



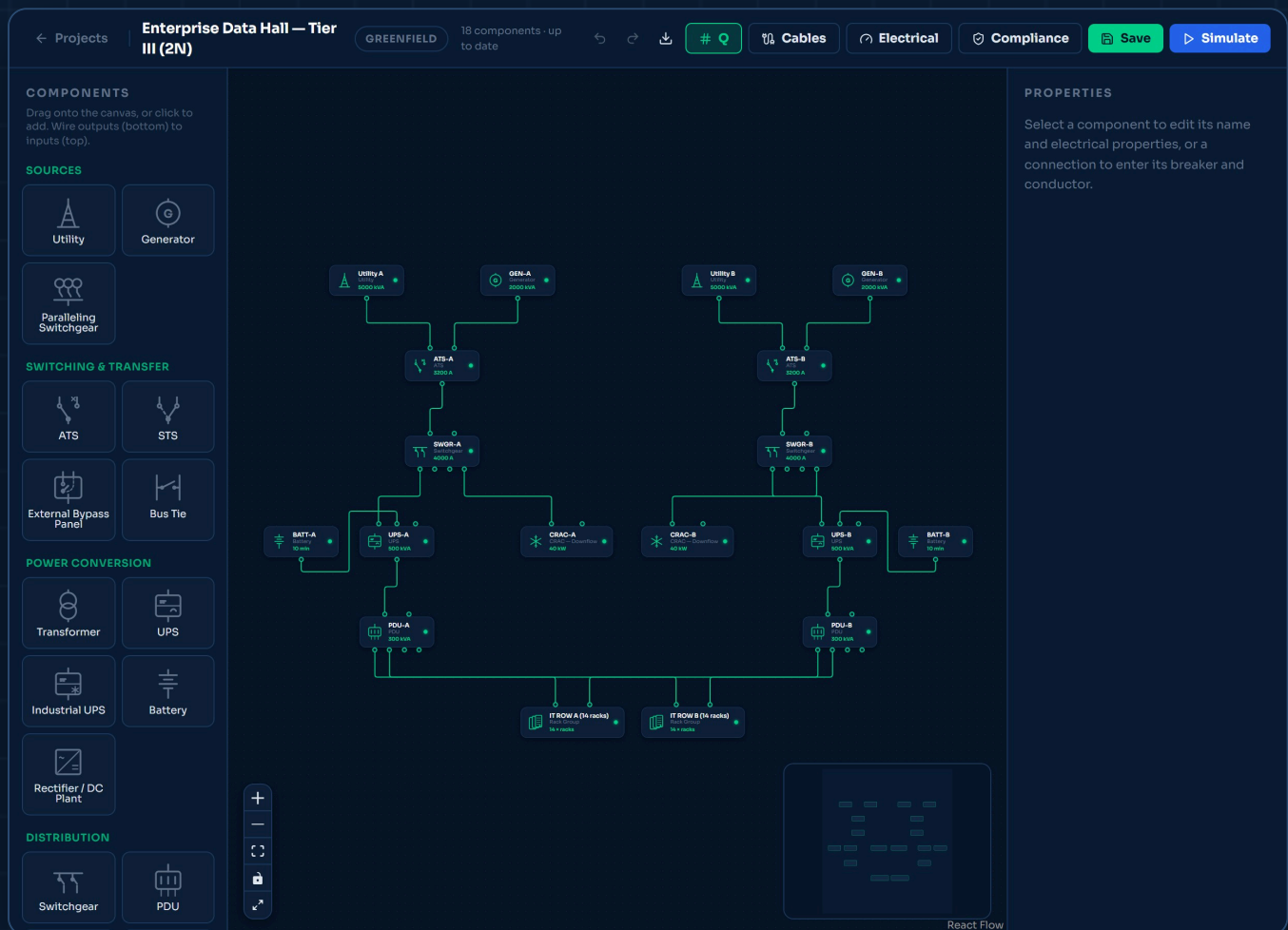
DATA CENTER SIMULATOR

DESIGN. SIMULATE. OPTIMIZE. DELIVER.

PRODUCT WALKTHROUGH

From single line diagram to a design you can defend.

A guided tour of Data Center Simulator on two sample projects: a new Tier III data hall, and an existing single-path hall upgraded to Tier III. Every picture in this document is the real application.



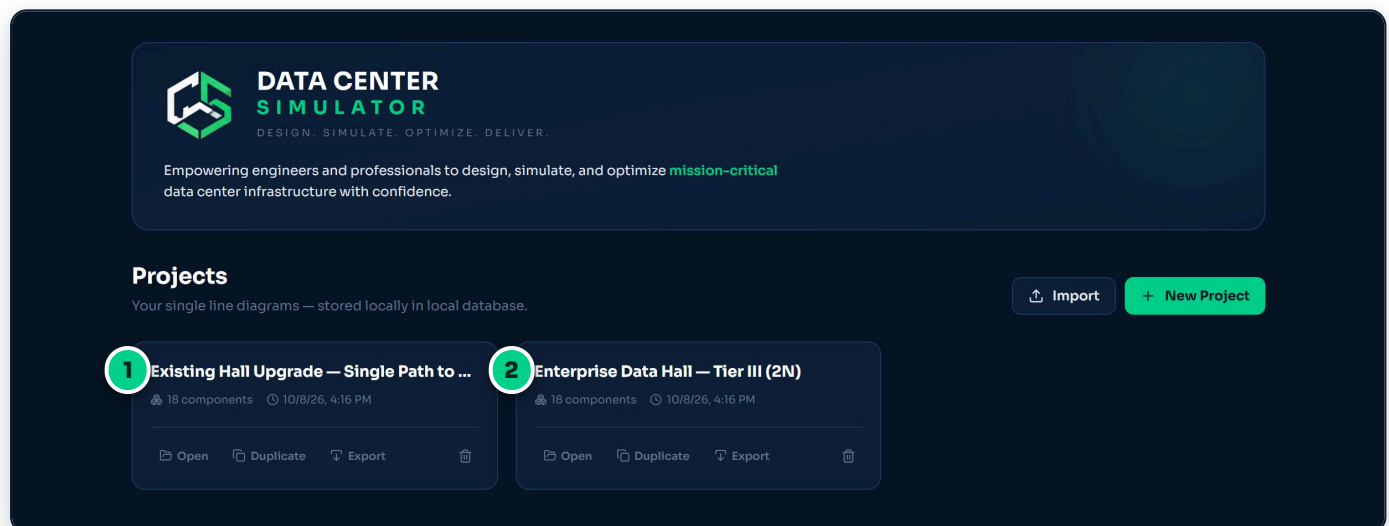
Engineering software for data center electrical and cooling design · Windows · runs locally
datacentersimulator.net

THE IDEA

One model. Every deliverable reads from it.

