

# THE ZAMZAMA FIELD PAKISTAN

## OVERVIEW

- BHP Billiton commissioned the Zamzama Phase 1 Development and made the first contractual commercial gas deliveries from the new facilities to its customers on 17 July 2003. The development was finished four months ahead of schedule and is forecast to be under budget. The development was completed with a first-class Health, Safety, Environment and Community performance. The Zamzama gas field is situated in the Sindh province of southern Pakistan.
- Phase I commercialises the 1.7 trillion cubic feet (Tcf) of gas resources (650 billion cubic feet (Bcf) BHP Billiton share) in the core area of the field. This was produced initially via a small extended well test (EWT) facility which commenced production in March 2001. The EWT was supplied by two production wells (Zamzama-1 & -2).
- Phase I involved drilling three new development wells (Zamzama-3, -4, & -5) and constructing two additional processing trains with a nameplate capacity of 140 million standard cubic feet per day (MMcf/d) each. A stabilised condensate flow of 2,000 barrels per day will be exported initially by road to an oil refinery in Karachi.
- The development of the Zamzama field is an example of project delivery within BHP Billiton Petroleum's gas commercialisation growth strategy.
- The budgeted capital cost for Phase I of the field development was approximately US\$100 million (US\$40 million net to BHP Billiton), representing a highly efficient, low cost development of a major gas resource. The joint venture partnership previously invested a total of \$53 million during the exploration and appraisal phase and to construct the EWT facilities.
- Plateau production (including existing EWT production) under current gas sales contracts will be 320 MMcf/d and 2,000 barrels per day of condensate (gross). Plant can be de-bottlenecked to produce in excess of 400 MMcf/d.
- Gas from the Zamzama development is sold under contract to Sui Southern Gas Company Limited and Sui Northern Gas Pipelines Limited. Condensate is currently transported by road to Enar Petrotech Services Pvt. Ltd. Karachi. It is envisaged that as an alternative arrangement, a condensate export pipeline from Zamzama will be constructed to tie-in to the Karachi-Multan PARCO crude oil pipeline.
- BHP Billiton Petroleum (Petroleum) is well placed to develop further growth opportunities in a country which has strong gas demand growth projections.
- BHP Petroleum (Pakistan) Pty Ltd has a 38.50 per cent interest in the Zamzama field and is operator, with partners Government Holdings (Private) Ltd – 25.00 per cent; PKP Exploration Ltd (a jointly owned company between Kufpec and Premier Oil) – 18.75 per cent; and ENI Pakistan (M) Ltd (formerly Lasmo (MP) Limited) – 17.75 per cent.

## KEY DATA

Phase 1 production:	320 MMcf/d gas
Field Life:	15 - 25 years
Capex (Phase I):	US\$100 million gross (US\$40 m net to BHP Billiton)
Fiscal terms:	55% income tax rate Wellhead Royalty of 12.5% (deductible)



THE ZAMZAMA GAS PLANT

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INSIDE THE ZAMZAMA GAS PLANT

## STRATEGIC CONTEXT

The development of the Zamzama field is an example of project delivery within BHP Billiton Petroleum's gas commercialisation activities. Gas commercialisation is one of Petroleum's areas of business focus, which also include high margin oil exploration and production, and securing access to discovered but undeveloped resources.

In the mid-90s, Petroleum recognised that Pakistan's hydrocarbon sector presented significant business opportunities due to its sizeable and growing domestic gas market, prospectivity for gas and competitive fiscal terms.

The Zamzama field represents BHP Billiton's first commercial production in Pakistan. A number of additional business development opportunities in Pakistan, aimed at securing medium to long-term growth, are also being considered.

## BACKGROUND

In 1993-1994 Petroleum conducted an exploration review of Pakistan which highlighted the Indus Basin as a prospective region close to existing pipeline infrastructure.

In February 1995 Petroleum was awarded an operated interest in the Dadu Concession (Block 2667-1) and the following year acquired 196 kilometres of 2-D seismic data which resulted in the identification of the Zamzama structure.

The first exploration well on the block, Zamzama-1/ST1, was spudded in January 1998. Drilled to a total depth of 3,938 metres, the well encountered hydrocarbons in the Khadro and Pab sandstones, and wireline logs subsequently confirmed a gas column in excess of 300 metres.

