



SOUTHERN AFRICA ENERGY PROGRAM

UTILITY MONITORING AND EVALUATION (M&E) MANUAL

FOR NEW UTILITY PERFORMANCE MANAGEMENT PROCESSES

September 21, 2020

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ACRONYMS

Acronym	Definition
BoD:	Board of Directors
BSC	Balanced Scorecard
CDS:	Consistent Data Set
CEO:	Chief Executive Officer
CI:	Confidence Intervals - unless stated these are two-sided 95% CI
CM&E:	Chief of the M&E Department
ECP:	Error Correction Process governed by a Committee, aka Technical Audit Committee
EDA:	Exploratory Data Analysis
ESO:	Energy Sent Out in MWh
ExCo:	Executive Committee
FinY-E:	Financial Year-End
FinYr:	Financial Year for the Utility as stipulated by the BoD
GoM:	Government of Malawi
GU	Generation Units
GWh:	GigaWatt-hour = 1,000 MWh
HR&A:	Human Resources & Administration
IBQ:	International Best Quartile
IC:	Installed Capacity
ICT:	Information and Communications Technology
KFAs:	Key Focus Areas aka Key Performance Areas
KPIs:	Key Performance Indicators
M&E FDC:	M&E Framework Development Committee
M&E:	Monitoring and Evaluation
MD:	Maximum Demand in MW
MW:	Megawatt, measure of Power
MWh:	MW-hour, measure of Energy
NESO:	Net Energy Sent Out aka ESO
OCLF:	Other Capability Loss Factor
PCLF:	Planned Capability Loss Factor
P&D:	Planning & Development
PM:	Performance Management
POC:	Point of Contact
QA&S:	Quality Assurance and Safety
RM:	Risk Management
SEO:	Senior Evaluation Officer
Serv. Pr.:	Service Provider
SMO:	Senior Monitoring Officer
SOW:	Scope of Work
SP:	Strategic Plan aka Integrated Strategic Plan (ISP)
UCLF:	Unplanned Capability Loss Factor
UNIPED:	International Union of Producers and Distributors of Energy

References are in brackets, e.g. [3] and listed in the REFERENCE Section of this Report

1



BACKGROUND

I BACKGROUND

I.1 OVERVIEW

The objective of USAID's Southern Africa Energy Program (SAEP) is to increase electricity availability and access in Southern Africa. This is done by facilitating transactions and strengthening the enabling environment for public and private sector investment in the power sector. SAEP will address five key constraints to such investment:

- i) ineffective regulation, planning and procurement for energy;
- ii) low commercial viability of utilities;
- iii) limited regional harmonization and cross-border electricity trade;
- iv) lack of demonstrated and scaled clean and renewable energy and energy efficiency technologies and practices, and
- v) weak institutional and human resource capacity for energy sector management.

The objective of SAEP's Outcome 2 is to improve the commercial viability of utilities to increase their capacity to operate as off-takers and increase access to electricity. As an exemplary guide for other utilities undergoing the Monitoring and Evaluation (M&E) process, SAEP outlines six tasks conducted previously for an M&E process for a utility in Africa:

- Task 1: Assessing the current PM culture, organizational structure and process
- Task 2: Developing the new monitoring and evaluation system including an utility performance scorecard
- Task 3: Developing the new PM process
- Task 4: Developing the new PM organizational structure
- Task 5: Communicating the new utility PM structure, process and scorecard
- Task 6: Implementing the improved utility PM structure, process, tools, and scorecard

As a brief overview in how these tasks could relate to another applicable utility:

Task 1 involved a review of the SP, the organizational structure, the PM process, and an assessment of the management of data. A gap assessment within the utility was used to identify gaps between the current situation and an acceptable desired state for PM at the utility.

Task 2 intended to design a performance indicator capture and reporting mechanism (scorecard) which supports the utility SP. Together with the utility, SAEP developed an Inquiry Document and an Inception Report.

Task 3 was segmented into two parts: Task 3A dealt with the workshops and Task 3B dealt with the procedures for the new PM process (this manual). The SAEP team held workshops with the Southern Africa utility to develop and expand on the development of the required processes which underline the operation of the M&E process.

For Task 4, a close interaction between SAEP and the Southern Africa utility needed to be established. SAEP facilitated this by supplementing and leveraging the functionality of an existing M&E Framework and Development Committee (M&E FDC) through the development of a Terms of Reference (ToR) which set out the operational framework for the Committee. These changes were approved and mandated by the CEO. The outcome was the establishment of an M&E Department in the Office of the CEO, supported by a workforce with detailed Job Output Models.

In Task 5, SAEP delivered a presentation to the utility’s EXCO of the New Performance Management Process, and proposed implementation of a Pilot Phase with the SAEP assistance to seek approvals for the former and the latter.

Task 6 addressed the following:

- Identification of tools needed for successful data capture and reporting
- Implementation of the data warehouse platform as per a Performance Measurement Framework
- M&E Department has capability, is functional and operational as per expectation,
- Software tools required for M&E staff for the devolution of their duties
- Facilitation of a Capacity Building workshop

This manual pairs well with SAEP’s leading practice guide in the brief Utility Performance Management Guide, outlined below.

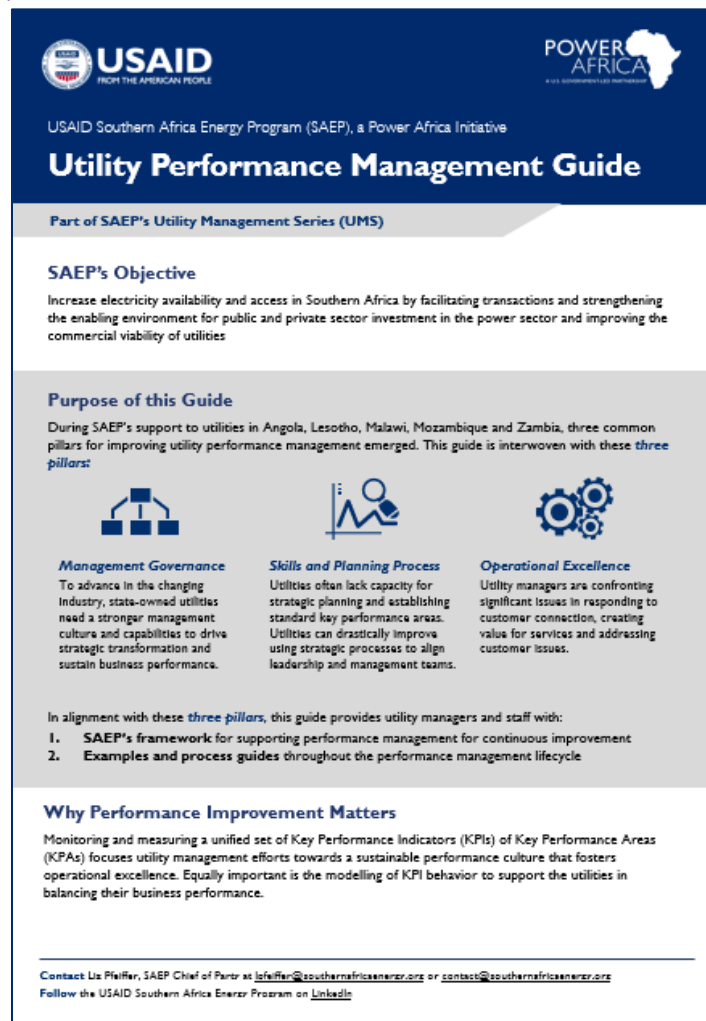


Figure 1 Utility Performance Management Guide

I.2 M&E PROCESS MANUAL DEVELOPMENT

1.2.1 M&E Process Workshops

SAEP conducted three workshops at the utility to:

- A. Assess the ICT systems and dovetail them onto a data warehouse platform
- B. Identify goals, objectives and outputs for the new PM process
- C. Identify phases, determine the progress on M&E assessment plan, as well as the progress on data analyst recruitment

1.2.2 Procedures Manual

With coordinated inputs from the workshops, SAEP commenced the development of the M&E procedures manual. The purpose of this manual is to provide a “living document” which sets out the actions, responsibilities and data requirements, and the reporting required consistent with the utility timeframe for PM. Essentially, this manual concludes Task 3, regarding the development of the new performance management process, procedures and tools to implement the monitoring and evaluation function; this is critical to the next phase of the project, which will involve a board meeting in early 2019 to review, agree, approve the M&E processes and organizational structure and endorse the setting up of the pilot project. This document serves as a guidebook which will be used by managers and staff to understand and implement the M&E process. It will be an integral part of the M&E training.

This manual is the first edition, it is intended for readers with some fundamental utility knowledge and it is expected to be upgraded from time to time. From Section 3 onward, an M&E background is a requirement.

The purpose of this manual is:

- **Define the new PM roles and activities**, particularly in the required M&E (new) Department, the Planning and Development (P&D) Division and the ICT Department.
- **Provide the interactions with the divisional and departmental Point-of-Contact (PoC)**. These interactions need to coincide chronologically with deliveries
- **Prepare the M&E Department with all skills needed for set-up**, which serves as a guideline when the practical operation of the department will be needed.
- **Detail information on the required M&E tools and interlinking communications** with the Information and Communications Technology (ICT) Division for the data capturing and storage. Both tools and communications are outlined in this manual and essential for the final report to stakeholders.
- **Provide a step-by-step process in line with a reporting schedule** as determined by ExCo and BoD
- **Provide a template of the functional specification for the data warehouse**, in compliance with one of the tasks resulting from the workshops

All the above must be coordinated with a utility’s reporting timeframe. The skills and the tools need to go hand in hand with the training aspect of a utility’s initiative. A fundamental training program is described in Section 3.5 of this document.

2



INTRODUCTION

2 INTRODUCTION

The goal of this assistance is to develop a new PM capability within a utility to monitor and report the progress towards the utility's Strategic Plan (SP).

In this section, the duality of the PM Process Map and the Performance Measurement Framework is explained as it applies to any utility. Synchronizing deliverables relative to timing requirements is important. The new PM process represents our recommended approach to ensure that the objectives of the M&E process will be achieved.

2.1 ROADMAP FOR THE PROCEDURES MANUAL

This manual provides the fundamental procedures for the M&E Department in the execution of its duties. This section sets out the elements of the roadmap so that a logical step-by-step process is followed when going through the manual.

A Performance Measurement Framework is necessary for the effective performance of a utility. This framework was dealt with in detail in Task 2 and is illustrated in Figure 2 below. Suffice it to say that this framework depicts the different environments where accountability resides. For instance, in the decision-making environment, the accountability rests in the BoD and ExCo; in the SP and PM environment, the accountability resides in the respective divisions. The accountability of the M&E and analytical environment resides with the M&E Department reporting to the CEO, while the data management and reporting environment accountability is shared between the M&E Department, ICT Department primarily, and Quality Assurance and Safety (QA&S) and Risk Management (RM), secondarily (see Figure 2 below).

Divisions must achieve their strategic and operational Key Performance Indicators (KPIs) outlined in Figure 2, as well as provide their own targets and agreed upon variations. KPIs serve as inputs to the respective division's business plans. This is an iterative process which involves determining, according to the initial strategic objectives of the SP, the feasibility of the outcomes, based on the financial, staff, and asset constraints. The results based on the feasibility of the outcomes then feeds back and updates the SP accordingly. This may result in recalibrating the KPIs' targets and spreads. In Figure 2, this repetitive process is reflected in the arrow from the final environment, "5 Data Management and Reporting Environment" back to "1 Decision Making Environment" as the user re-calibrates the utility business requirements and needs.

FRAMEWORK

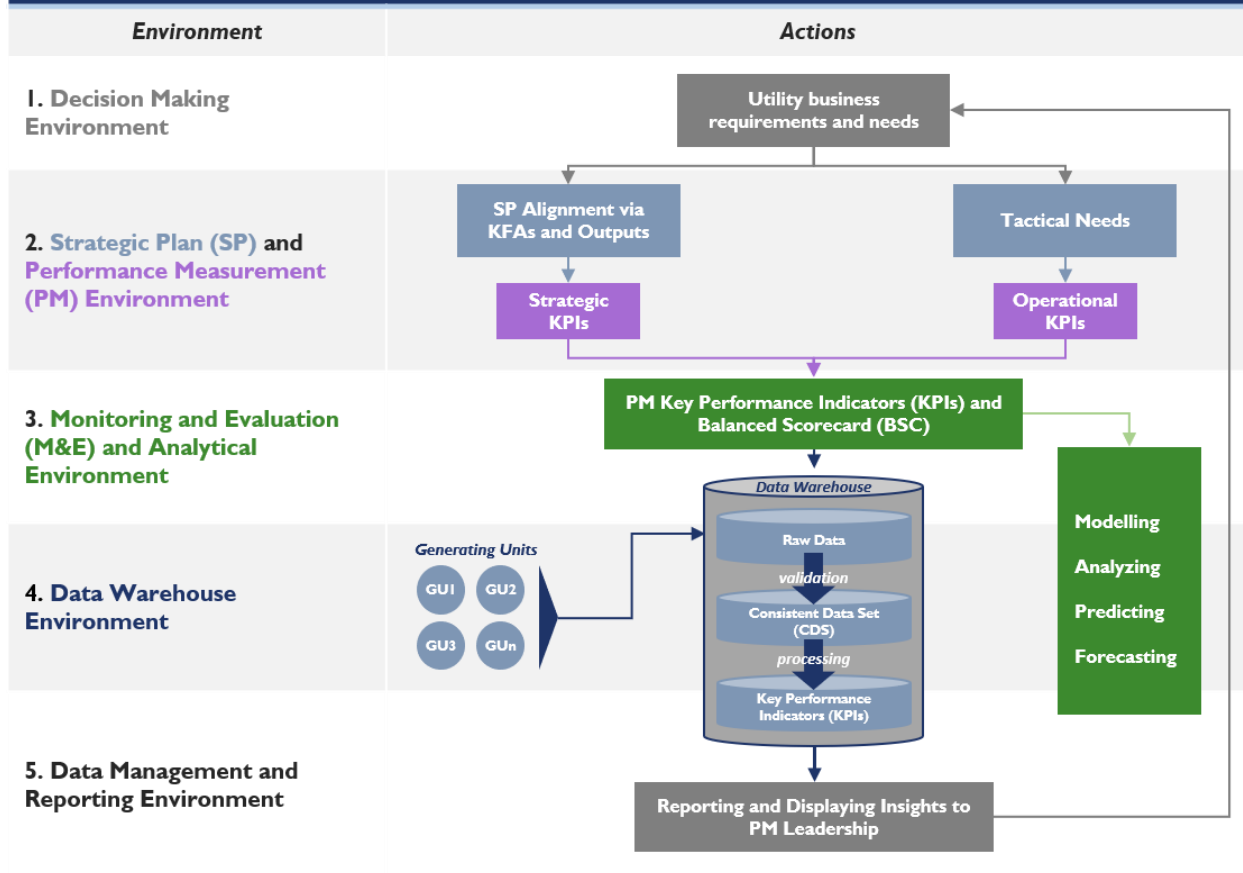


Figure 2: Performance Measurement Framework

As illustrated in Figure 3 below, as a roadmap for developing a PM Procedures Manual, one needs to adopt a bifocal approach; that is, to focus on both the PM Process Map (left side, figure 1) and the Performance Measurement Framework (right side, figure 2).

ROADMAP MANUAL

Utility Task 3B Manual Objective: Generate sufficient, reliable power which requires a means to ensure its performance capability. To successfully collaborate between divisions and service providers, a **bifocal approach** with both Framework and Process Map must be adopted:

Process Map (Figure 1) Goal: Accomplish the PM capability function for a utility

Framework (Figure 2) Goal: Explain what needs to be measured (KPIs) and where to gather this information

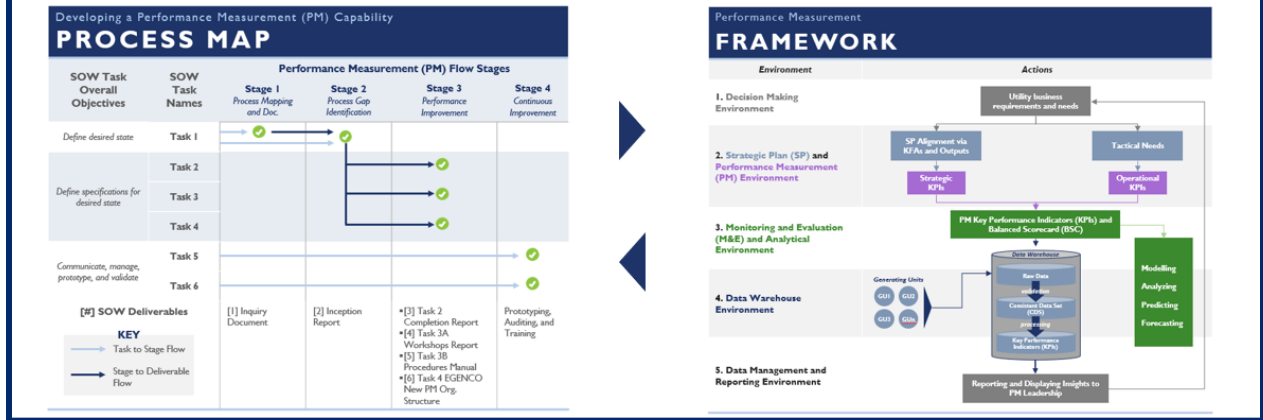


Figure 3: Roadmap for this Manual

The following provides an overview on how this roadmap is applied based on the SAEP SOW:

A. On the left-hand-side, the PM Process Map of Figure 3 focuses on:

1. The defined goals of the company and the application of the gap analysis provide a present and a desired state of the utility. The gap analysis provides the foundation of what, where and who is required to achieve the desired state (Task 1)
2. Tasks 2, 3 and 4 define the specifications for the what, where and responsibility of the desired state
3. Both tasks 5 and 6 place into action the results of 1 and 2 above by means of managing this process, prototyping, validating, reporting and communicating

B. On the right-hand-side, the Performance Measurement Framework of Figure 3, based on the results of A.2 above, focuses on:

1. The ‘what’, which is essentially what needs to be measured (e.g. Strategic & Operational KPIs). The ‘what’ aspect also determines what data needs to be collected and stored (which addresses the ‘where’ to collect it from and ‘where’ to store it – the data warehouse at the center of the framework)
2. The ‘where’ addresses where in the Performance Measurement Framework the process takes place and is very much dependent on the process’ requirement and the four main environments that play a part in this process (e.g. as a requirement, the decision-making environment in Figure 2 might require a variance report on three categories of a maintenance plan: Ii) the original one at the beginning of the Financial Year, ii) the adjusted one during the Financial Year and iii) the actual one at Financial Year End (see Section 3.2.2.1). The repositories in the data warehouse would be: for i) in the CDS source layer, in the raw data and CDS source layers for ii) and iii). The Maintenance Plan Variance Report would be stored in the results/reporting layer of the data warehouse
3. The areas of responsibility, in turn, are dependent on the ‘where’ (e.g. an evaluation specialist would be producing energy forecasts in the M&E analytical environment)
4. The remaining element is the ‘when’ and this is addressed in paragraph 2.2 below and provides the third dimension of the roadmap

2.2 THE TIMEFRAME

The process timeframe within the Performance Measurement Framework plays an important role in the process. The synchronization of the outputs from the SP, to the development of models (e.g. the KPIs targets and spreads, forecasts of energy, predictions of forced outages, etc.) to the reporting, need to occur at planned times for the framework to operate not only efficiently, but also effectively. Accordingly, a detailed schedule for the process needs to be determined and agreed upon to ensure all aspects of the process happen when designated.

