IFA CROSSROADS ASIA-PACIFIC 2007

Bali, Indonesia
17-19 December 2007

NATURAL GAS AND NITROGEN FERTILIZER PRODUCTION IN INDONESIA – CURRENT SITUATION AND PROSPECT

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1. Introduction

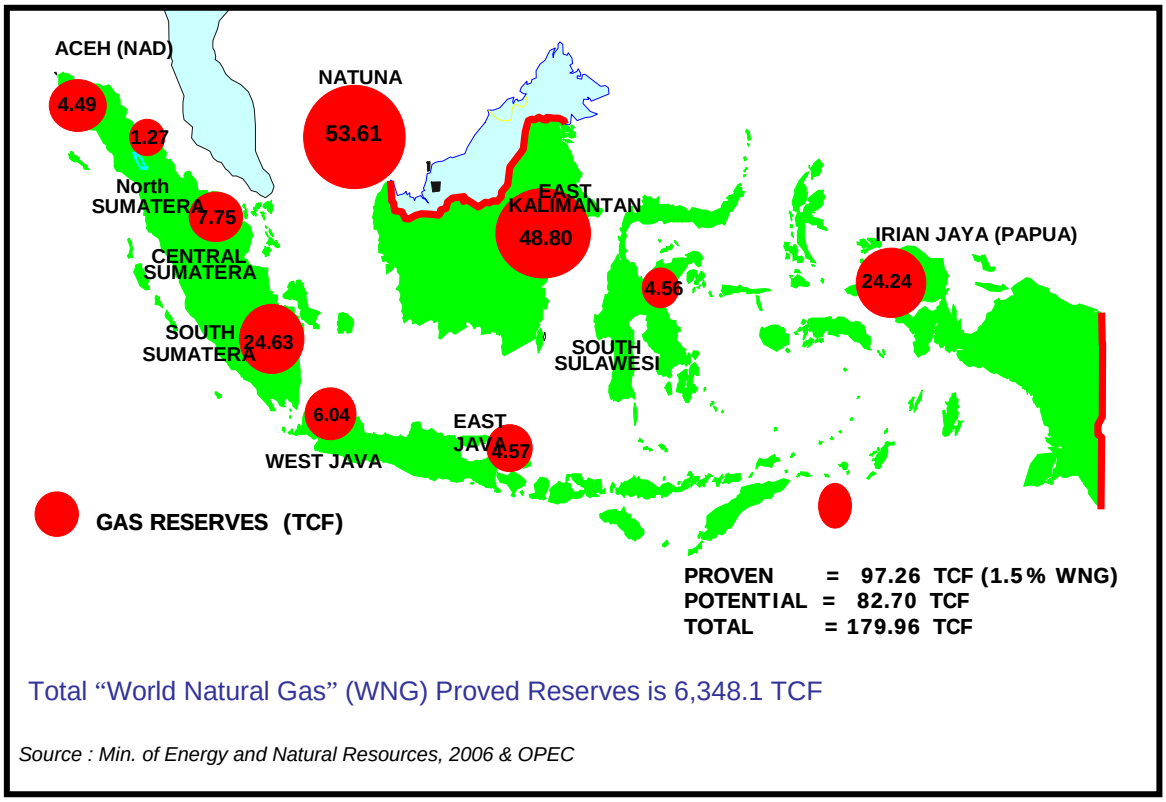
In Indonesia, fertilizer industry has been developing since 1959. It was began with PUSRI I Urea Plant which commenced production in 1963. PT. Pupuk Sriwidjaja (PUSRI) Holding is a state on company which has 14 urea plants, 3 ammonium sulphate plants, 2 SP-36 plants and 1 NPK plant. Indonesian statistics indicators the year 2006 showed that total area of land in Indonesia is 186 million Ha but only 60,8 million Ha or about 33% was used. The growth of GNP between year 2000-2006 is 4,88%. Population in Indonesia is ± 230 million people. This number included worker in agriculture sector which is about 41,9 million people. Food crops area is 22,5 million Ha taking 12% area of total land in Indonesia. This number included paddy field which is about 7,7 million Ha. Plantation area is 19,5 million Ha contents of palm oil, rubber, tea, tobacco, coffee and chocolate taking 10,4% area of total land in Indonesia. The growth of plantation area between year 1995-2005 is 7,69% p.a. The growth of plantation production between year 1995-2005 is 8,69% p.a. The average growth of urea fertilizer between year 1995-2006 is 0,06% p.a.

