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Final Report

ASSESSMENT OF SRI LANKA'S POWER SECTOR ISSUES AND PROJECTS

Review, Analysis, and Recommendations

Prepared for:

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and

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MEASURES

1 Kilovolt (kv)	=	1,000 volts (V)
1 Kilowatt (kW)	=	1,000 watts (W)
1 Megawatt (mW)	=	1,000 kilowatts (kW)
1 Kilowatt—hour (kWh)	=	1,000 watt—hours (Wh)
1 Megawatt—hour (MWh)	=	1,000 kilowatt—hours (kWh)
1 Gigawatt—hour (GWh)	=	1,000,000 kilowatt-hours (kWh)

ABBREVIATIONS AND ACRONYMS

A.I.D.	U.S. Agency for International Development
ADB	Asian Development Bank
BOI	Board of Investment
BOO	Build-Own-Operate (Financing Structure)
BOT	Build-Own-Transfer (Financing Structure)
CEB	Ceylon Electricity Board
CFED	Center for Financial Engineering in Development
EGAT	Electric Generation Authority of Thailand
GDP	Gross Domestic Product
GSL	Government of Sri Lanka
IBRD/World Bank	International Bank for Reconstruction and Development
K-M	Kelani River tributaries Kehelgamu Oya and Maskeliya Oya
LTGEP	Long-Term Generation Expansion Planning Studies: 1994-2008
MPPI	Ministry of Policy Planning and Investment
SIDI	Secretariat for Infrastructure Development and Investment
USAID	A.I.D. Mission to Sri Lanka

EXECUTIVE SUMMARY

Sri Lanka is on the verge of facing severe power shortages in the near future. To help the country find ways to use the private sector to fund new power projects, an electrical engineer from the Promotion of Private Infrastructure (PPI) Project, funded by the U.S. Agency for International Development (A.I.D.) Mission to Sri Lanka (USAID/Sri Lanka), researched Sri Lanka's power needs and reviewed the opportunities for private participation.

. This report, *Assessment of Sri Lanka's Power Sector Issues and Projects: Review, Analysis, and Recommendations,* details the findings of the two-month study conducted with the close collaboration of senior Ceylon Electrical Board (CEB) representatives and members of the Secretariat for Infrastructure Development and Investment (SIDI), the government body charged with coordinating, overseeing, and supervising the country's privatization activities in economic infrastructure.

The study found that several sectoral and institutional issues confront CEB and SIDI in their efforts to find private partners to help develop Sri Lanka's power sector. Some difficulties have arisen due to SIDI's lack of authority to negotiate and implement private/public partnerships, CEB's lack of confidence in SIDI's ability to protect its interests, and CEB concerns about being rushed and pushed into actions that can not be technically justified. An analysis of and recommendations to improve the support SIDI provides CEB is found in Chapter 2.

The study also found that while opinions differ on the projected growth of electricity use in the CEB system, even conservative load forecasts agree that additional generation facilities are needed in both the short and long term. All parties also agree that measures need to be taken in the near term to prevent the energy shortages that are expected to start this fall. These forecasting methodologies and the Sri Lanka power system are discussed in Chapter 3.

Chapter 4 describes CEB's financing options, including its need to attract financing using a combination of funding sources, and CEB's concerns about private sector financing. The chapter notes that upcoming educational courses will provide CEB with the skills necessary to understand complicated financial packaging and a closer collaboration with SIDI will enable it to make informed decisions on the various projects being presented.

Finally, Chapters 5 and 6 detail the status of the CEB's present and proposed projects, respectively.

1

INTRODUCTION

Sri Lanka is on the verge of facing severe power shortages in the near future. Like much of the country's economic infrastructure, Sri Lanka's power plants are outdated and deteriorating. The costs required to solve these economic infrastructure problems, however, are enormous and far exceed the resources available to the Government of Sri Lanka (GSL), even with bilateral donor and international lending agency support. Recognizing these needs, the U.S. Agency for International Development's (A.I.D.) Mission to Sri Lanka (USAID/Sri Lanka) began the Promotion of Private Infrastructure (PPI) Project in 1992 to identify opportunities for private participation in five primary sectors of the country's economic infrastructure, including the power sector. The goal of the project is to modernize the five sectors through private financing and management, using such methods as Build-Own-Operate (BOO), Build-Operate-Transfer (BOT), and similar joint-sector undertakings.

The GSL has demonstrated its commitment to the private provision of economic infrastructure and has set up the Secretariat for Infrastructure Development and Investment (SIDI) to coordinate, oversee, and supervise these activities. The Center for Financial Engineering in Development (CFED), the U.S.-based consulting firm managing the PPI Project, provides ongoing technical assistance to SIDI.

CFED fielded Steven W. Thompson, an electrical engineer, in May and June 1994 to research Sri Lanka's power needs and review the opportunities for private participation, including assessing the following:

1. Institutional and infrastructure reforms necessary for private sector development of generation on a public/private partnership basis
2. Risk sharing and financial programs for credit support of public/private partnership power projects

This report summarizes Thompson's findings, recommends ways to improve the support SIDI provides the Ceylon Electricity Board (CEB), presents a concise overview of the situation in the power sector, and details the status of the CEB's present and proposed projects.

2

SECTORAL AND INSTITUTIONAL ISSUES CONFRONTING CEB

Several sectoral and institutional issues confront CEB and SIDI in their efforts to find private partners to help develop Sri Lanka's power sector. Both agencies believe the decisions they make on near-term projects must be carefully crafted to ensure a positive impact on the future, larger projects needed to meet the country's ever increasing power needs. Some difficulties have arisen, however, due to SIDI's lack of authority to negotiate and implement private/public partnerships, CEB's lack of confidence in SIDI's ability to protect its interests, and CEB concerns about being rushed and pushed into actions that can not be technically justified. Following is an analysis of and recommendations to improve the support SIDI provides CEB to enable it to perform its responsibility of providing electricity at the most economical levels possible.

SIDI Institutional Arrangements

1. SIDI was formed under a mandate of the Ministry of Policy Planning and Investment (MPPI) to promote and facilitate a program of private sector investment in infrastructure development. While SIDI's formation received cabinet-level approval, it does not operate under the authority of any specific legislation or act of law of the GSL.

2. The Board of Investment (BOI) was legislated into being in 1977 under a specific act of law entitled the Board of Investment Law No. 4 or 1978. Section 17 of the act empowers the BOI to grant special concessions modifying or varying the provisions of the various statutes governing foreign investment. Additionally, because of such broad powers, the BOI can act as a "one window" agency for the application, processing, approval, and long-term coordination of qualifying projects.

3. SIDI is not legally empowered to operate on behalf of the GSL or as a substitute for any governmental authority. In reality, SIDI functions in an advisory capacity to the various infrastructure agencies. SIDI will provide the necessary expertise to enable the respective agencies to make informed decisions on complicated matters concerning proposals and solicitations for private sector development. SIDI may give advice to the respective governmental agencies and ministries on issues concerning private sector

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development, including contractual arrangements; however, unless the responsible agency agrees with and accepts the recommendation of SIDI, no constituted authority authorizes SIDI to continue negotiations or implementation. SIDI has a working agreement with the Power and Energy Committee to take the initiative on necessary energy related projects involving private sector funding.

4. SIDI is staffed with individuals provided through MPPI. SIDI also has direct-hire staff functioning in various management positions. In most organizations similar to SIDI, however, you would normally find personnel from the various line ministries, such as finance, law and justice, commerce, and utilities.

5. Since SIDI has no legislated authority, it can only make recommendations on project feasibility and contractual structure to the respective jurisdictional authorities. If the particular agency or ministry does not wish to take the recommendation of SIDI, nothing obligates the government agency or the private sector developer to commit to any agreement that SIDI has helped in developing or negotiating. Therefore, SIDI becomes a "middle man" in making recommendations to GSL on specific projects while trying to insist that developers offer projects on a complete and transparent basis for review and consideration. SIDI can, very easily, be placed in the middle between the developer and the ministries.

6. CEB's reluctance to work with SIDI is, in part, a result of SIDI's above-referenced structural shortfalls. It is not to imply that this situation results in a lack of progress at CEB but that it only helps exacerbate an already difficult relationship with CEB.

Power Sector Issues

1. There is considerable disagreement on what load forecasting methodology to use for long-range generation expansion planning at CEB. Even conservative load forecasts, however, agree that additional generation facilities are needed in the long term. (Long-term forecasting methodologies and the Sri Lanka power system are discussed further in Chapter 3.) All parties also agree that there is an immediate need for generation resources to solve the near-term problem.

