Gas Release: how to weaken incumbent suppliers without strengthening foreign producers

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Context

Liberalization of energy markets in the EU: results so far unsatifactory, few entrants and small market shares.

Natural gas market in France (2008): 19% of non-residential customers, and only 4% of residential customers left the incumbent.

EC Energy sector inquiry (2007) emphasizes the entrants' difficulties to gain access to

- essential facilities (networks, storage);
- final consumers (due to long-term contracts with incumbents);
- the gas resource itself (due to long-term import contracts with foreign producers, and a lack of liquidity in spot markets).

What can the regulator do?

- Access to essential facilities: unbundling or non-discriminatory access rules.
- Access to final consumers: prohibition of downstream long-term contracts (Distrigas 2007)
- Access to the gas resource
  - within the EU: promote the creation and development of liquid hubs
  - outside the EU: ?

The EU recognizes that long-term contracts with foreign producers are necessary for investment, but they are dominated by incumbents.

E-ON/MOL merger case

Significant barriers to entry in the Hungarian market for natural gas:

- no liquid hub,
- long-term contracts between MOL and the Russian producer Gazprom.
- Gazprom has no incentives to sign long-term contracts with new entrants.

Remedies: 5-year gas release programme.

Long-term contracts and essential facilities

Do long-term contracts constitute "essential facilities"? In theory, no (spot markets), but in practice, they seem indispensable to operate in the supply business.

- **Essential facilities** (*e. g.* transportation networks): vertical unbundling, regulated tariffs.
- **Storage:** not really essential? unbundling requirements are lighter, tariffs can be negotiated.
- **Long-term contracts:** mandatory resale? access at a regulated tariff?

Gas release programmes in practice

Hesitations: gas release programmes involving small volumes, for a short duration.

- Gas release imposed by the regulator to promote competition in natural gas supply (UK, Spain, France, Italy);
- Gas release as merger remedies (Econgas, E.ON-Ruhrgas, E.ON-MOL, DONG-Elsam).

No consensus:

- what volume? what duration?
- how to set the price? auctions? should it be such that the incumbent makes no losses (WACOG)?
- how to assess whether the gas release was successful? Number of entrants? Market shares?

The regulator's objective

We assume that the regulator maximizes the 'domestic welfare' (which excludes foreign producers selling the long-term contracts). He seeks to

- promote competition in the downstream market by attracting new entrants;
- ensure that adequate volumes of long-term contracts will be purchased at a favorable price.

The measure seeks to weaken the former monopolist by promoting entry. However, critics say that it will only enhance the market power of the foreign producer, who is outside the scope of regulation.
Can gas release have a positive impact both on competition in the downstream market, and on the bargaining position of domestic suppliers w.r.t. non-EU producers?

Model

Consumers : inverse demand $p_z = d - z_i - \sum_j z_j$, where z_i, z_j= sales of incumbent i and entrant j $(j = (1, .., n))$.

Suppliers : 1 incumbent and n entrants, entry cost $E(n) = \frac{F}{n}$, Cournot competition.

Spot producer: non-strategic, sells s at spot price p, production cost $C(s) = \frac{1}{2}s^2 + bs \Rightarrow p = b + s$.

Foreign producer : strategic, same production cost, but first he needs to invest in capacity Y, then he sells $y \leq Y$.

Long-term contract : before investing, the producer signs a contract (y, M) with the incumbent.

The foreign producer and the incumbent cooperatively choose the contract volume y. Each period, the incumbent pays M, which is adjusted to leave the producer with a share α of the contract surplus.

Timing

Phase 0: before the market opening

- The foreign producer and the incumbent sign a long-term contract (y_0, M_0), and the producer invests Y.
- Each period, the incumbent sells z_i to his customers (at price p_z), he receives y and buys an additional s_i on spot.

Phase I: downstream market liberalization

- n_1 new entrants.
- Renegotiation of the long-term contract: new contract (y_1, M_1), with $y_1 \leq Y$.
- Each period, Cournot competition: suppliers commit to sell $(z_i,\ z_j)$ to their customers, then i receives y and all suppliers adjust their spot positions $(s_i,\ s_j)$.

