9.2.3　計画代替案の比較検討

(1)　貯水池運用計画

(a)　Bayram計画

Bayramダム地点の年平均流入量は19.2㎥/sで、4月～6月の融雪期が豊水期にあたりこの時期に年間流入量の63%が流入する。渇水期にあたる12月～2月の流入量は、年間流入量の9%であり、流入量の季節変動幅は小さくない。また年間流入量の最小値は、平均流入量の49%、最大値は平均流入量の188%であり、年間流入量の最大値は最小値の3.8倍である。

この様にBayram計画地点の流入量は、季節変動および経年変動ともかなり大きく、発電への有効利用を図るには、ある程度の貯水池容量が必要である。

Bayram計画の貯水池容量は、満水位標高 740mで有効貯水容量 113×10^6 ㎥が確保できる。この程度の調整容量では、流入量を完全に平均化する事はできないが、貯水池からの溢水量を最小限に抑える事は可能である。

従って、Bayram貯水池の運用操作ルールは次の諸点を考慮して設定した。

(a)　豊水年の出水を貯留して渇水年に補給し、保証使用水量を出来るだけ大きくする。

(b)　一年の内では、豊水期の出水を貯留して渇水期に補給するよう運用する。

(c)　貯水池の無効溢水を出来るだけ小さくするよう運用する。

(d)　長期にわたり安定した出力が確保でき、かつ発生電力量が大きくなるよう運用する。

(b)　Bağlık計画

Bağlıkダム地点の流入量は、Bayramダム地点の流入量をBayram貯水池で調整した後の発電放流量およびダム洪水吐からの放流量と、BayramダムとBağlıkダムの間の残流域からの流入量の合計値となる。

Bayram計画の有効貯水容量が 113×10^6 ㎥の場合、Bağlıkダム地点では、年間平均流入量は24.9㎥/sである。4月～6月の融雪期が豊水期に年間流入量の51%が流入する。渇水期の12月～2月の流入量は年間流入量の15%である。また年間流入量の最小値は、平均流入量の56%、最大値は平均流入量の180%であり、年間流入量の最大値は最小値の4.09倍である。

この様にBayram貯水池による調整後のBağlıkダム地点の流入量は季節変動および経年変動ともかなり大きい。

一方、Baglikダム地点は満水位を標高 570mとした場合、ダム高さは124mとBayramダムと同程度の規模となるが、有効貯水容量は30×10^6㎥しか確保できない。この場合、わずかな調整効果を出す大幅な貯水池の変動を生じ、このため大幅な発電落差の変動を来す。この結果、貯水池による流入量の調整効果は、貯水池の水位変動による損失落差により相殺されてしまい、Baglik貯水池の規模を大きくする事がBaglik計画の発電量の増加にはつながらない。

従って、Baglik計画については季節調整を行う貯水池に加えて、日間調整容量のみ確保する貯水池規模についても検討を行う事とした。また貯水池の運用操作ルールはBayram貯水池と同様の方針で設定した。

(c) 貯水池運用計画

貯水池運用の計算は、電子計算機により月平均流量を用いて行い、1942年10月から1995年9月までの53年間を対象とした。保証使用水量は、53年間のうち95%の期間は使用出来る流量と定義し、流入量のマスカーブを用いて経年貯留も考慮して保証使用水量が最も大きくなるように決定した。Figure 9-9 にBayram貯水池流入量のマスカーブ、Figure 9-10 にBayram貯水池とBaglik貯水池の有効容量と保証使用水量の関係を示す。

発生電力量の計算は、水車、発電機の水位による効率の変化を考慮し、かつ基準取水位より水位の高い時は最大出力に合わせて最大使用水量を絞ることとし、基準取水位より水位の低い時は、落差の低下による最大使用水量の低下を考慮した。なお、基準取水位は満水位より利用水深の1/3だけ低い水位とした。

Figure 9-11 に電力量計算の手順を示し、Figure 9-12 にBayram計画の貯水池満水位740m、低水位 686m、放水位 530mのケースのBayram貯水池の運用ルールを示す。このFigure 9-12 に示す運用ルールカーブは、前期(a)~(d)に述べた貯水池運用の方針に基づいて、電子計算機によるDaynamic Program Method （ＤＰ法）にて、発生電力量が最大となるよう作成されたものである。

Figure 9-13 に、同じケースについて、従来一般的に用いられて来たマスカーブにより貯水池よりの溢水を最小限となるよう作成されたルールカーブを示す。

この２つのルールカーブによる電力量計算結果は下表に示す通りで、両者に大きな差は無い。このため代替案の比較検討では、各代替案の電力量計算はＤＰ法で作成したルールカーブにより行う事とした。

	DP法	マスカーブ法
年間発生電力量（GWh）	247.9	241.2
年間保証電力量（GWh）	141.4	141.6
保　証　出　力（MW）	58.0	58.4

またこのDP法によるBayram貯水池のルールカーブは、Bayram貯水池はBayram計画の発電のみの貯水池として作成されており、下流Baglik貯水池への影響は考慮されていないが最適開発計画に対しては、(4)に述べる様に、Bayram貯水池のルールカーブは、下流Baglik貯水池も含めた発電に対して最適となるよう検討した。

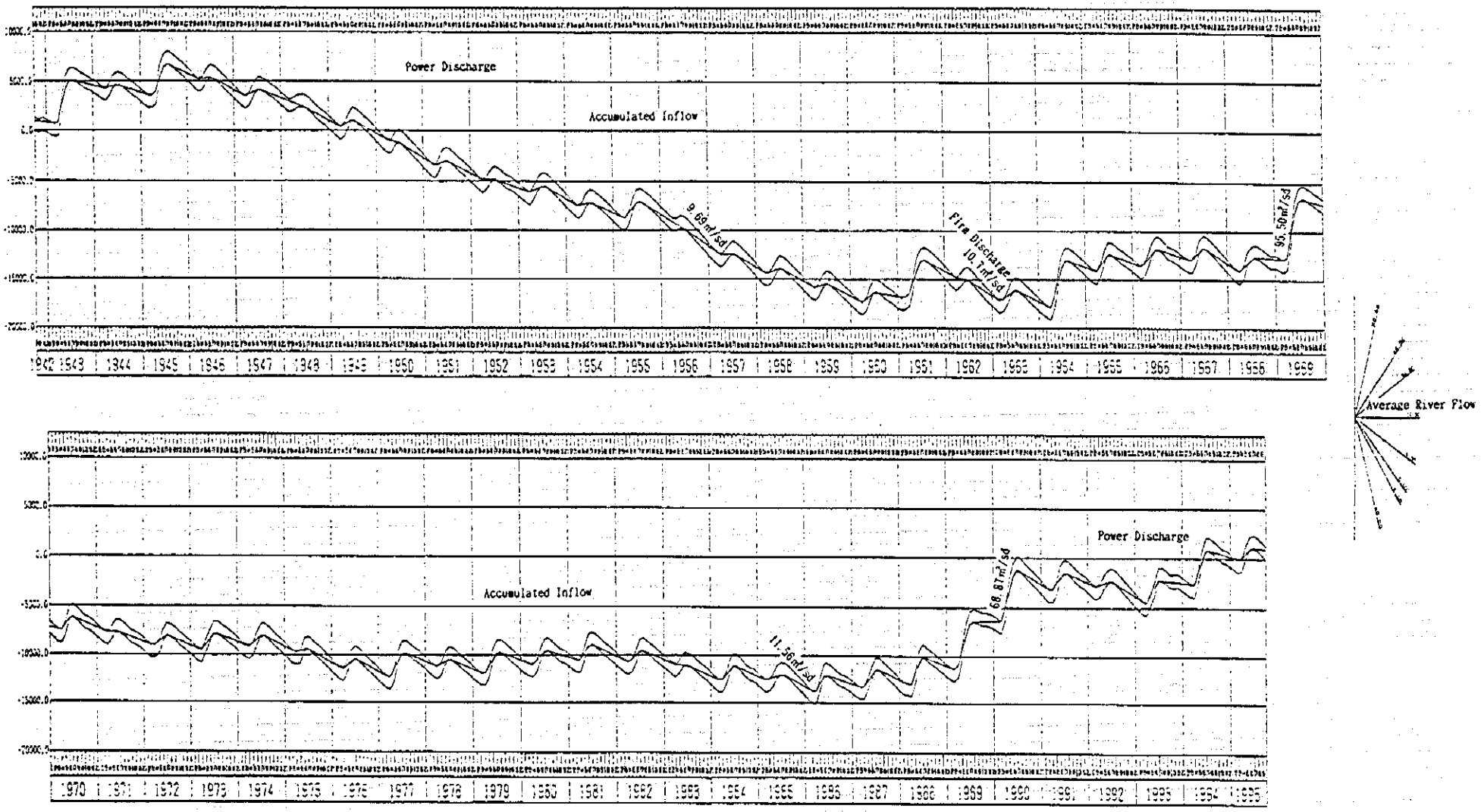


Figure 9-9 Mass Curve of Bayram Reservoir

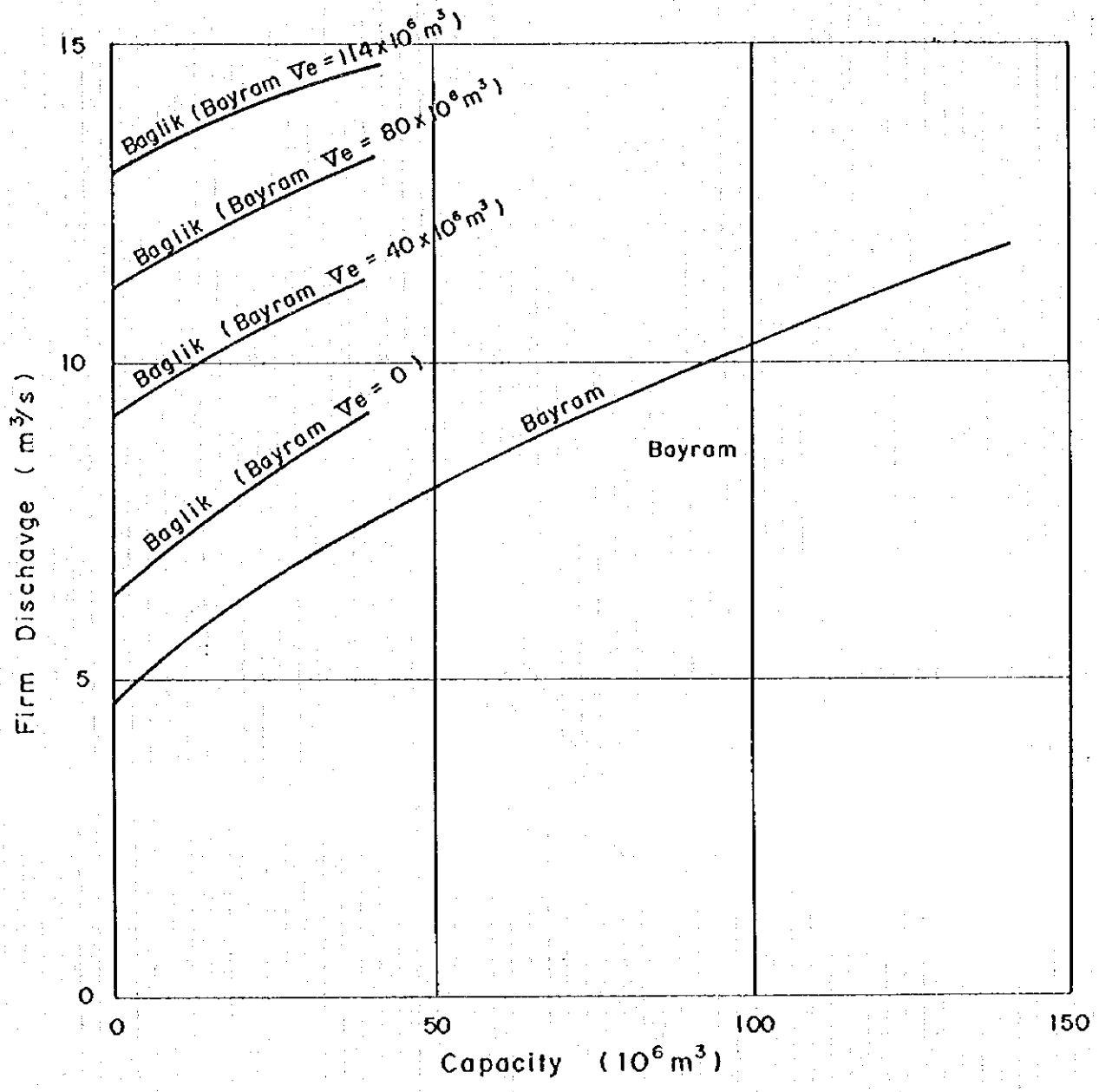


Figure 9-10 Firm Discharge of Bayram and Bağlık Reservoir

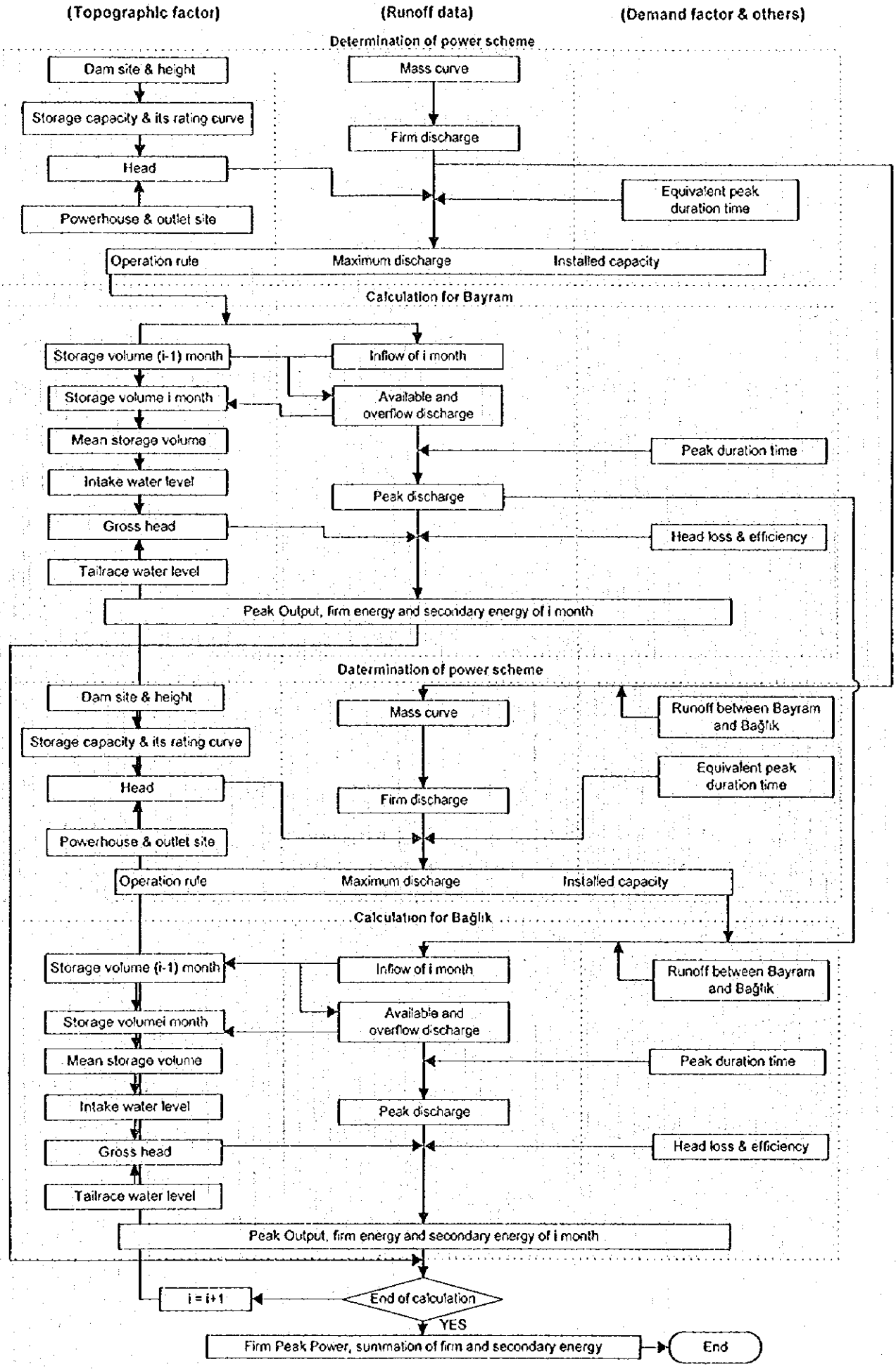
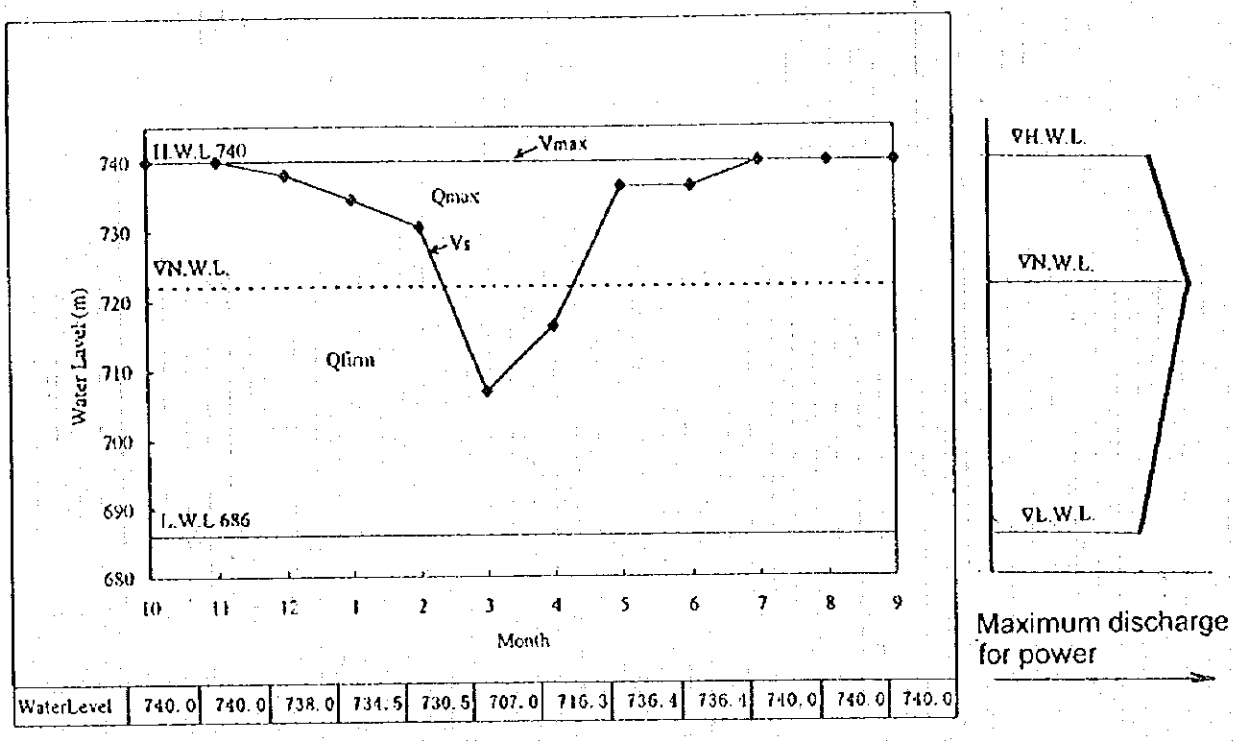


Fig.9-11 Flow Chart of Power and Energy Calculation



Symbols

Vn-1	:	Storage at the end of previous month
Vn	:	Storage at the end of current month
Vn'	:	Temporary storage at the end of current month
Vmax	:	Maximum storage (effective storage capacity)
Vs	:	Secured storage for firm discharge
fn	:	Spill in current month
qn	:	Inflow in current month
Qn	:	Available discharge for power in current month
Qfirm	:	Firm discharge for power
Qmax	:	Maximum discharge for power, variable depending on water level

Operation Rule

$V'n = Vn - 1 + qn$

1. $V'n \geq Vmax$
   - (1) $V'n - Vmax \geq Qmax \rightarrow Qn = Qmax$
   - (2) $Qmax > V'n - Vmax \geq Qfirm \rightarrow Qn = V'n - Vmax$
   - (3) $Qfirm > V'n - Vmax \rightarrow Qn = Qfirm$

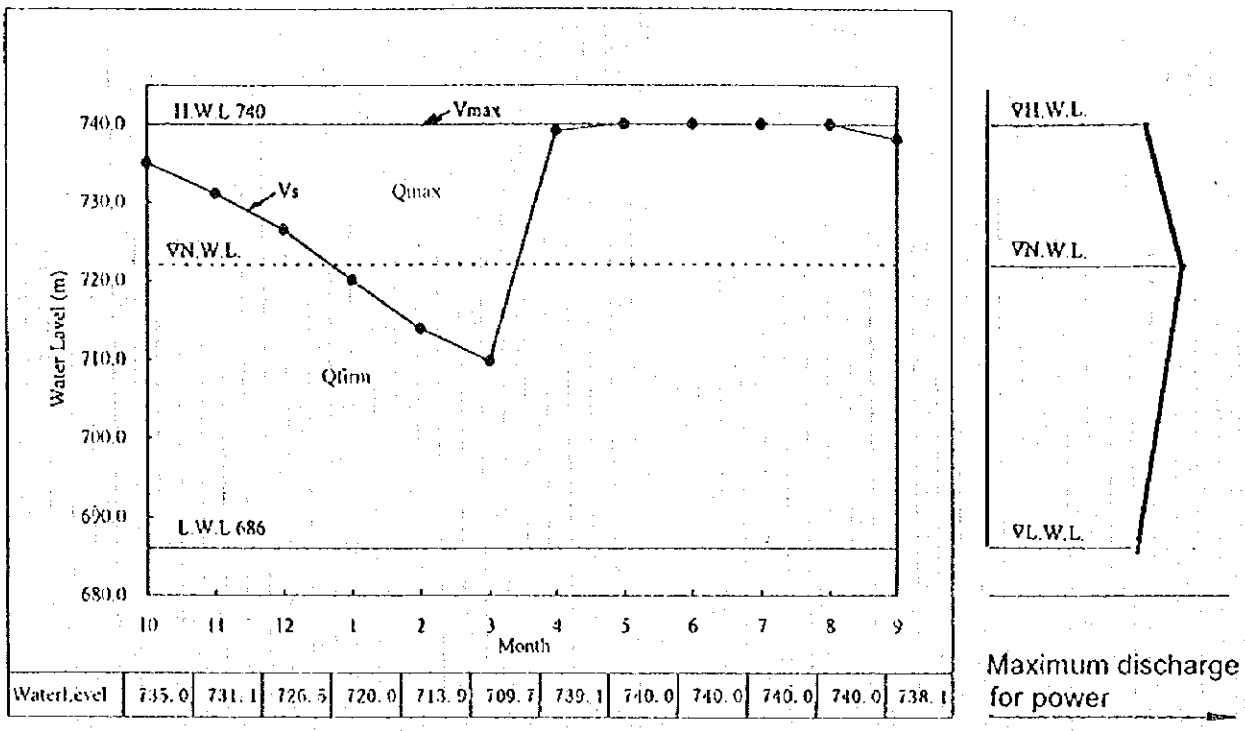
2. $Vs > V'n$
   - (1) $V'n \geq Qfirm \rightarrow Qn = Qfirm$
   - (2) $Qfirm > V'n \rightarrow Qn = V'n$

$V'n - Qn - Vmax \geq 0.0 \rightarrow fn = V'n - Vmax - Qn$

$V'n - Qn - Vmax < 0.0 \rightarrow fn = 0.0$

$Vn = V'n - Qn - fn$

Figure 9-12 Operation Rule of Reservoir by Dynamic Program Method for Energy Maximum



Symbols

Vn-1	:	Storage at the end of previous month
Vn	:	Storage at the end of current month
Vn'	:	Temporary storage at the end of current month
Vmax	:	Maximum storage (effective storage capacity)
Vs	:	Secured storage for firm discharge
fn	:	Spill in current month
qn	:	Inflow in current month
Qn	:	Available discharge for power in current month
Qfirm	:	Firm discharge for power
Qmax	:	Maximum discharge for power, variable depending on water level

Operation Rule

$V'n = Vn - 1 + qn$

1. $V'n \geq Vmax$
   - (1) $V'n - Vmax \geq Qmax \rightarrow Qn = Qmax$
   - (2) $Qmax > V'n = Vmax \geq Qfirm \rightarrow Qn = V'n - Vmax$
   - (3) $Qfirm > V'n - Vmax \rightarrow Qn = Qfirm$

2. $Vs > V'n$
   - (1) $V'n \geq Qfirm \rightarrow Qn = Qfirm$
   - (2) $Qfirm > V'n \rightarrow Qn = V'n$

$V'n = Vmax - Qn \geq 0.0 \rightarrow fn = V'n - Vmax - Qn$

$V'n = Vmax - Qn < 0.0 \rightarrow fn = 0.0$

$Vn = V'n - Qn - fn$

Figure 9-13(1) Operation Rules of Reservoir by Mass Curve for Spilled Water Minimum

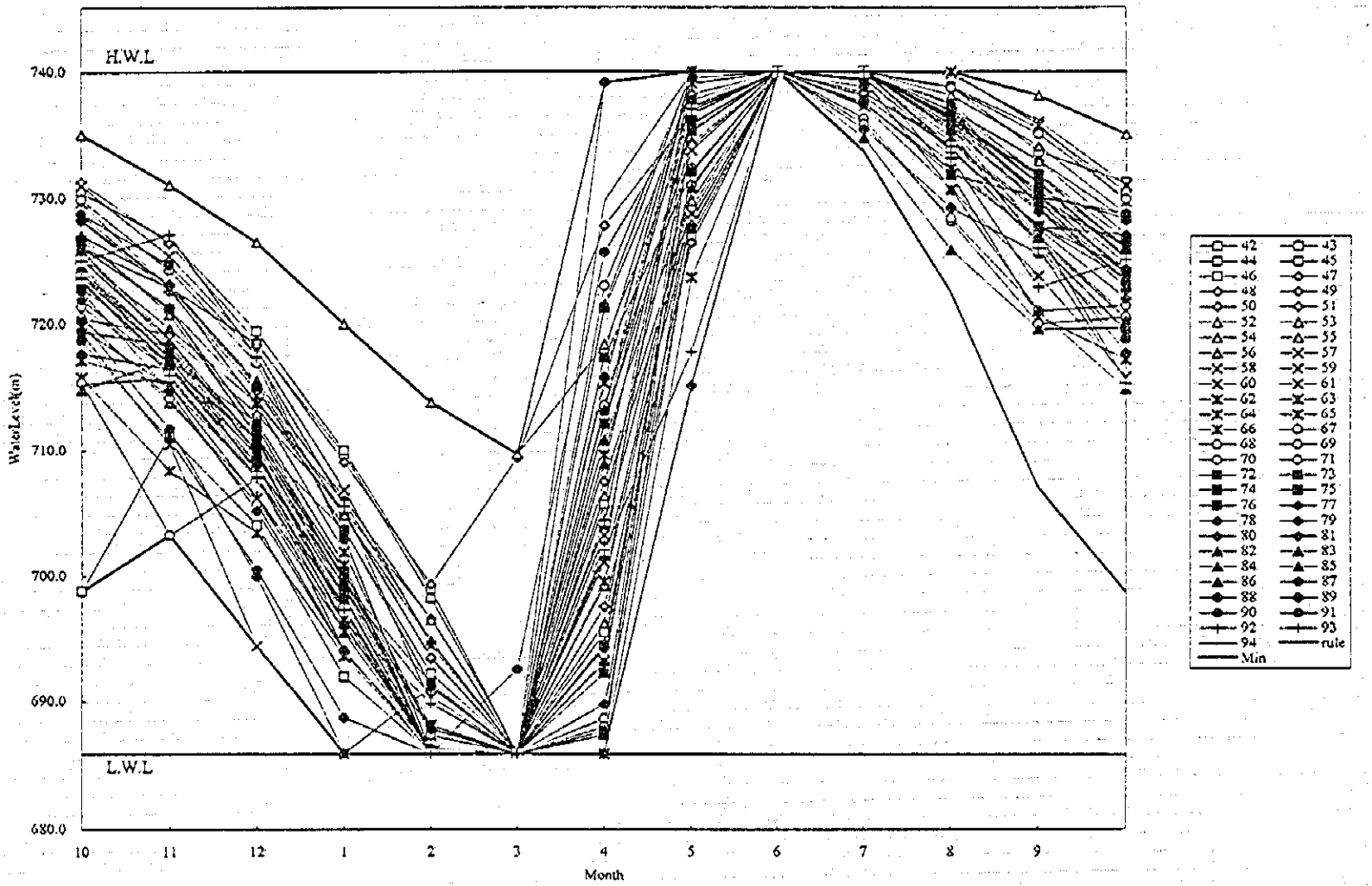


Figure 9-13(2) Operation Rules of Reservoir by Mass Curve for spilled Water Minimum

(2) 最適貯水池規模

Bayram計画とBağlık計画の貯水容量の組合せの代替案の比較検討結果を Figure 9-14 および Table 9-9, 9-10 に示す。

Bayram計画とBağlık計画の合計の年間超過便益は、Bağlık計画の貯水容量が小さければ小さい程大きくなる。またBayram計画の貯水容量と合計の年間超過便益の関係は、Bağlık計画の貯水容量との組合せによって最大点が移動するが、Bağlık計画の有効貯水容量 1.0×10^6 ㎥（H.W.L＝530m）との組合せがBayram貯水池の有効貯水容量の大小に関わらず単に最大となり、またBayram貯水池の有効容量が 113.0×10^6 ㎥（H.W.L＝740m）の場合が全ての組合せの中で最大となる。

更に、Bayram計画の場合、9.2.2(3)(b)に述べた通り、貯水池低水位の設定によって最適貯水容量および最適貯水池満水位が移動しないか比較検討を行った。この場合Bağlık計画は、有効貯水容量 1.0×10^6 ㎥（H.W.L＝530m）を最適貯水容量とした。

結果は Figure 9-15 および Table 9-11, 9-12 に示通り、Bağlık計画では貯水池低水位を堆砂容量から決まる最低水位である686mとする代替案が有効貯水容量の大小に関わらず常に最大となり、また満水位＝740m、有効貯水容量 113.0×10^6 ㎥のケースが全てのケースの中で最大となる。

従ってBayram計画はこのケースを最適とする。

Bağlık計画については、Table 9-13 に示す様にBayram計画の最適ケースである満水位＝740m、低水位＝686mのケースとの組合せでBağlık計画の満水位＝570mと550mに対して、堆砂容量から決定した低水位＝527mより高い水位に低水位を設定したケースによる代替案を策定して満水位＝530m（低水位＝527m）の代替案との比較検討を行った。

結果は Figure 9-16, Table 9-14, 9-15 に示す通り、最適貯水池規模である満水位＝530m、低水位＝527mがBağlık計画の最適貯水池規模となった。

(3) 発電所規模

水力発電所の設備出力の決定要因は、次式に示すとおり有効落差と最大使用水量であり、また最大使用水量は、一般に保証流量と、等価ピーク継続時間により決定される。

設備出力（kW）＝9.8×水車・発電機効率×有効落差（m）×最大使用水量（㎥/s）

$$\text{最大使用水量（㎥/s）}=\text{保証流量（㎥/s）}\times\frac{24\text{時間}}{\text{等価ピーク継続時間}}$$

上記要因のうち、有効落差と保証流量は、(2)の検討により有効貯水容量および取、放水位等の物理的条件により決定されるが、等価ピーク継続時間は、上記と違う条件により決定される。

本来、水力発電所の等価ピーク継続時間は、その水力発電所が投入される時点での電力系統からの要求により決定されるべきものである。ＴＥＡＳの1995年における電力需給計画によれば、Coruh・Berta 計画の建設開始が予定されている2002年および需給計画最終年である2010における電力系統の状況は Table 9-16 に示す通りである。

Table 9-16 Demand and Supply Balance

Year			2002	2010
Demand				
a.	Peak Power	(MW)	24,360	43,590
b.	Annual Energy	(GWh)	151,720	271,450
Consumption				
Supply				
c.	Thermal	(MW)	19,090	36,970
d.	Hydro	(MW)	15,421	23,086
e.	Total	(MW)	34,511	60,056
Annual Energy Production				
f.	Thermal	(GWh)	119,838	236,558
g.	Hydro (Dependable)	(GWh)	38,291	52,219
Supply Margin (e-a)		(MW)	10,151	16,466
Supply Margin Rate ((e-a)/a)		(%)	42	38
Equivalent Peak Duration Hours for Hydro (g/d)/365)		(Hour)	6.8	6.2

上表によれば、2002年および2010年時点の水力発電全体の平均の等価ピーク継続時間は各々6.8時間、6.2時間であるが、これは最大負荷日の日電力量を年間平均電力量として計算したものであるため、実際の等価ピーク継続時間はこれより多少長くなっているものと思われるが、電力系統全体に対する水力発電の占める割合は年々減少の傾向にあるため、等価ピーク継続時間も年々短くなっていくものと思われる。Bayram計画、Baglik計画

では他の大部分の水力発電計画と同様に、流入量のほぼ全量を発電に使用する事が可能なだけの貯水容量を備えているため、等価ピーク継続時間を短くして設備出力を大きくしても発生電力量の著しい増大は期待できない。

従って、Bayram計画、Bağlık計画の等価ピーク継続時間は、水力発電全体の平均である6時間程度を限度とする事が妥当であると判断される。

Bayram計画、Bağlık計画の設備出力の最適規模の検討は、保証流量に対して、等価ピーク継続時間を6時間と8時間のケースについて最大使用水量を設定して、比較する事により行った。

比較検討の結果は、Table 9-17 に示す通り、等価ピーク時間継続6時間が最適となり、従ってBayram計画では最大使用水量43㎥/s、設備出力68MWが最適規模となった。また、Bağlık計画では最大使用水量52㎥/s、設備出力59MWが最適規模となった。

(4) 最終貯水池運用計画

計画の最適化のための各代替案の貯水池運用計画は、(1)c)に述べた様に、上流計画であるBayram貯水池の貯水池運用計画はBayram計画の発電のみと対象にＤＰ法により行い、Bayram貯水池のルールカーブと作成したが、最終貯水池運用計画として下流Bağlık計画の発電も考慮したBayram計画の貯水池運用計画をＤＰ法により行い、Figure 9-17 に示す最適ルールを作成して電力量計算を行った。

この電力量計算では、ダム下流の減水区間の環境保全のため8月～10月の期間中は、BayramダムとBağlıkダムから各々ダム下流に、 0.5㎥/sの放流を行う事とした。

(5) 最適開発計画

これまでの開発計画の検討結果により、Berta川水力発電開発計画はBayram計画、Bağlık計画による2段開発計画とする。

Bayram計画はMeydançık川とSavsat川の合流点下流 2.5kmのBayram部落地点のBerta川に高さ 140mのダムを築造し、満水位標高 740m、有効貯水容量 113×10^6 ㎥の貯水池を設け、ダム右岸の取水口より最大43㎥/sを取水し、取水口直下流の地下式発電所で、有効落差 182.2mにより最大出力68MWの発電を行い、発電後の水を延長 7.93kmの放水路トンネルによりKarçal川との合流点上流2kmのKöprübaşı部落地点のBerta川に放流する開発計画を最適開発計画とする。

Bağlık計画は、Sungu川合流点下流 0.1kmのArklaşi部落地点のBerta川に高さ74mのダムを築造し、満水位標高 530m、有効貯水容量 1 ×10^6 ㎥の貯水池を設け、ダム左岸の取水口より最大52㎥/sを取水し、取水口直下流の地下式発電所で、有効落差 130.9 mにより最大出力59MWの発電を行い、発電後の水を延長、4.45kmの放水路トンネルによりArklaşi部落地点のBerta川に放流する開発計画を最適開発計画とする。

Table 9-18 にBerta川水力発電開発計画の最適開発計画諸元を示し、概算工事費内訳を Table 9-19 に示す。

Table 9-20 および Figure 9-18 に、Bayram計画の貯水池運用結果による流入量、使用水量、溢水量を示す。Table 9-21, 9-22, 9-23, 9-24 および Figure 9-19 同じく各月の発生電力量、保証電力量を、出力および出力デュレーションを示す。

Table 9-25, Figure 9-20 にBağlık計画の貯水池運用結果による貯水池流入量、使用水量、溢水量を示す。Table 9-26, 9-27, 9-28, 9-29 および Figure 9-21 に同じく各月の発生電力量、保証電力量、出力および出力デュレーションを示す。

