
THE ASSET MANAGEMENT ROADMAP FOR ELECTRIC UTILITIES [Affiliation]

An asset management roadmap provides the electric utility with guidance on the journey towards a mature level of asset management

Knowledge Partners



Founding Partners



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SUSTAINABLE TRANSFORMATION OF UTILITIES

THE THEME

The theme of the World Utility Summit, (WUS) is “Sustainable Transformation of Utilities”.

This summit would bring in thought leaders across the globe to deliberate the preparedness of utilities to deal with the transformational changes. Regulators, technology providers, consultants, government bodies and utility leaders are expected to share their views on the various challenging and exciting scenarios and help shape the roadmap of the future utilities.

SUMMIT TRACKS:



■ Accelerating Digital Journey of Energy Ecosystem

Utilities get their revenues primarily via billing the customers for their demand and energy usage. New energy ecosystem, with multiple options for consumers to meet their electricity demand, will pose stiff competition to the utilities. Earlier for paying electricity bills a long que has to be made but in today's era the process has been digitized. With the use of smart meters, every process is digitized and simple. The questions arise in what manner digitization of energy ecosystem will affect the consumers?



■ Best Practices in Asset Management

Proper asset management allows company to effectively provide their service to the nation. Any breakdown in this process brings the potential for catastrophic failure in the nation infrastructure. Proper asset management allows you to:

- Enhance the life of assets through proper maintenance
- Allows you to respond efficient during emergency situation
- Reduce operating cost in long term.

The four main pillar of the asset management are:

- Evaluate your system's asset
- Assess your current service level
- Identify your most critical component
- Map out your life cycle cost
- Develop maintenance plan



■ Enhancing the Utility System Resiliency

In this environment, the utilities, Government and others stakeholders needs to take longer and deeper look at building resilience to limit and mitigate the risk to customers. Protecting them from risk that threaten life, property and economic activities that can be costly. We would like to suggest important pillars in the effort to improve our Nations grid resilience.

- Smartening the Grid
- Hardening the Grid
- Distributed Generation
- Building resilience on demand



■ **Distribution Utilities of Future: Advanced Technologies for Business Transformation**

The Indian power sector is evolving at a fast pace and has undergone some major transformations in recent past aimed at improving grid efficiency, security, stability, and consumer experience. However, the distribution utilities remain the weakest link in power sector value chain. The deployment of advanced technologies such as smart-grids can reduce pilferage, enhance consumer participation, and realize more revenues through losses reduction, lower energy costs, and eliminate manual intervention. Further, the combination of advanced technologies, innovative market models and consumer engagement strategies can support solutions like grid interactive buildings and enable consumers to support the distribution utilities in managing the demand supply balance. Together, such technologies and solutions have the potential to transform the distribution utilities and accelerate the use of clean energy resources in power grids.



■ **Sustainable Practices towards Net Zero Utilities**

In current scenario, Energy and Utilities executives are working towards sustainable practices. Almost half of the energy and utilities respondents have committed to a net zero goal. The major driving factors for sustainable utilities are upcoming government policies favorable to consumers and industry, increasing consumer and shareholder demand, and Decreasing cost of renewable energy. The important question arises how the Utilities are building a sustainable future.



■ **New Energies (Common track with eTECH^{nxt})**

The Indian renewable energy sector is the fourth most attractive renewable energy market in the world. As of May 2022, India's installed renewable energy capacity stood at 159.94 GW which is 39.70 % of the overall installed power capacity. People everywhere are looking for new energy ideas to help them make energy smart decisions for the future. We believe in renewable Energy and changing the attitude and practices about the way people generate and use energy. Central to this is the discovery and development of alternative energy sources. This track will cover the latest developments in technologies, novel business ideas, grid dynamics, learnings from pilot demonstrations and working considerations associated with these technologies. The topic will emphasis on Green Hydrogen, Electrification of Transportation, Nuclear & Biomass.

MESSAGE FROM KNOWLEDGE PARTNER



Sunil Sharma
GIZ



Ashutosh Sharma
DNV

The term “Asset Management”, has historically been used by financial service companies that actively or passively manage investment funds. Asset Management in the financial sector is also concerned with return on capital, acquisitions, mergers, and asset stripping.