2. Vision and Mission of PT. Pupuk Sriwidjaja

Vision of PT. Pupuk Sriwidjaja is “To become a world - class company specialized in fertilizer and petrochemical industries as well as technical services through maximization of values for both company and customers satisfaction”. Similar with the vision, **Mission** of PT. Pupuk Sriwidjaja is “To produce and market fertilizers in order to support national food endurance, to produce petrochemical products and technical services in national and global markets emphasizing on overall quality”.

3. Natural Gas Reserves in Indonesia

Feed stock for urea production is mainly from Natural gas. Natural gas reserves in Indonesia is around 179.96 TCF or 2,8% of world’s Natural Gas reserves which is only 54% as a proven reserves. At this time, natural gas produced by 10 provinces of 32 that exist in Indonesia. Map that shown the location of gas reserve could be seen in picture below:

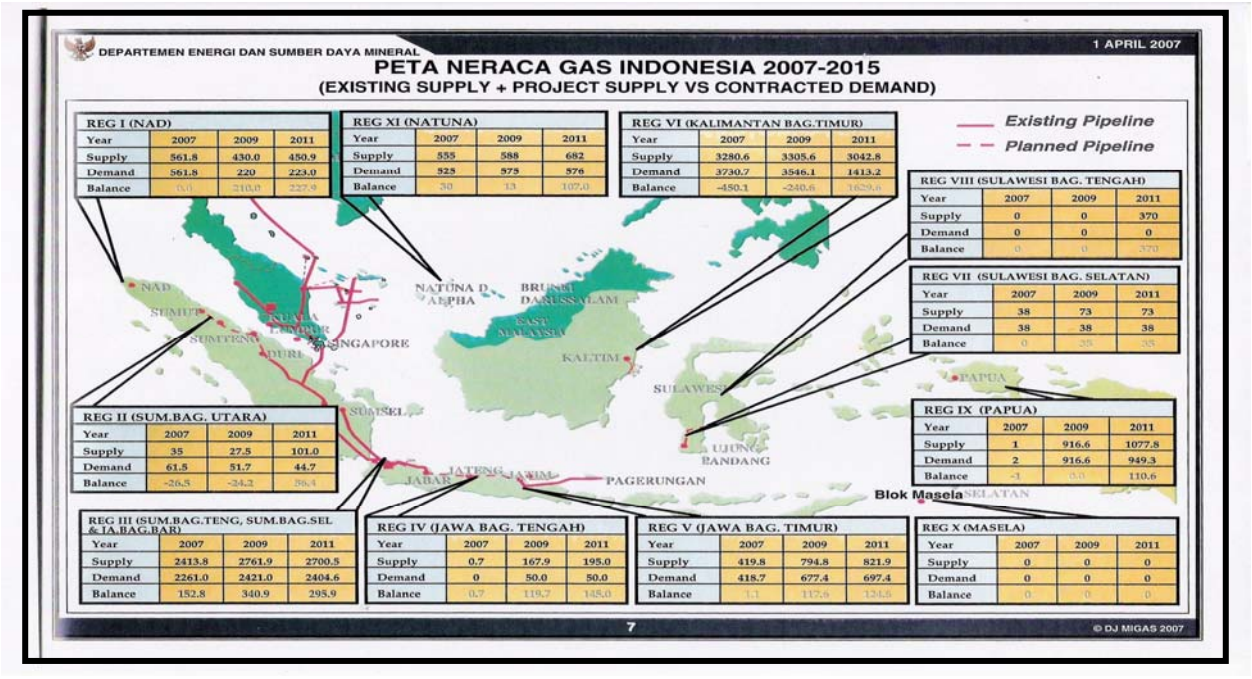


Total "World Natural Gas" (WNG) Proved Reserves is 6,348.1 TCF

Source : Min. of Energy and Natural Resources, 2006 & OPEC

