The Long-term Mechanism of Power Demand Side Management (DSM) in China

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Abstract:

Facing the nationwide continuous lack of power in the recant few years, the power demand side management (DSM) is making great contribution on releasing power supply pressure. However, compared with advanced power DSM in foreign countries, we obviously lack of long-term constitution to meet greatly increasing power demand which is caused by fast and continuous development of our economy and great improving of people's living. This paper analyzes the lack and importance of the long-term constitution on the power DSM in our country after expresses certainty on the periodic achievement of applying DSM. Then it elaborates the concrete measures to set up the long-term constitution on the power DSM.

Key Words:

Power Demand Side Management (DSM)
Long-term Constitution

0. Introduction

The State Council Premier Wen Jiabao first time set energy consumption index as one of the macro-control targets in this year's government work report of two Conferences (i.e. the National People's Congress and the Chinese Political Consultative Conference). The following Proposal for the 11th Five-year Plan definitely pointed out again that the index has to be decreased by 20 percent around to the year 2010. But the current energy-saving policy is still in the macro-level. In practice, it lacks of powerful supporting policies from the government such as financing convenience and financial compensation etc.. That makes it lack of private economic interests and more like morally required saving behaviors.

The executive of DSM has made active contributions to the electric industry of our country on saving energy and optimizing the allocation of resources.

1. The periodic achievement of applying Power DSM in China

In the early of 20th century, the Power DSM was led to our country and applied gradually. During the10 years from 1991 to 2000, the developing of Power DSM in our country has made great contributions to the sustainable development of the economy and power industry which has totally saved 130 billion kilowatt-hours, 60 million tons of coal, 1.3 million tons of sulfur dioxide less discharges.

Since 2002, the power in our country has been continuously deficient. For example, Shanghai Telecom has two main problems, lack of power in the peak time and larger and larger peak difference. As the measure to release the power over-demanding, the Power DSM got a great attention from the society. Each area, department and electric power states seriously carried out the assignment and requirement of power supply, took effective actions to transfer peak loading, decrease demands so as to assure the power consuming of people daily lives, agriculture and key units and stimulated the economic development.

2. We lack of the long-term mechanism on the power DSM

Although our country's DSM has made positive progress and obvious effects, DSM is not only the

major means to fill in the power supply gap and make the electric energy consumption in order, but also actually introduced to optimize the allocation of resources so that we could achieved the goal of energy saving and

environmental protection by enhancing the efficiency of end power consumption, optimizing the power consumption mix and taking effectively incentive measures.

However, compared with other counties which have developed DSM, ours is lack of long-term management mechanism which is rather tend to deal with short-term contradiction between supply and demand. There are two main problems as follows:

2.1 Lack of necessary supporting mechanism of law.

Legal measures guarantee the healthy development of power DSM. The countries where DSM is developing well such as America all have strict laws and rules. It is basic and important assurance to carry forward the work that we have to set up and improve the laws and rules supporting system from the worldwide viewpoints. For example, the United States successively introduced NECPA (National Energy Conservation Policy Act) and PURPA (Public Utilities Regulatory Policy Act), France issued Energy Development Orientation Act which all declare to reinforce the DSM. In contrast, as involving the interests of many social subjects, DSM in our country has no specific and operable supporting laws and rules so that we can't effectively stimulate the interest subjects' initiative and optimize all kinds of DSM resources.

2.2 Lack of powerful economic incentives.

As involving load transferring compensation, establishing of load management system and developing of power conservation products etc., the progress of DSM takes a certain amount of capitals input which actually requires lead and incentive on economic measures such as price, finance and tax etc.. The general practice abroad is to lead the users rather consume at valley than at peaks reasonably as often as possible by time-of-use, time of season, load interrupt and other price policies. In addition, it is also available to absorb users buy high-efficient utilities by loan preference and fiscal subsidies. A number of time- of use and discriminating pricing come out and improved recently have already been supporting the work of DSM to a certain degree along with the reform of electric pricing system accelerated everyday in our country. But the government supporting in the field of finance, tax and credit etc. is still quite weak, especially there is still no long-term stable special fund for DSM, which is just the main reason why DSM is still in the level of consuming in order so that we can't thoroughly optimize the allocation of electric resources and improve efficiency.

Therefore, if we want to make the DSM long-term more effective, we have to not only take it as an expedient to solve the current power supply and demand contradiction, but also keep the step with the advanced level worldwide and establish a long-term effective mechanism which becomes a strategic measure that accelerate the coordinated development of electric, economy, energy and environment, optimize the allocation of electric resources to meet the increasingly development of economy and electric demanding.

