

## 第10章

# 間 接 効 果



## 第10章 間接効果

### 10.1 一般

一般的に開発途上国と発展国との相違を示す重要な指標の一つは、国内に広く開発された電力系統により都市部のみならず農山村でも電力が有効に利用されているかどうかの点である。地方電化と地域開発とは不可分の関係にあり、フィリピンのごとき石油依存度が著しく高く、且つ国内的にも経済的危機に直面している国に於ては、地方電化の電力コストを低減することは困難で、水力発電、あるいは地熱発電等の自前電源開発による地方電化推進を行うことが唯一の活路と言えよう。本プロジェクト開発による地域社会に及ぼす各種有形、無形の効果は以下に記すごとく著しく大きいものがある。

### 10.2 間接効果

#### (1) フィリピン経済への貢献

Cadawaga水力発電計画は新規精鉱計画を通じて鉱石の付加価値を高めると同時に、受電端電力量29.0GWh はバンカーCの重油に換算して年間5,600トン(約3.7バレル)に相当し、非産油国のフィリピン経済に対する貢献は大きい。

#### (2) 地域住民の福祉の向上及び農村漁業の生産性向上

PALECOに供給予定の2,100kWは、事業実施後10年目の1998年で無点灯部落の約15,000戸の住宅および3,700件の商業需要に対して新規電力供給が可能となり、地域住民の福祉の向上、生活環境の改善に資するところ大である。又、同時に新規電力供給は、農林漁業における中小工業の拡大を促し、農山漁村の収入増加及び雇用増大に資する。

#### (3) 地域開発の活性化

本水力発電計画の計画地点が位置するPalawan島西海岸は道路もなく、小舟による交通手段しか持たない小部落が点在している未開地域である。この地域に発電所建設工事のため海岸に仮設栈橋が築造され、海岸からサイトまで約9kmのアクセス道路が建設される。本計画に伴う建設工事は周辺住民の雇用機会を増大させ、短期間ではあるが住民

の収入増加に資する。また、これら工事用施設は建設終了後も地域の発展に大きく寄与すると考えられる。本計画ではCandawaga 川およびCulasian川の河口付近の集落（現況600戸）にはプロジェクト関連の地元対策として配電する計画としている。

電化を契機とした地域開発として具体的にはCandawaga 下流域およびその周辺地区の農村総合開発が考えられる。例えば、当地域で開発の可能性が大きいと考えられるココナツを対象に、植林、収穫、集荷、処理してコプラを製造する開発を中心にこれに係わる農村開発、地域開発といった計画が実施されれば農村の収入増加と雇用増大につながる。

#### (4) パラワン島全体の電化促進

本水力発電計画による安価な電力がPALECOに供給されることにより、PALECOは発電施設に余裕を持つことになる。PALECOがパラワン島全体の電力需給を基に施設配置計画を見直すことにより、今回対象とした地区以外の地区の電化を促進することになる。

# 付 表



## インフラ施設整備計画 実績・所要投資額 (フィリピン全体)

Unit : million pesos at 1984 price

	Actual 1983	1984	Requirements 1985	1986	1987	1984-87 TOTAL	%
POWER AND ELECTRIFICATION	<u>11,938</u>	<u>7,962</u>	<u>8,193</u>	<u>6,121</u>	<u>8,114</u>	<u>30,390</u>	<u>40</u>
Power	11,029	7,046	7,547	5,059	6,522	26,174	
Electrification	909	916	646	1,062	1,592	4,216	
TRANSPORT	<u>5,924</u>	<u>5,920</u>	<u>4,612</u>	<u>4,269</u>	<u>4,727</u>	<u>19,527</u>	<u>26</u>
Highways	3,644	3,542	2,894	3,159	3,439	12,943	
Railways	1,737	1,192	610	245	284	2,330	
Ports	462	961	956	760	896	3,573	
Airports, Airnavs	81	315	151	105	108	680	
WATER RESOURCES	<u>3,957</u>	<u>3,775</u>	<u>4,995</u>	<u>4,503</u>	<u>5,837</u>	<u>19,110</u>	<u>25</u>
Irrigation	1,777	1,704	2,629	2,611	2,259	9,203	
Water Supply	1,706	1,798	2,133	1,656	3,330	8,917	
Flood Control, Drainage and Shore-Protection	474	273	233	236	248	976	
SOCIAL/RELATED INFRASTRUCTURE	<u>1,216</u>	<u>1,514</u>	<u>1,029</u>	<u>1,186</u>	<u>1,319</u>	<u>5,048</u>	<u>7</u>
School buildings	760	1,206	715	808	918	3,647	
Public health facilities	266	180	184	209	225	797	
City infrastructure	101	116	125	154	158	553	
Official building	89	12	5	15	18	50	
COMMUNICATION	<u>420</u>	<u>251</u>	<u>203</u>	<u>284</u>	<u>485</u>	<u>1,223</u>	<u>2</u>
Communication	386	230	187	259	460	1,135	
Mail	34	21	16	25	25	86	
Others	<u>16</u>	<u>30</u>	<u>21</u>	<u>49</u>	<u>47</u>	<u>147</u>	<u>*</u>
TOTAL	<u>23,471</u>	<u>19,452</u>	<u>19,052</u>	<u>16,412</u>	<u>20,529</u>	<u>75,445</u>	<u>100</u>

Source : Updated Philippine Development Plan, 1984-87

## 年度別エネルギー消費量 (フィリピン全体)

	Unit : Million Barrels of Fuel oil Equivalent							
	1980	1981	Actual 1982	Actual 1983	1984 Plan Target	1984 Actual	1983-84 Growth Rate(%)	1987 Target
INDIGENOUS	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	34.0 (34.5%)	38.3 (40.1%)	39.5 (42.0%)	16.0	72.2 (55.9%)
Conventional	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	19.4 (19.7%)	24.1 (25.2%)	24.5 (26.1%)	26.6	60.8 (47.1%)
Oil	3.8 (4.3%)	1.4 (1.7%)	2.3 (2.8%)	4.7 (4.7%)	2.7 (2.8%)	3.5 (3.7%)	(24.5)	6.3 (4.9%)
Coal	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	2.6 (2.7%)	4.7 (5.0%)	4.1 (4.4%)	57.0	22.5* (17.4%)
Hydro	6.2 (7.0%)	6.4 (7.9%)	6.6 (7.9%)	5.1 (5.2%)	9.3 (9.7%)	9.1 (9.7%)	78.3	15.5 (12.0%)
Geothermal	3.9 (4.4%)	4.8 (5.9%)	6.2 (7.4%)	7.0 (7.1%)	7.4 (7.7%)	7.8 (8.3%)	11.2	16.5 (12.8%)
NONCONVENTIONAL	-	0.6 (0.7%)	0.6 (0.7%)	14.6 (14.9%)	14.2 (14.9%)	15.0 (15.9%)	2.0	11.4 (8.8%)
Bagasse	-	-	-	5.5 (5.6%)	5.4 (5.7%)	6.6 (7.0%)	20.1	
Coconut Husk/shell	-	-	-	3.5 (3.6%)	-	3.2 (3.4%)	(10.0)	5.3
Wood and Woodwaste	-	-	-	4.4 (4.5%)	8.7 (9.1%)	4.0 (4.3%)	(9.9)	(4.1%)
Rice Husk	-	-	-	0.7 (0.7%)	-	0.7 (0.7%)	1.4	
Others	-	0.6 (0.7%)	0.6 (0.7%)	0.5 (0.5%)	0.1 (0.1%)	0.5 (0.5%)	(6.1)	6.1 (4.7%)
IMPORTED	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	64.4 (65.5%)	57.2 (59.6)	54.5 (58.0%)	(15.5)	56.9 (44.1%)
Oil	73.7 (83.3%)	67.1 (82.6%)	66.5 (79.7%)	63.5 (64.5%)	55.6 (58.2%)	53.1 (56.5%)	(16.4)	56.9 (44.1%)
Coal	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	0.9 (1.0%)	1.6 (1.7%)	1.4 (1.5%)	49.5	-
Total	88.5 (100%)	81.2 (100%)	83.4 (100%)	98.4 (100%)	95.5 (100%)	94.0 (100%)	(4.6)	129.1 (100%)
Oil Dependence (%)	87.6	84.4	82.5	69.3	61.0	60.2	(1.3)	49.0
Oil Import Dependence (%)	83.3	82.6	79.7	64.5	58.2	56.5	(2.9)	44.1

Source : Philippine Development Plan, 1983-1987 1984 Philippine Development Report, Statistical Yearbook, 1984

- Note : 1) N.A. is by reason that the rate of Indigenous and Imported amount is unclear  
 2) Target for 1987 is from Five-year Development Plan and is changed in Updated Philippine Development Plan



## 発電設備容量 (フィリピン全体)

	Unit : MW		
	1983	1984	Growth Rate (Percent)
<b>Plant Type</b>			
Hydro	1,585.0(27.6%)	1,666.1(28.2%)	5.1
Geothermal	784.0(13.7%)	894.0(15.1%)	14.0
Coal	119.7( 2.1%)	479.7( 8.1%)	300.8
Oil/Diesel	3,079.7(53.7%)	2,689.3(45.6%)	(-12.7)
Nonconventional*	167.1( 2.9%)	179.8( 3.0%)	7.6
Nuclear	-	-	-
TOTAL	5,735.5(100%)	5,908.9(100%)	3.0
<b>Utility Source</b>			
NPC	5,001.0(87.2%)	5,196.0(87.9%)	3.9
NEA	117.3( 2.0%)	135.0( 2.3%)	15.1
Private Utilities and Self-generating industries	617.2(10.8%)	577.9( 9.8%)	(-6.4)
TOTAL	5,735.5(100%)	5,908.9(100%)	3.0

\*Includes dendrothermal, solar and others.

Sources: Ministry of Energy, National Power Corporation, National  
Electrification Administration, and Board of Energy.

## 発生電力実績 (フィリピン全体)

	Unit : GWh		
	1983	1984	Growth Rate (Percent)
<b>Power Source</b>			
Hydro	2,994(14.0%)	5,256(24.9%)	75.6
Geothermal	4,093(19.1%)	4,536(21.5%)	10.8
Coal	1,155( 5.4%)	1,186( 5.6%)	2.7
Oil/Diesel	12,353(57.5%)	9,310(41.0%)	(-24.6)
Nonconventional*	847( 4.0%)	827( 5.5%)	(-2.4)
Nuclear	-	-	-
TOTAL	21,442(100%)	21,115(100%)	(-1.5)
<b>Utility Source</b>			
NPC	18,682(87.1%)	18,693(88.5%)	0.1
NEA	98( 0.5%)	32( 0.2%)	(-67.3)
Private Utilities and Self-generating industries	2,662(12.4%)	2,390(11.3%)	(-10.2)
TOTAL	21,442(100%)	21,115(100%)	(-1.5)

\*Includes dendrothermal, solar and others.

Sources: Ministry of Energy, National Power Corporation, National Electrification Administration, and Board of Energy.

需要家別電力使用量 (フィリピン全体)

	Unit : GWh		
	1983	1984	Growth Rate (Percent)
Residential	4,116(19.2%)	4,118(19.5%)	-
Commercial	3,451(16.1%)	3,167(15.0%)	(-8.2)
Industrial	8,966(41.8%)	8,656(41.0%)	(-3.5)
Utilities' own use and losses	3,901(18.2%)	4,012(19.0%)	2.8
Others**	1,008( 4.7%)	1,162( 5.5%)	15.3
TOTAL	21,442(100%)	21,115(100%)	(-1.5)

\*Also equal to NPC, NEA and other power plants' generation.

\*\*Includes consumption by government offices, streetlights, irrigation/water supply.

Sources: Ministry of Energy

1984年時点電化率状況 (フィリピン全体)

Item	Potential Connections ( '000)	Actual Household Connections ( '000)	Percent Coverage
Cooperatives	5,722	2,500	43.7
Private*	3,178	1,700	53.5
TOTAL	8,900	4,200	47.2

\*Estimates.

Sources: Ministry of Energy and National Electrification Administration.

## 電力共同組合状況 (フィリピン全体)

	1982	1983	1984
Cooperative	112	118	120
Municipalities Electrified	1,149	1,195	1,220
Barangay Electrified	15,779	17,140	18,250
Household Connections	2,031,040	2,284,000	2,485,000
Peak Load (kW)	595,732	604,250	598,000
Load Factor(%)	35.05	38.18	40.37
MWh Purchased/Generated	2,326,624	2,599,126	2,727,000
MWh Sold	1,829,339	2,020,778	2,115,000
Coop Consumption(MWh)	12,730	13,526	
Systems Loss(%)	21.4	22.3	22.4
Average Systems Rate(P)	0.73	0.92	
Average Power Cost/kWh(P)	0.41	0.54	

Source: National Electrification Administration

## PALECO電化状況

	1982	1983	1984
1. Municipalities			
-Coverage	4	4	6
-Electrified	4	4	6
2. Barangays			
-Coverage	124	124	152
-Electrified	59	66	90
3. No. of Consumer			
-Coverage	14,358	18,070	24,524
-Electrified	9,807	11,674	13,728
Residential	7,840	9,262	10,724
Commercial	1,626	1,985	2,471
Industrial	4	6	4
Public Buildings	337	421	529
Street Lights	(625)	(648)	(737)
4. Generation Capacity(kW)	6,350	6,700	6,830
5. Energy Generation (kWh)	8,504,609	9,156,110	8,949,392
6. Energy sold (kWh)	7,102,787	7,499,223	7,280,120
Residential	2,037,011	2,183,154	2,256,952
Commercial	2,720,141	2,609,506	1,849,017
Industrial	414,252	698,413	1,353,959
Public Buildings	1,789,507	1,861,575	1,660,557
Street Lights	141,876	146,575	159,635
7. Coop. Consumption (kWh)	165,773	221,763	144,663
8. System Loss (kWh)	1,236,049	1,435,124	1,524,609
" (%)	15	16	17
9. Peak Load (kW)	2,430	2,780	2,835

## PALECO電力単価

		1982	1983	1984
1. Energy Sold(kWh)	A	7,102,787	7,499,223	7,280,120
2. Operating Revenues (P)	B	13,246,211	15,553,586	25,123,793
3. Expenses (P)	C	14,691,212	17,028,925	26,750,716
-Operating Expenses	D	11,378,766	13,161,178	22,123,078
-Power Generation Expenses	E	9,026,689	10,570,139	18,358,494
-Interest	F	1,771,546	2,316,899	2,867,249
-Depreciation	G	1,540,900	1,550,848	1,762,389
4. Power Generation Unit Cost(P/kWh)	D/A	1.2709	1.4095	2.5217
5. Unit Cost(P/kWh)	C/A	2.0684	2.2708	3.6745
6. Average Selling Rate(P/kWh)	B/A	1.8649	2.0740	3.4510

## PALECO電化状況(Narra)

	1982	1983	1984
1. Municipalities			
-Coverage	2	2	2
-Electrified	2	2	2
2. Barangays			
-Coverage	37	37	37
-Electrified	21	23	28
3. No. of Consumer			
-Coverage	4,978	5,660	7,156
-Electrified	2,574	3,078	3,495
Residential	1,982	2,334	2,617
Commercial	502	619	722
Industrial	-	-	-
Public Buildings	90	125	156
Street Lights	(63)	(94)	(105)
4. Generation Capacity(kW)	700	800	800
5. Energy Generation (kWh)	806,721	1,104,274	980,776
6. Energy Sold (kWh)	623,444	802,654	785,725
Residential	288,548	336,163	337,088
Commercial	240,447	330,739	281,879
Public Buildings	53,656	88,750	119,189
Street Lights	40,793	47,002	47,569
7. Coop. Consumption (kWh)	52,611	111,225	23,596
8. System Loss (kWh)	130,666	190,395	171,455
" (%)	16%	17%	17%
9. Peak Load (kW)	300	350	350

