Chapter 6: ROLE IN POWER SECTOR

Chapter 6 Role of Japan's ODA in Power Sector of Malaysia

This Chapter focuses on the contribution of Japan's ODA in the power sector of Malaysia. The Power sector has been a target sector for Japan's ODA. As described in chapter 5, half the Yen Loan which is the main pillar of Japan's ODA to Malaysia, went to "the electric power and gas sector" as of July 1996 by commitment basis. Especially during the third Malaysia Plan, 77% of Yen Loan was invested for the power sector, and it contributed to the installation of 1,072MW equivalent to 67.7% of increased capacity in the period. This chapter explains the energy policy of Malaysia and the role of Japan's ODA in the policy at first. Then the impact of Japan's ODA is analyzed quantitatively for both direct and indirect contribution. On the other hand, Japan's ODA in this sector too has problems. Some of these problems which were observed in the study are described in the last part.

6.1. Energy Policy of Malaysia and Japan's ODA

6.1.1. The First Malaysia Plan (1966-70)

The total energy consumption of Malaysia increased by 11% per annum during the 1960s. This rate was higher than the GNP growth rate in the 1st MP, 6% per annum. RM 53 million or 12.5% of the total development expenditure was allocated to the energy sector in the 1st MP to catch up with the increasing demand. Although none of Japan's ODA was invested in the energy sector in the 1st MP, the Prai Thermal Power Plant (unit 1-4), with capacity
of 90MW, and the Port Dickson Power Plant, with capacity of 240MW, were developed as a main source of power in this period. A thermal power plant was the sole choice in this period to catch up with rapid growth. As a result, approximately 88% of the total energy was consumed by petro-chemical products in 1970. There was only one major hydro-electric power station in Cameron Highland, with a capacity of 260MW, constructed in 1963.

6.1.2. The Second Malaysia Plan (1971-75)

The total energy consumption showed an annual increase of 9% in the 1970s. During the 2nd MP, RM161 million, 3.6% of the total expenditure, was allocated to the power sector, mainly to the development of oil fueled power plants, and transmission & distribution. However, the Government of Malaysia planned to construct hydro power stations on a long-term view during this period. Since hydro power plants need huge initial investments and foreign technology, the Government used external assistance to develop them. This included Japan's ODA.

The Temengor Hydro-electric Power Plant, planned by a Canadian consultant under the assistance of Canada in 1967, was constructed under foreign assistance including Japan's. The dam was the first large scaled rock filled dam in Malaysia. The plant,

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1 Malaysia's first hydro project was Chenderoh in Perak state, constructed in the late 1920s by the Perak River Hydro-electric Company (PRHEP), with installed capacity of 27MW. However, it was run by PRHEP up to October 1982 and it was not an asset of NEB in those days. See p.118-128 "Hydro Power in Malaysia" 1993, KL, TNB
Chapter 6 - ROLE IN POWER SECTOR

with a capacity of 260MW, was also the largest hydro-electric power plant as was the plant in Cameron Highland. Japan's ODA was invested for civil works while equipment for generation was financed by IBRD. At the same time, expansion of the Prai Thermal Power Plant was executed under Japan's ODA, which installed another 240MW.

During the 2nd MP, out of three major projects, two of them, Prai and Temengor projects, were implemented by Japan's ODA.

Table 6-1 Development Allocation for Energy Programme

<table>
<thead>
<tr>
<th></th>
<th>2MP</th>
<th>3MP</th>
<th>4MP</th>
<th>5MP</th>
<th>6MP</th>
<th>7MP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro Power Generation</td>
<td>42</td>
<td>385</td>
<td>682</td>
<td>1,531</td>
<td>3,084</td>
<td>87</td>
</tr>
<tr>
<td>Oil/ Gas fueled Thermal</td>
<td>91</td>
<td>191</td>
<td>168</td>
<td>2,145</td>
<td>5,175</td>
<td>10,150</td>
</tr>
<tr>
<td>Rural Electrification</td>
<td>28</td>
<td>281</td>
<td>523</td>
<td>469</td>
<td>764</td>
<td>519</td>
</tr>
<tr>
<td>Transmission &amp; Distribution</td>
<td>170</td>
<td>110</td>
<td>516</td>
<td>1,711</td>
<td>5,252</td>
<td>15,179</td>
</tr>
<tr>
<td>Others</td>
<td>25</td>
<td>445</td>
<td>275</td>
<td>527</td>
<td>1,772</td>
<td>334</td>
</tr>
<tr>
<td>Total</td>
<td>356</td>
<td>1,407</td>
<td>2,163</td>
<td>6,385</td>
<td>15,449</td>
<td>26,268</td>
</tr>
<tr>
<td>Ratio to total expenditure</td>
<td>3.6%</td>
<td>5.1%</td>
<td>2.8%</td>
<td>10.3%</td>
<td>13.8%</td>
<td>16.2%</td>
</tr>
</tbody>
</table>

Source: p.334, Fourth Malaysia Plan, p.466, Fifth Malaysia Plan

p.321, Sixth Malaysia Plan, p.415, Seventh Malaysia Plan

6.1.3. The Third Malaysia Plan (1976-80)

RM 1,407 million, 5.1% of total expenditure, was invested in the power sector under the 3rd MP. The main development shifted from oil fueled thermal to hydro, as indicated by the fact that the budget allocation to hydro became nine-fold, while that to thermal
became doubled. Japan's ODA was extended to the construction of four hydro-electric power plants in this period, namely the Kenyir Hydro Plant (sometimes called Trengganu Hydro Plant), the Kenering Hydro Plant and the Bersia Hydro Plant, and the Tenom Pangi Hydro Plant in Sabah. Out of 4 projects, Kenering and Bersia were planned with Canadian assistance just like Temengor was. Kenyir was planned with Australian assistance while Tenom Pangi was planned by Japanese consultant under ADB finance. Since hydro-electric power plants need long construction periods, other thermal power plants had to be developed in order to meet the increasing demand. Japan's ODA was invested in two projects, namely, 4 units of gas turbines for various stations, and the Pasir Gudang Thermal Power Plant. It means that all the major power projects were implemented with Japan's assistance in the 3rd MP, while the Government used loans from IBRD and ADB partially to those projects.

