FUTURE LIQUID FUELS FOR AUSTRALIA

Presentation

Engineering House, Brisbane, 20th September 2011

Gas-to-Liquids (GTL) & Coal-to-Liquids (CTL) – new energy resources with major liquid fuel security ramifications

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Acknowledgements

- Dr. Duncan Seddon, Duncan Seddon & Associates, www.duncanseddon.com Fuel Conversion Technology Specialists

- Eng. Mike Hayes, Thermotek

  Email: thermotek@ecn.net.au, coal logistics and project management

The Reason for this talk

Australia is running out of liquid transport fuels

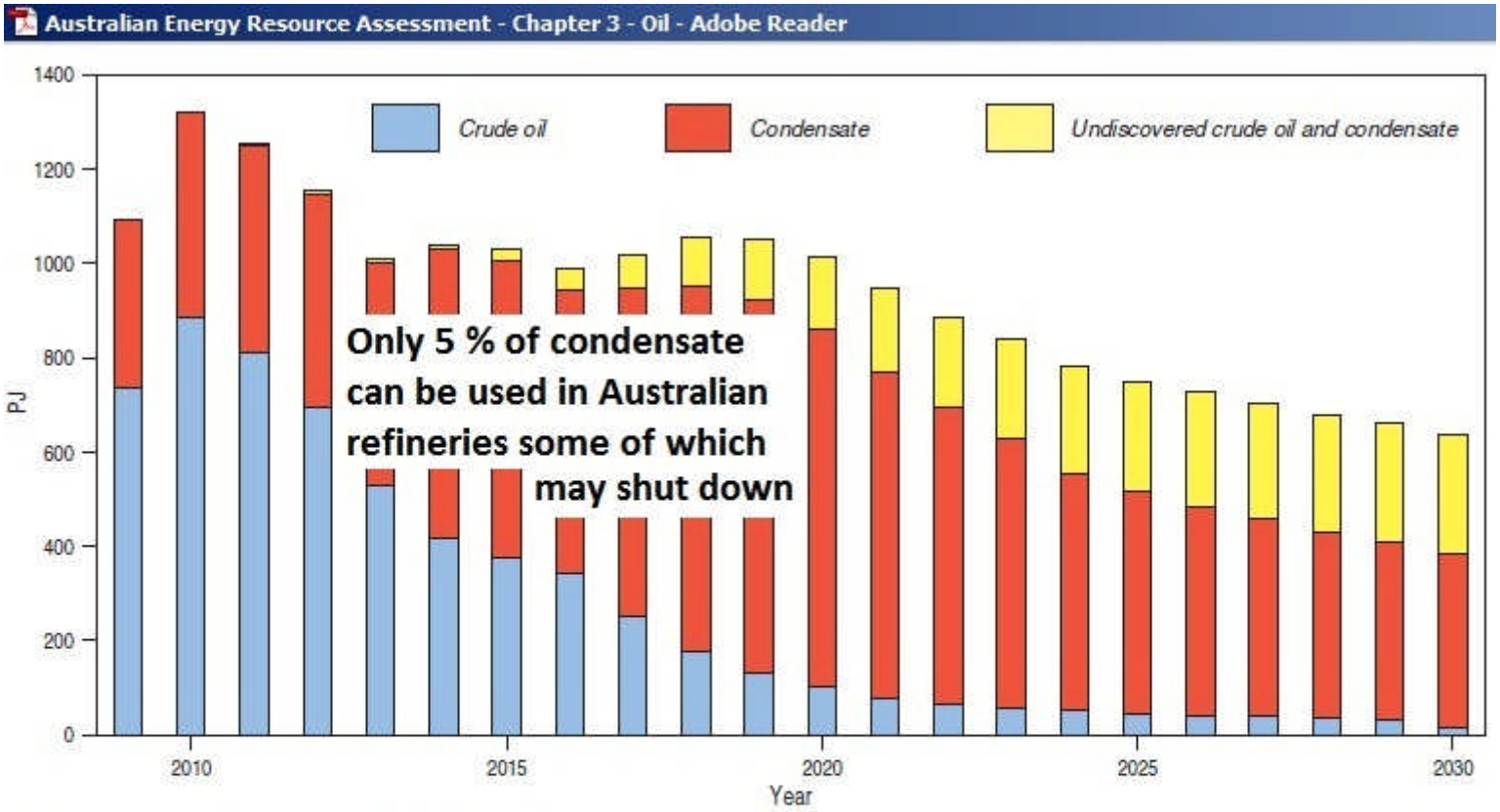


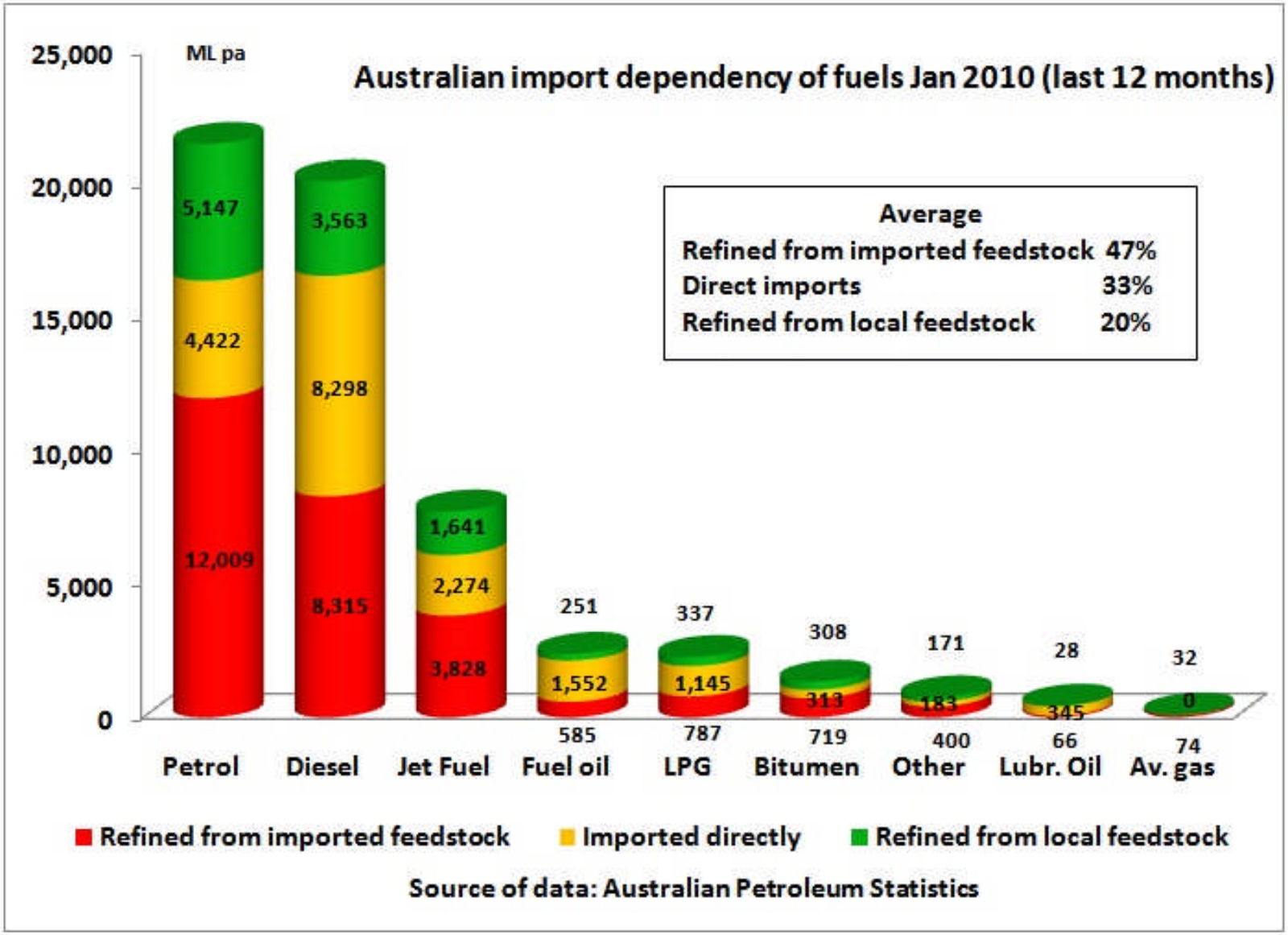
Figure 3.43 Australian oil production outlook from proven hydrocarbon basins AERA 3.43

Note: the production forecast is based on data from an industry survey of producing fields and Geoscience Australia's assessment of undiscovered resources in proven basins

Source: Geoscience Australia

https://www.ga.gov.au/servlet/BigObjFileManager?bigobjid=GA16759

Australia is importing ~80% of its petroleum

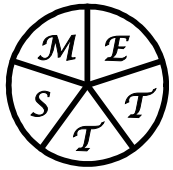


Production & shortfalls

- Australia imports around 500,000 bbl/day of crude,
- Australia imports around 420,000 bbl/day of refined product,
- Australia produces around 230,000 bbl/day indigenous crude (exclusive of condensate),
- Crude production is falling at around 6,000 bbl/day,
- So how many 50,000 bbl/day GTL/CTL production trains do we need to come on line to:
  - stop the decline in indigenous crude production, and
  - get back to say 60% self sufficiency?

Acknowledgement: Matt Mushalik (Crude Oil Peak)

Un-conventional Energy Sources 1



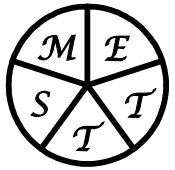
Fossil Fuels

- Coal Seam Methane
- Oil shales and tar sands
- Underground coal gasification
- Shale gas, shale oil and other tight petroleum occurrences

Non-fossil Energy Resources

- Geothermal Energy
- Renewables

Un-conventional Energy Sources 2



Fossil Fuels

Stranded Gas Resources (tight-gas and CSM)

