CLEAN CARBON INDUSTRIES Lda

65 000 bbls per day

liquid fuels from Low Grade Coal

Tete Mozambique

Hugh Brown - Chief Executive CCI Lda

VIII Conselho Coordenador Nampula 15-17 August 2012

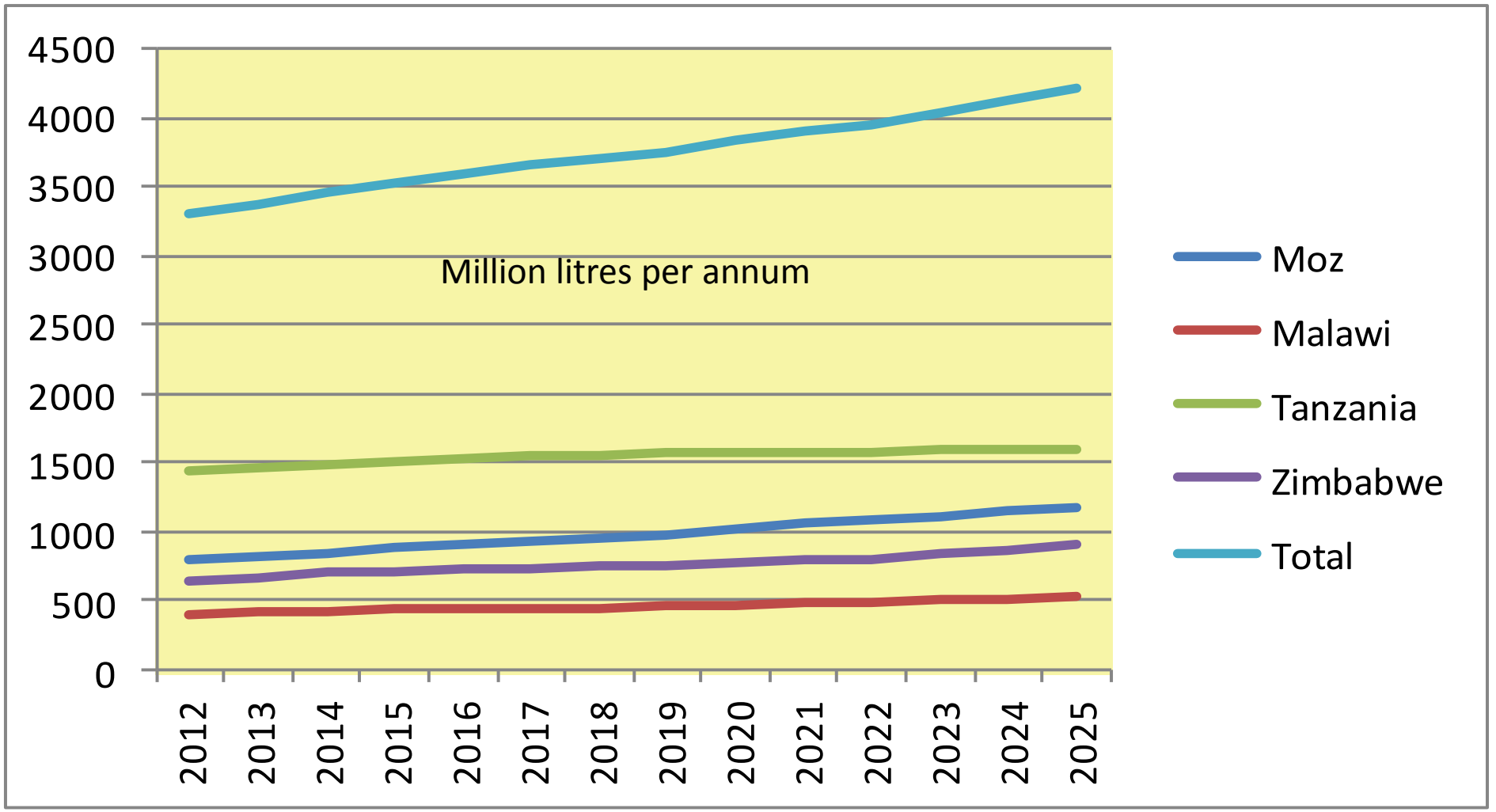
Project Objectives

- To manufacture liquid fuels from own and waste coal from Tete.
- To produce 65 000 bbls per day (3.5bn litres per year), 20 000 bbls petrol and diesel and 45 000 bbls A1 Jet fuel.
- To export 40 000bbls per day of the jet fuel
- To use existing road rail and sea distribution methods with an export pipeline to Savane from Tete along Sena rail servitude
- To serve Mozambique markets first and then export markets
- To consider production of chemical feedstock as well as fuels
- Export of liquids can be through road network and sea ports of Mozambique
- To save $800m per annum in foreign exchange
- To create 2500 direct jobs and appropriate housing and social services

