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Estimating the energy saving potential of telecom operators in China

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HIGHLIGHTS

- The methods are presented to estimate energy saving potential for telecom operators.
- The total energy saving is divided into that by technology and that by management.
- Technical advance in communications tech takes the largest part of energy saving.
- Technical reform brings about 20%-30% of the total energy saving.
- Marketing and control measure contribute little to telecom operators' energy saving.

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ABSTRACT

A set of models are employed to estimate the potential of total energy saved of productions and segmented energy saving for telecom operators in China. During the estimation, the total energy saving is divided into that by technology and management, which are derived from technical reform and progress, and management control measures and even marketing respectively, and the estimating methodologies for energy saving potential of each segment are elaborated. Empirical results from China Mobile indicate that, first, the technical advance in communications technology accounts for the largest proportion (70%–80%) of the total energy saved of productions in telecom sector of China. Second, technical reform brings about 20%–30% of the total energy saving. Third, the proportions of energy saving brought by marketing and control measures appear relatively smaller, just less than 3%. Therefore, China's telecom operators should seize the opportunity of the revolution of communications network techniques in recent years to create an advanced network with lower energy consumption.

1. Introduction

The national target of energy saving during China's 11th Five Year Plan (FYP) has been roughly achieved (Price et al., 2011). And China's 12th FYP further requires that from 2011 to 2015, energy consumption per unit of GDP (i.e., energy intensity) should be decreased by 16%. As for China's telecom operators, with the rapid growth of subscribers and telecommunications traffic in recent years, its energy consumption has been always maintaining robust increasing and energy saving has become an important threat to sustainable development. Take China Mobile, one of the largest mobile service providers in China, for example, it consumes energy like electricity, gasoline, diesel oil, and natural gas etc., and electricity accounts for over 80% of the total energy consumption. In 2011, the total energy consumption of China Mobile exceeds 1.8 million ton of coal equivalent and electricity consumption reaches over 13 billion KWh. Under this circumstance, China's State-owned Assets Supervision and Administration Commission (SASAC), as the regulating department of China Mobile, has set China Mobile as the category of Focused enterprise from the General enterprise[1] , and required China Mobile should equip full-time staff for energy saving management, periodically submit energy saving reports and evaluate energy saving effect. Meanwhile, with the constant growth of China Mobile, especially the large-scale deployment of the Three Generation network, its energy consumption may keep stable increasing in the near future, so great pressure and threats will be faced by China Mobile under the energy saving restraints from the government. Overall, the energy saving for China's telecom operators should be and have been attached close attention these years.

The Chinese Ministry of Industry and Information Technology (MIIT) announced that the overall energy consumption per unit of

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[1] In order to achieve the national energy saving target and restrain the energy consumption of large enterprises, China's SASAC set three layers for all enterprises regulated by the central government, i.e., Key enterprise, Focused enterprise, and General enterprise according to their roles in energy consumption.

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telecom traffic for the communications industry should reduce by 10% by the end of the 12th FYP. In order to achieve this goal, telecom operators are taking effective and numerous measures in many fields. These measures have achieved some energy-saving effect. Each year telecom operators may set energy saving targets, like electricity consumption per unit of telecommunications traffic, so as to assess the work they have done and roughly estimate the saved energy at the end of the year. With regard to the targets set each year, by means of interview, we have learned that the managers and specialists of energy saving in China Mobile do not make sure whether the energy saving targets are reasonable and feasible. Therefore they are eager to exactly identify the potential for energy saving in the next few years and at least they can put forward feasible annual targets of energy saving.

According to recent research, there are some methodologies to calculate the saved energy for a corporation (such as GB/T 13234-2009) and other methodologies to calculate the saved energy of technological measures (such as GB/T 13471-2008). For example, the GB/T 13234-2009 (General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ) and Standardization Administration of the People's Republic of China (SAC), 2009) defines the "energy saved of productions" as the index to calculate the annual saved energy for a corporation in China. However, for calculating the annual energy saving for telecom operators, there exist some problems (Yang et al., 2011b). For example, through the GB/T 13234-2009, the total "energy saved of productions" by the whole telecom operator can be calculated, but the energy saved by technological measures according to GB/T 13471-2008 only accounts for a little part (average 20–30%) of the total energy saved of productions. It is thus clear that a large disparity of energy saving exists, which has often been ignored. Put another way, the telecom operators in China almost do not exactly know how much potential of energy saving they have and where the energy saving may come from.

