

# **Willingness to Pay for Renewable Energy in China:**

## **A Case Study of Chongqing City**

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### **Summary**

Energy shortage, air pollution and climate change are three major challenges to China's sustainable development. To deal with these issues, China's government has set a series of ambitious targets including a substantial expansion in the use of renewable energy sources. The feasibility and effectiveness of any policy program to attain these targets strongly depends on the consumers' valuation of environmental quality and renewable energy. In spite of this importance, there is little empirical research about the Chinese consumers' preference and willingness to pay (WTP) for green electricity and environmental quality.

This study attempts to investigate three issues in China's urban households: (1) the environmental awareness; (2) the consumers' preferences and WTP for green electricity and environmental quality; and (3) the determining factors affecting the variation of WTP among individuals with different characteristics. Chongqing, the largest city of China, is selected as a case area for the investigation. A contingent valuation (CV) method and a linear regression model are used to conduct the analysis.

The survey revealed a higher preference for wind/solar/geothermal energy in comparison to biomass or hydropower, across all groups related to age, gender, education level and work status. The lower preference for hydropower may be explained by negative views about the Three Gorges Dam, located in the vicinity of Chongqing city. In the past few years, Chongqing suffered from several serious

natural disasters, including a drought in 2006, an inundation in 2007 and a large-scale blizzard in 2008. These were among the greatest disasters of their kind in China in the past hundred years. The public often connect these disasters with the Three Gorges Dam, although the real extent of such interrelations is still unclear. In addition, many ecological problems such as landslides caused by the project have raised suspicion among the public regarding the sustainability of hydropower. As to biomass energy, it is still at an early stage in China. The relatively low preference for this kind of energy can be related to the poor understanding of biomass potentials and consequences. .

The results also suggest that higher levels of income and education are associated with significantly higher levels of WTP for both green electricity and environmental quality. China has had a major development in education, resulting in a fivefold increase in the number of university graduates and doctoral degrees over the past ten years. Per capita GDP has increased at an annual growth rate of 12.37% between 1990 and 2007. With development of higher education and further economic growth, it is expected that the society will attach a greater importance to green electricity and environmental quality.

The survey includes several attitudinal questions. The consumers' attitude is measured by their reported degree of the importance of environmental protection, fossil fuel induced pollution, energy saving, renewable energy use and government intervention. The survey indicates that attitudinal factors play an important role in determining the WTP, suggesting the importance of public awareness. Attitudinal changes towards environmental protection can be achieved by dissemination of the benefits of green electricity and environmental protection, as well as education and promotion campaigns. According to our results, these changes will lead to a higher level of WTP, and build a foundation for further development of renewable energy.

The results suggest that urban households are willing to pay an additional monthly premium of at most CNY11.9 (USD 1.74) for green electricity and at most CNY11.7

(USD 1.71) for environmental improvements. This premium is equivalent to around 10% of current electricity bills based on an average typical household of 3.26 members. Prices of electricity from various energy sources differ largely in China. Hydropower has the lowest price of 0.2-0.3 Yuan/kwh, coal-fired electricity has a price of 0.4-0.5 Yuan/kwh. Costs of solar electricity are at least ten times that of coal-fired electricity. In order to promote renewable energy such as solar and wind electricity, the National Energy Administration announced a plan in September 2009 to set identical prices between hydropower and coal-fired electricity. Based on the results from this study, the implementation of this program may be feasible given the willingness to pay for green electricity including hydropower. It is however important to note that the estimated monthly premium is far from sufficient for covering the full costs of the most preferred green electricity, namely wind/solar/geothermal. Technological innovation for cost reduction of these types of green electricity together with government subsidies can be considered as a feasible solution for the promotion of green electricity.

The amount of WTP monthly premium (or USD 1.74) in China is still quite low compared with that in many developed countries, e.g. Japan (USD 17), UK(USD 7.9) and USA(USD 6.0). It is interesting that the WTP premium in China is quite close to that in South Korea, which is between USD1.8 and 2.2. The relatively low level of the green electricity premium can be only partly explained by generally lower prices and production cost of green electricity in China. However, even in terms of share relative to total electricity bills, China's WTP premium seems to be low. A large majority (81.5%) of the Swedish consumers were willing to pay at least 30-100% higher electricity bills for green energy, while 66.5% was willing to pay at least 60-200%. These percentages are much higher than 10% of China. The low premium may reflect relatively low living standards and lack of awareness about environmental problems.

The most significant barrier for the development of green electricity in China is the competitive advantage of coal. Largely due to the abundance of cheap coal, green

electricity cannot be expanded without favorable energy policies. The Renewable Energy Law (REL) enacted since 2006, includes several energy policies to promote green electricity. These policies include, to mention a few, guaranteed grid access and subsidies for green electricity generators, reduced duties for imported equipments, preferential loans and tax benefits to eligible development projects in renewable energy , cross-subsidization among electricity sources, and a public fund for renewable energy development.

This study provides useful information regarding the extent to which the promotion programs can be financed through higher energy prices. The methods used here can be applied to other Chinese cities.