Angola energy storage for backup power

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Generation dispatch will depend greatly on hydrology. In favourable years hydro will represent more than 70% of internal consumption, gas production will also serve exports, and the remaining thermal will be used only as a backup (representing less than 1% of the generation). In dry years, hydro will account only for 48% of production, gas power stations will be fully functioning for internal consumption, there will be a high utilization of the remaining thermal backup units and it may be necessary to import energy in off-peak hours. Maintaining supply security requirements, Angola may export energy in wet periods and import during off-peak hours in dry periods.

Public investment will progressively be replaced by long term private financing. Public financing is to be reserved for investments in the public sphere: large dams, the national transport network, investments in the distribution areas allocated to the public utility and rural electrification.The remaining investments should be progressively undertaken by the private sector, enabling single buyer"s creditworthiness in a way that allows for the mobilization of the required funding.

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The average daily use profile of the power plants by energy source chart below exemplifies the operation of the system along one average day should the same water flow levels as those occurred in 1971/1972 - the worst hydrologic year ever recorded - be observed in 2025. In this situation the hydroelectric generation only represents 47% of the total, with natural gas mounting up to 25% and the remaining thermal plants to 6%.

For the Angolan power system to work in a secure way, it is advisable that it disposes of at least a minimum backup power reserve - called the minimum required reserve - above the highest consumption load predicted for the system. This minimum required reserve should cover the accidental failure of the largest thermal generation set, of the largest hydropower generation set, of the lack of primary renewable and hydro energy as well as an increase in the consumption peak due to temperature effects. The guaranteed power capacity corresponds to the installed power minus the minimum required reserve.

The following map exemplifies the calculation of the guaranteed power capacity that should be available by 2017 - considering that La?ca only enters into service at the end of that year - and compares it with the estimated consumption peak this scenario we obtain a cover ratio of 1,1 (ratio between guaranteed power and peak demand), which demonstrates that an adequate implementation of the 2013-2017 Action Plan will allow reaching sufficient levels of coverage by 2017.

The analysis demonstrates that such future power capacity (expected plus already decided projects) is clearly not sufficient, with a deficit of guaranteed power of 1,3 GW with respect to the maximum load and of 1,7 GW if a cover ratio of 1,05 is intended (this value was selected as the cover ratio target in the present study for

2025 so as to safeguard eventual delays in the development of certain projects or a higher demand rate growth).

The need for additional capacity will be higher should it be decided to promote new additional hydropower projects which, although competitive, show lower guaranteed capacity relative to installed capacity and cannot benefit from a higher hour concentration of hydropower production as does La?ca. The need for power will also vary with the evolution of demand, hence it is important to adjust the system requirements to the evolution of project execution and consumption.

Angola has innumerous possibilities concerning supply options in order to face the needs of additional generation until 2025, in particular in what concerns hydropower and natural gas - as explained in the previous chapters. Four main possible guidelines were developed, designated as "macro-scenarios" in order to select which projects to install until 2025, giving different weights and relevance to each of the main alternative power sources:

The significant difference in CO2 emissions between the different scenarios resulted in a lower score for both the scenarios of diversification - due to the high emission levels associated with coke - and of natural gas. On the other hand, the lower investment needed for natural gas resulted in two scenarios of Hydropower and Gas Balance being considered.

The new hydropower projects of the Cuanza river, although highly competitive, should only be developed by 2025 if associated with new structuring projects that imply a significant increase of the forecasted demand.

The Angolan government"s focus is shifting towards the inclusion of more renewable energy sources and enhancing domestic electrification.