Thomson Reuters
Strait of Hormuz – The Aorta of global oil flows

July 2018

Oil Research
Dubai

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Ranjith Raja
Senior Analyst, Oil Research
Ranjith.Raja@thomsonreuters.com
+971 4 453 6215

Giorgos Beleris
Oil Research Manager, MENA
Giorgos.Beleris@thomsonreuters.com
+971 4 453 6522

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SUMMARY

The Strait of Hormuz, the most critical waterway in the world, funnels 18.3 million bpd of crude and condensate oil from OPEC's top five members. The strait has repeatedly been used as a leveraging point by Iran, which has threatened to shut the passage in case the country's oil exports are restricted in way of sanctions imposed by the US administration. Thomson Reuters Oil Research analyses Iran's capacity and authority to close the narrow passage, which partly consists of Iranian territorial waters and has seen more than 6,000 oil & LNG tankers crossing in the first half of the year. The team also seeks to assess the impact a closure would have on the shipping and oil industry, as the global economy remains strongly attached to the supply of oil.

The prolonged closure of the Strait of Hormuz seems rather unlikely as oil importing nations and the UN would be categorically against such actions, possibly triggering more than a vocal response against Iran. Short-term disruptions however, are very likely in case Iran seeks to challenge the free passage of oil tankers. Risk premiums would rise for oil prices and shipping costs, with heightened tensions that could lead to armed conflict.

HIGHLIGHTS

- H1 2018 saw 18.3 million bpd of crude and condensate oil, almost 800,000 bpd of fuel oil, more than 400,000 MT/day of refined products and more than 500,000 m^3/day of LNG exiting the Arab Gulf on average. Oil and LNG tankers alone were counted at more than 6,000 for the same period of time.

- The IMO has defined Traffic Separation Schemes that regulate traffic of ships in narrow straits. The UN has granted the right of transit passage for cases where such straits overlap with territorial waters.

- Iran's administration had agreed to the UN's resolution, however the Islamic Republic's parliament has yet to ratify the United Nations' Convention on the Law of the Sea, signed on December 1982.

- Waivers on importers of Iranian oil could lead the situation to a pre-2016 status, where the country had established a baseline of crude oil exports, which was however capped at around one million bpd.

- Military action as a result of a forceful closure of the Strait of Hormuz is likely to send oil prices to unprecedented levels, paralysing the global oil supply chain. Action from affected countries, with direct impact on their economies, will likely be very swift, restoring normality on oil flows out of the Middle East.

- Aggregated alternate export capacity from the UAE and Saudi Arabia stands at 4.9 million bpd, which would still leave the world with a massive disruption of 14.6 million bpd.

GEOGRAPHIC SIGNIFICANCE OF THE STRAIT

The Strait of Hormuz is of immense significance primarily due to the huge volume of petroleum products transiting through, its geographical location and the characteristics of the navigable waters. With the revival of US sanctions on Iranian oil exports and the constant emphasis by the Trump administration on bringing Iranian crude exports to 'zero', geopolitical tensions have re-ignited and are at a heightened level.

The Iranian President, followed by officials of the Islamic Revolutionary Guards Corp (IRGC), have hinted that the country will try to close the Strait of Hormuz and stop all exports from the region, if Iranian oil is not allowed to be exported. Although this is not the first such threat from Iran, Thomson Reuters Oil Research assesses the implication to oil flows from the region if Iran forcibly closes the strait.

With OPEC's top five exporters present inside the Arab Gulf, the volume of oil recorded to be crossing the strait has been constantly increasing each year. Based on oil flows data assessed by Thomson Reuters Oil Research, exports of crude and petroleum products exiting the Gulf via the Strait of Hormuz between January and June 2018, is approximately 21.73 million bpd, compared to the 2016 EIA estimate of 18.5 million bpd. Crude and condensate volumes accounted for 84% of the total petroleum exports from the region.