2.3 OVERVIEW OF APPLICATION TO UTILITY

As indicated in their SP, this example utility's overarching objective is to generate sufficient, reliable power which requires a means to ensure its performance capability. An M&E Department whose goal (see Figure 3 – left hand side) is to accomplish the performance capability measuring function can assist. Based on the information acquired from the M&E Department, the utility is empowered to make knowledgeable decisions (see Figure 3 – right hand side). Given the above, the roadmap for this manual is to work clockwise within the Performance Measurement Framework (Figure 3 – Right hand side), starting at the "Utility business requirements and needs", working clockwise through the "SP alignment via KFAs and Outputs" and finishing off at "Reporting, Displaying".

The mode of operation for implementing the M&E process working tasks is addressed in Section 3 of this manual. There are 6 appendices which are integral to this manual and provide detailed information and techniques required to achieve the results for the various tasks:

- Appendix A contains the Definitions & Models
- Appendix B provides the PM Tools utilized
- Appendix C sets out the M&E skill and software requirements
- Appendix D provides a functional specification template for the utility

The utility's timeframe is defined by its annual financial cycle (sample period July to 30 June) and requirement from other critical stakeholders, examples could be the Ministry of Finance (Treasury) of the country's government . The utility must ensure the complete set of deliverables work within these constraints.

Please note the abbreviations mentioned in the acronyms section at the beginning of this report. In this report, "upload" or "uploading" means storing of data/information in the data warehouse.

3



THE NEW PERFORMANCE MANAGEMENT PROCESS

3 THE NEW PERFORMANCE MANAGEMENT PROCESS

This section sets out the development of the new PM process as introduced in Section 2 above. It is highly recommended that readers familiarize themselves with the references here cited either prior or in parallel with reading this document which will provide useful context.

This process manual focuses on the responsibilities, activities and outputs required to manage the M&E process. *Accordingly, the manual is based on the assumption that an M&E Department has been constituted and fully complemented with the necessary members of staff, as well as that the KPIs and Balanced Scorecard (BSC) mentioned in Appendix B, and with the fundamental assumption is that the Data Warehouse and the Error Correction Process (ECP) Committee are operational.*

Given the above, the new PM process is focused on collecting, assessing and reporting on the KPI and BSC performance and corrective actions that need to be taken. In this regard, the following items are discussed below:

- Responsibilities in M&E: roles and activities
- Responsibilities in M&E: working tasks required
- Reporting requirements
- Data handling process
- Entailed training

We commence this process by first setting out the responsibilities in defining the roles and activities of the divisions (particularly the P&D Division) and the M&E Department. For a newly formed utility (like our example utility), this initial step is determined through an initial review of existing capabilities versus a “to be state”. This was accomplished in the first task of the SAEP assistance. As the utility matures, this Inception Report [1] of this first task becomes a status report to assess actual state versus a desired state of PM. This is detailed later in this manual.

3.1 M&E RESPONSIBILITIES: ROLES AND ACTIVITIES

Usually, a utility’s business requirements and needs are the fundamental results emanating from a SP or Integrated Strategic Plan (ISP). The SP would be constructed by a P&D Division with the assistance mainly of an M&E Department, an ICT Department, a RM Department and the inputs from other divisions. In this case, the Operations Division (which manages the generation assets of the utility), the Finance and HR & A Divisions would be supplementing the required inputs. The roles and activities provided below are by no means exhaustive and are more likely to be modified as the utility matures.

a. P&D Division

The role of this division provides the strategic projects in the SP that need to be completed by the utility to achieve the requirements of ExCo and the BoD mandates. These projects need to be aligned with fundamental PM principles [8], so that they can be monitored and evaluated; this is where the close relationship with the M&E Department takes place. For the latter to perform its functions, the progress of these projects needs to be measured in an acceptable format, which will be covered later under the M&E Department paragraph of Section 3.1.

Once developed by the P&D Division, the SP should have the following components as a minimal requirement:

- i. Four Fundamental Key Focus Areas (KFAs) (a.k.a. Key Performance Areas) based on the seminal works of Kaplan and Norton [8]; these are given below (in { } are the utility's named KFAs):
 - o **Customer:** "To achieve the utility's vision, how should the utility appear to its customers?" {Customer, Stakeholder and Corporate Image}.
 - o **Finance:** "To succeed financially, how should the utility appear to its shareholders?" {Revenue Generation and Financial Stewardship}
 - o **Internal Business Process:** "To satisfy its shareholders and customers, what business processes must the utility excel at?" {Business Process Excellence}
 - o **Learning and Growth:** "To achieve the utility's vision, how will the utility sustain its ability to change and improve?" {Learning, Growth and Innovation}.
- ii. The strategic objectives dealing with the answers to the KFA questions, as adapted from [9] p 19, we point out that before any metric selection, utilities should describe what they are attempting to achieve with their strategies, and, furthermore, we point out that the four fundamental KFAs provide a robust structure for companies/utilities to express their strategic objectives. Hence, strategic objectives, in a SP, need to be the minimal requirement for having line-of-sight between the strategies and the KFAs.
- iii. The third minimal requirement are the Key Tasks or Activities that are needed to be carried out in order to achieve the strategic objectives.
- iv. The fourth essential requirement is the output expected with its corresponding starting and completion time targets and the division/department responsible for that output deliverable.

All these points are the application of the elements mentioned in 2.1

b. M&E Department

The functions of this department are essentially interacting in two modes of operation: the monitoring function and the evaluation function. *It is important to note that the divisions are the owners of their data sets and therefore responsible for the collection and provision of the PM-required data. Hence a link or POC between each division and the M&E Department is essential.*

The M&E Department is responsible for the wholistic PM requirements of the utility. As a reference, using the Heat Map in Figure 8, this would mean ensuring that the linkages to the SP, the metrics, the processes are in place and related to the HR&A, the organizational requirements for an effective PM process. Given the linkage with the P&D Division in terms of the SP, the M&E Department needs to give guidance and strategic direction in the PM requirements. This department reports on monitoring and evaluation results (from BSCs/Dashboard) and would be responsible for the KPIs & BSCs structure, design (usually carried out by means of participative workshops with the divisions) and reporting thereof. The M&E Department contributes to performance improvement mechanisms of the utility by assisting the CEO in making information-driven decisions. The department presents to the CEO the PM Targets for submission to the Stakeholders (in the utility's case, the GoM – Treasury).

The KPIs structure is illustrated in diagrammatic form in Figure 4.

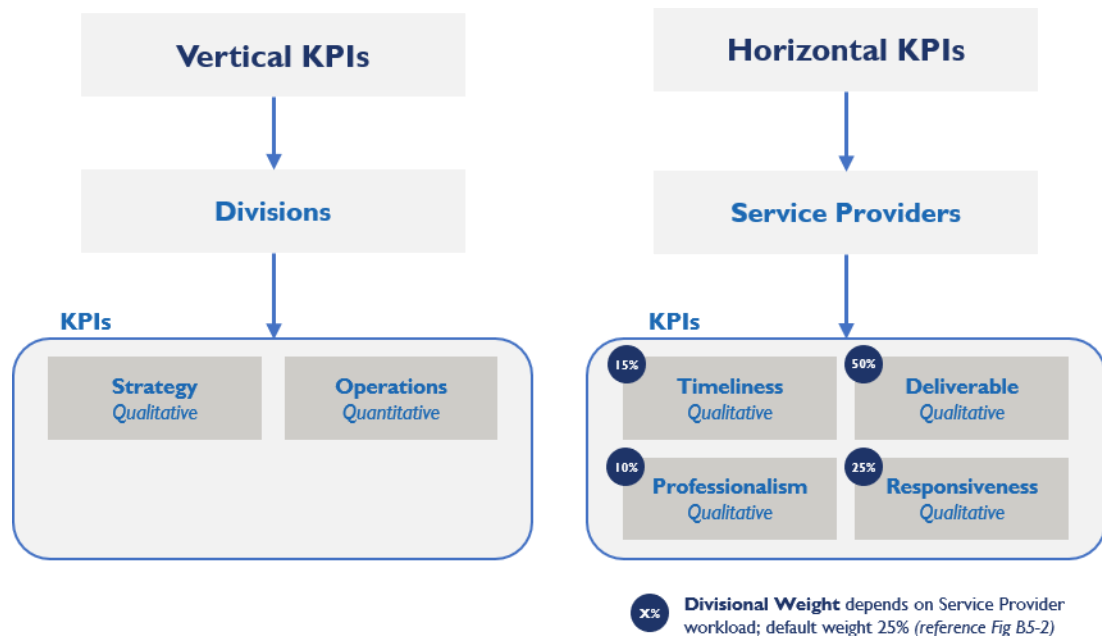


Figure 4: KPIs Categorization Map

The following paragraphs detail the “**what**” and the “**how**” for each of the functions in the M&E Department

b1. The Monitoring Function

The principal tasks for this function in the M&E Department are as follows (see Section 3.2 Working Tasks 1 to 16 and Annex 0 & Ax3):

1. **Collection:** of data from assigned POCs across the utility by using appropriate techniques (data capture and storage, surveys, interviews) to monitor performance
2. **Coordination:** by synchronizing the data collection from the divisions at predetermined times (Figure 6 below)
3. **Validation:** by substantiating the data provided by the divisions & SPs, with the support of the evaluation function, in terms of:
 - i. Preparation: Prepare the data so that outliers, mistakes are eliminated
 - ii. Formatting the “clean data” into an analytical protocol (e.g. variables in columns-observations in rows)
 - iii. Aggregation in predetermined tranches (e.g. hourly data, weekly data)
4. **Structuring:** by organizing the validated data in the required Reporting formats (e.g. Monthly reports on Planned Outages) – The reporting formats are dictated by ExCo
5. **Storing:** by gathering the processed data (as per 2 and 3 above), in a Consistent Data Set (CDS) repository, for analytical and for reporting purposes at predetermined times (Figure 6 below)
6. **Reviewing:** by modifying and developing evaluation tools, mechanisms, with the assistance of the evaluation function, modalities (review of PM Standards, PM processes) and providing comprehensive source of evidence documentation
7. **Verification:** by assessing the reporting reliability of the divisions and SPs in terms of PM

Assessing: by appraising the periodic performance of the utility’s strategic KPIs and, secondly, at FinY-E, the performance of all the utility’s KPIs

8. **Informing:** by providing monthly reports developed above to the utility’s ExCo, divisions and departments
9. **Monitoring:** by reviewing the current situation (vis-à-vis PM) in the utility and performing a gap assessment as mentioned in the status report paragraph above.

Tasks 1 to 9 above are regulated by the Chronological Timing Cycle shown in Figure 5 below.

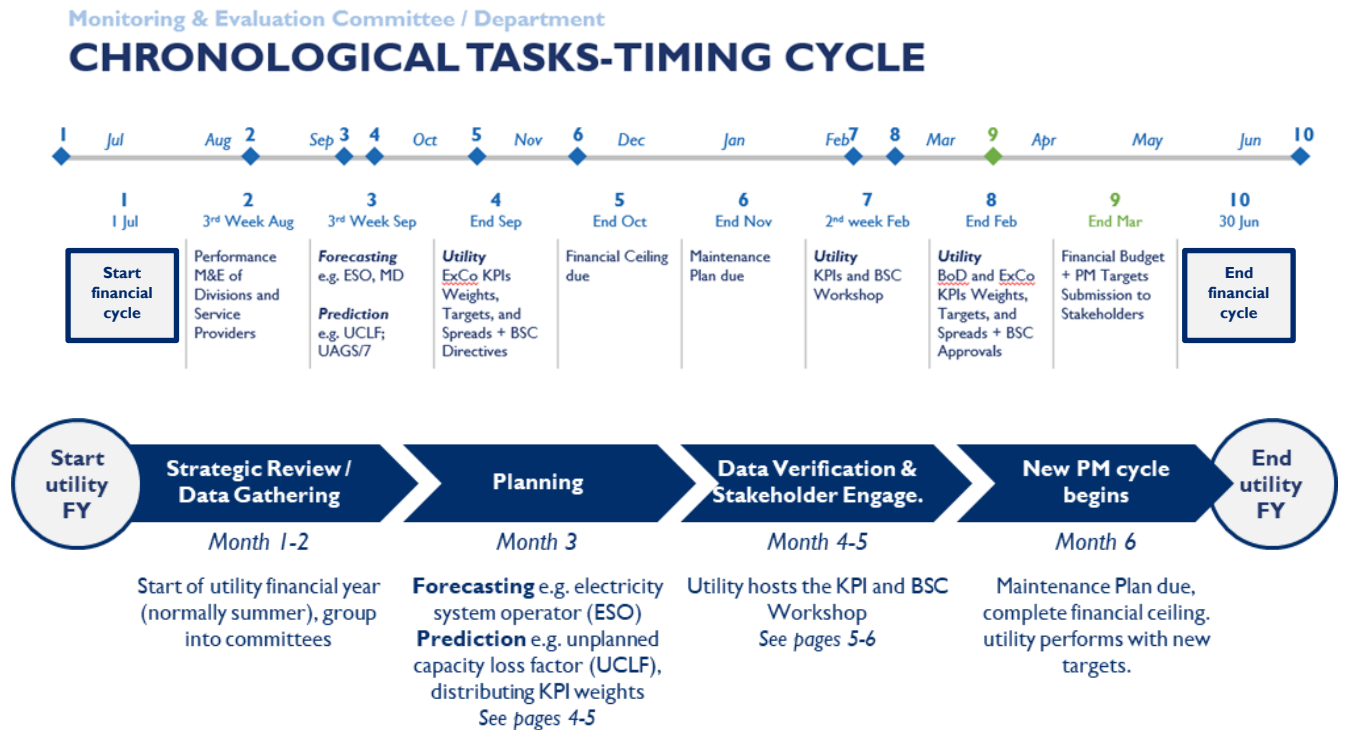


Figure 5: Detailed and Simplified Timeline for Utility M&E

b2. The Evaluation Function

This function is essential for the performance assessment in any utility. It provides an assessment of the robustness of the PM results for the decision-making environment (see Annex Ax.1). It is recognized as a highly specialized function and necessitates particularly skilled resources. In today’s terminology these resources are referred to as Data Scientists and more in this regard is covered in Section 3.2 below.

Figure 6 below provides a representation of a generation utility having a mix of hydro-reservoir and gas generating plants.. This figure illustrates the Primary Energy (Water, Gas) being converted into the Energy Sent Out (ESO in MWh) for each of the Power Stations (Station 1, Station 2, ..., Station). Each of these stations are subject to energy losses due to Forced Outages, Planned Outages and Other Losses outside management control (such as droughts). Most utilities use these as critical operational KPIs for the energy capability and availability. When utilizing these operational KPIs it is vital to utilize a recognized

international system. In this manual the “International Union of Producers and Distributors of Energy” (UNIPED) system is used.

The corresponding terminology is as follows (see Appendix A points 18 to 26 for detailed Definitions and Equations):

Forced Outages → UCLF

Planned Outages → PCLF

Other Losses → OCLF

In this manual from here onwards the UNIPED definitions will be used.

It is clear that the Unplanned Capability Loss Factor (UCLF) and Other Capability Loss Factor (OCLF) are random variables which need to be predicted, while the Planned Capability Loss Factor (PCLF) follows a certain maintenance plan for a particular period. This period is usually ringfenced to one year.

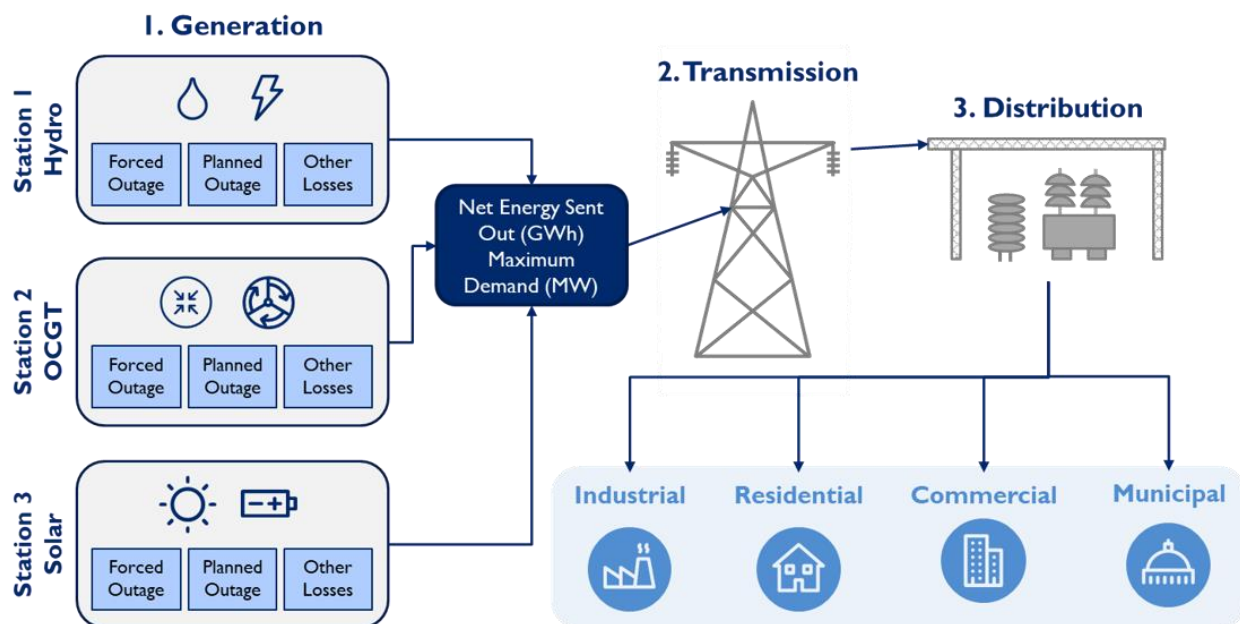


Figure 6: Schematic of a Generation Utility

The principal tasks of the M&E Department for this function are as follows (see Annex Ax2 & Ax3):

1. Forecasting: of time-related variables (with random noise)

Usually the first step is to forecast the Net ESO (NESO aka ESO); this is the total energy required by the grid in different time tranches (daily, weekly, monthly, quarterly and for the FinYE) usually measured in GWh. This entails the development of forecasting models (e.g. ForecastPro – see Appendix C).

2. Predictions:

- i. Hand in hand with the ESO Forecast goes the Prediction of the Maximum Demand (MD) required by the grid in different time-tranches (daily, weekly, monthly, quarterly and for the FinYE) generally measured in MW. Usually, the MD is linearly highly correlated (the Evaluation Function needs to verify this correlation regularly for different Time-Tranches) and hence, given

- ii. Being random variables the UCLF and OCLF needs to be predicted using Statistical techniques. The latter are highly dependent on the type of Plant mix in a Generating Utility mix and the statistical models vary significantly and a comprehensive Exploratory Data Analysis (EDA) needs to be performed. This entails the development of Statistical Distributions models (say, using Statistica – see Appendix C).
- iii. This UCLF and OCLF are weighted-Averaged across the Stations (the weight being the Installed Capacity (IC) of the station divided by the Total IC of Utility fleet), to obtain the expected Utility Total UCLF and Total OCLF. This entails the development of Simulation models (say, using @Risk – see Appendix C).
- iv. Based on the UCLF prediction, the corresponding Total PCLF, under average conditions, should be between 2.33 to 3.33 times the UCLF to keep the Plant under expected running conditions.
- v. Given the Total expectation of the planned maintenance (PCLF) according to iv. above and with its corresponding CIs, these values are then submitted to the P&D and Operations Divisions as constraints (or goals – depending on the Optimization Model used or scenarios – depending on the Simulation Models used) for the most likely outcome of the Maintenance Plan.

3. Development: of PM models across the Utility by using appropriate techniques. The development of these models is by no means exhaustive. However, there are basically three fundamental PM Models, the Strategic KPIs Model, the Operational KPIs Models (note the plural) and the Service Providers KPIs Model.

- i. The PM model for the Strategic KPIs; there is essentially one model for these KPIs which is based on the criteria classification shown in Table 1 and its conversion is illustrated in Figure 7 below.

