

# **CYPRUS OFFSHORE HYDROCARBONS EXPLORATION AND PRODUCTION**

## **PROSPECTS FOR THE ESTABLISHMENT OF A REGIONAL ENERGY HUB**

**South and East Mediterranean Hydrocarbon  
Workshop – ELG Third Energy Event**

**Vienna, September 2013**



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## History of Cyprus Hydrocarbons

### On Land

The first recorded activities in the area of hydrocarbon exploration in Cyprus date from 1938, when the Iraq Petroleum Company Ltd conducted geological and geophysical surveys on the island.

These surveys lasted until 1948, and afterwards during the period 1949-1970 four exploration wells were spudded onshore Cyprus in depths between 1,250-3,295 m.

The local company Oil Prospectors Ltd drilled two land based wells in the Moni and Tseri areas, while the Forest Oil Corporation followed with other two wells in Archangelos and Lefkoniko areas.

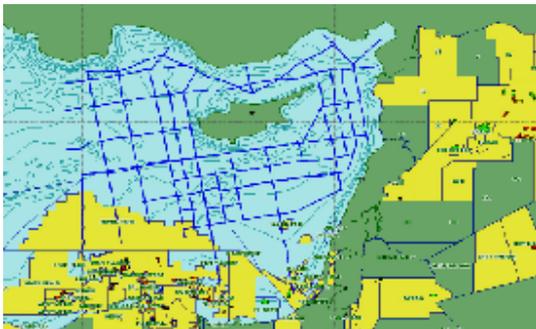
All these wells were assigned as dry holes.

### On sea

In 1975 the first seismic surveys offshore Cyprus were carried out by Delta Exploration Inc. during 1970 –1974 in the shallow waters up to 200m depth.

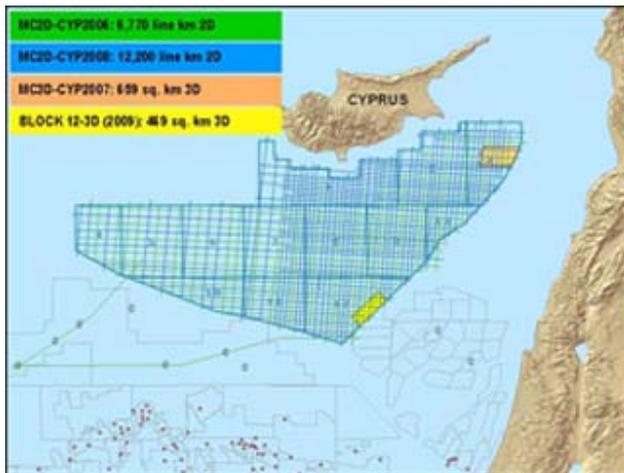
These were followed by an 8,000 line-km seismic survey in the Eastern Mediterranean covering mostly Cypriot waters carried out by Sefel Geophysical Ltd of Canada.

Ten years later, during the 1985-1987 the Soviet Academy of Scientists carried out geological and geophysical studies offshore Cyprus.



The results of the past hydrocarbon prospection and exploration studies showed that a moderate potential for hydrocarbons onshore and in the shallow waters existed in Cyprus.

## Recent Geophysical Surveys in the Exclusive Economic Zone (EEZ) of the Republic of Cyprus



The Energy Service of the Ministry of Commerce, Industry and Tourism of the Republic of Cyprus, in collaboration with PGS Geophysical AS, undertook in 2006 a multi-client 2D seismic survey (MC2D-CYP2006) amounting to approximately 6,770 line-km of new data on a 10 km by 20 km grid in an area of around 51,000 km<sup>2</sup> offshore Cyprus. A multi-client 3D seismic survey (MC3D-CYP2007) of 659 km<sup>2</sup> was also conducted by PGS in 2007.

Following that, a new multi-client 2D seismic survey (MC2D-CYP2008) totaling approximately 12,200 line-km on a 10 km by 10 km grid on the western side and a 5 km by 5 km grid on the eastern side of the area has been acquired by PGS.

The almost 19,000 line-km of 2D seismic data made possible the definition of 14 plays and many leads on the basis of closed surfaces only.

Some of them correspond to major structural features and display a closed surface of several hundred square kilometers. Thus, based on these data, offshore Cyprus showed great potential for hydrocarbon exploration.

Based on the above seismic surveys an integrated 2D Interpretation Report and a 3D Interpretation Report were prepared in collaboration with Beicip-Franlab.

## First Licensing Round – February 2007



Part of the Exclusive Economic Zone of Cyprus, that is located south of the island and covers an area of around 51,000 km<sup>2</sup>, has been divided into 13 Exploration Blocks.

