



## Egypt's Natural Gas Trends and Potential Impacts

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*The following guest post is from Jonathan Callahan, a PhD chemist currently working as a data management / information access consultant. Jonathan writes on energy issues and data management at [Mazamascience.com](http://Mazamascience.com)*

Current events in Egypt and throughout the Arab world have captivated world attention and with good reason — in 2009, Arab nations exported approximately 17 million barrels of oil and 18 billion cubic feet of natural gas every day.<sup>[1]</sup> Developed nations are extremely dependent upon this steady flow of energy into their economies.

North American audiences are very focused on the oil part of that equation. A [recent article in The Oil Drum](#) has analyzed the oil situation in Egypt, including its recent slide from oil exporter to oil importer. This post examines the other half of the equation — Egypt's production, consumption and exports of natural gas and the impact existing trends will have on nations that import that gas.

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## Geologic Setting

To fully understand trends in fossil fuel production one must know something about the geological prospects within a region. Among the most concise and well written geologic summaries are those published by Colin Campbell in his ASPO Newsletters. The following excerpt comes from his 2009 [Country Assessment for Egypt](#) which is well worth reading in its entirety.

### Geology and Prime Petroleum Systems

In geological terms, there are three main productive basins, of which by far the largest is the offshore Gulf of Suez, where oil is trapped beneath Miocene salt. [...] The third basin is the Nile Delta, which is a gas province. The Mediterranean shelf is narrow and steep. It might hold some deepwater potential, but the chances are slim.

### Exploration and Discovery

Exploration [for oil] commenced in the 1920's [...] but overall exploration is at a mature stage, with the larger fields well into decline. Exploration drilling [for oil] is expected to decline and draw to a close around 2030 as fewer and fewer prospects remain to be tested.

The Nile Delta holds substantial gas reserves of about 50 Tcf and offers some further potential. The country's total reserves amount to about 65 Tcf.

### Production and Consumption

Oil production commenced in 1914 but did not rise significantly until after the Second World War [...] Consumption has risen steeply in recently years to reach 241 Mb/a, meaning that the country is already a net importer.

Gas production commenced in 1935 and reached an early plateau at around 1.5 Gcf a year from 1941 to 1953 before falling steeply. A second surge of production came with the opening of the offshore in the Nile Delta to climb steeply over the last few years to almost 2 Tcf a year. It is now expected to plateau at about 2.2 Tcf/a for the next two decades before declining steeply. Consumption has risen in parallel. Along with related Gas Liquids, it will be an increasingly important source of energy for the population centres of Cairo and Alexandria.

In summary, Egypt's oil fields are all mature and in decline while natural gas is mostly limited to a single province — the Nile Delta. Campbell sees this province achieving a peak in natural gas production at 2.2 trillion cubic feet (Tcf) per year (6.0 billion cubic feet per day). This is very close to current production levels.

The [Egyptian Natural Gas Holding Company](#) (EGAS) is a little more optimistic than Campbell regarding total reserves:

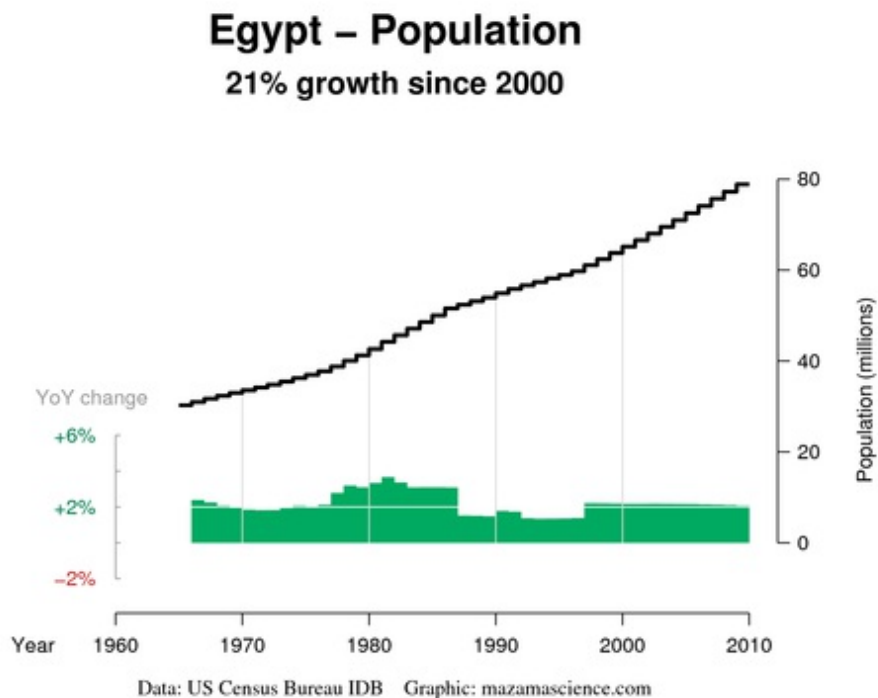
Recoverable natural gas reserves reached 78.1 TSCF as of June 30th, 2010. The Mediterranean area holds the largest amounts of total gas reserves of 76% followed by the western Desert 11%, Gulf of Suez 7% and the Nile Delta 6%.

