

Israel's Gas Bonanza

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The Leviathan offshore platform. Courtesy: Noble Energy.

In late December 2010, Noble Energy confirmed one of the world's largest gas finds of the decade—the 16-Tcf (450-Bcm) Leviathan field—located in approximately 5,400 ft of water approximately 80 miles offshore Haifa, Israel. The find is 29 miles southwest of the Tamar field, which is approximately 56 miles offshore west of Haifa and which yielded the world's largest gas discovery in 2009: an estimated 8.4 Tcf. (See **Fig. 1**.)

Noble Energy (39.66%) operates Leviathan, with Delek Drilling and Avner Oil Exploration (22.67% each) and Ratio Oil Exploration (15%). Noble also operates Tamar and Dalit, with 36% working interests.

Supported by 3D seismic acquisitions in 2009 and 2010, Noble has identified a number of additional prospects and leads on its significant acreage position offshore Israel and Cyprus.

Israel now faces the unprecedented prospect of at least partial energy independence—that afforded by the domestic presence of natural gas offshore

in the sub-salt and Plio-Pleistocene reservoirs of the Levant basin province.

The Gas Bonanza: Sudden or Gradual?

While news of the gas bonanza appears dramatic, the shift in Israel's energy stance represents the continuation of a trend building since the discovery offshore Ashqelon in 1999 of the Noa gas field and the Mari-B area in 2000. The impact of this trend started to be felt early 2004 when Mari-B—Israel's first offshore natural gas production facility—began supplying significant quantities of natural gas to the country's domestic market.

According to online Israeli state records, Israel has produced gas since 1958. However, the largest annual amount—5.2 Bcf in 1969—represents only 12.4% of 2004's 42.1 Bcf. And between 2004 and 2008, the entire production of 401 Bcf was 5.5 times greater than all the gas produced in Israel between 1958 and 2003. By 2009, more than half the natural gas

consumed in the country was provided by Israel's Yam Tethys consortium, with the remainder supplied by Egypt-based East Mediterranean Gas Company (EMG).

The Levant Basin Province

A report issued by the US Geological Survey (USGS) in March 2010 assessed the undiscovered oil and gas resources of the Levant basin province (**Fig. 2**) in the eastern Mediterranean. The area, encompassing approximately 32,000 sq miles, covers onshore and offshore territory including the Gaza Strip, Israel, Lebanon, Syria, and Cyprus. The USGS estimates the area holds a mean of 1.7 billion bbl of recoverable oil and a mean of 122 Tcf of recoverable gas. The assessment relies heavily on work done in the prior decade by Michael A. Gardosh of the Geophysical Institute of Israel, and Yehezkel Druckman and Binyamin Buchbinder of the Geological Survey of Israel.

With 2010 world proved reserves of natural gas estimated by the US Energy

Information Administration (EIA) at 6,609 Tcf, the Levant basin's resources appear by comparison minuscule. However, Israel is a small country with modest needs. In addition, not all these resources belong to Israel. However, on the basis of the report, Israel can have greater confidence its future natural gas needs will be met with domestic supplies despite possibly consigning part of the Leviathan find for export.

Israeli Government Response

In April 2010, the Israeli minister of finance appointed a six-person committee, headed by internationally renowned taxation and public finance expert Eytan Sheshinski, an economics professor emeritus at the Hebrew University of Jerusalem, to examine Israel's fiscal policy regarding oil and gas. "In most countries throughout the Western world, the tax laws pertaining to gas and oil have been changed many times since the 1950s, including in the past two decades. In Israel, nothing happened, and as a result we are today the country with the lowest government take," Finance Minister Yuval Steinitz stated at a news conference.

The Sheshinski committee's final report, released early January, recommends a progressive tax to be levied on part of the gas and oil companies' profits, after they recoup 150% of their investment. The tax rate would range from 20% to 50%, depending on the volume of the profits—less than the maximum rate of 60% recommended in the committee's interim report, published November 2010. The committee proposed keeping the basic royalty rate on oil and gas revenues at 12.5%.

"We also decided to recommend a gradual implementation of the new tax regime and include an interim period during which the government take from the oil and gas reserves will be in a range of 43% to 59%—below the level of comparable countries in the world," Sheshinski is quoted as saying.

The Sheshinski committee did not bow to pressure by National Infrastructures Minister Uzi Landau to exclude the Tamar gas discovery from the final recommendations, but it did include tax breaks for reserves that begin gas production no later than 1 January 2014. On these reserves, taxes will be levied only after a 200%



Fig. 1—Map showing major Israeli offshore gas fields. Sources: Noble Energy and The Economist.

return is received on the investment in exploration and development.

The final recommendations are now in Prime Minister Benjamin Netanyahu's hands, after which they will be presented for approval to the Knesset, Israel's 120-member legislature. The finance ministry expects the final Knesset vote will occur in mid-April.

The Importance of Infrastructure

With a current population of approximately 7.4 million people—growing at an annual rate the US Central Intelligence Agency estimates at 1.6%—and 2009 gas consumption of approximately 148.3 Bcf, projected by the Israeli Ministry of Infrastructures to rise almost fourfold by 2030, Israel could use resources from both Tamar and Leviathan to feed its own natu-

ral gas needs for close to 50 years. However, although Tamar will most likely be used for domestic consumption, Leviathan's future remains less clear.

