• Safety moment
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Arrow Energy

Heart of Australia

51
immediately referred for open heart surgery

1848
referred for on-going treatment

774
patients referred for urgent care

636
avoidable hospital admissions / reduced length of stay

258
potential avoidable deaths

48
number of registered organisations who are supporting the impact of Heart of Australia publicly
Heart of Australia launched its second mobile clinic

Custom built, 26m B-double road train

Expansion from 13 to 18 Queensland towns
  - two additional rotations to Dalby and Moranbah

Expansion of services to include:
  - Gynaecology
  - Gastroenterology
  - Neurology
  - Geriatric medicine
  - Endocrinology
  - as well as heart and chest.
About Arrow

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About Arrow

- An integrated coal seam gas company owned 50/50 by Shell and PetroChina
- Produces gas equivalent to 25% of Queensland’s annual demand
- Provides gas for industrial users and electricity generation
  - tenure over two major production basins - the Surat and Bowen basins
  - about 1,450 gas wells
  - some 17,000km² of Queensland production and exploration tenements
- Existing domestic gas operations:
  - five gas producing projects in the Surat and Bowen basins - Tipton, Daandine, Kogan, Stratheden (Surat Basin) and Moranbah Gas Project (50/50 AGL - Bowen Basin)
  - supply gas to power stations - Braemar 1, Braemar 2 (100% owned), Yabulu, Daandine, Moranbah, Swanbank
  - generation enough to power 800,000 average-sized Queensland homes.
- In 2017, Arrow announced a gas supply deal between Arrow and QCLNG to commercialise most of Arrow’s gas reserves in the Surat Basin through a phased development over 27 years.
- Arrow and QGC remain standalone companies.
Since our last update, we’ve been busy:

- Ongoing development to meet our domestic gas contracts
- Shareholder assurance reviews, with more to follow
- Conceptual engineering on our Surat development
- Front-end engineering and design (FEED) for first phase (gathering networks, off-tenure pipelines and gas facilities)
- Progressing commercial agreements with third parties
- Delivering on our social investment partnerships.
• CSG is natural gas:
  • trapped in underground coal beds
  • by water and pressure.

• To extract CSG:
  • 300-750m well to the target seam/s
  • in-seam water pumped out to release gas
  • gas and water flow separately to the surface.

• Well design isolates coal seams from groundwater aquifers.
EXISTING SURAT OPERATIONS

- Arrow wells
- Arrow low pressure water and gas gathering pipelines
- 3rd party pipeline
- CGPF (Central Gas Processing Facility)
- 3rd party pipeline
1. Kogan North
2. Daandine
3. Braemar 2
4. Tipton
5. Plainview Pilot
6. Meenawarra
Three new wells are now online.

Additional new wells are being developed to demonstrate coexistence on intensively farmed land:

- 21 new wells on six multi-well pads on intensively farmed land at Theten
- construction includes well pad facilities and 20km of gathering systems.

Expansion of existing field in 2019/20 will include:

- up to 15 new wells and gathering
- Area Wide Planning (AWP) for this area is complete.
Operational update

1. Kogan North
2. Daandine
3. Braemar 2
4. Tipton
5. Plainview Pilot
6. Meenawarra
• Maintenance activities at the Central Gas Processing Facility (CGPF) and Braemar 2 Power Station from 18 September for ~2 days.

• Flaring will be required during this time:
  • the size and appearance of the flare will vary – up to 30m high
  • flaring will be minimised as much as possible
  • flaring is regulated by Queensland Department of Environment & Science through the Queensland Environmental Protection Act.
Operational update

1. Kogan North
2. Daandine
3. Braemar 2
4. Tipton
5. Plainview Pilot
6. Meenawarra
Tipton

- Annual CGPF maintenance shutdown scheduled for 4 September.
- Construction planned from late 2018 to expand the existing Tipton field and facility:
  - ~80 new wells over four years
  - four new compressors at the Tipton CGPF
  - the existing gas vent replaced with a vertical flare for safety during maintenance and unplanned facility shutdowns
  - CGPF construction teams (50 - 70 people) onsite from early 2019 for ~15 months
  - access via Broadwater Road under approved Traffic Management Plans
  - community notifications will be provided throughout construction (subscribe via the Arrow website).
1. Kogan North
2. Daandine
3. Braemar 2
4. Tipton
5. Plainview Pilot
6. Meenawarra
Plainview Pilot

- Gathering construction underway to connect to the Tipton CGPF
  - ~11km of gas and water pipelines.
- Drilling of groundwater monitoring bore complete
- Drilling of 5 production wells underway
- 12-hour overnight road closures for pipeline commissioning
  - 6pm Friday 21 September to 6am Saturday 22 September
- Wells online ~November 2018
- Regular community email notifications (subscribe via the Arrow website).