Asset Management for utilities is not just about managing the assets while in operation, it involves the complete asset lifecycle, from planning, procurement, installation and commissioning, asset mapping, quality assurance, operational procedures, condition monitoring, condition-based decision-making concerning maintenance, repair and replacement of assets, maintenance management, and adoption of technologies for extending asset life. It is meant for the life cycle value of the assets. This paper is specifically designed for utilities and covers background, needs and benefits, as well as the core principles of asset management.

The need of the adoption of Asset management has become an eminent need for utilities as are passing through the energy transition where the broadening and utilisation pattern of assets is changing and posing unprecedented challenges while upkeeping the customer and regulators’ expectations.

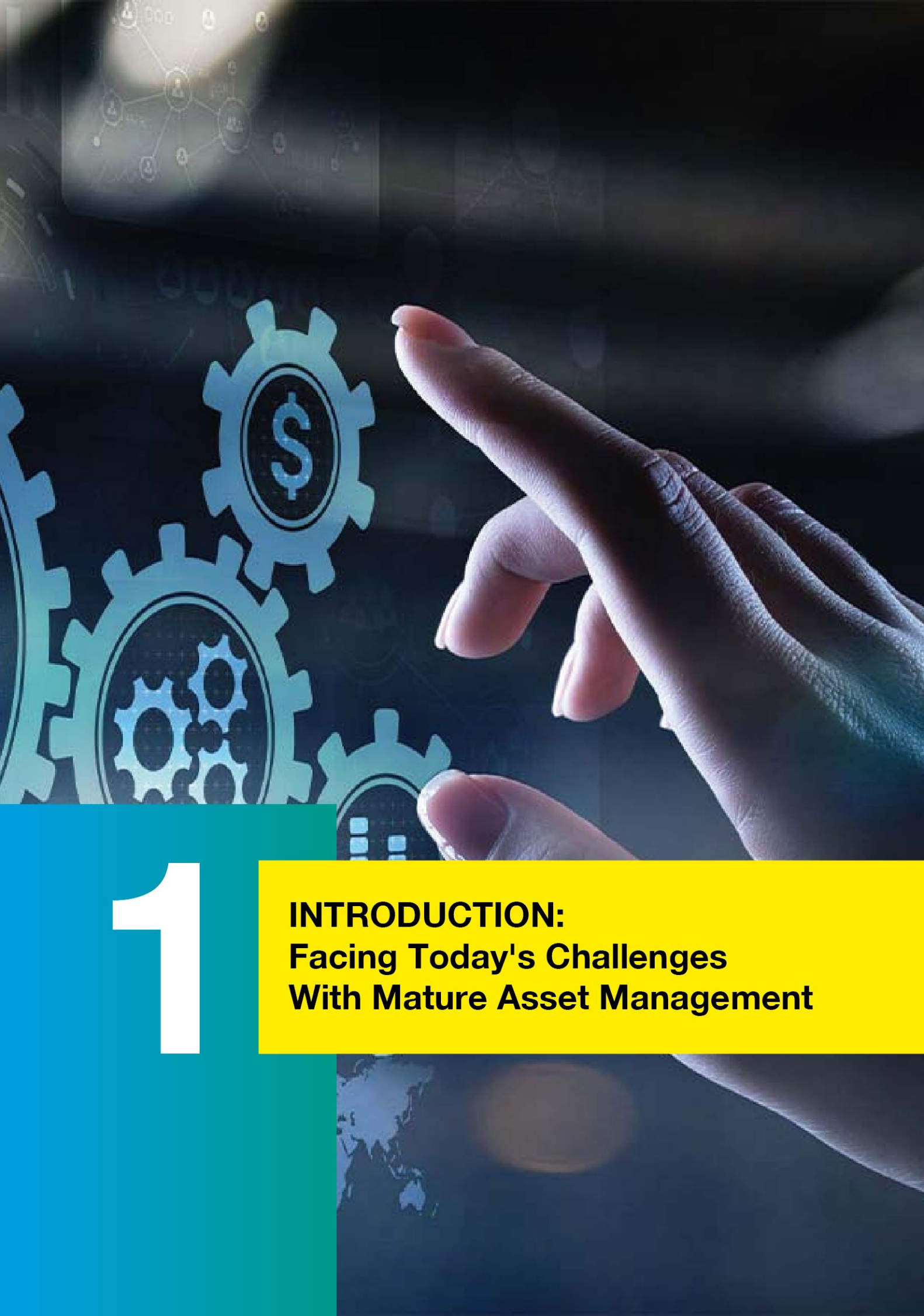
This paper has critically analysed how the power utility ecosystem is expected to evolve in the future and the role of the respective market enabler in ensuring sustainable value creation. The roadmap presented needs to be adjusted to the utility at hand. The roadmap for an individual utility depends on their ambition or goal and the present state and situation. The other influencing factors are available (financial and human) resources for running the implementation project and for running a mature asset management system, and on external conditions and requirements (regulatory regime, customer demands, climatic conditions, availability of external parties for outsourcing).