The Republic of Cyprus announced the first licensing round in February 2007 for the grant of Hydrocarbon Exploration Licenses and subsequent Hydrocarbon Exploitation Licenses (upon a commercial hydrocarbon discovery during exploration) in 11 Exploration Blocks within the EEZ of the Republic. Blocks 3 and 13 were excluded.

The Licensing Round was based on the MC2D-CYP2006 seismic data acquired by PGS Geophysical in 2006.

Following extensive negotiations based upon the model PSC after the submission of the applications in the framework of the First Licensing Round, an Exploration License for Block No 12 was granted to Noble Energy International Ltd in October 2008.

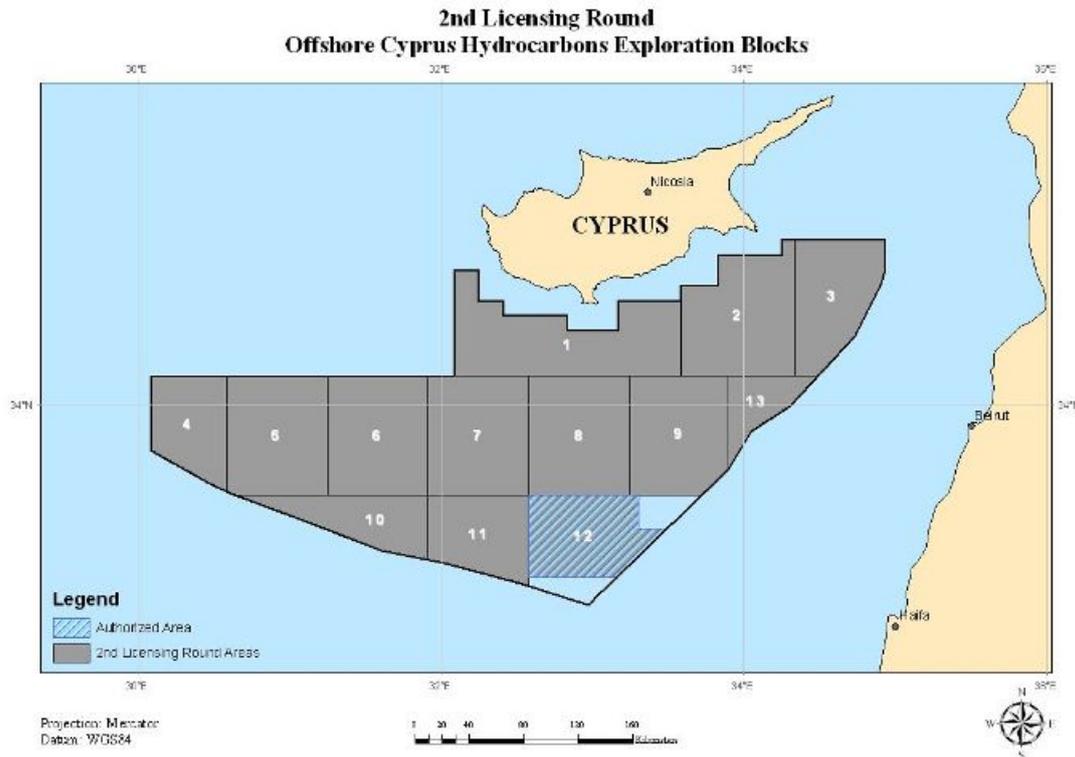
Upon examination of 3D seismic survey data which was acquired in 2009, in accordance with the Nobel PSC the findings for Block 12 point into a significant geological structure. This has been named “Cyprus A1 prospect” and also (not very originally) the “Aphrodite” field.

The Cyprus A-1 well encountered about 310 feet of net natural gas pay in multiple high-quality Miocene sand intervals.

A discovery well was drilled to a depth of 19,225 feet in water depth of about 5,540 feet. Results from drilling, formation logs and initial evaluation work indicate an estimated gross resource range (1) of 5 to 8 tcf, with a gross mean of 7 tcf.

Drilling on a second appraisal well in block 12 commenced in June 2013 and results are expected in September 2013 which will lead to the discovery being assigned as a **commercial discovery**.

## Second Licensing Round – January 2012



In January 2012 The Republic of Cyprus announced the second licensing round. The areas open for bidding included Exploration Blocks 1-11 and 13 within the Exclusive Economic Zone of Cyprus.

