



# POMBOK

Power Plant Operations & Management Body of Knowledge

*POMBOK became known as the Power Plant Operations & Management Body of Knowledge and this BOK describes the knowledge within the Power Plant Operations, especially for thermal power plant, which contains proven recognized good practices of Operations and Management as a standard of knowledge system. This is the first BOK Professional Book in the world related to the operations and management of a power plant, which were written, reviewed, and published by global experts in power plants in 2019.*

## The Concept of BOK

BOK is the abbreviation of Body of Knowledge. This is largely different from general business documents such as procedure manuals and business manuals in their versatility and purpose. BOK is a definition of common concepts and terms that make up the business, with experienced people and experts involved in the specified business area, and it is a "general-purpose" systematized knowledge book that summarizes the business activities (business, process) as one document. This is not a mere glossary or related information collection, but "it is possible for experts and business managers to understand cross-functionally by comprehensively explaining the expertise of the business from an overall perspective."

The objectives of BOK, including POMBOK, are the following three points.

- Organizing the functions in the target business as a comprehensive standard knowledge system, and defining the common concepts, terms and business contents of the operations and management
- Benchmarking the skills required for management practitioners in the target business
- Education curriculum and utilization toward proficiency evaluation and recognition for management practitioners in the target business

## Background of POMBOK Publication

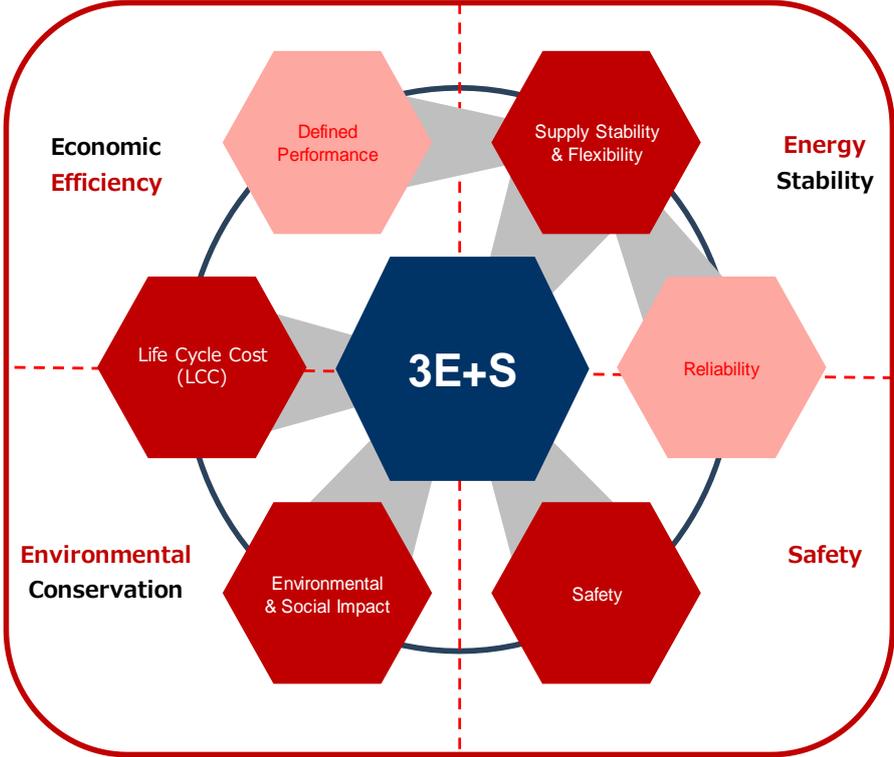
In recent years, the environment surrounding the energy industry has changed dramatically, and a review of power plant facilities and operations on a global scale has become necessary.

