

---

# The Societal Benefits of Copper webinar series

---

**Copper 's role in Renewable Energy and CO<sub>2</sub> reduction**

February 29, 2012

---

# ANTITRUST GUIDELINES FOR COPPER INDUSTRY TRADE ASSOCIATION MEETINGS

The following guidelines with respect to compliance with antitrust laws of the United States, Japan and European Community are intended to govern the conduct of participants in copper industry trade association meetings, both at the meeting itself and in informal discussions before or after the formal meeting.

**Price.** Competitors should not discuss future prices (including terms of sale) of their products. There is no blanket prohibition against the mention of or reference to current or past prices but limits must be observed. Such references or mentions should occur only when necessary in connection with the development of association programs. For example, reference to a particular price level in comparing the cost of a copper product to a competing product is permitted. Whenever possible, such references should be discussed in advance with legal counsel.

**Competitive Information.** Competitors should not discuss the market share of a particular copper producer or copper fabricator's products. Furthermore, nothing should be said at a meeting which could be interpreted as suggesting prearranged market shares for such products or producer production levels. The overall market share of copper products may be discussed with regard to competition with non-copper products and general market acceptance.

**New Products.** Competitors should not encourage or discourage the introduction of a new product by another competitor or reveal a particular copper company's plans to change the production rate of an existing product or to introduce a new product. No company should disclose to another company whether it is in a position to make or market a new product. New products may be discussed in a technical manner or from the standpoints of competition with non-copper products and general market acceptance. In addition, proposed methods for and results of field and laboratory testing can be considered.

**The Role of Legal Counsel.** Legal counsel attends association meetings to advise association staff and other meeting attendees regarding the antitrust laws and to see that none of the matters discussed or materials distributed raise even the appearance of antitrust improprieties. During the course of a meeting, if counsel believes that the discussion is turning to a sensitive or inappropriate subject, counsel will express that belief and request that the attendees return the discussion to a less sensitive area.

A paper entitled "Copper Industry Trade Associations and the Antitrust Laws" is available upon request.

10/92, 5/93

---

# International Copper Association

---

The Societal Benefits of Copper by Steve Kukoda  
February 29, 2012

# Introduction

**At no other time in ICA's history have we better understood how important copper is to addressing many of man's greatest challenges.**

**At no other time in ICA's history have we had such strong and positive messages about copper and its benefits to society.**

---

# Societal concerns

- Food supply
- Public health
- Climate change, CO2 reduction
- Responsible use of energy, alternative energy
- World electrification
- Green building
- Air quality

---

# Societal concerns

## Question:

- What do all of these issues have in common?

## Answer:

- Copper is uniquely able to make a positive contribution to all of them
- No other material can do the same
- And, we have the communications messages to prove it

---

# Societal concerns

## Sustainable Development (SD)

- On the minds of governments, companies, people
- Another unique advantage for copper:
  - Other materials need to communicate on the actual sustainability of the material
  - With copper we can communicate that copper makes the things that contain it more sustainable

---

# Societal Benefits of Copper

- Develop and disseminate positive messages about copper's role in addressing sustainable development concerns to the benefit of society
- Yes, we have the messages...but these messages belong not just to the ICA, but to ICA's members

## Top-level Goals

- Reposition copper as a *material* that addresses sustainable development concerns
- Reposition the *copper industry* as a key contributor to addressing many of society's greatest challenges



---

# Societal Benefits of Copper

- New issue once every two months
  - Stand-alone communications tools (Executive Summary, Fact Sheet, Press Release, Case Studies, Q&A, etc.)
- For each issue, webinar led by relevant ICA initiative/project leader
- Communications personnel within copper industry companies
  - Use these messages, where appropriate
    - Internal and external audiences
    - Online, print, conferences, etc.
- Members have requested program expansion
  - Regional/local members
  - Other industry organizations
  - Non-industry organizations

