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United States Government Accountability Office
Washington, DC 20548

March 23, 2010

The Honorable Joseph I. Lieberman
Chairman
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Jon Kyl
Ranking Member
Subcommittee on Terrorism and Homeland Security
Committee on the Judiciary
United States Senate

Subject: *Firms Reported in Open Sources as Having Commercial Activity in Iran's Oil, Gas, and Petrochemical Sectors*

Iran's oil and gas industry is vital to its economy and government. Oil export revenues have accounted for more than 24 percent of Iran's gross domestic product and between 50 and 76 percent of the Iranian government's revenues in recent years.¹ Iran has the world's third largest oil reserves and second largest gas reserves, according to the Congressional Research Service (CRS), and is the world's fourth largest producer of crude oil, according to the Central Intelligence Agency (CIA) World Factbook.² However, Iran has not reached peak crude oil production levels since 1978, does not produce sufficient natural gas for domestic use, and lacks the refining capacity to meet domestic demand for gasoline, according to the Department of Energy (DOE) and IHS Global Insight.³ IHS Global Insight reports that Iran's priorities for the next five years are to (1) raise oil production and exports as much as possible, (2) increase natural gas production for domestic use, and (3) expand refining capacity if financially and technically possible. CRS reported that the Deputy Minister of the National Iranian Oil Company said in November 2008 that Iran would need about \$145 billion in new investment over the next 10 years to build a thriving energy sector. Accordingly, Iran is seeking the participation of foreign firms in providing financing and technical assistance in numerous oil, gas, and petrochemical

¹Based on International Monetary Fund (IMF) data from 2005 to 2008, and data from the Economist Intelligence Unit (*The Economist*), Iran Country Report (Dec. 8, 2009).

²Central Intelligence Agency, World Factbook, <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2173rank.html?cou>, accessed on February 18, 2010.

³IHS Global Insight provides economic and financial information for the energy industry on a contract basis, including analysis and forecasting for the Iranian oil, gas, and petrochemical sectors discussed in this report.

projects, according to DOE. Although Iran prohibits non-Iranian firms from obtaining an ownership interest by investing in oil and gas fields, Iran allows them to enter into “buy-back” arrangements in which the foreign firms may receive entitlements to oil or gas for a limited time in exchange for the funds they expend on the project, according to DOE.⁴

U.S. law restricts U.S. firms from investing in Iran’s energy sector through a variety of sanctions administered by the Department of the Treasury to discourage Iran from supporting terrorism and developing nuclear weapons.⁵ In addition, the Iran Sanctions Act, as amended, provides for sanctions against persons, including foreign firms, who invest more than \$20 million in Iran’s energy sector in any 12-month period.⁶ For example, the Act allows the President, who delegated authority under the Act to the Secretary of State, to restrict loans to sanctioned firms and ban them from U.S. government procurement.⁷ The Secretary of State may waive the sanctions if the Secretary determines that it is important to the national interests of the United States to do so.⁸ For example, in 1998, the Secretary of State waived sanctions against a consortium of foreign firms due, in part, to the high level of cooperation with the European Union on counterproliferation and counterterrorism efforts involving Iran.⁹ See enclosure IV for more on the Iran Sanctions Act.

Our December 2007 report on Iran sanctions included a list of foreign firms potentially investing in Iran’s energy sector from 2003 to 2007.¹⁰ In 2009, a majority of members of Congress sponsored the Iran Refined Petroleum Sanctions Act of 2009, which would impose sanctions against firms that export gasoline and other

⁴Foreign firms typically hand over operations to the National Iranian Oil Company after the development phase, according to DOE.

⁵See e.g. Exec. Order 13,059, 62 Fed. Reg. 44,531 (Aug. 19, 1997).

⁶Iran-Libya Sanctions Act of 1996, Pub. L. No. 104-172, § 5, 110 Stat. 1541, 1543 as amended. The act also allows for sanctions against persons providing goods, technology, or services to Iran knowing that such provision would contribute materially to Iran’s ability to acquire or develop chemical, biological, or nuclear weapons or related technologies; or acquire or develop destabilizing numbers and types of advanced conventional weapons.

⁷Pub. L. No. 104-172, § 6; Memorandum: Delegation of Responsibilities Under the Iran and Libya Sanctions Act of 1996, 61 Fed. Reg. 64,249 (Nov. 21, 1996). Other sanctions include a denial of Export-Import Bank assistance, a ban on issuing licenses to export controlled technologies to the sanctioned firm, and other sanctions that fall under the powers of the International Emergency Economic Powers Act (IEEPA).

⁸Pub. L. No. 104-172, § 9; 61 Fed. Reg. 64,249.

⁹This instance was the first and only time that the United States has publicly made a determination that a firm’s investment violated the Iran Sanctions Act.

¹⁰GAO, *Iran Sanctions: Impact in Furthering U.S. Objectives Is Unclear and Should Be Reviewed*, GAO-08-58 (Washington, D.C.: Dec. 18, 2007).

refined petroleum products to Iran.¹¹ As of March 2010, Congress was considering this proposed legislation. This correspondence (1) provides a list of foreign firms reported in open sources as engaging in commercial activity in Iran's oil, gas, or petrochemical sectors from 2005 to 2009 and (2) provides information about these sectors.¹² We define commercial activity as having signed an agreement to conduct business, invested capital, or received payment for the provision of goods or services in the Iranian oil, gas, or petrochemical sectors. We did not review the contracts and documents underlying these transactions and did not independently verify these transactions. We did not attempt to determine whether the firms in this list meet the legal criteria for an investment specified in the Iran Sanctions Act. The Secretary of State is responsible for making such determinations.

To accomplish our objectives, we reviewed open source information, including industry standard trade publications and corporate statements. We listed a firm as having commercial activity in Iran's oil, gas, or petrochemical sectors if three reputable industry publications or the firm's corporate statements reported the firm to have signed an agreement to conduct business; invested capital; or received payment for providing goods or services in connection with a specific Iranian oil, gas, or petrochemical project. We provided the firms on our list an opportunity to comment on the information in our table. While we obtained information from DOE, the Department of State, and U.S. intelligence agencies, we used only open source data for this report. See enclosure I for a full description of our scope and methodology.

We conducted our work from September 2009 to March 2010 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objective. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objective and discuss any limitations in our work.