A copy of the Model PSC can be found at the following e-address:  
[http://www.mcit.gov.cy/mcit/mcit.nsf/all/2300DDB36D859732C22579AA002BDE09/\\$file/Model%20PSC.pdf?openelement](http://www.mcit.gov.cy/mcit/mcit.nsf/all/2300DDB36D859732C22579AA002BDE09/$file/Model%20PSC.pdf?openelement)

As a result of the second licensing round PSC's were concluded with the unincorporated joint venture between ENI International BV and Korea Gas Corporation (KOGAS) JV in February of 2013 for blocks 2,3 and 9 and with Total E & P Activites Petrolieres S.A. for blocks 10 and 11.

Current indications indicate a larger find than block 12.

## **Total Estimated Reserves for Cyprus**

The CNHC estimates that gas reserves within the six licensed blocks could amount to up to 40 tcf bringing in approximately Euro 4bn per year in Government revenue.

Total estimated natural gas reserves for Cyprus according to USGS amount to 60tcf.

## **Legislative Framework**

The legal framework in Cyprus that determines the conditions for granting and using licences for the prospecting, exploration and production of hydrocarbons is being covered by the Hydrocarbons (Prospection, Exploration and Exploitation) Law of 2007 and the Hydrocarbons (Prospection, Exploration and Exploitation) Regulations of 2007 and 2009.

According to the legislation, the Hydrocarbon Prospecting License is granted for up to one year and includes geophysical survey but no drilling. The Hydrocarbon Exploration License is granted initially for up to three years, with the ability for two renewals of two years each (maximum seven years).

A find must be declared commercial within the period of the duration of the Exploration License otherwise.

Relinquishment of blocks or parts thereof is provided for in the PSC so as to prevent an inactive Contractor from holding on the blocks which he does not intend or is incapable of exploiting.

It includes gravity and magnetic surveys, 2D/3D seismic surveys, as well as exploration drilling. On each renewal, at least 25% of the initial licensed area is relinquished. In case of a discovery, the licensee has the right to be granted an exploitation license for that discovery.

The Hydrocarbon Exploitation License is granted for an initial period of up to 25 years with the ability for one renewal of up to ten years.

The conditions and requirements contained in the license for exploration and in the license for exploitation are stated explicitly in a Contract concluded between the Government of the Republic of Cyprus and the holder of a license.

The type of the Contract used in the procedure for granting licenses in accordance with the provisions of the Hydrocarbon Regulations is the Production Sharing Contract (PSC).

Bids are received on the basis of the Model PSC - see link at e – address:  
[http://www.mcit.gov.cy/mcit/mcit.nsf/all/2300DDB36D859732C22579AA002BDE09/\\$file/Model%20PSC.pdf?openelement](http://www.mcit.gov.cy/mcit/mcit.nsf/all/2300DDB36D859732C22579AA002BDE09/$file/Model%20PSC.pdf?openelement)

The main characteristics of the PSC are the following:

The Contractor is the Contracting party

An Operator is nominated. The operator must have sufficient experience and technical capability to carry out the exploration and extraction processes in a manner which accords with the Contractor's obligations under the Contract.

A license for exploration is granted initially for up to one year with a prospect of renewal for two periods of up to three years each (maximum seven years) provided that the activities undertaken by the contractor warrant such renewal.

Subsequently and once a discovery is termed a commercial discovery a license for extraction is granted for up to 25 years.

Licenses may be revoked for a substantial breach. The PSC provides for a remedy period.

A license may theoretically be either partially or fully assigned provided that operator requirements are at all times complied with and provided that the national and security interests of Cyprus are not jeopardised.

The costs of the Contractor are monitored and approved on an annual basis in accordance with a pre – agreed budget.

The Contractor's costs are deducted from income from LNG at an agreed rate once production starts and the surplus (termed as Profit Gas) is divided between the Contractor and the State at an agreed level.

The PSC provides for co-operation in the selling of the Contractor's share of what is termed Profit Gas.

Disputes are settled by neutral international arbitration.

Profits from Hydrocarbon activities are effectively exempt from tax in Cyprus in so far as the Contractor is concerned. This is provided for in the PSC.

## **Cyprus Government Agencies for Natural Gas**

The Cyprus Government Agencies that involved in natural gas are the following:

**The Ministry of Energy, Commerce, Industry and Tourism** – this is the responsible ministry.

**CNHC – Cyprus National Hydrocarbons Company** – this is a recently established private law legal person wholly owned by the Ministry and will be responsible for planning and implementation of the gas policy of Cyprus in conjunction with the Ministry. It is expected to absorb the function of DEFA (below) which was envisaged to be the sole importer of natural gas into Cyprus.

**DEFA – National Natural Gas Company**

**CERA – Cyprus Energy Regulatory Authority** – the Cyprus Energy Regulator is responsible for the regulation of the electricity and gas markets of Cyprus.