## PALECO電化狀況(BROOKE'S POINT)

	1982	1983	1984
1. Municipalities			
-Coverage	1	1	1
-Electrified	1	1	1
2. Barangays			
-Coverage	27	27	27
-Electrified	5	10	12
3. No. of Consumer			
-Coverage	2,354	5,063	5,275
-Electrified	854	1,417	1,692
Residential	681	1,087	1,260
Commercial	149	287	375
Industrial	-	-	-
Public Buildings	24	43	57
Street Lights	(12)	(10)	(23)
4. Generation Capacity(kW)	150	400	400
5. Energy Generation (kWh)	137,306	319,534	491,033
6. Energy sold (kWh)	106,226	245,823	406,816
Residential	63,906	136,021	210,984
Commercial	34,285	87,523	162,509
Industrial	-	-	-
Public Buildings	6,954	20,586	30,348
Street Lights	1,081	1,693	2,975
7. Coop. Consumption (kWh)	4,511	5,609	12,286
8. System Loss (kWh)	26,569	68,102	71,931
" (%)	19%	21%	15%
9. Peak Load (kW)	130	230	210



## RIO TUBA 鉱山 電力状況

	Running Hours	Total Energy Generated (kWh)	Total Fuel Consumption (Liters)
1977	24,545	5,144,440	1,673,203
1978	25,091	6,952,606	2,137,186
1979	22,043	6,202,932	1,888,378
1980	18,343	5,276,176	1,623,004
1981	14,762	4,349,070	1,328,074
1982	16,230	3,793,762	1,190,960
			A-971,253 C-219,437
1983	11,735	2,130,264	712,563
			A- 53,682 C-658,881
1984	13,593	2,136,404	696,265
			A- 33,656 C-662,609

Note: A: Diesel Oil  
C: Bunker C

	Energy Consumption (kWh)					
	Drying & Crushing	Plant-site	Town-site	Mine-site	Power Plant	Pier-site
1977	4,211,156	200,024	95,424	2,332	256,515	64,568
1978	5,427,568	286,462	589,462	8,671	317,012	90,757
1979	4,737,673	261,566	521,944	42,944	306,227	100,464
1980	3,792,900	297,636	595,512	30,742	243,752	84,622
1981	2,633,444	400,429	708,488	87,231	235,639	50,921
1982	1,935,366	406,170	698,480	143,730	308,659	97,412
1983	193,624	418,872	707,496	128,556	394,930	74,864
1984	223,297	388,891	740,976	118,640	389,617	66,274

## RIO TUBA鉱山 ディーゼル発電 kWA単価

Item	1981	1982	1983	1984
Total Cost (P x 1000)1/	5,028.5	4,640.6	2,479.1	2,800.7
Distributed Energy (MWh)2/	4,113.5	3,485.1	1,735.4	1,746.8
kWh Unit Cost (P/kWh)	1.22	1.33	1.43	1.60
" (\$/kWh)	0.1557	0.1572	0.1285	0.0958

Note 1/ Except interest and depreciation

2/ Except auxiliary use

## 人口增加率想定

Year	ABORLAN	NARRA	BROOKE'S POINT	QUEZON	BATARAZA	MARCOS
1975-1980	2.45 <sup>1/</sup>	3.57 <sup>1/</sup>	4.61 <sup>1/</sup>	4.52 <sup>1/</sup>	2.99 <sup>1/</sup>	-
1980-1985	2.2	3.2	4.0	4.5	3.5	3.5
1985-1990	2.0	2.8	3.5	4.5	3.5	4.0
1990-1995	1.8	2.4	3.0	4.0	3.5	3.5
1995-2000	1.6	2.0	2.6	3.5	3.0	3.0
2000-2005	1.4	1.7	2.2	3.0	2.6	2.6
2005-	1.2	1.4	1.8	2.6	2.2	2.2

Note: <sup>1/</sup> Actual

1) The population growth rate for Aborlan has decreased in recent years and this trend is envisioned to continue hereafter. However, PIADP is planning the construction of numerous feeder roads into the area, and accordingly the population decrease is expected to be less than that originally projected by the Provincial Government Office.

2) The Provincial Government Office projected that the population growth rates in Narra and Brooke's Point would decrease suddenly. Although some decrease may occur due to promotion of family planning, migration to the area is also forecasted in view of its large area. Accordingly, a sudden, drastic decrease in the population growth rate is not envisioned.

3) Quezon and Marcos have large tracts of fertile cultivative lands. Main and feeder roads are now being built and, if electrification also progresses, a large population increase is forecasted. Even at present, the population is growing rapidly due to both migration and the high birth rate.

民生用電力需要想定 (全体)

Year	ABORLAN		NARRA		BROOKE'S POINT		QUEZON		BATARAZA		MARCOS		TOTAL	
	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)
1989	138	185	398	608	413	555	82	105	67	80	28	31	1,127	1,564
1990	159	515	466	1,711	509	1,643	105	319	85	241	34	89	1,357	4,517
1991	183	593	538	1,984	614	1,988	130	396	104	298	39	104	1,609	5,362
1992	209	679	615	2,273	732	2,376	158	483	126	362	46	121	1,886	6,294
1993	222	722	653	2,419	864	2,811	190	583	151	434	49	130	2,129	7,100
1994	235	767	693	2,575	1,011	3,298	226	696	179	515	53	141	2,397	7,993
1995	249	816	735	2,741	1,175	3,844	267	825	211	607	57	152	2,694	8,984
1996	264	866	781	2,923	1,256	4,119	288	891	226	652	61	163	2,876	9,613
1997	279	919	831	3,117	1,342	4,414	311	962	242	701	65	175	3,070	10,288
1998	296	975	883	3,324	1,435	4,730	335	1,040	260	753	70	188	3,278	11,010
1999	313	1,148	939	3,857	1,533	5,626	361	1,259	278	918	75	232	3,500	13,041
2000	331	1,218	999	4,112	1,639	6,027	389	1,360	298	986	81	249	3,736	13,952
2001	350	1,289	1,059	4,371	1,745	6,431	417	1,462	319	1,055	86	267	3,975	14,874
2002	369	1,365	1,122	4,646	1,857	6,862	447	1,571	341	1,129	92	285	4,229	15,859
2003	390	1,445	1,190	4,938	1,977	7,322	480	1,689	364	1,208	98	305	4,499	16,908
2004	412	1,530	1,262	5,250	2,105	7,814	515	1,816	389	1,293	105	326	4,787	18,028
2005	436	1,620	1,338	5,580	2,241	8,339	552	1,952	415	1,384	112	348	5,094	19,223
2006	459	1,712	1,414	5,915	2,377	8,864	590	2,090	442	1,475	119	371	5,401	20,427
2007	484	1,809	1,495	6,269	2,521	9,422	631	2,238	470	1,572	126	395	5,727	21,707
2008	510	1,912	1,580	6,645	2,674	10,016	674	2,397	500	1,676	135	421	6,073	23,067

表 4-3  
表 4-4

民生用電力需要想定 (ABORLAN)

Year	Coverage		Residential				Commercial				Total	
	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)
1980	11,799	2,185										
1 1989	14,240	2,637	1,450	80	116	106	363	170	62	79	138	185
2 1990	14,524	2,690	1,614	83	134	294	403	179	72	221	159	515
3 1991	14,786	2,738	1,780	87	154	337	445	187	83	256	183	593
4 1992	15,052	2,787	1,951	90	176	385	488	197	96	294	209	679
5 1993	15,323	2,838	1,986	94	186	407	497	207	103	315	222	722
6 1994	15,599	2,889	2,022	97	197	431	506	217	110	336	235	767
7 1995	15,880	2,941	2,058	101	208	456	515	228	117	359	249	816
8 1996	16,134	2,988	2,091	105	220	482	523	239	125	383	264	866
9 1997	16,392	3,036	2,125	109	233	509	531	251	133	409	279	919
10 1998	16,654	3,084	2,159	114	246	538	540	264	142	436	296	975
11 1999	16,921	3,133	2,193	118	260	683	548	277	152	466	313	1,148
12 2000	17,191	3,184	2,228	123	274	721	557	291	162	497	331	1,218
13 2001	17,432	3,228	2,260	128	289	761	565	305	172	529	350	1,289
14 2002	17,676	3,273	2,291	133	305	802	573	321	184	563	369	1,365
15 2003	17,923	3,319	2,323	139	322	846	581	337	196	599	390	1,445
16 2004	18,174	3,366	2,356	144	339	892	589	353	208	638	412	1,530
17 2005	18,429	3,413	2,389	150	358	941	597	371	222	680	436	1,620
18 2006	18,650	3,454	2,418	156	377	990	604	390	235	722	459	1,712
19 2007	18,874	3,495	2,447	162	397	1,042	612	409	250	767	484	1,809
20 2008	19,100	3,537	2,476	169	417	1,097	619	430	266	815	510	1,912

民生用電力需要想定 (NARRA)

Year	Coverage		Residential				Commercial				Total	
	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)
1980	30,099	5,375										
1 1989	39,348	7,026	3,865	80	309	282	1,159	220	255	326	398	608
2 1990	40,450	7,223	4,334	83	361	790	1,300	231	300	921	466	1,711
3 1991	41,421	7,397	4,808	87	416	911	1,442	243	350	1,073	538	1,984
4 1992	42,166	7,530	5,271	90	474	1,039	1,581	255	403	1,235	615	2,273
5 1993	42,925	7,665	5,366	94	502	1,100	1,610	267	430	1,320	653	2,419
6 1994	43,698	7,803	5,462	97	532	1,164	1,639	281	460	1,411	693	2,575
7 1995	44,484	7,944	5,561	101	563	1,233	1,668	295	492	1,508	735	2,741
8 1996	45,374	8,103	5,672	105	597	1,308	1,702	310	527	1,615	781	2,923
9 1997	46,282	8,265	5,785	109	633	1,387	1,736	325	564	1,730	831	3,117
10 1998	47,207	8,430	5,901	114	672	1,471	1,770	341	604	1,852	883	3,324
11 1999	48,151	8,598	6,019	118	713	1,873	1,806	358	647	1,984	939	3,857
12 2000	49,114	8,770	6,139	123	756	1,987	1,842	376	693	2,125	999	4,112
13 2001	49,949	8,920	6,244	128	800	2,102	1,873	395	740	2,269	1,059	4,371
14 2002	50,798	9,071	6,350	133	846	2,223	1,905	415	790	2,423	1,122	4,646
15 2003	51,662	9,225	6,458	139	895	2,351	1,937	436	844	2,587	1,190	4,938
16 2004	52,540	9,382	6,568	144	946	2,487	1,970	457	901	2,763	1,262	5,250
17 2005	53,433	9,542	6,679	150	1,001	2,630	2,004	480	962	2,950	1,338	5,580
18 2006	54,181	9,675	6,773	156	1,055	2,774	2,032	504	1,025	3,141	1,414	5,915
19 2007	54,940	9,811	6,868	162	1,113	2,925	2,060	529	1,091	3,344	1,495	6,269
20 2008	55,709	9,948	6,964	169	1,174	3,085	2,089	556	1,161	3,561	1,580	6,645

民生用電力需要想定 (BROOKE'S POINT)

Coverage		Residential					Commercial				Total		
Year	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	
1980	46,320	8,908											
1	1989	64,669	12,436	4,353	80	346	318	1,088	170	185	237	413	555
2	1990	66,932	12,872	5,149	83	428	938	1,287	179	230	704	509	1,643
3	1991	68,940	13,258	5,966	87	516	1,131	1,492	187	280	857	614	1,988
4	1992	71,009	13,656	6,828	90	614	1,346	1,707	197	336	1,030	732	2,376
5	1993	73,139	14,065	7,736	94	724	1,586	1,934	207	400	1,225	864	2,811
6	1994	75,333	14,487	8,692	97	846	1,853	2,173	217	471	1,446	1,011	3,298
7	1995	77,593	14,922	9,699	101	982	2,150	2,425	228	552	1,694	1,175	3,844
8	1996	79,611	15,310	9,951	105	1,048	2,294	2,488	239	595	1,825	1,256	4,119
9	1997	81,680	15,708	10,210	109	1,118	2,448	2,553	251	641	1,966	1,342	4,414
10	1998	83,804	16,116	10,476	114	1,193	2,612	2,619	264	691	2,118	1,435	4,730
11	1999	85,983	16,535	10,748	118	1,273	3,345	2,687	277	744	2,281	1,533	5,626
12	2000	88,219	16,965	11,027	123	1,358	3,569	2,757	291	802	2,458	1,639	6,027
13	2001	90,159	17,338	11,270	128	1,443	3,793	2,817	305	860	2,637	1,745	6,431
14	2002	92,143	17,720	11,518	133	1,534	4,032	2,879	321	923	2,830	1,857	6,862
15	2003	94,170	18,110	11,771	139	1,631	4,286	2,943	337	991	3,037	1,977	7,322
16	2004	96,242	18,508	12,030	144	1,733	4,555	3,008	353	1,063	3,259	2,105	7,814
17	2005	98,359	18,915	12,295	150	1,842	4,841	3,074	371	1,141	3,497	2,241	8,339
18	2006	100,130	19,256	12,516	156	1,950	5,126	3,129	390	1,219	3,738	2,377	8,864
19	2007	101,932	19,602	12,741	162	2,065	5,427	3,185	409	1,303	3,996	2,521	9,422
20	2008	103,767	19,955	12,971	169	2,186	5,745	3,243	430	1,393	4,271	2,674	10,016

民生用電力需要想定 (QUEZON)

Coverage		Residential					Commercial				Total		
Year	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	
1980	10,063	1,864											
1	1989	14,955	2,991	897	80	72	68	179	170	31	39	82	105
2	1990	15,628	3,126	1,094	83	91	199	219	179	39	120	105	319
3	1991	16,253	3,251	1,300	87	113	246	260	187	49	149	130	396
4	1992	16,903	3,381	1,521	90	137	300	304	197	60	184	158	483
5	1993	17,579	3,516	1,758	94	165	360	352	207	73	223	190	583
6	1994	18,282	3,656	2,011	97	196	429	402	217	87	268	226	696
7	1995	19,013	3,803	2,282	101	231	506	456	228	104	319	267	825
8	1996	19,679	3,936	2,361	105	249	544	472	239	113	346	288	891
9	1997	20,368	4,074	2,444	109	268	586	489	251	123	376	311	962
10	1998	21,080	4,216	2,530	114	288	631	506	264	133	409	335	1,040
11	1999	21,818	4,364	2,618	118	310	815	524	277	145	445	361	1,259
12	2000	22,582	4,516	2,710	123	334	877	542	291	158	483	389	1,360
13	2001	23,259	4,652	2,791	128	357	939	558	305	170	523	417	1,462
14	2002	23,957	4,791	2,875	133	383	1,006	575	321	184	565	447	1,571
15	2003	24,676	4,935	2,961	139	410	1,078	592	337	199	611	480	1,689
16	2004	25,416	5,083	3,050	144	439	1,155	610	353	216	661	515	1,816
17	2005	26,179	5,236	3,141	150	471	1,237	628	371	233	715	552	1,952
18	2006	26,859	5,372	3,223	156	502	1,320	645	390	251	770	590	2,090
19	2007	27,557	5,511	3,307	162	536	1,408	661	409	271	830	631	2,238
20	2008	28,274	5,655	3,393	169	572	1,503	679	430	292	894	674	2,397

## 民生用電力需要想定 (BATARAZA)

Coverage			Residential				Commercial				Total	
Year	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)
1980	8,696	1,850										
1 1989	11,852	2,522	756	80	81	55	113	170	19	25	67	80
2 1990	12,267	2,610	913	83	76	166	137	179	24	75	85	241
3 1991	12,696	2,701	1,081	87	93	205	162	187	30	93	104	298
4 1992	13,140	2,796	1,258	90	113	248	189	197	37	114	126	362
5 1993	13,600	2,894	1,447	94	135	297	217	207	45	137	151	434
6 1994	14,076	2,995	1,647	97	160	351	247	217	54	164	179	515
7 1995	14,569	3,100	1,860	101	188	412	279	228	64	195	211	607
8 1996	15,006	3,193	1,916	105	202	442	287	239	69	211	226	652
9 1997	15,456	3,289	1,973	109	216	473	296	251	74	228	242	701
10 1998	15,920	3,387	2,032	114	231	507	305	264	80	246	260	753
11 1999	16,397	3,489	2,093	118	248	651	314	277	87	267	278	918
12 2000	16,889	3,593	2,156	123	266	698	323	291	94	288	298	986
13 2001	17,328	3,687	2,212	128	283	745	332	305	101	311	319	1,055
14 2002	17,779	3,783	2,270	133	302	795	340	321	109	335	341	1,129
15 2003	18,241	3,881	2,329	139	323	848	349	337	118	360	364	1,208
16 2004	18,715	3,982	2,389	144	344	905	358	353	127	388	389	1,293
17 2005	19,202	4,086	2,451	150	367	965	368	371	136	418	415	1,384
18 2006	19,625	4,175	2,505	156	390	1,026	376	390	146	449	442	1,475
19 2007	20,056	4,267	2,560	162	415	1,090	384	409	157	482	470	1,572
20 2008	20,497	4,361	2,617	169	441	1,159	393	430	169	517	500	1,676

