ABS Group | Asset Leadership Network

RISK AND RELIABILITY

ADOPTING THE ISO 55000 ASSET MANAGEMENT FRAMEWORK FOR THE POWER INDUSTRY

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Introduction

There has always been asset management, but with the creation of ISO 55000 beginning in 2010, there has been a slow continuous process throughout industry to adopt and incorporate its principals into modern organizations. Over the past ten years, much has been written about the benefits of ISO 55000 standards and how they should be applied to organizations. Here, we will continue that effort to provide additional clarity as to how the ISO 55000 standard applies to and is implemented in power utilities. The ISO 55000 standard provides guidance related to the development of documented information specifying how organizational objectives are transformed into asset management objectives. In addition to documentation, the standard outlines the overall role and requirements of an Asset Management System (AMS). Considerations related to the context of the organization are used in the development of asset management policies, organizational objectives, organizational risk identification, implementation of a Strategic Asset Management Plan (SAMP), Asset Management Plans (AMPs) and the creation and implementation of Standard Operating Procedures (SOPs).

In the power industry, the reliability of electricity is of paramount consideration when developing an AMS. This includes a systematic approach to optimize assets performance to achieve improved reliability. While this statement is simple in theory, success requires many more factors to be considered within the context of an organization. A sample of these include environmental, social and cultural considerations, internal and external stakeholders and regulatory requirements.

What is ISO 55000?

The ISO 55000 standard, generally referred to as "ISO 55000" (and referenced as such from here forward), is comprised of three key chapters:

1. ISO 55000 – Asset Management – Overview, Principles and Terminology
2. ISO 55001 – Asset Management – Management Systems – Requirements
3. ISO 55002 – Asset Management – Management Systems – Guidelines for the Application of ISO 55001

ISO 55000 is a set of international consensus standards that provide requirements and specifications for an integrated, effective system for managing assets. The ISO 55000 series of Asset Management Standards was established in 2010 and launched in February 2014.

The ISO 55000 standard outlines the minimal components an AMS is required to have to be compliant with all seven elements of the standard. The seven elements are:

Context of the Organization

The organizational objectives provide context and direction to the organization's asset management activities. The organizational objectives are generally produced from the organization's strategic planning activities and are documented in an organizational plan.

Leadership

Asset Management is demonstrated by leadership through the development, implementation, operation and continual improvement of an AMS. However, a key success factor is that ownership and accountability for asset management remains at the top management level.

Planning

The approach of managing risks associated with the AMS requires alignment with the organization's risk management strategy including business continuity planning and contingency planning. The organization must integrate actions identified to address risk into the implementation plan for the AMS. The organizational

objectives are produced from the organization's strategic level planning activities and are documented in an organizational plan.

Support

Organizations must identify required resources and map available resources to planned activities to determine and address gaps. This gap analysis applies across all asset management activities and can require prioritization and program planning of many projects to close these gaps.

Operations

The AMS is managed by Operations who have defined roles and responsibilities for ensuring that the AMS is performing according to expectations. Operations utilizes the asset management tools implemented to ensure reliability, performance and quality.

Performance Evaluation

The organization evaluates the performance of its assets, its asset management and its AMS. Performance measures can be direct or indirect, financial or non-financial.

Continuous Improvement

Continuous Improvement goals are identified, assessed and implemented across the organization through a combination of monitoring and corrective actions for the assets, asset management or AMS. Continuous improvement should be regarded as an ongoing iterative activity, with the ultimate aim of delivering the organizational objectives.

Why ISO 55000?

Today, power utilities face many challenges, including transformation to interconnected digital technologies, renewable technologies, competitive wholesale power markets, new public policies, additional regulatory requirements and climate change. Asset owners and operators are required to deliver clean, safe, affordable power, increase stakeholder value to consumer and residential customers while reducing risk and minimizing costs, and deliver a return to investors.

Managing risk and performance through investments while working to optimize asset life cycles is almost impossible in today's world without a modern AMS. It is a fundamental requirement of ISO 55000 that the overall program is driven by an AMS. Today, digital technologies, modern computerized maintenance management systems, artificial intelligence and other advanced applications are providing data and analytics that have never been as easily accessible to all individuals within an organization. Many organizations are deploying combinations of these tools that are well suited to facilitate process execution and conformance of defined asset management program standards based on the ISO 55000 standard.

Currently, there are approximately 63 global power companies that are ISO 55000 certified according to ISO TC251. One of the benefits of ISO 55000 certification is the ability to show regulators, stakeholders and customers that the organization maintains its assets in accordance with a stringent level of diligence and quality parameters necessary to achieve and maintain the certification. With increasing acceptance of the standard as a best practice globally, there are many other power utilities that have adopted ISO 55000 as their foundational asset management approach and are currently employing the methods and practices without completing the certification process with ISO. Adopting an asset management framework based on the ISO 55000 standard demonstrates that the organization has an AMS to manage performance, risks, reliability and costs in a very effective and efficient manner.

