Legal Statement

The purpose of the information in this presentation is to guide ICA programs and provide members with information to make independent business decisions.
Antitrust Guidelines

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 Antitrust Laws’ is available upon request.

10/92, 5/93, 10/10

1. Other foreign competition laws apply to International Copper Association, Ltd. (ICA)'s activities worldwide.
Opportunities for Copper in Water and Waste Water Treatment

Krystyna Dawson
Director, BSRIA WMI
Agenda

- Challenges in water supply
- Water and waste water management requires changes
- What does it mean for copper?
- Main products of interest
- Market forecast and drivers for growth
- Ancillary applications & Conclusions
Water industry – brief overview

Provider of drinking water & waste water services

- Publicly owned
- Privatised
- Co-operation & NGO structures

residential, commercial and industrial sectors of the economy.

Average annual growth in the past: 3%

Source: ccuart.org

Source: clipartbest.com
Powerful global drivers prompt change

- Population growth
- Climate change
- Industrialization

“We used to think that energy and water would be the critical issues for the next century. Now we think water will be the critical issue.”

Mostafa Tolba, former head of the UN Environment Programme

Pressure on water supply is growing to ensure

- People’s health
- Food security
- Energy supply
- Industrial production

Industry forecasted annual growth: 7.4% – 11.4%*

*Sources: GWI; FMI

Image: cnmeonline.com
Water and waste water management under pressure

Water & waste water processes are energy consuming

Utility level

Collecting water

Water treatment

Wastewater treatment

Collecting wastewater

Returning water to the ecosystem

Waste Water treatment cycle

Water treatment cycle

Shift to low carbon economies impacts technologies used in water supply processes

Energy efficiency comes to focus

*Plumbing excluded
What does it mean for copper?
Global copper demand

2016: ca 27,419K tonnes

Source: Adapted from ICA/IWCC data
Main product areas in Water Utility segment

**Thermal**

- Heat exchangers (HE)
  - HE in boilers and in anaerobic sludge digestion process
  - HE in MSF desalination (copper-nickel alloy)
  - HE in water harvesting and re-use

**Electrical**

- Motors (in pumps & CHP units), wires, etc
  - Motors for a range of applications of which water pumps represent almost 90% of typical installed capacity
  - Electrical wiring and other ancillary electrical equipment such as switchgears

*Pump casing, valves etc. made of brass are excluded from the research*
Main and ancillary applications open up for more copper use

Main applications

- Water treatment
- Waste Water treatment

Ancillary applications

- Energy generation
- Heat exchange in grey water recovery
- Water reuse
- Heat exchange in solar preheating

Desalination is gaining importance

Main applications

Grey Water recovery

Picture: pinterest.com

Picture: jzcacayuran.wordpress.com

Source: ecohome.net
Focus on Copper Demand in Water Utility

2017 (including Cu-Ni alloy), ca 39,000 tonnes

By segment
- Municipal Waste Water: 14,744 (38%)
- Clean Water: 21,340 (55%)

By equipment type
- Heat Exchangers: 3,880 (10%)
- Electrical cabling and ancillary: 4,656 (12%)
- Motors: 30,264 (78%)

By application
- Replacement: 31,816 (82%)
- New built: 6,984 (18%)
Market assessment by type of product

- **Sheltered**
  - Wiring and ancillary electrical equipment

- **Challenging**
  - Heat exchangers in thermal desalination

- **Growing**
  - Motors

- **Emerging**
  - Heat exchangers in cogeneration and ancillary applications
Drivers for Copper Use in Water and Waste Water

**Efficiency**
- Motor efficiency (IEC 3)
- On site energy generation
- Efficiency in most energy demanding processes such as aeration and sludge treatment

**Industry Growth**
- Global economic growth
- Urban population growth
- Ageing infrastructure
- 3.6 billion live in water scarce areas at least one month/year

**Climate change**
- Water scarcity, drought and storm management
- Desalination growth
- Water waste reduction and remediation

**Up to +50% of copper per unit**

**Copper Demand CAGR minimum +16% in next 10 years**

**Investment growth:**
+ 100% in next 10 years
Copper demand in Water Utility – progression scenarios

Forecast of global copper demand * (including Cu-Ni alloy), 2017 – 2027f

* Includes clean water, municipal waste water and industrial waste water

- Global copper demand - Moderate
- Global copper demand - Progressive

170,000 tonnes
260,000 tonnes
Motors will account for lion’s share of growing demand

Forecast demand for copper (including Cu-Ni alloy) by equipment type, 2027f

What will drive progress?