Production from the Mari-B field—currently Israel's sole domestic source of natural gas—is expected to begin declining sharply in late 2013. Cost to develop Tamar has been estimated at USD 2.8 billion to 3 billion. While in August 2010 the government gave its consent to the Noble consortium's production plans, by late November funding issues raised by banks in the wake of the Sheshinski committee tax hike recommendations stood in the way of full closing on the project's financing. The Israeli finance ministry said it was important natural gas reached the country's shores in 2013 to ensure continuity of supply to the domestic mar-



Fig. 2—Map showing the extent of the Levant Basin Province. Source: US Geological Survey.

ket. The Israeli government is working with the Noble-led consortium on Tamar field financing matters.

Late in 2010, five Israeli firms, balking at uncertainties surrounding Tamar field development, signed long-term natural gas supply contracts with EMG. Egypt's gas reserves are estimated by the EIA at 58.5 Tcf for 2009—almost twice the reserves confirmed thus far offshore Israel. Contracting for the sale of natural gas from Tamar is under way, however, and Noble has negotiated a number of multi-year letters of intent to deliver new energy to customers.

It is premature to calculate the cost of developing Leviathan. In addition, as a result of the size of the Leviathan field—estimated to cover approximately 125 sq miles—two or more appraisal wells are required to further define total gas resources.

With the find far greater than required to meet Israel's foreseeable

needs, there is talk of exporting liquefied natural gas (LNG), which would require liquefaction facilities as well as transportation vessels—not to mention a viable market where the LNG could be sold. According to Amit Mor, CEO of Eco Energy, an Israeli-based energy, financial, and consulting firm, there are three options: to build LNG facilities on Cyprus or on Israel's coast, or to use a floating LNG facility. While he sees the first option as feasible but challenging from a security standpoint, he feels the second option is "very difficult and unlikely as Israelis typically take a 'not-in-my-backyard'" stand. The third option involves using cutting-edge technology not yet implemented anywhere in the world.

While Mor estimates that five years ago 80% of Israel's electricity came from coal-generated plants, this has declined to 63%. Compare this with

Poland at 92%, the US at 49%, and 79% in China. Such plants can be converted to natural-gas-fired generation. While low gas prices make this an attractive possibility, Infrastructures Minister Landau is on record as defending the use of coal generation "because countries don't want to rely too much on one specific type of fuel, like natural gas." The Israel Electric Corporation (IEC), now adding several thousand megawatts of generating capacity due to increased demand, has ignited debate within Israel regarding how much should be generated from new coal-fired versus gas-fired plants. The issue is complicated by the fact that some of the IEC's capital investment decisions predate Tamar and Leviathan. Nonetheless, Mor predicts coal-generated electricity will decline to 30% within the next 10 years.

Geopolitical Issues

To define countries' maritime business, environmental, and natural resource rights and responsibilities, the United Nations Convention on the Law of the Sea allows them to extend an exclusive economic zone (EEZ) 200 nautical miles from their coasts. Countries separated by fewer than 400 nautical miles are expected to draw a boundary equidistant between them. In December 2010, Israel signed a maritime agreement with Cyprus—not yet ratified by either government—including such a demarcation, whereby both the Leviathan and Tamar fields fall within Israel's EEZ.

Israel and Lebanon do not have an agreed-upon maritime border. A week following the Leviathan confirmation, Lebanon asked the UN to supervise the demarcation of Israel's maritime borders at the new wells. However, delineating maritime borders is outside the provenance of UN Security Council Resolution 1701.

A maritime agreement reached between Lebanon and Cyprus exists but has yet to be ratified by the Lebanese government. Leviathan's discovery has also sparked protests from Egypt, which warned it would closely monitor how the field's boundaries are drawn to ensure they do not infringe on Egypt's EEZ or its own maritime agreement with Cyprus.



Offshore Gaza Strip, the British Gas Group (BG) drilled two wells in 2000: Gaza Marine-1 and Gaza Marine-2. Following 3D seismic acquisition, BG estimated reserves at approximately 1.0 Tcf. Under former Prime Minister Ariel Sharon, Israel asserted that gas found offshore Gaza Strip must come ashore on Israeli territory, pending a full peace agreement. In light of Hamas' takeover of Gaza in 2007, the field's development has been sidelined.

Israeli Oil?

The USGS estimate that the Levant basin province holds a mean of 1.7 billion bbl of recoverable oil is promising. However, oil exploration offshore Israel has so far resulted in modest success.

According to a 2008 study of the Levant basin, conducted by Gardosh, Druckman, Buchbinder, and Rybakov, the first stage of exploration started in the 1960s, continuing through the late 1990s. Although 16 wells were drilled, no commercial production was established. The second stage, which began in 1999 and culminated in the recent gas discoveries, has so far yielded no oil prospect.

Although drilling is going forward on the Leviathan-1 well to 23,000 ft, Noble personnel said this is more to delineate the little-explored geology than in expectation of finding commercial quantities of oil.

The search for Israeli oil continues in shallow water at the eastern part of the Levant basin as well as inland where the 2009 Meged-5 well yielded promising results.

The Future

Resources like Tamar and Leviathan are likely to provoke Israeli innovation of the sort that propelled it into its present world-class high-technology status. The low price of natural gas—and, with the worldwide glut, the likelihood it will stay depressed for the foreseeable future—makes finding uses for it economically attractive.

As the extent of domestically available natural gas supply grows, so does Israel's consumption as more uses for the resource arise. While this involves relinquishing the use of crude oil and coal, the steep surge in overall energy usage

may offset environmental gains achieved by using the cleaner-burning fuel.

There is no doubt that the Tamar and Leviathan gas bonanza, and the likely prospect of further gas in decades to come, will effect beneficial economic consequences within Israel. But the road to riches depends on the petro-

leum industry's creative response and further capital investment. And, while having a reliable domestic source of natural gas for the next few decades will add to Israel's overall stability as a nation, without viable sources of domestic crude oil, its energy-dependent status remains. **JPT**



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