

Noble Energy's Mega-Discoveries



Transform Israel,

Mediterranean Offshore Potential

By Danny Boyd
Special Correspondent

HOUSTON—Noble Energy Inc.'s experience in the Levant Basin offshore Israel is the kind of success story that every operating company—not to mention host government—dreams of.

When Noble Energy entered the eastern Mediterranean Sea offshore Israel in 1998, it was exploring blocks that never had produced a single molecule of natural gas. Today, following a couple of the largest deepwater gas discoveries made over the past decade, Noble Energy and its partners are preparing to develop trillions of cubic feet of resources in the Levant Basin and single-handedly transform Israel from a net importer of energy to a net exporter.

“We took an opportunity to explore blocks offshore Israel that other operators had passed on,” says Rodney Cook, Noble Energy’s senior vice president, international. “We have built a leading acreage position in an emerging basin, drilled four consecutive successful wells based on geologic modeling and 3-D seismic—including the largest discovery in Noble Energy’s history at Leviathan—and have sanctioned a large-scale subsea development project at Tamar.”





The U.S. Geological Survey estimates the Levant Basin holds 122 trillion cubic feet of undiscovered, technically recoverable natural gas, including the Noble Energy-operated Mari-B, Dalit, Tamar and Leviathan fields offshore Israel. The company estimates its Leviathan (discovered in 2010) and Tamar (discovered in 2009) fields alone have a combined 24.5 Tcf of gross mean resources.

Noble Energy's first discovery in the eastern Mediterranean was Noa, a comparatively small, but important find that proved hydrocarbon potential in the area, Cook relates. Soon thereafter, Noble Energy reported commercial quantities of gas at the Mari-B No. 1 well located on nearby acreage 15 miles off the coast. At the time, Israel had no natural gas production.

"Mari-B is the first offshore natural gas production facility in Israel. Production began in 2004 and sales volumes have increased as Israel's power demand and pipeline infrastructure have expanded," states Cook, noting that Noble Energy holds a 47 percent interest in the Mari-B and nearby Noa Field, which are estimated to contain more than 1 Tcf of reserves combined. "Natural gas demand was up 23 percent in Israel in 2010, and we see the local gas market continuing to grow at a healthy pace with significant economic and environmental benefits to Israel."

String Of Discoveries

In early 2009, Noble Energy and its partners discovered gas at the Tamar Field west of Haifa, followed a few months later by Dalit to the southeast of Tamar. Then last summer, Noble Energy announced discovering a mammoth geologic structure below salt directly to the west of Tamar in the deepwater Leviathan Field, which holds an estimated 16 Tcf of natural gas. Noble Energy, as operator, holds 36 percent interests in both Dalit and Tamar, and a 40 percent interest in Leviathan.

"These discoveries will help meet Israel's energy needs for many, many years. They also are driving new regional market potential for natural gas, and we are evaluating export opportunities," Cook remarks.

With gross mean resources of 8.4 Tcf of natural gas, Tamar ranked as the world's largest deepwater gas discovery in 2009, Cook notes. "We sanctioned the project as a multiple-well subsea development in September 2010, and Tamar is on schedule to be commissioned late next year with full gas sales beginning sometime in early 2013."

With roughly twice the resources as Tamar, Cook says Leviathan opens possibilities for large-scale gas exports from Israel. "We still are looking at all the op-

tions for Leviathan," he continues. "The project certainly lends itself to gas exporting. We are studying multiple options for the produced gas, including different export pipeline scenarios and the possibility of developing liquefied natural gas export facilities."

This year, the Houston-based independent is spending \$650 million of its \$2.7 billion total worldwide capital budget in the eastern Mediterranean, including the Tamar development, as well as three to four exploration and appraisal wells on its nearly 1.5 million net acreage position in the region. That includes exclusive drilling rights to an offshore Cyprus block to the west of its discoveries in Israeli waters.

"Supported by 3-D seismic acquisition projects in 2009 and 2010, we have identified a number of additional prospects and leads on our acreage position offshore both Israel and Cyprus, with plans to drill three to four exploration and appraisal wells in the eastern Mediterranean by the end of this year," Cook states.

Noble Energy holds 29,000 net developed acres and 660,000 net undeveloped acres offshore Israel in water depths from 700 to more than 6,500 feet, with the distance from shore ranging between 10 and 90 miles (Figure 1). Altogether, offshore Israel gas sales volumes represented 10 percent of Noble Energy's total consolidated sales volumes in 2010, with reserves accounting for 28 percent of the company's total at year's end.

