NATHAN RESEARCH GROUP

MARKET STUDY
POWER & THE GRID
SEOUL · 2026-08

MARKET RESEARCH MONOGRAPH

The Grid Equipment Market where the product is a delivery date

A study of the world market for power transformers, cable, switchgear and HVDC — what is actually traded, the two quantities that circulate under one name and cannot be added, where the chain binds, and why the country that supplies the equipment took twenty-two years to finish one of its own lines.

FORWARD ORDER BOOK — SIX SUPPLIERS

~$160bn

four reporting groups

POWER TRANSFORMERS, 2026

$26–32bn

three dated house readings

POWER TRANSFORMER LEAD TIME

128 weeks

Q2 2025 survey · average

KOREA, TRANSFORMER EXPORTS FY2025

$1.3bn

units 10,000 kVA and above

Evidence base: the IEA's *Building the Future Transmission Grid* (2025-02-27, read from the published PDF) for chain structure, lead times and trade · five market-research publishers on 2026 sizing, each carrying its own publication date where one could be established · Wood Mackenzie via POWER Magazine on lead times and demand growth · results disclosures from Siemens Energy, GE Vernova and the Korean makers, reported by Bloter, The Elec, Hankyung, ZDNet Korea and Seoul Economic Daily · Korea Customs Service and the Korea International Trade Association on exports · Ofgem, ENTSO-E and KEPCO on capital plans. Of the nine Korean listed participants named here, one is collected in the repository; no filing collection was performed for this study. Figures are as published by the named sources; the evidence base was compiled 2026-08-12.

NOT INVESTMENT ADVICE
NO PRICE TARGET
PREPARED 2026-08, SEOUL

Contents

THE ANALYTICAL SPINE

The document runs the market forward: the instrument it has to be measured in, the price of a delivery date, where the chain actually binds, the load that arrived and changed the order flow, and the capacity answer with the clock it lands on. Korea comes last, on both sides of the same constraint. Three market environments and three transferable findings close.

Sections, and the exhibits that carry them

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HOW TO READ THIS DOCUMENT

This is a study of a market. Companies appear as the lens that makes it legible: their disclosures evidence how the market behaves, never what they are worth. There is no valuation, no price target and no buy or sell framing here, and where no credible figure exists an exhibit stops.

Executive Summary

SOLD FORWARD
AGAINST ONE YEAR'S FLOW

Six companies, reporting in four groups, are carrying about **US$160bn of grid orders they have not yet delivered**[1]. The whole world market for power transformers, on the largest of the specialist publishers' 2026 readings, is **US$32.03bn**[2]. Neither figure is wrong. One is a multi-year stock of commitments; the other is a single year's flow — and averaging them destroys the finding.

FORWARD ORDER BOOK · SIX SUPPLIERS	SAME, 2026 DISCLOSURE ONLY	POWER TRANSFORMERS, 2026	KOREAN BIG THREE, REVENUE COVER
~$160bn	**~$130bn**	**$26–32bn**	**2.4 years**
four reporting groups	five suppliers	three dated house readings	₩36.7tn ÷ ₩15.01tn

The four books are not one measurement. Two are segment backlogs — Grid Technologies inside Siemens Energy at €51bn[3], and Electrification inside GE Vernova at US$44.6bn after the Prolec GE consolidation[4]. One is a grid-pure company at more than US$30bn, and **that is a 2024 reading; no later figure was located**[5]. One is a group total for three Korean makers, ₩36.7tn[6], which includes a construction division this study places outside its scope and whose own published components sum to ₩36.9tn[7]. On 2026 disclosure alone the five suppliers that reported this year hold about **US$130bn**[1]. Against either figure the publishers' 2026 readings run US$26.18bn[8] to US$32.03bn[2] — a spread this study prints as a band, house by house.

EXHIBIT 1 **Four reporting groups, and what each has sold forward — US$bn, two of the four converted at the rates in the source line**



Sources: Siemens Energy fiscal Q3 2026 results, 2026-08-05, for the Grid Technologies segment backlog of €51bn · GE Vernova Q2 2026 results for the Electrification segment backlog of US$44.6bn, up from US$27.1bn, the step including the Prolec GE consolidation · IEA, *Building the Future Transmission Grid*, 2025-02-27, carrying a 2024 reading for Hitachi Energy · Seoul Economic Daily, 2026-08-06, for the Korean big three combined at ₩36.7tn. Hitachi Energy is published as more than US$30bn and is drawn at that floor, so its position against the two books drawn above it is not a measured ranking. The euro and won conversions are [NRG estimate] at €1.15/US$ and ₩1,400/US$; Exhibit 4 prints the same four books in the currency each was reported in and converts nothing.

WHY IT MATTERS A backlog is a multi-year stock and an annual market size is a one-year flow. §1 settles which of the two this market clears on.

What the evidence establishes

FIVE FINDINGS
AND TWO OMISSIONS

Five findings survive the sourcing rules this study applies. The first three describe how this market is measured rather than how much it will sell; the last two describe where it binds.

EXHIBIT 2 **The five findings, and where each one is established**

FINDING	WHAT THE RECORD SHOWS	WORKED THROUGH IN
There is no agreed size for this market	Five publishers span US$26.18bn to US$32.03bn on power transformers; only the three that are 2026-vintage and dated set the band.	E5 Mordor Intelligence, 2026-05-27 Coherent Market Insights published 2026-04-03
The participants sold years of revenue forward	₩36.7tn of backlog for Korea's three largest makers against ₩15.01tn of FY2025 revenue — 2.4 years sold [NRG estimate]; components sum to ₩36.9tn.	E1, E24 Seoul Economic Daily, 2026-08-06 ZDNet Korea, 2026-02-06
The most-quoted figure was measured in 2024	The four-year transformer lead time still quoted in 2026 is survey data collected in 2024; the newest global reading is a Q2 2025 survey.	E8 IEA, published 2025-02-27 Wood Mackenzie, 2026-01-02
Permitting binds the chain, and it has no supplier	One steel grade, about five makers at 765 kV, some sixty cable-lay vessels — and permitting, which no capacity investment reaches.	E12–E15 IEA, published 2025-02-27 Businesskorea, 2026-03-18
Korea sells the equipment its own grid waits for	North Dangjin–Sintangjeong ran from about 2002 to April 2025; site selection alone took more than ten years.	E24, E28 Seoul Economic Daily, 2026-05-02

None of the five is a forecast. What the record supports is the shape of the market: what is traded, how long a commitment takes to become a delivery, and which layer sets the date.

Nine Korean listed participants in this market are named here, and all nine file with the regulator. One of them is collected in the repository — the only one whose filings this study holds — and no filing collection was performed for this study, so every backlog, revenue and export figure for the other eight is dated public reporting of a disclosure rather than a document read.

TWO FIGURES THIS STUDY WILL NOT PRINT

The first is a share of this market held by a named company. No house publishes one for transformers or for cable: the ranking that circulates for Korea carries no share, no product code and no year, and the one top-ten cable chart located does not map its labels to its wedges reliably. The second is a price for the traded product. Every price figure here for the equipment itself is an index or a percentage change off a base year, with one exception: the only unit prices disclosed anywhere belong to one supplier's medium- and low-voltage switchgear.

1.1 What is actually traded

THE OBJECT
FIVE PUBLISHERS
THE ORDER BOOK

This market sells a place in a production programme. The ladder below is also a concentration ladder — dozens of makers at the bottom, and at the top whoever has a slot.

EXHIBIT 3 The object — six voltage classes, three product families, and the rung where the supplier count collapses

SIX VOLTAGE CLASSES AND THREE PRODUCT FAMILIES · NOTHING BELOW IS DRAWN TO SCALE

HVDC	>400 kV DC	long distance, subsea, asynchronous ties
A separate class, not a rung above 765 kV — DC cable waits more than five years		
Ultra high voltage	765 kV	long-haul bulk transfer
About five makers worldwide, two of them Korean		
Extra high voltage	345–500 kV	bulk transfer
Power transformer lead time 128 weeks on the Q2 2025 survey		
High voltage	72.5–345 kV	sub-transmission and substation
Switchgear lead time about 44 weeks on the same survey		
Medium voltage	35–72.5 kV	industrial and campus
SF6 banned in new equipment ≤24 kV from 2026-01-01, ≤52 kV from 2030-01-01		
Distribution	<35 kV	last mile
Prices up to +95% since 2019		

Large power transformers	**High-voltage cable**	**HV switchgear and breakers**
above ~10 MVA, per project	AC above 66 kV, and DC	HVDC adds converters

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for the class definitions and the DC cable waiting list · Businesskorea, 2026-03-18, for the count of 765 kV makers · Wood Mackenzie, via POWER Magazine, 2026-01-02, for the Q2 2025 lead times and the distribution price movement · EU F-gas Regulation for the SF6 dates. No quantity in the record covers all six classes, so the rungs carry conditions rather than one measure. The nearest it comes is a 765 kV maker count beside a Korean count of makers above 10,000 kVA, and those are a voltage class and a capacity class that neither source supports splicing.

Exhibit 1 converted these four books into one currency so their sizes could be compared. As reported they are four different measurements, and the scope column is where the differences sit.

