

SUCCESS STORY

Turning braking energy into profit!

58'000 US\$ saved in one year with our IGBT inverter system (1 single unit)



An energy-efficient success story powered by our regenerative braking technology

 **Agra Metro, Uttar Pradesh, India**



PROJECT OVERVIEW

In March 2024, the city of Agra (Uttar Pradesh, India) launched commercial operations on its first-ever metro system, the **Yellow Line**, as part of Phase 1 of the Agra Metro Rail Project.

Spanning 14 km and featuring both elevated and underground sections, this represents a major milestone in sustainable urban mobility.

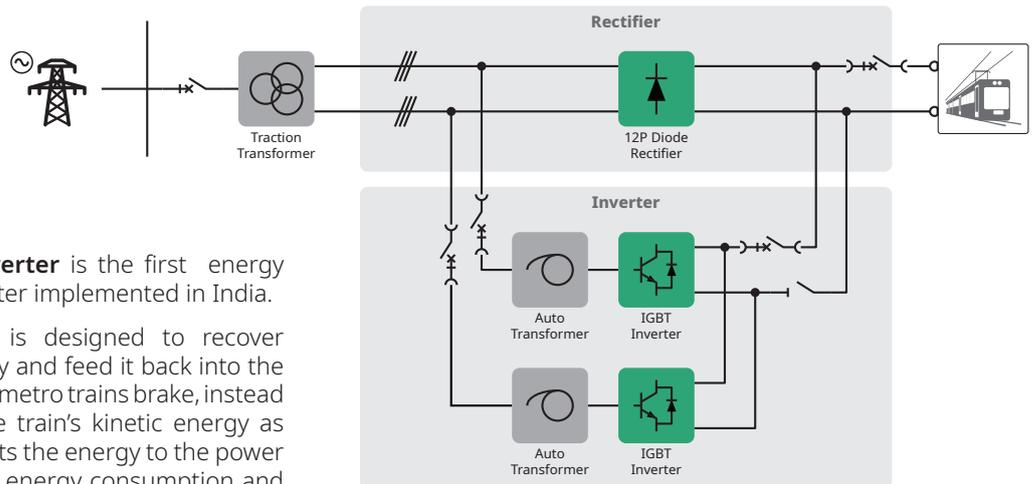
This project is expected to benefit approximately 2 million residents, improving daily transit and reducing Agra's carbon footprint.



AGRA METRO ROUTE MAP



SÉCHERON'S CONTRIBUTION



Our **IGBT Inverter** is the first energy recovery inverter implemented in India.

This solution is designed to recover braking energy and feed it back into the AC grid. When metro trains brake, instead of wasting the train's kinetic energy as heat, it redirects the energy to the power grid, reducing energy consumption and costs. The recovered energy supplies other electricity consumers such as electric transportation, households and industrial consumers among others.

 **Brochure INV-I** · SG839109BEN

Sécheron's full scope of supply for Agra Metro Rail Project:

- Rectifier, Inverter, DC Switchgear, Local SCADA & Control
- 13x Traction power substations (4 equipped with Inverters)
- Services: Commissioning, Start up, Fine tuning, Training

