Modelling Danish local CHP on market conditions

In Denmark, the development of local combined heat and power (CHP) plants has been characterised by large growth throughout the nineties, based in part on government subsidies in the form of feed-in tariffs. Simultaneously, there has been a significant growth of wind power, particularly in the Western Danish system. As both the power produced by the local CHPs and the wind power are prioritised, the production of these types of power is occasionally sufficient to meet the total demand in the system, causing the market price to drop dramatically, sometimes even to zero-level. In line with the liberalisation process of the energy sectors of the EU countries, it is however anticipated that Danish local CHP are to begin operating on market conditions within the year 2005. This means that the income that the local CHPs previously gained from selling electricity at the feed-in tariff is replaced in part by income gained from selling electricity on the Nordic spot market, Nord Pool. Thus, the production quantities of the local CHPs will depend on the market price. This paper analyses the new situation. This is done by creating a model for the supply function of a local CHP, which takes into account the local heat demand as well as technical factors such as heat storage facilities and production unit characteristics. Based on an adaptive prognosis for electricity spot prices, bids for the spot market are made in accordance with the rules of the Nord Pool 24-hour cycle. The paper will discuss the consequences of acting in a liberalised market for a given CHP plant, based on the abovementioned bottom-up model. The key assumption determining the bottom line is the electricity spot price. The formation of the spot price in the Nordic area depends heavily upon the state of the water reservoirs in Norway and Sweden. For this reason, the analysis is undertaken as a parametric study of the electricity spot price.