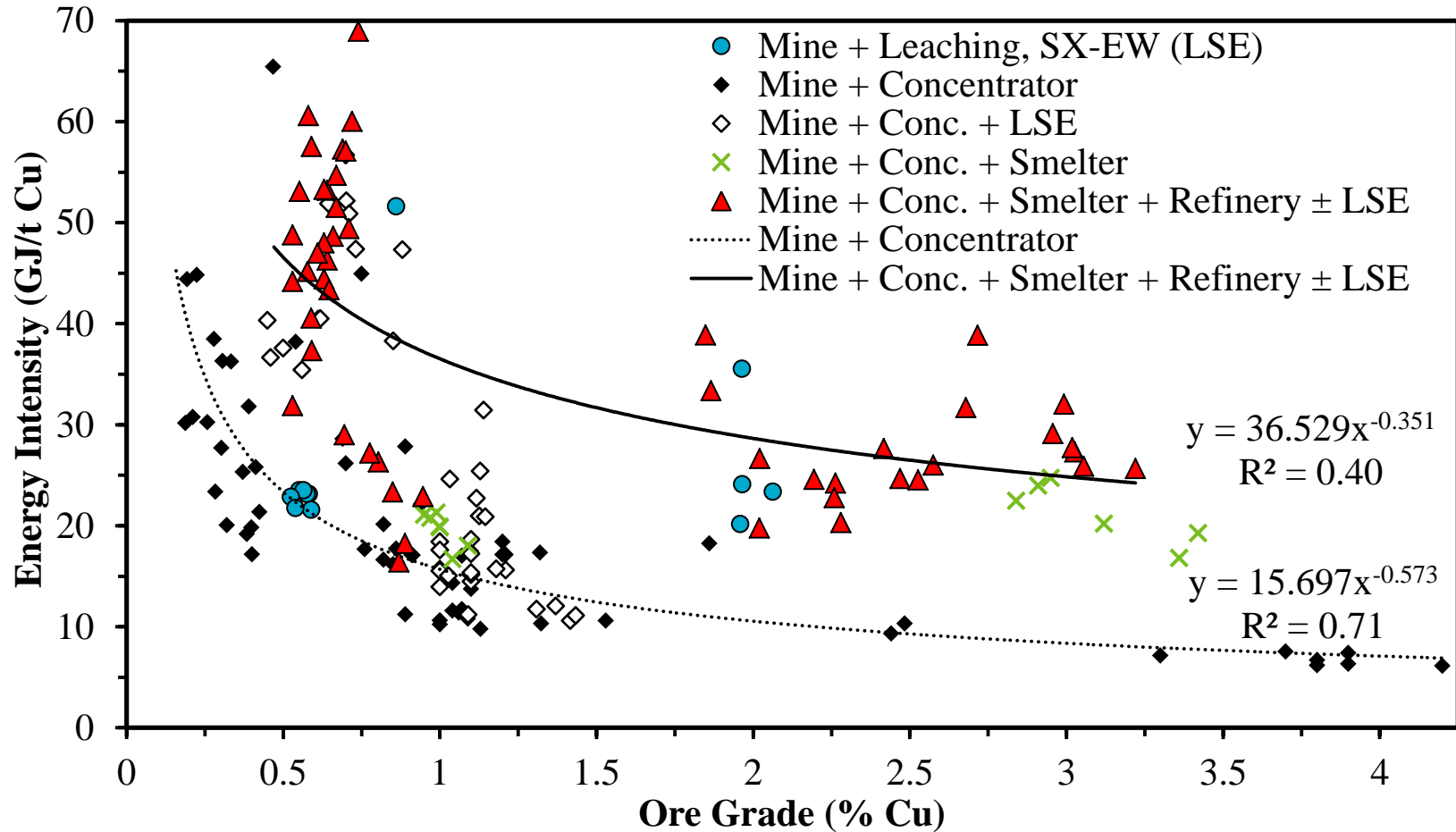


Status of specific energy intensity of copper

Insights from the review of sustainability reports

Stephen Northey | Research Projects Officer
3 February 2014

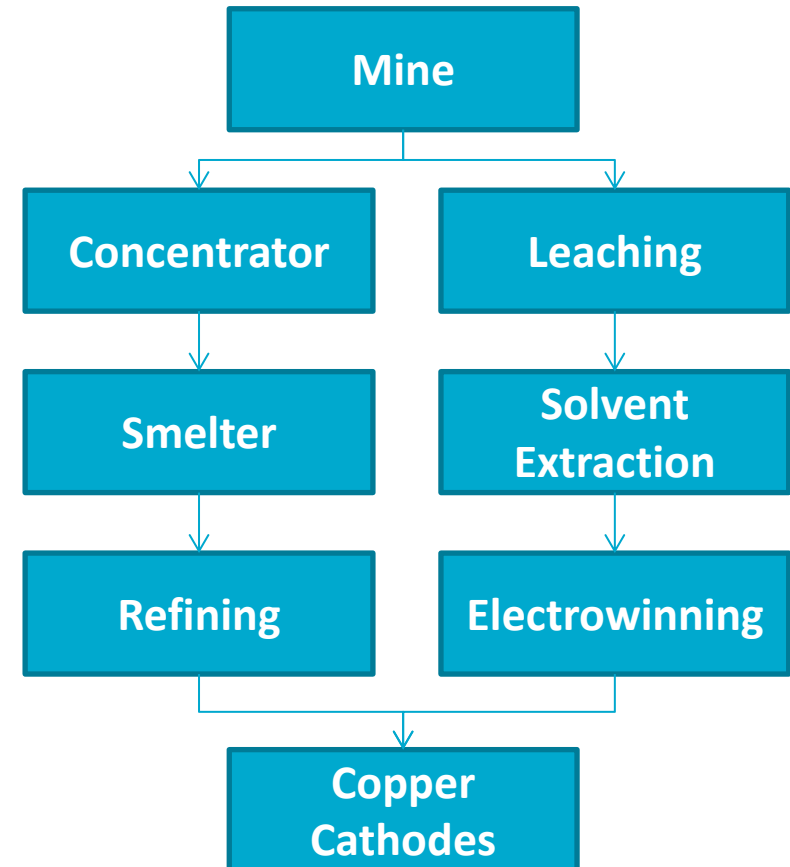
Reported energy intensity of copper



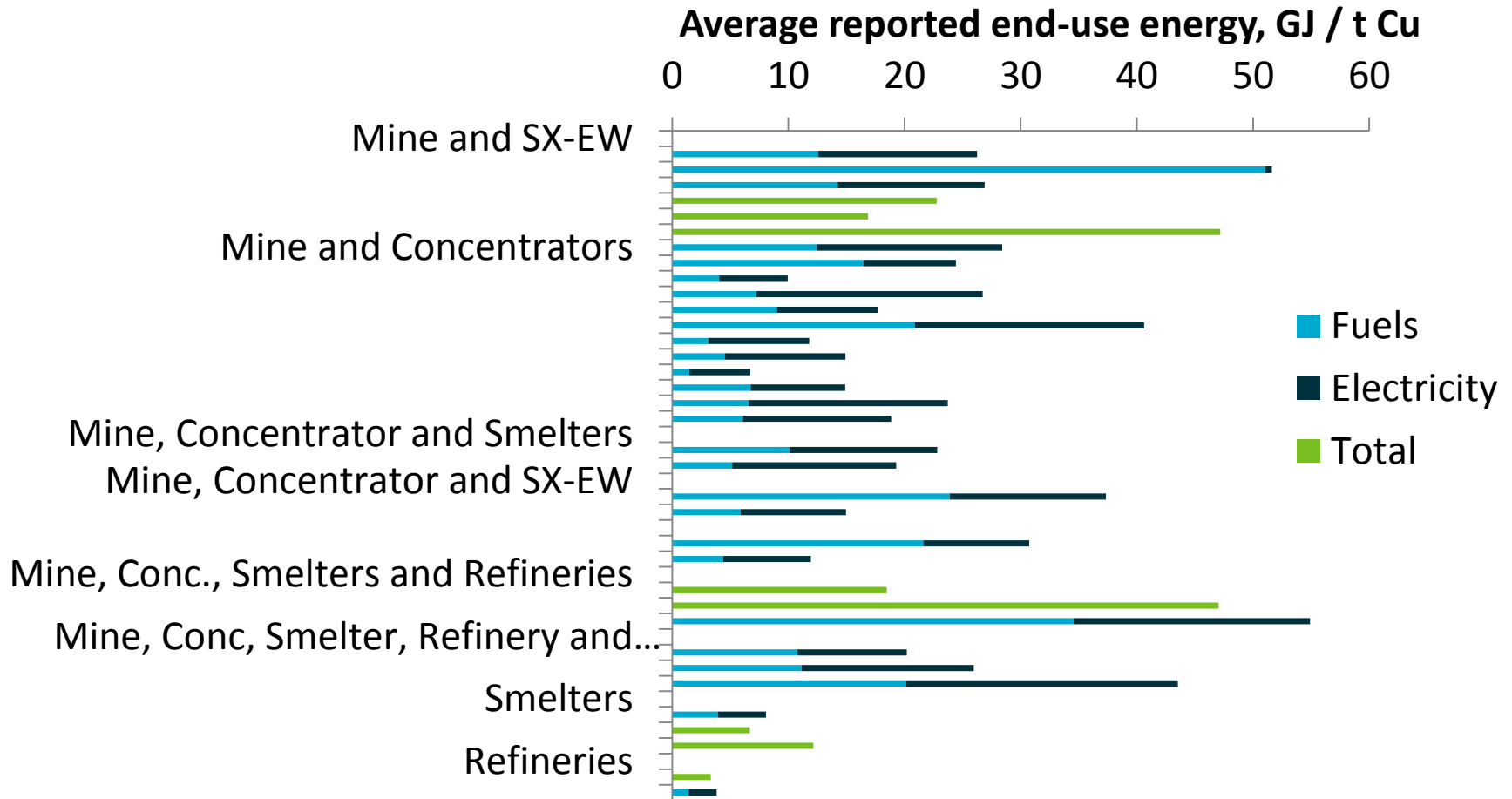
Northey et al., 2013. J of Cleaner Production, 40: 118-128.

