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INQUIRY INTO COAL SEAM GAS

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DART ENERGY

THE LEADING GLOBAL COAL BED METHANE COMPANY

NSW Parliamentary Coal Seam Gas Inquiry

Submission by Dart Energy Limited

The Development of a Coal Seam Gas (CSG) Industry in New South Wales

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Submission to the NSW Parliamentary Inquiry into Coal Seam Gas.

Introduction

This paper aims to describe:

- the energy needs of NSW and the role of natural gas in addressing these needs;
- economic benefits for the people of regional NSW;
- environmental benefits of this low emission energy source;
- CSG development concepts and how CSG can co-exist sustainably with other activities in urban, semi-urban and rural areas;
- measures taken to protect our important aquifers;
- Dart Energy and the Company's position with regard to key industry issues.

The paper has been written so as to be accessible to a broad audience.

Executive Summary

Dart Energy believes that important coal seam gas resources in NSW can be developed in a way that is sustainable and that can co-exist with all other land uses. CSG is safe, poses minimal impact on the surface environment, does not impact on agricultural and municipal aquifers and poses little risk to public health. Responsible development of the CSG industry will realise significant economic benefits for the people of NSW, largely in terms of job creation, additional revenue streams for government and reduced pressure on energy prices. In addition to the small environmental footprint of responsible CSG developments, there are significant global environmental benefits compared to other fossil fuels, thereby making natural gas a very necessary 'transition' fuel on the way to a world powered by renewable energy.

NSW Energy Demand and Supply Shortfall

Gas demand in NSW is expected to triple over the next 20 years (Figure 1). Currently, gas only makes up 10%[1] of the NSW energy mix and more than 90%[2] of that gas is imported from other states. Worryingly for the energy security of NSW, production from these interstate gas fields is declining and gas is possibly to be redirected in future to export LNG projects in Queensland.

[1] Australian Energy Statistics, ABARE (NSW energy consumption, by industry and fuel type)
[2] 2010 Gas Statement of Opportunities for Eastern and South Eastern Australia, AEMO

Despite the energy challenges facing the state, NSW possesses very significant natural gas (coal seam gas) resources. The CSIRO estimates that CSG resources in QLD and NSW are in excess of 250 trillion cubic feet, enough energy to power both states for 400 years at current demand. Dart Energy believes that the responsible development of local CSG resources will ameliorate the impact of a real energy shortfall in NSW, and deliver this capacity with positive economic benefits and with little environmental impact.

