# TEMPLATE AND GUIDELINES FOR THE PREPARATION OF THE FINAL PAPER

Aazam Fathollahzadeh
Tehran's regional electrical distribution
Fathollahzadeh1@gmail.com

Mohammad yari
Great Tehran electrical distribution
eng.yari.mohammad@gmail.com

Babak kashanizadeh
Tehran's regional electrical distribution
babak.kashanizadeh@gmail.com

## ABSTRACT

*In the past electric utilities were vertically integrated monopolies responsible for generation, transmission, and distribution. But today the industry is vertically unbundling so that generation, transmission, and distribution can be operated as separate businesses. Many traditional utilities are now "wires companies," where the vast majority of spending relates to physical infrastructure with slow load growth, aging equipment, depleting rate bases, rate freezes, and regulatory uncertainty, electric utilities are looking for ways to increase earnings, credit ratings, and stock price. The transmission and distribution business is asset intensive, and many feel that asset management is the best way to address these fundamental issues. [1]*
*Many techniques of financial asset management are applicable to infrastructure asset management. Of particular importance is the treatment of risk, which is related to the predictability of future performance. Transmission and distribution assets, however, are more complicated to manage than financial assets for a variety of reasons. They have nonfinancial aspects of performance and risk, they require maintenance and replacement, and they are part of a highly complex interconnected system.*
*Challenges, led by the ageing infrastructure and the increase in their failures, are two of the most arguable and debatable topics. Use as illegal is yet a new risk which is per the organizations strategy, and this is another task for the Asset Management team. Invisible assets, such as cables are a critical part of the infrastructure which needs to be addressed. Asset Management is to optimize the three pillars of the whole life cycle activities of assets: risk, cost and performance. This article discusses asset management for distribution companies and then will highlight one of the models of the Distribution Power Asset Management in Tehran's regional electricity distribution companies.*

## INTRODUCTION

The goal of an electrical power distribution is to provide a reliable service to the customers. These services must be provided in a cost effective manner. This indicates that utilities must satisfy quantitative reliability requirements while at the same time minimizing their costs.
Distribution Network managers worldwide face a continuous challenge for the sake of achieving the optimum balance of the whole-life-cycle of their assets, and here we mean physical assets. Due to the limitation in the budget of distribution companies, creating a good balance between the system reliability and investment cost is of utmost important. Typically, utilities adopt an asset management approach to reduce spending; more effectively manage risks, or drive corporate objectives throughout an organization.
This article describes the difference between asset management and financial asset management, and then will clarify the formal distinction between risk and reliability as applied to quantifying network performance. According to a survey of all the factors, the analysis of SOWT was recommended upon which asset managers can be aware of the strengths, weaknesses, threats and opportunities to manage their assets. According SWOT method, the methods of risk management to enter the smart grid systems have been evaluated; accordance with the plan, an innovative new algorithm was designed. Conforming to this algorithm, firstly an initial impact was calculated risks, Choose any of the answers are not running for second stage, Risk probability and impact of the implementation of the system has been modified, and taking action to reduce costs of the expected damage was calculated. Application of smart grid in the areas in company by examining the situation and calculate the risk and create asset management, will serve our purpose. The failure was divided into smaller parts. More than 100 risks have been identified that 10 risks were determined. By calculating Matrix of the probability of risk events, the proposed measures were determined. According to calculations adversely affects the quality of the project was reduced to an appropriate level.

## ASSET MANAGEMENT

### What is asset management?

A systematic process of maintaining, updating and operating assets, combining engineering principles with business activities and strong economy and provide a tool to approach systematic and flexible facilitate Justification to making decision required to meet the demand.
The approach of institutional asset management business), Cultural) is to manage.
Asset management is a term derived from the financial industry, where it is applied to investment portfolios containing stocks, bonds, cash, options, and other financial instruments.
Asset management industries on financial assets: a compromise between risk and income.

## What is Strategic Asset Management?

Asset Management is an integrated process of decision-making, planning and control over the acquisition, use, safeguarding and disposal of assets to maximize their service delivery potential and benefits, and to minimize their related risks and costs over their entire life (WRc 2009).
Asset management in an organization should include the following:

- Strategic Planning,
- analyze and evaluate the performance
- develop and evaluate alternative solutions,
- strategies and investment planning,
- Work planning and budgeting,
- Engineering and design stages,
- Build and implement
- Operation and maintenance,
- Monitoring and marketing.

