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CRE
COMISION REGULADORA DE ENERGIA

CIDE

NÚMERO 165

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REGULATION OF GAS MARKETING ACTIVITIES IN MEXICO

Resumen

En este documento estudiamos la relación de los mercados mexicano y norteamericano de gas natural y las implicaciones de este vinculo en la comercialización eficiente del gas en México. Argumentamos que a PEMEX se le debería permitir firmar contratos "spot" o de futuros en la venta de gas. Sin embargo, el precio del gas debería ser siempre igual al precio "netback" basado en el *Houston Ship Channel* al momento de entrega. A PEMEX no debería permitírsele descontar el precio del gas del precio "netback" de Houston incluso si lo hace de una manera no discriminatoria. Esta metodología es transparente, fácil de llevar a la práctica y no elimina ninguna opción legítima de mercado para ninguna de las partes involucradas. PEMEX o los consumidores de gas pueden usar el mercado de Houston para cubrirse de transacciones especulativas.

Abstract

We study linking the Mexican market for natural gas with the North American market and the implications of these links on efficient marketing of gas in Mexico. We argue that PEMEX should be permitted to enter into spot contracts or future contracts to sell gas, however, the price of gas should always be the net back price based on the Houston Ship Channel at the time of delivery. PEMEX should not be permitted to discount the price of gas from the Houston netback price even in a nondiscriminatory fashion. This arrangement is transparent, it is easy to enforce and does not eliminate any legitimate market options for any of the parties involved. PEMEX or consumers of gas can use the Houston market for hedging of speculative transactions.

Key words; natural gas, welfare, pricing, Mexico, regulation.

Introduction

The question we are addressing is what restrictions should be placed on PEMEX's marketing activities in the natural gas market. To address this question, it is useful to review what are probably well accepted goals for regulation. These include the efficient allocation of resources, achieving some redistributive goals, simplicity and transparency. With these goals in mind, it is clear that the decision to link the price of natural gas in Mexico to the price at the Houston ship channel by a netback rule solves some very difficult technical and institutional problems in a very simple fashion. The netback rule links the price of gas at any point in Mexico to the price of gas in Houston adjusting for the cost of transportation. The natural gas market in Mexico then has all the properties of the gas market at Houston. In particular, all agents are price takers with respect to the market and the Houston market can be used by agents in Mexico for hedging and other forward contracts. The key to the implementation of this policy is that there is sufficient pipeline capacity so that the gas markets can clear and rents do not accrue to the pipelines. If there is not sufficient pipeline capacity so that the natural gas markets in Mexico can clear at the Houston netback prices, it is impossible to implement the netback rule. At the net back price, demand will be greater than supply.

A proposal that is being discussed is to change the system so that PEMEX sells gas only at the point of injection. The prices in the local markets are set by local supply and demand conditions. These changes will create uncertainty in the gas market and also create the possibility of strategic manipulation of the price of gas that will be very difficult to regulate. Further, the current regulations permit the net back price to be an upper bound and PEMEX can sell gas below that price if it does so in a nondiscriminatory fashion.

The reason that has been given for allowing PEMEX to sell at a price below the Houston netback price, as long as the sales were non discriminatory, is that there is no reason to restrict voluntary transaction between parties. However, there is a substantial agency problem in these transactions. It is hard to understand why PEMEX (acting as a agent for the Mexican people) would want to sell gas in Mexico for less that it could net by selling the gas in Houston. There may be policy reasons to subsidize gas in certain circumstances, however, this does not seem like a decision that should be delegated to PEMEX gas marketing.

PEMEX should be permitted to enter into spot contracts or future contracts to sell gas, however, the price of gas should always be the net back price based on the Houston Ship Channel at the time of delivery. PEMEX should not be permitted to

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discount the price of gas from the Houston netback price even in a nondiscriminatory fashion. This arrangement is transparent, it is easy to enforce and does not eliminate any legitimate market options for any of the parties involved. PEMEX or consumers of gas can use the Houston market for hedging of speculative transactions.

The Houston market can also serve as a buffer for fluctuations in PEMEX's production or in demand. PEMEX can vary its sales in the Houston market to smooth fluctuation in Mexico.[1] This buffer allows PEMEX to only sell "plain vanilla" gas without having to engage in complex market operations in Mexico. Thus, it is very difficult to see what useful role can be played by PEMEX acting as a gas marketeer in Mexico. If PEMEX wants to engage in speculative market behavior, they can do so in the Houston market. Houston has the advantage of being a well developed market. PEMEX's transactions in that market would not create any regulatory issues for the CRE as long as PEMEX sells gas in Mexico at the Houston spot netback price. As long as there is sufficient pipeline capacity so that there are no bottlenecks in transporting gas, this simple rule will result in an efficient and transparent natural gas market in Mexico.

Allowing PEMEX discretion in pricing gas becomes an even more complicated problem if PEMEX is allowed to sell gas for future delivery at a price other than the Houston netback price at the time of delivery. For example, PEMEX can sell gas for delivery 30 days in the future at a given price and the next day sell gas for delivery 29 days in the future a different price. Technically, these transactions would not be discriminatory. Transactions that involve selling forward gas at a predetermined price would be very difficult to monitor and give PEMEX gas marketeers a very large amount of power and discretion.

