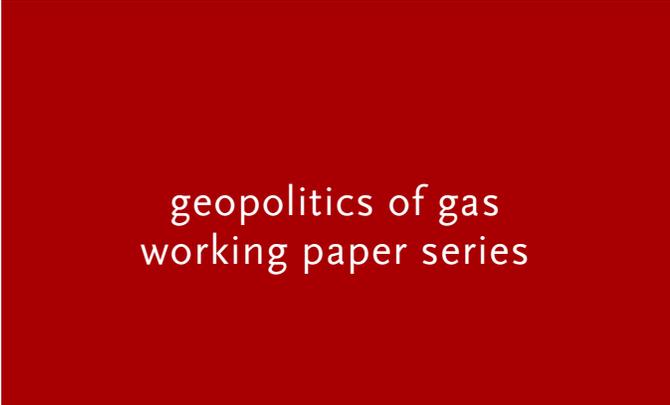




PROGRAM ON ENERGY AND  
SUSTAINABLE DEVELOPMENT



JAMES A. BAKER III  
INSTITUTE FOR PUBLIC POLICY  
ENERGY FORUM



# ALGERIAN GAS TO EUROPE: THE TRANSMED PIPELINE AND EARLY SPANISH GAS IMPORT PROJECTS

mark h hayes

**Algerian Gas to Europe:  
The Transmed Pipeline and  
Early Spanish Gas Import Projects**

Mark H. Hayes

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## **About the Geopolitics of Natural Gas Study**

Natural gas is rapidly gaining in geopolitical importance. Gas has grown from a marginal fuel consumed in regionally disconnected markets to a fuel that is transported across great distances for consumption in many different economic sectors. Increasingly, natural gas is the fuel of choice for consumers seeking its relatively low environmental impact, especially for electric power generation. As a result, world gas consumption is projected to more than double over the next three decades, rising from 23% to 28% of world total primary energy demand by 2030 and surpassing coal as the world's number two energy source and potentially overtaking oil's share in many large industrialized economies.

The growing importance of natural gas imports to modern economies will force new thinking about energy security. The Energy Forum of the James A. Baker III Institute for Public Policy and the Program on Energy and Sustainable Development at the Stanford University Institute for International Studies are completing a major effort to investigate the geopolitical consequences of a major shift to natural gas in world energy markets. The study utilizes historical case studies as well as advanced economic modeling to examine the interplay between economic and political factors in the development of natural gas resources; our aim is to shed light on the political challenges that may accompany a shift to a gas-fed world.

## **Disclaimer**

This paper was written by a researcher (or researchers) who participated in the joint Baker Institute/Stanford PESD *Geopolitics of Natural Gas Study*. Where feasible, this paper has been reviewed by outside experts before release. However, the research and the views expressed within are those of the individual researcher(s), and do not necessarily represent the views of the James A. Baker III Institute for Public Policy or Stanford University.

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# Algerian Gas to Europe: The Transmed Pipeline and Early Spanish Gas Import Projects

Mark H. Hayes<sup>1</sup>

## INTRODUCTION

A snapshot of the central Mediterranean region starting in the 1970's provides an ideal case for the analysis of decision making in cross-border natural gas transport projects. During this period the massive size of Algeria's gas reserves were well known and Sonatrach, Algeria's state-owned oil and gas company, actively sought to monetize this gas through exports. Across the Mediterranean, both Italy and Spain were seeking to expand natural gas consumption. Projects to import gas from Algeria via pipeline or by ship were proposed, studied, and discussed at the highest levels of government and in state-owned energy companies. Starting in the early 1970's, Ente Nazionale Idrocarburi (ENI), Italy's state-owned energy company, began to pursue a sub-sea pipeline to bring Algerian gas across the Mediterranean. The option of using ships to bring LNG from Algeria was also discussed, but the parties ultimately decided in favor of the "Transmed" pipeline and deliveries finally began in 1983. Spain also discussed numerous proposals for a pipeline under the Mediterranean with Sonatrach and potential French partners. However, by the mid-1980s two LNG import projects to bring gas to Spain from Algeria and Libya had been attempted and largely aborted. Only in 1996 did the Gaz Maghreb Europe<sup>2</sup> pipeline transport Algerian gas under the Mediterranean to Spain (see map, Figure 1).

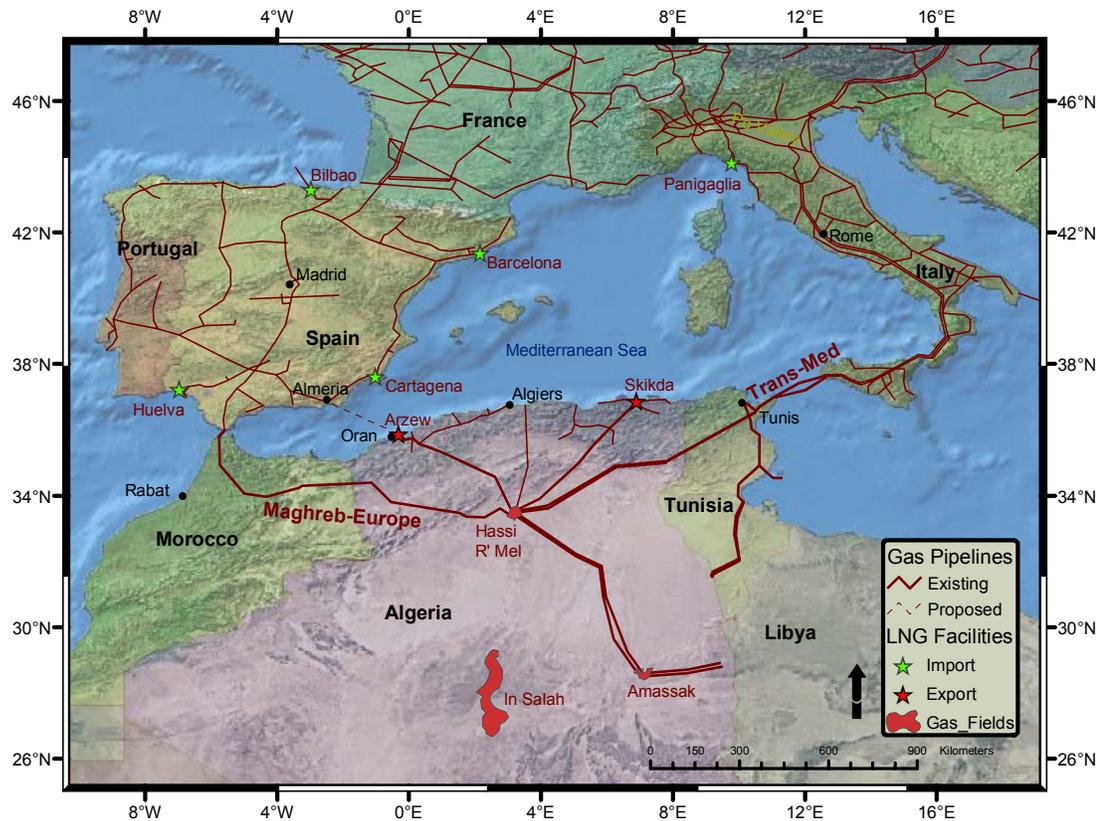
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<sup>1</sup> The author is indebted to Jack Hogan for his invaluable assistance in researching this subject. Amy Jaffe, James Jensen, Giacomo Luciani, Moustefa Ouki, Jonathan Stern, and David Victor provided many constructive comments on this draft. Meredith Williams created the map. Becca Elias provided editorial assistance. Responsibility for any mistakes, in fact or interpretation, is solely my own.

<sup>2</sup> In 2000, Algerian President Bouteflika renamed the two trans-Mediterranean gas pipelines. The TransMed was renamed *Enrico Mattei* gas pipeline and the Gaz Maghreb Europe (GME) pipeline was renamed *Pedro Duran Farrel* in honor of the late chairman of Spain's Gas Natural. I use the names *Transmed* and *Maghreb* pipelines throughout this text.

What factors explain these different outcomes? A natural gas export pipeline spanning international borders and deep ocean waters was an enormously complex political, economic, and technical undertaking at the time these projects were proposed in the 1970s. Pipeline routes from Algeria to Italy and from Algeria to Spain involved transit countries, massive investments and the technical challenges of laying the deepest sub-sea pipelines in the world at the time. But LNG provided its own set of challenges. Liquefaction and regasification technology was still in its infancy—Algeria, in particular, was plagued by high capital costs and reliability problems in its existing LNG liquefaction plants. LNG, however, did avoid difficult negotiations with transit countries (Tunisia or Morocco) and was more scaleable than the pipeline alternatives.

**Figure 1. Gas Pipelines and LNG in Algeria, Italy and Spain**



Ultimately, politics and energy security concerns dominated technological and economic considerations in determining which projects were built and at what time. Basic economics favored gas moving from Algeria to both Spain and Italy throughout this time period. The Transmed pipeline was completed rapidly in the early 1980s because Italy had

a strong and politically mobilized company, ENI, which pushed the project, favored pipelines as part of an energy security and technology imperative, and had the financial backing of the Italian and other European governments to make it happen. Spain and its gas company, ENAGAS, had none of these characteristics in the late 1970s and 1980s and thus it could not mobilize the resources required to create a successful gas import project during this period.<sup>3</sup>

## **POST-INDEPENDENCE ENERGY POLICY IN ALGERIA**

The bumpy history of post-colonial Algeria is deeply intertwined with the development of the country's oil and gas sectors. Major gas discoveries in Algeria date back to 1956 during the period of French colonial rule. In 1961 the giant Hassi R'Mel field commenced production, initially to supply the cities of Algiers and Oran and some electric power stations (Sutton 1978). After a long and vicious war to evict the French colonialists, Algeria achieved its independence from France in July 1962. Within eighteen months the first state enterprise, the Societe Nationale pour le Transport et la Commercialisation des Hydrocarbures (Sonatrach), was founded to engage in the oil and gas businesses.

Domestic consumption of natural gas grew slowly through the 1960s and 1970s, remaining below 1 bcm per year until 1974 (BP 2003). Meanwhile, gas exports quickly became a focus of the Algerian government as it increased its control over the country's oil and gas resources. The world's first commercial gas liquefaction plant was completed at Arzew in 1964, with the Algerian company CAMEL (Compagnie Algerienne de Methane Liquide) shipping LNG to the U.K and later France<sup>4</sup>. Later, under the leadership of President Hourari Boumediene, Algeria pursued an aggressive policy to implement national control of all 'strategic' interests—with Sonatrach as the instrument to achieve this goal in the energy sector. From 1965 until 1969, Algeria nationalized the holdings of most small companies and continued bitter negotiations with the French over their companies' remaining interests, mainly in the hydrocarbon sector<sup>5</sup>. By 1971 the government had assumed control over most of the hydrocarbon industry. Sonatrach assumed complete control of gas production and transmission, and directly controlled 70% of crude oil production (Aïssaoui 2001).

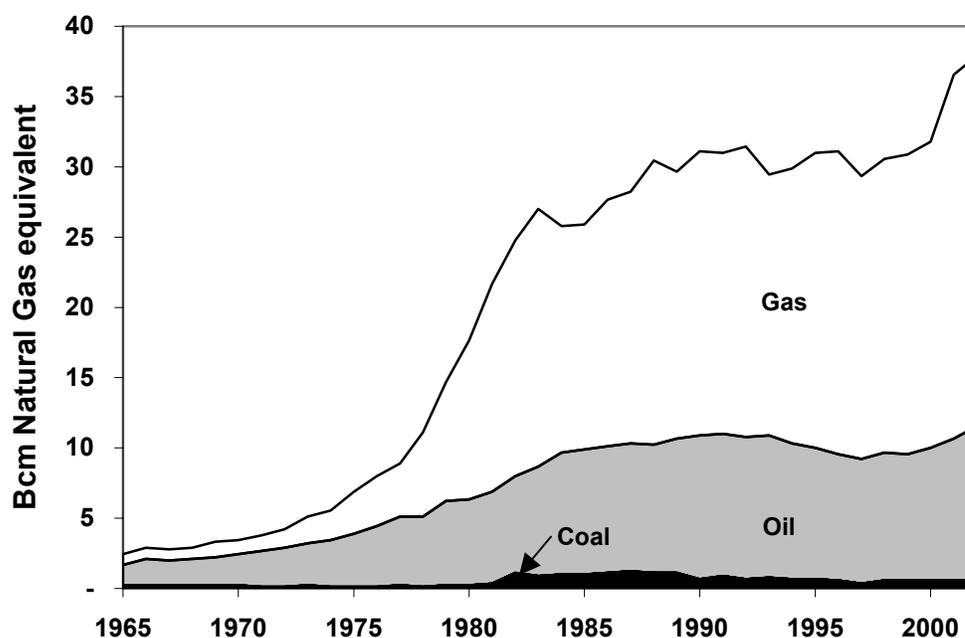
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<sup>3</sup> As all of these factors changed for Spain and ENAGAS in the mid-1990s and, in turn, the Gaz Maghreb Europe pipeline was completed by 1996. See Epilogue for more details.