A drawing tool records a decision; design software tests it. In Data Center Simulator the single line diagram is not a picture — it is the model. The floor layout, the Tier check, the failure simulation, the sequence of operation, the calculations, the bill of quantities and the report are all views of the same model, so they cannot drift apart.

01 Design Draw the single line from utility to rack with 41 component types.	02 Check Tier and Availability Class read from the paths you drew, with the codes cited.	03 Lay out Racks, containment, cooling and tiles on the floor — with a thermal map.	04 Simulate Fail anything and watch the plant respond second by second.	05 Sequence Generate and run the electrical sequence of operation, case by case.	06 Compare Hold the existing facility beside the proposal and test both.	07 Report Design report and bill of quantities generated from the model.
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The projects used in this walkthrough, on the dashboard.

- 1 Existing Hall Upgrade**
 A brownfield job: a hall running on a single path today, being taken to Tier III. Used in steps 09–10.
- 2 Enterprise Data Hall**
 A new 2N hall with 28 cabinets at 7 kW. Used in steps 01–08 and 11.

How to read this document

Each step shows one screen of the application. The numbered markers on the screen match the notes underneath it. Both sample projects are built from the reference designs that ship with the software. The design, simulation and floor-plan steps can be repeated in the free trial; the rest come with the licence.

01

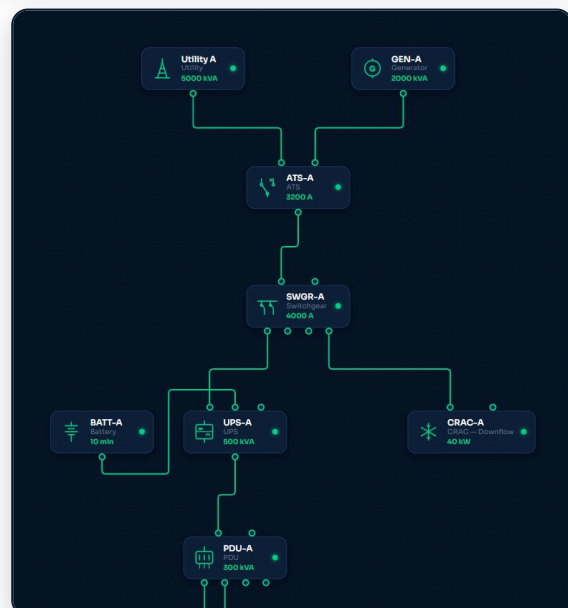
DESIGN

Draw the single line diagram

Drag components from the palette and wire outputs to inputs. Each block carries its ratings, so the drawing already knows what it can carry — no separate load schedule to keep in step.



- 1 Component palette**
Sources, switching, power conversion, distribution, IT load, cooling and protection — 41 types.
- 2 The model**
Utility, generators, ATS, switchgear, UPS with batteries, PDUs and dual-corded rack rows.
- 3 Device designations**
Number every breaker way (Q tags) the way the consultant's drawing does.
- 4 Compliance**
Opens the Tier and Availability Class assessment of what is drawn — step 03.
- 5 Simulate**
Takes the same drawing straight into the simulator — step 06.



Close-up of the A path: every block carries its name, type and rating.

02

DESIGN

Every block is an engineering object

Select a component to edit its name and its electrical properties. Click a connection instead to enter the breaker frame, trip setting and conductor for that circuit.

The screenshot shows the Data Center Simulator interface. On the left is a 'COMPONENTS' sidebar with categories: SOURCES (Utility, Generator), SWITCHING & TRANSFER (ATS, STS, External Bypass Panel, Bus Tie), POWER CONVERSION (Transformer, UPS, Industrial UPS, Battery, Rectifier / DC Plant), and DISTRIBUTION (Switchgear, PDU). The main canvas displays a power distribution diagram for 'Enterprise Data Hall — Tier III (2N)'. It shows two parallel paths (A and B) starting from Utility and Generator sources, passing through ATS and SWGR components, then through CRAC units, and finally through UPS and PDU units to IT racks. A red circle '1' highlights the 'UPS-A' component. On the right, the 'PROPERTIES' panel for 'UPS' is shown, with a red circle '2' on the title and red circles '3', '4', and '5' on the 'RATING (KVA)', 'POWER FACTOR', and 'MAINT. BYPASS (INTERNAL)' fields respectively. The 'Delete component' button is at the bottom of the panel.

- 1 Selected: UPS-A**
The UPS on the A side of the 2N plant.
- 2 What it is**
A plain-language description of the component type.
- 3 Rating**
500 kVA — used by every loading, sizing and redundancy check.
- 4 Power factor and efficiency**
Turn kVA into the kW it can really deliver, and into the heat it adds.
- 5 Internal maintenance bypass**
Whether the module can be bypassed for service — it changes what maintenance does to the load.

Why it matters

Ratings are entered once and used everywhere. Change UPS-A to 400 kVA and the loading, the Tier check, the sequence of operation and the bill of quantities all move with it.

03

CHECK

Tier and Class, read from the paths you drew

The assessment does not ask what the design is meant to be. It traces the drawing and rates it by the lowest level that fully passes — then tells you the one thing standing between you and the next level.

The screenshot displays the Data Center Simulator's compliance assessment interface. On the left, a sidebar lists components like Utility, Generator, Paralleling Switchgear, ATS, STS, External Bypass Panel, Bus Tie, Transformer, UPS, Industrial UPS, Battery, Rectifier / DC Plant, Switchgear, and PDU. The main area shows a power distribution diagram with various components connected. On the right, a 'Tier & Class Compliance' panel is open, showing a checklist of items. Three items are highlighted with numbered circles: 1. Tier III — Concurrently Maintainable (BICSI CLASS F3), 2. REACH TIER 4, and 3. Critical load defined and powered. A separate 'Tier & Class Compliance' panel on the far right shows a list of applicable codes and standards, including ANSI/BICSI 007, IEC 60364, IEC 60800-1, IEC 60947-2, IEEE C57.110, and NFPA 70 (NEC).

The Codes tab: every standard the checks lean on.

- The verdict**
Tier III — Concurrently Maintainable, BICSI Class F3, for this drawing as it stands.
- To reach the next level**
Here: continuous cooling — the room units are not on UPS-backed power.
- Each check cites its codes**
NFPA 70, NFPA 110, IEEE 1100, ANSI/BICSI 002, Uptime Institute topology — named on every line.

The assessment is an engineering aid against published Tier topology and ANSI/BICSI 002 criteria. It is not an Uptime Institute certification, which only the Institute can award.

Why it matters

A Tier claim is a statement about paths, not about how many units are installed. Reading it from the drawing is what catches the shared bus, or the pump on the wrong supply, before a reviewer does.

04

LAY OUT

Put the drawing on the floor

The floor plan carries the same racks the single line feeds. Draw white and gray space, place rows, contain the cold aisles, and set the cooling units and UPS rooms in the gray space.

