

# **Residential Solar Sustainability in China**

## **Executive Summary**

### **Introduction and Background**

Currently, China's rapid economic growth has led to a number of energy problems such as the heavy energy demands, unreasonable energy structure, and environmental concerns. Solar energy has become an important alternative resource due to its advantage of alleviating the power generation pressure and addressing environmental issues. Fortunately, the Chinese government has good awareness of solar energy development, and solar energy applications are encouraged and supported by laws and policies. Therefore, we designed a residential solar energy system, which could be adopted in individual families to provide heating, cooling, electricity and hot water.

### **Design and research**

The residential solar system is integrated with photovoltaic/thermal systems, heating and cooling system, and liquid battery set. The electricity and hot water are generated from the PV/T system and stored in the high-capacity liquid battery and heat-isolated water tank respectively. The heating and cooling system, which is thermally driven by hot water, could maintain indoor temperature at 20 °C in summer and 17°C in winter. In addition, all the individual solar system are connected to the local power grid to contribute the extra electricity that beyond daily use.

### **Market analysis and prospect**

The solar market in China is analyzed to demonstrate future market prospects. The enormous gap between solar production and consumption in China and the over reliance on exporting has led to a vulnerable market structure. Therefore, it is important for government to propose intensive policies to balance and promote domestic solar market. In this case, our design is desirable for this goal and could be successful in occupying the current vacancy of residential solar energy.

### **Conclusion**

The feasibility of this system is evaluated in three aspects: environment, society and economy. For the environmental impact, this system could reduce the emissions of greenhouse gas, without causing extra waste. For the social impact, the Chinese government published six laws and policies to stimulate the PV solar energy industry which is beneficial for the promotion of our design. Additionally, this design could provide stable electrical supply for the citizens in the urban and remote area, thus improving the living standard of residents in the mountainous areas. For the economic aspect, considering the installation costs, the electrovalence in China and

the subsidies from the government, the payback period of the system would be 7 - 14 years, while the lifecycle of the system is 25 to 30 years.

### **Recommendations**

Three aspects of recommendations are presented in this report. First, to promote the applicability and feasibility of the residential energy system nationwide, different versions of residential systems should be developed to meet different energy demands in different regions.

In addition, a technical support and maintenance network should be established. The after sale service is very important for the marketing of a mature product. Therefore, a well-established maintenance network could be the prerequisite for the commercialization of the proposed solar energy system.

Moreover, the Chinese government should introduce new subsidy policies to encourage the application of residential solar energy systems and the distributed power generation mode. In the short term, this may increase the government's financial burden; however in the long term, the subsidy policy could help achieve sustainable development, which is beneficial to both the government and the public.