



Khyber Pakhtunkhwa Oil & Gas Company Limited



**KHYBER PAKHTUNKHWA OIL AND GAS COMPANY  
LIMITED**

(KPOGCL) - PAKISTAN

**LAKKI BLOCK JOINT VENTURE IN PAKISTAN LOCATED  
ADJACENT TO THE PROVEN PETROLEUM SYSTEM**

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# **KHYBER PAKHTUNKHWA OIL & GAS COMPANY LIMITED (KPOGCL)**



**(KP Government Fully Owned & Provincial Holding Company)**  
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## **COMPANY PROFILE**

Khyber Pakhtunkhwa Government (KP), being cognizant of Oil & Gas reserves established Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) - a land mark achievement of the present Government. KPOGCL is not only entrusted with the responsibility of carrying out Exploration and Production (E&P) activities, itself, but is as well, entrusted the responsibility to allure more E&P Companies to do so by ensuring them with the requisite security and the first hand sharing of technological data thus literally acting as a Fast Track implementation of E&P. KPOGCL, while being actually KP Government sponsored / patronized, thus can very conveniently act as an Interface between the E&P Companies and all the other Government Related Agencies thereby actually performing the role of 'One Window of Operations'. It is also the Provincial Holding Company (PHC) under the Petroleum Policy – 2012. KPOGCL is in fact a facilitator to E&P companies.

The Company promotes all E&P activities throughout KP by investing in Producing and Exploration Blocks and procurement of heavy equipment (i.e. Rig and Seismic Data Acquisition Recorder) - all ultimately aimed at generating revenue and of course fulfilling the dire needed energy requirements of not only KP Province but the whole Country.

The Company is also member of Pakistan Petroleum Exploration & Production Companies Association (PPEPCA). It is run by an independent Board of Directors, who are experts from the private Sector with Mr. Raziuddin (Razi) as its CEO. Though, being newly established, the Company is in its embryonic stage of development but owing to the strong support and patronization it has, from the KP Government, it has very rapidly developed itself not only to engage itself, on war footing, in all E&P activities but also arrange with the KP Government to ensure a fool proof security to all the rest of the E&P Companies from abroad and within the country.

With KP Government, determined to boost the province's economy, has already taken a step forward by improving Communication Infrastructure, unearthing the province's hidden treasure of huge reserves of Oil and Gas initially through the province's indigenous Institutions, in which KPOGCL has taken the lead and later on through other multinational E&P Companies while KPOGCL continue to pay its role of 'One Window of Operation' for them.

Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) is looking to farm out 40% non-working interest in the Lakki Block “3270-9” in the province of Khyber Pakhtunkhwa, located in North Western Pakistan. Federal Government would hold 2.5% interest. As KPOGCL is fully owned by the Khyber Pakhtunkhwa Government, therefore KPOGCL holds the Provincial Government interest.

KPOGCL is looking for a joint venture partner to assist with seismic costs, the Geologic and the engineering study and an initial 2 to 3 well exploratory drilling program.

### **Lakki Block Highlights:**

1. Situated adjacent to the proven Oil Basin in Pakistan that is Kohat sub Basin, which is contributing over 50% of oil production to the overall country. The formation and lithology of the Kohat Sub Basin, Bannu Depression and the Tank sub Basin (Upper Indus Basin) is almost same.
2. Reference to the surrounding Kohat sub Basin where the production range has gone up to 6000 bbls/day of oil and 100-400 mmcf/d of gas. The area of the Lakki Block comprises three administrative districts i.e. (District Karak, Lakki Marwat and Bannu).The area is considered to be a prospective zone on the basis of its Petroleum System (Source rocks, Reservoir rocks, Seals and Traps). Probability of the Hydrocarbon Potential has been estimated from the surrounding Kohat sub Basin.
3. The Government of Pakistan provides guarantee of payment to oil producers.
4. The Government of Khyber Pakhtunkhwa being a Provincial Holding Company will facilitate the Exploration and Production activities at every stage.
5. Khyber Pakhtunkhwa is highly rich with Hydrocarbon Reserves but activities were sluggish. With the establishment of Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) activities have picked up due to higher level of confidence.

### **LAKKI BLOCK:**

Khyber Pakhtunkhwa Oil and Gas Company Limited is inviting parties to negotiate a joint venture or farm-out agreement for 2D seismic, 3D seismic survey in 2015 and drilling in 2016.

The Lakki Block has been designed by KPOGCL and sent an application for Reconnaissance Permit to Directorate General of Petroleum Concession (DGPC).