SPACE SUMMARY	
Room area	216.0 m²
White space	116.6 m²
Gray space	51.8 m²
White : Gray	2.25
Zones	2
BUILDING SYSTEMS	
Items placed	6
Cooling capacity	400 kW
UPS capacity	600 kVA
RAISED FLOOR	
Perforated tiles	0 perf · 28 grate
Delivered airflow	56,000 m³/h
Airflow coverage	106%
56,000 m³/h delivered vs -53,013 m³/h needed for 196 kW at ΔT 11 °C.	
IT LOAD	
Racks	28
Total IT load	196 kW
Avg / rack	7.0 kW
Density (white)	1.68 kW/m²
Electrical SLD: 28 racks, 196 kW — matches this floor ✓	
AISLES	
COLD aisle · 1.2 m ✓ · contained ✓	
HOT aisle · 1.8 m ✓ · open	

- Rack rows**
28 cabinets in two facing pairs; names and loads are editable per rack.
- Cold aisle containment**
Drawn as an object, with its length — the thermal model uses it.
- Cooling units**
Four room units in the gray space, 400 kW installed.
- UPS**
Placed where the electrical room is; their footprint is part of the gray-space area.
- Space summary**
Room, white and gray space areas, rack count, IT load and density, kept against the single line.

Why it matters

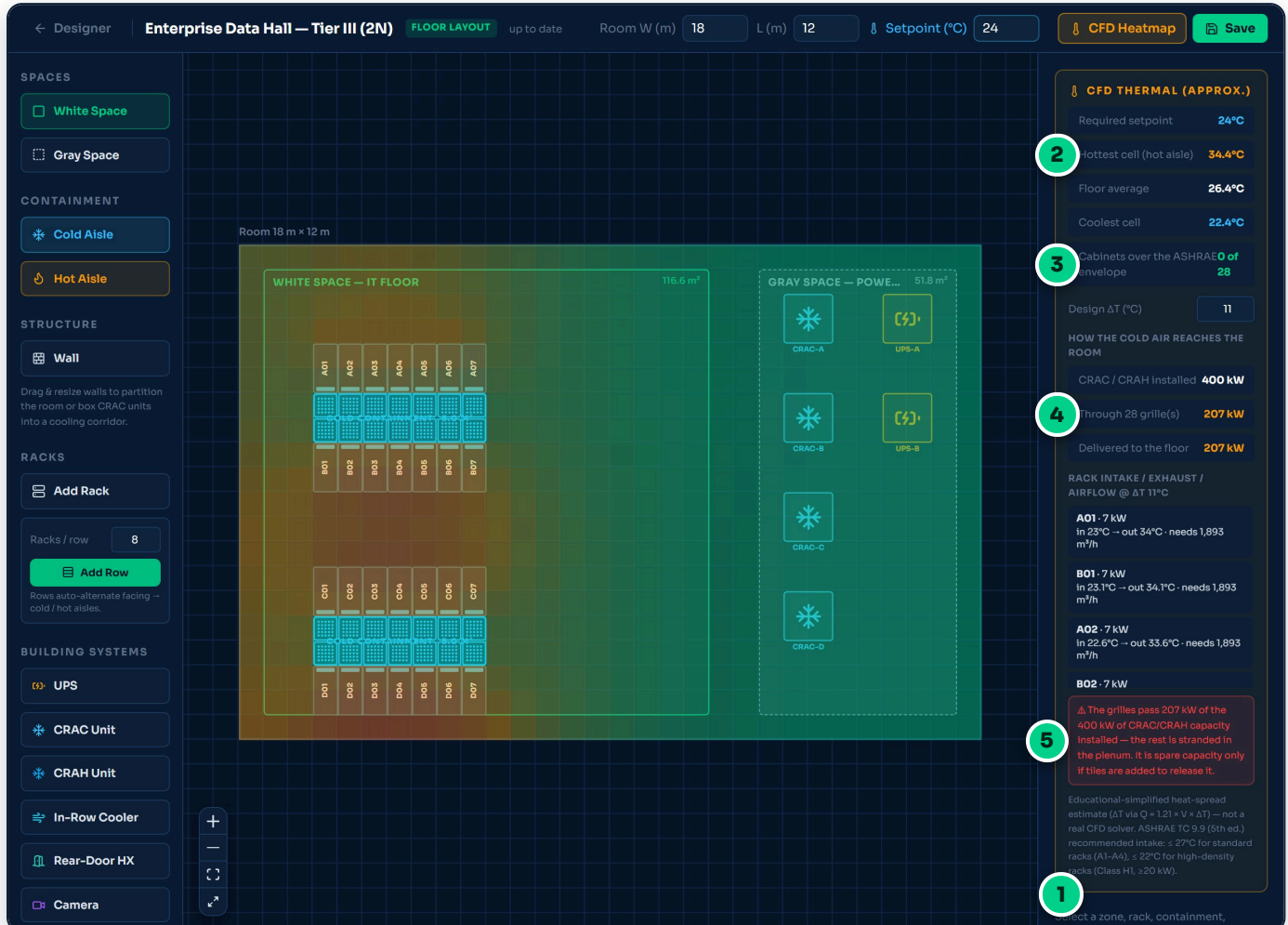
With the floor and the single line on one model, the rack count and the IT load cannot quietly disagree between the drawing set and the layout.

05

LAY OUT

See where the heat goes

The heatmap spreads each rack's heat across the room and checks every cabinet's intake against the ASHRAE envelope — and, just as important, how much of the installed cooling can actually reach the floor through the tiles.



1 Heat map

Warm where the racks exhaust, cool along the contained aisles.

2 Room figures

Setpoint, hottest, average and coolest cell.

3 Cabinets over the envelope

0 of 28 here — every intake is inside the recommended range.

4 Cooling that reaches the room

400 kW installed, 207 kW delivered through 28 high-flow grilles — enough for 196 kW of IT.

5 What to fix

The tool says plainly when capacity is stranded in the plenum and what would release it.

