

Presentation to Engineers Australia
8 May 2014

“A Prospective Approach To Engineering
Employment”

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Introduction

Federal Government is injecting \$50 billion into Infrastructure projects comprising Freeways, Highways, Rail and Public Works. Creates 50,000 construction jobs following the sum of 2014 actual and forecasted loss by 2017 of 150,000 construction and operation jobs in Mining, Refinery, LNG, Heavy Industrial and Manufacturing.

At the same time the domestic natural gas industry is compounding the many issues being imposed on community and industry alike of the above job loss by increasing NG supply prices and by avoiding sign off of long term surety of supply contracts with power generators and heavy industry.

NG supply owners are increasing supply prices of domestic natural gas to distributors by 200%. This supply action enables NG reserve suppliers to achieve "parity pricing" with NG exported as LNG.

The 50/50 split between supply and pipe-grid distribution costs of NG to domestic users , increases the final sale price of distributed NG to users by 50 %.

This magnitude of price hike of NG to domestic users and industry at times of high unemployment in the major works construction sector is depressing news for all. As even without NG price hikes, Industry is reeling from the sum of cost impacts from exchange rates, carbon tax, labour, and the 20% RES targets (Renewable Energy Scheme.) NG price hikes have and are leading to further heavy industries closing or industry not starting up in Australia in the first place.

Industry closures and reduced start ups, grid input from residential Solar PV and Wind Turbines, have reduced demand for electricity to an extent that is causing generators to further increase their prices to cover fixed costs, and causing generators to use low cost high CO2 coal.

NG suppliers are increasingly reluctant to sign off on surety of long term supply of domestic NG contracts to generators, as they now favour selling their NG to LNG exporters at higher prices. Generators are in turn preferring to use coal, as coal has no issues with signing off on long term supply contracts.

As 35% of Australia's electricity is produced by NG powered generators, these power station conversions away from the use of low CO2 high cost NG to high CO2 low cost coal, are of concern in relation to climate change issues. That is, higher domestic NG prices are ruling out power generators from switching from coal to NG and are encouraging major power generators already using gas to switch to coal, as has recently occurred in Qld.

Existing NG Pipe Grid Obstructs Eastern States from Accessing Major NG reserves in WA

Some 24,000 km of NG pipe grid Australia wide has been constructed since 1976 by the NG industry using private funding. The design over 44 years has been well intentioned but in 2014 it represents a system of NG supply and distribution that is now close to ruinous commercially for the 19 million residents, major industries, power generators alike that reside in Australia's Eastern States of NSW, ACT, SA, QLD, VIC, TAS.

The NG industry use of random timelines and restricted scopes for construction of Australia's NG works in the Eastern states over the 44 years has ensured that Eastern States with its major population of 19 million and major industries are restricted to obtaining their NG supplies from owners of the VIC Gippsland, Bass, Ottway offshore NG basin and the SA Amadeus onshore basin. Reserves that represent 15342 PJ.

That is, reserves made available by NG industry design for Eastern states that are only 11% of the total reserves in Australia's massive reserves of NG of 135,289 PJ.

The VIC Gippsland, Bass, Ottway and Amadeus reserve pressures and flow rates are predicted however to decline at increased rates from 2020, unless further development by the NG industry averts this situation. These reserves made accessible by Eastern states have been progressively drawn down following 44 years of usage.

Eastern states since 1976 have been obstructed by a NG pipe grid network that obstructs their access to the massive reserves of NG that reside in the major WA West coast Carnarvon basin (67,289 PJ) and Browse basin (20,733 PJ) in particular. Eastern states access is also currently blocked to the NT Bonaparte basin (31825 PJ).

Access by Eastern states to either of these WA basins by way of the mega project Transcontinental Natural Gas pipeline Dampier to Perth solves all "surety of long term supply concerns", dramatically opens up for Eastern States "significant increased choice of NG reserve for supply", choice of supply increases that increase the possibility of satisfactory price negotiation outcomes by Eastern states with NG reserve owners.

NG reserve owners in VIC and SA are preferring to sell their domestic natural gas reserves to LNG exporters in QLD at the expense of Eastern States domestic NG users. NG reserve owners in VIC and SA are raising prices of domestic NG supply to distributors to suit parity pricing with LNG and are deferring from signing off with Industry and domestic users alike, long term surety of supply contracts.

