

# Security Threats to Saudi Arabia's Oil Infrastructure



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**The Institute for Gulf Affairs**

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## Executive Summary

Saudi Arabia's oil infrastructure constitutes one of the most important components of the global economy. Any threat on its facilities would certainly have an immediate impact on the world's crude oil supply. But a broad-based attack targeting the most vulnerable sections of the oil facilities could trigger a significant global economic slowdown, due to the dependence of the world's major economies on Saudi oil.

This report addresses the major challenges Saudi authorities face as they seek to maintain a credible and robust security presence to deter attacks on oil facilities. Outlined are the key features of the Saudi oil infrastructure, including fields, plants, refineries and terminals. The report also elucidates the various threats to the security of the oil system, including previously unexamined and/or emerging threats that might prove harder to protect against. It also examines the strength of the various armed forces charged with oil security.

The report's findings draw attention to these key points:

- The country's pipeline network remains a key area of concern, due to its sheer size and complexity. Sections of the pipeline network run through unstable population centers. Violence across the region demonstrates the facility with which attacks on pipelines can negatively impact crude oil output.
- The Kingdom's precarious economic situation over recent years, in addition to the problem of widespread poverty and corruption in the oil-rich nation, could metastasize into a security threat by vigilante groups and disaffected Saudi citizens unconnected to any particular religious or nationalist agenda.
- While much attention has been paid to the threat posed by Al-Qaeda, Shi'a elements pose as much of a threat to the security of the oil infrastructure, particularly since the bulk of this infrastructure is located in Saudi Arabia's predominantly Shi'a volatile Eastern Province. Iranian support to emerging local groups within Saudi Arabia could threaten the country's energy sector.
- Ultimately, true long-term security for the Saudi oil infrastructure can only be achieved with a rapid implementation of a broad-based national transformation program. Such program must be inclusive and enfranchises all Saudi nationals and invests in meaningful citizenship and equality of opportunity.

## Preface

The extent to which the global economy relies on crude oil cannot be overstated, as well as the fact that one-fifth of the world's known reserves reside in one country – the Kingdom of Saudi Arabia. A founding member of OPEC, and the only OPEC member-state with significant enough spare (excess) capacity to be a “swing producer,” Saudi Arabia is critical to the world's oil market.

In today's tight crude oil market, spare production capacity is dwindling due to sky-high demand. As recently as mid-2002, OPEC suppliers could boast a crude oil spare capacity of nearly 2 MMbpd. With current production at around 9.5 MMbpd, and total production estimated to be around 12.5 MMbpd, the Saudis preserve a spare capacity of approximately 3 MMbpd. Consequently, an attack on the oil infrastructure would be especially devastating.

However, the country contends with a myriad of security challenges on a daily basis, including those affecting oil installations. The nation's government is a seven decade old absolute monarchy ruling over an increasingly discontent populace with the assistance of a religious establishment that has largely condoned a radical philosophy which inspires international and domestic terrorism.

The threat to oil security in Saudi Arabia, including threats to installations, operations and personnel, are of major importance to energy consumers and producers around the world. As the world's oil “super power,” any threat to Saudi Arabia's oil security could significantly affect the international energy market. Oil installations in Saudi Arabia have been repeatedly targeted by several violent groups with varying political or religious agendas, but none more so than Al-Qaeda. The failed attack on the Abqaiq processing plant on February 24, 2006, saw Brent crude oil April futures rise by US\$2.06 (from US\$60.54 to US\$62.60) on London's ICE Futures exchange is just an example of the significance of that energy security has on the energy market.<sup>1</sup> Additionally, there are new emerging threats to the country's oil infrastructure stemming from a rapidly deteriorating economic situation: ongoing conflicts in neighboring Bahrain, Egypt, Iraq and, Yemen as well as the Iranian nuclear dispute.

While the government of Saudi Arabia has an impressive array of security measures to protect oil wells, refineries, export terminals and other facilities, much more is needed to ensure the protection of the most vulnerable portion of the energy infrastructure: the extensive pipeline network and junctions which transport crude oil and gas from Saudi Arabia's fields to its export terminals and domestic refineries.

The purpose of this report is to highlight the vulnerability and threats to the country's energy infrastructure – particularly the pipeline network. This report will highlight the various potential symmetric and asymmetric security threats to the oil infrastructure and place this issue within the larger context of regional security and internal Saudi affairs.



## Oil Infrastructure

### History of Saudi Aramco

The California-Arabian Standard Oil Company (CASOC) was formed in the early 1930s, and comprised Standard Oil of California, among others. Oil was discovered in commercial volume in 1938 (at Dammam Well No. 7 along the Gulf coast) and CASOC began exporting oil in 1939. The firm changed its name to Arabian American Oil Company (ARAMCO) in 1944. In 1956, ARAMCO confirmed the sizes of Ghawar and Safaniya, the world's largest onshore and offshore oil fields, respectively. The Saudi government began acquiring a stake in ARAMCO in 1973, following the Arab Oil Embargo, and the firm was completely nationalized in 1980. Following the outbreak of the Iran-Iraq War, ARAMCO built the East-West pipeline to transport crude oil to the Red Sea export terminals. Eight years later, in 1988, the firm's name was changed to Saudi ARAMCO. The firm employs over 54,000 workers,<sup>2</sup> is the largest oil firm in the world by reserves, and dwarfs international oil companies like ExxonMobil and Shell.<sup>3</sup> In December 2006, a Financial Times survey ranked Saudi Aramco as the world's largest firm by market capitalization, with an estimated value of US\$781 billion.<sup>4</sup> Starting in May 2008, Aramco planned to invest \$129 billion on new energy projects over the next five years and in 2012 announced a \$200 billion spending program on oil and gas refining and exploration over the next decade.<sup>5</sup> The firm owns and runs various oil operations across the globe, including refining and marketing firms in many consumer nations.<sup>6</sup>

### Oil Fields

According to Saudi Aramco, Saudi Arabia produced a daily average of 9.5 MMB\|bpd in 2012<sup>7</sup>, and Saudi officials maintain that that its facilities can support a total capacity of about 12.5 MMBpd.<sup>8</sup> In April 2013, the Saudi Oil Minister Ali al-Naimi, announced that the kingdom would maintain production levels into the future, despite claims by a prominent prince that the Kingdom would increase levels to 15 MMBpd by 2020.<sup>9</sup>

Saudi Arabia's oil is located in approximately 80 fields across the Kingdom, with over half of its oil found in only eight fields. Of these, major reservoirs include Ghawar, Safaniya, Zuluf, Shaybah and Qateef.<sup>10</sup>

- **Ghawar**, located 100km southwest of Dhahran, is the largest oilfield in the world, with an estimated 70 billion barrels of Arabian light crude. The field is spread over 8400 sq km and produces 5 million barrels per day (bpd). Some analysts, most notably Matthew Simmons, have suggested that Ghawar's oil reserves are fast depleting.<sup>11</sup>

- **Safaniya**, located 265km north of Dhahran, is the largest offshore oilfield in the world, with estimated reserves of 35 billion barrels. The field is spread over 7500 sq km and produces 1.5 million bpd.
- **Zuluf**, located offshore in the Persian Gulf near Safaniyah, produces 450,000 bpd of Arabian Medium Crude and has estimated reserves of 8 billion barrels.
- **Shaybah**, located in the Rub al-Khali region near the UAE border, produces 750,000 bpd of Arab extra light sweet crude. The field has estimated reserves of 15 billion barrels and expansion plans in 2008 boosted production capacity to 750,000 bpd.<sup>12</sup>
- **Qateef**, located in the city of Qateef, 30 miles north of Dhahran, produces 500,000 bpd of Arabian light crude. The associated Abu Sa'afa offshore field has a production capacity of 300,000 bpd of Arabian medium crude.

Several recent projects, mostly onshore fields in the Eastern province, have boosted long-term Saudi capacity. These include expansion projects and new discoveries at Hawiyah, Khursanuya, Nuayyum, Khurais, Manifa and, Shaybah.

- **Hawiyah**, increased production to 310,000 bpd of condensates starting in 2008.
- **Khurais**, which includes the Abu Jifan and Mazalij fields, increased crude production by 1.2 Mbpd beginning in June 2009.
- **Khursaniya**, opened in August 2008, it includes the Abu Hadriyah and Fadili fields, and provides 500,000 bpd of crude.
- **Manifa**, an offshore field which will provide 900,000 bpd of crude by the end of 2014. It is projected to reach production of 500,000 bpd by July 2013.
- **Nuayyim**, a 100,000 bpd field brought on-stream in August 2009.
- **Shaybah**, a crude oil expansion program at that field increased production by 250,000 bpd starting in 2009.

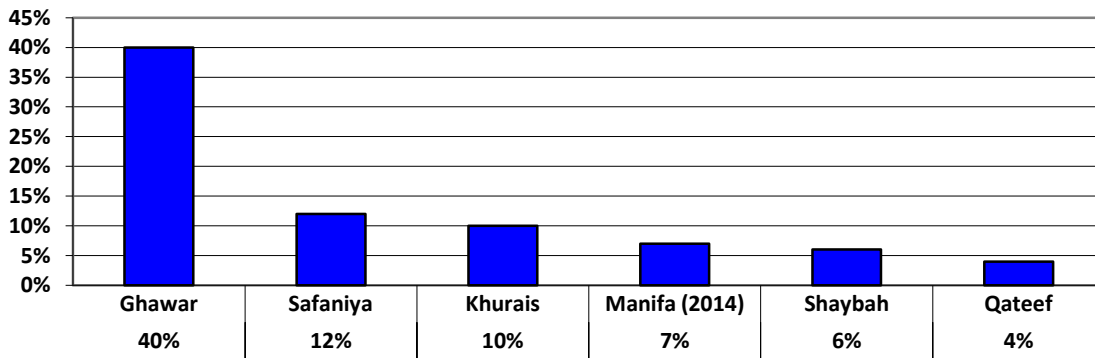


Figure 1: Graph of leading Saudi oil fields and share of national production (based on production of 12.5MMbpd).<sup>13</sup>

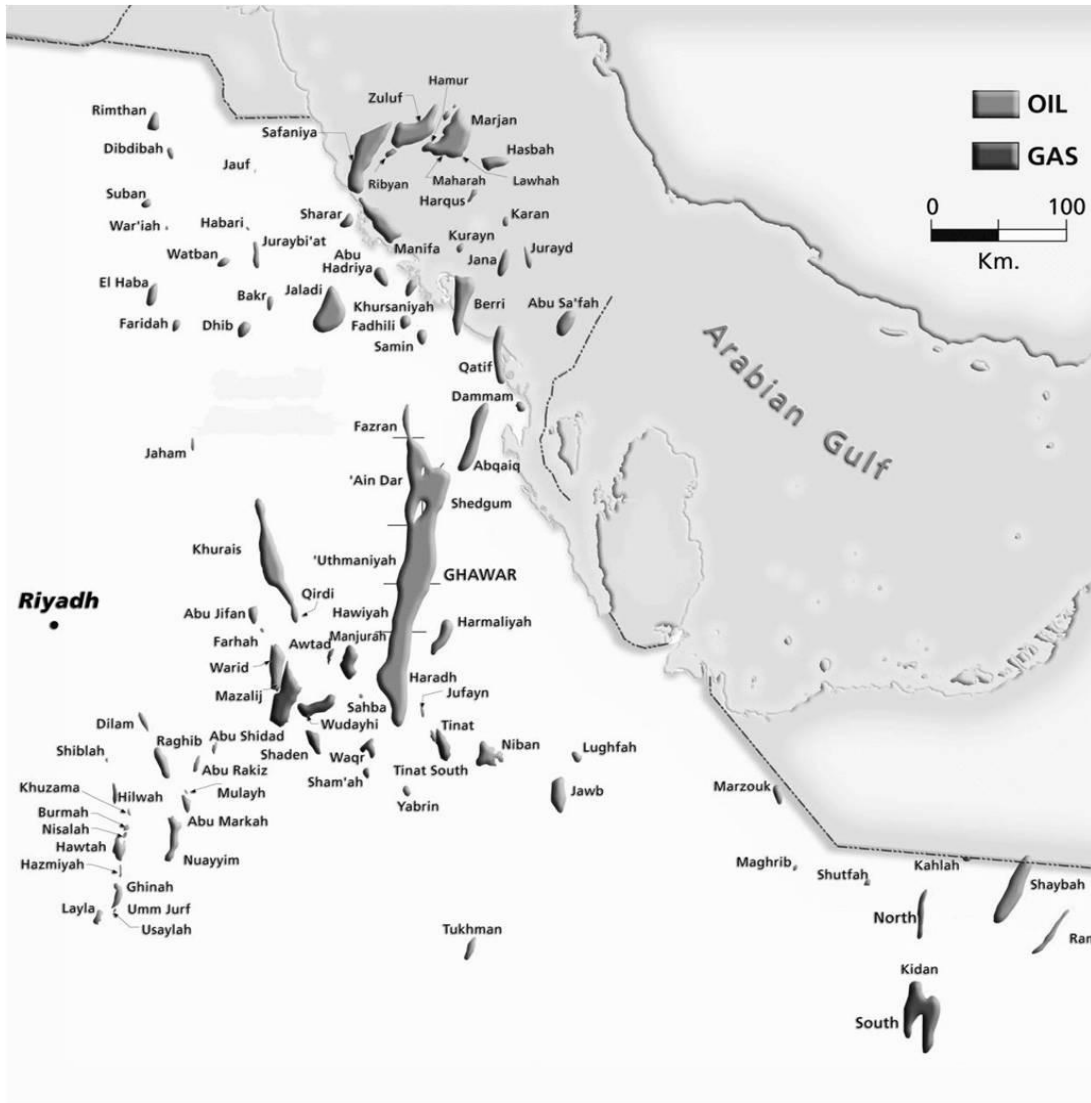


Figure 2: Map of Eastern Province Onshore and Offshore oil and natural gas fields.<sup>14</sup>

## Oil Stabilization

Most of Saudi Arabia's crude oil is exported from the Persian Gulf via Ras Tanura terminal that receives oil from the Abqaiq processing facility, which handles approximately two-thirds of the country's oil output. Abqaiq, the largest oil processing facility of its kind in the world, is the main processing center for Arabian extra light and Arabian light crude oils with a capacity of more than 7 million barrels a day. The crude is then stabilized and can only be safely transported by controlling the levels of dissolved gas, natural gas liquids (NGLs), and hydrogen sulfide. Additionally, there are ten hydro-desulfurization towers that "sweeten" incoming crude oil before transporting it to export terminals at Ras Tanura, Ju'aymah and elsewhere. Abqaiq is the starting point of the East-West Pipeline which terminates at Yanbu' on the Red Sea.<sup>15</sup>

## Oil & Gas Processing

“Associated gases” are gases recovered from crude oil extraction through the process of separating the gases from the oil which are then sent to gas processing plants to further extract natural gas liquids (NGL). The country’s most important Gas and Oil Separation Plant (GOSP) is located in the Abqaiq processing facility.<sup>16</sup> The other main gas processing plants, and their daily refining capacities, are as following:

- **Shedgum gas plant:** 1.5 billion standard cubic feet (bscfd).
- **Uthmaniyah gas plant:** 1.5 bscfd.
- **Hawiyah gas plant:** 2.4 bscfd.
- **Haradh gas plant:** 1.5 bscfd.
- **Berri gas plant:** 0.37 bscfd.<sup>17</sup>
- **Khursaniyah gas plant:** 2.88 bscfd.

## Refineries

Saudi Arabia’s total refining capacity is approximately 2.02 Mbd and is intended to double by 2015.<sup>18</sup> Saudi Aramco currently operates five domestic refineries at Riyadh, Ras Tanura, Rabigh, Yanbu' and Jiddah.<sup>19</sup>

- **Ras Tanura,** The Ras Tanura refinery started operations in 1941, and currently has a crude distillation capacity of 550,000 bpd. Crude is normally transferred to Ras Tanura by pipeline and can also be supplied by ship. Most of Ras Tanura’s production is for domestic use and is transferred to the Dhahran bulk plant, while some products are exported. The refinery produces gasoline, kerosene, heavy fuel oil and asphalt.<sup>20</sup>
- **Rabigh,** The Rabigh Refinery is a 400,000 bpd crude topping facility located 160 kilometers north of Jiddah. Crude is delivered by tanker from the Saudi Aramco Rabigh port to international customers.<sup>21</sup>
- **Yanbu’,** Began operations on January 30, 1983 with a capacity of 170,000 bpd, and mainly serves the domestic Saudi market.<sup>22</sup> The refinery is currently operated jointly with ExxonMobil and has a capacity of 400,000 bpd.<sup>23</sup>
- **Riyadh,** Started operations in 1974 with a capacity of 125,000 bpd. It is located in the Central Region of Saudi Arabia, and is supplied with crude oil via the East-West pipeline.<sup>24</sup>
- **Jiddah,** This refinery started operations in 1960 and handles 100,000 bpd. The refinery serves the local market exclusively. This capability highlights the importance of the refinery function in safeguarding and providing critical supplies of fuel to the Makkah Area as well as to local consumers, such as the King Abdulaziz Airport, the Jiddah Islamic Seaport and Power Plants. Through the Jiddah Refinery Terminal, crude and final products are imported, and petroleum products are exported. The majority of products are transferred to two local bulk plants, SWCC, SEC and the King Faisal Naval Base via pipelines. Jiddah refinery is critical to domestic stability by providing energy for the local area.<sup>25</sup>

Saudi Aramco additionally operates two joint-venture refineries – Yanbu's SAMREF (Saudi ARAMCO Mobile Refinery Company) refinery in cooperation with Mobil, and Jubail's SASREF (Saudi ARAMCO Shell Refinery Company) refinery in cooperation with Shell. These refineries have a joint capacity of producing 700,000 bpd worth of refining capacity.

