East Mediterranean Gas: what kind of a game-changer?

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Preface

The discovery of large gas fields offshore Cyprus and Israel has dramatically changed the stature of the region from one which was struggling in aggregate to obtain sufficient supplies to meet growing demand to one which has the potential to become a new exporter.

In recent years a key dynamic has been Egypt's struggle to balance rapidly growing domestic demand (in part exacerbated by low prices) and to meet export volume commitments (LNG and to a lesser extent pipeline gas), with new upstream exploration and field development hampered by a reluctance to materially increase domestic gas prices. This has been a familiar dilemma in many Middle East and North Africa countries.

Whilst superficially one might expect the recent large discoveries in Cypriot and Israeli territorial waters to offer a future of plentiful supply for adjacent markets, two factors militate against a smooth transition to this benign condition. The first is the water depth at the field locations. In order to enable viable economic development this will likely require a scale of production in excess of the requirements of the host country markets and in addition a sales price more in line with Asian and European import prices rather than those pertaining currently in the domestic markets of the East Mediterranean region. The second is the long history of strained (and at times hostile) relations between regional nation states, in places a lack of agreement on maritime borders and the relatively immature state of development of their energy and gas utilisation policies.

This paper examines the challenges and opportunities that have arisen as a consequence of these discoveries, arguing that to 2020 East Mediterranean gas is more likely to be a game-changer for local energy systems than for regional and international gas markets. The paper is the joint product of the Oxford Institute for Energy Studies Oil and Middle East and Natural Gas Research Programmes and as such allows the evaluation of past, present and future gas market dynamics to be cast in the context of the complex and evolving geo-politics of the East Mediterranean and wider Middle East region.

Howard Rogers

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Lebanon has surveyed most of its offshore territory; 2D and 3D seismic surveys off Lebanon's coasts have, according to government officials, confirmed 'a high possibility of very promising commercial quantities of gas', tentative first numbers ranging between 336-700 Bcm (12-25 Tcf) in the area – enough to supply Lebanon's domestic market for many decades to come if the prospects materialize.[12] Lebanon's offshore acreage was initially planned to be licensed out in the first quarter of 2012, but the long delay until late 2012 in appointing the country's Petroleum Administration as required by its hydrocarbon law has prevented the licensing round going ahead as planned.[13]

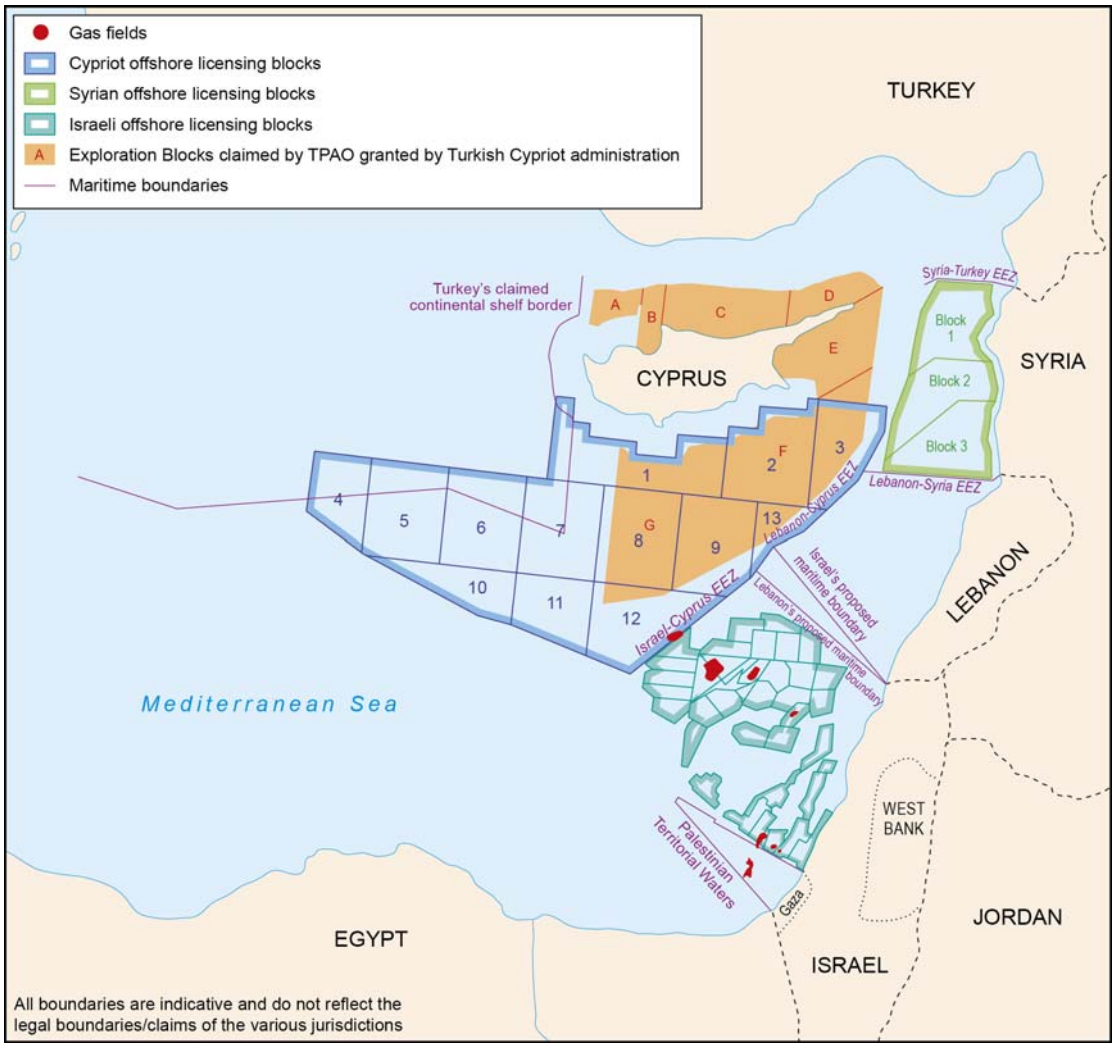
2.2. The complicating role of politics

The international relations of the Levant region have been shaped by decades of political conflict over land and borders, including the unresolved Northern Cyprus question between the Greek-Cypriot government of the Republic of Cyprus and Turkey; the ongoing border dispute between Israel and Lebanon; as well as the longstanding conflict between Israel and the Palestinians on the one hand, and Israel and its wider Arab neighbours on the other. Furthermore, the political uprisings that have engulfed many parts of the Arab world from early 2011 have not spared the Levantine countries, and have turned Syria in particular into a battleground between different political factions, with no apparent end in sight at the time of writing. Thus, in this context, the newly-discovered hydrocarbon resources in the region have a distinctly geo-political dimension.

Israeli-Palestinian relations. The controversy surrounding the discovery of the Gaza Marine field in 2000 provides an illustration of this. The potential proceeds from gas sales from Gaza Marine to the Palestinian Authority, estimated at more than US$1 billion, were seen by proponents of Gaza Marine's rapid development as a potential fuel to jump-start a Palestinian economy, and hence to advance the Middle East peace process.[14] However, under the pretext of security concerns, the Israeli government has refused to sanction the development of the field. After years of negotiations, failure to agree on a compromise on how to address these concerns, on the marketing of the gas and other issues led to the withdrawal of BG from the negotiations in 2008, with the possible end-result being the selling of its stake altogether.[15]

The Israeli-Lebanese border dispute. Potential for an Israeli-Lebanese maritime border dispute follows a history of military confrontation between the two neighbouring states. The 2000 Blue Line, which provides the basis for the Israeli claim to maritime borders with Lebanon, represents the line to which Israeli forces withdrew in 2000 following a UN-brokered ceasefire; it hence constitutes a working line, rather than an international boundary. The coordinates of Lebanon's own delimitation of its land and maritime borders with Israel, submitted to the UN in 2010, create an overlap of some 850km^2 with Israeli-claimed maritime territory.[16] Furthermore, Lebanese and other media reports suggest that Israel's Tamar field, which lies some 35km south of Lebanese waters, straddles at two locations the maritime border claimed by Lebanon, a claim that was denied by Lebanon's Energy Minister in the past.[17] Lebanon's demands for Cyprus to adjust its delimitation agreement with Israel so as to reflect Lebanon's claims were refused by Cyprus. Both Cyprus and the US have repeatedly sent diplomats to the region in an attempt to mediate between Lebanon and Israel.[18]

Map 1: Indicative schematic of maritime boundaries and exploration blocks in the East Mediterranean, as at end-2012



Source: Oxford Institute for Energy Studies

While Lebanon's Energy Minister stated in March 2012 that it was unlikely that the dispute with Israel over maritime borders would interfere with Lebanon's plans to move ahead with its planned licensing round,[19] the border conflict has resulted in mutual threats between Lebanese and Israeli politicians to resort to force in the case of an encroachment on what they see as their respective maritime territories.[20] Hezbollah leader Hassan Nasrallah warned Israel against 'extending its hands to this area and stealing Lebanon's resources from Lebanese waters', declaring that 'whoever harms our future oil facilities in Lebanese territorial waters, its own facilities will be targeted'.[21]

The Cypriot-Turkish conflict. Another smouldering conflict exists around the unresolved Cypriot question and the related issue of national sovereignty over Cyprus' offshore hydrocarbon reserves. Under UN and international law, the Republic of Cyprus is the only internationally recognised sovereign entity in Cyprus. Turkey, however, disputes the Greek-Cypriot hold over the whole of Cyprus, and Turkish troops have occupied the north of the island since 1974. Turkey only recognises the self-proclaimed Turkish-Cypriot government and the Turkish Republic

of Northern Cyprus (TRNC). Three UN-sponsored peace talks between the Greek- and the Turkish-Cypriot sides, including a most recent one in early 2012, have concluded without progress.[22]

