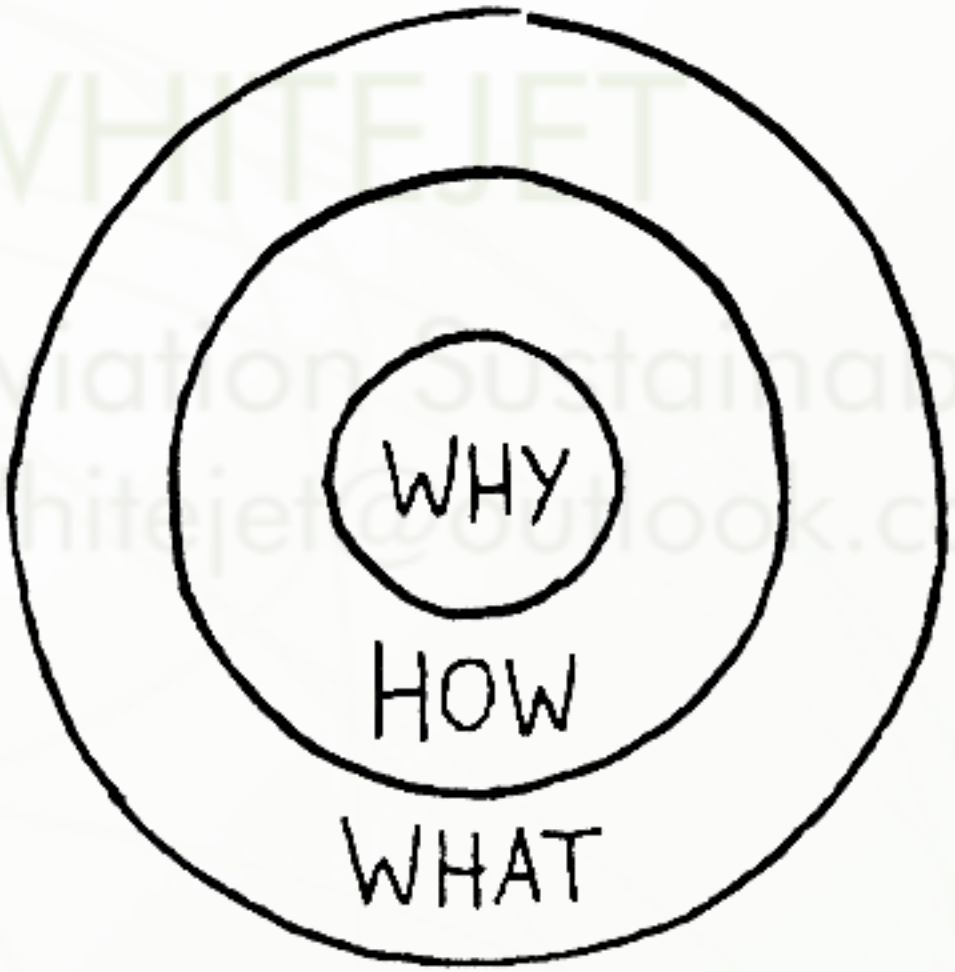
Sustainable Aviation Fuel

Evolution and prospects of sustainable aviation fuels in Australia

WHITEJET
Aviation Sustainability
Whitejet@outlook.com

The Golden Circle



Aviation Industry Targets

2010 - 2020
1.5% pa fuel efficiency

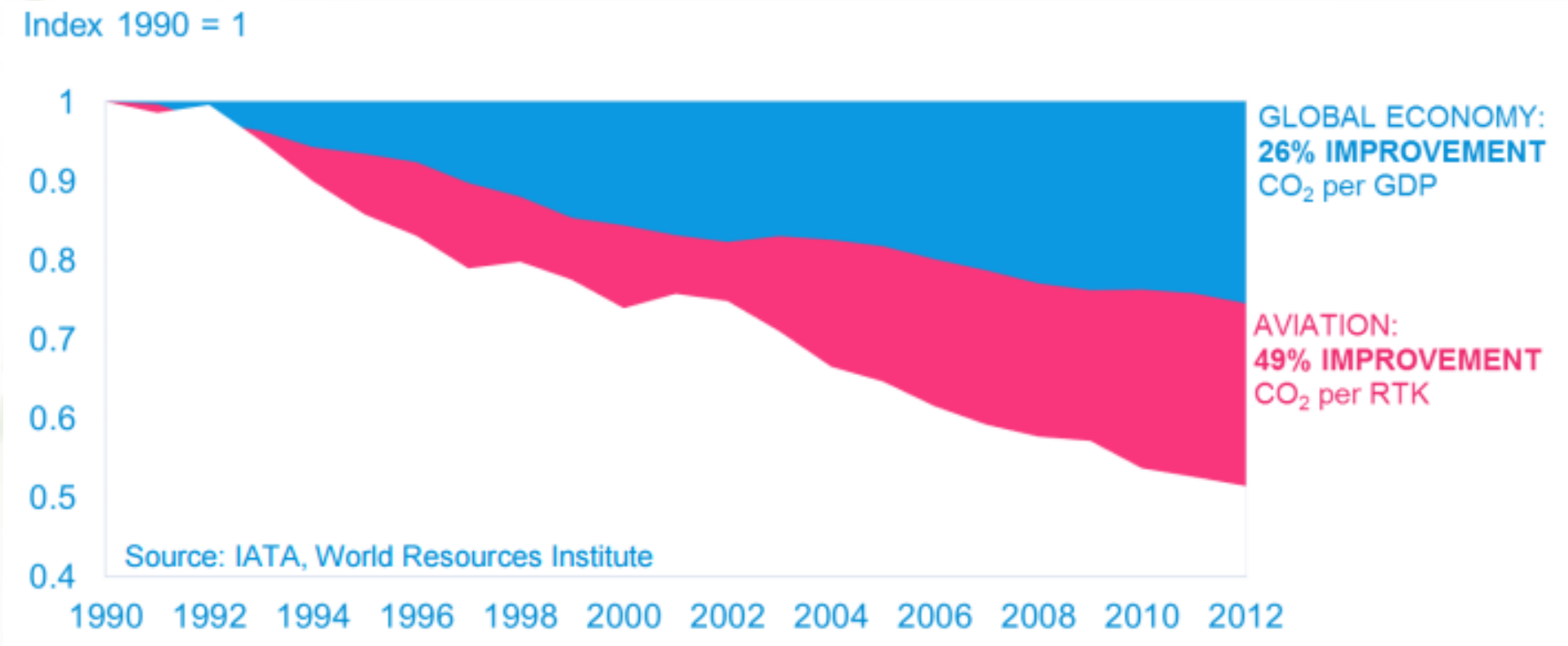
CNG from 2020
Implementation of global sectorial approach

2050
50% reduction in net CO2 emissions over 2005 levels

How?

Technology	Renewable Fuel	Operations and Infrastructure	Economic Measures
			

An Efficient Industry



http://www.iata.org/whatwedo/Documents/economics/chart-of-the-week-14-oct-2016.pdf

Timeline

- 2007 - Virgin Blue introduces world's first airline administered voluntary carbon offset program
- 2009 – Formation of Australian Sustainable Aviation Fuel User Group
- 2010/11 – "Flightpath to Sustainable Aviation" Roadmap undertaken and released
- 2011 – Australian Initiative for Sustainable Aviation Fuel
- 2012 – Carbon Price
- 2013 – Qantas/Shell SAF Feasibility Study Report
- 2013 – Strategic Aviation Forum with Defence Dept
- 2016 – Virgin Australia/ANZ RFI

Queensland Sustainable Aviation Fuel Initiative

Sustainable Mallee Jet Fuel Study

Roadmap

- Is there enough sustainable biomass available in the region?
- Will it be economically viable to produce bio-derived jet fuels?
  - **Refining pathways**
  - **Competition for biomass**
- What are the challenges?
- What are the benefits?