Eastern states with a 19 million population and many major industries, require access to a natural gas supply and distribution system, pricing structure and surety of long term supply, that is far superior than is currently being provided and/or planned by NG reserve and distribution owners for supply of NG to the Eastern States.

For example, NG reserve owners are reviewing the feasibility of using further local "band aid solutions" to Eastern states NG supply and pricing issues. Solutions that would for \$1.5 billion enable Eastern states to access the large NT Bonaparte reserves to add to the declining Amadeus and Gippsland reserves but not to the vast WA Carnarvon and Browse reserves. To obtain a net increase in flow, however, to each of the Eastern State cities from the NT Bonaparte basin through the existing complex pipe grids requires a reversal of **flow**

to occur in some large sections of the existing Eastern states grids. Resulting in reduced flow rates and pressures in several main areas that would require complex control system updates on demand and basically result in a totally unnecessarily complex system to operate.

Also being reviewed by the NG industry are projects to extract NG from Shale and Coal deposits in NSW and SA for use by Eastern states. Use of these types of projects with all their attached issues of potential contamination of water table supplies, access for thousands of wells and pipe gathering sets and political issues, is unnecessary if the TCNGL is constructed .

QLD has committed its total Coal seam gas reserves to LNG exporters and, in fact, requires the Amadeus NG basin reserve owners and the VIC Gippsland NG reserve owners, even with their relatively low reserves of NG, to commit to on demand topping up the Queensland LNG refineries at Gladstone with NG during times of decreased supply of coal seam gas to the LNG refineries. A further totally absurd situation that undermines industry and power generator confidence alike to obtain surety of long term supply contacts from NG reserve owners.

The construction of the mega sized Trans Continental Pipeline, Dampier to Moomba with less control complexity, less technical and political issues than the above options, is recommended to assist not only in creation of several thousands of construction jobs over five years but also in enabling a long term future for Australia in return of manufacturing and heavy industry.

Background

Loss of 150,000 jobs from 2012 to 2017 are occurring from closure of all vehicle manufacturing, heavy industry plant closures, major price hikes made by domestic Natural Gas supply owners, from major price hikes by Electricity supply generators who use domestic NG for generation of 35% of Australia's power needs and from the progressive completion of a record \$400 billion of Mining and LPG refinery mega projects with no follow on mega projects being planned to proceed in the near future in mining and LNG.

NG supply owners have created large price hikes by preferring to supply their NG to refineries for export as LNG at international prices. Supply Prices which are 200% higher than current and after addition of pipework distribution costs are 50% higher than current domestic NG prices sale price. The outcome being that:

Firstly, NG supply owners, when they do supply NG to domestic users, require residential, industrial and manufacturing users alike, to pay parity pricing with LNG.

And, secondly, from NG supply owners increasingly refusing to agree to offer long term surety of supply of domestic NG for residential, industry and manufacturing use. A business operating philosophy that is destroying Australia's ability to retain and attract businesses that are high energy consumers.

Adverse outcomes from the above closures and severe price hikes are obstructing Australia's ability to generate high numbers of value adding projects and technology based jobs but are obstructing our ability to make maximum possible "domestic" use of our vast

reserves of low CO2 Natural Gas, in turn enabling the progressive illogical return by Australia to the use of high CO2 low cost coal for energy generation.

RECOMMENDATIONS

Cease using “band aid” solutions for Eastern States NG supply and pricing issues. Instead, solve Eastern States long term NG surety of supply issues by construction of a single “mega project”, being the 3000 KM long Transcontinental Natural Gas Pipeline Dampier WA to Moomba SA. The TCNGL at the WA Dampier end to have a new domestic NG treatment plant for treatment of NG from the Carnarvon and/or Browse basins as required.

TCNGL to include an allowance for an extension to the NT grid at Palm Valley, to enable if and when required, addition of the NT Bonaparte reserves to the WA Carnarvon and VIC reserves.

TCNGP enables Eastern states 19 million population and industry to achieve improved negotiation weight with NG suppliers, from increased choice of accessible reserves to obtain long term surety of supply, stabilized and fair pricing for Eastern states.

Construction of Mega Scale Industrial Projects with the TCNGL project

Construction of Industrial mega projects works are recommended to create additional jobs and to enable a return on investment for the TCNGP construction capex.

