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Code for Planning of Urban Electric Power

城市电力规划规范

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2 Terms

2.0.1 Urban electricity load

The sum of active powers consumed practically by all electricity users at certain time in city or urban planning area.

2.0.2 Load coincidence factor

The ratio of the integrated peak load of the power system to the sum of all respective peak loads in all sub-areas (or all users and substations) within the specified time period.

2.0.3 Load density

The quantization parameter characterizing the load distribution density, measured by the average electrical power per square kilometer.

2.0.4 Urban power supply sources

The generic term of power plants which supply powers to city and substations which receive powers from power system beyond the municipal administrative area.

2.0.5 Urban power plant

All power generation facilities occupying independent lands for planning and development within the city.

2.0.6 Urban substation

Substation and supporting facilities configured for transforming voltages, exchanging powers as well as collecting and distributing electricity in urban area.

2.0.7 Urban power network

The generic term for power networks at all levels for supplying power to urban users in urban area.

2.0.8 Distribution room

The distribution site with low voltage load, equipped with medium voltage distribution incoming and outgoing lines (few outgoing lines allowed), distribution transformers and low voltage distribution devices and mainly for distributing powers to low voltage users.

3 Basic Requirements

3.0.1 Urban power plan shall meet the general requirements of regional power system planning and coordinate with urban master plan.

3.0.2 Urban power plan compilation stage, period and scope shall be consistent with urban planning.

3.0.3 Urban power plan shall be compiled by urban planning and power sectors through negotiation according to the conditions of the local city in terms of property, scale, national economy, social development, regional energy resource distribution, energy structure and power supply and in combination with the recent construction schedule of power development planning and the corresponding significant power facility projects.

3.0.4 Arrangement of urban substations, power lines and various power supply facilities shall meet the relevant requirements of GB 8702 “Regulations for Electromagnetic Radiation Protection” and GB 9175 “Hygienic Standard for Environmental Electromagnetic Waves”.

3.0.5 Interference and influence on ambient environment from operating noises generated as well as waste water, exhaust gas and waste residue discharged from various power facilities newly built under planning shall meet the relevant requirements of laws and regulations concerning national environmental protection.

3.0.6 Urban power plan compilation process shall coordinate with planning for road traffic, greening, water supply, drainage, heat supply, fuel gas and communication, all of which shall be arranged comprehensively and share the space(s), and mutual influence and contradiction shall be dealt with properly.

4 Urban Electricity Load

4.1 Urban Electricity Load Classification

4.1.1 Urban electricity loads shall be classified according to urban development land property and consistent with the urban development land classification specified in the current national standard GB 50137 “Code for Classification of Urban Land Use and Planning Standards of Development Land”. Classified by industry and household electricity, the urban electricity load may be classified into electricity respectively for primary industry, secondary industry and tertiary industry as well as electricity for urban and rural residents living.

4.1.2 Urban electricity load may be classified into general load (uniformly distributed load) and point load according to urban load distribution features.

4.2 Urban Electricity Load Forecast

4.2.1 Power planning load forecast at urban master planning stage should cover:

- 1 Peak load planned for municipal administrative area and urban center;
- 2 Annual total power consumption planned for municipal administrative area and urban center;
- 3 Load density planned for urban center.

4.2.2 Power plan load forecast at urban detailed planning stage should cover:

- 1 Peak load within detailed planning scope;
- 2 Load density within detailed planning scope.

4.2.3 A main method supplemented with other forecast methods shall be determined for urban electricity load forecast to check.

4.2.4 Load coincidence factor shall be determined according to power load characteristics for power networks in various areas.

4.2.5 Selection of urban electricity load forecast should meet the following requirements:

- 1 Electricity load forecast method at urban master planning stage should be per capita power utilization index method, lateral comparison method, electricity elasticity factor method, regression analysis methods, growth rate method, load density method for unit development land and unit consumption method.

5 Urban Power Supply Sources

5.1 Urban Power Supply Sources Type and Choice

5.1.1 Urban power supply sources may be from urban power plant and power substation receiving the power system beyond the municipal administrative area.

5.1.2 Urban power supply sources shall be selected economically and reasonably by performing comprehensive research on the energy resources condition, environmental conditions and exploitation & utilization conditions of the local area.

5.1.3 For large cities by electrifying to system or supplying power hydraulically, local power plants with proper capacity shall be planned to construct so as to ensure urban electricity safety and the demand for peak regulation.

5.1.4 For cities with sufficient stable cold and thermal loads, power supply planning should be combined with heating (cooling) planning, and power plants for combined cooling, heating and power, with proper capacity shall be constructed and meet the following requirements:

1 For cities where power supply is mainly realized by coal (fuel gas), coal-fired (fuel gas) power plants for combined heat and power should be planned for development according to thermal load distribution, furthermore, such power plants shall coordinate with urban heat supply network.

2 For centralized development area or functional area under urban planning, medium and small combined power supply system for fuel gas cooling, heating and power should be planned by combining with cold and thermal power load characteristics with planned land features in functional area.

5.1.5 Renewable energy power plant may be planned for construction in cities with sufficient renewable resources.

5.2 Power Balance and Power Source Layout

5.2.1 In terms of power balance, the total power capacity required to be provided to the city from the regional power system shall be proposed according to urban master plan and medium-term & long-term plan for regional power system and by considering reasonable spare capacity based on load forecast; besides, regional power planning shall be coordinated.