Limitations of using sustainability report data

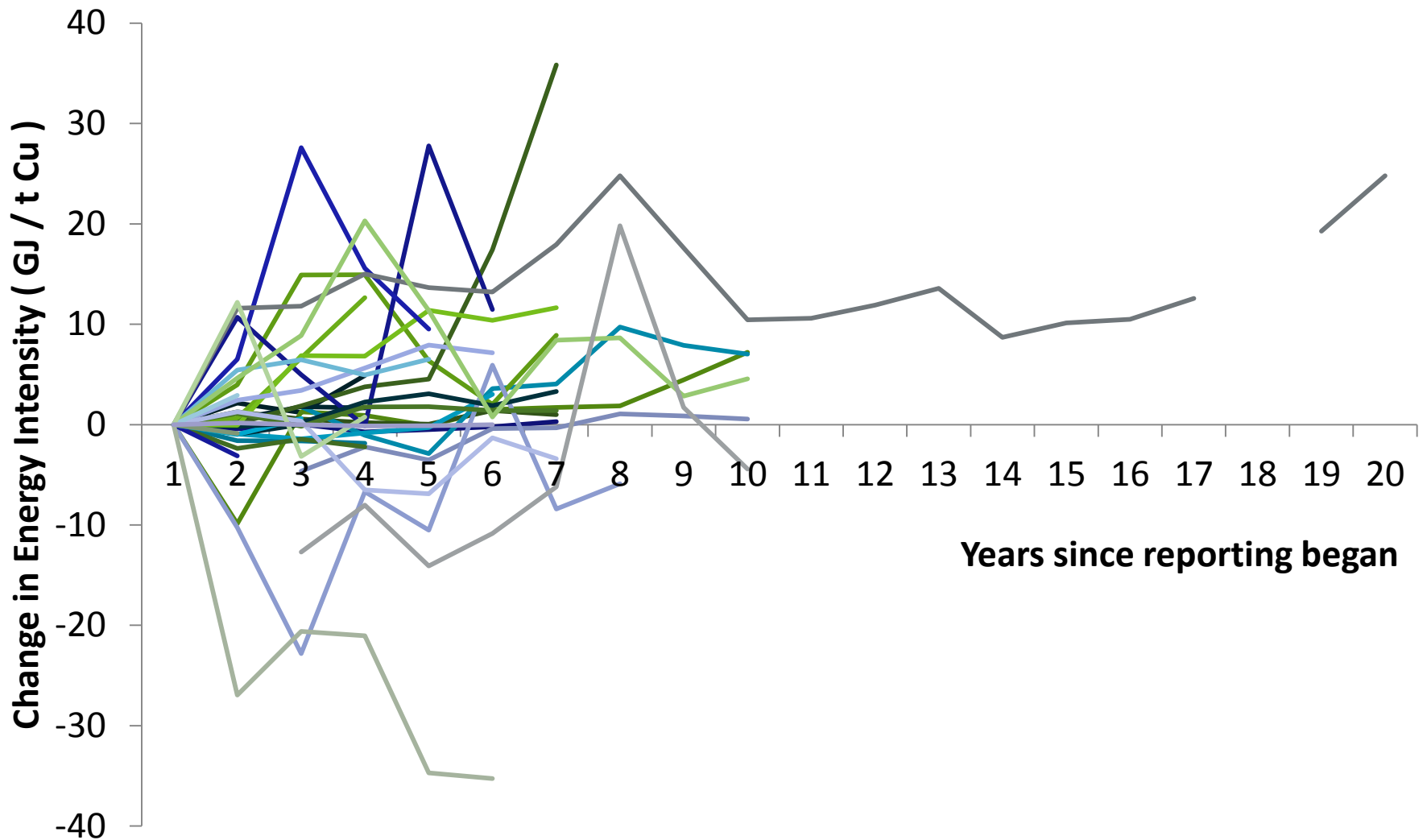
- Inconsistency in reporting methods between companies.
- Data is usually for entire sites or business units, rather than for individual processes.
- Need to allocate site-based data to co-products (eg. gold, molybdenum, etc.)



