WHITEPAPER

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Powering Belgium’s AI future

The electrical infrastructure imperative for data centers in Belgium

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ingenium

MANAGEMENT SUMMARY

Belgium stands at an electrical infrastructure crossroad that directly threatens its competitive position in the European AI economy. As demand for data center capacity grows exponentially, transmission and distribution networks face structural capacity constraints requiring multi-year lead times — while regulatory obligations, sustainability targets and investor scrutiny are tightening simultaneously.

The numbers are clear:

- Data centers today consume **5% of European electricity** — in Ireland already more than 20%
- Belgium's two grid operators are jointly investing **€14.3 billion** in grid reinforcement by 2034
- New connections in the Brussels-Antwerp-Ghent corridor face **waiting times of 2 to 4 years**
- The EU Energy Efficiency Directive rating scheme becomes **mandatory in May 2027**

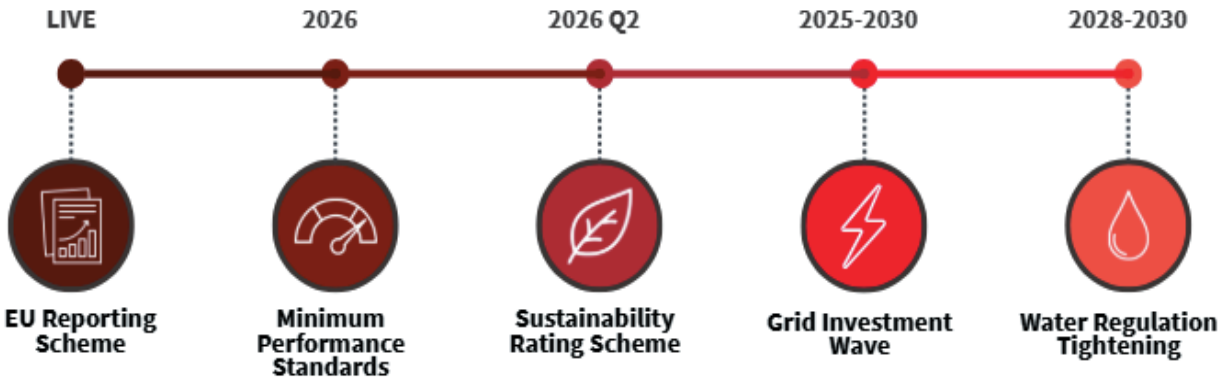
The message from the Datacloud Energy & ESG Congress 2026 in Brussels was unambiguous: **those who make the right electrical infrastructure decisions today will lead the digital economy of 2030. Those who wait will inherit grid congestion, higher energy costs and permitting gridlock.**

Ingenium NV accompanies data center owners, operators and real estate companies through the full infrastructure lifecycle — from strategy and site selection through design, construction and operational optimisation — with electrical infrastructure as the critical thread.

CURRENT AND FUTURE EU POLICIES

What changes in 2025–2026 (and beyond).

- **EU Reporting Scheme (live now)**. Datacenters ≥500 kW must report PUE, WUE, REF, and ERF annually (deadline: 15 May each year).
- **Minimum Performance Standards (2026)** . The EU will convert current reporting metrics into mandatory minimums. New datacenters will require PUE ≤1.2; existing facilities face phased targets. Waste heat recovery becomes a compliance item, not an optional extra.
- **Sustainability Rating Scheme (Q2 2026)**. The EC will publish a Bronze–Platinum rating for datacenter, similar to BREEAM. Buyers and tenants will demand high ratings. Low-rated facilities will lose market value.
- **Grid Investment Wave (2025–2030)**. The EU is allocating €170 billion to grid upgrades. Priority goes to operators already demonstrating efficiency and grid-aware design. If you optimize now, you move to the front of the queue for new capacity.
- **Water Regulation Tightening (2028–2030)**. Water Usage Effectiveness (WUE) reporting is currently voluntary but will become mandatory. Water-scarce regions like Spain are already restricting datacenter licensing and Belgium will follow. Proof of water recycling and low consumption is now a market advantage.



2. BELGIUM'S ELECTRICAL GRID CHALLENGE

2.1 THE STRUCTURAL BOTTLENECK

Belgium's grid faces a fundamental tension: exponentially growing demand from data centers, EV charging, heat pumps and industrial electrification — meeting a transmission and distribution network that was not designed for this pace of change.