## What is financial asset management?

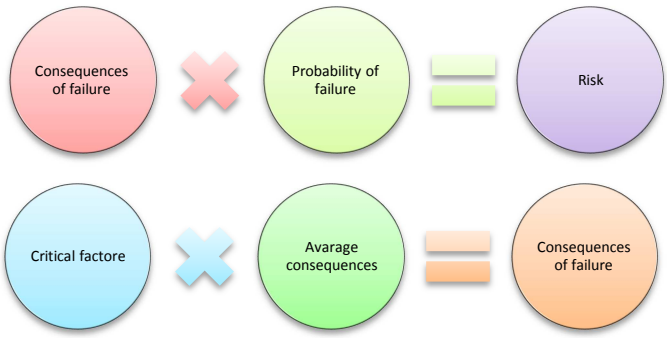
Fundamental to financial asset management is the trade-off between risk and return. Investors identify acceptable risk, and asset management techniques are used to achieve this level of risk for the highest possible return.

## DEFINITION OF RISK

Preparation steps of the risk management process and risk matrix:

- Identification of Risks
- Prioritize risk factors
- Probable risk factors (Quantitative Risk Analysis)
- Risk response planning

Risk assessment techniques can be used to prioritize assets and to align maintenance actions to business targets at any time. By doing so we ensure that maintenance actions are effective and the indirect maintenance costs such as costs associated with safety, environmental risk and customers' dissatisfaction are minimal. The risk-based objective function takes into account reliability and relative cost.
Risk is the potential impact to an asset or characteristic of value that may arise from some present processes or from some future events. In every day, "risk" is often used synonymously with "probability" and restricted to negative risk or threat. [2]




## FRAMEWORK

In its classical form, asset management separates itself from asset ownership and asset operations. The asset owner is responsible for setting financial, technical, and risk criteria. The asset manager is responsible for translating these criteria into an asset plan. The asset service provider is responsible for executing these decisions and providing feedback on actual cost and performance (risk is determined through variation in performance). [1]
This decoupled structure allows each asset function to have a focus: owners on corporate strategy, managers on planning and budgeting, and service providers on operational excellence (see Figure 1). The asset owner sets the business values, corporate strategy, and corporate objectives in terms of cost, performance, and risk. The asset manager identifies the best way to achieve these objectives and articulates this in a multiyear asset plan. The service provider executes the plan in an efficient manner and feeds back asset and performance data into the asset management process.


Figure 1. Asset management is based on three functions (asset owner, asset manager, and asset service provider), a single process, and many decisions.[1]

## COMPETENCIES

A robust asset management structure is supported by three pillars of competency: management, engineering, and information (see Figure 2).

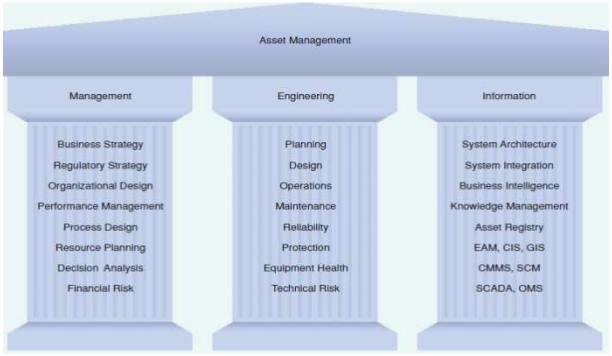
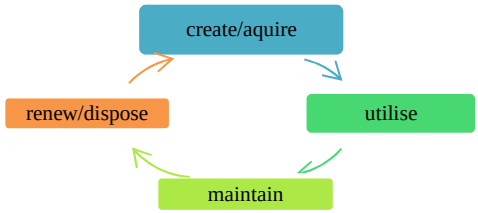



Figure 2. Asset management must be supported by three pillars of competency: management, engineering, and information. [1]

## ASSET MANAGEMENT - LIFE CYCLE




## RELIABILITY

Reliability is the most important measure of system performance for both transmission and distribution. Utilities will be required to meet reliability targets and must manage the risk of not meeting these targets. Reliability is also a major cost driver and is often the major focus of asset management initiatives.

All reliability decisions are based on solid historical information relating to equipment performance, system performance, operational performance, and cost. Decisions related to expansion, replacement, reconfiguration, operations, inspection, and maintenance are all considered together. Reliability is critical to performance, cost, and risk and is inseparable from asset management.

According to the description given of asset management in Tehran's regional electricity distribution companies, Asset Management was established as an independent body to take-over the responsibility of managing the existing portfolio of physical assets and regularizes the practices of Operations & Maintenance to be in-line with internationally adopted best-practices.