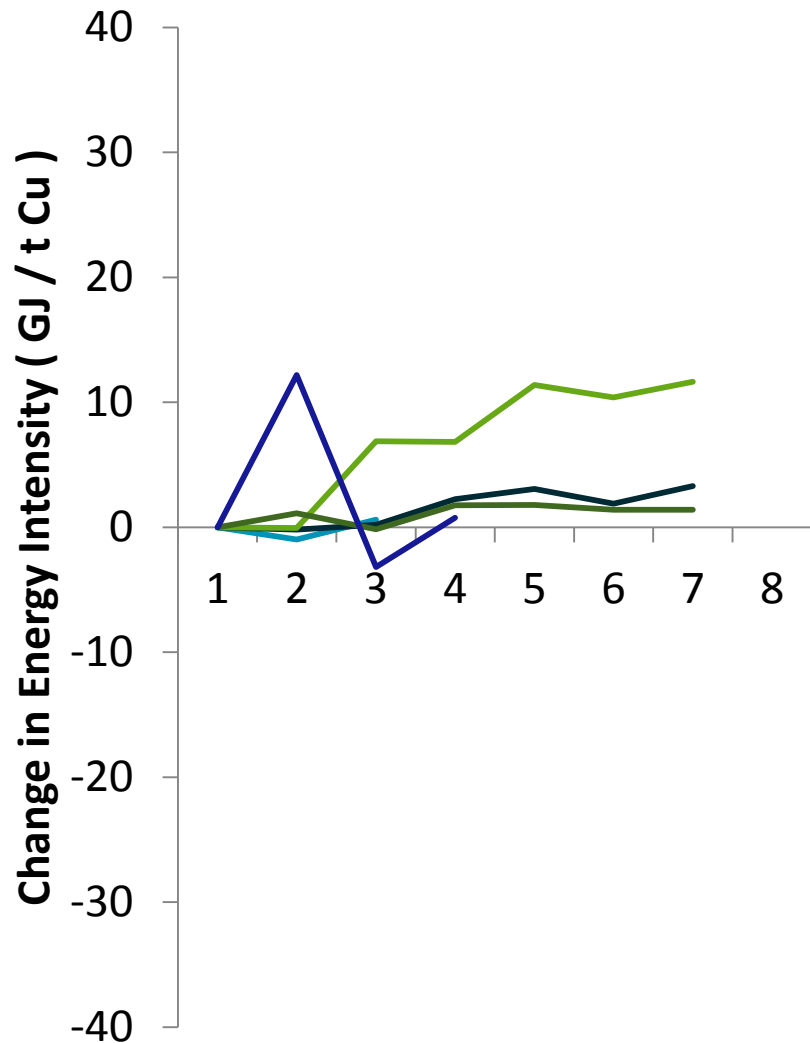
Significant site-to-site variability



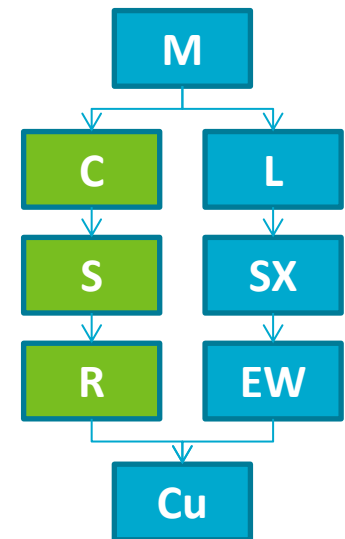
Change in energy intensity through time



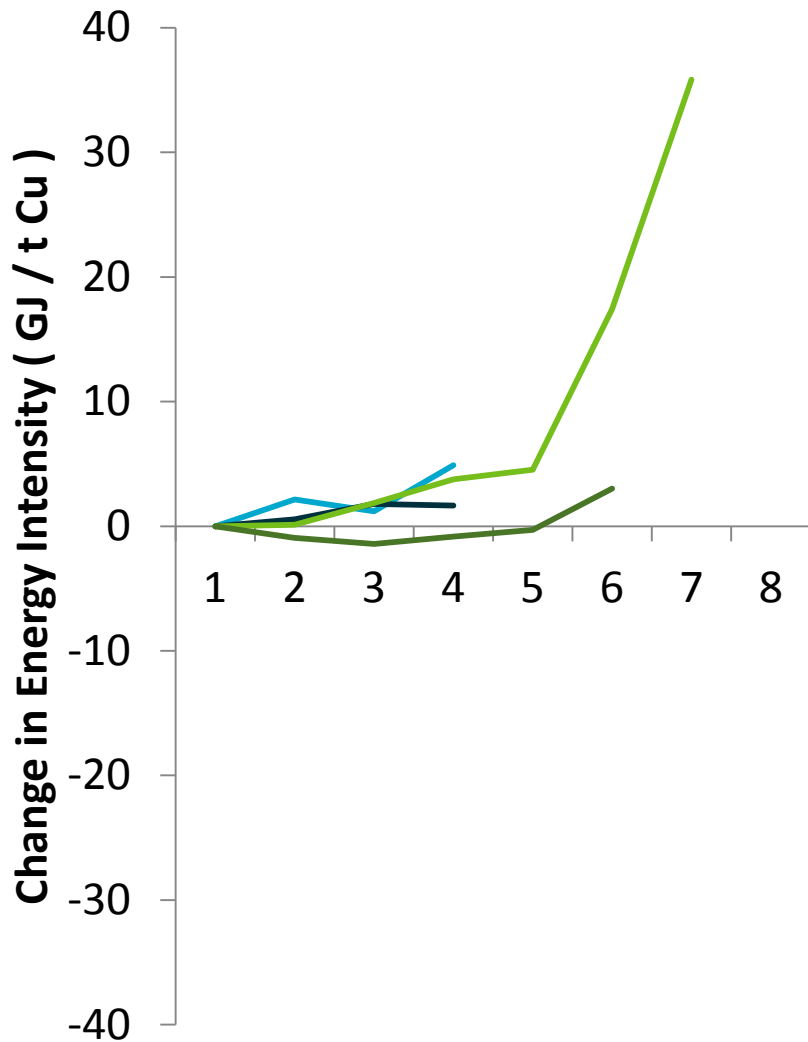
Mine and SX-EW



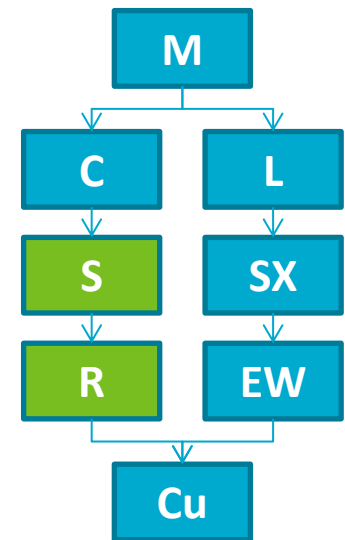
Lomas Bayas
Los Bronces
Mantos Blancos
Mantoverde
Quebrada Blanca
Sepon



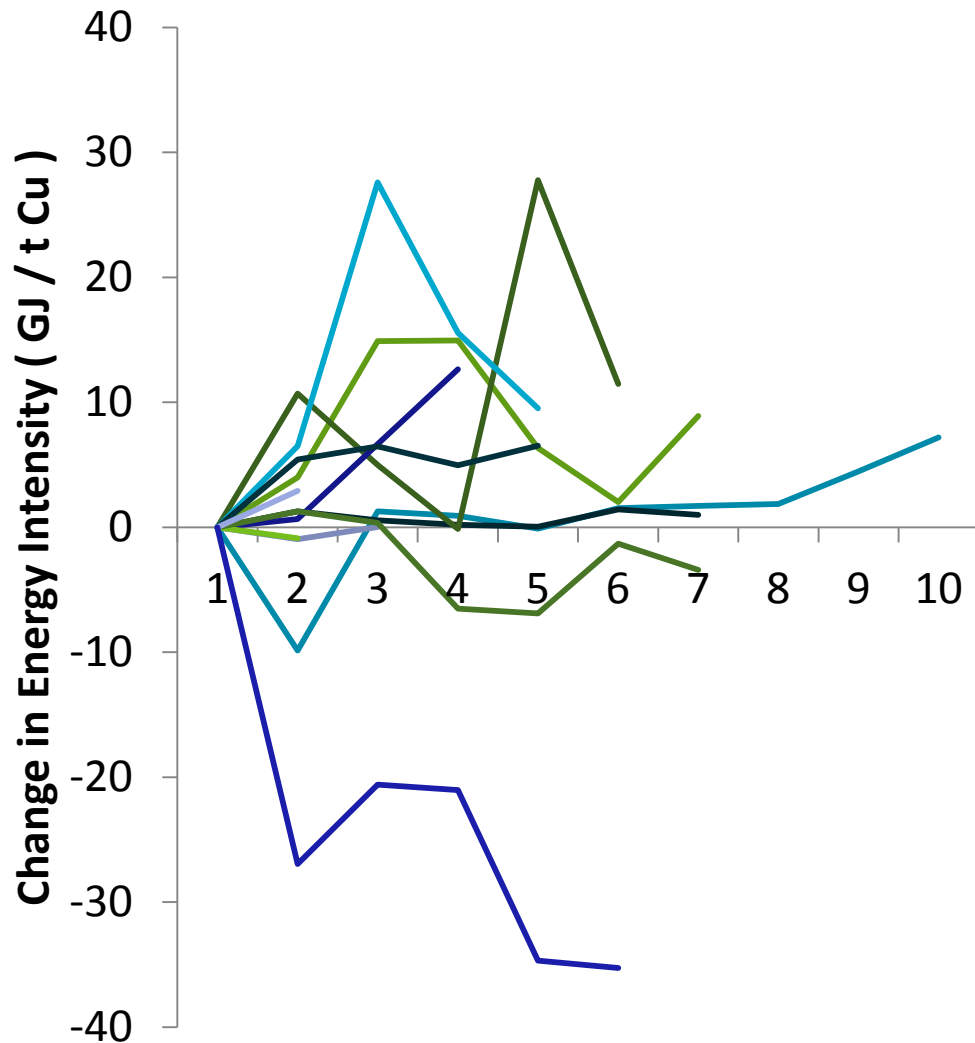
Mine, Concentrator and SX-EW



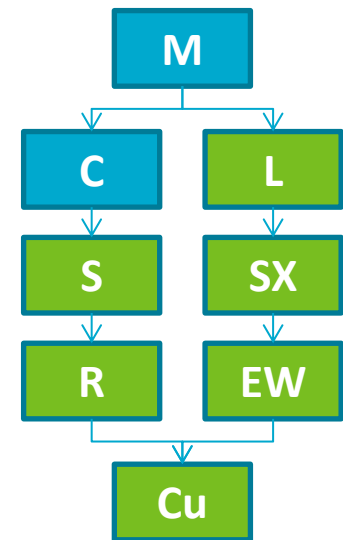
Alumbraera
Collahuasi
El Soldado
Escondida
Tintaya