<sup>4</sup> Sonatrach would later assume control of the operation and contract.

<sup>5</sup> The legacy of Algerian bitterness toward France from the colonial period—and French bitterness over nationalization of oil and gas assets—would taint relations for decades to come.

**Figure 2. Algeria Primary Energy Supply by Fuel**



Source: (BP 2003)

Through the 1970s the Boumediene government aggressively pursued investment in gas export infrastructure as a means to lift the country from a “vast legacy of political and economic backwardness left by the colonizing power” (Entelis 1999). The government realized that gas resources were much larger than oil and sought to increase utilization of gas. At the prodding of Belaïd Abdesselam, the Minister of Industry and Energy, the corresponding policies were incorporated into the 1976 National Charter and marked the shift from oil to natural gas as the main focus of energy policy (FLN 1976):

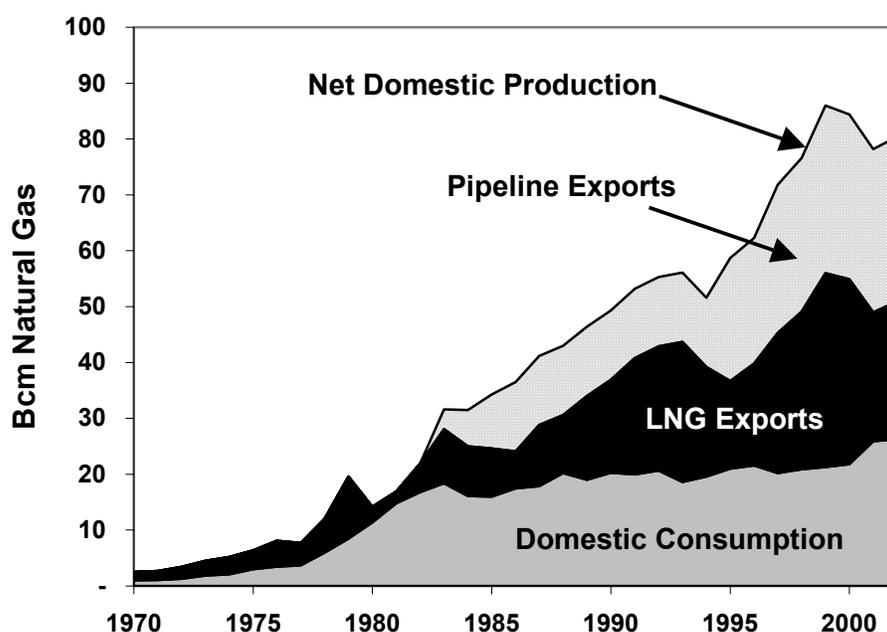
Natural gas reserves represent one of Algeria’s most valuable assets. Proved reserves are among the biggest in the world. Thus, the valorization of natural gas represents an important source of capital accumulation. Revenues generated by such an activity will enable the financing and economic development in the country and the creation for the foundation for the state’s financial independence. (Translated from the French version in (Aïssaoui 2001)

Sonatrach, in turn, commissioned the U.S. firm Bechtel to produce a financial plan to operationalize Abdesselam’s policy prescription. VALHYD, the “Hydrocarbon Development Plan of Algeria” was the culmination of Abdesselam’s planning. VALHYD called for the production of all of the known oil reserves and most of the known gas

reserves between 1976 and 2005—very aggressive export growth to be financed by foreign exchange earnings (Aïssaoui 2001). Under this framework LNG exports were to grow rapidly. By 1978 Algeria was shipping out 10 bcm of LNG per year on tankers to Europe and the United States, the latter being Algeria’s largest single customer at the time.

Expanding LNG exports required massive capital investments and posed technical challenges that ill-conceived foreign technical assistance programs did not efficiently tackle (Aïssaoui 2001). Rising interest rates combined with major cost overruns both in constructing and operating the liquefaction facilities at Arzew and Skikda placed increasing fiscal pressure on the Boumediene government in the late 1970s. Simultaneously, a burgeoning population of young Algerians placed a huge burden on the government to provide increased access to education and employment (Stern 1986).

**Figure 3. Algeria Gas Production, Consumption and Exports<sup>6</sup>**



Sources: (Moraleda 2002; BP 2003; Dispenza 2003a)

<sup>6</sup> Net domestic production does not include gas flared or re-injected for oil production. See Aïssaoui 2001, page 139 for complete breakdown.

On the international front, the 1970s saw the rise of OPEC with Algeria as a leading price-hawk of the cartel. Algeria also sought better terms for its gas exports. Led by its Vice-President for Marketing, Nordine Aït Laoussine, Sonatrach began the push to price its gas off alternative energy sources in the consuming markets (fuel oil or syngas from coal). This “net-back” pricing strategy replaced earlier pricing formulas in the early U.S. and U.K. contracts which sought to provide a fixed return on investment to Sonatrach and contracting parties (Aïssaoui 2001). Cost overruns in the construction of the liquefaction facilities fixed-return contracts were costly to the Algerians—and rising prices for oil made these contracts look even worse.

In this environment Italian, Spanish and French companies were in discussions with Sonatrach about plans to pipe gas under the Mediterranean. By 1973, productive relations with Italian state-energy company ENI had produced an agreement between the two companies to build a sub-Mediterranean pipeline to ship 12 bcm of gas per year to Italy for 25 years.

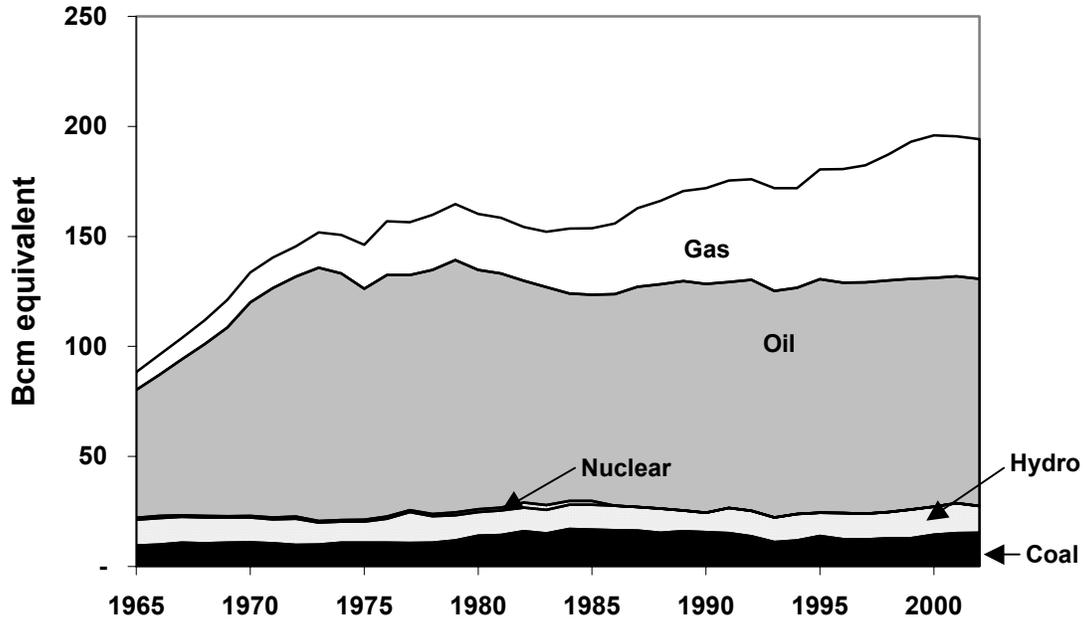
### **ITALY’S EARLY MOVE TO NATURAL GAS**

Italy is not a country well endowed with domestic energy resources. Throughout the post-war period the country has been dependent on imported energy sources (mainly coal, oil and later natural gas). In the mid-20<sup>th</sup> century, Italy followed the rest of Europe in the switch from a coal to a petroleum based energy system—with the significant caveat that Italy would take an early lead in utilizing gas resources (Darmstadter, Teitelbaum et al. 1971).

In the process of searching for oil during World War II, the state-oil company AGIP made significant gas discoveries in the Po Valley of Northern Italy. After the war, AGIP came under the leadership of Enrico Mattei—a man with little experience in the energy industry—but whose position as former commander of the opposition Partisans in the struggle against the Fascists made him one of the most powerful political figures in Italy at the time. As the Po (and Italy) was endowed with gas resources but little oil, Mattei turned this apparent weakness into strength. Mattei advanced the strategy that natural gas must not be a mere substitute for petroleum, but a cheaper and more functional substitute for imported coal for the growing industrial activities of Northern Italy.

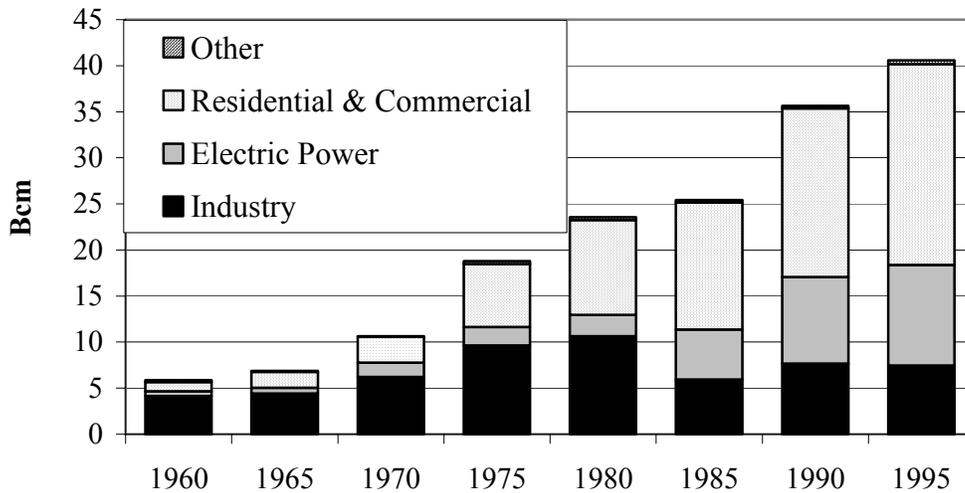
As Pozzi states in a recent analysis of the organizational history of ENI, “Large reservoirs in the Po Valley allowed (or better impelled) the creation of pipeline facilities to reach the major factories in northern Italy. That choice determined a virtuous circle of growth: the major Italian firms expanded enormously in the 1950s and 1960s, high profits from natural gas sales were plowed back into exploration, production, the expansion of pipelines, and the acquisition of new customers” (Pozzi 2003).

**Figure 4. Italy, Total Primary Energy Supply by Fuel**



Source: (BP 2003)

**Figure 5. Italy Gas Consumption by Sector**



Source: (IEA 2003)

Ente Nazionale Idrocarburi was created in 1953 with fresh financing from the government and a mission to supply the energy needs of the rapidly growing Italian economy. The AGIP drilling and production operations were folded in under the new ENI holding company. The company was granted exclusive rights to exploration and production in the Po Valley, providing a stable profit core on which ENI could grow. Later, ENI would gain a monopoly position over gas imports, transport and sales, though it was never exclusively granted this right by regulation (Pozzi 2003).

By 1965, Italy was the largest gas producer and consumer in Western Europe (Darmstadter, Teitelbaum et al. 1971). Gas met over 10 percent of the country's total primary energy demand, while other European countries such as the U.K., Spain and Germany had no natural gas production or use. Under Mattei's aggressive leadership, and with strong backing from the state, ENI announced plans to build a national gas grid. However, it soon became apparent to Mattei that the domestic resource base would not be sufficient to meet the Italy's growing energy demand.

