

## **Diversification Development and Utilization of New Energy in Rural Areas——Taking Qinhuangdao City of Hebei Province as an Example**

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**Abstract.** Development and utilization of new energy is to optimize the energy structure, an important measure to improve the quality of the environment. Universal application of new energy technologies in rural was targeted in Qinhuangdao City of Hebei Province. The promotion of rural biogas digesters, solar and hybrid of multiple energy, straw energy utilization, utilization of three marshes, technology product development of new energy, wind power, photovoltaic power generation were continuously explored, and so on. A model of diversified development and utilization of new energy was created, gradually matured, and made many successful experiences. For the existing problems of the development, such as: the lack of matching funds and working funds, large biogas supervision needs to be strengthened, property management staff technology needs to be improved, those improvement measures were proposed, the strengthen guidance and support of the government, strict project management, broaden investment channels, constructing the system of the research, increasing assistance of awareness and training, and promoting variety of business models, etc.

In recent years, the problem of air pollution is serious and fog and haze frequently arises. These situations seriously affect the environment security and threat to people's health. Development and utilization of new energy sources, reducing coal and the use of clean fuel are the key to solve the haze and other air pollution problems. Qinhuangdao City of Hebei Province vigorously promotes new energy model in rural areas, creates diversified development and utilization mode of new energy, accelerates the new energy-based clean energy and low-carbon economic development. Those contribute to the modern agriculture development and the rural energy conservation, bring significant economic and environmental benefits for the community[1-2].

### **Diversified development and utilization of new energy in Qinhuangdao city**

#### *Improving construction and management to the rural biogas*

Qinhuangdao City, in accordance with the requirements of the national and Hebei Province, constructed the projects of rural household biogas of state debt, large and medium-sized biogas project and the joint household biogas project. In 2013, more than 2450 household digesters were constructed and repaired, 250 new digesters and 285 straw briquette stoves were built, 400 old digesters were transformed and 3 biogas customer service outlets were created. The management of rural biogas digesters was strengthened in winter so that the utilization of biogas was improved.

#### *Carrying out the construction service station of rural biogas*

Project Bonds were well implemented in Qinhuangdao, in 2013, 40 biogas service stations that assigned by the State were established, which distributed in different regions. Checking must be

performed on rural biogas service system basis of self-checks of the counties. In the inspection process, identified the problem and found a solution.

#### *Promoting demonstration on pluripotent complementary heating -room*

For the promotion of solar energy complementary heating-room, multi-sector strengthened the technical guidance, solved problems and ensured that the design specifications and attractive appearance for demonstration households. In 2013, 26 demonstration households of solar energy complementary heating room were implemented in Qinglong, Lulong, Funing and Shanhaiguan, and building area reached more than 3,000 square meters. Currently, 400 households of solar energy complementary heating-room were built, and construction area reached up more than 50,000 square meters.

#### *Constructing demonstration base in utilization of biogas fertilizer*

New energy technologies, new energy projects and new energy research were continuously combined with the development of ecological organic agriculture. Government encourages the enterprises and the individuals to develop biogas fertilizer, and full use of the resources. The biogas residue, biogas slurry and biogas fertilizer were used in ecology agriculture, organic agriculture and recycle agriculture. The demonstration bases of biogas fertilizer were constructed, and the farms of biogas fertilizer docked with utilization demonstration bases. In recent years research, Changli Country have developed some special biogas fertilizers such as Leafy special, special fruit vegetables, root vegetables dedicated, fruit trees dedicated and hyperkalaemic. Up to now, there are some demonstration bases of utilization of biogas residue and biogas slurry, such as Haosongzhuang strawberry, Mafangying cucumber, Yangoutun fragrant-flowered garlic and Dayuzhangzi tomato. The area of utilization of biogas residue, biogas slurry and biogas fertilizer has over 130,000 mu.

#### *Actively developing projects of wind power and photoelectric*

In recent years, Qinhuangdao fully used wind and solar resources, and promoted the development and construction of wind power and photovoltaic. First-stage project of Changli County beach wind farm and Lulong County Lulong town wind farm project have been completed in succession. Photoelectric projects of Ligezhuang Village and Shangfangzi Village have started construction, and the total investment is about 357 million yuans, and covers an area of 600 mu, the installed capacity is 40,000 kilowatts. The photoelectric projects of Sanbazi Town and Liangshuihe Town of Qinglong Country are planning installed capacity of about 200MW and total investment of about 20 billion yuans.