Forty-One Foreign Firms Had Commercial Activity in Iran's Oil, Gas, or Petrochemical Sectors from 2005 to 2009, According to Open Source Information

Based on our review of open source information, we identified 41 foreign firms that had commercial activity in the development of the Iranian oil, gas, and petrochemical sectors from 2005 to 2009. These firms are listed in table 1. Open source information stated that these firms supported activities throughout Iran that involved the exploration and development of oil and gas, petroleum refining, or petrochemicals, including the construction of pipelines and tankers for the transport of oil or gas. (See figure 1 for a map of Iranian oil, gas, and

¹¹Iran Refined Petroleum Sanctions Act of 2009, H.R. 2194, 111th Cong. (2009). We will issue an additional report on firms that export refined petroleum products to Iran.

¹²We present the activities from what are considered "upstream" sectors, such as drilling for oil, to "downstream" sectors, such as exporting refined products in tankers.

petrochemical activities). According to the open source information, the firms provide technical expertise, equipment, or funding that enables Iran to increase the productive capacity and profitability of its oil, gas, and petrochemical sectors. See enclosure II for a more detailed description of the firms' reported activities in Iran, and see enclosure III for a glossary of terms used in this report.

The following table presents information gathered from reputable industry standard publications and firms' public statements. We did not attempt to determine whether the firms in this list meet the legal criteria specified in the Iran Sanctions Act.

Table 1: Foreign Firms' Publicly Reported to Have Commercial Activity in the Iranian Oil, Gas, or Petrochemical Sectors

Firm	Country ^a	Sector
1. ABB Lummus	Not applicable ^b	Refining, petrochemicals
2. Amona	Malaysia	Oil exploration and production
3. Belneftekhim	Belarus	Oil exploration and production
4. China National Offshore Oil Corporation	China	Natural gas
5. China National Petroleum Corporation	China	Oil exploration and production, natural gas
6. Costain Oil, Gas & Process Ltd.	United Kingdom	Natural gas
7. Daelim	South Korea	Natural gas
8. Daewoo Shipbuilding & Marine Engineering	South Korea	Oil tankers
9. Edison	Italy	Oil exploration and production
10. ENI	Italy	Oil exploration and production
11. Gazprom	Russia	Oil exploration and production, pipeline
12. GS	South Korea	Natural gas
13. Haldor Topsoe	Denmark	Refining
14. Hinduja	United Kingdom	Oil exploration and production, natural gas
15. Hyundai Heavy Industries	South Korea	Oil tankers
16. INA	Croatia	Oil exploration and production, natural gas
17. Indian Oil Corporation	India	Natural gas
18. Inpex	Japan	Oil exploration and production
19. JGC Corporation	Japan	Refining
20. Lukoil	Russia	Oil exploration and production
21. LyondelBasell	Netherlands	Petrochemicals
22. Oil India Ltd.	India	Natural gas
23. Oil and Natural Gas Corporation	India	Oil exploration and production, natural gas
24. OMV	Austria	Natural gas
25. ONGC Videsh Ltd.	India	Natural gas
26. Petrobras	Brazil	Oil exploration and production
27. Petrofield	Malaysia	Natural gas
28. Petroleos de Venezuela S.A.	Venezuela	Natural gas
29. Petronet LNG	India	Natural gas
30. PGNiG	Poland	Natural gas
31. PTT Exploration & Production	Thailand	Natural gas
32. Repsol	Spain	Natural gas
33. Royal Dutch Shell	Netherlands	Natural gas
34. Sinopec	China	Oil exploration and production, refining
35. SKS Ventures	Malaysia	Natural gas
36. Snamprogetti	Italy	Pipeline
37. StatoilHydro	Norway	Oil exploration and production, natural gas
38. Tecnimont	Italy	Petrochemicals
39. Total	France	Natural gas
40. Turkish Petroleum Company	Turkey	Natural gas
41. Uhde	Germany	Petrochemicals

Source: GAO analysis of open source information.

^aThe country listed is the physical location of the firm as reported in open sources.

^bABB Lummus no longer exists as a firm. ABB of Switzerland sold the Lummus Group in 2007 to Chicago Bridge and Iron Company (CB&I) of the United States. ABB and CB&I told us they no longer have commercial activity in Iran.

Figure 1: Map of Iranian Oil, Gas, and Petrochemical Activities



Source: GAO analysis of U.S. Department of Energy data.

Foreign Firms Are Reportedly Supporting Multiple Iranian Oil, Gas, or Petrochemical Sector Activities

According to open sources, foreign firms are supporting Iranian activities in oil and gas exploration and production, refining, petrochemicals, and pipelines and tankers. While some firms are reported to be involved in multiple activities, most were involved in a single activity. Using open source information, we identified 14 firms as involved in exploration and production of crude oil resources, 4 firms in expanding refining capacity, 23 firms in the development of natural gas resources, 4 firms in the production of petrochemicals, and 4 firms in oil and gas pipelines and tankers. Open source information reported that 8 firms were involved in multiple activities (such as natural gas and petrochemicals), and these firms are counted in each of the activity descriptions.

Oil Exploration and Production

Using open source information, we identified 14 foreign firms as having commercial activity in Iran's crude oil exploration and production efforts. For example, the China National Petroleum Corporation is reported to be financing 90 percent of the development of the North Azadegan oil field, in an agreement estimated at more than \$2 billion. As of January 2010, Iran faces a funding shortage and is reportedly prioritizing foreign investment in oil exploration and development efforts at the expense of downstream sectors, according to IHS Global Insight. Iran particularly needs technological assistance to increase the level of oil production in fields where oil reserves have declined over time, according to DOE. According to the IMF, Iran's oil production has remained virtually flat in recent years and will likely stagnate in the medium term due to insufficient investment. Iran requires increasingly modern and advanced enhanced oil recovery technologies in order to stop natural declines of oil production, but has found advanced technology difficult to import due to international sanctions and high costs. As a result, Iran depends on older methods to maintain oil recovery from its mature oil fields, such as injecting massive quantities of natural gas into oil reservoirs, according to DOE and IHS Global Insight. Due to the lack of investment, the natural decline in oil reserves, and other factors, Iran has been unable to continue producing oil at its peak level of over 5 million barrels per day since 1978.¹³

Refining Capacity

Using open source information, we identified 4 firms that are involved in expanding and upgrading the refining capacity of Iran. For example, JGC Corporation of Japan is reported to be assisting in the expansion of the Arak refinery, in an agreement estimated at \$25 million. According to DOE, Iran does not currently have sufficient refining capacity to meet its domestic demand for gasoline. In 2007 and 2008, Iranian gasoline production averaged less than 300,000 barrels per day, while daily domestic gasoline consumption averaged approximately 400,000 barrels. Although Iran imposed gasoline rationing in 2007, it imported approximately 130,000 barrels of gasoline per day in 2009, as well as other refined products such as diesel fuel. Iran's nine refineries are operated by the National Iranian Oil Refining and Distribution Company (NIORDC), according to DOE. With the potential participation of foreign companies, Iran plans to add capacity at 8 refineries to fully meet domestic demand for gasoline by 2013 or 2014, according to CRS and DOE officials. However, Iran's plans for doing so may fall behind schedule because it has recently placed a higher priority on finding and developing crude oil to address funding shortages, according to IHS Global Insight.