Coal Wastes and Coal Washery Middlings

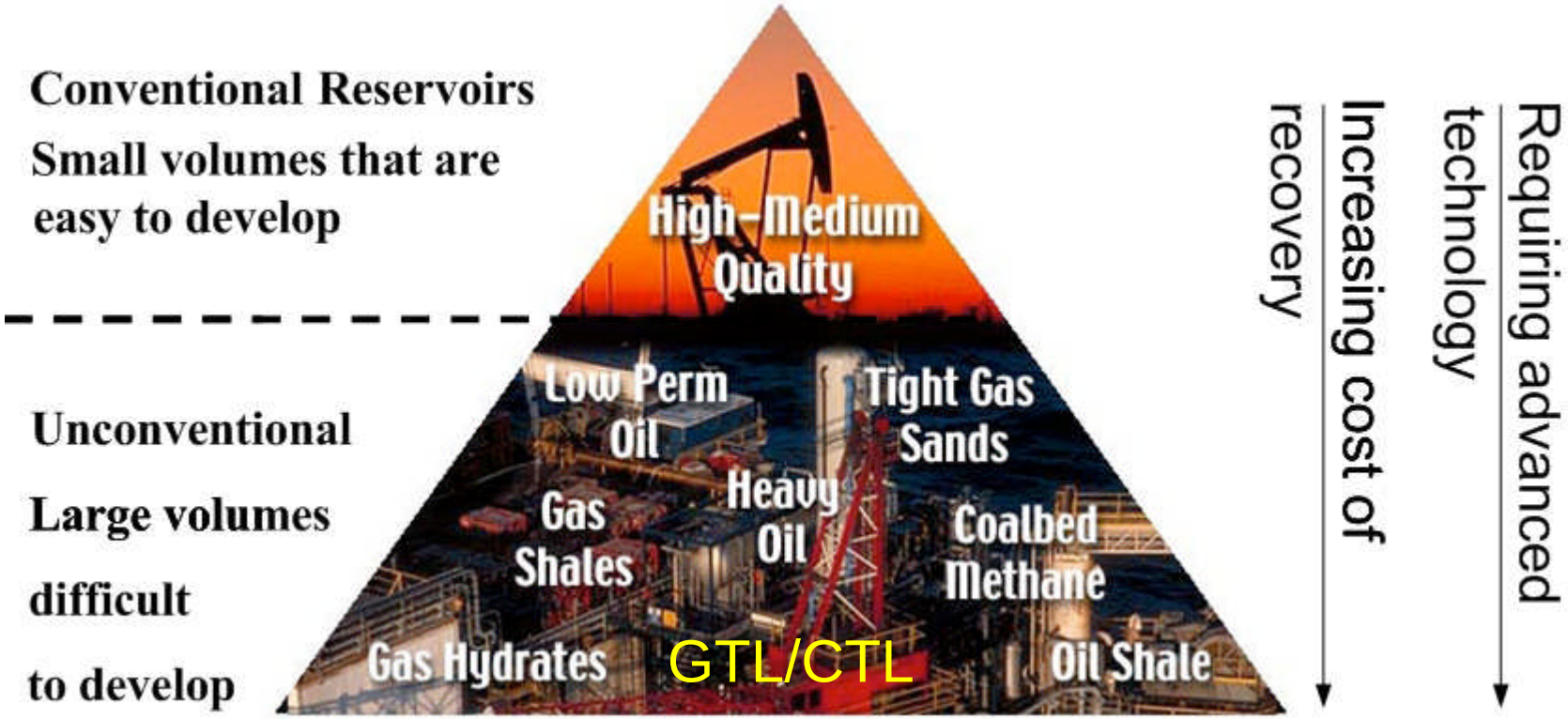
Underground coal gasification – synthesis gas (H_2 & CO)

Conversion of Non-conventional Energy Resources to Liquid Transport Fuels via synthesis gas (H_2 & CO)

GTL (Fischer-Tropsch) or Methane to Gasoline (MTG), or Methane to Methanol and/or Di-methyl Ether (DME)

CTL that uses synthesis gas derived from coal

Un-conventional Fuels



The resource triangle for oil and gas reservoirs

Source: NPC Global Oil & Gas Study - July, 2007

There are NO
‘GUSHERS’ in Un-conventional Fuels!

and

production is relatively costly.

Products and processes

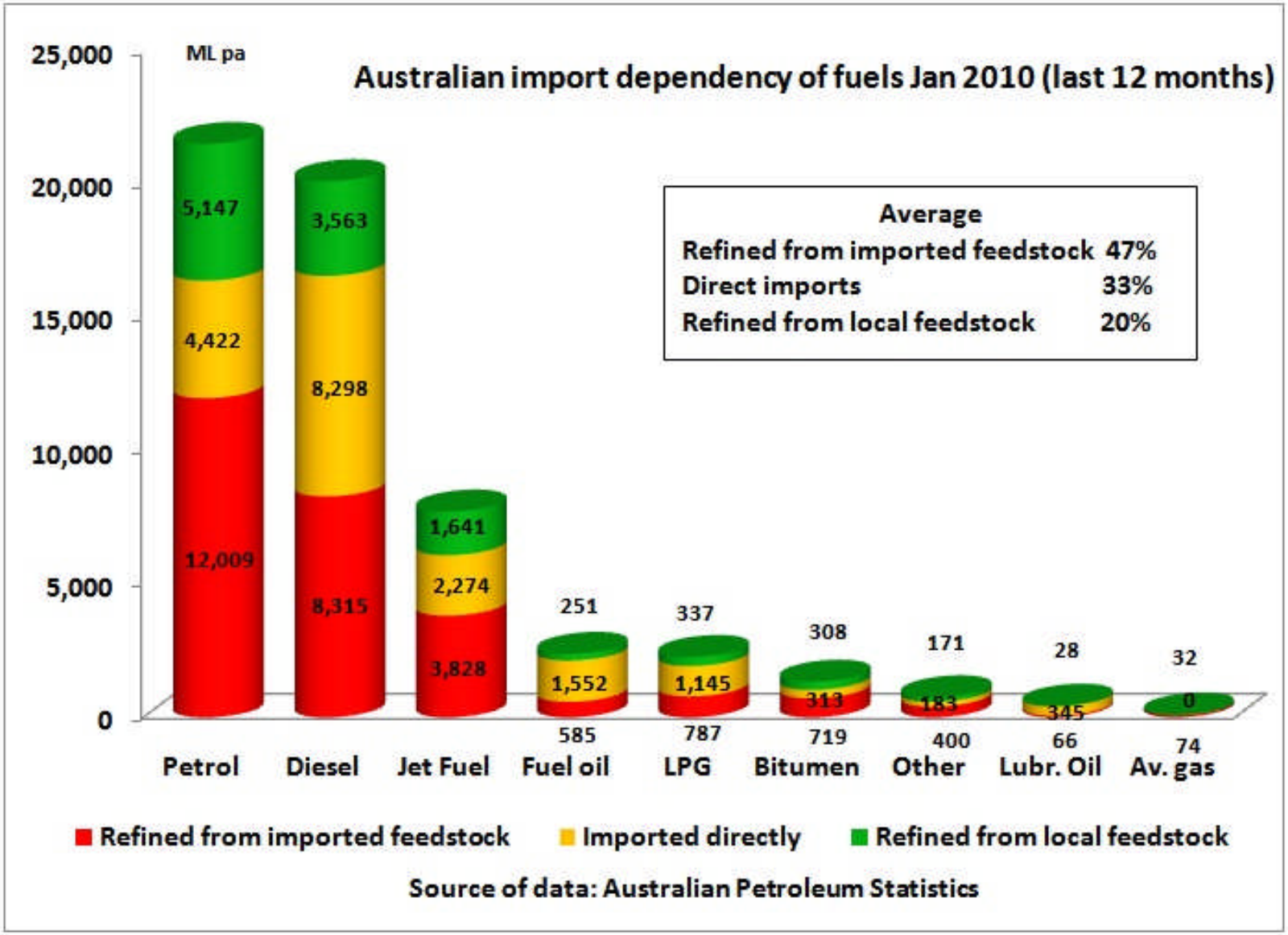
- Synthesis Gas (H_2 + CO) to synthetic fuels
  - $xH_2 + yCO \rightarrow z$ H-Cs + nH_2O

