

Localisation Support Fund

South African Sorghum Bioethanol Study

*A strategic localisation, energy security and
industrialisation opportunity.*

Presentation

Prepared by BluePrint Holdings (Pty) Ltd

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Public Version



Disclaimers and disclosures

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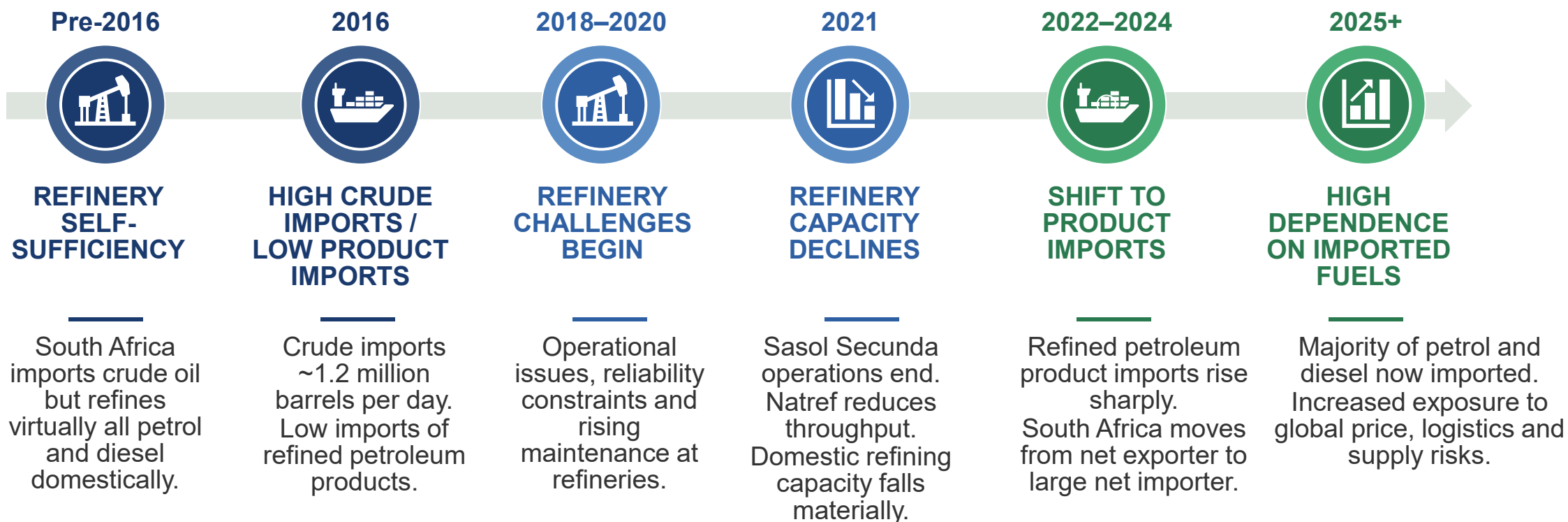
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Project Executive Summary



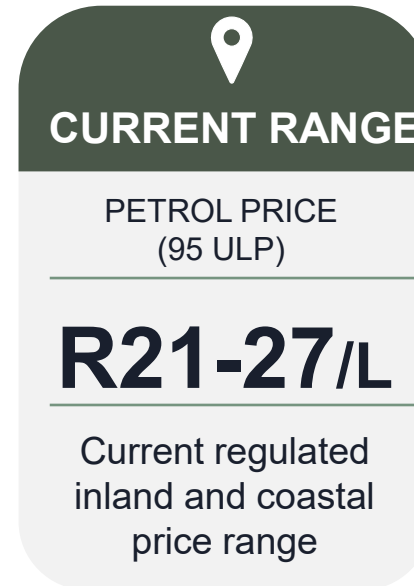
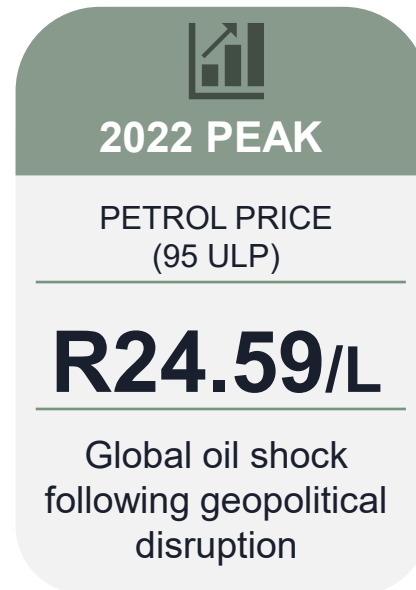
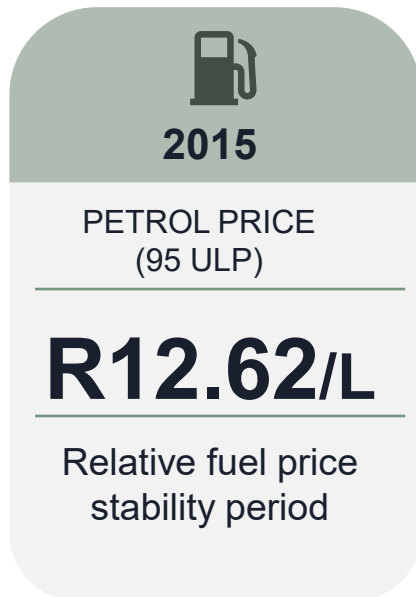
South Africa's Fuel Economy Was Built on Imported Energy



KEY TAKEAWAY: South Africa's fuel security has weakened as refinery capacity declined and refined fuel imports increased.
Every litre of petrol and diesel now exposes the economy to global volatility.

