CLEAN COAL TECHNOLOGY

INTRODUCTION

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OBJECTIVE - CLEAN COAL SESSION

Coal is facing significant threats as an energy source in most leading countries due to its emissions of greenhouse gases.

Many believe such emissions are leading to global warming.

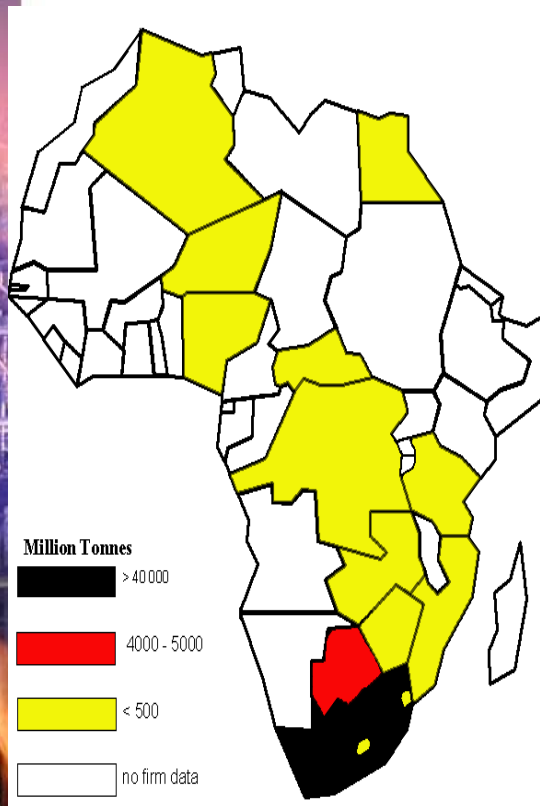
Coal is not the problem, but it is how it is used that is the problem.

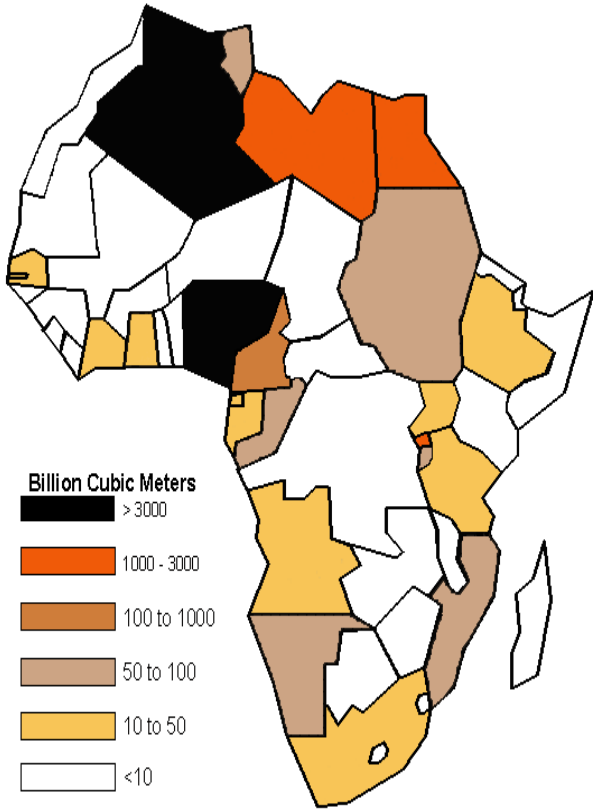
Significant attention needs to be paid to processes and plants that will **ensure its clean and sustainable use in future.**