Sustainable biomass resources

- Feedstocks covered in study –
- Lignocellulosic – Forest and wood residues, crop stubble, bagasse, coppice eucalypts
- Algae, tallow, oil seed crops, pongamia
- Others not suitable for Australia or not enough data

Key Findings

- Sustainable aviation fuels derived from biomass are a feasible option
- There is sufficient existing sustainable biomass to support a local bio-derived jet fuel industry
- There will be challenges in the scale-up of economically viable feedstock production
- There will be high demand among industries for biofuel
- Investment by the refining sector will be impacted by uncertainty

Sources of LC biomass

- Existing

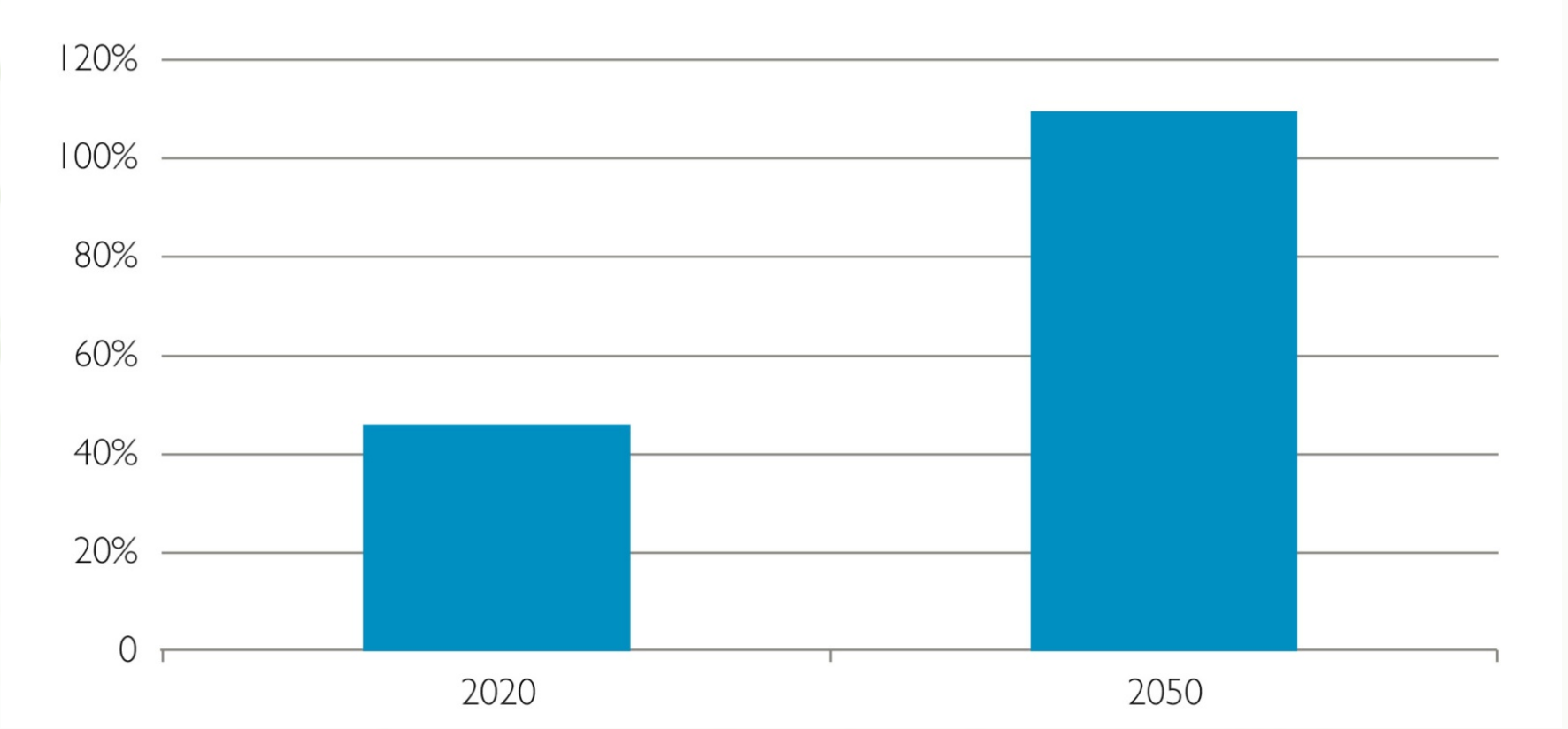
Bagasse	Crop stubble	Wood & forest residues	Landfill wastes
			