Along with the five main refineries in Saudi Arabia there currently are numerous plans to expand Saudi Arabia's refining capacity at locations throughout the country.<sup>26</sup> These projects are:

- **Rabigh**, operated by Petro-Rabigh, a former joint venture between Saudi Aramco and Sumitomo Chemical, was completed in 2008. In 2012 Saudi Aramco and Sumitomo decided to go ahead with implementing “Rabigh Phase II” improvements which will enhance petroleum and petrochemical production.
- **Yanbu' YASREF export refinery**, is expected to add 400,000 bpd of refining capacity in a joint venture with the Chinese firm, Sinopec, by 2014.
- **Jubail export refinery**, a joint-venture between Saudi Aramco and French energy giant Total, is expected to add 400,000 bpd of refining capacity following an expansion in 2013.
- **Jizan refinery**, slated to be constructed by 2016 in the south-west, the refinery and associated terminal will have a capacity of 400,000 bpd.<sup>27</sup>

### Saudi Arabia Oil Fields and Refineries

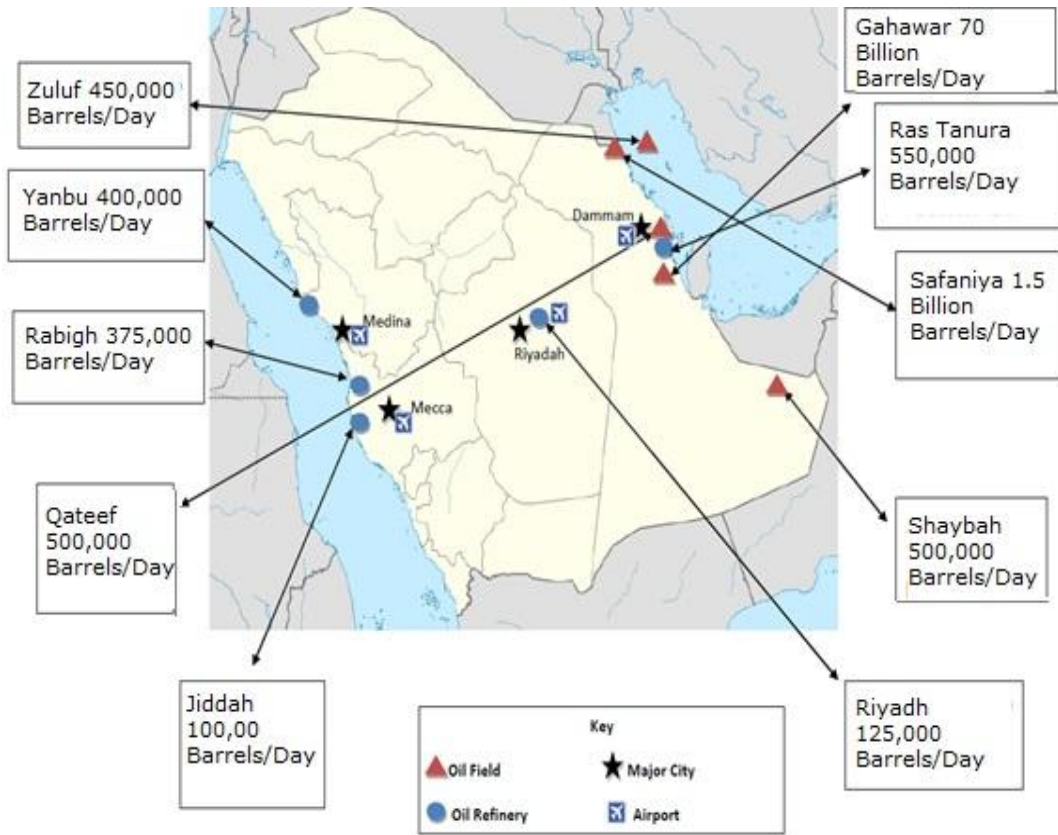


Figure 3: Map of Saudi Arabia indicating oil fields and refineries.

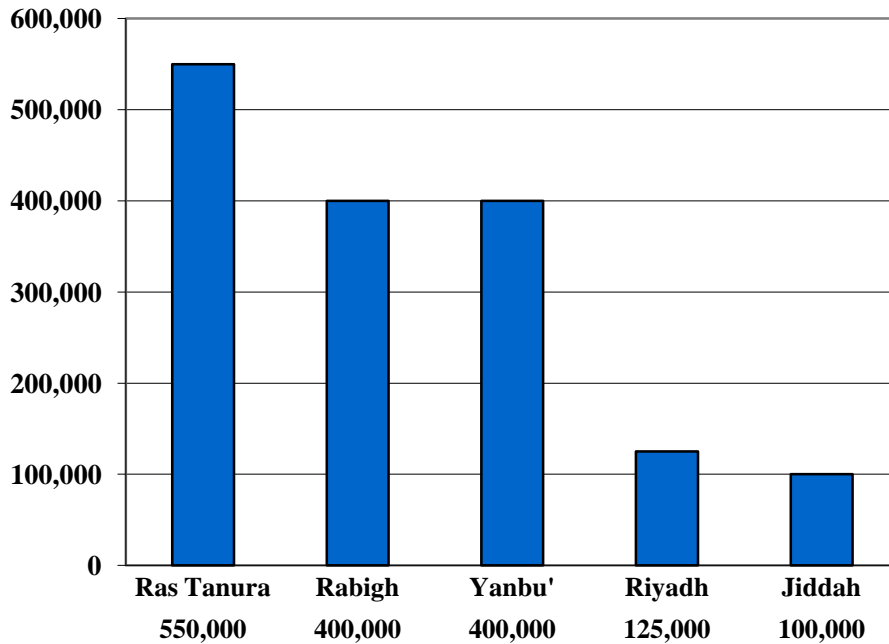


Figure 4: Saudi Arabia's daily refining capacity in barrels per day at top Refineries.

## Pipeline Network

Saudi Arabia's pipeline network runs more than 17,000 kilometers with the East-West Crude Oil Pipeline and the Natural Gas Liquids (NGL) Pipeline the longest operational and most critical pipelines in Saudi Arabia.<sup>28</sup>

Two major pipelines – the Trans-Arabian Pipeline (TAP) and the Iraqi Pipeline Across Saudi Arabia (IPSA) – are no longer operational. TAP, which was built in the 1950s to export oil to the Lebanese port of Az Zahrani on the Mediterranean Sea, was closed in 1984 and exports to Jordan were halted in September 1990 as a result of Jordanian support for Saddam after invading Kuwait. IPSA was similarly taken out of operation following the Iraqi invasion of Kuwait in 1990. Despite excess pipeline capacity, the Saudis are reportedly planning to conduct a feasibility study on construction of an oil pipeline from the Empty Quarter of southeastern Saudi Arabia through the Hadramaut in Yemen and the Arabian Sea, although details of the proposed project are unavailable.<sup>29</sup>

The 5 MMbpd East-West Crude Oil Pipeline (Petroline) has been operated by Saudi Aramco since 1984 and is used mainly to transport Arabian light and super light to refineries in the Western Province and to Red Sea terminals for export to European markets. The pipeline transits through the Riyadh Refinery, which serves domestic consumers.

The NGL pipeline linking Yanbu' and Shegdum is, at 1,170km, the longest gas line ever built in the Kingdom. This 290,000 bpd pipeline runs parallel to the Petroline and serves petrochemical plants at Yanbu'. Additionally, pipelines run from the Abqaiq processing facility to Ras Tanura, Ju'aymah, Riyadh and, Yanbu'.

- **Ras Tanura**, this line transfers processed oil to the 6 MMbpd Gulf export terminal. This line is comprised of several networks of pipelines that collectively carry crude oil to the Ras Tanura and other Persian Gulf Terminals. Saudi Arabia exports approximately 10 MMbpd, making the Abqaiq – Ras Tanura Pipeline the most vital oil pipeline in the country and possibly the world.<sup>30</sup>
- **Ju'aymah**, processed oil is transferred to the 3 MMbpd Gulf export terminal.<sup>31</sup>
- **Yanbu'**, processed oil is transferred to the 5 MMbpd Red Sea export terminal.<sup>32</sup>
- **Riyadh**, the line transfers processed oil to the capital's refinery.<sup>33</sup>

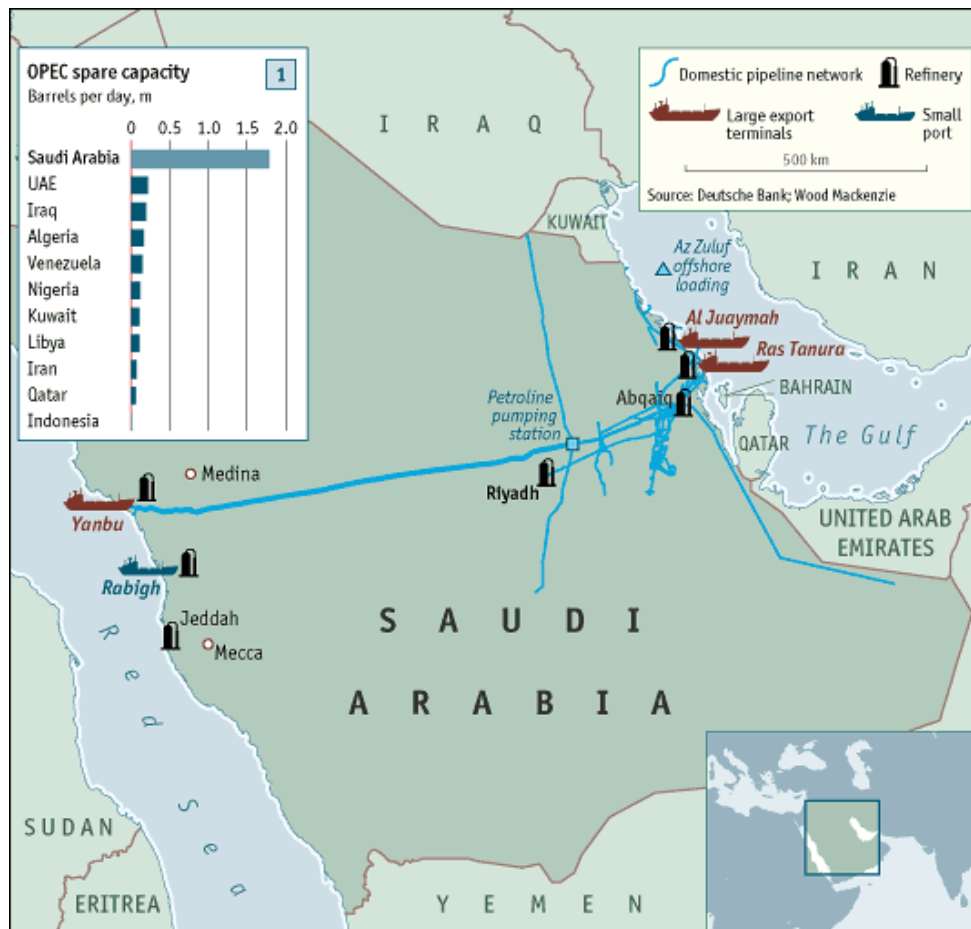


Figure 5: Pipeline Network northeast of Abqaiq facility<sup>34</sup>



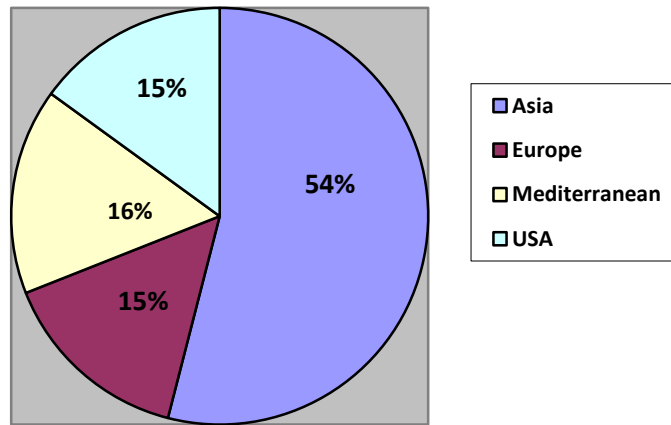
## Terminals

The bulk of Saudi oil is exported from terminals on the Persian Gulf coast, close to the production facilities of the Eastern Province. Most oil exported from these terminals is destined for Asian consumers, whereas oil piped to the terminals of the Red Sea coast is exported to Europe and the United States.<sup>35</sup> In total, over 9,000 oil tankers visit Saudi Arabia's terminals every year.<sup>36</sup> Saudi Arabia's major oil export terminals are:

- **Ras Tanura-** built in 1939, is the world's largest oil export terminal, and also boasts the world's largest offshore oil loading facilities – a series of steel structures 3 km offshore known as the “Sea Islands.” The terminal's daily export capacity is 5.5-6.0 MMbpd.<sup>37</sup>
- **Ju'aymah-** an oil terminal with a 3.0-3.5 MMbpd export capacity.<sup>38</sup>
- **Jubail-** the oil terminal is located alongside the country's largest industrial complex. It figures to be essential to Saudi oil and petrochemical export capacity as projects to develop local refineries are under way. New installations will produce 400,000 bpd of oil and over one million tons of petrochemicals per year.<sup>39</sup>
- **Yanbu'-** is on the Red Sea coast and was built in 1982, and has a 4.5-5.0 MMbpd capacity.<sup>40</sup>
- **Jiddah,** this terminal is situated on the Red Sea coast, about 2.5km west of Jiddah refinery. The terminal's capacity is 1.3 MMbpd.
- **Rabigh,** this terminal is situated north of Jiddah on the Red Sea. The terminal's capacity is 400,000 bpd.<sup>41</sup>
- **Ras al-Khafji,** this terminal is situated on the eastern coast of Saudi Arabia just south of the Kuwaiti border. The terminal was damaged following the Iraqi invasion of Kuwait.<sup>42</sup>

## Oil Exports

Roughly 54 percent of Saudi Arabia's crude oil and the bulk of its refined petroleum products were exported to Asian economies in 2012, which are far more susceptible to supply disruptions from Saudi Arabia than Western economies because of Asia's substantial dependency on Saudi crude oil imports.<sup>43</sup> Key Asian economies, such as South Korea and Japan, are particularly vulnerable as the Far East produces little crude oil and depends to a greater degree on oil in the Persian Gulf. In comparison, the United States benefits from oil imports from Canada, Mexico, Norway, Nigeria and elsewhere. Saudi Arabia recently became a major exporter of crude oil to China—now Saudi Arabia's third largest customer—accounting for sales in excess of 1.06 MMbpd in 2012. Exports to China are projected to continue to rise within the coming years.<sup>44</sup> Oil destined for Asian consumers is primarily shipped across the Persian Gulf and through the Straits of Hormuz into the Arabian Sea.<sup>45</sup>



**Figure 6:** Saudi crude exports by destination (2012).<sup>46</sup>

### Saudi Arabia Electricity Infrastructure

In November of 1998, it was declared that 10 separate electric companies in Saudi Arabia would be consolidated into one single entity, the Saudi Electric Company (SEC). By consolidating the electric sector, Saudi officials hoped to improve efficiency, increase profits, make the electric industry more dependable, and attract more outside investments. Currently the Saudi government holds an 85% stake in the company.<sup>47</sup>

By 2020, the government's goal is to increase power generation capacity by three times from its 1990 standards, from 22,000 megawatts (MW) to 69,000 MW. Saudi electricity is generated from natural gas (38%), crude oil (34%), diesel (22%) and heavy fuel oil (6%). Currently the SEC has a capacity of around 54,000 MW is planning to add about around 4,000MW over the next year, with an additional 8,000 MW by 2014; and due to increasing demand, SEC hopes to add 24,500 MW by 2020 to raise the Kingdom's total capacity to 95,000 MW.<sup>48</sup> In total the transmission network of SEC is 49,675 circuit kilometers. The relationship between electricity and oil in Saudi Arabia is symbiotic. The two rely on each other to stay afloat. Saudi oil refineries depend on electricity to run, while at the same time Saudi electric plants are reliant on oil to keep their operations going.<sup>49</sup>

Similar to the oil infrastructure, an attack on any electric entity would be catastrophic to the oil operations of Saudi Arabia. ARAMCO production and refining capacity is dependent on constant electricity, and a potential attack on any of the three key electricity generating plants in Saudi Arabia would effectively halt oil production. The safety of both the oil and electric infrastructure in Saudi Arabia is quintessential to both the physical security of the locations, and also to global economic stability.

## Vulnerabilities

### Chokepoint Vulnerabilities

Crude oil is transported by oil tankers along certain maritime routes – these routes often have “chokepoints,” i.e. certain geographic constraints that create security vulnerabilities. The two most critical chokepoints for Saudi oil exports include the Straits of Hormuz and Bab al-Mandab.

#### *Straits of Hormuz*

This is the world’s most important chokepoint. The 34 mile-wide Strait separates Oman and Iran and connect the Arabian Sea to the Persian Gulf. Approximately 16–17 MMbpd of crude oil and 40% of globally traded oil travel through the Strait. The Strait is also a vital passageway for petrochemicals and natural gas products. Thus the safe passage of vessels through the Strait is critical for international crude and gas supply.<sup>50</sup>

Strategists are concerned that a confrontation with Iran over its nuclear program might tempt the Iranians to threaten the safe passage of vessels through the narrow Strait. Consequently, Saudi Arabia would have to take alternative routes to transport its crude oil. King Abdullah’s December 23, 2006 visit to the Sultanate of Oman was rumored to have been spurred by a desire to examine the feasibility of a pipeline from Abqaiq to Oman’s only oil export terminal at Mina al-Fahal, on the Arabian Sea. In this manner, the Hormuz Strait could be avoided. Although it has not been presented as such, the Dolphin Energy Project pipelines almost act as a precedent – as they would allow exports of Qatari gas to the United Arab Emirates, including the port of al-Fujairah, on the Arabian Sea.<sup>51</sup>

#### *Bab al-Mandab*

This body of water separates Yemen from the African continent, and connects the Red and Arabian Seas. Approximately 3 MMbpd of crude oil travels through Bab al-Mandab. Security issues in the Bab al-Mandab were heightened following the 2002 attack on the French oil tanker ‘Limburg’ off the coast of Yemen. The threat to safe oil exports through the Bab al-Mandab arise mainly from Al-Qaeda cells and piracy, especially from failed states like Somalia.<sup>52</sup>

### Pipeline Network Vulnerabilities

Protecting the pipelines is a more difficult task due to the fact that the pipeline networks are the most vulnerable facilities. They are spread over large areas, rarely guarded, and run close to major highways and population centers, making them vulnerable to numerous attacks by relatively unsophisticated groups or individuals.

Saudi Arabia has taken enhanced security measures to ensure the pipeline is protected. Some of the measures taken include the following:

- Fitting pipelines with emergency shut-down valves at approximately every kilometer, to isolate the potential effect of any leak;
- Strategically placing specialized backup teams along the length of the line in order to be quickly dispatched by helicopter to repair any damage along the network within 36 hours;
- Maintaining the world's largest stockpile of materials and tools needed to repair pipelines. They are stored throughout the length of the pipeline;
- Installing security cameras to monitor certain locations along the pipelines. The control station in Dhahran, for example, can monitor up to 38 different locations along the NGL pipeline between Yanbu' and Shedgum.<sup>53</sup>

Pipelines near population centers are especially vulnerable. In response to reports by the Iranian state-owned Press TV in March 2012 that a pipeline in Saudi Arabia's Eastern Province had been attacked, oil prices rose sharply worldwide, with the price rising \$1.77 on the New York Mercantile Exchange.<sup>54</sup> The Saudis denied any damage, and the fire nearby was in reality caused by trash dumped by local residents.