South Africa imports virtually every litre of its liquid fuel requirements. This study asks whether a portion of that strategic vulnerability can be converted into a domestic industrial opportunity.

South Africa has no crude oil reserves. Every litre of petrol begins as an import.



The country previously buffered this exposure through domestic refining capacity.

That buffer has materially weakened following refinery closures.

Nothing structural currently exists to reduce exposure to imported liquid fuel volatility.

i Prices reflect average pump prices for 95 Unleaded Petrol (ULP) across inland and coastal regulated zones

Source: South African Department of Mineral Resources and Energy (DMRE), Fuel Price History Tables

South Africa Refinery Closures And Major Capacity Reduction

TIME	REFINERY /FACILITY	EVENT	STRATEGIC IMPACT
PRE-2020	● National refining system	Operating at significant capacity with domestic refining of crude oil	Large proportion of petrol and diesel refined domestically
2020	● Engen Durban refinery	Temporary shutdown following explosion and operational damage	Major reduction in refining capacity begins
2020	● Chevron Cape Town refinery	Temporary shutdown for upgrades and low market conditions	Increased reliance on imported product
2021	● Sapref	Refinery operations suspended indefinitely	South Africa loses its largest refinery
2021	● Astron Energy CPT refinery	Delayed restart after fire damage and Clean Fuels uncertainty	Refining system instability intensifies
2022	● Natref	Throughput reductions and operational pressure	Inland supply vulnerability increases
2022-2024	● National refining system	Shift from crude imports toward refined product imports accelerates	South Africa becomes structurally dependent on imported refined fuels
2025+	● National fuel market	Majority of petrol and diesel requirements increasingly imported	Greater exposure to global oil price, shipping and geopolitical risk

KEY TAKEAWAY: South Africa moved from refining imported crude domestically to importing increasing volumes of finished fuel products.

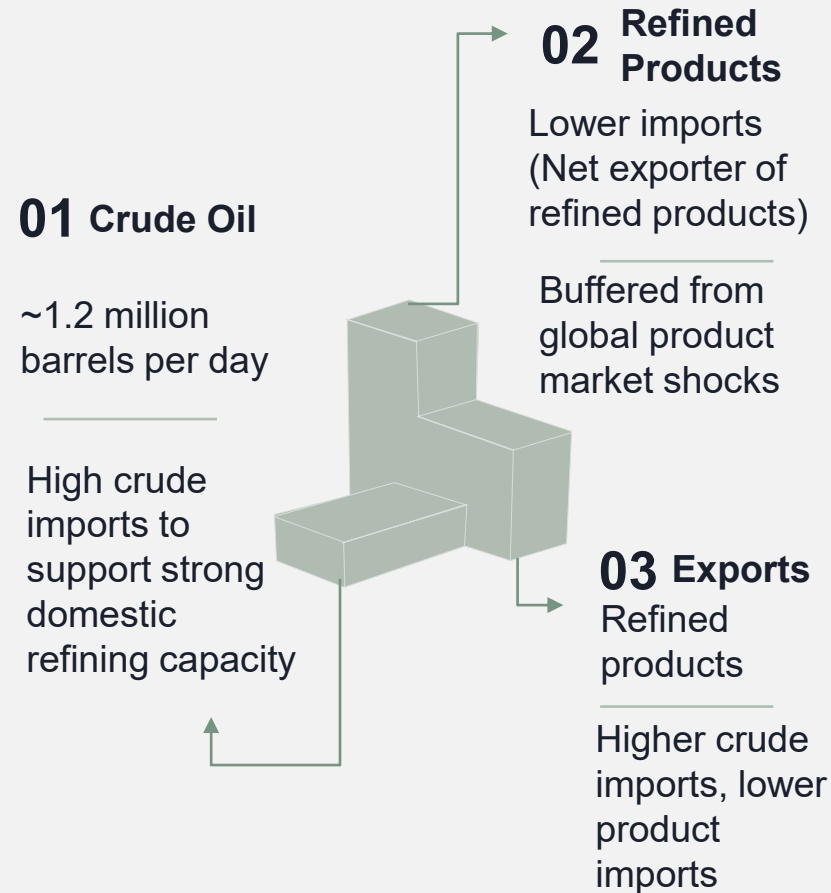
The Strategic Exposure Has Intensified.

South Africa's fuel import profile has fundamentally changed.

