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Comprehensive Energy Management Program

A. Scope of work:

1. Energy Strategies formation on the shop floor and the implementation
2. Demonstration of the energy gains aligned with the process
3. The techno-commercial benefits of the energy management process – outlining the possibilities with detailed pay back guarantees worked out
4. Sustainability mechanisms in place through the engagement of peoples' on the shop floor and institutionalizing the systems for continued energy gains on a long term basis
5. Laying the foundation for the formulation of the energy policy that would trigger innovations and major breakthroughs in achieving the gains in the energy conservation process

JUSTIFIED DOCUMENT

B. Energy conservation – the concept

1. The element of resource utilization in the process is the most important concept in the energy conservation mechanism defined by the following parameters:
 - a) Productivity in the process
 - b) Yield in the process



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- c) Machinery downtime defined by the mean time between failure (MTBF)
 - d) The time taken to repair defined by MTTR- mean time to repair a breakdown or failure
 - e) Maintenance and repair expenses
 - f) Quality improvements per unit of energy expended
2. Resource utilization – utility engineering is the second element in the concept having the following derivatives:
- a) Capacitive power (reactive power) as a relationship of the directive power (inductive power) to enable an optimized PF- power factor at all stages of the process and the utilities including the power bus for distribution
 - b) Energy efficiency of the drives for all critical machinery wherein non-linear loads are existent by controlling THD% (total harmonic distortion percentage) and the CF – crest factors through cable redesign and working on the motor wiring for covering current losses through leakage and micro-rupture of the wiring as a consequence of thermal stresses
 - c) Energy efficiency of the thermal facilities like the boilers as defined by the fuel-steam ratio, the quality of emissions and the refractory insulation for efficient heat losses
 - d) Energy efficiency of the air-compressors as define by the pressure at the input against the required pressure at the machinery points, the quality of air as determined by the life of the seals, the condensation frequencies and the incidence of micro-ruptures across the



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lines leading to compressed air leaks and consequent energy losses. Also, the AHU shall be worked on to improve the efficiency of the air handling process and influence positively the quality derivatives of the granulation and allied processes.

- e) The costs involved in maintaining the utility facilities at the site through detailed re-engineering and use of advanced condition based maintenance data management techniques for interpretation, decision making and execution on the shop floor on a routine basis.
- 3. The element of sustainable improvements in energy conservation through the implementation of the following parameters:
 - a) Institutionalizing the systems of tracking real time relevant data, having matrices of linking up multi-domain and multi-functional data to understand the statistical linkage of influences and finally the creation of a strong decision tree founded on engineering and process fundamentals to track potential outliers and shoot trouble way before the levels of a breakdown (effectively classified as a breakdown of quality, equipment or energy) have disrupted the process
 - b) Identifying potential areas of upgrading technology and working on the pay back guarantees to make the investment viable on a continuum
 - c) Establishing the comprehensive process appraisal program that would factor in energy performances at each stage in the process along with the other fundamentals to enable the management to have a comprehensive quantitative view of the state of the process and trigger changes and corrections well in time; in effect, to establish a system of monitoring and correction loop that brings in a performance equilibrium in the system



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[JUSTIFIED DOCUMENT-1](#)

[JUSTIFIED DOCUMENT-2](#)

[JUSTIFIED DOCUMENT-3](#)

[JUSTIFIED DOCUMENT-4](#)

[JUSTIFIED DOCUMENT-5](#)

[JUSTIFIED DOCUMENT-6](#)

C. Energy conservation – the strategy roadmap

1. Step-1: Creation of work groups in the energy process through the following measures:
 - a) Cross-functional teams shall constitute the project teams around classified process clusters; typically a mechanic, an electrician, two to three operators and a line supervisor along with the related quality technician forming such a work group
 - b) Data acquisition on a comprehensive multi-domain check sheets shall be the guiding factor for the road map to improvements
 - c) In-house and on the job training on the application of statistical techniques to interpret the acquired data sheet would be the founding principles for the various work teams thus formed to enable the teams to move onto informed levels of quantitative success in locating the potential process outliers
2. Step-2: Creation of a review system wherein the work groups apply the engineering techniques to acquire data , do the preventive maintenance, review the data for signs of improvements and discuss the challenging areas with the process managers on a regular basis to move forward; this loop effectively sets the energy process on a dynamic mode