Natural gas has already provided fuel for the ongoing conflict. Northern Cyprus claims large sections of the East Mediterranean offshore on the northern side of the island as international interest in Cyprus' hydrocarbon resources has grown. Both the governments of Northern Cyprus, and of Turkey, have called for a halt to current hydrocarbon exploration and development efforts offshore Cyprus until a comprehensive political settlement has been found for the island. Turkey has repeatedly issued statements that the Turkish-Cypriots 'have equal and inherent rights over the natural resources located on the whole continental shelf of the island'.[23] The Turkish government responded to Noble's first drillings in Block 12 by sending warships to the island's exclusive economic zone (EEZ), including Block 12.[24]

The conflict has since gone further as the Greek-Cypriot government moved ahead with a second offshore licensing round in February 2012. While Greek-Cypriot political leaders have emphasized that all earnings from exploration and development activities of Cyprus' hydrocarbon resources would be shared by the entire population once a settlement was agreed, Turkey called the new licensing round an 'irresponsible and provocative' act, and threatened 'all measures to protect the Turkish-Cypriots' rights and interests'.[25] Calling for the companies that applied for Greek-Cypriot licenses to withdraw their bids, the Turkish Foreign Ministry intends to bar all participating companies from future energy projects in Turkey.[26] In response to the Greek-Cypriot bidding round, the TRNC awarded in the same month a concession to Turkish Petroleum (TPAO) for the exploration of hydrocarbon resources in the Turkish-occupied part of Cyprus, including its offshore territory, with some overlaps with Nicosia's ongoing EEZ licensing round.[27]

The government of the Republic of Cyprus has taken precautions to avoid maritime border conflicts with other neighbours. It ratified the delimitation of Cyprus' southern EEZ with Egypt back in March 2003, and signed a framework agreement on the development of cross-median line hydrocarbon resources with Cairo in 2006. Nicosia also signed an agreement defining the EEZ with Lebanon in 2007, although this has not yet been ratified by the Lebanese parliament; and has been negotiating similar agreements with Syria and Israel.[28] That this exercise has not been devoid of own complications was evident in March 2012 after the failure of Greece, Cyprus and Israel to sign a previously agreed-on Memorandum of Understanding (MoU) on joint cooperation in energy matters. The MoU aimed to establish a supposed 'energy bridge', a 'third route' for the future supply of gas to South East and Central Europe. The eventual decision not to sign what many observers at the time believed to be common agreement between all sides came as a surprise, for the MoU had been drafted deliberately vaguely, contained no roadmap, no deadlines, no specified preferred method of exports, leaving open virtually all options. A likely reason lies in Greece's and Cyprus' fragile relations with their Arab neighbours, which a closer alliance with Israel would strain further.[29] With Cyprus' Block 12 being expected to extend slightly into Israeli EEZ, Cypriot-Israeli negotiations may yet face some additional sources for disagreement.

3. East Mediterranean energy markets: Israel, Lebanon, Cyprus and Syria

For the East Mediterranean economies, the region's recent offshore discoveries open up a potential window for the increased use of natural gas domestically, helping the region to diversify away from oil imports. Israel's and Cyprus' recent discoveries also promise both countries potential economic benefits, through savings made via the domestic use of newly found resources, and the potential of further monetisation via exports, discussed in more details below. The region could certainly use these benefits in view of the economic woes it has experienced in recent years, exacerbated by Israel's and the Palestinian Territories' isolated economic status, the long-term political and economic turmoil in Syria and Lebanon, and Cyprus' economic crisis in the wake of neighbouring Greece's ongoing debt crisis. This section focuses on the domestic aspects related to recent discoveries in the East Mediterranean, and describes ongoing plans for their development, bearing in mind that their pursuit both in the short and long terms depends on the potential role of politics, as outlined above, in delaying the development of the region's natural gas resources.

3.1. The role of natural gas in the region's energy mix

Natural gas has so far played a limited role in the East Mediterranean countries' energy mix. In Cyprus, natural gas does not feature in the energy mix at all, while in Lebanon the share of gas in total primary energy supplies is negligible. Both Syria and Israel rely on a small amount of domestic production of natural gas and on relatively small-scale gas imports. Only in Syria did natural gas constitute a sizeable share (25.6%) of total primary energy supplies in 2009 (see Table 2). In 2010, total gas consumption in the East Mediterranean (Israel, Jordan, Lebanon, and Syria) amounted to less than 14 Bcm. The limited reliance on natural gas as a primary source of energy can be explained mainly in terms of lack of access to domestic gas supplies and gas imports. The marketed production of gas in the East Mediterranean stood at around 10.5 Bcm in 2010, with the bulk of production concentrated in Syria (see Table 3).

Table 2: Primary energy use and total primary energy supplies in the East Mediterranean (2009)

	Primary energy use (kgoe per capita)	Total primary energy supply (ktoe)	Share of natural gas in total primary energy supply (%)
Cyprus	2,298	2,506	0.0
Israel	2,878	21,546	15.6
Lebanon	1,580	6,633	0.6
Syria	1,123	22,502	25.6

Source: World Bank (2012); IEA (2011)

Table 3: Production, consumption and trade of natural gas in the East Mediterranean (Bcm, 2010)

	Marketed production	Exports	Imports	Consumption
Cyprus	0	0	0	0
Israel	1.55	0	2.1	3.65
Lebanon	0	0	0.15	0.15
Syria	8.94	0	0.70	9.63

Source: Cedigaz (2012)

Israel's energy policy priorities are markedly different from all other East Mediterranean countries. The long-term Arab-Israeli conflict has shaped the country's relations with most of its Arab neighbours, and has driven Israel's energy policy towards prioritizing security of supply through reliance on indigenous production and such types of energy imports that preserve the relative independence of the country from its Arab neighbours – be it for supply or transit of energy imports. For many years, Israel's policymakers considered natural gas to be less reliable than oil and coal as natural gas required long-term contracts and permanent physical infrastructure which could be subject to attacks and sabotage.[30]

The importance of natural gas in Israel's energy mix has nevertheless been rising in recent years, although its share in total primary energy supply is still well below that of oil and coal. Israel's own discoveries during the 1990s contributed substantially to this policy shift; natural gas first entered the energy mix in 2005 following the beginning of production at the Yam Tethys offshore project. Since then, the share of natural gas in Israel's energy mix has risen sharply, reaching 16% in 2009.[31] Israel's policy shift towards greater reliance on natural gas is in part due to the increasing cost of Israel's oil and coal imports for the country's power sector, rising environmental concern about the use of these fuels for power generation, and the temporary warming of diplomatic relations with some of Israel's Arab neighbours, and hence the greater feasibility of regional pipeline imports.[32]

Among the East Mediterranean countries, Syria is the country with the highest penetration of natural gas in its energy mix thanks to its sizable domestic production. Syria has the oldest and most mature gas and oil industry among its East Mediterranean neighbours. In 2011, Syrian gas reserves stood at 300 Bcm with a reserve-to-production ratio of some 34 years.[33] From negligible levels in the mid 1980s, Syrian gas production increased to almost 9 Bcm in 2010 (see Table 3). This increase in production however did not keep pace with the rapid growth in domestic energy demand and consequently the share of gas in the energy mix remained comparatively low at just over 25% compared to the share of oil (74% in 2009). [34] Syria's plans to export gas were scrapped and in 2008 it turned into a net importer when it began receiving natural gas from Egypt via the Arab Gas Pipeline (AGP).

In Lebanon, the main constraint to the penetration of gas in the energy mix has been the lack of access to gas supplies. Lebanon has no proven gas reserves and until recently did not have any gas infrastructure. In 2003, the Government of Lebanon signed a 25-year contract with Syria to import around 1.5 Bcm/yr of natural gas at a price representing about two-thirds of the fuel cost for power production.[35] The Gasyle pipeline, a 32 km pipeline with capacity of 3 million cubic metres per day

connecting the Syrian border to the Beddawi power plant, was completed in 2005. However, Syria has not been able to supply Lebanon with gas, as its gas production was not sufficient to meet domestic consumption. Natural gas entered the energy mix for the first time in 2009 when the AGP started supplying Egyptian gas to the region.[36] The entry of natural gas however was very brief. Since 2009, the flow of Egyptian gas has been subject to frequent disruptions due to delays in payments and more recently due to a series of explosions targeted at Egyptian gas infrastructure in the Sinai. The last delivery of Egyptian gas to Lebanon was made in November 2010.[37]

Cyprus is heavily dependent on imported energy, particularly on oil products, which dominate the country's energy mix. In 2009, imported oil constituted more than 95% of Cyprus's primary energy balances with renewable energy accounting for the rest. So far, natural gas has not featured at all in Cyprus's energy mix. The high dependency on imported energy means that energy security has featured prominently in the country's energy policies over the years.[38] In particular, many policies were aimed at diversifying the fuel mix away from oil by promoting the role of gas and renewables in the energy mix. The gasification of the Cypriot economy has become a key priority for the government and is expected to achieve many objectives including reducing the energy import bill, shielding the economy from highly volatile oil prices, and reducing emissions. It is estimated that successful conversion to gas could save the Cypriot government up to €1.1 billion per year.[39] Cyprus however has not been successful so far in increasing the role of gas in its energy mix. Plans to develop regasification capacity aimed at importing LNG by 2014 were dropped as the country's upstream natural gas potential became more apparent. Therefore, the entry of gas into the energy mix is likely to be delayed to at least until the middle of this decade when the recent gas discoveries are brought on stream. [40]

3.2. Regional gas imports

The East Mediterranean has been a limited import market until now; combined, Israel, Lebanon and Syria imported some 3 Bcm/yr in 2010, all via pipeline from Egypt. Israel, the East Mediterranean's largest importer, imported some 2.1 Bcm of Egyptian gas in 2010. The original gas purchase agreement was signed between the Israel Electric Corporation (IEC) and East Mediterranean Gas (EMG)[41] in which EMG agreed to supply 25 Bcm of gas over 15 years at an annual rate of 1.7 Bcm, and first gas supplies from Egypt flowing in May 2008. Syria in the same year imported 0.7 Bcm and Lebanon (briefly) 0.2 Bcm.