The economy is increasingly exposed not only to oil price volatility, but to refined product availability, shipping costs, exchange rate volatility and global geopolitical shocks.

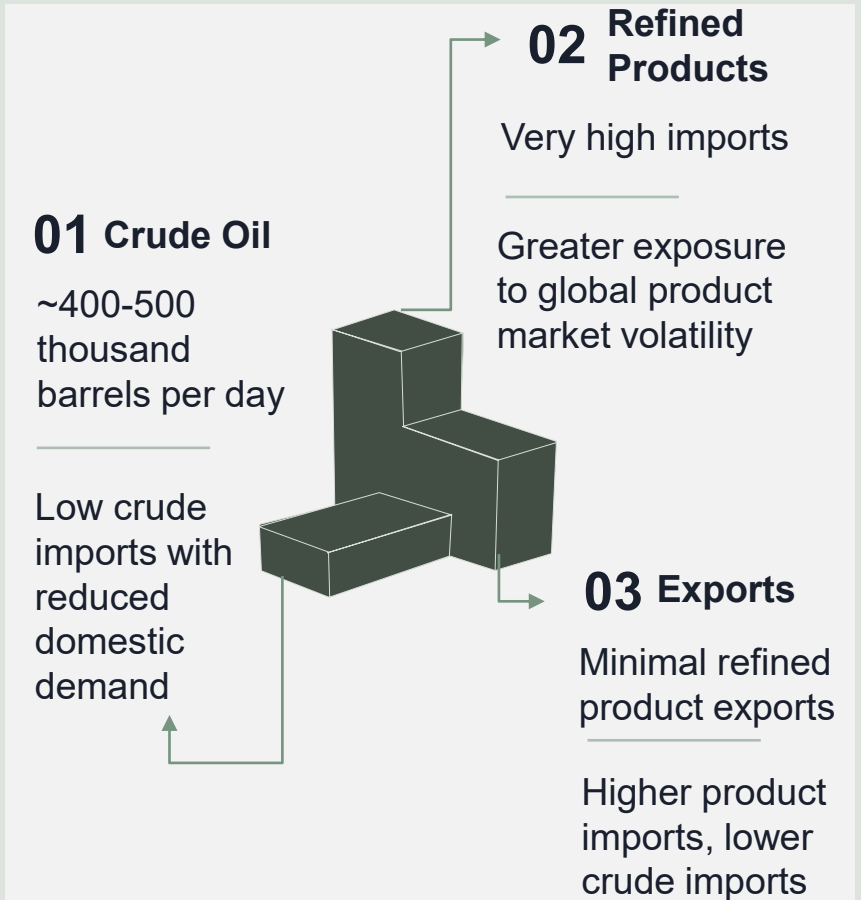
2016

High crude imports
-> Lower refined imports



2025

Low crude imports
-> Higher refined imports



South Africa Still Produces Virtually No Commercial Biofuels



South Africa has debated biofuels policy for almost two decades. The regulatory architecture now largely exists

Commercial production at scale does not. Commercial production today: effectively zero

But significant demand exists

South Africa has the demand base

The opportunity is not speculative demand, it is blending into existing fuel economy.

Large and Growing vehicle parc



13.1 million
Vehicles



7.8 million
Passenger vehicles



8.76 billion litres
Annual petrol pool

Mandates create immediate and growing ethanol demand

E2



181 million litres/year
+/- R2.5 billion
Annual ethanol market

E5



420 million litres/year
+/- R6 billion
Annual ethanol market

E10



903 million litres/year
+/- R12+ billion
Annual ethanol market

Phased implementation likely & global norm.

Industrial readiness



Existing fuel logistics system



Existing blending capability potential



Existing storage terminal & infrastructure



New ethanol plants still required



First mover facilities likely phased



Plant economics

Commercial scale ethanol plant:
Approx. R3.5 billion **CAPEX** depending on
scale and technology

Sugar industry opportunities

Could this
support sugar
sector transition?
Yes.

- Existing ethanol capability
- Existing industrial footprint
- Existing logistics corridor
- Existing agricultural capability
- Potential diversification pathway

South Africa does not need to create a fuel economy.

The strategic question is whether more of the value chain is localised

- SA does not need to create a fuel market for bioethanol.
- The market already exists in the current petrol pool and vehicle fleet.
- Even an enforced E2 blend mandate immediately creates an apprx. 181 million litre annual ethanol market
- E10 creates a market approaching one billion L/annum.

The geopolitical environment has changed materially since the study was completed - strengthening the case

The Iran conflict and Strait of Hormuz disruptions materially altered global fuel market dynamics.

Brent crude moved from approximately USD80/bbl before the conflict to peaks above USD120/bbl, with prices remaining structurally elevated above USD100/bbl.

- Higher oil **prices increase the value of ethanol** through the Basic Fuel Price mechanism.
- Higher energy prices **also increase fertiliser, logistics and agricultural input cost**

However, the strategic value of domestic fuel production rises materially during periods of geopolitical energy instability.