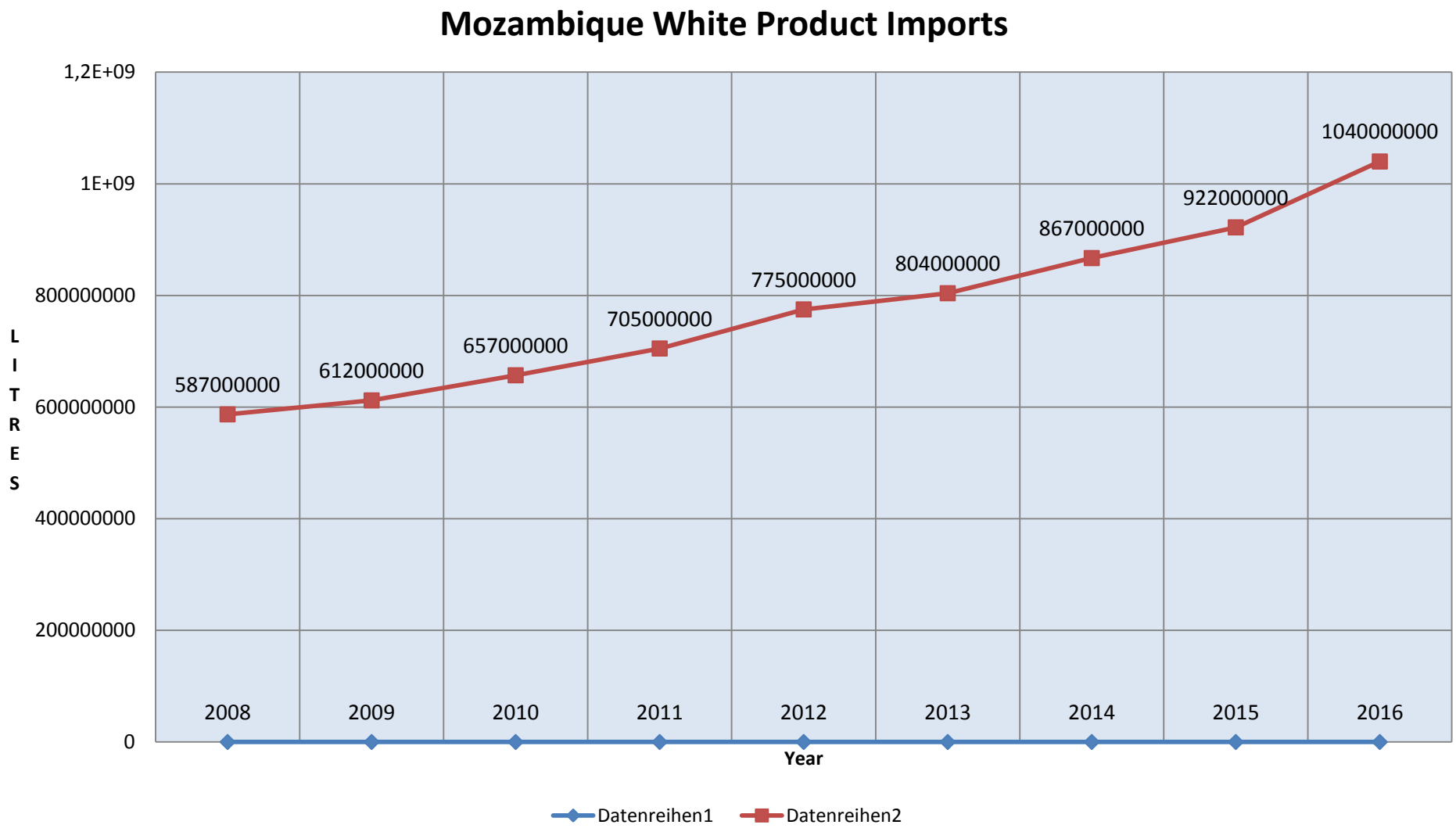
Importance to Mozambique

- Enables Mozambique's fuel supply to be secured inside of Mozambique at a known future feedstock price as opposed to using gas as a feedstock which is linked to oil price.
- Reduces current foreign exchange outflows used for fuel purchases. (+-800m USD per year)
- Uses low quality coals which cannot be exported as feedstock for fuel production and leaves gas to be converted to LNG for export earning foreign currency, power generation and minerals beneficiation.
- Reduces low grade unusable coal pile in Tete as export grades are produced, thus reducing environmental risk in the Tete basin.