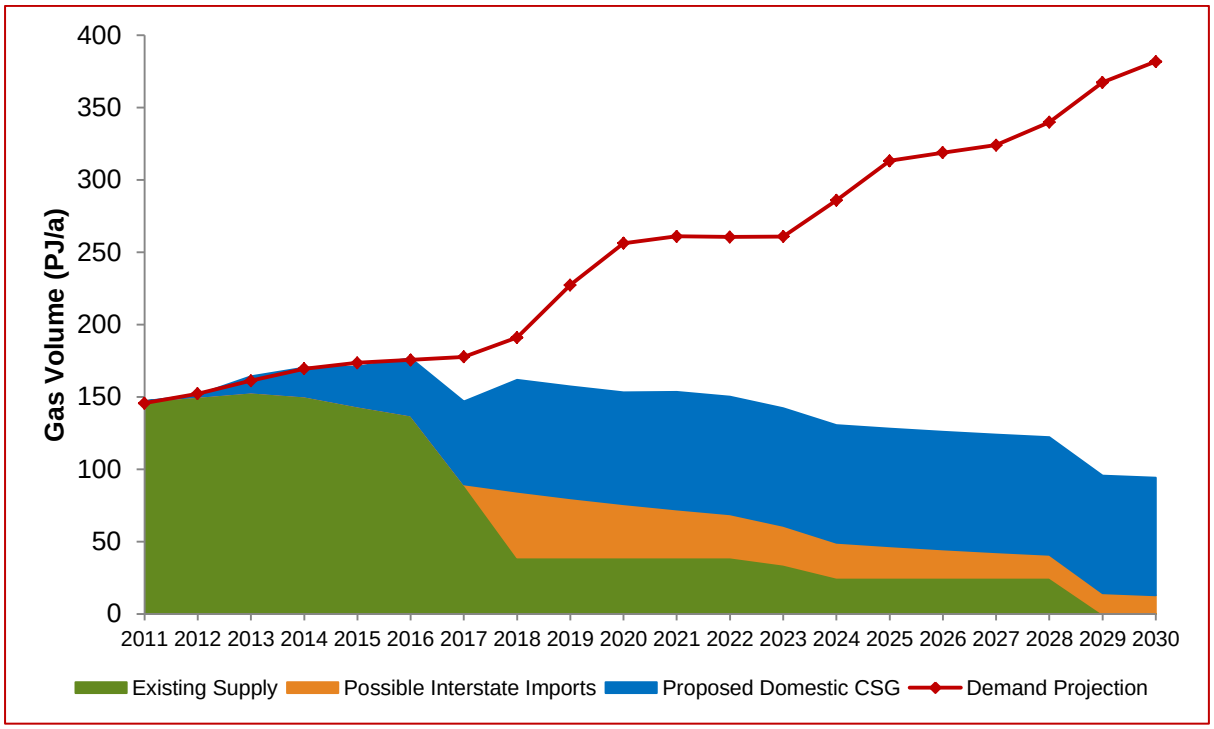

Figure 1 : Projection of NSW Gas Supply vs Demand (Sources: Demand - AEMO 2010 Electricity Statement of Opportunities (Slow Rate of Change Scenario), Supply - publicly available information on existing contracted gas supply arrangements and likely future production, Dart Energy estimates)

Economic Benefits

Natural gas, in particular coal seam gas, has the real potential to deliver major economic benefits to both the state of NSW and to local communities.

The responsible development of NSW gas resources is expected to generate hundreds of millions in royalty and tax revenue per annum for the people of NSW - revenue which can be used for critical infrastructure and to accelerate the development of renewable energy projects. Investment will transfer to the creation of potentially thousands of jobs, both in regional and metropolitan areas.

Dart Energy's CSG projects have the capacity to bring economic and social benefits to regional NSW. Such benefits include more local jobs through direct employment, more demand for local contractors and suppliers and flow-on industry, upgrades to local infrastructure including roads and service infrastructure, and availability of gas feedstock to local industry (such as methanol and fertiliser plants, ceramic manufacturers, abattoirs). Primary producers can reduce operating costs and dependence on the global oil market by using compressed natural gas (CNG) to power farm machinery. Landholders with gas production wells on their land will benefit through a long-term independent revenue stream, without gas operations affecting their core business.

Environmental Benefits

Natural gas, including coal seam gas, is a cleaner and more environmentally friendly source of energy than other fossil fuels, and unlike current renewable energy, can be used for base load power generation.

Many experts recognise the important role that natural gas has to play as a transition fuel before the world's base load energy demands can be provided by renewables. In delivering a cleaner energy supply, gas-fired power stations emit up to 70% less greenhouse gases than existing coal-fired power stations. Gas can replace coal as a continuous source of electricity (base load), while also complementing solar and wind power as it can be turned on and off quickly.

Gas-fired power generation produces far fewer emissions than coal-fired power generation, which NSW is heavily reliant upon. On average, gas-fired power produces 60% less CO_2, 68% less NO_X, 99.9% less SO_2, 84% less CO and 99.99% less particulate matter than black coal-fired power. The drastic reduction in emissions not only has greenhouse gas benefits, but also far less potential for acid rain (NO_X&SO_2) and health impact relating to airborne particulates.

