



THE EMERGING ELECTRICAL MARKETS FOR COPPER

Paul Dewison of Bloomsbury Minerals Economics

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OBJECTIVES OF THIS RESEARCH

- Identify new electrical markets for Cu
 - Markets that are at an early stage of development
 - Small markets that will be greater than 5 ktpy of copper by 2020
 - Drivers that will influence the growth of these markets
- ..with focus on Europe
 - Review the main European markets (DE, FR, IT, ES, UK and the rest)
 - World potential is also identified, assessing separately the United States, China and the Rest of the World
- Research and evaluation of the following market areas
 - Transport market
 - Electricity Infrastructure
 - Premise, Equipment and Other markets
- Identifying market size and growth potential
 - Identify the current market size for copper
 - Forecast the growth path and market size in 2020
 - Identify the factors that will influence the growth



NEW CLASSIFICATION OF IDENTIFIED MARKETS BASED ON THE THEORETICAL FRAMEWORK

Objts & Systems	Components
Wind Farm Generation	Generators
Solar Generation	Corrosion Resistant Cladding
Marine Generation	Cu-Based Solar Panels
Other Generation	Batteries
Storage Systems	HS Flywheels
Network Interconnection	Power Electronics
Transmission & Distribution	Transformers
Smart Systems	HV Cable (Subsea)
Fossil Fuel Generation	Carbon Capture Systems

Transport Vehicles & Infrastructure

Electricity Generation, Storage, Transmission & Distribution

Objts & Systems	Components
EV - Battery	Advanced Motors
EV - Fuel Cell / Other	Advanced Batteries
PHEV	Power Electronics
Hybrid Vehicle	Other Advanced Electronics
Other Alternative Vehicles	Ultra-fine Wiring
Charging Infrastructure	Regenerative Braking
IC Road Vehicles	HS Flywheels
	Electromagnetic Transmission

Objts & Systems	Components
Energy Efficient Buildings	Meters
Low Energy Data Centres	Power / Data Wire Nets
Smart Network Connection	High Power Data Cables
Full Power / Data Network	Wireless Power Systems
Building Management Systems	Advanced Motors
Equipment-Specific Control	Advanced Batteries
Efficient Equipment	Power Electronics
Smart Equipment	Microprocessors
Smart Appliances	Nanotechnology
Function-Rich Equipment	

Premise Structure, Internal Networks & Equipment



BASIC PRINCIPLES





- We are looking at very small markets likely to grow into “significant” ones by 2020
- By “significant” we take the arbitrary figure of 5 ktpy consumption of copper
- The markets uncovered are driven by the mega-trends in society:
 - The need for cleaner and more sustainable sources of energy
 - The need for efficient use of energy
 - An ageing population
 - Lack of clean water resources
 - An increasingly digital world
- The markets fall into four categories:
 - Transport
 - Energy infrastructure
 - Premises and within premise equipment
 - Cross sector products and technologies



THE EMERGING MARKETS MATRIX

	Cables Based Systems				Motor, Generator, Transformer Systems					Enabling Technologies	
	HV Harness	Premise Wiring	System Cabling	Charging Infrastructure	Motor Systems General	Motors CMR	Motor Shaded Poles	Generators	Transformer / Inverters	Power Electronics	Li-ion Batteries / Storage
Transport	HEV										
	PHEV										
	BEV										
	FCEV										
	ICV										
Energy Infrastructure	Wind Generation										
	Solar PV										
	Solar Concentration										
	Other DG										
	New Desalination										
	Carbon Capture etc										
Premise & Equipment	Smart Ageing										
	Advanced Rewinding										
	Green Tech Winding										
	Efficient Motors										

KEY

-  Market sector emerging market
-  Product category emerging market (over range specified)
-  Cells included in both market sector and product category emerging market definitions
-  Single cell emerging market defined as both market sector and product category

BASIC FINDINGS

- Markets can be defined as an object (such as a certain type of car) or a component (such as a motor), sometimes both
- We constructed a matrix showing emerging markets:
 - There are 18 markets that strictly meet our size and growth criteria
 - 3 are new road vehicle types
 - 3 are object markets in the energy infrastructure
 - 2 are in the premise sector
 - 10 are specific items of equipment or cross product technologies
- We show 6 markets already too large to be considered as “emerging”, as each is growing fast and should offer new opportunities
- For each market we consider:
 - The growth expected
 - Certainty of achieving that growth
 - Upside potential
 - Long term prospects beyond 2020



GROWTH & POTENTIAL FOR EMERGING MARKETS (1)

		Global Market Size (kt Cu)		Europe Market Size (kt Cu)		Certainty	Upside Potential	Long-Term Growth
		2010	2020	2010	2020			
Energy Infrastructure	Wind Generation							
	<i>Turbine Generator</i>	43.0	140.5	16.6	32.1			
	<i>Transformer/Inverter</i>	35.9	117.1	13.8	27.1			
	<i>Cables</i>	21.5	70.3	8.3	16.2			
	Solar PV							
	<i>Transformer/Inverter</i>	5.0	12.6	4.4	4.7			
	<i>Cables</i>	24.0	54.0	18.9	20.3			
	Concentrating Solar	0.3	7.5	0.0	0.5			
	Carbon Capture etc.	0.0	5.5	0.0	2.0			
	<i>New Destination*</i>	0.6	9.3	0.0	0.7			
<i>Electrical Parts*</i>	6.2	25.1	0.6	2.4				
Premise Market	Smart Wiring	4.1	42.7	1.7	12.7			
	Advanced Rewiring	1.4	30.1	0.4	7.7			
	Green Technology Wiring	17.2	46.8	2.9	4.8			