However, since 2011 supplies have been erratic owing to frequent bomb attacks against Egyptian gas infrastructure in the Sinai Peninsula, where Egypt's pipeline infrastructure to Israel and the Levant originates. Recurrent bombings in summer 2011 led to a number of power outages in Egypt's key customers Israel, Syria and its neighbour Jordan, which also imports Egyptian pipeline gas.[42] Egypt's continuing unstable political situation, coupled with rising domestic demand for gas in Egypt, has hence led to doubts among its contract partners as to the reliability of Egyptian gas supplies. Most recently, and after several months of contract disputes and mutual allegations of breach of contract between Egypt and Israel, Egypt's national gas company EGAS announced in April 2012 that its supply contract with Israel would be scrapped.[43]

Israel's offshore Noa field was brought on stream in late summer 2012, more than a month ahead of schedule, in an attempt to try to offset the loss of Egyptian supplies.[44]

However, Egyptian losses may also temporarily reduce the consumption of gas in Israel until new supplies are secured. Furthermore, Israel has moved ahead with plans to build a floating LNG regasification terminal, signing a supply contract with BP for the delivery of two cargoes per month between December 2012 and April 2013, with an option to extend for another year.[45]

3.3. Electricity sector and gas demand in the East Mediterranean

Gas demand in the East Mediterranean is strongly interlinked with developments in the power sector, as electricity generation is the primary consumer of gas. Table 4 compares electricity consumption per capita across the East Mediterranean countries. The variation across countries is large: electricity consumption per capita in Israel is more than twice that of Lebanon and more than four times that of Syria.

Table 4: Electricity sector in the East Mediterranean: basic indicators

	Electricity consumption (KWh per capita, 2009)	Net electricity generation (GWh, 2009)	Installed generation capacity (MW, 2009)	Share of natural gas in power generation in 2010 (%)	Quality of Electricity Supply (country rank/142, 2011)
Cyprus	4,620	4.9	1,392	0	30
Israel	6,608	51.5	12,067	36.6	36
Lebanon	3,130	13.0	2,314	0	141
Syria	1,563	40.9	8,200	63.5	92

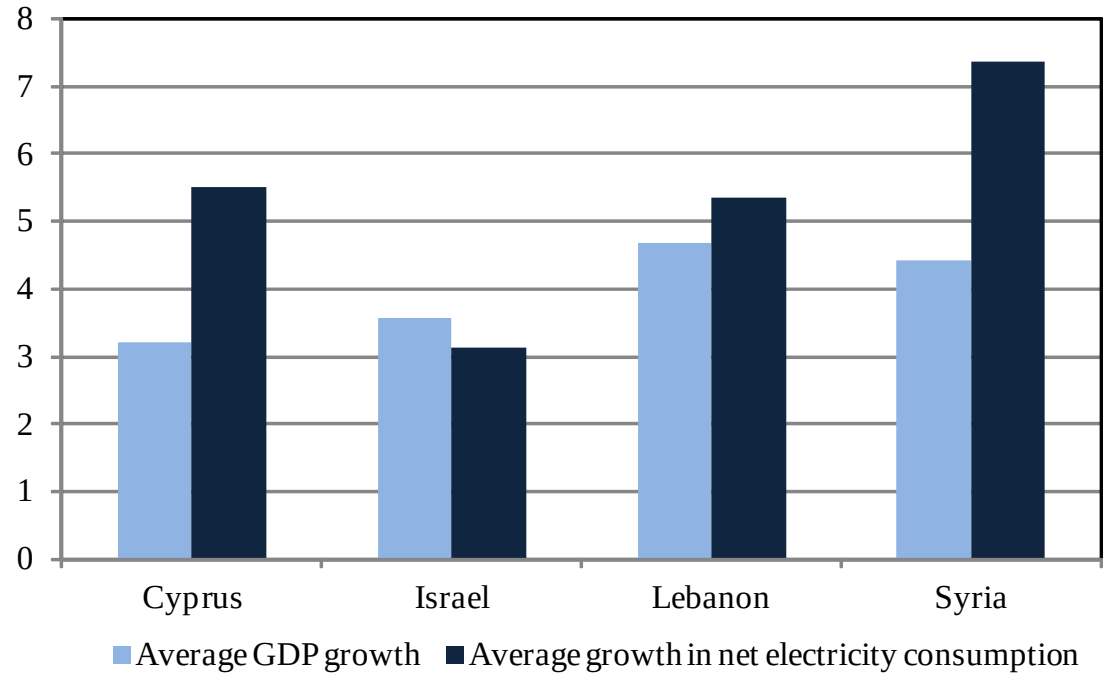
Source: Electricity consumption: World Bank (2012); EIA (2012); World Economic Forum (2012).

The share of gas in the power generation fuel mix also differs considerably across countries. Unlike in neighbouring countries, coal plays an important role in Israel's fuel mix but its relative importance has declined over time. In 2001, coal accounted for 78% of the fuel mix followed by heavy fuel oil (20%) and diesel (2%) while the share of gas was zero. By 2010, the share of natural gas increased to over 36% while that of coal, heavy fuel oil and diesel declined to 61%, 0.9% and 1.5% respectively.[46] Syria has the highest share of gas in the power fuel mix accounting for 60% of the power generation mix followed by heavy fuel oil (36.5%).[47]

Lebanon has two combined cycle gas turbine (CCGT) plants in operation, with a combined nominal generation capacity of 870 MW, accounting for about 50% of the country's total installed capacity. However, these plants have not been operating optimally due to shortages of gas feedstock and, in 2011, following the cessation of Egyptian gas imports, the share of gas in the fuel mix of the power sector declined to zero. The country is nevertheless keen to diversify away from oil; its current energy import bill, mainly amounting to imported oil, was put in mid-2012 at 15% of Lebanon's GDP by the country's energy minister.[48] Similarly, in Cyprus, until very recently, power plants were primarily designed to run on heavy fuel oil and diesel to a lesser extent. This has recently changed as new plants operating on natural gas have been introduced into the system. However, these power plants operate sub-optimally and currently only burn liquid fuels. In 2010, total consumption of heavy fuel oil in the power sector amounted to more than 1 million metric tonnes of HFO and 157.5 thousand metric tonnes of diesel. Natural gas so far plays no role in the power generation fuel mix.[49]

Figure 1 below compares the average growth in net electricity consumption with real GDP growth for the period 2000-2009. As seen from this figure, net electricity consumption has grown fast in all East Mediterranean countries, surpassing the growth in real GDP with Israel being the notable exception. This rapid growth can be explained by common factors including relatively robust economic performance, improvements in the standard of living and rapid population growth.

Figure 1: Average growth in real GDP and net electricity consumption in % (2000-2009)



Source: IMF (2012) and EIA (2012)

In Israel, high economic growth, rapidly expanding population which almost doubled between 1990 and 1999 in part due to the large migration wave from the former Soviet Union, and the expanding use of desalination for water production all contributed to rapid growth in electricity consumption.[50] Between 2000 and 2009, electricity demand grew at an average rate of 3.1% annually, slightly lower than the annual average GDP growth of 3.6%. In Syria, electricity consumption grew annually at an average of 7.3%, much higher than the average growth of GDP during this period. In Lebanon, met electricity demand increased by 5.3% between 2000 and 2009, slightly higher than the average real GDP growth during this period.

However, in the case of Lebanon, these average numbers mask some important trends, as most of the growth in electricity consumption occurred in the earlier years of the sample. For instance, between 2004 and 2009, net electricity consumption grew at an average of 2.15% while real GDP expanded at an annual average of 5.7%, atypical of a developing country such as Lebanon where electricity demand often grows faster than GDP. This implies that official figures for consumption figures (based on Electricité du Liban – EdL – data) do not reflect accurately the actual growth in demand because a significant part of demand is met by self-generation and a large part of demand never gets satisfied.[51] In Cyprus, electricity consumption grew at an average of 5.5% between 2000 and 2009 driven by robust economic growth and improvement in standards of living. GDP grew by a substantial 3.2% and per capita

GDP reached above $30,000 or nearly 75% of average levels seen in the richest EU member-states in 2008.[52]

To meet this rapid growth in electricity consumption, East Mediterranean governments had to accelerate their investment in new capacity, but not all East Mediterranean countries have been successful in doing so. In Israel, installed capacity grew at an average rate of 3.4% per year between 2000 and 2010, reaching almost 12,800 MW in 2010.[53] This has been in line with growth in electricity consumption. In Cyprus, installed capacity increased from about 990 MW in 2001 to over 1,400 MW in 2010, at an average annual growth rate of 4.5%, which is higher than the growth in net electricity consumption.[54] In Syria, installed capacity increased modestly from 7,460 MW to 8,200 MW between 2000 and 2009 at an average annual growth of around 3.5%, half the growth rate of electricity consumption due to lack of investment. The ongoing conflict in Syria has caused the loss of up to 2,600 MW of capacity, as the government has not been able to secure fuel supplies to power plants.[55] Syria's power grid is interconnected with those of several neighbouring countries, including Iraq, Jordan, Lebanon, and Turkey and thus part of the shortage has been met by electricity imports. In Lebanon, installed capacity almost stagnated, increasing marginally from about 2,292 MW in 2000 to 2,314 MW in 2009, which makes an average growth rate of 0.25% during this period. EdL suffers from huge financial and operating losses, which have to be covered by direct transfers from the government. In 2008 and 2009, these transfers constituted 25% and 20% of government's primary expenditure. EdL also suffers from chronic underinvestment, which has so far prevented it from modernizing its grid and expanding power generation capacity. Public investment in new generating capacity needed to meet this increase in demand is unlikely to be forthcoming any time soon.[56] To meet part of the shortfall, Lebanon relies on imported electricity from Syria and Egypt.[57]

The future evolution of natural gas demand in each of the East Mediterranean countries will be determined to a large extent by the pace of expansion of electricity demand; the energy mix within the power sector; the use of natural gas beyond the power sector; and the availability of gas supplies.