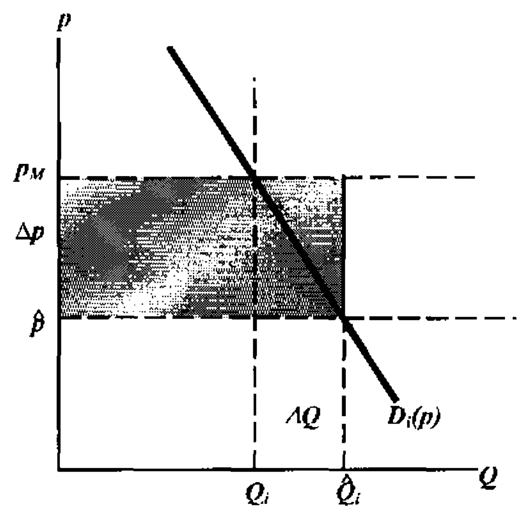
There are important and legitimate reasons why private oil companies use forward markets to reduce risk; let us grant that such reasons may also apply a nation oil company such as PEMEX. Restricting PEMEX to sell gas in Mexico at the Houston spot market netback price does not eliminate any options for PEMEX. Linking the price of gas in Mexico to the Houston market permits PEMEX to operate in these sophisticated markets with out involving their customers for gas delivered in Mexico. Further, buyers of natural gas in Mexico can enter into transactions in Houston without involving PEMEX. Thus, there is no economic reason for PEMEX has to operate as a gas marketeer in Mexico.

It may seem more efficient to permit PEMEX and other parties involved to enter into such transactions directly without going through the Houston market. However, requiring such transactions to take place in the well developed Houston market reduces the possibility of fraud and also reduces the regulatory burden in Mexico.

[1] This assumes that PEMEX is exporting gas.

Problems with flexibility in the netback rule

The present regulations permit PEMEX to sell gas at below the Houston netback price as long as they do so in a nondiscriminatory fashion. This policy is supported by the received wisdom in regulatory theory in that prohibiting a voluntary transaction on the part of two competent parties does not improve welfare.[2] However, this result does not apply in this case. The linkage to Houston means that all parties in the Mexican market are price takers. Since Mexican gas can always be sold in Houston, the value of the marginal cubic foot of gas at the well in Mexico is the Houston price less cost of transport. We will demonstrate that a policy to sell at the Houston netback price is Kaldor-Hicks superior to a policy that discount the gas in a nondiscriminatory fashion.



It is Kaldor-Hicks superior to have the price of gas in Mexico equal to the Houston price adjusted for transportation costs. Assume that gas is produced at Burgos and shipped to Houston and Monterrey. Let p_H be the spot price at Houston and p_M be the spot price at Monterrey. Let c_h be the cost of moving gas from Burgos to Houston, c_m be the cost of moving gas from Burgos to Monterrey. The netback rule would lead to the condition that the price of gas less transport cost is the same at Houston and Monterrey,

$$p_m - c_m = p_h - c_h \qquad (1)$$

[2] Suppose the regulator forces the firm to charge prices P^0. Total welfare would be $V(P^0) + \alpha\pi(P^0)$, where V is consumer surplus, π is profits and α in [0,1]. If the firm is allowed to offer P such that $V(P) \geq V(P^0)$, this alternative policy would not make consumers worse off and the firm would make a greater profit. (See Armstrong, et al, (1994), p.67).

Suppose a customer in Monterrey had a demand curve $Q_i=D_i(p)$ for the gas. PEMEX can sell the gas to the customer in Monterrey or sell the gas in Houston. Suppose PEMEX sold the consumer $\hat{Q}_i$ amount of gas at $\hat{p} < p_m$. It is feasible for PEMEX to sell the gas in Houston and transfer an amount $\Delta p \Delta Q_i + \frac{\Delta p \Delta Q}{2}$ to the Monterrey consumer.[3] This would lead to greater revenue, $\frac{\Delta p \Delta Q}{2}$, to PEMEX and make the Monterrey consumer no worse off. Thus it is Kaldor-Hicks superior to have the price of gas in Mexico equal to the Houston netback price and sell the balance of the gas on the Houston market rather than to sell gas in Mexico at a price below the Houston netback price.