In 1970, 88% of the total energy was consumed by petrochemical products. As a consequence of development of a series of thermal power plants, this ratio increased to 94% in 1980 as shown in table 6-2, because major hydro-electric plants had not been completed by that time.
Table 6-2 Primary Energy Supply by Source

(Unit of energy measured in tones of oil equivalent) (%)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil and Pet. Prod.</td>
<td>88%</td>
<td>94.7</td>
<td>70.9</td>
<td>59.3</td>
<td>52.2</td>
<td>49.4</td>
</tr>
<tr>
<td>Hydro</td>
<td>n.a.</td>
<td>4.4</td>
<td>7.4</td>
<td>5.7</td>
<td>4.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>n.a.</td>
<td>0.6</td>
<td>19.0</td>
<td>27.2</td>
<td>39.1</td>
<td>41.6</td>
</tr>
<tr>
<td>Coal and Coke</td>
<td>n.a.</td>
<td>0.6</td>
<td>2.7</td>
<td>7.8</td>
<td>4.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Forecast


6.1.4. The Fourth Malaysia Plan (1981-85)

This high degree of dependence on oil had created some serious problems. Firstly, Malaysia lost the opportunity to earn foreign currency in exporting crude oil of lighter and high quality. Although thermal power plants needed heavy oil for energy, Malaysia had to use its high quality oil for thermal energy. Secondly, Malaysia tended to lag behind non-oil-producing countries in development and conversion of other energy source. It was estimated that reserves of crude oil remaining in Malaysia were 3.5 billion barrels in terms in 1982. It would be exhausted in the next 20 years if no substitution measures were taken. On the other hand, Malaysia has a rich reserve of natural gas, estimated at 13.8 billion barrels of energy equivalent basis or 4 times the size of crude oil resource.

Chapter 6. ROLE IN POWER SECTOR

Under these circumstances, a "Four-Fuel Policy" was announced in this period to diversify the source of energy. "Four-fuel" means crude oil, natural gas, hydro energy and coal. The energy policy in the 4th MP was to obtain adequate power supplies to meet the demand, particularly that of electric energy, demand of which was expected to increase drastically as a result of high economic growth and the increase of income. At the same time, reducing high dependence on oil for power generation was of importance by utilizing oil-alternative resources like natural gas and hydro-electric power.

In addition to the above policy, the Government of Malaysia announced an "energy-saving programme" in September 1980. This programme, in its first stage, was limited to energy-saving by means of publicity campaigns through radio, television and other mass communication media. In the second stage, financial and legal means were used, including offers of incentives for investment in energy-saving facilities.

Japan's ODA was used for Phase I and II of the Port Klang Power Station and Batang Ai Hydro-electric Power Plant in the 4th MP. Phase I of the Port Klang Power Station which was committed in 1981 as the 7th Yen Loan Package, installed 2 units of turbines (2 × 300MW), which fired heavy oil at the initial stage. But it was scheduled to convert to natural gas in 1990, and supplied by gas pipeline from the east coast of the peninsula. Phase II of the project, committed in 1983 as the 9th Yen Loan Package and Special Package,
aimed at diversifying energy by using coal. Two units of turbine (2 \times 300MW) under phase II, fired coal from Sarawak. Those were the first coal fired turbines in Malaysia. Phase I and II of the Port Klang Power Station were planned by a British consultant agency with British assistance, but constructed with Japan's ODA under the influence of the "Look East Policy" as mentioned in the previous chapter. The Batang Ai Hydro Power Station in Sarawak was planned with Australian assistance and constructed with Japan's assistance and ADB. Japan's ODA was used for the equipment and transmission line, while the ADB loan was used for the civil works of the dam.

Because of the above projects, oil dependency decreased to 71% in 1985 from 94% in 1980 as shown in table 6-2.

6.1.5 The Fifth Malaysia Plan (1986-90)

Energy demand increased by 7.7% in the 5th MP. RM2,163 million, 10.3% of the total expenditure, was allocated for the energy development to catch up with the demand. The sector also placed priority on diversification of energy sources.

In this context, Japan's ODA was extended to the construction of pipelines for natural gas from Kerteh in Trengganu state to the Port Klang Power Station, the west coast of peninsular via Johor and Malacca. It supplies natural gas to the Paka Power Station, Pasir Gudang Power Station, Port Dickson Power Station and Port Klang Power Station. Because of the above projects, oil dependency decreased to 59% in 1990 and 52% in 1995 while
dependency on gas increased to 27% and 39% respectively as shown in table 6-2.

6.1.6. The Sixth Malaysia Plan (1999-95)

Under the 6th MP, RM15,449 million, constituting 13.8% of the total expenditure, was allocated to the power sector. TNB was to develop some 3,500 MW of new generating capacity, which will depend largely on natural gas. Japan’s ODA was used for phase III of the Port Klang Power Station, installing 2 units of mix fueled turbine (2×500MW), fired natural gas, coal & heavy oil. 1,000MW out of 3,500MW will be installed with Japan’s assistance, and another 2,500MW will be developed with finance such as TNB’s equity or EPF.

To promote competition, initially in the generation sector the Government has introduced Independent Power Producers (IPPs). This hoped to reduce the supply risk, with the IPPs selling bulk power to TNB, SEB and SESCO. The distribution or selling of electricity will, however, still be carried out by TNB.

As of June 1996, the Director General of Electricity Supply under Jabatan Bekalan Electric (JBE) has approved licenses under “the Electricity Supply Act 1990” to twelve (12) Independent Power Producers (IPPs), five (5) of the licenses were for IPPs to generate electricity in peninsular Malaysia. The licenses allow the IPPs to produce electricity for domestic consumption which must be sold to TNB. TNB will continue its monopoly of transmission and distribution. Also as part of the licensing condition, the IPPs should
Chapter 6. ROLE IN POWER SECTOR

offer TNB a maximum of 20 percent of their equity.

Table 6-3 Independent Power Producers in Peninsular Malaysia

<table>
<thead>
<tr>
<th>Capacity MW</th>
<th>On-line</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segari Energy Ventures</td>
<td>1,303</td>
<td>1996-97</td>
</tr>
<tr>
<td>YTL Power</td>
<td>1,170</td>
<td>1995-96</td>
</tr>
<tr>
<td>Genting Sanyen</td>
<td>720</td>
<td>1995-96</td>
</tr>
<tr>
<td>Powertek</td>
<td>440</td>
<td>1994-95</td>
</tr>
<tr>
<td>Port Dickson Power</td>
<td>440</td>
<td>1994-95</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: New Straits Times, 14 June 1996

The IPPs in Peninsular Malaysia presently have 2,125 MW of generation capacity and are scheduled to have a total generation capacity of 4,073 MW by the end of 1998, which is expected to be equivalent to about 30 percent of the projected installed generation capacity in Peninsular Malaysia at that time. The SEV, YTL Power and Genting Sanyen Facilities will contribute 11.5 percent, 9.4 percent and 5.8 percent respectively to Peninsular Malaysia's installed capacity by 1997. The Powertek and Port Dickson Power will act as “peak load facilities”, i.e. meeting demand only during peak hours.