Table 1: Oil / Gas exports crossing the strait (2018)

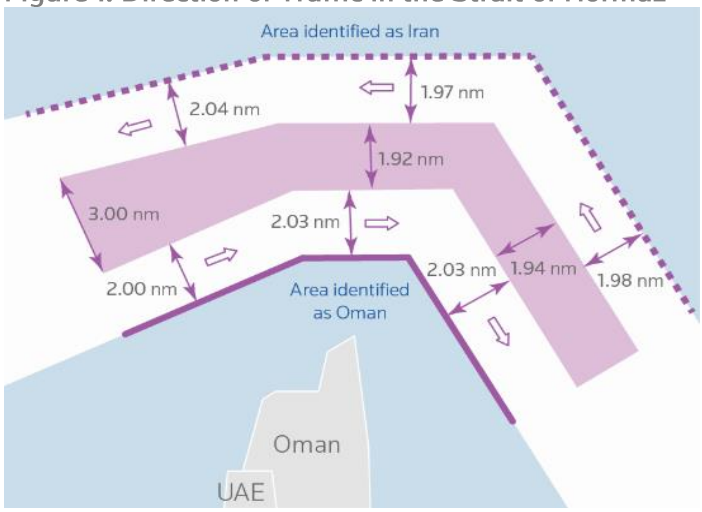
	Volume	Unit
Crude / Condensate	18,294,371	bpd
Fuel Oil	787,734	bpd
Clean Products	406,992	MT/day
LNG	506,339	m^3/day

**Assessments are based on exports from Jan-June 2018*
Source: Thomson Reuters Oil Research

The Strait of Hormuz is considered the most important chokepoint for global oil trade and is located in a narrow stretch between Oman and Iran. The strait connects the Arab Gulf to the Gulf of Oman and the Arabian Sea. At its narrowest point, the strait is 20.7 nautical miles (nm) wide. However, all vessels transiting in or out of the Gulf will have to follow the traffic lanes established by the International Maritime Organization (IMO).

Inbound vessels have to remain on the North & East segment of the channel, along the coast of Iran, while outbound vessels have to remain South & West, along the coast of Oman. Both traffic lanes are about 2 nm wide with a separation zone in between, of 2 nm as well. Vessels are not allowed to navigate within the separation zone except in the event of an emergency, hence the safe navigable width of the Traffic Separation Scheme (TSS) is around 2 nm either way.

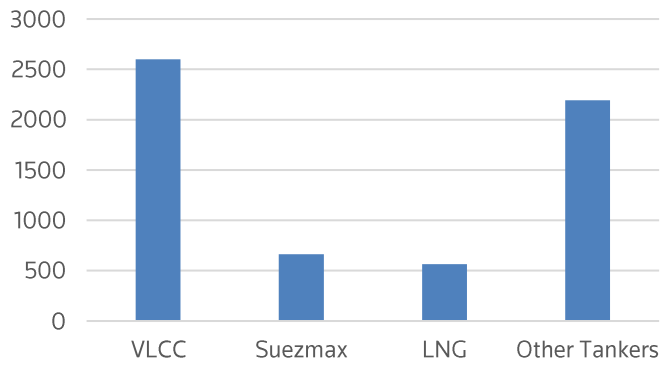
Figure 1: Direction of Traffic in the Strait of Hormuz



Source: Thomson Reuters Oil Research

Due to oil market economics and supply abundance, the strait is the most frequented waterway by Very Large Crude Carriers (VLCC), each with a capacity of about 2 million bbls. Based on vessel tracking data by Thomson Reuters Oil Research, an estimated 2,600 fully laden VLCCs have departed from the Gulf in the first half of 2018.