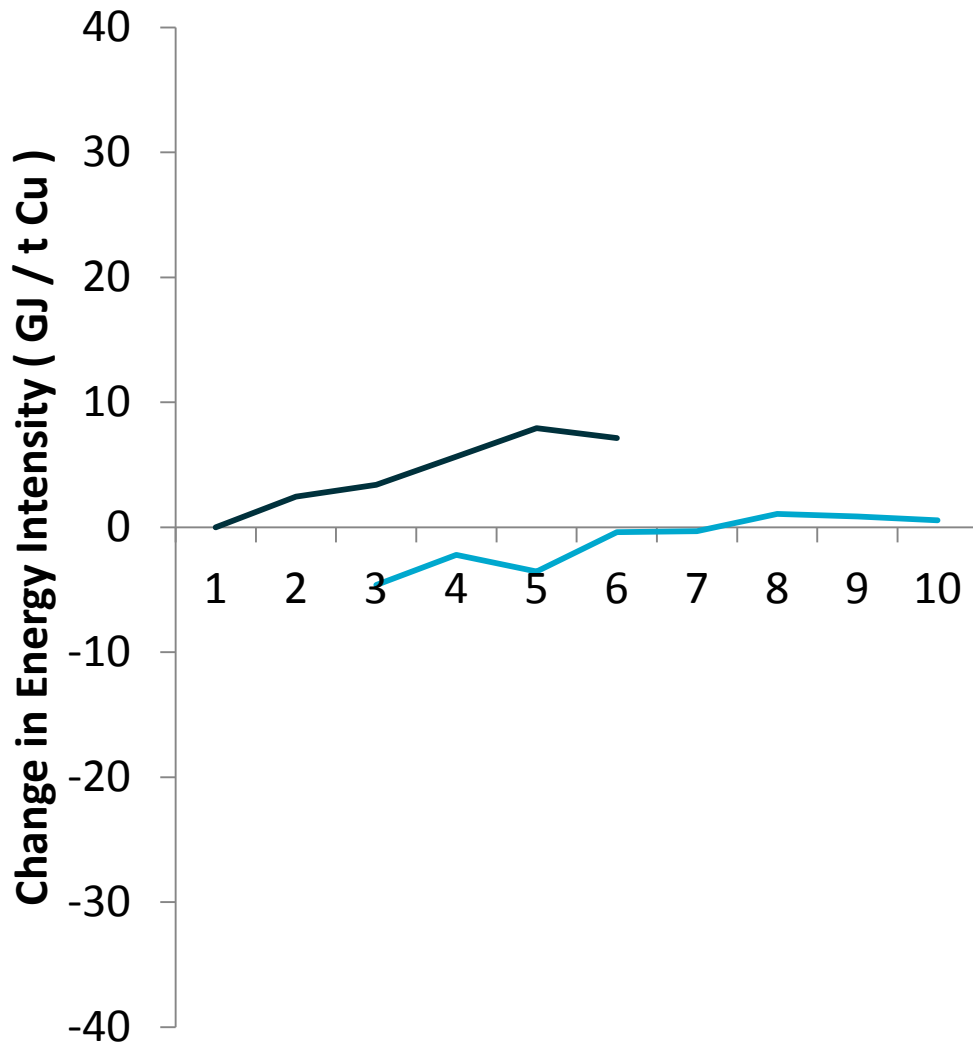
Mine and Concentrator



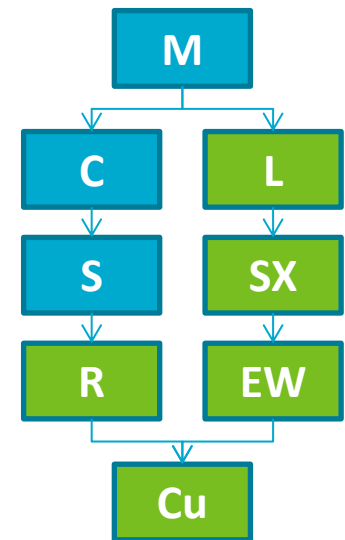
- Andina
- Cayeli
- Cadia Valley Operations
- Ernest Henry
- Gold Grove
- Highland Valley
- Northparkes
- Ok Tedi
- Prominent Hill
- Pyhasalmi
- Roseberry
- Telfer