The Abqaiq-Ras Tanura set of pipelines is particularly exposed. These lines run close to major highways and population centers (both Sunni and Shi'a) making them an easy target for quick hit-and-run attacks. An attack on the pipeline network leading out of Abqaiq could effectively shut down the processing facility, as much as if it were attacked directly. The pipelines are especially vulnerable when they are clustered together.

Over a dozen pipelines run closely together from Abqaiq to the Qateef Junction, located 46 miles to the northeast, which has been described as the Grand Central Station for the network of pipelines that Aramco has constructed throughout the Eastern Province. The Junction redirects over a dozen pipelines to Ras Tanura, Jubail, Juaymah, and Dhahran.<sup>55</sup>

While security services focus on threats such as car bombs and suicide attacks, oil facilities are susceptible to mortar attacks, as demonstrated in Iraq. Such attacks could be conducted against the Abqaiq facility by attackers from nearby Abqaiq city, against the Ras Tanura terminal and refinery by attackers in the nearby towns of Safwa, Tarout or Raheema, and against the Juaymah gas plant by attackers from nearby Safwa, Um-Alsahik and Raheema.<sup>56</sup>

Mortar attacks have not been carried out in Saudi Arabia, but Iraq has witnessed hundreds of them against military and civilian targets with deadly results.

## Potential Threats

### Al-Qaeda

Al-Qaeda has stated on several occasions that, consistent with its goal of waging an ‘economic jihad’ on the United States, it is acceptable to attack the oil infrastructure from which the Western economy gains its sustenance. On the fifth anniversary of the 11 September 2001 attacks, al-Jazeera broadcasted a video message from Ayman al-Zawahiri which reiterated this threat. Zawahiri said: "There must be a focus on [the West's] economic interests and in particular on stopping the theft of Muslims' plundered petroleum."<sup>57</sup> Zawahiri went on to say: "You have to bolster your defenses in ... the Gulf, from which you will be evicted."<sup>58</sup>

Jihadi websites reiterated, "We call our brothers in the battlefields to direct some of their great efforts towards the oil wells and pipelines. . . . The killing of 10 American soldiers is nothing compared to the impact of the rise in oil prices on America and the disruption that it causes in the international economy."<sup>59</sup>

Osama bin Laden recognized early on that Saudi Arabia’s immense oil wealth would be necessary for the prosperity of the future Islamic caliphate. Consequently, bin Laden ruled out the targeting of oil wells, as this could potentially cause permanent damage.<sup>60</sup> Instead, bin Laden called for targeting the infrastructure that transports oil to the West, namely, pipelines, refineries, personnel and terminals.

Al-Qaeda’s stance on attacking oil pipeline infrastructure was clarified following the February 2006 Abqaiq attack in Saudi Arabia. Days after the attack, an Al-Qaeda-affiliated cleric, Sheikh Abdel-Aziz bin Rashid al-Anzi, publicized the group’s doctrine on targeting oil infrastructure. In it, al-Anzi wrote that attacking pipelines was advisable because not only were they “easy military targets,” but the cost of attacking them was minimal compared to the benefits of the effect on international oil markets.<sup>61</sup>

In the 30<sup>th</sup> issue of the Al-Qaeda-affiliated media organization, “*Sawt al-Jihad*,” an interview with a participant in the Abqaiq attack, Badir Abdullah al-Himaidi, asserts that the attack was carried out based on the orders of “Osama bin Laden.”<sup>62</sup> In another article, attributed to AdeeB al-Bassam, Al-Qaeda’s desire to attack global crude oil supply to the United States is not recent, but rather reflects a longstanding area of interest.<sup>63</sup>

Saudi Al-Qaeda, also known as the Al-Qaeda Organization in the Arabian Peninsula, (AQAP) has been able to recruit members from prominent Sunni families with high positions in the government. The two suicide bombers who attacked the Abqaiq facility hail from the same families as current Saudi government ministers. The first suicide bomber, Abdullah Abdulaziz al-Twajjri, is related to Khaled al-Twajjri, King Abdullah's personal secretary and closest advisor. Many members of the al-Twajjiri

family also hold senior positions in the military and security apparatus. The second bomber, Mohamed Saleh al-Ghaith, is a relative of Wahhabi cleric Ibrahim Abdullah al-Ghaith, the former head of the Saudi religious police.<sup>64</sup> The al-Ghaith family also holds senior government positions. In addition, Al-Qaeda has been able to recruit Aramco engineers to plan attacks on Saudi and foreign oil infrastructure. Abdulatif Al-Ghamdi, who was a staff member for Saudi reeducation program for Al-Qaeda militants, said that he interviewed a Saudi Aramco engineer who was arrested following the Abqaiq attack in 2006. Al-Ghamdi said the engineer was planning bombing attacks against oil facilities in Shanghai, China. Aramco maintains offices in Shanghai.<sup>65</sup>

According to the confessions of militants arrested after the Abqaiq attack which were aired on Saudi government TV on May 13, 2007 (entitled "the Oil Cell"), the militants planned an attack that they claimed would be equivalent to September 11<sup>th</sup> in impact. Their goal was to cut off the flow of oil from Saudi Arabia to the rest of the world, draw American forces to the country, and harm the US economy by driving up oil prices. They also made clear that they were affiliated with Al-Qaeda and that Osama bin Laden had approved the operation.<sup>66</sup>

In addition, the seven Al-Qaeda cells arrested on April 27, 2007 had planned to hijack civilian airliners and crash them into major oil installations, including the Saudi oil "crown jewels" – Ras Tanura and Abqaiq. This plot added a new dimension to the threats facing the Saudi oil installations. This would have been the first reported plot of Al-Qaeda attempting to hijack civilian airliners for attacks in the Middle East.

The pattern of Al-Qaeda operations shows a tendency to re-attack a target if the first operation fails, reflecting the so-called "lose and learn doctrine." In his confession, Saudi militant Abdullah al-Moqrin confirmed Al-Qaeda's desire to attack the Abqaiq facility again, after the attempted attack in February 2006.<sup>67</sup> Following the airing of the confession, the reaction of many Wahhabi clerics in Saudi Arabia was mute to such a degree that it irked the main Saudi daily *al-Riyadh*, a government-funded newspaper. *Al-Riyadh* criticized the silence of major Wahhabi clerics such as Abdulrahman al-Baraak, Salman al-Odeh and Naser al-Omer, and their websites' reaction to the confessions of the so-called "Oil Cell."<sup>68</sup>

Despite the Saudi campaign against Al-Qaeda in Saudi Arabia, the organization's resilience and ability to survive was proven in June 2007 when security forces arrested an Al-Qaeda leader in Qaseem with 100 million Saudi Riyals (\$26 million) in his bank account. Saudi Arabia's former Interior Minister Prince Nayef asserted that up to 3,000 Saudis remain in detention for suspected links to terrorism.<sup>69</sup> The true number may be higher. Additionally, on 28 November 2007, the Saudi government announced the arrests of 208 militants, some of whom are alleged to have been planning an attack on an oil-related target. Another related cell, comprising 18 men, smuggled up to eight missiles into the Kingdom for terrorist attacks. The intended target was described as a "support facility" in the Eastern Province's oil infrastructure.<sup>70</sup>

The involvement of Saudi citizens in Al-Qaeda is not limited to the Kingdom. A report in the *Los Angeles Times* estimated that up to 45 percent of all foreign militants in Iraq – targeting both US forces as well as Iraqi civilians and security authorities – are from Saudi Arabia.<sup>71</sup> Concurrently, hundreds of Saudi militants are known to be fighting in Syria along jihadi groups, and Jabhat Al-Nusra has been classified by the U.S. State Department as an Al-Qaeda affiliated terrorist group. There are reports, too, that Saudi nationals are fighting alongside AQAP operatives in Yemen.<sup>72</sup> Furthermore, the bodies of ten Saudis were identified by Lebanese authorities among those of dead Fatah al-Islam fighters who engaged the Lebanese Army in heavy fighting in the Nahr al-Bared refugee camps in early July 2007.<sup>73</sup> Current political developments in both Lebanon and Iraq suggest that the Sunni establishments in both these countries are losing power relative to the Shi'a body politic. Consequently, those radicalized Saudi Sunnis returning from conflict in these nations could pose a problem to the Kingdom's government, much as their fellow citizens who fought in Afghanistan in the 1980s. Developments in Iraq, Yemen, and Syria, in particular, could spur extremist-minded Saudi Sunnis to draw themselves farther into the Al-Qaeda orbit, hence swelling the ranks of potential perpetrators of attacks on oil and gas facilities.

AQAP remains determined in its desire to target the country's energy infrastructure as a key tactic in their strategy to undermine the al-Saud monarchy and exploit the United States' dependence on Saudi crude oil.

In the past years the United States has dealt numerous crippling blows to Al-Qaeda's leadership network. In May of 2011 the face of Al-Qaeda, Osama Bin Laden, was killed by U.S. Special Forces at his compound in Abbottabad, Pakistan. Furthermore, in June 2012, Abu Yahya al-Libi, Al-Qaeda's second-in-command, was killed in a US drone attack in Mir Ali, in the Northern Waziristan region of Pakistan. Although the terrorist organization has taken major ideological blows and seems incapable of carrying out an attack on the same level and scope as 9/11 after the death of Bin Laden and Al-Libi, it seems that Al-Qaeda is poised to survive its founder's demise. Taking over Bin Laden's position, Ayman Al Zawahiri has kept his terrorist organization afloat despite predictions that he would be a complete disaster, and has even increased his influence in the region. In February 2012, Mukhtar Abu al-Zubair, the leader of the rebel movement Al Shabaab of Somalia, pledged allegiance to Al Zawahiri and his organization. He stated that he and his followers will, "march with you [Al-Qaeda] as loyal soldiers" and even addressed Al Zawahiri as his, "dear commander and kind sheikh."<sup>74</sup> Additionally, in April 2013, Jabhat Al-Nusra in Syria – the leading fighting force against Bashar al-Assad's regime - pledged its allegiance to Zawahiri's leadership. With the addition of Al Shabbab and Al-Nusra to the ranks of Al-Qaeda, it does not seem that Al Zawahiri's terrorist network is completely immobilized.

Since the death of Bin Laden there have been subtle strategic shifts in the paradigm of Al-Qaeda. It has tried to exploit regional changes brought about by the Arab Spring. No longer is the terrorist organization focused on large scale attacks against the United States but instead emphasizing regional struggles at a time when that message is

more likely to resonate with Muslims in the Middle East and specifically in Saudi Arabia. In May 2012, Al Zawahiri released a video calling on the citizens of Saudi Arabia to rise up against their government and to follow the example of their brothers in Tunisia, Libya, Egypt, Yemen and the Levant, "Muslim brothers in the land of the holy mosques! A year has passed since the uprising of the Arab people against their rulers...my dear brothers, why do you still accept to be ruled by the Al-Saud family. They are one of the worst corrupt governments who steal your money."<sup>75</sup> Al Zawahiri preached to the citizens of Saudi Arabia. Although the United States has carried out significant attacks against the Al-Qaeda network, the goals and ideology of Osama Bin Laden stick. Instability in Saudi Arabia would directly benefit the Al-Qaeda terrorist network and it seems clear that Saudi Al-Qaeda remains determined in its desire to target the country's energy infrastructure as a key tactic in their strategy to undermine the al-Saud monarchy and exploit the United States' dependence on Saudi crude oil.

### **Saudi Hezbollah (Hezbollah al-Hijaz)**

In addition to Al-Qaeda, Saudi Hezbollah is another threat which imperils the Saudi oil infrastructure. The organization received funding from the Iranian government, has strong local organizational links and previously targeted the oil infrastructure on at least one occasion in 1988. The threat posed by Saudi Hezbollah to the Saudi oil infrastructure must be seen through the context of the organization's history. The atmosphere of suspicion and mistrust between the Saudi government and the country's large Shi'a population following since the rise of Saudi rule but especially after the Iranian Islamic revolution in 1979 has been exploited by Iran to increase its geopolitical ambitions.<sup>76</sup>

Following the August 1987 massacre of over 400 Iranian pilgrims in the city of Makkah during the *haj* by Saudi security forces, the Iranians sought revenge against the Saudi government. In the fall of 1987, the Iranian government approached the main Saudi Shi'a opposition group at the time – the Organization for the Islamic Revolution in the Arabian Peninsula (OIRAP), headed by Sheikh Hassan al-Saffar – and encouraged the organization to conduct armed attacks in Saudi Arabia. OIRAP declined. OIRAP was at the time headquartered in Tehran and enjoyed limited support from the Iranian government due to its religious emulation of the late Grand Ayatollah Mohamed Al-Shirazi, who had a falling-out with then Iranian Supreme Leader Ayatollah Khomeini. OIRAP attempted to assert its independence from Tehran, and, as a result, was expelled from Iran and its offices and assets were seized by the government. With the rejection of OIRAP to conduct armed attacks inside Saudi Arabia, the Iranian government hastily formed its own Shi'a organization that would act on its behalf, Saudi Hezbollah, known as 'Hezbollah al-Hijaz.'<sup>77</sup>

Al-Hijaz is the name of the western region of Saudi Arabia and commonly used by the community if Iranian religious leaders to refer to the county. It was adopted in a way to delegitimize the Saudi Monarchy's rule because they name the country after



themselves. This organization was initially formed of dozens of Saudi Shi'a religious students studying in the holy city of Qum who emulated Grand Ayatollah Khomeini. Calling themselves 'The Line of the Imam Khomeini,' these students founded the organization with assistance from the Iranian Revolution Guards in the city of Qum in the fall of 1987.<sup>78</sup>

Saudi Hezbollah launched its first attack in May 1988 against the Sadaf Petrochemical plant in Jubail. The attack consisted of a small explosive charge that started a limited fire which was quickly extinguished, with no fatalities. The attack highlighted the limited experience of the organization and the level of training it had received from the Iranian government. The Saudi government's response was a massive crackdown on Shi'a working in the oil industry, particularly those working as security personnel, and curtailed Shi'a employment at Aramco for more than 15 years, in spite the fact no Aramco facilities were targeted. Additionally, over 500 Shi'a were arrested and the four attackers were summarily executed in 1989 without a trial.<sup>79</sup>

The generational political and economic marginalization of Shi'a in Saudi Arabia has been long ignored by the Saudi government, although its former ambassador to Washington Turki al-Faisal partially admitted in an October 2006 speech that Shi'a are alienated and that discrimination does exist.<sup>80</sup> The bulk of the oil-rich Eastern Province's population is predominately Shi'a, specifically the provinces of al-Hasa and Qateef, the largest population centers in the east. The Shi'a though only constitutes approximately 20 percent of the general population; they make the majority original inhabitants of the Eastern Province, the oil province. They face severe discrimination that bars them from mid-level and senior government jobs, higher educational opportunities, and basic religious freedoms. As recently as 2012 and 2007, Saudi authorities, under heavy security, demolished Shi'a mosques in Khober and Awamiyah respectively.<sup>81</sup>

The Shi'as situation improved slightly after a 1993 agreement between the Reform Movement, the successor of OIRAP, and the Saudi government which allowed exiles to return to the Kingdom, released all Shi'a political prisoners, including jailed Saudi Hezbollah members, and greater religious freedoms. As a result of the agreement, OIRP closed all of its offices in the US, Europe, and across the Middle East. But, the bombing of the US housing complex in Khobar in June 1996 ended the short period of calm between the Shi'a's and the Saudi government.

While Hezbollah has not been openly active since 1996, it has issued several statements on the internet about attacking Saudi Arabia's oil infrastructure. The last communiqué from Saudi Hezbollah was issued in the summer of 2006 during the Israeli bombardment of Lebanon and several websites believed to be linked to Hezbollah are still in operation.<sup>82</sup> Although the majority of known Saudi Hezbollah's members were arrested by 1996, the group's alleged leader Abdelkarim Hussein Mohamed al-Nasser is still at large along with three other Hezbollah members.<sup>83</sup> They are believed to be in Iran and might have reconstituted the organization from the hundreds of Saudi Shi'a students

in Qum, and the hundreds of thousands of Saudi Shi'a who travel to Iran annually for religious tourism and business.

The current Supreme Leader of the Islamic Republic of Iran, Ayatollah Syed Ali Khamenei, enjoys a large following among Saudi Shi'a. He is one of the three leading Shi'a *marrajae* (religious authority) in the region, which Shia emulate. He is believed to hold the second rank in terms of followers after Grand Ayatollah Ali al-Sistani. Khamenei photos are displayed in many Shi'a homes and religious community centers across the province. Khamenei also has dozens of religious representatives, *wakeel-s*, who collect religious taxes, provide religious edicts on his behalf, and recruit followers. The *wakeel-s* also control many mosques and *hussaniyat*, religious community centers, in Shi'a cities across Saudi Arabia.

Lebanese Hezbollah, a strong ally of the Iranian government, enjoys a large following among Saudi Shia's who see its stance against Israel as victorious that they wish to emulate domestically. During the 2006 Israel-Hezbollah War, Saudi Shia organized large protests, a rarity in the Kingdom, in support of Hezbollah in the streets of Qateef, carrying the distinctive yellow flags of Hezbollah. Additionally, millions of dollars were collected from mosques and homes and sent to Hezbollah affiliated organizations in Lebanon. Photographs of Hezbollah leader Hassan Nasrallah are increasingly visible in Shi'a homes and mosques. The success of the Iranian-backed Lebanese Hezbollah in attracting support among Saudi Shia's has helped to further raise Iranian influence within the Kingdom and made Hezbollah's model of armed struggle more inviting to the historically pacifist Shi'a community.