- A 400 MW Solar Thermal Power Station at Whyalla based on the successful Ivanpah design constructed in 2014 at Nevada USA \$2.2 billion
- Back up NG supply from the TCNGL to enable continuous operation of the Solar power station. \$ 0.1 billion
- “Giga Sized” factory complex at Whyalla, 1000 m x 500 m to manufacture large quantities for export at 30% reduced cost of Tesla USA designed electric vehicle battery packs for electric vehicle use worldwide, recharging stations, and for industry power storage. Factory powered by Solar Thermal PS and NG back up \$2.5 billion. Factory will use the rare elements of Lithium and Graphite mined in Australia for added value of Lithium Ion battery manufacture, rather than exporting to elements to China as current for Electric Vehicle Use
- Mega sized factory complex for ‘Google Cloud Data Farm’ plus 100 MW Solar Thermal PS \$1.7 Billion Similar to Oregon USA complex
- Mega sized Natural gas to Liquids Complex - \$ 1 billion
- Mega sized Urea Fertilizer complex using NG as feed - \$ 1.5 billion
- Conversion of the two coal fired power stations at Whyalla to NG to suit decline of Leigh Creek Coal mine by 2020 - \$0.1 billion

Total Cost of Industrials	=	\$9.1 billion
Construction Jobs	=	9100

TCNGL Construction Details

The TCNGL following connection to WA Carnarvon basin and the new Dampier Domestic Gas Treatment Plant, traverse below grade for an “effective” 3500 km over the “Great Sandy Desert “ in a SE direction to the Moomba SA pipe hub.

As the direct length of the TNGPL from Dampier to Moomba is 2500 KM, the 1000 km difference includes allowances for:

250 km for offshore well access at the WA Carnarvon basin

250 km for potential route variations from Dampier to Moomba

400 km for a possible branch line connection from the TCNGP to the NT ng pipe grid at the Mereenie reserve in the Amadeus basin (and thus to NT Bonaparte reserves

100 km for access variations at the Moomba Hub.

“All up” costs to date of long distances pipelines in Australia approach \$1.1 to 1.2 million/km, including cost of inline compressor stations at 150 km spacing. An all up “concept” cost of \$ 1.4 million /km has been adopted to allow for added costs associated with the totally isolated “Great Sandy Desert” route. A route requiring significant input of stand alone logistics to support construction.

Pipe supply and construction costs for 3500km @\$1.4 million /km	= \$4.9 billion
Allowance for Offshore connection at Carnarvon facility	= \$0.25 billion
Allowance for New Domestic NG Treatment plant at Dampier	= \$0.15 billion
Allowance for connection at Moomba Pipe Hub	= \$0.05 billion
Total concept cost of TC NGL	= \$5.35 billion.

Adopt \$5.5 billion

An “on site” construction time line at 4 km/day for 3500 km at 288 effective days/year = 3 years. Adopt a 4 year total timeline,

A four (4) year timeline allows for mobilization, demobilization, establishment of to and on site logistics, establishment of local and international pipe supply and fabrication works, local downtimes from logistic access washouts.

At one construction job per \$million of capex, the TCNGL creates 5500 construction jobs over a four (4) year project time line. Importantly It leads to establishing a firm foundation for added value and returns on investment via the TCNGL itself as a distributor of NG from the West Coast to the 19 million population plus heavy industry residing in Eastern Australia.

It also leads to added value from construction of new mega sized projects powered by Solar Thermal Power stations and Natural Gas from the TCNGL and Industry using NG as feed .

FACT SHEETS

Australia's onshore and offshore NG reserves = 135,289 PJ

- **WA Carnarvon (67289 PJ)**, Browse (20719 PJ), Perth (114 PJ) NG reserves.
Total = 88122PJ = 65% of Australia's total reserves
- NT Bonaparte basin reserves (31337 PJ), NT Amadeus (488)
Total = 31825 PJ = 24% of Australia's total reserves
- SA Amadeus/Cooper Eromanga (4898 PJ)
Total = 4898 PJ = 3% of Australia's total reserves
- VIC Ottway (1700 PJ) Bass (376 PJ), Gippsland (8368 PJ)
Total = 10444 PJ = 8% of Australia's total reserves

Conversions

1L	= 0.038 PJ
Mega	= E 6 ;
Giga	= E9;
Terra	= E12;
Peta	= E 15
Joule	=
PJ	= 1.06 X10 ¹⁰ kwh of energy
1 billion m ³	= 38 PJ

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