EXHIBIT 4 The four order books, and what each one measures

PARTICIPANT	MEASURE, AS REPORTED	PERIOD	SCOPE
Siemens Energy	Grid Technologies backlog, €51bn	Fiscal Q3 2026	A segment inside the group
GE Vernova	Electrification backlog, US$44.6bn	Q2 2026	A segment; the step from US$27.1bn includes the Prolec GE consolidation
Hitachi Energy	Company backlog, more than US$30bn	2024	A grid-pure company, and the only 2024 reading here; no later figure was located
Korean big three	Combined backlog, ₩36.7tn	Q2 2026	A group total; it includes a construction division outside this study's scope, and the same quarter's published components sum to ₩36.9tn

Sources: Siemens Energy, fiscal Q3 2026 results, 2026-08-05 · GE Vernova Q2 2026 results · IEA, 2025-02-27, carrying the 2024 Hitachi Energy reading · Seoul Economic Daily, 2026-08-06, for the Korean combined total, whose three Q2 2026 components were disclosed separately (Bloter, 2026-07-31; The Elec, 2026-07-28 and 2026-07-23) and sum to ₩36.9tn. Nothing in this table is converted.

1.2

Five readings, one product

THE OBJECT
FIVE PUBLISHERS
THE ORDER BOOK

Five publishers size the same product. Three of them published a 2026 reading with a date on it, and those three are the only ones that set a band.

EXHIBIT 5 **Five published readings of the power-transformer market — three of them 2026-vintage and dated**



Sources: Coherent Market Insights, published 2026-04-03 · Persistence Market Research, published 2026-05 · Mordor Intelligence, report dated 2026-05-27 — the three 2026-vintage dated readings, and the only members of the US$26.18bn–US$32.03bn band. Grand View Research is drawn but excluded from the band because no publication date for it could be established. market.us is drawn but excluded on a different ground: it is dated 2026-07-02 and its US$26.5bn is a 2025 base, consistent with the band's floor without setting it. Fortune Business Insights' US$80.8bn is deliberately off this axis — it counts all transformers, distribution units included, which is a different product set (relayed via Herald Business, 2026-07-19).

Orders ran ahead of revenue in the same quarter at each of the three suppliers below, on one observation apiece and with no earlier quarter to compare it against.

EXHIBIT 6 **One quarter, three suppliers — orders against revenue**

PARTICIPANT	PERIOD	ORDERS	REVENUE	RATIO
Siemens Energy · Grid Technologies	Fiscal Q3 2026	€5.4bn, +28% YoY	Not disclosed in the sources located	1.48, as reported
GE Vernova · Electrification	Q2 2026	US$6.3bn	US$3.6bn	1.7×
LS Electric	Q2 2026	~₩2.1tn	₩1.577tn	1.33 [NRG estimate]

Sources: Siemens Energy, fiscal Q3 2026 results, 2026-08-05 · GE Vernova Q2 2026 results · LS Electric Q2 2026 results, 2026-07-23. Exactly one book-to-bill observation exists for each of these three suppliers, and no prior-quarter figure was located anywhere in the evidence base, so nothing here supports a claim that the ratio has persisted. LS Electric's 1.33 is [NRG estimate], ₩2.1tn ÷ ₩1.577tn.

1.3 The budgets it is bought out of

THE OBJECT
FIVE PUBLISHERS
THE ORDER BOOK

Transformers, cable and switchgear are bought out of transmission capital budgets, and those budgets are the ceiling above this market. There are five of them below, and no two cover the same thing over the same period.

EXHIBIT 7 **The budgets this equipment is bought out of — five envelopes, three currencies, five horizons**

BUDGET	AMOUNT	PERIOD	WHAT IT COVERS
Global transmission investment	US$140bn, +10% YoY	2023	All transmission capital worldwide. More than US$200bn a year is required by the mid-2030s, and US$250–300bn for full emissions goals
US utility capex	~US$1.3tn	2026–2030	The whole US utility capital programme, on a 4.1% demand growth CAGR
Ofgem RIIO-3	£28.1bn upfront, in a ~£90bn pipeline	2026-04-01 to 2031-03-31	Three GB electricity transmission networks and one gas network, under a price control
ENTSO-E offshore transmission	~US$420bn	to 2050	54,000 km of offshore transmission across European markets
KEPCO 11th transmission plan	₩72.8tn	to 2038	70 routes and 3,855 km of transmission and substation, plus ₩10.2tn of distribution

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for global transmission investment and for the ENTSO-E offshore figure · S&P Global Market Intelligence, 2026-04, for US utility capex and the demand CAGR · Ofgem Final Determinations, published 2025-12-04 · KEPCO 11th Long-term Transmission and Substation Plan (2024–2038). Nothing here is converted and nothing is summed.

None of these envelopes is an equipment budget. Each is a larger programme — a price control, a utility capital plan, an offshore build-out — inside which this equipment is a line item nobody publishes separately. Adding them would double-count the same wires; converting them would imply a common horizon they do not have.

How the money is committed varies as much as how much of it there is. European buyers increasingly contract through frameworks with a fixed component and a variable one indexed to inflation or raw material prices, while contracts in the United States are generally still project based[5]. For a supplier, a European framework is revenue visibility and a US project order is a slot sale.

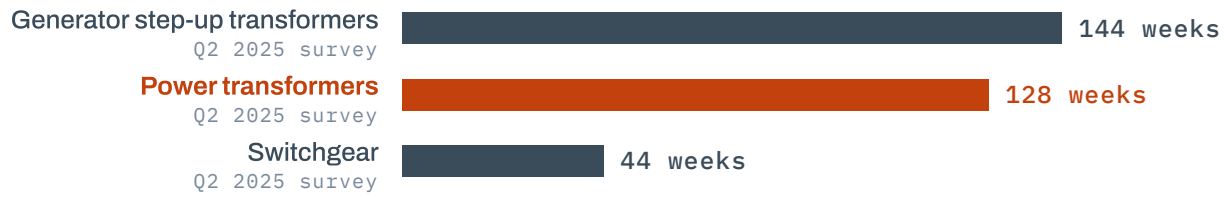
Both instruments were written before the chain tightened, and two European projects show what that does mid-build: the Princess Elisabeth Island project in the North Sea moved from an estimated US$2.3bn in 2021 to US$7.3bn, and the Harmony Link interconnector between Poland and Lithuania slipped from 2025 to 2028 on budget overruns[5].

2.1 How long, and how much more

LEAD TIMES
TWO BASE YEARS
ONE AUDITED SERIES

The traded good is a delivery date, so the operating price of this market is time. It is measured in weeks, by survey, and no 2026-vintage global survey of it has been published.

EXHIBIT 8 Lead times as last surveyed — weeks, on a Q2 2025 survey



Source: Wood Mackenzie, via POWER Magazine, 2026-01-02, on a Q2 2025 survey — the newest global lead-time measurement located, which is why the survey date sits on every bar. One 2026-vintage observation was located and is not drawn here: US substation transformer lead times ran roughly 140 weeks in 2023 and more than 160 weeks in 2026 (Korean industry compilation via Seoul Economic Daily, 2026-07-02). The four-year figure still quoted as current is IEA survey data collected in 2024 and published 2025-02-27, and it is not a bar on this chart.

Money moved too, and the two houses that measured it chose different base years for a nearly identical number.

EXHIBIT 9 Price movement, by house and by base year — the two series that do not reconcile

SERIES	MOVEMENT	BASE YEAR	MEASURED BY, AND WHEN
Power transformer price index, real 2018 US$	About +75%	2021	IEA, 2024 survey
Power transformers	+77%	2019	Wood Mackenzie, 2026-01-02
Generator step-up transformers	+45%	2019	Wood Mackenzie, 2026-01-02
Distribution transformers	up to +95%	2019	Wood Mackenzie, 2026-01-02
Cable price index, real 2018 US$	nearly doubled	2019	IEA, 2024 survey
Power transformers, upper tail of the spread	2.6× pre-pandemic, in real terms	2019	IEA, 2024 survey

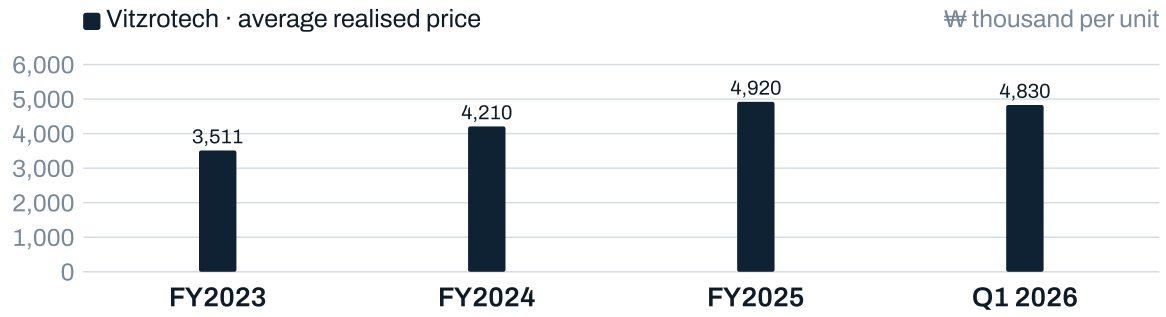
Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, on its 2024 survey, for the two indices and the upper tail · Wood Mackenzie, via POWER Magazine, 2026-01-02, for the three percentage movements. The +75% and the +77% are not one measurement taken twice: one runs from 2021 and the other from 2019. The evidence base does not reconcile them, and neither does this exhibit.