Recognizing the need to secure foreign supplies and driven by his goal to make ENI a player on par with the Exxons and Totals of the world, Mattei saw a strategic imperative to expand abroad. Bold, yet realistic, in his assessment of the company's resources, Mattei developed a strategy to forge partnerships that the world's major oil companies could not. His talent for creating good relations with producing countries led ENI first to Egypt (1955), Iran (1957), Morocco (1958), Libya (1959), Sudan (1959), Tunisia (1961) and Nigeria (1962) (Pozzi 2003).

Mattei visited Moscow in 1959, where he brokered the first oil import deal with the Soviets over heated protests from NATO and the U.S. His public position in support of independence movements against colonial powers allowed ENI to take advantage of post-colonial bitterness in places like Algeria. Indeed, several units of ENI were busy in Algeria in the years immediately following independence, notably Snamprogetti and other engineering/consulting units (Luciani 2004).

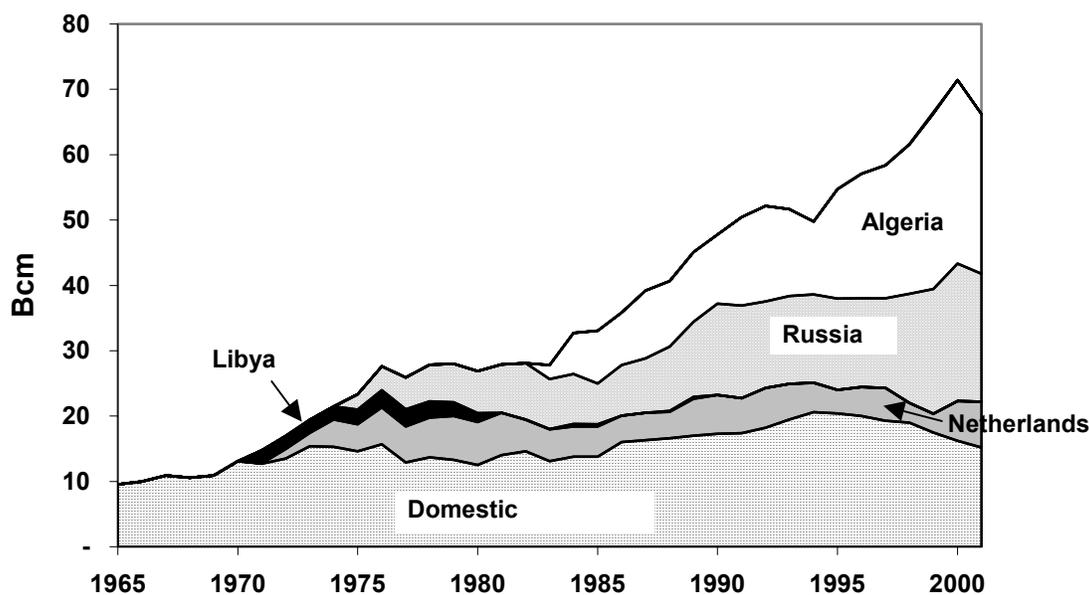
Mattei's leadership came to an end when his private plane crashed in 1962. His dealing with the Soviets and his courtship of the insurgent FLN in Algeria led many to suspect western intelligence agencies or bitter French colonialists in the "accident". Nonetheless, ENI's drive toward internationalization had begun and would continue after Mattei's passing.

## **THE TRANSMED GAS PIPELINE**

In the early 1970s, ENI secured gas imports from the Soviet Union and the Netherlands, and began to take shipments of Libyan gas into an LNG regasification facility at Panigaglia, near Genova. Building on the historically warm relations with Algeria and

Sonatrach—and seeking to diversify its rapidly growing gas imports—in 1973 ENI signed a contract with Algeria for 11.75 bcm of gas per year over 25 years (Petroleum Economist 1977a). The volume and offtake arrangements in the Algerian contract were similar to deals ENI struck with the Soviets and the Dutch. However, the daunting technical challenge of crossing the Mediterranean made the new “Transmed” project a radically different proposal.

**Figure 6. Italy, Sources of Natural Gas<sup>7</sup>**



Sources: (BP 2003; IEA 2003)

### *Pipeline vs. LNG*

The debate between using ship-based LNG technologies or a direct pipeline link to Algeria was a hotly debated subject within the ENI group during the 1970s. The decision to pursue the pipeline was founded on multiple strategic considerations.

Proposals to import gas from Algeria dating back to the 1960s envisioned using existing LNG technologies. However, LNG costs were high and encouraged ENI to explore the feasibility of a pipeline connecting Italy with North Africa. A preliminary feasibility study was carried out for the sub-sea pipeline in 1969, followed by the first route survey in 1970. Simultaneously, SNAM was testing its abilities in the LNG

<sup>7</sup> Italy also took shipments from shipments from Qatar and Abu Dhabi in the late 1990's, but total deliveries from these sources are negligible relative to overall volumes shown here.

business. In 1971, SNAM delivered LNG from Libya on its own tankers to Italy's first regasification facility at Panigaglia (near Genova). The project was troublesome from the start. Marcello Colitti, then ENI Director of Planning, recalls "near accidents, fires, and many delays" at the Panigaglia facility (Colitti 2003). Many of the problems in fact originated at the source, as the Libyan gas was too "rich" in heat content. Managing these quality problems would have required additional refining investments either in Libya or more likely on the Italian end (Dispenza 2003b). Algeria—despite being the first to utilize LNG technology—was having its own share of problems with its liquefaction facilities. Existing LNG export facilities at Skikda and Arzew experienced protracted operating difficulties and cost overruns (Petroleum Economist 1976a).

The strategy for developing ENI's core technical competencies was also a major consideration. Transportation technology looked to be critical to the future of the gas business. According to Marcello Colitti, ENI planners realized that the current leaders in LNG—including Total, Mobil and Exxon—would hold tightly to their proprietary technologies and capabilities. Rather than be beholden to the incumbent LNG leaders, Colitti adopted the view that through the Transmed project ENI could create its own strategic niche in sub-sea pipelines. Such a project was a risky venture, but it could create many future business opportunities for ENI subsidiaries Saipem and Snamprogetti. After much discussion and debate—including with SNAM management that was loath to see its existing LNG tankers sit idle—Colitti and the pipeline advocates won the day and early plans for the pipeline pushed forward (Colitti 2003).<sup>8</sup>

Commercial considerations and supply security also factored into the LNG versus pipeline debate within ENI. SNAM studies at the time showed that the delivered cost of pipeline gas to Northern Italy would be greater than LNG transport and regasification (Petroleum Economist 1976a). However, these studies did not consider that a share of the pipeline costs could be borne by newly connected gas users in southern Italy. Under the plan for the "Gasification of Mezzogiorno," the Transmed pipeline was to bring gas to the underserved south of the country. Such a plan would not have achieved rapid returns for ENI, however the potential benefits to the new customers was great. Some of these 'social benefits' could be counted against the incremental costs of piping the gas to the north of Italy and would later become an important part of providing political (and, in turn, financial) support for the project.

With regard to security, supporters of the pipeline argued that the "marriage" of partners would ensure greater supply stability (Colitti 2003). A new Algerian liquefaction train could fill a ship heading in any direction, while pipeline gas could go only to Italy.

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<sup>8</sup> It is worth noting that Colitti's and ENI's bet paid off handsomely. ENI's Saipem and Snamprogetti remain leaders in the field of designing and building pipelines worldwide, and particularly for deep sea pipe laying.

(Tunisian transit risks were perceived to be minimal, and thus not affecting the security benefits of the pipeline—as is discussed in more detail below.)

The pipeline option was also strongly favored by Sonatrach and the Algerians. Their costly experience with LNG exports in the 1970s made a pipeline appear an attractive option. A pipeline from the Hassi R'Mel gas field to the Tunisian border was shorter than a new pipeline to the Northern Mediterranean coast to deliver gas to an LNG liquefaction terminal (Skikda, Arzew, or some new plant). Most importantly, at the end of a Transmed pipe would be a cash payment from ENI—not a multi-billion dollar investment in a liquefaction terminal.

As the strategic and motivating force behind the project, ENI set out to develop the needed technical capabilities. In the early 1970s the worldwide experience in the design, construction and maintenance of offshore pipelines was limited to water depths of less than 150 meters, using diver-assisted procedures. Thus, new technologies needed to be developed for marine surveying, remote controlled seabed preparation equipment, and pipelaying procedures adapted to the much increased depths and pressures (Caroni 1992). The research and development program for these new technologies was tasked almost completely within the ENI group. Engineering and construction problems were tasked to ENI subsidiaries Snamprogetti and Saipem, respectively.

In 1974 Saipem laid the first test pipe 350 meters under the Straits of Messina, linking Sicily with the Italian mainland. Its engineers then moved to the Sicilian Channel where, in 1975, at a depth of 550 meters they artificially buckled a pipe to prove it could be recovered and repaired (Business Week 1977). In parallel with the successful testing program Saipem developed a new ship, the CASTORO 6, to be used in the Transmed and other major pipelaying operations (Caroni 1992).

### *1977 Contract*

As technical tests proceeded apace, troubles negotiating the transit fee with Tunisia forced ENI, Sonatrach and the Tunisian government back to the bargaining table to craft a new contract.<sup>9</sup> In the context of rising oil prices, a growing commitment from ENI in the Transmed project, and with the only feasible route passing through their territory, the Tunisians sought to take advantage of their strategic geographic position. In 1975, the Tunisian government demanded 12% of the value of the gas that entered its territory as payment for transit rights—essentially holding the project hostage. ENI first sought a reduction in the price of gas delivered to the Tunisian border to compensate, but Sonatrach was unwilling to accept such terms.<sup>10</sup> ENI thus explored the option of “abandoning” the

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<sup>9</sup> Tunisia did not want Sonatrach to have any role in the Tunisian section of the pipeline. Thus, negotiations were conducted separately, between Sonatrach and ENI and between ENI and the Tunisians.

<sup>10</sup> Sonatrach was initially offering gas to ENI at a price below the f.o.b. price Sonatrach was earning for its LNG—but more profitable since Sonatrach saved the liquefaction costs. However, the further reduction

Transmed project and negotiated a contract to import 8.5 bcm of LNG per year from Sonatrach instead (Petroleum Economist 1977a). Ultimately, this maneuver forced Tunisia to settle for a payment of 5.625% of transported gas volumes, in cash or in gas, less than half of its original demand.

The new transit agreement signed in July of 1977 involved only ENI and the Tunisian government (Petroleum Economist 1977a). Tunisia was loath to include Sonatrach in its segment of the project. Sonatrach would sell the gas at the Tunisian border to a newly created project company financed entirely by ENI. The transit agreement is discussed in detail below.

**Table 1. Transmed-1 Technical Details**

<b>Segment</b>	<b>Length (kilometers)</b>	<b># Pipes x Diameter (inches)</b>	<b>Number of Compressors</b>	<b>Maximum Depth</b>
Algeria	550 km	1 x 48"	1	
Tunisia	370 km	1 x 48"	3	
Sicilian Channel	155 km	3 x 20"		610 meters
<b>Italian Section</b>				
Sicily Overland	340 km	1 x 48"	1	
Straits of Messina	15 km	3 x 20"		270 meters
Italian Mainland	1055 km	1 x 42"- 48"	4	
<b>Total</b>	<b>2,485 km</b>		<b>9</b>	

(Source: Sonatrach, SNAM)

Separately, Sonatrach and ENI then needed to make an agreement for gas shipment. On October 22, 1977 the two parties signed a contract for gas imports, elaborating the structures necessary for the financing, construction and future operation of the pipeline. A review of both Algeria's and Italy's precedent gas trade deals—in the context of the broader events in the world energy markets—is necessary to better understand the framing of the 1977 Transmed contract.

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sought by ENI in response to Tunisian demands was deemed too low from: Aït Laoussine, N. (2003). Interview, December 11. Palo Alto, Geneva.