At USD80/bbl, grain sorghum was already near-commercial. At sustained oil prices above USD100/bbl, the strategic rationale for domestic bioethanol becomes materially stronger.

The strategic relevance of domestic bioethanol has strengthened materially DOMESTIC BIOETHANOL



Positive effects
Strengthening the case

- Higher ethanol transfer pricing
- Stronger fuel security rationale
- Greater localisation value
- Reduced strategic exposure to imported fuel
- Improved domestic substitution economics



Pressure effects
Costs are rising

- Higher fertilizer prices + Higher feedstock costs
- Increased logistics inflation
- Greater agriculture volatility
- Tighter farmer margins in maize systems



Domestic energy-linked agriculture

- Becoming strategically more valuable



High input grain systems

- Increasingly exposed to global fertilizer shocks

The question is no longer whether South Africa needs fuel resilience.

The questions is whether South Africa acts before the next shock.



Fuel security



Foreign exchange



Jobs & Growth



Lower emissions

The Central Question

Can South Africa convert agricultural assets into strategic energy assets?

Can a fuel currently imported almost entirely from international markets be partially produced domestically from a locally grown crop?



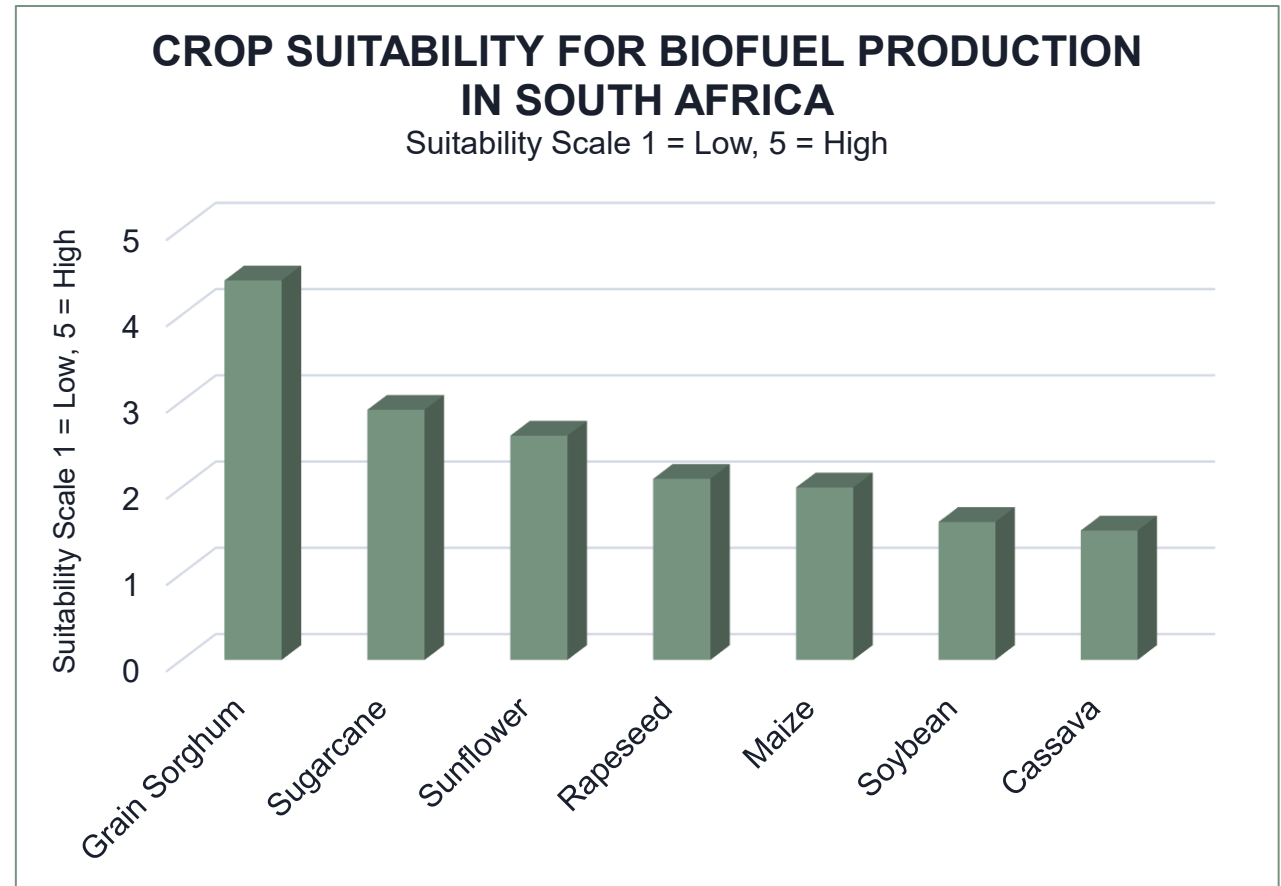
MODELLING SUGGESTS THIS IS A SIGNIFICANT INVESTABLE OPPORTUNITY ALONG THE VALUE CHAIN