Regulation of pipeline rates

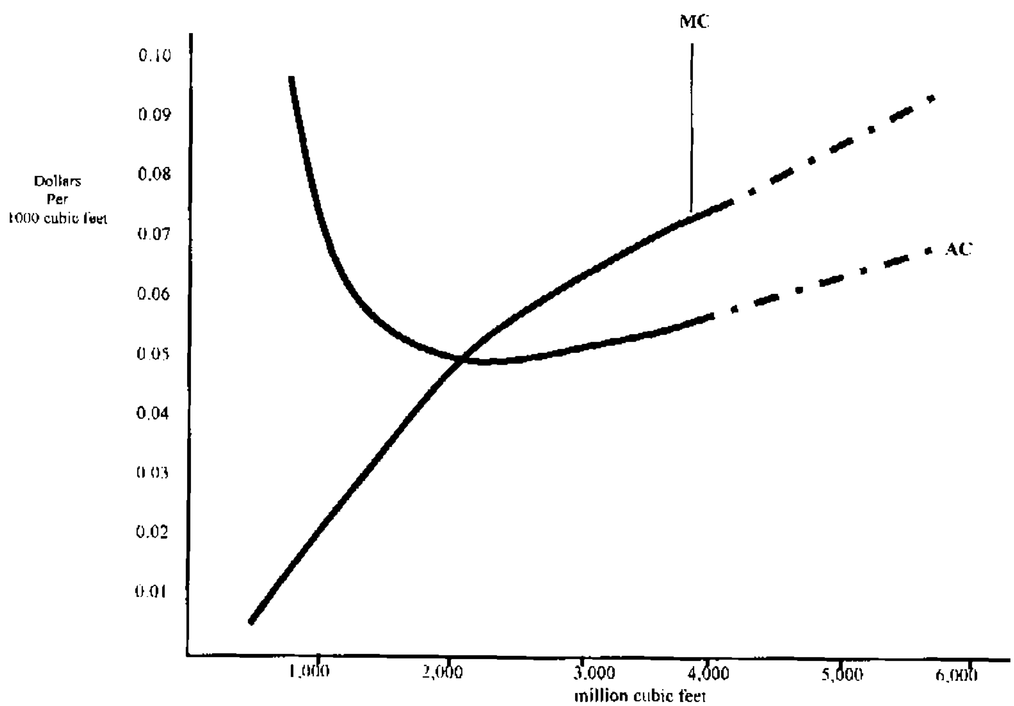


Figure 1

Pipelines have a high fixed cost, and for a substantial portion of their operating region low marginal costs. The capacity of the pipeline is ultimately limited by the pressure limits of pipe. Figure 1 illustrates the cost curves for a 48-inch pipeline 100

[3] Recall that under the netback rule, the revenue after transportation costs of selling gas in Houston or Monterrey would be the same.

miles long.[4] The dashed lines represent what the cost curves would be if the pressure limits are not binding. At a pressure limit of 1,500 pounds per square inch, the pipeline reached its limit at approximately 3,800 million cubic feet per day. At this point it becomes impossible to increase throughput by increasing power and it becomes necessary to add compressor stations which increases throughput without exceeding the line limit by increasing the pressure gradient.

We have shown in an earlier paper (Brito and Rosellon (1998)) that the netback pricing rule is the solution of a static welfare optimization problem if the fee for transporting gas is the marginal cost of transporting gas. However, marginal cost pricing results in a loss or rents. (See Figure 1.) One solution to this problem is to set a fee that yields a regulated rate of return over the life of the project sufficient to cover all costs. An alternative, more sophisticated alternative is a two-part tariff with a price cap.[5] The sophisticated price cap mechanism is efficient in that it sets the marginal cost of transporting gas equal to the variable change for moving gas. However, this price flexibility could permit PEMEX to behave strategically. The question is whether the more efficient allocation of resources merits the additional difficulties in regulation.

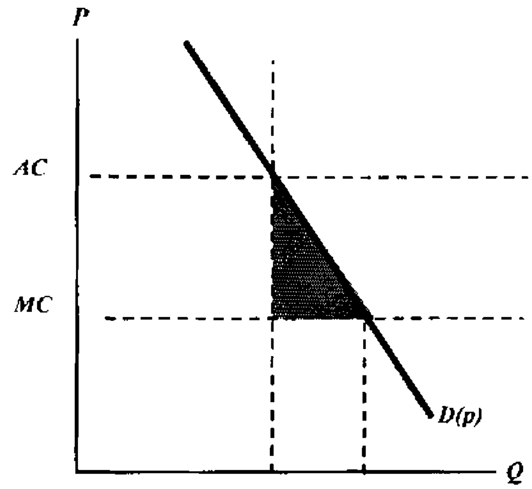


Figure 2

The shaded area in Figure 2 illustrates the welfare loss associated with using average cost rather than marginal cost in transporting gas. The loss, L, is given by

[4] These parameters used in constructing this example are based on numbers reported in the Oil & Gas Journal, November 27, 1995.

[5] CRE currently regulates PEMEX transportation rate through an average revenue cap that prevails during each five-year period. The initial value of the cap is set in each period through cost of service and adjusted by inflation, efficiency, pass through and correction factors. PEMEX estimates its fixed, variable and financial costs (including an 11.5 percent rate of return) and sets its two-part tariff according to its revenue requirements.

$$L = -\frac{(AC - MC)^2 Q\eta}{2p} \qquad (2)$$

where η is the elasticity of the demand for gas. Simple calculations suggest that for elasticities in the demand for gas in the range of - 0.1 to - 0.2 the welfare loss is of second order and can be ignored. If we calculate the dead weight loss for 4 billion cubic feet, the price of gas equal to \$2.00 per 1,000 cubic feet, an elasticity for the demand for gas equal to -0.1, and a differential between AC and MC of \$0.02, we get that the change in demand is 4,000,000 cubic feet and the deadweight loss is \$40.

