



The Quest: Securing the Supply

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13 - The Security of Energy

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11 - Is the World Running Out of Oil?



A defunct oil derrick

Source: Inhabitat

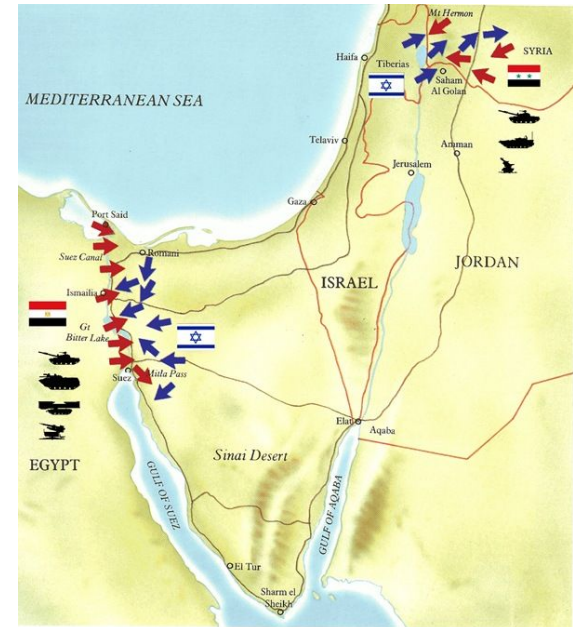


Peak Oil

- Peak Oil Theory is the theory that the world is either at or near max oil production
- Some say that the ramifications of peak oil could include:
 - Chaos, war, extinction
- Peak oil did not account for future developments in oil field technology
- The date of the peak has been pushed back multiple times
- Demand keeps rising, and experts predict that the peak will be more of a plateau

Risks Above Ground

- The International Energy Agency (IEA) estimates that over the next 25 years new development will require up to \$8 trillion
- Funding for oil projects comes from investors who are risk-averse
- There are many risks inherent to oil projects beyond technical difficulties
 - Regulation, National Stability, War



Troop movements during the Yom Kippur War of 1973



Running Out of Oil - For the First Time

- The world has been thought to be running out of oil at least five times
- The first successful American oil well was drilled in 1859 by Colonel Edwin Drake in Titusville, PA
- The primary use of oil for the first 40 years of American production was illumination
- Gasoline, a byproduct of lamp oil distillation, was dumped into rivers
- It was a commonly held opinion that oil would one day disappear
 - In 1885 the state geologist of PA declared oil to be a “temporary and vanishing phenomenon”
 - Shortly thereafter new fields in Kansas, Ohio, Texas, and Oklahoma were discovered



Running Out of Oil - Deja Vu

- The United States experienced an oil famine during WW1
 - War had become a mechanized affair utilizing tanks, trucks, and planes
 - American oil went to support European allies, causing “Gasolineless Sundays”
- It was largely believed that oil had won the war for the Allies, but that oil would disappear
 - Securing new reserves became a real concern
- Use of new war-driven technology advances such as seismic technology
- Discovery of new fields in Texas and elsewhere



Running Out of Oil

- WW2 increased world demand for oil
 - 6 out of 7 billion barrels of oil used by the allies were American
 - Oil was part of the reason for the invasion of the USSR, and Rommel's failure
 - After the war, America was an importer of oil, stoking fears, then new production came online in the middle east
- Oil shortage fears appeared again in the 70's due to a booming economy
 - Oil price jumps were exaggerated by war and revolution in the middle east
 - New production was brought on, cars became more efficient, and power plants switched from oil to coal and nuclear, causing the 80's glut

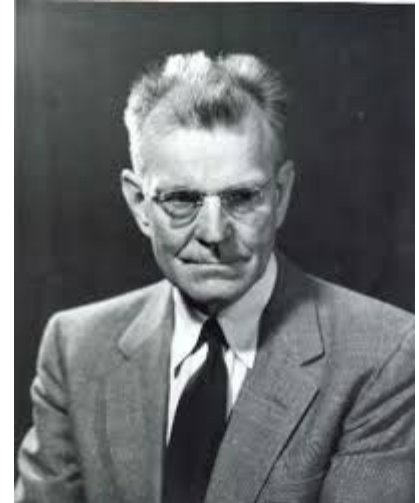


Running Out of Oil - For the 5th Time

- Modern day challenges facing the oil industry's ability to meet demand include:
 - New demand from emerging economies
 - Climate change and relevant regulations
 - Geologic considerations
- Modern day peak oil supporters see the world's oil fields as a full beer, and the world's population as a person drinking it
 - One day we will run out they say, but nobody knows how large the beer is