- The LSF Integrated Biofuels Model has been published alongside the study to allow independent scenario testing and stress analysis.
- It can be used for all potential bioethanol sources analysed.
- The economics are transparent, interrogatable and updateable.
- The model is transparent, public and interactive
- All scenario drivers can be tested in real time to deliver new scenarios and outcomes



In the Model Analysis, one Feedstock Materially Outperformed All Others

- The study modelled six feedstock and technology pathways.
- Grain sorghum emerged as the strongest-performing configuration by a significant margin.
- At extant prices, the remaining commercial gap was materially smaller than for all comparator pathways modelled



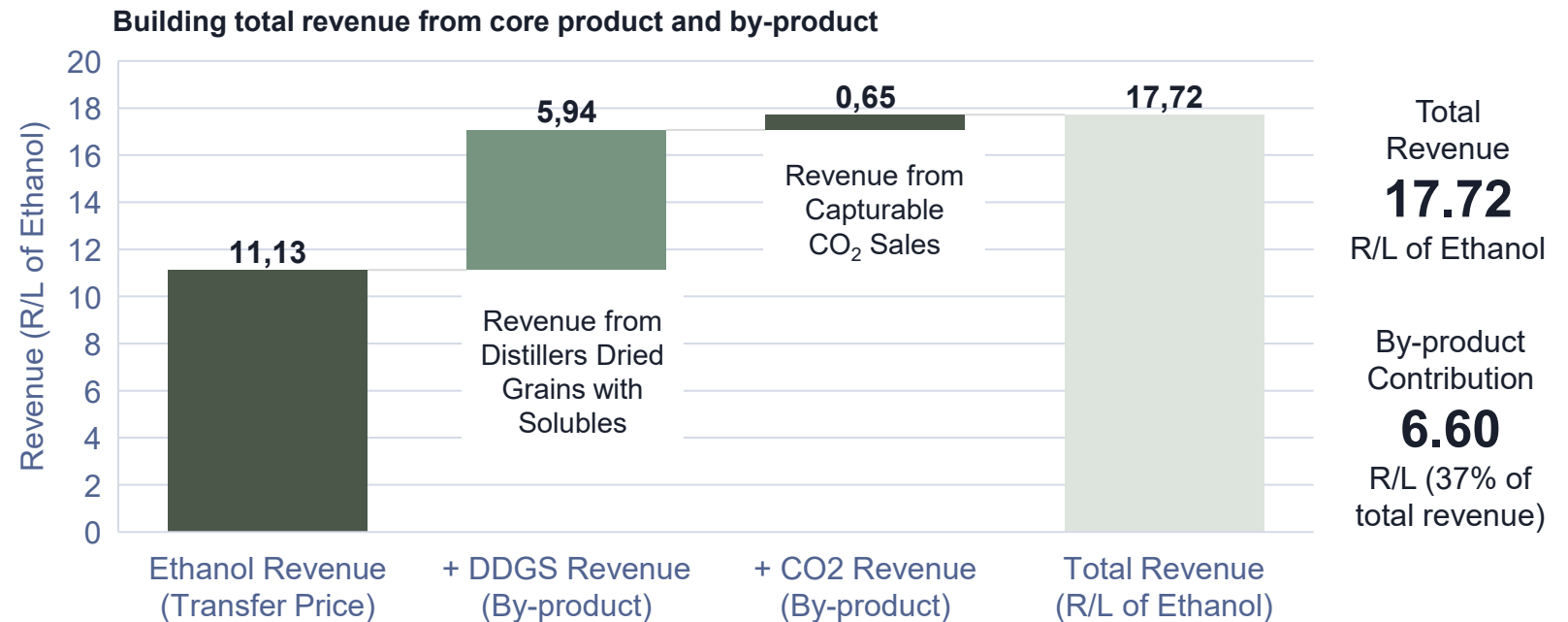
Source: Conservative assumptions based on integrated model outputs

The Economics Are Stronger Than They First Appeared

- By-products are not peripheral to the economics.
- DDGS and capturable CO₂ already contribute approximately 37% of total plant revenue under baseline assumptions.
- A commercially viable DDGS strategy is as important as the ethanol offtake itself.

Grain Sorghum Ethanol: Revenue Waterfall (Per Litre of Ethanol)

Model Output – 2025 Baseline Assumptions (USD80 Brent, R16.50/USD)



Source: Integrated Model Outputs – Grain Sorghum Ethanol Plant (2025)



Key Insight: By-product revenues from DDGS and CO₂ contribute R6.60/L, accounting for 37% of total revenue.

