

A medium-voltage switchroom lineup, seen down its operating aisle.

NLC ACADEMY · EPISODE 33

Specify the class, not the gas.

In a Saudi MV room, AIS against GIS is settled by numbers a tender can check: the connection voltage, the fault level at 60 Hz, the LSC class, the arc class and the room's own heat.

THE SAUDI LAYER FIRST

Above 4 MVA, the switchgear is yours

up to 4 MVA	**low voltage** a 20 m² plot per transformer
4 to 25 MVA	**13.8 kV or 33 kV** you build and run the substation
above 25 MVA	**transmission voltage** the same duty, one level up

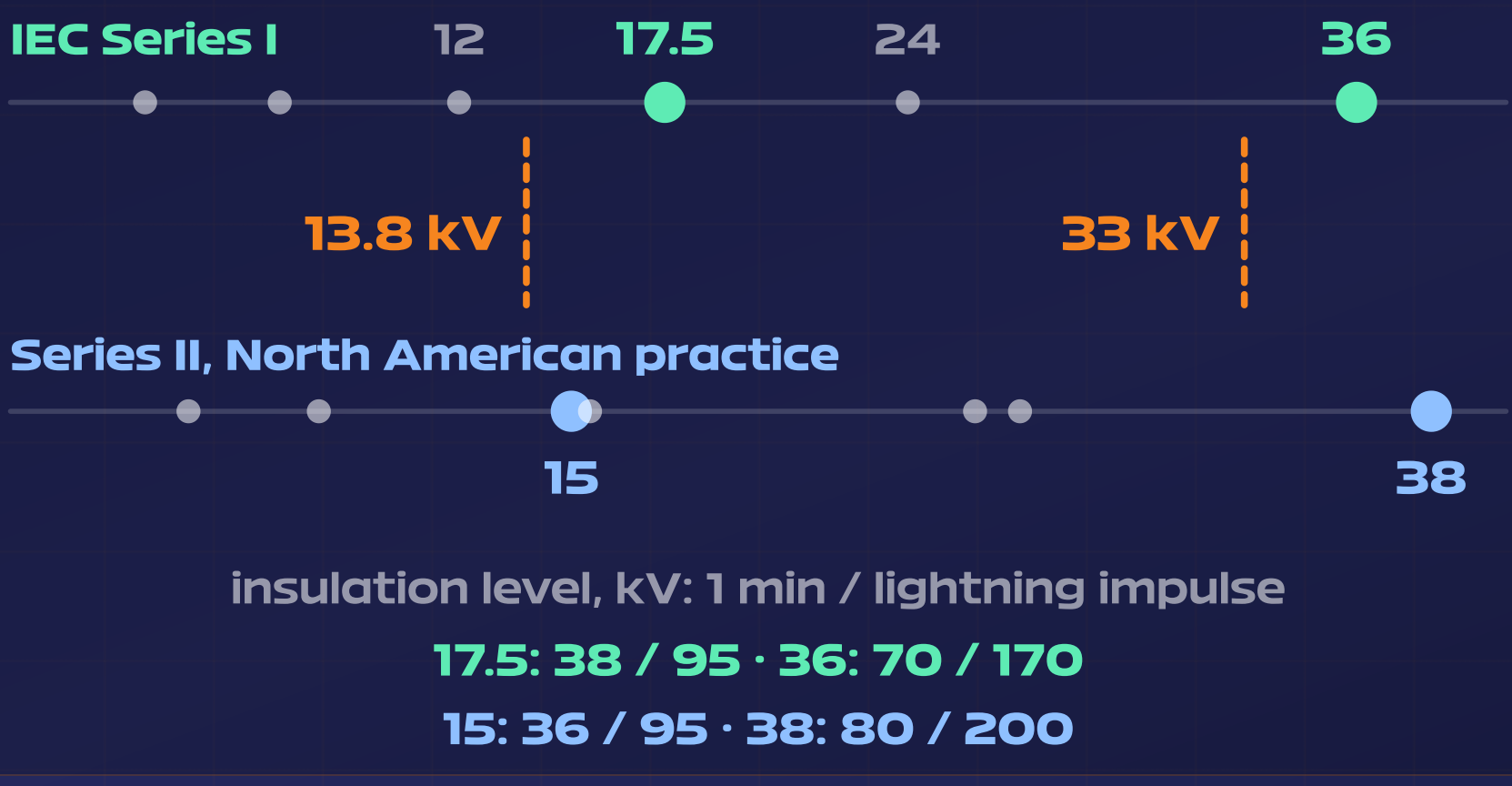
SEC runs it only if it meets SEC specifications
and is handed over, or kept at 2.5% of capital a year