Hail to the King

- M. King Hubbert was the creator of Peak Oil Theory
- An eminent earth scientist with a grating personality
 - Referred to by a former student as “arrogant, egotistical, dogmatic, and intolerant of work he perceived to be incorrect”
- Hubbert was a technocrat
 - Believed that society should be ruled by scientists, not politicians and economists
- Modeled oil field production on a bell curve
- Predicted US production would peak during 1965-1970, it did

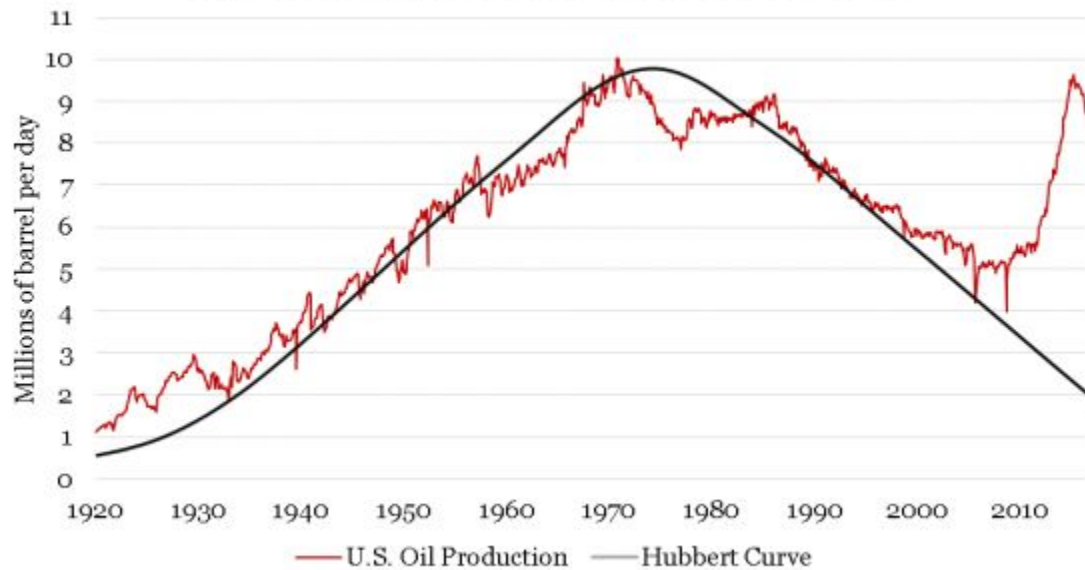


M. King Hubbert

Source: Hubbert Peak



U.S. Crude Oil Production and the Hubbert Curve



Source: U.S. Energy Information Administration

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Why Supplies and Production are Growing

- Hubbert did not account for the discovery of new fields, or increases in reservoir recovery
- One of the sources of new reserves Hubbert didn't know about was Saudi Arabia's Ghawar field
 - First drilled in 1948, it is the largest oil field in the world and produces over 5 million barrels per day at 50+ years old
- Hubbert also did not account for the fact that as prices increase, reserves grow
- Peak oil proponents argue that the rate of oil field discoveries has declined in recent years
 - But reserves are still increasing, due to “additions”
 - Revisions of reservoir capacity as new data is gathered
 - 86% of US oil reserves are the result of revisions, not discoveries



How Much Oil?

- At the end of 2011, the world had 1.65 trillion barrels of proved oil reserves, slightly more than at the beginning of the year
 - Additions were sufficient to replace oil used
- Replacing production is expensive and requires a long time horizon
- Currently there are about 5 trillion barrels of oil resources, and 1.4 trillion barrels of reserves in the world
- In 2010, oil production was about 92 million barrels per day (mbd), by 2030 it may be 114 mbd



12 - Unconventional



An oil rig off Angola's coast

Source: World Finance



Unconventional Oil

- Unconventional oil sources vary widely, but all require advances in technology to be made viable
- Unconventional sources of oil include:
 - Liquids with gas
 - Offshore
 - Oil sands
 - Oil shales
 - Tight oil
 - Oil produced from coal and other hydrocarbons

