

**Executive Summary - SADEC GAS BASED INDUSTRY
FEASIBILITY STUDY - FOCUS ON ANGOLA & MOZAMBIQUE**

Executive Summary

Angola and especially Mozambique have significant natural gas resources which are in the process of being monetized to promote their domestic economies and provide government revenue. For Angola we investigate options for reserves varying between 13 and 25 Tcf, for Mozambique we consider reserve estimates between 97 and 192 Tcf. We have evaluated eight different large industries, and assessed their economic viability under three price forecasts. The results of our netback analysis are given in the chart below.

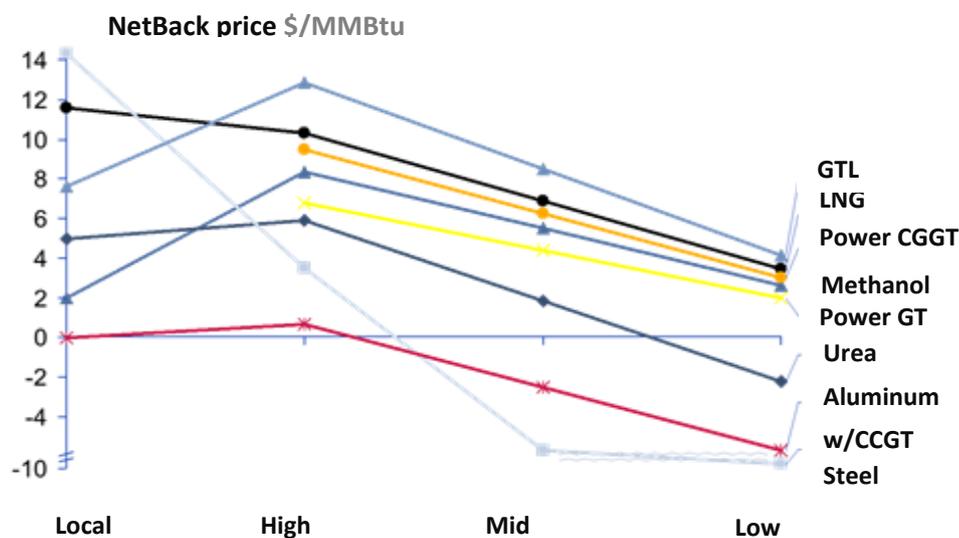


Figure 1. Netback analysis for industry options

Based on the netback and further analysis of the eight industries we conclude the first phase should involve a combination of the following three industries: LNG, Power plants, and Urea (fertilizer). Power plants and Urea have the greatest impact on domestic small and medium enterprise development, while LNG serves as anchor project to develop required infrastructure.

- LNG is an important anchor project, but it is not the best use of country resources to spur domestic development. Still it is a necessary component of the development because it provides significant revenue while building up a skills base to do more complicated projects. The high economic returns available from serving global LNG demand justify the significant investment in gas infrastructure required to develop the resources and bring them to market.
- Power plants should be developed as often as needed to stabilize the grid and grow demand as new hydroelectric facilities are built in parallel. The primary dependence on hydro power limits gas used for electric power and the resulting revenues, but makes gas available for other uses. If hydroelectric facilities are slow to develop, additional gas power plants can be built to ensure a reliable electric supply.

- Urea is an important project to develop both Mozambique and Angola domestic economies, and Mozambique is in a clear position to create great value by building a urea plant. There is significant urea demand in the SADC region which Mozambique is well positioned to serve. Based on this regional demand and the corresponding local prices, we see a netback value in the neighborhood of LNG and power. We do not recommend building urea plants in this region for global export as the corresponding netback value is very low or even negative.

For the second phase we propose additional units of the three industries mentioned above in combination with Methanol, Gas-to-Liquids, Steel, and Cement production facilities.