Figure 2: Vessels transiting Strait of Hormuz (by Type)



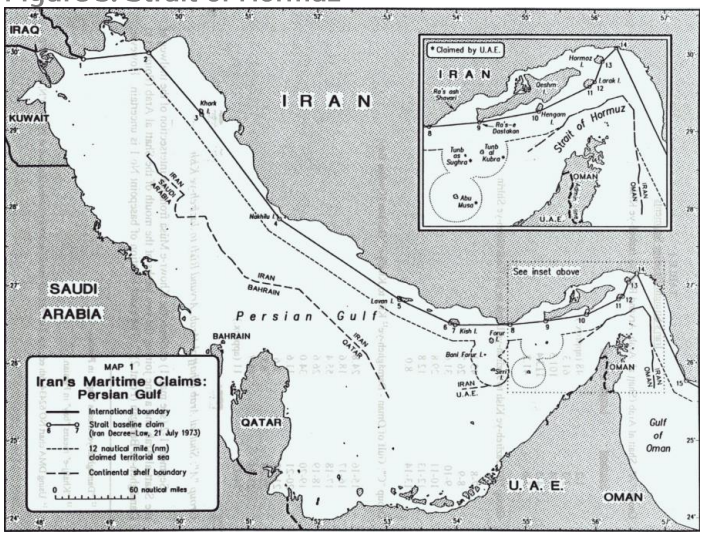
**Assessments are based on exports from Jan-June 2018*
Source: Thomson Reuters Oil Research

More than 6,000 oil and LNG tankers exited the Gulf via the Strait of Hormuz in H1 2018. If we account for traffic of container ships, dry bulk carriers, LPG tankers, RORO, passenger vessels and small shuttle vessels the result of closing the strait will not only have a regional economic impact, but will put the global trade in disarray. However, this is not as straight forward as it may sound since the action to disrupt or close the traffic is bound to be associated with repercussions and a strong resistance primarily from the Gulf Cooperation Council (GCC) and the US as well as nations in Europe and Asia.

CAN THE STRAIT BE CLOSED?

In order to answer this question, it is important to understand how the United Nations' Convention on the Law of the Sea, signed on December 1982, perceives the Constitutions for the Oceans. This convention defines "Territorial waters" to a maximum of 12 nautical miles beyond each country's coastline. Although, all foreign flagged vessels have the right of innocent passage in cases where territorial waters comprise of straits that are used for International navigation, such as the Strait of Hormuz. The right of transit passage for foreign flagged vessels are strengthened further placing fewer restrictions on such ships.

Figure 3: Strait of Hormuz



Source: US Dept. of State Bureau of Oceans and International Environmental and Scientific Affairs

For ships transiting such areas, the International Maritime Organization (IMO) has established Traffic Separation Schemes (TSS), which regulate the direction of traffic for ships transiting the zone with a separation zone between the main traffic lanes. For most TSS, the zone between the traffic lane and the coast is called the 'Inshore Traffic Zone' which is unregulated and vessels are advised to avoid these zones for navigation except in cases of emergency.

For the Strait of Hormuz, all waters to the North and East of the traffic lane will form part of the inshore traffic zone within the Iranian territorial waters, which can be easily closed for navigation by the Islamic Republic. However, waters to the South and West of the lane will form a part of Omani territorial waters, but due to the presence of small scattered islands and the lack of sufficient width and depth of navigable water, it will not be possible for big ships to transit except to follow the traffic lane.

It will also be interesting to see how the UN convention is being interpreted by Iran and the US regarding the 'Right to Transit'. Although Iran's government has signed the 1982 UN convention, their parliament has not approved it. At the time of signing the convention, Iranian delegates had made a statement on the interpretative declaration on the subject of straits that the Right of Transit passage through straits used for international navigation shall apply only for states which are parties to the Law of the Sea convention. Since the United States is not a signatory to the UN convention, the Islamic Republic could sight that as a probable cause for restricting vessels bound to the US. However, most of the vessels which carry the crude are not registered in the US and hence do not provide a valid reason for Iran to impede the Right to Transit, as the most common flag states are a party to the convention.