¹³According to the 2009 Economist Intelligence Unit (*The Economist*) Iran Country Report, oil production was at 3.8 million barrels per day in 2008.

Natural Gas

Using open source information, we identified 23 firms as having commercial activity in the development of Iran's natural gas resources. For example, Hinduja of the United Kingdom and Oil and Natural Gas Corporation of India reportedly signed an agreement in December 2009 for a 40 percent stake in developing phase 12 of Iran's massive South Pars offshore gas field, a project estimated to cost \$7.5 billion. Iran's domestic consumption of natural gas has increased rapidly over the past 20 years, and development of natural gas resources would better position Iran to meet domestic demand. According to U.S. officials, between 20 and 25 percent of Iran's natural gas is currently reinjected into mature oil fields to enhance oil recovery. According to IHS Global Insight, Iran has failed to develop its natural gas production quickly enough and is only preventing shortages by importing natural gas from other countries, such as Turkmenistan. Iran also plans to expand its development of liquefied natural gas (LNG), but this plan requires significant investment from international partners and has become less of a priority as Iran has recently focused limited funds on oil exploration and production projects. However, Iran continues to have three major LNG projects in various stages of development—Iran LNG, Pars LNG, and Persian LNG—all of which are associated with a phase of the South Pars development.¹⁴

Petrochemicals

Using open source information, we identified 4 firms as involved in the production of petrochemicals. For example, LyondelBasell of the Netherlands is reported to be licensing technology for a petrochemical plant that is expected to increase capacity by 300,000 metric tons per year. The main raw materials used in petrochemical production are derived from oil and natural gas, according to DOE. Natural gas and other products of the refining process are shipped to chemical plants, where they are used to manufacture more complex petrochemicals and plastics. Petrochemical products include ethylene, propylene, benzene, and similar nonfuel products, such as asphalt, road oil, lubricants, solvents, and wax. According to *Oil and Gas Journal*, expanding petrochemical production allows a country with large oil and natural gas resources to use them more profitably.

Pipelines and Tankers

Using open source information, we identified 4 firms as having commercial activity in Iran's oil and gas pipelines and tankers. For example, in 2009, Daewoo Shipbuilding and Marine Engineering of South Korea reportedly delivered crude oil tanker ships to Iran, as part of a contract valued at \$384 million. Iranian officials have stated that Iran needs large investments in its natural gas infrastructure, including pipelines. In addition, while Iran has over 40 tankers, Iran recently purchased additional tankers for shipping crude oil. The total

¹⁴According to DOE, South Pars natural gas field has a 25 phase development scheme spanning 20 years.

capacity of Iran's tankers is 9.56 million deadweight tons (for a total capacity of 70 million barrels, or about 2.4 percent of the world total oil tanker capacity).

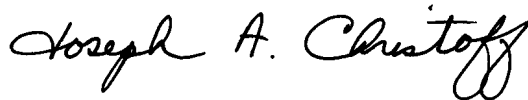
Agency Comments

We provided a draft report to the Department of State and Department of Energy for their review. The agencies provided technical comments which were incorporated into the report.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to interested committees, the Secretary of State, and the Secretary of Energy. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions about this report, please contact me at 202-512-8979 or christoffj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Major contributors to this report include Tetsuo Miyabara (Assistant Director), JoAnna Berry, Colleen Candrl, Jon Fremont, Phillip Farah, Lauren Membreno, and Pierre Toureille. Technical support was provided by Martin De Alteriis, Grace Lui, Rebekah Boone, and Patrick Breiding.

Sincerely,



Joseph A. Christoff
Director, International Affairs and Trade

Scope and Methodology

To develop this report, we analyzed open source information that was determined to be credible and comprehensive by information specialists and an energy expert within GAO. Open source information data is overt, publicly available information, as opposed to covert or classified sources. Open source information is a key component of traditional intelligence and information-gathering agencies, such as the Central Intelligence Agency. Open source information can provide a very broad range of useful data for analysis, but the validity of an analysis can be put at risk if it relies on open sources that contain inaccurate, imprecise, incomplete, or otherwise faulty information. We took a series of steps to mitigate this risk in developing our analysis.

First, we relied only on government reports and information, energy industry trade publications from around the world, corporate web site information, and professional trade association analysis. We obtained reports and information from the Department of Energy (DOE), the Congressional Research Service (CRS), other U.S. government agencies, the International Monetary Fund, and the Organization of Petroleum Exporting Countries (OPEC). We searched information from approximately 200 industry trade publications from January 2005 to December 2009, including *Oil and Gas Journal*, *Oil and Gas News*, *Platt's Publications*, *Petroleum Economist*, *Energy Compass*, and *World Refining & Fuels Today*. We excluded sources deemed insufficiently reliable, such as newspaper reports, newswires, and direct news releases from the Iranian government. We searched company web sites for press releases and corporate statements that made their activities in Iran public, or corrected information that had been publicly reported. In addition, we interviewed officials from the Department of Energy, the Department of State, and U.S. intelligence agencies.

