PROGRAM & ABSTRACTS

TECHNICAL UNIVERSITY OF CRETE
DEPARTMENT OF MINERAL RESOURCES ENGINEERING
University Campus, Akrotiri, Chania, Greece

Tel :+30 2821037657, Fax:+30 2821069554
www.mred.tuc.gr

CONFERENCE

'Oil & Gas Exploration in Greece – Challenges and Opportunities'

Chania Chamber of Commerce

Thursday, September 29th 2011, 9:30 – 16:30

PROGRAM

Registration – Welcome -- Opening of the conference by the Vice Rector of Technical University of Crete, Prof. T. Markopoulos	9:30 – 10:00
Session A: Oil and Natural Gas in Greece: Current Status and Perspectives	
I. Maniatis, Deputy Minister of Environment, Energy and Climate Change	10:00 – 10:30
Key Note Speaker: M.J. Economides, Professor UNIV. HOUSTON *Energy Geopolitics in the Eastern Mediterranean*	10:30 – 11:15
M. Rigas, Managing Director ENERGEAN OIL & GAS *The revival of the Greek Oil & Gas business in Greece - the success story of Prinos*	11:15 – 11:45
COFFEE BREAK	11:45 – 12:00
Session B: Greek geological setting and drilling exploration activities in Greece	
Dr. A. Mavromatidis, Petroleum Geologist ABU-DHABI NATIONAL OIL COMPANY *A review of hydrocarbon exploration in Western Greece and its potential*	12:00 – 12:15
Dr. D. Waters, Senior Exploration Geologist, ENDEAVOUR ENERGY UK Ltd *High-risk high-reward sub-thrust prospectivity in Epirus, NW Greece*	12:15 – 12:30
Dr. N. Nikolaou, Petroleum Geologist – Energy Economist ENERGEAN OIL & GAS *Hydrocarbon discoveries and petroleum systems in Greece*	12:30 – 12:45

Dr. E. Konofagos, Executive Vice-President FLOW ENERGY SA *Offshore Oil & Gas Exploration & Production,* *Investment Opportunities South of Crete*	12:45 – 13:00
A. Foscolos, Professor Emeritus, TECHNICAL UNIV. CRETE *Geological and geochemical evidences indicating the existence of large hydrocarbon deposits in the Libyan sea within the Greek Exclusive Economic zone (EEZ)*	13:00 – 13:15
G. P. Lourantos, Managing Director, PETRO-ENERGY INTERNATIONAL *Microbial Prospection for Oil and Gas. Potential applications in Greek exploration*	13:15 – 13:30
LIGHT LUNCH	13:30 – 14:30
Session C: R&D capabilities for Oil & Gas exploration	
A. Vafidis, Prof. TECHNICAL UNIV. CRETE *Marine seismic data acquisition and processing. Current practices – examples from the Mediterranean Sea and the Gulf of Mexico*	14:30 – 14:45
N. Pasadakis, Assoc. Prof. TECHNICAL UNIV. CRETE *Petroleum Geochemical studies in Greece*	14:45 – 15:00
V. C. Kelessidis, Assoc. Prof. TECHNICAL UNIV. CRETE *Meeting the challenges for deep water exploration with drilling fluid and drilling hydraulics research at TUC*	15:00 – 15:15
N. Varotsis, Prof. TECHNICAL UNIV. CRETE *Reservoir Engineering Answer Products developed and services provided by TUC to the international Oil Industry*	15:15 – 15:30
Z. Agioutantis, Professor & Head, Dept. Mineral Resources Engr. TECHNICAL UNIV. CRETE *Mineral Resources Engineering Department of TUC in support of Oil & Gas exploration*	15:30 – 15:45
P. Papanastasiou, Professor & Dean Engr. UNIV. CYPRUS *Challenges and Opportunities for Oil exploration in Cyprus: the Role of the University*	15:45 – 16:00
R. Time, Prof. UNIV. STAVANGER, Norway *Mutual benefits from University-Oil Industry collaboration: The Norwegian experience*	16:00 – 16:15
COFFEE BREAK	16:15 – 16:30
Panel Discussion	16:30 – 18:30

Session A:

Oil and Natural Gas in Greece:

Current Status and Perspectives

I. Maniatis, Deputy Minister of Environment, Energy and Climate Change

DEPUTY MINISTER OF ENVIRONMENT, ENERGY & CLIMATIC CHANGE

Yannis Maniatis was born in Argos in 1956. He is a Qualified Agronomer Topographer Engineer of the National Technical University of Athens and Doctor Engineer. From 1995 he was Assistant. Professor of Aristotle University of Thessaloniki while from 2002 is Assistant Professor at the University of Piraeus. He is also a visiting Professor in the Institute of Economic Geography of University of Bonn.

POLITICAL AND SOCIAL ACTIVITY

Mr Maniatis was elected as Member of the Parliament for the constituency of Argolida for the first time in the 2004 elections. He was re-elected in both the 2007 and 2009 elections. He is member of the Board of Director of ISTAME (Institute of Strategic and Development Studies) - Andreas Papandreou from 2004 and in charge of the 'Green Development' team.

M. J. Economides, Professor UNIV. HOUSTON
Energy Geopolitics in the Eastern Mediterranean

ABSTRACT

Energy resources have always been at the center of the Middle East conflict, creating alliances and clearly influencing the policies of many nations towards adversaries. Israel, recently in major energy news, has had a very complex relationship with its neighbors, mainly Egypt, a supplier of energy to Israel since the Camp David Accords in 1978. In 2004, Noble Energy, a relatively small but capable Houston-based independent, started producing natural from the Mari field, offshore Israel. In early 2009 Noble announced discovery of the 7 Tcf Tamar field, 90 km off of Israel's northwestern coast. The estimated initial gas in place was raised from 5 Tcf to 8.4 Tcf on the drilling of an appraisal well that quickly followed the exploration well. Tamar is located at a total depth of 16,000 ft in 5,500 ft of water. But the best was yet to come. At the close of 2010, Noble Energy and partners announced that the Leviathan field, off the north coast of Israel, contained at least 16 Tcf of recoverable gas, which would make the field one of the largest offshore natural gas fields ever. Such a giant discovery, which may be followed by other discoveries, would certainly make Israel a prime candidate natural gas exporter. The United States Geological Survey has estimated that the Eastern Mediterranean may hold 200 Tcf of ultimately recoverable natural gas. The two Israeli discoveries are perhaps the largest gas discoveries in the world in each of the last two years and are likely to greatly enhance Israel's regional and European geopolitical role.