The role of Japan's ODA became narrower under the policy of
Chapter 6. ROLE IN POWER SECTOR

IPP. The Government of Japan cannot give Yen Loans to IPPs because, should IPPs request a Yen Loan, which should be given on a government to government basis, Japan requires the Malaysian Government to become a guarantor for the loan, which cannot be done under present regulations. IPPs can finance themselves from domestic markets or private markets without help of the Government. Some IPP projects have been completed by self-financing, without any help from the Government, so it can be observed that the role of the Yen Loan is redundant at least in the power generating sector. Hence, the role of Japan's ODA will be limited to only rural electrification or technology transfer in the 7th MP.
### Table 6.4 Power Development Projects financed by Yen Loan (RM million)

<table>
<thead>
<tr>
<th>Project (commissioning)</th>
<th>Scope of Project</th>
<th>Total Project Cost</th>
<th>Yen Loan Portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temengor HPP (March 1979)</td>
<td>-127m high rock fill dam</td>
<td>451.7</td>
<td>233.1</td>
</tr>
<tr>
<td></td>
<td>-3 x 87MW</td>
<td></td>
<td>(51.6%)</td>
</tr>
<tr>
<td></td>
<td>-151km transmission line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Turbine (January 1980)</td>
<td>-5 x 20MW gas turbine</td>
<td>43.7</td>
<td>34.6</td>
</tr>
<tr>
<td></td>
<td>-2 x 20MW</td>
<td></td>
<td>(79.1%)</td>
</tr>
<tr>
<td>Prai TPP (January 1981)</td>
<td>-3 x 120MW</td>
<td>357.4</td>
<td>42.9</td>
</tr>
<tr>
<td></td>
<td>-2 x 120MW</td>
<td></td>
<td>(12.0%)</td>
</tr>
<tr>
<td>Pasir Gudang TPP (July 1982)</td>
<td>-2 x 120MW</td>
<td>256.3</td>
<td>61.5</td>
</tr>
<tr>
<td></td>
<td>-2 x 120MW</td>
<td></td>
<td>(24.0%)</td>
</tr>
<tr>
<td>KL-Kg Awah Transmission (September 1982)</td>
<td>-130km of 275kv transmission line</td>
<td>59.4</td>
<td>22.6</td>
</tr>
<tr>
<td></td>
<td>-130km of 275kv transmission line</td>
<td></td>
<td>(38.0%)</td>
</tr>
<tr>
<td>Bersia HPP (August 1983)</td>
<td>-3 x 24MW</td>
<td>143.3</td>
<td>34.1</td>
</tr>
<tr>
<td></td>
<td>-3 x 24MW</td>
<td></td>
<td>(23.8%)</td>
</tr>
<tr>
<td>Kenering HPP (August 1984)</td>
<td>-3 x 40MW</td>
<td>218.8</td>
<td>51.6</td>
</tr>
<tr>
<td></td>
<td>-3 x 40MW</td>
<td></td>
<td>(23.6%)</td>
</tr>
<tr>
<td>Kenyir HPP (March 1986)</td>
<td>-150m high rock fill dam</td>
<td>669.0</td>
<td>217.4</td>
</tr>
<tr>
<td></td>
<td>-4 x 70MW</td>
<td></td>
<td>(32.5%)</td>
</tr>
<tr>
<td>Port Klang TPP (phase I) (June 1986)</td>
<td>-2 x 80MW</td>
<td>1,121.3</td>
<td>206.3</td>
</tr>
<tr>
<td></td>
<td>-2 x 80MW</td>
<td></td>
<td>(18.4%)</td>
</tr>
<tr>
<td>Port Klang TPP (phase II) (March 1989)</td>
<td>-2 x 300MW (total 600MW gas)</td>
<td>1,900.0</td>
<td>501.6</td>
</tr>
<tr>
<td></td>
<td>-2 x 300MW (total 600MW gas)</td>
<td></td>
<td>(26.4%)</td>
</tr>
<tr>
<td>Port Klang TPP (phase III) (1998)</td>
<td>-2 x 500MW (total 1000MW)</td>
<td>3,219.4</td>
<td>1,461.6</td>
</tr>
<tr>
<td></td>
<td>-2 x 500MW (total 1000MW)</td>
<td></td>
<td>(45.4%)</td>
</tr>
<tr>
<td>Tenom Pangi HPP (December 1983)</td>
<td>-4 x 12MW</td>
<td>260.0</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>-4 x 12MW</td>
<td></td>
<td>(34.6%)</td>
</tr>
<tr>
<td>Batang Ai HPP (April 1986)</td>
<td>-6 x 24MW</td>
<td>618.2</td>
<td>141.6</td>
</tr>
<tr>
<td></td>
<td>-6 x 24MW</td>
<td></td>
<td>(22.9%)</td>
</tr>
<tr>
<td>Patau-Patau TPP (April 1996)</td>
<td>-1 x 284MW</td>
<td>97.2</td>
<td>95.1</td>
</tr>
<tr>
<td></td>
<td>-1 x 284MW</td>
<td></td>
<td>(97.8%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>9,415.79</strong></td>
<td><strong>3,194.0</strong></td>
</tr>
</tbody>
</table>

Source: OECF documents
6.1.7. Role of Japan's ODA in Overall Policies

Japan has contributed to both obtaining energy source as well as diversifying it, by adjusting Malaysia's heavy dependence on oil. The development of thermal power in the 2nd MP and 3rd MP clearly met the former objectives as well as phase I of the Port Klang Power Station in the 4th MP. The development of six hydro power stations under the 3rd MP & 4th MP contributed to alternative supply of energy as well as phase II of the Port Klang Power Station with coal fired generator. A power generating capacity of 2,598MW was installed in Malaysia under Japan's ODA, which comprised 35% of the total of TNB's capacity, as shown in table 6-5. And in East Malaysia, its share was 23% of SEB's capacity and 20% of SESCO's capacity as of 1994.

However, Japan's contribution only dominated finance for implementation. In the planning stage, Japan's ODA did not contribute anything. Feasibility studies for the four hydro power stations were carried out by Canada and Australia. The feasibility study for Tenom Pangi was done by a Japanese consultant, but with ADB's assistance. A feasibility study for thermal power plants was also carried out by UK. Japan came to the scene only in giving money when everything was ready. Through working together, recipient can appreciate the presence of assistance. Intellectual contribution, including technical cooperation, should be the next task of Japan's ODA.
Table 6-5  TNB's Major Generating Stations and Installed Capacity as of September 1995