Liquid Fuels

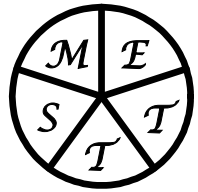
The Fischer Tropsch (F-T) reaction

  - Result a mixture of hydrocarbons that can be tuned to mostly produce diesel, or
  - A similar reaction to produce methanol, thence gasoline (plus some naphtha).

Australia Fuels' Balance



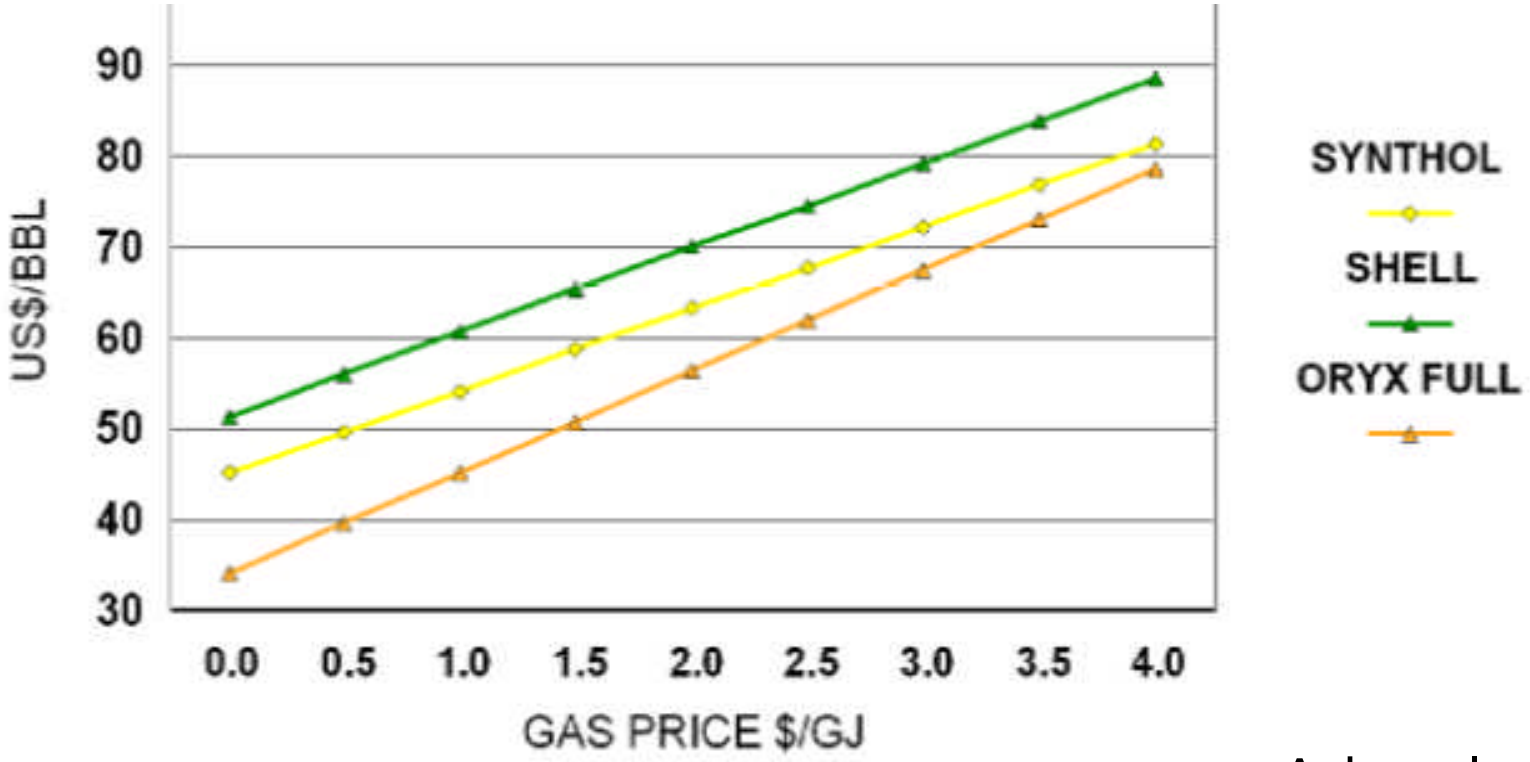
Feeds to CTL/GTL



(Base: 50,000 bbl/d, 8000 kL/d F-T plant)

