



# Energy as a controllable cost

## The benefits of energy productivity in mining and minerals processing

Dr Mary Stewart | 15 July 2015

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energetics<sup>o</sup>



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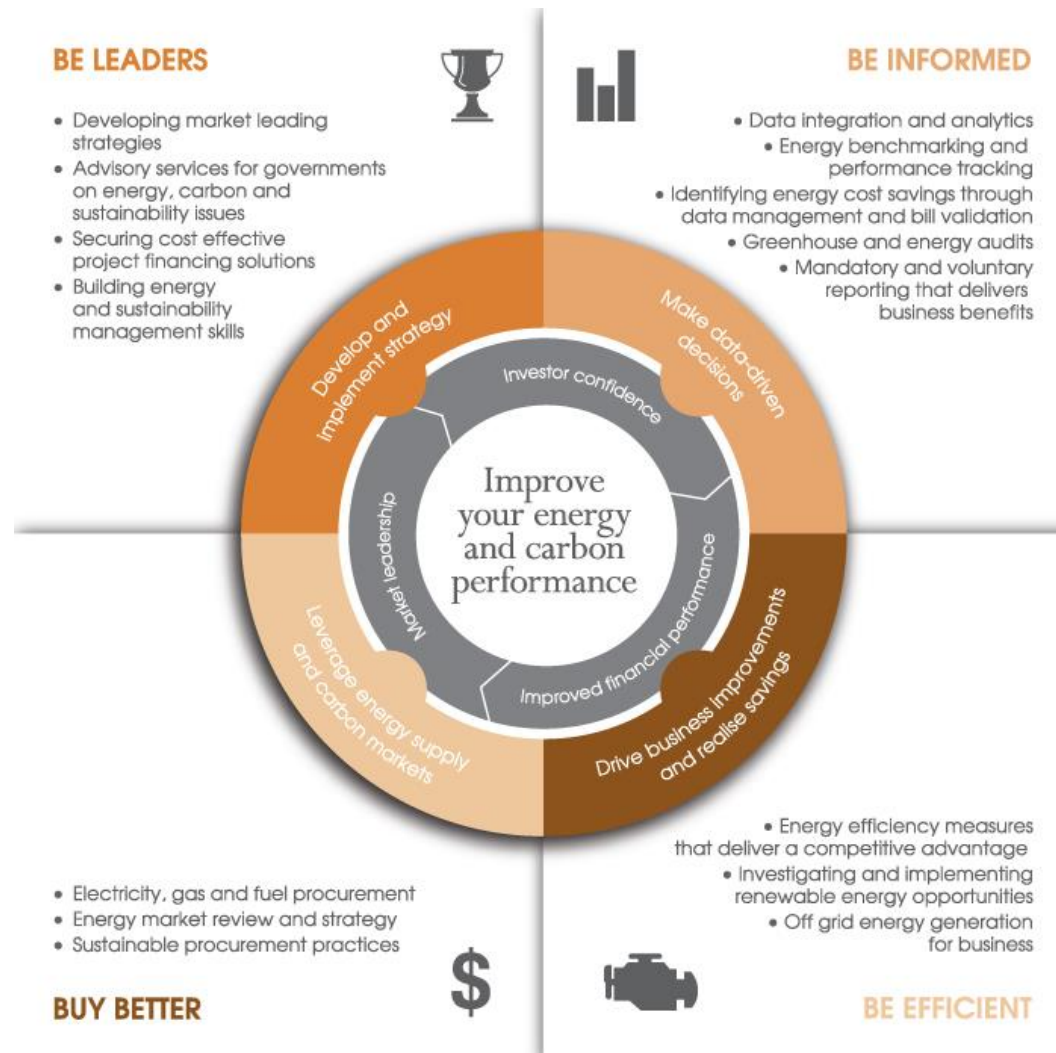
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# Energetics: what do we do



# Energetics: long term clients



## MANUFACTURING



## MINING



## RETAIL / COMMERCIAL



## GOVERNMENT



## TRANSPORT



# CEEC: a global NFP



## Vision

To accelerate the implementation of energy-efficient comminution strategies through promotion of research, data and industry benefits





# CEEC: a global NFP

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## Why?

Comminution can use up to 50% of stationary energy on site;  
productivity gains will deliver profit and growth

## The three Cs of CEEC

Communicate

Collaborate

Celebrate

# Outline

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## **Where are we now?**

- Energy and carbon markets and policy overview

## **Energy contract structures**

- Understanding your energy spend

## **Energy benchmarking**

- How hard is your energy working?

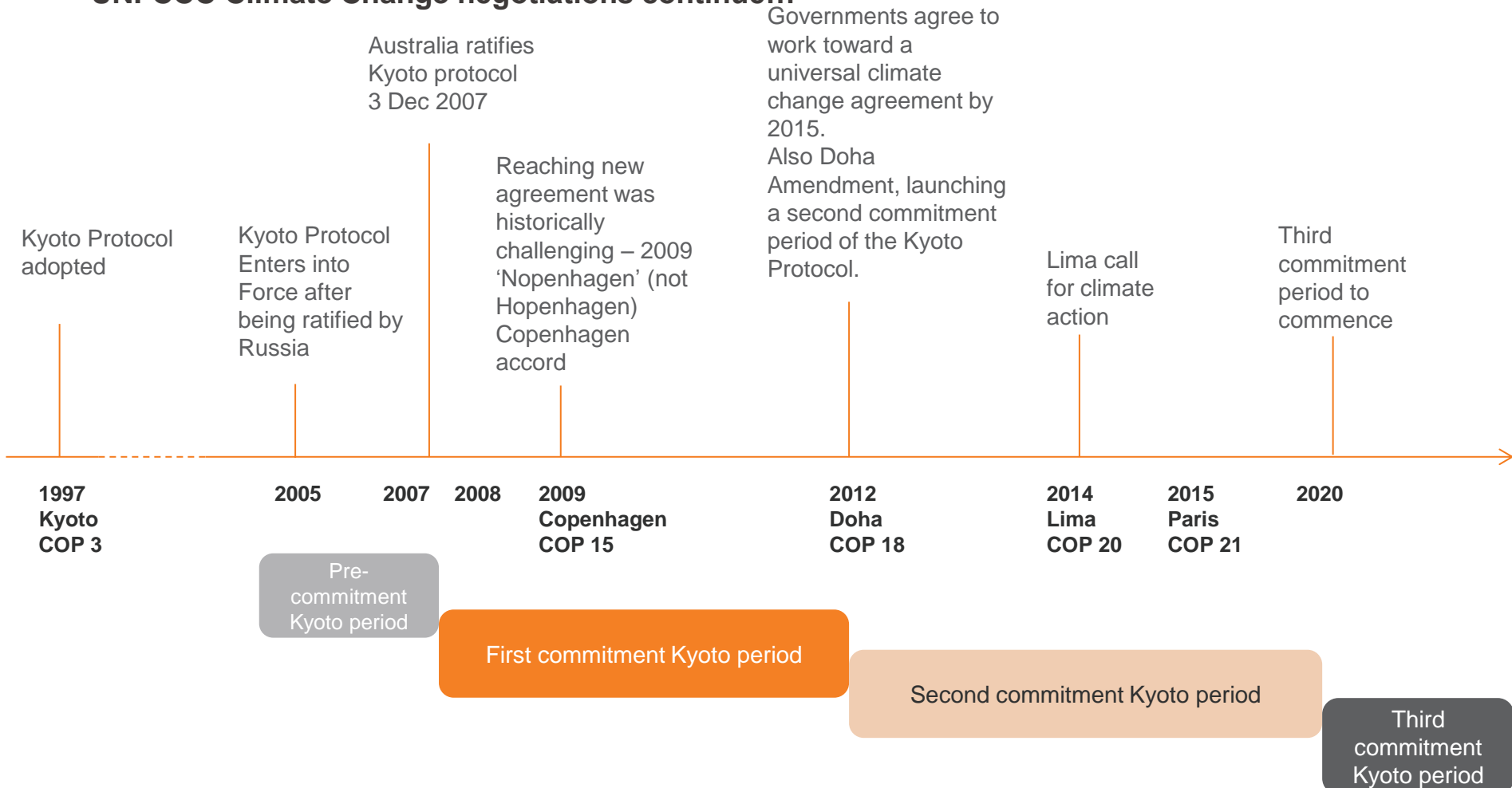
## **Energy productivity**

- Making your energy work harder

# International climate change policies



## UNFCCC Climate Change negotiations continue...





# Direct Action



## Legislation to enact the ERF has three main components:

1. The Carbon Farming Initiative has been expanded to include new methodologies and regulatory processes for the creation of ACCUs
2. A process has been established for the Government to purchase up to \$2.55 billion ACCUs through an reverse tender/bidding process
3. A Safeguard Mechanism has been incorporated which will require major emitters with net emissions above a baseline to buy ACCUs

Emissions Reduction Fund	Safeguard Mechanism
<ul style="list-style-type: none"><li>• \$2.55B to fund emission reductions</li><li>• Bid emission reduction projects through a reverse auction</li><li>• Minimum bid 2,000 tCO<sub>2</sub>e per year</li><li>• Access through approved methods still under development</li><li>• First auction held 15/16 April 2015</li></ul>	<p>Currently under development. Safeguard mechanism is expected to:</p> <ul style="list-style-type: none"><li>• Penalise facilities for exceeding baseline</li><li>• Apply to facilities greater than 100 ktCO<sub>2</sub>e</li><li>• Commence 1 July 2016</li></ul> <p><i>Details are being finalised by the Government</i></p>