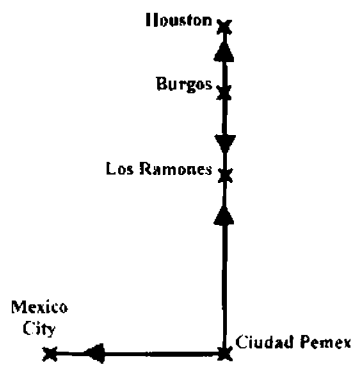


Figure 3

The welfare loss associated with using a rate of return fee structure for transport pipelines is so small that it is hard to see how the additional complexity in regulation can be justified given the low elasticity in the demand for gas in Mexico.[6] A flexible pricing mechanism permits the strategic manipulation of pipeline rates.

As an example, suppose that PEMEX can set a price for transporting gas through a pipeline in the range between c_1 and c_2 per mile. PEMEX is producing gas in Burgos and Ciudad Pemex and selling gas in Houston and Mexico City. Los Ramones is the arbitrage point. (See Figure 3. The arrows indicated which way gas is moving.) We will show that PEMEX can exploit this flexibility to set the pipeline tariff to increase revenues.

[6] The Energy Ministry of Mexico has estimated the following elasticities of demand for natural gas: national -.21, northwest: -0.47, northeast: -0.13, west -0.33, center: -0.05 gulf: - 0.15. See Secretaria de Energia, 1998)

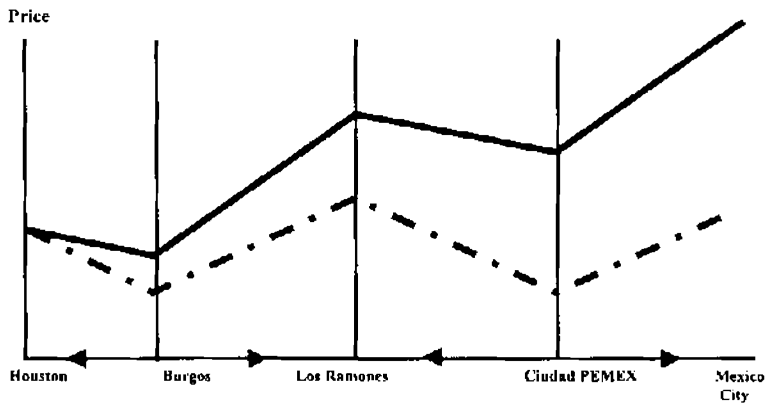


Figure 4

To maximize revenue, PEMEX can charge the low transport charge c_1 between Houston-Burgos, the high transport charge c_2 between Burgos-Los Ramones and the low transport charge c_1 between Los Ramones- Ciudad Pemex and a high transport charge c_2 between Ciudad Pemex - Mexico City. This is illustrated by the solid line in Figure 4. This pricing policy maximizes the revenue to PEMEX. They are cross subsidizing their pipeline segments. The result is higher price of gas in Mexico. The dashed line in Figure 4 illustrates the price pattern that would result if PEMEX charged the average of the two prices, $\frac{c_1 + c_2}{2}$ on all segments. To calculate this amount let:

d_1 be the distance from Houston to Burgos,

d_2 be the distance from Burgos to Los Ramones,

d_3 be the distance from Los Ramones to Ciudad Pemex,

d_4 be the distance from Ciudad Pemex to Mexico City,

p_H be the price at Houston,

p_{DF} be the price at Mexico City,

If PEMEX can manipulate the pipeline rates, the price of gas at Mexico City is given by

$$\overline{p}_{DF} = p_H + c_2(d_2 + d_4) - c_1(d_1 + d_3) \qquad (3)$$

If PEMEX charges a fixed rate, the price of gas at Mexico City is given by

$$\hat{p}_{DF} = p_H + \frac{c_1 + c_2}{2}\left[(d_2 + d_4) - (d_1 + d_3)\right], \qquad (4)$$

the difference is cost is

$$\bar{p}_{DF} - \hat{p}_{DF} = \frac{(c_2 - c_1)}{2}(d_1 + d_2 + d_3 + d_4). \qquad (5)$$

If c_2-c_1=0.04 and the distance from Mexico City to Houston via Ciudad Pemex is 1000 miles, then the strategic manipulation of the tariff could lead to an increase in the price of gas at Mexico City of about $.20 per 1000 cubic feet.

CRE could prevent such behavior by more detailed regulation, but this would increase the regulatory burden and the welfare gain from such complex pricing mechanism is very small.

PEMEX selling gas only at the point of injection

One advantage of using the netback rule with a fixed fee for transporting gas is that all parties act as price takers at all points along the pipeline. Restricting PEMEX to sell gas only at the point of injection and allowing local market conditions to set the price creates the possibility that marketeers could acquire some degree of market power. Parties could buy the gas at the point of injection and ship either to the Houston market (where they face an essentially flat demand curve) or to the Mexican markets where they face an inelastic demand curve. Collusive behavior on the part of marketeers would allow them to equatemarginal revenue in both markets and exploit the fact that demand curves in the local markets are very inelastic and earn monopoly rents. It then becomes necessary to regulate the activities of the marketeers. The regulatory problem is much simpler if PEMEX sells at all points on the pipeline system using the netback rule to determine the price. This would not eliminate other marketeers' activities.

