EM-Power Europe

Munich, May 7–9, 2025

TREND PAPER: SMART ELECTRIFICATION – UNLOCKING A COMPETITIVE EDGE FOR ENERGY-INTENSIVE INDUSTRIES

Munich/Pforzheim, April 2025 – Electrification is a key driver of industrial decarbonization, but without a smart and flexible approach, it risks becoming a cost burden rather than a competitive advantage. Energy-intensive industries (EIIs) must go beyond simply switching to electricity – they need to integrate demand-side flexibility (DSF), automation and market-based incentives to optimize energy costs and create new revenue streams. By strategically aligning energy consumption with price signals and grid needs, industries can lower operational expenses, enhance stability and remain competitive in an evolving energy landscape. How can EIIs unlock the full potential of smart electrification to turn decarbonization into a financial opportunity?

Energy-intensive industries (EIIs) play a crucial role in the economy but face increasing pressure to decarbonize while maintaining competitiveness. Electrification is often cited as a key pathway for industrial decarbonization, but its implementation matters significantly. A rigid, one-size-fits-all approach to electrification may not always be the most cost-effective option. Industries must instead adopt a smart and flexible approach, ensuring that electrified processes respond dynamically to market conditions and energy price signals, as much as technically possible and without undermining industrial outputs.

By electrifying intelligently, industries can not only reduce their running costs but also create new revenue opportunities through flexibility services. The key to success lies in leveraging demand-side flexibility (DSF), market-based incentives and automation to ensure that electrification remains financially viable and operationally efficient.

The business case for smart electrification

For EIIs, energy costs are a decisive factor in global competitiveness. While electrification plays a crucial role in decarbonization, its economic viability hinges on how it is implemented. Electrifying industrial processes without integrating flexibility can result in high operating costs. However, industries that use electrified processes in a flexible way, adjusting consumption based on price signals and market incentives can significantly lower their energy expenditures and even generate revenue.

A compelling example from a smartEn publication illustrates how flexibility transforms electrification from a cost burden into a financial asset. In industrial settings, electrified processes can become more cost-effective than fossil fuel alternatives when they are used flexibly, responding to price signals and market incentives. One case highlights the difference between a gas boiler and an electric heater - both serve the same function, but their cost-effectiveness depends on how they operate. If both run continuously, the gas boiler has a lower running cost. However, if the electric heater operates flexibly, adjusting to favorable electricity prices and flexibility incentives, its running cost can be lower than the gas alternative. As mentioned in smartEn's recent report 'Implementing EU Laws A guide to activate demand-side flexibility in the EU 27 Member States', by adopting smart electrification strategies, industries can:

- Reduce operational costs by shifting energy use to periods when electricity prices are lower

- Access financial remuneration by providing flexibility services to grid operators, turning energy management into a revenue stream
- Enhance competitiveness by cutting energy expenditures while maintaining production output
- Secure long-term price stability through flexibility mechanisms such as Power Purchase Agreements (PPAs)
- Ensure stable production by activating flexibility only within predefined operational limits, guaranteeing that industrial processes remain uninterrupted

Industries that strategically integrate flexibility into electrification will not only minimize costs but also gain a competitive edge. The transition is no longer a question of "if" but of how industries can maximize their returns by making electrification work in their favor.

Maximising the benefits of flexibility in electrification

To maximize the financial benefits of smart electrification, industries should first evaluate their flexibility potential through energy audits. These audits help determine:

- When flexibility can be activated without disrupting industrial processes
- How much capacity can be adjusted to optimize costs
- Which market mechanisms can provide financial returns

Activating flexibility does not mean interrupting production. Instead, it allows industries to adjust energy consumption within defined operational boundaries. The flexibility adjustments are made in a way that does not compromize output but instead improves cost efficiency and overall energy management.

Overcoming barriers: expanding market access for industrial flexibility

Despite its clear benefits, demand-side flexibility remains underutilized in EIIs due to persistent regulatory and market access barriers. Many industrial consumers are still unable to fully access price signals and remuneration mechanisms, limiting their ability to leverage flexibility for financial gain.

A significant barrier is that EIIs are often restricted to interoperability schemes or capacity remuneration mechanisms, which are highly limiting compared to the full range of flexibility markets available today. These outdated schemes fail to reflect the full potential of modern industrial flexibility. Industries should not be limited to reacting to emergency grid events but should instead have access to market-based incentives that reward proactive flexibility management.

To address these challenges, policymakers and regulators should:

- Eliminate regulatory, administrative and economic barriers that prevent EIIs from receiving price signals and participating in market-based flexibility offers
- Require audits to assess flexibility potential – these assessments identify where flexibility can be activated without impacting production and can help industries plan investments accordingly
- Support industrial electrification with subsidies such as Flexibility Support Schemes (FSC) or Capacity Mechanisms, ensuring that investments in flexible electrification are financially viable and activated in a market-based way

Smart electrification as a strategic advantage

For energy-intensive industries, the transition toward electrification must be strategic, flexible and financially optimized. Electrifying industrial processes without integrating smart flexibility mechanisms may not be financially sustainable. However, by leveraging flexibility to optimize energy costs, secure financial remuneration and enhance competitiveness, industries can make electrification a core advantage rather than a burden.

To achieve this, market barriers must be removed, industries must have access to the full range of flexibility services and financial incentives should be aligned with the real value that industrial flexibility provides. With the right policies and investments, smart electrification can drive decarbonization while delivering tangible business value, positioning European industries at the forefront of the global energy transition.

EM-Power Europe and the parallel events Intersolar Europe, ees Europe and Power2Drive Europe, will take place from May 7–9, 2025 as part of The smarter E Europe, Europe's largest alliance of exhibitions for the energy industry, at Messe München.

Further information on this topic can be found at the following events and exhibitors:

EM-Power Europe Conference

Smart Electrification of Demand
Tuesday, May 6, 2025, 2:30pm - 04:00pm
ICM München, Room 13A

Enhancing EU Industrial Competitiveness Through Large-Scale Electrification
Wednesday, May 7, 2025, 2:00pm - 03:30pm
ICM München, Room 13A

The smarter E Forum

Turning energy flexibility into money
Friday, May 9, 2025, 12:00pm – 01:00pm
Messe München, Hall B5, Booth B5.550

EM-Power Europe Exhibitors: www.em-power.eu/exhibitorlist
Product categories: Energy Management / Flexibility Management

www.em-power.eu
www.TheSmarterE.de

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