# The Safeguard Mechanism

Design element	Direct Action White Paper	The Xenophon Amendment
Commencement	1 July 2015	1 July 2066
Coverage	Determined by NGER Scope 1 emissions only Facility level (not company) for >100,000 t CO <sub>2</sub> e	Same
Baselines	Using NGER data Absolute emissions using historical data Highest reported emissions over 2009/10 to 2013/14	Keep net emissions within their baseline emissions in each relevant 'monitoring period'
New projects and expansion	"Flexibility" included in safeguard mechanism	Clean Energy Regulator can determine
Compliance	"Flexible" framework for compliance: <ul style="list-style-type: none"> <li>- Emissions-intensity test</li> <li>- Multi-year compliance period</li> <li>- Use of offsets</li> </ul>	Civil penalty enforceable by the Clean Energy Regulator in court

**Certainty  
in design  
elements**

**Safeguard  
rules due  
prior to 1  
October  
2015**

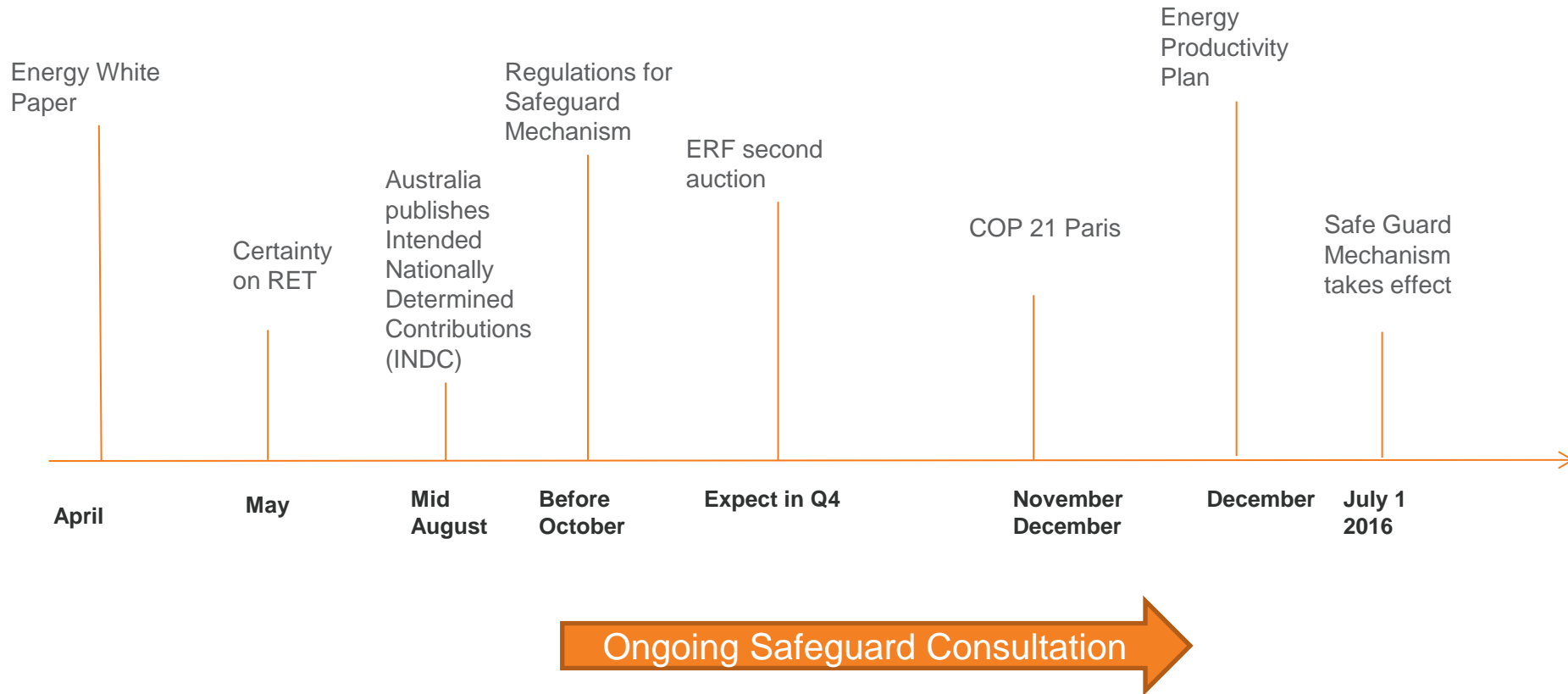
To be  
developed -  
focus of  
Government  
consultation  
for 2015



# Domestic policy timelines



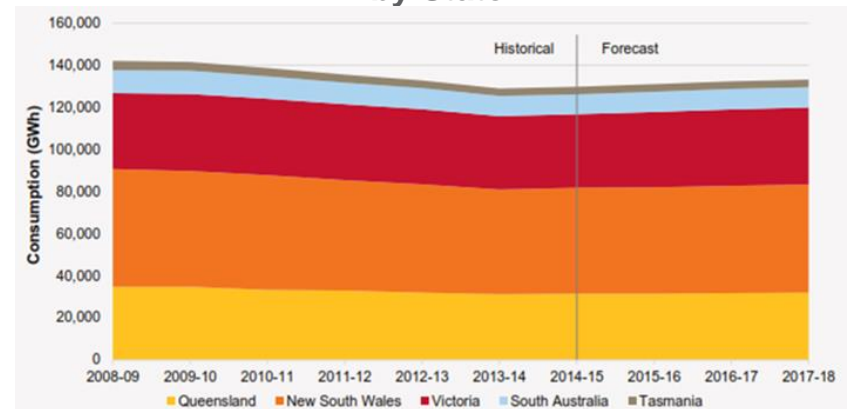
## Looking to June 2016



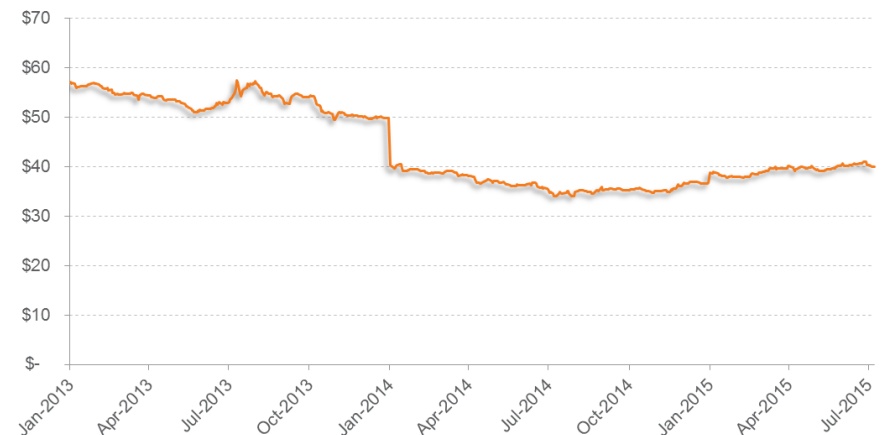
# Current electricity market conditions

- Electricity demand across the NEM has been declining since 2008
  - improved energy efficiency
  - rise of residential PV
  - decline in manufacturing
- Surplus generation capacity has generally reduced wholesale electricity prices through increased competition
- Recent historically low electricity prices have shown signs that they are levelling out
  - market is adjusting to a new generation mix
  - supply and demand are balancing

Forecast Residential and Commercial Consumption by State



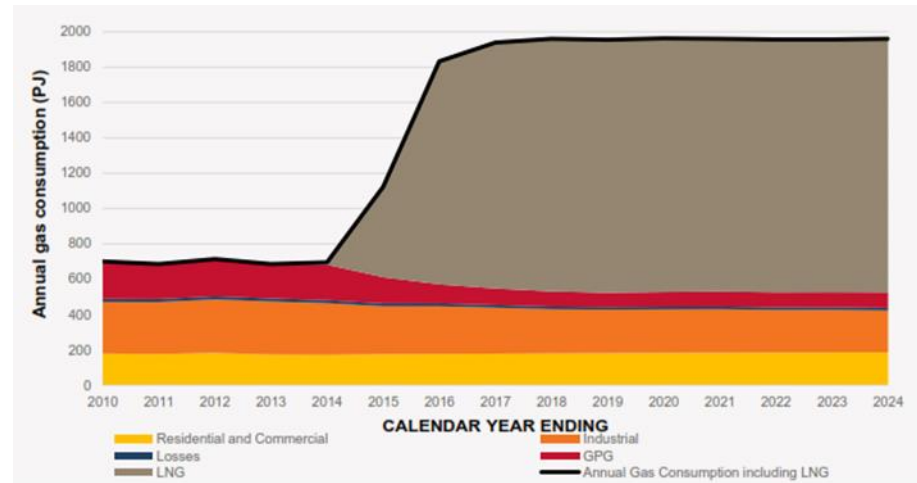
NSW Spot Price since Jan 2013



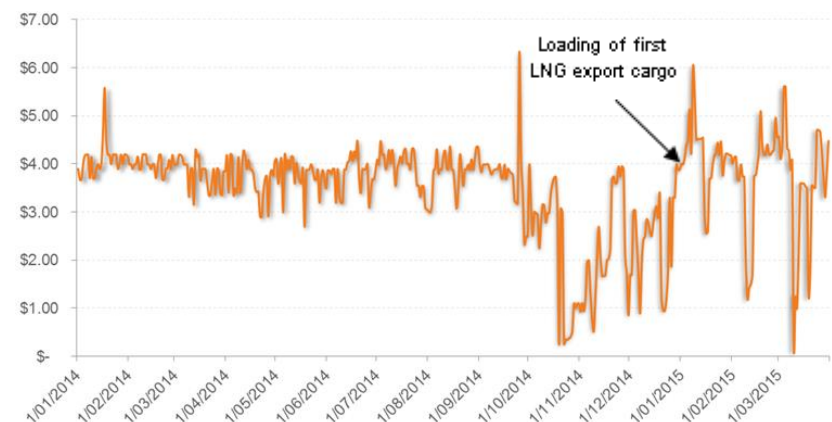
# Current gas market conditions

- Development of LNG export facilities has introduced a significant new dynamic into the Australian domestic gas market.
- Construction of a range of new LNG plants and seaports on the East coast of Australia will introduce global pricing to this market, significantly raising local gas prices.
- **Short-term Outlook:** Expect price volatility as the market establishes a new demand/supply balance.
- **Long-term Outlook:** Energetics estimates prices to increase approximately 20% through 2018.

