

Key findings of the geomechanical assessment of the proposed

# LEIGH CREEK UCG demonstration plant



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## AT A GLANCE

Leigh Creek Energy has proposed the development and operation of an underground coal gasification (UCG) demonstration plant.

The Energy Resources Division (ERD) of the South Australian State Government engaged Ikon Science to independently assess the risk of reactivating existing faults/fractures and creating new ones in the rock overlying the gasification chamber under operating conditions.

## ASSESSMENT CONCLUSIONS

The rock that overlies the proposed pilot UCG chamber and pre-existing faults are highly unlikely to be affected by planned and controllable operating conditions.

The risks of UCG gases moving outside the pilot UCG chamber and the well(s) can be mitigated with fit-for-purpose well construction and close monitoring of operating pressures.

## THE LEIGH CREEK DEMONSTRATION PROJECT

Leigh Creek Energy has proposed a trial UCG (also referred to as in-situ gasification) plant at Leigh Creek, within the old mine site.

This proposed demonstration plant will involve the establishment of a single gasifier chamber and associated above-ground infrastructure to produce synthesis gas (commonly referred to as syngas) for a short period of time (approximately 2-3 months).

The trial will test both the syngas composition and process performance. The results will inform a possible commercial development.

## PROJECT APPROVAL

The process for regulatory approval of this project consists of three stages, outlined in the *Petroleum and Geothermal Energy Act 2000* (PGE Act). **They are:**

**1** Licensing – grants exclusive rights to an area but does not grant rights to undertake on-ground activities.

**2** Statement of Environmental Objectives assessment and approval – a Statement of Environmental Objectives (SEO) is prepared on the basis of an Environmental Impact Report (EIR). The SEO identifies the environmental objectives and conditions that the licensee will be required to achieve to ensure it addresses the risks identified in the EIR. Both the EIR and SEO go out for public consultation. Approval is only granted when all relevant issues raised through this process are addressed.

**3** Activity notification and approval – requires submission and approval of technical and operational plans, and notification of intentions to undertake a regulated activity to all relevant landowners.

To inform Stage 2 of this process, ERD engaged Ikon Science to conduct an independent geomechanical assessment of the proposed site to assess the risk of creating new fractures or opening existing ones, which would allow the gas to move into the overlying aquifer and/or the surface.

## GEOMECHANICAL ASSESSMENT

Ikon Science investigated the strength of the rocks overlying the gasification chamber and assessed the likely operating limits with modelling.

### The mechanical strength of the rocks was measured by:

- wellbore measurements of acoustic properties to define rock elasticity before fractures or faults evolve in response to force
- wellbore measurements to define at what pressure rocks are susceptible to physical break-down (faulting and/or fracturing)
- images of boreholes to determine rock fabrics including but not limited to where boreholes are non-cylindrical – and have enlarged – and the orientation of that borehole enlargement, along with faults and fracture zones (strain features)
- lab tests on wellbore rock samples that further characterise stress orientations and magnitudes that enable reliable predictions of faults and/or fracturing.

### Ikon Science used these measurements to assess:

- the orientation of faults and fracture zones
- the forces (stress) required to exceed measured rock strengths
- the relevance of existing fault and fracture zone orientation to the predictability of rocks to become susceptible to the reactivation of faults and fracture zones, and the potential for inducing new faults and/or fracture zones

## RESULTS

Ikon Science determined that the mudstone overlying the coal seam would develop fractures at pressures of 94 bar/1363 psi or above.

The operating pressure for the gasification chamber will be 36 bar/522 psi, well below the threshold value.

## IMPLICATIONS

It will be important to ensure that operating pressures are maintained below the fracturing threshold. This can be achieved by putting operating standards and monitoring in place to enable the gasification chamber to be shut down in advance of exceeding critical operating pressure.

Well design and construction will also contribute to maintaining safe operating pressures.

## FURTHER INFORMATION

For more information and technical specifications, please refer to the full technical report available at: [http://petroleum.dpc.sa.gov.au/ikon\\_science\\_report](http://petroleum.dpc.sa.gov.au/ikon_science_report)

Additional information on the Leigh Creek project is available at: [http://petroleum.dpc.sa.gov.au/projects/prj\\_leigh\\_creek\\_energy\\_isg](http://petroleum.dpc.sa.gov.au/projects/prj_leigh_creek_energy_isg)

More information on underground coal gasification can be found in the Underground coal gasification in South Australia fact sheet available at: <https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/samref/sarig1/image/DDD/BROCH027.pdf>



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