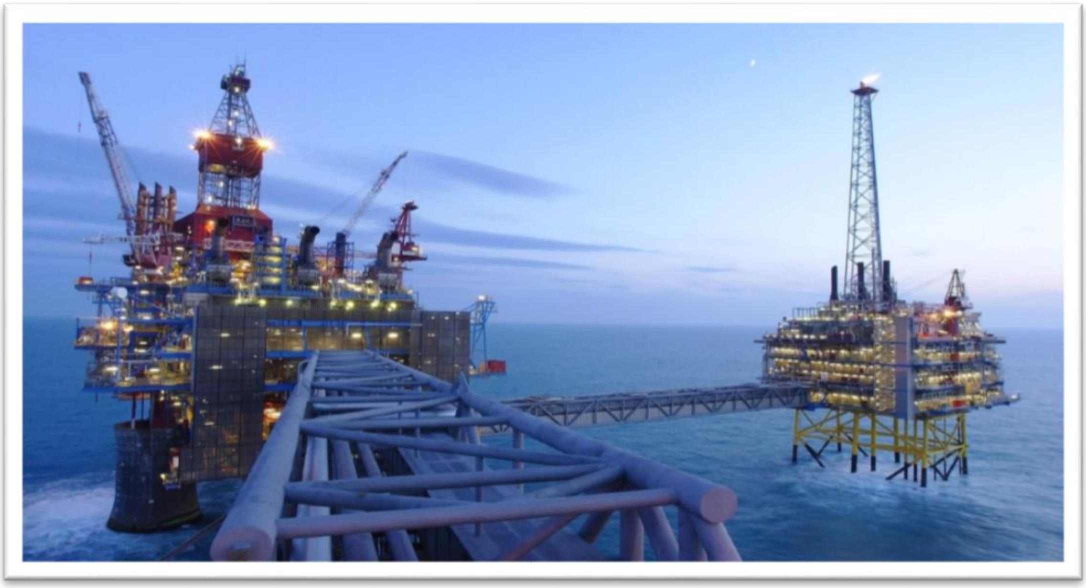
INTERINSTITUTIONAL MASTER PROGRAM
HYDROCARBON EXPLORATION AND EXPLOITATION

Key developments in the Oil and Gas Sector in two EU's Member Countries - Greece and Cyprus



Gkloumpos Antonios

Supervisor:

Professor Georgakopoulos Andreas

Thessaloniki 2019

Contents

CHAPTER 1. INTRODUCTION 5

CHAPTER 2. Geological plays of Greece and Cyprus 6

2.1 Geological Setting of western Greece 6

2.1.1 Ionian Zone 7

2.1.2 Pre-Apulian (Paxos) Zone 12

2.1.3 Apulian Platform 14

2.2 The Cyprus Arc System 17

2.2.1 Geological Setting of Eastern Mediterranean 19

2.2.2 Geological Setting of the Levantine basin 19

2.2.2.1 Stratigraphy of the Levantine basin 20

2.2.3 Geological Setting of Herodotus basin 22

2.2.3 Eratosthenes Continental Block (ECB) 26

CHAPTER 3. Legal and fiscal terms in the oil and gas sector in Greece & Cyprus 29

3.1. The legal framework of Greece 29

3.1.2 Lease agreement of hydrocarbons in Greece 30

3.1.3 Royalty System 33

3.1.3.1 Valuation of Hydrocarbons and By-products 34

3.1.3.2 Exploitation Stage 35

3.2 Legal framework of hydrocarbons in Cyprus 38

3.2.1 Legal and regulatory framework for hydrocarbon exploration 39

3.2.2 Lease agreement of hydrocarbon in Cyprus 41

3.2.3 Production sharing contract in Cyprus 42

CHAPTER 4. The legal and regulatory framework for licensing in Greece and Cyprus 44

4.1 The Legal framework of exploration and exploitation in Greece 44

4.1.1 The background of the exploration activities in Greece 45

4.1.2Active lease agreements in Greece 47

4.2 Definition of EEZ in the Republic of Cyprus 62

4.2.1 Oil and Gas Activities in the Cypriot EEZ 63

4.2.2 Exploration offshore Cyprus 64

4.2.3 Offshore lease blocks area of Cyprus 65

CHAPTER 5. Domestic needs, export options in oil and gas sector for Greece & Cyprus 67

5.1 The Greek Natural Gas System 67

5.1.1 Natural gas demand in Greece to continue an upward trend 71

5.1.2 Trans-Adriatic Pipeline (TAP) ... 73
5.2 Domestic sector for oil and gas in Cyprus ... 76
5.2.1 Pipeline to Greece ... 83
5.2.1.1 The EastMed pipeline ... 87
5.2.2 Pipeline to Turkey ... 88
5.2.3 Finding of block 10 in Cyprus' EEZ ... 90
CONCLUSIONS ... 93
References ... 94

CHAPTER 1. INTRODUCTION

The southeastern Mediterranean is the area with the greatest scientific interest since several geological phenomena are encountered there. Greece and Cyprus are considered to be two countries with a very strong interest in the hydrocarbon sector. In the west of Greece, both the mainland and the Ionian Sea have geological structures which, based on recent years' research, are likely to conceal hydrocarbon deposits. In Cyprus, there are also large sedimentation basins such as the Herodotus and Levantine basins, which are a very important part of the development of the region and the Eratosthenes continental block that has its own role in the region.

In the Southeast Mediterranean region, there is a great deal of interest in hydrocarbon fields that appear to exist in the Levantine and Herodotus basin, with the south-east Mediterranean countries (Cyprus, Israel, Lebanon, Syria, Egypt) licenses for the purpose of exploiting them.

The aim of this paper is to describe all the geological structures of Greece and Cyprus associated with the possible existence and development of hydrocarbon fields and to analyze and describe the legal and regulatory framework developed by the two countries in the field of exploration and exploitation of hydrocarbons in the context of tenders and concessions to companies or joint ventures. Finally, it describes the needs of the two countries in the oil and gas sector, natural gas networks and gas pipelines, which in relation to geopolitical developments in the region are planned to be made between states in the wider region of the southeastern Mediterranean.

CHAPTER 2. Geological plays of Greece and Cyprus

2.1 Geological Setting of western Greece

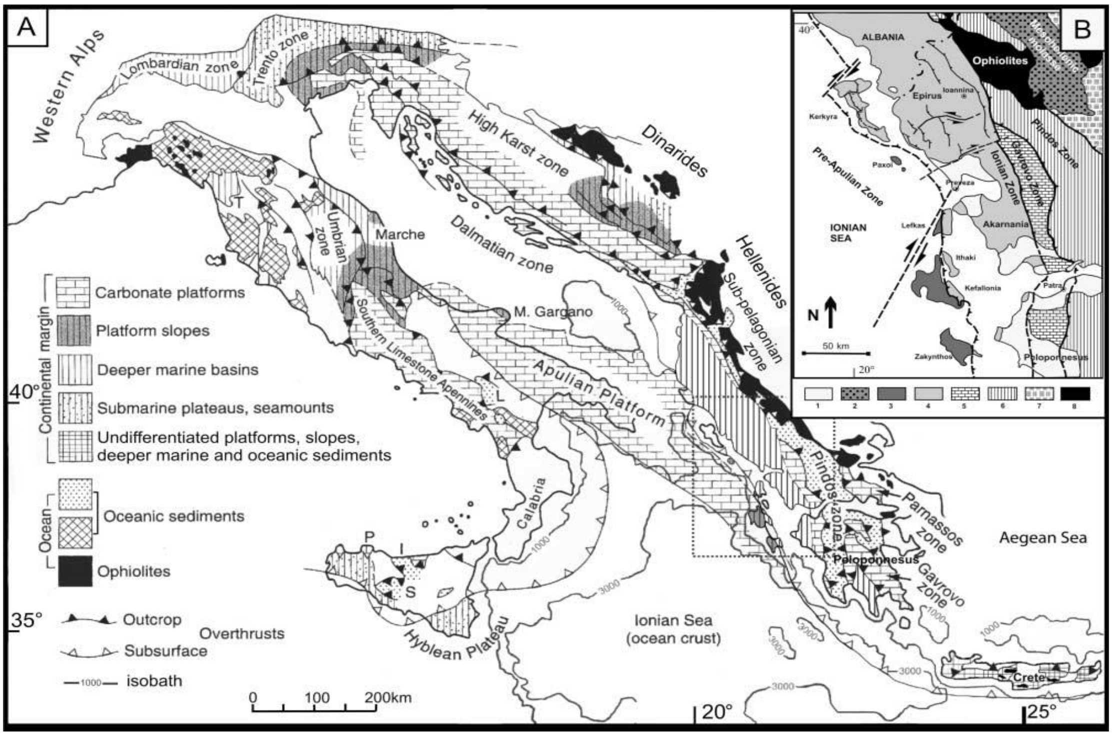


Figure 1. (A) Tectonic units and Late Jurassic paleogeography of the peri-Adriatic area (without palinspastic restoration), and the distribution of isolated Bahamian-type carbonate platforms surrounded by deeper basins (modified from Bernoulli, 2001). (B) Simplified geologic map of western Greece. (1) Neogene and Quaternary post-Alpine sediments. (2) Meso-Hellenic molasses. (3) Pre-Apulian (Paxos) zone. (4) Ionian zone. (5) Gavrovo-Tripolis zone. (6) Pindos zone. (7) Sub-Pelagonian zone. (8) Ophiolites. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems').

Western Greece is dominated by the external zones of the Hellenide fold-and-thrust belt, namely the pre-Apulian (or Paxos), Ionian, and Gavrovo zones (Figure 1B). From the Triassic to the Late Cretaceous, western Greece was part of the Apulian continental block on the southern passive margin of the Tethys Ocean (Figure 1A). In this area, siliceous facies are widely associated with organic carbon-rich deposits. Pre-Apulian zone rocks consist of Triassic to Miocene deposits, mostly mixed neritic-pelagic carbonates. Hydrocarbon source rocks include pelagic deposits rich in marine organic material, although the terrigenous organic matter is also found in siliciclastic sediments. The Ionian zone consists of sedimentary rocks ranging from Triassic evaporites to Jurassic–upper Eocene carbonates and minor cherts and shales, overlain by Oligocene flysch. Organic-rich intervals occur within Triassic evaporites and Jurassic–Cretaceous pelagic argillaceous sediments. The Gavrovo zone was a shallow water platform from the Triassic to the late Eocene, from which no organic matter–rich deposits have so far been found.

At a regional scale (hundreds of kilometers), the Alpine belt can be considered as the margin of the Tethys Ocean, inverted by the collision of the Apulian block with

Europe. On a smaller scale (tens of kilometers), in the Hellenic realm, the subbasins of the Tethyan margin have been inverted to produce the main thrust sheets or folded zones, known as Hellenides. This occurred progressively from the innermost (eastern) zones to the more external (western) zones.

The thrust boundary between the Ionian and pre-Apulian zones is marked by intrusive evaporites. This indicates that contractional distortion was the most significant structural control on orogenesis in western Greece. Although halokinesis was important along boundary faults during the Mesozoic extension, thrusting has overprinted the Mesozoic extensional structures to such an extent that the latter is almost impossible to distinguish. Field observations of the relationship between the pre-Apulian and Ionian zones emphasize the close association between Hellenide thrusts and folds and areas of evaporite exposure (evaporate dissolution–collapse breccias; even where the precise location of the thrust is unclear. Evaporites outcrop along the leading edges of thrust sheets in both zones. Their location, together with their occurrence in tectonic windows above tectonized flysch (observed in many localities), suggests that the evaporates represent the lowest detachment level of individual overthrust sheets in the external Hellenides. Furthermore, the absence of sub-evaporite units from outcrops in western Greece, the great thickness of the evaporites and the probable incorporation of Permian basement into the thin-skinned orogenic wedge east of the Pindos thrust all support the idea that the evaporites form a moderate to major décollement level throughout the external Hellenides, instead of a widespread diapirism. Thus, the function of the evaporites is similar to that which is well known in thin-skinned thrust belts in western Europe. (Karakitsios, V. (2013) ‘Western Greece and Ionian Sea petroleum systems’).

2.1.1 Ionian Zone

The Ionian zone is made up of three distinct stratigraphic sequences (Figure 3):

The pre-rift sequence represented by the Lower Jurassic (Hettangian to Sinemurian) Pantokrator limestones. These shallow-water limestones overlie Lower to Middle Triassic evaporites (>2000 m [6562 ft] thick) and the Foustapidima limestones of the Ladinian Rhaetian. The sub-evaporitic basement of the Ionian zone is not exposed at the surface, nor has it been penetrated by deep wells.

The overlying synrift sequence begins with the Pliensbachian pelagic Siniais limestones and their lateral equivalent hemipelagic Louros limestones. These formations correspond to the general deepening of the Ionian domain with the formation of the Ionian Basin. The structural differentiation that followed separated the initial basin into smaller paleogeographic units with a half-graben geometry. This is recorded in the abruptly changing thickness of the synrift formations that take the form of synsedimentary wedges. In the deeper parts of the half grabens, these wedges include complete Toarcian– Tithonian successions,

whereas in the elevated parts of the half grabens; the succession is interrupted by unconformities. The directions of synsedimentary structures (e.g., slumps and synsedimentary faults) indicate that deposition was controlled both by structures formed during extension related to the opening of the Neotethys Ocean and by halokinesis of evaporites at the base of the Ionian zone succession (Figure 2).

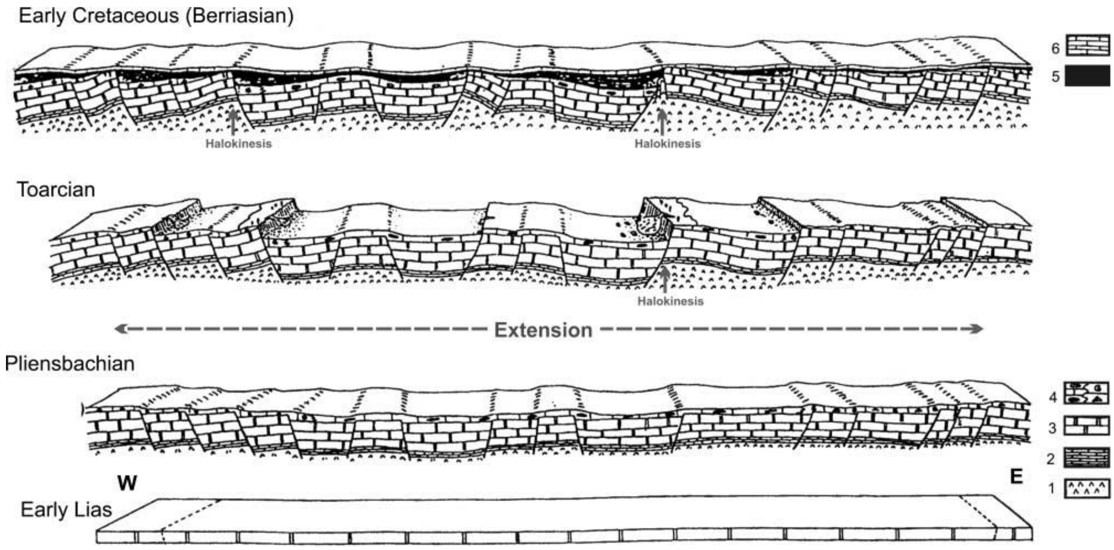


Figure 2. Paleogeographic evolution of the Ionian zone, from the Early Jurassic to the Early Cretaceous (Berriasian). (1)Evaporites. (2) Foustapidima limestones. (3) Pantokrator limestones. (4) Siniais and Louros limestones. (5) Synrift formations. (6) Vigla limestones. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems')

The post-rift sequence begins with the pelagic Vigla limestones, whose deposition was contemporary everywhere in the Ionian Basin, beginning in the early Berriasian.The Vigla limestones blanket the synrift structures and, in some cases, directly overlie pre-rift units (e.g., the Pantokrator limestones). The base of the Vigla limestones represents the breakup unconformity of the post-rift sequence in the Ionian Basin. Longstanding differential subsidence during the deposition of the Vigla limestones, as shown by the marked variations in the thickness of this formation, was probably caused by continued halokinesis of the basal Ionian zone evaporates.

The Senonian limestones, which rest on the Vigla limestones, correspond to calciturbidites comprising limestones with fragments of *globotruncana* and *rudists*, and micro-brecciated intervals with limestones and rudist fragments within calcareous cement containing pelagic fauna. The facies distribution of the Senonian reflects the separation of the Ionian Basin into a central, topographically higher area characterized by reduced sedimentation, and two surrounding talus slopes with increased sedimentation. Adjacent to this area, separate carbonate platforms (the Gavrovo platform to the east and the Apulian platform to the west), provided the clastic carbonate material that was transported by turbidity currents into the Ionian Basin.

Homogenous Paleocene and Eocene sediments were deposited without significant facies changes. During the Paleocene, the erosion of Cretaceous carbonates on the Gavrovo and Apulian platforms provided the Ionian Basin with brecciated rock fragments. However, the supply of clastic material diminished significantly during the Eocene, especially in the central Ionian Basin. The main depositional facies during this period were platy wackestone and mudstone with Globigerinidae and siliceous nodules, analogous to those of the Vigla limestones, but lack continuous cherty intervals. The greatest thicknesses of the Eocene units can be found in the marginal parts of the Ionian zone, where the micro-breccias are more frequent.

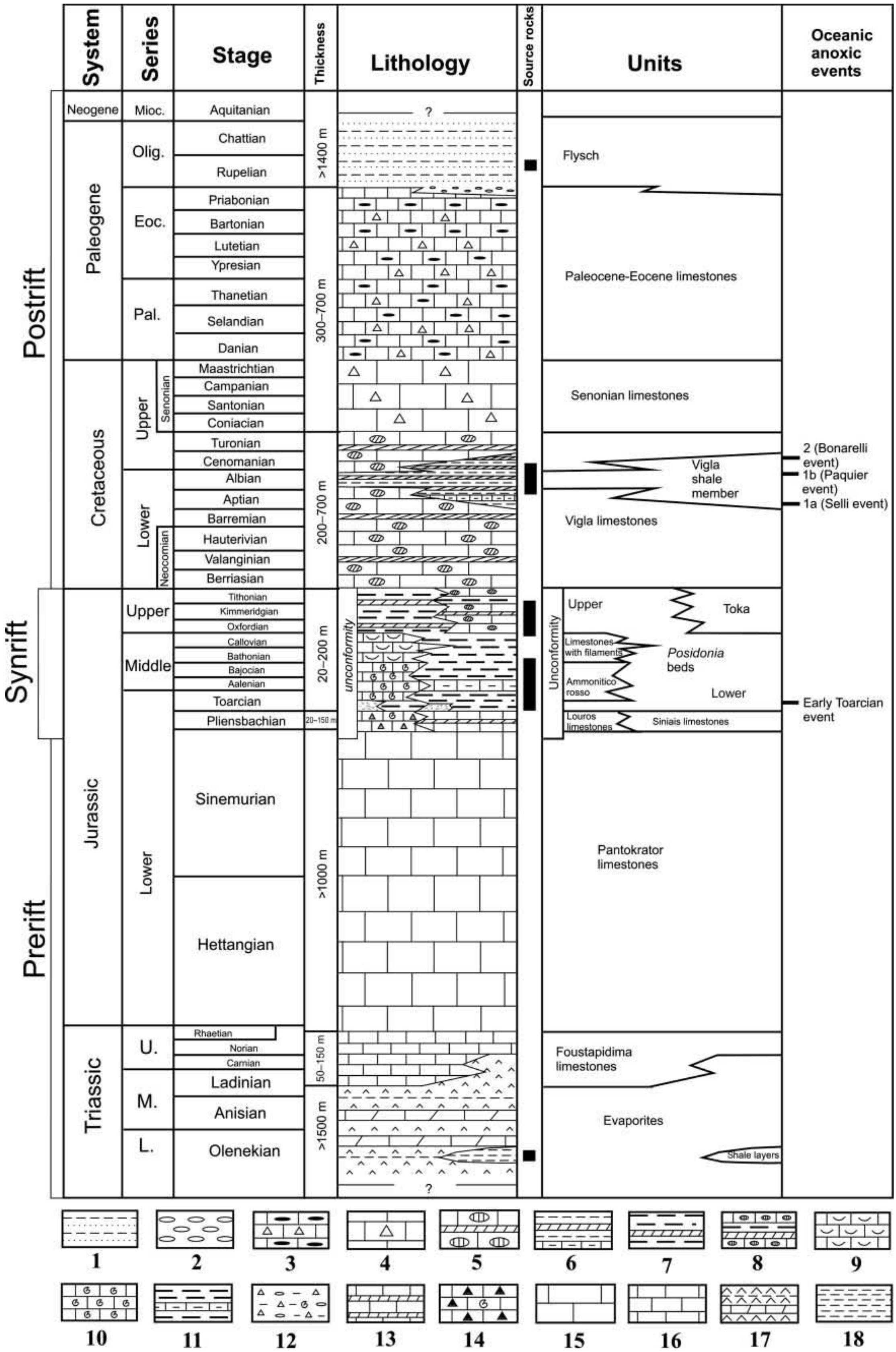


Figure 3. A synthetic lithostratigraphic column of the Ionian zone. (1) Pelites and sandstones. (2) Conglomerate. (3) Limestones with rare cherty intercalations, occasionally brecciated. (4) Pelagic limestones with calciturbidite intercalations. (5) Pelagic limestones with cherts. (6) Cherty beds with shale and marl intercalations. (7) Alternating cherty and shale bends. (8) Pelagic limestones with cherty nodules and marls. (9) Pelagic limestones with lamellibranchs. (10) Pelagic, nodular red limestones with ammonites. (11) Marly limestones and laminated marls. (12) Conglomerates-breccias and marls with ammonites. (13) Pelagic limestones with rare cherty intercalations. (14) External platform limestones with brachiopods and small ammonites in the upper part. (15) Platform limestones. (16) Thin-bedded black limestones. (17) Evaporites. (18) Shale horizons. OAE = oceanic anoxic

event; Mioc. = Miocene; Olig. = Oligocene; Eoc. = Eocene; Pal. = Paleocene; U = Upper; M = Middle; L = Lower; Malm. = Malm; Dogg. = Dogger. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems')

Flysch sedimentation in the main part of the Ionian zone began at the Eocene–Oligocene boundary and is deposited by some marly limestone transitional beds conformable overlying the upper Eocene limestones.

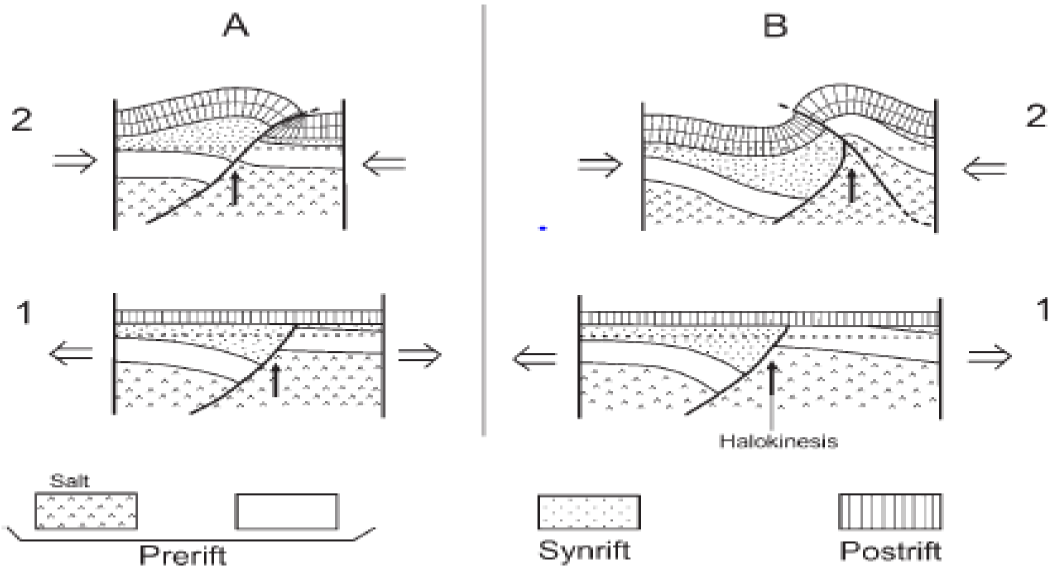


Figure 4. Examples of inversion tectonics affecting a half-graben system with evaporitic basement (Ionian zone, northwestern Greece. (A) Classical inversion tectonics. (B) The particular case of inversion tectonics observed at locations where the evaporitic substratum halokinesis was more expressed and, consequently, the footwalls elevation of the extensional phase were above average. Therefore, during the compressional phase, these most elevated footwalls have been thrust over the preexisting hanging walls. A1 and B1 correspond to the beginning of the post-rift period. A2 and B2 correspond to the beginning of orogenesis, showing the subsequent inversion geometries. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems')

Major orogenic movements occurred at the end of the early Miocene (Burdigalian), with the inversion of the Ionian Basin succession. The structures inherited from the Jurassic extensional phase were reactivated during the compressional phase of orogenesis with westward and eastward displacements. In general, extensional faults were reactivated with either reverse or strike-slip displacement, consistent with classical inversion tectonics. In some cases, during the compressional phase, extensional faults were not reactivated as thrusts in the way of classical inversion tectonics, but the elevated extensional footwalls were thrust over preexisting hanging walls by the movement of the basal evaporitic units, (Figure 4). This was facilitated by diapiric movements involving the basal evaporitic salt intervals. Field and available seismic data suggest that at least a moderate decollement occurred along the evaporites. However, the degree of this decollement is unknown and still remains speculative. Considering the existing data on the external Hellenides, the hypothesis of a major decollement along the evaporates is more favorable. In fact, as the Ionian and Gavrovo-Tripolis crust corresponds to thinned continental crust, the subevaporitic basement of the Ionian zone is probably underthrust and incorporated into the thin-skinned orogenic wedge east of the Pindos thrust, or it has been subducted beneath the more internal zones. Thus, it has been subjected either to basement deformation east of the

Ionian zone or to continental subduction. Continental subduction of the subevaporitic basement eastward of the Ionian zone is consistent with the presence

of the phyllite-quartzite unit beneath the Gavrovo-Tripolis calcareous zone in the southern Hellenides. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems').

2.1.2 Pre-Apulian (Paxos) Zone

Pre-Apulian - (Paxos) zone is considered as the most exterior domain of the fold-and-thrust belt of the Hellenides. It has traditionally been considered as a relatively uniform, Mesozoic Cenozoic carbonate domain, transitional between the Apulian platform and the Ionian Basin. Its general setting is complex as a result of intense tectonic deformation, including phases of extension, collision, and flexural subsidence, with undetermined amounts of shortening and block rotation (Accordi et al., 1998). Outcropping successions differ in stratigraphic completeness, sedimentary development, and faunal and/or floral content. The depositional sequence in the pre-Apulian zone (Figure 5) begins with Triassic limestones containing intercalations of black shales and anhydrites. The upper parts of this series, according to borehole data, are placed within the Toarcian to Bajocian interval. The stratigraphically lowest outcrops, located in Levkas Island, consist of Lower Jurassic dolomites and Middle Jurassic cherts and bituminous shales. The Upper Jurassic– Lower Cretaceous succession consists of white chalky limestones with dolomite intercalations, accompanied by rare cherts and organic carbon-rich black shales, containing planktonic species together with benthic foraminifera and algal species. Lower Cretaceous limestones and dolomites crop out only on the Kefalonia Island, and their facies is less pelagic than age-equivalent Ionian facies.

The depositional environment throughout the Cenomanian–Turonian interval is indicated by the presence of rudist fragments, benthic foraminifera, and algal species. The Campanian - Maastrichtian limestones gradually become chalky with thin argillaceous layers. They contain planktonic foraminifera, in addition to rudist fragments. This coexistence indicates the presence of intraplatform basins characterizing the slope between the Apulian platform and the Ionian Basin.

Paleocene micritic limestones with planktonic foraminifera were described by BP (1971) in the pre-Apulian zone. These Paleocene units sometimes rest on Santonian or Maastrichtian limestones and that neritic facies micro-breccias and brecciated limestones occur at their base. This indicates intense tectonic activity that resulted in the differentiation of the pre-Apulian zone into relatively deep-water and relatively shallow (sometimes emergent) areas, which provided the brecciated material. The lower Eocene consists of pelagic limestones with marl intercalations. The upper Eocene consists of massive limestones with algae, bryozoans, corals, echinoids, and large foraminifera. Oligocene sediments were deposited in small basins (tectonic grabens) between larger or smaller emergent areas, which were locally eroded, reflecting tectonic instability that continued throughout the Oligocene. The Oligocene–lower Miocene (Aquitanian) diversification of foraminiferal assemblages suggests the presence of subsiding foreland basins, in which spectacular slumps in carbonate turbidites are observed. Finally, in the late early Miocene, progressive deepening occurred, flooding the former carbonate slope.

The super-Oligocene pre-Apulian sediments show the progressive passage from the Ionian typical flysch to a more calcareous (age-equivalent) facies in the pre-Apulian zone (BP, 1971), indicating that they correspond to an atypical distal flysch unit. This facies is replaced in the lower part of the pre-Apulian slope (e.g., Paxos and Antipaxos Islands) by calciturbidites. This unit has been partially or completely eroded in the areas corresponding to the most external part of the forebulge in the Hellenide foreland basin.

Structures developed in the pre-Apulian zone (mainly on the islands of Kefalonia and Zakynthos) may be accommodated within a simple model of continued foreland-directed migration of Hellenide (Alpine) thrusting during the late Neogene and Quaternary. Initial activity on the Ionian thrust can be dated as early Pliocene, and the main thrusts (and some of the back thrust) observed in the pre-Apulian zone (e.g., on the Kefallonia and Zakynthos Islands) are of late Pliocene and Pleistocene ages. (Karakitsios, V. (2013) ‘Western Greece and Ionian Sea petroleum systems’).