## 民生用電力需要想定 (MARCOS)

Coverage			Residential				Commercial				Total	
Year	Popula- tion	House- hold	Household Electri- fied	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Number	Average Demand (W)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)
1980	2,168	401										
1 1989	3,012	602	331	80	27	24	33	170	6	7	28	31
2 1990	3,133	627	376	83	31	68	38	179	7	21	34	89
3 1991	3,242	648	422	87	36	80	42	187	8	24	39	104
4 1992	3,356	671	470	90	42	93	47	197	9	28	46	121
5 1993	3,473	695	486	94	46	100	49	207	10	31	49	130
6 1994	3,595	719	503	97	49	107	50	217	11	33	53	141
7 1995	3,721	744	521	101	53	115	52	228	12	36	57	152
8 1996	3,832	766	537	105	56	124	54	239	13	39	61	163
9 1997	3,947	789	553	109	61	133	55	251	14	43	65	175
10 1998	4,066	813	569	114	65	142	57	264	15	46	70	188
11 1999	4,188	838	586	118	69	182	59	277	16	50	75	232
12 2000	4,313	863	604	123	74	195	60	291	18	54	81	249
13 2001	4,426	885	620	128	79	209	62	305	19	58	86	267
14 2002	4,541	908	636	133	85	223	64	321	20	62	92	285
15 2003	4,659	932	652	139	90	237	65	337	22	67	98	305
16 2004	4,780	956	669	144	96	253	67	353	24	73	105	326
17 2005	4,904	981	687	150	103	270	69	371	25	78	112	348
18 2006	5,012	1,002	702	156	109	287	70	390	27	84	119	371
19 2007	5,122	1,024	717	162	116	305	72	409	29	90	126	395
20 2008	5,235	1,047	733	169	124	325	73	430	31	97	135	421

民生・RIO TUBA 鉱山電力需要想定

Year	Rio Tuba Mine		under PALECO		TOTAL		
	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	Peak Demand (kW)	Energy Demand (MWh)	
1	1989	8,500	74,460	1,127	1,564 <sup>1/</sup>	9,627	76,024
2	1990	8,500	74,460	1,357	4,517	9,857	78,977
3	1991	8,500	74,460	1,609	5,362	10,109	79,822
4	1992	8,500	74,460	1,886	6,294	10,386	80,754
5	1993	8,500	74,460	2,129	7,100	10,629	81,560
6	1994	8,500	74,460	2,397	7,993	10,897	82,453
7	1995	8,500	74,460	2,694	8,984	11,194	83,444
8	1996	8,500	74,460	2,876	9,613	11,376	84,073
9	1997	8,500	74,460	3,070	10,288	11,570	84,748
10	1998	8,500	74,460	3,278	11,010	11,778	85,470
11	1999	8,500	74,460	3,500	13,041	12,000	87,501
12	2000	8,500	74,460	3,736	13,952	12,236	88,412
13	2001	8,500	74,460	3,975	14,874	12,475	89,334
14	2002	8,500	74,460	4,229	15,859	12,729	90,319
15	2003	8,500	74,460	4,499	16,908	12,999	91,368
16	2004	8,500	74,460	4,787	18,028	13,287	93,488
17	2005	8,500	74,460	5,094	19,223	13,594	93,683
18	2006	8,500	74,460	5,401	20,427	13,901	94,887
19	2007	8,500	74,460	5,727	21,707	14,227	96,167
20	2008	8,500	74,460	6,073	23,067	14,573	97,527

<sup>1/</sup> Between August and December 1989.



## 計画電力需給

Year	Energy Demand Rio Tuba (MWh)	Hydropower Energy <u>1/</u>			Required Diesel Supply (MWh)	
		Total Supply (MWh)	PALECO Use (MWh)	Available for Rio Tuba (MWh)		
1	1989	72,600	17,090 <sup>2/</sup>	1,410 <sup>2/</sup>	15,680 <sup>2/</sup>	56,920
2	1990	72,600	29,020	4,080	24,940	47,660
3	1991	72,600	29,020	4,850	24,170	48,430
4	1992	72,600	29,020	5,690	23,330	49,270
5	1993	72,600	29,020	6,420	22,600	50,000
6	1994	72,600	29,020	6,420	22,600	50,000
7	1995	72,600	29,020	6,420	22,600	50,000
8	1996	72,600	29,020	6,420	22,600	50,000
9	1997	72,600	29,020	6,420	22,600	50,000
10	1998	72,600	29,020	6,420	22,600	50,000
11	1999	72,600	29,020	6,420	22,600	50,000
12	2000	72,600	29,020	6,420	22,600	50,000
13	2001	72,600	29,020	6,420	22,600	50,000
14	2002	72,600	29,020	6,420	22,600	50,000
15	2003	72,600	29,020	6,420	22,600	50,000
16	2004	72,600	29,020	6,420	22,600	50,000
17	2005	72,600	29,020	6,420	22,600	50,000
18	2006	72,600	29,020	6,420	22,600	50,000
19	2007	72,600	29,020	6,420	22,600	50,000
20	2008	72,600	29,020	6,420	22,600	50,000

Note: 1/ Considering energy loss; stop factor, auxiliary use loss of transmission line and transformers.

2/ Between August and December, 1979.

kw · kWh 価値計算一覽表

Discription	Unit	Remarks		
I. Alternative Diesel Plant				
Installed Capacity	5,000kw x 3 Unit			
Annual Operation Hours	8,760hr			
Service Life	17 years			
Generator Terminal Energy	10,000 x 8,760 x 0.85 = 74,460MWh	Plant Factor 85%		
Auxiliary Power Use	2.5%			
Annual Generated Energy	74,460 x (1 - 0.025) = 72,599MWh			
Construction Cost	1,200 x 10 <sup>6</sup> yen			
II. Power Value				
kw Value		$CRF = \frac{0.08(1+0.08)^{17}}{(1+0.08)^{17}-1} = 0.11$		
1) Capital Recovery Cost	1,200 x 10 <sup>6</sup> x 0.11 = 132 x 10 <sup>6</sup> yen	Interest 8%		
2) O&M and Administrative Cost	1,200 x 10 <sup>6</sup> x 0.031 = 37.2 x 10 <sup>6</sup> yen	Ratio 3.1%		
3) Total Fixed Cost	169.2 x 10 <sup>6</sup> yen	1)+2)		
4) Unit Fixed Cost per kW	11,280 yen/kW	Adjustment Factor for kW Value $\alpha = 0.97$		
5) kW value	11,280 x 0.97 = 10,940 yen/kW			
kWh Value				
1) Fuel Cost	71.01 yen/ℓ	4.9076 ℓ/ℓ x 1.066 x 13.573 ¥/ℓ = 71.01 yen/ℓ		
2) Fuel Consumption per kWh	0.204 ℓ/kWh			
3) Fuel Cost per kWh	71.01 x 0.204 = 14.49 yen/kWh	Adjustment Factor for kWh Value $\beta = 1.00$		
4) kWh Value	14.49 + (1 - 0.025) x 1.00 = 14.86 yen/kWh			
Loss	(kW) (kWh)			
	Hydro Diesel Hydro Diesel			
Transmission Loss	4.8%	4.1%	2.0%	$= \frac{(1-0.048)(1-0.005)(1-0.01)(1-0.02)}{(1-0.005)(1-0.02)(1-0.025)} = 0.97$
Forced Dutage	0.5	-	-	
Auxiliary Power Use	1.0	0.5	2.5	
Overhaul	2.0	(5.0)	-	$= \frac{(1-0.041)(1-0.005)}{(1-0.02)(1-0.025)} = 1.00$

取水地点最適案検討表

Item	Intake I.W.L. Outlet T.W.L. Case No.	Candawaga R.		Candawaga R.		Candawaga R.		Candawaga R.		Candawaga R.	
		280m 101m 1	63m 79m 2	30.8 30.8 30.8	1.5x7,700 1.5x7,000 1.5x9,700	1.5x7,000 1.5x7,000 1.5x9,700	72m 101m 4	79m 101m 5	63m 79m 6	235m 79m 7	101m 101m 8
Catchment Area	km <sup>2</sup>	30.0	30.8	30.8	30.8	30.8	30.8	30.8	32.9	32.9	32.9
Water Way											
Channel	m	1.5x7,200	1.5x7,700	1.5x7,000	1.5x9,700	1.5x6,400	1.5x7,100	1.5x5,750	1.5x6,700	1.5x6,700	1.5x6,700
Penstock	m	370	552	600	490	310	380	510	250	250	250
Access Road	m	12,200	9,500	10,900	9,400	12,200	9,500	10,900	12,200	12,200	12,200
Connection Road	m	2,200	2,800	3,300	2,600	2,200	4,100	4,400	1,900	1,900	1,900
Power Plant Scheme											
Intake Water Level	EL.m	280	260	260	260	260	235	235	235	235	235
Head Tank Water Level	EL.m	272.8	252.3	253.0	250.3	253.6	227.9	229.2	228.3	228.3	228.3
Tailrace Water Level	EL.m	101	63	79	72	101	63	79	101	101	101
Effective Head	m	168.8	185.1	170.1	174.5	149.4	161.5	146.8	124.2	124.2	124.2
Maximum Discharge	m <sup>3</sup> /s	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85
Maximum Output	kW	5,470	6,000	5,520	5,660	4,840	5,240	4,760	4,030	4,030	4,030
Annual Generated Energy	GWh	28.8	32.1	29.5	30.3	25.9	29.1	26.4	22.2	22.2	22.2
Construction Cost	10 <sup>6</sup> ¥	4,051	3,950	3,964	4,307	3,827	3,833	3,770	3,729	3,729	3,729
Construction Cost per kWh	¥/kWh	140.8	123.1	134.4	142.1	147.8	131.7	142.8	168.0	168.0	168.0
Benefit/Cost Ratio	B/C	0.943	1.078	0.987	0.933	0.897	1.007	0.929	0.790	0.790	0.790
Benefit - Cost	10 <sup>6</sup> ¥	-23.4	31.1	-5.3	-29.3	-39.8	2.6	-27.3	-79.5	-79.5	-79.5

最大取水量最適案検討表

Item	Case	Proposed Culasian P/S Scheme			Alternative Candawaga P/S Scheme						
		Qmax = 3.5m <sup>3</sup> /s	3.7	3.85	4.1	4.3	Qmax = 3.5m <sup>3</sup> /s	3.7	3.85	4.1	4.7
Catchment Area	Km <sup>2</sup>			30.8							
Intake Water Level	EL.m			260.0							
Head tank Water Level	EL.m			252.3							
Tailrace Water Level	EL.m			63.0							
Effective Head	m	184.9	185.0	185.1	185.2	185.3	168.6	168.7	168.8	168.9	169.0
Maximum Discharge	m <sup>3</sup> /s	3.5	3.7	3.85	4.1	4.3	3.5	3.7	3.85	4.1	4.3
Maximum Output	kW	5,450	5,770	6,000	6,400	6,710	4,960	5,250	5,470	5,830	6,120
Annual Generated Energy	GWh	30.6	31.5	32.1	32.7	33.1	27.6	28.3	28.8	29.4	29.8
Number of Generator	unit	2	2	2	2	2	2	2	2	2	2
Construction Cost	10 <sup>6</sup> ¥	3,813	3,887	3,950	4,057	4,141	3,939	4,005	4,051	4,136	4,200
Construction Cost per kWh	¥/kWh	124.2	123.4	123.1	124.1	125.1	142.8	141.5	140.7	140.7	140.9
Benefit/Cost Ratio		1.068	1.075	1.078	1.069	1.060	0.929	0.937	0.943	0.943	0.941
Benefit - Cost	10 <sup>6</sup> ¥	26.1	29.4	31.1	28.3	25.1	-28.2	-25.6	-23.4	-24.0	-25.2

Note: Fuel Cost per kWh : 14.86¥/kWh  
Annual Cost for Hydropower Plant is 10.13% of Construction Cost.

計畫月別出力・發生電力量

Hydropower Generation for 1975-1984 Candawaga-Culassian Scheme Intake: EL. 260.00 m C.A.: 30.8 sq. km R: 3.85 CMS