In Israel, the growth in gas demand is likely to accelerate as electricity demand continues to rise and as gas increases its penetration in the energy mix. The Ministry of Energy and Water Resources expects consumption of natural gas to increase from about 5 Bcm in 2010 to 12.5 Bcm in 2020 and to 18 Bcm by 2030, with 85% of gas going to electricity generation and industry.[58] These projections are based on the assumptions that electricity consumption will grow at an average of about 3% annually; minimal use of heavy fuel oil in the power sector; the reliance on coal power stations to the same extent as at the present time; and on gradual adoption of renewable energy sources to reach a level of 10% in 2030.[59] They are also based on the assumption that by 2014, natural gas becomes the primary fuel for electricity generation, reaching 60% of the power mix in 2027 and 68% in 2040.[60] The IEC's original opposition that natural gas should not constitute more than 50% of the fuel mix to avoid over reliance on one source of fuel oil has receded.[61]

In Cyprus, electricity demand is expected to continue to grow at historical rates. The Electricity Authority of Cyprus projects total generation to increase from 5,607 million KWh in 2011 to 6,930 million KWh in 2018, i.e. at an average annual growth of more than 3%.[62] It remains unclear what the implications of such growth will be for gas demand. However, it is estimated that the full conversion to natural gas would

have created a natural gas market of about 2.3 Bcm[63] in 2010 with the local stationary sector consuming about 1.1 Bcm of gas. It is estimated that Cyprus's natural gas requirement could reach almost 0.9 Bcm in 2020 increasing to 1.5 Bcm in 2030. Power generation will constitute the main source of demand, and current refurbishment is expected to allow all of the island's power plants to burn natural gas by 2015.[64] The gasification of the transport sector if successful could add an additional 1.1 Bcm per annum.[65]

The Syrian government predicts electricity demand to grow at the slower rate of 3.7% annually up to 2030, as the economic structure shifts to less energy intensive industries and as efficiency measures kick in. Growth in electricity demand may well fall below the historical average, but this may happen due to slower economic growth rather than improvement in efficiency. According to the IMF, Syrian economic growth has slowed down from 5.9% in 2009, to 3.4% in 2010 and is expected to contract in 2012. A key priority for the government is to increase the share of gas in the power generation energy mix to 75%, which would constitute a major source of gas demand growth. Before the eruption of violence, ESMAP (2010) estimated Syria's gas demand to increase to 19.35 Bcm in 2020 and to 27.5 Bcm in 2030. Now with the country engulfed in a civil conflict, there is much uncertainty about the prospects for gas market development in Syria.

In Lebanon, the Policy Paper for the Electricity Sector prepared by the Ministry of Energy and Water proposes a diversified fuel supply, with an ambitious plan to increase the share of natural gas from its current level of zero to two thirds of the fuel mix by 2030.[66] In the proposed plan, the share of renewables will increase to 12%, while fuel oil and gas oil will account for the rest. The Ministry of Energy and Water has also ambitious plans to extend the use of natural gas to the industrial, commercial and residential sectors and convert the nation's ground transport fleets to compressed natural gas (CNG).[67] However, in the time horizon of this study, it is unlikely that the distribution system will be in place and hence one can safely assume that the power sector will remain the main (if not the only) source of gas demand. ESMAP (2010) estimates that gas demand will reach 2.6 Bcm in 2020 increasing to almost 4 Bcm by 2030. Most of this increase will be accounted for by the power sector. In its base case scenario, the World Bank (2008) projects total demand for electricity to increase to 5.9% per annum from 2010 onwards.

Table 5 shows the expected growth in gas demand between 2010 and 2030. By 2020, domestic gas consumption is expected to reach 36 Bcm, almost a threefold increase from the 2010 level. In all countries, increasing the share of gas in the power mix is a priority.

Table 5: Projected increase in natural gas demand

	Domestic gas consumption (Bcm)			Planned share of gas in power mix by 2030
	2010	*2020*	*2030*	
Israel	3.7	12.5	18	60%
Cyprus	0	0.9	1.5	n/a
Lebanon	0.15	2.7	4	75%
Syria	9.6	19.4	27.5	75%
Total	13.45	35.5	51	

Source: Figures for 2010 are from Cedigaz (2010). For Syria and Lebanon, the figures are from UNDP. For Israel the figures are from the Ministry of Energy and Water Resources; for Cyprus, the figure for 2020 is from Giamouridis (2012).

3.4. How would the potential increase in gas demand be met?

The ability to secure new sources of gas supplies will ultimately determine whether the East Mediterranean countries will be able to satisfy the projected increase in gas demand. In this respect, East Mediterranean countries face different options with some countries being better positioned than others to meet their expected gas requirements.

The transformation of Israeli's fortunes has been dramatic. From having virtually no gas reserves in the early 1990s, Israel has made large discoveries, which would enable it to satisfy its domestic gas demand for many years and may even transform the country into a net gas exporter during the current decade. But this transformation has also raised major challenges for Israeli policymakers in at least two areas. The first concerns the share of natural gas in the energy mix and particularly in power generation. The second concerns how much gas should be used domestically versus exports. This latter question has stirred a debate within Israel whose outcome will significantly impact the pace of Israel's offshore reserves in the future. Domestic voices opposed to any Israeli gas exports view any decision to export gas as undermining Israel's long-term energy security. Perhaps, this is best illustrated by Dr. Shlomo Wald the chief scientist of the Energy and Water Ministry who he has recently stated:

> For many, many years we (Israelis, authors' note) were almost totally dependent on importation. Now we are facing a new era – where for the first time we have the chance to get some energy independence, which is a crucial element in the energy security. Exporting gas is a mistake, it's against energy security. It's against energy independence.[68]

Presently, as far as the volume of domestic gas production, exports, and the number of years of reserves to be retained for domestic consumption are concerned, the picture is still ambiguous and depends on a number of factors, the most important of which is government policy. Meanwhile, the development of the 9.7 Tcf Tamar field is moving forward according to plan, with first gas expected before the summer of 2013. Gas from Tamar will mostly be used to supply the Israeli domestic market, though license-holder Noble Energy and its Israeli partners have not ruled out the possibility of exports to Cyprus and further away through a floating liquefaction facility (FLNG).[69]

Tamar is being developed in two phases, delivering when completed a combined 10-11 Bcm/yr to onshore processing facilities at Ashdod, in southern Israel. So far, supply agreements have been concluded between the Noble-led consortium and several Israeli buyers (Table 6),[70] with overall offtake volumes amounting to 116-139 Bcm over many years and prices in the range of $5.20-6.25/MMBtu.

To meet the projected increase in demand, Syria has little choice but to rely on gas imports. The recent social unrest, the deterioration in security, and the imposition of sanctions are likely to slow Syria's gas production growth further as foreign investors shy away from Syria and as associated gas continues to decline in line with the decline in oil production. Royal Dutch Shell, Total, Suncor Energy, Gulfsands, Kulczyk Oil and INA all withdrew from Syria in the last few months.[71] The General Petroleum Corporation (GPC) established in 2009 to formulate a comprehensive strategy to increase exploration activities onshore and offshore, has been blacklisted by the EU. Decline in production capacity and inability to attract sufficient investment to develop reserves indicate that Syria will continue to rely on heavy fuel oil and imported gas for power generation. In principle, given its strategic location, Syria can import gas from a number of sources. In 2007, Syria signed an agreement with Egypt to purchase gas. The AGP however has been subject to a series of sabotage acts disrupting gas flows into Syria.[72]

In 2011, Syria and Iran signed a preliminary cooperation agreement for a gas pipeline project (dubbed the Islamic Gas pipeline) from Iran to a terminal in Syria, via Northern Iraq.[73] This project however remains doubtful. It is not clear how such a project will be financed given that both Iran and Syria are subject to strict financial sanctions.[74] Syria has also signed an agreement with Azerbaijan to import Azeri gas via Turkey. This requires the connection of the Turkish and Syrian networks through an extension of the AGP from the Syrian side of the Turkish border and through a pipeline to be constructed between Turkish network facilities and the Syrian border. Azeri gas was expected to start flowing in 2012 at the rate of 1 Bcm/year increasing to 2 Bcm/y after 2015.[75] This has not yet materialized. The rapid deterioration in bilateral relations between Syria and Turkey is likely to delay the project further. There are also plans to build a gas pipeline linking Iraq's Akkaz gas field (located near Syria) to the Syrian gas grid. The details of this agreement remain vague.

Lebanon's energy policy is in disarray. The country has no proven gas reserves and although officials are very optimistic that major commercial discoveries will be made in Lebanon's EEZ, there will be a long time lag before these gas reserves can be brought on stream. The deep political divisions and the fragility of the political system have prevented subsequent governments from formulating a clear energy policy. The sectarian nature of Lebanon's political system has also delayed the formation of the Petroleum Authority, a key committee constituted by the Offshore Hydrocarbons Law.[76] Lebanon has so far failed to launch its offshore licensing round and therefore, it is still difficult at this stage to gauge foreign companies' interest in Lebanon's hydrocarbon reserves.

Table 6: Tamar supply contracts as at 1 December 2012

Buyers	Volume (Bcm/yr)	Duration (years)	Reported value (US$ bn)	Observations
IEC	3 – 5	15	18 – 23	Price partly indexed to US CPI
Dalia	1.38	17	5	Price indexed to cost of electricity generation
Israel Corp.	0.3 0.6 0.8	2015 – 2017 16 7	0.2 2.5 1.3	For power generators Israel Chemicals & Rotem price indexed to electricity gen. cost For ORL, price is oil-indexed
Dorad Energy	0.7 – 0.8	16	3.5	Price indexed to cost of electricity generation
Hadera Paper	0.22	15	0.75	Price indexed to cost of electricity generation
Mashav	0.2	15	0.68	Price indexed to cost of electricity generation
Ramat Negev	0.22	16	0.8	Price indexed to cost of electricity generation
Ashdod Energy	0.11	16	0.4	Price indexed to cost of electricity generation

Source: Authors' research

While the formation of the Petroleum Administration is a welcome development, the underlying political and institutional dynamics that delayed the bidding round in the first place are still in full swing. The assumption that the approval of the Petroleum Administration will speed up the licensing round should be treated with caution. After all, this newly created body is likely to be subject to the same institutional constraints that have plagued most governmental agencies for the last few years. Lebanon is not expected to produce any natural gas by 2020 and thus would have to import all of its gas requirements if it is to achieve its ambitious objective of increasing the share of natural gas in power generation. Due to rising demand in their markets and limited potential to expand supply, pipeline gas from Syria and Egypt is unlikely to be forthcoming, at least not in large quantities.

