



INDEPENDENT GEOLOGIST'S REPORT
ON LEYSHON RESOURCES LTD
ZIJINSHAN PSC

November 2013



DECISIONS WITH CONFIDENCE

The Directors
Leyshon Resources Limited
Suite 3, Level 3
1292 Hay Street
West Perth WA 6005
Australia

BDO Corporate Finance (WA) Pty Ltd
38 Station Street
Subiaco, WA 6008
PO Box 700 West Perth WA 6872
Australia

21 November 2013

Dear Sirs,

Leyshon Resources Limited (Leyshon) has appointed RISC Operations Pty Ltd (RISC) to provide an Independent Expert's report (Report) in relation to the proposed demerger of Pacific Asia Petroleum Limited (PAPL), a wholly owned subsidiary of Leyshon.

PAPL holds a 100% interest in the Zijinshan PSC in the Ordos Basin. RISC was asked to provide an independent evaluation of the gas resources in the Zijinshan production Sharing Contract (PSC). In preparing this Report, RISC has utilised information and interpretations provided by Leyshon as well as information in the public domain. The material was reviewed for its quality, accuracy and validity and was considered to be acceptable. RISC believes that that full disclosure has been made of all relevant material in Leyshon's possession and that the information provided, is to the best of its knowledge, accurate and true. The methodology employed by RISC to evaluate the resources is set out in detail in our Report.

The effective date of the contingent and prospective resource estimates in this report is 31 July 2013. Since then, we are not aware of any events that would materially alter our conclusions. The ZJS7 well has been drilled and final logging data has been acquired. RISC has carried out a review of the ZJS7 well results and we conclude that the net pay counts interpreted from wireline logs is are within the expected range and we do not anticipate any material changes to our resource estimates attributable to the well results.

Reliance

This Report is to be relied upon by BDO Corporate Finance (WA) Pty Ltd (BDO) acting as the Independent Expert. RISC acknowledges that Leyshon and BDO will use and place reliance on this Report in determining whether due and careful enquiry has been taken by the Directors of Leyshon in preparing documents for the proposed demerger.

Valmin Code

This Report has been prepared in accordance with the Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports 2005 Edition ("The VALMIN Code").

Petroleum Resources Management System

In the preparation of this Report, RISC has complied with the guidelines and definitions of the Petroleum Resources Management System approved by the Board of the Society of Petroleum Engineers in 2007 (PRMS).

Report to be presented in its entirety

RISC has been advised by Leyshon that this report will be presented in its entirety without summarisation.

Independence

RISC is independent with respect to Leyshon and confirms that there is no conflict of interest with any party involved in the assignment.

Under the terms of engagement between RISC and Leyshon for the provision of this Report RISC will receive a fee, based on its current standard terms and conditions, payable by Leyshon. The payment of this fee is not contingent on the outcome of the proposed demerger. The directors and staff of RISC do not own shares in Leyshon.

Prior Engagements with Leyshon and Prior Resource Reports

In June 2012, RISC was engaged by Leyshon to carry out high level reviews of several exploration properties onshore China including the Zijinshan PSC. The Zijinshan terms of reference also included a public domain review of the resource potential. These resources estimates have been superseded by this Report.

Qualifications

RISC was founded in 1994 to provide independent advice to companies associated with the oil and gas industry. RISC has offices in Perth and Brisbane, Australia, Dubai and London. We have completed over 1300 assignments in approximately 68 countries for nearly 500 clients. Our services cover the oil and gas business lifecycle:

- Oil and gas asset valuations, expert advice to banks for debt or equity finance;
- Exploration / portfolio management;
- Field development studies and operations planning;
- Reserves assessment and certification / Independent Expert / Expert Witness;
- Strategy and corporate planning / Gas market advice.

The principals of RISC have also had responsible charge for the preparation of reserves statements, the preparation, evaluation and implementation of oil and gas field development plans, gas and LNG contracting, joint venture negotiations and evaluation of new business opportunities during their careers with major organisations such as Shell, BP, Arco, Santos, Mobil, Petrofina and Woodside. Further corporate information about RISC can be found on our website at <http://www.riscadvisory.com>.

This Report has been prepared under the supervision of Mr Geoffrey Barker. Mr Barker leads RISC's unconventional gas practice. He has thirty years of global experience in the upstream hydrocarbon industry, with extensive expertise in the areas of asset valuation, business strategies, evaluation of conventional and non-conventional petroleum (shale gas, coal seam gas and tight gas), due diligence assessment for mergers, acquisitions and project finance requirements and reserves assessment/certification. This experience includes evaluation of tight gas and CBM properties in China. Mr Barker is a Past Chairman of the SPE WA Section, a past member of the SPE International's Oil and Gas Reserves Committee 2007-2009, and was a contributing author of the Guidelines for Application of the Petroleum Resources Management System published by the SPE in November 2011. Mr Barker is a Member of the Society of Petroleum Engineers (SPE), and holds a BSc (Chemistry), Melbourne University, 1980 and a M.Eng.Sc (Pet Eng), Sydney University, 1989.

This Report has been prepared with the assistance of Mr Nick Hall, Mr Bruce Gunn, Mr Joe Collins, Mr Peter Stephenson and Mr Simon Douse.

Mr Hall has BSc (Hons) Geology, University of Durham, UK, 1981 and over 30 years of international experience as a geoscientist, gained from operating, consulting and service company environments. He has extensive experience with clastic, carbonate, shale gas, tight gas and CBM sequences in the UK, North Sea, South America, Middle East, Africa, China, India and Australia. Mr Hall has held various technical and leadership positions in multiple disciplines (subsurface, projects, legal and commercial) and project teams involved in development planning, reservoir management plus equity and reserves determination including Subsurface Manager for Santos' Scotia-Peat CSG Project. Mr Hall has been a Principal Geoscience Advisor with RISC since 2006.

Mr Gunn has over 30 years international experience in the petroleum industry particularly in the assessment and reporting of hydrocarbon reserves. He has a B.Sc. Hons (1st class) in Earth Sciences from Flinders University and an M. Sc. from the University of Cape Town. He has undertaken various studies of a reservoir/petroleum engineering and planning nature including: CBM and tight gas resource assessments and valuations in India, China, Indonesia, Europe and Australia, conventional gas and oil resource assessments and forecasts in Azerbaijan, Australia, England, Indonesia, PNG, the Philippines, New Zealand and USA. His experience includes co-ordination of multi-disciplinary reports, preparation of Expert Witness Statements, data room attendance and preparation of Independent Technical Expert's reports. Mr Gunn is a Member of the Society of Petroleum Engineers (SPE).

Mr Collins has over 8 years diverse experience in process and facilities engineering and well evaluation. Joe has developed skills in petroleum and production engineering and has completed a number of assignments including conventional and unconventional oil and gas field project evaluations. Mr Collins has a Bachelor of Oil and Gas Engineering from the University of Western Australia and a Diploma in Project Management. He is a chartered member of Engineers Australia.

Mr Stephenson is a Partner with RISC and is a Reservoir Engineer with 30 years experience in the upstream hydrocarbon industry with BP, Shell and RISC. Extensive experience with mature and greenfield oil, gas, gas-condensate, tight gas and CBM developments in the North Sea, Africa, Middle East, China and Australasia. Peter specialises in reservoir evaluation, field development planning, integrated project reviews and multidisciplinary team coordination and leadership. Mr Stephenson has M.Eng Petroleum Engineering, Heriot Watt University (1984), B.Sc Chemical Engineering (Ili Hons), University of Nottingham (1982), is a Member of the SPE and a Chartered Engineer (MIChemE).

Mr Douse has 5 years experience in financial evaluation, corporate finance and transactions focussing on the resources and energy sectors. He is experienced in the commercial aspects of the energy sector based on fundamental understanding of the issues involved from experience as an energy trader and engineer. Mr Douse has a BSc Electro-Mechanical Engineering, University of Cape Town, 2006.

Limitations

The assessment of petroleum assets is subject to uncertainty because it involves judgments on many variables that cannot be precisely assessed, including reserves and resources, future oil and gas production rates, the costs associated with producing these volumes, access to product markets, product prices and the potential impact of fiscal/regulatory changes.

The statements and opinions attributable to RISC are given in good faith and in the belief that such statements are neither false nor misleading. In carrying out its tasks, RISC has considered and relied upon information obtained from Leyshon as well as information in the public domain. The information included well reports, seismic data, maps, interpretation reports, previous analyses, financial records and legal documents. The material was reviewed for its quality, accuracy and validity and was considered to be acceptable. RISC believes that that full disclosure has been made of all relevant material in Leyshon's possession and that information provided, is to the best of its knowledge, accurate and true.

The information provided to RISC has included both hard copy and electronic information supplemented with discussions between RISC and representatives of Leyshon.

Whilst every effort has been made to verify data and resolve apparent inconsistencies, we believe our review and conclusions are sound, but neither RISC nor its servants accept any liability, except any liability which cannot be excluded by law, for its accuracy, nor do we warrant that our enquiries have revealed all of the matters, which a more extensive examination may disclose. In particular, we have not independently verified property title, encumbrances and regulations that apply to these assets. RISC has also not audited the opening balances at the evaluation date of past recovered and unrecovered development and exploration costs, undepreciated past development costs and tax losses.

Our review was carried out only for the purpose referred to above and may not have relevance in other contexts.

Consent

RISC has consented to this Report in its entirety being provided to the General Meeting of Leyshon for the proposed demerger. Neither the whole nor any part of this Report nor any reference to it may be included in or with or attached to any other document, circular, resolution, letter or statement without the prior consent of RISC.

This Report is authorised for release by Mr Geoffrey Barker, RISC Partner. Mr Barker is a Member of the Society of Petroleum Engineers (SPE), and holds a BSc (Chemistry), Melbourne University, 1980 and a M.Eng.Sc (Pet Eng), Sydney University, 1989.

A handwritten signature in black ink, appearing to be "GB", with a long horizontal flourish extending to the right.

Geoffrey J Barker

Partner

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1. EXECUTIVE SUMMARY

Leyshon Resources Limited (Leyshon) has appointed RISC Operations Pty Ltd (RISC) to provide an Independent Expert's report (Report) in relation to the proposed demerger of Pacific Asia Petroleum Limited (PAPL), a wholly owned subsidiary of Leyshon.

PAPL holds a 100% interest in the Zijinshan PSC in the Ordos Basin held by Pacific Asia Petroleum Limited. RISC was asked to provide an independent evaluation of the gas resources in the Zijinshan production Sharing Contract (PSC). The SPE (Society of Petroleum Engineers) PRMS (Petroleum Resource Management System) has been used for resource classification.

Exploration and appraisal of the Zijinshan PSC is at a relatively early stage with 8 wells drilled to date (LX0001, ZJS1 to ZJS7) and acquisition of approximately 475 km of 2D seismic, of which 318 km was acquired in 2013 and is currently being processed. Two gas plays have been identified within the PSC.

The deep gas play addresses resources contained within Permian tight sandstone reservoirs in a structural sag or depression in the central part of the PSC. This deeper part of the PSC is at sufficient pressure for the sandstones to produce gas at commercial rates. A number of gas fields to the west of the Zijinshan PSC acreage have been or are being developed and these fields are understood to be stratigraphically trapped, with gas present where reservoir quality sand bodies are present. As such the deep gas resource area is not limited to the traditional structural highs but extensive over the area. The key uncertainty is reservoir quality which affects gas volumes and whether gas will flow to surface.

The ZJS5, ZJS6 and ZJS7 wells are located in the deeper structural province of the PSC and the recent 2D seismic data was acquired to provide additional definition of the geology within this area. Testing of the ZJS5 and ZJS6 wells is in progress and Leyshon recently announced¹ a post-frac flow rate of 160,000 scf/d from one of several sandstone intervals in the well in which gas has been identified from petrophysical analysis of the wireline logs.

The shallow gas play addresses gas resources contained within the coals that are interbedded with the tight sandstones and two coal seams in particular, the Shanxi 4/5 and Taiyuan 8/9. Commercial target depths for CBM are generally between 150 m and 1000 m below ground level as gas content at shallower depths are usually too low to be economic and permeability at deeper depths is usually too low to support commercial production rates. Recent advances in technology has resulted in gas flows from coal seams at greater depths and for the Zijinshan PSC resource estimation RISC has used a maximum depth limit of 1500 m below ground level. There is limited data available to characterise the CBM potential of the Zijinshan PSC. It is not known if the data acquired from the ZJS3 and ZJS4 wells which are relatively closely spaced is representative of the entire PSC area. The high rank, high density, low gas content and gas saturation measured from the coals in these wells may be the result of local elevated geothermal gradients caused by magmatic emplacement associated with the Mt Zijinshan intrusive complex in the west of the PSC. If this is the case, it could be expected that the CBM characteristics of the coals could improve towards the eastern side of the PSC.

The Zijinshan PSC occupies an area of 705.4 km² located in the western part of Shanxi Province. The PSC was approved for a term of 30 years by the Ministry of Commerce on April 1st, 2008. Leyshon Resources Limited has a 100% interest in the exploration phase of the PSC with China National Petroleum Corporation (CNPC) having the right to back in to a 40% interest at the development stage.

The geomorphology consists of tablelands, mounds, slopes and dendritic gullies that radiate out from the igneous Mt Zijinshan located in the western part of the block. The area is located in the centre of the Hedong coalfield and coal seams outcrop along the eastern edge of the tenement. The Qiushui River crosses the block approximately mid-way between Mt Zijinshan and the eastern block boundary. Provincial and

¹ Leyshon ASX release, 28 May 2013

minor roads provide good access for field operations; electricity, communications and the existing seismic lines follow these roads.

In an announcement on 17 September 2013 on the results of drilling ZJS7, Leyshon Resources Limited notified that the exploration and appraisal of the Zijinshan Gas Project remains at a relatively early stage and accordingly each well will be fully evaluated before proceeding with the subsequent well. Leyshon Resources Limited also notified that this would likely result in slower progress in the overall programme than originally planned (and as announced on 25 February 2013) and that an assessment of the rate of progress of the ongoing programme will be undertaken once the full results from the latest well are known and once it has been agreed with its partner. Subject to finalizing plans for the new programme with its partner, and dependent on results, Leyshon Energy and its partner are considering a programme with a total expenditure of approximately US\$17 million in 2013/14 comprising the drilling 3 of wells and fracture stimulation / testing 2 wells, with the remainder comprising principally PSC maintenance costs and geology studies.

RISC has assessed the contingent and prospective resources for Zijinshan PSC as at 31 July 2013 shown in Table 1-1 and Table 1-2. Please refer to Table 4-31 and Table 4-32 in the main report for more detailed notes in relation to the resource estimates. Resources have been estimated using probabilistic methods.

PJ	Gross			Net Attributable			Chance of development	Operator
	1C	2C	3C	1C	2C	3C		
Deep Gas - Shiqianfeng formation	19	77	285	11	46	171	70%	PAPL
Total	19	77	285	11	46	171		

Table 1-1 Summary of Zijinshan Gas Contingent Resources as at 31 July 2013

PJ	Gross			Net Attributable			Chance of development	Operator
	Low	Best	High	Low	Best	High		
Deep gas - Shihezi, Shanxi, Taiyuan	265	995	2072	159	597	1243	56%	PAPL
Shallow gas	138	194	273	83	116	164	Average 13%	PAPL
Total	403	1189	2345	242	713	1407		

Table 1-2 Summary of Zijinshan Gas Prospective Resources as at 31 July 2013

The deep gas resources within the Shiqianfeng Formation are classified contingent resources as a result of the successful post-frac gas flow from the Shiqianfeng interval in ZJS5 reported by Leyshon on 28th May 2013. The deep gas resources within the Shihezi, Shanxi and Taiyuan formations are currently classified prospective resources as producible gas has yet to be demonstrated from these formations in the Zijinshan PSC. Successful test results are expected to result in a reclassification to a contingent resource.

The shallow gas resources (CBM) are classified as prospective resources as producible gas has yet to be demonstrated. Subject to successful acquisition of data which demonstrates significant quantities of potentially moveable hydrocarbons, the classification of a portion of the prospective resources may change to contingent resources.

Discovery of prospective resources carries a geological probability of discovery which is defined as the chance of demonstrating "a significant quantity of potentially moveable hydrocarbon". At present RISC considers that only the Shiqianfeng formation has satisfied this test, testing of the deeper formations has been ascribed a relatively high chance of success based on the demonstration of production from the

Shiqianfeng. For the shallow gas, the chance of discovery for the western region is considered lower for the western region than the eastern region due to the impact of the Mt Zijinshan intrusive complex.

Once discovered, the resource may be classified as either a contingent resource or reserve. Development of the contingent resources is not guaranteed and carries a probability of commercial development. This depends on a number of factors, including; successful Chinese reserve certification, approval of the ODP, supporting results from the pilot test, stakeholder approval and funding for the development. At present one well has been tested and testing is ongoing, further evaluation is required to determine the commercial viability of the formation, this represents the most significant contingent factor. With further successful testing of wells it is anticipated that the chance of development will increase.

The probability of development of the prospective resources is the chance of discovery times the chance of commerciality, the probability of development of a contingent resource is the chance of commerciality.

The Contingent and Prospective Resources shown in Table 1-1 and Table 1-2 have not been adjusted for these probabilities and are therefore unrisks values. RISC has assessed the chance of commercial development of the deep gas resources to be between 56% and 70%. The assessed chance of commercial development of the shallow gas resource is between 3% and 20%.

The majority of the potential development expenditure will be related to drilling, completion and fracturing of the development wells. The development wells drive not only the well costs but also the associated gathering costs.

The highly mountainous and rugged terrain overlying the PSC area makes it likely that any development will involve drilling multiple wells from each drilling pad. This reduces the cost of wellhead facilities, flowlines and site preparation, but is offset by higher well costs due to the requirements for deviated drilling. Overall RISC expects that there will be a small cost saving as clustering wells makes field management, maintenance easier and reduces the land and environmental footprint.

During the development cycle, surface facilities capacity and phasing is usually optimised against the rates and likelihood of various production cases. Consideration is given to the flexibility gained by installing increased capacity in equipment that is not easily expanded (e.g. vessels) and allowing for phased installation of more expensive equipment, e.g. additional processing trains, compressors, if information gained during early production increases the probability of higher production.

The gas from the wells is assumed to be gathered through a network of flowlines and processed at a central gas plant located strategically within the block to process discovered reserves. The sales gas destination is yet to be determined. Sales could be to a provincial pipeline grid or to a customer via one of the national gas pipelines that either run through or nearby the PSC.

The wells are located within approximately 10 km of a tie-in point on the recently commissioned Lin-Lin pipeline which supplies the growing demand in Shanxi Province. Leyshon advises that recent discussions with potential off-take partners suggest that there continues to be a shortage of locally sourced gas to feed the pipeline and as a result prices are continuing to rise. Locally based major industrial users are reportedly paying in the region of US\$10 per Mscf.

2. TERMS OF REFERENCE

Leyshon Resources Limited (Leyshon) has appointed RISC Operations Pty Ltd (RISC) to provide an Independent Expert's report (Report) in relation to the proposed demerger of Pacific Asia Petroleum Limited (PAPL), a wholly owned subsidiary of Leyshon.

The scope of the report is to review the geological setting of Leyshon's tenements and provide an opinion on the potential for economic petroleum resources. The report addresses:

- permit status and exploration history;
- permit work programme and commitments;
- Leyshon's exploration programme and provide an opinion on whether the proposed level of expenditure is sufficient undertake the proposed work programme;
- the structural and depositional setting;
- data availability;
- drilling and testing results;
- low/best/high in-place, contingent and prospective resources estimated in accordance with PRMS definitions and guidelines;
- risk factors for contingent and prospective resources;
- appropriate maps/diagrams: e.g. location maps, seismic, etc.; and
- description of the economic conditions for the working of the PSC, concessions or similar including any environmental, land access, planning and obligatory closure costs (to the extent that these disclosures are permitted under the prevailing PSC law).

Valmin Code

This report has been prepared in accordance with the Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports 2009 Edition ("The VALMIN Code").

The report has been based on confidential information to be provided by the Company as well as information in the public domain.

A site visit was not deemed necessary to prepare our report.

3. TENEMENT HISTORY AND STATUS

The Zijinshan Production Sharing Contract (PSC) under review in this report is located Shanxi Province, China, Figure 3-1. The licence area is 705.4 km². The PSC contractor is Pacific Asia Petroleum Limited (PAPL), a wholly owned subsidiary of Leyshon Resources Limited.

On December 26th, 2007 China United Coalbed Methane Company (CUCBM) and PAPL, then a subsidiary of CAMAC Energy Inc. signed the Zijinshan Production Sharing Contract (PSC) for coal bed methane development of the Zijinshan unconventional gas project on the eastern side of the Ordos Basin in Central China. The PSC was approved for a term of 30 years by the Ministry of Commerce on 21st March, 2008. PAPL has a 100% interest in the exploration phase of the PSC with China National Petroleum Corporation (CNPC) having the right to back in to a 40% interest at the development stage.

On 6th August 2012 Leyshon Resources Limited completed the acquisition of PAPL from CAMAC.

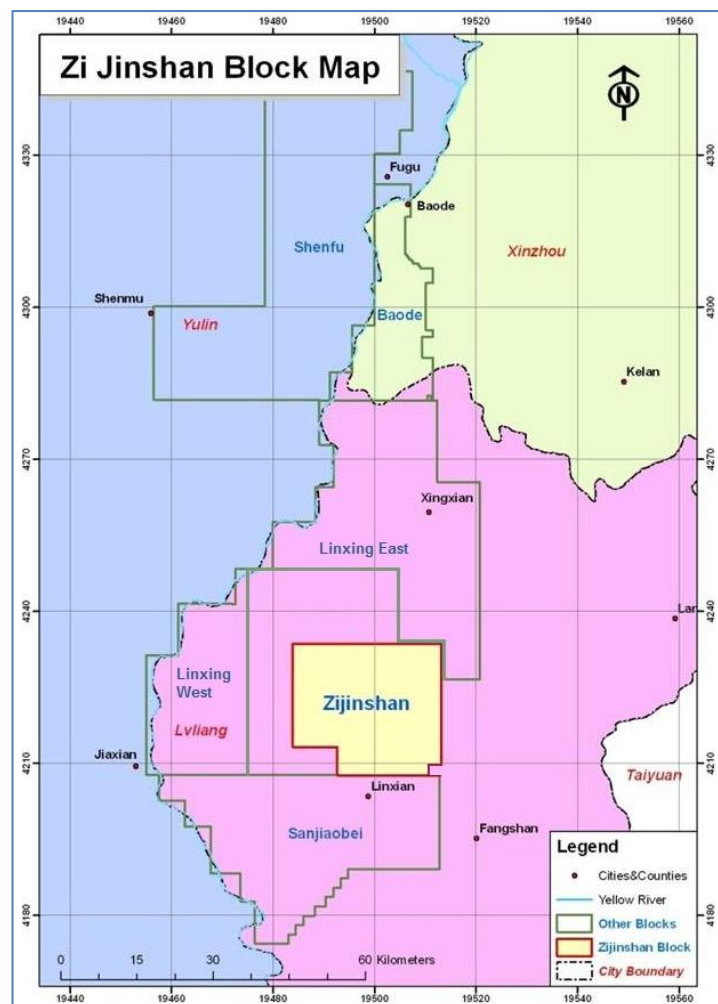


Figure 3-1 Zijinshan block is located in the Linxian and Xingxian region of the Shanxi province

The legal firm Jun He was engaged by Leyshon to provide an independent assessment of the status of the PSC in China.