The United Nations Framework Convention on Climate Change (UNFCCC) Agreement reached during the 21st Conference of the Parties (COP21) in Paris on 12 December 2015 will have a significant impact on all thermal power plant operators. More and more, human activity is surpassing the capacity of the Earth. Community infrastructures such as energy, water, waste, transportation, information and communications technology (ICT), support communities. Community infrastructures that develop in line with population growth can sometimes have a negative impact on sustainability. They have a significant impact on economic and social development and are a means of ensuring the delivery of goods and services that promote prosperity and growth. Smart community infrastructures take into consideration environmental impact, economic efficiency and the quality of life. The International Organization for Standardization (ISO) is focusing on the development of the ISO/TR 37150 Smart Community Infrastructure Standard. Balancing the Economic, Social and Environmental challenges will be the key to sustainable development of our future communities.

Energy infrastructure, and especially thermal power plant infrastructure will be a significant focus point for any

smart community development. In order to realize the sustainable future of industry while meeting the commitments of the COP21 Paris Agreement, it is necessary to consider the balance between economic growth and social and environmental issues in the operation and maintenance of thermal power generation infrastructure.

The development of the Thermal Power Plant Operations & Management Body of Knowledge (POMBOK) is thus based on the key principles as defined in the figure below. The 3E+S or Economic (E) fficiency, (E)nvironmental Conservation, (E)nergy Stability and (S)afety principles form the core pillars which underpin the POMBOK.



In this figure, the relationship between "3E+S" and "6 elements" are also expressed.

"6 elements": Defined Performance, Supply Stability & Flexibility, Reliability, Safety, Life Cycle Cost, Environmental & Social Impact

## Object of POMBOK Publication

POMBOK shows a kind of operational standard knowledge framework, which will be the base of the thermal power plant business management (Operation and Maintenance) for the people who work in the thermal power plant industry to realize the sustainable society even under the rapid change of business surroundings.

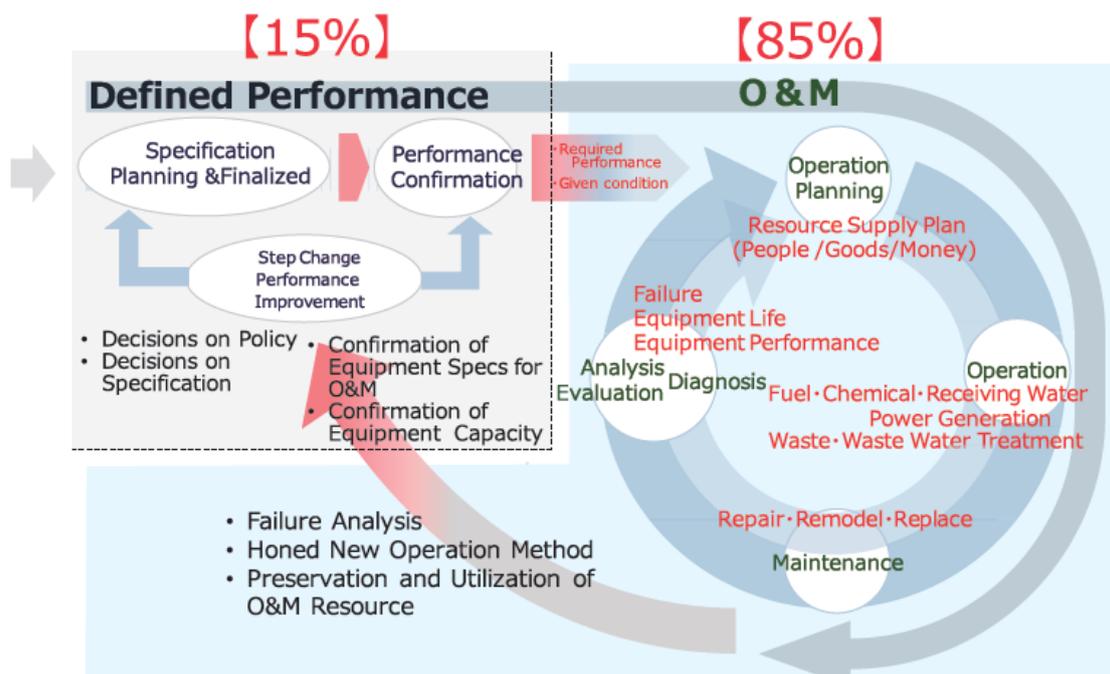
And this POMBOK defines the common concept for the operations & management, common wording in the industry and operational processes.

