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Economic Issues is a series of reports published by the South Australian Centre for Economic Studies, as part of the Centre's Corporate Membership Program. The scope of *Economic Issues* is intended to be broad, limited only to topical, applied economic issues of relevance to South Australia and Australia. Within this scope, the intention is to focus on key economic issues — public policy issues, economic trends, economic events — and present an authoritative, expert analysis which contributes to both public understanding and public debate. *Economic Issues* is published on a continuing basis, as topics present themselves and as resources allow.

This issue presents an overview of the current situation with respect to the development of the massive Timor Sea natural gas reserves. It is a paper which is of general interest, but with particular relevance to the future development of the Northern Territory. In addition, the major projects likely to be associated with the development of the Timor Sea natural gas reserves will also have broader significance for the Australian economy as a whole.

The author of this paper is Mr Andrew Symon. Andrew Symon is a Research Associate of the SA Centre for Economic Studies. He is a journalist and economic analyst working in South East Asia, currently based in Singapore, now working for the UK-based energy analysis group Petroleum Argus, as editor of its *Asia Pacific Gas and Power* Report. Andrew has worked throughout East Asia since 1992, as editor of various newsletters and on projects ranging from Asian Development Bank funded government policy planning projects to industry surveys and market studies for private companies. His work focuses on energy issues, infrastructure development, and the business and public policy issues associated with the provision of primary infrastructure. Andrew is an honours graduate in history and economics from the University of Adelaide.

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Kevin Kirchner
Editor
28 August, 2001

Timor Sea Natural Gas Development: Still In Embryo

Summary

Some 20 trillion cubic feet (Tcf) of natural gas reserves have been identified in sedimentary basins in the Timor Sea, making it potentially one of the world's major gas producing provinces. Petroleum liquids — oil and condensates — have also been found in the region. An array of natural gas projects, requiring total investment of several billion dollars, are planned and proposed by major foreign and Australian owned companies to harness these reserves.

This paper provides a description of the extent of the reserves in the Timor Sea and of the various projects currently planned or proposed.

Development of the Timor Sea gas reserves is, however, at an embryonic stage. Plans are ambitious and their progress to reality is likely to take several years, at least.

Nevertheless, world demand for natural gas over the long term is expected to be strong and sustained, so that the prospect of major investment in the Timor Sea proceeding is high.

The scale of the possible development is such that it is likely to have a major impact on the economy of the Northern Territory, while also contributing significantly to the growth of the Australian economy.

1. Overview

An array of natural gas projects requiring total investment of several billion dollars are planned and proposed by major foreign and Australian owned companies to harness the abundant natural gas reserves in the Timor Sea between northern Australia and East Timor.

Planned projects and proposals include a natural gas liquefaction (LNG) plant and a methanol plant in Darwin or its surrounds; an offshore “floating” LNG plant (a proposal in competition with the onshore LNG plant); power generation facilities using gas as fuel for local grid consumption; dedicated power generation for an alumina refinery plant; and long distance pipelines to take gas to markets in southern and eastern Australia.

The gas reserves that would support these projects lie in both purely Australian waters and also in an area subject to overlapping territorial claims by Australia and the new state of East Timor. Uncertainty over the resolution of these claims and the fiscal regime that will apply to companies in this contested area has hindered project planning and continues to do so (see part 2).

Development of the Timor Sea gas reserves is at an embryonic stage. Plans are ambitious and their progress to reality is likely to take several years, at best. Apart from the immediate uncertainty created by the recently expressed desire of East Timor to review company tax arrangements in the common maritime zone jointly administered with Australia, the economics of natural gas commercialisation are also an obstacle to speedy development. Natural gas reserves are far more difficult to commercialise than oil and condensates if there is no downstream infrastructure already in place. Whereas petroleum liquids can be sold directly into the market (as can coal), with producers taking market prices, natural gas producers have no ready market without first putting in place the large scale infrastructure necessary to transport and process the gas.