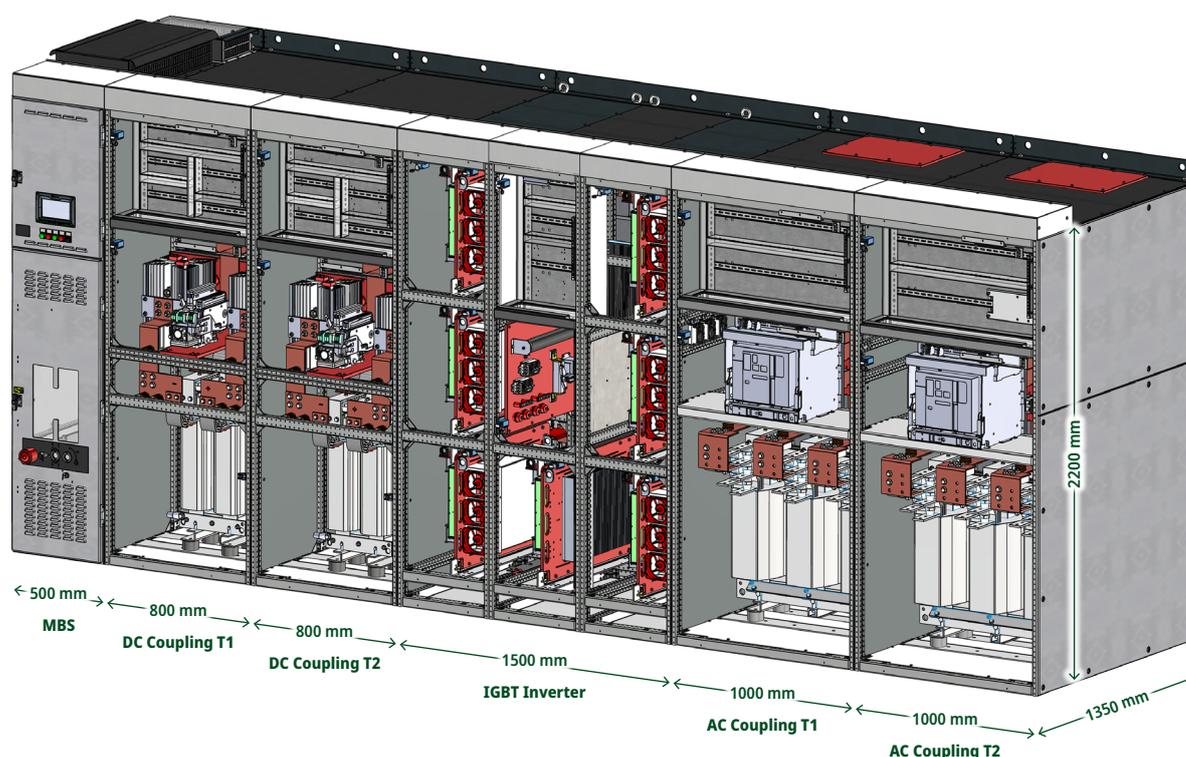
TECHNICAL CHARACTERISTICS

IGBT inverter

Parameter	Value description
Type	Double bridge two-level three-phase IGBT inverter
Rated power	1'000 kW
Rated DC voltage	850 V
DC input voltage range	800...900 V
Maximum DC voltage (non-permanent)	1'000 V
Rated DC current	1'177 A (@ 850 V)
Rated insulation voltage	1.8 kV (according to EN 50124)
Connecting diagram	2 x 3-phase bridges in parallel
Cooling system	Forced air (IGBTs) / Natural (Reactors)
Rated load efficiency	> 95.0%
Displacement power factor	0.99 (cos phi)
Use	Indoor

IGBT inverter associated Transformer

Parameter	Value description
Total basic power	2'850 kVA
Primary voltage	33 kV
Secondary voltage	585 V



ENERGY & COST SAVINGS

Within just one year, Agra Metro saved nearly ₹5 million⁽¹⁾ (around 58'000 US\$) in recovered energy value, thanks to only a single unit of our regenerative braking system in operation.

This result not only confirms the effectiveness of our technology, but also demonstrates its potential for scaling across similar urban transport networks. This means **long-term energy efficiency** and strong return on investment.

WHY IT WORKS?

- ✓ Highly-reliable technology
- ✓ Low maintenance requirements
- ✓ Energy savings from day one
- ✓ Long-term value
- ✓ Type-tested in the facilities of our production site in Prague



PAYBACK PERIOD

Sécheron's inverter-transformer system is fully amortized in less than **5 years**.

5
YEARS



POST-PAYBACK SAVINGS

Once the investment is recovered, our system generates a net profit of approximately **58'000 US\$** annually.

58'000 US\$
PER YEAR



PROJECTED LIFETIME

Designed for a lifetime of more than **30 years⁽¹⁾**, the total net return is expected to exceed 1.4 M US\$.

30
YEARS

⁽¹⁾ including a midlife overhaul program for electronic control boards

This solution stands as a **sustainable investment**, offering both financial and environmental returns, lowering the system's carbon footprint.

⁽¹⁾ Source: <https://tahkikattoday.com/agra-metro-traction-system-regenting-energy-from-braking-of-metro-saving-upto-rs-50-lakh-worth-energy-in-one-year/>
Conversion rates (as of March 2025): ₹ 50 Lakh = INR 5'000'000 = USD 58'400 = EUR 54'200

Looking to implement a similar solution? Contact us!

HEAD OFFICE

📍 Sécheron SA (Switzerland)
Rue du Pré-Bouvier 25
1242 Satigny - Geneva - Switzerland
+41 22 739 41 11 | tps@secheron.com



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