---

# Launch of campaign: June 2011

- 2011 Campaign
  - Aquaculture: Copper's role in addressing food supply concerns
  - Public Health: A positive impact on infection control (Antimicrobial Copper)
  - Sustainable Energy: A positive impact on climate change and CO<sub>2</sub> reduction
- 2012
  - Renewable Energy: Energy and CO<sub>2</sub> reduction
  - Human Health: Copper is fundamental – anticipated for April/May
- Upcoming topics
  - Energy Access ( World Electrification), Technology, Earthquake Dissipation, Air Quality, Water Quality, Green Building and much more

---

# The Societal Benefits of Copper webinar series

---

**Copper 's role in Renewable Energy and CO<sub>2</sub> reduction**

February 29, 2012

---

# Copper and Sustainability

---



---

# Summary

- Renewables
  - Wind
  - Photovoltaics
  - Solar Thermal Electricity
  - Other electrical renewables
  - Solar water heater
- Electric vehicles

---

# Introduction – Why renewables?

## Why renewables?

- Fuel reserves depletion
- Climate change
- Energy dependency on imported resources
- Growth of global population and increased standard of living

## Advantages

- Naturally replenished sources
- No net CO<sub>2</sub> release to the atmosphere
- Local source of energy

## Are renewables a viable option?

- IPCC 2011 special report
- IEA “Deploying Renewables 2011” report

---

# Renewables progress

**Today, 7% of world  
power generation**

**Targets in 119 countries**

EU: 20% contribution by 2020  
China: 15% contribution by 2020

**Increasing investments**

USD 211 billion in 2010 – 30% increase compared to 2009

Source : 2011 global status report by Renewable Energy Policy Network for the 21st Century (REN21)

---

# Renewable Energy Reduces CO<sub>2</sub>; Copper is Key to Renewable Energy Systems

**Copper: efficiency and minimum environmental impact in energy generation and transmission**

- Renewable energy systems rely on copper to generate and transmit the energy with maximum efficiency and minimum environmental impact
- Best electrical conductor available (after silver and gold). Economic benefit enables the progression towards a low-carbon economy.

**Copper plays a greater role in renewable energy generation than conventional thermal power plants**

- Copper products are required: electrical equipment (generators, transformers) or for special applications (corrosion resistance, other) in solar, wind, hybrid vehicles, wave, biomass, tidal, hydro and geothermal



---

# Renewable Energy Reduces CO<sub>2</sub>; Copper is Key to Renewable Energy Systems

**Copper is a key driver to increased efficiency in all electrical equipment**

- Copper is the standard benchmark for electrical conductivity
- Resulting in conserved energy, demand and generating capacity are reduced

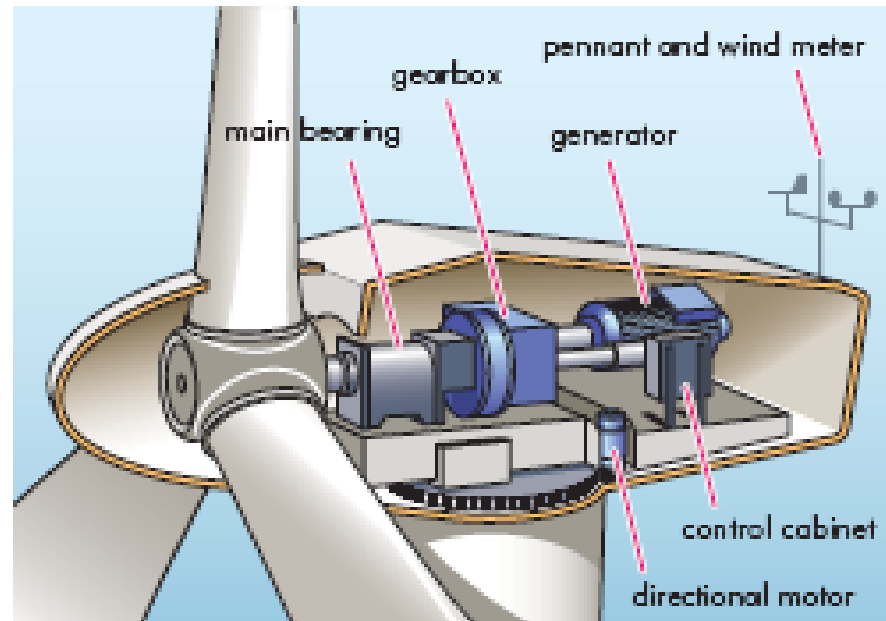
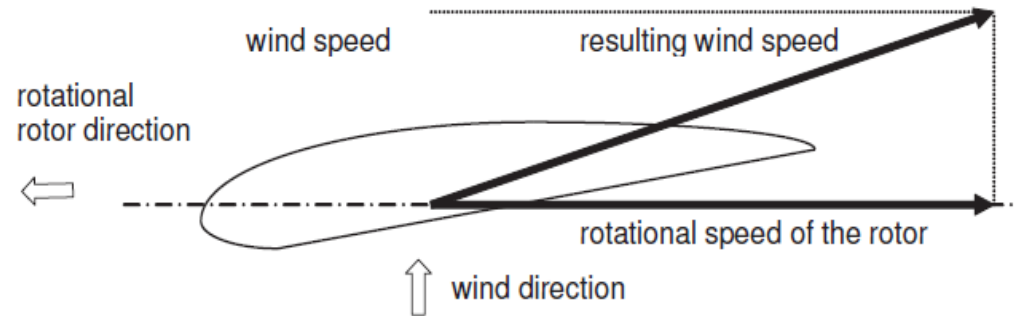
**Copper is 100% recyclable**