Year	Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave./T	
1975	(CMS)	3.849	3.237	2.228	1.588	1.246	2.989	3.056	3.707	3.849	3.849	3.849	3.849	3.849	3.849
	EffHead (m)	185.020	186.372	188.017	188.775	189.089	186.685	186.736	185.371	185.020	185.020	185.020	185.020	185.020	185.020
	Output (kW)	5999.9	5133.5	3469.1	2541.3	1933.2	4710.7	4780.7	5806.1	5999.9	5999.9	5999.9	5999.9	5999.9	5999.9
	G. Enrgy. (MWh)	4463.99	3443.03	2381.05	1829.79	1460.63	3391.77	3556.85	4319.77	4319.99	4463.99	4319.99	4319.99	4452.55	42603.40
	(CMS)	3.646	2.253	1.310	0.833	0.589	1.522	2.519	2.396	2.554	2.815	2.815	2.815	2.815	2.324
EffHead (m)	185.490	187.972	189.035	189.379	189.527	181.493	187.433	187.562	185.667	187.104	186.620	186.085	182.865	182.865	
Output (kW)	5715.3	3537.3	2080.6	1273.0	813.1	2364.0	3968.0	3759.7	5571.6	4442.0	4812.0	5291.7	3638.5	3638.5	
G. Enrgy. (MWh)	4252.20	2461.99	1347.97	916.60	605.02	1702.10	2952.24	2804.66	4011.59	3304.89	3464.67	3937.08	31961.00	31961.00	
1976	(CMS)	2.303	1.535	0.996	0.532	0.318	1.150	3.538	3.619	3.849	3.849	3.849	3.849	3.849	3.285
	EffHead (m)	187.909	188.836	189.280	170.579	110.058	93.734	185.727	185.558	185.020	185.048	186.312	187.722	171.307	171.307
	Output (kW)	3596.5	2482.2	1528.3	717.3	432.0	1797.2	5561.0	5678.4	5999.9	5988.2	5156.8	3778.6	3568.6	3568.6
	G. Enrgy. (MWh)	2675.80	1654.64	1137.09	516.46	321.42	1294.03	4131.40	4224.77	4319.99	4455.23	3712.90	2811.28	31261.00	31261.00
	(CMS)	1.508	0.935	0.626	0.353	0.226	0.637	1.740	2.082	2.866	3.803	3.803	3.803	3.803	3.085
EffHead (m)	188.858	189.325	189.508	25.276	67.032	185.502	85.546	169.950	185.454	185.135	185.276	186.626	153.832	153.832	
Output (kW)	2413.0	1418.7	877.4	87.0	665.3	895.3	469.4	2701.8	4330.6	5937.3	5859.7	4875.2	2591.8	2591.8	
G. Enrgy. (MWh)	1795.28	953.39	652.79	62.67	495.03	644.62	349.25	2010.20	3478.05	4417.39	4218.99	3627.16	22704.80	22704.80	
1979	(CMS)	1.751	1.004	0.651	0.353	0.226	0.637	1.740	2.082	2.866	3.803	3.803	3.803	3.803	3.290
	EffHead (m)	188.595	189.277	189.495	170.285	189.398	188.470	185.212	185.360	187.010	185.020	185.844	186.233	185.788	185.788
	Output (kW)	2762.8	1543.1	919.8	1237.3	1203.7	2539.1	5900.1	5802.0	4522.0	5999.9	5999.9	5189.0	3651.9	3651.9
	G. Enrgy. (MWh)	2055.58	1036.99	684.34	890.87	895.62	1838.16	4389.69	4316.70	3235.87	4463.99	4312.89	3860.66	31991.40	31991.40
	(CMS)	1.987	1.514	0.917	0.773	0.812	1.639	3.775	3.706	2.866	3.849	3.849	3.849	3.849	3.359
EffHead (m)	188.323	188.809	189.361	189.031	187.426	185.033	185.360	185.855	185.995	185.995	185.995	187.390	187.594	187.594	
Output (kW)	3126.5	2490.0	1387.8	1122.4	1617.1	3770.1	5994.4	5811.4	5388.9	4168.1	4168.1	3830.8	3684.8	3684.8	
G. Enrgy. (MWh)	2326.12	1676.69	1032.56	808.17	1203.15	2710.43	4459.90	4323.75	3925.14	4009.40	3001.04	2887.35	32367.80	32367.80	
1981	(CMS)	3.164	2.040	1.113	0.664	0.381	1.750	2.725	3.600	3.261	3.107	3.060	3.772	3.772	2.391
	EffHead (m)	186.422	188.257	189.192	189.489	128.398	162.921	187.183	185.599	186.208	186.594	186.680	185.216	180.101	180.101
	Output (kW)	4972.2	3202.0	1735.0	941.8	521.0	2728.3	4265.4	5651.3	5113.5	4911.4	4842.0	5895.7	3739.6	3739.6
	G. Enrgy. (MWh)	3699.35	2151.75	1230.85	678.14	387.66	1964.43	3173.47	4204.62	3681.78	3654.13	3486.29	4386.42	32758.90	32758.90
	(CMS)	2.399	1.370	0.842	0.688	0.827	1.972	2.905	2.424	1.990	2.340	1.970	1.299	1.299	1.756
EffHead (m)	187.749	188.987	189.384	189.468	91.135	187.950	186.921	187.601	188.317	187.720	188.359	189.044	180.056	180.056	
Output (kW)	3775.3	2185.0	1255.4	985.5	1291.9	3090.6	4577.8	3808.3	3125.3	3675.5	3092.3	2061.0	2750.1	2750.1	
G. Enrgy. (MWh)	2808.87	1468.37	934.05	709.59	961.17	2233.23	3405.91	2833.38	2250.24	2734.58	2226.52	1533.45	24891.30	24891.30	
1983	(CMS)	0.869	0.300	0.000	0.000	0.000	1.109	3.353	3.759	3.757	3.849	3.849	3.849	3.849	2.076
	EffHead (m)	189.362	121.848	0.000	0.000	0.000	74.675	186.078	185.234	185.275	185.020	185.020	185.020	124.966	124.966
	Output (kW)	1300.6	490.9	0.0	0.0	0.0	1724.9	5274.4	5871.0	5877.3	5999.9	5999.9	5999.9	3231.8	3231.8
	G. Enrgy. (MWh)	967.64	329.90	0.00	0.00	0.00	1241.94	3924.17	4368.05	4231.70	4463.99	4319.99	4463.99	28311.40	28311.40
	(CMS)	3.706	3.072	1.762	1.696	2.405	3.209	3.153	3.500	3.306	3.829	3.829	3.849	3.849	3.113
EffHead (m)	185.387	186.644	188.587	188.569	187.579	186.292	186.467	185.823	186.186	185.076	185.020	185.020	186.385	186.385	
Output (kW)	5807.2	4850.4	2786.8	2686.1	3761.3	5027.7	4967.7	5512.6	5211.6	5972.9	5999.9	5999.9	4883.8	4883.8	
G. Enrgy. (MWh)	4320.58	3375.89	2073.44	1933.99	2798.45	3619.57	3895.97	4101.38	3752.41	4443.90	4319.99	4463.99	42899.50	42899.50	
Ave/T	(CMS)	2.518	1.693	1.045	0.768	0.808	1.839	2.916	3.216	3.298	3.470	3.314	3.124	2.338	2.338
	EffHead (m)	187.311	176.987	170.183	150.118	134.125	158.915	176.234	184.351	186.104	185.773	186.073	186.361	173.561	173.561
	Output (kW)	3946.9	2660.8	1604.0	1159.2	1226.9	2864.7	4575.9	5041.3	5170.3	5431.6	5192.1	4895.6	3653.4	3653.4
	G. Enrgy. (MWh)	2936.54	1851.92	1193.41	834.63	912.81	2062.64	3404.48	3750.73	3722.67	4041.15	3738.32	3642.39	32091.70	32091.70

## 代替 CANDAWAGA 發電所案 主要諸元

Item		Description	Remarks
River for Intake		Candawaga River	
Power Station Location		along Candawaga River	
River for Outlet		Candawaga River	
Catchment Area	km <sup>2</sup>	30.8	
Outline of Development Scheme			
Generation Method		Run-of-River Type	
Intake Water Level	EL.m	280	
Tailrace Water Level	EL.m	101	
Gross Head	m	179	
Maximum Output	kW	5,470	
Maximum Discharge	m <sup>3</sup> /s	3.85	
Effective Head	m	168.8	
Minimum Output	kW	700	
Annual Generated Energy	GWh	28.8	10 years average
Outline of Facilities			
Intake Dam			
Type		Concrete Gravity	
Height x Crest Length	m	14 x 50	
Water Way Length (total)	m	7,520	
Open Channel	m	7,200	
Tunnel	m	-	
Penstock Line	m	320	φ1,650-620mm
Powerhouse		each 2,870kW x 2 unit	Horizontal Shaft Francis Turbine
Transmission Line	km	39.5	69kV x 1cct
Substation	unit	2	
Access Road	m	12,200	
Connection Road	m	2,600	
Construction Cost	10 <sup>6</sup> ¥	4,051	
Construction Cost per kWh	¥/kWh	140.7	
Benefit/Cost Ratio	B/C	0.943	Annual Cost 10.13%
Benefit - Cost	10 <sup>6</sup> ¥	-23.4	at Consumer End

## 代替 CANDAWAGA 發電所案 概算工事費

	Unit : million yen
1. Civil Works	<u>2,013.5</u>
(1) Intake dam	187.7
(2) Intake	48.2
(3) Settling basin	39.0
(4) Headrace	809.0
(5) Head tank (incl. over-flow section)	116.2
(6) Penstock	89.2
(7) Powerhouse (house, basement)	182.9
(8) Miscellaneous works (incl. temporary works)	541.3
2. Electrico-mechanical Facility	<u>803.9</u>
(1) Power equipments (turbine, generator, transformer etc.)	543.3
(2) Rio Tuba Side Substation	103.8
(3) Transmission line (incl. distribution line to Candawaga & Culasian)	156.8
3. Land Acquisition and Compensation	<u>31.5</u>
4. Administration	<u>598.2</u>
5. Physical Contingency	<u>333.9</u>
6. Interest during construction period	<u>270.0</u>
TOTAL	<u><u>4,051</u></u>

年度別平均 水力発電コスト

Year	Discount Rate	5.9%	unit Million Yen										Capital Recovery Cost (¥/kWh)		
			Book Value	Interest	Depreciation	Real Property Tax	Personnel Expense	Repair Expense	Others Expense	Adminis-ration Expense	Total Fixed Expense	Fixed Cost (¥/kWh)		Discount Value Factor	Accumu-lated Value (¥/kWh)
1	1988	3,950.00	233.05	79.00	11.43	15.80	3.95	2.49	394.87	13.01	0.944287	12.85	12.85	1.059000	13.61
2	1989	3,871.00	228.39	79.00	11.43	15.80	3.95	2.49	389.23	13.41	0.891678	11.96	24.81	0.544673	13.51
3	1991	3,792.00	223.73	78.00	11.43	15.80	3.95	2.49	383.58	13.22	0.842000	11.13	35.94	0.373418	13.42
4	1992	3,713.00	219.07	78.00	11.43	15.80	3.95	2.49	383.07	13.20	0.795090	10.50	46.43	0.287931	13.37
5	1993	3,634.00	214.41	79.00	11.43	15.80	3.95	2.49	377.32	13.00	0.750793	9.76	56.20	0.239751	13.30
6	1994	3,555.00	209.75	79.00	11.43	15.80	3.95	2.49	371.57	12.80	0.708964	9.06	65.27	0.202724	13.23
7	1995	3,476.00	205.08	79.00	11.43	15.80	3.95	2.49	365.81	12.61	0.669466	8.44	73.71	0.178489	13.16
8	1996	3,397.00	200.42	79.00	11.43	15.80	3.95	2.49	360.06	12.41	0.632168	7.84	81.56	0.160399	13.08
9	1997	3,318.00	195.76	79.00	11.43	15.80	3.95	2.49	354.31	12.21	0.596948	7.29	88.84	0.146383	13.01
10	1998	3,239.00	191.10	79.00	11.43	15.80	3.95	2.49	348.55	12.01	0.563690	6.77	95.61	0.135225	12.93
11	1999	3,160.00	186.44	79.00	11.43	15.80	3.95	2.49	342.80	11.81	0.532285	6.29	101.80	0.126145	12.85
12	2000	3,081.00	181.78	79.00	11.43	15.80	3.95	2.49	337.05	11.61	0.502830	5.84	107.74	0.118624	12.78
13	2001	3,002.00	177.12	79.00	11.43	15.80	3.95	2.49	331.30	11.42	0.474627	5.42	113.16	0.112301	12.71
14	2002	2,923.00	172.46	79.00	11.43	15.80	3.95	2.49	325.54	11.22	0.448184	5.03	118.19	0.106920	12.64
15	2003	2,844.00	167.80	79.00	11.43	15.80	3.95	2.49	319.79	11.02	0.423215	4.66	122.85	0.102291	12.57
16	2004	2,765.00	163.14	79.00	11.43	15.80	3.95	2.49	314.04	10.82	0.399636	4.32	127.17	0.098274	12.50
17	2005	2,686.00	158.47	79.00	11.43	15.80	3.95	2.49	308.28	10.62	0.377371	4.01	131.18	0.094760	12.43
18	2006	2,607.00	153.81	79.00	11.43	15.80	3.95	2.49	302.53	10.42	0.356347	3.71	134.90	0.091664	12.37
19	2007	2,528.00	149.15	79.00	11.43	15.80	3.95	2.49	296.78	10.23	0.336494	3.44	138.34	0.088922	12.30
20	2008	2,449.00	144.49	79.00	11.43	15.80	3.95	2.49	291.02	10.03	0.317747	3.19	141.52	0.086476	12.24
21	2009	2,370.00	139.83	79.00	11.43	15.80	3.95	2.49	285.27	9.83	0.300944	2.95	144.47	0.084291	12.18
22	2010	2,291.00	135.17	79.00	11.43	15.80	3.95	2.49	279.52	9.63	0.285328	2.73	147.20	0.082325	12.12
23	2011	2,212.00	130.51	78.00	11.43	15.80	3.95	2.49	273.76	9.43	0.269543	2.52	149.73	0.080551	12.06
24	2012	2,133.00	125.85	79.00	11.43	15.80	3.95	2.49	268.01	9.24	0.252637	2.33	152.06	0.078944	12.00
25	2013	2,054.00	121.18	79.00	11.43	15.80	3.95	2.49	262.26	9.04	0.238562	2.16	154.22	0.077485	11.95
26	2014	1,975.00	116.53	79.00	11.43	15.80	3.95	2.49	256.50	8.84	0.225271	1.99	156.21	0.076156	11.90
27	2015	1,896.00	111.86	79.00	11.43	15.80	3.95	2.49	250.75	8.64	0.212720	1.84	158.05	0.074942	11.84
28	2016	1,817.00	107.20	79.00	11.43	15.80	3.95	2.49	245.00	8.44	0.200869	1.70	159.74	0.073830	11.79
29	2017	1,738.00	102.54	79.00	11.43	15.80	3.95	2.49	239.24	8.24	0.189678	1.56	161.30	0.072811	11.74
30	2018	1,659.00	97.88	79.00	11.43	15.80	3.95	2.49	233.49	8.05	0.179111	1.44	162.75	0.071873	11.70
31	2019	1,580.00	93.22	79.00	11.43	15.80	3.95	2.49	227.74	7.85	0.169132	1.33	164.07	0.071010	11.65
32	2020	1,501.00	88.56	79.00	11.43	15.80	3.95	2.49	221.98	7.65	0.159709	1.22	165.30	0.070214	11.61
33	2021	1,422.00	83.90	78.00	11.43	15.80	3.95	2.49	216.23	7.45	0.150811	1.12	166.42	0.069478	11.56
34	2022	1,343.00	79.24	79.00	11.43	15.80	3.95	2.49	210.48	7.25	0.142409	1.03	167.45	0.068797	11.52
35	2023	1,264.00	74.58	79.00	11.43	15.80	3.95	2.49	204.73	7.05	0.134475	0.95	168.40	0.068167	11.48
36	2024	1,185.00	69.92	79.00	11.43	15.80	3.95	2.49	198.97	6.88	0.126983	0.87	169.27	0.067582	11.44
37	2025	1,106.00	65.25	79.00	11.43	15.80	3.95	2.49	193.22	6.68	0.119908	0.80	170.07	0.067038	11.40
38	2026	1,027.00	60.59	79.00	11.43	15.80	3.95	2.49	187.47	6.46	0.113228	0.73	170.80	0.066533	11.36
39	2027	948.00	55.93	79.00	11.43	15.80	3.95	2.49	181.71	6.26	0.106920	0.67	171.47	0.066063	11.33
40	2028	869.00	51.27	79.00	11.43	15.80	3.95	2.49	175.96	6.06	0.100963	0.61	172.08	0.065626	11.29
41	2029	790.00	46.61	79.00	11.43	15.80	3.95	2.49	170.21	5.87	0.095338	0.56	172.64	0.065218	11.26
42	2030	711.00	41.95	79.00	11.43	15.80	3.95	2.49	164.45	5.67	0.090026	0.51	173.15	0.064837	11.23
43	2031	632.00	37.29	79.00	11.43	15.80	3.95	2.49	158.70	5.47	0.085011	0.46	173.62	0.064482	11.20
44	2032	553.00	32.63	79.00	11.43	15.80	3.95	2.49	152.95	5.27	0.080275	0.42	174.04	0.064150	11.16
45	2033	474.00	27.97	79.00	11.43	15.80	3.95	2.49	147.19	5.07	0.075802	0.38	174.42	0.063839	11.14