<table>
<thead>
<tr>
<th>Stations</th>
<th>Installed capacity (MW)</th>
<th>Yen Loan Portion (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paka</td>
<td>1,026</td>
<td>1,220</td>
</tr>
<tr>
<td>Kapar</td>
<td>1,724</td>
<td>20</td>
</tr>
<tr>
<td>Port Dickson</td>
<td>602</td>
<td>20</td>
</tr>
<tr>
<td>Connaught Bridge, Klang</td>
<td>884</td>
<td>20</td>
</tr>
<tr>
<td>Pasir Gudang</td>
<td>720</td>
<td>240</td>
</tr>
<tr>
<td>Perai</td>
<td>424</td>
<td>240</td>
</tr>
<tr>
<td>Malacca</td>
<td>220</td>
<td>20</td>
</tr>
<tr>
<td>Serdang</td>
<td>610</td>
<td></td>
</tr>
<tr>
<td>Gelugor</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Kenyir</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Temengor</td>
<td>328</td>
<td>261</td>
</tr>
<tr>
<td>Bersia</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>Kenering</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Sungai Piah</td>
<td>14.6</td>
<td></td>
</tr>
<tr>
<td>Jor</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Who</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Chenderoh</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Habu</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>Odak</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Mini Hydro (36 Units)</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Diesel Engines</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,485.7</strong></td>
<td><strong>2,598</strong></td>
</tr>
</tbody>
</table>

(34.7% of the total)

Source: p.11, TNB, Annual Report 1995 and OECF documents

6.2. Direct Effects of Japan's ODA

The direct effects of Japan's ODA can be measured in two ways, i.e., by the increase of electricity sales and technology transfer.
6.2.1. Impact to Sales Revenue

The direct electricity supply effect was calculated from the sales of newly developed electricity from power plants under Japan's ODA. Only West Malaysian power plants were included in the analysis due to difficulties in obtaining such data from the East Malaysian power generation.

The percentage of Japan's ODA to the total project cost was applied to the total power generated\(^3\) in order to obtain only the effect directly attributed by Japan's ODA. For example out of the total 30,696 thousand kW generated by the Temengor Hydro Electric Power Plant in 1978, only 15,839 thousand kW (51.6 percent) were included in the analysis as the contribution of Japan's ODA in table 6-6. This figure was multiplied by the unit price to obtain the total revenue arising from Japan's ODA. The prices have been adjusted through the use of the Consumer Price Index so that the revenues reflect constant 1994 prices. Total electricity sale by TNB was also calculated through the use of the adjusted unit price.

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\(^3\) Electricity power generated by the plants was obtained through questionnaire to the Generation Division of TNB and an interview with Ir. Lim Tiong Jin, Assistant General Manager of the Generation Division, on 20th June 1996.
| Table 6-6 Electric Power Generation by the Plants financed Yen Loan (Unit: Thousand kW) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1872 | 1873 | 1874 | 1875 | 1876 | 1877 | 1878 | 1879 | 1880 | 1881 | 1882 | 1883 | 1884 |
| Year Loan | | | | | | | | | | | | | |
| Temperate T.P.P. | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| Gas Turbine 1 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 |
| Gas Turbine 2 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 |
| Gas Turbine 3 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 | 45,625 |
| Gas Turbine 4 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Gas Turbine 5 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Power T.P.P. | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 |
| Power Station T.P.P. | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 | 999,999 |
| Total | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 |

Chapter 6: ROLE IN POWER SECTOR
<table>
<thead>
<tr>
<th>Year</th>
<th>Unit Price of Electricity RM/Kw</th>
<th>TNB Total '000 Kw</th>
<th>TNB Revenue RM</th>
<th>OECF Share '000 Kw</th>
<th>OECF Share RM</th>
<th>OECF Contribution %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>0.19</td>
<td>5,960,635</td>
<td>1,153,978,898</td>
<td>218,831</td>
<td>42,365,754</td>
<td>3.67</td>
</tr>
<tr>
<td>1979</td>
<td>0.22</td>
<td>6,534,354</td>
<td>1,414,687,641</td>
<td>457,778</td>
<td>99,108,874</td>
<td>7.01</td>
</tr>
<tr>
<td>1980</td>
<td>0.24</td>
<td>7,257,874</td>
<td>1,761,468,020</td>
<td>725,101</td>
<td>175,981,306</td>
<td>9.99</td>
</tr>
<tr>
<td>1981</td>
<td>0.33</td>
<td>7,993,486</td>
<td>2,616,267,968</td>
<td>859,983</td>
<td>281,472,542</td>
<td>10.76</td>
</tr>
<tr>
<td>1982</td>
<td>0.31</td>
<td>8,356,656</td>
<td>2,558,806,067</td>
<td>918,570</td>
<td>281,266,211</td>
<td>10.99</td>
</tr>
<tr>
<td>1983</td>
<td>0.27</td>
<td>9,034,933</td>
<td>2,449,371,692</td>
<td>979,657</td>
<td>265,585,042</td>
<td>10.84</td>
</tr>
<tr>
<td>1984</td>
<td>0.29</td>
<td>9,880,045</td>
<td>2,843,476,951</td>
<td>1,184,016</td>
<td>340,759,805</td>
<td>11.98</td>
</tr>
<tr>
<td>1985</td>
<td>0.28</td>
<td>10,544,000</td>
<td>2,947,048,000</td>
<td>1,518,043</td>
<td>424,293,044</td>
<td>14.40</td>
</tr>
<tr>
<td>1986</td>
<td>0.26</td>
<td>11,671,000</td>
<td>3,053,133,600</td>
<td>1,736,527</td>
<td>454,275,505</td>
<td>14.88</td>
</tr>
<tr>
<td>1987</td>
<td>0.26</td>
<td>12,438,020</td>
<td>3,255,029,834</td>
<td>2,189,600</td>
<td>573,018,307</td>
<td>17.60</td>
</tr>
<tr>
<td>1988</td>
<td>0.24</td>
<td>13,637,752</td>
<td>3,330,339,038</td>
<td>2,491,031</td>
<td>608,309,677</td>
<td>18.27</td>
</tr>
<tr>
<td>1989</td>
<td>0.22</td>
<td>15,253,434</td>
<td>3,364,907,540</td>
<td>2,793,321</td>
<td>616,206,573</td>
<td>18.31</td>
</tr>
<tr>
<td>1990</td>
<td>0.21</td>
<td>17,394,253</td>
<td>3,664,969,107</td>
<td>2,828,319</td>
<td>595,926,864</td>
<td>16.26</td>
</tr>
<tr>
<td>1991</td>
<td>0.20</td>
<td>19,505,630</td>
<td>3,947,939,512</td>
<td>3,309,954</td>
<td>669,934,617</td>
<td>16.97</td>
</tr>
<tr>
<td>1993</td>
<td>0.20</td>
<td>25,239,162</td>
<td>4,949,399,668</td>
<td>3,753,524</td>
<td>736,066,139</td>
<td>14.87</td>
</tr>
<tr>
<td>1994</td>
<td>0.18</td>
<td>28,683,000</td>
<td>5,266,198,800</td>
<td>4,088,872</td>
<td>750,716,910</td>
<td>14.28</td>
</tr>
<tr>
<td>1995</td>
<td>0.20</td>
<td>32,247,000</td>
<td>6,536,466,900</td>
<td>3,853,614</td>
<td>781,127,465</td>
<td>11.95</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>264,058,719</td>
<td>59,466,683,105</td>
<td>37,523,283</td>
<td>8,398,386,002</td>
<td>14.12</td>
</tr>
</tbody>
</table>

