34.11 crores" sits alongside "successfully developed 765 kV 31 mm/kV Solid Core Post Insulators" as if both were equally newsworthy. The factory and trade-show photographs tell a different story: this is a credible Tier-1 porcelain manufacturer with genuine UHV capability, full-spectrum product breadth, and explicit market positioning toward the substation-apparatus segment that the NEP 2023–32 will most heavily fund.

Three observations from the visual evidence

Capability is more substantive than disclosure suggests. Figure 1.2's batch of 12-plus UHV solid core posts in commercial-scale production in March 2025 is the kind of evidence that contradicts the modest annual report language. Companies that produce at this voltage class at this batch size belong in the same conversation as Modern Insulators, Aditya Birla Insulators, and BHEL's insulator unit — not as marginal players.

The portfolio is well-positioned for the NEP cycle. Approximately 50–60% of estimated revenue sits in product categories directly leveraged to NEP 2023–32 substation and transmission buildout. The hollow insulator emphasis on the trade-show booth, listing SF6 CB / CT / PT / LA / ESP as application areas, signals deliberate strategic positioning toward the highest-margin segment.

The capacity doubling has product-mix optionality. The 19,500 MT new dispatchable capacity coming live in December 2026 is the lever that turns capability into financial outcomes. If management directs this capacity toward hollow insulators and UHV solid core posts (the bull-case scenario), the operating leverage on the company's P&L could be substantial.

For the investor, the visual evidence is supportive of the long-term capability thesis but does not by itself answer the financial-translation question. The annual report numbers — particularly the FY25 segment EBIT loss of 34 crore in the insulator division — show that capability has not yet consistently translated to profitability. The Q3 FY26 reported numbers suggest an operational inflection, but a single quarter of strong numbers requires further validation through audited annual data.

Recommended monitoring framework

Verify that Q3 FY26 operating performance sustains for 2–3 more quarters.

Track product-mix disclosures in FY26 annual report and management commentary on the capacity expansion mix.

Watch for major utility approvals on UHV and HVDC apparatus products, particularly any 800 kV DC HVDC bushing qualification, which would materially upgrade the capability assessment.

The company is at an inflection point where capability and capital alignment are converging with a once-in-a-decade industry demand cycle. Whether the financial outcomes match this conjunction is the question the next 18 months will answer.

APPENDIX

Methodology, Caveats and Glossary

Sources used

Eleven factory and trade-show photographs of the IEC Mandideep facility, sourced from the public domain (Google Maps user uploads, ELECRAMA 2025 trade show photographs).

Hindusthan Urban Infrastructure Limited Annual Reports for FY23, FY24 and FY25, including Management Discussion & Analysis sections, segment reporting, and director re-appointment notices.

Industry context from IEEMA sector reports, Central Electricity Authority publications on the National Electricity Plan 2023–32, and trade publications on the Indian insulator market.

Public peer disclosures from Modern Insulators Limited, Aditya Birla Insulators / Grasim, and trade directories listing Indian porcelain manufacturer capabilities.

Methodological caveats

This report relies primarily on visual interpretation of factory and trade-show photographs to infer product capability. While visual evidence is often more revealing than annual report language, it has inherent limitations:

Voltage class assessments from photographs are inferential, based on physical dimensions, shed profiles, and grading ring presence. Definitive voltage class confirmation requires customer purchase order details or type-test certificates that are not available in the public domain.

Production volume estimates from yard photographs are visual approximations and should be interpreted as indicative rather than precise.

Revenue percentage estimates by product category are inferred from portfolio breadth, image evidence and industry-typical mixes. The company does not disclose product-category revenue split in its annual reports, so these are analytical estimates rather than reported figures.

What this report does not cover

This report focuses on product capability assessment based on visual and disclosure evidence. It does not include financial analysis or valuation of the company, comparison of management quality or governance, detailed peer benchmarking on capacity, capacity utilisation or financial metrics, forecasts of revenue, margins or cash flows under specific scenarios, or investment recommendations or target prices. These topics require separate analysis based on financial modelling, peer studies, and direct management interaction.

Glossary of technical terms

Term	Meaning
AC / DC	Alternating Current / Direct Current. HVDC = High Voltage Direct Current.
ckm	Circuit kilometres — measure of transmission line length.
CPRI	Central Power Research Institute, the principal Indian high-voltage testing facility.
EHV / UHV	Extra-High Voltage (typically 400–765 kV) / Ultra-High Voltage (above 765 kV).
EPC	Engineering, Procurement and Construction contractor.
ESP	Electrostatic Precipitator — pollution control equipment at thermal power plants.
GVA	Giga Volt-Ampere — measure of transformer / substation transformation capacity.
HVDC	High Voltage Direct Current — used for bulk long-distance power transmission.
IEC (in this report)	Insulators & Electricals Company, the manufacturing unit of HUIL at Mandideep. Not the International Electrotechnical Commission.
ISTS	Inter-State Transmission System, operated centrally by PGCIL.
kN	Kilonewton — measure of mechanical strength rating for disc insulators.
MT	Metric Tonne — measure of porcelain production volume.
NEP	National Electricity Plan.
OEM	Original Equipment Manufacturer (e.g., transformer maker).
OHE	Overhead Equipment — railway traction electrification system.
PGCIL	Power Grid Corporation of India Limited — the central transmission utility.
RTV	Room Temperature Vulcanising — silicone coating applied to porcelain insulators for pollution mitigation.
TBCB	Tariff-Based Competitive Bidding — procurement mechanism for transmission projects.

END OF REPORT