Offshore Oil Production

- Offshore oil drilling was invented in the 1880's by H.L. Williams off the coast of Santa Barbara, California
 - Unsuccessful business venture
- Today 27% of world production, or 25 mbd is produced offshore
- Offshore shallow drilling was proven a success by Kerr-McGee in the Gulf of Mexico
 - Small company fighting for Class-A acreage in 1947
- State vs Federal gov't for rights to outer-continental shelf taxes
- By the 1960's shallow offshore was a large industry
 - A well blowout occurred in Santa Barbara in 1969, forever pitting environmentalists against offshore drillers

Non-Opec and New Frontiers

- Nine months after the Santa Barbara disaster Phillips Petroleum discovered the massive Ekofisk oil field
 - Experienced substantial investment due to oil scarcity fears of the 70's
 - By 1985 produced 3.5 mbd and served as a pillar of non-OPEC
 - Total OPEC production in 1985 was 13.7-18 mbd



Location of the Ekofisk oil field

Source: Subsea World News

Non-Opec and New Frontiers

- Petrobras was the first company to drill a well in deepwater, at 2,562 ft of water in 1992
- In 1994 Shell's Auger oil platform went into production in the Gulf of Mexico
 - 26 stories tall standing over 2,864ft of water
 - Took 9 years and \$9 billion to build
 - Eventually reached 100,000 barrels per day of production
- By 2009 the Gulf of Mexico was the world's fastest growing oil province, supplying 30% of US domestic demand through shallow and deep water platforms



Shell's Auger oil platform

Source: Subsea World News



Deepwater Horizon

- The Deepwater Horizon was a drilling platform leased by British Petroleum (BP)
- The rig had just finished drilling the “well from hell,” the Macondo well
 - 48 miles off the coast of Louisiana
 - Fought through gas kicks, 5,000 ft of water, and 13,000 ft of rock
- The Macondo well had been drilled, and was being plugged so that it could be produced at a later date
- On April 20th, 2010 at 7:55pm oil and gas began to seep around the plug
- A device called a blowout preventer was meant to prevent a catastrophic release of gas, but failed to completely seal the well when activated
 - At 9:49pm, gas that had been escaping the well caught a spark, causing an explosion

Deepwater Horizon Aftermath

- The explosion killed 11/126 crew members
 - The rig sank 2 days later
- There was no established method for stopping oil flow resulting from a deepwater accident
 - It took 88 days for a newly designed capping stack to be installed, sealing the well
 - 2 months after that, mud and concrete was pumped into the Macondo well, “killing” it
- 6,700 ships and 45,000 people participated in the cleanup
- Damage was not as bad as expected thanks to hydrocarbonistic microbes eating the oil



Fire boats attempting to extinguish the Deepwater Horizon

Source: Slate Magazine



Deepwater Horizon Aftermath cont.

- 3 weeks prior to the Deepwater Horizon accident President Obama had begun the process of allowing companies to drill in new areas off of America's coast
 - Proposals removed after the accident
- Short-lived moratorium on drilling in the Gulf of Mexico
- 1 regulatory agency split into 3: one for licensing, one for safety and environmental regulation, and one for royalties
 - Federal safety inspectors, to avoid appearing cozy with the oil industry, could not accept anything while on an inspection, including water
- Oil companies collaborated to establish several companies meant to respond to deepwater accidents in the future
- Oil production in the Gulf will continue due to its economic importance in the region

North American Mega-Resource

- The Canadian oil sands are located in Alberta
 - Viscous bitumen embedded in sand and clay
 - Must be heated to allow oil to flow
- Two methods of extraction:
 - Conventional: Shovel and truck mining method
 - In-situ: Use superheated steam to stimulate wells
- In-situ extraction caused Canada's oil reserves to jump from 5 billion barrels to 175 billion, giving them the world's 2nd largest reserves



A rope shovel and CAT 797 400 ton haul truck in the oil sands

Source: Oil Sands Magazine

Tight Oil

- Tight oil is colloquially referred to as shale oil , and is oil that is found trapped in shale
- Advances in hydraulic fracturing and horizontal drilling have made tight oil an important element of American reserve growth over recent years
- Could give America an additional 20 billion barrels of oil that aren't in Alaska