RISC has reviewed the report prepared by the Jun He Law Firm, dated June 8 2013 in accordance with Section 67 of the Valmin Code. Jun He found that:

1. The listed PSC became effective and binding on PAPL and China United Coal Bed Methane Corporation Ltd (CUCBM) upon the approval of the Ministry of Commerce of the PRC (MOFCOM) dated March 21, 2008.
2. The First Modification Agreement of the PSC became effective and binding on PAPL, China National Petroleum Corporation (CNPC) and CUCBM upon the approval of MOFCOM dated August 23, 2011, pursuant to which the Chinese party of Zijinshan Project was changed from CUCBM to CNPC.
3. Upon the approvals of MOFCOM, the PSC and the First Modification Agreement granted PAPL the rights set out therein to participate in the Zijinshan Project with the Chinese Party.
4. The Exploration License No. 0200001230129 under the name of PetroChina relating to exploration of coalbed methane in Zijinshan area, which is valid until May 7 of 2014, appears to be in order.
5. The Exploration Period of the PSC expired on April 30, 2013. CNPC and PAPL have agreed in principle to extend the exploration period to the end of 2017 and the two parties are preparing for the extension amendment to the PSC.
6. PAPL does not hold the exploration licence directly. In accordance with common practice, PAPL has to rely on CNPC and its subsidiary PetroChina Company Limited (PetroChina) to maintain and extend the exploration licence.

3.1. TENEMENT DESCRIPTION

The Zijinshan PSC occupies an area of 705.4 km² located in the western part of Shanxi Province.

The geomorphology consists of tablelands, mounds, slopes and dendritic gullies that radiate out from the igneous Mt Zijinshan located in the western part of the block, Figure 3-2. The area is located in the centre of the Hedong coalfield and coal seams outcrop along the eastern edge of the tenement.

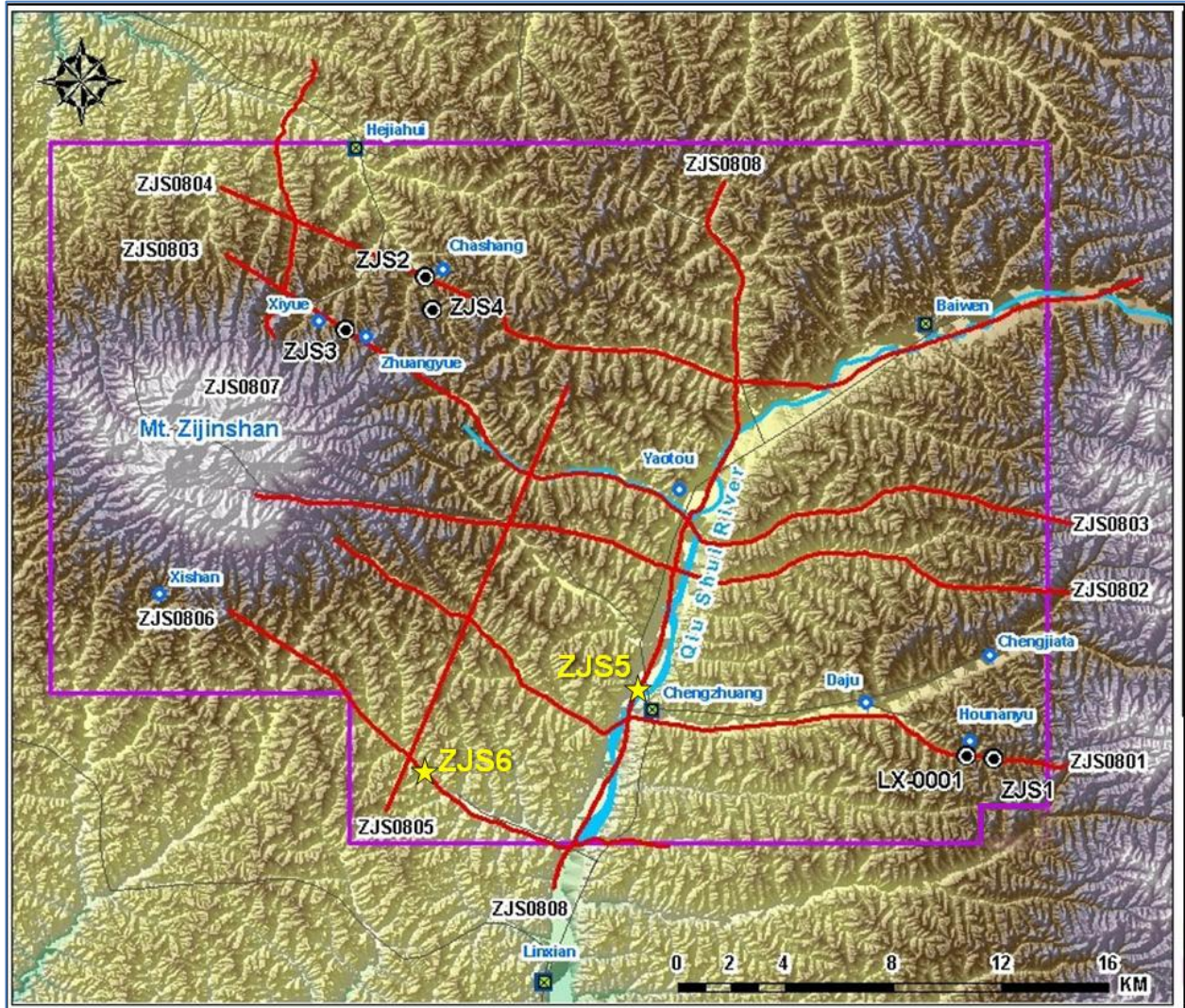


Figure 3-2 Stylised image with location of existing exploration wells and 2D seismic lines superposed

The Qiu Shui River crosses the block approximately mid-way between Mt Zijinshan and the eastern block boundary. Provincial and minor roads provide good access for field operations; electricity, communications and the existing seismic lines follow these roads. The highest elevation is 1,882 m but in general surface elevation is between 900 m and 1,480 m; the elevation difference between tablelands and gullies is between 100 and 300 metres, Figure 3-3.

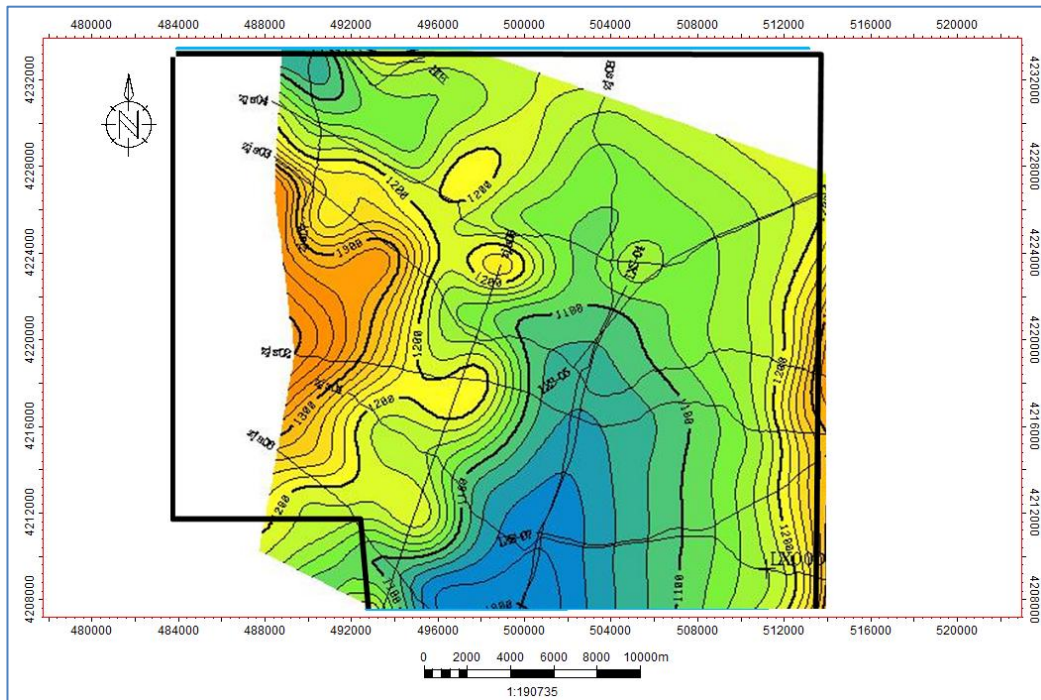


Figure 3-3 Surface elevation map

The area has a thick loess covering and the primary land use is agriculture. The majority of the farms and villages are located on the slopes and within gullies that are occupied by perennial rivers although some of the tributary gullies have seasonal rivers. Figure 3-4 is a photograph of the ZJS2 well site in the north west of the PSC area showing the typical geomorphology.



Figure 3-4 ZJS2 well site showing local geomorphology

The annual temperature in the region ranges between 37 degrees C in summer and -19 degrees C in winter. The wet season is from June to September and accounts for 60% of the annual rainfall which averages between 550 - 570 mm. Drilling and field operations are constrained from December to March due to snow and low temperatures unless specialist cold weather equipment is sourced.

4. TECHNICAL DISCUSSION

4.1. GEOLOGICAL SETTING

The Zijinshan block located in the Linxian and Xingxian region of the Shanxi province is within the Ordos Basin, a cratonic basin on the western margin of the North China Platform covering an area estimated between 250,000 - 370,000 km² with up to 10,000 m of Palaeozoic and Mesozoic sediments².

The lower Palaeozoic strata are dominated by carbonates with a thickness of 1,000 - 2,000 m. The Carboniferous - Permian strata are coal measures with a thickness of 800 - 1,200 m and the Mesozoic strata consist of fluvial lacustrine sequences, with a thickness of 2,200 - 2,800 m. Throughout most of the basin, the upper Cretaceous and Cainozoic sediments are absent because of uplift and erosion of the basin after the late Cretaceous.

The structural framework of the basin is a huge asymmetric syncline with a gentle dip towards the east and north, and a steep dip towards the west and south.

The basin comprises six structural units: Yimeng uplift, Western edge overthrust belt, Tianhuan depression, Yishan ramp, Jinxi flexural belt and Weibi uplift³. These areas are shown in Figure 4-1. The Yishan ramp (also known as the central slope, Shanbei slope, and Ih Jumeng-Shaanxi slope) has an area of approximately 2,000 km² and hosts the majority of the discovered Upper Palaeozoic low permeability gas fields.

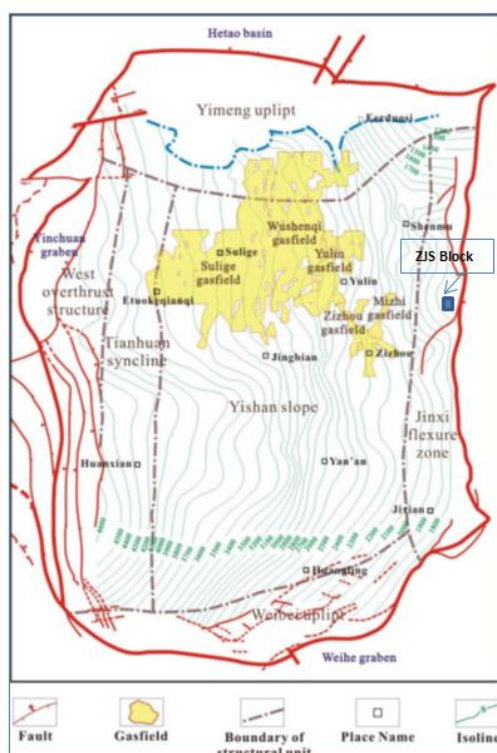


Figure 4-1 Ordos Basin structural units and distribution of discovered Upper Palaeozoic low permeability gas fields

² X. M. Xiao et al 2003, Upper Palaeozoic petroleum system, Ordos basin, *China Marine and Petroleum Geology* 22 ; (2005); pp 945-963

³ Jingzhou Zhao et al 2012, Geological conditions for Upper Paleozoic shale gas enrichment , in the Ordos basin, *China Search and Discovery Article #80209*; March 2005

The Zijinshan PSC is located in the West Shanxi flexural belt of the east Ordos Basin. The Shanxi flexural fold belt is a giant monoclonal structure dipping from east to west. Figure 4-2 shows a schematic west-east geological section through the basin; the Zijinshan PSC is situated on the eastern side of the Central Slope.

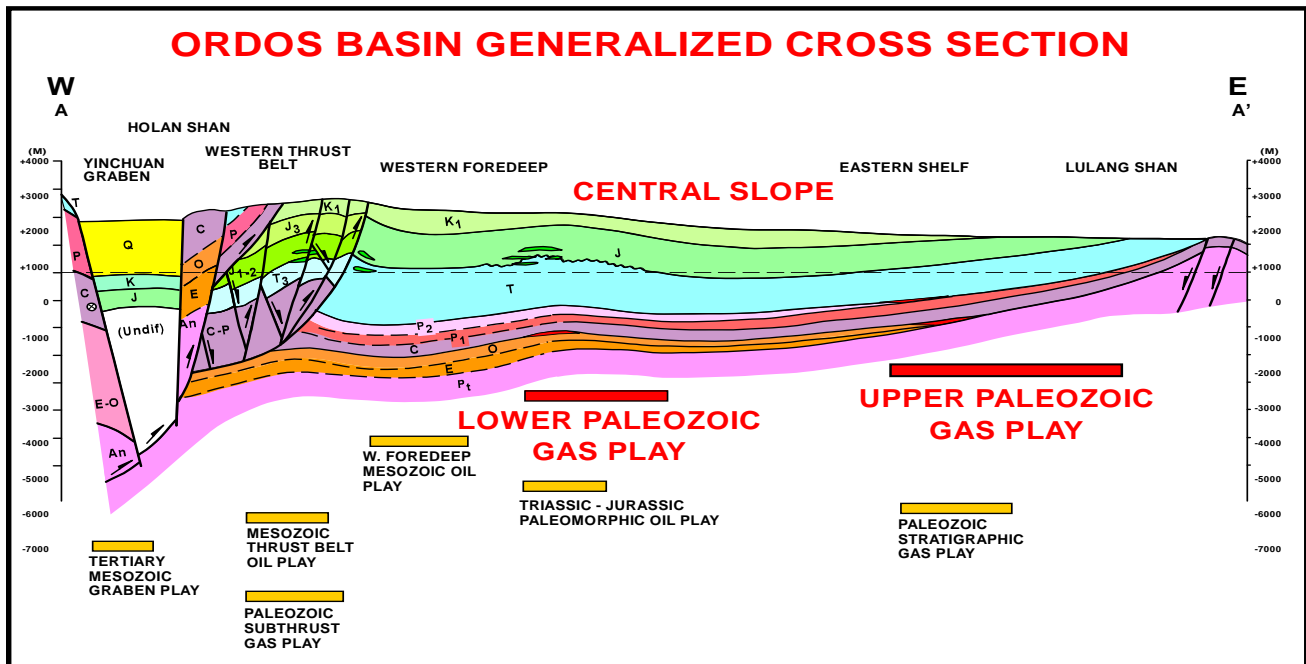


Figure 4-2 Ordos Basin schematic geological cross section, west-east

The stratigraphy reflects a broad regressive system from early marginal marine deposition in the Carboniferous, becoming largely deltaic and ultimately alluvial fan in the Permian. A series of major deltaic systems built out from the northern margin of the basin.

The schematic geological column below shows the age of the formations and their main depositional environments. It also illustrates the position of the various sands, and the interbedded coal measures of the Taiyuan and Shanxi Formations. The tight gas reservoirs within the Zijinshan PSC are within the Taiyuan, Shanxi, Shihezi and Shiqianfeng formations. CBM potential exists in the Taiyuan and Shanxi formations.

Era	System	Epoch	Formation	Member Name	Lithology	Facies	Sub-Facies	Lithostratigraphy				Major mark beds and coal seams	
								System	Series	Formation	Segment		
PALAEOZOIC	PERMIAN	Upper	Shiqianfeng			Continental	Fluvial	Permian	Upper	Shiqianfeng formation			Marl and thin gypsum Bright red sandstone
											Middle	Shihezi formation	Upper segment
		He 2											
		He 3											
		He 4											
		Lower segment	He 5	Peach mudstone Yellow-green sandstone Camel neck sandstone									
			He 6										
		He 7											
		He 8											
		Lower	Shanxi formation	Shan 1		1/2 coal seam, alcaeous shale							
Shan 2				4/5 coal seam, Beichaagou sandstone									
Taiyuan formation	Tai 1		6/7 coal seam, Dongdayao limestone, Qiligou sandstone, Maoergou limestone										
	Tai 2		8/9 coal seam, Wujiayu limestone Jinci sandstone										
Carboniferous	Upper	Benxi formation	Ben 1		Pangou limestone								
			Ben 2		Allite, ferrolite								
Ordovician	Middle	Majiagou formation			Limestone, dolomite								

Figure 4-3 Schematic geological column

Figure 4-4 is a type well log section from ZJS5 showing the interval from Shiqianfeng Formation to the base of the Taiyuan Formation. RISC has used the Shihezi Formation subdivision into Upper and Lower Members, but for simplicity has not subdivided the other Formations.

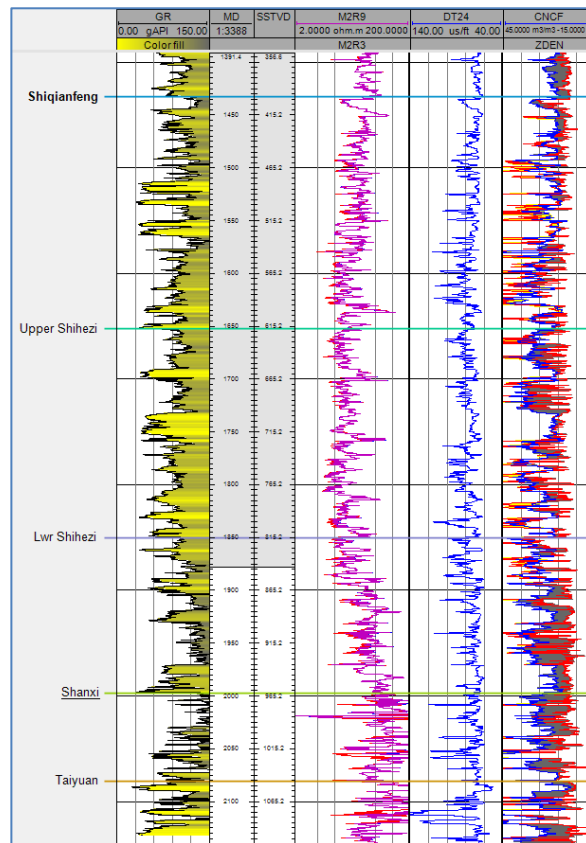


Figure 4-4 Type well log section ZJS5

The coals of the Carboniferous and Permian intervals are present across the basin and provide the source for the gas. Interbedded carbonaceous shales are also believed to contribute. The maturity of the coals, as measured by vitrinite reflectance, vary from immature ($R_o < 0.5$) in the north of the Basin to above peak maturity for gas ($R_o 1.8$) in the south as shown in Figure 4-5. Prior to drilling, R_o values in the Zijinshan block were estimated to lie between 1.0 and 1.6, high volatile bituminous to low volatile bituminous rank, however higher rank (anthracite) coals were tested in the ZJS3 and ZJS4 wells. This higher thermal and/or pressures history may be a local phenomenon associated with magmatic emplacement. Thermal maturity was reached in the Early to Middle Jurassic, with peak hydrocarbon generation reached during the Late Jurassic to Early Cretaceous in the basin centre. Migration into the acreage is expected to have been from the southwest. Biogenic methane may also contribute. Figure 4-5 is a map showing the distribution of depositional environments and sandstone reservoirs interpreted for the Permian Shanxi Formation. During this time the Mi Zhi delta was prograding south. Its southern extension contains the Chang Dong and Mizhi (originally named Jia Xian) gas fields with reservoirs in channel sands deposited in a delta front setting.

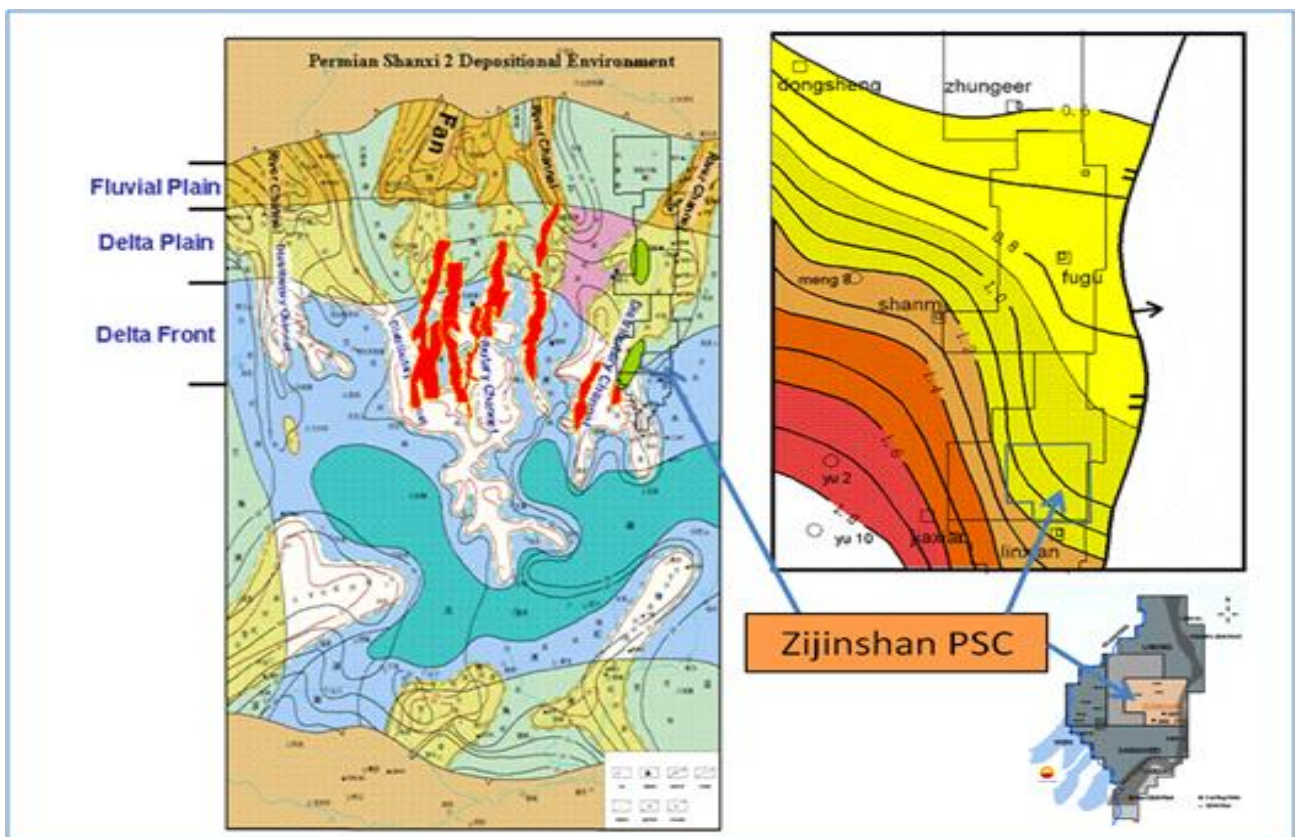


Figure 4-5 Shanxi Formation depositional model and vitrinite reflectance (R_o) map

The Zijinshan alkaline massif is located on the western side of the Zijinshan PSC, Figure 3-2. It is composed of Mt Zijin, Mt Dadu and Mt Jiopai and forms a stock and sill having an area of approximately 23 km^2 . The massif has a zonal-circular structure with its centre at a height of 1,767 m above seal level. It lies at the intersection of two large deep seated faults which were conduits for the intrusion of magma into Middle Triassic sediments during the Jurassic and Cretaceous. The main rocks of the Zijinshan alkaline massif are monzonites, syenites, trachytes, latites, trachyandesites and phonolite and trachyte volcanic breccias. Isotope data suggest that the Zijinshan alkaline rocks were produced by multistage intrusive magmatism and effusive volcanism⁴. It is possible that magmatism also occurred in the Carboniferous to early Permian.