The backdrop of Saudi-Iranian relations must be considered in any discussion on the status of Shi'a in Saudi Arabia and especially the influence Iran enjoys within the Kingdom's Shi'a population. This prickly relationship between Saudi Arabia and Iran is not limited to just bilateral disputes and suspicions as Saudi Arabia could, in fact, end up playing a major role in any future armed confrontation between Iran and the United States. During a meeting with US Senators in December 2006, King Abdullah reportedly made his view clear that the US should attack Iran.<sup>84</sup> The *Washington Post* reported that former Saudi Ambassador Prince Bandar bin Sultan, in secret meetings with top US officials, pressed the Bush administration not to deal with Iran, but instead urged joint efforts to counter Iran's growing influence in the Middle East, such as in Lebanon.<sup>85</sup> The *Post* also reported that Washington and Riyadh were planning a major aid and military training package for the beleaguered Lebanese government of former Prime Minister Fouad Siniora, whose government faced opposition from supporters of Hezbollah.<sup>86</sup>

Saudi-Iranian relations remain very strained. In 2010, Wikileaks revealed a 2008 U.S. cable detailing meetings with Saudi officials and King Abdullah. Amidst fears regarding the Iranian nuclear program, King Abdullah reportedly implored U.S. officials to attack Iran, end the nuclear weapons program, and "cut off the head of the snake."<sup>87</sup> What's more, a July 2013 report released by IHS Janes suggests that Saudis have constructed a military base that houses ballistic missiles pointed at both Israel at Iran.<sup>88</sup>

The only successful attack attributed to Saudi Hezbollah since 1988 is the 1996 bombing of the Khobar Towers complex housing personnel from the 404<sup>th</sup> Wing of the United States Air Force. In all, 20 men were killed, of whom 19 were Americans. In June 2001, the US District Court in Alexandria, Virginia issued an indictment for 19 men, including the head of Saudi Hezbollah. The indictment clearly attributed blame for the attack to the Iranian government, which “supported and supervised members of Saudi Hezbollah” and to whom “the charged defendants reported their surveillance activities.”<sup>89</sup> However, not everyone is convinced that Iran and Saudi Hezbollah were behind the attack. Former US Secretary of Defense William Perry stated in June 2007 that he now thinks Al-Qaeda is the more likely culprit while the FBI believed at the time that all the evidence pointed towards Iran.<sup>90</sup> Osama bin Laden himself took responsibility for the attack by reciting a poem in 1998 stating “we bombed Khobar”.<sup>91</sup>

There have been no attacks on the Saudi oil infrastructure by a Shi’a group cell since the 1988 incident. Yet an attack by a group (whether Hezbollah-linked or not) remains a notable possibility especially with the ongoing militarization of heavily populated Shi’ah areas and the arrests and killings of protesters in Qatif. Compounding the problem is the fact that the organization benefits from a disaffected Saudi Shi’a populace which it can shelter and eventually activate. Since 1987, the Iranian capacity to form, finance, train, and equip local groups to carry out subversive activities has been greatly enhanced. Iran has gained substantial experience in working with local actors through its support of groups such as Lebanese Hezbollah, Palestinian Hamas and Islamic Jihad, the Houthi rebels in Yemen, and several groups in Iraq, such as Asaib Ahl al Haq.<sup>92</sup>

While the Saudi Shi’a community remains mindful of the situation in Iraq, there is no evidence of them supporting fellow Iraqi Shi’as in confrontation with US forces, unlike their Sunni counterparts who actively participated through AlQaeda in many attacks on American and Iraqi military and civilian targets. Consequently, all indications suggest that sectarian violence in Iraq could potentially “spill over” into the Kingdom and would rile the Saudi Sunni community more so than the Shi’a community.

The Israeli and Iranian issue seem to be more pertinent to the Saudi Shi’a population as evidenced by the aforementioned mass demonstrations in the predominantly Shi’a town of Qatif during the 2006 Israel-Hezbollah conflict.<sup>93</sup> Anecdotal evidence strongly suggests that Iranian Supreme Leader Ayatollah Ali Khamenei and Lebanese Hezbollah chief Sayyid Hassan Nasrallah have both gained in popularity within the Kingdom’s Shi’a community since that summer confrontation.

## The Arab Spring

Of recent, the Shi'a population has come under increased scrutiny due to other regional developments. Since 2011, the upheaval of the Arab Spring has reignited sectarianism between Sunnis and Shi'as across the region; and in particular, the Bahrain uprising and the conflict in Syria has adopted significant sectarian overtones. The Shia region witnessed massive protests in support of the Bahraini majority uprising's push for democracy.

The cities of Qatif and Awamyia witnessed dozens of large protests calling for the release of Shia and Sunni political prisoners, and in support for Bahraini uprising. The Saudi government tolerated the protest for few months before it started to kill protesters who took to the streets inspired by the speech of Shia cleric Nimer AlNimer from his mosque in Awamyia. Special Saudi Forces and death squads killed two dozen protesters including children. Few hundreds were also arrested including AlNimer who was shot in public and arrested in July 2012.

The Saudi violent response to peaceful protest has radicalized elements within the Shia community. Protesters changed their chants from demanding release of political prisoners and an end to discrimination, to calls for the fall down of the Saudi Monarchy. Chants of "Down with AlSaud" are now common in most protests in Awamyia and Qateef. The photos of King Abdullah and other leading members of the Saudi Monarchy were burnt and disfigured in public as well.

In spite taking place in of the most sensitive regions in the world in terms of energy, the protest movement received limited international media coverage reflecting the Saudi government's influence over international media covering the region, and western governments who made no comment on the protests and/or the killings.

These events have placed Hezbollah and its sponsor, Iran, at odds with the Saudis. With the overt Iranian support for Bashar al-Assad, and the recent announcements by Hassan Nasrallah that Hezbollah is fighting alongside the Syrian regime, Saudi Arabia and its allies have stepped up their involvement and rhetoric to support the Syrian rebels and to combat Iranian influence.

Hezbollah's involvement has specifically strained sectarian associations. Long suspected of supporting the Assad regime, the Lebanese Shi'a group finally announced its stake in Syria in May 2013. Shortly thereafter, the Qatari-based popular Sunni Sheikh, Yusef Qaradawi, denounced Hezbollah's intervention and urged Sunnis to join the fight in Syria. He declared that "the leader of the Party of Satan comes to fight the Sunnis... Now we know what the Iranians want... They want continued massacres to kill Sunnis."<sup>94</sup> The Saudi Grand Mufti, Sheikh Abdulaziz bin Abdullah al-Sheikh, subsequently endorsed Qaradawi's statement, and urged "all politicians and clerics to take substantial measures against this repulsive sectarian group (Hezbollah) and all those backing it so as to deter this aggression."<sup>95</sup> The GCC proceeded to pledge sanctions against Hezbollah,

and Saudi Arabia announced that it plans to deport any Lebanese nationals who support Shi'a group.<sup>96</sup> Other Saudi Sunni clerics, too, have called for action in Syria, and have enflamed sectarian tensions like the controversial Sheikh Mohamed al-Arefe, who has called for jihad in Syria.<sup>97</sup> Additionally, on June 14, the Imam of the Grand Mosque in Mecca, Sheikh Saudi Al-Shoreym, appealed to Muslims to help "by all means" the Syrian rebels.<sup>98</sup>

### **Iranian Conventional Forces Threat**

The prospect of direct conventional confrontation with Iran is perhaps the most critical threat facing Saudi Arabia's energy infrastructure.

In the past few years Saudi-Iranian relations have deteriorated to the point where most analysts have taken to calling the situation akin to a 'Cold War' confrontation as both states jockey for power in pursuit of regional hegemony and several factors must be examined on determining whether this 'Cold War' will turn hot. The first and most likely are the reactive scenarios wherein Iran responds to economic distress caused by sanctions, or an attack on its nuclear facilities prompting it to lash out at Saudi Arabia and the Gulf States. The possibility of a pro-active scenario in which Iran chooses to strike first is less likely but still plausible. Yet, if regional tensions such as those exposed over Syria, Bahrain, Iraq and, Yemen, were to become significantly exacerbated it is possible that Iran might choose to strike first either in a limited or total fashion.

Since March 2013, Saudi officials have arrested a total of 28 men who they accuse of working as part of an Iranian spy ring. Saudi authorities said the suspects were linked to Iranian intelligence services, and were gathering information about important installations and vital sites.<sup>99</sup> While Shia leaders have publically spoke out against the legitimacy of such allegations, they have no less further strained Saudi-Iranian relations.

One of the most apparent examples of the tension between Saudi Arabia and Iran was the thwarted assassination attempt on Saudi Ambassador Adel Al-Jubeir in Washington, DC in 2011. According to the official indictment, the attacker Manssor Arbabsiar confessed to meeting Gholam Shakuri, a member of the Iranian Islamic Revolutionary Guard Corps's Quds Force, and other officials several times in Iran. The emboldened attack signifies the low-level conflict that could very quickly escalate to larger foreign policy tensions.<sup>100</sup>

Regardless of the scenario or cause of such a conflict, the implications for the energy security of Saudi Arabia are dire. Furthermore for the Iranians to successfully attack Saudi Arabia oil infrastructure, they do not need to raise the level of general warfare for the greatest amount of damage to be inflicted. The Iranian conventional threat revolves around several key sectors of the armed forces with a versatile arsenal allowing for both conventional and asymmetric engagement. In consideration of a pro-active

Iranian attack in response to sanctions or a geopolitical conflagration the possibility that a slow escalation of force will be used to send signals whilst causing damage cannot be ignored.<sup>101</sup>

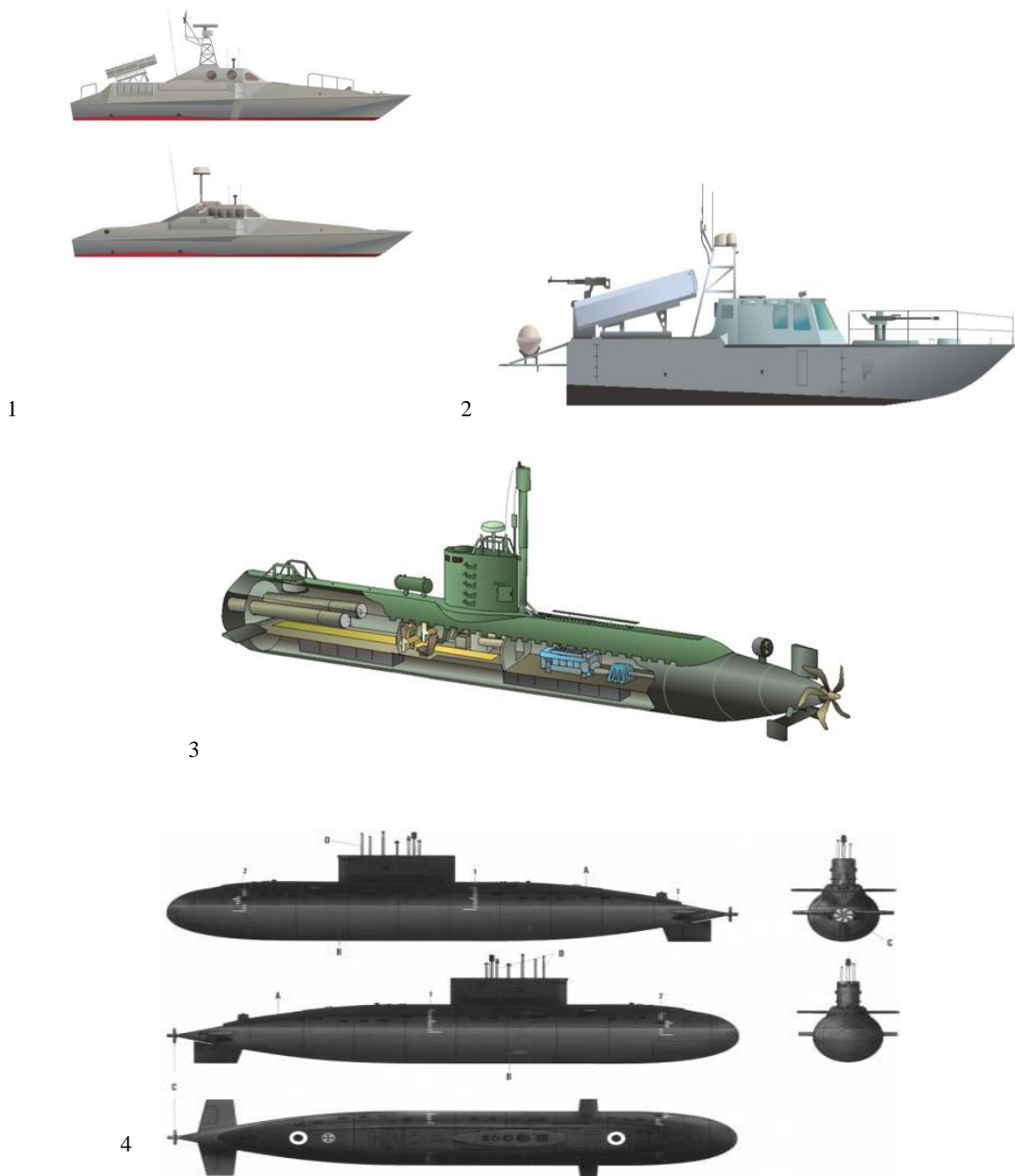
### *Iranian Navy*

The first sector and the most likely to be utilized in a limited engagement or opening flashpoint is the Iranian naval command.

Tehran has constructed its naval force and accompanying naval doctrine with the nature of its foe in mind. The Iranian naval command is acutely aware of the superiority of American naval forces, having experienced it firsthand in the 1980's during Operation Praying Mantis. As a result the Iranian navy is geared towards providing the greatest amount of firepower possible in tandem with the greatest level of survivability with the goal being to deal as much damage as possible while straining opposition resources by forcing them simultaneously into a defensive and offensive posture. Iran's defensive strategy is focused on securing tankers, infrastructure, and other naval assets, while offensive in order to hunt down and remove naval combatants.<sup>102</sup> The result has been an emphasis on missile boats, heavily armed fast-attack craft, mining vessels, and its small fleet of submarines.

Though Iran maintains a small flotilla of missile frigates the real core of the Iranian fleet revolves around its 43 missile boats all at varying degrees of age and armament.<sup>103</sup> The four principle classes are the IPS-16 (*Peykaap*) torpedo boats, the French built *Kaman* class missile boats, the Chinese built *Thondar* and C-14 (*China Cat*), and the *Sina* class missile boats.<sup>104</sup> The IPS-16's are normally torpedo equipped vessels designed to harass shipping while there are reports that indicate the Iranian Navy has equipped them with domestically produced Kowsar anti-ship cruise missiles (ASCM).<sup>105</sup> The more advanced French built *Kaman* and Iranian adapted *Sina* missile boats are considered to be some of the most modern Western vessels left in the Iranian arsenal which are equipped with C-802 and *Noor* missiles. The *Thondar* and the C-14 are fast attack missile boats designed to overwhelm and swarm a target, allowing the smaller vessels to confuse and defeat larger opponents.<sup>106</sup>

In addition to its considerable fleet of missile boats, Tehran has invested heavily in creating a sizable fleet of several hundred small fast-attack boats. Though there are close to a dozen different variants, all the vessels serve the purpose in providing a confusing and dangerous array of ships to swarm enemy vessels, platforms, and fleets either in solitary operations or in coordination with surface warships to deal the maximum damage possible. The vessels are small usually with no more than a 5-10 man crew, and are equipped with a variety of armaments ranging from rocket propelled grenades (RPG's) and small arms to multiple launch rocket systems (MLRS) systems or a single ASCM.<sup>107</sup> The fast attack fleet is largely controlled by the IRGC Navy and as a result is suspected of maintaining a reserve of 'suicide' attack vessels.<sup>108</sup>



**Figure 6:** Iranian Navy Ships (1. IPS-16 (Peykaap) torpedo boat; 2. C-14 China Cat Class Fast Attack Craft,; 3. Kilo Class Submarine; 4. Ghadir Class submarine).<sup>109</sup>

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Supporting these surface combatants, is a small but nonetheless potent, Iranian submarine fleet. Though the Islamic Republic retains only three Russian built *Kilo* class submarines, the only submarines in its arsenal that can be considered regular and modern, it has developed a substantial domestic midget submarine flotilla.<sup>112</sup> The *Ghadir* is a small submarine of domestic manufacture, designed to launch fast attack strikes in the shallow waters of the Gulf. Though not as powerful as the *Kilo* class the Iranians currently possess 19 of them, and are constructing more.<sup>113</sup>

The proliferation of these vessels further complicates preparatory Western naval plans to 'clear' the Gulf of enemy warships by potentially adding hundreds of combatants. This, in turn, dramatically lengthens the time and scope of operations, and increases the need for shipping security.

