

PART ONE

FROM BEDOUIN TO BOURGEOISIE

Of all the many nations that emerged into the harsh light of history and modernity during the twentieth century, none moved so rapidly from obscurity to glaring prominence as Saudi Arabia. Dominated by the Ottoman Turks and warring tribal chiefs in the 1890s, the Arabian Peninsula was in political disarray, and the Saud family, traditional rulers of the area around Riyadh from the mid-1400s, was in exile in Kuwait. The British sought to exercise influence by establishing protectorates among the traditional monarchies along the southern and eastern coasts of Arabia.

The present nation came into being only in 1932 when Abdul Aziz ibn Saud proclaimed the kingdom of Saudi Arabia after reclaiming the traditional family homeland and battling rival tribes for 25 years to gain control of most of the peninsula. He ruled a largely rural people who followed centuries-old traditional ways as farmers and nomadic herders driving their sheep, goats, and camels across the desert expanses. They practiced Wahhabi Islam, an austere doctrine requiring strict observance of Muslim laws that had been taken up by the Saud family in the mid-1700s and

spread throughout Arabia by their conquests. The new kingdom was poor and utterly lacking in industrial development.

By the beginning of 1970, less than 40 years after its founding, Saudi Arabia was suddenly thrust into assuming a major role in economic activities and political events that affected the entire world. The world's urgent and virtually insatiable need for more oil catapulted the kingdom onto the center of the world stage and suddenly made it wealthy almost beyond any historical precedent. The Saudi people were moving into splendid new cities and developing tastes for modern Western goods and entertainments. Its oil industry began diversifying further downstream and gaining world-class technical sophistication.

But Saudi Arabia was by no means a modern state in the early 1970s, nor is it one today. As a monarchy with no elected assembly or parliament, the nation is still dominated by the Saud family and has been ruled for its entire history by Ibn Saud and his hereditary successors—his five eldest sons. These six men have dominated a vast expanse of desert and mountains for 103 years. While oil provided Saudi Arabia great wealth and an enviable array of public services and welfare systems, it has not built an economy that generates enough professional jobs for a rapidly growing population. Saudi society is extremely conservative and, from a Western perspective, restricts the freedom of women severely. The Wahhabist clergy enforce strict Muslim law and impose criminal punishments considered barbaric in the West. The once symbiotic relationship between state and religion appears threatened by rivalries that divide the allegiances of the people. And as the world has recently discovered, the peculiarly Saudi Arabian mix of monarchy, conservative Islam, social restrictions, and economic contradictions has proven to be a fertile breeding ground for discontent, opposition, and terrorism.

Saudi Arabia has also been an extremely reliable proprietor of the world's most critical oil supply. The kingdom has maintained a very close relationship with the United States and has generally shown a sympathetic understanding of the interests of the Organization for Economic Cooperation and Development (OECD) nations. As the largest producer in the Organization of Petroleum Exporting Countries (OPEC), Saudi Arabia has been a "dove" in policy disputes, working to maintain fair oil prices and safe, reliable oil supplies.

The critical issues facing the Saudi oil industry cannot be properly appreciated without some understanding of Saudi Arabia and its people.

How did a disparate collection of desert tribes come to occupy such a critical position on the world stage? What are the composition and organization of Saudi society today? What are the country's concerns and challenges? What forces are driving the internal dynamics of this desert nation? How do Saudi Arabia's demographics and economic realities impact its oil-producing future? Part I answers these questions, to provide background necessary for understanding the current Saudi oil situation.

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The Birth of a Nation

A Century of Extraordinary Change and Economic Challenges

The West has had very little appreciation of the rich history and culture of the entire Islamic Middle East. Knowledge of Saudi Arabia, in particular, was almost nonexistent until oil was discovered in 1938. Even after oil was found, the kingdom remained cloaked in obscurity for another three decades. Once the kingdom was thrust onto the world stage, obscurity gave way to glaring celebrity and negative stereotypes. Today, although much more is known about Saudi Arabia, ignorance and prejudice are only slowly giving way to understanding.

Only a handful of geopolitical experts and oilmen has ever traveled to this remote part of the world. Despite the critical role Saudi Arabia's oil now plays in the world economy, many people still assume the country consists of a few thousand wealthy princes squandering an endless flow of

petro-dollars in self-indulgent decadence. This view may once have had a certain plausibility. Today, however, the real picture is vastly different.

