Direct-DC power for AI data centres

Natural-gas turbine-generator packages, built from existing aero engines, designed to deliver 800 V DC directly from the generator to the racks.

CONCEPT Concept render: scale-up to a 100 MW or larger data centre with eight generators, minimum white space and minimum 800 V DC copper buses. Not built equipment.

Next step: an NDA

Michael Tomsic, President / mtomsic@hypertechresearch.com / +1 740-517-3569

THE CONSTRAINT AND THE IDEA

800 V DC, available at the generator

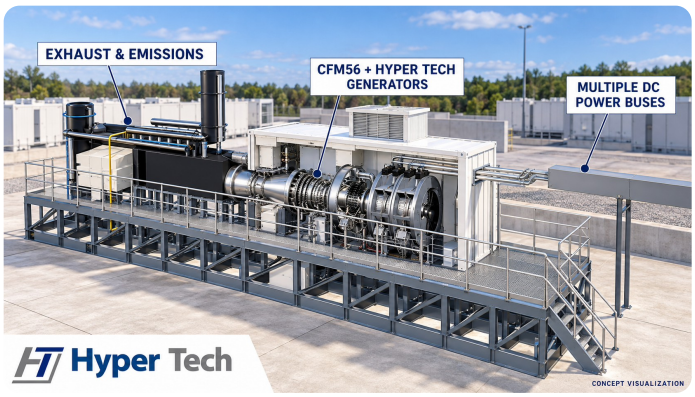
Hyper Tech is working to solve the biggest constraint facing AI data centres in the 2027–2033 window: timely access to additional power from natural gas behind the meter, at lower capital cost. Its natural-gas turbine-generator packages are designed to deliver 800 V DC directly from the generator to the racks.

TARGET
16 MW
per unit, with a pathway to 20 MW

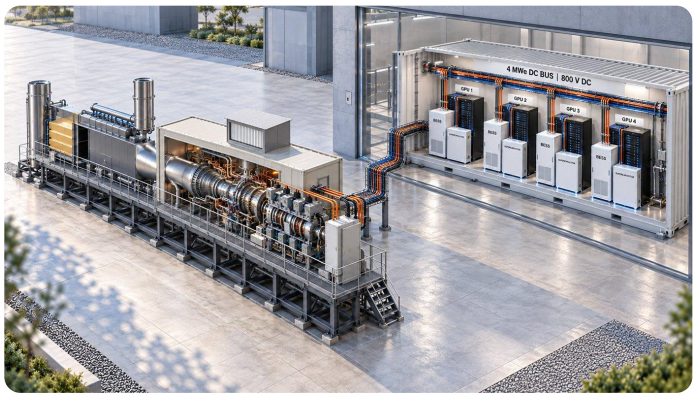
CONCEPT
800 V DC
direct from the generator, on multiple isolated buses

MODELLED
~$860/kW
data-centre CAPEX saving: about 35% of the equipment cost, ~$0.86B per GW

TARGET
Q2 2028
first unit and pilot, built from existing aero engines



CONCEPT 16 MW turbine generator with direct 800 V DC output on multiple isolated buses.



CONCEPT Each 4 MVA, 800 V DC bus feeds GPU racks, battery storage (BESS) and supercapacitors: four isolated pods in the data hall ("white space") for NVIDIA 1 MW racks.

TWO POWER CHAINS TO THE SAME 800 V DC

Conventional turbine plant
AC output, then separate rectification

Gas turbine → 13.8 kV generator → MV transformers, switchgear, breakers → LV transformers, switchgear, breakers → Separate rectification → 800 V DC at the racks

No longer required: MV and LV transformers, switchgear and breakers; separate rack-mounted rectifiers; the turbine gearbox

Hyper Tech CROSSOVER
800 V DC available at the generator

Aero-engine gas turbine → Generator with integrated rectification 600 V AC to 800 V DC → Multiple isolated 800 V DC (or ±400 V DC) buses of 2–5 MW → 800 V DC at the racks

The shortest possible DC buses run to the GPU racks: less real estate, lower losses (no transformer losses) and higher reliability (far fewer components). Future conventional designs: multiple, costly solid-state transformers converting 13.8 kV AC directly to 800 V DC.

	CONVENTIONAL TURBINE PLANT	HYPER TECH CROSSOVER
Bus isolation	External transformers	**Inside the generator: 600 V AC converted to 800 V DC, with local fuses and IGBT controls. The generator then feeds multiple isolated buses.**
Time to power	New turbines largely sold out to 2029–2030; transformers 2.5–4 years (current lead times)	**First unit and pilot Q2 2028 (target), built from existing aero engines**

Ratings, emissions and dates are design targets; costs and savings are modelled estimates, not guarantees.