The stem residue remaining after crushing to remove sugar-rich juice from sugar cane	The residue remaining after the harvest of crops such as wheat, barley and lupins	Bark, sawdust, pulpwood (wood used for processing into paper and related products) and harvest residues	Includes municipal, commercial and industrial solid wastes, as well as construction and demolition wastes

Sources of LC biomass

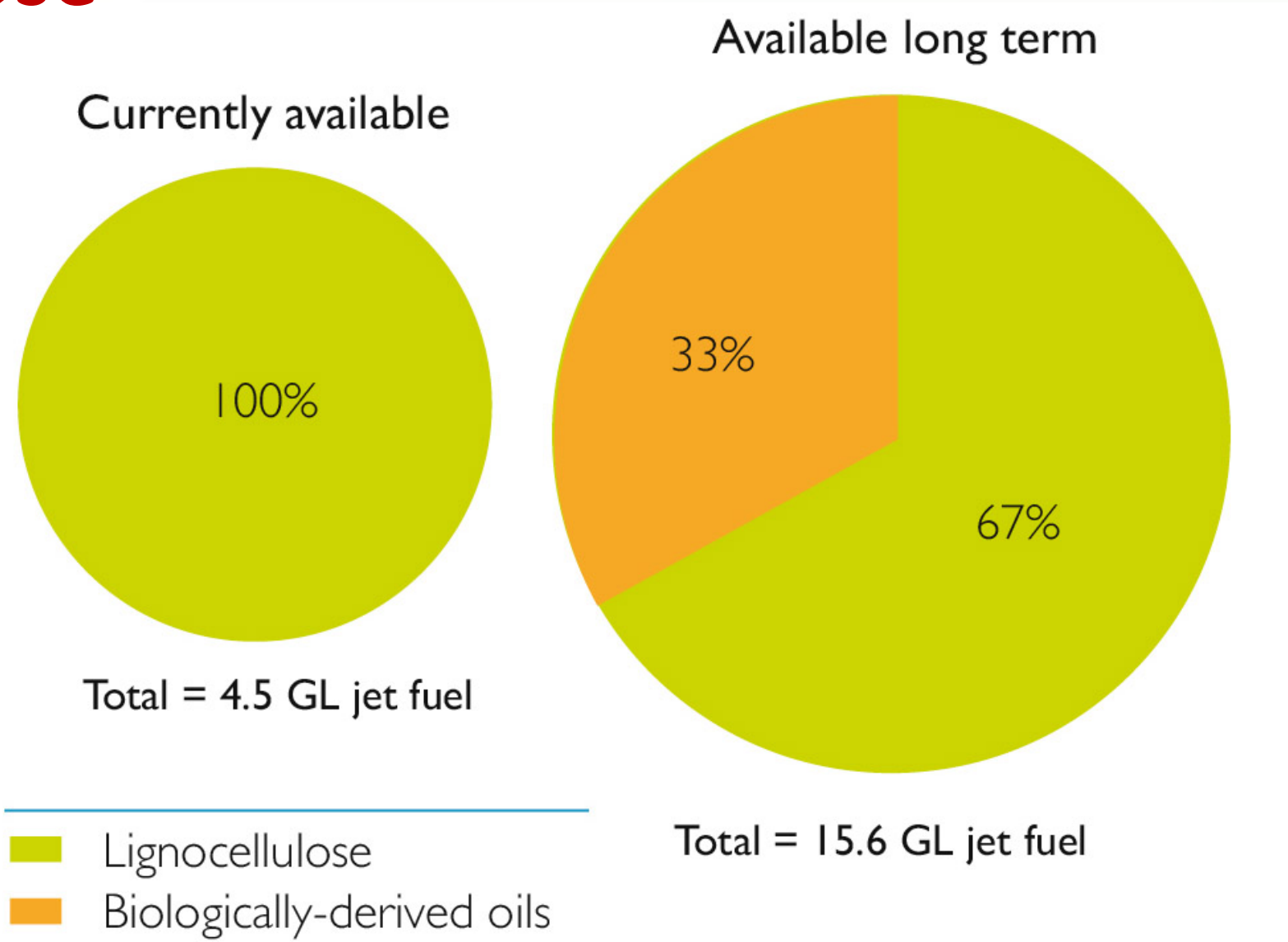
- Emerging

Short Rotation Coppice (SRC)	Grasses
	
Short rotation tree species (eg poplar, willow and eucalyptus) that regenerate quickly via coppicing (via shoots from the stump of cut down trees).	Various varieties – wild sorghum, kangaroo grass, tall fescue, perennial ryegrass.