Why it matters

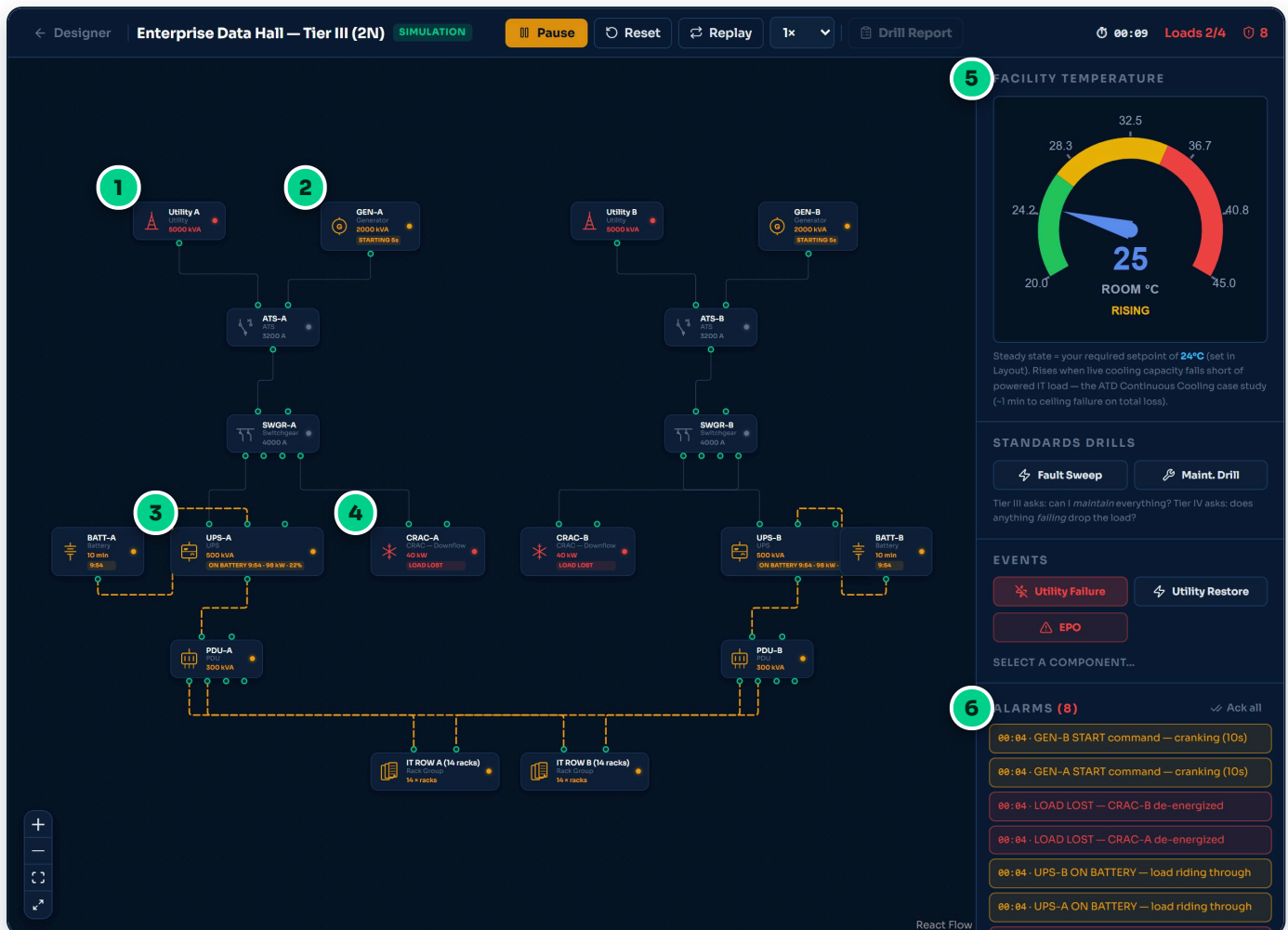
Installed cooling is not delivered cooling. The tiles decide how much of it reaches the cabinets — the most common gap between a cooling schedule and a hot room.

06

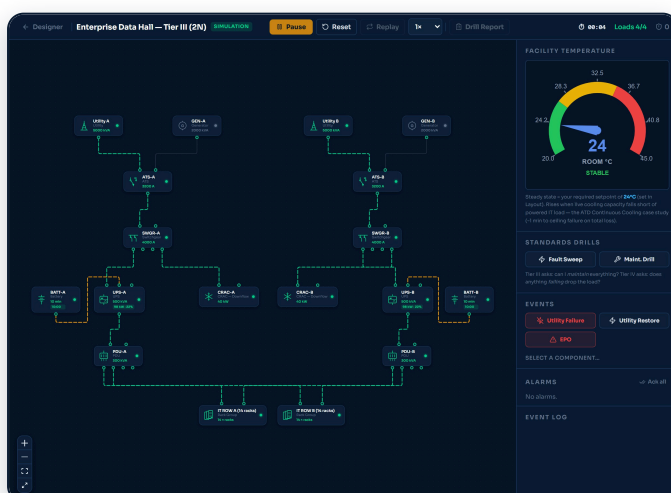
SIMULATE

Fail something and watch the plant respond

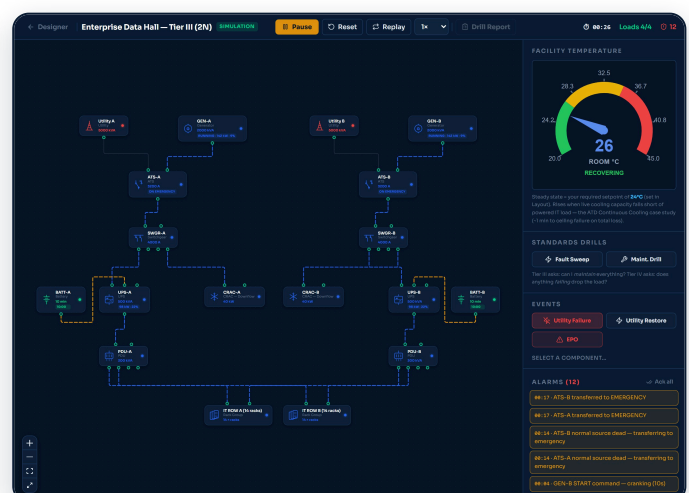
Press Run, then Utility Failure. The event plays in time: utilities drop, the UPS carries the load on battery, generators crank, transfer switches move.



- Utility lost**
Both utility supplies fail at 00:01.
- Generators cranking**
Start command issued, 10 seconds to rated speed.
- UPS on battery**
The IT load rides through on stored energy — the amber path.
- Cooling dropped**
The room units are not on UPS, so they stop until the sets take over.
- Room temperature**
Rising — the gauge shows what losing cooling does to the room.
- Alarms**
Every event with its time stamp, as an operator would see it.



00:00 — normal, both paths on utility.



00:22 — on generator, cooling back.

07

SEQUENCE

The electrical sequence of operation, generated and run

One click builds the standard single-fault set from the drawing — every source, every switch, every breaker way. Run all, and each case is played over time and judged against the Tier you are designing to.

