A Decade of Fruitful Network Asset Management in CLP Power

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The Power Systems Business Group (PSBG) of CLP Power has developed and implemented a structured asset management framework that has proved invaluable to the company's business performance. Over the last 10 years, PSBG has achieved more than 90% reduction in Customer Minutes Lost (CMLs) while simultaneously responding to a 20% load growth, expanding our assets, and maintaining our tariff competitive. PSBG has achieved such high supply reliability and cost effectiveness by continuously improving its asset management capability. In 2010, PSBG was independently accredited with a PAS 55 certificate for the optimal management of its physical assets.

This paper describes the implementation experience and critical success factors of PSBG's asset management system.

Introduction of CLP Power

More than a century ago, CLP Power (formerly named China Light & Power Company) was established to supply electrical power and street lighting to some of the residents in Hong Kong. Today, CLP Power operates a vertically integrated electricity generation, transmission and distribution business in Hong Kong and provides electricity to over 5.7 million people. Our network contains about 13,000 kilometres of overhead, underground and submarine cables that feed into more than 13,000 substations. Beginning in the 1990s, with a stronghold in Hong Kong, our parent company, CLP Holdings, has been expanding its energy business in China, and other Asia-Pacific countries such as Australia, India, Taiwan and Thailand.

A Decade of Asset Management Implementation

Before 1998, CLP Power's electricity supply business was served by three core Business Groups: the Transmission Group took care of the transmission network, the Distribution and Customer Services Group served the distribution network and retail business, and the Generation Business Group ran all the generating facilities. CLP Power restructured its organization in 1998 with the goal to enhance its marketing and customer services and achieve measurable improvements in the efficiency, reliability and quality of electricity supply. The Power Systems Business Group (PSBG) was established by merging the transmission and distribution functions, incorporating a central Asset Management Department (AMD) to better manage the combined T&D assets and capture the synergies of such integration. Network planners, asset planners and strategists were thus gathered together under the single AMD umbrella. This started our continuous performance improvement journey in asset management.

Since 1964, CLP Power has been operating under a Scheme of Control Agreement with the Hong Kong Government. The Agreement allows CLP Power a stable return for its investments as a vertically integrated electricity service provider. In 2002, in view of the electricity market reforms in North America and Europe which we envisaged would ultimately shape the electricity market in Hong Kong, PSBG reviewed its asset management processes so as to better prepare itself for a contestable operating regime. Based on the results of this assessment, a Strategic Asset Management (SAM) model was developed and adopted. In adopting SAM, several significant improvement actions were taken:

- Clearly defined roles of Asset Owner, Asset Manager and Service Managers. Partnership Agreements between Asset Manager & Service Managers were established to define the responsibilities and expectations of all parties involved.
- Consolidated the dispersed asset investment decision-making process. A centralized Investment Planning function was implemented. This avoided regional disparity of methods, priorities and duplication of efforts.
- Established a full life cycle asset planning process to create an integrated Asset Plan, thus avoiding the 'false economies' of chasing short-term cost savings that often result in higher O&M costs and performance problems subsequently.
- Established a risk management framework to standardize the PSBG risk management approach. This provided a consistent basis for investment and resource prioritization.

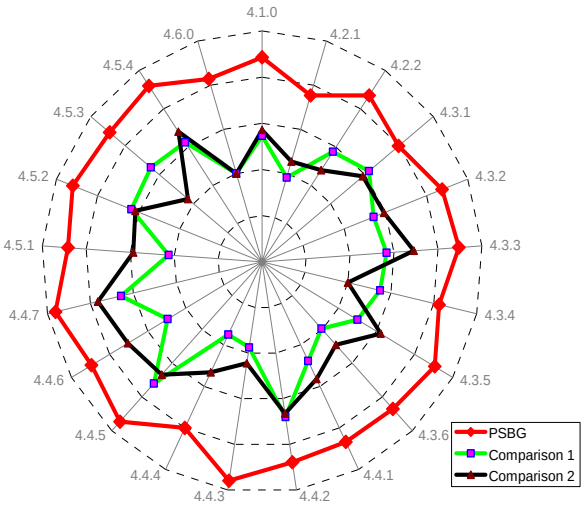
PSBG again reviewed its asset management model and practices in 2006, this time against the PAS 55 model. PAS 55 was, and still is, the only international standard for the optimized management of physical assets, first published in 2004 by British Standards Institution and subsequently adopted by, among others, the UK electric and gas utilities regulator. PAS 55 provides a comprehensive scope and a recognised, transparent and measurable definition of good practices, including the need for continual improvement. In 2007, CLP Power became the first Asian electric utility company to receive the PAS 55 compliance certificate. This involved an independent audit by The Woodhouse Partnership Ltd (TWPL), who also facilitated a subsequent roadmapping exercise to develop further improvement plans. Five strategic initiatives were identified to take the organization forward to higher levels of asset management excellence:

- Enhance Knowledge and Competency,
- Refine Capital Investment Process,
- Develop Innovative Supplier Relations,
- Optimise Maintenance Strategy,
- Achieve greater Engagement of Frontline.