Nevertheless, long term demand for gas should be strong and sustained. There should be confidence that commercialisation of Timor Sea gas reserves ultimately will go ahead. Planning should allow a five to ten year time frame for development (see part 6).

2. East Timor and Australia

Jurisdiction is shared.

Jurisdiction over a large area in the Timor Sea, rich in oil and gas resources, is shared by Australia and the new state of East Timor as a result of the absence of a previous agreement for an absolute maritime border between the two countries. Until the end of Indonesian rule of East Timor in 1999 the maritime boundaries question was determined between Australian and Indonesia. Australia and Indonesia had agreed to a joint development approach for the area and in 1989 signed a treaty to govern petroleum exploration and production in the

Timor Gap. This divided the area into three zones: one nearest East Timor, administered entirely by Indonesia; one zone nearest Australia, administered by Australia; and a middle, and largest zone, administered jointly by the two governments, with revenue share divided between the two.

The establishment of an independent East Timor means new treaty arrangements ...

The end of Indonesian rule in 1999 and the establishment of an independent East Timor meant that a new treaty was needed for the zone. Subsequently, East Timor, under its provisional United Nations supported government, argued that the boundaries in the old treaty were unjust, effectively giving Australia too generous a share of the contested area.

... which have affected development plans.

New treaty arrangements were agreed in July 2001. These new arrangements appear to leave the area divisions as before, but with East Timor replacing Indonesia and providing for a different government revenue share between Australia and East Timor. Government revenue shares in the area jointly administered by the two countries are now to be split 90 per cent for East Timor and 10 per cent for Australia. However, the UN Transitional East Timor Government says there is still the possibility that East Timor may also seek to levy a heavier fiscal regime on companies operating in its jurisdiction and in the joint area, than what existed under the old treaty.

In early August 2001, partners in the key Bayu Undan upstream gas project — which had been expected to supply the initial gas for various downstream projects and also be the trigger for the development of other fields which would supply additional gas over the longer term — announced that they were deferring development until the company tax requirement was known. Bayu Undan operator, Phillips Petroleum of the US, said that the partners had decided to “defer indefinitely an investment commitment in a US\$500 million subsea pipeline proposed to transport natural gas from the Bayu Undan field to Darwin.” The decision to defer reflected the need to resolve “certain critical legal, fiscal and taxation issues ... arising from the Timor Sea Arrangement entered into between the governments of Australia and East Timor.”

One of the key reasons why East Timor may be motivated to get a higher take from the companies at the upstream stage of production is because all of the processing of the gas and higher value added activity is planned to take place in Australia. Although some of the major fields may be closer to East Timor, all gas must be processed in Australia because of a deep-sea trough on the East Timor side of the Timor Gap zone, which makes it technologically not possible, at least currently, to pipe gas to East Timor.

The tax situation is not likely to become clear for several months, as Timor's decision-making structure is now in limbo. The East Timorese go to the polls on August 30 to elect their first government, which will replace the United Nations provisional administration that has run the new state since Indonesian rule ended at the end of 1999. Hence, any further negotiation between Australia and East Timor, and with the companies, most await the creation of the new East Timor government.

3. Reserves

3.1 Natural Gas Reserves

Natural gas reserves are massive.

Some 20 trillion cubic feet (Tcf) of natural gas reserves have been identified in sedimentary basins in the Timor Sea, making it potentially one of the world's major gas producing provinces. Petroleum liquids — oil and condensates — have also been found in the region, but natural gas appears the most abundant resource.

The major gas and condensate fields include:

- **Bayu-Undan field** - located about 500 km northwest of Darwin and 250 km south of Suai in East Timor. The field is in the middle of the zone of co-operation between Australia and East Timor and has proven plus probable reserves of 3.4 Tcf of gas and 400 million barrels (mmbbl) of liquid hydrocarbons (liquid petroleum gas and condensates). The field is operated by Phillips Petroleum of the US. Partners in the venture are Phillips (50.3 per cent), Santos (11.8 per cent), Inpex (11.7 per cent), Kerr-McKee (11.2 per cent), Petroz (8.3 per cent) and Agip (6.7 per cent).