## POMBOK Framework

For capturing operational value chain of power generation operation, there are two main operational cycles, that is, Defined Performance and O&M (Operation & Maintenance).

Because the daily O&M activities (Operation Planning, Operation, Maintenance, Analysis/Evaluation/Diagnosis/Kaizen) and the requirements for the performance are linked closely, it's important to capture these two main cycles.

The (%) figures represent the proportion of the operating time of the plant.



In order to capture these operational value chain work processes within the POMBOK a simple framework has been defined.

The POMBOK Framework is structured around ‘Execution’ processes and ‘Management’ processes.

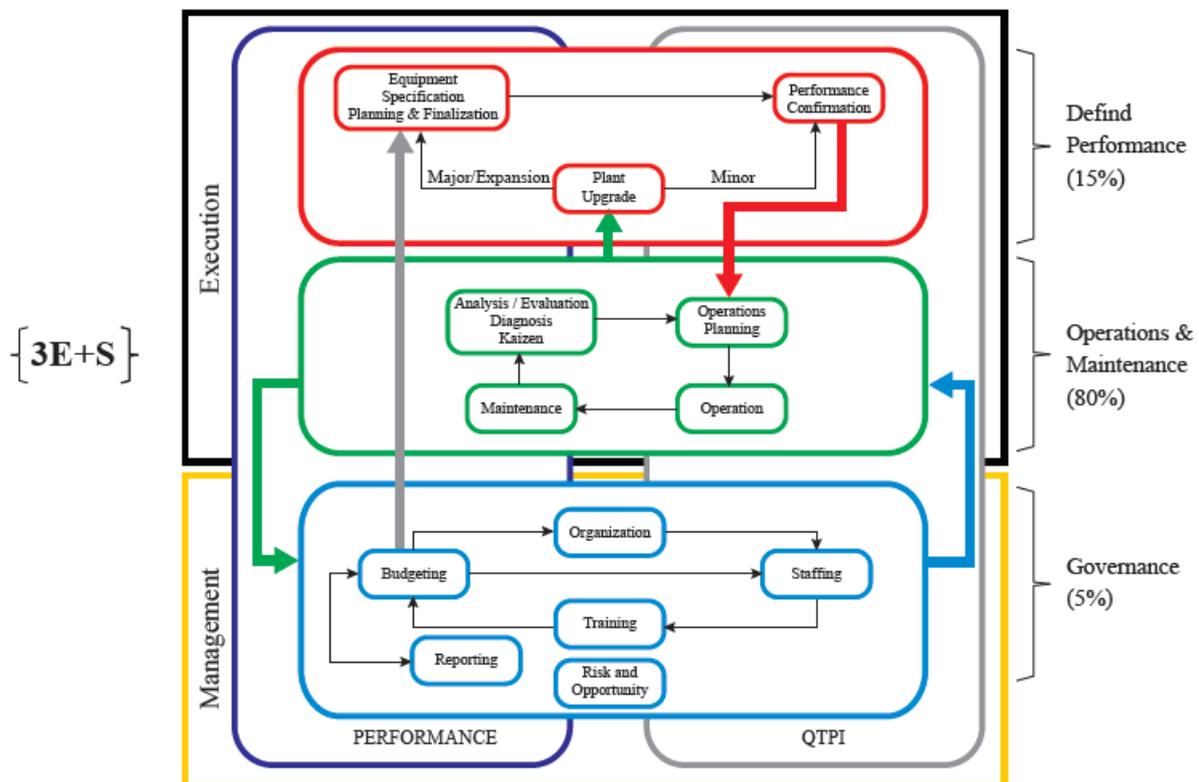
The Execution processes are those defined in the power plant operational value chain activities discussed above while the Management processes are the typical business management activities required to run a business i.e. organization structures, staffing, training, budgeting, reporting and risk management.