Forward Markets and Pipeline Capacity

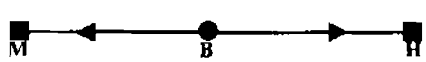


Figure 5

If PEMEX is required to sell gas on the spot market at the Houston Ship Channel price adjusted by the netback rule, can PEMEX use its monopoly power over the pipeline to get monopoly rents in this forward market? To address this question let us consider a simple model. Assume a two period model. Gas is produced at Burgos and shipped to Houston and Monterrey. Let be p_{0h} the spot price at Houston a time 0, p_{0m} the spot price at Monterrey at time 0, p_{1h} the spot price at Houston a time 1, p_{1m} the spot price at Monterrey at time 1, $\hat{p}_h$ the forward price at Houston a time 0, $\hat{p}_m$ the forward price at Monterrey at time 0. Let c_h be the cost of moving gas from Burgos to Houston, c_m be the cost of moving gas from Burgos to Monterrey, and $\Delta c = c_m - c_h$. Let $\overline{Q}_m$ be the capacity constraint on the pipeline from Burgos to Monterrey. If the capacity constraint does not bind, the netback price at Monterrey is $p_{\tau m} = p_{\tau h} + \Delta c$. (See Figure 6 left) If the capacity constraint binds, the price at Monterrey is $p_{\tau m} = p_{\tau h} + \Delta c + R$, where R are the rents associated with the capacity constraint. (See Figure 6 right)

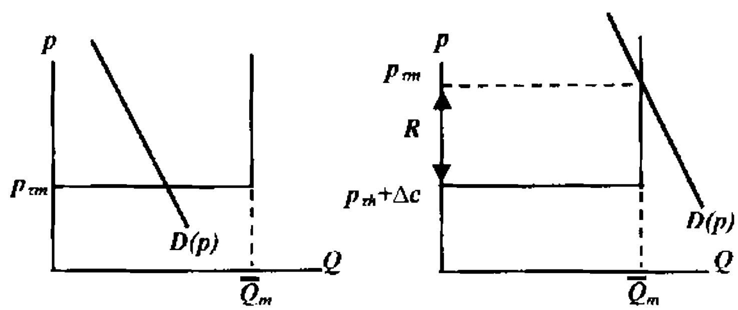


Figure 6

If the pipeline capacity does not bind, anyone who desires to engage in forward transactions can do so in the Houston market and PEMEX does not have an effective monopoly of the forward market and will capture no rents. However, if the pipeline capacity does bind, PEMEX can capture the rents associated with the pipeline constraint by selling output forward. PEMEX can become a monopoly in the forward firm-service market. Note that if the pipeline capacity does bind, rents will exist and the only question is who will appropriate them. Given that the capacity constraint on the pipeline is binding, there are no real effects.

The key regulatory issue in this context appears to be insuring that PEMEX invests sufficiently in pipeline capacity so that capacity constraints are not a serious issue.

Optimal Pipeline Capacity

A necessary element in implementing a policy where the Houston gas market is the reference point for pricing gas in Mexico is that there is sufficient capacity so that the market for gas can always clear at the netback price. The obvious question is whether the cost of maintaining such capacity is warranted. This is a very difficult question in that there are economic, political and institutional constraints involved in the basic question of pricing gas along the Mexican pipelines.

A benchmark for discussion is the pattern of investment that would be followed by a planner that is attempting to maximize a measure of welfare. Such a policy may involve periods where the capacity constraint binds. The length of this period is a measure of the cost of the deviation from "optimal" that results from the policy of using the Houston gas market as a benchmark for pricing gas. We will show that a policy that insures sufficient capacity on the pipeline so that the gas market can clear at the Houston netback price deviates from an "optimal" policy only by a matter of weeks.

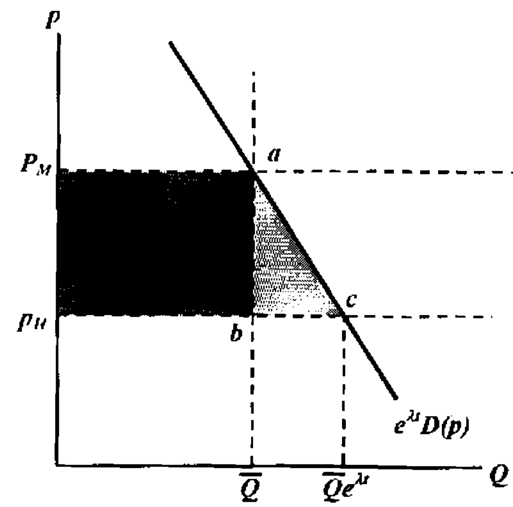


Figure 7

Let us consider a case where the pipeline capacity is given by $\overline{Q}$. Demand is growing at a rate λ. Let $\overline{p}_M$ be the price in Monterrey based on Houston net back. Assume that demand reaches the pipeline capacity at t=0 so that $p_M = \overline{p}_M$ for $Q < \overline{Q}$ and $\overline{p}_M = \theta(\overline{Q})$. If the pipeline capacity binds, $p_M = \theta(\overline{Q}e^{\lambda t})$ and the excess burden associated with this bottleneck is given by,

$$X_1(t) = \frac{\Delta p \Delta Q}{2} = \frac{\overline{Q}(e^{\lambda t} - 1)[\theta(\overline{Q}e^{\lambda t}) - \overline{p}_M]}{2} \qquad (6)$$