## Forecast Total Demand for East Coast Gas



## Sydney ex ante STTM prices since Jan 2014



# Electricity contracts

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## **Fixed charges**

- Typically less than 2% of the total bill, these are usually supply charges and are fixed for each meter used

## **Consumption charges**

- Payment made for the electricity used, typically 20 to 50% of the total bill, this is the element of the bill which has consideration of time of use charges – peak, shoulder and off peak tariffs

## **Network charges**

- Costs of running the poles and wires, these costs can be more than 30% of the total bill; complex in their derivation

## **Environmental certificates and other charges**

- Starts in the region of 5%, these cover the RET (LRET and SRES) requirements as well as other environmental and market fees

# Reducing costs

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## **Fixed charges**

- Contestable, negotiated when contracts are struck

## **Consumption charges**

- Demand shifting and reduction in consumption

## **Network charges**

- Complex, need to manage one or more of (note these can also be fixed and only change when the contract is struck):
  - Total consumption in kWh and maximum demand in kVA
  - Contract Maximum Demand (CMD) in kVA as specified in your contract and penalties
- Power factor and load flow correction

## **Environmental certificates and other charges**

- Negotiable, fixed price vs fixed charge, can be decoupled from total consumption



# Benchmarking to target reductions

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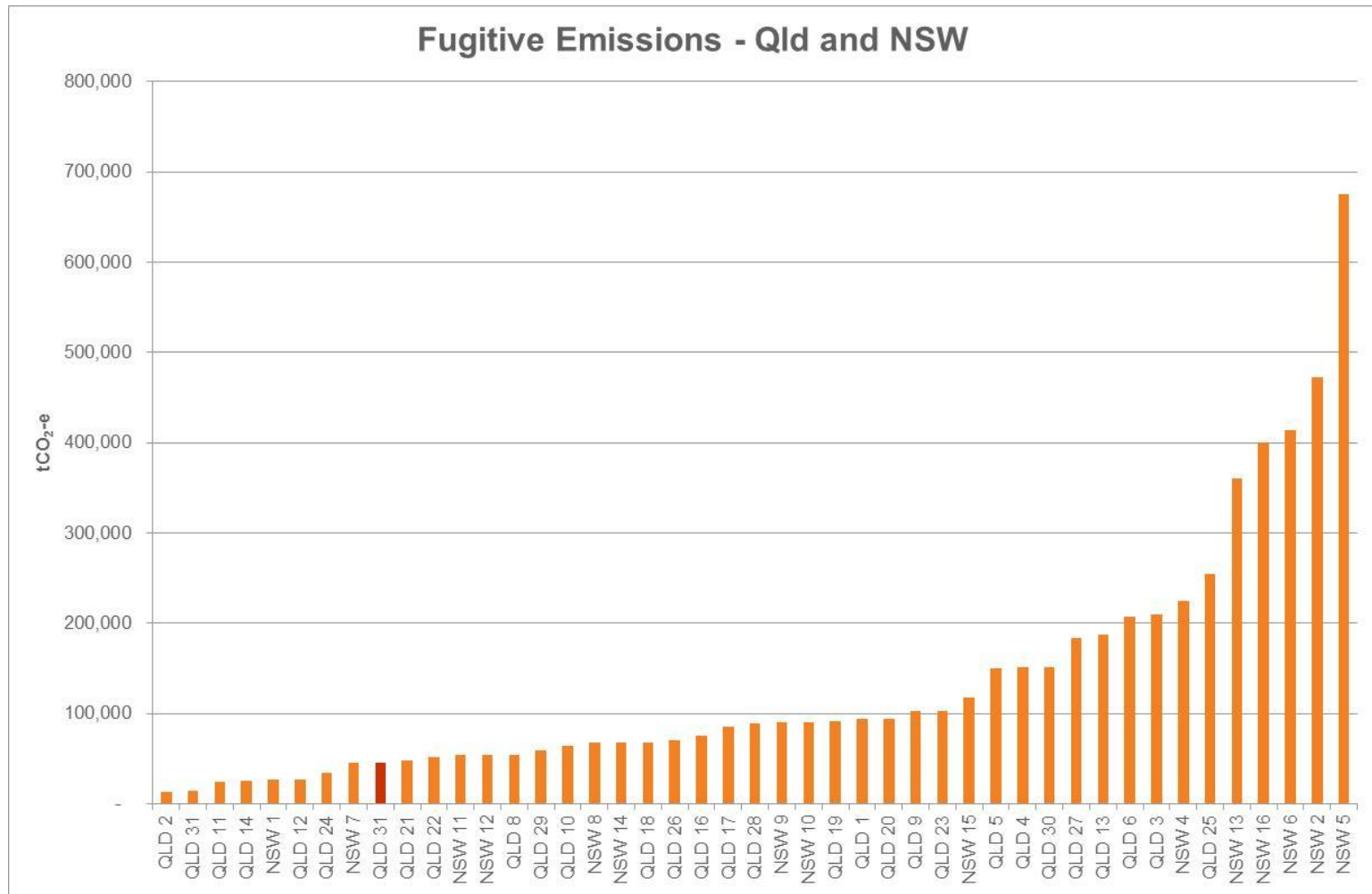
## **Coal mining: greenhouse emissions**

- Energy and greenhouse
- Risk and potential to improve performance
- ~45 site fugitive emissions only
- ~30 sites full scope 1 + scope 2