These Management processes define the companies Governance practices.

It is important to note that underpinning the framework is the 3E+S principles discussed earlier.

These form the 4 pillars of the framework.

The (%) figures represent where the emphasis or proportion of the normal O&M activities lie when operating and maintaining a power plant.



## POMBOK Content Chapter Descriptions

Introduction	Content	References
<b>1. Introduction</b> <ul style="list-style-type: none"><li>- Purpose</li><li>- Framework</li><li>- Taxonomy</li><li>- Objectives</li></ul>	<b>2. Defined Performance (15%)</b> <ol style="list-style-type: none"><li>1) Equipment Specification: Planning and Finalization</li><li>2) Plant Upgrade</li><li>3) Performance Confirmation</li></ol> <b>3. O&amp;M (80%)</b> <ol style="list-style-type: none"><li>4) Operation Planning</li><li>5) Operation</li><li>6) Maintenance</li><li>7) Analysis / Evaluation / Diagnosis / Kaizen</li></ol> <b>4. Governance (5%)</b> <ol style="list-style-type: none"><li>8) Organization</li><li>9) Staffing</li><li>10) Training</li><li>11) Budgeting</li><li>12) Reporting</li><li>13) Risk and Opportunity</li></ol>	<b>5. Appendix</b> <ul style="list-style-type: none"><li>- PMBOK</li><li>- Industry</li><li>- APEC Guideline</li><li>- Other</li></ul>

### Defined Performance

#### Chapter 1 : Equipment Specification – Planning & Finalization

This chapter will focus on two topics, namely, (i) Greenfield or new plant installations, and (ii) Brownfield or modifications to existing plant. It will deal with the equipment specification considerations to meet the defined plant performance requirements (e.g. heat rate, start-up / shutdown, loading rates, etc.), environmental and social considerations, disaster prevention and safety requirements and lifecycle cost (LCC) economic efficiency aspects.

#### Chapter 2 : Plant Upgrade

This chapter will focus on three topics, namely, (i) Minor Upgrade, (ii) Major Upgrade, and (iii) Expansion. It will deal with the drivers for the plant upgrade or expansion which could be plant performance related or required by applicable laws or regulation changes. The type of plant upgrade required will be defined by the extent of changes or modifications to plant that will be required and whether the upgrade can be carried out by own maintenance staff or external third parties.

### **Chapter 3 : Performance Confirmation**

This chapter will focus on three topics, namely, (i) Acceptance, (ii) Certification, and (iii) Take-over. It will cover the key activities required to accept that the desired plant performance is achieved after the plant upgrade is complete. If the plant upgrade is required due to applicable laws or regulation changes then external third party certification may be required. In addition, as part of the take-over process, the plant O&M manuals and training programmes may need to be adapted accordingly.

## **Operation & Maintenance (O&M)**

### **Chapter 4 : Operation Planning**

This chapter will focus on three topics, namely, (i) Production Plan, (ii) Resourcing, and (iii) Compliance. It will cover the general requirements to operate a thermal power plant. These will include the confirmation on plant specifications, the preparation and updating of plant O&M manuals, the planning and securing of the O&M personnel as per the defined organization and their training. Further, the power plant operational plan including plant shutdowns and outages, fuel resourcing plan and associated O&M costs will be covered in the chapter under the appropriate topics. In addition, the compliance requirements with applicable laws and regulations i.e. operational permits or license, will form an important element of this chapter.