   Short-term generation additions are necessary to meet the firm energy requirements of the hydro-based system because less than normal rainfall conditions will result in a shortfall of available firm energy. The CEB system will be short of needed energy, even with normal rainfalls, beginning as early

as late 1994 and continuing into the 1995 peak season. Abnormally high rainfalls from the monsoons and upgrading of some small thermal units may alleviate otherwise necessary load shedding. Discussions with CEB officials, however, confirm that the needed rehabilitation of the existing thermal generation plants will not begin until sometime in calendar year 1995.

As a result, without abnormally high monsoon rainfall this fall, CEB will experience load shedding of at least 4 to 6 hours a day, as in 1992. Additionally, if the monsoon is abnormally low, the load shedding will increase to as much as 8 to 10 hours. This will likely be done on a twice-a-day, rotating basis. How load shedding is administered is a function of the design and flexibility of the CEB low voltage distribution system.

2. It is estimated that the available, exploitable hydro resources available to economically serve the needs of the CEB system are far short of the capacity necessary to continue to provide firm energy, even at a modest load growth (Chapter 4 discusses CEB financing issues further). SIDI and CEB have received many proposals for development of small to intermediate hydro projects as well as other renewable energy projects, such as wind-power generation. Even using modest load growth projections, these projects fall far short of meeting the needs for a reliable base-load generation supply in future years.

3. Many unsolicited proposals for private sector development projects have been submitted. These include five proposals for one or more hydro projects, one conventional diesel thermal project, one wind farm, and the Trincomalee 300 mW coal-fired project. (These projects are discussed further in Chapter 6.) However, unless the proposed projects are included as a part of the approved August 1993 ***Long-Term Generation Expansion Planning Studies: 1994-2008*** (LTGEP), CEB is at risk of entering into projects that could result in a suboptimal generation expansion program in terms of long-term, least-cost generation alternatives.

   CEB has received recommendations and studies from its lenders, primarily the Asian Development Bank (ADB) and the International Bank for Reconstruction and Development (IBRD/World Bank), directing CEB to obtain qualified consultants to assist CEB in performing a number of studies that will enable it to make decisions on projects using quantified criteria. The recommended studies include the following:

   - Detailed thermal generation expansion study to determine the least-cost thermal options

- Design of a uniform power purchase agreement for both small and large projects seeking to sell to CEB
- Tariff analysis to establish the "buy-back" rate or avoided cost of energy for small and intermediate sized projects
- Formulation of uniform equipment guidelines and interconnection policies for connecting projects to the existing CEB electrical grid

Unfortunately, CEB officials confirm that no funding currently exists or is available to CEB to conduct such studies.

4. Irrespective of the timing of construction of new generation facilities, it is clear that conventional government financing sources are insufficient. For this reason, CEB is exploring other avenues for financing necessary projects. To date, however, it has only expanded its sources of financing to include the use of supplier credit options for specific smaller thermal projects—an approach unfeasible for larger base-load thermal projects, such as the proposed coal-fired generation project.

5. CEB is sensitive to the impact of long-term financial obligations required with private sector financing. Entering into private sector projects will require CEB to commit to long-term, take-or-pay power purchase agreements in order for developers to finance the project. A detailed thermal generation expansion study, in conjunction with the other referenced technical support, would allow CEB to select the optimal projects and mitigate entering into smaller projects that could have an adverse impact on the long-range electric tariff requirements.

6. CEB has identified a number of methods to improve and expand the short-term thermal generation needs. These include the addition of several increments of combustion turbine generation that would total approximately 150 mW by the time the final stage is completed. The first unit of 33 mW could be installed within 9 months of signing the contract, and it would take up to 22 months to complete the entire project. CEB has negotiated this on the basis of a supplier credit financing. Total project costs would be approximately 97 million U.S. and would be on the basis of a supplier credit facility equaling 85 percent of the total cost of the project.

   CEB is also planning to enter into some sort of rehabilitation project on portions of the existing thermal generation units. Some of the existing units are in a poor state of repair and need extensive rehabilitation before they can be used. The anticipated cost of this project is U.S. $50 million. It is questionable, however, as to whether this is a cost-effective alternative. In addition, the

length of time it takes to complete the rehabilitation is in question. As of this date, there are firm commitments or agreements on the rehabilitation.

CEB would also like to do this project on the basis of a supplier credit. If such an agreement is reached, the contractor would complete the upgrade and then continue to operate the plant on some sort of lease-operating agreement. CEB would pay the operator a fee that would include a component for the debt repayment as well as the normal operating cost of the facility.

CEB is reviewing two projects for possible implementation in the intermediate and longer term. These include a 40 mW slow speed diesel installation known as the KHD project and a base-load coal plant proposed by Mihaly International of 300 mW (discussed in further detail in Chapter 5). As this report shows, CEB must install generation capacity to meet both short- and long-term, base-load needs. These projects are just two of the options available. Both are being reviewed as an ongoing part of Thompson's consultancy.

Recommendations

As this report emphasizes, the power sector is on the verge of a severe shortage in coming months. To mitigate this situation, all parties must cooperate and coordinate to solve the problem. Meetings with various representative of CEB have been very positive with respect to representatives of SIDI and CFED continuing with and increasing the level of technical support available to CEB for the evaluation and understanding of the various projects.

The upcoming educational courses the PPI Project is scheduled to provide will provide CEB with the skills to understand the complicated financial packaging necessary to meet the needs of its generation expansion program. This is essential if meaningful negotiations can continue with developers, such as KHD and Mihaly.

By continuing to assist CEB during the educational process, CFED and SIDI will be able to have input on the schedules and milestones necessary to go forward with the Mihaly project. This will include developing a realistic timetable for the negotiations and continuing to assist SIDI and CEB with the technical and financial issues.

Additionally, we need to continue to emphasize to the GSL the need to enhance the institutional strengthening of SIDI. Figure 1 shows the

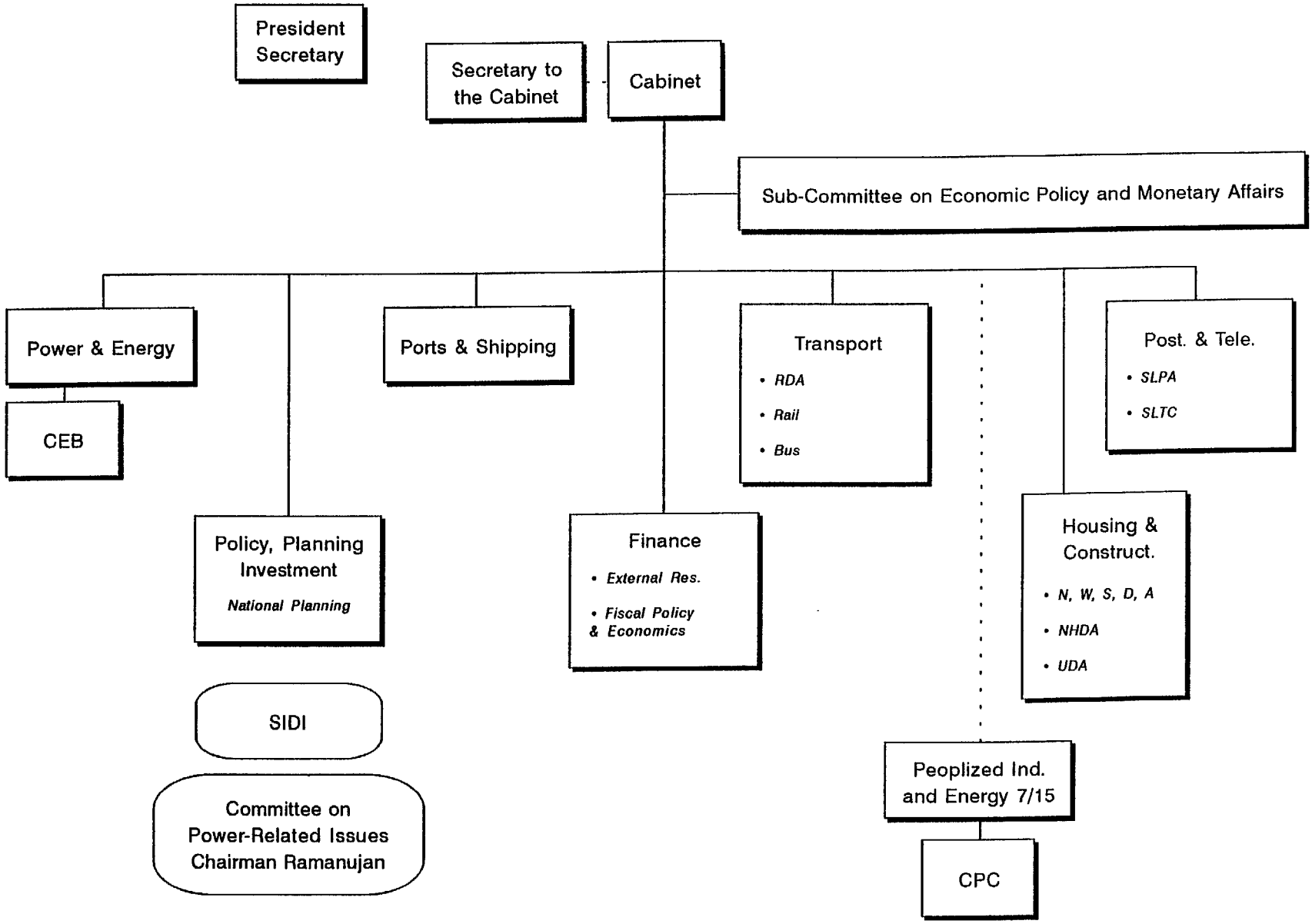

Figure 1 Organizational and Reporting Structure for Power Sector Projects

organizational and reporting structure for approving projects in the power sector. As the figure shows, the decision-making process for approving letters of intent, issuing directives on unsolicited proposals, and making decisions on solicited proposals can be vested in as many as five different governmental agencies or ministries. These are:

1. The Cabinet
2. The Sub-Committee on Economic Policy and Monetary Affairs
3. Ministry of Power and Energy
4. Committee on Power Related Issues
5. Cabinet Appointed Tender Board

Hopefully the parties will be able to develop a defined process for the processing and evaluation of projects. The groundwork has been developed on this, and there is an exchange of ideas with CEB in the process. The recent change in government may slow the process, but it is the opinion of the author that some process will result.

SIDI should provide technical support to CEB for completion of the necessary studies to allow CEB to make informed decisions on the various projects being presented. Without these tools of knowledge in financial planning and tariff design, CEB cannot evaluate the complicated financing and legal provisions of the joint public/private sector financing that will be required to meet the increasing needs in the power sector.

Because the technical training and the technical studies will continue during the time frame in which CEB will be required to continue the negotiation and evaluation of projects, such as KHD and Mihaly, SIDI should continue to make available technical assistance for the evaluation of specific projects. The Mihaly project, for example, represents a project financing in excess of U.S. $300 million and involves a complicated financing plan for foreign coal supply on a new project site. A project of this complexity and magnitude will require protracted negotiations involving international experts in finance, engineering, and legal frameworks. SIDI is available to provide such services to CEB. Without such assistance, it is doubtful that projects of this complexity can become a reality for Sri Lanka in this decade.

3

SRI LANKA'S ELECTRICAL SYSTEM

Load Growth History and Projections

Opinions differ on the projected growth of electricity use in the CEB system. Historical trends over long periods of time (10 to 15 years) become distorted by political events and rapidly changing economic variables. In developing the LTGEP, CEB has factored into its resource planning the sensitivity of alternative levels of load growth. CEB noted in the LTGEP sectoral consumption of energy on a historic basis and attempted to temper longer-term, higher averages with more realistic comparisons to Gross Domestic Product (GDP) and probability of industrial and domestic use.

CEB's plans are based on the assumption that real GDP will grow at 5.3 percent in 1993, rising to 6.9 percent in 1996, compared to the average rate of 4.2 percent since 1970. The GSL is assuming an even higher rate than assumed in the LTGEP, resulting in an electricity-load growth-rate forecast of about 14 to 15 percent. The CEB assumptions equate to an annual demand growth of about 8.2 percent over the next 20 years. The historical trend shows that the demand has doubled in 12 years, and the energy use has increased by 106 percent.

The continuing controversy over CEB load projections deals with the timing and size of larger base-load, coal-fired power plants planned for the 2001 to 2003 time frame. None of the parties are questioning the immediate need for generation resources to solve the near-term problem.

The projected demand and energy growth for the electrical system is shown on Figures 2 and 3. These are derived from a comparative analysis of historical electrical load growth, factored against certain key country economic indicators, such as gross disposable income and sustained economic growth. The macro economic assumption is that the availability of reasonably priced electricity helps sustain the overall economic growth of the country and vice versa. Historical trends are somewhat impacted by short-term political and economic abnormalities, but Sri Lanka has shown a steady growth rate of approximately 8 percent since 1980. The question is whether this can be sustained in the future.

Based on current projections, large energy deficits could result in 1994, 1995, and 1996. These are shown in Table 1.

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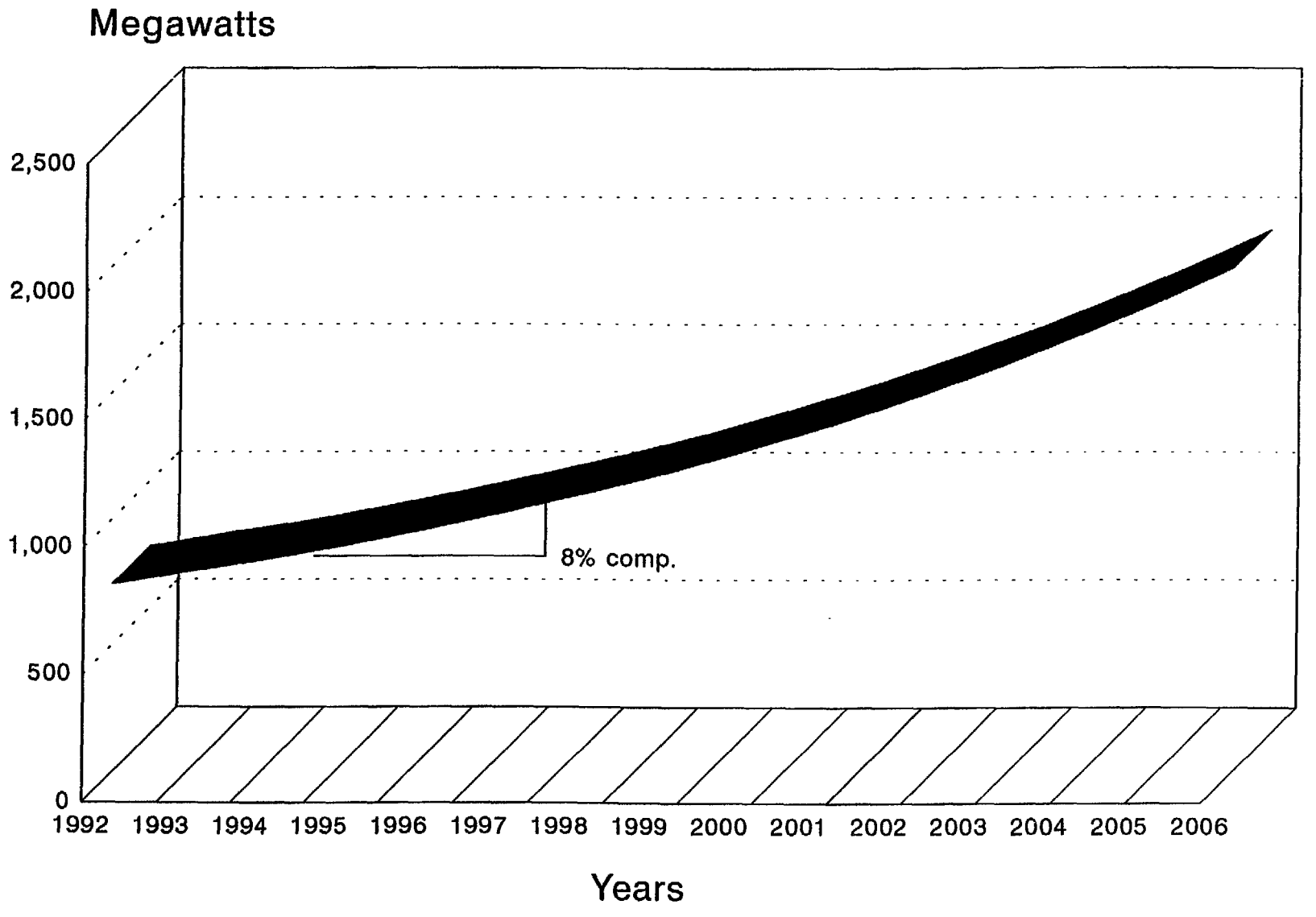