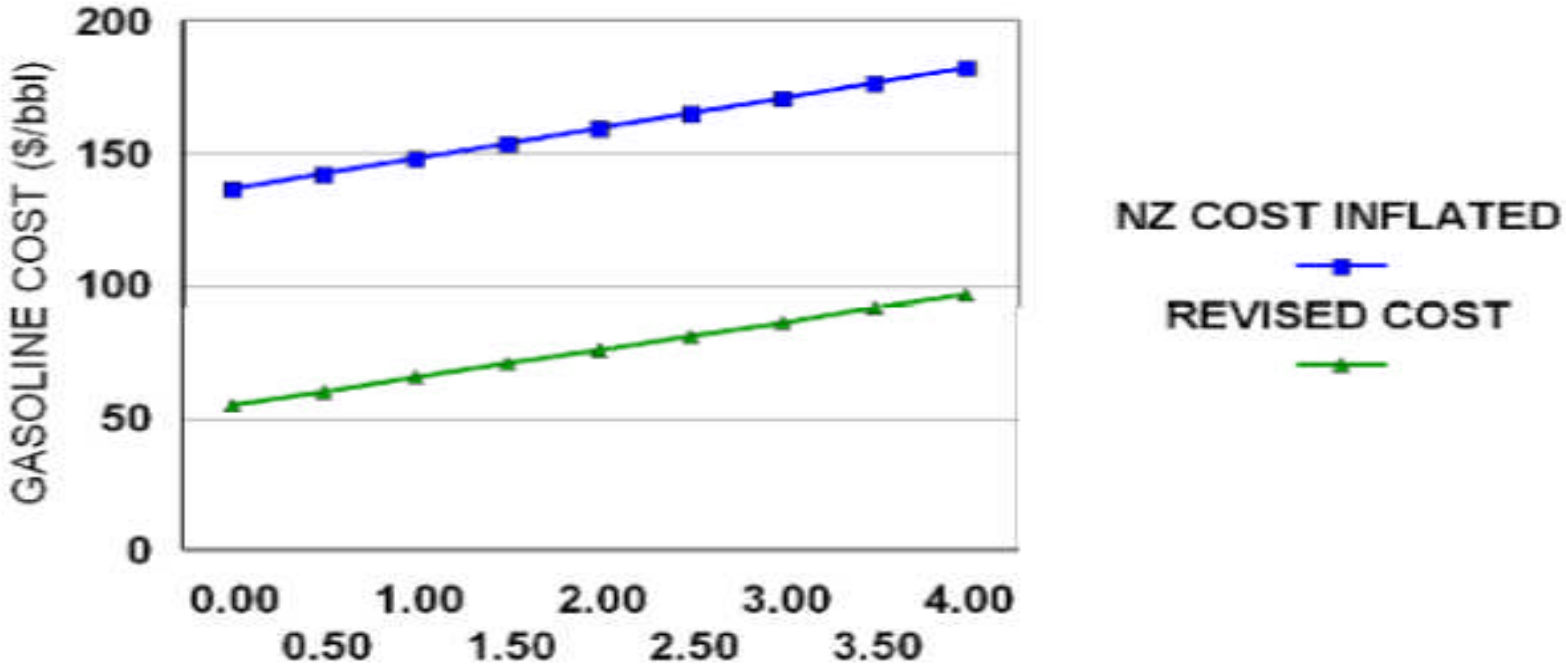
Fuel type	Yearly Demand
Natural Gas	3 million tonnes 150 Million GJ/a
High Volatile, Low Moisture Surat Coal	6 - 7 million tonnes
Medium Volatile, High Moisture SA Coal	11 million tonnes
High Moisture, High Ash WA Lignite	22 - 25 million tonnes
Very High Moisture, Very Low Ash, Victorian Lignite	25 million tonnes 7 million tonnes if dried to 12% TM

