



Original research article

Energy at work: Social psychological factors affecting energy conservation intentions within Chinese electric power companies

Chien-fei Chen^{a,*}, Kyle Knight^b

^a NSF Center for Ultra-wide-area Resilient Electrical Energy Transmission Networks (CURENT), Department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, United States

^b Department of Sociology, University of Alabama in Huntsville, 301 Sparkman Drive, Huntsville, AL 35899, United States

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ABSTRACT

Energy use is becoming an important environmental concern in China. Based on the theory of planned behavior, this study investigates how energy concern influences employees' intentions to conserve energy at work through the mediation effects of attitudes, perceived behavioral control (PBC), and injunctive norms. This study sampled 564 employees of nine state-owned electric companies in China. Results of structural equation modeling indicate energy concern directly influenced attitudes, PBC and injunctive norms, but not behavioral intentions. In addition, injunctive norms and PBC have direct and positive effects on energy conservation intentions. However, attitudes toward energy saving were not related to behavioral intention. Importantly, injunctive norms and PBC fully mediated the effect of energy concern on energy conservation intentions and injunctive norms had the strongest direct effect on energy conservation intentions.

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1. Introduction

In China, energy use is gaining attention as an important environmental issue with serious social and economic consequences as the country has become the largest energy consumer in the world, consuming 3.62 billion metric tons of coal equivalent in 2012. According to the U.S. Energy Information Administration (EIA), China's net consumption of electricity in 2012 was 3634.54 billion kilowatt-hours (kWh), ranked second in the world [1]. East-coast provinces in China, such as Zhejiang and Jiangsu, consumed even more electricity in comparison with other areas due to rapid economic growth [2].

Rising energy consumption has severe environmental consequences in China, such as increased carbon dioxide emissions, urban heat islands, and air and water pollution [3,4]. A recent protest against the new coal-firing power plants in Guangdong province suggests growing concern about the environmental consequences of coal power and industrial overproduction in China

[5]. In addition to environmental consequences that contribute to poor quality of life for residents, power outages in urban centers of China have important social and economic consequences. While technological innovations or tighter environmental regulations are necessary preconditions for improving energy efficiency [6], numerous researchers argue that more attention needs to be paid to behavioral factors (e.g., [7,8]).

Indeed, as Sovacool notes, the vast majority of energy studies focus on "technological fixes" for altering energy consumption rather than the social psychological aspects of end-users' behaviors [8]. With this paper, we seek to contribute to the advancement of social scientific perspectives in energy studies research by focusing on the social-psychological factors affecting individuals' energy use intentions within the workplace. While a growing number of studies have focused on the importance of environmental behaviors in China [10–12], little attention has been paid to social-psychological factors associated with energy conservation in workplaces or other organizations. Gaining a more comprehensive understanding of the social-psychological factors that influence energy use behaviors in China is especially relevant for policy and academic conversations about mitigating global climate change given the fact that China is the world's leading emitter of carbon dioxide, having overtaken the United States in 2007 [12].

Applying the framework of the theory of planned behavior (TPB), this study investigates the effect of social psychological

* Corresponding author at: CURENT Engineering Research Center, Department of Electrical Engineering and Computer Science, University of Tennessee, 508 Min H. Kuo Building, 1520 Middle Dr., Knoxville, TN 37996-2250, United States.

Tel.: +1 865 974 3787; fax: +1 865 974 9723.

E-mail address: cchen26@utk.edu (C. Chen).

factors on energy conservation behavioral intentions within the context of a workplace [13]. We adopt the TPB framework in this study for two reasons. First, the TPB is well supported as a model explaining a variety of behaviors, especially environmental behaviors, such as recycling and energy conservation [14–18]. In addition, there is some evidence that the TPB performs better in predicting environmental behaviors than alternative theoretical models, such as the value-belief-norm theory [14,18]. Second, the TPB is ideal for studying environmental behaviors among individuals in workplace and organizational settings because it highlights the role of situational constraints – in particular, perceived behavioral control and social norms [17,19]. However, few studies have applied this model to explain environmental behaviors in workplaces [17,20,21].

In this study we build on the TPB model by including a measure of environmental concern (focused specifically on energy issues). While environmental concern is often found to have little or no direct effect on environmental behaviors, research indicates that concern does have important indirect effects via other social-psychological factors (e.g. [22]). Specifically, we assess whether the effect of energy concern (i.e., individuals' affect associated with perceived importance of energy issues) is mediated by the core constructs of the TPB model.