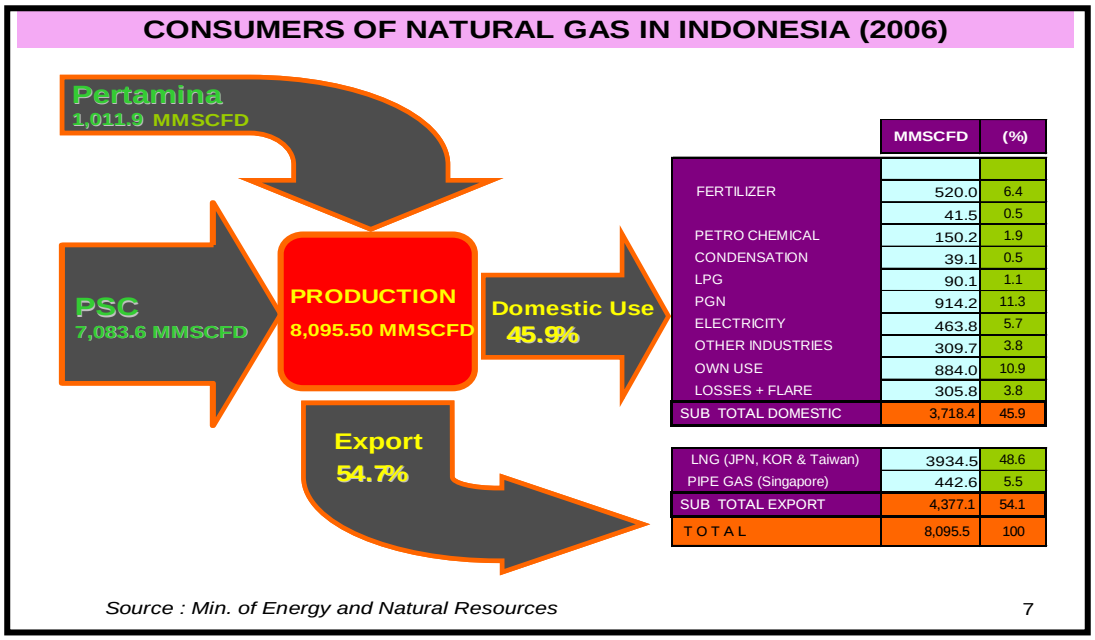
4. Supply Demand of Natural Gas in Indonesia

Based on the chart that show "(existing supply + project supply) versus contracted demand" of the Natural gas in Indonesia, the demand of the Natural gas in certain province is higher than supply. Due to that condition, PUSRI Holding should survive to have allocation of the Natural gas for Indonesian Urea Fertilizer Plants.



5. Consumers of Natural Gas in Indonesia

In the year 2006, natural gas production was around 8.095 MMSCFD. Approximately 12,6% of that production was produced by State Oil and Gas Company (Pertamina). The rest which is around 87,4% was produced by Production Sharing Contract. Domestic used of the natural gas is around 45,9%, which is 6,4% was used as urea fertilizer feed stock. Approximately 54,1% of Natural Gas production are for export, which is 90% was exported as LNG (for Japan, South Korea) and the rest was exported through pipe lines (for Singapore). The picture below shows consumers of natural gas in Indonesia in the year 2006.