# Wind Power – Technology

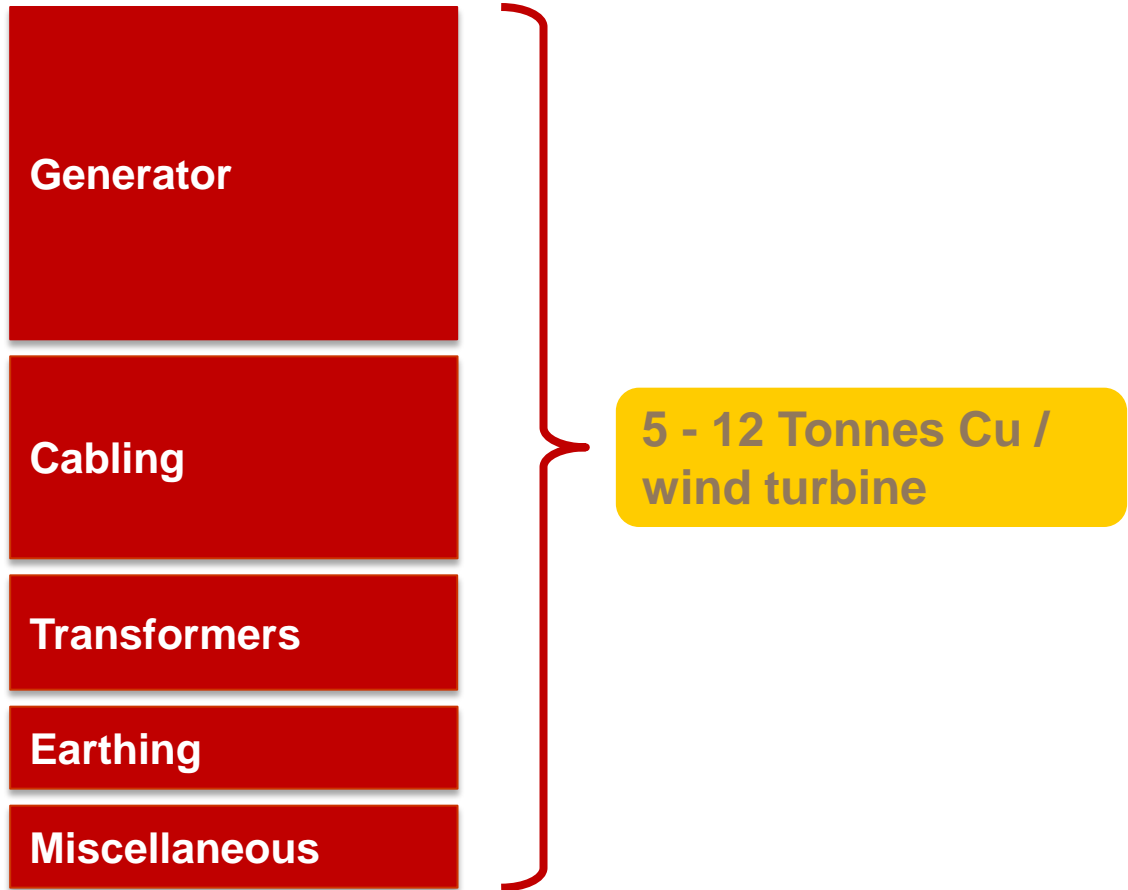
The rotor blades known as aerofoils act like an aircraft wing; the so-called principle of lift.

