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Oil pipelines investments in Brazil positive externality from Paranaguá-Araucária-Cuiabá route

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Indicative Oil Pipeline Plan

- With continental dimensions, Brazil has fuel markets distributed throughout its territory, which poses logistical challenges, especially for shipments to the regions farthest from the refineries, such as the consumer centers in the Midwest.
- In the projections of the *Ten-Year Energy Expansion Plan* (EPE, 2022) the supply and demand for fuels continues to grow during the entire period. Furthermore, net imports of oil products should gradually increase, surpassing the historical maximum by the end of the ten-year period.
- In this context, the promotion of infrastructure for the fuel transportation will be fundamental. The deficiency of logistics and fuel transportation infrastructure generates vulnerability and can result in loss of competitiveness, causing potential increases in costs in the oil production chain, with the possibility of supply failures, in addition to environmental and health impacts.

Indicative Oil Pipeline Plan



General characterization

- Oil products pipeline infrastructure analysis
- Possible points of supply and potential demands
- Definition of the origin, destination and preliminary route
- Estimation of extensions, products movements, pipeline capacity and preliminary costs



Social Environmental analysis

- Final corridor and proposed route definitions
- Social and environmental areas to avoid



Technical economic feasibility analysis

- Technical and finance detailing
- Capital expenditure estimation (CapEx and OpEx)
- Physical and financial schedule
- Pipeline competitiveness and potential developments



Oil products' demand

Identifying key regions

A map with the sum of LPG, gasoline, diesel oil and jet fuel of each *Immediate Geograph Region*^{*} in 2031^{**} was elaborated, with graduated colors.

This allowed different analysis to be carried out and to identify the key regions for the pipelines.



** According to Ten Year Energy Expansion Plan 2031 (EPE, 2022).

Projected pipelines



The proposed pipelines comprise the duplication of Olapa Pipeline, including new terminals in Paranaguá (PR) and Araucária (PR), and a new oil pipeline from Araucária to Cuiabá, including new terminals in Jataizinho (PR), Presidente Prudente (SP), Campo Grande (MS), Rondonópolis (MT) and Cuiabá (MT), denominated Route 1A in the Indicative Oil Pipeline Plan.



Projected pipelines

Araucária-Cuiabá Pipeline

Pipeline section	Extension	Diameter	Maximum
ripetille section	(km)	(in)	flow rate (m ³ /h)
Araucária - Jataizinho	375	20	1,455
Jataizinho - Presidente Prudente	147	16	930
Presidente Prudente - Campo Grande	415	14	715
Campo Grande - Rondonópolis	471	10	415
Rondonópolis - Cuiabá	159	8	280

Estimated CapEx: US\$2,426.1 million*

Terminal	State	Volume handled (1,000 m³/year)
Jataizinho	Paraná	4,179
Presidente Prudente	São Paulo	1,586
Campo Grande	Mato Grosso do Sul	1,559
Rondonópolis	Mato Grosso	1,591
Cuiabá	Mato Grosso	1,750

Estimated CapEx: US\$383.8 million*



* - Include exchange rate of R\$ 5,032/US\$.

Projected pipelines

Paranaguá-Araucária Pipeline

Binolino costion	Extension Dia	Diameter	Maximum
Pipetine section	(km)	(in)	flow rate (m ³ /h)
Paranaguá - Araucária	94	22	1,765

Estimated CapEx: US\$238.5 million*

Terminal	State	Volume handled (1,000 m³/year)
Paranaguá	Paraná	13,159
Araucária	Paraná	13,159

Estimated CapEx: US\$871.6 million*



* - Include exchange rate of R\$ 5,032/US\$.

Impact of implementing the proposals

Araucária-Cuiabá Oil Pipeline

Destination	Road distance (km)	Oil products transported (1,000 m³/month)	Number of trips	Total distance (1,000 km/month)	Avoided diesel oil consumption (m³/month)	Estimated cost of road transport (millions US\$/month)
Jataizinho	810	336	5,596	4,533	2,628	10
Presidente Prudente	1,162	130	2,161	2,511	1,456	5
Campo Grande	2,012	126	2,104	4,233	2,454	9
Rondonópolis	2,980	126	2,105	6,273	3,636	13
Cuiabá	3,402	139	2,317	7,882	4,570	16
Total	-	857	14,283	25,432	14,743	52

Paranaguá-Araucária Oil Pipeline

Road distance (km)	Oil products transported (1,000 m³/month)	Number of trips	Total distance (1,000 km/month)	Avoided diesel oil consumption (m³/month)	of road transport (millions US\$/month)
218	1,097	18,276	3,984	2,310	11
	Road distance (km) 218	RoadOil products transporteddistance (km)(1,000 m³/month)2181,097	RoadOil products transportedNumber of tripsdistance(1,000trips(km)m³/month)1,097	RoadOil productsTotaldistancetransportedNumber ofdistance(km)(1,000trips(1,000m³/month)km/month)2181,097	Road distance (km)Oil productsTotal Number of transportedAvoided diesel oil consumption (m³/month)2181,09718,2763,9842,310

The Araucária-Cuiabá Oil Pipeline would avoid 14,200 trips monthly by B-double trucks, an annual consumption greater than 180,000 m³, averting emissions of 471,000 t of CO₂, 30.4 t of CH₄ and 22.2 t of N₂O.

The Paranaguá-Araucária Oil Pipeline would avoid 18,000 trips monthly by B-double rucks, an annual consumption greater than 27,000 m³, averting emissions of 71,000 t CO_2 , 4.6 t of CH_4 and 3.3 t of N₂O.



Potential for lowering cost of fuel transport

Based on road transport cost data for liquid bulk, obtained by the Transport Cost Simulator (Infra S.A., 2022) and with data on road distance and transported volume, the annual cost was estimated for equivalent points to Route 1A.

Investments in buying trucks were disregarded, but the capital expenditure for the pipelines and associated terminals is present.



Final Remarks

• The expansion of the pipeline system can contribute to the reduction of product handling costs, as it stimulates competitiveness in the country's fuel markets.

• With the expansion of pipeline transport, the potential avoided consumption of diesel oil for road use represents one of the positive externalities. Furthermore, pipeline projects contribute to reduce the national deficit of this fuel, to improve national energy security and, possibly for a reduction in the freight cost.

• Deficient logistics infrastructure and bottlenecks limits a country's fuel supply, increasing costs in the production chain and loss of competitiveness in other sectors of the economy.



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