Israel's success in the energy arena is a game-changer in geopolitics. Further west, Noble already holds the only lease in Cyprus waters, which could prove success in the outer reaches of the Levantine Basin. Israel and Cyprus are cooperating to define the borders of the continental shelf under the rules of the UN Convention on the Law of the Sea.

As expected various versions of the exclusive economic zones have been drawn, based on different interpretations of territorial waters. Greece and Turkey would certainly need to resolve the issue (in addition to the actual determination of whether there are extractable hydrocarbons.)

Natural gas may bring Israel and Cyprus (and by extension Greece) into a natural alliance, not just for the economic benefit. In a classic example of the "enemy of my enemy is my friend" the recent breech between Israel and Turkey brings the Greeks closer to Israel. A natural gas pipeline from the Israeli finds to Cyprus would be an obvious gesture of the rapprochement. Such a pipeline can become the vehicle for LNG liquefaction and then exports of LNG to a natural gas starving Europe, suffocated by Russian natural gas imports. An alternative substantial source of natural gas to Europe can provide what the ill-fated Nabucco pipeline is unlikely to ever deliver.

Two LNG trains on Cyprus each of 7 million metric tons of LNG will amount to about 23 percent of Russian exports to Western Europe, which were 3.3 Tcf in 2009.

Eastern Mediterranean natural gas, as almost everything else in that part of the world, has many more dimensions than the obvious.

MICHAEL J. ECONOMIDES

A Chemical and Petroleum engineer and an expert on energy geopolitics he is a professor at the Cullen College of Engineering, University of Houston and Managing Partner of Dr. Michael J. Economides Consultants, Inc. with a wide range of industrial consulting, including major retainers by several Fortune 500 companies and national oil companies. He is the Editor-in-Chief of *Energy Tribune* (www.energytribune.com) and Editor-in-Chief of the peer-reviewed *Journal of Natural Gas Science and Engineering*.

Technically, he casts a commanding figure in petroleum and natural gas reservoir and production engineering. With 15 textbooks and almost 300 journal papers and articles, his works are referenced by almost all practitioners in the field.

In the relatively recent past he has served as Senior Technical Advisor to China's CNOOC and subsidiary COSL, to ENI, Italy's main petroleum multinational company and for more than 5 years to Yukos and Sibneft, Russia's major petroleum companies. During 1997 and 1998 Economides was in Venezuela as the Senior Advisor on Production Technology for PDVSA, the national oil company of Venezuela.

Following his 2000 best seller *The Color Of Oil* and a large number of publications in international magazines, he is considered by many as the premier world expert on the geopolitics of energy, giving about 50 speeches per year to groups from many large professional societies, organizations and corporations. He is a frequent guest on national and international media. He writes for the editorial pages of major newspapers, magazines and internet news organizations.

His latest wide appeal books are *From Soviet to Putin and Back: The Dominance of Energy in Today's Russia* (www.soviettoputin.com), *Energy: China's Choke Point, Energy and Climate Wars* and *The Energy Imperative.*

M. Rigas, Managing Director ENERGEAN OIL & GAS

The revival of the Greek Oil & Gas business in Greece - the success story of Prinos

Mathios Rigas

Founding shareholder of the Company and has a unique combination of Petroleum Engineering background and 20 years of investment banking and private equity experience, primarily in the oil & gas sector

Former CEO of Capital Connect Venture Managers, a Greek Private Equity fund with investments in IT, medical devices, recycling, food industries and tourism

Vice President of Shipping, Energy and Project Finance at Chase Manhattan Bank in London; raised in excess of US$5 billion in oil and gas financings

Head of Investment Banking for Piraeus Prime Bank in Greece

Degree in Mining and Metallurgic Engineering from the National Technical University of Athens and a MSc in Petroleum Engineering from Imperial College in London.

Session B:

Greek geological setting and drilling exploration activities in Greece

A. Mavromatidis, Dr. Petroleum Geologist, Abu-Dhabi National Oil Company

A review of hydrocarbon exploration in Western Greece and its potential

ABSTRACT

Ionian Zone in western Greece is a possible hydrocarbon producing area. Oil seeps are abundant in the area and the zone is a continuation of the Albanide tectonic zones with active oil fields. The Ionian Zone is composed of Triassic evaporites and carbonates that are overlain by Jurassic-Cretaceous carbonates and Cretaceous-Tertiary clastics. The units under the evaporites are believed to host the most attractive plays in the area. However, these units have never been reached. Tectonic movements in Miocene to Pliocene times have a serious effect on this lithology and the role of the evaporites in the tectonics is highly underlined. Maturity modeling shows that the units under the evaporites produce hydrocarbons and hence comprehensive studies aiming to target these plays are more than essential. One exploration well, drilled in 2002, experienced severe overpressures and hence deep drilling was not encouraged. Variable explanations are listed, one of them is the possibility of hydrocarbon reservoirs.

As a general hydrocarbon potential of western Greece should not be diminished due to the seismicity neither thrillingly encouraged due to the existence of oil-gas fields in neighboring countries.

The exploration history in Greece reveals that foreign explorers were interested but unorthodox drilling, scarcity of planning, delays and unprofessionalism has a negative impact to the upstream Greek industry. Greece is the only country in the Mediterranean area without any drilling activity since 2002.