Source: unit price; TNB Document; Others; Calculated by the Writer
Chapter 6. ROLE IN POWER SECTOR

Table 6-7 shows the result of revenue arising from Japan's ODA, which compares to the total TNB revenue to determine the contribution of Japan's ODA to TNB revenues. It is observed that the power plants under Japan's ODA contribution towards TNB's revenue has increased steadily over the years. In 1978, Japanese plants only accounted for 3.7 percent of TNB's revenue. However, by 1985, the contribution jumped to 14.4 percent and reached a peak level of 18.3 percent in 1989. This was mainly due to the fact that most projects under Japanese assistance were operational during the mid to late 1980s. The early 1990s period shows that Japan's contribution was stabilizing but slowly decreasing, due to no new Yen Loans for the power development projects, while at the same time, TNB's other power development projects went on line. However this is expected to change with the completion of phase III of the Port Klang Power Station, which has a capacity of 1,000 MW. Japan financed 45.4 percent of the project cost.

6.2.2. Technology Transfer Effects

The effect of transfer of technical knowledge through implementation of the projects under the Japan's ODA has been highly significant, particularly in view of acquisition of construction techniques and improvement of management and operation techniques by introducing new technology. Through interviews with staff of TNB and consultants4, some of the effects

4 The Interviews were conducted to the following staff:
● Ir. Lim Tiong Jin, Assistant General Manager, Generation Division, TNB, interviewed on 20 June 1996
● Ir. Huah Beng An, Director, Zelleco Engineering (former project manager of various projects), interviewed on 22 June 1996.
can be observed.

The first is the technology of gas turbine. Since the Gas Turbine Power units were the first ones introduced in NEB (National Electricity Board, the former body of TNB), a great deal of technical knowledge including construction method, maintenance, operations and management was transferred to NEB engineers during the implementation of the project. This technical knowledge was utilized fully for the subsequent construction of the same type of gas turbine units at both Connaught Bridge and Paka Power Plants.

A second is technology of thermal power plants. The power unit of 120MW, installed at the Prai Thermal Power Station, was the same type as the two power units (120MW × 2) installed later at the Pasir Gudang Thermal Power Plant. Therefore, the effect of technical knowledge transferred during construction of these units was highly significant. The simulator for the Prai thermal power unit operation was installed at the Bangi training center of NEB, and contributed particularly to the improvement of operation and control techniques of thermal power units.

A third is the technology of civil works of hydro power plant. The Temengor dam was the first large scale rock filled dam for NEB, and both the Bersia and Kenering dams were also the first large
Chapter 6. ROLE IN POWER SECTOR

scale concrete gravity type dams for NEB. During design and construction of these dams, a great deal of technical knowledge was transferred to NEB engineers regarding the procedures for planning and design, construction method, operation, maintenance and management of hydro-power plants. The knowledge transferred was significant to the following hydro development projects, especially to the Pergau Hydro-electric project\(^5\) in Kelantan in the early 1990s.

The last is the technology transfer to IPPs. Under phase I & II of the Port Klang Power Station, four units of the biggest turbines in Malaysia, to date, were installed. Several TNB engineers, who had experience in the project, were recruited by private developers for IPPs for construction of power plants, because they were the only engineers in Malaysia who had experienced such large scale power development. As far as confirmed in the interviews, four engineers went to IPPs, GE Power for the construction of Port Dickson Power Station, Genting Sanyen for the Kuala Langat Power Station, Segari Energy Ventures for the Lumut Power Station and Kuala Lumpur International Airport Berhad for the generation system of the new airport. They have occupied key positions such as project managers for each project.

\(^5\) The Pergau Hydro Project was planned in 1986 with assistance from Australia. The construction was awarded in 1991 to a consortium of Malaysian and British companies under British finance. The project, costing RM1.82 billion and installed capacity of 600MW, will be completed in 1996. See p.175-181, TNB, Hydro Power in Malaysia, 1993
6.3. Indirect Effects of Power Development

Huge investments have been made in the development of electric power resources, which have induced industrial production and increased production and income. These effects can be considered as a project investment effect. The effects can be classified into production inducement effect (primary inducement effect) and the income inducement effect (secondary inducement effect). The latter results from the consumption of the induced income, which then induces further production.

Those effects can be evaluated by means of input-output analysis. "Malaysia Input-output table 1987" was used for Analysis because the major investment under Japan's ODA to the power sector was made in the mid-1980s, and the 1987 version was the latest issue, October 1994.

An outline of the input-output table and evaluation

---

6 Input-output analysis is an economic evaluation analysis using input-output table which is an integrated set of supply and use tables. This provides a detailed analysis of the process of production and the use of goods and services among various industries. This method is sometimes used for evaluation in influencing of investments in specific sectors to other sectors or total economy. In this sense, this method is way to measure the impact of Japan's ODA in a specific sector to the total Malaysian economy.

7 The 1987 Table was the third set of tables produced for Malaysia, the earlier being in 1978 and 1983. It was the latest I/O tables issued in October 1994. The table was the result of the collaborative efforts of the Department of Statistics and the Economic Planning Unit, Prime Minister's Department, with technical assistance provided by the United Nations Development Programme.
procedure are explained as follows;

The input-output table takes the form below (see attachment 6-1 for actual table)

<table>
<thead>
<tr>
<th></th>
<th>Intermediate Demand</th>
<th>Final Demand</th>
<th>Total Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>AX</td>
<td>F</td>
<td>X</td>
</tr>
<tr>
<td>Value Added</td>
<td>V = X' t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Output</td>
<td>X' t</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Malaysia Input-output Tables 1987 p.32

where; X: Output Vector
A: Technical Coefficient
F: Final Demand
V: Value Added

The input structures show what each sector requires to produce its output. To obtain direct and indirect effects, the basic equation below were solved for X:

\[ AX + F = X \]
\[ X = (I - A)^{-1} F \]

\((I - A)^{-1}\) is called the Matrix Multiplier or the Leontief Matrix, which can be obtained from the Interdependence Coefficient Table (see attachment 6-3). The columns of this matrix show the total input requirements both direct and indirect. The entries in this matrix are considerably larger than the input coefficient which shows direct inputs; the differences between the two are the
indirect inputs. This inverse matrix \((I - A)^{-1}\) is fundamental to input-output analysis as it shows the full impact of the demand for the output of each sector on all the other sectors. A change in the final demand of a particular industry will not merely affect the production of that particular commodity but will also lead to increased demand for products used in its production. The latter demand, in its turn, will require more inputs from yet other sectors. It is thus possible to define two types of inputs. Direct inputs are those purchased by the industry under consideration, and thus create direct effects. Indirect inputs are those purchased by all industries, in which production is required in order to supply inputs to the first industry thus creating indirect effects.