CCI CTL Potential Regional Fuel Markets

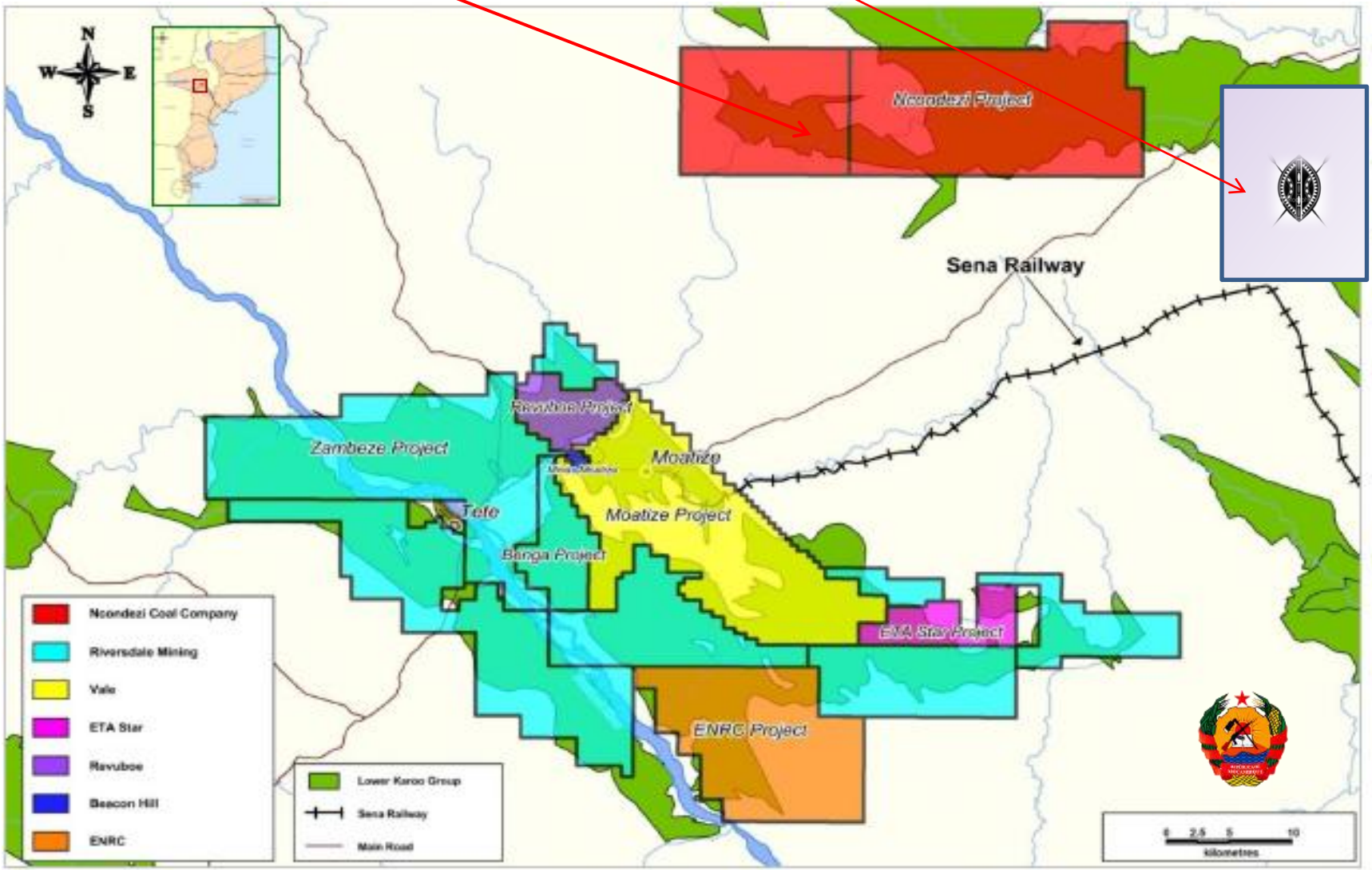


Mozambique Fuel Imports

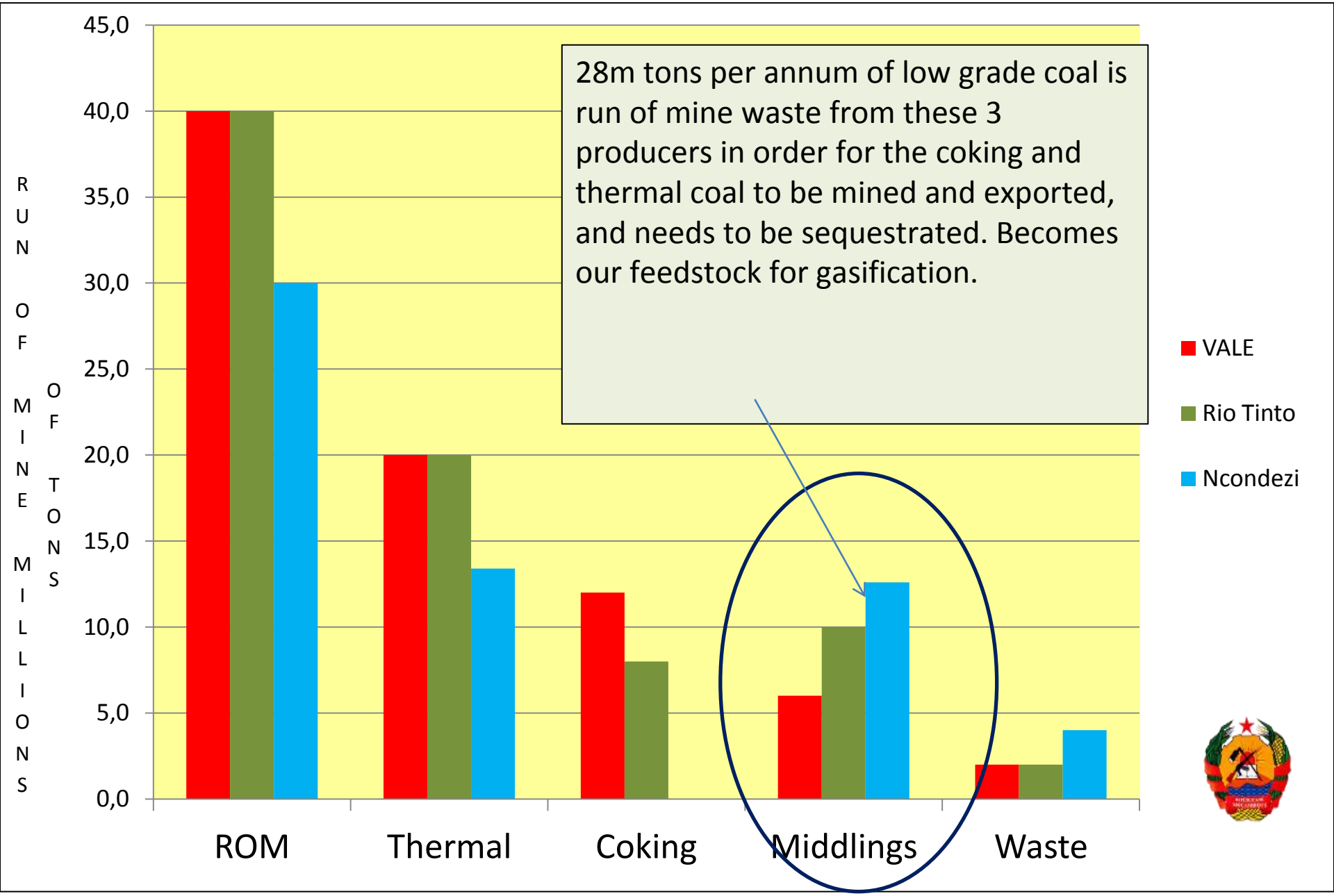


Project Configuration

Coal Feedstock 2012



COAL MINING SCENARIOS PER ANNUM (assumed)



“Waste” Coal Type Specifications

Ncondezi /Warrior Middlings	Characteristic
Moisture, wt %	8%
Volatile Matter, wt %	10%
Fixed Carbon, wt %	90
Sulfur, wt %	0.2 – 1.2
Free Swelling Index	0 – 8
Ash Content, wt %	40 -50%
Ash Softening Temp – T_1, deg C	1,500
Heating Value, Kcal/kg	17Mj/Kg

Advanced Gasification Technology

The Key to adding value from Low Value High Ash Coals

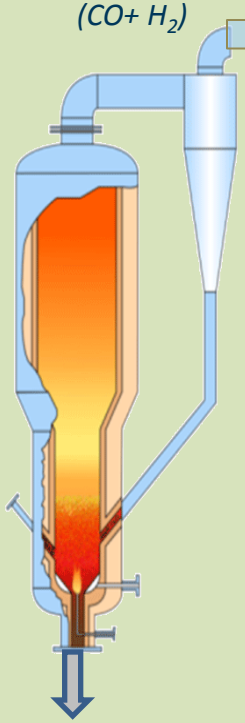
Low Value Feedstock

Low cost low quality coal

GASIFIER (REACTOR)

Synthesis Gas

($CO + H_2$)