- Policy
- Energy demand
- Economic growth
- Efficiency awareness

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Copper Demand (tonnes)</th>
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</thead>
<tbody>
<tr>
<td>Moderate scenario</td>
<td>Electrical wiring &amp; ancillary: 150,000, HE (Desalination &amp; WW treatment): 50,000, Motors (pumps, rakes, CHP): 200,000</td>
</tr>
<tr>
<td>Progressive scenario</td>
<td>Electrical wiring &amp; ancillary: 200,000, HE (Desalination &amp; WW treatment): 50,000, Motors (pumps, rakes, CHP): 250,000</td>
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North America and China – the main current markets

Current demand for Copper Use in Water and Waste Water

- US & China – over 50% market share
- Bulk of current demand is in replacement & energy retrofit
- New build is slow and financing is challenging
- Strong demand from aging infrastructure
- Arabian Peninsula strong market for desalination
- Europe strong market for retrofit

Between 25% and 30% of global share
Between 2% and 7% of global share
Below 2% of global share
China, Kazakhstan and Arabian Peninsula – strong growth potential

Demand by forecast growth rate, 2017 - 2027

- China policy is pulling the market in new and retrofit applications
- India’s economic growth support the market but governance is weak
- Desalination investments are driving the market in Kazakhstan and Arabian Peninsula
- US will face investment backlog in retrofit
- Water shortage drives investments in LatAm, South Africa and Australia

Colour shade indicates how fast growth will occur with darker shades indicating growth starting in first five year and lighter shades later growth from 2023 onward
China

• Estimated copper demand growth 2017 – 2027 : 35%
• Currently 2\textsuperscript{nd} biggest market, set to overtake the US in 2019
• IEC 3 market still small (less than 10%) but strong governance will support it;

\textbf{Drivers:} urbanization, industrialization, pollution & efficiency focus

Government expected to invest an equivalent of 300 US$ Billion to 2020 (+35%) with special focus on municipal and industrial Waste Water improvements

\textit{In 2016, the Chinese Government admitted that over 80% of groundwater in China is heavily polluted and unsuitable for human consumption}
Arabian Peninsula

- Estimated copper demand growth 2017 - 2027: 25%
- Largest desalination capacity in the world with almost 90% of MSF market;
- Growing market for new water and waste water plants

Drivers: Fast growing population, replacement of aged infrastructure, shift towards efficient processes

Centralized governance:
US$ B 53 investments to 2020 in SA

New Fresh Water Investments
2,645 million m³/D of new desalination capacity (RO) by 2020

New Waste Water Investments
2,800 million m³/D of new municipal waste water capacity by 2020
Kazakhstan

- Estimated copper demand growth 2017 - 2027: 17%
- Relatively small market but large potential
- Large desalination market and large O&G producer

Drivers: Replacement of old infrastructure, expansion of water provision

Utility fund of Kazakhstan in partnership with EBDR:
10 US$ Billions investments until 2026

Flagship desalination project in 2018 in Kuryk for 50,000 m³D and an investment of around 200 US$ millions
Hot spots for the future in ancillary application

- Waste water plants with cogeneration units
- Harvesting HVAC condensation water (pumps / motors)
- Harvesting hot sanitary waste water (HE)
- Use of solar thermals for desalination processes

Source: Mage Water Management
Desalination installation in Al-Hail in Oman
Water value perception is changing

The price of water is low  The ROI in modernizing is long

How much will it cost not to have water?
Conclusions

• Increasing need for water supply and waste water treatment will result in growing energy demand in this area.

• Energy efficiency will come into focus across the sector paving way for increased use of copper in electric and thermal side of the processes.

• Preliminary research results show that overall demand for copper in water and waste water treatment can grow between 16% and 21% per year in the next decade.
Thank you

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