Halliburton pump trucks

Source: Aspen Public Radio



13 - The Security of Energy

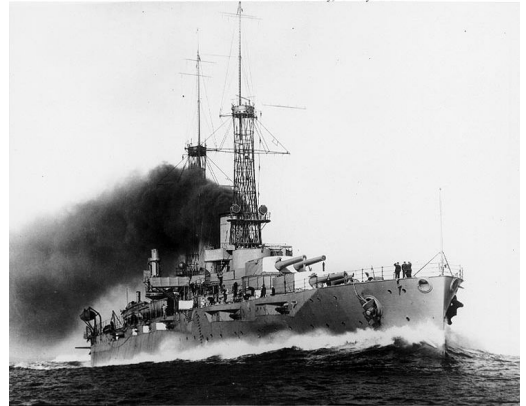


A NOAA satellite image of Hurricane Katrina from 8-28-5

Source: Encyclopedia Britannica

The Importance of Energy

- Electricity is necessary for the internet age
- Oil is necessary for sea, land and air transport
- In 1911 Winston Churchill decided to switch the Royal Navy's ships to oil power
 - Said it would increase mobility and firepower in arms race with Germans
- Critics said that this was foolhardy, as Britain had coal but no oil
- Churchill responded with "Safety and certainty in oil lie in variety and variety alone"



American New-York Class coal-powered battleship
Source: Wikipedia



The Vulnerability of Energy

- Hurricanes Katrina and Rita struck the Gulf Coast in 2005
 - Caused catastrophic damage to electrical, transportation, and communications infrastructure
 - Production, receiving facilities were down, causing an integrated energy shock
- The 2011 Japanese earthquake and tsunami took down electricity, services, communication, transportation, and response efforts
- Both of these events have shown us how vulnerable the modern world is to disruptions in the energy supply



The Security of Energy

- Energy Security: the availability of a sufficient supply of energy at affordable prices
- Importers secure a supply of energy
- Exporters secure a demand
- In 1973 President Nixon coined the phrase “Energy Independence” as part of a push to increase US domestic output in response to the 1973 embargo
 - Stated that energy independence meant an ability to meet all domestic demand without imports
- Today energy independence can mean two things
 - Lack of imports
 - Security of the supply chain



The International Energy Agency

- The oil embargo of 1973 caused strife and turmoil within the US and between western allies
- In response, the Energy Treaty of 1974 was signed in Washington DC
- The treaty established the IEA, an agency meant to coordinate the western response to future uses of the “oil weapon”
- The IEA is headquartered in Paris, France and consists of 28 industrial nations
- Helps to foster dialogue between oil producers and importers

The Strategic Petroleum Reserve

- Part of the IEA's job is to oversee the strategic stockpiles of oil maintained by its member nations and to disperse supplies in times of need
- The worldwide IEA stockpile is 1.5 billion barrels, with the US maintaining 700 million barrels of oil in its Strategic Petroleum Reserve
- Oil from these reserves is meant to be used solely in response to supply disruptions
 - Used 1st time during the Gulf Crisis
 - Used 2nd time in response to Katrina
 - Used 3rd time in response to Libyan War

