

The Industrial Efficiency Gap

# HOW A 0.2% DECISION SCALES TO BILLIONS

Long-term value and large-scale energy savings across sectors and regions



An ABB Report of Large Motor and  
Generator Efficiency Data, 2015–2025

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# EXECUTIVE SUMMARY

Industrial electrification is accelerating across sectors. It is being driven by the replacement of combustion-based systems with electric motor-driven solutions and the upgrading of existing electrical systems to higher efficiency technologies.

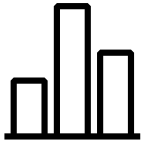
In this context, overall system efficiency is determined not by the motor or generator alone, but by the performance of the entire motor-driven system – including the driven equipment, controls, and operating profile. Still, the motor and generator define the core energy conversion efficiency and remain a critical lever in reducing energy use and emissions. Large motors and generators are some of the most significant and important investments made in assets in heavy industry, yet the critical need to maximize their energy efficiency is often overlooked.

Motors rated above 375 kW account for an estimated 10.4% of all global electricity usage today, and demand is projected to double by 2040<sup>1</sup>. Across industries such as oil and gas, metals, chemicals, utilities, and pulp and paper, a persistent gap remains between achievable and realized efficiency in these systems.

This report draws on a decade of verified delivery data from ABB's Västerås manufacturing facility in Sweden, covering more than 1,000 large motors and generators supplied between 2015 and 2025. It quantifies how small efficiency differences at the point of specification translate into substantial impacts on energy consumption, emissions, and operating costs over the average 25-year lifetime of these assets.

<sup>1</sup> [World Energy Outlook 2025 – Analysis - IEA](#)





### THE CENTRAL FINDING IS CLEAR

The technology to close the efficiency gap already exists, requires no new specifications or added complexity, and pays for itself in up to three years. This is exemplified by ABB's Top Industrial Efficiency (TIE) option: a promise to deliver large motors and generators with the highest possible energy efficiency, without compromising reliability, complexity or specification compliance. It is a contractual commitment made by ABB to provide the most efficient solution available.

For large synchronous machines (motors and generators), TIE typically improves efficiency from around 98.5% to 98.7-98.8%. While seemingly marginal, this ~0.2% increase compounds into significant lifetime savings. For induction-based systems – which make up a large share of installed equipment – the achievable improvement is often even higher, typically in the range of 1-1.5 percentage points.

A recent example illustrates the scale of the opportunity. A 56 MW TIE-optimized synchronous motor delivered to a steel plant in India in 2025 achieved a verified efficiency of 99.13%, setting a new world record. Over its lifetime, this single machine is expected to save \$5.9 million in electricity costs and avoid 45,000 tonnes of CO<sub>2</sub>, with a payback period of just over three months – even in a relatively low electricity cost environment.

Across the more than 1,000 Västerås factory deliveries alone, if every standard machine delivered by ABB over the past decade had been specified under the TIE option, global industry could already have saved 11.1 TWh of electricity – approaching \$1 billion (under US energy costs). At the same time 5,900,000 tonnes of CO<sub>2</sub>, might have been avoided, equivalent to taking roughly 1.3 million cars off the road for an entire year.



### THE SCALE OF THE OPPORTUNITY ACROSS THE GLOBAL INSTALLED BASE

This makes the case even more compelling. Large industrial motors represent only a small fraction of the total motor population, yet they account for a disproportionate share of industrial electricity use — collectively converting between 3,000 and 3,900 TWh of electricity every year<sup>2</sup>, roughly equivalent to the entire annual electricity consumption of the European Union. Applying just the 0.2% efficiency uplift across this installed base through TIE-optimized specifications would save 4 to 6 TWh per year, enough electricity to power roughly 750,000 to 1 million households<sup>3</sup>.

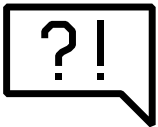
<sup>2</sup> Energy Statistics Data Browser – Data Tools - IEA

<sup>3</sup> Based on residential electricity consumption across OECD countries, per [IEA Energy End-uses and Efficiency Indicators database \(EEI\)](#).