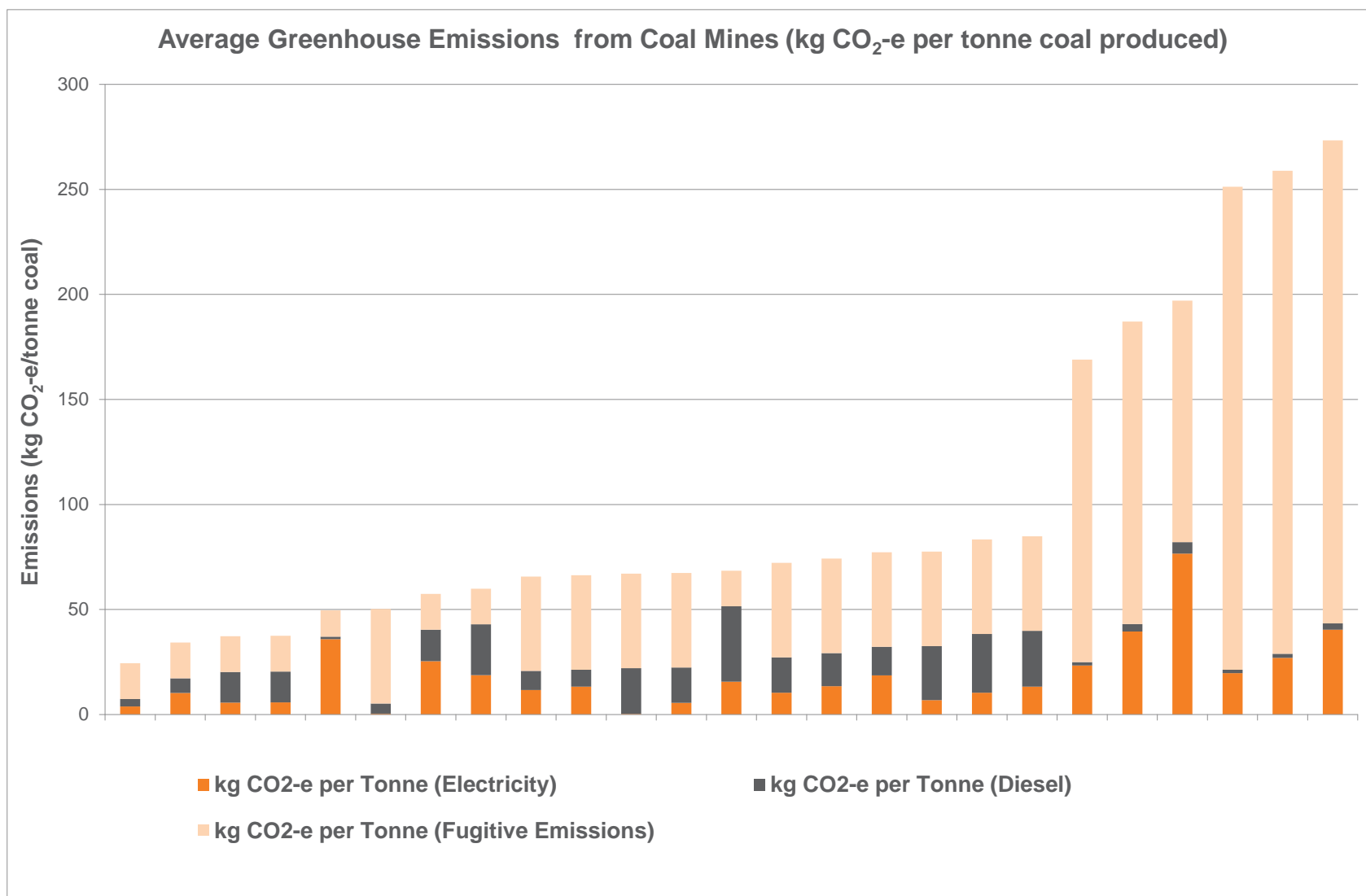
## **Coal processing**

- The value of increased information detail

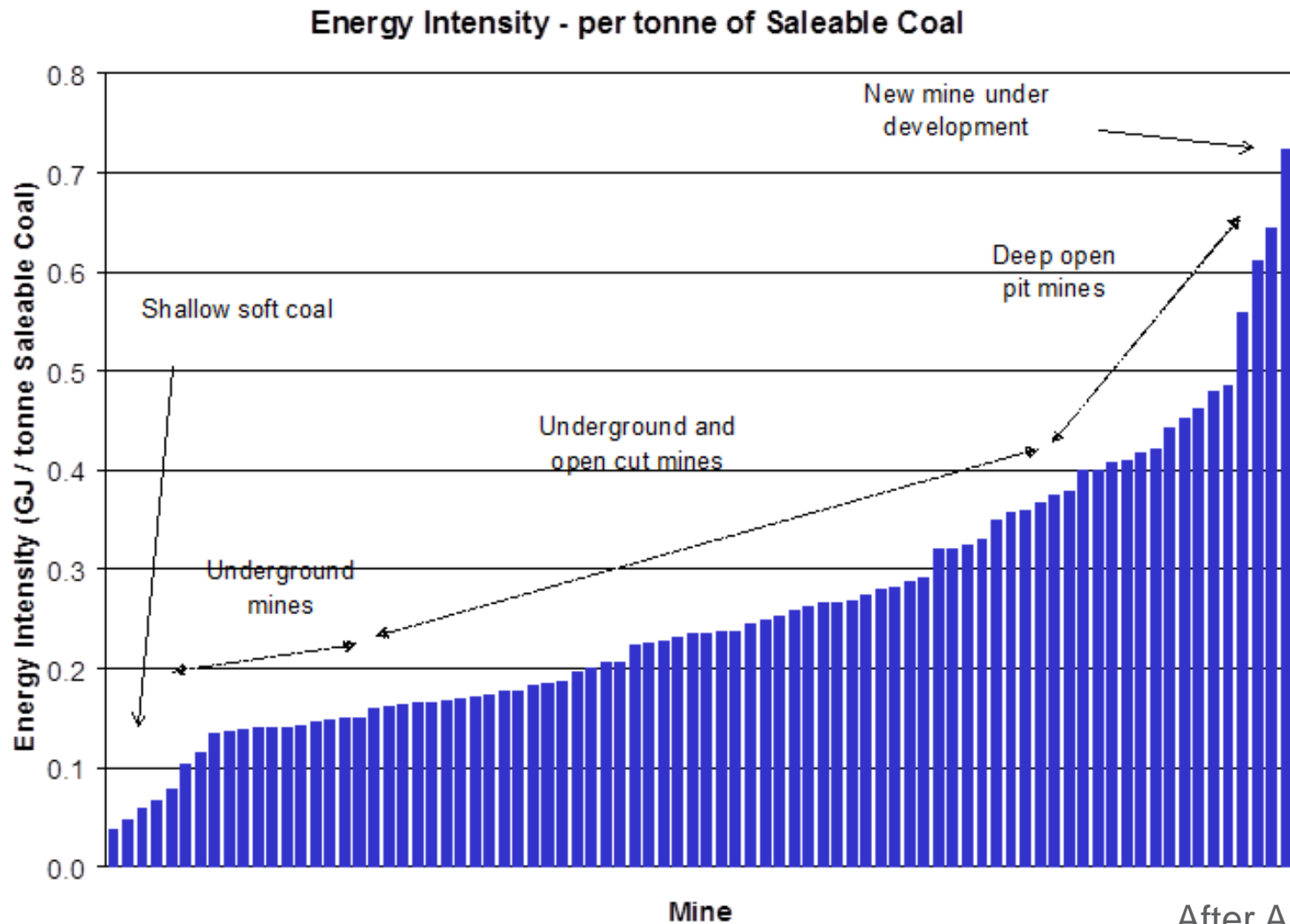
# Absolute emissions – Fugitive



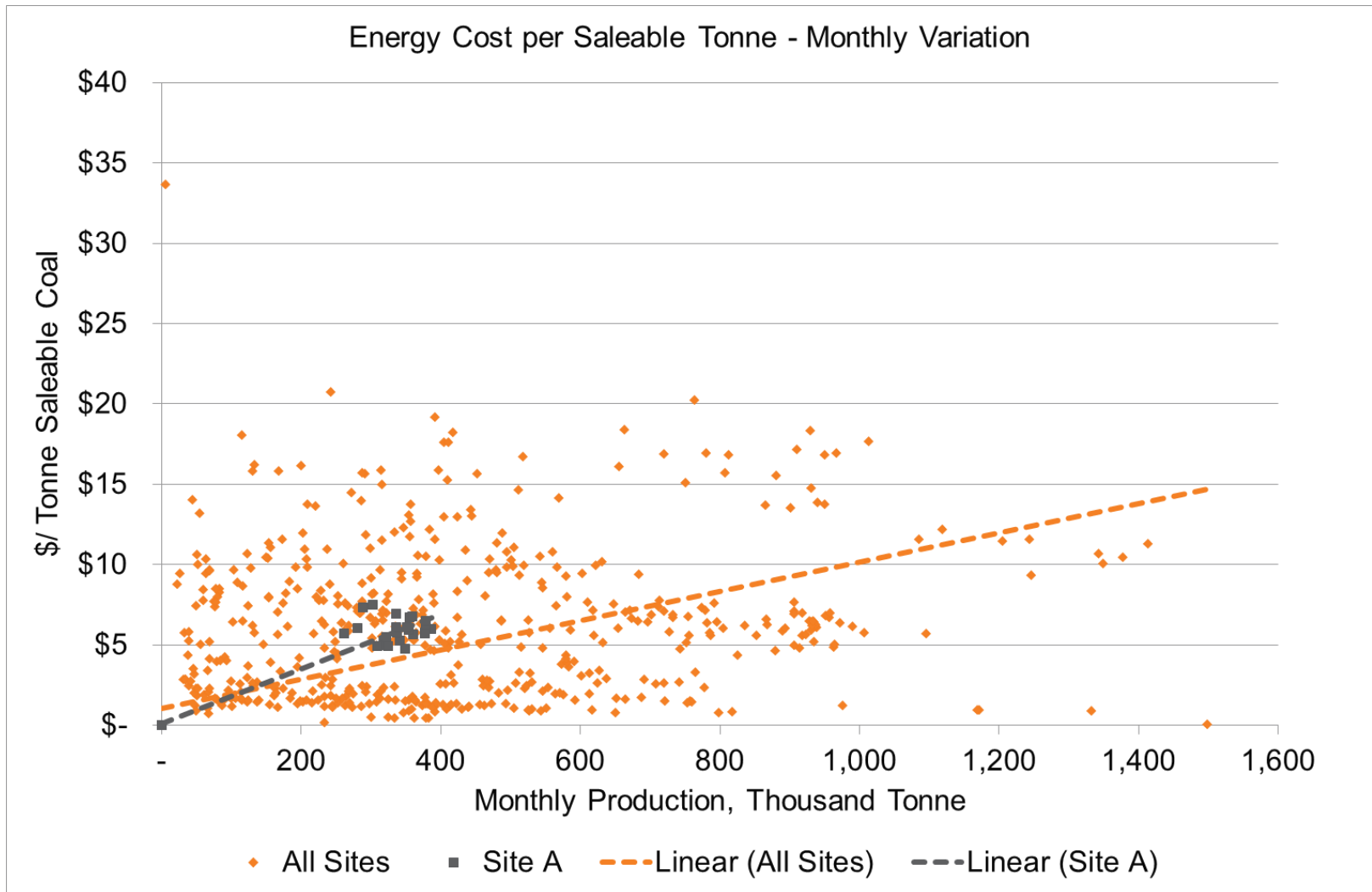
# Fugitive emissions intensity



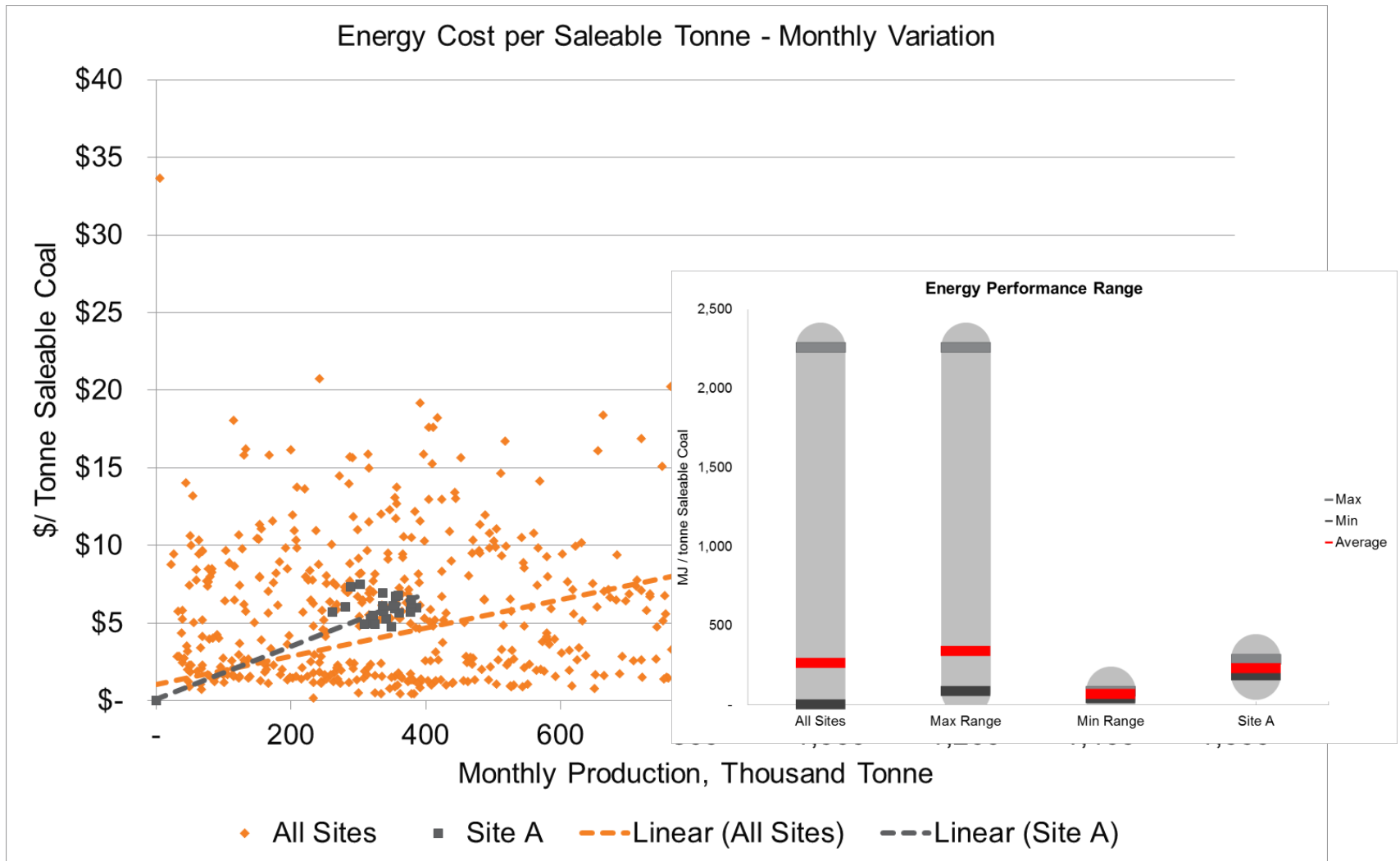