The Transmed was the first pipeline export project for Sonatrach, but the company had been selling LNG to several European buyers and the U.S. for over a decade.<sup>11</sup> The company's first LNG contracts were with British and American customers. These were long-term, fixed volume contracts with prices based on capital and operating costs, indexed only to macroeconomic indicators, with no clauses for renegotiating the pricing formula. The aim was to provide the LNG seller with a stable return on investment. However, major cost overruns in the construction and operation of the liquefaction plants continually eroded positive margins to Sonatrach (Aïssaoui 2001).

The 1970s saw many gas sellers begin to tie gas prices to the costs of competing fuels in the consuming market, usually fuel oil. The Boumediene-era Sonatrach leadership sought pricing formulas that reflected the rising costs of competing fuels (often fuel oil) in the offtake markets (Aït Laoussine 1977). Sonatrach was able to obtain these gains in its contracts with European buyers in the mid-1970s, including Spain, France and Belgium. The prices in these contracts escalated from US\$1.30 per mmbtu in 1975 to US\$1.60 per mmbtu in 1978—compared to the earlier fixed price El Paso (U.S.) contract that started deliveries in 1978 at US\$0.37 per mmbtu. Although the El Paso contract was subsequently revised to US\$1.75 per mmbtu, the contract became a point of contention between rivals in the Algerian government. Later, when Algerian president Boumediene died in 1978, opponents used the apparent failure of the El Paso contract as a platform from which to launch an aggressive campaign to rapidly raise Algerian gas export prices (Aïssaoui 2001).

The price of ENI imports from other suppliers was also rising. From 1974 to 1977, Gasunie of the Netherlands—which supplied nearly 40% of Italy's gas imports—more than doubled the price of its pipeline-delivered gas, from US\$0.62 per mmbtu to over \$1.30 per mmbtu. Soviet gas export prices during the period are harder to discern. Anecdotal evidence suggests that the Soviet Union likely maintained a somewhat lower price level, seeking to increase volumes, but secured significant price increases during this period nevertheless (Stern 1986).

When the negotiations settled on the 1977 contract with SNAM, Nordine Aït Laoussine, the Vice President of Marketing for Sonatrach, had secured a price of US\$1.00 per mmbtu for gas delivered to the Tunisian border—at a time when Gaz de France was paying US\$1.30 per mmbtu c.i.f for its LNG. The escalation formulas in both contracts were identical, using the “net-back” formula that linked the gas price to competing fuels in the off-take market (Petroleum Intelligence Weekly 1982a).

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<sup>11</sup> The LNG contract with the U.K. was first signed with CAMEL (Compagnie Algerienne de Methane Liquide). Later, Sonatrach took complete control of the operation and contract.

The 1977 natural gas sale and purchase contract between ENI and Sonatrach was signed for a duration of 25 years with deliveries to begin in 1981. The contractual build-up was established as follows:

**Table 2. Transmed Contracted Volumes, 1977**

<b>Year</b>	<b>Volume</b>
1981-1982	3.9 bcm
1982-1983	7.4 bcm
1983-1984	10.5 bcm
After 1984	12.4 bcm per year

### *Transit Risks*

Serious mention of the additional risks posed by the 370 kilometers of pipeline that cross Tunisian soil is notably absent from published reports and interviews with key players on the Italian or Algerian sides. Tunisia's failed attempt to squeeze an oversized share of the rents from the project nearly stalled the whole project in its early stages. Few analysts, either internal or external to the project, seem to have considered the range of events that might affect the continued operation of the pipeline once it was built. Presumably, planners considered Tunisia a necessary risk in choosing the pipeline route.<sup>12</sup> Hindsight is perfect, and indeed history shows that Tunisia has been a perfectly stable partner in the project. But a brief review of the Tunisian historical context reveals that this outcome was far from predetermined when the 1977 contract for the Transmed pipeline was signed.

Habib Bourguiba led Tunisia with a heavy hand from its independence in 1956 through the late 1980s when he was deposed in a bloodless coup. Bourguiba's reign was marked by numerous twists and turns in foreign and domestic policy as the president sought to maintain power and steer the country between its two much more powerful neighbors, Algeria and Libya. Bourguiba first supported the insurgent FLN in their fight for independence from France, but later sided against Algeria in its heated dispute with Morocco over the Western Sahara. He then tilted toward the rising radical Colonel Qaddafi in 1974, briefly entertaining the idea of a union with Libya after a proposed "merger" between Libya and Egypt had failed (Knapp 1977).

At the time of the 1977 contract negotiations, ENI negotiators must have been relatively at ease in Tunis, a favorite tourist destination for Europeans with an open

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<sup>12</sup> It is worth noting that current proposals by Algeria and Libya to expand gas pipeline capacity to Italy seek to avoid Tunisia and pipe directly to the European continent. (ENI, however, has no qualms about expanding transit capacity through Tunisia.) This strategy likely has more to do with avoiding Tunisia's transit fees than a risk management strategy. Moreover, two and a half decades of technological improvements make long deep-water pipes less of a hurdle than political negotiations with Tunisia.

economy that welcomed foreign investment. Still, the future stability of the country was not assured. Bourguiba was in his mid-70s in 1977 and had suffered from years of bad health. By 1977 economic malaise and social unrest unleashed massive street protests in Tunis—which were in turn brutally repressed by the military. Any destabilization of the country would not have lasted long before Libya and Algeria became involved (Parker 1984).

The 1977 agreement between ENI and the Tunisian government rewarded Tunisia handsomely for its location at the edge of the Sicilian Channel. Bourguiba did not obtain the 12% share of the gas he had sought in 1975. However the 5.625 % share of total gas shipments provided as a transit fee still tripled the country’s existing gas supplies—and Tunisia bore no financial or operational responsibility for any part of the project. President Bourguiba just had to decide whether he wanted his payment in gas or cash.

The following excerpt contains the main terms of the agreement for the construction and operation of the 370-kilometer Tunisian pipeline, as reported in ENI internal documentation (Dispenza 2003a):

Construction activities had to be carried out by SCOGAT (Société pour la Construction du Gazoduc Transtunisien), a Tunisian company fully owned by ENI. SCOGAT retained the ownership of the new facilities until the beginning of operations and was wholly financed by TTPC.

TTPC (Trans Tunisian Pipeline Company Limited) was a company wholly owned by ENI and based outside Tunisia (in Jersey, Channel Islands); it was established with the purpose of financing the pipeline and holding exclusive transportation rights.

The agreement establishes that, once the pipeline becomes operational, the ownership shall pass from SCOGAT to TTPC - against the settlement by TTPC of all debts connected with the construction - and then from TTPC to the state-owned Tunisian company SOTUGAT (Société du Gazoduc Transtunisien). TTPC would retain exclusive rights to transport gas, including the right to conclude transportation contracts with third parties, subject to the previous approval of the Tunisian Government.

ENI had to conclude a transportation contract with TTPC, in order to transport natural gas bought from Sonatrach through the Tunisian section. The “ship-or-pay” transportation charges due by ENI to TTPC represented the security for the TTPC lenders.

The agreement between ENI and the Tunisian Government dealt with taxation as well. The Tunisian Government was granted a yearly global fiscal charge determined in proportion to the actual gas throughput and payable in kind or, at the sole discretion of the Tunisian Government, in cash. ENI and related companies were exonerated from all tax payments, including royalties, excise and custom duties, during construction and operation.

ENI did receive concessions on taxes for the construction and operation of the Tunisian section, but with transit fees worth US\$25 million per year Bourguiba could be quite content with his bargain.<sup>13</sup>

Sonatrach was not involved in the Tunisian segment—at the behest of the Tunisians—but the Algerians did acquire a stake in the Sicilian Channel crossing. The 1977 contract between ENI and Sonatrach also established the Trans-Mediterranean Pipeline Company Ltd (TMPC). TMPC was jointly funded by ENI (50%) and Sonatrach (50%) and given responsibility for the finance, construction, and operation of the Sicilian Channel section of the Transmed. TMPC financing was, in turn, supported by a long-term transit contract with ENI (SNAM).

Discussions with ENI officials suggest that Sonatrach was given a role in the TMPC to increase its stakes in the project, given that almost all of the other risks except price were squarely borne by ENI (Dispenza 2003b). However, Sonatrach also benefited from the transfer of technical knowledge from its involvement in the TMPC. Such experience would have been valuable for Sonatrach’s potential participation in other deep-sea pipelines, such as a pipeline to Spain.<sup>14</sup>

ENI had no off-shore experience prior to the Transmed project. Indeed, never had a gas pipe been attempted at the depths required for the Transmed. The risk of technical failure on the sub-sea section of the pipeline was significant. Newham (1979) notes the strategies Snamprogetti engineers utilized to mitigate the risk of catastrophic failure through robust design:

- (1) Designed over-capacity—each pipeline was over-built to allow for capacity increases on two lines to compensate for a failure on one of the others;
- (2) Two pipelines were run together in a southern route from Cape Bon on the Tunisian coast to Sicily, while the third pipeline will start and end at the same points, but will be as far as 20 kilometers from the other pair, thus minimizing the risk that all three could be damaged in one event;
- (3) In shallow depths near the coast, pipelines were encased in cement to protect against ship’s anchors;
- (4) Saipem conducted tests of its own repair capabilities in advance of laying any of the pipes.

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<sup>13</sup> Based on the 1977 Italian contract price of \$1.00 per mmbtu and full capacity of 12 bcm per year of flow.

<sup>14</sup> Sonatrach’s involvement in the sub-sea project was mostly in the operation of the pipeline, after construction was completed. SNAM and Snamprogetti would long retain their leadership in the deep-water pipe-laying.

### *Financing*

International, and in particular European, lending agencies lined up to finance the Transmed project despite the many technical challenges and the turbulent energy markets of the late 1970s and early 1980s (see Table 2). ENI supplied nearly all of the financing for the Transmed project. The company assumed responsibility either through ownership of the project companies (as in the Tunisian segment and half of the Sicilian Channel crossing) or by directly guaranteeing the financing for the Algerian section of the pipe. Where feasible, the project companies sought international financing, as interest rates on foreign borrowing were around 9% at the time, while Italian domestic borrowing costs were significantly higher at 15% per year (Newham 1979).

Ultimately, however, ENI's financial position was backed by the Italian government. The company was largely government-owned and though the company had long been self-sustaining, the government was the guarantor of all its financial obligations. Thus, the policies of ENI and the government were strongly connected. The European Community also provided major financial backing through the European Investment Bank, by providing financial support for the planned expansion of the main gas trunk line in Italy—and the gasification of Mezzogiorno.

**Table 3. Transmed Financial Details**

<b>Segment</b>	<b>Investment (Millions of Y2000 USD)</b>	<b>Ownership</b>	<b>Debt Financing (Amounts in Y2000 USD)</b>
Algeria	\$2,000	100% Sonatrach	\$2,000 billion total; \$1.2 billion from Italian banks backed by guarantee from ENI— Sonatrach shall use to buy Italian services and equipment; \$800 million from international consortium of banks;
Tunisia	\$1,000	SOTUGAT, Tunisian Govt.; Leased to TTPC—100% SNAM owned	\$950 million total; \$650 million from export credit agencies; \$300 million from international consortium of banks;
Sicilian Channel	\$1,700	TMPC; 50% SNAM, 50% Sonatrach	\$1.5 billion total; \$700 million from export credit agencies; additional financing from international consortium of banks;
Italy	\$4,000	100% SNAM	\$1.8 billion total from the European Investment Bank
<b>Total</b>	<b>\$8,700</b>		<b>\$6,250</b>

Source: (Newham 1979; Dispenza 2002). All numbers are rounded and adjusted to year 2000 USD.

### *Supply Risks*

The super-giant Hassi R'Mel field was the planned source of gas for the Transmed pipe. Hassi R'Mel was discovered in 1956 and entered into production in 1961, supplying gas mainly to LNG export facilities and also to domestic users. In 1976, the massive field was estimated to contain 2,000 bcm of gas reserves, over half of Algeria's known total reserves at the time (Sutton 1978). At the time of the Transmed signing, Sonatrach already had future commitments for gas deliveries of rising to over 70 bcm per year by the mid-1980s. The aggressive target under Boumediene's VALHYD was to increase exports to over 100 bcm per annum through the end of the century (Aïssaoui 2001). Even if ENI planners took the Algerians' hyper-aggressive targets seriously the Hassi R'Mel field alone would not have been depleted for 20 years.<sup>15</sup>

Technical and political risks were more pressing concerns for the long-term stability of the gas supply into the Transmed pipeline. Sonatrach's technical and organizational capabilities were largely unproven, and thus were an area of potential concern for Italy and ENI. However, the recent history of nationalization and the potential for continued swings in government energy policies—played directly through Sonatrach—were *ex ante* primary concerns for the Italian partners. History shows that ENI was not well prepared to protect itself from these risks. ENI had fronted the vast majority of the capital invested in the project, yielding Sonatrach and the Algerian government tremendous bargaining power once the pipeline was completed. ENI Italy would later become acutely aware of this asymmetric bargaining situation.