Methane to F-T Fuels – Production Costs



Acknowledgement
Dr. Duncan Seddon

Methane to Gasoline (MTG) – Production Costs



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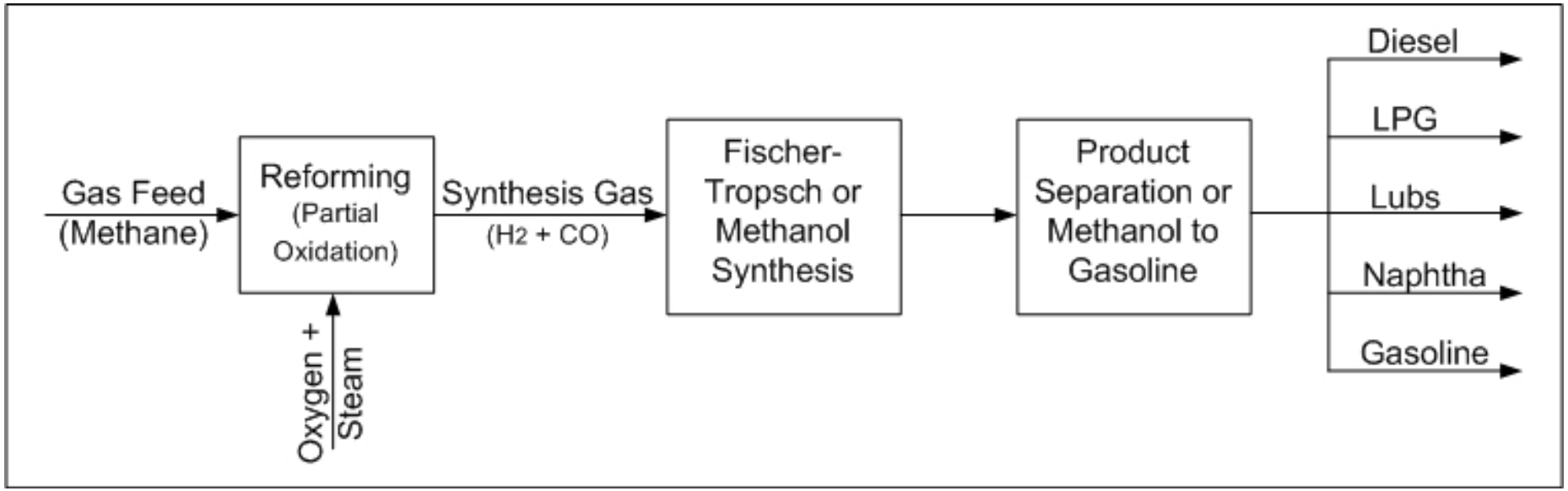
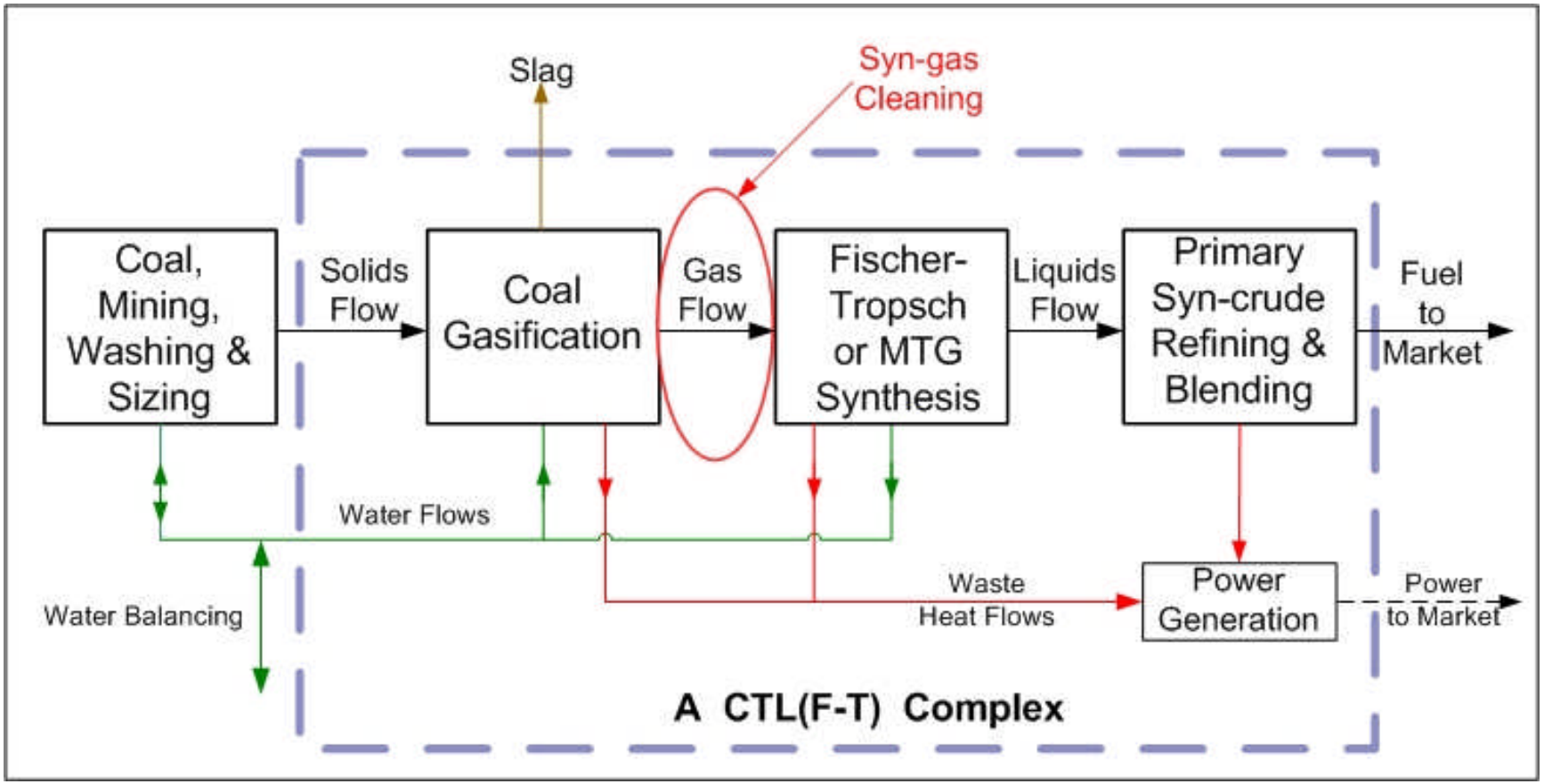
A Gas-to-Liquids Route