### **Anti-Ship Cruise Missiles**

A critical component of Iran's area denial, area access, and infrastructural targeting strategy is the Islamic Republics large arsenal of anti-ship cruise missiles (ASCM). Partially controlled by the Navy and the Iranian Revolutionary Guards Corps (IRGC), the anti-ship missiles have the capacity to deal great damage without bringing on a general commitment from the Iranian armed forces or exposing them to significant harm and is conducted by firing a single missile or small series of missiles from stand-off locations on land or at sea. While in a wider war setting the missiles, which are a blend of aerial, naval, and ground-based platforms, are deadly and difficult to guard against tools capable of dispensing significant damage to tankers, naval vessels and, sea terminals.<sup>114</sup>

Iran's current anti-ship missile capacity rests upon a mix of domestically produced missiles and a varied arsenal of imported weapons platforms. The most prolific missiles within the Iranian arsenal are a series of Chinese imported models. The 'C-series' missiles include the C-701, the C-704, and the C-802.<sup>115</sup> Both the C-701 and C-704 are relatively cheap models with a limited range of 15-30km with the latter model having a much larger 130kg warhead.<sup>116</sup> These missiles are mostly designed to be delivered by aircraft or ships due to their large size and short range. However, as previously mentioned, some fast attack boats have been equipped with ASCM's. The C-704 and its domestically produced Iranian counterpart the *Nasr-1*, in particular, have become popular armaments for Iranian small boats like the *Zulfiqar* fast attack boat. By mounting the ASCM's on these fast-boats Iran believes it is layering its wisely offensive capability by providing small vessels the capacity to deal with major targets. This, in turn, forces opposing naval forces to deal with the small vessels as a significant potential threat. However the number of ASCM's in the Iranian arsenal is limited and comparatively few small boats could be armed with the weapons.<sup>117</sup>



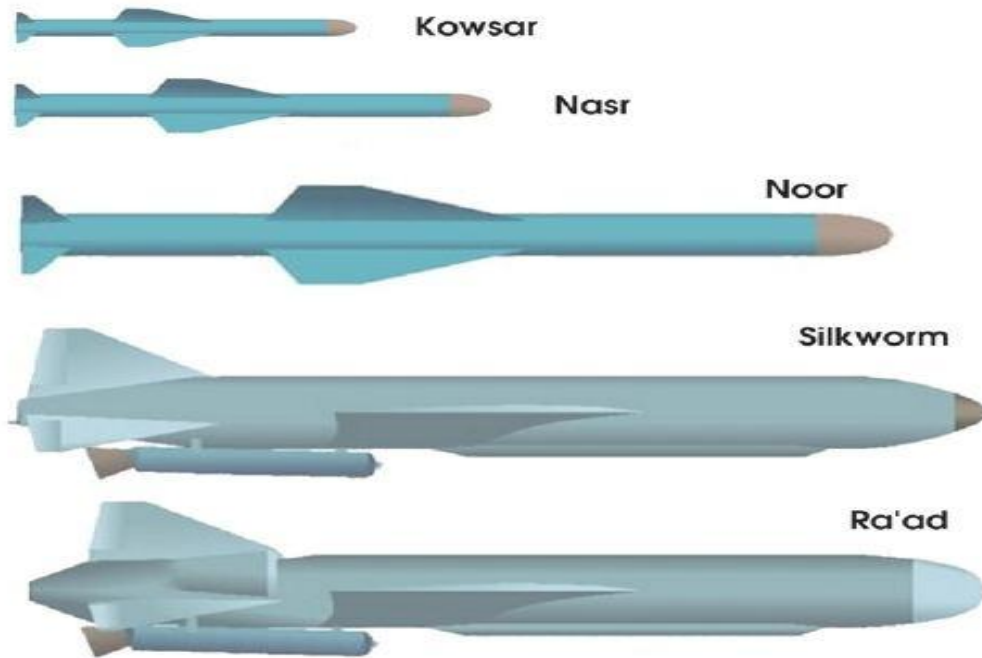


Figure 7: Comparison of Major Iranian ASCM models.<sup>118</sup>

At the top of the Islamic Republics ASCM arsenal are the C-802 and the Silkworm. The C-802 has a very low angle of approach, anti-jamming capability, a heavy warhead, a Mach 1.6 attack velocity, and according to reports unless intercepted has a 98 per cent target accuracy rate.<sup>119</sup> After the Gulf War, Iran purchased 60 land based platforms from China. With a 120km range poses a significant threat to shipping especially at the choke points in the Strait of Hormuz.<sup>120</sup> Though slower and more out of date than the C-802, the HY-2 Silkworm has an unusually large warhead of 513kg making it a significant threat to tankers and shipping lacking defenses. The significance of the C-802 and the HY-2 Silkworm to the Iranian arsenal is evidenced by resources invested in the development of domestically produced successor models like the *Noor* which is a derivative of the C-802 with an extended range of 200km and a more sophisticated guidance system.<sup>121</sup> The threat posed by these missiles was demonstrated during the 2006 Lebanon War. On July 14, 2006 Hezbollah militants fired an Iranian imported C-802 missile at an Israeli corvette, the INS *Hanit*, off the coast of Beirut.<sup>122</sup> Struck by a single missile, the *Hanit* suffered severe damage forcing it to withdraw to Haifa for refitting and repairs. Though the counter-measures of the ship had been turned off for multiple reasons, the damage done by a single land based anti-ship missile to an armored naval vessel is cause for great concern.<sup>123</sup> The threat that multiple missiles could pose to tankers and other shipping is severe despite the fact that land based deployment makes these missiles more difficult to discover and destroy quickly as shown in the INS *Hanit* incident.

The possibility of an Iranian offensive against international shipping and energy infrastructure in the Gulf is not an idle threat without precedent. During the Iran-Iraq War, Saddam Hussein declared all vessels traveling to Iranian ports or carrying Iranian crude as legitimate targets. He proceeded to initiate a series of high profile attacks against such ships. The Iranians retaliated quickly by declaring Iraqi shipping tankers open to attacks as well as all friendly vessels. A series of strikes against Iraqi tankers escalated into a campaign that included Kuwaiti deep-sea infrastructure and shipping due to their role as a financial conduit for Hussein. The campaign quickly spiraled, as tankers in Saudi and Bahraini waters were struck in conjunction with an uptick in attacks on international shipping.<sup>124</sup>

The risk posed to crude output is highlighted by the October 24, 1987 attack on the Kuwaiti Sea Island terminal.<sup>125</sup> The terminal which handled some 320,000bpd of Kuwaiti crude output was struck by an Iranian HY-2 Silkworm missile and though the damage was quickly contained it was a jarring reminder of how vulnerable such vital facilities were to an Iranian attack particularly from ASCM's.<sup>126</sup> The loss of similar terminal would have been a blow to the global energy market and the economy of Kuwait by reducing their 960,000bpd output by a third. A similar strike or series of strikes at the Saudi terminal of Ras Tanura would be even more damaging. The distance between Ras Tanura and the nearest Iranian coastal port of Bandar-e-Kangan is only 240km, allowing an Iranian ship or plane to loiter only a few dozen kilometers off shore before entering into range.



**Figure 9:** Distance between Kuwait City, Ras Tanura and, Iran.

The initial impact of the 'Tanker War' was a drastic rise in the price of crude oil and an increase in the cost of commercial maritime insurance which, in conjunction with the dangerous atmosphere, drove down shipping in the Gulf by 25 per cent.<sup>127</sup> However, the energy market and shipping recovered over the course of the war as shipping

companies and captains proved willing to brave the danger as it became clear that a major escalation was not technically feasible or desired as well as the US led mission to flag and protect convoys of oil tankers leaving the Gulf.<sup>128</sup>

Though the 'Tanker War' was fairly inconclusive, the information and data gathered from the war reveals important information on the nature for potential threats. Both Iraq and Iran were severely limited by the paucity of their arsenals during the 'Tanker War'. Iraq had a limited number of AM-39 Exocet missiles while Iran had even less of the HY-2 Silkworm missiles its disposal and despite the limited number of anti-ship missiles in their arsenal, the Iranians still proved to be much more effective weapons for targeting shipping.<sup>129</sup> However, the tankers themselves proved remarkably resilient and of the 239 oil tankers that were attacked, only 23 per cent were destroyed or considered a total loss.<sup>130</sup> It is important to remember, however, that for the purposes of energy disruption a ship only needs to be prevented from delivering its cargo and thus, any amount of damage that causes a ship to return to its port is, in some ways, a successful attack.

The 'Tanker War' provides us a template in which Iran managed to inflict damage with a marginal arsenal and the threat posed by an Iran with a larger and more advanced arsenal of ASCM's needs to be inconsideration. If such a confrontation were to occur again, Iran would likely focus its efforts on Very Large Crude Carriers (VLCC) and Ultra Large Crude Carriers (ULCC's) in order to maximize the damage caused by its still limited ASCM's arsenal. A VLCC or ULCC loading up at Ras Tanura could carry as much as 2,000,000bbl, a significant portion of the global consumption of 88.18bbpd.<sup>131</sup> The destruction or damage to a few of these ships over even a short period of time could cause a panic in the global energy market and cause significant revenue disruption for Saudi Arabia.



**Figure 10:** Comparison of Tanker classes.<sup>132</sup>

The combined use of Iranian ASCM platforms in conjunction with the Iranian surface fleet and irregular IRGC naval units to temporarily halt to shipping in the Gulf is a great cause for concern. For Saudi Arabia this would put enormous strain on the East-West pipeline and the Red Sea outlet at Yanbu. The Yanbu crude terminals currently handle 2.5MMbbd but, are capable of handling 4.5MMbbd, which is less than half of the Kingdom's 10.5-11.5MMbbd current peak capacity.<sup>133</sup> Another unattractive cost is the addition of the 4-5 days it takes for crude oil shipped from Yanbu to reach Asian markets.<sup>134</sup> Yet, even the loss of a few tankers to anti-ship missiles could bring a temporary halt to shipping as companies and countries decide to hedge their bets and pull their shipping fleets off the waters and re-organize into a convoy system or wait for the danger to pass.

### ***Iranian Ballistic Missiles***

Western officials have been monitoring the development of Iran's ballistic missile program with growing concern for more than a decade.<sup>135</sup> Though the decision to develop such capabilities dates back to the Shah, the current missile program is seen as being inextricably linked with the Iranian nuclear program.<sup>136</sup> When seen through this prism, analysts are quick to study the potential for certain missiles such as the *Shahab-3* to act as a platform for a nuclear warhead. But, what is often overlooked is the conventional application of these weapons in a warlike setting. This context though is usually limited to a study of these weapons application against military targets such as airfields and naval facilities. Less studied is Iran's potential deployment of ballistic missiles against major Saudi energy facilities in a concerted missile offensive.

There is concern among analysts that current Iranian missile capability might be sufficient to threaten the safety of Saudi Arabia's oil infrastructure, considering that the bulk of these facilities are located in the Eastern Province, close to the Persian Gulf shoreline.<sup>137</sup> In 2007, an advisor to Ayatollah Khamenei warned that Iran would launch missiles at Gulf military bases and energy installations in the event of a preemptive attack upon Iran's nuclear facilities.<sup>138</sup> The nearest point along Iran's coastline is Abqaiq which is approximately 280-290 kilometers while the terminal of Ras Tanura is approximately 190 kilometers. Both locations are within reach of Iran's missile arsenal. The "*Shahab-3*" missile and future generations of such missiles (variants of North Korea's *Taepodong* missile, for example) could place most, if not all, of Saudi territory within range. Iranian missile tests in July 2008, of which at least one missile is believed to be a *Shahab-3*, only served to heighten tension in the region.<sup>139</sup>

Iran's current missile arsenal revolves around the "*Shahab*" system which, according to a 1995 report by Jane's Intelligence Review, comprises nearly 300 Scud-B missiles and 15 transporter-launchers. All of these missiles are believed to be of North Korean origin, and have a range of 285-330 kilometers, making Saudi Arabia's oil infrastructure a potential target.<sup>140</sup> The United States Air Force estimates that Iran has deployed close to 50 modified versions of the Scud-C missiles, which have been rechristened the "*Shahab-2*", and Iran may possess up to 200 such missiles each of which has an estimated range of 500-700 kilometers.<sup>141</sup> Also in Iran's arsenal is a medium-range ballistic missile, known as the "*Shahab-3*." A derivative of the North Korean "*Nodong*," the "*Shahab-3*," has an estimated range of 1,300 kilometers while Iran's possesses a modified version boasting a range of up to 1,900 kilometers.<sup>142</sup>

Most analysis has been focused on the *Shahab-3* due to its range and perceived purpose as an atomic weapons platform.<sup>143</sup> More immediately relevant as a threat to Saudi's oil infrastructure located in the Eastern Province is Iran's copious supply of *Shahab-1*'s, *Shahab-2*'s, and *Fateh-110*'s. These short range ballistic missiles (SRBM) form the bulk of Iran's missile arsenal but are less accurate and with a shorter range than more advanced models.<sup>144</sup> However, they can be quickly deployed for an attack.

The missiles have effective ranges of 300-500km thus making them capable of striking a wide range of Saudi facilities including the extremely important energy nodes of Abqaiq and Ras Tanura. Their shorter ranges also enable them to have larger payload as fuel and booster requirements are lower. The *Shahab-1* has a warhead ranging from 77-1000kg.<sup>145</sup>

That being said, analysts have noted that the Iranian missiles are too inaccurate to be used to target any significant fixed positions. In the pursuit of destroying a specific target, Iranian missile command would have to expend so many missiles before achieving success that it would be an implausible course of action.<sup>146</sup> While largely true, this has been mistakenly applied to major facilities like Abqaiq. At close to 4km<sup>2</sup> the facility is easily targetable by the aforementioned SRBM's. With the *Shahab-1*'s circular error

probability (CEP) of about 450m, even a small barrage would ensure that many of the missiles would hit the complex.<sup>147</sup>

One hypothesis is that to disable or significantly degrade Abqaiq's operating capacity the fourteen stabilization towers that ring the complex would need to be destroyed. This is an overly specific and discriminatory approach. The multitude of fuel tanks, over-pressurized gas infrastructure at the NGL facility, gas-oil separation lines, electrical lines, and transformers cast doubt upon the claim that such a surgical destruction of the plant would be necessary. The attack would require the Iranians to launch thousands of missiles accurately targeting Abqaiq's stabilizing towers.<sup>148</sup> Nevertheless, such an attack poses a greater threat if Iran acquires or develops more accurate missiles.<sup>149</sup>

A more plausible scenario that could also cause significant damage to the plant is a series of strikes hitting some or all of the above mentioned targets. The destruction of gas lines would touch of massive explosions requiring major repairs to affected areas. Likewise, if damage is dealt to any portion of the pipelines that funnel crude for oil-gas separation, the explosions would be less severe but the fires more pervasive due to the chemical makeup and thermodynamic of petroleum vs. natural gas (which requires pressurization). The facility is not only large but, it is dense. As demonstrated in the map above, piping, processing lines and, filters crisscross the facility and are in relatively close proximity to each other. As a result, there is a severe risk of cascading effects as the destruction of one pipeline, damages another, and so on. The resulting fires and threat of further waves of attacks in the midst of repair operations would greatly strain the capabilities of Saudi ARAMCO to keep Abqaiq functioning. The attack would require a veritable feat of administrative and logistical efforts upon the part of Saudi ARAMCO to keep Abqaiq functioning in the face of a sustained missile offensive. It is likely that damage would be so severe that even extraordinary competence would not prevent a significant reduction of Abqaiq's performance if not temporarily taking it offline.

To still maintain production if the Eastern Province is attacked, Saudi Arabia has reinforced its alternative export options with two major refineries on the Red Sea coast at Yanbu' and a third under construction. These refineries and the corresponding East-West pipeline that pumps crude to them, figure prominently as a Saudi trump card in the event of a Gulf crisis. The Saudis have also reportedly been considering a series of pipelines that would carry its oil through the Rub al-Khali desert into Oman and then exported from Arabian Sea ports. In late December 2006, King Abdullah paid a previously unscheduled visit to Oman's Sultan Qaboos and reportedly discussed this proposal.

All of these facilities lie in range of the *Shahab-3*'s estimated range, and certainly within the ranges of more advanced models, and are at the moment, relatively bare of anti-missile batteries. While it may not be an immediate priority, the possibility that Iran would follow up a successful missile offensive in the Gulf, with a secondary offensive aimed crippling alternative export infrastructure must be considered.

The difficulty of a campaign to reduce or halt the Iranian missile offensive must also be addressed. Iran possesses a substantial mix of stationary, road-mobile, and disassembled transferable weapons in a variety of locations. It might take weeks for strike missions to identify and destroy all Iranian launch-able and active missile variants.<sup>150</sup> Such an endeavor would also require the targeting and degradation of the Iranian air defense grid, something that would take a substantial amount of time providing a window for sustaining the missile offensive. The ability to respond is also dependent on how much resources are deployed to the region in time to counteract the missile offensive.

The most relevant example would be the first Gulf War and Saddam Hussein's SCUD missile offensive against Saudi and coalition targets. In that instance the Saudi's and their Gulf allies benefited from Kuwait acting as a geopolitical trip-wire that brought about a massive and rapid U.S. and allied response. By the time hostilities erupted a substantial coalition presence, the deployment of Patriot batteries, the insertion of Special Forces, and months of planning had substantially reduced the risk from Saddam's relatively paltry missile arsenal. In the instance of an Iranian missile offensive it is unclear whether or not allied powers will have the opportunity to concentrate forces in Saudi Arabia prior to hostilities.<sup>151</sup>

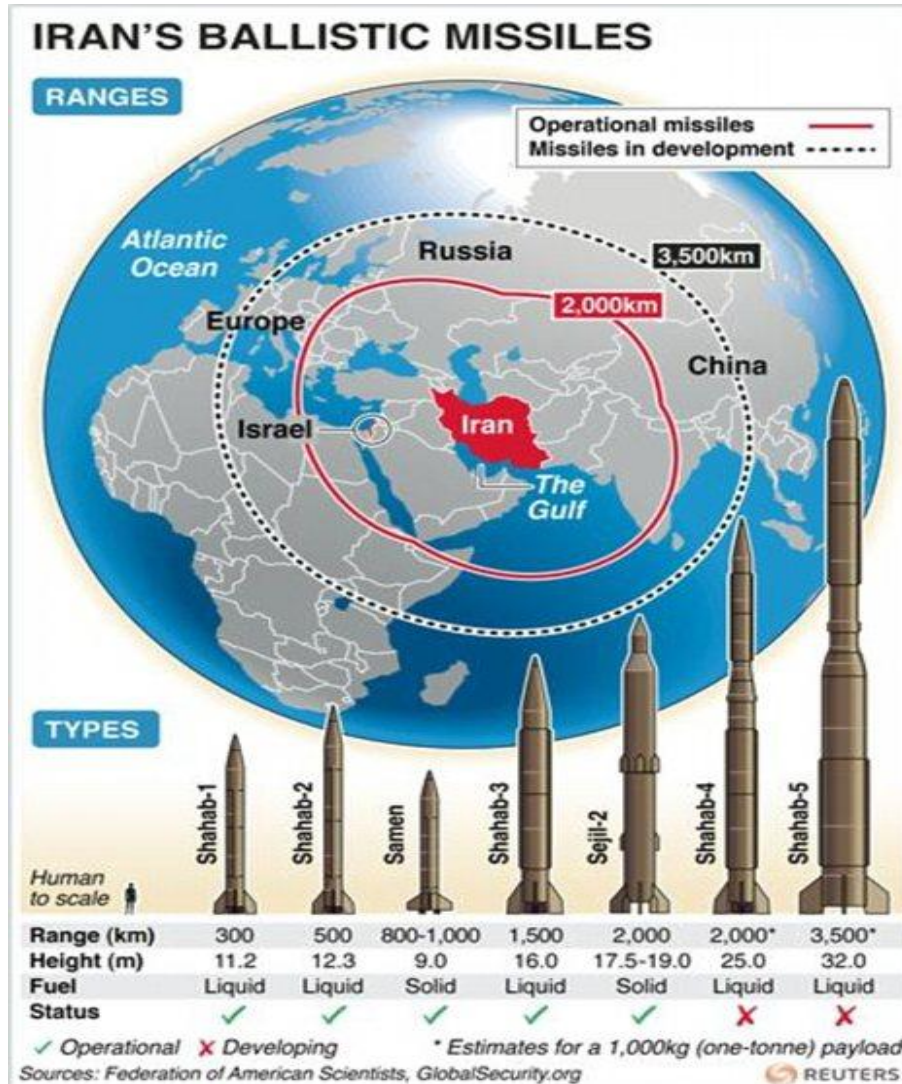


Figure 8: Estimated Range and Visual of Iranian Long-Range Missiles.<sup>152</sup>

### *Iranian Drones*

The global proliferation of Unmanned Aerial Vehicles (UAVs) has not bypassed Iran. With the rise of drone warfare across the world, Iran has been eager to enhance its program and develop a formidable supplement to its conventional forces. And while Iran is unable to legitimately boast a program on par with the most advanced international programs, Iranian drones have become an increasingly important military asset in a region where there is very little domestic UAV development. This in turn has helped to spur regional drone proliferation. Saudi Arabia has already recognized the potential threat of Iranian UAV production, and recently agreed to buy Seeker 400 combat drones from South Africa in April 2013. The Saudis are also in the midst of developing their own surveillance drones for their southern border.<sup>153</sup> In addition, the United Arab Emirates



struck a deal with an American company to buy unarmed Predator drones in February 2013.<sup>154</sup> Undoubtedly then, the Iranians have caught the attention of others around the region. And as drone technology enters into the fore of modern warfare, the Iranians will certainly look to deploy their fleet on a strategic basis, in both combat and reconnaissance, and in ways that may compromise Saudi energy security.