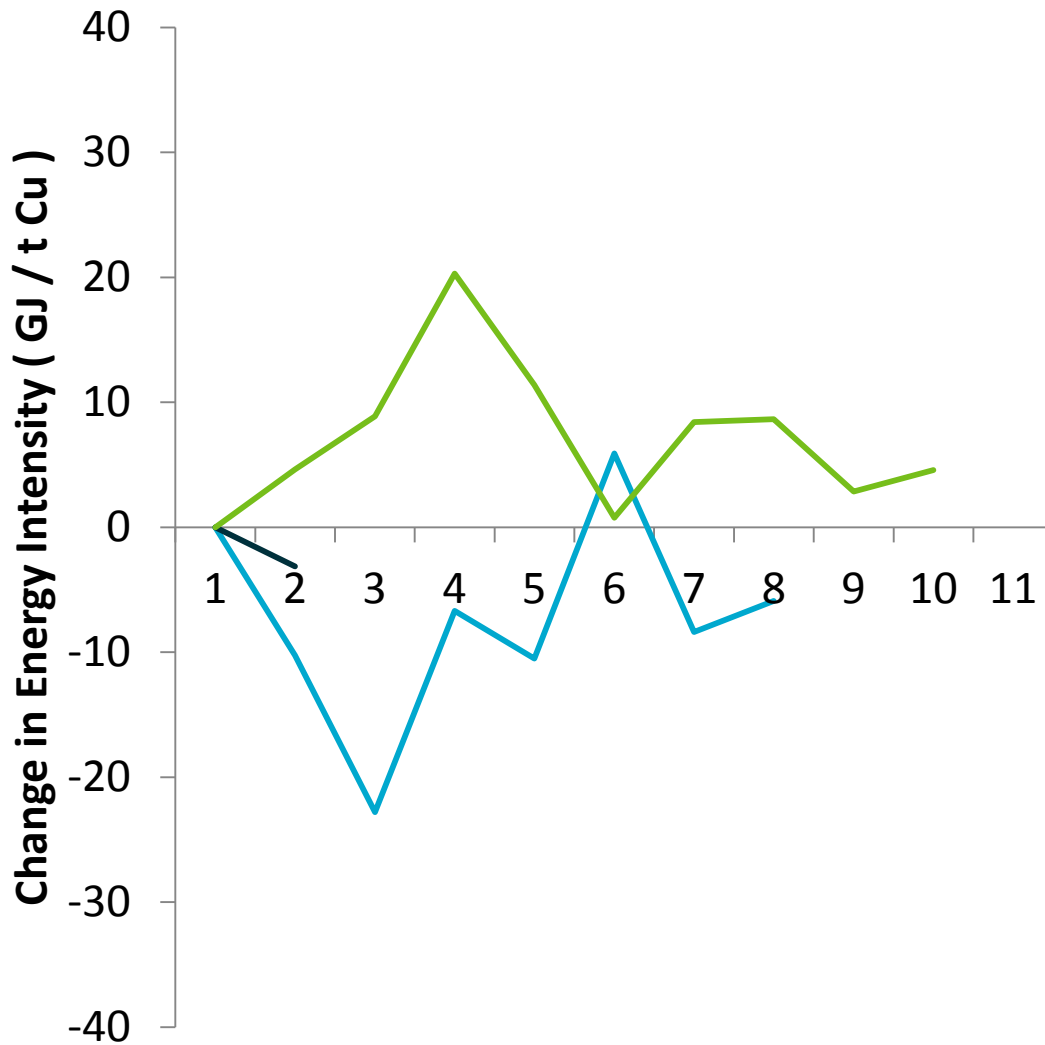
Mine, Concentrator and Smelter



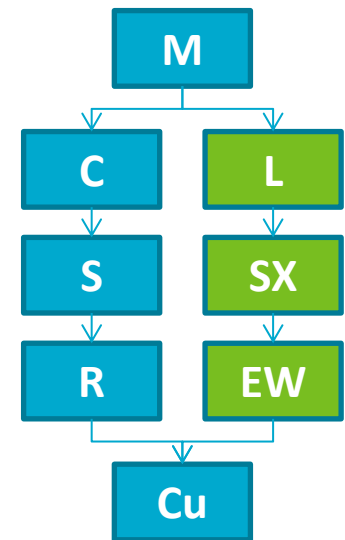
El Teniente
Mt Isa



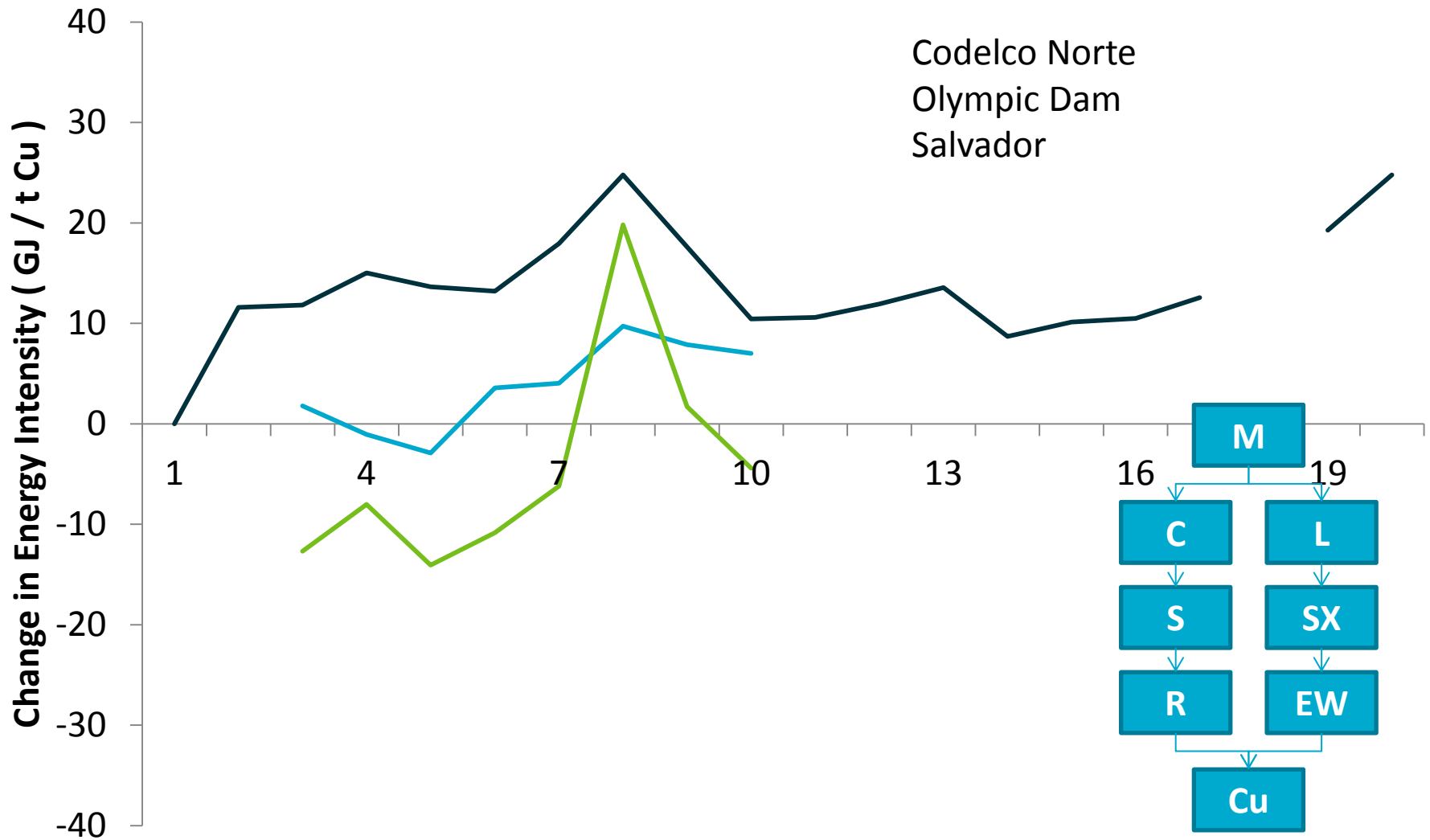
Mine, Concentrator, Smelter and Refinery



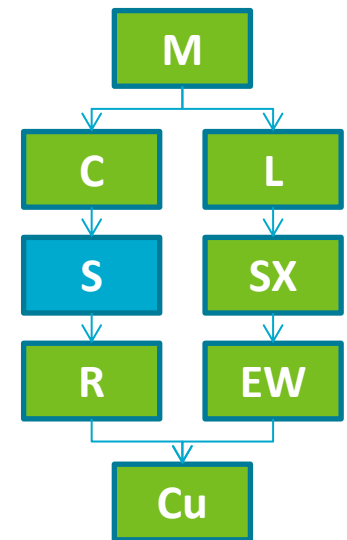
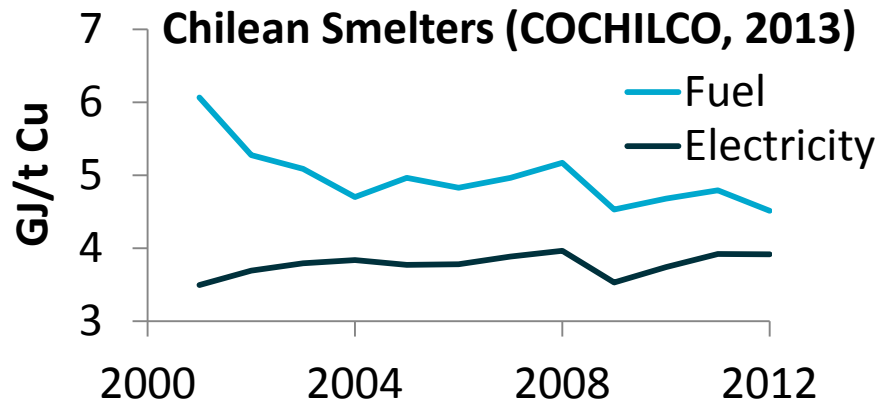
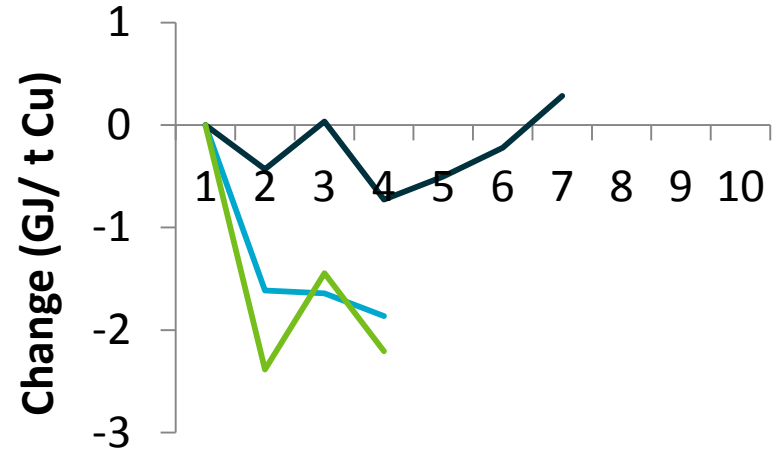
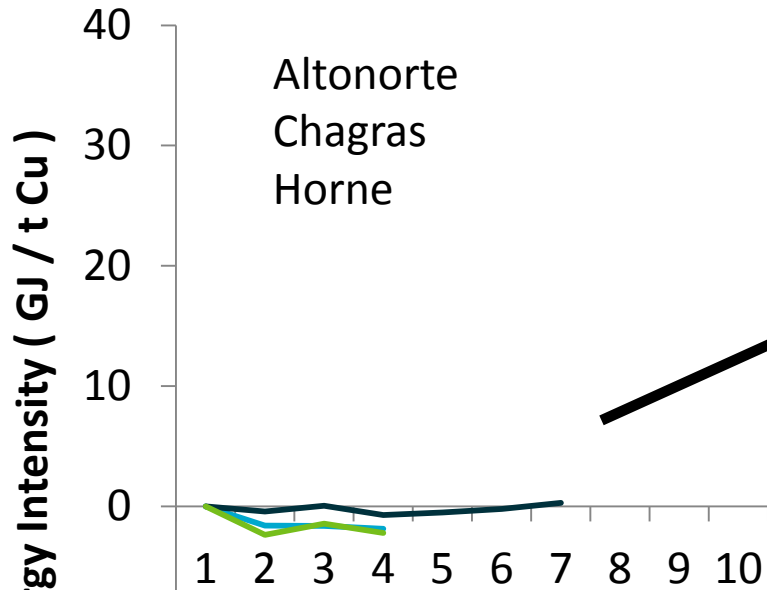
Kennecott Utah
Kidd Creek
Palabora



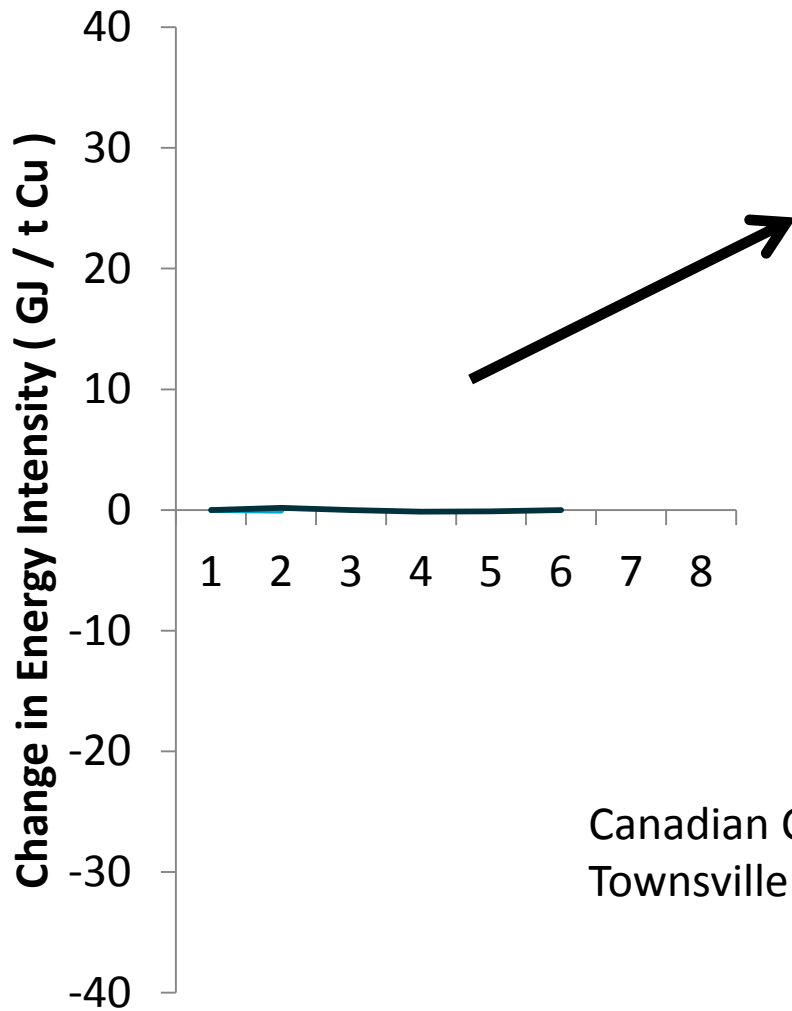
Mine, Conc., Smelter, Refinery and SX-EW



