Considerations on Rural Energy and New Countryside Construction in Beijing Deputy Center Area

WANG ZHI1,* and GAO XIANG2
1Institute of Agricultural Information and Economics, Beijing Academy of Agricultural and Forestry Sciences, Beijing 100097. 2Beijing's Tongzhou District Lucheng Towns Government

angelwang1009@163.com

Abstract. "Beijing Deputy Center Construction" is an important part of one of the three major national development strategies in China. The Deputy Center is located in Tongzhou District in Beijing. At present, the construction of the Beijing deputy center is in its infancy and there are many rural areas that need to make strategic design for rural energy and new countryside construction in deputy center. The government can make great efforts to make the key links in the new countryside construction by establishing a digital management system, promoting new energy technologies and changing farmers' traditional concept of using energy. If we can make a new type of urban agriculture in deputy center through active selection, and adjust the structure of rural energy use. In the future, Beijing's deputy center will form a seamless connection between "international village" and "cosmopolitan city."

1. Introduction
"Beijing Deputy Center Construction" is an important part of one of the three major national development strategies in China[1-3]. The Deputy Center is located in Tongzhou District in Beijing. At present, the construction of the Beijing deputy center is in its infancy and there are many rural areas that need to make strategic design for rural energy and new countryside construction in deputy center. Developing and building a rural energy source in Beijing's sub-center area is a powerful means of promoting regional integration and accelerating the coordinated development of Beijing, Tianjin and Hebei. At the same time, it is also an effective measure to improve air quality and smog in the capital and its surrounding areas.

2. Beautiful countryside construction is an important basis for the construction of ecological civilization and beauty of China
Chinese capital of Beijing, an area of 16,400 square kilometers in rural areas accounted for 1.5 million square kilometers, if rural development is not good, ecological Beijing will be no barrier, there will be no space environment[3,4], and sustainable development will be on the lack of foundation[5].

3. Major policies and measures to promote the construction of beautiful countryside
We recognize the importance and urgency of the beautiful countryside construction, but also, perceive that the complexity and difficulty to build a beautiful countryside. In recent years, Beijing launched a series of livelihood projects, including farmhouse seismic energy-saving projects, risk village and insurance households from mountain relocation project, Clean Air Initiative in rural areas reducing coal, Agricultural non-point source pollution control projects, Rural Ecological Environment
Construction Engineering, and so on, rural environment continues to improve, rural infrastructure and
public service facilities gradually improved, the rural energy structure was further optimized, farmer
housing conditions and income levels are rising[5,6]. New Rural Construction of Beijing has been
built a beautiful countryside and laid a good foundation. At the same time we should also see that
although the new rural construction of Beijing has made remarkable achievements, yet, with the urgent
needs of the majority of farmers, and the requirements of building world-class city, there is still a big
gap, but also need to be improved in the following areas[7,8].

3.1. Rural energy structure adjustment and optimization
In recent years, the Beijing government has been to actively promote the use of new energy sources,
new technologies in rural areas, and started to implement the "Reducing Coal and Replaced Coal,
Clean air" Initiative. Table 1 reflects the research team's research on rural energy use in deputy center.

**Table 1.** Beijing Deputy Center Rural Living Energy Data.

| Energy form          | Statistics sample total (4235 households) | Sample per household (tce) | The city's total (Ten thousand tce) | proportion (%) |
|----------------------|------------------------------------------|---------------------------|-------------------------------------|---------------|
| Commodity energy     | -                                        | 11573.73                  | 2.73                                | 588.13        | 87.01        |
| Bulk coal            | 9250.8                                   | 6607.85                   | 1.56                                | 335.78        | 49.68        |
| Briquettes           | 726.5                                    | 259.51                    | 0.06                                | 13.19         | 1.95         |
| Briquette            | 1311.87                                  | 468.6                     | 0.11                                | 23.81         | 3.52         |
| Liquefied gas        | 361.78                                   | 620.2                     | 0.15                                | 31.52         | 4.66         |
| Electricity          | 111071(11tkW)                            | 3617.57                   | 0.85                                | 183.83        | 27.20        |
| Biomass energy       | -                                        | 1727.31                   | 0.41                                | 87.78         | 12.99        |
| Straw                | 1245.03                                  | 684.76                    | 0.16                                | 34.80         | 5.15         |
| Tree branches        | 1895.56                                  | 1042.55                   | 0.25                                | 52.98         | 7.84         |
| Total energy         | -                                        | 13301.03                  | 3.14                                | 675.89        | 100          |
| consumption of life  | -                                        | 7335.95                   | 1.73                                | 372.30        | 55.15        |

The data in the above table shows that the energy consumption in rural areas in Beijing's deputy
center is mainly commodity energy, reaching 87.01%. Coal is the main source of domestic energy in
rural areas, accounting for 55.15% of the total energy consumption in the country.