The Block may be accessed via the Indus Highway and the nearby towns of District Karak, Lakki Marwat and Bannu where modern facilities are available due to the current boom in the Oil and Gas discoveries in the nearby District Karak which has contributed a lot to the overall Oil and Gas industry of Pakistan.

Due to the proven reserves in the Southern Districts of Khyber Pakhtunkhwa, Pakistan KPOGCL is considering the unexplored areas in Khyber Pakhtunkhwa as much of the area is yet to be explored.

Oil is currently trucked 4 hours to the Attock Oil Refinery near Islamabad. Khyber Pakhtunkhwa Government is planning to build a local refinery capable of handling 40,000 bbl per day by 2016, which will be a good economical achievement and will increase the profit rate. Pakistan currently imports over 15 billion dollars in crude oil products per year and local crude is sold at import prices.

Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) invites Joint Venture Partner(s). It will carry out 2D and 3D Seismic Program in addition with drilling and engineering study and 2-3 exploratory well program in the Lakki Block. Work Program is to begin in 2015 leading to the drilling activities in 2016, full program capital cost is estimated at 50-65 million US dollars.

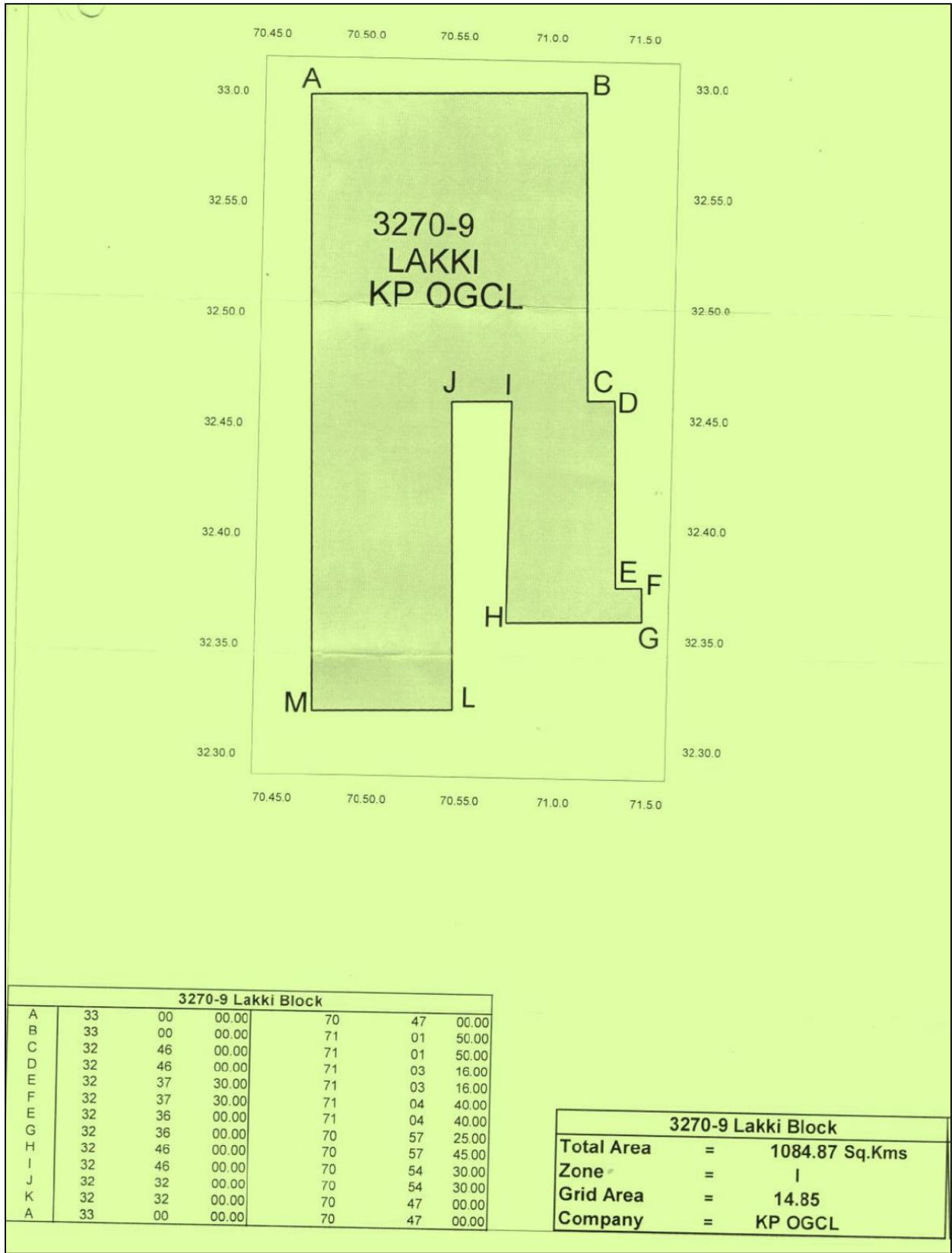
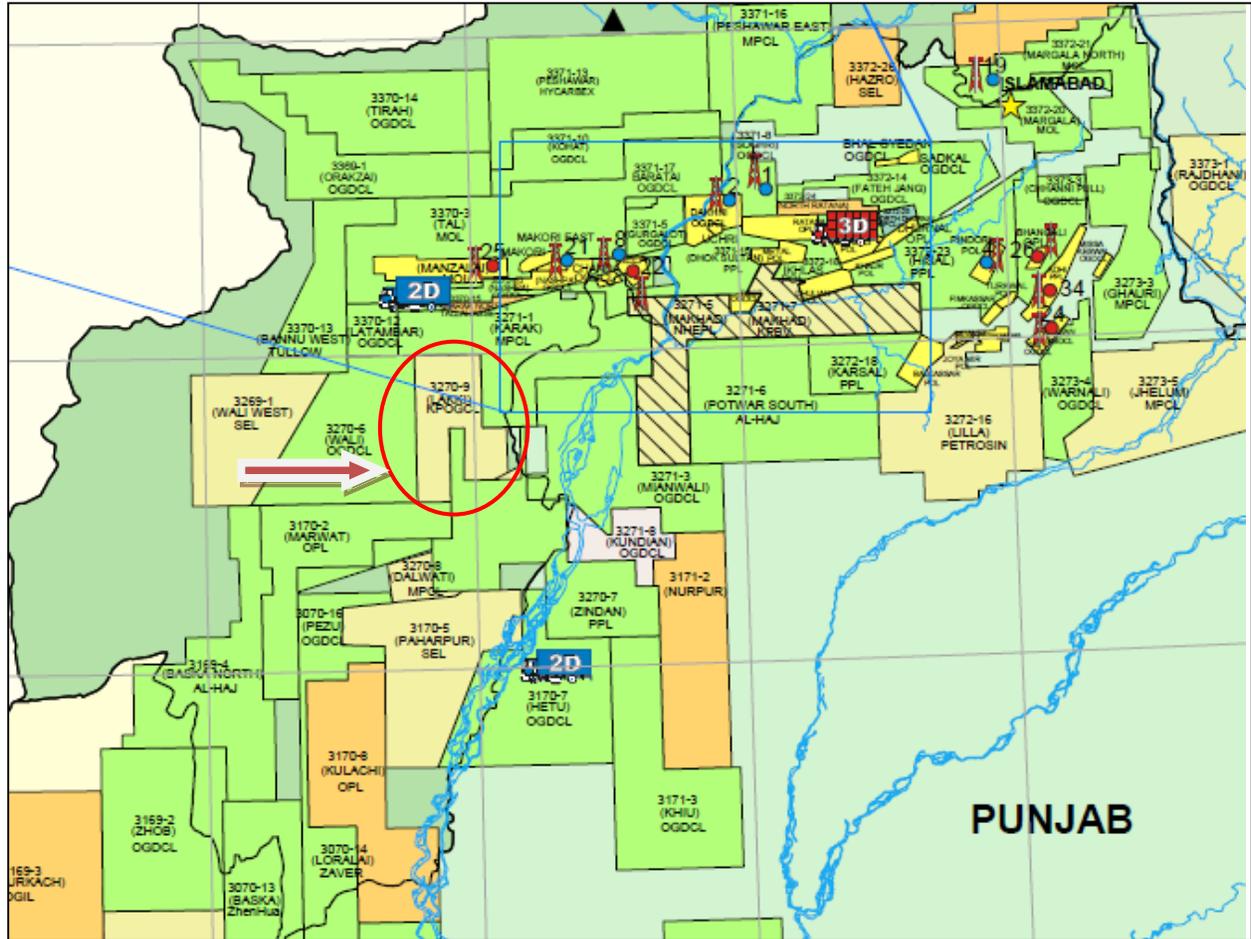


Figure: 1.0. Block Map with Total Area 1084.87 sq.kms along with its coordinates.