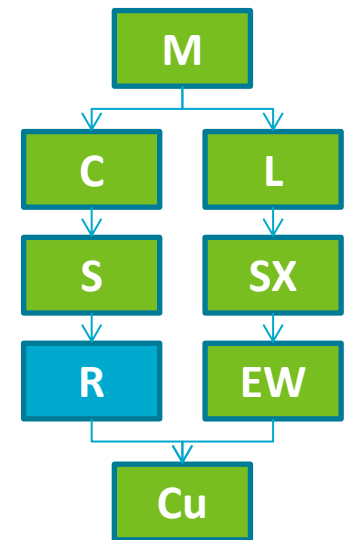
Smelters



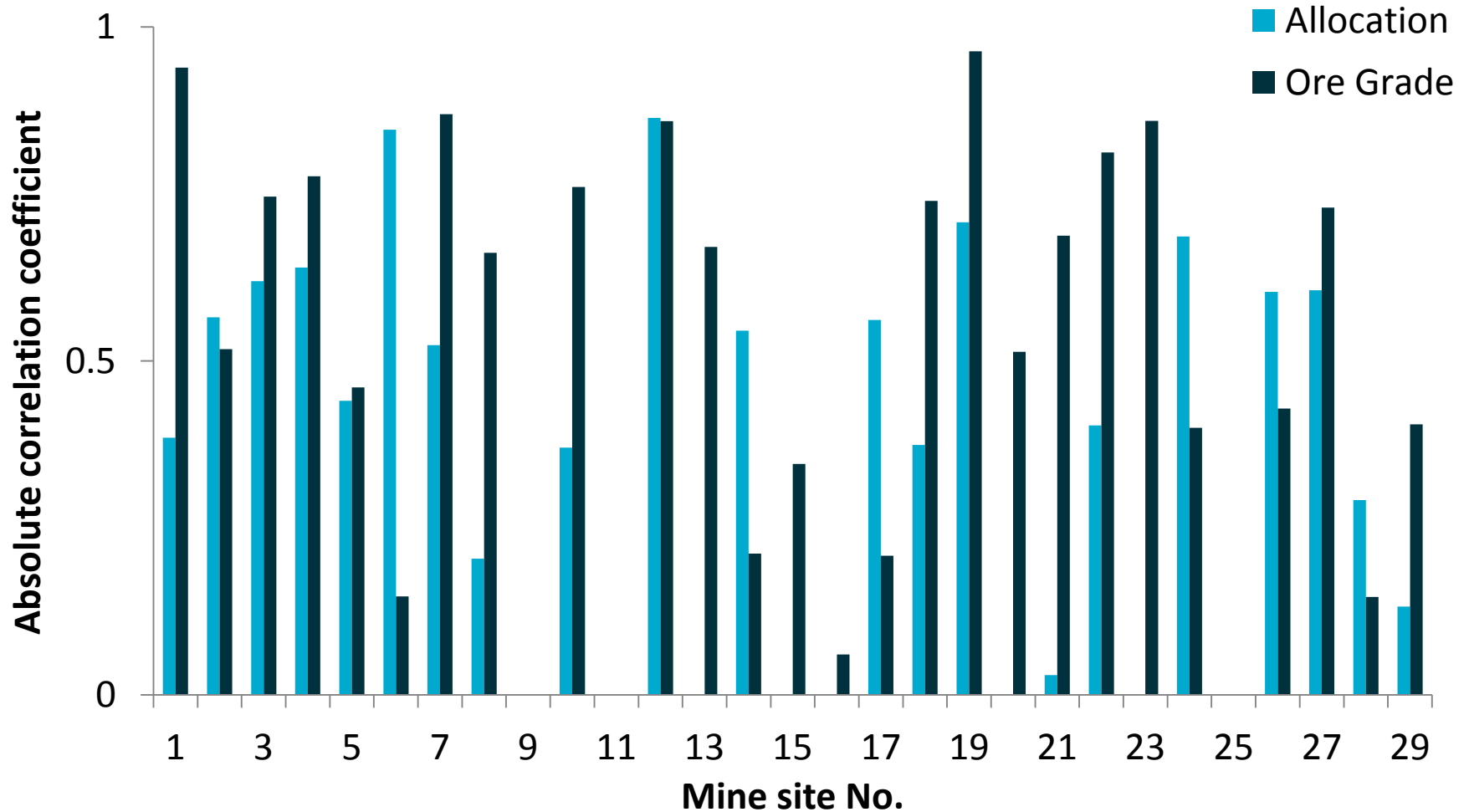
Refineries



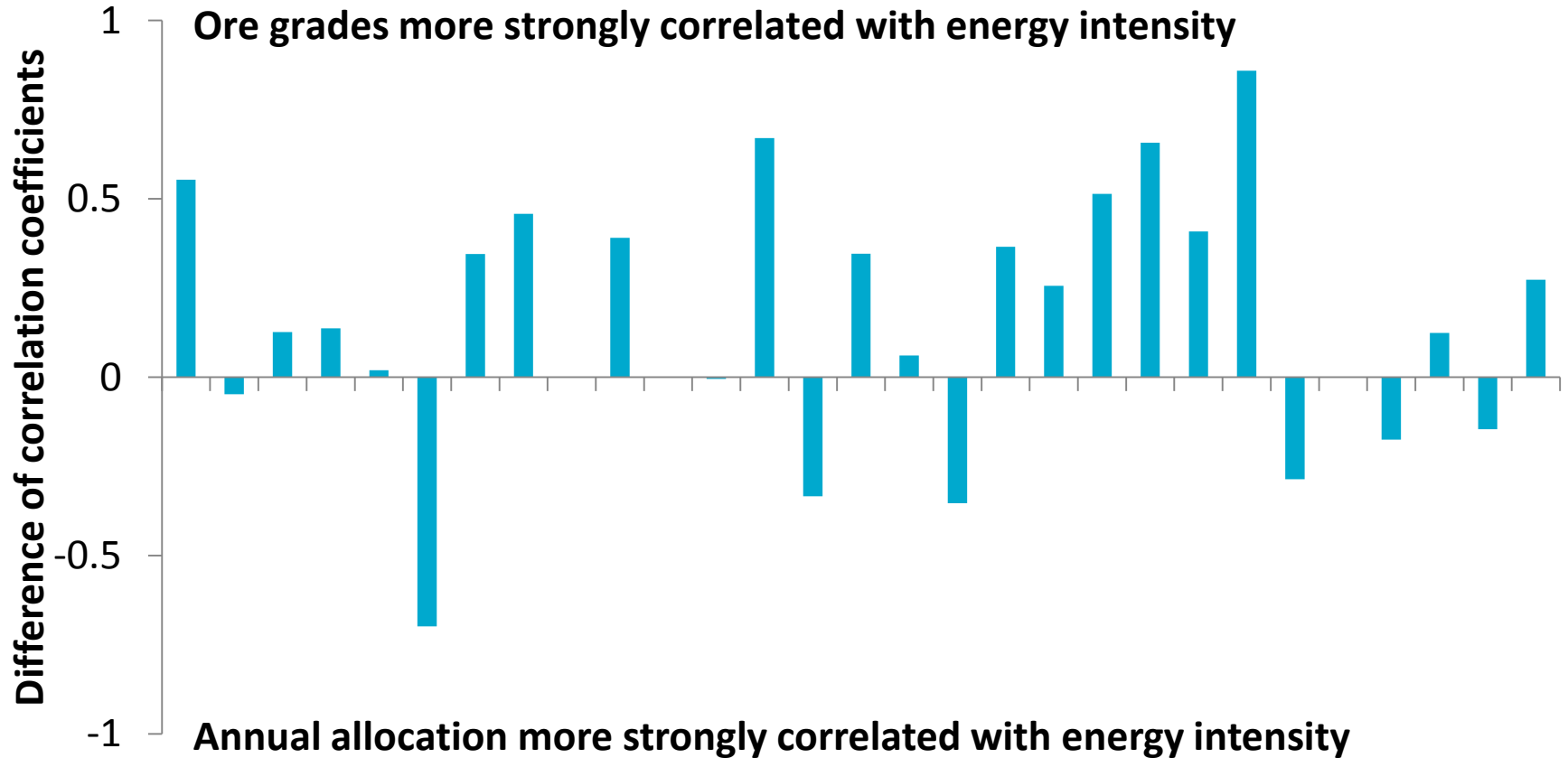
Canadian Copper Refinery
Townsville Refinery