	MMSCFD	(%)
FERTILIZER	520.0	6.4
	41.5	0.5
PETRO CHEMICAL	150.2	1.9
CONDENSATION	39.1	0.5
LPG	90.1	1.1
PGN	914.2	11.3
ELECTRICITY	463.8	5.7
OTHER INDUSTRIES	309.7	3.8
OWN USE	884.0	10.9
LOSSES + FLARE	305.8	3.8
SUB TOTAL DOMESTIC	3,718.4	45.9
LNG (JPN, KOR & Taiwan)	3934.5	48.6
PIPE GAS (Singapore)	442.6	5.5
SUB TOTAL EXPORT	4,377.1	54.1
T O T A L	8,095.5	100

6. Production System

Fertilizer production, mainly Nitrogen fertilizer production is based on Ammonia (NH3). The source of raw material and utilities are definitely natural gas which is reacted with water and air at high pressure & high temperature. Location of plant is usually based on proximity to raw material sources. Plant is constructed progressively in tandem with domestic demand growth.

7. Indonesian Fertilizer Plant Locations

The total capacity of 14 urea plants which is produced by 5 companies is 7,85 million ton per year, whereas in amount of 22% produce as urea granular and 78% as urea prill. Due to shortage of Natural gas for feed stock, 1 (one) urea plant with capacity 600.000 ton/year in North Sumatera under PT. AAF stopped the operation since 2003. Today, that company is under process of liquidation. The picture below shows the location of fertilizer companies in Indonesia.

Company	DESIGN CAPACITY (Ton / Year)			
	UREA	SP-36	ZA	NPK
PT Pusri	2.262.000			
PT Pupuk Kaltim	2.850.000			
PT Petrokimia Gresik	462.000	1.000.000	650.000	300.000
PT Pupuk Kujang	1.140.000			
PT PIM	1.140.000			
Total	7.854.000	1.000.000	650.000	300.000

8. Technology & Efficiency of Ammonia and Urea Plant

The modern urea plant was started the operation in year 1974 in PT. Pupuk Sriwidjaja located in Palembang, South Sumatera. The energy consumption was vary between 26 to 37 MMBTU/ton urea, depend on the technology and age of the plants. 7 of 14 urea plant have more than 20 years old with high energy consumption which is around 33-37 MMBTU/ton. Table below shows technology and efficiency of ammonia and urea plants.

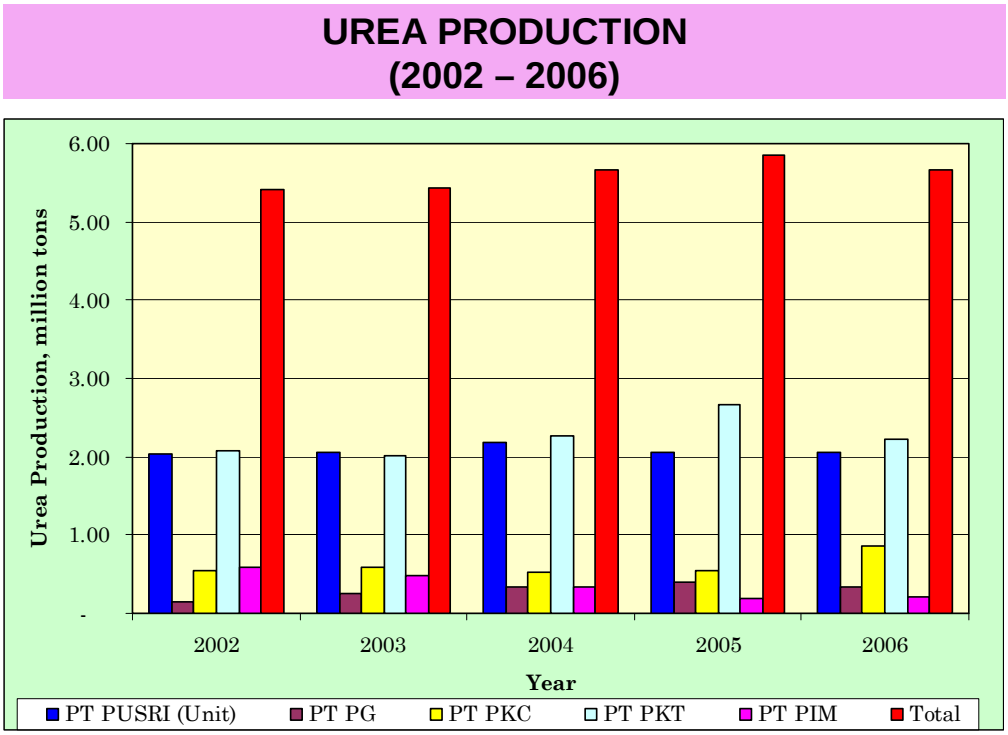
TECHNOLOGY & EFFICIENCY OF AMMONIA AND UREA PLANT

