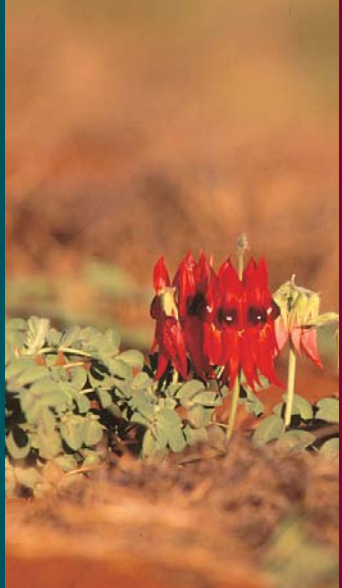




the **australian**
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Natural gas provides usable energy to the Australian economy in two ways. First, gas can be used directly in the home, business or factory as a source of heat. Second, gas can be used to power boilers and turbines in power stations, generating electricity that can be used for a range of purposes.

Currently in Australia, while the proportions vary widely between the states, approximately 70% of natural gas is used for direct applications and 30% is used for electricity generation.

Gas Fired Electricity Generation in Australia

In 2007/08, 381 PJ of natural gas was used to generate electricity,; accounting for 19% of Australia's total electricity capacity.¹

The Australia Bureau of Agriculture and Resource Economics predicts that within 2 decades, natural gas will be the largest contributor to Australia's electricity generation, accounting for 37% of total electricity generation by 2029/30.

Attention on emissions intensity of our energy is already leading to a significant increase in the use of gas fired electricity generation in Australia²:

- In the 18 months to April 2010, 11 of the 24 completed electricity generation projects in Australia were gas fired. These 11 gas fired power stations accounted for 73% of the total new capacity built in Australia, 3,530MW out of a total 4,864MW .
- Of the 15 advanced electricity generation projects in April 2010, gas fired projects accounted for 57% or 1,531MW of the total 2657MW capacity of these advanced projects.
- Of the 127 less advanced projects, gas fired projects are the largest contributor, accounting for 37% or 10,813MW of the total potential capacity.

How does it work?

Gas can be used to produce electricity in specially designed thermal power stations. In thermal power stations, electricity is produced by using a heat engine to transfer the thermal energy of the fuel, usually by burning it (known as combustion) into rotational energy of a turbine. The turbine makes use of electromagnetic forces to produce electricity.

Gas is used in three different types of thermal power stations.

Gas as a fuel in steam turbine power stations

In steam turbine power stations, the heat engine is essentially a large boiler, where the fuel is combusted to heat water, producing steam which is allowed to build up pressure before being used to drive the turbines. This is known as a steam turbine generator. Almost all coal, nuclear, solar thermal and geothermal power stations utilise steam turbines, and natural gas is also used as a fuel for this type of power station.

Gas as a fuel in gas turbine power stations

In thermal power stations where natural gas is the fuel, the natural gas itself can be used to drive the turbines. These power stations are called combustion or gas turbine power stations.

¹ ABARE Energy in Australia 2009

² ABARE Electricity Generation – Major Development Projects April 2010

Open Cycle Gas Turbine

In an open cycle gas power station, instead of burning gas to heat water and produce steam to drive a steam turbine, the natural gas itself is combined with air and ignited. The combustion of the gas produces a higher temperature, higher pressure and higher velocity stream of gas. This gas is directed through a nozzle onto a turbine, spinning it and producing electricity.

The primary advantage of open cycle gas power stations is their ability to be turned on and off within minutes, supplying power during peak demand. They are usually used as peaking power stations, which operate anywhere from several hours per day to a few dozen hours per year, when electricity demand is at its greatest (for example on the hottest days of the year when many air conditioners are running concurrently).

Combined Cycle Gas Turbine

In a combined cycle gas turbine (CCGT) power station, a gas turbine generator generates electricity as in an open cycle gas power station and the heat from the exhaust is used to make steam to generate additional electricity via a steam turbine as in a steam turbine power station; this extra step enhances the efficiency of electricity generation.

In fact, CCGT power stations have the highest thermal efficiency of any fossil fuel power stations. Combined with the lower carbon intensity of natural gas, when compared to other fossil fuels, electricity produced from CCGT power stations is the cleanest of all fossil fuel power sources.

Electricity from Natural Gas and the Future

Natural gas is the cleanest fossil fuel energy source available. When used in electricity generation, a natural gas fired power station has around 40% of the carbon dioxide emissions of a black coal power station and less than 33% the emissions of a brown coal power station. Gas fired power stations also use around 1/6th of the water required for the most efficient coal fired power stations and emit little or no other pollutants or particulates..

Gas has a strong role to play in electricity generation into the future. Even when Australia's primary source of electricity is from renewable sources, gas will retain a significant role as the ideal back-up when weather conditions are less than ideal and during times of peak demand. Unlike coal fired power stations, natural gas power stations can be quickly turned on and off to provide power as demand and supply factors vary.

There are even complimentary generation opportunities. There are several projects under consideration in Australia that seek to use solar and gas combinations to generate electricity. In these projects solar energy provides the initial heat, and gas is used to achieve the high temperatures that increase generation efficiency. One such project is Transfield's proposal to convert the Collinsville coal-fired power station in Queensland into a 150MW solar thermal linear Fresnel power plant, currently on the Federal Government's Solar Flagships shortlist.

Observations

- Gas fired electricity utilises mature technology to provide competitively priced, low emission electricity to the economy and has the characteristics necessary to drive Australia's emissions reductions.
- Current Federal and State government energy initiatives are focussed on almost every source of energy except gas. The only gas-centric energy policy is the Queensland government's Gas Scheme, which will require 18% of the state's electricity to come from gas by 2020.
- Many government energy initiatives involve 'picking winners', funding specific projects in certain locations. These projects should not be funded at the expense of existing or economic gas projects that attract private investment.
- The Federal Government has currently committed \$10billion to renewable and CCS initiatives, which have no articulated emissions reductions goals. If \$10billion was spent on building new gas fired power stations, Australia could reduce its emissions by at least 8%.
- As gas becomes the largest provider of electricity in Australia over the next two decades, gas transmission and electricity transmission infrastructure options will come into increasing competition. Policy makers need to ensure the right frameworks are in place so that the two options are competing on a level playing field and that investment decisions are made in an economically rational manner.

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