Moranbah

Community Information Session

October 2011
<table>
<thead>
<tr>
<th>ARROW ENERGY</th>
<th>TODAY’S AGENDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Arrow Energy</td>
<td></td>
</tr>
<tr>
<td>Exploration Update</td>
<td></td>
</tr>
<tr>
<td>Moranbah Gas Project</td>
<td></td>
</tr>
<tr>
<td>Arrow Bowen Pipeline (ABP) Update</td>
<td></td>
</tr>
<tr>
<td>Addressing Community Concerns</td>
<td></td>
</tr>
<tr>
<td>Community Engagement</td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td></td>
</tr>
</tbody>
</table>
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
ARROW ENERGY
OUR STORY

- Today's value $5bn (indicative)
- Shell / PetroChina Takeover
- First gas sold
- Listed at $20 m
- Listed at $250m

Staff numbers:
- 2007: 212
- 2008: 235
- 2009: 372
- 2010: 432
- 2011*: 800

*year to date

Gross Reserve Position (PJ)
- 2001: 2,000
- 2002: 2,000
- 2003: 2,000
- 2004: 4,000
- 2005: 6,000
- 2006: 8,000
- 2007: 10,000
- 2008: 12,000
- 2009: 14,000
- 2010: 16,000
### ARROW ENERGY
#### GAS RESOURCES IN THE TENEMENTS

<table>
<thead>
<tr>
<th></th>
<th>Bowen Basin</th>
<th>All Qld Arrow tenements</th>
<th>Current Qld usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas resources:</td>
<td>36 000 PJ</td>
<td>74 000 PJ</td>
<td>150 PJ</td>
</tr>
<tr>
<td>Equivalent to:</td>
<td>6 billion barrels of oil</td>
<td>12 billion barrels of oil</td>
<td>25 million barrels of oil</td>
</tr>
</tbody>
</table>

![Bar chart comparing gas resources in Bowen Basin, All Qld Arrow tenements, and Current Qld usage.](chart.png)
ARROW ENERGY
OUR PROJECTS

Arrow LNG (proposed)
• Surat Gas Project
• Bowen Gas Project
• Arrow Surat Pipeline
• Arrow Bowen Pipeline
• Arrow LNG Plant
• Power Development

Domestic gas operations
• Tipton
• Daandine
• Kogan
• Stratheden
• Moranbah Gas Project

Power stations
• Braemar 2
• 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.
ARROW ENERGY
BOW ENERGY ACQUISITION

• Arrow has entered definitive agreement to acquire Bow Energy via a Scheme of Arrangement

• The offer is subject to customary conditions including regulatory, court and shareholder approvals

• The acquisition of Bow enhances our opportunity to expand the size of the project trains at our planned liquefied natural gas (LNG) on Curtis Island
EXPLORATION UPDATE
ARROW ENERGY
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
ARROW ENERGY  
BASICS OF DRILLING

- Hole diameter is about 120mm (5 inches)
- Hole depth depends of 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 – lifesavings rules
- Site rehabilitated after drilling

*Exploration wells will not be converted to production wells*
ARROW ENERGY IN THE HILLSBOROUGH BASIN
WHERE ARE WE OPERATING?

- Completed 3 exploration wells north-west of Proserpine
- Plan to complete 2 exploration wells in 2012
- Very early stages of exploration and a geological map of the area has not yet been completed
MORANBAH GAS PROJECT
ARROW ENERGY IN THE BOWEN BASIN
OVERVIEW

• Moranbah Gas Project (MGP) produced its first gas in 2004
• Supply gas to power homes, businesses and industry:
  – Moranbah Power Station
  – Yabulu Power Station in Townsville
  – Dyno Nobel
  – Xstrata copper refinery
  – QLD Nickel in Townsville
• Approximately 160 staff in Moranbah
• Our business partners are AGL Energy and QGC
• 100% overlapping tenure with 30 major coal companies
• 18 co-development agreements with coal companies
ARROW ENERGY IN THE BOWEN BASIN
WHERE ARE WE OPERATING?