Figure 2 Annual Peak Demand

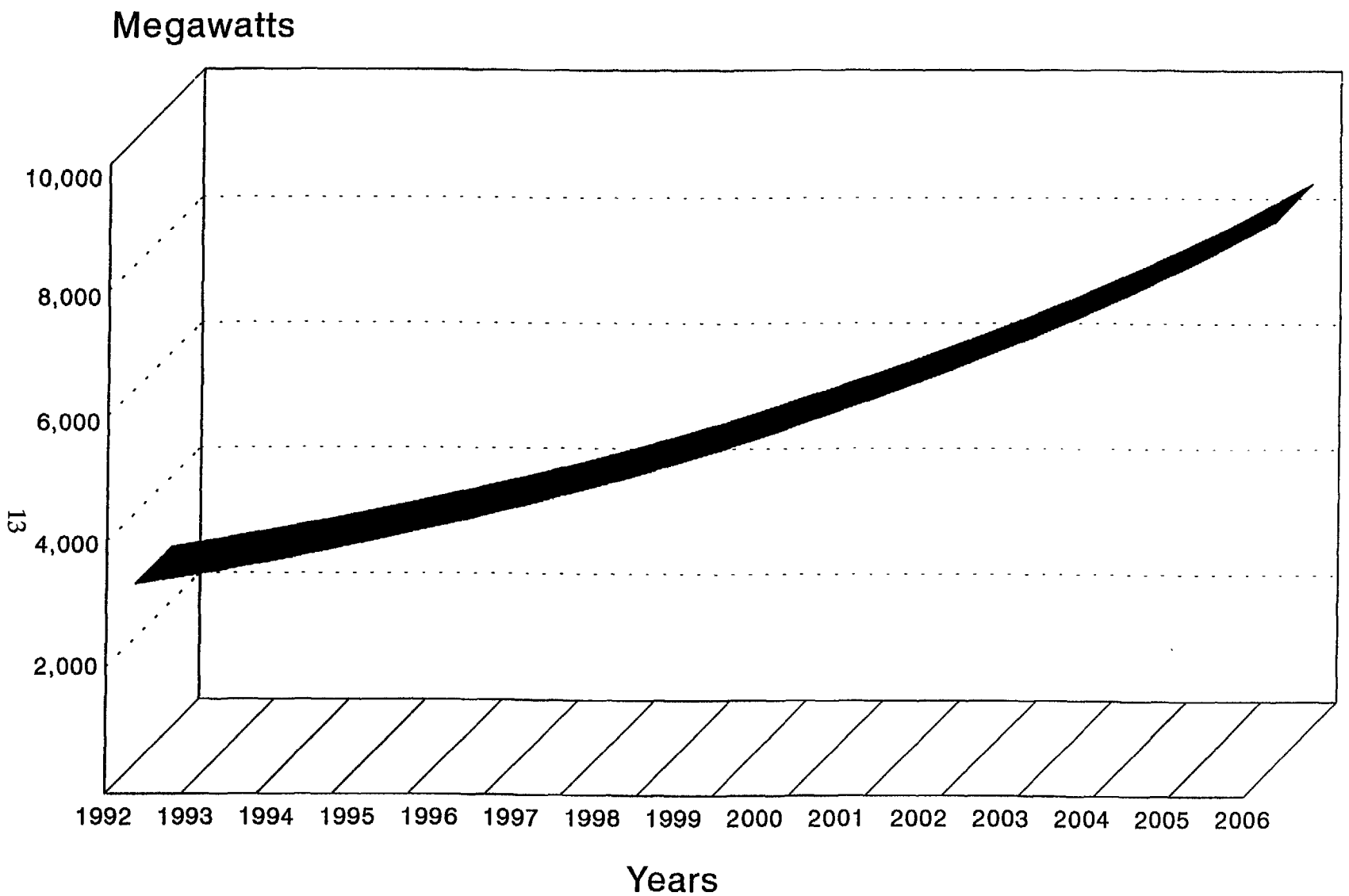

Figure 3 Energy Requirements

Table 1 Expected Energy Deficits

	Expected Deficits Average Hydrology		Expected Deficits Dry Conditions	
Year	GWh	Percent	GWh	Percent
1994	52	1.3	275	6.7
1995	91	2.1	494	11.3
1996	41	1.0	222	4.7

Complications of Generation System Planning

To understand the reason why the decision-making process at CEB is at a gridlock, it is essential to understand the complications being dealt with at CEB.

As shown on the load-growth charts, there are two components to be considered in generation planning. The first is the ***demand component***. Demand is defined as the maximum amount of energy that will be instantaneously needed at any one time. The unit of reference is kilowatt (kW). This is sometime referred to as the system "peak" demand. The other component to consider in system planning is the ***energy component***. The system energy is a mathematical calculation of the demand component in any given period, multiplied by the total hours in the period of the forecast. Hence the unit of reference is kilowatt-hours (kWh).

The need for electricity is not steady throughout the year, month, week, or even on a daily basis. The electrical system will fluctuate greatly, allowing the planners to develop trends for "base-load" requirements and "peaking" requirements. The types of generation facilities used to meet these requirements can differ greatly and are selected based on operational costs, installation cost, and long-term viability.

The "base-load" generating system in Sri Lanka is predominantly hydro-electric. There are 15 hydro power stations with a total installed capacity of 1,135 mW.

The major hydro-power schemes already developed are associated with the Kelani and Mahaweli river basins. Five hydro-power stations with a total installed capacity of 335 mW have been built in the Laxapana Complex associated with the two main tributaries of the Kelani River: Kehelgamu Oya and Maskeliya Oya (K-M). No irrigation or other water requirements govern the operation of this complex, and, accordingly, these five stations have the flexibility for operation purely to suit the requirements of the CEB power system. Castlereigh and Moussakelle are the major storage reservoirs under the K-M hydro power

development. Minor storage is provided by the ponds at Canyon, Norton and Laxapana.

In the Mahaweli River development, six hydro power stations—Ukuwela, Bowatenne, Kotmale, Victoria, Randenigala and Rantambe—have been constructed with a total installed capacity of 660 mW. The Mahaweli system has three major reservoirs: Victoria, Kotmale and Randenigala. The Mahaweli system is a multi-purpose system and the dispatching or operations of these power stations are also governed by the down-stream, seasonal irrigation requirements. ***Approximately 55 percent of the total available hydro capacity and energy is subject to a first call on the water for irrigation requirements down-stream of generation facilities.***

Finally, another major hydro power station unrelated to the K-M and Mahaweli complexes, the Samanalawewa hydro power station, has an installed capacity of 120 mW. (Table 2 gives details on the K-M, Mahaweli, and Samanalawewa hydro power stations.)

Since the irrigation needs have a priority basis over generation dispatch, CEB is obligated to base load the available hydro generation when it is available, rather than when the energy will best fit the CEB load duration profile for monthly and daily load requirements. CEB must take advantage of this generation opportunity to blend the low cost of hydro energy with the other thermal energy. The net effect of this cost averaging is to help hold the overall cost of energy to its lowest possible component. In addition, CEB must rely on seasonal rainfall to recharge the streams and reservoirs to have sufficient energy available to dispatch into the system. Thus, CEB not only competes with the irrigators for the use of the same water, it must also rely on rainfall to generate. This recharging of the system is totally reliant on the two seasonal monsoon periods. Without sufficient rains in those seasons, the system will be severely curtailed as was the case in April and May of 1992. Figure 4 shows the seasonal diversity from one section of the hydro generation scheme. As shown, the "demand" and "energy" capability vary drastically on a seasonal basis.

Because of this peculiar requirement, CEB is forced to generate electricity from these hydro resources when it might otherwise desire to save the water for periods of higher peak load. In other words, the season diversity of downstream irrigation requirements may or may not match the dispatching requirements of the CEB system as it tries to meet its daily and monthly generation requirements to serve system energy needs.

