



Independent Statistics & Analysis

U.S. Energy Information  
Administration

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## Background Reference: Oman

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### Overview

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***Oman is the largest oil and natural gas producer in the Middle East that is not a member of the Organization of the Petroleum Exporting Countries (OPEC).***

Located on the Arabian Peninsula, Oman's proximity to the Arabian Sea, Gulf of Oman, and Persian Gulf grant it access to some of the most important energy corridors in the world, enhancing Oman's position in the global energy supply chain (Figure 1). Oman plans to capitalize on this strategic location by constructing a modern oil refining and storage complex near Ad Duqm, Oman, which lies outside the Strait of Hormuz (an important [oil transit chokepoint](#)).

Like many countries in the Middle East, Oman is highly dependent on its hydrocarbons sector. The ninth version of the *Oman 5-Year Plan (2016-2020)*, released in 2016, was created in the context of sustained low oil prices, and aims to enhance the country's economic diversification by adopting a set of sectoral objectives, policies, and mechanisms that will increase non-oil revenue. Oman's diversification program is largely aimed at expanding industries such as fertilizer, petrochemicals, aluminum, power generation, and water desalination. Concerted efforts to develop these sectors would also accelerate non-oil job growth in coming years.<sup>1</sup> The *5-Year Plan* draws upon another national program, Vision 2020, which will use hydrocarbon revenues to achieve economic diversification.<sup>2</sup>

However, with rising oil and natural gas production levels and a growing petrochemical sector—which relies on liquefied petroleum gases (LPG) and natural gas liquids (NGL)—the country is unlikely to significantly alter its dependence on hydrocarbons as a major revenue stream in the short term.

Figure 1. Map of Oman



Source: Central Intelligence Agency World Factbook

## Petroleum and other liquids

### Sector organization

The Ministry of Oil and Gas coordinates the government's role in Oman's hydrocarbon sectors. Final approval on policy and investment, however, rests with the Sultan of Oman. The state-owned Petroleum Development Oman (PDO) holds most of Oman's oil reserves and operates the Sultanate's largest block, Block 6. PDO is responsible for more than 70% of the country's crude oil production.<sup>3</sup> In addition to the government's 60% ownership stake in PDO, Shell (34%), Total (4%), and Portugal's Partex (2%) also own stakes.<sup>4</sup> The Oman Oil Company (OOC) is responsible for energy investments both inside and outside of Oman. The OOC is fully owned by the government. The Oman Oil Refineries and Petroleum Industries Company (ORPIC) is owned by the Government and by the OOC. ORPIC controls the country's refining sector and owns both of Oman's operating refineries, Sohar and Mina al-Fahal.<sup>5</sup>

The U.S. firm, Occidental Petroleum (Oxy), is the second-largest operator after PDO and has the largest presence of any foreign firm in Oman. Oxy operates mainly in northern Oman at Block 62 and Block 9, and in the Mukhaizna field in the south. Lebanese independent Consolidated Contractors Energy Development (CCED) operates Blocks 3 and 4 with a 50% stake alongside Sweden's Tethys Oil (30%) and Japan's Mitsui (20%). Daleel Petroleum, which is a 50/50 joint venture between Omani private firm Petrogas and Chinese state firm China National Petroleum Corporation (CNPC), operates Block 5.

## Production and consumption

***Enhanced oil recovery techniques helped Oman's oil production rebound from a multi-year decline in the early 2000s.***

Oman is the largest oil producer in the Middle East that is not a member of the Organization of the Petroleum Exporting Countries (OPEC). Oman's annual petroleum and other liquids production first peaked at 972,000 barrels per day (b/d) in 2000 but dropped to 715,000 b/d by 2007. Oman successfully reversed that decline, and total oil production has risen, hitting a new peak of a little more than 1 million b/d in 2016. Enhanced Oil Recovery (EOR) techniques helped drive this production turnaround, along with additional production gains that resulted from previous discoveries.

In 2017, Oman Oil Company Exploration and Production (OOCEP) announced three significant oil and natural gas discoveries in Block 60. The first of these finds, named Bisat, was reported to be north of the currently producing Abu Butabul (ABB) field.