2.2 One audited price, and the floor under it

LEAD TIMES
TWO BASE YEARS
ONE AUDITED SERIES

Every price the equipment itself has carried so far is an index or a percentage change off a base year. One issuer publishes audited unit prices for three fiscal years[9] and the quarter after them[10], at medium voltage rather than 765 kV.

EXHIBIT 10 **The only issuer-audited price series in this study — a medium-voltage vacuum circuit breaker, ₩ thousand per unit**



Source: Vitzrotech (KOSDAQ 042370), Annual Report FY2025, filed 2026-03-23, and Quarterly Report Q1 2026, filed 2026-05-15; both receipts are in the source register. The first three columns are fiscal years and the fourth is a single quarter, so the 40.1% rise is FY2023 to FY2025 and the 1.8% easing is one quarter measured against an annual average, both [NRG estimate] on the four values drawn above. The filing's own category translates literally as high voltage but denotes medium voltage in IEC terms; at ₩3.5–4.9m per unit these are medium-voltage vacuum breakers, so the title uses the IEC class and not the filing's literal word.

Under those prices sits a bill of materials the maker does not set, and one of its metals set an all-time high this year.

EXHIBIT 11 **The cost floor — what the product is made of, and what those inputs did**

INPUT	SHARE OF THE PRODUCT	PRICE, AND AS AT
Grain-oriented electrical steel	More than 20% of a large power transformer's cost	Doubled between 2021 and mid-2023
All materials together	More than 50% of transformer cost	—
Copper	About 60% of a copper cable's weight	LME all-time high US$14,527.50/t, 2026-01-29; three-month US$14,258/t, 2026-08-07
Aluminium	Up to 80% of an aluminium cable's weight; about 18% of an HV overhead line	LME US$3,336.25/t, 2026-08-10
High-power semiconductors	No published share — converter valves and DC breakers	In shortage on the 2024 survey

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for every share of cost or weight, for the steel price move and for the semiconductor shortage · Investing News Network compilation, 2026-08, for the two LME copper prices · Trading Economics, 2026-08-10, for LME aluminium. Two different quantities sit side by side here and are not comparable with each other: a share of the finished product, and a market price for the input. Neither is plotted.

3.1 Seven layers, and the three that bind

SEVEN LAYERS
THREE CHOKEPOINTS
FOUR POSITIONS

Seven layers separate electrical steel from an energised substation. Published concentration clusters in the middle of the chain, and the first of the three chokepoints below sits outside it, at the upstream end, where no concentration share is published. One of the seven layers has no supplier to concentrate at all.

EXHIBIT 12 The chain in seven layers — named holders, and a published share for three of them

01	**Materials**	Cleveland-Cliffs, the one US producer of grain-oriented electrical steel	No published share
02	**Transformer manufacture**	Hyosung Heavy, HD Hyundai Electric, LS Electric, Hitachi Energy, Siemens Energy, Prolec GE	No published share
03	**Cable manufacture**	LS Cable & System, inside the global top ten; Sumitomo Electric prominent in Asia-Pacific	Top ten ~50% of the global market
04	**HVDC cable and converters**	NKT, Prysmian, Nexans; Hitachi Energy, Siemens Energy, GE Vernova	Cable trio ~two-thirds; converters ~60–65% single-tier
05	**Switchgear**	Five full-line firms, counted but not named	~55–65% of US HV switchgear, single-tier
06	**Installation and permitting**	No supplier at all — permitting and right-of-way	No published share
07	**The buyer**	Regulated TSOs, US integrated utilities, data-centre developers	No published share

Three of the seven layers publish a share; none of the three resolves to a company
Permitting sits inside the chain, not beside it: no supplier, and no plant shortens it

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for the HVDC cable share, the slot position and the permitting layer · IEA analysis of S&P Capital IQ, 2023 data, for the cable top ten · trade compilation, 2026, single-tier, for the converter and US switchgear shares · Businesskorea, 2026-03-18, and Herald Business, 2026-07-19, for the transformer makers · US Department of Commerce reporting, 2020, for the single US steel producer. The published cable top-ten pie carries wedge values but no reliable mapping from label to wedge, which is why layer 03 stays at the group level.

EXHIBIT 13 The three deepest chokepoints

CHOKEPOINT 1

Grain-oriented electrical steel

A third of world output sits in one country, and the IEA's supply-chain analysis records no substitution pathway.

>20% of transformer cost

CHOKEPOINT 2

765 kV design and build

About five makers worldwide, two of them Korean. Hyosung's Memphis phase-3 expansion completes in 2028.

~5 makers · 2 of them Korean

CHOKEPOINT 3

HVDC cable, and the ships that lay it

Three European makers hold about two-thirds, with slots booked to 2030, and DC cable waits exceed five years.

~60 cable-lay vessels

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for the steel cost share, the output concentration, the substitution finding, the HVDC trio, the slot position, the DC cable waiting list and the vessel count · Businesskorea, 2026-03-18, for the 765 kV maker count · Korea JoongAng Daily and PR Newswire, 2025-12, for the Memphis phase-3 announcement and its 2028 completion. Two further layers rank below these three and are not panels: HVDC converters, which Exhibit 14 counts, and permitting, which Exhibit 15 measures in years.

3.2 What is counted, and what is timed

SEVEN LAYERS
THREE CHOKEPOINTS
FOUR POSITIONS

Concentration in this market is published for groups rather than for companies, and every figure counts a different set.

EXHIBIT 14 **Concentration, measured — and what each figure counts**

LAYER	GROUP COUNTED	SHARE OR COUNT	BASIS AND DATE
Power transformer trade	Four exporting countries	50% of world trade	IEA / UN Comtrade, 2023
765 kV transformers	Makers worldwide	~5, two of them Korean	Businesskorea, 2026-03-18
Transformers above 10,000 kVA	Korean makers · capacity class	3	Herald Business, 2026-07-19
Cable	Top ten makers	~50% of the market	IEA / S&P Capital IQ, 2023
HVDC cable	Three European makers	~two-thirds	IEA, 2025-02-27
HVDC converters	Top three	~60–65% of 2025 orders	Trade compilation · single-tier
US HV switchgear	Five full-line firms	~55–65%	Trade compilation · single-tier

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27 — its UN Comtrade analysis of 2023 trade, and its S&P Capital IQ analysis of 2023 cable data · Businesskorea, 2026-03-18 · Herald Business, 2026-07-19 · trade compilation, 2026, single-tier, for the converter and US switchgear rows. China alone holds about a quarter of world trade, half of that four-country group, and the largest single cable maker about a quarter of that top ten; neither wedge is resolvable to a named company. The 765 kV row is a voltage class and the 10,000 kVA row a capacity class, and no source supports combining them.

The layer that no capacity investment reaches publishes no count at all. It is measured in years instead, and the three national norms below span a factor of more than five.

EXHIBIT 15 **Four positions on the time it takes to develop an extra-high-voltage line**

1.5 YEARS
China
The IEA's development norm for an extra-high-voltage line.

3 YEARS
India
The same norm, twice China's.

~8 YEARS
Europe and the United States
The slowest of the three norms, and the one where the IEA names permitting rather than equipment as the cause of delay.

22 YEARS
Korea · North Dangjin–Sintangjeong
Not a norm: one named line, completed April 2025. Site selection alone took more than ten years.

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for the three development norms · Seoul Economic Daily, 2026-05-02, for the North Dangjin–Sintangjeong line. The first three cards are development norms for a country; the fourth is a single completed project and not a Korean average.

4.1 A small share of energy, a large share of attention

ONE YEAR'S GROWTH
FOUR QUEUES
A NEW BUYER

Demand stopped being this market's constraint two years ago. Data centres are the reason everyone gives, and they were under a tenth of the energy the world added in 2025.

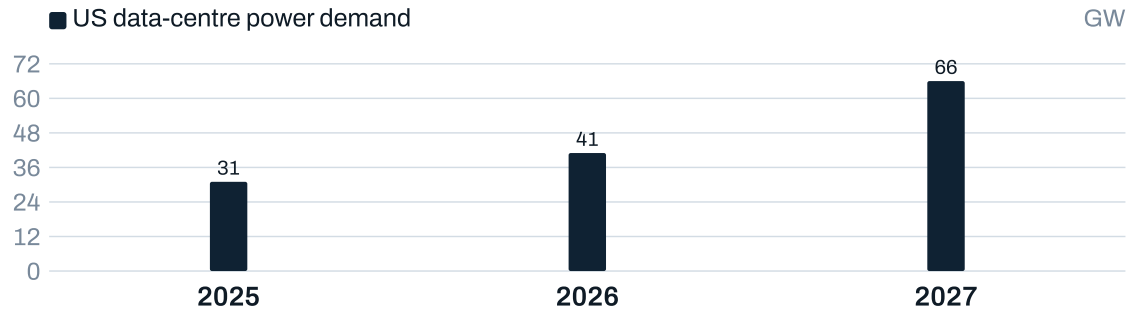
EXHIBIT 16 Where 2025's demand growth came from — per cent of one year's energy growth



Source: IEA *Electricity 2026*, 2026-02-25, for both inputs — data-centre consumption up about 17%, or +70 TWh, against a total demand increase of about 800 TWh. The 8.8% share and the 730 TWh residual are [NRG estimate], 70 ÷ 800 and 800 − 70. The equipment market's attention to data centres is not proportional to this quantity; it is proportional to their share of new interconnection requests, which Exhibit 18 counts.

