

ASSESSMENT OF GAS TRANSMISSION PIPELINES IN BRAZIL'S SOUTH REGION

Rio Pipeline 2019 – Estande da EPE

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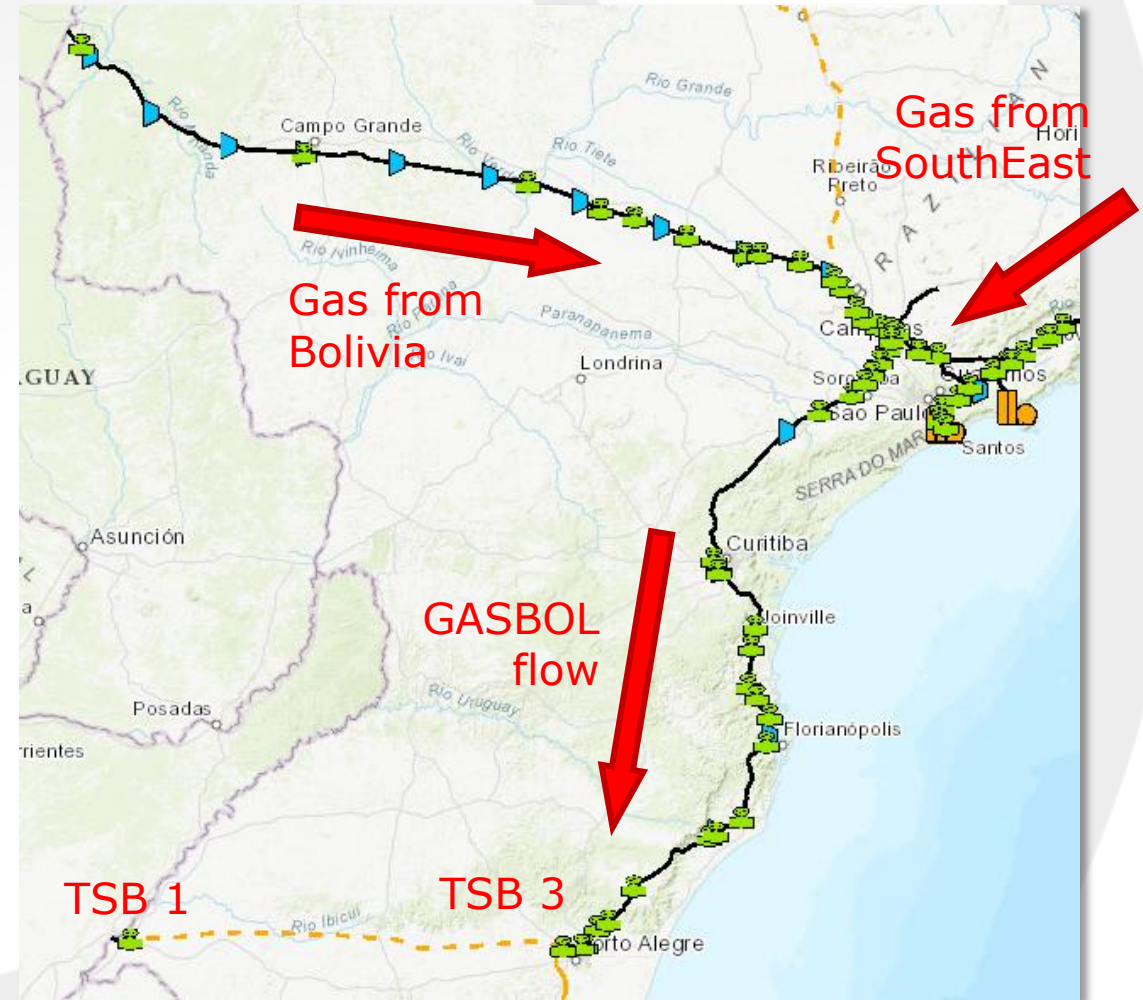
Topics

- Gas Infrastructure in South Region
- Projects under study
- Pipeline Simulations
- Pipeline Alternatives
- Pipeline Costs
- Feasibility Analyses
- Conclusions