Second, we required multiple corroborating sources of information for every entry in our list of firms reported to have commercial activity in Iran's oil, gas, and petrochemical sectors (see tables 1 and 2). We collected and reviewed thousands of articles; extracted relevant information about firms involved in Iran; organized and analyzed the information using data-analysis software designed to aid in processing unstructured data from multiple sources; and developed a final listing based on an evidentiary threshold established through consistently-applied decision rules. We generated a preliminary listing of firms reported to have commercial activity in Iran's oil, gas, or petrochemical sectors. We defined commercial activity as having signed an agreement to conduct business, invested capital, or received payment for the provision of goods or services in the Iranian oil, gas, or petrochemicals sectors. To generate the preliminary listing, we analyzed information in *Oil and Gas Journal's WorldWide Construction Update* reports from 2005 through 2009. This publication conducts a global survey of ongoing and planned oil and gas contractors and firms working in sectors such as pipelines, refining, and engineering, and is greatly trusted and utilized by other U.S. government agencies and those familiar with the international oil industry. We verified the survey methodology with *Oil and Gas Journal's* Survey Editor

and found it was sufficiently reliable for our purposes. We then began to confirm these firms' commercial activity in Iran by conducting searches in approximately 200 industry trade publications between January 2005 and December 2009. The trade publications were compiled by Nexis and include publications where more than 60 percent of the stories pertain to the oil industry. This generated several thousand additional articles listing firms with potential commercial activity in Iran. To expand the scope of our searches, we searched our sources for specific firms named in U.S. government reports as investors in Iran's oil, gas, or petrochemical sectors. The U.S. government reports were from DOE, CRS, and other government agencies. Finally, we reviewed the source information and extracted details about the firm and their projects in Iran, such as the purpose of the projects, the amount of the firm's commercial activity, and the projects' status. These details were systematically organized and tracked using software designed to synthesize large quantities of textual information.

To determine whether the preliminary listing reflected sufficient evidence that a firm had commercial activity in Iran, a team of analysts reviewed the list and confirmed that one of the following criteria had been met: (1) at least three standard industry publications cited the firm as having commercial activity in a specific project, or (2) the firm provided information on its corporate web site about its involvement in a specific project *and* the firm's involvement in the specific project was also cited by at least one standard industry publication. If not all analysts were completely satisfied that these criteria were met, the firm was not included in our listing. Like all GAO products, our evidence also had to convince independent GAO fact-checkers—who confirmed that the appropriate criteria had been met for all firms—before it could be included in our final listing. Our list, therefore, represents a minimum of firms with commercial activity in Iran's oil, gas, or petrochemical sectors.

After confirming that a firm had commercial activity in a specific project in Iran, we obtained additional information presented in the table—including the firm's commercial activity and the project's status—from the industry standard publications. When reports varied about certain details of a firm's project, we presented the information reported in the most recent source available. Where information was not available on the value of a specific firm's commercial activity, we reviewed the relevant sources to determine the total value of the project in which the firm was involved. In some cases, specific information was not reported and is reflected as such in the tables.

Finally, analysts fluent in the appropriate language contacted the firms directly by telephone in order to introduce GAO, explain our project, and obtain an appropriate point of contact within the firm to officially comment on the reported information. Beginning January 14, 2010, we e-mailed the firms a letter containing information from enclosure II concerning the firms' reported activities, giving each firm an opportunity to comment. As of March 22, 2010, 13 of the firms responded and we have incorporated these responses into enclosure II.

Publicly Reported Commercial Activity of Foreign Firms in the Iranian Oil, Gas, or Petrochemical Sectors

The following table presents information gathered and organized from reputable industry standard publications and firms' public statements. The details and terminology presented in the table are as reported in the original sources. See enclosure III for a glossary of terms presented in this table. We provided all firms with an opportunity to comment on the information found in open sources. We did not attempt to determine whether the firms in this list meet the legal criteria specified in the Iran Sanctions Act.

Table 2: Foreign Firms Publicly Reported Commercial Activity in Iran and Firms' Comments Regarding Their Activity

Firm/country ^a	Firm activity	Status	Commercial activity	Firm comment
ABB Lummus / Not applicable ^b	Catalytic cracker in a refining expansion in Abadan. Continuous catalytic regenerative in refinery upgrade in Bandar Abbas, helping to increase capacity by 80,000 bbl/d. Licensed technology to produce ethylene in petrochemical expansion in Bandar Imam (moved to Gachsaran in 2007).	Expected completion 2009-2010. Expected completion 2010. Delayed until 2011.	Total project to expand refinery estimated to cost \$450 million. Part of \$512 million contract. Part of \$320 million contract.	ABB and Chicago Bridge and Iron Company (CB&I) confirmed ABB sold Lummus Group to CB&I in 2007. ABB indicated Iran activities were part of the Lummus sale. CB&I indicated it prohibited all Lummus companies from activities with or in Iran, and CB&I has no current activities in Iran.
Amona/ Malaysia	Rehabilitation of the Resalat oil field in the Lavan area. Drilling 30 wells and building a processing plant, to increase output to 47,000 bbl/d.	Expected completion September 2011.	Project valued at \$1.53 billion.	Contacted on February 17, 2010; no response as of March 22, 2010.
Belneftekhim/ Belarus	Oil production in Jofeir field, increasing production by 40,000 bbl/d.	Talks under way to produce oil as of June 2009.	Two-year contract signed in 2007 valued at \$450 million.	Contacted on February 18, 2010; no response as of March 22, 2010.
China National Offshore Oil Corporation (CNOOC)/ China	Development of natural gas field and construction of liquefied natural gas (LNG) plant.	Initial agreement reached 2006-2007; final agreement signed 2009; expected completion in 2015.	Project valued at \$16 billion. CNOOC to receive 50% share of LNG product.	Contacted on February 19, 2010; no response as of March 22, 2010.

Enclosure II

Firm/country^a	Firm activity	Status	Commercial activity	Firm comment
China National Petroleum Corporation (CNPC)/ China	Oil exploration and development in Masjed-i-Suleiman oil field.	Agreement approved and drilling started in 2007.	CNPC has a 75% holding in project.	Contacted on February 19, 2010; no response as of March 22, 2010.
	Development of the North Azadegan oil field.	Contract signed in January 2009.	Providing 90% of the financing for Azadegan under a buy-back contract, a more than \$2 billion investment.	
	LNG project in South Pars phase 11.	Contract signed June 2009.	12.5% share of project valued at more than \$13 billion.	
Costain Oil, Gas & Process Ltd./ United Kingdom	Gas refinery/processing plant at Bid Boland II.	Expected completion 2009.	Part of consortium whose contract is valued at \$1.7 billion.	Contacted on January 14, 2010; no response as of March 22, 2010.
Daelim/ South Korea	Construction of liquid storage tanks for Iran LNG project that will be fed by phase 12 of South Pars gas field.	Expected completion by January 2011.	Total cost of Iran LNG project is \$5 billion, which includes other components.	Confirmed role in project is an engineering and procurement contractor, and the value of their work is \$162 million.
Daewoo Shipbuilding and Marine Engineering/ South Korea	Construction of crude oil tanker ships.	Delivery was scheduled for 2009, as of 2005.	Contract for \$384 million. Total cost of Iranian tanker building program estimated at \$2.4 billion.	Confirmed delivery of tanker ships in August 2009, at an estimated contract cost of \$384 million. No other sales planned.
Edison/ Italy	Oil exploration in offshore Dayyer block in the Persian Gulf.	In 2009, signed contract for four-year exploration period.	Four-year contract valued at around \$44 million.	Noted the exploration contract was signed on January 8, 2008 and not in 2009.
ENI/ Italy	Development and operation of first and second phases of onshore Darkhovin oil field.	Signed 5.5 year buy-back contract in 2001; submitted feasibility study of third phase in 2009.	2001 contract worth \$1 billion and 60% stake.	Contacted on February 19, 2010; no response as of March 22, 2010.
	Development of phases 4 and 5 of South Pars.	Completed as of 2006.	Buy-back contract with 60% stake.	
Gazprom/ Russia	Construction of new gas pipeline from Iran to Armenia.	Pipeline inaugurated May 2009.	Project valued at \$120 million, with Gazprom's share at 45%.	Contacted on February 11, 2010; no response as of March 22, 2010.
	Exploration and development of Azar oil fields of Anaran block; field expected to produce up to 65,000 bbl/d when fully developed.	Memorandum of Understanding signed in November 2009.	Not reported.	
	Possible exploration and development of Azadegan oil field.	General cooperation agreement between Iran and Gazprom signed in July 2008. Talks continuing as of July 2009.	Not reported.	