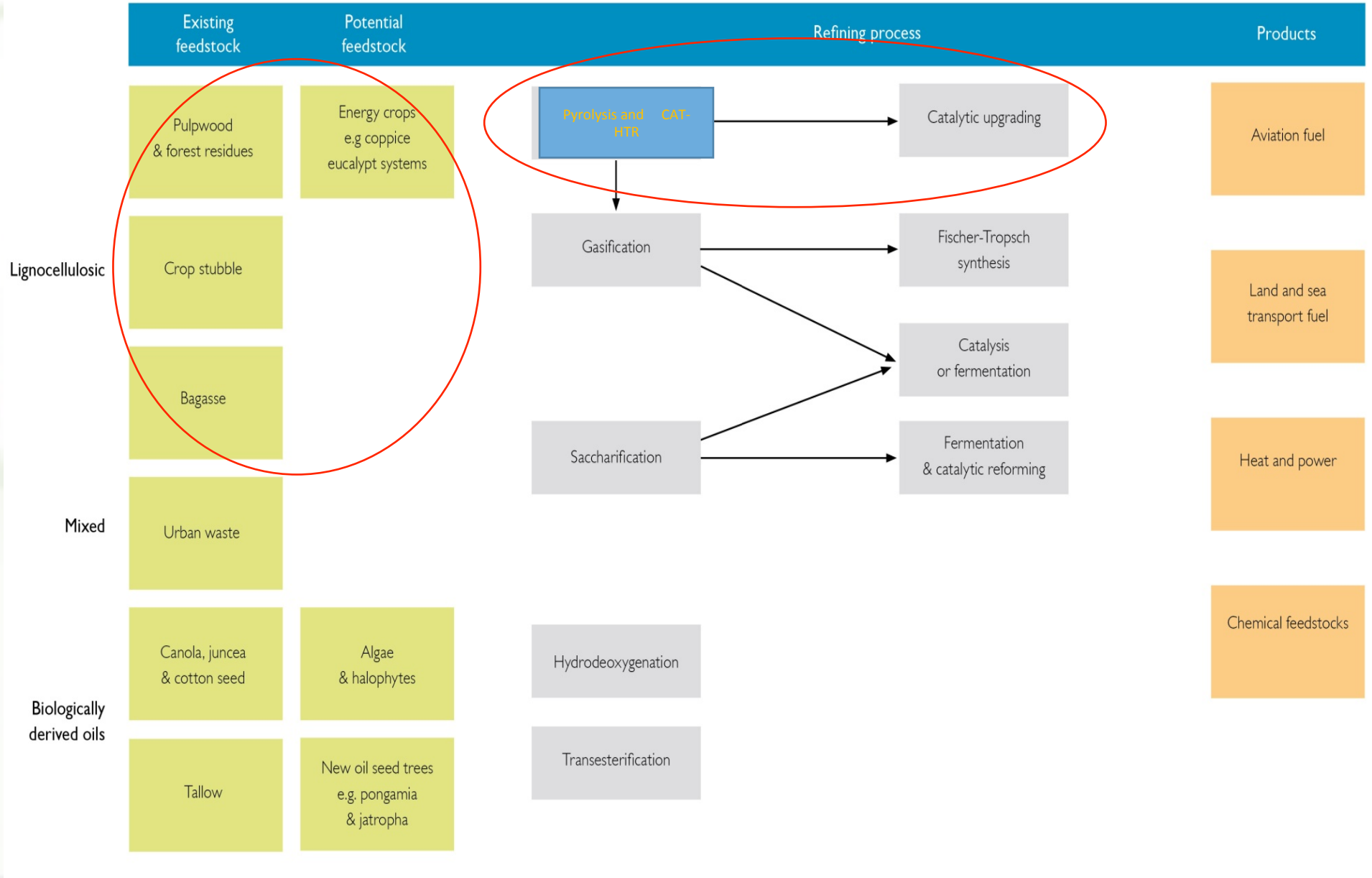
Scale of biomass resources relative to aviation need in Australia