"Heating and cooking," these two links is an important part of rural energy, they are also the main
part of the extensive use of coal as well as air pollution. In the rural energy structure adjustment, we
must really control the proportion of coal in heating and cooking in order to effectively improve the
quality of the atmospheric environment.

Through the survey of rural areas in Beijing found that the residents of the current application of
the main heating technologies are electric heating, heat pump heating, gas heating, clean coal heating
and solar heating in five ways[5]. According to the survey data, combined with the application of the
Beijing area and product technology maturity, the existing mainstream rural areas in Beijing can be
used for rural use of clean energy technologies in Table 2.

**Table 2.** Commonly used in rural areas heating technology.

| Serial number | Heating mode |
|---------------|--------------|
|               | Heat source (priority) | Auxiliary heat source (alternate) | Terminal |

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|   | 1 | Heat pump | Low temperature air source heat pump | —— | Floor heating |
|---|---|-----------|-----------------------------------|-----|---------------|
| 2 | —— | Ground source heat pump | —— | —— | Floor heating |
| 3 | Solar composite heating category | Solar hot water heating | Clean coal boilers | —— | Floor heating |
| 4 | Solar hot water heating | Gas boiler | —— | —— | Floor heating |
| 5 | Solar hot water heating | Low temperature air source heat pump | —— | —— | Floor heating |
| 6 | Solar hot water heating | Ground source heat pump | —— | —— | Floor heating |
| 7 | Solar hot water heating | Electric heating | —— | —— | Floor heating |
| 8 | Gas category | Gas boiler | —— | —— | Radiator / floor heating |
| 9 | Coal-fired class | Clean coal heating stove | —— | —— | Radiator / floor heating |
| 10 | Electric hot water boiler | —— | —— | —— | Radiator / floor heating |
| 11 | Electric heating | Heat storage type electric boiler | —— | —— | Radiator / floor heating |
| 12 | Carbon crystal plate class | Carbon storage electric heating | —— | —— | —— |
| 13 | Energy storage electric heating | —— | —— | —— | —— |

### 3.2. Rural Residential Seismic energy-saving projects
Beijing government started farmhouse seismic energy-saving projects since 2007, it has supported 380,000 rural residents in the implementation of energy-saving residential earthquake. Through the implementation of seismic energy-saving projects, farmers housing winter indoor temperature has increased by 4 to 6 degrees, saving more than 30% of coal-fired[9,10]. In summer, obviously feeling the cool interior, indoor temperature is relatively low outside temperatures 5 to 6 degrees[11]. According to statistics, only this thermal insulation, has an annual saving of coal-fired nearly 55 million tons, a significant reduction in carbon dioxide emissions, effectively improve air quality. According to surveys, there are still 530,000 rural residents in Beijing have seismic energy-saving requirements. Therefore, to further increase the Farmhouse seismic energy-saving efforts, using of 5 years, at a rate of about 100,000 a year, it will complete the city's Farmhouse seismic energy-saving task.

### 3.3. Sewage treatment works in rural areas
In recent years, new rural construction in Beijing, more than 500 villages have been built sewage treatment facilities in 1010, but due to complex process, facilities scattered layout, unfocused, factory
network is not complete, the high cost of operation and maintenance, management operation is not in place and other reasons, rural sewage treatment facilities, 30% did not run or intermittent operation. In Beijing rural area, annual output of sewage is more than 100 million tons, but, treatment rate is only about 50%. large amounts of sewage is discharged directly[12]. With the rapid development of urbanization and rural economic and social, supply and demand contradictions in rural city sewage treatment facilities have become increasingly prominent. Therefore, the reality requires us to rural sewage treatment as an important part of the construction of the beautiful countryside. For facilities that have been built to run on to assess the situation, according to local conditions to transform and strengthen the operation and maintenance, and ensure that the newly built sewage treatment facilities operating normally, the basic objectives of rural sewage discharge standards may successfully achieve in 2020.