More studies are important for the Ionian Zone and generally for western Greece, such as the pre-Apulian Zone, which has similar lithology to the Ionian Zone, and the Gavrovo Zone. These studies must trace the deep evaporitic strata and target areas where the evaporites will be fully penetrated. Drilling in western Greece should continue.

There are some 25 oil and gas fields in Albania, only one discovery has been made so far in western Greece (west Katakolon). This is highly significant as it proves the existence of a viable play and its continuation throughout western Greece. It is evident for obvious economic and scientific purposes that a new drilling era should begin in the near future. It is so profound the advantages of such activity for the Greek economy.

Angelos Mavromatidis

Angelos studied geology at the Aristotle University in Thessaloniki, 1988. In 1997 got his PhD in Petroleum Geophysics from the Adelaide University in Australia. Angelos worked as an exploration geologist with Enterprise Oil in Greece and continued his career working as production and exploration geologist in Oman and United Arab Emirates (UAE). Currently is working for ADNOC, the government company of Abu Dhabi in UAE. His main interests include basin and reservoir modelling of mature fields and exploration of deep undeveloped gas fields.

Dr. D. Waters, Senior Exploration Geologist, ENDEAVOUR ENERGY UK Ltd

High-risk high-reward sub-thrust prospectivity in Epirus, NW Greece

ABSTRACT

The Ionian zone of Northwest Greece and Albania has a well recognised petroleum system. In the onshore part of NW Greece (Epirus), surface seeps abound but discoveries have been more evasive, partly because the target structures are usually exposed at surface. There is however the possibility that a deeper sub-thrust environment, sealed by a large Triassic decollement, and containing thrust-stacked Ionian zone units, is regionally present below most of Epirus. This would imply the presence of a (so far untested) onshore gas-prone hydrocarbon province.

The Ionian zone of NW Greece and Albania lies at the transition from oceanic subduction to continental collision at the NW termination of the rapidly migrating Hellenic subduction zone. Nowhere else in the world is such a dramatic tectonic situation co-incident with km-scale thicknesses of evaporite. In Epirus the Ionian zone is thrust over the Apulian platform part of the Adriatic microplate, contiguous with Apulia in southern Italy. Well documented paleomagnetic rotations extend throughout the entire Ionian zone, into the hinterland Pindos zone, and are remarkably consistent. They suggest about 45 degrees clockwise rotation relative to north during the Cenozoic, mainly since the Oligocene. Equally well documented & consistent anticlockwise rotations in central & southern Italy suggest the Adriatic plate has rotated about 20 degrees anticlockwise relative to north since the late Cretaceous. The Ionian Zone of Greece & Albania is the only obvious deformation belt of appropriate age that can accommodate the implied displacements between these regions.

There-in lies a conundrum, as the deformation observed at the surface of the Ionian zone (quantified through numerous structural restorations), accounts for less than half of the deformation implied by the rotations. There are only three ways this discrepancy can be reconciled:

1) Model 1: The southern part of the Adriatic Microplate has also rotated clockwise by about 25 degrees post Oligocene, in sympathy with the Ionian zone, and there is as an as yet undetected deformation zone between the northern and southern Adriatic that is accommodating large amounts of internal relative rotation within the Adriatic microplate.
2) Model 2: Strike-parallel dextral shear accompanying thrusting within the Ionian zone is rotating individual thrust sheets bounded by numerous transverse structures - giving the illusion of a regional rotation which is actually a separate rotation, in unison, of multiple individual fault blocks.
3) Model 3: The Ionian zone Triassic evaporitic decollement is super-efficient & has allowed displacements of the order of 100 km or more along the Ionian zone thrust front, so that much of the deformation implied by the regional rotations has occurred sub-thrust and is not apparent at the surface. Only this model implies the presence of an untested onshore hydrocarbon province.

Structural analyses, seismicity, analogues, and the Filiates-1 well in W Epirus suggest model 3 may be the more likely. The Ioannina-1 well drilled by Enterprise oil in 1998 attempted to test this model but and failed to penetrate the sub-thrust objective

below the evaporites. However it can be further de-risked relatively cheaply without the need for drilling by:

- Paleomagnetic studies on the island of Paxos. It is the only emergent autochthonous part of the Adriatic microplate seaward of the Ionian thrust but still close to it. If model 1 is the correct one it will be evident from regional rotations on this island.
- Regional scale documentation of the lithologies, petrography, and biostratigraphy of xenoliths within the Epirus Ionian zone evaporites, focussing on clastics and any evidence of Paleozoic basement. These could help decipher between the duplexed Tertiary clastics or basement in different parts of the sub-thrust environment.

A preferred exploration strategy would be to perform these studies first, then if sufficiently encouraged, to tag lithologies sub-evaporite in the area north or west of Ioannina with one or two (high-pressure) deep onshore exploration wells. Any confirmation of the sub-thrust model could then trigger a more comprehensive geophysical acquisition and drilling exploration program.

Dave Waters

My interest in fold and thrust belts began with a first degree at Victoria University in New Zealand, looking at thrust tectonics near the southern termination of Pacific plate subduction in the northern South Island. A PhD at Cambridge University UK followed, looking at the tectonic evolution of Epirus, NW Greece, supervised by Prof. Alan Smith. From 1995 to 2002 I worked with Enterprise Oil and was involved in the initial stages of their exploration activity in Greece and Albania, as well as other projects in the UK, Ireland, Norway and Middle East. Upon Enterprise's takeover by Shell I worked for two years based in Rijswijk, working on the opposite side of the Mediterranean, the Sirte Basin of Libya. From 2004 until early 2011 I worked three years with each of RWE & E.ON, based in London, working on UK North Sea and Atlantic margin exploration. I have recently joined Endeavour Energy in London and continue to work on North Sea Exploration.