Electrical Sequence of Operation

Enterprise Data Hall — Tier III (2N) Target Tier: Tier 3 (design) Run all Open report CSV Export Import Save

Case List:

- Normal operation
- Utility failure
- GEN-A — fault
- ATS-A — fault
- SWGR-A — fault
- 1 GEN-A — fault**
- GEN-B — fault
- ATS-B — fault
- SWGR-B — fault
- UPS-B — fault
- ATS-A — Normal — open
- ATS-A — Emergency — open
- ATS-B — Normal — open
- ATS-B — Emergency — open
- GEN-A — Feed — open
- GEN-B — Feed — open
- PDU-A — Feed A — open
- PDU-A — Feed B — open
- PDU-A — Cct 1 — open
- PDU-A — Cct 2 — open
- PDU-B — Feed A — open
- PDU-B — Feed B — open
- PDU-B — Cct 1 — open
- PDU-B — Cct 2 — open
- SWGR-A — Feed A — open

Case Selection: UPS-A — fault Run

CAUSE / EFFECT: Fault in UPS-A

ACTION SUMMARY (WHAT THE DESIGN SHOULD DO): Downstream boards take their alternate feed

SETTLE TIME (S): 900 **EXPECTED TIER (OVERRIDE):** Target Tier 3

WHAT HAPPENS IN THIS CASE:

Utility supply: Available

COMPONENTS:

- GEN-A — Generator: Normal
- ATS-A — ATS: Normal
- SWGR-A — Switchgear: Normal
- UPS-A — UPS: Fault
- BATT-A — Battery: Normal
- PDU-A — PDU: Normal
- GEN-B — Generator: Normal
- ATS-B — ATS: Normal

Q DEVICES (WAYS):

- GEN-A Feed — ATS-A: ON
- ATS-A Normal — from Utility A: ON
- Emergency — from GEN-A: ON
- SWGR-A: ON

WARNING: target Tier 3 — remaining plant Tier I — Basic Capacity

- Loads held, but the remaining plant is Tier I — Basic Capacity — below the target Tier 3
- UPS module redundancy (N+1): Only 1 UPS module — N+1 needs a redundant unit.

Source loading: UPS-B 196 kW (46%), Utility-B 244 kW (5%), Utility-A 40 kW

CAUSE / EFFECT	ACTION SUMMARY	RESULT	WORST SOURCE	ATS-A - Normal	ATS-A - Emergency	ATS-B - Normal	ATS-B - Emergency	GEN-A - Feed	GEN-B - Feed
Normal operation	Reference state	SUCCESS		ON	OFF	ON	OFF	OFF	OFF
Normal operation — utility power		SUCCESS		ON	OFF	ON	OFF	OFF	OFF
Utility failure	Sets start and the transfer switches move to the generator side	SUCCESS	UPS-A 22%	FAULT	ON	FAULT	ON	ON	ON
Loss of the utility supply		SUCCESS	UPS-A 22%	FAULT	ON	FAULT	ON	ON	ON
GEN-A — fault	Downstream boards take their alternate feed	WARNING	UPS-A 22%	ON	FAULT	ON	OFF	OFF	OFF
Fault in GEN-A		WARNING	UPS-A 22%	ON	FAULT	ON	OFF	OFF	OFF
ATS-A — fault	Downstream boards take their alternate feed	WARNING	UPS-A 44%	FAULT ISOLATION	FAULT ISOLATION	ON	OFF	OFF	OFF
Fault in ATS-A		WARNING	UPS-A 44%	FAULT ISOLATION	FAULT ISOLATION	ON	OFF	OFF	OFF
SWGR-A — fault	Downstream boards take their alternate feed	WARNING	UPS-B 44%	FAULT ISOLATION	FAULT ISOLATION	ON	OFF	OFF	OFF
Fault in SWGR-A		WARNING	UPS-B 44%	FAULT ISOLATION	FAULT ISOLATION	ON	OFF	OFF	OFF
UPS-A — fault	Downstream boards take their alternate feed	WARNING	UPS-B 44%	ON	OFF	ON	OFF	OFF	OFF
Fault in UPS-A		WARNING	UPS-B 44%	ON	OFF	ON	OFF	OFF	OFF
GEN-B — fault	Downstream boards take their alternate feed	WARNING	UPS-A 22%	ON	OFF	ON	FAULT	OFF	OFF
Fault in GEN-B		WARNING	UPS-A 22%	ON	OFF	ON	FAULT	OFF	OFF
ATS-B — fault	Downstream boards take their alternate feed	WARNING	UPS-A 44%	ON	OFF	FAULT ISOLATION	FAULT ISOLATION	OFF	OFF
Fault in ATS-B		WARNING	UPS-A 44%	ON	OFF	FAULT ISOLATION	FAULT ISOLATION	OFF	OFF
SWGR-B — fault	Downstream boards take their alternate feed	WARNING	UPS-A 44%	ON	OFF	FAULT ISOLATION	FAULT ISOLATION	OFF	OFF
Fault in SWGR-B		WARNING	UPS-A 44%	ON	OFF	FAULT ISOLATION	FAULT ISOLATION	OFF	OFF
UPS-B — fault	Downstream boards take their alternate feed	WARNING	UPS-A 44%	ON	OFF	ON	OFF	OFF	OFF
Fault in UPS-B		WARNING	UPS-A 44%	ON	OFF	ON	OFF	OFF	OFF
ATS-B — Normal — open									

- The case list**
Normal, utility failure, a fault on every source and an opened way on every board.
- The verdict for the case**
Success, warning or fail — against the target Tier — with the reason in words.
- Worst source**
The UPS or generator left most heavily loaded in each case, as a share of its rating.
- The sheet**
Every Q device ON, OFF, FAULT or ISOLATION per case — the matrix the commissioning agent works from.
- Run all, CSV, report**
Re-run after any drawing change; export the sheet or print it as a report.

Why it matters

Written by hand, a sequence of operation drifts away from the drawing within one revision. Generated from the model, it is re-run in seconds after every change.

08
ANALYZE

Calculations that read the drawing

Load, UPS, generator and cooling figures are read from the model through the same engines that build the report and the compliance verdict — nothing is typed in twice, so nothing can disagree.

Electrical Calculations

Educational-simplified formulas for facility sizing. See the Calculations Methodology reference for assumptions.

[View / Print Methodology](#)
[← Home](#)

This Project
read from the open design

General Calculator
standalone sizing

Enterprise Data Hall — Tier III (2N)
18 COMPONENTS · 28 CABINETS · FLOOR PLAN 28 CABINETS

Every figure below is read from your drawing through the engines that build the report and the compliance verdict. Nothing on this tab is calculated a second time, so it cannot disagree with what the report says.

LOAD

What the facility actually draws, split the way the design feeds it.

1

IT load
28 cabinets · FROM DIAGRAM ANALYSIS
196 kW

Mechanical load
cooling units and plant · FROM COOLING MODEL
80 kW

Total facility load
FROM DIAGRAM ANALYSIS
276 kW

UNINTERRUPTIBLE POWER

Installed capacity against the load it is responsible for.

UPS installed
2 units at pf 0.9 · FROM DIAGRAM ANALYSIS
1,000 kVA

UPS capacity
FROM DIAGRAM ANALYSIS
900 kW

2

UPS loading
against IT load · FROM DIAGRAM ANALYSIS
21.8 %

Shortest battery autonomy
2 strings drawn · FROM DIAGRAM ANALYSIS
10 min

STANDBY GENERATION

Sizing runs on the whole facility load, building services included.

