



Transforming power.



IONATE is building the tech-backbone for the smart, adaptable grids of tomorrow.

Their hardware is the Hybrid Intelligent Transformer (HIT): a new building block for the grid and everything connecting. Like a transformer, it integrates as a connection point into the network, renewable generation, or C&I connection. There, it removes constraints and solves key power quality issues through all-in-one power flow control.

But in doing so, HITs effectively light up real-time control nodes for the very first time. Once placed in strategic points of the network, IONATE's AI platform can coordinate them to form a true smart system, coupling top-down grid orchestration with instantaneous bottom-up control in the physics.

This full stack will achieve real-time system optimisation and turn the passive old grid into a flexible, decentralized platform that catalyses innovation.

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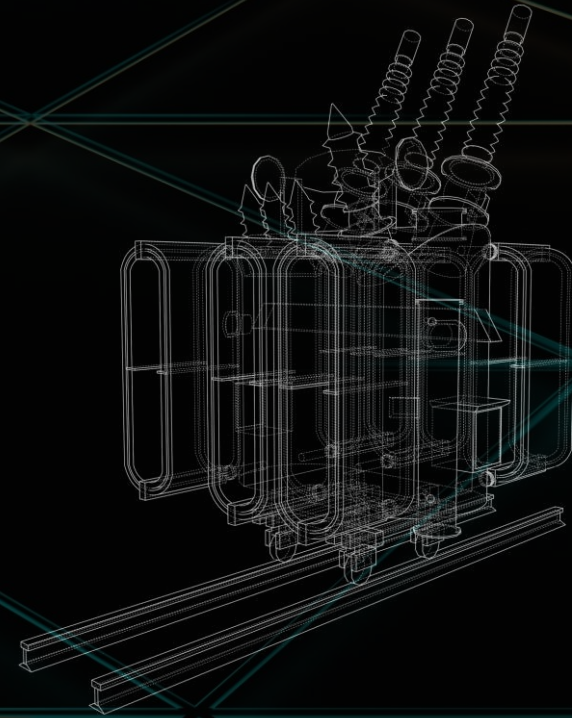
## The Hybrid Intelligent Transformer (HIT)

IONATE's patented hardware innovation is the Hybrid Intelligent Transformer. It is an entirely new device, with the unique ability to dynamically control electrical power flow in the magnetic domain in real time.

This allows it to not only provide the fixed ratio voltage transformation of a traditional transformer, but to simultaneously:

- Control independent phase voltage steplessly, bidirectionally
- Control reactive power to unity, or leading/lagging.
- Eliminate voltage and current harmonics

+ Real-time monitoring is built-in to enable the above. HITs can provide continuous data to existing SCADA/ADMS, or other software systems, which, in turn, can send setpoints for each HIT.



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HITs provide a singular, all-in-one, real-time power flow control point in the grid.

The HIT goes in the place of a traditional transformer, but as an all-in-one device, it also makes add-on technologies (e.g., STATCOMs, SSSCs, OLTCs, and others) redundant. As such, one HIT provides a reliable, affordable and comprehensive control upgrade option.

- Voltage control contributes to network stability and helps finely balance supply and demand in real-time
- Resolves both supply- or load-side harmonics (e.g., from motors, electronics) that could damage assets.
- Reactive power control maximises efficiency, reduces power losses, and helps balance the grid.

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Its innovative control approach gives HITs ROI and performance advantages.

HITs come at a lower CAPEX & OPEX than the alternative of achieving HIT functions with multiple devices (e.g., the collection of transformer + sensors + harmonics filter + voltage regulator + capacitor bank provides similar capabilities to one HIT).

Using one all-in-one device instead of many disconnected technologies leads to simpler & more robust operations and maintenance.

The HIT's sensing and monitoring enable autonomous operation and provide the real-time visibility software platforms need – without additional digitalization costs. However, uniquely, this real-time data is coupled with an instantaneous point of control back into the system – a critical differentiator from other digitalization technologies.

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HITs are designed to uphold network reliability.

Power conditioning reduces the causes of network trips and shields connected assets from related degradation.

Unlike electronics-based alternatives, the HIT puts no electronics in the primary pathway of power. This means any potential controller failure triggers fail-safe standard transformer operations. Electronics-based alternatives (e.g., flexible AC transmission devices = FACTS) don't have this advantage.

The HIT's modular design enables a simple hot swap in the event of any part replacement while maintaining network operations.

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## Grid-wide benefits

IONATE's technology is an enabler at its core. In the grid, it unlocks real-time local power flow management capabilities.

An independent, detailed network power system modelling study<sup>1</sup> found that replacing all transformers with IONATE's HITs (and no other changes) would allow:

33%

More Distributed  
Energy Resources

25%

More system  
capacity

6%

Reduction in  
losses

<sup>1</sup>The study, conducted by academics of Imperial College London, ran thousands of simulated scenarios, comparing hundreds of IEEE networks with traditional transformer technology and with those transformers replaced by IONATE's HITs. The reported results are averaged across all simulations; degree of benefits will depend on the exact network topology.

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## Private customer benefits

For other IONATE customers, such as wind and solar generation, energy storage, and large intelligent consumers, like data centres IONATE's technology provides:

- High power quality
- Reduced CAPEX & OPEX
- Longer asset lifetimes
- Higher energy efficiency
- Reduced failure rates

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## Devices coordinated via AI platform

HITs are effectively a means to turn previously passive network nodes into active ones. Coordinating them with IONATE's software transforms the rigid one-way grid into a decentralized, renewables-powered, interconnected system.

This system will:

- Provide full operational data visibility
- Manage dynamic system control schemes
- Minimise system losses
- Maximise Distributed Energy Resources (renewables, EVs, etc.)
- Deliver substation-level demand response

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IONATE is ready to scale.


**Milestones**

Manufacturing with established OEMs

Technology scaled to 500kVA

IEC testing in progress

**Next**

Paid pilots in Europe with  edp

Smart city pilot with a European utility

Scaling to multi-MVA for C&I customers

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Best Startup, as chosen by the CIRED committee.



"ground-breaking innovation"  
UK Energy Innovation Centre (EIC)



"impact which is pretty much unheard of" (Publicis Sapient)



✉ info@ionate.energy

🌐 www.ionate.energy

🌐 ionate-energy/



Interested in learning more?



[info@ionate.energy](mailto:info@ionate.energy)



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