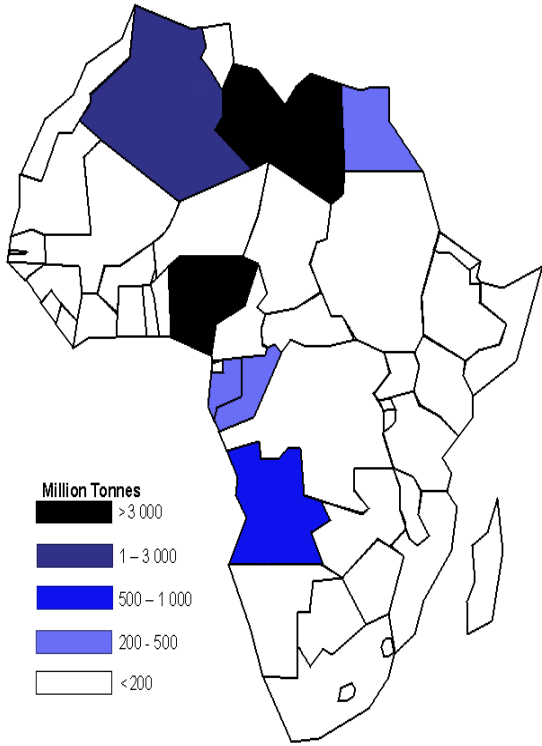
This session endeavours to present a selection of clean coal technologies and their concepts.