Es tab Lish ed	PLANT	Start of Operation	Urea Capacity (T/Y)	Technology (Process Licensor)		Natural Gas Consumption (MMBTU/ton)-Actual *)	
				Ammonia	Urea	Ammonia	Urea
1959	PT Pusri						
	PUSRI II	1974	552,000	Kellogg	TEC	44.92	33.51
	PUSRI III	1976	570,000	Kellogg	TEC	41.90	33.51
	PUSRI IV	1977	570,000	Kellogg	TEC	41.30	34.21
	PUSRI IB	1993	570,000	Kellogg	TEC Aces	35.10	29.84
1972	PT Petrokimia G.						
	Amm.& Urea Plant	1995	462,000	Kellogg	TEC Aces	31.37	26.00
1975	PT Pupuk Kujang		586,000				
	Kujang I Kujang 1B	1979 2005	586,000 570.000	Kellogg Kellogg	TEC TEC Aces 21	41.39	33.91 27.00
1977	PT Pupuk Kaltim						
	Kaltim 1	1984	700,000	Lurgi	Stamicarbon	40.50	37.65
	Kaltim 2	1985	570,000	Kellogg	Stamicarbon	39.20	29.16
	Kaltim 3	1989	570,000	Chiyoda/Haldor Topsoe A/S	Chiyoda / Stamicarbon	32.73	25.37
	Popka	1999	570,000	--	Chiyoda / Stamicarbon	-	28.96
	Kaltim 4	2002	570.000	MHI/Haldor Topsoe A/S	Snamprogetti SpA / Hydroagri	31.00	29.00
1982	PT PIM						
	PIM -1 PIM-2	1984 2005	600,000 570.000	Kellogg Kellogg	TEC TEC Aces	42.00 32.00	36.14 28.00

*) Average last 5 year

9. Ammonia / Urea Production

Achievement of PT. Pupuk Sriwidjaja Holding to produce urea between 2001 to 2006 is 5,4 to 5,85 million ton per year. The low capacity utilization, beside the problem of the plant, is also due to the shortage of natural gas. Chart below shows urea production in Indonesia between 2002 to 2006.



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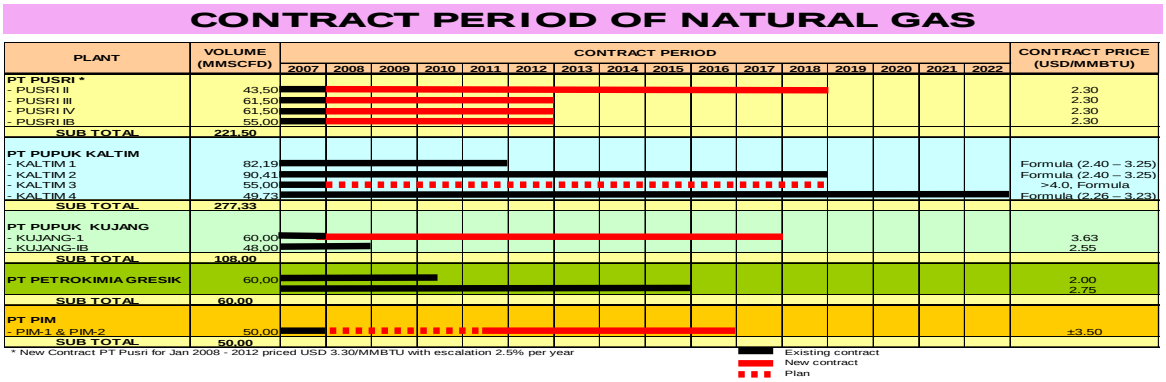
10. Contract Period of Natural Gas

Based on the plants performance, the plants can be operated for more than 40 years. Today, the new Natural gas contract duration can only be applied for short and medium term, between 5 to 10 years depending on locations. The period of the existing natural gas contract is far beyond of our requirement. Picture below shows the remaining contract period of natural gas of fertilizer companies in Indonesia.