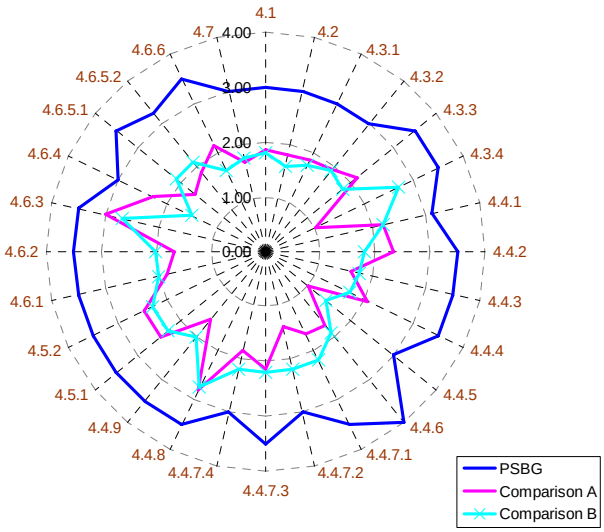
These programmes were all implemented successfully and followed-up closely to improve PSBG's business. PSBG was again assessed and accredited by TWPL in 2010, under the revised and extended PAS 55:2008 standard.

The results for PSBG's PAS 55 assessments in 2007 and 2010 are shown below, with benchmark comparisons against two similarly sized electrical utilities (the numbering relates to elements within PAS 55:2004 and PAS 55:2008 versions)

2007 assessment results:



2010 assessment results:



"The sustained accreditation demonstrates CLP Power's determination to pursue excellence in asset management. This will help us reach ever higher levels of asset optimization" said K.C. Wong, Manager - Asset Management, PSBG.

Critical Success Factors in Asset Management

Given PSBG's vision to become a respected world class organization in the delivery of electrical energy, it continuously pursues the best industry practices and has spent over 10 years developing and refining its asset management approach. The experience tells us that good asset management results are built upon a foundation of critical success factors.

1) Sustained Organization Commitment

PSBG has adopted and retained asset management as a business approach for more than a decade. Both the management team and the organization are committed to the principles and methods of asset management. Throughout the years, PSBG strengthened its capabilities through continuous improvements, regular reviews, benchmarking and incorporating good practices.

2) Organization Alignment

The Asset Management Department (AMD) has served as a centre of excellence for asset planning within PSBG. The functions of network planning, asset strategy formulation, investment planning, performance management, procurement and information system support are brought under a single organization structure with asset management as its business focus.

AMD looks after the whole life cycle of all T&D assets in PSBG. Network development and asset plans are prepared and published annually to guide our actions in meeting future demands and challenges. Operation & maintenance strategies and standards are updated regularly to reflect the ever changing asset portfolio and operating conditions. Investment plans and procurement strategies are reviewed closely so that PSBG can better utilize its capital and benefit from quality suppliers. Performance data are monitored and analyzed to measure the effectiveness of different asset management strategies and to provide constructive feedback to strategists and planners. All these core asset management activities are centralised and efficiently designed, implemented, managed, and monitored by AMD.

3) Change Management

Asset management has been a major driver for continuous improvement within PSBG's operations. Many of the improvements bring along changes to our business practices, e.g. changes in standards, procedures, technical skills, business processes, IT systems and organization structures. PSBG adopted a change management framework to better plan, execute, monitor, and adapt to the variety of changes. This provides a mechanism that effectively manages different types and sizes of changes, especially their impacts on safety, health, environment, security, regulatory compliance, plant integrity and reliability. It has strengthened our capability to ride through changes smoothly and efficiently. Undoubtedly, it also contributed towards the implementation of new asset management strategies.

The key steps of our change management are as follows:

- Changes are identified and risk assessment is performed;
- Control measures are devised to mitigate any risks identified and keep them at an acceptable level;
- Changes are documented, communicated to affected parties and training is provided as appropriate;
- The changes and their impacts are monitored during implementation.