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While Saudi Arabia became an oil producer in the late 1930s, the kingdom's rapid emergence as a global energy and economic power took place when U.S. oil production suddenly peaked in 1970. This event, coming at a time of rapidly increasing global oil demand, created an immediate potential for supply shortages. Saudi Arabia was the only producer with the capacity to keep pace with the world's ravenous appetite for oil. Seizing the opportunity, the kingdom leapt from the rank of a leading oil producer, with output of about 2.5 million barrels a day in 1965, to super-star status by providing over eight million barrels a day in 1974. For the next three decades, Saudi Arabia would become the key swing supplier of oil exports to the rest of the world, adjusting its output according to changes in world demand.

Tables 1.1 and 1.2 demonstrate the importance of the Middle East's oil production and reserves, the basic reason why Saudi Arabia and the rest of the Middle East are likely to remain among the world's crucial geopolitical regions.

Table 1.1 Middle East Proven Petroleum Reserves

	At End of 2003	
	Oil	Natural Gas
	(Billion barrels)	(Trillion cubic meters)
Saudi Arabia	262.7	6.68
Iran	130.7	26.69
Iraq	115.0	3.11
United Arab Emirates	97.8	6.06
Kuwait	96.5	1.56
Qatar	15.2	25.77
Oman	5.6	0.95
Syria	2.3	0.30
Yemen	0.7	0.48
Bahrain		0.09
Other	0.1	0.05
Total	726.6	71.72
Middle East % of World	63.3%	40.8%
Saudi % of World	22.9%	3.8%
Saudi % of Middle East	31.2%	9.3%
World Total	1,147.7	175.78

SOURCE: *BP Statistical Review of World Energy*

Table 1.2 Middle East Oil Production

	Thousand Barrels Daily		
	1992	1997	2003
Saudi Arabia	9,098	9,361	9,817
Iran	3,523	3,726	3,852
United Arab Emirates	2,516	2,490	2,520
Kuwait	1,077	2,137	2,238
Iraq	531	1,166	1,344
Qatar	495	694	917
Oman	748	909	823
Syria	518	582	594
Yemen	184	375	454
Other	54	50	48
Middle East Total	18,738	21,490	22,607
World Total	65,705	72,024	76,777
Saudi as Percent of Middle East	49%	44%	43%
Saudi as Percent of World	13.8%	13.0%	12.8%
Middle East as Percent of World	28.5%	29.8%	29.4%

SOURCE: *BP Statistical Review of World Energy*

Note: Includes crude oil, shale oil, oil sands and NGLs

Given these plentiful oil resources, why should anyone worry about Saudi Arabia? Apart from concerns about potential political upheaval, most energy observers seem not to have entertained the possibility that Saudi Arabia's Oil Miracle might someday end. This chapter reviews the history of Saudi oil, to provide some framework for better understanding the oil supply situation facing the world today.

The Reign of the Warrior King: 1902–1953

The roots of the Kingdom of Saudi Arabia go back to January 15, 1902, when Abdul Aziz (also known as King Ibn Saud, Figure 1.1) gathered a large group of warriors to capture Riyadh. Prior to this raid, most of Arabia had been controlled for several centuries by the Rashid Arab clan aligned with the waning Ottoman Empire. The victorious Abdul Aziz expelled the Rashid dynasty forever from what ultimately became Saudi Arabia.



Figure 1.1 King Abdul Aziz ibn Saud

SOURCE: Photographer: Hulton Archive; Collection: Getty Images

After capturing Riyadh, Abdul Aziz embarked on a series of campaigns to subdue additional towns and consolidate his control. In January 1926, Abdul Aziz became the King of Hadja and the Sultan of Najd, and thus established his authority over most of the territory of modern Saudi Arabia.

As Abdul Aziz conquered the Arabian Peninsula, some of his most powerful supporters were the Ikhwan, the strictest, most zealous group within the Islamic Wahhabi sect. Once his power was secure, Abdul Aziz turned on these strict but unruly Wahhabists and, after four bloody, battle-ridden years, finally brought them under his control. But the religious fanaticism of this group never ebbed and played a dominant role in preserving the strict religious control that is still evident in Saudi Arabia today.

After almost three decades of warfare and political consolidation, on September 22, 1932 Abdul Aziz finally declared his realm the Kingdom of Saudi Arabia by merging the Hadja and Najd realms. He ruled this new kingdom for 21 additional years. While he remained quite obscure throughout his life outside his kingdom, he was truly one of the twentieth century's most dynamic and intriguing characters.

