



Position Paper

Towards a sustainable & decentralized energy system

Flexibility as a near-term lever, decentralization as the long-term goal

Executive summary

The end goal of our work in energy innovation is rapid, durable decarbonization. For energy, one of the primary pathways is electrification. As renewable electricity scales, it becomes more variable, more local, and often out of sync with nearby demand and other energy assets such as heat, mobility, and industry. That reality makes a decentralized system – local production, local storage, and locally optimised consumption – a means to the end of decarbonization, not an end in itself.

The Dutch energy transition faces an urgent bottleneck: grid congestion. Businesses ready to grow and decarbonize are unable to connect new loads or renewable projects, while traditional grid reinforcement can take five to ten years. We cannot afford to wait.

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This position paper sets out our stance: flexibility is not the ultimate solution, but it is a commercially available near-term lever to reduce congestion and stabilize the system. By optimizing consumption, production, and storage – coordinated by algorithms that forecast supply and demand – we can unlock hidden capacity today, prevent renewable curtailment, and create the breathing space to build what truly matters: a sustainable energy system based on locally produced, stored, and optimally consumed energy, in other words decentralized.

While the potential is clear, the scaling of flexibility

is currently constrained by several structural barriers: regulation that is still built around centralized models, immature market mechanisms, asymmetric cost allocation between grid reinforcement and flexibility, and limited awareness among end users. At the same time, important enablers are emerging: the new Dutch Energiewet, dynamic tariffs and real-time data access, technological advances in storage and digital optimisation, and the rise of practical fieldlabs and capacity-limiting contracts that demonstrate flexibility in action.

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Our long-term goal remains unchanged: a decentralized system enabled by emerging technologies such as renewable heat, next-generation batteries, and advanced digital markets. Our investment approach follows two horizons: (1) near-term, commercially deployable flexibility solutions that make a difference now; and (2) mid-to long-term enabling technologies that will make the decentralized system a reality.

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1. The growing challenge of grid congestion

Across the Netherlands, grid operators are increasingly forced to declare congestion zones. In these areas, new connections cannot be guaranteed, stalling business expansion, renewable projects, and housing developments.

The drivers are clear: electrification of transport and heating through EVs and heat pumps, the rapid rise of data centers and digital industries, and an ever-growing share of renewables such as solar and wind. Together, these trends create peaks and volatility that our traditional grid was never designed to handle.

The consequences are far-reaching. In Brabant alone, hundreds of companies have been put on waiting lists, delaying billions of euros in planned investments. In a report by BCG, they estimate that grid congestion costs the Dutch society more

than €10 billion annually in lost opportunities and inefficiencies.

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In 2023 and 2024, around 3 terawatt-hour of solar and wind production was curtailed – enough to power more than one million households for a year. Such waste undermines climate targets, increases prices and weakens confidence in the energy transition. Left unresolved, congestion could suppress GDP growth by several percentage points in the coming decade, as businesses relocate or postpone expansion.

This challenge is not unique to the Netherlands. Regions across Europe and beyond that are now electrifying at scale will face the same bottlenecks. Today's Dutch problem will be tomorrow's global challenge – creating a vast market opportunity for the solutions we develop here.



2. Flexibility as a near-term lever

Electrification changes the physics and the economics of the system. As renewables become the dominant source of new generation, supply grows weather-driven and local, while demand (buildings, mobility, industry) is also increasingly local and dynamic.

Without decentralized coordination, these assets are chronically misaligned – creating peaks, curtailment, and connection backlogs. A decentralized system is therefore the practical enabler of decarbonization at speed. Grid reinforcement is essential, but slow and capital-intensive. Even if capital is abundant, finding the technical people and the space in and above the ground is difficult in a densely populated country.