### *Off-take risk*

ENI, through SNAM, held a monopoly position over the import, transport and sales of natural gas in Italy. As the state gas company, ENI worked with the Ministry of Industry to develop the National Energy Plan and then sought to meet the targets established in the plan. Gas consumption growth (like overall energy consumption) grew rapidly over the period 1960-1977, increasing almost 9 percent per year (IEA 2003). When the 1977 Transmed contract was drafted Italy expected growth in gas demand to continue, albeit at the slower pace of 4 percent per year through 1990 (IEA 1978). Rapidly rising prices for oil and oil products and the clean burning characteristics of gas relative to coal made gas a favored fuel.

ENI's dominance of domestic gas production, imports, and domestic supply afforded it the position to effectively manage the entire gas supply chain. Domestic production allowed ENI to take a steady stream of gas imports, managing fluctuations in demand by varying domestic production and storage. Domestic production could be

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<sup>15</sup> This is a reference calculation only. Gas from Hassi R'Mel was also to be utilized for domestic gas supply, petrochemical production etc. Additional fields could also have been brought on-line to meet Italian demands.

slowed and imports used to fill storage during the warm summer months of the north. In the winter, domestic production could be increased and storage utilized, while maintaining continued flows on the expensive gas import pipelines.

ENI had both an obligation to the state and a commercial incentive to deliver gas to meet the expected demand. ENI also secured major political and financial support for the Transmed project by promising to use the new pipeline to deliver gas for the ‘gasification of Mezzogiorno’, the bold plan to expand the gas network to the south of Italy, which previously lacked access to the natural gas supplies.

As the monopoly gas importer and seller, ENI (SNAM) was relatively protected by price risks in its domestic market. Consumer prices were set by the company with oversight by the Ministry of Industry. The industrial users lobby was the strongest advocate for lowered prices (Colitti 2003). Again, ENI was ultimately backed by the resources of the Italian state.

### *Pricing Dispute*

With the construction of the Transmed project about to begin, major events both within and outside Algeria began to set the stage for what would eventually become a contentious dispute among Sonatrach, ENI and their respective governments. President Boumediene died unexpectedly in December of 1978 and in the transition the more conservative wing of the ruling FLN (Front de Libération Nationale) sought to grab power. Colonel Chadli Benjedid emerged from the FLN conservatives in March 1979 to assume the presidency. Wresting control of petroleum rents was the first goal of the new administration. “Sonatrach was at the heart of the political struggle in the course of the transition from the Boumediene to the Benjedid regime. The new political leadership maneuvered through the apparatus of the FLN to secure control of the main source of income and power in the country” (Aïssaoui 2001). Sonatrach was to be restructured to ensure that the hydrocarbon sector would be controlled at the “suitable political level” (Benachenou 1980 in (Aïssaoui 2001). The FLN majority in Parliament strongly backed the Sonatrach restructuring. In March of 1979 Minister of Energy and Industry Abdesselam was replaced by Belgacem Nabi.<sup>16</sup> Nabi in turn forced out the entire top management at Sonatrach, including Aït Laoussine.<sup>17</sup>

Abdesselam and the Boumediene technocrats were particularly vulnerable because of the dismal performance of the LNG export projects—in particular the El Paso contract.

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<sup>16</sup> Responsibilities for industry and energy were actually split, so Nabi actually became Minister of Energy.

<sup>17</sup> Nabi and fellow conservative members of the FLN were also settling scores with the technocrats who had dominated during the Boumediene era. The dispute between Nabi and Abdesselam was largely personal, dating back to the formation of Sonatrach in the pre-Boumediene era. Nabi was previously the chairman of SN-Repal, the Algerian-French partnership that was squeezed out to the benefit Abdesselam-led Sonatrach.

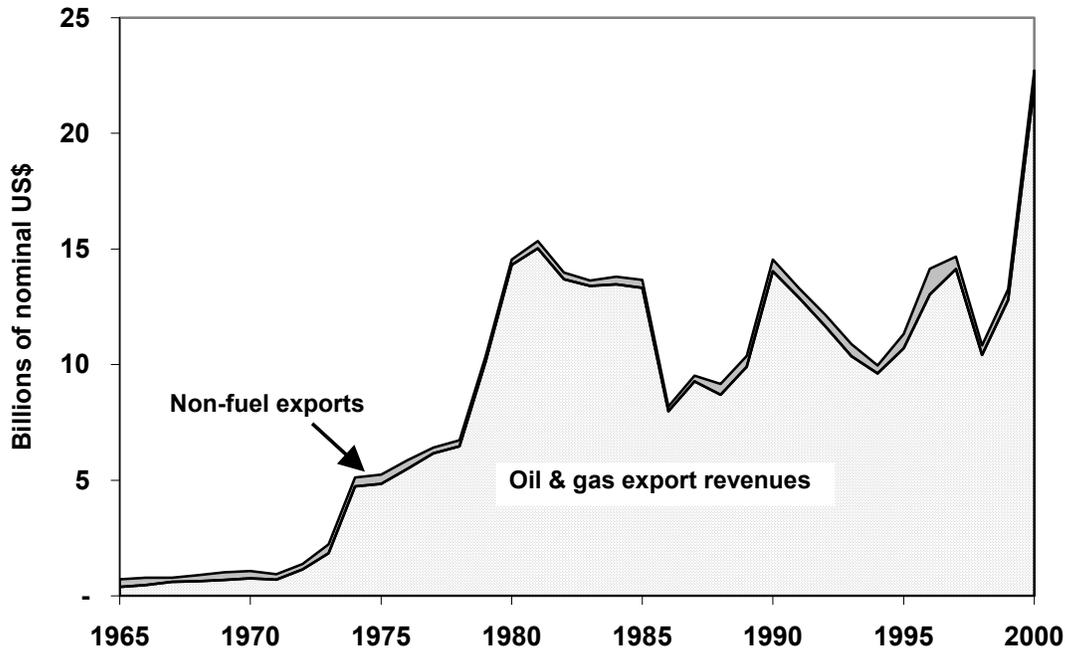
The pricing arrangement in the original El Paso contract meant that the first LNG deliveries in 1978 from the new liquefaction plant at Arzew earned only 37 cents per mmbtu f.o.b. (Zartman and Bassani 1987). More recently signed contracts with Spain, France, Belgium and Italy were garnering US\$1.60 per mmbtu f.o.b. for the same gas. The pricing terms with El Paso were actually revised before Nabi took over—but the record left the incumbent energy leaders vulnerable. Nabi established a Commission of Enquiry to investigate former Sonatrach CEO Sid Ahmed Ghozali and the El Paso contract (Aïssaoui 2001).

Rising domestic pressures were also a significant factor affecting the new Algerian leadership's changes in energy policy. Boumediene had pursued a program of rapid industrialization, financed by dramatic increases in oil exports and austerity measures that curtailed domestic consumption. The expansion of gas export infrastructures absorbed the huge volumes of domestic investment—and was slow in yielding returns. Heavy industry received the bulk of attention and resources while ill-designed, and underfunded agricultural policies moved Algeria from domestic surplus to a food importer by the end of the Boumediene era (Aïssaoui 2001). Thus, the new Benjedid government saw a political imperative to abandon this investment strategy in favor of the immediate needs of agriculture and education in particular (Stern 1986).

New energy guidelines were adopted by the FLN Central Committee in 1980 which put particular emphasis on 'guaranteeing long term domestic energy requirements', rationalizing energy demand within an 'energy consumption pattern' and conserving energy resources by establishing 'strategic reserves' of hydrocarbons. While couched in a rational framework, the new policies were in large part politically motivated and a direct refutation of Abdesselam's export-oriented VALHYD policy—particularly with respect to natural gas.

External events also favored this radical shift in gas export policy. Rising OPEC power in the late 1970s and the aftermath of the Iranian Revolution had resulted in skyrocketing oil prices. The volumes of Algerian oil and oil product exports remained relatively constant, but surging prices created overflowing export revenues. The mindset among petroleum exporters was that greater export revenues could be generated from higher prices rather than from higher export volumes (Aïssaoui 2001). Oil producers were also placing increasing emphasis on the distribution of rents from the resource trade. Framed in terms of the "North-South" dialogue, the argument was intertwined with post-colonial development and the rise of OPEC. Producing countries were seeking a larger share of rents for their resource exports. In this broad context—and supported by overflowing oil revenues—the new Algerian and Sonatrach leadership saw the opportunity to push aggressively for price increases for its gas exports in line with sky-high oil prices.

**Figure 7. Algeria Export Revenues by Source**



Source: (World Bank 2003)

Despite the radical changes in the political regime in Algiers, construction on the Transmed project officially began with a ceremony in Algiers in June 1979. By the end of 1980, the three pipes spanning the Straits of Sicily were completed. The 1981 target for first gas deliveries appeared technically achievable.

Toward the end of the pipeline construction, in mid-1980, Algeria notified Italy that it would demand more than US\$5.50 per mmbtu for gas delivered to the Tunisian border, two dollars more than the price as determined by the formula in the 1977 contract (US\$3.50 per mmbtu)<sup>18</sup>. After transit charges this would yield a cost of gas to ENI of \$6.32 per mmbtu at the Italian border and a cost to Italian buyers of more than \$7 per mmbtu. ENI flatly refused and argued that the 1977 contract provisions should hold (Zartman and Bassani 1987). When ENI refused to accept the new pricing terms, Sonatrach and the Algerian government escalated the dispute quickly. Sonatrach stopped payments on its project-related debts to Italian banks and the Algerian government ordered a halt to all Italian industrial contracts and construction projects in Algeria.

<sup>18</sup> The formula price increased from 1977 with the rising oil product prices in the Italian market—but as fast or as much as the Algerians desired.

The new price demands for Transmed gas were part of a broader shift in gas pricing policy sought by Minister of Energy Nabi. Nabi was directing Sonatrach to demand from gas buyers an immediate increase to f.o.b. parity with Algeria's own high-grade crude oil. This was a major jump in price and a radical departure from the Aït Laoussine strategy of pricing gas off competing fuels in the off-take market, the so-called "netback pricing" scheme. Such a strategy ensured that gas was able to compete and gain market share relative to oil products. The earlier strategy would price gas near oil on a c.i.f. basis.

Under Nabi's new formula, the de-facto high transportation costs of gas made gas a premium fuel relative to most alternatives. The new *political* leadership of Sonatrach would demonstrate unprecedented willingness to withhold supplies to achieve these price demands.

When negotiations stalled in Rome, the Algerian government pushed Sonatrach to pursue price increases with each of its LNG buyers. Negotiations with U.S. buyer El Paso began—and ended—rapidly. The U.S. Department of Energy and Department of State effectively represented El Paso in the negotiations. The Reagan Administration would not allow a price significantly above that for imports from Canada and Mexico. The U.S. government feared that a higher Algerian price would encourage Canadian and Mexican suppliers to use "most-favored nation" treatment clauses in their contracts to seek similar price increases (Mortimer 1984). Algerian imports accounted for a small fraction of the U.S. market, and the government determined it was better to curtail Algerian supplies completely than see across the board price increases.

However, Algerian imports were much more critical to Belgium and France than to the United States. In the early 1980s, Algerian LNG imports accounted for over half of Belgian gas demand and nearly a quarter of French gas consumption, while the sum of Algerian contracts with U.S. buyers amounted to less than one percent of the U.S. gas market (BP 2003).