In addition to reduced emissions at the power generation stage, even further reductions in CO_2 can be achieved using local coal seam gas resources. CSG typically has a very high methane (>95%) and low carbon dioxide (<5%) composition. In contrast, conventional gas fields have higher carbon dioxide levels (>15%) which must be stripped from conventional gas prior to pipeline transmission. This CO_2overhead is often released to atmosphere in conventional gas processing, however may be injected back into the reservoir in some cases. This compositional difference allows coal seam gas to have a smaller carbon dioxide footprint compared to conventional natural gas.

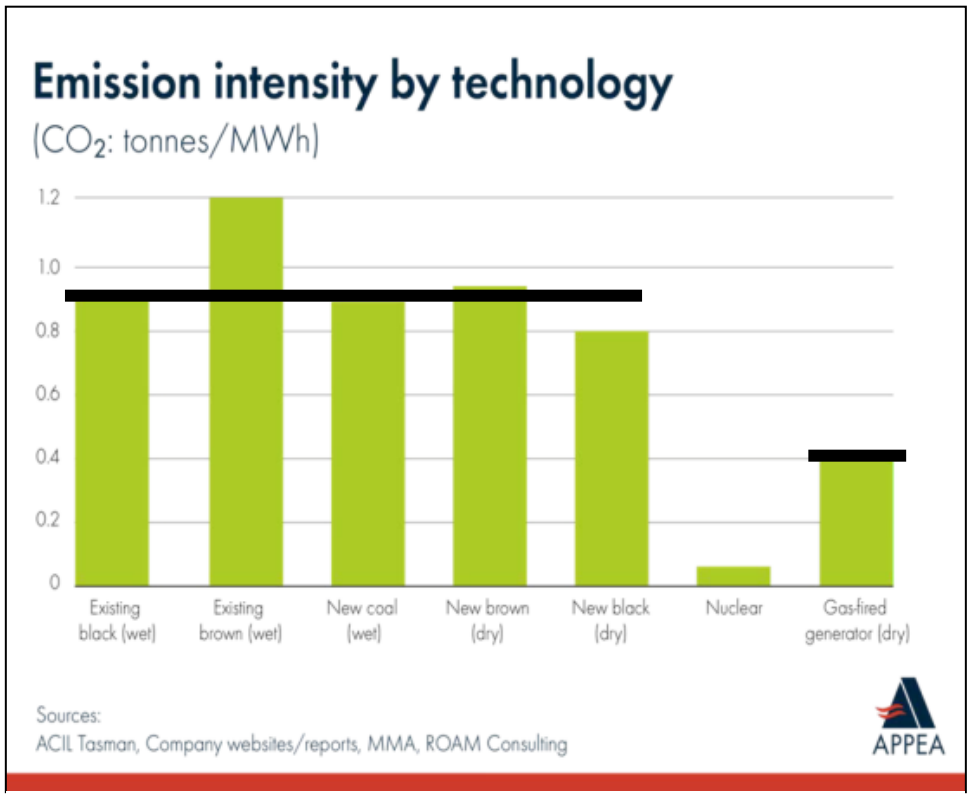

Figure 2 : CO_2 emission intensity by technology

Optimising a CSG Development

Dart Energy intends to develop CSG resources with minimal impact on the surrounding environment. The Company believes that most other land use activities (including agriculture, tourism, recreation, industrial/commercial, and even residential) can continue without being adversely impacted upon by CSG development.

This belief is underpinned by the highly professional engineering of existing projects and by established technology which allows for "low density" well spacing, which result in much fewer surface installations.