Enclosure II

Firm/country ^a	Firm activity	Status	Commercial activity	Firm comment
GS/ South Korea	Gas sweetening facility in Phases 6-8 of the South Pars gas field. Development of South Pars phases 9 and 10, which is expected to produce 50 million cubic meters per day of natural gas.	Agreement signed October 2009. Expected completion in March 2009.	Value of contract is \$1.24 billion. \$1.6 billion development contract with GS to lead consortium; project valued at \$4 billion.	Contacted on February 11 and 19, 2010; no response as of March 22, 2010.
Haldor Topsoe/ Denmark	Licensors of a hydrotreater for refinery in Esfahan.	Completed in 2009.	Not reported.	Confirmed activity. Noted expected completion of activity is 2013 to 2014.
Hinduja/ United Kingdom	Development of natural gas field in South Pars phase 12. Project to convert natural gas into LNG for export. Development of the Azadegan oil field.	Agreement signed in December 2009. Agreement signed in December 2009. Company involvement reported in 2008 and 2009.	Along with India's ONGC, 40% stake in project, estimated to cost \$7.5 billion to develop. Along with India's ONGC and Petronet LNG, 20% stake in project, estimated cost of plant is \$4.35 billion. Along with India's Oil and Natural Gas Corporation (ONGC), 45% stake in the project. Cost of development estimated at \$2.5 to \$3 billion.	GAO letter was sent on February 18, 2010, to the only Hinduja entity in the United Kingdom listed on Hinduja's web site. The entity responded on March 5, 2010, that it was not the firm cited in our sources. A representative did not address our repeated requests for contact information for Hinduja (United Kingdom).
Hyundai Heavy Industries/ South Korea	Construction of crude oil tanker ships.	Delivery was scheduled for 2009, as of 2005.	Total cost of Iranian tanker building program estimated at \$2.4 billion.	Contacted on February 19, 2010; no response as of March 22, 2010.
INA/ Croatia	Exploration of Moghan 2 oil and gas block project in Ardebil province.	Contract signed April 2008.	Contract worth at least \$140 million.	Confirmed activity. Noted contract value is \$40 million.
Indian Oil Corporation/ India	Development of Farzad-B natural gas field in the Farsi block.	Part of consortium that is exploring the Farsi block and that submitted a 2009 plan to develop the gas field over a 7-to 8-year period.	40% stake in the project, with an estimated total investment of \$5 billion.	Contacted on February 19, 2010; no response as of March 22, 2010.
Inpex/ Japan	Development of Azadegan oil field.	Initial agreement in 2004, revised in 2006. Iran proceeding with initial development using local companies.	75% share was reduced to 10% in 2006.	Confirmed share was reduced to 10% in October 2006, and the role of operator was transferred to an Iranian company.
JGC Corporation/ Japan	Expansion of Arak refinery to produce 250,000 bbl/d.	Completion was estimated for 2009.	Arak refinery expansion project worth \$25 million.	Confirmed activity. Noted involvement was in the initial project design, and their activity was completed nearly 5 years ago.

Enclosure II

Firm/country ^a	Firm activity	Status	Commercial activity	Firm comment
Lukoil/ Russia	Oil exploration and development of the Anaran block in Zagros Mountains, including Azar, Changuleh West, Dehloran, and Musian.	Activities reported halted in 2007 due to threat of U.S. sanctions.	Lukoil had 25% stake in project; project cost is more than \$1 billion.	Contacted on February 18, 2010; no response as of March 22, 2010.
LyondelBasell/ The Netherlands	Supplying technology for new HDPE petrochemical plant in Kermanshah, increasing capacity by 300,000 metric tons per year. Supplying technology for LDPE plant in Sanandaj.	Expected completion 2009 to 2010. Startup was scheduled for 2008.	Not reported. Not reported.	Confirmed activities. Noted that profits from the two projects are small compared to its European operations.
Oil India Ltd. (OIL)/ India	Development of Farzad-B natural gas field in the Farsi block.	Part of a consortium that is exploring the Farsi block and that submitted a 2009 plan to develop the gas field over a 7-to 8-year period.	20% stake in the project, with an estimated total investment of \$5 billion.	Contacted on February 18, 2010; no response as of March 22, 2010.
Oil and Natural Gas Corporation (ONGC)/ India	Development of natural gas field in South Pars phase 12. Project to convert natural gas from South Pars into LNG for export. Development of the Azadegan oil field.	Agreement signed in December 2009. Agreement signed in December 2009. Company involvement reported in 2008.	Along with United Kingdom's Hinduja, 40% stake in project, estimated to cost \$7.5 billion to develop. Along with Hinduja and India's Petronet LNG, 20% stake in project. Estimated cost of plant is \$4.35 billion Along with Hinduja, 45% stake in the project. Cost of development estimated at \$2.5 to \$3 billion.	Contacted on February 18, 2010; no response as of March 22, 2010.
OMV/ Austria	Development of South Pars natural gas fields and share of Iran LNG.	Signed preliminary agreement in 2007.	Total project value is potentially \$30 billion.	Confirmed that agreement was signed with the National Iranian Oil Company in 2007 to develop South Pars phase 12 and Iran LNG. Since 2007, further nonbinding negotiations. Also noted a 2001 exploration contract for Mehr block that ended in 2009 due to technical and economical constraints.

