ARROW ENERGY – UBOBO
Community Information Session
November 2011
ARROW ENERGY
TODAY’S AGENDA

➢ Overview of Arrow Energy
➢ The exploration process
➢ Exploration in the Nagoorin Graben
➢ Arrow Bowen Pipeline update
➢ Community engagement
➢ Questions
ARROW ENERGY OVERVIEW
ARROW ENERGY
COMPANY OVERVIEW

Arrow is a leading coal seam gas company with five domestic gas supply operations, interests in three gas-fired power stations and plans to deliver liquefied natural gas to the international market through a world class plant in Gladstone.

• Queensland based company which started in 2000
• Joint venture Shell (50%) and PetroChina (50%) established owners committed to safety, environment and long term relationships with stakeholders
• Currently have almost 500 producing coal seam gas wells across Queensland
• Provide approximately 20 per cent of Queensland’s gas needs which is primarily used for electricity generation
ARROW ENERGY

OUR PROJECTS

Arrow LNG
- Surat Gas Project
- Bowen Gas Project
- Arrow Surat Pipeline
- Arrow Bowen Pipeline
- Arrow LNG Plant
- Power Development

Domestic operations
- Tipton
- Daandine
- Kogan
- Stratheden
- Moranbah Gas Project

Power stations
- Braemar 1
- Braemar 2
- Townsville
ARROW ENERGY
WHERE DO WE EXPLORE?

54,088km² of acreage

- Bowen Basin – QLD
- Surat Basin – QLD
- Clarence Moreton Basin – QLD and NSW
- Nagoorin Graben – QLD
- Capricorn Area – QLD
- Styx Basin – QLD
- Hillsborough Basin – QLD
- Galilee Basin - QLD
Our domestic gas and electricity supply business has been in operation since 2004.

We currently supply approximately 20 per cent of Queensland’s gas needs which is primarily used to create electricity.
THE EXPLORATION PROCESS
COAL SEAM GAS (CSG)
WHAT IS CSG?

• Natural gas – methane

• Commonly used for electricity generation and industrial uses (e.g. refining)

• Coal seams contain both gas and water. The gas is kept in place by water pressure and ground pressure

• Gas is produced from coal seams by drilling wells, pumping water from coal seams, which allows the gas to be released

• CSG is very different to Underground Coal Gasification (UCG)
THE EXPLORATION PROCESS
RIGHT TO EXPLORE

• Right to explore provided by “Authority to Prospect” (ATP)

• Granted under the *Petroleum and Gas (Production and Safety) Act, 2004*

• Administered by Department of Employment, Economic Development and Innovation (DEEDI)
THE EXPLORATION PROCESS
WHAT DOES EXPLORATION MEAN?

• Exploration is a three step process to identify and assess the potential of coal seam gas (CSG) resources in an area to determine:
  1. The presence, depth and extent of coal seams
  2. Whether the coal seams contain gas
  3. Whether the gas can be ‘produced’ (ie brought to the surface)

• Exploration is one key part of deciding if a CSG resource can be developed into a project – also need to obtain environmental, Government and commercial approvals
THE EXPLORATION PROCESS

EXPLORATION DRILLING

• Landholder consultation

• Flexible approach

• Site inspection/survey (eg environment/vegetation/cultural heritage)

• Site preparation for drilling activity only (70m x 70m)

• Drilling and logging testing

• Cementing of well

• Drilling and testing timeframe – approx one month

• Rehabilitation of site
THE EXPLORATION PROCESS
EXPLORATION - SEISMIC SURVEYING

• Seismic surveying is a process that generates a 2-D image of the subsurface which helps determine the presence and extent of coal seams.

• The process requires acoustic signals to be passed through the surface of the Earth in straight lines, these are reflected by the interfaces of different rock types. The reflected signals are received by geophones and recorded for interpretation into a 2-D image.