### **Chapter 5 : Operation**

This chapter will focus on three topics, namely, (i) Routine, (ii) Non-Routine, and (iii) Emergency operational activities. It will cover the essential works and procedures required to operate the power plant in a safe, reliable, efficient and environmental compliant manner and to ensure that it operates within requirements of its operational permit or license and/or the Power Purchase Agreement (PPA) if applicable. These routine activities would include amongst others the daily operations, maintenance, testing, reporting etc. In addition, the chapter will cover the operational actions required to respond to a non-routine and emergency situations to ensure the prevention of any disaster.

### **Chapter 6 : Maintenance**

This chapter will focus on two topics, namely, (i) Planned, and (ii) Unplanned maintenance activities. It will cover all aspects required to perform maintenance interventions on equipment within the power plant either as planned or unplanned activities. These will include methods for equipment repair, upgrading and/or replacement, spare parts management and consumables. Maintenance activity scheduling particularly for minor and major outages for the prevention of unplanned plant shutdowns. Recording of maintenance logs will also form an important part of this chapter.

## **Chapter 7 : Analysis / Evaluation / Diagnosis /Kaizen**

This chapter will focus on two topics, namely, (i) Sources, and (ii) Analytics of plant data. It will cover the specification on which and what data should be collected and analysed and how to ensure the data collected is 'clean' data. The data may be sourced via equipment sensors, operations and maintenance logs, control systems and incident reports i.e. safety related incidents. The use of analytical methods and tools to analyse the data to solve problems, mitigate risks and move towards more preventive/predictive maintenance strategies will also form part of the chapter.

## **Governance**

### **Chapter 8 : Organization**

This chapter will focus on four topics, namely, (i) Structure (internal & external), (ii) Stakeholders, (iii) Functions (roles & responsibilities), and (iv) Governance. It will cover all the organizational aspects associated with operating and maintaining a power plant within the local environment and company strategy. These would include the roles and responsibilities of the various O&M functions and stakeholders both internally and externally. Company governance policies and procedures form an important part of this chapter.

### **Chapter 9 : Staffing**

This chapter will focus on two topics, namely, (i) Job Descriptions, and (ii) Employment Practises. It will cover the requirements for the various job functions within the O&M organization, including their respective skills and knowledge requirements. The Employment Practices will focus on recruitment, payroll, compensation & benefits, insurance, incentive or reward schemes, etc. processes and requirements to ensure the professional management of staff and compliance to local statutory regulations.

### **Chapter 10 : Training**

This chapter will focus on two topics, namely, (i) Skill Development, and (ii) Training Practices. It will cover the training requirements for the O&M organization. This will include the education methods & training techniques/courses, knowledge management and institutional learning to meet the requirements of the business as well as local statutory regulations. An important element of this chapter will be the definition of internal training courses and specific subjects which may be outsourced to external training institutions.

## **Chapter 11 : Budgeting**

This chapter will focus on three topics, namely, (i) Planning/Development, (ii) Controlling, and (iii) Auditing. It will cover the financial management processes for a power plant which includes the budget development, controlling and auditing. The financial planning would cover both short and long term financial strategy plans incorporating cash flow plans, insurances policies, capital allocations, profit & loss statements and balance sheets, debt financing, fuel cost planning, etc.

## **Chapter 12 : Reporting**

This chapter will focus on three topics, namely, (i) Internal, (ii) External, and (iii) Statutory reporting activities. It will cover all reporting requirements of the power plant within the power plant organization itself, externally to stakeholders i.e. owners, and to fulfil the local statutory requirements. The reporting process and regularity for the different internal and external stakeholders needs to be defined. Reporting would cover all the 3E+S aspects (refer section 1) of the power plant i.e. technical, financial, environmental and safety performance.

## **Chapter 13 : Risk and Opportunity**

This chapter will focus on the risk management approach to be followed by the O&M organization on all level. Risk management should again cover all the 3E+S aspects (refer section 1) of the power plant i.e. technical, financial, environmental and safety performance. It should also focus on internal and external factors taking both a short and long term view on the implications of the risks and opportunities for the power plant operations.

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