表1



年度別平均 ディーゼル発電コスト

Year	Discount Rate (%)	Million Yen										Capital Recovery Cost (Yen/kWh)						
		Book Value	Interest	Deprecia- tion	Real Property Tax	Personnel Expense	Repair Expense	Others Expense	Administ- ration Expense	Total Fixed Expense	Fixed Cost		Fuel Cost (Y/J)	Variable Unit Cost (Y/kWh)	Unit kWh (Y/kWh)	Discount Value (Y/kWh)	Accum- ulated Value (Y/kWh)	Capital Recovery Factor
1	1989	1,200.00	96.00	63.60	25.65	16.00	25.08	1.20	3.38	230.91	3.18	74.78	15.49	18.67	0.925920	17.28	1.080000	18.67
2	1990	1,136.40	90.91	63.60	24.29	16.00	25.08	1.20	3.38	224.40	3.08	75.75	15.68	18.78	0.857339	16.10	0.580789	18.72
3	1991	1,072.80	85.82	63.60	22.93	16.00	25.08	1.20	3.38	218.02	3.00	76.73	15.88	18.89	0.793882	15.00	0.380084	18.77
4	1992	1,009.20	80.74	63.60	21.57	16.00	25.08	1.20	3.38	211.97	2.95	77.73	16.10	19.04	0.730959	14.00	0.301921	18.83
5	1993	945.60	75.65	63.60	20.21	16.00	25.08	1.20	3.38	207.37	2.89	78.74	16.31	19.16	0.669583	13.00	0.250456	18.89
6	1994	882.00	70.56	63.60	18.85	16.00	25.08	1.20	3.38	200.77	2.77	79.76	16.52	19.28	0.609170	12.15	0.216315	18.94
7	1995	818.40	65.47	63.60	17.49	16.00	25.08	1.20	3.38	194.17	2.67	80.80	16.73	19.41	0.550490	11.32	0.192072	19.00
8	1996	754.80	60.38	63.60	16.13	16.00	25.08	1.20	3.38	187.57	2.58	81.85	16.95	19.53	0.493269	10.55	0.174015	19.05
9	1997	691.20	55.30	63.60	14.78	16.00	25.08	1.20	3.38	180.97	2.48	82.81	17.17	19.66	0.440240	9.84	0.160080	19.10
10	1998	627.60	50.21	63.60	13.42	16.00	25.08	1.20	3.38	174.38	2.40	83.89	17.39	19.80	0.400393	9.17	0.148028	19.14
11	1999	564.00	45.12	63.60	12.07	16.00	25.08	1.20	3.38	167.78	2.31	85.08	17.62	19.93	0.428883	8.55	0.140076	19.19
12	2000	500.40	40.03	63.60	10.72	16.00	25.08	1.20	3.38	161.18	2.22	86.37	17.85	20.07	0.397114	7.97	0.132095	19.24
13	2001	436.80	34.94	63.60	9.37	16.00	25.08	1.20	3.38	154.58	2.13	87.71	18.08	20.21	0.367088	7.43	0.128522	19.28
14	2002	373.20	29.86	63.60	8.02	16.00	25.08	1.20	3.38	147.98	2.04	89.10	18.32	20.36	0.338401	6.93	0.121287	19.33
15	2003	309.60	24.77	63.60	6.67	16.00	25.08	1.20	3.38	141.38	1.95	90.50	18.56	20.50	0.312522	6.48	0.116880	19.37
16	2004	246.00	19.68	63.60	5.32	16.00	25.08	1.20	3.38	134.78	1.86	91.94	18.80	20.65	0.289289	6.03	0.112977	19.41
17	2005	182.40	14.59	63.60	4.33	16.00	25.08	1.20	3.38	128.19	1.77	93.44	19.04	20.81	0.267258	5.62	0.108659	19.45
18	2006	120.00	9.50	63.60	3.34	16.00	25.08	1.20	3.38	121.60	1.68	94.94	19.28	21.07	0.246218	5.23	0.104128	19.49
19	2007	1,138.40	90.91	63.60	20.99	16.00	25.08	1.20	3.38	235.70	3.22	107.35	19.54	22.51	0.226212	5.35	0.104128	19.54
20	2008	1,072.80	85.82	63.60	19.63	16.00	25.08	1.20	3.38	229.17	3.04	108.75	19.79	22.83	0.214518	4.90	0.101852	19.58
21	2009	1,009.20	80.74	63.60	18.27	16.00	25.08	1.20	3.38	213.97	2.95	109.82	20.05	23.00	0.198856	4.57	0.099832	19.75
22	2010	945.60	75.65	63.60	16.91	16.00	25.08	1.20	3.38	207.37	2.86	111.60	20.31	23.17	0.189921	4.26	0.098032	19.81
23	2011	882.00	70.56	63.60	15.55	16.00	25.08	1.20	3.38	200.77	2.77	113.35	20.58	23.34	0.183315	3.98	0.096432	19.87
24	2012	818.40	65.47	63.60	14.19	16.00	25.08	1.20	3.38	194.17	2.67	115.10	20.84	23.52	0.176938	3.71	0.094978	19.92
25	2013	754.80	60.38	63.60	12.83	16.00	25.08	1.20	3.38	187.57	2.58	116.91	21.11	23.70	0.170608	3.48	0.093679	19.97
26	2014	691.20	55.30	63.60	11.47	16.00	25.08	1.20	3.38	180.97	2.48	118.75	21.39	23.88	0.164322	3.23	0.092507	20.02
27	2015	627.60	50.21	63.60	10.11	16.00	25.08	1.20	3.38	174.38	2.40	120.60	21.67	24.07	0.158187	3.01	0.091448	20.07
28	2016	564.00	45.12	63.60	8.75	16.00	25.08	1.20	3.38	167.78	2.31	122.48	21.95	24.26	0.152184	2.81	0.090489	20.11
29	2017	500.40	40.03	63.60	7.39	16.00	25.08	1.20	3.38	161.18	2.22	124.39	22.23	24.45	0.146317	2.62	0.089650	20.15
30	2018	436.80	34.94	63.60	6.03	16.00	25.08	1.20	3.38	154.58	2.13	126.32	22.52	24.65	0.098377	2.45	0.088827	20.19
31	2019	373.20	29.86	63.60	4.67	16.00	25.08	1.20	3.38	147.98	2.04	128.27	22.82	24.85	0.092010	2.29	0.088107	20.23
32	2020	309.60	24.77	63.60	3.31	16.00	25.08	1.20	3.38	141.38	1.95	130.24	23.11	25.00	0.085200	2.14	0.087451	20.27
33	2021	246.00	19.68	63.60	1.95	16.00	25.08	1.20	3.38	134.78	1.86	132.23	23.41	25.27	0.078880	1.99	0.086822	20.30
34	2022	182.40	14.59	63.60	0.59	16.00	25.08	1.20	3.38	128.19	1.77	134.22	23.72	25.48	0.073045	1.84	0.086204	20.33
35	2023	1,200.00	96.00	63.60	28.50	16.00	25.08	1.20	3.38	233.70	3.22	116.01	24.02	27.24	0.070335	1.84	0.085893	20.33
36	2024	1,136.40	90.91	63.60	26.99	16.00	25.08	1.20	3.38	227.10	3.13	117.51	24.31	27.47	0.062625	1.72	0.085335	20.41
37	2025	1,072.80	85.82	63.60	25.48	16.00	25.08	1.20	3.38	220.57	3.04	119.04	24.60	27.69	0.057986	1.61	0.084924	20.45
38	2026	1,009.20	80.74	63.60	23.97	16.00	25.08	1.20	3.38	213.97	2.95	120.59	24.87	27.92	0.053600	1.50	0.084539	20.48
39	2027	945.60	75.65	63.60	22.46	16.00	25.08	1.20	3.38	207.37	2.86	122.16	25.30	28.15	0.049713	1.40	0.084185	20.51
40	2028	882.00	70.56	63.60	20.95	16.00	25.08	1.20	3.38	200.77	2.77	123.74	25.63	28.39	0.046031	1.31	0.083860	20.55
41	2029	818.40	65.47	63.60	19.44	16.00	25.08	1.20	3.38	194.17	2.67	125.35	25.96	28.64	0.042571	1.22	0.083561	20.57
42	2030	754.80	60.38	63.60	17.93	16.00	25.08	1.20	3.38	187.57	2.58	126.96	26.30	28.88	0.039304	1.14	0.083287	20.60
43	2031	691.20	55.30	63.60	16.42	16.00	25.08	1.20	3.38	180.97	2.49	128.63	26.64	29.13	0.036251	1.06	0.083034	20.63
44	2032	627.60	50.21	63.60	14.91	16.00	25.08	1.20	3.38	174.38	2.40	130.31	26.99	29.39	0.033334	0.99	0.082802	20.65
45	2033	564.00	45.12	63.60	13.40	16.00	25.08	1.20	3.38	167.78	2.31	132.00	27.34	29.65	0.030328	0.93	0.082587	20.68

年度別平均 ディーゼル発電コスト (水力・ディーズル併用案)

Year	Interest Rate %	Book Value	Interest	Depreciation	Real Property Tax	Personnel Expense	Repair Expense	Others Expense	Administ-ration Expense	Total Fixed Expense	Fixed Cost (¥/kWh)	Fuel Cost (¥/kWh)	Variable Cost (¥/kWh)	Unit Cost (¥/kWh)	Discount Factor	Discount Value (¥/kWh)	Accumulated Value (¥/kWh)	Capital Recovery Factor	Capital Recovery Cost (¥/kWh)
1	1989	1,200.00	96.00	56.88	25.65	13.72	21.32	1.02	2.88	217.47	3.82	74.78	16.02	19.84	0.925920	18.37	18.37	1.080000	19.84
2	1990	1,143.12	86.00	56.88	24.43	13.72	21.32	1.02	2.88	211.71	4.44	75.75	10.23	20.07	0.857339	17.72	36.09	0.550769	20.24
3	1991	1,086.24	76.00	56.88	23.22	13.72	21.32	1.02	2.88	205.84	4.25	76.73	15.44	20.09	0.783932	16.42	52.51	0.388034	20.38
4	1992	1,029.36	66.00	56.88	22.01	13.72	21.32	1.02	2.88	200.02	4.11	77.73	10.65	20.76	0.735030	15.28	67.77	0.301921	20.46
5	1993	972.48	56.00	56.88	20.80	13.72	21.32	1.02	2.88	194.15	3.93	78.74	16.87	20.80	0.680583	14.16	81.93	0.250450	20.52
6	1994	915.60	46.00	56.88	19.59	13.72	21.32	1.02	2.88	188.28	3.82	79.70	17.09	21.01	0.630170	13.06	95.10	0.215315	20.57
7	1995	858.72	36.00	56.88	18.38	13.72	21.32	1.02	2.88	182.41	3.70	80.80	17.31	21.11	0.583409	12.00	107.38	0.192072	20.62
8	1996	801.84	26.00	56.88	17.17	13.72	21.32	1.02	2.88	176.54	3.58	81.85	17.53	21.11	0.540269	11.01	118.70	0.174015	20.67
9	1997	744.96	16.00	56.88	15.96	13.72	21.32	1.02	2.88	170.67	3.46	82.91	17.70	21.82	0.500249	10.02	128.38	0.160069	20.71
10	1998	688.08	6.00	56.88	14.75	13.72	21.32	1.02	2.88	164.80	3.34	83.00	17.99	21.84	0.463193	9.08	139.26	0.149039	20.75
11	1999	631.20	0.00	56.88	13.54	13.72	21.32	1.02	2.88	158.93	3.22	85.08	18.23	21.45	0.428883	8.20	148.46	0.140078	20.80
12	2000	574.32	0.00	56.88	12.33	13.72	21.32	1.02	2.88	153.06	3.11	86.19	18.46	21.57	0.397114	7.37	157.03	0.132695	20.84
13	2001	517.44	0.00	56.88	11.12	13.72	21.32	1.02	2.88	147.19	2.99	87.31	18.70	21.69	0.367938	6.58	165.00	0.126522	20.88
14	2002	460.56	0.00	56.88	9.91	13.72	21.32	1.02	2.88	141.32	2.87	88.45	18.95	21.82	0.340491	5.82	172.43	0.121297	20.92
15	2003	403.68	0.00	56.88	8.70	13.72	21.32	1.02	2.88	135.45	2.75	89.59	19.19	21.95	0.315292	5.10	179.35	0.116850	20.95
16	2004	346.80	0.00	56.88	7.49	13.72	21.32	1.02	2.88	129.58	2.64	90.73	19.44	22.08	0.291800	4.42	185.70	0.112877	20.99
17	2005	289.92	0.00	56.88	6.28	13.72	21.32	1.02	2.88	123.71	2.52	91.84	19.69	22.21	0.270209	3.76	191.38	0.109529	21.03
18	2006	233.04	0.00	56.88	5.07	13.72	21.32	1.02	2.88	117.84	2.40	93.14	19.95	22.35	0.250249	3.09	197.30	0.106702	21.06
19	2007	176.16	0.00	56.88	3.86	13.72	21.32	1.02	2.88	111.97	2.28	94.35	20.21	22.49	0.231712	2.42	202.60	0.104128	21.10
20	2008	120.00	0.00	56.88	2.65	13.72	21.32	1.02	2.88	106.10	2.16	95.57	20.47	22.63	0.214548	1.75	207.84	0.101852	21.14
21	2009	64.32	0.00	56.88	1.44	13.72	21.32	1.02	2.88	100.23	2.04	96.82	20.74	25.03	0.198659	1.08	212.91	0.099832	21.26
22	2010	8.64	0.00	56.88	0.23	13.72	21.32	1.02	2.88	94.36	1.92	98.07	21.01	25.18	0.188911	0.41	217.54	0.098032	21.33
23	2011	0.00	0.00	56.88	0.02	13.72	21.32	1.02	2.88	88.49	1.80	99.35	21.28	25.32	0.180315	0.00	221.86	0.098422	21.39
24	2012	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	82.62	1.68	100.64	21.50	25.40	0.172009	0.00	225.88	0.098976	21.45
25	2013	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	76.75	1.56	101.95	21.74	25.65	0.164018	0.00	229.62	0.099597	21.51
26	2014	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	70.88	1.44	103.27	22.02	25.82	0.156202	0.00	233.11	0.099907	21.56
27	2015	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	65.01	1.32	104.58	22.41	25.99	0.148514	0.00	236.37	0.099948	21.62
28	2016	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	59.14	1.20	105.98	22.70	26.16	0.141514	0.00	239.40	0.099489	21.66
29	2017	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	53.27	1.08	107.35	23.00	26.34	0.135228	0.00	242.23	0.099189	21.71
30	2018	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	47.40	0.96	108.75	23.29	26.52	0.129377	0.00	244.80	0.098827	21.75
31	2019	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	41.53	0.84	110.10	23.60	26.71	0.123916	0.00	247.32	0.098307	21.79
32	2020	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	35.66	0.72	111.00	23.90	26.88	0.118820	0.00	249.81	0.097751	21.83
33	2021	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	29.79	0.60	113.05	24.21	27.09	0.113989	0.00	252.15	0.097162	21.86
34	2022	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	23.88	0.48	114.52	24.53	27.28	0.109305	0.00	254.34	0.096534	21.89
35	2023	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	17.97	0.36	116.01	24.85	27.48	0.104763	0.00	256.40	0.095863	21.93
36	2024	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	12.06	0.24	117.51	25.17	27.60	0.100325	0.00	258.35	0.095145	21.96
37	2025	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	6.15	0.12	119.00	25.50	27.70	0.095986	0.00	260.18	0.094382	21.98
38	2026	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.24	0.00	120.50	25.83	27.81	0.095390	0.00	261.90	0.093578	22.00
39	2027	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	122.00	26.17	28.11	0.094713	0.00	263.51	0.092731	22.05
40	2028	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	123.48	26.51	30.79	0.094031	0.00	265.00	0.091840	22.09
41	2029	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	125.35	26.85	31.25	0.093351	0.00	266.40	0.090911	22.12
42	2030	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	126.98	27.20	31.05	0.092684	0.00	267.70	0.090000	22.15
43	2031	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	128.61	27.55	31.49	0.091954	0.00	268.90	0.089100	22.18
44	2032	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	130.24	27.91	31.73	0.091284	0.00	270.10	0.088200	22.21
45	2033	0.00	0.00	56.88	0.00	13.72	21.32	1.02	2.88	0.00	0.00	131.87	28.27	31.97	0.090614	0.00	271.20	0.087300	22.23