## Enhanced oil recovery

Oman's ability to increase its oil and natural gas production relies heavily on innovative extraction technologies such as enhanced oil recovery (EOR). Several EOR techniques are already used in Oman, including polymer, miscible, steam injection, and solar techniques.<sup>6</sup> Because of the relatively high cost of production in the country, Oman's government offers incentives to international oil companies (IOCs) for exploration and development activities related to the country's difficult-to-recover hydrocarbons. The government enlists foreign companies in new exploration and production projects, offering generous terms for developing fields that require the sophisticated technology and expertise of the private sector. Given the technical difficulties involved in oil production, the contract terms for IOCs have become more favorable in Oman than in other countries in the region, and certain projects have allowed significant equity stakes.

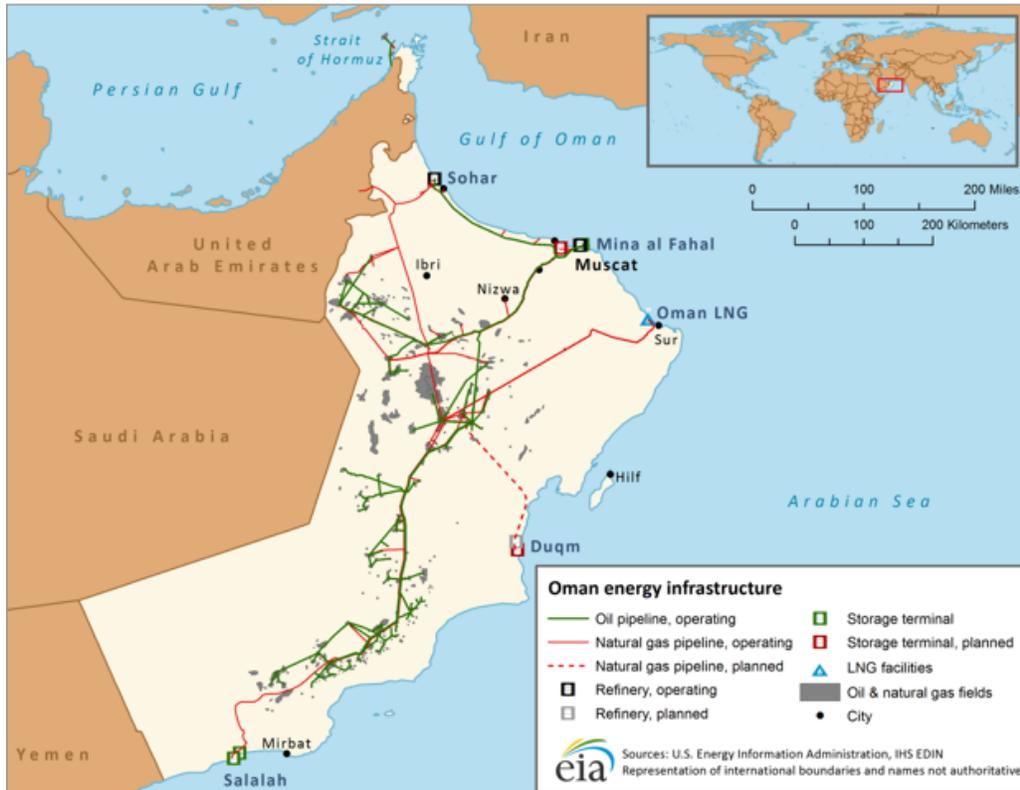
Block 6, located in central and southern Oman and operated by PDO, is the center of current EOR operations. This block uses all four of the EOR techniques with the Marmul field (polymer), Harweel field (miscible), Qarn Alam field (steam), and Amal-West field (solar). Solar EOR at Alam-West in southern Oman, completed by GlassPoint Solar in 2012 and commissioned in early 2013, was the first solar EOR project in the Middle East. This project uses the production of emissions-free steam that feeds directly into current thermal EOR operations, reducing the need to use natural gas in EOR projects.<sup>7</sup>

In partnership with PDO, GlassPoint Solar built the Miraah solar thermal plant to improve recovery of heavy and viscous crude oil from the Amal oil field. The plant is expected to produce more than 1 gigawatt (GW) of peak thermal energy and more than 6,000 tons of solar steam per day (no electricity is produced) for heavy oil production.<sup>8</sup> The project uses large mirrors to concentrate sunlight to boil oilfield water directly into steam, which is then used to extract heavy oil. This process allows them to replace the natural gas used to extract oil. Construction on the project began in October 2015, and the plant came online in November 2017.<sup>9</sup>

## Refining

Oman is not a major refined petroleum product producer, although it has plans to expand the country's refining and storage sectors. Oman aims to capitalize on its strategic location on the Arabian Peninsula by expanding its refining capabilities there.