1. SERA's service guide connects loads up to 4 MVA at low voltage, 4 to 25 MVA at medium voltage, and above 25 MVA at transmission voltage. [1]
2. An MV customer builds the substation and bears its operation and maintenance, under a boundary agreement with the utility. [1]

The utility runs it only if it meets the utility's standard specifications, sits on the boundary and is handed over, or the owner pays 2.5% of its capital value a year. [1]

TWO VOLTAGES, TWO LADDERS

13.8 kV is not on the IEC Series I ladder

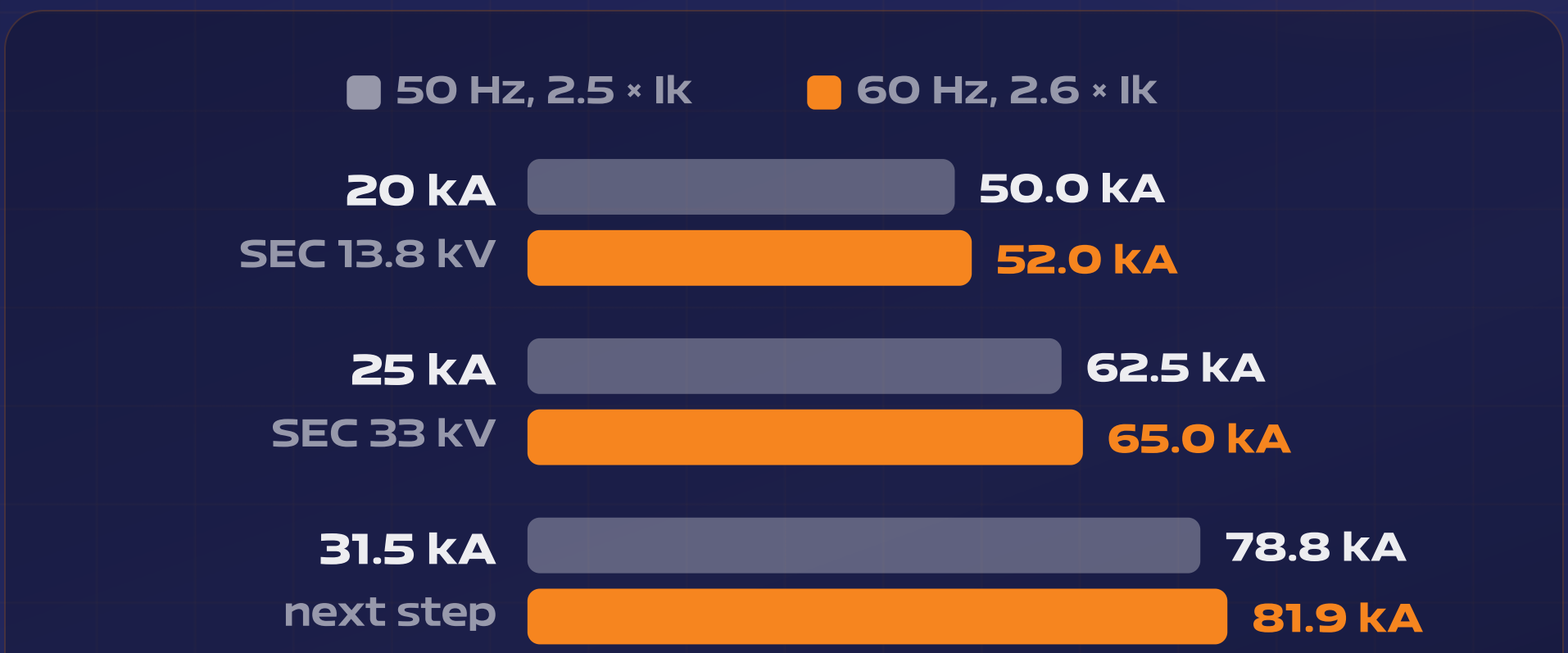


1. SEC's standard MV levels are 13.8 kV and 33 kV. IEC 62271-1 Series I has 12, 17.5, 24 and 36 kV; 15 and 38 kV sit in Series II, the North American ladder. [2][4]
2. So a 13.8 kV board is a 17.5 kV or a 15 kV panel, and a 33 kV board is 36 or 38 kV. Ask which series the submittal is rated in. [4]

A clean-air range that stops at 24 kV covers 13.8 kV. For 33 kV, ask for a range rated 36 kV or 38 kV. [6][13]