## 年度別平均 水力・ディーゼル併用発電コスト

Year	Available Energy			Diesel Power Plant		Hydro-power Plant		Combined with Diesel & Hydro		
	Diesel Energy (MWh)	Hydro Energy (MWh)	Total Energy (MWh)	Unit Cost (¥/kWh)	Capital Recovery Cost (¥/kWh)	Unit Cost (¥/kWh)	Capital Recovery Cost (¥/kWh)	Unit Cost (¥/kWh)	Capital Recovery Cost (¥/kWh)	
1	1989	14,570	17,090	31,660	19.84	19.84	13.61	13.61	16.47	16.47
2	1990	47,880	29,020	76,880	20.67	20.24	13.41	13.51	17.92	17.69
3	1991	48,430	29,020	77,450	20.69	20.38	13.22	13.42	17.89	17.77
4	1992	49,270	29,020	78,290	20.76	20.46	13.20	13.37	17.96	17.83
5	1993	50,000	29,020	79,020	20.80	20.52	13.00	13.30	17.94	17.87
6	1994	50,000	29,020	79,020	20.90	20.57	12.80	13.23	17.93	17.88
7	1995	50,000	29,020	79,020	21.01	20.62	12.61	13.16	17.92	17.88
8	1996	50,000	29,020	79,020	21.11	20.67	12.41	13.08	17.92	17.88
9	1997	50,000	29,020	79,020	21.22	20.71	12.21	13.01	17.91	17.88
10	1998	50,000	29,020	79,020	21.34	20.75	12.01	12.93	17.91	17.88
11	1999	50,000	29,020	79,020	21.45	20.80	11.81	12.85	17.91	17.88
12	2000	50,000	29,020	79,020	21.57	20.84	11.61	12.78	17.91	17.88
13	2001	50,000	29,020	79,020	21.69	20.88	11.42	12.71	17.92	17.88
14	2002	50,000	29,020	79,020	21.82	20.92	11.22	12.64	17.92	17.87
15	2003	50,000	29,020	79,020	21.95	20.95	11.02	12.57	17.93	17.87
16	2004	50,000	29,020	79,020	22.08	20.99	10.82	12.50	17.94	17.87
17	2005	50,000	29,020	79,020	22.21	21.03	10.62	12.43	17.96	17.87
18	2006	50,000	29,020	79,020	22.35	21.06	10.42	12.37	17.97	17.87
19	2007	50,000	29,020	79,020	22.49	21.10	10.23	12.30	17.99	17.87
20	2008	50,000	29,020	79,020	24.88	21.18	10.03	12.24	19.42	17.90
21	2009	50,000	29,020	79,020	25.03	21.26	9.83	12.18	19.45	17.92
22	2010	50,000	29,020	79,020	25.18	21.33	9.83	12.12	19.47	17.94
23	2011	50,000	29,020	79,020	25.33	21.39	9.43	12.06	19.49	17.96
24	2012	50,000	29,020	79,020	25.49	21.45	9.24	12.00	19.52	17.98
25	2013	50,000	29,020	79,020	25.65	21.51	9.04	11.95	19.55	18.00
26	2014	50,000	29,020	79,020	25.82	21.56	8.84	11.90	19.58	18.01
27	2015	50,000	29,020	79,020	25.99	21.62	8.64	11.84	19.62	18.03
28	2016	50,000	29,020	79,020	26.16	21.66	8.44	11.79	19.65	18.04
29	2017	50,000	29,020	79,020	26.34	21.71	8.24	11.74	19.69	18.05
30	2018	50,000	29,020	79,020	26.52	21.75	8.05	11.70	19.74	18.06
31	2019	50,000	29,020	79,020	26.71	21.79	7.85	11.65	19.78	18.07
32	2020	50,000	29,020	79,020	26.89	21.83	7.65	11.61	19.83	18.07
33	2021	50,000	29,020	79,020	27.09	21.86	7.45	11.56	19.88	18.08
34	2022	50,000	29,020	79,020	27.28	21.90	7.25	11.52	19.93	18.09
35	2023	50,000	29,020	79,020	27.48	21.93	7.05	11.48	19.98	18.09
36	2024	50,000	29,020	79,020	27.69	21.96	6.86	11.44	20.04	18.10
37	2025	50,000	29,020	79,020	27.90	21.99	6.66	11.40	20.10	18.10
38	2026	50,000	29,020	79,020	28.11	22.02	6.46	11.36	20.16	18.11
39	2027	50,000	29,020	79,020	30.57	22.05	6.26	11.33	21.64	18.12
40	2028	50,000	29,020	79,020	30.79	22.09	6.06	11.29	21.71	18.12
41	2029	50,000	29,020	79,020	31.02	22.12	5.87	11.26	21.78	18.13
42	2030	50,000	29,020	79,020	31.25	22.15	5.67	11.23	21.86	18.14
43	2031	50,000	29,020	79,020	31.49	22.18	5.47	11.20	21.93	18.14
44	2032	50,000	29,020	79,020	31.73	22.21	5.27	11.16	22.01	18.15
45	2033	50,000	29,020	79,020	31.97	22.23	5.07	11.14	22.09	18.16

財務的内部收益率感度分析 (CASE 1)

FIRR= 0.101087

NPV=-0.013818

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants										Diesel Power Generation(w/o Hydro)			Benefit					Benefit - Cost	
		Investment		Operation and Maintenance						Investment	Operation & Maintenance		Cost	Benefit				Total			
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant					Fuel	Tax		Repair /Others	Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold		
				Tax	Repair /Others	Fuel	Tax	Repair /Others													
1	1986	138.60																0.00	-138.60		
2	1987	850.50																0.00	-850.50		
3	1988	1645.35	1260.00															0.00	-1645.35		
4	1989	1240.05		49.15	33.67	911.86	25.65	38.94				1124.48	25.65	45.66	1240.05	212.62	-49.15	-26.95	25.19	161.71	-1078.34
5	1990			48.16	33.67	773.52	24.43	38.94				1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94				1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94				1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	101.66	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94				1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94				1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94				1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94				1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94				1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94				1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94				1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94				1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94				1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94				1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94				1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94				1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94				1382.62	4.33	45.66	-1134.00	397.91	-39.69	-26.95	114.70	445.97	1579.97
21	2006			36.04	33.67	997.51	5.53	38.94	1134.00			1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1134.00	34.95	33.67	1010.48	4.18	38.94				1418.80	26.99	45.66	1134.00	408.33	-12.14	-26.95	114.70	483.94	-650.06
23	2008			33.86	33.67	1023.61	28.50	38.94				1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94				1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94				1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94				1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94				1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94				1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94				1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94				1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94				1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94				1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94				1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94				1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94				1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94				1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94				1722.12	4.33	45.66	-1134.00	495.62	-23.83	-26.95	114.70	559.54	1693.54
38	2023			17.47	33.67	1242.44	8.24	38.94	1134.00			1744.51	28.50	45.66	0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94				1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94				1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1134.00	14.20	33.67	1291.53	4.18	38.94				1813.43	23.97	45.66	1134.00	521.90	5.59	-26.95	114.70	615.24	-518.76
42	2027			13.11	33.67	1308.32	28.50	38.94				1837.01	22.46	45.66	0.00	528.68	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94				1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94				1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94				1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94				1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94				1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-387.45	-716.23	6.55	33.67	1413.75	20.39	38.94	-400.24			1985.03	13.40	45.66	-703.44	571.28	-13.54	-26.95	114.70	645.49	1348.93

表 8-2

財務的内部收益率感度分析 (CASE 2)

FIRR= 0.093244

NPV=-0.014887

		Million Yen															
Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)			Cost	Benefit				Benefit - Cost	
		Investment		Operation and Maintenance				Investment	Operation & Maintenance			Total	Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold
		Hydro	Diesel	Hydropower Plant	Diesel Power Plant				Fuel	Tax							
				Tax	Repair /Others	Fuel	Tax	Repair /Others									
1	1986	151.80									151.80					0.00	-151.80
2	1987	931.50								931.50					0.00	-931.50	
3	1988	1802.05	1380.00							1380.00	1802.05				0.00	-1802.05	
4	1989	1358.15		49.15	33.67	911.86	25.65	38.94			1358.15	212.62	-49.15	-26.95	25.19	161.71	-1196.44
5	1990			48.16	33.67	773.52	24.43	38.94			0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94			0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94			0.00	336.41	-51.81	-26.95	101.66	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94			0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94			0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94			0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94			0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94			0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94			0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94			0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94			0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94			0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94			0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94			0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94			0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94	1242.00		-1242.00	397.91	-39.69	-26.95	114.70	445.97	1687.97
21	2006			36.04	33.67	997.51	5.53	38.94			0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1242.00	34.95	33.67	1010.48	4.18	38.94			1242.00	408.33	-12.14	-26.95	114.70	483.94	-758.06
23	2008			33.86	33.67	1023.61	28.50	38.94			0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94			0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94			0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94			0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94			0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94			0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94			0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94			0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94			0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94			0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94			0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94			0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94			0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94			0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94	1242.00		-1242.00	495.62	-23.83	-26.95	114.70	559.54	1801.54
38	2023			17.47	33.67	1242.44	8.24	38.94			0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94			0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94			0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1242.00	14.20	33.67	1291.53	4.18	38.94			1242.00	521.90	5.59	-26.95	114.70	615.24	-626.76
42	2027			13.11	33.67	1308.32	28.50	38.94			0.00	528.68	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94			0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94			0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94			0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94			0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94			0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-424.35	-784.44	6.55	33.67	1413.75	20.39	38.94	-438.36		-770.43	571.28	-13.54	-26.95	114.70	645.49	1415.93

表 8-3

財務的内部收益率感度分析 (CASE 3)

FIRR= 0.110408

NPV=0.006905

		Million Yen																
Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)				Cost	Benefit				Benefit - Cost	
		Investment		Operation and Maintenance				Investment	Operation & Maintenance				Total					
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant			Fuel	Tax	Repair /Others			Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold
1	1986	125.40												125.40				
2	1987	769.50									769.50					0.00	-769.50	
3	1988	1488.65	1200.00								1200.00					0.00	-1488.65	
4	1989	1121.95		49.15	33.67	911.86	25.65	38.94			1121.95	212.62	-49.15	-26.95	25.19	161.71	-960.24	
5	1990			48.16	33.67	773.52	24.43	38.94			0.00	365.58	-48.30	-26.95	72.89	363.22	363.22	
6	1991			47.18	33.67	810.00	23.22	38.94			0.00	343.91	-47.47	-26.95	86.65	356.14	356.14	
7	1992			51.33	33.67	832.50	24.45	38.94			0.00	336.41	-51.81	-26.95	101.66	359.31	359.31	
8	1993			50.24	33.67	843.32	23.10	38.94			0.00	340.78	-50.88	-26.95	114.70	377.65	377.65	
9	1994			49.15	33.67	854.29	21.75	38.94			0.00	345.21	-49.95	-26.95	114.70	383.01	383.01	
10	1995			48.06	33.67	865.39	20.39	38.94			0.00	349.70	-49.01	-26.95	114.70	388.44	388.44	
11	1996			46.96	33.67	876.64	19.04	38.94			0.00	354.24	-48.07	-26.95	114.70	393.92	393.92	
12	1997			45.87	33.67	888.04	17.69	38.94			0.00	358.85	-47.14	-26.95	114.70	399.46	399.46	
13	1998			44.78	33.67	899.58	16.34	38.94			0.00	363.51	-46.21	-26.95	114.70	405.05	405.05	
14	1999			43.69	33.67	911.28	14.99	38.94			0.00	368.24	-45.28	-26.95	114.70	410.71	410.71	
15	2000			42.59	33.67	923.12	13.64	38.94			0.00	373.03	-44.35	-26.95	114.70	416.43	416.43	
16	2001			41.50	33.67	935.12	12.29	38.94			0.00	377.88	-43.42	-26.95	114.70	422.21	422.21	
17	2002			40.41	33.67	947.28	10.94	38.94			0.00	382.79	-42.49	-26.95	114.70	428.05	428.05	
18	2003			39.32	33.67	959.60	9.59	38.94			0.00	387.77	-41.56	-26.95	114.70	433.96	433.96	
19	2004			38.23	33.67	972.07	8.24	38.94			0.00	392.81	-40.63	-26.95	114.70	439.93	439.93	
20	2005			37.13	33.67	984.71	6.89	38.94	1080.00		1080.00	397.91	-39.69	-26.95	114.70	445.97	1525.97	
21	2006			36.04	33.67	997.51	5.53	38.94			0.00	403.09	-13.07	-26.95	114.70	477.77	477.77	
22	2007		1080.00	34.95	33.67	1010.48	4.18	38.94			1080.00	408.33	-12.14	-26.95	114.70	483.94	-596.06	
23	2008			33.86	33.67	1023.61	28.50	38.94			0.00	413.63	-36.88	-26.95	114.70	464.50	464.50	
24	2009			32.77	33.67	1036.92	27.15	38.94			0.00	419.01	-35.95	-26.95	114.70	470.81	470.81	
25	2010			31.67	33.67	1050.40	25.80	38.94			0.00	424.46	-35.01	-26.95	114.70	477.20	477.20	
26	2011			30.58	33.67	1064.05	24.45	38.94			0.00	429.98	-34.08	-26.95	114.70	483.65	483.65	
27	2012			29.49	33.67	1077.89	23.10	38.94			0.00	435.57	-33.15	-26.95	114.70	490.17	490.17	
28	2013			28.40	33.67	1091.90	21.75	38.94			0.00	441.23	-32.22	-26.95	114.70	496.76	496.76	
29	2014			27.30	33.67	1106.09	20.39	38.94			0.00	446.96	-31.27	-26.95	114.70	503.44	503.44	
30	2015			26.21	33.67	1120.47	19.04	38.94			0.00	452.78	-30.34	-26.95	114.70	510.19	510.19	
31	2016			25.12	33.67	1135.04	17.69	38.94			0.00	458.66	-29.41	-26.95	114.70	517.00	517.00	
32	2017			24.03	33.67	1149.79	16.34	38.94			0.00	464.62	-28.49	-26.95	114.70	523.88	523.88	
33	2018			22.94	33.67	1164.74	14.99	38.94			0.00	470.66	-27.56	-26.95	114.70	530.85	530.85	
34	2019			21.84	33.67	1179.88	13.64	38.94			0.00	476.78	-26.62	-26.95	114.70	537.91	537.91	
35	2020			20.75	33.67	1195.22	12.29	38.94			0.00	482.98	-25.69	-26.95	114.70	545.04	545.04	
36	2021			19.66	33.67	1210.76	10.94	38.94			0.00	489.26	-24.76	-26.95	114.70	552.25	552.25	
37	2022			18.57	33.67	1226.50	9.59	38.94	1080.00		1080.00	495.62	-23.83	-26.95	114.70	559.54	1639.54	
38	2023			17.47	33.67	1242.44	8.24	38.94			0.00	502.06	2.79	-26.95	114.70	592.60	592.60	
39	2024			16.38	33.67	1258.60	6.89	38.94			0.00	508.59	3.72	-26.95	114.70	600.06	600.06	
40	2025			15.29	33.67	1274.96	5.53	38.94			0.00	515.20	4.66	-26.95	114.70	607.61	607.61	
41	2026		1080.00	14.20	33.67	1291.53	4.18	38.94			1080.00	521.90	5.59	-26.95	114.70	615.24	-464.76	
42	2027			13.11	33.67	1308.32	28.50	38.94			0.00	528.68	-19.15	-26.95	114.70	597.28	597.28	
43	2028			12.01	33.67	1325.33	27.15	38.94			0.00	535.56	-18.21	-26.95	114.70	605.10	605.10	
44	2029			10.92	33.67	1342.56	25.80	38.94			0.00	542.52	-17.28	-26.95	114.70	612.99	612.99	
45	2030			9.83	33.67	1360.01	24.45	38.94			0.00	549.57	-16.35	-26.95	114.70	620.97	620.97	
46	2031			8.74	33.67	1377.69	23.10	38.94			0.00	556.72	-15.42	-26.95	114.70	629.05	629.05	
47	2032			7.65	33.67	1395.60	21.75	38.94			0.00	563.95	-14.49	-26.95	114.70	637.21	637.21	
48	2033	-350.55	-682.12	6.55	33.67	1413.75	20.39	38.94	-381.18		-651.49	571.28	-13.54	-26.95	114.70	645.49	1296.98	

財務的内部收益率感度分析 (CASE 4)