Table 1: Criteria for Strategic KPIs

< 25% of Norm is achieved
25% ≤ Norm achieved < 75%
Norm is achieved (Completed by expected date)
Facilitation provided to functional areas to enable delivery against Norm
Delivery realisation enabled against SP objectives (tracking & progress verified and reported)



Figure 7: Conversion Model onto a Likert Score

The details of the Assessment Tool and Application are provided in Appendix B

ii. The PM models for the Operational KPIs (Appendix B4 for details)

Operations (aka Generation) Division

- Planned Outage Model: PCLF (see Appendix A definition-point 19)
- Forced Outage Model: UCLF (see Appendix A definition-point 20)
- Reliability Model: UAGS/7000(see Appendix A definition-point 26)

Finance Division

- Control on Cost of Production: Cost of Production Variance (%)
- Return on Capital Employed: ROCE (%)
- Gearing Ratio: Total Debt/Total Equity ratio

Planning & Development Division

- Planned Project Control: Abs. Time to delivery variation (%)
- Project Cost Control: Abs. Cost Variance (%)
- Implementation Failure: No. of Projects not implemented (relative to Plan)

Human Resource & Administration Division

- Organizational Churn: Employee Retention Index (%)
- Hiring Performance: 100% - Hire Failure rate (%)
- Organizational Climate: Leave Frequency (excl. Annual Leave) per person

iii. The PM Model for the Service Providers KPIs

The BSC design for the Service Providers (Horizontal KPIs) is based on 4 criteria: Timeliness, Responsiveness, Deliverables and Professionalism. The highest weight is given to the Deliverables, this includes the quality of the deliverable and the achievement of their mandates. The second highest weight is given to Responsiveness (e.g. answering emails, phone calls, etc.). The rationale being that this determines the effectiveness of the Service Provider, whereas efficiency is measured by Timeliness. Since Responsiveness can affect timeliness (changes due to unforeseen circumstances), being efficient in delivering

at the stipulated time might be counterproductive due to the lack of Responsiveness; in turn, Timeliness can be affected by constraints beyond their control and hence the weight of Timeliness should be less than Responsiveness. Finally, Professionalism is the way the service providers conduct the activities within the aspect of the other 3 criteria.

4. Validations:

- i. The Evaluation Function performs validations (see Appendices C1 and C2). The primary validation is on the SP (fundamental document for PM). This validation is used to support the Monitoring Function (as mentioned in paragraph b1-3 above) in terms of Consistency, Omissions and Duplications.
 - o Consistency is mostly achieved when:
 - data is reasonably structured (e.g. in ASCII, CSV formats)
 - data values conform with expectations or to conventional models
 - a particular field that is supposed to be a function of n others is dependable
 - information is specified during the data collection planning phase (as opposed to extra data that were not planned for)
 - outliers are identified and managed
 - ease of manipulation of data for analytical purposes is ensured
 - comparative checks (assessing additivity e.g. No of Strategic Objectives < Activities < Outputs) are performed
 - importing, exporting data files (e.g. data losses, data corrupted due to pauses during up/downloads) are dependable transactions
 - human errors (e.g. especially with spreadsheets and manual entries) are minimized
 - in analytical mode, sensitivities of the models are checked.
 - o Omissions, check for:
 - missing data
 - mislaying data (e.g. in the Responsibility field of the SP, “responsible person” is entered instead of, say, “Director of Finance”)
 - planned omission (omission of data for a specified period, with valid reasons; e.g. during equipment change and testing thereof, such as a turbine shaft replacement and a turbine-acceptance-test)
 - o Duplications, check for:
 - single: usually with mislabeling of Outputs (e.g. with abbreviations such as Mb for both Mabeele and Mayabongwe for a Power Station [fictitious names])
 - multiple: generally due to copy-and-paste portions of a document/spreadsheet
- ii. Once the Maintenance Plan has been finalized by the Operations Division (see 2 v. above) the expected NESO needs to be reconciled with the Forecasts obtained in 1 above.
- iii. Validation of Weights
Elicitation of Weights via Divisional Workshops
Ensuring that Weights balancing equations are bias-free

5. Reviewing: The Evaluation Function reviews by modifying and developing evaluation tools, mechanisms

- i. Reviews of Models adopted as mentioned in paragraphs 1 to 4 above
- ii. Review of Consistent Data Set (CDS) in Data Warehouse

c. ICT Department

The ICT Department relationship with M&E is critically important. Data is collated by the systems supported by ICT in the utility's divisions (e.g. the Operations Division's Data is presently collected manually and will soon import via SCADA). The ICT is responsible for providing and maintaining the Data Warehouse.

d. Divisions & Service Providers

The divisions and SPs are responsible to provide a link to the M&E Department via a POC residing in their respective division or department. The POCs are responsible to upload the information required to populate the BSCs (KPIs, Targets, Weights, Actual values, Sources of Evidence). It is the POC's responsibility to ensure that these uploads are effectively implemented (accessible, the information is available on demand and reliable).

The divisions and departments are responsible for the reliability of the BSCs (refer to paragraph 3.2.2.1).

3.2 EXECUTION TASKS AND RESPONSIBILITIES

Table 2: Roadmap for selected utility

Work Task	Requirement	When required	Responsible party	Remarks
WT1	SP Review	Every 3-5 yrs.	CM&E	Validation & Verification of Strat Objectives & Outputs
WT2	Review of Divisional & Serv. Prov. BSCs	FinY-E	SMO	Particularly Validation & Verification of Strategic KPIs and Weights
WT3	BSCs Assessments	3 rd Week Aug FinYr	SMO	Divisions & Serv. Pr.
WT4	Updated Forecasts & Predictions	3 rd Week Sep FinYr	SEO	ESO, MD, UCLF, Revenue, and KPIs
WT5	PMI Report to CEO	Last week Sep FinYr	CM&E	BSC Assessments; Forecasts & Predictions
WT6	PMI Presentation to ExCo	End Sep FinYr	CM&E	Elicit ExCo for directives on PMI results
WT7	Upload values of Financial KPIs and data from Financial Division	End Oct FinYr	SMO	Required for WT10
WT8	Semi-annual Validation & Review KPIs and Weights	Mid Nov FinYr	SEO	
WT9	Validation, Review and Upload Maintenance Plan	End Nov FinYr	SMO	
WT10	Revise Divisional KPIs	End Nov FinYr	SEO	Subject to Financial, Maintenance, Forecast & Predictions constraints
WT11	PM2 Report to CEO	Mid Dec FinYr	CM&E	Results from WT10
WT12	Revisions of WT11	End Jan FinYr	SMO/SEO	Based of feedback from the CEO
WT13	Utility KPIs and BSC Review Workshop	Mid Feb FinYr	CM&E	Div. & Utility KFAs, KPIs, Weights, Targets, Spreads, BSCs
WT14	PM3 Report to CEO	1 week after WT13	CM&E	Results of WT13
WT15	Presentation to ExCo	End Feb FinYr	CM&E	Results of WT14
WT16	Presentation to BoD	Mid Mar FinYr	CEO / CM&E	Results of WT14

Refer to Appendix C for skills and basic software requirements

The roadmap guide for selected utility in Table 2 above provides:

- The required Work Tasks (WT) that need to be performed
- When these WT need to occur
- The responsible party in the M&E Department for the WT
- Remarks summarizing the description of the WT

3.2.1 Work Task 1: Strategic Plan Review – Timing: every 3 to 5 years Responsible Party: CM&E

The Inquiry Document

At this point, an Inquiry document, by either an external party to the Utility, or by a member of the P&D Division should have a checklist confirming the minimal requirements above. Such a checklist is provided in Appendix BI. It queries the state of the SP. A positive result in this regard would reinforce that the sequence of processes from there on having a robust foundation.

In addition, a validation of the SP (Outputs particularly), is also necessary. This can be carried out with the assistance of the M&E Department whereby the Evaluation Specialist would check for issues (detailed in paragraph b. M&E Department, below) of:

- Consistency: e.g. data sequential in time (common error: Start and Completion times are not in sequence)
- Omissions: e.g. missing data
- Duplications: e.g. double labelling

The Status Report

This report provides the information of the PM status based on the information obtained from the Inquiry Document and a review of:

- the Strategic Plan,
- the Organizational structure,
- the Performance Management (PM) process
- the management of Data,

A Situation Assessment (the Status) is evaluated based on the four points above. This evaluation constitutes the input for a Gap Assessment which is then used to identify gaps between the current situation and an acceptable desired state for Performance Management.

The Gap Assessment, in terms of PM, is measured by tools such as Heat Maps as illustrated in Figure 8 below. A detailed derivation of the Heat Map is provided in Appendix B.

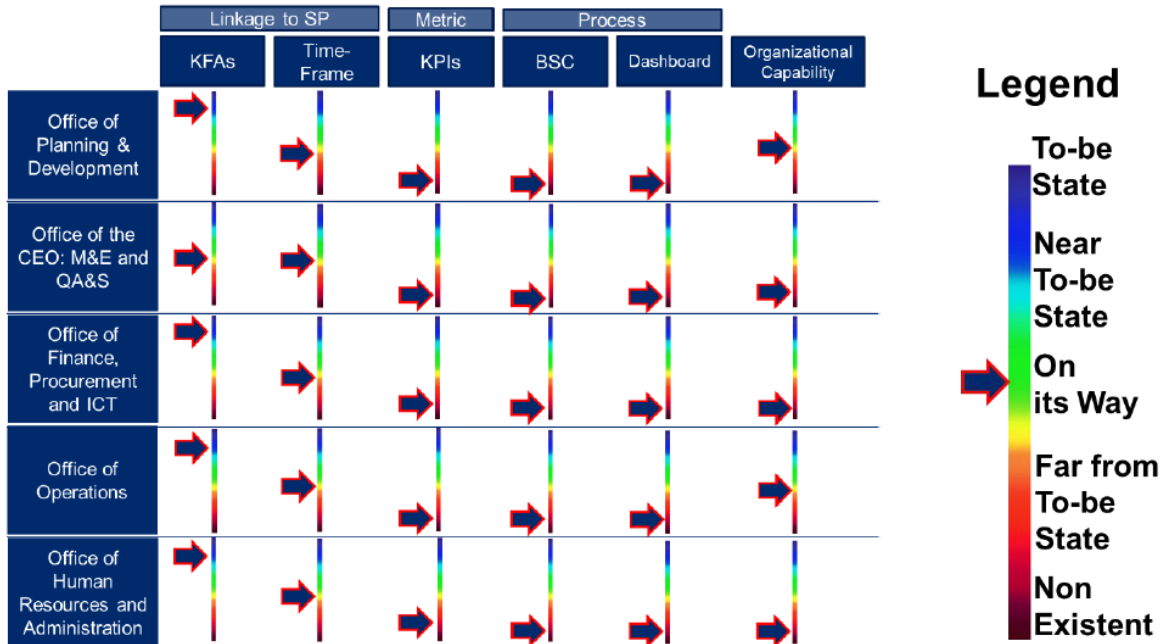


Figure 8: Gap Assessment Heat Map

Each arrow indicates where each Division/Office stands (current situation) in terms of the SP (KFAs and Time-Frame), the metrics (KPIs), the Processes in place (BSC and the Dashboard) and Organizational capability to carry out the PM requirements. The example above (Figure 8), illustrates that, apart from the KFAs, all other PM requirements need attention.

The Situation Review and Gap Assessment are usually performed by the Monitoring Function of the M&E Dept or an external Specialized Entity (e.g. SAEP); every 3 to 5 years, this task should be performed by an independent Specialized Entity. Details of such workings are reflected in [1].

3.2.2 Work Task 2: Review of Divisional & Service Providers BSCs – Timing: Fin Y-E

Responsible Party: SMO

At the Financial Year-End (e.g. if the Financial Year spans from 1 July 2018 to 30 June 2019, then Financial Year End is 30 June 2019) the SMO needs to action the monitoring of performance of the Utility. The SMO needs to validate and verify the Divisional and Service Providers BSCs, to ensure that the performance assessments are reliable.

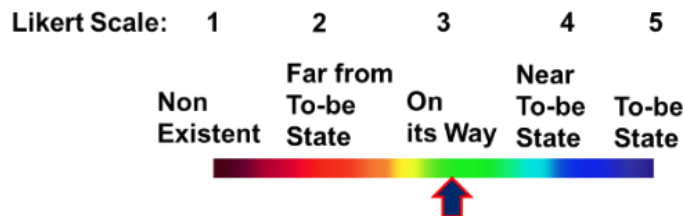
3.2.2.1 Validation of Divisional and Service Providers BSCs by acting on the following:

- With the POC, the SMO ensures that the Divisions and Department have uploaded their respective populated with Actuals KPIs values (of the BSCs) into the Raw Data layer of the **Data Warehouse** for the FinYE (these are the non-validated BSCs)
- The SMO, assisted by the SEO, analyze the Actual reported KPIs values to identify mistakes, outliers in the BSCs

- Report these findings, via the CM&E to the Division / Department copy to the **ECP Committee**, for a corrective (documented) response (if no findings: then report such to the **ECP Committee**)
- The SMO applies the documented changes as per ECP Committee resolution to the BSCs (if any) and uploads these into the Results/Reports layer of the **Data Warehouse** (these are the validated BSCs).

3.2.2.2 Verification of Divisional and Service Providers BSCs by acting on the following:

- The SMO performs a comparative analysis of the BSCs submissions (non-validated and validated) with the originally uploaded BSCs regarding the KPIs and the Weights (both Strategic and Operational for the Divisions and for the Service Providers)
- The SMO assesses the BSCs reliability based on the following scoring model:
From the comparative analysis record the number of differences between the validated and non-validated BSCs for each Division / Department This number constitutes the number of findings; then apply the following Likert Scale:
Likert Scale: 5- No findings; 4- 1 finding; 3- 2 findings; 2- 3 findings; 1- > 3 findings



The score determines the level of reliability of the BSCs for each Division/Department

After completion of the validations and verifications (3.2.2.1 and 3.2.2.2), the SMO, via the CM&E, issues a Technical Audit Report, based on the findings above, to the CEO and the ECP Committee Chair. This report is uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.3 Work Task 3: BSCs Assessments – Timing: 3rd Week Aug FinYr Responsible Party: SMO

During the third week in August of the FinYr, the SMO needs to assess the performance of the utility. The SMO needs to assess the utility’s divisional and service providers’ performance by using the validated BSCs (see Work Task 2), to ensure that the performance assessments are reliable.

- 3.2.3.1 For the assessment of the Strategic KPIs particular to each Division, the appraisal needs to be done at the end of each month of the FinYr (see Appendix B: Assessment Template B3 and Example B3-1). Hence, the SMO needs to work with the Assessment Plan that was submitted to the CM&E the previous FinYr (see Work Task 14) and during the previous FinYr, have assessed all the Strategic KPIs for all the Divisions. The SMO would then populate the consolidated Strategic KPIs assessments in the validated BSCs of the respective Divisions
- 3.2.3.2 For the assessments of the Operational KPIs particular to each Division, the appraisal is done at FinY-E (the Operational KPIs values are uploaded by the respective Divisions POCs in the Raw Data layer of the **Data Warehouse** and the results are populated in the validated BSC of the respective Divisions. This task is very dependent on task 3.2.2.1 (first bullet) above.

3.2.3.3 For the assessment of the Service Providers KPIs the appraisal needs to be done at the end of each month of the FinYr (see Appendix B: Assessment Template B5). Similarly, to 3.2.3.1 above, the SMO needs to work with the Assessment Plan that was submitted to the CM&E the previous FinYr (see Work Task 14) and during the previous FinYr, have assessed all the Service Providers KPIs for all the Departments.

3.2.3.4 For the assessment of the utility out of the Divisional and Service Providers BSCs automated final scores (as per 3.2.3.1 to 3.2.3.3 above), these must feed directly into the utility's BSC (see Appendix B – B6). The SMO is responsible for this transition of information.

After completion of tasks 3.2.3.1 to 3.2.3.4), the SMO, via the CM&E, issues a Performance Assessment Report, based on the findings above, to the CEO by the 3rd week in August of the FinYr. This report is uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.4 Work Task 4: Updated Forecasts & Predictions – Timing: 3rd Week Sep FinYr

Responsible Party: SEO

From the 1 July FinYr to mid-Sep FinYr, the SEO performs an Exploratory Data Analysis (EDA) on the historical Data of the KPIs. The SEO also models the behavior of the KPIs, Energy Sent Out (ESO) and Maximum Demand (MD) and utilizes those models to forecast and predict the next FinYr estimates with their corresponding spreads. The SEO then provides the following to the CM&E:

3.2.4.1 A Variance Report (historical) providing the difference between actuals and expected values as well as the difference between the actual and expected variances of the KPIs, for the previous FinYr (using inferential methods). This report needs to include the significance level of the differences. Identify critical KPIs. Upload in Results/Reports layer of the **Data Warehouse**.

3.2.4.2 A Forecast & Predictions Report (for the FinYr) which contains the following:

3.2.4.2.1 As per tasks in Section 3.1.b2.1 Forecasting and 3.1.b2.2 Predictions

3.2.4.2.2 Use the above and, provide simulations for the Revenue. Estimate the Costs of Production (these will differ from Utility to Utility and may change from FinYr to FinYr). Compute Financial KPIs and other requested Indicators (by the CM&E), based on the simulations.

3.2.4.2.3 Based on 3.2.4.2.1 and Status Report, model the 5year Forecasts using Statham's Curves (with CIs)-See Appendix A1 and Appendix A2. Provide Sustainability curves for critical KPIs (as per Variance Report in 3.2.4.1).

3.2.4.2.4 A summary of 3.2.4.2.1 to 3.2.4.2.4

3.2.4.2.5 Upload in Results/Reports layer of the **Data Warehouse**.

3.2.5 Work Task 5: PMI Report to CEO – Timing: Last Week Sep FinYr (prior to ExCo)

Responsible Party: CM&E

From the 3rd Week Sep FinYr to the last week Sep FinYr, the CM&E collates the Variance Report and the Forecasts & Predictions Report and, by summarizing them, produces the First Performance Management Report (PMI) in tandem with a slide presentation for Exco.

The CM&E, then:

- 3.2.5.1 Sends the PMI report and presentation to the CEO for changes (if any) and approval to present to ExCo
- 3.2.5.2 Once approved, uploads in Results/Reports layer of the **Data Warehouse**.

3.2.6 Work Task 6: PMI Presentation to ExCo – Timing: End Sep FinYr

Responsible Party: CM&E

Presentation and hand-over of PMI Report to ExCo. Depending on the results, the CM&E would elicit comments/directives on the past FinYr Performance and on the Targets (with Spreads) that ExCo may wish to set for the next FinYr. The Record of Decisions are documented and uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.7 Work Task 7: Upload values of Financial KPIs and data from Financial Division – Timing: End Oct FinYr

Responsible Party: SMO

By the end of October FinYr, the SMO assures that the POC (Finance) has uploaded Financial Data (incl. KPIs data) in the Raw Data layer **Data Warehouse**. As per the M&E Monitoring functions, i.e. 3.1.b1, the SMO performs Tasks 1, 3, 4 and 5 and may require assistance from the SEO. After all validations are checked, the information is the Financial Data and KPIs Report which is uploaded in the CDS layer of the **Data Warehouse**.

3.2.8 Work Task 8: Semi-annual Validation & Review KPIs and Weights – Timing: Mid Nov FinYr

Responsible Party: SEO and CM&E

By mid-November FinYr, the SEO repeats tasks 3.2.4.1 and 3.2.4.2 and then provides the following to the CM&E:

- 3.2.8.1 Semi-annual Variance Report
- 3.2.8.2 Semi-Annual Forecasting & Predictions Report for FinYE

The above, once ratified, are then uploaded in the Results/Reports layer of the **Data Warehouse**.