Gas reserves yet to prove is estimated to be 120 TCF which still need further efforts maximizing utilization of latest technological advances in the field and increasing investments in exploration and production as well as attracting foreign international investors.

With oil in decline, Egypt is increasingly reliant upon natural gas to fuel power generation, as a source of export revenue and to fuel transportation. (In 2009, Egypt had 122 thousand vehicles running on Compressed Natural Gas (CNG) [according to EGAS](#). The milestone for 2015 is 300 thousand vehicles.)

## Production and Consumption Trends

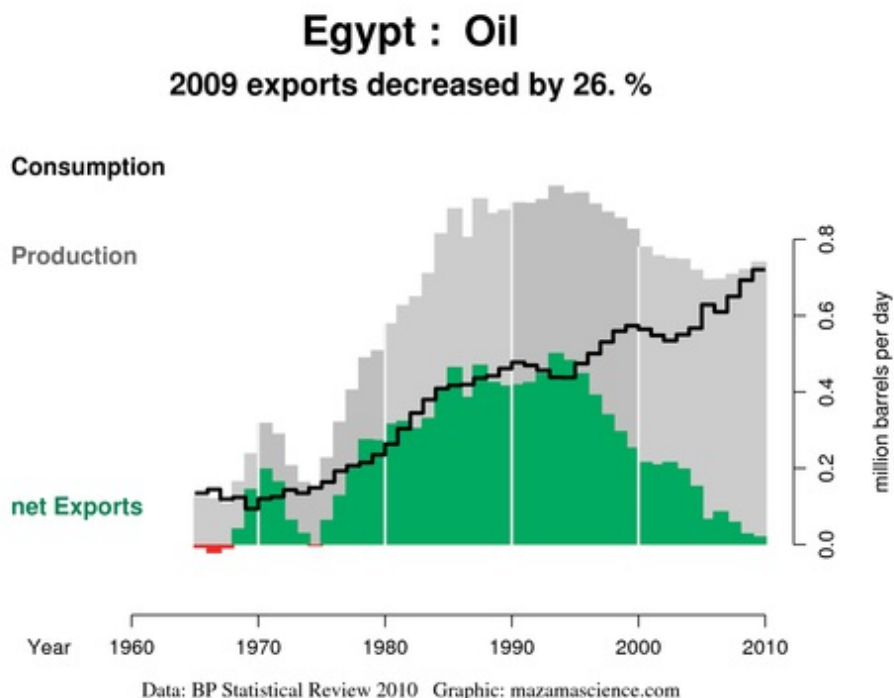
To put Egypt's overall situation in context, let's first take a look at the trends in population and net oil exports.



**Figure 1)** *Egyptian population trends*

Figure 1), from the [Population Trends databrowser](#), shows Egypt's rapidly rising numbers. Many have been aware of Egypt's population problem for years but the inflationary summer of 2008 saw awareness spread to the main stream US media with the NY Times article: [Egypt fights to stem rapid population growth](#).