INSIDE THE PACKAGE

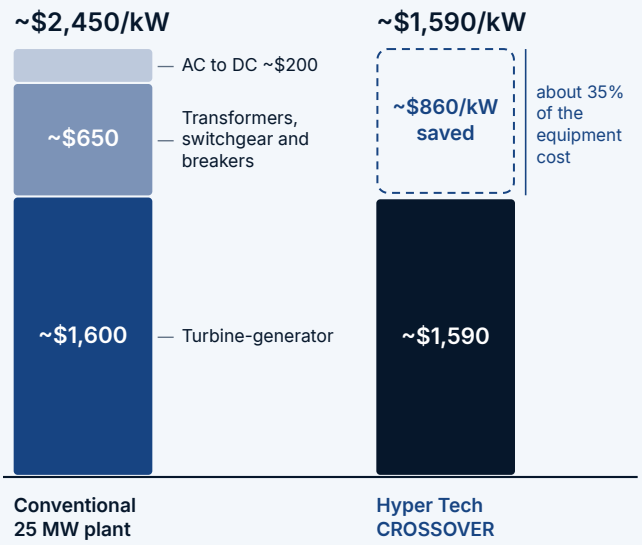
Where the cost goes, and what you get

CONCEPT Aero core driving Hyper Tech generators with integrated rectification: 800 V DC leaves the generator.

Equipment cost per kW

- **Conventional 25 MW plant: ~$2,450/kW.** Turbine-generator ~$1,600/kW; transformers, switchgear and breakers ~$650/kW; AC to DC ~$200/kW.
- **Hyper Tech CROSSOVER: ~$1,590/kW.** Turbine generator direct to DC.
- **Data-centre CAPEX saving: ~$860 per kW,** ~$0.86B per GW: about 35% of the equipment cost.

WHERE THE COST GOES: AVERAGE EQUIPMENT CAPEX



MODELLED Hyper Tech cost model, cross-checked by a Monte Carlo of public sources for one 25 MW unit delivered 2027–28 (P50 ~$2,450/kW; range $2,200–2,750).

What a data centre gets

- **16 MW per unit, with a pathway to 20 MW.** Natural-gas turbine-generator packages for behind-the-meter power.
- **800 V DC from the generator.** Multiple isolated 800 V DC (or ±400 V DC) buses, matching the latest GPU and CPU architectures for NVIDIA, Meta, AWS and Microsoft.
- **Short DC run, no AC cable losses.** Smooth DC output, designed to need no separate filter or condenser.
- **Fewer long-lead items.** Bypasses the transformer backlog and the queue for new turbines, and cuts capital cost.
- **NOx control.** SCR designed for as low as 1 ppm NOx (design target); hydrogen, other fuels and fuel cells on the same buses later.

Programme and supply

- **Existing aero engines.** A route to purchase rebuilt CFM56 engines is established; modifications in hand; life targeted to match a new gas turbine; $/kW parity or better.
- **Made in the US.** Design and manufacturing in the United States, close to the customer.
- **Next-generation data centre.** Designed to cut space dramatically, with higher efficiency, fewer components and higher reliability.

MILESTONES TARGET

2027 Load demonstration

Q2 2028 First-of-a-kind unit and data-centre pilot

2029 Volume production

CLAIM STATUS CONCEPT proposed design TARGET intended outcome MODELLED calculation from the Hyper Tech model

Ratings, emissions and dates are design targets; costs and savings are modelled estimates, not guarantees.

HOW IT COMPARES

On-site power options for AI data centres

OPTION (PUBLIC INFORMATION)	UNIT SIZE	EFFICIENCY*	OUTPUT TO THE DATA HALL	AVAILABILITY
GE Vernova LM2500XPRESS	~35 MW aero	~37–40%	AC; transformers, switchgear and rectifiers needed for 800 V DC	Turbine slots largely committed to 2029–2030
Siemens Energy SGT-800 with Eaton	60–75 MW industrial	~40%	AC; Eaton MV switchgear; DC conversion still needed	Joint 500 MW modular offer announced 2025; delivery slots not published
Baker Hughes NovaLT16 with BRUSH	~16.5 MW industrial	~35–38%	AC through a gearbox and generator; DC conversion still needed	Delivering to Frontier (270 MW) and Dynamis (~1.3 GW) from 2026; new slots not published
Caterpillar Solar Turbines (Titan)	10–39 MW industrial	~35–40%	AC, integrated with Vertiv; DC conversion still needed	Selling to data centres now; deliveries from 2026
Natural-gas combustion engines, reciprocating (Cummins, Caterpillar, Wärtsilä, Jenbacher); diesel versions too	1.5–20 MW	~40–50%	AC; many units, paralleling switchgear and transformers. Diesel is mainly backup: emissions permits limit running hours	Lead times typically 12–18 months for large orders
Combined-cycle plant	100 MW+	~55–62%	AC to grid or site; full conversion chain	4–6 years to operation
Hyper Tech CROSSOVER	**16 MW, 20 MW upside**	**37–39% (model)**	**800 V DC direct from the generator, multiple isolated buses**	**First unit Q2 2028 (target); existing aero engines**