NATIONAL CONTEXT OF COAL

FOSSIL FUEL DISTRIBUTION IN AFRICA

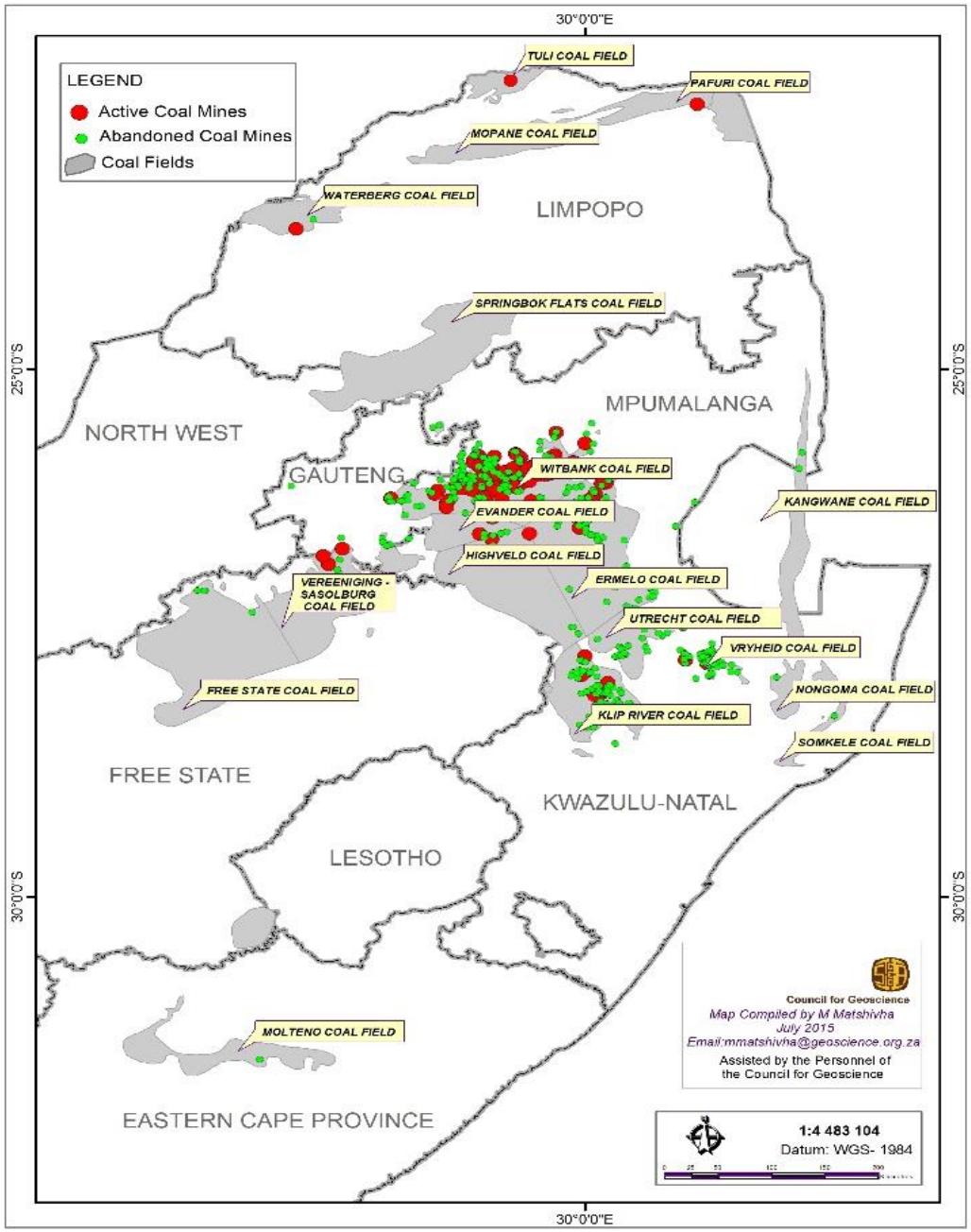






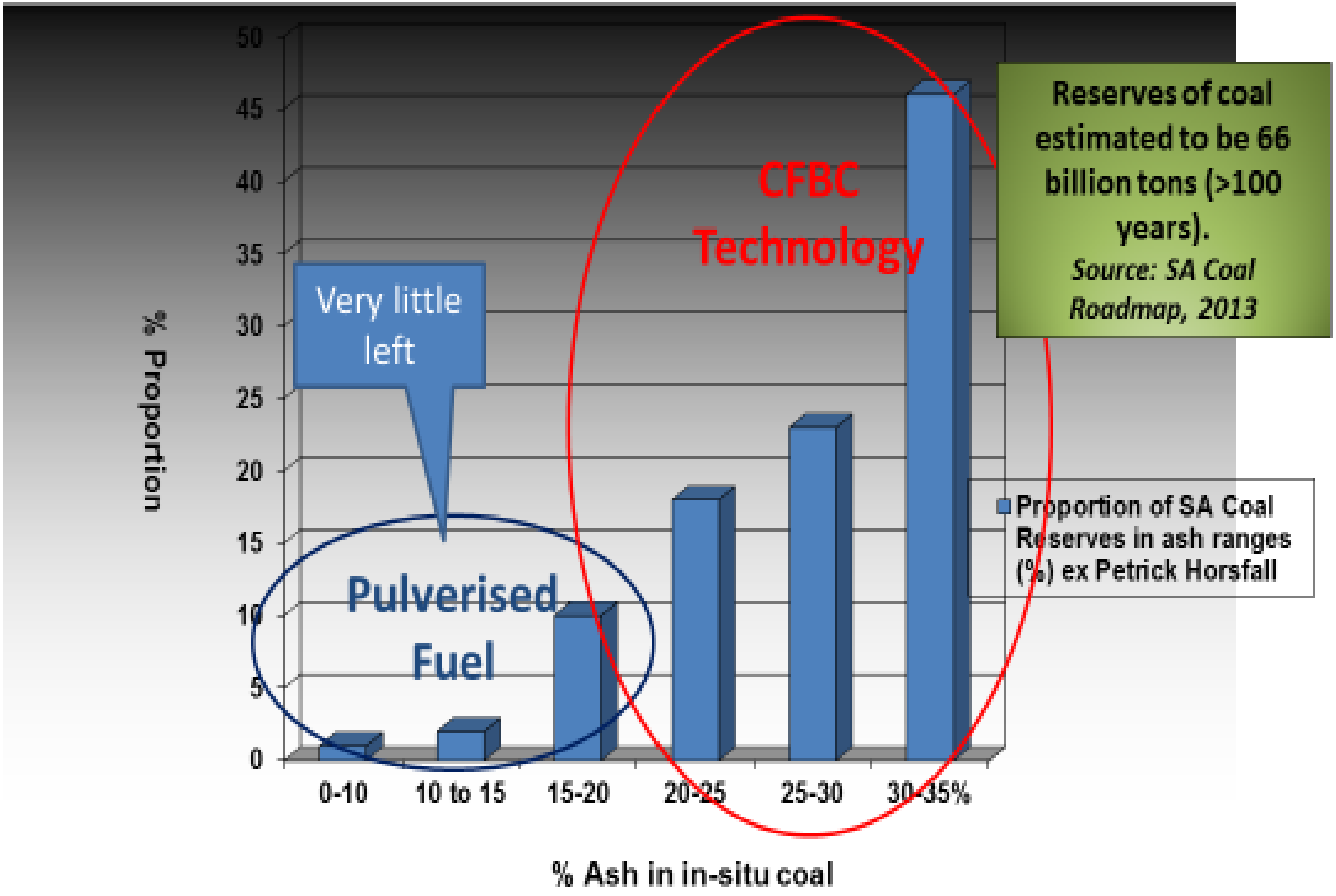
COAL **GAS** **OIL**

COAL DISTRIBUTION IN SA



South Africa has 200 years of coal resources in the ground

COAL QUALITIES IN SOUTH AFRICA