Dr. N. Nikolaou, ENERGEAN OIL & GAS

Hydrocarbon discoveries and petroleum systems in Greece

ABSTRACT

As ex. E&P technical director of Hellenic Petroleum and after 37 years of experience in this sector I will try to answer the question whether Greece represents any oil potentiality and could produce its own oil. I will cite the findings of exploration conducted over the past four decades, whose data I lately managed personally, coordinating some of the best geoscientists and oil engineers of our country. We all know that the central body of oil exploration over the last 35 years was the Public Petroleum Company then its subsidiary DEP-EKY and eventually its successor, HELLENIC PETROLEUM S.A.

Hydrocarbon Fields and Discoveries: Prinos Oil field, South kavala Gas Field, North Prinos Oil Field, Epsilon oil Field, Athos, Ammodis, East Thassos discoveries, all in Thracian Sea, West Katakolon Oil Field and Alykes Asphalt discovery both in Western Greece and Epanomi Gas field in Chalkidiki, are the only proven discoveries in Greece.

Production: 116 million barrels of oil have already been produced from Prinos, North Prinos ant Epsilon Fields and 855 million cubic meters of natural gas from the respective field in South Kavala.

Oil and Gas Shows: More than 200 oil and gas shows have been detected in wells or on surface

Petroleum Systems: 10-12, proven working petroleum systems have been defined [petroleum system is the coexistence of the fundamental factors for hydrocarbons presence into a specific region. (source, reservoir, seal rocks, traps ant right geological history)].

Moreover, in Italy, Croatia, Albania and Eastern Thrace, there are working and productive petroleum systems, **analogue to the ones of western Greece, the Ionian Sea and the Greek Thrace.** And of course, nobody believes that there geological or other physical barriers between these countries' borders with Greece, which respectively prevent the existence of hydrocarbons in our country.

To sum up, according to exploration finding available so far in Greece, I would like to emphasize that there is reasonable evidence that additional hydrocarbon reserves might be discovered. Some areas of the country present good oil existence features, some areas present less, others request for more research to draw secure conclusions. Even though I can name some of these places, I will not do that. **It is up to oil companies to decide which of these places will be chosen.** They are called upon to make their decisions because they will risk their own capital.

And of course it is up to **the State** to provide an opportunity for oil companies to engage in similar activities in our country via bid rounds or open door procedures, for concession areas.

Unfortunately, conclusions regarding the business environment, in which private companies invited to undertake investments in the E&P sector, I can tell you for sure that it is not the best. It will take a great effort, perseverance and a great deal of resources to overcome all the issues, from sophisticated technical problems to simple administrative matters in their cooperation with the government.

Konstantinos Nikolaou

Dr. Nikolaou has 37 years of experience in E&P Business. As Technical Director of Hellenic Petroleum he managed and supervises exploration and productions activities and projects in Greece, Libya, Egypt, Albania, evaluating more than 150 business opportunities in more than 25 countries and in more than 75 different petroleum systems, in North Africa, the Middle East, CIS and East Mediterranean. Dr. Nikolaou has held Special Advisor positions in the Greek Ministry of Development, Hellenic Petroleum Company, Public Petroleum Corporation E&P of Hydrocarbons S,A, and the Ministry of Industry, Energy and Technology (Secretary of the National Energy Committee). He is a member: of Hellenic Geological Society, the Greek Geotechnical Chamber, the American Association of Petroleum Geologists, the International Association of Energy Economists and member of the Board of Directors of the Institute of Energy of SE Europe(IENE) and Hellenic Institute of Petroleum. From October 2009 he is technical advisor of Energean Oil &Gas, the only operator and producer of Oil and Gas in Greece.

Dr. E. Konofagos, FLOW ENERGY SA

Offshore Oil & Gas Exploration & Production, Investment Opportunities South of Crete

ABSTRACT

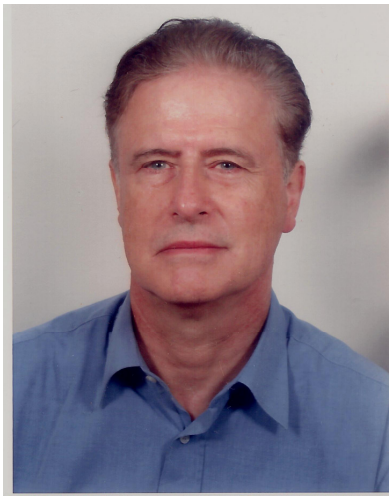
During the years 2001 to 2004 the Greek Company Hellenic Petroleum S.A. in Joint Venture with the Chilean Oil Company Sipetrol International (as Operator) & Oil Search Ltd Papua New Guinea Oil Company, negotiated with the National Libyan Oil Company N.O.C. the acquisition of the Offshore Concession O6 Block (40.000 km2) located between the town of Sirte and the island of Crete, just 100 km way of the informally Greek EEZ borders (the Author was appointed as Hellenic Petroleum sole representative member of the Consortium Negotiations Committee). In 2003, on behalf of his partners, Sipetrol International based in London acquired, reprocessed, interpreted & studied all available official & unofficial non exclusive seismic data recorded into the Gulf of Sirte & between Cyrenaica and the island of Crete. At the time all Consortium Companies noticed that a great number of seismic lines were present and were executed into the informal Greek EEZ from different seismic companies and more particularly from CGG (Compagnie Generale de Geophysique) & also from some other Seismic Companies.

At the end of 2003, Consortium studies showed that South West Crete offshore areas included extensive sedimentary areas. These sedimentary basins presented a great number of geological analogies with those located into the Sirte Offshore Basin. Specific Petroleum System analogies were clearly identified in all areas studied between the Gulf of Sirte and Crete. Then the Consortium proposed to N.O.C. to immediately proceed to a $100 million Exploration investments program, program that could be executed during a first three years time period. Unfortunately Consortium negotiations with N.O.C. ended unexpectedly in 2004 without success. Surprisingly immediately after -in 2006- the Libyan Government published in the international press and in the Libyan official gazette a Map showing new network offshore Concession Blocks to be granted to the International Oil Companies. The Blocks were smaller in size, but the Map contained all South Crete Greek Offshore sedimentary areas!! The Libya Concessions Map included even the whole island of Gavdos.