Enclosure II

Firm/country ^a	Firm activity	Status	Commercial activity	Firm comment
ONGC Videsh Ltd. (OVL)/ India	Development of Farzad-B natural gas field in the Farsi block.	Part of consortium that is exploring the Farsi block and which submitted a 2009 plan to develop the gas field over a 7-to 8-year period.	40% stake in the project (along with India Oil Corporation and Oil India Ltd.), with an estimated total investment of \$5 billion.	Contacted on February 19, 2010; no response as of March 22, 2010.
Petrobras/ Brazil	Completed exploratory activities in the Tusan block.	Returned its concession in 2009.	Spent \$178 million before returning its concession.	In 2004, a subsidiary of Petrobras signed service contract to explore Tusan; contract expired in July 2008. Confirmed project costs of \$178 million. Currently no activities or plans in Iran.
Petrofield ^c / Malaysia	Developing an LNG plant on Iran's gulf coast to process natural gas from the Golshan and Ferdos fields in southern Iran.	Agreement made in 2008.	Will finance 100% of the LNG plant. Investment will be repaid in 7 years through the sale of gas and related products.	Contacted on February 10, 2010; no response as of March 22, 2010.
Petroleos de Venezuela S.A. (PDVSA)/ Venezuela	Development of natural gas field in South Pars phase 12.	Project initiated in 2009.	10% stake in project, valued at \$760 million.	Contacted on February 18, 2010; no response as of March 22, 2010.
Petronet LNG/ India	Project to convert natural gas from South Pars into LNG for export.	Memorandum of Agreement signed December 2009.	Part of a consortium with India's ONGC and UK's Hinduja to take a 20% stake in the project.	Contacted on February 18, 2010; no response as of March 22, 2010.
PGNiG/ Poland	Development of natural gas fields. Development of offshore natural gas field at Lavan.	Memorandum of Intent signed February 2008. Project under negotiation in 2008.	Not reported. Buy-back agreement with Iranian Offshore Oil Company valued at \$2 billion.	Contacted on February 11, 2010; no response as of March 22, 2010.
PTT Exploration and Production/ Thailand	Exploration and development of the Saveh block natural gas field.	Signed a 25-year contract in 2005.	Has a 100% stake in the Saveh block.	Contacted on February 19, 2010; no response as of March 22, 2010.
Repsol/ Spain	Development of South Pars natural gas fields (also known as Persian LNG).	Signed a framework agreement.	25% stake in project, with an estimated total cost of \$10 billion.	Contacted on February 9, 2010; no response as of March 22, 2010.
Royal Dutch Shell/ The Netherlands	Development of South Pars natural gas fields (also known as Persian LNG).	Signed a framework agreement.	25% stake in project, with an estimated total cost of \$10 billion.	Confirmed signing a framework agreement. Stated that the agreement would give it a 50% share in development of South Pars phases and 25% share of liquefaction company. Stated that it has not yet decided whether to proceed.

Enclosure II

Firm/country ^a	Firm activity	Status	Commercial activity	Firm comment
Sinopec/ China	Development of Yadavaran oil field. Expansion and upgrade of the Arak refinery.	Contract signed in 2007. As of 2008, estimated completion was 2011.	Contract valued at \$2 billion. Contract valued at \$2.8 billion.	Contacted on February 19, 2010; no response as of March 22, 2010.
SKS Ventures/ Malaysia	Development of two offshore natural gas fields Golshan and Ferdos in southern Iran.	Signed a contract in 2008; development expected to take over 5 years.	Buy-back contract is valued at \$5 to \$6 billion.	Contacted on February 19, 2010; no response as of March 22, 2010.
Snamprogetti ^{d/} Italy	Feasibility study of underwater route for Iran-India pipeline from South Pars.	Study being conducted in 2005.	Not reported.	Contacted on February 18, 2010; no response as of March 22, 2010.
StatoilHydro/ Norway	Development of South Pars natural gas fields. Oil exploration and development of the Anaran block in Zagros Mountains, including Azar, Changuleh West, Dehloran, and Musian.	Froze new investments in Iran in 2008. Activities reported halted in 2007 due to threat U.S. sanctions.	Acquired 37% share in 2002. StatoilHydro had 75% stake in the project; project cost is more than \$1 billion	Contacted on February 18, 2010; no response as of March 22, 2010.
Tecnimont/ Italy	Engineering, procurement, and construction contractor for a LDPE plant in Sanandaj that will produce 300,000 metric tons per year.	Startup was scheduled for 2008.	Not reported.	Contacted on February 18, 2010; no response as of March 22, 2010.
Total/ France	Development of South Pars natural gas fields.	No final agreement or investment as of December 31, 2009.	Possible 30% share of a \$4 billion project	Confirmed that Total has been a significant investor in the Iranian energy sector for the past 20 years. Confirmed discussions with Iranian authorities regarding development of South Pars phase 11 and the Pars LNG project. Does not anticipate new investments in the near future.
Turkish Petroleum Company (TPAO)/ Turkey	Development of natural gas field in South Pars phases 22-24. Total production is projected to be 35 billion cubic meters per year.	Preliminary agreement to be finalized by February 2010.	Memorandum of Understanding agreement signed in 2007.	Contacted on February 9, 2010; no response as of March 22, 2010.
Uhde/ Germany	Building new petrochemical plant in Kermanshah, increasing capacity by 300,000 metric tons per year.	Expected completion 2009 to 2010.	Not reported.	Contacted on February 18, 2010; no response as of March 22, 2010.

Source: GAO analysis of open source information.

^aThe country listed is the physical location of the firm as reported in open sources.

^bABB Lummus no longer exists as a company. ABB of Switzerland sold the Lummus Group in 2007 to Chicago Bridge and Iron Company (CB&I) of the United States. Both ABB and CB&I commented that they no longer have any commercial activity in Iran.

^cPetrofield is a subsidiary of SKS Ventures.

^dSnamprogetti is a subsidiary of ENI.

Glossary of Terms and Abbreviations¹⁵

Barrel: A unit of volume equal to 42 U.S. gallons.

bbl: The abbreviation for barrel(s).

bbl/d: The abbreviation for barrel(s) per day.

Butane: A normally gaseous hydrocarbon extracted from natural gas or refinery gas streams.

Butylene: A hydrocarbon recovered from refinery processes.

Buy-back contract: Under “buy-back” arrangements, foreign firms may receive entitlements to oil or gas for a limited time in exchange for the funds they invest.