ATP759 Joint venture
Arrow 57%
QGC 43%
ARROW ENERGY IN THE BOWEN BASIN
CSG WELL AT SURFACE
ARROW BOWEN PIPELINE UPDATE
ARROW ENERGY
OUR CSG TO LNG PLAN IN THE BOWEN BASIN


Submit EIS

Environmental authority approvals

Petroleum pipeline lease approvals

Final investment decision

Construction

Commissioning and operation

Arrow Bowen Pipeline

Commence EIS

Consultation

Submit EIS

Environmental authority approvals

Petroleum lease approvals

Final investment decision

Field Development

Bowen Gas Project
Arrow Bowen Pipeline (ABP) update

- Pipeline Survey Licence
- Environmental Impact Statement (EIS) terms of reference
- Two ecological field surveys
- Contacted all potentially affected landholders

Next steps (6 – 12 months)

- Continue discussions with landholders
  - negotiate access to conduct detailed ecological assessments and cultural heritage surveys
  - landholders will be shown detailed alignment plans for discussions regarding easements
- Plan to submit the EIS in December 2011
  - sent to landholders and also available in community libraries
  - information sessions will be held to discuss the EIS in 2012
ARROW ENERGY
PROPOSED ARROW BOWEN PIPELINE (ABP) ROUTE
ARROW ENERGY
ARROW BOWEN PIPELINE IMPACTS

Arrow Bowen Pipeline (ABP)

• Proposed 600km long buried steel transmission pipeline
• Up to 650 jobs during construction
• Five temporary camps along pipeline route

Roads

• Under the Petroleum & Gas Act, Arrow must adhere to “notifiable road use” standard
  – Compensation and upgrade/maintenance requirements over 10 000 tonnes per year
• Road and traffic management plans will be developed in collaboration with local Councils
ADDRESSING COMMUNITY CONCERNS
ADDRESSING COMMUNITY CONCERNS
WORKING WITH LANDHOLDERS

Arrow recognises every property is unique and we are committed to working with landholders to ensure our work practices minimise impacts on land and existing agricultural activities.

- All staff and contractors are required to abide by 12 Land Access Rules
- Landholders have asked us to ‘add value’ not just compensate for impacts
- Arrow has:
  - a Standard Compensation agreement
  - removed the privacy provisions (landholder can request inclusion)
  - implemented new compensation framework for exploration activities
ADDRESSING COMMUNITY CONCERNS
URBAN EXCLUSION POLICY

• The “Exploration and urban living: striking the balance” public consultation paper was released by the Queensland Government on 15 August 2011

• Effective 16 August 2011, the Queensland Government declared large areas of Queensland ‘Restricted Area’ (RA) under the Mineral Resources Act 1989

• 2km buffer zone around all towns in the South East Queensland Regional Plan Area and towns that have a population >1000

• Arrow Energy has issued a submission to Government identifying areas for clarifications, concerns and questions

• Arrow will actively work with Government processes in the development of legislation
• Fraccing has been used in the Bowen Basin since the late 1980s
  – MGCRA at Broadmeadow and Capcoal at German Creek
• Arrow is currently trialling fraccing at our Bowen Basin operations
• Fraccing fluid consists of 99.5 per cent water and sand
• Arrow does not use fraccing fluids that contain Benzene, Toluene, Ethylbenzene or Xylenes (BTEX)
ADDRESSING COMMUNITY CONCERNS
WATER MANAGEMENT

• Arrow is committed to the sustainable management of coal seam water
• We understand the importance of groundwater resources to local communities
• We have developed a comprehensive strategy to manage the potential impacts from our activities
ADDRESSING COMMUNITY CONCERNS
IMPACTS ON GROUNDWATER - EXPLORATION

There is minimal to no impact on groundwater during exploration:

• No water is removed/produced from exploration holes
• No fraccing is required for exploration holes
• Minimal additives used to produce drilling fluids:
  – KCL (Potassium Chloride salt – used worldwide as a fertiliser) for well control in small amounts (<5%).
  – Xanthan polymers and cellulose based filter loss agents are also used (these are both food grade additives).
• Small area of interaction around wellbore with drilling fluids – water not injected into aquifers – same as a water driller
ADDRESSING COMMUNITY CONCERNS
IMPACTS ON GROUNDWATER - PRODUCTION

• Prevention of groundwater contamination is regulated for CSG activities
• Dam standards and specifications
• Prescriptive drilling standards
• Arrow will:
  – line all dams, install additional leak detection
  – use qualified drillers
  – ensure wells are isolated from formations other than the coal seam
• Arrow will not use oil-based drilling fluids
ADDRESSING COMMUNITY CONCERNS
RESILIENCE OF THE GAB

- 8,700,000 GL – volume stored in GAB
- 25 GL/yr - Arrow abstraction
  - 0.00029% of GAB Volume per year
- 3400 years to drain - if we assume 1% of GAB is recoverable water
- 200 GL/yr lost from:
  - Uncapped bores
  - Unlined drains

Source: GAB Coordination Committee
ADDRESSING COMMUNITY CONCERNS
SURAT BASIN MAPPING AND MODELLING

• Detailed groundwater assessment completed to assess potential for impact if productive area is determined

• Model built to predict regional impacts and covers ~450Km by 270Km area

• Simulates aquifers in 15 layers from the Condamine Alluvium to the Precipice Sandstone

• Undertaking
  – connectivity assessment of Condamine Alluvium & Walloon Sub-group
  – Shallow & deep injection trials

• Commissioned research studies into geochemistry of aquifers
ADDRESSING COMMUNITY CONCERNS
SALT MANAGEMENT

Arrow Energy is committed to removing salt from the landscape.