65% + ash coals being mined and included in market products today

RELEVANCE OF COAL IN SOUTH AFRICA

Coal in SA accounts for: -

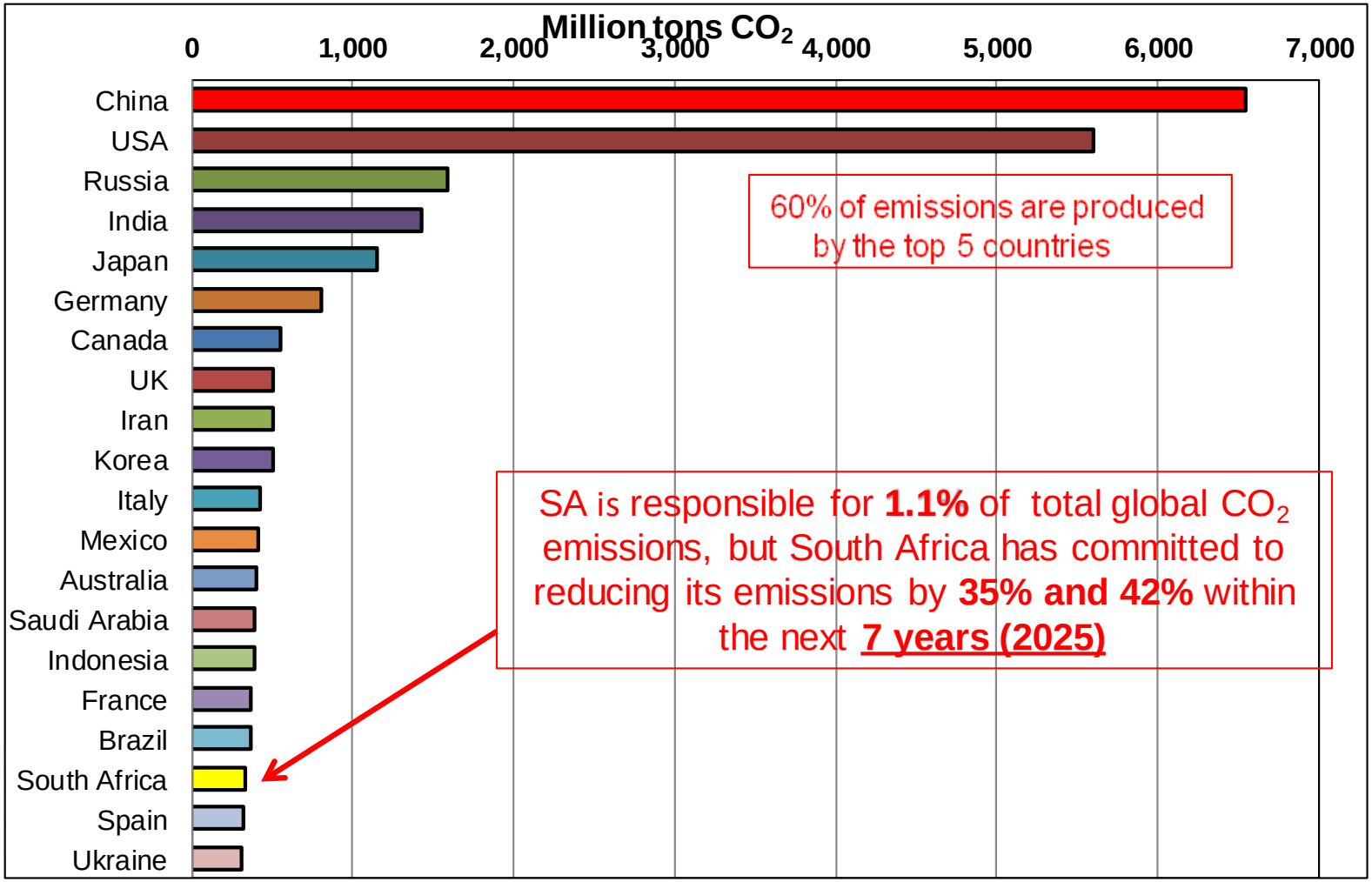
- **Highest foreign exchange earnings** from 2011 **(R50 Billion in 2017)**
- **Total coal sales local and export** generated **R120 billion 2017**.
- **Largest mining income earner**, beating gold, platinum, diamonds
- **>91% of SA energy production**, 81% of the regions' energy
- **100% of carbon reductants** in the metallurgical industry
- **>33% of liquid fuel**s - petrol, diesel and other requirements
- **>200 major chemicals** for over 7000 of carbon-based products