On behalf of the GIZ and DNV, we are pleased to be a knowledge partner with the World Utility Summit 2023, particularly on the theme of ‘ Best Practices on Asset Management. We wish all success to the WUS 2023.

We look forward positively towards the implementation of Asset Management systems across the utilities in India and globally supporting the net zero mission for saving the ecosystems of mother earth.

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1

**INTRODUCTION:
Facing Today's Challenges
With Mature Asset Management**

1.1 Asset management has gained urgency over the last decades

Over the last decades, Asset Management has played an increasingly prominent role in the field of electrical infrastructures, driven by the need for being in control of risks, achieve a better balance between performance, cost, and risk, have transparency and accountability, and achieving the most value from assets.

Asset Management was first used in the financial world. In the industry, asset management was originally focused on the operation and maintenance of plants and equipment. However, due to catastrophic events such as the Piper Alpha disaster in the 1980s, the focus shifted toward risk control and asset integrity. Nowadays the prime focus is on creating value from (physical) assets, and electric utilities are adopting the concept of integrated, optimised whole-life management of physical, human, intellectual, reputational, financial, and other assets.

These developments have led to the introduction of new standards. In 2004 PAS55 (a Publicly Available Specification) was issued by the British Standard Institute, and later revised in 2008 and 2014 ISO (the International Organization for Standardization), published a series of standards on Asset management, the ISO 55000 series.

ISO 55000 series on Asset Management			
ISO 55000	ISO 55001	ISO 55002	ISO 55010
Overview, principles, and terminology Issued in 2014, presently under revision	Management systems - Requirements Issued in 2014, presently under revision	Management systems - Guidelines for the application of ISO 55001 Issued in 2014, revised in 2018	Guidance on the alignment of financial and non-financial functions in asset management Issued in 2019

The introduction of asset management in line with the ISO 55000 series represents a large paradigm shift compared to the traditional approach of merely “managing the assets”.

1.2 Asset management is more than just managing assets

ISO 55000 defines Asset Management as “the coordinated activity of an organization to realize value from assets”. That realization of value normally involves a balancing of costs, risks, and opportunities. Hence asset management refers to the (economic) value associated with the asset, and all processes that influence the value are part of asset management.

Asset Management is not just about managing the assets while in operation, it involves the complete asset lifecycle, from planning, procurement, installation and commissioning, asset mapping, quality assurance, operational procedures, condition monitoring, condition-based decision-making concerning maintenance, repair and replacement of assets, maintenance management, and adoption of life extension technologies.

Also, asset management involves the management system needed to operate an asset management organization, including policies and procedures, strategies and planning, the organization and its governance and resourcing, as well as the use of continual improvement.

1.3 Asset management covers the whole asset lifecycle

Electric utilities own a range of assets such as transformers, switchgear, overhead lines, cables, and feeder pillars. These assets are critical for reaching the company's business objectives not only regarding the present performance but also for the future performance, the attainable useful life and the economic value that can be extracted from the asset. Asset management allows the optimisation of operational processes to improve asset lifecycle performance. It provides and builds on a unified and accurate view of all types of equipment, including its state, status, and health.