The data-centre weight sits in applications for capacity, and that quantity is measured in gigawatts.

EXHIBIT 17 US data-centre power demand, one named house — 2026 and 2027 as its forecast, GW



Source: Goldman Sachs Research, 2026 — 31 GW in 2025, 41 GW in 2026 and 66 GW in 2027, the last two the house's own forecast. A separate 2026 compilation puts 2026 at 75.8 GW against about 53 GW in 2023; the two cannot both describe the same quantity, so it is recorded here as an outlier and nothing is averaged. This axis is power capacity in gigawatts and does not share a unit with Exhibit 16.

4.2 Four queues, four definitions

ONE YEAR'S GROWTH
FOUR QUEUES
A NEW BUYER

A connection queue is not a forecast. It is a list of applications, and the four below count four different things, only three of them as at a date this study could verify. What separates them is how much filtering each has already had.

EXHIBIT 18 **Four queues, four definitions**

QUEUE	SIZE	WHAT IT COUNTS	AS AT
ERCOT interconnection queue	>474 GW across >1,800 developments	Proposed load applications. Data centres are about 90% of it, and the whole queue is more than five times the grid's all-time peak	2026-08-03
Solar and wind awaiting connection	1,650 GW	Projects in advanced development, financed and sited, waiting for a connection	2024 tracking
All projects stalled in connection queues worldwide	>2,500 GW	Every technology and every market, in any queue	Publication date not verified
Korea, data-centre grid-impact reviews	736 applications	First-stage technical reviews. 522 of them (71%) were filed for the capital region, about 33,591 MW, and 279 of those were ruled supply-not-possible	Aug 2024 – Mar 2026

Sources: ERCOT and the Public Utility Commission of Texas, via Utility Dive and Texas Tribune, 2026-08-03 · IEA, *Building the Future Transmission Grid*, 2025-02-27, for the 1,650 GW on 2024 tracking · the worldwide figure is also the IEA's and is carried without a publication date this study could verify · Money Today, 2026-05-19, for Korea's grid-impact reviews. The four rows overlap and count different objects; nothing here is summed.

The Texas queue is the one that broke into policy. It grew large enough that the state ordered a pause on data-centre interconnection approvals pending an audit of what those projects would actually draw, generate, cool and pay for[11]. The audit is the admission that nobody could tell which of the applications were real. For an equipment maker that is clarifying rather than damaging: a filtered queue is a schedule, and a schedule is what a factory can be booked against.

Korea's own two numbers for the same load do not agree. The twelfth national electricity plan works to an incremental data-centre demand of 4.0 GW in 2040[12]; the data-centre projects the same government has announced come to 18.4 GW by 2035[13]. That is a 4.6× gap [NRG estimate], 18.4 ÷ 4.0, between a planning assumption and an announcement book, on two horizons drawn from two documents, and the plan is being rewritten because of it[12]. A wider announcement book of 24.7 GW exists and is not the right numerator: it adds semiconductor fabs, which are not data centres[13].

4.3 The buyer that changed the order flow

ONE YEAR'S GROWTH
FOUR QUEUES
A NEW BUYER

A data centre is built in eighteen to twenty-four months. A substation takes three to seven years[14]. That arithmetic is why the buyer stopped waiting for a utility and started contracting the equipment itself.

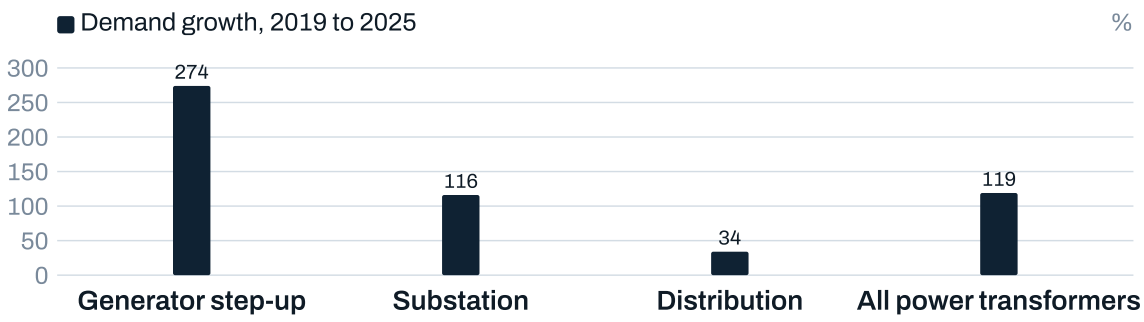
EXHIBIT 19 The new buyer class — the disclosed contract values, each in the currency its own source printed

SUPPLIER AND BUYER	VALUE	TERM, AND WHAT FOR	DISCLOSED
Gaon Cable → Meta	up to ₩4tn	Five years, to 2030-12-31; volumes set by individual purchase orders	2026-05-18
HD Hyundai Electric → an unnamed global big-tech buyer	up to ₩1.1212tn	Long-term; ₩553.9bn distribution and ₩567.3bn power equipment	2026-07
LS Electric → an unnamed US big-tech buyer	US$70m	Switchgear and power supply equipment	2026-05-18
LS Electric → AWS	₩170bn	Distribution panels	2026-05-19
GE Vernova Electrification → data-centre buyers	US$2.7bn in Q2 2026; >US$5bn in H1 2026	Data-centre orders; more than double full-year 2025	Q2 2026

Sources: Gaon Cable disclosure via KED Global, 2026-05-18 · HD Hyundai Electric disclosure via Seoul Economic Daily, 2026-07 · KED Global, 2026-05-18, and Bizwatch, 2026-05-19, for the two LS Electric contracts · GE Vernova Q2 2026 results. Won and dollar values share one column and each cell names its currency; nothing is converted — this study holds no published rate for these contract dates — and nothing is summed. The Meta framework buys bus duct — busway inside a building — and not transmission equipment. Two items are not rows: data-centre transformer contracts for delivery in 2026 and 2027, whose value is not disclosed, and about US$685m of further packages HD Hyundai Electric reports as still in discussion rather than contracted.

The last cycle bought one kind of transformer far harder than the others, and the split says what was being connected.

EXHIBIT 20 Demand growth by transformer role, 2019 to 2025 — one house, four measurements



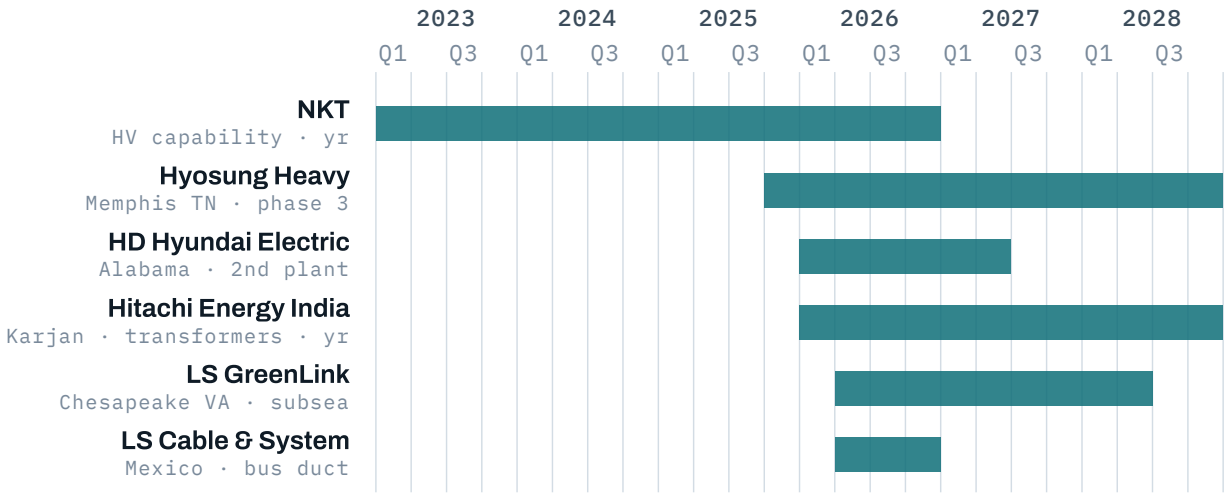
Source: Wood Mackenzie, via POWER Magazine, 2026-01-02. The generator step-up and substation figures are published as 2019 to 2025; the distribution figure and the aggregate are published as "since 2019". The fourth bar is the house's aggregate for the whole power-transformer category rather than a fifth role, and distribution transformers sit outside that category, so the four bars do not add. Generator step-ups are bought when generation is added and substation units when load is added.

5.1 Six expansions, and their dates

SIX EXPANSIONS
TWO CLOCKS

Capacity is the answer this market has already given. What it has mostly not given is a date. Every bar below runs from the quarter its source dates the start to the quarter that source publishes for completion, and eight further announcements are named beneath it because each publishes one of those two dates and not the other.

