



# Israel's Offshore Natural Gas Discoveries Enhance Its Economic and Energy Outlook

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## Summary

Israel has been dependent on energy imports since it became a nation in 1948, but the recent offshore natural gas discoveries could change that and possibly make Israel an exporter of natural gas. Development of the recently discovered natural gas fields—Tamar, Dalit, and Leviathan—likely will decrease Israel's needs for imported natural gas, imported coal, and possibly imported oil. A switch to natural gas would most likely affect electric generation, but could also improve Israel's trade balance and lessen carbon dioxide emissions. Regionally, Israel's success thus far has sparked interest from its neighbors to explore their boundaries for energy resources and has raised concerns from Lebanon about sovereignty over the discoveries. Development of these new resources, and possibly other discoveries, would enhance Israel's economic and energy security. Israel is in the early stages of formulating the regulatory framework to oversee the development of these resources and may seek assistance from the United States or other natural gas producing countries in weighing its options.

### **Key Points:**

- The new discoveries—depending upon the actual production—could represent over 200 years' worth of Israel's current natural gas consumption.
- Israel's electrical generation sector will likely be the beneficiary of the new natural gas resources.
- Additional natural gas and possibly oil resources may exist.

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## Introduction

Israel's energy sector is set to undergo significant changes that could transform the country into an exporter of natural gas. Development of three recently discovered natural gas fields—Tamar, Dalit, and Leviathan (see **Figure 1**)—is projected to begin at the end of 2012 and be completed by the end of the decade. The estimated supplies from these fields (see **Table 1**) would enable Israel to decrease its natural gas and coal imports and possibly its oil imports.

**Table 1. Israel's Estimated New Natural Gas Resources**

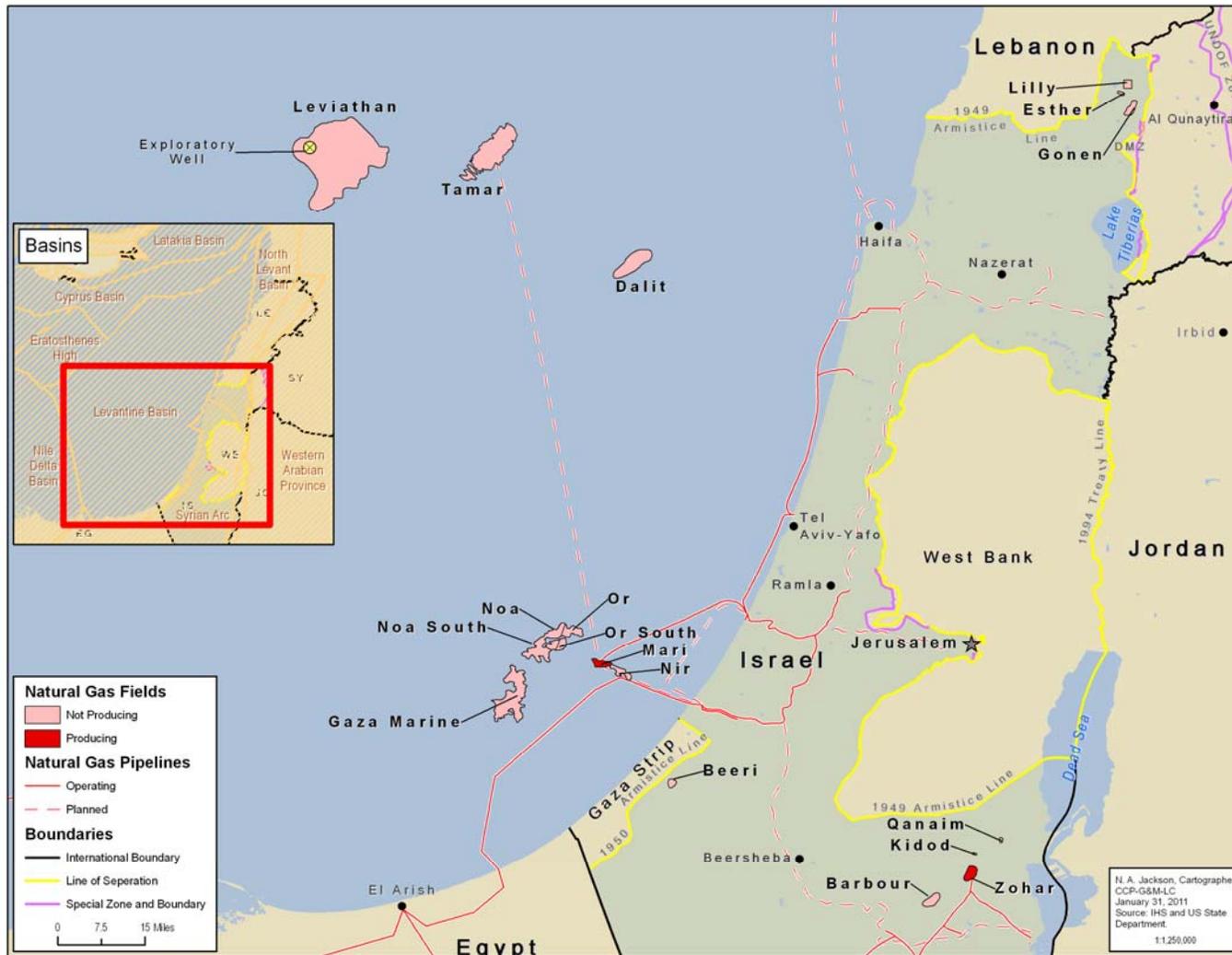
| Field     | Resource (trillion cubic feet) | Expected Production Date |
|-----------|--------------------------------|--------------------------|
| Tamar     | 8.4                            | 2012-2013                |
| Dalit     | 0.5                            | 2013-2014                |
| Leviathan | 16.0                           | 2016-2018                |