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2.1 Why flexibility matters

Flexibility fits now. Flexibility is the near-term instrument we can scale today to operate the existing grid closer to its true capacity while we build tomorrow's decentralized architecture. Flexibility provides breathing space:

- Balancing demand and supply locally to reduce peaks.
- Unlocking production of renewable energy that would otherwise be curtailed.
- Reducing dependence on expensive infrastructure upgrades.
- Creating time and stability to scale future-oriented technologies.

2.2 Building blocks of flexibility

Flexibility emerges from the interaction of multiple

components across the energy system. Together, these building blocks enable real-time alignment of supply, demand, and network constraints:

- **Flexible storage:** batteries at every scale, vehicle-to-grid applications, and thermal storage.
- **Flexible production:** dispatchable renewables such as renewable iron fuel, biogas and hydrogen, hybrid solar-wind projects, and CHP adapted for sustainable fuels.
- **Flexible consumption:** industrial demand response, smart EV charging, responsive buildings and appliances.
- **Digital layer:** algorithms and platforms that orchestrate supply and demand through aggregators, VPPs, and AI-driven high resolution forecasting.
- **Unlocking legacy assets:** retrofitting add-on hardware to make legacy energy assets “smart”.

2.3 From assets to systems

Flexibility scales when assets are coordinated across locations and functions. The systems below illustrate how integration translates individual assets into system-level capacity:

- **Smart energy hubs:** shared connections and coordinated on-site assets aligning electricity, heat/cold, and mobility.
- **Virtual power plants:** aggregated portfolios that behave like a single, dispatchable resource.
- **Local energy markets:** price and governance mechanisms that align local actors around system-wide outcomes.

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3. Collaboration and innovation in practice

In energy, collaboration – not disruption – is the key to progress. The complexity of the grid demands that startups, corporates, and public actors work together. Startups bring innovation and speed, corporates bring scale and integration, and public actors like BOM create the conditions for testing and scaling through financing, ecosystems, and fieldlabs.

3.1 Innovators driving change

Innovation becomes tangible through companies that translate system challenges into working solutions. The companies below demonstrate how new technologies create measurable impact across industry, buildings, and energy systems:

- **RIFT:** pioneering renewable iron fuel technology that decarbonizes industrial heat, reducing electricity demand while building a pathway to

renewable heat.

- **Integer Technologies:** transforming buildings into smart, flexible energy hubs with up to 40% efficiency gains.
- **Chargee:** delivering high resolution forecasting, real-time data, and portfolio optimization for suppliers, businesses, and households.
- **Tibo Energy:** deploying AI-driven optimization of industrial assets, unlocking capacity without costly reinforcement.

3.2 Showcase: Brainport Industries Campus

The Brainport Industries Campus (BIC) in Eindhoven demonstrates flexibility in practice. Here, companies operate under a shared grid connection, manage solar PV, battery storage, and EV infrastructure collectively, and distribute peaks to avoid congestion. They even integrated collective heating and cooling, therefore displaying a perfect example of system integration to avoid unbalanced e-consumption. This Smart Energy Hub increases resilience and autonomy while supporting sustainable growth.

The Brainport Industries Campus (BIC) in Eindhoven



The smart energy system at BIC was realized through close collaboration between industry partners, Equans as system integrator, and BOM, which played a key role in structuring, co-financing, and governing the shared energy utility. The campus illustrates how coordinated technical and organizational arrangements can enable flexibility at industrial sites and provide a basis for further learning and replication.

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4. Barriers and enablers

Despite growing momentum and successful pilots, flexibility has yet to scale structurally. Its development is shaped by a combination of persistent barriers and emerging enablers that together determine the pace and direction of system change.

4.1 Structural barriers to scaling flexibility

Despite strong momentum and promising pilots, the scaling of flexibility is still constrained by structural barriers:

- **Regulation lags behind innovation.** Existing rules and grid codes still assume centralized control and one-way energy flows. This limits the commercial deployment of decentralized

coordination and flexibility trading.