4. Beijing 's rural energy demand forecast

4.1. Analysis of energy - using factors

4.1.1 Farmers' own needs. With the development of rural economy, farmers' concept of energy use is gradually changing. The higher income level of farmers, the more emphasis on the convenience and comfort with energy, and then health, the last is the economy. Therefore, in cooking, the farmers are more willing to use the cleanliness of liquefied petroleum gas or biogas, rather than coal. In the heating, according to affordability, farmers will focus on electricity, solar and other clean energy heating.

4.1.2 The Impact of Urbanization Policy. With the acceleration of urbanization in the rural areas and the implementation of ecological resettlement, the rural energy structure has also been greatly affected.

(1) Heating will be converted into centralized heating. The Beijing municipal government proposed that by 2020 the city will make about two-thirds of the farmers into urban residents, the living conditions of farmers will be dispersed from the living, into a centralized way to live, therefore, the corresponding heating will focus on the form Heating mode change, which will help save energy consumption of heating[13-15].

(2) Farmers' choice of energy will become more commoditized and cleaner. Due to the concentration of living forms and the difficulty in obtaining biomass resources such as straw, farmers will tend to favor commercialized energy sources for energy selection[13-15]. With the popularization and cleaning of public facilities such as heat and gas, The proportion of the use of energy will be a substantial increase.

(3) Housing construction will become more energy-saving. With the process of urbanization, the new farmers will focus on energy-saving housing and comfort[16], thus directly reduce the heating load and reduce the use of heating energy.

(4) Energy use will become more low-carbon and comfortable[17] Urbanization directly promote the increase of farmers’ income, and with the construction of new houses, solar energy and geothermal energy and other low-carbon new energy and renewable energy in the proportion of domestic energy consumption will gradually increase.

4.2. Potential evaluation of coal adjustment in rural energy structure

In the heating, through the existing energy-saving transformation of rural households, the annual heating coal can be saved about 62.76 million tons of standard coal (in accordance with the energy-saving transformation to save 40% of the heating coal to calculate). On this basis, by 2020, 952,000 farmers will live in the cities and towns of residence, so that the original decentralized heating will transform into a central heating. This way can reduce heating coal-burning 94,100 tons of standard coal per year.

In addition, for the remaining decentralized heating farmers, the Government can actively promote solar heating, electric heating and other new green energy-saving technologies, which can reduce the heating coal-fired 25.10 million tons of standard coal.
From the adjustment potential, based on full use of existing resources and actively promote green energy-saving technology, respect for heating and cooking, the total coal pressure reduction will be more than 1.1451 million tons of standard coal per year.

5. Some thoughts on rural energy policy and new rural construction in Beijing

In the capital, to promote the rural energy construction process, the author has deeply thinking for rural energy policies and beautiful countryside construction as follows:

First, the establishment of Beijing rural information service platform and the beautiful countryside of information resource library. It will cover many aspects of rural infrastructure, rural economy, industry characteristics, population health, culture, education, grass-roots organizations and other resources for effective integration of information and data, and establish a cover Beijing, connecting Beijing, Tianjin city, county, township and village "digital village” information network platform.

The second is the establishment of "Beijing Digital Village” platform, its function should have a strong practical and advanced. It can form in a variety of vivid visual image, data, icons and text, etc., it can provide information on all aspects of rural work for the government at all levels in Beijing, so as to provide a reliable basis for the scientific and democratic decision-making of new rural construction. Beautiful countryside construction in every measure can be demonstrated and managed through the information platform to maximize for the construction of ecological civilization provide effective protection, as well as the national new rural construction to enhance digital play a leading and exemplary role.

The third, pay attention to the establishment of several information platform, focusing on people's livelihood and ecological protection. The main measures "optimal adjustment of rural energy structure, agricultural nonpoint source pollution control, rural residential seismic energy-saving projects, sewage treatment works in rural areas” and other beautiful countryside construction are to be monitored and managed through the information platform to maximize for the construction of ecological civilization provide effective protection, as well as the national new rural construction to enhance digital play a leading and exemplary role.

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