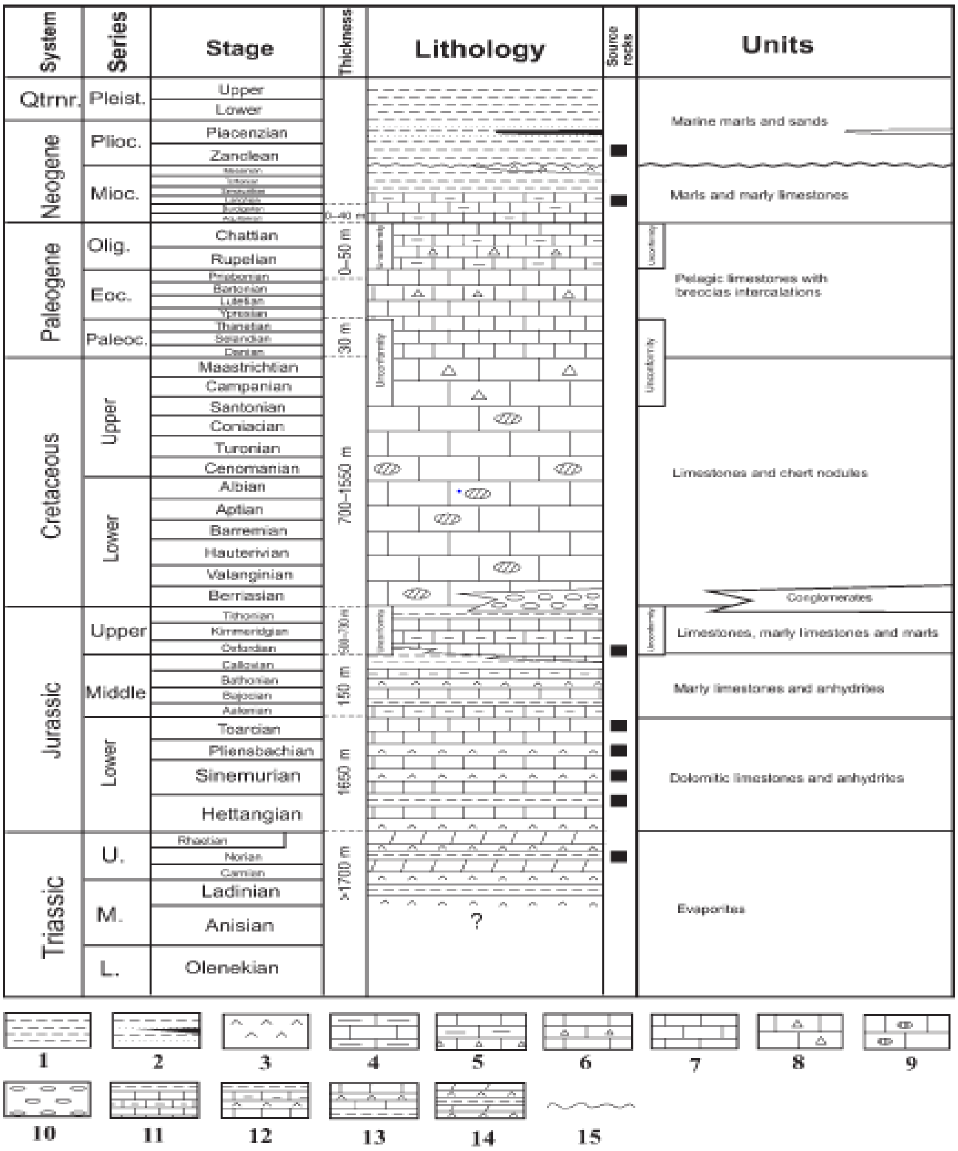


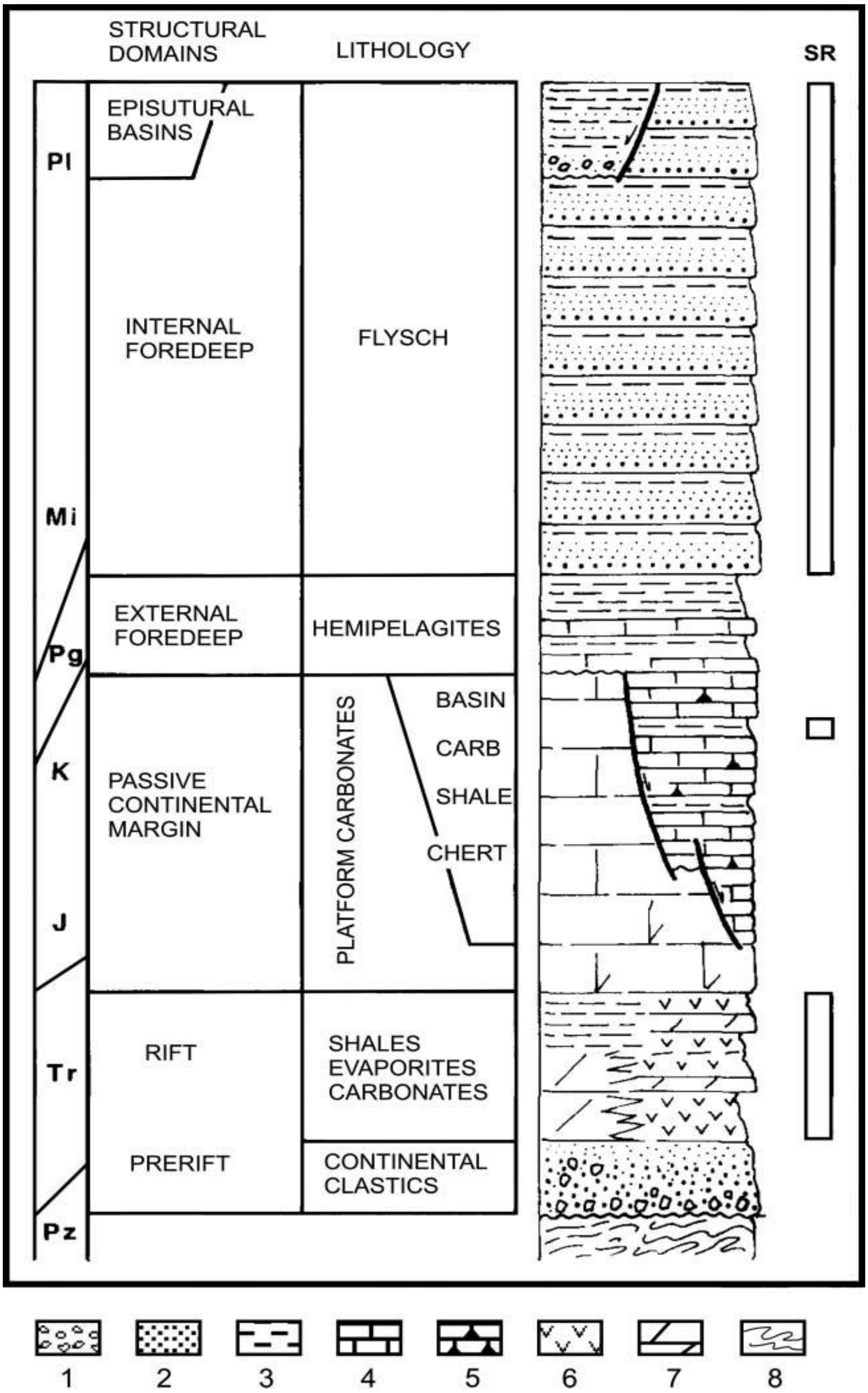
Figure 5. Synthetic lithostratigraphic column of the Paxos (pre-Apulian) zone. (1) Marine marls. (2) Marine marls and sand (in black, lignite intercalations). (3) Evaporites. (4) Limestones commonly marly. (5) Pelagic limestones marly limestones and brecciated intercalations. (6) Mixed pelagic-neritic limestones sometimes with breccias. (7) Pelagic limestones. (8) Mixed pelagic-neritic calcareous sediments with rudist fragments. (9) Pelagic limestones with nodules and rare cherty intercalations. (10) Conglomerates with calcareous and magmatic elements. (11) Pelagic limestones commonly marly. (12) Limestones, shales, and basal anhydrites. (13) Limestones and dolomitic limestones, anhydrites, and shale intercalations. (14) Evaporites with shale intercalations. (15) Unconformity. Qtrnr = Quaternary; Pleist = Pleistocene; Plioc = Pliocene;Mioc = Miocene; Olig = Oligocene; Eoc = Eocene; Paleoc = Paleocene; U = Upper;M=Middle; L = Lower;Malm. =Malm; Dogg. = Dogger. (Karakitsios, V. (2013) ‘Western Greece and Ionian Sea petroleum systems’).

2.1.3 Apulian Platform

The Apulian platform, known at the southeastern end of the Italian peninsula (Figure 1A), is one of the so-called peri-Adriatic carbonate platforms. It belongs to the Adria microplate, which was detached from the African plate during the Mesozoic. The Apulian carbonate platform is essentially a Mesozoic paleogeographic element, which, in large part, acted as a rigid block during the Alpine (Tertiary) orogenesis. Now, it is partly buried under the Apennine thrust sheets and partly constitutes the weakly deformed foreland of both the Apennine and Dinaric-Hellenic mountain chains.

The Hercynian basement of the Apulian platform, folded and commonly metamorphosed, is covered by Permian - Triassic continental. These are followed by thick evaporitic deposits, the Burano Formation (Figure 6). From the Middle Triassic to the early Lower Jurassic, a shallow sea spread over the Burano Formation, and a carbonate platform environment prevailed. During the Early and Middle Jurassic, the rift stage evolved into ocean spreading with the inception of the central Atlantic and the Mesogea Ocean between Adria and Africa. The Adria plate probably originated during this period and hence behaved as an independent kinematic unit, in which the carbonate sedimentation persisted through the Mesozoic and even the Paleocene on a large Bahamian-type platform, whereas large block-faulted areas of the initial platform were drowned in deep water, giving way to the accumulation of pelagic deep-water carbonates and shaly episodes. The Apulian platform is one of the persistent platforms of the initial Adria microplate. Toward the Hellenic domain, the transition of the Apulian platform to the drowned Ionian basin is recorded by the pre-Apulian zone. Also, the transition from carbonate to clastic sedimentation toward the same direction is typically diachronous, following the progressive migration of the thrust belt of the Hellenides to the Apulian foreland (to the west) together with the foredeep in front of it, as recorded by the Oligocene Ionian flysch and the super-Oligocene pre-Apulian atypical distant flysch. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems').

Figure 6. Type sequence of the deposits on the Adria continental margin. Age intervals are indicative; stratigraphy is correlated to the main stages of the geodynamic evolution. Triassic evaporites and subflysch hemipelagites correspond to the main detachment levels. Main source rock (SR) intervals are shown. (1) Conglomerates. (2) Sandstones. (3) Marls. (4) Limestones. (5) Cherty limestones. (6) Evaporites. (7) Dolomites. (8) Metamorphic rocks. Pl = Pliocene; Mi = Miocene; Pg = Paleogene; K = Cretaceous; J = Jurassic; Tr = Triassic; Pz = Paleozoic. (Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems').



2.2 The Cyprus Arc System

The geological evolution of the eastern Mediterranean, which is directly joined with the opening and closing of the Neo-Tethys ocean (Gardosh et al., 2010; Garfunkel, 1998, 2004; Stampfli & Borel, 2002), has attracted great interest and is still discussed. The Cyprus Arc system, which includes the Cyprus Island, is located in the central part of the eastern Mediterranean region and constitutes the present-day boundary of the African and Anatolian plates (Figure 7).

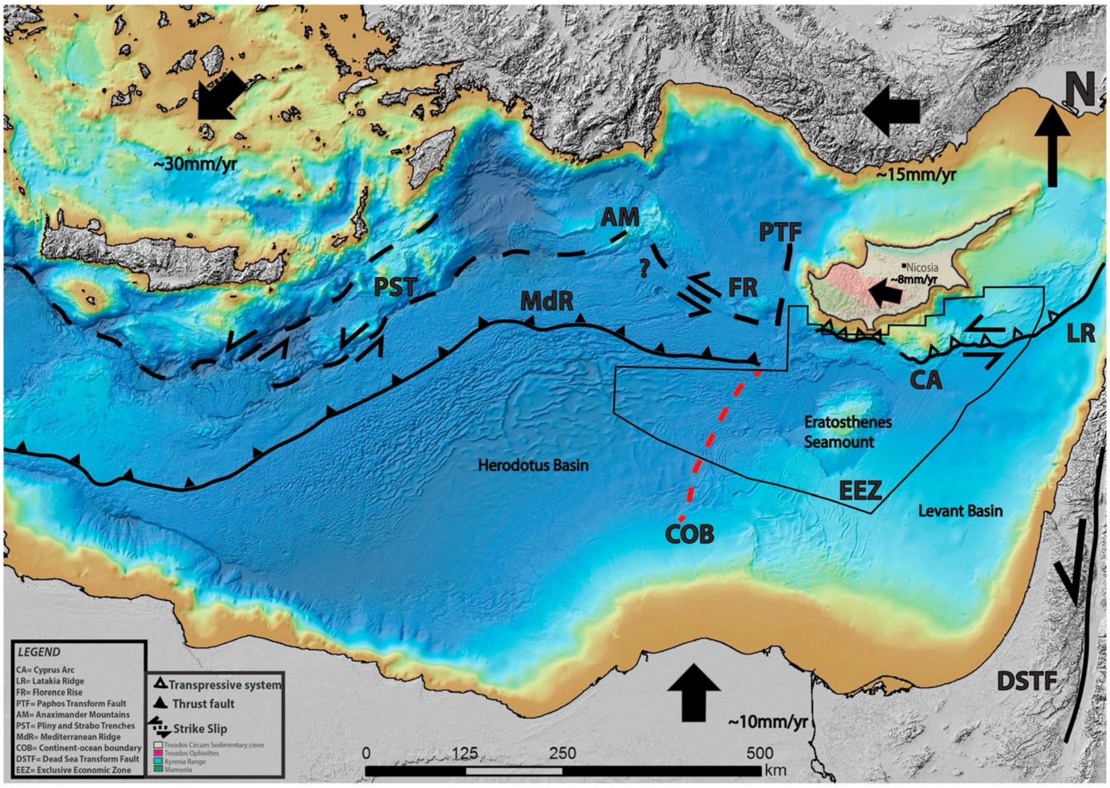


Figure 7. Regional bathymetric map (EMODnet), with the main tectonic structures. The red dashed line delineates the boundary between the thin continental crust (Levant Basin) and the oceanic crust (Herodotus Basin) as it was identified by Granot (2016). The black arrows indicate the relative motion and average slip rate for the African and Anatolian plates (McClusky et al., 2000). Abbreviations: AM = Anaximander Mountain, CA = Cyprus Arc, COB = Continent-ocean boundary, DSTF = Dead Sea Transform Fault, EEZ = Exclusive Economic Zone of Cyprus, FR = Florence Rise, HA = Hellenic Arc, LR = Latakia Ridge, MdR = Mediterranean Ridge, PTF=Paphos Transform Fault, PST = Pliny and Strabo Trenches.

Different versions attempting to characterize the tectonic evolution of the region exist. The three main versions are the following: (a) long-lived collision scenario: describing continuous thrusting and folding onshore and offshore Cyprus from Eocene until recent as a result of the continent-continent collision between the African and Eurasian plates. This acceptation is suggested by the change in facies of the juxtaposed Paleogene-Oligocene deep pelagic carbonates with the Miocene flysch deposits in the Mesaoria basin, a basin considered as a piggyback basin which developed between the Troodos-Larnaca culmination and the Kyrenia thrust belt (Calon et al., 2005a, 2005b; Sage & Letouzey, 1990); (b) strike-slip scenario, supported by the absence of a volcanic arc and a Benioff zone offshore Cyprus, in addition to the recognition of strike-slip structures onshore, which suggests that the emplacement of the ophiolites and the creation of the Cenozoic basins and Recent structures are associated with a left-lateral strike-slip regime since Late Cretaceous (Harrison, 2008; Harrison et al., 2012); and (c) Pliocene collision scenario: where the Pliocene compressional tectonics followed a succession of compressional (from Late Cretaceous to Paleogene) and extensional regimes (Miocene time due to slab roll-back of the northward subducting African plate). This last acceptation reposes on the recent uplift of Cyprus and the transition in sedimentation from Miocene hemipelagic carbonates to Pliocene clastics as a result of the continent-continent collision between the Eratosthenes microcontinent and the Eurasian plate in Pliocene (Kempler, 1998; Kinnaird et al., 2011; Robertson, 1998; Robertson et al., 2012).

These different models/scenarios highlight the main plate-scale driving mechanisms responsible for the Cenozoic deformations in the eastern Mediterranean region. The deformation commenced with the northward convergence of the Afro-Arabian plates with respect to Eurasia and is later accompanied by the westward extrusion of the Anatolian microplate relative to the African plate through time. Only a limited amount of published work on the Cyprus Arc system focuses on the lateral evolution of the structural style along this major boundary. Even less emphasis is given on the integration of the tectonic structures of the Cyprus Arc system within the frame of the complex nature of the eastern Mediterranean basin.

In the eastern domain, thin continental crust (Levant Basin) and obducted ophiolite (Cyprus Basin) are in contact. In the central domain, the continental crust underneath the Eratosthenes microcontinent is colliding with the continental crust under Cyprus. Finally, in the western domain, the oceanic crust of the Herodotus Basin is subducting northward under the continental crust of the Antalya Basin (southern margin of Turkey).

In the eastern Mediterranean, the tectonic development begins with the disruption of the supercontinent of Pangea and the constitution of the Neo-Tethys Ocean (Frizon de Lamotte et al., 2011; Gardosh et al., 2010). Rifting was followed by a convergent phase, resulting in the creation of tectonic structures (i.e., Cyprus Arc system), and the emplacement of the ophiolitic belt (Garfunkel, 1998) from East in Baer-Bassit in Syria, through Troodos Mountains in Cyprus to the West in the Antalya region in Turkey (figure 8).

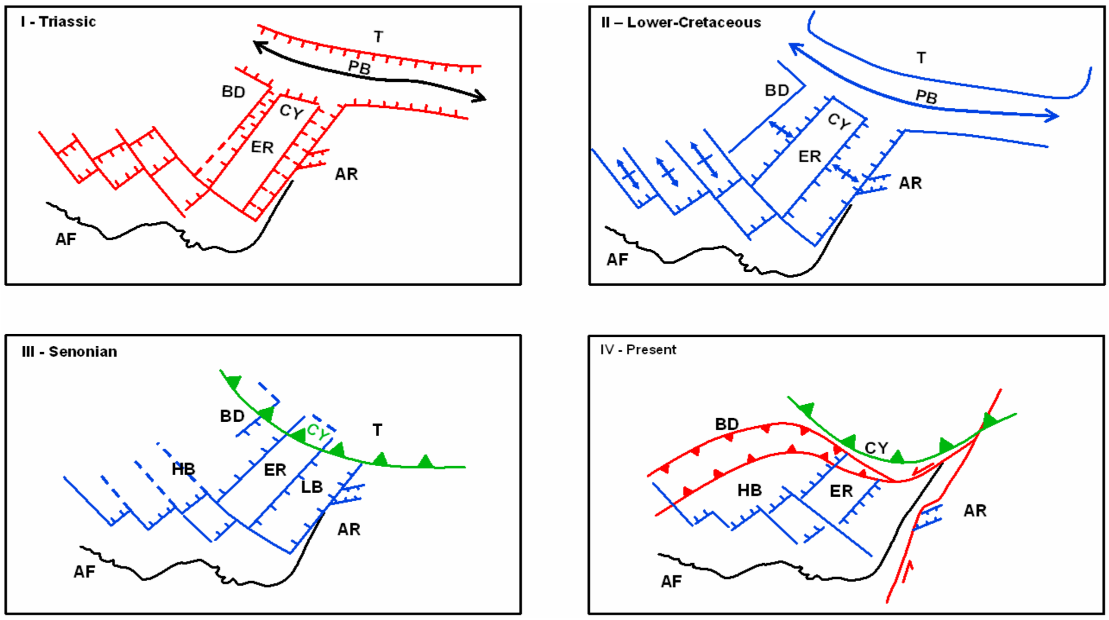


Figure 8. Paleotectonic sketch maps of the Eastern Mediterranean since the Triassic
(I)Triassic, beginning of rifting. (II) Lower Cretaceous, after rifting and spreading. (III) Senonian, formation of the Cyprus Arc and Ophiolite Belt. (IV) Present, with the Mediterranean Ridge. ER = Eratosthenes Continental Block; CY = Cyprus; BD = Bey Daglari; HB = Herodotus Basin; PB = Pamphylian Basin; T = Taurus; AR = Arabia; AF = Africa: MR = Mediterranean Ridge.

2.2.1 Geological Setting of Eastern Mediterranean

The eastern part of the Mediterranean Sea is of great geological interest. One of the main interesting topics is the genesis and the development of hydrocarbon fields in the area. The analysis of the palaeogeographic evolution of two major basins in the eastern Mediterranean Sea, such as the Levantine basin and Herodotus basin, shows the same evolution and accommodate the same sediment types. Also, the presence of the Eratosthenes Continental Block (E.C.B.) and the Nile cone, have their own role in the development of the basins and the wider Eastern Mediterranean region.

2.2.2 Geological Setting of the Levantine basin

The Levantine basin is located SE of Cyprus in the eastern Mediterranean Sea (Figure 9). It is a foreland basin at the southern end of the front of the Alpine deformation zone, in the zone of interaction between the tectonic plates of Africa, Arabia and Anatolia (Vidal et al., 2000). The basin formed in Middle Miocene as a result of subduction of African tectonic plate under Eurasia. It has an average length ~ 325km, an average width ~ 155km and water depth over 2km. It covers an area of ~50.375km^2. It is bounded to the north from Larnaca thrust zone to the northwest from Eratosthenes continental block. The Nile cone and the eastern margin of the Mediterranean are the southwest and east margins respectively. The basin contains Mesozoic and Cenozoic sequences with thickness up to 14km. The basin has a complex structure due to compression and extension regime that produced movement of tectonic plates and tectonic gravity processes (Roberts & Peace, 2007).

Levantine Basin comprises the easternmost Mediterranean Sea, representing a discrete remnant of the Neo-Tethys Ocean. This ocean formed after the separation of the continental margins of Europe-Asia and Africa-Arabia initiated during the Permo-Trias and completed by Early Jurassic rifting and the subsequent phase of Cretaceous drifting. The Permo-Trias rifting is characterized by extensional faults, oriented NE-SW NNE-SS, which shaped the architecture of the continental margins (Gardosh et al., 2008; 2010).

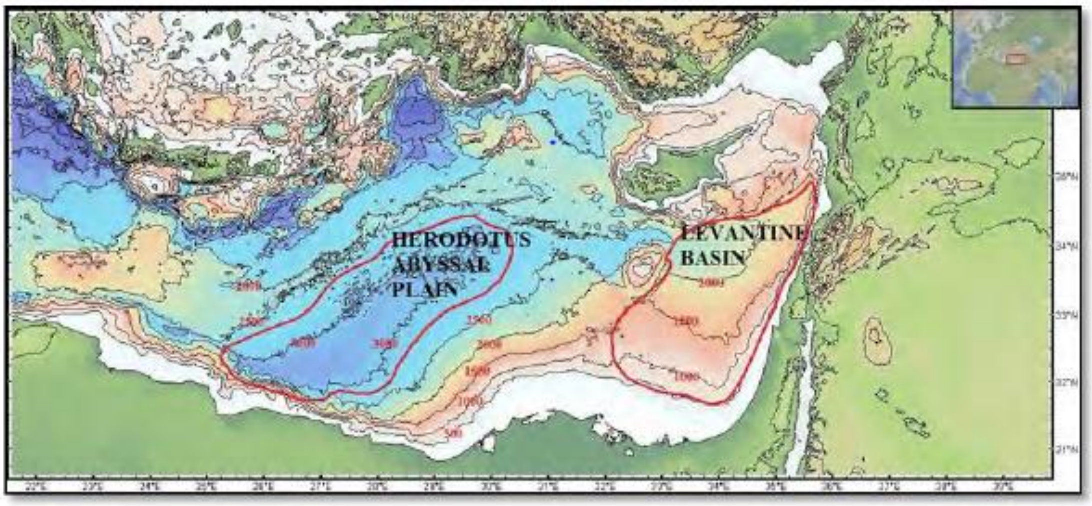


Figure 9. Bathymetrical map which shows the two basins. NE of Cyprus is the Levantine basin and NW of Cyprus the Herodotus abyssal plain. (Geomap).

2.2.2.1 Stratigraphy of the Levantine basin

The Levantine basin is composed of clastic sediments with a thickness of 14km (Figure 10). The bedrock of the basin of Triassic age is not clear whether it is the oceanic or continental crust. The sediments from bottom to top are divided into a) Triassic section, composed by ten depositional cycles, b) Jurassic section, composed by seven depositional cycles, c) Cretaceous section, composed by eight depositional cycles, d) Tertiary section, composed by eleven depositional cycles. The types of sediments are referring in figure 9.

The initial marine transgression of the rift dates back to the Triassic syn-rift stages, when the first shallow water carbonate was deposited with locally developed evaporates and minor siliciclastic. Yet from the Jurassic, post-rift subsidence led to deep water pelagic sedimentation in the basin center continuing through the Cretaceous such that carbonate platforms were confined to the continental margins, and only locally could carbonate reefs develop on basement highs. The pelagic sedimentation in the basin during the Cretaceous and Paleogene comprised deep water and detrital limestone, chalk, marls, and shale. Siliciclastic input was present locally since the Mesozoic in both shallow and deep water, associated with variations of the drainage of the nearby landmasses.

From the Late Cretaceous, the subduction in the Taurides Arc consumed the northern oceanic crust of the Arabian Plate, brought the continental block of Arabia and Anatolia to collide by the end of the Oligocene and during the Miocene, closing the open seaway to the Persian Gulf to the east. In the Oligocene, the slowdown in the migration of the allochthonous frontal thrust caused by this collision led to an end of the subduction phase, yet was replaced by the formation of large-scale folding. The convergence, of course, continued with the uplift of oceanic thrust ophiolite of the Troodos Terrane of the Cyprian Arc and the reactivation of previous discontinuities along the continental boundary of Arabia i.e. Levant Fracture System (Geological Survey Department of Cyprus, 1995; Beydoun, 1999).

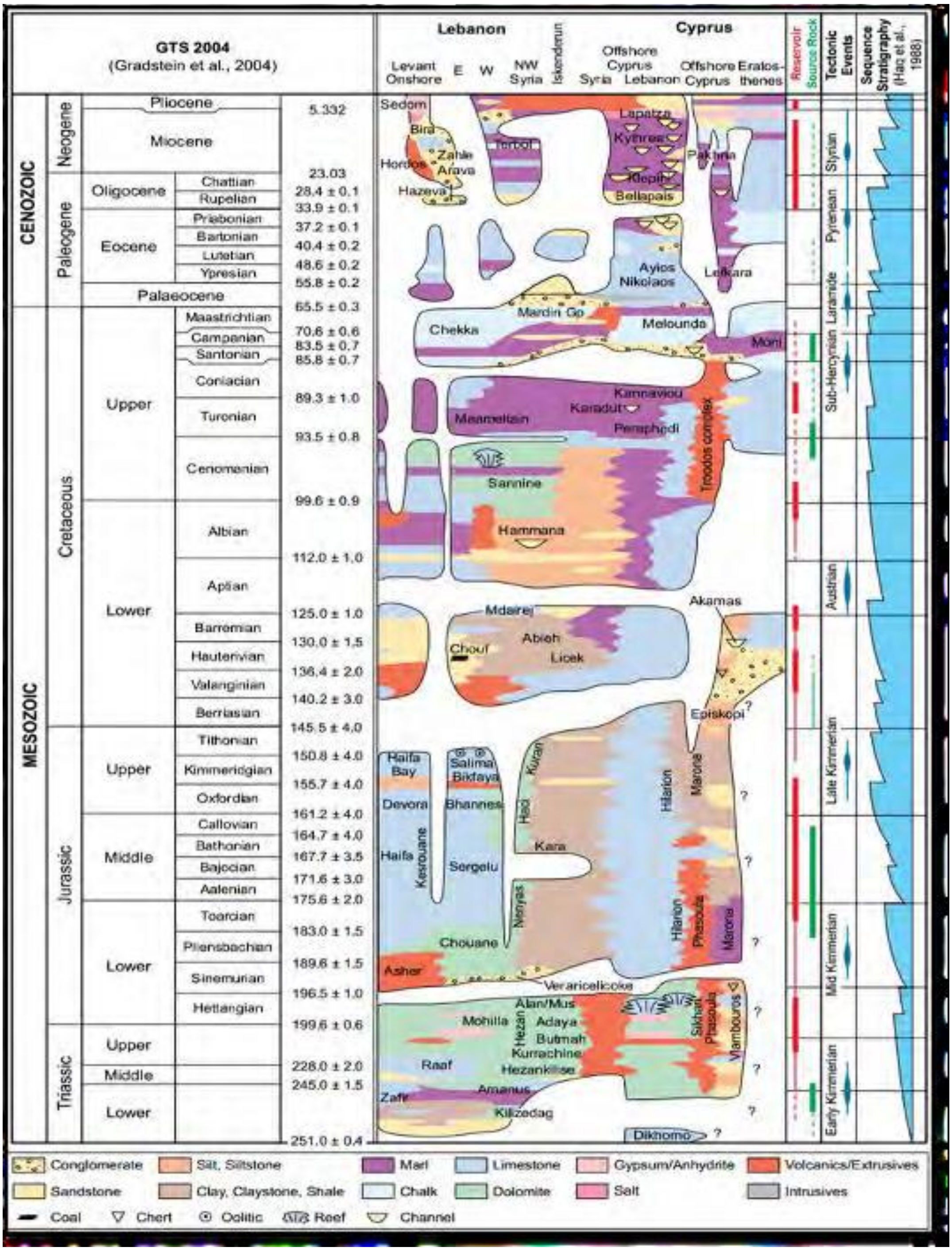


Figure 10. Levantine basin stratigraphy (Roberts & Peace 2007).

2.2.2.2 Hydrocarbon Plays in the Levantine Basin

The source rocks (Figure 11) in the Levantine basin are Pliocene clays and are the source of dry biogenic gas. The source rocks that have the potential to give natural gas are the fine coarse sediments of Triassic and Jurassic age. In contrast, the source rocks that have the potential to give oil are sediments of Upper Cretaceous age. Potential reservoirs (Figure 11) are sandstones of Plio - Pleistocene, endo - Messinian, Oligocene, Eocene and Paleocene age. Sandstones and limestones of Cretaceous, including carbonate reefs. Sandstones, limestones, dolomites, and oolitics limestones are the reservoirs of the Jurassic. Finally, the oldest reservoirs are the Triassic sandstones. The cap rocks (Figure 11) are the Messinian evaporites, Paleogene, Neogene and Cretaceous clays and marls and finally Triassic and Jurassic evaporates. The migrations are through faults that exist in the basin (Figure 11). The traps are stratigraphic and structural such as anticline and pinch-outs.

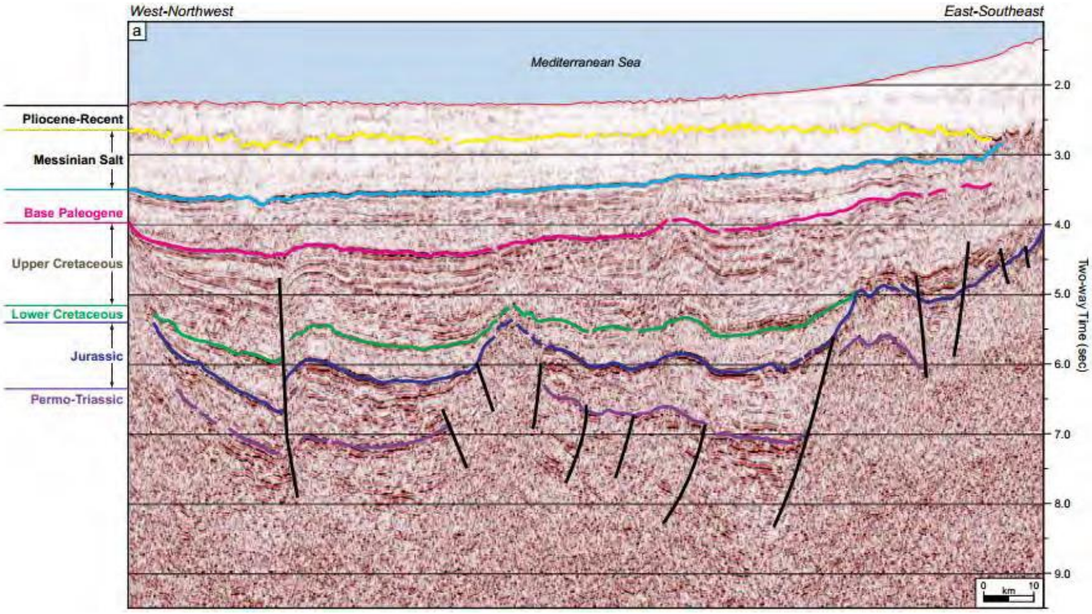


Figure 11. WNW-ESE seismic line over the southern part of the Levantine Basin showing a Triassic-Jurassic rifted terrain and the age of the sequences. Section width approximately 160 km (Roberts & Peace 2007).

2.2.3 Geological Setting of Herodotus basin

The Herodotus abyssal plain is located SW of Cyprus (Figure 9). The abyssal plain also formed in Middle Miocene as a result of subduction of African tectonic plate under Eurasia. It is a deep basin with water depth over 3km. It has an average length of ~450km and an average width ~255km. It covers an area of ~113,000km2, which is two times bigger than the Levantine basin. On the north is bounded from the Mediterranean Ridge, from the African (Libyan/Egyptian) continental slope on the SW and from the Anatolian rise on the NE. The Herodotus basin also contains Mesozoic and Cenozoic sediments up to 15km in thickness (Montadert et al., 2009). The size of the basin is reduced during the time as the Nile cone proceeds and progrades into the basin. As a result, the sediments accreted to the Mediterranean Ridge.

2.2.3.1 Stratigraphy of Herodotus Basin

The Herodotus basin as mentioned above is composed of clastic sediments with a thickness up to 15km (Figure 12). The bedrock of the basin is the oceanic crust of Triassic age. The sediments from bottom to top are divided into a) Mesozoic and Paleogene sediments, b) pre-Messinian sediments (Miocene), c) Messinian evaporites and d) Plio - Quaternary sediments.

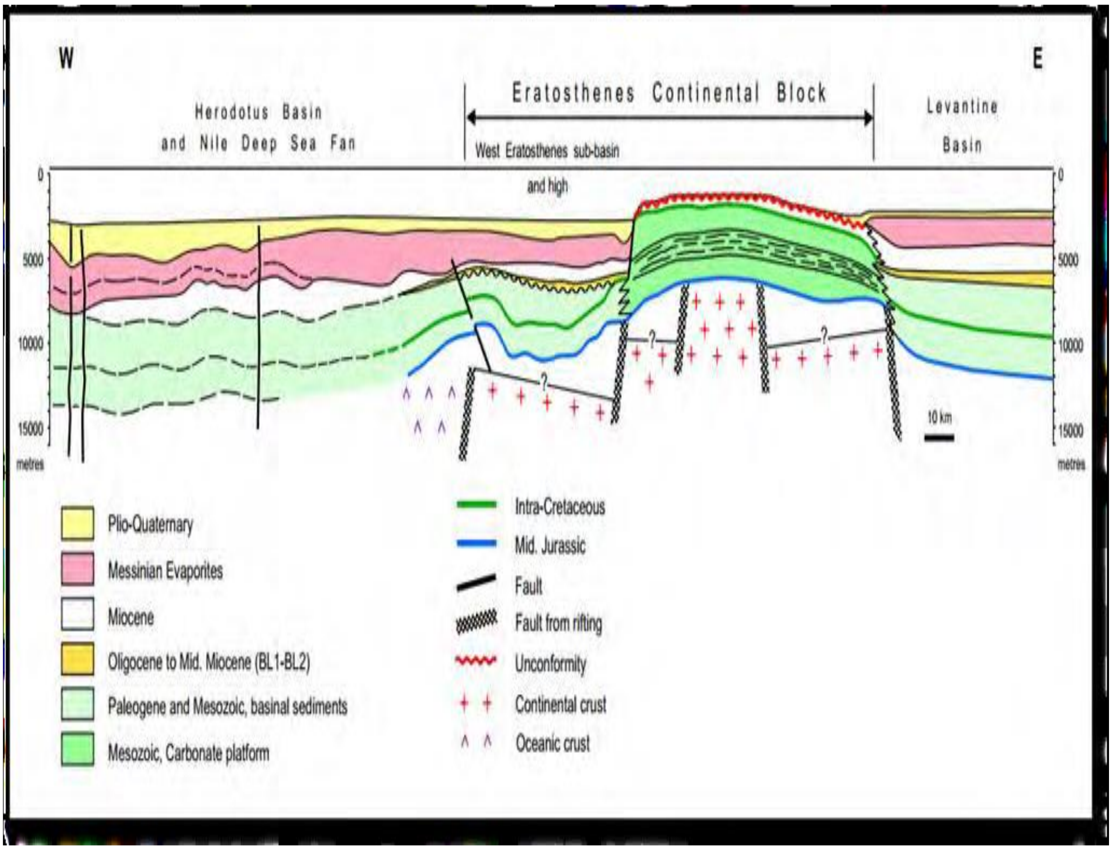


Figure 12. Stratigraphic cross section of the Herodotus basin and Eratosthenes continental block (Montadert & Nicolaides, 2010).

Pre-Messinian Sediments

These sediments have a thickness greater than 7.5km and are divided into seven lithotypes (Figure 11). Calcarenites (Aquitanian) siltstones (Burdigalian), calcareous siltstones (Burdigalian-Langhian), fossiliferous micrites (Serravallian), sapropels (Tortonian), grated biomicrites (Tortonian- Messinian), bio-arenites (Tortonian-Messinian).

