ELSEVIER

Energy Policy 35 (2007) 4340–4354

ENERGY POLICY

www.elsevier.com/locate/enpol

# Transaction costs of Tradable White Certificate schemes: The Energy Efficiency Commitment as case study

Luis Mundaca*

*International Institute for Industrial Environmental Economics at Lund University, P.O. Box 196, SE-221 00 Lund, Sweden*

Received 24 October 2006; accepted 27 February 2007
Available online 20 April 2007

**Abstract**

This paper analyses the nature and scale of transaction costs (TCs) borne by obliged parties under a "Tradable White Certificate" (TWC) scheme. Taking the first phase of the Energy Efficiency Commitment (EEC1) in Great Britain as a case study, several sources of TCs were considered, such as search for information, persuasion of customers, negotiation with business partners, and measurement and verification activities. Information was obtained through interviews and a questionnaire distributed to obliged parties. Results show that the most significant sources of TCs were related to search for information, persuading customers and negotiating with managing agents/contractors to implement energy efficiency measures. Perceived high TCs related to contract negotiation and liability risks slightly reduced the low trading level. The scale of TCs was estimated to be around 10% and 30% of total investments costs for the lighting and insulation segments, respectively. The results indicate that, despite the presence and scale of TCs, the EEC1 scheme generated energy savings that yielded net societal benefits. Estimated financial benefits range from 0.6 to 6 p/kWh for insulation and lighting savings, respectively. When avoided external costs due to electricity savings are included, estimated economic benefits range from 3 to 8 p/kWh. Several lessons from the EEC1 can be drawn for TWC schemes. Among others, it is found that informative policy instruments to raise awareness among end-users are critical if a TWC scheme is to deliver cost-effective energy savings. In all, the nature and scale of TCs under TWC schemes will differ because of a number of endogenous and exogenous determinants.


*Keywords:* Energy efficiency; Tradable White Certificates; Transaction costs

## 1. Introduction

Greater energy efficiency plays a fundamental role in achieving a sustainable energy future. The continuous oil price escalation, increased awareness of the need for energy security, and energy-related environmental problems—including the threat of human-induced climate change—are all contributing to a reassessment of rational energy use. As the policy debate focuses more on achieving greater energy efficiency across all end-use sectors, the key challenge for policy makers is to choose the right portfolio of instruments to address institutional and market barriers and imperfections.

Recently, much more attention has been given to the role of marketable certificates for achieving higher energy efficiency. Some European Union (EU) member states (France, Italy, the United Kingdom [UK][1]) have implemented tradable certificate[2] schemes to improve energy efficiency in end-use sectors (so-called "Tradable White Certificates" [TWC]), and other countries (e.g., The Netherlands) are exploring possible design options. A TWC scheme involves achieving a mandatory energy-saving target against the "business-as-usual" scenario. Obliged parties (e.g., energy distributors or suppliers) are required to meet individual targets set by the government; one option is to trade certified energy savings, which encourages parties to seek market strategies for least-cost compliance. At EU level, the proposed Directive on "Energy End-use Efficiency and Energy Services"

*Tel.: +46 46 2220257; fax: +46 46 2220240.
*E-mail address:* Luis.Mundaca@iiiee.lu.se.

[1]With the exception of Northern Ireland: in other words, Great Britain.
[2]Note that in this paper the words "permit" and "certificate" are used interchangeably.

0301-4215/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.enpol.2007.02.029

(EEE&ES), which includes an overall energy-saving target of 1% per year over 9 years, may trigger further implementation of TWC schemes and even prepare the ground for a future EU-wide TWC scheme (EC, 2006a). Addressing the European "Action Plan for Energy Efficiency", which indicates policies and measures for realizing a 20% estimated saving potential in EU by 2020, the European Commission highlights that the EEE&ES Directive enables the assessment of an EU-wide TWC scheme in 2008 (EC, 2006b).

Despite these developments, there has been little research regarding the performance of these new markets. Some general *ex ante* evaluations have been carried out (see Farinelli et al., 2005; Mundaca, 2006; Mundaca and Santi, 2004; Oikonomou et al., 2007; Oikonomou and van der Gaast, forthcoming), however transaction costs (e.g., search for information, due diligence, negotiation of contracts, measurement, etc.) have not being addressed in such studies so the cost savings involved must be taken with caution. The successful implementation and performance of any TWC scheme will undoubtedly depend, inter alia, on the effects of transaction costs (TCs).