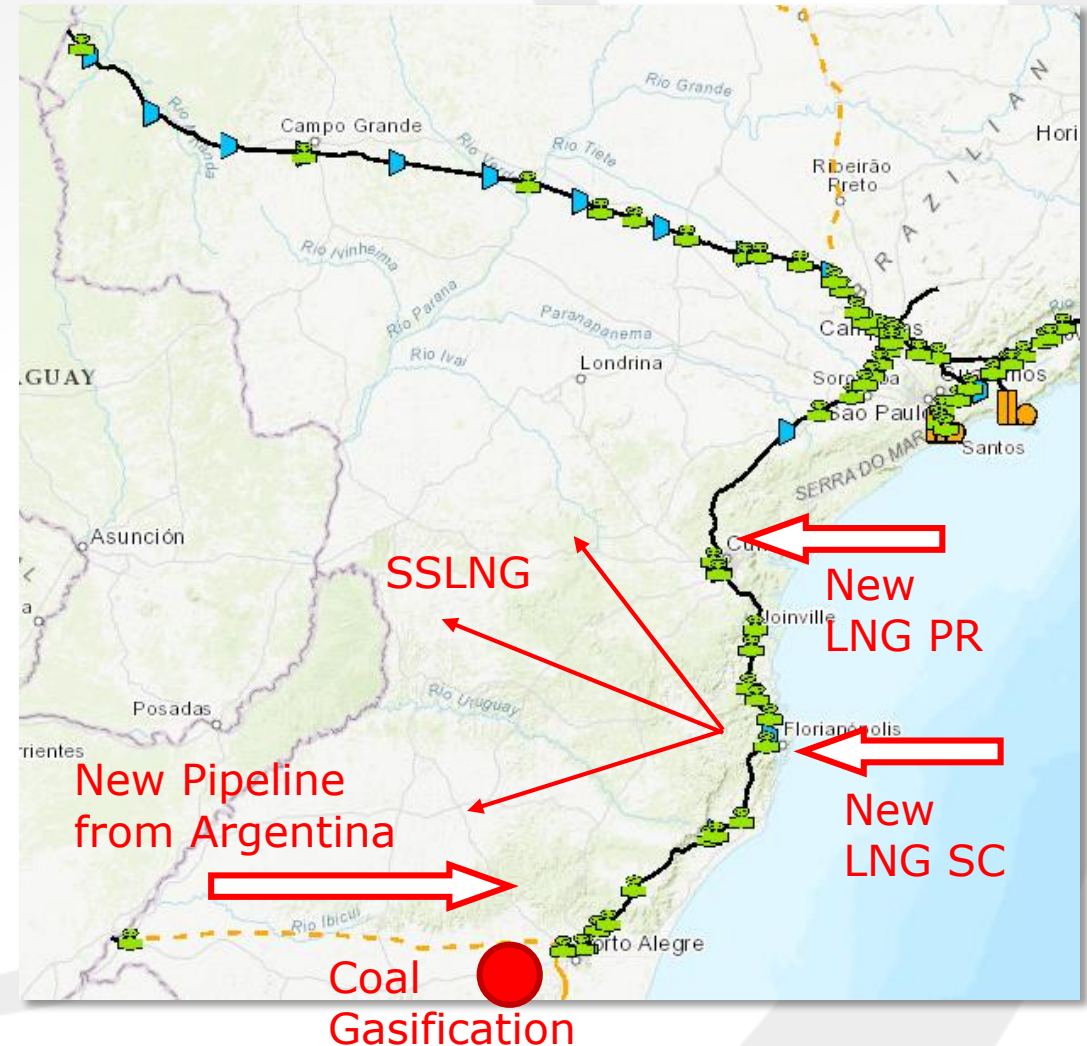
Gas Infrastructure in South Region

- GASBOL South Stretch
- TSB 1st and 3rd Stretches
- Gas-Fired Power Plants
 - Sepé-Tiaraju/RS
- Refineries and Fertilizers
 - REPAR/PR
 - FAFEN/PR
 - REFAP/RS
- Petrochemical Plant
 - Polo de Triunfo/RS
- Capacity Constraints to RS