The purpose of this study is to estimate and analyze the segments of total energy saving for telecom operators in detail, especially providing the detailed estimating segmented model for energy saved by technical advance according to the classification of communication equipment. At last we also propose some suggestions for decision makers to set proper assessment indicators and to work out better energy saving plan based on the estimation of energy saving potential. In this way, we attempt to answer the following questions: (1) where does the energy saving room come from for the telecom operators in China; (2) how to estimate the segmented energy saving potential; and (3) how much is the energy saving potential for each segment; so as to help the telecom operators in China to reasonably assess the difficulty of energy saving and scientifically determine the energy saving plan.

The empirical case in this research refers to the largest provincial branch of China Mobile, which is called A company here. China Mobile has signed the Green Action Plan in 2007 and promised to reduce energy consumption. In 2010, China Mobile Limited was selected as the only one of Chinese mainland enterprises in the Dow Jones Sustainability Indexes (DJSI) for the third consecutive year (China Mobile Communications Corporation (CMCC), 2011).

The paper proceeds as follows. Section 2 presents the literature review of energy saving and its potential estimation. Section 3 deals with the calculating methodology and the data used in the empirical analysis. Section 4 proposes the empirical results. Finally, Section 5 concludes the paper and puts forward some policy implications.

2. Literature review

There has been a body of research on energy saving and its potential in the past years. We focus on the research which elaborates the frameworks and methodologies to estimate energy saving amount and potential at first, and then review main existing related research on energy saving in telecom sector.

In fact, many environmental protection organizations, such as the WWF (World Wide Fund for Nature (WWF), 2010), EVO, BSI, IPCC, have conducted a great deal of important research on energy saving measurement and most of the studies are based on the LCA analysis.

These studies can be roughly divided into two categories; one is from a corporate perspective and the other is from a project perspective. Research from a corporate perspective often provides principles and methods to analyze the energy saving situation of a corporate. For instance, World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) (2004) put forward the GHG Protocol for Corporate Accounting, which contains systematical principles, concepts, and methods for quantifying and reporting GHG reductions for a corporate. And the GB/T 13234-2009 (General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ) and Standardization Administration of the People's Republic of China (SAC), 2009) issued by Chinese government specifies the classification and basic calculating principles of corporate energy savings. And research from a project perspective mainly discusses the calculating frameworks and procedures for energy saving and emissions reduction of projects. For instance, UNFCCC (2012) tries to calculate the emission reduction of a CDM project. It conducts various research methods on different scenarios to carry out suitable baselines and monitoring methodologies, which define the boundary, baseline, project emission and the emission reduction. Similar studies include the IPMVP (Efficiency Valuation Organization (EVO), 2002), which contains the concepts and options for determining energy savings, and the GHG Protocol for Project Accounting (World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), 2005). The IPMVP provides the measurement and verification plan, which defines four basic options for deriving routine adjustments of energy use in the base year.

On basis of these basic frameworks and methodologies, many scholars have conducted an array of research on the topic of energy saving potential in various fields, like building industry, steel industry, chemical industry and telecom industry. For instance, Sardianou (2007) develops a model to empirically investigate the main determinants of household energy conservation patterns and possible energy saving in Greece. Zhao et al. (2009) describe the energy consumption situation and reality of commercial building in Tianjin of China according to statistics and field investigation. Lin et al. (2011) evaluate the energy saving potential of Chinese steel industry by studying its future potential energy efficiency gap. Dutta and Mukherjee (2010) make a foray into the energy demand for steel, aluminum and cement industries in India and explore the potential of any future reduction in their energy consumption. Lin et al. (2012) find that in chemical industry of China there is a long-run equilibrium relationship between electricity intensity and technology, labor, electricity prices and industry structure.

While in telecom industry, energy saving research mainly focuses on energy saving potential estimation by Information and Communication Technology (ICT) solutions and energy efficiency improvement brought by technical measures in base stations, equipment rooms and terminals on basis of the GHG Protocol for Project Accounting (World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), 2005). For example, Global e-Sustainability Initiative (GeSI) and The Climate Group (2008) demonstrate the potential role the ICT sector can play in mitigating climate change. And they outline the required policy support of smart implementation of ICTs, including standard implementation, secure communication of information within and between sectors and financing for research and pilot projects. Yang et al. (2011a) calculate