*Simple-cycle (or combined-cycle) electrical efficiency on a lower-heating-value basis; approximate public ranges for the class, not OEM guarantees. Hyper Tech figures are cycle-model outputs (Rev 14): 37.1% at 16 MW, 38.9% at 20 MW.

Sources: OEM and industry public releases (GE Vernova, Siemens Energy, Baker Hughes, Caterpillar, Cummins), EIA Annual Energy Outlook, Lazard LCOE+ 2026, SemiAnalysis 2025 and GridLab 2025. Natural gas is priced at $4.40/MMBtu (HHV). Hyper Tech figures are design targets and model outputs, not guarantees.

Running cost: natural gas, on one basis

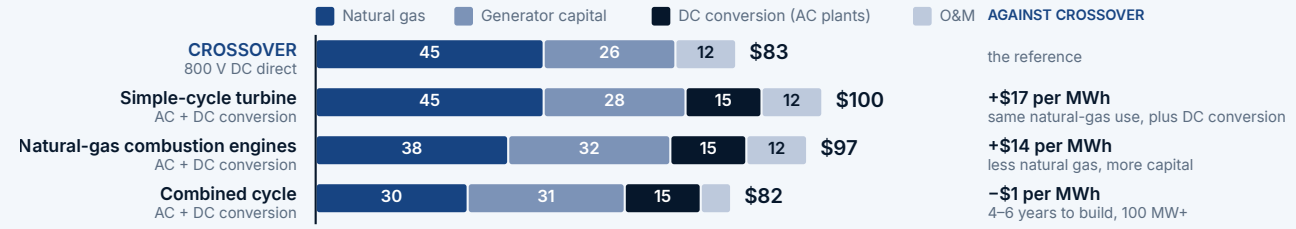
- **The same natural-gas cost as any simple-cycle turbine.** About $43–45 of natural gas per MWh at $4.40/MMBtu and 37–39% efficiency, in line with the aeroderivative and industrial turbines bought for data centres today (37–40%).
- **Slightly less at the racks.** AC plants lose 3–5% in transformers and rectifiers; CROSSOVER output is already 800 V DC.
- **Where other options differ.** Natural-gas combustion engines use about $38 and combined cycle about $30 of natural gas per MWh, but combined cycle takes 4–6 years to build. Diesel is about $400 per MWh in fuel at $6 a gallon: backup only.
- **Turbine Refurbishment Exchange.** Competitively priced ‘core GT’ replacement as a service.

Total cost of electricity

- **About $81–83 per MWh at the racks (modelled).** Natural gas $43–45, capital about $26, maintenance and core exchange $12, at 85% load factor.
- **Against a quick estimate.** Natural gas plus the equipment price spread over 10–15 years is about $59–66. Financing adds about $12 and maintenance $12, as for any generator.
- **Lower than an AC simple-cycle plant.** A turbine with DC conversion is about $100 on the same basis: its conversion chain adds about $15 and losses about $3.
- **Further gains.** The 20 MW rematch raises efficiency from about 37% to 39%; a heat-recovery bottoming cycle is under study.

COST OF ELECTRICITY PER MWh AT THE RACKS (800 V DC): SAME BASIS FOR EVERY OPTION

MODELLED



One basis for every row: natural gas at $4.40/MMBtu (HHV), 85% load factor, 15 years at a 9% cost of capital. AC plants add $850/kW of transformers, switchgear and rectifiers and lose 4% on the way to 800 V DC. CROSSOVER: 37.1% efficiency (16 MW), $1,590/kW. Simple-cycle turbine: 38.5%, $1,600/kW, same maintenance allowance. Natural-gas combustion engines: EIA heat rate and O&M, $1,850/kW. Combined cycle: Lazard LCOE+ 2026 midpoints. Estimates, not quotes.

Next step: an NDA

We then share technical details with data centres and financial information with investors.

Michael Tomsic, President
Hyper Tech Research, Inc. / +1 740-517-3569
mtomsic@hypertechresearch.com