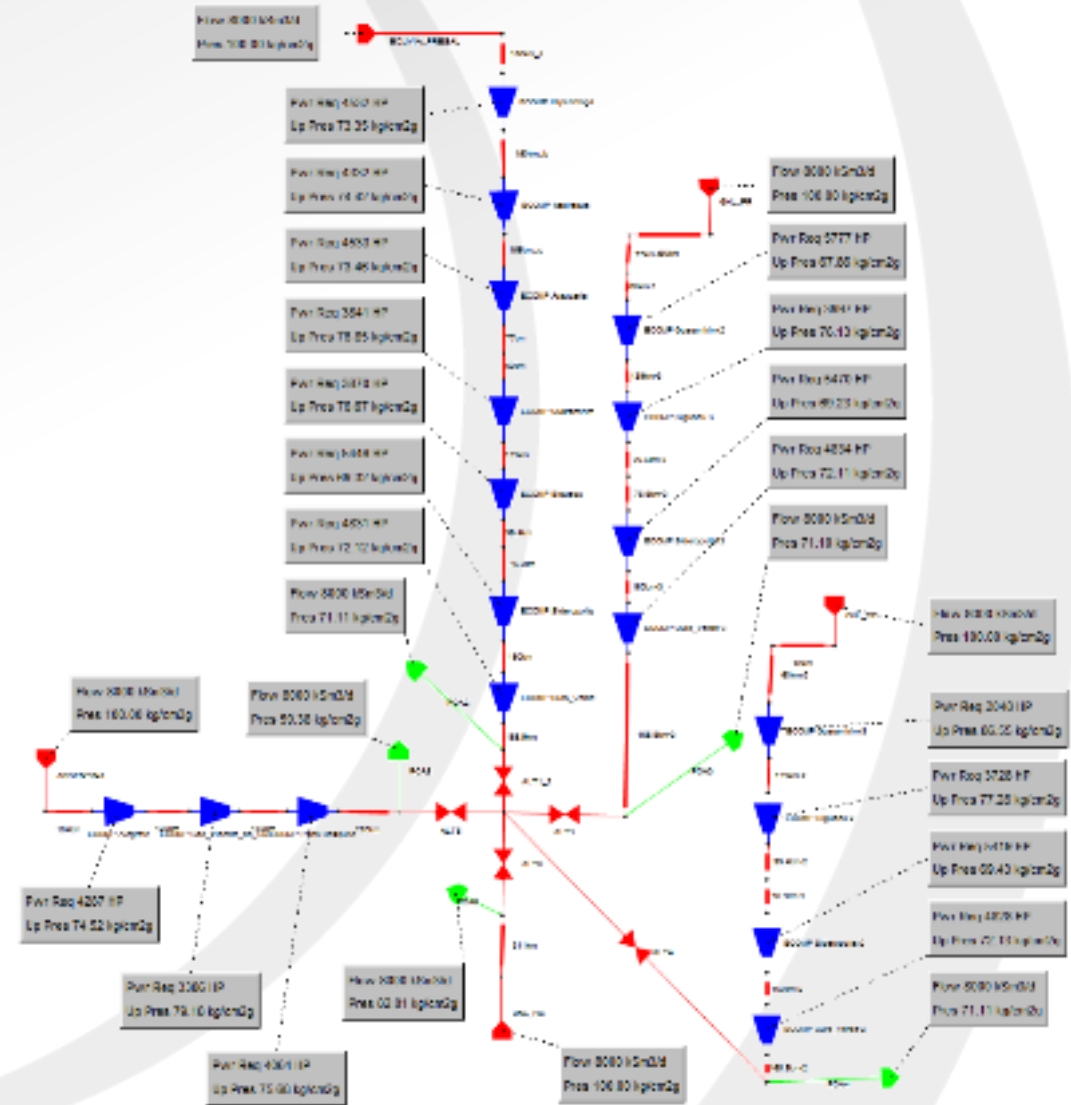
Projects Under Study

- New LNG in Santa Catarina (SC)
- New LNG in Paraná (PR)
- New pipeline from Argentina
- Coal Gasification project in Mina Guaíba/RS
- Small-Scale LNG to the countryside in PR, SC, RS



Pipeline Simulations

- Alternatives designed to bring 8 million m³/day to Porto Alegre/RS
- Diameter of 20" for all projects
- Compression Stations were necessary in 2 of the alternatives (Argentina, GASBOL duplication)



Source: EPE.