Total Revenue = Ethanol + DDGS + CO₂

More than half the value remains inside South Africa

GRAIN SORGHUM ETHANOL VALUE CHAIN: LOCAL GDP RETENTION

WAGES: 18–22%

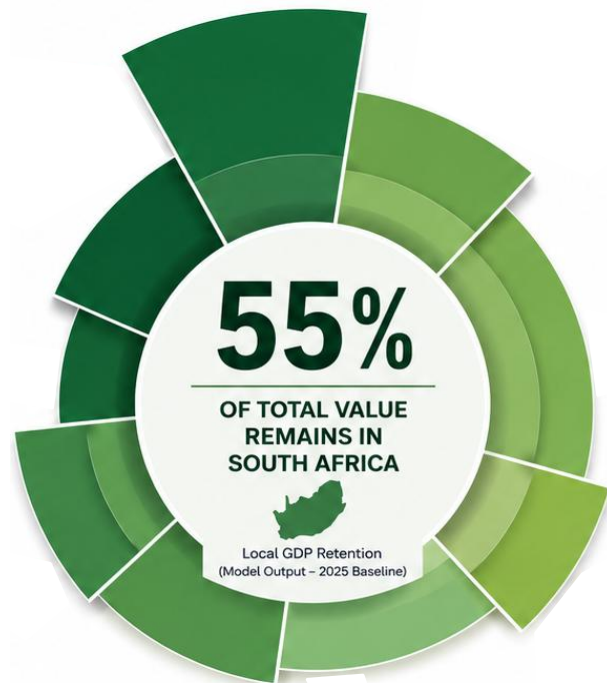
Direct & indirect employment across farming, processing & services.

OTHER SHAREHOLDERS

Returns to capital providers, investors & government.

LOGISTICS: 8–12%

Transport, storage, distribution.



PROCUREMENT: 10–15%

Local goods & services.

AGRICULTURE: 15–20%

Sorghum production by commercial, emerging and smallholder farmers.

PROCESSING: 10–15%

Ethanol production & plant operations.

SERVICES: 7–10%

Professional, financial, technical, regulatory.

At breakeven pricing, ~55% of economic value circulates domestically through wages, procurement, operating surplus and local economic activity.

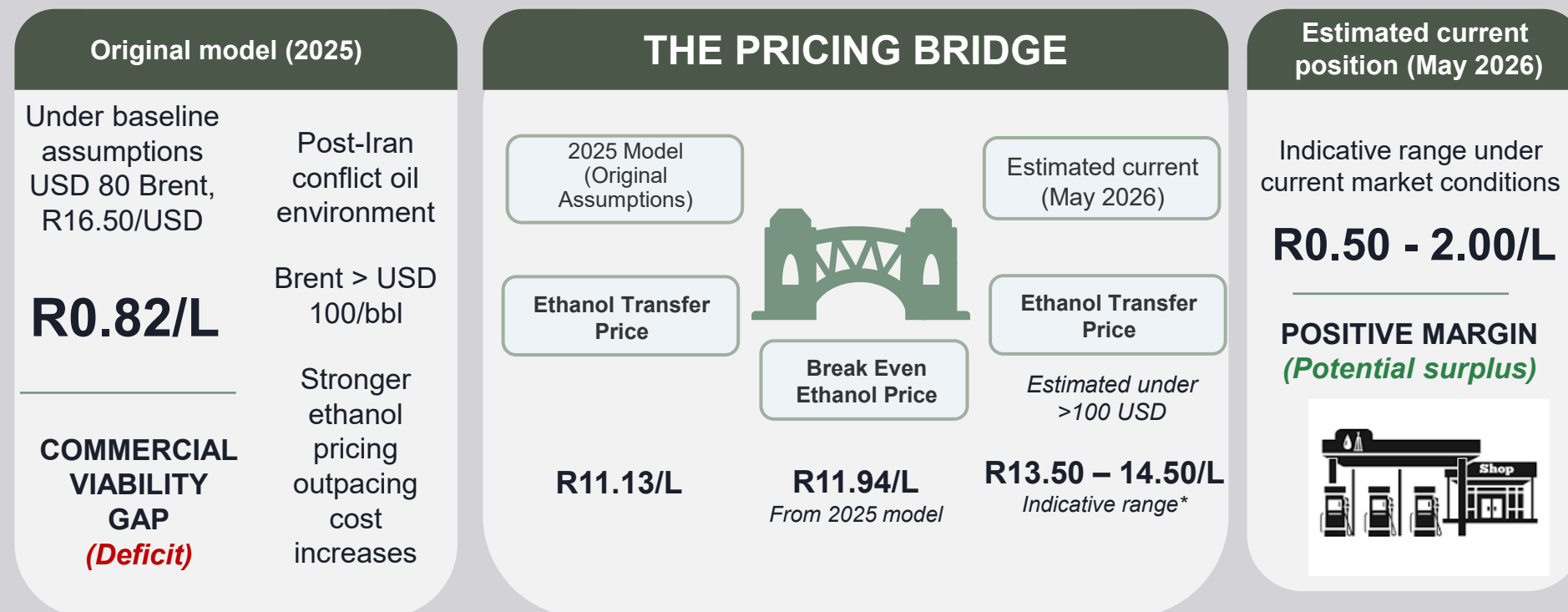
*Imported fuel exports economic value.
Domestic bioethanol retains and recirculates it.*

The commercial breakeven was only R0.82/litre at the time of analysis

- The technology pathway is established globally.
- The feasibility question has largely been answered.
- The remaining issue is closing a relatively narrow commercial gap.
- A number of identified positive steps were identified to close the remaining gap even before current oil price increases
- For example, a 1.5% improvement in dryland yields closes the gap entirely.