**Source:** Noble Energy.

**Note:** Resources or resource base is a broad term that includes reserves (see below) as well as natural gas less likely to be produced. Resources are not subject to today's technology or price constraints as reserves are and may be produced sometime in the future. Reserve is an industry term to define the likelihood that natural gas resources can be produced using current technology and at today's prices according to the Society of Petroleum Engineers and the World Petroleum Congresses definition.

Coal imports would likely be most affected as coal is currently the primary fuel for electric generation, and can be displaced by natural gas. Israel's trade balance would likely improve and its carbon dioxide emissions would likely decline as a result. The discovery of natural gas resources has also led Israel to reevaluate the nation's energy tax policy. Israel's Ministry of Finance has recommended tax policy changes that would increase tax revenues, but decrease potential after-tax profits for developers. Regionally, Israel's success thus far has sparked interest from its neighbors to explore their boundaries for energy resources and has raised concerns from Lebanon about sovereignty over the discoveries.

**Figure I. Israel's Growing Natural Gas Sector**



**Source:** Library of Congress Cartography.

**Note:** Inset depicts the regional geologic basins and the red box highlights where the new discoveries are in the Levantine Basin.

## Natural Gas Discoveries Improve Energy Security

Israel is poised to become an energy producer and perhaps even a natural gas exporter provided its recent discoveries come to fruition. At the end of last year, Noble Energy, a U.S. independent energy company, reconfirmed its estimates for its third and largest natural gas discovery off the northern coast of Israel. The Leviathan field has an estimated resource base of 16 trillion cubic feet (tcf)<sup>1</sup> of natural gas, but will require at least two more appraisal wells to be drilled before the size of the resource base is better defined.<sup>2</sup> Noble Energy's other natural gas discoveries (Tamar and Dalit) coupled with the success of other companies puts Israel in a position to be self sufficient in natural gas and possibly become a natural gas exporter, thus improving the country's energy and economic security.

Since January 2009, Noble Energy has made three natural gas discoveries—Tamar, Dalit, and Leviathan—with an estimated 25 tcf of resources. Israel's natural gas reserves—natural gas that has been discovered and can be expected to be economically produced—prior to the Noble Energy discoveries were estimated at 1.5 tcf or about 16 years worth at current production levels. If only half the natural gas from the new discoveries is produced at today's production levels, Israel would have well over a 100-year supply of natural gas. It is too early to know the rate of natural gas recovery from the three new fields or if other discoveries will arise, but it is highly likely that Israel's energy mix will move towards natural gas by the end of the decade. Tamar's first production is expected at the end of 2012, with Dalit one or two years after that, and Leviathan between 2016 and 2018.<sup>3</sup> According to Noble Energy, Tamar alone is expected to reach a maximum capacity of one billion cubic feet per day (bcf/d) by 2013 or 2014, or over three times the rate of Israeli consumption in 2009 of 0.31 bcf/d.<sup>4</sup>