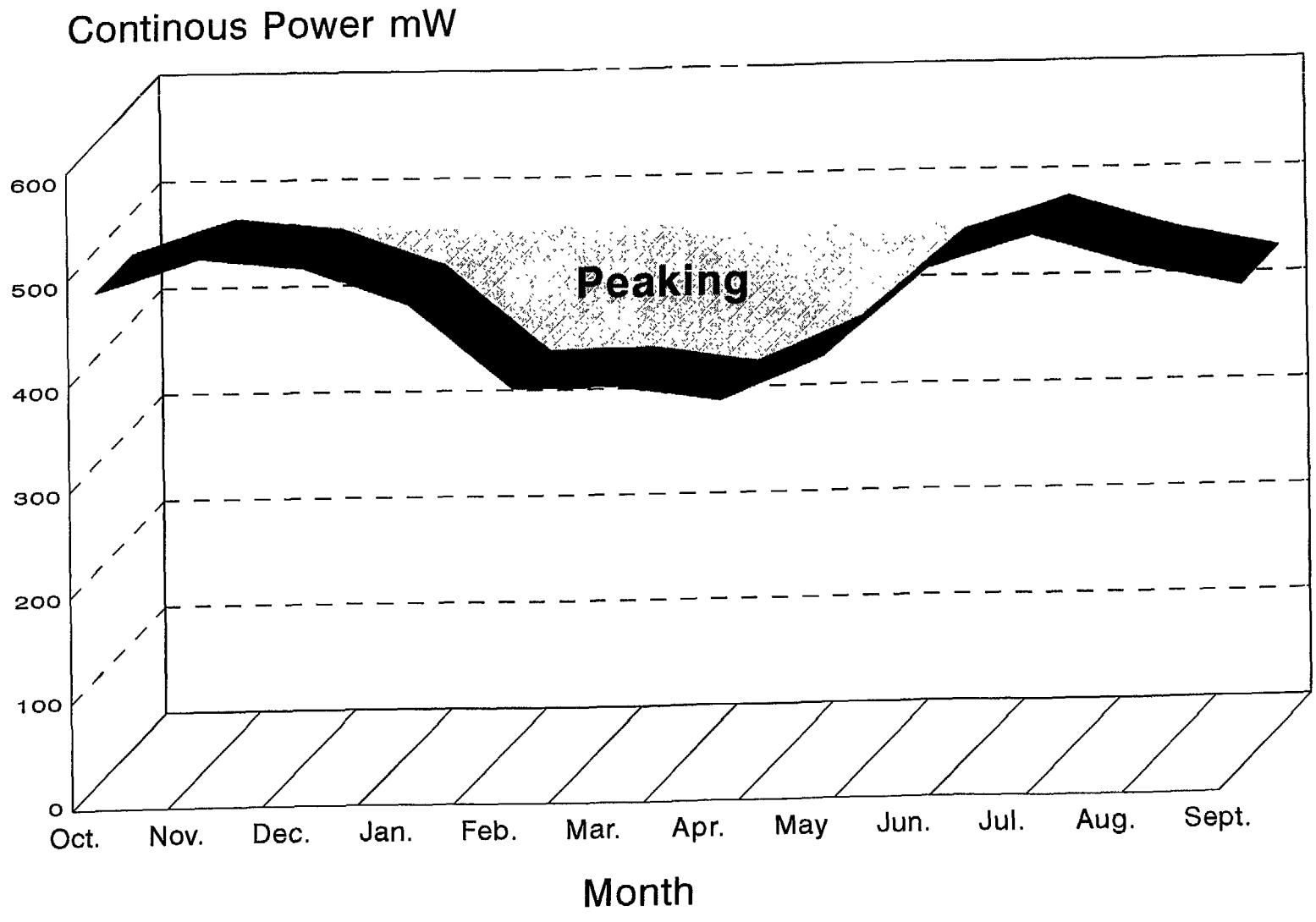

Figure 4 Monthly Diversity

Table 2 Details of Hydro Power Stations

Hydro Plant	Installed Capacity	Units X Capacity mW	Annual Energy Expected GWh	Commissioning Dates
Laxapana (K-M Complex)				
Old Laxapana	3 x 8.33 2 x 12.5	50	286	Dec. 1950 Dec. 1958
New Laxapana	2 x 50	100	480	Unit 1—Feb. 1974 Unit 2—March 1974
Wimalasurendra	2 x 25	50	112	Jan. 1965
Polpitiya	2 x 37.5	75	417	April 1969
Canyon	2 x 30	60	162	Unit 1—March 1983 Unit 2—1988
Total Capacity		335	1,457	
Mahaweli Complex				
Victoria	3 x 70	210	737	Oct. 1984/Jan. 1985
Kotmale	3 x 67	201	483	April 1985/Feb. 1988
Randenigala	2 x 61	122	381	July 1986
Rantembe	2 x 24.5	49	214	Jan. 1990
Ukuwela	2 x 19	38	175	July 1976/Aug. 1976
Bowatenne	1 x 40	40	53	June 1981
Total Capacity		660	2,040	
Samanalawewa	2 x 60	120	288	Oct. 1992
Total		1,115	3,785	

Note: Small hydro power stations at Inginiyagala, Nilambe, and Uda-Walawe are not included.

As a result of the continued growth in base load, peak load, and the operating constraints resulting from irrigation priorities and reliance on rainfall, CEB has identified the need to switch its base-load generation from hydro electric to thermal generation. Unfortunately, the types of thermal generation used for peaking requirements (diesel and combustion turbine) are different from the thermal generation stations associated with base load (coal, nuclear, and gas-fired steam).

Thermal generation plants in the CEB system consist of steam power plants, combustion turbine plants, and diesel plants. The steam power plants and the

combustion turbine plants are located at Kelanitissa, while the diesel power plants are located at Sapugaskanda. The total installed capacity is 216 mW and is made up of 44 mW of steam power plant (originally 50 mW now derated to 44 mW), 108 mW of gas turbine plant (originally rated at 120 mW), and 64 mW of Diesel plant (originally rated at 80 mW). The fuels used in these thermal plants differ from each other. The steam plants at Kelanitissa use furnace oil. The combustion turbines, also located at Kelanitissa, use heavy diesel oil. The diesel generation plants at Sapugaskanda use residual oil. The details of the thermal power plants are given in Table 3.

Therefore, the need for new generation resources results from load growth, both peak and base load, as well as factoring in the ongoing operational constraints of the hydro system. ***When these factors are examined in a complex, computerized planning model, it can be substantiated that CEB's most cost-effective long-range alternative is to switch from base-load hydro to base-load thermal generation.*** The debate arises as to the exact time of the transition. CEB is further constrained in its decision-making process by the fact that it has no market for surplus energy. In most countries, any surplus energy associated with a new generation facility can be sold to neighboring utilities, thus lessening the financial burden on the utility. With no such option available, CEB must carefully time the installation of new base-load facilities to maximize the cost effectiveness.

Table 3 Details of Thermal Power Plants

Plant	Capacity	Commissioning Dates	Fuel Used	Remarks
Kelanitissa oil steam	2 x 22 mW (Originally 2 x 25 mW—now derated)	1. June 1962 2. Sept. 1963	Furnace oil (1,000 s)	Rehabilitated in 1991. To be retired by end of 2000.
Kelanitissa gas turbines	6 x 18 mW (Originally 6 x 20 mW—now derated)	1. Nov. 1980 2. March 1981 3. April 1981 4. Dec. 1981 5. April 1982 6. March 1982	Heavy diesel	To be overhauled in 2002 and 2003. 03 units each year.
Sapugaskanda diesel	4 x 16 mW (Originally 4 x 20 mW—now derated)	1. May 1984 2. May 1984 3. Sept. 1984 4. Oct. 1984	Residual oil (3,500 s)	To be retired by end of 2003 and end 2007. 02 units each year.

Operation of the Power Plants

The typical climate conditions of Sri Lanka are characterized by the southwest and northeast monsoons. As a result of the seasonal variation in rainfall and irrigation water requirements, the operation of the CEB power system is subject to marked seasonal variation. The water resources of the Mahaweli basin are also required to meet irrigation needs. The highest water requirements occur during the Yala season, which runs from April to September. The present method of medium-term operation is to satisfy the irrigation requirements in the basin as evaluated by the Water Management Secretariat of the Mahaweli Authority and CEB's system control center. The water released according to this agreed plan is used for electricity generation. The balance of the electricity demand is supplied from the Laxapana Complex and/or Mahaweli Complex by additional releases that would not jeopardize the future irrigation requirements. Any further shortfalls are met by operation of thermal plants.

Due to the complicated nature of the operation of the power system, a computer model has been developed incorporating all essential details of irrigation and power requirements. This model is used to optimize the operation of the integrated power system to provide defined reliabilities of irrigation and power supplies at minimum cost.

In the past, the power system demand was generally met by hydro power stations during the wet years. In the dry years, a portion of the power requirements was met by thermal generation. In the very wet years, almost the entire requirements of energy was met by hydro, e.g., in the year 1990, 99.8 percent of the requirements were met by hydro, and the thermal generation was only 0.2 percent. On the other hand, in the year 1983, the thermal plants provided 42.4 percent of the system requirements. (Table 4 gives the details of hydro and thermal generation for the period 1982 to 1992). ***Planning studies, however, indicate that thermal generation will be required to meet a portion of the system demand every year from now on.*** According to the capabilities of the existing plants and the system requirements forecast, increasing amounts of thermal generation will be required from 1995 onwards. These studies reveal that a position will be reached later (after 1999 according to one forecast) where some thermal plants will need to be operated on continuous base-load operation. Thus, the predominance of hydro power in the CEB system will gradually change.