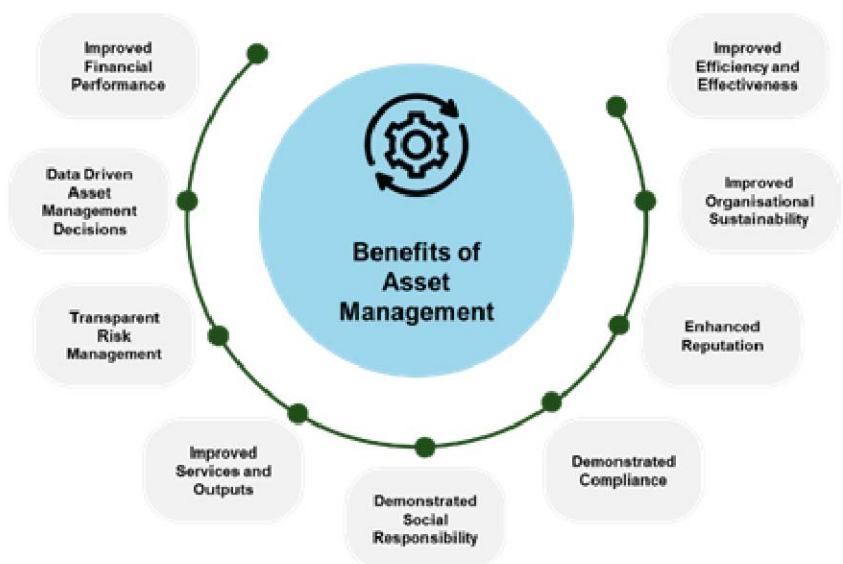
The asset life cycle starts from the planning stage. Asset planning sets the outline of a planned operational utilisation and service life. In the design stage, the asset is designed for a pre-designated service life under specified service conditions during the service life. Next, the asset must be manufactured, constructed, and tested to meet the design standard. Consecutively, the asset is to be installed and commissioned following manufacturer guidelines and utility specifications at specified service conditions. The asset then enters the operation and maintenance phase meeting the pre-established requirements. Any exceedance of these requirements beyond design tolerances may abuse the asset and affect the service life and the expected reliability of the asset. During the service life, the asset will need due care in operation, monitoring, maintenance, correction of defects and forecasting the end of life. Once the asset service life is exhausted, it needs to be disposed of as per manufacturer guidelines, and local bodies' environmental, health and safety regulations.



1.4 Asset management offers essential benefits for electric utilities

The benefits of asset management are well-described in a publication by the Institute of Asset Management (IAM)[1]. This publication was issued for understanding and guidance when implementing ISO 55001.

The ISO 55001 standard and the IAM brochure focus on asset-intensive industries in general and are not specific to electric utilities. CIGRÉ has issued two publications which are dedicated to applying ISO 55001 in utility companies, and which provide guidance as well as examples from pioneer companies [2,3].



For **electric utilities**, the asset management concept offers particular benefits because:

- The high investment volumes require a strong emphasis on prioritized decision-making. This need is further boosted by the average asset age, the energy transition, and the massive uptake of distributed generation.
- The combination of simultaneous challenges those electric utilities are facing such as regulatory requirements, the dependence of society on the electrical infrastructure, the digitization of control and communications systems and the increase of intelligent systems, and the climate challenges.

When considering the specific situation of **Indian electric utilities**, the following particular considerations are solid arguments for reinforcing the present status of asset management:

- Regulatory requirements on country and state level
- The need for a well-functioning electricity infrastructure when further electrifying a geographically spread area with urban and rural areas
- Future transition-related challenges such as the large-scale introduction of renewables, digitization, and India's Strategic Roadmap towards Smart Grid
- Present challenges in the distribution sector, such as the operational and financial state, power losses and failure rates.

1.5 Knowing the core principles of asset management

The core principles of modern asset management first describe the context and key areas of an asset management system.

Next, the core principles identify a risk-based decision-making framework which ranges from the strategic level through the asset management level to the operational level. This framework recognizes two strategic elements, the line-of-sight, and a risk-based decision-making methodology.



The line-of-sight

- Stakeholders' interests
- Business values and corresponding KPIs
- SWOT analysis
- Strategic SMART objectives
- Strategic Asset Management Plan
- Asset portfolio and yearly plans
- Execution of plans
- Monitoring, evaluation, and improvement.