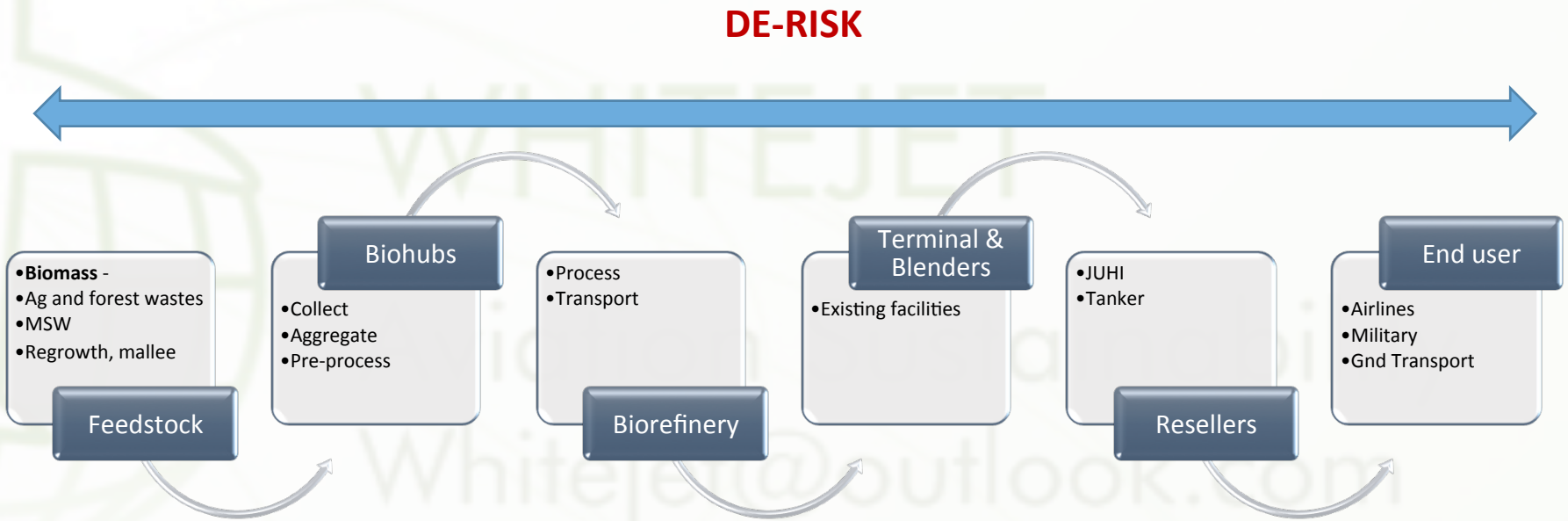
However, most resources are in the form of lignocellulose



Focus on research and cost reductions



Building the Renewable Fuel Value Chain



Significant work has been undertaken on specific aspects especially feedstock and Conversion (bio refinery).
Focus is required on downstream elements and supply chain integration.
And importantly DE-RISK.

Brisbane BioPort

- Partners: SkyNRG, Virgin Australia, Brisbane Airport Corporation
- Focus on determining the most promising supply chain combination with the ultimate goal of producing an investable business case and advancing to the construction phase.
- The approach is unique in that no pre-committing to a specific feedstock, logistics or technology combination upfront. There are a number of very promising projects currently underway in these areas in the state
- It is important that we objectively assess all potential pathways with a robust and transparent methodology. This will work towards minimising risk and maximising investment potential.
- Two key elements:
  - Get co-funding mechanisms in place (government incentives + Corporate Program to bridge the transition)
  - Development of a efficient regional supply chain (feedstock + conversion technology) that can compete with fossil fuel