The appraisal programme involved 3-D seismic acquisition and the drilling of the Zamzama-2 appraisal well. Zamzama-2 was drilled to a total depth of 3,933 metres and confirmed the presence of hydrocarbons in the Khadro and Pab formations. Subsequent pressure testing and wireline log data confirmed a gas column in excess of 350 metres, and the well tested in excess of 90 MMcf/d.

## THE ZAMZAMA FIELD

The Zamzama field is a major resource, covering an area of around 120 square kilometres, and ranking fourth in terms of Pakistan's discovered gas reserves. Under full development the field adds approximately 15% to Pakistan's daily gas production, thus reducing the requirement for fuel oil imports.

The field lies close to existing pipeline infrastructure. The main Sui Southern-operated pipeline, which carries gas from the Sui field to Karachi, lies approximately eight kilometres east of the Zamzama field.

Zamzama is one of several gas fields discovered in the Sindh province. Others include the Bhit gas field, which lies to the south west of Zamzama, and the Kadanwari, Sawan and Miano fields to the north east.

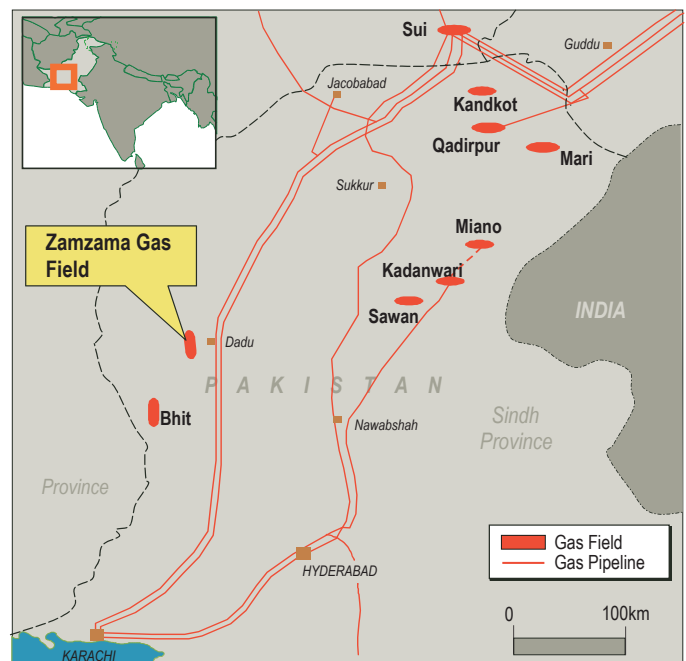
## RESERVES

The total estimated proven plus probable recoverable reserves for the core area of the Zamzama field to be developed are 1.7 Tcf of gas (gross), of which BHP Billiton's equity share is around 650 Bcf. The field will have a plateau production rate of around 320 MMcf/d of gas and 2,000 standard barrels of condensate (stb/d) for 10 to 12 years, and an expected economic field life of 15 to 25 years.

Situated in the highly productive Pab reservoir, at a depth of around 3,500 metres, Zamzama gas is sweet and dry, with a low condensate to gas ratio of 6.5 barrels/MMcf.

## GAS SALES CONTRACTS

In July 2001 the Zamzama Joint Venture offered the Government of Pakistan, which has the right to buy the gas under the licence agreement, sales gas for purchase from the Zamzama field. This offer was approved by the Economic Coordination Committee, and a total of 350 MMcf/d of gas was allocated to Sui Southern Gas Company Ltd (SSGCL) and Sui Northern Gas Pipelines Ltd (SNGPL) as the Government's nominated buyers.



Sales of gas from the Zamzama Field Development are defined by three commercial agreements: a Gas Sales and Purchase Agreement with each of Sui Southern Gas Company Ltd and Sui Northern Gas Pipelines Ltd, and the Gas Pricing Agreement.

### PHASED DEVELOPMENT APPROACH

The Zamzama field used an innovative phased approach. Gas production commenced in March 2001 via an extended well test (EWT) as a precursor to full field development. Gas was lifted from the Zamzama-1 and Zamzama-2 wells and treated at a minimum processing facility for gas dehydration, dew point control and condensate stabilisation and handling, before being compressed and delivered eight kilometres into the main Sui Southern Sui-Karachi gas pipeline. Gas from the EWT was sold to the SSGCL under an initial 21-month contract.