WHAT 60 HZ CHANGES

At 60 Hz the standard peak factor is 2.6



45 ms time constant: 60 Hz peak is 4% higher

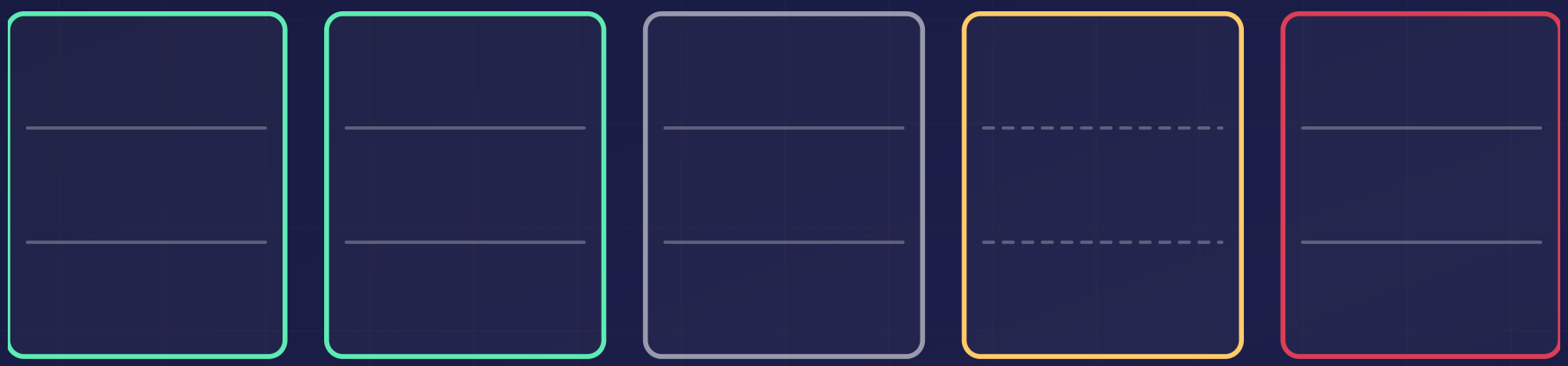
1. IEC 62271-1 sets peak withstand at 2.5 Ik at 50 Hz and 2.6 Ik at 60 Hz, for the standard 45 ms d.c. time constant. At 20 kA that is 52 kA peak, not 50. [4]

2. SEC's 2004 planning standard uses 20 kA at 13.8 kV and 25 kA at 33 kV, 1 s. Size to the fault level SEC gives for your connection, plus your own motors and generators. [2][15]

If a submittal shows only the 50 Hz peak, ask for the 60 Hz rating. Some catalogues print both: 125 kA and 130 kA. [6]

ONE STANDARD, THREE CLASSES

LSC belongs to each panel, not to the board



IEEE metal-clad vs LSC2B-PM: compare only

1. IEC 62271-200 covers AIS, SF6 GIS and SF6-free alike. It grades each functional unit by LSC (what stays live when it is opened) and partition class, PM or PI. [5][12]
2. As drawn: LSC2B breaker feeders, an LSC2 fuse panel with an insulating shutter, an LSC1 riser. A bus coupler without a connection compartment has no LSC. [5][6]

LSC is not a reliability ranking. IEEE metal-clad and IEC LSC2B-PM are compared, not swapped. [5][15]

