

A Perspective on Mining Energy Issues and Solutions

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Topics

- Mining Energy Solutions Conference, Elko August 2003
- Energy use in mining in US and Canada
- Some thoughts on finding solutions

Mining Energy Solutions Conference

- Conference sponsored by DOE, Nevada State Office of Energy, Mining Companies, Nevada Office of Industries of the Future, Nevada Division of Minerals and Management Assistant Partners
- Program, presentations and other information available: www.unr.edu/mines/noif
- Some of the mining specific highlights:
 - Description of DOE programs:
 - Collaborative targeted assessments
 - Plant wide assessments
 - Analysis tools and training
 - Case studies and technical materials
 - Many operations made use of training and some of the other programs

Mining Energy Solutions Conference (2)

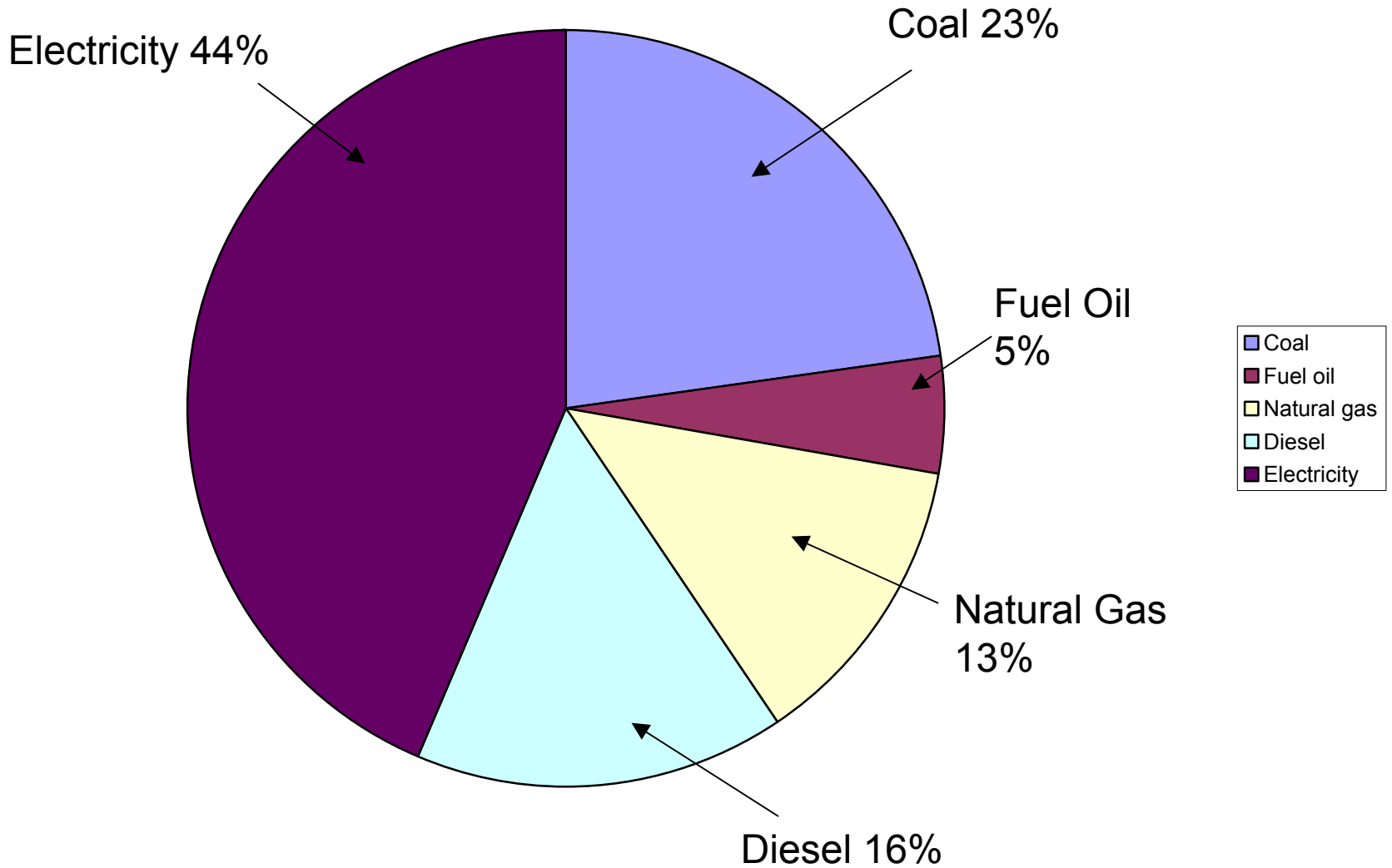
- Progress reported by mining companies:
 - Barrick:
 - Improved blasting reduced net energy use and increase the mill throughput
 - Energy use at roaster:
 - 30 million kWh/mo (15 for the mills, 10 for oxygen plant and 5 for rest)
 - Reduced overall roaster energy use from 80 kWh/ton in 2000 to 60 kWh/ton in 2003 by increasing throughput