Until 2009, Israel's demand for natural gas was met by domestic production. An import pipeline from Egypt began deliveries in 2009 and despite public discontent against the sales in Egypt, the pipeline remains operational today (**Figure 2** illustrates Israel's natural gas consumption and highlights the effect of Egyptian imports). Natural gas from the new fields could displace the Egyptian imports, which has benefits and disadvantages for both countries. Israel pays below market prices for the natural gas it imports from Egypt. Continuing the imports and using additional production to begin exports, most likely to Europe or Jordan, could further improve Israel's energy and economic security. Eliminating the imports could improve Israel's trade balance and provide greater supply security. For Egypt, stopping the exports to Israel would have political advantages as the natural gas sales to Israel were unpopular with Egyptians and were taken into court. The impact of the current unrest in Egypt on its natural gas exports to Israel is unclear. Maintaining the exports to Israel could help Egypt's trade balance.

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<sup>1</sup> The units used throughout this paper vary from billion cubic feet (bcf) to trillion cubic feet (tcf or 1,000 times 1 bcf) to bcf per day (bcf/d or 1 bcf divided by 365).

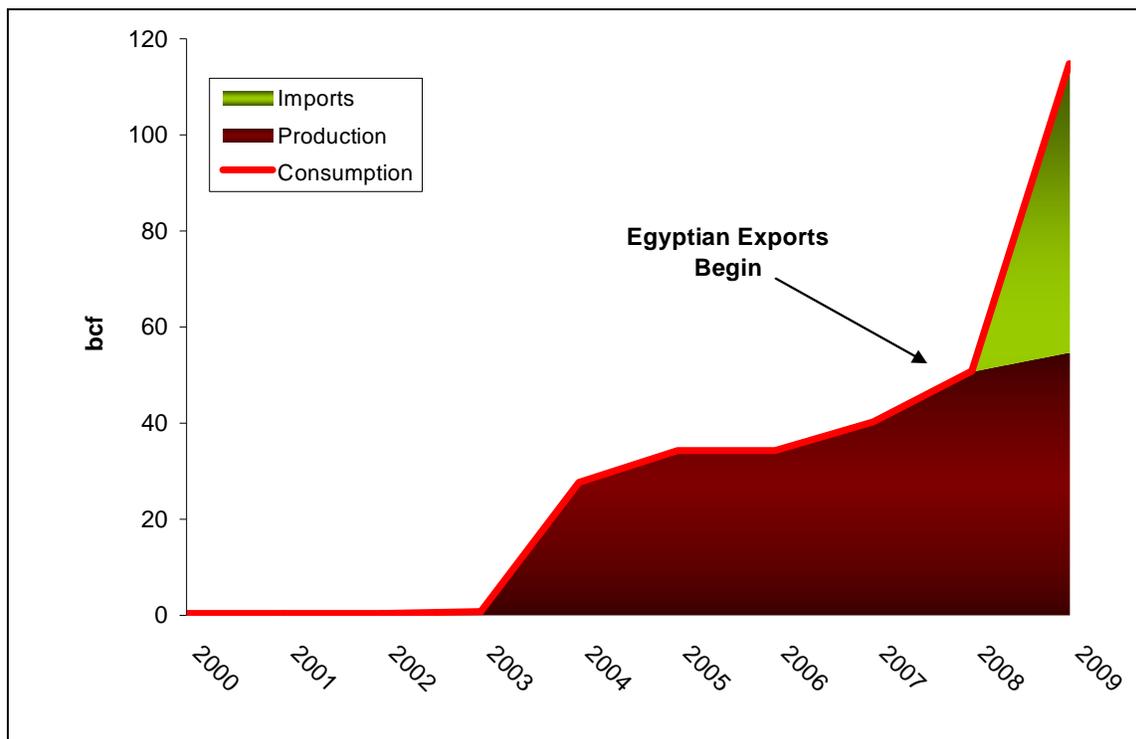
<sup>2</sup> *Noble Energy Announces Significant Discovery at Leviathan Offshore Israel*, Nobel Energy Press Release, December 29, 2010, <http://www.nobleenergyinc.com>.