THE ARC CLASS, WRITTEN RIGHT

IAC, then access type, sides, current, time

IAC	A	FLR	20 kA	1 s
class	access	sides	current	time

A authorised staff only, cotton at 300 mm

B the public too, cotton at 100 mm

and the room as tested: ceiling, walls, relief

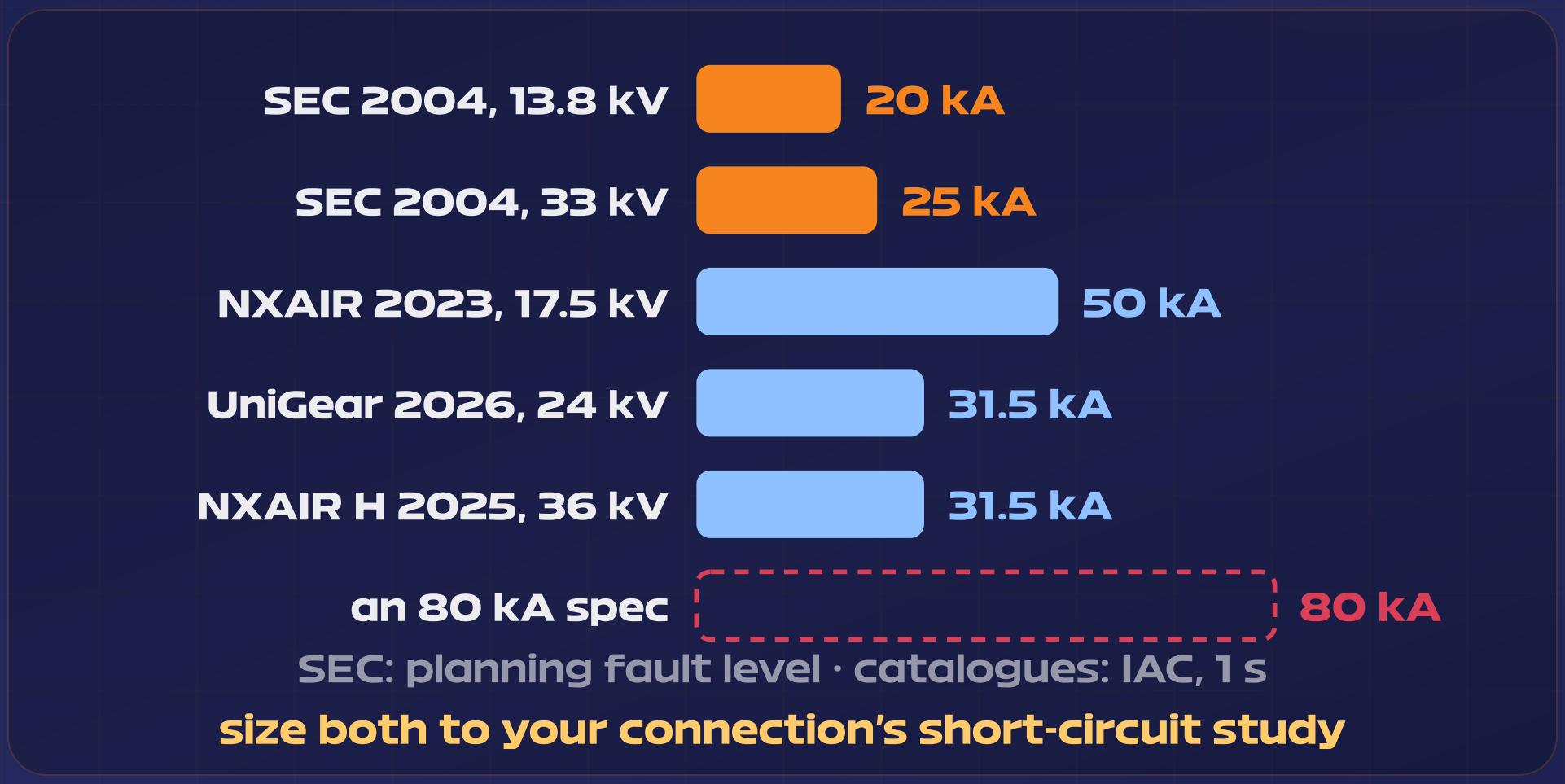
optional: no IAC unless the tender writes it

1. A and B are the accessibility type: A for authorised staff, indicators at 300 mm; B admits the public, at 100 mm. F, L and R name the sides tested: front, lateral, rear. [5]
2. The arc class is optional, so write it in full: type, sides, current, duration, and the installation as tested: ceiling, wall gaps, relief route. [5][6]

Catalogues often print “AFLR”. Read it as type A, sides F, L and R, then check the current, the duration and the room it was tested in.