Two structural problems dominate:

1. **Permitting and lead times** Building or reinforcing transmission infrastructure takes 7 to 13 years in Europe. Even medium-voltage distribution reinforcements by Fluvius require 3 to 5 years. Data center investment decisions cannot wait that long. **The operator who plans today has a 3-year head start on the one who plans tomorrow.**
2. **Geographic saturation** Demand concentrates in the Brussels-Antwerp-Ghent triangle — the same zones where the grid is most saturated. Available medium-voltage capacity in Zaventem, Mechelen and Vilvoorde is critically scarce. Connection waiting lists are real and growing.

2.2 THE TRANSITION PRESSURE

Belgium's nuclear transition adds urgency. Doel 4 and Tihange 3 remain operational until 2035, providing critical baseload stability. Post-2035, **2 GW of firm baseload capacity must be replaced**— through off shore wind (Princess Elisabeth Zone, 3.5 GW by 2030), battery storage, demand flexibility, and ultimately Small Modular Reactors (available from 2030–2034). The window between now and 2035 is the most critical planning period in Belgian energy history.

This is precisely the moment when electrical infrastructure strategy matters most.

Tihange Nuclear Power Station

2.3 THE NIS2 ADVANTAGE

Data centers classified as national critical infrastructure under NIS2 gain access to **accelerated permitting, priority grid connections and government support mechanisms** — but only if the permit application is correctly constructed.

3. THE FOUR ELECTRICAL CHALLENGES FACING BELGIAN DATA CENTERS

3.1 NEW BUILDS: CONNECTING TO A CONGESTED GRID

A new data center in Belgium today faces an immediate question: **where can I get the power I need, and when?** The answer requires simultaneous assessment of:

- Transmission capacity (Elia) and distribution capacity (Fluvius) at the site
- Connection timeline given current grid operator pipelines and reinforcement plans
- Site-level infrastructure: substation footprint, cable routing, transformer capacity
- Expansion headroom for power increases
- Demand-response possibilities on site

Choosing the wrong site — or the right site with the wrong assumptions — can delay a project by 3 to 5 years. Ingenium NV performs this assessment before any commitment is made.

3.2 REFURBISHMENT: UPGRADING AGEING INFRASTRUCTURE

Belgium has a significant stock of data centers built in the 1990s and 2000s — designed for power densities of 1–3 kW per rack, now being asked to support AI workloads at 80–250 kW per rack. The electrical infrastructure challenge in refurbishment is threefold:

1. **Selectivity and protection** Older electrical installations were designed for lower fault currents and simpler topologies. Upgrading power density without redesigning protection selectivity creates cascade failure risks. Ingenium NV has the right tools for low and medium-voltage **simulations** to model and validate selectivity across the full electrical installation before a single cable is touched. In order to get the maximum out of the existing infrastructure.
2. **Grid connection capacity**A refurbishment that doubles IT load requires a grid connection upgrade — which re-enters the Fluvius connection queue. **Early engagement with the grid operator, backed by a technically credible dossier, is the difference between a 12-month a nd a 36-month upgrade timeline.**
3. **Reliability** Increasing power capacity at the entrance of the datacenter is one thing, but getting this power in a reliable and energy-efficient way to the IT equipment requires a from **top to bottom approach** so every electric component is dimensioned in the right way to keep up with **Tier availability** levels.

3.3 ON-SITE RENEWABLE GENERATION

Where grid connection is constrained or delayed, on-site renewable generation offers a legitimate and sustainable bridge:

- **Rooftop and carport PV**: immediately deployable; directly reduces grid offtake
- **Windturbines**: on sites, it is more difficult to realize due to the required permits, which are not easy to obtain.

Ingenium NV performs **feasibility studies for on-site renewable energy deployment**, quantifying generation potential, self-consumption rates, grid injection limits and financial returns — integrated with the overall electrical capacity plan.

3.4 GRID FLEXIBILITY: FROM COST CENTRE TO REVENUE STREAM

Belgian data centers hold a largely untapped asset: backup power generation capacity that can support the electricity grid when it is needed most.