The risk management framework

- Approach, risk metrics, risk-appetite, criteria
- The risk-based decision-making process
 - o Identifying possible threats
 - o Analysing probability, impact, and risk
 - o Assessment against a risk appetite
 - o Defining mitigating solutions
 - o Prioritization and portfolio management
 - o Managing residual risk

WHAT ARE THE CORE PRINCIPLES OF ISO 55001-BASED ASSET MANAGEMENT?

Connect the business to stakeholder interests through a line-of-sight	The primary goal of a modern asset management organisation is to provide optimum value for the stakeholders. Strategy, policy, planning, execution, and evaluation are well-aligned.
Having a good practice risk management methodology is key	The scope of modern asset management is to optimise performance while managing risks and controlling costs. This calls for a solid risk-based methodology.
Asset management requires a dedicated risk-based decision-making process	In modern asset management, risk management is not only organised as a separate process to control significant risks but is integrated into the day-to-day decision-making processes for operation, maintenance, and replacement.
The organisation, roles, and responsibilities need to support asset management	The function of the asset management system is to optimally enable the asset management processes. This requires clearly defined roles and responsibilities, adequate processes, procedures, documentation, an (IT) infrastructure and information management, and adequate resources.
Controlling risks involves the complete lifecycle	Throughout the asset's lifecycle, the processes need to be governed by a centralised asset management policy, strategy, and system addressing all lifecycle phases.
Advanced asset management requires continual improvement	An organisation needs to learn from faults, near-faults, deviations, anomalies, etc. This requires monitoring performance, condition, and progress, evaluating the impact of deviations, and taking corrective action.

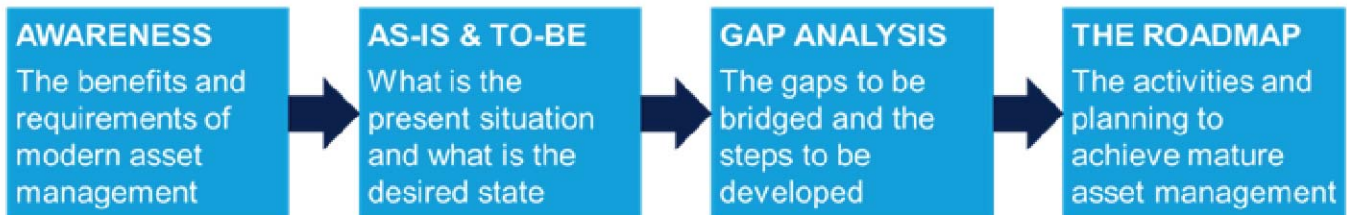


2

**THE JOURNEY:
Towards Mature
Asset Management**

2.1 How to advance from the present (As-Is) to the future (To-Be)

In the first phase of the journey towards mature asset management, a company needs to define its goals, and take the necessary preparations for implementation. For building a realistic roadmap it is essential to first create awareness of the benefits and requirements of mature asset management. Next one should have a clear picture of the present situation and define what the future situation should look like, before planning the required activities and creating a roadmap.



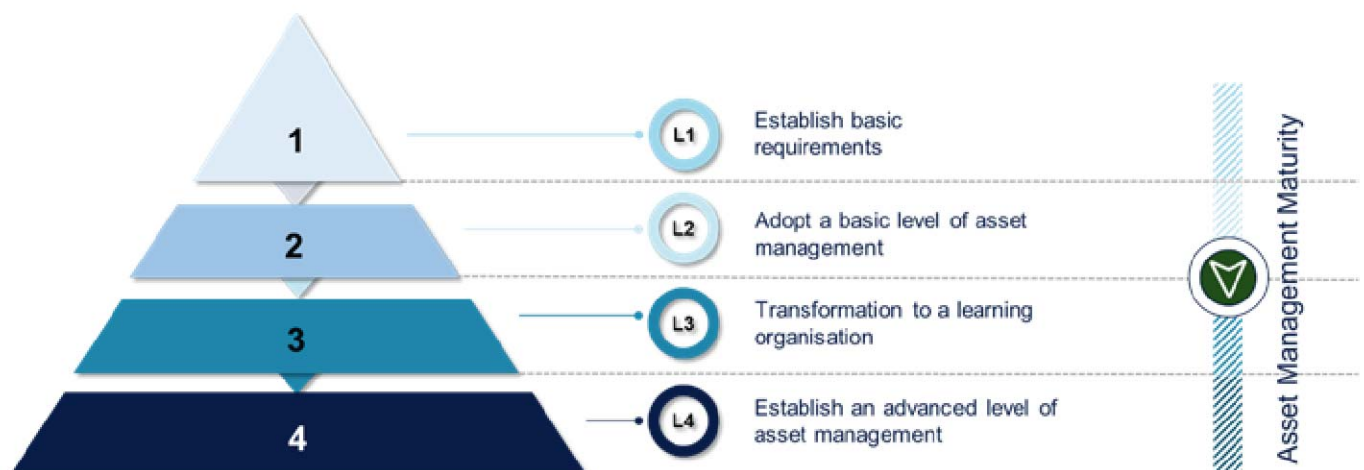
2.2 “One-size-fits-all” does not apply to electric companies