⁴ Yang Xingke, Chao Huixia, N.I Volkova, Zeng Menglin, Yao Weihua. 2009. Geochemistry and SHRIMP geochronology of alkaline rocks of the Zijinshan massif in the eastern Ordos basin, China., *Russian Geology and Geophysics* v50 (2009) 751-762

The effect of elevated geothermal gradients accompanying the magmatic emplacement is important to both deep (tight gas) and the shallow (CBM) gas resources in the Zijinshan PSC as it effects source rock gas generation, reservoir quality of the sandstones and rank, structure and gas content of the coals.

The region is highly gas-prone with most if not all wells around the Zijinshan PSC generally indicating gas where permeable formations are drilled.

A number of gas fields have been developed or are being developed west of the Zijinshan PSC acreage and these are shown in Figure 4-6. These fields are understood to be stratigraphically trapped, with gas present where reservoir quality sand bodies are present⁵. As such, the resource area is not limited to the traditional structural highs but is extensive over the area. The key uncertainty is reservoir quality which affects gas volumes and whether gas will flow to surface.

4.1.1.1. Neighbouring gas discoveries

Several gas discoveries have been made in the Ordos basin as shown in Figure 4-6. Of most relevance to the Zijinshan PSC is the Mizhi gas field.

In August 2007 PetroChina announced first commercial gas production from the Mizhi gas field which is located in the Jia Xian and Mizhi counties south west of the Zijinshan block. The Mizhi Gas Field has been developed over a period of 3 years commencing in 2005. The Phase I development comprised 76 vertical wells, 13 gas gathering stations and one central gas plant delivering 18 Bcf/year into the main No 2 Ordos to Beijing pipeline via a new trunk line constructed from the Mizhi / Jia Xian area. Phase I daily production was reported by Petro China as 50 MMscf/d giving an average well rate of 650 Mscf/d. The gas field has been further developed and now has ca. 200 wells which produce a total of approximately 95 MMscf/d. Individual well gas rates are reported to range from 350 Mscf/d to 1 MMscf/d. The current gas plant has a gas processing capacity of 54 Bcf/year which would enable the field to deliver 150 MMscf/d of gas.

⁵ **Yongtai Yang et al 2005** Tectonic and stratigraphic controls of hydrocarbon systems in the Ordos basin: A multicycle cratonic basin in central China *AAPG Bulletin*; February 2005; v. 89; no. 2

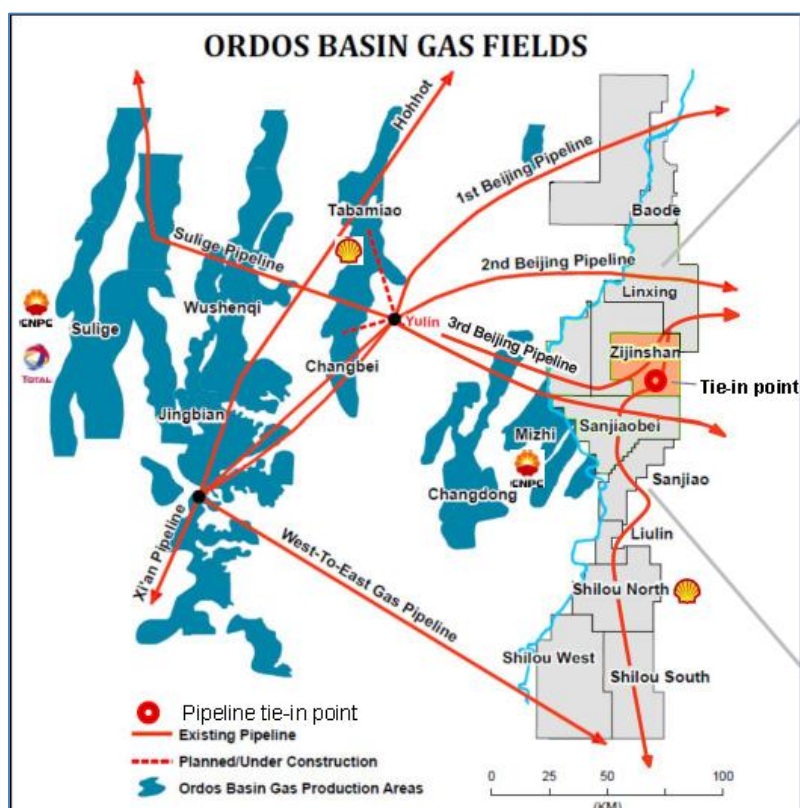


Figure 4-6 Ordos Basin gas fields and pipelines

The Sino Gas and Energy (SGE) Tuban gas accumulation is an extension of the Mizhi gas reservoirs which have reported proven reserves of 0.5 Tcf. Gas is being produced from the Permian and Carboniferous He-8, Shanxi and Taiyuan reservoirs which are also gas bearing in the SGE Tuban field.

In the Linxing PSC and Sanjiaobei PSC which are adjacent to the Zijinshan PSC, Sino Gas and Energy has recently announced aggregate gross 2P reserves and 2C contingent resources of 0.3 Tcf and 2.2 Tcf respectively⁶. Exploration and appraisal activity in these PSCs includes additional drilling and batch flow testing.

Other discoveries in the basin include the Jing Bian gas field, a gas field discovered by CNPC in 1989 and now in development phase has reservoirs in both the Permian and Ordovician. Development wells typically produce 35 MMscf/d.

The Chang Bei reservoir is currently being developed by Shell. Development is focused on the Shanxi sandstone at about 3,000 m depth; the Taiyuan and Shihezi formations are poorer quality and are not being developed. Initial vertical pilot wells were hydraulically fractured and typically produced 0.3 MMscf/d per metre of sand. The ODP (Overall Development Plan) has been submitted using 2 km barefoot horizontal wells to target the single Shanxi sand interval.

A PSC was awarded to Total in 2006 for the South Sulige block which lies to the west of the Jing Bian Gas Field. Total has acquired seismic and drilled and fraced a number of appraisal wells. The Shihezi and especially the He8 is the primary target. A project with 600 vertical wells with multiple hydraulic fractures (3 per well) is currently being planned with each well producing 2 to 4 MMscf/d. The primary reservoirs are at a depth of 3,600 m. Total submitted an ODP (Overall Development Plan) to the Chinese Authorities in December 2008.

⁶ Sino Gas and Energy, Annual General Meeting Presentation, 23 May, 2013

The Tabamiao field is under development by Sinopec. 200 to 300 vertical wells fractured in 3-10 m intervals in the He8, Shanxi and Taiyuan are producing. Productivity is typically 0.1 MMscf/d per metre sand interval.

4.2. ZIJINSHAN PSC EXPLORATION AND APPRAISAL HISTORY

Exploitation of the coal coking and thermal coal resources in the area commenced in the late 1980s and the exploration for coal bed methane started in the nearby Hedong coalfield at the beginning of the 1990s with several companies drilling test wells. Exploration in the area that is now the Zijinshan PSC included four 2D seismic lines and one shallow CBM well, LX0001 which is located in the south east of the PSC and drilled to a depth of 750 m MDBRT. Although mapping at the time indicated that little of the PSC is likely to be prospective for CBM with the primary 9/8 seam interpreted to be deeper than 1,000 m across the majority of the area, the seismic data had limited coverage and its quality was poor. Data acquired from the LX0001 well was unreliable with gas content data showing high nitrogen content suggesting air contamination.

PAPL commenced its first phase of exploration in 2008 with the acquisition of 160 km of 2D seismic lines, covering a total area of approximately 650 km², Figure 4-7. The primary objectives of the seismic programme were to define the distribution of the coal seams (in particular Shanxi 5/4 and the Taiyuan 8/9) as well as confirming regional and localised faulting. The data would be used to identify potential stratigraphic and structural traps and to select suitable well locations.

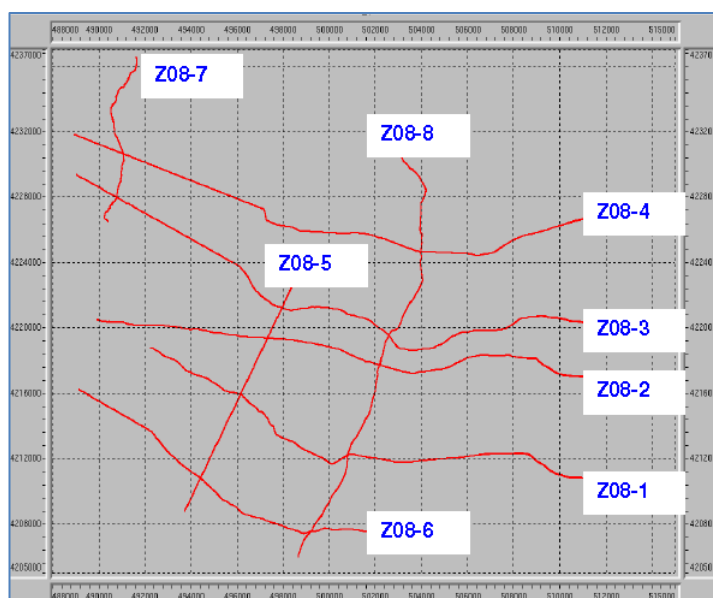


Figure 4-7 2008 2D seismic grid

Exploration well ZJS1 was drilled in 2009 to a total depth of 535 m MDBRT to target CBM potential of the Permian Shanxi 4/5 coal seam and the Carboniferous Taiyuan 8/9 seam on the faulted eastern side of the PSC, Figure 4-8. The well is located approximately 1 km south east of the older LX0001 exploration well. It intersected a 6 m thick 4/5 seam at a depth of 462 m and an 8 m thick 8/9 seam at 518 m. A wireline retrievable coring system was used to acquire core data from the coals. As no gas was encountered during drilling and the desorbed gas contents from the core samples were low, the well was plugged and abandoned.

ZJS2 drilled in 2010 was located to test a small fault block in the north west of the permit. The targets were the 4/5 and 8/9 coal seams and to evaluate the tight gas sandstone properties of the Lower Shihezi Formation and limestone in the Lower Ordovician. It was designed as a vertical well but was plugged back and sidetracked due to stuck pipe at 1,826 m. The sidetracked well was drilled to a depth of 1,784 m MDBRT. A mix of conventional and wireline retrievable coring was conducted however coring of the target coals was unsuccessful due to technical difficulties. Logs indicated that the 4/5 seam and the 8/9 seam were

thin (2.0 m and 2.4 m respectively) and although three intervals with gas potential were identified, the well was plugged and abandoned.

ZJS3 was drilled in March 2011 and was located to drill a faulted anticline structure, 3.5 km south east of ZJS2 in the northwest of the block. The well targeted the 4/5 and 8/9 coal seams and the Shihezi group and Ordovician and was drilled to a total depth of 1,598 m MDBRT. The well intersected 13 seams/plies with a cumulative coal thickness of almost 18 m. The 4/5 seam (1.9 m thick) was intersected at 1,392 m and the 8/9 seam (5.8 m thick) at 1,462 m. The well was cased and suspended.

ZJS4, located approximately 1.5 km south of ZJS2 (within the same fault block) was drilled in June 2011. The well was drilled to a total depth of 1,683 m MDBRT to test the CBM, tight gas and shale gas potential of the entire section from the Lower Shihezi to the lower Ordovician Limestone. In particular the well was to acquire data to characterize the sandstones in the Lower Shihezi and Shanxi; acquire gas content and reservoir parameters of the 4/5 coal seam and gas content and reservoir characteristics of the carbonaceous shales in the Shanxi and Taiyuan. The well intersected 18 seam/plies with a total cumulative coal thickness of 22.7 m. The 4/5 seam was penetrated at 1,522 m and was only 2 m thick. The 5 m thick 8/9 seam was at a depth of 1,572 m. The well was cased and suspended.

Following its acquisition of PAPL, Leyshon drilled two wells in late 2012 as part of an initial programme designed to explore and test the potential for commercial gas production in the relatively unexplored central depression area that appears to show good continuity with the neighbouring Sanjiaobei discovery.

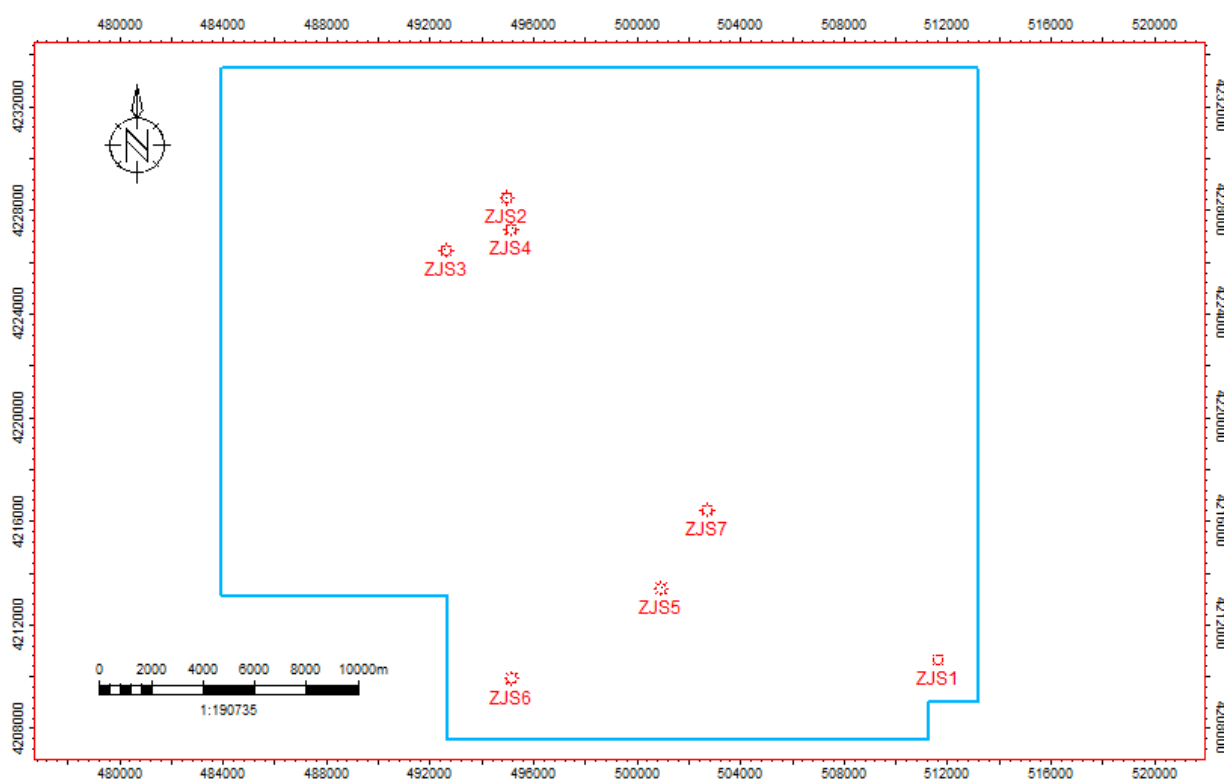


Figure 4-8 Zijinshan PSC showing location of PAPL exploration and appraisal wells ZJS1 to ZJS7

ZJS5 was a vertical appraisal well drilled to a depth of 2,155 m MDBRT and discovered a number of potential tight gas pay zones which showed similarities to the neighbouring Sanjiaobei and Linxing discoveries. Initial results from petrophysical analysis indicated that ZJS5 had encountered nine potential gas pay zones with a total thickness of 56 m. The 4/5 seam and 8/9 seams were intersected at 2051 m and 2108 m respectively and although thicker (8 m and 9 m) than in the northern wells they are too deep for a viable standalone CBM development. The well was cased to allow future testing. In December 2012 two unstimulated sandstone intervals (1,552 m - 1,555m and 1,560 m - 1,564 m) in the Shiqianfeng were tested using

underbalanced perforating technology. No commercial flows were achieved and a rise in liquid level up to 1,037 m within 24hrs of perforation is interpreted to be due to formation water breakthrough from the upper perforated interval. On 28 May 2013, Leyshon announced that following the hydraulic fracture stimulation Shiqianfeng (Q5) interval in well ZJS5 a free gas flow rate of 160,000 scf/day has been achieved over eight hours of stable flow at a tubing head pressure of 200 psi.

ZJS6 is located in the south of the PSC, approximately 7 km south west of ZJS5 and was drilled to a depth of 2,105 m MDBRT. It encountered 15 potential pay zones with a total thickness of 80 m. The well was cased and suspended pending future selective fracture stimulation and testing of the tight gas zones.

Figure 4-9 is a structural reservoir section from NW to SE including wells ZJS2-ZJS4-ZJS5-ZJS6. Lateral continuity and thickness variation of the sandstones across the PSC is apparent.

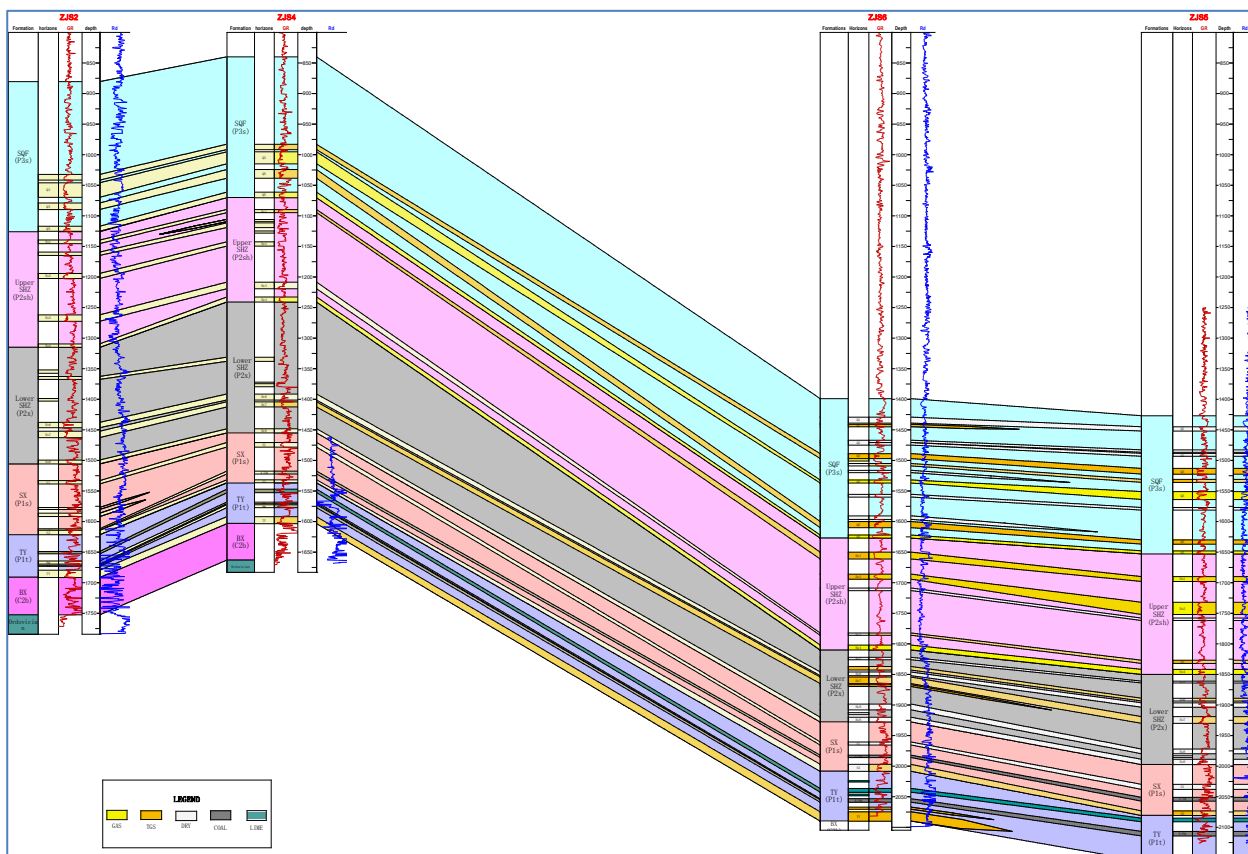


Figure 4-9 NW to SE structural well section showing correlation of reservoir units between wells ZJS2-ZJS4-ZJS5-ZJS6

Subsequent to the completion of the resource evaluation contained within this report, the ZJS7 well has been drilled nearby to the north east of the ZJS5 well and wireline logs evaluated. RISC has reviewed the ZJS7 well results. We conclude that Leyshon's petrophysical estimates are reasonable. The Deep Gas sand pay counts are on low side of net sand ranges used in our probabilistic volumetrics. Shallow Gas coals of the 4/5 and 8/9 seams are similar in thickness to those seen in ZJS 5 and therefore towards the high end of the probabilistic input range.

Therefore the ZJS7 well results are within our probabilistic range of expected outcomes and our reported OGIP and recoverable resource estimates remain valid.

4.3. ZIJINSHAN PSC 2013/14 WORK PROGRAMME

In an announcement on 17 September 2013 on the results of drilling ZJS7, Leyshon Resources Limited notified that the exploration and appraisal of the Zijinshan Gas Project remains at a relatively early stage and accordingly each well will be fully evaluated before proceeding with the subsequent well.

Leyshon Resources Limited also notified that this would likely result in slower progress in the overall programme than originally planned (and as announced on 25 February 2013) and that an assessment of the rate of progress of the ongoing programme will be undertaken once the full results from the latest well are known and once it has been agreed with its partner.

Subject to finalizing plans for the new programme with its partner, and dependent on results, Leyshon Energy and its partner are considering a programme with a total expenditure of approximately US\$17 million in 2013/14 comprising the drilling 3 of wells and fracture stimulation / testing 2 wells, with the remainder comprising principally PSC maintenance costs and geology studies.

318 km of 2D seismic data have been acquired in 2013 and are currently being processed and interpreted (Figure 4-10). RISC considers this program to be appropriate at this stage of the project.