This is the triangle *a-b-c* in Figure 7. The bottleneck results in rents being generated and these rents result in the loss given by

$$X_2(t) = \gamma_1 \overline{Q} \Delta p = \gamma_1 \overline{Q}[\theta(\overline{Q}e^{\lambda t}) - \overline{P}_M] \qquad (7)$$

where γ_l is a parameter that can range from 0 to 1. This loss represents the fraction of rents that are consumed in transfer and reflects such factors as rent seeking and *X*-

inefficiency. This is the rectangle $p_M - \overline{p}_M - a - b$ in Figure 7. Define the total loss in welfare as

$$X(t)=X_1(t)+X_2(t). \qquad (8)$$

Opening a second pipeline reduces average costs of transporting gas moving the operating range of both pipelines to $\frac{Q}{2}$. The marginal cost of moving gas will be reduced by ΔMC. This will reduce the cost of moving gas by $\varphi = \Delta MC\overline{Q}$. Let γ_2 be the weight of these cost savings in the welfare function. A welfare maximizing planner would want to pick the time of opening the second pipeline to minimize the welfare loss less the savings in operating costs which is given by

$$\Psi = \int_0^T e^{-rt}\left\{\frac{\overline{Q}\left(e^{\lambda t}-1\right)\left[\theta\left(\overline{Q}e^{\lambda t}\right)-\overline{p}_M\right]}{2}+\gamma_1\overline{Q}\left[\theta\left(\overline{Q}e^{\lambda t}\right)-\overline{p}_M\right]-\gamma_2\varphi\right\}dt+e^{-rT}C_0 \quad (9)$$

The first order condition for this maximization is

$$\left\{\frac{\overline{Q}\left(e^{\lambda T}-1\right)\left[\theta\left(\overline{Q}e^{\lambda T}\right)-\overline{p}_M\right]}{2}+\gamma_1 Q\left[\theta\left(\overline{Q}e^{\lambda T}\right)-p_M\right]-\gamma_2\varphi\right\}-rC_0=0 \quad (10)$$

which can be written as

$$\frac{\dfrac{\overline{Q}\left(e^{\lambda T}-1\right)\left[\theta\left(\overline{Q}e^{\lambda T}\right)-\overline{p}_M\right]}{2}+\gamma_1\overline{Q}\left[\theta\left(\overline{Q}e^{\lambda T}\right)-\overline{p}_M\right]-\gamma_2\varphi}{C_0}=r \qquad (11)$$

We can use our previous numerical example in Section 3 to calculate the value of T for those values of the parameters and get a rough approximation of the length of the period where it is efficient for the capacity constraint to bind.

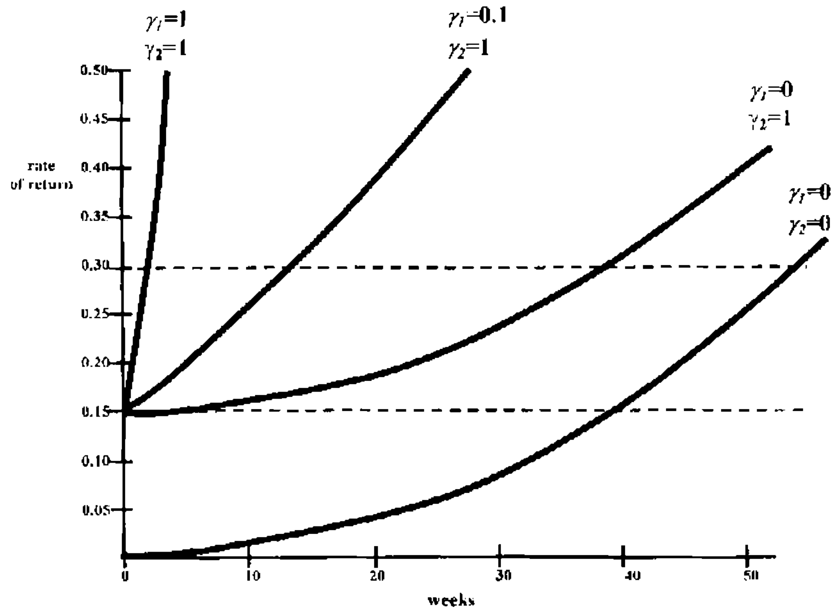


Figure 8

Figure 8 illustrates the solution of the minimization problem for a 48 inch pipeline, 300 miles long. The curve labeled γ_1=1, γ_2=1 depict the loss to the consumers. If we examine the curve we see that even for a very high rate of return on the order of 30 per cent, the "optimal" investment time is about two weeks after the capacity constraint begins to bind. For a rate of return of 15 percent, the consumers will never want the capacity constraint to bind. Consumers of natural gas are willing to pay for the facilities to transport the gas they demand at the Houston netback price. Thus it is feasible to construct a rate structure that will compensate the operator of the pipeline to maintain sufficient capacity to transport the gas demanded at the Houston netback price. Note that such a policy is Pareto superior.