SIZE IT TO THE CONNECTION

No catalogue reviewed offers 80 kA for 1 s

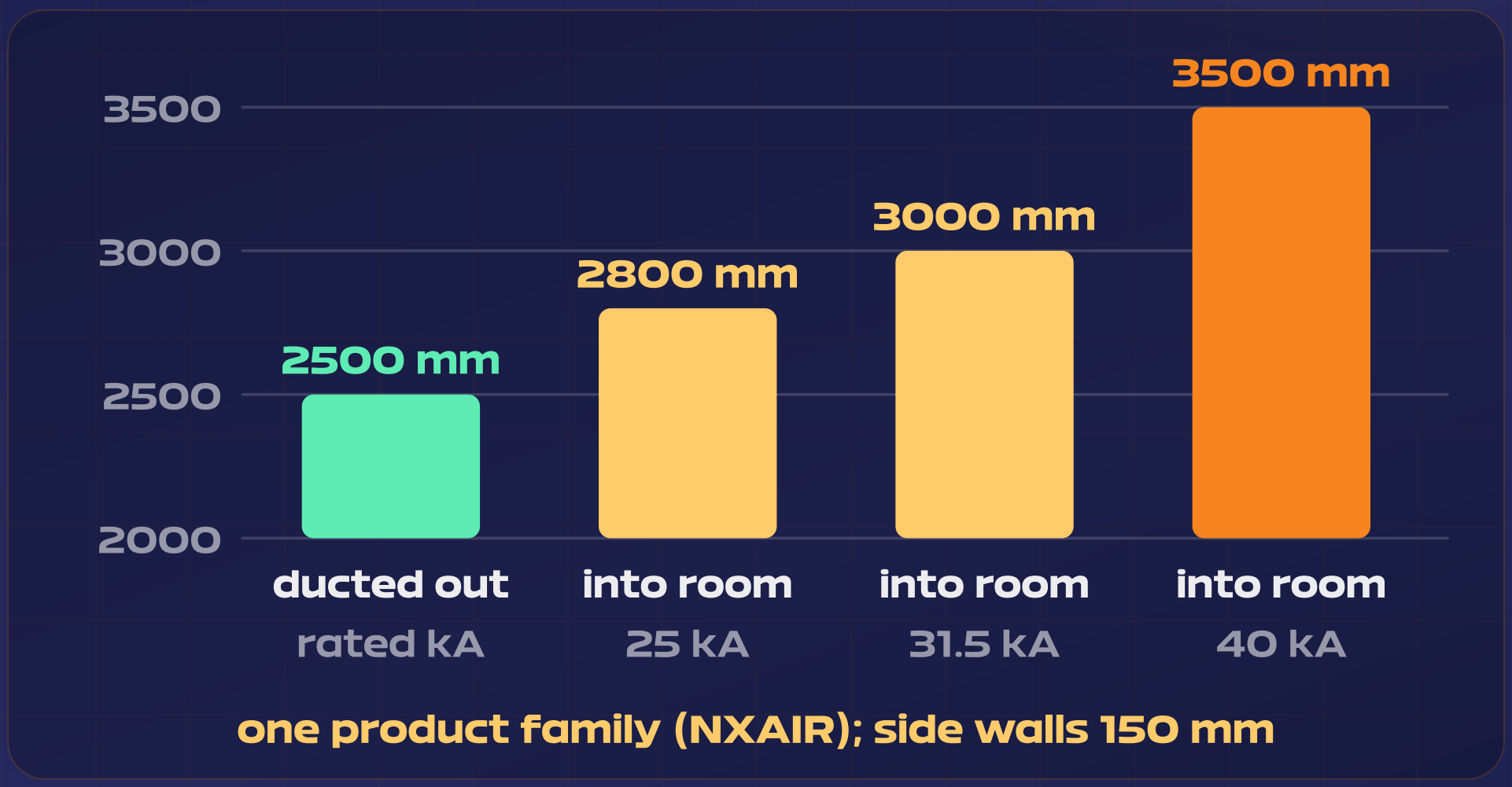


1. Highest IAC found, all 1 s: 50 kA at 17.5 kV (Siemens NXAIR, 2023); 31.5 kA at 24 kV (ABB UniGear ZS1, 2026) and 36 kV (Siemens NXAIR H, 2025). [6][7]
2. SEC's 2004 planning values are 20 kA and 25 kA. An 80 kA arc class is three to four times those: size it to your connection's short-circuit study. [2][15]

Arc and short-time ratings are separate: one range is 40 kA for 3 s short-time and 40 kA for 1 s arc. Write both, each with its duration. [6]

THE ROOM IS PART OF THE TEST

The arc class stops at the ceiling



one product family (NXAIR); side walls 150 mm

1. One AIS family (NXAIR, 2023) asks 2800 mm of ceiling at 25 kA and 3500 mm at 40 kA when the gas vents into the room at 12 kV; 2500 mm ducted out, to 17.5 kV. [6]

2. IEC 62271-200 edition 3.0 treats the test-room ceiling as the minimum for the real room. Clean air builds pressure faster than SF6, so a class proven in one gas does not carry to the other. [5][6]

Those heights are one product family's examples. Ducting holds only to the tested rating the maker declares.

THE ROOM, PART ONE: HEAT

Rated at 40 °C, installed at 50



example: 2007 limits, n = 2, rated at 40 °C

1. IEC 62271-1 rates current at 40 °C ambient. With the 2007 text's limits and n = 2, at 50 °C bare copper contacts keep 85% and silver-plated 92%. Table 14 (2017) raised some limits. [4]

2. ABB's UniGear guide (2005) lists a 1250 A feeder at 1140 A at 50 °C, and 800 A in a dust-tight IP5X enclosure. The next frame up is a wider panel. [7]

SEC rates its own lines at 50 °C. The 2007 text's very hot climate class runs to 55 °C, and applies only if the enquiry names it. [2][4]