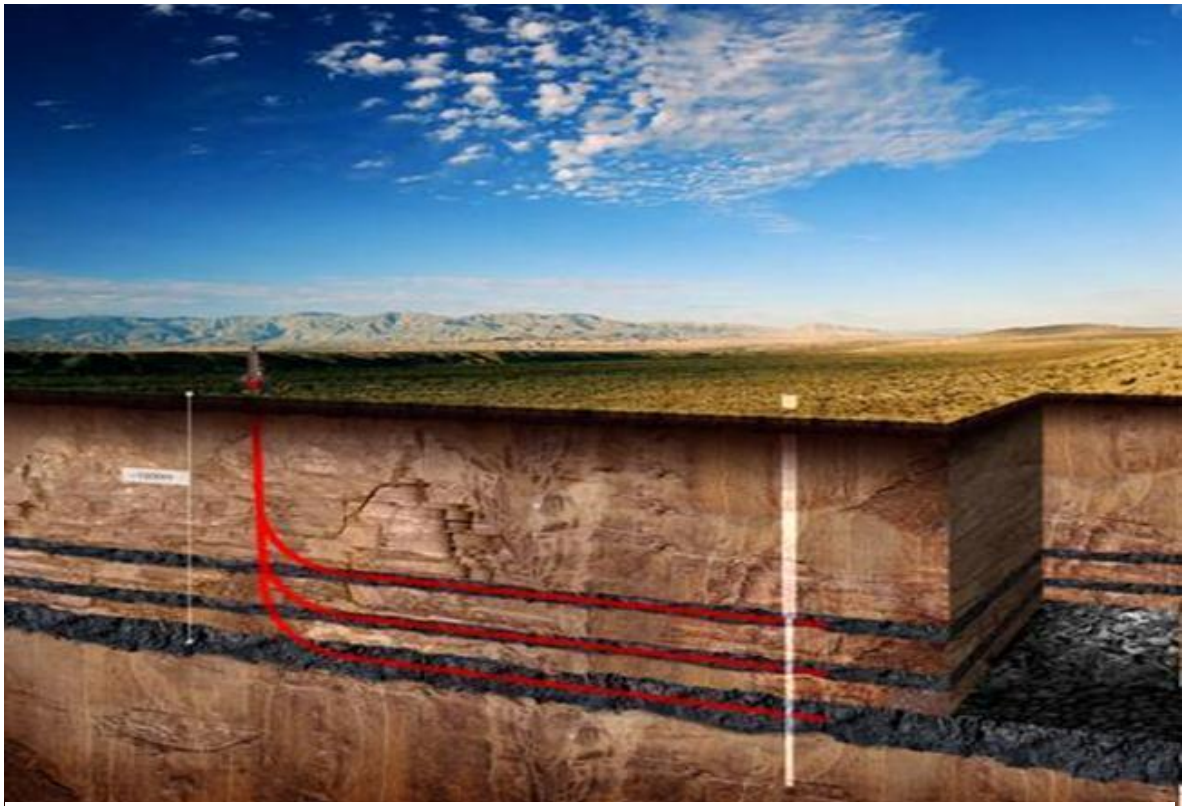

Figure 3: multi-lateral surface to in-seam (SIS) well accessing several seams

Low density well spacing can be achieved through the development of multi-lateral surface to in-seam (SIS) drilling (Figure 3). Multi-lateral wells target several coal seams through a single well bore at the surface, with a horizontal leg drilled laterally within each seam for a distance of several kilometres. Implementation of multi-lateral SIS wells enables a large reservoir area to be drained with fewer surface installations. This drilling technology is well established and Australia is a global technical leader in its execution.

Multi-lateral surface to in-seam wells can not only reduce the surface footprint of a CSG field, but have the added benefit of minimising, or even eliminating, the need for hydraulic fracture stimulation ("fraccing"). It is prudent to note, however, that geological variables will ultimately dictate which well type will succeed.

Individual wells can also be optimised. In urban or semi-rural areas wells can be enclosed (figure 4), with a small underground water tank and solar powered controls. Gas pipelines are buried, and aligned to follow existing roads and fences, further reducing the impact on existing land uses, including productive agricultural land. Remote well control via telemetry, and the small volume of produced water (in most NSW areas), can result in fewer vehicle visits to well sites and further reduce the impact of CSG production on existing land use activities and local residents.