The curve labeled γ_1=0.1, γ_2-1 depict the welfare loss if we assume that 10 percent of the rents transferred to PEMEX are lost to X-inefficiencies. For a rate of return of 30 percent, the "optimal" period for the capacity constraint to bind is 15 weeks. For a rate of return of 15 percent, it is not optimal for the capacity constraint to bind. The savings in operating costs are sufficient to warrant the investment.

The curve labeled γ_1=0, γ_2=1 ignores the transfers from consumers and includes on the savings in operating costs and the deadweight loss. The curve labeled γ_1=0, γ_2=0 ignores everything but the deadweight loss. Even using this measure of welfare loss the optimal period for the constraint to bind is less than one year for a rate of return of 15 percent.

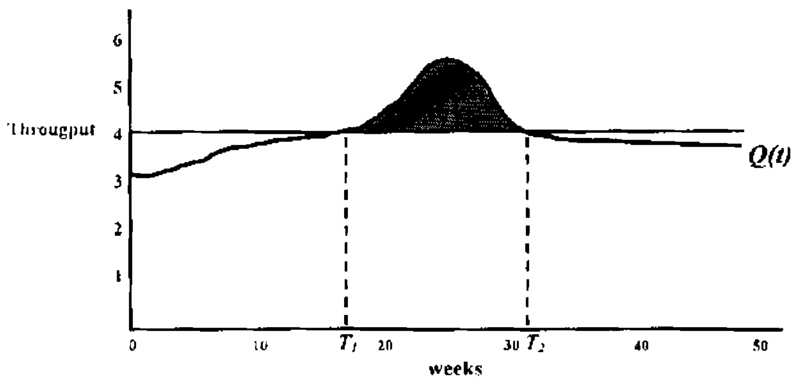


Figure 9

The weather in Mexico does not fluctuate as much as in the United States, however, there do occur peaks that could result in seasonal bottlenecks. Assume the bottleneck starts at $t=T_1$ and ends at $t=T_2$. (See Figure 9) The welfare loss associated with such a bottleneck is then $\int_{T_1}^{T_2} X(t)dt$. It pays to invest in additional pipeline capacity to eliminate the bottleneck if

$$\frac{\int_{T_1}^{T_2} X(t)dt - \gamma_2\varphi}{C_0} = \frac{\overline{X}(T_2 - T_1) - \gamma_2\varphi}{C_0} \geq r, \qquad (12)$$

where $\overline{X}$ is the average of welfare loss. (See Figure 10 below)

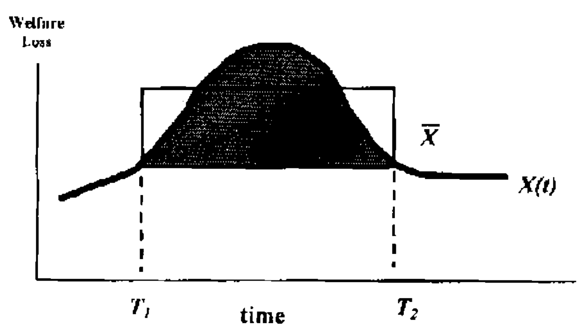


Figure 10

Let $\Delta T = T_2 - T_1$, Figure 11 depicts the relationship between ΔT and $\overline{X}$ for $r=0.15$.

A

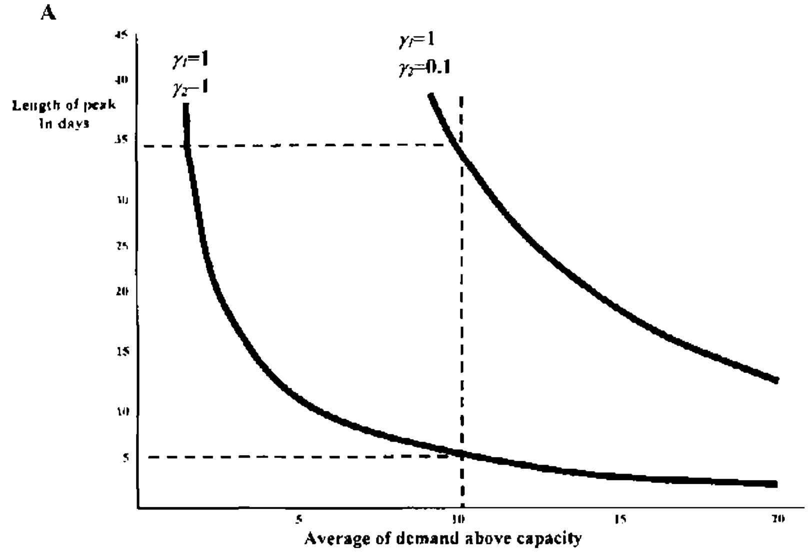


Figure 11

Consumers of gas are willing to pay to eliminate a five-day peak whose average is 10 percent over capacity. A planner that assigns a 10 percent cost to transfers will invest to eliminate a 35-day peak whose average is 10 percent over capacity.