Recently, Iran and Lebanon agreed to build a gas pipeline through Iraq and Syria to supply Iranian gas for Lebanon's power plants.[77] This project, however, is unlikely to materialize due to a number of factors, including the instability in Syria, the sharp divisions in the Lebanese political scene regarding the role of Iran in the country, the financial sanctions on Iran that limit the options for financing the project, and the limited availability of Iranian gas for exports. Lebanon seems to have little choice but to rely on LNG imports to meet its gas requirements. The Ministry of Energy and Water has proposed to build a 3.5 mtpa LNG import terminal at Baddawi. A study by consultancy Poten & Partners indicated that the Zahrani power plant alone would require 1.5-2 mtpa of LNG. There is a plan to build a 173km gas pipeline (known as

the North-South pipeline) to connect the proposed LNG terminal to the country's power stations. The plan has been submitted to the parliament for approval however no decision has been taken yet. Decisions on these key projects are likely to be delayed, at least until after the 2013 elections.

In Cyprus, where appraisal drilling of the Aphrodite field is due to start by early 2013, the earliest date for the arrival of gas on the island by pipeline is 2018.[78] Until then, Cyprus will most likely continue to burn liquid fuels. Assuming a best case scenario in which companies and governments agree on pricing and monetization options and there is no escalation of conflict with Turkey, Cyprus's production could reach close to 9 Bcm by 2020: 0.9 Bcm of which will be consumed domestically while 8 Bcm could be exported as LNG. Given the small size of the domestic market and the small incentive for companies to develop the reserves for local consumption only, supplying the domestic markets and gas exports will likely occur simultaneously.

Table 7 below summarizes the gas balances in the four East Mediterranean countries in 2020. Lebanon and Syria will remain net importers of natural gas. The UNDP estimates Syria's import requirement to reach 10.3 Bcm while that of Lebanon to reach 2.65 Bcm.[79] In contrast, Israel and Cyprus could potentially become net exporters, with larger volume of exports expected to originate from Cyprus.

Table 7: Gas supply demand-balances in the East Mediterranean by 2020 (in Bcm)

	Production	**Consumption**	**Import requirements (-)/exports (+)**
Israel	15-20	12.5	2.5-7.5
Cyprus	9	0.9	8
Lebanon	0	2.7	-2.7
Syria	9	19.4	-10.3

Source: ESMAP (2010); Giamouridis (2012); own analysis

4. Gas export monetisation options: overview and assessment

In addition to satisfying local energy needs, East Mediterranean gas can also underpin the development of a gas export industry. Indeed, these resources provide the prospect of long-term energy self-sufficiency and a new revenue stream for the economy, but they require for their development suitable conditions, the absence of which would result in the identified resource potential being under- or un-realised. Generally, these conditions include factors such as fiscal terms, costs, pricing and, in the case of natural gas, guaranteed market demand. For the East Mediterranean resource holders, the latter factor is particularly challenging, given the large investments required for the development of their discoveries,[80] the relatively small size of their domestic gas markets – even though this is potentially less true for Israel – and the numerous (geo)political, commercial and regulatory hurdles facing the export options available to them. Indeed, upstream investors will require an optimal level of production – and hence revenue – to ensure economic viability for their development projects, and domestic markets alone are unlikely to support the required economic profile of gas production.

The monetisation challenge is most pressing for Israel and Cyprus, which are the two countries of the Levant Basin most advanced in terms of E&P activity. As mentioned

above, Lebanon and Syria have yet to begin offshore hydrocarbon exploration and are unlikely to start producing gas from potential offshore resources before 2020. Syria is in a worse situation than Lebanon, with the outlook for the civil conflict that has engulfed the country since 2011 looking increasingly bleak. As for Lebanon, there is much enthusiasm inside and outside the country about the first offshore licensing round that is due to be launched in the first half of 2013, but the intricate complexities and the inherent fragility of the Lebanese polity may well prove to be inhibiting factors for the development of the country's gas potential.

Thus, the focus in this section is on Israel and Cyprus. Cyprus is clearly intent on developing a natural gas export industry on the back of its 7 Tcf Aphrodite discovery, while in Israel the debate about the country's export policy has yet to be finalised. For the Noble Energy-led consortia that are developing the main fields discovered so far in Israel and Cyprus, there appear to be promising project synergies between the two countries, but numerous challenges need to be overcome before these can materialise. In a region charged with inter-state tensions and rivalries, geopolitics will undoubtedly play a significant role in the monetisation of the discovered resources. However, with limited state involvement in the execution of projects, economic fundamentals will be the ultimate drivers in this monetisation process.

4.1. Cyprus: opting for LNG

The Republic of Cyprus has discussed a number of options for the export of its natural gas finds.[81] The option of a pipeline to Greece seems to be of interest more to decision-makers and energy operators in this country than to resource-holder Cyprus (see Map 2). Even if laying the required 1,000-km pipeline at depths of up to 3,000 metres is technically feasible, it is a project that would present stakeholders with major complexities and not necessarily the most optimal commercial returns. For the financially embattled Greek state, the prospect of becoming a transit country for gas supply from the East Mediterranean into Europe has both economic and geopolitical appeal, as it is perceived to have the potential to contribute to improving the country's standing vis-à-vis the European Union. From a gas supply perspective, this is entirely plausible considering the waning interest within Europe in the prospects for the flow by the end of the 2010s of substantial volumes of gas through the Southern Corridor in its current configuration.

However, for Cyprus, Noble and its partners, future investors, and even Israel, a pipeline to Greece is not necessarily the most obvious first choice in terms of gas export options. For interested state parties in Cyprus and Israel, there may be potential geopolitical merit in linking their gas reserves to other parts of the European market,[82] but from a commercial perspective there are several risks associated with this option. For a start, the outlook for European gas demand is far from certain, with growth expected to remain sluggish at best until 2020.[83] As Giamouridis points out, even in South East Europe, demand for gas is likely to continue being undermined by the numerous economic, pricing and regulatory uncertainties prevailing in these markets.

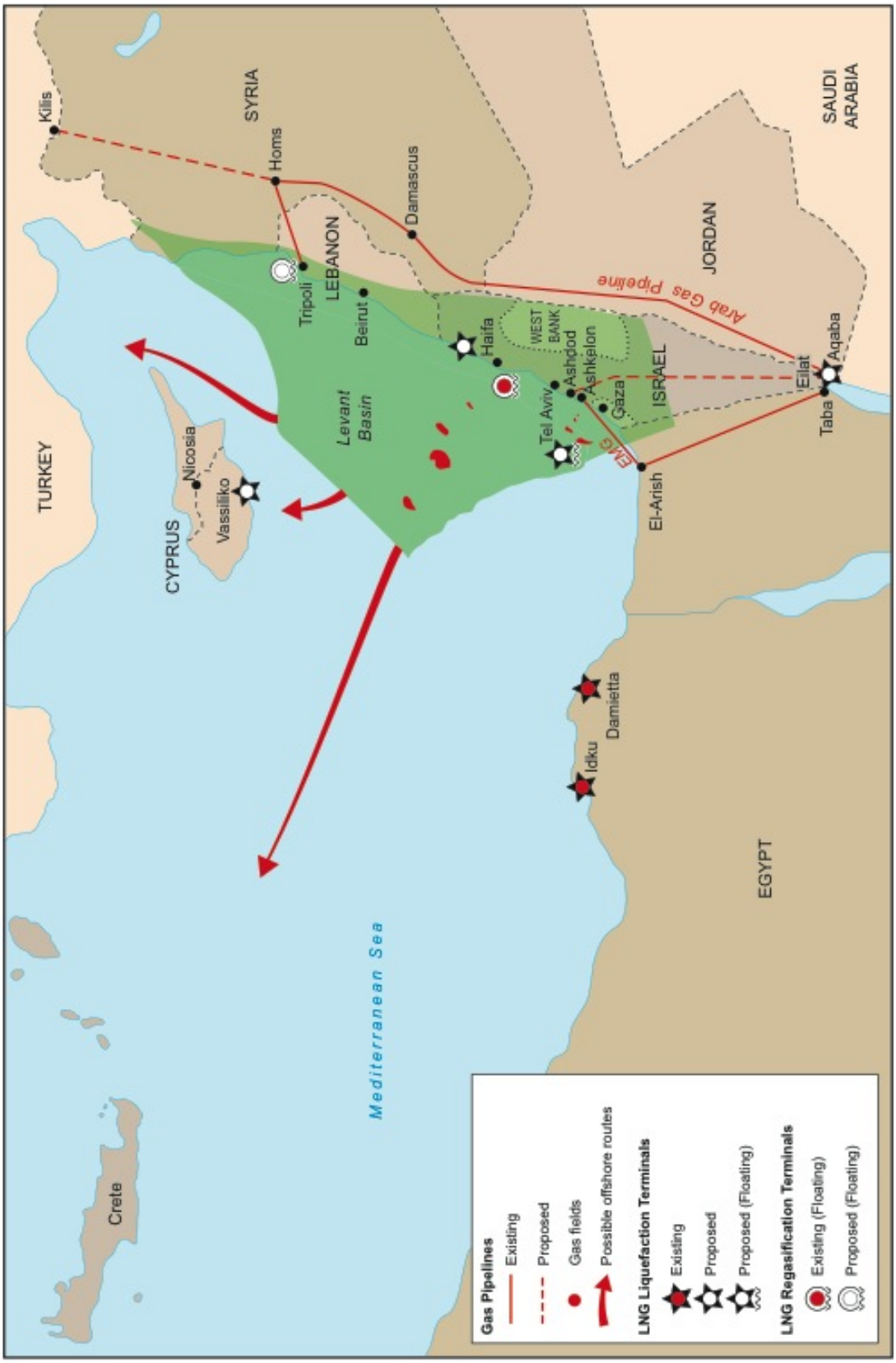
Against this backdrop, East Mediterranean gas would have to compete with existing contracted pipeline supply and with future supply from Azerbaijan and Russia, with Gazprom's 63 Bcm/yr South Stream now due online in 2015-17.[84] What's more, with gas pricing in Continental European long-term supply contracts apparently undergoing a fundamental transformation away from oil indexation, the attractiveness of the European market under the prevailing conditions is further undermined. Even if prices in South East European markets remain oil-linked for now, further

interconnection with the more liberalised Western European markets is expected to lead sooner or later to a shift to (lower) hub-based pricing.[85] Hence, for East Mediterranean suppliers, committing capital and gas supply to a (South East) European market that presents so many uncertainties in the medium to long term would be a risky undertaking, especially when considered against the merits of the available alternative options.