<sup>3</sup> Conversation with Noble Energy, January 10, 2011.

<sup>4</sup> Cedigaz databases, an international industry association—<http://www.cedigaz.org>. See "Minimal Use of Natural Gas Currently" section below for background on current Israeli energy consumption.

**Figure 2. Israeli Natural Gas Consumption and Sources**

Units = billion cubic feet (bcf)



**Source:** Cedigaz databases, <http://www.cedigaz.org>.

**Notes:** Production plus imports less exports equals consumption. Israel has never been an exporter of natural gas.

## Minimal Use of Natural Gas Currently

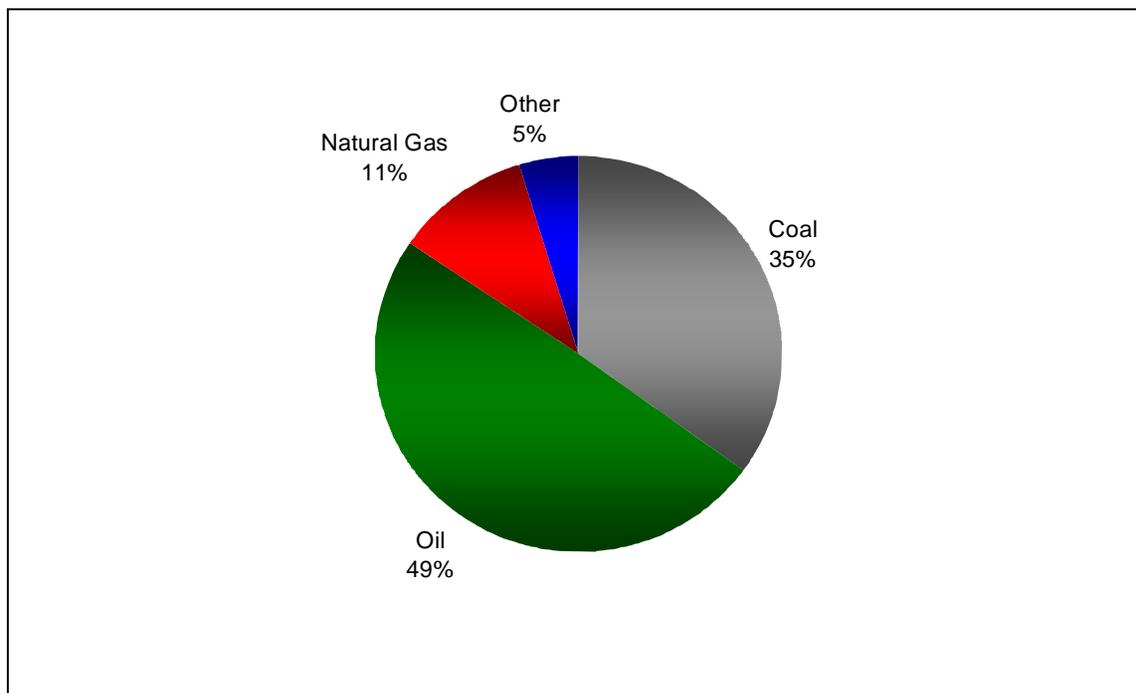
Israel's consumption of natural gas has been growing since 2003, but remains a relatively small portion of its current energy mix at 11%.<sup>5</sup> Oil accounts for almost half of Israel's primary energy consumption, while coal is 35%. (See **Figure 3**.) However, the recent natural gas discoveries have the potential to substantially change the share of natural gas use in Israel. Industry forecasts project that by 2015, Israel could be consuming 1 bcf of natural gas per day, an almost threefold increase from today's consumption.<sup>6</sup> The three new natural gas fields represent potentially 26 times the total amount of energy currently consumed annually by Israel from all fuel sources. Israel's electricity generation sector will most likely utilize the new resources more than other sectors (see section below) and could even facilitate Israel moving towards electrification of its car fleet, a goal the government has set. Current energy infrastructure is equipped primarily for oil and coal; substituting natural gas would require major changes and investment to the electricity and transportation sectors.

<sup>5</sup> International Energy Agency data—[http://www.iea.org/stats/balancetable.asp?COUNTRY\\_CODE=IL](http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=IL).