In terms of practical feasibility, although Iran has indicated their readiness and capability to disrupt the regional crude shipments in the Strait of Hormuz, it must be clear that the Islamic Republic is jeopardizing its own economy which is as much dependent on the Right of Free Passage through the strait. Most of the major ports for Iran are situated inside the Gulf and would face similar disruptions as other GCC members. As for Iran capacity to physically challenge any vessel transiting the strait, either in terms of an attack or stopping the transit, the extent of disruption or closure to impact oil trade will depend on the gravity of actions taken. A swift deployment of Iranian military assets would create a crisis for a few weeks. The strait will probably be shut down temporarily on safety concerns from other ship owners or operators until the UN or other military forces stave off any immediate danger for the marine traffic.

In short, it is not possible for Iran to close the strait sighting legal reasons. However, Iran has the ability to mobilize and implement alternate strategies if they decide to intentionally disrupt the flow of traffic through the strait.

MILITARY OPTIONS FOR IRAN TO DISRUPT TRAFFIC IN THE STRAIT

In the Political – Military analysis of the Strait of Hormuz carried out by the Lyndon B. Johnson School of public affairs, a detailed review of the weapons that can be used by Iran to threaten tankers transiting the strait and the probable success rate for each of those options are discussed. According to that project report, the following are deemed to be the most effective options:

I. ***Small Boat Attack*** – Iran is known to have used the small speedboats extensively during the 1980's war with Iraq to damage vessels, using RPG's, machine guns or simply a suicide attack to incapacitate a ship crossing the strait. According to the report, the IRGC patrol boats have the highest probability of success at 18.7% when the transiting ships have no defensive measures and a mere 3.8% when all defensive

measures are in place and a protection convoy is carried out by warships.

II. ***Missiles*** – The Anti-ship cruise missiles (ASCM) are known to have a better range, higher accuracy and capability for mass application compared to alternate options. However according to the report, Iran does not possess the capability to launch ASCM's by air and hence will be more land based. Since the ASCM's are designed to attack warships and not oil tankers, the success rate for ships to be decisively damaged or sunk based on the 1980's war data is estimated at 23%.

III. ***Mines*** – While the deployment methods and types have been discussed extensively in the project report, the bottom mines have been proven to be ineffective due to the depth of the strait exceeding the effective damage radius of the mines. According to the analysis, even in the best case scenario of deploying over 1000 mines, the expected hits to neutralise or sink a vessel are at about 4 vessels. However, this option is expected to create a disruption more due to the psychological fear of ship crews and owners rather than an actual damage to incapacitate the ships.

Any intentional disruption to the flow of traffic through the strait by any of the above means, will be a direct failure to comply with the UN convention. This will result in deepening the hostility prevailing in the region and will have to face the brunt of many nations.

IMPACT ON SHIPPING & OIL FLOWS

WAR RISK AREA

Any action by Iran to intentionally hamper the safety of vessels transiting the strait will immediately categorize the Hormuz strait as a 'War Risk' zone by marine insurers. According to one of the insurance clubs, currently within the Arab Gulf – Iran, Iraq and Saudi Arabia including their territorial waters – are listed under "Perceived Enhanced Risk" which will require the ship owners to take the required War Risk insurance while calling ports in the respective countries. However, if the perceived threat or the situation escalates, then it is highly likely that most of the insurers will increase the premiums that ship owners will need to take as an additional cover to protect their assets while transiting through the straits. This is similar to how the premiums for vessels transiting the Gulf of Aden increased due to the increase in piracy and attacks on ships transiting the zone.

POSSIBLE SCENARIOS

There are two scenarios which can pan out of the current situation according to Thomson Reuters Oil Research.

- ***Return to the pre-2016 status*** – In spite of past threats to shut the strait, no action has been taken since the Iran-Iraq war, as the country was still allowed to export limited crude oil volumes, supporting its ailing economy. Although this could be attributed to the way the US government has negotiated previously, it could be rather different this time around, considering the current administration is keen to enforce the sanctions to the highest effect. However, recently the US appears to be considering waivers for some countries that import Iranian crude oil.