Historians still debate the extent to which Abdul Aziz was involved in the development of Saudi Arabia's oil. As will be detailed later, a series of advisors and quasi-advisors such as New Zealand's Major Frank Holmes, the Arabist Harry St. John Philby, the American philanthropist Charles Crane of the Crane Plumbing fortune, the Vermont mining engineer Karl Twitchell, and a group of Standard Oil Company of California geologists all played important roles in convincing Abdul Aziz to grant the oil concession that ultimately led to the discovery of the world's greatest collection of super-giant oilfields. But the king played a canny role in orchestrating the early development of Saudi Arabian oil resources. Did he suspect that this barren kingdom might have such rich petroleum deposits, or were fate and luck the key determinants? Given the lack of records and the limited written history of Saudi Arabia's early years, definitive answers to these questions may never be known.

What is clear, however, is that by the time Abdul Aziz finally consolidated his power, his new kingdom was extremely poor. Its only source of real money came from fees charged to Muslims on the annual pilgrimage to Mecca. When Aziz finally became king, the global depression had reduced the flow of pilgrims to a trickle, and the royal family of the new kingdom teetered on the brink of insolvency. Their need for hard currency was so urgent that an oil company might have been expected to hold the clear upper hand in negotiations for an oil concession. That an oil company

might take a gamble at all on the unknown geology of Arabia at that time is somewhat surprising, since most oil companies were struggling to stave off insolvency as the depression deepened and oil prices fell to 10 cents a barrel.

Opposition to Jewish Immigration Foreshadows First Oil Crisis

As he battled to establish control of Arabia, Abdul Aziz was acutely aware of the potential for political disruption and violence stalking his kingdom and the entire Middle East region as a result of Zionist efforts to create a Jewish homeland in Palestine. In fact, Abdul Aziz was among the first Arab leaders to warn that a Jewish homeland in the Muslim-dominated region posed serious risks for the Middle East and the world. The prominent role that Abdul Aziz tried to play during the crucial years of the Zionist campaign has been overlooked by many Middle East historians. And while the story has limited relevance to Saudi Arabia's oil development, it does shed some light on King Faisal's use of the "oil sword" to trigger the 1973 oil shock.

In 1937, Abdul Aziz spoke at length to Sir Percy Cox's deputy H. R. P. Dickson about the millennium-long hatred that true adherents to the Muslim faith had towards Jews and urged the British government to maintain Palestine under British sovereignty, ruling it, if necessary, for another 100 years rather than partitioning it to create a Jewish state. In March 1943, Abdul Aziz invited representatives from *Life* magazine to Riyadh to proclaim his strong opposition to Jewish immigration to Palestine. During this visit, he retold the history of the region and gave his reasons for rejecting all arguments used to validate the Jewish claim to a homeland in the region.

Abdul Aziz came face to face with world leaders only rarely. The most prominent meetings took place in 1945, when he secretly conferred with both President Franklin Roosevelt and Prime Minister Winston Churchill. These visits occurred late in Abdul Aziz's life on the occasion of FDR's last trip outside the United States before his death two months later. After FDR left the gathering of Allied leaders at Yalta in February 1945, he secretly flew to Egypt and boarded a navy vessel, the USS *Quincy*, which steamed to Great Bitter Lake. The purpose of his trip was to meet three kings: Farouk of Egypt, Haile Selassie of Ethiopia, and Abdul Aziz ibn Saud of Saudi Arabia.

The journey to meet FDR was one of the few trips during his long life that Abdul Aziz made outside of his kingdom. On the way to this

meeting, in the Marrat area of Saudi Arabia, the king shared his vehemence about a Jewish homeland with a crowd of his staunch supporters. Abdul Aziz told them of the progress of the war and what place the Arab nations should claim in the world when the war ended. He warned his supporters of the dangers if Zionists dared to drive a small and weak nation of Palestinians from their own land. These views were a key component of the positions Abdul Aziz brought to his meeting with Roosevelt.

On Valentine's Day, King Ibn Saud was lifted onto the *Quincy* in his wheelchair to meet the American president, the most powerful leader in the world, who was also wheelchair-bound (Figure 1.2). Jim Bishop, in his book *FDR's Last Year*, eloquently characterized this historic visit as "two sick men facing each other in their respective wheelchairs." Roosevelt led off this discussion by speculating on the wonders to be achieved if all the arid land in Saudi Arabia and Egypt could be made to flourish and bloom. The king, in a most respectful manner, said he was not interested in the



Figure 1.2 King Abdul Meets with FDR on USS Quincy

SOURCE: Photographer: Hulton Archive; Collection: Getty Images

subject of water. He spoke to FDR about his love for the desert. He went on to explain that he was simply a warrior—nothing more, nothing less. He had spent a lifetime fighting recalcitrant tribes to establish his kingdom, and now he was nearing the end of his days. The thought of making deserts bloom was a good one, but there should still be a place for deserts. Deserts were good, not bad! This was a true Bedouin talking candidly to a true aristocrat.