EXHIBIT 21 **Six announced expansions, from published start to stated operation**



Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for NKT · Korea JoongAng Daily and PR Newswire, 2025-12, for Hyosung Heavy's Memphis phase 3 · Businesskorea, 2026-03-18, and Seoul Economic Daily, 2026-07-06, for HD Hyundai Electric's second Alabama plant · Hitachi Energy India, 2026, for Karjan · Seoul Economic Daily, 2026-06-25, for LS GreenLink's Chesapeake plant and 2026-05-18 for the LS Cable bus-duct plant in Mexico. Two completions are published as a month and the rest as a year or a half year; a year-only completion resolves to the end of its year and a half-year to its later quarter, so no bar ends earlier than its source allows. The flag "· yr" marks a start published as a year only, and such a bar opens at the first quarter of that year. Eight announcements are named here without a bar, because each is missing one of the two dates: Hyosung Heavy's Changwon HVDC plant and its Pennsylvania breaker plant, LS Electric's Utah plant and Texas hub, Siemens Energy's Charlotte transformer plant, Eaton's South Carolina plant, Prysmian's US$2bn programme through 2027, Nexans' Morocco medium-voltage plant and Toshiba's India expansion, those last three from the IEA report named above. North American transformer capacity announced as at January 2026 comes to about US$1.8bn, an aggregate that carries no dates, via POWER Magazine, 2026-01-02.

Read as a schedule rather than as a total, the six say one thing: nothing here completes before 2026 and nothing after 2028. The capacity lands after the books it answers were written, so a buyer arriving now is buying a place behind them.

How much of the shortage closes, and by when, is one house's measurement and no one else's. It puts the United States power-transformer deficit at 30% in 2025, narrowing to about 5% by 2030, and the generator step-up deficit at 47% narrowing to 14% over the same span[15]. Every deficit percentage in circulation here traces to that one survey, so the path is a single forecast rather than a consensus.

What holds the dates out is neither capital nor orders. A cable factory takes three to four years to build and needs skilled labour as well as money, and manufacturers say plainly that they commit capacity only against long-term visibility on demand[5]. The five-year framework in Exhibit 19 supplies exactly that, and a purchase order does not.

5.2

Two clocks the order book does not set

SIX EXPANSIONS
TWO CLOCKS

Two schedules run over this equipment, and no buyer or factory sets either of them. One takes a gas out of new switchgear on fixed dates; the other prices the metal it is made of.

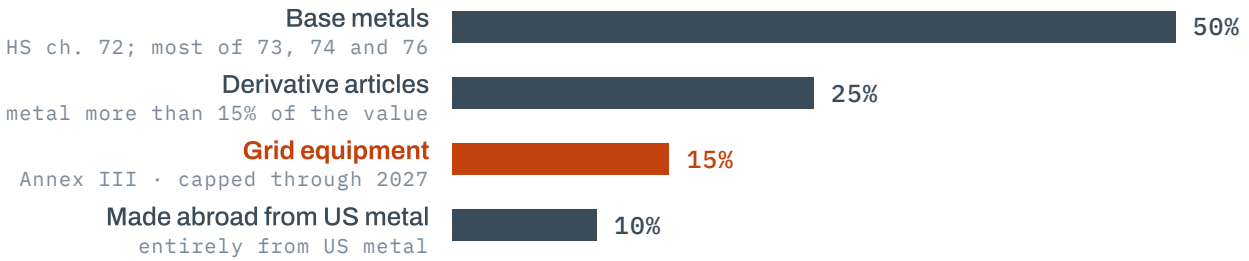
EXHIBIT 22 **The SF6 phase-out, gate by gate**



Source: EU F-gas Regulation. A filled marker means the gate is in force at this study's 2026-08-12 cut-off, not that any supplier has qualified against it. The 2028 gate covers high-voltage switchgear of 52 to 145 kV rated at or below 50 kA, which is narrower than the voltage band alone would suggest. Four of the five gates bind equipment newly placed on the market; 2035 is the date that reaches equipment already installed, through maintenance and repair. SF6 has a global warming potential 24,300 times that of carbon dioxide.

Because the dates are fixed and qualification is not, a European switchgear order placed after January 2026 is a qualification event as well as a purchase. The second clock is a tariff schedule.

EXHIBIT 23 **Section 232 as it now stands — rate by category**



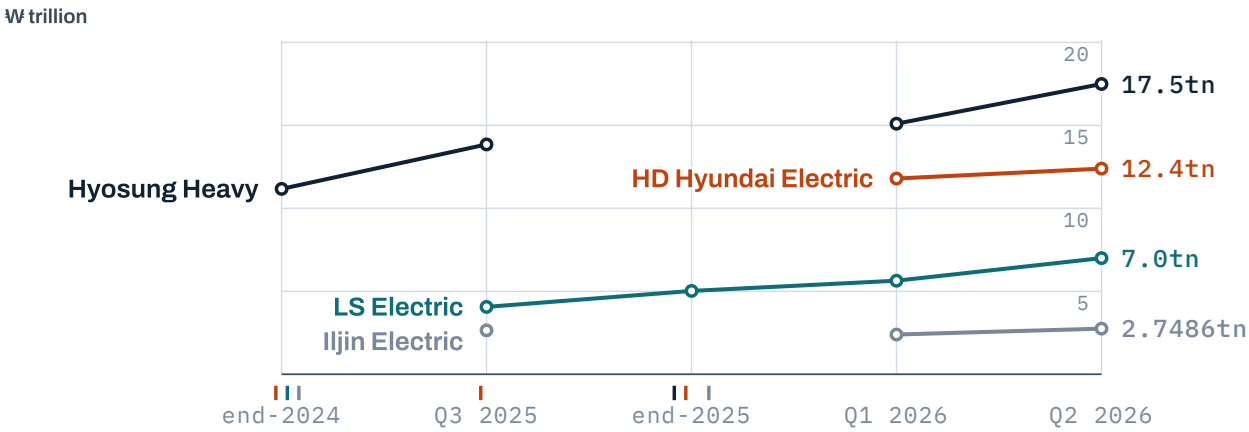
Source: the United States presidential proclamation of 2026-04-02, via a CH Robinson advisory of the same date, effective for goods entered from 2026-04-06. Annex III covers metal-intensive industrial and electrical grid equipment, and its 15% is a cap that runs through 2027. Korea-origin metal goods are advised at a maximum of 15% including base duty under the 2026-06-08 update, on a single tier of advisory. Fourteen further derivative products were proposed on 2026-08-03 with 25% signalled, on trade advisories of that month rather than on the proclamation. The Annex III text was not read for this study, so no rate is asserted here for any specific transformer tariff line.

6.1 The book, and the line that stopped tracking it

THE ORDER BOOK
THE CONTROL CASE
THE GRID AT HOME

Korea publishes two series that get read as the same story: a book of commitments, and a customs count of what actually left the country. They no longer move together.

EXHIBIT 24 Korean order backlog by quarter — ₩ trillion, end-2024 to Q2 2026



A dash below the axis marks a period with no won figure in the sources located
The periods are evenly spaced on this axis; the intervals between them are not equal

Sources by period: Seoul Economic Daily compilation (end-2024 and Q3 2025) · ZDNet Korea, 2026-02-06 (end-2025) · AJU Press, 2026-04-27, and Bizwatch, 2026-05-19 (Q1 2026) · Bloter, 2026-07-31, The Elec, 2026-07-28 and 2026-07-23, and Hankyung, 2026-08-11 (Q2 2026). The earliest point is as reported: its compilation states a quarter without its year. HD Hyundai Electric enters at Q1 2026 because its Q3 2025 book is in dollars, at US$6.983bn, and the one won figure located for that quarter contradicts the company's own disclosure. Taihan Cable & Solution (₩4.0629tn, Q2 2026) and LS Cable & System (₩7.63tn, May 2026) hold one located point each and are named rather than drawn.

The delivered series now stops short of the market in two places.

EXHIBIT 25 The export line, and the two things it can no longer show

MEASURE	VALUE	PERIOD	NOTE
Large power transformer exports, units above 10,000 kVA	US$657.49m → US$701.52m	H1 2025 → H1 2026	+6.7% in dollars. The category counts capacity, not voltage
The same customs series, full year	US$1.3bn	FY2025	First year above US$1bn since 2010, and the highest ever recorded
Of that year, to the United States	US$738m	FY2025	57% of the year [NRG estimate], 738 ÷ 1,300; up about sevenfold in three years
Output built inside the customer's border	Not measured	—	US-built units never enter this series, and no maker publishes the split

Sources: Korea Customs Service, via Herald Business, 2026-07-19, for the two matched half-years · Korea International Trade Association, via AJU Press, 2026-01-21, for FY2025 and the United States share. Against the US$1.3bn full year the half-year figure returns −46%, a period mismatch rather than a decline. The won figures published beside it (₩1,044.2bn and ₩978.7bn) are one conversion of the dollar series at a single implied rate of ₩1,488.5/US$, so the first half-year above ₩1tn is rate-dependent. The two things this series cannot show are the forward book beside it and production inside the customer's border.

6.2

Five participants, and what is not disclosed

THE ORDER BOOK
THE CONTROL CASE
THE GRID AT HOME

Five listed suppliers carry the Korean order book. What the record holds about them is quarterly disclosure reported by dated press; what it does not hold is anything below the company line.