Development of a first stage of production which is focused on the recovery of liquids is now underway. Commercial production is scheduled to commence in early 2004, with daily production expected to peak at 110,000 barrels of condensate and LPG. Capital expenditure for the liquids stripping phase of development is estimated at US\$1.5 billion and facilities to produce up to 750 million cubic feet per day (mmcf) of gas by pipeline are included in the design. The decision to defer the natural gas development phase (see discussion of part 2 above) does not affect the condensate production phase.

- **Greater Sunrise fields (Sunrise, Sunset, Troubadour and Loxton Shoals)** – located about 500 km north west of Darwin and 200 km north east of Bayu Undan. About 20 per cent of these fields are located within the Australia-East Timor zone of co-operation. The fields have proven plus probable reserves of at least 8.8 Tcf of natural gas and 300 mm bbl of condensate. These fields are operated by Woodside Energy, with partners in the development being Woodside (33.44 per cent), Royal Dutch/

Shell, Phillips Petroleum (30 per cent), Royal Dutch/Shell (26.56 per cent), and Osaka Gas (10 per cent).

- **Evans Shoal field** - located 300 km north of Darwin and 160 km south east of the Greater Sunrise area in Australian waters. There are believed to be reserves of at least 6.6 Tcf of gas and 31 mm bbl of condensate. The field is operated by Royal Dutch/Shell. Partners in the development are Shell (50 per cent), Santos (40 per cent) and Osaka Gas (10 per cent).
- **Petrel/Tern fields** - located in the Bonaparte Basin, 255 km west of Darwin in Australian waters. There are believed to be reserves of at least 1.5 Tcf of natural gas. The fields are operated by Santos, who have a 95 per cent interest in the Petrel field and a 100 per cent interest in the Tern field.

3.2 Crude Oil Reserves

Oil is also found and produced in the Timor Sea. Fields include the 145,000 barrels per day (b/d) Laminaria and Corallina oil fields, 550km west-north-west of Darwin and 160km south of Timor, operated by Woodside; BHP-Billiton's 45,000 b/d Buffalo oil field; and BHP-Billiton's Elang Kakatua and Kakatua North oil fields. Prospects for additional production appear good. Recently, Cultus, the Australian subsidiary of Australian energy company OMV, discovered oil 20km in Australian waters northeast of the Tenacious oilfield. Strong flows were reported from its Audacious-1 well.

4. Co-operative vs Competitive Development

*Development strategies
continue to unfold ...*

Timor Sea gas development plans and proposals feature both competition and co-operation between the lead companies.

In November 2000, Woodside and Phillips announced that Greater Sunrise and Bayu Undan were to be developed co-operatively, after Woodside transferred equity to Phillips, raising its stake to 30 per cent. Prior to this, Woodside and Shell formed an unincorporated venture in 1997, the North Australian Gas Venture (NAGV), to co-operate in the development of Greater Sunrise and Evans Shoals. The Woodside Phillips agreement was made at the time of Shell's attempt to takeover Woodside, a bid that was rejected by the Federal Government in April 2001 as being contrary to the national interest. Some viewed Woodside's agreement with Phillips as cutting against its understanding with Shell.

One recent factor which suggests that there remains a fine balance between competition and co-operation in gas development was an announcement by Shell in August 2001 of an LNG plant proposal that appears to compete with Phillips' earlier proposal. Shell's announcement came soon after Phillips said that it had "indefinitely

deferred” the natural gas development phase of its Bayu Undan project because of uncertainty over the company tax regime that will be imposed in the joint development zone under the new treaty between Australia and East Timor.

