Research on Bill of Engineering Quantity and Calculation Standard for Power Grid Marketing Project

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Abstract. As a construction project tender and valuation method, the bill of engineering quantity has been widely used at home and abroad. According to the relevant requirements of Power Grid Corp, in this paper, the bill of the engineering quantity of power grid marketing project and its calculation specification were studied and discussed. Coding rules, item name, item future, units, engineering quantity calculation rules and work content of Power Grid marketing project were mainly researched, compilation method of the bill of quantity was formulated, and the specification of engineering quantity for marketing project was formed. The paper provides standard and basis for the bid invitation and settlement review.

Introduction

Marketing project refers to the project of professional services for the marketing. Marketing projects accounts for a higher proportion in the total annual investment of Provincial Electric Power Company. In order to meet the requirements of “conglomerated operation, intensive development, lean-oriented management and standardization construction”, better promote the construction of standardized management system of the company's marketing project, strengthen project cost management, and unify the compilation and the valuation method of bill of engineering quantity for marketing project invested by the company, according to the relevant laws and regulations of the state, in accordance with the relevant provisions of the company, the bill of project quantity and calculation of the power grid marketing project are studied and discussed in this paper.

Power Grid Marketing Project Division and Coding Rules

Segregation of Items

Segregation of items refers to the regulation of items settings, layout order and layout position of the bill of project quantity. Power grid marketing projects mainly include electric energy measurement, power-use business, power supply services, market and energy efficiency, and intelligent use of electricity.

Electric Energy Measurement. Electric energy measurement mainly includes the construction and improvement of electricity information collection system, the popularization and application of electric energy meter and its supporting, the construction and improvement of measuring system, the construction and improvement of metering device, etc.

(1) Construction and Improvement of Electricity Information Collection System

Construction and improvement of electricity information collection system refer to covering electric information collection equipment to power consumers, and accessing collection system master station through the remote communication to realize the remote collection, analysis, detection and other automation applications of electricity information. It is an important part of the power utilization link in the construction of smart grid.

(2) Popularization and Application of Electric Energy Meter and its Supporting
Popularization and application of electric energy meter and its supporting refer to the improvement of measurement facility of power consumers. Traditional electric energy meter is replaced with intelligent electric energy meter. In addition to satisfying basic electricity metering function of the traditional electric energy meter, intelligent electric energy meter realizes the intelligent functions, such as power information storage, bidirectional multiple cost measurements, user terminal control, bidirectional data communication and anti-theft, so as to adapt to the development of smart grid and new energy.

(3) Construction and Improvement of Metering Device

Construction and improvement of metering device refer to construction and heavy repair of gate and customer electric energy meter, mutual inductor, secondary circuit, measurement panel (cabinet, box), popularization and application of new technologies to improve the measurement performance, so as to make the electric energy metering device meeting the requirements of related technical regulation, and effectively reduce the loss of the circuit and the zone area.

(4) Construction and Improvement of Measuring System

Construction and improvement of measuring system refer to construction, improvement and heavy repair of measurement laboratory, measurement equipment warehouse, on-site inspection, testing equipment and ancillary facilities. The main construction contents include the construction of the first level meter room of the provincial measurement center, the construction of the second level meter rooms of the city and county companies, and the construction of the third level meter rooms of power supply stations, as well as the measurement and verification laboratory, so as to achieve the centralized verification of power measuring instruments, unified distribution, intelligent storage, and specification of life cycle management of assets, effectively control measurement asset management quality risk, and improve the level of the lean management of electric energy metering.

Power-Use Business. Power-use business mainly includes the construction and improvement of marketing archives management, marketing customer service information collection engineering etc.

(1) Construction of Marketing Archives Management

Construction of marketing archives management mainly refers to construction of marketing archives office and configuration of archives equipment, which are used for marketing archives management.

(2) Marketing Customer Service Information Collection Engineering

Marketing customer service information collection engineering refers to collection, collation, entering and improvement of electricity production data and marketing information data, and realization of data homology.

Power Supply Services. Power supply services mainly include standardization construction and reconstruction of business outlets. Standardization construction and reconstruction of business outlets refers to construction and reconstruction of the power supply business halls and ancillary rooms with different levels of A, B, C and D. Main construction contents include business outlets infrastructure improvement, environmental construction, supporting service facilities configuration, service environment monitoring system construction, State Grid brand identity system construction, etc.

Market and Energy Efficiency. Market and energy efficiency mainly include electric power replacement demonstration project. Electric power replacement demonstration project refers to internal electric power replacement project with the promotion value, which is implemented to promote the company’s electric power replacement strategy, including coal-to-electricity, gas-to-electricity, oil-to-electricity and other projects.

(1) Construction of Port Shore Power System

Shore power system refers to using power on land to supply ships to satisfy the power demand of ships. This power supply system is called shore power system. The constructed system is applied to ships including cruise ship, container ship, bulk cargo ship and other ships; according to the voltage level, it is divided into two categories which are low voltage (400V) and high voltage (6.6KV/60HZ
and 6KV/50HZ). It mainly includes construction of power distribution room, power distribution system, shore power equipment management platform, control system and safety monitoring system. It effectively promotes the social energy conservation and emission reduction work, so as to improve energy efficiency, reduce the intensity of carbon dioxide emissions and reduce noise pollution, which has a great significance in the improvement of the quality of the port environment and the coordinated development of urban areas.