As the meeting between these two old warriors extended into several hours, their friendship grew. Roosevelt said he was particularly interested in the Palestine question. King Ibn Saud said, “You mean the Jews?” and then went on to say, “When peace comes [i.e., when World War II ends], the Jews should be returned to the lands from which they have been driven, not sent to Palestine.” The king was clearly very alarmed about the pace at which Jews were buying Palestinian land and acquiring arms to fight the Palestinian Arabs. Once WW II ended, Abdul Aziz warned FDR that if the Jews came to Palestine, they would establish a culture entirely different from the Arabs. This would eventually lead to armed conflict between the Muslim world and the Jewish people. As a true believer, King Ibn Saud told FDR, he would then be forced to fight on the side of the Arabs. To prevent this chaos, Ibn Saud urged that a Jewish European homeland be created instead.

After the king departed the USS Quincy, FDR reportedly told Harry Hopkins that he had learned more about the Arab-Jewish situation from Ibn Saud in five minutes than he had from others over the whole course of his life. According to Jim Bishop, Hopkins would enjoy telling others, long after the trip ended, that “The only thing FDR really learned was that the Arabs don’t want any more Jews in their neighborhoods.”

Did King Ibn Saud and President Franklin Roosevelt Discuss Oil?

Whether or not oil entered the five-hour conversation between FDR and the king is not recorded. It would be odd if it did not. An American oil company had made the first two significant oil discoveries in Saudi Arabia several years earlier, and one field was then in production. Abdul Aziz was eager to further develop Saudi Arabia’s bonds to the United States as a balance to the strong British influence in the region. Access to Middle East oil was an Axis objective in WW II and the reason behind the North African campaign. And Roosevelt was keenly aware of the oil potential in

Saudi Arabia. During the height of the war in 1943, Roosevelt instructed Harold S. Ickes, U.S. Secretary of the Interior, to dispatch a senior delegation from the Petroleum Reserves Corporation, the official entity responsible for supplying petroleum to the war effort, to inspect Saudi Arabia's oil resource. The Allies were gearing up for massive offenses in Southeast Asia which had to be fueled by Middle East oil; U.S. reserves could not sustain the wartime drain of two billion barrels of oil per year.

Leading this delegation was Everett Lee DeGolyer, one of the world's most distinguished geologists. Upon his return to the United States, DeGolyer reported to Roosevelt that the center of gravity for oil production would soon begin shifting from what he labeled the American-Caribbean area to the Middle East-Persian Gulf area. He estimated the kingdom's oil resources at 2 billion barrels of proven reserves, 5 billion barrels of probable reserves, and 20 billion barrels of possible reserves.

A day after his meeting with FDR, Abdul Aziz met with Winston Churchill in Cairo. From notes taken at the visit, it seems that Churchill may have confused Abdul Aziz with a member of Iraq's royal family. This confusion highlights the obscurity of Saudi Arabia even as World War II was coming to an end.

FDR was clearly impressed with Abdul Aziz, oil or no oil. After FDR returned to the United States, he penned a handwritten note to the king dated April 4, 1945 reiterating his pledge that no decision would be taken with respect to the Palestine issue without fully consulting both the Arabs and the Jews. He ended the note by assuring the king, "I will take no action in my capacity of Chief of the Executive Branch of this government, which might prove hostile to the Arab people." Eight days later, FDR died.

During this brief but potentially profound friendship between FDR and Abdul Aziz, it is unlikely that either leader glimpsed the powerful position the Kingdom of Saudi Arabia would occupy once it became the world's most important oil supplier, nor the violence that would engulf Middle East politics. Had these two old warriors each been 20 years younger when they first met, and had their brief acquaintance blossomed while they were both still young, it is not hard to imagine that the history

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of the Middle East might have taken a different course. Only weeks before FDR died, he apparently suggested to his wife, Eleanor, that he would like to travel back to the Middle East after he left office and become more

engaged in seeing that part of the world grow.