Mining Energy Solutions Conference (3)

- Progress by mining companies:
 - Newmont:
 - Energy audits saved \$3m in energy costs
 - Power costs \$/ounce

1999	18
2000	15
2001	23
2002	26
2003	29

Rio Tinto
Worldwide Energy Use Reported in 2003



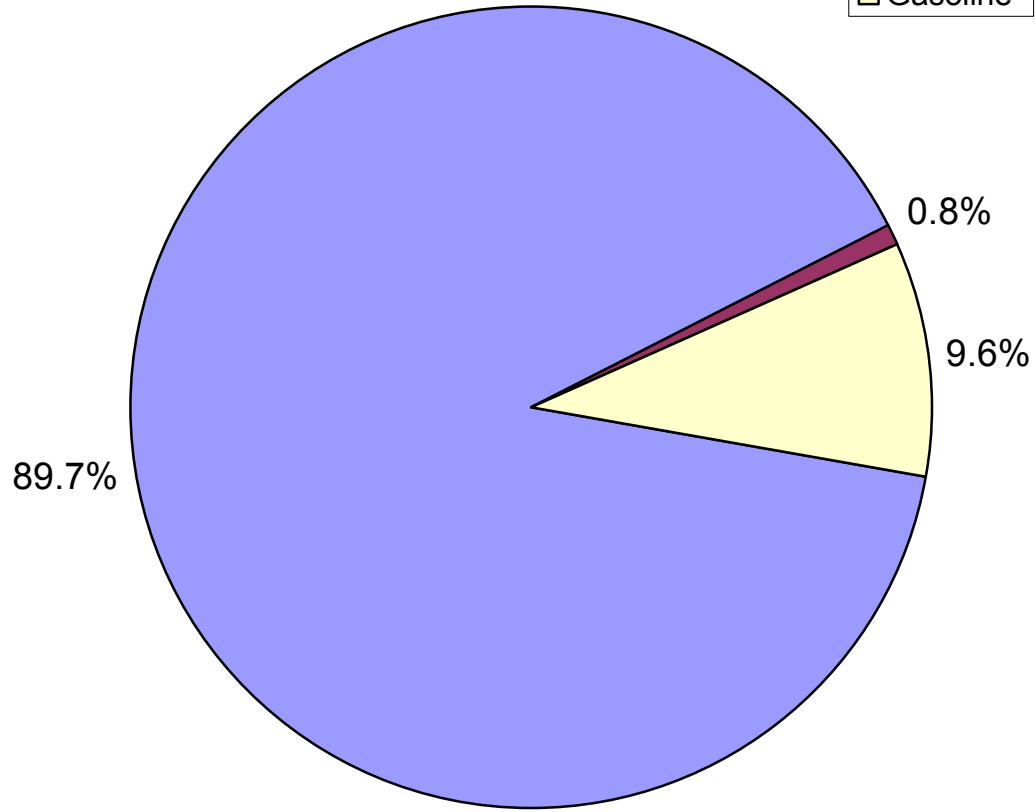
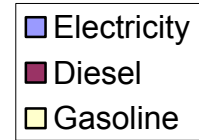
Mining Energy Use

- Difficult to obtain energy use for mines as a basis for benchmarking
- Annual data available for Canada
- Complete data available for US for 1997
- Some data available from mining company annual reports