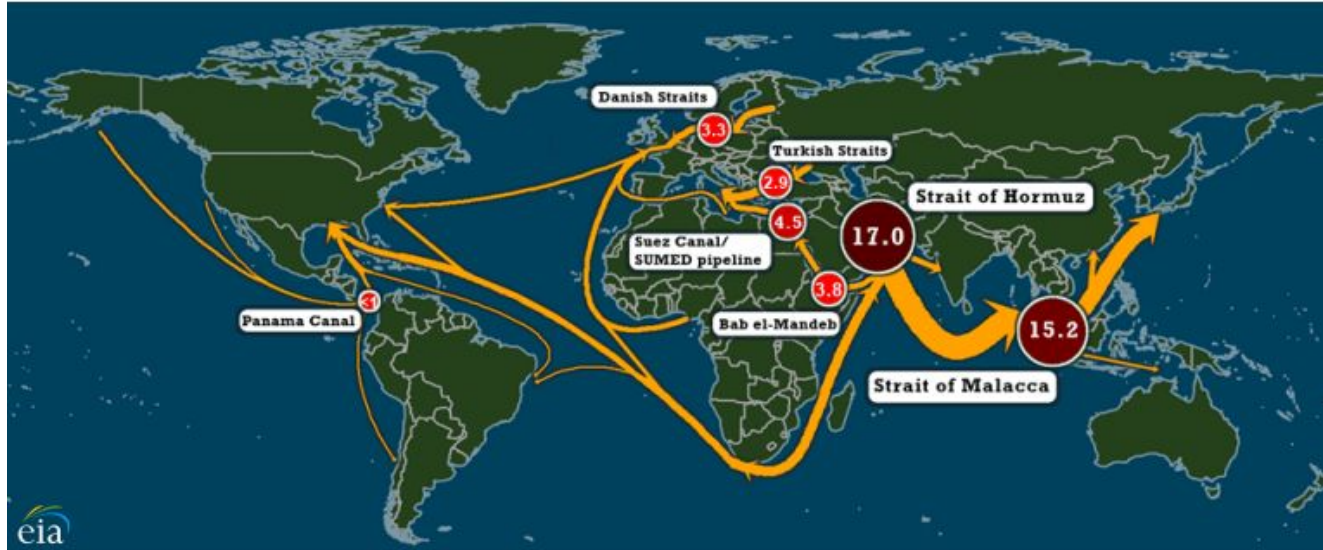


SPR storage locations

Source: Selous Foundation

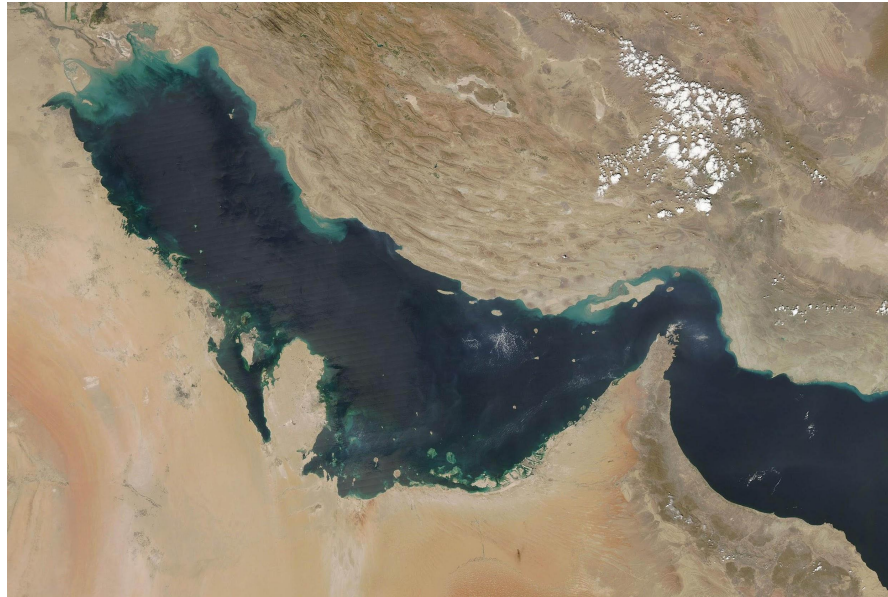
Threats to the Supply


Daily transit volumes through world maritime oil chokepoints



- Cybersecurity is a major threat to all modern infrastructure - Including pipelines and power stations
- China and India must be brought to the table
- National stability, war, disasters, and pirates are all threats to the supply of oil
- In the Malacca straits alone, 15.2 mbd of oil and $\frac{2}{3}$ of internationally traded LNG are transported

14 - SHIFTING SANDS IN THE PERSIAN GULF



- 
- The 1956 Suez Crisis
 - Egypt's expropriation of the Suez Canal triggered an invasion by Britain, France and Israel
 - As a consequence of the crisis, technological advancement in development of larger tankers that could sail around Africa instead of using the canal.
 - In 1967, Arab oil embargo against the US, Britain, and West Germany for Israel's victory in the Six Day War - Failed
 - 1973 embargo for U.S. resupply of Israel - Successful
 - Resulted in increased oil prices
 - The 1978-79 Iranian Revolution also delivered another oil shock
 - 1990 invasion of Kuwait led to loss of 5 million barrels a day of supply from Iraq and Kuwait
 - 2003 invasion of Iraq shut down its oil industry
 - Resulted in the oil price spike of 2008



The Center of Gravity of World Oil

- The Roosevelt administration, in 1943, sent Everette Lee DeGolyer to Persian Gulf to assess the petroleum potential
- In 1926, one petroleum company decided that Saudi Arabia was “devoid of all prospects” of oil
 - Suggest the big reserves would be found in Albania
- In February 1938, Anglo-Persian and Gulf Oil found petroleum in Kuwait
- Chevron and Texaco did the same in Saudi Arabia next month
- DeGolyer reported that “The center of gravity of world oil production is shifting from the Gulf-Caribbean area to the Middle East - to the Persian Gulf area.”