1. Activity Map of Lakki Block 3270-9

## **History of the Block and Petroleum System of the Area:**

The Province of Khyber Pakhtunkhwa has had a series of discoveries over the past 15 years, beginning from the Chanda Oil field Discovery in 1999 which was a major achievement of Oil and Gas Development Company Limited (OGDCL). After that a Hungarian National Oil Company, MOL showed interest in District Karak, who succeeded and discovered Manzalai and Makori Oil fields in 2002 and 2005 in Tal Block adjacent to Bannu West and Lakki Block. Many Exploration and Production (E&P) Companies including Multinational Companies get interested to work specifically in the Southern Districts of Khyber Pakhtunkhwa Province of Pakistan ultra-rich with Hydrocarbons proven practically and by Literature but due to the Security/ Law and Order situation some E&P companies feel hesitant to work in Khyber Pakhtunkhwa.

The formation of Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) is to ensure all the E&P Companies to feel comfortable while conducting the E&P activities in Khyber Pakhtunkhwa as KPOGCL is fully authorized and will facilitate all the companies regarding Security, Boarding and Lodging and preliminary Geological and Geophysical Surveys and more.

## **Petroleum System of the Area:**

Fold and Thrust Belts throughout the world are the most significant areas for hydrocarbon exploration and exploitation. These fold and thrust belts have globally been explored for hydrocarbons since more than a century now with mixed results and are still challenging frontiers for hydrocarbon search despite the high exploration risk and cost. Though the seismic data have contributed a lot to the understanding of the complex geometries in the fold-thrust belt. Exploration for hydrocarbons in the Himalayan foreland fold-thrust belt of Pakistan has been an important part of major oil and gas companies exploration strategies for years. Based on the recent discoveries in the central Kohat fold belt and the increasing demand for hydrocarbons and the expectation that we will continue to find large hydrocarbon reserves in the Himalayan foreland fold-thrust belt, this is a trend that will continue for many years to come. The Himalayan foreland fold-thrust belt of Pakistan includes Kohat foreland fold-and thrust belt along with its associated frontal ranges that include Surghar-Shinghar, Marwat-Khisor, Bhattani and Manzai (Trans-Indus ranges), Northern Sulaiman Range and the D.I. Khan Plain in the south. This entire belt is geologically defined compressional structural domain, and the area involved extends more than 15,000 square kilometers. Till date this domain has experienced several significant discoveries of oil and gas within Kohat fold-thrust belt to the north and Bannu Basin in the south. These oil and gas discoveries have proved the maturity, migration and entrapment of the hydrocarbons in the region and demands re-appraisal as for as the complex structural evolution of the Himalayan fold-thrust belt, Bannu depression and the D.I.Khan Basin are concerned.

Critical review of the available literature and geological field work in the region depicts that all the ingredients of a working “hydrocarbon machine” that are source, reservoir, trap/seal, timing

and migration exist in the area. The petroleum system of the area is characterized by multiple reservoirs and sealing horizons that are likely to be charged by multiple source rocks. Surface structural style shows that en-echelon anticlinal closures developed within the hanging walls of major faults could provide primary traps for hydrocarbons. In addition, sub-thrust plays as well as Stratigraphic traps (formed a result of eastward truncation of various horizons) may provide potential drillable prospects. The presence of a regional hydrocarbon kitchen is well supported by the stratigraphic record of the area whereas the oil and gas discoveries along with oil/gas seepages in the surrounding area provide clear indication of the optimum timing of hydrocarbons generation, migration and entrapment in the Trans Indus ranges.

### **Source Rock Potential:**

Some geochemical data, oil to source correlation studies and lithological characteristics of some rocks suggest that there are multiple source rock horizons with varying levels of maturity in the Potowar and Kohat areas. These include the following:

- Marine shales in the Panoba/Patala formations.
- Distal marine shales in the Lower Cretaceous.
- Marine and deltaic shales of the Jurassic, Triassic and Permian.
- Marine shales of the Infracambrian.