EXHIBIT 26 **Five participants, and what the record does not carry for each**

	HD HYUNDAI ELECTRIC	HYOSUNG HEAVY	LS ELECTRIC	TAIHAN CABLE & SOLUTION	ILJIN ELECTRIC
WHAT IT SELLS HERE	UHV transformers, HV breakers, distribution gear	765 kV transformers, HVDC, breakers	EHV transformers, switchgear, data-centre distribution	EHV and submarine cable, industrial wire	Transformers and breakers; cable
Q2 2026, AS REPORTED	Backlog ₩12.4tn on revenue ₩1.1418tn	Backlog ₩17.5tn on revenue ₩1.687tn	Backlog ₩7.0tn on revenue ₩1.577tn	Backlog ₩4.0629tn on revenue ₩1.1987tn	Backlog ₩2.7486tn on revenue ₩637.4bn
WHAT THE RECORD DOES NOT CARRY	No third-party measure of its US share	No confirmed North American order share	No North American revenue before Q2 2026	No FY2025 revenue located here	No FY2025 revenue located here

Four more participants earn no column here: LS Cable & System is unlisted, inside LS Corp; Vitzrotech is the only one whose filings this study holds; Doosan Enerbility is adjacent and is bounded rather than merged; and KEPCO is the buyer rather than a supplier.

Sources: the five Q2 2026 results releases — Bloter, 2026-07-31 (Hyosung Heavy) · The Elec, 2026-07-28 (HD Hyundai Electric) and 2026-07-23 (LS Electric) · Energy Times, 2026-07-30 (Taihan Cable & Solution) · Hankyung, 2026-08-11 (Iljin Electric). Every figure in the middle row is disclosure reported by press rather than a filing read directly: eight of the nine Korean listed participants in this market are absent from this study's repository, and no collection was performed for it. No margin appears in this table because none of these issuers publishes one for its power-equipment business.

What the books are made of is disclosed unevenly. Three of the five publish a decomposition, and no two of them use the same measure. Iljin Electric publishes its own by destination and by product line, at 76% overseas and 67% heavy electric, as at the end of June[16]. LS Electric published ultra-high-voltage transformers at 54% of its end-2025 book[17]. HD Hyundai Electric publishes the share of its orders linked to data centres, at 1.8% in 2025 and a planned 6.3% this year and 16% in 2027[18].

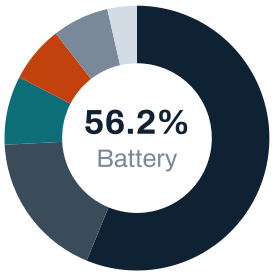
Those three shares count three different things, so they cannot be set beside one another, and the middle row of the table is the only quantity all five publish on a common basis. Below it the record stops. No participant discloses a margin for its power-equipment business, and none publishes how much of its output is made in Korea and how much inside the border of the customer buying it.

6.3 The control case

THE ORDER BOOK
THE CONTROL CASE
THE GRID AT HOME

One Korean grid-equipment maker in this market is held here as filings rather than as press reports, and the cycle did not reach it. Most of its revenue is lithium primary cells, and its power lines sit at medium and low voltage.

EXHIBIT 27 **The control case — Vitzrotech revenue by segment, FY2025**



Battery · Li/$SOCl_2$ cells ₩243.0bn	56.2
Power · low-voltage ₩77.8bn	18.0
Special · aerospace and plasma ₩36.6bn	8.4
Power · MV equipment ₩29.8bn	6.9
Power · switchboards ₩29.7bn	6.9
Relays, metering, other and rental ₩15.4bn	3.6

Source: Vitzrotech (KOSDAQ 042370), Annual Report FY2025, filed 2026-03-23; the receipt is in the source register. Shares are as published in the filing and sum to 100.0%. The 6.9% wedge is the filing's own high-voltage equipment segment — vacuum interrupters, breakers and load-break switches — relabelled here as medium voltage on the basis Exhibit 10 carries: the category translates literally as high voltage and denotes medium voltage in IEC terms. The last wedge is three published lines drawn as one: relays and metering at 2.0% and raw-material resale at 1.4%, both inside the power segment, with rental at 0.2% outside it. The three named Power wedges plus the two power lines inside that tail come to 35.2% at one decimal each; computed from the filing's own won figures the power segment is 35.1% [NRG estimate], ₩151,869m ÷ ₩432,287m.

The whole power segment is 35.1% of the year [NRG estimate]. Inside it the breaker line was flat at −0.3% and the switchboard line fell 39.6%, while consolidated revenue grew 0.9% — all three [NRG estimate] on the segment table the filing publishes[9]. Over the same year Hyosung Heavy grew revenue 21.9% and HD Hyundai Electric 22.8%[17].

Nameplate capacity is the sharper reading. It was identical across FY2024, FY2025 and the first quarter of 2026 at ₩225.0bn a year across the power segment[10]. A maker that did not face the export cycle did not invest against it, and the filings show that decision period by period; nothing here is inferred.

This is a finding about the shape of the market and not a judgement about the company. What ran from 2024 to 2026 was a 765 kV export cycle, identifiable by voltage class and by destination, and it did not reach a supplier whose products sit at medium and low voltage and whose export channel is a US generator-set manufacturer[9].

6.4

The grid it cannot build at home

THE ORDER BOOK
THE CONTROL CASE
THE GRID AT HOME

Korea builds its own transmission slowly. Four named lines carry the record: the shortest length published is nine kilometres and the longest-running took twenty-two years, and the record attributes none of the four to a shortage of equipment.

EXHIBIT 28 **Four named lines, and what each one cost in years**

PROJECT	LENGTH	ORIGINAL TARGET	WHERE IT STANDS	SLIP
Uljin–Hanam HVDC	280 km, 436 towers	2019	Phase 1 final completion May 2029	~10 years
154 kV Gijang–Jangan	9 km	October 2025	October 2028	~3 years
345 kV Bukcheonan–Singiheung	Not published	After 2032, in the 2023 plan	2036, in the 2025 plan	4+ years
North Dangjin–Sintangjeong	Not published	Started about 2002	Completed April 2025	22 years elapsed

Source: Seoul Economic Daily, 2026-05-02, for all four projects, with the Uljin–Hanam schedule history also in Daehan Economy, 2024-11-18. Direct losses of ₩1.1727tn are attributed to the 22-year line. The fourth project is complete and the other three are not, which is what the “Where it stands” column separates.

Korea legislated against exactly this. A special act for critical grid expansion came into force in September 2025, moved delivery from a utility-alone model to state support, and designated 99 transmission and substation projects costing about ₩2.8tn, with the stated aim of delivering them three to four years earlier[19]. The same programme sets its two flagship corridors in the 2030s and the 2040s[19].

The ₩2.8tn of designated projects sits beside a ₩72.8tn transmission plan, which is the measure of what the act is: a permitting instrument applied to a priority subset rather than a capital programme.

Money is not the missing input either. KEPCO earned a record operating profit in 2025 and still carries ₩205.7tn of debt against its own stated need of ₩113tn of grid investment over the decade[20]. The record came from price rather than volume: sales were flat while the average tariff rose 4.6%, after seven industrial increases since July 2022 totalling about 70%[20]. A utility raising ₩10tn a year for wires out of a book already that size has little room to solve a permitting problem with money.

Nor is generation. Korea met its highest demand recorded so far in 2026, 95.321 GW, with 8.2 GW of reserve against a 5.5 GW alert threshold[21] — and while the scope of that 8.2 GW is unresolved, neither reading of it makes generation the binding input.

7 Three environments for the market itself

THREE ENVIRONMENTS
THREE GOVERNING VARIABLES

What is genuinely unsettled here is not how much this market will sell. It is which variable sets the quantity that clears. Three candidates sit in the record, they run on different clocks, and not one of them is the demand growth the market is usually discussed in terms of.

Three market environments, and the variable that governs each

A · MATERIALS-GOVERNED

The floor under the product sets what clears

More than half of a transformer's cost is material its maker does not price, and more than a fifth of it is one steel grade for which no substitution pathway is recorded (Exhibits 11 and 13). In this environment the equipment price follows the metal, the deficit closes on schedule because the binding input sits below the factory, and the order book converts to revenue at a margin the maker cannot set.

Markers: whether the 2026 copper and aluminium levels hold; any second producer of grain-oriented electrical steel outside the concentrated third; the next transformer price index published off a 2019 base.

B · PERMISSION-GOVERNED

Consent sets the quantity, and it is not for sale

The path the record supports best. Permission is a layer of this chain with no supplier to expand and a clock measured in years rather than in weeks (Exhibits 12 and 15), and two markets moved on it inside the study window — an interconnection pause in Texas, and a statute in Korea (§4.2 and §6.4). Here the capacity of Exhibit 21 arrives on its dates and waits for a consent no expansion buys.

Markers: the Texas decision point of 2026-08-20; whether Korea's twelfth national plan is published, and on what data-centre assumption; the next completion date published for the Uljin–Hanam line.

C · QUEUE-GOVERNED

How much of the pipeline is real sets the flow

The variable nobody has measured yet. A filtered queue and a raw one imply very different clearing quantities, and the audit running in Texas is the first attempt to tell them apart (§4.2). Whether the deficit in §5 narrows on its published path depends on how much of that demand is real: if much of the queue is speculative, it closes earlier than 2030 and the expansions of Exhibit 21 land into a market already served.

Markers: what share of the Texas queue survives its audit; whether a second house publishes a deficit measurement; the first order cancellation disclosed by a listed supplier.