5.2.2 Number and layout of urban power supply points shall be determined reasonably according to property, population and land layout of the city; multiple power supplies system shall be constituted for large and middle-sized cities.

6 Urban Power Network

6.1 Plan Principle

6.1.1 Urban power network planning shall be by layers and zones; clear power supply range shall be provided for each layer and zone while such layers and zones shall not be overlapped and staggered with each other.

6.1.2 Urban power sources shall be planned in synchronization with urban power network planning; land for power sources and corridor shall be planned for urban power network according to regional development plan and regional load density.

6.1.3 Urban power network plan shall meet the requirements of ensuring reasonable structure, safety and reliability as well as economical operation. Wiring for power grids at all levels should be standardized and shall ensure electricity quality as well as meet urban power demand.

6.1.4 Planning and construction of urban power network shall be brought into urban and rural planning as well as arranged and reserved reasonably with positions for substations, switching stations and power lines for voltages at all levels and lands according to urban network layout and pipeline integration.

6.2 Voltage Rank and Level

6.2.1 Voltage rank of the urban power network shall meet the requirements of the current national standard GB/T 156 "Standard Voltages".

6.2.2 Voltage transformation level shall be simplified, voltage rank sequence shall be optimized for configuration and repeated voltage reduction shall be avoided for urban power network. Voltage rank sequence of the urban power network shall be determined according to local practical conditions and perspective development.

6.2.3 Voltage rank beyond the target voltage rank sequence in urban power network plan shall be restricted for development and reformed gradually.

6.2.4 The top level of voltage in urban power network shall be determined according to long-term planned load capacity of the urban power network and the mode to connect the urban power network with the external power grid by considering the current status of the urban power network.

6.2.5 Capacity of urban power networks at all levels shall be configured according to certain capacity-to-load ratio, and the capacity-to-load ratio for urban power networks at all voltage ranks should meet those specified in Table 6.2.5.

7 Urban Power Supply Facility

7.1 General Requirement

7.1.1 Construction standards and structure selection for urban power supply facilities planned to be newly built or reconstructed shall match with the integral level of urban modernization construction.

7.1.2 Equipment selection shall be safe and reliable, economical and practical, with differences being considered. General equipment shall be used; namely, energy-saving & environment-friendly products with mature technology and seismic performance shall be selected and meet the requirements of relevant national standards.

7.1.3 Structural type and architectural appearance for urban power supply facilities planned to be newly built shall be selected to coordinate with ambient environment landscape according to geographic and geomorphic conditions as well as environmental requirements at the section where such facilities are located.

7.1.4 Design criteria for urban power supply facilities at region where natural disasters are frequent and sections where railway or bridge are crossed over shall be raised.

7.1.5 In the planning of power supply facilities, layout and accessing demands of urban distributed energy and electric vehicles charging station so as to adapt to the development of smart power grids.

7.2 Urban Substation

7.2.1 Classification of structural types of urban substation shall meet those specified in Table 7.2.1.

Table 7.2.1 -- Classification of Structural Types of Urban Substation

Category	Structural type	Sub-category	Structural type
1	Outdoor type	1	All outdoor type
		2	Semi-outdoor type
2	Indoor type	1	Routine indoor type
		2	Small indoor type
3	Underground type	1	Semi-underground type
		2	All underground type
4	Movable type	1	Cabinet-mounted type
		2	Complete type

7.2.2 Urban substations may be classified into those of 500 kV, 330 kV, 220 kV,

single distribution transformer should not exceed 1000 kVA.

7.5.3 Distribution room planned to be newly built should be indoor for urban center, residence community, high-rise buildings, tourist sites, street blocks with special requirements for city appearance and scattered big electricity users all with high load density.

7.5.4 Distribution room(s) planned to be newly built in public buildings shall be provided with good ventilating and fire-fighting measures.

7.5.5 Cabinet/pad-mounted distribution substation may be adopted if the urban land is rare and the existing distribution room cannot expand regarding capacity and it is difficult for site selection, besides, the capacity of single transformer should not exceed 630 kVA.

7.6 Urban Power Circuit

7.6.1 Urban power circuit is classified into overhead circuit and underground cable circuit.

7.6.2 Routing selection for urban overhead power circuit shall meet the following requirements:

1 Such circuits shall be erected along road, river and canal as well as green area according to urban landform and landscape characteristics as well as urban road network plan; the route shall be short, straight and smooth while its intersection with road, river and railway shall be reduced and it shall be avoided to cross buildings;

2 Dedicated passageway shall be planned for HV overhead power circuits of 35 kV or above while protection shall be provided;

3 HV overhead power circuits of 35 kV or above planned to be newly built should not pass through urban center, key scenic spots or central landscape area;

4 The zone with air being seriously polluted or buildings, stockyards and warehouses with explosive hazardous articles should be kept clear of;

5 Flood control and seismic requirements shall be met.

7.6.3 The corridor width planned for HV overhead power circuits of 35 kV ~ 1000 kV in internal single-pole & single-circuit type and horizontally arranged or in single-pole & multiple-circuit type and vertically arranged should be determined reasonably according to those specified in Table 7.6.3 based on the geographic location, landform, landscape, hydrological conditions, geologic and meteorological conditions as well as local land use conditions.

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