

Management Summary

In line with the power sector reforms in Ghana and conforming to regulations, Volta River Authority (VRA), a state owned electric utility in Ghana is on the verge of restructuring its power generation business in the advent of the emerging competitive electricity industry. This has become necessary because according to the Electricity regulations of Ghana, VRA Thermal will be subjected to both spot and bilateral contracts in the wholesale electricity market whilst VRA Hydro will only be subjected to the spot market. Even though currently there is an independent grid operator and three IPPs in addition to VRA in the wholesale market, there is really no functioning electricity spot market mainly due to the insufficient number of market players. Hence all the trading is done by bilateral contracts but this will change when the number of players increase and over capacities set in some time down the line which will lead to fierce competition.

For this reason VRA Thermal must improve its competitiveness if it has to stay in contention because even though currently demand exceeds supply and therefore very little competition exists, there are many more IPPs who are getting ready to enter the market. And should that happen, there will be strong competition leading to huge pressure on cost thereby power producers may be dispatched based on economic merit order. This could ultimately lead to some utilities not getting dispatched because of lack of competitiveness.

The problem here is that VRA Thermal power generation business may not be in sufficient control of its activities and the relationship between its activities and their alignment to its competitive strategy. This has led to underperformance over the years. The thesis seeks to focus on Physical Asset Management concepts and how they can help to improve and sustain VRA Thermal's competitiveness.

The work reviewed the theory and concepts of Asset Management, its principles and benefits, and how it can enable VRA's fossil power generation business to improve its plant performance, reduce cost and minimize its exposure to risk. Asset Management seeks to optimize life cycle cost, performance and risk.

The regulation of the electricity industry both in Ghana and the WAPP region were assessed. The Ghanaian electricity industry has been unbundled into Generation, Transmission and distribution. The generation is open to competition and for that matter; IPPs are eligible to enter the market. However, the transmission sector which is a natural monopoly is limited to one player at a time. The role of PURC in the economic regulation by way of setting tariffs for the regulated market has not been satisfactory. Even though the policy calls for full cost recovery of the cost of provision of the service, PURC has failed to implement the Automatic Tariff Adjustment Formula consistently to tariffs and this has created a huge gap of under recovery in cost for the power producers like VRA who have no PPA with ECG, the biggest buyer of VRA's energy. The IPPs tariffs are set in PPAs and so are not directly affected by end user tariffs approved by PURC.

VRA is the biggest thermal power producer with a market share of 57% whilst ECG is the biggest wholesale customer with 65% of demand. The electricity market has two state owned distribution companies, ECG and NEDCo and one private, EPC. Whilst tariffs for ECG and NEDCo are regulated, other bulk customers such as the mines, industries, export customers (CEB and SONABEL) have unregulated tariffs. The current and future market prospects are

high due to existing under supply issues and projected increase in demand both in Ghana and West Africa. However, the issue of under supply may turn to over supply sooner or later when plants under construction are completed. Consequently competition will increase and exert more pressure on the already low prices.

The fuel market study also revealed the inadequate supply of gas fuels right now and in the future. Even though Ghana has recently found gas in commercial quantities, it will not be enough to power all plants now and in the future. Considering the unreliable gas supplies from WAGP, VRA would have to look to LNG to secure its gas fuel needs in the future but it may be at a higher cost.

The technical performances of VRA Takoradi Thermal plant from 2007 to 2014 were assessed through documents and found to be unsatisfactory considering the cyclic nature of the annual availabilities both in the simple cycle as well as the combined cycle. It also revealed an undulating nature of the capacity utilization factors and low efficiencies in simple and combined cycles. The unusually extended duration of forced outages were noted as too significant to discount. The level of Asset Management processes in VRA Thermal which were assessed using Electric Power Research Institute's model were found to be low. These assessments were done by way of interviews and questionnaires and in certain instances some of the processes were adjudged as non-existent. The low performances of the processes and the low technical performances seem to have a correlation. Some of the benefits to be derived should Asset Management be deployed are enumerated below.

1. Predictability of performance
2. Transparency in decision making
3. Improvement in credibility, repeatability and accountability for decisions
4. Improvement in demonstrated compliance to regulations
5. Reduction of risks, cost and improvement in performance

PEST and SWOT analysis of the thermal power industry were carried out to facilitate the strategic analysis of VRA Thermal. Key success factors in the industry are (1) Cost efficiency and Reliability (2) Fuel flexibility (3) Capacity utilization (4) Minimization of all regulatory and market risks. The success of the entire industry depends on the success of ECG so an effective and politically insulated distributor will be inuring to the benefit of all stakeholders including the Government. The business plan proposed Asset Management initiatives, cost of such initiatives and savings/revenues or benefits to be derived. The benefits of Asset Management can span several years. Asset Management will therefore improve VRA Thermal's competitiveness in the emerging electricity market.

Implementing Asset Management to improve the underperformance of VRA Thermal, minimize its exposure to risk and improve its bottom line will require senior management's commitment, new business values and processes at all levels, adopting a phased approach, motivated, trained and flexible staff across all functions. However, implementation may require overcoming challenges such as workplace culture, size of gaps to filled, combining Asset Management with day to day operations work and implementing it in one step across the entire organization.

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