2. An organizational focus

Energy use and conservation issues are clearly not limited to individuals and households, but extend to organizations as well. Indeed, various stakeholders are increasingly demanding greater regulatory control over the environmental behaviors of large organizations [23,24]. Despite this, the growing literature on the behavioral and psychological aspects of energy conservation has not given much attention to dynamics within organizations, such as workplaces [17]. This is an important topic to explore because the factors affecting energy behaviors within organizations and workplaces may be different from those in home and public contexts. Energy consumption in the workplace, in particular, is distinctive for a number of reasons. Employees typically are not responsible for utility costs and thus have less financial motivation to keep track of and reduce energy use, appliances and facilities are shared among coworkers, which may inhibit a sense of individual responsibility for conservation, employees are easily observed, and there is often a high degree of social interaction in workplaces [17,25,26].

By investigating employees' energy use behaviors within utility companies in China, this research provides new insights on the patterns of energy behaviors in large organizations. As Scherbaum et al. [27] note, understanding the predictors of employees' energy conservation behaviors at work is important for increasing the effectiveness of organizational conservation initiatives which often target such behaviors. In particular, this research can help identify barriers or facilitators of pro-environmental behaviors within workplaces [17].

In the context of China, an organizational focus may be even more relevant. Environmental issues are only recently emerging as widespread public concerns. For instance, a recent report found that in 2013, 47% of Chinese considered air pollution a "very big problem," up from 31% in 2008 [28]. However, while environmental concerns are on the rise in China, they often fall well behind economic concerns such as rising prices and inequality [28]; in particular, Harris finds that "a common sentiment is that the environment is important but that economic development should come first" [3] (p. 9). Furthermore, research indicates that environmental concerns among the public in China are often not acted upon at the individual level and that most consider it to be

the responsibility of the government, not individuals, to protect the environment [3,29]. Thus, useful insights may be gained by investigating social-psychological factors associated with energy conservation behaviors among the employees of Chinese state-owned electric power companies since energy use is likely to be more salient to them than to the general public.

3. The theory of planned behavior (TPB)

Environmental scholars have applied the TPB to a variety of environmental behaviors [27,30,31]. Numerous empirical studies of a wide range of behaviors have found support for the TPB, and research has demonstrated it to be quite successful in predicting self-reported environmental behaviors and behavioral intentions. In one study, Kaiser and Gutscher [32] found that the TPB variables explained 81% of variance in the intention to perform conservation behaviors. Furthermore, Greaves et al.'s [17] study of environmental behavioral intentions within a workplace in the United Kingdom determined that the TPB explained 61% of variance in employees' intentions to turn off their computers when leaving their desk, 46% of variance in intentions to use video-conferencing rather than travel to meetings, and 53% of variance in intentions to recycle at work.

The TPB argues that human beings are rational agents and a behavior is a series of conscious decision-making processes [13]. People's behavior is guided by three factors: attitudes toward the behavior (i.e., overall evaluation of behavior), beliefs about the normative expectations from significant others (i.e., subjective norms), and beliefs about the presence of factors that may facilitate or hinder performance of the behavior (i.e., perceived behavioral control, PBC). According to the TPB, the major antecedent of a behavior is an individual's intention toward that behavior, and in turn behavioral intention is influenced by attitudes, subjective norms, and PBC. Indeed, in a meta-analysis of studies examining a wide variety of behaviors, Armitage and Connor [33] found a consistently strong positive relationship between intentions and behaviors in the literature on the TPB. Attitudes, subjective norms, and PBC are three commonly studied factors in determining environmental behaviors and behavioral intentions, e.g., [22,30]. Given the difficulties of accurately measuring actual behaviors, we follow previous research in focusing on self-reported behavioral intentions as our dependent variable in this study [16,17,34].

3.1. Attitudes

In the context of the TPB, attitudes refer to an individual's favorable or unfavorable evaluation of a behavior. A person is likely to assess the benefits and costs that may result from a specific behavior prior to performing that behavior. According to Ajzen [13], positive attitudes would influence an individual's intention to perform that behavior. For our purposes, attitudes toward energy conservation refer to a person's subjective judgments about the positive and negative evaluation of the act of energy use. There is evidence that positive attitudes toward 'green' electricity have the strongest effect on the intention to use 'green' electricity products, followed by subjective norms, and PBC [22]. Attitudes toward energy conservation are positively related to intentions to reduce energy use [30]. In addition, Fujii [35] reports that attitudes toward frugality are positively associated with the intention to reduce electricity use. Evidence indicates that positive attitudes toward green electricity increase the level of individuals' willingness to pay for green electricity [36]. Kaiser and Gutscher [32] found that attitudes are significantly related to recycling, fuel conservation and environmental organization membership.

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