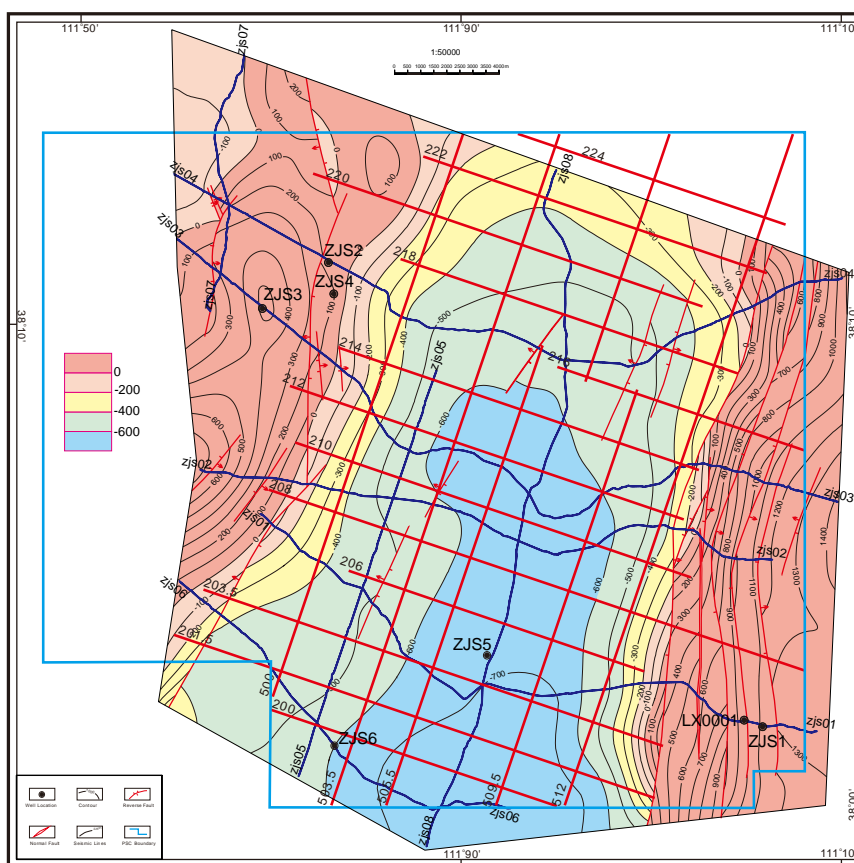


Figure 4-10 2013 planned seismic programme (red lines) on base Shiqianfeng depth structure

4.4. DATA REVIEW

RISC has conducted an audit of the petrophysical evaluation of the last two wells drilled by PAPL in order to estimate the tight gas and CBM resource distribution in the Zijinshan PSC. Scanned seismic sections were also reviewed as part of a qualitative assessment of the structure, however RISC has not reinterpreted these data and has used depth structure maps provided by Leyshon in its analysis.

4.4.1. Seismic data availability and quality

BGP acquired 160 km of 2D seismic data in 2008/09. The seismic lines have an approximate spacing of 4 km but because they follow existing roads they do not form a regular grid as shown in Figure 4-7.

The acquisition geometry design needed to consider the depth of the target horizons between 400 m and 2,200 m and structural dips between 1 and 30 degrees. Additional complications included the large variation in thickness of surface loess and changes in surface lithology which impact interval velocity and the loess absorbs high end frequency components. As a result it is difficult to improve signal to noise and resolution. Furthermore areas covered by silt and gravels in the river beds have unfavourable shooting and receiving conditions. Therefore the reflection energy from the main target layer is weak and the dominant frequency of the seismic waves is low. Areas of exposed rock make drilling difficult. For crooked line operation some lines bend excessively with the problem exacerbated with steep dips.

The topographic relief in the area is large with an elevation range from the tableland to gully landforms being between 900 – 1,480 m. Seismic data quality is better in the gullies. There is a loss of reflector continuity in the eastern and western fault belts compared to the central slope area. This is seen in seismic section line ZJS08-03 (Figure 4-11) which is an east-west strike line located in the central part of the PSC. Exploration is focused on the deeper central depression area and therefore the loss of data quality in the structurally more complex eastern and western areas is not important.

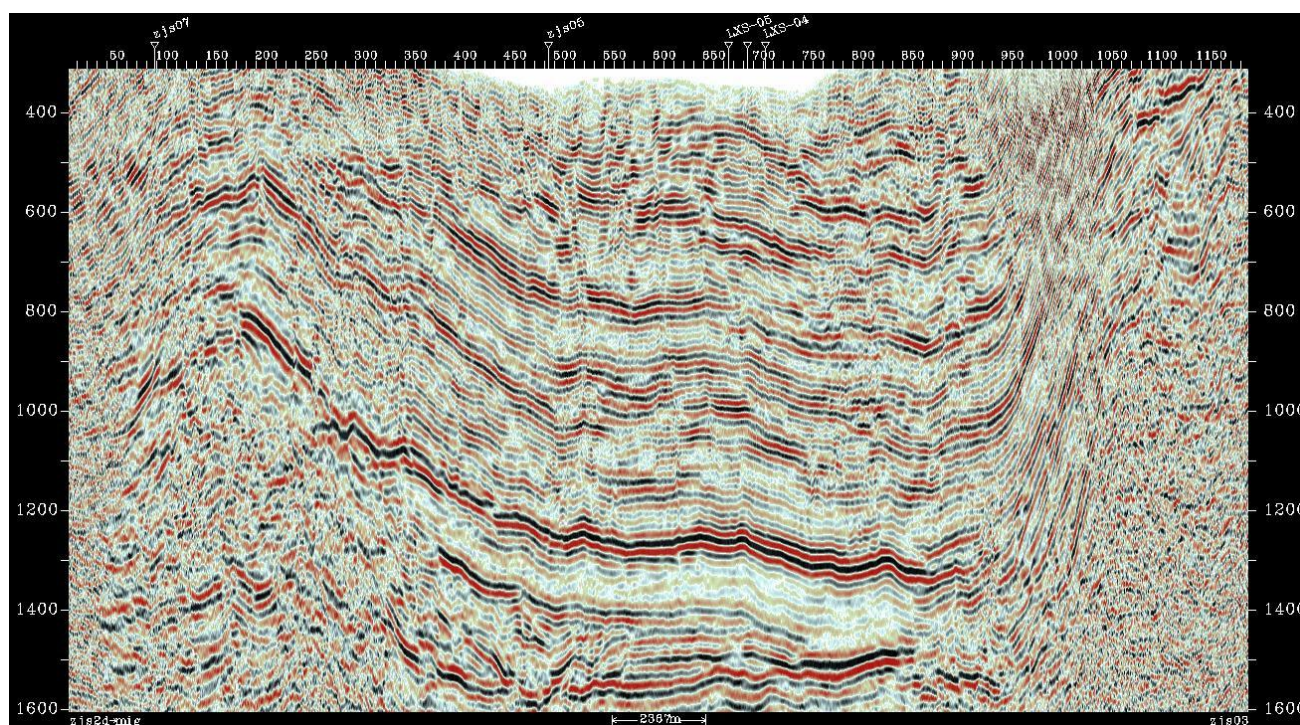


Figure 4-11 Pre-stack Time migration seismic profile of line ZJS08-03

4.4.1.1. Seismic interpretation

The initial Interpretation was conducted for PAPL by CNPC's Data Processing Center of Geophysical Research Institute/BGP⁷ in 2009. The seismic was tied to the LX0001 well. At the time there was no stratigraphic breakdown for the well and correlation was made to regional wells in the Sulige area. On this basis six seismic reflectors were tied and mapped, Table 4-1 and Figure 4-11.

⁷ CNPC, 2009, 2D seismic data interpretation on Block PSC of Zijinshan. Report prepared for PAPL by CNPC Data processing Center of Geophysical Research Institute/BGP, August 2009

Reflector	Event
P2q	Base Shiqianfeng
P2h8s	Near base Upper Shihezi
P2h8x	Near base Lower Shihezi
P1s	Base Shanxi
P1t	Base Taiyuan
C2b	Base Benxi

Table 4-1 Interpreted seismic events, 2009

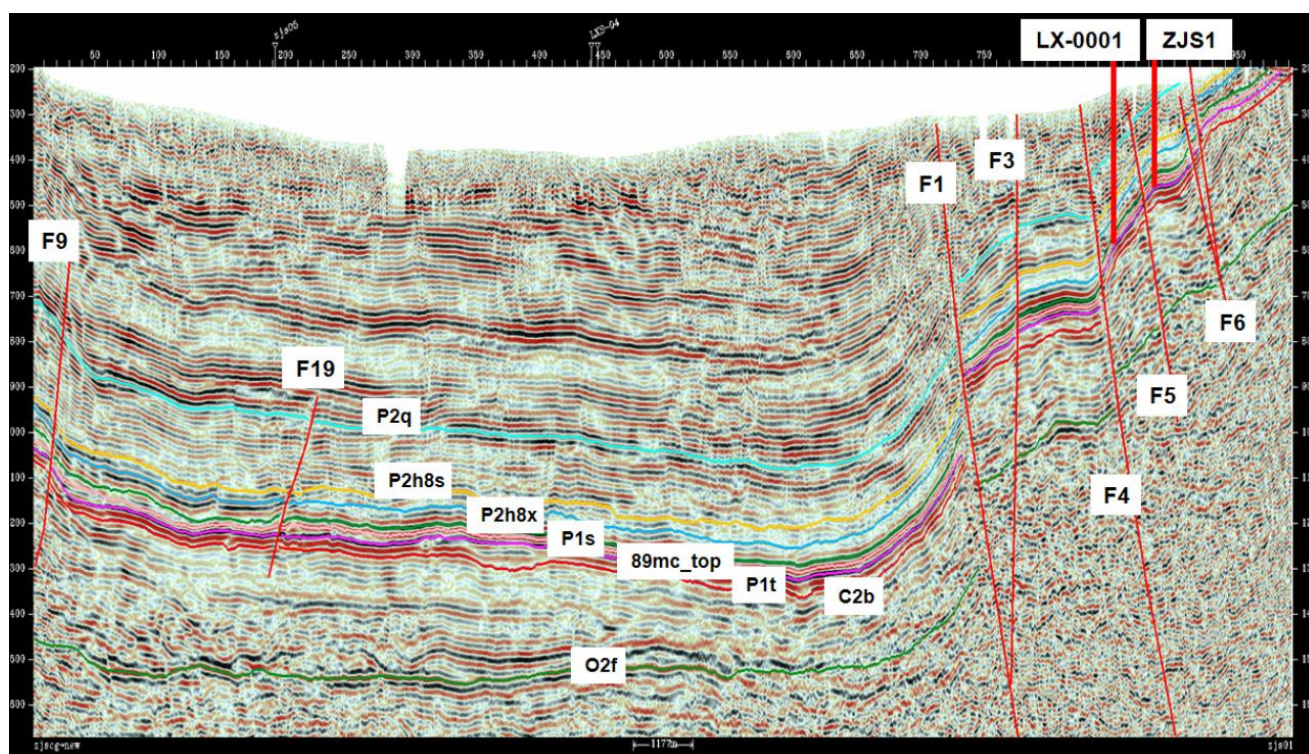


Figure 4-12 Interpreted seismic profile of migrated line ZJS08-01

In 2011 the seismic data was reprocessed by CNPC's Data Processing Center of Geophysical Research Institute/BGP⁸ and a new interpretation of nine events (listed in Table 4-2) was carried by out using additional well ties to ZJS1, 2, 3 and 4.

Reflector	Event
P3s	Base Shiqianfeng Fm
P2sh	Near base Upper Shihezi
H7 in P2x	Yellow Green sandstone in Upper Shihezi
P2x	Near base Lower Shihezi
P1s	Lower coal in Shanxi
8/9 Seam	8/9 coal seam in Taiyuan
P1t	Base Taiyuan Fm

⁸ CNPC, 2011, Special processing and interpretation of Zijinshan block, report prepared for PAPL by Data Processing Center of Geophysical Research Institute, BGP, September 2011

C2b	Base Benxi Fm
O	Base Ordovician Majiagou Gp

Table 4-2 Interpreted seismic events, 2011

Depth conversion has also been undertaken by BGP, using an average velocity map based on stacking velocities, referenced to the seismic T0 datum. Velocity maps for each of the nine horizons were created using a horizon controlling method. The low velocity surface loess soil layer has a significant impact on time structure, although this was reduced as most the lines which were shot within valleys where the loess is thin or absent. The two way time grids were used to trend average velocity maps. The velocity and two way time maps were convolved to create the depth maps.

The definition of (and uncertainty around) the structural geometry is normally a key element in the estimation of hydrocarbon volumes. However, due to the evident stratigraphic/permeability-related nature of the trapping, the precise form of the depth structure (and uncertainty in depth conversion) is much less of an issue than would be the case for the definition of structural closure. The form of the Zijinshan structure map is not used directly in the definition of the tight gas discovered or prospective areas, however it does affect the area of prospective CBM resources which are limited to a 150 m to 1,500 m overburden depth window.

RISC has flexed the resulting depth grids to tie them to the respective well tops at the six ZJS well locations.

The map shown in Figure 4-13 is the depth structure map at the top of the Taiyuan Formation. The contours values are datumed on sea level. It can be seen that there are three dominant structural provinces: a central sag or depression, flanked by east and west fault belts which are elevated and more faulted than the central area. The areas of structural slope leading out from the main depression are also identified. The western area is dominated by the Mt Zijinshan alkali complex, the surface expression of which is shown in Figure 3-2. These features are highlighted in Figure 4-23 and the seismic section ZJS8-04 shown in Figure 4-14.

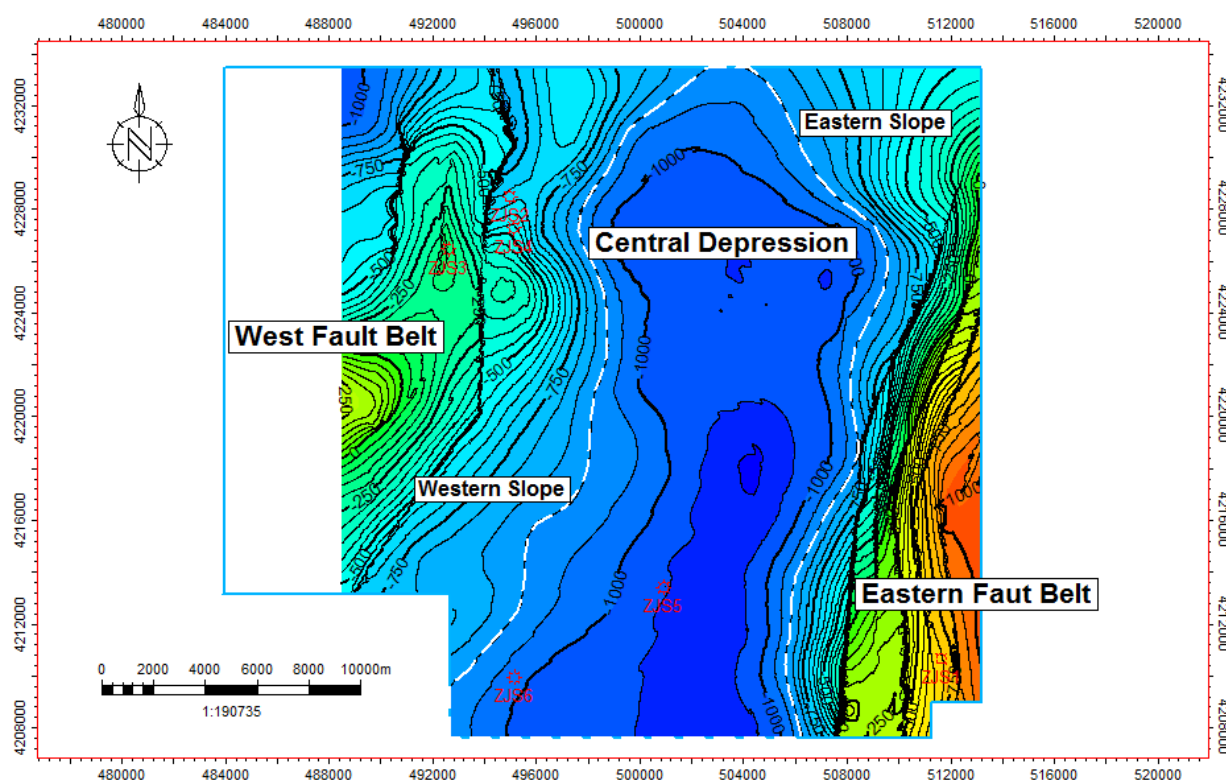


Figure 4-13 Top Taiyuan Formation depth structure map (subsea datum) showing structural provinces

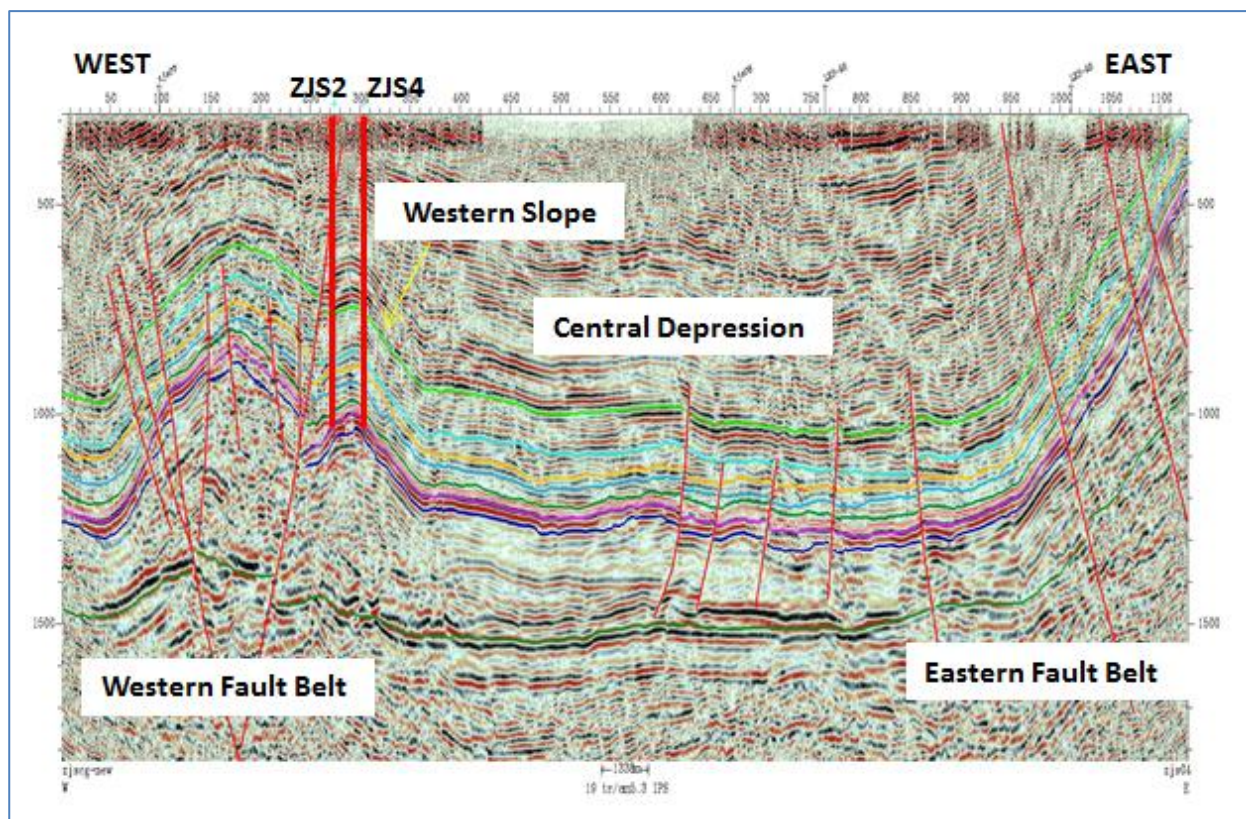


Figure 4-14 East – west strike line, ZJS08-04 showing structural provinces

Twenty six faults have been mapped of which by far the majority are reverse faults caused by east-west compressional stress. The faults generally strike N-S and are mainly developed in the east and west fold belts where they exhibit moderate to large throws as seen in the seismic sections Figure 4-12 and Figure 4-14. The central depression or sag area is relatively undisturbed with few fractures and faults.

The tight gas fairway is interpreted to exist in the area of the central depression. Conversely the potential for CBM production is higher in the eastern and western fault belts and this is discussed in section 4.4.3

An additional aim of the 2011 reprocessing and interpretation work was to use seismic attributes from pre-stack impedance inversion to attempt to map the distribution of the two main coal seams (4/5 and 8/9), and the distribution of sand and gas filled sand within the PSC area⁸.

Due to differences in impedance values between sandstone, shale and coal it is possible to use impedance inversion to distinguish these lithologies from the seismic data. Although gas bearing sands and shale have similar impedance values, hydrocarbon prediction can be made from an analysis of elastic parameters such as the V_p/V_s (compressional velocity and shear velocity ratio). These parameters can be obtained from the application of pre-stack simultaneous inversion.

Figure 4-15 shows an example of the inversion results for line ZJS08-04. The sand layers most possibly being potential pay zone are distributed in the formations of Shiqianfeng, Lower Shihezi (He7 and He8) and Shanxi.

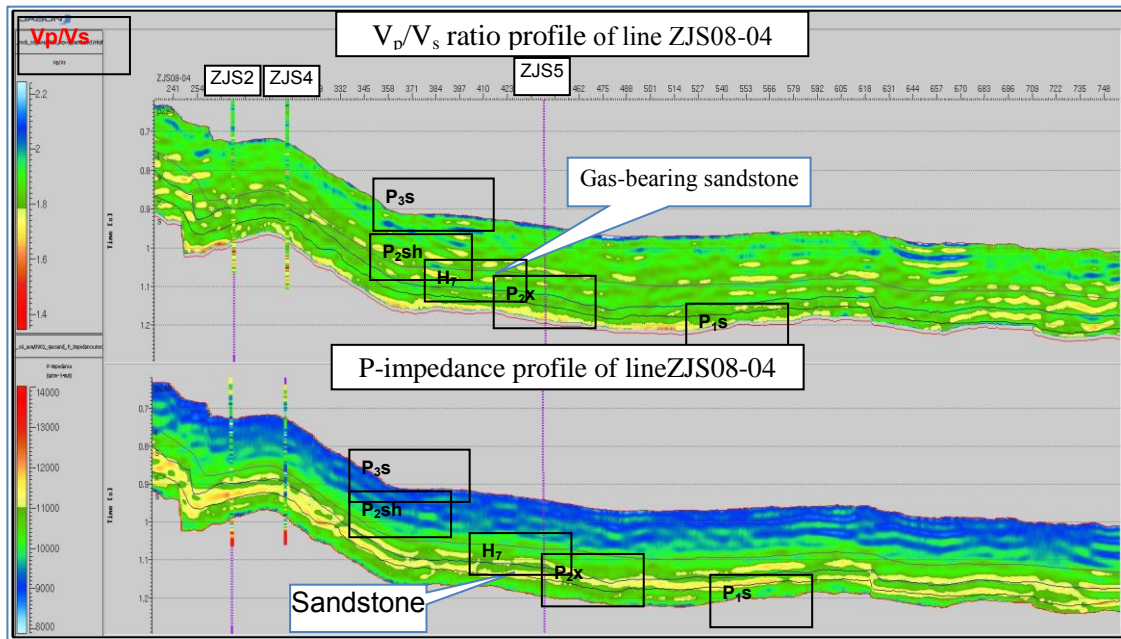


Figure 4-15 Pre-stack inversion profiles of line ZJS08-04 showing interpreted sandstone and gas bearing sandstone distribution

Figure 4-16 show examples of gross sands thickness maps generated from the seismic inversion and illustrate the fluvial channel geometries that are interpreted for this depositional environment. Figure 4-17 shows the interpreted hydrocarbon thickness maps for the same two interpreted intervals derived from V_p/V_s attribute analysis.