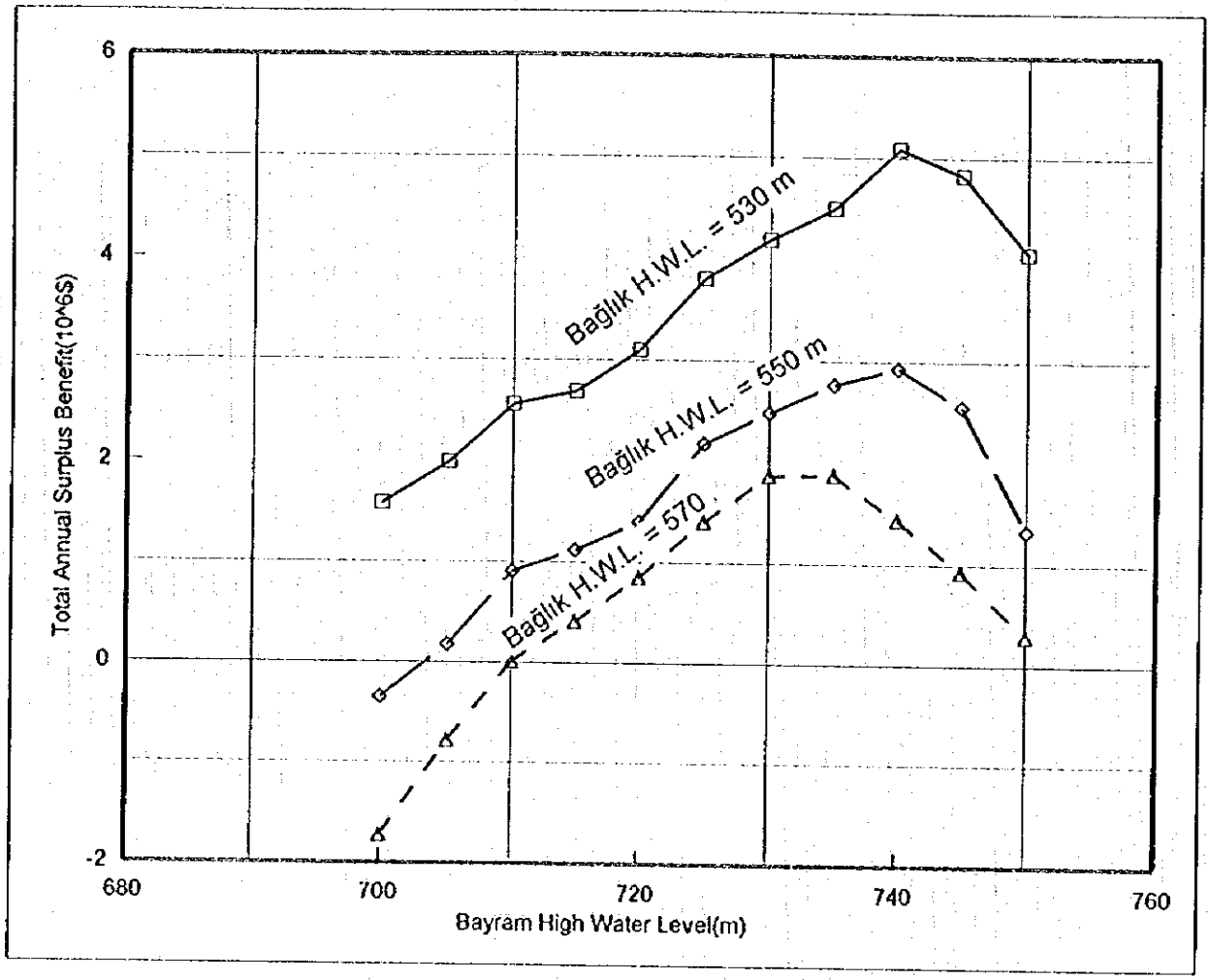


Figure 9-14 Comparison Study on Reservoir Capacity

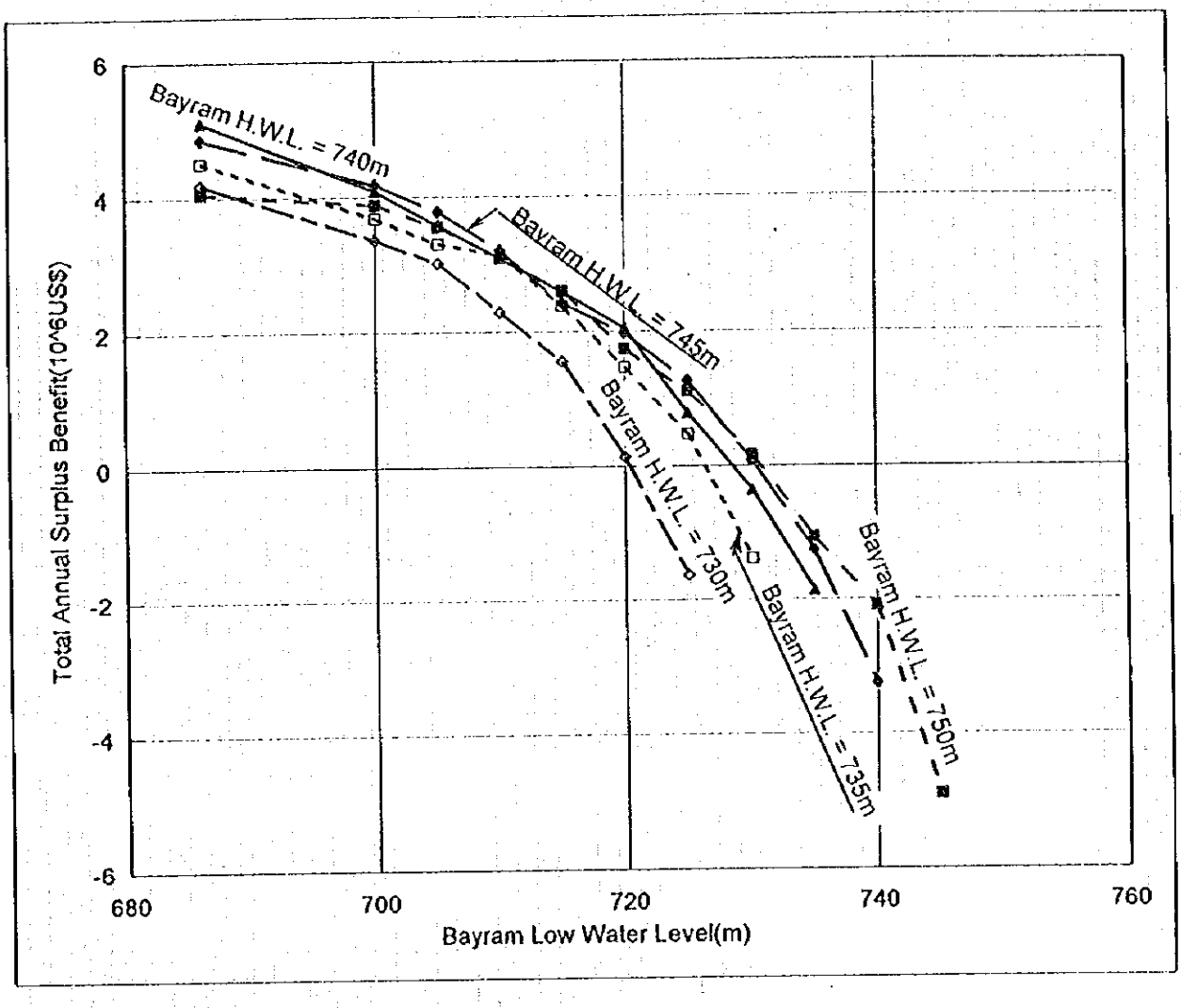


Figure 9-15 Comparison Study on Reservoir Water Level of Bayram Project

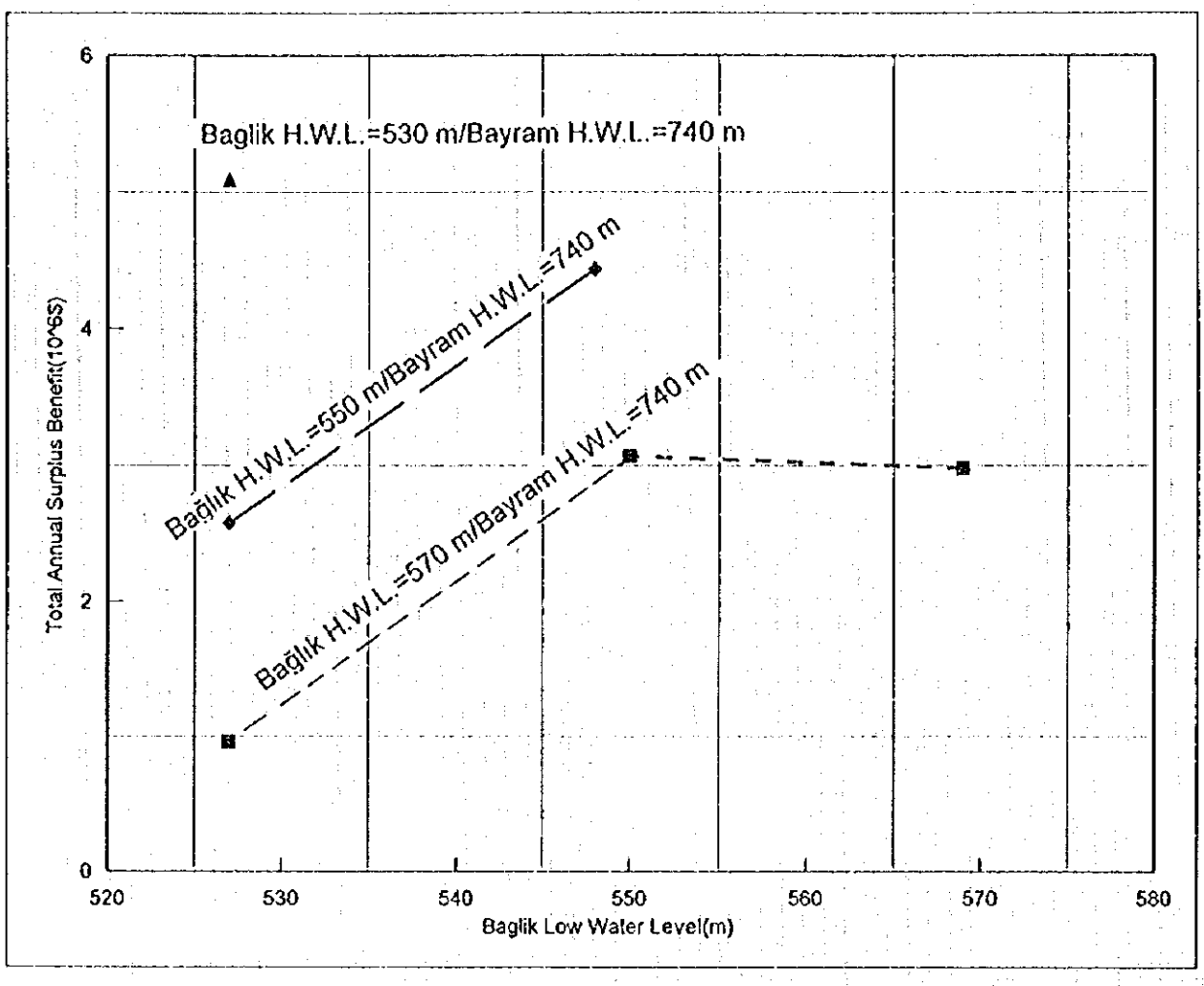
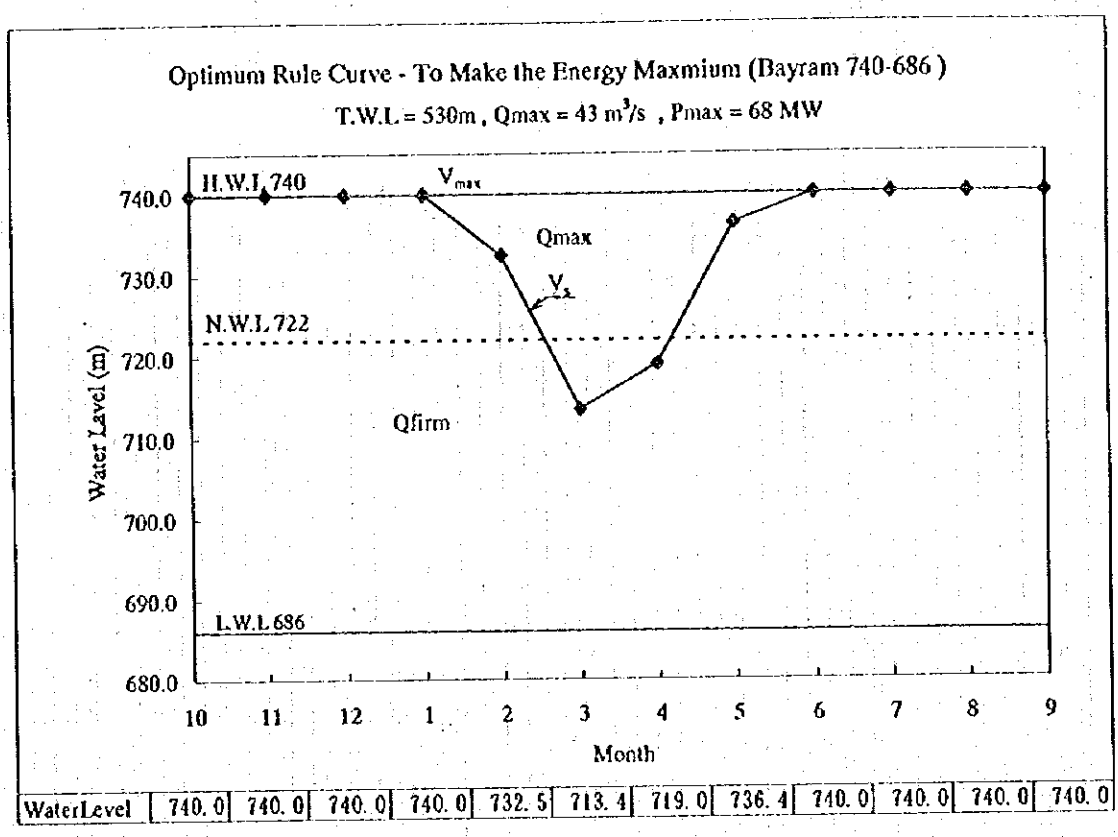


Figure 9-16 Comparison Study on Reservoir Water Level of Bağlık Project



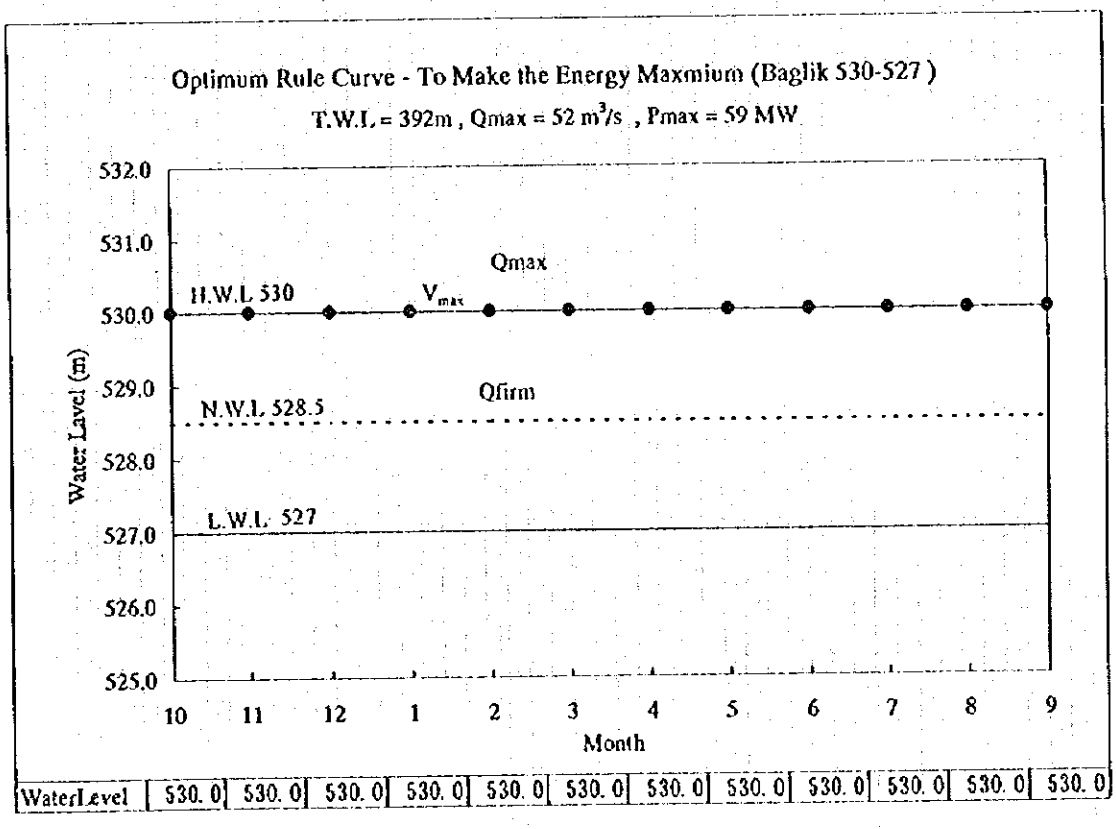


Figure 9-17 Final Reservoir Operation Rule

Table 9-9(1) Cost Estimate of Alternative Plan for Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=750m-700m With Baglik H.W.L.=570m Unit:10^3US$

Description Dam Site / Layout Type	Bayram 750M.P	Bayram 745M.P	Bayram 740M.P	Bayram 735M.P	Bayram 730M.P	Bayram 725M.P	Bayram 720M.P	Bayram 715M.P	Bayram 710M.P	Bayram 705M.P	Bayram 700M.P
High Water Level (m)	750	745	740	735	730	725	720	715	710	705	700
Reservoir Area (km^2)	3.98	3.68	3.38	3.11	2.83	2.58	2.32	2.10	1.88	1.68	1.47
Dam Volume (10^6m^3)	8,500	7,200	6,144	5,400	4,800	4,300	3,900	3,500	3,100	2,700	2,400
Dam Height (m)	155	150	145	140	135	130	125	120	115	110	105
Maximum Head (m)	180	175	170	165	160	155	150	145	140	135	130
Maximum Discharge (m^3/s)	49	46	43	40	38	36	33	31	29	26	24
Relocation Road	13,724	12,589	11,655	10,724	9,758	8,896	8,000	7,241	6,483	5,793	5,069
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	2,539	2,416	2,242	2,063	1,878	1,712	1,539	1,393	1,247	1,115	975
Civil Work	96,218	86,162	76,876	70,197	65,019	60,508	56,750	53,076	49,653	45,618	42,781
Diversion	2,421	2,885	2,885	2,885	2,885	2,885	2,885	2,885	2,885	2,885	2,885
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	65,412	55,407	47,281	41,556	36,938	33,091	30,012	26,934	23,856	20,778	18,469
Spillway	8,143	8,143	7,523	7,434	7,346	7,169	7,080	6,992	6,815	6,726	6,603
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,280	1,280	1,087	999	912	842	736	666	596	491	412
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	450	413	377	342	317	292	261	239	218	190	171
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	2,985	2,856	2,696	2,503	2,407	2,279	2,086	2,022	2,215	1,733	1,605
Tailrace Tunnel	9,287	8,937	8,586	8,236	7,973	7,710	7,447	7,097	6,834	6,571	6,396
Switchyard	161	161	161	161	161	161	161	161	161	161	161
Pre-Subtotal	113,731	102,268	91,374	83,784	77,455	71,917	67,089	62,511	58,189	53,323	49,625
Contingency (15%)	15,611	14,948	13,370	12,258	11,337	10,531	9,833	9,168	8,541	7,831	7,298
Eng. and Admi. (10%)	12,735	11,460	10,250	9,398	8,691	8,074	7,538	7,029	6,548	6,004	5,595
Sub Total	143,078	128,675	114,993	105,440	97,483	90,521	84,460	78,707	73,279	67,159	62,518
I D C (9.5%/Year)	31,447	28,994	22,974	21,068	19,476	18,085	16,874	15,725	14,640	13,417	12,490
Total	174,525	155,670	137,968	126,506	116,959	108,606	101,334	94,432	87,919	80,576	75,008
Hydraulic Equipment	4,917	4,722	4,385	4,135	3,936	3,754	3,509	3,338	3,170	2,943	2,779
Spillway	856	856	856	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528	528	528	528
Intake Gate	858	858	763	701	640	591	517	468	418	345	289
Penstock	1,979	1,815	1,656	1,504	1,392	1,285	1,149	1,051	956	836	751
Draft Gate	139	131	122	113	108	102	94	88	82	74	68
Tailrace Gate	70	65	61	57	54	51	47	44	41	37	34
Pre-Subtotal	4,470	4,293	3,986	3,760	3,578	3,413	3,190	3,034	2,882	2,675	2,526
Contingency (10%)	447	429	399	376	358	341	319	303	288	268	253
Electro-Mechanical Equipment	15,621	14,494	13,759	12,774	12,320	12,036	11,015	10,343	9,761	9,049	8,438
Equipment	14,877	13,804	13,104	12,166	11,733	11,463	10,490	9,850	9,296	8,618	8,036
Contingency (5%)	744	690	655	608	587	573	525	493	465	431	402
Eng. and Admi. (10%)	2,054	1,922	1,814	1,631	1,626	1,579	1,452	1,368	1,293	1,199	1,122
Sub Total	22,592	21,137	19,959	18,601	17,881	17,370	15,977	15,048	14,225	13,191	12,339
I D C (9.5%/Year)	1,215	1,743	1,645	1,533	1,474	1,432	1,317	1,241	1,173	1,087	1,017
Total	23,806	22,880	21,604	20,134	19,355	18,802	17,294	16,289	15,397	14,278	13,356
Grand Total	198,331	178,550	159,572	146,640	136,314	127,407	118,628	110,720	103,316	94,854	88,364

Baglik Project Tailrace Type Undergro. P/S Layout H.W.L.=570.00m With Bayram H.W.L.=750m-700m Unit:10^3US$

Description Dam Site / Layout Type	Baglik 750M.P	Baglik 745M.P	Baglik 740M.P	Baglik 735M.P	Baglik 730M.P	Baglik 725M.P	Baglik 720M.P	Baglik 715M.P	Baglik 710M.P	Baglik 705M.P	Baglik 700M.P
High Water Level (m)	570	570	570	570	570	570	570	570	570	570	570
Reservoir Area (km^2)	0.97	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
Dam Volume (10^6m^3)	680	680	680	680	680	680	680	680	680	680	680
Dam Height (m)	114	114	114	114	114	114	114	114	114	114	114
Maximum Head (m)	178	178	178	178	178	178	178	178	178	178	178
Maximum Discharge (m^3/s)	62	60	57	54	51	49	46	44	42	40	38
Relocation Road	8,759	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603	9,603
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	598	598	598	598	598	598	598	598	598	598	598
Civil Work	52,826	52,730	52,147	51,753	51,250	50,829	50,321	49,823	49,688	49,267	48,926
Diversion	0	0	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0	0	0
Dam	34,813	34,813	34,813	34,813	34,813	34,813	34,813	34,813	34,813	34,813	34,813
Spillway	780	780	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake	128	126	121	116	111	107	102	99	95	92	88
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	575	557	530	503	476	458	431	413	395	377	359
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	4,247	4,171	3,944	3,906	3,678	3,603	3,451	3,299	3,155	3,110	3,034
Tailrace Tunnel	9,805	9,805	9,481	9,157	8,914	8,590	8,266	7,942	7,942	7,617	7,374
Switchyard	0	0	0	0	0	0	0	0	0	0	0
Pre-Subtotal	60,983	63,731	63,145	62,754	62,251	61,829	61,321	60,824	60,689	60,268	59,927
Contingency (15%)	9,058	9,470	9,382	9,323	9,248	9,185	9,109	9,034	9,014	8,950	8,899
Eng. and Admi. (10%)	6,944	7,260	7,193	7,148	7,090	7,042	6,983	6,926	6,910	6,862	6,823
Sub Total	76,985	80,462	79,723	79,225	78,589	78,056	77,413	76,784	76,613	76,080	75,649
I D C (9.5%/Year)	19,229	20,098	19,913	19,789	19,630	19,497	19,336	19,179	19,137	19,003	18,896
Total	96,214	100,559	99,637	99,014	98,219	97,553	96,750	95,963	95,750	95,083	94,545
Hydraulic Equipment	4,148	4,059	3,913	3,768	3,622	3,525	3,379	3,281	3,184	3,086	2,988
Spillway	870	870	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake Gate	543	535	514	492	470	456	434	420	405	391	378
Penstock	2,141	2,075	1,974	1,874	1,774	1,707	1,606	1,539	1,472	1,405	1,337
Draft Gate	144	140	133	126	119	114	107	102	98	93	88
Tailrace Gate	73	70	67	63	60	57	54	52	49	47	45
Pre-Subtotal	3,771	3,690	3,558	3,425	3,293	3,204	3,071	2,983	2,894	2,805	2,717
Contingency (10%)	377	369	356	343	329	320	307	298	289	281	272
Electro-Mechanical Equipment	23,392	22,083	21,528	20,942	20,368	20,169	19,477	18,997	18,493	17,754	17,465
Equipment	22,278	21,032	20,503	19,945	19,398	19,208	18,550	18,092	17,612	16,909	16,633
Contingency (5%)	1,114	1,052	1,025	997	970	960	927	905	881	845	832
Eng. and Admi. (10%)	2,754	2,614	2,544	2,474	2,399	2,369	2,286	2,228	2,168	2,084	2,045
Sub Total	30,294	28,756	27,986	27,181	26,389	26,063	25,141	24,506	23,844	22,924	22,499
I D C (9.5%/Year)	1,716	1,629	1,585	1,540	1,495	1,476	1,424	1,388	1,351	1,299	1,274
Total	32,010	30,385	29,571	28,721	27,884	27,539	26,566	25,894	25,195	24,223	23,773
Grand Total	128,224	130,945	129,208	127,734	126,103	125,092	123,315	121,857	120,944	119,306	118,318

Table 9-9(2) Cost Estimate of Alternative Plan for Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=750m-700m with Baglik H.W.L.=550.00m

Unit:10^3US$

Description Dam Site / Layout Type	Bayram 750A	Bayram 745A	Bayram 740A	Bayram 735A	Bayram 730A	Bayram 725A	Bayram 720A	Bayram 715A	Bayram 710A	Bayram 705A	Bayram 700A
High Water Level (m)	750	745	740	735	730	725	720	715	710	705	700
Reservoir Area (km^2)	3.58	3.58	3.36	3.11	2.83	2.58	2.32	2.10	1.88	1.68	1.47
Dam Volume (10^6m^3)	8,500	7,200	6,144	5,400	4,800	4,300	3,900	3,500	3,100	2,700	2,400
Dam Height (m)	155	150	145	140	135	130	125	120	115	110	105
Maximum Head (m)	200	195	190	185	180	175	170	165	160	155	150
Maximum Discharge (m^3/s)	49	46	43	40	38	36	33	31	29	26	24
Relocation Road	13,724	12,689	11,655	10,724	9,758	8,896	8,000	7,241	6,483	5,793	5,069
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	2,989	2,616	2,242	2,063	1,878	1,712	1,539	1,393	1,247	1,115	975
Civil Work	100,862	89,792	80,880	74,407	69,276	64,884	61,157	57,408	53,853	50,182	47,444
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	65,412	55,407	47,281	41,556	36,938	33,091	30,012	28,934	23,856	20,778	18,469
Spillway	8,143	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,280	1,192	1,192	1,192	1,192	1,192	1,192	1,192	1,192	1,192	1,192
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	545	501	456	417	387	358	321	295	269	236	212
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	3,145	3,081	2,856	2,664	2,568	2,439	2,215	2,066	2,022	1,829	1,701
Tailrace Tunnel	13,676	13,160	12,644	12,128	11,741	11,354	10,967	10,451	10,063	9,676	9,418
Switchyard	161	161	161	161	161	161	161	161	161	161	161
Pre-Subtotal	118,375	105,898	95,577	87,994	81,712	76,292	71,496	66,843	62,383	57,870	54,268
Contingency (15%)	17,306	15,492	14,000	12,890	11,975	11,187	10,494	9,817	9,170	8,513	7,997
Eng. and Admi. (10%)	13,269	11,877	10,733	9,882	9,181	8,577	8,045	7,527	7,031	6,527	6,131
Sub Total	148,953	133,267	120,311	110,765	102,869	96,056	90,035	84,187	78,584	72,910	68,416
I.D.C (9.5%/Year)	32,738	27,958	24,037	22,130	20,552	19,191	17,988	16,819	15,700	14,566	13,669
Total	181,691	161,225	144,347	132,896	123,421	115,247	108,023	101,006	94,284	87,476	82,084
Hydraulic Equipment	5,376	5,081	4,847	4,647	4,493	4,344	4,150	4,012	3,879	3,705	3,583
Spillway	856	856	856	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528	528	528	528
Intake Gate	838	837	837	837	837	837	837	837	837	837	837
Penstock	2,397	2,202	2,003	1,833	1,702	1,575	1,412	1,295	1,182	1,037	934
Draft Gate	139	131	122	113	108	102	94	88	82	74	68
Tailrace Gate	70	65	61	57	54	51	47	44	41	37	34
Pre-Subtotal	4,888	4,619	4,407	4,225	4,085	3,949	3,773	3,647	3,526	3,368	3,257
Contingency (10%)	489	462	441	422	408	395	377	365	353	337	326
Electro-Mechanical Equipment	18,638	15,591	14,501	13,792	13,247	12,643	11,731	11,120	10,230	9,536	9,238
Equipment	15,846	14,849	13,810	13,135	12,616	12,041	11,172	10,591	9,743	9,082	8,798
Contingency (5%)	792	742	691	657	631	602	559	530	487	454	440
Eng. and Admi. (10%)	2,291	2,067	1,935	1,844	1,774	1,699	1,568	1,513	1,411	1,324	1,282
Sub Total	24,216	22,739	21,283	20,283	19,514	18,686	17,470	16,646	15,520	14,564	14,102
I.D.C (9.5%/Year)	1,302	1,223	1,144	1,091	1,049	1,005	939	895	834	783	758
Total	25,518	23,962	22,427	21,374	20,563	19,691	18,409	17,541	16,354	15,348	14,860
Grand Total	207,209	185,187	166,775	154,269	143,984	134,938	126,432	118,547	110,638	102,824	96,945

Baglik Project Tailrace Type Undergro. P/S Layout H.W.L=550.00m With Bayram H.W.L=750m-700m

Unit:10^3US$

Description Dam Site / Layout Type	Baglik 750A	Baglik 745A	Baglik 740A	Baglik 735A	Baglik 730A	Baglik 725A	Baglik 720A	Baglik 715A	Baglik 710A	Baglik 705A	Baglik 700A
High Water Level (m)	550	550	550	550	550	550	550	550	550	550	550
Reservoir Area (km^2)	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Dam Volume (10^6m^3)	420	420	420	420	420	420	420	420	420	420	420
Dam Height (m)	94	94	94	94	94	94	94	94	94	94	94
Maximum Head (m)	158	158	158	158	158	158	158	158	158	158	158
Maximum Discharge (m^3/s)	59	57	54	52	47	45	42	40	38	35	33
Relocation Road	8,043	8,043	8,043	8,043	8,043	8,043	8,043	8,043	8,043	8,043	8,043
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	1,115	598	598	598	598	598	598	598	598	598	598
Civil Work	38,697	38,677	38,097	37,798	37,123	36,706	36,240	35,745	35,369	34,946	34,570
Diversion	0	0	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0	0	0
Dam	21,502	21,502	21,502	21,502	21,502	21,502	21,502	21,502	21,502	21,502	21,502
Spillway	780	780	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake	97	94	89	87	80	78	75	71	68	65	61
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	491	475	451	435	395	378	354	338	322	298	282
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,868	3,868	3,641	3,603	3,299	3,223	3,110	2,958	2,844	2,692	2,579
Tailrace Tunnel	9,481	9,481	9,157	8,914	8,590	8,266	7,942	7,617	7,374	7,131	6,888
Switchyard	0	0	0	0	0	0	0	0	0	0	0
Pre-Subtotal	48,655	48,118	47,537	47,239	45,564	46,147	45,681	45,186	44,809	44,387	44,010
Contingency (15%)	7,131	7,128	7,041	6,996	6,895	6,832	6,762	6,688	6,632	6,568	6,512
Eng. and Admi. (10%)	5,467	5,465	5,398	5,364	5,286	5,238	5,185	5,128	5,084	5,036	4,992
Sub Total	61,253	60,711	59,976	59,599	58,745	58,217	57,628	57,002	56,525	55,991	55,515
I.D.C (9.5%/Year)	15,300	15,164	14,981	14,887	14,673	14,541	14,394	14,238	14,119	13,985	13,867
Total	76,552	75,876	74,957	74,485	73,419	72,758	72,023	71,239	70,644	69,977	69,381
Hydraulic Equipment	3,647	3,556	3,425	3,343	3,128	3,047	2,920	2,831	2,741	2,614	2,524
Spillway	870	870	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake Gate	412	398	376	369	340	333	318	304	289	275	260
Penstock	1,827	1,767	1,678	1,618	1,469	1,409	1,319	1,259	1,199	1,109	1,049
Draft Gate	137	133	126	121	109	105	98	93	88	81	77
Tailrace Gate	69	67	63	61	55	53	49	47	45	41	39
Pre-Subtotal	3,316	3,235	3,113	3,039	2,844	2,770	2,655	2,573	2,492	2,377	2,295
Contingency (10%)	332	323	311	304	284	277	265	257	249	238	229
Electro-Mechanical Equipment	21,622	20,638	20,192	19,723	18,493	17,965	17,215	16,652	16,324	15,621	15,402
Equipment	20,593	19,655	19,231	18,784	17,612	17,110	16,395	15,860	15,547	14,877	14,669
Contingency (5%)	1,030	983	962	939	881	855	820	793	777	744	733
Eng. and Admi. (10%)	2,527	2,420	2,362	2,307	2,162	2,101	2,014	1,948	1,907	1,824	1,793
Sub Total	27,797	26,616	25,979	25,373	23,783	23,113	22,149	21,431	20,972	20,059	19,719
I.D.C (9.5%/Year)	1,575	1,508	1,472	1,437	1,347	1,309	1,255	1,214	1,188	1,136	1,117
Total	29,371	28,123	27,450	26,811	25,130	24,422	23,403	22,645	22,160	21,195	20,836
Grand Total	105,924	103,999	102,408	101,296	98,549	97,181	95,426	93,885	92,804	91,172	90,218

Table 9-9(3) Cost Estimate of Alternative Plan for Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=750m-700m with Baglik H.W.L.= 530.00m — Unit:10^3US$

Description Dam Site / Layout Type	Bayram 750C	Bayram 745C	Bayram 740C	Bayram 735C	Bayram 730C	Bayram 725C	Bayram 720C	Bayram 715C	Bayram 710C	Bayram 705C	Bayram 700C
High Water Level (m)	750	745	740	735	730	725	720	715	710	705	700
Reservoir Area (km^2)	3.98	3.68	3.38	3.11	2.83	2.58	2.32	2.10	1.88	1.68	1.47
Dam Volume (10^6m^3)	8,500	7,200	6,144	5,400	4,800	4,300	3,900	3,500	3,100	2,700	2,400
Dam Height (m)	155	150	145	140	135	130	125	120	115	110	105
Maximum Head (m)	220	215.00	210.00	205.00	200.00	195.00	190.00	185.00	180.00	175.00	170.00
Maximum Discharge (m^3/s)	49	46	43	40	38	36	33	31	29	26	24
Relocation Road	13,724	12,689	11,655	10,724	9,758	8,896	8,000	7,241	6,453	5,793	5,069
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	2,989	2,616	2,242	2,063	1,878	1,712	1,539	1,393	1,247	1,115	975
Civil Work	103,704	92,403	83,113	76,299	70,884	66,201	62,266	58,227	54,253	50,323	47,318
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	65,412	55,407	47,281	41,556	36,938	33,091	30,012	26,934	23,856	20,778	18,469
Spillway	8,143	7,789	7,523	7,434	7,346	7,169	7,080	6,992	6,815	6,726	6,603
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,280	1,192	1,087	999	912	842	736	666	596	491	412
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	651	599	546	501	466	432	388	357	327	287	259
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	3,370	3,177	3,049	2,792	2,664	2,568	2,407	2,247	2,086	1,926	1,765
Tailrace Tunnel	18,187	15,576	14,965	14,354	13,896	13,438	12,980	12,369	11,911	11,453	11,147
Switchyard	161	161	161	161	161	161	161	161	161	161	161
Pre-Subtotal	121,217	108,506	97,811	89,886	83,320	77,609	72,805	67,661	62,783	58,030	54,162
Contingency (15%)	17,734	15,884	14,335	13,173	12,216	11,385	10,660	9,940	9,230	8,537	7,978
Eng. and Admi. (10%)	13,596	12,178	10,990	10,100	9,366	8,728	8,173	7,621	7,077	6,545	6,116
Sub Total	152,547	136,570	123,136	113,159	104,902	97,722	91,438	85,222	79,090	73,113	68,256
I.D.C. (9.5%/Year)	33,528	28,651	24,601	22,608	20,958	19,524	18,268	17,026	15,801	14,607	13,637
Total	186,075	165,220	147,737	135,767	125,860	117,245	109,706	102,249	94,891	87,720	81,893
Hydraulic Equipment	5,889	5,557	5,203	4,904	4,658	4,430	4,123	3,908	3,698	3,411	3,206
Spillway	856	856	856	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528	528	528	528
Intake Gate	898	837	763	701	640	591	517	468	416	345	289
Penstock	2,862	2,635	2,400	2,202	2,049	1,900	1,707	1,569	1,436	1,262	1,140
Draft Gate	139	131	122	113	108	102	94	88	82	74	68
Tailrace Gate	70	65	61	57	54	51	47	44	41	37	34
Pre-Subtotal	5,353	5,052	4,730	4,458	4,234	4,028	3,748	3,552	3,362	3,101	2,915
Contingency (10%)	535	505	473	446	423	403	375	355	336	310	291
Electro-Mechanical Equipment	17,492	16,260	15,780	14,944	14,250	13,527	12,713	12,073	11,375	10,357	9,605
Equipment	16,649	15,486	15,029	14,233	13,572	12,883	12,107	11,498	10,833	9,864	9,338
Contingency (5%)	832	774	751	712	679	644	605	575	542	493	467
Eng. and Admi. (10%)	2,337	2,182	2,098	1,985	1,891	1,796	1,684	1,598	1,507	1,377	1,301
Sub Total	25,707	23,999	23,082	21,833	20,799	19,753	18,519	17,578	16,580	15,145	14,312
I.D.C. (9.5%/Year)	1,382	1,290	1,241	1,174	1,118	1,062	996	945	891	814	769
Total	27,090	25,289	24,323	23,007	21,917	20,815	19,514	18,523	17,471	15,959	15,082
Grand Total	213,164	190,509	172,060	158,774	147,777	138,060	129,220	120,772	112,362	103,679	96,974

Baglik Project Tailrace Type Undergro. P/S Layout H.W.L.= 530.00m with Bayram H.W.L.=750m-700m — Unit:10^3US$

Description Dam Site / Layout Type	Baglik 750C	Baglik 745C	Baglik 740C	Baglik 735C	Baglik 730C	Baglik 725C	Baglik 720C	Baglik 715C	Baglik 710C	Baglik 705C	Baglik 700C
High Water Level (m)	530	530	530	530	530	530	530	530	530	530	530
Reservoir Area (km^2)	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	56	55	52	48	45	43	40	38	36	33	31
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilities	800	800	800	800	800	800	800	800	800	800	800
Land Acquisition	598	598	598	598	598	598	598	598	598	598	598
Civil Work	26,946	26,447	25,984	25,410	24,987	24,495	24,034	23,662	23,290	22,834	22,418
Diversion	0	0	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake	44	42	40	37	36	34	32	31	30	28	26
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0	0
Penstock	426	405	376	356	335	321	299	285	271	250	235
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,754	3,603	3,413	3,185	3,110	2,958	2,844	2,730	2,617	2,427	2,351
Tailrace Tunnel	9,481	9,157	8,914	8,590	8,266	7,942	7,617	7,374	7,131	6,888	6,564
Switchyard	0	0	0	0	0	0	0	0	0	0	0
Pre-Subtotal	35,103	34,604	34,141	33,566	33,144	32,652	32,191	31,819	31,446	30,991	30,575
Contingency (15%)	5,176	5,101	5,031	4,945	4,882	4,808	4,739	4,683	4,627	4,559	4,497
Eng. and Admi. (10%)	3,958	3,911	3,857	3,791	3,743	3,686	3,633	3,590	3,548	3,495	3,447
Sub Total	44,247	43,616	43,030	42,303	41,768	41,146	40,563	40,093	39,621	39,045	38,518
I.D.C. (9.5%/Year)	11,052	10,894	10,748	10,566	10,433	10,278	10,132	10,014	9,897	9,753	9,621
Total	55,299	54,510	53,778	52,870	52,201	51,424	50,695	50,107	49,518	48,797	48,140
Hydraulic Equipment	3,130	3,023	2,884	2,774	2,668	2,594	2,488	2,418	2,344	2,237	2,163
Spillway	870	870	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0	0	0
Intake Gate	186	177	170	159	152	145	137	134	127	119	112
Penstock	1,587	1,508	1,400	1,325	1,246	1,193	1,114	1,062	1,009	929	876
Draft Gate	135	128	121	112	105	100	93	88	84	77	72
Tailrace Gate	68	65	61	56	53	50	47	45	42	39	36
Pre-Subtotal	2,846	2,748	2,622	2,522	2,425	2,359	2,262	2,198	2,131	2,034	1,967
Contingency (10%)	285	275	262	252	243	236	226	220	213	203	197
Electro-Mechanical Equipment	20,208	19,723	19,216	18,176	17,614	17,028	16,418	16,223	15,559	15,015	14,719
Equipment	19,245	18,784	18,301	17,311	16,775	16,217	15,636	15,450	14,818	14,300	14,018
Contingency (5%)	962	939	915	866	839	811	782	773	741	715	701
Eng. and Admi. (10%)	2,334	2,275	2,210	2,095	2,028	1,962	1,891	1,864	1,790	1,725	1,688
Sub Total	25,672	25,021	24,310	23,045	22,310	21,584	20,797	20,505	19,693	18,978	18,570
I.D.C. (9.5%/Year)	1,454	1,417	1,377	1,306	1,264	1,223	1,178	1,161	1,116	1,075	1,052
Total	27,126	26,438	25,687	24,351	23,573	22,807	21,975	21,666	20,809	20,053	19,622
Grand Total	82,425	80,949	79,464	77,220	75,774	74,231	72,670	71,774	70,326	68,850	67,762

Table 9-10(1-1) Comparison Study on Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=760m-700m With Baglik H.W.L.=570m by Mixed Alternative Thermal Power Plant