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Abdul Aziz viewed the danger embedded in creating a Zionist state in the Middle East with great passion. To make his views more widely known, he sent his favorite son, Prince Faisal, to the international gathering in San Francisco that created the United Nations. Faisal appealed to the United States to honor FDR's promise to hear Saudi concerns about creating a Jewish state in

Palestine. His appeal was ignored, and he returned to Saudi Arabia nurturing a deep resentment against the United States for not supporting a key ally and instead tilting toward the establishment of a secular Jewish state. These resentments may have influenced Faisal's action 25 years later when, as the King of Saudi Arabia, he used the "oil sword" to punish the United States for its support of Israel in the 1973 Middle East war, creating the first U.S. oil crisis and gasoline lines at service stations from coast to coast.

In the last eight years of his life, Abdul Aziz quietly retreated from public affairs, delegating most of his official duties to his sons, particularly the two most senior, Saud and Faisal. Upon his death in 1953, a fierce power struggle erupted between the two eldest sons. Saud became the new king. Faisal became the crown prince.

At the time of Abdul Aziz's death, Saudi Arabia's oil production had risen to almost 840,000 barrels per day. By then, five great oilfields had been discovered, although only two of the five fields, Abqaiq and Ghawar, were in full production. Revenue to this tiny kingdom, however, had risen to \$110 million.

King Saud and Crown Prince Faisal could not have been further apart in their personal preferences, behavior, and styles. Saud loved his expansive palace, luxuries, and the opulent lifestyle. Faisal was best known for his sobriety, piety, purity, and financial acumen. King Saud did not take well to the role of steward of the nation's resources, and through the 1950s, Saudi Arabia's economy often teetered on the brink of financial collapse. King Saud had inherited a surprisingly large debt from his father, estimated to total around \$200 million in 1953. By 1958, the kingdom's debt had soared by another 250 percent.

In the early 1960s, King Saud traveled abroad for medical treatment. When he left, Faisal formed a new cabinet and assumed effective control of the kingdom. In 1964, Saud returned to Saudi Arabia and threatened to mobilize the Royal Guard against Faisal. Within weeks this threat backfired. On March 28, 1964, King Saud agreed to abdicate the throne to his brother. He left Saudi Arabia for Cairo and died in Greece five years later.

Soaring Oil Production and Revenues

Faisal was crowned king at a fortuitous time, as oil revenues soon began to grow rapidly. Thanks to Faisal's frugal principles and increasing oil flows, the financial crisis that he inherited soon faded into historical oblivion. Saudi Arabia was on the way to becoming a financial superpower.

In the first month of his reign, Faisal appointed his half brother, Khalid, as the new crown prince. Another half brother, Sultan, became the minister of defense. Zaki Yamani became his minister of oil and petroleum, replacing Al-Tariqi who had served in this role since 1960. Al-Tariqi is still credited as one of the originators of OPEC, the now famous organization created to represent the interests of the major oil suppliers.

King Faisal played a unique role in Saudi Arabia's history, and his untimely death in 1975 was seen by many as a tragedy. Unlike most of the Saudi royal family, Faisal had traveled extensively by the time he became king. He visited the USSR in 1934. He first visited the United States in 1943. As was previously mentioned, he led the Saudi delegation to the UN conference in San Francisco in 1945.

King Faisal ruled Saudi Arabia as the obscure kingdom soared to oil prominence. The sudden growth in oil revenues opened economic doors for Faisal, and he began making dramatic changes to modernize his kingdom. His advances in education, including educating women, started the kingdom down a path toward a more open society—a path that became rocky and slow once King Faisal died.

History will always remember King Faisal best for wielding his "oil sword" in October, 1973, launching the first OPEC oil embargo. Less than two years later, he was assassinated by a deranged cousin. He was replaced by the next eldest of Abdul Aziz's sons, Khalid, who was subsequently replaced by another son, Faud. King Faud suffered a debilitating stroke in the late 1990s. The next eldest son, Crown Prince Abdullah, became the de facto leader. In 2005, Crown Prince Abdullah was in his early eighties.

A Population Explosion Creates Economic Challenges

For years, the population of Saudi Arabia was tiny, numbering only six million as recently as 1970. Close to one-third of these people were expatriate immigrants merely working in the kingdom. By 1980, the population had grown by 50 percent to nine million. By 1990, there were 14 million people, and by 2000, Saudi Arabia's population had soared to almost 22 million, including about 5.5 million non-Saudis. In 30 brief years, the number of Saudi citizens quadrupled from about four million in 1970 to over 16 million in 2000. An appreciation of the various consequences of this demographic explosion is crucial to understanding the issues confronting the Saudi monarchy as the twenty-first century gets underway.