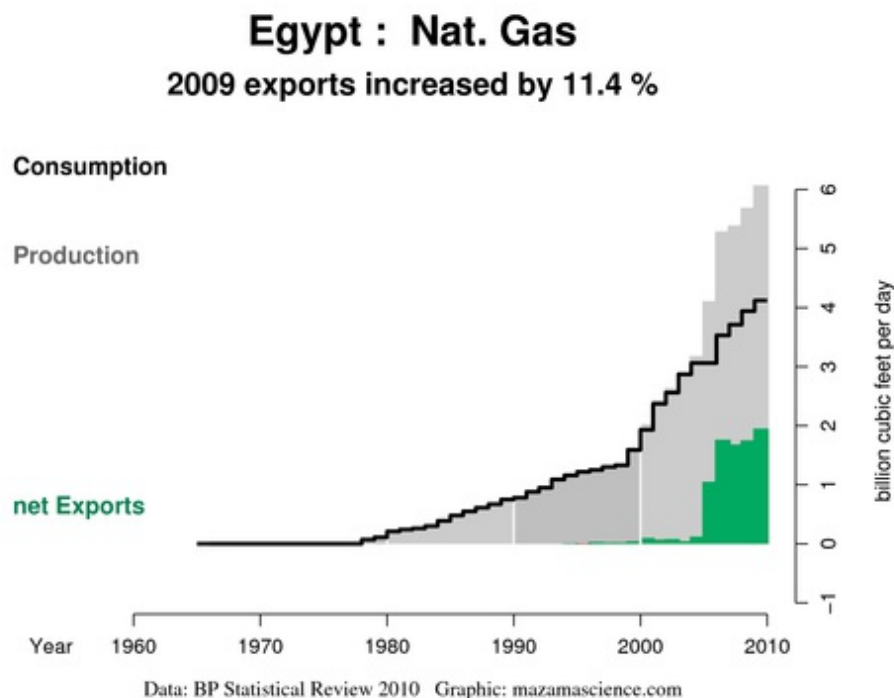
The recent political crisis has called attention to Egypt's rapid fall from oil exporter status as seen in Figure 2) from the [Energy Export databrowser](#).



**Figure 2)** *Egyptian trends in oil consumption, production and net exports*

Even though oil production has been up in recent years, consumption has increased so rapidly that it has overtaken production causing net exports (production minus consumption) to decline to zero. Egypt is now an oil importing nation. [Like Indonesia before it](#), Egypt is a classic example of the [Export Land Model](#) as proposed by geologist Jeffrey Brown.

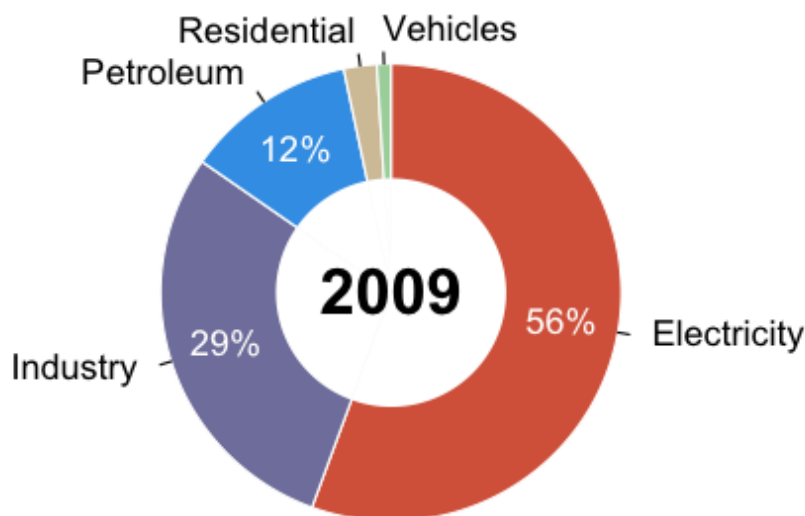
Unfortunately for Egypt, the proceeds from oil exports that helped to subsidize water, food and fuels for the impoverished masses have been replaced with an expense. On the positive side, exports of natural gas have been up in recent years as seen in Figure 3) from the [Gas Trends databrowser](#).<sup>[2]</sup>



**Figure 3)** Egyptian trends in gas consumption, production and net exports

The breakdown of Egypt's internal consumption of gas by sector is given in Figure 4) with power generation, industry and petroleum production consuming the lion's share.<sup>[3]</sup>

## Egyptian Nat. Gas Consumption



Data: EGAS Graphic: mazamascience.com

**Figure 4)** Egyptian natural gas consumption by sector

If Campbell's assessment of a maximum production rate of 6 Bcf per day is accurate, there is little room for growth on the production side. Given current trends, Egypt will soon face reduced exports of natural gas unless it can reign in consumption. This seems unlikely in the face of rapid population growth and the changing lifestyles of [Egypt's High-Energy suburbs](#).

