



China's transition to green energy systems: The economics of home solar water heaters and their popularization in Dezhou city

Wei Li ^{a,*}, Guojun Song ^b, Melanie Beresford ^a, Ben Ma ^b

^a Department of Economics, Macquarie University, Sydney, NSW 2109, Australia

^b Environmental Policy and Planning Institute (EPPI), Renmin University of China, Beijing, China

ARTICLE INFO

Article history:

Received 8 January 2011

Accepted 21 June 2011

Available online 30 July 2011

Keywords:

China

Solar water heaters

Transition

ABSTRACT

Studying the popularization of solar water heaters (SWHs) is significant for understanding China's transition to green energy systems. Using Dezhou as a case study, this paper presents new angles on analyzing SWH deployment in China by addressing both the economic potential and the institutional dimensions at the local level. Using estimates from the demand-side of hot water for a typical three-person household in Dezhou, the paper evaluates the economic potential of a SWH in saving electricity and reducing carbon dioxide emissions. Then, expanding the analysis beyond economics, we take an institutionalist approach to study the institutional factors that contribute to Dezhou's success in SWH adoptions. By examining the five main actors in Dezhou's energy regime, we find that Dezhou's SWH deployment is driven by an urge to develop businesses and the local economy, and its success results from at least five unique factors, including the development of SWH industrial clusters in Dezhou, big manufacturers' market leadership in SWH innovations, a tight private enterprise-local government relation, geographic location within the SWH industrial belt, and the adaptive attitude of Dezhou's households towards natural resource scarcity.

© 2011 Elsevier Ltd. All rights reserved.

1. Introduction

China is among the world's leading countries using solar thermal power. It is estimated that the national installation rate of solar water heaters (SWHs) is above 10 percent (Qianlong Website, 2010), and the installed capacity reached 134 GW-thermal of heating in 2009, ranking it first in the world (REN21, 2010). Despite this progress in harnessing solar energy, the success of SWH adoption has not been universal. The rate of adoption has varied widely at the local level, characterized by highly successful adoptions in some regions yet low installation rates across other areas of the country. For example, the SWH installation rate rose to 20 percent in Shandong province, but only 4 percent in Guangdong and Hebei provinces (Song et al., 2010). Evidently, this variation in adoptions is not induced by the central government's preferential treatment or investment priority in solar development, because until recently China had no national or regional policy to facilitate SWH adoption.¹ Unlike other top-down centralized projects, such as wind and

photovoltaic power generation stations, SWH adoptions have been developed at the local level in China with little central support. Under increasing signs of energy shortages, however, we need to ask why some regions succeed in SWH adoption whereas most regions do not. What factors are important in contributing to SWH deployment? What are the policy relevant lessons for both central and local governments in China? The answers are crucial for shedding light on China's transition to green energy systems.

Current studies on SWHs mainly focus on investigating the technical, economic and behavioral barriers to SWH deployment, in order to find the most cost-effective policy instruments. Faiers and Neame (2006), for example, find that poor aesthetics and high installation and maintenance costs of solar technologies are the main factors preventing the majority of homeowners in Central England from adopting solar power. Others scholars, however, suggest that a transition to renewable energy requires the correction of market failures and, thus, an overhaul of the entire energy market (Neuhoff, 2005). These discussions reflect the constraints faced by users and the intrinsic failures in the current energy system. While they suggest the necessity of governmental intervention through implementing various policy instruments, what motivates governments to intervene and why efficient outcomes can be achieved only in certain areas in China remain unclear.

This paper presents new angles on analyzing SWH deployment by addressing the institutional dimension involved in intervening and facilitating green technology adoption, specifically the design and implementation of SWH popularization policies in Dezhou

* Corresponding author. Postal address: 725A, Building: E4A, Department of Economics, Macquarie University, Balaclava Road, North Ryde, NSW, Australia. Tel.: +61 405 290 958; fax: +61 298 506 140.

E-mail address: weiweileede@gmail.com (W. Li).

¹ The only subsidy for SWHs is under the Home Appliances to the Countryside program, allowing each rural household to receive subsidies from central and local finance departments for 13 per cent of the purchasing price of designated electrical appliances, including SWHs.