Grain sorghum bioethanol: Commercial viability has been proven

Rising oil prices since the Iran conflict have strengthened ethanol economics



BOTTOM LINE: The original model showed a R0.82/L commercial viability gap in 2025. Under current oil market conditions, grain sorghum ethanol is likely at or above breakeven, with an estimated positive margin of R0.50 0 R2.00.L

Three risks dominate the economics

- The economics are sensitive to oil prices, exchange rates and mandate certainty.
- However, these are manageable policy and market risks rather than technological risks.
- The dominant uncertainty is no longer technical feasibility.
- It is policy sequencing and market confidence.

1

BRENT CRUDE VOLATILITY



SCENARIO EXAMPLE
Baseline - USD80/bbl
Higher oil - USD110/bbl

INDICATIVE IMPACT

Baseline; +R1.30 –
ZAR2.50/L uplift

2

RAND/USD VOLATILITY



SCENARIO EXAMPLE
R16.50/USD/
R18.50/USD

INDICATIVE IMPACT

Mixed effect
Scenario monitoring
required

3

POLICY UNCERTAINTY



SCENARIO EXAMPLE
Mandate certainty
Mandate delays

INDICATIVE IMPACT






WACC 15%
WACC 17% -18%

- Higher oil prices strengthen ethanol economic rapidly
- A weaker Rand improve fuel substitution economics
- Policy sequencing and enforcement remains the largest non- technical risk

Model output baseline
Total revenue ZAR17.72/L
By product contribution ZAR6,60/L (37%)

South Africa Can Win – If We Get The Framework Right

Benchmarking South Africa against successful ethanol programmes

Key Dimension	Brazil 	USA 	Kenya 	Zimbabwe 	South Africa 
Mandates	27% - 30% Gasoline blend mandate (E27 rising to E30)	10% Federal mandate (RFS – varies by year)	10% E10 ethanol blend mandate	10% E10 ethanol blend mandate	0% (Today) No blending mandate (policy under development)
Incentives	Strong Tax incentives, low interest financing (BNDES), price support mechanisms	Strong 45Z tax credit (-\$0.21/gal), RINs market, blender credits	Moderate Duty exemptions, tax relief on ethanol & equipment	Basic Duty relief on ethanol & denatured alcohol	Limited No direct incentives at present
Feedstock	Sugarcane High yield, low cost, established value chain	Maize (Corn) Abundant, highly productive, established supply chain	Molasses & Cassava Local availability, import substitution focus	Molasses By-product from sugar industry	Sorghum & Maize Locally grown, scalable, food-security aligned
Maturity	Mature 40+ years of ethanol production and policy support	Mature 40+ years, well-established market & infrastructure	Emerging Program launched 2010, growing steadily	Emerging Program launched in 2014, still developing	Early Stage Feasibility complete, policy & investment mobilisation underway
Scale (2024)	~34bn Litres World's 2 nd largest ethanol producer	~56bn Litres World's largest ethanol producer	~420mn Litres Growing domestic production	~120mn Litres Small scale, growing capacity	0 Litres Planned: 250-300mn Litres at full commercial operation (single plant)

International experience shows a consistent pattern

Global bioethanol industries

consistently emerge where governments establish durable demand certainty before expecting large-scale private investment.

Regulation alone does not build industries. Sequenced market certainty does.

Can South Africa compete?



STRENGTHS

- Sorghum land & climate fit - 2.3M ha suitable with low water needs
- Existing fuel distribution system - national blending infrastructure
- Industrial & financial capacity - deep capital markets, strong industry
- Policy framework now in place - 2% (E2) mandate, DFFE registration, transfer pricing gazetted Aug 2025 closes the key gap
- 55% local GDP retention - more than half the value stays in SA



OPPORTUNITIES

- E2 mandate creates anchor demand – 300M L/year
- R0.82/L gap is bridgeable – VGF or equivalent can crowd in capital
- VGF can unlock first movers – de-risk capital, crowd in commercial finance
- Contract farming can secure supply – stability for farmers and plants
- Carbon credits can stabilise margins – 70–80% lower GHG vs petrol



WEAKNESSES

- Low current sorghum yield & volume - restricts scale and costs
- Thin feedstock market - limited aggregation & offtake certainty
- Limited biofuels implementation track record - industry is early stage
- High first-mover capital risk – long payback, policy enforcement risk
- Coordination gap - between farmers, blenders, government & funders



THREATS

- Mandate not enforced – biggest risk to demand certainty and investment
- Grain & fertiliser price shocks – squeeze margins and competitiveness
- Policy drift / implementation inertia – delays benefits, raises risk premium
- Cheap ethanol imports – undercut local industry without safeguards
- Climate shocks & logistics failures – droughts, rail/port disruptions, raise feedstock and distribution costs

The prize if we execute:



300M L/year domestic demand (E2 mandate)



R6–8bn/year reduction in fuel import spend



20 00+ jobs across agriculture, industry and logistics



1.0–1.5Mt CO₂e emissions reduction per year



R4–6bn+/year fiscal & GDP uplift potential

South Africa has the feedstock logic, policy framework and industrial base

The investability question is execution: enforce the mandate, de-risk first movers, and organise feedstock supply

What this means for investors, DFIs and industry

The opportunity extends materially beyond ethanol production itself.