RELEVANCE OF COAL IN SOUTH AFRICA

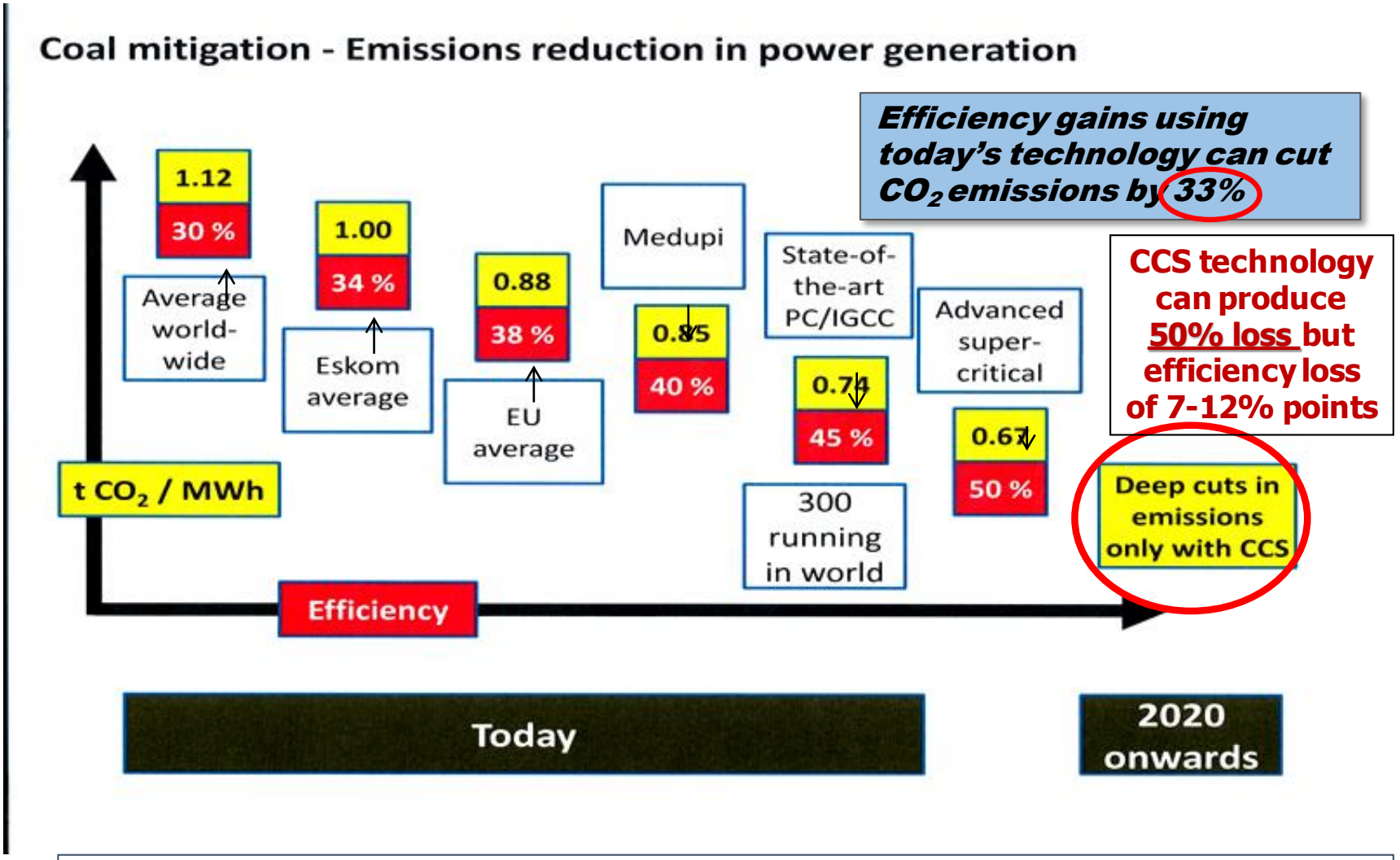
Socio-economic factors

- **Over 255 000 direct employees** in coal mining, power generation, Sasol, metallurgical industries, hospitals, railways and over 6 000 coal-fired industrial factories, including those producing paper, plastics, explosives, petrol, diesel, brick/tile, chemicals, sugar, food, +
- **More than 4 times employed** in related services eg transport, supporting industries or dependents.
- **Major coal mines support social services -** schools, hospitals, clinics, housing and retail trade
- **Coal industry supports most major towns** in Mpumalanga and Limpopo, and some in KwaZulu Natal (Witbank over 100 000)