(2) Photovoltaic Power Generation System

Photovoltaic power generation system refers to a technique that uses the photovoltaic effect of semiconductor interface to directly convert light energy into electrical energy. It is composed of solar panels (components), controllers and inverters, and has sufficient resources and potential economic characteristics. It provides technical means for large-scale popularization and application of clean energy, which is of great significance to the country's energy development strategy.

Intelligent Use of Electricity.

Intelligent use of electricity mainly includes construction and improvement of charging system. Construction and improvement of charging system refer to construction of city fast charging station, scattered charging pile, expressway service area fast charging station, supporting grid access and charging intelligent service platform according to the overall development planning of urban and rural and the actual demand for charging, and necessary transformation of the facilities, so as to form a reasonable, scientific and efficient charging infrastructure system.

Coding Rule

We make list coding rules. The list item code is composed of 12 digits and it is divided into five grades, as shown in Figure 1.

Figure 1. List coding rule of power grid marketing project.

With the installation of electric energy meter in marketing electric energy measurement project for example, for “MD0101E11001”, the first grade MD means installation project of marketing project; the second and third grade 0101 mean marketing project division which is the electric energy meter in electric energy metering; the fourth grade E11 is list item name code; the fifth grade “001” is the feature sequence code of the list item. Specific as shown in Table 1 and Table 2.
Table 1. Power grid marketing project division and coding (part for example).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item coding</th>
<th>Item name</th>
<th>Main work contents and scope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Installation project of electric energy metering</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MD0101</td>
<td>Electric energy meter</td>
<td>Including installation, test and removal of electric energy meter, current transformer, current transformer bracket, and current transformer wiring</td>
</tr>
<tr>
<td>2</td>
<td>MD0102</td>
<td>Collection equipment</td>
<td>Including installation, test and removal of collector, collection box, communication junction box, air switch, 485 wire, shielding wire, protection pipe and bracket, hole and signal line.</td>
</tr>
<tr>
<td>3</td>
<td>MD0103</td>
<td>metering box</td>
<td>Including metering box and box door maintenance, floor maintenance, observation window maintenance, lock replacement, installation and removal of non-standard metering box.</td>
</tr>
<tr>
<td>4</td>
<td>MD0104</td>
<td>piping and wiring</td>
<td>Including grounding electrode, grounding stranded conductors.</td>
</tr>
<tr>
<td>5</td>
<td>MD0105</td>
<td>Grounding device</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MD0106</td>
<td>Meter storeroom facilities</td>
<td>Including removal of tray, intelligent meter cabinet, metering turnover cabinet.</td>
</tr>
</tbody>
</table>

Table 2. Name, code and features of power grid marketing project (part for example).

<table>
<thead>
<tr>
<th>Item coding</th>
<th>Item name</th>
<th>Item feature</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>E11</td>
<td>Electric energy meter</td>
<td>1. name 2. type specification 3. Working mode</td>
<td>piece</td>
</tr>
</tbody>
</table>

**Engineering Quantity Calculation and Bill Compilation**

Power grid marketing project is divided into two major categories of installation engineering and building engineering.

**Installation Engineering**

Installation engineering refers to assembly, installation and test works of equipment, pipe, cable and auxiliary device that constitute the production process system in electric energy measurement, power-use business, power supply services, market and energy efficiency and intelligent use of electricity. Taking the installation of electric energy meter as an example, as shown in Table 3, include Item coding: E11, Item name: Electric energy meter, Item feature: name, type specification and working mode, Unit of measurement: piece, project quantity calculation rules and work content: installation and adjustment of electric energy meter, single phase wire bonding, camera and check, production and installation of auxiliary current transformer and bracket, wiring installation, transportation, removal, cleaning, stacking.
Building Engineering

Building engineering refers to facility engineering of buildings and structures that constitute the construction project in electric energy measurement, power-use business, power supply services, market and energy efficiency and intelligent use of electricity, including decoration of meter storage, archives office, business hall and other buildings, and foundation construction engineering of meter storage. Taking site leveling as an example, as shown in Table 4, include Item coding: A11, Item name: site leveling, Item feature: soil type, Unit of measurement: square meter, Project quantity calculation rules and work content: earthwork excavation when level is below ± 30cm, site leveling, transportation on the site.

Compilation of Calculation Specification of Engineering Quantity for Power Grid Marketing Project

The calculation specification of engineering quantity of marketing project stipulates the regulations of the provincial power company marketing project quantity calculation, and the compilation method of engineering quantity list. It is applied to engineering quantity calculation activity of new and renovation project bidding and its implementation phase in electric energy measurement, power-use business, power supply services, market, energy efficiency and intelligent use of electricity. The specific composition is shown in Figure 2.
The calculation specification of engineering quantity of marketing project sums up the experience of application and management of quantities bill of marketing project in recent years, widely solicits the views of each local company, fully absorbs standardized application results of the company, achieves cost and quality separation and risk sharing of the project settlement, forms same caliber management means and work carrier of project bidding, engineering quantity process control and project settlement, effectively regulates valuation behavior of the bill of quantity, and further improves the engineering cost management level.

Conclusions
In this paper, coding rules, item name, item future, units, engineering quantity calculation rules and work content of Power Grid marketing project is researched, compilation method of the bill of quantity is formulated, and the calculation specification of engineering quantity of marketing project is formed. It is a standard basis for bidding control and settlement review. In the bidding stage, the bill of engineering quantity of power grid marketing project provides an equal and common foundation for the bidder's bid competition. The bill of engineering quantity requires the bidder to list the complete project and the corresponding number of the project entity, which provides information on the basic content, quantity and quality requirements of the proposed project to the bidders. It makes all the bidders have the same information, and the treatment is objective, fair and equitable.

References