Production Inducement Effect is calculated as following:

- A breakdown of expenses invested in the construction of the plants were analyzed and the final demand vector \(F\) is created. The investment were distributed to the 10 sectors of the economy based on the project cost component. The proportion of the cost component were taken from table 6-4 and other OECF documents.

- The output \(X\), induced by the final demand \(F\), is calculated using the formula; \(X = (I - A)^{-1}\). The interdependence coefficients from the input output system were applied to the final demand vector \(F\) created for each sector of the economy.

- The value added \(X^i\) is calculated by applying the value added rate (see attachment 6-4) to the final demand of the sector from the investment.
Income Inducement Effect is calculated as follows:

- The final demand for private consumption is created in the input output system by adding in the column for private consumption into the system, prior to calculating total intermediate demand. The technical and interdependence coefficients were calculated in the same way as before.

- The secondary inducement is then derived by applying the value added, derived in the earlier process, to the interdependence coefficient.

- The value added $X_t$ is calculated by applying the value added rate (derived through similar process as before i.e. multiplying the technical coefficient of each sector's value added and the interdependence coefficient of each sector), to the final demand of the sector from the investment.

For the purpose of this analysis, all the financial values were expressed in 1994 constant prices. The consumer price index shown in table 6.8 was applied for inflation/deflation.
Table 6-8 Consumer Price Index

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>47.5</td>
</tr>
<tr>
<td>1975</td>
<td>49.6</td>
</tr>
<tr>
<td>1976</td>
<td>50.9</td>
</tr>
<tr>
<td>1977</td>
<td>53.3</td>
</tr>
<tr>
<td>1978</td>
<td>56.0</td>
</tr>
<tr>
<td>1979</td>
<td>58.0</td>
</tr>
<tr>
<td>1980</td>
<td>61.9</td>
</tr>
<tr>
<td>1981</td>
<td>67.9</td>
</tr>
<tr>
<td>1982</td>
<td>71.8</td>
</tr>
<tr>
<td>1983</td>
<td>74.5</td>
</tr>
<tr>
<td>1984</td>
<td>77.1</td>
</tr>
<tr>
<td>1985</td>
<td>77.4</td>
</tr>
<tr>
<td>1986</td>
<td>77.8</td>
</tr>
<tr>
<td>1987</td>
<td>78.4</td>
</tr>
<tr>
<td>1988</td>
<td>80.4</td>
</tr>
<tr>
<td>1989</td>
<td>82.6</td>
</tr>
<tr>
<td>1990</td>
<td>85.2</td>
</tr>
<tr>
<td>1991</td>
<td>88.9</td>
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<tr>
<td>1992</td>
<td>93.1</td>
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<tr>
<td>1993</td>
<td>96.4</td>
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<td>1994</td>
<td>100.0</td>
</tr>
<tr>
<td>1995</td>
<td>103.7</td>
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<tr>
<td>1996</td>
<td>107.5</td>
</tr>
<tr>
<td>1997</td>
<td>111.5</td>
</tr>
<tr>
<td>1998</td>
<td>115.6</td>
</tr>
</tbody>
</table>

Source: Economic Report, various years

The yearly project investment amount by year is shown in attachment 6-5. The resulting yearly project investment, after applying the consumer price index, is shown in attachment 6-6. The project investment amount for each project was then distributed among the industry sectors by analyzing the cost component of each project. The final demands obtained from this analysis was shown in attachment 6-7. The cost includes those for accompanying projects such as the construction of access roads. Due to the nature of the development, a large portion of investment was assigned to the manufacturing sector. In the case of the hydro electric power plant
development, however, the construction sector requires a large portion of investment. In addition, the portion which turns into the value added becomes larger in the case of the hydro electric power plant development. The project investment by sector was then applied to the 1987 Malaysia input output table interdependence coefficient, to calculate the production inducement and production value added for each project.

For the purpose of this impact analysis, the resulting effects obtained from earlier calculations, which were derived from the total project cost, were apportioned according to the financing component (OECF and others). This was done in order to reflect OECF’s contribution to the project. The final results therefore only show the impact of the OECF portion of the projects and not the total project.
<table>
<thead>
<tr>
<th>Year of Development</th>
<th>GDP at 1994 Prices</th>
<th>Value Added</th>
<th>Share of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temenggor</td>
<td>1977</td>
<td>60,669.84</td>
<td>282.44</td>
</tr>
<tr>
<td>Gas</td>
<td>1978</td>
<td>64,781.79</td>
<td>41.35</td>
</tr>
<tr>
<td>Perai</td>
<td>1980</td>
<td>83,770.21</td>
<td>47.22</td>
</tr>
<tr>
<td>Pasir Gudang</td>
<td>1979</td>
<td>77,723.09</td>
<td>69.08</td>
</tr>
<tr>
<td>KL - Kg Awah</td>
<td>1980</td>
<td>83,770.21</td>
<td>25.10</td>
</tr>
<tr>
<td>Bersia</td>
<td>1982</td>
<td>85,246.03</td>
<td>36.18</td>
</tr>
<tr>
<td>Keninga</td>
<td>1981</td>
<td>82,582.27</td>
<td>46.66</td>
</tr>
<tr>
<td>Terengganu</td>
<td>1982</td>
<td>85,246.03</td>
<td>142.62</td>
</tr>
<tr>
<td>Port Klang 1</td>
<td>1983</td>
<td>91,227.82</td>
<td>179.93</td>
</tr>
<tr>
<td>Port Klang 2</td>
<td>1986</td>
<td>91,420.04</td>
<td>419.33</td>
</tr>
<tr>
<td>Port Klang 3</td>
<td>1995</td>
<td>118,151.00</td>
<td>891.09</td>
</tr>
<tr>
<td>Tenom Pangi</td>
<td>1980</td>
<td>83,770.21</td>
<td>94.42</td>
</tr>
<tr>
<td>Batang Ai H.P.P</td>
<td>1983</td>
<td>91,227.82</td>
<td>65.87</td>
</tr>
<tr>
<td>Batang Ai T. Line</td>
<td>1983</td>
<td>91,227.82</td>
<td>35.30</td>
</tr>
<tr>
<td>Engkili Sibu</td>
<td>1987</td>
<td>102,857.08</td>
<td>27.99</td>
</tr>
<tr>
<td>Patau Patau</td>
<td>1994</td>
<td>185,692.00</td>
<td>9.97</td>
</tr>
<tr>
<td>Rehab of Tenom Pangi</td>
<td>1996</td>
<td>223,080.03</td>
<td>1.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>2,416.10</strong></td>
<td></td>
</tr>
</tbody>
</table>

- Share of GDP were calculated by dividing the Value Added by the GDP of the year where the investment were made most intensively.
Table 6.9 summarizes the value added of production and income inducement of each project, which is similar in concept to GDP. The value added for Temengor appeared to be 0.47% to GDP of the year when the investment was most intensive. It means that Yen Loan to the Temengor project contributed in creating a value equivalent to 0.47% of GDP. This means this project as a whole has helped to push up the annual national GDP by 0.47%. The Kenyir project also has significant effects on the GDP, pushing it up by 0.18%. Each stage of the Port Klang Power Station contributed to push GDP up by 0.197%, 0.459%, 0.767% respectively. Therefore, the total contribution to the GDP of Malaysia is equivalent to RM 2,416 million at 1994 price, which is equivalent to 1.3% of 1994 GDP. Thus, it is clear that Japan's ODA has considerable impact on the Malaysian economy.