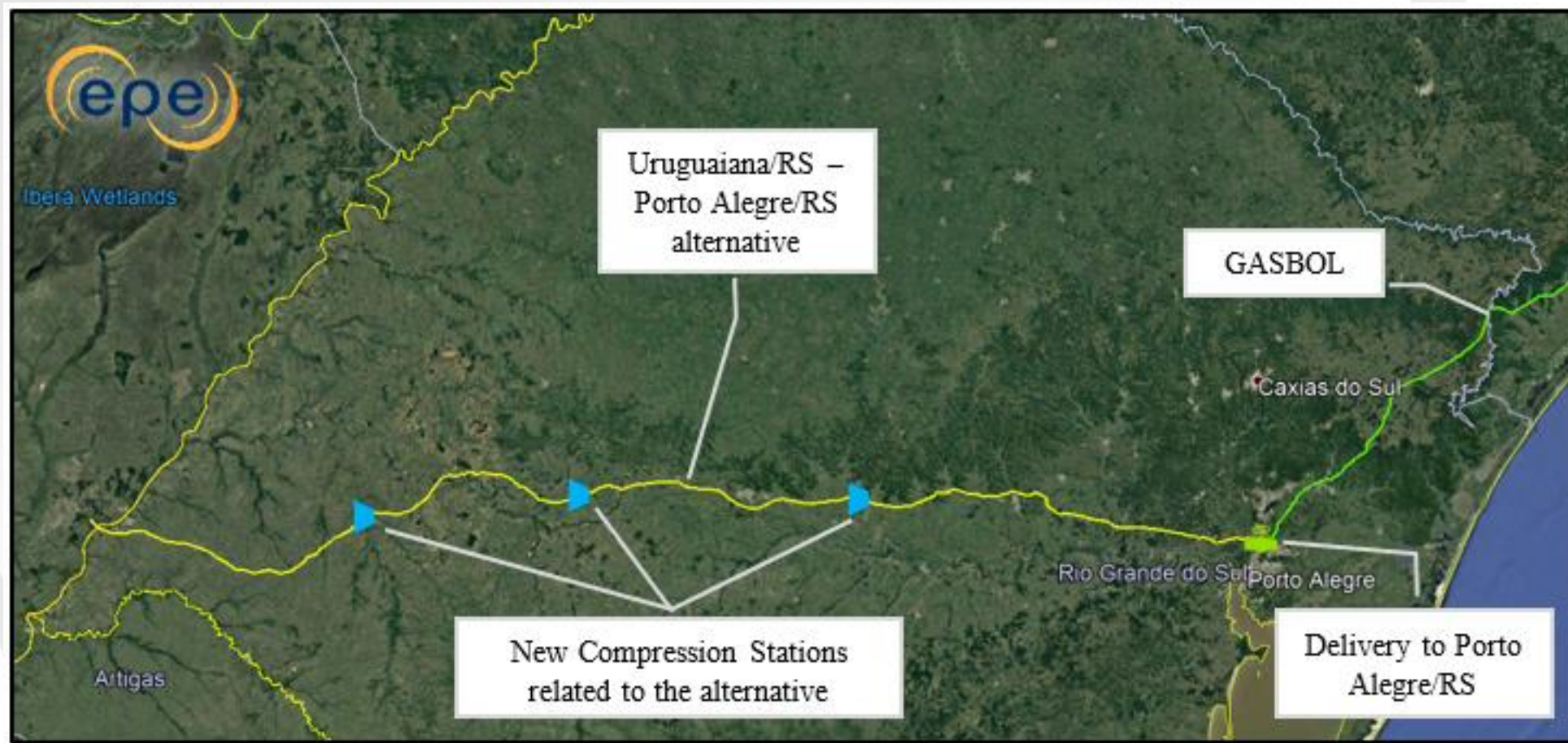
Pipeline Alternatives

Siderópolis/SC - Porto Alegre/RS



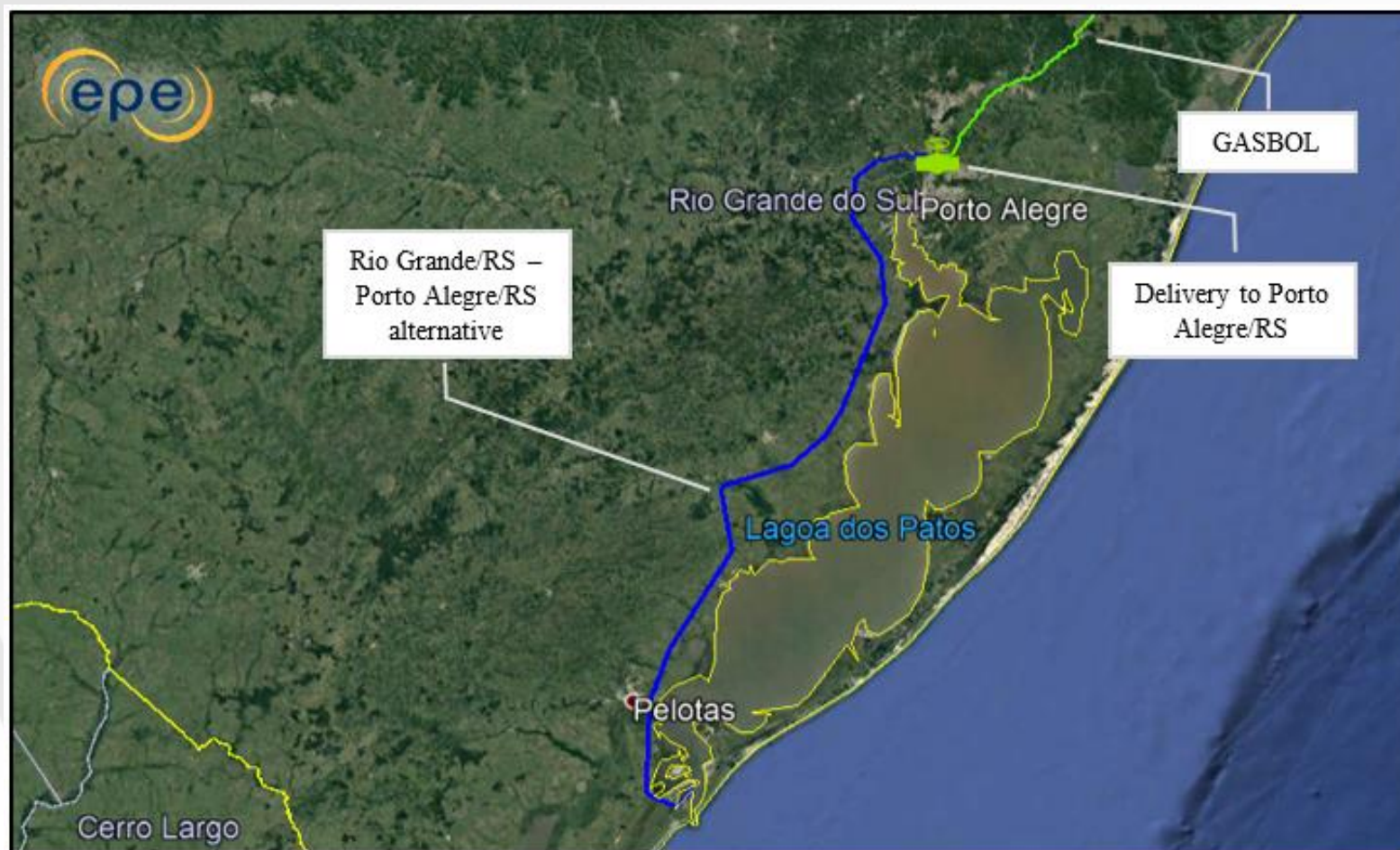
Pipeline Alternatives

Uruguaiana/RS - Porto Alegre/RS



Pipeline Alternatives

Rio Grande/RS - Porto Alegre/RS



Pipeline Alternatives

Mina Guaíba/RS – Porto Alegre/RS



Pipeline Costs

Alternative	Extension (km)	Diameter (inches)	Capacity (MMm ³ /day)	CAPEX (mi R\$)	OPEX (mi R\$)	Tariff (US\$/MMBtu)
Siderópolis-Porto Alegre	249	20	8	2,403	113	1.09
Uruguaiana-Porto Alegre	644	20	8	4,959	198	2.14
Rio Grande-Porto Alegre	336	20	8	2,350	94	1.01
Mina Guaíba-Porto Alegre	43	20	8	406	17	0.17