WORLD CO_2 EMISSIONS BY COUNTRY



HOW TO REDUCE CO_2:
HIGH EFFICIENCY AND LOW EMISSIONS – HELE PROGRAMME



NB: South Africa has little or no long term storage possibilities for CO_2

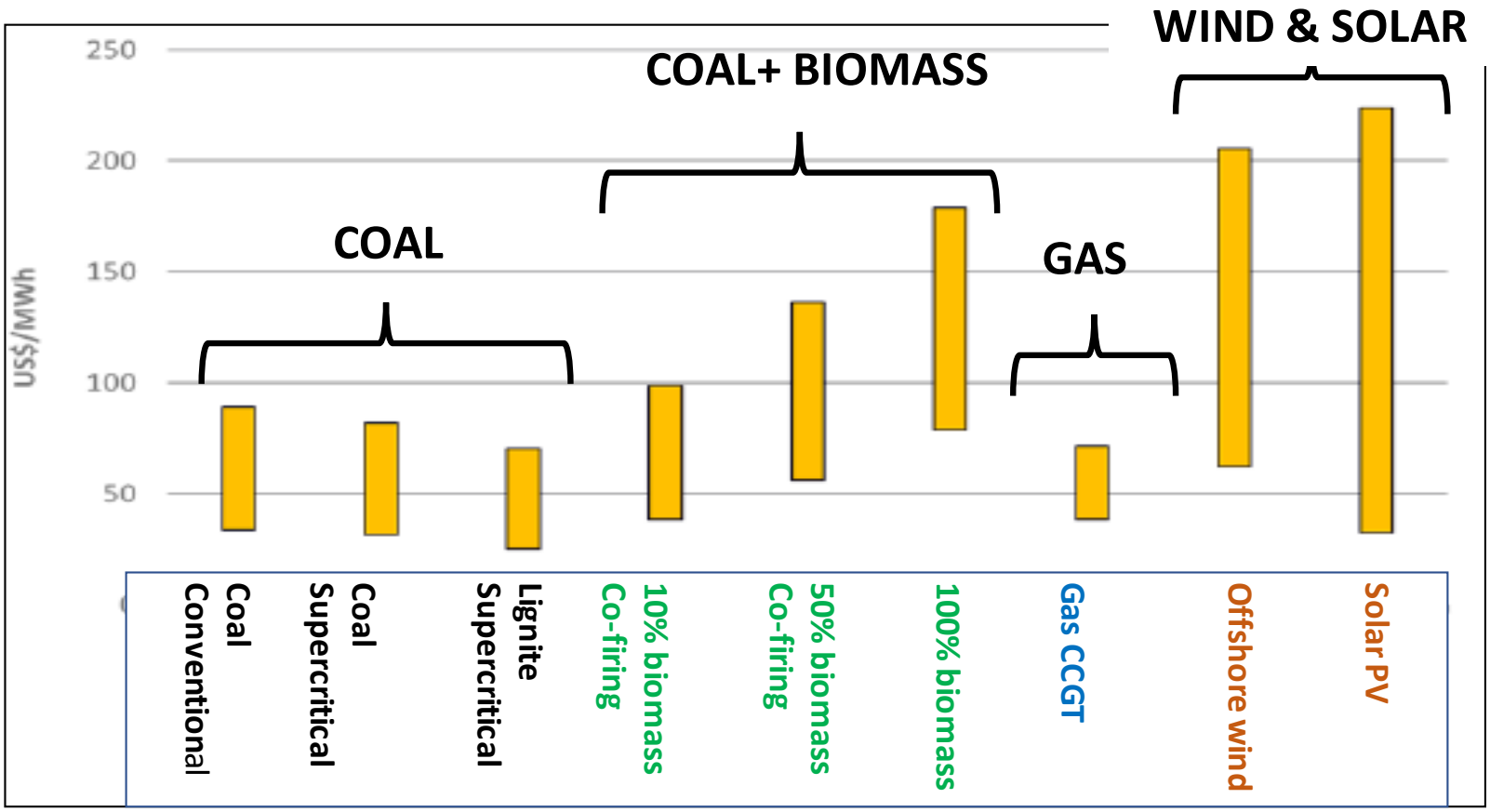
RELEVANCE OF COAL AND CCT

ULTRA SUPERCRITICAL POWER GENERATION (USC) IN AFRICA

Kenya's Amu "Clean Coal" Power Station:

- **Highest efficiency in the world - up to 49%** (world av 33%)
- **Reduces SOx and NOx and particulates by >99%**
- **Lowers CO_2 by 512 000 tons annually** (re to Supercrit plants)
- **Below emissions Standards of the World Bank and OECD**
- **Lowest non-subsidised tariff** in the country – **7.81/kWh**
- **Reduces power generating costs by 12-36%**
- **Cost of projects $2 Billion**
- **Will provide 30% country power, extensive employment**
- **Highly flexible operation for daily demand**
- **Similar sized plants in Germany, Malaysia and Dubai**