Buy-back oil: Crude oil acquired from a host government whereby a portion of the government’s ownership interest in the crude oil produced in that country may or should be purchased by the producing firm.

Catalytic cracking: The refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Catalytic cracking is accomplished by the use of a catalytic agent and is an effective process for increasing the yield of gasoline from crude oil.

Catalytic hydrocracking: A refining process that uses hydrogen and catalysts with relatively low temperatures and high pressures for converting middle boiling or residual material to high octane gasoline, reformer charge stock, jet fuel, or high-grade fuel oil.

Catalytic hydrotreating: A refining process for treating petroleum fractions from atmospheric or vacuum distillation units (e.g., naphthas, middle distillates, reformer feeds, residual fuel oil, and heavy gas oil) and other petroleum (e.g., cat cracked naphtha, coker naphtha, gas oil, etc.) in the presence of catalysts and substantial quantities of hydrogen.

Commercial activity: We define commercial activity as having signed an agreement to conduct business, invested capital, or received payment for the provision of goods or services in the Iranian oil, gas, or petrochemicals sectors.

Consortium: Group of companies formed to promote a common objective or engagement in a project of benefit to all members. The relationship normally

¹⁵The U.S. Energy Information Administration, an independent agency within the U.S. Department of Energy, was the primary source for definitions contained in this glossary.

entails cooperation and a sharing of resources, sometimes even common ownership.

Construction: An energy-consuming subsector of the industrial sector that consists of all facilities and equipment used to perform land preparation and construct, renovate, alter, install, maintain, or repair major infrastructure or individual systems therein. Infrastructure includes buildings; industrial plants; and other major structures, such as tanks, towers, monuments, roadways, tunnels, bridges, dams, pipelines, and transmission lines.

Crude oil: A mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Liquids produced at natural gas processing plants are excluded. Crude oil is refined to produce a wide array of petroleum products, including heating oils; gasoline, diesel, and jet fuels; lubricants; asphalt; ethane, propane, and butane; and many other products used for their energy or chemical content.

Deadweight tons: The lifting capacity of a ship expressed in long tons (2,240 pounds), including cargo, commodities, and crew.

Development: The preparation of a specific mineral deposit for commercial production; this preparation includes construction of access to the deposit and of facilities to extract the minerals. The development process is sometimes further distinguished between a preproduction stage and a current stage, with the distinction being made on the basis of whether the development work is performed before or after production from the mineral deposit has commenced on a commercial scale.

Diesel fuel: A fuel composed of distillates obtained in a petroleum refining operation or blends of such distillates with residual oil used in motor vehicles. The boiling point and specific gravity are higher for diesel fuels than for gasoline.

Downstream: When referring to the oil and gas industry, this term indicates the refining and marketing sectors of the industry. More generically, the term can be used to refer to any step further along in the process.

Ethane: A normally gaseous hydrocarbon extracted from natural gas and refinery gas streams.

Ethanol: A clear, colorless, flammable oxygenated hydrocarbon. Ethanol is typically produced chemically from ethylene, or produced biologically from fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood.

Ethylene: A hydrocarbon recovered from refinery processes or petrochemical processes. Ethylene is used as a petrochemical feedstock for numerous chemical applications and the production of consumer goods.

Exploration, drilling: Drilling done in search of new mineral deposits, on extensions of known ore deposits, or at the location of a discovery up to the time when the company decides that sufficient ore reserves are present to justify commercial exploration. Assessment drilling is reported as exploration drilling.

Exploratory well: A hole drilled: (a) to find and produce oil or gas in an area previously considered to be an unproductive area; (b) to find a new reservoir in a known field (i.e. one previously producing oil and gas from another reservoir); or (c) to extend the limit of a known oil or gas reservoir.

Field: An area consisting of a single reservoir or multiple reservoirs all grouped on, or related to, the same individual geological structural feature or stratigraphic condition. There may be two or more reservoirs in a field that are separated vertically by intervening impervious strata or laterally by local geologic barriers, or by both.

Firm: An association, company, corporation, estate, individual, joint venture, partnership, or sole proprietorship, or any other entity, however organized, including (a) charitable or educational institutions; (b) the federal government, including corporations, departments, federal agencies, and other instrumentalities, and state and local governments. A firm may consist of (1) a parent entity, including the consolidated and unconsolidated entities (if any) that it directly or indirectly controls; (2) a parent and its consolidated entities only; (3) an unconsolidated entity; or (4) any part or combination of the above.

Gas: A nonsolid, nonliquid combustible energy source that includes natural gas, coke-oven gas, blast-furnace gas, and refinery gas.

Gas plant operator: Any firm, including a gas plant owner, which operates a gas plant and keeps the gas plant records. A gas plant is a facility in which natural gas liquids are separated from natural gas or in which natural gas liquids are fractionated or otherwise separated into natural gas liquid products or both.

Gas processing unit: A facility designed to recover natural gas liquids from a stream of natural gas that may or may not have passed through lease separators or field separation facilities. Another function of natural gas processing plants is to control the quality of the processed natural gas stream. Cycling plants are considered natural gas processing plants.

Gas sweetening: conditioning for the removal of acid gases, which can cause corrosion to gas flowlines (pipelines) and can also be harmful to consumers.

Gas to liquids (GTL): A process that combines the carbon and hydrogen elements in natural gas molecules to make synthetic liquid petroleum products, such as diesel fuel.

HDPE: High-density polyethylene, a petrochemical derivative.

Hydrocarbon: An organic chemical compound of hydrogen and carbon in the gaseous, liquid, or solid phase. The molecular structure of hydrocarbon compounds varies from the simplest (methane, a constituent of natural gas) to the very heavy and very complex.

Hydrotreater: See *catalytic hydrotreating*.

LDPE: Low-density polyethylene, a petrochemical derivative.

LNG: Liquefied natural gas.

Liquefied natural gas (LNG): Natural gas (primarily methane) that has been liquefied by reducing its temperature to -260 degrees Fahrenheit at atmospheric pressure.

Mcf: One thousand cubic feet.

Methane: A colorless, flammable, odorless hydrocarbon gas (CH_4), which is the major component of natural gas. It is also an important source of hydrogen in various industrial processes.

Metric ton: A unit of weight equal to 2,204.6 pounds, used to measure products such as LDPE and HDPE.

MMbbl/d: One million barrels of oil per day.

Natural gas: A gaseous mixture of hydrocarbon compounds, the primary one being methane.