#### *Actively commencing to work in technology development and demonstration of new energy*

Qinhuangdao is constantly developing new technologies and methods of new energy utilization. By promoting the technology of solar energy complementary heating-room, the equipment of collector walls and ventilation holes of aluminum assembled have successfully tested in Lulong Country. Around the comprehensive utilization of corn straw, the straw briquetting machine of diesel-powered flow-type was developed. 11 villages have promoted straw briquette heating mode, involving more than 2,000 households. There were 4 projects of straw semi-gasifier, which 3 projects of the straw semi-gasifier and biomass heating boilers had marketed, and it can save energy by 34%. The discharge machine of biogas residue and slurry was developed to improve the use efficiency of biogas digesters and the level of follow-up management.

Qinhuangdao actively promoted the construction of new energy demonstration village, In 2013,

there demonstration villages of solar street light were built, and over 40 solar street lights were installed. More than 700 households, five demonstration villages involved construction of straw replace coal heating in Fu-ning, Lu-long and Shan hai-guan, and solved the heating problems of the villages, but also achieved energy saving and emission reduction.

*Actively carry out universal technical training work of new energy*

New energy was broadly publicized in news media. Various training courses were regularly organized about maintenance and use of digester in rural areas, management of large biogas engineering technology, biogas service system, gas safety management and technologies of solar energy complementary heating-room, and distributing promotional materials.

## **Problems**

*Lack of working funds and matching funds*

The local matching funds of new energy projects can not be allocated in full. New energy sector lacked the necessary funding for the work, resulted in the difficulty of project funding, and affected the progress of construction projects.

*Supervision of large biogas project needs to be strengthened*

The regulatory targets of biogas project are farming enterprises, which the vast majority is individual nature, the necessary constraints can not be carried out. The matching funds are not available in all parts of a country. So the enthusiasm of some enterprises is high when they declared the project, the construction phase of enthusiasm decreased, the project is difficult to do well.

*Property management staff technology needs to be improved*

With the construction of biogas digesters increasing year by year, the technical staff can not meet the need in the number and skill level. A serious lack of the knowledge of equipment and technical expertise, they can not resolve the problems of digesters[3].

*Development is inadequate*

Most of the technology of renewable energy has matured and achieved good results in the demonstration. However, he development drop behind requirements of the times because of lack of funds and policy support.

*Problems in Straw energy utilization*

The scale of the utilization of straw energy was still relatively small, the work carried out focused on a few points of testing and demonstration, and the rate is relatively low. The price of Semi-gasifier of household straw was high in selling, the masses were not enthusiastic use. The people were difficult to buy fuel briquettes because of a small number of the plant of straw briquetting.

## Measures of improvement

### *Strengthen government guidance and support*

The development and utilization of new energy should be included in the agenda of the city, county party committee and government. The related department should support new energy industry in the function, the projects, the funding and other aspects[4].

### *Strict project management*

The procedures are strictly implemented in the project application, feasibility studies, approval. The relevant national technical standards and the approach of project management are earnestly implemented. Taking the mode of contract management, the contract is signed by the subject of construction with farmers.

### *Broaden the investment channels*

A diversified investment mechanism of business investment, social investment and government investment is established[5]. To play the role of benefits to attract, the industrial and commercial capital, private capital and foreign capital are gathered. The construction of new energy projects is invested in the form of wholly-owned, cooperative and equity. Financial sector supports the project construction through microfinance, joint household guarantees, etc.

### *Building Scientific Research System*

A expert database of new energy is established. A number of experts and other senior personnel engaged in scientific research, marketing, consulting, assessment and appraisal work. The market access system is implemented. The qualification of a number of research institutes, universities, consulting assessment unit and design construction unit.

### *Increasing helping efforts to awareness and training*

Taking advantage of television, newspapers, other media, the self-timer videos of new energy, and printed brochures, etc., so that it is well known that the new energy industry in rural and energy saving. A number of practical complex farmer senior skilled personnel are trained through prominent technical training, the technical level is further improved in the new energy industry.

### *Promotion variety of business models*

The implementation of new energy projects adhere to local conditions, a variety of operating modes were used in the management, including: the mode of the construction of the whole industrial chain business, the mode of village as the main for the construction, the mode of corporate briquette and central heating, the mode of business operation and supplying biogas of jointing household, the mode of the enterprise gasification and centralized gas supply, and so on.

## Conclusions

A lot of work was completed in the development and utilization of new energy sources in rural areas in Qinhuangdao City. The model of diversified development and utilization of new energy was massive. Many rural biogas digesters were built. Those were continuously promoted that solar and hybrid of multiple energy, and solar energy more complementary, straw energy utilization, utilization of three marsh, wind power, photovoltaic power generation, and technology product development of new energy, and so on, and many successes were achieved.

Development and utilization of new energy also exists many problems in the process. Those measures need to be taken to strengthen government guidance support, strict project management, broaden investment channels, building research system, increase awareness and training assistance, and to promote a variety of business models, so that new energy greatly contributes to the development of modern agriculture and energy saving of the rural, bring significant economic and environmental benefits for the community.

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