Production via the EWT enabled the early delivery of gas to the market while retaining flexibility in the planning for the field development.

### LOCAL CONTENT

As the operator of the Zamzama Joint Venture, BHP Billiton is committed to maximising local involvement in the field development wherever practicable. During the construction phase for the EWT, labour and materials-related contracts totalling US\$5.6 million were placed with Pakistani companies including Descon Engineering Ltd, Associated Constructors Ltd, Allied Engineering, NESPAK, Alstom Pakistan and Siemens Pakistan.

A similar approach was applied to the execution of the full field development, building on the experience gained and seeking to increase the level of local content. Some 3,275 workers were employed at the Zamzama site during the peak of construction activities, with about 40% of them coming from the local area, representing a major employment opportunity for the communities living around the plant site. On average, about 2,000 local workers were employed at the Zamzama plant site over the total construction period of 14 months. A significant proportion of the

major plant equipment was also built in local fabrication yards. It is estimated that the total Pakistani content stands at about 34% of the budget for the gas processing plant and associated facilities.

### HEALTH, SAFETY AND ENVIRONMENT

BHP Billiton implements and maintains health, safety and environmental management systems that are aligned with internationally recognised standards, and are consistent in all countries and areas of its business activity. A comprehensive Operations Management System which implements BHP Billiton's global Health, Safety, Environment and Community Management Standards is in place for Petroleum's operations in Pakistan.

To ensure continuous improvement in health and safety management there is a leadership focus on ensuring they are at the top of all agendas and improving communication through regular health and safety meetings. For any activity, risks are identified and assessed and control measures and safe systems devised. All employees and contractors underwent comprehensive training and all visitors to site were briefed. To date, the project remains LTI free (i.e. no Lost Time Injuries) with more than three million workhours spent on construction activities alone.

An environmental assessment study for the Zamzama field development was prepared. The study identified all potential environmental impacts and considerations relating to the project and the control measures required to manage any potential environmental effects.

BHP Billiton's Health, Safety, Environment and Community Policy requires each operating business to adopt a strategy of continuous improvement. As part of the planning for the Zamzama field development, all the environmental aspects of the existing extended well test operation were reviewed and areas where improvement could be made identified.



SUNRISE OVER THE ZAMZAMA GAS PLANT DURING CONSTRUCTION

## COMMUNITY RELATIONS

BHP Billiton is committed to building effective relationships with local communities wherever it operates. The Group aims to work with regional and local government, community groups and other organisations to ensure local communities benefit from its activities, both in the short and longer-term.

In Pakistan, BHP Billiton Petroleum is working closely with community groups in the Dadu and Johi areas of Sindh province. In addition to providing employment opportunities wherever possible, the company is participating in a number of local development projects. These include, for example:

### Health

- In addition to two already existing clinics, three new community health centres were established in 2003 in partnership with a local NGO (JORDAN) serving some 63 villages with a total population of over 13,000. On average, around 25 patients attend a clinic each day.
- The community donated the buildings and individuals pay for subsidised treatment.
- Training community health workers in curative and preventative medicine has been a priority. Special emphasis is placed on children learning about the significance of a healthy environment.
- BHP Billiton joined with the Local Government Health Department and two partner organisations in an "Immunisation Day" where children were given polio drops.

### Education

- Five Primary Schools have been established in partnership with local government, communities and local NGOs - Child Development Organisation and Village Shadabad Welfare Organisation (VSA).
- The schools serve 60 villages and have 477 children enrolled.
- The NGOs contribute to the implementation, monitoring and evaluation of the project.
- The Local Government Education Department registered the schools into the formal education network.
- Local women play a key role in five Community Based Organisations and five School Management Committees which have responsibility for school maintenance.
- The positive impact of the Community Development Programme is seen in both increased literacy and enrolment levels.

### Water & Sanitation

- Installation of a hand water pump in Fateh Mohammad Panhwar means women no longer have to travel to other villages to collect water. BHP Billiton had already constructed a water supply scheme in village Mithoo Khan Lashari in 2002. The people of this village used to fetch the drinking water from an open pond.

In addition, a micro-credit scheme for the women of Johi was launched, in partnership with the Sindh Graduate Association (Women's Branch) and a Women's Vocational Centre and a Computer Training Centre were established at Johi.



FOCUS ON EDUCATION: THE PEER MASHAIKH COMMUNITY GIRLS SCHOOL

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