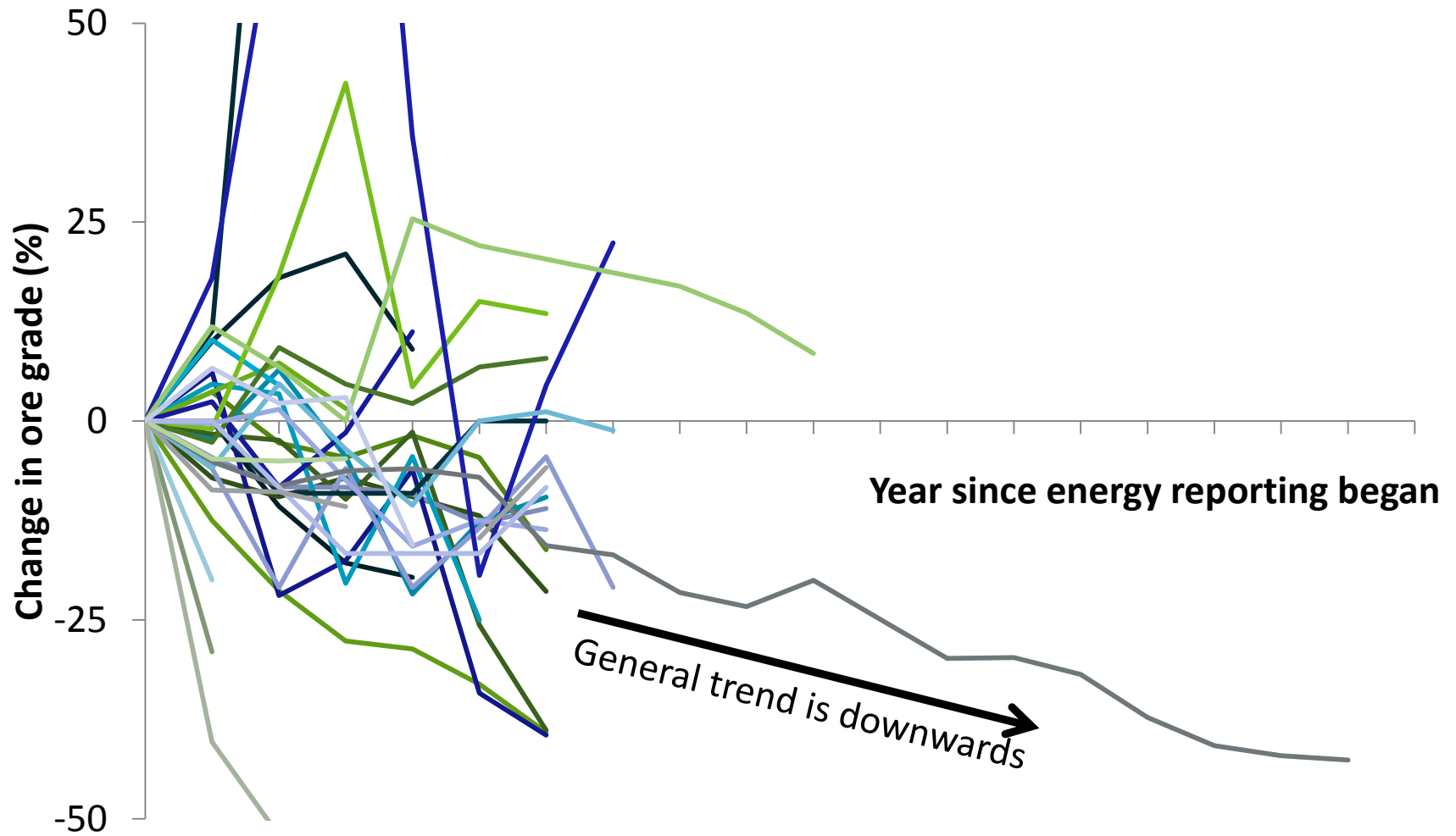
Reasons for changing energy intensity



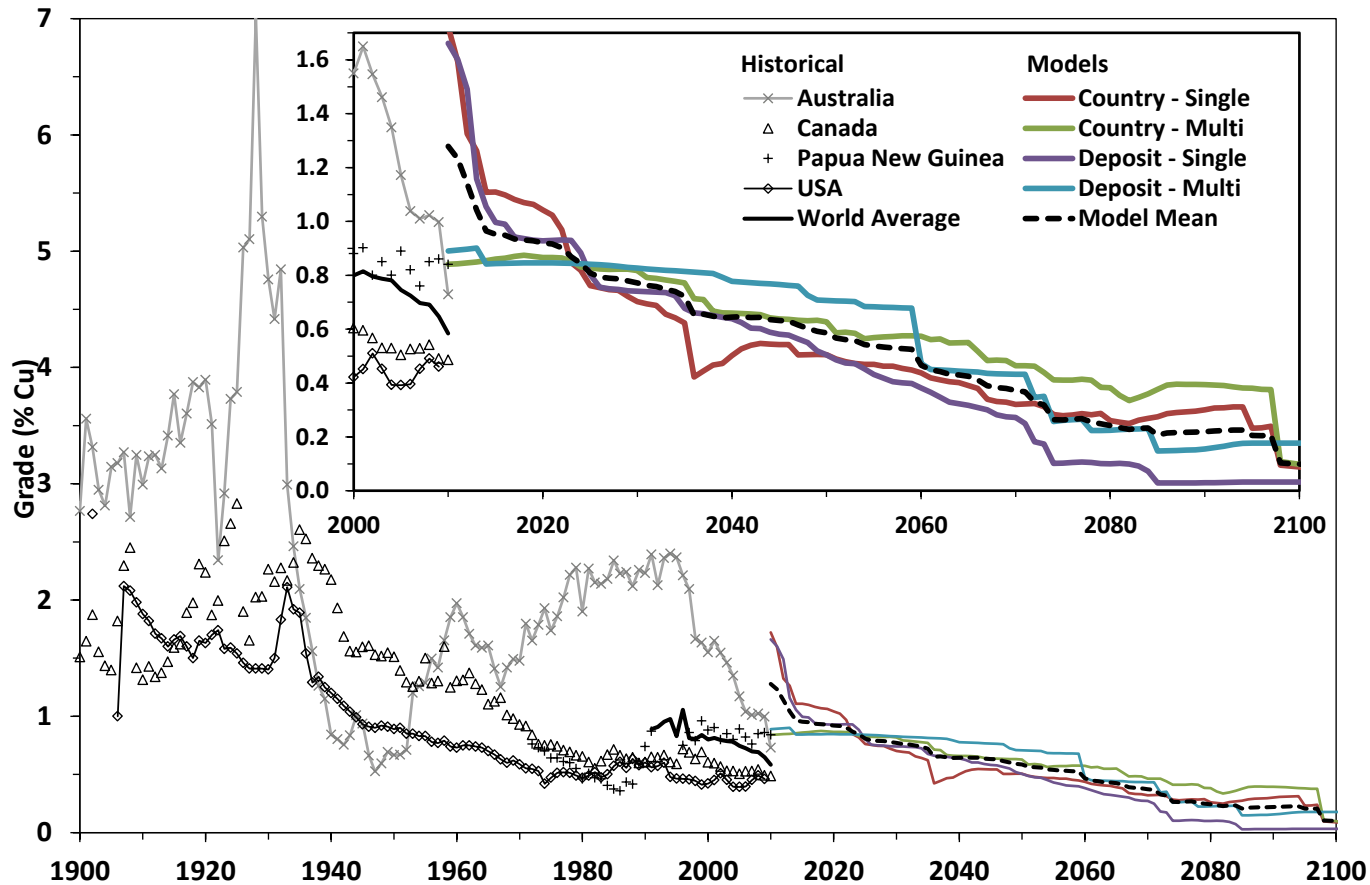
Reasons for changing energy intensity



Change in Ore Grades

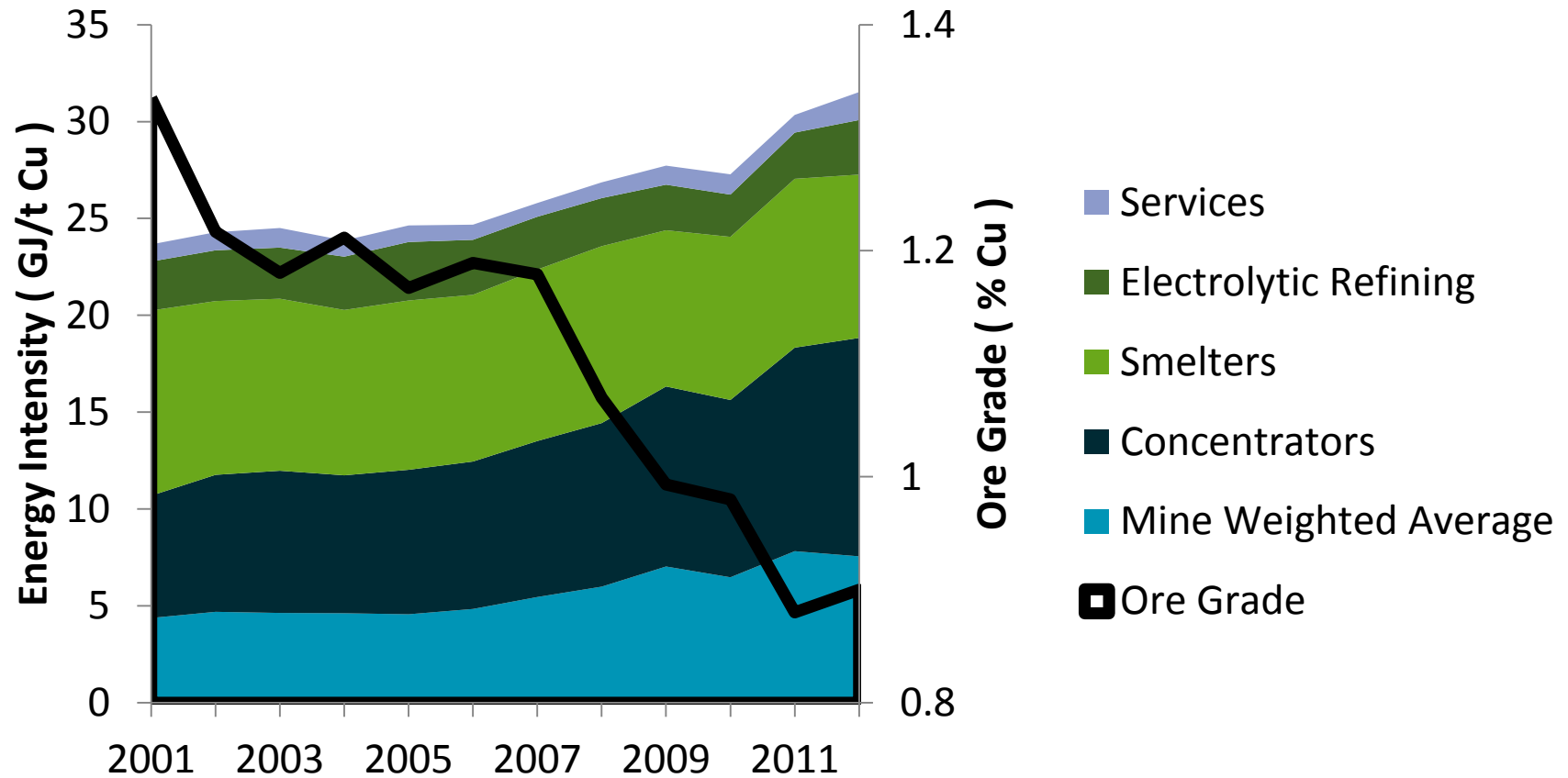


Ore Grade Decline is a Long Term Trend



Northey et al. 2013. Resources, Conservation and Recycling, 83: 190-201.

Chile sourced electro-refined copper



Chilean Copper Commission (COCHILCO), 2013. "Anuario De Estadísticas del Cobre y Otros Minerales", Yearbook: Copper and other Mineral Statistics, 1993-2012.

Implications

- The energy intensity of copper is likely to increase despite efficiency improvements of individual processes.