Then, the CM&E:

- 3.2.8.3 Collates the Semi-annual Variance Report and the Semi-annual Forecasts & Predictions Report and, by summarizing them, produces the Mid-FinYr Performance Management Report and summarizes it into a presentation for the CEO
- 3.2.8.4 Sends the Mid-FinYr Performance Management Report and presentation to the CEO for changes (if any) and directives therefrom. Once ratified by the CEO the report and presentation are uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.9 Work Task 9: Validation, Review and Upload Maintenance Plan – Timing: End Nov FinYr

Responsible Party: SMO

By the end of November FinYr, the SMO assures that the POC (Operations) has uploaded the Maintenance Plan in the Raw Data layer **Data Warehouse**.

As per the M&E Monitoring functions, i.e. 3.1.b1, the SMO performs Tasks 1, 3, 4 and 5 and may require assistance from the SEO. After all validations are checked, the information is compiled the Planned Maintenance Original M&E Report which is delivered to the CM&E for ratification and then uploaded in the CDS Source layer of the **Data Warehouse**.

3.2.10 Work Task 10: Revise Divisional KPIs – Timing: End Nov FinYr Responsible Party: SEO

By the end of November FinYr, the SEO needs to assess the feasibility of the performance expectations, based on the information provided so far in the FinYr by:

- 3.2.10.1 Collates the information from Work Tasks 4 to 9 for the Divisions
- 3.2.10.2 Analyzes the obtained information as per the functions in 3.1.b2
- 3.2.10.3 Designs either an optimization model subject to constraints given in Work Tasks 7 and 9 or constructs various scenarios (based on 3.2.10.2) by using different simulation models.
- 3.2.10.4 Produces a Planned Maintenance Adjusted M&E Report to the CM&E and, once ratified, uploads it the Results/Reports layer of the **Data Warehouse**.
- 3.2.10.5 Consolidates the methodologies in 3.2.10.2 and the results obtained from 3.2.10.3, into a Revised Divisional KPIs Report to the CM&E and, once ratified, uploads it in the Results/Reports layer of the **Data Warehouse**.

3.2.11 Work Task 11: PM2 Report to CEO– Timing: Mid Dec FinYr Responsible Party: CM&E

From the End November FinYr to the Mid December FinYr, the CM&E utilizes the Revised Divisional KPIs Report outcomes, and:

- 3.2.11.1 Produces the Second Performance Management Report (PM2) in tandem with a slide presentation for the CEO.
- 3.2.11.2 Presents to the CEO and the Record of Decisions are documented and uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.12 Work Task 12: Revisions of Work Task 11– Timing: End Jan FinYr Responsible Parties: SMO and SEO

Depending on the results of the optimization and/or simulation results the CEO would provide certain directives (e.g. tighten the PCLF spreads, decrease the UCLF expectation with a 5-year strategic plan mapping, etc.); this means to:

- 3.2.12.1 SMO to inform the Divisional Directors and POCs as well as the HODs of the COE decisions
- 3.2.12.2 SMO to provide them with a Template which will consist at least of the following fields for preparing information and presenting at the Workshop (Work Task 13) on:
 - 3.2.12.2.1 Historical Performance for Strategic and Operational KPIs and BSCs scores as well as descriptive reasons for such performance for the Divisions. For the Service

Providers, their Historical Performance for the BSCs based on their Service Level Agreements with the Divisions and other Departments.

3.2.12.2 The next FinYr Strategic KPIs and Operational KPIs with corresponding spreads and weights (with balancing checks)

3.2.12.3 The SEO might be required to repeat Working Task 10

3.2.12.4 The SMO and SEO need to produce a Workshop Facilitating Presentation: Utility KPIs and BSC Review, for the CM&E and upload in the Compacting layer of the **Data Warehouse**.

3.2.13 Work Task 13: Utility KPIs and BSC Review Workshop – Timing: Mid Feb FinYr

Responsible Party: CM&E and SMO

For this important strategic Workshop to be conducted at latest Mid-February FinYr, the CM&E is responsible for:

3.2.13.1 The logistics (allocated suitable dates and times, suitable venue to accommodate participants, catering, travelling and accommodation requirement, laptop with projector, white-board with markers, etc.)

3.2.13.2 Officially informing the Divisional Directors and HODs of the logistics (latest Mid-Jan FinYr) via the Office of the CEO

3.2.13.3 Obtain the populated Divisional and Service Providers Presentations as per 3.2.12.2 and upload them into a folder “*Utility KPIs and BSC Review Workshop / Original Submissions*” in the Compacting layer of the **Data Warehouse**.

3.2.13.4 Instructs the SMO to keep records of attendance and outcomes from the Workshop. The records of attendance and outcomes are collated into a Utility KPIs and BSC Review Workshop Report and uploaded by the SMO into a folder “*Utility KPIs and BSC Review Workshop / Workshop Outcomes*” in the Compacting layer of the **Data Warehouse**.

3.2.14 Work Task 14: PM3 Report to CEO – Timing: 1 week after Work Task 13

Responsible Party: CM&E

Within one week after Work Task 13, the CM&E deals with:

3.2.14.1 The SMO submission to the CM&E, for the following FinYr, of the Assessment Plan for the Strategic KPIs that were derived from the Utility KPIs and BSC Review Workshop (see Work Task 13, also Appendix B3 and Appendix B3-1 Example)

3.2.14.2 The Utility KPIs and BSC Review Workshop Report by summarizing its outcomes

3.2.14.3 Consolidating 3.2.14.1 and 3.2.14.2 into the Third Performance Management Report (PM3) in tandem with a slide presentation for the CEO

3.2.14.4 Sending the PM3 report and presentation to the CEO for changes (if any) and approval to present to ExCo

3.2.14.5 Once approved, uploads in Results/Reports layer of the **Data Warehouse**.

3.2.15 Work Task 15: Presentation to ExCo – Timing: End Feb FinYr Responsible Party: CM&E

Presentation and hand-over of PM3 Report to ExCo. Depending on the results, the CM&E would elicit comments/directives on the next FinYr Performance Targets (with Spreads) that ExCo needs to ratify for the next FinYr BoD approval. The Record of Decisions are documented and uploaded in the Results/Reports layer of the **Data Warehouse**.

3.2.16 Work Task 16: Presentation to BoD – Timing: Mid Mar FinYr Responsible Parties: CEO and CM&E

Presentation and hand-over of PM3 Report by the CM&E to BoD. Depending on the discussions, the CM&E would defend by substantiating the ExCo decisions (supported by the CEO and Director of Finance), elicit (if necessary) comments/directives on the next FinYr Performance Targets (with Spreads) that ExCo would need to change to seek BoD approval. The Record of Decisions are documented and uploaded in the Results/Reports layer of the **Data Warehouse**.

3.3 REPORTING REQUIREMENTS

In Section 3.2, each type of report is submitted by the responsible party. For example, it is the responsibility of the CM&E to ensure that the Technical Audit Report is in order, uploaded and delivered to the CEO and the ECP Committee Chair. Refer to Section 3.2.x for the details required in each Work Task x report; for instance, Section 3.2.2 will contain the details of Work Task 2 and its related report, i.e. the Technical Audit Report. All mentions of reports in 3.2.x are underlined.

The format and structure of each report does not form part of this Manual; the CM&E would structure each report according to the recipient requirements, and inclusive of the 3.2.x specified details.

A summary for the Work Tasks, Description, Due Time/Period, Report Type(s) and the Responsible Party is given in Table 3 below.

There are five critical Reporting requirements in the New Performance Management Process. These are best explained by the deliverables, namely (refer to Table 3 below):

- a. The Status Report (Work Task 1b)
- b. The Performance Management Report 1 to the CEO (Work Task 5)
- c. The Mid-FinYr Performance Management Report to the CEO (Work Task 8c)
- d. The Performance Management Report 2 to the CEO (Work Task 11)
- e. The Performance Management Report 3 to the CEO (Work Task 14)

Other Reporting requirements are the Inputs of the KPIs (all KPIs or sets thereof) and other Indicators, as required by ExCo, which would need displaying on a Dashboard(s) and would most likely change from time to time during the FinYr (especially the Strategic KPIs).

Table 3: Summary of Reporting Requirements

Work Task No.	Description	Due Time/Period	Report Type(s)	Responsible Party
1	Strategic Plan Review	every 3 to 5 years	a. Inquiry Document b. Status Report	a. CM&E b. CM&E
2	Review of Divisional & Service Providers BSCs	Fin Y-E	Technical Audit Report	CM&E
3	BSCs Assessments	3rd Week Aug FinYr	Performance Assessment Report	CM&E
4	Updated Forecasts & Predictions	3rd Week Sep FinYr	a. Variance Report b. Forecast & Predictions Report	a. CM&E b. CM&E
5	PMI Report to CEO	Last week Sep FinYr	First Performance Management Report (PMI)	CM&E
6	PMI Presentation to ExCo	End Sep FinYr	PMI ExCo Record of Decisions	CM&E
7	Upload values of Financial KPIs and data from Financial Division	End Oct FinYr	Financial Data and KPIs Report	SMO
8	Semi-annual Validation & Review KPIs and Weights	Mid Nov FinYr	a. Semi-Annual Variance Report b. Semi-Annual Forecasting & Predictions Report c. Mid FinYr Performance Management Report	a. SEO b. SEO c. CM&E
9	Validation, Review and Upload Maintenance Plan	End Nov FinYr	Planned Maintenance M&E Report	SMO
10	Revise Divisional KPIs	End Nov FinYr	a. Planned Maintenance Adjusted M&E Report b. Revised Divisional KPIs Report	SEO
11	PM2 Report to CEO	Mid Dec FinYr	a. Second Performance Management Report (PM2) b. CEO Record of Decisions	CM&E
12	Revisions of Work Task 11	End Jan FinYr	Workshop Facilitating Presentation: Utility KPIs and BSC Review	SMO/SEO
13	Utility KPIs and BSC Review Workshop	Mid Feb FinYr	a. Divisional and Service Providers Presentations b. Utility KPIs and BSC Review Workshop Report	a. Divisional and Service Providers POCs; CM&E b. SMO
14	PM3 Report to CEO	1 week after WT 13	Third Performance Management Report (PM3)	CM&E
15	Presentation to ExCo	End Feb FinYr	PM3 ExCo Record of Decisions	CM&E
16	Presentation to BoD	Mid Mar FinYr	PM3 BoD Record of Decisions	CEO / CM&E

3.4 DATA HANDLING PROCESS REQUIREMENTS

3.4.1 Data Warehouse

Links, uploads and downloads events are highlighted as ‘**Data Warehouse**’ at various points in this Manual.

- Regular Data Inputs for Operational KPIs (daily, weekly, monthly, quarterly, FinYE)
- Intermittent Data Inputs for Strategic and Service Providers KPIs

The two above are entered in the Raw Data layer of the **Data Warehouse**.

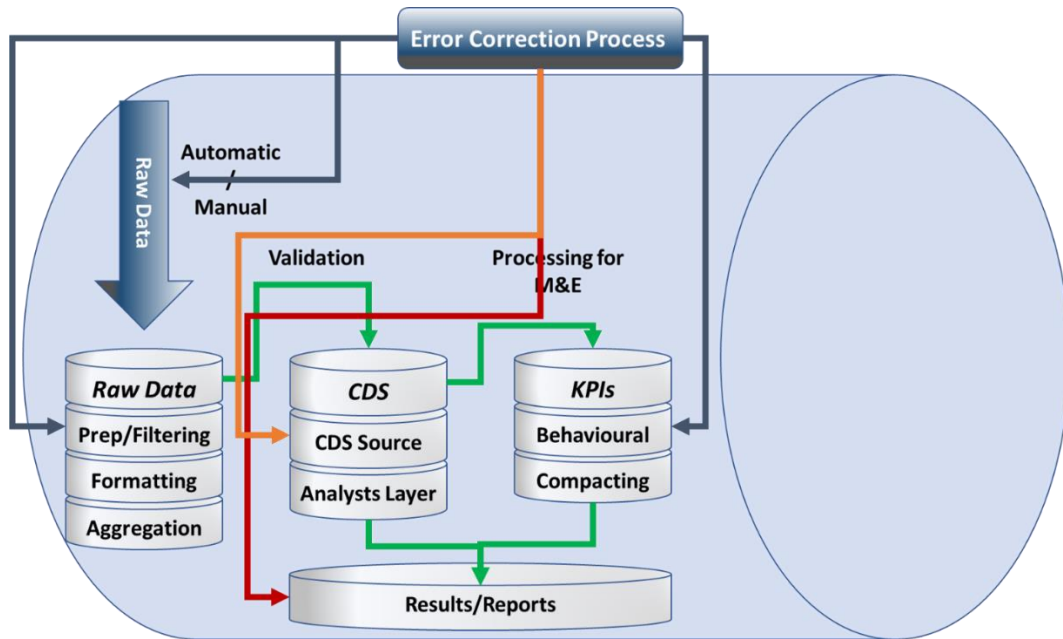


Figure 2 Data Warehouse

3.4.2 Data Connectors Required for:

- The aggregation from external data sources
- Queries
- Handling Big Data
- Analytical software interfacing
- The Inputs to Dashboard software

3.4.3 Outputs

- Structured Files
- Routine Reports (see Section 3.5 Reports Requirements)
- Customized Reports

3.4.4 P&D Division

The P&D Division relationship with ICT, is fundamentally important. Data is collated by the systems supported by ICT for the construction of the SP. This interface needs to be automated, and linked to the **Data Warehouse**.

3.4.5 M&E Dept

The M&E Department relationship with ICT, is also critically important. Data is collated by the systems supported by ICT in the Utility's Divisions (e.g. the Operations Division's Data is presently collected manually and soon it will be imported via SCADA).

3.4.6 Software

3.4.6.1 Information Management software needs to be produced to handle the Data Warehouse inputs/Outputs, the Documentation tracking, the BSCs assessments and the Dashboards populations. Interfaces with various platforms (as per 3.3.2) need also to be produced.

3.4.6.2 The term 'produced' is as per coding definition (i.e. design, testing, debugging, proto-typing and launching into production).

3.4.6.3 A decision will be taken after the Technical Specification (see Appendix C) is received on the repository for the software; for instance, it could reside in the Raw Data, Analysts, Compacting and Results/Reports Layers or have its own layer in the **Data Warehouse**.

The platform used is illustrated in Annex Ax.3

3.5 PROPOSED TRAINING REQUIREMENTS

While not part of the SAEP scope, the Training should have its particular SoW and could be structured in three phases as a possible high-level plan:

Phase 1: ExCo training

Phase 2: Management training

Phase 3: Operating Staff & Analysts training

All 3 phases would start with an Induction particular to the targeted audience, This Induction would have an introduction to KPIs (types of measures [Qualitative & Quantitative]) and the KPIs elements of risk to achieve their expectations. Phase 3 Induction will include some Division Specifics (requirements). Roles of: M&E, Analysts, Service Providers.

After the Induction:

Phase I would include Interpretations consisting of:

- KPIs (types of Measures: e.g. Scores, Units [UCLF%], ...)
- Weights (constraints: e.g. sums must balance to 100%...)
- Targets & Spreads (strategic curves for Scores, for Units...)
- Sources of Evidence (for each KPI, auditable, ...)
- Contracts & Compacts
- Practical examples within the utility

This would follow with Benchmarking consisting of:

- Internal Benchmarks (e.g. based on Statham's Curves)
- International Benchmarks (e.g. based on International Best Quartiles)
- Practical examples within the utility

Phase 2 would include Interpretations & Implementation consisting of:

- Understanding the BoD & Exco directives and Mapping these onto each Division BSC
- KPIs (types of Measures: e.g. Scores, Units [UCLF%], ...)
- Weights (constraints: e.g. sums must balance to 100%...)
- Targets & Spreads (strategic curves for Scores, for Units...)
- Sources of Evidence (for each KPI, auditable, ...)
- Contracts & Compacts (if required)
- Practical examples within the utility

This would follow with Benchmarking & Reporting consisting of:

- Internal Benchmarks (e.g. based on Targets and Spreads above)
- Reporting high-level formats
- Practical examples within the utility

Phase 3 would include Analyses, Construction of KPIs and BSCs consisting of:

- Analyses of KPIs datasets
- Modelling and derivation of Targets & Spreads for KPIs
- Mapping these onto each Division KPIs & Service Providers
- Construction of New KPIs (types of Measures: e.g. Scores, Units [UCLF%], ...)
- Construction of Weights (from SP, modifications and constraints: sums to balance 100%...)
- M&E information acquisition and scoring (evaluation)
- Practical examples for each Division & Service Providers

This would follow with Reporting consisting of:

- General reporting structural requirements
- Reports design

4



APPENDIX

APPENDIX A: DEFINITIONS & MODELS

AI Definitions & Concepts

1. **Contracts:** As per SP, a Division is responsible for targeting the Objectives' outputs. Once this is done, then a measuring instrument is necessary to monitor the progress of particular outputs. Since this should be of meaningful substance, it ought to be a binding agreement (like a "promise") between the responsible Division and the utility (represented by the BoD and ExCo). These instruments are called Contracts and span over a year (business or calendar).
2. **Compacts:** Compacts are aggregated Contracts to establish over a period (which normally corresponds to the tenure of the responsible Division – usually 5 years) how attainable the proposed targets are over time. The form part of the quantification of the Sustainability of the utility.

Both Contracts and Compacts are quantitative demonstrations of the seriousness in the commitments made by the various Divisions responsible to the utility. They provide also a measure of feasibility in what can be achieved by when; in doing so, they enable the utility to make quantifiable changes to become progressively better at performing.

3. **Likert scale:** Here, it is adopted as a rating scale, to elicit information about a qualitative or quantitative KPI, for the purpose of quantifying (for a qualitative KPI) the measure, or reducing the KPI to a common scale (quantitative KPI), enabling weighted aggregation of the KPIs'. The scale utilized here is 1 to 5 where, the performance is:
 - a. **1:** Very poor
 - b. **2:** Worse than expected
 - c. **3:** As expected
 - d. **4:** Better than expected
 - e. **5:** Excellent

Down to 2-decimals values are permitted (e.g. 4.32). These are usually a result when the scores are a result of a weighted average.

Performance Statistical Model:

4. **Norm:** This is the expectation or estimated value that would be the median (quantitative KPI) or the expectation (qualitative KPI) that has a 50 : 50 chance of being achieved.
5. **Floor:** The KPI value (quantitative KPI) or event (qualitative KPI) that has a 95% chance of being bettered; it also provides a peg to evaluate overestimation of the Norm.
6. **Kick-in:** The KPI value (quantitative KPI) or event (qualitative KPI) that has an 80% chance of being bettered (close to the worse quartile).
7. **Stretch:** Given the Norm, the KPI value (quantitative KPI) or event (qualitative KPI) that would reflect a stretch on the Norm. This would have a 20% chance of being bettered (close to the best quartile).

- 8. **Ceiling:** The KPI value (quantitative KPI) or event (qualitative KPI) that has a 5% chance of being bettered. It constitutes the capping of the KPI; it also provides a peg to evaluate underestimation of the Norm.

Definitions 4 to 8 provide the elements that define the areas of performance or performance zones. These zones provide an additional dimension of awareness of the KPI’s condition. They provide the building blocks for a reporting dashboard.

Performance Zones:

- 9. **Red Zone:** Any KPI at or below the Floor, is deemed to affect the strategy and sustainability of the Company; could flag overestimation of the KPI.
- 10. **Orange Zone:** Value between Floor (excl.) and Kick-in (incl.), is intended as an alarm zone, to flag the state of the indicator.
- 11. **Green Zone:** Value between Kick-in (excl.) and Stretch (excl.). This zone shows that the KPI is meeting the agreed/negotiated expectation; it can signal the start of a proportional reward.
- 12. **Blue Zone:** Value between Stretch (incl.) and Ceiling (incl.). Within this zone, the KPI is exceeding the expectation and the reward is accrued at a higher rate.
- 13. **Purple Zone:** Any KPI with a value greater than the Ceiling (capped value) does not accrue a reward; could flag underestimation of the KPI.