It is clear, then, that Egypt's ability to export natural gas will be reduced in the coming years unless it either 1) makes huge and unanticipated new discoveries or 2) radically reduces its own internal consumption. Neither of these is likely. Given that knowledge, nations that currently import Egyptian gas should be looking to replace those supplies within the next decade, regardless of what is written in any contracts.

## Natural Gas Export Infrastructure

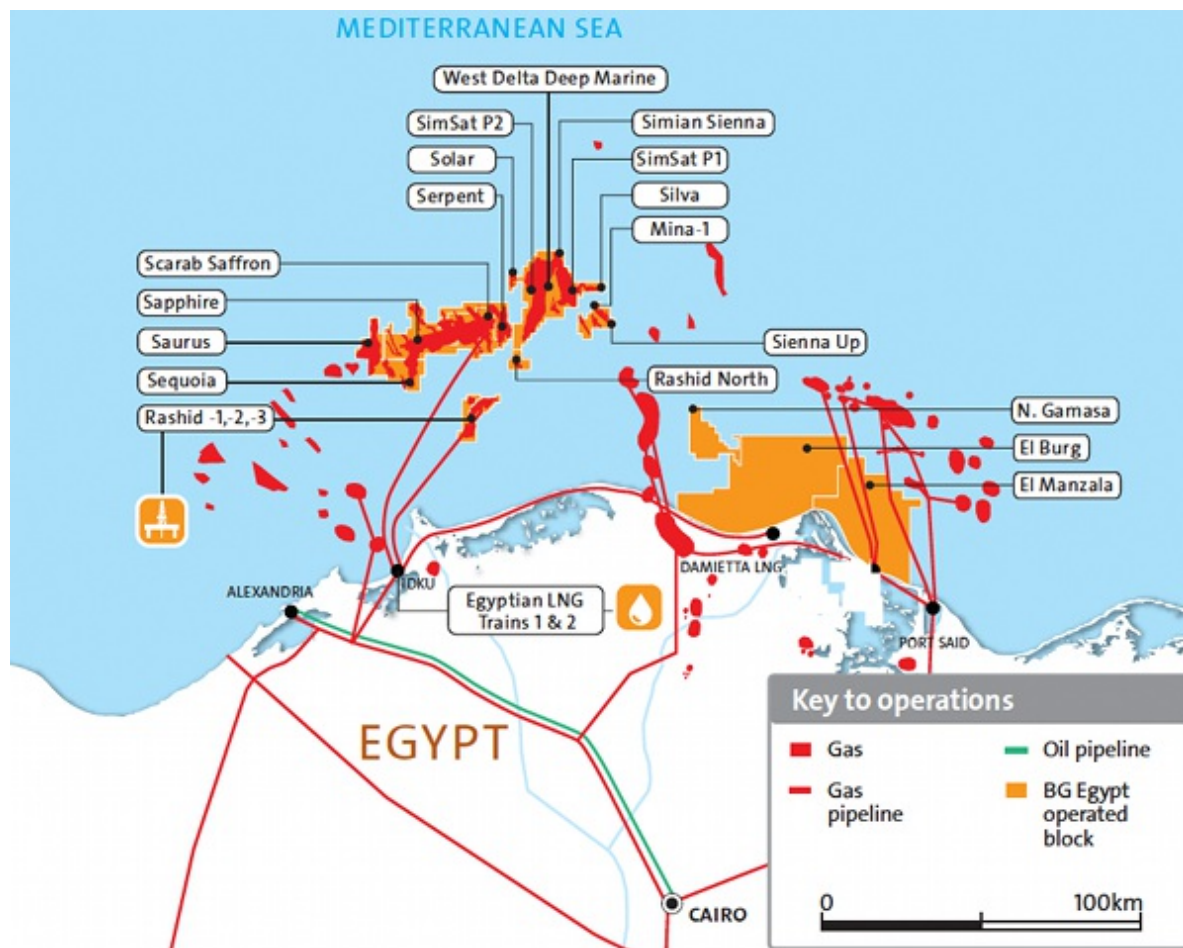
As seen in Figure 3), Egypt currently exports 2.5 Bcf/day of natural gas via pipeline and LNG which represents 38% of total production.<sup>[4]</sup> An overall view of the natural gas fields, pipelines and LNG trains is seen in Figure 5) from the [Egyptian Natural Gas Holding Company](#).