Messinian Evaporites

The Messinian evaporites have a thickness many times more than 2.5km (Figure 12). They were deposited by the closure of Gibraltar so that no water enters from the Atlantic Ocean to the Mediterranean, resulting in intense evaporation, and the deposition of halite, gypsum, and anhydrite in the Mediterranean. The water level fell 3-5km in the Mediterranean. The structure of the basin is characterized from domes which can form either by syn-depositional folding or diapirism. From magnetic measurements made in the region appear to not be magmatic origin as there are no magnetic anomalies related to the domes. In contrast, sedimentary diapirism indicated by the concentration of domes in a small area of the deepest parts of the basin. The sedimentary diapirs caused by mud or evaporites movement. In gravity measurements made in similar blocks close to this area, show steep negative anomalies Bouguer and show that under these there is a low-density material. This material shows evaporitic composition despite the mud.

Plio - Quaternary Sediments

The Plio - Quaternary deposits consist of sediments rich in carbonate material deposited in the open sea, with plenty of pelagic organisms and benthic fauna. These deposits are brown to black, laminated, rich in organic material sapropels and sand turbidites. The turbidites were divided into three types, type A and type B and C also debris flow (Figure 13 and 14) according to their source. The types differ in composition and thickness. Finally, 12 layers of sapropel rich in organic material, laminated, deposited in anaerobic, deep waters in Quaternary were detected (Kempler et al., 1996).

The Type A turbidites (Figures 13 and 14) are rich in smectite which means that the source of this type is the Nile cone because the sediments of the Nile are rich in smectite. They are also rich in organic material. Their thickness range from 15cm to 750cm (Reeder et al., 2000) and their age range from Middle Pleistocene to Holocene. The transportation from the Nile cone in the basin, made by channels that favor the transport by turbiditic mudflows. The Type B turbidites (Figure 13 and 14) are richer in carbonates, ranging from 36% to 84,5%, and that shows that the source of these turbidites is the African continental slope. The transport is done through submarine canyons. Their age is Upper Pleistocene. The most noticeable layer of this type turbidite is called ‘’beta’’ by the Greek letter (β). The turbidite sequence ‘’β’’ reaches 7m. in thickness. Finally, their thickness range from 6-1.570 cm (Reeder et al., 2000). The Type C turbidites (Figure 14) came from the Anatolian rise and are conducted towards the east and northeast parts of the basin. Finally, the debris flows (Figure 13 and 14) derived from the Mediterranean ridge and they are restricted in the northern part of the basin (Cita et al., 1984a).

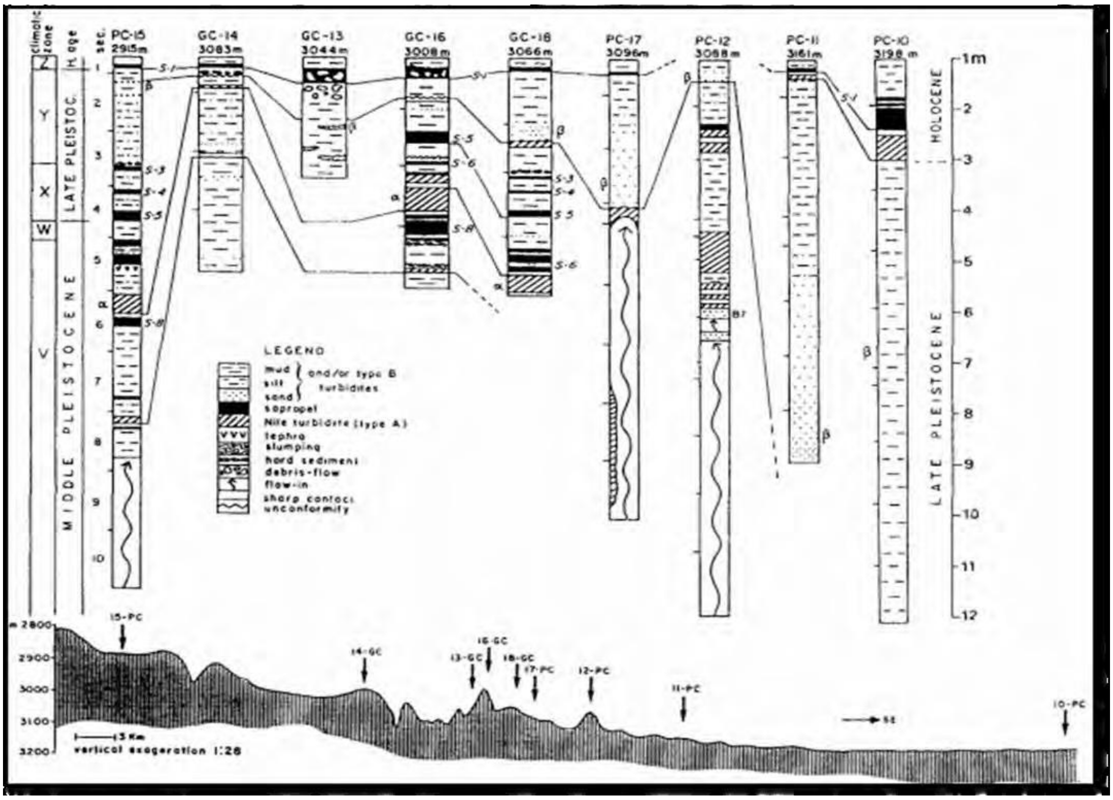


Figure 13 . Stratigraphic columns of type A and B turbidites of 9 cores that were taken in the Herodotus basin. Also in black color are shown the layers of sapropel (Cita et al., 1984).

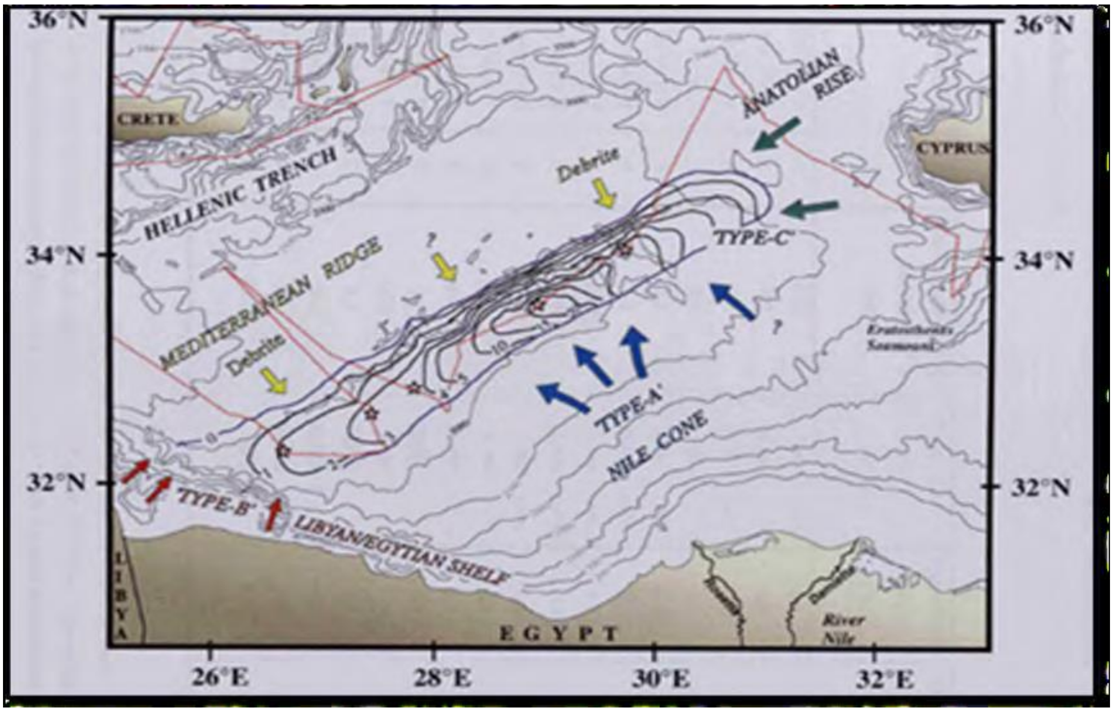


Figure 14. Bathymetric map that shows the four turbidites sources in the Herodotus basin (Reeder et al., 2000).

2.2.3 Eratosthenes Continental Block (ECB)

One of the most leading bathymetric features in the Eastern Mediterranean is the Eratosthenes Seamount. The Eratosthenes Seamount, located about 100 km south of Cyprus and northeast of the African Plate, is surrounded by the Cyprus Arc, the cone of the Nile and the Levantine Basin (Fig. 15). It is a single massive peak rising to about 0.8 km below sea level, above an adjacent 2.3 km abyssal plain (Emery *et al.* 1966, Neev *et al.* 1973) and rises about 1.5 km above its surroundings.

The continental nature of the ECB has been proven by seismic refraction data (Makris et al.,1983). The ECB is considered as a sliver of continental crust detached from Arabia after rifting from Triassic to Middle Jurassic times with creation of the 12 to 14 km thick Levant Basin. The motion of this block was governed by a major transform fault NW-SE oriented, starting in the Levant margin and running through the Levant Basin and South of the ECB until the Herodotus Basin. It is in accordance with the transforming nature of the North African margin and the left lateral motion of Africa versus Eurasia. As a result, the eastern and western margins of the ECB were passive margins while the southern margin was a transform margin.

The deep structures linked to rifting are particularly well visible along the southern and western margins. A major fault SW-NE oriented, separate the central part of the ECB from the eastern part where syn-rift deposits are particularly thick. It is also the boundary of a prominent magnetic anomaly (Chamot-Rooke et al. 2005) which does not extend off the edge of the ECB in the Levant Basin. It is interpreted as due to Triassic-Liasic volcanic. On the contrary, the structures linked to rifting are perpendicular to the southern transform margin of the ECB. It resulted in a series of spurs and embayments extending to the south. An E-W spur controlled by the transform fault zone extends also on a long distance to the West in the Herodotus Basin.

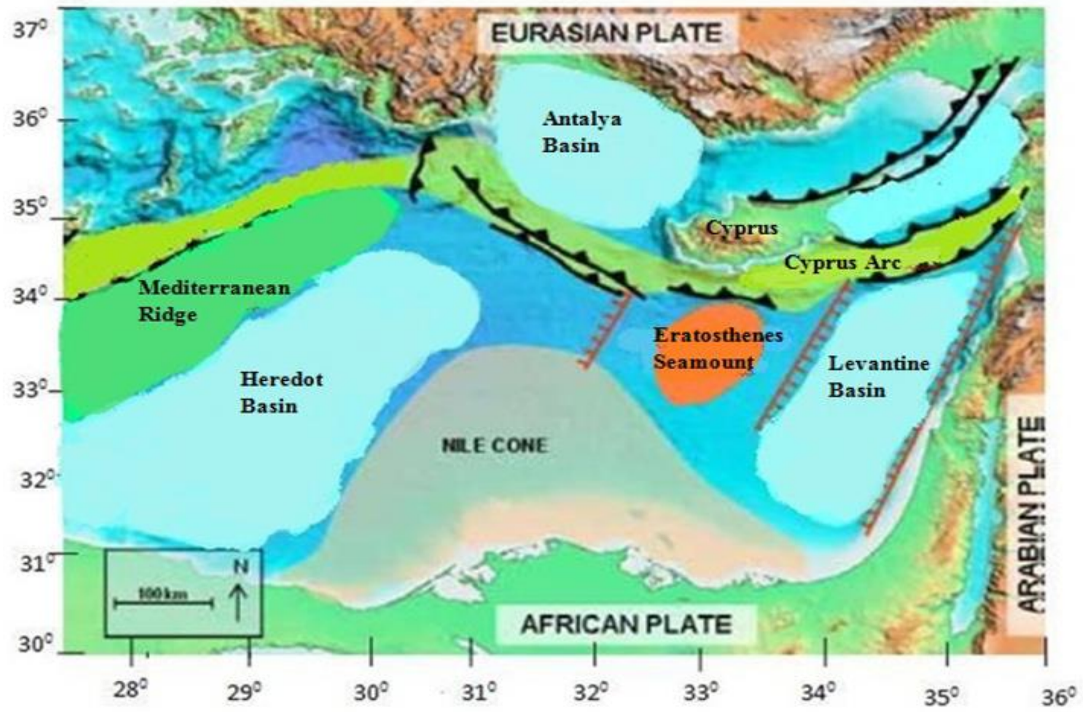


Fig. 15. Major tectonic elements of Eastern Mediterranean and location of Eratosthenes Seamount (modified from Sage and Letouzey 1990).

2.2.3.1 The Neogene sedimentation and tectonics.

As in other parts of the Eastern Mediterranean, the Neogene tectonics brought important changes on the structure of the ECB with consequences on its prospectivity.

The Lower Miocene compressional event, SE-NW trending, is associated with the formation of the gas bearing anticlines bounded by reverse faults to the NW, i.e. Aphrodite, in the Levant Basin. The whole ECB was affected by the uplifting of its western flank and further west the Herodotus sediments by west vergent folds and thrusts extending to the South through the transform margin of the ECB correlated to a prominent Bouguer anomaly. Even the eastern part of the carbonate platform may have been deformed. On the top of it and in relation with the Lower Miocene uplift, water depths permitted the recovery of a Miocene carbonate platform of limited extent with a flat top very well displayed on the morpho-bathymetric map. Outside the platform on the slope, Miocene deposits are thin. At the Late Miocene, the ECB was affected by the Messinian salinity crisis as everywhere in the Mediterranean. A large part of it was sub-aerially exposed in relation with the 1500m sea level drop (Fig.15) while it was surrounded by a thick (around 2000m) section of evaporites, the regional seal of the Levant and Herodotus Basins. This pinch out along or above the edge of the Lower Cretaceous carbonate platform Another tectonic event from the latest Miocene-early Pliocene to the Present is linked to the subduction of the ECB below the Cyprus Arc (Fig.16). It caused bending of the ECB with extrados normal faulting at its top. Its northern slope is affected by south-vergent ramp anticlines. The sedimentary cover including carbonate build-ups extends below a detached pop-up structure including Messinian Evaporites Finally a set of strike-slip faults NNW-SSE oriented, affect the SE part of the ECB and the Herodotus Basin(Fig.15). These can be correlated with the Temsah faults in Offshore Egypt and could represent the western boundary of a recent Sinai microplate. Open marine conditions prevailed during the Plio-Pleistocene after the reflooding of the Mediterranea with very thin pelagic deposits.

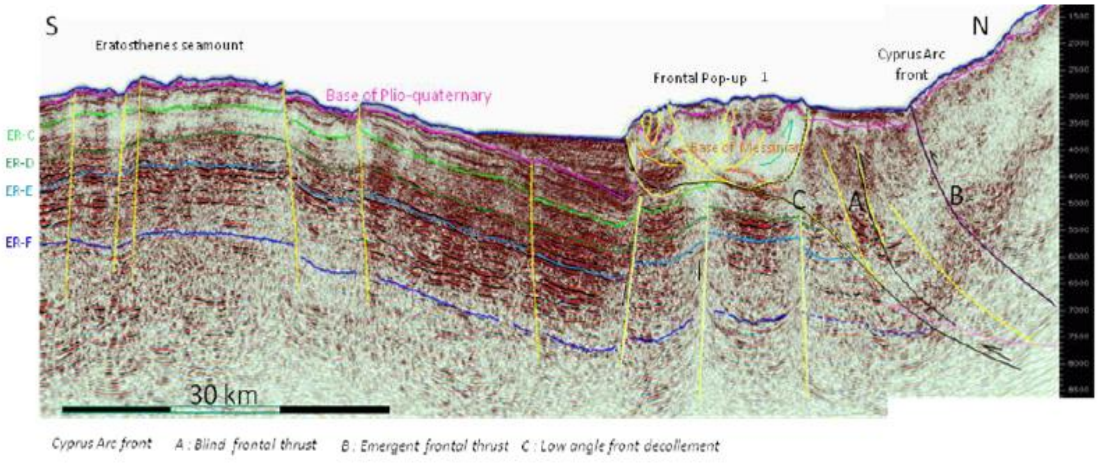


Fig.16. Seismic section across the Eratosthenes carbonate platform and the front of deformation of the Cyprus Arc (PGS 2D PTDM)

CHAPTER 3. Legal and fiscal terms in the oil and gas sector in Greece & Cyprus

3.1. The legal framework of Greece

Hellenic Hydrocarbon Resources Management S.A. (HHRM S.A.) was established in 2011 and is headquartered in Athens. The legal basis of the Company is Law No. 4001/2011 and the Presidential Decree 14/2012. HHRM S.A. is a state-owned company with the Hellenic State being the sole stakeholder (100%), however, it operates independently as a private-sector economic entity. The fundamental legal framework for exploration and production activities in Greece is set by Law No. 2289/1995, as amended. Since 2011, exploration and production gained impetus and the establishment of HHRM S.A. played a critical role in the exploitation of onshore and offshore hydrocarbon resources of the Hellenic Republic. With regard to the licensing regime for exploration and production, Greece follows the EU directive 94/22/EC "on the conditions for granting and using authorizations for the prospection, exploration, and production of hydrocarbons" – the directive has been amended with various instruments since the initial transposition.

More specifically, the prospection, exploration, and exploitation of hydrocarbons in Greece are governed by Law no. 2289/1995, which incorporated Directive 94/22/EC of the European Parliament and of the Council of 30 May 1994 on the conditions for granting and using authorizations for the prospection, exploration, and production of hydrocarbons. Law no. 2289/1995 has been modified by Law no.4001/2011, which intended to attract important investments of high business risk and to intensify the exploration activity in Greece, with the application of successful foreign practices by operators.

According to the provisions of Law no. 2289/1995, as currently in force, the right of exploration and exploitation of Hydrocarbons situated in the Greek territory exclusively belongs to the Greek state. The exercise of such rights shall always intend to serve the public interest. The management of such rights, on behalf of the Greek State, is being done by the Greek Management Company of Hydrocarbons S.A. (H.H.R.M SA), which may grant such rights to third-party/parties with the conclusion of a concession agreement (art.2 par.1, 2 Law no. 2289/1995). This agreement may take the form of a lease agreement, bearing the characteristics of a concession agreement, or the form of a distribution agreement, a form similar to production sharing contracts (art.2 par.10 Law no. 2289/1995). The form of the concession agreement that shall be concluded is chosen separately for each contract area of exploration, according to the procedure provided by Law no. 2289/1995.

The rights of exploration and exploitation of hydrocarbons are, in fact, two separate rights, which are granted together with the conclusion of an agreement. The right of exploration consists of the necessary acts for the discovery of hydrocarbons, with any appropriate method, including drills. The right of exploitation consists of the excavation of hydrocarbons and their elaboration-excluding refinement- with the purpose to commercially exploit them and their by-products, stock them and transfer them for further disposal (art.1 par. 4 and 5 Law no. 2289/1995). Such rights are exclusive and immune to seizure, the concessionaire being the only one able to exercise them, depriving any other third party (including the state). The rights are exercised in one or more contiguous areas, onshore or offshore (contract area), which is later limited to the areas where commercially exploitable hydrocarbons have been discovered (art.2 par.11 and 12 Law no. 2289/1995).

Any natural person or legal entity may be party to a concession agreement, with or without the collaboration of other parties or the Greek state (art. 3 par.1 and art. 4 par.1 Law no. 2289/1995). The content of the agreement is negotiated between the parties, within the framework provided by Law no.2289/1995. The rights and obligations of the parties to the agreement are extensively provided by the law, most of them being coercive legal provisions which cannot be a matter of negotiation and bind the parties, regardless of whether they are incorporated in the agreement or not. Therefore, the field for negotiation of the terms of the agreement between the parties is limited. Further, at any stage of the execution of the agreement, conditions concerning the exercise of the rights of exploration and exploitation may be imposed with a Ministerial Resolution (art.2 par.3 Law no. 2289/1995).

3.1.2 Lease agreement of hydrocarbons in Greece

The exclusive right to explore and exploit hydrocarbons may be granted with the conclusion of a lease agreement. The framework of the lease agreement, regulated by the provisions of Law no. 2289/1995 and Presidential Decree no. 127/1996 on the terms of the lease of the right of exploration and exploitation of hydrocarbons.

3.1.2.1 Contractual obligations and rights

Upon signature of a lease agreement, the Lessee undertakes the obligation to execute exploration and exploitation operations of Hydrocarbons and their By-products in the contract area and is granted the respective exclusive right. The Lessee shall provide all the necessary technical means, materials, staff and capitals for the exploration and exploitation, for which it exclusively bears the financial risk, in any event, and, namely in the event that no commercially exploitable reservoir is discovered or in the event that the production of a reservoir is insufficiently profitable (art.2 par.22, 24 Law no. 2289/1995). In the event that a commercially exploitable reservoir is discovered, after formally notifying the Lessor, the Lessee becomes lessee of the right of exploitation of the reservoir, with the obligation and the right to produce hydrocarbons and by-products from it and to dispose them for its benefit, either in natura or after elaboration, excluding refinement, paying to the Lessor the royalty and the respective tax (art.2 par.23 Law no. 2289/1995).

The Lessee is bound to comply with the Strategic Environmental Assessment (SEA), initiated by the Ministry of Environment, Energy and Climate Change and the respective approval of the Special Environmental Service for the relevant contract area. In addition, construction and operation of each project for hydrocarbons exploration and development will require Environmental Impact Assessment (EIA) and may commence only after the relevant EIA license are granted (Law no. 4014/2011).

The Lessee shall, also, be obliged each year to train at its installations local technical and scientific personnel (art.6 par.10 Law no. 2289/1995). It may, further, be obliged to sell to the state all or part of the quantity of the hydrocarbons produced, in case of war or any other state of emergency of the country. The agreement may provide that the Lessee has the same obligation, regardless of the above conditions (art.7 par.1 Law no. 2289/1995).

The Lessee, upon conclusion of the agreement, undertakes to bear the expenses and the risk of the works during the whole term of the agreement. The relevant works are carried out according to work programmes and budget, which are submitted to the Lessor for approval. More specifically, the Lessee shall submit the following to the Lessor for approval:

- Annual work programme and Budget: Three months before the beginning of each calendar year or at any other time designated by mutual agreement between the Lessor and the Lessee, the latter shall draft and submit to the Lessor a programme of all works (plans, research, supplies, facilities' equipment) pursuant to the agreement, and with the respective budget of the cost of each work that it is proposing to execute within the next twelve-month period. The Lessor may, within a month from submission, suggest the modification of parts of the work programme and the budget, regarding the kind of works and expenses. The execution of the programme is monitored by the Lessor (art.2 par.1 P.D. 127/1996).
- Development and production programme: Within six months after the beginning of the stage of exploitation of each area of exploitation, the Lessee shall submit to the Lessor a detailed development and production programme, which shall secure the placement and expansion of the facilities of the exploitation in a pace compatible with the good oilfield practice and respective to the size of the reservoir. Such programme shall contain all basic kinds of equipments and works that are necessary for the

- production of hydrocarbons in the area of exploitation, the measures of environmental protection that shall be taken, the economic analysis of the estimated cash flows and the estimated capital return of the capital that shall be invested in the execution of the schedule, the respective costs estimated for each stage of the development and table of investments, which shall present the total budget of the capital necessary for the execution of the above programme, the respective approximate timetables, for each stage of the development, the estimated beginning time of the production for each stage, the estimated inflow stocks of hydrocarbons and the expected annual production. The Lessor may, within two months from submission, suggest the modification of parts of the development and production programme (art.2 par.2 P.D.127/1996).

Respectively to the above, the Lessee shall be entitled to perform all exploration and exploitation operations and projects required in order to fulfill its obligations under the agreement. The Minister of Environment, Energy and Climate Change, after notification by the Lessee regarding the location of each drilling within the time limits set forth in the agreement, may forbid such drilling for important reasons regarding the national or public interest. Further, the above Minister may grant by resolution the license for the installation and operation of Hydrocarbons storage tanks, exploitation platforms and all kinds of mechanical installations as well as the license for the installation of pipelines for the transportation of the extracted hydrocarbons to the separation, processing or storage and loading installations which the Lessee has in the country. Provided that the existing installations in the country are not suitable or adequate, also a license for the installation, operation and exclusive use of installations generating and transporting electricity shall be granted (art.6 par.1 Law no. 2289/1995).

By joint resolution of the Minister of Environment, Energy and Climate Change and the competent by case Minister, upon recommendation of H.H.R.M SA, regulations shall be enacted for the performance of operations and projects of any kind, storage tanks and pipelines, the carrying out of drilling operations and the plugging of wells, and such regulations shall be aimed at the adoption of safety measures of any kind for persons or things; the prevention of pollution or contamination of the environment; the protection of flora and fauna, fishing, the navigation, antiquities in general, historic sites and sites of special natural beauty as well as other activities within the exploitation areas. The agreement shall provide that until such regulations are issued, the exploration and exploitation operations shall be carried out in accordance with the respective regulations in force in the Member States of the European Union (art.12A par.1 Law no. 2289/1995).

Moreover, in order to fulfill its obligations, the Lessee may use contractors and subcontractors for the execution of the agreement, being obliged to submit to the Lessor copies of the contracts concluded with them (art.6 par.4 Law no.

2289/1995). The Lessee also has the right to transfer and assign all or a percentage of its contractual rights and obligations to an independent third party, with the Lessor's written consent and the Minister's of Environment, Energy and Climate Change approval. Additionally, it has the right transfer and assign its contractual rights and obligations to an affiliate company, with the Lessor's written consent and the Minister's of Environment, Energy and Climate Change approval, under the condition that it will remain severally liable towards the Lessor for the observance of the contractual obligations (art.7 par.5 Law no. 2289/1995). If the Lessee is a Consortium, each member has the right to transfer and assign its contractual rights and obligations to another member of the Consortium, with the Lessor's written consent and the Minister's of Environment, Energy and Climate Change approval (art.7 par.6 Law no. 2289/1995). However, the Lessee, may not transfer and assign only part of its rights and obligations (e.g. the right of drilling). The state may exercise a pre-emption right in case of substitution or rates transfer from the Lessee (art.7 par.4 Law no. 2289/1995).

Any transfer and assignment of rights and obligations as per above shall be done with a notarial act, either in Greece or in any other country, while the Minister's of Environment, Energy and Climate Change approval may be given with the initial agreement (art.7 par.7,8 Law no. 2289/1995).

Finally, the Lessee shall be entitled to acquire ownership or other rights in rem on real property by concluding contracts, which it enters into in the name of and in favor of the state but at its own expense, provided that, by Ministerial Decision it is certified that said real property is required for the exploration or exploitation operations. In the event that the Contractor cannot acquire the above rights through contract, and special provisions of the legislation then in force do not prohibit the compulsory expropriation of real property, then the compulsory expropriation of the real properties in favor of the State and at the expense of the Contractor shall be effected in accordance with relevant legal provisions. (art.6 par.3 and art. 11(12) Law no. 2289/1995, Law 367/1976). The future of the property acquired as per above, after termination of the stage of exploitation, is determined by the agreement (art.10 par.1 Law no. 2289/1995).

3.1.3 Royalty System

The royalty paid in kind or in cash in accordance with the Lessor's choice is owed to the Lessor in any event, no matter whether any profit is achieved by the Lessee. Royalty in kind consists of a percentage of the quantity of the hydrocarbons produced, while royalty in cash consists of a percentage of their value, as provided by the agreement (art.2 par.27 Law no. 2289/1995). Additionally, the agreement may provide for a signature bonus, paid upon the conclusion of the agreement, a production bonus and a surface fee, i.e. an annual fee for each acre of the area of exploration or the area of exploitation (art.2 par.19 Law no. 2289/1995).

If the royalty is payable in cash, the ownership of the excavated hydrocarbons passes to the Lessee upon acquisition of their possession. If the royalty is payable in kind, upon excavation of the Hydrocarbons until their delivery, the Lessor and the Lessee become co-owners of them and, namely, the Lessor with a percentage equal to the proportion of the total estimated royalty of the respective three-month period by the total production of it and the Lessee with the remaining percentage(art.2 par.3 P.D.127/1996).

If the Lessor wishes to receive the lease in cash, either in part or in total, it shall notify the Lessee in written at least ninety days before the beginning of each calendar year, defining the exact percentage, the value of which it wishes to receive in cash during the specific year (art.2 par.3 P.D.127/1996).

3.1.3.1 Valuation of Hydrocarbons and By-products

For the calculation of the value of the Hydrocarbons and By-products, the following provisions apply (art.7 P.D. 127/1996):

- Crude oil

In the case of sales of crude oil by the Lessee to independent third parties, its value is equal to the price on board at the place of loading by the Lessee, under the condition that it is true and reasonable. In the case of sales by the Lessee to affiliate companies and the crude oil received by the Lessor as royalty, its value is equal to the average of each three-month period weighted price at the place of loading, the price resulting from the sale of the production of the contract area of respective kind of crude oil, during this three-month period, by the Lessee to independent third parties and by the Lessor to any third buyer.

- Natural gases, natural gasoline and rest of Hydrocarbons and By-Products

In the case of sales of hydrocarbons and by-products by the Lessee to any third party, their value is equal to the actual sale price of them, under the condition that it is true and reasonable, taking into account each time formed prices in the international market and the specific characteristics of the product. In the case of hydrocarbons and by-products received by the Lessor, their value shall be defined by the Lessee and the Lessor in common, taking into account the above prices.

- Stage of exploration

The term of the stage of exploration, which is divided into two or three phases, specified in the Call for tender or the agreement, cannot exceed seven years onshore and eight years offshore (art.5 par.1 Law no. 2289/1995). Under certain conditions, such as unexpected technical problems, the discovery of reservoir- the Lessee may request the extension of the term of the stage of exploration for a period no longer than half of the initial term. The term of the stage of exploration may also be extended with a decision of the Ministerial Council, which shall also impose any additional terms and conditions, notwithstanding the agreement (art.5 par.3 and 4 Law no. 2289/1995).

After termination of each phase of the exploration stage, the Lessee shall be obliged to complete the operations, to remove the installations it used, to plug appropriately and to abandon all wells which may be in progress and to restore the environment to its original condition within a period not exceeding six months. Following the lapse of such period, the contract area reverts free and clear to the Lessor, apart from those exploitation areas which may have been created. The areas reverted to the Lessor shall range between 20% and 50% of the initial contract area, while further details shall be stipulated in the agreement (art 5 par. 5 Law no. 2289/1995, art.4 par.3 P.D. 127/1996).

The Lessee may renounce its contractual exploration rights in one or more areas or in the whole contract area by written notice which becomes effective thirty days after it has been served on the Lessor. The exercise of the above right may depend on the payment of a sum of money to the Lessor, which is specified in the agreement (art 5 par. 6 Law no. 2289/1995, art.4 par.1 P.D. 127/1996).

3.1.3.2 Exploitation Stage

In the event that the Lessee finds out that the reservoir discovered is commercially exploitable, after determining its size and the rest of the details necessary for the planning of the exploitation, it is obliged to inform the Lessor for the exploitability of the reservoir and for the estimated inflow stocks of it, with written notice, within the time-period designated in the agreement. A commercially exploitable reservoir may consist of a productive reservoir or of a group of reservoirs, the co-exploitation of which renders them productive. The decision as to whether the reservoir is commercially exploitable rests exclusively with the Lessee. However, the latter is obliged to justify its decision in the abovementioned notice, submitting at the same time all the necessary relevant data (art.5 par.8 Law no. 2289/1995, art.5 P.D. 127/1996). More specifically, the Lessee shall submit to the Lessor the results of the drills and the works, along with the elements of elaboration and interpretation and the relevant calculations, description of the oil field and the map of scale 1:50.000, depicting the exact borders of the area that has been chosen for exploitation (area of exploitation) (art.5 P.D. 127/1996).

Upon the date of submission of the above data, the stage of exploitation begins (art.5 par.2 P.D. 127/1996). The term of the stage of exploitation is twenty-five years and it may be extended for up to two five-year periods, in the event that the initial term is evidently insufficient for the completion of activities. In the latter case, the terms of the agreement may be re-negotiated and a new agreement may be concluded, after the Lessee’s application, before the expiration of the agreement (art.5 par.8, 13 Law no. 2289/1995).

The area of exploitation shall be rectangular, to the degree possible, and its surface cannot exceed 100 s.km. It may be extended up to 200 s.km, in the event that the Lessee proves that the reservoir of hydrocarbons may exceed 100 s.km., without surpassing the contract area (art.5 par.9 Law no. 2289/1995). If a hydrocarbon reservoir extends beyond the limits of the Lessee's contract area into the contract area of another Lessee and it would be advisable, for the better and more profitable exploration and exploitation thereof, to proceed with a joint program for the performance of the relevant operations, the Lessor invites the Lessees to submit for approval within a specified time limit a joint program of exploration and exploitation. If the Lessees do not submit joint program within the above time limit, the Lessor may terminate the related agreements (art.5 par.15 Law no. 2289/1995). If the area to which the reservoir extends has not been granted to a third party, then that area is granted to the Lessee.

The Lessee may renounce its contractual right of exploitation over one or more areas of exploitation by giving written notice to the Lessor. The date on which such renunciation becomes effective shall be stipulated in the agreement. No claims for any losses or damages whatsoever in favor of the Lessee against the Lessor shall arise as a result of such renunciation (art.5 par.14 Law no. 2289/1995).

- Termination of exploitation

After termination of the stage of exploitation, the Lessee is obliged to remove all the facilities and to restore the environment according to the environmental impact studies approved by the competent authorities of the Ministry of Environment, Energy and Climate Change. Apart from the monitoring by the competent authorities of the Ministry of Environment, Energy and Climate Change, according to the legal provisions in force, a Committee for the Removal and Disposal of Facilities is formed by a decision of the Minister of Development, with the task to check the programme submitted by the Lessee with relevance to the removal and disposal of the facilities and its modification, to coordinate the relevant works, follow the execution of the obligations of the Lessee relevant to the restoration of the environment and the removal and disposal of the facilities and adopt any measure it may consider appropriate, relevant to the execution of the above obligations of the Lessee (art.8 par.1 P.D. 127/1996).