Sources: IEA, *Building the Future Transmission Grid*, 2025-02-27, for the materials shares and the substitution finding (A) · ERCOT and the Public Utility Commission of Texas, via Utility Dive and Texas Tribune, 2026-08-03, and the Korean statute record (B) · Wood Mackenzie, via POWER Magazine, 2026-01-02, for the deficit path (C). Every figure in a panel body is established elsewhere in this study, at the reference beside it. The markers are things to watch, and the Texas decision date sits in the same 2026-08-03 reporting as the pause. None of the three carries a probability.

SCOPE OF THESE SCENARIOS

These describe the market and not any company in it. They carry no price target, no multiple and no buy or sell implication, and they are not alternatives to one another: the materials floor and the permitting layer are already operating together, and the third environment sets how much of the demand behind both is real.

8 Three findings that travel

THREE FINDINGS
THAT TRAVEL

Three things this market teaches survive being lifted out of grid equipment. Each surfaced from measuring the market itself, and each is a question worth asking of the next one.

The three findings, and where each one is established

FINDING 1

When the traded good is a delivery slot, the annual market size stops describing the market

Six suppliers reporting in four groups hold roughly five times the whole annual market as the largest located reading sizes it, and both figures are right: one is a multi-year stock of commitments and the other a single year's flow. Where participants have already sold years of revenue forward, what describes the market is the order book and the delivery date, and an annual revenue figure understates the commitment structure that governs it.

Worked through in Exhibits 1, 2, 5 and 24

FINDING 2

An operating figure can be two years old and still be quoted as current

The number this market repeats about itself — four-year transformer lead times — was collected by survey in 2024, published in 2025 and still quoted verbatim in mid-2026. The newest global measurement located is a year older than this study, and the one 2026-vintage reading found says the wait grew again after the quoted figure was frozen. Where an operating figure circulates without a survey date attached, the date is the finding.

Worked through in Exhibits 8 and 9

FINDING 3

When the constraint is permission, the forward indicator is a statute rather than an order book

Korea has the makers, the capital plan and, since 2025, the legislation, and it still produced a 22-year line and a decade of slip on its own HVDC spine (Exhibit 28). Neither equipment nor money was the input that bound; consent was, and no plant expansion or price increase reaches it. Where a market is shaped that way, the observable that moves first is a permitting calendar, and it is public well before the orders are.

Worked through in Exhibits 15, 21 and 28

Every figure on this page is established in the exhibit named beside its finding. The multiple in the first is the four order books of Exhibit 1 against the largest reading of Exhibit 5, US$159.5bn ÷ US$32.03bn.

THE MARKET IN ONE LINE

The grid equipment market in one line: what it sells is a place in a production programme, what prices that place is an index and a two-year-old survey, and what binds it is permission rather than iron or capital. Everything structural in this study follows from the first clause.

Working With Nathan Research

THE BENCH
AND THE OPEN QUESTIONS

Published sources establish the **shape** of this market. They do not settle the questions a diligence outcome turns on — how much of a backlog is export, what a slot is worth to the buyer holding it, whether a consent will arrive before the equipment does. Reaching the people who can answer them, compliantly, is what Nathan Research does.

NRG operates **Korea's first dedicated expert-network service, established in 2013**, built for the global private-equity, hedge-fund or corporate-strategy team carrying a thesis on a Korean or Asian grid, industrial or export-led asset.

Who we put in the room

BENCH	WHERE THEY SIT IN THE CHAIN
Electrical-steel and core supply	Layer 01 — grain-oriented steel, and the cost share it carries
Transformer plant and test engineers	Layer 02 — 765 kV capability, and what an expansion really adds
Cable, HVDC and marine installation	Layers 03–04 — converters, the lay-vessel fleet, and its queue
Switchgear and the SF6 transition	Layer 05 — what each gate takes out of a product line
Permitting, consent and interconnection	Layer 06 — the layer with no supplier, and how long it holds
Buyer-side and order-book desks	Layer 07 — what a reported backlog contains, and what it excludes

How an engagement works

STEP 1

Scope

We translate your thesis into a precise expert profile and question set, mapped to the diligence decisions you need to close.

STEP 2

Source and vet

We identify, screen and compliance-clear each expert, confirming relevance, recency and the absence of conflicts before any call takes place.

STEP 3

Convene and synthesize

We arrange interviews on your timeline and, where useful, deliver written synthesis tied back to the questions this study raises.

THE QUESTIONS THIS STUDY LEAVES OPEN — AND WE CAN HELP CLOSE

Backlog composition. Three of the five Korean participants publish a decomposition and no two use the same measure; only one of them splits its book by destination. **Segment margin.** No participant publishes one for its power-equipment business, so only consolidated margins exist. **The slot.** No lead-time survey later than Q2 2025, and no maker discloses how much of its capacity is already committed. **Permission.** Whether the 2025 statute moves a corridor faster than the ones that took twenty years.

Partner With Nathan Research

CONTACTS
AND HOW AN ENGAGEMENT STARTS

If your team is studying the **market for grid equipment** — the transformer, cable and switchgear houses that hold the order books, the layers upstream that set their delivery dates, or the Korean makers who sell into that constraint and wait on it at home — or the wider **Korean industrial and export complex**, we would welcome the conversation. Tell us the decision you are trying to make, and we will tell you candidly whether and how our network can help you make it.

What to expect when you reach out. A partner replies to you directly, and the first conversation is about scope: the questions you need answered, and the people who can answer them. From there, a compliant and conflict-cleared expert panel is assembled to your timeline and, where useful, written synthesis that builds on the analysis in this study.

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COMPLIANCE This study is based solely on public disclosures, regulatory filings and named third-party research. Nathan Research does not request or facilitate the exchange of material non-public information, confidential customer, supply or grid-connection contracts, or undisclosed pricing, delivery-slot, backlog or financing terms, and runs every engagement through a documented compliance protocol with expert attestations and client-defined restricted-topic lists agreed before the first call.

A Appendix — method, and the market-sizing sources

AUTHORITY ORDER
WHAT IS CITED

METHOD

Market sizing is web-research-first and cross-checked across publishers to 2026-08-12. Where sources disagree the range is printed with attribution and never averaged; where the record thins to observations that cannot be joined, the exhibit stops. Authority order: the IEA transmission-grid report, read from the published PDF; then issuer disclosure as carried by dated reporting of it; then the Wood Mackenzie survey as relayed by POWER Magazine; then customs and trade-association series as relayed by Korean press; then market-research publisher sizing, recorded as a band; and last unnamed compilations, labelled as such at every point of use.

No single won-dollar rate governs this study, and only one exhibit converts anything. Exhibit 1's bars are stated in dollars at €1.15/US$ and ₩1,400/US$, tagged [NRG estimate], and Exhibit 4 prints the same four books in the currency each was reported in. The customs series carries its own won column at an implied ₩1,488.5/US$ — its publisher's conversion, not this study's, and 6% away from the other rate. Every other value carries the currency its own source used, and no exhibit puts won and dollars on one axis.

[NRG estimate] marks arithmetic performed here on published inputs, with the operands shown at the point of use. The one collected issuer was read through **DART**, the regulator's electronic disclosure system, and has seven filings in the repository; this study reads two, and the executive summary gives what that leaves press-sourced. **Market data is unused.** Nothing here turns on what a listed participant is worth, so no share-price, trading-volume or short-interest series appears anywhere.

NAMED SOURCES

MEASURED ON ONE BASIS, AND SURVEYED IN 2024

International Energy Agency (IEA) — *Building the Future Transmission Grid*, published 2025-02-27, read from the published PDF. It is the only document located that measures prices, lead times, trade flows and supplier concentration on one consistent basis, and it supplies the voltage-class definitions, the cost and weight shares of Exhibit 11, the concentration rows of Exhibits 12 and 14, the development norms of Exhibit 15 and the investment envelope of Exhibit 7. **Its survey was conducted in 2024**, so every operating number taken from it is treated here as a 2024 baseline and dated on the face of the exhibit that carries it. It separately credits a **UN Comtrade** cut of 2023 trade and an **S&P Capital IQ** cut of 2023 cable revenue. **IEA *Electricity 2026***, 2026-02-25, supplies both inputs to Exhibit 16. **ENTSO-E** reaches these pages through the first of the two, not directly.

MARKET-RESEARCH PUBLISHERS

Six market-research publishers size this market and are drawn or named in Exhibit 5. **Mordor Intelligence** (report dated 2026-05-27), **Coherent Market Insights** (2026-04-03) and **Persistence Market Research** (2026-05) are the three carrying a dated 2026 reading, and only those three set the band. **Grand View Research** is drawn and excluded for want of a date this study could establish. **market.us** is dated 2026-07-02 but its figure is a 2025 base. **Fortune Business Insights** counts all transformers, distribution units included, which is a different product set; it reaches this study through Herald Business, 2026-07-19.

SURVEYS, DATA PROVIDERS AND PRICE SERIES

Wood Mackenzie — the transformer survey of Q2 2025 behind Exhibits 8, 9 and 20 and the deficit path in §5, throughout via **POWER Magazine**, 2026-01-02. **S&P Global Market Intelligence**, 2026-04 — US utility capital expenditure and the demand growth rate in Exhibit 7. **Goldman Sachs Research**, 2026 — the US data-centre power series in Exhibit 17, its last two points the house's own forecast. **London Metal Exchange** (LME) copper and aluminium quotes in Exhibit 11, reaching this study through an **Investing News Network** compilation of 2026-08 and **Trading Economics**, 2026-08-10. **Where an attribution reads compilation with no house behind it** — the converter and switchgear shares of Exhibits 12 and 14, and the outlier under Exhibit 17 — the figure circulates across trade outlets with no single publisher and is labelled as such at the point of use.