One Quarter of World Reserves



- In 2010, Saudi Arabia's output averaged 8.2 million barrels per day
- The country's entire industry is operated by the state-owned Saudi Aramco
 - It has over 100 fields that contain nearly 370 reservoirs
- The part of Saudi Arabia that is heavily explored is relatively small
- Kuwait and Abu Dhabi each produce about 2.3 million barrels per day
- Qatar pumps 0.8 mbd oil



The “Hinges” of the World Economy

- Al-Qaeda has targeted what it has called the “hinges” of the world’s economy
- When Al-Qaeda first emerged in the 1990s, energy systems were not targets
- In 2004, it proclaimed the oil industry a legitimated target
 - As long as long-term oil production was not damaged
- Bin Laden urged attacks on oil targets as part of the economic jihad against the US
 - Wanted to drive oil to \$100 a barrel with the aim of bankrupting the country
- A raid in September 2005 near the largest Saudi oil field discovered the practical tools for this new doctrine

A Critical Node



- The vast Abqaiq processing plant is 60 miles from Saudi Arabia's largest oil field
 - One of the most critical nodes in the global supply system
 - Up to 8% of total world supply passes through this facility everyday
- On February 2006, the facility was unsuccessfully attacked by terrorists
 - The suicide explosions caused by them did no damage to the facilities
- The remaining shooters that escaped were killed by the police in a few days
- In the aftermath, the Saudi government moved to further enhance security
- For their part, the Arab oil-exporting countries along the Gulf have substantially deepened security and honed their intelligence operations

The Social Foundations



- In December 2010, a fruit vendor set himself ablaze in Tunisia in front of the municipal building in protest of the corrupt police and government
- The footage of his fate set off a blaze that burned across the Middle East, shaking down the political order and bringing down part of the geostrategic structure of the region
- The protest movement spread to Egypt
 - Hundreds of thousands of people in Cairo demanded the resignation of President Hosni Mubarak
 - On February 11, 2011, Mubarak gave up power
- In Bahrain, when protests turned into protracted violence, the Gulf Cooperation Council, led by Saudi Arabia, sent troops into the country
- Social instability had become a critical factor for energy security
- Oil prices surged, taking the Brent price towards \$130 a barrel
- As long as there was uncertainty about the Middle East, oil prices would reflect the risk premium

Iraq's Potential



- Six years after the U.S. invasion of Iraq and after years of violence, oil output was almost back to the 2001 level of 2.5 million barrels per day
- By 2020, Iraq can produce around 6.5 million barrels per day
- That target faces obstacles and uncertainties. It requires:
 - Political stability
 - Physical security for oil fields and pipelines
- One further obstacle is Iran
 - Iran does not want Iraq to supplant it as the 2nd largest producer in the Gulf and in OPEC



“The Great Satan”

- Iran’s new leader after the Iranian Revolution in 1979, Ayotollah Khomeini, hated Israel and the US
- The U.S. support for the 1953 coup that toppled the nationalist prime minister Mohammad Mossadegh and brought back the shah was a powerful historical memory that fundamentalists could manipulate
- By 1992, Iran had earned the title of “the most dangerous sponsor of state terrorism
- After Khomeini’s death in 1989, the new government tried to reduce tensions with the US through commercial relations
- Iran also offered to train 20,000 Afghan troops under U.S. leadership
- Moreover, some dialogue was resumed during the early phase of Iraq war
- However, that dialogue was closed with the 2005 election of Mahmoud Ahmadinejad
 - He told the UN that the 9/11 attacks were orchestrated by the U.S. government
- With Iraq demolished as its regional rival, Iran communicated its ambition to dominate the Gulf

The Game Changer



- The biggest threat to the balance of power in Gulf is Iran's pursuit of nuclear weapons
 - It obtained the know-how and technology from the Pakistani Abdul Qadir Khan network
- Iran temporarily halted its enrichment program in 2003 under pressure from Europe
- In 2006, the program entered a new phase with the activation of a large number of centrifuges to enrich uranium
 - Iran, however, claims that the enriched uranium is exclusively for its civilian nuclear program
- Iranian possession of such weapons would create insecurity for the region and world oil supplies
- The US and Europe have mounted increasing array of sanctions that restrict investment, trade and flow of finance
- The timing as to when Iran would cross a red line in its nuclear program is uncertain, as is the response of those who feel most threatened by it