THE ROOM, PART TWO: AIR

Dust, salt and altitude act on the air-insulated parts



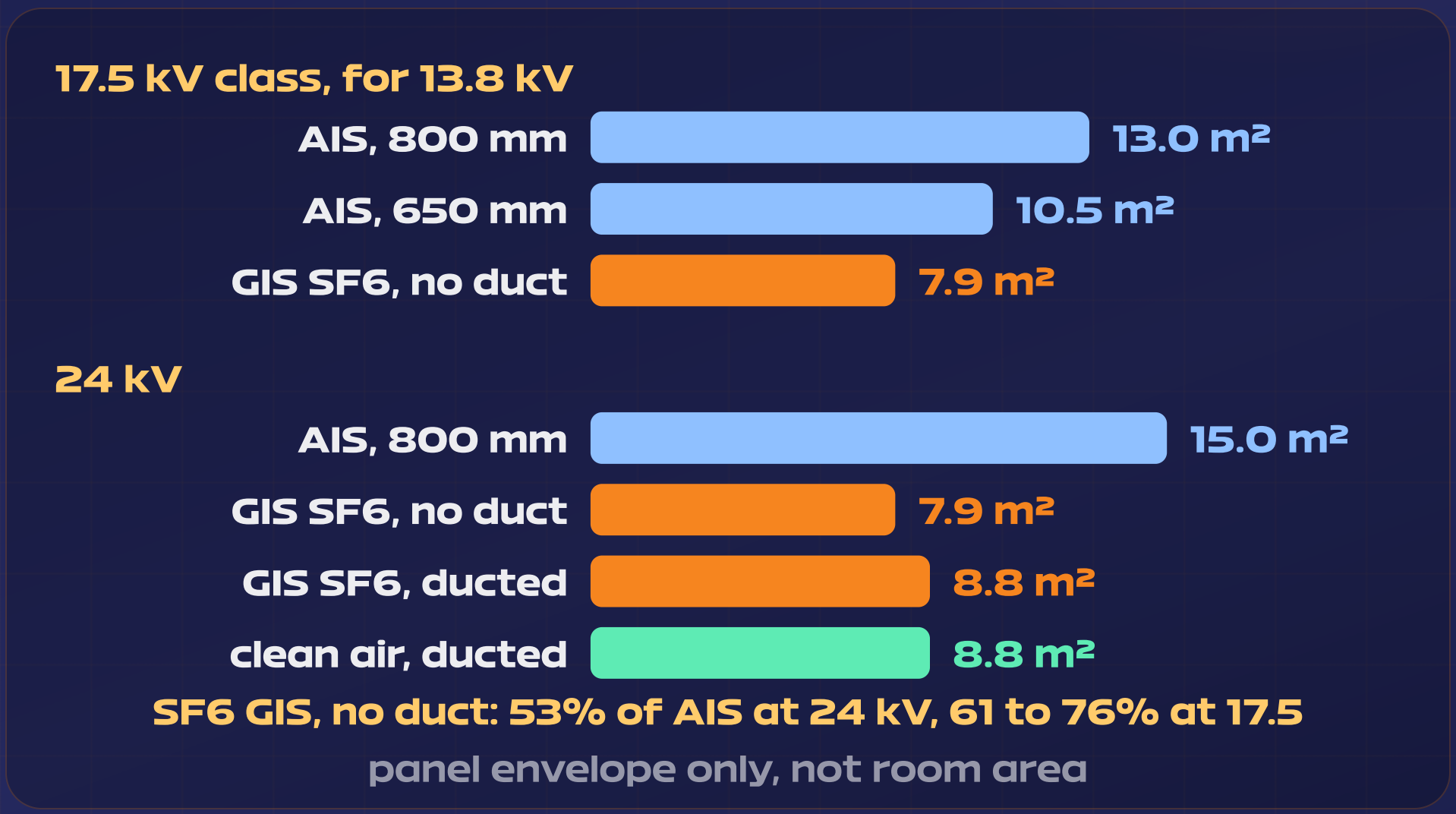
GIS bushings and cable ends are in air too

1. IEC 62271-1 assumes clean air: no dust, salt or corrosive gas unless the user says otherwise, and its enquiry form has a box for it. [4]
2. Above 1000 m external insulation is corrected: 1.09 at 1700 m, 1.17 at 2270 m, taking m = 1. A sealed vessel is rated by its maker (one GIS to 4000 m). [4][13]

A GIS still has bushings, cable terminations and air-insulated parts: state altitude, dust and salt for those too.