Coming back to our days, it seems today that a great number of official (under Egyptian Licencee) & unofficial non-exclusive seismic lines have been already recorded and are also present South - South East of Crete, actually being available to any Oil Company active in the region or into the International E&P arena. More specifically following recent offshore Egypt Gas Field discoveries and other discoveries announced between Cyprus & Israel, further studies of the existing above mentioned seismic data together with any new official forthcoming non-exclusive seismic data south of Crete, could provide evidence of extensive possible geological analogies between the Levantine Basin & the Nile Delta Basin Petroleum Systems with the ones located South - South East of Crete. Furthermore East Mediterranean Noble Energy Gas Fields (sea water depths ~1.700 m) development studies together with recent "LNG FPSO's" (Shell-Technip, Prelude LNG Floating Units etc) successful cost effective developments into the international offshore market, showed that if petroleum system analogies and gas fields analogies are present between the South Cyprus basins or the Nile Delta basin with the South – South East Crete basins

then exploration-development-production costs could be expected to be into a range between $6/bbl to $12/bbl. If we take into account that the exploration-development-production Costs of Prinos Fields exceeds $13/bbl, possible presence South-South East-South West Crete Gas Fields opportunities could be economically attractive even if the South Crete sedimentary areas are presently considered as frontier ones and even if the sea water depths are in the range of 1.500 t0 2.500 meters.

Dr. Elias Konofagos



Dr Elias Konofagos has been active for more than 35 years in the Oil & Gas Exploration and Production Business. He successively joined and worked in several Oil & Gas Companies as Elf Acquitaine, Mobil North Sea, Public Petroleum Corporation of Greece S.A., Hellenic Petroleum S.A., and today acting as Executive Vice President of Flow Energy S.A. based in Athens and as co-Chairman of Parthenon Energy based in Cyprus.

A. Foscolos, Professor Emeritus, TECHNICAL UNIV. CRETE

Geological and geochemical evidences indicating the existence of large hydrocarbon deposits in the Libyan sea within the Greek Exclusive Economic Zone (EEZ)

ABSTRACT

Evaluation of geological and geochemical data acquired since 1985 from scientists working in the Libyan Sea indicate the possible existence of large hydrocarbon deposits in an area of 80000 Km^2 within the Mediterranean Ridge, The indicators are:

a) The existence of large number of mud volcanoes which release methane in large quantities while hydrocarbon seeps have been recorded adjacent to mud volcanoes. Portion of the emitted methane is converted to gas hydrates. The volume, within the Greek EEZ, is about 30 Trillion M^3
b) Based upon the values of C_1/ C_2+C_3 substantial portion of the emitted methane is thermogenic. This implies that pyrolysis or better thermal cracking of hydrocarbons take place at depth were temperatures are 160^0C to 180^0C .Based upon a geothermal of 33^0/1000 meters this takes place at 5000 to 5500 meters of depth. Hence working petroleum systems are encountered at depth while the thickness of the sediments, below sea level, is over 5000 meters.
c) Hydrocarbon analysis of mud from ODP cores suggests the presence of an active hydrocarbon system at depth.
d) Within the Mediterranean Ridge Accretionary Prism Complexes exist. Since Accretionary prisms are productive throughout the world one should expect the same thing to take place within the Mediterranean Ridge. The latter has a length around 1000 kilometers and probable width of 80 kilometers.

Given that under very similar conditions that is, the existence of active mud volcanoes emitting thermogenic gases and with working petroleum systems at depth in both the Nile Cone and in Cyprus lead to the discovery of very large natural gas deposits, 1, 8 Trillion M^3 and anticipated 1,3 Trillion M^3 respectively, one should expect the same amount to be discovered in the Libyan Sea. This optimistic approach is shared by PGS since they equate the Southern Mediterranean Basin with the Levantine Basin where out of the anticipated 3, 45 Trillion M^3 of natural gas, 1 Trillion M^3 has already been discovered

The abyssal Herodotus basin which is a remnant of the Tethys Sea, seems to have large hydrocarbon deposits as indicated by a number of petroleum geologists. The reason is its proximity to the Nile cone where 126 natural gas deposits have been discovered having a total reserve of 1,8 Trillion M^3 and the revelation by PGS geophysical data that in Block 3 of the EEZ of Cyprus, that is in the portion of the Herodotus basin belonging to Cyprus, 2 large and 1 small Bright Spots have been identified thus betraying the existence of large natural das deposit In addition analysis of the geophysical data carried out by TGS-NOPEC inside the Egyptian portion of the Herodotus basin have revealed the existence of 7 multiple reservoir interval carrying hydrocarbons. Given that hydrocarbon systems do not recognize international boundaries, as is the case with Albania and Libya, one should expect hydrocarbons to occur in the Greek portion of the Herodotus basin. BEICIP/FRANLAP estimates that in the portion of the Greek Herodotus basin the amount of natural gas hovers around 2 Trillion M^3 or the equivalent of 6-8 billion

barrels of oil. Geophysical surveys carried out by TGS-NOPEC inside the Greek Herodotus basin, tagged as GR-lines, should be studied in order to verify the existing optimist as expressed by petroleum geologists, petroleum geophysicists and prominent institutions such as BEICIP?FRANLAB regarding the existence of huge hydrocarbon deposits or negating their optimism.

ANTHONY E. FOSCOLOS

Born on 1930 in Cairo Egypt where I completed my elementary and high school studies. Subsequently, I pursued my education at the Aristotelian University, Bachelor in Agricultural Engineering followed by an M. Sc and PhD. at the University of California Berkeley in the field of Physical Chemistry of Clay Minerals. Upon completing my graduate studies in 1966, I was hired by the Geological Survey of Canada, Institute of Sedimentary and Petroleum Geology to carry research in the area of hydrocarbons in Central Alberta, Northeastern British Columbia, the Beaufort MacKenzie Delta and the Canadian Arctic Islands. One third of my scientific publications are related to these activities.