- **Market models remain immature.** Business cases for aggregators, flexibility providers, and energy communities often depend on temporary subsidies or one-off pilots rather than stable revenue streams.
- **Cost allocation is asymmetric.** Grid reinforcement is publicly financed or socialized via tariffs, while flexibility must stand on its own commercial legs – even when it delivers system-wide benefits.
- **Limited awareness and trust.** End users and SMEs rarely understand the value of flexible consumption or the mechanisms to participate safely. Also, the costs of consumer congestion on the grid is socialized, so they do not feel the pain.

4.2 Enablers reshaping the landscape

At the same time, several enablers are rapidly reshaping the landscape:

- **The new Dutch Energiewet (2026)** provides a legal foundation for active system participants, energy sharing, and local energy communities. It opens the door for new business models in aggregation, storage, and peer-to-peer flexibility services.
- **Dynamic tariffs and real-time data access** reward flexible behavior and allow digital platforms to respond autonomously to price and grid signals.
- **Advances in storage, hydrogen, and digital twins** expand the technical scope of flexibility beyond electricity – integrating heat, mobility, and industry.
- **Public-private coalitions and fieldlabs** (such as Brainport Industries Campus) prove that collaboration between startups, corporates, and regional authorities can turn regulation into innovation testbeds.

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4.3 Capacity-limiting contracts as a transition instrument

Capacity-limiting contracts (CBCs) illustrate how flexibility mechanisms can function both as enablers and as constraints in the current energy system. They make active congestion management possible within existing grid capacity, while at the same time exposing the limitations of today's regulatory and market design.

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Under CBCs, network operators and connected users agree on temporary reductions in consumption or injection during periods of congestion, in exchange for compensation. The approval by the ACM for such contracts, including applications with solar and wind parks, marks an important step in recognizing flexibility as

a regulated system instrument rather than an exceptional measure. At the same time, a fundamental tension remains. Network operators operate under a public mandate to ensure reliability and neutrality, not to commercialize scarcity. As a result, CBCs are primarily applied as operational tools to manage congestion, rather than as structural market mechanisms that provide long-term revenue certainty for flexibility providers. This limits their role in scaling investment-driven flexibility solutions.

BOM applies this transitional approach in practice. At the Tichelrijt solar park in Tilburg, a capacitylimiting contract with the regional grid operator demonstrates how regulated flexibility can relieve congestion in the short term, while generating practical experience that informs future

market design. In this sense, CBCs represent a bridge between today's constraints and tomorrow's flexibility markets. They show that regulation is evolving from a limiting factor into a catalyst, provided that legal frameworks, market incentives, and investment structures continue to converge.



5. Conclusion & our position

Flexibility is not the end goal, but it is the most effective near-term instrument to reduce congestion and stabilize the energy system. It creates the breathing space we need to scale the next generation of solutions – from renewable heat technologies like RIFT, to advanced battery storage, to new digital architectures for decentralized markets.

Our position is clear

Near term

Invest in commercially available flexibility solutions that can be deployed at scale today (Integer Technologies).

Mid to long term

Build towards a truly decentralized, sustainable energy system based on local production, storage, and optimal consumption (RIFT)

BOM supports both horizons. We catalyze immediate impact through flexibility while backing the innovations that will make decentralized, sustainable energy systems possible worldwide.

By doing so, we turn today's challenges into tomorrow's opportunities – and make Brabant, and the Netherlands, a leader in the global energy transition.

Do you want to know more?



Please contact:

Daan van Lange
dvanlange@bom.nl

About the Brabant Development Agency (BOM)

BOM is the regional development agency for Noord-Brabant. We invest in innovative companies and build ecosystems that accelerate the energy transition. Within the energy transition, BOM plays a dual role: supporting entrepreneurs who develop scalable solutions, and enabling realworld implementation through fieldlabs, partnerships, and mission-driven investments. This position paper reflects BOM's perspective on how flexibility and decentralization can accelerate the transition toward a sustainable and resilient energy system in Brabant and beyond.