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THE DPE POWER PLANT

The International Electrical Engineering Firm (IEEF) is proposing a combined-cycle gas power plant in the Mekong Delta. The project will use gas purchased from Petro Vietnam (PVN) and sell electricity to Electricity of Vietnam (EVN).

IEEF has an established long experience in designing and managing power plants in many countries. The project proposed by IEEF is a 700 MW combined-cycle gas power plant^{1, 2} with a total investment cost of more than US\$ 400 million. This is a relatively low-risk project as its technology is proven. Many combined-cycle gas power plants are operating successfully in Phu My, Ca Mau and Nhon Trach.

In order to limit its financial exposure to the project, IEEF has invited the equity investment from a foreign passive investment fund (Fund) and a local state-owned enterprise (SOE) and decided to undertake the project as BOT. A new project company is to be set up under the name of DPE. Under the BOT contract, DPE will build the project from 2009 to 2011, operate it for 20 years from 2012 to 2031, and then transfer it at no cost to the government. Besides

INVESTMENT COSTS

DPE will sign an Engineering, Procurement and Construction (EPC) contract with IEEF as a turn-key contract. The total value of the EPC contract is fixed at US\$295 million. This is the largest cost component of the project. Other costs include initial spare parts, consulting services, administration, initial fuels, insurance, financial commitments, interests during construction, and physical and inflation contingencies. The total cost is US\$409.97 million.

Investment costs (US\$ million)

EPC contract	295.00
Initial spare parts	12.30
Consulting services	10.20
Administration	12.00
Initial fuels	12.00
Insurance	6.60
Financial commitments	6.70
Interests during construction	11.33
Physical contingency	40.00
Inflation contingency	3.84
Total investment costs	409.97

¹ Compared to single-stage gas turbines, combined-cycle gas plants are more expensive to put in place, but are also more fuel efficient, are used more for base load and intermediate-load power.

² 1 megawatt (MW) = 1.000 KW (kilowatt).

Based on the construction schedule in the EPC contract, the investment cost schedule is as follows.

Investment cost schedule (US\$ million)

Year	2009	2010	2011	Total
Investment cost (2009 prices)	38.50	233.40	122.90	394.80
Interests during construction	0.00	0.20	11.13	11.33
Inflation contingency	0.00	1.87	1.97	3.84
Total	38.50	233.57	136.00	409.97

For simplicity, assume that the total investment cost of \$409.97 million can be treated as eligible costs that constitute the project's fixed assets, and there fore can be depreciated over the 20-year life of the BOT contract.

FINANCING

IEEF, the Fund, and the SOE will contribute US\$122.64 million (accounting for 30% of the total investment). IEEF, the Fund and the SOE shares in the total equity are 50%, 45% and 5% respectively.

The remaining investment costs (US\$287.33 million) will be financed by banks' loans. As the project is development-oriented, the Asian Development Bank is considering using its Ordinary Capital Resources' (OCR) to loan US\$126.65 million (US\$120 million face value plus US\$6.65 million of capitalized interests during construction) to DPE at 5.36% interest rate. US\$3.8 million of the face value of US\$120 million will be disbursed in 2009 and US\$116.2 million in 2010. There are two years of grace period in 2011 and 2012, after which, the whole principal of US\$126.65 million will be paid back according to the following schedule.

ADB loan principal repayment schedule

Year	Percentage of the loan principal
2013	5%
2014	5%
2015	5%
2016	10%
2017	10%

Year	Percentage of the loan principal
2018	10%
2019	10%
2020	15%
2021	15%
2022	15%

The project is also trying to secure a commercial loan of US\$160.68 million (US\$156 million of face value plus US\$4.68 million of capitalized interests during construction) from a syndicate of international commercial banks at 8.13% interest rate. US\$57.6 million will be disbursed in 2010 and US\$98.4 million in 2011. One year of grace period (2012) is applied. The principal value of US\$160.68 will be paid back in equal amounts over 8 years from 2013 to 2020.

Capital structure

	US\$ million	Percentage
Total investment cost	409.97	100.0%
Equity	122.64	29.9%
IEEF	61.32	15.0%
Fund	55.19	13.5%
SOE	6.13	1.5%
Debt	287.33	70.1%
ADB	126.65	30.9%
International Commercial banks	160.68	39.2%

BOT CONTRACTUAL ARRANGEMENTS

The two most important contracts in the DPE project are the Power Purchase Agreement (PPA) and the Gas Supply Agreement (GSA). PPA will be signed between DPE and EVN. The average electricity tariff (including a fixed charge and a variable cost component), which is being negotiated, is 8.5 cent per kWh based on 2009 prices over the life of the project.³ The electricity tariff will be escalated annually according to the US\$ inflation rate. The 8.5 cent tariff does not include VAT.