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with important derivatives in the process quality, consistency and productivity
enhancements

3. Step-3: Swapping the data between the work groups and reviewing the progress jointly to enable the teams to appreciate real time the influences of the lead process indicators and design counter measures for both the medium and long term corrections in the process
4. Step-4: Establishing the process appraisal program as a sequential program for steps-1,2 and 3 that factors in the process and energy fundamentals simultaneously and with the linkage between the indicators well defined for the management to make informed decisions real time
5. Enabling the sustainable loop to progressively make a difference in the energy derivatives as also in the process

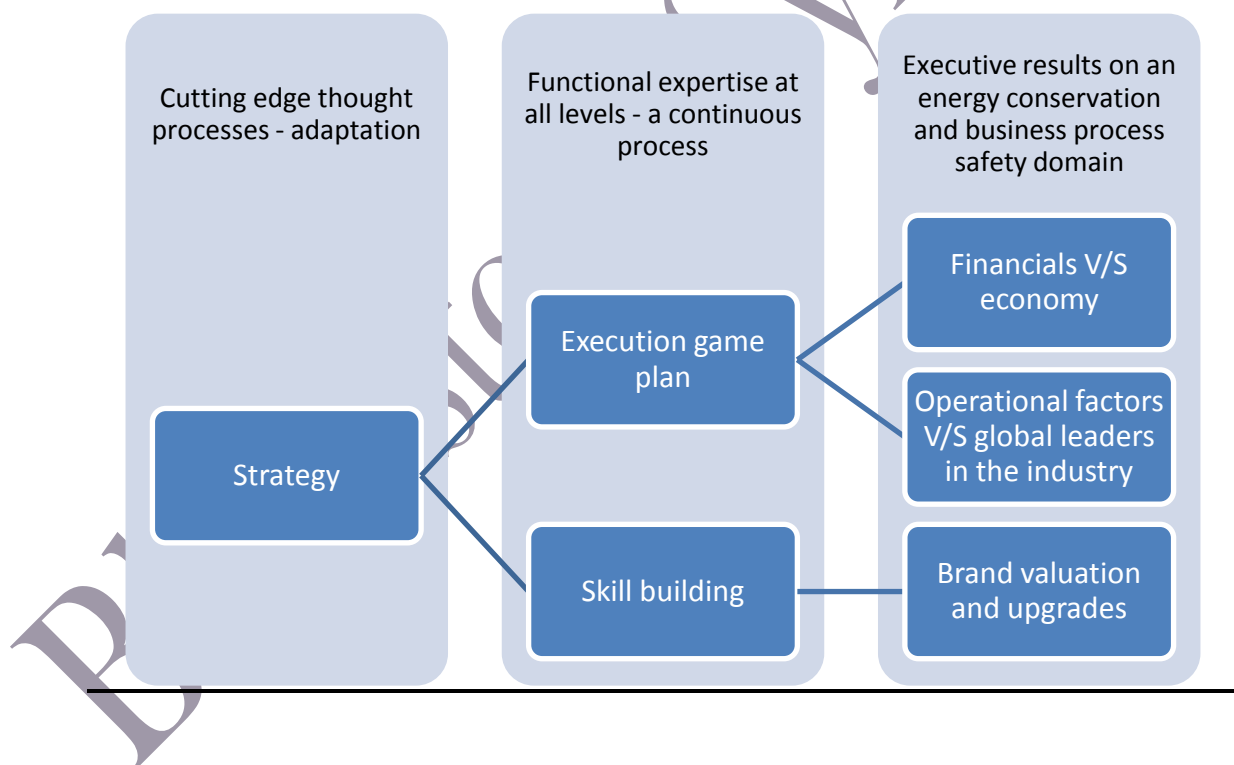
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D. Energy Conservation – policy framework and establishment (SCOPE OF COMPONENT-B)