Expressing All Energies in kWh

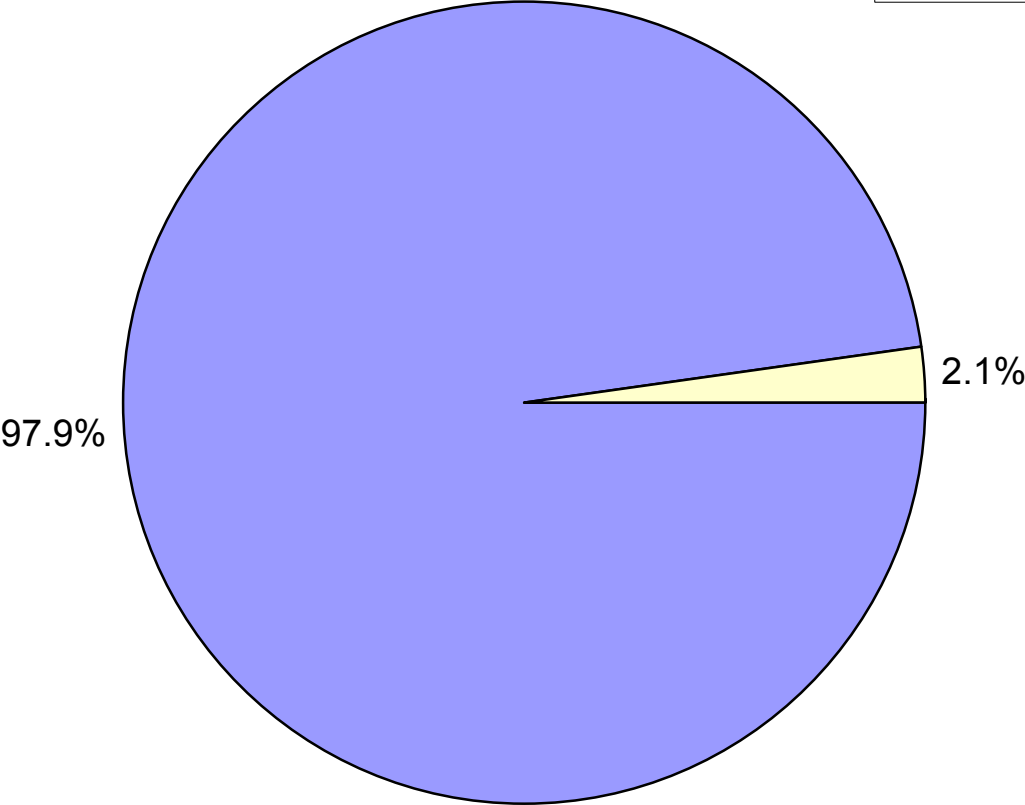
Conversion table	Units	kWh equivalent per unit
Diesel	L	10.74
Gasoline	L	9.63
Natural Gas	cubic meter	10.31
Explosives	kg	1.06
Light Fuel oil	L	10.40
Propane	Gallon	26.82
Bunker C	L	11.59

Energy Used for Gold Mining (US)

