FORGING A REAL WORLD PATHWAY TO A BIOREFINERY INDUSTRY IN AUSTRALIA

BIOREFINERIES

- Biorefining is the process of producing commercial replacements for chemicals, plastics and fuels from biomass.
- Biomass is any material derived from plants that uses sunlight to grow. Australia's agricultural sector produces a variety of crops including sugarcane, grains cotton, and forestry products and the biomass residues of these processes including bagasse, trash, stover, and other green wastes.
- The biorefinery industry is viewed as a key global growth sector and is already developing internationally in North America, Europe, Malaysia and Brazil.
- Global markets for bio-based products are expected to continue growing strongly to US$160 billion by 2020.
- The movement to sustainable chemicals and plastics manufacture through biorefining has already been supported by major chemical and technology-based companies.

Beta Renewables, Crescentino, Italy

POET/DSM – Emmetsburg, Iowa

Granbio, Alagoas, Brazil

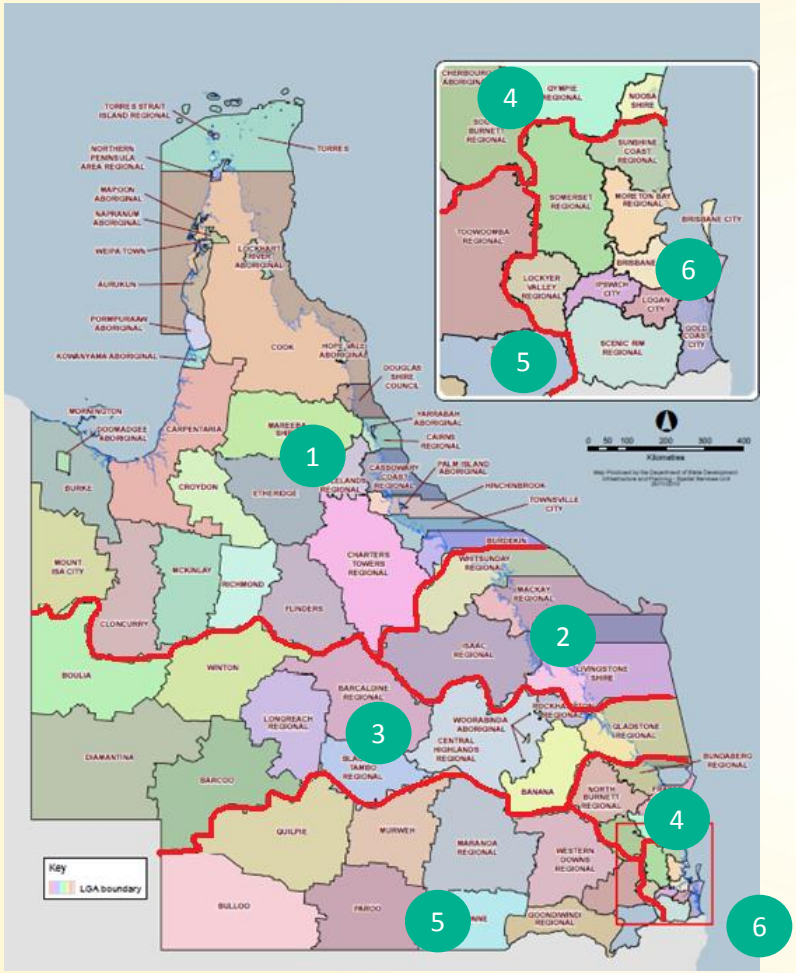
DuPont, Nevada, Iowa

Abengoa, Hugoton, Kansas

Braskem, Triunfo, Brazil

AUSTRALIA'S COMPETITIVE ADVANTAGE

- Australia has:
- a climate conducive to the production of large quantities of biomass
- a strong agricultural sector and appropriate infrastructure
- an international reputation for research
- established manufacturing industries such as grains, forestry and sugar milling
- a stable government.