Soil Gas Monitoring Project

- 23 soil gas monitoring points
- First data has been collected to establish baseline before Plainview Pilot begins production.

Future Pilot activity

- In 2019 Arrow will replicate this pilot nearby, a site has not been identified
- Community will be updated as planning progresses.
• Four new vertical wells to be drilled north of the existing Meenawarra wells
• ~2km gas and water gathering pipelines
• Drilling and construction from ~November 2018.
Arrow Energy

Current survey works

- Arrow is completing seismic survey series across the Surat Basin
- The next seismic campaign: September to October 2018:
  - ~20km north-east of Miles
  - ~90km of seismic acquisition on private property and gazetted roads.
- Directly impacted landholders already contacted
- Seismic surveys gather images below the earth’s surface:
  - Truck-mounted vibrating pad creates seismic waves
  - Waves travel below surface and reflect off underground rock layers
  - Strings of geophones (small microphones) ‘hear’ reflected waves
  - Geophone signals recorded for analysis
  - Geologists – and high-powered computing – turn raw data into a picture.
About Arrow

Operations Update

Surat Gas Development Update

What Happens Next?

Water

Arrow in the Community
EXISTING SURAT OPERATIONS

CGPF

3RD PARTY PIPELINE

Arrow wells

Arrow low pressure water and gas gathering pipelines

CGPF

Arrow Central Gas Processing Facility (CGPF)

3rd party pipeline
-arrow energy

development planning is underway

-overarching project principles unchanged including arrow’s coexistence commitments

-arrow is operator and developer:
  - phased development over 27 years
  - two new gas facilities (near miles and tipton/cecil plains)
  - 2,500 wells
  - well pad life ~20 years
  - onsite generators to self-power wells, where possible
  - surface infrastructure on gathering lines:
    - low point drains
    - high point vents
    - some water pumping equipment
  - some off tenure pipelines are required
  - the arrow surat pipeline is not required.

-arrow will offset any impact on the condamine alluvium and will maximise beneficial use of treated coal seam water.
Arrow uses area wide planning (AWP):

- incorporates landholder and local knowledge into development plans
- gathers landholders’ constraints and overland flow patterns
- arrives at the best layout for both landholders, and Arrow
- Arrow’s development plans are not defined until after AWP
- Output examples include:
  - locating well sites for least impact on land
  - routing low pressure gas, water and underground power lines to follow existing tracks, where possible
  - defining depth-of-cover suitable for ongoing land use
  - defining access priorities for different farming and project activities.
• Arrow has 12 coexistence commitments for intensively farmed land, to ensure:
  • minimised impact
  • no permanent damage to productivity of the land or the Great Artesian Basin
  • landholders are fairly compensated for possible impacts from our activities.

• We will demonstrate coexistence, in collaboration with our landholders, through:
  • pre-development design work to minimise our footprint
  • best practice construction management to minimise our impact on landholder operations
  • best practice operational management to minimise our impact on farm productivity.
Coexistence on intensively farmed land

Practically, Arrow’s coexistence means:

- Multi-well pads as standard on intensively farmed land, where coal depth allows, unless negotiated
- Gathering lines deep enough for future land use
- Power: reticulated underground to well sites or generated on-site, unless otherwise agreed
- Well site surface spacing will average not less than 800m on intensively farmed land
- Area wide planning to identify infrastructure locations
- Arrow’s compensation framework considers the value of prime farming land, including:
  - value of the land
  - level of disturbance
  - intensity of development.
Project execution strategies

- Project strategies are informed through our approved Environmental Impact Statement and Social Impact Management Plan

- Our philosophy:
  - support local
  - maximum opportunity for local participation
  - mitigate impacts.