For decades now Iran has owned and deployed a fleet of short and medium range UAVs. Iran was the first country to deploy an armed drone, outfitting it with RPG-7 rounds during the Iran-Iraq war. More advanced reconnaissance drones were developed thereafter—some of which have been supplied to, and deployed by Hezbollah in Lebanon. In the 2006 Hezbollah-Israeli war, a number of Iranian-made Ababil drones armed with explosives were shot down by the IDF in Israeli airspace.<sup>155</sup> Iranian officials too claimed in 2012 that “dozens” of Iranian drones have entered Israeli airspace undetected from Lebanon since 2006.<sup>156</sup> Only in recent years has Iran’s drone program seen a marked development in surveillance and combat capabilities, opening up a new field of technological advancement and military capacity.

In August 2010, Iran unveiled its first domestically produced long-range unmanned combat drone, the “Karrar.” The drone is capable of carrying two 250 pound bombs, a 500 pound precision missile, or up to four cruise missiles, and has a range of about 1000km, or 621 miles.<sup>157</sup> Dubbing it the “Ambassador of Death,” President Ahmadinejad characterized it as both a defensive deterrent and pre-emptive offensive weapon. Since then, Iran has introduced several new indigenous drone models, including the Shahed 129 in September 2012. As Iran’s first medium-altitude long-endurance (MALE) UAV, the Shahed, with a range of 2,000 km, can carry out 24-hour non-stop combat and reconnaissance missions. Consequently, the drone enhances surveillance capabilities in border areas, the Persian Gulf, and Sea of Oman. Upon its unveiling, IRGC commander, Major General Mohammad-Ali Ja’fari also claimed that the Shahed can carry and fire Iranian-developed “Sadid” long-range missiles, making it a formidable military force.<sup>158</sup>



**Figure 9:** Shahed-129.<sup>159</sup>



Figure 10: Sarir H-110.<sup>160</sup>

Iran has developed a host of new drone models. Iranian officials claim that the country is currently working on 40 varieties of drones, 30 of which are already in production.<sup>161</sup> Most recently in April 2013, it announced four new programs, Azem-2, Mohajer B, Hazem 3, and Sarir H-110. The Sarir is the most notable as Iran's first indigenous air-to-air missile combat drone. Iranian military commanders allege that it is a long-endurance, radar evading UAV—capable of carrying missiles and cameras. At the time of its display too, it was announced that it was already under mass production.<sup>162</sup> Shortly thereafter in May 2013, Iranian military commanders announced the arrival of Iran's newest, and most advanced combat and reconnaissance UAV to date, the "Hamaseh" or "Epic" drone. Iranian Defense Minister Brigadier General Vahidi asserted that the drone is "simultaneously capable of surveillance, reconnaissance and missile and rocket attacks."<sup>163</sup> The drone was displayed with two 107mm rockets, and according to the Iranians, it is capable of radar-evasion as well as high altitude and long range flight. However, based on the visual impression of the UAV while in flight, its overall shape, and apparent features such as a non-tractable landing gear, the Hamaseh is most likely less "stealthy" than Iranian officials claim it to be, and doesn't match up to standards of more advanced drone technology.<sup>164</sup>



Figure 11: The new "Hamaseh" combat-reconnaissance UAV.<sup>165</sup>

Iran has attempted to exploit United States UAV technology in recent years. In February 2012, Iran announced that the IRGC has started to mass produce copies of the U.S. ScanEagle drone, a small, low-cost, long endurance American-made reconnaissance drone capable of providing low-altitude surveillance.<sup>166</sup> The ScanEagle has been essential to U.S. intelligence gathering in the region, and especially so to the U.S. Fleet in the

Gulf.<sup>167</sup> This comes after the IRGC reportedly took down a ScanEagle drone over Gulf waters only a few months prior. This remains a matter of dispute between U.S. military officials and Iran as the U.S. argues it didn't lose any of its drones at that time.<sup>168</sup>

To date, the most significant example of such engagement is an incident in 2011 when an American RG-170 Sentinel drone—an advanced high-altitude surveillance UAV deployed by the CIA and US Air Force—was downed in Iran, and captured by Iranian military personnel. The cause for malfunction remains disputed, as American officials refuse the Iranian claim that Iran was able to hack the navigational mainframe and take control of the drone. The U.S. rather contends that the UAV malfunctioned on its own. Nevertheless, shortly after the drone's capture in December 2011, Iran announced its intention to reverse-engineer the drone, and has since declared that it has successfully decoded data from the drone.<sup>169</sup> Concurrently, the Iranians claim that they have decoded all the intelligence in the drone, but this has not yet been verified.<sup>170</sup> The Sentinel is not the most advanced model in the U.S. fleet, and experts argue that Iran does not have the expertise to successfully reverse-engineer it or extract valuable intelligence. The Sentinel, though, remains a valuable addition to the Iranian drone program, and it remains to be seen how Iran will make use of the valuable U.S. technology for the future of its program.

As with the case of the Hamaseh drone, and the Iranian possession of the U.S. Sentinel drone, it is difficult to distinguish fact from hyperbole with regards to the trajectory of Iranian UAV advancements. Despite its advancements and the proclamations from Iranian commanders—who are privy to make lofty claims about their crafts' capabilities—the Iranian arsenal is nowhere near the sophistication and capability of Israeli and American counterparts, and can only be used in a limited way.<sup>171</sup> At the moment, the fleet of Iranian drones can supplement its intelligence, reconnaissance, and surveillance capabilities to support its other forces, but Iran has yet to develop its drone technology to deploy a serious threat. The recent maturation of the Iranian program is evident, and their confidence in deploying their drones across the region has expanded in suit.

Over the past few years, Iranian drone-related incidents have undoubtedly heightened tensions across the region. Two drones deployed by Hezbollah in Lebanon, and believed to originate from Iran, were shot down in Israel—the first in October 2012 and the second in April 2013. The drones themselves were simple in design, but experts speculate that these drone missions have aimed to demonstrate Iranian capabilities to enter Israeli airspace and potentially damage Israeli facilities.<sup>172</sup> In Syria, it is reported that Iran has supplied drones to the Assad regime, and that they have been deployed to aid the regime in surveillance and targeting. They have since become commonly used on the Syrian battlefield, and may be piloted by the Iranians themselves. These reports further substantiate Iranian support for the Syrian regime, and raise questions about proliferation of drones in modern warfare.<sup>173</sup>

In the Gulf region tensions have risen as well. On May 22, 2013, Bahraini officials announced that they found an Iranian drone in the sea north of Bahrain, between Saudi Arabia and Bahrain. Iran subsequently denied that it was theirs, but the incident exacerbates already-strained relations between Bahrain and Iran, and highlights Iran's growing confidence to deploy its fleet around the region.

More recently, Iranian drones have been reported working alongside Assad's forces in Syria. It is widely known that the Syrians have been receiving weapons and support from Iran but unlike Bahrain, the Iranians are not denying their use of drones in Syria. The deployment of drones in Syria can be viewed as a sort of "trial by fire" for Iranian technology. The conflict provides an opportunity for the Iranians to test their drone technology in actual combat environments without the risks of being involved in an armed conflict of their own.<sup>174</sup>

These developments signal that Iran is becoming more emboldened to deploy its drone technology across the region. With the contention surrounding the deployment of drones in the world today, drone deployment over foreign territory may serve as a trigger for more sustained hostilities between nations. While Iran has a ways to go before its drone technology becomes a serious force, its concerted focus on drone R&D might yield a formidable fleet down the road which could threaten Saudi energy security. Iran does not yet possess a functioning satellite system required to effectively operate combat drones, but it is currently developing one.<sup>175</sup> If anything, reconnaissance missions will make Saudi Arabia's infrastructure vulnerable to more conventional attack. With the development of combat capability, Iran may develop the capacity to tactically strike Saudi infrastructure with drone warfare.

## Saudi Defense & Deterrence

In response to the growing threat from Iranian missile and naval threats, the Saudi's and their Gulf allies have begun to focus more heavily on naval and anti-missile capabilities. Though the past decade has seen a dramatic expansion of Saudi arms purchases, it has only been in the last few years that the emphasis on anti-missile and naval systems was initiated.

The Saudi Navy is the smallest of the three main branches of the Saudi military, and has usually been lowest on the Kingdom's tier of importance. This is perhaps best evidenced by the commanding officer of the Saudi naval forces Vice Admiral Dakheel-Allah Bin Ahmad Al-Wakadani, who until recently was the only commander of a major branch of the Saudi military not to be a royal. It remains relatively small and unadorned compared to rival services, especially in light of the nearly \$60 billion arms sale in 2010 that included almost nothing for the Navy.<sup>176</sup>

In the short term it appears as though the Saudi's have made the move to leave their surface warfare and defense responsibilities to the United States in conjunction with their Gulf allies. However this may soon be changing. The Saudis have been in negotiations with the United States and Lockheed Martin on a major naval arms expansion termed SAUD Naval II.<sup>177</sup> Those negotiations may be aided by the February 2013 opening of a new regional office for Lockheed Martin in Riyadh, a sign of the maturing relationship between the American arms manufacturer and the bottomless pockets of the Kingdom.<sup>178</sup>

Saudi Arabian defense officials have expressed a keen interest in the US Littoral Combat Ship (LCS), Seahawk helicopters, patrol boats and, contracts to expand naval base infrastructure and coastal defense systems. This interest stems from a realization on the part of Saudi Arabia that the naval sphere is an increasingly critical part of their energy security strategy, particularly with regard to missile security.<sup>179</sup>

The Saudis have been adamant that the frigates they purchase from the United States be equipped with the US Aegis Combat System, an option not currently available for the LCS. However, Lockheed Martin officials have assured the Saudis that they would offer a multi-role version of the LCS to suit their needs. The Aegis Ballistic Missile Defense (BMD) system is a sophisticated anti-missile platform capable of integrating with wider networks such as the U.S. Ground Midcourse Defense (GMD) system. It is also the only boost phase anti-missile platform currently in operation. Considering the geography of a potential missile encounter with Iran, the Aegis system would be an enormous asset. The deal which is said to be close to \$23 billion USD, could see the Saudi's acquire as many as a dozen ships and accompanying Aegis systems.<sup>180</sup>

Additionally, the emphasis on hardening key facilities and constructing radar arrays at coastal installations heralds an acceptance by the Saudis that the critical threat

may come from Iranian missiles. While the planned expansion of Saudi naval infantry and patrol boat capabilities points towards efforts to defend coastal infrastructure like Ras Tanura from sudden assault.<sup>181</sup>

Saudi Arabia's current air-defense system comprises a total of 33 surface-to-air missile batteries of which, 17 batteries are designated to protect its oil infrastructure. These latter batteries are equipped with 68 *Shahine* surface-to-air missile units, which are derivatives of the French *Crotale* missile system.<sup>182</sup> Additionally, Saudi Arabia purchased a US\$1 billion Patriot theater missile defense system in November 1990, during Operation Desert Shield, to protect the Kingdom against Iraqi Scud missiles.<sup>183</sup>

In addition to the SAUD Naval II proposal, Saudi Arabia has started to explore the possibility of expanding its land based anti-missile batteries. In 2011, Saudi Arabia inked a deal worth \$1.8 billion USD that will see the Kingdom's existing Patriot systems significantly overhauled and upgraded. The Saudi acquisition comes on the heels of a spree of anti-missile purchases from its Gulf neighbors. In 2011 Kuwait purchased 209 Patriot missiles in a deal worth \$900 million USD, and the UAE finalized the sale of two Theater High Altitude Area Defense (THAAD) batteries and 96 missiles worth \$3.5 billion USD.<sup>184</sup> Most recently in March of 2013, the Saudis were successful in another related negotiation with Lockheed Martin. The finalization of the \$253 million USD deal secured an F-15SA pilot and maintenance training program for the Royal Saudi Air Force, demonstrating the Saudi desire improve all aspects its Air Defense program including air-to-air intercept capabilities.<sup>185</sup>

The recent emphasis the Gulf States have placed on anti-missile systems is a clear acknowledgement of the risk posed by ballistic missiles to their energy infrastructure. It points to a realignment of risk considerations from a purely naval focus on the Strait of Hormuz, to Iranian missile capabilities.

Concurrently, the Saudi gambit to acquire combat drones from South Africa, and develop its own line of surveillance drones emphasizes its recognition of the risk posed by recent improvements to the Iranian program. In April 2013, South Africa's state-owned Denel Dynamics defense company agreed to work with Saudi Arabia to develop its own UAV program. The Saudis hope to secure the Seeker 400, which would have a range of 160 miles, and a flight-time endurance of 16 hours.<sup>186</sup> It would reportedly be equipped with South Africa's Mokopa air-to-ground missiles—the same armaments used by Algerian helicopters—and outfitted with laser-guided Impi missiles, which have a range of 10 kilometers.<sup>187</sup> Saudi Arabia has also launched an indigenous program to develop a surveillance UAV program. According to King Abdullah City for Science and Technology (KACST) initiative, "UAVs are particularly important resource for the Kingdom as they provide a cost-effective solution for patrolling large areas such as the Kingdom's 9,000 kilometer borders along land and sea. They also have potential civilian values such as monitoring the pipelines for maintenance and security, and search-and-rescue missions in the desert."<sup>188</sup>

The Saudi drone program is still in its nascent stages, and the Saudis claim it is for counter-terrorism and reconnaissance. But with Iran actively developing its own drone fleet, the Saudi program is also a defensive response to Iranian advances and an attempt to neutralize the drone advantage Iran currently possesses.

## Emerging Threats: Vigilantism, Discontent and Royal Infighting

Saudi Arabia's mounting economic, political and social problems are creating an environment of instability that could lead to violence, possibly including attacks on the oil infrastructure. Despite repeated calls for genuine political reform and public participation in decision-making, the ruling tribe of Al-Saud has largely punted the issue, partly out of a desire to avoid dealing with painful change, and partly due to the inability of the various competing schools of thought within the tribe to reach a consensus on the future of the Kingdom.

As a result of substantial liquidity in the post-Iraq War years of high oil prices, middle-class Saudis began investing heavily in the country's stock market, the Tadawul All-Share Index (TASI). As of February 25, 2006, trading had pushed the TASI to a record 20,967 points.<sup>189</sup> However, by June 25, 2007, the TASI fell to 7,102 – a spectacular market crash of 13,865 points, a value loss of 66%. According to a report by Birinyi Associates Inc, Saudi Arabia suffered the largest decline in stock market value in 2006.<sup>190</sup>

Dr. Khalid al-Bassam, an associate professor of economics at King Abdulaziz University, compiled a report on the deterioration of the middle class in Saudi Arabia resulting from the stock market collapse. Dr. al-Bassam told the *al-Sharq al-Awsat* newspaper that the crisis is leading to the “eradication” of the Saudi middle class. One Saudi newspaper columnist, blaming the stock-market crash for affecting 10 million Saudi citizens, termed the crash a “tragedy” and “catastrophe.”<sup>191</sup> Abdulrahman al-Sammari, writing a two-part column for *al-Jazirah Daily*, said that the primary achievement of the stock market was the “plunging of 10 million Saudis into poverty.”<sup>192</sup> Hundreds of thousands of Saudi retirees and unemployed citizens, who have taken out loans, he wrote, are facing insolvency and are unable to repay their debts.

A substantial number of middle-class Saudis had taken to investing in the stock-market, to the extent of selling their cars or using up their life-savings. Saudi media reported that upwards of 37,000 Saudis had sought psychiatric help in the aftermath of the crash, and that the government had increased funding for new psychiatric hospitals to cope with the rise in demand for mental health services.<sup>193</sup>

However, the stock-market crash alone cannot be blamed for the poor economic situation in Saudi Arabia. The country's rentier state model involves high levels of government social spending but little incentive for domestic entrepreneurial activity. Furthermore, the country's education system does not impart appropriate skills to young Saudis who enter the job market in larger numbers every year. The average age in Saudi Arabia is 25 and the current level of unemployment teeters around ten percent.<sup>194</sup> The real unemployment numbers are much higher and are believed to be in the 30% range among men, and over 60% among women. A combination of unemployment, low wages, and inflation has led to a rash of suicide by few dozen young men in the past year.



Meanwhile, corruption remains an ever-pertinent issue in a country where it is an established reality at every level of economic transaction. This is most apparent in the one of the most glaring examples of Saudi government economic failures, housing. While the country enjoys massive land size and a relatively small population, homeownership is among the lowest in the world around 22%. While neighboring countries especially in the GCC enjoy over 80% homeownership rates, Saudi feel they have been left behind due to the greed of the thousands of the Saudi Monarchy princes who monopolize the real-estate business and have expropriated some say over 20% of the country land. Photos of land grabs by members of Saudi ruling family are commonly shared on twitter. They are known as fences, as massive lands are fences with signage proclaiming them properties of some prince.

The issue of housing or lack of it has been among the hottest debated issues in the country n the internet and in the local media as well.