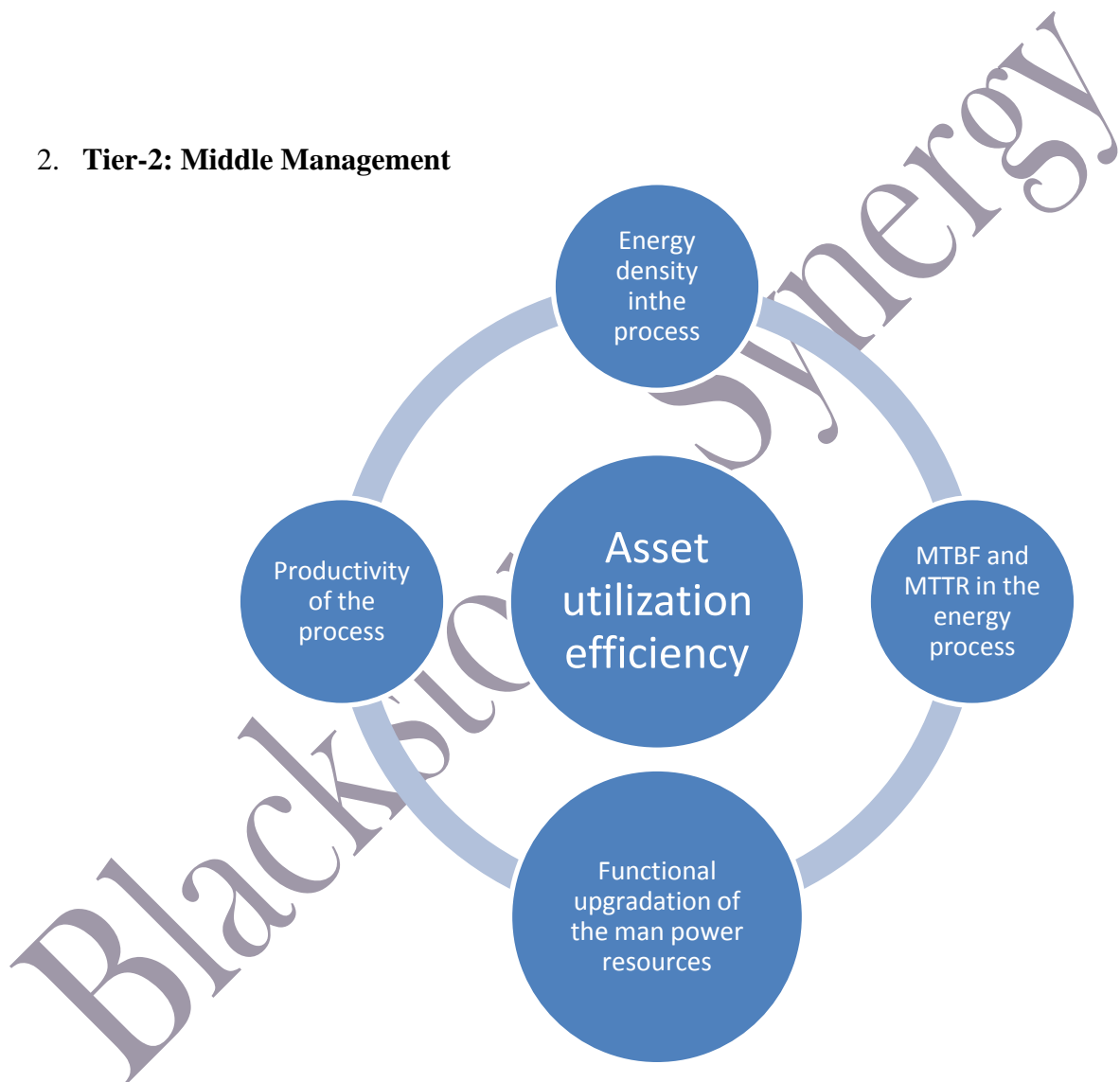
1. Tier-1: Apex management





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2. Tier-2: Middle Management