5. Downstream Gas Processing and Transport Plans

The following projects are being put forward to commercialise Timor Sea gas:

Major projects already planned or proposed include ...

- **Phillips LNG onshore plant** – Phillips of the US proposes an onshore natural gas liquefaction plant near Darwin producing about 5 million tonnes per year (mt/yr). Such a liquefaction plant would cost of the order of US\$2 billion dollars. This does not take into account upstream development costs, costs of shipping, and consumers’ receival terminals. The aim is to supply LNG to US West Coast and Mexican markets, an opportunity created by the current and expected to be continuing high gas prices from US and Canadian fields. Phillips signed a letter of intent (LOI) in March 2001 with US downstream gas and power supply company El Paso, to supply 4.8 mt/yr of LNG to Southern California and Mexico’s Baja California peninsula. The LOI proposes that sales begin in 2005. Upstream gas supply – 650 mmcf/d of gas is needed for the LNG output - would initially come from the Phillips operated Bayu Undan fields. Longer run supply would come from the more abundant Sunrise fields, operated by Woodside, and where Phillips is a partner.
- **Royal Dutch/Shell LNG offshore plant** - Shell announced in August 2001 its proposal for what would be the world's first floating liquefied natural gas (FLNG) plant. This would be associated with the development of the Greater Sunrise gas fields in the Timor Sea. The facility would be located offshore on a barge, close to the proposed Sunrise drilling platform. Shell has not indicated costs. It says that as well as manufacturing LNG the barge offers the option of compressing gas for delivery by pipeline to Darwin. This would support the development of new industries in the Darwin area and provide for the longer-term supply of gas to customers in the eastern states of Australia.
- **Methanex methanol plant** - Canadian company Methanex proposes a US\$780 million export oriented 2 mt/yr methanol plant near Darwin using natural gas as a feedstock. This plant would likely in the longer term replace the Methanex facility in New Zealand. The latter now serves Asia Pacific markets, but declining gas reserves at this locality are forcing Methanex, the world’s largest producer of methanol, to look for a new site. Methanex signed a letter of intent in March 2000 with Woodside

and Shell to take 290 mmcf/d of gas from their NAGU venture. A target date for plant operation is 2005.

- **Nabalco alumina refinery** - Gas sales are proposed to the already operating Nabalco alumina refinery at Nhulunbuy on Gove Peninsular for the plant's power generation. Current bauxite reserves are expected to last until 2030.
- **Northern Territory Power and Water Authority** – Gas sales are proposed for power generation.
- **Transmission pipeline to southern and eastern Australian domestic markets** – Rival proposals have been put forward for long distance domestic transmission pipelines by Epic Energy (a joint venture between El Paso and Dominion Resources of the US and investment arms of AMP, Deutsche Bank, and Hastings Fund), and Australian Pipeline Trust (a joint venture between Australian Gas Light and Petronas, Malaysia's state oil and gas company).

Epic Energy entered into an alliance in 1999 with Phillips Petroleum to pursue development of a US\$1 billion, 2,200 km pipeline to take gas from the Timor Sea to Moomba in central Australia. At Moomba the new pipeline would connect to the existing pipeline network to New South Wales, Victoria and South Australia. There is also the possibility of a spur line to Queensland. An indicative date of 2004 has been set for pipeline operation, with construction taking about 18 months.

Australian Pipeline Trust proposes a similar route and also a possible spur to Queensland. Already it operates a pipeline in the Northern Territory, which takes gas from the Amadeus Basin in central Australia northwards for mainly power generation in Darwin. The company says this pipeline could be developed as a north south conduit for Timor Sea gas.

The possible Queensland spurs for Timor Sea gas proposed by each of these groups challenges plans by a group led by Exxon Mobil, for a major long distance gas pipeline from Papua New Guinea to eastern coast Queensland, down to Brisbane and possibly beyond. This project has been in planning for several years but has fallen well behind earlier timetables.