Wind turbines extract the energy from the wind by transferring the thrusting force of the air passing through the rotor blades into the turbine rotor.

A gearbox connects the rotor to the generator. Then, electrical energy is conducted through vertical cables down to the ground level and exported to the grid.



# Copper's role



Source : Frost and Sullivan survey for European Copper Institute  
April 2010 – Order 10058

# Specific Benefits



## Competitive technology

In several countries wind power is already more competitive than most of fossil fuel alternatives: there is no need for subsidies to foster its development.

## Wholesale power scale

A typical wind park can easily have 10 MW or more installed power. This produces bulk electricity for the wholesale market.

# World market overview



**Total installed power:  
198 000 MW in 2010**

More than 100.000 wind turbines

Annual generation: 500 TWh / year (enough to power more than 100 M people in a developed country)

**40 000 new MW in 2010**

30% growth rate annually

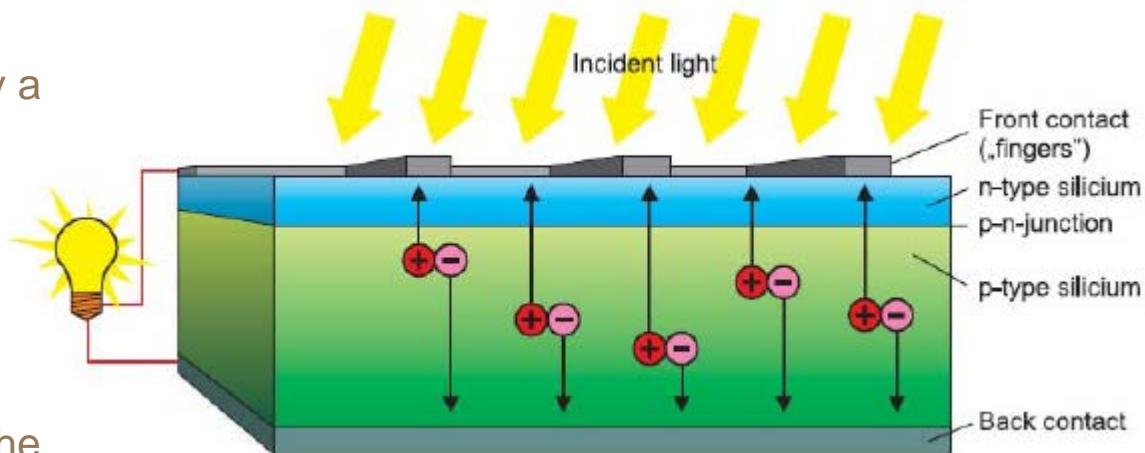
Source : 2011 global status report by Renewable Energy Policy Network for the 21st Century (REN21)

# Photovoltaic Energy – Technology

Photovoltaic energy is produced by a reaction to sunlight. Cells made of silicon, called photovoltaic cells, convert the light of the sun into electrical energy.

Photovoltaic energy is the result of turning sunlight into electricity. As the sunlight hits a photovoltaic cell, it frees and stirs up electrons which then collect on conductive plates to create heat or electricity.

Solar cells are connected into panels. Sets of panels are then connected into arrays, constituting a PV system (which also includes a power conditioning unit called inverter, to convert DC to AC current).



# Copper's role



Cabling

Earthing

Inverter

(Transformer)

PV cell ribbons

12 kg Cu / household installation (2.5 kW)



Source : Renovalia analysis for European Copper Institute  
July 2010 – Order 10062

# Specific Benefits



## Sharp cost reduction

Promotion of this technology worldwide has driven costs dramatically downward, rapidly reducing the price of generated energy.