- Methanol does not compete with LNG in terms of the netback analysis, but we see opportunity for the country from a diversification perspective. As there is presently a lack of local expertise for this industry, we recommend it to start up at least three years after first LNG. As it is vulnerable on global markets in the near term with large oversupply we would recommend vertical integration, so the buyer of methanol takes a stake in the gas production, or agrees to long term supply contracts from the producer to ensure security of future revenue. It is also encouraged to develop local beneficial uses for methanol, which could include its use as an energy carrier.
- Gas-to-Liquids (GTL) is the most complicated facility that requires a deep base of local expertise to be built economically. We only recommend GTL in a high case scenario for Mozambique.
- Steel production should be considered in Mozambique if ore reserves prove economical as expected. The netback value was not as high as LNG and the global market is oversupplied, but steel is an important industry that allows a lot of expansion in the manufacturing and construction sectors. Natural Gas is competing with coal to be the most economical fuel, so on this basis natural gas may not be needed. A decision in Angola can be differed until economical iron resources are validated.
- Cement, like steel production, can readily utilize coal resources that are available in Mozambique and to a lesser extent in Angola via regional trade. From a netback perspective cement is not that promising. However, from an environmental perspective gas use in cement production is preferred above coal. This environmental perspective was the background for the fuel switch in 2008 for the cement factory in Mozambique.

From a netback perspective we see no ground for gas use in aluminum production. As hydro sources are available in the region generally aluminum smelters will be delivered with hydro generated power. As shown in the industry section the gas use in aluminum production is only substantial if the electricity used is generated by gas. Implicitly this gas use is already been taken into account when describing the Power generation.

A potential outlook of a gas based industry in both countries is provided in the chart below:

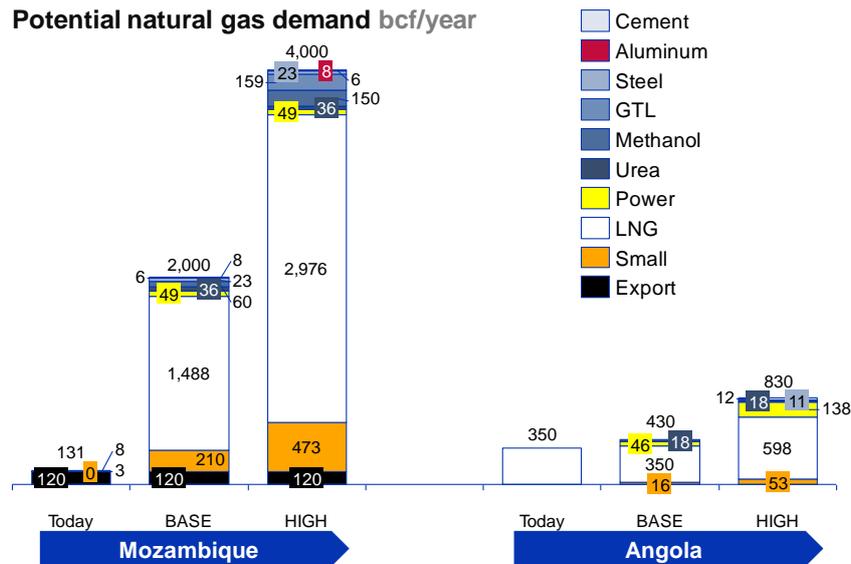


Figure 2. Future natural gas demand by sector and scenario

To enable the gas based industry as shown above our most important recommendations are:

- Stable and transparent regulation is key to any economic development. It provides confidence to investors and reduces investment risks.
- The planning of gas transport infrastructure co-jointly with the planning of gas-fired power generation (and large gas-using projects in general) is of major importance to Angola and Mozambique.
- The declared exclusive state property rights for dry natural gas in Angola seem a major barrier for IOCs to invest in gas exploration and development in the country. We recommend abolishing these exclusive state property rights.
- A constructive industrial development plan for natural gas in Mozambique is key, given the huge gas reserve base. A clear coordinated approach, which has been shown by the Qataris, may help to develop integrated large-scale projects linked to LNG exports and downstream industries that use natural gas as a feedstock. The government of Qatar has clearly prioritized domestic projects enabling to serve industry e.g. in terms of providing input for large plants such as fertilizer, GTL and methanol.
- LNG is a global market and new projects are being considered all around the world. Angola and especially Mozambique should bear in mind that this industry may show a boom-and-bust investment cycle. We have clear indication that traditional oil indexation will not hold in future. Innovative pricing and other terms and conditions may help to serve as well the producer with a reasonable return, the governments with reasonable tax income and the buyer with affordable prices in their market.