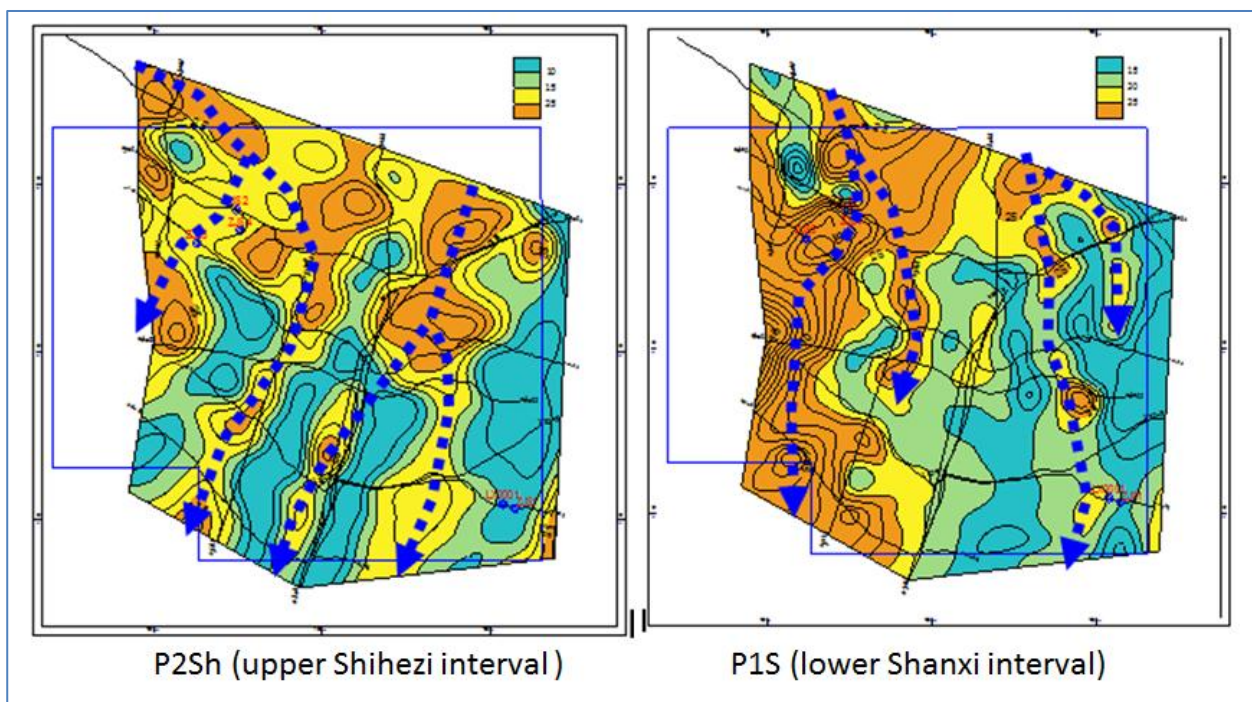


Figure 4-16 Examples of gross sandstone thickness maps generated from seismic inversion

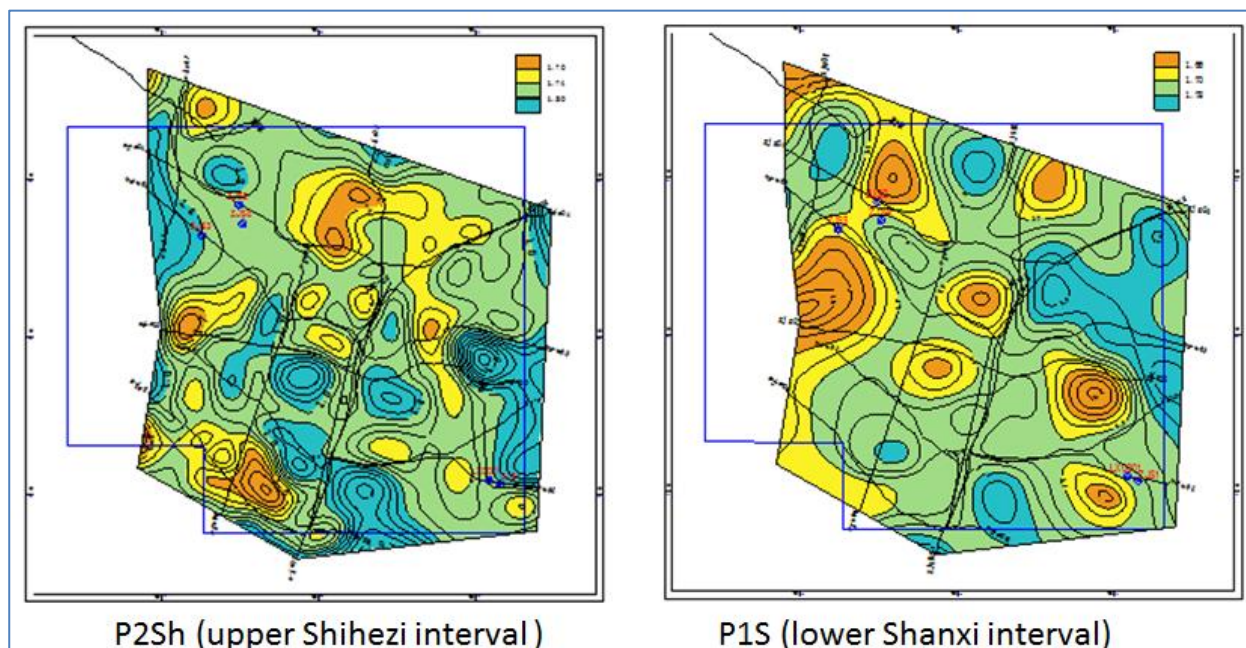


Figure 4-17 Examples of hydrocarbon filled sandstone thickness maps from vp/vs

4.4.2. Deep gas resource

4.4.2.1. Trapping mechanism and sand distribution

Well log data provides information on gross sand thicknesses. In structural traps, such information is combined with closure size to define a gross rock volume of the field or prospect. In the case of the Ordos Basin fields, wells drilled outside of structural closure contain gas and the depositional setting is likely to provide variably connected channel and shelf sand bodies. Although vertical intra-formational sealing is quite likely to be present locally, and the generally north-south channel axes are likely to provide east-west sealing in places, we have seen no evidence that sands ultimately pinch-out updip. It is not apparent that simple stratigraphic trapping operates. The precise trapping mechanism is not known, but may involve reduction in permeability that prevents gas from being a mobile phase. Given the very limited well penetrations and uncertainty in the trapping mechanism, the gas-filled area is understandably difficult to estimate but is ideally most appropriately determined by the presence and distribution of sand.

The most recent model to explain the Ordos Basin tight gas accumulation and trapping mechanism is based on a concept known as the quasi-continuous accumulation system, (2012, Zhou et al⁹) in which numerous small to medium sized gas-bearing lithological traps or sweet spots are connected or half-connected laterally and stacked vertically. They comprise a widely distributed “pseudo-continuous” accumulation, without defined boundaries. Gas-water contacts are absent for most reservoirs and the distribution of water and gas within the hydrocarbon accumulation is complex, controlled by several factors including source, structure, reservoir and preservation of which source condition is considered by Zhou to be the most critical.

Of importance to the formation of these accumulations is a gentle structure that has not undergone severe tectonism allowing the extensive deposition and distribution of source and reservoir lithologies. These conditions are found on the Yishan slope which is underlain by strong Proterozoic and Achaean metamorphic crystalline basement rocks (and is characterized by a large gentle monocline, where folds and

⁹ Jingzhou Zhao et al 2012, Quasi-continuous lithologic accumulation system: a new model for tight gas occurrence in the Ordos basin, China, *Search and Discovery Article #80210*; March 2005

faults are not developed and the dip is less than 1°. Source rocks are nearly basin-wide in distribution and mostly interbedded with reservoirs so that gas generation is extensive and gas charge is pervasive. Migration distances are small and the minimum gas generation intensity for a large tight gas accumulation under these conditions can be low. Gas charge is not strong enough for gas to thoroughly displace water in the reservoirs.

The sandstones are mostly tight and extensive but exhibit a strong lateral heterogeneity, showing no trend of updip improvement of reservoir quality. Cross plots of porosity, permeability and production of gas in the Sulige field show that porosity and permeability do not play an important role in controlling gas production⁹.

Lateral seals are well developed because the accumulation occurred within the lithological traps, and no other trapping mechanism such as phase trapping is necessary.

BGP used seismic inversion and seismic attributes techniques to derive a prediction for sand distribution across the Zijinshan PSC. The methods included analysis of seismic facies and geometries, as described in section 4.4.1.1. The derived isopach maps necessarily relied on models of regional depositional trends and although appear to be reasonable the supporting information for this work that has been given to Leyshon (and RISC) is insufficient to give us the confidence to use this work for resource estimation.

4.4.2.2. Net sand and porosity

Wireline logs for wells ZJS2 to ZJS6 were interpreted by Well-Tech for Petro China and PAPL and the results from the two latest wells, ZJS5 and ZJS6 have been audited by RISC. The results from individual sand intervals vary between the interpretations, but the assessment of tight sandstone is very sensitive to methods used so this sort of variation is not surprising. Given the low quality of the rock, slight changes in porosity can significantly alter whether a zone would be considered as net reservoir.

RISC has independently estimated net pay and porosity from the ZJS5 and ZJS6 well logs and concluded that the estimation of net sand and porosity by COSL is reasonable, and so we have accepted its tabulation of these properties.

COSL has used a variety of petrophysical cut-offs to define producible gas intervals, “poorer gas” intervals, water zones and tight zones. These cut-offs are based on COSL’s experience of calibration of petrophysical parameters with well test results in adjacent areas. We have not seen any direct support for these cut-off values, but acknowledge the large amount of well data available to COSL and its experience in the basin.

We have calculated rock property values using the well summaries provided in COSL/PAPL’s petrophysical analysis reports for wells ZJS2 to ZJS6. Our analysis has used a porosity cut-off of $\geq 4\%$ to determine net reservoir which is commonly used in other tight gas basins to capture the full spectrum of reservoir quality in the gas in place estimate. Table 4-3 to Table 4-6 show the resulting net reservoir intervals and average rock properties calculated by well for each formation.

Formation	Well	Interval		Net	VSH	POR	SW
		Top	Base				
		m MDRT		m	%	%	%
Shiqianfeng	ZJS5	1513.0	1516.9	3.9	13.8	5.5	83.6
	ZJS5	1517.7	1522.1	4.3	6.1	8.2	57.2
	ZJS5	1523.7	1524.8	1.2	7.3	4.7	51.3
	ZJS5	1531.1	1535.8	4.7	2.2	8.4	52.1
	ZJS5	1549.8	1550.7	0.9	23.7	5.6	71.5
	ZJS5	1551.9	1555.4	3.5	5.0	12.3	61.4
	ZJS5	1557.8	1560.2	2.3	20.7	5.6	82.3
	ZJS5	1560.2	1564.2	4.1	4.2	14.2	53.6
	ZJS5	1630.9	1637.1	6.1	20.3	9.9	47.3
	ZJS5	1648.0	1650.1	2.1	24.0	5.4	83.6
	ZJS6	1441.0	1444.2	3.1	9.1	7.8	64.6
	ZJS6	1489.6	1492.2	2.6	5.0	6.6	73.5
	ZJS6	1493.7	1497.2	3.5	11.6	6.3	65.7
	ZJS6	1497.2	1500.3	3.1	1.6	11.6	50.0
	ZJS6	1500.3	1502.1	1.9	9.0	4.9	75.0
	ZJS6	1532.6	1537.2	4.7	5.6	13.1	56.5
	ZJS6	1601.5	1609.9	8.5	7.9	6.0	44.9
	ZJS6	1622.1	1626.7	4.6	1.6	12.2	20.8

Weighted Average	8.8	54.1
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Table 4-3 Shiqianfeng Formation properties by well (>= 4% porosity cut-off)

Formation	Well	Interval		Net (m)	VSH (%)	POR (%)	SW (%)
		Top	Base				
		(m MDRT)					
Upper and Lower Shihezi	ZJS2	1438.3	1441.5	3.2	4.8	12.5	62.1
	ZJS2	1442.6	1447.7	5.1	6.5	11.4	63.9
	ZJS2	1451.7	1463.7	12.0	14.5	11.1	58.7
	ZJS2	1466.9	1468.3	1.4	22.9	8.6	65.0
	ZJS2	1477.7	1480.1	2.4	27.8	4.0	77.7
	ZJS2	1498.8	1504.4	5.6	9.2	7.4	73.0
	ZJS3	1197.2	1205.3	8.1	18.0	3.3	75.8
	ZJS3	1218.8	1220.9	2.1	38.5	5.5	77.5
	ZJS3	1240.8	1244.2	3.4	13.6	11.6	62.6
	ZJS3	1245.7	1247.1	1.4	41.1	4.4	79.2
	ZJS3	1247.1	1249.4	2.3	19.3	10.0	67.1
	ZJS3	1255.8	1263.8	8.0	20.0	5.6	54.9
	ZJS3	1265.6	1271.8	6.2	26.6	2.4	83.6
	ZJS3	1271.8	1273.8	2.0	5.6	10.3	44.5
	ZJS3	1277.5	1285.0	7.5	25.4	2.2	76.3
	ZJS3	1301.6	1303.2	1.6	24.4	2.5	59.5
	ZJS3	1305.0	1307.5	2.5	29.2	2.9	62.8
	ZJS3	1319.6	1337.5	17.9	19.2	4.6	50.3
	ZJS3	1101.9	1107.4	5.5	4.8	9.0	73.3
	ZJS3	1112.8	1121.4	8.6	23.3	5.0	83.8
	ZJS5	1994.1	1997.2	3.2	20.9	4.1	72.4
	ZJS5	1650.1	1653.0	2.9	11.1	11.5	47.2
	ZJS5	1692.7	1698.8	6.0	12.7	10.9	40.4
	ZJS5	1732.5	1735.0	2.5	22.7	5.9	83.3
	ZJS5	1735.0	1739.2	4.2	10.6	11.1	61.4
	ZJS5	1743.6	1745.6	2.0	19.2	10.2	69.0
	ZJS5	1746.4	1748.4	2.0	5.2	12.2	57.0
	ZJS5	1748.4	1752.7	4.3	5.9	12.7	59.0
	ZJS5	1829.9	1832.3	2.4	3.6	5.8	82.2
	ZJS5	1843.5	1846.1	2.6	22.8	12.8	35.0
	ZJS5	1846.1	1850.0	3.9	32.4	4.7	76.6
	ZJS6	1837.0	1839.5	2.5	13.9	8.4	65.0
	ZJS6	1854.2	1860.2	6.0	3.3	8.2	60.2
	ZJS6	1868.3	1870.1	1.7	13.0	5.8	78.5
	ZJS6	1990.6	1992.8	2.2	31.4	5.4	61.8
	ZJS6	1649.9	1660.5	10.6	13.0	5.5	45.0
ZJS6	1686.4	1693.7	7.3	17.1	7.2	58.7	
ZJS6	1739.8	1742.0	2.1	49.2	5.9	40.0	
ZJS6	1807.1	1810.2	3.2	3.3	12.0	49.4	
Weighted Average						7.0	60.5

Table 4-4 Shihezi (Upper and Lower) Formation properties by well (>= 4% porosity cut-off)

Formation	Well	Interval		Net	VSH	POR	SW
		Top	Base				
		m MDRT					
Shanxi	ZJS2	1531.8	1534.0	2.2	19.0	5.4	50.7
	ZJS2	1534.7	1538.5	3.8	4.8	6.3	53.9
	ZJS2	1577.0	1579.1	2.1	6.9	5.6	65.7
	ZJS2	1605.3	1606.1	0.8	31.4	7.4	55.4
	ZJS2	1606.9	1607.7	0.8	13.7	5.3	51.1
	ZJS2	1615.0	1618.7	3.7	13.0	8.3	63.3
	ZJS2	1629.0	1631.3	2.3	4.8	4.4	47.3
	ZJS3	1356.2	1357.9	1.7	30.4	5.1	31.7
	ZJS3	1361.8	1364.6	2.8	2.5	8.2	58.2
	ZJS3	1368.2	1373.0	4.8	12.8	5.9	50.0
	ZJS4	1513.2	1515.6	2.4	8.8	9.3	67.9
	ZJS4	1515.6	1517.8	2.2	43.0	6.6	69.7
	ZJS4	1517.8	1521.7	3.9	4.0	11.3	69.8
	ZJS4	1533.0	1536.0	3.0	14.5	8.5	68.1
	ZJS5	2072.9	2076.4	3.5	30.0	9.3	47.7
ZJS5	2079.2	2080.5	1.3	42.9	12.1	28.2	

Weighted Average	7.6	57.4
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Table 4-5 Shanxi Formation properties by well (>= 4% porosity cut-off)

Formation	Well	Interval		Net	VSH	POR	SW
		Top	Base				
		m MDRT					
Taiyuan	ZJS2	1678.5	1679.9	1.4	23.1	6.0	72.7
	ZJS3	1472.1	1474.9	2.8	28.8	4.2	38.5
	ZJS3	1476.8	1482.5	5.7	21.8	8.1	16.4
	ZJS4	1594.8	1602.0	7.2	15.3	7.5	78.8
	ZJS4	1604.8	1605.6	0.8	14.4	5.2	23.2
	ZJS6	2062.7	2067.0	4.3	18.4	4.4	83.3
	ZJS6	2067.0	2069.9	2.9	4.4	8.2	54.2
	ZJS6	2074.7	2090.2	15.5	13.6	6.6	53.6

Weighted Average	6.6	53.9
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Table 4-6 Taiyuan Formation properties by well (>= 4% porosity cut-off)

As a sensitivity, RISC has also estimated net reservoir thickness statistics for two additional porosity cut-off limits: 9% and 6%. These cut-off values are equivalent to the values used by COSL to define producible gas and "poorer gas" intervals respectively.

Comparison of the mean net thickness values for each Formation shown in Table 4-7 illustrates the impact of the cut-off value on net reservoir thickness.

Formation	Mean Net Thickness (m)			
	Porosity cut-off value	4%	6%	9%
Shiqianfeng		32.9	26.0	14.9
Shihezi		44.5	23.5	15.3
Shanxi		11.2	6.5	2.5
Taiyuan		13.7	8.7	0.0
	Sum	102.3	64.8	32.8

Table 4-7 Mean net reservoir thickness calculated from PAPL's petrophysical analysis (ZJS2 to ZJS6 wells)

4.4.2.3. Net to gross ratio

The petrophysical summations are based on net reservoir thickness. The net to gross ratio for these intervals is therefore 100%.

4.4.2.4. Water saturation

Water saturation is difficult to estimate in tight formations and the nuclear magnetic resonance (NMR) logging tool is often run to attempt to measure the free water and bound water components of the total water saturation. This tool has not been run in any of the Zijinshan wells and there is considerable uncertainty in estimating water saturation in tight gas sands in the Zijinshan area. COSL has used the Indonesian equation with Archie constants and water resistivity inputs based on regional data. Key issues are water salinity, and the ability of conventional wireline tools to resolve Sw. No water saturation cut-offs have been applied by COSL to estimate gas pay in net sand intervals and all intervals that are above the net sand porosity and Vshale cut-off thresholds are considered to be gas bearing.

RISC has calculated weighted average water saturations for the 4% porosity cut-off case from COSL's petrophysical results and these are shown in Table 4-3 to Table 4-6. High water saturation values were truncated at 85%. The water saturation values reflect the high irreducible water saturation that is present in the tight sandstones and it is unlikely that water will be produced. The high irreducible water volume has a detrimental impact on gas-in-place volumes as the proportion of the total pore space that is available for gas storage is reduced.

4.4.2.5. Permeability

COSL has used a the Timur Equation which relates permeability to porosity and irreducible water saturation (Swir) on the basis that core permeability and core porosity regression techniques are unreliable where porosity is less than 15%. As both the porosity and irreducible water saturation measurements have a large measurement uncertainty, the uncertainty in the computed permeability results must also be large.

4.4.2.6. Pore pressure and gas properties

Although there is an absence of pressure data from wells drilled in the Zijinshan PSC, regional data suggests that the reservoirs will be slightly under-pressured. This is a result of the basin history.

The Upper Palaeozoic gas accumulation system has experienced 3 stages of development:

- Pre-Cretaceous: formation of tight sandstones;

- Early Cretaceous: peak gas generation, extensive accumulation and development of overpressure; and
- Post-Early Cretaceous: recharging and adjusting of gas reservoirs and formation of underpressure. The end of Early Cretaceous structural inversion and uplift resulted in a reduction of temperature and pressure which led to underpressured conditions; desorption of absorbed gas, leading to re-charge. Today the reservoirs exhibit multiple pressure systems showing poor connectivity among the numerous smaller-sized traps.

Gas composition data from gas produced from the Zijinshan sandstones reservoirs has yet to be analysed. Regional data suggests that the gas will have a high methane content. The impact on gas composition from intrusives associated with Mt Zijinshan in the west of the PSC is uncertain and may result in elevated carbon dioxide content.

4.4.2.7. *Well deliverability*

The testing and fracture stimulation program at Zijinshan is at an early stage and preliminary results are encouraging. A hydraulic fracture treatment was performed on the Shiqianfeng (Q5) interval from 1,631 to 1,637m in ZJS5. A stable flow rate of 160,000 scf/d was obtained (12/64" choke, 200 psi tubing head pressure) and the well is currently shut in for pressure build up. A down hole pressure gauge is installed which will provide additional reservoir information in due course.

In June 2011 SGE announced unstimulated commercial gas flow rates of 362,000 scf/d and 1.15 MMscf/d from its Tuban TB-03 and TB-09 wells respectively¹⁰. Subsequently the TB-05 well has flowed gas post hydraulic fracture stimulation.

¹⁰ New Bulletin net, www.petroleumnews.net/companystoriesEnergy

4.4.3. Shallow gas resource

From information acquired from existing wells and seismic, it is likely that coal seams are present across the entire PSC. The #4/5 seam in the Lower Permian Shanxi Formation and the #8/9 seam in the Carboniferous Taiyuan Formation are the primary exploration focus in the region. Other minor seams and plies have been penetrated by the wells and will contribute to the total gas-in-place resource in the PSC however RISC has focussed on the two main seams for this evaluation.

4.4.3.1. Depth and thickness of target coal seams

All wells except for ZJS1 intersected the target seams at depths greater than 1,000 m MDBRT (Table 4-8).

Seam	Well	Horizon	Depth		Gross Thickness
			m MDBRT	m SS	m
Shanxi 4/5	ZJS1	Roof	455.6	718.3	6.1
		Floor	461.7	712.2	
	ZJS2	Roof	1610.3	-451.7	3.4
		Floor	1613.7	-455.1	
	ZJS3	Roof	1391.1	-91.4	2.3
		Floor	1393.4	-93.7	
	ZJS4	Roof	1521.7	-332.3	2.7
		Floor	1524.4	-335.0	
	ZJS5	Roof	2051.3	-1016.1	8.2
		Floor	2059.5	-1024.4	
	ZJS6	Roof	1982.6	-949.8	2.0
		Floor	1984.6	-951.8	
Taiyuan 8/9	ZJS1	Roof	509.9	664.1	8.1
		Floor	518.0	656.1	
	ZJS2	Roof	1665.5	-506.8	6.7
		Floor	1672.2	-513.5	
	ZJS3	Roof	1462.3	-162.6	5.9
		Floor	1468.2	-168.5	
	ZJS4	Roof	1566.3	-376.8	11.6
		Floor	1577.9	-388.4	
	ZJS5	Roof	2108.1	-1072.9	13.8
		Floor	2121.9	-1086.7	
	ZJS6	Roof	2054.3	-1021.5	4.3
		Floor	2058.6	-1025.8	

Table 4-8 Coal seam depth and gross thickness

Typically the depth range for commercial CBM production worldwide is between 150 to 1,000 m. Shallower coals often have insufficient gas content; coals deeper than 1,000 m usually lack sufficient permeability to

flow gas at commercial rates, although there are reports¹¹ that in some basins coals have commercial gas contents at depths approaching 1,400 m.