Expected in 2-3 years to become less expensive than grid electricity at retail level for sunny countries in the world

## Generated at the point of consumption

Avoids losses in transmission and distribution networks. Global households can generate their electricity and use the grid for support and reliability..



# World market overview



**Total installed power:  
40 000 MW in 2010**

Annual generation: 50 TWh / year (enough to power more than 10 M people of a developed country)

**17 000 new MW in 2010**

40% growth rate annually

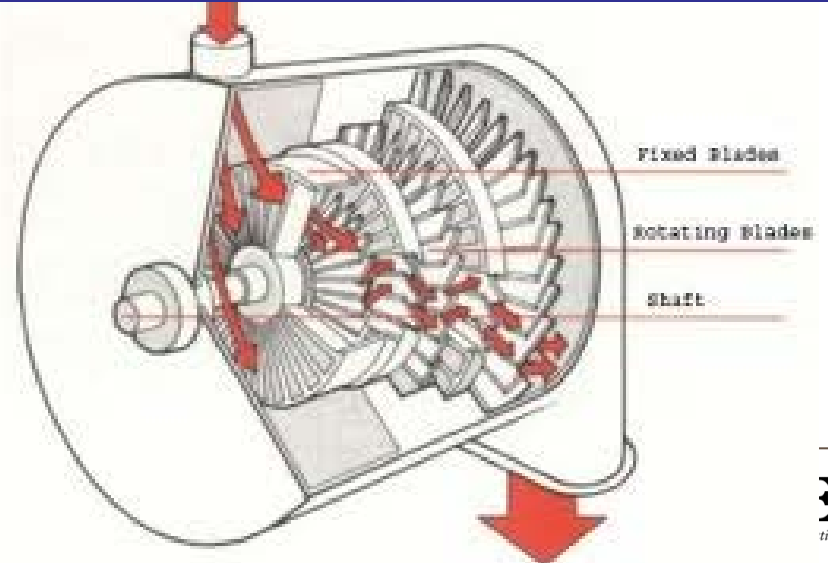
Source : 2011 global status report by Renewable Energy Policy Network for the 21st Century (REN21)

# Solar Thermal Electricity – Technology

Solar thermal electricity (STE) is a technology for harnessing solar energy for thermal energy (heat).

STE systems work by concentrating the rays of sun to heat up a fluid.

Once at high pressure and temperature, this fluid is expanded in a turbine (or equivalent device), to produce electrical power.



# Copper's role



**Cabling**

**Motors**

**Generator**

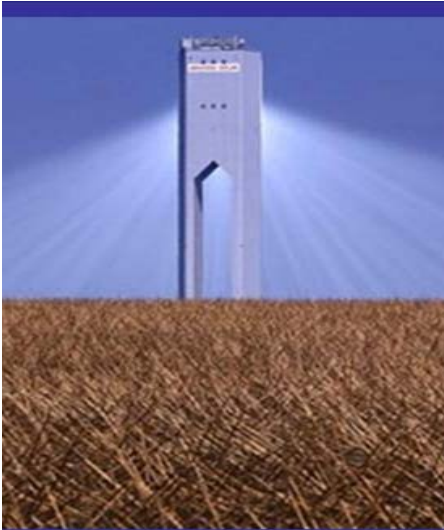
**Transformers**

**200 Tonnes Cu /  
power plant (50 MW)**



Source : European Solar Thermal Electricity Association (ESTELA-SOLAR)  
survey for European Copper Institute – July 2010 – Order 10098

# World market overview



**Total installed power:**  
**1 500 MW in 2010**  
**5 000 MW in 2011**

Mostly developed in Spain and US

Forecast to reach about 20 000 MW by 2015 worldwide



**About 20 000 MW by 2015**

50% growth rate annually

Sources :

- 2011 global status report by Renewable Energy Policy Network for the 21st Century (REN21)
- European Solar Thermal Electricity Association (ESTELA-SOLAR) survey for European Copper Institute – July 2010 – Order 10098