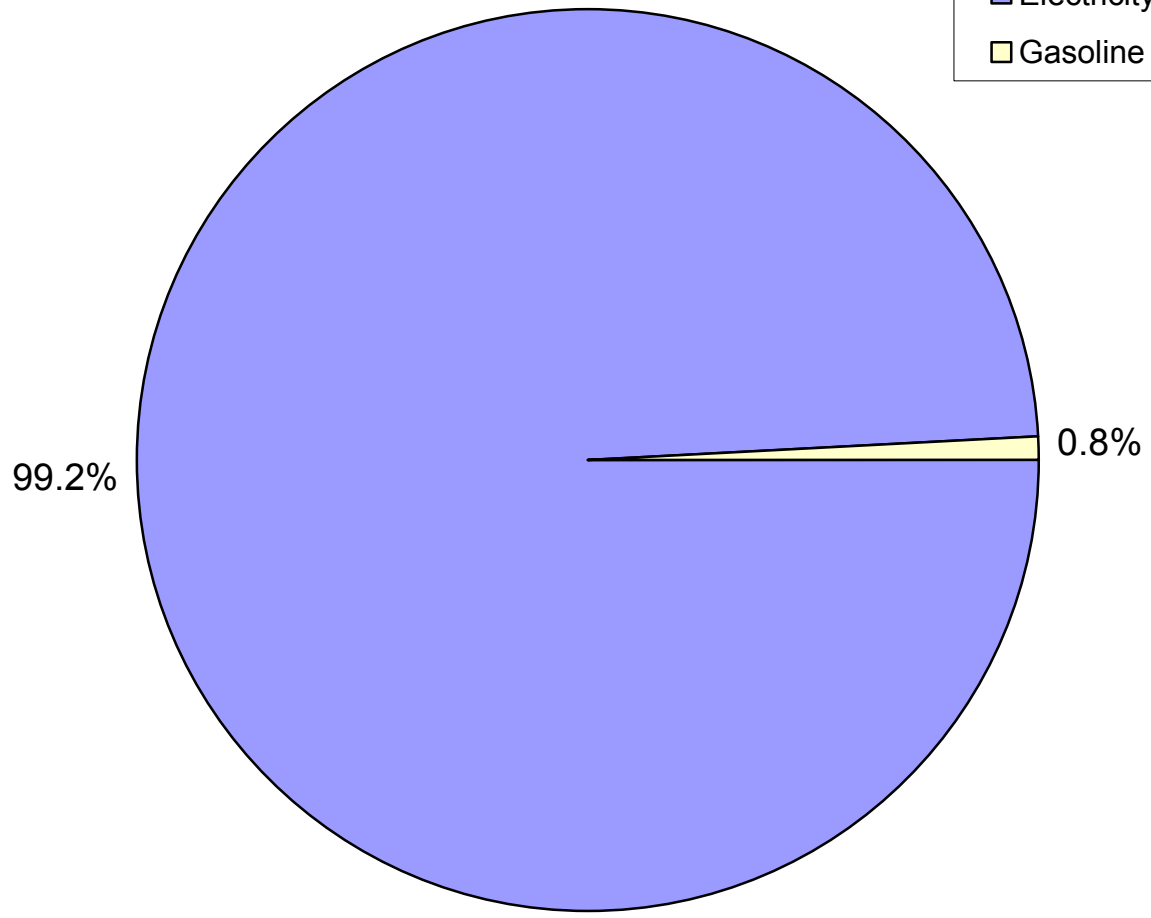
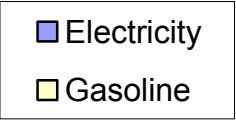


Energy Used for Silver Mining (US)