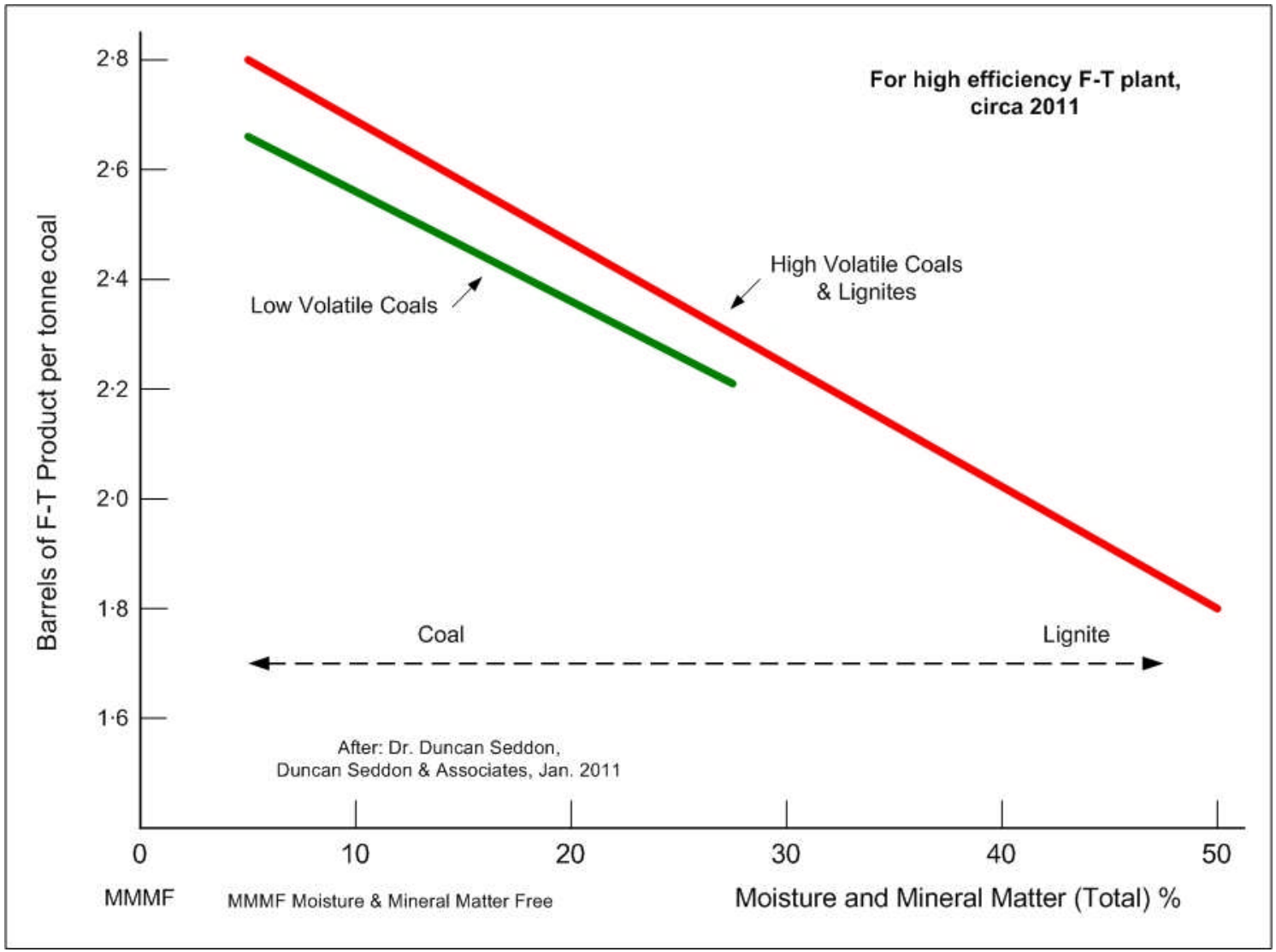
- A simplified production of liquid fuels from natural gas.
- Gas recycle, power generation and fuels refining are part of the ‘whole’ process.

A Coal-to-Liquids Route



- Synthesis gas (from coal gasification) requires major cleaning and secondary processing – these are challenges.

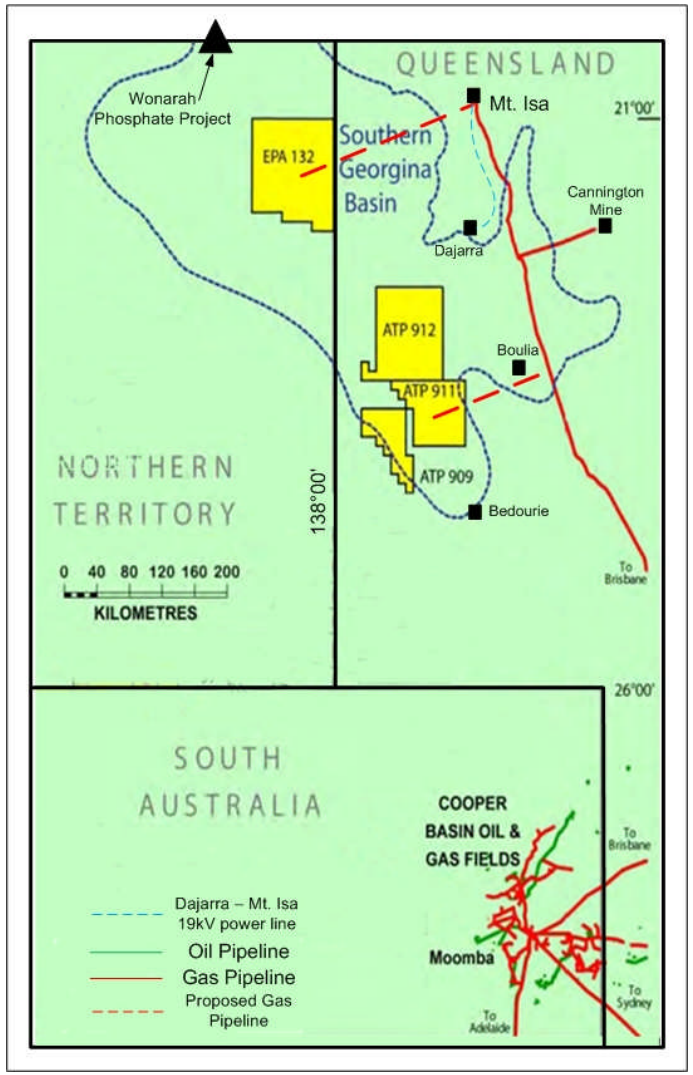
Coal to CTL Crude Conversion



Dollars and sense?