## ASSET MANAGEMENT IN TEHRAN'S REGIONAL ELECTRICITY DISTRIBUTION COMPANIES

At a quick glance, on the below table, the sum of systems Assets in Rey power is shown; of which requires systematic and well-coordinated practices to optimally manage them.

| *type* | *number* | *Capacity in MVA* |
|---|---|---|
| 20kv/420v | 1389 | 590 |
| 63kv/20kv | 7 | 430 |

Table (1): Distribution substations & capacities

| *Voltage level* | *type* | *Length(km)* |
|---|---|---|
| 63kv/20kv | OHL | 428 |
| | underground | 158 |
| 20kv/420v | OHL | 764 |
| | underground | 304 |

Table (2): Length of Distribution Cable & OHL network

| | |
|---|---|
| Geogphical area | 273KM$^2$ |
| No.of subscribers | 176662 |
| Purchasing power | 485195MWh |
| Sale of energy | 394992MWh |

Table (3): information of Rey

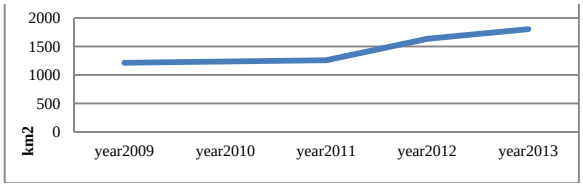



Figure 3. Growth of network system

## AGING INFRASTRUCTURE

Most distribution utilities have average equipment ages exceeding 30 years. It often seems wasteful to replace old equipment before it fails, but the possibility of drastic increases in equipment failures is unacceptable from both financial and system performance perspectives.

Clearly, old equipment must eventually be replaced, and present investment rates are not sustainable. The traditional utility structure seems incapable of proactively addressing this ubiquitous and looming problem.

Aging infrastructure illustrates the potential of asset management to address critical transmission and distribution problems. First, it forces asset owners (executive management) to articulate clear goals in terms of budgets, system performance, and acceptable risk. It also requires an asset registry that tracks, at a minimum, the age of each piece of equipment in the field Engineers can then perform detailed technical analyses comparing tactics such as inspect, repair, extend life, replace, and make system modifications. This analysis must take a multiyear approach, since aging infrastructure cannot be addressed in a single budget cycle. If performance and risk targets cannot be met within budget constraints, asset owners must decide

which targets to relax. When done properly, asset management will produce an aging-infrastructure plan that justifies increased capital spending through a rigorous, data-driven, and auditable process.
When looking at ageing infrastructure, we take normally replacement decisions while taking that decision we might fall under two extremes, either:

- We replace too early; thus, incurring extra costs on the non-utilized life of replaced equipment; or
- We replace too late; upon encountering too many failures, again incurring extra costs on repairs, spare parts, or loss of revenue due to shutdowns, etc.

The following diagram shows the decision point is when right decision is taken to replace the equipment. This point is a critical point for all managers that can be named as critical point. Access to all data of equipment for the analysis of any process, contingencies, or repeated failure to reach a critical point (projected) will be required.

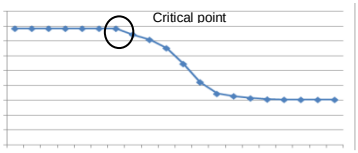



Figure (4): Asset expected-life curve

To be aligned with asset management, planning must consider all activities that impact performance and risk. Capacity planning is replaced with performance and risk planning. Capital planning is replaced with integrated capital, operations, and maintenance planning. This new function is called asset planning, and it is the essence of asset management (see Figure 5). Asset planning is driven by corporate objectives determines all asset-level spending, and is based on rigorous analysis and asset-level data.


Figure 5: Asset planning identifies the best combination of capital, operations, and maintenance spending to achieve all targets for the least possible life-cycle cost.

Asset management is a corporate culture that consistent with all organizational levels .in the diagram below would indicate these levels.

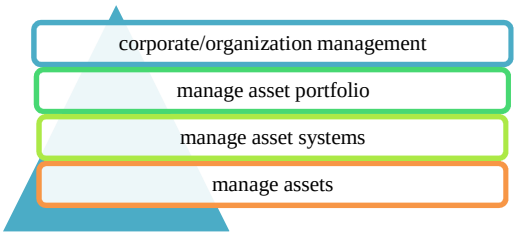



Figure (6): Levels of Assets and their management

## METHODS PROPOSED IN THE ORGANIZATION

According to a survey of all the factors, the analysis of SOWT was recommended upon which asset managers can be aware of the strengths, weaknesses, threats and opportunities to manage their assets.