RISC has created overburden depth maps for the Shanxi 4/5 and Taiyuan 8/9 seams in the Zijinshan PSC by first phantoming the Taiyuan subsea depth grid to tie to the respective coal tops to create subsea depth grids for the two coal seams. As no surface elevation grid was available RISC created a grid from well elevation data inserting dummy points where required to closely match the surface elevation map shown in Figure 3-3. The elevation grid was then added to the subsea depth grids to create the two overburden depth grids shown in Figure 4-18 and Figure 4-19 respectively. The annotated depth contours indicate where the respective seams are within the 150 m to 1,500 m depth window. The total area is approximately 193 km² for the 4/5 seam and 130 km² for the 8/9 seam and the areas are restricted to the eastern and western fault belt structural zones.

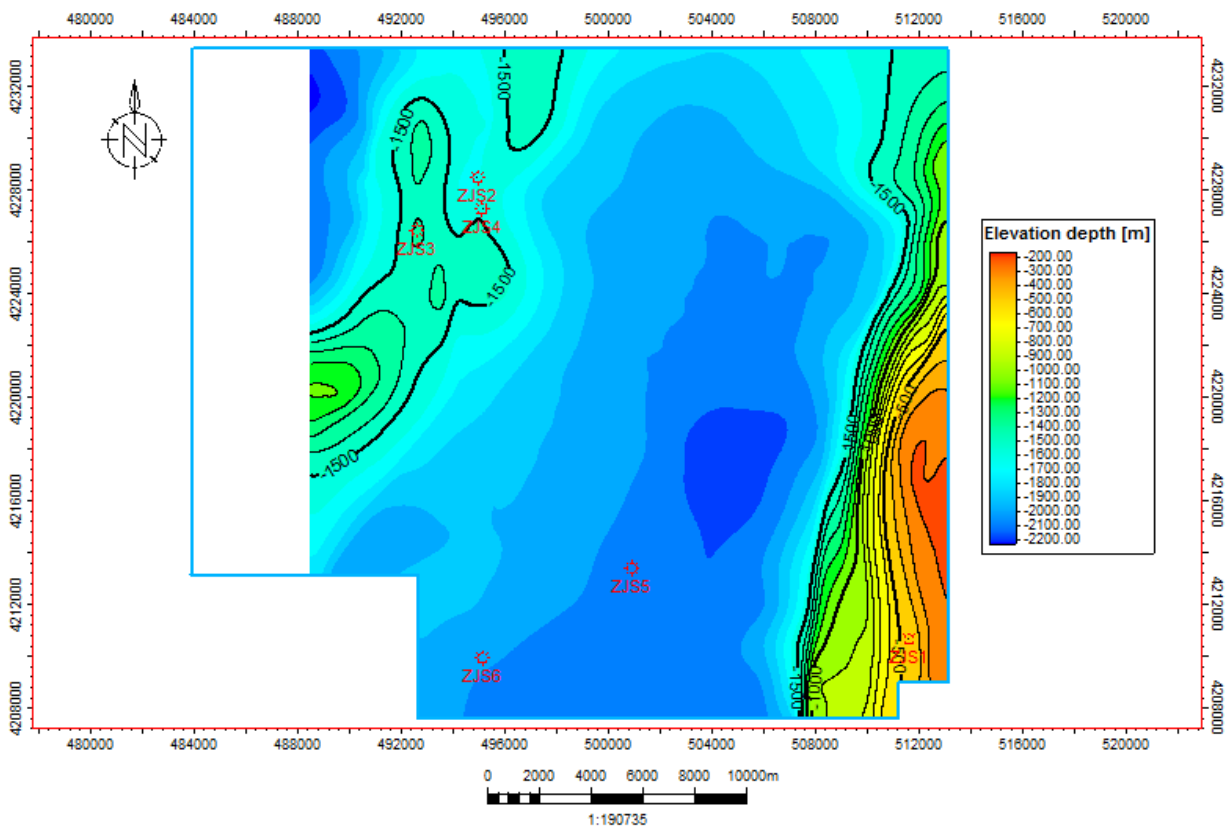


Figure 4-18 Shanxi 4/5 seam overburden depth 150 m to 1,500 m

¹¹ RISC, 2013 Shouyang CBM Reserves as at December 2012, a report prepared for Far East Energy Corporation, FEE website <http://www.fareastenergy.com/presentations>

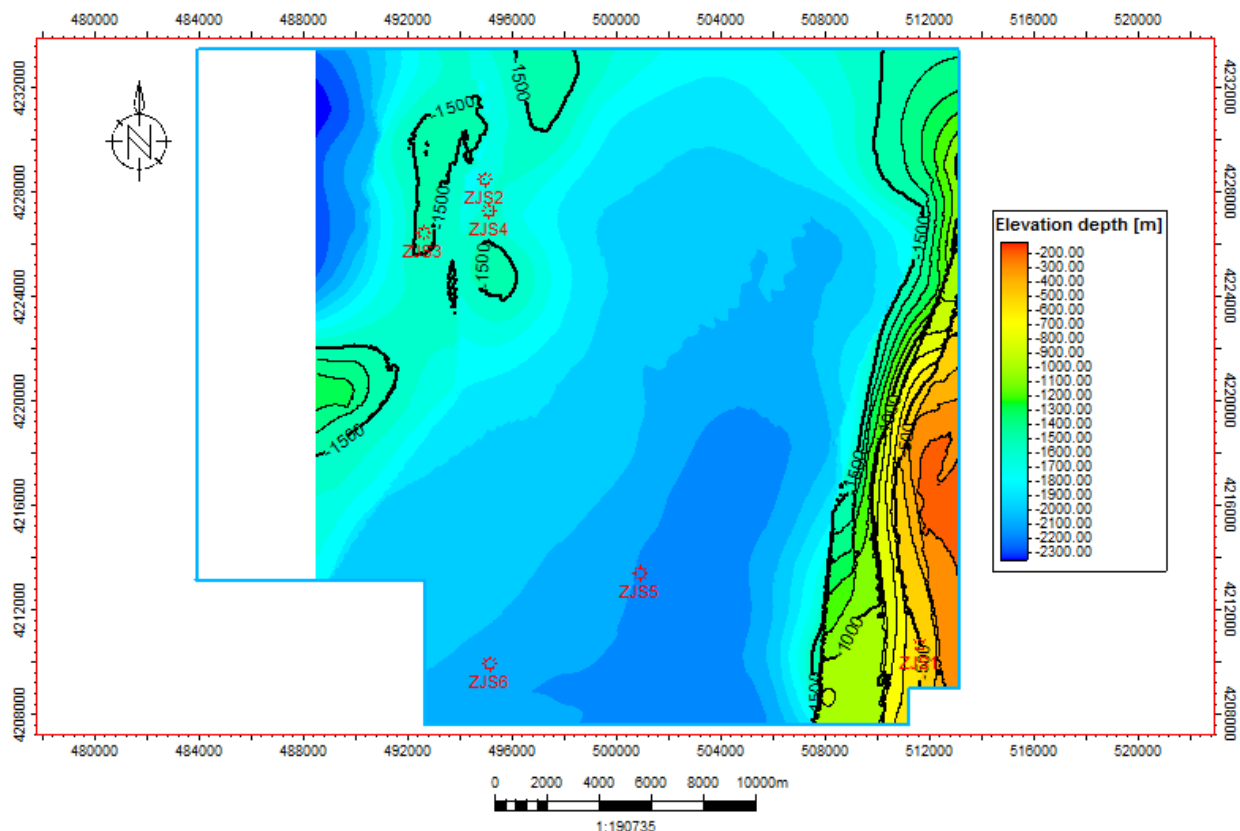


Figure 4-19 Taiyuan 8/9 seam overburden depth 150 m to 1,500 m

The area of the respective seam depth tranches is shown Table 4-9.

Seam	Region	Seam Area (km ²)		
		Depth Tranche		Total
		150-1000 m	1000-1500 m	150-1500 m
Shanxi 4/5	East	56.3	40.3	96.6
	West	0.0	69.4	69.4
	Total	56.3	109.7	166.0
Taiyuan 8/9	East	52.3	45.2	97.5
	West	0.0	43.3	43.3
	Total	52.3	88.5	140.8

Table 4-9 Seam area analysis – depth tranche area

PAPL’s coal thicknesses derived from seismic inversion are shown as Figure 4-20. The maps show a variation in coal thickness across the PSC with the 8/9 seam (shown on the right hand side) being better developed than the younger 4/5 seam. The maps are a qualitative representation of coal thickness distribution; however the resolution of the 2D seismic data is insufficient to accurately map the thickness of the relatively thin coal seams for resource estimation purposes.

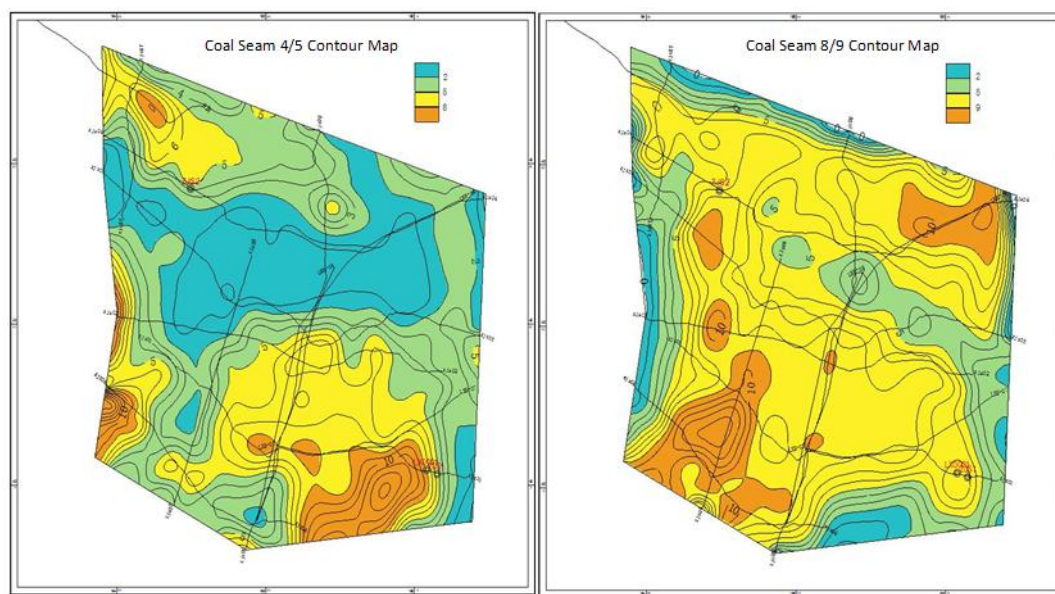


Figure 4-20 PAPT coal thickness maps based on seismic inversion

The gross seam thickness at each well is listed in Table 4-8. Net coal is the fraction of the gross coal interval that is likely to produce gas and should be included in the gas resource estimates. The estimation of net coal thickness is usually determined by calibrating density logs to core.

RISC has evaluated the sensitivity of the density log cut-off value to net coal thickness. Density cut-off values were applied from 1.70 g/cc to 2.20 g/cc and the effect on coal thickness are shown in Table 4-10. The well log of ZJS5 (Figure 4-21) illustrates the effect showing that more coal is included in the net coal flag as the density cut off is relaxed. In this example the 8/9 seam has particularly sharp boundaries and is insensitive to the cut-off value.

Seam	Well	<=1.70 g/cc	<=1.75 g/cc	<=1.80 g/cc	<=1.85 g/cc	<=1.90 g/cc	<=1.95 g/cc	<=2.00 g/cc	<=2.05 g/cc	<=2.10 g/cc	<=2.15 g/cc	<=2.20 g/cc
4/5 Seam	ZJS1	5.7	5.7	6.0	6.0	6.0	6.0	6.0	6.1	6.1	6.1	6.1
	ZJS2	2.3	2.8	2.8	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9
	ZJS3	0.0	0.0	0.0	0.9	1.2	1.5	1.5	1.7	1.7	1.8	2.0
	ZJS4	1.7	1.7	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.3	2.3
	ZJS5	5.5	5.8	6.1	6.1	6.1	6.4	6.4	6.7	6.7	6.7	6.9
	ZJS6	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.7	1.7	1.8	1.8
8/9 seam	ZJS1	7.7	7.7	7.7	7.9	7.9	8.0	8.0	8.0	8.0	8.1	8.0
	ZJS2	3.3	3.4	3.4	3.6	3.6	3.6	3.8	3.8	3.8	3.9	3.9
	ZJS3	0.9	0.9	1.4	2.7	3.4	4.0	4.4	5.1	5.4	5.8	5.8
	ZJS4	4.3	4.6	5.5	5.5	6.5	7.5	7.8	8.4	8.8	9.6	10.5
	ZJS5	8.2	8.2	8.5	8.5	8.5	9.0	9.0	9.0	9.0	9.5	9.9
	ZJS6	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.3	4.3	4.3

Table 4-10 Sensitivity of net coal thickness to density log cut-off value

Typical density cut-off values for net coal are in the 1.75 to 1.85 g/cc range, however the value depends upon the composition of the coal. Using higher density cut-off values (e.g. 1.9-2.2 g/cc) allows for the

inclusion of carbonaceous shale in the net thickness volumetric parameter as under certain conditions gas can desorb from carbonaceous shale and contribute to the gas production stream. RISC has estimated mean net coal for the Zijinshan wells using a cut-off value of 1.85 g/cc. These values are highlighted in Table 4-10.

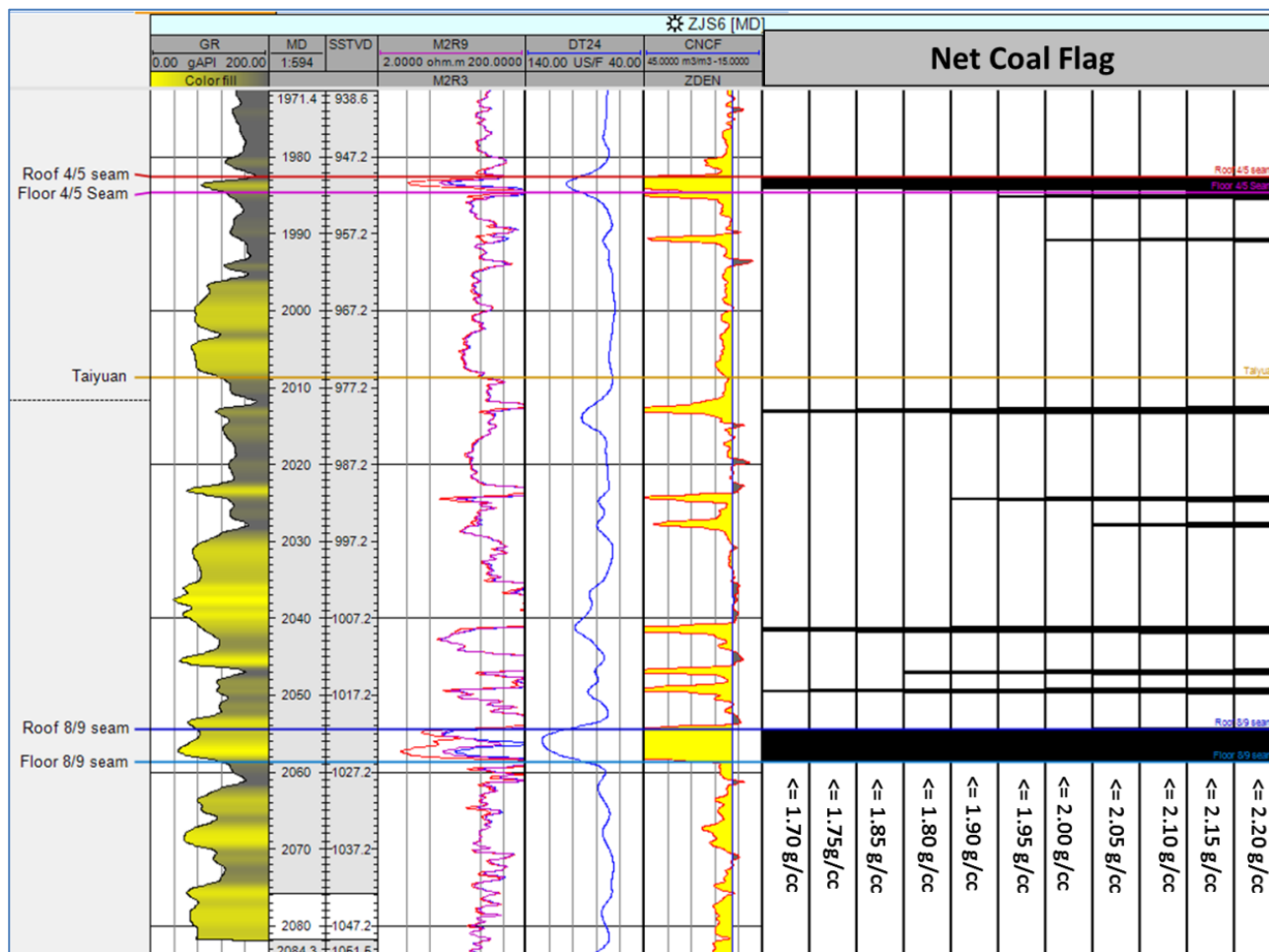


Figure 4-21 Variation of density cut off and its effect on net coal thickness

Net coal thickness statistics from the well logs are shown in Table 4-11. Net coal is calculated using a density cut off value ≤ 1.85 g/cc.

Seam	Count	Net thickness		
		Min	Ave	Max
		m	m	m
Shanxi 4/5	6	0.9	3.2	6.1
Taiyuan 8/9	6	2.7	2.4	8.5

Table 4-11 Net coal thickness statistics from well logs (where net coal ≤ 1.85 g/cc)

4.4.3.2. Coal rank and maturity

Coal analyses are critical for determining gas content, the gas saturation state of the coals, gas composition, coal composition, and coal maturity. These are used to understand the gas deliverability potential of the coals and for comparing coal quality from different areas of the reservoir. Measurements have been made on Shanxi 4/5 and Taiyuan 8/9 coal samples from depths between 1,379 and 1,571 mMDRT in the ZJS3 and ZJS4 wells. RISC has supplemented this limited dataset with analogue data from neighbouring areas such as the Hedong area¹².

Vitrinite reflectance work shows that the coal rank for the Hedong area increases southward from high volatile A bituminous to semi-anthracite coal. These coals are in the prime gas-generating window and are comparable to the rank of commercial CBM projects in several U.S. basins. The deep coal samples from the Zijinshan wells have vitrinite reflectance values (R_{max}) in excess of 6 and are ranked as anthracites and meta-anthracites. These more recent measurements are significantly higher than predicted from regional trends where R_o values in the Zijinshan block were estimated to lie between 1.0 and 1.6 (Figure 4-5) which would classify the coals as high volatile bituminous to low volatile bituminous rank. The high rank of the coals intersected in ZJS3 and ZJS4 may be due to localised high heat flows associated with the emplacement history of the Zijinshan alkali complex. There is mineralogical evidence that temperatures could have exceeded 500 degrees C during these events¹³. The Zijinshan alkali complex covers an area of 23 km² and there is a risk that the entire western area where the coals are at a depth to be prospective for CBM could be affected.

The average gas composition from coal desorption from samples in the permit shows a large variability. Whilst the carbon dioxide content in the sorbed gas is less than 1%, the nitrogen content ranges from 14% to 54%, and the methane content ranges from 45% to 85%. Normalised gas sample analysis for the Zijinshan coal samples are shown in Table 4-12. The high nitrogen (N₂) content is possibly a result of air contamination. It is recommended that well head gas samples are collected during future pilot testing to provide greater confidence in the gas composition.

Seam	Well	Sample count	N ₂			CO ₂			CH ₄			C ₂₊		
			Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
			%	%	%	%	%	%	%	%	%	%	%	%
Shanxi 4/5	ZJS3	6	15.7	24.5	51.2	0.3	0.5	1.1	47.7	75.0	84.0	0.0	0.0	0.0
	ZJS4	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Taiyuan 8/9	ZJS3	2	53.7	54.3	54.9	0.2	0.2	0.3	44.9	45.4	45.9	0.0	0.1	0.1
	ZJS4	5	1.0	14.1	28.8	0.2	0.4	0.9	70.8	85.4	98.7	0.0	0.1	0.2

Table 4-12 Normalised gas composition (after subtraction of air)

Compositionally, the coals contain 30-60% vitrinite, 30-60% inertinite, 0-2% liptinite, and 5-25% ash. In general, the amount of vitrinite is greater in the deeper seams (seam 8-9) than the shallower seams (seam 4/5).

¹² Jenkins, C. *et al*, 1999, Appraisal drilling focuses on Ordos basin coal seams, *The Oil and Gas Journal*, April 26th, 1999

¹³ Yao, Y Liu D., 2012, Effects of igneous intrusions on coal petrology, pore-fracture and coalbed methane characteristics in Hongyang, Handan and Huaibei coalfields, North China, *International Journal of Coal Geology* 97-97 (2012) 72-81

The high proportion of inertinite in the Zijinshan coals (compared to regional values) is likely due to their proximity to intrusion¹³ and the high rank and low volatile matter (<7%) also indicate that the Zijinshan coals in ZJS3 and ZJS4 are heat affected.

A petrographic study of the coals shows that bright, high-vitrinite, low ash coals in the deeper coal seams have the most closely spaced cleats. In general, well tests show that the deeper seams also have higher permeability, implying that coal composition strongly affects this parameter.

4.4.3.3. Coal density and ash content

Ash contents of 5-25% are reported from nearby analogues¹² and are in line with the measurements made in ZJS3 and ZJS4, shown in Table 4-13.

Seam	Well	Sample count	Ash content		
			Min	Ave	Max
			%	%	%
Shanxi 4/5	ZJS3	5	15	20	32
	ZJS4	0	n/a	n/a	n/a
Taiyuan 8/9	ZJS3	9	10	19	30
	ZJS4	3	10	15	25

Table 4-13 Zijinshan ash content measurements

Indirect petrophysical log interpretation techniques based on empirical relationships between log response to ash and moisture content were used by the Henan Coal and Geological Reconnaissance Institute¹⁴ to estimate average ash content values of 14.5% and 10.1% for the 4/5 and 8/9 seams in ZJS1 and these estimates are also in agreement with the regional analogue values.

Henan reports the average log density for the two seams to be 1.42 g/cc and 1.39 g/cc respectively.

RISC has calculated density statistics from density logs for the two seams restricted to the net coal intervals. Net coal was defined as coal with density <= 1.85 g/cc. Similar arithmetic average values are computed for the two seams.

Seam	Sample count	Average density		
		Min	Mean	Max
		g/cc	g/cc	g/cc
Shanxi 4/5	6	1.43	1.55	1.82
Taiyuan 8/9	6	1.40	1.53	1.75

Table 4-14 Net coal density statistics from well logs (where net coal <= 1.85 g/cc)

Figure 4-22 is a well log correlation panel datumed on the 4/5 seam roof and shows the variation in coal seam thickness between wells and occasional seam splits into separate plies. The density log is displayed in the far right hand track and has been given a solid black fill to highlight the coals and variation in coal density. The density log scale is from 1.0 g/cc to 3.0 g/cc. It can be seen that the density of the coals in ZJS3 and ZJS4 is higher than in the other wells and the density of the 8/9 seam in the ZJS2 well is also high. ZJS5 and ZJS6 exhibit lower coal density values that are in line with regional coal density values.