The Committee for the Removal and Disposal of Facilities is formed within three months after the beginning of the stage of exploitation. One of its members is designated by the Lessee, one by the Lessor and the third one, being its President, is designated by the Lessee and the Lessor in common. In the event that the Lessee and the Lessor do not agree on the person that shall be the President of the Committee, the Minister of Development requests the Independent Petroleum Institute of an EU country or the American Petroleum Institute to designate him (art.8 par.1 P.D. 127/1996).

For the expenses needed for the sealing of the production, the removal of the facilities and the restoration of the environment, the Lessee is obliged to keep a special account in Bank(s) in Greece, in which an amount is annually deposited. Such amount is designated initially in the contract and can be adjusted with a decision of the Committee. The total annual deposits are equal to the estimated cost of the above works, as described in the schedule of development and production. The accumulated amount of the account, plus interest, constitutes a special reserve of the Lessee for the performance of the above obligations and the annual deposits are credited on the income and expenses account of the area of exploitation (art.8 par.2 P.D. 127/1996).

The Committee is competent to follow and check the movement on the account. Withdrawal of amounts by the Lessee is permitted only for the fulfillment of its above obligations, after the approval of the Committee. Fulfillment of the obligations of the Lessee is ascertained with a decision of the Committee. If the above decision ascertains that an amount remains in the special reserve account after the fulfillment of the Lessee's obligations, the same decision approves the total withdrawal of the said amount by the Lessee and the amount is credited on the income and expenses account for the year of withdrawal. If the Committee finds out that the amount of the account is not enough for the fulfillment of the obligations of the Lessee, it invites the Lessee to pay the amount needed for the total fulfillment of its obligations (art.8 par.2 P.D. 127/1996).

- Violations-Lessee's forfeiture-Settlement of disputes

The Lessor shall be entitled to declare that the Lessee has forfeited its rights under the agreement in the event that the Lessee fails, by default, to fulfill its contractual obligations or fails to pay on time the royalty or the production share, as the case may be, or the income tax. In such a case, the Lessor may also seek compensation for any damage it has suffered and any consequential loss. In the event of any other breaches by the Lessee and its subsequent failure to comply with the terms of the agreement within a sixty (60) day time limit imposed by the Lessor, the Lessor may be declared to have forfeited its rights pursuant to an award by the arbitrators, provided that the agreement makes provision for an arbitration procedure otherwise the Lessee may be declared to have forfeited its rights pursuant to a decision by the competent Court (art.10 par.8 and 9 Law no. 2289/1995).

Any disputes which may arise during the performance of the agreement shall be resolved by ***Athens Administrative Court of Appeal***. However, all disputes among the parties related to the performance of the terms of the agreement or tort or delict, may be settled through arbitration, according to Law 2735/1999 for international commercial arbitration or any other internationally recognized arbitration system, such as the International Chamber of Commerce (ICC), the London Court of International Arbitration, the Arbitration Institute of the Stockholm Chamber of Commerce, excluding ordinary proceeding of the Greek courts or other court jurisdictions. Such decision shall be rendered through three arbitrators, two of whom are appointed by the parties with the umpire being appointed by them. The place of arbitration proceedings shall be Athens and the language applied will be the Greek. All claims in conjunction with the provisions of the Law no. 2289/1995 shall be governed by the Greek Law (art.10 par.12 and 13 Law no. 2289/1995).

- Tax provisions

The Hellenic Republic set out to become an attractive destination for oil and gas companies and international investors. HHRM S.A. spearheads this effort with agile and effective management and a relatively small, yet highly competent personnel, with relevant experience from the international oil and gas industry.

The fiscal regime in Greece is based on "tax and royalty" lease agreements. Greece provides a competitive corporate tax rate of 20%, with an additional regional tax of 5%. The taxation model is final and it has been specifically designed in order not to incur any further, direct or indirect, cost for the investor.

Specifically, the Lessee is subject to special income tax of ratio 20%, as well as to regional tax of ratio 5%, without any other regular or irregular contribution of any kind to the state or any other third party. Such income tax shall be imposed separately on the Lessee's income accruing from each of the agreements concluded by it. The tax, by which all income tax obligations of the Lessee and its shareholders are exhausted, is imposed on the net income of the Lessee, resulting from the contractual works. In the event of a consortium, calculation of the income tax is done separately for each member of the consortium, while all members shall remain jointly and severally liable for such tax. The tax assessed is payable in a lump sum. The Lessee is not subject to tax prepayment (art.8 Law no. 2289/1995). It is further noted that the Lessee is subject to V.A.T., according to each time in force ratio.

3.2 Legal framework of hydrocarbons in Cyprus

The hydrocarbon exploration and exploitation activities in the Republic of Cyprus are regulated by the Hydrocarbon (Prospection, Exploration, and Exploitation) Laws of 2007 to 2015 (L.4(I)/2007, L.126(I)/2013, L.29(I)/2014 & L.186(I)/2015) and the Hydrocarbon (Prospection, Exploration and Exploitation) Regulations of 2007 to 2014 (P.I. 51/2007, P.I. 113/2009 & P.I 576/2014) .

The provisions of the European Union Directive on the conditions for granting and using authorizations for the prospection, exploration, and production of hydrocarbons (Directive 94/22/EC) have been incorporated into the Cypriot Law, by the abovementioned legislation.

The activities pertaining to hydrocarbons prospection, exploration and exploitation are also subject to the general national legislation on taxation, environmental protection, health, and safety. The exception is the corporate income tax applicable to the licensee, which is included in the Republic of Cyprus' share of the hydrocarbon revenues.

The ownership of hydrocarbons wherever they are discovered in Cyprus, including the Territorial Waters, the Continental Shelf and the Exclusive Economic Zone of the Republic of Cyprus, shall be deemed to be and always to have been vested in the Republic of Cyprus.

3.2.1 Legal and regulatory framework for hydrocarbon exploration

The legal framework applies to the territorial waters, the continental shelf and the Exclusive Economic Zone of the Republic of Cyprus. Hydrocarbon activities are subject to general Cypriot laws and regulations on environmental protection, health, and safety. The following laws and regulations are applicable to Hydrocarbon activities:

• The Hydrocarbons (Prospecting, Exploration, and Exploitation) Law (2007).

• The Hydrocarbons (Prospecting, Exploration, and Exploitation) Regulations (2007 and 2009).

• Harmonization with Directive 94/22/ EC of the European Parliament and Council concerning the Hydrocarbon prospecting, exploration and production activities • The Contiguous Zone Law (2004).

• The Declaration of the EEZ Law (2004) – (UNCLOS'82) • Strategic Environmental Assessment (SEA).

The Hydrocarbons (Prospecting, Exploration, and Exploitation) Law and Regulations 2007 and 2009. This law and regulations determine the conditions for granting and using authorizations for the prospection, exploration, and exploitation of Hydrocarbons activities in Cyprus Offshore Exploration Blocks. Furthermore, they provide guidelines and evaluation criteria over a prospective application for licensing. For further details, please refer to the "Upstream Sector" section on pages 14 to 15.

The purpose of Directive 94/22/EC is to set up common rules for all EU member states for ensuring that the procedures for granting authorizations for prospection, exploration, and exploitation of hydrocarbons are open to all entities possessing the necessary capabilities, whereas authorizations must be granted on the basis of objective, published criteria. Cyprus as a full member state of the EU harmonized the above law and regulations for Hydrocarbons activities legislated in the Republic of Cyprus with the provisions of this Directive and other relevant EU legislation.

The Contiguous Zone Law (2004) By this Law, the Contiguous Zone is proclaimed, the inner limit of which is identical with the outer limit of the territorial sea and the outer limit of which shall not extend beyond the 24 nautical miles from the baselines from which the breath of the territorial sea is measured. In cases where part of the Contiguous zone overlaps with part of the Contiguous Zone of any other State, the delimitation shall be effected by agreement between the states involved. In the absence of an agreement, the delimitation of this zone shall not extend beyond the median line or the equidistance line, measured from the respective baselines from which the breadth of the territorial seal is measured.

In 1988, the Republic of Cyprus ratified the United Nations Convention on the Law of the Sea (UNCLOS'82). Based on this ratification, the Declaration of the EEZ Law was legislated in 2004. By this Law, the exclusive economic zone is defined as an area beyond and adjacent to the territorial sea, subject to the specific legal regime established, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention. The exclusive economic zone shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.

Where the coasts of two States are opposite or adjacent to each other, neither of the two States is entitled, failing agreement between them to the contrary, to extend its territorial sea beyond the median line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of each of the two States is measured. The exact limits of the EEZ at any given time shall be made public by Notification issued by the Minister of Foreign Affairs, as these limits will be shaped according to the specific areas and the possible delimitation agreements to be reached.

The Ministry of Commerce, in accordance with the EU Directive 2001/42/EC of 27 June 2001, has carried out a Strategic Environmental Assessment to identify, describe and evaluate the likely significant effects on the environmental effects of implementing hydrocarbon exploration and exploitation activities. The sea will bind all the licensees to follow and comply with the results and recommendations of this assessment. The environmental assessment can be found on the website of the Ministry (www.mcit.gov.cy, Hydrocarbon Exploration under Energy Service). Every licensee shall ensure that hydrocarbon operations are conducted in an environmentally acceptable and safe manner, consistent with the environmental legislation and the good international industry practice.

3.2.2 Lease agreement of hydrocarbon in Cyprus

The Hydrocarbons Law and Hydrocarbons Regulations provide for three types of licence:

- Prospecting. Prospecting licences are valid for up to one year. They are granted to locate hydrocarbons by any appropriate method other than drilling, by identifying geological structures by means of gravity, magnetic and seismic surveys.
- Exploration. Exploration licences are initially valid for three years and allow the holder to undertake gravity, magnetic and seismic surveys, and exploratory drilling. They are renewable for up to two terms. Each term must not exceed two years. In the event of a discovery, the licensee has the right to be granted an exploitation licence for the discovery.
- Exploitation. Exploitation licences are granted after a hydrocarbon discovery for an initial period of up to 25 years with the option of one renewal for up to ten years, subject to the terms of the contract.

Successful applicants for a licence must enter into an exploration and production sharing contract (EPSC), in the form published by the Ministry of Commerce, Industry, and Tourism. Any holder of a licence who wishes to transfer it or assign any rights under it to another entity must submit a written application to the Minister for consideration.

The EPSC provides for annual surface fees of:

- EUR25 per square kilometer during the exploration period.
- EUR30 per square kilometer during the first renewal period.
- EUR35 per square kilometer during the second renewal period.

An additional EUR500 per year per square kilometer is payable during the exploitation period.

The EPSC also provides for a lump-sum payment on signature and production bonuses once certain production thresholds are attained.

Under the EPSC the contractor must indemnify any person, including the Republic of Cyprus for any damage or loss which results from operations under the contract and to have appropriate insurance in place. If any operations are subcontracted, the subcontractor must have appropriate insurance. Entities which are subsidiaries of others may be required to provide parent company guarantees.

3.2.3 Production sharing contract in Cyprus

The Republic and the Contractor are referred to either individually as "Party" or collectively as "Parties".

- Whereas, all Hydrocarbons existing within the territory of the Republic of Cyprus, including the continental shelf and the exclusive economic zone, are national resources owned by the Republic of Cyprus.
- Whereas, the Republic wishes to promote the development of Hydrocarbons resources within and throughout the Contract Area and the Contractor desires to join and assist the Republic in evaluating the Hydrocarbons potential and promptly and efficiently developing Hydrocarbons resources which may be discovered within the Contract Area.
- Whereas, the Contractor represents that it has the financial ability, technical competence and professional skills necessary to carry out the Hydrocarbons Operations hereinafter described.
- Whereas, in accordance with the Hydrocarbons (Prospecting, Exploration, and Exploitation) Law No. 4(I) of 2007 and regulations made thereunder, agreements in the form of Production Sharing Contracts may be entered into between the Republic and the Contractor.

This Contract is a Production Sharing Contract, the scope of which is the exploration, appraisal, development, and production of Hydrocarbons in the Contract Area and the supply of required infrastructure within and outside of the Contract Area up to the Delivery Point, all at the Contractor's sole risk and expense. The Contractor shall:

(a) be responsible to the Minister for the execution of the Hydrocarbons Operations in accordance with the provisions of this Contract, and is hereby appointed and constituted as the exclusive entity to conduct Hydrocarbons Operations in the Contract Area for the term hereof.

(b) provide all necessary capital, machinery, equipment, technology, and personnel necessary for the conduct of Hydrocarbons Operations.

(c) bear the risk of Hydrocarbons Costs required in carrying out Hydrocarbons Operations and shall, therefore, have an economic interest in the rapid development of the Hydrocarbons deposits in the Contract Area.

The Hydrocarbons Costs shall be recoverable as provided in Article 8 (Model Production Sharing Contract; Recovery of Hydrocarbons Costs, Production Sharing and Marketing of Production), provided that if there is no Commercial

Discovery in the Contract Area during the term of this Contract or if the production achieved from this Contract is not enough to recover all the Hydrocarbons Costs incurred by the Contractor, the Contractor shall bear its own losses. During the term of this Contract, the total production achieved from this Contract shall be shared between the Parties in accordance with the provisions of Article 8. The Minister shall be responsible for supervising the Hydrocarbons Operations performed by the Contractor under this Contract, in accordance with the provisions thereof.

The exploration and production sharing contract (EPSC) provides for a lump-sum payment by the contractor on the signature, followed by annual surface fees and production bonuses once certain production thresholds are attained.

There is no specific regime within Cypriot income tax law concerning the oil and gas sector. Contractors and their subcontractors must comply with the applicable taxation laws and regulations in force in Cyprus and are entitled to the benefits of the various double taxation agreements and international conventions to which Cyprus is a party. Taxable profits from trading operations are taxable at the normal corporate income tax rate and taxable profits are determined under a framework of deductions for expenses wholly incurred in the derivation of income and capital allowances for assets used in the trade. It is expected that the tax authorities will issue some guidance in due course.

VAT law in Cyprus operates under the framework of the EU VAT Directive. The principal rate is 18% increasing to 19% from January 2014. The current position of the VAT authorities is that Cyprus' EEZ is within the territory of Cyprus for VAT purposes.

It is noteworthy that under the EPSC the applicable corporate tax is deemed to be included in the Republic's share of profit oil, and the portion of available oil which the contractor is entitled to be net of corporate tax.

In addition to the payments, the Government is entitled to the proceeds of the sale of its share of "profit hydrocarbons" as defined in the exploration and production sharing contract (EPSC). The contractor is required to provide free sales and marketing assistance for the sale of the Republic of Cyprus' share of profit hydrocarbons or to purchase all or part of Cyprus' share on the basis set out in the EPSC.

Finally, as an EU member state, Cyprus is a member of the EU Customs Union and applies the common EU tariff. This means that no customs duties apply to goods traded in Cyprus' EEZ beyond its territorial waters.

CHAPTER 4. The legal and regulatory framework for licensing in Greece and Cyprus

4.1 The Legal framework of exploration and exploitation in Greece

According to the Law 2289/1995, which incorporated a large part of the Directive 94/22/EE, concerning the prospection, exploration and exploitation of hydrocarbons in the Greek legislation, in conjunction with the new Law 4001/2011 which modernises and clarifies the legal framework being in force since 1995, the rights for exploration and exploitation of hydrocarbons are granted on behalf of the Greek State, according to the following procedures (Article 156, paragraph 17 L 4001/2011):

a) Either after an invitation to tender, for the areas of paragraph 4, that is approved by the Minister of Environment, Energy and Climate Change, published in the Government Gazette and sent for publication in the Official Journal of the European Union. The deadline for the submission of the offers is defined in the invitation and can not be less than ninety (90) days from the day of the last publication.

b) Or after submission of application by an interested party for an area which is not included in the invitation to tender according to case a. The H.H.R.M. SA, if the application is accepted, issues invitation to tender, approved by the Minister of Environment, Energy and Climate Change, published in the Government Gazette and sent for publication in the Official Journal of the European Union. The deadline for the submission of offers by other interested parties is at least ninety (90) days from the day of the last publication.

c) Or after an open invitation (open door) for expression of interest, when the area for which the concession is requested is available on a permanent basis or has been the subject of a previous procedure which has not resulted in the conclusion of a lease agreement or a production sharing agreement or has been abandoned by contractor, in the case that he has withdrawn from the agreement or has terminated it. The Minister of Environment, Energy and Climate Change, by notice, published in the Government Gazette and sent for publication in the Official Journal of the European Union shall notify the above areas with the minimum basic terms of the concessions as well as any other relevant information. Interested parties may tender for a concession in more than one area. The offers are submitted until the last day of the first and second semester of each calendar year. Within thirty (30) days from the end of the semester, the Minister of Environment, Energy and Climate Change announces that the area is excluded from the areas which are available as above, in case the area is on an ongoing process of concession. The offers are evaluated and among them is selected the one most advantageous to the State, following negotiations with the interested parties and based on the selection criteria of the open invitation. The deadline for submission of offers is specified in the call for tenders and cannot be less than ninety (90) days from the day of last publication.

At present, the interest is focused on the case (c), since the country disposes a considerable number of areas that meet the above criteria and is believed that the adoption of this procedure will accelerate the processes and restart of the exploration activities very soon.

4.1.1 The background of the exploration activities in Greece

Exploration activities for Hydrocarbons in Greece date back to the early 20th century, with the first drilling operations, carried out by international Oil Companies namely: London Oil Development, HELLIS, PAN-ISRAEL, DEILMAN-ILIO in the areas Elos, Keri in Zakynthos, in North-West Peloponnese and Evros Thrace.

In 1960 begins a more systematic effort by the former Ministry of Industry with the aid of IGME (the Institute of Geology and Mineral Exploration) and the French Petroleum Institute (IFP) as its consultant. Extensive geological surveys were out, in particular in continental Greece and 17 shallow wells were drilled. Contemporaneously, major oil companies obtained concessions, namely BP (in Etoloakarnania), ESSO (in NW Peloponnese, Zakynthos, Paxoi), HUNT (Thessalonica), TEXACO (in Thermaikos golf), CHEVRON (in Lemnos), ANSCHUTZ (in Thessalonica - Epanomi) and OCEANIC - COLORADO (in the Thracian Sea), when more than 40 wells were drilled on land and sea. Most of these wells drilled geological targets with promising indications of hydrocarbons and contributed to the enrichment of the geological knowledge and to the strengthening of the belief for the oil potential of the country. The results, of these activities, was the discovery of the first exploitable reserves in the offshore of Thasos (Oil field of Prinos and the natural gas field of South Kavalla 1971-1974).

In 1975 the Public Petroleum Corporation (D.E.P. S.A.) is founded and in the Greek parliament approved the first Law 468/76 concerning the exploration and production of hydrocarbons.

In 1985, DEP EKY S.A. is founded as a subsidiary of D.E.P. S.A. and assumed the National upstream sector as well as the licensing procedures.

In 1995, the Law 2289/95 is voted which incorporated the relevant EU directive 94/22/EE. During that period 24 exploration and production concessions in areas on land and sea without competition were granted by the Greek State to DEP S.A and DEP EKY S.A which in their turn performed 73.000 km 2D seismic, 2.500 km^3 3D seismic and 73 exploration wells based on the results of seismic surveys.

The result of the above exploration activity was the discovery of the offshore oil field in Katakolo western Greece and the natural gas filed in Epanomi –

Thessalonica, as well as interesting concentrations of biogenic gas. The geological knowledge of these areas was strengthened, the evaluation of areas of interest became systematic and the collection and creation of an extensive database of the exploration data consist of a serious base for new ventures.

In 1996, the first international contract of concessions for six areas took place, as shown in (Figure 17.) and four areas in Western Greece were finally granted:

NW Peloponnese and Aitoloakarnania to the company Triton and Ioannina and Western Patras Gulf to the company Enterprise Oil. 85 million € were invested in seismic surveys and drillings. The exploration was not successful but is to be mentioned that the executed wells did not reach the scheduled depths according to the initial agreement for the areas of Western Patras and Aitolokarnania.

The concession of Ioannina area the abandonment of the deep drilling (4.000 m) due to serious technical problems by the company Enterprise Oil and in the concession of Western Patras Gulf, was the planned drilling was not performed resulted to the withdrawal of the involved companies. The companies withdrew in 2000- 2001 (letter of credit $ 8 million deducted).

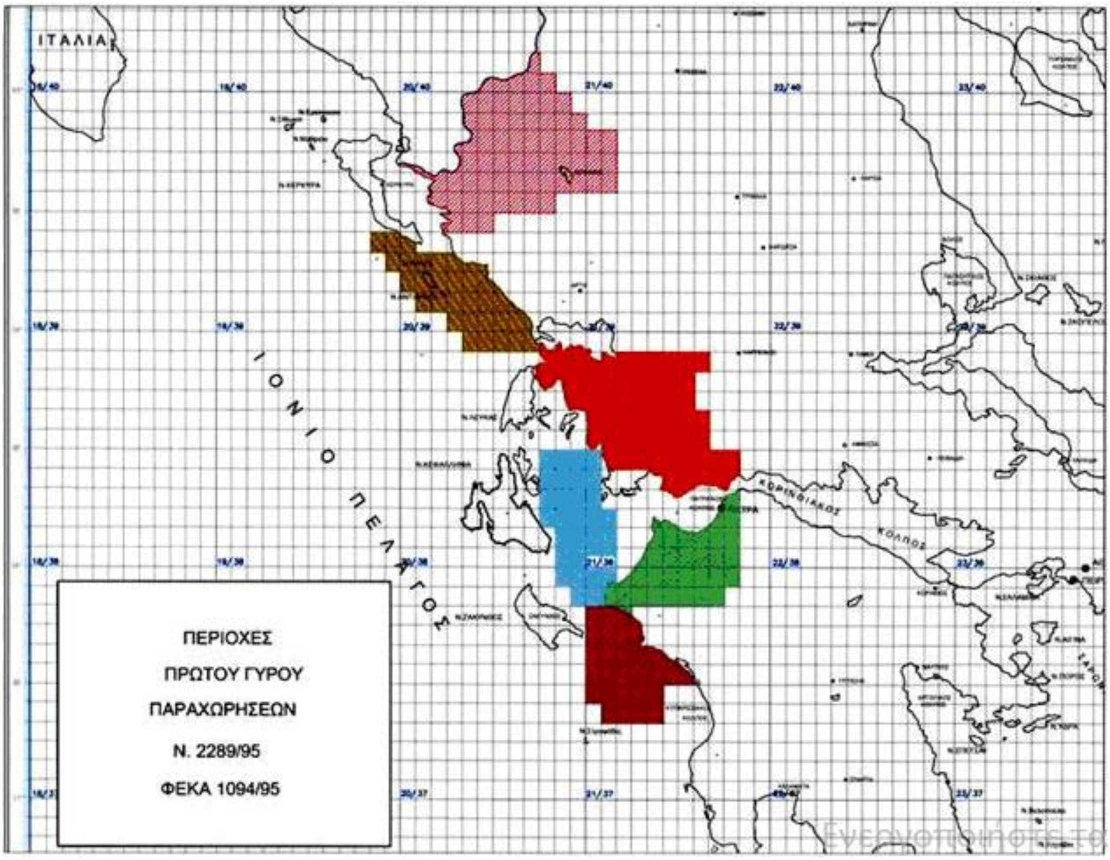


Figure 17: Areas of the first round of concessions according to the Law 2289/95

In 2007, with an amendment of the Law 3587/2007 (article 20), the Greek State withdrew all the concessions offered to DEP/DEP-EKY/ELPE {after the privatization of DEP EKY and the change of the shareholder composition of the ELPE SA (Hellenic Petroleum SA)} which (concessions) return to YPEKA (Ministry of Environment and Climatic Change) except those in which ELPE SA participates in the wider area of Prinos.

The concessions that returned to the State are shown in Figure 18.

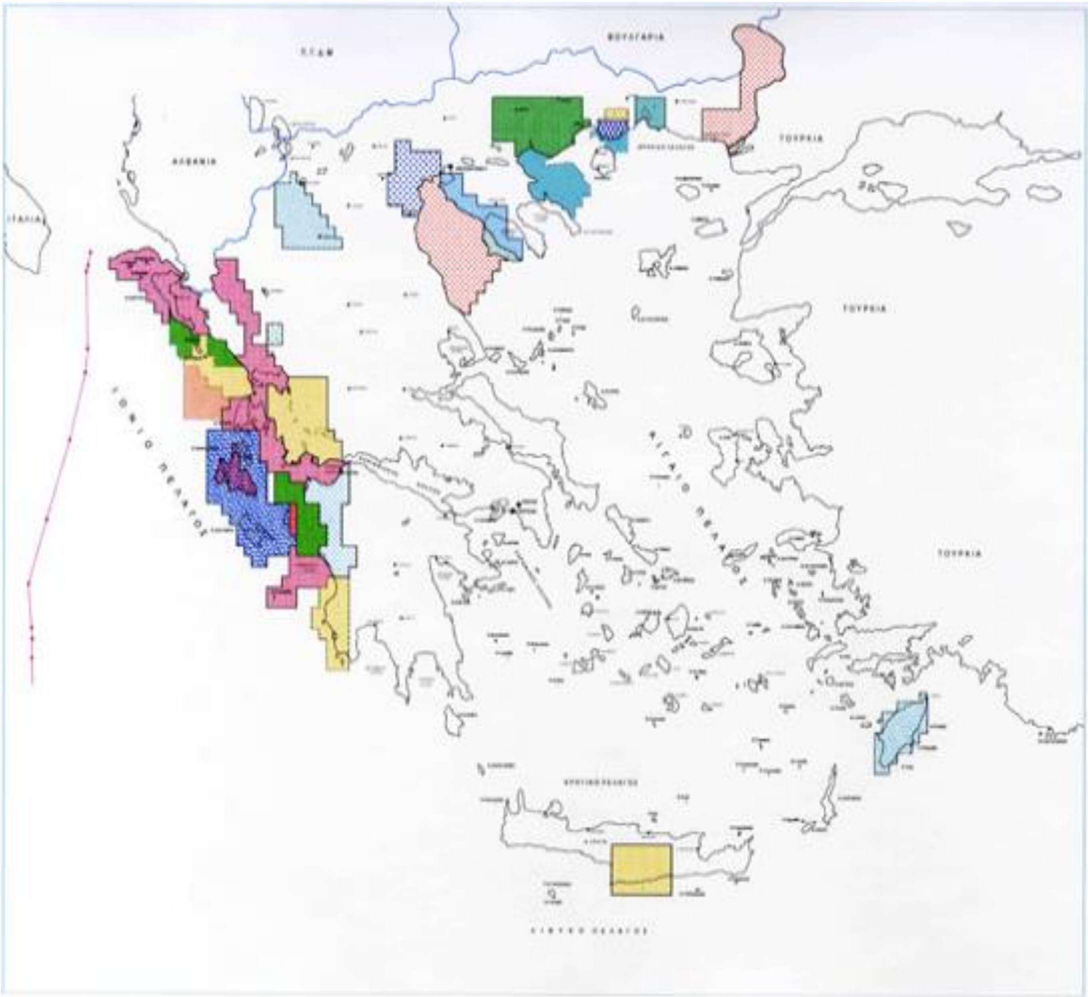


Figure 18: Concessions to DEP/DEP-EKY/ELPE that were withdrawn according to the Law 3587/2007 (Article 20)

4.1.2Active lease agreements in Greece

4.1.2.1 Onshore blocks

- **The Block of Aitoloakarnania**

Licencees: REPSOL: 60% (operator under the approval process)
ENERGEAN OIL&GAS: 40%

Aitoloakarnania is a large underexplored block of 4,360 km^2. Onshore Western Greece is part of the same petroleum system, commonly referred to as the Ionian "Basin" or "Zone". On a regional scale, the area may also be considered to be the southern-most extension of the greater peri-Adriatic basin, which is proven productive for oil and gas in Albania, Italy, and Croatia.

Over 10 billion barrels of oil and 30 trillion cubic feet of gas have been discovered in place associated with the hydrocarbon systems throughout this area. Moreover, Jurassic oil recovered on Paxi Island.

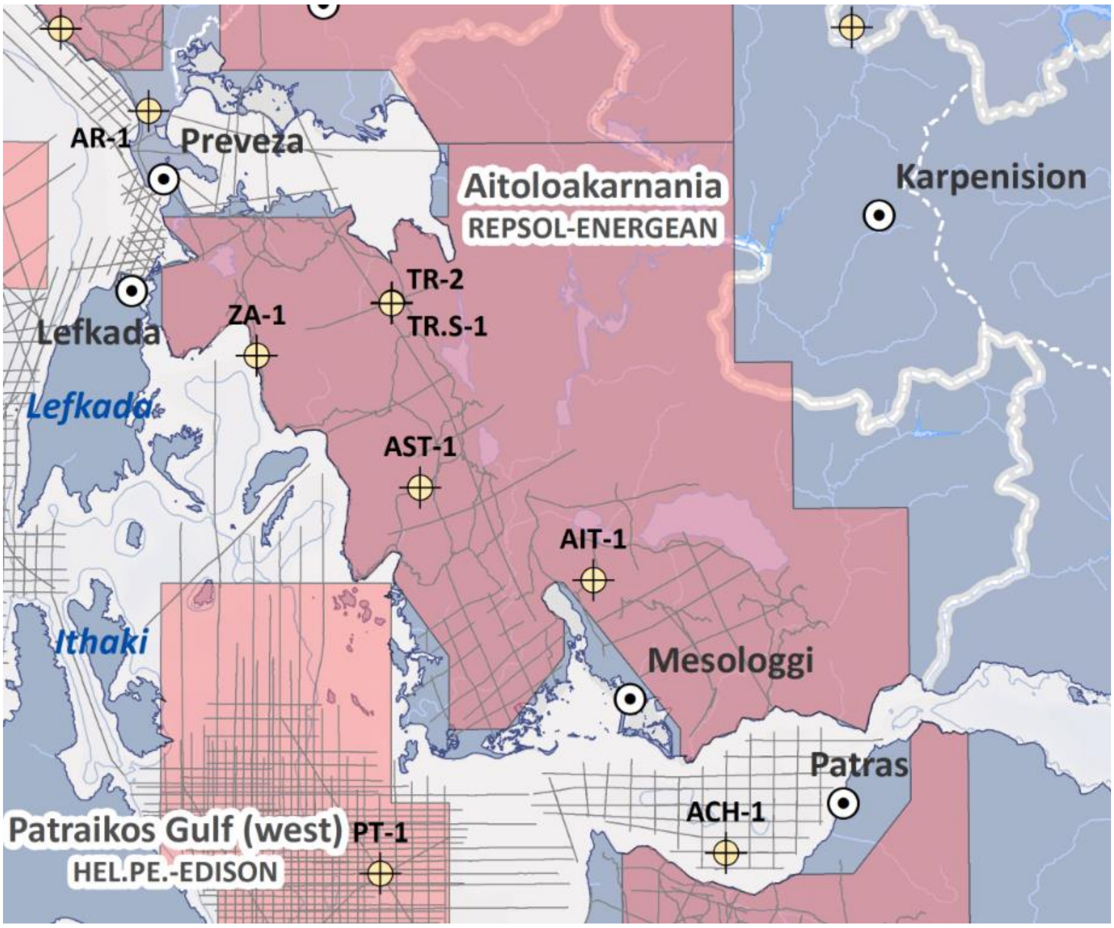


Figure19. Block of Aitoloakarnania

- **Ioannina Lease block**

Licencees: REPSOL: 60% (operator)
ENERGEAN OIL&GAS: 40%

The block is an under explored (less than 1500 Km 2D seismic and only one well drilled during the last 25 years) area of 4,187 km^2. Western Greece is part of the same petroleum system(s), commonly referred to as the Ionian "Basin" or "Zone". On a regional scale, the area may also be considered to be the southern-most extension of the greater peri-Adriatic Basin, which is proven productive for oil and gas in Albania, Italy, and Croatia. Over 10 billion barrels of oil and 30 trillion cubic feet of gas have been discovered in place associated with the hydrocarbon systems throughout this area.

The proven, productive oil play(s) of the Ionian Basin onshore Albania extend south into the Energean Ioannina Block, where they remain substantially underexplored. It should be noted that Royal Dutch Shell has acquired the neighboring “Block 4” in Albania. Significant potential can be demonstrated in the “classic” thrust Mesozoic carbonates play productive in Albania, and in the Apulian sub-thrust play similar to onshore Southern Italy. Robust oil seeps have also been well documented throughout the block area. These seeps have been typed to the known source rocks.

