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## ANALYSIS

# The social efficiency of instruments of promotion of renewable energies: A transaction-cost perspective

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## ABSTRACT

This paper compares the social efficiency of the regulatory instruments used to promote renewable energy sources in electricity generation, taking into consideration their role in promoting the preservation of collective goods. They are based on a purchase obligation and act either by price (feed-in tariffs) or by quantity (bidding for new RES-E capacities; RES-E quotas). From the Public Economics perspective, the two instruments are distinct in terms of cost-efficiency and market incentives in a world of imperfect information. Exchangeable quotas of green certificates are preferred because this instrument allows better control over consumer costs and whilst retaining market incentives. Transaction cost economics (TCE) contributes to the assessment of these instruments, by introducing RES-E investment safeguard as a major determinant of social efficiency, and the instruments' conformity to its institutional environment as a determinant of its viability. In light of this additional consideration, the arrangements between RES-E producers and obligated buyers inherent in each instrument are in fact quite similar—either long-term contracting or vertical integration. We compare and assess RES-E price- and quantity-instruments on several dimensions from both the public economics and TCE perspectives: control of the cost for consumers, safeguards of RES-E investments, adaptability of the instrument in order to preserve its stability in the long run, market incentive intensity, and conformity with the new market regime of electricity industry. It shows neither instruments offer an optimal solution in each of these dimensions. The government will thus select an instrument in accordance with the relative importance of its objectives.

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Since the 1990s, multiple objectives have driven governments to develop renewable energy policies: preserving a set of collective goods; climate stability; local environment; and energy security. Ambitious targets have been set at both national and European Union (EU) levels. If the voluntary objectives adopted by EU Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources are met, the share of

“new” renewables in the electricity production are projected to increase from 1% to 8% of the total electricity production in average in the EU by 2010 (European Commission, 2001).

Government support is necessary for Renewable Energy Sources in Electricity (RES-E) because, although desirable from a social welfare perspective, their private costs are not competitive in power generation systems dominated by large

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electricity generation plants. Three reasons account for the bias against RES-E in the electricity market: (i) environmental costs are not adequately internalized for conventional electricity generation technologies; (ii) the absence of scale effects on costs, due to the small size of the plants,<sup>1</sup> and (iii) the random nature of their intermittent production of some major sources of RES (wind power, minihydraulic) which creates negative externalities.

Following failed attempts using systems of voluntary purchases of green electricity by consumers, as well as direct investment subsidies, demand-side strategic deployment policies have emerged as the preferred instrument in most countries. By imposing obligations to purchase RES electricity or to meet a RES-E quota on a clearly specified type of agents, these policies are designed to allow demand-side forces to determine the allocation of RES-E production subsidies to pre-commercial and commercial RES-E technologies. There are three instruments with such common character: feed-in tariffs (FIT), bidding instruments (BI) for the assignment of long-term purchase contracts and exchangeable quotas (EQ).<sup>2</sup>

FIT obliges electricity distributors (or the incumbent suppliers in a spatial area) to purchase electricity from any new RES-E plant in their service area and pay a minimum guaranteed tariff per kilowatt-hour that is fixed over a long period of time. BI selects by auctions RES-E projects and obliges local electricity distributors (or the incumbent supplier in the market regime) to buy electricity from the successful plants by a long-term contract on the basis of bid price in the reference design (or the marginal price in some countries). EQ introduces future obligatory targets for electricity suppliers to buy either green electricity directly from the RES-E producers or green certificates issues to RES-E producers, targets being defined in terms of a percentage of their electricity deliveries. A complementary trait is a compensation mechanism for the opportunity cost for obligated purchasers, which is different in the monopoly regime and in the market regime.

This paper analyses the intrinsic properties of these instruments in their reference design from the perspective of transaction cost economics (TCE). By doing so, we make useful contribution to the findings from the public economics literature which compares the efficiency of policy instruments on different issues:<sup>3</sup> the choice between price-instrument and quantity-instrument in a world of uncertainty, the issue of long-term efficiency by differentiating the support of RES-E technologies and the possibilities of control of the collective

cost and the windfall rent for the producers. Using the TCE approach introduces three valuable aspects.

Firstly, instruments are analyzed as “governance structures” that legally bind agents by contractual frames offering safeguard on RES-E investments to agents. Secondly, TCE approach takes into consideration the performances of RES-E instruments both in terms of efficiency and in terms of transaction cost supported by contractors. Finally, TCE also considers issues of feasibility which is strengthened with greater conformity with the new market electricity regime, and issues of credibility, i.e., the strength of its guarantee that the regulatory instrument will not deviate from its course or be abandoned (Levy and Spiller, 1994). Both issues are rooted in institutional environment of transactions firstly analysed by Nobel Prize laureate D.C. North (1990).

To date, few studies have been carried out with specific focus on TCE to assess and compare public policy instruments designed to promote the preservation of environmental goods. Delmas and Marcus (2004) explore the role of transaction costs in determining relative desirability of alternative instruments (command and control, market instruments, voluntary agreements) from the perspective of the firm, by tracing out the parameters of the preferential choice. Langniss and Wiser (2003) and Langniss (2004), on the other hand, compare transaction costs of RES-E instruments from the perspective of the developers–investors. Here we adopt a double perspective: the point of view of government who aims to maximize social welfare by providing sufficient incentives for RES-E investments using the least-cost method, and also the point of view of investors and producers whose objective is to maximize private returns.

We note two methodological difficulties. First, the comparison of the three instruments is made on the basis of the intrinsic qualities of their reference design. This method has its own limitations because each instrument has many variants, each with varying levels of efficiency performance and ability to adapt to address inefficiencies. Second, references to empirical observations is misleading because we cannot isolate the influence of instruments from other factors that contribute to the development of RES-E.<sup>4</sup> Some factors create obstacles, such as the planning permission procedures and the relation to the grid operators for the recovery of connection costs (these are generally not among the activists of the RES-E promotion). Conversely, each instrument frequently benefits from other support measures such as investment subsidies, low-interest loans, tax credits, or exemption of ecological tax. We therefore do not refer to results of effective RES-E policies based on instruments as proof of intrinsic performances.

The paper is structured as follow. First, we present a survey of the main findings from comparison of RES-E instruments in the public economics perspective in order to throw light on issues let aside. Second, we introduce our theoretical framework for assessing RES-E regulation as a governance structure

<sup>1</sup> This character could be discussed for certain RES-E technologies, as the biomass electricity which could benefit from the scale economies in the supply of the biomass up to a certain size.

<sup>2</sup> Let us note that some instruments are well known under other generic names such as the Renewable Portfolio Standards in the USA and Canada. But in fact, it is not a category of instruments. On the twenty RPS existing in 2004 in the USA, half are in the categories of the bidding, and only seven develop quota with exchange of certificates. RPS based on voluntary commitment of the electricity public utilities also exists, as it is the case of the British Columbia RPS (Berry and Jaccard, 2001).

<sup>3</sup> We focus on their intrinsic characteristics and do not consider the application of these instruments in conjunction with other measures such as direct subsidy, tax credit to investment.

<sup>4</sup> There is an abundant literature discussing causal links between the diffusion of RES-E and variation in design and strength of the governmental policy. Some examples are Reiche (2002, 2005), Morthorst and Jorgensen (2005), Van Dijk et al. (2003), Sijm (2002), European Commission (2004), Haas et al. (2001).

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