As with the entire Middle East today, the majority of the Saudi population is very young. According to the 2003 UN statistics, only 2.5 percent of the population is over 65, and 43 percent are still under 14. The birthrate is an astonishing 6.3 children per female. Unless Saudi Arabia's demographic trends change rapidly, the kingdom is headed towards a population of 40 million.

The University of Utrecht, which is known for its studies of population, forecast that Saudi Arabia's population will surpass 30 million by 2010 and will be close to 50 million in 2030. An increase of that magnitude is

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nearly certain because all of the potential parents needed to create another 15 to 20 million people are now alive. Given the high birthrate in the kingdom and the waves of young people entering child-bearing age, these population forecasts could end up being too low.

The economic challenges embedded in Saudi Arabia's population explosion are staggering. Not only does the number of jobs of all types need to grow rapidly, but Saudi Arabia's internal use of energy must rise also. Just creating a reliable electricity grid and building new desalination plants to ensure sufficient potable water for another 10 to 20 million citizens will require vast increases in domestic energy use.

Saudi Arabia is still wealthier than the other large countries in the Middle East. But this wealth is a far cry from the opulence the kingdom enjoyed 25 years ago. On a per capita basis, the current Saudi gross domestic product (GDP) is 50 percent less than that of the poorest countries of the OECD. Saudi Arabia's wealth per capita now pales in comparison to

some of its neighbors, such as Kuwait, the United Arab Emirates, and Qatar, which all benefit from still having small populations relative to the oil revenues each country receives.

The backbone of the Saudi economy has always been oil. It still accounts for 40 percent of the country's GDP, 70 percent to 80 percent of state revenues, and about 95 percent of total export revenues. The Saudi economy is oil and will remain so for the foreseeable future.

Challenge #1: The Need to Modernize the Oil Industry and Diversify the Economy.

In 1975, Saudi Arabia began creating a modern chemical and petrochemical industry in an effort to use some of its oil and associated natural gas to begin diversifying its economy. Saudi Arabia Basic Industries Corporation (SABIC) was formed in 1976. Over the next two decades, SABIC grew into the eleventh largest petrochemical company in the world. It now ranks alongside companies like E. I. DuPont as a world-class chemical/petrochemical leader. This sorely needed diversification was important, but it still left the kingdom totally reliant on its ability to produce vast volumes of oil from its handful of giant but aging oilfields since all the petrochemical feedstock comes from gas and lighter petroleum liquids that are separated from produced oil. Moreover, the petrochemical business, like the oil industry, is not a labor-intensive endeavor. Creating decent, high-paying jobs for Saudi Arabians outside the royal family has always been a great challenge.

Challenge #2: The Need to Provide Social Services. The Saudi economy was flush with vast amounts of excess cash in the days when oil prices were high and only six to nine million people lived in the kingdom. With this wealth the government was able to provide many social services, such as health care, education, electricity, and water, either free or at heavily subsidized prices.

Challenge #3: The Need to Handle Debt. Just as the Saudi population was beginning to soar, the price it received for its oil collapsed and production was cut back. Today, the Saudi economy bears no resemblance to the wealth and splendor many in the West still assume exists. Saudi Arabia's government debt at the end of 2003 totaled about \$170 billion. On a per capita basis, this represented more debt than Argentina. By 2003, the kingdom has run budget deficits for 19 of the past 20 years. Its GDP

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per capita was now less than \$8,000 annually. While the surge in oil prices finally created a budget surplus in 2004, Saudi Arabia's debt still remains very high, particularly for a country often considered very wealthy.

Challenge #4: The Need to Reduce Unemployment and Create New Jobs. Estimates vary on the current unemployment in Saudi Arabia. The best educated guesses estimate unemployment somewhere in the range of 15 to 25 percent. An even bigger problem is that a large number of young Saudis are just starting to enter the labor market, and, due to religious and cultural restrictions, many industries still shy away from hiring women. Moreover, there are no Saudi-based industries of any significant size, apart from the state-owned oil company and the state-owned chemical company, Aramco and SABIC, respectively. Neither Aramco nor SABIC is a business that can employ an ever-increasing number of young people, even those with petroleum and chemical schooling and training. Saudi Arabia's population growth cries out for the creation of new industries that are labor-intensive.

