The Solar Energy Promotion Policy of Technical Standard System in China

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Abstract. In this paper, a series of reasonable design and high-operability technical standards are put forward, which make solar energy as a practical application project can be understood or measured by a complex technical standard system, and provide support for the planning, management and decision-making of the industry. It will give better way to the guiding role of existing policies, standards and norms, and improve the level of solar energy applications in the mainland. In these plans, they summarize the latest research and technical progress of solar energy promotion standard. These studies can provide strong support for decision-making in solar energy application planning and management.

1. Introduction
The promotion policies of solar energy application at home and abroad are summarized. Foreign solar energy promotion policies are mainly divided into mandatory government policies and economic incentive policies [1].

The mandatory policies made by legislative or administrative means require new buildings to install solar energy equipment [2]. In this case, the government usually does not provide financial assistance. As early as 1980, Israel issued the mandatory installation of solar water heaters. It is considered to be the first national mandatory law. According to the law, any new house less than 27 meters high must be equipped with solar hot water system. After more than 20 years of development, more than 80% of Israeli roofs are covered by solar collectors. At present, a huge and stable solar water heater market has been formed. On April 1, 2001, the federal government of Australia began to implement the mandatory renewable energy target, that is, new buildings must reach a certain level of building energy consumption to be approved for construction [3].

Economic incentive policies mainly include subsidies, tax preferences, low interest loans and the establishment of venture capital funds, etc., but the cost of implementing tax preferences and subsidies is higher, which is more suitable for the early stage of Industrial Development [4]. According to the European PV economic incentive policy, the electricity price is as follows.

International experience shows that legislation and long-term incentive based on law are more effective than short-term incentive [5]. The encouragement by government is helpful to the growth of the market, but the market is gradually mature on the basis of its own development. The role of the government should be gradually reduced. At the beginning of solar thermal market development, subsidies are effective. With the gradual expansion of the market, tax preference and legislation are better choices. Finally, in a mature market, the role of government should be similar to other construction products.
Table 1. Europe's PV grid electricity price.

| Euro-Countries | ITA | FRA | GER | UK | ESP | AUS | NEL | POR |
|----------------|-----|-----|-----|----|-----|-----|-----|-----|
| On-Grid Price (€/kW·h) | 0.28 | 0.35 | 0.227 | 0.268 | 0.37~0.46 | 0.33 | 0.43 | 0.47 |
| Ground-Based Power Station (>1000kW) | 0.422 | 0.45 | 0.22 | 0.268 | 0.37~0.46 | 0.47 | 0.35 |
| BIPV Subsidy or Proportion* (€c or %) | 20% | 50% | 9% | 46 | 19~46 | 38 | -- | -- |
| Upper Limit for Installed Capacity (GW/Year) | 3.1 | 0.8 | 3.5 | 0.5 | 2.5 | 1.5 | 1.5 | 1.0 |

*That’s the proportional upper-limit for subsidy.

2. The Domestic Solar Policy

The domestic solar energy policies review were above. In mainland, the solar energy policy of development and utilization mainly include policy and economic incentives by government [6].

For mandatory government policies, in the past two years, in terms of solar energy and thermal energy utilization, especially in the "2007 national solar energy heat utilization working conference" jointly held by the national development and Reform Commission and the Ministry of construction, many provinces and cities began to implement the mandatory policies of local governments. The enforcement policies of Hainan, Shenzhen, Jinan, Xingtai, Qinhuangdao, Sanmenxia, Yantai, Hohhot, Nanjing, Wuhan and other countries have been implemented. Including more than ten provincial, municipal and local governments [7].

Since 2009, the national development and Reform Commission, the Ministry of finance, the Ministry of housing and construction and the national energy administration have issued a number of important solar energy utilization policy documents. It includes encouraging solar photovoltaic power generation, supporting the combination of renewable energy and buildings, and promoting the combination of new energy construction and new rural construction. These mainly include:

The interim measures of the China Ministry of Finance on the administration of financial subsidies for the application of solar photovoltaic construction (Ministry of finance [2009] No. 129). The main contents are as follows: the central government arranges funds or subsidies for renewable energy from special funds. According to the standard of 20 ¥/W, it is used to support the integrated application of urban photovoltaic buildings and promote the demonstration of photovoltaic utilization of buildings in rural and remote areas. Foreign and foreign policies are as follows. Although the photovoltaic industry started late, we found that it has a late development advantage [8].

Table 2. The List of Related Policy for Solar Industry Overseas and Domestic.

| Country Year | USA | JPA | GER | ESP | CHN |
|--------------|-----|-----|-----|-----|-----|
| 1978 | The PURPA | | | | |
| 1979 | The End of the Fossil Era | | | | |
| 1990 | The Atmosphere Clean Amendment | | | | |
| 1992 | Energy Tax Law | | | | |
| 1993 | New Sunshine Project | | | | |
| 1995 | Green Government Action Plan | | | | |
| 1999 | City Bill of Solar Energy | | | | |
| 2004 | The EEG Law | The Energy Efficiency Regulations for Civil Building | | | |
| 2005 | The EPACT | The Renewable Energy Law | | | |
| 2006 | National Building Technology Law | | | | |
| 2007 | The Solar Pilot Program | Civil Building Energy Efficiency Regulations | | | |
| 2008 | EEG Amendment | The Regulation of Building Energy Efficiency | | | |
| 2009 | Renewable Energy Quota Method | | | | |

Notice on the implementation of the golden sun demonstration project (Ministry of finance [2009] No. 397) issued by the Ministry of finance, the Ministry of science and technology and the state
energy administration. Main content: the central government has arranged part of the special funds for renewable energy. According to the project, the grid photovoltaic power generation project will be subsidized with 50% of the total investment. Like the "golden sun project" demonstration construction, the promotion of photovoltaic projects is encouraged, and the total capacity of demonstration projects in each province is not more than 20MW. Combined with these incentives, the study shows that the grid connected photovoltaic power price will be significantly reduced as follows.