<sup>6</sup> Conversation with Noble Energy about their estimates for the Israeli consumption of natural gas. Their estimate did not include converting Israel's coal-fired electric power to natural gas; January 10, 2011.

**Figure 3. Israeli Primary Energy Consumption by Fuel**

2008 total was 22 million metric tonnes of oil equivalent or 161 million barrels of oil equivalent



**Source:** International Energy Agency data—[http://www.iea.org/stats/balancetable.asp?COUNTRY\\_CODE=IL](http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=IL).

**Notes:** A conversion factor of 7.33 was used to go from metric tones of oil equivalent to barrels of oil equivalent.

## Electricity Generation Sector Likely to be Transformed

Israel's electricity generation sector will most likely undergo the greatest change because of the development of Israel's natural gas resources. Currently, natural gas fuels about 26% of Israel's electric generation. (See **Figure 4**.) Coal supplies almost two-thirds of the generation capacity. If Israel were to convert all of its existing electric power generation to natural gas, it would require approximately an additional 0.8 bcf/d of natural gas,<sup>7</sup> the estimated maximum output from the Tamar natural gas field alone. Replacing only its coal units would require approximately 0.67 bcf/d of natural gas. If these conversions were to occur, carbon dioxide emissions from the electricity generation sector would decrease 52% and 50%, respectively.<sup>8</sup> However, this would be a major investment and likely require many years to achieve.

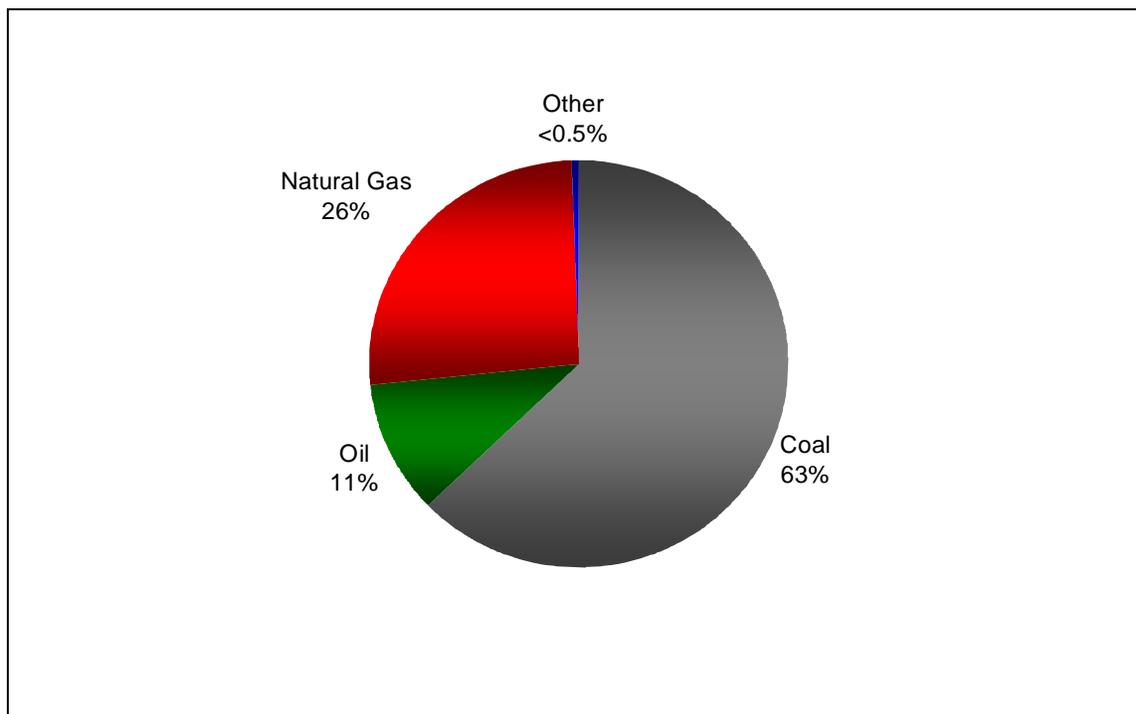
Switching to a natural gas-based electrical sector would allow Israel to increase the domestic share of energy production. Currently, Israel imports all of its coal and most of its oil.