In 1986 I was elected as a professor at the Technical University of Crete, Department of Mineral Resources Engineering. My teaching was related to the field of Inorganic and Organic Geochemistry and Organic Petrology .Between 1966 and 1997 I also served as Academic vice President.1988-1993, Head of the Department of Mineral Resources Engineering, 1995-1997, energy consultant for the United Nations Development Program (UNDP), 1975-1985 and Adjunct Professor, Department of Geography and Archaeology, University of Calgary, 1975-1986.

My scientific record includes 75 publications, most of them in peer review journals, with a Citation Index of 243 (till 2003), 33 participations at International and National Conferences with presentations and posters and 14 Technical Reports foe the Public Petroleum Corporation of Greece (DEP-EKY), Public Power Corporation of Greece, S.A. (DEH), Institute of Mineral Exploration, Greece (IGME) and the United Nations.

G.P. Lourantos, Managing Director, PETRO-ENERGY INTERNATIONAL

Microbial Prospection for Oil and Gas. Potential applications in Greek exploration

ABSTRACT

Mr. Lourantos will be presenting oil & gas land and subsea exploration technique (**MPOG®**) he implements in collaboration with foreign companies. This technique concerns detection of microbes which develop in the ground when small quantities of hydrocarbons are present, through specific analyses performed in the laboratory on soil samples taken in situ.

The basis of **MPOG®** is that oil or gas fields emit a continuous stream of light hydrocarbon gases at the earth's surface. Specialized microorganisms, the Hydrocarbon Oxidizing Bacteria, depend on light hydrocarbon gases as their only energy source. Such microorganisms are able to utilize extremely low concentrations of hydrocarbons wherever there is a continuous gas flow, and are only found enriched in the sub-surface above hydrocarbon bearing structures. The exceptionally high adaptability of bacteria to grow on most different nutrient sources and its ubiquitous distribution form the basis of microbial prospection.

The amount of soil needed is small (100 g) and it is taken from subsurface at depths of 150 cm when in land and at depths of 30 cm below the sea sediments when in subsea exploration. Sampling is performed with sample points in distance of 250 m to 1000 m, depending on the magnitude of the expected reservoir. The results are presented in 2D maps and any detected anomalies on the maps denote potential subsurface reservoir. Thus, the technique can give results for high hydrocarbon concentrations in large areas with low cost compared to the high cost of geophysics.
Mr. Lourantos will present successful examples of implementation of this technique in various parts of the world and he will present his proposals for implementing this technique in various areas in Greece with emphasis in Western Greece and in the areas south of Crete.

G. P. LOURANTOS B.Sc. (Honours), M.Sc., D.I.C.

Gerassimos (Gerry) P. LOURANTOS is a graduate of the Royal School of Mines (R.S.M.) at the Imperial College, University of London. His post graduate thesis was carried out at the British Petroleum (BP) Research Centre at Sunbury, under the direct supervision of Dr Roy White.

His international carrier, which spans more than 30 years, started in 1978 working for GeoSource International in the oil and gas seismic data field acquisition and seismic data processing working in Europe, Africa, the Middle East and Asia.

Between 1980 and 1985 he was based in London (U.K.) working for Phillips Petroleum Company (International) on African exploration and production projects. Highlights during this period is his involvement with the high-tech operations offshore the Ivory Coast and Ghana using the very early 3D seismic technology, leading to the discoveries of the Espoir and Foxtrot Cretaceous oil fields offshore the Ivory Coast, and the Pan-African geo-tectonic regional study of the African Mesozoic Epicontinental Cratonic Basins focusing on the major Cretaceous oil discoveries in Chad and the Sudan.

Between 1985 and 1996 he was based in Stavanger (Norway) working for Petrofina (Norway) as Chief Geophysicist in the Barents Sea in the extreme north of Norway, in Mid-Norway and in the Norwegian North Sea. Highlights during this period is his direct involvement with various exploration projects, leading to the discoveries of the Snow White East (Snohvit) Cretaceous oil and gas field in the Barents Sea and the 24/9-5 Tertiary oil field in the Norwegian North Sea, and with various oil and gas production projects associated with the giant Greater Ekofisk Fields.

Since 1996 he established, owned and run a number companies involved with the high-tech end of oil and gas exploration and production projects. Highlights during this period is his direct involvement in 1996-1998 with the First Greek International Exploration Round in Western Greece and the Prinos oil field operations as a Senior Advisor to the D.E.P.-E.K.Y. S.A. upper management.

During the last four (4) years his companies are involved in major oil and gas exploration operations in West Africa, using very extensively advance technologies like the Microbial Prospecting for Oil and Gas (MPOG) methodology.

Session C:

R&D capabilities for Oil & Gas exploration

A. Vafidis, Professor TECHNICAL UNIVERSITY OF CRETE

Marine seismic data acquisition and processing. Current practices – examples from the Mediterranean Sea and the Gulf of Mexico

ABSTRACT

A powerful method for investigating geological structures at sea, indeed the most widely used geophysical technique in commercial exploration, is based on recording seismic waves reflected from beneath the sea floor.

The most commonly used sources for offshore seismic exploration generate elastic waves from the rapid expansion of an underwater gas bubble. Airgun arrays produce a wide range of pulse shapes and source spectra. Arrays of hydrophones over 6000 m long with 500 or more channels are commonly employed for seismic surveys. A significant noise problem in marine surveys is that of the multiple reflections including ghost reflections from the sea surface.

In this paper we will discuss current practices which provide broadband output signal and generate images of subsalt structures, and present examples from East Mediterranean Sea.