With the Transmed pipeline sitting empty—and its new US\$2 billion dollar LNG facility at Arzew shut down with the cancellation of the U.S. contracts—Sonatrach sought to use its leverage over Belgium's Distrigaz to achieve Nabi's price goals. Distrigaz acquiesced, seemingly protected by a "most-favored company" clause that allowed the Belgians to claim any lower prices subsequently negotiated with Sonatrach's other buyers. While this seemed advantageous to Distrigaz, Sonatrach instead used the Belgian contract to increase the leverage on the French and Italians (Zartman and Bassani 1987).

Gaz de France first tried to ignore the new Algerian gas price demands and continued to send payments only for the originally contracted price. Sonatrach responded by sending only a fraction of the obligatory gas shipments. The French bargaining position was further weakened as the Netherlands also sought increases in its pipeline delivered gas

from US\$2.54 to US\$4.10 per mmbtu. The Soviets also sought price increases from their Western European buyers (Zartman and Bassani 1987).

The French Socialist government ultimately intervened in the negotiations and agreed to provide a direct subsidy to add to the commercially viable price (as determined by Gaz de France) to the oil-gas f.o.b. parity price sought by Algiers. The French Socialist government's intervention had as much to do with addressing post-colonial guilt as it did with energy security concerns. On February 3, 1982, the French signed a 20-year agreement for 5.15 bcm per year with a formula price of US\$5.12 per mmbtu f.o.b. or US\$5.85 per mmbtu c.i.f., based on the US\$30 per barrel oil prices of the day. In return for the "political subsidy" from the French government, Algeria provided guarantees for future industrial orders totaling US\$2.13 billion (Petroleum Intelligence Weekly 1982a).

After the French had signed, ENI had little negotiating leverage left. Both France and Belgium had caved to Sonatrach's demands and ENI was stuck with virtually all of the payments on an empty multi-billion dollar gas pipeline. ENI's one strategic bargaining chip was the negotiations that were taking place simultaneously for new Soviet gas imports.

The Soviets—more focused on securing markets—used Italy's weakened negotiating position to their advantage, but did not seek the aggressive price indexing demanded by the Algerians.<sup>19</sup> An agreement was reached between ENI and Moscow in January 1982 for a base price of US\$4.53 per mmbtu indexed 20 percent on a basket of crude oils, 32 percent on domestic gasoline, and 48 percent on domestic fuel oils—yielding a border price at the time of US\$4.73 and a distributors' price of US\$5.38, a 30 cent increase over previous Soviet gas contracts (Zartman and Bassani 1987).

The French government's intervention in the LNG import contract made it nearly inevitable that the Italian government would also become involved in the Transmed pricing dispute. Italian businesses with contracts frozen in Algeria saw the French "goodwill" gas price as paving the way for more French imports into the country at the expense of Italian goods and services (Financial Times 1982a). Separately, political pressures were rising for the delivery of the promised gas to the millions of new customers to be connected in Mezzogiorno.

On September 23, 1982, ministerial meetings opened in Rome, and in only four days Italian Minister of Foreign Trade Capria and the Algerian Minister Nabi signed a

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<sup>19</sup> The Soviet contracts were a source of significant geopolitical tension during this heated period of the Cold War. The U.S. staunchly opposed to increased European dependency on Soviet gas supplies—ultimately creating a significant trans-Atlantic rift. Italian politics had their own dynamics related to the gas pipelines with the opposition Socialists seeking to displace the Christian Democrat Chairman of ENI.

ministerial agreement for the delivery of Algerian gas to Italy, based on a formula similar to that imposed on Gaz de France in 1981 (Buxton 1982b).

### *1983 Contract*

As in France, it was the willingness of the Italian government to guarantee to pay the “political price” demanded by the Algerians that kept the Transmed project from sitting indefinitely idle—or at least lying unused until oil prices came back to earth. Before it would sign any contract with Algiers, ENI demanded a legislative commitment to cover the difference between what it would define as the “commercial” price for gas and the larger price demanded by Algeria. The law was to be renewed annually and did not specify the commercial price and thus the direct cost of the subsidy the Italian government was to be determined.

With this legislative guarantee, Sonatrach in turn received its f.o.b. oil-linked pricing formula, yielding US\$4.41 per mmbtu at the Tunisian border based on the crude prices still in the US\$30 per barrel range. The price was less than the US\$4.80 Algeria had most recently demanded. But it was substantially above the US\$3.67 Italy would have paid under the original 1977 contract. Including US\$0.72 in pipeline charges, US\$4.41 f.o.b. translated into US\$5.13 c.i.f. delivered into Italy. In its negotiations with the legislature, ENI argued for a substantially lower “commercial price”. After a tumultuous battle the government agreed to provide a subsidy to ENI of US\$0.53 per mmbtu (Petroleum Intelligence Weekly 1983). Finally, after conquering a monumental technical challenge and a political battle that ultimately proved more costly, the first btu’s of gas were delivered through the Transmed pipeline in June 1983.

**Table 4. Transmed Revised Contract Volumes, 1983**

<b>Year</b>	<b>Volume</b>
1983	3.5 bcm
1984	6.5 bcm
1985	9.7 bcm
After 1985	12.4 bcm per year

History shows that Algeria’s pricing gains did not come cheap or last long. Rising energy prices were showing signs of slowing demand growth worldwide in the early 1980s and the Italian economy was no exception. After gas deliveries were held hostage for two years by Sonatrach, ENI still sought reductions in the base contracted volumes for the Transmed when the project started up in 1983. The new contract with Sonatrach included take-or-pay provisions for only 19.7 bcm for the first three years, down from 22 bcm in the 1977 agreement. Furthermore, the new contract contained flexibility provisions for revising all aspects of the accord—not only the price—after the first three years (Petroleum Intelligence Weekly 1982b).

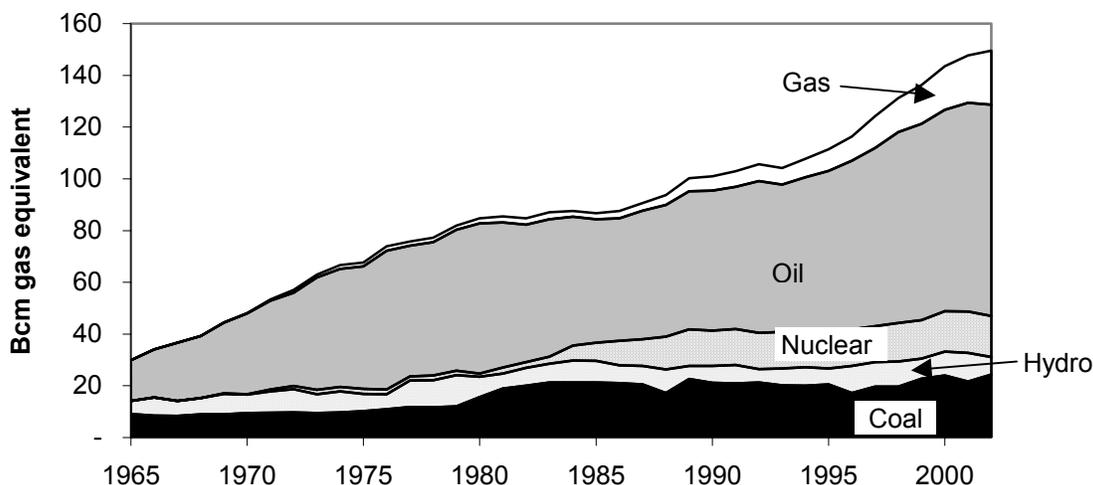
The delayed start-up of the Transmed had mixed impacts on ENI. Obviously, ENI was not earning revenues from the sale of Transmed gas. However, to accommodate the surge in gas from the Transmed, ENI had originally planned to restrain domestic production while the domestic gas market expanded to utilize full Transmed imports along with other contracted deliveries (Soviet and Dutch). With the economic slow-down in Italy, this would have meant even greater cuts in domestic gas production—ENI's most profitable business segment. Thus, the Algerian cutoff allowed domestic production to continue at near full volume, off-setting some of the damages of its idle investment in the Transmed. Soviet and Dutch gas imports continued largely as planned. In the long term, the biggest impact of the whole 'Gas Battle' was the tarnished reputation of Algeria and Sonatrach as a stable gas supplier—to be discussed further in the epilogue.

### **THE GAS IMPERATIVE FOR SPAIN IN THE 1970S**

Like Italy, Spain is not endowed with plentiful domestic energy resources. At the start of the 1960s, Spanish oil and gas production were nonexistent. Coal production at the time provided half of total primary energy supplies, yet Spain's domestic coal supplies were limited, of poor quality and relatively expensive to mine. Hydropower provided nearly half of the electricity supply in 1960. Yet growth prospects for hydropower were limited as most of the best sites were already exploited by that time. Thus, the rapid industry-led growth that Spain experienced in the 1960s during an era of cheap world oil prices was fueled in large part by imported oil.

Between 1960 and 1973, Spain's total primary energy demand grew nearly three-fold, at an annual rate of 8.5% per year. With stagnating coal and hydropower supplies and nascent domestic oil production, oil imports soared. By 1973, imported oil supplied nearly two-thirds of the country's energy needs (IEA 1978). Thus, the Spanish economy (like many other European economies) was dangerously exposed to the 1973-1974 oil embargo and resultant spike in world oil prices. The tab for foreign oil created a balance of payments crisis, increased interest rates and inflation, and ultimately stalled economic growth. Such problems plagued oil-dependent economies the world around during this period.

**Figure 8. Spain Total Primary Energy Supply by Fuel (in bcm equivalent)**



Source: (BP 2003)

Despite the six-fold increase in world oil prices between 1970 and 1975, Spanish oil imports and consumption continued to grow steadily throughout the period. Relative to its European peers such as Italy, Spain was unique in its near total lack of policy response to the oil crisis. However, natural gas imports were on the agendas of foreign companies operating in Spain, and to a somewhat lesser extent the main Spanish state gas company, ENAGAS. In Spain, as in the rest of Europe, the gas imperative was strong and growing. The macroeconomic costs of growing oil imports could not be ignored.

#### **SPANISH PIPELINE AND LNG IMPORT PROPOSALS IN THE 1970s AND EARLY 1980s**

Gas pipelines to bring Algerian gas to Spain and on to France were proposed as early as 1963 by French companies, with French government support (Pawera 1964). Two basic routes are described in Pawera's early report on Algerian infrastructure (see map, Figure 1). The first pipeline route would run from the Hassi R'Mel field west across Algeria and Morocco, under the 24 miles of sea at the Straits of Gibraltar at depths up to 450 meters, and then north into Spain. If this pipe continued through to Strasbourg to serve the French market, the pipeline would have spanned some 3,200 kilometers (Pawera 1964).<sup>20</sup> The second proposed gas pipeline route would also tap the Hassi R'Mel field, follow an existing pipeline route toward the Arzew LNG export facility, then head straight

<sup>20</sup> This is the basic route that the Gaz Maghreb Europe pipeline would eventually take, shown in the map in Figure 1. The connection to France was never made. Instead the GME connects to the Portuguese market.

under the Mediterranean for nearly 200 kilometers at depths of up to 2,500 meters, before terminating in Spain near Almeria. Finally, LNG imports from Algeria were also an option. Algeria was the world's leading LNG exporter at the time, and the closest source to Spanish markets.

Both of the pipeline routes faced major technical hurdles during the 1960s and the 1970s. Industry experience with sub-sea gas pipelines at the time was very limited. The Transmed pipeline, completed in 1981, was the first sub-sea gas pipeline completed below depths at which divers could do most construction and maintenance. Maximum depths on that project were similar to the Gibraltar route. As discussed above, a major research and development initiative by ENI was required to make the construction of the Transmed pipeline possible in the late 1970s. However, for decision makers in Spain or elsewhere at the time, the edge of the technological envelope was not so obvious. Engineering reports by Bechtel and Williams Bros. suggested that both the Gibraltar or Almeria routes were technically feasible in the 1970s (Pawera 1964; Petroleum Economist 1976a; Petroleum Economist 1977a). However, the experience with the Transmed pipeline suggests that: (1) the Gibraltar pipeline would have required a major financial commitment from either the governments or companies to make it technically feasible; and (2) the Almeria route would not have been possible to construct at this time without major technological breakthroughs.<sup>21</sup>

Despite the additional technological challenge of building the much deeper Almeria pipeline, this is the only pipeline project that was the subject of serious attention during the early 1970s. In November 1973 the direct Almeria route was the route chosen by the Sociedad de Estudios Gasoducto del Mediterráneo Occidental (Segamo), a consortium comprised of Sonatrach (50 percent), Spain's ENAGAS (25 percent), and GdF (25 percent) (Petroleum Economist 1977a). The Almeria route did indeed provide a shorter path to reach the French market—about 500 kilometers less pipeline. However, as discussed above, the technical challenges of the deep-sea route would likely have made it at least as costly as the Gibraltar route. Indeed, it was non-economic factors that derailed any progress on a trans-Morocco Gibraltar route at any time in the 1970s, and thus made the deep and technically challenging Almeria route the only option available to technical planners.