• Advantages:
  • Low impact alternative to drilling
  • Can be conducted along existing roads in many areas.
THE EXPLORATION PROCESS

BASICS OF DRILLING

• Hole diameter is about 120mm (5 inches)
• Hole depth depends on geology – but generally less than 800m
• Multiple strings of casing – isolation of well from surroundings
• Water flushed down the drill string to the face of the bit, to allow cuttings to be flushed back to surface
• Cuttings at surface are captured in a small ground pit
• All strings cemented in place to isolate any aquifers
• Qualified drilling personnel
• Strong safety focus – lifesaving rules
• Site rehabilitated after drilling

• **Exploration wells will not be converted to production wells**
THE EXPLORATION PROCESS
EXPLORATION DRILLING

Exploration wells
• Chip hole - to determine presence of coal
• Core holes – to determine gas contents
• Exploration drilling is low intensity, sites several kilometres apart
• Level of site preparation deemed necessary in consultation with landholder and assessed on case by case basis

Landholders are compensated in accordance with the Petroleum & Gas Act
• 3-6 weeks duration depending on depth and type of exploration hole
• Small, truck mounted rigs and support vehicles (water, drill rods, personnel transport, testing services etc)
THE EXPLORATION PROCESS
PILOT TESTING

- Drilling up to five individual wells
- Wells in close proximity (between 100m – 500m apart)
- Water and gas brought to surface – water stored in small purpose-built dam
- Pilot testing may last up to 18 – 24 months
EXPLORATION IN THE NAGOORIN GRABEN
ARROW ENERGY
NAGOORIN GRABEN EXPLORATION ACTIVITIES

• ATP 679 (Nagoorin Graben) is located approximately 80km southwest of Gladstone and coincides with the Boyne River valley where approximately 90% of Nagoorin Graben deposits are situated.

• Nagoorin Graben:
  • Small area – 3km wide by 43km long
  • Lignite coals, oil shales and carbonaceous mudstone constitute the main targets for coal seam gas in the area
  • Reaches up to 1500m thick in the central portion of the basin which is approximately 4km southeast of the Ubobo township
  • Target depth for drilling – 450-850m

• Initial drilling has indicated reasonable gas content however, further exploration is required to determine the potential of the area.
Arrow’s exploration campaign in the Nagoorin Graben began in 2004, since the campaign began 10 exploration wells have been drilled at various sites:

- Boyne River-2/2a/2b/2c (2005)
- Boyne River-3 (2006-2007)
- Boyne River-4 (2007)
- Boyne River-5 (January 2010)
- Boyne River-6a (November 2009)
- Boyne River-7 (March 2010)
CSG EXPLORATION
EXPLORATION ACTIVITIES

• Five additional wells have been drilled in 2011:
  • Boyne River-8/8a
  • Boyne River-9/9a
  • Boyne River-11

• While initial drilling has indicated reasonable gas content in the area, further exploration activity is required to determine the potential of the area.
CSG EXPLORATION

EXPLORATION ACTIVITIES

- 2012 and 2013 will concentrate predominantly on:
  - One core hole
  - Potential seismic program consisting of two lines

- Provided these exploration activities give favourable results, up to two pilot wells will also be drilled within the next two years.
Difficulties in achieving results:

- Poorly consolidated and ‘clayey’ nature of the Nagoorin Beds sediments
- The extensive wet season between January and April annually
- Structural complexity along the Graben area due to transtensional stress regimes during and post deposition of the Nagoorin Beds

Producing coal seam gas well at surface
COMMUNITY ENGAGEMENT
BRIGHTER FUTURES – COMMUNITY INVESTMENT PLAN

Employee committees assess applications for donations, sponsorships and partnerships on the following focus areas:

• Health and safety
• Education
• Environment

Successful applicants in the region to date include:

• Isolated Children’s Parents’ Association
• Outback Barbarians Rugby Club
• Camboon Campdraft & Recreation Club Inc
• Birri Indigenous Organisation
• Theodore District Health Council Inc.
• The Salvation Army (Qld) Property Trust for Samaritan House Mackay
Questions and Answers

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