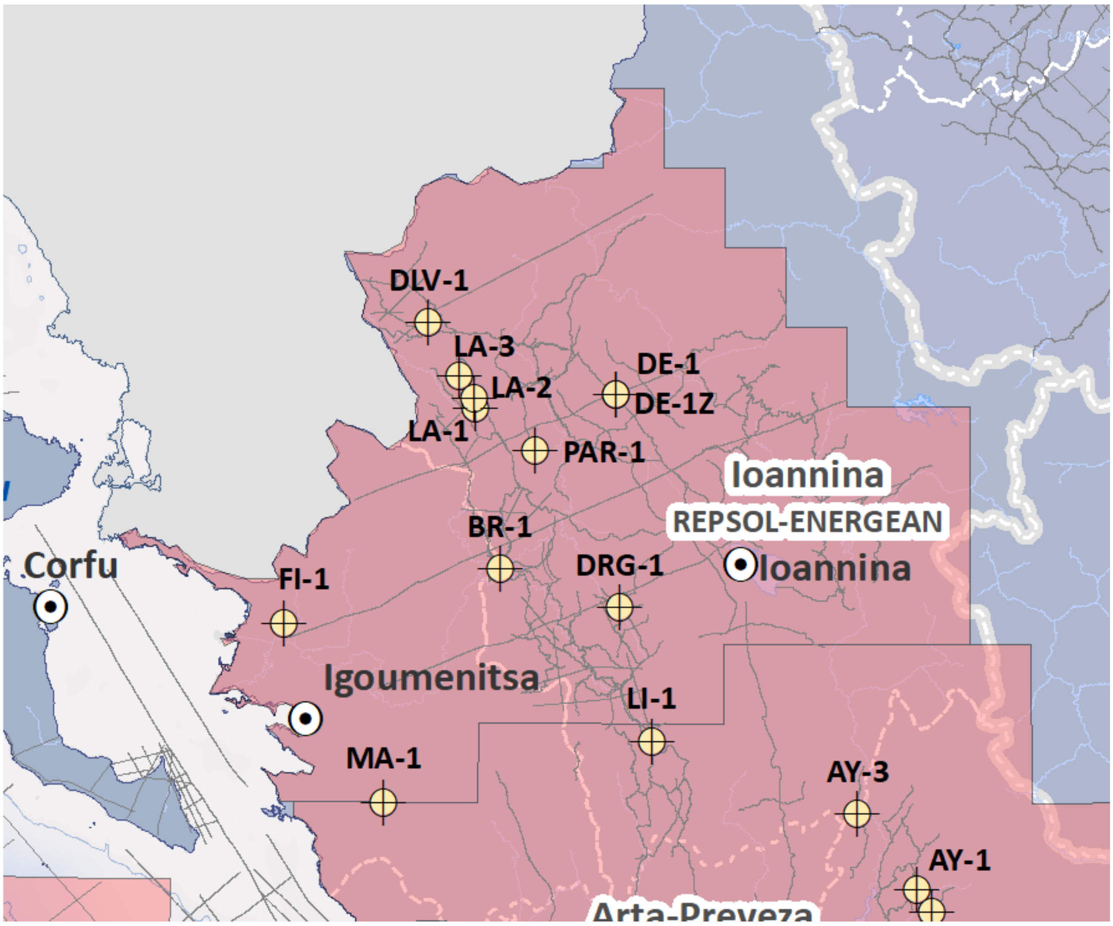


Figure 20. Ioannina block

- **Arta-Preveza Block**

Licencees: HELLENIC PETROLEUM: 100%

The "Arta-Preveza" block lies in the Epirus region, located in North Western Greece, covering an area of 4,762.9 km2. The area is bordered at the north by the “Ioannina Block” partly by the Amvrakikos Gulf to the south, the Ionian Sea to the west and to the southern Pindos Mountain Range to the east. The block includes two important rivers, the Louros and the Arachthos creating the artificial Lakes of Pournari and Louros, respectively.

Western Greece comprises the sedimentary sequence lying west of the Pindos Mountains and includes the mainland sector (Epirus, Aitoloakarnania and Western Peloponnese) and offshore areas in the Ionian Sea. The Eastern limit of the area is represented by Pindos overthrust, whose NNW-SSE trends can be followed northward by the Dinarides and Southeastward into Turkey.

From Triassic to Late Cretaceous, Greece constituted part of the Southern Tethys margin. At a regional scale (hundreds of kilometers), the Alpine belt can be considered as the margin of the Tethys Ocean, inverted by the collision of the Apulian block with Europe. On a smaller scale (tens of kilometers), in the Hellenic realm, the various sub-basins of the Tethyan margin have been inverted to produce the main thrust sheets or folded zones, known as the Hellenides. This occurred progressively from the inner (eastern) zones to the more external (western) zones.

The most external zones of the Hellenides, Paxi, Ionian, and Gavrovo, are included in the geological setting of Western Greece. They were formed during the early Jurassic period, when crustal extension differentiated the Southern Tethys passive margin creating the Ionian basin and the shallow water platforms, Gavrovo to the East and Paxi to the West.

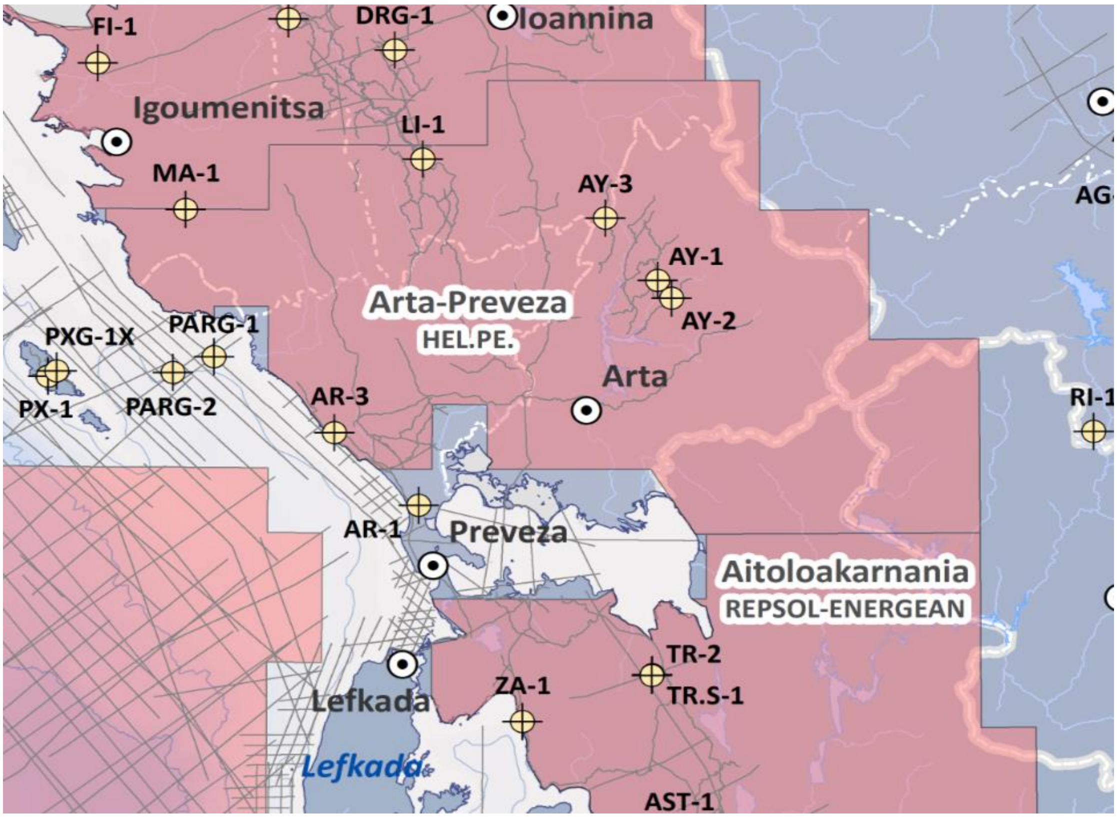


Figure 21. Arta-Prevaza Block

- **NW Peloponnese Block**

Licencees: HELLENIC PETROLEUM 100%

The Block contains protected coastal lagoons (Kotychi and Kalogria) and low elevation marshy areas mainly to the W–NW of the area (3,778.3 km2). Main rivers included are the Peiros to the north, Pineus in the central area and the Alpheus to the south. The mountain of Skolis (960m) forms an abrupt and prominent feature to the northwest of the contract area. The NW Peloponnese is part of the western Hellenides thrust fault belt, which runs parallel to the coast of western Greece. Skolis mountain represents the tectonic boundary between the Ionian and Gavrovo zones and is a perfect example of compressional tectonics in a thrust fault belt. It gives the opportunity to study the structure and relationship between the Gavrovo and Ionian zones.

From a structural and geological point of view, this area is characterized by the presence of Pindos, Gavrovo, and Ionian tectonostratigraphic units. The two main relevant geotectonic zones, in terms of hydrocarbon potential in this block, are, moving westward, Gavrovo and Ionian Zones, related to an N-S trending fold and thrust belt system that, especially for the Ionian area, produce oil and gas fields both in Albania and Peloponnese offshore.

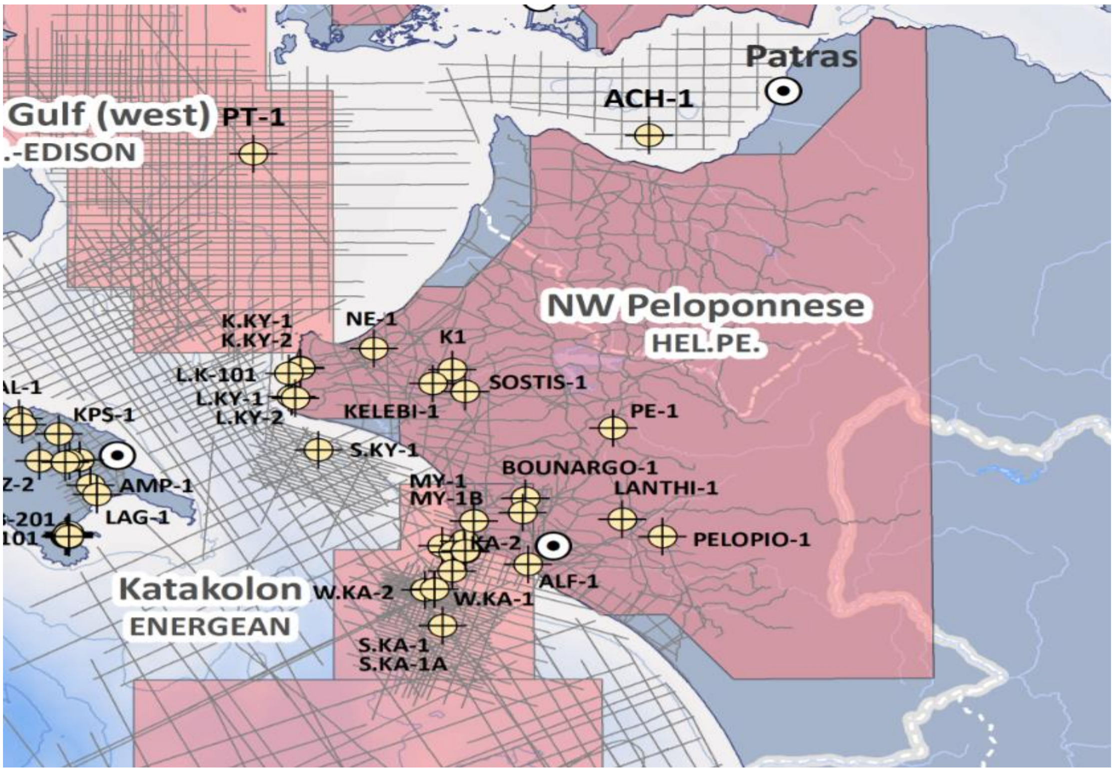


Figure 22. NW Peloponnese Block

4.1.2.2 Offshore Blocks

- **Katakolon Lease**

Licencees: ENERGEAN OIL&GAS: 100%

Katakolo off-shore area (545 km2) in western Peloponnese comprises the only area in western Greece (Ionian zone) with a proven oil/gas-field discovery. The discovery dates back to the early 80s where recoverable reserves were estimated at 3 million barrels of oil. Limestones of Cretaceous-Eocene age, part of the Ionian zone, form an anticline structure with reservoir rock, unconformably overlain by Neogene sediments.

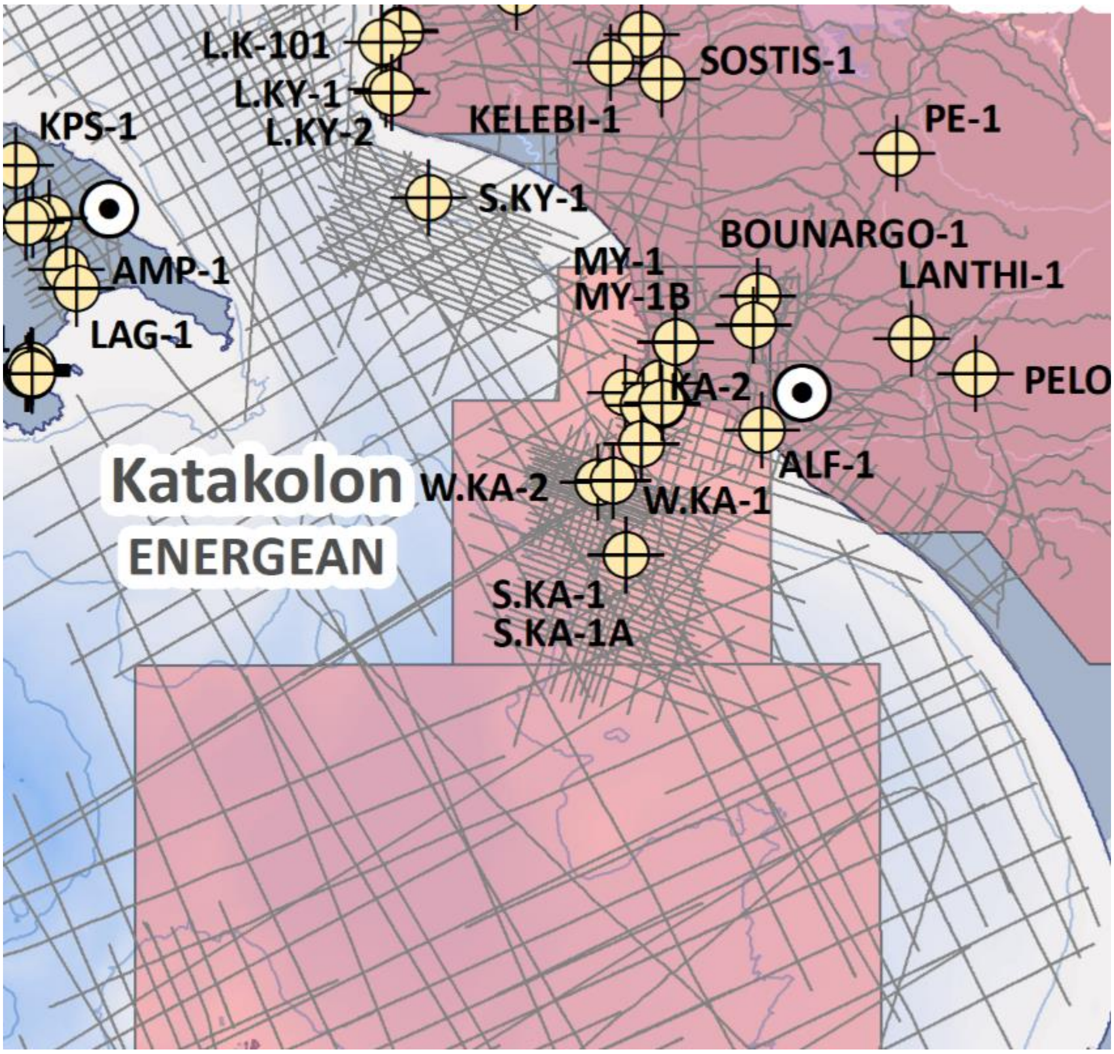


Figure 23. Katakolon Block

- **Patraikos Gulf (west) Block**

Licencees: HELLENIC PETROLEUM: 50% (operator) | EDISON: 50%

- **Sea of Thrace Concession**

Licencees: CALFRAC WELL SERVICES 75% (operator)
HELLENIC PETROLEUM 25%"

- **West of Crete Block**

Licencees: TOTAL-EXXON MOBIL-HEL.PE. (preferred bidder)

Forearc basins result from plate convergence. These basins are situated offshore between an outer-arc high and the mainland (20,058.4 km2). These regions have not been considered important petroleum provinces, partly because of low heat flow may limit thermal hydrocarbon generation. The Backstop area west of Crete bounded to the east by the Hellenides thrust-and-fold belt (Hellenides TFB) and to the west by the Mediterranean Ridge presents similar settings with the Apulian platform to the North, which is also bounded by the Hellenides TFB and the Calabrian prism to the east and the west respectively.

The area does not have conventional forearc geometry and it is covered by a thick salt blanket that conceals an older mountain chain. This chain of limestones and clastic rocks is characterized by many highs. Some of these highs probably underwent subaerial exposure or developed Mesozoic pre-salt build-ups. In some cases, the post-Messinian-salt sediments could also act as reservoirs, a petroleum model that was studied and tested in other forearc settings.

Multichannel seismic data, acquired in 2012, exhibit bright spots in these carbonate build-ups probably associated with gas-bearing sediments. Amplitude versus offset analyses will be necessary for gas exploration, while modeling will help in evaluating thermal hydrocarbon generation. Heat flow ranges between 40 and 60 milliWatts per sq. m. (mW/m2). Paleozoic mudstones and shallow-marine carbonates, Cretaceous shales and Neogene sapropels and mudstones are three possible source rocks where oil and gas generation is possible within the main depocenters of the basin where deep burial (>5 km) can compensate for low heat flow.

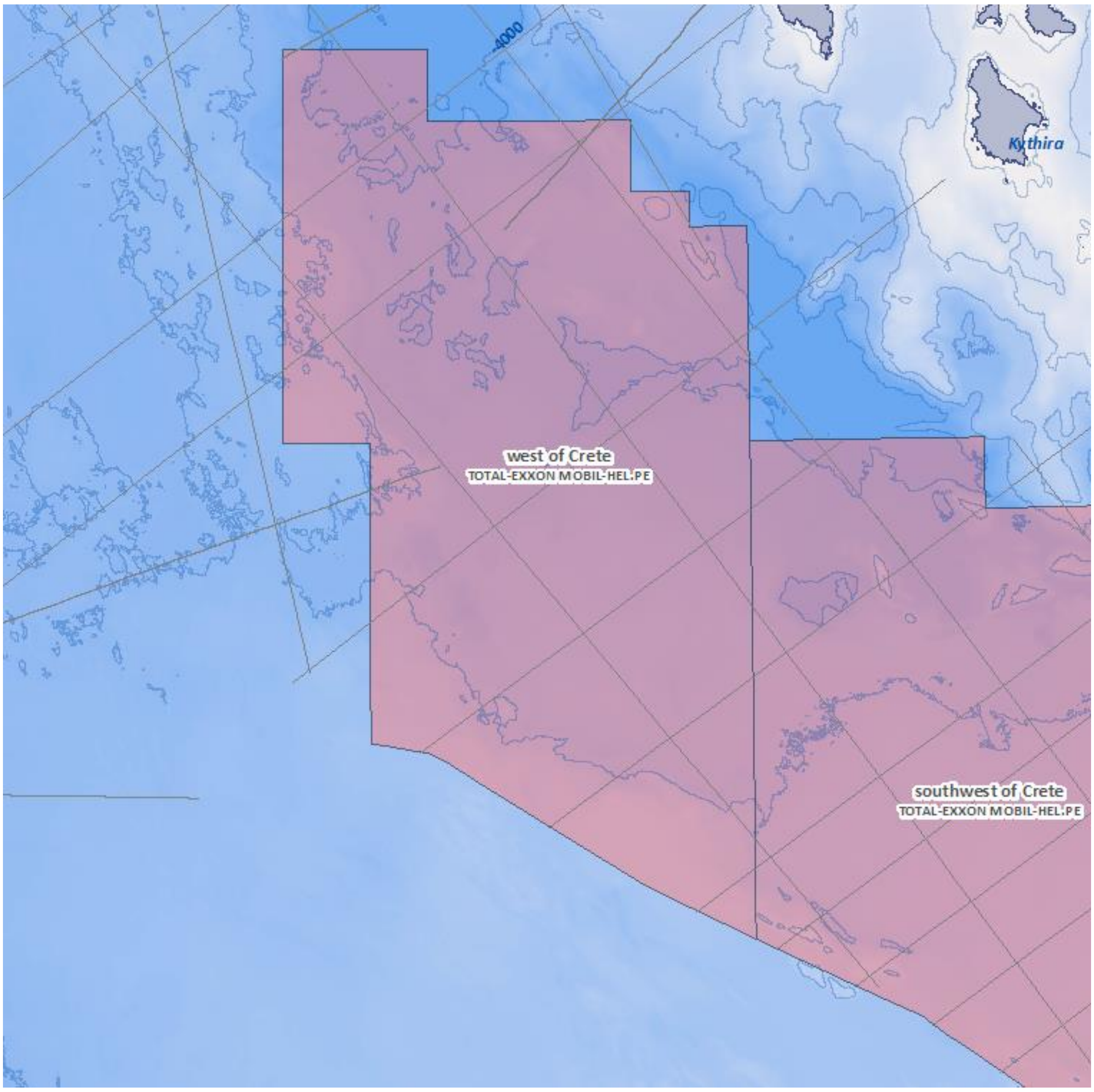


Figure 24. West of Crete Block

- **Southwest of Crete Block**

Licencees: TOTAL-EXXON MOBIL-HEL.PE. (preferred bidder)

Forearc basins result from plate convergence. These basins are situated offshore between an outer-arc high and the mainland (19,868.37 km2). These regions have not been considered important petroleum provinces, partly because low heat flow may limit thermal hydrocarbon generation. The Backstop area west of Crete bounded to the east by the Hellenides thrust-and-fold belt (Hellenides TFB) and to the west by the Mediterranean Ridge presents similar settings with the Apulian platform to the North, which is also bounded by the Hellenides TFB and the Calabrian prism to the east and the west respectively.

The area does not have conventional forearc geometry and it is covered by a thick salt blanket that conceals an older mountain chain. This chain of limestones and clastic rocks is characterized by many highs. Some of these highs probably underwent subaerial exposure or developed Mesozoic pre-salt build-ups. In some cases, the post-Messinian-salt sediments could also act as reservoirs, a petroleum model that was studied and tested in other forearc settings.

Multichannel seismic data, acquired in 2012, exhibit bright spots in these carbonate build-ups probably associated with gas-bearing sediments. Amplitude versus offset analyses will be necessary for gas exploration, while modeling will help in evaluating thermal hydrocarbon generation. Heat flow ranges between 40 and 60 milliWatts per sq. m. (mW/m2). Paleozoic mudstones and shallow-marine carbonates, Cretaceous shales and Neogene sapropels and mudstones are three possible source rocks where oil and gas generation is possible within the main depocenters of the basin where deep burial (>5 km) can compensate for low heat flow.

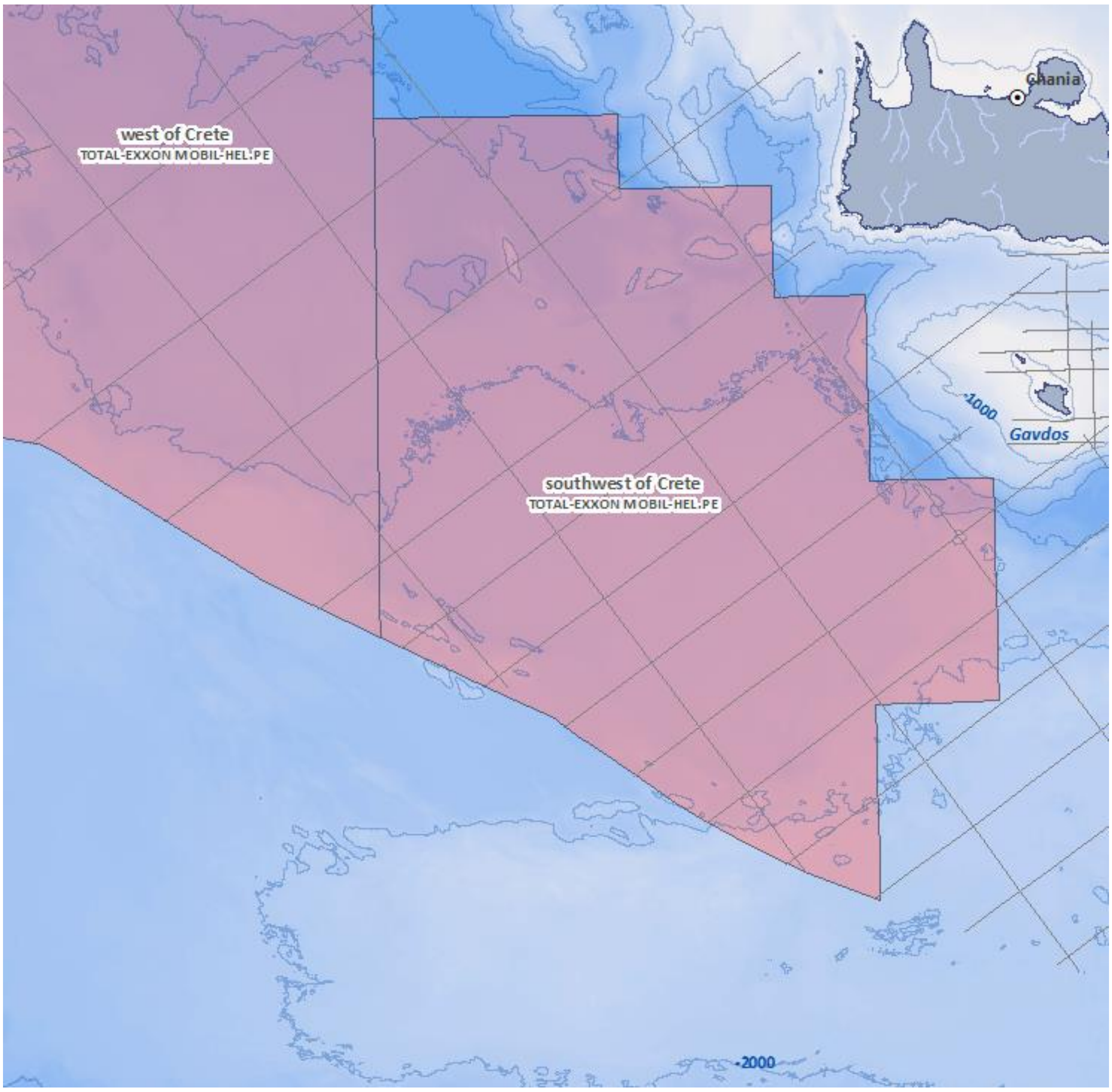


Figure 25. Southwest of Crete Block

- **Block 1 Ionian sea**

Licencees: HELLENIC PETROLEUM (preferred bidder)

The western part of the Block 1 (1,801.7 km2), which belongs to the pre-Apulian zone is covered by a network of legacy data and portions of new PGS lines whose total length is about 125km. The eastern part belongs to the Ionian zone and is covered by a very dense network of 2D seismic lines recorded in the early ’80s, belonging to different vintages with different acquisition parameters and processed to different stages. Since the block belongs to two geological zones, the geological studies should cover both all aspects of the limestone platform geology as well as the overtrust complex tectonic regime.

Some legacy seismic data (about 2.000km) were acquired in 1979-1980, using Maxipulse as an energy source, which provides high-frequency data in the shallow parts but not great penetration of energy into the deeper horizons. About 1.000km of seismic lines were recorded in 1982 using Airgun energy source that provided a more narrow frequency spectrum, but better penetration.

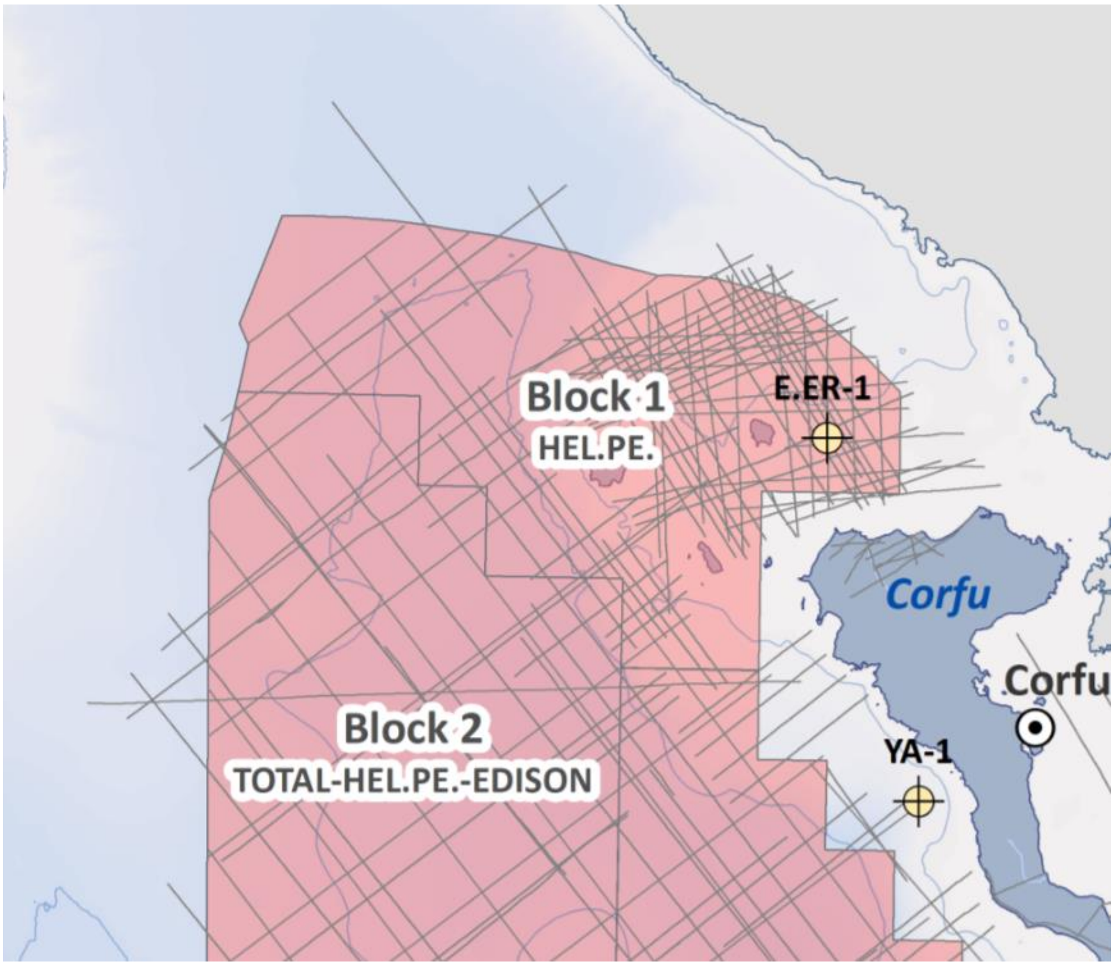


Figure 26. Block 1 Ionian sea

- **Block 2 Ionian sea**

Licencees: TOTAL: 50% (operator)
EDISON: 25%
HELLENIC PETROLEUM: 25%

The offshore Greece Block 2 is located 30 kilometers west of Corfu Island (2,422.1 km2). Its western boundary is adjacent to the Greek - Italian border. Water depth is ranging from 800 to 1200m from West to East of the block. This block belongs to the Apulian platform geological unit.

The Western Greece area is a largely sub-explored region, where the few drilled wells are located in the coastal areas and on the narrow continental shelf. The onshore area is characterized by a great number of surface oil seeps and several hydrocarbon indications can be seen at most of the wells. However, at present, only one proven hydrocarbon accumulation (sub-commercial) was identified at the West Katakolon field (offshore, close to the coast). The lack of extensive exploration together with the existence of a proven petroleum system generates a clear interest in the region.

The North Ionian Sea area is dominated by the most external zones of the Hellenic fold-and-thrust belt and its foreland the Apulia platform. The Hellenides belong to the Alpine orogenic system which comprises the Hellenides in Greece, the Dinarides – Albanides in the Eastern Adriatic and the Apennines in Italy. In the Adriatic area, the system consists of intensively deformed thrust sheets verging towards the stable Adriatic or Apulia foreland.

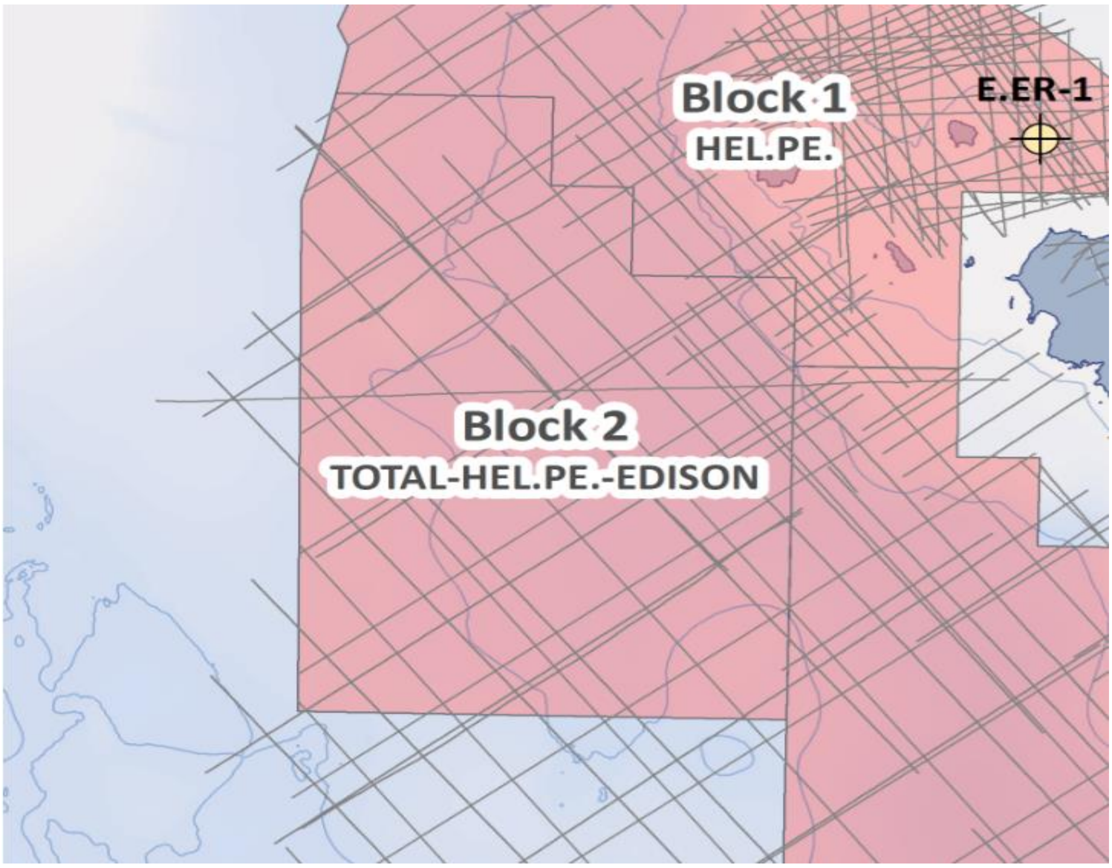


Figure 27. Block 2 Ionian sea

- **Block 10 Ionian sea**

Licencees: HELLENIC PETROLEUM (preferred bidder)

Block 10 is located in the offshore Western Peloponnese, specifically within the Kyparissiakos Gulf, lying between Strofades islets and Peloponnese (3,420.6 km^2). The hydrocarbon shows in the area attracted the interest of oil companies and the Hellenic Government in 1938 and several shallow wells were drilled before the 2nd World War. During the next years, several seismic campaigns of poor quality were acquired, as well as geological and geophysical studies. The old legacy seismic data have a rather dense coverage to the east, but most of the lines lie outside the borders of the block. Within the block exists a very sparse network of legacy seismic lines that were acquired between 1979-1982.