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<sup>21</sup> The record set by the Trans-Mediterranean gas pipeline at 600 meters depth remained unchallenged for many years and was in fact only beaten recently by the Blue Stream, connecting Russia to Turkey across the Black Sea at depths over 5,000 meters. Laying the Blue Stream pipeline only was made possible by the introduction of a novel pipe laying method (J-lay as opposed to S-lay), which could be adopted following adaptation of the special pipe-laying vessel, the Saipem 7000. However, this is history now. The boundaries of feasibility are never so obvious with time running forward, rather than looking in retrospect.

## **REGIONAL POLITICAL TENSIONS PREVENT THE GIBRALTAR PIPELINE**

Two disputes created political tensions that stalled any serious discussion of a gas pipeline crossing Morocco to Spain during this period. First, Algeria and Morocco have long had uneasy relations. The border between the two countries has been contested ever since Algeria won its independence in 1962, leading even to armed conflict in the 1963 “War of the Sands.” The border dispute can be framed in the broader struggle for regional dominance. On-again, off-again tensions between the two countries have long made Algerians uncomfortable with any gas export pipeline transiting Morocco.

Still, the Transmed example demonstrates that a Spanish company could have—in theory—conducted separate negotiations in Algiers and Rabat and established separate project companies. Such a structure would have required a strongly motivated Spanish player with strong government and financial backing (as was the case with ENI in the Transmed). However, a regional political dispute starting in the mid-1970s made any bilateral agreement between Spain and Morocco unlikely.

The Western Sahara dispute prevented any serious discussions of a pipeline connection involving Algeria, Morocco and Spain during the 1970s and early 1980s. Until the early 1970s, Spain controlled a section of the western Sahara, south of Morocco and along the Atlantic coast. The region was sparsely populated with a people known as the Saharawi and was a valuable source of phosphate for fertilizers. An independence movement began in the 1960s, actively supported by Morocco, Mauritania and Algeria, each seeking to assert territorial dominance. By 1974 Morocco and Mauritania were conspiring to carve up what became known as the Western Sahara. King Hassan II of Morocco launched a diplomatic campaign to gain support for Morocco its dispute with Spain. The U.N. and the International Court of Justice became involved (Parker 1984). Spain was simply seeking the best exit strategy, and in May of 1975 announced its evacuation from the Western Sahara.

The Western Sahara dispute also incited a decade of tensions between Algeria and Morocco. Algeria supported self-determination for the Sahawari and a close friendship with Algiers. Morocco was angling to split the country with Mauritania. In 1975, King Hassan organized a movement of 300,000 Moroccans to lay claim to the western Sahara region—the so-called “Green March.” Hassan’s tactic forced Spain out, and weak statements from the international community could not prevent Morocco and Mauritania from quickly carving up the former colony. Algeria—seeking to protect its regional position and advance its commitment to liberation movements everywhere—soon began to funnel fuel and weapons to support the insurgent Polisario guerillas. Algeria officially recognized the Polisario’s Saharan Arab Democratic Republic (SADR) as an independent state in March 1976—although Morocco retained defacto control of the country. Morocco, in turn, terminated diplomatic relations with Algeria. A proxy war ensued through the early 1980s, with Algeria supporting the Polisario with weapons and diplomatic support

(Entelis 1983; Parker 1984). Diplomatic relations between Morocco and SADR are not normalized to date. A U.N.-brokered cease-fire was negotiated in 1991, but a referendum on the sovereignty of the country has been delayed since.

Ultimately, the high-level and at times hot disputes between Algeria, Morocco and Spain prevented any proposal of a pipeline to across Morocco to Spain. No evidence of any serious discussions of a trans-Morocco pipeline can be found in the trade press through the mid-1980s.

### **DOMESTIC POLITICAL ECONOMY AND ENERGY POLICY IN SPAIN**

With external political relations stalling any progress on the Morocco-Gibraltar route, two options for bringing Algerian gas to Spain remained: (1) the deep-sea pipeline route to Almeria; and (2) LNG imports.<sup>22</sup> Despite the Segamo proposal and supposed positive findings from seabed surveys and the consulting studies, no concrete or steel was ever put on the Mediterranean floor to even test the technical feasibility of this pipeline route. If regional political tensions were the key factor preventing progress on a trans-Morocco Gibraltar gas pipeline during the 1970s and 1980s, Spain's domestic political economy with strong oil concerns and no proponent for natural gas, may be viewed as a critical factor stalling Spanish gas imports more generally during this period.

Any pipeline route to Spain would have needed to deliver at least 10 bcm of gas per year to be economically viable. Total gas consumption in 1973 amounted to less than 2 bcm per year, delivered on less than 2,000 kilometers of gas pipelines. The near total lack of residential connections to gas supply meant that the majority of initial gas supplies would first connect to industrial and commercial users. Industrial users are less costly per unit gas sales to bring onto the gas grid. However, the absence of a viable residential market limited the potential volume of sales. Significant new capital investments in gas-burning equipment would have been needed to switch consumers of other fuel types to using gas to create a robust market for gas consumption. In total, the expansion of infrastructure to distribute and consume 10 bcm of new gas supplies demanded bold moves on the part of ENAGAS and local gas companies likely requiring financial backing from the Spanish government and probably international lenders. In total, the cost of expanding the pipeline grid within Spain and new investments in gas-burning equipment would have been comparable to the estimated US\$4 billion cost of building the main pipeline to Almeria from Algeria (Petroleum Economist 1977b).

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<sup>22</sup> Other proposals were offered during this period to bring Nigerian gas north across Africa to mainland Europe. Spain could also have expanded connections to the European grid via France. The first option was a fanciful proposal of diplomats—never receiving serious attention from investors. The second option to build connections to France (and thus potentially to Dutch and Soviet gas) was stalled in Spain-EC politics that were cold during the Franco period, but then warming considerably afterward.

However, in the 1970s, ENAGAS was in no position to mobilize its own capital or secure support from the Spanish government to expand the gas grid. During the Franco period and the transition to democracy, the Spanish gas industry was of mixed capital (state and private) in a manner similar to the country's petroleum refining industry. Unlike the petroleum industry, however, the structure of the Spanish gas industry was dispersed and lacked cohesion (Lancaster 1989). ENAGAS did not enjoy the financial resources or political clout of the major petroleum companies, such as *Compañía Española de Petróleos, S.A. (CEPSA)*. CEPSA was able to secure subsidies to support LPG sales as oil prices climbed. As a result, the expansion of capital-intensive natural gas transport and distribution infrastructure was slow, while sales of CEPSA's bottled LPG, refined from imported oil, soared.

The relative weakness of ENAGAS may also explain the lack of attention given natural gas in the National Energy Plan (PEN-75) drafted in the last years of the Franco regime. Drafted in an attempt to respond to the first oil crisis, PEN-75 sought to reduce Spain's petroleum dependence by substituting coal, hydroelectricity and nuclear energy—with little attention to natural gas (Lancaster 1989).

The Franco regime ended with the Generalissimo's death in November 1975. The transition to democracy that followed was peaceful, but nevertheless stalled most major policy-making decisions (Lancaster 1989). Interim energy policy objectives were included in the broader Moncloa Pacts signed between representatives of business, labor and the state in 1977. It would be nearly two years later, in July of 1979 before the new Spanish Parliament would debate and approve PEN-79, yielding initiatives to expand natural gas infrastructures (IEA 1980).

Lacking the political and financial support necessary to pursue a major gas import pipeline, ENAGAS and other players were forced to look to LNG as the only viable supply source starting in the 1960s. Gas Natural, S.A. was formed in 1966 by a consortium of banks, the Catalunya Gas Company, and U.S.-based Exxon to import LNG from Exxon's Libyan fields (Lancaster 1989). But due to delays in the Libyan project, it was the ENAGAS regasification terminal at Barcelona that first brought LNG to Spain in 1969. These first shipments came from Sonatrach and would presage a larger future contract. The first Libyan shipments did not arrive until 1971 and these supplies would later dwindle when Libya nationalized its petroleum industry.

For ENAGAS, LNG was the option best suited for the limited Spanish market and its limited financial resources at the time. Sonatrach and Algeria bore over a third of the total capital cost of the gas trade project in the liquefaction terminal on Algerian soil. ENAGAS also partnered with Norwegian and private Spanish companies in the LNG tankers. The LNG project allowed ENAGAS to deliver smaller initial volumes to customers into the Barcelona gas grid, with limited connection to the rest of the country.

Still, the impetus for expanding gas imports—rising oil consumption and prices—drove ENAGAS to more aggressive measures for gas. With the Gibraltar route blocked by politics and a deep-sea route beyond the company’s technological or financial capacity, ENAGAS signed a contract with Sonatrach in 1975 to take 4.5 bcm (3.3 mtpa) of LNG per year for 25 years. The contract had the typical rigid take-or-pay terms of the day, with indexing to a basket of oil products.

The failure of the only bold foray by ENAGAS and Spain into LNG in the 1970s is instructive of the broader limitations on gas imports during this period. From the inception of its 25-year contract, ENAGAS never took more than 1.5 bcm per year, nor did it pay for the full 4.5 bcm of contracted volume in the period of 1975 through 1980.<sup>23</sup> ENAGAS was unable to market all of the gas for which it had agreed to take delivery. Gas distribution expansion plans were proposed, but the distribution network was very slow to expand outside of Barcelona (Petroleum Economist 1977a). As mentioned above, this was a period of policy uncertainty and the types of government regulatory and financial support needed to expand the gas grid were not forthcoming in the post-Franco transition.

Sonatrach, under Ait-Laoussine’s leadership, was probably hesitant to press ENAGAS on its contractual violations, realizing the fragile state of the gas business in Spain. As in other markets, the goal of Sonatrach pre-1979 was to build markets, with a view toward long-term gas sales and securing a foothold in European markets. Sonatrach’s strategy changed markedly when Algerian President Boumediene died in late 1978.

The aggressive ‘Gas Battle’ waged by the post-Boumediene leadership in Algiers and Sonatrach dealt a deadly blow to the possibility for gas imports to Spain. ENAGAS, in its weakened position, had been unable to sell what volumes it was taking from Algiers (under 2 bcm per year). When Nabi and the Sonatrach leadership began to threaten to withhold gas deliveries without price increases, ENAGAS was more inclined to not take the gas at all than to pay higher prices for gas it could not sell. Unlike Belgium, France and Italy, Spain did not cave in to the Algerian price demands for it had much less at stake.

Ultimately, the political and economic contexts of the period did not support the complex cooperation and clear policy initiatives required to complete an international gas pipeline connecting Algerian gas reserves to the Spanish market. Fractious political relations between all of the countries potentially involved in the more technically feasible Gibraltar route stalled any progress on this route. The mid-to-late 1970s were also a period of major political uncertainty in Spain, as the new democratic government struggled to

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<sup>23</sup> ENAGAS non-performance in the early stages of the project did not leave them in a solid negotiating position when Algeria later sought rapid price increases. As mentioned below, international arbitrators ordered ENAGAS to pay two hundred million USD in damages for breach of contract.

gain stable footing after the death of Franco. Just as a new Spanish energy policy began to take shape in the late 1970s and early 1980s, the political transition in Algiers significantly changed Sonatrach's perspective on gas exports. The new Algerian administration may have favored pipelines over costly LNG exports, but this policy preference was overshadowed by the contentious 'Gas Battle' being waged by Algiers in demand of higher prices for all gas sales. Whatever the political challenges—the key limiting factor for major a project to deliver Algerian gas to Spain was the absence of a single actor like ENI with the resources and the mettle to push such a project through.