A roadmap will always be finetuned to the company at hand:

- Firstly, no company starts from scratch, each company has some form of asset management in place, at a certain level of maturity. Establishing a baseline forms the starting point of any roadmap aiming at improving the maturity level of asset management.
- Secondly, the roadmap depends on the company’s ambition or goal. What level of maturity is required to satisfactorily achieve the company goals? This may be different for a Transmission or Distribution company, for an urban or a rural network, for a public or a private company, or for a critical or common infrastructure.
- Thirdly, it depends on the availability of (financial and human) resources both for running the implementation project and for running a mature asset management system.
- Fourthly, it depends on external conditions and requirements, such as the regulatory regime, consumer demands, climatic conditions, and the availability of external parties for outsourcing.



2.3 Rome wasn’t built in a day, and neither will asset management by

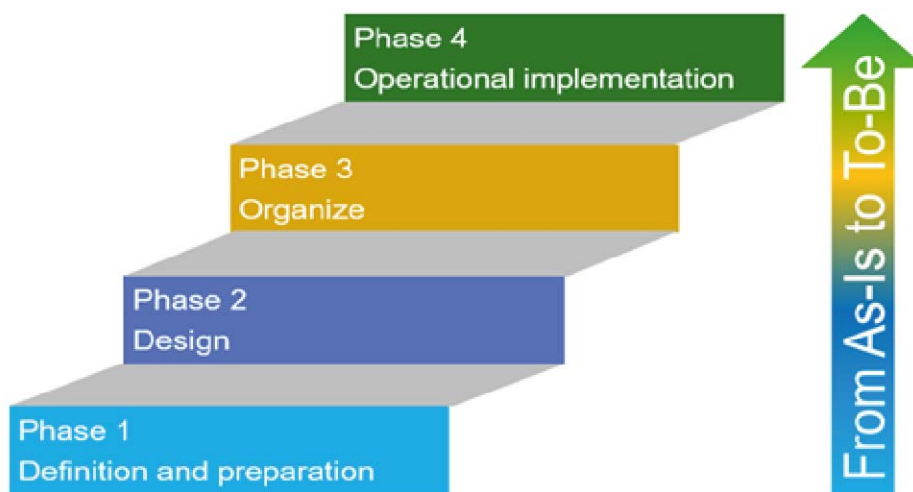


The development towards a mature level of asset management is a gradual process. Before starting this process, some basic requirements must be fulfilled. Next, a utility can move to a basic level of asset management, start implementing a learning organization and then move on to higher levels of maturity.

DEVELOPMENT LEVEL	DESCRIPTION
Basic requirements	Foundation and boundary conditions for implementing AM Mission, vision, strategic objectives, well-defined business values and KPIs Sense of urgency, willingness, and commitment Collecting, organizing, and making accessible available information and data
Basic level of AM	Implementing asset management based on the present level of knowledge, experience, tools, and methodologies, as the basis for further growth Commonly: limitations w/r risk management and risk-based decisions, data quality, condition- and risk assessment, forecasting, IT capabilities.
Learning organization	Gain experience with the new way of working, analysing, learning, and improving Gather quality information, create new knowledge, and develop new tools and methodologies, as a basis for further improvement.
Advanced level of AM	Reach an advanced level of asset management.
<i>Note: maturity is not measured by complexity or advanced technology but by the effectiveness of reaching goals.</i>	

2.4 Defining roadmap phases and activities

Implementing asset management is a gradual, step-by-step, process. Each step in this process has a starting point (the As-Is state) and a goal (the To-Be state). The process of moving from As-Is to To-Be can be organized in phases.