The demand of the Natural gas for urea fertilizer plants in Indonesia is 776 MMSCFD and the available natural gas only 653,5 MMSCFD or 84% of our requirement. Table below shows the breakdown of natural gas consumption in the year 2007.

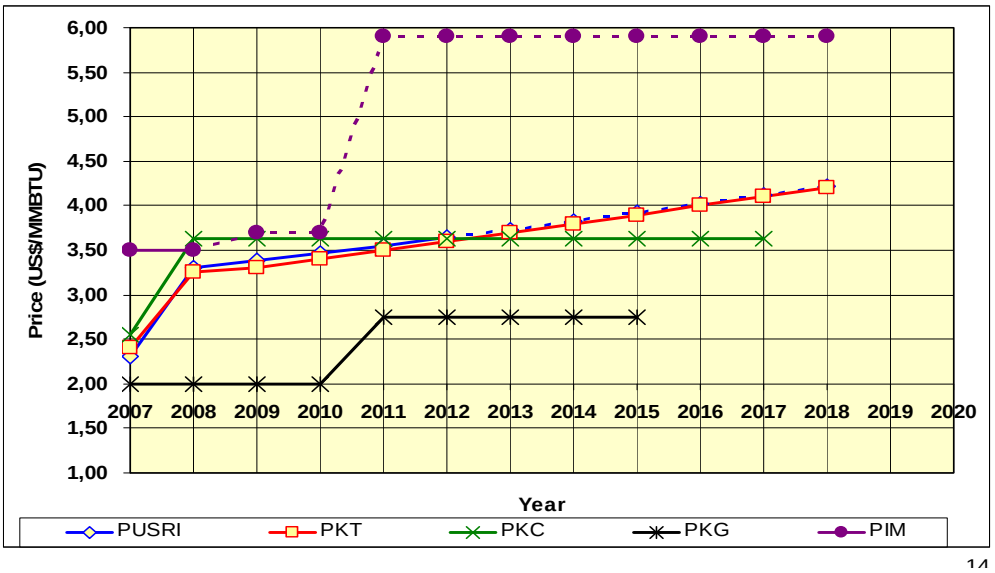
NATURAL GAS CONSUMPTION (2007)

COMPANY	DEMAND (MMSCFD)	AVAILABLE (MMSCFD)
PT PUSRI	221.5	221.5
PT PUPUK KALTIM	277.33	240.0
PT PETROKIMIA GRESIK	60.0	50.0
PT PUPUK KUJANG	108.0	92.0
PT PUPUK ISKANDAR MUDA	110.0	50.0 *)
TOTAL	776.83	653.5

*) Only for 3 month / year, since 2006 by Swap gas for PKT, compensate by LNG for PIM

Natural gas price for the year 2008 onward will increase gradually and each company will have different price. Natural gas price depend on the economic value of the Natural gas reserve of each province. The fertilizer companies should have high Natural gas price due to no other alternatives. Since there is no integration yet among the gas producer for each province through pipe line, the natural gas price can not be optimized (except the Natural gas system for South Sumatera to West Java have pipe line integration system which is belong to Gas Distribution Company (PGN)). Chart below shows the trend of natural gas price.

TREND OF NATURAL GAS PRICE (CONTRACTUAL) FOR INDONESIAN FERTILIZER



11. Production Cost of Urea

Natural gas price contribution for production cost is very significant. Urea Plant has to compete with other natural gas consumers. If operation expenditures (opex) is US$ 40/Ton and capital expenditures (capex) for new technology plant's is US$ 50/Ton and for old technology plant's is US$ 20 / Ton, the variation of production cost are shown in the table below.