Description Dam Site	Layout	Bayram 750M/P	Baglik 750M/P	Total	Bayram 745M/P	Baglik 570M/P	Total	Bayram 740M/P	Baglik 570M/P	Total	Bayram 735M/P	Baglik 570M/P	Total	Bayram 730M/P	Baglik 570M/P	Total	Bayram 725M/P	Baglik 570M/P	Total
High Water Level	m	750.00	570.00		745.00	570.00		740.00	570.00		735.00	570.00		730	570.00		725	570.00	
Normal Water Level	m	728.67	555.67		725.33	555.67		722.00	555.67		718.67	555.67		715.3333	555.67		712	555.67	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686	527.00		686	527.00	
Available Drawdown	m	64.00	43.00		59.00	43.00		54.00	43.00		49.00	43.00		44	43.00		39	43.00	
Gross Storage Capacity	m^3*10^6	189.00	36.40		150.00	36.40		133.00	36.40		116.00	36.40		102	36.40		88	36.40	
Effective Storage Capacity	m^3*10^6	149.00	30.10		130.00	30.10		113.00	30.10		96.00	30.10		82	30.10		68	30.10	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.	
Dam Hight	m	155	114		150	114		145	114		140	114		135	114		130	114	
Dam Volume	m^3	6,500	680		7,200	680		6,144	680		5,400	680		4,900	680		4,300	680	
Tailwater Level	m	570.00	392.00		570.00	392.00		570.00	392.00		570.00	392.00		570.00	392.00		570.00	392.00	
Effective Head	m	152.37	158.17		149.03	158.17		145.70	158.17		142.27	158.07		138.93	158.07		135.50	158.07	
Maximum Discharge	m^3/s	49.00	62.00		46.00	60.00		43.00	57.00		40.00	54.00		38.00	51.00		36.00	49.00	
Installed Capacity	MW	64.00	85.00	149.00	59.00	82.00	141.00	54.00	78.00	132.00	49.00	74.00	123.00	45.00	69.00	114.00	42.00	67.00	109.00
Firm Peak Power	MW	52.40	72.50	124.90	48.80	70.80	119.60	44.80	67.60	112.40	40.70	67.80	108.50	37.20	66.20	103.40	34.50	62.50	97.00
Energy Production																			
Average Energy	GWh	215.00	287.00	502.00	207.60	285.60	493.20	198.50	282.13	480.63	188.20	279.50	467.70	178.90	276.30	455.20	170.90	269.60	440.50
Firm Energy	GWh	135.00	178.00	313.00	123.90	172.20	296.10	113.20	163.70	276.90	102.30	156.20	258.50	93.50	147.90	241.40	87.20	141.10	228.30
Secondary Energy	GWh	80.00	109.00	189.00	83.70	113.40	197.10	85.30	118.43	203.73	85.90	123.30	209.20	85.40	128.40	213.80	83.70	128.50	212.20
Unit Benefit Value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	US$/kW	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	US$/kWh	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	US$/kWh	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit																			
Firm Peak Power	US$*10^6	9.02	12.48	21.49	8.40	12.18	20.58	7.71	11.63	19.34	7.00	11.67	18.67	6.40	11.39	17.79	5.94	10.76	16.69
Firm Energy	US$*10^6	3.58	4.72	8.31	3.29	4.57	7.86	3.00	4.34	7.35	2.72	4.15	6.86	2.48	3.93	6.41	2.31	3.75	6.06
Secondary Energy	US$*10^6	1.72	2.35	4.07	1.80	2.44	4.24	1.84	2.55	4.39	1.85	2.65	4.50	1.84	2.76	4.60	1.80	2.77	4.57
Total	US$*10^6	14.32	19.55	33.87	13.49	19.20	32.68	12.55	18.53	31.08	11.57	18.47	30.04	10.72	18.08	28.80	10.05	17.27	27.32
Investment Cost																			
Civil Facilities	US$*10^6	174.52	96.21	270.74	155.67	100.56	256.23	137.97	99.64	237.60	126.51	99.01	225.52	116.96	98.22	215.18	108.61	97.55	206.16
Hydrau. and Ele.-Mech Eq.	US$*10^6	23.81	32.01	55.82	22.88	30.39	53.27	21.60	29.57	51.16	20.13	28.72	48.85	19.36	27.88	47.24	18.80	27.54	46.34
Total	US$*10^6	198.33	128.22	326.56	178.55	130.94	309.49	159.57	129.21	288.78	146.64	127.73	274.37	136.31	126.10	262.42	127.41	125.09	252.50
Annual Cost																			
Civil Facilities	US$*10^6	17.63	9.72	27.34	15.72	10.16	25.88	13.93	10.06	24.00	12.78	10.00	22.78	11.81	9.92	21.73	10.97	9.85	20.82
Hydrau. and Ele.-Mech Eq.	US$*10^6	2.71	3.65	6.36	2.61	3.46	6.07	2.46	3.37	5.83	2.30	3.27	5.57	2.21	3.18	5.39	2.14	3.14	5.28
Total	US$*10^6	20.34	13.37	33.71	18.33	13.62	31.95	16.40	13.43	29.83	15.07	13.27	28.35	14.02	13.10	27.12	13.11	12.99	26.10
Annual Surplus Benefit(B-C)	US$*10^6	-6.02	6.18	0.16	-4.84	5.58	0.73	-3.85	5.09	1.25	-3.50	5.19	1.69	-3.30	4.98	1.69	-3.06	4.27	1.22
Benefit Cost Ratio(B/C)		0.70	1.46	1.00	0.74	1.41	1.02	0.77	1.38	1.04	0.77	1.39	1.06	0.76	1.38	1.06	0.77	1.33	1.05
Unit Annual Cost (Firm)	US$/kWh	0.151	0.075	0.108	0.148	0.079	0.108	0.145	0.082	0.108	0.147	0.085	0.110	0.150	0.089	0.112	0.150	0.092	0.114
Unit Annual Cost (Average)	US$/kWh	0.095	0.047	0.067	0.088	0.048	0.065	0.083	0.048	0.062	0.080	0.047	0.061	0.078	0.047	0.060	0.077	0.048	0.069

Table 9-10(1-2) Comparison Study on Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=750m-700m With Baglik H.W.L.=570m by Mixed Alternative Thermal Power Plant

Description Dam Site	Layout	Bayram 720M/P	Baglik 570M/P	Total	Bayram 715M/P	Baglik 570M/P	Total	Bayram 710M/P	Baglik 570M/P	Total	Bayram 705M/P	Baglik 570M/P	Total	Bayram 700M/P	Baglik 570M/P	
High Water Level	m	720.00	570.00		715.00	570.00		710.00	570.00		705.00	570.00		700.00	570.00	
Normal Water Level	m	708.67	555.67		705.33	555.67		702.00	555.67		698.67	555.67		695.33	555.67	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00	
Available Drawdown	m	34.00	43.00		29.00	43.00		24.00	43.00		19.00	43.00		14.00	43.00	
Gross Storage Capacity	m^3*10^6	76.00	36.40		65.00	36.40		55.00	36.40		46.00	36.40		169.00	36.40	
Effective Storage Capacity	m^3*10^6	56.00	30.10		45.00	30.10		35.00	30.10		26.00	30.10		149.00	30.10	
Dam Type	0	Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.		Rockfill	Con-gra.	
Dam Hight	m	125	114		120	114		115	114		110	114		105	114	
Dam Volume	m^3	3,900	680		3,500	680		3,100	680		2,700	680		2,400	680	
Tailwater Level	m	570.00	392.00		570.00	392.00		570.00	392.00		570.00	392.00		570.00	392.00	
Effective Head	m	132.07	157.97		128.73	157.97		125.30	157.97		121.87	157.87		118.43	157.87	
Maximum Discharge	m^3/s	33.00	46.00		31.00	44.00		29.00	42.00		26.00	40.00		24.00	38.00	
Installed Capacity	MW	37.00	63.00	100.00	34.00	60.00	94.00	31.00	57.00	88.00	27.00	54.00	81.00	24.00	52.00	76.00
Firm Peak Power	MW	30.20	60.10	90.30	27.60	56.80	84.40	26.20	53.20	79.40	23.80	47.90	71.70	21.10	43.40	64.50
Energy Production																
Average Energy	GWh	158.40	263.10	421.50	149.80	257.10	406.90	139.70	251.30	391.00	127.30	243.40	370.70	117.30	233.30	350.60
Firm Energy	GWh	78.50	132.70	211.20	70.50	126.10	196.60	64.40	121.50	185.90	56.20	114.60	170.80	51.80	108.00	159.80
Secondary Energy	GWh	79.90	130.40	210.30	79.30	131.00	210.30	75.30	129.80	205.10	71.10	128.80	199.90	65.50	125.30	190.80
Unit Benefit Value																
Firm Peak Power	US$/kW	180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450	
Firm Energy	US$/kWh	0.0270	0.027		0.0270	0.027		0.027	0.027		0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.0219	0.022		0.0219	0.022		0.022	0.022		0.022	0.022		0.022	0.022	
Benefit																
Firm Peak Power	US$*10^6	5.20	10.34	15.54	4.75	9.77	14.52	4.51	9.16	13.66	4.10	8.24	12.34	3.63	7.47	11.10
Firm Energy	US$*10^6	2.08	3.52	5.61	1.87	3.35	5.22	1.71	3.22	4.93	1.49	3.04	4.53	1.37	2.87	4.24
Secondary Energy	US$*10^6	1.72	2.81	4.53	1.71	2.82	4.53	1.62	2.79	4.42	1.53	2.77	4.30	1.41	2.70	4.11
Total	US$*10^6	9.00	16.67	25.67	8.33	15.94	24.27	7.84	15.17	23.01	7.12	14.06	21.18	6.42	13.03	19.45
Investment Cost																
Civil Facilities	US$*10^6	101.33	96.75	198.08	94.43	95.96	190.40	87.92	95.75	183.67	80.58	95.08	175.66	75.01	94.55	169.55
Hydrau. and Ele.-Mech Eq	US$*10^6	17.29	26.57	43.86	16.29	25.89	42.18	15.40	25.19	40.59	14.28	24.22	38.50	13.36	23.77	37.13
Total	US$*10^6	118.63	123.32	241.94	110.72	121.86	232.58	103.32	120.94	224.26	94.85	119.31	214.16	88.36	118.32	206.68
Annual Cost																
Civil Facilities	US$*10^6	10.23	9.77	20.01	9.54	9.69	19.23	8.88	9.67	18.55	8.14	9.60	17.74	7.58	9.55	17.12
Hydrau. and Ele.-Mech Eq	US$*10^6	1.97	3.03	5.00	1.86	2.95	4.81	1.76	2.87	4.63	1.63	2.76	4.39	1.52	2.71	4.23
Total	US$*10^6	12.21	12.80	25.01	11.39	12.64	24.04	10.64	12.54	23.18	9.77	12.36	22.13	9.10	12.26	21.36
Annual Surplus Benefit(B-C)	US$*10^6	-3.21	3.87	0.67	-3.07	3.30	0.23	-2.80	2.63	-0.16	-2.65	1.69	-0.95	-2.68	0.77	-1.91
Benefit Cost Ratio(B/C)	-	0.74	1.30	1.03	0.73	1.26	1.01	0.74	1.21	0.99	0.73	1.14	0.96	0.71	1.06	0.91
Unit Annual Cost (Firm)	US$/kWh	0.155	0.096	0.118	0.162	0.100	0.122	0.165	0.103	0.125	0.174	0.108	0.130	0.176	0.114	0.134
Unit Annual Cost (Average)	US$/kWh	0.077	0.049	0.059	0.076	0.049	0.059	0.076	0.050	0.059	0.077	0.051	0.060	0.078	0.053	0.061

Table 9-10(2-1) Comparison Study on Reservoir Capacity

Bayram Project Tailrace Type Underground P/S Layout H.W.L.=760m~700m with Beglik H.W.L.=550.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Layout	Bayram 750A	Beglik 750A	Total	Bayram 745A	Beglik 745A	Total	Bayram 740A	Beglik 740A	Total	Bayram 735A	Beglik 735A	Total	Bayram 730A	Beglik 730A	Total	Bayram 725A	Beglik 725A	Total
High Water Level	m	750.00	550.00		745.00	550.00		740.00	550.00		735.00	550.00		730	550.00		725	550.00	
Normal Water Level	m	728.67	538.50		725.33	538.50		722.00	538.50		718.67	538.50		715	538.50		712	538.50	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686	527.00		686	527.00	
Available Drawdown	m	64.00	23.00		59.00	23.00		54.00	23.00		49.00	23.00		44	23.00		39	23.00	
Gross Storage Capacity	m^3*10^6	169.00	17.70		150.00	17.70		133.00	17.70		116.00	17.70		102	17.70		88	17.70	
Effective Storage Capacity	m^3*10^6	149.00	11.40		130.00	11.40		113.00	11.40		96.00	11.40		82	11.40		68	11.40	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.	
Dam Hight	m	155	94		150	94		145	94		140	94		135	94		130	94	
Dam Volume	m^3	8,500	420		7,200	420		6,144	420		5,400	420		4,800	420		4,300	420	
Tailwater Level	m	550.00	392.00		550.00	392.00		550.00	392.00		550.00	392.00		550.00	392.00		550.00	392.00	
Effective Head	m	170.67	141.00		167.33	141.00		163.90	140.90		160.47	140.99		157.13	140.80		153.70	140.80	
Maximum Discharge	m^3/s	49.00	59.00		46.00	57.00		43.00	54.00		40.00	52.00		38.00	47.00		36.00	45.00	
Installed Capacity	MW	72.00	72.00	144.00	65.00	69.00	135.00	60.00	66.00	126.00	55.00	63.00	118.00	51.00	57.00	108.00	47.00	54.00	101.00
Firm Peak Power	MW	69.40	65.80	126.20	55.90	63.00	116.90	51.40	59.80	111.20	46.70	57.80	104.50	42.60	55.00	97.60	38.70	53.00	91.70
Energy Production																			
Average Energy	GWh	226.69	255.00	481.69	233.00	252.90	485.90	223.30	250.50	473.80	213.20	245.80	459.00	203.30	240.20	443.50	194.20	235.20	429.40
Firm Energy	GWh	143.17	152.00	295.17	139.20	145.50	284.70	126.40	139.00	265.40	115.30	132.30	247.60	106.40	120.20	226.60	99.70	115.70	215.40
Secondary Energy	GWh	83.52	103.00	186.52	93.80	107.40	201.20	96.90	111.50	208.40	97.90	113.50	211.40	96.90	120.00	216.90	94.50	119.50	214.00
Unit Benefit Value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	US$/kW	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	US$/kWh	0.0270	0.0270		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.0219	0.0219		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022	
Benefit																			
Firm Peak Power	US$*10^6	10.39	11.32	21.72	9.62	10.84	20.46	8.85	10.29	19.14	8.04	9.95	17.98	7.33	9.46	16.80	6.66	9.12	15.78
Firm Energy	US$*10^6	3.80	4.03	7.83	3.69	3.86	7.56	3.35	3.69	7.04	3.06	3.51	6.57	2.82	3.19	6.01	2.65	3.07	5.72
Secondary Energy	US$*10^6	1.80	2.22	4.02	2.02	2.31	4.33	2.09	2.40	4.49	2.11	2.44	4.55	2.09	2.58	4.67	2.03	2.57	4.61
Total	US$*10^6	15.99	17.58	33.57	15.33	17.02	32.35	14.29	16.38	30.67	13.20	15.90	29.11	12.24	15.24	27.48	11.34	14.76	26.10
Investment Cost																			
Civil Facilities	US$*10^6	181.69	76.55	258.24	161.23	75.88	237.10	144.35	74.96	219.30	132.90	74.49	207.38	123.42	73.42	196.84	115.25	72.76	188.01
Hydrau. and Ele.-Mech.Eq.	US$*10^6	25.52	29.37	54.89	23.96	28.12	52.09	22.43	27.45	49.88	21.37	28.81	48.18	20.56	25.13	45.69	19.69	24.42	44.11
Total	US$*10^6	207.21	105.92	313.13	185.19	104.00	289.19	166.77	102.41	269.18	154.27	101.30	255.56	143.98	98.55	242.53	134.94	97.18	232.12
Annual Cost																			
Civil Facilities	US$*10^6	16.35	7.73	24.08	16.28	7.66	23.95	14.56	7.57	22.15	13.42	7.52	20.95	12.47	7.42	19.88	11.64	7.35	18.99
Hydrau. and Ele.-Mech.Eq.	US$*10^6	2.91	3.35	6.26	2.73	3.21	5.94	2.56	3.13	5.69	2.44	3.06	5.49	2.34	2.66	5.21	2.24	2.78	5.03
Total	US$*10^6	21.26	11.08	32.34	19.02	10.87	29.88	17.14	10.70	27.84	15.86	10.58	26.44	14.81	10.28	25.09	13.88	10.13	24.02
Annual Surplus Benefit(B-C)	US$*10^6	-5.27	6.50	1.23	-3.68	6.15	2.46	-2.85	5.68	2.83	-2.65	5.32	2.67	-2.57	4.96	2.39	-2.54	4.63	2.09
Benefit Cost Ratio(B/C)		0.75	1.59	1.04	0.81	1.57	1.08	0.83	1.53	1.10	0.83	1.50	1.10	0.83	1.46	1.10	0.82	1.46	1.09
Unit Annual Cost (Firm)	US$/kWh	0.148	0.073	0.110	0.137	0.075	0.105	0.136	0.077	0.105	0.138	0.080	0.107	0.139	0.086	0.111	0.139	0.088	0.112
Unit Annual Cost (Average)	US$/kWh	0.094	0.043	0.067	0.082	0.043	0.062	0.077	0.043	0.059	0.074	0.043	0.058	0.073	0.043	0.057	0.071	0.043	0.056

Table 9-10(2-2) Comparison Study on Reservoir Capacity

Bayram Project Tailrace Type Underging P/S Layout H.W.L.=750m-700m with Bagils H.W.L.=550.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Layout	Bayram 720A	Bagils 720A	Total	Bayram 715A	Bagils 715A	Total	Bayram 710A	Bagils 710A	Total	Bayram 705A	Bagils 705A	Total	Bayram 700A	Bagils 700A	Total 0.00
High Water Level	m	720.00	550.00		715.00	550.00		710.00	550.00		705.00	550.00		700.00	550.00	1,250.00
Normal Water Level	m	708.67	538.50		705.33	538.50		702.00	538.50		698.67	538.50		695.33	538.50	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00	
Available Drawdown	m	34.00	23.00		29.00	23.00		24.00	23.00		19.00	23.00		14.00	23.00	
Gross Storage Capacity	m^3*10^6	76.00	17.70		65.00	17.70		55.00	17.70		46.00	17.70		36.00	17.70	
Effective Storage Capacity	m^3*10^6	56.00	11.40		45.00	11.40		35.00	11.40		26.00	11.40		18.00	11.40	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.	
Dam Hight	m	125	94		120	94		115	94		110	94		105	94	
Dam Volume	m^3	3,900	420		3,500	420		3,100	420		2,700	420		2,400	420	
Tailwater Level	m	550.00	392.00		550.00	392.00		550.00	392.00		550.00	392.00		550.00	392.00	
Effective Head	m	150.27	140.80		146.93	140.70		143.50	140.70		140.07	140.60		136.63	140.60	
Maximum Discharge	m^3/s	33.00	42.00		31.00	40.00		29.00	36.00		26.00	33.00		24.00	33.00	
Installed Capacity	MW	42.00	51.00	93.00	39.00	48.00	87.00	35.00	46.00	81.00	31.00	42.00	73.00	26.00	40.00	66.00
Firm Peak Power	MW	33.90	50.00	83.90	32.20	47.00	79.20	30.60	44.70	75.30	27.80	41.00	68.80	25.80	38.40	64.20
Energy Production																
Average Energy	GWh	182.70	227.50	410.20	171.40	221.00	392.40	161.00	214.00	375.00	146.40	203.50	349.90	135.40	196.90	332.30
Firm Energy	GWh	89.10	107.00	196.10	81.20	102.60	183.80	75.00	98.10	173.10	64.90	89.50	154.40	58.60	85.10	143.70
Secondary Energy	GWh	93.60	120.50	214.10	90.20	118.40	208.60	86.00	115.90	201.90	81.50	114.00	195.50	76.80	111.80	188.60
Unit Benefit Value																
Firm Peak Power	US$/kW	180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450	
Firm Energy	US$/kWh	0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022	
Benefit																
Firm Peak Power	US$*10^6	5.83	8.60	14.44	5.54	8.09	13.63	5.27	7.69	12.96	4.78	7.06	11.84	4.44	6.61	11.05
Firm Energy	US$*10^6	2.36	2.84	5.20	2.16	2.72	4.88	1.99	2.60	4.59	1.72	2.38	4.10	1.56	2.26	3.81
Secondary Energy	US$*10^6	2.02	2.59	4.61	1.94	2.55	4.49	1.85	2.50	4.35	1.75	2.45	4.21	1.65	2.41	4.06
Total	US$*10^6	10.21	14.04	24.25	9.64	13.36	23.00	9.11	12.79	21.90	8.26	11.89	20.15	7.65	11.27	18.92
Investment Cost																
Civil Facilities	US$*10^6	108.02	72.02	180.05	101.01	71.24	172.25	94.28	70.64	164.93	87.46	69.98	157.45	82.08	69.38	151.47
Hydrau. and Ele.-Mech Eq.	US$*10^6	18.41	23.40	41.81	17.54	22.65	40.19	16.35	22.16	38.51	15.35	21.20	36.54	14.86	20.84	35.70
Total	US$*10^6	126.43	95.43	221.86	118.55	93.88	212.43	110.64	92.80	203.44	102.82	91.17	194.00	96.94	90.22	187.16
Annual Cost																
Civil Facilities	US$*10^6	10.91	7.27	18.18	10.20	7.20	17.40	9.52	7.14	16.66	8.84	7.07	15.90	8.29	7.01	15.30
Hydrau. and Ele.-Mech Eq.	US$*10^6	2.10	2.67	4.77	2.00	2.56	4.58	1.86	2.53	4.39	1.75	2.42	4.17	1.69	2.38	4.07
Total	US$*10^6	13.01	9.94	22.95	12.20	9.78	21.98	11.39	9.66	21.05	10.58	9.48	20.07	9.98	9.38	19.37
Annual Surplus Benefit(B-C)	US$*10^6	-2.80	4.10	1.30	-2.56	3.58	1.02	-2.28	3.13	0.85	-2.32	2.40	0.08	-2.34	1.89	-0.44
Benefit Cost Ratio(B/C)		0.79	1.41	1.06	0.79	1.37	1.05	0.80	1.32	1.04	0.78	1.25	1.00	0.77	1.20	0.98
Unit Annual Cost (Firm)	US$/kWh	0.146	0.093	0.117	0.150	0.095	0.120	0.152	0.098	0.122	0.163	0.106	0.130	0.170	0.110	0.135
Unit Annual Cost (Average)	US$/kWh	0.071	0.044	0.056	0.071	0.044	0.056	0.071	0.045	0.056	0.072	0.047	0.057	0.074	0.048	0.058

Table 9-10(3-1) Comparison Study on Reservoir Capacity

Beyram Project Tailrace Type Underpro. P/S Layout H.W.L.=750m-700m with Begik H.W.L.= 630.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Layout	Beyram 750C	Begik 750C	Total	Beyram 745C	Begik 745C	Total	Beyram 740C	Begik 740C	Total	Beyram 735C	Begik 735C	Total	Beyram 730C	Begik 730C	Total	Beyram 725C	Begik 725C	Total
High Water Level	m	750.00	530.00		745.00	530.00		740.00	530.00		735.00	530.00		730	530.00		725	530.00	
Normal Water Level	m	728.67	528.50		725.33	528.50		722.00	528.50		718.67	528.50		715.3333	528.50		712	528.50	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686	527.00		686	527.00	
Available Drawdown	m	64.00	3.00		59.00	3.00		54.00	3.00		49.00	3.00		44	3.00		39	3.00	
Gross Storage Capacity	m^3*10^6	169.00	7.30		150.00	7.30		133.00	7.30		116.00	7.30		102	7.30		88	7.30	
Effective Storage Capacity	m^3*10^6	149.00	1.00		130.00	1.00		113.00	1.00		96.00	1.00		82	1.00		68	1.00	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.	
Dam Hight	m	155	74		150	74		145	74		140	74		135	74		130	74	
Dam Volume	m^3	8,500	195		7,200	195		6,144	195		5,400	195		4,800	195		4,300	195	
Tailwater Level	m	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	m	189.67	131.00		186.33	130.90		182.90	130.90		179.47	130.90		176.13	130.80		172.70	130.80	
Maximum Discharge	m^3/s	49.00	58.00		46.00	55.00		43.00	52.00		40.00	46.00		38.00	45.00		36.00	43.00	
Installed Capacity	MW	80.00	65.00	145.00	74.00	62.00	136.00	68.00	59.00	127.00	62.00	54.00	116.00	57.00	51.00	108.00	53.00	48.00	101.00
Firm Peak Power	MW	67.40	62.90	130.30	63.00	59.60	122.60	58.00	56.40	114.40	52.40	52.00	104.40	48.50	49.00	97.50	43.60	47.00	90.60
Energy Production																			
Average Energy	GWh	266.80	227.00	493.80	257.70	224.00	481.70	247.90	221.40	469.30	237.00	215.70	452.70	227.00	210.60	437.60	216.60	206.80	423.40
Firm Energy	GWh	168.50	139.20	307.70	154.40	130.70	285.10	141.40	124.20	265.60	128.20	113.60	241.80	119.50	107.10	226.60	110.70	102.50	213.20
Secondary Energy	GWh	98.30	87.80	186.10	103.30	93.30	196.60	106.50	97.20	203.70	108.80	102.10	210.90	107.50	103.50	211.00	105.90	104.30	210.20
Unit Benefit Value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	US$/kW	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	US$/kWh	0.0270	0.0270		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.0219	0.0219		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022	
Benefit																			
Firm Peak Power	US$*10^6	11.60	10.62	22.42	10.84	10.26	21.10	9.98	9.71	19.69	9.02	8.95	17.97	8.35	8.43	16.78	7.50	8.09	15.59
Firm Energy	US$*10^6	4.47	3.69	8.17	4.10	3.47	7.57	3.75	3.30	7.05	3.40	3.02	6.42	3.17	2.84	6.01	2.94	2.72	5.66
Secondary Energy	US$*10^6	2.12	1.89	4.01	2.22	2.01	4.23	2.29	2.09	4.39	2.34	2.20	4.54	2.31	2.23	4.54	2.28	2.25	4.53
Total	US$*10^6	18.19	16.41	34.60	17.16	15.73	32.90	16.03	15.09	31.12	14.76	14.16	28.92	13.83	13.50	27.34	12.72	13.05	25.78
Investment Cost																			
Civil Facilities	US$*10^6	186.07	55.30	241.37	185.22	54.51	219.73	147.74	53.78	201.51	135.77	52.67	188.64	125.86	52.20	178.06	117.25	51.42	168.67
Hydrau. and Ele.-Mech Eq.	US$*10^6	27.09	27.13	54.22	25.29	26.44	51.73	24.32	25.69	50.01	23.01	24.35	47.36	21.92	23.57	45.49	20.82	22.81	43.62
Total	US$*10^6	213.16	82.43	295.59	190.51	80.95	271.46	172.06	79.46	251.52	158.77	77.22	235.99	147.78	75.77	223.55	138.06	74.23	212.29
Annual Cost																			
Civil Facilities	US$*10^6	18.79	5.59	24.38	16.69	5.51	22.19	14.92	5.43	20.35	13.71	5.34	19.05	12.71	5.27	17.98	11.84	5.19	17.04
Hydrau. and Ele.-Mech Eq.	US$*10^6	3.09	3.09	6.18	2.86	3.01	5.90	2.77	2.93	5.70	2.62	2.78	5.40	2.50	2.69	5.19	2.37	2.60	4.97
Total	US$*10^6	21.88	8.68	30.56	19.57	8.52	28.09	17.69	8.36	26.05	16.34	8.12	24.45	15.21	7.96	23.17	14.21	7.79	22.01
Annual Surplus Benefit(B-C)	US$*10^6	-3.69	7.73	4.04	-2.41	7.21	4.81	-1.67	6.74	5.07	-1.57	6.05	4.47	-1.38	5.54	4.17	-1.49	5.26	3.77
Benefit Cost Ratio(B/C)		0.83	1.89	1.13	0.88	1.85	1.17	0.91	1.81	1.19	0.90	1.74	1.18	0.91	1.70	1.18	0.89	1.67	1.17
Unit Annual Cost (Firm)	US$/kWh	0.130	0.062	0.099	0.127	0.055	0.099	0.125	0.067	0.096	0.127	0.071	0.101	0.127	0.074	0.102	0.126	0.076	0.103
Unit Annual Cost (Average)	US$/kWh	0.062	0.036	0.062	0.076	0.036	0.056	0.071	0.038	0.056	0.069	0.038	0.054	0.067	0.038	0.053	0.066	0.038	0.052

Table 9-10(3-2) Comparison Study on Reservoir Capacity

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=750m-700m with Baglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site		Bayram	Baglik	Total	Bayram	Baglik	Total	Bayram	Baglik	Total	Bayram	Baglik	Total	Bayram	Baglik	Total
	Layout	720C	720C		715C	715C		710C	710C		705C	705C		700C	700C	
High Water Level	m	720.00	530.00		715.00	530.00		710.00	530.00		705.00	530.00		700.00	530.00	
Normal Water Level	m	708.67	528.50		705.33	528.50		702.00	528.50		698.67	528.50		695.33	528.50	
Low Water Level	m	686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00		686.00	527.00	
Available Drawdown	m	34.00	3.00		29.00	3.00		24.00	3.00		19.00	3.00		14.00	3.00	
Gross Storage Capacity	m^3*10^6	78.00	7.30		65.00	7.30		55.00	7.30		46.00	7.30		38.00	7.30	
Effective Storage Capacity	m^3*10^6	56.00	1.00		45.00	1.00		35.00	1.00		26.00	1.00		18.00	1.00	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.		Rockfill	Con-Gra.	
Dam Hight	m	125	74		120	74		115	74		110	74		105	74	
Dam Volume	m^3	3,900	195		3,500	195		3,100	195		2,700	195		2,400	195	
Tailwater Level	m	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	m	169.27	130.70		165.83	130.70		162.50	130.70		158.97	130.60		155.53	130.50	
Maximum Discharge	m^3/s	33.00	40.00		31.00	38.00		29.00	36.00		26.00	33.00		24.00	31.00	
Installed Capacity	MW	48.00	45.00	93.00	44.00	43.00	87.00	40.00	40.00	80.00	35.00	37.00	72.00	32.00	35.00	67.00
Firm Peak Power	MW	39.00	44.00	83.00	36.90	41.00	77.90	35.00	39.00	74.00	31.80	36.00	67.80	29.50	34.00	63.50
Energy Production																
Average Energy	GWh	204.90	200.60	405.50	193.30	192.60	385.90	180.80	185.90	366.70	167.30	176.90	344.20	154.40	170.40	324.80
Firm Energy	GWh	100.10	96.10	196.20	92.00	89.50	181.50	83.90	85.10	169.00	75.30	78.60	153.90	67.20	74.20	141.40
Secondary Energy	GWh	104.80	104.50	209.30	101.30	103.10	204.40	96.90	100.80	197.70	92.00	98.30	190.30	87.20	96.20	183.40
Unit Benefit Value																
Firm Peak Power	US$/kW	180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450	
Firm Energy	US$/kWh	0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022		0.022	0.022	
Benefit																
Firm Peak Power	US$*10^6	6.71	7.57	14.28	6.35	7.06	13.41	6.02	6.71	12.73	5.47	6.20	11.67	5.08	5.85	10.93
Firm Energy	US$*10^6	2.66	2.55	5.21	2.44	2.38	4.82	2.23	2.26	4.49	2.00	2.09	4.08	1.78	1.97	3.75
Secondary Energy	US$*10^6	2.26	2.25	4.51	2.18	2.22	4.40	2.09	2.17	4.26	1.98	2.12	4.10	1.68	2.07	3.95
Total	US$*10^6	11.62	12.37	24.00	10.97	11.65	22.62	10.34	11.14	21.48	9.45	10.40	19.85	8.74	9.89	18.63
Investment Cost																
Civil Facilities	US$*10^6	109.71	50.70	160.40	102.25	50.11	152.36	94.89	49.52	144.41	87.72	48.80	136.52	81.89	48.14	130.03
Hydrau. and Ele.-Mech.Eq.	US$*10^6	19.51	21.97	41.49	18.52	21.67	40.19	17.47	20.81	38.28	15.96	20.05	36.01	15.08	19.62	34.70
Total	US$*10^6	129.22	72.67	201.89	120.77	71.77	192.55	112.36	70.33	182.69	103.68	68.85	172.53	96.97	67.76	164.74
Annual Cost																
Civil Facilities	US$*10^6	11.08	5.12	16.20	10.33	5.06	15.39	9.58	5.00	14.59	8.86	4.93	13.79	8.27	4.86	13.13
Hydrau. and Ele.-Mech.Eq.	US$*10^6	2.22	2.51	4.73	2.11	2.47	4.58	1.99	2.37	4.36	1.82	2.29	4.11	1.72	2.24	3.96
Total	US$*10^6	13.30	7.63	20.93	12.44	7.53	19.97	11.58	7.37	18.95	10.68	7.21	17.89	9.99	7.10	17.09
Annual Surplus Benefit(B-C)	US$*10^6	-1.68	4.75	3.07	-1.47	4.12	2.65	-1.24	3.77	2.53	-1.23	3.16	1.96	-1.25	2.79	1.54
Benefit Cost Ratio(B/C)		0.87	1.62	1.15	0.88	1.55	1.13	0.89	1.51	1.13	0.89	1.44	1.11	0.87	1.39	1.09
Unit Annual Cost (Firm)	US$/kWh	0.133	0.079	0.107	0.135	0.084	0.110	0.138	0.087	0.112	0.142	0.092	0.116	0.149	0.096	0.121
Unit Annual Cost (Average)	US$/kWh	0.065	0.038	0.052	0.064	0.039	0.052	0.064	0.040	0.052	0.064	0.041	0.052	0.065	0.042	0.053

Table 9-11(1) Cost Estimate of Alternative Plan for Bayram Reservoir Water Level

Bayram Project Tailrace Undergro. P/S Layout H.W.L.=750m L.W.L.=686-745m With Baglik H.W.L.= 530.00m Unit:10^3US$

Description Dam Site / Layout Type	Bayram 750-686	Bayram 750-705	Bayram 750-710	Bayram 750-715	Bayram 750-720	Bayram 750-725	Bayram 750-730	Bayram 750-735	Bayram 750-740	Bayram 750-745
High Water Level (m)	750	750	750	750	750	750	750	750	750	750
Reservoir Area (km^2)	3 68	3 68	3 68	3 68	3 68	3 68	3 68	3 68	3 68	3 68
Dam Volume (10^6m^3)	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Dam Height (m)	155	155	155	155	155	155	155	155	155	155
Maximum Head (m)	220	220	220	220	220	220	220	220	220	220
Maximum Discharge (m^3/s)	49	45	43	42	40	38	35	33	29	24
Relocation Road	13,724	12,689	12,689	12,689	12,689	12,689	12,689	12,689	12,689	12,689
Camp Facilities	800	800	800	800	800	800	800	800	800	800
Land Acquisition	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Civil Work	103,423	102,351	101,541	101,417	100,633	99,973	99,219	98,591	97,109	95,824
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	65,412	65,412	65,412	65,412	65,412	65,412	65,412	65,412	65,412	65,412
Spillway	8,143	8,143	8,143	8,143	8,143	8,143	8,143	8,143	8,143	8,143
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,280	1,052	964	885	824	736	631	544	421	272
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0
Penstock	651	600	574	561	535	509	471	445	393	328
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	3,370	3,177	3,081	3,049	2,953	2,856	2,696	2,632	2,375	2,054
Tailrace Tunnel	15,906	15,306	14,705	14,705	14,105	13,655	13,205	12,755	11,704	10,954
Switchyard	161	161	161	161	161	161	161	161	161	161
Pre-Subtotal	120,936	118,829	118,019	117,895	117,112	116,452	115,697	115,069	113,587	112,302
Contingency (15%)	17,692	17,376	17,255	17,236	17,118	17,019	16,906	16,812	16,590	16,397
Eng. and Admi. (10%)	13,564	13,322	13,228	13,214	13,124	13,048	12,961	12,889	12,719	12,571
Sub Total	152,192	149,527	148,502	148,345	147,354	146,519	145,565	144,770	142,896	141,270
I.D.C (9.5%/Year)	33,450	32,864	32,639	32,604	32,387	32,203	31,993	31,819	31,407	31,049
Total	185,641	182,391	181,141	180,950	179,741	178,722	177,558	176,589	174,302	172,319
Hydraulic Equipment	5,389	5,245	5,243	5,115	4,934	4,732	4,449	4,248	3,882	3,429
Spillway	856	856	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528	528	528
Intake Gate	858	738	677	621	578	517	443	382	295	191
Penstock	2,862	2,636	2,523	2,466	2,352	2,239	2,068	1,954	1,728	1,440
Draft Gate	139	128	122	119	113	108	99	94	82	68
Tailrace Gate	70	64	61	60	57	54	50	47	41	34
Pre-Subtotal	5,353	4,950	4,767	4,650	4,485	4,301	4,044	3,860	3,529	3,117
Contingency (10%)	535	495	477	465	449	430	404	386	353	312
Electro-Mechanical Equipment	17,482	16,944	16,587	16,638	16,246	15,591	14,723	14,268	12,691	11,513
Equipment	16,649	16,137	15,798	15,846	15,472	14,849	14,022	13,589	12,086	10,965
Contingency (5%)	832	807	790	792	774	742	701	679	604	548
Eng. and Admi. (10%)	2,337	2,239	2,183	2,175	2,118	2,032	1,917	1,851	1,657	1,494
Sub Total	25,707	24,627	24,014	23,929	23,297	22,355	21,089	20,366	18,230	16,438
I.D.C (9.5%/Year)	1,382	1,324	1,291	1,287	1,253	1,202	1,134	1,095	980	884
Total	27,090	25,952	25,305	25,215	24,550	23,557	22,222	21,461	19,210	17,319
Grand Total	212,731	208,342	206,446	206,165	204,290	202,280	199,780	198,050	193,512	189,639

Baglik Project Tailrace Undergro. P/S Layout H.W.L.= 530.00m With Bayram H.W.L.=750m L.W.L.=686-745m Unit:10^3US$

Description Dam Site / Layout Type	Baglik 750-686	Baglik 750-705	Baglik 750-710	Baglik 750-715	Baglik 750-720	Baglik 750-725	Baglik 750-730	Baglik 750-735	Baglik 750-740	Baglik 750-745
High Water Level (m)	530	530	530	530	530	530	530	530	530	530
Reservoir Area (km^2)	0 37	0 37	0 37	0 37	0 37	0 37	0 37	0 37	0 37	0 37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	58	54	52	50	47	44	42	39	36	31
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilities	800	800	800	800	800	800	800	800	800	800
Land Aquisition	598	598	598	598	598	598	598	598	598	598
Civil Work	26,946	26,326	25,992	25,883	25,364	24,903	24,449	23,912	23,571	22,456
Diversion	0	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,583	9,583	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0	0
Intake	44	41	40	39	37	35	33	31	30	28
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0
Penstock	426	398	384	370	349	328	313	292	271	235
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,754	3,489	3,413	3,299	3,148	3,034	2,920	2,730	2,655	2,389
Tailrace Tunnel	9,481	9,157	8,914	8,914	8,590	8,266	7,942	7,617	7,374	6,564
Switchyard	0	0	0	0	0	0	0	0	0	0
Pre-Subtotal	35,103	34,483	34,149	34,020	33,521	33,060	32,606	32,069	31,727	30,613
Contingency (15%)	5,176	5,083	5,033	5,013	4,938	4,869	4,801	4,721	4,669	4,502
Eng. and Admi. (10%)	3,958	3,897	3,858	3,844	3,786	3,733	3,681	3,619	3,580	3,452
Sub Total	44,247	43,462	43,040	42,877	42,245	41,662	41,088	40,409	39,977	38,566
I.D.C (9.5%/Year)	11,052	10,856	10,751	10,710	10,552	10,406	10,263	10,093	9,985	9,633
Total	55,299	54,318	53,790	53,587	52,797	52,069	51,351	50,503	49,962	48,200
Hydraulic Equipment	3,130	2,986	2,917	2,848	2,737	2,631	2,558	2,451	2,344	2,163
Spillway	870	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0	0
Intake Gate	186	174	170	166	156	148	141	134	127	112
Penstock	1,587	1,432	1,430	1,377	1,299	1,220	1,187	1,088	1,009	878
Draft Gate	135	126	121	118	109	102	98	91	84	72
Tailrace Gate	68	63	61	59	55	52	49	46	42	36
Pre-Subtotal	2,845	2,715	2,652	2,569	2,489	2,392	2,325	2,226	2,131	1,967
Contingency (10%)	285	271	265	259	249	239	233	223	213	197
Electro-Mechanical Equipment	20,208	19,477	19,216	18,455	17,922	17,098	16,766	16,152	15,559	14,445
Equipment	19,245	18,550	18,301	17,586	17,069	16,284	15,967	15,383	14,818	13,757
Contingency (5%)	962	927	915	879	853	814	798	769	741	688
Eng. and Admi. (10%)	2,334	2,246	2,213	2,131	2,066	1,973	1,932	1,850	1,790	1,661
Sub Total	25,672	24,710	24,346	23,444	22,726	21,702	21,256	20,464	19,693	18,269
I.D.C (9.5%/Year)	1,454	1,400	1,379	1,328	1,287	1,229	1,204	1,159	1,116	1,035
Total	27,126	26,109	25,725	24,772	24,013	22,931	22,460	21,623	20,809	19,304
Grand Total	82,425	80,428	79,515	78,359	76,810	75,000	73,811	72,126	70,771	67,504

Table 9-11(2) Cost Estimate of Alternative Plan for Bayram Reservoir Water Level

Bayram Project Tailrace Underpro. P/S Layout H.W.L.=745m L.W.L.=686-740m With Baglik H.W.L.= 530.00m Unit:10^3US$