## **Future Projects and Prospects for Cyprus and the Eastern Mediterranean Region**

### **Cyprus/Regional LNG Infrastructure Investments**

#### **Cyprus LNG Terminal**

##### **The Background**

The estimated natural gas reserves of Cyprus amounting to 60 tcf and those of Israel which have so far been confirmed to be at least 24tcf in the two fields that it has opened with the possible addition of gas from the Lebanon give a potential of 100tcf to 120 tcf which may be extractable.

This has led to the planning of a natural gas export terminal which will act as a production/export hub for the gas from the fields of these three countries. With this the creation of a regional energy hub providing access to markets in Europe and to Asia through the Suez canal becomes a distinct possibility.

Planning has commenced in association with the companies involved in the extraction of LNG, currently Noble and its partners Delek Drilling and Avner Oil Exploration for the construction of an LNG terminal. The other companies involved in the Cyprus fields namely ENI/KOGAS JV and Total have also expressed an interest to join the project and it is anticipated and expected that all Contractors will eventually participate.

The terminal will be multifaceted. It will consist of the following parts:

**Receiving Station** – for local consumption – estimated to be between 5% and 10% of production from the Cypriot fields.

**Liquefaction / Production Terminal** – for export

**Possible Re-gasification Terminal** – for storage in accordance with EU requirements relating to energy reserves. This could serve both Cyprus and Greece.

### **LNG Project Time Line**

**PRE-FEED** has been completed for an LNG exporting terminal consisting initially of one train with possible expansion to three lines and some say even to seven lines. The block 12 discovery is thought to be sufficient to make the one line viable.

**Project Agreement** is envisaged to be completed by the end of 2013

**FID** – by the end of 2015 / beginning of 2016.

**First Anticipated import of LNG for Cyprus Domestic Consumption by Q1 2019**

**First export of Natural Gas by Q3 2019**

**Potential Export Levels** – between 35 and 50 bcm per year.

**Pipeline from Fields to Shore** – in addition to the terminal outlined above the fields to shore gas transpiration system will also need to be planned and constructed.

### **The EuroAsia Interconnector Project**

The EuroAsia Interconnector is the first energy bridge between Europe and Asia.

The project will connect Israel, Cyprus and Greece with a sub-sea cable that will also hook up with the Paneuropean Electricity Grid.

The cable's length of 540 nautical miles (1,000 km), ultimate depth of 2000 metres below sea level, and its 2000MW capacity make it the most ambitious electricity connector project in the world.

It is envisaged that the natural gas of the area will be used to generate up to 2000MW of power in Cyprus which will be exported to Europe by way of the submarine cable which will connect Israel and Cyprus to the European energy grid via the island of Crete in Greece, and thereafter to mainland Greece where it will connect with the Greek grid and ultimately the European grid.

The cable will stretch for 155 nautical miles (n.m.) between Israel and Cyprus, 320 n.m. between Cyprus and Crete, and 65 n.m. from Crete to mainland Greece (Peloponnese).

The DEH-Quantum Energy joint venture has undertaken the role of securing funding for the overall project.

The total cost of implementation of the project is expected to reach €1.5 bn (approx. US\$2 bn).

Euro-Asia Interconnector's partners are the Public Power Corp. (PPC/DEH) of Greece, institutional authorities in Israel and DEH Quantum Energy of Cyprus. The management team of the project will include technocrats from the partner companies, as well as representatives of the states of Israel, Cyprus and Greece.

It is estimated that the project will be completed within 36 months of FID. Revenues earned from this energy bridge are estimated to reach €17.5 bn (approx. US\$ 23.3 bn) with an expected return on investment (ROI) at about 1500 days of operation.

It is significant to note that the Cyprus Government officially appointed the DEH-Quantum Energy JV as the promoters for this project in May 201. This project is currently in the pre-feasibility stage and that specific mention of this project is made in the tri-partite MOU between Cyprus, Greece and Israel (see below).

## **REGIONAL COOPERATION BETWEEN STATES**

### **Background**

In energy terms both Cyprus and Israel are what may be termed as "small isolated power systems". Cyprus being an island is physically isolated whereas Israel being surrounded by states with which it does not have diplomatic relations is politically isolated and so cannot for the present expect that its power grid will be integrated with that of its neighbours.

This has led to co-operation between the two countries for purposes of security of supply as well as for the maximization of the potential natural gas which they will have at their disposal with a view to becoming integral parts of a regional energy hub. Israel has made the decision that it will export at least 40% of its natural gas. Cyprus provides a means by which it will enable it to do so.