Natural Gas Price ($/MMBTU)	Production Cost (US$/Ton)	
	New Technology	Old Technology
2.0	140	130
3.0	165	165
4.0	190	200
5.0	215	235
6.0	240	270
7.0	265	305
8.0	290	340

Contribution of Natural gas price for production cost is very significant. But on the other hand, fertilizer' companies have to compete with other Natural gas Consumers such as Power Plant Company (PLN) and Gas Distribution Company (PGN) which will be ready to buy with higher Natural gas price.

Cash cost for each company in the year 2008 with higher Natural gas price seem still competitive, as long as the urea export price can be maintained at high price. Table below shows projection of cash cost for urea production.

CASH COST FOR UREA PRODUCTION (PROJECTION 2008)

	PUSRI	PKG	PKC	PKT	PIM
Natural Gas (US$ / MMBTU)	3.30	2.00	3.63	3.25	3.50
Natural Gas Cost (US$ / ton Urea)	109.6	52.0	113.9	97.3	136.7
Other's Cost (US$ / ton)	40.3	83.6	44.6	66.0	100.4
Cash Cost (US$ / ton Urea)	**149.9**	**135.6**	**158.5**	**163.3**	**237.1**

12. Development of Urea Fertilizer

The development of the urea fertilizer for all the companies is depend on the several factor such as feed stock availability, equity fund availability and which one is more efficient, maintaining the existing plant up to the economic of the plant or replace with the new technology. We have to make sure that the fertilizer is available for the country since we have to maintain the security of the food of the country. Therefore PUSRI Holding have to consider in replacing the old plant with the new plant or optimizing the old plant with high energy consumption by using Natural gas or substitute to coal as feed stock. This is necessary for the sustainability of the urea fertilizer production.

13. Obstacles Each Location of Urea Production v/s Gas Availability

There are obstacles of urea fertilizer production for the future of the urea fertilizer production. The first obstacle is availability of the Natural gas with reasonable gas price. The second obstacle is the purchasing power of fertilizer companies. The other gas consumer such as Power Plant Company (PLN) and Distribution Gas Company (PGN) are willing to buy the Natural gas with high gas price. To develop and built new urea plant we have to secure the feed stock from the beginning, at least for 15 year with reasonable price. Table below shows the brief description regarding natural gas condition in each location of natural gas reserve in Indonesia.

No.	Location	Description
1	Lhokseumawe, NAD	Available NG for LNG Plant. No gas available for Fertilizer. The only gas available is from Block A with limited resource and high gas price. To going concern coal gasification after 2013 should be considered
2	Palembang, South Sumatera	Gas is available, but problem is in purchasing power
3	Cikampek, West Java	Limited resource of NG with high gas price
4	Bontang, East Kalimantan	Gas resource mostly dedicated for LNG, no further allocation for Fertilizer Plant
5	Gresik, East Java	Limited resource of NG with high price
6	Tangguh, Papua	Gas mostly dedicated for LNG (for export), not feasible for urea fertilizer
7	Senoro, Central Celebes	Gas mostly dedicated for mini LNG (for export), not feasible for urea fertilizer

