BENEFITS OF VERTICAL INTEGRATION OF LIGNITE MINES AND POWER PLANTS

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(1) Overview

Benefits of vertical integration of mine-mouth power plants and nearby coal mines or at least from very close their relationships through long-term contracts has been already described from the point of view of transaction costs economics by Wiliamson (1985), Joskow (1987) and Kerkvliet (1991). Although mentioned authors described situation on electric energy market over 20 years their observed advantages of integration or close relations are especially true for lignite mines and power plants today due to their relation can not be broken as it was observed lately on hard coal markets. Power plants can not purchase lignite from other sources due to boilers are prepared for the specific lignite from the nearby mine and the lignite transportation cost to other energy producers are to high to be profitable for a mine. Both sides make relationship-specific investments and this lead to close relations and connected with that benefits e.g. reduced transaction costs, security of supply etc. Nowadays hard coal market is different. It is much more competitive than it was previously and power plants can purchase fuel from different suppliers focusing more on coal quality parameters due to environmental requirements than on its price. Also hard coal mines have invested in preparation plants what increased the coal value and enable them on competition all over the world. Number of mine-mouth power plants has decreased substantially in hard coal but not in lignite due to above-mentioned reasons.

Here author propose different approach from the above. He doesn't question benefits flowing out from reduction of transaction costs and close relationship but stresses another aspect of integration. Elimination of threat of sub optimal use of resources due to inherent conflict of individual and group rationality in the bilateral monopoly (BM) of a lignite mine and a power plant if both sides belong to different owners. This approach is based on the newest achievements in finding the optimal solution maximising joint profits of both sides of BM by application of pit optimisation technique and game theory methods (Jurdziak, 2007).

(2) Methods

It has been proposed to adjust the classical solution for the bilateral monopoly described e.g. by Blair et al. (1989) to the condition of mining. In the classical solution the quantity of intermediate product is determined but the price not and it has to be negotiated freely from the range creating the contract curve. The important assumption in this approach is lack of influence of this price on joint profits except upon its division between both sides. In mining the situation is similar if the shape and size of the ultimate pit is determined and unchangeable. But if only the mine's management has the flexibility to adjust the ultimate pit to the lignite price it appears that the price negotiation is no longer the zero sum game but it becomes the non-zero sum game with positive and variable joint profits (Jurdziak, 2006). Cooperation of both sides can increase profits in long run. Thanks to application of the Lerchs-Grossman pit optimisation algorithm it is possible to obtain several optimal ultimate pits (nested one in another) maximising mine's profits for different lignite price levels. Among them we can find the optimal lignite price, which maximises not only mine's profit but also joint profits (Jurdziak, 2004).

(3) Results

Organizational and ownership solution of lignite mines and power plants and their attitude to lignite price negotiation have a key influence on BM operation and capability of realisation of optimal variant maximising joint profits. Analysis of different BM organizational and ownerships structures leads to conclusion that because of the inherent conflict of individual and group rationality only the full vertical integration of a lignite mine and a power plant can

secure realisation of the optimal solution – excavation of the optimal ultimate pit maximising joint BM profits.

In any other structure the incentive to opportunistic behaviour can appear. This incentive magnifies with the increase of the difference between the optimal lignite price and the price established during negotiation. It is therefore important to know the optimal price and to have equal access to all necessary information. Such asymmetry of information leads to opportunism. Knowledge about the deposit in condition of lack of cooperation and concentration only on price negotiation allows the mine to apply its predominant strategy – for the every negotiated lignite price it can choose the ultimate pit, which maximises its own profits. Usually it will be the smaller pit than those optimal for the whole BM, what reduces joint profits and the profit of the power plant in long run. In consequence the period of excavation will be shorter and utilisation of the deposit lower, what means that this solution is not optimal in Pareto sense.

Existence of two owners of BM sides having opposed interests increases the threats of non-cooperative behaviours and realisation of the inefficient solution. There are real example of such structures and opportunistic behaviours on energy market in Poland. Also in short run it is better to operate vertically integrated energy producers instead of two firms belonging to different owners. The obvious advantage is the avoidance of double marginalisation problem.

(4) Conclusions

Vertical integration of lignite mines and the power plants do not create any threats to electric energy market and energy consumers due to the pit optimal for the BM is greater than the pit optimal only for the mine, what increases electric energy supply. There will be also other positive synergy effects to consumers (e.g. decrease of transaction costs) increasing economic effectiveness of integrated energy producer (Jurdziak, 2005).

Profit of the vertically integrated BM does not depend on lignite price. It means that its improvement should be found in optimal adjustment of the shape and size of the ultimate pit to the demand for electricity (its prices) and not in prolonged negotiations of lignite prices. For the chosen optimal ultimate pit lignite price decides only about profit division between both sides – a power plant and a mine, and cannot improve joint financial results.

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