<sup>7</sup> This assumes utilizing high efficiency combined cycle gas turbines to generate the electricity. This type of power plant is common and considered an industry standard for new natural gas generation.

<sup>8</sup> Based on International Energy Agency production data and industry estimates for carbon dioxide emissions from electric power plants.

**Figure 4. Israeli Electricity Fuel Mix**

2008 total was 56,420 gigawatt hours



**Source:** International Energy Agency data—[http://www.iea.org/stats/balancetable.asp?COUNTRY\\_CODE=IL](http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=IL).

**Notes:** Other includes hydroelectric power, wind, and various other sources.

## Related Issues

### Proposed Energy Tax Changes<sup>9</sup>

In April 2010, Israel's Minister of Finance appointed a committee to examine fiscal policy related to oil and gas resources in Israel, prompted by the recent natural gas discoveries.<sup>10</sup> The committee was directed by Israel's Minister of Finance to (1) evaluate Israel's fiscal system as it relates to oil and gas reserves and compare Israel's system to countries in similar economic circumstances; (2) propose an updated fiscal system; and (3) examine the potential effects current and future natural gas discoveries would have on the Israeli economy.<sup>11</sup>

<sup>9</sup> Analysis of Israel's energy taxes and proposed changes was provided by Molly Sherlock of CRS.

<sup>10</sup> Israel's oil and gas tax policy had been left largely unchanged since the 1950s.

<sup>11</sup> State of Israel: Ministry of Finance, *Summary of the Draft Conclusions by the Committee to Examine the Policy on Oil and Gas Resources in Israel*, Headed by Prof. Eytan Sheshinski, November 10, 2010. Available at <http://www.financeisrael.mof.gov.il/FinanceIsrael/Pages/En/News/20101110.aspx>.

The committee's draft conclusions were released by Finance Ministry on November 10, 2010.<sup>12</sup> The committee found that "the current system does not properly reflect the public's ownership of its natural resources."<sup>13</sup> The committee's draft conclusions recommended two major changes to Israel's tax treatment of the oil and gas industry. First, the draft conclusions suggested eliminating the existing depletion deduction.<sup>14</sup> Second, a progressive tax on oil and gas profits was proposed. In the proposal, profits were determined using the ratio of total revenues to total exploration and development costs. The committee's draft conclusions did not recommend a change in Israel's royalty rate, which is set at 12.5%.<sup>15</sup>

The committee's final report was released on January 3, 2011 and fully accepted by Prime Minister Netanyahu and the cabinet.<sup>16</sup> Overall, the committee's recommendations would increase the government's share on oil and gas revenues to between 52% and 62%, up from the current 30%.<sup>17</sup> Like the draft conclusions, the committee's final recommendations suggest eliminating the depletion allowances and imposing a tax on oil and gas profits. The tax on profits would start after the project had earned cumulative net income equal to 150% of its exploration and development costs.<sup>18</sup> The rate of tax would start at 20%, increasing to maximum rate of 50%.<sup>19</sup>

This tax increase would be phased in over time. Fields that start production prior to 2014—which would likely include Tamar and possibly Dalit, but not Leviathan—would be partially exempt from the tax increase. For reserves in which extraction begins by January 1, 2014, the profits tax will not apply until cumulative net income reaches 200% of exploration and development costs and will not be fully phased in until reaching 280%.

The tax increase recommended in the final report was less than was initially presented in the draft proposal.<sup>20</sup> The proposed tax increases will be enacted only if approved by the Israeli

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<sup>12</sup> The full committee report has not yet been released. CRS has relied on the English version of the Executive Summary of the committee's recommendation as well as secondary sources in the overview presented here. The English translation of the Executive Summary is available at [http://www.financeisrael.mof.gov.il/FinanceIsrael/Docs/En/publications/20110110\\_Sheshinski\\_Executive\\_Summary\\_of\\_Final\\_Conclusions\\_Eng.pdf](http://www.financeisrael.mof.gov.il/FinanceIsrael/Docs/En/publications/20110110_Sheshinski_Executive_Summary_of_Final_Conclusions_Eng.pdf). A Hebrew version of the final report is available from Israel's Ministry of Finance at <http://www.mof.gov.il/BudgetSite/Reform/Pages/PhysicsPolicy.aspx>.

<sup>13</sup> State of Israel: Ministry of Finance, p. 3.