The rapid integration of renewable energy — both wind and solar — is increasing balancing volatility, which Elia cannot manage through conventional means alone. While UPS systems can provide flexibility in large-scale data centers (typically above 200 MW), the associated revenue streams in Belgium are yet operational. Time or location-shiftable AI workloads may offer future potential, but remain an emerging and uncertain option.

In practice, backup power generators already provide a proven and immediately available solution. These emergency power systems, primarily designed for reliability, can be activated to support the transmission grid and provide flexibility at the connection point when required. In addition, participation in balancing markets such as mFFR (manual Fast Frequency Response) creates a viable revenue stream.

From a sustainability perspective, there is also a clear transition pathway: modern generators can operate on both conventional diesel and HVO (Hydrotreated Vegetable Oil) without loss of performance, provided they are properly designed. This enables a significant reduction in carbon emissions while maintaining operational reliability.

Three flexibility mechanisms with immediate financial return:

Mechanism	Technology	Revenue Potential
Back-up power generator services (mFRR)	Back-up power generators	€25,000 – €50,000 / MW /Y
BESS grid services (FCR, aFRR, imbalance, …)	On-site batteries — aggregator contract	€50,000 – €200,000 / MW /Y
IT load shifting	AI workload scheduling — dynamic tariff alignment	10–15% energy cost reduction estimation

Unfortunately, using UPS systems of datacenters for energy flexibility is no longer possible in Belgium. Only grid operators outside Belgium with special flexibility services (which don't exist in Belgium) allow datacenters >200MW to do so.

Ingenium NV designs the technical and contractual architecture of your site to make flexibility work.

Rapid integration of renewable energy: PV and windturbines

4. WASTE HEAT RECOVERY: ELECTRICAL EFFICIENCY MEETS COMMUNITY VALUE

4.1 THE REGULATORY OBLIGATION

The Energy Efficiency Directive requires heat recovery documentation from 2025 and mandatory EED rating compliance from May 2027. Liquid-cooled AI infrastructure now produces waste heat at 42–52°C — directly usable for district heating for new builts without heat pump uplift in most conditions.

4.2 THE BELGIAN OPPORTUNITY

City	District Heating Integration	Homes heated (50 MW DC)
Brussels	Sibelga/Vivaqua network extension	10,000–15,000
Ghent	Port industry + greenhouse coupling	8,000–12,000
Antwerp	Port district heating	10,000–14,000
Liège	Industrial reconversion sites	6,000–10,000

4.3 WASTE HEAT RECOVERY IN DISTRICT HEATING NETWORKS AS GRID CONGESTION OPTIMISATION

Beyond environmental compliance, integrating heat recovery in district heating networks reduces the need for electricity for cooling the datacenter and for the fossil-free building heating, as the recovered heat can be used instead.

A well-designed heat recovery system — integrating heat pumps, thermal storage and district heating directly supports grid congestion and improves the operator's negotiating position with the grid operator.

Ingenium NV's heat feasibility study (subsidized by VLAIO warmtevergroeningsscan) of 1.750€ identifies heat recovery potential and connects operators to available Flemish subsidies.

Please refer to our white paper on Data Thermics and District Heating Networks: https://www.ingenium.be/documenten

5. INGENIUM NV AS YOUR ELECTRICAL INFRASTRUCTURE PARTNER

We are energy and regulatory experts for buildings and MEP infrastructure. For datacenters, we combine three capabilities:

1. **Compliance & Reporting** — we ensure your facility meets EU standards and deadlines;
2. **Technical Optimization** — we unlock grid capacity, improve cooling efficiency, and design waste heat recovery systems;
3. **Strategy** — we map your path to AI-grade infrastructure without waiting for new grid connections.

As an EU Data Centres Code of Conduct Endorser since 2013, Ingenium NV combines more than 20 years of hands-on data center infrastructure experience with deep expertise in Belgian energy regulation, grid operator relationships and building technology design.

We cover the **full project lifecycle** — from strategy and feasibility through design, construction supervision and operational optimisation. Our multidisciplinary team integrates electrical engineering, energy consulting, sustainability certification and regulatory advisory in a single point of contact.

We are engineers who execute, not consultants who talk.

Curious on how we can help you? Contact wim at ***wim.boone@ingenium.be***

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