3

Generators installed
2 sets · FROM DIAGRAM ANALYSIS
4,000 kVA

Sizing calls for
276 kW ÷ 0.8 pf · FROM GENERATOR SIZING
350 kVA

Headroom
FROM GENERATOR SIZING
+3,650 kVA

COOLING AND AIR

Room-side capacity is what removes heat; plant duty sits upstream of it.

Room cooling capacity
2 room units · FROM COOLING MODEL
440 kW

Against IT load
FROM COOLING MODEL
+244 kW

4

Airflow required
 $Q = 1.21V \cdot \Delta T \text{ at } \Delta T 11^\circ\text{C} = 31,202 \text{ CFM}$ · FROM THERMAL ENGINE
53,013 m³/h

- 1

Load
IT, mechanical and total facility load, with where each figure came from.
- 2

Uninterruptible power
Installed kVA, usable kW, loading and the shortest battery autonomy on the drawing.
- 3

Standby generation
Installed sets against the sizing the load calls for, and the fuel autonomy.
- 4

Cooling and air
Room cooling against IT load, airflow required, and what the grilles really deliver.

The General Calculator tab sizes UPS, battery, cable and cooling on their own when there is no drawing yet. The method behind every figure is printable from **View / Print Methodology**.

Why it matters

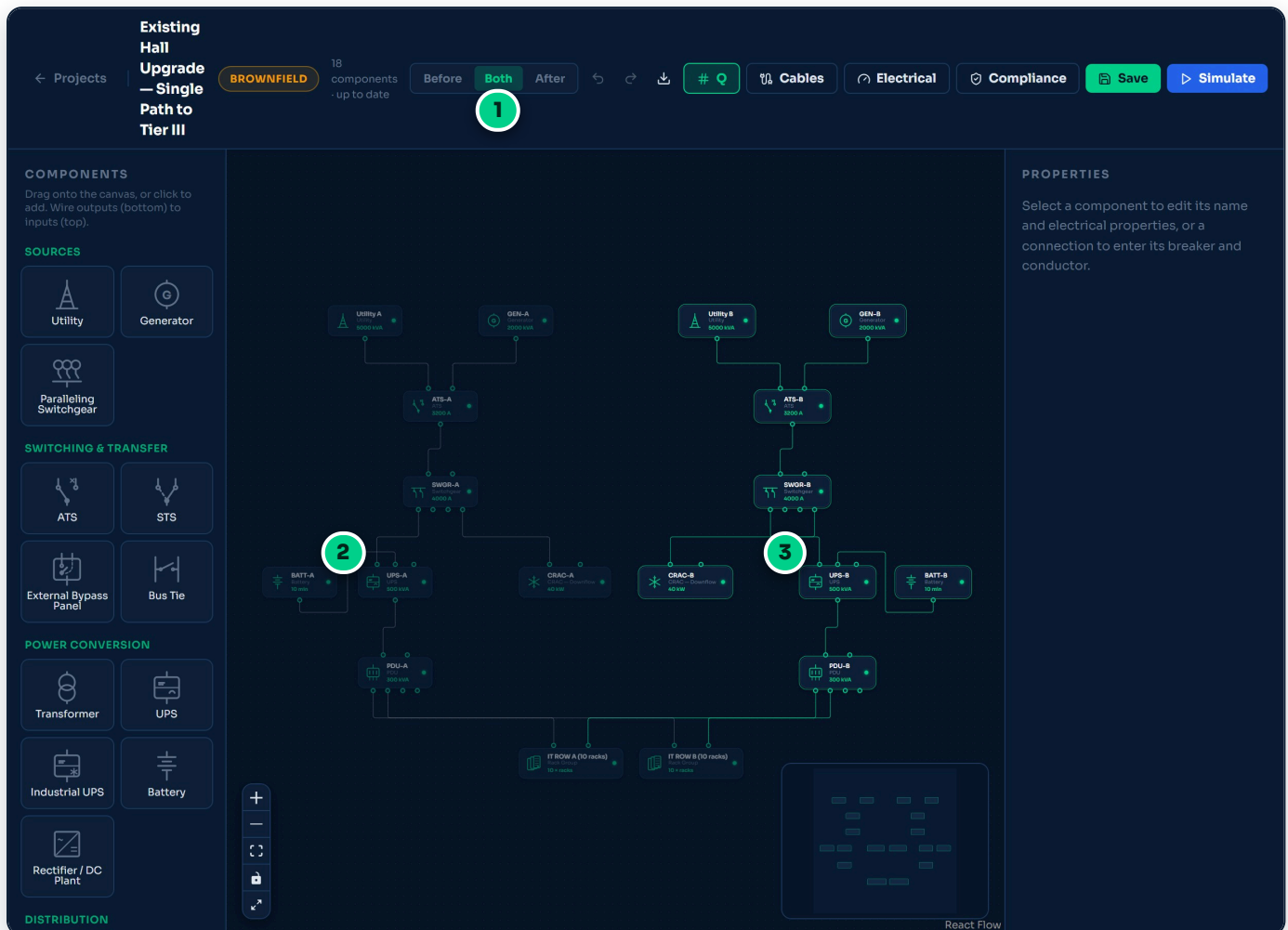
Every figure on this screen comes from the same engines as the report and the compliance verdict, so the numbers a client reads in the report are the numbers you checked here.

09

COMPARE

Existing facility beside the proposal

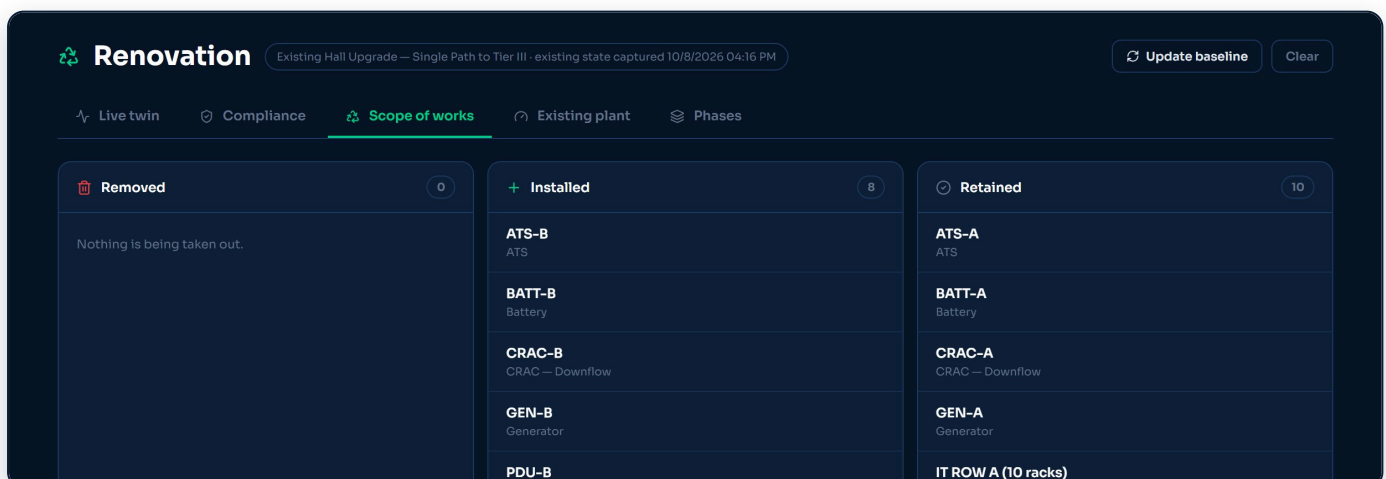
Most data center work is brownfield. Capture the facility as it stands, then design the change on top of it. The scope of works is listed for you.



