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Abstract. The ecological compensation mechanism of reconstructing small hydropower is different from each other in different places. In this paper, the status quo and problems of the green reconstruction of small hydropower are analyzed in combination with the study of typical individual cases. Meanwhile, the feasibility of the compensation mechanism of small hydropower green transformation under the protection of ecological flow is discussed.

1. Introduction

At present, our country is in the all-around deepening reform, vigorously promotes the ecological civilization construction the brand-new stage, the green energy will become China and even the global future energy development new tendency. Figure 1 shows the world's main countries' hydropower capacity in 2017. By the end of 2017, the world's hydropower capacity had reached 1267 GW. It is expected to produce clean electricity of 4185TWh. The scale of hydropower installed in China is 341GW. The proportion of the total installed capacity in the world is 26.91, ranking first in the world; The second is the U. S. hydropower installed capacity of 103 GW, accounting for the world's total installed capacity of 8.13. Generating from water and electricity In terms of electricity, hydropower in China generates 1194.5 TWhs of electricity in the world's major countries, accounting for 28.5% of the world's total output.

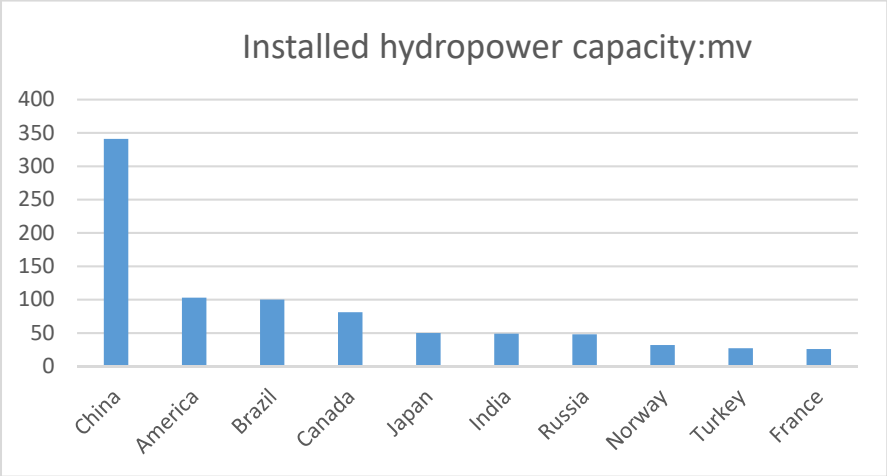

Figure1. Installed capacity of major hydropower countries in 2017

At present, our country has built up 47 073 hydropower stations and the total installed capacity is up to 7322x104kw. However, restricted by the development concept, technology and funds in the past, some small hydropower stations in the river basin are facing a serious crisis. The disorderly development, unreasonable layout and other abuses in earlier time have become increasingly obvious, causing irreversible damage to the ecological environment. For a long time, the intensive construction of small hydropower stations blocks the whole ecological chain of the river, and even the surrounding ecological environment will be seriously damaged. It is difficult to restore the initial environment of each small hydropower station, but the ecological impact will never end once the construction of these small hydropower stations have been constructed.

River ecological flow refers to maintain the natural river or lake ecosystems and human survival and development depends on the quantity required, time and quality of the declaration of Brisbane (2007). The concept of river ecological flow not only refers to the minimum ecological water demand but include whole flow of rhythm,including the low water, smooth water and flood peak flow. The core idea is to propose the recommended value of the flow to maintain the ecological health of the river from the perspective of maintaining the minimum flow requirements of aquatic organisms. The concept of "environmental discharge" and "ecological water demand" in China was put forward in the 1970s. The ecological flow in China is mainly analyzed from the point of view of ecosystem stability and water balance, and some achievements have been made.

2. Current situation and existing problems of the compensation mechanism construction of small hydropower green transformation in China

The ecological compensation mechanism of green small hydropower development is different from each other. Some localities have adopted special government funds to support the construction of ecological hydropower demonstration areas, while others have set up an ecological electricity pricing mechanism. At all events,the comprehensive consideration of ecological flow and attention from relevant departments are indispensable.

Synthesizing the present situation of the small hydropower green transformation compensation mechanism in various parts of our country, we found that there are the following problems:

2.1. Lack of strong financial guarantee for ecological compensation

As China's small hydropower green transformation is still in its preliminary stage, relevant compensation mechanisms have not been formulated uniformly. In the practice of ecological compensation, there is basically no participation of social capital and no standardized payment market for ecological services. The lack of a strong financial guarantee has limited the implementation area and scope of ecological compensation in various regions. At the same time, the lack of compensation for the loss of income caused by the sacrifice of development opportunities of rural small hydropower

operators has also led to the lack of motivation for the transformation, making it difficult for small hydropower green transformation.