Natural gas liquids (NGL): Those hydrocarbons in natural gas that are separated from the gas as liquids through the process of absorption, condensation, adsorption, or other methods in gas processing or cycling plants. Generally, such liquids consist of propane and heavier hydrocarbons and are commonly referred to as lease condensate, natural gasoline, and liquefied petroleum gases. Natural gas liquids include natural gas plant liquids (primarily ethane, propane, butane, and isobutane) and lease condensate (primarily pentanes produced from natural gas at lease separators and field facilities).

Natural gas liquids production: The volume of natural gas liquids removed from natural gas in lease separators, field facilities, gas processing plants, or cycling plants during the report year.

Natural gas processing plant: Facilities designed to recover natural gas liquids from a stream of natural gas that may or may not have passed through lease separators or field separation facilities. These facilities control the quality of the natural gas to be marketed.

Offshore: That geographic area that lies seaward of the coastline. In general, the coastline is the line of ordinary low water along with that portion of the coast that is in direct contact with the open sea or the line marking the seaward limit of inland water.

Offshore reserves and production: Unless otherwise dedicated, reserves and production that are in either state or federal domains, located seaward of the coastline.

Oil: A mixture of hydrocarbons usually existing in the liquid state in natural underground pools or reservoirs. Gas is often found in association with oil. Also see *petroleum*.

OPEC (Organization of the Petroleum Exporting Countries): An intergovernmental organization created in 1960 whose stated objective is to “coordinate and unify the petroleum policies of member countries.” Current members include Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Operated: Exercised management responsibility for the day-to-day operations of natural gas production, gathering, treating, processing, transportation, storage, or distribution facilities or a synthetic natural gas plant.

Petrochemical feedstocks: Chemical feedstocks derived from petroleum principally for the manufacture of chemicals, synthetic rubber, and a variety of plastics.

Petrochemicals: Organic and inorganic compounds and mixtures that include but are not limited to organic chemicals, cyclic intermediates, plastics and resins, synthetic fibers, elastomers, organic dyes, organic pigments, detergents, surface active agents, carbon black, and ammonia.

Petroleum: A broadly defined class of liquid hydrocarbon mixtures. Included are crude oil, lease condensate, unfinished oils, refined products obtained from the processing of crude oil, and natural gas plant liquids.

Petroleum products: Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon

compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products.

Petroleum refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and alcohol.

Processing plant: A surface installation designed to separate and recover natural gas liquids from a stream of produced natural gas through the processes of condensation, absorption, adsorption, refrigeration, or other methods and to control the quality of natural gas marketed or returned to oil or gas reservoirs for pressure maintenance, repressuring, or cycling.

Production, crude oil: The volumes of crude oil that are extracted from oil reservoirs. These volumes are determined through measurement of the volumes delivered from lease storage tanks or at the point of custody transfer.

Production, natural gas: The volume of natural gas withdrawn from reservoirs less (1) the volume returned to such reservoirs in cycling, repressuring of oil reservoirs, and conservation operations; less (2) shrinkage resulting from the removal of lease condensate; and less (3) nonhydrocarbon gases where they occur in sufficient quantity to render the gas unmarketable. Volumes of gas withdrawn from gas storage reservoirs and native gas, which has been transferred to the storage category, are not considered production. Flared and vented gas is also considered production.

Production, oil and gas: The lifting of oil and gas to the surface and gathering, treating, field processing (as in the case of processing gas to extract liquid hydrocarbons), and field storage. The production function shall normally be regarded as terminating at the outlet valve on the lease or field production storage tank. If unusual physical or operational circumstances exist, it may be more appropriate to regard the production function as terminating at the first point at which oil, gas, or gas liquids are delivered to a main pipeline, a common carrier, a refinery, or a marine terminal.

Propylene: Propylene is intended for use in nonfuel applications such as petrochemical manufacturing. Nonfuel propylene includes chemical-grade propylene, polymer-grade propylene, and trace amounts of propane. Nonfuel propylene also includes the propylene component of propane/propylene mixes where the propylene will be separated from the mix in a propane/propylene splitting process. Nonfuel propylene excludes the propylene component of propane/propylene mixes where the propylene component of the mix is intended for use as fuel.

Refined petroleum products: Refined petroleum products include but are not limited to gasolines, kerosene, distillates, liquefied petroleum gas, asphalt, lubricating oils, diesel fuels, and residual fuels.

Refiner: A firm or the part of a firm that refines products or blends and substantially changes products, refines liquid hydrocarbons from oil and gas field gases, or recovers liquefied petroleum gases incident to petroleum refining and sells those products to resellers, retailers, reseller/retailers, or ultimate consumers. “Refiner” includes any owner of products that contracts to have those products refined and then sells the refined products to resellers, retailers, or ultimate consumers.

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

Reinjected: The forcing of gas under pressure into an oil reservoir in an attempt to increase recovery.

Reserve: That portion of the demonstrated reserve base that is estimated to be recoverable at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the demonstrated reserve base.

Upstream: The exploration and production portions of the oil and gas industry.

Iran Sanctions Act

Under the Iran Sanctions Act, a person can be sanctioned for an investment, made on or after August 5, 1996, of \$20 million or more (or any combination of investments of at least \$5 million each, which in the aggregate equals or exceeds \$20 million in any 12 month period).¹⁶ However, this investment must be made with actual knowledge and it must be an investment that directly and significantly contributed to the enhancement of Iran's ability to develop the petroleum resources of Iran.¹⁷

The act requires the President, delegated to the Secretary of State, to impose at least two of the following sanctions:

- denying Export-Import Bank assistance for exporting to the foreign person;
- banning licenses to export controlled technologies to the sanctioned person;
- banning U.S. financial institutions from loaning the sanctioned person more than \$10 million in a 1-year period unless such person is engaged in activities to relieve human suffering and the loans or credits are provided for such activities;
- if the sanctioned person is a financial institution, prohibiting the designation of that institution as a primary dealer in U.S. government debt instruments or serving as an agent for the U.S. government or as repository for U.S. government funds; and
- banning U.S. government procurement from the sanctioned person, and
- as well as other sanctions that fall under the powers of the International Emergency Economic Powers Act (IEEPA), including IEEPA-derived executive orders, to restrict imports with respect to the sanctioned person.¹⁸

The President may waive these sanctions if the President determines that doing so is important to the national interest of the United States.¹⁹

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¹⁶Pub. L. No. 104-172, § 5, as amended.

¹⁷*Id.*

¹⁸Pub. L. No. 104-172, § 6, as amended.

¹⁹Pub. L. No. 104-172, § 9, as amended.