• CSG water contains salt, the majority of which is made up of chloride, sodium and carbonates
• Amount of salt depends on the location and age of the coal seam.
• Typically between five to eight tonnes every 1000 megalitres
• Preferred strategy is for beneficial use of salt for industrial applications
• Currently investigating potential beneficial uses in the Surat Basin such as:
  – Crystallisation for use in industrial processes such as chloride, sodium carbonate and sodium bicarbonate
  – Use of brine in the chemicals industry such as caustic soda and chlorine production
COMMUNITY ENGAGEMENT
Local employee committees assess applications for donations, sponsorships and partnerships on the following focus areas:

- Health and safety
- Education
- Environment

Successful applicants in the Bowen Basin to date include:

- Moranbah District & Support Services
- Moranbah State High School
- Moranbah Athletics club
- Moranbah East State School
- Moranbah MyTime Group
- Moranbah Arts Council
- QLD Arts Council
• Indigenous Land Use Agreements (ILUA) executed and are being lodged with the National Native Title Tribunal and we continue to work closely with these communities:
  – Jangga
  – Barada Barna
  – Wiri
  – Birri
• Cultural heritage is a significant component of each ILUA
COMMUNITY ENGAGEMENT
LOCAL SCHOOLS AND TRAINING

• Speaking at local Primary and High schools
• Identifying opportunities to support established training institutions, for example:
  – Year 12 students manufacturing guards for our wells as part of the Moranbah Advanced Skills Program
• School based traineeships:
  – Year 11 students at Moranbah State High School
  – Two administration traineeships
  – Two engineering traineeships
  – Certificate II level
• University scholarships
• Vacation employment
  – 12 weeks paid employment
  – 2nd year university students
Questions and Answers

Freecall: 1800 038 856

Email: info@arrowenergy.com.au

Next visit: First half 2012
(six monthly ongoing)
ADDITIONAL SLIDES IF REQUIRED
ARROW ENERGY
WHAT IS COAL SEAM GAS?

- Coal seam gas (CSG) is naturally occurring gas trapped in underground coal seams, most commonly methane.
- Trapped by water and ground pressure.
- Extracted by drilling into the coal seam and pumping water which releases the gas.
- Vast CSG resources across Australia’s coal basins.
- Commercially produced in Queensland for more than 15 years.
- Gas-fired power stations create less than half the greenhouse gas emissions of equivalent sized coal fired power station.
ARROW ENERGY
HOW DO WE PRODUCE AND TRANSPORT CSG?

Well specifications
• Horizontal wells
• 70m x 60m for drilling
• Rehabilitated to 10m x 10m
• Currently looking a fraccing and other completion technologies
• Well spacing approx 1 well per square km

Gathering system - pipelines
• Buried to 750mm in grazing land
• Burial depth agreed with the landholder in cropped areas (nominal 1200mm)
ARROW ENERGY
WHAT IS LIQUEFIED NATURAL GAS?

• Liquefied Natural Gas (LNG) is natural gas that has been cooled and converted to liquid for transport
• We are planning an LNG plant in Gladstone that will convert CSG to LNG in preparation for international shipping
• CSG from the Bowen and Surat Basins will be piped to the proposed Arrow LNG plant
• It will produce up to 16 million tonnes of LNG per annum (mtpa)

Artist's impression of Arrow LNG Plant
ADDRESSING COMMUNITY CONCERNS
APPROACH TO INTENSIVELY FARmed LAND

• Arrow recognises that intensively farmed land requires additional measures
• Flexibility in well locations and spacing
• We are studying methods to minimise impacts and maintain soil profile for gathering system pipelines:
  – Fully understand soil types in the region
  – Use plowing rather than trenching
  – Burial to 1.5m depth
  – Discussions with farmers for three field development case studies on strategic cropping land (various farming practices)
ADDRESSING COMMUNITY CONCERNS

BTEX

Arrow Energy does not use fraccing fluids that contain Benzene, Toluene, Ethylbenzene or Xylenes (BTEX)

- BTEX are a group of chemicals ie benzene, toluene, ethylbenzene and xylenes
- BTEX can be found in a number of petroleum based products such as lubricants, petrol, plastics and foams
- BTEX chemicals are present in number of hydraulic fracturing fluids
- The QLD government has banned the use of fracturing fluids that contain BTEX
- Arrow regularly conducts tests on wells. It is possible that small traces of BTEX could be detected as they may be present in petroleum-based lubricants used during the well drilling process and they also can also potentially occur naturally in coal