¹⁴ Henan, 2009, E-logging explanation report of the ZJS1 well by Henan Coal and Geological Reconnaissance Institute for Pacific Asia Petroleum Ltd., November 18th, 2009

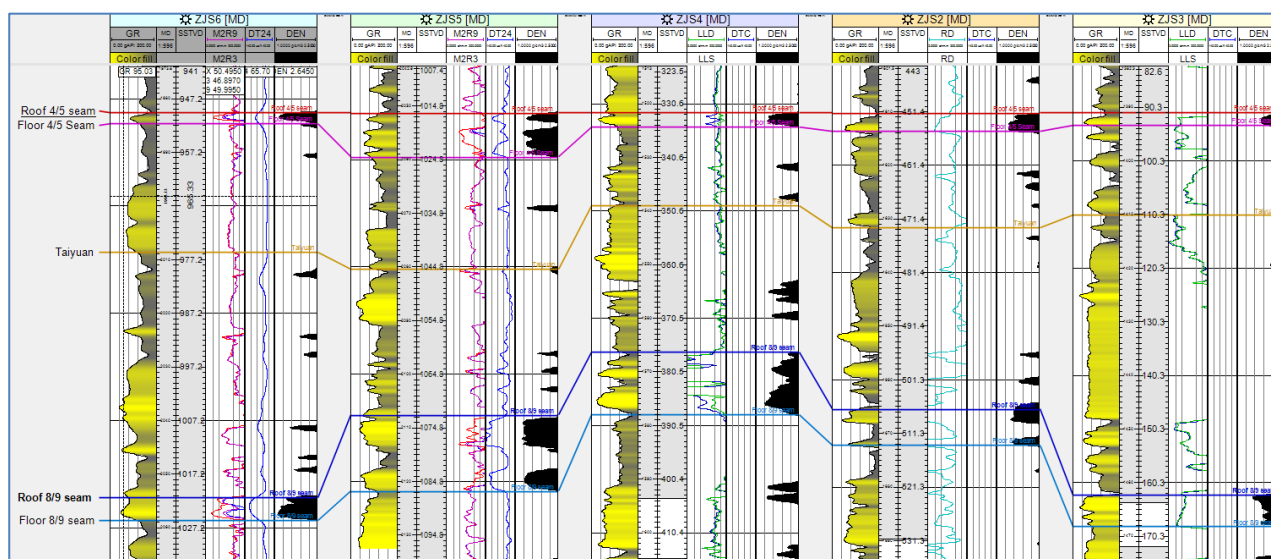


Figure 4-22 Well log correlation panel datumed on 4/5 seam roof showing variation in coal thickness and density

Table 4-15 shows the true density values measured in the laboratory. The higher density values support the density log observations.

Seam	Well	Sample count	True density		
			Min	Mean	Max
			g/cc	g/cc	g/cc
Shanxi 4/5	ZJS3	4	1.92	1.96	1.99
	ZJS4	0	n/a	n/a	n/a
Taiyuan 8/9	ZJS3	4	1.96	2.00	2.06
	ZJS4	3	1.83	1.91	2.02

Table 4-15 Zijinshan coal true coal density from laboratory analysis

The higher coal density values are also a feature of heat affected coal¹³. ZJS2, ZJS3 and ZJS4 are located closer to the Zijinshan alkali complex than ZJS1, ZJS5 and ZJS6. Although the density values have been shown to have little effect on net coal thickness above the 1.85 g/cc cut-off, they will impact the net tonnage component of the volumetric calculation. RISC has used a higher average density value for the western area than the eastern area to account for the effects of thermal alteration of the coal in proximity to the Zijinshan alkali complex.

4.4.3.4. Gas content and gas saturation

Table 4-16 summarises the gas content (air dry basis) measurements from the Zijinshan coal samples.

Seam	Well	Sample Count	Gas content (Air dry)		
			Min	Ave	Max
			m3/tonne	m3/tonne	m3/tonne
Shanxi 4/5	ZJS3	4	1.2	2.5	3.2
	ZJS4	0	ND	ND	ND
Taiyuan 8/9	ZJS3	9	0.2	0.3	0.7
	ZJS4	3	0.6	5.1	7.5

Table 4-16 Zijinshan gas content measurements (air dry basis)

Analogue data from the region¹⁵ indicate that gas content varies with coal rank and depth, from about 6.6 m³/tonne (6 m³/ton) in sub-bituminous coals to more than 16.5 m³/tonne (15 m³/ton) in anthracite. The gas contents measured in ZJS3 and ZJS4 are lower than the regional average, this is believed to be a result of thermal effects from the Mt Zijinshan intrusive complex.

Table 4-17 summarises the methane adsorption measurements from the Zijinshan coal samples.

		Seam 4/5				Seam 8/9			
		Count	Low	Ave	High	Count	Low	Ave	High
VL m ³ /tonne	Balanced moisture basis	2	7.1	7.4	7.8	5	1.9	3.9	9.0
	Air dry basis	2	8.0	8.5	8.9	5	2.1	4.6	10.8
	Dry ash free basis	2	10.4	10.6	10.9	5	2.7	5.9	14.5
PL MPa	Balanced moisture basis	2	14.8	15.3	15.8	5	7.0	11.0	14.8
	Air dry basis	2	14.8	15.3	15.8	5	7.0	11.0	14.8
	Dry ash free basis	2	14.8	15.3	15.8	5	7.0	11.0	14.8

Table 4-17 Zijinshan methane adsorption data summary

For the volumetric gas calculations for the western coals RISC has determined the gas content based on the measured data above. For the eastern coals, which are not expected to be subjected to the Mt Zijinshan thermal effects, RISC has assumed a Langmuir volume of 10 m³/tonne based on regional data.

The gas saturation for ZJS3 data was between 25% and 75%, average 46%, consistent with regional coal saturation data which range from 30% to 60% with an average of 42%. Data from ZJS4 showed saturations greater than 100%. Often such saturations can be explained by high carbon dioxide content of the sorbed gas, however this was not the case for this well and the reason for the apparent over-saturation remains unexplained. (In the absence of pressure data hydrostatic pressure has been assumed for the saturation calculations.)

4.4.3.5. Permeability

Permeability of 10.3 mD is estimated from an injection–fall off test conducted on the Shanxi 4/5 seam in ZJS5 at 1,386 mMDRT. This is the only test permeability measurement from the Zijinshan PSC and is encouraging considering the depth of the coal that was tested.

4.4.3.6. Potential for CBM

Current production from the Ordos Basin is from sandstone reservoirs, however the potential for an economic CBM development in the Ordos Basin is high. Sino Gas and Energy (SGE) has announced plans to develop its CBM resources in the Linxing East and Sanjiaobei PSCs adjacent to the Zijinshan PSC (Figure 3-1). The company is sourcing an additional six drill rigs to complement the four rigs already in the field as it moves to complete up to 25 wells by the end of the third quarter. Dewatering operations are being expanded on Linxing East.

There is limited data available to characterise the CBM potential of the Zijinshan PSC. It is not known if the laboratory data acquired from the ZJS3 and ZJS4 wells, which are relatively closely spaced, is representative of the entire PSC area. The high rank, high density, low gas content and gas saturation measured from the coals in these wells may be the result of local elevated geothermal gradients caused by magmatic emplacement associated with the Mt Zijinshan intrusive complex in the west of the PSC. If this is the case, it

¹⁵ Honglin et al, 2004 China has good CBM prospects but few commercial prospects, *The Oil and Gas Journal*, December 13th, 1999

could be expected that the CBM characteristics of the coals could improve towards the eastern side of the PSC. The evidence for this is not definitive as there are no laboratory analysis reports available for the eastern ZJS1 well: the drilling report states that there was no gas show during drilling and gas content from the core desorption was very poor. The petrophysical analysis calculates low volatiles percentages which also suggests heat affected coal, however the petrophysical estimate is not a direct measurement and is not as reliable as laboratory data. Conversely, the petrophysical coal density values of 1.42 g/cc (4/5 seam) and 1.39 g/cc (8/9 seam) are indicative of normal geothermal gradients. Clearly, additional exploration is required in the eastern area to address the current uncertainty.

4.5. DEEP GAS

The deep gas in-place is calculated from the following formula:

$$\text{Area} \times \text{net pay thickness} \times \text{porosity} \times \text{gas saturation} \times \text{gas expansion factor}$$

RISC has used a probabilistic methodology to estimate gas initially in place (GIIP) for the Shiqianfeng, Shihezi, Shanxi and Taiyuan formations. Industry standard software was employed using various parameter ranges and distributions based on analysis of the input datasets. These are described below.

4.5.1. Input parameters

The areas of the tight gas accumulation are the most uncertain factors within the calculation of in-place gas, and the hardest to formulate. Gas is assumed to be trapped by variation in sand permeability.

In principle, the reservoir thickness maps derived by BGP from seismic data could be used to estimate most-likely sand thicknesses within the Zijinshan PSC. However, as noted earlier, at present RISC has not seen sufficient supporting data to give us the confidence to use this approach. We have used a simpler approach to estimate gas volumes.

Although sands have been penetrated in every well drilled within the PSC, the area that is most likely to contain producible gas is the area of the central depression (excluding the western and eastern slope regions). This area is 258 km². Shallower areas within the PSC are unlikely to have sufficient pressure to produce gas at commercial rates. As there is uncertainty in the accuracy of the depth mapping away from well control and the recently acquired 2D seismic data is yet to be interpreted, RISC has allowed for mapping and depth conversion uncertainty by applying an uncertainty range of + or – 20% to the most likely area to create a range of possible areas for the accumulation. The resulting area values are shown in Table 4-18. An identical range of values was used for each of the four reservoir units.

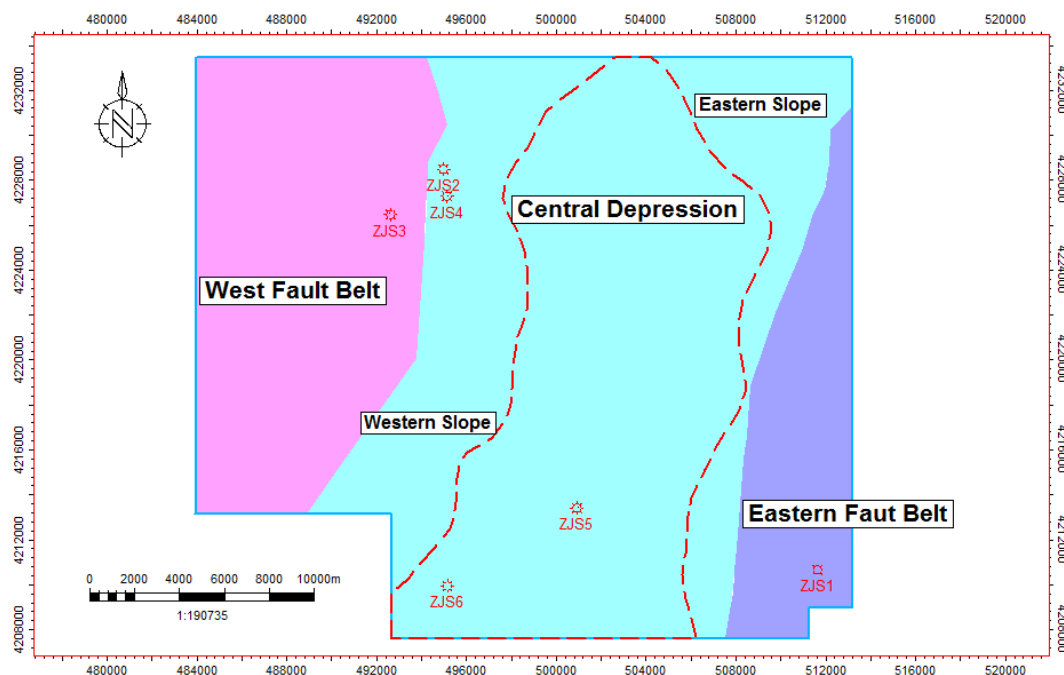


Figure 4-23 Map highlighting structural provinces within Zijinshan PSC

Formation	Area (km ²)					
	P99	P90	P50	P10	P1	Mean
Shiqianfeng	179	206	258	310	335	258
Shihezi	179	206	258	310	335	258
Shanxi	179	206	258	310	335	258
Taiyuan	179	206	258	310	335	258
Distribution: Beta						

Table 4-18 Reservoir area input values for Monte Carlo simulation

Statistics of minimum, maximum and mean net thickness values calculated using the $\geq 4\%$ porosity cut-off formed the basis for the net thickness input values. The beta distribution of these values is shown in Table 4-19.

Formation	Net Thickness (m)					
	Min	P90	Mode	P10	Max	Mean
Shiqianfeng	22.3	28.0	34.0	40.0	46.0	34.1
Shihezi	11.9	28.0	45.0	62.0	79.0	45.2
Shanxi	2.4	6.5	11.0	16.0	21.2	11.3
Taiyuan	1.7	8.0	14.0	18.0	21.7	13.2
Distribution: Beta						

Table 4-19 Net reservoir input values for Monte Carlo simulation

The average porosity input values take into account the range of average porosity values that are considered reasonable for the entire prospective area and therefore the maximum values are slightly lower than maximum values calculated in individual wells. As a result the mean of each distribution is slightly different to the weighted mean well values. A porosity cut-off value of $\geq 4\%$ was used to define net reservoir thickness and therefore this is the minimum porosity value used in the beta distribution.

Formation	Average Porosity (%)					
	Min	P90	Mode	P10	Max	Mean
Shiqianfeng	4.0	4.1	8.0	11.9	13.0	8.0
Shihezi	4.0	4.1	7.8	11.0	14.0	7.6
Shanxi	4.0	4.1	7.0	11.0	13.0	7.3
Taiyuan	4.0	4.2	5.5	8.0	11.0	6.0
Distribution: Beta						

Table 4-20 Average porosity input values for Monte Carlo simulation

RISC has estimated water saturation inputs to account for the uncertainty in the petrophysically derived estimates. The input ranges are shown in Table 4-21. We have included a moderate negative dependency (30%) with average porosity.

Formation	Average Water Saturation (%)					
	Min	P90	Mode	P10	Max	Mean
Shiqianfeng	15.0	20.0	50.0	70.0	85.0	46.0
Shihezi	15.0	20.0	50.0	70.0	85.0	46.0
Shanxi	15.0	20.0	50.0	70.0	85.0	46.0
Taiyuan	15.0	20.0	50.0	80.0	85.0	46.0
Distribution: Beta						

Table 4-21 Water saturation input values for Monte Carlo simulation

In the absence of direct pressure measurements in the Zijinshan PSC, pressure used for the determination of gas expansion factors have been based on regional observation that the Palaeozoic gas reservoirs of the Ordos basin are generally hydrostatic to under-pressured¹⁶. A +/-20% range about the P50 has been ascribed to the expansion factor to account for the uncertain pressure and unknown gas composition.

Formation	Gas Expansion Factor (vol/vol)		
	P90	P50	P10
Shiqianfeng	32	40	48
Shihezi	103	129	155
Shanxi	153	191	229
Taiyuan	168	210	252
Distribution: Beta			

Table 4-22 Gas expansion factor input and distribution

4.5.2. Deep gas-in-place estimate

Table 4-25 summarises the range of unrisks prospective gas in place estimates calculated from the REP™ Monte Carlo simulation based on a 4% porosity cut-off.

Total volumes have been summed arithmetically and probabilistically assuming no dependencies between individual formations.

OGIP (>= 4% cut off)				
Prospective Gas-In-place in Bcf	P90	P50	P10	Mean
Shiqianfeng	219	536	1108	611
Shihezi	787	2063	4581	2431
Shanxi	256	719	1653	861
Taiyuan	239	672	1477	781
Arithmetic consolidation (unrisks)	1501	3990	8819	4684
Probabilistic consolidation (unrisks)	2658	4370	7073	4667

Table 4-23 Zijinshan PSC total gas in place estimates

Not all intervals with more than 4% porosity will contribute to flow or be completed for development. A range of developable GIIP has been estimated from the total GIIP in order to estimate resource volumes.

The effect of a 9% and 6% porosity cut-off has been used to estimate the low case and best case developable GIIP. Table 4-24 shows the effect of higher porosity cut-off on GIIP.

¹⁶ Yang, Hua; FU, JinHua; Wei, XinShan; Ren, JunFeng: Tight sandstone gas reservoirs (exploration) in Upper Paleozoic of Ordos Basin

Relative net hydrocarbon thickness (fraction)			
Formation	Porosity Cut-off		
	9%	6%	4%
Shiqianfeng	0.63	0.95	1.00
Shihezi	0.60	0.73	1.00
Shanxi	0.37	0.72	1.00
Taiyuan	0.00	0.89	1.00

Table 4-24 Zijinshan PSC effect of porosity cut-off on GIIP

Applying the productivity (porosity cut-off) uncertainty results in the developable GIIP shown in Table 4-25.

Formation	Low	Best	High
	bcf	bcf	bcf
Shiqianfeng	138	509	1108
Shihezi	472	1506	4581
Shanxi	95	518	1653
Taiyuan	0	598	1477
Arithmetic consolidation (unrisked)	705	3131	8819
Probabilistic consolidation (unrisked)	1248	3429	8010

Table 4-25 Zijinshan PSC developable gas in place estimates

4.5.3. Deep gas recovery estimate

Assuming a typical tight gas well spacing used in the area of 80-160 acres, RISC has estimated gas recovery factors and recoverable gas quantities. In estimating the recoverable resource volume RISC has assumed that, as a result of surface constraints, development would be restricted to approximately 80% of the available area with a range of 70 – 90%. The estimated range of gas recovery is detailed in Table 4-26.

Formation	P90 PJ	P50 PJ	P10 PJ
Contingent Resource: Shiqianfeng	19	77	285
Prospective Resource: Shihezi	92	401	1096
Shanxi	32	235	672
Taiyuan	0	241	667
Prospective Arithmetic sum	124	877	2435
Prospective Probabilistic sum	265	995	2072

Table 4-26 Zijinshan PSC recoverable gas estimates

The estimated recovery is equivalent to an overall recovery factor range of 20-31% of the developable GIIP on an arithmetic basis and 25-32% on the probabilistic values. Based on the high methane contents seen regionally RISC has assumed a gas heating value of 1PJ/bcf and a fuel use of 5%.

4.6. SHALLOW GAS

4.6.1. Shallow gas input parameters

Table 4-27 summarises the distribution data for the primary input parameters for the CBM OGIP and ultimate recovery equation.

		Shanxi East			Shanxi West			Tiayuan East			Tiayuan West		
		P90	P50	P10	P90	P50	P10	P90	P50	P10	P90	P50	P10
Area	150-1000m km ²	42.6	56.3	70.0	0.0	0.0	0.0	39.5	52.3	65.0	0.0	0.0	0.0
Net thickness	m	4.2	6.1	8.0	n/a	n/a	n/a	5.6	8.1	10.6	n/a	n/a	n/a
Gas content	m ³ /tonne ar	3.5	5.9	9.3	n/a	n/a	n/a	3.5	5.9	9.5	n/a	n/a	n/a
Coal density	g/cc	1.46	1.55	1.64	n/a	n/a	n/a	1.44	1.53	1.61	n/a	n/a	n/a
Recovery factor	fraction	0.27	0.50	0.73	n/a	n/a	n/a	0.27	0.50	0.73	n/a	n/a	n/a
Area	1000-1500m km ²	30.5	40.3	50.1	52.5	69.4	86.3	34.2	45.2	56.2	32.7	43.3	53.8
Net thickness	m	4.2	6.1	8.0	1.9	2.8	3.7	5.6	8.1	10.6	5.6	8.1	10.6
Gas content	m ³ /tonne ar	4.3	7.1	11.3	1.7	2.3	2.9	4.3	7.1	11.2	0.8	1.4	2.2
Coal density	g/cc	1.46	1.55	1.64	1.84	1.95	2.06	1.44	1.53	1.61	1.84	1.95	2.06
Recovery factor	fraction	0.27	0.50	0.73	0.27	0.50	0.73	0.27	0.50	0.73	0.27	0.50	0.73

Table 4-27 CBM OGIP and UR input distributions

4.6.2. Shallow gas in place estimate

RISC has made a probabilistic gas in place estimate, shown in Table 4-28, for the CBM for the Shanxi 4/5 and Taiyuan 8/9 seams. The calculations were made for a depth range of 150-1,000 m and 1,000 to 1,500 m using the average parameter values for net thickness (defined by ≤ 1.8 g/cc density cut off) and net coal density. As the shallower areas of the permit are separated by the central depression separate calculations were performed for the eastern and western areas.

Formation	150-1000 m			1000-1500 m			Total		
	P90 bcf	P50 bcf	P10 bcf	P90 bcf	P50 bcf	P10 bcf	P90 bcf	P50 bcf	P10 bcf
Shanxi East	57	105	191	47	92	168	130	208	321
Shanxi West	0	0	0	18	29	45	18	29	45
Taiyuan East	70	129	227	71	134	243	179	274	412
Taiyuan West	0	0	0	17	31	57	17	31	57
Arithmetic sum	127	234	418	153	286	514	344	542	835
Probabilistic sum	157	243	370	214	302	430	427	560	725

Table 4-28 CBM OGIP estimates

4.6.3. Shallow gas recovery estimate

As for the deep gas, RISC has assumed that as a result of surface constraints, development would be restricted to approximately 80% of the available area. The estimated unrisks recovery range is detailed in Table 4-29.

Formation	150-1000m			1000-1500m			Total		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
	PJ	PJ	PJ	PJ	PJ	PJ	PJ	PJ	PJ
Shanxi East	15	35	76	12	30	63	39	69	120
Shanxi West	0	0	0	5	10	18	5	10	18
Taiyuan East	19	42	88	18	45	93	53	95	163
Taiyuan West	0	0	0	5	11	23	5	11	23
Arithmetic sum	34	77	164	40	96	197	101	185	324
Probabilistic sum	47	85	143	66	104	161	138	194	273

Table 4-29 CBM gross recoverable gas estimates

The estimated recovery is equivalent to an overall recovery factor range of 29-39% on an arithmetic basis and 32-38% on the probabilistic values.

4.7. RESOURCE CLASSIFICATION

The deep gas resources within the Shiqianfeng Formation are classified contingent resources (see Table 4-31) as a result of the successful post frac gas flow from the Shiqianfeng interval in ZJS5 reported by Leyshon on 28th May 2013. Additional testing and appraisal drilling is planned for 2013 with submission of the Chinese Reserves Report planned for mid 2014. The Chinese Reporting process is effectively a commitment to progress to development. Full field production occurs once the Overall Development Plan (ODP) is approved and production license awarded. The Chinese Reserve Reporting is the first step in this process and once reserves are assigned, progress into development is expected by the authorities.

The deep gas resources within the Shihezi, Shanxi and Taiyuan are currently classified prospective resources, pending successful testing results as producible gas has yet to be demonstrated from these formations in the Zijinshan PSC.

The shallow gas resources are classified as prospective resources as producible gas has yet to be demonstrated (see Table 4-31). Subject to successful acquisition of data which demonstrates significant quantities of potentially moveable hydrocarbons, the classification of a portion of the prospective resources may change to contingent resources.

4.7.1. Risks

Discovery of prospective resources carries a geological probability of discovery which is defined as the chance of demonstrating "a significant quantity of potentially moveable hydrocarbon". At present RISC considers that only the Shiqianfeng formation has satisfied this test, testing of the deeper formations has been ascribed a relatively high chance of success based on the demonstration of production from the Shiqianfeng. For the shallow gas, the chance of discovery for the western region is considered lower for the western region than the eastern region due to the impact of the Mt Zijinshan intrusive complex.