1 Before · Both · After
Flip between the as-found plant, the proposal, or both overlaid.

2 Retained
The existing A-side plant, dimmed: utility, generator, ATS, switchgear, UPS and PDU.

3 Installed
The new B side that turns a single path into 2N.



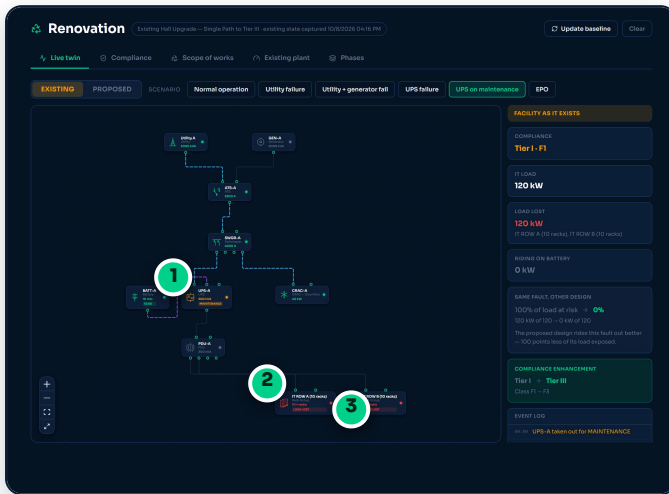
Scope of works — removed, installed and retained, generated from the difference.

10

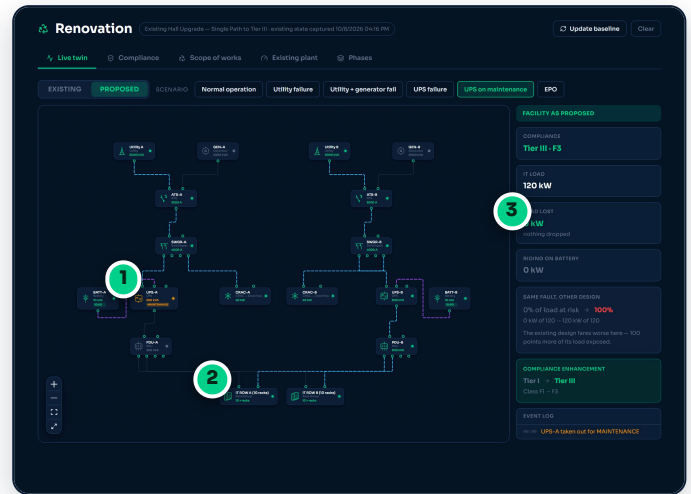
COMPARE

Run the same fault on both designs

The Renovation workspace plays any scenario on the existing plant and on the proposal. Here UPS-A is taken out for maintenance — the test a Tier III claim has to pass.



Existing: UPS-A on maintenance — 120 kW of IT load lost.

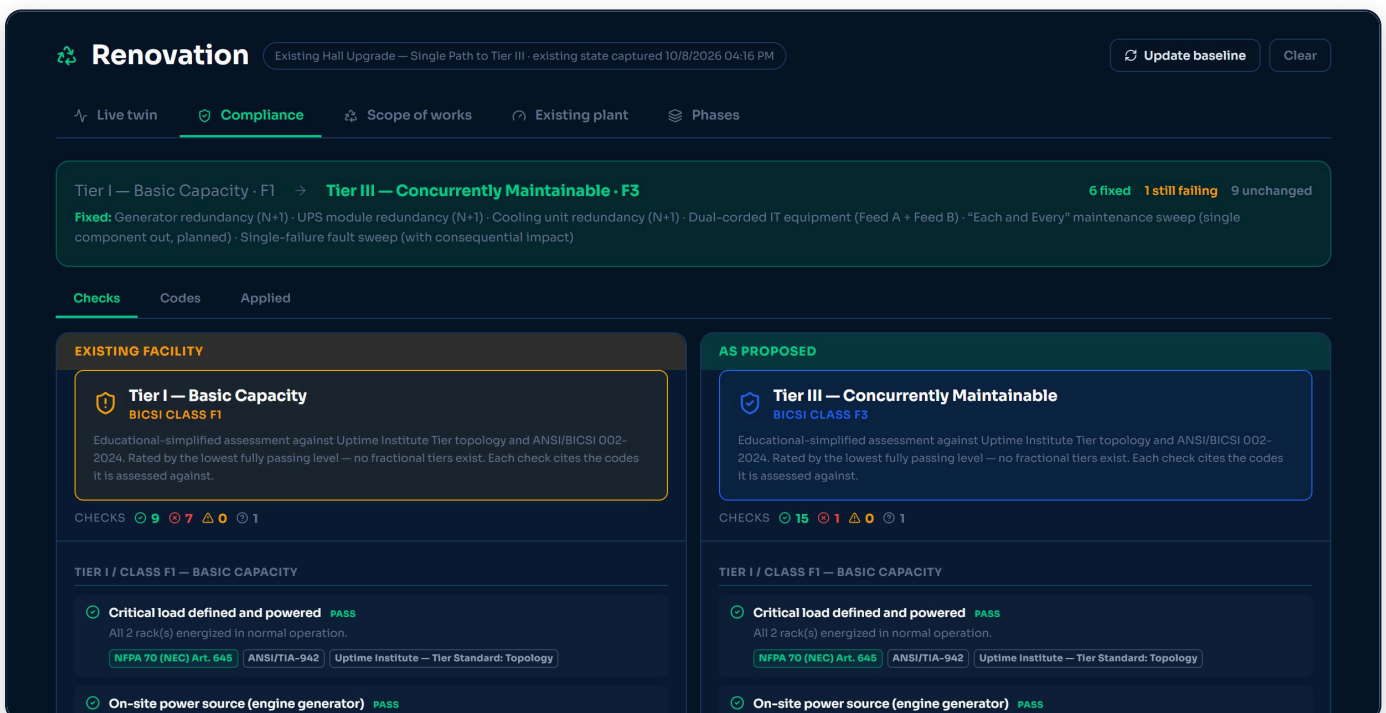


Proposed: same event — nothing dropped.