Ash

Conversion Processes
RECTISOL, FISCHER TROPSH AND TREATMENT

CO_2 Capture Capable

Downstream Fischer Tropsch And treatment Processes

By-Products

Sulfur

High Value End Products

Fertilizers

- Ammonia
- Urea

Gas

- SNG
- Fuel Gas

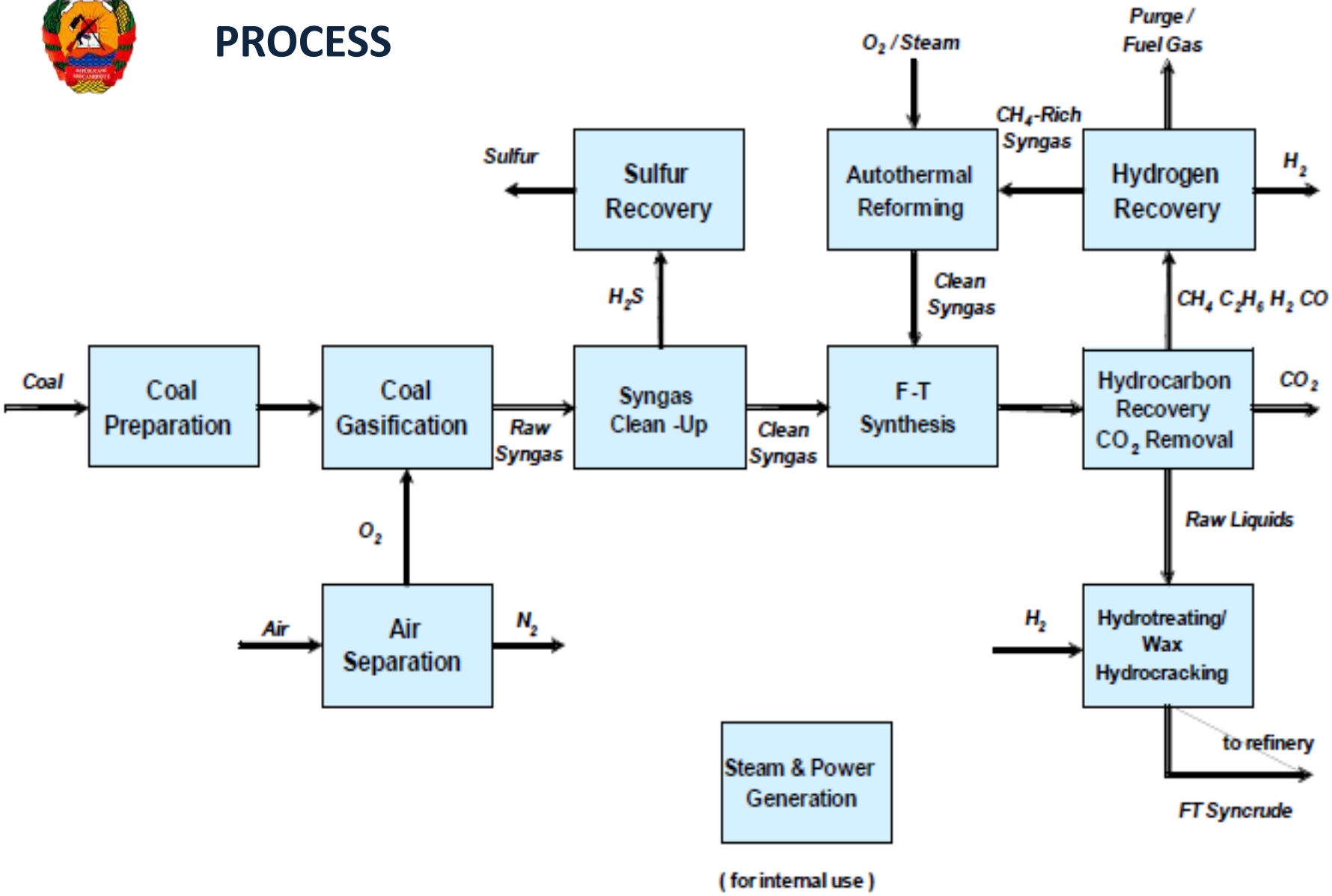
High Quality Fuels

- **Diesel - Petrol**
- **Aviation A1 Jet**

Chemicals

- Methanol
- Hydrogen
- Olefins
- Acetic Acid
- Glycol

PROCESS


Coal
Coal Preparation
Coal Gasification
Air
Air Separation
N_2
O_2
Raw Syngas
Syngas Clean -Up
H_2S
Sulfur
Sulfur Recovery
Clean Syngas
F-T Synthesis
O_2 / Steam
Autothermal Reforming
CH_4-Rich Syngas
Purge / Fuel Gas
Hydrogen Recovery
H_2
CH_4 C_2H_6 H_2 CO
Hydrocarbon Recovery CO_2 Removal
CO_2
Raw Liquids
H_2
Hydrotreating/ Wax Hydrocracking
to refinery
FT Syncrude
Steam & Power Generation
(for internal use)

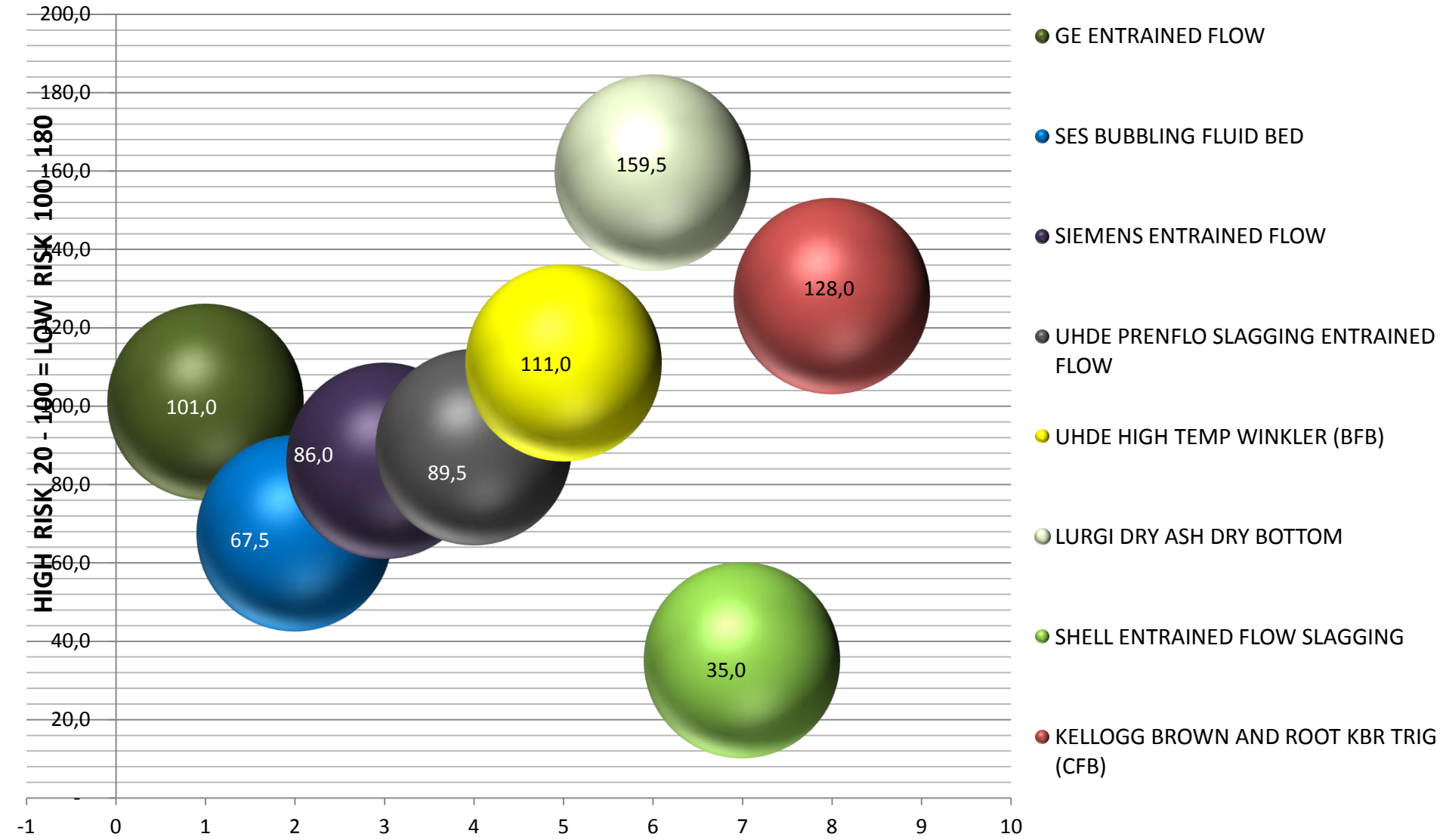
International Prefeasibility Study

Best Engineers from USA, Germany and top ex SASOL/Mossgas specialists on team

Expert team review USA/Europe

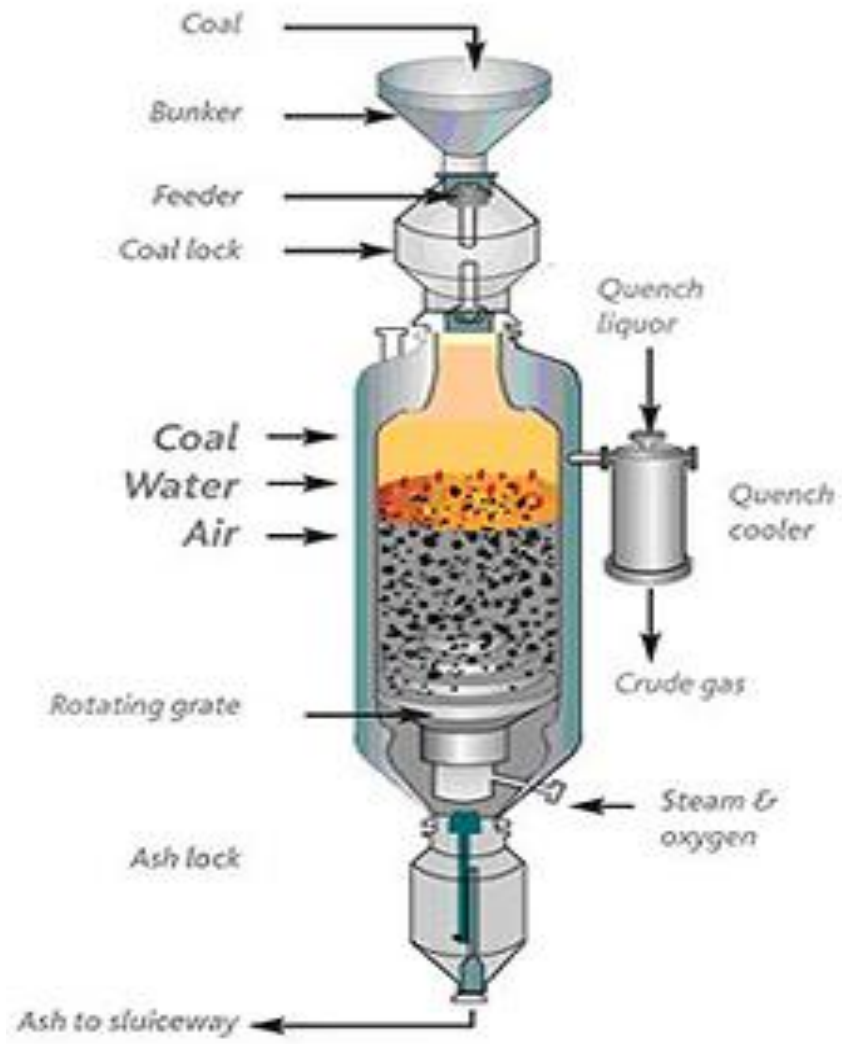
Worlds technologies investigated against Tete coal characteristics