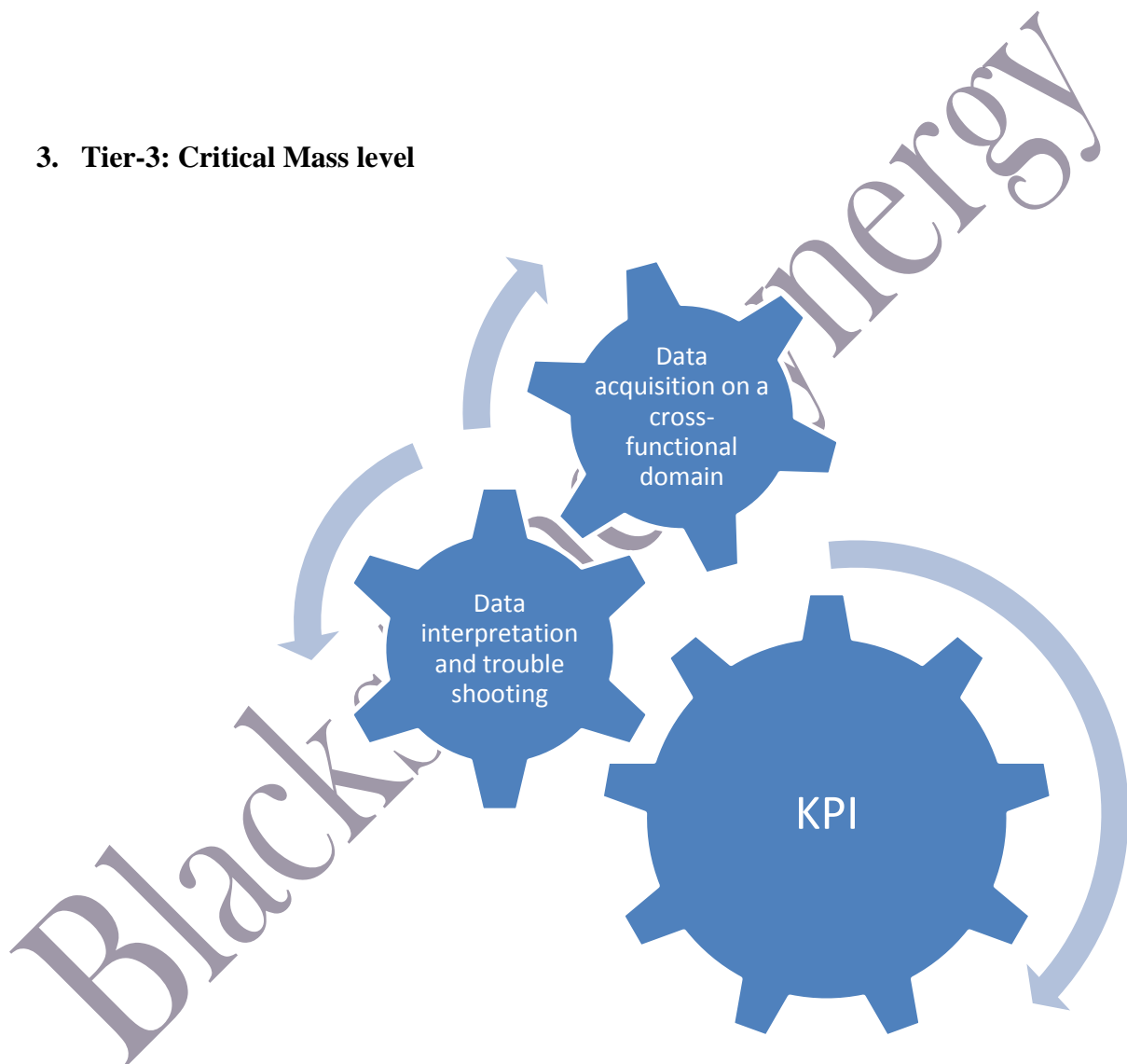


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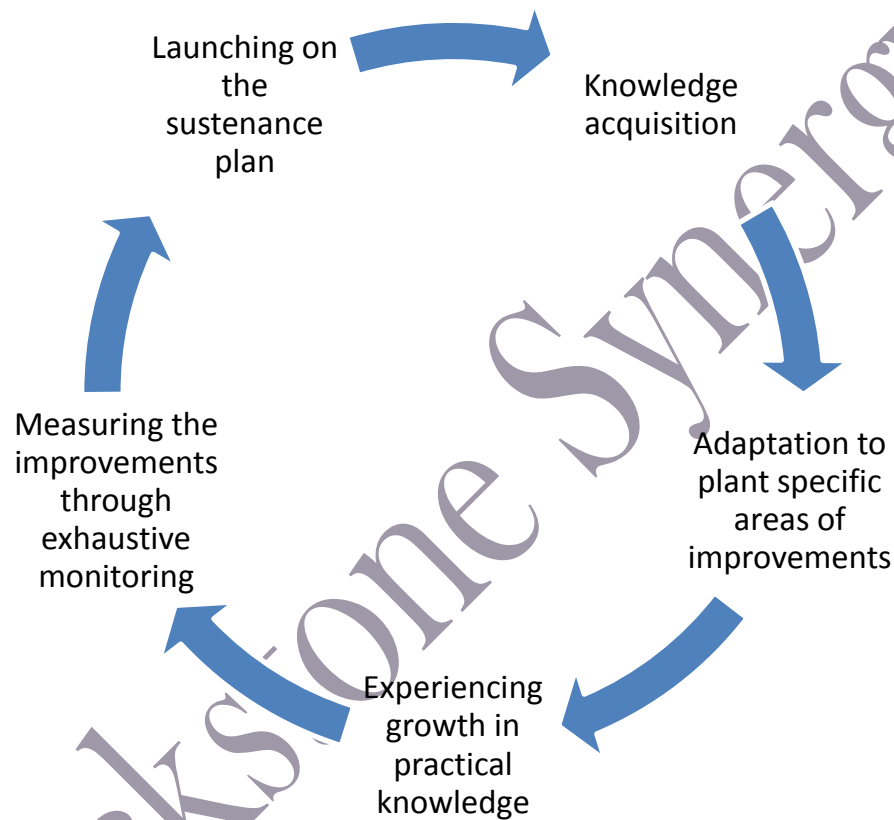
3. Tier-3: Critical Mass level





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4. Tier-4: Organizational level



E. Performance Guarantees:

- a) Energy savings on the **monthly bill – 10% on the average consumption of units** per month on a sustainable basis
- b) Productivity enhancement on the **critical machinery in the process – 15%**



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c) **Advanced condition based maintenance and decision making in the process** through the **linkage with the quality derivatives – complete implementation in the system with an understanding on the data interpretation** by the site team members through the rank and file of the organization.

d) **Rework percentage – 30% reduction** from historical benchmarks

e) **Maintenance and repair costs – 30% on historical benchmarks** on the strength of the implementation of the energy management program.

JUSTIFIED DOCUMENT

F. Quotation and scope of the services:

➤ Component-A

- a. COMPONENT-A: Implementation of the energy roadmap across the organization**
- b. DURATION: 3 months or 60 working days spread over the three-month timeline**
- c. CONSULTING FEES: Ksh 1,000,000 + VAT payable on 33.3% advance in cash or RTGS, 33.3% mid-term after the review of satisfactory progress at 6-week point of engagement and the balance 33.3% on completion of the audited results of the implementation program and the commensurate gains as envisaged and agreed on in the assessment document of Component-A**

- 1. Engaging the site team as per the road map



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2. Monitoring the work done as per the milestone map and tabulating progress online
3. Ensuring the on-the-job training program of the site teams
4. Initiating on-course corrective measures to bring in compatibility with the stated delivery points
5. Reviewing for external audit and validation of the road map results post-implementation

Concluding remarks:

1. Justification has been provided with documentary evidence of data and the detailed outlining of steps with clarity for each element of the proposal in the hyperlinked relevant document.
2. The fundamental structure for imparting the training of the site teams is in place considering the relevance of the cross-functional data management grid that has been showcased for the benefit of the members of the team with the statistical derivatives and the data modeling in place. Execution of the training modules lies with the onus of the floor management to be ready for the intake of the initiatives rather than on the consultant – something that cannot be punitive for the service provided by any yardstick of justice and fair play in the engagement process.
3. The measures taken hitherto are clarified in no uncertain terms and with clear **reproducible steps and engineering data that cannot be refuted by global standards of the universal principles of engineering – something that is fundamentally not**



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open to any form of debate; data and derivatives are both self-explanatory and being irrefutable have to be accepted as presented.

4. The performance **guarantees that have been provided with the execution of each step are self-evident of the assured implications of each step on behalf of the service provider and hence complete the loop unambiguously.**

5. The major areas of risk are a) phase imbalances, b) mechanical wear of the compression machinery resulting from a prolonged influence of the weakening factors of electrical drives as explained in the documents with data and c) the poor quality of heat transfer as a combination of process steps, heat insulation and the fundamental design of the thermal process of selection of heat parameters for transmission onto the FBD and syrup lines. These are all major risks of corporate governance as well as effective shop floor management for the key sustainability factors of the process and equipment.

6. The machinery in the pharmaceutical process; especially the compression machines require precision engineering and meticulous care requiring the extensive use of certain instruments to check out on the compressed air leakages, the temperature of the frictional elements and the vibration of key rotating elements – all of these have been captured effectively in the documents and the simulated check sheets. The management needs to appreciate that the routine overhauling maintenance needs to be in place through an external expertise owing principally to the two factors a) the workshop equipment needed for executing the elements of precision engineering are sophisticated and expensive – the scale of which is practically impossible for the factory to manage economically and hence would be prudent for engaging a strong technical collaboration – Blackstone Synergy has provided the foundation for such a collaborative partnership for Beta since providing solutions that work and deliver the performance guarantees are within the



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scope of the engagement elements and factor b) quite understandably, the engineering team of any factory cannot have the practical expertise at their disposal to perform high-precision engineering jobs at site; hence the overwhelming need for collaborative approaches to bring down the costs of maintenance and repairs radically while ensuring higher thresholds of operating performances.

7) Data assimilation and interpretation has been done on the principles of effective focus – the contributing factors of the mainline productivity like the compression machines, the FBD and syrup machine – 1000 liter capacity is representative of the factory and the derivatives of the stirrer motor as well as thermal process are identical for the 500 and 2000 liter capacities as well – effectively the gains demonstrated in the 1000 liter capacity are identical for the 500 and the 2000 liter capacities as well.

The packaging and filling lines are governed by non-linear load applications and the derivatives therein – an oft repeated refrain and the solutions being provided are both generic and specific to the packaging and filling lines as well since they have been conceived for the entire plant and not just for the specific examples taken for demonstrating the problems. Hence, it was of no relevance to repeat the studies for the packaging, filling lines and the syrup lines of 500 liters and 1000 liters.

The data for the air velocities in controlling the AHU performance have been taken and are reflected in the excel sheet – these are there for everyone's perusal. The AHU performances are implicitly poised for better thresholds of performances after implementing the recommendations related to the RPC – reactive power controllers.

➤ **Component-B**

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- a. **COMPONENT-C: Integration with the environment document ISO 14000**
 - b. **DURATION: 2 MONTHS or 40 working days over the period of two-months**
 - c. **CONSULTING FEES: Ksh 300,000 + VAT**
1. Aligning the **document with the global standards through the integration of the best management practices** at the strategic and shop floor levels
 2. **Factoring** innovations in the energy process as a differentiating element for Beta health care in the global perspectives with the pharmaceutical industry as the baseline
 3. **Creation** of the **basic innovation infrastructure** to build on and expand in the areas of the product engineering and design within the gamut of the pharmaceutical industry for the future

Submitted for management approval on dated 6th June, 2016 - Monday by:

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