Antonis Vafidis

He received a B.Sc. (1981) in physics from Aristotle University of Thessaloniki, Greece, an M.Sc. (1984) in applied geophysics from McGill University, Montrıal, Quıbec, Canada, and a Ph.D. (1988) in geophysics from the University of Alberta, Canada. His main research interests are seismic and GPR data processing, including modeling and inversion, and near-surface geophysics. Since 2006, he has been editor of the Journal of the Balkan Geophysical Society. He has been head of the Mineral Resources Engineering Department.
He is a member of SEG, EAGE, and BGS.

N. Pasadakis, Associate Professor TECHNICAL UNIV. CRETE
Petroleum Geochemical studies in Greece

ABSTRACT

The "Hydrocarbon Chemistry and Technology" Research Unit is currently the unique laboratory in Greece, which is active in Petroleum Geochemistry. It is equipped with all the necessary analytical systems and accessories for routine and specialized studies in organic geochemistry, such as characterization of the organic matter, Rock-Eval analysis, biomarkers determination e.t.c. In the last decade the laboratory has been involved in several petroleum geochemistry projects, including geochemical characterization of Prinos and Ionian Basins. Additionally the laboratory has carried out analytical work in the determination and characterization of organic contaminants in the surface and sub-surface environment in areas polluted by petroleum.

Nikos Pasadakis

Dr. Nikos Pasadakis, currently Associate Professor at the Mineral Resources Engineering Department, Technical University of Crete (TUC), obtained his Chemical Engineering Diploma (MSc) in "Chemical Technology of Oil and Natural Gas" (1985), and his Ph.D. in the Physical Chemistry Division, Department of Organic Chemical Technology, Technical University of Lviv (former USSR). Since 1992 he works at TUC as Research Fellow, Lecturer, and Assistant Professor. His current research interests include ***instrumental analysis*** and characterization of fossil fuels, **o*rganic geochemistry*** in expoloration and exploitation of fossil fuels, analysis and characterization of ***organic pollutants*** in the environment from the production and use of fossil fuels and c***hemometric*** modelling of the analytical data. He is the author/co-author of 34 publications in international refereed scientific journals.

Website: http://www.mred.tuc.gr/p013219_UK.htm

V. C. Kelessidis, Assoc. Prof. TECHNICAL UNIV. CRETE

Meeting the challenges for deep water exploration with drilling fluid and drilling hydraulics research at TUC

ABSTRACT

Exploration for oil and gas in the Mediterranean involves drilling in deep and very deep waters which presents significant challenges to drilling industry. In such an environment adverse conditions of pressures and temperatures are encountered creating huge problems many of which are directly or indirectly related to drilling fluids and drilling hydraulics. In this work we will explore the challenges for drilling fluid industry to overcome deep water drilling problems and the implications they have on flow pressures, formation damage and well control. We will then present the capabilities of the Drilling Engineering and Fluid Mechanics laboratory unit at Technical University of Crete together with the actions to take to support the drilling bonanza that Greece will be embarking.

Vassilios C. Kelessidis

Vassilios C. Kelessidis is an Associate Professor in Drilling Engineering at Technical University of Crete for the past 11 years. Prior to this he was with Schlumberger companies working on surface logging while drilling with Anadrill Schlumberger for four years, on oil well cementing with Dowell Schlumberger for three years and with Schlumberger Cambridge Research for a year doing R&D on new drilling techniques. He currently teaches drilling engineering and fluid mechanics. His research activities include work on flow phenomena in oil well drilling, on drilling hydraulics, on pressure estimation, on cuttings transport, on drilling fluids, on additive development for high temperature wells, on two phase flow, on rheology of non-Newtonian fluids, on kick and gas analysis, on drilling engineering analysis and rock-bit interaction. He has authored over 70 publications in refereed journals and conferences, with over 250 citations. He is the co-author of Chapter 5 - Drilling Hydraulics in the newly published book 'Fundamentals of Drilling Engineering' in 2011, from the SPE Textbook Series (the gospel in Drilling Engineering).

website of the lab: http://drillinglab.mred.tuc.gr

N. Varotsis, Prof. TECHNICAL UNIV. CRETE

Reservoir Engineering Answer Products developed and services provided by TUC to the international Oil Industry

ABSTRACT

The PVT & Core Analysis Laboratory of the Technical University of Crete, directed by Prof. N. Varotsis, conducts research oriented towards the study of the behavior of the fluids and of the porous media of oil and gas reservoir.

It is adequately equipped to perform full experimental PVT studies on petroleum fluids captured at reservoir or surface conditions including the full compositional characterization of oil and gas. The phase experimental set-up is unique in Greece, it includes, among others, a dual visual cell system installed in a thermostatically controlled airbath, which is rated to 520 bar and 280^{o}C, and which has already been used to perform complete PVT studies on samples recovered from oil and gas condensate reservoirs. Since 1992, all hydrocarbon samples recovered on Greek territory have been studied in the PVT & Core Analysis Laboratory of TUC (NAPC, Kavala Oil). The asphaltene deposition problem encountered in the Snorre reservoir (North Sea, Norwegian sector) was studied in the lab both experimentally and through the use of theoretical models and recommended procedures were issued for dealing with the associated deposition problems that occurred during production.

The PVT & Core Analysis Laboratory of TUC has developed state-of-the-art know-how in developing pattern recognition models for the prediction of fluids physical properties based on simple measurements and these models are currently utilized by the petroleum industry worldwide in conjunction with Multiphase Flowmeters, with the PVT Express service, and with the MDT downhole tool.

Pioneering work to replace the functioning of Equation-of-State models during the execution of a compositional reservoir simulation with a Phase Stability Classificator and an emulating Function Learning Tool for the Phase split showed CPU time savings of orders of magnitude. This model is currently under field testing by a leading petroleum software company.

The Core Analysis capabilities of the Laboratory include measurements of porosity, absolute and relative permeabilities, fluid saturations, capillary pressures and wettability of the rock-fluid system.

The PVT & Core Analysis Laboratory of TUC has successfully participated in several EU funded research projects and studied experimentally and theoretically the thermodynamic behavior and the dissociation kinetics of gas hydrates contained in marine sediments.