# Energy cost benchmarking



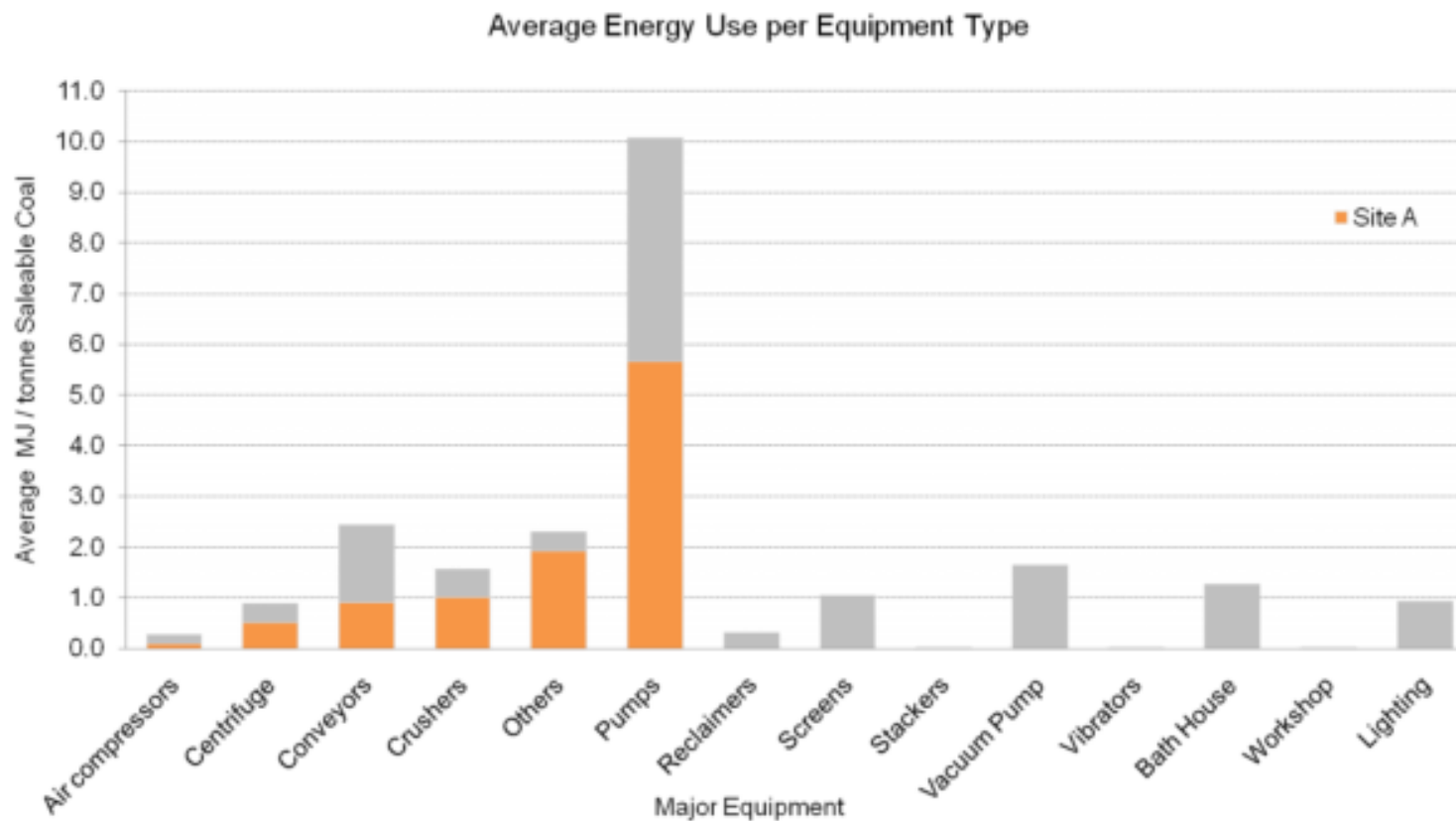
# Energy cost benchmarking



# Energy cost benchmarking



# Equipment level benchmarking





# CEEC Energy Curve program

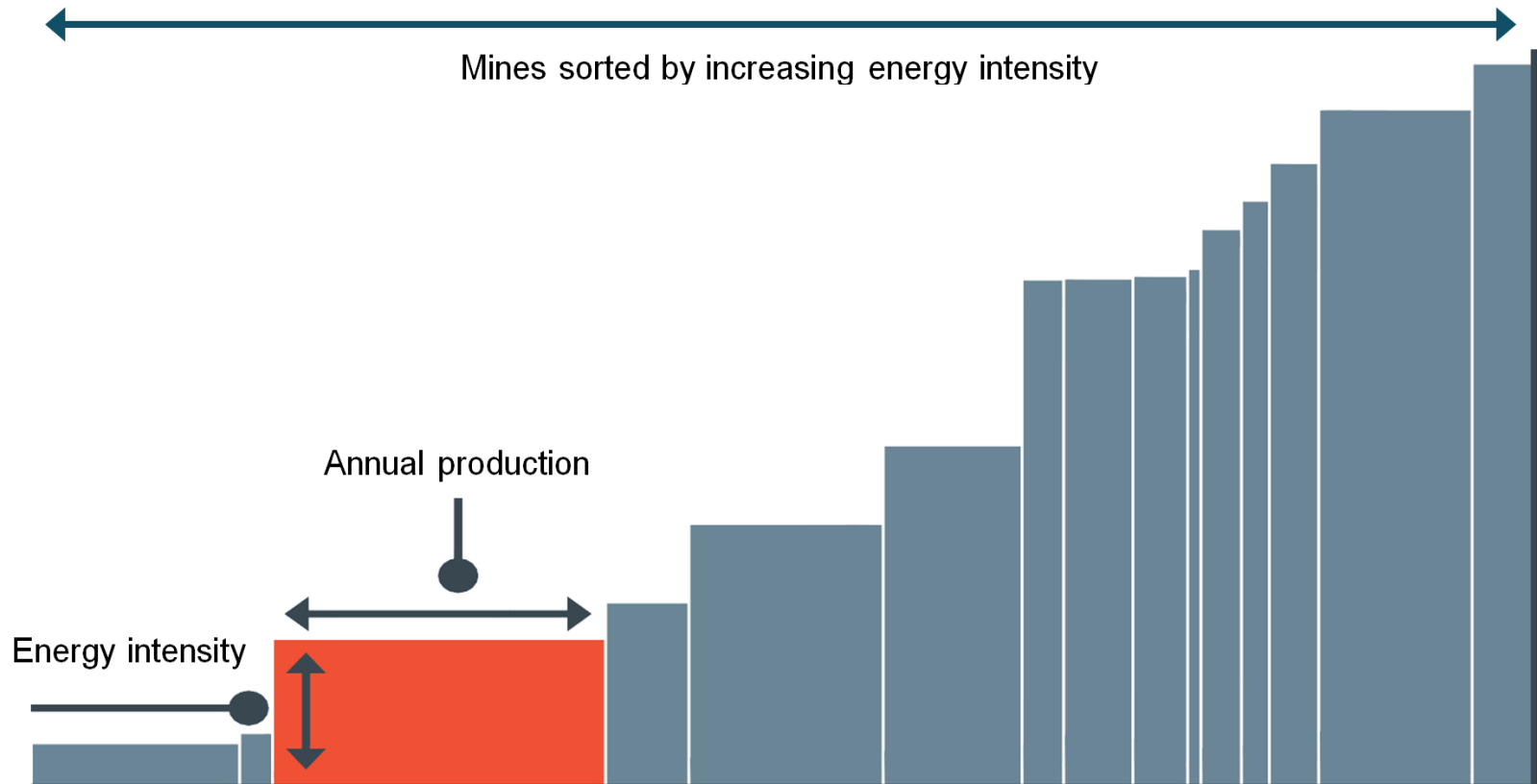
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**Collect, measure and compare comminution energy intensity**