Supply to Queensland is also being pursued by Woodside from the Greater Sunrise fields. In May 2001 Woodside and Shell signed a letter of intent for a 20-year supply of up to 50 mmcf/d of gas for QNI's Yabulu nickel and cobalt refinery at Townsville. The gas would be used for power generation and processing feedstock. QNI is owned by BHP-Billiton.

6. Conclusions

Development is at an embryonic stage.

Development of the Timor Sea's gas reserves are at an embryonic stage. Plans are ambitious, with their progress to reality likely to take several years at least. Although a number of proposals have target operation dates of around 2005, a more sensible time frame for government policy planning (and associated business investment) might be 2010. Apart from the immediate uncertainty created as a result of the emergence of the new state of East Timor and its desire to review company tax arrangements in the common maritime zone jointly administered with Australia, the economics of natural gas commercialisation are an obstacle to speedy development.

The challenges to realizing development are significant.

Natural gas reserves are far more difficult to commercialise than oil and condensates if there is no downstream infrastructure already in place. Whereas petroleum liquids can be sold directly into the market, with producers taking market prices, natural gas producers first need to put in place the infrastructure to transport and process the gas. Gas markets must be created. The extended time it can take to commercialise a gas discovery is underlined by the fact that gas was first found in the Greater Sunrise area in 1974 by Woodside. Prior to development long term gas supply contracts must be secured, in order to ensure sufficient economic scale of operation and thereby give companies and financing agencies confidence to make the large, long term investment necessary. Gas supply negotiations can be a lengthy process. Natural gas project development can take many years before operations begin.

Once infrastructure is in place, additional supply can, however, be introduced far more quickly and simply. Ultimately, with many sellers and buyers, true market conditions and shorter term or spot natural gas trade may develop. Such a process is beginning to develop in the southern and eastern Australian gas markets. Initiatives since the mid 1990s at Federal and State government level to create a liberalized and integrated gas (and electricity) supply system out of the formerly discrete State based systems, has the potential to result in a large scale, competitive domestic gas and electricity system, whereby producers can readily commercialise fields and sell into the market.

The obstacle created by the need for large upfront investment to be in place before new development can begin holds for projects aimed at both domestic supply and also for LNG processing for export markets.

In particular, LNG is a very high capital cost process, requiring, *inter alia*, supply plant, ships and receiving terminals. LNG processing becomes economic over simple pipeline supply of natural gas once the pipeline distance from field to consumer becomes too great. Construction of new LNG plants in the past have not begun until there have been firm contracts for at least a large proportion of plant output in place, because of the need to guarantee plant finance.

LNG demand is expected to grow significantly from Japan, South Korea and Taiwan, the traditional markets for LNG from Australia (from the existing North West Shelf facility in Western Australia) and from other areas in South East Asia (Indonesia, Malaysia and Brunei). Potentially large markets are also emerging in China and India. The US West Coast also has suddenly become a prospective market as a result of its recent high domestic gas prices and power shortages. This situation though may yet prove to be a short term one.

Competition for new contracts to traditional and new Asian markets is intense, however. The proposed Darwin LNG plants face competition from plants in Malaysia, Indonesia, Brunei, the Russian Far East (Sakhalin), and also from low cost suppliers in the Middle East in Qatar and Oman. Possible demand from the US West Coast is also generating LNG plant proposals on the west coast of South America.

Natural gas is, nevertheless, an attractive proposition over the long term. Once infrastructure is in place then the economics of natural gas make it a very competitive energy source for power generation, industrial heating and residential use, and often (but not always) competitive as a feedstock in the petrochemical and fertilizer industries. In addition, natural gas has desirable environmental qualities, namely, low carbon dioxide and nitrous oxide and sulphur emissions compared with oil and coal.

There is good reason to be confident that commercialisation of Timor Sea gas reserves ultimately will go ahead.