The need for concern about the possibility of capacity constraints in gas pipelines follows from projections about demand. Demand for natural gas in the PEMEX transportation system will grow at an annual rate of 11.0%. These estimates are based on increases in the demand for natural gas of electricity generation (annual growth rate of 19% in 1999-2003), industrial consumers (5%), and LDC's (4%) (see Figure 11). The northeastern and northwestern regions will register a growth of 12% and 18%, respectively, during the 1999-2003 period due to the CFE's projects. (CFE is the national electricity monopoly.) These two regions will represent 36% of total market demand.

Table 1

Natural gas demand: annual growth rates by consumer type

	1994-1997	1997-2003
CFE	7	17
Industrial	5	5
Cogeneration		76
PEMEX	1	5
Vehicles		51
Distribution	1	13

SOURCE: Escenarios de Oferta y Demanda en el Sistema Nacional de Gasoductos de PEMEX-Gas, Comisión Reguladora de Energía (1999)

In 1999, demand and supply for natural gas in Mexico will be 4,824 and 4,838 million cubic feet per day (mcfd), respectively, in 2000-2001 5,096 mcfd and 5,111 mcfd, and in 2002-2003 5,259 mcfd and 5,275 mcfd, respectively. According to the permit granted by CRE to PEMEX in order to transport natural gas,[7] PEMEX will face this increase in demand by expanding its transportation capacity (See Table 1).[8]

Table 2

Maximum average transport capacity of PEMEX's national pipeline system

Units	Year 1	Year 2	Year 3	Year 4	Year 5
MMGcal/Year	421.5	445.3	445.3	459.5	459.5
MMPCD	4,824	5,096	5,096	5,259	5,259

SOURCE: Comisión Reguladora de Energía (1999).

As shown, the increase of pipeline capacity will barely cope with the increase of demand, and there could be bottlenecks during peak periods. Specially important is the 1597 kilometer-long pipeline system in the Reynosa and Monterrey operating sectors where a huge increase of demand is expected and where two of the three compression stations are old.[9]

A very strong case can be made from these calculations that a policy that makes sure that there is always sufficient pipeline capacity so that the gas market can always clear should be followed. Such a policy would generate sufficient savings to the consumers of gas that they will be willing to pay for such investment.

The only argument that can be made against investing in this pipeline capacity is that the government loses the revenue created by rents to the pipeline. However, the Mexican government can at present capture the rents that would be generated by pipeline congestion by taxing gas. If we take as given that additional taxation of natural gas is not desired, then a pipeline investment policy that prevents pipeline congestion can be Pareto superior. Consumers would be willing to pay for this capacity and the only cost to the government is not collecting rents it can now collect and has chosen not to do so.

[7] Comisión Reguladora de Energía (1999). This permit states all the technical details and investment plans that Pemex will have to fulfill during the next five years in its transportation activities.

[8] These calculations are based on estimates of injection and extraction requirements at each node (Comisión Reguladora de Energía (1999), appendix 3.1), flow and capacity technical information for each transportation sector (annex 3, appendix 3.1 and 3.2), repowering needs at each compression station (appendix 3.1), and investment needs for expansion of the pipeline network (annex 6.2.1).

[9] There are three compression stations located in these sectors. In the Monterrey sector here are two old "reciprocate" compression stations "Ojo Caliente", and "Santa Catarina", with more than 30 years of operation, and with huge drops in pressure and low volumes. In the Reynosa sector there is a "turbo compression" station" that was constructed in 1997.

Conclusions

PEMEX should be permitted to enter into spot contracts or future contracts to sell gas, however, the price of gas should always be the net back price based on the Houston Ship Channel at the time of delivery. PEMEX should not be permitted to discount the price of gas from the Houston netback price even in a nondiscriminatory fashion. This arrangement is transparent, it is easy to enforce and does not eliminate any legitimate market options for any of the parties involved. PEMEX or consumers of gas can use the Houston market for hedging of speculative transactions.

The Houston market thus serves as a buffer for fluctuations in PEMEX's production or in demand. PEMEX can vary its sales in the Houston market to smooth fluctuation in Mexico. This buffer allows PEMEX to only sell "plain vanilla" gas without having to engage in complex market operations in Mexico. Thus, it is very difficult to see what useful role can be played by PEMEX acting as a gas marketeer in Mexico. If PEMEX wants to engage in speculative market behavior, they can do so in the Houston market. Houston has the advantage of being a well-developed market. PEMEX's transactions in that market would not create any regulatory issues for the CRE as long as PEMEX sells gas in Mexico at the Houston spot netback price.

As long as there is sufficient pipeline capacity so that there are no bottlenecks in transporting gas, this simple rule will result in an efficient and transparent natural gas market in Mexico.

The key to this policy is that there be sufficient investment in pipeline capacity so that bottlenecks do not develop. A very strong case can be made from these calculations that a policy that makes sure that there is always sufficient pipeline capacity so that the gas market can always clear should be followed. Such a policy would generate sufficient savings to the consumers of gas that they will be willing at pay for such investment in the rate structure. Consumers would be willing to pay for this capacity. The only argument that can be made against investing in this pipeline capacity is the loss of revenue created by rents to the pipeline. However, the Mexican government can at present capture these rents and does not do so. If this is the correct policy, then a pipeline investment policy that prevents pipeline congestion can be Pareto superior.

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