CoB: Chance of Betterment

Spread: The tolerance of an Operational KPI around the Norm, based on definitions 5 to 8 above.

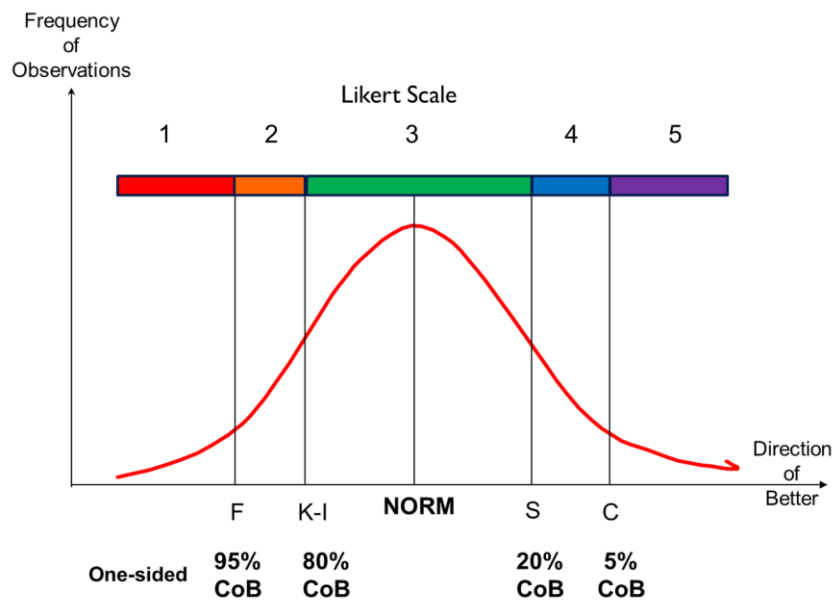


Figure AI-1: KPI Distribution – Illustration of definitions 3 to 13

SMART definition for a KPI: **S**imple, clear and understandable; **M**easurable; **A**chievable and **A**greed between Stakeholders; **R**ealistic – within the control of accountable Division and within the ambit of its spread; and **T**ime-bound.

A2 International Models and Equations

Statham's Family of Curves:

Here we illustrate the application of these curves to an Operational KPI with the intention of achieving the International Best Quartile (IBQ [target]) within or at the 5th Year.

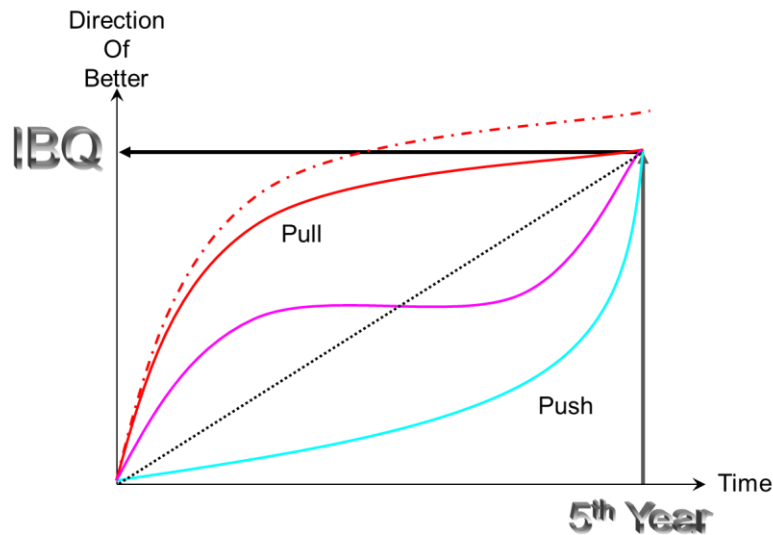


Figure A2-1: Subset of Statham's Family of Curves

14. **Linear Strategy:** This strategy is the neutral one, progressing at a constant rate towards the target (black dotted line).
15. **Push Strategy:** This is the riskiest strategy as, usually, the intended time window (in this case of 5 years) is exceeded (cyan line). However other external factors may prevent the adoption of other curves.
16. **Pull Strategy:** This is the strategy (red line) usually adopted by BoD's and ExCo's to drive the business. Under the right conditions, the likelihood is that the target will be achieved earlier than expected (red dash-dot line).
17. **Hybrid Strategy:** Pull-Push (purple line), is a strategy that somewhere within the time window there is an expected (or planned) constraint that would invert the condition of the strategy. Other hybrid strategies are Pull-Pull, Push-Push and Push-Pull.

International Union of Producers and Distributors of Energy – UNIPEDE:

The implementation Operational KPIs is usually linked to the Country's Energy Regulating Body's mandate of Setting of rules, guidelines and codes for the regulation of the Electrical Energy industry. It is therefore important to utilize Operational KPIs that are Internationally accredited

and can be benchmarked. Such indicators can be obtained from the UNIPEDA definitions and formula. The main relevant ones for this project are:

18. **REG:** Reference Energy Generation is the energy that could be produced if the unit were operated continuously at reference unit power under reference ambient conditions throughout the period. Reference ambient conditions are environmental conditions representative of the annual mean (or typical) ambient conditions for the unit.

$$REG = \text{Net Maximum Capacity (MW)} \cdot T$$

where T represents the total hours in the time-window under measurement

19. **PCLF:** Planned Capability Loss Factor is defined as the ratio of the planned energy losses during a given period of time, to the reference energy generation expressed as a percentage. Planned energy loss is energy that was not produced during the period because of planned shutdowns or load reductions due to causes under plant management control. Energy losses are considered to be planned if they are scheduled at least four weeks in advance. The following data is required to determine each unit's value for this indicator: Planned energy loss, expressed in units of megawatt-hours (electric) and REG.

$$PCLF = \frac{\text{Planned Energy Loss (MWh)}}{REG} \%$$

20. **UCLF:** Unplanned Capability Loss Factor is the percentage of maximum (or reference) energy generation that a plant is not capable of supplying to the electrical grid because of unplanned energy losses (such as unplanned shutdowns, outage extensions or load reductions). Energy losses are considered unplanned if they are not scheduled at least four weeks in advance. A low value for this indicator indicates that important plant equipment is reliably operated and well maintained. The following data is required to determine each unit's value for this indicator: Unplanned energy loss, expressed in units of megawatt-hours (electric) and REG.

$$UCLF = \frac{\text{Unplanned Energy Loss (MWh)}}{REG} \%$$

21. **UCF:** The Unit Capability Factor monitors the progress in attaining high unit and industry energy production availability. This indicator reflects effectiveness of plant programs and practices in maximizing available electrical generation, and provides an overall indication of how well plants are operated and maintained.

$$UCF = 100\% - PCLF - UCLF$$

22. **OCLEF:** Other Capability Loss Factor is the percentage of energy generation that a plant is not capable of supplying to the electrical grid due to causes beyond the control of plant management including internal non-engineering constraints.

$$OCLEF = \frac{\text{Other Unplanned Energy Loss (MWh)}}{REG} \%$$

23. **EAF:** Energy Availability Factor monitors the progress in attaining high unit and industry energy production availability after the losses due to causes beyond the control of plant management including internal non-engineering constraints have been deducted.

$$EAF = UCF - OCLF$$

$$EAF = 100\% - PCLF - UCLF - OCLF$$

24. **LF** or **GLF**: Load Factor or Generation Load Factor is the ratio of the energy utilized to the reference energy generation expressed as a percentage.

$$LF = \frac{\text{Energy Utilized or Loading (MWh)}}{REG} \%$$

25. **EUF**: Energy Utilization Factor is the ratio, expressed as a percentage, of the energy utilized (load) to the available energy after the losses due to causes beyond the control of plant management including internal non-engineering constraints have been deducted.

$$EUF = \frac{LF}{EAF} \%$$

For a Power Station (PS): the Operational KPIs (definitions 19 to 25) need to be aggregated as a weighted average of the generating units; where the weights are the ratio of Net Maximum Capacity of the generating unit, to the total Net Maximum Capacity of the PS. Similarly, the Utility Operational KPIs (definitions 19 to 25) are aggregated as a weighted average of the generating units of the Utility; where the weights are the ratio of Net Maximum Capacity of the generating unit, to the total Net Maximum Capacity of the Utility.

Weighting in terms of the Generating Units Net Maximum Capacity over the Total Net Maximum Capacity is used to compute the Power Station's or the utility overall KPI as given in definitions 20 to 25 above, but checks and balanced must be performed to assure the values produced.

26. **UAGS/7000**: The purpose of this indicator is to enable monitoring of an important aspect of the reliability of service provided to the electrical grid. It considers the success in improving reliability by reducing the number of the generating unit trips. It also provides an indication of plant operation and maintenance performance. It is defined as corresponding to the number of unplanned (unintentional) automatic grid separations of internal origin, which occur per 7000 operating hours.

"Unplanned" means that grid separation is not an anticipated part of a planned test, nor part of an operating program designed to adjust output to demand (e. g. a controlled shutdown). Controlled shutdowns of units where the line circuit breaker is manually or automatically opened at loads equal to or below the first automatic synchronizing load should not be considered when computing this indicator.

"Grid separation" means the opening of the generator breaker or HV yard breaker where no generator breaker exists. This could be an opening signal actuated by overshooting of a safety threshold, or a spurious trip. Grid separation can only occur during grid service of the units. Grid service is obtained when the start-up is successful for requested start-ups or when loads in excess of the first synchronizing load is reached for "contracted" or "other start-ups" (i.e. house or block load as programmed into the automatic synchronizing equipment). "Automatic" (unintentional) means that the grid separation is not the result of an action by the operator either on one of the switches to trigger a unit trip or grid separation, or to simulate operation of a protection system. (Note: Generation Utilities have used the word "manual" to distinguish trips initiated by the operator to protect the plant. However, trips caused by the operator in error e.g. opening the wrong switch leading to a trip are excluded from the "manual" category. Controlled shutdowns

of units where the line circuit breaker is manually or automatically opened at loads equal to or below the first automatic synchronizing load should not be considered when computing this indicator).

“Operating” means that the generator set is connected to the off-site grid (transmission of generated power) even if the alternator is operating in synchronous motor mode due to exceptional circumstances.

“Of internal origin” means that the trip is due to an unspecified internal installation failure resulting in a loss of reliability - even if the initial event can be traced to an off-site cause. The signal, which triggered grid separation, must originate from one of the sensors (or protection logic) for monitoring unit parameters (generator set and power transmission, up to and including the generator transformer HV breaker, and boiler). Grid separations actuated by protection systems for the physical parameters of the grid are not included unless they were incorrectly controlled. The selected figure of 7000 hours represents the typical number of on-line hours for most plants operating at base load or semi-base load. The indicator thus represents an approximate value of the actual number of grid separations occurring in one year.

The following data are required to determine the value for this indicator: the number of unplanned automatic grid separations (U) with the generator circuit breaker (or HV breaker where no generator breaker exists) in initially closed position and the number of operating hours (OPH).

It is expressed as the average number of ‘trips’ per unit per year (rate).

$$UAGS \text{ per } 7000 = \frac{U}{OPH} \cdot 7000 \text{ rate}$$

For a Power Station (PS): the UAGS/7000 need to be calculated as follows: the number of unplanned automatic grid separations (U_t) and the number of operating hours (OPH_t), need to be summed for all the PS generating units the PS $UAGS/7000 = \sum(U_t \cdot 7000) / \sum(OPH_t)$. The same would apply for the Utility (no weighting applies).

27. **Variance:** Statistical Variance, that is the averaged (unbiased) squared measure of how values are spread from their expectation. Its squared root, i.e. returning to the values unit-of- measure, is the Standard Deviation. There is a fundamental mathematical reason why the square is used rather than the simple difference from the expectation: it can be proved that the average of this difference is always equal to zero. This is the reason why here we would work with Statistical Variance rather than the Accounting Variance (which is the arithmetic difference).

28. Performance Dashboard Examples

Figure A2-2 below shows an example for a dashboard Bar-Chart on how each Power Station is performing vis-à-vis the Unit Capability Factor for a particular time of the year (e.g. monthly or quarterly; at Financial Year-End it will be the final Contractual result for each of the Power Stations). It permits to benchmark the Power Stations within the utility. If monitored monthly, it provides a visual on how each Power Station is likely to fulfill its contractual obligations at Financial Year-End (sustainability)

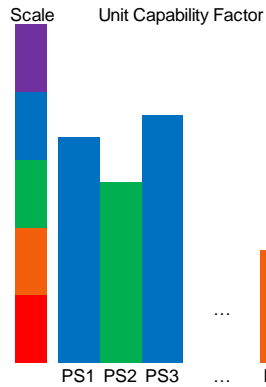


Figure A2-2: UCF Illustration of Power Stations Performance

Dashboards provide high level user interfaces are typically used for executive level information [10]. The Dashboard will be designed, tested and implemented in the final task of this assistance- which will be a pilot for the utility M&E program. Each Division as well as Service Providers would have a similar one. In the final task, these will be upgraded as a direct mapping from the BSCs, in form of gauges / dials;.

The final Dashboard would be colour coded in the same type palette as a Likert Scale (defined in Section 4) and have as components the following:

- i. Strategic KPIs
- ii. Operational KPIs
- iii. Service Providers KPIs

An illustrative example is shown in Figure A2-3 below.



Figure A2-3: Dashboard illustration

APPENDIX B: PM TOOLS

This Appendix provides guidance to the Evaluation Officer in the M&E Department in the application of the tools in the reviews.

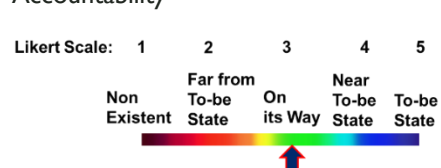
BI Linkage to Strategic Plan & Timeframe Assessment Tool:

ASSESSMENT Date: June 2018		By: SAEP	
Key Focus Areas (KFAs)	Consistency	Omissions	Duplications
“To achieve the Utility’s Vision, how should the utility appear to its Customers?” SP **			
“To succeed financially, how should the utility appear to its Shareholders?” SP **			
“To satisfy its Shareholders and Customers, what Business Processes must the utility excel at?” SP **			
“To achieve the utility’s Vision, how will the utility sustain its ability to change and improve SP **			
Strategic Objectives (SO)	Consistency	Omissions	Duplications
“Have the Strategic Objectives been adequately described what they are attempting to achieve vis-à-vis the Key Focus Areas?” SP ***			
Key Tasks / Activities (KA)	Consistency	Omissions	Duplications
“Are the Activities adequately aligned to the Strategic Objectives?” SP ***			
Outputs (O/P)	Consistency	Omissions	Duplications
“Are the Outputs adequately aligned to their corresponding Activities?” SP *			
“Is the responsible Division/Department aligned to each Output?” SP *			
“Are the Start and Completion times for each Output adequate?” Addresses the <u>Time-Frame</u> ***			

the Evaluation Specialist checks for issues (detailed in Section 3.1, paragraph b. M&E Department) of:

- Consistency: e.g. data sequential in time (common error: Start-Completion times are not in sequence)
- Omissions: e.g. missing data
- Duplications: e.g. double-labelling

* M&E Department Accountability; ** Divisional Accountability; ***Both M&E Department and Divisional Accountability



Consistency, Omissions and Duplications:

Likert Scale: 5- No findings; 4- 1 finding; 3- 2 findings; 2- 3 findings; 1- > 3 findings

BI-I SP Validation – Specific Utility Application

REVIEW: when the Outputs were scrutinized, the following findings were observed in the SP.

Key Focus Area 1: **Customer, Stakeholders and Corporate Image**

- a) p31 (C): Tedzani IV EPC contract in place Ongoing Jul 2017
DOPD

Is this correct? Was this task completed in 2017? If yes, the should all the completed projects be reflected in the SP? This would no longer make it a Strategic Plan. Is it a typo?

- b) p32 (C): Wowwe Contract for consultancy in place Ongoing Dec 2017
DOPD

Is this correct? Was this task completed in 2017? If yes, the should all the completed projects be reflected in the SP? This would no longer make it a Strategic Plan. Is it a typo?

- c) p34 (C): STAGE IA (20MW) Leasehold to the site concluded Ongoing
Mar 2018 DOF

In subsequent tasks, when the “Leasehold to the site concluded” appears the Responsible Office is DOHRM. Is it correct to have this one for the DOF?

- d) p34 (D): STAGE IA (20MW)

Financial closure Jan 2018 Jun 2018 DOF

EPC contract in place Feb 2018 Aug 2018 DOPD

20 MW installed and commissioned Sep 2018 Dec 2019 DOPD

This Output seems a duplicate with the Output above it. Is this correct?

- e) p34 (O): 30 MW installed and commissioned Jul 2021 Dec 2022 Responsible
Office

Responsible Office is missing. Can DOPD be assumed?

- f) p36 (C): Wind – Stage 1 Financial closure May 2019 Dec 2019 DOPD

In these tasks, when the “Financial closure” appears the Responsible Office is DOF. Is it correct to have this one for the DOPD?

p36 (C): Wind – Stage 2 ditto

- g) p36 (O): Wind – Stage 2 Carry out feasibility studies Sep 2018 Apr 2019
Responsible Office

Responsible Office is missing. Can DOPD be assumed?

Key Focus Area 3: **Business Process Excellence**

- a) p46 (C): Involve key users in procurements Users involved in procurement
Procurement 100% 100% DOF

Should this be consistent with the term “Ongoing” used in other tasks? Or is there another meaning to “100%”?

- b) p49 (O or D): Power Stations & Liwonde Quarterly 1st, 2nd, 3rd & 4th DOO

What is the meaning of “Power Stations & Liwonde” as an “Output”. Is it a duplicate of the previous Output “Hold Safety Drills” or is there an omission of “Hold Safety Drills”?

c) p51 (C): Upgrade existing Power station access roads

Nkula Access road upgraded Jul 2018 Dec 2018 DOHRM

Tedzani Access road upgraded Jan 2019 Jun 2019 DOHRM

Kapichira Access road upgraded Jul 2019 Dec 2020 DOHRM

Wovwe Access road upgraded Jan 2021 Dec 2022 DOHRM

Is the DOHRM responsible for the upgrading of access roads? Would the DOO or DOPD be more appropriate?