Description Dam Site / Layout Type	Bayram 745-686	Bayram 745-700	Bayram 745-705	Bayram 745-710	Bayram 745-715	Bayram 745-720	Bayram 745-725	Bayram 745-730	Bayram 745-735	Bayram 745-740
High Water Level (m)	745	745	745	745	745	745	745	745	745	745
Reservoir Area (km^2)	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68
Dam Volume (10^6m^3)	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Dam Height (m)	150	150	150	150	150	150	150	150	150	150
Maximum Head (m)	215	215	215	215	215	215	215	215	215	215
Maximum Discharge (m^3/s)	48	43	42	40	38	36	34	32	28	24
Relocation Road	12,689	12,689	12,689	12,689	12,689	12,689	12,689	12,689	12,689	12,689
Camp Facilities	800	800	800	800	800	800	800	800	800	800
Land Acquisition	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616
Civil Work	92,133	91,205	91,108	90,243	89,593	88,933	88,315	88,065	88,825	85,459
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	55,407	55,407	55,407	55,407	55,407	55,407	55,407	55,407	55,407	55,407
Spillway	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789	7,789
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,192	999	947	868	789	701	622	528	412	272
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0
Penstock	599	562	549	524	499	473	448	423	372	321
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	3,177	3,061	3,049	2,889	2,792	2,696	2,632	2,503	2,279	2,054
Tailrace Tunnel	15,306	14,705	14,705	14,105	13,655	13,205	12,755	12,755	11,704	10,954
Switchyard	161	161	161	161	161	161	161	161	161	161
Pre-Subtotal	108,238	107,311	107,213	106,348	105,698	105,038	104,420	104,170	102,730	101,564
Contingency (15%)	15,843	15,704	15,690	15,560	15,462	15,363	15,271	15,233	15,017	14,842
Eng. and Admi. (10%)	12,147	12,040	12,029	11,929	11,854	11,779	11,707	11,679	11,513	11,379
Sub Total	136,228	135,055	134,932	133,838	133,015	132,180	131,398	131,081	129,260	127,785
I.D.C. (9.5%/Year)	28,579	28,333	28,307	28,077	27,905	27,730	27,566	27,499	27,117	26,806
Total	164,806	163,387	163,239	161,915	160,919	159,910	158,964	158,581	156,377	154,593
Hydraulic Equipment	5,557	5,211	5,105	4,912	4,720	4,521	4,328	4,121	3,769	3,395
Spillway	856	856	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528	528	528
Intake Gate	837	701	665	609	554	492	437	369	289	191
Penstock	2,635	2,469	2,413	2,302	2,191	2,060	1,969	1,857	1,634	1,410
Draft Gate	131	122	119	113	108	102	96	91	79	68
Tailrace Gate	65	61	60	57	54	51	48	45	40	34
Pre-Subtotal	5,052	4,737	4,641	4,466	4,291	4,110	3,934	3,747	3,426	3,087
Contingency (10%)	505	474	464	447	429	411	393	375	343	309
Electro-Mechanical Equipment	16,260	15,955	15,995	15,566	15,155	14,723	14,057	13,592	12,364	11,578
Equipment	15,486	15,195	15,233	14,825	14,434	14,022	13,388	12,945	11,775	11,027
Contingency (5%)	774	760	762	741	722	701	669	647	589	551
Eng. and Admi. (10%)	2,182	2,117	2,110	2,048	1,988	1,924	1,839	1,771	1,613	1,497
Sub Total	23,999	23,283	23,210	22,526	21,863	21,167	20,224	19,485	17,746	16,471
I.D.C. (9.5%/Year)	1,290	1,252	1,248	1,211	1,175	1,138	1,087	1,048	954	886
Total	25,289	24,534	24,457	23,737	23,038	22,306	21,311	20,533	18,700	17,357
Grand Total	190,095	187,922	187,696	185,652	183,957	182,216	180,275	179,113	175,077	171,949

Baglik Project Tailrace Underpro. P/S Layout H.W.L.= 530.00m Bayram H.W.L.=745m L.W.L.=686-740m Unit:10^3US$

Description Dam Site / Layout Type	Baglik 745-686	Baglik 745-700	Baglik 745-705	Baglik 745-710	Baglik 745-715	Baglik 745-720	Baglik 745-725	Baglik 745-730	Baglik 745-735	Baglik 745-740
High Water Level (m)	530	530	530	530	530	530	530	530	530	530
Reservoir Area (km^2)	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	55	52	49	48	45	43	41	38	35	30
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilities	800	800	800	800	800	800	800	800	800	800
Land Acquisition	599	598	598	598	598	598	598	599	598	598
Civil Work	26,447	25,992	25,493	25,410	24,987	24,533	24,042	23,662	23,244	22,373
Diversion	0	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0	0
Intake	42	41	38	37	36	34	33	31	29	26
Headrace Tunnel	0	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0	0
Penstock	405	384	363	356	335	321	306	285	264	228
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,603	3,413	3,261	3,185	3,110	2,996	2,844	2,730	2,579	2,313
Tailrace Tunnel	9,157	8,914	8,590	8,590	8,266	7,942	7,617	7,374	7,131	6,564
Switchyard	0	0	0	0	0	0	0	0	0	0
Pre-Subtotal	34,604	34,149	33,650	33,566	33,144	32,690	32,199	31,819	31,400	30,530
Contingency (15%)	5,101	5,033	4,958	4,945	4,882	4,814	4,740	4,683	4,620	4,490
Eng. and Admi. (10%)	3,911	3,858	3,801	3,791	3,743	3,691	3,634	3,590	3,542	3,442
Sub Total	43,616	43,040	42,409	42,303	41,768	41,194	40,573	40,093	39,563	38,461
I.D.C. (9.5%/Year)	10,894	10,751	10,593	10,568	10,433	10,290	10,134	10,014	9,882	9,607
Total	54,510	53,791	53,002	52,870	52,201	51,484	50,708	50,107	49,445	48,068
Hydraulic Equipment	3,023	2,919	2,811	2,774	2,668	2,594	2,525	2,418	2,307	2,130
Spillway	870	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0	0
Intake Gate	177	172	163	159	152	145	141	134	123	112
Penstock	1,508	1,430	1,351	1,325	1,246	1,193	1,141	1,062	982	849
Draft Gate	128	121	114	112	105	100	95	88	81	70
Tailrace Gate	65	61	57	56	53	50	48	45	41	35
Pre-Subtotal	2,748	2,654	2,555	2,522	2,425	2,359	2,295	2,198	2,098	1,937
Contingency (10%)	275	265	256	252	243	236	230	220	210	194
Electro-Mechanical Equipment	19,723	19,216	18,430	18,387	17,813	17,215	16,863	16,223	15,433	14,932
Equipment	18,784	18,301	17,553	17,512	16,965	16,395	16,060	15,450	14,699	13,459
Contingency (5%)	939	915	878	876	848	820	803	773	735	673
Eng. and Admi. (10%)	2,275	2,213	2,124	2,116	2,048	1,981	1,939	1,864	1,774	1,626
Sub Total	25,021	24,348	23,365	23,278	22,529	21,790	21,327	20,505	19,515	17,889
I.D.C. (9.5%/Year)	1,417	1,379	1,323	1,319	1,276	1,234	1,208	1,161	1,105	1,013
Total	26,438	25,727	24,689	24,596	23,805	23,025	22,535	21,666	20,620	18,902
Grand Total	80,949	79,519	77,691	77,466	76,006	74,508	73,243	71,774	70,068	66,971

Table 9-11(3) Cost Estimate of Alternative Plan for Bayram Reservoir Water Level

Bayram Project Tailrace Underpro. P/S Layout H.W.L.=740m L.W.L.=688m-735m With Baglik H.W.L.= 530.00m — Unit:10^3US$

Description Dam Site / Layout Type	Bayram 740-688	Bayram 740-700	Bayram 740-705	Bayram 740-710	Bayram 740-715	Bayram 740-720	Bayram 740-725	Bayram 740-730	Bayram 740-735
High Water Level (m)	740	740	740	740	740	740	740	740	740
Reservoir Area (km^2)	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38
Dam Volume (10^6m^3)	6,144	6,144	6,144	6,144	6,144	6,144	6,144	6,144	6,144
Dam Height (m)	145	145	145	145	145	145	145	145	145
Maximum Head (m)	210	210	210	210	210	210	210	210	210
Maximum Discharge (m^3/s)	43	40	39	37	36	33	31	27	24
Relocation Road	11,655	11,655	11,655	11,655	11,655	11,655	11,655	11,655	11,655
Camp Facilities	800	800	800	800	800	800	800	800	800
Land Acquisition	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242
Civil Work	83,113	82,203	82,091	81,445	80,907	79,888	79,309	77,870	77,230
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	47,281	47,281	47,281	47,281	47,281	47,281	47,281	47,281	47,281
Spillway	7,523	7,523	7,523	7,523	7,523	7,523	7,523	7,523	7,523
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	1,087	982	947	912	877	754	666	386	281
Headrace Tunnel	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0
Penstock	546	512	500	475	463	426	401	351	314
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	3,049	2,889	2,824	2,696	2,664	2,568	2,407	2,215	2,022
Tailrace Tunnel	14,965	14,354	14,354	13,896	13,438	12,674	12,369	11,453	11,147
Switchyard	161	161	161	161	161	161	161	161	161
Pre-Subtotal	97,811	96,900	96,789	96,142	95,605	94,585	94,007	92,568	91,927
Contingency (15%)	14,335	14,199	14,182	14,085	14,004	13,851	13,765	13,549	13,453
Eng. and Admi. (10%)	10,990	10,886	10,873	10,799	10,737	10,619	10,553	10,387	10,314
Sub Total	123,136	121,985	121,843	121,026	120,348	119,056	118,324	116,504	115,694
I.D.C. (9.5%/Year)	24,601	24,371	24,343	24,179	24,044	23,788	23,640	23,276	23,114
Total	147,737	146,356	146,186	145,205	144,389	142,842	141,964	139,780	138,808
Hydraulic Equipment	5,203	4,945	4,854	4,698	4,606	4,318	4,121	3,645	3,369
Spillway	856	856	856	856	856	856	856	856	856
Outlet Works	528	526	528	528	528	528	528	528	528
Intake Gate	763	689	665	640	615	529	458	271	197
Penstock	2,400	2,252	2,198	2,089	2,035	1,872	1,783	1,544	1,380
Draft Gate	122	113	111	105	102	94	88	77	68
Tailrace Gate	61	57	55	52	51	47	44	38	34
Pre-Subtotal	4,730	4,496	4,413	4,271	4,188	3,925	3,745	3,314	3,063
Contingency (10%)	473	450	441	427	419	393	375	331	306
Electro-Mechanical Equipment	15,780	15,388	15,395	14,944	14,494	13,792	13,294	12,233	11,331
Equipment	15,029	14,655	14,662	14,233	13,804	13,135	12,661	11,650	10,792
Contingency (5%)	751	733	733	712	690	657	633	583	540
Eng. and Admi. (10%)	2,098	2,033	2,025	1,964	1,910	1,811	1,742	1,588	1,470
Sub Total	23,082	22,366	22,274	21,606	21,010	19,921	19,157	17,466	16,170
I.D.C. (9.5%/Year)	1,241	1,203	1,198	1,162	1,130	1,071	1,030	939	869
Total	24,323	23,569	23,471	22,768	22,140	20,992	20,187	18,405	17,040
Grand Total	172,060	169,925	169,658	167,974	166,529	163,834	162,151	158,185	155,848

Baglik Project Tailrace Underpro. P/S Layout H.W.L.= 530.00m With Bayram H.W.L.=740m L.W.L.=688m-700m — Unit:10^3US$

Description Dam Site / Layout Type	Baglik 740-688	Baglik 740-700	Baglik 740-705	Baglik 740-710	Baglik 740-715	Baglik 740-720	Baglik 740-725	Baglik 740-730	Baglik 740-735
High Water Level (m)	530	530	530	530	530	530	530	530	530
Reservoir Area (km^2)	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	52	48	46	44	42	40	37	34	30
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilities	800	800	800	800	800	800	800	800	800
Land Acquisition	598	598	598	598	598	598	598	598	598
Civil Work	25,984	25,410	24,995	24,661	24,569	24,035	23,581	23,123	22,297
Diversion	0	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0	0
Intake	40	37	37	36	34	33	31	29	26
Headrace Tunnel	0	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0	0
Penstock	376	356	342	328	313	299	279	257	228
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,413	3,185	3,110	3,034	2,958	2,844	2,655	2,465	2,237
Tailrace Tunnel	8,914	8,590	8,266	8,023	8,023	7,617	7,374	7,131	6,564
Switchyard	0	0	0	0	0	0	0	0	0
Pre-Subtotal	34,141	33,566	33,151	32,817	32,726	32,192	31,738	31,280	30,454
Contingency (15%)	5,031	4,945	4,883	4,833	4,819	4,739	4,671	4,602	4,478
Eng. and Admi. (10%)	3,857	3,791	3,744	3,705	3,695	3,633	3,581	3,526	3,433
Sub Total	43,030	42,303	41,778	41,356	41,240	40,564	39,990	39,411	38,365
I.D.C. (9.5%/Year)	10,748	10,566	10,435	10,330	10,301	10,132	9,983	9,844	9,583
Total	53,778	52,870	52,214	51,686	51,541	50,696	49,978	49,255	47,948
Hydraulic Equipment	2,884	2,774	2,705	2,635	2,562	2,492	2,392	2,277	2,130
Spillway	870	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0	0
Intake Gate	170	159	156	152	145	141	134	125	112
Penstock	1,400	1,325	1,272	1,220	1,167	1,114	1,040	956	849
Draft Gate	121	112	107	102	98	93	87	79	70
Tailrace Gate	61	56	54	52	49	47	44	40	35
Pre-Subtotal	2,622	2,522	2,459	2,396	2,329	2,265	2,174	2,070	1,937
Contingency (10%)	262	252	246	240	233	227	217	207	194
Electro-Mechanical Equipment	19,216	18,176	17,871	17,098	16,786	16,418	15,949	15,152	14,004
Equipment	18,301	17,311	17,020	16,284	15,967	15,636	15,190	14,431	13,337
Contingency (5%)	915	866	851	814	798	782	759	722	667
Eng. and Admi. (10%)	2,210	2,095	2,058	1,973	1,933	1,891	1,834	1,743	1,613
Sub Total	24,310	23,045	22,634	21,706	21,260	20,801	20,175	19,172	17,747
I.D.C. (9.5%/Year)	1,377	1,305	1,282	1,230	1,204	1,178	1,143	1,086	1,005
Total	25,687	24,351	23,916	22,936	22,464	21,979	21,318	20,258	18,752
Grand Total	79,464	77,220	76,129	74,622	74,005	72,676	71,296	69,513	66,701

Table 9-11(4) Cost Estimate of Alternative Plan for Bayram Reservoir Water Level

Bayram Project Tailrace Undergro. P/S Layout H.W.L.=735m L.W.L=688m-730m With Baglik H.W.L.= 530.00m Unit:10^3US$

Description Dam Site / Layout Type	Bayram 735-686	Bayram 735-700	Bayram 735-705	Bayram 735-710	Bayram 735-715	Bayram 735-720	Bayram 735-725	Bayram 735-730
High Water Level (m)	735	735	735	735	735	735	735	735
Reservoir Area (km^2)	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11
Dam Volume (10^6m^3)	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400
Dam Height (m)	140	140	140	140	140	140	140	140
Maximum Head (m)	205	205	205	205	205	205	205	205
Maximum Discharge (m^3/s)	40	37	35	34	32	30	27	23
Relocation Road	10,724	10,724	10,724	10,724	10,724	10,724	10,724	10,724
Camp Facilties	800	800	800	800	800	800	800	800
Land Acquisition	2,063	2,063	2,063	2,063	2,063	2,063	2,063	2,063
Civil Work	78,050	75,418	74,856	74,315	74,095	73,251	72,066	69,744
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	41,556	41,556	41,556	41,556	41,556	41,556	41,556	41,556
Spillway	7,434	7,434	7,434	7,434	7,434	7,434	7,434	7,434
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	999	962	947	912	877	754	666	388
Headrace Tunnel	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0
Penstock	501	465	453	429	404	380	344	295
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	2,792	2,664	2,600	2,568	2,407	2,311	2,150	1,958
Tailrace Tunnel	14,105	13,655	13,205	12,755	12,755	12,154	11,254	9,453
Switchyard	161	161	161	161	161	161	161	161
Pre-Subtotal	89,637	89,005	88,443	87,902	87,682	86,839	85,654	83,331
Contingency (15%)	13,136	13,041	12,957	12,876	12,843	12,716	12,539	12,190
Eng. and Admi. (10%)	10,071	9,998	9,934	9,871	9,848	9,749	9,613	9,346
Sub Total	112,844	112,044	111,334	110,649	110,371	109,304	107,805	104,867
I.D.C. (9.5%/Year)	22,545	22,385	22,243	22,106	22,051	21,838	21,538	20,951
Total	135,389	134,429	133,577	132,755	132,422	131,142	129,343	125,818
Hydraulic Equipment	4,904	4,701	4,611	4,457	4,304	4,083	3,825	3,354
Spillway	856	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528	528
Intake Gate	701	689	665	640	615	529	468	271
Penstock	2,202	2,043	1,990	1,884	1,777	1,671	1,510	1,296
Draft Gate	113	105	102	96	91	85	77	65
Tailrace Gate	57	52	51	48	45	43	38	33
Pre-Subtotal	4,458	4,274	4,192	4,052	3,913	3,711	3,477	3,049
Contingency (10%)	446	427	419	405	391	371	348	305
Electro-Mechanical Equipment	14,944	14,268	14,043	13,792	13,105	12,596	11,593	11,004
Equipment	14,233	13,589	13,374	13,135	12,481	11,996	11,041	10,480
Contingency (5%)	712	679	669	657	624	600	552	524
Eng. and Admi. (10%)	1,985	1,897	1,865	1,825	1,741	1,668	1,542	1,436
Sub Total	21,833	20,866	20,519	20,075	19,150	18,347	16,959	15,784
I.D.C. (9.5%/Year)	1,174	1,122	1,103	1,079	1,030	986	912	849
Total	23,007	21,988	21,622	21,154	20,180	19,333	17,871	16,643
Grand Total	158,396	156,417	155,199	153,909	152,601	150,475	147,214	142,461

Tailrace Type Underground Powerhouse Layout Bayram H.W.L.=735m L.W.L.=688-730m and Baglik H.W.L.=530m Unit:10^3US$

Description Dam Site / Layout Type	Baglik 735-686	Baglik 735-700	Baglik 735-705	Baglik 735-710	Baglik 735-715	Baglik 735-720	Baglik 735-725	Baglik 735-730
High Water Level (m)	530	530	530	530	530	530	530	530
Reservoir Area (km^2)	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	48	44	42	41	39	36	33	29
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilties	800	800	800	800	800	800	800	800
Land Acquisition	598	598	598	598	598	598	598	598
Civil Work	25,409	24,903	24,450	24,042	23,950	23,494	22,834	22,008
Diversion	0	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0	0
Intake	37	35	34	33	31	29	28	26
Headrace Tunnel	0	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0	0
Penstock	356	328	313	306	292	271	250	221
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,185	3,034	2,920	2,844	2,768	2,579	2,427	2,199
Tailrace Tunnel	8,590	8,266	7,942	7,617	7,617	7,374	6,888	6,321
Switchyard	0	0	0	0	0	0	0	0
Pre-Subtotal	33,566	33,060	32,607	32,199	32,106	31,651	30,991	30,165
Contingency (15%)	4,945	4,859	4,801	4,740	4,726	4,658	4,559	4,435
Eng. and Admi. (10%)	3,791	3,733	3,681	3,634	3,623	3,571	3,495	3,400
Sub Total	42,303	41,663	41,089	40,573	40,456	39,880	39,045	38,000
I.D.C. (9.5%/Year)	10,566	10,407	10,263	10,134	10,105	9,961	9,753	9,492
Total	52,869	52,069	51,352	50,707	50,561	49,842	48,797	47,491
Hydraulic Equipment	2,773	2,633	2,560	2,524	2,447	2,343	2,237	2,093
Spillway	870	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0	0
Intake Gate	158	150	143	140	130	125	119	109
Penstock	1,325	1,220	1,167	1,141	1,068	1,009	929	823
Draft Gate	112	102	98	95	91	84	77	67
Tailrace Gate	56	52	49	48	46	42	39	34
Pre-Subtotal	2,521	2,393	2,327	2,295	2,225	2,130	2,034	1,903
Contingency (10%)	252	239	233	229	222	213	203	190
Electro-Mechanical Equipment	18,176	16,906	16,582	16,504	16,152	15,402	14,871	13,714
Equipment	17,311	16,101	15,793	15,718	15,383	14,669	14,163	13,061
Contingency (5%)	866	805	790	786	769	733	708	653
Eng. and Admi. (10%)	2,095	1,954	1,914	1,903	1,860	1,775	1,711	1,581
Sub Total	23,044	21,493	21,056	20,931	20,459	19,520	18,819	17,388
I.D.C. (9.5%/Year)	1,305	1,217	1,193	1,186	1,159	1,106	1,066	985
Total	24,349	22,711	22,249	22,116	21,618	20,625	19,885	18,373
Grand Total	77,218	74,780	73,601	72,824	72,180	70,467	68,682	65,865

Table 9-11(5) Cost Estimate of Alternative Plan for Bayram Reservoir Water Level

Unit:10^3US$

Bayram Project Tailrace Undergro. P/S Layout H.W.L.=730m L.W.L.=686m-725m With Baglik H.W.L.=530.00m

Description Dam Site / Layout Type	Bayram 730-686	Bayram 730-700	Bayram 730-705	Bayram 730-710	Bayram 730-715	Bayram 730-720	Bayram 730-725
High Water Level (m)	730	730	730	730	730	730	730
Reservoir Area (km^2)	2.83	2.83	2.83	2.83	2.83	2.83	2.83
Dam Volume (10^6m^3)	4,800	4,800	4,800	4,800	4,800	4,800	4,800
Dam Height (m)	135	135	135	135	135	135	135
Maximum Head (m)	200	200	200	200	200	200	200
Maximum Discharge (m^3/s)	38	35	33	31	28	26	23
Relocation Road	9,758	9,758	9,758	9,758	9,758	9,758	9,758
Camp Facilities	800	800	800	800	800	800	800
Land Acquisition	1,878	1,878	1,878	1,878	1,878	1,878	1,878
Civil Work	70,643	69,935	69,228	68,438	67,686	67,014	65,927
Diversion	2,421	2,421	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Dam	36,938	36,938	36,938	36,938	36,938	36,938	36,938
Spillway	7,346	7,346	7,346	7,346	7,346	7,346	7,346
Outlet Works	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Intake	912	754	649	579	473	403	263
Headrace Tunnel	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0
Penstock	456	431	407	383	348	324	268
Acces Tunnels	3,980	3,980	3,980	3,980	3,980	3,980	3,980
Power House	2,664	2,600	2,471	2,375	2,215	2,085	1,926
Tailrace Tunnel	13,655	13,205	12,755	12,154	11,704	11,254	10,504
Switchyard	161	161	161	161	161	161	161
Pre-Subtotal	83,079	82,371	81,664	80,874	80,122	79,450	78,363
Contingency (15%)	12,180	12,074	11,968	11,849	11,737	11,636	11,473
Eng. and Admi. (10%)	9,338	9,257	9,175	9,085	8,998	8,921	8,795
Sub Total	104,597	103,702	102,807	101,808	100,857	100,006	98,632
I.D.C (9.5%/Year)	20,897	20,718	20,540	20,340	20,150	19,980	19,705
Total	125,494	124,421	123,347	122,147	121,007	119,987	118,337
Hydraulic Equipment	4,658	4,351	4,146	3,968	3,701	3,522	3,227
Spillway	856	856	856	856	856	856	856
Outlet Works	528	528	528	528	528	528	528
Intake Gate	640	529	455	406	332	283	185
Penstock	2,049	1,893	1,789	1,685	1,529	1,424	1,267
Draft Gate	106	99	94	88	79	74	65
Tailrace Gate	54	50	47	44	40	37	33
Pre-Subtotal	4,234	3,955	3,769	3,607	3,364	3,202	2,934
Contingency (10%)	423	396	377	361	336	320	293
Electro-Mechanical Equipment	14,250	13,758	13,294	12,596	11,593	11,426	10,612
Equipment	13,572	13,104	12,661	11,996	11,041	10,882	10,106
Contingency (5%)	679	655	633	600	552	544	505
Eng. and Admi. (10%)	1,891	1,811	1,744	1,656	1,529	1,495	1,384
Sub Total	20,799	19,921	19,184	18,220	16,823	16,443	15,223
I.D.C (9.5%/Year)	1,118	1,071	1,031	980	904	884	818
Total	21,917	20,992	20,215	19,200	17,727	17,327	16,041
Grand Total	147,411	145,413	143,562	141,348	138,735	137,313	134,378

Unit:10^3US$

Tailrace Type Underground Powerhouse Layout Bayram H.W.L.=735m L.W.L.=686-730m and Baglik H.W.L.=530m

Description Dam Site / Layout Type	530 730-686	530 730-700	530 730-705	530 730-710	530 730-715	530 730-720	530 730-725
High Water Level (m)	530	530	530	530	530	530	530
Reservoir Area (km^2)	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Dam Volume (10^6m^3)	195	195	195	195	195	195	195
Dam Height (m)	74	74	74	74	74	74	74
Maximum Head (m)	138	138	138	138	138	138	138
Maximum Discharge (m^3/s)	45	41	40	38	35	32	29
Relocation Road	6,759	6,759	6,759	6,759	6,759	6,759	6,759
Camp Facilities	800	800	800	800	800	800	800
Land Acquisition	598	598	598	598	598	598	598
Civil Work	24,987	24,060	24,034	23,662	23,244	22,826	22,084
Diversion	0	0	0	0	0	0	0
Care of River	0	0	0	0	0	0	0
Dam	9,983	9,983	9,983	9,983	9,983	9,983	9,983
Spillway	780	780	780	780	780	780	780
Outlet Works	0	0	0	0	0	0	0
Intake	36	33	32	31	30	27	26
Headrace Tunnel	0	0	0	0	0	0	0
Surge Tank	0	0	0	0	0	0	0
Penstock	335	306	299	285	264	242	221
Acces Tunnels	2,478	2,478	2,478	2,478	2,478	2,478	2,478
Power House	3,110	2,882	2,844	2,730	2,579	2,427	2,275
Tailrace Tunnel	8,266	7,617	7,617	7,374	7,131	6,888	6,321
Switchyard	0	0	0	0	0	0	0
Pre-Subtotal	33,144	32,237	32,191	31,819	31,401	30,983	30,240
Contingency (15%)	4,882	4,746	4,739	4,683	4,621	4,558	4,446
Eng. and Admi. (10%)	3,743	3,638	3,633	3,590	3,542	3,494	3,409
Sub Total	41,768	40,621	40,563	40,093	39,564	39,035	38,096
I.D.C (9.5%/Year)	10,433	10,146	10,132	10,014	9,882	9,750	9,516
Total	52,201	50,768	50,695	50,107	49,447	48,785	47,611
Hydraulic Equipment	2,668	2,525	2,488	2,418	2,311	2,200	2,093
Spillway	870	870	870	870	870	870	870
Outlet Works	0	0	0	0	0	0	0
Intake Gate	152	141	137	134	127	116	109
Penstock	1,246	1,141	1,114	1,062	982	903	823
Draft Gate	105	95	93	88	81	74	67
Tailrace Gate	53	48	47	45	41	38	34
Pre-Subtotal	2,425	2,295	2,262	2,198	2,101	2,000	1,903
Contingency (10%)	243	230	226	220	210	200	190
Electro-Mechanical Equipment	17,614	16,504	16,418	16,055	15,281	14,590	13,569
Equipment	16,775	15,718	15,636	15,290	14,553	13,895	12,942
Contingency (5%)	839	786	782	765	728	695	647
Eng. and Admi. (10%)	2,028	1,903	1,891	1,847	1,759	1,679	1,568
Sub Total	22,310	20,932	20,797	20,320	19,352	18,469	17,251
I.D.C (9.5%/Year)	1,264	1,186	1,178	1,151	1,096	1,046	977
Total	23,573	22,117	21,975	21,471	20,448	19,515	18,228
Grand Total	75,774	72,885	72,670	71,578	69,895	68,300	65,839

Table 9-12(1) Comparison Study on Bayram Reservoir Water Level

Bayram Project Tailrace Undergro P/S Layout H W L=750m L W L=686-745m With Baglik H W L= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 750-685	Baglik 530C	Total	Bayram 750-705	Baglik 530C	Total	Bayram 750-710	Baglik 530C	Total	Bayram 750-715	Baglik 530C	Total	Bayram 750-720	Baglik 530C	Total
High Water Level	750 00	530 00		750 00	530 00		750 00	530 00		750	530 00		750	530 00	
Normal Water Level	728 67	528 50		736 00	528 50		736 67	528 50		738 3333	528 50		740	528 50	
Low Water Level	685 00	527 00		705 00	527 00		710 00	527 00		715	527 00		720	527 00	
Available Drawdown	64 00	3 00		45 00	3 00		40 00	3 00		35	3 00		30	3 00	
Gross Storage Capacity	169 00	7 30		169 00	7 30		169 00	7 30		169	7 30		169	7 30	
Effective Storage Capacity	149 00	1 00		123 00	1 00		114 00	1 00		104	1 00		93	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	155	74		155	74		155	74		155	74		155	74	
Dam Volume	8 500	195		8 500	195		8,500	195		8 500	195		8 500	195	
Tailwater Level	530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00	
Effective Head	189 67	131 00		195 90	130 90		197 57	130 90		199 23	130 90		200 80	130 80	
Maximum Discharge	49 00	58 00		45 00	54 00		43 00	52 00		42 00	50 00		40 00	47 00	
Installed Capacity	80 00	65 00	145 00	76 00	61 00	137 00	73 00	59 00	132 00	72 00	56 00	128 00	69 00	53 00	122 00
Firm Peak Power	67 40	62 90	130 30	66 40	58 00	124 40	64 10	56 40	120 50	62 40	55 00	117 40	60 20	51 00	111 20
Energy Production															
Average Energy	266 80	227 00	493 80	266 00	223 00	489 00	265 20	221 90	487 10	264 50	219 00	483 50	263 50	216 50	480 00
Firm Energy	168 50	139 20	307 70	156 61	127 02	293 63	161 44	124 10	285 54	156 02	120 45	276 47	149 42	111 69	261 11
Secondary Energy	98 30	87 80	186 10	99 39	95 98	195 37	103 76	97 80	201 56	108 48	98 55	207 03	114 08	104 81	218 89
Unit Benefit Value	0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00	
Firm Peak Power	180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45	
Firm Energy	0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270	
Secondary Energy	0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219	
Benefit															
Firm Peak Power	11 60	10 82	22 42	11 43	9 58	21 41	11 03	9 71	20 74	10 74	9 46	20 20	10 36	8 78	19 14
Firm Energy	4 47	3 69	8 17	4 42	3 37	7 79	4 28	3 29	7 58	4 14	3 20	7 34	3 97	2 96	6 93
Secondary Energy	2 12	1 89	4 01	2 14	2 07	4 21	2 23	2 11	4 34	2 34	2 12	4 46	2 46	2 26	4 71
Total	18 19	16 41	34 60	17 99	15 42	33 41	17 55	15 11	32 65	17 21	14 78	32 00	16 78	14 00	30 78
Investment Cost															
Civil Facilities	185 64	55 30	240 94	182 39	54 32	236 71	181 14	53 79	234 93	180 95	53 59	234 54	178 74	52 80	232 54
Hydrau and Ele -Mech Eq	27 09	27 13	54 22	25 95	26 11	52 06	25 30	25 72	51 03	25 22	24 77	49 99	24 55	24 01	48 56
Total	212 73	82 43	295 16	208 34	80 43	288 77	206 45	79 52	285 96	206 17	78 36	284 52	204 29	76 81	281 10
Annual Cost															
Civil Facilities	18 75	5 59	24 34	18 42	5 49	23 91	18 30	5 43	23 73	18 28	5 41	23 69	18 15	5 33	23 49
Hydrau and Ele Mech Eq	3 09	3 09	6 18	2 96	2 98	5 93	2 88	2 93	5 82	2 87	2 82	5 70	2 80	2 74	5 54
Total	21 84	8 68	30 52	21 38	8 46	29 84	21 18	8 37	29 55	21 15	8 24	29 39	20 95	8 07	29 02
Annual Surplus Benefit(B-C)	-3 65	7 73	4 08	-3 39	6 96	3 57	-3 63	6 74	3 11	-3 94	6 55	2 61	-4 17	5 93	1 76
Benefit Cost Ratio(B/C)	0 83	1 89	1 13	0 84	1 82	1 12	0 83	1 81	1 11	0 81	1 79	1 09	0 80	1 73	1 06
Unit Annual Cost (Firm)	0 130	0 062	0 099	0 128	0 067	0 102	0 131	0 067	0 103	0 136	0 068	0 106	0 140	0 072	0 111
Unit Annual Cost (Average)	0 082	0 036	0 063	0 080	0 038	0 061	0 080	0 038	0 061	0 080	0 038	0 061	0 080	0 037	0 060

Bayram Project Tailrace Undergro P/S Layout H W L=750m L W L=686-745m With Baglik H W L= 530.0 by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 750-725	Baglik 530C	Total	Bayram 750-730	Baglik 530C	Total	Bayram 750-735	Baglik 530C	Total	Bayram 750-740	Baglik 530C	Total	Bayram 750-745	Baglik 530C	Total
High Water Level	750 00	530 00		750 00	530 00		750 00	530 00		750 00	530 00		750 00	530 00	
Normal Water Level	741 67	528 50		743 33	528 50		745 00	528 50		745 67	528 50		748 33	528 50	
Low Water Level	725 00	527 00		730 00	527 00		735 00	527 00		740 00	527 00		745 00	527 00	
Available Drawdown	25 00	3 00		20 00	3 00		15 00	3 00		10 00	3 00		5 00	3 00	
Gross Storage Capacity	169 00	7 30		169 00	7 30		169 00	7 30		169 00	7 30		169 00	7 30	
Effective Storage Capacity	61 00	1 00		67 00	1 00		53 00	1 00		36 00	1 00		19 00	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	155	74		155	74		155	74		155	74		155	74	
Dam Volume	8 500	195		8 500	195		8 500	195		8 500	195		8 500	195	
Tailwater Level	530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00	
Effective Head	202 47	130 90		204 03	130 80		205 60	130 70		207 17	130 70		208 53	130 50	
Maximum Discharge	38 00	44 00		35 00	42 00		33 00	39 00		29 00	36 00		24 00	31 00	
Installed Capacity	66 00	49 00	115 00	61 00	47 00	108 00	56 00	44 00	102 00	51 00	40 00	91 00	43 00	35 00	78 00
Firm Peak Power	58 61	48 00	106 61	54 70	46 00	100 70	52 10	42 00	94 10	48 80	39 00	87 80	40 30	34 00	74 30
Energy Production															
Average Energy	259 50	212 00	471 50	253 90	206 40	460 30	245 00	198 00	443 00	232 70	186 10	418 80	195 80	169 00	364 80
Firm Energy	141 79	105 12	246 91	128 90	100 70	229 60	120 21	91 98	212 19	110 20	85 10	195 30	88 26	74 46	162 72
Secondary Energy	117 71	106 88	224 59	125 00	105 70	230 70	124 79	106 02	230 81	122 50	101 00	223 50	111 54	94 54	206 08
Unit Benefit Value															
Firm Peak Power	180 450	180 450		180 450	180 450		180 450	180 450		180 450	180 450		180 450	180 450	
Firm Energy	0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270	
Secondary Energy	0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219	
Benefit															
Firm Peak Power	10 06	8 26	18 35	9 41	7 92	17 33	8 97	7 23	16 19	8 40	6 74	15 11	6 94	5 85	12 79
Firm Energy	3 76	2 79	6 55	3 42	2 67	6 09	3 19	2 44	5 63	2 92	2 26	5 18	2 34	1 98	4 32
Secondary Energy	2 53	2 30	4 84	2 69	2 28	4 97	2 69	2 28	4 97	2 64	2 17	4 81	2 40	2 04	4 44
Total	16 38	13 35	29 73	15 53	12 86	28 39	14 84	11 95	26 79	13 96	11 14	25 10	11 68	9 86	21 54
Investment Cost															
Civil Facilities	178 72	52 07	230 79	177 56	51 35	228 91	176 59	50 50	227 09	174 30	49 96	224 26	172 32	48 20	220 52
Hydrau and Ele -Mech Eq	23 56	22 93	46 49	22 22	22 45	44 68	21 46	21 62	43 08	19 21	20 81	40 02	17 32	19 30	36 62
Total	202 28	75 00	277 28	199 78	73 81	273 59	198 05	72 13	270 18	193 51	70 77	264 28	189 64	67 50	257 14
Annual Cost															
Civil Facilities	18 05	5 26	23 31	17 93	5 19	23 12	17 84	5 10	22 94	17 60	5 05	22 65	17 40	4 87	22 27
Hydrau and Ele Mech Eq	2 69	2 61	5 30	2 53	2 56	5 09	2 45	2 47	4 91	2 19	2 37	4 56	1 97	2 20	4 18
Total	20 74	7 87	28 61	20 47	7 75	28 21	20 28	7 57	27 85	19 79	7 42	27 21	19 38	7 07	26 45
Annual Surplus Benefit(B-C)	-4 35	5 48	1 13	-4 94	5 12	0 18	-5 44	4 39	-1 05	-5 83	3 73	-2 11	-7 70	2 79	-4 91
Benefit Cost Ratio(B/C)	0 79	1 70	1 04	0 76	1 66	1 01	0 73	1 58	0 96	0 71	1 50	0 92	0 60	1 40	0 81
Unit Annual Cost (Firm)	0 146	0 075	0 116	0 159	0 077	0 123	0 169	0 082	0 131	0 180	0 087	0 139	0 220	0 095	0 163
Unit Annual Cost (Average)	0 080	0 037	0 061	0 081	0 038	0 061	0 083	0 038	0 063	0 085	0 040	0 065	0 097	0 042	0 072

Table 9-12(2) Comparison Study on Bayram Reservoir Water Level

Bayram Project Tailrace Underpro. P/S Layout H.W.L.=745m L.W.L.=668-740m With Baglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 745-695	Baglik 530C	Total	Bayram 745-700	Baglik 530C	Total	Bayram 745-705	Baglik 530C	Total	Bayram 745-710	Baglik 530C	Total	Bayram 745-715	Baglik 530C	Total
High Water Level	745.00	530.00		745.00	530.00		745.00	530.00		745	530.00		745	530.00	
Normal Water Level	725.33	528.50		730.00	528.50		731.67	528.50		730.33	528.50		735	528.50	
Low Water Level	688.00	527.00		700.00	527.00		705.00	527.00		710	527.00		715	527.00	
Available Drawdown	59.00	3.00		45.00	3.00		40.00	3.00		35	3.00		30	3.00	
Gross Storage Capacity	150.00	7.30		150.00	7.30		150.00	7.30		150	7.30		150	7.30	
Effective Storage Capacity	130.00	1.00		112.00	1.00		104.00	1.00		95	1.00		85	1.00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	150	74		150	74		150	74		150	74		150	74	
Dam Volume	7,200	195		7,200	195		7,200	195		7,200	195		7,200	195	
Tailwater Level	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	186.33	130.90		190.90	130.90		192.57	130.90		194.13	130.90		196.80	130.80	
Maximum Discharge	45.00	55.00		43.00	52.00		42.00	49.00		40.00	48.00		38.00	45.00	
Installed Capacity	74.00	62.00	136.00	70.00	59.00	129.00	69.00	55.00	124.00	67.00	54.00	121.00	64.00	51.00	115.00
Firm Peak Power	63.00	59.60	122.60	60.90	56.40	117.30	60.12	54.00	114.12	58.29	52.00	110.29	56.20	49.00	105.20
Energy Production															
Average Energy	257.70	224.00	481.70	257.10	220.70	477.80	256.47	218.50	474.97	253.81	215.60	469.21	249.42	212.50	461.92
Firm Energy	154.40	130.70	285.10	148.92	123.52	272.44	151.40	118.26	269.66	149.79	113.68	263.67	139.48	107.31	246.79
Secondary Energy	103.30	93.30	196.60	108.18	97.18	205.36	105.07	100.24	205.31	103.83	101.72	205.55	109.54	105.19	215.13
Unit Benefit Value	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit															
Firm Peak Power	10.84	10.26	21.10	10.48	9.71	20.19	10.35	9.29	19.64	10.03	8.95	18.98	9.67	8.43	18.10
Firm Energy	4.10	3.47	7.57	3.95	3.28	7.23	4.02	3.14	7.16	3.98	3.02	7.00	3.70	2.85	6.55
Secondary Energy	2.22	2.01	4.23	2.33	2.09	4.42	2.26	2.16	4.42	2.24	2.19	4.43	2.37	2.26	4.63
Total	17.16	15.73	32.90	16.76	15.08	31.84	16.63	14.59	31.22	16.24	14.16	30.40	15.74	13.55	29.29
Investment Cost															
Civil Facilities	164.81	54.51	219.32	163.39	53.79	217.18	163.24	53.00	216.24	161.81	52.87	214.78	160.92	52.20	213.12
Hydrau. and Ele.-Mech Eq.	25.29	26.44	51.73	24.53	25.73	50.26	24.46	24.69	49.15	23.74	24.60	48.33	23.04	23.81	46.84
Total	190.10	80.95	271.04	187.92	79.52	267.44	187.70	77.69	265.39	185.65	77.47	263.12	183.96	76.01	259.96
Annual Cost															
Civil Facilities	16.65	5.51	22.15	16.50	5.43	21.94	16.49	5.35	21.84	16.35	5.34	21.69	16.25	5.27	21.53
Hydrau. and Ele.-Mech Eq.	2.88	3.01	5.90	2.80	2.93	5.73	2.79	2.81	5.60	2.71	2.80	5.51	2.63	2.71	5.34
Total	19.53	8.52	28.05	19.30	8.37	27.66	19.28	8.17	27.44	19.06	8.14	27.20	18.88	7.99	26.87
Annual Surplus Benefit(B-C)	-2.36	7.21	4.85	-2.54	6.71	4.17	-2.65	6.42	3.77	-2.82	6.02	3.20	-3.14	5.56	2.42
Benefit Cost Ratio(B/C)	0.88	1.85	1.17	0.87	1.80	1.15	0.86	1.79	1.14	0.85	1.74	1.12	0.83	1.70	1.09
Unit Annual Cost (Firm)	0.126	0.065	0.098	0.130	0.068	0.102	0.127	0.069	0.102	0.127	0.072	0.103	0.135	0.074	0.109
Unit Annual Cost (Average)	0.076	0.038	0.058	0.075	0.038	0.058	0.075	0.037	0.058	0.075	0.038	0.058	0.076	0.038	0.058