# Specific Benefits



## Dispatch-able power

Unlike wind or photovoltaic power, STE can store the heated fluid and deliver power on command, which makes a big difference and can complement the variable generation of other renewable power sources

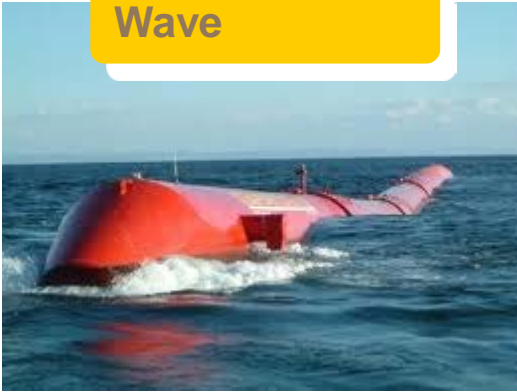
## Wholesale power scale

A typical STE installation ranges from 50 MW to 200 MW or more installed power. This produces bulk electricity for the wholesale market.



# Other electrical renewables

Wave



Copper products are required either for electrical equipment (generators, transformers) or for special applications (corrosion resistance, other)

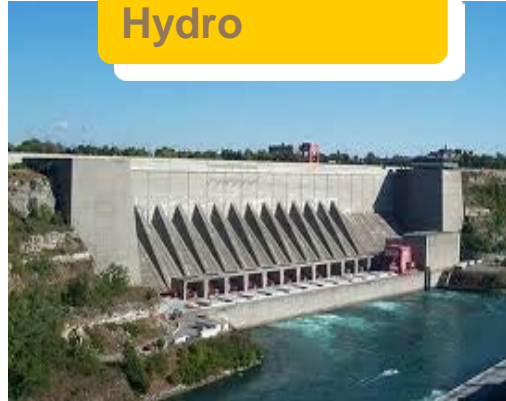
Biomass



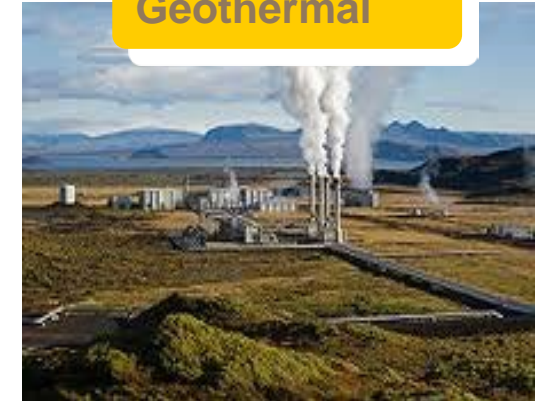
Tidal



Hydro



Geothermal



# Solar Thermal Water Heating



Total installed capacity in 2010 was 185 000 MW-thermal.

Copper combines a set of properties suitable for this application:

- high heat conductivity,
- resistance to atmospheric and aqueous corrosion,
- ease of fabrication,
- seal-ability (joined by soldering),
- mechanical strength and longevity.

Copper is used both in the receiver and in the primary circuit (pipes and heat exchangers for water tanks).

Source : 2011 global status report by Renewable Energy Policy Network for the 21st Century (REN21)

---

# Summary



- **Renewables**
  - Wind
  - Photovoltaics
  - Solar Thermal Electricity
  - Other electrical renewables
  - Solar water heater
  
- **Electric vehicles**



# Technology

**Battery electric vehicle** : powered exclusively with electric motor.

Battery needs to be charged with power from the grid.



**Hybrid vehicle** : powered by both an electric motor and internal combustion engine.

The only outside supply is fuel. Battery is charged using fuel.