- Project strategies under development include:
  - road impact assessments
  - road use management plans
  - workforce and accommodation plans
  - contracting and procurement strategies
  - training and capacity building.

Working with Arrow

- Economic benefits through employment, contracting and procurement

- Job opportunities:
  - Arrow strongly supports local employment
  - 800 jobs in construction – peak in 2022
  - 200 jobs in on-going operations
  - vacancies will be advertised.

- Local content:
  - Arrow and its contractors will provide full, fair and reasonable opportunities for capable and competitive local industry participation
  - Arrow will publish a Supplier Information Guide on the Arrow Energy website and [www.arrow.icn.org.au](http://www.arrow.icn.org.au)
  - Work with local supplier advocates, regional development bodies, chambers of commerce and local councils to promote supply opportunities
  - Support for local suppliers to develop their businesses in prequalifying or tendering with workshops in 2019.
• Resource activities, including coal seam gas, require:
  - tenure (petroleum licences) and
  - environmental authority (EA) before production.
• Arrow’s SGP will require both on-tenure and off-tenure approvals
• On-tenure approvals include:
  - Regional Interest Development Approvals (RIDA)
  - 16 petroleum leases and associated environmental authorities
  - 2 petroleum facility licences (field compression stations) and EAs.
• Off-tenure pipelines and activities will require:
  - New federal (Environment Protection and Biodiversity Conservation Act) approval – lodged May 2018
  - 8 petroleum pipeline licences (PPLs) and associated EAs – phased lodgement from 2018 to 2022.
Approvals received to date

- The SGP North EA (red) covers ~78,000ha from Miles north to Guluguba:
  - 588 new gas production wells
  - 650km of gathering pipelines to be installed over ~20 years.

- This EA has no effect until six corresponding petroleum leases are granted by the State Government.

- The Hopeland pilot and pipeline EAs (grey) cover a small area ~25km south-west of Chinchilla:
  - Arrow to collect gas from an existing 6-well pilot, and bring it to market
  - install up to 14 additional water monitoring bores.

- Tipton Expansion approvals, including:
  - an amendment to the EA for Arrow’s existing domestic gas operations (7 blue PLs), to expand the existing Tipton CGPF
  - Tipton CGPF expansion RIDA, for activity on Arrow-owned cropping land.
Groundwater
Arrow anticipates less drawdown than predicted in environmental impact statements.

Arrow will continue to update drawdown predictions by using OGIA’s most appropriate groundwater model.

Arrow’s groundwater activities

- Surat Cumulative Area Underground Water Impact Report (UWIR)
- Arrow’s Surat groundwater monitoring network >200 bores
- Surat Groundwater Dependent Ecosystem investigations completed (15 bores installed)
- Stage 1 Water Monitoring and Management Plan submitted to Federal Government
- Voluntarily undertaking pro-active negotiations for make good agreements
- Early planning for water beneficial use network
• Arrow’s Surat groundwater monitoring network (>200 Surat bores) contributes to regional understanding of groundwater levels

• Groundwater Net’s community groundwater monitoring program also works to expand knowledge of the groundwater resource

• Grants cover up to 75% of costs to install monitoring equipment on registered bores in the Surat Basin

• Groundwater Net, through the Department of Natural Resources, Mines and Energy coordinate the collection of groundwater levels

• Information is published online via the Queensland Globe.
• Arrow is committed to offset our impact on the Condamine Alluvium.

• Our end use strategy aims to balance known stakeholder concerns, as far as possible, considering volumes are comparatively small.

• There is insufficient water to support ‘new’ users – this will inevitably lead to stranded investment and poor outcomes for users.

• Following community feedback, we’ve committed to substitution of allocation.
**Treatment**
- Existing Arrow water infrastructure (Tipton & Daandine)
- Existing QGC water infrastructure (Kenya).

**End use**
- Existing QGC/SunWater pipeline
- New pipeline back to Condamine Alluvium region
- New beneficial use network.

**Milestone dates**
- 2019 – engage with Condamine Alluvium Allocation holders
- 2023 – target date for beneficial use network.
Investing in our communities