15 - GAS ON WATER





Cabot's Cryogenics

- Thomas Cabot started writing a scientific paper concerned with cryogenics - the study of very low temperatures, at which various gases turn into liquids
- Cryogenics was based on the work of Michael Faraday
- Cabot wanted to explore how extreme refrigeration could be used to compress natural gas into a liquid, enabling it to be held in storage when demand was low and returned to its gaseous state when demand was high
- After World War II, interest in LNG shifted to using it as a way to transport gas over long distances

Killer Fog



- In December 1952, a killer fog gripped London
 - It resulted from the interaction of weather conditions and coal smoke
 - The government imported LNG to replace coal with a cleaner fuel
- Royal Dutch Shell bought controlling interest in the nascent LNG company and started developing a large natural gas deposit in Algeria
- In 1959, a huge gas field was discovered in the northern part of the Netherlands
- In 1965, natural gas deposits were also found in the British sector of the North sea
 - This caused Britain to shift to natural gas for appliances and heating
- The first LNG arrived in Japan in 1969 from the United States
 - South Korea and Taiwan also became major LNG importers

THE “FUEL NON-USE ACT”

- Natural gas became a continental business, in which the main population and industrial centers were connected to gas fields that were far across the country
- By beginning of 1970s, natural gas provided 25% of America’s total energy
 - But then a natural gas shortage gripped the country
- It turned out the natural gas shortage was due to inflexible regulation
- The Natural Gas Policy Act of 1978 started to decontrol prices
 - Provided distinct pricing schedules for 22 different categories of a commodity that was more or less all the same
- Congress enacted the Fuel Use Act that banned the burning of natural gas in power plants to produce electricity
- Deregulation led to surge in supplies and prices settled at lower levels
- The low-cost domestic gas turned the LNG business into a bust
- It started proving harder to step up gas output from existing basins
 - In the face of rising demand and flat supply, the market tightened

- The answer once again seemed to be LNG
 - Cabot not started to look for new LNG supplies
 - One possible source was Trinidad
- Cabot succeeded in bringing down costs of LNG substantially by simplifying designs and promoting much more competitive bidding



The Crown Jewel

- The North Field was discovered by shell in 1971 in the waters off Qatar
 - Today its reserves are estimated at 900 trillion cubic feet
- In the same year, Mobil Oil discovered Arun, a huge offshore natural gas field in the northern part of Sumatra, the largest of the 17,000 islands that comprise the nation of Indonesia
 - But a problem emerged - Arun's output appeared set to decline
- Qatar's emir was determined to turn his small Persian Gulf principality into a global energy giant based on LNG
 - The merger of Mobil with Exxon in 1999 made the great expansion more doable
 - By 2007, Qatar had leapfrogged over Indonesia and Malaysia to become world's number one supplier of LNG
- Natural gas had become a global commodity





THE NATURAL GAS REVOLUTION

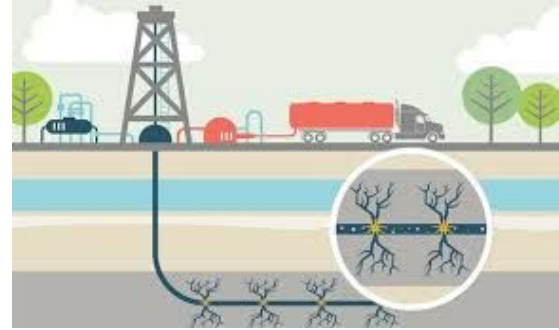


“Figure A Way”

- Gas could be extracted from shale rock
 - Mitchell Energy owned a large region called Barnett Shale
- Producing commercial-sale shale gas was proving difficult
- In 1997, only Mitchell Energy and few other smaller independents were left developing shale gas
- The introduction of 3-D seismic improved the understanding of the subsurface
 - Still, Mitchell Energy had not cracked the Barnett’s code



Breakthrough



- Fracking - also known as hydraulic fracturing - injects large amounts of water, under high pressure, combined with sand and small amounts of chemicals, into the shale formation
 - This fragments underground rock, creating pathways for trapped natural gas to find a route and flow through to the well
- Mitchell Energy, by the end of 1998, successfully adopted a fracking technique known as LSF, or light sand fracking, to break up the shale rock
- In 2002, Devon Energy acquired Mitchell Energy for \$3.5 billion
- Devon combined the fracking know-how acquired from Mitchell with its own skills in horizontal drilling
 - Shale gas, heretofore commercially inaccessible, began to flow in significant volumes