Figure 2. Oman's major oil and natural gas infrastructure



Source: U.S. Energy Information Administration, IHS Markit Midstream Database (via IHS EDIN)

Oman has two refineries, Mina al Fahal and Sohar. As of early 2017, Minal al Fahal was operating at 106,000 b/d and Sohar at 116,000 b/d.<sup>10</sup> The ORPIC-led Sohar Refinery Improvement Project (SRIP) was completed in 2017,<sup>11</sup> expanding its capacity to 197,000 b/d from 116,000 b/d in previous years. A major bunkering and storage terminal near Sohar is scheduled to be completed in 2020, and the facility's location outside of the Strait of Hormuz could make it an appealing option for international crude oil shippers.<sup>12</sup> The use of crude oil by domestic refineries jumped considerably during 2017 because of a significant increase in exports of refined oil. This increase was the result of the rise in crude distillation capacity after the completion of the SRIP.<sup>13</sup>

The OOC and Kuwait Petroleum International (KPI) have signed a partnership agreement for their Ad Duqm Refinery and Petrochemical Industries Company (DRPIC) joint venture to build two facilities: a 230,000 b/d export refinery in a special economic zone under development at Ad Duqm on the Arabian Sea coast of central Oman and a 200 million barrel crude oil storage terminal at Ras Markaz.<sup>14</sup> The

storage terminal, with Phase One estimated to be complete in 2019, will be one of the world's largest crude oil storage facilities.<sup>15</sup> The Ad Duqm refinery could be operational by 2022, and most of the plant's output will be exported.<sup>16</sup> According to the OOC, the cost of developing the refinery will be \$6 billion–\$7 billion. Both Oman and Kuwait will provide crude oil feedstock.

## Exports

***Oman is an important oil exporter, particularly to Asian markets.***

Oman's only export crude oil stream is the Oman blend, a medium-light and sour (high sulfur- 1.33%) crude oil with an API gravity of 32. Oman is an important crude oil exporter, particularly to Asian markets. China is Oman's largest export market, and Taiwan receives the second-highest volume.<sup>11</sup>

Oman does not have any international oil pipelines, although plans are in place to expand the country's domestic pipeline infrastructure. The Muscat Sohar Pipeline Project (MSPP), built by ORPIC, began commercial operations in 2017. The 180-mile refined product pipeline connects the Mina al-Fahal and Sohar refineries with a new storage terminal near Muscat airport and reduces tanker traffic between the two coastal facilities.<sup>17</sup> ORPIC says that the 93,000 b/d capacity MSPP will handle more than 50% of Oman's products demand.<sup>18</sup>

## Natural gas

***The greatest growth potential for Oman's natural gas production is in the Khazzan-Makarem field, Block 61.***

### Sector organization

PDO has an even greater presence in the natural gas sector than it does in the oil sector, accounting for nearly all of Oman's natural gas supply. Smaller contributions came from Occidental Petroleum, Oman's largest independent oil producer, and Thailand's PTTEP. The Oman Gas Company (OGC) directs the country's natural gas transmission and distribution systems. The OGC is a joint venture between the Omani Ministry of Oil and Gas (80%) and OOC (20%). Oman Liquefied Natural Gas (Oman LNG)—owned by a consortium including the government, Shell, and Total—operates all liquefied natural gas (LNG) activities in Oman through its three liquefaction trains in Qalhat near Sur.<sup>19</sup>

### Production and consumption

***Oman's potential for natural gas production growth may be substantial, supported by promising developments in several new projects.***

Natural gas is becoming a key source in energy to the Omani economy with its increased focus on economic diversification away from oil.<sup>20</sup> The Central Bank of Oman estimates that demand for natural gas will continue to rise going forward as a result of the number of energy-intensive industries coming online combined with rising demand in the electric power sector.<sup>21</sup>