Figure 4: enclosed well in Western Sydney area

Protecting Our Aquifers

In NSW, aquifers are protected by strong legislation, industry best practice well design and the geological architechure of the CSG resource areas. Aquifers used for agricultural and municipal supply are actively isolated from CSG developments, not only to protect these critical water sources, but also to ensure economic gas project outcomes.

Each CSG well is designed to the highest industry standards by experienced and professional engineers to ensure its structural integrity and safe operations. Wells are completely isolated from any near surface aquifers through multiple layers of high-grade steel casing, which is inserted in the well from surface to the top of the coal seam (Figure 6). This steel casing is cemented in place, and the cement tested to confirm a competent seal (i.e. cement bond log).

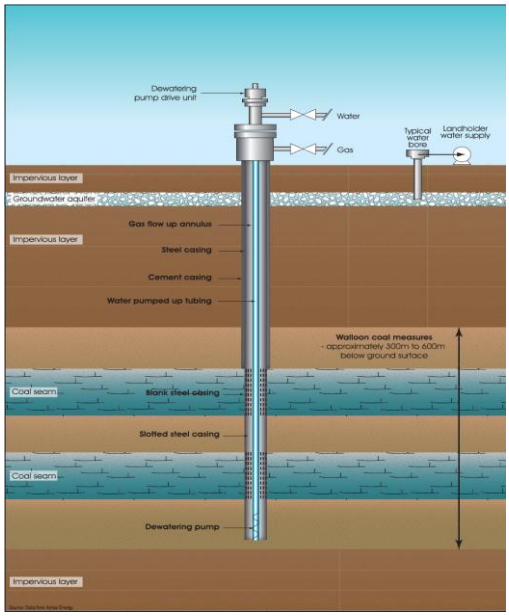

Figure 5: standard vertical well designed drilled to the highest industrial standards

The geological setting of coal seam reservoirs provides a natural protection to aquifer water resources, where the aquifer and the coal seam are separated by hundreds of meters of vertical rock section. Coal-bearing strata contains numerous impervious layers, which inhibit the vertical movement of groundwater, and provide an extremely solid seal between the shallow aquifers and the deeper coal seams.

Despite the engineering and geological separation of aquifers from CSG production, the protection of aquifer water resources is something Dart Energy, the industry and government take very seriously. In areas of CSG production, water levels are continuously monitored and water quality sampled at regular intervals so that immediate action can be taken in the unlikely event that water resources are affected by CSG production.

Figure 6: typical development area; other activities can continue around the wells. Pipelines are buried.

Responsible Management of Produced Water

Coal seams are aquifers, however they are rarely used for water supply, and much of that water must be removed from the CSG reservoir to initiate methane gas flow. The volume and quality of formation water produced during CSG production varies greatly between areas and is controlled by geological factors.

Typically, water volumes in NSW are significantly lower than in other prospective areas, particularly the Surat Basin in QLD. The reason for this is the lower permeability of the coal seams in NSW, particularly the Sydney Basin. This low permeability also makes Sydney Basin coal seams more amenable to multi-lateral drilling. Figure 7 shows the typical water production for different areas in eastern Australia.

The Company estimates that in most of its resource areas initial water production rates per lateral well would range from 1000 l/day(6 bbl/day) to approximately 5000 l/day(25 bbl/day) with water production declining rapidly over time. Figure 7 shows that water volumes in the Surat Basin can be up to a hundred times greater than CSG fields in NSW (Camden, Gloucester, Hunter). The Surat Basin in QLD is where many of the produced water issues are most pronounced.

Production water can be put to beneficial use, either partially treated for irrigation or industrial use, or further treated to drinking water standard. Mobile reverse osmosis plants are commonly used. Options also exist for reservoir re-injection of produced water.