FOOTPRINT, AT SAUDI VOLTAGES

About half the floor at 24 kV, less at 17.5



SF6 GIS, no duct: 53% of AIS at 24 kV, 61 to 76% at 17.5

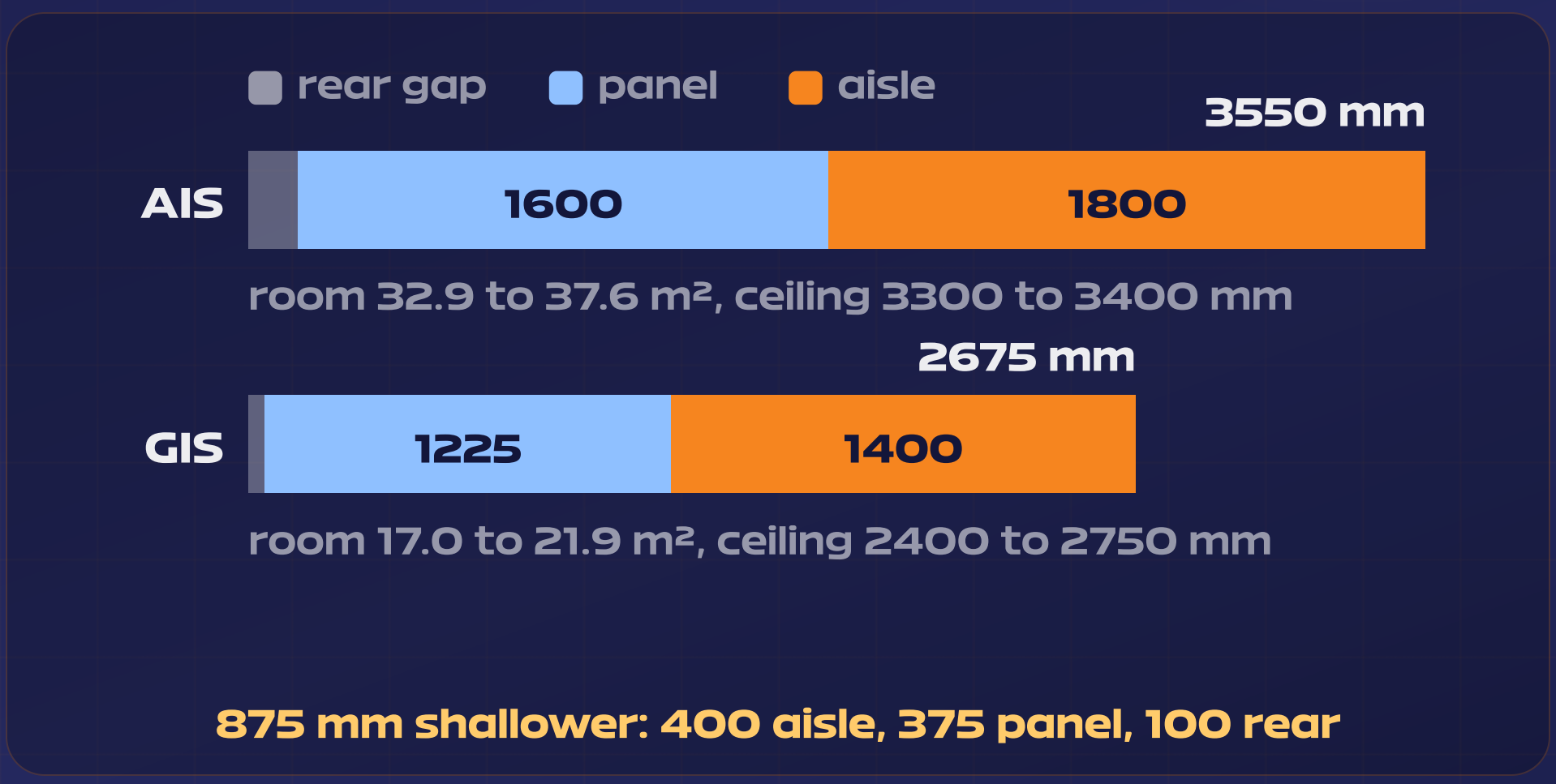
panel envelope only, not room area

1. Twelve panels, envelope only: SF6 GIS without a relief duct is 53% of AIS at 24 kV, and 61 to 76% at 17.5 kV, used for 13.8 kV. [6][7][13]
2. Clean-air GIS (600 by 1225 mm) matches SF6 GIS only with its rear duct (59% of AIS). Against SF6 without a duct it is 11% more. [13]

Panel footprint is not room area. Ask for both, and say whether ducts are included.

THE ROOM, NOT THE PANEL

At 24 kV the GIS room is 875 mm shallower



1. Of that, 400 mm is aisle: a withdrawable breaker truck needs 1350 to 1800 mm, a fixed GIS 800 to 1400 mm. Rooms come to 32.9 to 37.6 m² against 17.0 to 21.9. [6]
2. GIS also saves height: one maker asks 3300 to 3400 mm for 24 kV AIS with arc absorbers and 2400 to 2750 mm for GIS. [6]

None of the catalogues reviewed publishes a GIS price ratio. Price the room and the slab, not a multiplier.