Oman consumes more than 70% of the natural gas it produces. Most natural gas production is used domestically in gas-based industries, oil fields, and power generation.<sup>22</sup> Approximately 80% of production was from non-associated fields.<sup>23</sup>

The greatest growth potential for Oman's natural gas production is in the Khazzan-Makarem field in BP's Block 61. The field is a tight natural gas formation, and BP proposed two phases to develop the 10.5 trillion cubic feet (Tcf) of recoverable natural gas resources. Phase 1 production from the field, which started-up in 2017, is expected to significantly ease the pressure on Oman's natural gas supplies.<sup>24</sup> Combined production from Phases 1 and 2 is expected to total approximately 1.5 billion cubic feet per day (Bcf/d), equivalent to about 40% of Oman's current total domestic gas production.<sup>25</sup> This project includes construction of a three-train central processing facility with associated gathering and export systems and drilling about 325 wells within a 15-year period.<sup>26</sup>

The Rabab Harweel integrated project (RHIP), located in Block 6, is PDO's largest capital project underway. The project integrates sour miscible gas injection (MGI) in several oil reservoirs with production and pressure maintenance of a government gas condensate field. It will also contribute to easing Oman's overall natural gas demand. The RHIP is slated for completion in 2019.<sup>27</sup>

## Exports

***Oman is a member of the Gas Exporting Countries Forum (GECF) and exports natural gas as LNG through its Oman LNG facilities near Sur in the Gulf of Oman.***

Oman's natural gas sector grew in importance during the past two decades, which was largely the result of two LNG trains that opened in 2000 at the LNG complex at Qalhat, near Sur, operated by Oman LNG (a joint venture between PDO and other shareholders). The third LNG train, operated by Qalhat LNG SAOC and built alongside the two existing trains, entered into production in 2005. Qalhat merged into Oman LNG in 2013. Its main shareholders are the Omani state (51%) and Shell Gas B.V (30%).

[South Korea](#) is the primary buyer of Oman LNG. Oman's LNG exports have increasingly been under pressure as rising domestic consumption has cut into volumes available for export. LNG supplies received a boost from new production when the Khazzan natural gas field which came online in 2017.<sup>28</sup> Khazzan volumes are primarily designated for domestic consumption, and excess volumes are exported from Oman's LNG facilities.

The Sultanate has been focused on diversifying its LNG export destinations because regional demand for LNG is growing. Oman LNG's *2016 Annual Report* reported the first-ever sales of two spot cargoes to Kuwait and Jordan as representing "new departures for our company" by exporting to new geographic destinations.<sup>29</sup>

## Imports

Oman has one international natural gas pipeline—the Dolphin Pipeline—that runs from Qatar to Oman through the United Arab Emirates (UAE). Oman is not a major importer of natural gas, although the country imports from Qatar through the Dolphin Pipeline to meet domestic demand.<sup>30</sup>

In March 2014, Oman signed a memorandum of understanding with [Iran](#) on a natural gas import contract. The deal will deliver approximately 353 million cubic feet of natural gas per year through a new pipeline under the Gulf of Oman, much of which is slated to be re-exported as LNG. A new route was agreed upon in February 2017 to avoid [UAE](#) waters, and Iran is expecting natural gas to begin flowing in 2020.<sup>31</sup>

## Electricity

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***Oman's electricity sector relies heavily on domestic natural gas to fuel electricity generation.***

### Sector organization

The Authority for Electricity Regulation Oman (AER Oman) regulates the country's electricity and associated water sectors. Its primary functions include implementing general policy from the state, licensing, compliance, and coordination between the various ministries, organizations, and stakeholders in the sector. The Oman Power and Water Procurement Company (OPWP) is the planning body for power supplies in Oman, and the Oman Electricity Transmission Company (OETC) is in charge of the country's transmission networks.