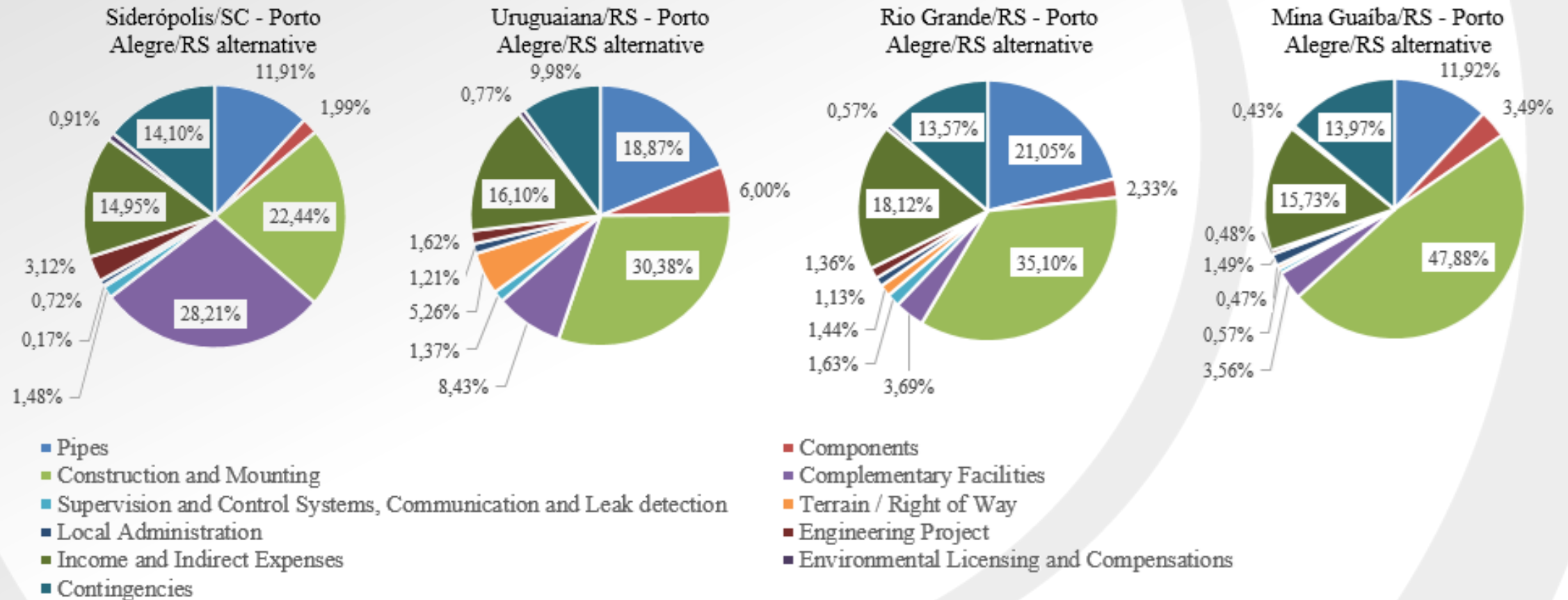
Note: estimates based on concept screening level analyses, with -20% to -50% and +30% to +100% precision.

Source: EPE.



Source: 3D pipe cad free.