Monopolistic incumbent

Backwards:

- i sells $z_i = \frac{d-b}{4} + \frac{y_0}{2}$ in the downstream market.

$$\Pi_i = \frac{1}{r}\left(\frac{(d-b)^2}{8} + \frac{y_0}{2}(d+b-y_0) - M_0\right), \tag{1}$$

- sharing of the contract-related revenue: $V(y_0) = \frac{y_0}{2}(d+b-y_0)$.

$$\Pi_p = \frac{1}{r}\alpha(V(y_0) - C(y_0)). \tag{2}$$

$$\Pi_i = \frac{1}{r}\left((1-\alpha)(V(y_0) - C(y_0)) + \frac{(d-b)^2}{8}\right). \tag{3}$$

Accordingly, the lump-sum transfer to the producer is

$$M_0 = \frac{y_0}{2}\left(\alpha d + (2-\alpha)b + (1-2\alpha)y_0\right). \tag{4}$$

The parties choose $y_0 = \frac{d-b}{4}$, and the producer invests $Y = \frac{d-b}{4}$.

Liberalized downstream market

Backwards:

- Spot : $s_j = z_j$ and $s_i = z_i - y_1$ (i can be spot buyer or spot seller).
- Cournot downstream : $z_i = \frac{d-b}{2(n+2)} + \frac{y_1}{2}$, $z_j = \frac{d-b}{2(n+2)}$;

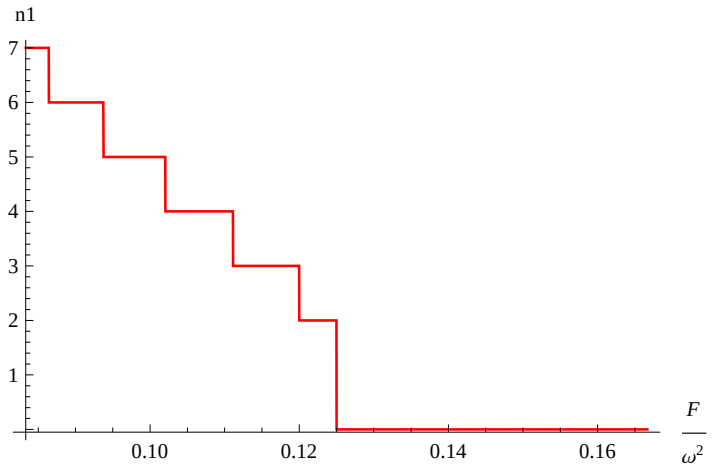
$$\Pi_i = \frac{1}{r}\left(\frac{(d-b)^2}{2(n+1)^2} + \frac{y_1}{2}(d+b-y_1) - M_1\right). \tag{5}$$

- Contract renegotiation: V is unchanged, therefore the contract is unchanged: $y_1 = y_0$, $M_1 = M_0$.
- Entry decision: let $\omega \equiv \frac{d-b}{\sqrt{2r}}$,
  $\Pi_j = \frac{\omega^2}{(n_1+2)^2} - \frac{F}{n_1}$.
  n_1 is the largest integer such that $\Pi_j \geq 0$, or

$$\omega^2 \geq \frac{(n_1+2)^2}{n_1} F.$$

Number of entrants

If $F = 0$, n_1 is infinite. If $F > 0$,



The regulator maximizes the domestic welfare. With no intervention:

$$DW = \left(1 - \frac{1}{(n_1+2)^2}\right)\frac{(d-b)^2}{4r} + \frac{y_1}{r}\left((1-\alpha)\frac{d-b}{2} + \frac{4\alpha-3}{4}y_1\right) - F$$

A gas release programme will affect both y (in the short run) and n (in the long run).

Gas Relase : Timing

Phase III: Gas Release

- The regulator announces the gas release parameters (T, β, p_r or the way it is set);
- n_2 additional entrants $\rightarrow$ there are now n entrants.
  Assumption: entry cost of the n_2 entrants of the second wave is $F/(n_1 + n_2)$.
- Long-term contract renegotiation: (y, M).
- Entrants choose to participate or not in the gas release programme: if j accepts, he receives y_j at price p_r during T periods. The incumbent keeps $y_i = y - \sum_j y_j$.
- Each period, Cournot downstream: z_i, z_j, then spot adjustment: $s_i = z_i - y_i$, $s_j = z_j - y_j$.
- After T periods, the gas release programme expires. Suppliers compete as before.