GASIFIER RANKINGS - FEEDSTOCK, EXPERIENCE AT COMMERCIAL SCALE AND EPC RISK



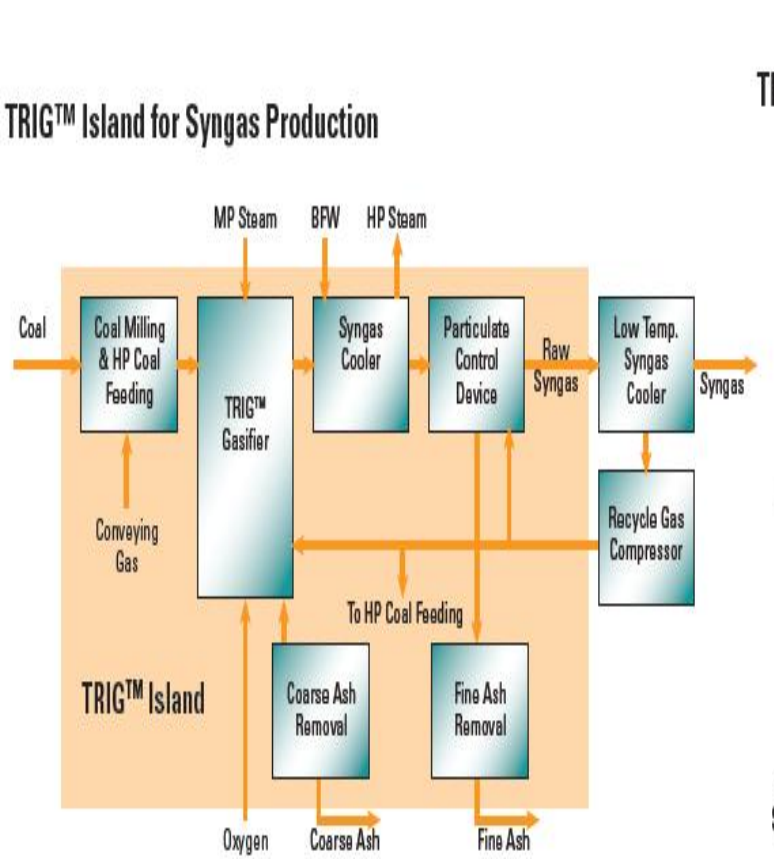
Lurgi (Germany)

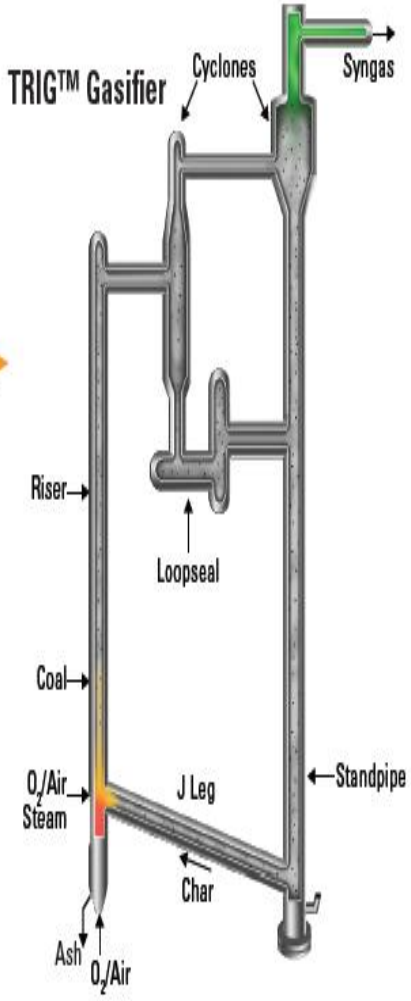
- Due to their experience base at **SASOL** gasifying low grade Karoo type coals at large commercial scale, Lurgi scored a high 54.0 points out of 60.0 for feedstock suitability.
- In terms of experience at scale, the SASOL plant is the largest coal gasification plant worldwide by far. They scored a total of 58.0 out of 60.0 for confidence at scale.
- Finally they have a long track record of engineering and shut down support at SASOL and were extremely capable in supporting Fluor Daniel when SASOL was constructed. However they do not undertake EPC contracts themselves. So the EPC capability score was 47.5 out of 60.0. Overall Lurgi scored an impressive 159.5 out of 180.0 points.



KBR USA

- KBR ranked second in the competent persons rankings, and has the best EPC capability of all candidates.
- Their very robust technology is also easily operated, a good feature for Mozambique. (isolated) KBR scored 44.0 out of 60.0 for feedstock compatibility as they have tested some high ash coals including one from South Africa.
- Experience at scale is considered both positive and negative. Because the pilot plant is the only operating reference they have, they were penalized for not being at commercial scale as such. However due to their major experience in pioneering oil cracking technology which has certain similarity in vessel characteristics their scale up implications were considered simpler than other designs.
- Their massive EPC financing and engineering capability will be a major positive to a potential project in Mozambique. They scored 50.5 out of 60 for this item. Overall KBR scored 128 points out of a possible 180 points.