Brisbane BioPort

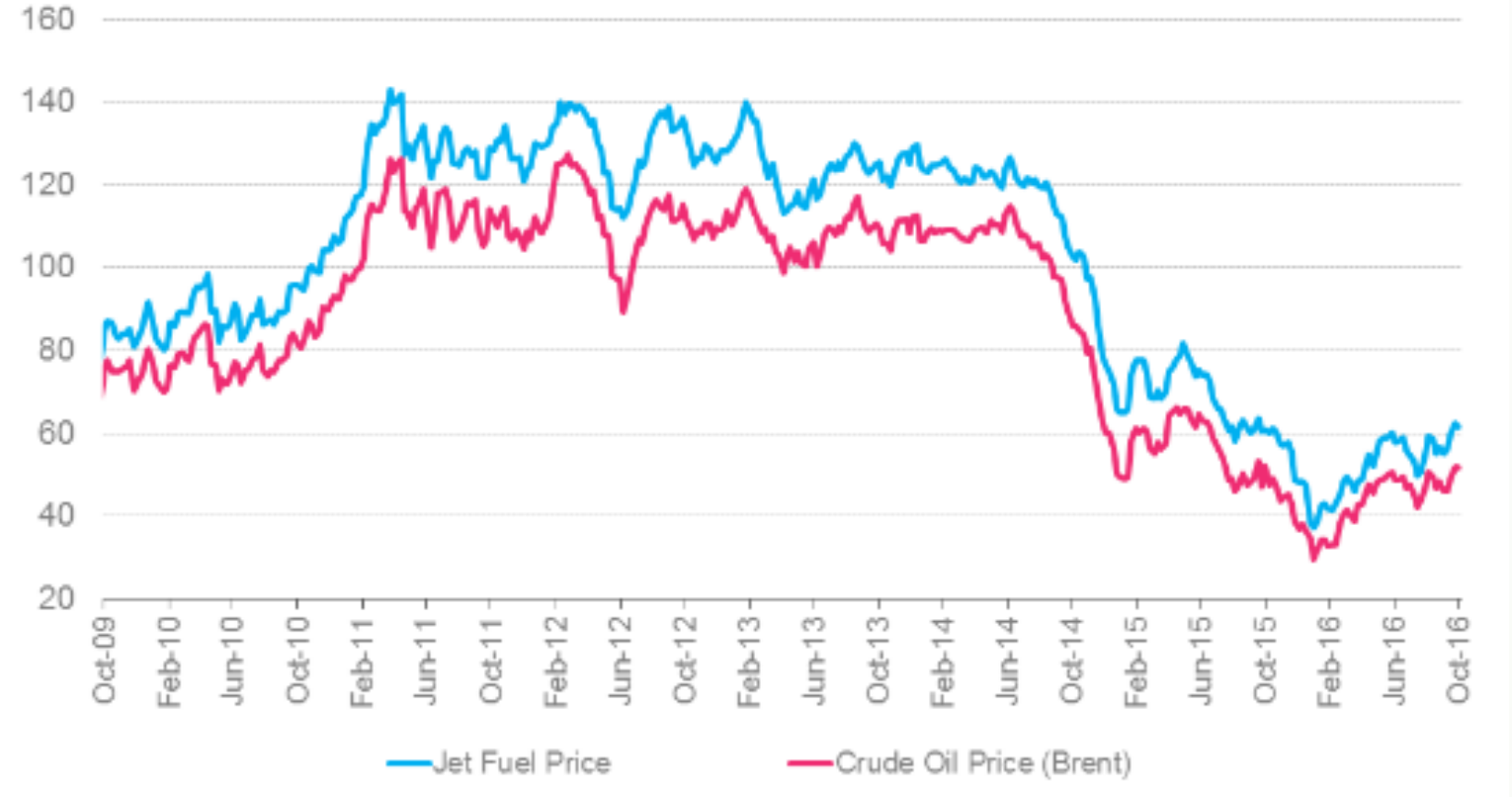
Some things we know and some we think we know