FINDINGS on Outputs (KPIs): Consistency (C) = 12; Omissions (O) = 3; Duplications (D) = 4

FINDINGS on Strategic Objectives: In ‘purple: 1 and 2’ (C) = 2; Omissions (O) = 2; Duplications (D) = 0

B1-2 SP Assessment – Utility Application

Scored using Likert Scale across the DIVISIONS – Summarized in Figure B2-I

ASSESSMENT Date: June 2018		By: SAEP		
Key Focus Areas (KFAs)	Consistency	Omissions	Duplications	
“To achieve the Utility’s Vision, how should the Utility appear to its Customers?” Addresses the Linkage to SP (5+5+5)/3 = 5**	Consistent throughout: 5	No omissions: 5	None: 5	
“To succeed financially, how should the Utility appear to its Shareholders?” Addresses the Linkage to SP (5+5+5)/3 = 5**	Consistent throughout: 5	No omissions: 5	None: 5	
“To satisfy its Shareholders and Customers, what Business Processes must the Utility excel at?” Addresses the Linkage to SP (5+5+5)/3 = 5**	Consistent throughout: 5	No omissions: 5	None: 5	
“To achieve the Utility’s Vision, how will the Utility sustain its ability to change and improve Addresses the Linkage to SP (5+5+5)/3 = 5**	Consistent throughout: 5	No omissions: 5	None: 5	
Strategic Objectives (SO)	Consistency	Omissions	Duplications	
“Have the Strategic Objectives been adequately described what they are attempting to achieve vis-à-vis the Key Focus Areas?” Addresses the Linkage to SP (3+4+5)/3 = 4***	2 findings: 3	2 findings: 4	None: 5	
Key Tasks / Activities (KA)	Consistency	Omissions	Duplications	
“Are the Activities adequately aligned to the Strategic Objectives?” Addresses the Linkage to SP (5+5+5)/3 = 5***	Consistent throughout: 5	No omissions: 5	None: 5	
Outputs (O/P)	Consistency	Omissions	Duplications	
“Are the Outputs adequately aligned to their corresponding Activities?” Addresses the Linkage to SP (1+2+1)/3 = 1.3*	8 findings: 1	3 findings: 2	4 findings: 1	

“Is the responsible Division/Department aligned to each Output? 8 findings: **1** 3 findings: **2** 4 findings: **1**
 Addresses the Linkage to SP $(1+2+1)/3 = 1.3^*$

“Are the Start and Completion times for each Output adequate?” Addresses the Time-Frame $(1+5+1)/3 = 2.3^{***}$ 4 findings: **1** None: **5** 4 findings: **1**

* M&E Department Accountability; ** Divisional Accountability; ***Both M&E Department and Divisional Accountability

Consistency, Omissions and Duplications:

Likert Scale: **5**- No findings; **4**- 1 finding; **3**- 2 findings; **2**- 3 findings; **1**- > 3 findings

Linkage to SP

SCORE for Divisions: KFAs: $(5 \times 4)/4 = 5$, SO: 4, KA: 5; Overall each Div. SCORE: $(5+4+5)/3 = 4.7$

SCORE for M&E Dept: SO: 4, KA: 5, O/P: $(1.3 \times 2)/2 = 1.3$; Overall M&E SCORE: $(4+5+1.3)/3 = 3.4$

Time-Frame

Both, M&E Department and Div. have structured the deliverables with a workable Time-Frame in terms of PM which scales it between at “On its Way” and “Near To-be State” (score 3.5); but the Start and Completion times have issues with C and D and score 2.3; Overall Time-Frame SCORE: $(3.5+2.3)/2 = 2.9$

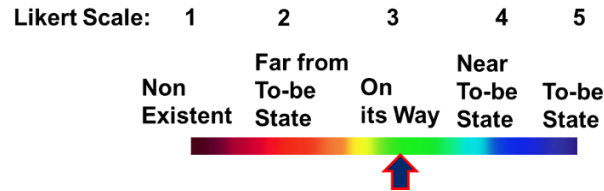
B2 Metric, Process and Organizational Capability Assessment Tools:

B2-I Metric: KPIs (Vertical & Horizontal)

$$\text{Metric Assessment} = \frac{\text{S-Score} + \text{M-Score} + \text{A-Score} + \text{R-Score} + \text{T-Score}}{5}$$

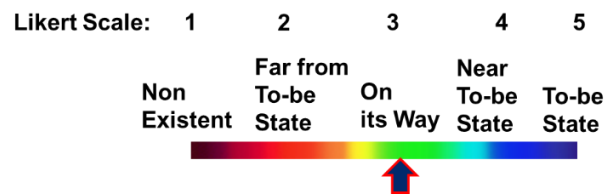
Simplicity, clarity and comprehensive:

S-Score:



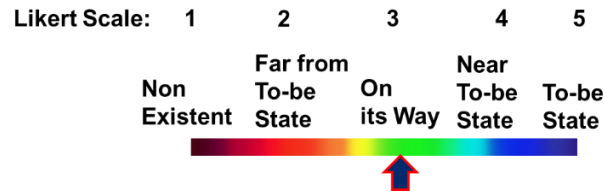
Measurability:

M-Score:



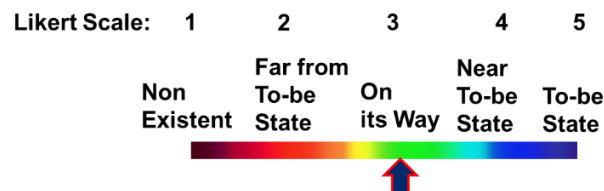
Attainability and Approved by Stakeholders:

A-Score:



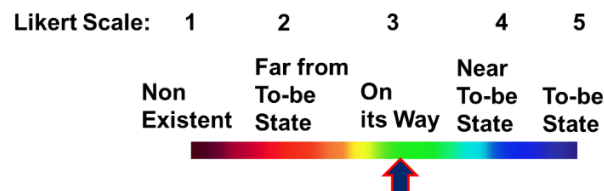
Realistic – within the control of accountable Division and within the ambit of its spread:

R-Score:



Time-bound:

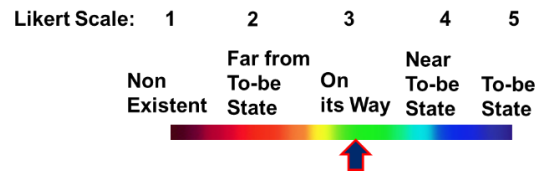
T-Score:



B2-2 Process: BSCs and Dashboards

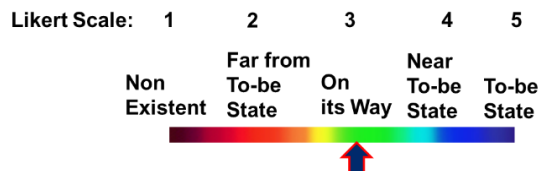
$$\text{Process Assessment} = \frac{\text{D-Score} + \text{A-Score} + \text{W-Score} + \text{S-Score}}{4}$$

Data Management (acquisition, collation, validation, storage and extraction, BSCs & Dashboards) D-Score:



Alignment to SP's KFAs and Outputs per Division (Strategic KPIs mainly, but also Operational KPIs)

A-Score:



Weights are Balanced (sum up to 100%):

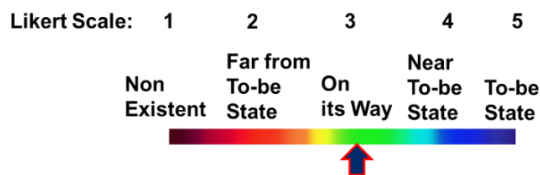
- For KFAs
- For KPIs (within & between [final weight: product of KPI within weight and relative KFA weight])

Weights Inertia: These are the minimum weights that KFAs or KPIs need to exercise on the BSC

- For KFAs: Each KFA weight must be greater than or equal to 8%
- For KPIs (final weight [between]) must be greater than or equal to 4%
- Subject to balancing constraint above (sum to 100%)

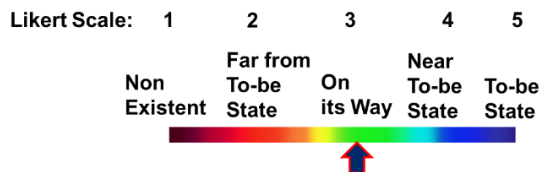
These two Weights criteria (Balanced and Inertia) are assessed equally in strength, meaning that the failing of one is a failure for all and that the overall score is the smallest score in any one of them.

W-Score:



Source of Evidence: Substantiation, in document form (incl. electronic), in place for each KPI assessment (per Division)

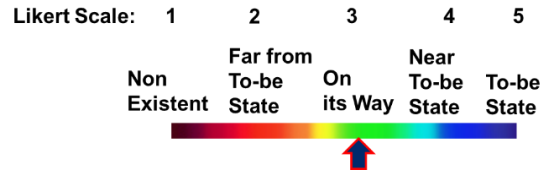
S-Score:



This process should be optimised based on the Metric Assessment and Data, Alignment, Weight and Source of Evidence assessments. This usually takes place in the form of KPIs Workshops

B2-3 Organizational Capability in terms of PM

This scoring system sets out the methodology for scoring the capabilities within the Divisions using the Likert Scale (1 to 5) and the criteria below.



All the Divisions require a POC to interface with the M&E Dept (refer to task 4 report)

M&E Department: as per points i. to iv. below

ICT Department: as per points i. to iv. below

Human Resources & Administration Division: as per point iii. below + Capability to interface PM & Individuals Performance Appraisals (Carving of Bonus Pools)

*POC: Point of Contact

i. **Capability Related Diagnostics (subjective & objective)** C-Score: Average of below

Developed:

- Skills → Score:
- Instruments → Score:
- Methods → Score:
- Procedures → Score:

ii. **Alignment to Other Divisions (Points of Contact – POCs)** A-Score:

iii. **Timing processes synchronization plan (includes Communication processes)**

T-Score:

iv. **Storage of Data, Assessments, Models (CDS)** S-Score:

$$\text{Organizational Capability Assessment} = \frac{\text{C – Score} + \text{A – Score} + \text{T – Score} + \text{S – Score}}{4}$$

B2-4 Metric, Process and Organizational Capability (i.t.o. PM) Assessment – Specific Utility Application

Scored using Likert Scale across the **DIVISIONS** and **SERVICE PROVIDERS**

METRIC

Simplicity, clarity and comprehensive S-Score: 1

Measurability M-Score: 1

Attainability and Approved by Stakeholders A-Score: 1

Realistic – within the control of accountable Division and within the ambit of its spread
R-Score: 1

Time-bound T-Score: 1

$$\text{Metric Assessment} = \frac{\text{S – Score} + \text{M – Score} + \text{A – Score} + \text{R – Score} + \text{T – Score}}{5}$$
$$= (1+1+1+1+1)/5 = 1$$

PROCESS

Data Management (acquisition, collation, validation, storage and extraction, BSCs & Dashboards) D-Score: 2 (some manual acquisition from Gen. Units)

Alignment to SP’s KFAs and Outputs per Division (Strategic KPIs mainly, but also Operational KPIs) A-Score: 1

Weights Balancing & Inertia W-Score: 1

Source of Evidence: Substantiation, in document form (incl. electronic), in place for each KPI assessment (per Division) S-Score: 1

$$\text{Process Assessment} = \frac{\text{D – Score} + \text{A – Score} + \text{W – Score} + \text{S – Score}}{4}$$
$$= (2+1+1+1)/4 = 1.25$$

ORGANIZATIONAL CAPABILITY (i.t.o. PM)

P&D Division: POC in M&E FDC → Score: 3

M&E Department: Organizational Capability Assessment (see below) → Score: 1.3

Finance Division: POC in M&E FDC → Score: 3

ICT Department: Organizational Capability Assessment (see below) → Score: 1.3

Operations Division: POC in M&E FDC → Score: 3

Human Resources & Administration Division: POC in M&E FDC → Score: 3, Timing processes synchronization plan (includes Communication processes) → T-Score: 1, Individuals Performance Appraisals (Carving of Bonus Pools) → Score: 1; Overall → Score: 1.7

Capability Related Diagnostics (subjective & objective) C-Score: $(2+1+1+1)/4 = 1.25$

Developed:

- Skills → Score: 2
- Instruments → Score: 1
- Methods → Score: 1
- Procedures → Score: 1

Alignment to Other Divisions (Points of Contact – POCs) A-Score: 2*

Timing processes synchronization plan (includes Communication processes) T-Score: 1

Storage of Data, Assessments, Models (CDS) S-Score: 1

$$\text{Organizational Capability Assessment} = \frac{\text{C – Score} + \text{A – Score} + \text{T – Score} + \text{S – Score}}{4}$$

$$= (1.25+2+1+1)/4 = 1.3$$

*Members of M&E FDC but M&E Dept non-existent

SUMMARY HEAT MAP for Specific Utility

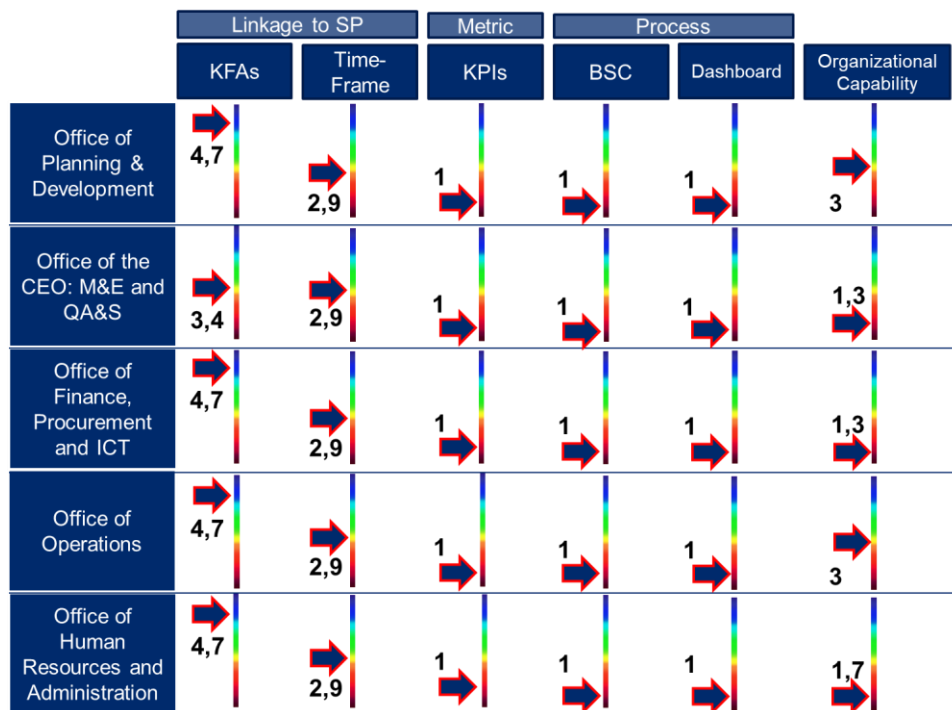


Figure B2-1: Heat Map

B3 Strategic KPIs - M&E Assessment Tool:

ASSESSOR: M&E		STRATEGIC KPIs: INPUTS Highlighted in 'yellow'							DATE: <input type="text"/>
DIVISION / SERVICE PROVIDER :									
Fin. Year:		Outputs	Targeted NORM	< 25% of Norm is achieved	25% ≤ Norm achieved < 75%	Norm is achieved (Completed by expected date)	Facilitation provided to functional areas to enable delivery against Norm	Delivery realisation enabled against SP objectives (tracking & progress verified and reported)	Source of Evidence: Documents, Reports, etc. reference that can substantiate assessment
Assessment									
KFA1: Customer, Stakeholders and Corporate Image									
Strategic Objective 1: Meet customer expectations									
Objective									
Strategic Objective 2: Enhance corporate image and visibility									
Objective									
KFA2: Revenue Generation and Financial Stewardship									
Strategic Objective 1: Improve Financial Performance									
Objective									
Strategic Objective 2: Achieve Cost Optimization									
Objective									
KFA 3: Business Process Excellence									
Strategic Objective 1: Improve Operational Efficiency									
Objective									
Strategic Objective 2: Enhance quality of internal processes									
Objective									
Strategic Objective 3: Improve Technological Infrastructure									
Objective									
Key focus area 4: Learning, Growth and Innovation									
Strategic Objective 1: Cultivate a High Performance Culture									
Objective									

Figure B3-1: M&E Assessment form/template for Strategic KPIs.

Template used by the M&E Department to monitor and evaluate a Division's & Service Provider's Strategic KPIs.

B3-I Strategic KPIs Utility Application: Operations Division Assessment (Example)

ASSESSOR: M&E		STRATEGIC KPIs: INPUTS Highlighted in 'yellow'										
DIVISION / SERVICE PROVIDER :		Operations DIVISION								DATE: 15-Jul-19		
Fin. Year: 2018 / 19		Outputs		Targeted NORM	< 25% of Norm is achieved	25% ≤ Norm achieved < 75%	Norm is achieved (Completed by expected date)	Facilitation provided to functional areas to enable delivery against Norm	Delivery realisation enabled against SP objectives (tracking & progress verified and reported)	Source of Evidence: Documents, Reports, etc. reference that can substantiate the assessment		
										Assessment		Value
KFA1: Customer, Stakeholders and Corporate Image												
Strategic Objective 1: Meet customer expectations												
Objective 2. Provide reliable power												
		Nkula trash diversion barrier constructed		Sep-18	15%					15%	M&E Report OpsA1	
		Tedzani trash diversion barrier constructed		Jun-19				20%		107%	M&E Report OpsA7	
		Disposal site constructed for Kapichira HPP		Oct-18			100%			102%	M&E Report OpsA2	
		Kapichira Power Plant fully rehabilitated		Dec-18					100%	142%	M&E Report OpsA3	
		Tedzani I & II Power Plants fully rehabilitated – Stage I		Mar-19		70%				70%	M&E Report OpsA6	
		2 dams on Rivirivi: Feasibility study		Jun-19				5%		103%	M&E Report OpsA8	
		2 dams on Lirangwe: Feasibility study		Jun-19	0%					0%	M&E Report OpsA9	
		2 dams on Lisungwi: Feasibility study		Jun-19		30%				30%	M&E Report OpsA10	
		2 dams on Mkulumadzi: Feasibility study		Jul-19				100%		126%	M&E Report OpsA11	
KFA 3: Business Process Excellence												
Strategic Objective 1: Improve Operational Efficiency												
Objective 2. Optimize management of assets												
		eFAC implemented		Dec-18					100%	142%	M&E Report OpsA4	
		TGM systems in place		Dec-18				50%		114%	M&E Report OpsA5	
Strategic Objective 3: Improve Technological Infrastructure												
Objective 2. Enhance power plant operations												
		Acquired up-to-date software: generation planning tools e.g. plexos, digisilent (stability component)		Jun-19			100%			102%	M&E Report OpsA12	
		Staff trained on generation planning e.g. plexos, digisilent		Jun-19	5%					5%	M&E Report OpsA13	

Figure B3-2: M&E Assessment for Utility Operations Div. Strategic KPIs.

G	H	I	J	K	L	M	N	O	P	Q	R	S
< 25% of Norm is achieved	25% ≤ Norm achieved < 75%	Norm is achieved (Completed by expected date)	Facilitation provided to functional areas to enable delivery against Norm	Delivery realisation enabled against SP objectives (tracking & progress verified and reported)		Source of Evidence: Documents, Reports, etc. reference that can substantiate the assessment						
						Assessment		Value				
0,15					-SUM{O10:S10}	M&E Report OpsA1	-G10	=H10	=IF{I10>="" ;I10+2%;0}	=IF{I10>="" ;(I10*23,5%/100%)+102%;0}	=IF{K10>="" ;(K10*40,25%/100%)+102%;0}	
			0,2		-SUM{O11:S11}	M&E Report OpsA7	-G11	=H11	=IF{I11>="" ;I11+2%;0}	=IF{I11>="" ;(I11*23,5%/100%)+102%;0}	=IF{K11>="" ;(K11*40,25%/100%)+102%;0}	
		1			-SUM{O12:S12}	M&E Report OpsA2	-G12	=H12	=IF{I12>="" ;I12+2%;0}	=IF{I12>="" ;(I12*23,5%/100%)+102%;0}	=IF{K12>="" ;(K12*40,25%/100%)+102%;0}	
				1	-SUM{O13:S13}	M&E Report OpsA3	-G13	=H13	=IF{I13>="" ;I13+2%;0}	=IF{I13>="" ;(I13*23,5%/100%)+102%;0}	=IF{K13>="" ;(K13*40,25%/100%)+102%;0}	
	0,7				-SUM{O14:S14}	M&E Report OpsA6	-G14	=H14	=IF{I14>="" ;I14+2%;0}	=IF{I14>="" ;(I14*23,5%/100%)+102%;0}	=IF{K14>="" ;(K14*40,25%/100%)+102%;0}	
			0,05		-SUM{O15:S15}	M&E Report OpsA8	-G15	=H15	=IF{I15>="" ;I15+2%;0}	=IF{I15>="" ;(I15*23,5%/100%)+102%;0}	=IF{K15>="" ;(K15*40,25%/100%)+102%;0}	
					-SUM{O16:S16}	M&E Report OpsA9	-G16	=H16	=IF{I16>="" ;I16+2%;0}	=IF{I16>="" ;(I16*23,5%/100%)+102%;0}	=IF{K16>="" ;(K16*40,25%/100%)+102%;0}	
		0,3			-SUM{O17:S17}	M&E Report OpsA10	-G17	=H17	=IF{I17>="" ;I17+2%;0}	=IF{I17>="" ;(I17*23,5%/100%)+102%;0}	=IF{K17>="" ;(K17*40,25%/100%)+102%;0}	
				1	-SUM{O18:S18}	M&E Report OpsA11	-G18	=H18	=IF{I18>="" ;I18+2%;0}	=IF{I18>="" ;(I18*23,5%/100%)+102%;0}	=IF{K18>="" ;(K18*40,25%/100%)+102%;0}	

Figure B3-3: M&E Assessment Formula for Strategic KPIs.