14. Environmental Scanning

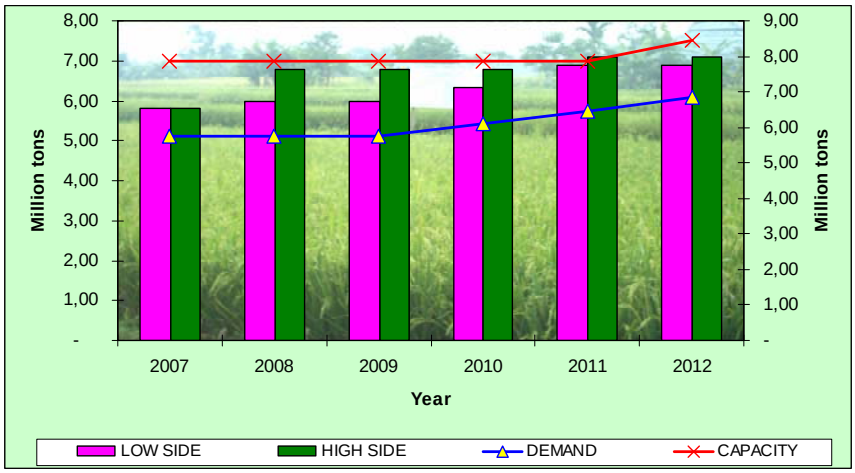
The results of external analysis of Indonesia's Fertilizer companies are divided into part 1 and 2. Natural gas price is increasing very fast following the rising of energy price trend, resulting in significant increase of production cost; plants are located near residential area will harm cause the Industries could be source of pollution; and the companies do not have enough equity to develop new business. This 3 (three) **threats** are include in part 1 (one). On the other hand, urea's domestic market demand and international market growth; demand growth in India, ASEAN and Pacific Countries; plant relocation from rich countries to countries rich with natural gas resource; and coal gasification and availability coal bed methane as feed stocks. These 4 (four) **opportunities** are include in part 2 (two).

The results of internal analysis of Indonesia's fertilizer companies are divided into part 3 and 4. Old technology plant; aging population of human resources; fat and big organization structure; and part of business system are obsolete. These 4 (four) **weaknesses** are include in part 3. On the other hand, design capacity of urea plant is 7.84 million tons per year, with good in performance; and experience in the production and distribution of urea in domestic and international markets since 1960. These 2 (two) **strengths** are included in part 4.

15. Projection of Urea Product by Considering NG Availability

The projection of urea fertilizer production for 2007 to 2012 with high side and low side scenario compare to demand for domestic use, there is still excess of urea possibly to be export. The graph shows the production of urea fertilizer is between 6 - 7 million ton per year and the urea consumption is around 5,8 million ton per year. Graph below shows the projection of urea fertilizer production.

PROJECTION OF UREA PRODUCT BY CONSIDERING NG AVAILABILITY (2007 – 2012)



16. Strategies

PT. Pupuk Sriwidjaja (PUSRI) Holding's strategies are divided into short term, medium term and long term strategies that will be explain in table below.

Strategies	Description
Short Term	1. Maintain and increase reliability to achieve the name plate capacity of the plants 2. Inspect and conduct plant audit to establish a proper preventive maintenance schedule 3. Improve plant efficiency in order to get energy saving 4. Optimizing the plant resource to find optimal solution 5. Using coal to produce power, steam and utility 6. Keep the waste level on standard to maintain relationship with the community 7. Strengthen R&D, as well as learning and application of coal technology/coal gasification 8. Plan to perform global and rational use of resources

Strategies	Description
Medium Term	Establishment of Urea fertilizer business through alliance with The Iranian Company (NPCI). With the development of urea plant in Iran, natural gas prices at US$ 1+(plus)/MMBTU under a 25-year contract
Long Term	Backward Integration, Industry will get "mining concession" of Coal and Coal Bed Methane (CBM) in domestic

17. Conclusion

In conclusion as agriculture country, Indonesia will consume huge of fertilizer. About (**70-75)%** of Urea Fertilizer is necessary to maintain rice production of the country. The Natural gas price in Indonesia is based on economic mechanism for each location of the gas as a consequence fertilizer industry has low purchasing power compare to other consumers because fertilizer for domestic market is sold base on subsidy. To build new fertilizer plants, long term contract of feed stocks which is include natural gas and coal, is required as a prerequisite. Maintain the existing plants is a must, as long as the production cost can compete with the new plants. It can be done by good equipment replacement program or revamping project. Go global to find natural gas sources with abundant reserves and reasonable natural gas price and or make alliance with natural gas products in overseas.

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