FIRR= 0.115775 NPV=0.009144

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)			Cost	Benefit				Benefit - Cost				
		Investment		Operation and Maintenance				Investment	Operation & Maintenance			Total	Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold			
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant			Fuel	Tax								Repair /Others		
				Tax	Repair /Others	Fuel	Tax												Repair /Others	
1	1986	118.80								118.80					0.00	-118.80				
2	1987	729.00								729.00					0.00	-729.00				
3	1988	1410.30	1200.00						1200.00	1410.30					0.00	-1410.30				
4	1989	1062.90		49.15	33.67	911.86	25.65	38.94		1062.90	1124.48	25.65	45.66	0.00	212.62	-49.15	-26.95	25.19	161.71	-901.19
5	1990			48.16	33.67	773.52	24.43	38.94		0.00	1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94		0.00	1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94		0.00	1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	101.68	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94		0.00	1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94		0.00	1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94		0.00	1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94		0.00	1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94		0.00	1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94		0.00	1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94		0.00	1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94		0.00	1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94		0.00	1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94		0.00	1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94		0.00	1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94		0.00	1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94	1080.00	-1080.00	1382.62	4.33	45.66	0.00	397.91	-39.69	-26.95	114.70	445.97	1525.97
21	2006			36.04	33.67	997.51	5.53	38.94		0.00	1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1080.00	34.95	33.67	1010.48	4.18	38.94		1080.00	1418.80	26.99	45.66	1080.00	408.33	-12.14	-26.95	114.70	483.94	-596.06
23	2008			33.86	33.67	1023.61	28.50	38.94		0.00	1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94		0.00	1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94		0.00	1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94		0.00	1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94		0.00	1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94		0.00	1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94		0.00	1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94		0.00	1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94		0.00	1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94		0.00	1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94		0.00	1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94		0.00	1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94		0.00	1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94		0.00	1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94	1080.00	-1080.00	1722.12	4.33	45.66	0.00	495.62	-23.83	-26.95	114.70	559.54	1639.54
38	2023			17.47	33.67	1242.44	8.24	38.94		0.00	1744.51	28.50	45.66	0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94		0.00	1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94		0.00	1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1080.00	14.20	33.67	1291.53	4.18	38.94		1080.00	1813.43	23.97	45.66	1080.00	521.90	5.59	-26.95	114.70	615.24	-464.76
42	2027			13.11	33.67	1308.32	28.50	38.94		0.00	1837.01	22.46	45.66	0.00	528.68	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94		0.00	1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94		0.00	1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94		0.00	1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94		0.00	1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94		0.00	1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-332.10	-682.12	6.55	33.67	1413.75	20.39	38.94	-381.18	-633.04	1985.03	13.40	45.66	0.00	571.28	-13.54	-26.95	114.70	645.49	1278.53



表 8-5

財務的内部收益率感度分析 (CASE 5)

FIRR= 0.094568

NPV=0.012608

		Million Yen																
Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)			Cost	Benefit				Benefit - Cost		
		Investment		Operation and Maintenance				Investment	Operation & Maintenance			Total	Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold	
		Hydro	Diesel	Hydropower Plant	Diesel Power Plant				Fuel	Tax								Repair /Others
				Tax	Repair /Others	Fuel	Tax	Repair /Others	Fuel	Tax	Repair /Others							
1	1986	132.00										132.00					0.00	-132.00
2	1987	810.00										810.00					0.00	-810.00
3	1988	1567.00	1200.00									1200.00					0.00	-1567.00
4	1989	1181.00		49.15	33.67	893.85	25.65	38.94	1099.03	25.65	45.66	1181.00	205.18	-49.15	-26.95	25.19	154.27	-1026.73
5	1990			48.16	33.67	754.47	24.43	38.94	1104.53	24.29	45.66	0.00	350.06	-48.30	-26.95	72.89	347.70	347.70
6	1991			47.18	33.67	786.12	23.22	38.94	1110.05	22.93	45.66	0.00	323.93	-47.47	-26.95	86.65	336.16	336.16
7	1992			51.33	33.67	803.94	24.45	38.94	1115.60	23.97	45.66	0.00	311.66	-51.81	-26.95	101.66	334.56	334.56
8	1993			50.24	33.67	807.96	23.10	38.94	1121.18	22.46	45.66	0.00	313.22	-50.88	-26.95	114.70	350.09	350.09
9	1994			49.15	33.67	812.00	21.75	38.94	1126.78	20.95	45.66	0.00	314.78	-49.95	-26.95	114.70	352.58	352.58
10	1995			48.06	33.67	816.06	20.39	38.94	1132.42	19.44	45.66	0.00	316.36	-49.01	-26.95	114.70	355.10	355.10
11	1996			46.96	33.67	820.14	19.04	38.94	1138.08	17.93	45.66	0.00	317.94	-48.07	-26.95	114.70	357.62	357.62
12	1997			45.87	33.67	824.24	17.69	38.94	1143.77	16.42	45.66	0.00	319.53	-47.14	-26.95	114.70	360.14	360.14
13	1998			44.78	33.67	828.36	16.34	38.94	1149.49	14.91	45.66	0.00	321.13	-46.21	-26.95	114.70	362.67	362.67
14	1999			43.69	33.67	832.50	14.99	38.94	1155.23	13.40	45.66	0.00	322.73	-45.28	-26.95	114.70	365.20	365.20
15	2000			42.59	33.67	836.67	13.64	38.94	1161.01	11.88	45.66	0.00	324.34	-44.35	-26.95	114.70	367.74	367.74
16	2001			41.50	33.67	840.85	12.29	38.94	1166.82	10.37	45.66	0.00	325.97	-43.42	-26.95	114.70	370.30	370.30
17	2002			40.41	33.67	845.05	10.94	38.94	1172.65	8.86	45.66	0.00	327.60	-42.49	-26.95	114.70	372.86	372.86
18	2003			39.32	33.67	849.28	9.59	38.94	1178.51	7.35	45.66	0.00	329.23	-41.56	-26.95	114.70	375.42	375.42
19	2004			38.23	33.67	853.53	8.24	38.94	1184.41	5.84	45.66	0.00	330.88	-40.63	-26.95	114.70	378.00	378.00
20	2005			37.13	33.67	857.79	6.89	38.94	1190.33	4.33	45.66	-1080.00	332.53	-39.69	-26.95	114.70	380.59	1460.59
21	2006			36.04	33.67	862.08	5.53	38.94	1196.28	28.50	45.66	0.00	334.20	-13.07	-26.95	114.70	408.88	408.88
22	2007		1080.00	34.95	33.67	866.39	4.18	38.94	1202.26	26.99	45.66	1080.00	335.87	-12.14	-26.95	114.70	411.48	-668.52
23	2008			33.86	33.67	870.72	28.50	38.94	1208.27	25.48	45.66	0.00	337.55	-36.88	-26.95	114.70	388.42	388.42
24	2009			32.77	33.67	875.08	27.15	38.94	1214.31	23.97	45.66	0.00	339.24	-35.95	-26.95	114.70	391.04	391.04
25	2010			31.67	33.67	879.45	25.80	38.94	1220.38	22.46	45.66	0.00	340.93	-35.01	-26.95	114.70	393.67	393.67
26	2011			30.58	33.67	883.85	24.45	38.94	1226.49	20.95	45.66	0.00	342.64	-34.08	-26.95	114.70	396.31	396.31
27	2012			29.49	33.67	888.27	23.10	38.94	1232.62	19.44	45.66	0.00	344.35	-33.15	-26.95	114.70	398.95	398.95
28	2013			28.40	33.67	892.71	21.75	38.94	1238.78	17.93	45.66	0.00	346.07	-32.22	-26.95	114.70	401.60	401.60
29	2014			27.30	33.67	897.17	20.39	38.94	1244.98	16.42	45.66	0.00	347.80	-31.27	-26.95	114.70	404.28	404.28
30	2015			26.21	33.67	901.66	19.04	38.94	1251.20	14.91	45.66	0.00	349.54	-30.34	-26.95	114.70	406.95	406.95
31	2016			25.12	33.67	906.17	17.69	38.94	1257.46	13.40	45.66	0.00	351.29	-29.41	-26.95	114.70	409.63	409.63
32	2017			24.03	33.67	910.70	16.34	38.94	1263.74	11.88	45.66	0.00	353.04	-28.49	-26.95	114.70	412.30	412.30
33	2018			22.94	33.67	915.25	14.99	38.94	1270.06	10.37	45.66	0.00	354.81	-27.56	-26.95	114.70	415.00	415.00
34	2019			21.84	33.67	919.83	13.64	38.94	1276.41	8.86	45.66	0.00	356.58	-26.62	-26.95	114.70	417.71	417.71
35	2020			20.75	33.67	924.43	12.29	38.94	1282.80	7.35	45.66	0.00	358.37	-25.69	-26.95	114.70	420.43	420.43
36	2021			19.66	33.67	929.05	10.94	38.94	1289.21	5.84	45.66	0.00	360.16	-24.76	-26.95	114.70	423.15	423.15
37	2022			18.57	33.67	933.70	9.59	38.94	1295.66	4.33	45.66	-1080.00	361.96	-23.83	-26.95	114.70	425.88	1505.88
38	2023			17.47	33.67	938.36	8.24	38.94	1302.13	28.50	45.66	0.00	363.77	2.79	-26.95	114.70	454.31	454.31
39	2024			16.38	33.67	943.06	6.89	38.94	1308.64	26.99	45.66	0.00	365.59	3.72	-26.95	114.70	457.06	457.06
40	2025			15.29	33.67	947.77	5.53	38.94	1315.19	25.48	45.66	0.00	367.42	4.66	-26.95	114.70	459.83	459.83
41	2026		1080.00	14.20	33.67	952.51	4.18	38.94	1321.76	23.97	45.66	1080.00	369.25	5.59	-26.95	114.70	462.59	-617.41
42	2027			13.11	33.67	957.27	28.50	38.94	1328.37	22.46	45.66	0.00	371.10	-19.15	-26.95	114.70	439.70	439.70
43	2028			12.01	33.67	962.06	27.15	38.94	1335.01	20.95	45.66	0.00	372.96	-18.21	-26.95	114.70	442.50	442.50
44	2029			10.92	33.67	966.87	25.80	38.94	1341.69	19.44	45.66	0.00	374.82	-17.28	-26.95	114.70	445.29	445.29
45	2030			9.83	33.67	971.70	24.45	38.94	1348.40	17.93	45.66	0.00	376.69	-16.35	-26.95	114.70	448.09	448.09
46	2031			8.74	33.67	976.56	23.10	38.94	1355.14	16.42	45.66	0.00	378.58	-15.42	-26.95	114.70	450.91	450.91
47	2032			7.65	33.67	981.45	21.75	38.94	1361.92	14.91	45.66	0.00	380.47	-14.49	-26.95	114.70	453.73	453.73
48	2033	-369.00	-682.12	6.55	33.67	986.35	20.39	38.94	-381.18	13.40	45.66	-669.94	382.37	-13.54	-26.95	114.70	456.58	1126.52



		Million Yen																		
Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)				Benefit				Benefit - Cost				
		Investment		Operation and Maintenance				Investment	Operation & Maintenance			Cost	Benefit							
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant			Fuel	Tax	Repair /Others		Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold	Total		
Tax	Repair /Others	Fuel	Tax	Repair /Others	Fuel	Tax	Repair /Others	Fuel	Tax	Repair /Others	Fuel Saving	Tax Saving	Repair /Others Saving	Turn-over from Energy Sold	Total					
1	1986	132.00														0.00	-132.00			
2	1987	810.00														0.00	-810.00			
3	1988	1567.00	1200.00							1200.00						0.00	-1567.00			
4	1989	1181.00		49.15	33.67	865.95	25.65	38.94			1067.86	25.65	45.66	1181.00	201.91	-49.15	-26.95	25.19	151.00	-1030.00
5	1990			48.16	33.67	725.14	24.43	38.94			1067.86	24.29	45.66	0.00	342.72	-48.30	-26.95	72.89	340.36	340.36
6	1991			47.18	33.67	749.60	23.22	38.94			1067.86	22.93	45.66	0.00	318.26	-47.47	-26.95	86.65	330.49	330.49
7	1992			51.33	33.67	760.53	24.45	38.94			1067.86	23.97	45.66	0.00	307.33	-51.81	-26.95	101.66	330.23	330.23
8	1993			50.24	33.67	760.53	23.10	38.94			1067.86	22.46	45.66	0.00	307.33	-50.88	-26.95	114.70	344.20	344.20
9	1994			49.15	33.67	760.53	21.75	38.94			1067.86	20.95	45.66	0.00	307.33	-49.95	-26.95	114.70	345.13	345.13
10	1995			48.06	33.67	760.53	20.39	38.94			1067.86	19.44	45.66	0.00	307.33	-49.01	-26.95	114.70	346.07	346.07
11	1996			46.96	33.67	760.53	19.04	38.94			1067.86	17.93	45.66	0.00	307.33	-48.07	-26.95	114.70	347.01	347.01
12	1997			45.87	33.67	760.53	17.69	38.94			1067.86	16.42	45.66	0.00	307.33	-47.14	-26.95	114.70	347.94	347.94
13	1998			44.78	33.67	760.53	16.34	38.94			1067.86	14.91	45.66	0.00	307.33	-46.21	-26.95	114.70	348.87	348.87
14	1999			43.69	33.67	760.53	14.99	38.94			1067.86	13.40	45.66	0.00	307.33	-45.28	-26.95	114.70	349.80	349.80
15	2000			42.59	33.67	760.53	13.64	38.94			1067.86	11.88	45.66	0.00	307.33	-44.35	-26.95	114.70	350.73	350.73
16	2001			41.50	33.67	760.53	12.29	38.94			1067.86	10.37	45.66	0.00	307.33	-43.42	-26.95	114.70	351.66	351.66
17	2002			40.41	33.67	760.53	10.94	38.94			1067.86	8.86	45.66	0.00	307.33	-42.49	-26.95	114.70	352.59	352.59
18	2003			39.32	33.67	760.53	9.59	38.94			1067.86	7.35	45.66	0.00	307.33	-41.56	-26.95	114.70	353.52	353.52
19	2004			38.23	33.67	760.53	8.24	38.94			1067.86	5.84	45.66	0.00	307.33	-40.63	-26.95	114.70	354.45	354.45
20	2005			37.13	33.67	760.53	6.89	38.94	1080.00		1067.86	4.33	45.66	-1080.00	307.33	-39.69	-26.95	114.70	355.39	1435.39
21	2006			36.04	33.67	760.53	5.53	38.94			1067.86	28.50	45.66	0.00	307.33	-13.07	-26.95	114.70	382.01	382.01
22	2007		1080.00	34.95	33.67	760.53	4.18	38.94			1067.86	26.99	45.66	1080.00	307.33	-12.14	-26.95	114.70	382.94	-697.06
23	2008			33.86	33.67	760.53	28.50	38.94			1067.86	25.48	45.66	0.00	307.33	-36.88	-26.95	114.70	358.20	358.20
24	2009			32.77	33.67	760.53	27.15	38.94			1067.86	23.97	45.66	0.00	307.33	-35.95	-26.95	114.70	359.13	359.13
25	2010			31.67	33.67	760.53	25.80	38.94			1067.86	22.46	45.66	0.00	307.33	-35.01	-26.95	114.70	360.07	360.07
26	2011			30.58	33.67	760.53	24.45	38.94			1067.86	20.95	45.66	0.00	307.33	-34.08	-26.95	114.70	361.00	361.00
27	2012			29.49	33.67	760.53	23.10	38.94			1067.86	19.44	45.66	0.00	307.33	-33.15	-26.95	114.70	361.93	361.93
28	2013			28.40	33.67	760.53	21.75	38.94			1067.86	17.93	45.66	0.00	307.33	-32.22	-26.95	114.70	362.86	362.86
29	2014			27.30	33.67	760.53	20.39	38.94			1067.86	16.42	45.66	0.00	307.33	-31.27	-26.95	114.70	363.81	363.81
30	2015			26.21	33.67	760.53	19.04	38.94			1067.86	14.91	45.66	0.00	307.33	-30.34	-26.95	114.70	364.74	364.74
31	2016			25.12	33.67	760.53	17.69	38.94			1067.86	13.40	45.66	0.00	307.33	-29.41	-26.95	114.70	365.67	365.67
32	2017			24.03	33.67	760.53	16.34	38.94			1067.86	11.88	45.66	0.00	307.33	-28.49	-26.95	114.70	366.59	366.59
33	2018			22.94	33.67	760.53	14.99	38.94			1067.86	10.37	45.66	0.00	307.33	-27.56	-26.95	114.70	367.52	367.52
34	2019			21.84	33.67	760.53	13.64	38.94			1067.86	8.86	45.66	0.00	307.33	-26.62	-26.95	114.70	368.46	368.46
35	2020			20.75	33.67	760.53	12.29	38.94			1067.86	7.35	45.66	0.00	307.33	-25.69	-26.95	114.70	369.39	369.39
36	2021			19.66	33.67	760.53	10.94	38.94			1067.86	5.84	45.66	0.00	307.33	-24.76	-26.95	114.70	370.32	370.32
37	2022			18.57	33.67	760.53	9.59	38.94	1080.00		1067.86	4.33	45.66	-1080.00	307.33	-23.83	-26.95	114.70	371.25	1451.25
38	2023			17.47	33.67	760.53	8.24	38.94			1067.86	28.50	45.66	0.00	307.33	2.79	-26.95	114.70	397.87	397.87
39	2024			16.38	33.67	760.53	6.89	38.94			1067.86	26.99	45.66	0.00	307.33	3.72	-26.95	114.70	398.80	398.80
40	2025			15.29	33.67	760.53	5.53	38.94			1067.86	25.48	45.66	0.00	307.33	4.66	-26.95	114.70	399.74	399.74
41	2026		1080.00	14.20	33.67	760.53	4.18	38.94			1067.86	23.97	45.66	1080.00	307.33	5.59	-26.95	114.70	400.67	-679.33
42	2027			13.11	33.67	760.53	28.50	38.94			1067.86	22.46	45.66	0.00	307.33	-19.15	-26.95	114.70	375.93	375.93
43	2028			12.01	33.67	760.53	27.15	38.94			1067.86	20.95	45.66	0.00	307.33	-18.21	-26.95	114.70	376.87	376.87
44	2029			10.92	33.67	760.53	25.80	38.94			1067.86	19.44	45.66	0.00	307.33	-17.28	-26.95	114.70	377.80	377.80
45	2030			9.83	33.67	760.53	24.45	38.94			1067.86	17.93	45.66	0.00	307.33	-16.35	-26.95	114.70	378.73	378.73
46	2031			8.74	33.67	760.53	23.10	38.94			1067.86	16.42	45.66	0.00	307.33	-15.42	-26.95	114.70	379.66	379.66
47	2032			7.65	33.67	760.53	21.75	38.94			1067.86	14.91	45.66	0.00	307.33	-14.49	-26.95	114.70	380.59	380.59
48	2033	-369.00	-682.12	6.55	33.67	760.53	20.39	38.94	-381.18		1067.86	13.40	45.66	-669.94	307.33	-13.54	-26.95	114.70	381.54	1051.48