6.4. Conclusion

Although significant contributions can be seen in the above study, there are some problems in Japan's ODA in the sector.

Firstly, the most common problem is the burden caused by the yen appreciation. The previous study examined effects of investment by Yen Loan, but it did not take into account the repayment or the interest. Tremendous disbursements were made during the mid-1980s when yen appreciation had not as yet occurred. But the Yen has appreciated by doubling or trebling in the recent 10 years.
For example, the Temengor Hydro-electric Project was committed in January 1974, when US$1 was equivalent to ¥291. It was disbursed intensively in 1975 and 1976 when US$1 was nearly ¥300, but was repaid in the next 20 years. In 1993 when final repayment was made, US$1 had became ¥113. Table 6.10 shows cash flow of the loan. Although the interest rate was 3.2% in terms of the Yen, actual interest rate in terms of US dollars became 8.3% in the end. A Malaysian Government officer⁸ complained that the actual interest of Yen Loan was higher than an US market loan, even if it was given under the name of assistance.

⁸ See p.4 "Japan-Malaysia Relations: External Debt with Special Emphasis on Official Assistance" Lin See Yan, 1988 ISIS
### Table 6-10  Cash Flow of Project Loan
(The Temengor Hydro-Electric Power Station Project)

<table>
<thead>
<tr>
<th>Year</th>
<th>Yen (million yen)</th>
<th>US dollars (US$ thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disbursement amount</td>
<td>Principal repayment</td>
</tr>
<tr>
<td>1974</td>
<td>980</td>
<td>0</td>
</tr>
<tr>
<td>1975</td>
<td>4,456</td>
<td>0</td>
</tr>
<tr>
<td>1976</td>
<td>4,645</td>
<td>0</td>
</tr>
<tr>
<td>1977</td>
<td>2,548</td>
<td>0</td>
</tr>
<tr>
<td>1978</td>
<td>58</td>
<td>0</td>
</tr>
<tr>
<td>1979</td>
<td>612</td>
<td>0</td>
</tr>
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<td>1980</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1981</td>
<td>0</td>
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</tr>
<tr>
<td>1982</td>
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</tr>
<tr>
<td>1983</td>
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<td>1,023</td>
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<tr>
<td>1984</td>
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<td>1,023</td>
</tr>
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<td>1985</td>
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<tr>
<td>1986</td>
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<td>1987</td>
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<tr>
<td>Total</td>
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</table>

**Interest rate in Yen=3.204%**

**Interest rate in US$ = 8.267%**

Note: Interest rate is calculated in cash flow as a discount rate which makes Net Present Value zero.

Source: The writer's calculation based on OECF document.
Secondly, Japan's ODA lacks intellectual contribution. The previous study showed significant financial contributions of Japan's ODA to the Malaysian economy. However, Japan has provided only money, and not planning or supervising such as Canada, UK or Australia. Nor did it provide policy consultation such as did the World Bank and ADB. Thus, Japan should emphasize on intellectual contribution in the future.

Thirdly, the Japanese system of ODA has been closed to local companies. Up to 1986, Japan's ODA was extended only to the projects, under which Japanese companies were awarded. Since 1987, it has become fully untied, but the Government of Japan applied procurement guidelines to procure equipment, civil works and consultancy services. Under the guidelines, preference cannot be given to local companies. Furthermore, technical transfer to a local partner is not obliged. Then, some projects were implemented only by Japanese participation. Little technology transfer was realized during the construction period, or limited training was conducted before commissioning.

For instance, phase II of the Port Klang Power Station had the above problems. Under the phase II project, TNB hired a Japanese consultant firm and encouraged it to associate with local firms in view of the need for transfer of technology. However, technology transfer to TNB was not sufficient under phase II, which caused several problems in the initial operation stage. TNB changed its policy of technology transfer in the next stage. Under
phase III, TNB sent its own staff to Japanese consultant firms, as well as joint ventures with local firms, who worked as engineers under the supervision of Japanese engineers. The contract under phase III between TNB and the Japanese consultant firm specified,

To maximize technology transfer, TNB will second a number of its engineers in civil, electrical and mechanical disciplines to work closely with the consultants during the engineering phase of the project. These seconded engineers will come under the supervision and management of the consultants and they should be fully utilized as part of the technology transfer exercise.\(^9\)

At present, twelve young TNB staff are seconded to Japanese firms and work with Japanese engineers at the site under phase III. TNB has judged the most effective way of technology transfer is to work together with Japanese engineers who usually do not hesitate to work out of office. This case shows that Japan should promote local participation for technology transfer, and the Malaysian side is also required to make every effort to absorb technology\(^10\).

Lastly, the system of Japan’s ODA is so rigid that it cannot catch up with privatization policies. Since it was a loan or grant on Government-to-Government basis, and it requires government guarantee or participation, the role of Japan’s ODA is very limited

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\(^9\) Source is TNB, Contract Documents with EPDCI

\(^10\) Kassim Chan, *Impact study on OECF funded Power Development Projects*, 1996
under the present privatization policy.

Having considered the above problems, the following conclusions can be derived;

- Japan's ODA has contributed to the development of power by 35% of TNB's installation capacity, 23% of SEB's and 20% of SESCO's. It also contributed to increase between 10% to 18% of TNB's revenue. Through the investment by Japan's ODA to development of power, it has created value added, amounting 1.3% of 1994 GDP. It has the same effect to push up GDP by this ratio.

- Under each 5 year plan, Japan's ODA has been a stable financial source. According to the policy, Japan's ODA contributed not only to meet with rapid increasing demand but also in the diversification of energy sources from heavy dependence on oil. Japan's ODA was especially suitable for long term development projects such as hydro-electric power, due to its long maturity and low interest rate. It has been invested in six hydro power plants out of eight major ones in the country.