<sup>14</sup> Depletion deductions allow taxpayers to account for a reduction in a product's reserves. The deduction reduces taxable income, thereby reducing tax liability. The commission's draft conclusions provided a rationale for eliminating the depletion deduction. The commission noted that the depletion deduction was intended to compensate owners of mineral assets for the asset's reduced value following resource extraction. In the present case, the asset is owned by the state. Thus, allowing depletion deductions does not compensate the asset owner (the state) for a reduction in asset value.

<sup>15</sup> For comparison, royalty payments in the United States are generally between 12.5% and 30% of the gross wellhead value of production, depending on the lease contract.

<sup>16</sup> The recommendations still need to be passed by Israel's parliament before they take effect. See *Netanyahu "fully accepts" Sheshinski C'tee findings*, Jerusalem Post, January 18, 2011; Ethan Bronner, "Israel Approves Doubling of Taxes on Oil and Gas Extraction Profits," *New York Times*, January 23, 2011.

<sup>17</sup> Guy Chazan, "Israel Sets Steep Rise in Taxes on Oil, Gas," *The Wall Street Journal*, January 4, 2010.

<sup>18</sup> Net cumulative income is defined as cumulative income less project expenses, royalty payments, and profits taxes paid in previous years.

<sup>19</sup> The 50% rate would be applied once the ratio of net cumulative income to exploration and development costs reaches 230%.

<sup>20</sup> The draft proposal would have imposed a 60% to 70% tax on earnings above 150% of a company's investment.

government. Israeli and U.S. companies oppose any tax increase, and argue that changing the tax regime will deter future energy resource development.<sup>21</sup>

## **Comparison to U.S. Energy Tax Policy<sup>22</sup>**

Oil and gas producers in the United States pay the U.S. corporate income tax. The corporate tax is levied on taxable income, which is calculated as gross income less deductions. The statutory corporate income tax rate is generally 35%. There are a number of deductions specific to the oil and gas industry, such as the ability to expense intangible drilling costs (IDCs) and to claim percentage depletion instead of cost depletion.<sup>23</sup> Oil and gas producers are also eligible for the Section 199 production activity deduction.<sup>24</sup>

The United States has generally not imposed a specific profits tax above and beyond the corporate income tax on the oil and gas industry. However, from 1980 through 1988, the United States levied a windfall profits tax (WPT) on the U.S. oil industry. In practice, the WPT was an excise tax.<sup>25</sup> The tax was determined according to the price of oil rather than on profits. The WPT was enacted to address increased oil industry profits following the decontrolling of oil prices.<sup>26</sup>

## **Lebanon Contests Discoveries**

The announcements by Israel and Noble Energy of significant natural gas discoveries have prompted Lebanese leaders to raise concerns that the natural gas fields are at least partially in Lebanese waters and that Israel will “steal” Lebanon’s resources if the Lebanese government does not act. Lebanon and Israel have never defined their maritime border as the two countries are still technically at war. The Lebanese government has appealed to the United Nations, particularly the UN Interim Force in Lebanon, to intervene in defining the maritime border, but the UN has declined thus far to delineate the maritime border.<sup>27</sup> Some trade press for the natural gas industry is depicting all the Noble Energy discoveries within Israeli borders.<sup>28</sup>

There has been rhetoric from both the Lebanese and Israeli governments about using all means necessary, including military action, to defend their national resources, according to regional press reports.<sup>29</sup>

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<sup>21</sup> Vita Bekkar, *Delek warns of impact from Israeli tax regime*, Financial Times, January 4, 2011.

<sup>22</sup> Comparison to U.S. energy taxes was provided by Molly Sherlock of CRS.

<sup>23</sup> Cost depletion allows for the recovery of the actual capital investment. With cost depletion, total deductions cannot exceed the original capital investment. Under percentage depletion, the deduction for recovery of a capital investment is a percentage of the “gross income”—that is, revenue—from the sale of the mineral. With percentage depletion, total deductions may exceed the initial capital investment.

<sup>24</sup> Internal Revenue Code (IRC) § 199 allows domestic manufacturers to take a deduction from net income. Most manufacturers are allowed a deduction of 9%. Oil and gas producers are allowed a reduced deduction of 6%.

