



Copper: Essential to Sustainable Energy



Copper Development
Association Inc.
Copper Alliance



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Copper is an integral part of sustainable energy initiatives because of its reliability, efficiency and performance. Its superior electrical and thermal conductivities increase the energy

efficiency of countless energy-driven systems that rely on electric motors and transformers. The same physical properties are vital in the collection, storage and distribution of energy from solar, wind and other renewable sources.

Renewables

Commercial, industrial and utility sectors throughout the U.S. are installing photovoltaic panels and building high-megawatt wind farms to generate clean, efficient power to meet our rising energy demands. These alternative energy sources (sun and wind) are free and plentiful, and the energy plants required to harvest and deliver this energy do not continuously generate carbon or other emissions. Such alternative energy plants are clean and reliable.



Solar Photovoltaic by the Numbers

60-70 percent:

compounded annual growth rate of residential and commercial sectors. Utility scale photovoltaic (PV) installations have quadrupled since 2008.

5:

top states using PV are California, New Jersey, Florida, Arizona and New York*

601,133:

number of U.S. Shipments of Photovoltaic Cells and Modules in 2009

*Source: U.S. Energy Information Administration

Wind Power by the Numbers

25 percent:

compounded annual growth rate of the onshore wind energy program in the U.S. It has surpassed \$60 billion in size.

20 percent:

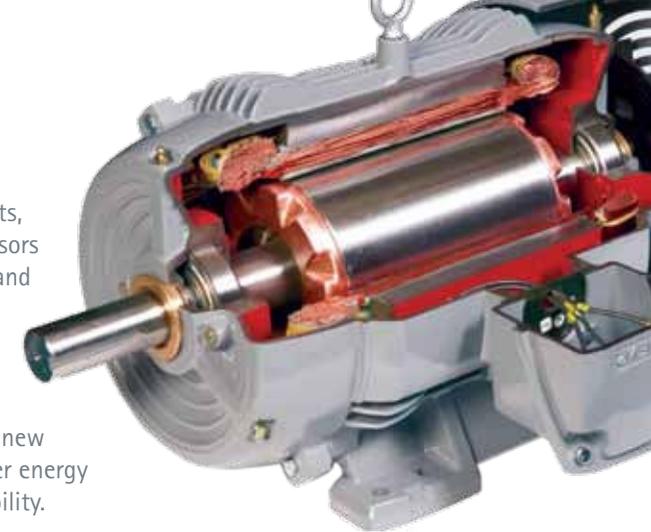
the U.S. wind power capacity ratio compared to the world's total installed wind power, according to the American Wind Energy Association.

20 percent:

U.S. Energy Department's goal for Renewable Energy growth of "20 percent by 2030," which offers opportunities for onshore wind energy but more particularly for offshore wind energy.

Electric Motors

Electric motors are found everywhere in commercial facilities and industrial plants, where they power fans, pumps, compressors and exhausts as well as manufacturing and assembly equipment. Electrical energy consumption can be greatly reduced by replacing older, worn-out motors with energy-efficient equivalents and by specifying energy-efficient motors in new equipment. Such practices not only lower energy costs, but also improve equipment reliability.



Transformers

About a million distribution transformers are produced and sold annually in the United States alone. Virtually all electric power in the country passes through at least one of these units before it's consumed. The purchase of a premium, high-efficiency, copper-wound unit instead of a lower-cost, low-efficiency, aluminum-wound unit, will result in significant savings over the life of a transformer.



Energy Storage

Advancements in technology have enabled the grid energy storage market to grow from a "future concept" to an accepted tool in certain applications, according to the Copper Development Association (CDA) commissioned KEMA study*. And, because storage plays an important role in facilitating renewables in the U.S. grid, it will continue to play a contributing role in the ongoing development of utilities. Copper is now, and will continue to be, a partner in this growth because its qualities of reliability, efficiency, durability and safety are fundamental to the design of properly-functioning battery cells.



**Market Evaluation for Energy Storage in the United States" prepared for the Copper Development Association Inc. by KEMA, Inc. Fairfax, Virginia, copyright 2012.

A close-up photograph of copper coils and electrical components, showing the intricate wiring and the metallic sheen of the copper. The image is partially obscured by a semi-transparent dark brown overlay at the bottom.

Benefits of Copper

Reliable

Copper's high-quality, long-life, and proven performance ensure long-term reliability of energy systems and equipment.

Efficient

Copper's electrical conductivity is unmatched by any other engineering metal. Copper's conductivity, plus its ability to create high-quality, low-resistant connections is the basis for highly-efficient electrical equipment and lower energy losses.

Sustainable, Renewable, Recyclable

Copper plays a vital role in sustainable electric energy, increasing the efficiency and reliability of wind and solar installations and their related power transmission systems. Copper can be easily and effectively recycled over and over again without degradation of its properties.

Copper outlasts, outperforms and works more efficiently time and time again.



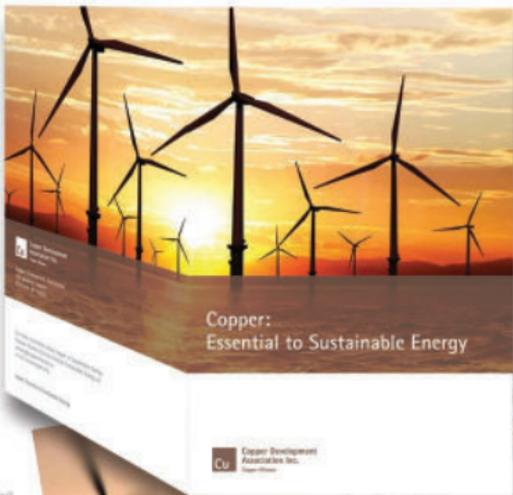
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Supports the copper industry's role in sustainable energy. Provides information on the benefits of copper in renewable energy applications. Promotes the use of copper in sustainable energy applications.

Renewables

Renewable energy is a key component of sustainable energy. Copper is essential to the production and distribution of renewable energy. Copper is used in solar panels, wind turbines, and other renewable energy applications. Copper is also used in the production of hydrogen fuel cells. Copper is a key component of sustainable energy.



Solar Photovoltaic by the Numbers

60-70 percent

of solar panels are made of copper.

Source: International Copper Association

601,133 tonnes of copper used in solar panels in 2019.

Source: International Copper Association



Wind Power by the Numbers

25 percent: copper used in wind turbines.

20 percent: copper used in wind turbine cables.

20 percent: copper used in wind turbine transformers.

20 percent: copper used in wind turbine generators.

Transformers

Transformers are essential for the transmission and distribution of electricity. Copper is used in the windings of transformers. Copper is also used in the core of transformers. Copper is a key component of transformers.



Energy Storage

Energy storage is essential for the integration of renewable energy into the power grid. Copper is used in the production of energy storage devices. Copper is also used in the production of energy storage systems. Copper is a key component of energy storage.



Source: International Copper Association