Successful "discovery" would enable the resource to be classified as either a contingent resource or reserve. Development of the contingent resources is not guaranteed and carries a probability of commercial development. This depends on a number of factors, including; successful Chinese reserve certification, approval of the ODP, supporting results from the pilot test, stakeholder approval and funding for the development. At present one well has been tested and testing is ongoing, further evaluation is required to determine the commercial viability of the formation, this represents the most significant "contingent factor" at present. With further successful testing of wells it is anticipated that the chance of development will increase.

The probability of development of the prospective resources is the chance of discovery times the chance of commerciality, the probability of development of a contingent resource is the chance of commerciality. Table 4-30 details the success factors assessed by RISC.

Trend	Formation	Chance of discovery	Chance of commerciality	Total chance of commercial development
Deep gas	Shiqianfeng	1.00	0.70	0.70
	Shihezi, Shanxi, Taiyuan	0.80	0.70	0.56
Shallow gas	<1,000m, west	0.25	0.20	0.05
	<1,000m, east	0.50	0.40	0.20
	>1,000m, west	0.25	0.10	0.03
	>1,000m east	0.50	0.20	0.10

Table 4-30 Assessed chances of discovery and commerciality

If development does not proceed there is a potential negative outcome due to the cost of progressing the evaluation prior to a negative development decision.

The Contingent and Prospective Resources assessed in this report have not been adjusted for these probabilities and are therefore unrisksed values.

PJ	Gross			Net Attributable			Chance of development	Operator
	1C	2C	3C	1C	2C	3C		
Deep Gas - Shiqianfeng formation	19	77	285	11	46	171	70%	PAPL
Total	19	77	285	11	46	171		

Table 4-31 Gas Contingent Resources as at 31 July 2013

Source: Geoffrey J Barker

Notes:

1. Contingent resources have been classified in accordance with SPE-PRMS.
2. "Chance of development" for contingent resources means the estimated chance, or probability, that the volumes will be commercially extracted.
3. "Operator" is name of the company that operates the asset.
4. "Gross" are 100% of the reserves and/or resources attributable to the licence whilst "Net attributable" are those attributable to Leyshon assuming CNPC exercises its 40% back-in rights at the development stage.
5. PJ – 10¹⁵ Joule.
6. Contingent resource quantities have been estimated using probabilistic methods.

PJ	Gross			Net Attributable			Chance of development	Operator
	Low	Best	High	Low	Best	High		
Deep gas - Shihezi, Shanxi, Taiyuan	265	995	2072	159	597	1243	56%	PAPL
Shallow gas	138	194	273	83	116	164	Average 13%	PAPL
Total	403	1189	2345	242	713	1407		

Table 4-32 Gas Prospective Resources as at 31 July 2013

Source: Geoffrey J Barker

Notes:

1. Prospective resources have been classified in accordance with SPE-PRMS.
2. The estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration, appraisal and evaluation are required to determine the existence of a significant quantity of potentially moveable hydrocarbons. "Chance of development" for prospective resources means the estimated chance, or probability, that the volumes will be discovered and be commercially extracted.
3. "Operator" is name of the company that operates the asset.
4. "Gross" are 100% of the reserves and/or resources attributable to the licence whilst "Net attributable" are those attributable to Leyshon assuming CNPC exercises its 40% back-in rights at the development stage.
5. PJ – 10¹⁵ Joule.
6. Prospective resource quantities have been estimated using probabilistic methods.
7. The total shown is an arithmetic addition and therefore may be conservative at the "low estimate" and optimistic at the "high estimate" as arithmetic addition does not include the "portfolio effects" that may occur.
8. Shallow gas refers to an unconventional (CSG) prospective resource.

5. DEVELOPMENT CONSIDERATIONS

The majority of the potential development expenditure will be related to drilling, completion and fracking of the development wells. The development wells drive not only the well costs but also the associated gathering costs.

The highly mountainous and rugged terrain overlying the PSC area makes it likely that any development will involve drilling multiple wells (up to nine) from each drilling pad. This reduces the cost of wellhead facilities, flowlines and site preparation, but is offset by higher well costs due to the requirements for deviated drilling. Overall RISC expects that there will be a small cost saving as clustering wells makes field management, maintenance easier and reduces the land and environmental footprint.

5.1. PROCESSING FACILITIES

During the development cycle, surface facilities capacity and phasing is usually optimised against the rates and likelihood of various production cases. Consideration is given to the flexibility gained by installing increased capacity in equipment that is not easily expanded (e.g. vessels) and allowing for phased installation of more expensive equipment e.g. additional processing trains, compressors, if information gained during early production increases the probability of higher production.

The gas from the wells is assumed to be gathered through a network of flowlines and processed at a central gas plant located strategically within the block to process discovered reserves. The sales gas destination is yet to be determined. Sales could be to a provincial pipeline grid or to a customer via one of the national gas pipelines that either run through or nearby the PSC, Figure 5-1.

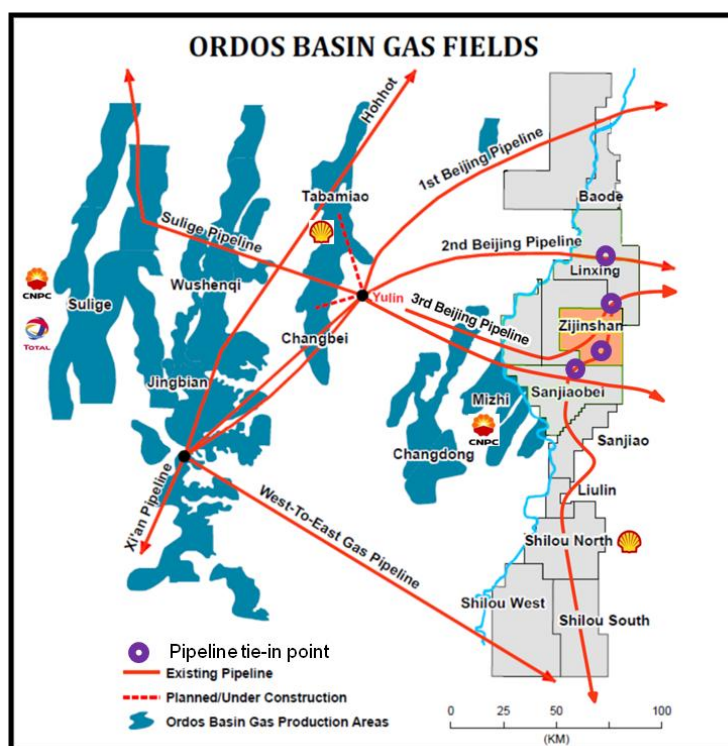


Figure 5-1 Gas pipeline network

Produced gas will require minimal treatment to get hydrocarbon dewpoint to meet pipeline specification as the gas is generally very lean. Dehydration will be needed to meet pipeline water specification. Gas will be compressed from relatively low pressures at the wellhead up to approximately 1,450 psia (100 bar) for delivery. An export pipeline, sized close to maximum expected capacity for the discovered plus prospective areas, will be required for a short distance to tie in to the existing pipeline network.

5.2. DEEP GAS DEVELOPMENT

A typical development will see well spacing of 80-160 acres (0.3-0.6 km²) with an average of 120 acres (0.5 km²). It is assumed that only 80% of the total prospective area will be available for development due to the terrain. The tight sands are prospective over 258 km² which will lead to approximately 500 wells for the development.

A key component of tight gas development involves creating (and maintaining) a large reservoir surface area in individual wells and often multiple wells. Hydraulic fracture stimulation plays a large role in providing increased reservoir contact area, as well as increased exposure to naturally occurring fractures. The development will require drilling of deviated wells and hydraulic fracturing.

Gas plants are generally equipped with gas or electric driven multi-stage compressors. Consequently field fuel and flare usage could be 5% of produced gas if gas is chosen as the fuel.

5.3. SHALLOW GAS DEVELOPMENT

CBM well spacing is expected to be 20-80 acres (0.1-0.3 km²) with 40 acres (0.16 km²) assumed as an average. It is assumed that only 80% of the total prospective area will be available for development due to the terrain. The prospective coal seams overlap and the total area covered is approximately 50 km² which will lead to approximately 300 wells for the development.

Depending on the permeability of the coals, hydraulic fracture stimulation and dewatering of the coals may also be required to achieve commercial rates.

The CBM wells are connected to gathering lines which feed larger gathering lines, also called trunklines. The lines are often constructed of high density polyethylene (HDPE) with an outside diameter of typically 110-500 cm (4"-20"). Large amounts of power is required to dewater the wells using pumps and compress gas from the low gathering system pressure to high export pipeline pressure. Gas plants are generally equipped with gas or electric driven multi-stage compressors. Consequently field fuel and flare usage is high, often up to 7% of produced gas if gas is chosen as the fuel.

5.4. WATER TREATMENT

It is likely that there will be a significant volume of produced water both from the tight gas sands, as fracing water flowback and from the coal beds. Fracing water requires treatment before potential re-use or disposal. As CBM wells usually produce water, wells are typically equipped with downhole pumps. Produced water is gathered at water transfer stations and routed to centrally located plants for handling. This water is often saline and contains impurities that limit its use unless treated.

Likely approaches for managing the produced water include: surface discharge, evaporation, reverse osmosis, underground disposal, re-use as fracing water and use as agricultural water.

Whilst often the easiest and cheapest way to dispose water, the applicability of discharging into surface water systems is limited due to the poor quality of the CSG water relative to the quality of the receiving environment.

Subject to technical and environmental factors such as possible contamination of ground water systems, it is often possible to dispose of the water into underground aquifers, such that produced water is contained and environmental impact is minimised.

6. PSC DESCRIPTION

Contract term	<p>Commencement Date: 21-March-08</p> <p>Contract Term: 30yrs</p> <p>% Split Contractor/ Partner: 60%/40%</p> <p>CNPC has a back-in right of 40% in the development phase of the project</p>								
Minimum obligations	<p>Exploration phase 1: 3 wells, 50km² seismic, \$2,800,000 per PSC</p> <p>Exploration phase 2: 4 wells, \$2,000,000 per PSC</p> <p>Minimum annual spend</p> <p>RMB 2,000/km² for the first exploration year</p> <p>RMB 5,000/km² for the second exploration year</p> <p>RMB 10,000/km² for the third exploration year and also the exploration year thereafter</p>								
Signature bonuses	\$300,000 total (\$150,000 at signing, \$150,000 at first development)								
Fees	For each of training and an assistance fee, \$50,000/yr payable during exploration and \$200,000/yr during production.								
Exploration fees	<table> <tr> <td>1st year</td> <td>Exempt</td> </tr> <tr> <td>2nd - 3rd years</td> <td>50% of ¥100/km²</td> </tr> <tr> <td>4th - 7th years</td> <td>75% of an additional ¥100/km²/yr</td> </tr> <tr> <td>8th year</td> <td>¥500/km² capped</td> </tr> </table>	1st year	Exempt	2 nd - 3 rd years	50% of ¥100/km ²	4 th - 7 th years	75% of an additional ¥100/km ² /yr	8 th year	¥500/km ² capped
1st year	Exempt								
2 nd - 3 rd years	50% of ¥100/km ²								
4 th - 7 th years	75% of an additional ¥100/km ² /yr								
8 th year	¥500/km ² capped								
Training fee	<p>\$50,000 pa during exploration</p> <p>\$200,000 pa during production</p>								
Royalty	<table> <tr> <td><1.0 BCM</td> <td>0%</td> </tr> <tr> <td>1.0 - 2.5 BCM</td> <td>1%</td> </tr> <tr> <td>2.5 - 5.0 BCM</td> <td>2%</td> </tr> <tr> <td>>5.0 BCM</td> <td>3%</td> </tr> </table>	<1.0 BCM	0%	1.0 - 2.5 BCM	1%	2.5 - 5.0 BCM	2%	>5.0 BCM	3%
<1.0 BCM	0%								
1.0 - 2.5 BCM	1%								
2.5 - 5.0 BCM	2%								
>5.0 BCM	3%								
Resource tax	Not applicable								
Production sharing	<p>Production sharing is determined from annual gross production.</p> <p>Cost recovery production is calculated on production net of all royalties and capped at 70%. Remainder of Production revenue after royalties and cost recovery is added to the Total remainder gas pool</p> <p>Cost recovery provides for the recovery of expenses and expenditure by the Contractor/Partner including Petroleum royalties; production and operating expenses; exploration and development expenditure; and deemed interest cost recovery on development costs (9%). The contractor recovers any costs carried for the Partner.</p>								

	<p>Excess cost recovery oil/gas is added to the Total Remainder Gas pool for profit production split according with X% allocated to the contractor and partner and (1-X%) as Chinese Share Gas. X% is determined as follows:</p> <table> <tr> <td><0.5 BCM</td> <td>99%</td> </tr> <tr> <td>0.5 - 0.8 BCM</td> <td>99%</td> </tr> <tr> <td>0.8 - 1.2 BCM</td> <td>98%</td> </tr> <tr> <td>1.2 - 1.8 BCM</td> <td>97%</td> </tr> <tr> <td>1.8 - 2.5 BCM</td> <td>96%</td> </tr> <tr> <td>2.5 - 5.0 BCM</td> <td>93%</td> </tr> <tr> <td>>5.0 BCM</td> <td>90%</td> </tr> </table> <p>Allocable remainder gas is split 60% Contractor /40% as per working interests</p>	<0.5 BCM	99%	0.5 - 0.8 BCM	99%	0.8 - 1.2 BCM	98%	1.2 - 1.8 BCM	97%	1.8 - 2.5 BCM	96%	2.5 - 5.0 BCM	93%	>5.0 BCM	90%
<0.5 BCM	99%														
0.5 - 0.8 BCM	99%														
0.8 - 1.2 BCM	98%														
1.2 - 1.8 BCM	97%														
1.8 - 2.5 BCM	96%														
2.5 - 5.0 BCM	93%														
>5.0 BCM	90%														
Corporate income tax	<p>Petroleum companies are taxed at 25% of taxable income. A company's reported income is consolidated for all PSC participations it directly owns in China. Net operating tax losses are carried forward for up to 5 years to offset future taxable income.</p> <p>Capital allowances & Deductions:</p> <p>Qualified R&D expenditure can be deducted at 150% of actual expenses</p> <p>Exploration expenditure can be either expensed against production income generated by other Chinese gas fields owned by the company or may be capitalized and depreciated over 8 years.</p> <p>Development expenditure is depreciated on a straight line basis over not less than 8 years from start of production with any residual value recognised as a loss for tax purposes</p> <p>Abandonment expenses are provisioned from the start of production on a production or straight-line method.</p> <p>Interest on financing may be deducted subject to the arms-length principal and subject to a debt-to-equity ratio of 2:1.</p>														
Value added tax	Fully rebated VAT of 13% on gas sold														
Local levies	<p>City construction tax</p> <p>Education surcharge</p>														

7. LIST OF TERMS

The following lists, along with a brief definition, abbreviated terms that are commonly used in the oil and gas industry and which may be used in this report.

Abbreviation	Definition
1P	Equivalent to Proved reserves or Proved in-place quantities, depending on the context.
1Q	1st Quarter
2P	The sum of Proved and Probable reserves or in-place quantities, depending on the context.
2Q	2nd Quarter
2D	Two Dimensional
3D	Three Dimensional
4D	Four Dimensional – time lapsed 3D in relation to seismic
3P	The sum of Proved, Probable and Possible Reserves or in-place quantities, depending on the context.
3Q	3rd Quarter
4Q	4th Quarter
AFE	Authority for Expenditure
Bbl	US Barrel
BBL/D	US Barrels per day
BCF	Billion (10 ⁹) cubic feet
BCM	Billion (10 ⁹) cubic meters
BFPD	Barrels of fluid per day
BOPD	Barrels of oil per day
BTU	British Thermal Units
BOEPD	US barrels of oil equivalent per day
BWPD	Barrels of water per day
°C	Degrees Celsius

Abbreviation	Definition
Capex	Capital expenditure
CAPM	Capital asset pricing model
CBM	Coal bed methane
CGR	Condensate Gas Ratio – usually expressed as bbl/MMscf
Contingent Resources	Those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects but which are not currently considered to be commercially recoverable due to one or more contingencies. Contingent Resources are a class of discovered recoverable resources as defined in the SPE-PRMS.
CO ₂	Carbon dioxide
CP	Centipoise (measure of viscosity)
CPI	Consumer Price Index
DEG	Degrees
DHI	Direct hydrocarbon indicator
Discount Rate	The interest rate used to discount future cash flows into a dollars of a reference date
DST	Drill stem test
E&P	Exploration and Production
EG	Gas expansion factor. Gas volume at standard (surface) conditions / gas volume at reservoir conditions (pressure & temperature)
EIA	US Energy Information Administration
EMV	Expected Monetary Value
EOR	Enhanced Oil Recovery
ESP	Electric submersible pump
EUR	Estimated ultimate recovery
Expectation	The mean of a probability distribution
°F	Degrees Fahrenheit
FDP	Field Development Plan

Abbreviation	Definition
FEED	Front End Engineering and design
FID	Final investment decision
FM	Formation
FPSO	Floating Production Storage and offtake unit
FWL	Free Water Level
FVF	Formation volume factor
GIIP	Gas Initially In Place
GJ	Giga (10^9) joules
GOC	Gas-oil contact
GOR	Gas oil ratio
GRV	Gross rock volume
GSA	Gas sales agreement
GTL	Gas To Liquid(s)
GWC	Gas water contact
H ₂ S	Hydrogen sulphide
HHV	Higher heating value
ID	Internal diameter
IRR	Internal Rate of Return is the discount rate that results in the NPV being equal to zero.
JV(P)	Joint Venture (Partners)
Kh	Horizontal permeability
km ²	Square kilometres
K _{rw}	Relative permeability to water
K _v	Vertical permeability
kPa	Kilo (thousand) Pascals (measurement of pressure)
Mstb/d	Thousand Stock tank barrels per day

Abbreviation	Definition
LIBOR	London inter-bank offered rate
LNG	Liquefied Natural Gas
LTBR	Long-Term Bond Rate
m	Metres
MDT	Modular dynamic (formation) tester
mD	Millidarcies (permeability)
MJ	Mega (10^6) Joules
MMbbl	Million US barrels
MMscf(d)	Million standard cubic feet (per day)
MMstb	Million US stock tank barrels
MOD	Money of the Day (nominal dollars) as opposed to money in real terms
MOU	Memorandum of Understanding
Mscf	Thousand standard cubic feet
Mstb	Thousand US stock tank barrels
MPa	Mega (10^6) pascal (measurement of pressure)
mss	Metres subsea
MSV	Mean Success Volume
mTVDss	Metres true vertical depth subsea
MW	Megawatt
NPV	Net Present Value (of a series of cash flows)
NTG	Net to Gross (ratio)
ODT	Oil down to
OGIP	Original Gas In Place
OOIP	Original Oil in Place
Opex	Operating expenditure

Abbreviation	Definition
OWC	Oil-water contact
P90, P50, P10	90%, 50% & 10% probabilities respectively that the stated quantities will be equaled or exceeded. The P90, P50 and P10 quantities correspond to the Proved (1P), Proved + Probable (2P) and Proved + Probable + Possible (3P) confidence levels respectively.
PBU	Pressure build-up
PJ	Peta (10^{15}) Joules
POS	Probability of Success
Possible Reserves	As defined in the SPE-PRMS, an incremental category of estimated recoverable volumes associated with a defined degree of uncertainty. Possible Reserves are those additional reserves which analysis of geoscience and engineering data suggest are less likely to be recoverable than Probable Reserves. The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (3P) which is equivalent to the high estimate scenario. When probabilistic methods are used, there should be at least a 10% probability that the actual quantities recovered will equal or exceed the 3P estimate.
Probable Reserves	As defined in the SPE-PRMS, an incremental category of estimated recoverable volumes associated with a defined degree of uncertainty. Probable Reserves are those additional Reserves that are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves. It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate.
Prospective Resources	Those quantities of petroleum which are estimated, as of a given date, to be potentially recoverable from undiscovered accumulations as defined in the SPE-PRMS.
Proved Reserves	As defined in the SPE-PRMS, an incremental category of estimated recoverable volumes associated with a defined degree of uncertainty. Proved Reserves are those quantities of petroleum, which by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under defined economic conditions, operating methods, and government regulations. If deterministic methods are used, the term reasonable certainty is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate. Often referred to as 1P, also as "Proven".

Abbreviation	Definition
PSC	Production Sharing Contract
PSDM	Pre-stack depth migration
PSTM	Pre-stack time migration
psia	Pounds per square inch pressure absolute
p.u.	Porosity unit e.g. porosity of 20% +/- 2 p.u. equals a porosity range of 18% to 22%
PVT	Pressure, volume & temperature
QA/QC	Quality Assurance/ Control
rb/stb	Reservoir barrels per stock tank barrel under standard conditions
RFT	Repeat Formation Test
Real Terms (RT)	Real Terms (in the reference date dollars) as opposed to Nominal Terms of Money of the Day
Reserves	RESERVES are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be discovered, recoverable, commercial, and remaining (as of the evaluation date) based on the development project(s) applied. Reserves are further categorised in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by development and production status.
RT	Measured from Rotary Table or Real Terms, depending on context
SC	Service Contract
scf	Standard cubic feet (measured at 60 degrees F and 14.7 psia)
S_g	Gas saturation
S_{gr}	Residual gas saturation
SRD	Seismic reference datum lake level
SPE	Society of Petroleum Engineers
SPE-PRMS	Petroleum Resources Management System, approved by the Board of the SPE March 2007 and endorsed by the Boards of Society of Petroleum Engineers, American Association of Petroleum Geologists, World Petroleum Council and Society of Petroleum Evaluation Engineers.

Abbreviation	Definition
s.u.	Fluid saturation unit. e.g. saturation of 80% +/- 10 s.u. equals a saturation range of 70% to 90%
stb	Stock tank barrels
STOIIP	Stock Tank Oil Initially In Place
S_w	Water saturation
TCM	Technical committee meeting
Tcf	Trillion (10^{12}) cubic feet
TJ	Tera (10^{12}) Joules
TLP	Tension Leg Platform
TRSSV	Tubing retrievable subsurface safety valve
TVD	True vertical depth
US\$	United States dollar
US\$ million	Million United States dollars
WACC	Weighted average cost of capital
WHFP	Well Head Flowing Pressure
Working interest	A company's equity interest in a project before reduction for royalties or production share owed to others under the applicable fiscal terms.
WPC	World Petroleum Council
WTI	West Texas Intermediate Crude Oil



Level 3
1138 Hay Street
WEST PERTH WA
6005
P. +61 8 9420 6660
F. +61 8 9420 6690
E. admin@riscpl.com

Level 2
147 Coronation
Drive
MILTON QLD 4064
P. +61 7 3025 3369
F. +61 7 3025 3300
E. admin@riscpl.com

53 Chandos Place
Covent Garden
LONDON WC2N 4HS
P. +44 20 7484 8740
F. +44 20 7812 6677
E. riscuk@riscpl.com

DIFC, The Gate Building
Level 15, Office 63
Sheikh Zayed Road
DUBAI UAE
P. +971 4 401 9875
F. +61 8 9420 6690
E. admin@riscadvisory.com

www.riscadvisory.com



DECISIONS WITH CONFIDENCE