<sup>25</sup> Excise taxes are typically imposed on a transaction, rather than on a person or corporation. Excise taxes can be levied on a per-unit basis or ad valorem basis.

<sup>26</sup> For additional background, see CRS Report RL33305, *The Crude Oil Windfall Profit Tax of the 1980s: Implications for Current Energy Policy*, by Salvatore Lazzari.

<sup>27</sup> Neal Sandler, *UN rejects call to delineate the Lebanese-Israeli maritime border*, Platts, January 5, 2011.

<sup>28</sup> *Israeli gas heightens interest in Eastern Mediterranean*, Wood Mackenzie Consulting, November 2010, p. 2.

<sup>29</sup> *Shami Wants UN To Keep An Eye on Israel Oil Aims*, NOW Lebanon, January 4, 2011; *Israel's Discovery of Natural* (continued...)

## Prospects for the Future

### Export Potential Possible

Whether Israel will become an exporter of natural gas is yet to be determined. If the resource estimates are correct, the new fields would give Israel the resources to become an exporter. A number of factors raise doubts about the viability of exports: Growing domestic demand—and potential new uses for gas, energy security issues, the expense of liquefying the natural gas for transport, an existing global glut of natural gas, and the politics of pipeline exports. Noble Energy is exploring the possibility of building a liquefaction facility, possibly in Cyprus to utilize any natural gas discovered there, for exports to Europe and Asia, but it is too early to determine the feasibility of such a project.

### Other Regional Natural Gas Development Likely

Hoping to replicate Israel's success in finding new energy resources, Cyprus, Lebanon, and Syria have announced timetables for holding auctions for licenses to explore for oil and gas. Cyprus and Syria plan to hold their license auctions this year, while Lebanon has theirs scheduled for 2012.<sup>30</sup> It is unclear how the ongoing political deadlock might affect the Lebanese government's plans to move forward with its energy development.<sup>31</sup> In December 2010, Cyprus and Israel signed an agreement defining their sea border.

In March 2010, The U.S. Geological Survey (USGS) released a report on the Levant Basin province that stretches from the Sinai peninsula to the northern border of Syria and from the coast into the Mediterranean Sea to the western side of Cyprus. The report stated that the Levant Basin may hold 1.7 billion barrels of recoverable oil and 122 trillion cubic feet of recoverable natural gas.<sup>32</sup>

### Oil Discoveries Possible

In light of the USGS report, Noble Energy and its partners have raised the prospect of drilling deeper, below the natural gas bearing formations in the Leviathan field in search of oil. Noble Energy estimates that there is a 17% probability that it could find 3 billion barrels of oil.<sup>33</sup> The probability and estimate will likely change as additional information and data is gathered.

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(...continued)

*Gas Threatens Lebanon's Rights!*, Al-Manar, January 2, 2011.

<sup>30</sup> *Israeli gas heightens interest in Eastern Mediterranean*, Wood Mackenzie Consulting, November 2010, p. 5.

<sup>31</sup> For more information on Lebanon, see CRS Report R40054, *Lebanon: Background and U.S. Relations*, by Casey L. Addis.

<sup>32</sup> *Assessment of Undisclosed Oil and Gas Resources of the Levant Basin Province, Eastern Mediterranean*, USGS, March 2010.

<sup>33</sup> Avi Bar-Eli, *Leviathan Natural Gas Reserves Said Worth \$90 Billion*, Haaretz, December 30, 2010.

## **Policy Considerations**

The U.S. government<sup>34</sup> is not directly involved in Israel's oil and gas policies. However, in the near-term, consultations regarding the energy policy and regulations would be one area that government to government interaction might take place. Israel has never been a major energy producer and must balance its normal economic and security concerns with development of this new resource. The United States has experience related to regulatory oversight, tax policy, and environmental concerns that could benefit Israel.

The regional interest from other countries to develop energy resources creates an opportunity for discussions between Israel and its neighbors, bilaterally or multilaterally and directly or indirectly. Additionally, resolving the maritime demarcation issue between Israel and Lebanon would alleviate industry uncertainty.

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## **Acknowledgments**

Molly Sherlock, Analyst in Economics, contributed to this report.

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<sup>34</sup> For more information on Israel/U.S. relations, see CRS Report RL33476, *Israel: Background and Relations with the United States*, by Carol Migdalovitz.