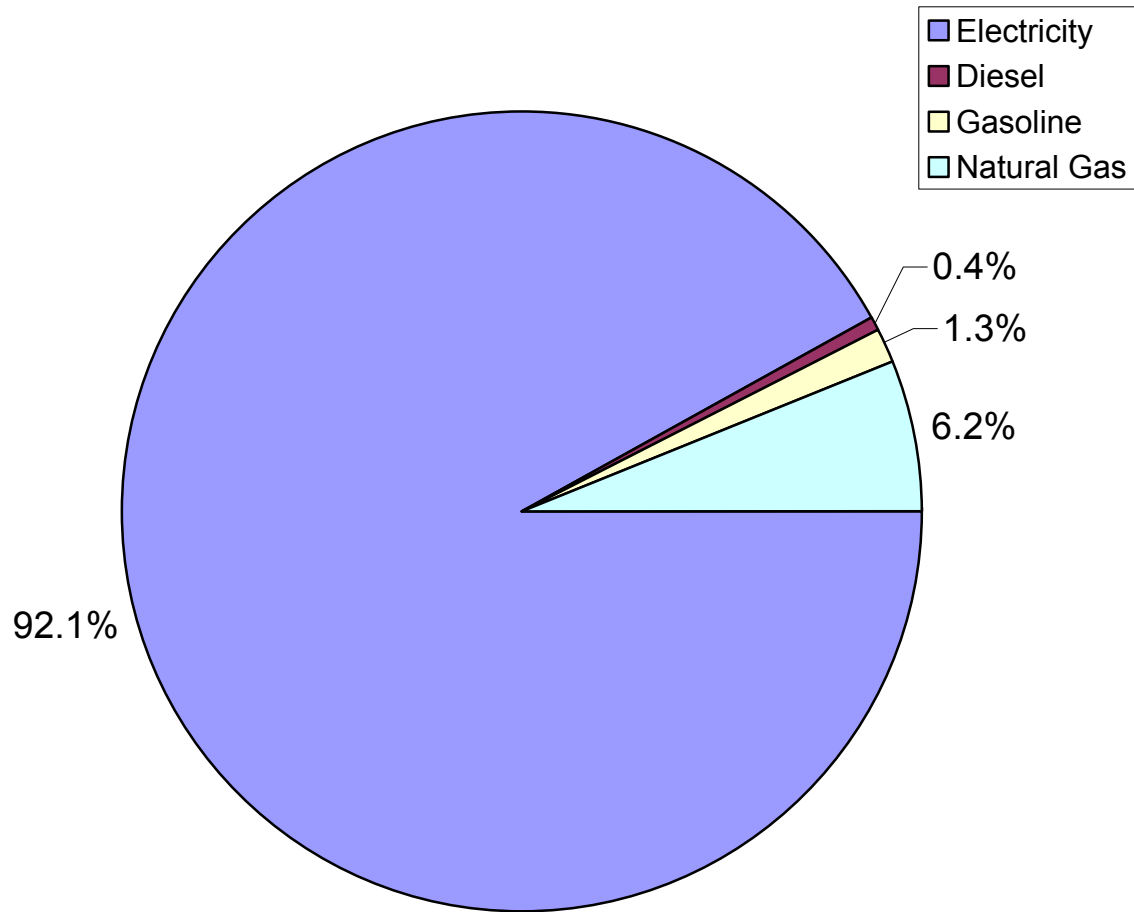
- Electricity
- Gasoline



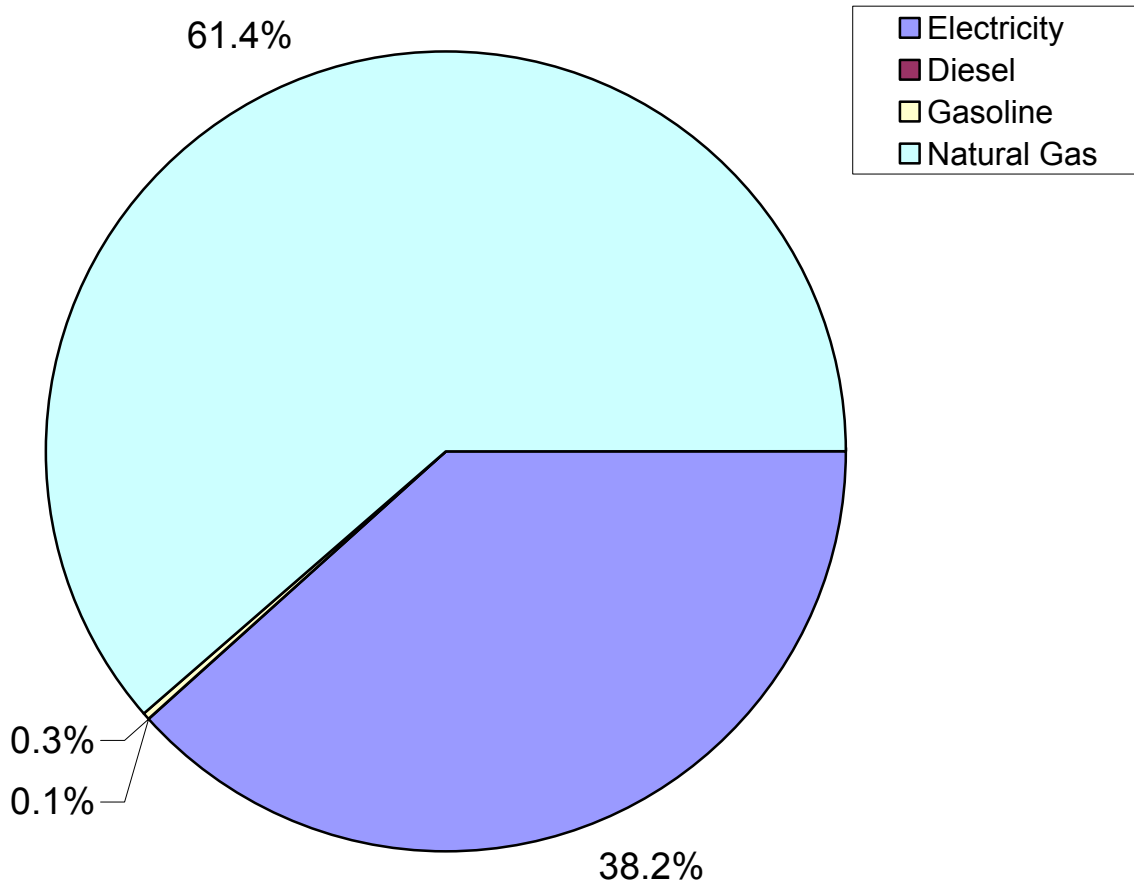
Energy Used in Lead and Zinc Mining (US)