There is empirical evidence from emission trading schemes that TCs can be significant and hamper the performance of these markets (e.g., Hahn and Hester, 1989; Atkinson and Tietenberg, 1991). According to Stavins (1995), TCs can make trading schemes less cost-effective. Montero (1997) argues that transaction costs and uncertainties reduce the level of welfare, making the post-trading outcome different from the least-cost equilibrium. Analysing the US lead permit programme, Kerr and Maré (1998) found that TCs can reduce between 10% and 20% of the potential gains from trade. Stressing the need for *ex post* evaluations, OECD (2002) suggests that much more research should be focused on the various forms of TCs affecting tradable permit schemes in general. In the case of TWC schemes, very little attention has been given to TCs. Their impacts are unknown and can negatively affect: (a) the planning and implementation of eligible energy efficiency projects (e.g., profitable eligible small-scale projects may appear unfeasible) and thus the creation of TWCs; (b) the efficient functioning of the TWC market; and (c) the overall performance of the portfolio of policy instruments aimed at increasing energy efficiency. The information gap is due to a lack of experience (except in Great Britain), which this paper attempts to fill.

Taking the first phase (2002–2005) of the Energy Efficiency Commitment (EEC1) in Great Britain as a case study, this paper analyses the nature and scale of TCs borne by obliged parties (i.e., energy suppliers) under a system comparable to a TWC. Although the EEC1 is not a certificate-based scheme as such, it gives energy suppliers the option to trade their obligations and achieved energy savings, making it fairly similar to a TWC scheme. The present study identifies and obtains data for the estimation of TCs, focusing on TCs borne by energy suppliers. TCs borne by beneficiaries of energy efficiency measures were not considered.

The focus of this study is to identify the nature of TCs during the EEC1. When possible, the scale of TCs was estimated. Taking into account these results, cost-effectiveness of energy savings was calculated, including financial and economic benefits. The study discusses whether TCs hampered the trading of energy savings during the EEC1. Based on these results, it draws some lessons for TWC schemes in general.

The methodology of the study is based on interviews and a questionnaire, supported by the review of official documentation and related studies. Key stakeholders involved in the EEC1 were interviewed in September and October 2005. This included the Department for Environment Food and Rural Affairs (DEFRA), the Energy Retail Association (ERA),[3] the Energy Saving Trust (EST), the Green Alliance, the Office of Gas and Electricity Markets (OFGEM), energy researchers, involved consultants, and energy suppliers that participated in the scheme. The main objective of the interviews was to identify the *nature* of TCs (i.e., sources of TCs). Interviews were complemented with a questionnaire distributed to energy suppliers addressing both the *nature* and *scale* of TCs. The level of response to our questionnaire achieved 25% of energy suppliers (2 out of 8) currently involved in the scheme and willing to participate. In turn, this sample represents 16.5 TWh or 27.2% of the delivered energy savings (ca. 60.6 TWh) compared to the target of 62 TWh. Considering a confidence level of 95%, the margin of error of the reported data for estimating the scale of TCs is 20%. Finally, telephone interviews with energy suppliers were carried out in March 2006 in order to supplement and deepen all the gathered information.

The structure of this paper is as follows. Section 2 gives a short overview of current TWC schemes, presenting key design elements and describing the EEC and the outcomes achieved during the first phase. Section 3 elaborates on the theoretical elements guiding this research in relation to TCs, energy efficiency, and TWC schemes. Sections 4 and 5 present the main findings. Taking into account the life cycle of TWCs, Section 4 discusses the nature of TCs and Section 5 shows the estimated scale of TCs of energy savings. Section 6 discusses the underlying issues related to the nature and scale of TCs under EEC1, drawing some general lessons learnt for TWC schemes. Conclusions are presented in Section 7.

## 2. TWC schemes

### 2.1. An overview

White Certificates are tradable certificates used in the field of energy efficiency. Under TWC schemes, the government sets an overall energy saving target to be met by obliged parties within a given time frame. To reduce compliance costs, obliged parties have the option to trade

[3]ERA represents 75% of the obliged parties under the EEC.