PROJECTS AND REGIONS MODELLED

Region 1 – North Queensland
Project A – Polyethylene from sugarcane
Project B – Resins from green waste

Region 2 – Whitsunday
Project C – Succinic acid from sugarcane bagasse

Region 3 – Central Queensland
Project D – Aviation fuel from Brigalow regrowth

Region 4 – Wide Bay Burnett
Project E – Levulinic acid from forestry residues
Project F – Ethanol from sweet sorghum

Region 5 – Darling Downs/South West
Project G – Ethanol from sorghum stover

Region 6 – South East Queensland
No projects here, but still impacted

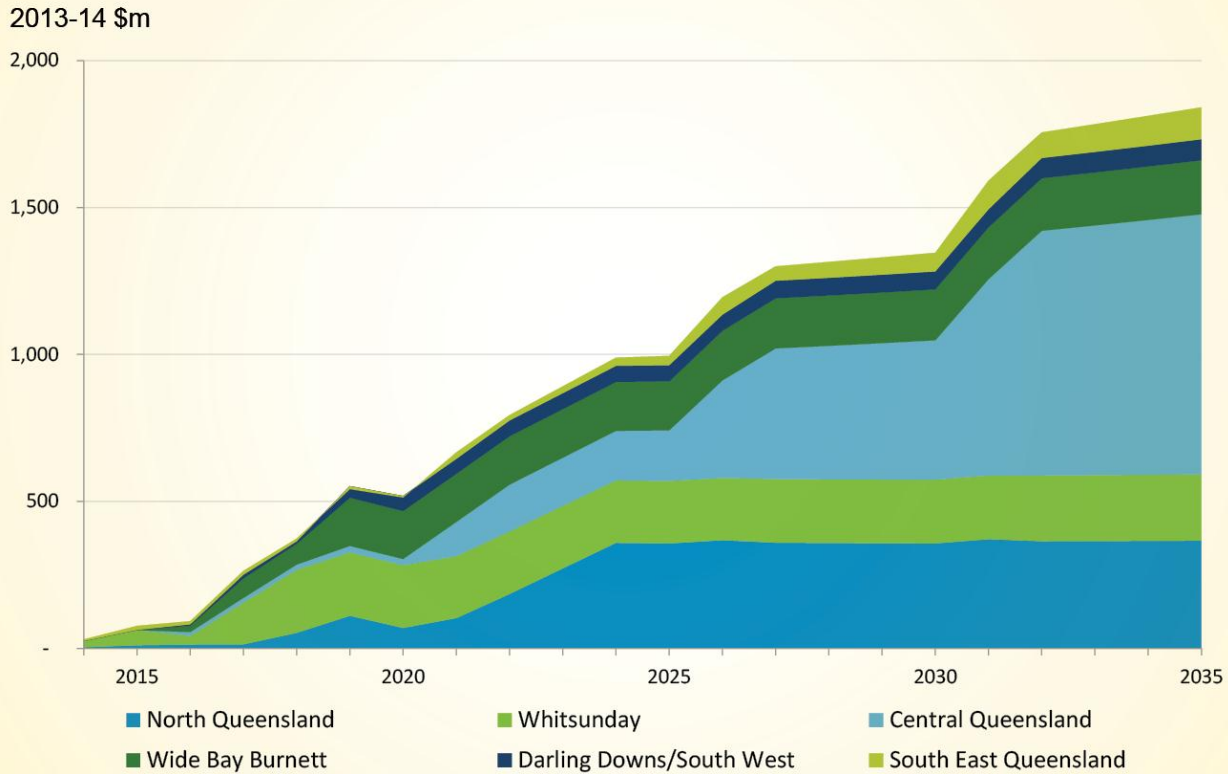
PROJECT ECONOMIC CHARACTERISTICS

	Project	Start date	Capital expenditure ($m)	Revenue ($m)	Costs ($m)	Benefit-cost ratio	Internal rate of return
A	Polyethylene	2018-19	$663	$1,631	$1,568	0.73	N/A
B	Resins	2015-16	$19	$48	$11	1.56	16.6%
C	Succinic acid	2014-15	$391	$2,158	$1,217	1.34	19.7%
D	Aviation fuel	2016-17	$473	$3,883	$3,063	1.10	16.6%
E	Levulinic acid	2017-18	$13	$77	$37	1.57	31.6%
F	Ethanol	2016-17	$240	$1,269	$640	1.44	22.7%
G	Ethanol	2016-17	$91	$356	$177	1.33	17.0%