NIKOS VAROTSIS

Professor of the Department of Mineral Resources Engineering and Director of the Fluid Analysis Laboratory of the Technical University of Crete. Before joining the University, he served as Head of the PVT and Fluid Analysis Research and Development Group for Schlumberger in Paris. He holds a Dipl. of Chemical Engineering from the National Technical University of Athens, an M Eng Degree in Petroleum Engineering and a PhD in Petroleum Engineering from Heriot-Watt University, Scotland.

Acting Consultant since 1990 on Phase Behaviour, Fluid Analysis topics for various international oil companies and service companies. Invited Speaker for various SPE Sections around the world. He authored over 80 papers for the SPE conventions and journals as well as for other international scientific journals and conferences.

Z. Agioutantis, Professor & Head, Dept. Mineral Resources Engr. TUC

Mineral Resources Engineering Department of TUC in support of Oil & Gas exploration

ABSTRACT

The Department of Mineral Resources Engineering at TUC offers a five year diploma in Engineering related to the exploration, extraction and exploitation of mineral resources. In support of this, the Department features a multitude of multidisciplinary laboratories that allow the undergraduate student to become familiar with a number of modern technologies related to the exploration and extraction of fossil fuels.

Oil and Gas exploration is a multidisciplinary field that involves geologists, sedimentologistis, geophysistics, chemists and chemical engineers, geotechnical engineers, drilling engineers, mechanical engineers, etc. Our department covers most of these topics both in regular classes (undergraduate and graduate) as well as with a number of applied laboratories that conduct state of the art research in most of these topics.

Zacharias Agioutantis

Professor Zacharias.Agioutantis has a diploma in mining engineering from NTUA, Greece and postgraduate degrees from Virginia Tech, USA. He has been a professor at the TUC since 1989. He is currently the Head of the Department of Mineral Resources Engineering as well as the director of the Rock Mechanics and Engineering Geology Labs. He has participated in many national and international research and development projects. He has authored and co-authored over 160 technical papers in proceedings and journals. He has also authored and co-authored three books in Greek: Elements of Rock Mechanics, Technical Writing, and Elements of Drilling and Blasting. He serves as editor in two international journals.

P. Papanastasiou, Professor & Dean Engr. UNIV. CYPRUS

Challenges and Opportunities for Oil exploration in Cyprus: the Role of the University

ABSTRACT

The issue of oil exploration in Cyprus has many different aspects such as political, technical, economic and environmental. Taking into consideration all the aspects of the subject, including the last developments, a plan of action is proposed in order to shape a good management strategy which will result in the biggest finances long-lasting profits for Cyprus. The role of the University of Cyprus and its R&E infrastructure, capabilities and plans to achieve this objective will be presented.

Panos Papanastasiou

Panos Papanastasiou is Professor and Dean of the Engineering School of the University of Cyprus. He served as the founding Chairman and Chairman of the Department of Civil and Environmental Engineering from 2002-2008. He worked as Principal Research Scientist in the Research Center of Schlumberger at Cambridge, England from 1991 to 2002 and as consultant to Schlumberger from 2002-2007. His expertise and scientific contributions are in Petroleum Geomechanics and in particular on wellbore stability, hydraulic fracturing, sanding prediction and control, reservoir Geomechanics, CO2 geological storage and petroleum management. He has published more than 100 articles in scientific journals and conference proceedings and he invented 3 patents. He is a member of the Society of Petroleum Engineers (SPE) and editorial advisor for the International Journal of Geomechanics published by ASCE.

R. Time, Professor UNIV. STAVANGER, Norway

Mutual benefits from University-Oil Industry collaboration: The Norwegian experience

ABSTRACT

The Norwegian oil age started in the late 1960's, despite all previous "experts" assertion that there would be no oil to be found in the North Sea or the other offshore areas surrounding Norway. Exploration and field development was initiated with the discovery of the "Ekofisk" field by Phillips Petroleum Company in 1969 and was initially a "Foreigners Know-how" industry. However there was a lucky strike of visionary politicians and strong governmental attendance leading to establishment of the state owned Statoil company. Combined with hungry Norwegian industry and research institutes in the 1970's the situation soon shifted to become a prosperous national development of competence and industry. From the 1980's there was an increasing trend to involve the universities in education, research and problem solving. As one example in 2000, Statoil established a broad cooperation agreement with the five Norwegian universities as part of a big project to develop knowledge on how to extend the tail - lifetime of the "Gullfaks" field. These contracts with Statoil alone started with a budget of 10 million NOK per year, with a goal to expand to 100 MNOK per year. In addition a number of other national and foreign oil companies have found it useful to invest similar R&D money into the universities. A side effect of this has been a very useful international networking between universities in Norway and abroad. This presentation addresses the particular Norwegian background, together with the large challenges that followed the with field development in offshore petroleum industry such as deep waters, complex fields, improved oil recovery, as well as environmental issues in cold and partly subarctic waters. All these factors have forced the cooperation between industry and universities far beyond the level of just a polite support.

Rune W. Time

Rune W. Time is professor in Multiphase Production at the University of Stavanger (UiS), Norway. He holds a Master of Science (cand.real) from the University of Bergen in high-energy nuclear physics (1980), and a PhD in multiphase metering and advanced instrumentation from the University of Bergen (1994). He has a background as Senior Scientist and group leader of fluid dynamics from IRIS Research (previously Rogaland Research Institute) with later affiliations, and has during sabbaticals been visiting scientist at Christian Michelsen Research (CMR) in Bergen, and at SAFL hydraulics laboratory in Minneapolis. Main research focus has been experimental multiphase fluid dynamics, in applications ranging from drilling operations (managed pressure drilling and cuttings transportation) , pipeline transportation as well as process related topics. Recent focus has been on multiphase metering techniques, including impedance, ultrasonics, and high speed optical methods (LDA and PIV). The scientific work includes more than 70 publications.