SF6, AND WHICH NUMBER

Four GWP figures for SF6, four legal homes



1. AR6 gives 24,300 over 100 years, the value EU 2024/573 uses. AR5's 23,500 is the one Paris reporting uses, Saudi Arabia's included. [8][9][10]
2. AR6 also cut SF6's atmospheric lifetime from 3,200 to about 1,000 years. 25,200 is a draft value, not the published table. [8]

Quote the number with its basis. 23,500 labelled as the F-gas regulation's figure is wrong on both counts.

SF6-FREE IS THREE CHEMISTRIES

Name the gas and its GWP, then check the range

Clean air

Nitrogen and oxygen, with vacuum interrupters. Siemens 8DAB 40 (2025) to 40.5 kV; ABB's Air ranges to 24 kV. [13]

GWP 0

C5 fluoroketone

ABB AirPlus, CIRED 2019: about 7.6 mol% in dry air, 24 kV RMU; not on ABB's current SF6-free pages. [9][11]

GWP 0.29

C4 fluoronitrile

GE Vernova g3 (flyer, Feb 2026) starts at 72.5 kV; no MV product found from the makers reviewed. A listed F-gas. [9][11]

GWP 2,750

SF6

The incumbent across the MV ratings in the catalogues reviewed. GWP on the AR6 basis. [8][9]

GWP 24,300

SF6-free is not F-gas-free. Of these four, only clean air sits outside the EU regulation's annexes. [9]

THE LAW, AS IT STANDS

In Saudi Arabia, the driver is the tender



The aisle a withdrawable truck needs is most of the AIS room.

0	2026	0.1%
Saudi SF6 rules	**EU, up to 24 kV**	**leak check exempt**
none in the documents reviewed; Kigali covers HFCs only [3][10]	no F-gas put into operation from 2026; to 52 kV from 2030; derogations apply [9][14]	any one of three: a tested rate, an alerting monitor, or under 6 kg [9]

Leak checks, Art. 5(1): switchgear is exempt if (a) its tested leakage rate is below 0.1% a year, stated in the maker's technical specification and labelled; (b) a pressure or density monitor alerts automatically in operation; or (c) it holds under 6 kg of Annex I gases. [9]
The ban is on putting into operation, not export. Derogations: no compliant bid (13(11), 13(12)), orders before 11 March 2024, extensions, relocation, spare parts. [9][14]

THE CLAUSE TO WRITE

Five lines a tender can check

MV SWITCHGEAR, SPECIFICATION

a. Metal-enclosed to IEC 62271-200:2021+AMD1:2024 and IEC 62271-1:2017+AMD1:2021, 60 Hz, rated 17.5 kV (or 15 kV) for 13.8 kV, 36 kV (or 38 kV) for 33 kV.

b. Short-time current and duration from the connection study; peak at 60 Hz stated. IAC: type, sides, kA, s, for this room's ceiling and relief route.

c. LSC2B-PM for breaker feeders, LSC and partition class stated per functional unit.

d. Rated current declared at the room's maximum ambient; altitude, dust and salt stated in the enquiry.

e. Insulating medium named by chemistry and GWP basis; tested leakage rate, density alarm per compartment, gas handling to IEC 62271-4.

1. Every line names a document, a quantity and a unit. None of them can be answered with a brand.

2. Line d is the easiest to leave out. It decides whether a 1250 A panel is a 1250 A panel in August.

SOURCES

Where every number in this deck comes from

[1] SERA Electricity Service Guide, 9th ed. 1446 H, art. 11
[2] SEC Distribution Planning Std, 2004 (planning values)
[3] Saudi Arabian Grid Code, May 2024, clause 2.4.2.1
[4] IEC 62271-1:2017+AMD1:2021, 4.1.2, 4.2.2, 5.2 to 5.7, 9.4
[5] IEC 62271-200:2021+AMD1:2024, 3.6.101, 5.103, Annex A
[6] Siemens NXAIR HA 25.71 to 25.75, editions 2019 to 2025
[7] ABB UniGear ZS1 1VCP000138 Rev Z 2026; 1VLM000005
[8] IPCC AR6 WGI Table 7.SM.7 and ch. 2; AR5 Table 8.A.1
[9] Regulation (EU) 2024/573, Art. 5, 6, 12, 13; Annexes I, III
[10] Decision 18/CMA.1; Montreal Protocol Annex F (Kigali)
[11] ABB CIRED 2019 paper 1031; GE Vernova g3 flyer, 2026
[12] Schneider Electric MV guide AMTED300014EN, 2022
[13] Siemens NXPLUS C HA 35.41, 2016; blue GIS range, 2023
[14] EU switchgear FAQ, 2025; UBA factsheet, Sep 2026
[15] IEEE C37.20.2-2025 metal-clad; IEC 60909-0 short-circuit

Recomputed with stated assumptions. Values in IEC 62271-1 clauses not readable in 2017 text are from 2007; see the page.

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