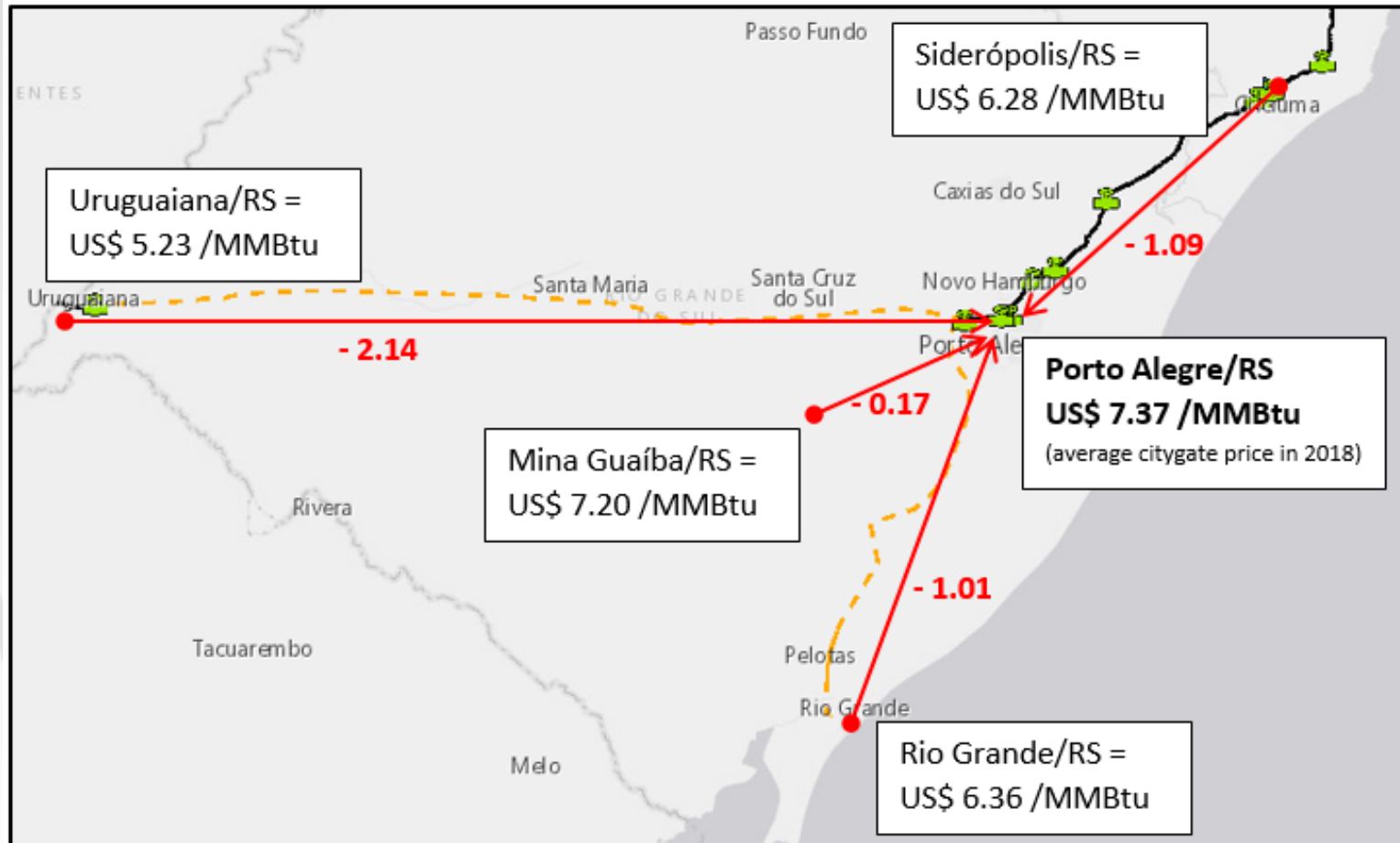
Pipeline Costs



Note: estimates based on concept screening level analyses, with -20% to -50% and +30% to +100% precision.

Source: EPE.

Feasibility Analyses




Price of Natural Gas from each source, so that it can be competitive in Porto Alegre/RS based on current citygate prices

Note: estimates based on concept screening level analyses, with -20% to -50% and +30% to +100% precision.

Source: EPE.

Conclusions

Final Considerations and Future Developments

- Many alternatives can provide new natural gas volumes to the South Region of Brazil
- New pipeline projects are necessary for gas transmission
- Alternatively, new capacities can be provided by shifting the Compression Stations in GASBOL (TBG projects)
- New gas sources with a price around US\$ 5.2 to US\$ 7.2 /MMBtu can be feasible for delivery in Porto Alegre/RS
- For more details, including current cost analyses, see the **Indicative Pipeline Plan** by EPE (Plano Indicativo de Gasodutos – **PG**)

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