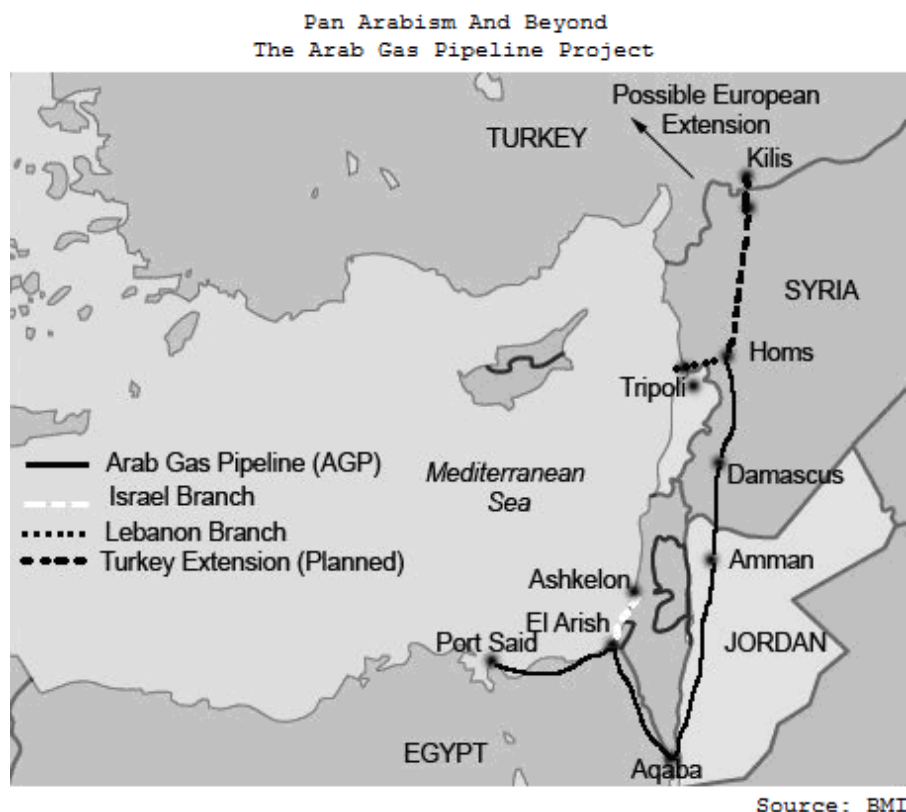
**Figure 5) Egypt's natural gas network (click for larger version)**

Natural gas pipelines connect offshore fields with the major population centers of Alexandria and Cairo as well as the LNG trains in Idku and Damietta. A closeup of the Nile delta and offshore region, showing individual fields is given in Figure 6) from the [BG Group country profile for Egypt](#).



**Figure 6) Nile Delta natural gas fields and pipelines**

A 36" pipeline connects the Nile Delta producing region to the Sinai town of El Arish. From El Arish, the [Arab Gas Pipeline](#) carries Egyptian natural gas to Jordan, Syria and Lebanon while the Arish-Ashkelon undersea pipeline carries gas to Israel as seen in Figure 7) which comes from [Stroytransgaz](#), the Russian firm contracted to build the Syrian segment of the Arab Gas Pipeline.

**Figure 7) Arab Gas Pipeline**

The EIA [Country Analysis Brief](#) section on natural gas succinctly summarizes Egyptian natural gas exports:

### Exports

Egypt began exporting natural gas in the mid-2000s with the completion of the Arab Gas Pipeline (AGP) in 2004 and the startup of the first three LNG trains at Damietta in 2005. In 2009, Egypt exported close to 650 billion cubic feet (Bcf) of natural gas, around 70 percent of which was exported in the form of LNG and the remaining 30 percent via pipelines.