With the rise of social media, calls for reform have expanded as Saudis increasingly debate the government's behavior and continue to break the taboo against criticizing the ruling family. In March 2013, Saudi authorities handed down a high-profile prison sentencing against two well-known political and human rights activists, Mohammad Fahd al-Qahtani and Abdullah Hamad—founding members of the banned Saudi Civil and Political Rights Association.<sup>195</sup> It has also jailed other leading activists such as Dr Abdulkarim AlKhuder, Sheikh ‘Suliman AlRashoodi and many other young activists calling for political change. This event, in conjunction with the previous protests against mass detentions, triggered a popular Saudi Sunni cleric, Salman al-Odah, to release an open letter on Facebook and Twitter calling on the monarchy to reform, and warning against the consequence of failing to do so. In exposing a number of ills, Odah reflects that there are “certain negative feelings that have accumulated over a considerable period of time,” which he has learned “from many social groups across several regions.”<sup>196</sup> A cleric known for his moderate views and a supporter of Arab protests elsewhere, Odah calls for a comprehensive reform program which addresses social, economic, and political grievances. He further warns the government that a “wasted opportunities may give no second chance. Action that is too late may be useless. Time is a weapon for or against you.”<sup>197</sup>

It remains to be seen if the Saudis will have to combat the same tempest that other Arab regimes have faced since the emergence of the Arab Spring. Saudi Arabia has so far resisted the wave of change seen elsewhere, but it has yet to subdue it completely as discontent persists on daily bases. Continued protests around the country and the region pose a threat to Saudi stability; and al-Odah's unprecedented attack upon the ruling family broke previous taboos and galvanized the Saudi people, especially since Shia see him as bridge to a broader base of support.<sup>198</sup> A failure to adequately respond to criticisms may trigger more violent dissension. Additionally, unrest and instability continue to rage not far from the Kingdom as violent protests continue to mar the situation in Bahrain. In the long term, these forces represent an obstacle to Saudi stability; in the short term they serve as a persistent threat to the state of Saudi security.

As noted Saudi political scientist Turki al-Hamad wrote, "The transformation from the state of prosperity to the state of destitution or what is approximate to it, and when individuals fall from one social class to a lower one, [that] spreads grievances and a sense of jealousy, unrest and loss [as well as] being taken advantage of. All these emotions transform into a mixed social time bomb that is ready to explode at any moment, as it melts into one pot, especially when it finds expression in this or that extremist ideology, either rightist or leftist, or until it forms its own unique ideology, which by necessity is of a radical direction."<sup>199</sup>

An additional threat may emanate from the ruling family's infighting over power, especially following the death of King Abdullah, who is now 90. As senior members of the ruling family continue to age and pass away, the monarchy has witnessed a shuffling of the guard in government and ministerial positions—bringing family politics to the fore. The death of hardliner Crown Prince Nayef bin Abdul Aziz in June 2012 triggered a series of moves to place new princes in government positions. This has consequently created a new kind of uncertainty. Although his brother Salman bin Abdul Aziz was named as the new Crown Prince, Nayef had been in control of the Ministry of Interior for over 35 years. The importance of the Ministry cannot be overstated as Nayef and his Ministry were notorious for their harsh security measures within Saudi Arabia.

Subsequently, Nayef's son, Muhammad bin Nayef, was named Minister of Interior in July 2012. He was seemingly next in line behind the elderly Crown Prince and Deputy Prime Minister Salman until King Abdullah appointed his own half-brother, Muqrin bin Abdul Aziz, who is not a Sudairi, to be Second Deputy Prime Minister in February 2013. This position, which is not always filled, is long believed to be designated for the future king.<sup>200</sup> King Abdullah himself held the position in the 1970s. Muqrin's mother was a slave girl, and his appointment also challenges the assumption that the King's mother must be from a Saudi tribe—further muddling family politics.<sup>201</sup> This move was seen to block the ascension of Mohamed Bin Nayef to the throne, especially after his high-level meeting in Washington, London, and Paris, with leaders of these countries, a move seen by King Abdullah as an attempt to push Bin Nayef as the new Saudi king.

Over the past year a number of younger princes have been appointed to elevated positions. This signals that the ruling family recognizes the necessity to address impending questions regarding succession, but it has also triggered jostling between family factions. Saud bin Nayef, son of the recently deceased Minister of the Interior and nephew of Crown Prince Salman, was appointed governor of the Eastern Province; while the son of Crown Prince Salman, Faisal bin Salman, was appointed to be governor of Medina in January 2013. Both are of the Sudairi clan.

Further shaking the balance is King Abdullah's May 2013 appointment of his own son, Prince Mutaib bin Abdullah, as the Minister of the National Guard. The National Guard is an elite security force in the oil kingdom, and never before operated as

a ministry. King Abdullah commanded the force from 1962 until 2010. As a result, his move to elevate the guard to a ministry, and appoint his son as its minister serves to empower his clan and challenges the prominence of the Sudairis. It also calls into question the significance of the previous appointment of a Second Deputy Prime Minister, and further complicates the succession debate.

The clan of King Abdullah, as well as other underrepresented clans in the ruling tribe, may resort to using the oil facilities as a bargaining chip in their struggle with the Sudairi clan, the most powerful branch of the al-Saud. The Sudairi's control the Ministry of Interior, and all armed forces, except the National Guard, which is commanded by Abdullah's clan. Losing power to the Sudairi's might prompt the seizure or sabotage of major oil facilities by one clan or another.

Mixed with regional instability, uncertainly regarding family succession and the monarchy's future poses a risk to the security of the Saudi energy infrastructure. While King Abdullah established the Allegiance Council 2006 comprised of senior Princes as a mechanism to help address questions of succession, it remains to be seen if the Council will be effective in the years to come. And to further complicate matters, with political unrest and violence in border nations, there is no telling what might spill over and into the desert kingdom.

## **Attacks in the Region**

### **SAUDI ARABIA**

#### ***Abqaiq***

On February 24, 2006, would-be suicide bombers drove up to the Abqaiq processing facility in two pick-up trucks. Security forces opened fire on the vehicles, prompting the men to detonate their explosives at the outer perimeter. No damage to the oil facilities was reported. On February 25, an Islamist website posted a claim of responsibility from Saudi Al-Qaeda.<sup>202</sup>

#### ***Khobar***

On May 29, 2004, four gunmen broke into 'The Oasis,' a housing complex for foreigners working in nearby oil installations. The attack took the lives of 22 people, including 19 foreigners, most of them Asian expatriates. In spite of a siege by counter-terror paramilitary forces, several of the attackers escaped, suggesting collusion with the security personnel. On May 30, a statement by the 'Jerusalem Brigade,' an Al-Qaeda-linked group, appeared on an Islamist website, claiming responsibility for the attack.<sup>203</sup>

#### ***Yanbu'***

On May 1, 2004, four militants entered the offices of a petrochemical plant in Yanbu', and opened fire on several Westerners. Two Americans, two Britons, an Australian and a Canadian worker were killed in the attack. A Saudi National Guardsman also died. On May 14, a statement purportedly from Abdel Aziz al-Muqrin (Al-Qaeda's Saudi chief) claimed responsibility for the attack on behalf of Al-Qaeda's Yanbu' cell.<sup>204</sup>

#### ***Jubail***

In May 1988, four Shi'a militants attacked fuel storage tanks at the Sadaf petrochemical plant, causing a small fire, although there were no casualties. In response, Saudi security forces imposed virtual martial law around the towns of Tarut and Qateef, in search of the men responsible for the attack. In late September 1988, the militants were caught and executed. Subsequently the government terminated the jobs of Shi'a security personnel.<sup>205</sup>

## ***Riyadh***

In November 2003, a suicide bombing at a Riyadh housing compound kills 17, most of them Muslims working in Saudi Arabia. However, after making numerous arrests, Saudi officials say that the terrorists mistakenly targeted a facility that they thought was housing Americans. Just two weeks before the attacks, Osama bin Laden released an audio tape calling the Saudi royal family “corrupt Zionists”, and for Saudis to attack government oil installations.<sup>206</sup>

In June 2008, the Ministry of Interior released a statement saying they have arrested over 700 militants planning to carry out attacks against Saudi Arabian oil installations. The arrests happened in multiple waves, taking into custody Al-Qaeda sympathizers of multiple nationalities. Additionally in February of 2009, 172 suspected militants were arrested in a plot to launch air attacks on the kingdom's oil infrastructure.<sup>207</sup>

## ***Yemen***

On 15 September 2006, Yemeni security forces foiled attack attempts against two oil facilities – a refinery in the northeast province of Madrab and an oil storage facility at the port of Dubba in the province of Hadramaut.<sup>208</sup> The latter port was the scene of the 2002 attack on the French ‘Limburg’ tanker. The attackers were four suicide-bombers split into two teams, each of which attempted to ram through the facilities’ gates with their cars. The four men, two at each target, were dressed in uniforms similar to those worn by staff at the facilities and had timed their attacks to coincide with early morning shift changes, security officials said.

The attempted attacks came just three days after Ayman al-Zawahiri’s call for attacks against Gulf oil infrastructure. No doubt, the two events are related, especially considering Yemen’s status as Osama bin Laden’s ancestral homeland. Furthermore, Yemen’s oil facilities could have been perceived as a soft target as the bulk of Yemeni counter-terror protection has focused on the country’s ports since the 2000 USS Cole attack.

On 5 November 2007, a bomb blast damaged a pipeline in northern Yemen, carrying oil from the Safer oil field to the Red Sea export terminal at Hodeida, failing, however, to interrupt supplies.<sup>209</sup> The pipeline transports 155,000 bpd, representing almost half the country’s daily crude exports. Security officials confirmed that Islamist militants were not involved in the attack. Just three days later, clashes broke out between tribesmen and security forces protecting Ukrainian oil personnel in Shabwa province, a dispute that arose after the Ukrainian firm declined the tribe’s request for more jobs. Twelve people were killed, all Yemeni.<sup>210</sup> More recently, an Al-Qaeda-linked Yemeni group called the “Yemeni Soldiers Brigade” claimed responsibility for a failed mortar attack on a Yemeni refinery on 30 May 2008.<sup>211</sup> Al-Qaeda further claimed responsibility

for a 25 July 2008 attack on a building housing Yemeni security forces in the province of Hadramout.<sup>212</sup>

MV Limburg: On October 6<sup>th</sup>, 2002, the French flagged ship was attacked by an explosive rigged boat. Tactically, the attack involved the explosive-laden dinghy ramming into the side of the vessel and then detonating. The explosion blew a hole in the side of the vessel, setting it on fire, and spilling 90,000 barrels of oil into the Gulf of Aden. One crew member was killed in the attack and 12 others were injured.<sup>213</sup>

On June 30<sup>th</sup>, 2008, Al-Qaeda's Yemeni branch, Kataeb Jund al-Yemen, claimed responsibility for rocket attacks against an oil refinery in Safir, located east of the capitol in the Maarib province. The group threatened to escalate its campaign of violence against oil infrastructure in Yemen unless the state released members of Al-Qaeda held in Yemeni prison.

As Yemen continues to struggle with heightened division and insurgency since rise of the Arab uprisings in 2011, its pipelines and oil facilities have endured a spate of recent attacks. In July 2012, the Petroleum and Minerals Minister announced that Yemen has lost more than \$4 billion in revenue due to attacks since February 2011.<sup>214</sup> A December 2012 attack on an LNG pipeline was the eighth such attack since October 2011.<sup>215</sup> And on May 24, 2013 militants blew up the country's main export pipeline and halted its flow of crude. The pipeline pumps around 125,000 bpd per day, but has come under increased attack in the Maarib province as Yemeni forces struggle to combat a growing Al-Qaeda presence and to establish stability throughout the country.<sup>216</sup>

## Iraq

There have been over 400 attacks on the Iraqi oil infrastructure since 2003, including attacks on security personnel. These confrontations have been directed at personnel and facilities both from terrorist/militant groups as well as smugglers. These incidents, more often than not, involve IED attacks upon pipelines and gun attacks upon personnel and their vehicles. In one incident in January 2007, a group of 50 militants, armed with rocket-propelled grenades, ambushed a group of Oil Protection Force personnel, resulting in 20 deaths.<sup>217</sup> More recently, Iraqi officials have struggled to combat a growing insurgency, in large part sponsored by Al-Qaeda. In April 2013, gunmen attacked the Akkas oil field, killing three local workers and kidnapping two more.<sup>218</sup> In May 2013, officials reported they foiled an Al-Qaeda plot to detonate explosives at an oil facility in Baghdad.<sup>219</sup> Only a few days later, a number of bombs were defused at the Bai Hassan oil field, which pumps about 150,000 bpd.<sup>220</sup> For much of 2013, Iraqi oil exports have hovered around 2.5 MMbpd, but continued unrest and infrastructural shortcomings are making it difficult for the export capacity to reach the country's goal of 2.9 MMbpd by the end of 2013.

Iraq's two biggest oil-producing regions are located in the south (Rumaila field) and in the north (Kirkuk field). Pipelines connect the Kirkuk field to the Mediterranean

port of Ceyhan, passing through northern Iraq into Turkey. Pipelines also connect the Rumaila field to the Persian Gulf at Basra Port. The oil infrastructure around Kirkuk has been attacked nearly four times as often as that in southern Iraq.<sup>221</sup> The reason is ethnic: Kirkuk is near the dividing line between the predominantly Sunni central band of Iraq and the predominantly Kurdish north. The Sunni insurgency has taken advantage of its proximity to Kirkuk to launch attacks against the Baiji refinery and pipelines to Ceyhan.<sup>222</sup> And as Iraq remains politically fragile, insurgent attacks have continued to target its energy network. In February 2013, militants attacked and damage a pipeline from the Baiji plant, while in April 2013 an attack on the Kirkuk-Ceyhan pipeline temporarily halted oil flow. The Kirkuk-Ceyhan pipeline has a designed capacity of 1.1 MMbpd, but has been operating at fraction of that capacity due to periodic sabotage attacks.<sup>223</sup> As a result, exports through the Ceyhan line have averaged just below 400,000 bpd, and Iraqi oil officials admit that terrorist attacks have hampered the pipeline's export capacity.<sup>224</sup>

Neither has Iraq's south been immune from attacks – on June 13, 2004 a sabotage attack on a pipeline in the Faw peninsula was responsible for a significant drop in oil exports: from 1.7 MMbpd to 0.5 MMbpd.<sup>225</sup> Iraq's former Prime Minister Iyad Allawi said in June 2004 that persistent attacks against Iraq's oil infrastructure cost the country around US\$200 million in revenues.<sup>226</sup> More recently, exports through the south have averaged 2 MMbpd, with current total production estimated at 2.4 MMbpd.

Both Shi'a and Sunni militants in Saudi Arabia may resort to such tactics in the face of increased security measures around terminals and oil and gas facilities. As a result of high-profile attacks, such as Abqaiq, militants may choose to focus on those sections of the infrastructure that are the most vulnerable and least protected.

## **Nigeria**

On February 5<sup>th</sup>, 2012, A Nigerian militant group released a statement claiming responsibility for an attack on an oil pipeline owned by Italian firm Eni. Fighters of the Movement for the Emancipation of the Niger Delta (M.E.N.D) attacked and destroyed the Agip trunk line at Brass in the Bayelsa State of the Niger Delta.<sup>227</sup> On April 5, 2013, members of M.E.N.D announced that they would renew attacks upon Nigeria's petroleum infrastructure within the oil-rich Niger Delta region in response to reports that their suspected leader, Henry Okah, was imprisoned in South Africa.<sup>228</sup>

Nigeria has recently suffered from sustained operations of oil theft against their pipeline system. In April 2013, Shell announced that it had shut down the Nembe Creek Pipeline in the Nigerian Delta due to rampant oil thievery—halting around 150,000 barrels per day of production. This came after its previous announcement in March 2013 that oil thievery in Nigeria had increased so drastically it was considering shutting down the pipeline. Shell alleged that the volume of oil thievery is the highest in three years—over 60,000 barrels per day from Shell-operated pipelines alone. Shell further estimated

that the cost of oil theft is about \$6 billion per year, based upon estimates that 150,000 barrels a day are stolen.<sup>229</sup>

This comes at a time when militancy is on the rise in Nigeria. Boko Haram has emerged a violent threat to Nigerian security as it struggles to establish an Islamic state there—further endangering the future of Nigerian oil infrastructure.

## **Egypt**

Since early 2011 when Egypt erupted in revolution, the gas installations of the Sinai Peninsula have been continuously targeted. To date since the revolution started, there have been 14 recorded incidents attempting to sabotage gas supplies to Egypt's eastern neighbors, Israel and Jordan. The most recent attack (number 14) occurred when “unknown” perpetrators bombed the Gasco pipeline near Al-Arish on April 8<sup>th</sup>, 2012.<sup>230</sup> Similar to other attacks, the Gasco pipeline was already undergoing repairs from a previous attack on March 5<sup>th</sup> (number 13). Witnesses of the March 5<sup>th</sup> attack said two large explosions occurred after six men arrived in an unmarked car. The 12<sup>th</sup> attack happened on February 8<sup>th</sup> when this same pipeline was targeted. A pattern of repair and attack seems to be in play throughout the Sinai Peninsula of Egypt.<sup>231</sup>

## **Horn of Africa**

Piracy off the coast of Somalia proves to be another impending threat to the Saudi energy infrastructure. In 2010 alone there was a recorded 219 attacks in the region with 49 successful hijackings.<sup>232</sup> That number, however, has dipped precipitously as companies adopt greater safety measures and international initiatives establish maritime security networks. Reports suggest that piracy in the Gulf Aden dropped to a five-year low in 2012, while piracy is on the rise in the Gulf of Guinea in West Africa. Nevertheless, Somali pirates continue to attack vessels from the Gulf of Aden all the way out into the Indian Ocean.<sup>233</sup> Every day, filled oil tankers leave from the different export terminals in Saudi Arabia (Ras Tanura, Ju'aymah, Jubail, Yanbu, Jiddah, Rabigh, and Ras al-Khafji) and must safely navigate these waters to arrive at their destinations. Due to high price of crude oil and the strategic and political importance of the ship's cargo, each of these tankers has now become a target for Somali pirates. U.S. Department of Energy estimated that 3.4 million barrels of oil per day traveled in 2011 through the Bab El Mandeb strait between the gulf of Aden and the Red sea.<sup>234</sup> The security of that body of water is of the utmost importance for global economic security.

Although increased patrols and proactive efforts by ships have reduced attacks in the Gulf of Aden, the U.N. Secretary-General warns that “while the effectiveness of naval disruption operations has increased and more pirates have been arrested and prosecuted, this has not stopped piracy. The trend of the increased levels of violence employed by the



pirates as well as their expanding reach is disconcerting.<sup>235</sup> And with the high cost of anti-piracy measures, current policies are largely unsustainable, and a long-term solution will require on-shore solutions.<sup>236</sup> Piracy, therefore, is a credible and ongoing threat that will have to be taken seriously in order to protect the oil tankers leaving the export terminals from Saudi Arabia.