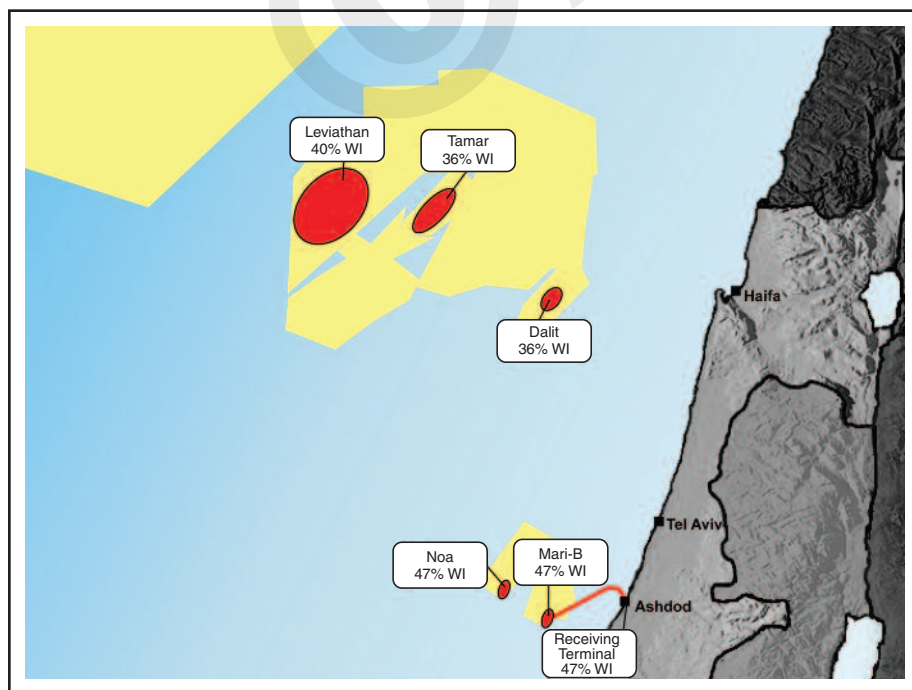
"The Mari-B development established the Levant Basin as a hydrocarbon province, and Tamar and Leviathan show that it has world-class potential," Cook holds. "Our discoveries have opened the basin not only for Noble Energy and its partners, but also as a new global gas province for the entire industry."

Establishing A Market

Noble Energy acquired its initial lease position offshore Israel in 1998 and began drilling in 1999, Cook recalls. Discovering significant natural gas reserves at Mari-B in 2000 was something of a mixed blessing for both Noble Energy and Israel because there was no local infrastructure or markets for natural gas, he explains.

"We began to work in earnest to develop not only a field, but establish a gas market in Israel. At that point, there was no natural gas being consumed by the Israeli electric power industry," Cook says. "By the end of 2010, natural gas was accounting

FIGURE 1
Noble Energy's Eastern Mediterranean Sea Acreage Position





for 40 percent of the Israel's power generation needs."

While Noble Energy and its partners developed Mari-B, the Israel Electric Corporation began converting boilers to dual-fuel capability to utilize the biogenic, dry gas produced from the field. Sales from Noble Energy's Mari-B platform to Ashdod began in 2004.

Production from Mari-B was boosted by adding compression facilities and two development wells that have maintained gross deliverability of 600 million cubic feet a day (approximately 240 MMcf/d net to Noble Energy), Cook says.

In addition to organic sales growth, Noble Energy has ramped Mari-B production to fill unmet demand when gas sales from Egypt were halted for a second time in April after a pipeline network facility was burned during the uprising against the Hosni Mubarak regime. The facility has since been repaired, but sales from Egypt had not yet resumed in late May.

Israel's peak gas consumption in July and August 2010 was 900 million cubic feet a day. Electricity demand this year is on trend for 9 percent annual growth, compared with 6 percent in 2010, Cook says. This increased demand along with additional pipeline capacity continues to spur sales growth.

The investments in the Mari-B Field and the sanctioning of Tamar will enable Noble Energy and its partners to supply the growing Israeli market for years to come, insists Charles "Chuck" Davidson, Noble Energy's chairman and chief executive officer. "Our existing and potential customers are asking for higher volumes of clean, reliable, domestic natural gas in Israel," Davidson says. "Recent trends suggest that demand projections may have been too conservative, which means we are going to have to plan earlier for growth beyond the first phase of Tamar."

Cook describes Mari-B as a "big mountain of sand" that will be well suited for gas storage after the reservoir is depleted. "When Tamar comes on line, the Mari-B

reservoir still will have some capacity to flow," Cook says. "We will be managing both of those. At some point, our plans are to store as much gas in the Mari-B reservoir as we can to meet seasonal demand."

Development Plan

Like Mari-B, Tamar's biogenic gas is more than 99 percent methane. The reservoir has "superior" reservoir characteristics, according to Cook, with 1.0 Darcy permeability and 25 percent porosity. In addition to Noble Energy's 36

says.

"All contracts have been awarded and we are focusing on technical and commercial execution," Davidson says. "In addition, given the importance of getting this project on line as soon as possible, we took steps to source additional materials so the project timing would not be affected by the earthquake in Japan in March."

While there are no plans for expenditures this year at Dalit, Cook says the discovery is certainly on the radar screen for Noble Energy's long-term regional development strategy.