Furthermore, applying a 1.5% efficiency uplift, since a large portion of the installed base is induction rather than synchronous motors, would save 30 to 40 TWh per year.

Working on the basis that a motor or generator will have an average 25-year lifetime, this 0.2% uplift in efficiency compounds to 100 to 150 TWh of electricity saved - enough to power the United Kingdom for five months. The associated CO<sub>2</sub> avoided would reach 60 to 75 million tonnes, equivalent to taking 13 to 16 million cars off the road for an entire year. Furthermore, the cumulative electricity cost savings would amount to \$9.5 to \$12 billion.

The typical payback period for adopting the TIE option remains under three years. This is not a marginal gain. It is one of the largest untapped efficiency levers in the global industrial economy, available today, using proven technology.

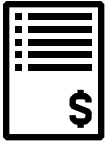


#### **WHY THIS MATTERS NOW.**

The world is in the middle of an energy transition, including a surge in demand to power AI and data centers. This requires making the maximum use of each unit of electricity, while also securing security of supply to ease global concerns over fuel imports. Industrial electrification is accelerating, from replacing gas turbine-driven compressors with electric motors, to powering new industrial processes from cleaner grids. But electrification alone is not enough. A motor that wastes even a fraction more energy than necessary locks in decades of added costs and emissions.

The International Energy Agency (IEA) estimates that energy efficiency is responsible for 37% of the emissions reductions needed to meet the Paris Agreement's 1.5°C target. In the industrial sector, large motor-driven systems are among the most accessible and financially attractive levers available to act on that ambition. This is especially important as the use phase of a large motor accounts for approximately 99% of its lifetime CO<sub>2</sub> emissions.

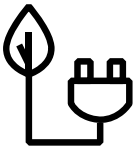
With energy costs representing the single largest component of the total cost of ownership for large motor-driven systems, efficiency is no longer just an environmental obligation. It is a direct driver of industrial profitability.

**THE BARRIER IS NOT COST OR COMPLEXITY.**

Efficiency outcomes are shaped by several factors – most notably regional energy economics, industry buying models, and a loss of long-term perspective – rather than any limitation in technology.

Geographically, decisions are often anchored in current energy prices, undervaluing how costs, demand, and energy security may evolve. At the same time, in industries with fragmented value chains, purchasing decisions are disconnected from long-term operational costs, reinforcing a short-term focus.

The data makes this clear: efficiency varies not because technology changes, but because of where projects are located, how decisions are made, and how far into the future those decisions look.

**THE CALL TO ACTION IS CLEAR.**

No matter what the reason may be, industry must be encouraged to regard energy efficiency as a key factor, even when the most efficient motor or generator requires an incremental investment upfront. Every RFQ for a large motor or generator is an opportunity to lock in decades of savings. Asking for the TIE option can deliver payback from a few months to up to three years. The remaining 22 years contribute directly to bottom line productivity.



"Industry has spent decades optimizing what happens inside a plant. Yet large motors and generators have rarely been part of that conversation, even though they run continuously for 25 years and sometimes even more, converting more energy than almost anything else on site. What our data shows is that the gap between a standard machine and a TIE-optimized one is not technological. It is a specification gap. The companies closing it fastest are the ones where the engineer who selects the motor and the CFO or CSO responsible for energy performance are aligned around a single metric: total cost of ownership. That alignment is what TIE is designed to create."

**David Bjerhag,**

Global Business Line Manager for High Speed Synchronous Motors  
Generators and Condensers, ABB



# THE STATE OF ILLINOIS TRANSPORTATION

Summary of findings and key recommendations from the report.

Summary of findings and key recommendations from the report.

To read the full version, click here

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| Category | Item   |
|----------|--------|
| Item 1   | Item 1 |
| Item 2   | Item 2 |
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