### Pipelines

Egyptian pipeline exports travel through the Arab Gas Pipeline (AGP) that provides gas to Lebanon, Jordan and Syria with further additions being planned. The Arish-Ashkelon pipeline addition, which branches away from the AGP in the Sinai Peninsula and connects to Ashkelon, Israel began operations in 2008. Domestic pressure over contracts, pricing for exports to Israel, and technical problems caused a few interruptions but exports resumed in 2009.

### Liquefied Natural Gas (LNG)

Egypt has three LNG trains: Segas LNG Train 1 in Damietta and Egypt LNG trains 1 and 2 in Idku. The combined LNG export capacity is close to 600 Bcf per year with plans to expand in the near future pending export policy changes and legislation. In 2009, LNG exports were approximately 450 Bcf. The largest recipient of Egyptian LNG for 2009 was the United States, which imported around 160 Bcf, representing 35 percent of Egyptian LNG exports for the year and also 35 percent of U.S. LNG imports. Other major destinations for Egyptian LNG include Spain (32 percent) and France (13 percent) with smaller volumes travelling to Canada, Mexico, Asia and other European countries.

## Importers of Egyptian Gas via Pipeline

The recent attack on the Egyptian pipeline facilities in the Sinai has [heightened concern in nations that receive pipeline imports from Egypt](#). Below, we summarize the natural gas situation in each nation that imports gas from Egypt. (A more thorough review of the total energy situation in the Levant is available in the 2008 [Energy Profile of the Eastern Mediterranean](#).)

### Jordan

Jordan has one producing natural gas field which provides 25 million cubic feet per day of gas to fuel a single power plant.<sup>[5]</sup> Egypt provides Jordan with over 232 million cubic feet per day at subsidized prices.<sup>[6]</sup> The Kingdom of Jordan thus relies on gas from Egypt for 80% of its electricity generation needs. A recent [article in the Jordan Times](#) covers what happens when Egyptian gas becomes unavailable:

“We have converted all our power plants to heavy fuel oil and diesel and all plants are in operation,” NEPCO Director Ghaleb Maabreh told The Jordan Times.

“We are on the safe side in sources of fuel and availability of power,” he said, stressing that there will be “no power cuts” as long as reserves last.

According to NEPCO, the Kingdom’s power plants have two weeks worth of diesel and over one month worth of heavy fuel in strategic reserves.

Maabreh noted that the switch to heavy oil and diesel for electricity generation will be “more expensive”, but declined to estimate the amount the disruption will cost the Kingdom, adding that the full financial impact will “be clearer” once individual power plants report later in the week.

“Right now our first priority is to have a secure supply of power rather than to think of costs,” he said.

When natural gas supplies from Egypt dropped to 70 per cent of their normal levels last summer, the Kingdom witnessed various brown-outs and blackouts affecting the water distribution.

Based on the impact of the previous drop in supply, it is believed that the current disruption will cost the Kingdom “millions” each day.



## Syria

Until recently, Syria has been largely self-sufficient in terms of natural gas. Newly constructed, gas fired power plants are the main users of recent imports from Egypt which amount to 66 million cubic feet per day or about 8% of total consumption.<sup>[7]</sup>

## Lebanon

Lebanon has no natural gas of its own and recently generated 87% of its electricity with oil products, mainly gas/diesel and residual fuel oil. The remaining 13% is produced with hydro.<sup>[8]</sup> With the arrival of the Arab Gas Pipeline in Tripoli in 2009, however, a previously defunct power plant has been converted to run on imported Egyptian gas, significantly reducing fuel costs.<sup>[9]</sup>

The recent discovery of the [Leviathan gas field](#) off the coast of Israel has Lebanese excited about the natural gas prospects off their own coast and determined to carefully demarcate their maritime boundary with Israel, with whom they are still technically at war. The regional dynamics associated with this discovery are explained in an [article in Atlantic Council](#).