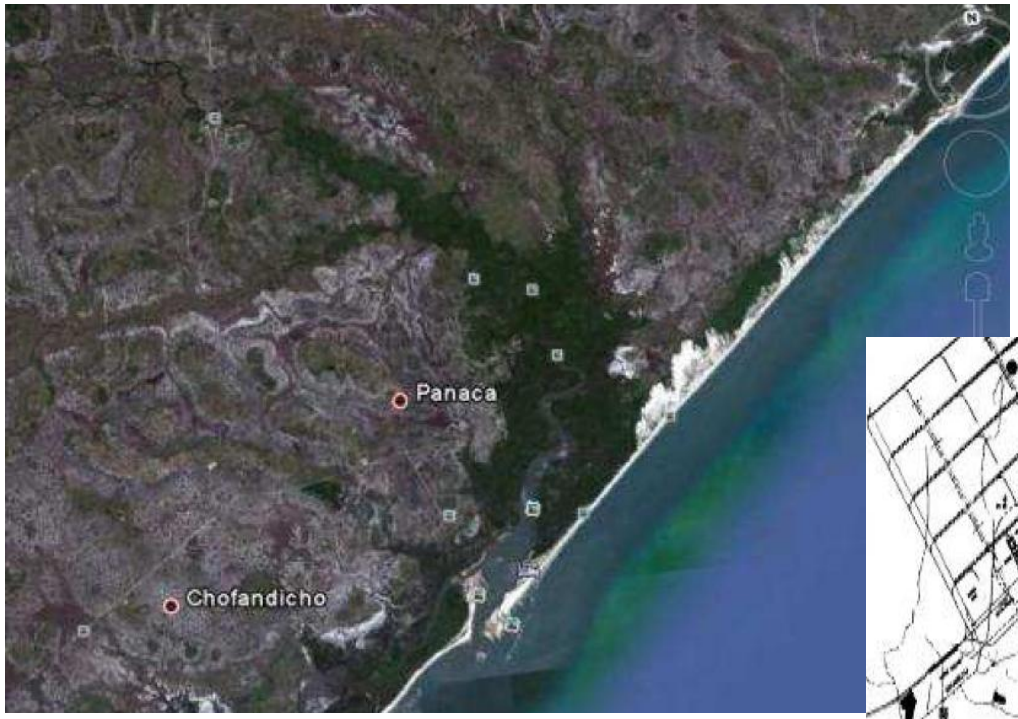


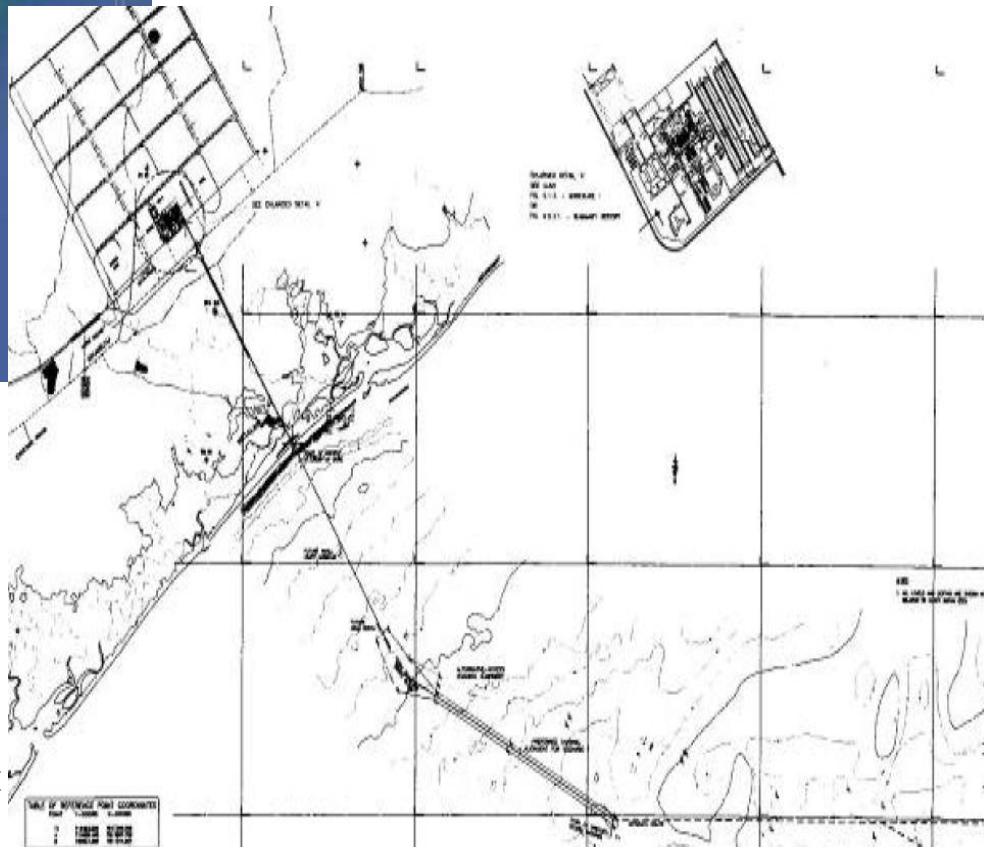
Results of CCI technology review with world wide coal gasification suppliers regarding use of Tete Coal

- Lurgi technology suitable
- KBR technology suitable
- CCI has secured both of their commitment to supply technology under license with a guarantee to our consortium
- Kick off meeting with both companies in USA held and Europe held in June/July 2012
- Both companies are engaged in concept engineering
- We are funded and ready to go to end prefeasibility study now… due Oct 31st 2012

Pipeline Route along Sena railway: 520km to Savanna for product - Servitude granted for export of liquid fuels

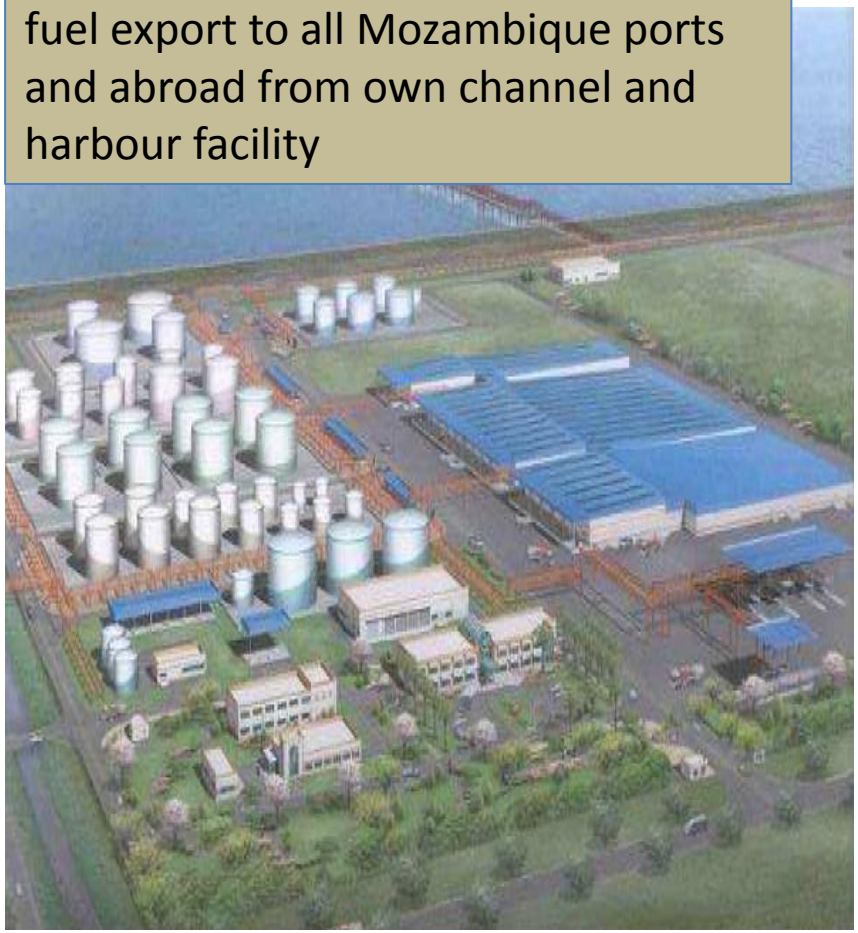
Loading buoy and FTZ at Savanna





Production and Export Facility

Tanker mooring and floating buoy for fuel export to all Mozambique ports and abroad from own channel and harbour facility