4) Collaboration between Asset Managers and Service Managers

Close collaboration and effective communication between Asset Managers and Service Managers are vital to align the direction and actions across the PSBG organization. Communication mechanisms are established for all asset management activities. Building mutual understanding among stakeholders and gaining their support has been critical in joining up the jigsaw puzzle of different functional teams and their contributions. For example, when developing our asset management plans, the Asset Manager goes through 3 stages of communication as follows:

- Preliminary plan – used for consultation with Service Managers to collect their feedback;
- Draft plan – a refined plan for further discussion and consultation;
- Final plan – communicated with the frontline in road shows to solicit their support for implementation.

5) Information System Support

PSBG utilizes an integrated information system, the Enterprise Work Management System (EWMS) based on SAP, to support its construction, operation and maintenance activities. EWMS serves as our master asset register. It also captures and holds our cost and maintenance data, and provides various management reports for performance monitoring. EWMS has evolved to become a rich source of O&M cost and activity data. It was recognised in the PAS 55 assessments as having been particularly well implemented and exploited. Utilizing its historical cost data, we have built a set of O&M unit cost reports, which allow the users to review cost information from various perspectives and at different granularities. For example, we can easily obtain the average annual labour cost incurred in routine maintenance of a specific make of 11kV switchgear during any specified period. Such unit cost information can also be used to support various management and planning activities, such as budgeting of annual O&M expenditures or contractor scope management.

Other vital support systems include Automated Mapping / Facilities Management (AM/FM) and Trouble Call and Outage Management System (TCOM). AM/FM is a Geographical Information System used to maintain the master records of power line assets. It also provides additional functions such as network analysis, trench work management and outage display. TCOM is used to track customers' trouble calls, dispatch emergency crews and record outage information. TCOM contains detailed information of all outages, such as outage classification, duration, and number of affected customers. The data facilitates accurate measurement and in-depth analyses on our reliability performance.

All these systems allow better understanding of asset costs and performance over any given periods. This knowledge enables our planners to make informed decisions and strengthens our asset management ability. Our emphasis on having the fit-for-purpose information systems is reflected in our organization of IT services. In addition to central IT functions, there is a dedicated team within AMD whose responsibility is to identify and develop information system requirements and solutions. This ensures fit-for-purpose information systems and business processes to support effective asset management.

With excellence, we serve. CLP Power is committed to powering Hong Kong responsibly and providing the best services to our customers.

Our Challenges and Way Forward

In coming years, our business will see both new and on-going challenges in different areas:

- Excellent supply reliability and power quality must be maintained, if not improved. Supply reliability is ranked by our customers the most important element of our services. CLP Power's reliable services have very much become part of our citizens' everyday life and the slightest degradation will not be accepted.
- Following the world trend, Hong Kong Government is also taking a keen interest in the electricity industry. There is tightening regulatory oversight on CLP Power's investment & service performance.
- Customers expect a low tariff. Even a slight tariff increase (e.g. on par with inflation) may be negatively reported by media and criticized by pressure groups.
- The aftermath of the financial tsunami is lingering. While the world economy is still on uncertain ground, the governments' monetary policies may lead to substantial inflation. Commodity prices (for fuel and metal) and civil construction costs will be highly volatile.
- The expiry of the current Scheme of Control in 2018 or 2023 at the latest (if the Government elects an extension) may pose a new business framework for the power industry.
- To fulfil its social responsibility, CLP Holdings is answering the call for a better environment and is striving to reduce its carbon footprint. To support the Group's low carbon position, various green technologies and initiatives, usually at higher initial costs, have been adopted in recent years in the Hong Kong business. CLP Power's plan for a much lower carbon intensity in its generation portfolio by 2020 will further increase our cost pressure.
- Smart Grid initiatives are picking up speed in many countries. A wide range of smart devices and technologies may bring significant changes to our industry and our mode of operation.