3. Measures for long-term effective mechanism

As there are two problems on long-term mechanism establishment of power DSM, with practice abroad, we future job of long-term mechanism of DSM should be emphasized on 4 main respects hereinafter:

3.1 Government directional measures

As the development of power DSM is a kind of social behavior of public welfare, it needs the lead and powerful stimulation from the government. Thus, the government is just dominant in power DSM. It is supposed to both take necessary leading measures to assure the executive of legal and economic measures effective and enhance social popularity of DSM and the users' enthusiasm in participation. It is also supposed to make a great environment for power DSM in the respects of laws and rules, system, standard, policy, monitor, cooperation, service and etc. so that power DSM could become a social behavior which people all participate.

Facing the peculiar energy crisis in 2001, the California State in the USA saved 5700MW electric power from peak shaving among which over 1100MW power demand is permanently reduced by DSM and long-term mechanism of it. Specifically pointed, a number of measures the government took all worked a lot on long-term energy saving. For example, they set up the strictest standard in America on building energy efficiency. It requires that architects and the erectors have to both focus on the parts where air-condition and electric heat trace often leak and reduce the sun radiation through the windows and attics. This could save 200MW extra power every year by forecast and reach 1000MW a year after five years. As no cost from the government, we may say it is the most profitable investment. In addition, the California State also raised minimal standards of many often-used electric equipment so that the average power consuming of the residents there rarely increased compared with that nearly increased by 50% in other states under conditions of

the same life quality. If the government make a huge investment in DSM，It will certainly bring a great amount of profit. The research shows if the California could invest one billion dollars in the project on energy efficiency, it will save 12 huge power-stations ten years and bring 12 billion dollars to consumers and merchants. The case tells us Government leading measures do greatly help the electric industry to improve the long-term effect on DSM. As the Chinese government usually has good capability for macro-control and policy executive, the directional measures will surely work a lot.

3.2 Improve the supporting mechanism of laws and rules step by step.

In the process of modifying <Electricity Law>, <The management methods of conserving electric power> and other laws and rules, We must give a clear definition of rights and duty of the interest-subjects, the working principle of DSM which make the management standardized and legalized. Thus, the power DSM can develop healthily and continuously.

3.3 Execute economic incentives that match our country

a. Policy of TOU rate (time-of-use)

Power Grid Corporations leading the DSM by leveraged rate needs to make new breakthrough in expanding the range of TOU rate using, imposing time of seasons rate, increasing the electricity rate of peak-and-valley points, introducing load interrupt rate etc..

According to the statistics on electric consuming in each period of time within 24 hours from all kinds of industry users in shanghai recently, raising the electric price of peak-and-valley for industry, non-industry and agriculture users to 3:1(Table 1) in order to encourage the users to transfer consuming in peak period of time so as to extend the moving Pinnacle and Fill Vale of the Electrical Power more efficiently, let's take an example of 35KV users---Shanghai Nanjing Dockyard, the previous price is 0.6yuan per KW/h (Table 2), of which 8 hours' electric power consumption is 32000KW/h and the charge is 19200yuan according to 4000KVA Electric Capacity assigned to the factory. After the new price system come out, the factory initiated to work overtime at night. As calculated as 60% of the day-time working, 4.8 hours' working time at night consumed 19200KW/h electric power and was charged 5683.2yuan. And 3.2 hours' daytime working consumed 12800KW/h electric power and was charged 12454.4yuan even it is all in peak period. So, the whole days' charge is 18137.6yuan which reduced 5.5% of the charge at previous price. Totally it could save 4 hundred thousand RMB a year.

Although the introduction of time-of-use reduced the income for power companies, it caused huge amount of economic and social profits on optimizing resource allocation by improving the average working hour of power equipment and Power Efficiency.

b. Awarding policy。

The users joining peak load shifting contribute to releasing the social electric power shortage, but they suffer a certain economic loss. Thus, on one hand, we have to put more emphasis on publicity of new situations and tasks so as to improve the conscientiousness in energy conservation socially and participation of peak load shifting. On the other hand we need to introduce awarding and punishing policies to assure the initiative of it.

The practice for moving Pinnacle of the Electrical Power first created by Jiangsu Province, which is 1yuan compensation for 1 hour's interrupt, got applied successfully for the work on meeting summer peaks in the year 2002 to 2003, which the effect of moving pinnacle is quite noticeable. However, Shanghai Electric Power Company don't neglect the negative effect on power shortage caused by 'three highs' (high cost, high energy consumption, high contamination) enterprises such as printing and dyeing chemical factories, mining machinery plants etc., which don't pay the electricity charges by rules, obligatorily limit or interrupt electric power consumption so that the demand of the residents and other emergency users could be assured.