2.2. Lack of diversity in the channels of ecological compensation

In view of that present, the ecological compensation channel can be mainly divide into the state to pay for the financial transfer of the ecological protection area and the people's government of the beneficiary and the regional and the ecological protection area to compensate the people's government in the area of ecological protection through consultation or according to the market rule. However, due to the imperfect financial subsidy structure of the state for ecological protection areas, there are many loopholes in special fund matching and so on, which urgently needs to establish a new ecological compensation public fiscal revenue system. In addition, the market rules are hard to making, water and other natural resources value, in the direct value and indirect value is often difficult to reflect in the price of the system.In short, the unification of the country and the specialized control are difficult to meet the individual needs of the ecological reserves, while the hands of the laissez-faire market are regulated, and the market mechanism is not perfect and difficult to perfect in a short period of time.

2.3. imitations of the management system

In recent years, although the state is making efforts to improve the defects of unclear division of powers and responsibilities of government departments, the responsibilities between departments are not clear, and the phenomenon of playing football still exists. Under the existing management system in our country, wading management departments including the ministry of water resources, geology and mineral, nine departments such as administration of the state oceanic administration, environmental protection, coupled with a little green water and electricity transformation compensation mechanism in the process of building the ecological and environmental protection department, the department of funding needs, such as departments of compensation mechanism to build has a certain jurisdiction, and each department has its own set of procedures and methods, both hinder centralized management, and is not conducive to increasing the efficiency of funds.

2.4. Protection system of ecological compensation such as laws and regulations is not perfect

There is no special legislation on ecological compensation in China at present. With the deepening of the construction of ecological compensation mechanism and the increasingly severe ecological problems, it is urgent to perfect the legislation on ecological compensation. At present, the laws and regulations related to ecological compensation in China are scattered in many laws. The content of the law is not perfect. In terms of the compensation standards for small hydropower basins, people in the protection areas cannot directly benefit from them. In addition, the current ecological compensation legislation is more ornamental than practical, and the rights, obligations and legal responsibilities of all parties are not clearly explained, thus reducing the effectiveness of the law.

3. The premise of establishing compensation mechanism for small hydropower green transformation: To guarantee ecological flow

Small hydropower construction in China and the development work in the replacement of traditional energy use of clean energy such as water and electricity, etc have important contribution, but as a result of the early neglect ecological benefits, the excessive pursuit of economic efficiency, and downstream of small hydropower surrounding water environment and ecological system have caused the pollution and destruction, with the growing national awareness of environmental issues and their needs of the construction of the hydropower station, the construction of small hydropower green transformation mechanism must abide by and enforce relevant laws and regulations, set up the special ecological flow relief hole, in the protection of the ecological flow under the premise of the downstream of the damaged due to hydropower development of ecological environment in ecological compensation. This paper will take the typical location of green small hydropower station in 2017 as an example.

The Jiufeng Hydropower Station in Jinhua City responded positively to the "Jinhua City Water Conservancy and Fisheries Bureau's notice on promoting the three-year action plan for the establishment of green small hydropower stations (2018-2020)". Since 2014, Jinhua City has invested 72.24 million yuan to rebuild 117 small hydropower stations. Through ecological transformation, 16 new sluice holes for ecological discharge, 2 new ecological dams and dams, 16 rivers were repaired, and 18 hectares of dewatering section were repaired. It can effectively improve the riverbank environment of the lower reaches of the power station, and ensure the downstream production and life and landscape ecological water use. In addition, Jinhua City actively promoted the "problem power station" orderly withdrawal. It formulated a "one-stop, one-strategy" implementation of the establishment of the program. According to the actual situation of different power stations, the time node is defined, the responsibility to the people is carried out, and the "one station, one policy" is established and implemented.

4. Feasibility of establishing compensation mechanism for small hydropower green transformation under ecological flow

4.1. he state has stepped up its supporting policies, and the policy environment has improved.
In early 2016, the central no. 1 document proposed "developing green small hydropower". Over the past two years, the ministry of water resources has issued the guidelines on promoting the development of green small hydropower and the guidelines on rural hydropower capacity expansion and river ecological restoration, aiming at the establishment of green small hydropower stations.It can be seen that the state is providing full protection for the establishment of the compensation mechanism for the green transformation of small hydropower. It is believed that local governments will also issue supporting policies as soon as possible to accelerate the establishment of the compensation mechanism for the green transformation of small hydropower under the protection of ecological flow.