Oman's electricity sector has two major networks—the Main Interconnected System (MIS) and the Salalah system. The MIS, the larger of the two, covers most of the northern area of Oman. The Dhofar Power System (DPS) covers the city of Salalah and surrounding areas in the Governorate of Dhofar in the south. Areas outside both networks get electricity from the Rural Areas Electricity Company (RAECO), primarily from diesel generators.<sup>32</sup> OPWP expects a new 400 kilovolt (kV) transmission line to be completed by 2023, linking the MIS to the PDO power system and to the developing industrial hub at Ad Duqm.<sup>33</sup>

The Sultanate's power plants are almost entirely natural gas-fired, and OPWP expects peak demand from power plants connected to each of Oman's two main power grids to rise by 6% per year through 2024.<sup>34</sup>

Oman is a part of the Gulf Cooperation Council's (GCC) grid interconnection system, which allows for electricity transfers between the six connected countries (Kuwait, Saudi Arabia, Qatar, Bahrain, the United Arab Emirates, and Oman). A 220 kV interconnection between the Oman (MIS) and UAE (Abu Dhabi) power systems has been commercially operational since 2012. The link has provided emergency reserves on a number of occasions, preventing power failures in the MIS.

OPWP has put the 8 gigawatt (GW) Misfah power project on hold because of slowing demand growth and more efficient electric generators, with startup in 2022 at the earliest.<sup>35</sup> OPWP plans to raise electricity generating capacity by 51% from 7.77 GW at the end of 2016, to 11.7GW in 2023 to meet rising demand. OPWP's *2018 Seven-Year Plan* sees peak power demand rising by 53%, from 6.52 GW in 2016 to 9.96 GW in 2023.<sup>36</sup> Misfah will be the first conventional large-scale power plant for which Oman's Ministry of Oil and Gas has not specified the fuel to be burned, because the plant can no longer guarantee natural gas availability.<sup>37</sup>

OPWP plans to implement the Fuel Diversification Policy that was adopted in December 2017. Under this policy, OPWP plans to procure 2.6 GW of renewable energy projects and make the country's first

Clean Coal program operational by 2024. These projects will reduce commitments of natural gas to the electricity sector, allowing natural gas supply to be diverted to new industrial projects that are designed to aid economic growth.

## Renewables

Oman has a growing renewable energy sector, and several projects are making progress. RAECO plans to install 90 MW of renewable capacity by 2020. In July 2015, Oman's first commercial solar power project, with a 307 kilowatt capacity, started generating electricity. RAECO will purchase electricity for 20 years from this plant, which is operated by Bahwan Astonfield Solar Energy Company.<sup>38</sup>

UAE's Masdar was awarded a contract to build the 50 MW wind farm at Harweel in the Dhofar region, estimated to start up in 2020, which will be followed by the Dhofar II wind farm (150 MW) in 2023.<sup>39</sup>

Although Oman does not currently have a nuclear energy program, the country joined the International Atomic Energy Agency in 2009. The country has no plans to construct any nuclear generating facilities.<sup>40</sup>

## Notes

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- In response to stakeholder feedback, the U.S. Energy Information Administration has revised the format of the Country Analysis Briefs. As of December 2018, updated briefs are available in two complementary formats: the Country Analysis Executive Summary provides an overview of recent developments in a country's energy sector and the Background Reference provides historical context. Archived versions will remain available in the original format.
- Data presented in the text are the most recent available as of December 12, 2018.
- Data are EIA estimates unless otherwise noted.

## Endnotes

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<sup>1</sup> Central Bank of Oman, "[Annual Report 2016](#)," (June 2017).

<sup>2</sup> Sultanate of Oman, Supreme Council for Planning. "[Vision 2020](#)" (Accessed September 28, 2018).

<sup>3</sup> [Petroleum Development Oman](#) (Accessed May 15, 2017).

<sup>4</sup> [Petroleum Development Oman](#) (Accessed May 15, 2017).

<sup>5</sup> [Oman Oil Refineries and Petroleum Industries Company \(ORPIC\)](#) (Accessed August 15, 2017).

<sup>6</sup> [Petroleum Development Oman](#) (Accessed August 15, 2017).

<sup>7</sup> GlassPoint Solar, "Petroleum Development Oman and GlassPoint Commission the Middle East's First Solar EOR Project" (May 21, 2013).

<sup>8</sup> [Petroleum Development Oman](#) (Accessed August 1, 2017); Glasspoint, [Miraah Project](#) (Accessed October 2, 2018).

<sup>9</sup> Petroleum Development Oman, "[Miraah Solar Plant Delivers First Steam to Amal West Oilfield](#)" (November 2, 2017).