The “Shale Gale”

- Over the next few years, the output of shale gas continued to increase
 - Some now started to call it the “Shale gale.”
- In 2000, shale was just 1% of natural gas supply. By 2011, it was 25%, and within two decades it could reach 50%
- With the new abundance and lower prices, lower-carbon gas seemed likely to play a larger role in electricity generation
- Shale gas also began to have an impact on both climate change and energy security policy
- Critics warn that fracking may damage drinking water aquifers
- In fracking, the water that flows back to the surface is called “flow back” and then the “produced water” comes out of the well over time.
- This water needs to be handled properly, managed and safely disposed. 3 things can be done:
 - It can be injected into deep disposal wells
 - It can be put through treatment facilities
 - It can be recycled back into operations

- The industry is now recycling 70 to 80% of the flow back
- A recent concern is “migration”
 - Whether methane leaks toward the surface and into some water wells as a result of fracking
- Gas developers are now routinely taking such measurements before drilling begins in order to establish whether methane is pre existing in water aquifers
- Some argue that drilling is an unregulated activity
 - In fact, the entire drilling process is heavily regulated by a mixture of state and federal agencies
- The next several years are surely to see a substantial addition to the world’s supply of natural gas





Global Gas

- In 2010, Qatar celebrated reaching 77 million tons of LNG capacity - 28% of the world total
- Australia is emerging as a new LNG powerhouse
- Between 2004 and 2012, the world's LNG capacity will double
- Freely available LNG, sold on a spot basis, can take some market share away from pipeline
gs
 - This not only creates competition among gas suppliers, pushing down price
- In the 1970s, a new pipeline brought the first Soviet gas into Europe in the 1970s
 - The gas trade, for the Soviets, became a major source of hard currency earnings

“Wounded By A Friend”



- By the early 1980s, major discoveries in West Siberia had propelled the Soviet Union ahead of the United States as the world’s largest gas producer
- The Reagan administration struck back at the proposed new pipeline. It imposed a unilateral embargo that prohibited companies from exporting the billions of dollars of equipment that was essential to the construction and the operations of the pipeline
- The British government ordered the British companies that had contracts with the Soviets to ignore the embargo and to go ahead and ship their goods
- In the 1990s the earnings from gas exports would prove a critical source of revenues for Russia

The Emergence Of Gazprom



- Out of the Soviet collapse, and specifically out of the Ministry of Gas Industry, a new Russian gas company emerged: Gazprom
- In mid-2008, Gazprom's stock market capitalization catapulted to more than \$300 billion
 - The company produces over 80 percent of Russia's total natural gas output
- Gazprom, while retaining its primacy at home, has also been moving to become a global diversified energy company
- In order to promote "competition," the European Union was seeking to break up the integrated companies that had helped build the market and move away from the stability of 25-year contracts that the companies had used as the building blocks.

UKRAINE VERSUS RUSSIA

- No relationship was more complex than that with Ukraine
- Gas complicated the new relationship between the two countries
- Ukraine was heavily dependent on gas from Russia. It has the most energy-intensive economy in the world
- In its relations with Russia, Ukraine had one trump—the pipeline network, which carried over 80% of Russia’s gas exports to Europe.
- Ukraine owed Russia billions of dollars in unpaid bills for gas
- On January 1, 2006, Gazprom had begun to cut gas deliveries directed to Ukraine itself
- Over the next couple of years, natural gas became a heated subject of contention and suspicion between East and West.



Diversification



- The Russians were determined to get around Ukraine and Poland with a series of new pipelines.
- Gazprom and ENI had already built Blue Stream, which crosses the Black Sea from Russia to Turkey and is the deepest underwater pipeline in the world.
- Russia also launched a large pipeline project, Nord Stream
 - It travels under the Baltic Sea from near St. Petersburg to northern Germany
- EU and European proposals aimed at bringing non-Russian gas to Europe
- This clash of pipeline politics is further unsettled by the potential for alternative new supplies—from the global LNG market
- And then there is the potential for shale gas
 - There is no geologic law that restricts shale gas to North America.

A Fuel For The Future

- Natural gas is a fuel of the future
- Its share of the total energy market is growing
- It is a relatively low-carbon resource
- A few years ago the focus was mainly on rapid growth in LNG
- The arrival of shale gas has, for the time being, disproved that assumption