Table 4 Hydro and Thermal Generation (1982-1992)

Year	Hydro Generation		Thermal Generation		Total Generation
	GWh	%	GWh	%	
1982	1,608	77.8	458	22.2	2,066
1983	1,217	57.6	897	42.4	2,114
1984	2,091	92.5	170	7.5	2,261
1985	2,395	97.2	69	2.8	2,464
1986	2,645	99.7	7	0.3	2,652
1987	2,177	80.4	530	19.6	2,707
1988	2,597	92.8	202	7.2	2,799
1989	2,801	98.0	57	2.0	2,858
1990	3,144	99.8	5	0.2	3,149
1991	3,116	92.3	260	7.7	3,376
1992	2,900	81.9	640	18.1	3,540

Future Power Requirements

The long-term power and energy demand forecast, prepared by the CEB, generally covers a 20-year period. The forecast is updated annually (or more frequently as necessary). To analyze the effects of any variations in the demand forecast (base case), two more forecasts are prepared as low and high forecast. The long-term power expansion plan will be based on the power and energy demand forecast. The power expansion plan will be influenced by a large number of factors including:

- Characteristics of the power plants considered
- Costs of development and operation
- Period of completion
- Available studies on candidate hydro projects
- Available fuel sources and their prices etc.

In the development and analysis of the generation plans, the CEB utilizes the WASP III software package, which is designed to find the economically optimal generation expansion policy within the specified constraints. It also takes into account system production costs, cost of unserved energy, and reliability of the power system.

Taking all the relevant factors into consideration, the least-cost expansion plan, meeting the stated constraints, is prepared and this is called the ***base-case expansion plan.*** Table 5 shows the required additions to the CEB system the base case indicates is needed within the next 10 years.

Table 5 Required Additions to the CEB System (1996-2004)

Year	Required Addition	mW
1996	Gas Turbines	66
1996	Diesel Plant (Ext.)	40
1997	Diesel Plant	110
1998	Diesel Plant	40
1999	Kukule Hydro Plant	70
2000	Upper Kotmale Hydro Plant	123
2001	Coal Plant—Trincomalee, Unit 1	150
2002	Coal Plant—Trincomalee, Unit 2	150
2003	Refurbished Gas Turbines	3 x 20
2004	Coal Plant—Trincomalee, Unit 1	300
2004	Refurbished Gas Turbines	3 x 20

The power system in the northern province has not been connected to the national grid since mid-1987. The base-case forecast does not include this load. The energy requirement in this area is estimated at 200 GWh per year, and when this load is taken into account, the requirements of additional gas turbine plants and diesel plants in 1996 and 1997 show an increase as given above. The capacity balance and the energy balance for the CEB system (base case) are given in Table 6 and 7, respectively.

When the above expansion plan was prepared in 1993, it was quite evident that very urgent action was needed if the target dates for completion of the proposed projects were to be achieved. When the present status of these projects' implementation is considered, it would appear that the original target dates for the addition of certain gas turbines and diesel plants to the CEB system in 1996 and 1997 are no longer realistic. The consequence would be energy deficits in 1996 and 1997 at levels very much more than those shown in the plans.

Table 6 Base Case Capacity Balance (1994-2003)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hydro Plants										
Existing Major Plants	1,115	1,115	1,115	1,115	1,115	1,115	1,115	1,115	1,115	1,115
Kukule	—	—	—	—	—	70	70	70	70	70
Upper Kotmale	—	—	—	—	—	—	123	123	123	123
Installed Hydro Capacity (mW)	1,115	1,115	1,115	1,115	1,115	1,185	1,308	1,308	1,308	1,308
Thermal Plants										
Existing Thermal Plants	216	216	216	216	216	216	216	172	118	64
Diesel Ext., Sapugaskanda	—	—	40	40	40	40	40	40	40	40
Gas Turbines—New	—	—	66	66	66	66	66	66	66	66
Diesels—New	—	—	—	110	150	150	150	150	150	150
Coal—Trincomalee	—	—	—	—	—	—	—	150	300	300
Gas Turbines—Refurbished	—	—	—	—	—	—	—	—	—	60
Installed Thermal Capacity (mW)	216	216	322	432	472	472	472	578	674	680
Total Installed										
Capacity (mW)	1,331	1,331	1,437	1,547	1,587	1,657	1,780	1,886	1,982	1,988
Total Demand (mW)	843	899	961	1,030	1,105	1,186	1,276	1,371	1,474	1,585
Reserve (mW)	488	432	476	517	482	471	504	515	508	403

Note: The existing thermal plants are scheduled for retirement as follows:

1. Steam plants at Kelanitissa—44 mW at the end of 2000
2. Gas turbines at Kelanitissa—54 mW at the end of 2001 and 54 mW at the end of 2002
3. Diesel plants at Sapugaskanda—32 mW at the end of 2003 and 32 mW at the end of 2007

The gas turbines are scheduled for refurbishment by end of 2002 and 2003 and after refurbishment will have a capacity of 60 mW at the beginning of 2003 and a further 60 mW at the beginning of 2004.

Table 7 Base Case Energy Balance (1994-2003)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hydro Plants										
Existing Major Plants	3,623	3,706	3,752	3,770	3,775	3,776	3,768	3,772	3,777	3,780
Kukule	—	—	—	—	—	305	305	305	305	305
Upper Kotmale	—	—	—	—	—	—	526	526	526	526
Total Hydro Energy (GWh)	3,623	3,706	3,752	3,770	3,775	4,081	4,599	4,603	4,608	4,611
Thermal Plants										
Existing Thermal Plants	395	573	491	349	410	451	434	196	86	141
Diesel Ext, Sapugaskanda	—	—	238	192	205	213	212	165	93	190
Gas Turbines—New	—	—	184	81	93	140	147	120	56	136
Diesels—New	—	—	—	673	969	982	940	843	714	924
Coal—Trincomalee	—	—	—	—	—	—	—	918	1,833	1,856
Gas Turbines—Refurbished	—	—	—	—	—	—	—	—	—	66
Total Thermal Energy (GWh)	395	573	913	1,295	1,677	1,786	1,733	2,242	2,782	3,313
Total Energy										
Hydro and Thermal (GWh)	4,018	4,279	4,665	5,065	5,452	5,867	6,332	6,845	7,390	7,924
Demand (GWh)	4,069	4,371	4,706	5,071	5,469	5,901	6,371	6,870	7,412	7,997
Deficit (GWh)	51	92	41	6	17	34	39	25	22	73

Note: Energy figures are based on weighted average hydrological conditions.

If the power system in the northern area also gets reconnected to the national grid, the energy shortfalls will be further increased.

Sensitivity to Selecting and Installing New Generation

Because CEB is attempting to do both short- and long-range resource planning with those resources, the size and timing of the installation of new base-load facilities will have a tremendous financial impact on CEB. Figure 5 shows a typical operational mode for CEB at this time. The hydro capacity and energy are used for base load, and the thermal generation is used to fill in during peak requirements as well as fill in the valleys associated with shortfalls due to lack of rain or prior call on the water by the irrigators.

The third chart in Figure 5 shows how CEB would like to operate after the year 2000 when it would have a larger, base-load thermal plant in service. The manner in which it operates the system would be completely different. Hydro electric capacity would no longer be base loaded. Instead, the larger, coal-fired plant would be used to meet as much of the base-load requirements as possible. The hydro capacity would be dispatched to make up the difference between the coal-fired capacity and the system peaks. The diesel and combustion turbine thermal would be used for additional peaking and to fill in any valleys resulting from lack of hydro generation during droughts or irrigation diversion.

CEB considers any additional generation investment that requires a take-or-pay contract for longer than five to seven years as a negative impact on the financial feasibility of the larger, coal-fired generation project. This is because once the coal-fired plant is placed in service, the smaller thermal plant will be used less, and CEB will face a situation in which it is financially supporting the coal plant and simultaneously continuing to make payments for smaller thermal plants that are not used.

Therefore, CEB is taking steps to meet the immediate shortfall of capacity by installing combustion turbine generation using supplier credits to fund the project.