The second export option consists of a pipeline to Turkey and has almost exclusively been advocated by the Turkish authorities, with state-owned oil and gas company TPAO leading the way.[86] This is a view that points to the relatively short distance between Cyprus and Turkey (c.200 km), the sustained growth of Turkish gas demand compared to other European markets,[87] the aspiring role of Turkey as an energy hub, and the potential peace-building ramifications of the project as factors working in favour of this option. In this vein, the East Mediterranean is presented as a new source of gas that would allow the Southern Corridor to finally become reality.[88] However, while all of this may be true, Turkey's belligerent reaction to the discovery of the Aphrodite field, disputing the sovereignty of the Republic of Cyprus over its internationally-recognised waters and threatening to use military force to interrupt exploration efforts there, hardly lends any weight to its proposal.[89] Thus, for Cyprus, the option of a pipeline to Turkey may be economically more attractive than the alternative route to Greece, but it is politically unpalatable in the current circumstances. Only if it were designed as part of a larger conflict resolution effort might a pipeline to Turkey receive political approval from the Greek-Cypriot authorities.

While, from a geopolitical standpoint, Turkey's reaction to the formation of an axis of convenience between Israel, Cyprus and Greece may be understandable, given the longstanding animosity between Turkey and Cyprus/Greece on the one hand and the recent deterioration in Turkish-Israeli relations on the other, Ankara stands a meagre chance of making any difference to the momentum that the upstream gas sector in the region has gained. Not only do Cyprus and Israel enjoy the support of the US, the EU and Russia in their gas exploration efforts, but a number of major IOCs have demonstrated their willingness to invest in both countries in spite of Turkish threats. Eni, Total and Gazprom (through GazpromBank) participated in Cyprus' second upstream bidding round, which should see them awarded exploration licences in 2013, despite having varying midstream interests in Turkey.[90] Australia's Woodside in which Shell, a company with upstream and downstream exposure in Turkey, holds a 24% stake, and China's CNOOC have both expressed interest in farming into Israel's Leviathan and participating in the monetisation of its resources.

Map 2: Schematic of possible export monetisation routes for East Mediterranean gas

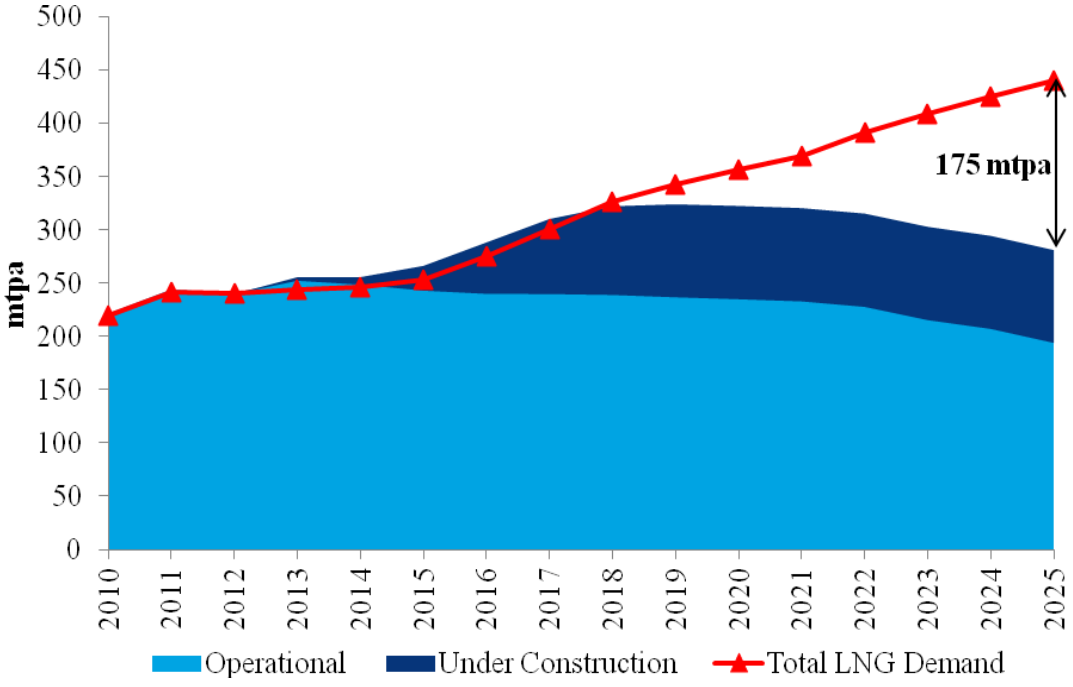


Source: Oxford Institute for Energy Studies

Being almost entirely dependent on imports for its oil and gas supply, Turkey has limited leverage over these companies. Apart from the overlapping area between its Continental Shelf and blocks 1, 4, 5, 6, and 7 in Cyprus' EEZ (Map 2), which might lend support to its case against the award of licenses by Cyprus in those blocks, Turkey has almost no legal room for manoeuvre. It stands a better chance of preserving its interests and those of Turkish Cypriots through diplomacy and dialogue, with the discovery of gas resources offshore Cyprus having the potential to significantly improve the prospects for conflict resolution on the divided island.[91]

In the meantime, the third and most realistic option available to Cyprus for the monetisation of gas reserves at Aphrodite and future fields through exports is LNG. In fact, the island's political leadership seems to have set its eyes on LNG exports soon after the discovery of the Aphrodite field, seeing this as the most attractive way for the country to achieve its commercial and geopolitical objectives.[92] Indeed, with LNG providing destination flexibility for sellers, allowing them to target higher-paying markets and capture the highest possible rent from their gas exports, Cyprus could develop a liquefaction facility with a view to supplying premium markets, be they in Asia or the Atlantic Basin. With demand for LNG expected to continue growing solidly in the coming years and the ability of supply to keep up with demand being uncertain, notably as a result of the challenges facing Australian, US and East African liquefaction projects, there is a strong chance that a window of opportunity will open up from about 2017-18 for Cyprus to land supply agreements in what is likely to be a sellers' market (Figure 2).

Figure 2: Global LNG capacity vs. demand, 2000-2025

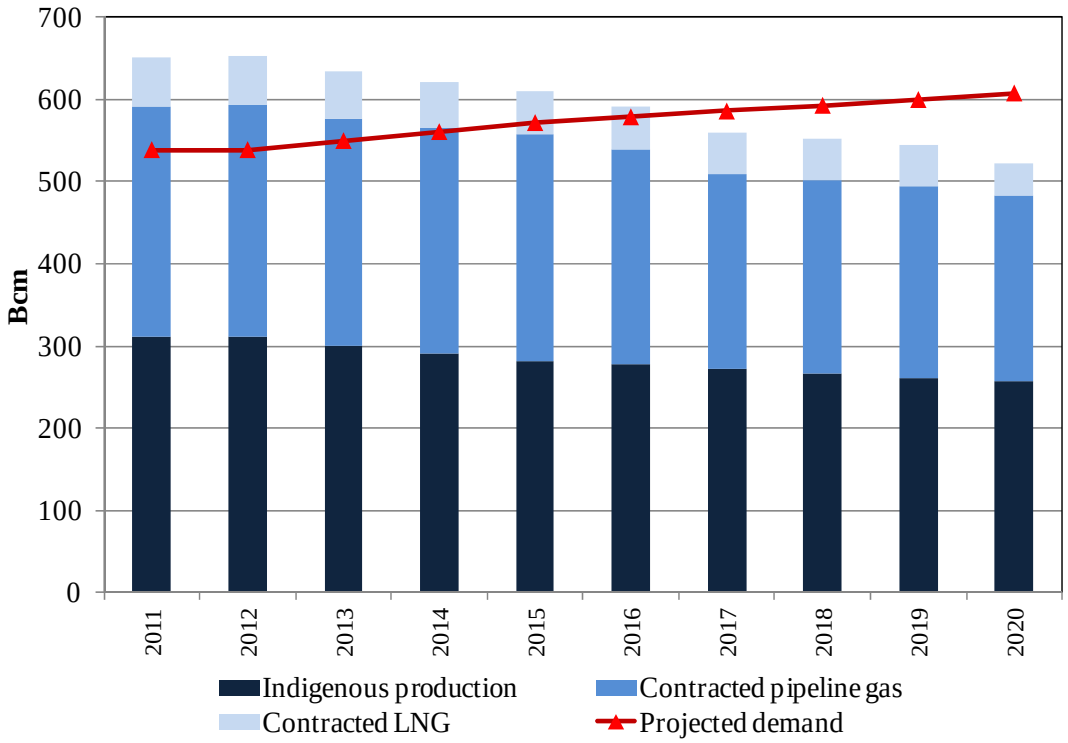


Source: Wood Mackenzie LNG Research

Conversely, if as has been suggested Cyprus decides to use its LNG exports to open up an 'East Mediterranean Corridor' and contribute to the EU's security of gas supply, thereby seeking to reap geostrategic rent on top of the economic rent from its gas resources,[93] then there could be further marketing opportunities for Cypriot LNG volumes as European buyers will need to secure new supply from 2017 (Figure 3).