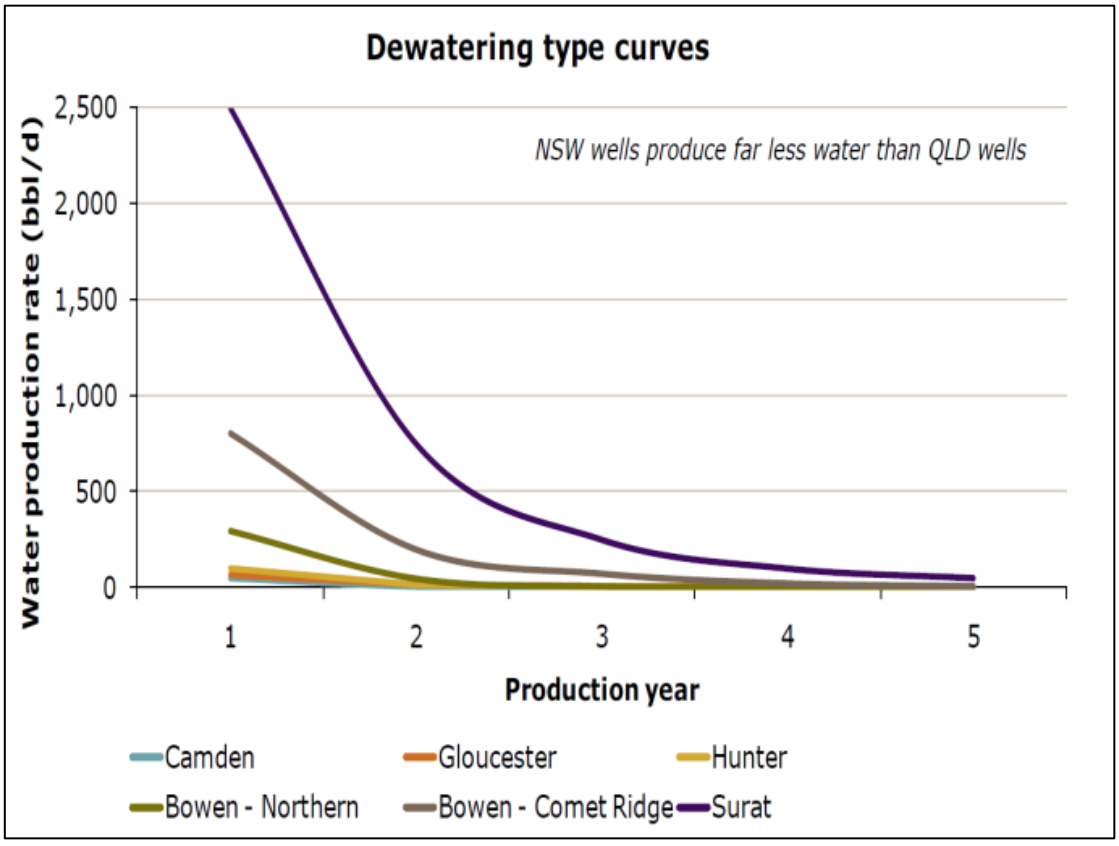

Figure 7: CSG water production by geographic area

About Dart Energy

Dart Energy Limited is an Australian ASX 200 listed company focused on the development of coal seam gas in Australia, as well as in China, India, Indonesia, Vietnam, UK and Europe. The Company was spun off from Arrow Energy Limited in 2010 and has a highly regarded technical and management team.

In Australia, Dart Energy is exploring for CSG opportunities in 7 Petroleum Exploration Licences (Figure 10) and intends to drill about 8 – 12 exploration and pilot (production testing) wells over the coming year.

Dart Energy is fully committed to operational transparency and to working closely with communities, landholders and government to work out how CSG can co-exist with other activities in a way that minimises impact and that is sustainable.

Our position on key issues includes:

- Our wells are double cased with steel and cement to ensure aquifers are fully protected.
- We do not use BTEX as direct additives in our operations.
- We will not use fraccing unless:
  - Deemed acceptable and approved by the authorities; and,
  - There has been adequate community dialogue.