## Algeria

Armed Islamists have begun to violently threaten Algeria's energy infrastructure. On January 19, 2013, Algerian military forces raided the In Amenas gas facility in order to retake the plant and free its hostages from armed Islamists. The plant had been previously captured by regional terrorists on January 16, and the plan was masterminded by Mokhtar Belmokhtar—a militant leader known to have ties with Al-Qaeda. Upon the resolution of the deadly conflict, the Algerian Prime Minister revealed that the aim of the kidnapers was to “blow up the gas plant.”<sup>237</sup> The attack has since called into question the security of international energy installations, and will most certainly precipitate an increase in such measures to defend against future attacks.<sup>238</sup>

Shortly thereafter, on January 28, two guards were killed and seven other wounded in an attack against the Ain Chikh pipeline outside Algiers, the nation's capital. It is suspected that Islamist militants carried out the attacks, as the region is believed to be an AQIM stronghold.<sup>239</sup>

In response to the In Amenas attack, and the threat posed by the rise of regional Islamist militants, the Algerian government has reportedly enhanced surveillance along the Libyan border—where militants are believed to be active. It has also strengthened perimeter security around oil and gas facilities, and has deployed military personnel within these facilities.<sup>240</sup> This signals a serious response on behalf of the Algerian government to protect against future attacks and ensure the security of its energy infrastructure.

## Libya

While the Libyan oil industry has made an unexpectedly fast recovery since the uprising against Gaddafi in 2011, there are growing concerns about the threat posed by militants in the region. A fragmented domestic security system coupled with fears stemming from the In Amenas gas facility attack in neighboring Algeria have spurred Libyan officials to increase the security of their energy installations. The Petroleum Facility Guard (PFG) has long been a mainstay in the industry, and the government announced its expansion from 3,000 to 12,000 following the Algerian In Amenas incident. In addition to enhancing plant security systems, the government has also sub-contracted regional militias to aid in the security of major installations.<sup>241</sup> Yet this arrangement has precipitated conflict, as gas flow was suspended from the Mellitah gas

facility in March 2013 because militias there clashed over competition for the security contract.<sup>242</sup> The Mellitah plant was also the target of a militant attack on May 20, 2013. Two guards were injured at the time, and weapons and vehicles were stolen from the premises.

Libya's political situation has also affected its oil output. Oil fields and refineries have become a popular stage for demonstrations against the government and oil companies, as local residents continue to express their dissatisfaction with the post-Gaddafi transition. Since November 2012, protestors have four times disrupted oil flow from Zueitina terminal in Eastern Libya—which accounts for about 20% of Libya's daily exports.<sup>243</sup> On May 31, 2013, protests by guards at the Mellitah Oil and Gas complex forced a shutdown of the plant, which produces 74,000 barrels a day.<sup>244</sup>

The precarious security situation in Libya, the threat posed by Islamists militants, and the rivalries between local militias and tribes will continue to present a challenge to the Libyan oil industry. In March 2013, a gunman attacked security forces Waha Oil Co.'s Dahra field, injuring two guards and stealing weapons and vehicles. On April 2, 2013, a blast was conducted against a Zueitina-operated pipeline—later concluded by investigators to be an act of “sabotage.”<sup>245</sup>

Consequently, developments in Libya not only point toward the importance of operational safeguards for industrial production, but also expose the importance of political stability for the sake of oil security.

## Saudi Security Forces

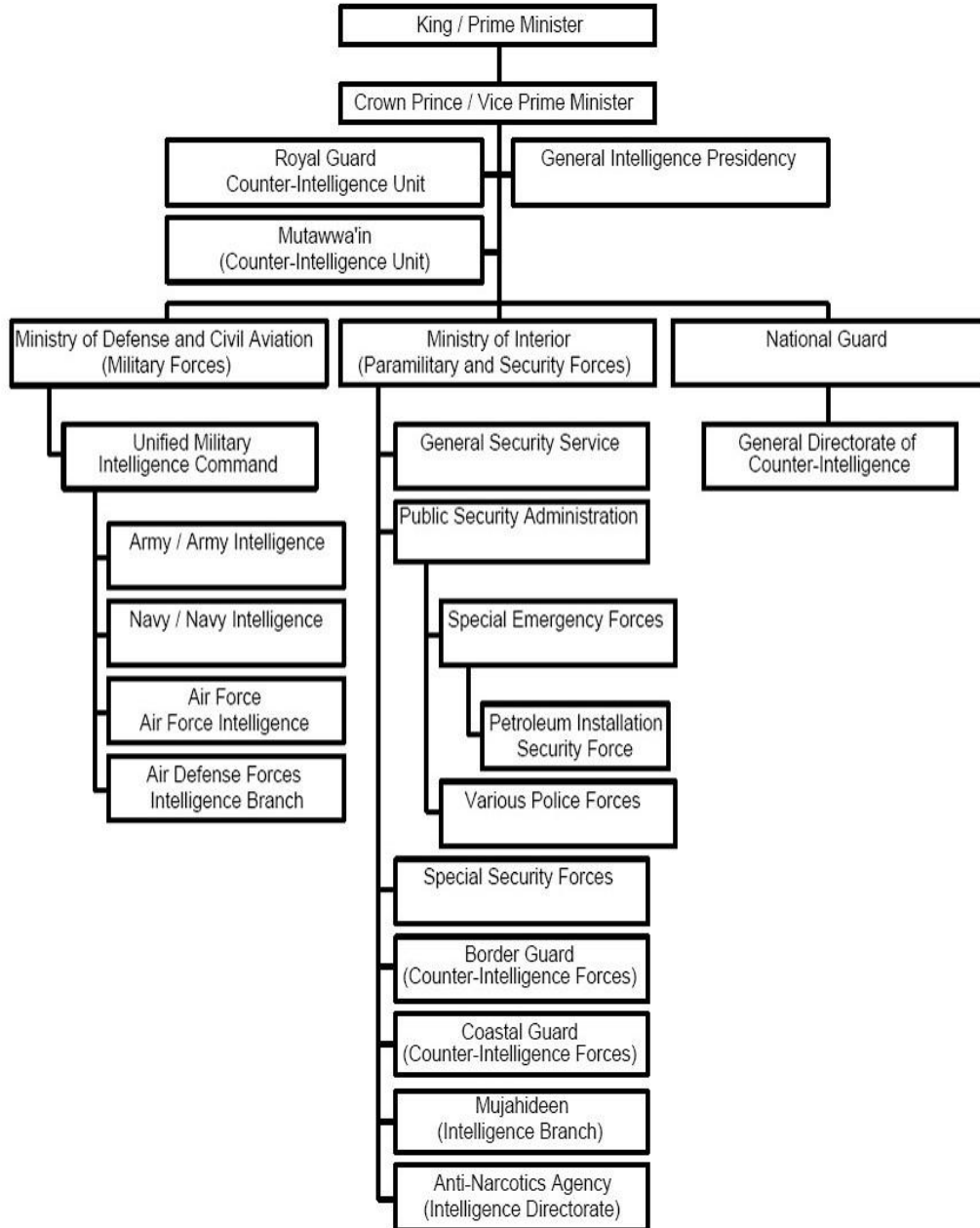
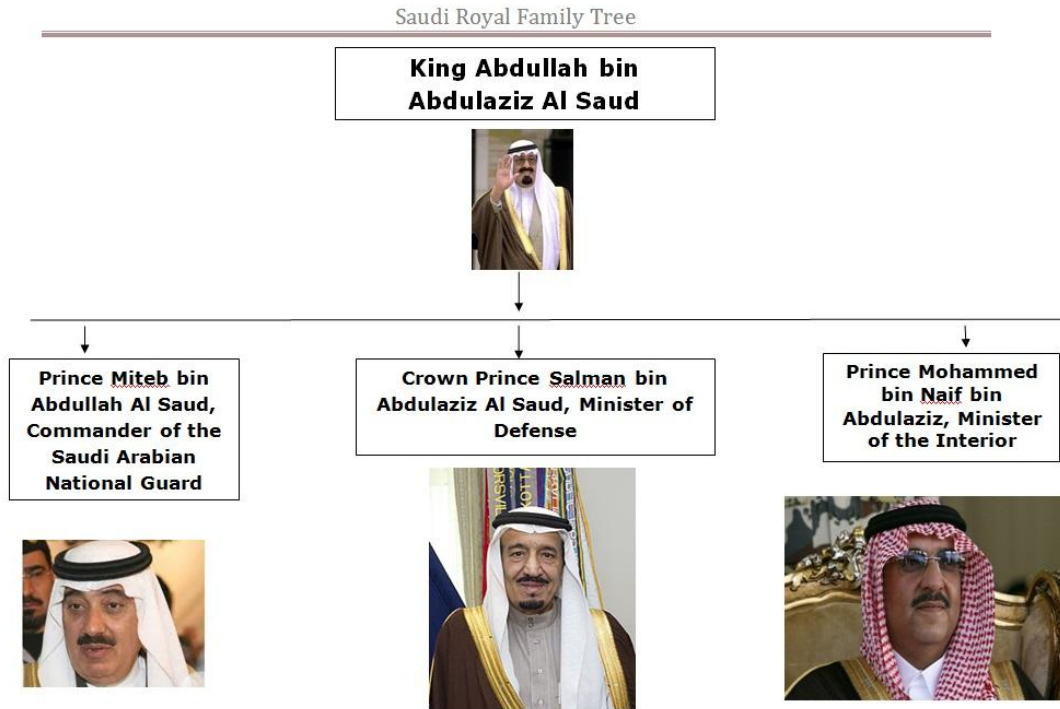


Figure 12: Saudi Arabia's Security Apparatus.<sup>246</sup>



**Figure 13:** Saudi Royal Family Tree.

Many protective measures implemented by the various security forces that guard the Kingdom's oil facilities are invisible to the naked eye and are only sprung into action in the event of an attack. Consequently, security measures can be more comprehensive than they would initially appear. The security measures include the use of several layers of forces, as well as sophisticated cameras, infrared technology and seismic sensors.<sup>247</sup> In addition, road signage leading to plants, pumps and other facilities utilizes codes comprehensible only to Aramco staff, reported an Aramco security officer.

Saudi authorities are aware of the threat posed to its oil infrastructure, and over the years, have enacted a general tightening of security precautions. Between 2002 and 2004, the Saudi government allocated approximately \$1.2 billion to increase security at all of its energy facilities.<sup>248</sup> At any one time, it is estimated that there are between 25,000 and 30,000 troops protecting the Kingdom's oil infrastructure. More recently, on 1 July 2007, Interior Minister Prince Nayef bin Abdulaziz al-Saud announced the creation of yet another security force dedicated to bolstering the security of the oil infrastructure – a force that would comprise up to 35,000 personnel.<sup>249</sup> In November 2007, the Saudi Interior Ministry announced that 9,000 personnel had already been deployed at various installations, while the rest would be added over the next few years.<sup>250</sup> US defense contractor Lockheed Martin is said to be providing training and crisis management support. The U.S. government has publicly pledged to assist Saudi Arabia in protecting

oil and gas infrastructure and enhancing Saudi border security; this was most recently affirmed during President George W. Bush's May 2008 visit to Saudi Arabia.<sup>251</sup>

In recent years however, the professionalism and competence of the existing security forces has been questioned. In March 2007, two fishermen from the island of Tarout went missing while fishing in the Persian Gulf and their bodies were found washed ashore by locals near Khobar, 30 miles to the south. The Saudi Coast Guard searched for their vessel, but only located the boat two days later.<sup>252</sup> Consequently, doubts have been cast as to the Coast Guard's ability to stop, for example, a waterborne attack against an oil facility.

The level and quality of education and training imparted to the security forces remain an area of concern. Many police and military personnel are hampered by limited schooling and tribal backgrounds, and this directly impacts their ability to fully benefit from training and carry out their mission. The poor training quality of Saudi forces was witnessed as early as 1990, during the Iraqi occupation of the Saudi border town of Khafji, which was liberated by American and Qatari forces whilst Saudi forces evaded battle altogether. More recently, National Guard forces charged with protecting the American Consulate in Jeddah fled their posts after they came under attack by Al-Qaeda militants. The incident was caught on videotape and later released on American television.<sup>253</sup>

The selection process is sectarian in nature, as the recruitment of security personnel is limited to Saudi Sunni, hence barring Saudi Shi'a from protecting oil facilities which are ironically located in Shi'a-majority areas. This angers the Shi'a community, creating an added source of tension between the government and the locals.

According to sources familiar with oil security arrangements, the Ministry of Interior successfully pressured Saudi Aramco to gain access to the latter's camera and sensor feeds that monitor the firm's vast facilities across the country. The Ministry operates its own state-of-the-art Command and Control center from its headquarters in Riyadh. It operates as the nerve center for security in Saudi Arabia, and directs the Ministry's forces' response to emergencies around the clock. Citing "A.S.", a retired Mabahith officer, the center takes the lead on all security operations and measures including those involving the forces of the Ministry of Defense and the National Guard.

There are three layers of security forces that are commanded by four different security structures: Aramco security, the forces of the Ministry of Interior, the Ministry of Defense, and the National Guard.

## **Saudi Aramco Security**

### ***Aramco Industrial Security***

Forces are armed with Taser guns and are stationed both inside the facilities as well as at perimeters and gates. They report to their own chain of command headquartered in the Aramco main offices in Dhahran, where Aramco maintains its command-and-control center. The center controls hundreds of cameras and sensors as well as Aramco's own aerial, maritime and land security patrols.<sup>254</sup>

## **Ministry of Interior Forces**

Special Security Forces, Special Emergency Forces and the Installation Protection Forces were established in 1978. These forces are armed with AK47 and MP3X series German submachine guns.<sup>255</sup>

### ***General Security Service***

This is comprised of personnel from domestic intelligence service forces, police officers, traffic police and, civil defense forces.<sup>256</sup>

### ***Installation Security Force***

Created in 1986 and numbers around 7,000 personnel armed with AK47s and light Japanese-made SUV's. They guard oil and other industrial facilities though checkpoints outside these facilities.<sup>257</sup>

### ***Mujahideen***

Formally established in 1964, they are now part of the Interior Ministry. The Mujahideen are descendants of the men who fought alongside the forces of Saudi Arabia's founder, King Abdulaziz al-Saud to conquer most of Arabia. The Saudi government arms the Mujahideen to guard those sections of the infrastructure where the government can rely on tribal loyalty with branches in Mecca, the Eastern Province, and Jazin. These forces are armed with AK47s, G3 rifles and jeeps. Mujahideen guard government installations, oil facilities in the Eastern Province, assist in border patrols along the Yemeni frontier, and provides at least 4,000 guards for the Hajj.<sup>258</sup>

### ***The Border and Coast Guard***

Both of which are divisions of the Interior Ministry forces, assist in patrols outside oil facilities. They are equipped with Japanese four-wheel-drive trucks and are armed with AK47's and German-made submachine guns.<sup>259</sup>

### ***Interior Ministry Special Forces***

Established in 1962 to protect Crown Prince Faisal but were reconfigured in 1964 to be part of the Interior Ministry. In 1978 they were named Special Forces with the task of protecting the headquarters of the Interior Ministry and senior officials.<sup>260</sup>

### ***Road Safety Forces***

Formed in 1990 and tasked with protecting highway safety but have also assisted in the provision of oil installation security. They are equipped with four-wheel drive vehicles, and armed with handguns and automatic rifles. These forces set up checkpoints on major highways and conduct patrols.<sup>261</sup>

### ***General Directorate of Investigations***

Also known as the *Mabahith*, is the Saudi equivalent of the FBI, and was established in 1960. They are a branch of the Interior Ministry and their director reports to Mohamed bin Nayef, assistant to the Interior Minister. The *Mabahith* plays a significant role in providing intelligence on, and surveillance of, violent groups. Their work is seen as key to the success of other Saudi security forces in thwarting a multitude of threats against the government and its entities. They are credited with discovering and thwarting the plot involving seven militant cells which were arrested in April 2007, who planned to hijack civilian airliners and crash them into oil facilities. The *Mabahith* is among the largest investigative apparatuses in the Middle East and runs its own prison system.<sup>262</sup>

## **Ministry of Defense Forces**

### ***Navy***

Specialized brigades number around 15,000 personnel.<sup>263</sup> They protect the gates of oil facilities, establish checkpoints, and patrol the outskirts of oil facilities. They are equipped with American-made Humvees and are armed with truck mounted machineguns and AK47s.<sup>264</sup>

### ***Army***

Forces armed with Humvee-mounted machine guns patrol the outskirts and entrances of major oil and energy facilities.<sup>265</sup>

## **National Guard Forces**

These play a major role in internal security, including guarding vital facilities across the country such as oil installations. The Guards' Security Patrol Unit, which was established in 1977, is tasked with providing security support by patrolling the parameters of installations. They are armed with Saudi-manufactured G3 automatic rifles, and equipped with American-made trucks.<sup>266</sup>

## Recommendations

1. There are a large number of stakeholders in the security of the Saudi oil infrastructure, especially the major importers of Saudi crude oil – the United States, Western European states and the important developing Asian economies, among others. Consequently, it would behoove these nations to jointly examine ways to contribute to Saudi oil security. The formation of an informal international panel – comprising the above-mentioned countries – to review Saudi oil security measures could help in this regard. The International Energy Forum (headquartered in Riyadh) already acts as a forum linking consumers and producers to discuss the larger issues of energy demand, supply and conservation; a similar organization dedicated to improving physical security of wells, refineries, pipelines, processing facilities and export terminals is suggested.
2. Training of security forces protecting the oil facilities must be improved.
3. Heavier-grade weaponry must be provided to the security forces to deter suicide attacks.
4. The number of guards must be increased to prevent an overpowering of forces at any one location.
5. Religious and regional affiliation must be disregarded as a recruitment criterion vis-à-vis the security forces. Shi'a Saudi-s must be equitably included in the hiring of security personnel, as a long-term deterrence against attacks.
6. Security parameters have to be re-considered with a special eye to dealing with car bombs and large-scale attacks.
7. At a macro-level, the security of oil installations, and the country as a whole, is contingent on societal reform and progressive development. The introduction of genuine political, social and economic reforms will benefit all citizens including the Shi'a minority.
8. Oil companies can create foundations to fund social and charitable programs that benefit and build citizens' loyalty to the oil companies and its facilities. Consequently, local communities are given a greater stake in the security of the oil infrastructure and the well-being of its employees.
9. The creation of a unified Saudi missile defense command should be a priority. Additionally anti-missile systems should be significantly and immediately expanded, with programs like SAUD Naval-II accelerated to completion.
10. Due to the geographic and physical nature of a missile attack in the Gulf it is



imperative that Saudi Arabia integrates its systems and measures within a wider regional apparatus. The Gulf Cooperation Council (GCC) is the ideal vehicle for such an effort.

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