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“To Efficiency – and Beyond”

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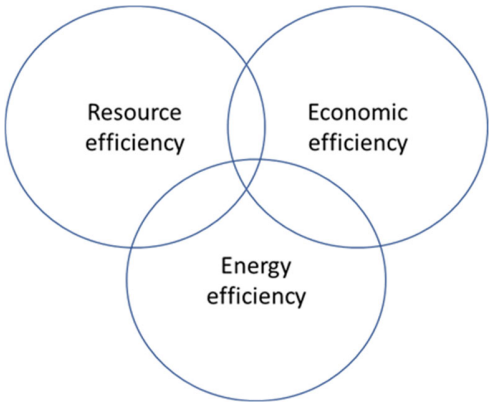
“If you look at modern society, still more energy is wasted than used.”

This simple yet profound insight was shared by Dr. Johann KOLAR, Director, Power Electronics System Laboratory, ETH Zurich, the Swiss Federal Institute of Technology, in a recent interview with Mike Umiker, Managing Director of the Energy Efficiency Movement. This dilemma is precisely why the Energy Efficiency Movement came into being – and why more than 380 organizations have joined the Movement to date.

For Professor Kolar, the Energy Efficiency Movement is key to catalyzing progress over the coming years in terms of combatting planetary heating. “We need to make people aware of energy efficiency, provide tools, provide concepts, and finally solutions to make this a reality for industry that is economically viable,” he remarks.

“I see energy efficiency as the first, main important part [of a larger evolution]”, Professor Kolar continues. To his thinking, energy efficiency is a necessary but insufficient condition; resource efficiency and economic efficiency must also be considered. “We need to bring these together,” he stresses.



His assessment proceeds from the hard reality confronting industry in terms of greenhouse gas emissions. The IPCC’s “carbon budget” for the planet – that is, what the world can “afford” in terms of greenhouse gas emissions to keep to a prescribed temperature increase limit (e.g., 1.5°C) over a specific timeframe – will be exhausted by 2029, according to a recent analysis from DNV. Their projections suggest the global

economy will “overshoot” its carbon budget by some 300 Gt of CO2 between 2030 and 2050, the date the Paris Agreement has established as the target for reaching net zero emissions.

For Professor Kolar, the consequences of this overshoot are troubling. While achieving net zero emissions is no mean feat itself, the larger task presented by this analysis is even more daunting. By this math, the world will, in fact, need to be significantly net-*negative* in terms of carbon emissions in the years after 2050 to make up for this overshoot. This gap creates clear urgency for industry, what Professor Kolar deems the “elephant in the room.”

While the International Energy Association (IEA) has established that energy efficiency will contribute as much as one third of the emissions reductions required to achieve net zero, Professor Kolar sees energy efficiency as one step in a journey – from “an energy efficiency movement to an energy transition movement to a circular economy movement.” A global economy that embraces circularity at scale is pivotal to addressing this challenge in the longer term, he maintains.

“My vision would be that we finally make a fully renewable-powered society with resource circularity [embedded throughout] a reality”, he states. In power electronic systems, he calls for a more holistic lifecycle approach that contemplates environmental impact, human health, resource efficiency and embodied energy, maximizing repairability, reusability, and recyclability, while minimizing scarce material use, toxic substances and waste.

To get there, Professor Kolar foresees a new generation of emerging disruptive technologies, including the Internet of Things, digital twins and AI, as enablers of the wider shift to a circular economy. But technical challenges loom in the form of data sources, data quality, abstraction and generalization.

Taking a more circular approach will mean a more “comprehensive characterization” of power electronics in terms of sustainability, spanning resource intensiveness, ecosystem effects, material waste and emissions – not just optimizing for narrower design considerations in how such systems use energy. This means a different mindset for all concerned in terms of how we measure system performance and a fundamentally new approach to the power electronics value chain.

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According to Prof. Dr. Johann KOLAR, Director, Power Electronic Systems Laboratory at ETH Zürich the Hashtag#industry needs to provide solutions today that are economically viable. There is also a necessity to educate the next generation of engineers at the level required to provide Hashtag#energy-efficient solutions.