Domestic welfare

Given a gas release programme (T, β, p_r), the intertemporal domestic welfare is:

$$DW = \frac{\omega^2}{2}\left(1 - \frac{1}{(n+2)^2} + \frac{(1-\tau)(5-4\alpha)}{16}\right) + \frac{\tau}{r}Q - \frac{n_2}{n_1+n_2}F \quad (6)$$

where

$$\tau \equiv 1-(1+r)^{-T} \quad (7)$$

$$Q \equiv y\left((1-\alpha)\frac{d-b}{2} + \frac{4\alpha-3}{4}y + \frac{\alpha\beta}{2}(d+b-y-2p_r)\right). \quad (8)$$

Domestic welfare maximization

$$DW = \frac{\omega^2}{2}\left(1 - \frac{1}{(n+2)^2} + \frac{(1-\tau)(5-4\alpha)}{16}\right) + \frac{\tau}{r}Q - \frac{n_2}{n_1+n_2}F \quad (9)$$

As will be proved, y does not depend on n_1 or n_2.
$\rightarrow$ Maximize separately?
What is the optimal number of additional entrants n_2?

- If n_1 was strictly positive, n_2 should be zero: no gas release.
- If n_1 was zero, n_2 should be infinite: the gas release should maximize the number of entrants.

What is the optimal contract volume y?
If the foreign producer has a strong bargaining power (α), it is better to have the incumbent buy less long-term contract (he gets a small share of the surplus).

Gas release objectives

- If $n_1 = 0$, need to maximize n_2: stimulate entry.
- Optimal Q (optimal y) depends on α: optimize long-term contract terms.

$$DW = \frac{\omega^2}{2}\left(1 - \frac{1}{(n+2)^2} + \frac{(1-\tau)(5-4\alpha)}{16}\right) + \frac{\tau}{r}Q - \frac{n_2}{n_1+n_2}F \quad (10)$$

Theoretically, optimization of n_2 and of y could be treated as separate problems. But the gas release instruments affect both y and n_2.
$\rightarrow$ conflicting objectives?

Gas release auctions

- Cournot downstream: $z_j = \frac{d-b}{2(n+2)} + \frac{y_j}{2}$, the same for i.
- Entrant participation in gas release: no externality between bidders (y will anyway be brought to the market: take-or-pay)
  each entrant is willing to pay up to $p_r = \frac{d+b-y}{2}$, so that they finally all pay this price and obtain $y_j = \frac{\beta y}{n}$.

Summary

- The entrants' additional profits are extracted by the incumbent through the auction mechanism.
- Consequently, his profit function is unchanged: with the producer, he will choose the same y and pay the same M as before.
- Entrants make the same profit as before $\rightarrow$ the GR auction induces no additional entry.
- The positive effect is only apparent: entrants' market shares increase, but their profits don't.

Gas release at a predetermined price

In all cases, the gas release should be as long (T) and as large (β) as possible.
As for the choice of p_r, there is a trade-off:

- to maximize n: small p_r, attracts additional entrants, but induces a lower contract volume y (during the GR).
- to optimize Q: larger p_r to maintain y if $\alpha \leq \frac{1}{2}$, else to reduce it a little, but induces less entry.

Gas release with *ex post* adjusted price

Regulator commits to adjust p_r to the average price of contract gas:

$$p_r = \frac{M}{y}. \tag{11}$$

Again, gas release should be as long (T) and as large (β) as possible.

- y will be the same as with no gas release.
- If $\beta = 1$, the number of entrants will be larger than when p_r is defined *ex ante*.
- Gas release mitigates/annihilates the foreign producer's market power.

$$\Pi_i = V - M = (1 - \alpha)(V - C(y)). \tag{12}$$

When $\beta \to 1$, almost all contract volumes are resold under gas release: revenue $V \to (y - \varepsilon)\frac{M(\beta)}{y} - M + ...$ To leave the incumbent with a positive surplus, the producer must reduce M.
But as a result, $p_r = M/y$ also decreases, and so does the incumbent's revenue...
In the end, $M \to C(y)$ and the producer makes zero profit.

Conclusion

Gas Release can be beneficial in the long run (entry) but also in the short run (mitigate the foreign producer's market power).
Comparison of different designs:

- auctions are not efficient,
- gas release at a predetermined price is better,
- gas release with a price adjusted to contract cost is even better.

The larger and the longer, the better (if entrants can never sign long-term contracts): the optimum would be to create a dedicated entity to negotiate long-term contracts, and resell them to all suppliers at average purchasing cost.
Limit: if it is possible for entrants to sign long-term contracts when they become large enough, better limit gas release duration and choose less favorable terms, to incite them to become importers (ladder of investment).