**Provide a simple, visual and global methodology for assessing best practise**

**Motivate operations to improve comminution efficiency (move down the Energy Curve) to achieve best practice**

# Energy Curve methodology

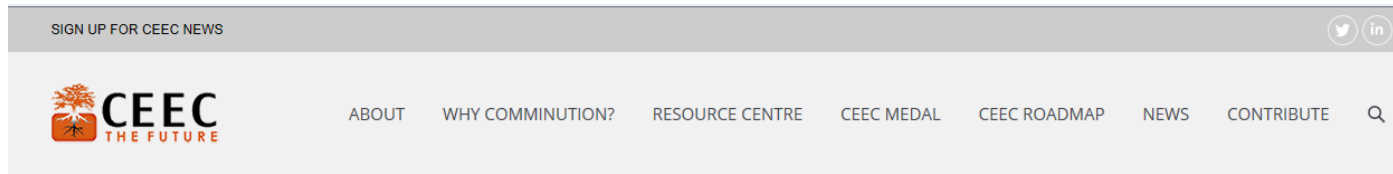


# Initial sources of data for the Energy Curve



15 technical databases including JKMRC, JKTech, AusIMM publications

Growing number of operators providing real operating data

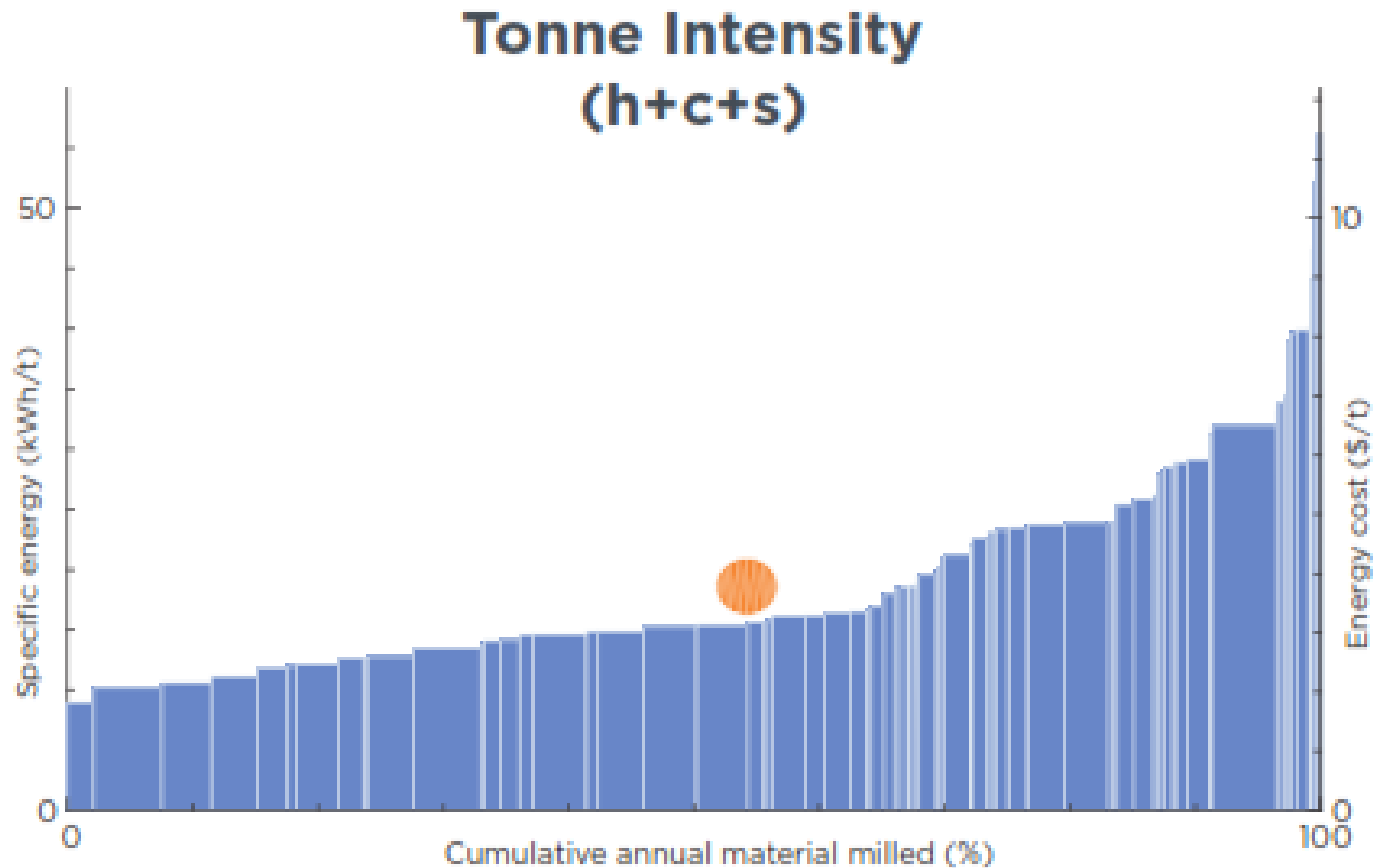


The Coalition for Eco-Efficient Comminution (CEECE) has been established and is supported by a broad range of mining sector companies keen to accelerate awareness, knowledge transfer and, by implication, improve energy and cost outcomes in the substantive area of comminution.

[> About](#)

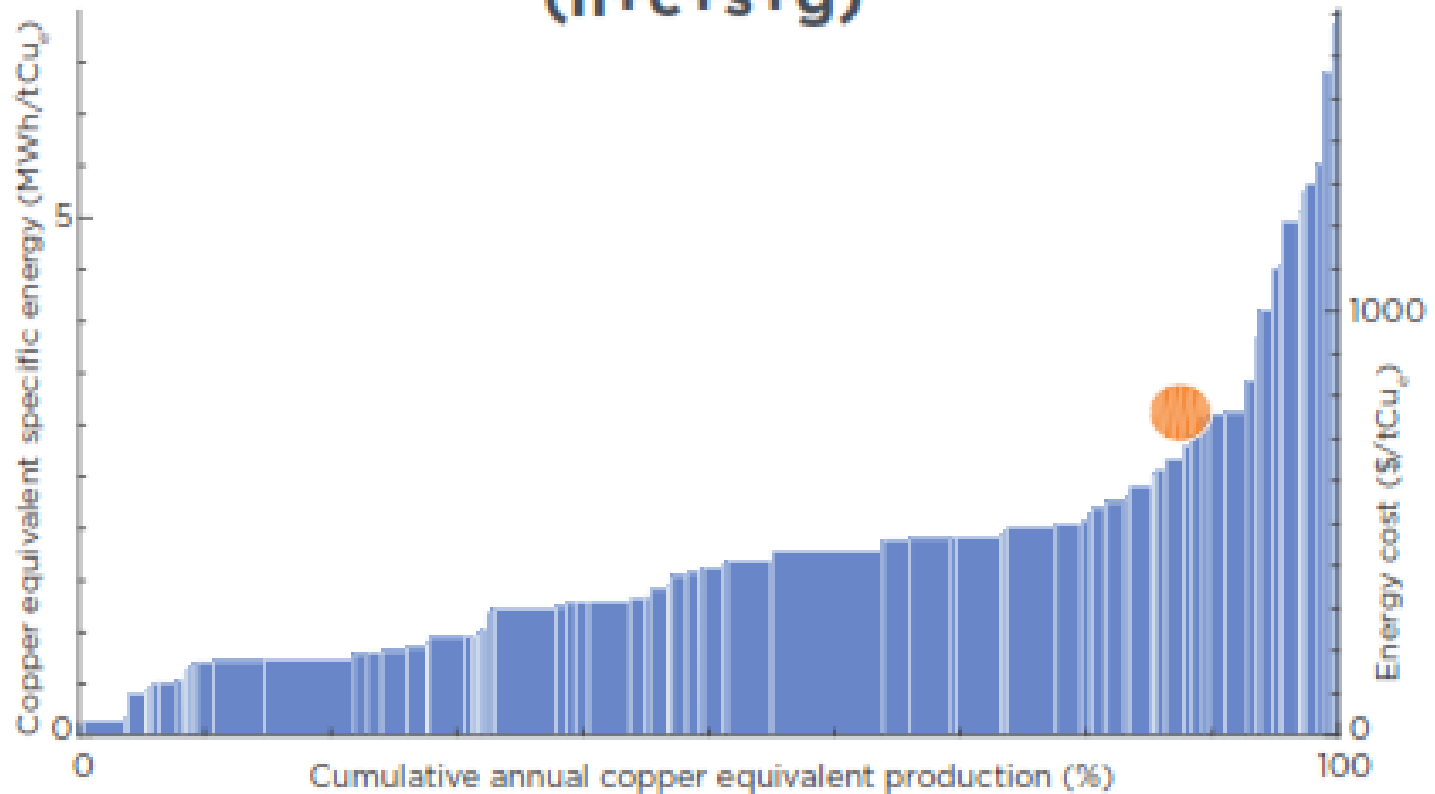
A banner for the 'Energy Curve Program'. It features a bar chart with five blue bars of increasing height, connected by dashed orange lines. A green button with the text 'Participate Now' is in the top right corner. Below the chart, a paragraph reads: 'Welcome to the CEECE Energy Curve Program, a tool which allows comminution circuit operators to benchmark the energy efficiency of their operations and to contribute anonymously to the database on which the tool is based.'