Challenge #5: The Need to Grow the Economy. If Saudi Arabia achieves a sound foundation of economic stability, it will, at a minimum, need to grow its economy to a level where GDP per capita begins to approach that of the poorer countries in the OECD. Because its demographic trends will create a country with as many people as Spain, its GDP would need to grow from \$8,900 per capita in 2004 to \$15,000 by 2015 to become merely as modestly wealthy a decade from now as Spain is today.

Challenge #6: The Need to Develop New Industries. Saudi Arabia is unlikely to develop new industries quickly enough to decrease its high dependency on oil. The kingdom can build this "Spain 2000 prosperity" (and for anyone not knowledgeable about Spain, it is still one of the poorer countries in Western Europe) only on the back of its oil. By spending the profit it makes from oil exports wisely, Saudi Arabia can achieve this minimum level of economic growth.

Those who assume Saudi Arabia will intentionally flood the world's oil markets to bring oil prices low enough to bankrupt its competitors, a scenario that is often mentioned at global economic forums, have obviously never taken a close look at either the demographics or the economic fundamentals of the desert kingdom. It is no longer a country of 7,000 billionaire princes and some expatriate help, but a country with an exploding population base, a need for jobs, water, electricity, education, health care,

and so forth, and a current debt that is far too high. Without prolific oil productivity and favorable market conditions, the future for the Saudi Arabian economy will be bleak. We will now turn this analysis to Saudi Arabia's oil and natural gas resources to examine how strong and substantial this base of oil and gas really is.

Facts About Saudi Arabian Oil

As I implied earlier, the concept of "fact" becomes problematic when the Saudi Arabian oil industry is concerned. What we know about the kingdom's oil is pretty much what Saudi Aramco, the Petroleum Ministry, and the royal family want us to know. The "known facts" about Saudi Arabia's oil, then, are few and simple. In late 2004, "proven oil reserves" totaled 259.4 billion barrels, plus another 2.5 billion barrels in the Saudi-Kuwait neutral zone. If these proven reserve numbers are real, it means that Saudi Arabia's oil will last another 90 years at the current production rates of eight to nine million barrels per day.

Over 100 Discovered Oil and Gas Fields

Conventional energy wisdom assumes that most of Saudi Arabia's portion of the Arabian Peninsula has been lightly explored because current oil resources are deemed adequate for the foreseeable future, thus obviating the need to look for more. Some oil experts argue that even with minimal future exploration, there might be little need for new successes since Saudi Arabia already has an ample inventory of over 80 known oilfields and another 20 to 22 gas fields waiting in the wings to come onstream (see Table B.1, Discovered Saudi Arabian Oilfields as of 2000, in Appendix B.) Saudi Arabia's discovered oilfields are said to contain over 315 separate, producible oil and gas reservoirs.

Five of the kingdom's known oilfields have been exceptional by any world standard. They are super-giants containing vast quantities of oil and gas, and they have produced 90 percent of Saudi Arabia's oil from 1950 through the end of the twentieth century. Ghawar, the most super of super-giants, is the greatest oilfield the world has ever known; after more than 50 years of production, Saudi Aramco claims that Ghawar still contains 70 billion barrels of proven reserves (and statements from a recent

Aramco brochure describe Ghawar as still containing one-eighth of the world's total reserves. If true, this equates to some 125 billion barrels.)

Almost all of Saudi Arabia's 101 oil and gas fields are located in a compact corner of the kingdom's Eastern Province. Most of these fields are land-based. Only 13 are offshore, lying at the top of the Persian Gulf in and just south of the Neutral Zone, a territory Saudi Arabia shares with Kuwait.

An oilfield is usually classed as a super-giant based on its estimated proven reserves or the amount of original oil-in-place. But proven reserves can be an imprecise and somewhat slippery concept when applied to fields of this magnitude, so I prefer an alternative definition. A super-giant oilfield, as I use the term, is a single oilfield that can produce at least 400,000 to 500,000 barrels a day of crude oil for several decades. Likewise, my definition of a giant oilfield is one whose daily production can exceed 100,000 barrels a day for some sustained period of time.

Fields of this size have always been rarities. In the past 30 years, only a handful of giant oilfields was found throughout the entire world. Most of these were the first-generation discoveries in the early days of North Sea exploration offshore Western Europe. Very few oilfields discovered since 1980—probably fewer than five—are now producing in excess of 250,000 to 300,000 barrels a day.