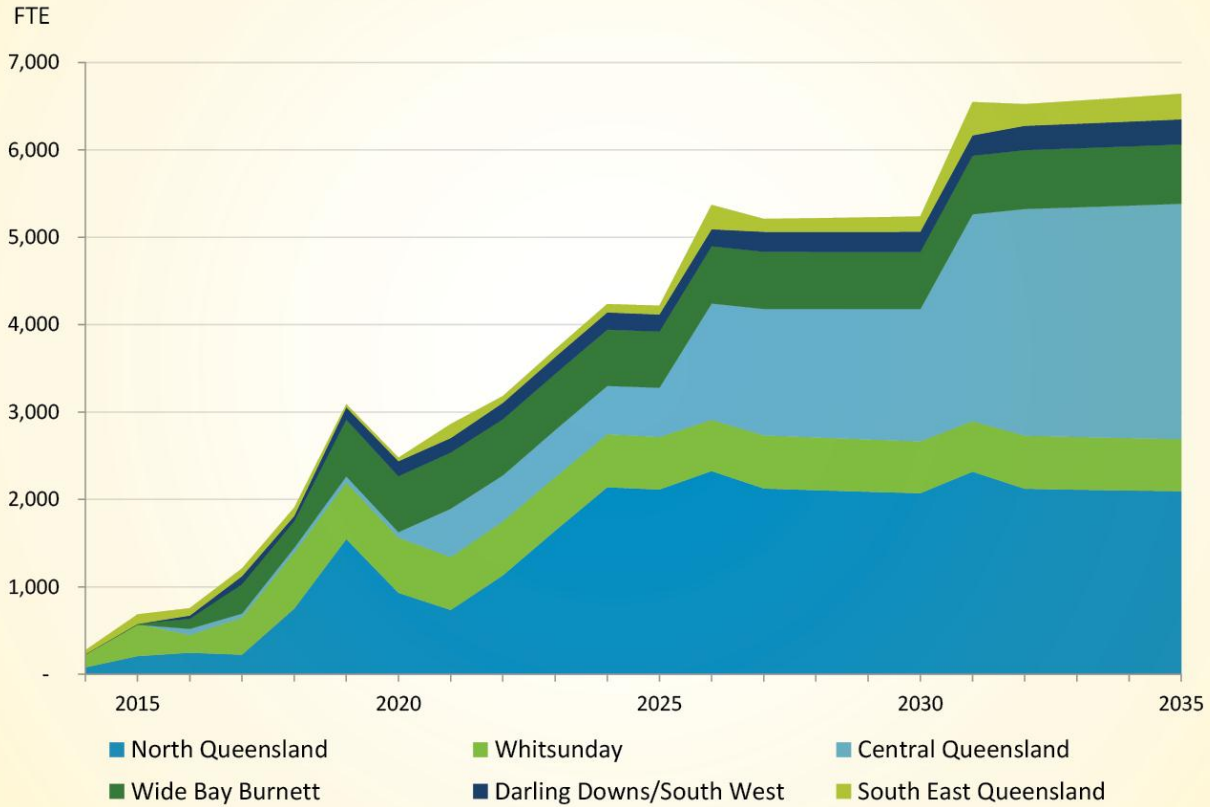
Only the 'greenfield' sugar cane proposal had uncertain viability (more work needed on capital costs).

Not an exhaustive list, but examples of different biorefineries that may be viable in various climates.

RESULTS – IMPACT ON GSP



RESULTS – IMPACT ON EMPLOYMENT



RESULTS – INDUSTRY IMPACTS IN 2025

INDUSTRY	OUPUT ($M)	EMPLOYMENT (FTE)
Agriculture	104.0	583
Mining	-30.6	-32
Manufacturing	849.0	996
Electricity and water	6.1	30
Trade	181.4	951
Transport	14.7	110
Services	295.6	1,489

- At the state level, all industries except mining are positively impacted by the biorefinery industry in terms of both output and employment.
- Agriculture, trade, and services are all positively impacted in all regions.

SUMMARY

- Queensland's climate and agriculture sector ensure a large supply of biological material that can be utilised in the production of fuels, chemicals, and plastics.
- Preliminary assessment indicates there is potential for a profitable biorefinery industry in Queensland in a number of regions.
- The development of a tropical biorefinery industry could have a significant economic impact on the Queensland economy – around $1.8 billion and 6,640 FTEs over the next two decades.
- Biorefineries in Queensland are likely to be a viable source of economic growth and diversification.
- While full feasibility studies would be required to make any investment decisions, this analysis demonstrates the case for investing in the next phase of detailed design, engineering, construction cost estimation and due diligence.

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