# Are there real improvements that can be made?



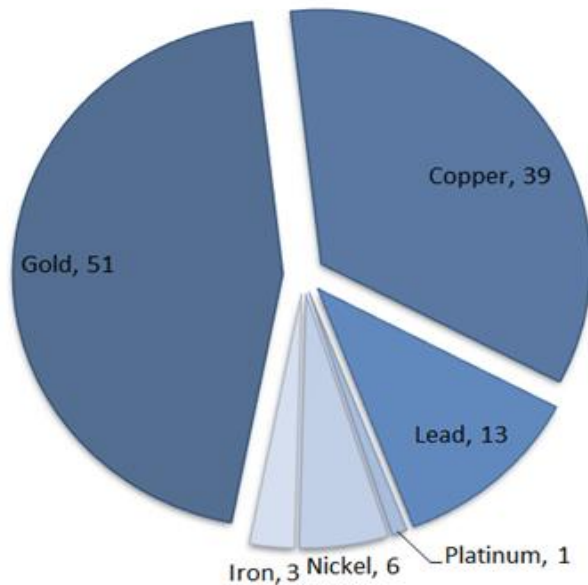
# Productivity considerations change the response

## Grade Intensity (h+c+s+g)

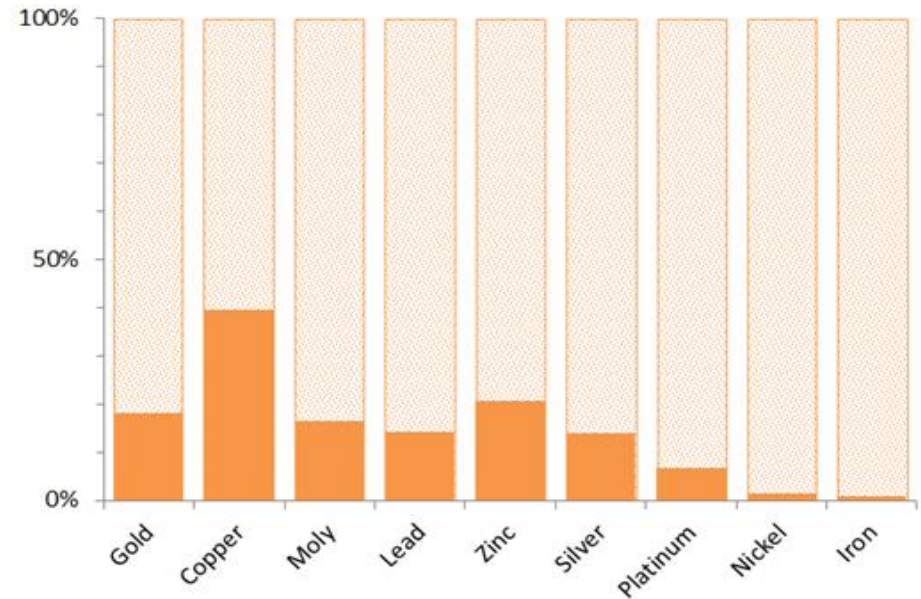


# Current energy curve database

Number of mines by commodity



Proportion of global production in database



Commodity by production in database



# Barriers to change

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**Availability of capital**

**Competing objectives**

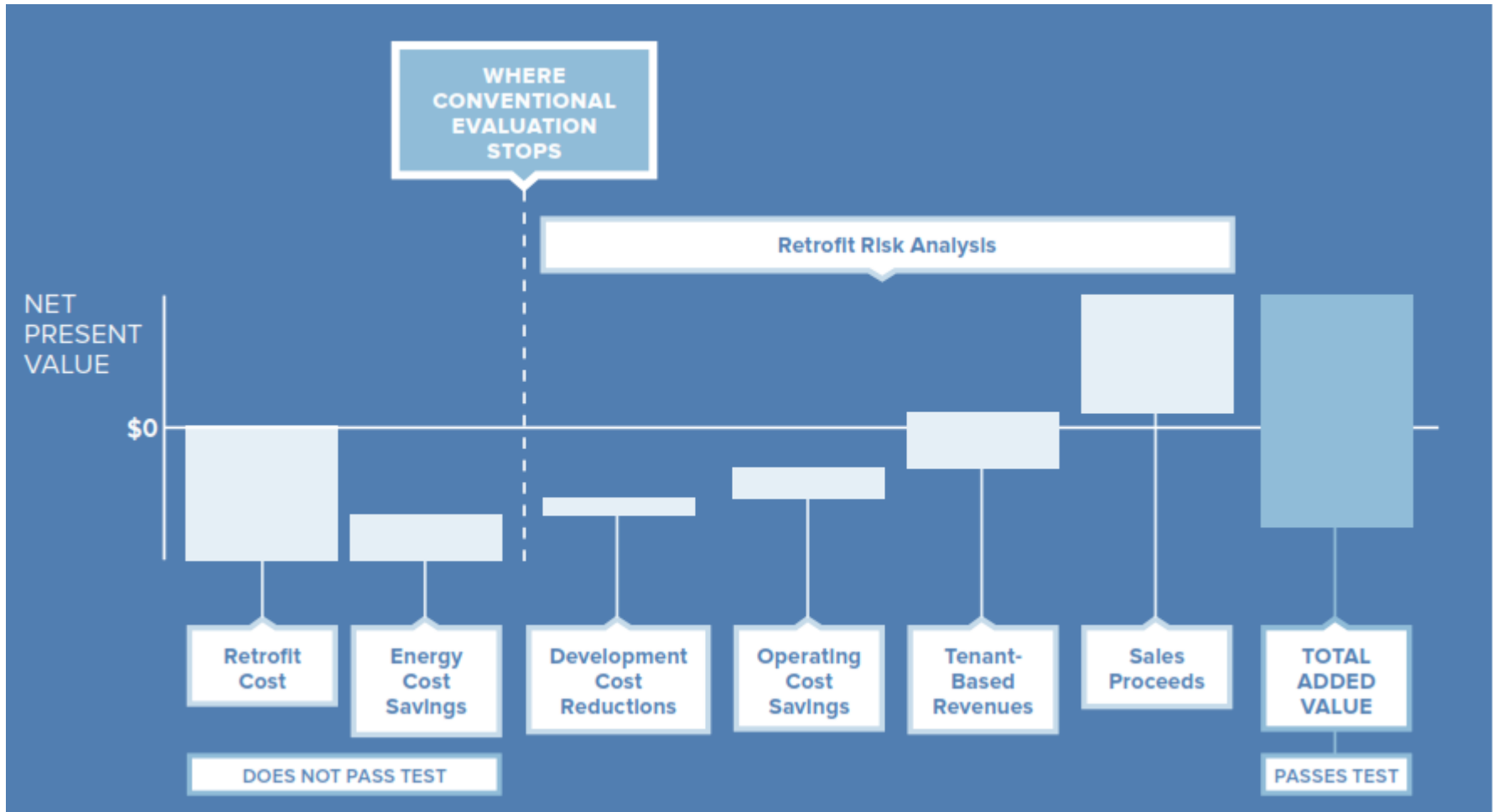
**A focus on output**

**There are more important issues**

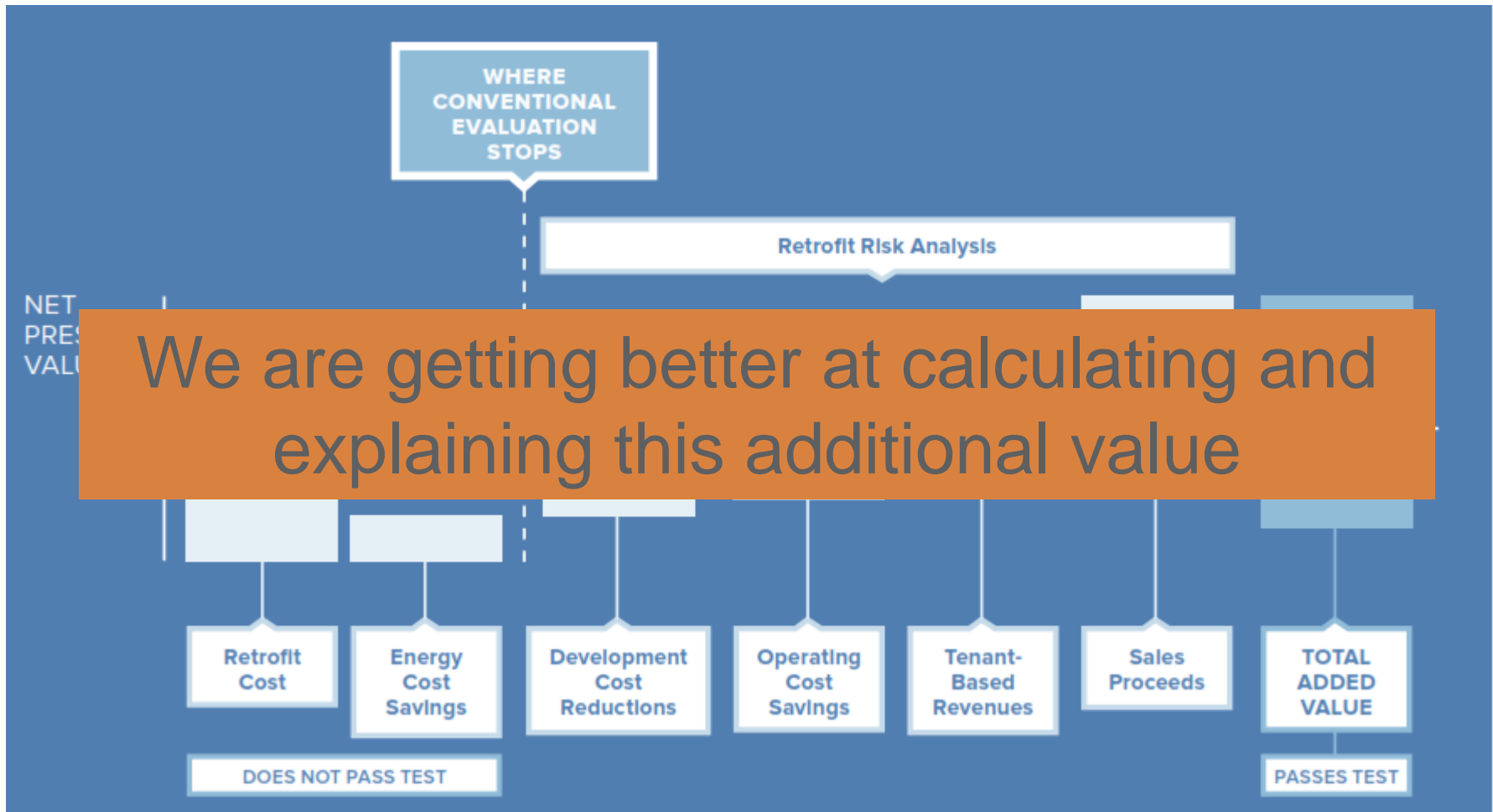
- All of these point to the materiality of the decision, if there was more at risk the decisions would be different