Western Greece belongs to the Alpine orogenic system. In particular, its southern branch includes the Apennines, the Southern Alps, the Dinarides, the Hellenides, and the Taurids, delineating the northern margin of the East Mediterranean. This mountainous chain was formed as a result of the closure of the Tethys Ocean due to the collision between the Eurasian continent in the north, with African (Apulian) plate in the south. Collision began in Late Cretaceous-Early Eocene times and continued throughout the Tertiary with westward prograding intercontinental deformation. The result of the Alpine orogenesis in the Tertiary was the so-called 'External Hellenides', representing a west verging fold-and-thrust belt consisting of NNW-SSE striking thrust sheets.

The Ionian zone is characterized by the predominance of pelagic facies for an extended time period; in particular from Middle Jurassic to early Miocene. Moreover, the Ionian zone changed its paleogeographic character from neritic to pelagic at the end of Early Jurassic, contrary to the neighbor isopic zones such as pre-Apulian and Gavrovo, which remained shallow platforms during Mesozoic. The nature of the sediments below the evaporites remains unknown so far.

Several oil and gas fields have been discovered in Albania, which belongs to the same fold-and-thrust belt having the same geological characteristics. The presence of a working petroleum system in Western Greece is proven by the discovery of West Katakolo oilfield, situated very close to the block area.

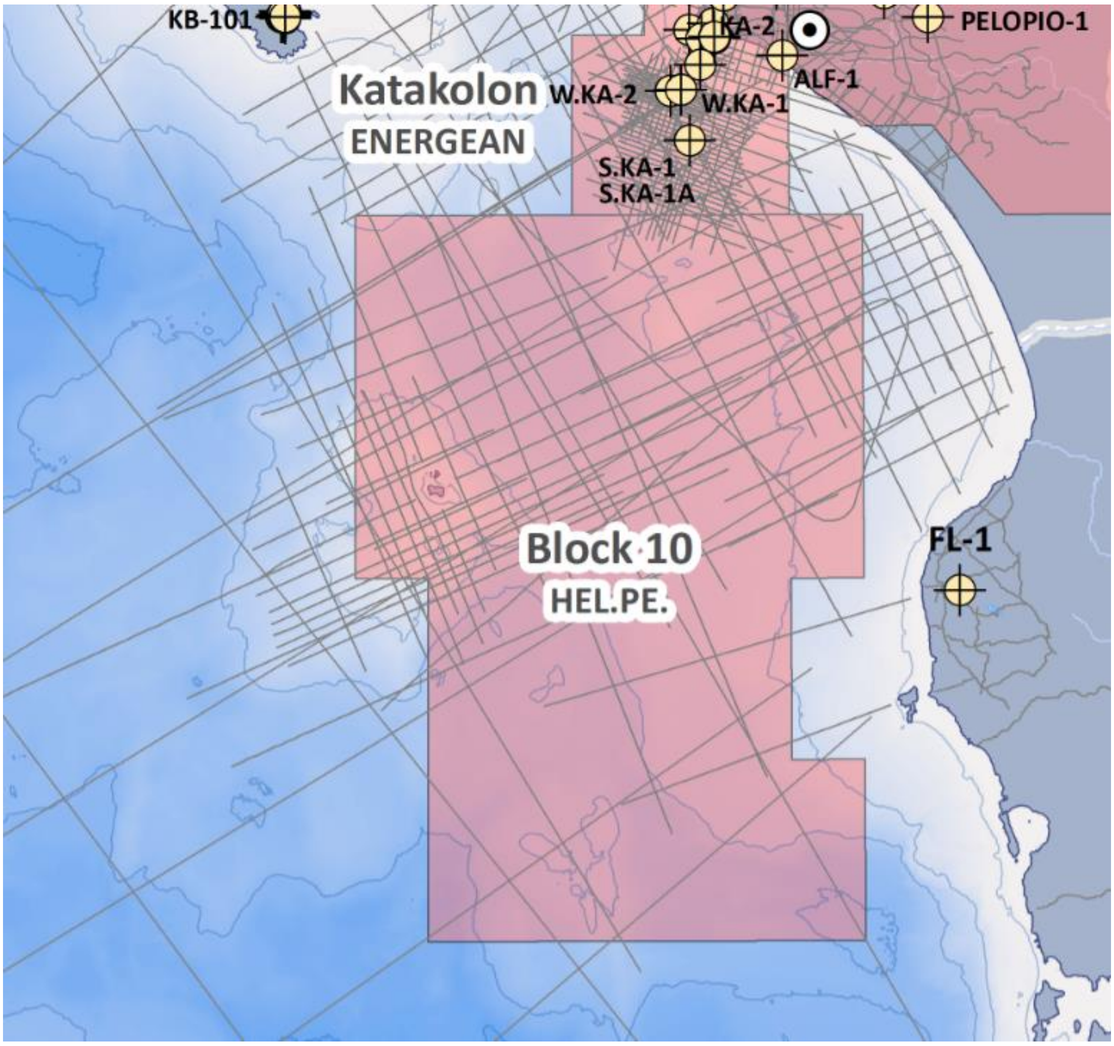


Figure 28. Block 10 Ionion sea

- **Ionian Block**

Licencees: REPSOL (50%)-HEL.PE. (50%) (Preferred bidder)

The northwest Ionian Sea (6,671.136 km2) is subdivided into three distinct geological areas; to the east, the external parts of the Hellenides thrust-and-fold belt (Hellenides TFB) the central area of the south Adriatic basin, and to the west the Apulian carbonate platform. The Ionian Block lies over the central and western areas of the northwest Ionian Sea. Only its eastern border is covered by thrusts.

The south Adriatic basin is a transition between the Apulian platform and the deep-water basin in front of the Hellenides TFB. The main reservoirs in this area include shallow-water bioclastic carbonate build-ups along the platform edge, redeposited carbonates (calciturbidites) along the base of the platform slope and Oligocene-Miocene sandy layers belonging to the flysch series deposited at the front of the main Hellenides thrusts. The Messinian evaporites, where present, along with the mudstone beds (marls, clays, and shales) of the flysch deposits and the Pliocene shales seal the reservoirs in this area.

The western parts belong to the Apulian shallow-water carbonate platform. The reservoirs in this area are karstified carbonate rocks, sealed by the argillaceous Pliocene deposits.

The hydrocarbon charge in this area is characterized by the proven hydrocarbon generation from Late Triassic source rocks (sabkha or lagoonal environments), Early Liassic intra-platform basin deposits and lacustrine organic-rich facies offshore Apulian platform deposited during the Turonian unconformity event. The oil and gas discoveries offshore Albania and Italy are valid indicators of a working petroleum system in the northwest Ionian Sea.

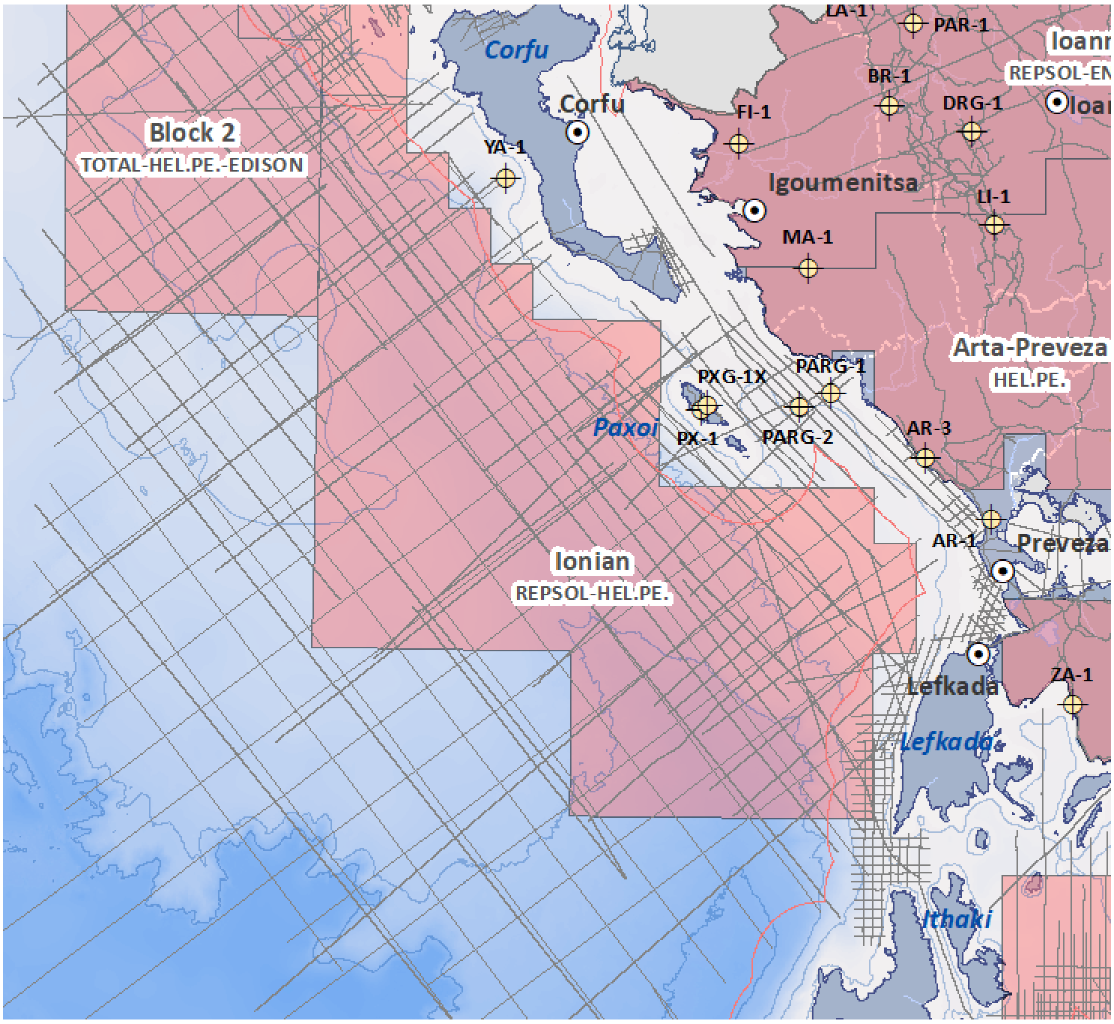


Figure 29. Ionian Block

4.2 Definition of EEZ in the Republic of Cyprus

The geostrategic position of Cyprus has played a major role in shaping its history and contributed to its modern emergence as a key business hub in the Eastern Mediterranean. Cyprus has provided the catalyst for investments and services between Europe, Africa, and Asia by developing one of the most secure, stable and attractive business environments in the region. By adopting EU standards (as a full European member since 2004) and creating an advanced telecommunications network, infrastructure, and investment-friendly tax regime, Cyprus became a highly reputable international shipping center, ranking among leading maritime nations in the world.

The definition and delimitation of the Republic of Cyprus Exclusive Economic Zone (EEZ) have been progressed through the following key activities:

- 1988: Cyprus ratified the United Nations Convention on the Law of the Sea (UNCLOS) which defines "the rights and responsibilities of states in their use of the world's oceans, establishing guidelines for business, the environment and the management of marine natural resources and regulating the territorial waters, contiguous zones and exclusive economic zones (EEZ) of states".
- 2003: Delimitation Agreement of the EEZ with the Arab Republic of Egypt ratified in 2004.
- 2004: Cyprus passed a Law defining and regulating its EEZ. "Law to provide for the Proclamation of the Exclusive Economic Zone by the Republic of Cyprus" (the "EEZ Law").
- 2007: Delimitation Agreement of the EEZ with the Republic of Lebanon.
- 2010: Delimitation Agreement of the EEZ with the State of Israel ratified in 2011.
- 2013: Common utilization Agreement with the Arab Republic of Egypt.

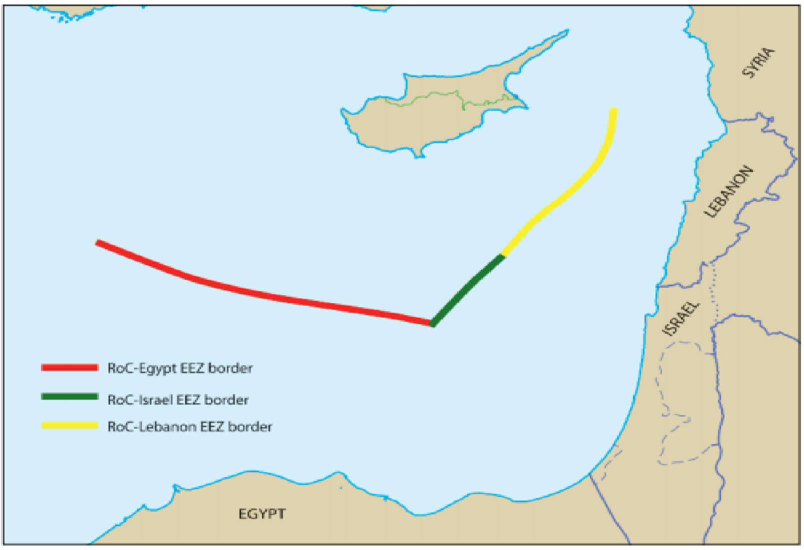


Figure 30. RoC's EEZ boundaries as agreed with Egypt, Lebanon, and Israel.

4.2.1 Oil and Gas Activities in the Cypriot EEZ

Recent Oil & Gas activities in the Eastern Mediterranean have revealed the possibility of significant hydrocarbons reserves in the area and also within Cyprus EEZ. With Egypt and Israel already established as hydrocarbons producers, Cyprus is in the process of fully exploiting its hydrocarbons potential and contributing to regional and European energy security.

- 2007: The Government of Cyprus proceeded with its first licensing round for eleven offshore blocks.
- 2008: Awarded one Hydrocarbon Exploration License to Noble Energy International LTD for offshore block 12.
- 2011: Exploration well drill by Noble in Block 12 leads to the discovery of the Aphrodite field with contingent reserves estimated between 5-8 tcf (trillion cubic feet).
- 2012: The Government of Cyprus proceeded with its second licensing round consisting of 12 offshore blocks.
- 2013: Total awarded two Hydrocarbon Exploration Licenses for offshore blocks 10 and 11.
- 2013: Appraisal well drilled by Noble and Delek group on Aphrodite field confirms discovery of contingent reserves between 3.6 – 6 tcf.
- 2016: BG Group (now part of Shell) joins the Block 12 Licence with a 35% shareholding
- 2016: The Government of Cyprus proceeds with its third licensing round consisting of 3 offshore blocks.
- 2017: The Government of Cyprus awards licenses for all three blocks on offer in the 3rd licensing round; ENI International and Total in Block 6,
- ENI International for Block 8, and ExxonMobil and Qatar Petroleum for Block 10.

4.2.2 Exploration offshore Cyprus

In 2006 the Republic of Cyprus (RoC) began prospecting for hydrocarbons in an exploration area of 51,000 sq km offshore Cyprus. The exploration area, divided into 13 blocks (see Figure 1.), is only part of the total Exclusive Economic Zone (EEZ) proclaimed by the RoC. Two-dimensional (2D) surveys were conducted in March to May 2006 in all 13 blocks and three-dimensional (3D) surveys were conducted in January–March 2007 Block 3. Having already signed in February 2003 an Exclusive Economic Zone (EEZ) delineation agreement with Egypt, the RoC also made a similar agreement with Lebanon in January 2007. In February 2007 and based on the available seismic data, the RoC launched its first international tender for three-year oil and gas exploration licences. In this round 11 of the 13 blocks were offered (Blocks 3 and 13 were excluded). At that time, there were only three bids, and just one company, Noble Energy, was awarded a licence

in Block 12. A production-sharing contract was signed with Noble in October 2008. After further seismic surveys, and an EEZ agreement signed with Israel in December 2010, the first exploratory drilling began on 20 September 2011. In December 2011, Noble announced that it had discovered an estimated 5 to 8 tcf' with a gross mean of 7 tcf'(198 bcm) in the field known as Aphrodite. Noble's partner, Delek, which as a company listed on the Tel Aviv Stock Exchange is obliged to use different methods for estimation, estimated the reserves a little lower at 5.2 tcf (147 bcm).

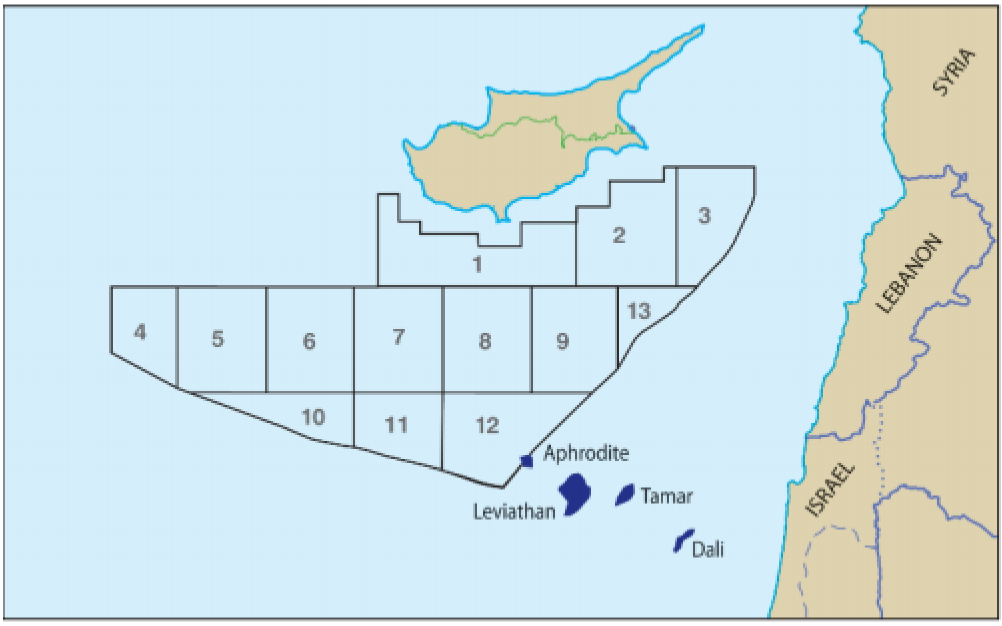


Figure 31. The RoC's present offshore exploration area and its proximity in the south-east to the gas fields discovered by Israel. [Source: Petroleum Geo-Services(PGS)]

The discovery in Block 12, together with the large finds in the neighboring Israeli Leviathan block, significantly raised interest for the second Cyprus offshore licensing round, launched on 11 February 2012. Despite protestations from Turkey, the round had attracted 15 bidders by the bid deadline of 11 May 2012, comprising individual companies and consortia, and included a handful of large oil and gas companies such as Total of France, ENI of Italy, Gazprombank of Russia, Petronas of Malaysia and Kogas of South Korea. The main interest was in Block 9, adjacent to Block 12, and Block 2, adjacent to Block 9. The successful bidders for Blocks 2, 3, 9 and 11were announced at the end of October 2012. ENI and Kogas were initially invited to negotiate a contract for Blocks 2 and 3, Total and Novatek for Block 9 and Total by itself for Block 11. Talks with Total and Novatek over Block 9 were subsequently terminated and the government started negotiations for that block with the ENI-Kogas consortium instead. At the same time, it started talks with Total for Block 10 with Total alone. Two points are worth noting in this regard. First, absent from the list of successful bidders were the five blocks which Turkey claims partly fall within its continental shelf, although bids were reportedly also received for some of these blocks. Second, all the companies chosen were very large oil and gas companies from countries with significant military strength. Both of these facts suggest that the RoC is, on the one hand, being cautious, by not licensing the blocks that have parts directly claimed by Turkey, but on the other hand affording itself potentially strong military protection in the other blocks where the Turkish Cypriots claim equal rights. The RoC's bolstering of ties with Israel in the past two years can also be seen in this light. Israel is both a potential partner for the export of gas but also currently has poor relations with Turkey.

4.2.3 Offshore lease blocks area of Cyprus

The development of the oil & gas sector in Cyprus continues. The recent discoveries of hydrocarbons within Cyprus EEZ and the massive discovery of the Zohr gas field in the Egyptian waters, which is very close to the Cypriot acreages, has attracted a lot of attention internationally and has created locally a lot of optimism about the future.

At present, 8 exploratory licences have been granted with corresponding PSCs entered into. The first licence was for Block 12, named Aphrodite, granted to Noble Energy in October 2008. In January 2012 Noble Energy announced a natural gas field discovery with an estimated resource range of 5 to 8 Trillion cubic feet (Tcf), revised to a range of 3.6 to 6 Tcf in October 2013. In November 2014, the estimated resources were further revised upwards by 12%. In June 2015 the Aphrodite gas field was declared commercial. Over the period, Noble Energy has farmed-out most of its participation in the gas field, retaining a stake of 35%. Noble's partners to Block 12 now include Royal Dutch Shell, and the Israeli companies Delek and Avner.

The Cypriot Government closed a second bid round on 11 May 2012 for licences for an additional 12 offshore blocks. There were 33 applications received for 9 of the 12 blocks from 15 companies or consortia (representing 29 companies in total). In January 2013, the ENI-KOGAS consortium was granted exploratory licences for Blocks 2, 3 and 9 and in February 2013 Total was granted licences for Blocks 10 and 11. Total relinquished Block 10 in February 2015.

ENI commenced exploratory drillings in September 2014 and in January 2015 in Block 9, however it was announced that no sufficient exploitable natural gas was found.

In February 2016, the Cypriot Government announced the third offshore licensing round, putting up for auction Blocks 6, 8 and 10. During 2017, exploration licenses were awarded for all three blocks and the Government entered into PSC’s with ENI & Total consortium for Block 6, ENI for Block 8, and ExxonMobil & Qatar Petroleum consortium for Block 10.

In February 2018, the ENI & Total consortium announced a preliminary natural gas discovery in Block 6. The size of the find is estimated to be between 4.8 and 8.1 Tcf, although additional studies are expected to be carried out to assess the range of the gas volumes in place.

The Government is continuing its discussions and negotiations concerning the infrastructure required for landing the gas in Cyprus and for liquefaction for export, while exploring all the alternatives for Cyprus gas exports, through collaboration with other countries in the Eastern Mediterranean region.

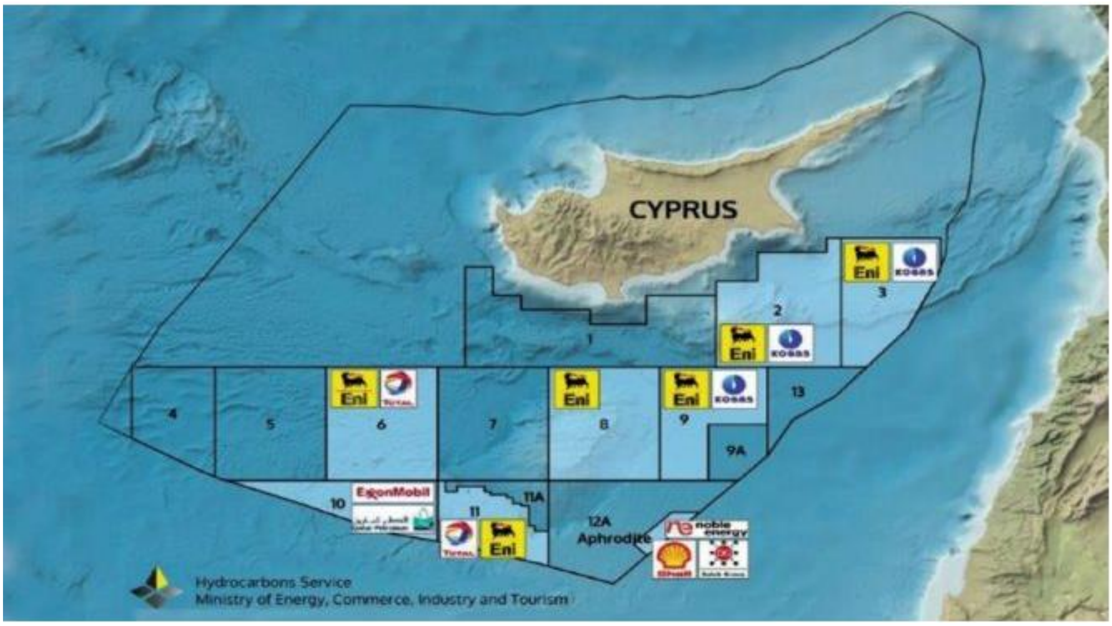


Figure 32. Map of offshore blocks of Cyprus

CHAPTER 5. Domestic needs, export options in oil and gas sector for Greece & Cyprus

5.1 The Greek Natural Gas System

The National Natural Gas Transportation System of Greece consists of:

a) three entry points for natural gas (Sidirokastro, Kipoi, Agia Triada);

b) a 512 km high-pressure trunk line of 70 bar design pressure;

c) approximately 690 km of high-pressure branch lines (under expansion in both the Peloponnese and Euboea);

d) almost 3,500 km of medium and low-pressure networks;

e) tens of metering and regulating stations, with Sidirokastro and Agia Triada stations currently being upgraded;

f) the dispatching and control center (DCC);

g) the control center and load distribution center;

h) operation and maintenance centers in Athens, Thessaloniki, Larissa, and Xanthi;

i) a modern nationwide telecommunication system, including an integrated SCADA system.

Medium pressure networks (19 bar) allow natural gas to be delivered to major industrial consumers, while low-pressure networks (4 bar) bring gas to the domestic, commercial, and small to medium industrial consumers in Greece. Medium pressure networks have been developed (and/or continue to be developed) at Alexandroupolis, Komotini, Xanthi, Kavala, Drama, Kilkis, Serres, Thessaloniki, Platy, Larissa, Volos, Lamia, Thiva (Thebes), Inofyta (Oinofyta), Halkida, and Attica; there are low-pressure networks in Komotini, Xanthi, Kilkis, Thessaloniki, Volos, Inofyta, and Athens.

The distribution system in Attica/greater Athens (the largest such system in the country) stands at an estimated 2,900 km and covers more than 193,000 households, 5,000 commercial customers, and 400 industrial customers. The system in Thessaloniki consisted of 921.5 km in mid-2009, aiming at some 1,200 km by approximately 2015. In October 2008, the National Gas System Operator (DESFA) completed the interconnection of the cities of Karditsa and Trikala with the Greek gas system at a cost of approximately €18 m, adding an additional 72 km to the network of the Gas Supply Company (EPA) in Thessaly.

Greece covers 100 percent of its natural gas requirements with imports, which it distributes to customers through three entry points connected to its transportation system, namely:

a) Sidirokastro on the Greece Bulgaria border (it is currently being upgraded)

- 28 inch, high-pressure pipeline coming from Russia through Ukraine, Moldova, and Romania.
- Sidirokastro entry point currently being upgraded to allow increased levels of natural gas imports.
- Theoretical current capacity 437 x 10^3 Nm^3/hr; ongoing upgrades to 660 × 10^3 Nm^3/hr (5.2 bcm/y).

b) Kipoi on the GreeceTurkey border.

- Since November 2007, fuel also enters the county through the interconnection of the Greek National Natural Gas Transportation System with the corresponding Turkish system (TGI connection).
- Theoretical current capacity is 856 × 10^3 Nm^3/hr (6.7 bcm/y).

c) Agia Triada, which serves as a point of entry for the neighboring Revithoussa LNG terminal.

- Theoretical capacity at Agia Triada stands at 580 × 10^3 Nm^3/hr (4.6 bcm/y) since February 2009.
- Underwater link (600 m long 24-inch diameter) connects Agia Triada to Revithoussa, its sole current supplier.
- Max Revithoussa vessel tonnage/length/draft at some 130,000 cu.m/290 m/11.8 m.
- Since June 2007 upgrades, normal regasification capacity at Revithoussa stands at approximately 1,000 Nm^3/hr (5.2 bcm/y) or 1,250 Nm^3 /hr (6.5 bcm/y)with all spare vaporizers in use
- Infrastructure includes two tanks with a combined storage capacity of some 144,000 cu.m (of which 130,000 cu.m recoverable) and a planned third tank of 90,000 cu.m capacity by end 2013 (in progress).
- Completion in early 2009 of 14.5 MW thermal/13 MW electrical co-generation unit aimed at covering own needs in operation since April 2009.

However, the real capacity of the network should be considered to be substantially lower compared to the theoretical total capacity the three points of entry (16.5 bcm/y) due to a number of restrictions. First, DESFA historical data and available Bulgartransgas information suggests that at the moment the Bulgaria–Greece connection is unable to deliver volumes exceeding the level of some 3.8 bcm/y without upgrades to the system.

Second, the activation of the link with Turkey in November 2007 has so far not allowed the system to be tested, and thus its maximum real capacity continues to be estimated by Greek authorities at only some 0.7 bcm/y – i.e. on a par with the current contractual obligations of Turkey. However, SEES estimates real capacity to stand closer to the level of some 3 bcm/y, which may be a more realistic estimate in this context.

Third, Agia Triada is supplied only by the neighboring Revithoussa LNG terminal, thus rendering it subject to all restrictions applicable to that terminal. Notable among them is a lack of adequate storage capacity at Revithoussa, which in turn requires the renewal of its supplies every four days when operating at maximum capacity. The Greek Regulatory Authority for Energy (RAE) estimates that under the present conditions real capacity in Agia Triada/Revithoussa is closer to the level of some 2 bcm/y, which represents a utilization rate of less than 45 percent.

The RAE estimate is based on the assumption that one 75,000 cu.m tankers would berth/unload at Revithoussa every eight days, in order to account for storage and weather limitations. However, as mentioned above, the jetty of Revithoussa is indeed capable of receiving substantially larger LNG tankers with a theoretical max of 130,000 cu.m and 11.8 m in vessel tonnage and draft respectively. In fact, Revithoussa's real jetty capacity should be considered to be even higher as it received cargoes of up to some 145,000 cu.m in 2009, suggesting the RAE estimate may be too pessimistic in this context.

The operator itself estimates terminal capacity at Revithoussa to stand closer to the level of 1.95 million tons of LNG per year, or almost some 2.7 bcm of natural gas in the same period, which seems to be more realistic given the terminal's current configuration. However, even this improved figure remains far below Revithoussa's full theoretical import capacity (less than 60 percent utilization rate). Recently, at Revithoussa a third tank was inaugurated and the terminal capacity of the three tanks reached at 235.000m^3.

Furthermore, the Greek gas system suffers from the lack of a compressor station on the main gas pipeline, which would allow it to offset inherent difficulties stemming from the country's geography; namely the fact that two out of the three points of entry for natural gas into the country are located in northern Greece, whereas the most important demand center is Athens in the south. This limitation also has a direct impact on the capacity of entry points, with the problem further aggravated by the recent activation of the Aluminium of Greece link in April 2009.

However, in December 2008 the Greek government offered a €53.4 m contract for the engineering, procurement, and construction (EPC) of such a station in N. Mesimbria, Thessaloniki to a Joint Venture (JV) between Stroytransgaz and Prometheus Gas. The JV will also be responsible for assembling equipment, piping connections, electricity, instrumentation, and automated control systems, cathode protection, operational systems, and pre-commissioning.

Finally, with the exception of Komotini in northern Greece, which is supplied by both the Turkey–Greece Interconnector (TGI) and the pipeline with Bulgaria, the rest of the Greek market is subject to inescapable interruptions in piped gas if their sole supply pipeline is for any reason disrupted. The urgency of this problem was exemplified during the Russia–Ukraine crisis of January 2009, when the supply of natural gas to the country from both Bulgaria and Turkey was interrupted for a period exceeding three weeks.

A careful consideration of the abovementioned technical and/or contractual restrictions indicates a serious discrepancy between theoretical and actual capacity in the Greek network which needs to be bridged as soon as possible. RAE has already called on DESFA to create a system whereby real capacity can be monitored, in order to facilitate Greek strategic planning and to boost competition in the Greek market, by making information freely available to interested players. Figure 33 below summarizes the current theoretical and estimated real capacity of the natural gas entry points in Greece. Figure 34 shows the main routes and locations on the Greek natural gas system.