Passive margin subsidence will undoubtedly have taken deeply buried source rocks to hydrocarbon generating conditions prior to the onset of thrusting/folding in the Eocene/Oligocene (Qadri Report, 1996). The oldest potential source rocks are in the Salt Range Formation, which consists of a clastic-dominated lower part, carbonate-dominated middle part and evaporate dominated upper part. Potential source rock intervals are found primarily in the upper evaporate sequence with reported TOC of about 30 %, hydrocarbon Index up to 879 and genetic potential of about 250 kg/t (Ahmad et al., 1999). The Permian Sardhai and Chhidru are although sandy, have sufficiently high TOC values to have source rock potential (Qadri, 1996). TOC values in the Permian Wargal are 1.0 percent (Jaswal et al., 1997). Mianwali Formation in the Khisor Range also contains enough carbonaceous material to qualify for a potential source rocks in the Trans Indus ranges. Samples from Datta Formation at Chanda Syncline near the southwestern end of the Marwat Anticline in the Sheikh Budin Hills have reported TOC ranging from 0.6 to over 20 %. The Cretaceous Lumshival Formation (equivalent to Lower Goru) is reported to have TOC consistently over 2 % and this could constitute a good source rock. The presence of Paleocene strata in the sub-surface beneath the Bannu Basin is confidently inferred from the well and seismic data. Chonai-1 well penetrated 68 meters of Patala shale which has a good source potential (Qadri Report, 1996).

The Paleocene Patala Formation appears to be the primary source for the oil fields in the Potowar Basin to the east. The Source rock potential of rock samples from outcrops in the Marwat-Khisor ranges and well cuttings from Marwat-1 and Pezu-1 wells was determined by Hydrocarbon Development Institute of Pakistan (HDIP) for Pakistan Petroleum Limited (PPL) by analyzing these samples geochemically (HDIP Report, 1992). The Genetic Potential (GP) indicates maximum amount of hydrocarbons that could be generated under optimum thermal conditions. The GP depends on the TOC of a source rock sample. Following are the source rock formations with Vitrinite Reflectance (VR), Total Organic Content (TOC), Genetic Potential (GP) kg/t, Hydrocarbon Index (HI) mg/g:

| AGE        | FORMATION              | AREA/WELL    | VR%  | TOC %     | GP kg/t | HI mg/g  |
|------------|------------------------|--------------|------|-----------|---------|----------|
| Cambrian   | Khisor Fm              | Marwat-1     | 0.65 | 0.48-0.90 | <1-11.5 | 170-1280 |
| Cambrian   | Khisor Fm              | Khisor Range | -    | 0.77      | 1.2     | 150      |
| Permian    | Sardhai Fm             | Marwat-1     | 0.68 | 0.28-0.73 | <1      | -        |
| Permian    | Sardhai Fm             | Khisor Range | 0.75 | 0.96-2.30 | <1      | -        |
| Triassic   | Mianwali Fm            | Marwat-1     | 0.56 | 0.50      | 1.9     | 380      |
| Jurassic   | Shinawari Fm           | Marwat-1     | 0.51 | 0.52      | <1      | -        |
| Jurassic   | Shinawari Fm           | Marwat Range | 0.34 | 1.50      | <1      | -        |
| Cretaceous | Chichali Fm            | Marwat Range | 0.39 | 1.24      | <1      | -        |
| Cretaceous | Chichali Fm            | Pezu-1       | 0.62 | 0.50-1.24 | 1.2-1.7 | 130-250  |
| Cretaceous | Lumshiwali Fm          | Marwat Range | 0.31 | 1.10-1.50 | <1      | -        |
| Eocene     | Jatta Shales<br>Gypsum | Kohat Area   | 0.65 | 0.50-1.16 | <1-1.4  | 130-160  |

### **Hydrocarbon Migration/ Entrapment:**

Hydrocarbon sourced in the Kitchen areas will migrate either through fault conduits or permeable carrier beds into the anticlinal structures developed on the hanging walls of thrust faults in the fold-belt or developing fore deep structures. In the migration of hydrocarbons, faults and associated fractures in the carbonate rocks play an important role. Long range up-dip migration is also possible once hydrocarbons find a suitable carrier bed. Effective horizontal migration pathways must rely on permeable carrier beds that are regionally continuous. This kind of migration is restricted to carrier beds close to the source rocks. However, pinch-out relationships up-dip on the platform will allow access to higher reservoir levels.

## **RESERVOIR ROCKS**

Reservoir rocks capable of storing the petroleum fluids and producing them to the well bore at commercial quantities form an integral part of a petroleum system. Clastic and non-clastic reservoir rocks are well developed throughout the area. Potential reservoirs in the Eocene include Limestone of the Habib Rahi and Pirkoh members of the Kirthar Formation. Beside these the fractured carbonate of Dunghan and Kirthar Formation should not be overlooked as potential reservoir rocks. Ranikot sandstone is the main reservoir in the Dhodak oil and gas field and Savi Ragma gas condensate discovery that lies near by the area. The Pab Sandstone along with the sand horizons within the Mughal Kot Formation is the most potential reservoir for the entire area. The Pab Sandstone is well proven reservoir throughout the Sulaiman Range. Subsequently, OGDCL has also tested commercial quantities of hydrocarbons from Jurassic Chiltan reservoir by drilling deep well at Dhodak gas/condensate field.