It is important to realize that the phases have a logical sequence, each phase builds on the previous phases. First, the goal needs to be defined and the boundary conditions need to be in place. Next, the To-Be state needs to be designed, the organization needs to be (re)arranged such as to support the newly designed processes, and finally, it needs to be implemented in the day-to-day processes.

PHASE	DESCRIPTION
Definition and preparation	Corporate requirements and goals, stakeholder interests, KPIs Awareness and communication in all layers of the organization Gathering existing data and information Defining the implementation approach
Design	AM Strategy AM policy, including risk management process, risk-based decision making Definition of lifecycle phases Continual improvement
Organize	Organizational structure Lifecycle processes and procedures AM support systems Data quality Process monitoring and auditing Resources and competences Reporting and documentation structure
Operational implementation	Further detailing of the organization from the previous phase, communication, reporting Further detailing of processes and production of process documents Implementing AM support systems and protocols Producing (standard) operating procedures Organize competence development

2.5 Building a roadmap

When building a roadmap, it is important to recognize that asset management implementation requires improvement activities at different levels:

- AM governance
- AM risk management and decision-making
- AM lifecycle processes
- AM systems

PROCESS LEVEL	EXAMPLES OF SUBPROCESSES
AM Governance	<ul style="list-style-type: none"> • AM Strategy&AM policy • Risk management policy • Continual improvement • Company organization
AM risk management and decision-making	<ul style="list-style-type: none"> • Condition assessment • Risk identification, risk register, risk analysis • Solutions prioritization • Decision-making process
AM lifecycle processes	<ul style="list-style-type: none"> • Planning•Commissioning • Specification• Operation • Procurement• Maintenance • Quality assessment• Replacement • Installation• Disposal
AM systems	<ul style="list-style-type: none"> • Data quality • Data systems • Information model • Management system

First, the present (As-Is) situation needs to be assessed. This may be done by a self-assessment or by an independent audit. Knowing the As-Is situation, the required (To-Be) situation needs to be defined. Depending on the As-Is situation at hand, the To-Be situation may be to establish a basic level of asset management maturity or to aim for a more advanced level of maturity.

Once the target level is established, the activities need to be defined in line with the phases described, and planning needs to be made. An example is given of a roadmap that aims for achieving a basic level of asset management.

DETAILED ROADMAP BASIC AM

		Prep			Basic AM																		
Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1 Definition and preparation																							
	Corporate requirements																						
	Awareness and communication																						
	Information and data collection																						
	Implementation approach																						
2 Design																							
	AM policy																						
	• risk management framework																						
	• risk management process																						
	• risk-based decision-making																						
	AM strategy (or SAMP)																						
	Definition of lifecycle phases																						
	Continual improvement process																						
3 Organize																							
	Organizational structure (high level)																						
	Lifecycle processes																						
	Systems (high level)																						
	Data quality plan																						
	Process monitoring / auditing																						
	Resources and competences (high level)																						
	Reporting & documentation structure (high level)																						
4 Operational implementation																							
	Organization structure (detailed)																						
	Process descriptions / procedures																						
	Systems (detailed)																						
	Data quality improvement																						
	Resources and competences (detailed)																						
	Reporting and documentation structure (detailed)																						



3

The Key Success Factors For Implementation

3.1 The value of pilot projects

A company may choose between two approaches when implementing asset management. One may start with implementing asset management throughout the company, or one may begin with one or more pilot projects and use the experience gained to widen the application of the asset management approach throughout the company. In the end, the objective of both approaches is the same, but the path is different.



ADVANTAGES OF PILOT PROJECTS

- The company starts by gaining experience in the new way of working at a limited scale. The lessons learned may be used to improve the roadmap for the full roll-out
- The company gains a better understanding of the relevance of certain prerequisites. For example, the impact of poor data quality will be directly experienced when making decisions in a pilot environment
- The positive results reached in a successful pilot project may create confidence, acceptance, and enthusiasm for engaging in the full implementation.
- Staff engaged in the pilot project will gain experience and may form a critical mass of employees that may support the full implementation.