Point of entry	Theoretical Capacity (bcm/y)	Real Capacity (bcm/y)
Sidirokastro	5.2	3.8
Kipoi	6.7	0.7
Agia Triada	4.6	2.7
Total	16.5	7.2

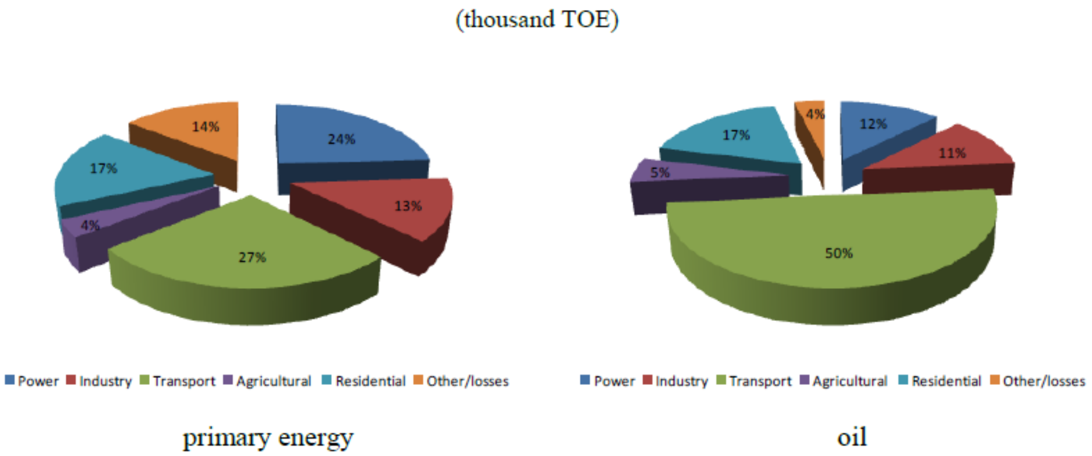
Figure33: Theoretical current capacity of natural gas points of entry in Greece

Figure 34: The Greek Natural Gas System

5.1.1 Natural gas demand in Greece to continue an upward trend

Growth in natural gas consumption in Greece is expected to come mostly from the substitution of Heavy Fuel Oil (HFO) and other fossil fuels in the rapidly expanding Greek power generation sector, substitution of heating oil in the residential sector, and substitution of HFO and other oil products in the industrial sector. Low crude and oil product prices could, of course, undermine natural gas penetration; however, this prospect remains rather unlikely for the period after the end of the ongoing economic and financial crisis. A breakdown of the Greek primary energy and oil product demand by use is presented in Figure 35 below.

Figure 35: Primary energy and oil product demand in Greece by sector in 2006



Ever since its introduction to the energy mix in 1996, use of natural gas has grown rapidly. Total demand has more than doubled from 2 bcm in 2000 (1.9 billion Nm3) to some 4.2 bcm in 2008 (4.0 billion Nm3), threatening the role of oil across traditional demand sectors.32 The power generation sector (baseload capacity) is by far the largest consumer of natural gas in the country, notably by state-owned and former power monopoly PPC, accounting for some 71.6 percent of total national gas demand in 2008. This renders the Greek natural gas market all the more appealing to suppliers, as demand remains largely secured, and indeed on a strong upward trend.

Power generation demand is followed by that in the industrial sector, with the latter representing approximately 15.2 percent of the Greek gas market in 2008. The category includes consumers with an annual consumption in excess of 2,200,000 kWh Gross Calorific Value or approximately 200,000 mcm per year. According to DEPA, use of the fuel in areas of supply availability already exceeds the level of 90 percent. The company claims contractual relations with 129 small and 25 large industrial customers (with annual consumption above 100 GWh) and total contracted volumes of almost 1 bcm annually. Of these players, roughly 96 small and 22 large industrial plants are already supplied with the fuel by DEPA. The residential sector follows power generation and industry in terms of demand with a relatively low 12.6 percent share of the market, suggesting large untapped potential. Good demand potential also exists in the transport sector, where gas usage is still minimal but growing. Figure 36 below summarizes relevant data.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Power Generation	516	1051	1518	1511	1591	1759	1909	1912	2295	2966	3021
Industry	307	433	462	395	420	485	517	583	572	580	643
Residential	13	13	30	79	122	169	225	321	421	484	534
Transport**	0	0	0	7	12	13	16	18	21	21	23
Total	836	1497	2010	1993	2144	2425	2668	2834	3308	4050	4221

Table 36: Natural gas consumption in Greece by sector, 1998–2008 (million cubic meters)*

*original figures in normal cubic meters converted to standard mcm

**autogas consumption figures are author's estimates

Short-term prospects for natural gas are likely to suffer, and some demand reduction looks inevitable as recessionary pressures take their toll on power generation and other industrial uses. Greek gas demand indeed contracted by some 24.5 percent year-on-year (y-o-y) in the final quarter of 2008, with demand reduction reaching 35.9 percent y-o-y in the first quarter of 2009. Expected gas demand levels for 2009 with reference to Greece accordingly range between only 3.5 bcm and 4 bcm.

If these estimates prove correct, as preliminary data, in fact, suggest, this will be the first annual contraction in gas demand in the country since 2001, and probably the largest ever. However, the structural trend is clearly upwards in all sectors, and estimates by SEES see it rising to roughly 7.1°bcm/y by 2015, and 7.3 bcm by 2020, with power generation, needs being at the level of 5°bcm°per year from 2013 onwards (SEES does not make available exact figures but only graphs representing its gas demand forecasts for the country). DEPA is even more optimistic, projecting 8.1°bcm for 2015 and as high as 8.8 bcm for 2020 (see Figure37).

Year	Low Case Scenario	High Case Scenario	Volume Differential	Percentage Differential
2000	2010	2010	-	-
2008	4221	4221	-	-
2015	7100	8100	1000	14
2020	7300	8800	1500	21

Figure 37: Projected natural gas consumption in Greece to 2020 (million cubic meters).

5.1.2 Trans-Adriatic Pipeline (TAP)

Trans Adriatic Pipeline project was announced in 2003 by Swiss energy company EGL Group (now named Axpo). The feasibility study was concluded in

March 2006. Two options were investigated: a northern route through Bulgaria, the Republic of Macedonia and Albania, and a southern route through Greece and Albania, which finally was considered to be more feasible. In March 2007, the extended basic engineering for the pipeline was completed. Greece opposed for the route of the Trans Adriatic Pipeline passing through Albanian territory, as it would allow Albania to become transmission hub for gas in the Western Balkans.

On 13 February 2008, EGL Group and the Norwegian energy company Statoil signed an agreement to set up Trans Adriatic Pipeline AG, a joint venture to develop, build and operate the pipeline. In June 2008, the project company filed an application with the Greek authorities to build a 200 kilometers (120 mi) section of the pipeline from Thessaloniki to the Greek-Albanian border. In January 2009, the TAP project carried out a marine survey in the Adriatic Sea to verify the offshore route for the future gas pipeline. A route assessment survey in Albania started in July 2009. In March 2009, an intergovernmental agreement between Italy and Albania on energy cooperation mentioned TAP as a project of common interest for both countries. In January 2010, TAP opened country offices in Greece, Albania, and Italy. In March 2010, TAP submitted an application to Italian authorities for inclusion into the Italian gas network. On 20 May 2010, it was announced that E.ON becomes a partner in the project. The deal was successfully closed on 7 July 2010.

In November 2010, TAP started a route refinement survey in northern Greece in preparation for the environmental impact assessment. On 7 September 2011, the Trans Adriatic Pipeline AG (TAP AG) submitted its EU Third Party Access Exemption applications in all three host countries. The exemption will allow TAP AG to enter into long term ship-or-pay gas transportation agreements with the shippers of Shah Deniz II gas. The exemptions were granted on 16 May 2013.

In February 2012, the Trans Adriatic Pipeline was the first project to be pre-selected and to enter exclusive negotiations with the Shah Deniz Consortium. In August 2012, consortium partners BP, SOCAR and Total S.A. signed a funding agreement with TAP's shareholders, including an option to take up to 50% equity in the project.

On 28 September 2012, Albania, Greece, and Italy confirmed their political support for the pipeline by signing a memorandum of understanding. On 22 November 2012, the TAP consortium and Trans-Anatolian gas pipeline's partners signed a memorandum of understanding that establishes a cooperation framework between the two parties. In February 2013, Greece, Italy, and Albania signed an intergovernmental agreement.

In June 2013, the project was chosen as a route for gas from Shah Deniz II over the competing Nabucco West project. Later in 2013, BP, SOCAR, Total, and Fluxys became shareholders of the project. In December 2015, Snam joined TAP, acquiring Statoil’s 20% interest in the project.

The pipeline starts at the Greece–Turkey border at Kipoi, Evros, where it will be connected with the Trans-Anatolian gas pipeline. It will cross Greece, Albania, and the Adriatic Sea and come ashore in Italy near San Foca. The total length of the pipeline will be 878 kilometers (546 mi), of which 550 kilometers (340 mi) in Greece, 215 kilometers (134 mi) in Albania, 105 kilometers (65 mi) in offshore, and 8 kilometers (5.0 mi) in Italy. The offshore leg will be laid at a maximum depth of 810 meters (2,660 ft).

The initial capacity of the pipeline will be about 10 billion cubic meters (350 billion cubic feet) of natural gas per year, with the option to expand the capacity up to 20 billion cubic meters (710 billion cubic feet). It will use 48-inch (1,200 mm) pipes for the pressure of 95 bars (9,500 kPa) on the onshore section and 36-inch (910 mm) pipes for the pressure of 145 bars (14,500 kPa) on the offshore section.

TAP also plans to develop an underground natural gas storage facility in Albania and offer a reverse flow possibility of up to 8.5 billion cubic meters (300 billion cubic feet). These features will ensure additional energy security for Southeastern Europe.

Total construction costs are expected to be about €4.5 billion. TAP will be ready to commence pipeline operations in time for first gas exports from Shah Deniz II (expected in 2017–2018). The "Interconnector" (IGB) is intended to connect Greece and Bulgaria.

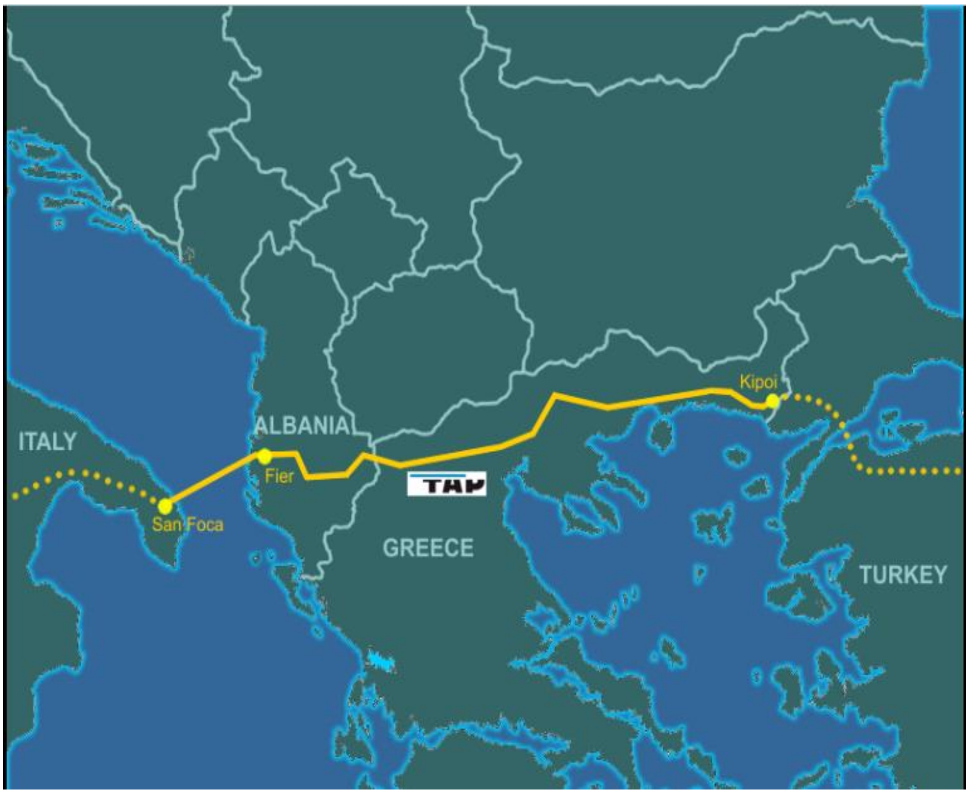


Figure38: Map of Trans Adriatic Pipeline

5.2 Domestic sector for oil and gas in Cyprus

Cyprus's total consumption of petroleum products for 2010, the latest year for which figures are available, was 35.2 billion kWh. This represented less than 0.5% of European consumption and 0.1% of global consumption. Consumption was satisfied by imports of refined products, which typically account for approximately 20% of all imports by value. However, the announcement of the discovery of substantial gas deposits in Cyprus's Exclusive Economic Zone (EEZ) in December 2011 marks a transition for Cyprus from a relatively small importer of hydrocarbons, to a significant potential producer and exporter. Since the discovery was announced a second licensing round has commenced and negotiations are in progress for a further three blocks. At this stage, a number of options are under consideration for exploitation and export, and it is likely to be at least five years before the necessary facilities are in place and exports start on a commercial scale.

Oil and gas meet more than 95% of domestic energy need, with the balance representing solar and wind energy. Fuel oil accounts for around 60% of total energy imports, with the remaining 40% made up of gasoline and other refined products.

As a member of the EU, Cyprus has aligned its energy policy with the acquis communautaire (cumulative body of EU laws) and transposed all relevant EU Directives into national law. The Hydrocarbons (Prospection, Exploration, and Production) Law 4(I) 2007 (Hydrocarbons Law) transposes Directive 94/22/EC on the conditions for using authorizations for the prospection, exploration and production of hydrocarbons, into national law.

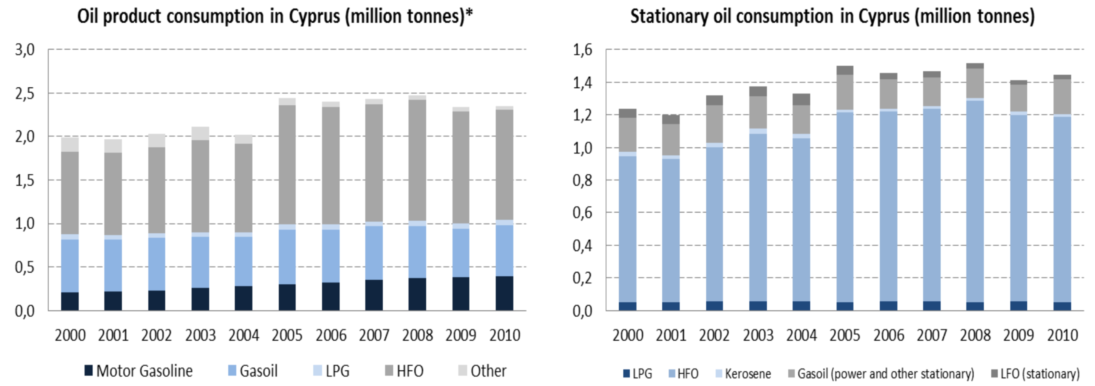
A law has also been passed to implement Directive 2003/55/ EC concerning common rules for the internal market in natural gas (Gas Directive), to regulate the natural gas market and the storage, transmission, supply, and distribution of natural gas within Cyprus. However, the regulation is currently suspended and there is a state monopoly on natural gas supply.

The exploration and exploitation process is the responsibility of the Energy Service of the Ministry of Commerce, Industry, and Tourism (MCIT).

The Immovable Property (Tenure, Registration, and Valuation) Law provides that private ownership of land does not extend to minerals, including oil and natural gas. The Hydrocarbons Law and the Hydrocarbons (Prospection, Exploration, and Production) Regulations (Hydrocarbons Regulations) together set out the licensing framework for the prospecting, exploration and extraction of hydrocarbons in Cyprus's territory including its EEZ. Currently, the oil and gas exploration area covers approximately 51,000 square kilometers offshore Cyprus, to the south and south-west of Cyprus. It has been divided into 13 exploration blocks.

Local energy market and gasification prospects

Domestic oil products consumption in recent years has been just above 2 million tonnes/year. In fact, oil is the only fuel available for power generation and other stationary use; with the latter accounting for some 1.4 million tonnes, or 60% of the total oil products use (Figure 39). This dependency clearly incentivizes gasification as a means of enhancing fuel diversification and security of supply, as well as reducing exposure to high oil product prices. The rationale for gasification is made stronger if gas is to be supplied by local fields.



** Includes bunker fuel*

Figure 39: Oil product consumption in Cyprus (million tonnes)

The state-owned monopoly Electricity Authority of Cyprus (EAC) is by far the largest user of oil products on the island, as it continues to rely on Heavy Fuel Oil (HFO) and gasoil for the growing needs of power generation. Installed power generation capacity in Cyprus, which for the moment remains almost exclusively oil-fired, increased 46% between 2000 and 2010, and by as much as 211% between 1990 and 2010; from 471 Megawatt (MW) to 1465 MW.

By the same token, electricity production increased by some 57% between 2000 and 2010; and almost 170% between 1990 and 2010 (Figure 40); hence aggravating this oil dependency, whilst, at the same time highlighting the penetration potential for natural gas in these sectors. Renewables exist and are on the rise; however, production still stood below 1.5% in 2010. HFO is also used by the local cement industry, but the fuel faces regulatory restrictions on environmental grounds with regard to its penetration to the commercial and other sectors.

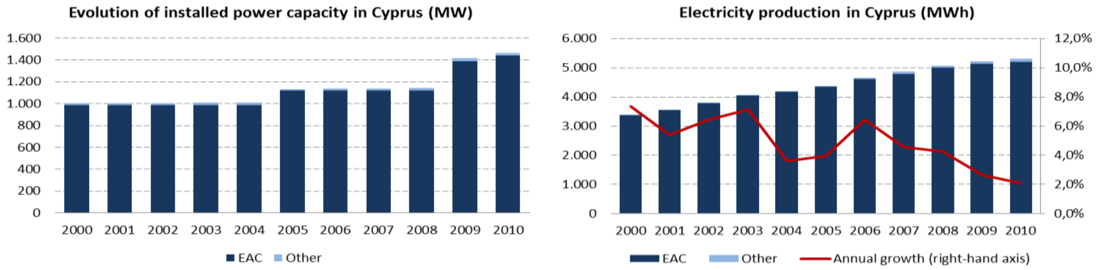


Figure 40: Installed power capacity and production in Cyprus (MW/MWh)

Other industrial/commercial and heating needs are met primarily by gasoil, with close to 150,000 tonnes in 2010 (motor diesel accounted for another 330,000 tonnes in the same year); by Liquefied Petroleum Gas (LPG), with ~50,000 tonnes in 2010; and Light Fuel Oil (LFO), which sold a little more than 30,000 tonnes in the same year. Kerosene makes only a small contribution to these sectors, with total 2010 use of this fuel standing close to 14,000 tonnes. Finally, some gasoil and LFO volumes are diverted to the declining local bunkering sector (for a breakdown of national gasoil usage see Figure 41).

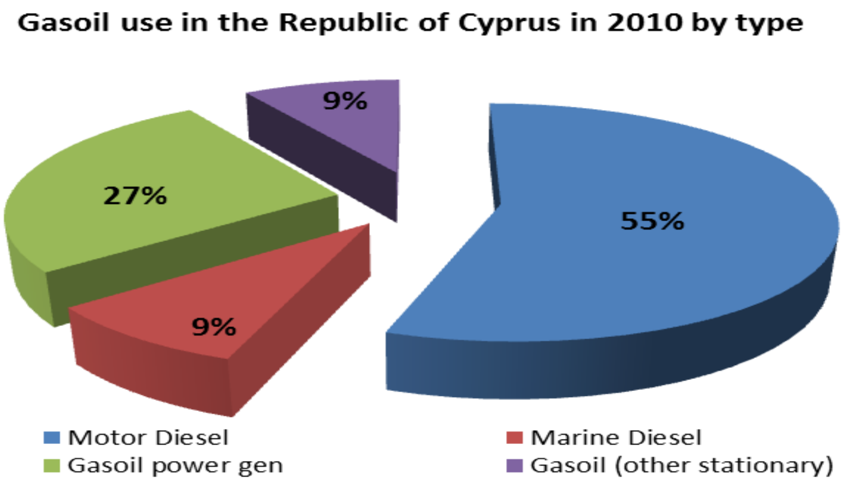
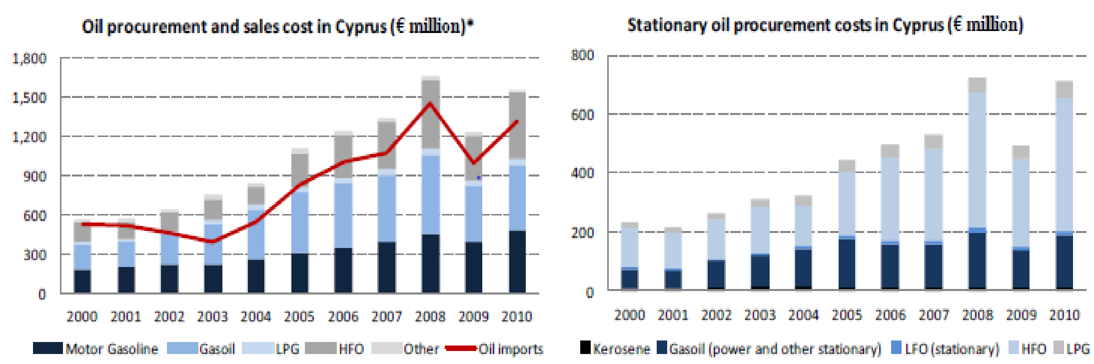


Figure 41: Gasoil use in the Republic of Cyprus in 2010 by type

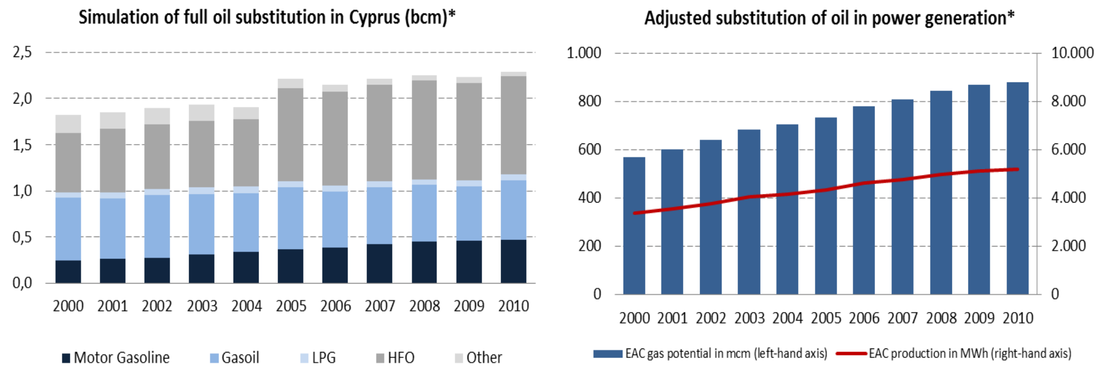
This dependence on imported oil products creates a substantial budget drain in Cyprus which, similar to other Eurozone countries, has decreasing tolerance levels for avoidable expenditure. In 2010, Cyprus imported oil products worth a combined 1.3 billion Euros, with final consumers on the Mediterranean island has to pay more than 1.5 billion Euros – even excluding Value Added Tax (VAT) charges - to use them. More than 90% of this expenditure referred to motor gasoline, gasoil and HFO purchases. Some 710 million or 46% of all expenditure was related to stationary use, for the most part, HFO and gasoil (Figure 42).



* *Includes bunker fuel*

Figure 42: Oil procurement and sales cost in Cyprus (€ million)

If Cyprus had used gas instead of oil across all sectors of its economy except bunker in 2010, the domestic market would have been ~2.3 billion cubic meters (bcm). By the same token, the local stationary sector would have consumed approximately 1.1 bcm; with almost 900 million cubic meters (mmcm) of this gas demand coming directly from EAC, for its power generation needs (Figure 43).



* Assumes efficiency of gas-fired power generation sector at 55%

Figure 43: Simulation of oil substitution in Cyprus (bcm)

Even if Cyprus were importing this gas at average European prices of roughly USD 4/mmbtu between 2000-2005; and as high as an average of some USD 8/mmbtu between 2005-2010, rather than procuring domestic gas with some discount, as is often the case internationally, this could still generate substantial savings for domestic energy consumers. In 2010 alone, these could have reached Euros 1.1 billion, compared to a GDP of approximately 17 billion. There would be substantial savings even if penetration were limited to the stationary sector - almost 500 million Euros - or even just in the most basic of candidates in this framework i.e. power generation, where relevant savings would have stood at above 400 million in 2010. Depending on actual substitution levels and efficiency gains, consumers in Cyprus could have been spared the expenditure of between 1.5 and 7.4 billion Euros over the past decade.

These benefits for end consumers would be somewhat diluted – but still very significant – if an excise tax was imposed on the consumption of such domestically-procured natural gas. Even assuming excise at a relatively high Euros 4.74 per gigajoule, which is the level currently imposed by the Netherlands, on all market segments except power generation and the cement industry (which are not liable for oil excise either in the Republic of Cyprus), then the consumers of these volumes could have saved approximately Euros 970 million in 2010. Stationary sector savings would stand at almost Euros 470 million, or 66% below the Euros 710 million paid by Cypriot consumers for stationary oil usage in the same year.

Figures 44 and 45 give an indication of the cost-benefit of substitution of oil products by gas in Cyprus, based on consumption patterns and prices between 2000 and 2010; across the board, in the stationary sector (including in power generation), and for power generation alone. Figure 44 assumes the imposition of no excise tax surcharges on locally procured natural gas; while Figure 45 uses Euros 4.74/gigajoule (as in the Netherlands) as the basis of calculation.

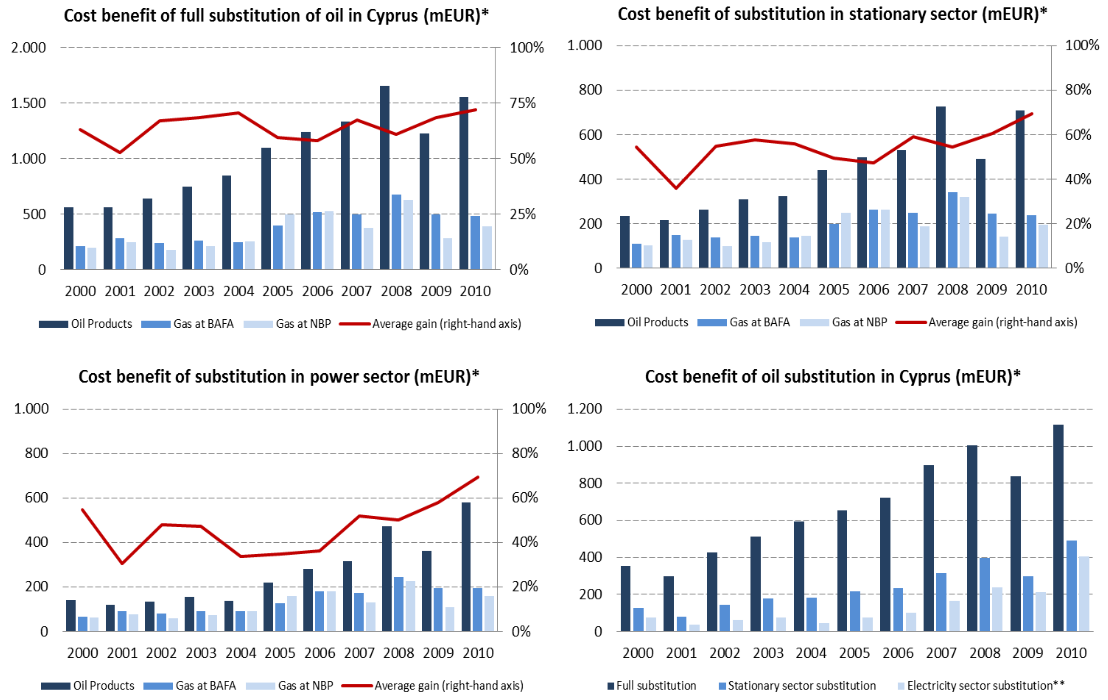
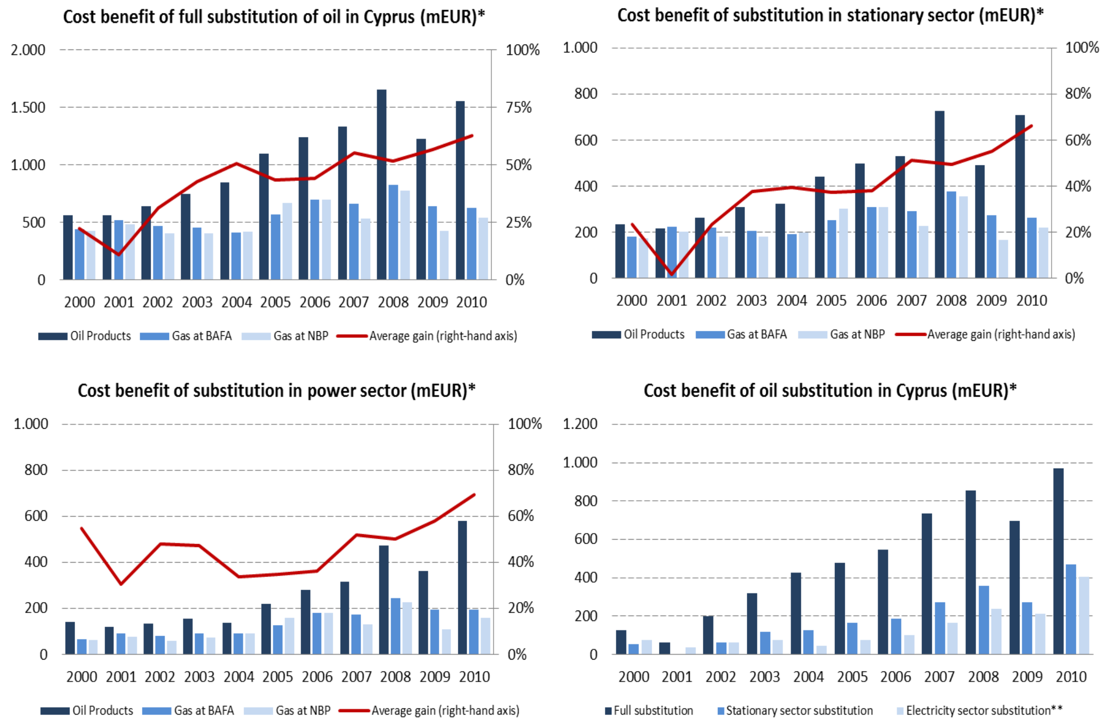


Figure 44: Cost benefit of substitution of oil in Cyprus (€ million) – no gas excise



* based on retail prices including excise tax but not VAT / power generation at 55% efficiency

** Stationary sector substitution savings include those from substitution in the electricity generation sector

Figure 45: Cost-benefit of substitution of oil in Cyprus (€ million) – NL gas excise

Mindful of such economic benefits, EAC had called for the gasification of local power generation as early as 2001. Cyprus sought to develop a regasification terminal aimed at allowing LNG imports from 2014 and even came close to signing a 20-year supply contract with supermajor Shell to that end. However, these plans were finally dropped in mid-2011, following opposition from a number of sources due to the island's own upstream potential and drilling scheduled for later that year, including from the influential Director of the Energy Service of the Ministry of Commerce, Industry, and Tourism, Solon Kassinis.

EAC now targets switching to natural gas by mid-decade, provided supplies become available in Cyprus by then. The Vasilikos Power Station, which suffered serious damage in July 2011 in an accidental ammunition explosion with human casualties in the adjacent Evangelos Florakis Naval Base, already has a 220 MW Combined Cycle Gas Turbine CCGT (Unit IV) with two gas turbines and a steam turbogenerator temporarily using diesel, as a result of the unavailability of gas. Moreover, an additional identical 220 MW CCGT (Unit V) was almost committed to at that time. Vasilikos also includes three steam turbogenerators, 130 MW each.

The other power stations at Dhekelia and Moni include both some steam turbogenerators as well as a number of diesel-fired gas turbines, which serve as peak shaving and back-up units. The combined installed capacity of the Dhekelia and Moni power stations is some 700 MW; while ~100 MW at Dhekelia and an extra 150 MW at Moni could be easily converted to gas. Cyprus has already proceeded with preliminary planning and also secured Euros 10 million from the EU for the development of gas pipeline links from Vasilikos to Dhekelia and Moni (before branching off also to other industrial and residential gas areas). Cypriot authorities expect construction of this natural gas pipeline infrastructure to take three years to complete, at an estimated total cost of Euros 80 million. Besides the economic benefits described above, oil products substitution in the local power generation would also save EAC an estimated 11 million Euros due to lower emissions.

Assuming full substitution of oil products in the power and other stationary sectors, as well as a continuation of recent trends with regard to Cypriot energy demand growth in these sectors, which are the first that local gas will likely penetrate, in 2025 Cyprus, could have a domestic requirement of up to 1.7 bcm/annum (bcma). The bulk of this demand would come from power generation with an expanding share, albeit this probably represents the upper bound for such projections. The ultimate level of demand will be constrained by the potential inability of gas to penetrate fully these sectors in the envisaged time frame, the downward influence from planned renewables penetration, and the impact of the economic crisis. For example, even a fairly modest penetration of relatively mature renewable energy sources such as wind and photovoltaics in the order of 400 MW by 2025 into the energy mix of Cyprus, could radically reduce the gas input required into its power generation sector; although gas-fired generation capacity would be required as back-up to these intermittent power sources.

Working in the opposite direction, any subsequent gasification of the transportation sector could add an extra 1.2 bcma of demand (Figure 46). However, penetration there will depend on fleet conversion costs and gas availability, and it would be expected to proceed at a much slower pace compared to stationary sectors, probably extending into the 2020s and beyond.