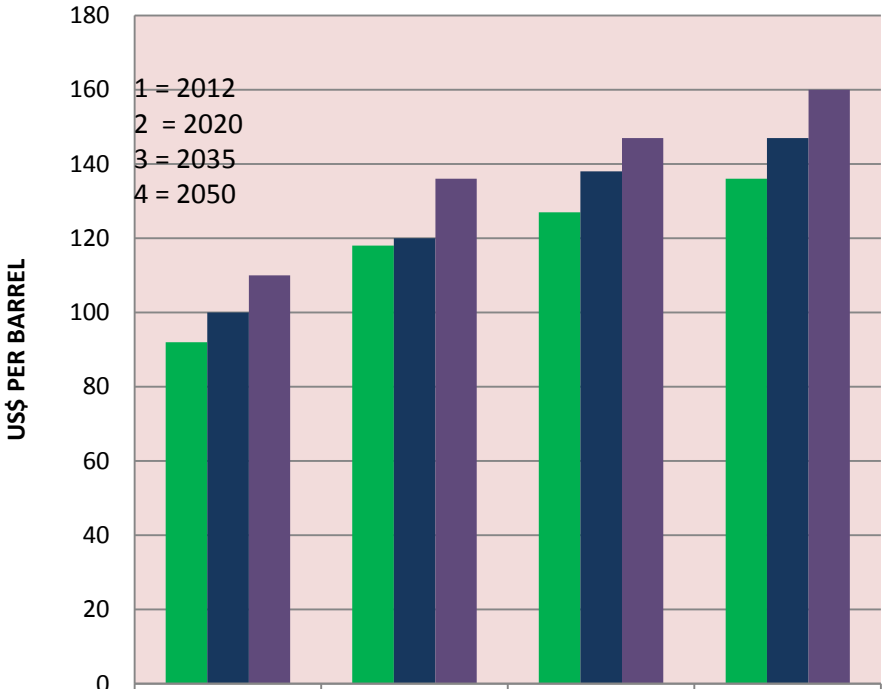


Gasification Plant, syngas reforming to fuels, plus methanol and export viatruck, rail and pipeline

Fuel Storage, Pipeline and mooring buoy and approach channel all owned by CCI, up to 80 00 ton ships handled

