

Executive summary

Simultaneous use of black, green and white certificates systems

By

Eirik S. Amundsen and Torstein Bye

In addition to targets on the reduction of greenhouse gas emission, many countries also have targets on shares of renewable energy and targets on energy savings/ energy efficiency improvements. In recent years, an increasing number of countries have adopted, or planned to adopt, market mechanisms to achieve these additional targets. To reach the targets on renewables various versions of so-called “green certificates markets” (as opposed to feed-in tariffs systems) have been implemented (e.g. in France, Norway/ Sweden, the UK, and some states in the US). For the energy savings target “white certificates markets” (as opposed to direct subsidies) have been adopted (e.g. by France, Italy, UK, and Connecticut, Pennsylvania and Nevada in the US).

Hence, there are up to four interconnected markets involved in the energy sector; the energy market itself, the emission permits market, the green certificates market and the white certificates market. In this paper we address compatibility issues and ask what the net effects of such markets are when they act in concert.

In order to do this, we formulate a model with black, green and white certificates markets that function in conjunction with an electricity market. The markets function well in the sense that a common equilibrium solution exist, where all targets are satisfied (e.g. share of green electricity and share of energy saving/ efficiency increase.) The equilibrium solution also adapts to changing targets (e.g. harsher target on energy saving). However, it turns out that it is in general impossible to tell whether this will lead to more, less, or unchanged consumption of ”black”, ”green” or ”white” electricity. These, markets, thus, in general, give a poor guidance for future investments in green and white electricity. In order to get clear cut results, specific assumptions of parameter values and functional forms are needed. An example of this, based on a calibrated model founded on Norwegian data, is provided in the paper.

In the paper we also calculate gains and losses in terms of consumers' and producers' surpluses. Introduction of a green and /or a white certificate system leads to sizable redistributions of consumers' and producers' surpluses. The calibrated model shows that an increase of the percentage requirement of green and / or white electricity from zero level first gives rise to an increase of consumers' surplus, before it starts to fall off. The increase of the percentage requirement of green electricity also increases the producers' surplus of green electricity, whereas the producers' surplus of white electricity falls, and vice versa if the percentage requirement of white electricity is increased. The losers are always the producers of black electricity that experience reductions of the producers' surplus following from the introduction of the green and white certificates systems.

Based on this analysis one may wonder whether it is economically beneficial to introduce green and white certificates on top of a system of carbon pricing (i.e. a black certificate system or a carbon tax). One view would be that these systems should at least in theory have predictable effects on the amount of energy generation they give rise to, as a guidance for the industry's investment. This paper shows that they do not.

Related to this discussion is the question of why it is optimal to have several targets for energy use, when the essential target is to reduce the emission of greenhouse gases. Additional specific targets on share of renewables and energy saving/ efficiency improvements may function as un-necessary and costly constraints. A simple observation is that a carbon tax or a black certificates market itself may generate the preferred effects, i.e. an increase of the carbon price will reduce the generation of black electricity, but at the same time also increase the share of green electricity, as well as increasing the level of energy saving through price increases. Otherwise, the green and white certificates systems do not seem to add to the efficiency in achieving the greenhouse gas targets when recognizing the importance of uncertain abatement costs.