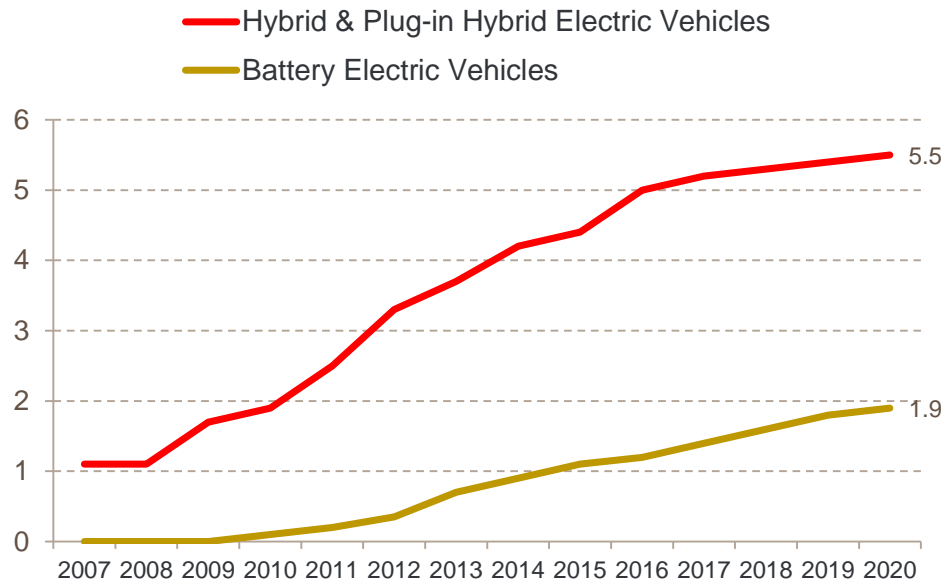


**Plug-in hybrid** : Can charge the battery from the grid power and use fuel later when the battery is depleted.



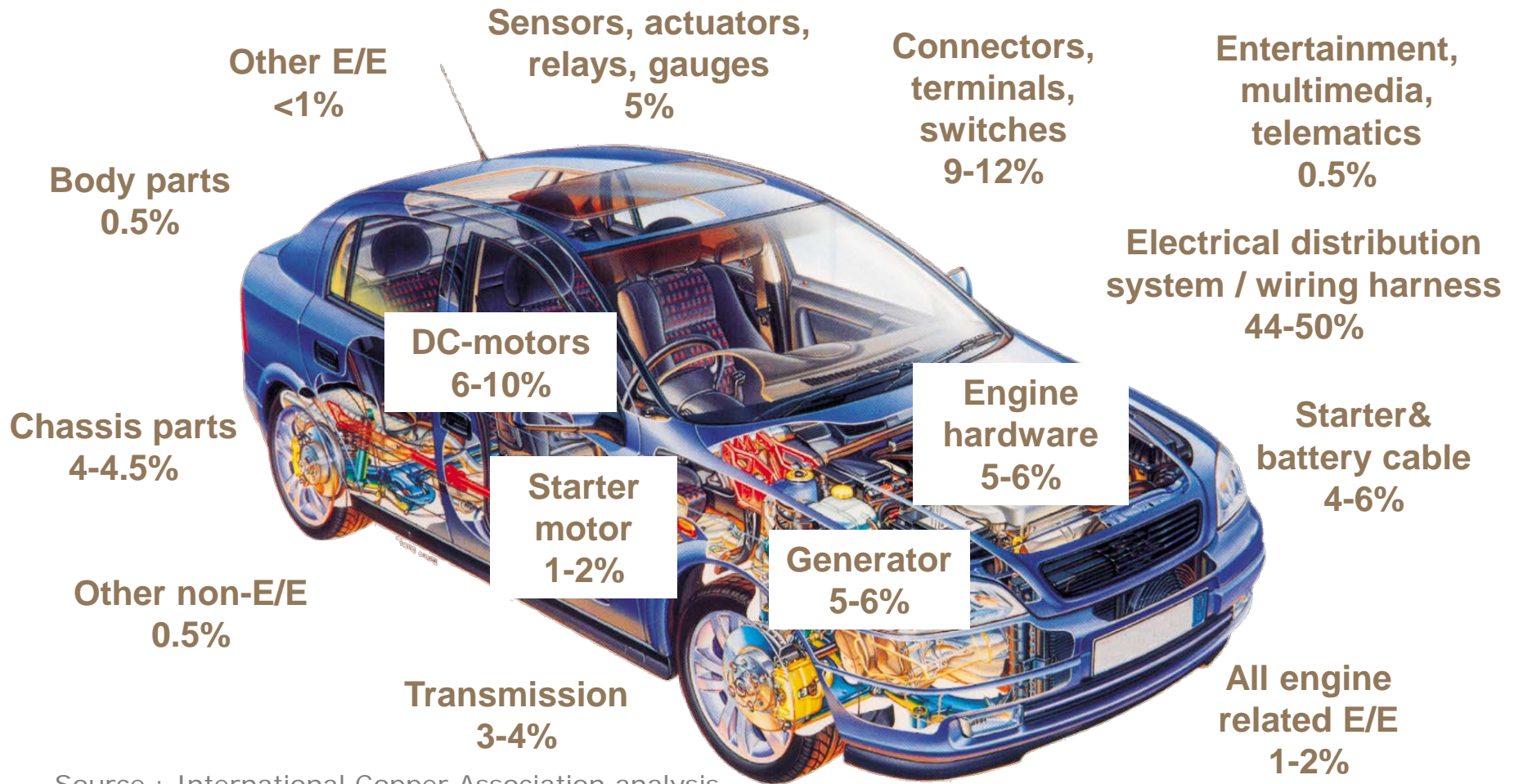
# World market overview

5 million plug-in cars in use by 2017



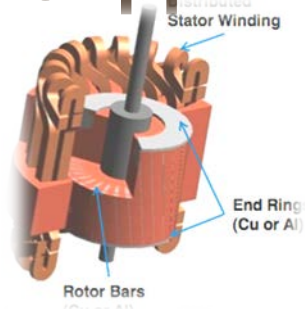
Source: J.D. Power & Associates

# Copper in a conventional car



Source : International Copper Association analysis

# Copper's role in electric vehicle



Copper is required in (beyond conventional use):

- HV Wiring (200 Volts)
- Battery (Li-ion)
- Converter/ rectifier
- Electric motor
- Electric compressor



In average 50 kg of copper per electric vehicle



A number of motor technologies are available. Due to the volatility and high price of *rare earths*, **copper rotor induction motor** offers a competitive advantage, coping with the main requirements of electric traction and ensuring a stable economic framework.



# Conclusions



**Relevant role of copper  
in renewable energy**

- 4 tonnes of copper required per MW as an average for wind and solar technologies (1 tonne for conventional power technologies)

**Electric vehicles : more  
copper required**

- A number of additional specific equipments require an increased use of copper

**Copper : fundamental  
part of sustainable  
development**


- Key material to implement the sustainable solutions to cope with climate change, growth of energy consumption and fossil fuel depletion