## **CAP ROCKS**

To restrict the leakage, seepage and migration of hydrocarbons, impermeable horizon or regional top seal is essential. Fine-grained rocks such as shale or evaporites have the tendency as effective cap rocks. The Paleocene and Eocene successions of Northern Sulaiman ranges comprise thick shale horizons and are the potential sealing horizons underneath these ranges in addition to several intra-formational thick shale beds at various levels.

## **Lakki Block Petroleum System**

- Surrounded by Karak and Tal Block
- 3 Geological Zones
- Next to Tal – high prospective Block held by MOL (Hungary)
- 2-3 exploratory well Program
- Probability  $0.5 \times 0.7 \times 0.6 \times 0.6 = 12.6 \%$
- Exploration In monetary terms \$ 60 Million
- Expected Production P10 of Oil 8000bpd and Gas 60 mmcfd.

## Lakki Petroleum System

|                | 0.10<br>Unfav<br>orable | 0.20<br>Unfav<br>orable | 0.30<br>Unfav<br>orable | 0.40<br>Questi<br>onabl<br>e | 0.50<br>Encou<br>raging | 0.60<br>Very<br>Encou<br>raging | 0.70<br>Favora<br>ble | 0.80<br>Favora<br>ble | 0.90<br>Favora<br>ble |
|----------------|-------------------------|-------------------------|-------------------------|------------------------------|-------------------------|---------------------------------|-----------------------|-----------------------|-----------------------|
| Source<br>Rock |                         |                         |                         |                              | X                       |                                 |                       |                       |                       |
| Reserv<br>oir  |                         |                         |                         |                              |                         |                                 | X                     |                       |                       |
| Seal           |                         |                         |                         |                              |                         | X                               |                       |                       |                       |
| Trap           |                         |                         |                         |                              |                         | X                               |                       |                       |                       |

## Reserves in the Southern Districts of Khyber Pakhtunkhwa (Karak, Kohat)

Nearby discoveries possess over 120 million barrels of oil in place and 833 BCF of gas, while Nashpa holds over 277 Bcf and 57 million barrels of recoverable oil reserves.

### *Oil reserve as of December 31<sup>st</sup> 2013 (Millions of Barrels)*

| <b>OFF-SET FIELD</b> | <b>DISCOVERY DATE</b> | <b>ORIGINAL RECOVERABLE</b> | <b>CUMULATIVE PRODUCTION</b> | <b>REMAINING RECOVERABLE</b> |
|----------------------|-----------------------|-----------------------------|------------------------------|------------------------------|
| Nashpa               | 2009                  | 57                          | 13                           | 44                           |
| Makori               | 2005                  | 11                          | 4                            | 7                            |
| Makori East          | 2011                  | 43                          | 3                            | 40                           |
| Manzalai             | 2002                  | 8                           | 6                            | 2                            |
| Chanda               | 1999                  | 35                          | 14                           | 21                           |
| Mela                 | 2006                  | 22                          | 11                           | 11                           |

### *Gas reserve as of December 31<sup>st</sup> 2013 (Billions of Cubic Feet)*

| <b>OFF-SET FIELD</b> | <b>DISCOVERY DATE</b> | <b>ORIGINAL RECOVERABLE</b> | <b>CUMULATIVE PRODUCTION</b> | <b>REMAINING RECOVERABLE</b> |
|----------------------|-----------------------|-----------------------------|------------------------------|------------------------------|
| Nashpa               | 2009                  | 277                         | 48                           | 229                          |
| Makori               | 2005                  | 221                         | 51                           | 170                          |
| Makori East          | 2011                  | 278                         | 11                           | 267                          |
| Manzalai             | 2002                  | 570                         | 382                          | 188                          |
| Chanda               | 1999                  | 69                          | 30                           | 39                           |
| Mela                 | 2006                  | 185                         | 37                           | 148                          |

### **Invitation to Joint Venture:**

KPOGCL will negotiate with parties on a case by case basis until a joint-venture agreement is established. Contact us to discuss the terms.

To execute a Confidentiality Agreement (CA) and gain access to proprietary information please direct inquiries to Raziuddin, CEO

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