Commercial opportunity exists across logistics, storage, aggregation, by-product commercialisation, infrastructure and blended finance.

This is an industrial ecosystem opportunity.

From Sorghum To Bioethanol A Local Value Chain. Real Returns.

AGGREGATION

Farmers supply sorghum to hubs

Contract farming for volume & quality farmer earnings increase rural economies grow

STORAGE

Grain stored, managed and protected

Modern silos reduce losses and costs; Productivity high, quality grain, reliable supply

LOGISTICS

Road, Rail, Pipeline, Storage

Lower logistics costs and integrated corridors unlock scale

PROCESSING

Milled, fermented, ethanol and by product

Local processing creates jobs, Higher efficiency Lower emissions

BLENDING

Fuel E2 to E10

Valuable co-product improves returns Supports livestock Cuts feed imports

LOGISTICS AND STORAGE

To the pump, retail

Displaces imports, Saves forex, Lower carbon Energy sovereign security

FINANCE AND RISK SHARING - THE ENABLER

Viability gap funding de-risks first movers

Blended finance crowds in capital

Offtake agreements de-risk revenue

Credit guarantees unlock bank funding


Carbon finance improves project returns

An Investment that compounds Value 

20,000 + jobs 

Reduction in fuel import spend ZAR6-8 Bn/Year 

1- 1,5 Mn Tonnes CO₂e Emissions Reduction a Year 

ZAR4-6 Bn/year GDP and fiscal uplift potential 

Key Research & Model Findings - 2025

OVERALL

FUEL SECURITY

- Bioethanol evolving into a **strategic fuel-security opportunity**.
- Rising dependence on imported refined fuels makes domestic bioethanol a **resilience intervention**.

ECONOMIC VIABILITY

- Commercial viability gap already **narrow at ~R0.82/L**.
- Higher oil prices and refined fuel vulnerability have **strengthened the economics**.

LOCALISATION & ECONOMIC IMPACT

- Over half of value retained in the South African economy.
- Supports GDP, jobs, logistics, agriculture, and downstream industries.
- **Multiplier effects** extend well beyond the ethanol plant.

INTERNATIONAL EVIDENCE

- Successful bioethanol industries become **industrial ecosystems**, not isolated projects.
- **Brazil's case study** shows decades of agricultural expansion, industrial processing, logistics investment, rural employment, and technology localisation.

Key Research & Model Findings - 2025

INVESTMENT

REVENUE DIVERSIFICATION

- By-product revenues (DDGS, CO₂, animal feed) create **multiple industrial revenue streams**.
- Diversification across ethanol, logistics, and agriculture improves **resilience vs. single-product projects**.

MARKET TIMING & DEMAND

- Rising global energy insecurity and oil-price volatility make this a **timing opportunity, not a speculative bet**.
- Demand case already exists - **petrol pool, vehicle parc, and blending architecture** provide immediate market once mandates are enforced.

COMMERCIAL VIABILITY & RETURNS

- Narrow baseline gap (~R0.82/L) means **modest improvements in yields, financing, logistics, or policy certainty** can close viability.

STRATEGIC POSITIONING

- **First-mover advantage** critical if blending enforcement accelerates - early operators secure feedstock, logistics, and industrial positioning.

Key Research & Model Findings - 2025

FARMERS AND AGRICULTURE

RESILIENCE & STRATEGIC FIT

- Sorghum is ***resilient under lower-rainfall conditions.***
- Bioethanol evolving into a ***strategic fuel-security and localisation opportunity.***

FARMER PARTICIPATION & INCLUSIVITY

- Opportunity spans ***commercial, emerging, and smallholder farmers.***
- Provides a ***new demand channel for dryland agriculture,*** easing pressure from fertiliser costs and climate volatility.

MARKET DIVERSIFICATION

- Bioethanol demand helps ***diversify producer exposure*** beyond conventional grain cycles.

RURAL ECONOMIC ACTIVITY

- Value chain extends to ***storage, transport, handling, aggregation, and local processing.***
- Generates ***secondary employment and rural economic activity.***

A strategic window now exists

The economics are now quantifiable.

The policy framework largely exists.

The strategic rationale is increasingly compelling.

The remaining question is whether South Africa chooses to industrialise around the opportunity while the window remains open.



Real Impact
Job creation
Energy security



Real returns
Attractive
fundamentals
Long term value



Real Partnership
Government Industry,
Investors, Farmers,
Labour



Real solutions
Lower emissions
Global relevance



Real security
Local feedstock
Local value



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