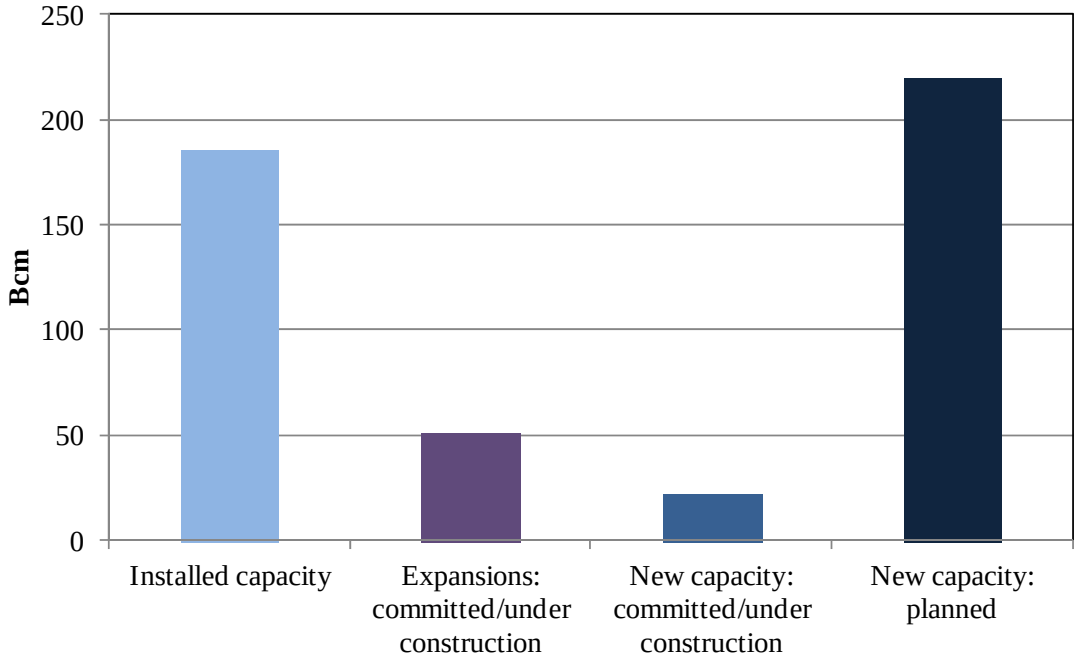
This is a prospect that would be reinforced by the anticipated decline in LNG supply from Algeria and Egypt, which in 2011 accounted for a combined 23% of Europe's LNG imports,[94] as well as by the planned increase in Europe's regasification capacity from 186 Bcm/yr (137 mtpa) in 2011 to at least 259 Bcm/yr (190 mtpa) by 2020 (Figure 4). In fact, some see the decision by the Republic of Cyprus to award exploration blocks from the second licensing round to Eni and Total as an indication of a calculated move by Nicosia, confirming its plans to market (some of) its LNG in European markets.[95] However, with this 'political' marketing option, Cyprus would have to forego higher netbacks from the export of those volumes to premium markets in Asia and elsewhere, assuming that current price differentials between Europe and those markets will persist.

Figure 3: Europe's gas supply-demand balance to 2020



Sources: Honoré (2010) and IEA (2012) - courtesy of Anouk Honoré

Figure 4: Regasification capacity in Europe, 2011-2020



Source: Gas Infrastructure Europe

Ultimately, where Cyprus ends up selling its LNG will to a large extent depend on the project structure of the planned liquefaction facilities. The plan currently is to begin with the development of a 5 mtpa liquefaction train at an estimated capital cost of $6-7 billion, with the possibility of adding two similar-size trains in future as more gas reserves are firmed up and/or more feed gas becomes available from Israeli reserves. Government officials in Nicosia have also stated that the Cypriot NOC would be the main shareholder in any future LNG facility,[96] which appears to rule out the possibility of an integrated ownership structure for LNG projects. However, this opens the door for participation in the first train of a foreign investor with more financial wherewithal and experience in the LNG industry than Noble Energy, which holds a 70% interest in and is the operator of the Aphrodite field. This could be done either through a joint venture structure or a tolling arrangement for the liquefaction facility. The decision on how to structure future trains will also to some degree depend on the discovery of more reserves by new investors and on whether Israel decides to use joint liquefaction with Cyprus for the monetisation of reserves at Leviathan or other fields.

4.2. Israel: navigating through a minefield

Despite having so far discovered almost four times as much gas as Cyprus, Israel has yet to decide on a definitive export policy. An inter-ministerial committee, known as the Tzemach committee,[97] was tasked in October 2011 with the formulation of recommendations for a national gas utilisation policy, but after two rounds of deliberations, clarity on Israel's gas export policy remains elusive. In its second and most recent report, the committee proposed to the government of Israel that up to 500 Bcm, out of an estimated reserve base of 950 Bcm,[98] of gas be allowed to be exported, with the balance to be earmarked for the domestic market for the next 25 years. More specifically, the Tzemach committee advised that developers of fields

with reserves of 200 Bcm and over should be allowed to export up to 50% of their gas, that for fields of 100-200 Bcm the allowance be 60%, and for those with reserves of 25-100 Bcm 75%. Furthermore, to encourage the development of smaller fields, developers would be allowed to trade their export allowances with other producers, with total exports from any one field capped at 75% of its proven reserve base. And lastly, the committee relaxed an earlier restriction on the location of export infrastructure, allowing the use of facilities outside Israeli territory with the proviso that this is done under a bilateral cooperation framework with the country concerned.[99]

The Tzemach committee's second report received unanimous applause from upstream investors in Israel, as it was seen as not only encouraging the development of existing reserves, but also as an incentive for further investment in gas exploration. However, its recommendations have yet to translate into policy proper and it should not be taken for granted that they automatically will, given that there is no consensus within the Israeli establishment on its main provisions.

For a start, with early general elections having been called by Israel's prime minister for the end of January 2013, it is unlikely that the report will be submitted to the new Knesset for debate and approval before Q2 2013 at the earliest. This could mean that adoption of Israel's gas export policy could take several more months, which would undoubtedly have a negative impact on the investment plans of upstream developers.

Secondly, senior Israeli politicians have questioned some of the key assumptions underlying the conclusions of the Tzemach report, with some demanding that at least 50 years of domestic demand be guaranteed through reservation of proven deposits,[100] which would at the current stage almost rule out the possibility of exports altogether. Others, moreover, have argued that the committee's reserve estimates are overly optimistic.[101] Critiques from the latter, conservationist camp felt vindicated by the recent failure of the ILDC-led consortium to find any gas in the Sara and Myra blocks after drilling their first wells.[102] Expectations were high for potential discoveries in these two blocks, which are located just 40 km south of Tamar, especially given that seismic results in 2011 were said to be promising. Hence, even if dry wells are not an unusual occurrence in the upstream gas business, opponents of an export-oriented gas utilisation policy in Israel will see this setback as sufficient reason to warrant a more cautious approach to reserve estimates.

And lastly, there appears to be strong opposition within the security establishment to the location of export facilities outside Israeli territory. The preference of national security decision-makers is said to be for infrastructure to be firmly placed under Israeli sovereignty, with the representative of National Security Council in the Tzemach committee reported to have vetoed the option of joint liquefaction with Cyprus on security/military grounds.[103]

As things stand, any delay in the adoption of an explicit gas export policy is likely to affect the development of the 17 Tcf Leviathan field (and other smaller discoveries), especially given that license-holders Noble Energy, Delek Group and Ratio Oil plan on completing a farm-out for a 30% stake in order to raise the necessary financing and bring onboard an experienced partner for the development of the field and the monetisation of its reserves. With the reported $2.5 billion bid of Australia's Woodside Petroleum being accepted by the Leviathan license-holders,[104] all that is left is for Tel Aviv to send clearer monetisation signals for a final investment decision on the development of the field to be taken. By contrast, the development of the 9.7

Tcf Tamar field is moving forward according to plan, with first gas expected by summer 2013. Gas from Tamar will mostly be used to supply the Israeli domestic market, though license-holder Noble Energy and its Israeli partners have not ruled out the possibility of exports to Cyprus and further afield through a floating liquefaction facility (FLNG).

The difficulties facing gas exports from Israel are not limited to the protracted formulation of a coherent policy. Arguably, the most challenging tasks will eventually be choosing what option(s) to go with and moving forward to project execution. Already, Israel's problematic relations with its Arab neighbours, its crowded coastline and issues of security appear to rule out a number of possibilities from the outset. These include exports by pipeline to gas-short neighbours Jordan, Syria, and Lebanon, or to demand centres further away, such as Europe, by transiting through neighbouring countries.

Indeed, most countries in Israel's immediate vicinity need to import gas to satisfy their growing needs. Egypt, which ceased exporting gas to Israel in early 2012, is planning to import LNG from the second half of 2013; Jordan, whose supplies from Egypt through the AGP have been running well below the contracted quantity – if at all – since the start of the Egyptian revolution in 2011, is considering permanent LNG imports to plug its deficit; Lebanon, which has not received any supplies through the AGP since 2010, has plans for the construction of a temporary floating regasification terminal until it is able to develop its own potential offshore reserves; and Syria, currently bogged down in domestic conflict, has looked at pipeline imports from Iraq and Iran as possible alternative supply sources to the AGP, but is unlikely to be in a position to develop either of these options before the end of the conflict.

Lack of trust, fear of hostile popular reactions, or simply the absence of diplomatic engagement between Israel and its neighbouring countries mean that, economically logical though they may be, pipeline gas exports to these markets are off-limits for now. Israel is only left with users in the Palestinian Territories as potential customers, though the volumes required here would be relatively small. Having said this, the prospect of exports to Jordan and Egypt, two countries with which Israel has full diplomatic relations, cannot be excluded entirely. If and when the heavy dose of uncertainty injected into regional politics by the events of the 'Arab Spring' gets diluted by new developments, such as the coming to office of a different government in Israel and/or the resumption of the Peace Process, then developing gas trade will become more palatable, especially if external actors such as the US provide mediation and guarantees. After all, Egypt was supplying Israel with gas until very recently, while Israel supplies water to Jordan as part of the 1994 peace treaty between the two countries.

