

BACKGROUND: COPPER AND ENERGY EFFICIENCY

Energy efficiency is a contributor to sustainable development and economic growth. Many of the necessities that define a modern quality of life require a power source, making energy supply/security critical to long-term sustainable development.

Copper's superior electrical and thermal conductivity is the foundation of energy efficiency. Copper is the most efficient nonprecious conductor of heat and electricity, so the things containing copper tend to operate more efficiently. A vast majority—70 percent—of copper goes to end-use applications that benefit from its high level of efficiency.

THE BENEFITS OF ENERGY EFFICIENCY

Energy efficiency provides benefits in multiple areas, including:

- *Reduced Consumption:* By making the products using energy more efficient, less energy resources are consumed. This makes grids more reliable and reduces the need to build new power generation capacity. Energy efficiency makes it possible to do more with less.
- *Saving Money:* The end users of energy-efficient products receive economic benefits through lower energy bills. Businesses and industries are more profitable, and consumers have increased purchasing power.
- *Climate-Change Mitigation:* Efficient products emit less CO₂, making energy efficiency a key contributor to climate-change mitigation actions. Energy efficiency is recognized as one of the most effective paths toward meaningful reductions in global CO₂ emissions.

REDUCED CONSUMPTION

Energy demand is growing. According to the International Energy Agency (IEA), by 2030 global electricity consumption is expected to grow by 60 percent. While population growth will certainly contribute to this increased need for energy, a far greater driver is a growing middle class. Currently, two billion people worldwide can be considered "middle class." That number is set to grow to five billion by 2030 (Brookings Institute), with a vast majority of that growth in non-OECD (Organization for Economic Cooperation and Development) countries. Evidence of this may be found in a further analysis of IEA's projections on future energy consumption, which will more than double in non-OECD countries—a growth rate of nearly five times that of the developed world.

While the developed world has embraced the concept of energy efficiency as evidenced by mandatory minimum energy performance standards (MEPS), unfortunately these types of standards are largely absent in the developing world. The availability of efficient products can help to alleviate over-stressed grids and reduce the need to bring new capacity online. Having access to safe, reliable power provides numerous socio-economic benefits.

Electricity is required in industries and in homes, and the equipment and appliances using it should be as efficient as possible. Home and industrial appliances consume almost half of the world's electricity. These appliances become more efficient by incorporating copper into their motors. Because copper is a very efficient conductor of heat and electricity, it drastically reduces the amount of energy needed to power appliances. This helps conserve natural resources and lowers consumers' bills.

If the growing energy needs of the world's seven billion inhabitants are to be met, more will have to be done with less. Energy efficiency is critical to a sustainable future.

SAVING MONEY

When industries and individuals use more efficient products, they consume less energy and save money on their energy bills. While more efficient products at times command a premium in the marketplace, very often investments in energy efficiency pay for themselves quickly—at times in a matter of months—and the resultant payback to the user can last for years and years. An investment in energy efficiency is one that pays for itself over and over again.

Energy-efficient products consume less energy than their less-efficient counterparts, which provides the users (industries, people) of those products with significant economic benefits. In general, producing a watt of electricity through power generation—by fossil-fuel-based or renewable means—is far more expensive than saving a watt of energy. *The most efficient unit of energy is the one that is never generated at all.*

Copper is critical to the economics of energy efficiency. For each tonne of copper used in conductive applications that benefit from copper's outstanding efficiency, ICA estimates that over the lifetimes of those products their users will save between \$25,000 and \$2,500,000.

CLIMATE-CHANGE MITIGATION

For all the benefits of modern, safe access to energy, a negative byproduct of its generation and use is the emission of greenhouse gases such as CO₂. Climate change is progressing at an unprecedented rate. Sea levels are rising, oceans are warming, ice sheets are shrinking, and extreme weather events are more frequent. This means a change of 2 to 5 degrees centigrade by 2050. However, the difference between 2 and 5 is huge. The world's CO₂ production desperately needs to decrease—meaning the global population needs to find ways to do things more efficiently. Increasingly, energy efficiency is being seen as an effective, realizable path toward climate-change mitigation.