Bayram Project Tailrace Underpro. P/S Layout H.W.L.=745m L.W.L.=668-740m With Baglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 745-720	Baglik 530C	Total	Bayram 745-725	Baglik 530C	Total	Bayram 745-730	Baglik 530C	Total	Bayram 745-735	Baglik 530C	Total	Bayram 745-740	Baglik 530C	Total
High Water Level	745.00	530.00		745.00	530.00		745.00	530.00		745.00	530.00		745.00	530.00	
Normal Water Level	736.67	528.50		738.33	528.50		740.00	528.50		741.67	528.50		743.33	528.50	
Low Water Level	720.00	527.00		725.00	527.00		730.00	527.00		735.00	527.00		740.00	527.00	
Available Drawdown	25.00	3.00		20.00	3.00		15.00	3.00		10.00	3.00		5.00	3.00	
Gross Storage Capacity	150.00	7.30		150.00	7.30		150.00	7.30		150.00	7.30		150.00	7.30	
Effective Storage Capacity	74.00	1.00		62.00	1.00		48.00	1.00		34.00	1.00		17.00	1.00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	150	74		150	74		150	74		150	74		150	74	
Dam Volume	7,200	195		7,200	195		7,200	195		7,200	195		7,200	195	
Tailwater Level	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	197.37	130.80		198.93	130.70		200.60	130.70		202.07	130.60		203.53	130.50	
Maximum Discharge	36.00	43.00		34.00	41.00		32.00	38.00		28.00	35.00		24.00	30.00	
Installed Capacity	61.00	48.00	109.00	58.00	45.00	104.00	55.00	43.00	98.00	49.00	39.00	87.00	42.00	33.00	75.00
Firm Peak Power	54.24	47.00	101.24	52.33	45.00	97.33	50.49	41.00	91.49	45.35	38.00	83.35	40.26	33.00	73.26
Energy Production															
Average Energy	248.46	206.50	454.96	241.24	203.50	444.74	235.23	192.00	427.23	221.13	185.00	406.13	199.83	169.00	368.80
Firm Energy	130.66	102.93	233.59	124.15	98.55	222.70	112.43	89.79	202.22	99.32	83.22	182.54	86.17	72.27	160.44
Secondary Energy	115.82	105.57	221.39	117.09	104.95	222.04	122.81	102.21	225.02	121.81	101.78	223.59	111.63	96.73	208.36
Unit Benefit Value															
Firm Peak Power	180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450	
Firm Energy	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit															
Firm Peak Power	9.33	8.09	17.42	9.01	7.74	16.75	8.69	7.06	15.75	7.80	6.54	14.34	6.93	5.68	12.61
Firm Energy	3.47	2.73	6.20	3.30	2.62	5.91	2.98	2.38	5.37	2.64	2.21	4.84	2.34	1.92	4.26
Secondary Energy	2.49	2.27	4.77	2.52	2.26	4.78	2.64	2.20	4.84	2.62	2.19	4.81	2.40	2.06	4.49
Total	15.30	13.09	28.39	14.82	12.62	27.44	14.32	11.64	25.96	13.06	10.94	24.00	11.67	9.68	21.35
Investment Cost															
Civil Facilities	159.91	51.48	211.39	156.96	50.71	209.67	158.56	50.11	208.69	156.38	49.45	205.82	154.59	48.07	202.66
Hydrau. and Ele.-Mech Eq.	22.31	23.02	45.33	21.31	22.54	43.85	20.53	21.67	42.20	18.70	20.62	39.32	17.36	18.90	36.26
Total	182.22	74.51	256.72	180.27	73.24	253.52	179.11	71.77	250.89	175.08	70.07	245.14	171.95	68.97	238.92
Annual Cost															
Civil Facilities	16.15	5.20	21.35	16.06	5.12	21.18	16.02	5.06	21.08	15.79	4.98	20.79	15.61	4.85	20.47
Hydrau. and Ele.-Mech Eq.	2.54	2.62	5.17	2.43	2.57	5.00	2.34	2.47	4.81	2.13	2.35	4.48	1.98	2.15	4.13
Total	18.69	7.82	26.52	18.48	7.69	26.18	18.36	7.53	25.89	17.93	7.34	25.27	17.59	7.01	24.60
Annual Surplus Benefit(B-C)	-3.40	5.27	1.87	-3.66	4.93	1.27	-4.04	4.11	0.07	-4.86	3.59	-1.27	-5.92	2.67	-3.25
Benefit Cost Ratio(B/C)	0.82	1.67	1.07	0.80	1.64	1.05	0.78	1.55	1.00	0.73	1.49	0.95	0.66	1.38	0.87
Unit Annual Cost (Firm)	0.143	0.076	0.114	0.149	0.078	0.118	0.153	0.084	0.128	0.180	0.088	0.138	0.200	0.097	0.153
Unit Annual Cost (Average)	0.076	0.038	0.058	0.077	0.038	0.059	0.079	0.039	0.061	0.081	0.040	0.062	0.088	0.043	0.067

Table 9-12(3) Comparison Study on Bayram Reservoir Water Level

Bayram Project Tailrace Undergro. P/S Layout H.W.L.=740m L.W.L.=686m-735m With Baglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 740-686	Baglik 530C	Total	Bayram 740-700	Baglik 530C	Total	Bayram 740-705	Baglik 530C	Total	Bayram 740-710	Baglik 530C	Total	Bayram 740-715	Baglik 530C	Total
High Water Level	740.00	530.00		740.00	530.00		740.00	530.00		740	530.00		740	530.00	
Normal Water Level	722.00	528.50		726.67	528.50		728.33	528.50		730	528.50		732	528.50	
Low Water Level	686.00	527.00		700.00	527.00		705.00	527.00		710	527.00		715	527.00	
Available Drawdown	54.00	3.00		40.00	3.00		35.00	3.00		30	3.00		25	3.00	
Gross Storage Capacity	133.00	7.30		133.00	7.30		133.00	7.30		133	7.30		133	7.30	
Effective Storage Capacity	113.00	1.00		95.00	1.00		87.00	1.00		78	1.00		68	1.00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	145	74		145	74		145	74		145	74		145	74	
Dam Volume	6,144	195		6,144	195		6,144	195		6,144	195		6,144	195	
Tailwater Level	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	182.90	130.80		187.47	130.90		189.13	130.80		190.70	130.80		192.37	130.80	
Maximum Discharge	43.00	52.00		40.00	46.00		39.00	46.00		37.00	44.00		36.00	42.00	
Installed Capacity	68.00	59.00	127.00	64.00	54.00	118.00	63.00	52.00	115.00	61.00	49.00	110.00	59.00	47.00	106.00
Firm Peak Power	58.00	56.40	114.40	55.60	51.50	107.10	54.00	50.00	104.00	52.10	48.00	100.10	51.00	46.00	97.00
Energy Production															
Average Energy	247.90	221.40	469.30	246.50	218.30	462.80	244.89	213.50	458.39	242.80	210.70	453.50	240.00	206.80	446.80
Firm Energy	141.40	124.20	265.60	134.50	113.60	248.20	130.82	109.50	240.32	126.30	104.90	231.20	122.18	100.74	222.92
Secondary Energy	106.50	97.20	203.70	111.90	102.70	214.60	114.06	104.00	218.06	116.50	105.80	222.30	117.82	106.06	223.88
Unit Benefit Value	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit															
Firm Peak Power	9.56	9.71	19.69	9.57	8.86	18.43	9.29	8.60	17.90	8.97	8.26	17.23	8.78	7.92	16.69
Firm Energy	3.75	3.36	7.05	3.57	3.02	6.59	3.47	2.91	6.38	3.35	2.78	6.14	3.24	2.67	5.92
Secondary Energy	2.29	2.09	4.39	2.41	2.21	4.62	2.46	2.24	4.69	2.51	2.28	4.79	2.54	2.28	4.82
Total	16.03	15.09	31.12	15.55	14.09	29.64	15.22	13.75	28.97	14.83	13.32	28.15	14.56	12.87	27.43
Investment Cost															
Civil Facilities	147.74	53.78	201.51	146.36	52.87	199.23	148.19	52.21	198.40	145.21	51.68	196.89	144.39	51.54	195.93
Hydrau. and Ele.-Mech Eq	24.32	25.69	50.01	23.57	24.35	47.92	23.47	23.92	47.39	22.77	22.94	45.70	22.14	22.45	44.60
Total	172.06	79.46	251.53	169.92	77.22	247.15	169.66	76.13	245.79	167.97	74.62	242.60	166.53	74.01	240.53
Annual Cost															
Civil Facilities	14.92	5.43	20.35	14.78	5.34	20.12	14.76	5.27	20.04	14.67	5.22	19.89	14.58	5.21	19.79
Hydrau. and Ele.-Mech Eq	2.77	2.93	5.70	2.69	2.78	5.46	2.68	2.73	5.40	2.60	2.61	5.21	2.52	2.56	5.08
Total	17.69	8.36	26.05	17.47	8.12	25.58	17.44	8.00	25.44	17.26	7.83	25.10	17.11	7.77	24.87
Annual Surplus Benefit(B-C)	-1.67	6.74	5.07	-1.92	5.97	4.05	-2.22	5.75	3.53	-2.44	5.49	3.05	-2.55	5.11	2.56
Benefit Cost Ratio(B/C)	0.91	1.81	1.19	0.89	1.74	1.16	0.87	1.72	1.14	0.86	1.70	1.12	0.85	1.66	1.10
Unit Annual Cost (Firm)	0.125	0.067	0.066	0.130	0.071	0.103	0.133	0.073	0.106	0.137	0.075	0.109	0.140	0.077	0.112
Unit Annual Cost (Average)	0.071	0.038	0.056	0.071	0.038	0.055	0.071	0.037	0.055	0.071	0.037	0.055	0.071	0.036	0.056

Bayram Project Tailrace Undergro. P/S Layout H.W.L.=740m L.W.L.=686m-735m With Baglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 740-720	Baglik 530C	Total	Bayram 740-725	Baglik 530C	Total	Bayram 740-730	Baglik 530C	Total	Bayram 740-735	Baglik 530C	Total
High Water Level	740.00	530.00		740.00	530.00		740.00	530.00		740.00	530.00	
Normal Water Level	733.33	528.50		735.00	528.50		736.67	528.50		738.33	528.50	
Low Water Level	720.00	527.00		725.00	527.00		730.00	527.00		735.00	527.00	
Available Drawdown	20.00	3.00		15.00	3.00		10.00	3.00		5.00	3.00	
Gross Storage Capacity	133.00	7.30		133.00	7.30		133.00	7.30		133.00	7.30	
Effective Storage Capacity	57.00	1.00		45.00	1.00		31.00	1.00		17.00	1.00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	145	74		145	74		145	74		145	74	
Dam Volume	6,144	195		6,144	195		6,144	195		6,144	195	
Tailwater Level	530.00	392.00		530.00	392.00		530.00	392.00		530.00	392.00	
Effective Head	193.93	130.70		195.50	130.70		197.07	130.60		198.53	130.50	
Maximum Discharge	33.00	40.00		31.00	37.20		27.00	34.00		24.00	30.00	
Installed Capacity	55.00	45.00	100.00	52.00	42.00	94.00	46.00	38.00	84.00	41.00	33.00	74.00
Firm Peak Power	49.00	44.00	93.00	46.50	40.00	86.50	42.90	37.00	79.90	39.30	33.00	72.30
Energy Production												
Average Energy	235.20	201.00	436.20	225.82	192.60	418.42	212.60	180.80	393.40	193.83	169.50	363.33
Firm Energy	116.00	96.10	212.10	107.83	87.60	195.43	97.40	80.80	178.20	86.07	72.27	158.34
Secondary Energy	119.20	104.90	224.10	117.99	105.00	222.99	115.20	100.00	215.20	107.77	97.23	205.00
Unit Benefit Value												
Firm Peak Power	180.450	180.450		180.450	180.450		180.450	180.450		180.450	180.450	
Firm Energy	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit												
Firm Peak Power	8.43	7.57	16.00	8.00	6.88	14.89	7.36	6.37	13.75	6.76	5.68	12.44
Firm Energy	3.08	2.55	5.63	2.86	2.33	5.19	2.59	2.14	4.73	2.28	1.92	4.20
Secondary Energy	2.57	2.26	4.82	2.54	2.26	4.80	2.48	2.15	4.63	2.32	2.05	4.41
Total	14.08	12.38	26.45	13.40	11.47	24.87	12.45	10.66	23.11	11.37	9.69	21.06
Investment Cost												
Civil Facilities	142.84	50.70	193.54	141.96	49.98	191.94	139.78	49.25	189.03	138.81	47.96	186.78
Hydrau. and Ele.-Mech Eq	20.99	21.98	42.97	20.19	21.32	41.50	18.40	20.26	38.66	17.04	18.75	35.79
Total	163.83	72.68	236.51	162.15	71.30	233.45	158.18	69.51	227.70	155.85	66.70	222.55
Annual Cost												
Civil Facilities	14.43	5.12	19.55	14.34	5.05	19.39	14.12	4.97	19.09	14.02	4.84	18.86
Hydrau. and Ele.-Mech Eq	2.39	2.51	4.90	2.30	2.43	4.73	2.10	2.31	4.41	1.94	2.14	4.08
Total	16.82	7.63	24.45	16.64	7.48	24.12	16.22	7.28	23.50	15.96	6.98	22.94
Annual Surplus Benefit(B-C)	-2.74	4.76	2.01	-3.24	3.99	0.76	-3.77	3.38	-0.39	-4.59	2.71	-1.88
Benefit Cost Ratio(B/C)	0.84	1.62	1.08	0.81	1.53	1.03	0.77	1.46	0.98	0.71	1.39	0.92
Unit Annual Cost (Firm)	0.145	0.079	0.115	0.154	0.085	0.123	0.166	0.090	0.132	0.185	0.097	0.145
Unit Annual Cost (Average)	0.072	0.038	0.056	0.074	0.039	0.058	0.076	0.040	0.060	0.082	0.041	0.063

Table 9-12(4) Comparison Study on Bayram Reservoir Water Level

Bayram Project Tailrace Undergro P/S Layout H W L=735m L W L=685m-730m With Baglik H W L= 530 00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 735-685	Baglik 530C	Total	Bayram 735-700	Baglik 530C	Total	Bayram 735-705	Baglik 530C	Total	Bayram 735-710	Baglik 530C	Total	Bayram 735-715	Baglik 530C	Total
High Water Level	735 00	530 00		735 00	530 00		735 00	530 00		735	530 00		735	530 00	
Normal Water Level	718 67	528 50		723 33	528 50		725 00	528 50		726 6667	528 50		728 3333	528 50	
Low Water Level	686 00	527 00		700 00	527 00		705 00	527 00		710	527 00		715	527 00	
Available Drawdown	49 00	3 00		35 00	3 00		30 00	3 00		25	3 00		20	3 00	
Gross Storage Capacity	116 00	7 30		116 00	7 30		116 00	7 30		116	7 30		116	7 30	
Effective Storage Capacity	96 00	1 00		78 00	1 00		70 00	1 00		61	1 00		51	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	140	74		140	74		140	74		140	74		140	74	
Dam Volume	5 400	195		5 400	195		5 400	195		5 400	195		5 400	195	
Tailwater Level	530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00	
Effective Head	179 47	130 90		184 03	130 80		185 70	130 80		187 27	130 70		188 93	130 70	
Maximum Discharge	40 00	48 00		37 00	44 00		35 00	42 00		34 00	41 00		32 00	39 00	
Installed Capacity	62 00	54 00	116 00	58 00	49 00	107 00	57 00	47 00	104 00	55 00	46 00	101 00	52 00	44 00	96 00
Firm Peak Power	52 40	52 00	104 40	50 46	48 00	98 46	49 59	46 00	95 59	49 50	45 00	94 50	47 32	42 00	89 32
Energy Production															
Average Energy	237 00	215 70	452 70	235 08	210 10	445 18	233 13	207 20	440 33	228 93	203 20	432 13	233 33	197 50	430 83
Firm Energy	128 20	113 60	241 80	110 51	105 12	215 63	108 60	100 74	209 34	108 41	98 55	206 96	103 63	91 98	195 61
Secondary Energy	108 80	102 10	210 90	124 58	104 98	229 56	124 59	106 46	231 05	120 53	104 65	225 18	129 70	105 52	235 22
Unit Benefit Value	0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00	
Firm Peak Power	180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45	
Firm Energy	0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270	
Secondary Energy	0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219	
Benefit															
Firm Peak Power	9 02	8 95	17 97	8 68	8 26	16 94	8 53	7 92	16 45	8 52	7 74	16 26	8 14	7 23	15 37
Firm Energy	3 40	3 02	6 42	2 93	2 79	5 72	2 88	2 67	5 56	2 86	2 62	5 49	2 75	2 44	5 19
Secondary Energy	2 34	2 20	4 54	2 68	2 26	4 94	2 68	2 29	4 97	2 59	2 25	4 85	2 79	2 27	5 06
Total	14 76	14 16	28 92	14 30	13 31	27 61	14 10	12 88	26 98	13 99	12 61	26 60	13 69	11 94	25 63
Investment Cost															
Civil Facilities	135 39	52 87	188 26	134 43	52 07	186 50	133 56	51 35	184 93	132 76	50 71	183 46	132 42	50 56	182 98
Hydrau and Ele -Mech Eq	23 01	24 35	47 36	21 99	22 71	44 70	21 82	22 25	43 87	21 15	22 12	43 27	20 18	21 62	41 80
Total	158 40	77 22	235 61	156 42	74 78	231 20	155 20	73 60	228 80	153 91	72 82	226 73	152 60	72 18	224 78
Annual Cost															
Civil Facilities	13 67	5 34	19 01	13 58	5 26	18 84	13 49	5 19	18 68	13 41	5 12	18 53	13 37	5 11	18 48
Hydrau and Ele -Mech Eq	2 62	2 78	5 40	2 51	2 59	5 10	2 46	2 54	5 00	2 41	2 52	4 93	2 30	2 46	4 78
Total	16 30	8 12	24 41	16 08	7 85	23 93	15 96	7 72	23 68	15 82	7 64	23 46	15 68	7 57	23 25
Annual Surplus Benefit(B-C)	-1 53	6 05	4 51	-1 79	5 46	3 68	-1 86	5 16	3 30	-1 83	4 97	3 14	-1 99	4 37	2 38
Benefit Cost Ratio(B/C)	0 91	1 75	1 18	0 89	1 70	1 15	0 88	1 67	1 14	0 88	1 65	1 13	0 87	1 58	1 10
Unit Annual Cost (Firm)	0 127	0 071	0 101	0 146	0 075	0 111	0 147	0 077	0 113	0 146	0 078	0 113	0 151	0 082	0 119
Unit Annual Cost (Average)	0 069	0 038	0 054	0 068	0 037	0 054	0 068	0 037	0 054	0 069	0 038	0 054	0 067	0 038	0 054

Bayram Project Tailrace Undergro P/S Layout H W L=735m L W L=685m-730m With Baglik H W L= 530 00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 735-720	Baglik 530C	Total	Bayram 735-725	Baglik 530C	Total	Bayram 735-730	Baglik 530C	Total
High Water Level	735 00	530 00		735 00	530 00		735 00	530 00	
Normal Water Level	730 00	528 50		731 67	528 50		733 33	528 50	
Low Water Level	720 00	527 00		725 00	527 00		730 00	527 00	
Available Drawdown	15 00	3 00		10 00	3 00		5 00	3 00	
Gross Storage Capacity	116 00	7 30		116 00	7 30		116 00	7 30	
Effective Storage Capacity	40 00	1 00		26 00	1 00		14 00	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	140	74		140	74		140	74	
Dam Volume	5 400	195		5 400	195		5 400	195	
Tailwater Level	530 00	392 00		530 00	392 00		530 00	392 00	
Effective Head	190 50	130 70		192 07	130 60		193 43	130 50	
Maximum Discharge	30 00	36 00		27 00	33 00		23 00	29 00	
Installed Capacity		40 00	40 00	44 00	37 00	81 00	38 00	32 00	70 00
Firm Peak Power	46 06	39 00	85 06	43 12	36 00	79 12	37 62	31 00	68 62
Energy Production									
Average Energy	215 78	189 50	405 28	204 78	180 00	384 78	184 73	156 00	350 73
Firm Energy	100 87	85 41	186 28	94 43	78 84	173 27	82 39	67 89	150 28
Secondary Energy	114 88	104 09	218 97	110 35	101 16	211 51	102 34	88 11	200 45
Unit Benefit Value									
Firm Peak Power	180 450	180 450		180 450	180 450		180 450	180 450	
Firm Energy	0 027	0 027		0 027	0 027		0 027	0 027	
Secondary Energy	0 022	0 022		0 022	0 022		0 022	0 022	
Benefit									
Firm Peak Power	7 93	6 71	14 64	7 42	6 20	13 62	6 47	5 33	11 81
Firm Energy	2 68	2 27	4 94	2 51	2 09	4 60	2 19	1 80	3 99
Secondary Energy	2 47	2 24	4 71	2 38	2 18	4 55	2 20	2 11	4 32
Total	13 08	11 22	24 30	12 30	10 47	22 77	10 86	9 25	20 11
Investment Cost									
Civil Facilities	131 14	49 84	180 98	129 34	48 80	178 14	125 82	47 49	173 31
Hydrau and Ele -Mech Eq	19 33	20 63	39 96	17 87	19 89	37 76	16 64	18 37	35 02
Total	150 47	70 47	220 94	147 21	68 68	215 90	142 45	65 86	208 33
Annual Cost									
Civil Facilities	13 25	5 03	18 28	13 06	4 93	17 99	12 71	4 80	17 50
Hydrau and Ele -Mech Eq	2 20	2 35	4 56	2 04	2 27	4 30	1 90	2 05	3 99
Total	15 45	7 39	22 83	15 10	7 20	22 30	14 60	6 85	21 50
Annual Surplus Benefit(B-C)	-2 37	3 83	1 46	-2 80	3 27	0 47	-3 74	2 36	-1 38
Benefit Cost Ratio(B/C)	0 85	1 52	1 06	0 81	1 45	1 02	0 74	1 34	0 94
Unit Annual Cost (Firm)	0 153	0 066	0 123	0 150	0 091	0 129	0 172	0 102	0 143
Unit Annual Cost (Average)	0 072	0 035	0 058	0 074	0 040	0 058	0 079	0 042	0 061

Table 9-12(5) Comparison Study on Bayram Reservoir Water Level

Bayram Project Talkace Undergro. P/S Layout H.W.L.=730m L.W.L.=535m-725m With Beglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 730-685	Beglik 530C	Total	Bayram 730-700	Beglik 530C	Total	Bayram 730-705	Beglik 530C	Total	Bayram 730-710	Beglik 530C	Total	Bayram 730-715	Beglik 530C	Total
High Water Level	730 00	530 00		730 00	530 00		730 00	530 00		730	530 00		730	530 00	
Normal Water Level	715 33	528 50		720 00	528 50		721 67	528 50		723 3333	528 50		725	528 50	
Low Water Level	686 00	527 00		700 00	527 00		705 00	527 00		710	527 00		715	527 00	
Available Drawdown	44 00	3 00		30 00	3 00		25 00	3 00		20	3 00		15	3 00	
Gross Storage Capacity	102 00	7 30		102 00	7 30		102 00	7 30		102	7 30		102	7 30	
Effective Storage Capacity	82 00	1 00		64 00	1 00		56 00	1 00		47	1 00		34	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	135	74		135	74		135	74		135	74		135	74	
Dam Volume	4,800	195		4,800	195		4,800	195		4,800	195		4,800	195	
Tailwater Level	530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00		530 00	392 00	
Effective Head	176 23	130 80		150 80	130 70		182 37	130 70		183 93	130 70		185 50	130 60	
Maximum Discharge	38 00	45 00		35 00	41 00		33 00	40 00		31 00	38 00		28 00	35 00	
Installed Capacity	57 00	51 00	108 00	54 00	46 00	100 00	52 00	45 00	97 00	49 00	43 00	92 00	44 00	39 00	83 00
Firm Peak Power	48 50	49 00	97 50	46 30	45 00	91 30	45 00	44 00	89 00	43 60	41 00	84 60	42 40	38 00	80 40
Energy Production															
Average Energy	227 00	210 60	437 60	223 90	204 00	427 90	221 00	200 00	421 00	215 40	193 30	408 70	206 50	183 00	389 50
Firm Energy	119 50	107 10	226 60	110 80	98 30	209 10	107 10	96 36	203 46	103 20	89 50	192 70	97 06	83 22	180 28
Secondary Energy	107 50	103 50	211 00	113 10	105 70	218 80	113 90	103 64	217 54	112 20	103 80	216 00	109 44	99 78	209 22
Unit Benefit Value	0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00		0 00	0 00	
Firm Peak Power	180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45		180 45	180 45	
Firm Energy	0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270		0 0270	0 0270	
Secondary Energy	0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219		0 0219	0 0219	
Benefit															
Firm Peak Power	8 35	8 43	16 78	7 97	7 74	15 71	7 74	7 57	15 32	7 50	7 06	14 56	7 30	6 54	13 84
Firm Energy	3 17	2 84	6 01	2 94	2 61	5 55	2 84	2 56	5 40	2 74	2 38	5 11	2 58	2 21	4 78
Secondary Energy	2 31	2 23	4 54	2 43	2 28	4 71	2 45	2 23	4 68	2 42	2 23	4 65	2 36	2 15	4 50
Total	13 83	13 50	27 34	13 34	12 63	25 97	13 04	12 36	25 40	12 66	11 67	24 32	12 23	10 90	23 13
Investment Cost															
Civil Facilities	125 49	52 20	177 70	124 42	50 77	175 19	123 35	50 70	174 04	122 15	50 11	172 25	121 01	49 45	170 45
Hydrau and Ele -Mech Eq	21 92	23 57	45 49	20 96	22 12	43 11	20 72	21 97	42 19	19 20	21 47	40 67	17 73	20 45	38 18
Total	147 41	75 77	223 19	145 41	72 88	218 30	143 56	72 67	216 23	141 35	71 58	212 93	138 73	69 89	208 63
Annual Cost															
Civil Facilities	12 67	5 27	17 95	12 57	5 13	17 69	12 46	5 12	17 58	12 34	5 06	17 40	12 22	4 99	17 22
Hydrau and Ele -Mech Eq	2 50	2 69	5 19	2 39	2 52	4 91	2 30	2 51	4 81	2 19	2 45	4 64	2 02	2 33	4 35
Total	15 17	7 96	23 13	14 96	7 65	22 61	14 76	7 63	22 39	14 53	7 51	22 03	14 24	7 33	21 57
Annual Surplus Benefit(B-C)	-1 34	5 54	4 20	-1 62	4 98	3 36	-1 72	4 74	3 01	-1 87	4 18	2 29	-2 01	3 57	1 56
Benefit Cost Ratio(B/C)	0 91	1 70	1 18	0 89	1 65	1 15	0 88	1 62	1 13	0 87	1 55	1 10	0 86	1 49	1 07
Unit Annual Cost (Firm)	0 127	0 074	0 102	0 135	0 078	0 108	0 138	0 079	0 110	0 141	0 084	0 114	0 147	0 088	0 120
Unit Annual Cost (Average)	0 067	0 038	0 053	0 067	0 037	0 053	0 067	0 038	0 053	0 067	0 039	0 054	0 069	0 040	0 055

Bayram Project Talkace Undergro. P/S Layout H.W.L.=730m L.W.L.=685m-725m With Beglik H.W.L.= 530.00m by Mixed Alternative Thermal Power Plant

Description Dam Site	Bayram 730-720	Beglik 530C	Total	Bayram 730-725	Beglik 530C	Total
High Water Level	730 00	530 00		730 00	530 00	
Normal Water Level	726 67	528 50		729 33	528 50	
Low Water Level	720 00	527 00		725 00	527 00	
Available Drawdown	10 00	3 00		5 00	3 00	
Gross Storage Capacity	102 00	7 30		102 00	7 30	
Effective Storage Capacity	26 00	1 00		14 00	1 00	
Dam Type	Rockfill	Con-Gra		Rockfill	Con-Gra	
Dam Height	135	74		135	74	
Dam Volume	4,800	195		4,800	195	
Tailwater Level	530 00	392 00		530 00	392 00	
Effective Head	187 07	130 60		188 53	130 50	
Maximum Discharge	26 00	32 00		23 00	29 00	
Installed Capacity		36 00	36 00	37 00	32 00	69 00
Firm Peak Power	39 48	35 00	74 48	36 26	31 00	67 26
Energy Production						
Average Energy	187 80	171 70	359 50	150 00	162 00	312 00
Firm Energy	87 30	76 40	163 70	79 41	67 89	147 30
Secondary Energy	100 50	95 30	195 80	80 59	84 11	164 70
Unit Benefit Value						
Firm Peak Power	180 450	180 450		180 450	180 450	
Firm Energy	0 027	0 027		0 027	0 027	
Secondary Energy	0 022	0 022		0 022	0 022	
Benefit						
Firm Peak Power	6 79	6 02	12 82	6 24	5 33	11 57
Firm Energy	2 32	2 03	4 34	2 11	1 80	3 91
Secondary Energy	2 16	2 05	4 22	1 74	1 81	3 55
Total	11 27	10 10	21 38	10 08	8 95	19 03
Investment Cost						
Civil Facilities	119 99	48 78	168 77	118 34	47 61	165 95
Hydrau and Ele -Mech Eq	17 33	19 52	36 84	16 34	18 23	34 27
Total	137 31	68 30	205 61	134 38	65 84	200 22
Annual Cost						
Civil Facilities	12 12	4 93	17 05	11 95	4 81	16 76
Hydrau and Ele -Mech Eq	1 96	2 22	4 20	1 83	2 08	3 91
Total	14 06	7 15	21 25	13 78	6 89	20 67
Annual Surplus Benefit(B-C)	-2 82	2 95	0 13	-3 70	2 06	-1 64
Benefit Cost Ratio(B/C)	0 80	1 41	1 01	0 73	1 30	0 92
Unit Annual Cost (Firm)	0 161	0 054	0 130	0 174	0 101	0 140
Unit Annual Cost (Average)	0 075	0 042	0 059	0 096	0 045	0 066

Table 9-13 Outline of Alternative Plan for Bağlık Reservoir Water Level

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=740m L.W.L=686m With Beglik L.W.L=527-569m

Reservoir	Damsite Layout	Bayram 740M.P	Bayram 740M.P	Bayram 740M.P	Bayram 740A	Bayram 740A
Catchment Area	KM^2	1,159	1,159	1,159	1,159	1,159
Annual Inflow	M^3/S	19.20	19.20	19.20	19.20	19.20
High Water Level	M	740.00	740.00	740.00	740.00	740.00
Normal Water Level	M	722.00	722.00	722.00	722.00	722.00
Low Water Level	M	686.00	686.00	686.00	686.00	686.00
Available Drawdown	M	54.00	54.00	54.00	54.00	54.00
Gross Capacity	10^6M^3	133.00	133.00	133.00	133.00	133.00
Effective Capacity	10^6M^3	113.00	113.00	113.00	113.00	113.00
Dam						
Type		Rockfill	Rockfill	Rockfill	Rockfill	Rockfill
Height from Found.	M	145	145	145	145	145
Crest Length	M	415	415	415	415	415
Volume	10^3M^3	6,144	6,144	6,144	6,144	6,144
Headrace Tunnel						
Type						
Diameters	M					
Length	M					
Penstock						
Type		Tunnel	Tunnel	Tunnel	Tunnel	Tunnel
Diameters	M	3.3	3.3	3.3	3.3	3.3
Length	M	268	268	268	294	294
Powerhouse						
Type		Undergr.	Undergr.	Undergr.	Undergr.	Undergr.
Tailrace Tunnel						
Type		Non-Pre.	Non-Pre.	Non-Pre.	Non-Pre.	Non-Pre.
Diameters	M	4.6	4.6	4.6	4.6	4.6
Length (Tunnel)	M	4,550	4,550	4,550	6,700	6,700
(Channel)	M					
Firm Discharge	M^3/S	10.70	10.70	10.70	10.70	10.70
Maximum Discharge	M^3/S	43.00	43.00	43.00	43.00	43.00
Tail Water Level	M	570.00	570.00	570.00	550.00	550.00
Gross Head						
Maximum Head	M	170.00	170.00	170.00	190.00	190.00
Normal Head	M	152.00	152.00	152.00	172.00	172.00
Minimum Head	M	116.00	116.00	116.00	136.00	136.00
Loss of Head	M	6.40	6.40	6.40	8.10	8.10
Effective Head						
Maximum	M	163.60	163.60	163.60	181.90	181.90
Normal	M	145.60	145.60	145.60	163.90	163.90
Minimum	M	109.60	109.60	109.60	127.90	127.90
Installed Capacity	MW	54	54	54	60	60
Firm Peak Power	MW	44.8	44.8	44.8	51.4	51.4
Annual Energy						
Average	GWh	198.5	198.5	198.5	223.3	223.3
Firm	GWh	113.2	113.2	113.2	126.4	126.4
Secondary	GWh	85.3	85.3	85.3	57.7	57.7

Baglik Project Tailrace Type Underground Powerhouse Layout

Reservoir	Damsite Layout	Baglik 740M.P	Baglik 740M.P	Baglik 740M.P	Baglik 740A	Baglik 740A
Catchment Area	KM^2	1,509	1,509	1,509	1,509	1,509
Annual Inflow	M^3/S	24.90	24.90	24.90	24.90	24.90
High Water Level	M	570.00	570.00	570.00	550.00	550.00
Normal Water Level	M	555.67	563.33	569.50	538.50	549.00
Low Water Level	M	527.00	550.00	569.00	527.00	548.00
Available Drawdown	M	43.00	20.00	1.00	23.00	2.00
Gross Capacity	10^6M^3	36.40	36.40	36.40	17.70	17.70
Effective Capacity	10^6M^3	30.10	18.70	1.00	11.40	1.00
Dam						
Type		Con-gra.	Con-gra.	Con-gra.	Con-gra.	Con-gra.
Height from Found.	M	114	114	114	94	94
Crest Length	M	284	284	284	240	240
Volume	10^3M^3	680	680	680	420	420
Headrace Tunnel						
Type						
Diameters	M					
Length	M					
Penstock						
Type		Tunnel	Tunnel	Tunnel	Tunnel	Tunnel
Diameters	M	3.8	3.7	3.6	3.7	3.6
Length	M	213	213	213	213	213
Powerhouse						
Type		Undergr.	Undergr.	Undergr.	Undergr.	Undergr.
Tailrace Tunnel						
Type		Hosesho.	Hosesho.	Hosesho.	Hosesho.	Hosesho.
Diameters	M	5.1	5.0	4.9	5.0	4.9
Length (Tunnel)	M	4,454	4,454	4,454	4,454	4,454
(Channel)	M					
Firm Discharge	M^3/S	14.30	13.80	13.00	13.50	13.00
Maximum Discharge	M^3/S	57.00	55.00	52.00	54.00	52.00
Tail Water Level	M	392.00	392.00	392.00	392.00	392.00
Gross Head						
Maximum Head	M	178.00	178.00	178.00	158.00	158.00
Normal Head	M	163.67	171.33	177.50	146.50	157.00
Minimum Head	M	135.00	158.00	177.00	135.00	156.00
Loss of Head	M	5.50	5.60	5.60	5.60	5.60
Effective Head						
Maximum	M	172.50	172.40	172.40	152.40	152.40
Normal	M	158.17	165.73	171.90	140.90	151.40
Minimum	M	129.50	152.40	171.40	129.40	150.40
Installed Capacity	MW	78	79	77	66	68
Firm Peak Power	MW	67.6	75.5	75.0	59.8	67.6
Annual Energy						
Average	GWh	282.1	290.4	288.6	250.5	252.1
Firm	GWh	163.7	163.7	164.3	139.0	147.9
Secondary	GWh	118.4	126.7	124.4	111.5	104.2

Table 9-14 Cost Estimate of Alternative Plan for Bağlık Reservoir Water Level

Bayram Project Tailrace Type Undergro. P/S Layout H.W.L.=740m L.W.L.=568m With Baglik L.W.L=527-560m Unit:10^3US$

Description Dam Site / Layout Type	Bayram 740M.P	Bayram 740M.P	Bayram 740M.P	Bayram 740A	Bayram 740A
High Water Level (m)	740	740	740	740	740
Reservoir Area (km^2)	3.38	3.38	3.38	3.38	3.38
Dam Volume (10^6m^3)	6,144	6,144	6,144	6,144	6,144
Dam Height (m)	145	145	145	145	145
Maximum Head (m)	170	170	170	190	190
Maximum Discharge (m^3/s)	43	43	43	43	43
Relocation Road	11,655	11,655	11,655	11,655	11,655
Camp Facilities	800	800	800	800	800
Land Acquisition	2,242	2,242	2,242	2,242	2,242
Civil Work	76,180	76,180	76,180	80,512	80,512
Diversion	2,421	2,421	2,421	2,421	2,421
Care of River	1,082	1,082	1,082	1,082	1,082
Dam	47,281	47,281	47,281	47,281	47,281
Spillway	7,523	7,523	7,523	7,523	7,523
Outlet Works	1,018	1,018	1,018	1,018	1,018
Intake	1,087	1,087	1,087	1,087	1,087
Headrace Tunnel	0	0	0	0	0
Surge Tank	0	0	0	0	0
Penstock	377	377	377	458	458
Acces Tunnels	3,980	3,980	3,980	3,980	3,980
Power House	2,664	2,664	2,664	2,856	2,856
Tailrace Tunnel	8,586	8,586	8,586	12,644	12,644
Switchyard	161	161	161	161	161
Pre-Subtotal	90,878	90,878	90,878	95,209	95,209
Contingency (15%)	13,295	13,295	13,295	13,945	13,945
Eng. and Admi. (10%)	10,193	10,193	10,193	10,691	10,691
Sub Total	114,366	114,365	114,366	119,845	119,845
I.D.C. (9.5%/Year)	22,849	22,849	22,849	23,944	23,944
Total	137,215	137,215	137,215	143,789	143,789
Hydraulic Equipment	4,385	4,385	4,385	4,779	4,779
Spillway	856	856	856	856	856
Outlet Works	528	528	528	528	528
Intake Gate	763	763	763	763	763
Penstock	1,656	1,656	1,656	2,015	2,015
Draft Gate	122	122	122	122	122
Tailrace Gate	61	61	61	61	61
Pre-Subtotal	3,986	3,986	3,986	4,345	4,345
Contingency (10%)	399	399	399	434	434
Electro-Mechanical Equipment	13,956	13,956	13,956	14,501	14,501
Equipment	13,291	13,291	13,291	13,810	13,810
Contingency (5%)	665	665	665	691	691
Eng. and Admi. (10%)	1,834	1,834	1,834	1,928	1,928
Sub Total	20,175	20,175	20,175	21,208	21,208
I.D.C. (9.5%/Year)	1,085	1,085	1,085	1,140	1,140
Total	21,259	21,259	21,259	22,348	22,348
Grand Total	158,474	158,474	158,474	166,137	166,137

Baglik Project Tailrace Type Underground Powerhouse Layout Unit:10^3US$

Description Dam Site / Layout Type	Baglik 740M.P	Baglik 740M.P	Baglik 740M.P	Baglik 740A	Baglik 740A
High Water Level (m)	570	570	570	550	550
Reservoir Area (km^2)	1.23	1.23	1.23	0.69	0.69
Dam Volume (10^6m^3)	680	680	680	420	420
Dam Height (m)	114	114	114	94	94
Maximum Head (m)	178	178	178	158	158
Maximum Discharge (m^3/s)	57	55	52	54	52
Relocation Road	9,603	9,603	9,603	8,043	8,043
Camp Facilities	800	800	800	800	800
Land Acquisition	598	598	598	598	598
Civil Work	52,185	51,810	51,402	38,098	37,783
Diversion	0	0	0	0	0
Care of River	0	0	0	0	0
Dam	34,813	34,813	34,813	21,502	21,502
Spillway	780	780	780	780	780
Outlet Works	0	0	0	0	0
Intake	121	89	26	90	34
Headrace Tunnel	0	0	0	0	0
Surge Tank	0	0	0	0	0
Penstock	530	512	485	451	435
Acces Tunnels	2,478	2,478	2,478	2,478	2,478
Power House	3,982	3,982	3,906	3,641	3,641
Tailrace Tunnel	9,451	9,157	8,914	9,157	8,914
Switchyard	0	0	0	0	0
Pre-Subtotal	63,186	62,811	62,403	47,539	47,224
Contingency (15%)	9,368	9,332	9,271	7,041	6,994
Eng. and Admi. (10%)	7,198	7,155	7,108	5,358	5,362
Sub Total	79,771	79,298	78,781	59,979	59,580
I.D.C. (9.5%/Year)	19,925	19,807	19,678	14,982	14,882
Total	99,697	99,106	98,460	74,960	74,462
Hydraulic Equipment	3,913	3,681	3,269	3,432	3,097
Spillway	870	870	870	870	870
Outlet Works	0	0	0	0	0
Intake Gate	514	376	112	383	145
Penstock	1,974	1,908	1,507	1,878	1,618
Draft Gate	133	128	121	126	121
Tailrace Gate	67	65	61	63	61
Pre-Subtotal	3,558	3,346	2,871	3,120	2,815
Contingency (10%)	356	335	297	312	282
Electro-Mechanical Equipment	21,528	21,747	22,513	20,450	20,669
Equipment	20,503	20,712	21,441	19,476	19,685
Contingency (5%)	1,025	1,036	1,072	974	984
Eng. and Admi. (10%)	2,544	2,543	2,578	2,388	2,377
Sub Total	27,986	27,971	28,360	26,271	26,142
I.D.C. (9.5%/Year)	1,585	1,584	1,606	1,488	1,481
Total	29,571	29,555	29,966	27,759	27,623
Grand Total	129,268	128,660	128,426	102,719	102,085