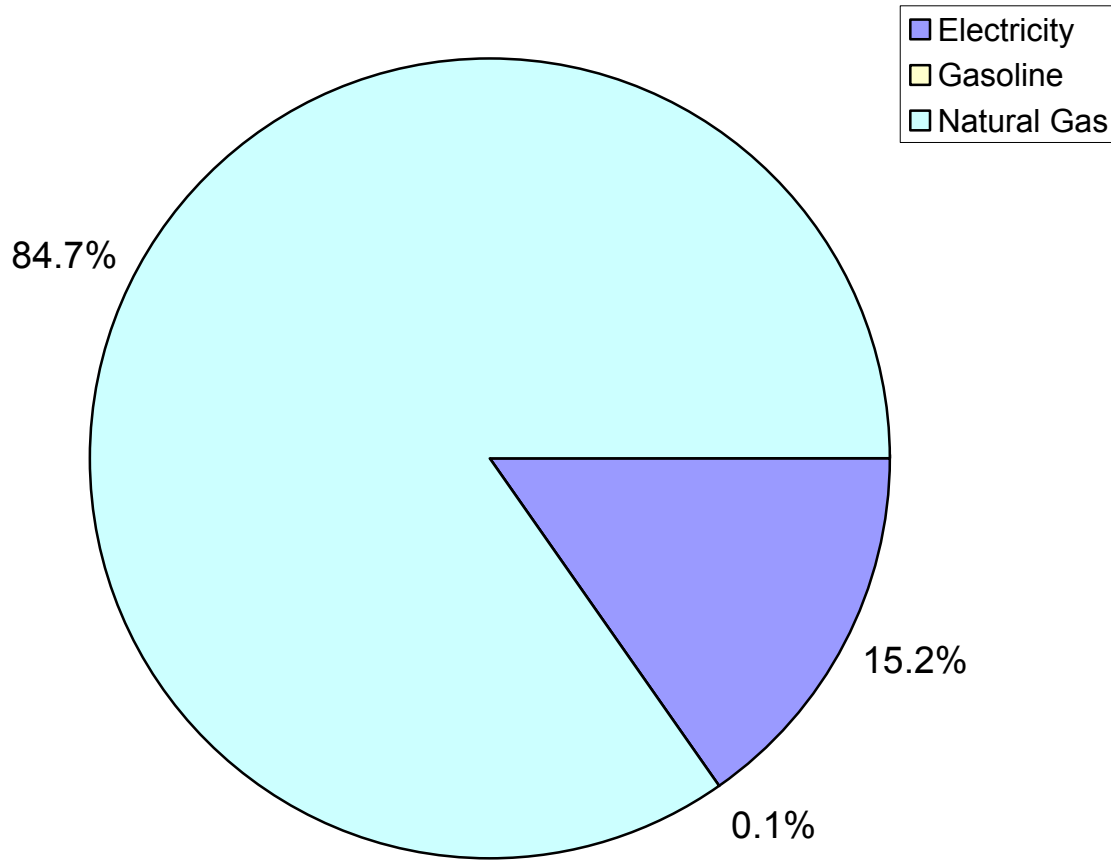
Energy Used in Copper and Nickel Mining (US)



Energy Used in Iron Mining (US)