In this Assessment (Figure B3-2, Example as in 15 Jul 2019), the 1st Output ('Nkula trash...') was reportedly assessed in Sep 2018 and the evidence is in Report 'M&E Report Ops A1'. It indicates that it performed less than 25% of expectation (i.e. 15%) was accomplished by Sep-18.

For the 2nd Output ('Tedzani trash...'), it was reportedly assessed in Jun 2019 and the evidence is in Report 'M&E Report Ops A7'. It indicates 20% of the Facilitation provided to functional areas to enable delivery against Norm, was accomplished. The Assessment Model computes the performance Value according to the formulæ shown in Figure B3-3, and results in 107%.

Conversion onto the Common Performance Scale (Likert Scale: Figure B3-4)

1st Output: 15% → Likert Score: 1

2nd Output: 107% → Likert Score: 3.21



Figure B3-4: Strategic KPIs Conversion Model onto a Likert Score

The Strategic KPIs Likert Scores (i.e. 1 for 1st Output, 3.21 for 2nd Output, etc.) are then entered in the Operations Division BSC.

This Methodology is consistently applied across all the Divisions for the Performance Scoring of the Strategic KPIs

B4 Operational KPIs - M&E Assessment Models:

Each and every Division in a Utility has different Operational KPIs and each KPI needs to be analyzed and Workshopped with the corresponding Division. Here a typical Operations (sometimes aka Generation) Division is used to provide guidance in the methodology for the Evaluation Function of an M&E Department

CAPABILITY

The preferred method is usually to measure the Capability of the Generating Units (or the UCF, see Appendix A definition-point 21 and corresponding formula); but since this indicator is a computed value derived from the maintenance (PCLF) and forced (UCLF) outages, the focus, as Operational KPIs should be on the PCLF and UCLF.

The PCLF should measure the ability to have the maintenance plan under control and hence a measure of deviation from plan is appropriate. An accepted practice for the PCLF is an expected 2 percentage points deviation from plan, with a spread of 1 percentage point either side (i.e. a deviation of 1% or less from plan would be deemed as excellent and a deviation of 3% or more from plan would be unacceptable).

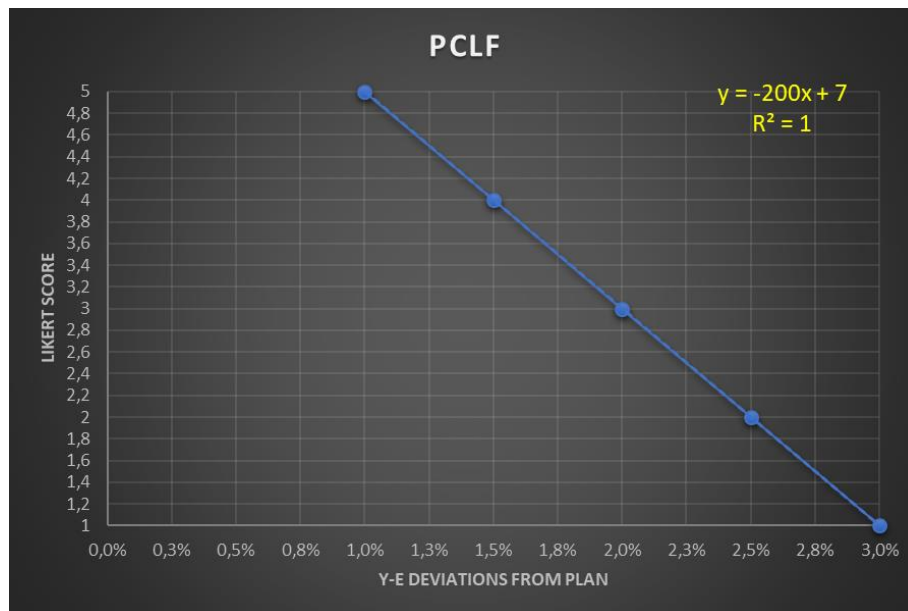


Figure B4-1: Operational KPI: PCLF Conversion Model onto a Likert Score

The UCLF should measure the ability to benchmark against peer Utilities. A Utility that has a fleet of Hydro-Reservoir and Gas-Turbines mix should have a UCLF of less than 3%. Using the Performance Statistical Model given in Appendix A definition-points 4 to 8 (see also Figure A1-1) which provides the same chances of betterment for different Operational KPIs within and between Divisions, the following is obtained:

For the UCLF as a variable expressed as a percentage, a logit model may be used to arrive at required probabilities.

For a value of a UCLF expected at 3%, the spread (as per Figure A1-1) would be:

- C = 1.0% with a 5% chance of being bettered
- S = 1.9% with a 20% chance of being bettered
- Norm = 3% as per expectation
- K-I = 4.7% with an 80% chance of being bettered

F = 7.2% with a 95% chance of being bettered

The above values are entered in the Divisional BSC

The Corresponding Likert Score conversion model for the above values is illustrated in Figure B4-2.

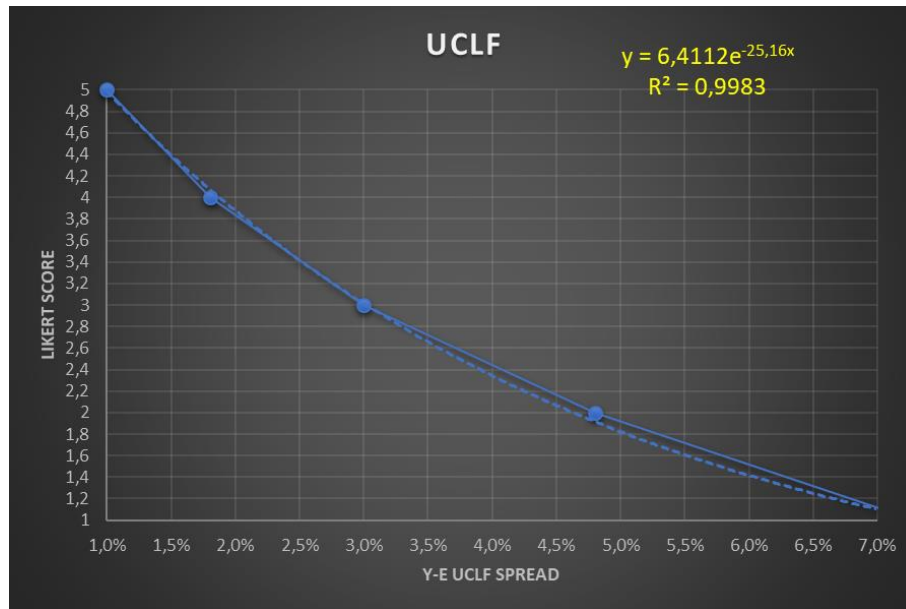


Figure B4-2: Operational KPI: UCLF Conversion Model onto a Likert Score

The OCLF (see Appendix A definition-point 22) is deemed outside Management control (such as a drought). This Operational KPI does not affect the Capability of the Utility, but affects the Availability of the Energy dispatched and hence the Utility’s Revenue. If hedging (Risk Management) is plausible, this is an indicator that may be used for Energy Derivatives (Options).

RELIABILITY

The usual manner to measure the Reliability of the Generating Units (or the UAGS/7000, see Appendix A definition-point 26 and corresponding formulæ); this indicator provides a demonstration of the Generating Units tripping when they are capable (available) of supplying energy. It is essentially a “Trip Rate”; an accepted benchmark for a Utility that has a fleet of Hydro-Reservoir and Gas-Turbines mix, would be an expected value of 1 Trip/Generating Unit/Year.

By keeping the Generating Units’ Operating Hours constant (as per the computations of UCLF and PCLF), using Poisson Statistical models and the Performance Statistical Model given in Appendix A definition-points 4 to 8 (see also Figure A1-1), the following is obtained:

For a value of UAGS/7000 expected at 1 Trip/Generating Unit/Year, the spread (as per Figure A1-1) would be:

C = 0.43	with a 5% chance of being bettered
S = 0.78	with a 20% chance of being bettered
Norm = 1.01	as per expectation
K-I = 1.21	with an 80% chance of being bettered
F = 1.39	with a 95% chance of being bettered

The above values are entered in the Divisional BSC

The Corresponding Likert Score conversion model for the above values is illustrated in Figure B4-3.

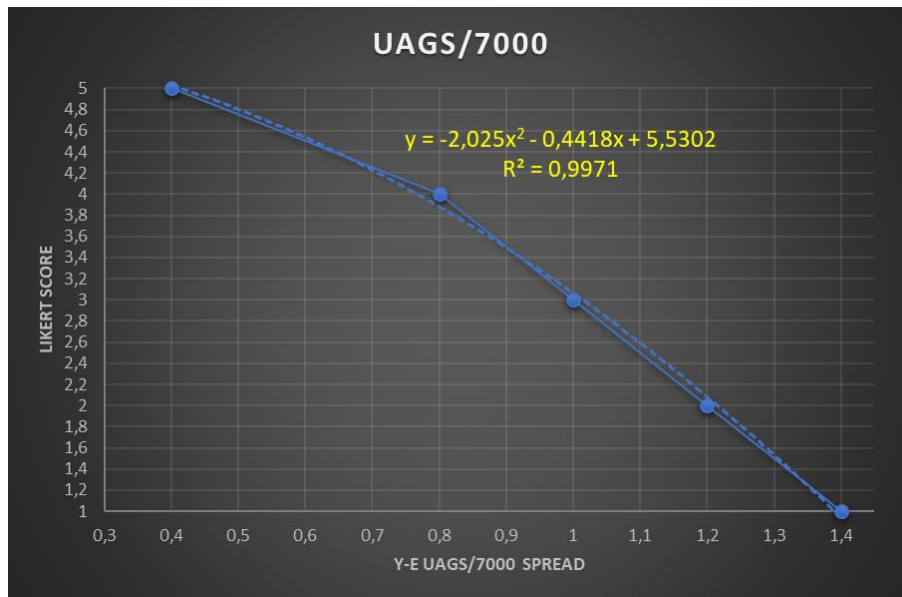


Figure B4-3: Operational KPI: UAGS/7000 Conversion Model onto a Likert Score

The models given above (Figures C4-1 to C4-3) enable the BSCs to be automated within a Data Warehouse . Other Divisional Operational KPIs are modelled in similar fashion and then transferred to their corresponding BSCs

B5 Service Providers KPIs - M&E Assessment Tool:

SERVICE PROVIDER:				← Please enter your Department here
		Weight		
OPERATIONS SCORE:	0	25%		} ← Please enter the Division Weights here According to largest to lowest service provision / demand
FINANCE SCORE:	0	25%		
P&D SCORE:	0	25%		
HR&A SCORE:	0	25%		
OVERALL SCORE		0		
			100%	← Must add to 100%

Input cells are in 'YELLOW'

Figure B5-1: Service Providers KPI: Overall BSC for a Service Provider

SERVICE PROVIDER:		Please enter your Department in OVERALL Worksheet				Name:		Date:		Signed	
DIVISION SUPPORTED:		OPERATIONS				Name:		Date:		Signed	
		Likert Scale Score: 1= Poor; 2= less than expected; 3 = As expected; 4= Better than expected; 5= Exceeds all expectations				OPERATIONS SCORE:	0				
100%	OUTPUT	15%	25%	50%	10%	100%					
Weight	No.	DESCRIPTION	Timeliness	Responsiveness	Deliverable	Professionalism	O/P Score				
10%	1						0				
10%	2						0				
10%	3						0				
10%	4						0				
10%	5						0				
10%	6						0				
10%	7						0				
10%	8						0				
10%	9						0				
10%	10						0				

Figure B5-2: Service Providers KPI: Section of BSC for the Operations Division

B6 Utility KPIs – BALANCED SCORECARD (BSC)

<Utility Department>

<Utility Logo>

Balanced Scorecard (Example)

<utility name> Score:

TBD

Strategic Performance

Source of Evidence: xyz

Ex. Area	Ex. Actual Score	Ex. Divisional Weight	Ex. Effective Weight
Shareholder Boards	3,4	X	X
Executive Committee	4,5	X	X
Others?	2,25	X	X
Weight for Divisions total:		100%	80%

Divisional Performance (Operational KPIs)

Source of Evidence: Divisional BSC

Operations	2	40%	32%
Finance	2,75	22.5%	18%
Planning & Development	4	22.5%	18%
HR & Administration	2,5	15%	12%
Weight for Divisions total:		100%	80%

External and Service Providers

Source of Evidence: Providers BSC

Public Relations	3	10%	2%
Monitoring & Evaluation (M&E)	3,5	10%	2%
Quality Assurance & Safety	2,8	15%	3%
Risk Management	4,1	15%	3%
Procurement	3,2	40%	8%
Legal	4,2	10%	2%
Weight for Service Providers total:		100%	20%

APPENDIX C: M&E FUNDAMENTAL SKILLS & SOFTWARE

It is important to note that the Management of the M&E Department requires a good understanding of the data management, analytical tools and the presenting of information in an M&E environment application.

The minimal requirement is a formal four-year University degree in Statistics, Computer Science, or relevant discipline inclusive of registration with ICCSSA or RSS as a Certificated Statistician.

Preferably, a master's degree in Statistics, Computer Science, or relevant discipline inclusive of registration with ICCSSA or RSS as a Chartered Statistician. Experience in the following sections of Statistical Sciences would be required in the Monitoring and Evaluation Functions.

- Data Formatting, Data Storage and Data Mining
- A good knowledge in EDA (Univariate and Multivariate)
- A clear understanding of the difference between Prediction (as in Regression) and Forecasting (as in Time-Series models) and the ability to model in these two fields
- Statistical modelling skills (distributional, linear, non-linear, time-series, transformational, etc.)
- Machine Learning
- Optimization and Simulation

Programming:

R-Coding (preferred)

Python-Coding

Data Management:

Data Handling and Querying: **MySQL**

Reporting: **Spotfire**

Analytical:

EDA, Distributional, Regression: **Statistica**

Forecasting: **Forecast-Pro** for Windows (Professional)

Optimization: **Evolver, RISKOptimizer** (Palisade)

Simulation: **@Risk** (Palisade)

Decision Analysis: **DecisionTools Suite** (Palisade) which includes Evolver, @ Risk, RISKOptimizer and is supplemented by PrecisionTree, TopRank, NeuralTools, StatTools and BigPicture

Reporting/Communicating:

Microsoft Office

APPENDIX D: SAMPLE FUNCTIONAL SPECIFICATION TEMPLATE FOR PROCUREMENT OF SOFTWARE AND IT DEVELOPMENT

<UTILITY LOGO HERE>

FUNCTIONAL SPECIFICATION

SECTION 1: COLLABORATIVE BACKGROUND

[City], _____ YYYY

The [Name of Counterpart/Organization], hereinafter referred to as the **Developer**, represented by the [Name and Official Title], on the one hand, and the **Utility**, represented by [Name and Official Title], on the other hand, hereinafter collectively referred to as the “Parties,” completed this Functional Specification, hereinafter referred to as the “FSpec”, deliberated during the meeting at Utility’s Offices in [City], dated _____2019, on the following:

1. Utility Performance Management Initiative BACKGROUND

One of Utility’s objectives is to improve the commercial viability of the utility so as to increase their capacity to operate as off-takers and increase access to electricity. In this regard, support to the Monitoring and Evaluation (M&E) Department in Utility and the development of a performance management (PM) capability within the Utility, as well as the monitoring and reporting the progress toward obtaining the objectives of the Utility’s Strategic Plan (SP), is required. Presently a Data Warehouse (DW) addressing the PM objectives is non-existent.

2. Acknowledgement

2.1 Intent of the FSpec

The Parties specifically acknowledge that this FSpec expresses the present intentions and expectations of the Parties with respect to the principles and goals specified in the FSpec, and that this FSpec is not an obligation of funds, nor does it constitute a legally binding agreement by any Party.

In view of the above, this document defines the basic principles of the requirements as delineated in Section 2 below and that the Developer is stated as the official counterpart to the said requirements.

2.2 Confidentiality

The Parties specifically also acknowledge that all elements in this document and further submitted documents by each of the two Parties to the other are treated with the highest confidentiality, may be legally privileged and is intended solely for both Parties. Any use, disclosure or distribution of the contents of this document and/ any other submitted documents by each of the two Parties to the other is unauthorized and may be unlawful.

3. Overarching goal of the FSpec

The Parties mutually agree that this FSpec expresses the elicitation for a Technical Specification, hereinafter referred to as the “TechSpec”, addressing the requirements in the FSpec.

4. Process Management

The process is shown in Figure 1 of Section 2 below.

Upon completion of the meeting the Developer will submit the TechSpec and Quotation to Utility. Once mutual agreement is reached on the Quotation, the Utility will exercise control and delegate the overseeing for the implementation of the TechSpec to a suitable competently qualified supervisor. The tasks addressing the FSpec requirements and detailed in the TechSpec may be revised, from time to time, by mutual Parties agreement during the period of implementation; these revisions are documented, submitted to the utility for approval and, if approved, included in the Appendix of the FSpec and TechSpec.

5. Liability Limitation

This is not a contract, but a FSpec. Either party can discontinue involvement in the activities as described herein by giving a curtesy notice. Any and all legally binding obligations shall be codified in separate documentation (legal contracts) pertaining the TechSpec and Quotation thereof.

While both parties shall execute the activities in accordance with the highest professional standards, neither Party shall be held liable to the other for any loss, or damage arising, in connection with or relating in any way to this FSpec, including, but not limited to, indirect, special, incidental, consequential, punitive, or exemplary loss or damages. The FSpec signatories have no financial and material liabilities to each other.

On behalf of the Developer

On behalf of <UTILITY NAME HERE>

SECTION 2: FUNCTIONAL SPECIFICATIONS REQUIREMENTS

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ACRONYMS

Acronym	Description
CC:	electronic 'Carbon Copy'
CoB:	Close of Business
DW:	Data Warehouse
FRD:	Functional Requirement Document
FSpec:	Functional Specification aka Functional Requirements Document (FRD)
M&E:	Monitoring and Evaluation
PM:	Performance Management
SP:	Strategic Plan aka Integrated Strategic Plan (ISP)
TechSpec:	Technical Specification

MAIN ELEMENTS

This FSpec is identical to what is also known as a Functional Requirement Document (FRD). As a primer the Developer is encouraged to get acquainted with utility M&E documents <insert document names here>. This specification expresses the required basic features from a User perspective.

Functional Requirements

The FSpec addresses the M&E and Analytical Environment as well as the Performance Measurement Framework illustrated in Figure 2 in the context of PM.