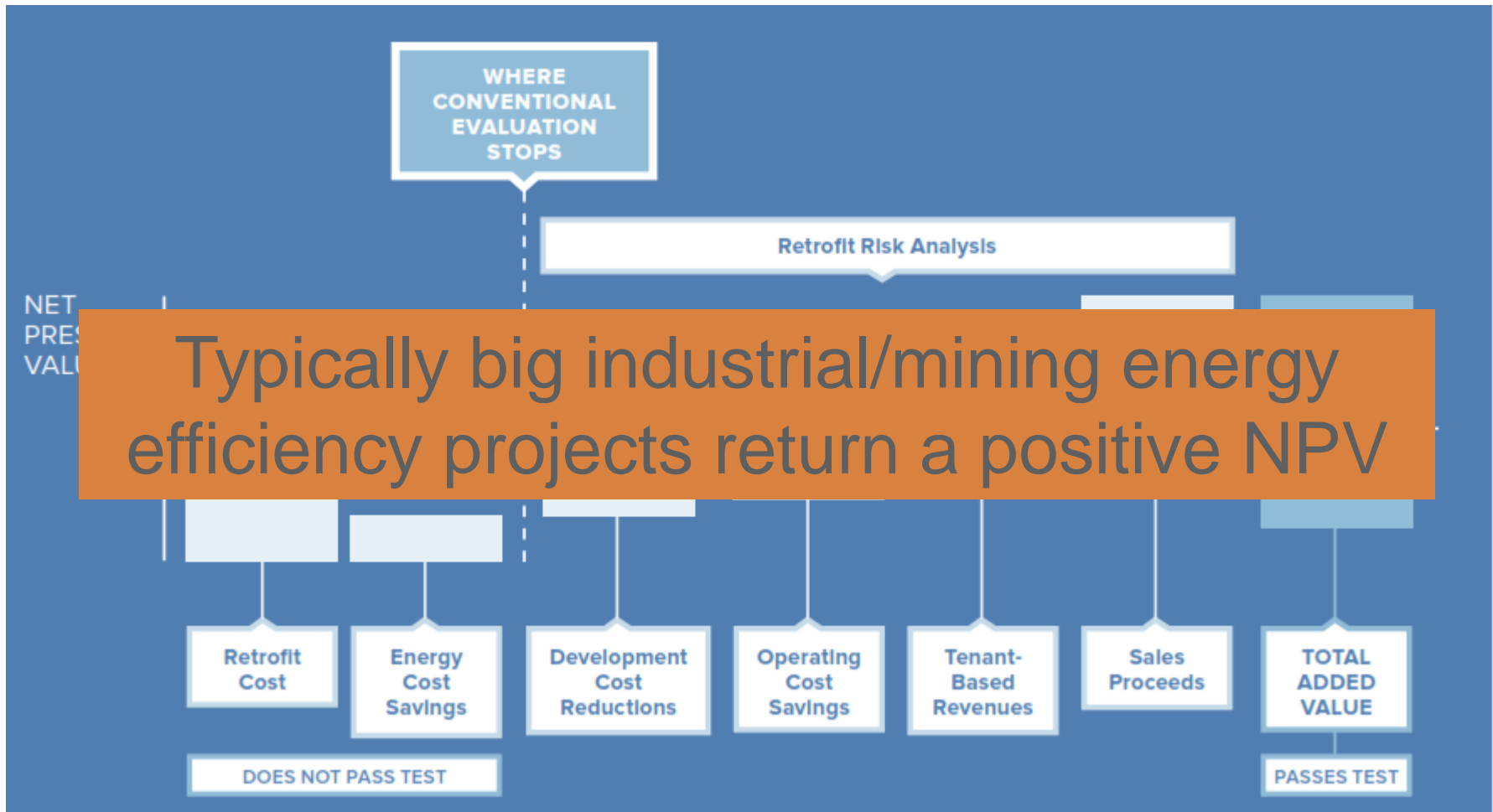
# There is more at risk



# There is more at risk



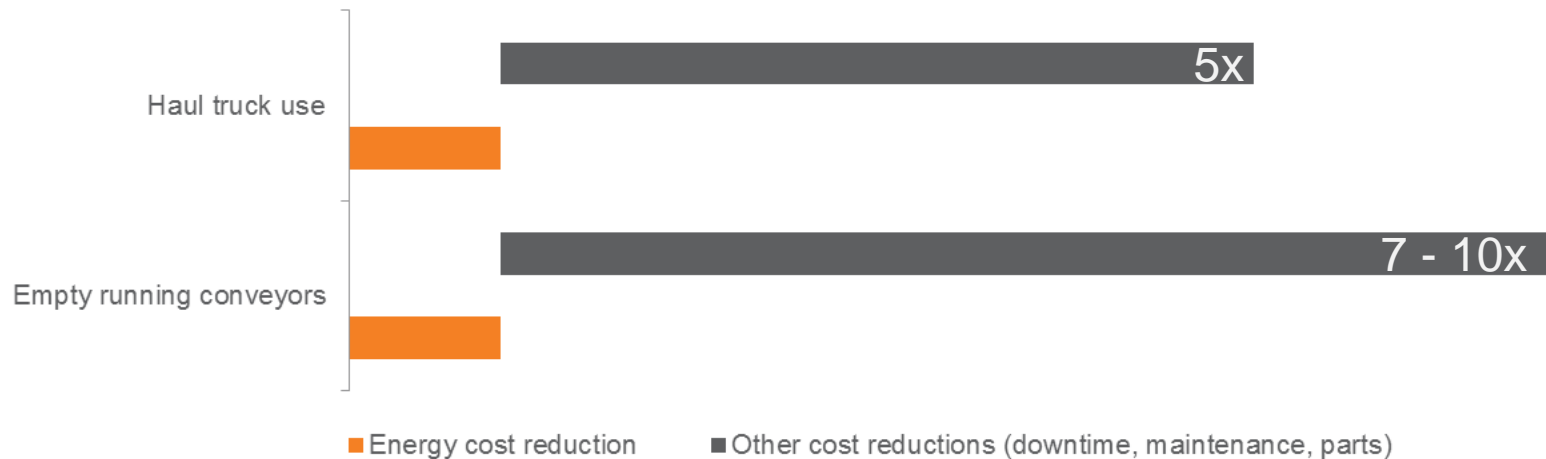
# There is more at risk



# Can we paint the same picture for mining?



**Many energy efficiency projects return a positive NPV on energy cost alone**



**Energy is around 10% of operating costs but influences significantly more savings**

**Energy is a powerful diagnostic tool for overall plant productivity**

- And it is easy to measure

# A concern for Australia

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**Competition for capital is a challenge for energy efficiency without a carbon price**

**The business case is better in other jurisdictions**

**Will we see further degradation in the energy productivity of our multi-nationals because of a lack of policy?**

# A concern for Australia



Comparison of the financial implication of one project in different jurisdictional regions.

	<b>Australia – Qld</b>	<b>Australia – NSW</b>	<b>Australia – off-grid diesel</b>	<b>South Africa</b>
Scheme considerations	Qld emissions intensity and electricity prices, selling reductions into the federal scheme	NSW emissions intensity and electricity prices, selling reductions into the state scheme	Off-grid diesel generation emissions and diesel prices for non-transport uses, selling reductions into the federal scheme	Average Eskom emissions factors, average electricity prices for South Africa, accessing income tax rebate 12L and avoiding the payment of the carbon price on electricity
Reduction in electricity consumption (MWh/a)	3770	3770	3770	3770
Resulting reduction in CO <sub>2</sub> -e emissions (CO <sub>2</sub> -e t/a)	3054	3242	3094	3883
Reduction in electricity costs (US\$/a)	409 573	365 690	779 561	144 813
Additional income from carbon offsets (US\$/a)	35 545	31 449	36 013	-
Cost reduction from avoided carbon tax (US\$/a)	-	-	-	38 099
Additional cost reduction from income tax savings (US\$/a)	-	-	-	1 316 484
<b>Total benefit (US\$/a)</b>	<b>445 118</b>	<b>397 139</b>	<b>815 574</b>	<b>1 499 396</b>

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# In summary

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We are operating in an uncertain policy environment

Energy costs are controllable, it is not all about the flow of electrons

Benchmarking offers new insights and drives different outcomes

We need to pay more attention to the materiality of energy  
productivity decisions



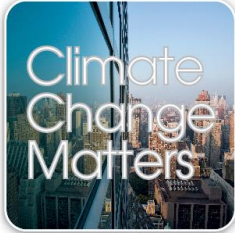
The lack of a carbon price is a concern for energy productivity in  
Australia





**CEEC**  
THE FUTURE



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# Glossary

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ACCUs – Australian Carbon Credit Units

ANREU – Australian National Registry of Emissions Units

CER – Clean Energy Regulator

Clean Energy Act – now repealed carbon tax's legislative framework

COP – Conference of the Parties

CFI – Carbon Farming Initiative

ERF – Emission Reduction Fund

NGER – National Greenhouse and Energy Reporting Act

Safeguard mechanism – penalty for facilities (greater than 100,000 tCO<sub>2</sub>e) exceeding historical baseline