How Utilities Can Apply the ISO 55000 Standard

Power utilities provide electricity to consumers throughout the world. In modern times, power is essential for the production of goods, light, heat, safety and touches almost all aspects of life in general. Therefore, reliability of the assets required to generate and distribute power is of critical significance to the public (external stakeholders). An example of impact to the public due to poor electric reliability can be seen from the 2021 Texas Power Crisis, resulting in a massive electricity generation failure in the state of Texas. Power customers experienced shortages of water, food and heat. Could this have been prevented if power utilities had protocols, risks and indicators that could have been provided by a robust AMS? While not every incident can be predicted, when events occur, ISO 55000 provides guidance in the form of Root Cause Analysis to identify the Root Cause(s) and nonconformities associated with the failure to provide power. The SAMP should encompass protocols for incident investigation, planning and execution of avoidance strategies to mitigate or eliminate that specific failure point in the future. Power utilities seeking to align their AMS with ISO 55000 need to consider all assets associated with power generation, transmission and distribution. These departments tend to work in silos. However, the overall governing Asset Management Policy and SAMP should apply to all departments. Each department, or service area, has unique challenges when it comes to asset management. For example, ensuring reliability for power generation equipment requires a maintenance protocol and strategy to address rotating equipment. Managing maintenance outages related to essential power equipment is one of the most critical aspects of asset management. Power utilities must pay particular attention to the planning and executing of outages to ensure power is available when needed.

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Utilizing Technology to Drive ISO 55000 Compliance

Typically, power utilities have an established computerized maintenance management system (CMMS) to facilitate the management of assets. Modern best of breed CMMS applications provide robust functionality to monitor, plan and schedule maintenance activities, serve as a database for documentation and archival of maintenance activities, monitor and provide analytical data of the performance and risk related to identified assets, drive review and approval processes, facilitate safety protocols and provide evidence for the North American Electric Reliability Corporation (NERC) and environmental audits.

Other technological tools can be strategically integrated with the core CMMS application to facilitate predictive and prescriptive maintenance activities based upon analytical analysis of asset data including real time sensor readings. Asset Health Index (AHI) is becoming more popular and is being utilized by larger power providers (especially transformer asset health). As defined by Dr. R.J. Heywood and Dr. T. McGrail, "An Asset Health Index (AHI) is an asset score which is designed to reflect or characterize asset condition and thus likely asset performance in terms of the asset's role. AHI links available raw data from condition monitoring, asset history, maintenance and operational data through failure modes, or issues which will affect asset performance. Diagnosis of failure mode and an understanding of the time associated with that failure mode, allows for intervention planning."[1]

1 Generating Asset Health Indices Which Are Useful and Auditable – 2016.

Performance monitoring of power assets generates information on how assets are performing and may provide alerts to intervene when assets are not performing according to expectations. One of the many benefits of a properly designed CMMS and associated tools includes visibility for reliability engineers to review data stored in the CMMS and identify "Bad Actors", or nonconformities that can then be addressed by maintenance personnel or engineering. The implementation of a successful program requires a methodical approach to facilitate effective asset management. The foundational elements include the preparation and verification of a Master Asset List (MAL) using a naming convention and prioritization of assets through an Asset Criticality Ranking (ACR). The MAL and ACR set priority for remaining work. Spare Parts Analysis (SPA) comes after maintenance and optimization. These are key elements required to build and execute a strategy to provide effective asset lifecycle management. The completed data set allows assets to be prioritized for maintenance optimization and spare parts analysis efforts regarding maintenance strategy and techniques (PM optimization, Predictive and Prescriptive remedies) and provides the ability to search for and act upon accurate information. Overall enhanced maintenance plans for assets can now be specifically developed based on the prioritized assets to ensure that the most important works gets performed first on the most critical assets.

Issues Encountered When Applying ISO 55000

Power utilities have been around for more than 100 years and have experienced unimaginable transformation from rudimentary power generation techniques to the utilization of the sun and wind to generate power at a scale that allows endless possibilities while protecting our other natural resources. The challenges of implementing change are difficult. Executive leadership must work hard to get everyone involved and invested in asset management to embrace change. Implementing change throughout a power utility is particularly difficult as most generation, transmission and distribution divisions usually work independently of each other. Senior management must provide a focus and mandate to integrated departments with the common goal of alignment with ISO 55000 asset management practices. This can be accomplished by having one overarching Asset Management Policy and a single Strategic Asset Management Plan that applies to the organization as a whole.

To facilitate desired levels of success, power utilities must stress the importance of communications between power generations, independent system operators and transmission operators. ISO 55000 requires organizations to determine the appropriate level for internal and external communications relevant to assets, asset management and the AMS. Communications between power generators and independent system operators involve scheduling generation and outages. For example, communications between transmission operators and power generators involve switchyard and substation switching.