- Ore grade decline will be a major cause of this, other factors include:
 - Increasing mine depth
 - Changing mineralogy
- Research needs to consider the full value chain (ore to refined metal) so that tradeoffs between energy and cost between individual unit processes can be fully considered.
- Life-cycle assessment and techno-economic assessments provide a pathway to understand these.

Thankyou

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Stephen Northey
Research Projects Officer

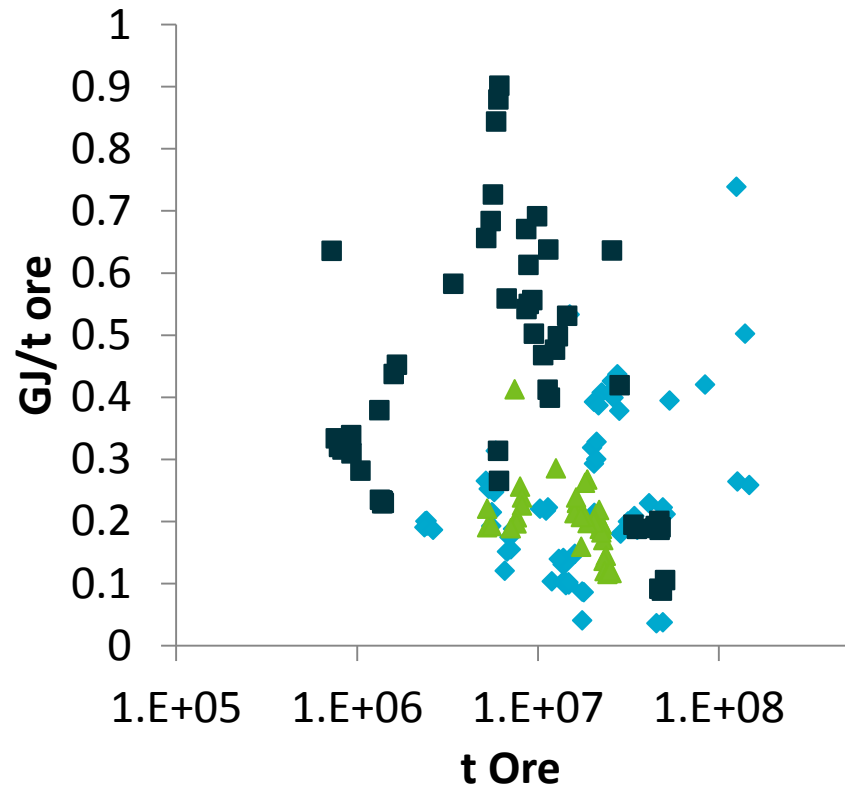
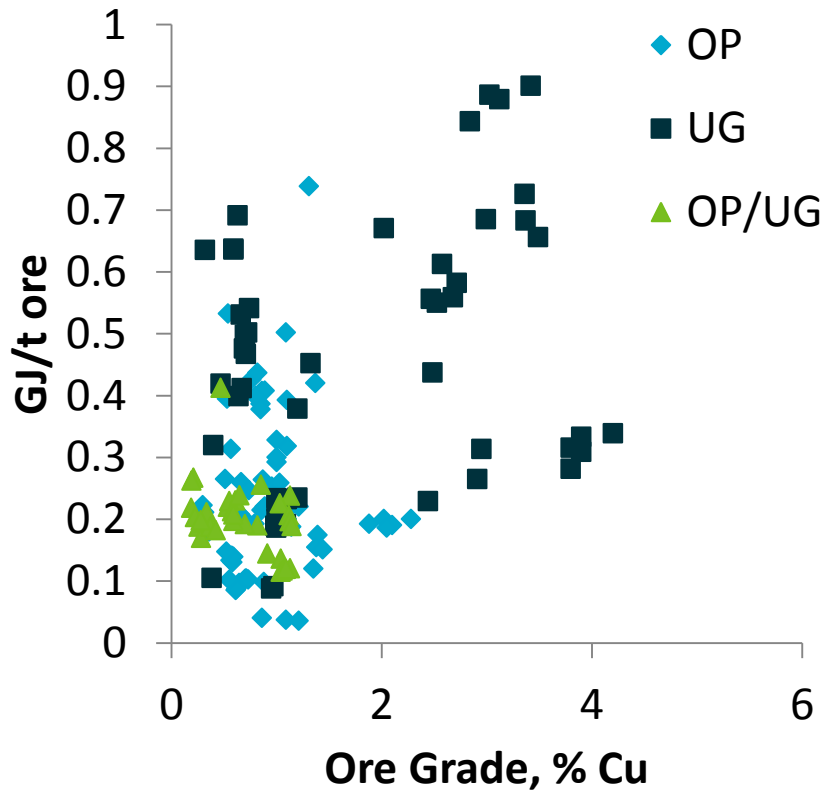
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Other Graphs

Mine Type



Greenhouse gas emissions