- GTL and CTL require low feedstock costs, e.g. natural gas at <$3/GJ, or coal at less than <$1·50/GJ to provide ‘acceptable’ raw crude costs,
- With Victorian lignite (60+% moisture), the mining and processing cost to produce gasifier feed CTL project proponents are looking at $1·50/GJ to the gasifiers, but
- How about Coal Seam Gas and Shale Gas and Synthesis gas from Underground Coal Gasification costs/prices?
- How about ‘unloved’ Queensland coal costs/prices?

Central Petroleum and its Shale Un-conventional Gas/Oil Prospects



- Central Petroleum is a junior explorer with a number of unconventional gas/oil prospects,
- They are looking to monetise those potential resources by sales of gas, electricity and/or liquid fuels, and
- There is the possibility of regional production of synthetic liquid fuels either at the well-head, or in say Mt. Isa.

Gas-to-Liquid (GTL) Fuels in remote areas

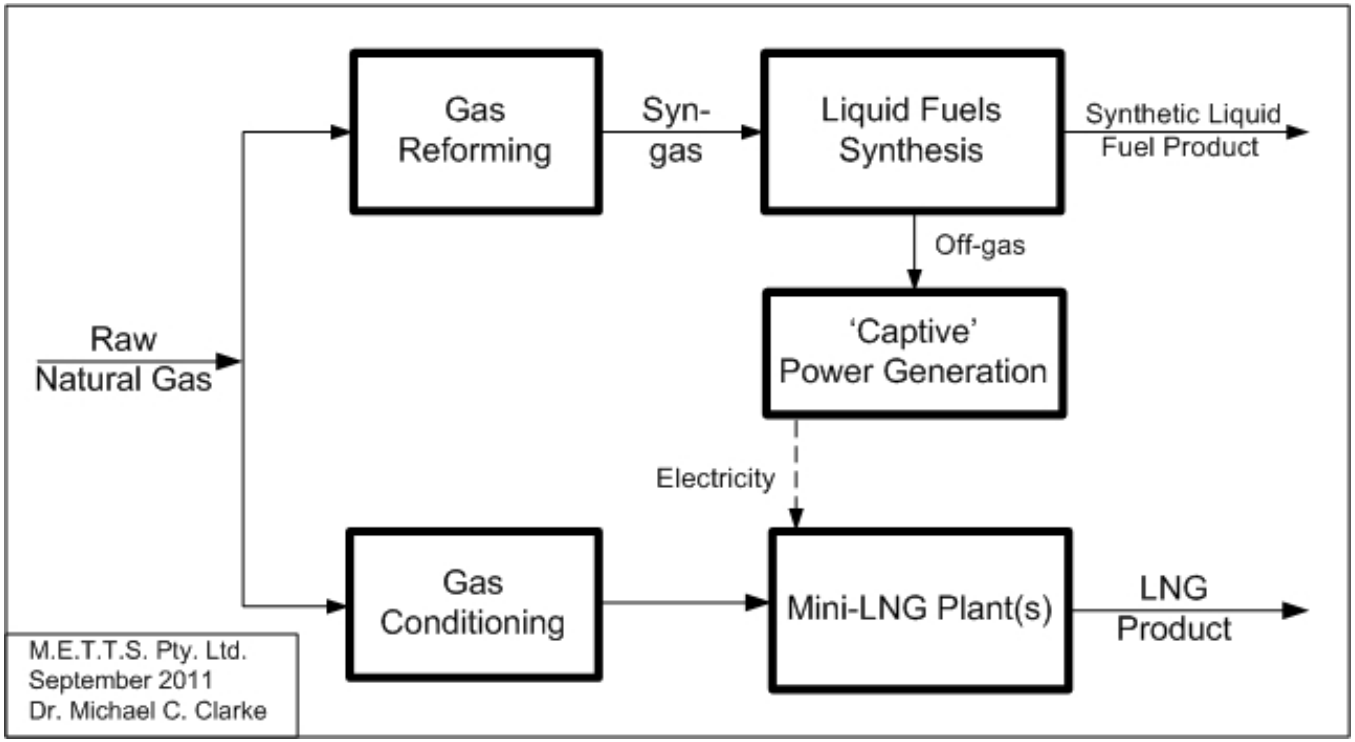
GTL – the production of synthetic liquid fuels, that include diesel, gasoline & LPG can be undertaken in remote areas in smaller plants of say 1000 – 10,000 bbls/day.

Local niche liquid fuels production is a possibility, with Diesel being the prize.

An advantage is that fuel will be consumed close to its point of production, and that significant inward fuel transport costs are saved.

Modular, skid mounted, relocatable plant will be the production units.

Gas-to-Liquid (GTL) Fuels in remote areas

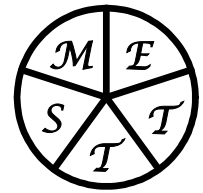


A twinned train liquid fuels production system

Fuel Security and Shale Gas/Oil

- Intra-continental natural gas has an excellent ‘security’ value,
- Shale-gas as a future component to the intra-continental natural gas inventory will be welcome, but
- Liquid transport fuel security will require the establishment of condensate refining capabilities and GTL production and refining facilities.

Conclusion



- On-shore oil and gas resources and prospects, although often unconventional are very significant for the future, and Gas-to-Liquids (GTL) should be developed for large and small scale liquid fuels projects,
- Coal-to-Liquids (CTL) is another serious option for Australia for large-scale projects of say greater than 100,000 bbl/day production, and
- These resources and prospects can provide Australia with excellent fuel security into the future.

Thank you!