Table 9-15 Comparison Study on alternative Plan for Bağlık Reservoir Water Level

Bayram Project Tailrace Type Underground P/S Layout H.W.L.=740m L.W.L.=656m With Bağlık L.W.L.=527.5m								by Mixed Alternative Thermal Power Plant									
Description Dam Site	Layout	Bayram 740M/P	Bağlık 740M/P	Total	Bayram 740M/P	Bağlık 740M P	Total	Bayram 740M/P	Bağlık 740M/P	Total	Bayram 740A	Bağlık 740A	Total	Bayram 740A	Bağlık 740A	Total
High Water Level	m	740.00	570.00		740.00	570.00		740.00	570.00		740	550.00		740	550.00	
Normal Water Level	m	722.00	558.87		722.00	563.33		722.00	569.50		722	536.50		722	549.00	
Low Water Level	m	686.00	527.00		686.00	550.00		686.00	569.00		656	527.00		656	548.00	
Available Drawdown	m	54.00	43.00		54.00	20.00		54.00	1.00		54	23.00		54	2.00	
Gross Storage Capacity	m^3*10^6	133.00	36.40		133.00	36.40		133.00	36.40		133	17.70		133	17.70	
Effective Storage Capacity	m^3*10^6	113.00	30.10		113.00	18.70		113.00	1.00		113	11.40		113	1.00	
Dam Type	0	Rockfill	Con-gra		Rockfill	Con-gra		Rockfill	Con-gra		Rockfill	Con-gra		Rockfill	Con-gra	
Dam Hight	m	145	114		145	114		145	114		145	94		145	94	
Dam Volume	m^3	8 144	680		8 144	680		8 144	630		8 144	420		8 144	420	
Tail Water Level	m	570.00	392.00		570.00	392.00		570.00	392.00		550.00	392.00		550.00	392.00	
Effective Head	m	145.80	158.17		149.80	165.73		145.80	171.96		183.90	140.90		183.90	151.40	
Maximum Discharge	m^3/s	43.00	57.00		43.00	95.00		43.00	92.00		43.00	54.00		43.00	52.00	
Installed Capacity	MW	54.00	78.00	132.00	54.00	78.00	132.00	54.00	77.00	131.00	60.00	66.00	126.00	60.00	66.00	126.00
Firm Peak Power	MW	64.80	67.60	112.40	64.80	75.46	120.26	64.80	75.00	119.80	51.40	59.80	111.20	51.40	67.55	118.95
Energy Production																
Average Energy	GWh	196.50	292.13	488.63	196.50	290.40	486.90	196.50	294.82	487.12	223.30	250.50	473.80	223.30	252.15	475.45
Firm Energy	GWh	113.20	163.70	276.90	113.20	163.70	276.90	113.20	164.25	277.45	126.40	139.00	265.40	126.40	147.84	274.24
Secondary Energy	GWh	83.30	118.43	203.73	83.30	126.70	242.00	83.30	124.57	209.87	96.90	111.50	208.40	96.90	104.21	201.11
Unit Benefit Value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Firm Peak Power	US$/kW	180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45		180.45	180.45	
Firm Energy	US$/kWh	0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270		0.0270	0.0270	
Secondary Energy	US$/kWh	0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219		0.0219	0.0219	
Benefit																
Firm Peak Power	US$*10^6	7.71	11.63	19.34	7.71	12.99	20.70	7.71	12.91	20.62	8.85	10.29	19.14	8.85	11.62	20.47
Firm Energy	US$*10^6	3.00	4.34	7.35	3.00	4.34	7.35	3.00	4.36	7.36	3.35	3.69	7.04	3.35	3.93	7.28
Secondary Energy	US$*10^6	1.84	2.55	4.39	1.84	2.73	4.58	1.84	2.68	4.51	2.09	2.40	4.49	2.09	2.24	4.33
Total	US$*10^6	12.55	18.53	31.08	12.55	20.06	32.61	12.55	19.94	32.49	14.29	16.38	30.67	14.29	17.79	32.08
Investment Cost																
Civil Facilities	US$*10^6	137.21	99.70	236.91	137.21	98.10	236.32	137.21	98.46	235.67	143.79	74.96	218.75	143.79	74.46	218.25
Hydro and Ele. Mech Eq	US$*10^6	21.26	29.57	50.83	21.26	29.56	50.81	21.26	29.97	51.23	22.35	27.76	50.11	22.35	27.82	49.97
Total	US$*10^6	158.47	129.27	287.74	158.47	127.66	287.13	158.47	128.43	286.90	166.14	102.72	268.86	166.14	102.08	268.23
Annual Cost																
Civil Facilities	US$*10^6	13.86	10.07	23.93	13.86	10.01	23.87	13.86	9.94	23.80	14.52	7.57	22.09	14.52	7.52	22.04
Hydro and Ele.-Mech Eq	US$*10^6	2.42	3.37	5.79	2.42	3.37	5.79	2.42	3.42	5.84	2.55	3.16	5.71	2.55	3.15	5.70
Total	US$*10^6	16.28	13.44	29.72	16.28	13.38	29.66	16.28	13.36	29.64	17.07	10.74	27.81	17.07	10.67	27.74
Annual Surplus Benefit(B-C)	US$*10^6	-3.73	5.09	1.36	-3.73	6.68	2.95	-3.73	6.58	2.85	-2.78	5.65	2.86	-2.78	7.13	4.34
Benefit Cost Ratio(B/C)		0.77	1.38	1.05	0.77	1.50	1.10	0.77	1.49	1.10	0.84	1.53	1.10	0.84	1.67	1.16
Unit Annual Cost (Firm)	US$/kWh	0.144	0.082	0.107	0.144	0.082	0.107	0.144	0.081	0.107	0.135	0.077	0.105	0.135	0.072	0.101
Unit Annual Cost (Average)	US$/kWh	0.082	0.048	0.062	0.082	0.046	0.061	0.082	0.046	0.061	0.076	0.043	0.059	0.076	0.042	0.058

Table 9-17 Comparison Study on Optimum Installed Capacity

Tailrace Type Underground Powerhouse Layout Bayram H.W.L.=735m L.W.L.=686m-730m and Baglik H.W.L.=530m

Description Dam Site	Layout	Bayram 6h Peak	Baglik 6h Peak	Total 6h Peak	Bayram 8h Peak	Baglik 8h Peak	Total 8h Peak
High Water Level	m	740.00	530.00		740.00	530.00	
Normal Water Level	m	722.00	528.50		722.00	528.50	
Low Water Level	m	686.00	527.00		686.00	527.00	
Available Drawdown	m	54.00	3.00		54.00	3.00	
Gross Storage Capacity	m^3*10^6	150.00	7.30		133.00	7.30	
Effective Storage Capacity	m^3*10^6	130.00	1.00		113.00	1.00	
Dam Type	0	Rockfill	Con-Gra.		Rockfill	Con-Gra.	
Dam Hight	m	145	74		145	74	
Dam Volume	m^3	6,144	195		6,144	195	
Tailwater Level	m	530.00	392.00		530.00	392.00	
Effective Head	m	182.90	130.90		182.60	130.70	
Maximum Discharge	m^3/s	43.00	52.00		32.00	39.00	
Installed Capacity	MW	68.00	59.00	127.00	50.00	44.00	94.00
Firm Peak Power	MW	58.00	56.40	114.40	43.10	41.60	84.70
Energy Production							
Average Energy	GWh	247.90	221.40	469.30	225.59	201.47	427.06
Firm Energy	GWh	141.40	124.20	265.60	141.40	124.20	265.60
Secondary Energy	GWh	106.50	97.20	203.70	84.19	77.27	161.46
Unit Benefit Value		0.00	0.00		0.00	0.00	
Firm Peak Power	US$/kW	180.45	180.45		180.45	180.45	
Firm Energy	US$/kWh	0.027	0.027		0.027	0.027	
Secondary Energy	US$/kWh	0.022	0.022		0.022	0.022	
Benefit							
Firm Peak Power	US$*10^6	9.98	9.71	19.69	7.42	7.16	14.58
Firm Energy	US$*10^6	3.75	3.30	7.05	3.75	3.30	7.05
Secondary Energy	US$*10^6	2.29	2.09	4.39	1.81	1.66	3.48
Total	US$*10^6	16.03	15.09	31.12	12.98	12.12	25.10
Investment Cost							
Civil Facilities	US$*10^6	147.74	53.78	201.51	146.60	49.07	195.67
Hydrau. and Ele.-Mech Eq.	US$*10^6	24.32	25.69	50.01	20.06	22.21	42.27
Total	US$*10^6	172.06	79.46	251.52	166.66	71.28	237.93
Annual Cost							
Civil Facilities	US$*10^6	14.92	5.43	20.35	14.81	4.96	19.76
Hydrau. and Ele.-Mech Eq.	US$*10^6	2.77	2.93	5.70	2.29	2.53	4.82
Total	US$*10^6	17.69	8.36	26.05	17.09	7.49	24.58
Annual Surplus Benefit(B-C)	US$*10^6	-1.67	6.74	5.07	-4.11	4.63	0.52
Benefit Cost Ratio(B/C)		0.91	1.81	1.19	0.76	1.62	1.02
Unit Annual Cost (Firm)	US$/kWh	0.125	0.067	0.098	0.121	0.060	0.093
Unit Annual Cost (Average)	US$/kWh	0.071	0.038	0.056	0.076	0.037	0.058

Table 9-18 Outline of Optimum Development Plan of Çoruh-Berta Project

	Unit	Bayram Project	Bağlık Project	Total
Reservoir				
Catchment Area	km^2	1,159	1,509	
Annual Inflow	m^3/s	19.20	24.90	
High Water Level	m	740.00	530.00	
Normal Water Level	m	722.00	528.50	
Low Water Level	m	686.00	527.00	
Available Drawdown	m	54.00	3.00	
Gross Capacity	10^6m^3	133.00	7.30	
Effective Capacity	10^6m^3	113.00	1.00	
Surface Area	10^6m^2	3.38	0.37	
Dam				
Type		Rockfill	Con-Gra	
Height from Foundation	m	145	74	
Crest Length	m	415	190	
Volume	10^3m^3	6,147	195	
Penstock				
Type		Tunnel	Tunnel	
Diameters	m	3.3	3.6	
Length	m	321	213	
Powerhouse				
Type		Underground	Underground	
Tailrace Tunnel				
Type		Horseshoe	Horseshoe	
Diameters	m	4.6	4.9	
Length (Tunnel)	m	7,930	4,454	
Tail Water Level	m	530.00	392.00	
Gross Head				
Maximum Head	m	210.00	138.00	
Normal Head	m	192.00	136.50	
Minimum Head	m	156.00	135.00	
Loss of Head	m	9.10	5.60	
Effective Head				
Maximum	m	200.90	132.40	
Normal	m	182.90	130.90	
Minimum	m	146.90	129.40	
Firm Discharge	m^3/s	10.70	13.00	
Maximum Discharge	m^3/s	43.00	52.00	
Installed Capacity	MW	68	59	127
Number of Unit		1	1	
Firm Peak Power	MW	57.60	56.2	113.8
Annual Energy				
Average	GWh	250.4	225.8	476.2
Firm	GWh	144.9	128.4	273.3
Secondary	GWh	105.5	97.5	203.0
Investment Cost	(10^6US$)	172.1	79.5	251.5
Annual Surplus Benefit	(10^6US$)	-1.66	6.82	5.15
Benefit - Cost Ratio		0.91	1.82	1.20
Unit Energy Cost	(US$/kWh)	0.071	0.037	0.055

Table 9-19 Cost Estimate of Optimum Development Plan of Çoruh-Berta Project

Unit: 10^3US$

Description	Bayram Project	Bağlık Project	Total
Relocation Road	11,655	6,759	
Camp Facilities	800	800	
Land Acquisition	2,242	598	
Civil Work	83,113	25,984	
Diversion	2,421	0	
Care of River	1,082	0	
Dam	47,281	9,983	
Spillway	7,523	780	
Outlet Works	1,018	0	
Intake*-1	1,087	40	
Headrace Tunnel	0	0	
Surge Tank	0	0	
Penstock*-2	546	376	
Access Tunnels*-3	3,980	2,478	
Power House*-4	3,049	3,413	
Tailrace	14,965	8,914	
Switchyard	161	0	
Pre-Subtotal	97,810	34,141	
Contingency (15%)	14,335	5,031	
Eng. and Admi. (10%)	10,990	3,857	
Sub Total	123,136	43,030	
I.D.C. (9.5%/year)	24,601	10,748	
Total	147,737	58,778	206,515
Hydraulic Equip.	5,203	2,884	
Spillway	856	870	
Outlet Works	528	0	
Intake Gate	763	170	
Penstock	2,400	1,400	
Draft Gate	122	121	
Tailrace Gate	61	61	
Pre-Subtotal	4,730	2,622	
Contingency (10%)	473	262	
Electro-Mechanical Equip.*-5	15,780	19,216	
Equipment	15,027	18,301	
Contingency (5%)	751	915	
Eng. And Admi. (10%)	2,098	2,210	
Sub Total	23,082	24,310	
I.D.C. (9.5%/year)	1,241	1,377	
Total	24,323	25,867	50,190
Grand Total	172,060	79,464	251,524

*-1: including Intake Adit

*-2: including Penstock Adit

*-3: including Cable Tunnel and Tailrace Adit

*-4: including Drainage Tunnel, Surge Chamber and Surge Chamber Access Tunnel

*-5: including Transmission Line

Table 9-20 Reservoir Operation of Bayram Project

Unit $10^6 m^3$

	Year	Inflow	Evaporation	Power Discharge	Environment Discharge	Spill	Total Outflow
1	1942	998.64	2.82	719.10	3.97	243.33	969.22
2	1943	549.41	2.73	551.56	3.97	0.00	558.27
3	1944	803.53	2.70	636.47	3.97	154.57	797.71
4	1945	457.91	2.65	468.71	3.97	0.00	475.32
5	1946	525.01	2.58	502.90	3.97	0.00	509.46
6	1947	406.79	2.57	430.93	3.97	0.00	437.47
7	1948	512.54	2.51	486.49	3.97	0.00	492.98
8	1949	389.08	2.49	397.35	3.97	0.00	403.82
9	1950	464.57	2.46	450.70	3.97	0.00	457.13
10	1951	458.18	2.57	442.51	3.97	0.00	449.05
11	1952	557.13	2.68	552.22	3.97	0.00	558.87
12	1953	463.30	2.54	450.80	3.97	0.00	457.31
13	1954	628.09	2.66	598.47	3.97	19.74	624.83
14	1955	296.56	2.39	338.58	3.97	0.00	344.94
15	1956	421.05	2.35	382.20	3.97	0.00	388.52
16	1957	478.52	2.49	470.73	3.97	0.00	477.19
17	1958	471.40	2.52	464.70	3.97	0.00	471.18
18	1959	552.19	2.56	534.24	3.97	0.00	540.77
19	1960	895.78	2.83	712.87	3.97	173.19	892.86
20	1961	369.76	2.48	404.57	3.97	0.00	411.02
21	1962	551.52	2.42	518.96	3.97	0.00	525.36
22	1963	914.65	2.65	666.12	3.97	223.16	895.90
23	1964	617.20	2.67	599.86	3.97	24.67	631.17
24	1965	643.13	2.64	651.25	3.97	1.82	659.68
25	1966	614.92	2.61	595.66	3.97	7.20	609.44
26	1967	571.85	2.51	523.54	3.97	14.44	544.46
27	1968	1,139.87	2.85	740.53	3.97	389.40	1,136.75
28	1969	571.95	2.65	578.12	3.97	24.88	609.62
29	1970	476.69	2.55	461.20	3.97	0.00	467.72
30	1971	600.41	2.66	583.48	3.97	0.00	590.11
31	1972	642.03	2.67	614.86	3.97	12.66	634.16
32	1973	567.68	2.63	573.73	3.97	3.29	583.62
33	1974	472.67	2.50	465.15	3.97	0.00	471.63
34	1975	519.29	2.50	517.89	3.97	0.00	524.36
35	1976	690.13	2.56	597.28	3.97	72.54	676.35
36	1977	535.96	2.64	532.77	3.97	0.00	539.38
37	1978	683.62	2.64	618.08	3.97	54.10	678.78
38	1979	618.21	2.63	603.55	3.97	14.11	624.26
39	1980	635.32	2.69	592.24	3.97	39.33	638.23
40	1981	579.29	2.60	524.79	3.97	38.54	569.90
41	1982	455.55	2.63	454.67	3.97	0.00	461.27
42	1983	583.47	2.57	595.99	3.97	0.00	602.53
43	1984	552.32	2.56	530.36	3.97	0.00	536.90
44	1985	577.63	2.55	523.51	3.97	54.25	584.28
45	1986	677.79	2.64	646.56	3.97	26.28	679.45
46	1987	720.80	2.60	570.16	3.97	131.83	708.55
47	1988	975.42	2.77	700.15	3.97	245.93	952.83
48	1989	992.47	2.87	698.96	3.97	320.75	1,026.55
49	1990	593.79	2.51	560.00	3.97	24.35	590.83
50	1991	524.41	2.56	519.39	3.97	0.00	525.92
51	1992	643.85	2.48	560.75	3.97	61.61	628.80
52	1993	861.65	2.82	685.73	3.97	172.86	865.37
53	1994	601.54	2.70	605.54	3.97	1.95	614.15
	Total	32,106.39	138.15	29,206.82	210.64	2,550.77	32,106.37
	Ave.	605.78	2.61	551.07	3.97	48.13	605.78
	Max.	1,139.87	2.87	740.53	3.97	389.40	1,136.75
	Min.	296.56	2.35	338.58	3.97	0.00	344.94

Table 9-21 Total Energy Production of Bayram Project

Unit: GWh

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	<TOTAL>
1	1942	13.12	16.85	16.39	14.46	27.76	46.05	48.96	50.59	48.96	27.83	14.00	13.36	338.31
2	1943	13.72	13.31	15.18	13.79	19.37	33.09	31.46	36.09	32.06	20.46	13.79	13.21	255.53
3	1944	13.46	12.88	13.19	13.02	11.60	33.18	30.58	50.59	48.96	38.55	13.82	13.30	293.14
4	1945	13.58	12.98	13.22	12.91	11.32	12.30	22.02	32.56	38.01	19.55	13.73	13.03	215.19
5	1946	13.13	12.40	12.43	12.04	10.50	11.28	19.93	37.06	44.95	25.26	14.77	13.29	227.04
6	1947	13.64	13.16	13.42	13.18	12.12	35.94	27.95	12.86	13.08	13.69	13.49	12.71	195.23
7	1948	12.76	12.16	12.39	12.01	10.48	11.16	19.87	38.45	46.94	16.97	13.73	13.08	217.81
8	1949	13.26	12.56	12.63	12.12	10.43	11.10	11.13	28.08	25.74	13.77	13.57	12.81	177.19
9	1950	12.87	12.03	11.89	11.22	9.40	10.03	20.88	36.45	26.73	18.00	13.72	12.99	196.19
10	1951	13.15	12.55	12.71	12.32	11.09	11.51	23.16	24.27	34.41	17.23	13.73	13.10	199.23
11	1952	13.51	13.15	13.50	13.30	11.85	28.32	40.79	32.92	35.03	23.95	13.76	13.11	253.19
12	1953	13.22	12.45	12.43	11.85	10.14	10.57	11.28	34.87	37.39	20.72	13.76	13.18	201.87
13	1954	13.40	12.72	12.85	12.44	10.87	12.77	40.24	50.59	48.96	31.32	13.81	13.25	273.21
14	1955	13.47	12.78	12.90	12.48	11.18	11.52	11.33	12.80	13.09	13.55	13.18	12.27	150.54
15	1956	12.01	10.87	9.99	3.78	5.37	7.45	10.89	23.29	36.03	19.30	13.71	12.99	165.69
16	1957	13.05	12.21	12.03	11.28	9.41	10.38	17.68	33.53	41.73	19.94	13.72	13.01	207.97
17	1958	13.10	12.33	12.33	11.78	10.09	10.87	19.90	34.87	37.39	17.49	13.70	13.00	206.84
18	1959	13.12	12.37	12.40	11.94	10.66	11.16	24.02	45.95	47.93	23.69	13.79	13.20	240.23
19	1960	13.50	12.99	13.27	13.22	23.86	50.59	48.96	50.59	48.96	32.09	14.00	13.28	335.32
20	1961	13.46	12.75	12.84	12.34	10.57	11.22	20.37	22.57	24.74	13.72	13.39	12.47	180.45
21	1962	12.27	11.22	11.06	10.43	6.80	10.85	38.07	42.78	37.02	18.39	13.70	12.98	225.58
22	1963	13.10	12.38	12.44	12.07	10.97	11.57	47.62	50.59	48.96	50.59	21.36	13.31	304.98
23	1964	13.58	12.95	13.16	12.86	11.36	20.88	43.98	50.59	48.96	18.91	13.73	13.07	273.99
24	1965	13.37	12.85	13.19	13.06	11.57	38.03	47.40	50.59	48.96	21.75	13.66	12.81	297.24
25	1966	13.00	12.67	13.09	12.95	11.65	29.32	40.68	50.59	43.45	17.36	13.67	12.88	271.32
26	1967	12.88	11.89	11.56	10.63	4.98	9.08	12.48	50.59	44.58	36.87	15.16	13.33	234.02
27	1968	13.63	13.06	16.86	16.01	25.36	49.14	48.96	50.59	48.96	34.80	16.06	13.36	348.79
28	1969	13.75	13.22	13.56	13.34	11.76	30.36	45.60	50.59	31.95	13.76	13.51	12.71	263.90
29	1970	13.02	12.60	12.82	12.55	11.13	21.67	42.33	24.15	15.32	13.77	13.57	12.86	205.81
30	1971	13.26	12.90	13.24	13.04	12.03	34.43	28.17	50.59	45.23	16.84	13.80	13.16	266.69
31	1972	13.29	12.66	12.94	12.75	11.25	18.89	48.69	50.59	48.96	25.24	13.75	13.18	282.20
32	1973	13.48	12.90	13.13	12.83	11.40	21.00	29.26	48.39	48.96	24.47	13.71	12.97	262.50
33	1974	13.05	12.38	12.53	12.11	10.44	11.50	17.78	49.60	28.84	13.76	13.51	12.85	208.35
34	1975	13.05	12.26	12.20	11.64	10.31	10.88	43.87	36.45	36.40	14.00	13.66	12.87	227.59
35	1976	13.00	12.31	12.28	11.75	10.14	11.15	41.14	50.59	48.96	29.76	13.75	13.12	267.96
36	1977	13.43	12.92	13.15	12.86	11.30	17.39	29.15	46.44	40.12	19.68	13.73	13.06	243.24
37	1978	13.26	12.64	12.79	12.38	10.90	19.34	44.74	50.59	48.96	28.21	13.79	13.17	280.79
38	1979	13.33	12.65	12.84	12.62	11.68	22.35	34.09	50.59	48.96	29.12	13.76	13.08	275.08
39	1980	13.21	12.75	13.26	13.16	11.72	34.07	48.96	50.59	34.20	13.83	13.71	13.00	272.45
40	1981	13.14	12.51	12.71	12.39	10.84	12.08	23.99	38.77	48.96	26.65	13.76	13.14	238.96
41	1982	13.36	12.73	13.01	12.85	11.40	17.08	32.23	31.95	17.68	16.97	13.75	13.08	206.08
42	1983	13.27	12.70	12.85	12.44	11.23	20.78	46.60	50.59	46.53	15.29	13.62	12.72	268.64
43	1984	12.78	12.40	12.85	12.56	11.02	25.18	34.66	38.16	29.33	22.40	13.74	13.03	238.31
44	1985	13.02	12.17	12.07	11.43	9.72	11.02	48.96	50.59	25.82	13.74	13.47	12.77	236.79
45	1986	13.20	12.87	13.24	13.07	11.67	34.16	47.86	50.59	48.96	24.47	13.65	12.84	296.58
46	1987	12.90	12.10	11.96	11.37	10.69	11.83	48.96	50.59	48.96	13.75	13.55	12.96	259.62
47	1988	13.24	12.61	12.80	12.57	11.32	45.67	48.96	50.59	48.96	34.42	17.74	15.32	324.20
48	1989	22.74	19.18	17.29	13.79	21.09	50.59	48.96	50.59	48.96	15.42	13.64	12.83	335.09
49	1990	12.92	12.15	12.08	11.40	9.57	10.82	37.69	50.59	43.45	21.23	13.67	12.90	248.69
50	1991	13.02	12.52	12.88	12.58	11.41	30.86	46.49	22.12	28.09	15.16	13.69	12.90	231.71
51	1992	12.88	11.93	11.71	11.01	8.81	9.99	34.69	45.22	48.96	23.30	13.77	13.15	245.43
52	1993	15.98	24.68	13.78	13.68	16.39	39.99	48.96	50.59	48.96	22.66	13.74	13.08	322.49
53	1994	13.22	12.78	13.33	13.24	11.89	45.12	48.96	50.59	30.57	13.79	13.62	12.86	279.97
	TOTAL	711.20	688.07	688.61	654.88	631.84	1167.52	1832.16	2224.02	2093.02	1147.44	742.17	691.99	13272.91
	AVE	13.42	12.98	12.99	12.36	11.92	22.03	34.57	41.96	39.49	21.65	14.00	13.06	250.43
	MAX	22.74	24.68	18.84	16.01	27.76	50.59	48.96	50.59	48.96	50.59	21.36	15.32	348.79
	MIN	12.01	10.87	9.99	3.78	4.98	7.45	10.89	12.80	13.08	13.55	13.18	12.27	150.54

Table 9-22 Firm Energy Production of Bayram Project

Unit: GWh

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	<TOTAL>
1	1942	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
2	1943	12.65	12.24	12.65	12.65	11.83	12.65	11.62	12.65	12.24	12.65	12.65	12.24	148.71
3	1944	12.65	12.24	12.65	12.65	11.42	12.35	11.62	12.65	12.24	12.65	12.65	12.24	148.00
4	1945	12.65	12.24	12.65	12.65	11.32	11.98	11.62	12.65	12.24	12.65	12.65	12.24	147.53
5	1946	12.65	12.24	12.42	11.87	10.18	10.79	11.16	12.65	12.24	12.65	12.65	12.24	143.73
6	1947	12.65	12.24	12.65	12.65	11.83	12.42	11.62	12.65	12.24	12.65	12.65	12.24	148.47
7	1948	12.65	12.16	12.36	11.82	10.15	10.63	11.00	12.65	12.24	12.65	12.65	12.24	143.20
8	1949	12.65	12.24	12.63	11.97	10.09	10.55	10.75	12.65	12.24	12.65	12.65	12.24	143.29
9	1950	12.65	12.00	11.84	10.71	8.68	9.11	10.61	12.65	12.24	12.65	12.65	12.24	137.82
10	1951	12.65	12.24	12.65	12.25	10.85	11.11	11.29	12.65	12.24	12.65	12.65	12.24	145.48
11	1952	12.65	12.24	12.65	12.65	11.42	12.62	11.62	12.65	12.24	12.65	12.65	12.24	148.27
12	1953	12.65	12.24	12.42	11.59	9.69	9.83	10.68	12.65	12.24	12.65	12.65	12.24	141.53
13	1954	12.65	12.24	12.65	12.43	10.70	11.66	11.62	12.65	12.24	12.65	12.65	12.24	146.34
14	1955	12.65	12.24	12.65	12.48	10.98	11.13	11.02	12.65	12.24	12.65	12.65	12.24	145.57
15	1956	11.79	10.37	9.47	3.78	5.37	7.45	10.42	12.65	12.24	12.65	12.65	12.24	121.07
16	1957	12.65	12.21	11.85	10.79	8.70	9.58	10.91	12.65	12.24	12.65	12.65	12.24	139.11
17	1958	12.65	12.24	12.27	11.49	9.62	10.23	10.99	12.65	12.24	12.65	12.65	12.24	141.92
18	1959	12.65	12.24	12.37	11.72	10.25	10.63	11.20	12.65	12.24	12.65	12.65	12.24	143.47
19	1960	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
20	1961	12.65	12.24	12.65	12.29	10.28	10.71	11.08	12.65	12.24	12.65	12.65	12.24	144.31
21	1962	12.16	10.85	10.49	9.64	6.80	10.22	11.46	12.65	12.24	12.65	12.65	12.24	136.04
22	1963	12.65	12.24	12.43	11.90	10.68	11.21	11.91	12.65	12.24	12.65	12.65	12.24	145.65
23	1964	12.65	12.24	12.65	12.65	11.34	12.02	11.62	12.65	12.24	12.65	12.65	12.24	147.59
24	1965	12.65	12.24	12.65	12.65	11.42	12.26	11.86	12.65	12.24	12.65	12.65	12.24	148.15
25	1966	12.65	12.24	12.65	12.65	11.42	12.47	11.62	12.65	12.24	12.65	12.65	12.24	148.11
26	1967	12.65	11.80	11.19	9.92	4.98	9.06	10.49	12.65	12.24	12.65	12.65	12.24	132.50
27	1968	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
28	1969	12.65	12.24	12.65	12.65	11.42	12.64	11.62	12.65	12.24	12.65	12.65	12.24	148.09
29	1970	12.65	12.24	12.65	12.55	11.08	11.94	11.62	12.65	12.24	12.65	12.65	12.24	147.15
30	1971	12.65	12.24	12.65	12.65	11.83	12.38	11.62	12.65	12.24	12.65	12.65	12.24	148.43
31	1972	12.65	12.24	12.65	12.65	11.25	11.97	12.17	12.65	12.24	12.65	12.65	12.24	148.01
32	1973	12.65	12.24	12.65	12.65	11.40	12.18	11.62	12.65	12.24	12.65	12.65	12.24	147.80
33	1974	12.65	12.24	12.53	11.95	10.10	11.10	11.48	12.65	12.24	12.65	12.65	12.24	144.48
34	1975	12.65	12.24	12.09	11.29	9.76	10.25	11.10	12.65	12.24	12.65	12.65	12.24	141.81
35	1976	12.65	12.24	12.20	11.45	9.88	10.63	11.26	12.65	12.24	12.65	12.65	12.24	142.52
36	1977	12.65	12.24	12.65	12.65	11.30	11.99	11.62	12.65	12.24	12.65	12.65	12.24	147.52
37	1978	12.65	12.24	12.65	12.35	10.75	11.75	11.62	12.65	12.24	12.65	12.65	12.24	146.43
38	1979	12.65	12.24	12.65	12.62	11.68	12.09	11.62	12.65	12.24	12.65	12.65	12.24	147.97
39	1980	12.65	12.24	12.65	12.65	11.42	12.46	12.24	12.65	12.24	12.65	12.65	12.24	148.73
40	1981	12.65	12.24	12.65	12.38	10.67	11.61	11.62	12.65	12.24	12.65	12.65	12.24	146.22
41	1982	12.65	12.24	12.65	12.65	11.40	12.09	11.62	12.65	12.24	12.65	12.65	12.24	147.72
42	1983	12.65	12.24	12.65	12.43	11.04	11.57	11.66	12.65	12.24	12.65	12.65	12.24	146.67
43	1984	12.65	12.24	12.65	12.56	10.92	11.76	11.62	12.65	12.24	12.65	12.65	12.24	146.82
44	1985	12.65	12.17	11.90	11.00	9.11	10.45	12.24	12.65	12.24	12.65	12.65	12.24	141.96
45	1986	12.65	12.24	12.65	12.65	11.42	12.44	11.97	12.65	12.24	12.65	12.65	12.24	148.45
46	1987	12.65	12.10	11.75	10.92	10.29	11.57	12.24	12.65	12.24	12.65	12.65	12.24	143.94
47	1988	12.65	12.24	12.65	12.57	11.32	12.20	12.24	12.65	12.24	12.65	12.65	12.24	148.28
48	1989	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
49	1990	12.65	12.15	11.91	10.97	8.92	10.17	11.24	12.65	12.24	12.65	12.65	12.24	140.43
50	1991	12.65	12.24	12.65	12.58	11.30	11.77	11.63	12.65	12.24	12.65	12.65	12.24	147.23
51	1992	12.65	11.86	11.39	10.63	8.43	9.08	10.66	12.65	12.24	12.65	12.65	12.24	136.90
52	1993	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
53	1994	12.65	12.24	12.65	12.65	11.42	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
	TOTAL	668.99	644.00	655.31	632.93	555.06	604.39	611.51	670.34	648.72	670.34	670.34	648.72	7680.62
	AVE	12.62	12.15	12.36	11.94	10.47	11.40	11.54	12.65	12.24	12.65	12.65	12.24	144.92
	MAX	12.65	12.24	12.65	12.65	11.83	12.65	12.24	12.65	12.24	12.65	12.65	12.24	148.92
	MIN	11.79	10.37	9.47	3.78	4.98	7.45	10.42	12.65	12.24	12.65	12.65	12.24	121.07

Table 9-23 Peak Power of Bayram Project

Unit: MW

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	< AVE >
1	1942	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
2	1943	68.00	68.00	68.00	68.00	68.00	68.00	64.54	68.00	68.00	68.00	68.00	68.00	67.72
3	1944	68.00	68.00	68.00	68.00	68.00	66.39	64.54	68.00	68.00	68.00	68.00	68.00	67.55
4	1945	68.00	68.00	68.00	68.00	67.39	64.41	64.54	68.00	68.00	68.00	68.00	68.00	67.36
5	1946	68.00	68.00	66.76	63.79	60.61	58.02	61.98	68.00	68.00	68.00	68.00	68.00	65.63
6	1947	68.00	68.00	68.00	68.00	68.00	66.76	64.54	68.00	68.00	68.00	68.00	68.00	67.61
7	1948	68.00	67.56	66.46	63.56	60.42	57.15	61.12	68.00	68.00	68.00	68.00	68.00	65.39
8	1949	68.00	68.00	67.88	64.36	60.04	56.71	59.73	68.00	68.00	68.00	68.00	68.00	65.43
9	1950	68.00	66.68	62.57	57.58	51.64	48.99	58.92	68.00	68.00	68.00	68.00	68.00	62.93
10	1951	68.00	68.00	68.00	65.88	62.35	59.75	62.70	68.00	68.00	68.00	68.00	68.00	66.24
11	1952	68.00	68.00	68.00	68.00	68.00	67.83	64.54	68.00	68.00	68.00	68.00	68.00	67.70
12	1953	68.00	68.00	66.76	62.34	57.69	52.83	59.35	68.00	68.00	68.00	68.00	68.00	64.62
13	1954	68.00	68.00	68.00	66.81	63.69	62.56	64.54	68.00	68.00	68.00	68.00	68.00	66.82
14	1955	68.00	68.00	68.00	67.11	63.12	59.81	61.22	68.00	68.00	68.00	68.00	68.00	66.29
15	1956	63.37	57.59	50.89	20.31	31.98	40.07	57.90	68.00	68.00	68.00	68.00	68.00	55.28
16	1957	68.00	67.82	63.69	58.02	51.76	51.51	60.61	68.00	68.00	68.00	68.00	68.00	63.52
17	1958	68.00	68.00	65.94	61.78	57.27	55.02	61.08	68.00	68.00	68.00	68.00	68.00	64.80
18	1959	68.00	68.00	66.48	63.00	58.91	57.15	62.21	68.00	68.00	68.00	68.00	68.00	65.33
19	1960	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
20	1961	68.00	68.00	68.00	66.05	61.17	57.60	61.55	68.00	68.00	68.00	68.00	68.00	65.90
21	1962	65.36	60.29	56.39	51.85	40.49	54.94	63.65	68.00	68.00	68.00	68.00	68.00	61.21
22	1963	68.00	68.00	66.85	63.97	61.40	60.25	66.18	68.00	68.00	68.00	68.00	68.00	66.23
23	1964	68.00	68.00	68.00	68.00	67.48	64.64	64.54	68.00	68.00	68.00	68.00	68.00	67.39
24	1965	68.00	68.00	68.00	68.00	68.00	65.89	65.87	68.00	68.00	68.00	68.00	68.00	67.65
25	1966	68.00	68.00	68.00	68.00	68.00	67.02	64.54	68.00	68.00	68.00	68.00	68.00	67.63
26	1967	68.00	65.57	60.14	53.32	28.61	48.71	58.25	68.00	68.00	68.00	68.00	68.00	60.34
27	1968	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
28	1969	68.00	68.00	68.00	68.00	68.00	66.88	64.54	68.00	68.00	68.00	68.00	68.00	67.62
29	1970	68.00	68.00	68.00	67.48	65.96	64.19	64.54	68.00	68.00	68.00	68.00	68.00	67.19
30	1971	68.00	68.00	68.00	68.00	68.00	66.54	64.54	68.00	68.00	68.00	68.00	68.00	67.59
31	1972	68.00	68.00	68.00	68.00	68.97	64.38	67.64	68.00	68.00	68.00	68.00	68.00	67.58
32	1973	68.00	68.00	68.00	68.00	67.84	65.46	64.54	68.00	68.00	68.00	68.00	68.00	67.49
33	1974	68.00	68.00	67.39	64.26	60.12	59.68	63.80	68.00	68.00	68.00	68.00	68.00	65.97
34	1975	68.00	68.00	64.99	60.72	56.10	55.09	61.69	68.00	68.00	68.00	68.00	68.00	64.57
35	1976	68.00	68.00	65.60	61.54	57.63	57.12	62.54	68.00	68.00	68.00	68.00	68.00	65.08
36	1977	68.00	68.00	68.00	68.00	67.26	64.48	64.54	68.00	68.00	68.00	68.00	68.00	67.36
37	1978	68.00	68.00	68.00	66.40	64.01	63.16	64.54	68.00	68.00	68.00	68.00	68.00	66.86
38	1979	68.00	68.00	68.00	67.84	67.12	65.02	64.54	68.00	68.00	68.00	68.00	68.00	67.38
39	1980	68.00	68.00	68.00	68.00	68.00	66.98	68.00	68.00	68.00	68.00	68.00	68.00	67.91
40	1981	68.00	68.00	68.00	66.46	63.49	62.44	64.54	68.00	68.00	68.00	68.00	68.00	66.77
41	1982	68.00	68.00	68.00	68.00	67.84	65.01	64.54	68.00	68.00	68.00	68.00	68.00	67.45
42	1983	68.00	68.00	68.00	66.84	63.47	62.20	64.80	68.00	68.00	68.00	68.00	68.00	66.79
43	1984	68.00	68.00	68.00	67.53	64.97	63.24	64.54	68.00	68.00	68.00	68.00	68.00	67.04
44	1985	68.00	67.63	64.00	59.16	54.20	56.16	68.00	68.00	68.00	68.00	68.00	68.00	66.81
45	1986	68.00	68.00	68.00	68.00	68.00	66.91	66.50	68.00	68.00	68.00	68.00	68.00	67.78
46	1987	68.00	67.20	63.15	58.69	59.15	62.23	68.00	68.00	68.00	68.00	68.00	68.00	65.55
47	1988	68.00	68.00	68.00	67.59	67.37	65.57	68.00	68.00	68.00	68.00	68.00	68.00	67.71
48	1989	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
49	1990	68.00	67.52	64.05	58.96	53.07	54.68	62.63	68.00	68.00	68.00	68.00	68.00	64.12
50	1991	68.00	68.00	68.00	67.61	64.97	63.27	64.59	68.00	68.00	68.00	68.00	68.00	67.05
51	1992	68.00	65.90	61.21	56.07	50.17	48.72	59.21	68.00	68.00	68.00	68.00	68.00	62.51
52	1993	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
53	1994	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
	AVE	67.86	67.50	66.48	64.21	61.81	61.31	64.10	68.00	68.00	68.00	68.00	68.00	66.13
	MAX	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00	68.00
	MIN	63.37	57.59	50.89	20.31	28.61	40.07	57.90	68.00	68.00	68.00	68.00	68.00	55.28