The key financial issue is to unlock capital – both debt and equity

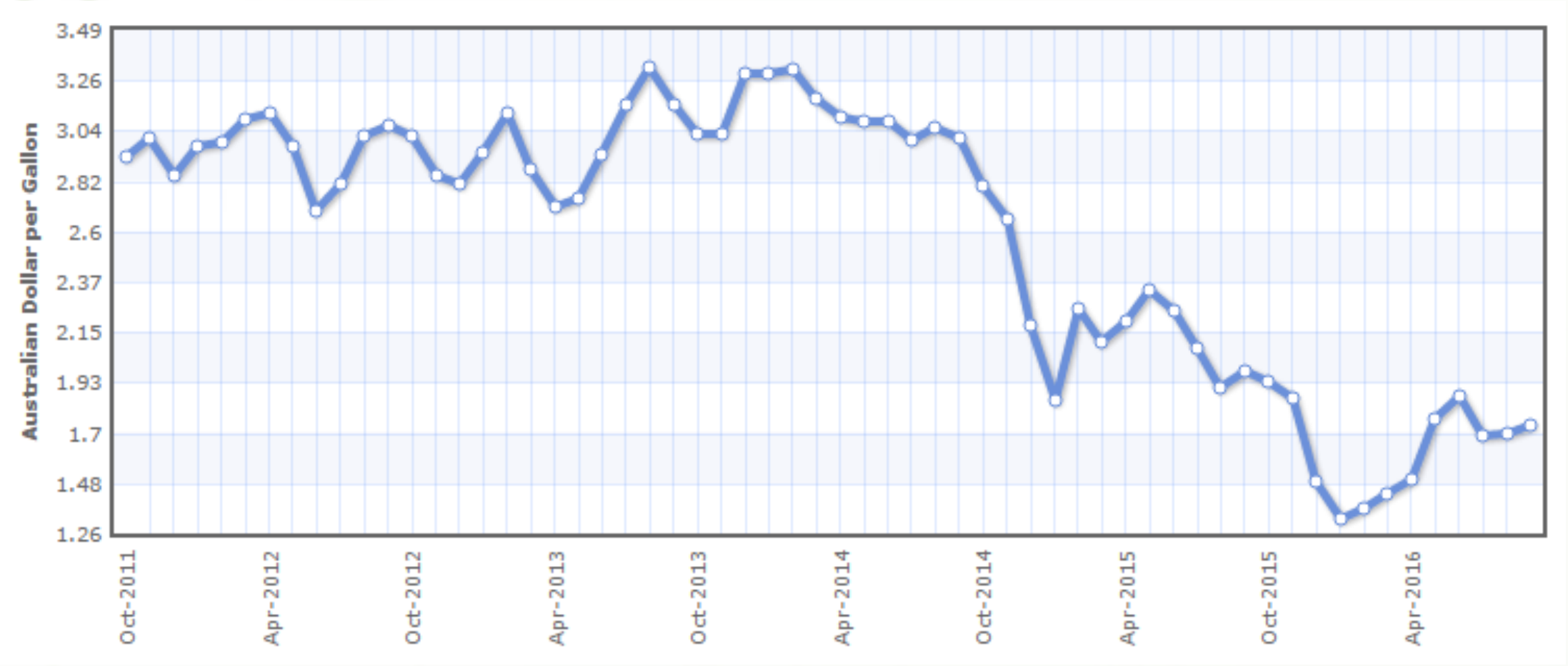
There are some things we know and some things we are fairly confident of:

- To be economically viable renewable jet fuel must be priced at a level the market will find acceptable.
- Traditional jet fuel is forecast to become more expensive (*how much/when?).*
- Renewable fuel will become less expensive (*how much/when*).
- Government leadership, vision and support is required.
- Australia in particular has a unique opportunity.

Jet Fuel Prices ($/bbl)



Jet Fuel Prices ($/Gal)



SCENARIO

- FLIGHT FROM BRISBANE TO SYDNEY
- 1 BBL = 159 litres 3.785L/US gal
- BNE-SYD about 3.5tonnes Jet-A burn in 737-800 about(4.4kL)
- Approx 27L/pax = approx. 100kg CO2 per pax average
- At 2013 price = $28/pax in fuel.
- Now if we use 20% biojet at $2/L it is $35/pax **$7 PREMIUM**
- To offset 20% of carbon normally would cost **$0.20** at offset cost of $10/tonne.

HOW DO WE BRIDGE THIS GAP?

Moving forward

Steps to make progress:

1. Policy enablers are required to help de-risk public and private investment in renewable jet fuels.
2. Policy makers must level the playing field between aviation and other sectors. Difficult as airlines pay no excise on Jet-A.
3. Financial instruments for biojet production (eg futures contract – lock in price and vol to give certainty).
4. Price on carbon ($20/t carbon price = approx. 6c/L fuel cost) – is this enough?
5. Consider extending MBM to domestic aviation

It is time for bold thinking.