LEVELISED COST OF ELECTRICITY GENERATION – 2a

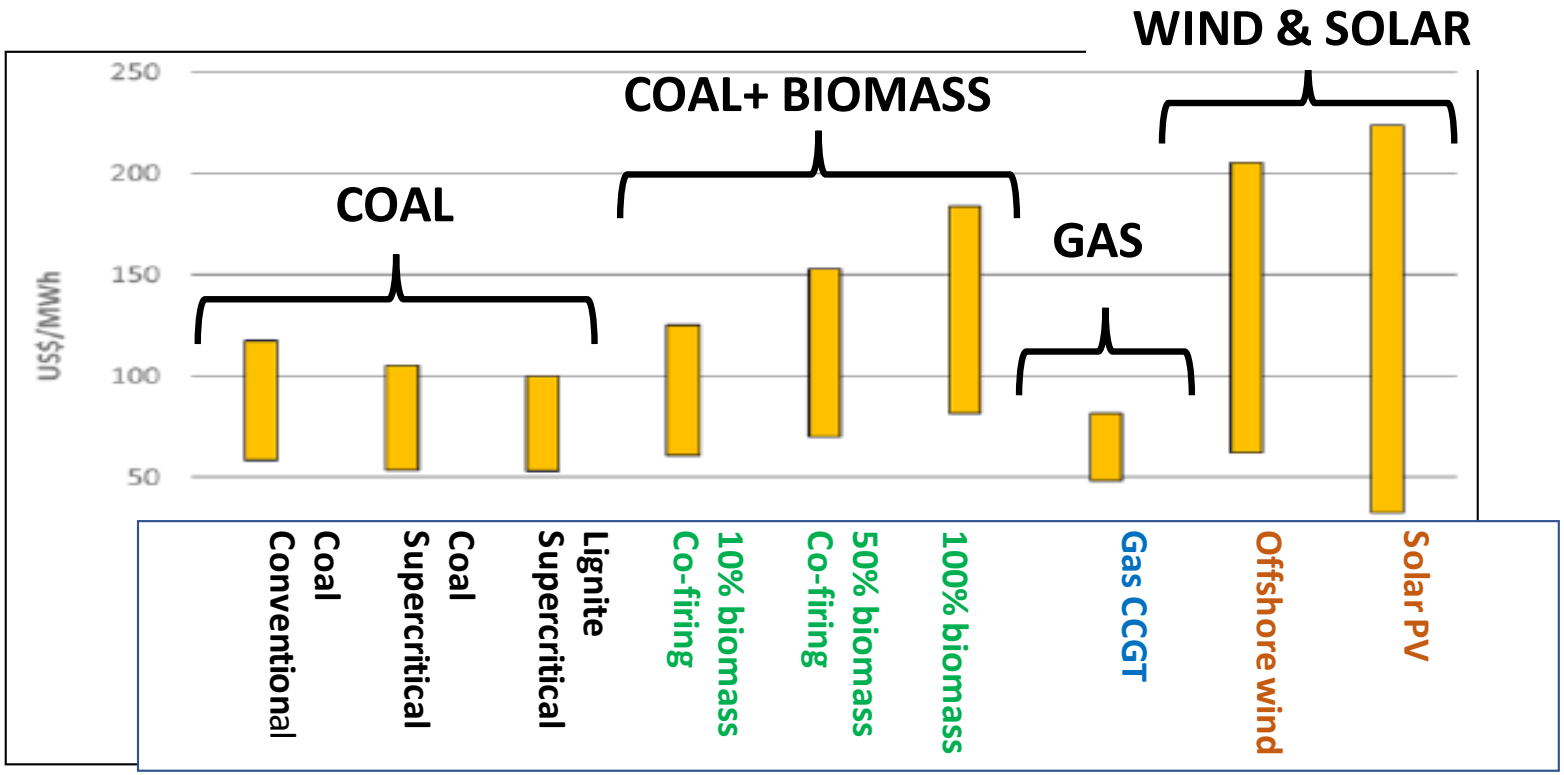


- LCOE from co-firing is seen to be competitive with offshore wind and solar installation
- There is <u>LESS CERTAINTY IN THE ESTIMATION of the LCOE for Renewable technologies</u> than for other technologies

Source:: IEA Clean Coal Centre, 2018

LEVELISED COST OF ELECTRICITY GENERATION - 2b

(WITH $30 CARBON TAX)



- With carbon tax, wind and solar become cheaper than co-firing in some cases.
- The <u>RANGE in LCOE estimation for wind and solar is significant</u> compared to others

Source: IEA Clean Coal Centre, 2018