3.4 Continuous breakthrough in technology.

Our electric power company needs to continuously make breakthrough in energy conservation technology as well as get government supporting and leading, supporting laws and rules being improved and economic incentives optimized so that we can radically optimize electric resource allocation, conserve energy and protect environment. For example, in early construction period, Nanjing Cigarette Factory used a large number of Metal Halide Lamps which has the problems on too much consumption of electric power, more faults, wasting air-conditioning drive energy and so on. From 2003, the factory started to conduct experiment in replacing Metal Halide Lamps with high-powered lamps. They respectively replaced 400W, 250W, 175W, 100W Metal Halide Lamps with 185W, 105W, 85W, 45W high-powered lamps and tested the Light and quality etc. after trial, the power saving rate is above50%. It has not only noticeable saving effect ,

Table 1 Electrical power rate of Shanghai Electric Grid（Two-part rate system user）

Sort			Under 400V	10KV	35KV	Above 110 KV
Price(RMB /kilowatt hour)	Peak Period (8:00-11:00, 18:00-21:00)	Industrial	1.013	0.993	0.973	0.953
		Non-industrial	1.039	1.019	0.999	0.979
		Agricultural （experimental）		0.730		
	Normal Period (6:00-8:00, 21:00-22:00)	Industrial	0.631	0.611	0.591	0.571
		Non-industrial	0.708	0.688	0.668	0.648
		Agricultural （experimental)）		0.448		
	Trough Perioc (22:00-6:00)	Industrial	0.306	0.301	0.296	0.291
		Non-industrial	0.309	0.304	0.299	0.294
		Agricultural （experimental）		0.242		

Table 2 Electrical power rate of Shanghai Electric Grid（Single rate system user）

Sort		Under 400V	10KV	35KV	Above 110KV
Price (RMB/kilowatt hour)	Normal industry	0.640	0.620	0.600	0.580
	ferro-alloys , calcium carbide, sodium hydroxide		0.465	0.445	0.425
	sodium hydroxide （ion membrane）		0.450	0.430	0.410
	synthetic ammonia		0.279	0.259	0.239
	Coal Gas		0.605	0.585	0.565
	illumination	0.820	0.800	0.780	0.760

but also more convenience, much lower maintenance cost and drive energy of air-conditioning conservation. It made integrated plan on energy saving reform of lightening equipment which was introduced gradually. As calculated, after reforming over 900 lamps, the electric load will decline by 170KW so that they can save over 1.3 million KW/h electric power and 6 hundred thousand charge a year. Therefore, we power plants and power grid enterprises should actively introduce talent, conduct foreign technological exchanges, assure the capital for R&D and catch up advanced saving technology in developed countries. Meanwhile, we need to make the research results match our actual situation in electric industry, introduce results as half step and walk faster to increase the effect of DSM.

In the long term run, limited by all kinds of factors like coal, earth, water, environment space and capital etc., it can't meet the fast increasing electric demand of our country to set up electric plants.

Energy conservation-oriented is the only way for electric industry and social economy to develop continuously. The establishment on long-term mechanism of power DSM can not only significantly increase social efficiency of power consuming, effectively reduce the pay of resources, environment and fund, but also make a cooperated and optimized integration of supply and demand. The mechanism which could directly stimulate people to join the establishment of conservation-oriented society must proceed consistently and thoroughly in any supply and demand situation. In this sense, it is a long way ahead.

4. Conclusion

Electric conservation is a kind of both valuable implicit and more economic resource. The practice abroad shows, the investment in saving 1Kilowatt capacity is even less than 20% of the cost in increasing 1 kilowatt capacity, and the investment in saving 1kilowatt is around 40% of the cost in generating 1 kilowatt power. Therefore, as a developing country where it is a shortage in per capita energy resource, consistently carrying out DSM and deeply developing this kind of treasure is a long-term strategic task from now on.

Although recently the power DSM has made noticeable progress, compared with higher requirement of energy conservation-oriented society and the countries which did it wonderfully, we must note that the depth and breadth of the work we did is still not good enough, which there are still a lot of problems and obstacles more or less, especially the long-term mechanism is too weak. The practice abroad tells us that the establishment and improvement of long-term mechanism is the key and essential assurances. In a word, the long-term mechanism is the urgent work of our power DSM facing directly.

References

1) <The International Experience and Revelation of DSM>, Economic Operation Bureau Apr. 2006.

2) <Enhancing Power Demand Side Management and Relieving the Contradiction of Demand> Economic Operation Bureau Apr. 2006.

3) <Power DSM>, Issue 3 May 2004, Issue 5 Oct. 2003.

[4] http://www.dzyd.com/