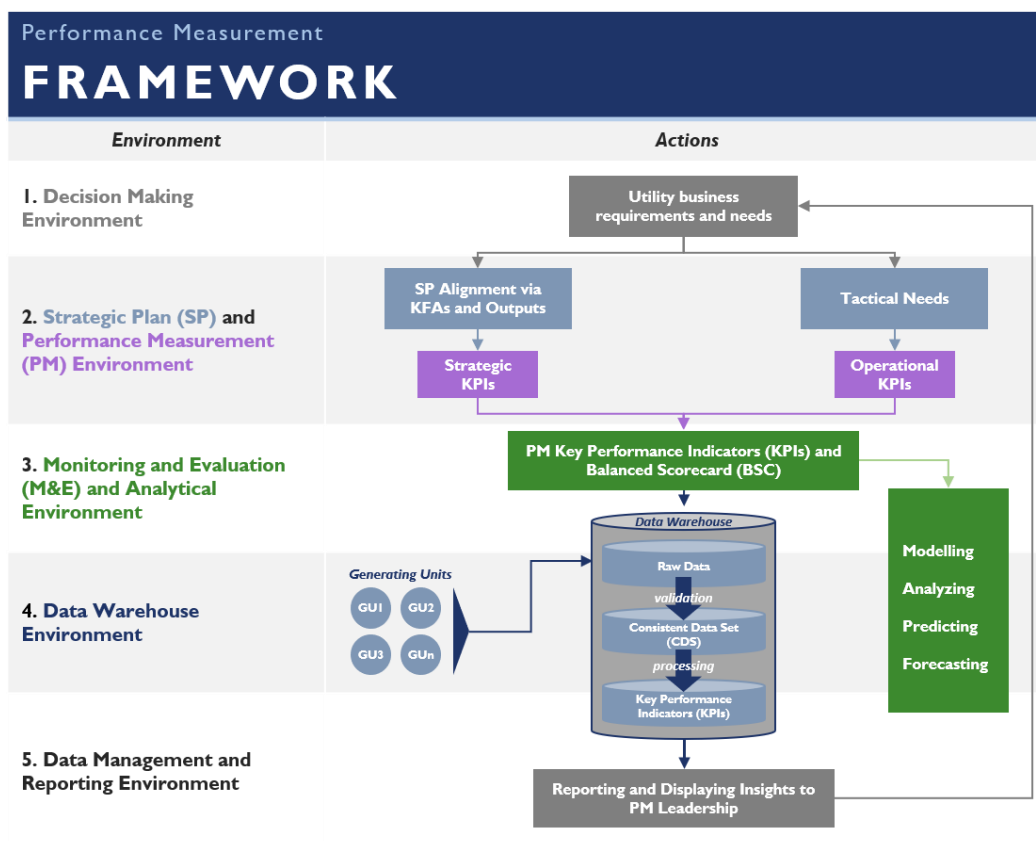


Figure 2: Performance Measurement Framework

The Data Warehouse (DW) is represented schematically at the center of the Framework (Figure 2). This schematic is further expanded in Annex A1 and provides a high-level outline of the components of the Data Warehouse with the corresponding activities and interactions of the M&E Department Staff.

In Annex A1, the diagram shows that Raw Data enters the DW whereby it goes through a process of verification and validation and other modes of preparation (such as filtering, formatting, aggregating). Subsequent to that process, the clean and reliable Data is stored in the Consistent Data Set (CDS) Source (read-only: access restricted). The Analysts work with their respective Data Marts from the CDS Source. The information produced from the analytics has two outputs: either in the KPIs Layer or in the Results/Reporting Layer.

The final product needs to address the access and storage of Data and Information in terms of authorization. The main users are the Divisions and Service Providers Points-of-Contact (POCs) as well as Members of staff in the M&E Department of the Utility.

Annex A2 shows the Data and Information flow in terms of inputs, processing and information outputs elements in the DW. Information queries could emerge at any of the elements in Annex A2.

Non-Functional Requirements

The performance of the DW, the security of the DW as well as its usability and maintainability are also in consideration.

Other Requirements

The following requirements will be addressed at the second meeting as per the Process Management route for the FSPEC:

- User Requirements (Agile protocol expressed as “User Stories”)

- Product Requirements in terms of Data Connectors and Off-the-Shelf Software interfaces
- Results/Reports Templates format details
- System Requirements

ANNEXES

Annex 1. Figure A1 provides the cross-cutting responsibilities of the M&E Department Staff

MS: Monitoring Specialist; **SMO:** Senior Monitoring Officer **ES:** Evaluation Specialist; **SEO:** Senior Evaluation Officer
CM&E: Chief of Monitoring & Evaluation Department

Dash-Dot lines indicate responsibility cross-cuts

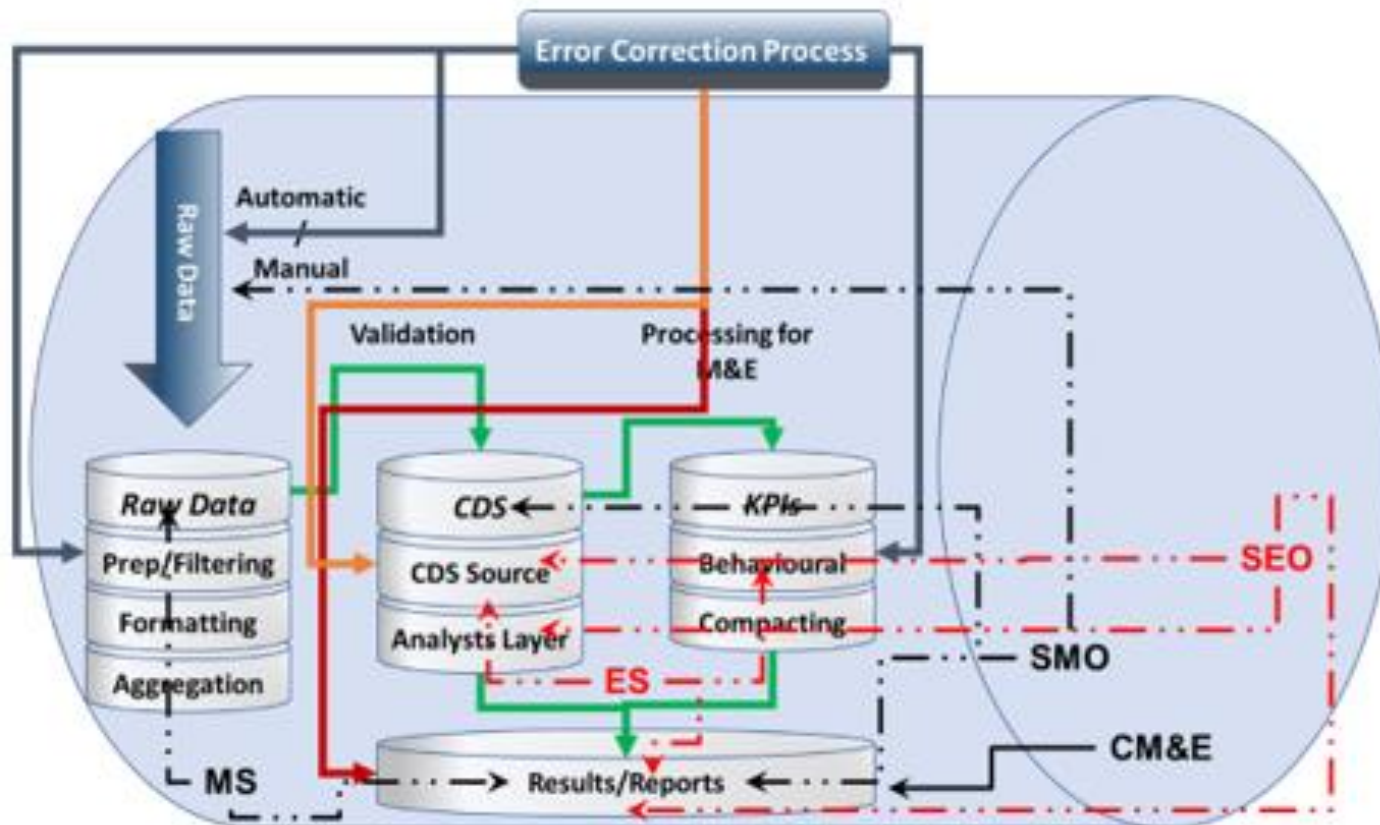


Figure A1: M&E Functional Responsibilities in the Data Warehouse

Annex 2. the figure below provides a schematic diagram of the data inputs into the Data Warehouse, the processing of the data, the storage into a Consistent Data Set (CDS) repository, the analytical platforms, the KPIs historical information and their forward-looking expectations.

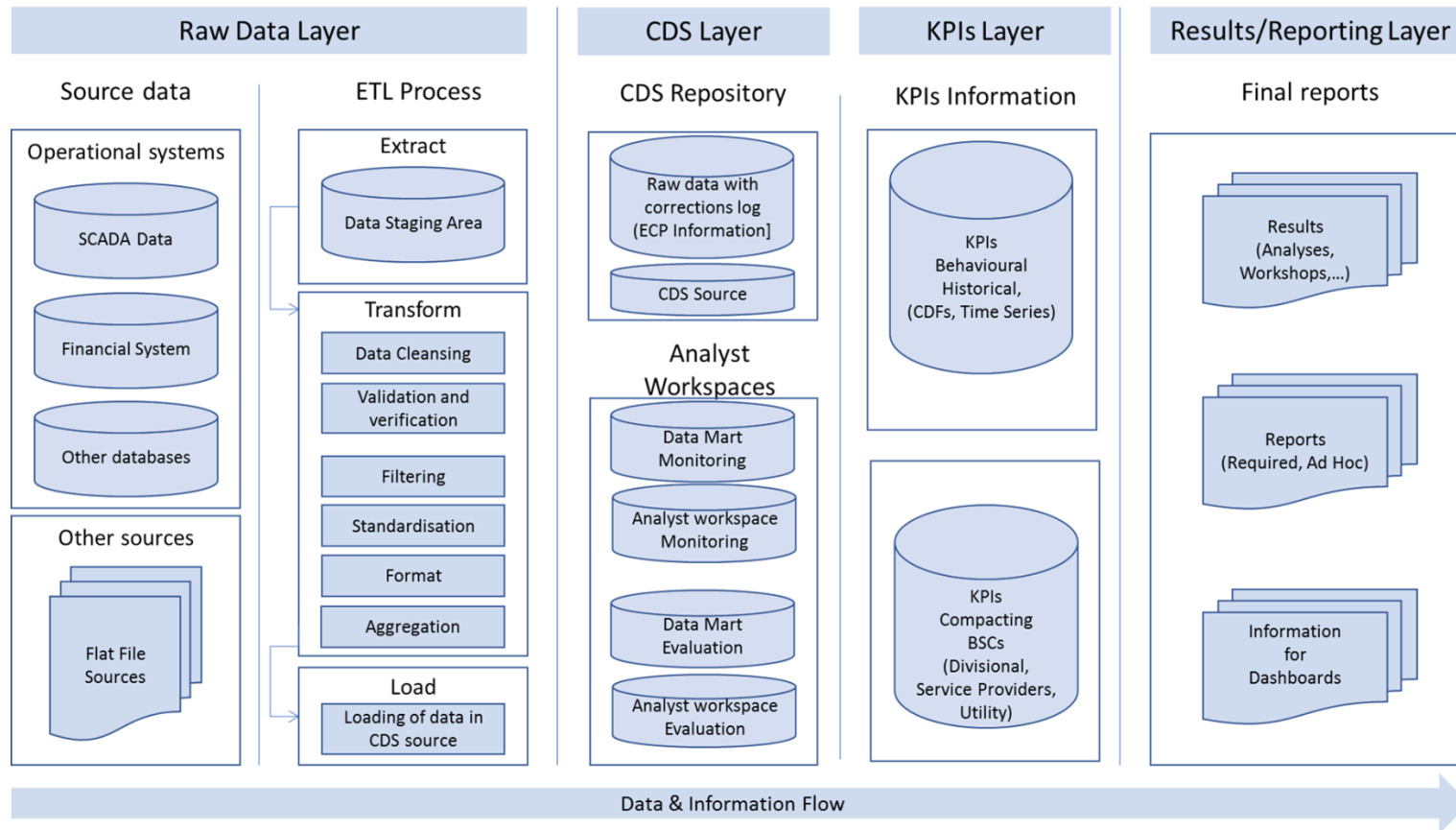
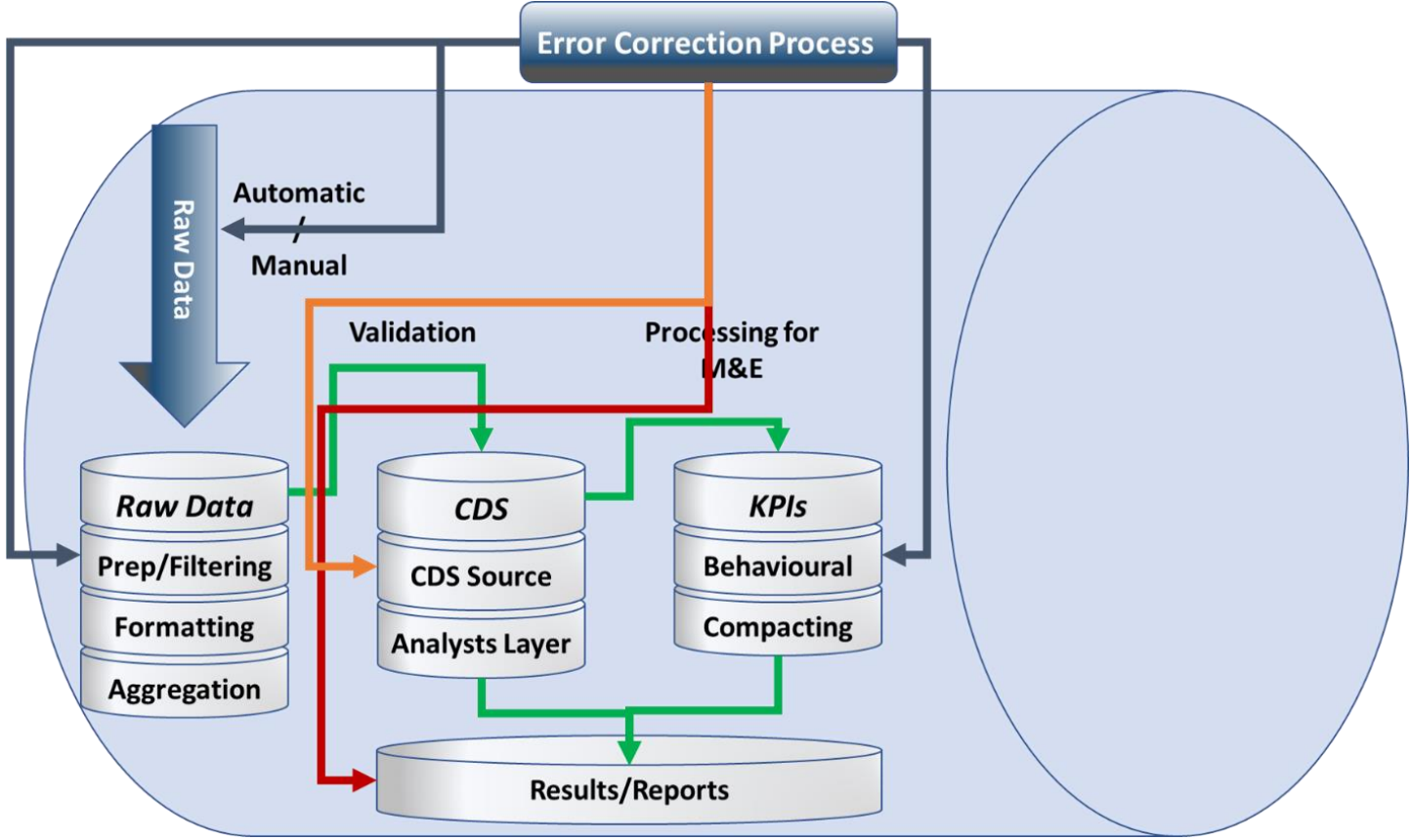


Figure A2: Data and Information Flow Diagram

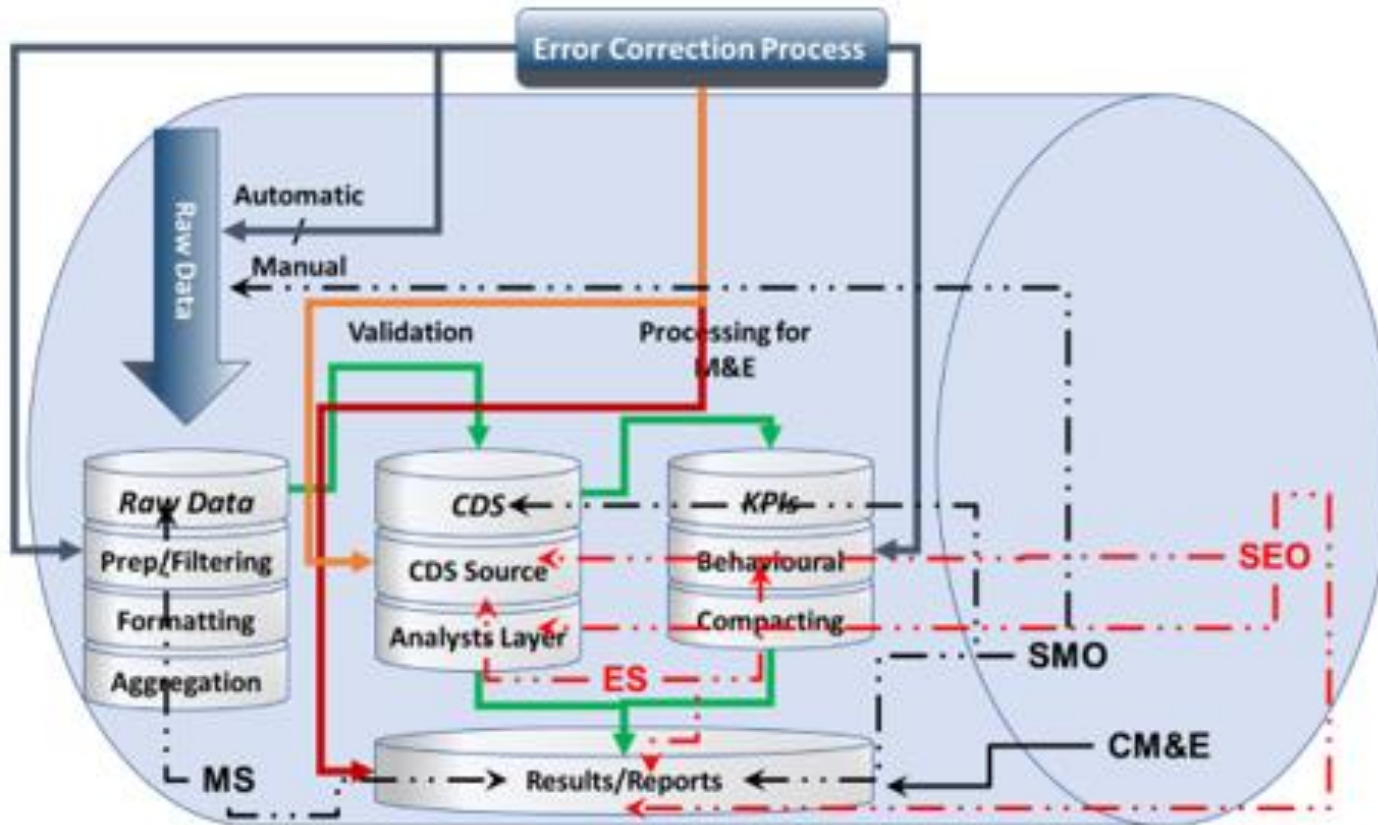
ANNEX 3. DATA WAREHOUSE



ANNEX 4. M&E FUNCTIONAL RESPONSIBILITIES IN THE DATA WAREHOUSE

MS: Monitoring Specialist; **SMO:** Senior Monitoring Officer **ES:** Evaluation Specialist; **SEO:** Senior Evaluation Officer
CM&E: Chief of Monitoring & Evaluation Department

Dash-Dot lines indicate responsibility cross-cuts



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