  In the event Iran is allowed a baseline level of crude oil exports, similar to previous sanction levels, combined with higher refinery input needs and crude oil deliveries to Iraq and Russia, the actual loss in export quantities will be mitigated. Iran is revamping its refining industry to achieve self-sufficiency in gasoline supply, a long-standing pain-point. The country has inked an oil-for-goods agreement with Russia and an oil swap deal with Iraq, which has become a significant trade counterpart. Hence, the situation could return to the pre-2016 status, whereby the trade continues as usual without any disruptions of trade flows. We find this scenario as the most likely, assuming that the US will issue wavers to a number of countries.

- ***Iran takes military action*** – Unlike last time, if the Islamic Republic decides to show its strength by physically impairing vessels by any of the means discussed earlier or by repositioning the National Iranian Tanker Company (NITC) fleet to block the strait, we can expect a full show of force in retaliation by many countries affected by a disruption in oil flows. While this may create chaos and uncertainty in the short term, it is unlikely Iran would be able to keep blocking the strait for a prolonged period.

  Oil prices would soar to unprecedented levels and nations like the US, Europe and China would have to activate their Strategic Petroleum Reserves, in order to mitigate the effect on their economies. As a lot of the advanced economies have forward coverage of up to 90 days, if not more, a swift operation to re-open the Strait could be put in place with many countries likely to join such a coalition as the industrial backbone of our planet would paralyze.

Figure 4: US Military bases near Iran

Source: Worldwide Web

In the event that Iran decides to take the military route to disrupt the flow of traffic in the strait, the first counter measure is expected to be from the US military bases that are present in the region. Some of the most prominent US bases in the region are:

- Bahrain Naval base – The US 5th fleet has remained at this location and is headquartered in the Juffair area of Manama, Bahrain. More than 2,000 US troops in Bahrain monitor the Gulf and provide security for commercial maritime traffic
- Camp As Sayliyah – This is the largest pre-positioning base outside the US, located on the outskirts of Doha, Qatar. This facility is for both the Army and the Air Force and the primary reason for this installation was to contribute to the National Security Strategy that calls for the rapid deployment and forward presence in the area.
- Jebel Ali / Fujairah – These are the preferred ports of call for US Navy ships in the Gulf and the most frequented among ports outside the US. Jebel Ali also serves as the surface hub logistics site for the United States Naval Forces Central Command (NAVCENT). The Jebel Ali – Fujairah land link is the Navy's pipeline to the Gulf should the Strait of Hormuz be closed. The US Naval security force in Fujairah was mobilized in 2004.
- Kuwait – Ali Al Salem acts as the Military airbase for the 386th Air Expeditionary Wing of the US Air Force, while the Ahmed Al Jaber installation has sections designed for use by the US Air Force. The Arifjan installation acts as the forward logistics hub for the US Air Force, US Navy, US Marine Corps and the US Coast Guard.

ALTERNATE LOAD POINTS TO BY-PASS HORMUZ STRAIT

In the event that there is a disruption stopping vessels from transiting the Strait, only the United Arab Emirates (UAE) and Saudi Arabia have alternate loading points outside the Arab Gulf. For the UAE, the Abu Dhabi crude oil pipeline connects the Emirate's oil fields to Fujairah, where there are three SPM's operated by ADCO, with a maximum loading rate of 80,000 bbl/hr. According to 2016 EIA data, this pipeline is expected to have an unused capacity of 1 million bpd *(Refer to Infographic)*.

Similarly, for Saudi Arabia, the alternate load point would be at the Red Sea port of Yanbu, which is connected through the East-West pipeline running across the Kingdom. According to 2016 EIA data, this has an unused capacity of 2.9 million bpd *(Refer Infographic)*. There are four crude berths operated by Saudi Aramco in Yanbu which are equipped with four loading arms, each with a capacity of 32,500 bbl/hr, giving a maximum capacity at the berth of 130,000 bbl/hr.