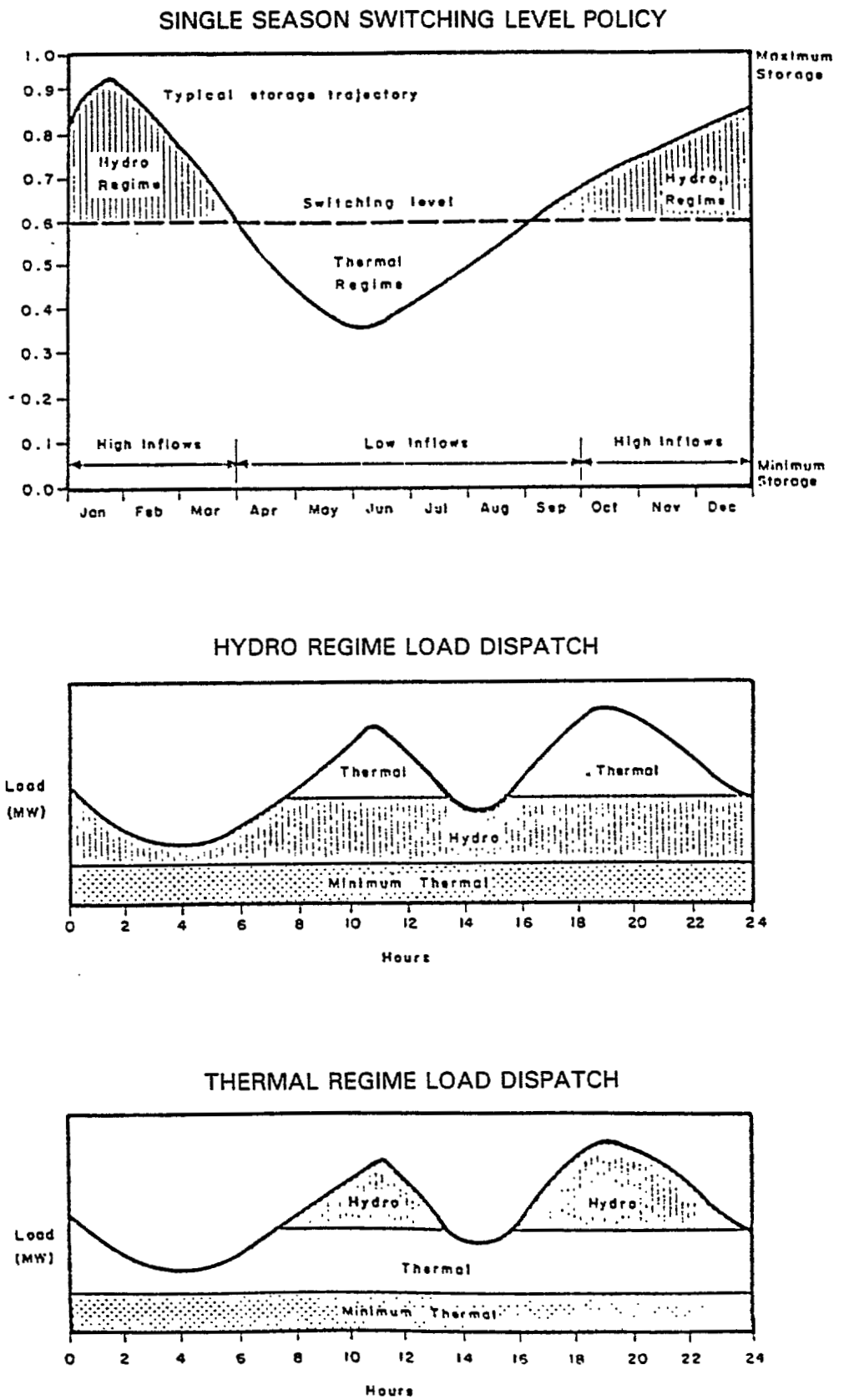

Figure 5 Single Switching Policy and Typical Load Dispatches

Source: LTGEP

4

CEB AND FINANCING

Financing Options for CEB

In most developing countries the power system expansion was developed through a combination of donor-funded low interest rate or concessionary loans and export credit facilities on an ongoing basis. As such, traditional accounting and tariff designs favored a social subsidy and political approach to providing electricity to the domestic user through subsidized domestic tariffs. These were cross subsidized from other government sectors or through tariff design in the industrial and commercial categories.

When developing long-range generation expansion studies, the electric authority had only to factor the use of any potential renewable resources, such as hydro, and run a long-range marginal cost study to determine which type of thermal generation best fits the combination of affordability and system load growth. It then became a matter of negotiating with multilateral lenders and export credits for the best loan conditions for the respective projects. In most cases, the increased availability of electricity for industrial development stimulated the GDP growth and vice versa; therefore, the conventional credit sources looked at expansion in the power sector as a co-inducement for their participation in other social sectors.

Historically, the capitalization of these generation projects were spread over long periods, such as 20 to 25 years. In many instances, the utility enjoyed an immediate infusion of equity as a result of the "soft" repayment conditions of the government subsidized loans. System planning was a function of the most optimal project, given the size and load, rather than the more traditional approach to the most economically affordable projects, given current financial indicators. The ability of the consumers to absorb the required tariff increases necessary to show financial feasibility for a project was not as important a factor as the necessity of providing service to the most numbers of people.

Just as other countries have had to contend with the dilemma of financing increased generation expansion in light of reduced traditional funding, so has the CEB. Accordingly, the Honorable Mr. R. Paskaralingam, then secretary of finance, in a speech before a seminar on private investment in the power sector on April 12, 1994, stated that "only about 5.5 billion rupees is allocated for the power sector" (in fiscal year 1994, this equates to approximately U.S. $115 million annually).

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The LTGEP proposes a total expenditure of U.S. $1.873 billion (foreign costs U.S. $1.208 billion) at January 1993 prices (see Table 8) and provides for the addition of 1244 mW of thermal and 242 mW of hydro capacity.

Table 8 Generation Expansion Plan Investment Program: Base Case in Millions of U.S. Dollars* (1994-2003)

Year	Local	Foreign	Total U.S. $
1994	11.7	22.7	34.4
1995	58.3	107.4	165.7
1996	71.2	130.4	201.6
1997	92.3	171.5	263.8
1998	107.4	192.6	300.0
1999	87.3	152.8	240.1
2000	65.3	115.3	180.6
2001	64.2	115.9	360.7
2002	50.3	93.0	143.3
2003	57.2	106.2	163.4
Totals USxMil	665.3	1207.8	1873.1

*Note: Exchange rate at 48.00 Rs./U.S $.

CEB considered none of the pending private sector proposals in developing these financial estimates. All estimates in the expansion plan assume that CEB will construct, own, and operate all existing and planned generation facilities. In addition, the plan has not updated the transmission and distribution investments for 1993, but 1992 estimates projected expenditures of U.S. $409 million through 1996.

Clearly, if Secretary Paskaralingam's forecast is accurate, the funding needs of CEB during the next three- to five-year period will be far in excess of the ability of the GSL to meet those needs. Transmission and distribution facility needs alone could potentially absorb the funding available through traditional sources.

CEB must develop a strategy to attract financing using a combination of funding sources. Supplier credits, direct government funding and guarantees, and private sector participation through debt and equity investment in new facilities will need to be utilized to meet the financing needs for needed generation projects.

CEB Resistance to Alternate Funding

During the past 24 months, CEB has been presented with a number of hydro and thermal generation projects that have been packaged around a BOO scenario relying on stringent take-or-pay financial terms and conditions. CEB's reluctance to participate and support these projects arises from two concerns or misconceptions. The first concern is over the effect of private sector-staffed projects on the labor force of CEB. Developers will not structure a BOT power project in developing countries. To assure the lenders and equity participants that the project will be operated and maintained in an orderly manner, they typically will own the project, and the majority of the key personnel will be expatriates the project operator hires. CEB views this type of operation as a first step to the total privatization of CEB. The majority of the electrical utilities in southeast Asia have been or are in the process of becoming a fully autonomous organization that will eventually be fully privatized. This process is very lengthy and because it necessarily results in downsizing the staffing of the utility for more efficient operations, it is resisted vehemently.

In Thailand, for example, the Electric Generation Authority of Thailand (EGAT) shifted to private sector financing to fund the massive needs of the generation expansion program. The labor unions went out on strike after losing jobs associated with the closing of older government projects being replaced by new private sector staffed and managed projects. This resulted in a two-year delay in the necessary construction schedules with EGAT and the developers being forced to maintain a minimum hiring requirement for local EGAT generation personnel. A similar situation could exist with CEB in the near future.

Special interest concerns that support and promote doing projects by what is referred to as a "supplier's credit" financing also heavily influenced CEB's decision to avoid private sector projects. These projects are centered around a specific supplier offering attractive financing terms and conditions in exchange for CEB selecting that specific supplier's product. The supplier arranges for its lenders to make attractive loans to CEB. In most cases the supplier's lenders are agreeable because they want to promote that supplier and increase the volume of business.

The last misconception effecting CEB is that a project must either be BOO, BOT, supplier credit, or totally government funded. There has been no educational process at CEB to assist its management in understanding the financial packaging of projects. The only educational process that CEB has experienced has been as a result of limited negotiations with some of the project developers over the last year. In these instances CEB has only been exposed to the developer's viewpoint, and obviously this may not be in CEB's best financial interest.

As noted in Chapter 2, however, the upcoming educational courses will provide CEB with the skills necessary to understand complicated financial packaging and a closer collaboration with SIDI will enable it to make informed decisions on the various projects being presented.

5

CURRENT STATUS ON PROJECTS

Load forecasts of the CEB suggest that additional generation facilities are needed in both the near and long terms. Short-term generation additions are necessary *immediately* to meet the firm energy requirements of the hydro-based system. Less than normal rainfall conditions will result in a shortfall of available firm energy from the hydro-based system. Additionally, depending on load growth assumptions, the CEB system will be short of needed energy, even with normal rainfalls, beginning as early as the 1994 or 1995 peak season. Abnormally high rainfalls from the monsoons and upgrading of some small thermal units may alleviate otherwise necessary load shedding. As defined in this report, factors influencing CEB's generation capability include:

- Fifty-five percent of the available hydro resources have other priority water rights.
- The rehabilitation schedule of existing thermal generation facilities and assumptions on level of load growth.