4.2. Continuous progress is made in the green transformation technology of small hydropower, and the ecological damage in the transformation process is being reduced as far as possible.
With the development of science and technology, whether the detection technology of ecological flow or small hydropower green transformation technology is in rapid development, which to protect the ecological flow under small hydropower green transformation provides a strong technical support, in the protection of the ecological flow of green transformation smoothly under the condition of small hydropower stations, the resistance will greatly reduce the compensation mechanism. At the same time, the technological progress brings down the cost and reduces the destruction of ecological chain, which will reduce the expense of ecological compensation and reduce the pressure of establishing compensation mechanism.

4.3. People's urgent need for a good ecological environment in areas with small hydropower.
With the continuous development of social economy and the continuous improvement of people's living standards in China, especially in recent years, the country attaches great importance to ecological environment, making "green" deeply popular. People abandoned the old idea of "green water and green mountain for silver mountain", and the idea of "green water and green mountain is silver mountain" took root in people's mind. In regions with small hydropower, people in this region are more urgent for a good ecological environment due to the ecological damage caused by previous restrictions on small hydropower technology. Therefore, under the condition of perfect supporting facilities, the initiative of small hydropower green renovation is strong, and the resistance of the compensation mechanism will be reduced.

5. The construction idea of the compensation mechanism for small hydropower green transformation under the guarantee of ecological flow.

According to the basic situation of China's small hydropower construction, it is urgently needed to

construct a new mechanism of green small hydropower construction with government guidance, enterprise main body, standard leading position and policy support through the establishment of work so as to achieve a win-win situation of ecological benefits and economic benefits. In order to implement the requirements of green development, ensure ecological flow, and improve the compensation mechanism for small hydropower green transformation. We need to do the following:

5.1. We will strengthen policy guidance and support, strengthen monitoring, supervision and assessment, and improve relevant laws and regulations.

Pilot projects for the transformation of small green hydropower plants have been set up nationwide to stimulate the initiative of the people with practical results.The government must be in full consideration on the national conditions of small hydropower construction in China, through scientific planning and design, establish and improve the incentive and guarantee mechanism, strive to in the regulations, and improve the mechanism of ecological compensation, ecological compensation mode, scientific definition of ecological protectors and beneficiary rights and obligations, to speed up the formation of ecological damage compensation, pay beneficiary, or guardian get reasonable compensation mechanism.Safeguarding the vital interests of the people in the ecological zone.We will pay close attention to the decentralization and use of special national funds for ecological compensation.In terms of policies, we should guide the investment of funds precisely, and strengthen the supervision and inspection of the implementation of laws, regulations, standards and norms of small hydropower.The key point is to inspect and supervise the protection of ecological water demand of small hydropower.

5.2. Each area formulates the standard of small hydropower that has specific aim according to oneself circumstance.

On the premise of meeting relevant requirements,we should formulate the green small hydropower standard and issue the minimum discharge standard according to local conditions. In consideration of characteristics of different rivers in different watersheds,the ecological flow should be timely verified and dynamically managed,the minimum discharge and regulation principles of power stations should be stipulated in order to ensure ecological water use.

6. Prospect of the compensation mechanism of small hydropower green transformation under the guarantee of ecological flow

At present, the development of small hydropower has been highly valued.The ministry of water resources has made a new strategic plan for the development of small hydropower in China.By 2020, China will build 300 small hydropower counties with an installed capacity of more than 100,000 kw, 100 large small hydropower bases with an installed capacity of more than 200,000 kw, 40 super-large small hydropower bases with an installed capacity of more than 1,000,000 kw, and 10 small hydropower provinces with an installed capacity of more than 5,000 kw.

The plan also defines the development of rural hydropower and the implementation of small hydropower generation fuel ecological protection projects. By vigorously developing small hydropower. It is planned to add 78.1 billion kilowatt hours of electricity a year by 2020, solve the problem of domestic fuel for 104 million rural residents, reduce firewood cutting by 149 million cubic meters per year, reduce carbon dioxide emissions by 41 million tons, and gain 36 billion yuan in ecological benefits.

After the establishment of the compensation mechanism for the green transformation of small hydropower under the protection of ecological flow. The green transformation of small hydropower will be vigorously promoted to balance the interests of all parties and promote the substantial development of China's small hydropower.

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