Aggregated alternate export capacity from the UAE and Saudi Arabia stands at 4.9 million bpd, which would still leave the world with a huge disruption of 14.6 million bpd of primarily medium grade crude oil, which is in high demand among multiple refiners in Asia, Europe and the US. This would prove to be a catastrophic scenario for the global oil supply chain as this is multiple times the spare capacity countries outside the Gulf have.

CONCLUSION

Overall, it would be very hard for Iran to forcibly close the Strait of Hormuz for a prolonged period of time, an action which would go against the UN and would likely spark a polyphonic response from many countries affected. Regardless, the country has the means to create a disruption and increase risk premiums for both oil prices and shipping rates. Risk premium, which could rise to unprecedented levels, will likely remain in place for a longer period in case an armed conflict manifests, albeit militaries from multiple nations will rush to protect the transit of oil & gas, accompanying the commercial vessels in and out of the Gulf, therefore mitigating the possibility of any actual supply disruption.

Transiting of Oil & Gas through the **Strait of Hormuz (January to June 2018)**

Pipeline capacity for bypassing the Strait of Hormuz (As of 2016)

Pipeline Name	Country	Status	Capacity	Throughput	Unused capacity
Petroline (East-West Pipeline)	Saudi Arabia	Operating	4.8	1.9	2.9
Abu Dhabi Crude Oil Pipeline	UAE	Operating	1.5	0.5	1.0
Abqaiq-Yanbu Natural Gas Liquid Pipepline	Saudi Arabia	Operating	0.5	0.3	0.0
Total			6.6	2.7	3.9

Note. All estimates expressed in million barrels per day (mmbpd).
Unused capacity is defined as pipeline capacity that is not currently used but can be readily available.
Sources. U.S. Energy Information Administration, Lloyd's List Intelligence.

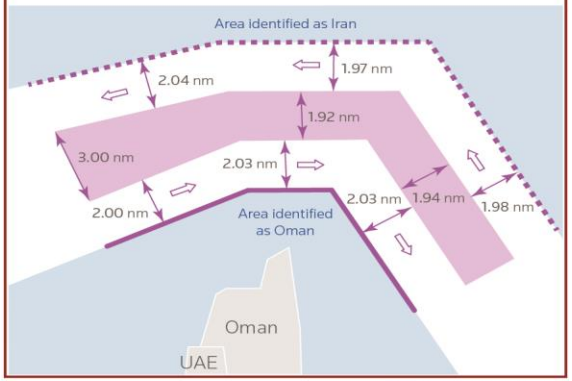
Number of vessels transiting the Strait of Hormuz

VLCC	2,601
Suezmax	663
LNG	564
Other Tankers	2,192

Oil & Gas exports from the region

Crude/Condensate	18.29 million bpd
Fuel Oil	787,700 bpd
CPP	407,000 MT/day
LNG	506,355 m^3/day

Traffic Separation Schemes (TSS) in the Strait of Hormuz



Note. 'nm' = nautical miles

Source: Thomson Reuters Oil Research
Visualisation by **Applied Innovation**

CONTACT LIST THOMSON REUTERS OIL RESEARCH MENA

Shakil Begg – Head of Oil Research
Shakil.Begg@thomsonreuters.com
+44(0) 20 7542 2028

Fabrice Tayot – Head of Commodities Market Development – Emerging countries
Fabrice.Tayot@thomsonreuters.com
+971 (0)43 918 300

Giorgos Beleris – Oil Research Manager, MENA
Giorgos.Beleris@thomsonreuters.com
+971 (0)44 536 522

Capt. Ranjith Raja – Senior Analyst, Oil Research
Ranjith.Raja@thomsonreuters.com
+971 (0)44 536 215

Annkit Agarwal – Analyst, Oil Research
Annkit.Agarwal@thomsonreuters.com
+971 (0)44 536 631

Mohammed Yasser – Junior Analyst, Oil Research
Mohammed.Yasser@thomsonreuters.com
+971 (0) 44 536 709

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