OFFICIAL SERIES, REGULATORS AND STATUTE

Korea Customs Service, via Herald Business, 2026-07-19, and the **Korea International Trade Association**, via AJU Press, 2026-01-21 — the two halves of Exhibit 25. **Ofgem** Final Determinations, published 2025-12-04, and **KEPCO**'s 11th Long-term Transmission and Substation Plan (2024–2038) — two of the five budget envelopes in Exhibit 7. **EU F-gas Regulation** — every gate in Exhibit 22. The **United States** presidential proclamation of 2026-04-02 behind Exhibit 23, via a **CH Robinson** advisory of the same date. **US Department of Commerce** reporting, 2020, for the single domestic producer in layer 01. **ERCOT** and the **Public Utility Commission of Texas**, via **Utility Dive** and **Texas Tribune**, 2026-08-03. **Korea Power Exchange** for the 2026 peak. The **International Electrotechnical Commission** (IEC) supplies the voltage classes Exhibits 10 and 27 use.

Appendix — issuer and press sources, and the register

WHAT IS CITED
THE FOOTNOTE MAP

NAMED SOURCES, CONTINUED

ISSUER DISCLOSURE AND COMPANY STATEMENTS

Vitzrotech (KOSDAQ 042370) — Annual Report FY2025 and Quarterly Report Q1 2026, the only two filings read directly for this study and the only source behind Exhibits 10 and 27. Their receipt numbers are printed in the register below and nowhere else. **Siemens Energy** fiscal Q3 2026 results, 2026-08-05, and **GE Vernova** Q2 2026 results are company-reported and reach these pages through the companies' own results disclosure. The five Korean Q2 2026 results releases behind Exhibits 24 and 26 — **Hyosung Heavy Industries**, **HD Hyundai Electric**, **LS Electric**, **Taihan Cable & Solution** and **Iljin Electric** — reach this study through the outlets named beside this group, not through a filing. **Hitachi Energy India**, 2026, for the Karjan expansion.

NAMED IN THE STUDY, BUT NOT AS SOURCES

Hitachi Energy, **Prolec GE**, **Cleveland-Cliffs**, **NKT**, **Prysmian**, **Nexans**, **Sumitomo Electric**, **Toshiba**, **Eaton**, **LS Cable & System**, **LS Corp**, **LS GreenLink**, **Gaon Cable**, **Doosan Enerbility** and **KEPCO** as a buyer appear as participants in this market rather than as sources of it, as do the data-centre buyers named in Exhibit 19 — **Meta** and **AWS** — and the regulated transmission operators and utilities of layer 07. Every figure printed about them is attributed in the source block of the exhibit that carries it, to a source named on these two pages.

PRESS AND TRADE

Seoul Economic Daily — 2026-02-27, 2026-05-02, 2026-05-18, 2026-06-25, 2026-07, 2026-07-02, 2026-07-06 and 2026-08-06, and one backlog compilation that states a quarter without its year. **The Elec** — 2026-07-23 and 2026-07-28. **Bloter** — 2026-07-31. **Hankyung** — 2026-08-11. **ZDNet Korea** — 2026-02-06. **Energy Times** — 2026-07-30. **Businesskorea** — 2026-03-18. **Herald Business** — 2026-07-19. **AJU Press** — 2026-01-21 and 2026-04-27. **KED Global** — 2026-05-18. **Bizwatch** — 2026-05-19. **Money Today** — 2026-05-19. **Korea JoongAng Daily** and **PR Newswire** — 2025-12. **Daehan Economy** — 2024-11-18. **Electimes** and **Daily Hankooki** — 2026, for the plan and the announcement book in §4.2. **Utility Dive** and **Texas Tribune** — 2026-08-03.

SOURCE REGISTER — EVERY FOOTNOTE MARKER IN THE BODY

Each marker in the body resolves here, numbered in order of first appearance. Two kinds of entry share the series: the outlet or institution standing behind a figure a paragraph states, set out at length in the named-source groups on this page and the last; and the two **DART** entries carrying the receipt numbers of the one collected issuer, printed here and nowhere else. The series is short by design. On a visual-led brief the exhibits carry provenance in their own source blocks, so a chart can be read without turning to this page, and a marker appears only where connective prose states a figure of its own.

[1] NRG estimate — the four order books drawn in Exhibit 1, summed at €1.15/US$ and ₩1,400/US$; each component is sourced in that exhibit's own source line · **[2]** Coherent Market Insights, power transformers, published 2026-04-03 · **[3]** Siemens Energy, fiscal Q3 2026 results, 2026-08-05 · **[4]** GE Vernova, Q2 2026 results · **[5]** IEA, *Building the Future Transmission Grid*, published 2025-02-27 (2024 survey data throughout) · **[6]** Seoul Economic Daily, 2026-08-06 · **[7]** Bloter, 2026-07-31 (Hyosung Heavy) · The Elec, 2026-07-28 (HD Hyundai Electric) and 2026-07-23 (LS Electric) — the three Q2 2026 disclosures; the ₩36.9tn sum is an NRG estimate · **[8]** Mordor Intelligence, power transformers, report dated 2026-05-27 · **[9]** Vitzrotech (KOSDAQ 042370), Annual Report FY2025 (receipt 20260323000806, 2026-03-23) · **[10]** Vitzrotech (KOSDAQ 042370), Quarterly Report Q1 2026 (receipt 20260515002487, 2026-05-15) · **[11]** ERCOT and the Public Utility Commission of Texas, via Utility Dive and Texas Tribune, 2026-08-03 · **[12]** 12th Basic Plan for Long-term Electricity Supply and Demand, working drafts, via Electimes, 2026 · **[13]** Korean government megaproject announcements, via Electimes and Daily Hankooki, 2026 · **[14]** Korean industry compilation via Seoul Economic Daily, 2026-07-02 · **[15]** Wood Mackenzie transformer survey, via POWER Magazine, 2026-01-02 · **[16]** Hankyung, 2026-08-11 · **[17]** ZDNet Korea, 2026-02-06 · **[18]** HD Hyundai Electric Q2 2026 disclosure, via The Elec, 2026-07-28 · **[19]** National Critical Power Grid Expansion Special Act (in force 2025-09-26) and the first Committee meeting, Ministry of Climate, Energy and Environment, 2025-10-01 · **[20]** KEPCO 2025 results and investment statement, via Seoul Economic Daily, 2026-02-27 · **[21]** Korea Power Exchange, peak demand recorded 2026-08-07

Appendix — data gaps and scope

WHAT IS MISSING
DISCLAIMER

DATA GAPS CARRIED FORWARD

(1) No single 2026 size for this market — five publishers span US$26.18bn to US$32.03bn for power transformers and a sixth counts a different product set at US$80.8bn, and none of them is comparable with a multi-year order book. The band is printed with its houses and nothing is averaged. (2) No publication date for one of the five drawn, so it sits on the axis without setting the band. (3) No 2026 global lead-time survey — the newest located is Q2 2025, and the four-year figure still quoted as current was collected in 2024. (4) No HVDC price level: the source charts price per km per kV without publishing values, so only the direction is described. (5) No Korean share of world transformer trade — the first-place claim in circulation carries no share, no product code and no year, so Exhibit 14 gives the four-country group instead. (6) No named cable share: the published top-ten wedges do not map reliably to their labels, so layer 03 stays at the group level. (7) No segment margin for any Korean maker — only consolidated margins exist, so Exhibit 26 carries none. (8) No multi-quarter book-to-bill: exactly one observation exists per supplier, so no ratio is claimed to persist. (9) No Korean backlog before end-2024, and the one compilation reaching further back states a quarter without its year, so Exhibit 24 starts there and leaves the undisclosed quarters open. (10) No confirmed regional split for Hyosung Heavy's orders — a North American percentage circulates through an aggregator and is not printed. (11) No FY2025 revenue located for two of the five participants, so Exhibit 26 records that absence for each of them; no per-company cover ratio is printed anywhere, and nothing is annualised from a quarter. (12) No growth base published for the ₩36.7tn combined backlog, and the same quarter's components sum to ₩36.9tn; both figures are printed and the growth rate is not. (13) No rate for a specific transformer tariff line — the Annex III text was not read, so Exhibit 23 draws the category rates only. (14) No settled scope for the reserve figure at Korea's 2026 peak: whether it is the reserve measured at the peak or the resource secured for the season was not established, and the clause carrying it says so. (15) No filing evidence for eight of the nine Korean listed participants, whose figures are therefore dated public reporting of a disclosure rather than a document read.

SCOPE AND DISCLAIMER

This is a **market-research study** prepared to support diligence on a market. It is **not investment advice**, not a solicitation, and contains **no price target, no valuation, no multiple and no buy or sell recommendation**. Company disclosures and results are cited only as evidence of market dynamics, never as a value argument. The three market environments in §7 are readings of the record rather than NRG forecasts, and figures labelled **[NRG estimate]** are our own arithmetic on published inputs, identified at the point of use. Prepared by Nathan Research Group, Seoul, 2026-08.