## CONCLUSION

The design of this study facilitates comparison across the Italian and Spanish cases. Both ENI and ENAGAS sought to bring gas from Algeria to their respective European markets. Both Italian and Spanish energy markets were growing rapidly in the midst of the energy crisis of the 1970s. Many of the economic and political factors mentioned above are hard to measure empirically, particularly for the un-built pipelines to Spain that existed only in the hypothetical (or realized only when the Gaz Maghreb Europe pipeline was completed thirteen years later).

Working from the assumption that the factors identified here as common hold constant across the two cases, logic instructs that the factors that differ between the Spanish and Italian cases are those critical to project completion. Casual observers—including those very knowledgeable about the region and the projects—may at first glance find this a trivial exercise. Indeed, in retrospect it does seem obvious that the Spanish gas market was limited and that troubled relations between Morocco, Algeria and Spain spoiled any hope of a trans-Gibraltar route in the late 1970s. In hindsight, it is simple to say that the deep water Almeria route was impossible at the time. However, when the lens of analysis is turned to the perspective of decision-makers at the time, rather than to *ex-post* storytelling, questions that ask *why* a particular project succeeds become much more interesting.

The course of events that led to the construction of the Transmed and the numerous innovative mechanisms used to complete the project are worthy of closer examination. Gas transport technologies have advanced considerably in the last three decades and will continue to do so in the future. However, many of the political and strategic considerations that affected ENI's decision to proceed with the Transmed project and the ENAGAS decision to pursue limited LNG imports in the 1970s will continue to play an important role in gas import decision-making in the future.

Tables 5 and 6 list common and contrasting factors for the Transmed project and the proposed project to pipe gas from Algeria to Spain. Starting with the historical perspective, ENI's (SNAM's) success with natural gas in Italy's Po Valley in the 1950s

and 1960s propelled the company into a national powerhouse. With its success came the expansion of the gas grid and in turn a stable and rapidly growing market, eventually demanding more gas than domestic resources could provide. The company then set out to secure imports from Algeria (and elsewhere). Critical to the company's success—particularly in the Algerian venture—was its complete monopoly of the off-take market and the critical financial backing of the Italian government that in turn made ENI the favorite of international lenders.

Spain's ENAGAS was nearly on the opposite end of the spectrum. Endowed with neither domestic resources nor a power base in the national government, the company struggled to expand the gas network and gain markets for its contracted shipments of LNG from Algeria and Libya.<sup>24</sup> The limited size of the Spanish market at the time necessitated French involvement in a pipeline project to make it economically viable. The French market would come at the expense of more pipeline and increased complexity with a new party added to the negotiations.

Beyond these fundamental factors, other historical and political events were at work. The Algerian nationalization of French energy assets in 1971 tempered any French interest in engaging again with Sonatrach in a pipeline project. In the mid-1970s, the Western Sahara dispute raised obstacles to a Gibraltar route, while the transition from dictatorship toward democratic rule in Spain stalled major energy policy decisions through the late 1970s. As these distractions cleared, a new regime in Algiers started Sonatrach on a 'Gas Battle' that soured commercial and political relations with most of its gas buyers and made new gas export projects unattractive to importers. Gas priced on parity with oil would not have been a solution to Spain's energy security crisis, particularly as Sonatrach showed its persion for withholding deliveries.

The Transmed pipeline, however, was never a foregone conclusion. Strong financial backing and political support were necessary to bring the Transmed pipeline to completion. ENAGAS enjoyed neither of these strengths during the 1970s, and thus it was left only with the limited LNG option for gas imports until the 1990s.

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<sup>24</sup> Domestic gas discoveries in the 1980s provide further evidence that state-support may have been the critical limiting factor in building the Spanish gas market.

**Table 5. Factors Common to Both Projects**

<b>Factor</b>	<b>Transmed</b>	<b>Not-Built Pipeline / ENAGAS LNG imports</b>
1. Policy drivers	Italy 79% dependent on imported oil in 1973; very limited supply of domestic energy resources	Spain 73% dependent on imported oil in 1973; very limited supply of domestic energy resources
2. Supply risk (Algeria)	Sonatrach offered secure access to massive reserves	Sonatrach offered secure access to massive reserves
3. Transit country involvement	No direct disputes between Italy or Algeria and Tunisia; Tunisia did stall deal in attempt to squeeze rents	Difficult relations between both Morocco and Spain and Morocco and Algeria during the 1970s and 1980s; Direct route to Spain would have avoided transit country issue—although increased project technical complexity
4. Technical challenge ( <i>depth for sub-sea pipe</i> )	610 meters maximum depth	450 meters max. depth for Gibraltar crossing; Approx. 2000 meters for direct route
5. Total capital cost / Scope	US\$4 billion in 1977 / 2,500 km pipeline	US\$4 billion in 1977; rough estimate depending on route/ 3,200 km to France via Gibraltar; 2,400 km via direct route
6. Legal Environment	Legal risk only relevant in Tunisia as other players were state-owned and operating domestically	Legal risk only in Morocco for Gibraltar route as other players were state-owned companies operating domestically
7. Regulatory	State-owned monopolies	State-owned monopolies

**Table 6. Factors Varying Across the Two Projects**

<b>Factor</b>	<b>Transmed</b>	<b>Not-Built Pipeline / ENAGAS LNG imports</b>
1. Domestic political economy	The ENI group was the dominant player in both the energy market and policy making with strong political and financial backing	ENAGAS is a poor step-child to Spanish oil companies; Domestic policy instability/void in post-Franco transition
2. Off-take risks	Monopoly pricing subject to ministerial approval; 22 bcm domestic gas market in 1977	Monopoly pricing subject to ministerial approval; Less than 2 bcm domestic gas market in 1977
3. Financing	ENI had no problem with financing based in large part on domestic political economy	ENAGAS had limited ability to raise funds, a product of domestic political economy
4. Resource base / path dependence	Domestic gas resources, though limited, spawned the development of ENI's core competency in gas and the company's growth	Spain still trying to rationalize its coal subsidies in the 1980s; no domestic gas industry
5. Multiple off-takers / Transit countries	Slovenia signed contract for deliveries in follow-on deal; minimal effect on original deal complexity	Spain's limited gas market necessitated French involvement; multiplying political and commercial complexity

## EPILOGUE: ITALIAN AND SPANISH GAS IMPORT PROJECTS THROUGH THE 1990s

This research is focused on the factors that affect the initial decision to invest in and build a cross-border gas trade project—in this case comparing projects to move Algerian gas to Italy and to Spain. Many will also be interested to know about the performance of the projects after that initial decision was made. A complete analysis of the private and social returns on these projects would be a daunting task for the projects that were actually completed, and an exercise in the hypothetical for the Algeria to Spain pipeline that was ultimately built in a different era (1996 rather than 1980). Such an analysis is beyond the scope of this study. Some general insights are offered here on the history of operations in the region and the current status of these and other new projects.

The ‘Gas Battle’ waged by Nabi and Sonatrach ultimately turned into the ‘Gas Fiasco’<sup>25</sup> (Aït Laoussine 2003). The abrogation of the 1977 Transmed contract and the ensuing dispute over prices were costly for all parties involved: Algeria and Italy, Sonatrach and ENI. Nabi’s dogmatic pursuit of oil-price parity through any means necessary proved rather quickly to be shortsighted. By November of 1985, with oil prices falling to US\$25 per barrel, the gas price fell to US\$3.50 per mmbtu f.o.b. By mid-1986, oil prices fell to US\$10 per barrel and the pricing formula—if it held—would have yielded a negative f.o.b. price.<sup>26</sup> ENI was keen to keep the Transmed project viable and renegotiated the contract months before such a damaging event occurred. The revised contract replaced the OPEC official oil price as an index and used the old and reliable netback formula instead. The base price in the contract was lowered to US\$1.30 per mmbtu (Aïssaoui 2001).

However, the pricing issues had a relatively short-term effect compared to the longer-term impact on the Algerian market share and reputation that resulted from the ‘Gas Battle’. Sonatrach lost almost completely its U.S. market for LNG as well as a sizable fraction of its European market. Previously, it was the dominant LNG supplier in both of these markets. As a result, Sonatrach’s existing LNG export operated significantly below design capacity through the 1980s and 1990s (Zartman and Bassani 1987; Aïssaoui 2001). Sonatrach later had trouble keeping its LNG facilities properly maintained, and only in the late 1990s was it able to invest in the necessary plant refurbishments to bring its export facilities at Arzew and Skikda back to designed capacity.

The goal of ENI in the Transmed project was to secure a long-term, stable and economic supply of gas. Excepting Sonatrach’s early performance, the project has shown to be a surprisingly reliable supplier, especially given Algeria’s troubles with its LNG

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<sup>25</sup> ‘Gas Fiasco’ was dubbed by Aït Laoussine, who had earlier been forced out by Nabi and thus some obvious bitterness remains. Still, even to the objective analyst the title does seem appropriate.

<sup>26</sup> More conservative pricing formulas, such as that included in the 1977 Transmed contract, would have included a higher base price and a less-direct oil-gas linkage substantially reducing this type of volatility.

exports and the tumultuous decade of civil unrest and terrorism of the 1990s. ENI was suitably pleased with Algerian supply that it partnered with Sonatrach to add new compressors and an additional subsea line to expand Transmed capacity to 24 bcm per year in 1995. In the fall of 1997, terrorists did attack the pipeline severing one section of the pipeline on Algerian soil and stopping deliveries for five days.<sup>27</sup> Italian consumers were not significantly affected as ENI had adequate storage to cover the shortfall (WGI 2/26/98).<sup>28</sup> Despite these challenges, the Italian gas market continues to expand. The Galsi pipeline project is its early stages and if completed it will bring more Algerian gas to Italy via Sardinia.

On the Spanish side, when Sonatrach tried to raise its selling price in 1982, ENAGAS was not interested in any 'political subsidy' to keep its LNG deliveries coming as Italy did on the Transmed project. ENAGAS did not want to lift its full contract amount in the future, nor would it pay for any of its liftings by the new formula agreed to by France and Belgium (US\$5.12-\$5.28 per mmbtu) for LNG. Sonatrach and ENAGAS were soon deadlocked. Algeria eventually pursued arbitration under the International Chamber of Commerce and won US\$200 million in damages (Zartman and Bassani 1987).

Given the experience with LNG, it is hard to imagine Spanish gas demand developing rapidly enough in the 1980s without a very different policy approach taken by the Spanish government. Expanding gas infrastructure would have required major public support. Nevertheless, the energy policy context also changed in the 1980s and Spain was able to take advantage of cheap oil prices for a time.

It was not until the mid-1990s that the Spanish government was able to stimulate a burgeoning gas market. The opening of the Spanish gas and electric power markets spurred new investment, particularly in new gas-fired power generation. The drivers and context had changed completely to bring about this project. Liberalization of the Spanish market had spawned a new powerhouse in Gas Natural. With support of the European Union, the new Spanish company pushed through an agreement with Sonatrach and Morocco for the long-troubled Gibraltar route. In 1996 the Gaz Maghreb Europe pipeline was finally built, spanning Morocco and passing under the Straits of Gibraltar to bring Algerian gas to Spain and on to Portugal. The importance of the shifting policy context can be seen as the project was completed in the middle of a near continuous violence in Algeria in the 1990s. The empowered Gas Natural still pushed forward despite the civil unrest and continued difficult relations between Rabat and Algiers. The Maghreb gas pipeline has since been expanded and LNG deliveries to Spain have grown rapidly in the

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<sup>27</sup> LNG shipments have also been interrupted by terrorism and accidents. In the spring of 1998 supply pipelines to Arzew were blown up reducing LNG exports from facility to 50% of capacity for approximately one week. In January 2004, a fire at the Skikda refinery spread to a liquefaction train resulting in a massive fire that curtailed LNG shipments indefinitely.

<sup>28</sup> Italy has total storage capacity of over 12 bcm, on 63 bcm annual consumption. The amount of gas in storage varies seasonally (IEA 2003).

late 1990s (from Algeria, Qatar, and Trinidad among others). The direct under-sea pipeline from Algeria to Almeria, Spain is back on the drawing table. The so-called Medgaz project is set for engineering design in 2004. The Spanish gas market in 2002 is still relatively small, however, when compared to the well established Italian gas system (20 bcm versus 60 bcm, respectively).

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