Pilot projects are particularly beneficial in complex situations common in large or medium-scale utilities which are characterized by the:

- An extensive grid with a high geographical spread, or by
- A complex organization (layers in the organization, regions, offices, and responsibilities)

AA pilot project may be defined for one region of a larger network, or a selection of substations or an asset class in one specific region.

For simple organizations, the pilot approach has no added value.

3.2 Reaching maturity step by step

Reaching too high a target level may result in delays, disappointment, or frustration, because of the complexity of the implementation process. Therefore, one can better aim for a target level which is reachable with the present capabilities in a reasonable timeframe. After the first next level is reached and operational, and lessons are learned, one may define steps for further advancement.

3.3 Dealing with change management and overcoming resistance

The implementation of a mature asset management system not only involves a change in utility management and processes, but it is predominantly a change in company culture and mindset. This calls for:

- risk awareness throughout the company
- a transition from following protocols to taking responsibility
- a transition from task-oriented work to result-oriented work
- a critical culture of continuous feedback and improvement
- the flexibility needed to address changing external requirements and conditions.



To stimulate employees to embrace this new mindset, and to overcome the (inevitable) resistance towards change, implementation also requires:

- solid communication from the start
- commitment through all layers of the company
- learning new habits and letting go of old ones
- training new competencies.

3.4 Mind the gap between dream and reality

When applying or implementing asset management, one should realize that often there is a gap between dream and reality. In the course of time, one may encounter conditions and boundary conditions that were not anticipated, or new events and inconsistencies that were not foreseen. It is therefore crucial that throughout any asset management process, as well as during the implementation of any process, the asset manager should monitor whether the goals and approach are still valid. Further one should monitor the progress, analyse the gap between planning and realization, consider the impact of such gaps, identify bottlenecks and adjust the planning accordingly. This requires a continuous improvement cycle involving audits, analysis of the impact, corrective action and updating the planning.



3.5 How to get started: the first blow is half the battle

When implementing asset management, the first blow is half the battle. For identifying the crucial first steps one may distinguish between different layers in the organization which each have its own responsibility.

At the **board level**, the journey requires full commitment and a clear directive to implement asset management. Further, it should be clear who is the company's stakeholders, what are their interests and how this will be recognized in corporate KPIs.

At the **management level**, the priority is to assign an asset manager, or an asset management department, with the responsibility to assess the present situation, develop an implementation strategy and roadmap, and initiate and monitor roadmap activities.

As a priority, this AM authority needs to (re)develop the AM strategy, AM policy and AM KPIs, as well as

a risk management methodology and decision-making process. In the next phase the roles and responsibilities as well as the processes and procedures may be developed.

At the **engineering level**, the priority is to build an asset register, gather all available data, assess, and start improving, the data quality, and track and trend asset failures, inspections, and maintenance activities.

REFERENCES

- [1] Asset Management – an anatomy, version 3, IAM, (2015)
- [2] CIGRÉ Technical Brochure, TB 787, ISO series 55000 standards: Implementation and information guidelines for utilities, 2019
- [3] CIGRÉ Green Book, GB 12, Power System Assets - Investment, Management, Methods and Practices, Springer, 2022



ABOUT WUS 2023

World Utility Summit was conceptualised to provide a wider forum for utilities to deliberate together on changes that will come, probable ideas and solutions to deal with continuous changes. World Utility Summit is scheduled in 2023 with theme Sustainable Transformation of Utilities. The electricity ecosystem is undergoing an unprecedented transformation with the proliferation of renewables, distributed generation of resources and electric vehicles on one side and consumer activism and regulatory pressures on other. These developments can help utilities to embrace the complexities of the network and to prepare to drive decisions based on probabilities and real-time data.

- Accelerating Digital Journey of Energy Ecosystem
- Best Practices in Asset Management
- Enhancing The Utility System Resiliency
- Distribution Utilities of Future: Advanced Technologies For Business Transformation
- Sustainable Practices Towards Net Zero Utilities
- New Energies (Common Track With **eTECH^{inxt}**)

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