Accordingly, the agency concluded that each of the patterns is appropriate for some purposes. [3]

### SO offensive strategy

In this strategy corporation strives, using with our strengths to make the most of opportunities. Companies using this strategy to create improvement the leap and create a gap with rivals. Some of the goals, objectives, financial resources and present in all IT technologies and operational objectives, some customers like to use modern technology and ...with this strategy are followed.

### WO conservative strategy

In this strategy corporation tried using environmental opportunities to take action to resolve their weaknesses and increase productivity through continuous improvement towards acting. The objectives of the present issues such as engineering, human resources, technical planning and ... with this strategy are followed.

### ST defensive strategy

In this strategy corporation tried based on our strengths to prepare and cope with environmental threats and through preventive actions and barriers defensive stability to maintain its .The objectives of the present issues such as digital measurement equipment, construction, electricity markets and ... with this strategy is followed.

### Competitive strategy WT

In This strategy with preventive measures corporation strove to weaknesses in the organization to minimize the environmental consequences of threats. And by reducing or limiting or liquidation activities can act. In the current situation of human resource goals and structure and ... with this strategy is followed.
Due to the expansion strategy targets four types are

applied to the proportion of the target company. Therefore, the asset management team in order to spread to lower levels of thinking and acting strategically decided to develop an overall strategy for the organization and allocate job strategies applied to the lower levels.

## ABBREVIATIONS AND ACRONYMS

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or section headings unless they are unavoidable.

Asset Management enablers and controls ensures the viability of Asset Management Policy & Strategy and their consistency with the Organizational Strategic Plan. Further it ensures that the Asset risks are identified, assessed & controlled. Like other Asset Management documents, this should also be communicated & maintained.

An effective, step by step, Implementation of Strategic Asset Management in company was done as bellow diagram.

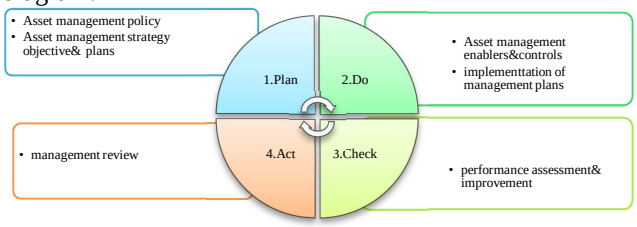



Diagram1: Strategic Asset Management

## AND THE FUTURE THAT LIES AHEAD!

Arrival rate technology, computational tools, and new ways of managing the distribution network are much more than other parts of the power system, while there is less willing in this section.

If there is not a clear plan and strategic plan, this section of the power industry is prone to instability!

The main orientation of future electricity networks.

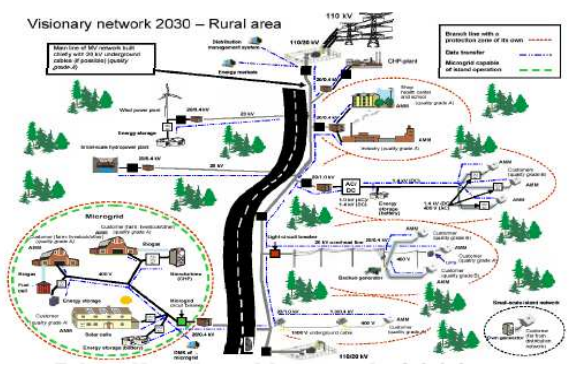



Figure 7: distribution network 2030 vision of the future power system [4]

## COMPARED WITH EXISTING NETWORKS AND FUTURE NETWORK

| Electromechanical | Digital |
|---|---|
| One-way communications(if any) | Two-way communication |
| Built for centralized generation | Accommodates distributed generation |
| Radial topology | Network topology |
| Few sensors | Monitors and sensors throughout |
| "Blind" | Self-monitoring |
| Manual restoration | Semi-Automated restoration and ,eventually ,self-healing |
| Prone to failures and blackouts | Adaptive protection and islanding |
| Check equipment manually | Monitor equipment remotely |
| Emergency decisions by committee and phone | Decision support systems, predictive reliability |
| Limited control over power flows | Pervasive control systems |
| Limited price information | Full price information |
| Few customer choices | Many customer choices |

Table (4): compared with existing networks and network [4]

The effective factors the development of sustainable energy systems in Tehran's regional electrical distribution was expressed according to the following diagram.