![Figure 1. Supporting Measures Waterfall (cumulative impact)](image)

In recent years, the provincial and municipal governments have also introduced relevant incentive measures. In Shandong Province, Jiangsu Province, Hainan Province, Zhejiang Province, Shanghai City, Shenzhen City, Yantai City, more than 20 provinces and cities have formulated solar energy development policy recommendations and incentives. They promote the development and utilization of local solar energy resources.

3. Solar Technology Standard System Research

The level of standard system is divided into basic standard, general standard and special standard. The basic standards have a wide range of guiding significance for solar energy application technology. For example, terms, symbols, units of measurement, figures, modules, classification codes, etc. are the regular components. The basic standards must conform to the construction standards reflecting the product requirements. That is to say, the terms, symbols, modules of construction products specified in this standard and the relevant provisions in this standard shall not conflict with the construction procedures.

The general standard is related to the superior and subordinate standards. Its main function is to put forward common requirements for building product categories according to building standards or other superstructure standards and regulations. Such as performance (safety, fire protection, health and environmental protection), quality level, and methods to meet the above requirements, such as general detection methods, evaluation methods, etc., the above requirements shall be included. The construction of a part of a general form has a functional common standard. It is used for building products, requiring performance, quality, grade, etc. and testing methods. However, as a limitation, there are no materials, processing and installation methods for construction products. At the same time, the third level of general standards plays a guiding and restricting role in the special standards. This is a master-slave relationship.

Special standards refer to specific individual standards issued by standardized products. According to the requirements of basic standards and general standards, prepare product standards according to the requirements of product standards. Special product standards shall include general requirements, test methods, test rules or quality assessment procedures, classification and coding signs, signs and labels, packaging, storage and transportation and other components, such as solar equipment unit curtain wall, roof, roof lighting, lighting components, etc. product standards are one of the typical products of the above categories.
Table 3. Standard of PV Grid Power Quality Specification Detailed Contrast.

| Parameter     | International Practice | CHN | AU | USA | UK |
|---------------|------------------------|-----|----|-----|----|
| V-Deviation   |                        | 12% $U_n \leq U \leq 10% U_n$ | 10% $U_n \leq U \leq 7% U_n$ | 6% $U_n \leq U \leq 10% U_n$ | 10% $U_n \leq U \leq 10% U_n$ | 2% $U_n \leq U \leq 2% U_n$ |
| Frequency Bias| ±0.1Hz                 | 49.5~50.5Hz | 50±0.2Hz | 59.3~60.5Hz | 50±0.5Hz |
| V-Fluctuation | 0.1%~7% $U_n$          | ≤3% $U_n$ | ≤3% $U_n$ | 0.1%~7% $U_n$ | ≤4% $U_n$ |
| Flickering    | $P_{st}=0.2$ ~ $2$    | $P_{st}=0.7/ P_{st}=0.9$ | $P_{st}=0.65$ | $P_{st}=0.2$ ~ $2$ | $P_{st}=0.65$ |
|               | $P_{st}=0.6/ P_{st}=0.8$ | $P_{st}=1$ | -- | -- | $P_{st}=1$ |
| $U_{THD}$     | ≤0.5% $\Delta U$      | ≤0.5% $\Delta U$ | ≤0.5% $\Delta U$ | ≤0.5% $\Delta U$ | ≤20mA |
| V-Unbalance   | $\varepsilon U=0.5%$ ~ $2\%$ | $\varepsilon U=2\%$ | -- | $\varepsilon U=3\%$ | -- |
| PF            | 0.85<$\cos \beta<1$   | 0.98<$\cos \beta<1$ | 0.8<$\cos \beta<1$ | 0.85<$\cos \beta<1$ | 0.95<$\cos \beta<1$ |

In China, more than 5 solar energy applications in national and industrial standards have been revised. Including technical code for solar photovoltaic system applied to civil buildings, technical code for solar heating engineering, civil building technology for solar air conditioning engineering, design code for passive solar buildings, evaluation standard for renewable energy building application engineering, photovoltaic modules for civil buildings, design and installation atlas for solar photovoltaic system of civil buildings. There are more than 50 projects in the application of revised local standards. For example, there are great differences in the quality standards of photovoltaic grid connected power generation at home and abroad. The comparison is shown in Table 3.

4. Conclusion
This paper systematically analyses the standard information system of solar energy technology in the United States, Germany, Japan and China. The information of the basic standard is analysed and screened. The standard database, information management and analysis of these four figures, time distribution, technology and category distribution, current situation of solar technology standard system are established. It is found that the solar energy technology standards of Germany and Japan are developing into national standards. It gives priority to or pays more attention to the development of photovoltaic technology and photovoltaic industry products. The codification of the two countries also presents a diversified development trend. However, in China, the output of solar thermal industry shows a more diversified development trend. In recent years, a large number of product standards have appeared in the above fields.

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