Table 9-24(1) Peak Power Duration of Bayram Project

No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)
1	68.00	41	68.00	81	68.00	121	68.00	161	68.00	201	68.00	241	68.00	281	68.00
2	68.00	42	68.00	82	68.00	122	68.00	162	68.00	202	68.00	242	68.00	282	68.00
3	68.00	43	68.00	83	68.00	123	68.00	163	68.00	203	68.00	243	68.00	283	68.00
4	68.00	44	68.00	84	68.00	124	68.00	164	68.00	204	68.00	244	68.00	284	68.00
5	68.00	45	68.00	85	68.00	125	68.00	165	68.00	205	68.00	245	68.00	285	68.00
6	68.00	46	68.00	86	68.00	126	68.00	166	68.00	206	68.00	246	68.00	286	68.00
7	68.00	47	68.00	87	68.00	127	68.00	167	68.00	207	68.00	247	68.00	287	68.00
8	68.00	48	68.00	88	68.00	128	68.00	168	68.00	208	68.00	248	68.00	288	68.00
9	68.00	49	68.00	89	68.00	129	68.00	169	68.00	209	68.00	249	68.00	289	68.00
10	68.00	50	68.00	90	68.00	130	68.00	170	68.00	210	68.00	250	68.00	290	68.00
11	68.00	51	68.00	91	68.00	131	68.00	171	68.00	211	68.00	251	68.00	291	68.00
12	68.00	52	68.00	92	68.00	132	68.00	172	68.00	212	68.00	252	68.00	292	68.00
13	68.00	53	68.00	93	68.00	133	68.00	173	68.00	213	68.00	253	68.00	293	68.00
14	68.00	54	68.00	94	68.00	134	68.00	174	68.00	214	68.00	254	68.00	294	68.00
15	68.00	55	68.00	95	68.00	135	68.00	175	68.00	215	68.00	255	68.00	295	68.00
16	68.00	56	68.00	96	68.00	136	68.00	176	68.00	216	68.00	256	68.00	296	68.00
17	68.00	57	68.00	97	68.00	137	68.00	177	68.00	217	68.00	257	68.00	297	68.00
18	68.00	58	68.00	98	68.00	138	68.00	178	68.00	218	68.00	258	68.00	298	68.00
19	68.00	59	68.00	99	68.00	139	68.00	179	68.00	219	68.00	259	68.00	299	68.00
20	68.00	60	68.00	100	68.00	140	68.00	180	68.00	220	68.00	260	68.00	300	68.00
21	68.00	61	68.00	101	68.00	141	68.00	181	68.00	221	68.00	261	68.00	301	68.00
22	68.00	62	68.00	102	68.00	142	68.00	182	68.00	222	68.00	262	68.00	302	68.00
23	68.00	63	68.00	103	68.00	143	68.00	183	68.00	223	68.00	263	68.00	303	68.00
24	68.00	64	68.00	104	68.00	144	68.00	184	68.00	224	68.00	264	68.00	304	68.00
25	68.00	65	68.00	105	68.00	145	68.00	185	68.00	225	68.00	265	68.00	305	68.00
26	68.00	66	68.00	106	68.00	146	68.00	186	68.00	226	68.00	266	68.00	306	68.00
27	68.00	67	68.00	107	68.00	147	68.00	187	68.00	227	68.00	267	68.00	307	68.00
28	68.00	68	68.00	108	68.00	148	68.00	188	68.00	228	68.00	268	68.00	308	68.00
29	68.00	69	68.00	109	68.00	149	68.00	189	68.00	229	68.00	269	68.00	309	68.00
30	68.00	70	68.00	110	68.00	150	68.00	190	68.00	230	68.00	270	68.00	310	68.00
31	68.00	71	68.00	111	68.00	151	68.00	191	68.00	231	68.00	271	68.00	311	68.00
32	68.00	72	68.00	112	68.00	152	68.00	192	68.00	232	68.00	272	68.00	312	68.00
33	68.00	73	68.00	113	68.00	153	68.00	193	68.00	233	68.00	273	68.00	313	68.00
34	68.00	74	68.00	114	68.00	154	68.00	194	68.00	234	68.00	274	68.00	314	68.00
35	68.00	75	68.00	115	68.00	155	68.00	195	68.00	235	68.00	275	68.00	315	68.00
36	68.00	76	68.00	116	68.00	156	68.00	196	68.00	236	68.00	276	68.00	316	68.00
37	68.00	77	68.00	117	68.00	157	68.00	197	68.00	237	68.00	277	68.00	317	68.00
38	68.00	78	68.00	118	68.00	158	68.00	198	68.00	238	68.00	278	68.00	318	68.00
39	68.00	79	68.00	119	68.00	159	68.00	199	68.00	239	68.00	279	68.00	319	68.00
40	68.00	80	68.00	120	68.00	160	68.00	200	68.00	240	68.00	280	68.00	320	68.00

Table 9-24(2) Peak Power Duration of Bayram Project

No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)
321	68.00	361	68.00	401	68.00	441	68.00	481	66.76	521	64.54	561	62.34	601	57.69
322	68.00	362	68.00	402	68.00	442	68.00	482	66.68	522	64.54	562	62.23	602	57.63
323	68.00	363	68.00	403	68.00	443	68.00	483	66.54	523	64.54	563	62.21	603	57.60
324	68.00	364	68.00	404	68.00	444	68.00	484	66.50	524	64.54	564	62.20	604	57.59
325	68.00	365	68.00	405	68.00	445	68.00	485	66.48	525	64.54	565	61.98	605	57.58
326	68.00	366	68.00	406	68.00	446	68.00	486	66.46	526	64.54	566	61.78	606	57.27
327	68.00	367	68.00	407	68.00	447	68.00	487	66.46	527	64.54	567	61.69	607	57.15
328	68.00	368	68.00	408	68.00	448	68.00	488	66.40	528	64.54	568	61.55	608	57.15
329	68.00	369	68.00	409	68.00	449	67.88	489	66.39	529	64.48	569	61.54	609	57.12
330	68.00	370	68.00	410	68.00	450	67.84	490	66.18	530	64.41	570	61.40	610	56.71
331	68.00	371	68.00	411	68.00	451	67.84	491	66.05	531	64.38	571	61.22	611	56.39
332	68.00	372	68.00	412	68.00	452	67.84	492	65.96	532	64.36	572	61.21	612	56.16
333	68.00	373	68.00	413	68.00	453	67.83	493	65.94	533	64.26	573	61.17	613	56.10
334	68.00	374	68.00	414	68.00	454	67.82	494	65.90	534	64.19	574	61.12	614	56.07
335	68.00	375	68.00	415	68.00	455	67.64	495	65.89	535	64.05	575	61.08	615	55.09
336	68.00	376	68.00	416	68.00	456	67.63	496	65.88	536	64.01	576	60.72	616	55.02
337	68.00	377	68.00	417	68.00	457	67.61	497	65.87	537	64.00	577	60.61	617	54.94
338	68.00	378	68.00	418	68.00	458	67.59	498	65.60	538	63.97	578	60.61	618	54.68
339	68.00	379	68.00	419	68.00	459	67.56	499	65.57	539	63.80	579	60.42	619	54.20
340	68.00	380	68.00	420	68.00	460	67.53	500	65.57	540	63.79	580	60.29	620	53.32
341	68.00	381	68.00	421	68.00	461	67.52	501	65.46	541	63.69	581	60.25	621	53.07
342	68.00	382	68.00	422	68.00	462	67.48	502	65.36	542	63.69	582	60.14	622	52.83
343	68.00	383	68.00	423	68.00	463	67.48	503	65.02	543	63.65	583	60.12	623	51.85
344	68.00	384	68.00	424	68.00	464	67.39	504	65.01	544	63.56	584	60.04	624	51.76
345	68.00	385	68.00	425	68.00	465	67.39	505	64.99	545	63.49	585	59.81	625	51.64
346	68.00	386	68.00	426	68.00	466	67.37	506	64.97	546	63.47	586	59.75	626	51.51
347	68.00	387	68.00	427	68.00	467	67.26	507	64.97	547	63.37	587	59.73	627	50.89
348	68.00	388	68.00	428	68.00	468	67.20	508	64.80	548	63.27	588	59.68	628	50.17
349	68.00	389	68.00	429	68.00	469	67.12	509	64.64	549	63.24	589	59.35	629	48.99
350	68.00	390	68.00	430	68.00	470	67.11	510	64.59	550	63.16	590	59.21	630	48.72
351	68.00	391	68.00	431	68.00	471	67.02	511	64.54	551	63.15	591	59.16	631	48.71
352	68.00	392	68.00	432	68.00	472	66.98	512	64.54	552	63.12	592	59.15	632	40.49
353	68.00	393	68.00	433	68.00	473	66.97	513	64.54	553	63.00	593	58.96	633	40.07
354	68.00	394	68.00	434	68.00	474	66.91	514	64.54	554	62.70	594	58.92	634	31.98
355	68.00	395	68.00	435	68.00	475	66.88	515	64.54	555	62.57	595	58.91	635	28.61
356	68.00	396	68.00	436	68.00	476	66.85	516	64.54	556	62.56	596	58.69	636	20.31
357	68.00	397	68.00	437	68.00	477	66.84	517	64.54	557	62.54	597	58.25		
358	68.00	398	68.00	438	68.00	478	66.81	518	64.54	558	62.44	598	58.02		
359	68.00	399	68.00	439	68.00	479	66.76	519	64.54	559	62.43	599	58.02		
360	68.00	400	68.00	440	68.00	480	66.76	520	64.54	560	62.35	600	57.90		

Table 9-25 Reservoir Operation of Bağlık Project

Unit $10^6 m^3$

	Year	Inflow	Evaporation	Power Discharge	Environment Discharge	Spill	Total Outflow
1	1942	1,216.32	0.34	921.08	3.97	289.92	1,215.32
2	1943	717.37	0.35	713.05	3.97	0.00	717.37
3	1944	1,003.39	0.35	811.68	3.97	187.40	1,003.39
4	1945	610.83	0.35	606.53	3.97	0.00	610.85
5	1946	659.85	0.35	655.51	3.97	0.00	659.83
6	1947	563.73	0.35	559.70	3.97	0.00	564.01
7	1948	640.77	0.35	636.17	3.97	0.00	640.48
8	1949	523.52	0.34	519.21	3.97	0.00	523.53
9	1950	592.58	0.34	588.80	3.97	0.00	593.11
10	1951	585.26	0.35	580.41	3.97	0.00	584.73
11	1952	718.18	0.35	713.86	3.97	0.00	718.18
12	1953	593.43	0.34	589.12	3.97	0.00	593.43
13	1954	796.40	0.35	762.55	3.97	29.54	769.40
14	1955	443.75	0.34	440.44	3.97	0.00	444.75
15	1956	514.93	0.34	509.64	3.97	0.00	513.95
16	1957	615.99	0.34	611.68	3.97	0.00	615.99
17	1958	608.88	0.34	604.54	3.97	0.00	608.86
18	1959	696.67	0.35	692.35	3.97	0.00	696.67
19	1960	1,121.07	0.35	913.10	3.97	203.65	1,121.07
20	1961	524.73	0.34	521.42	3.97	0.00	525.73
21	1962	680.86	0.34	675.55	3.97	0.00	679.86
22	1963	1,122.23	0.35	847.99	3.97	269.93	1,122.23
23	1964	799.51	0.35	760.10	3.97	35.10	799.51
24	1965	834.53	0.34	814.16	3.97	17.06	835.53
25	1966	779.58	0.34	755.43	3.97	19.84	779.58
26	1967	701.94	0.34	668.23	3.97	28.41	700.94
27	1968	1,406.78	0.35	941.80	3.97	460.66	1,406.77
28	1969	767.65	0.34	720.05	3.97	44.29	768.65
29	1970	609.22	0.34	603.90	3.97	0.00	608.22
30	1971	758.38	0.34	744.36	3.97	10.70	759.38
31	1972	809.96	0.34	776.41	3.97	28.23	808.96
32	1973	742.95	0.35	732.46	3.97	6.70	743.48
33	1974	610.06	0.34	597.04	3.97	8.17	609.53
34	1975	671.35	0.34	660.99	3.97	6.89	672.18
35	1976	858.65	0.34	761.76	3.97	91.74	857.81
36	1977	692.61	0.35	688.29	3.97	0.00	692.61
37	1978	861.40	0.35	785.73	3.97	71.36	861.40
38	1979	794.73	0.35	766.36	3.97	24.58	795.26
39	1980	811.01	0.35	743.44	3.97	62.73	810.49
40	1981	731.18	0.35	683.37	3.97	43.48	731.16
41	1982	616.21	0.34	612.90	3.97	0.00	617.21
42	1983	801.04	0.34	748.12	3.97	48.61	801.04
43	1984	724.86	0.34	720.55	3.97	0.00	724.86
44	1985	781.64	0.34	653.61	3.97	122.73	780.64
45	1986	911.06	0.34	818.53	3.97	89.22	912.06
46	1987	954.90	0.34	725.47	3.97	224.12	953.90
47	1988	1,288.18	0.35	908.33	3.97	375.54	1,288.18
48	1989	1,367.41	0.34	906.57	3.97	457.53	1,368.41
49	1990	800.34	0.34	732.95	3.97	63.08	800.34
50	1991	699.94	0.34	687.48	3.97	8.15	699.94
51	1992	854.63	0.34	739.07	3.97	110.25	853.63
52	1993	1,170.14	0.35	901.59	3.97	264.23	1,170.14
53	1994	801.02	0.34	755.10	3.97	42.64	802.05
	Total	41,563.74	18.19	37,588.42	210.64	3,746.50	41,563.73
	Ave.	784.22	0.34	709.22	3.97	70.69	784.22
	Max.	1,046.78	0.35	941.98	3.97	460.66	1,406.77
	Min.	443.75	0.34	440.44	3.97	0.00	444.75

Table 9-26 Total Energy Production of Bağlık Project

Unit: GWh

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	<TOTAL>
1	1942	12.19	17.27	14.36	12.72	22.24	38.31	42.48	43.90	42.48	23.68	12.49	11.65	293.73
2	1943	12.21	12.32	13.46	11.88	15.56	26.77	30.98	35.22	28.15	17.70	12.03	11.24	227.50
3	1944	11.70	11.49	11.79	11.54	10.65	29.28	30.14	43.90	42.48	32.31	12.29	11.40	258.96
4	1945	11.53	11.49	11.19	11.08	9.97	11.37	22.28	32.23	32.95	17.02	11.52	10.75	193.38
5	1946	11.19	10.83	11.11	11.45	10.03	11.88	22.13	35.99	38.57	21.63	13.17	11.15	209.16
6	1947	12.38	11.41	11.36	11.36	10.87	31.48	27.74	14.78	13.47	11.87	11.11	10.71	178.53
7	1948	11.07	11.91	11.37	11.28	10.27	11.36	22.49	35.48	40.14	14.88	11.52	11.16	202.93
8	1949	11.36	10.92	11.08	10.98	9.74	11.26	13.72	29.37	23.02	11.78	11.19	10.75	165.16
9	1950	11.11	10.72	10.94	10.61	9.73	11.85	25.02	35.48	23.85	15.85	11.35	10.69	187.00
10	1951	11.55	11.16	11.28	11.11	10.47	11.79	24.65	25.23	30.05	15.05	11.52	11.24	185.11
11	1952	12.90	11.90	11.62	11.45	10.65	23.59	39.40	32.57	30.55	20.52	11.69	10.91	227.75
12	1953	11.11	10.72	10.98	10.61	9.73	10.93	15.31	34.20	32.45	17.96	11.78	11.32	187.09
13	1954	11.36	11.08	11.08	11.01	10.11	13.24	38.90	43.90	42.48	26.50	12.20	11.24	243.10
14	1955	11.36	10.91	11.11	11.01	10.16	11.09	13.22	15.63	13.05	11.19	10.88	10.11	139.73
15	1956	10.45	10.11	10.26	4.84	6.63	9.00	15.13	24.57	31.38	16.76	11.35	10.75	161.24
16	1957	11.04	10.46	10.44	10.27	9.81	12.70	20.85	33.09	35.92	17.27	11.44	10.75	194.05
17	1958	11.10	10.83	11.08	10.93	9.81	11.85	22.67	34.20	32.45	15.22	11.27	10.91	192.32
18	1959	11.19	10.83	11.19	11.19	10.34	12.33	25.83	43.43	40.89	20.35	12.03	11.15	220.77
19	1960	12.04	11.57	11.45	12.65	21.35	42.66	42.48	43.90	42.48	27.18	12.49	11.07	291.32
20	1961	11.27	10.83	11.08	10.68	9.58	11.18	22.80	23.86	22.20	11.35	10.71	9.95	165.47
21	1962	10.36	10.35	11.10	11.11	8.50	14.38	37.71	40.78	32.20	15.99	11.27	10.91	214.67
22	1963	11.19	10.92	11.28	11.37	10.95	12.22	42.48	43.90	42.48	43.90	18.55	11.32	270.55
23	1964	11.61	11.08	11.36	11.19	10.19	19.47	42.29	43.90	42.48	16.42	11.52	10.99	242.51
24	1965	12.30	11.24	12.22	11.36	10.26	34.13	42.48	43.90	41.72	18.72	11.04	10.13	259.50
25	1966	12.02	12.40	11.71	11.88	11.19	25.26	39.32	43.90	36.24	15.14	11.04	10.53	240.62
26	1967	10.44	9.95	10.44	10.27	5.96	10.76	16.77	43.90	37.15	31.03	13.43	11.57	211.67
27	1968	11.61	11.66	17.83	14.00	20.23	40.96	42.48	43.90	42.48	29.32	14.19	11.61	300.48
28	1969	12.04	11.57	11.79	11.04	9.96	26.13	42.48	43.90	27.06	11.69	11.01	10.50	229.16
29	1970	12.44	11.33	11.45	11.45	10.80	20.48	40.80	25.14	14.51	11.78	11.27	11.08	192.53
30	1971	13.07	11.66	11.79	11.36	11.19	30.34	27.99	43.90	38.63	14.71	12.12	10.61	237.37
31	1972	11.17	11.16	11.96	11.37	10.34	17.75	42.48	43.90	42.48	21.63	11.69	11.65	247.59
32	1973	11.70	11.41	11.28	11.11	10.88	18.90	28.98	43.90	42.48	20.95	11.35	10.69	233.63
33	1974	11.01	11.21	11.37	11.08	9.95	12.84	18.95	43.90	25.59	11.61	11.07	11.53	190.09
34	1975	11.08	10.69	11.01	10.95	10.17	12.44	42.48	35.48	31.62	12.40	11.04	10.58	209.94
35	1976	11.17	10.83	11.04	10.98	9.94	12.77	41.42	43.90	42.48	25.30	11.69	11.07	242.60
36	1977	12.38	11.33	11.36	11.11	10.26	16.26	28.81	43.85	34.68	17.10	11.52	10.91	219.60
37	1978	11.70	11.16	11.11	11.08	10.69	19.06	42.48	43.90	42.48	24.02	12.03	10.91	250.62
38	1979	11.36	11.16	11.45	11.62	11.43	20.51	33.36	43.90	42.48	24.71	11.78	10.69	244.44
39	1980	11.21	12.48	12.22	11.54	10.50	29.62	42.48	43.90	28.88	12.20	11.35	10.75	237.12
40	1981	11.53	11.25	11.54	11.19	10.27	12.64	24.10	37.45	42.48	22.74	11.69	11.18	218.02
41	1982	11.53	11.16	11.71	11.45	10.03	15.53	36.02	35.48	17.24	15.16	11.52	10.61	195.42
42	1983	11.34	11.25	10.71	10.69	9.84	21.56	42.48	43.90	42.20	13.60	10.28	9.54	237.38
43	1984	11.10	13.15	11.36	11.08	9.97	25.39	36.67	41.38	27.65	19.92	11.44	10.37	229.48
44	1985	10.02	10.27	10.27	10.27	9.66	14.13	42.48	43.90	23.01	11.35	10.79	10.80	206.96
45	1986	13.41	11.82	11.79	11.28	10.73	30.47	42.48	43.90	42.48	21.80	10.62	10.02	260.80
46	1987	10.69	10.11	10.27	10.52	12.81	12.73	42.48	43.90	42.48	11.44	11.27	11.65	230.35
47	1988	11.45	11.00	11.19	11.54	11.58	43.67	42.48	43.90	42.48	30.69	15.99	13.84	289.80
48	1989	20.41	17.06	15.36	11.88	16.94	43.90	42.48	43.90	42.48	13.77	10.53	10.18	288.88
49	1990	10.36	10.19	10.44	9.94	9.43	13.29	41.69	43.90	42.48	19.07	11.07	10.49	232.34
50	1991	10.69	12.28	11.62	10.79	10.19	30.59	42.48	24.82	29.64	14.11	11.01	9.65	218.06
51	1992	9.86	10.43	10.44	9.77	8.32	12.19	42.48	43.90	42.48	22.57	11.10	10.97	234.52
52	1993	19.24	23.01	13.16	11.53	14.44	36.29	42.48	43.90	42.48	20.43	11.78	10.91	287.65
53	1994	10.29	11.13	11.28	11.19	10.03	38.92	42.48	43.90	27.56	12.55	11.11	10.11	240.55
	TOTAL	621.93	616.46	613.11	587.64	585.33	1097.48	1775.74	2042.68	1834.29	993.63	623.23	577.62	11969.12
	AVE	11.73	11.63	11.57	11.09	11.04	20.71	33.50	38.54	34.61	18.75	11.76	10.90	225.83
	MAX	20.41	23.01	17.83	14.00	22.24	43.90	42.48	43.90	42.48	43.90	18.55	13.84	300.48
	MIN	9.86	9.95	10.26	4.84	5.96	9.00	13.22	14.78	13.05	11.19	10.28	9.54	139.73

Table 9-27 Firm Energy Production of Bağlık Project

Unit: GWh

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	<TOTAL>
1	1942	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
2	1943	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
3	1944	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
4	1945	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
5	1946	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
6	1947	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
7	1948	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
8	1949	10.97	10.62	10.97	10.97	9.74	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.06
9	1950	10.97	10.62	10.94	10.61	9.73	10.97	10.62	10.97	10.62	10.97	10.97	10.62	128.63
10	1951	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
11	1952	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
12	1953	10.97	10.62	10.97	10.61	9.73	10.90	10.62	10.97	10.62	10.97	10.97	10.62	128.59
13	1954	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
14	1955	10.97	10.62	10.97	10.97	10.13	10.97	10.62	10.97	10.62	10.97	10.88	10.11	128.83
15	1956	10.45	10.11	10.26	4.86	6.63	9.00	10.62	10.97	10.62	10.97	10.97	10.62	116.08
16	1957	10.97	10.66	10.44	10.27	9.75	10.97	10.62	10.97	10.62	10.97	10.97	10.62	127.66
17	1958	10.97	10.62	10.97	10.93	9.75	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.01
18	1959	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
19	1960	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
20	1961	10.97	10.62	10.97	10.68	9.58	10.97	10.62	10.97	10.62	10.97	10.71	9.95	127.64
21	1962	10.36	10.35	10.97	10.97	8.50	10.97	10.62	10.97	10.62	10.97	10.97	10.62	126.92
22	1963	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
23	1964	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
24	1965	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.13	128.72
25	1966	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.53	129.12
26	1967	10.44	9.95	10.44	10.27	5.96	10.76	10.62	10.97	10.62	10.97	10.97	10.62	122.61
27	1968	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
28	1969	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.48	129.07
29	1970	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
30	1971	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.61	129.56
31	1972	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
32	1973	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
33	1974	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
34	1975	10.97	10.62	10.97	10.93	10.14	10.97	10.62	10.97	10.62	10.97	10.97	10.56	129.33
35	1976	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
36	1977	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
37	1978	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
38	1979	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
39	1980	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
40	1981	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
41	1982	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.61	129.20
42	1983	10.97	10.62	10.71	10.69	9.84	10.97	10.62	10.97	10.62	10.97	10.26	9.56	126.82
43	1984	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.37	128.96
44	1985	10.02	10.27	10.27	10.27	9.66	10.97	10.62	10.97	10.62	10.97	10.79	10.62	126.07
45	1986	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.62	10.02	128.25
46	1987	10.69	10.11	10.27	10.52	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	127.62
47	1988	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
48	1989	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.53	10.18	128.33
49	1990	10.36	10.19	10.44	9.94	9.43	10.97	10.62	10.97	10.62	10.97	10.97	10.49	125.98
50	1991	10.69	10.62	10.97	10.79	10.14	10.97	10.62	10.97	10.62	10.97	10.97	9.85	128.21
51	1992	9.86	10.43	10.44	9.77	8.32	10.97	10.62	10.97	10.62	10.97	10.97	10.62	124.58
52	1993	10.97	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.21
53	1994	10.29	10.62	10.97	10.97	9.91	10.97	10.62	10.97	10.62	10.97	10.97	10.11	128.02
	TOTAL	576.02	559.76	577.07	569.12	516.63	579.36	562.86	581.62	562.86	581.62	579.58	557.09	6803.57
	AVE	10.87	10.56	10.89	10.74	9.75	10.93	10.62	10.97	10.62	10.97	10.94	10.51	128.37
	MAX	10.97	10.62	10.97	10.97	10.27	10.97	10.62	10.97	10.62	10.97	10.97	10.62	129.56
	MIN	9.86	9.95	10.26	4.86	5.96	9.00	10.62	10.97	10.62	10.97	10.28	9.56	116.08

Table 9-28 Peak Power of Bağlık Project

Unit: MW

NO.	YEAR	< OCT >	< NOV >	< DEC >	< JAN >	< FEB >	< MAR >	< APR >	< MAY >	< JUN >	< JUL >	< AUG >	< SEP >	< AVE >
1	1942	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
2	1943	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
3	1944	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
4	1945	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
5	1946	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
6	1947	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
7	1948	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
8	1949	59.00	59.00	59.00	59.00	57.98	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
9	1950	59.00	59.00	58.81	57.03	57.93	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.92
10	1951	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.73
11	1952	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
12	1953	59.00	59.00	59.00	57.06	57.93	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
13	1954	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.72
14	1955	59.00	59.00	59.00	59.00	58.24	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
15	1956	56.19	56.18	55.16	26.02	39.48	48.41	59.00	59.00	59.00	59.00	58.69	56.17	58.66
16	1957	59.00	58.13	56.13	55.24	58.04	59.00	59.00	59.00	59.00	59.00	59.00	59.00	53.01
17	1958	59.00	59.00	59.00	58.77	58.04	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.29
18	1959	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.91
19	1960	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
20	1961	59.00	59.00	59.00	57.40	57.03	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
21	1962	55.72	57.52	59.00	59.00	58.60	59.00	59.00	59.00	59.00	59.00	57.56	55.26	58.28
22	1963	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	57.96
23	1964	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
24	1965	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
25	1966	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	56.27	58.78
26	1967	56.14	55.25	56.14	55.24	34.28	57.84	59.00	59.00	59.00	59.00	59.00	58.49	58.96
27	1968	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	55.83
28	1969	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
29	1970	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.22	58.94
30	1971	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
31	1972	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.96	59.00
32	1973	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
33	1974	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
34	1975	59.00	59.00	59.00	58.74	58.25	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
35	1976	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.66	58.89
36	1977	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
37	1978	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
38	1979	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
39	1980	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
40	1981	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
41	1982	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
42	1983	59.00	59.00	57.58	57.47	58.58	59.00	59.00	59.00	59.00	59.00	59.00	58.97	59.00
43	1984	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	55.27	57.75
44	1985	53.89	57.04	55.23	55.23	57.48	59.00	59.00	59.00	59.00	59.00	59.00	57.61	58.89
45	1986	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.00	59.00	57.56
46	1987	57.49	56.14	55.24	56.58	59.00	59.00	59.00	59.00	59.00	59.00	57.08	55.67	58.56
47	1988	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	58.11
48	1989	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
49	1990	55.69	56.59	56.13	53.44	56.14	59.00	59.00	59.00	59.00	59.00	56.63	56.57	58.60
50	1991	57.48	59.00	59.00	58.03	58.30	59.00	59.00	59.00	59.00	59.00	59.00	58.25	57.52
51	1992	53.00	57.95	56.14	52.54	49.54	59.00	59.00	59.00	59.00	59.00	59.00	56.71	58.38
52	1993	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	56.89
53	1994	55.30	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	56.19	58.45
	AVE	58.43	58.68	58.54	57.73	57.53	58.77	59.00	59.00	59.00	59.00	58.79	58.40	58.58
	MAX	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00	59.00
	MIN	53.00	55.25	55.16	26.02	34.28	48.41	59.00	59.00	59.00	59.00	55.27	52.99	53.01

Table 9-29(1) Peak Power Duration of Bağlık Project

No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)
1	59.00	41	59.00	81	59.00	121	59.00	161	59.00	201	59.00	241	59.00	281	59.00
2	59.00	42	59.00	82	59.00	122	59.00	162	59.00	202	59.00	242	59.00	282	59.00
3	59.00	43	59.00	83	59.00	123	59.00	163	59.00	203	59.00	243	59.00	283	59.00
4	59.00	44	59.00	84	59.00	124	59.00	164	59.00	204	59.00	244	59.00	284	59.00
5	59.00	45	59.00	85	59.00	125	59.00	165	59.00	205	59.00	245	59.00	285	59.00
6	59.00	46	59.00	86	59.00	126	59.00	166	59.00	206	59.00	246	59.00	286	59.00
7	59.00	47	59.00	87	59.00	127	59.00	167	59.00	207	59.00	247	59.00	287	59.00
8	59.00	48	59.00	88	59.00	128	59.00	168	59.00	208	59.00	248	59.00	288	59.00
9	59.00	49	59.00	89	59.00	129	59.00	169	59.00	209	59.00	249	59.00	289	59.00
10	59.00	50	59.00	90	59.00	130	59.00	170	59.00	210	59.00	250	59.00	290	59.00
11	59.00	51	59.00	91	59.00	131	59.00	171	59.00	211	59.00	251	59.00	291	59.00
12	59.00	52	59.00	92	59.00	132	59.00	172	59.00	212	59.00	252	59.00	292	59.00
13	59.00	53	59.00	93	59.00	133	59.00	173	59.00	213	59.00	253	59.00	293	59.00
14	59.00	54	59.00	94	59.00	134	59.00	174	59.00	214	59.00	254	59.00	294	59.00
15	59.00	55	59.00	95	59.00	135	59.00	175	59.00	215	59.00	255	59.00	295	59.00
16	59.00	56	59.00	96	59.00	136	59.00	176	59.00	216	59.00	256	59.00	296	59.00
17	59.00	57	59.00	97	59.00	137	59.00	177	59.00	217	59.00	257	59.00	297	59.00
18	59.00	58	59.00	98	59.00	138	59.00	178	59.00	218	59.00	258	59.00	298	59.00
19	59.00	59	59.00	99	59.00	139	59.00	179	59.00	219	59.00	259	59.00	299	59.00
20	59.00	60	59.00	100	59.00	140	59.00	180	59.00	220	59.00	260	59.00	300	59.00
21	59.00	61	59.00	101	59.00	141	59.00	181	59.00	221	59.00	261	59.00	301	59.00
22	59.00	62	59.00	102	59.00	142	59.00	182	59.00	222	59.00	262	59.00	302	59.00
23	59.00	63	59.00	103	59.00	143	59.00	183	59.00	223	59.00	263	59.00	303	59.00
24	59.00	64	59.00	104	59.00	144	59.00	184	59.00	224	59.00	264	59.00	304	59.00
25	59.00	65	59.00	105	59.00	145	59.00	185	59.00	225	59.00	265	59.00	305	59.00
26	59.00	66	59.00	106	59.00	146	59.00	186	59.00	226	59.00	266	59.00	306	59.00
27	59.00	67	59.00	107	59.00	147	59.00	187	59.00	227	59.00	267	59.00	307	59.00
28	59.00	68	59.00	108	59.00	148	59.00	188	59.00	228	59.00	268	59.00	308	59.00
29	59.00	69	59.00	109	59.00	149	59.00	189	59.00	229	59.00	269	59.00	309	59.00
30	59.00	70	59.00	110	59.00	150	59.00	190	59.00	230	59.00	270	59.00	310	59.00
31	59.00	71	59.00	111	59.00	151	59.00	191	59.00	231	59.00	271	59.00	311	59.00
32	59.00	72	59.00	112	59.00	152	59.00	192	59.00	232	59.00	272	59.00	312	59.00
33	59.00	73	59.00	113	59.00	153	59.00	193	59.00	233	59.00	273	59.00	313	59.00
34	59.00	74	59.00	114	59.00	154	59.00	194	59.00	234	59.00	274	59.00	314	59.00
35	59.00	75	59.00	115	59.00	155	59.00	195	59.00	235	59.00	275	59.00	315	59.00
36	59.00	76	59.00	116	59.00	156	59.00	196	59.00	236	59.00	276	59.00	316	59.00
37	59.00	77	59.00	117	59.00	157	59.00	197	59.00	237	59.00	277	59.00	317	59.00
38	59.00	78	59.00	118	59.00	158	59.00	198	59.00	238	59.00	278	59.00	318	59.00
39	59.00	79	59.00	119	59.00	159	59.00	199	59.00	239	59.00	279	59.00	319	59.00
40	59.00	80	59.00	120	59.00	160	59.00	200	59.00	240	59.00	280	59.00	320	59.00

Table 9-29(2) Peak Power Duration of Bağlık Project

No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)	No.	Peak Power (MW)
321	59.00	361	59.00	401	59.00	441	59.00	481	59.00	521	59.00	561	58.74	601	56.19
322	59.00	362	59.00	402	59.00	442	59.00	482	59.00	522	59.00	562	58.66	602	56.19
323	59.00	363	59.00	403	59.00	443	59.00	483	59.00	523	59.00	563	58.59	603	56.18
324	59.00	364	59.00	404	59.00	444	59.00	484	59.00	524	59.00	564	58.49	604	56.17
325	59.00	365	59.00	405	59.00	445	59.00	485	59.00	525	59.00	565	58.49	605	56.14
326	59.00	366	59.00	406	59.00	446	59.00	486	59.00	526	59.00	566	58.30	606	56.14
327	59.00	367	59.00	407	59.00	447	59.00	487	59.00	527	59.00	567	58.25	607	56.14
328	59.00	368	59.00	408	59.00	448	59.00	488	59.00	528	59.00	568	58.25	608	56.14
329	59.00	369	59.00	409	59.00	449	59.00	489	59.00	529	59.00	569	58.24	609	56.14
330	59.00	370	59.00	410	59.00	450	59.00	490	59.00	530	59.00	570	58.22	610	56.13
331	59.00	371	59.00	411	59.00	451	59.00	491	59.00	531	59.00	571	58.13	611	56.13
332	59.00	372	59.00	412	59.00	452	59.00	492	59.00	532	59.00	572	58.04	612	55.72
333	59.00	373	59.00	413	59.00	453	59.00	493	59.00	533	59.00	573	58.04	613	55.69
334	59.00	374	59.00	414	59.00	454	59.00	494	59.00	534	59.00	574	58.03	614	55.67
335	59.00	375	59.00	415	59.00	455	59.00	495	59.00	535	59.00	575	58.00	615	55.30
336	59.00	376	59.00	416	59.00	456	59.00	496	59.00	536	59.00	576	57.98	616	55.27
337	59.00	377	59.00	417	59.00	457	59.00	497	59.00	537	59.00	577	57.95	617	55.26
338	59.00	378	59.00	418	59.00	458	59.00	498	59.00	538	59.00	578	57.93	618	55.25
339	59.00	379	59.00	419	59.00	459	59.00	499	59.00	539	59.00	579	57.93	619	55.24
340	59.00	380	59.00	420	59.00	460	59.00	500	59.00	540	59.00	580	57.84	620	55.24
341	59.00	381	59.00	421	59.00	461	59.00	501	59.00	541	59.00	581	57.61	621	55.24
342	59.00	382	59.00	422	59.00	462	59.00	502	59.00	542	59.00	582	57.58	622	55.23
343	59.00	383	59.00	423	59.00	463	59.00	503	59.00	543	59.00	583	57.56	623	55.23
344	59.00	384	59.00	424	59.00	464	59.00	504	59.00	544	59.00	584	57.52	624	55.16
345	59.00	385	59.00	425	59.00	465	59.00	505	59.00	545	59.00	585	57.49	625	54.71
346	59.00	386	59.00	426	59.00	466	59.00	506	59.00	546	59.00	586	57.48	626	53.89
347	59.00	387	59.00	427	59.00	467	59.00	507	59.00	547	59.00	587	57.48	627	53.44
348	59.00	388	59.00	428	59.00	468	59.00	508	59.00	548	59.00	588	57.47	628	53.00
349	59.00	389	59.00	429	59.00	469	59.00	509	59.00	549	59.00	589	57.40	629	52.99
350	59.00	390	59.00	430	59.00	470	59.00	510	59.00	550	59.00	590	57.08	630	52.54
351	59.00	391	59.00	431	59.00	471	59.00	511	59.00	551	59.00	591	57.06	631	50.60
352	59.00	392	59.00	432	59.00	472	59.00	512	59.00	552	59.00	592	57.04	632	49.54
353	59.00	393	59.00	433	59.00	473	59.00	513	59.00	553	59.00	593	57.03	633	48.41
354	59.00	394	59.00	434	59.00	474	59.00	514	59.00	554	59.00	594	57.03	634	39.48
355	59.00	395	59.00	435	59.00	475	59.00	515	59.00	555	59.00	595	56.63	635	34.28
356	59.00	396	59.00	436	59.00	476	59.00	516	59.00	556	59.00	596	56.59	636	26.02
357	59.00	397	59.00	437	59.00	477	59.00	517	59.00	557	58.97	597	56.58		
358	59.00	398	59.00	438	59.00	478	59.00	518	59.00	558	58.96	598	56.58		
359	59.00	399	59.00	439	59.00	479	59.00	519	59.00	559	58.81	599	56.57		
360	59.00	400	59.00	440	59.00	480	59.00	520	59.00	560	58.77	600	56.27		