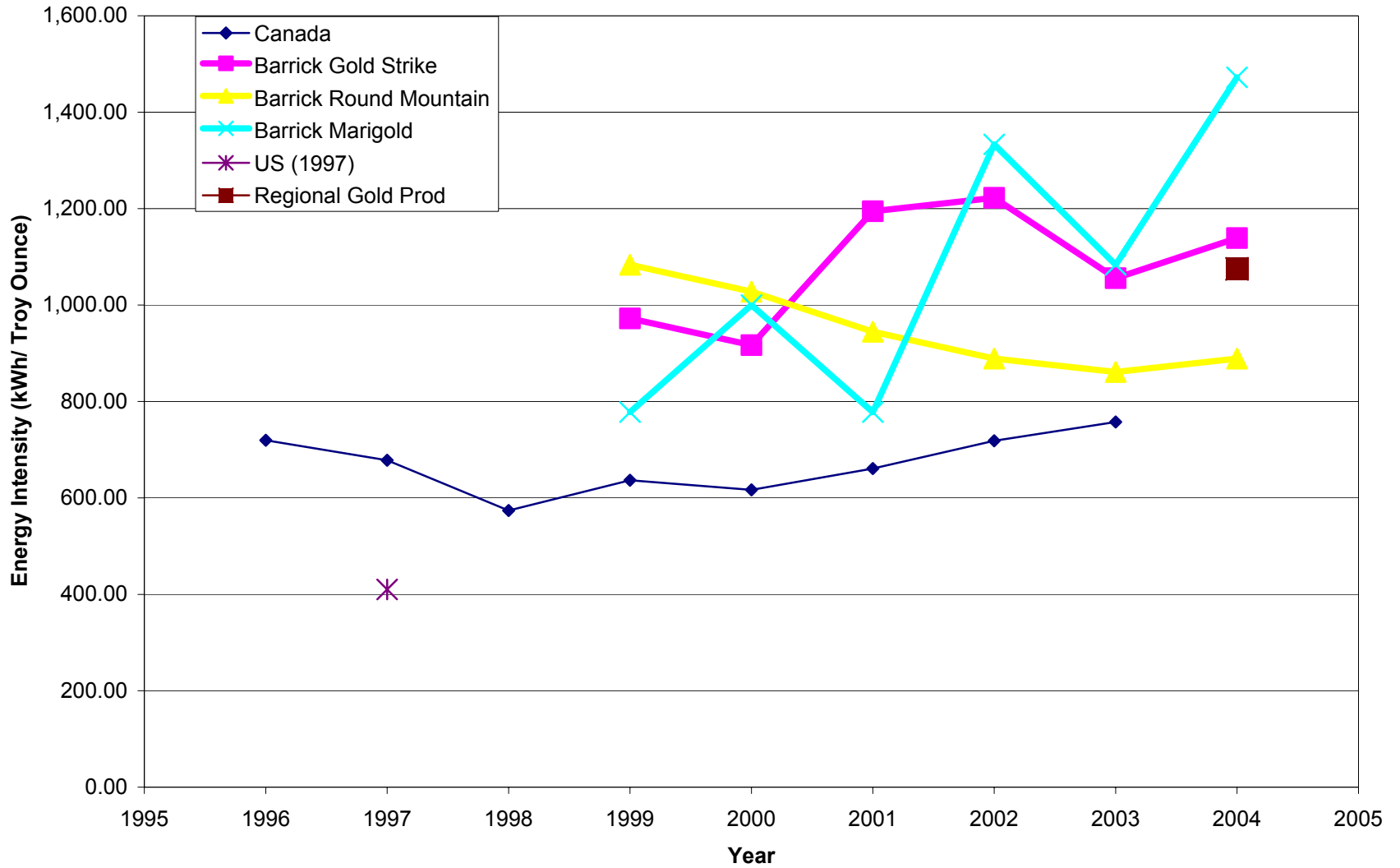
Energy Used in Potash, Borate and Soda Mining (US)