And lastly, as is the case with Cyprus, there is the possibility of building a pipeline to Turkey for exports to the Turkish and European markets, but this is an option that presents short-term political challenges and long-term commercial uncertainties (not to mention technical difficulties), despite being economically feasible. Relations between Turkey and Israel have deteriorated markedly since 2010, with official overtures towards Israel for the export of its gas by pipeline through Turkey being rebuffed by Israelis.[105] However, it has to be pointed out that, here too, the status quo could well prove to be contextual, with a change of government in either or both countries likely to lead to improved relations in future. Still, the longer-term

uncertainties over demand and prices in the European market militate from an Israeli perspective against 'locking' reserves in a pipeline to Turkey/Europe.

In the short to medium term, the status quo in political relations with neighbouring countries leaves Israel with liquefaction as the only feasible option for the monetisation of gas reserves through exports. And LNG plans come with a whole set of complications in the case of Israel. To start with, Israel's crowded coastline and strict environmental regulation mean that constructing onshore liquefaction terminals in Israel is almost a non-starter. This seems to apply to the country's Mediterranean coast, as well as the port of Eilat on the Red Sea. Developers of the Tamar field experienced this problem first hand when they sought to build onshore processing facilities for their gas in the northern part of Israel but faced significant administrative delays, which led them to opt for existing facilities in the south. Only strong commitment from the state to simplify the regulatory approval process can help resolve this issue, but it is unclear if this is a feasible prospect.

This leaves the possibility of developing a joint liquefaction facility with Cyprus, or constructing an export terminal in the Jordanian free economic zone of Aqaba. Both options would serve the respective interests of Cyprus and Jordan, helping the one dispose of enough gas to achieve economies of scale for its own LNG export projects, and the other to receive pipeline gas supplies from Israel. For Israel, the Cypriot option would accommodate security concerns and provide favourable access to the European market, while the Aqaba location would help achieve the goals of targeting the Asian markets and avoiding shipments transiting through the Suez Canal.[106] However, a key issue with the joint liquefaction project would be the ability of governments and partners on both sides to reconcile the political, legal, commercial and strategic interests of the various stakeholders. And if Israel opts for the Aqaba option, then besides security issues, it will have to overcome the likely reluctance of major IOCs with LNG experience from investing in Israel because of their significant exposure in energy-rich Arab countries.

This potential restriction also poses a problem for FLNG, which is the other option available to Israel as far as liquefaction is concerned. So far, as mentioned above, the Tamar consortium has considered FLNG as a solution for marketing part of its supply on export markets, signing in 2011-2012 a memorandum of understanding with Daewoo Shipbuilding for the construction of a 2-3 mtpa facility and a letter of intent with Gazprom Marketing & Trading, the downstream subsidiary of Gazprom, for commercial volume offtake.[107] The option could also be deployed offshore Eilat, although a pipeline of some 250 km would need to be constructed to transport the feed gas from the Mediterranean coast.[108]

While FLNG would help Israel overcome the political and regulatory complications of onshore liquefaction, as well as address fears over the loss of sovereignty and economic benefit from depending on a third party, it is an option that comes with its own challenges. Only a handful of international companies, most notably Shell and Malaysia's Petronas, are qualified candidates for commercially operating floating liquefaction, but their exposure in Arab countries may discourage them from partnering with Israel. Furthermore, the technology is largely untested and, given the high capital costs it involves, the likely associated difficulty of raising finance would be a serious challenge.

Thus, the path to gas exports for Israel is far from being straightforward. All options available to the government and field developers present serious challenges and none

of them appears to satisfy the concerns and needs of all stakeholders at once. For this reason, the end result may well be that Israel decides to prioritise the gasification of the domestic market beyond the stationary sector, focusing on offering the right pricing incentives for producers, or to monetise its gas reserves through the production and export of higher value-added (energy) products. The decision to export gas, if and when it is made, will have to consider the pros and cons of all available options. But, ultimately, with the Israeli state unable to exert financial influence on project development, the export project(s) that will proceed to successful execution will be the one(s) that provide foreign investors with optimal commercial returns. If, however, non-commercial considerations end up overpowering the decision-making process, then the outcome will at best be project delays and at worst no gas exports.

5. Conclusion

The discovery of significant reserves of natural gas in the offshore East Mediterranean has significantly transformed the region's outlook, offering the prospect of both self-sufficiency in natural gas supplies and, possibly, becoming a new source of exports to international markets by 2020. It will also provide much-needed impetus for local economies, especially in countries like Cyprus and eventually Lebanon and Palestine. However, the development of gas export projects based on these discoveries faces a plethora of geopolitical, regulatory and commercial challenges which, if unresolved, would undermine the development of these resources altogether, let alone export projects. Hence, given that it can safely be assumed that some of these hurdles stand little chance of being overcome in the short term, East Mediterranean gas will by the end of the current decade be a game-changer more locally than for regional and international gas markets.

The East Mediterranean's complex geopolitical landscape is likely to play a secondary role in the development of the region's natural gas resources. Turkey's stance towards the unresolved Cyprus question will likely constitute the most significant source of regional contention over the development of the Levant Basin's natural gas resources in the next few years, but with limited effect on the pace of resource developments under way. The pace of development of gas reserves will be mainly driven by local political dynamics and energy policies within each of the East Mediterranean countries.

In particular, Syria and Lebanon have underexplored resource potential owing to domestic political issues, whilst Israel needs to formulate a clear export policy. Nevertheless, a complex geopolitical landscape and the long-term border conflicts across the region will impact producing countries' choices over possible monetisation options and hence will be pivotal in determining the future direction of gas trade flows. The East Mediterranean's geopolitical complexity means that its gas resources are unlikely to feed the regional market in the short to medium term, despite rapidly rising regional demand and the relative cost-competitiveness of regional vis-à-vis international trade alternatives.

Thus, LNG emerges as the most favoured export option for both Israel and Cyprus. In Cyprus, there appears to be a consensus on onshore liquefaction being the most optimal export monetisation option. The pipeline options to Greece and Turkey present commercial and political challenges and are therefore unlikely to materialise any time soon. With liquefaction, the only uncertainty facing stakeholders relates to

the timing of the development – in other words, should a liquefaction facility be developed on the basis of the Aphrodite find or should it be delayed until more reserves are firmed up. The government seems intent on moving forward with the development of a 5 mtpa LNG export terminal and start exports towards the end of the decade, but investors may favour a different approach to be able to achieve economies of scale and optimise returns for their investment.

What might tip the balance one way or the other is whether Israel decides to monetise some of its reserves using liquefaction facilities in Cyprus. This will in the first instance depend on whether Israel adopts a pro-export gas utilisation policy, which as of now remains uncertain. Indeed, with concerns over the long-term gas needs of Israel and the security of export infrastructure, a conservative approach to gas exports cannot be excluded. However, should it do so, the Cypriot liquefaction option would still need to satisfy Israeli concerns about security and economic sovereignty, despite being the option that provides the most optimal solution to the monetisation of some of Israel's gas under the current conditions. Alternatively, the other realistic export monetisation option available to Israel is building floating LNG in the Mediterranean and/or the Red Sea. This option would accommodate Israel's concerns over security and sovereignty, allowing gradual scale up, and provides flexibility to target both the Atlantic and the Pacific basins without transiting through the Suez Canal.

So far, Cyprus seems more advanced in its plans to export a share of its new natural gas resources, despite having so far discovered smaller reserves than neighbouring Israel. We hence estimate that the region's combined export potential by 2020 may reach no more than 5mtpa in the form of Cypriot exports and, should Israeli decide to move ahead with gas exports, some additional 2-3mtpa of Israeli (floating) LNG. These relatively small export volumes render East Mediterranean gas an unlikely game-changer for international gas markets, though the region remains a potential new source of gas for markets in Europe seeking to diversify their supply sources.

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[56] The latest plans to build a 450 MW combined cycle gas turbine (CCGT) and a 180 MW reciprocating engine unit have been postponed over allegations of corruption and lack of clear energy policy.
[57] The slow pace of expansion in new generation capacity in the face of rapid electricity demand growth has had a large impact on the quality of electricity supply in some East Mediterranean countries. Power outages are very common in Lebanon. It is estimated that residential consumers suffer up to 220 days of interruption per year, the worst record in the MENA region. So does the industrial sector, which despite heavy investment in private power plants for back up supplies, still suffers from huge losses from power supply interruptions, with the average firm losing up to 7% of its sales value (World Bank 2008). The situation has got worse recently with power outages exceeding 10 hours a day in many parts of the country, adding to the political unrest. The World Economic Forum's Global Competitiveness Report for 2011-2012 ranks Lebanon 141 out of 142 in terms of the quality of electricity supply (see, World Economic Forum, (2012), Global Competitiveness Report 2011-2012, Geneva, Switzerland). Syria has also been facing serious power outages even before the intensification of the current conflict. The situation has deteriorated since the start of political unrest, with Syria losing 35% of its total capacity. In Israel and Cyprus, there has been a decline in the electricity reserve capacity over the last few years, but the quality of electricity supply is relatively high.
[58] Ministry of Energy and Water Resources Website, http://energy.gov.il/English/Subjects/Natural%20Gas/Pages/GxmsMniNGEconomy.aspx
[59] In 2009, the government passed a resolution setting a target for renewable energy: By 2020, 10% of the country's energy needs should be met by renewables. The resolution also calls for building power stations based on renewable energy sources in the Negev and Arava regions, of at least 250 MW each year. The government also set an interim target of 5% of electricity consumption coming from renewable energy sources by 2014.
[60] Ministry of Energy and Water Resources Website.
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