<sup>10</sup> Middle East Economic Survey, "Oman, Kuwait Sign Multi-Billion Refinery Deal" (April 14, 2017) and [ORPIC](#) (Accessed August 15, 2017).

<sup>11</sup> Middle East Economic Survey, "Oman, Kuwait Sign Multi-Billion Refinery Deal" (April 14, 2017) and, [ORPIC](#) (Accessed June 1, 2017).

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- <sup>12</sup>Middle East Economic Survey, “Oman Completes Key Units in Sohar Refinery Upgrade” (February 17, 2017).
- <sup>13</sup> Central Bank of Oman, “[Annual Report 2017](#),” (August 2018).
- <sup>14</sup> Middle East Economic Survey, “Oman, Kuwait Sign Multi-Billion Refinery Deal” (April 14, 2017).
- <sup>15</sup> [Oman Tank Terminal Company LLC](#) (Accessed August 1, 2017).
- <sup>16</sup> IHS Energy Oman Downstream Profile (Accessed August 1, 2017.)
- <sup>17</sup> Middle East Economic Survey, “Oman, Kuwait Sign Multi-Billion Refinery Deal” (April 17, 2017).
- <sup>18</sup> Middle East Economic Survey, “Oman Starts-Up Products Pipeline” (October 20, 2017).
- <sup>19</sup> [Oman LNG](#) (Accessed August 2, 2017).
- <sup>20</sup> Central Bank of Oman, “[Annual Report 2016](#),” (June 2017).
- <sup>21</sup> Central Bank of Oman, “[Annual Report 2016](#),” (June 2017).
- <sup>22</sup> Central Bank of Oman, “[Annual Report 2017](#),” (August 2018).
- <sup>23</sup> Middle East Economic Survey, “Oman’s Reliance on Chinese Crude Export Markets Deepens” (January 27, 2017).
- <sup>24</sup> Middle East Economic Survey, “BP Start-Up Of 1Bn Cfd Khazzan Field Gives 20% Boost To Oman Gas” (September 29, 2017).
- <sup>25</sup> BP, “[BP deepens commitment to Oman; to extend license and develop second phase of major Khazzan gas field](#)” (Accessed August 2, 2017).
- <sup>26</sup> BP, “[BP deepens commitment to Oman; to extend license and develop second phase of major Khazzan gas field](#)” (Accessed August 2, 2017).
- <sup>27</sup> Petroleum Development Oman, “[PDO Sustainability Report 2016](#).”
- <sup>28</sup> BP, “[BP to develop second phase of Oman’s giant Khazzan gas field](#),” April 9, 2018.
- <sup>29</sup>Middle East Economic Survey, “Oman LNG Records Rare Output Rise, But Revenue Falls Regardless” (April 17, 2017) and; [Oman LNG Annual Report 2016](#).
- <sup>30</sup> Middle East Economic Survey, “Oman’s Reliance on Chinese Crude Export Markets Deepens” (January 27, 2017).
- <sup>31</sup> Middle East Economic Survey, “Total Gives \$1bn Impetus to Iran’s Upstream Opening” (June 23, 2017).
- <sup>32</sup> [Oman Power and Water Procurement Company](#) (Accessed June 5, 2017).
- <sup>33</sup> Oman Power and Water Procurement Company, [7 Year Statement \(2018-2024\)](#).
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- <sup>35</sup> Middle East Economic Survey, “Oman Postpones Misfah With Slowing Demand Growth” (June 30, 2017).
- <sup>36</sup> Middle East Economic Survey, “Oman Sees Peak Power Demand Up 51% by 2023; Gas Fuel Crunch Looms” (May 26, 2017).
- <sup>37</sup> Middle East Economic Survey, “Oman Lines Up 11 Companies for Misfah Power Project, Eyes Import Options” (February 3, 2017).
- <sup>38</sup> [U.S. International Trade Administration](#) (Accessed June 5, 2017).
- <sup>39</sup> Oman Power and Water Procurement Company, [7 Year Statement \(2018-2024\)](#).
- <sup>40</sup> Middle East Economic Survey, “‘Opportunities Are Immense’: Mees Speaks With Oman’s Rumhy” (September 7, 2018).