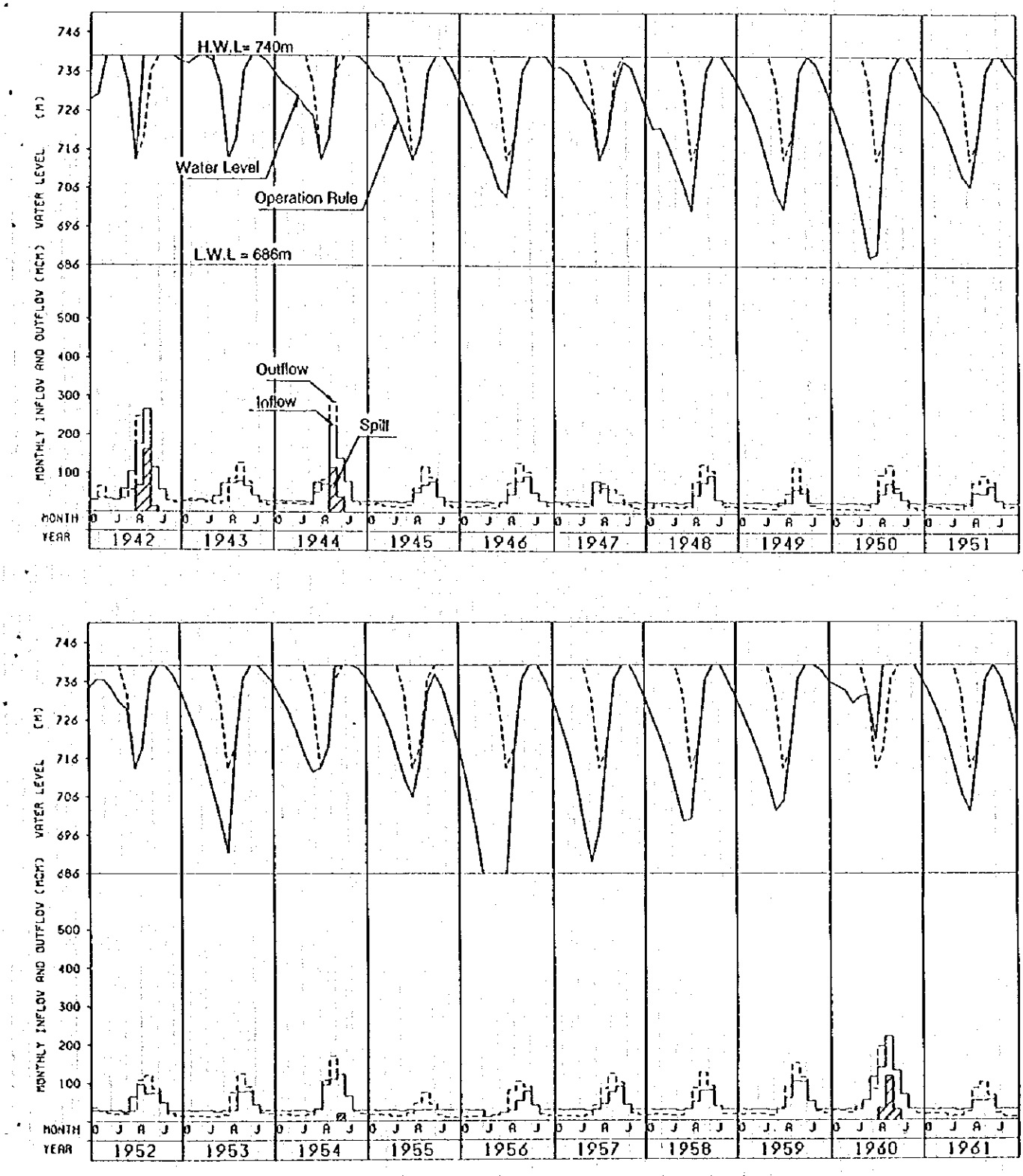


Figure 9-18(1) Reservoir Operation of Bayram Project

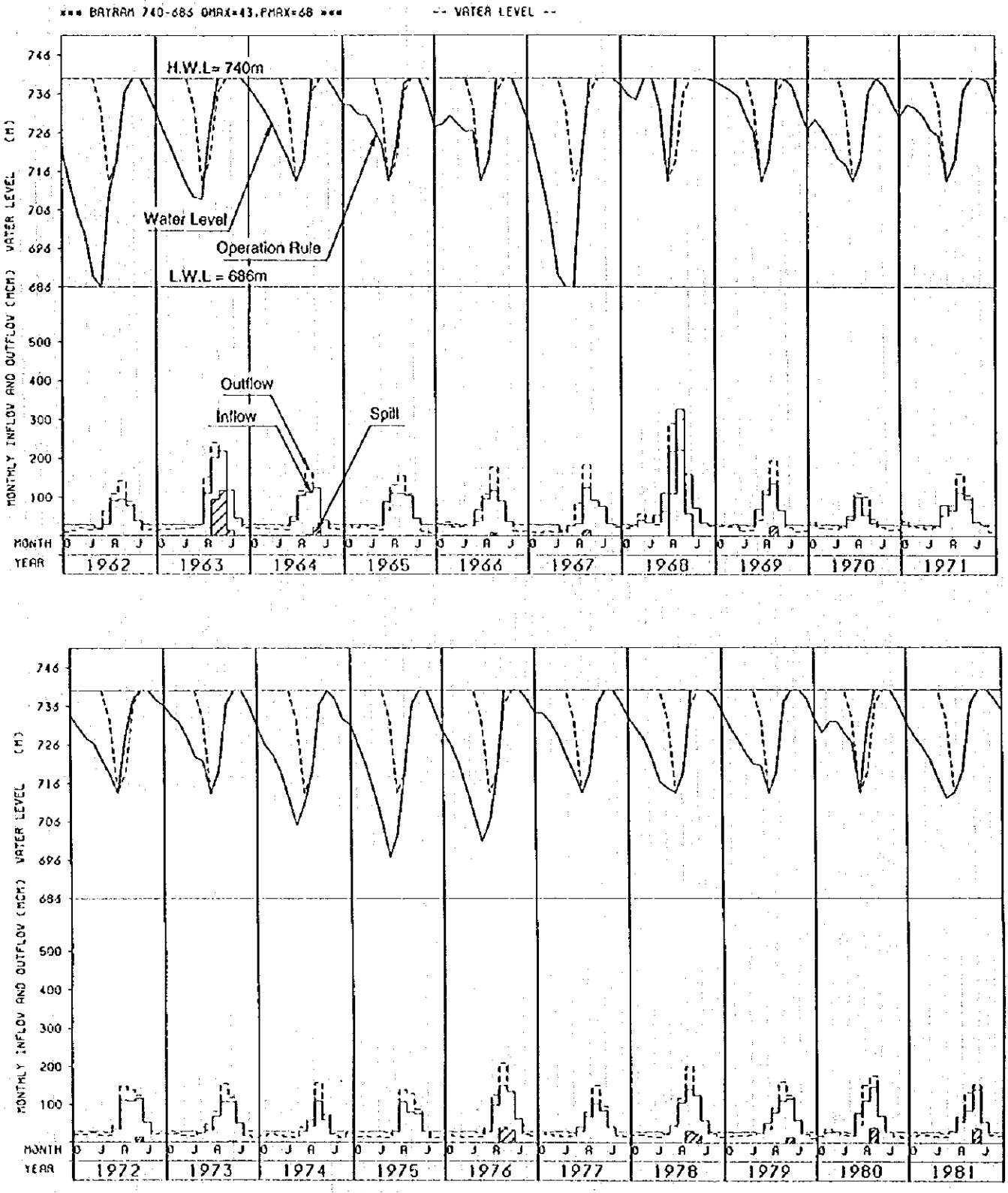


Figure 9-18(2) Reservoir Operation of Bayram Project

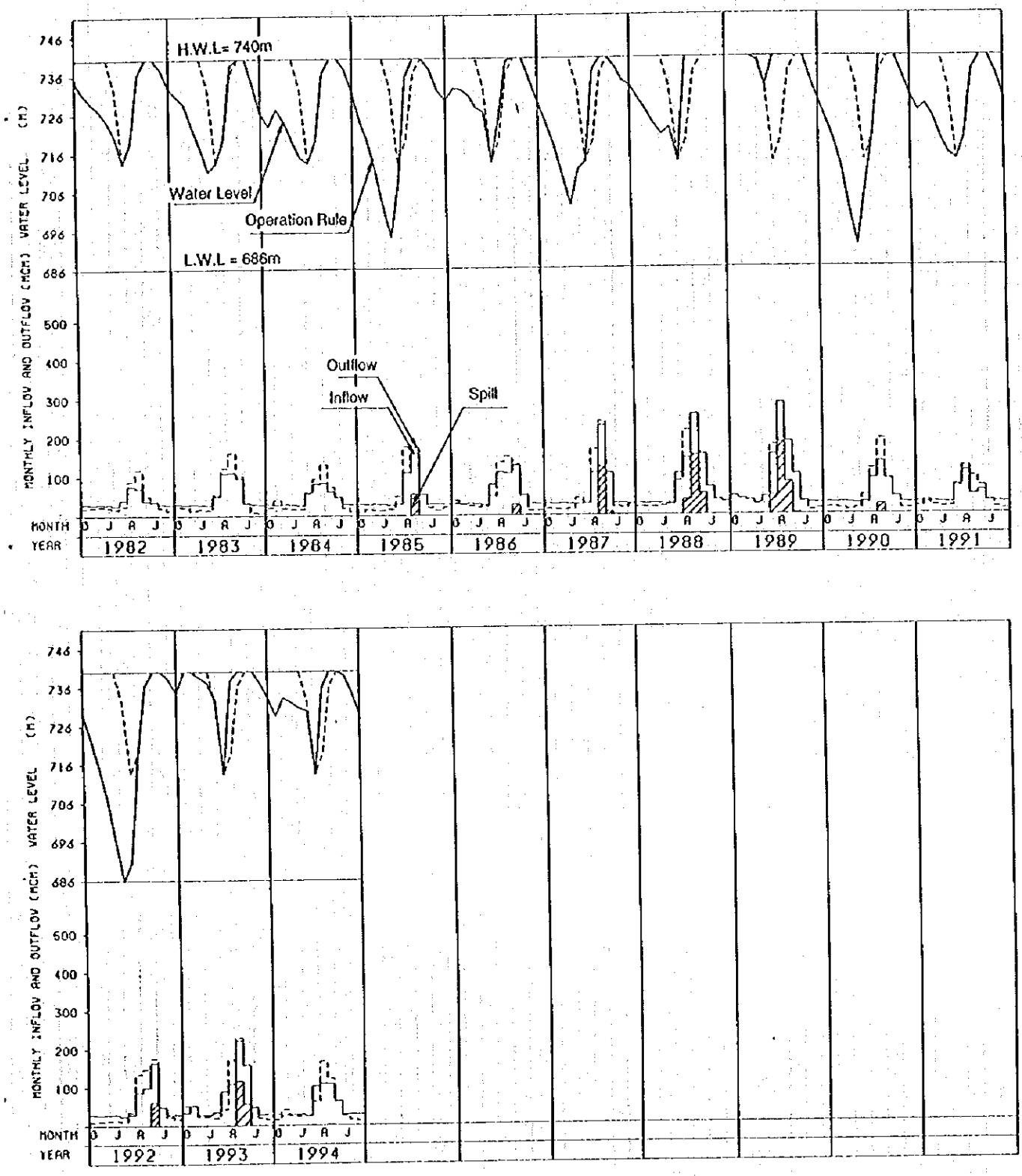


Figure 9-18(3) Reservoir Operation of Bayram Project

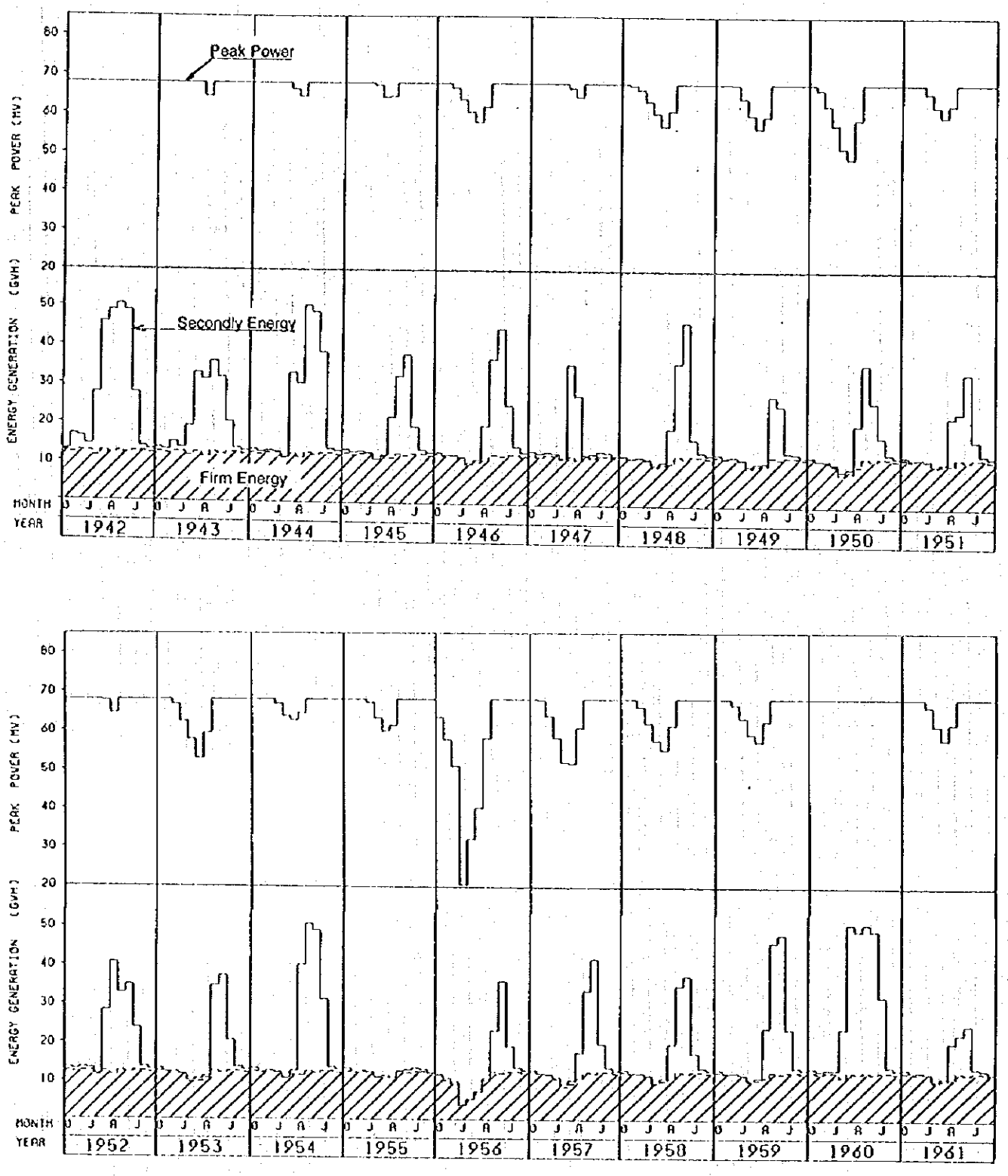


Figure 9-19(1) Energy Generation of Bayram Project

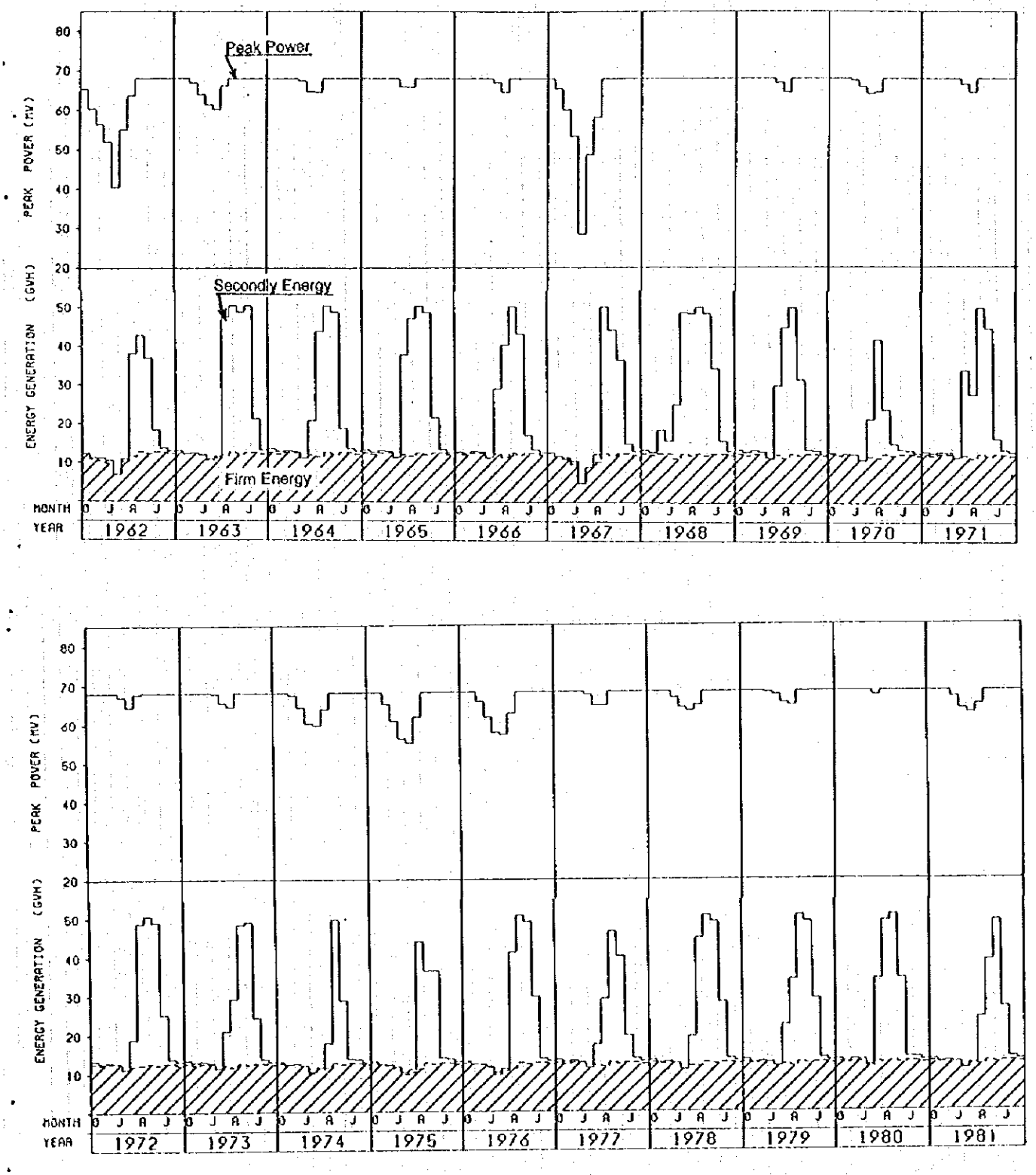


Figure 9-19(2) Energy Generation of Bayram Project

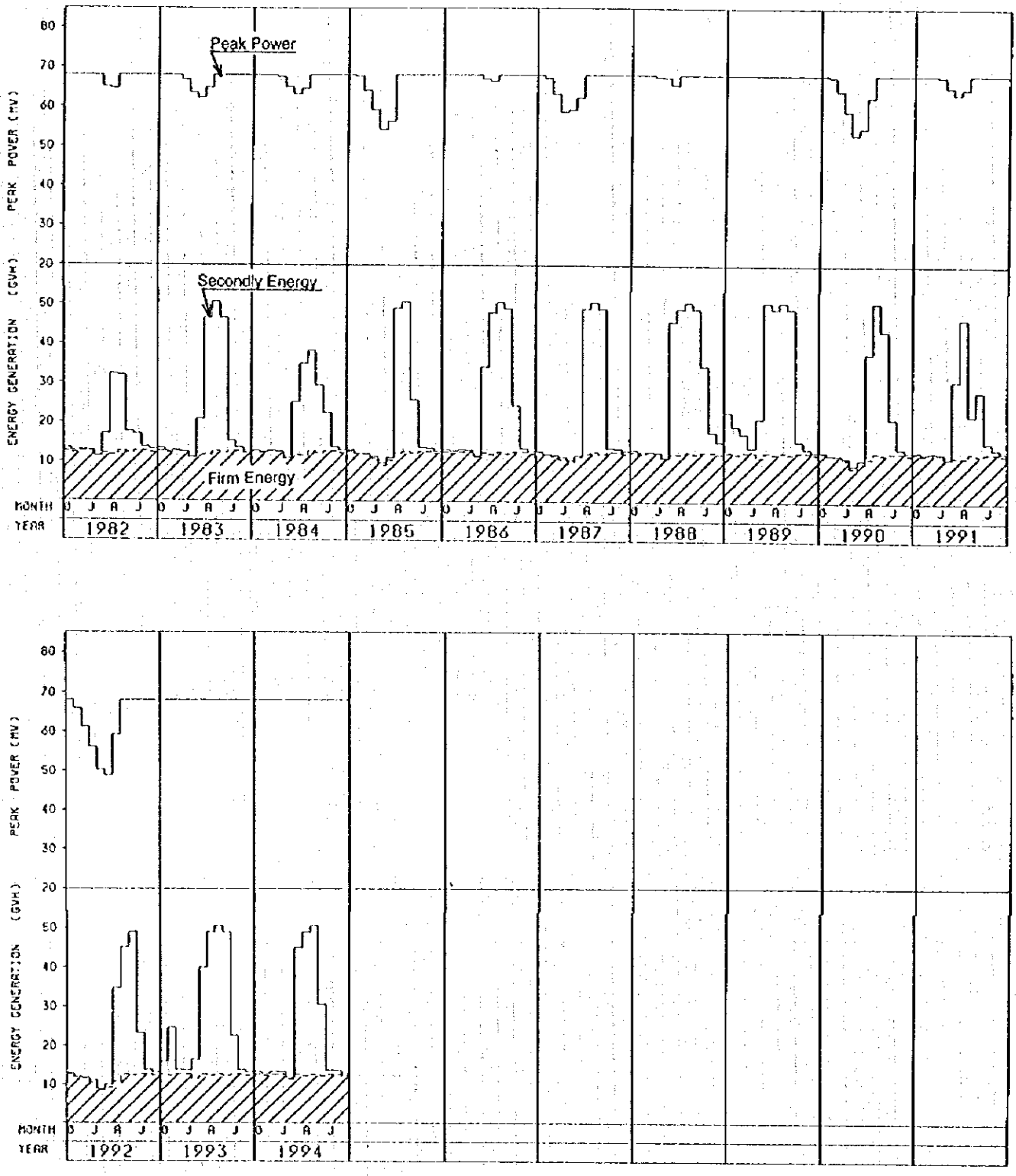


Figure 9-19(3) Energy Generation of Bayram Project

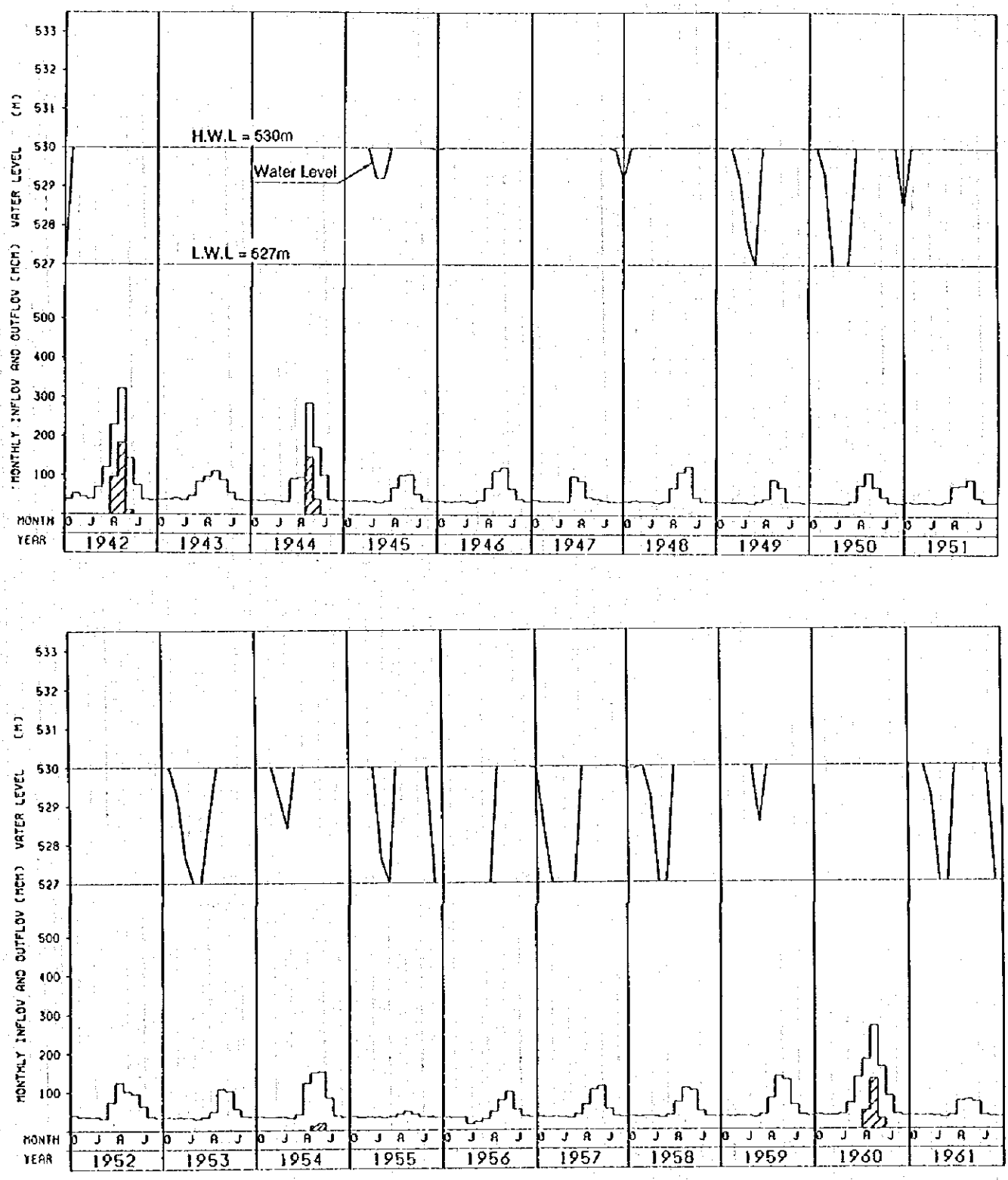


Figure 9-20(1) Reservoir Operation of Bağlık Project

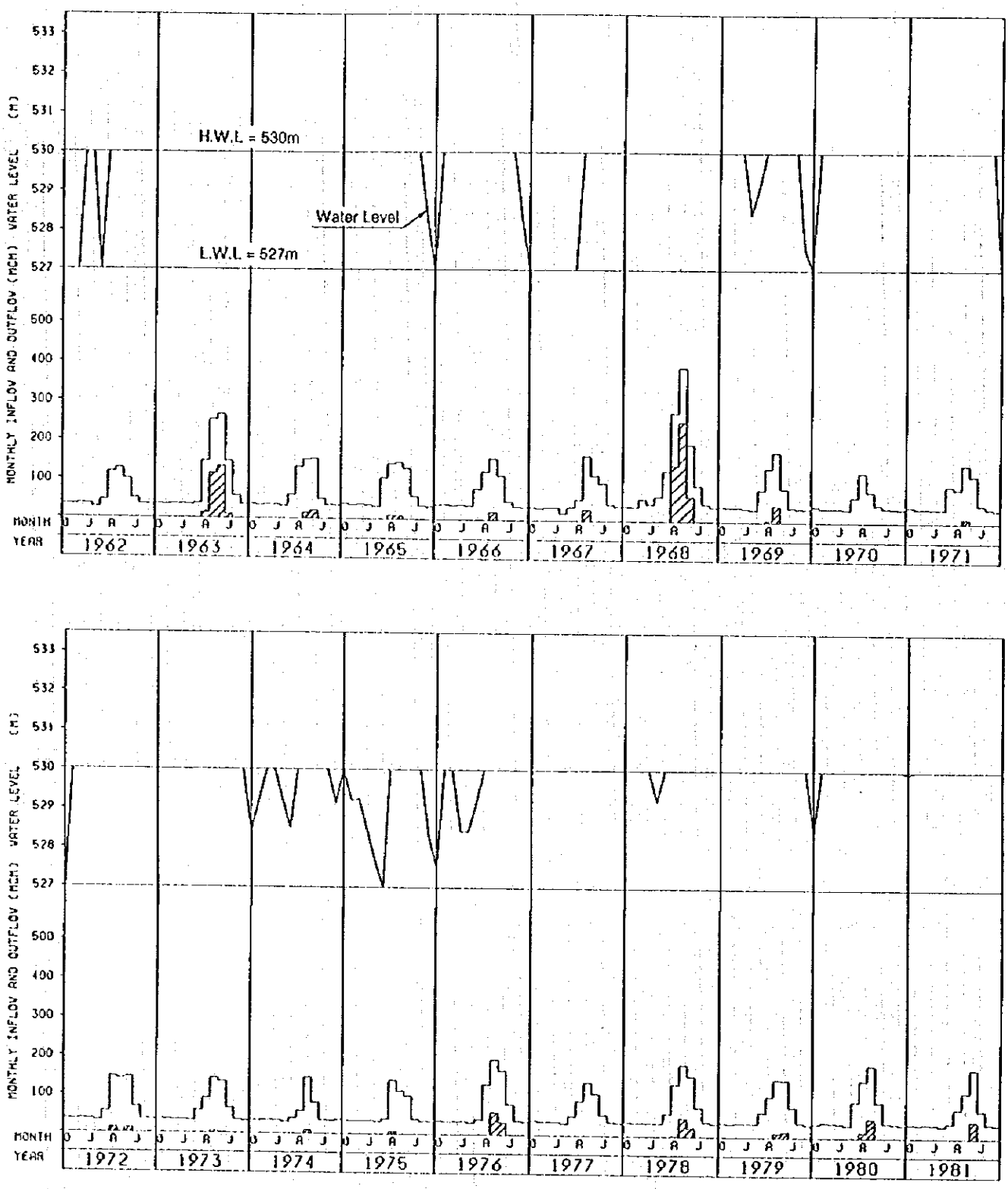


Figure 9-20(2) Reservoir Operation of Bağlık Project

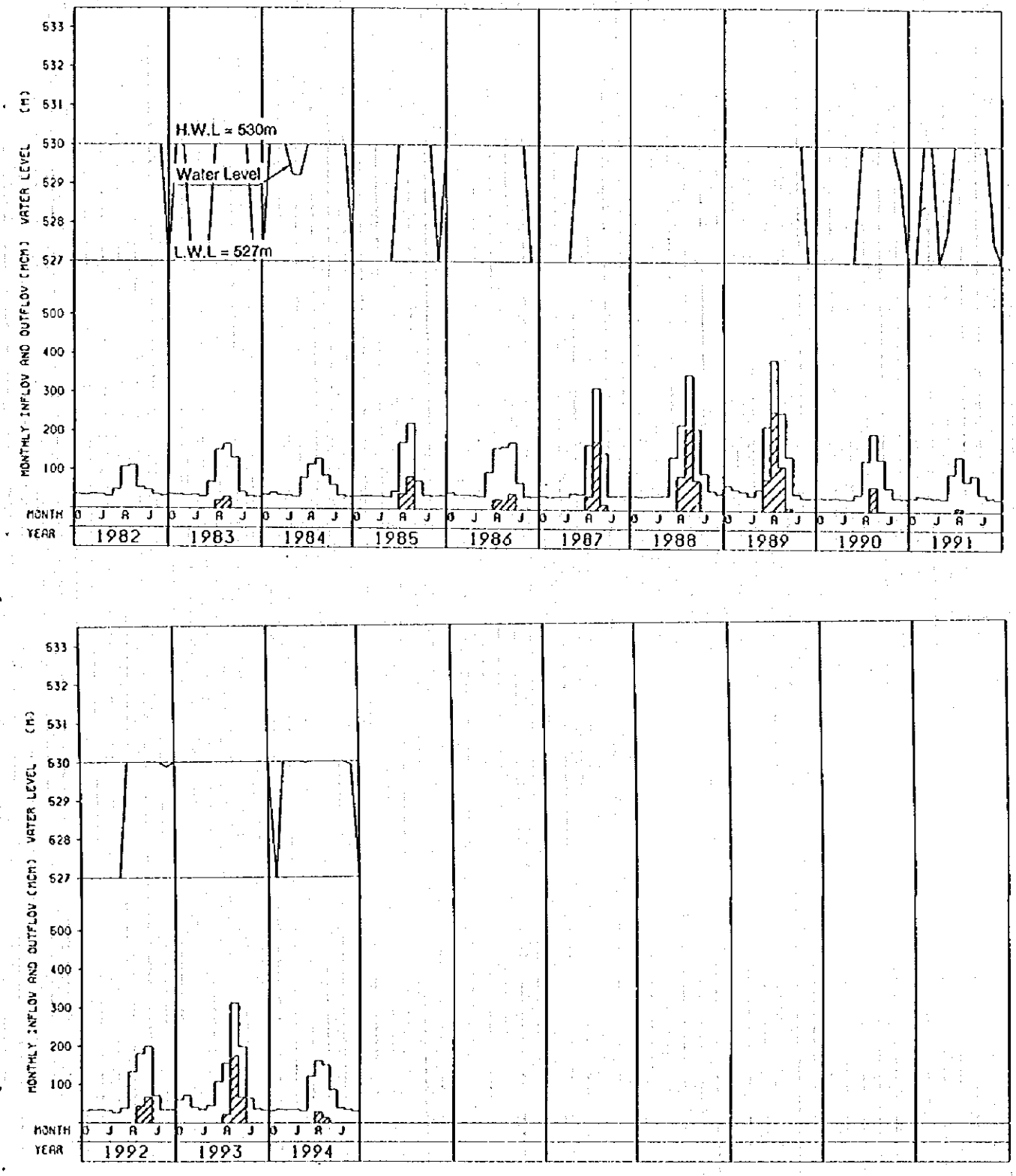


Figure 9-20(3) Reservoir Operation of Bağlık Project

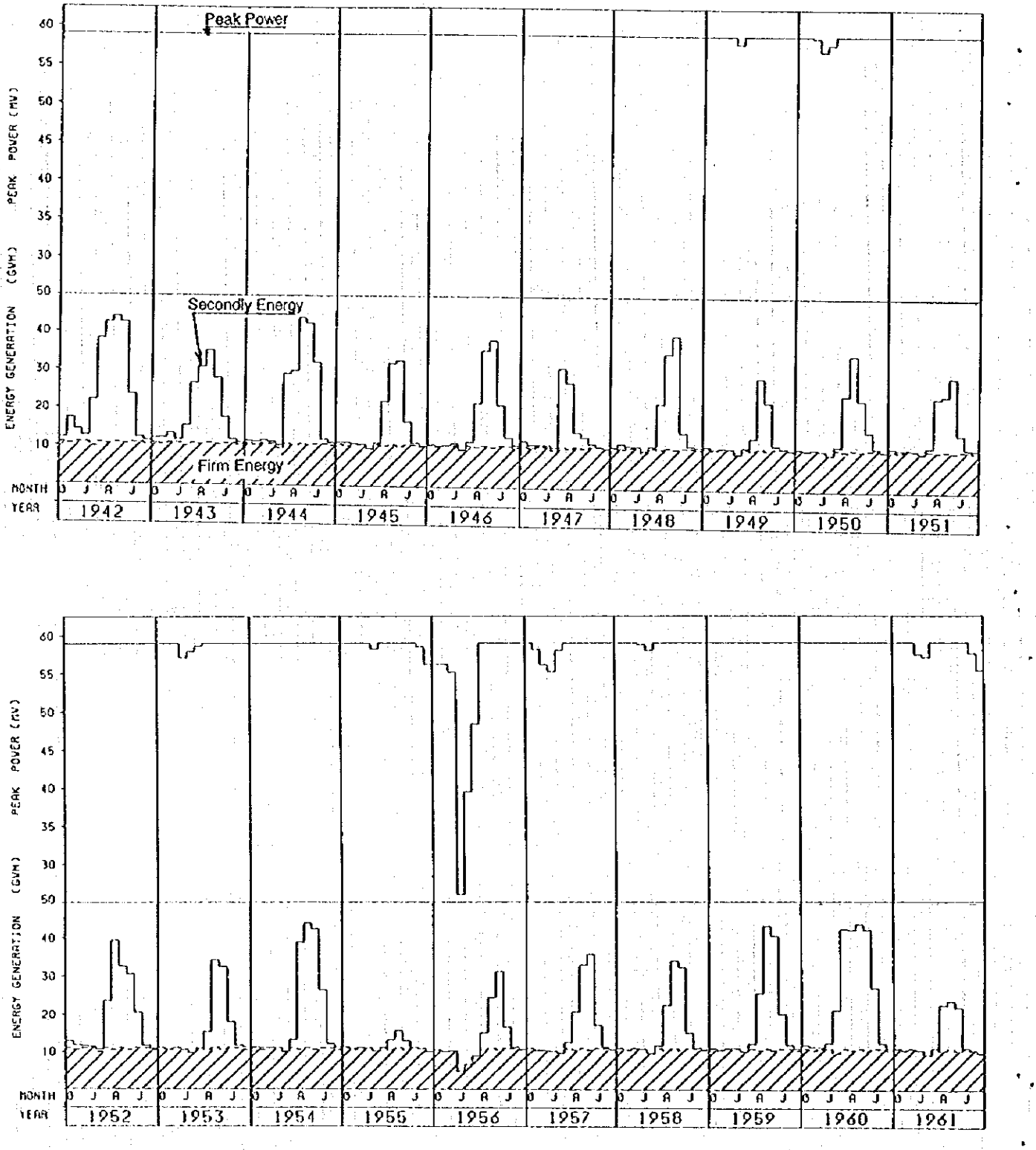


Figure 9-21(1) Energy Generation of Bağlık Project

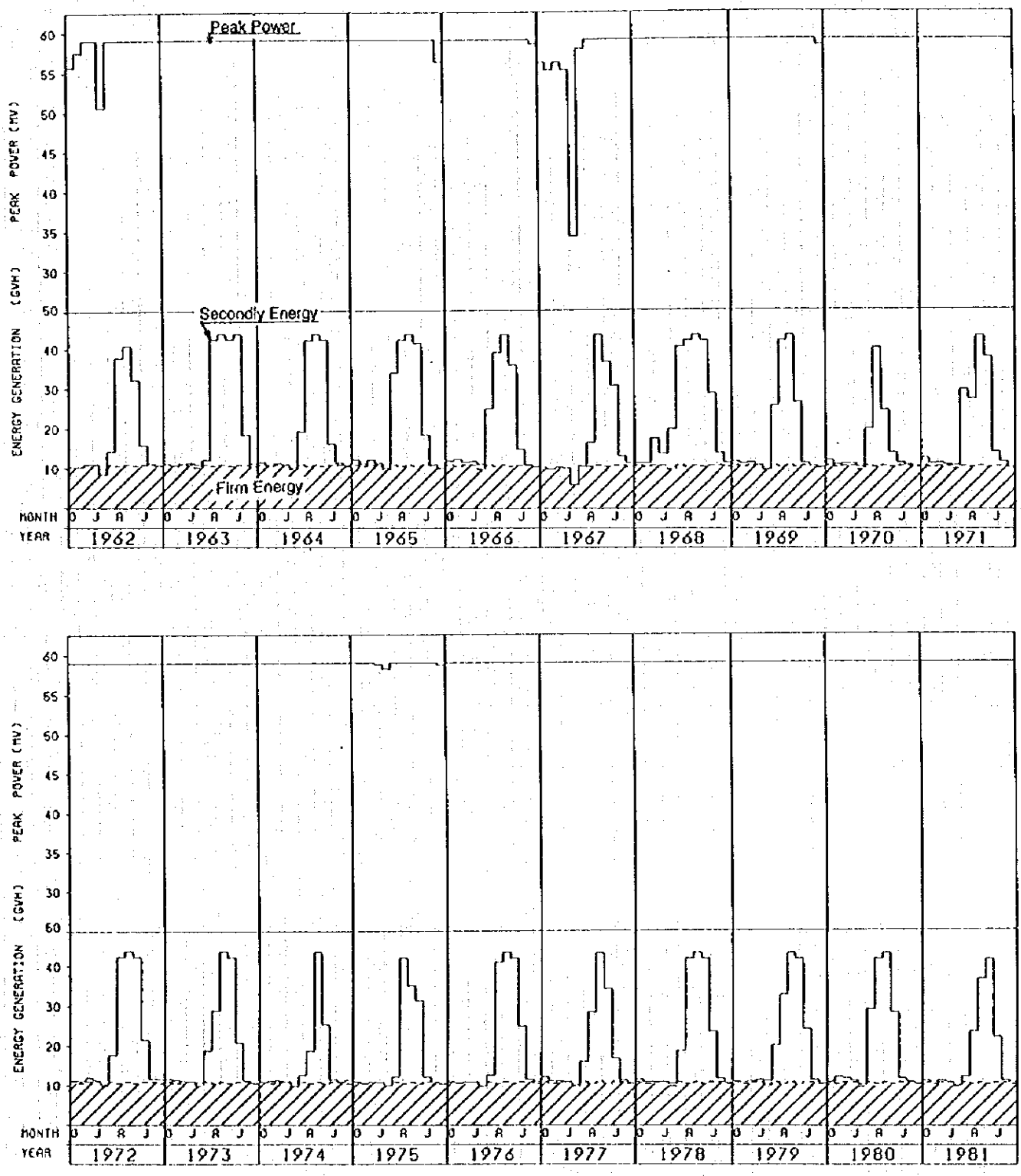


Figure 9-21(2) Energy Generation of Bağlık Project

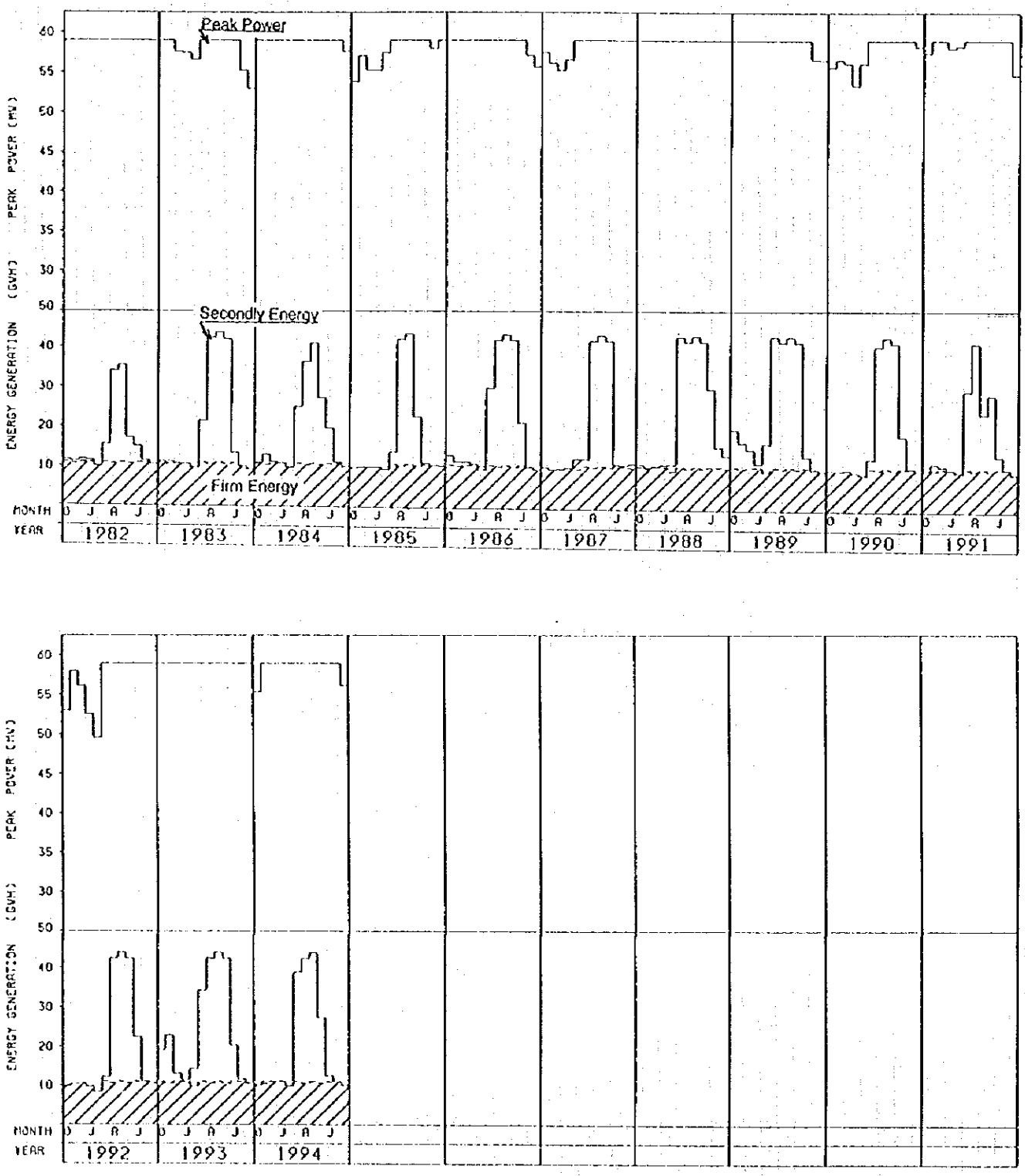


Figure 9-21(3) Energy Generation of Bağlık Project