DPE will enter into a GSA with PVN. The natural gas price will be fixed over the life of the project at US\$9.5 per one million BTU in 2009 prices.⁴ This price will also be escalated annually according to the US\$ inflation rate.

TECHNICAL AND OPERATING PARAMETERS

With modern technology and good maintenance, the capacity availability rate for DPE is expected at 90%. However, the negotiated electricity tariff of 8.5 cents per kWh is higher than the current average cost of electricity to EVN. As a result, the dispatch order is sensitive to EVN's price discrimination in a sense that EVN power stations may EVN power stations might out-dispatch DPE particularly during rainy seasons when a lot of electricity is available from low variable cost hydro power plants. The plant dispatch factor for DPE, therefore, is expected to be at only 75%, which is equivalent to the total production time of 6,570 hours per year.⁵ At 700 MW capacity, the electricity production output of the project will be 4,599 million kWh.⁶

The gas used to generate electricity depends on the plant heat rate, which is the amount of BTUs used to produce one kWh of electricity. The higher the heat rate, the lower the amount of gas used to generate electricity. For DPE, the heat rate is estimated at 6,200 BTU/kWh.⁷ Based on this parameter, the unit cost of natural gas for the project is 5.89 cents/kWh.⁸

Based on the management contract which is to be signed between DPE and an international operator, the fixed operating costs (FOC) are estimated at US\$1.15 per kW per month or US\$9.66 million per year

³ kWh = kilowatt hour.

⁴ BTU = British thermal unit. 1 BTU = 1.055 KJ (kilojoule)

⁵ 365 days/year*24 hours/day*75% = 6,570 hours/year

⁶ 700 MW*6,570 hours/year= 4,599 million MWh or 4,599 million kWh.

⁷ Coal or single stage power plants have a much higher heat rate (9,000 BTU/kWh).

⁸ Unit cost of natural gas = Gas price*Heat rate =

= (US\$9.5/1 million BTU/10⁶)*6,200 BTU/kWh*(100 cents/1US\$) = 5.89 cents/kWh.

in 2009 prices.⁹ The variable operating costs (VOC) are estimated at 0.2 cent per kWh. If the project produces 4,599 million kWh a year, the VOMC will be US\$9.2 million a year in 2009 prices.¹⁰

The maintenance and major repair costs are estimated over the life of the project and presented in the below table.

Maintenance and major repair costs (US\$ million in 2009 prices)

Year	Costs	Year	Costs
2012	9.07	2022	10.55
2013	6.00	2023	21.64
2014	37.54	2024	12.05
2015	6.30	2025	11.37
2016	16.46	2026	24.90
2017	28.02	2027	15.13
2018	20.91	2028	12.24
2019	9.80	2029	23.61
2020	18.53	2030	10.22
2021	10.98	2031	12.94

The management fee that DPE will have to pay under the management contract is 1% of electricity sale revenue (excluding VAT) and 3% of operating profit (which is equal to electricity sale revenue minus natural gas cost, operating costs, and maintenance and major repair costs.)

COST OF CAPITAL AND OTHER ASSUMPTIONS

For its equity investment, the project investors require an expected rate of return which is equal to the required return it would get from investing in power plants in the US plus a country risk premium and exchange rate premium for investing in Vietnam. The average levered beta for power plants in the US is 0.78 with the average debt-equity ratio of 0.91 and average corporate income tax rate of 32%. The Moody's credit rating for Vietnam is Ba3, which is equivalent to a country risk premium of 5.25%. DPE expects to secure strong guarantee from the government for foreign exchange conversion. Therefore the exchange rate risk premium is estimated to be around 2%. The current yield on 10-year US government bond is 3.36% and the historical US market risk premium is 5.65%.

The future USD and VND inflation rates are assumed at 0.8% and 6.8% respectively.

The project will enjoy three years of tax exemption since the first year of making profits. After that, the corporate income tax rate of 25% is applied.

⁹ Fixed operating costs

= 1.15 US\$/kW/month*700 MW*(1000 kW/MW)*(12 months/year)/10⁶ = 9.66 million US\$/year

¹⁰ Variable operating costs

= 0.2 cent/kWh*4,599 million kWh/(100 cent/USD) = 9.20 million US\$/year.