Because of the impending power shortage crisis, the GSL position on additional funding to CEB, and CEB's perception of alternative joint-participation projects, the CEB is pursuing a course of action that is slightly different than originally set forth in the base case of the LTGEP.

Combustion Turbine Project

To obtain generation facilities as quickly as possible, CEB has requested proposals from several manufacturers for the immediate installation of a series of combustion turbines, beginning in 1995.

The turbines would be supplied on the basis of a manufacturer's credit and installed in three phases as set forth in Table 9.

40,000 KW Diesel Project

CEB is considering its options with respect to 40 mW of new thermal projects in addition to the combustion turbines. The original base case recommended 40 mW of slow speed diesel generation, such as the KHD project. CEB, however,

Table 9 Combustion Turbine Project Stages

Stage	No. of Units and Size	Total Capacity	Construction Time
I	2—33,000 kW	66,000 kW	9 months
II	1—33,000 kW	33,000 kW	11.5 months
III	1—50,000 kW	50,000 kW	22 months
Total Capacity		149,000 kW	

Note: Stage I and II are simple-cycle combustion turbines. Stage III is a steam boiler operating with the other units. This is referred to as a combined cycle project.

considers the financial terms and conditions of the current proposal from KHD as unacceptable and is considering preparing a tender offer for this project on the terms of a supplier credit, similar to the structure of the combustion turbine project.

Rehabilitation of Existing Thermal Plants

As recommended by the World Bank and ADB, CEB is attempting to obtain financing to upgrade and rehabilitate 60 mW of diesel generation located at the Sapugaskanda generation site. These units have experienced operational problems and have not been able to be operated satisfactorily for a number of years. It is questionable that this is a reasonable approach in light of the cost of such an effort. It is estimated that the cost of this project is approximately U.S. $50 million. CEB is negotiating with the government of France and an equipment manufacturer to do this project as a Rehabilitate-Lease-Operate type of project. The manufacture would rehabilitate the plant, lease it from CEB, and sell the capacity and energy back to CEB at a rate sufficient to amortize the loan and pay operational costs.

Base-Load, Coal-Fired Project

CEB continues to evaluate the need for a larger, base-load coal-fired generation project to use in transition from hydro to thermal base-load generation. Several proposals have been presented to CEB for a project located at Trincomalee. Additionally, the Japanese have announced that they will provided funding for a feasibility study that will evaluate the feasibility of a large coal plant located on the

west coast of Sri Lanka. Both the World Bank and ADB have expressed concern over the location of a large project on the east coast near Trincomalee. The transmission facilities necessary to move the power and energy from a plant at this location must be constructed along a route that is easily accessible for sabotage of the transmission towers. CEB was instructed to study this issue before either the ADB or World Bank would consider a credit facility to construct such a transmission line.

Other Potential Projects

Chapter 6 contains a compilation of projects that have been presented to SIDI and CEB as of the date of this report. Some of the smaller hydro schemes have merit and are being considered by CEB as helping to alleviate the longer-term problem. The construction time, however, for major hydro projects is extremely long compared to thermal generation. Some of these projects will be completed, but experience in other countries dictates that it can take as long as two years to finish the negotiations and sign the agreements.

Mihaly Proposal

The consortium led by Mihaly International has been granted an extension of exclusivity to continue work on the project proposal associated with the 150 mW coal-fired thermal generation project at Trincomalee. The letter agreement provides that as long as certain milestones are met, Mihaly will continue to have the exclusive right to develop the project. The extension, based upon meeting all of the milestones, is through July 15, 1995. At that time, Mihaly anticipates having received all necessary government approvals as well as having arranged satisfactory financing arrangements. Under the time-bound agreement, CEB and the government of Sri Lanka must continue to negotiate the terms and conditions of the power purchase agreement and the implementation agreement to ensure these documents are signed by January 1995. In light of the magnitude of the project, this is a very aggressive schedule for such negotiations. There will probably be slippage in the schedule, but if both parties feel that progress is being made, adjustments will be accommodated.

KHD Diesel Project

The 40,000 kW slow speed, diesel generation project referred to as the KHD project has reached a point in the negotiations in which CEB and the developer should reassess their positions on the major business issues concerning the sale price for the project's electricity. As of this report, each side has drafted a version of the project documents and is insisting that they will not negotiate unless the other party uses the other's contract. CEB has taken the position that the current price for electricity proposed is different from the price agreed upon in the original letter agreement both parties signed in July 1993. KHD has taken the position that it had to change the terms and conditions to finance the project.

Negotiations are expected to begin again after the elections. Unless KHD agrees to certain changes, however, it is the opinion of the author that CEB will reject the current proposal and call for other tenders on the basis of a supplier's credit financing approach.

6

LIST OF PROPOSED PUBLIC/PRIVATE POWER PROJECTS

SIDI has reviewed a number of proposals for various types of projects: hydro, thermal, and renewable energy, such as wind power. These projects have been of both a solicited and unsolicited nature. The solicited proposals, however, were initially prepared for tender by CEB staff and subsequently have been relegated to SIDI for assistance in the final preparation and negotiation of documentation. As with all sectors, the power sector should prioritize the projects that are of the most economic benefit to the long-term goal of providing the least-cost electricity to the country. The power sector should also allow SIDI to provide the in-depth technical assistance and support needed to ensure the consummation of these projects.

Until this action is taken, there will be a continual parade of unsolicited proposals that may or may not be in the interest of CEB to undertake. Until such time that a present-day crisis is occurring—i.e., black outs and continued load shedding—it is doubtful that CEB will focus on the problem.

Mini Hydro Power Projects

This project proposes the development of nine mini hydro power plants with a total potential installed generating capacity of 49 mW and an estimated annual energy component of 212 GWh. These sites were originally part of a CEB hydro master plan. CEB short listed companies to submit proposals, and as of this time, CEB has received three. An evaluation committee is currently analyzing the proposals to determine a project award.

Hydro Power Project—Belihul Oya

This unsolicited proposal is for 17 mW of capacity and resulted from extensive studies of the River Belihul Oya by Nagrak Power Ltd. In 1991 the Ministry of Power and Energy permitted a full feasibility study of the project, but it was also conditioned that CEB would not be involved in this study and the purchase of the power would be discussed after the project feasibility was approved. In February 1993, the Power and Energy Committee approved Nagrak Power Ltd. to continue with the feasibility study. The entire cost of the study was to be the responsibility of the developer.

Four Small Hydro Projects

The small projects Pllundalu Oya, Tini Oya, Boltumbe Oya, and Rath Gange total 10.9 mW of potential capacity. This project was an unsolicited proposal requesting the exclusive right to proceed with detailed feasibility analysis. The feasibility studies are continuing to be developed at this time.

Dick Oya Small Hydro

This is a small hydro project of only .7 mW that is being offered as an unsolicited proposal by the same developer as the four small hydro projects listed above. CEB approved this project for construction in February 1993 on the contingency that all other government approvals would be obtained. This project is to be completed in August of 1994. Meetings have been held with the developer and evidence has been submitted that the developer has met CEB conditions for acceptance. The developer is reviewing the Standard Power Purchase Agreement and is to submit its comments to SIDI.

Broadlands Hydro

This is a proposed 40 mW hydro project making use of the cascade discharge from other upstream hydro projects from differing drainage basins. The planned operation of the project would generate about 145 GWh with a net output of 40 mW. It would have to be operated, however, in conjunction with other existing projects to maximize the useful release of river flows. It will totally depend upon upstream water requirements for existing generation. It is doubtful that this project will be a candidate for private sector financing because of the lack of adequate assurance of upstream water flow for generation.

Bundala Wind Project

This project is 12 mW of renewable energy generation using convention technology for large scale wind generators or a "wind farm" concept for production of capacity and associated energy. It is currently being reviewed for feasibility and environmental compatibility in the proposed region.

Sapugaskan Diesels

Two projects are being proposed at this location. One project is in the normal public sector financing portfolio of CEB and has been funded by ADB. The other one is known as the KHD project. A separate review of the documentation on this project was completed. Currently, CEB has returned comments to KHD on the January drafts of the power purchase agreement, the implementation agreement, and the fuel supply agreement. No further official action has taken place.

Barge Plant

Proposals have been received for variations of simple-cycle and combined-cycle, barge-mounted combustion turbine generators. The exact size of the plant is subject to further discussion and is being studied by a number of different parties.

Appendix A

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Documents and Correspondence from SIDI, CEB, and Developers.

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