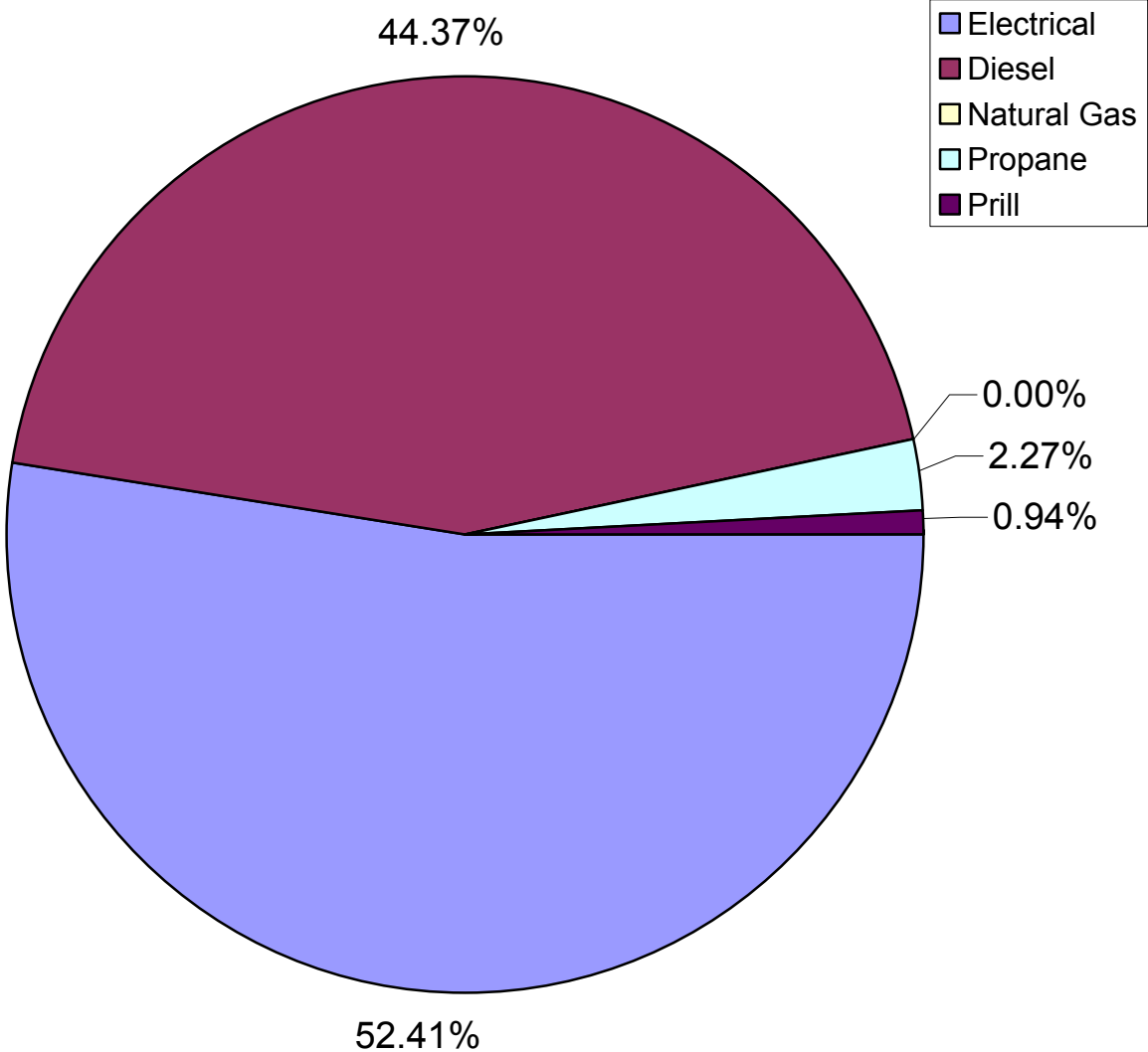
1997 US Data

Metal	Unit	Amount
Gold	kWh/ounce	432
Copper and Nickel	kWh/pound	1.98
Lead and Zinc	kWh/pound	0.40

Energy Used in Gold Mining



Energy Distribution for Regional Producer (kWh Equivalent)



Thoughts on Finding Solutions

- Audits, etc.
 - Energy audits, assessments should be initiated by mining companies as there will be more buy in
 - Turf protection is an important issue
 - Making changes may look like admitting failure
 - Payback for investments an important consideration – timelines different when profits are up

Thoughts on Finding Solutions (2)

- Design of new mine facilities:
 - Include energy considerations (“optimization”) as part of the design criteria
 - Appoint an “energy manager” as part of the project team and review all designs for energy efficiency
 - Consider special design features following elements of the LEED program for building design, especially office buildings – set a clear tone of energy efficiency at all levels

Have a Wonderful Meeting!