The Optimal Design of a NOME-type Regulation in Greece

Report prepared for the Greek Regulatory Authority for Energy[1]

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Chapter 4: The Implications of NOME for the Retail Market in the Short-Run Under the Operation of the Pool (and with full competition between the players in the retail market)

In this Chapter we examine how the retail electricity market in Greece will adjust to the deregulation of prices and the implementation of NOME in the short-run, that is under the assumption that the wholesale market continues to operate as a centralized exchange (a pool) AND under the assumptions that ADMIE and LAGIE are making concerning the operation of this market immediately after NOME is implemented. In contrast to the analysis of the last section of Chapter 2, here we assume that firms other than PPC can also purchase energy from the wholesale market (operated as a pool) in order to supply the retail market in competition with PPC.

Our understanding of the rules with which the market will operate in the short-run immediately after NOME is implemented, according to the statements made by ADMIE and LAGIE officials is the following. Assume for simplicity one E firm and firm I (PPC):

1. I has to give E through NOME, lignite capacity αK_λ at price p^a
2. In pool, I bids *all* his capacity including αK_λ (which cannot be bid by E) and E bids just his gas capacity.

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3. Let the price that emerges in pool (from uniform price auction) is p^W = wholesale price
4. E must have OTC contracts equal to $\frac{\alpha K_\lambda}{\varphi}$ in order to get allocated αK_λ according to the NOME rules .
5. There is a mechanism through which E gets from the pool an amount αK_λ for a price equal to p^a (and not p^W) to satisfy his OTC contract.
6. I cannot sell OTC.
7. Both E and I can obtain energy from the pool (as suppliers) and supply the retail market.

We start by noting that it is important to distinguish and not to confuse "retail sales" with the "OTC contracts". These are completely different things. OTC means producing and selling to final consumers without a pool. "Retail" also of course means selling to the final customers but this can be done by buying from a pool even in the complete absence of OTC contracts - as is the case in Greece right now. So what we must analyze to satisfy the immediate concerns of ADMIE and LAGIE is a market in which firms sell retail by buying from the pool and one of them also sells retail (in part) through OTC contracts.

Also, it is worth stressing that supplying retail from pool and supplying retail through OTC contracts are very different things. When supplying retail from pool each player has access to potentially all the capacity available in the pool, not just to his capacity, at the same price, p^W. Supplying retail through OTC contracts one has access to just his capacity (and the amount allocated through NOME). The latter is much harder to analyze as was shown in the previous section and will be clarified further below (because of the asymmetries in available capacities and marginal costs which disappear when retail is supplied from the pool).

Assume that retail demand is $D \le K_\lambda + K_g$, as is the case currently in Greece, and that enough energy has been supplied to the pool to satisfy this demand.

Though this is NOT important to our main argument, note here that if we assume that I supplies to pool all his lignite and gas capacity and E supplies all his gas

capacity then, assuming for simplicity that demand equals total lignite and gas capacity, the wholesale profits of I will be

$$\Pi_I^W = (p^W - c_\lambda)(1-\alpha)K_\lambda + (p^a - c_\lambda)\alpha K_\lambda + (p^W - c_g)K_{gI}$$

If I is the only firm that sells retail (an assumption also examined in the context of the last section of Chapter 2), other than the amount from the OTC contracts of E, then the retail profit of I is:

$$\Pi_I^r = (p_I^r - p^W)(D - \frac{\alpha K_\lambda}{\varphi})$$
$$= (p_I^r - p^W)[K_\lambda + K_{gI} + K_{g\mathrm{E}} - \frac{\alpha K_\lambda}{\varphi}]$$

and **since I supplies more retail than it sells wholesale, it has an incentive to lower the wholesale price ,** p^W , as also indicated in section 6 of Chapter 2**.**

Let us now turn to competition between E and I in the retail market.

I's retail profit, if c^r = retail cost, is:

$$\Pi_I^r = (p_I^r - p^W - c^r)Q_I^r$$

where

Q_I^r = I's total supply in retail market

E's retail profit on the other hand is:

$$\Pi_E^r = (p_E^r - c_E^a - c^r)\frac{\alpha K_\lambda}{\varphi} + (p_E^r - p^W - c^r)(Q_E^r - \frac{\alpha K_\lambda}{\varphi})$$
$$= (p_E^r - p^W - c^r)Q_E^r + (p^W - c_E^a - c^r)\frac{\alpha K_\lambda}{\varphi}$$

where

$Q_E^r \geq \frac{\alpha K_\lambda}{\varphi}$ = E's total supply in retail market, and

$$Q_I^r + Q_E^r \leq D$$

$$p^W \geq c_E^a + c^r$$

If E and I compete in price then their sales will be determined as in a standard Bertrand oligopoly set-up, by the following two expressions:

$$Q_I^r = \begin{Bmatrix} \frac{D}{2} \, if \;\; p_I^r = p_E^r \\ D \, if \;\; p_I^r < p_E^r \\ 0 \, if \;\; p_I^r > p_E^r \end{Bmatrix}$$

and

$$Q_E^r = \begin{Bmatrix} \frac{D}{2} \, if \;\; p_E^r = p_I^r \\ D \, if \;\; p_E^r < p_I^r \\ 0 \, if \;\; p_E^r > p_I^r \end{Bmatrix}$$

So there are two possible Bertrand Nash Equilibrium prices (p*).

(i) If $\frac{D}{2} \geq \frac{\alpha K_\lambda}{\varphi}$ then $p^* = p^W + c^r$ and the two players share the market (note that E does not have an incentive to lower price further since it will have a negative margin on all sales above $\frac{\alpha K_\lambda}{\varphi}$).

(ii) If $\frac{D}{2} < \frac{\alpha K_\lambda}{\varphi}$ then $p^* = p^W + c^r - \varepsilon$ and E supplies all the retail market (now, by keeping the same price E cannot sell all his NOME mix capacity on which it makes a positive profit margin, so now it has an incentive to undercut by ε reducing very slightly its margin on sales above $\frac{\alpha K_\lambda}{\varphi}$ but increasing discretely the sales on which it makes a positive margin).

Clearly, in this set-up NOME gives an enormous advantage to firm E by allowing it to make a part of its sales ($\frac{\alpha K_\lambda}{\varphi}$) in the retail market at a cost of c_E^a rather than p^W. With price competition, this may allow it to dominate the retail market. Further, it is

also clear that, **in this set-up the unambiguous prediciton is that the (deregulated) retail price will just be equalised to the wholesale price plus the retail marginal cost.**