- On the other hand, the role of Japan's ODA has become narrow under the privatization policy and its advantage and effectiveness has deteriorated because of the Yen appreciation and its rigid system. Japan should adjust the system of its ODA to meet new demands under the present circumstances.

- Furthermore, Japan's ODA contribution is only by financial
assistance. Japan should contribute technology transfer through localization, including recruitment and training for local partners. Japan should be requested to contribute in the knowledge field now.
<table>
<thead>
<tr>
<th></th>
<th>Agriculture</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Electric, Gas</th>
<th>Transport</th>
<th>Wholesale</th>
<th>Finance</th>
<th>Government Serv.</th>
<th>Other Services</th>
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Source: 1987 Malaysia Input-Output Table p.53-59
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<th>Agriculture</th>
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<th>Manufacturing</th>
<th>Construction</th>
<th>Electric, Gas</th>
<th>Transport</th>
<th>Wholesale</th>
<th>Finance</th>
<th>Government Serv.</th>
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Total Input:

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- **Mining**: 1
- **Manufacturing**: 1
- **Construction**: 1
- **Electric, Gas**: 1
- **Transport**: 1
- **Wholesale**: 1
- **Finance**: 1
- **Government Serv.**: 1
- **Other Services**: 1

**Total Int. Demand**: 1
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<th></th>
<th>Agriculture</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Electric, Gas</th>
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<th>Wholesale</th>
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<th>Government Serv.</th>
<th>Other Services</th>
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| Year  | Total | Total
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**Note:** The table above shows the total figures for each year, with the years 2020 to 2024 listed. The totals are provided for both columns, with the data for each year and column clearly indicated.
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### Production

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### Terengganu H.P.P

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### Port Kelang T.P.P 1

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<td>3,308,511</td>
<td>4,688,485</td>
</tr>
<tr>
<td>Private Cons.</td>
<td>-</td>
<td>3,579,212</td>
<td>-</td>
<td>3,500,469</td>
<td>3,550,469</td>
</tr>
<tr>
<td><strong>Total Inducement</strong></td>
<td>35,167,044</td>
<td>37,944,571</td>
<td>34,393,369</td>
<td>37,109,790</td>
<td>71,503,159</td>
</tr>
<tr>
<td><strong>Total Value Added</strong></td>
<td>7,130,304</td>
<td>3,061,204</td>
<td>5,973,437</td>
<td>2,893,858</td>
<td>8,867,295</td>
</tr>
<tr>
<td><strong>Rehab of Tenom Pangi</strong></td>
<td></td>
<td></td>
<td>0.749</td>
<td>0.749</td>
<td>0.749</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>143,211</td>
<td>153,843</td>
<td>107,265</td>
<td>115,243</td>
<td>222,508</td>
</tr>
<tr>
<td>Mining</td>
<td>38,434</td>
<td>155,749</td>
<td>28,787</td>
<td>116,556</td>
<td>145,443</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1,360,585</td>
<td>731,313</td>
<td>1,040,799</td>
<td>547,753</td>
<td>1,588,553</td>
</tr>
<tr>
<td>Construction</td>
<td>1,591,512</td>
<td>1,022,898</td>
<td>1,102,042</td>
<td>784,553</td>
<td>1,956,595</td>
</tr>
<tr>
<td>Electric, Gas</td>
<td>122,586</td>
<td>278,438</td>
<td>91,817</td>
<td>208,550</td>
<td>300,367</td>
</tr>
<tr>
<td>Transport</td>
<td>86,311</td>
<td>214,782</td>
<td>86,063</td>
<td>206,672</td>
<td>292,734</td>
</tr>
<tr>
<td>Wholesale</td>
<td>152,871</td>
<td>210,005</td>
<td>113,286</td>
<td>157,294</td>
<td>271,821</td>
</tr>
<tr>
<td>Finance</td>
<td>92,571</td>
<td>201,129</td>
<td>89,411</td>
<td>150,648</td>
<td>239,869</td>
</tr>
<tr>
<td>Government Service</td>
<td>123,504</td>
<td>202,907</td>
<td>92,504</td>
<td>151,977</td>
<td>244,482</td>
</tr>
<tr>
<td>Other Services</td>
<td>520,859</td>
<td>628,688</td>
<td>300,123</td>
<td>471,111</td>
<td>881,234</td>
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<tr>
<td>Private Cons.</td>
<td>-</td>
<td>296,226</td>
<td>-</td>
<td>221,873</td>
<td>221,873</td>
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<tr>
<td><strong>Total Inducement</strong></td>
<td>4,250,079</td>
<td>4,094,296</td>
<td>3,900,789</td>
<td>3,066,528</td>
<td>7,067,327</td>
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<tr>
<td><strong>Total Value Added</strong></td>
<td>1,512,801</td>
<td>564,435</td>
<td>1,133,088</td>
<td>422,792</td>
<td>1,555,860</td>
</tr>
<tr>
<td><strong>Accumulated Production and Income Inducement by Sector for all OECF Projects (Ringgit Malaysia - 1994 Prices)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>814,397,536</td>
<td>283,325,211</td>
<td>897,722,747</td>
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<td>Mining</td>
<td>404,650,237</td>
<td>279,145,490</td>
<td>683,825,726</td>
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<td>Manufacturing</td>
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<td>1,410,849,220</td>
<td>4,378,692,419</td>
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<tr>
<td>Construction</td>
<td>2,247,758,406</td>
<td>1,317,352,480</td>
<td>3,565,120,886</td>
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</tr>
<tr>
<td>Electric, Gas</td>
<td>526,059,361</td>
<td>436,620,650</td>
<td>1,061,680,017</td>
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</tr>
<tr>
<td>Transport</td>
<td>446,618,154</td>
<td>385,134,951</td>
<td>831,753,104</td>
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<tr>
<td>Wholesale</td>
<td>867,452,831</td>
<td>373,373,590</td>
<td>1,240,826,421</td>
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<tr>
<td>Finance</td>
<td>494,585,922</td>
<td>341,865,552</td>
<td>836,451,474</td>
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<tr>
<td>Government Service</td>
<td>537,194,850</td>
<td>348,501,508</td>
<td>885,696,358</td>
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<tr>
<td>Other Services</td>
<td>864,042,125</td>
<td>631,740,581</td>
<td>1,315,791,706</td>
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</tr>
<tr>
<td>Private Cons.</td>
<td>-</td>
<td>626,123,831</td>
<td>626,123,831</td>
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<td></td>
</tr>
<tr>
<td><strong>Total Production</strong></td>
<td>9,442,854,420</td>
<td>6,392,132,081</td>
<td>16,834,986,501</td>
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</tr>
<tr>
<td><strong>Total Value Added</strong></td>
<td>1,778,371,284</td>
<td>682,498,317</td>
<td>2,460,869,701</td>
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213