Figure 8: typical exploration drilling site

Figure 9: well site after rehabilitation

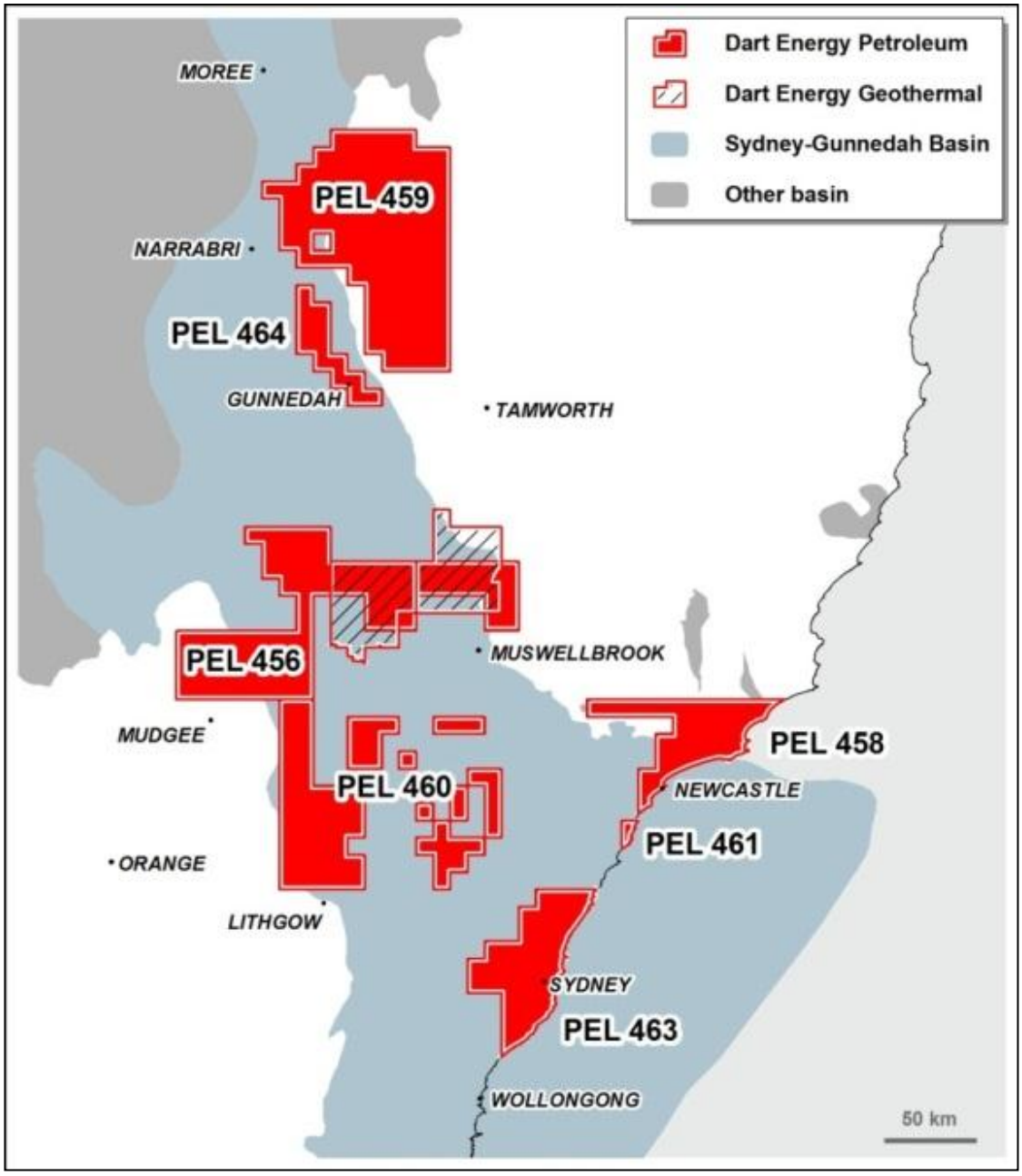

Figure 10: Dart Energy license areas in New South Wales

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