To meet these challenges, the latest (2010) asset management roadmapping review identified our priorities ahead:

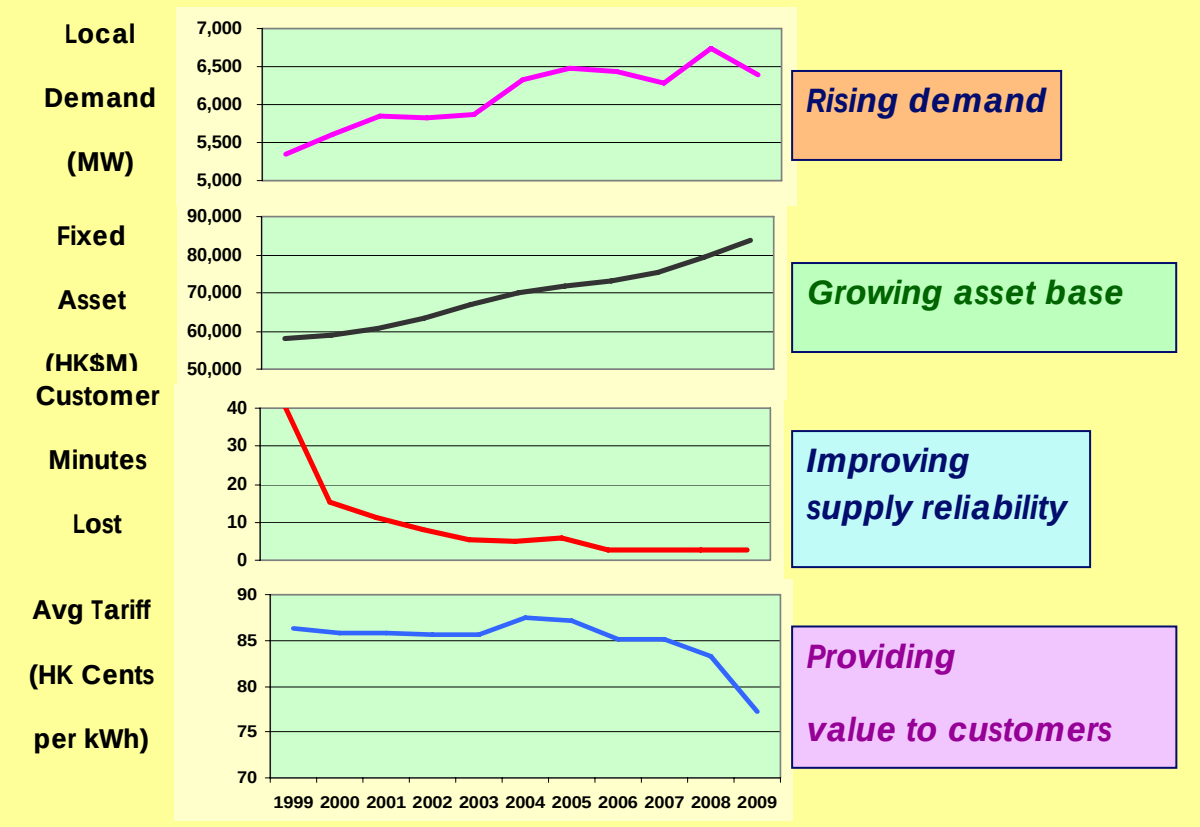
- Further enhance customer satisfaction and loyalty by understanding customers' values and proactively anticipating and meeting their needs;
- Maintain our network and assets in their optimal conditions to ensure reliable and quality supply for our customers;
- Further improve our condition-based maintenance (CBM) and asset-based risk management (ABRM) systems to optimise asset performance and associated expenditures;
- Implement prudent cost management measures (e.g. investment prioritization, better cost transparency, partnership with contractors) to control our costs;
- Develop our staff's technical expertise and commercial mindedness to handle future uncertainties in our business;
- Continue to explore and implement green and smart grid technologies.

Asset management will continue to play a vital role in our pursuit of excellence. We have adopted the strategy of minimizing the total life cycle cost of electrical equipment. Some past examples were the adoptions of gas insulated switchgear, XLPE cable, pole-mounted gas switch, etc. These are more robust equipment having fewer maintenance requirements, resulting in lower life cycle costs. We have adopted an Asset Based Risk Management (ABRM) scheme in which we prioritise our investments by analyzing the current and future conditions, performance and risk for our network assets. By adopting innovative online condition monitoring technologies, we can also continuously assess the real-time condition of equipment so that the appropriate maintenance can be carried out at the right time – striking the best balance between using the equipment to its maximum capability and minimizing disruption from possible failures.

We are more than 100 years young. The next hundred years for CLP is a journey for us to shape.

CLP Power's Performance in a Decade

The structured asset management framework has contributed much to CLP Power's success in the last decade. Today, Hong Kong is an energetic and prosperous city: our business and the electric power network have grown rapidly in response. Yet we also achieve very high supply reliability at an affordable tariff. The following charts summarise our key accomplishments.



Asset management experts from TWPL observed; "*PSBG are a shining example of outstandingly good asset management practices and processes - we are always impressed with the way they set themselves tough challenges and consistently achieve their goals.*"

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