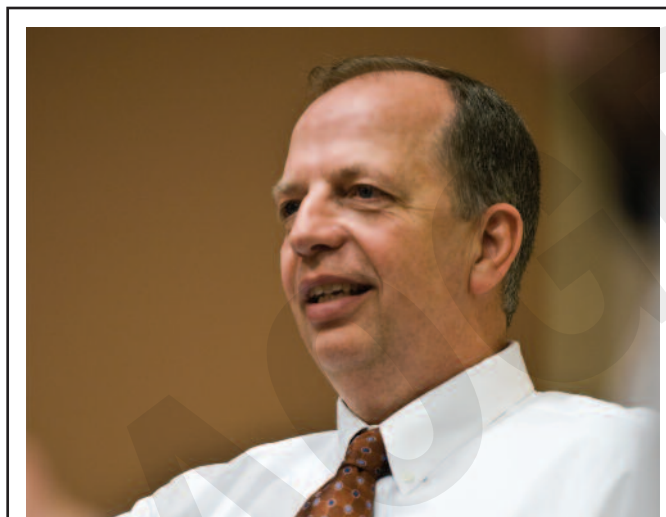
"It is a part of the plan as we look forward to how we expand Tamar and bring in Leviathan," he comments. "Hopefully, with the exploration drilling we are going to do this year and early next year offshore Israel, we will have other discoveries and they will all be a part of a development scenario that will allow us to bring full value, not only to ourselves and our shareholders, but also to the state of Israel and our partners there."

While Noble Energy is focused on the full-scale development at Tamar, a company team continues to plot a course for delineating Leviathan, Cook reports. The company's partners on Leviathan are Delek Drilling (22.67 percent), Avner Oil Exploration (22.67 percent) and Ratio Oil Exploration (15.0 percent).

This spring, Noble Energy spudded the Leviathan No. 2 appraisal well eight miles from the discovery well site. However, on May 16, Noble Energy and its partners announced that they had ended drilling operations on the No. 2 appraisal

well before reaching the targeted depths for the gas intervals discovered at the Leviathan No. 1 discovery well because of water flowing from the well bore up to the seafloor. The source was identified as a water-saturated sand that was flowing behind the surface casing, and there were no indications of hydrocarbons in the produced water, according to Cook.

After deeming the No. 2 well location and bore hole unsuitable for continued drilling, Cook says Noble Energy was working in late May to relocate the rig to a new site to resume the Leviathan ap



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Senior Vice President, International
Noble Energy Inc.

percent operated working interest, partners in Tamar are Isramco Negev 2 (28.75 percent), Delek Drilling (15.625 percent), Avner Oil Exploration (15.625 percent), and Dor Gas Exploration (4.0 percent).

The Tamar development plan includes five subsea completions with daily production capability of 200 MMcf-250 MMcf per well. Water depth is 5,500 feet with production from a sandstone at 9,000-10,000 feet total depth from the mud line. Tamar will have flow capacity up to 1 Bcf/d if demand calls for it, Cook



Transocean's *Sedco Express* semisubmersible drilling rig is shown here on location offshore Israel for Noble Energy. The rig drilled the Noble Energy-operated Leviathan discovery well in 2010 and also is drilling development wells on the company's 2009 Tamar discovery. Noble Energy estimates the Leviathan and Tamar discoveries have a combined 24.5 Tcf of gross mean natural gas resources.

praisal drilling program. He adds that Noble Energy plans to keep a rig working in the field for a majority of the year.

"Water depths are 5,800-6,000 feet, and we are drilling subsalt to depths of 15,000-16,000 feet into a high-quality reservoir package," he says. "Leviathan is a high-quality reservoir that has the capacity to deliver a large volume of gas with very little drawdown on the reservoir."

Long-Term Opportunities

Although the partners have not yet established a long-term development time frame for Leviathan, Cook assures that Noble Energy will work to bring the field on in a timely, effective manner that is consistent with market access.

"We are not prepared to talk yet about the timing of Leviathan, but suffice it to say, we are not going to sit back," he

insists. "Noble Energy has a history of working hard to monetize discoveries as quickly as we can and in the proper fashion that makes sense to everybody involved. We are working toward that objective with Leviathan, and are analyzing both potential pipeline and LNG export possibilities."

Once fully commissioned, gas production from Leviathan is expected to be a significant contributor to Noble Energy's corporate growth, Cook adds. "Leviathan is a world-class reservoir with long-term drilling and development opportunities that will help drive our growth in the years ahead," he states.

In the meantime, Noble Energy also continues to assess the potential of 795,000 net undeveloped acres it holds offshore Cyprus, adjacent to the company's Israeli offshore blocks to the east. Depending on rig tendering and well permitting, Cook reports that exploration could begin in the fourth quarter on Cyprus Block 12, where Noble Energy holds a 100 percent working interest and has acquired 3-D seismic data.

"Our goal is to get a well drilled as soon as possible, spudding as early as October. We are in the process of finding what rigs are available and should have a better feel for the exact timing by the end of the second quarter," he concludes. "We look at the Cyprus acreage as an extension of the Levant Basin, and we are hopeful that our eastern Mediterranean program eventually will include fields in blocks offshore both Cyprus and Israel." □