Developing New Oilfields

Development is now underway on a number of giant oilfields around the world where peak production will hopefully exceed 150,000 to 200,000 barrels a day. Most noteworthy are the two giant projects in the Caspian Sea—the three-field complex in Azerbaijan's sector of the Caspian and the Kashagan field in Kazakhstan's oil sector. But these fields contain complex reservoirs. In the case of Kashagan, three of the original owners have already sold or announced the sale of their shares. An estimated \$29 billion is now being spent, and initial production in 2009 is estimated to reach only 75,000 barrels a day. Kashagan's oil output is projected ultimately to exceed one million barrels a day, but this event is not expected to occur until sometime in 2015.

The other new "giant" oilfield developments are located in the deep-water regions of the Gulf of Mexico and West Africa. None of these projects is expected to produce in excess of 200,000 to 250,000 barrels a day. The Gulf of Mexico fields will likely peak quickly and then begin expe-

riencing relatively high rates of decline. They are unlikely to produce at rates near their peak levels for even one decade.

Geologic Analysis of Saudi Oilfields

Perhaps a dozen or so geologic formations have been explored within Saudi Arabia and the subject is very technical. But from a layman's perspective, the most important feature of Saudi Arabian petroleum geology is how few of the various rock formations deemed to have hydrocarbon potential have ever produced oil in any significant quantity. Saudi Arabian geologic formations are listed in order of depth from the surface in Table B.2, Appendix B.

Saudi Arabia's Jurassic-age Arab carbonate rock formation has produced almost all the highly valued light and extra light oil in Saudi Arabia. "Light" refers to an oil's density and is expressed for all crude oil grades in degrees API (American Petroleum Institute). Light oils are more valuable and range from 38° to 34° API. Medium oils have an API gravity of about 32°, and heavy oils start at about 29°. As API gravity decreases, the oil thickens until it becomes tar that will not flow at normal temperatures. On the long list of known geologic formations in Saudi Arabia, the Arab formation is almost hard to find. This remarkable reservoir rock is divided into A, B, C and D zones. Virtually all the oil produced at the super-giant Ghawar and Abqaiq fields has come from the Arab D oil column, meaning the vertical thickness of the oil-bearing rock layer. In total, the Arab D oil column was commonly about 250 feet thick at locations near the center of the field and grew thinner toward the edges of the field, or flanks, where it was in contact with the underlying aquifer, referred to as the oil/water contact. The first 150 feet of this column were typically produced before Aramco constructed its water handling facilities to cope with water produced along with the oil, called the water cut. Almost all of the Arab D oil has been produced from the top 80 feet of the continuous oil column, a special reservoir formation known as Arab D Zone 2-B. The bulk of the remaining oil reserves, however, lie in the lower portion of Arab D. Several now retired Aramco executives say this oil will be extremely difficult to recover.

These two onshore giant carbonate oilfields plus the Berri field produce a high portion of Saudi Arabia's light and extra light oil. Two other oilfields, Shaybah and Hawtah, produce the balance of the light and extra light oil. The remainder of Saudi Arabia's oil production, which is medium

to heavy grade, comes from three offshore oilfields. These offshore fields produce from sandstone formations in the Middle Cretaceous Wasia Formation.

Conventional wisdom still accepts Saudi Arabia's claim that its cost to produce oil is the least expensive in the world. Whether this is true or not remains a mystery since Saudi Arabia publishes very little financial information on the economics of its oil and gas business. The kingdom reveals few details of its annual exploration and production (E&P) budgets and how the money is spent, and never provides expenditures on a field-by-field basis. Given the general cloak of silence, it seemed surprisingly forthcoming when Saudi Aramco stated in early 2004 that it expected to spend \$18 billion through 2007 simply to maintain Saudi Arabia's current production capacity.

Conclusion

This modest set of generalized facts and claims, despite the lack of detail to warrant the quality of the information, is accepted at face value with few questions by many energy observers and forms the basis of the assumption that Saudi Arabia will always have the ability to produce cheap oil at steadily increasing volumes. The same information supports the thesis that it would be easy and painless for Saudi Arabia to suddenly attempt to gain market share by producing and selling far greater quantities of its cheap oil, regardless of how low oil prices would fall as a result of such an action.

The preponderance of technical information in the technical papers published by the Society of Petroleum Engineers ("SPE papers") about every significant producing Saudi oilfield tells a far different story. It is a true story based on undeniable facts, but one that has never been told in its entirety. But before plunging into the details of that story, it is helpful to first review the evolution of Saudi Arabia's oil industry, because its history helps us to understand why the kingdom now faces so many challenges.