GROWTH & POTENTIAL FOR EMERGING MARKETS (2)

		Global Market Size (kt Cu)		Europe Market Size (kt Cu)		Certainty	Upside Potential	Long-Term Growth
		2010	2020	2010	2020			
Transport	PHEV	0.1	93.0	0.0	12.1	High	High	High
	BEV	0.3	136.6	0.0	33.2	High	High	High
	FCEV	0.0	13.9	0.0	2.1	Moderate	High	Exceptional
Equipment & Cross-Market Technologies	Energy Storage - Auto	1.1	23.0	0.0	4.5	High	High	High
	Energy Storage - Network	0.0	5.3	0.0	1.3	Moderate	High	Exceptional
	Motor-Auto	7.0	166.2	0.1	32.2	High	High	High
	HV Harness- Auto	5.0	91.9	0.1	17.0	High	High	High
	Charging Infrastructure - Auto	0.1	10.6	0.0	4.1	High	High	Moderate
	Motor - CMR	4.9	35.1	1.0	4.7	Moderate	High	High
	Motor - Shaped Conductors	0.0	25.8	0.0	6.3	Moderate	High	High
	Power Electronics- Auto	5.2	40.6	0.7	8.1	Exceptional	Exceptional	Exceptional
	Power Electronics- Renewables	4.3	14.4	2.1	3.7	Exceptional	Exceptional	Exceptional

Note: * "New Desalination" refers to renewables-based units only. Electrical parts refers to all



TRANSPORT MARKETS

NEW ROAD VEHICLES A KEY MARKET, WITH MANY OPPORTUNITIES

- New vehicle types to take a large part of a 101 unit market by 2020
 - Reducing CO₂ emissions and fuel dependency will push electric vehicles
 - Combined new types HEV, PHEV and BEV will count for 16% market share
 - PHEV and BEV markets, yet to emerge, will become very large
 - ICE vehicles will remain dominant, but new features with potential
 - Fuel cells in FCEVs will transform the market, mainly beyond 2020
- Copper in alternative vehicles will reach 357 kt in 2020
 - Copper in electric traction motors will use 166 kt of copper
 - HV harnesses will account for around 70 kt of copper
 - Energy storage, mainly li-ion batteries, will create a 24 kt market, much of it in high value copper foil
 - Charging infrastructure at domestic and community level will create a further 11 kt emerging market for copper
 - Power electronics key to new vehicle development, making a 45 kt market vehicles



ENERGY INFRASTRUCTURE

REFORMING OF ENERGY INFRASTRUCTURE A CENTRAL THEME

- Renewable and distributed electricity generation the big future market
 - Wind and solar PV are established markets; some sub-markets still emerging
 - For wind, offshore development and maybe repowering offer potential
 - For solar PV, enhanced cabling, 2nd generation cells etc. provide opportunities
 - Concentrating Solar Power (CSP) an emerging market, to grow to 8 kt
 - Marine generation to become a major market with time, after 2020
 - Like autos, power electronics a market enabler, with 14 kt consumption forecast
- Renewables-based desalination an energy-relating emerging market
 - Strong growth in electrical system use of copper in desalination overall
- Network development key to the new energy infrastructure
 - Heavy use of electronics in the Smart Grid
 - HVDC and other developments feature in transmission and distribution
 - Bulk storage of electricity for the net still in its infancy – but coming
- Cleaner power from fossil fuels means strong growth in CCS
 - A market to develop in earnest after 2020



PREMISE & EQUIPMENT MARKETS / ENABLING TECH.

PREMISE WIRING STRUCTURES & WITHIN-PREMISE SYSTEMS TO GROW

- Two emerging premise markets: “smart ageing” market and advanced rewiring driven by more rigorous inspection regimes
 - Adaptation of homes for needs of elderly to create a 40 kt market
 - Advanced rewiring associated with Smart Grids provide 30 kt extra Cu use
- Green technologies for better energy use another expanding area
 - Wiring for “green” tech in total to account for 48 kt in 2020, up from 17 kt today
 - Heat pumps also in system, growing from 11 kt to 23 kt
- Efficient motors to offer opportunities for high-copper motors & VSD
 - Two emerging market motor types: CMR (already commercial), and shaped copper conductor motor (now being developed)
 - Efficient factory systems also crucial, including VSD and process automation
- All of this could not happen without key enabling technologies
 - Electronics one such technology, especially power electronics – and emerging market both in auto and distributed generation markets
 - The other one is energy storage. Again, separate emerging markets in both auto and distributed generation

ABOUT BME

Bloomsbury Minerals Economics is a specialised consultancy engaged in base metals market and price analysis, focussing in particular on copper. Our analysis and advice relates to all sectors of the industry from mine to thorough and detailed coverage of end markets for products containing base metals.

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For more information contact: **Paul Dewison**, Head of Consultancy

Phone: +44(0)207 529 8914

Email: pd@bloomsburyminerals.com

Or visit: www.bloomsburyminerals.com

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Minerals Economics Ltd