## Israel

Israel has embraced natural gas in its attempt to diversify its sources of energy. According to the Israeli [Ministry of National Infrastructures](#), major extensions are proposed to the existing pipeline infrastructure ([see map](#)) as part of a “national outline plan”. The recent pipeline blast in Egypt has heightened Israeli fears of their dependence on Egyptian natural gas. An [article in Time magazine](#) reports:

The explosion that ripped through a natural-gas pipeline in the northern Sinai Desert on Saturday, Feb. 5, did more than cut off the flow of Egyptian fuel to Israel and Jordan. It also deepened Israeli fears about the changes under way in a powerful neighbor rendered at least neutral over the past 30 years by a peace treaty that might not survive the change in government.

...

Egypt supplies Israel with some 40% of its natural gas, which Israel now uses to generate electricity, replacing dirtier coal and diesel. The two countries are barely three years into a 15-year contract for 1.7 billion cubic meters of Egyptian gas a year, provided via an undersea pipeline that branches off the line shattered by the blast.

Efforts to develop the recently discovered offshore gas fields, especially the large, deepwater Leviathan gas field [have shifted into high gear](#). Once these offshore fields are brought on line, most likely beginning with the Tamar field in 2013, Israel can look forward to over a decade of energy independence.<sup>[10]</sup> (It is perhaps worth noting that [Noble's Leviathan-1 well](#) is in 5400 ft of water. For comparison, the [Deepwater Horizon](#) was drilling in 5000 ft of water.)

## Importers of Egyptian Gas as LNG

Unlike the nations that import Egyptian gas through pipelines, the main importers of Egyptian LNG are nowhere near as dependent upon Egypt as a main supplier of natural gas.

US imports of LNG equivalent to 160 Bcf represent less than 1% of annual gas consumption in a nation that is largely self-sufficient in natural gas. Spain's imports of 145 Bcf represent approximately 10% of Spain's annual consumption, all of which is imported. France is also completely dependent upon imports but only receives 78 Bcf from Egypt which amounts to 5% of annual consumption.<sup>[11]</sup>

## Summary

The natural gas trends in place do not bode well for Egypt's export capacity in the coming years. Increased internal consumption combined with a relatively mature natural gas province imply that exports of Egyptian gas will begin their inevitable decline sooner than anticipated. Indeed, Egypt may be scrambling to live within its own energy means before the end of the decade.

Of the two importing nations heavily dependent upon gas imports from Egypt, Israel is in the happy position of having significant recent discoveries within its maritime jurisdiction. For Israelis, energy independence is a distinct possibility if they can develop those fields before the decline in Egyptian exports. Jordan, by contrast, is in an extremely uncomfortable position with no reserves of its own and no immediate replacement for Egyptian gas. Their only hopes may be for a completion of the Arab Gas Pipeline, hoping that the flow may be reversed to deliver Iraqi or Kurdish gas to Jordan, or for such massive production in Israeli fields that they overcome political differences and begin imports from Israel.

"Gas for Peace" may be a phrase we hear before the decade is out.

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1. [BP Statistical Review of World Energy 2010](#) [↔]
  2. It is worth noting that the BP data used in Figure 3) differ significantly from EIA data for Egypt which has recent production and consumption numbers almost 25% lower than those found in the BP dataset. [↔]
  3. Data used in Figure 4) are from the [Egyptian Natural Gas Holding Company](#). [↔]
  4. [Egyptian Natural Gas Holding Company](#) [↔]
  5. [Energy Profile of the Eastern Mediterranean](#) [↔]
  6. [Attack on Egypt gas line forces Kingdom to use fuel reserves](#) (Jordan Times, Feb. 11, 2011) [↔]
  7. [Egyptian Gas to Israel, Jordan May Halt for Two Weeks](#) (Bloomberg, Feb. 06, 2011) [↔]
  8. [State of the Energy in Lebanon](#) [↔]
  9. [Lebanon Receives Egypt Gas To Run Power Plant](#) (Downstream Today, Oct 20, 2009) [↔]
  10. [The Sinai Gas Blast: Another Reason for Israeli Anxiety over Egypt](#) (Time, Feb. 07, 2011) [↔]
  11. All data from the EIA [Country Analysis Brief](#) and [BP Statistical Review of World Energy 2010](#). [↔]
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