- 1 UPS-A on maintenance**
The same planned event, applied to both designs.

- 2 The racks**
Existing: both rows de-energised. Proposed: carried by the B side.

- 3 Load lost**
120 kW against 0 kW — the case for the upgrade, in one number.



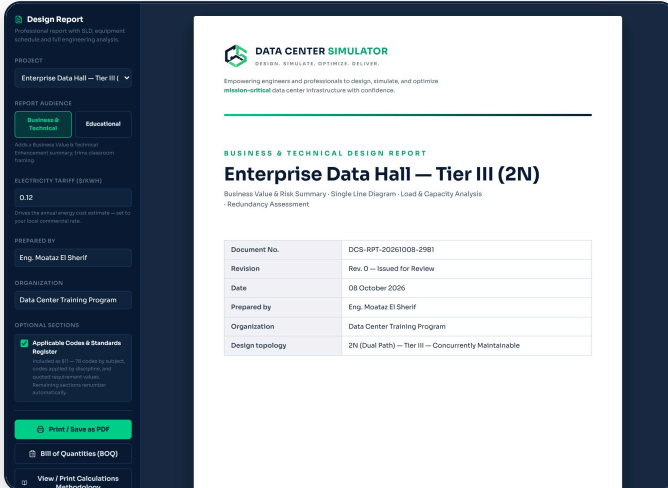
Compliance, before and after: Tier I → Tier III. Six checks fixed, one still failing, nine unchanged — each one listed.

11

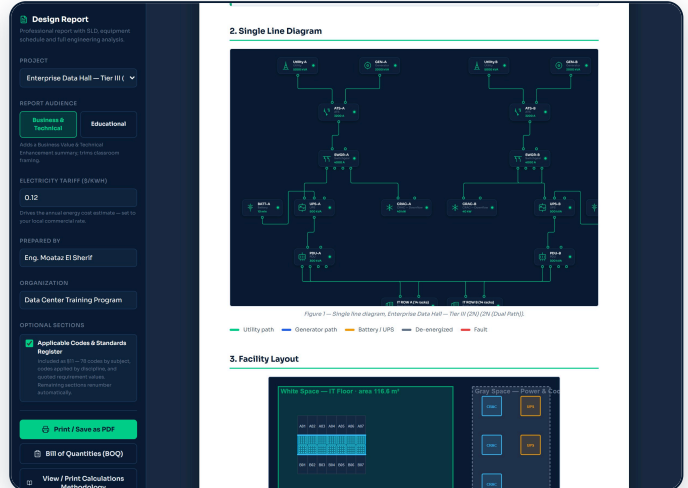
REPORT

The design report and the bill of quantities

Generated from the model, not re-keyed from it. Choose the audience, add the codes register, and print to PDF. The bill of quantities is laid out for tender pricing, section by section.



Report cover — document number, revision, topology.



Inside — the single line diagram and the facility layout as figures.

Design Report
Professional report with SLD, equipment schedule and full engineering analysis.

PROJECT
Enterprise Data Hall — Tier III ()

REPORT AUDIENCE
Business & Technical Educational

Adds a Business Value & Technical Enhancement summary, trims classroom framing.

ELECTRICITY TARIFF (\$/KWH)
0.12
Drives the annual energy cost estimate — set to your local commercial rate.

PREPARED BY
Eng. Moataz El Sherif

ORGANIZATION
Data Center Training Program

OPTIONAL SECTIONS
☒ **Applicable Codes & Standards Register**
Included as §11 — 78 codes by subject, codes applied by discipline, and quoted requirement values. Remaining sections renumber automatically.

Print / Save as PDF

Back to Report

View / Print Calculations Methodology

Item	Description	Specification	Unit	Qty	Unit Price (USD)	Total Price (USD)
8.1	MV Power Cable — 4 x (1C×630 mm ²) Cu/XLPE per phase	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 3,200 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
8.2	LV Power Cable — 5 x (1C×630 mm ²) Cu/XLPE per phase	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 4,000 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
8.3	LV Power Cable — 4 x (1C×630 mm ²) Cu/XLPE per phase	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 3,200 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
8.4	LV Power Cable — 3C×630 mm ² Cu/XLPE	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 722 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
8.5	LV Power Cable — 3C×300 mm ² Cu/XLPE	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 433 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
8.6	LV Power Cable — 3C×70 mm ² Cu/XLPE	Supply, install, terminate & test; 4 circuit(s) per the Cable Sizing Schedule (design current up to 157 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	4		
8.7	LV Power Cable — 3C×16 mm ² Cu/XLPE	Supply, install, terminate & test; 2 circuit(s) per the Cable Sizing Schedule (design current up to 68 A); route lengths to be measured from the routing/containment drawings, incl. lugs, glands & tray share	Cct	2		
Section 8 Subtotal — carried to Summary						

Summary of Sections

Section	Title	Items	Amount (USD)
1	Sources	2	
2	Switching & Transfer	1	

Bill of quantities — quantities from the drawing and the floor plan, price columns left for the bidder.

YOUR TURN

Try it on a facility you already know.

Draw a plant you know well, break the component you already know is the weak point, and see whether the tool finds it. That is the fastest way to judge it.

1

Download the free trial

The designer, simulator, floor plan and Tier verdict on one project, for five days. A single Windows file — nothing to install, nothing sent anywhere.

datacentersimulator.net

2

Send your Machine ID

The licence is tied to one computer. The trial shows its Machine ID — in the welcome window and in Settings → Licence. It looks like this:

DCS-1A2B-3C4D-5E6F

3

Paste your key

The key arrives by email. Paste it into the activation screen and the full edition opens — the projects you made in the trial are still there.

Runs locally

The application and your projects live on your own disk. No cloud account, no upload of your client's drawings.

Standards it leans on

Uptime Institute Tier topology, ANSI/BICSI 002, NFPA 70 and 110, IEEE 450, 1100 and 1184, IEC 60364 and 60502, ASHRAE TC 9.9.

Who it is for

Consultants, contractors and operators designing, upgrading or reviewing data center electrical and cooling plant.

WEBSITE

datacentersimulator.net

EMAIL

Sales@datacentersimulator.net

WHATSAPP

+2 010 4376 2627

Prefer to see it on your own drawing first? Ask for an engineering walkthrough at datacentersimulator.net — it is run by the engineer who built the software.

Tier and Availability Class assessments in Data Center Simulator are engineering aids against published Uptime Institute Tier topology and ANSI/BICSI 002 criteria. They are not certifications. Thermal results are an approximate heat-spread estimate, not a CFD solution. Uptime Institute, BICSI, NFPA, IEEE, IEC and ASHRAE are the owners of their respective standards and marks.