### **JOINT COMMUNIQUÉ CYPRUS – GREECE – ISRAEL - 8 August 2013**

The Minister of Energy, Commerce, Industry and Tourism of the Republic of Cyprus Mr. Yiorgos Lakkotrypis, the Minister of Environment, Energy and Climate Change of the Hellenic Republic Mr. Yannis Maniatis, and the Minister of Energy and Water Resources of the State of Israel Mr. Silvan Shalom, met on 8 August 2013 in Nicosia and signed a Memorandum of Understanding on cooperation in

the fields of energy and water between the Ministry of Energy, Commerce, Industry and Tourism of the Republic of Cyprus, the Ministry of Environment, Energy and Climate Change of the Hellenic Republic and the Ministry of Energy and Water Resources of the State of Israel.

Recalling the Memorandum of Understanding, the Ministers of the three respective countries welcome joint projects in the energy sector which enhance the security of energy supply, sustainable development and cooperation among the countries of the region.

In this respect, the Ministers of Cyprus, Greece and Israel welcome the privately initiated **EuroAsia Interconnector project** which aims at creating an electricity interconnection between Israel, Cyprus and Greece. This project, as a European Union project of common interest, could potentially allow for the export of electricity generated in the Eastern Mediterranean to the European Union energy market through the trans-European electricity networks.

The Ministers of the three respective countries pledge to continue their close co-operation in the fields of energy, renewable energy, power production and water treatment and to encourage the development of other related industries, which promote regional cooperation among the countries of the Eastern Mediterranean region.

## **Geopolitics – Regional Co-operation between States**

A number of agreements have been signed between the Republic of Cyprus and its neighbouring countries with which, with the notable exception of Turkey Cyprus enjoys cordial diplomatic relations.

The full exploitation of the Natural Gas capacity of the region as a whole faces some geopolitical problems which will need to be overcome if the full potential of the region is to be realised.

To date the following agreements have been entered into:

### **Cyprus – Arab Republic of Egypt – February 2003**

Delimitation agreement of the EEZ with Arab Republic of Egypt (Feb 2003)

Republic of Cyprus ratified the delimitation of the EEZ with Arab Republic of Egypt by Law (Mar 2003)

Framework Agreement concerning the development of cross-median line Hydrocarbon resources (May 2006)

Confidentiality Agreement (May 2006)

### **Cyprus – Lebanon – January 2007**

Delimitation agreement of the EEZ with Lebanon (Jan 2007) – yet to be ratified by Lebanon

### **Cyprus – Israel – December 2010**

Delimitation Agreement of the EEZ with Israel (Dec 2010)

The Republic of Cyprus ratified the delimitation of the EEZ with Israel by Law (Feb 2011)

### **MOU entered into by Cyprus – Greece – Israel – August 2013**

Tri-lateral Co-operation MOU signed for co-operation in the fields of Energy and sea resources.

It should be noted that in the region there are the following “relationships of conflict”

Cyprus – Turkey

Israel – Lebanon

These relationships will impact upon the maximization of the benefits of the LNG finds in the region.

### **Cyprus - Turkey**

Turkey in defiance of UNCLOS seeks to deny the right of Cyprus to exploit its EEZ and has taken steps to dissuade participants in the Cyprus bidding process.

It has banned ENI from operating in Turkey and it has also sought to impede the survey vessels operating in the Cyprus EEZ.

Further, it has entered into an “agreement” with the so called “Turkish Republic of Northern Cyprus” a pseudo state recognized only by Turkey for cooperation in the fields of natural resources. This agreement disregards UNCLOS and the concept of the medial line and instead speaks of an “equitable” division of natural resources, with the word equitable not being defined.

It is however clear that despite the Cyprus – Turkey politics Greek Cypriots will need to find a way of sharing the income that will be generated from LNG with the Turkish Cypriots. It is a resource for all Cypriots not just Greek Cypriots. Perhaps this may spur a solution of the Cyprus problem which has existed and burdened both communities in Cyprus since 1974.

### **Israel – Lebanon**

Whilst the Lebanese laws prevent any recognition or co-operation with Israel on any level a true regional co-operation cannot exist and Lebanon which is a potentially a significant producer in its own right (with current estimates of reserves at 25tcf of natural gas and 660 million barrels of oil) may not be able to exert its full regional influence. This is a loss to the Eastern Mediterranean initiative as a whole and it is in the interests of everyone to explore ways in which all possible prospects of regional co-operation may be fully utilized so as to make the Eastern Mediterranean a major potential supplier of gas and ultimately power to Europe.

Andrew Demetriou

September 2013