Increased efficiency means less energy consumption, which means less CO₂ emissions. While CO₂ is emitted to produce copper, its inherent efficiency allows the products that contain it to operate more efficiently and with a lower carbon footprint.

To produce copper and further refine it into a usable form results in the production of CO₂. On average, 3.5 tonnes of CO₂ are emitted in the production of one tonne of copper cathode (99.9 percent pure copper). However, because of its outstanding efficiency, the products that contain copper operate more efficiently and emit less CO₂ in their end-use phases. In those products, that one tonne of copper (for which 3.5 tonnes of CO₂ were emitted in its production), emits *between 100 and 7,500 fewer tonnes of CO₂. That is a mitigation factor of between 30- and 2,000-to-one!*ⁱ

Copper helps reduce carbon and other pollutants, sustaining the environment for the future and positively impacting human health. The use of copper in the power grid improves grid resilience and longevity. Copper's high conductivity ensures efficient, reliable, and safe generation, transmission and distribution of electricity. Copper's electric and thermal properties decrease load loss and keep the power grid working at full capacity. Copper ensures long-lasting, energy-efficiency performance of equipment and systems.

"UNITE FOR ENERGY" ENERGY EFFICIENT APPLIANCES GLOBAL PARTNERSHIP PROGRAM

Through the programs of the International Copper Association (ICA), the copper industry is committed to energy efficiency and the benefits it provides. Perhaps there is no greater evidence of this than ICA's leadership in a global initiative focused on energy-efficient appliances and industrial equipment.

The Unite For Energy partnership was formally launched in 2015. It was founded by ICA, the United Nations Environment Program (UNEP), the UN Development Program (UNDP), the Collaborative Labelling and Appliance Standards Program (CLASP) and the Natural Resources Defense Council (NRDC). The partnership is focused on market transformations based on mandatory Minimum Energy Performance Standards (MEPS) in six categories of industrial and consumer products.

- Motors
- Distribution Transformers
- Air Conditioners
- Refrigerators
- Lighting
- Information Technology

These six product categories will collectively account for 60 percent of global electricity consumption by 2030. Through these market transformations with MEPS at the center, some impressive goals can be achieved:

- Reduce global electricity consumption by 10 percent
- Lower CO₂ equivalent to the emissions of a half-billion passenger vehicles
- Save \$350 billion annually through reduced electricity bills

The partners in Unite For Energy bring the collective experience, expertise and resources to achieve these goals. For example, ICA has helped nearly 40 countries to adopt MEPS in motors.

The partnership is aligned with the UN's Sustainable Energy For All (SE4ALL) initiative, which aims to make sustainable energy a reality for all the world's citizens by 2030. One of SE4ALL's goals is to double the rate of improvement in energy efficiency, and an "accelerator" platform has been adopted to help achieve this goal. The Unite For Energy program is recognized as an official accelerator under SE4ALL.

As noted earlier, a growing middle class is the primary driver behind the growth in global energy consumption. Indeed, a vast majority (90 percent) of the focus for this partnership will be in the developing world, where this growing middle class will have the potential to put into use hundreds of millions of refrigerators and air conditioners (and other appliances) in the coming years. The industries in these countries will continue to grow as will the need for high-energy-consuming industrial products like motors. Of concern is the lack of MEPS in the developing world. Without intervention, these markets will grow inefficiently, and the increased energy consumption—and associated CO₂ emissions—will not be sustainable.

Through initiatives like Unite For Energy, the copper industry is at the forefront of global action to make a positive impact on the critical societal concerns of energy efficiency/security and climate-change mitigation.

ⁱ The manufacturing processes to refine copper cathode into end-use products result in varying amounts of additional CO₂ emissions depending on the end-use product. These processes are generally less energy intensive than primary production.