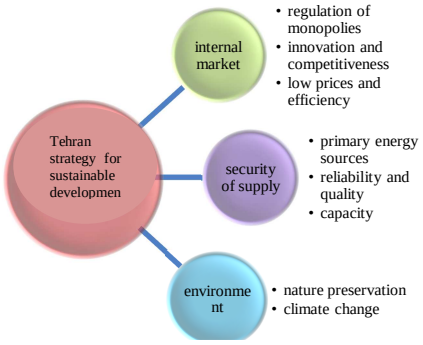



Diagram2: sustainable energy system

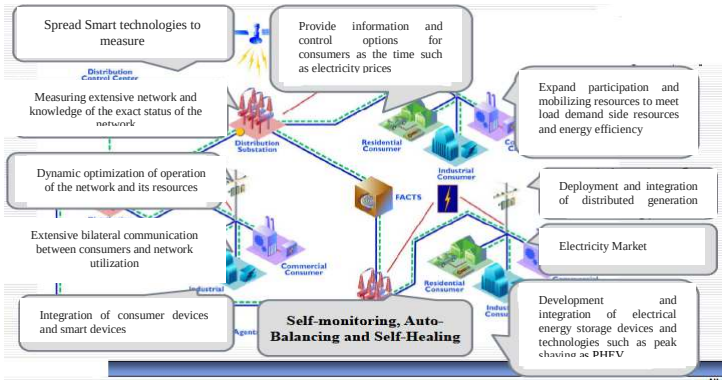



Figure (8): Arrival smart grid [4]

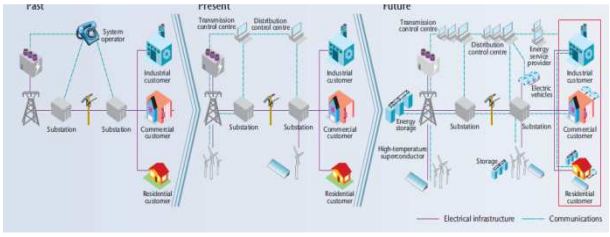



Figure (9): The evolutionary process of "smartening" the grid [5]

According SWOT method, the methods of risk management to enter the smart grid systems have been evaluated; accordance with the plan, an innovative new algorithm was designed. Conforming to this algorithm, firstly an initial impact was calculated risks, Choose any of the answers are not running for second stage, Risk probability and impact of the implementation of the system has been modified, and taking action to reduce costs of the expected damage was calculated. Application of smart grid in the areas in company by examining the situation and calculate the risk and create asset management, will serve our purpose. The failure was divided into smaller parts. More than 100 risks have been identified that 10 risks were determined. By calculating Matrix of the probability of risk events, the proposed measures were determined. According to calculations adversely affects the quality of the project was reduced to an appropriate level.

## PROBABILITY - IMPLICATIONS MATRICES

Probability - implications Matrices according standards Australia and Newzealand Was designed according to the following table:

| consequences | | | | | | |
|---|---|---|---|---|---|---|
| ***Negligible (A)*** | ***Slight (2)*** | ***Average (3)*** | ***Importa nt(4)*** | ***Catastrophic (5)*** | | ***probability*** |
| H | H | E | E | E | Definition(A) | |
| M | H | H | E | E | Likely(B) | |
| L | M | H | E | E | Possible(C) | |
| L | L | M | H | E | Impossible(D) | |
| L | L | M | H | H | Rare(E) | |

Table (5): Risk matrices [6]

E: extreme risk
H: high risk
M: moderate risk
L: Low risk
According to Table (5) reduces the risk was considered with respect to the total cost of the developed method can also enter any risk through asset management system, the network can be assessed.

## CONCLUSIONS

In this paper, the problem of proper use and maintenance of equipment assets were assessed. According to the studies for the development of smart grid in the distribution network, the best approach was to examine asset management model and its implementation were prepared. Since the reliability of electricity distribution networks is the best way to compute the power grid companies examined, then, based on risk management the amount of influence project, smart grid was examined, And the probability of failure and its impacts on projects using innovative algorithm was minimized then with create smart grid in the company, was obtained good results of proper maintenance, asset replacement.

## REFERENCES

[1] Richard E. Brown and Bruce G. Humphrey2005, "Asset management for transmission and distribution" IEEE power and energy magazine.
[2] John Sinclair ,"moving from passive to active, a view on what drives the way we operate electricity networks in the UK"EEA conference.
[3] Tehran's regional electrical distribution "strategy program"
[4] Haghifam-Mahmmodreza, "Asset management in electrical distribution networks, with emphasis on improving operational".
[5] IEA smart grids
[6] AS/NZS 4360 risk management .Australia: standards Australia.