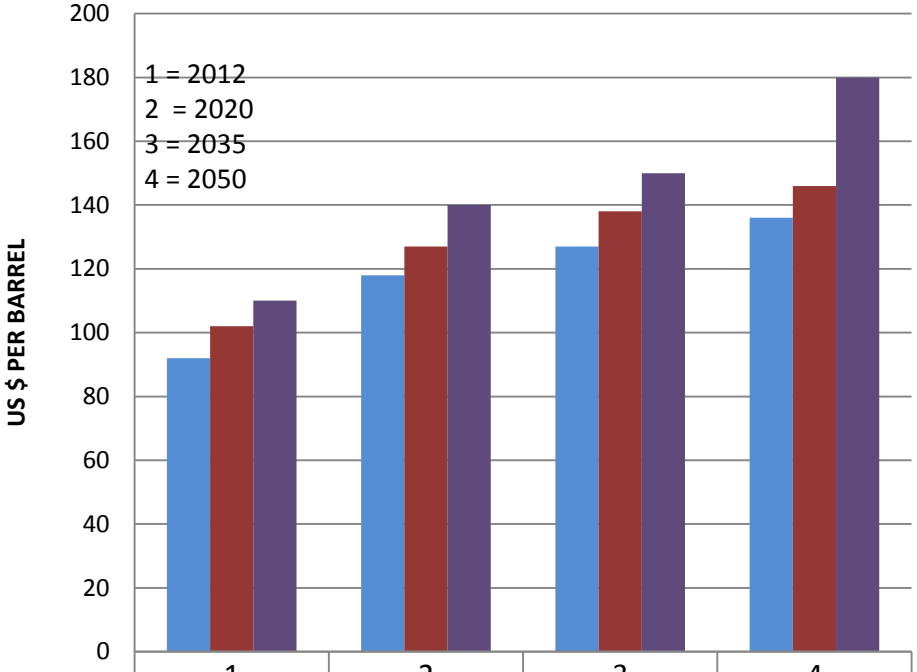
OIL PRICE PREDICTIONS

DOE OIL PRICE PREDICTIONS



	1	2	3	4
LOW	92	118	127	136
LIKELY	100	120	138	147
HIGH	110	136	147	160

CCI OIL PRICE PREDICTIONS

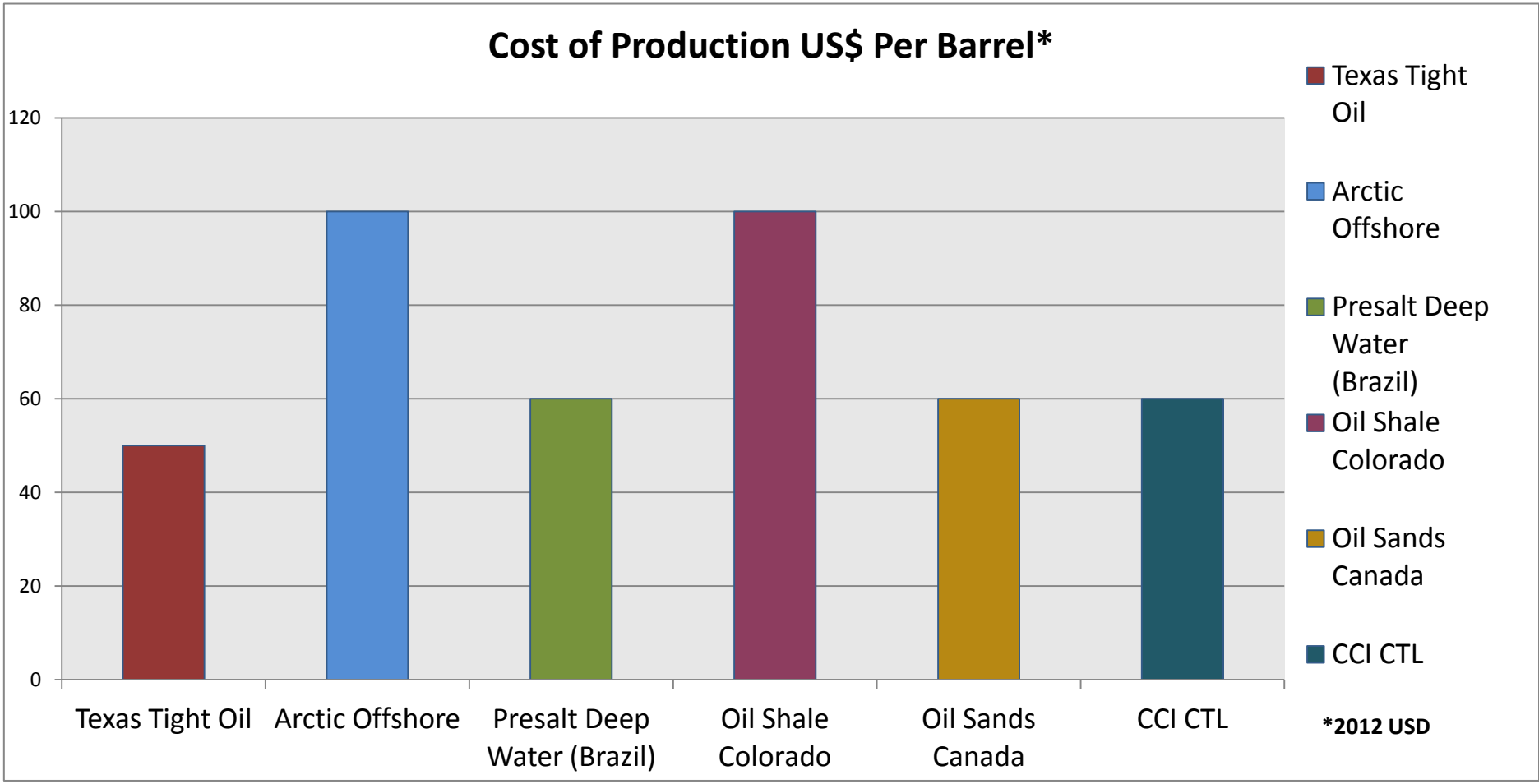


	1	2	3	4
LOW	92	118	127	136
LIKELY	102	127	138	146
HIGH	110	140	150	180

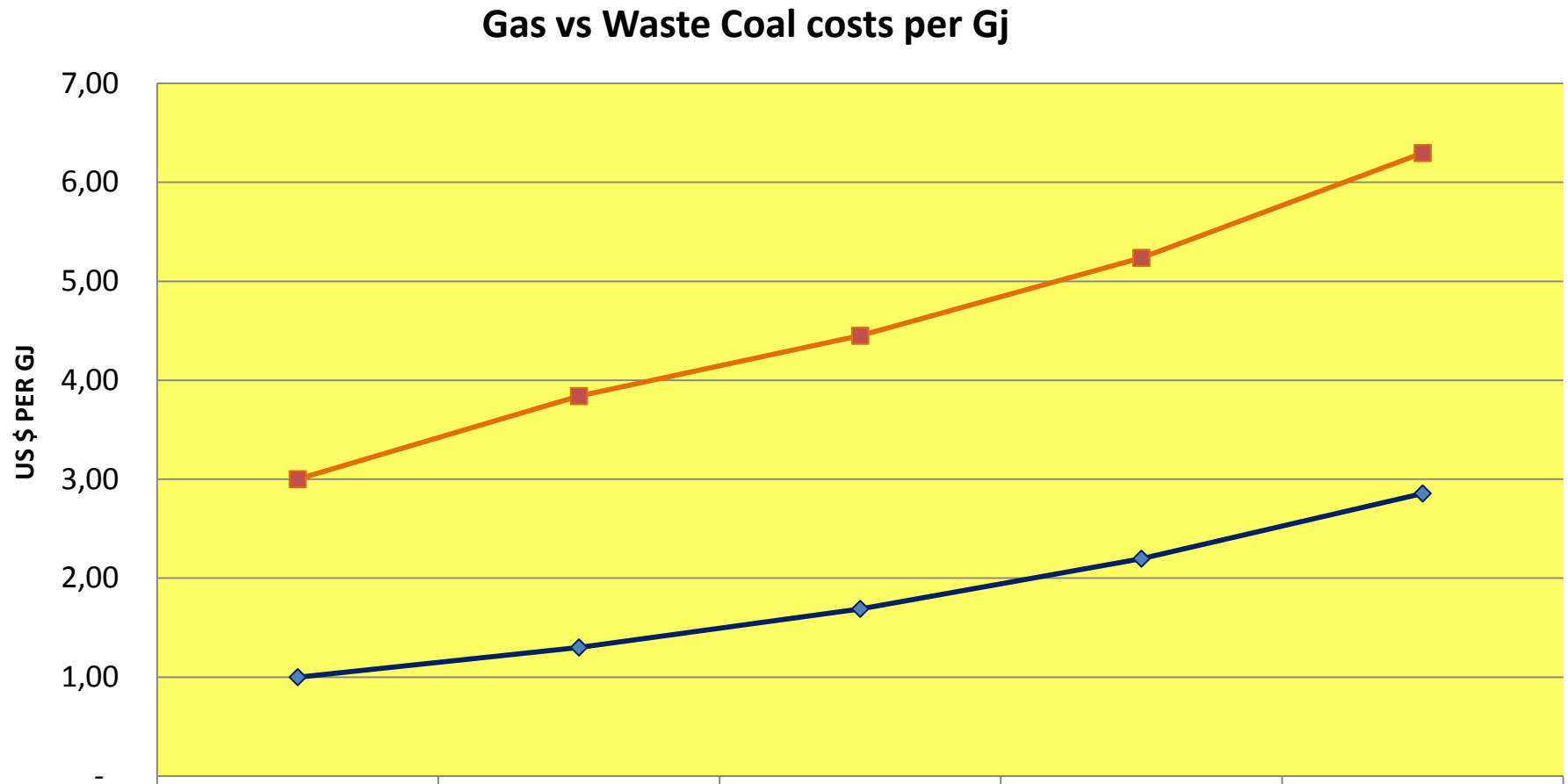
Capital Costs

- Plant Capital
  - US$6 450m
- Off-sites and Utilities
  - US$950m
  - Pipeline
  - US$600m
  - Port
  - US$200m

Competitiveness – Costs of Production



Security of Feedstock Costs (own supply)



	2012	2020	2030	2040	2050
Gas Costs	2,00	2,54	2,76	3,04	3,44
Coal costs	1,00	1,30	1,69	2,20	2,86

Status

- Project Prefeasibility study stage 1 completed.
- Technology review and coal tests complete
- Meetings with technology vendors in USA and Europe complete
- Team and consortium appointed, finalized
- Savanna Port site prefeasibility study done in 1999 confirms suitability of site. Requires some updating
- Conceptual Engineering has commenced
- Project overall requires prefeasibility study (50% complete) followed by bankable feasibility study. (2 years starting March 2013)
- MOA with Ministry of Energy signed
- All assumptions are in tact to date

Conceptual Engineering USA and Germany

Prefeas Phase 2 in progress

Phase ends 31 10 2012

- LKBR and Lurgi competing for gasifier plant
- Lurgi to supply liquids reforming and Fischer Tropsch Plant (Cobalt Catalyst technology)
- Basic plant engineering layout, costs and full project proposal ready end October 2012.

Binding Rights Agreement signed 8 Feb 2012 – Min of Energy Government of Mozambique (Gasification, Land Rights, Servitudes, Pipeline).

CCI /Min of Energy legal teams

Advantages of this Project

- Feedstock is reactive, rich in carbon, physically hard, with very low phosphorous and sulphur makes very clean quality fuel through gasification and Latest Fischer Tropsch downstream processing
- Security of supply from this project is un-paralleled due to integrated ownership of feedstock, availability of waste coal, plant, pipeline port terminal etc.
- De linked from the oil price.
- Security of asset and export chain guaranteed.
- Has good carbon credits in stable political country of Mozambique

We are already in the second stage of the prefeasibility stage of the project now.

Phase 1 prefeasibility study has been delivered to MINEN (March 2012).

We Look forward to an exciting and efficient development programme with the Ministry of Energy as our champion and partner

Hugh Brown CCI

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