# Promoting Sustainable Development






## Leonardo ENERGY

The Global Community for Sustainable Energy Professionals [Home](#) - [Tagcloud](#) - [Sitemap](#) - [Contact-us](#) - [Login](#)

Leonardo ENERGY



[About us](#) | [Blogs](#) | [Community](#) | [E-learning](#) | [Library](#) | [Service](#)

 <p><b>Energy efficiency</b> Practical solutions to save energy ...</p>	 <p><b>Ecodesign</b> Better design for improved performance ...</p>	<p>352020 page views this month 68659 email subscribers 4430 registered users 722 RSS readers (via feedburner) </p> <p><b>What's new</b></p> <ul style="list-style-type: none"><li>- Technology Readiness Level</li><li>- Leonardo ENERGY on Twitter</li><li>- What will customers value most in the future electricity supply?</li><li>- How do you view the use of either electricity (E) or gas (G) for the future energy delivery chain evolving?</li><li>- What will be the share of various</li></ul>
 <p><b>25 predictions on electricity</b> 25 predictions on the future electricity s...</p>	 <p><b>Power Quality</b> Quality of supply in the digital society</p>	
 <p><b>Renewable Energy Systems</b> Shortening the way to grid parity ...</p>	 <p><b>Transformers</b> Transformers in high efficiency power dist...</p>	
 <p><b>Motors</b> Promoting high efficiency motor systems in...</p>		

European Copper Institute /  
International Copper Association  
initiative

Offers information and training on  
sustainable energy, including  
interactive events, e-learning,  
documents, communities of  
practice, etc.

For more information visit: <http://www.leonardo-energy.org/>

---

# Thank you

---

---

---