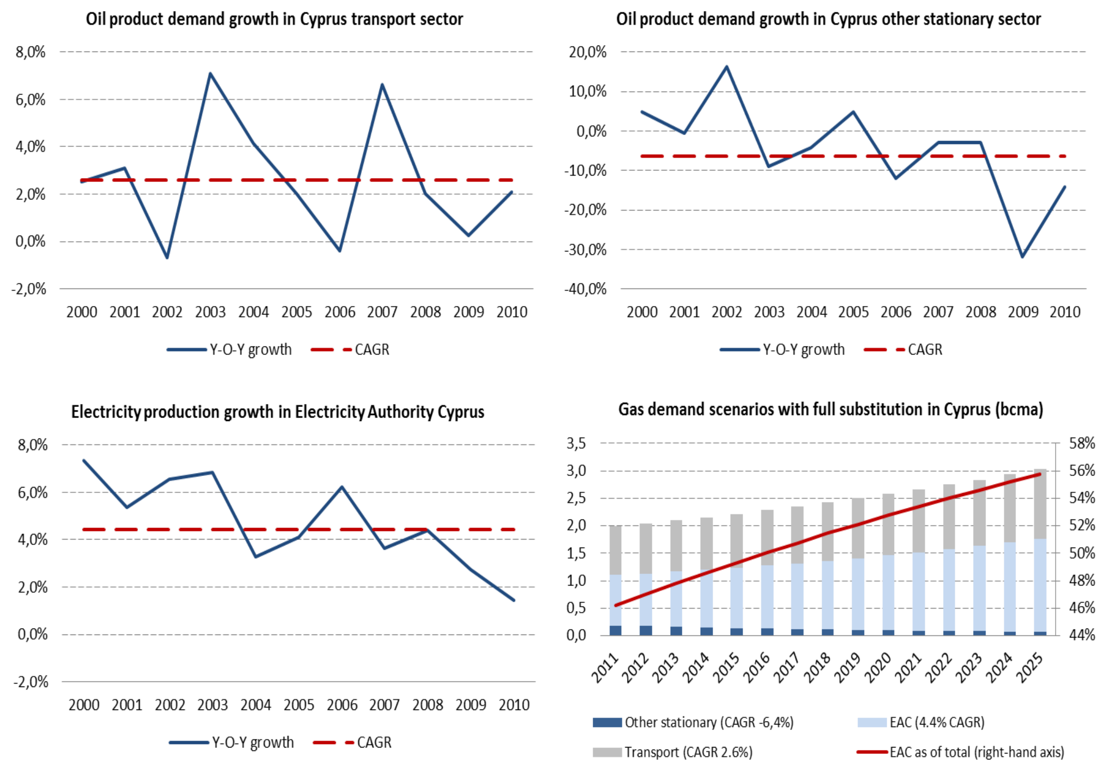


Figure 46: Cyprus historical oil demand and natural gas demand scenario

Besides the benefits associated with the planned gasification of the power generation sector, availability of competitively-priced fuel in the form of domestic gas could facilitate the emergence of chemical industry and other industrial activity (methanol plant, fertilizers etc.) contributing to the diversification of the economy from its present dependence on services. Nevertheless, additional competitive advantages may be necessary for success in this context, given the substantial similar investments of recent years - and ensuing strong competition – from natural gas-rich counties in the adjacent Middle East and North Africa (MENA) region.

In other words, the competitive advantage of Cyprus in this framework is far from obvious; while needed advantages may thus include tax breaks and/or the existence of cheap feedstock, as a result of either real low breakeven prices for local gas; or an agreement for below-cost supply; albeit this would have to be in compliance with EU/international competition rules. Moreover, Cyprus will need to balance such industrial activity with environmental protection, both in its own right but also in order not to undermine its profitable tourist industry.

5.2.1 Pipeline to Greece

The Republic of Cyprus could monetize its upstream reserves via a natural gas export pipeline that would ultimately reach natural gas markets in Europe, through either Greece or Turkey. The first option could be realized by construction of a subsea pipeline of roughly 700-km to the Greek island of Crete; continuing for approximately 200-km along or onshore Crete for gasification of local power generation (currently oil-fired) and cost-reduction purposes; and returning to its subsea route for an additional ~200-km from western Crete to the Peloponnese in mainland Greece (south Greece), with the aim of connecting to the Greek grid (Figure 47). Athens and the country's Public Gas Corporation DEPA have been pushing in that direction, while preliminary independent studies commissioned by DEPA suggest that such a pipeline, with a transportation capacity of around 8 bcma, is technically and economically feasible.

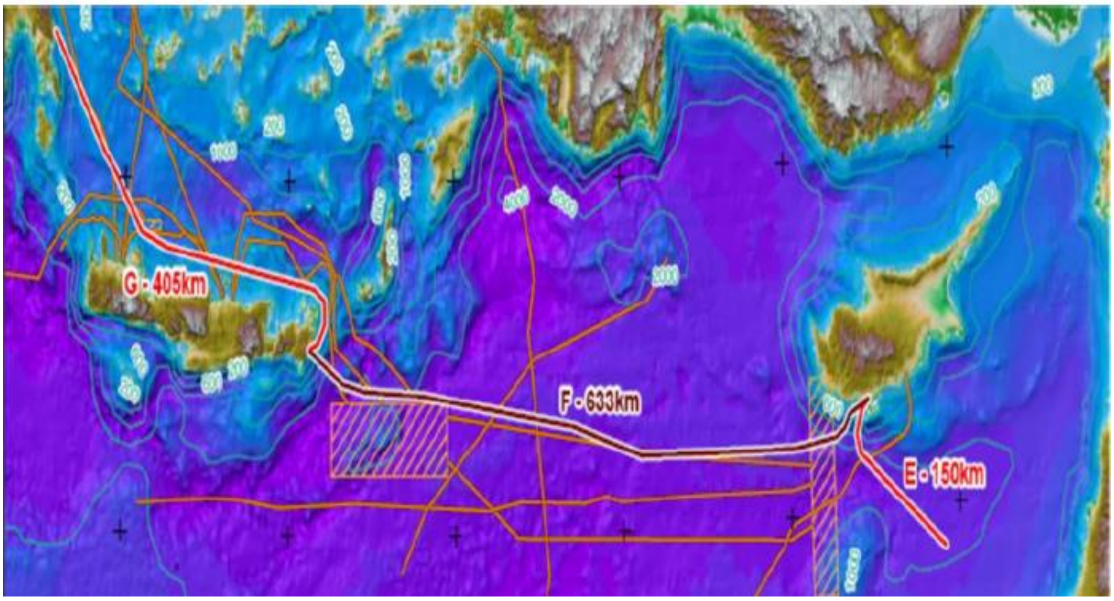


Figure 47: Potential route of proposed East Med - Greece gas pipeline

The commercial rationale for a pipeline to Greece is that Cypriot (and even Israeli) gas could access a market with relatively high gas import prices, despite current economic difficulties; as well as capture regional synergies with both existing and planned natural gas infrastructure in Greece and the wider region, including the Trans Adriatic Pipeline; DEPA's and Edison's Interconnector Turkey–Greece–Italy (ITGI) and the Interconnector Greece-Bulgaria (IGB); and also various bilateral gas interconnectors in South Eastern Europe and beyond (Figure 48). This means that East Mediterranean volumes reaching Greece could flow westwards to large European markets such as Italy; and northwards to South Eastern and even Central Europe.

Additionally, there are hopes that markets in South East Europe, in particular, could offer opportunities for increased natural gas imports from new sources in the coming years due to: a) growing overall energy demand, as a result of low current levels and macroeconomic gains; b) declining indigenous gas production, which will need to be complemented by new supply; c) substitution of other inefficient and polluting fuels, in line with EU rules and regulations; d) and a desire to diversify their present gas import mix with new (non-Russian) supplies. Moreover, the contractual framework for the supply of natural gas to buyers in South Eastern Europe remains relatively firmly anchored to long-term oil-indexed gas pricing mechanisms. This is in direct contrast to the more liberalized and interconnected natural gas markets of Western Europe, where buyers are pushing their suppliers for shorter-term, hub-indexed gas. In the present market context, hub-indexation results in lower procurement prices for buyers; and, thereby to reduced profit margins for the natural gas producers supplying them.

DEPA estimates that pipeline tariffs will be very competitive compared to the LNG option with regard to gas deliveries to Greece, as well as across South Eastern Europe and even Italy; specifically that East Mediterranean gas could be delivered to Greece at nearly one third of the cost of equivalent LNG deliveries, and at less than two thirds for deliveries to Italy.

Figure 48: Synergies with planned infrastructure in SE Europe

There might even be a political rationale to support construction of such a pipeline to Greece, given that at the moment Nicosia has very limited political leverage and would ideally like to see that increased, so as to be able to achieve its foreign policy imperatives; while Israel may similarly be interested in improving both its regional as well as its European political ties, including with Greece and European countries farther afield, for its own security reasons. Against this backdrop, the construction of a pipeline that would unlock a fifth energy corridor for the supply of Europe with gas while inevitably also committing all capacity to European buyers (rather than just a part as would likely be the case under the flexible LNG option) could be a political gesture towards supply security and economic competitiveness in the EU; and it could also greatly benefit South Eastern Europe, one of the most vulnerable European regions in terms of supply disruptions, as demonstrably shown in the context of the 2009 Russo-Ukrainian crisis which heavily affected it.

All this would, in fact, be strongly confluent with EU policy on the matter, especially given the lowered expectations of the flow of substantial gas volumes to Europe via Southern Corridor, (which is now scheduled to transport only ~10 bcma, out of originally envisaged ~30 bcma); thereby boosting the diplomatic and political capital of the contributing parties in EU circles. Various Cypriot officials have at times spoken very warmly of this prospect; albeit they are not providing project funding to that end.

However, there is still relatively little consensus on the commercial viability of this project. First, there are concerns about the potential technical complexity of the proposed gas pipeline, stemming from its significant length as well as sea depths in which it will need to be laid. Second, even if in fact viable, the project is dependent on successful completion of other downstream infrastructure projects to allow it to reach its full export potential beyond Greece, including both upgrades in the Greek natural gas system and new regional interconnectors. Third, even if these technical/economic obstacles are successfully overcome, the project still locks suppliers into a relatively limited number of regional natural gas markets, compared to the inherently more flexible LNG option, which offers the seller access to global markets. Fourth, there are important uncertainties in connection with anticipated market opportunities in South East Europe, notably around the realization of their demand potential and pricing. And fifth, pipeline exports to South Eastern Europe (and even to Central Europe and Italy) will have to compete not only with the existing long term contracted pipeline supplies from the Russian Federation but also with new Azeri pipeline gas from Shah Deniz Phase 2 and other pipeline sources such as South Stream; as well as with longer-term gas supply prospects including Turkmenistan and also indigenous Black Sea and unconventional gas reserves.

The alternative of developing a pipeline to Greece and beyond as a complement to rather than a substitute for liquefaction looks attractive, by theoretically offering the best of both worlds. However, it fails to take into account the importance of brownfield economics and economies of scale in the context of costly infrastructure development such as that of liquefaction plants. LNG projects tend to improve significantly their profitability as they expand beyond their first greenfield phase and capture cross-train synergies and the ensuing cost efficiencies; thereby reducing their applicable unit costs by some 15% to 35% (or, minus USD 1 to 1.5/mmbtu); enhancing their access and terms vis-à-vis capital markets; and even ameliorating sales terms, including in the context of both their contractual as well as flexible spot sales.

Against this backdrop, the Cypriot government seems to have remained unconvinced as to the merits of constructing a long subsea gas pipeline link from the East Mediterranean to Greece; and its officials have in fact stated very clearly on various occasions that they see LNG as the only viable monetization option for their gas. Moreover, in June 2012 the Cypriot government decided to take all necessary steps towards the development of liquefaction facilities in Cyprus. In contrast, the government of Israel has shown itself to be more open to discuss closer energy cooperation with both Greece and Cyprus, including with reference to gas pipeline options; possibly as a means of strengthening regional ties and shunning export dependency on Turkey especially after the Mavi Marmara incident of 2010 and the ensuing diplomatic fallout.

Given the very clear risk for regional players that Cyprus (and/or Israel) will move towards the liquefaction monetization option, rather than for their own natural gas pipeline proposals, there is value for them in adopting a much more flexible commercial position in this context; potentially following the successful example of leading Asian buyers like Kogas, Osaka Gas, Tokyo Gas and others, which often seek small equity stakes in liquefaction, and sometimes also upstream, as a means of adding value to their portfolios by capturing attractive margins; while at the same time benefiting from securing better terms in the SPAs they sign with them (on top of equity gas offtake). Indeed, their involvement early on in the development process means that they are often able to sign long-term gas supply agreements on favorable terms, as operators need such firm contracts in order to boost bankability and secure their financing.

Adoption of such a strategy by regional companies could therefore arguably allow them to capture more of the value that is to be generated by recent gas discoveries in their periphery. However, this presupposes that they have the financial capacity to participate as investors; moreover, even though these players may benefit from such a hedge along the value chain, they will likely have to charge high prices for the resulting volumes in their domestic and/or targeted downstream gas markets which, may prove challenging under present circumstances.

At any rate, early involvement and negotiation for firm and potentially also favourably-priced LNG supply contracts (with or without equity) would also buttress the project rationale for the development of 'gateway’ regasification terminals targeting markets in South East Europe, one of the most vulnerable regions in terms of their security of natural gas supply in Europe, for example DEPA's planned Aegean FSRU in northern Greece.

5.2.1.1 The EastMed pipeline

The EastMed gas pipeline from Israel through Cyprus and Greece to Europe is back in the limelight.

It was reported on November 24 that the governments of Israel, Cyprus, Greece and Italy reached agreement on the construction of this pipeline based on the results of a feasibility study funded by the EU. However, government sources from Cyprus said that even though an inter-governmental agreement is in sight, a few weeks are still needed to complete the process and obtain approval by the European Commission (EC).

The project is being performed by Edison, an EDF Group company, and Greece's Depa with about €35 million in funding from the EC, as a project of common interest (PCI). In a recent presentation Depa reported the capacity of the pipeline to be 10-16 billion cubic metres per year (bcm/yr). The project is currently designed to initially carry 10bcm/yr from the East Med to Greece, about 1900km, where it will connect to the Poseidon pipeline in Italy, about 300km.

Even though for the East Med region exporting 10bcm/yr gas is quite important, it is only about two per cent of annual European gas consumption. This should put into context exaggerated claims from the region that the EastMed pipeline will "to some extent minimise Arab influence on Europe!"

The EastMed pipeline so far has the support of the four governments and the EC, but no international oil company (IOC) or investor has yet expressed interest to join.

The four governments and the EU cannot fund the project. This requires IOC and investor participation, and above all it requires buyers for its gas.

IGI Poseidon states that the pre-FEED studies have confirmed the project to be technically viable, economically feasible and commercially competitive, but no details are given.

The most challenging part of the project is its section from Cyprus to Crete, which reaches a depth of over 3000m. Laying the pipe to such depths is challenging – stretching the limits – but technically feasible. However, the terrain is very uneven and the area is seismically active, subject to landslides. This could pose integrity and repair challenges.

The total cost of the pipeline has been estimated to be about $7billion, but most experts consider this to be optimistic, expecting it to be closer to $8-10bn.

With initial gas quantities expected to be 10bcm/yr from the Levantine Basin, almost all of the gas will be from Israel. Phase 2 of Leviathan is estimated to add another 9bcm/yr to production, with all gas destined for export. Currently there is no indication on timing, but from the technical point of view Phase 2 could conceivably be operational by 2025. This is also the year IGI Poseidon expects the pipeline to be available to transport gas.

If all of the Leviathan Phase 2 gas is exported through the EastMed pipeline there will be no room left for Cypriot gas, for example from the Aphrodite gasfield. In any case, if one is to rely on recent statements from Cyprus, Aphrodite is on the verge of signing an agreement with Shell to export its gas through the Idku liquified natural gas (LNG) plant in Egypt.

Gas prices in Israel are high, with the cost of the gas expected to be between $4-5/mmbtu, even before it enters the pipeline. Allowing for the cost of the pipeline, by the time such gas reaches Italian consumers it will be too expensive.

Europe is well-supplied with gas from Russia, Norway, North Africa, Qatar, the US and others. Europe's gas demand is not expected to increase significantly in future, with the decline in indigenous gas production well-covered by Russian gas and LNG imports. The EC and Gazprom agreed in May "binding obligations on Gazprom to enable free flow of gas at competitive prices." In addition, US LNG is well poised to increase its penetration of Europe's gas markets.

Most forecasts at recent gas and LNG conferences in Europe expected spot gas prices to come down and by the mid-2020s – when the pipeline is scheduled to be operational – to be about $6/mmbtu. At a Gas & LNG Summit in London in October, Gazprom confirmed it can sell gas at $4/mmbtu and still make money. In addition, US LNG companies are confident they will increase their sales to Europe at about $6.50/mmbtu.

These are prices that EastMed pipeline gas may have to compete with if it is to secure export markets in Europe – a big challenge.

An additional challenge could be that it passes through an area, west of Cyprus, of undeclared and disputed exclusive economic zones, but ultimately this may not be a show-stopper.

5.2.2 Pipeline to Turkey

Meanwhile, Ankara through state-owned company TPAO has argued that development of greenfield liquefaction in the East Mediterranean would not be a suitable commercial option, as a result of (what TPAO claims to be) a saturated regional LNG market due to the existence of significant liquefaction capacity in the broader MENA, notably Qatar, Egypt, and Algeria. According to this view, monetization of the Cypriot natural gas reserves can be successful only by means of a pipeline to Turkey; with Cypriot volumes transiting to European markets. The Turkish side has also invoked the potential political benefits of building such a pipeline, with Turkish Energy Minister Taner Yildiz stating in December 2011 that energy cooperation between Turkey and Cyprus including monetization of indigenous reserves through Turkey could follow the successful negotiation of a settlement in the Cyprus dispute.

On the commercial level, the Turkish position on the presumed unsuitability of liquefaction as a suitable monetization option with regard to East Mediterranean natural gas seems to ignore LNG market fundamentals (to be examined in more detail in the next section "liquefaction"). Still, depending of course on the agreed price formation mechanism, sales of Cypriot gas to Turkey via pipeline would probably offer good returns, due to the latter's proximity to Cyprus and the relatively small investment and transportation costs that would need to be incurred in order to link the Cypriot upstream with the Turkish downstream gas market; combined with attractive import prices and expected domestic price liberalisation in Turkey.

However, if a part of these volumes were to continue onwards to EU gas markets to achieve diversification, as has indeed been proposed and would be a prudent commercial strategy, this project could face some of the same challenges confronting the proposed pipeline to Greece. Specifically, it would be dependent on the successful completion of regional interconnectors, and could even require upgrades in the Turkish system; and would inevitably also increase transportation costs, thus diluting realized profit margins in each of its proposed end markets. Furthermore, even if all of these challenges were to be successfully overcome, the very nature of monetisation by pipeline would lock Cypriot natural gas volumes to Turkey and a limited number of other natural gas markets with important uncertainties as to their future potential, as well as expose it to possibly strong competition from other gas pipeline supply projects; compared to the inherently more flexible LNG option, which offers access to global markets.

On the political level, committing to a gas pipeline to Turkey, or to Europe through Turkey, looks unlikely before the two sides can agree on a solution in the ongoing Cyprus dispute, given that Ankara does not recognize (or even engage directly with) the Republic of Cyprus. Moreover, it is difficult to envisage the Greek Cypriot side agreeing to long-term dependency on Turkey as a market and/or transit, even after a negotiated solution to the Cyprus problem (and it is conceivable that even the EU would in the first instance not choose dependency on Turkish transit for all its non-Russian inflows, i.e. from the Caspian and East Mediterranean).

5.2.3 Finding of block 10 in Cyprus' EEZ

ExxonMobil added another giant gas discovery to the east Mediterranean region after finding a gas-bearing reservoir offshore Cyprus but infrastructure bottlenecks and geopolitical disputes mean output from the field could be far off.

Exxon, together with partner Qatar Petroleum (QP), estimated in-place gas resources in the reservoir at 5 to 8 trillion cubic feet (tcf) of gas, similar order of magnitude to the Aphrodite and Calypso gas finds nearby, also in Cypriot waters.

The region's gas output has begun to soar thanks to older discoveries finally bearing fruit. Israel's Leviathan field, found in 2010 with around 22 tcf, will fully come online in November, though the 2015 Zohr discovery offshore Egypt with up to 30 tcf is already producing.

The new discoveries have prompted Egypt, which has the ability to liquefy and regasify gas for LNG trade, to try to establish itself as a regional hub. It also provided a degree of energy security to Israel.

In Cyprus, development could be complicated by the internationally-recognized government's dispute with Turkey, which does not recognize its right to develop the resources.

This giant gas discovery to the east Mediterranean region after finding a gas-bearing reservoir offshore Cyprus but infrastructure bottlenecks and geopolitical disputes mean output from the field could be far off.

Meanwhile, Cyprus' Aphrodite, which was first discovered in 2011, has been delayed as block stakeholders Noble Energy, Delek and Royal Dutch Shell renegotiate their production sharing agreement with the government.

A development concept for Aphrodite is also still being debated, with some now advocating that the gas be sent to Egypt to be liquefied and exported onwards on LNG tankers.

2018 was a good year for Cyprus and for the East Mediterranean in general. Progress was made with moving projects forward and relations between countries have improved as plans for the region's emerging gas sector take shape. The one blot has been continuing threats from Turkey against Cyprus and the IOCs that are engaged in exploring the island's EEZ.

Cyprus entered 2019 with considerable anticipation. ExxonMobil is currently drilling the first of two back-to-back wells in Block 10, with the results due early in the New Year. Italy's Eni and France's Total have yet to make their plans for next year known, but it is anticipated they will form a joint company for the purpose of exploration in Cyprus. They have recently bid jointly on Block 7 and will likely receive the licence for the asset soon.

Eni is the largest investor in the Cypriot offshore, where it is partnered with KOGAS in Blocks 2, 3 and 9, and with Total in Blocks 6 and 11 – and soon 7. It also holds the licence for Block 8 on its own.

Political relations with Egypt continue to deepen, as Cairo looks to transform the country into a regional energy hub. The import and subsequent re-export of Cypriot gas would assist its progress to this end. Egypt has also taken steps to improve technical and legal matters in order to facilitate the import of Israeli gas for domestic use. Israeli gas could also be re-exported from the North African country as LNG.

On the domestic front, Cyprus may finally get a chance to more towards cleaner energy and cut the cost of its electricity bills. The Natural Gas Public Co. (DEFA) has launched its fourth attempt to secure LNG cargoes with a tender for an FSRU to be installed at Vassilikos near the island's main power station. DEFA will then tender for LNG supply early in 2019. The company was previously unable to find a deal that was cheaper than the cost of importing liquid fuel for power generation, though this time a solution has to be found, as Cyprus faces fines from the EU if it does not reduce its carbon emissions.

While the Turkish navy disrupted Eni's drilling plans in Block 3 earlier this year, there has so far been no repeat at ExxonMobil's drill sites.

Indeed, ExxonMobil's presence could change the dynamic offshore Cyprus, provided the US super-major makes a worthwhile discovery and stays on in the region. Its presence appears to have contributed to changing Washington's attitude towards Cyprus. The US' previous position was that the Republic of Cyprus had a right to explore its EEZ and any revenues earned should be shared equitably with all Cypriots (including the Turkish-Cypriots) in the context of a settlement of the four-decade-old Cyprus problem.

This line, which had become the US mantra on Cypriot exploration over the last couple years, never addressed Turkey's belligerent tone towards Nicosia or its interference in offshore exploration work.

For the last few years, Cyprus has cultivated tripartite groupings designed to build consensus on regional energy co-operation. There is the Cyprus, Greece, Israel tripartite group, which has come to include Italy, and in which the US has also expressed an interest in participating. There is also the Cyprus, Greece, Egypt group, which France has expressed an interest in joining.

Washington's rekindled focus on the region has been encouraged by ExxonMobil's presence. But other geopolitical factors are also in play, such as Russia's growing presence in Syria, its relationship with renegade Libyan General Khalifa Haftar and its budding oil friendship with Saudi Arabia. While these may not be top concerns for US President Donald Trump, who has his own problems with Russia, they are certainly issues that the US State Department and

Department of Defence are concerned with. The Iranian military presence in Syria and its support for Lebanon's Hezbollah, which virtually controls the country, are major worries for Washington.

Furthermore, Turkey's stance towards the US' Kurdish allies in Syria and its threats to invade their stronghold in eastern Syria may be an indication to the US that Ankara is not the ally that Washington thought it was.

What is clear is that 2019 will be a pivotal year for Cyprus and the rest of the East Mediterranean. By the end of it, there should be a clearer picture of how the gas sector will evolve, with considerable progress on several key projects.

CONCLUSIONS

In conclusion, all the geological structures of Greece and Cyprus described above are promising regarding the existence of oil and gas deposits.

Both countries have decreed an organized framework of laws and regulations to attract well-established oil companies and to come to an agreement with them according to the specificities and interests of each of the two countries. In this part, Cyprus moved much faster than Greece with the achievement of the erection of the EEZ with its neighboring countries. This is considered to be a great advantage over Greece in attracting well estabshed companies to the competition and ultimately in the faster development of negotiations and agreements on possible deposits.

Cyprus in terms of competitions and concessions is in a much more favorable position than Greece. In the Southeast Mediterranean region, developments are running at a rapid pace. In the EEZ of Cyprus, exploration is in its final stages with very positive results for the existence of natural gas fields and they are continuing.

Moreover, between the two countries, Greece already has a well-established gas network and is constantly expanding. Their fuel needs are very different due to their population. Thus, in the gas and oil production process, Cyprus is in need of more exports due to the low demand of the domestic market as opposed to Greece that will be the opposite.

Finally, the position of both countries has a huge geopolitical and economic significance as the lights of all major are on the South-East Mediterranean. This results in alliances and plans between the two countries and not only for the future construction of large gas pipelines.

References

- Karakitsios, V. (2013) 'Western Greece and Ionian Sea petroleum systems'.

- Calon, T. J., Aksu, A. E., & Hall, J. (2005a). The Neogene evolution of the Outer Latakia Basin and its extension into the Eastern Mesaoria Basin (Cyprus), Eastern Mediterranean. Marine Geology, 221, 61–94.
- Calon, T. J., Aksu, A. E., & Hall, J. (2005b). The Oligocene-Recent evolution of the Mesaoria Basin (Cyprus) and its western marine extension, Eastern Mediterranean. Marine Geology, 221, 95–120.
- Chamot-Rooke, N, C.Rangin, X. Le Pichon, and DOTMED Working Group, 2005. A synthesis of deep marine data in the Eastern Mediterranean: Mem. Soc. Géol. France, n.s, no.177, 64 p.
- Cita M.B., Beghi C., Camerlenghi A., Kastens K.A., McCoy F.W., Nosetto A., Parisi E., Scolarp F. and Tomadin L. 1984. Turbidites And Megaturbidites From The Herodotus Abyssal Plain (Eastern Mediterranean) Unrelated To Seismic Events, *Marine Geology*, 55: 79-101.
- Emery, K.O., B.C. Heezen, and T.D. Allan (1966), Bathymetry of the eastern Mediterranean Sea, *Deep-Sea Res. Ocean. Abstr*. **13**, 2, 173-192.
- Gardosh, M., Garfunkel, Z., Druckman, Y., & Buchbinder, B. (2010). Tethyan rifting in the Levant region and its role in early Mesozoic crustal evolution. In C. Homberg & M. Bachmann (Eds.), Evolution of the Levant Margin and Western Arabia Platform Since the Mesozoic, Geological Society, London, Special Publications (Vol. 341, pp. 9–36).
- Garfunkel, Z. (1998). Constrains on the origin and the history of the Eastern Mediterranean basin. Tectonophysics, 298, 5–35.
- Frizon de Lamotte, D., Raulin, C., Mouchot, N., Wrobel-Daveau, J.-C., Blanpied, C., & Ringenbach, J.-C. (2011). The southernmost margin of the Tethys realm during the Mesozoic and Cenozoic: Initial geometry and timing of the inversion processes. Tectonics, 30, TC3002.
- Harrison, R. W., Newell, W., Panayides, I., Stone, B., Tsiolakis, E., Necdet, M., …, Schindler, S. J. (2008). Bedrock geological map of the greater Lefkosia Area, Cyprus. In US Geological Survey Scientific Investigations Map, 3046.
- Harrison, R. W., Tsiolakis, E., Stone, B. D., Lord, A., McGeehin, J. P., Mahan, S. A., & Chirico, P. (2012). Late Pleistocene and Holocene uplift history of Cyprus: Implications for active tectonics along the southern margin of the Anatolian microplate. Geological Society, London, Special Publications, 372, 561–584.
- Kempler, D. (1998). Eratosthenes Seamount: The possible spearhead of incipient continental collision in the Eastern Mediterranean. In A. H. F. Robertson, et al. (Eds.), Proceedings of the Ocean Drilling Program, Scientific Results (Vol. 160, pp. 709–721). College Station, TX. Kempler, D., & Garfunkel, Z. (1994). Structures and kinematics in the northeastern Mediterranean: A study of an irregular plate boundary. Tectonophysics, 234, 19–32.

- Kinnaird, T. C., Robertson, A. H. F., & Morris, A. (2011). Time of uplift of the Troodos massif (Cyprus) constrained by sedimentary and magnetic polarity evidence. Journal of the Geological Society, 168, 457–470.
- Makris J., Z.Ben Abraham, A. Ginzburg, P.Giese, L.Steinmetz, R.B. Witmarsh and S.Eleftheriou, 1983, Seismic refraction profiles between Cyprus and Israel and their interpretation: Geophysical Journal of the Royal Astronomical Society, v.75, p.575-591
- Montadert L., Nicolaides S., Semb H.P. and Lie O. 2009. Petroleum Systems Offshore Cyprus.
- Neev, D., G. Almagor, A. Arad, A. Ginzburg, and J.K. Hall (1973), The geology of the southeastern Mediterranean Sea, Israel Geol. Surv. Rep., MG/73/5, 43 pp.
- Reeder S.M., Rothwell G.R. and Stow A.V.D. 2000. Influence Of Sea Level And Basin Physiography On Emplacement Of The Late Pleistocene Herodotus Basin Megaturbidite, SE Mediterranean
- Sea, *Marine and Petroleum Geology*, 17: 199-218.
- Robertson, A. H. F. (1998). Tectonic significance of the Eratosthenes Seamount: A continental fragment in the process of collision with a subduction zone in the eastern Mediterranean (Ocean Drilling Program Leg 160). Tectonophysics, 298, 63–82.
- Robertson, A. H. F., Parlak, O., & Ustaomer, T. (2012). Overview of the Paleozoic-Neogene evolution of the Neotethys in the Eastern Mediterranean region (southern Turkey, Cyprus, Syria). Petroleum Geoscience, 18, 381–404.
- Roberts G. and Peace D. 2007. Hydrocarbon Plays and Prospectivity of the Levantine Basin, Offshore Lebanon and Syria From Modern Seismic Data, *GeoArabia Vol. 12, No 3.*
- Sage, L., & Letouzey, J. (1990). Convergence of the African and Eurasian Plate in the Eastern Mediterranean. In J. Letouzey & Editions Technip (Eds.), Petroleum and Tectonics in Mobile Belts (pp. 49–68). Paris.
- Stampfli, G. M., & Borel, G. D. (2002). A plate tectonic model for the Paleozoic and Mesozoic constrained by dynamic plate boundaries and restored synthetic oceanic isochrones. Earth and Planetary Science Letters, 196, 17–33.
- Vidal N., Alvarez-Marron J. and Klaeschen D. 2000. Internal Configuration of the Levantine Basin From Seismic Reflection Data (Eastern Mediterranean), *Earth and Planetary Science Letters* 180: 77-89.

WEBSITES:

- https://kpv-legal.com/en/prospection-exploration-and-exploitation-of-hydrocarbons-in-greece-legal-framework/
- https://www.greekhydrocarbons.gr/en/LegalFiscal_en.html
- http://www.ypeka.gr/LinkClick.aspx?fileticket=l3TNzx1rKsM%3D&tabid=765&language=en-US
- http://www.mcit.gov.cy/mcit/hydrocarbon.nsf/page15_en/page15_en?OpenDocument
- https://www.lexology.com/library/detail.aspx?g=49cf5bd0-beec-4169-8c99-abdaa6c1467f
- https://uk.practicallaw.thomsonreuters.com/1-524-0155?transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1
- http://www.mcit.gov.cy/mcit/hydrocarbon.nsf/All/9E627A7ABDE91ACFC2257F5A0030C736/$file/Model_PSC_1LR.pdf
- http://www.ypeka.gr/Default.aspx?tabid=766&locale=en-US&language=el-GR
- https://www.iene.gr/workshop-for-hydrocarbon/articlefiles/session4/Nikolaou.pdf
- https://www.greekhydrocarbons.gr/en/ExplorationDevelopmentProduction_en.html
- https://sapientaeconomics.com/wp-content/uploads/2014/02/The-Cyprus-hydrocarbons-issue-ENG-WEB.pdf
- http://www.academia.edu/17600796/Hydrocarbon_Findings_off_the_Coast_of_Cyprus_Showdown_in_the_Eastern_Mediterranean_or_a_Chance_for_Local_and_Regional_Reconciliation
- https://www2.deloitte.com/content/dam/Deloitte/cy/Documents/energy-resources/oil-and-gas/CY_EnergyAndResources_OilAndGas_Noexp.pdf
- http://chc.com.cy/activities/brief-outline/
- https://cyprus-mail.com/2018/12/02/eastmed-gas-pipeline-increasingly-doubtful/
- https://www.tovima.gr/2019/03/01/international/exxon-announces-hug-gas-find-in-cyprus-eez/
- https://www.newsbaseeastmed.com/2019/01/28/cyprus-optimistic-about-outlook-for-2019/
- www.desfa.gr
- www.rae.gr
- www.imerisia.gr
- www.sees.gov.gr
- www.stroytransgaz.com
- www.ypan.gr
- https://en.wikipedia.org/wiki/Trans_Adriatic_Pipeline
- www.eac.com.cy
- www.ec.europa.eu

- www.kathimerini.com.cy
- www.energia.gr
- www.zawya.com
- www.reuters.com
- www.mees.com
- www.energypress.gr
- www.euro2day.gr
- www.academyofathens.gr
- www.iene.gr
- www.oxfordenergy.org
- www.bloomberg.com
- www.academyofathens.gr
- www.woodmacresearch.com
- www.upstreamonline.com
- www.moi.gov.cy
- www.bbc.com
- www.aksam.com.tr
- www.sigmalive.com