Benefits Realized by ISO 55000

Many existing power utilities are challenged with aging infrastructure, aging workforce and a rapidly changing political and technological environment. The benefits of a successful ISO 55000 asset management implementation are well documented. These include better management of risk, the breakdown of organizational silos with increased alignment around asset lifecycle management, structured training and retention of key skills and effective prioritization of investment. Organizations are seeking to improve management of physical assets due to issues associated with how their assets are currently managed and performing. These asset management improvements often consist of:

- Increased production capacity
- Lower cost of maintaining physical assets
- Reduced and/or eliminated risks associated with physical assets
- Improved financial outcomes

Table 1 shows benefits from companies that have adopted ISO 55000 asset management practices.

20% Reduction in Capital Costs

10% Reduction in Operational Costs

Improved environmental compliance (from worst to first)

China Light and Power

90% Reduction in system losses

20% Growth in demand

40% Reduction in rate charges to customers

Sodexo's facilities management clients who followed its ISO 55001 compliant asset management framework experienced these benefits from doing so:

220% Operational efficiencies through improved asset management planning

7%-12% Total cost of operation reductions annually

10%-25% Increased reliability of asset infrastructure

40% Reduction in risk-related costs

20% Reduction in equipment failure rates

A hydroelectric generation company in Brazil owned by AES Corporation, a global power company, was able to reduce forced stops in generating units by about **75%**, reduce insurance costs by **14%** and save approximately **$2.2 million** in one year.

Saudi Aramco Shell refinery (SASREF) in Jubail, Saudi Arabia implemented an emergency maintenance and reliability program based on ISO 55000 in 2016 and realized a **13.5%** reduction in budgeted maintenance costs that year and an additional **3.2%** reduction in 2017.

Table 1 – Benefits from ISO 55000

Source: Asset Leadership Network and 4Tell Solutions, A Roadmap to High Performance, ISO 55000 and a Management Systems Approach to Asset Management

ISO 55000 Certification

To certify or not certify? That is the question. Geographical regions that have embraced certification and have the most certified organizations include Japan, Australia, UK and South America. At present time, most North American organizations do not execute actual certification but do adopt much of the guidance from ISO 55000. For now, certifying or not certifying is not considered to be a critical element to most organizations. However, obtaining ISO 55000 certification does provide external stakeholders, regulators and customers with a level of comfort that an organization is using industry best practices when managing the reliability of their assets. Certifications are more common in the food and beverage, pharmaceuticals and life sciences and water treatment organizations. In general, a larger body of corporations are acknowledging the benefits and impacts of conforming to ISO 55000, which is leading to a slow growth of certifications. Some government agencies are contemplating the development of possible mandates for certifications.

Starting the Transition to ISO 55000 Conformance

The process of implementing an ISO 55000 AMS begins with performing an in-depth gap analysis of the existing AMS. The gap analysis identifies asset management practices that currently exist and are aligned with the ISO 55000 standard. In addition, this process exposes gaps in the AMS allowing the development of an implementation plan to ultimately close those gaps and implement the practices necessary for conformance. Asset management assessments should be based on ISO 55000 standards, best practices from recognized reliability institutions and performed by resources or organizations with significant asset management experience. Upon completion of the gap analysis, AMS findings can be developed into an organizational road map of scheduled tasks to be completed within an agreed timeframe. Recommendations are developed from the asset management assessment to identify the gap(s) between an organization and the ISO 55000 standard to assist in the development of an asset management framework. When doing gap analysis for power utilities it is not uncommon to see power generation, transmission and distribution having their own departmental AMS. Combining the power utilities asset management policies and SAMP into one organizational framework will provide more consistency in how assets are managed throughout the organization. The framework is used to identify the elements required to be developed including the policy, AMPs, standard operating procedures and change management to name a few. The elements identified in the framework will be a combination of what already exists, as well as new items that were recommended to close the gap identified in the evaluation process that aligns the AMS with the ISO 55000 standard.

The road map and implementation plan should contain specific information regarding the tasks, milestones and dates that define the overall project implementation plan and objectives.

Conclusion

The power industry is an ideal candidate for ISO 55000 standard based asset management. Transmission, generation and distribution are complex, capital-intensive businesses that require significant capital investment in equipment and infrastructure. Additionally, the overall nature and criticality of the power industry to our entire global sustainability make the reliability of electricity essential to life. Therefore, the ISO 55000 framework provides a proven methodology to manage complex assets in an efficient, economic and environmentally friendly capacity.

About ABS Group

ABS Group of Companies, Inc. (www.abs-group.com), through its operating subsidiaries, provides data-driven risk and reliability solutions and technical services that help clients confirm the safety, integrity, quality and environmental efficiency of critical assets and operations. Headquartered in Spring, Texas, ABS Group operates with over 1,000 professionals in over 20 countries serving the marine and offshore, oil, gas and chemical, government and industrial sectors. ABS Group is a subsidiary of ABS (www.eagle.org), one of the world's leading marine and offshore classification societies.

About The Asset Leadership Network

The Asset Leadership Network is a non-profit industry association that advocates for the dramatic benefits available by using a structured approach to asset management, such as ISO 55000. Through our organizational members, close relationship with government executives, and leading experts, the Asset Leadership Network provides content that assists organizations in their path to improved mission success with a structured approach to asset management.

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