表 8-7

財務的内部收益率感度分析 (CASE 7)

FIRR= 0.103144

NPV=-0.001650

		Million Yen																			
Project Year	Year	Generation by Hydro and Diesel Power Plants							Diesel Power Generation(w/o Hydro)				Benefit				Benefit - Cost				
		Investment		Operation and Maintenance					Investment	Operation & Maintenance			Cost	Benefit							
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant				Fuel	Tax	Repair /Others		Fuel Saving	Tax Saving	Repair /Others Saving		Turn-over from Energy Sold	Total		
		Tax	Repair /Others	Fuel	Tax	Repair /Others	Fuel	Tax	Repair /Others												
1	1986	132.00																0.00	-132.00		
2	1987	810.00																0.00	-810.00		
3	1988	1567.00	1200.00							1200.00								0.00	-1567.00		
4	1989	1181.00		49.15	33.67	911.86	25.65	38.94				1124.48	25.65	45.66	1181.00	212.62	-49.15	-26.95	22.67	159.19	-1021.81
5	1990			48.16	33.67	773.52	24.43	38.94				1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	65.60	355.93	355.93
6	1991			47.18	33.67	810.00	23.22	38.94				1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	77.99	347.47	347.47
7	1992			51.33	33.67	832.50	24.45	38.94				1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	91.49	349.14	349.14
8	1993			50.24	33.67	843.32	23.10	38.94				1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	103.23	366.18	366.18
9	1994			49.15	33.67	854.29	21.75	38.94				1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	103.23	371.54	371.54
10	1995			48.06	33.67	865.39	20.39	38.94				1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	103.23	376.97	376.97
11	1996			46.96	33.67	876.64	19.04	38.94				1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	103.23	382.45	382.45
12	1997			45.87	33.67	888.04	17.69	38.94				1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	103.23	387.99	387.99
13	1998			44.78	33.67	899.58	16.34	38.94				1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	103.23	393.58	393.58
14	1999			43.69	33.67	911.28	14.99	38.94				1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	103.23	399.24	399.24
15	2000			42.59	33.67	923.12	13.64	38.94				1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	103.23	404.96	404.96
16	2001			41.50	33.67	935.12	12.29	38.94				1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	103.23	410.74	410.74
17	2002			40.41	33.67	947.28	10.94	38.94				1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	103.23	416.58	416.58
18	2003			39.32	33.67	959.60	9.59	38.94				1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	103.23	422.49	422.49
19	2004			38.23	33.67	972.07	8.24	38.94				1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	103.23	428.46	428.46
20	2005			37.13	33.67	984.71	6.89	38.94				1382.62	4.33	45.66	-1080.00	397.91	-39.69	-26.95	103.23	434.50	1514.50
21	2006			36.04	33.67	997.51	5.53	38.94	1080.00			1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	103.23	466.30	466.30
22	2007		1080.00	34.95	33.67	1010.48	4.18	38.94				1418.80	26.99	45.66	1080.00	408.33	-12.14	-26.95	103.23	472.47	-607.53
23	2008			33.86	33.67	1023.61	28.50	38.94				1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	103.23	453.03	453.03
24	2009			32.77	33.67	1036.92	27.15	38.94				1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	103.23	459.34	459.34
25	2010			31.67	33.67	1050.40	25.80	38.94				1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	103.23	465.73	465.73
26	2011			30.58	33.67	1064.05	24.45	38.94				1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	103.23	472.18	472.18
27	2012			29.49	33.67	1077.89	23.10	38.94				1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	103.23	478.70	478.70
28	2013			28.40	33.67	1091.90	21.75	38.94				1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	103.23	485.29	485.29
29	2014			27.30	33.67	1106.09	20.39	38.94				1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	103.23	491.97	491.97
30	2015			26.21	33.67	1120.47	19.04	38.94				1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	103.23	498.72	498.72
31	2016			25.12	33.67	1135.04	17.69	38.94				1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	103.23	505.53	505.53
32	2017			24.03	33.67	1149.79	16.34	38.94				1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	103.23	512.41	512.41
33	2018			22.94	33.67	1164.74	14.99	38.94				1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	103.23	519.38	519.38
34	2019			21.84	33.67	1179.88	13.64	38.94				1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	103.23	526.44	526.44
35	2020			20.75	33.67	1195.22	12.29	38.94				1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	103.23	533.57	533.57
36	2021			19.66	33.67	1210.76	10.94	38.94				1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	103.23	540.78	540.78
37	2022			18.57	33.67	1226.50	9.59	38.94				1722.12	4.33	45.66	-1080.00	495.62	-23.83	-26.95	103.23	548.07	1628.07
38	2023			17.47	33.67	1242.44	8.24	38.94	1080.00			1744.51	28.50	45.66	0.00	502.06	2.79	-26.95	103.23	581.13	581.13
39	2024			16.38	33.67	1258.60	6.89	38.94				1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	103.23	588.59	588.59
40	2025			15.29	33.67	1274.96	5.53	38.94				1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	103.23	596.14	596.14
41	2026		1080.00	14.20	33.67	1291.53	4.18	38.94				1813.43	23.97	45.66	1080.00	521.90	5.59	-26.95	103.23	603.77	-476.23
42	2027			13.11	33.67	1308.32	28.50	38.94				1837.01	22.46	45.66	0.00	528.68	-19.15	-26.95	103.23	585.81	585.81
43	2028			12.01	33.67	1325.33	27.15	38.94				1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	103.23	593.63	593.63
44	2029			10.92	33.67	1342.56	25.80	38.94				1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	103.23	601.52	601.52
45	2030			9.83	33.67	1360.01	24.45	38.94				1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	103.23	609.50	609.50
46	2031			8.74	33.67	1377.69	23.10	38.94				1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	103.23	617.58	617.58
47	2032			7.65	33.67	1395.60	21.75	38.94				1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	103.23	625.74	625.74
48	2033	-369.00	-682.12	6.55	33.67	1413.75	20.39	38.94	-381.18			1985.03	13.40	45.66	-669.94	571.28	-13.54	-26.95	103.23	634.02	1303.96

表 8-8

財務的内部收益率感度分析 (CASE 8)

FIRR= 0.100764

NPV=-0.006988

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants										Diesel Power Generation (w/o Hydro)				Benefit				Benefit - Cost		
		Investment		Operation and Maintenance						Investment	Operation & Maintenance			Cost	Benefit							
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant					Fuel	Tax	Repair /Others		Fuel Saving	Tax Saving	Repair /Others Saving	Turn-over from Energy Sold	Total			
				Tax	Repair /Others	Fuel	Tax	Repair /Others														
1	1986	132.00										132.00							0.00	-132.00		
2	1987	810.00										810.00							0.00	-810.00		
3	1988	1567.00	1200.00									1200.00							0.00	-1567.00		
4	1989	1181.00		49.15	33.67	911.86	25.65	38.94				1181.00	1124.48	25.65	45.66	1181.00	212.62	-49.15	-26.95	20.15	156.67	-1024.33
5	1990			48.16	33.67	773.52	24.43	38.94				0.00	1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	58.31	348.64	348.64
6	1991			47.18	33.67	810.00	23.22	38.94				0.00	1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	69.32	338.81	338.81
7	1992			51.33	33.67	832.50	24.45	38.94				0.00	1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	81.33	338.98	338.98
8	1993			50.24	33.67	843.32	23.10	38.94				0.00	1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	91.76	354.71	354.71
9	1994			49.15	33.67	854.29	21.75	38.94				0.00	1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	91.76	360.07	360.07
10	1995			48.06	33.67	865.39	20.39	38.94				0.00	1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	91.76	365.50	365.50
11	1996			46.96	33.67	876.64	19.04	38.94				0.00	1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	91.76	370.98	370.98
12	1997			45.87	33.67	888.04	17.69	38.94				0.00	1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	91.76	376.52	376.52
13	1998			44.78	33.67	899.58	16.34	38.94				0.00	1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	91.76	382.11	382.11
14	1999			43.69	33.67	911.28	14.99	38.94				0.00	1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	91.76	387.77	387.77
15	2000			42.59	33.67	923.12	13.64	38.94				0.00	1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	91.76	393.49	393.49
16	2001			41.50	33.67	935.12	12.29	38.94				0.00	1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	91.76	399.27	399.27
17	2002			40.41	33.67	947.28	10.94	38.94				0.00	1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	91.76	405.11	405.11
18	2003			39.32	33.67	959.60	9.59	38.94				0.00	1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	91.76	411.02	411.02
19	2004			38.23	33.67	972.07	8.24	38.94				0.00	1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	91.76	416.99	416.99
20	2005			37.13	33.67	984.71	6.89	38.94				1080.00	1382.62	4.33	45.66	-1080.00	397.91	-39.69	-26.95	91.76	423.03	1503.03
21	2006			36.04	33.67	997.51	5.53	38.94				0.00	1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	91.76	454.83	454.83
22	2007		1080.00	34.95	33.67	1010.48	4.18	38.94				1080.00	1418.80	26.99	45.66	1080.00	408.33	-12.14	-26.95	91.76	461.00	-619.00
23	2008			33.86	33.67	1023.61	28.50	38.94				0.00	1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	91.76	441.56	441.56
24	2009			32.77	33.67	1036.92	27.15	38.94				0.00	1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	91.76	447.87	447.87
25	2010			31.67	33.67	1050.40	25.80	38.94				0.00	1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	91.76	454.26	454.26
26	2011			30.58	33.67	1064.05	24.45	38.94				0.00	1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	91.76	460.71	460.71
27	2012			29.49	33.67	1077.89	23.10	38.94				0.00	1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	91.76	467.23	467.23
28	2013			28.40	33.67	1091.90	21.75	38.94				0.00	1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	91.76	473.82	473.82
29	2014			27.30	33.67	1106.09	20.39	38.94				0.00	1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	91.76	480.50	480.50
30	2015			26.21	33.67	1120.47	19.04	38.94				0.00	1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	91.76	487.25	487.25
31	2016			25.12	33.67	1135.04	17.69	38.94				0.00	1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	91.76	494.06	494.06
32	2017			24.03	33.67	1149.79	16.34	38.94				0.00	1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	91.76	500.94	500.94
33	2018			22.94	33.67	1164.74	14.99	38.94				0.00	1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	91.76	507.91	507.91
34	2019			21.84	33.67	1179.88	13.64	38.94				0.00	1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	91.76	514.97	514.97
35	2020			20.75	33.67	1195.22	12.29	38.94				0.00	1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	91.76	522.10	522.10
36	2021			19.66	33.67	1210.76	10.94	38.94				0.00	1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	91.76	529.31	529.31
37	2022			18.57	33.67	1226.50	9.59	38.94				1080.00	1722.12	4.33	45.66	-1080.00	495.62	-23.83	-26.95	91.76	536.60	1616.60
38	2023			17.47	33.67	1242.44	8.24	38.94				0.00	1744.51	28.50	45.66	0.00	502.06	-2.79	-26.95	91.76	569.66	569.66
39	2024			16.38	33.67	1258.60	6.89	38.94				0.00	1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	91.76	577.12	577.12
40	2025			15.29	33.67	1274.96	5.53	38.94				0.00	1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	91.76	584.67	584.67
41	2026		1080.00	14.20	33.67	1291.53	4.18	38.94				1080.00	1813.43	23.97	45.66	1080.00	521.90	5.59	-26.95	91.76	592.30	-487.70
42	2027			13.11	33.67	1308.32	28.50	38.94				0.00	1837.01	22.46	45.66	0.00	528.68	-19.15	-26.95	91.76	574.34	574.34
43	2028			12.01	33.67	1325.33	27.15	38.94				0.00	1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	91.76	582.16	582.16
44	2029			10.92	33.67	1342.56	25.80	38.94				0.00	1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	91.76	590.05	590.05
45	2030			9.83	33.67	1360.01	24.45	38.94				0.00	1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	91.76	598.03	598.03
46	2031			8.74	33.67	1377.69	23.10	38.94				0.00	1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	91.76	606.11	606.11
47	2032			7.65	33.67	1395.60	21.75	38.94				0.00	1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	91.76	614.27	614.27
48	2033	-369.00	-682.12	6.55	33.67	1413.75	20.39	38.94				-381.18	1985.03	13.40	45.66	-669.94	571.28	-13.54	-26.95	91.76	622.55	1292.49

財務的内部收益率感度分析 (CASE 9)

FIRR= 0.082886 NPV=0.011504

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants										Diesel Power Generation(w/o Hydro)				Benefit - Cost					
		Investment		Operation and Maintenance						Investment	Operation & Maintenance			Cost	Benefit						
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant					Fuel	Tax	Repair /Others		Fuel Saving		Tax Saving	Repair /Others Saving	Turn-over from Energy Sold	Total	
				Tax	Repair /Others	Fuel	Tax	Repair /Others													
1	1986	138.60																	0.00	-138.60	
2	1987	850.50																	0.00	-850.50	
3	1988	1645.35	1260.00																0.00	-1669.35	
4	1989	1240.05		49.15	33.67	865.95	25.65	38.94				1067.86	25.65	45.66	1240.05	201.91	-49.15	-26.95	22.67	148.48	-1091.57
5	1990			48.16	33.67	725.14	24.43	38.94				1067.86	24.29	45.66	0.00	342.72	-48.30	-26.95	65.60	333.07	333.07
6	1991			47.18	33.67	749.60	23.22	38.94				1067.86	22.93	45.66	0.00	318.26	-47.47	-26.95	77.99	321.83	321.83
7	1992			51.33	33.67	760.53	24.45	38.94				1067.86	23.97	45.66	0.00	307.33	-51.81	-26.95	91.49	320.06	320.06
8	1993			50.24	33.67	760.53	23.10	38.94				1067.86	22.46	45.66	0.00	307.33	-50.88	-26.95	103.23	332.73	332.73
9	1994			49.15	33.67	760.53	21.75	38.94				1067.86	20.95	45.66	0.00	307.33	-49.95	-26.95	103.23	333.66	333.66
10	1995			48.06	33.67	760.53	20.39	38.94				1067.86	19.44	45.66	0.00	307.33	-49.01	-26.95	103.23	334.60	334.60
11	1996			46.96	33.67	760.53	19.04	38.94				1067.86	17.93	45.66	0.00	307.33	-48.07	-26.95	103.23	335.54	335.54
12	1997			45.87	33.67	760.53	17.69	38.94				1067.86	16.42	45.66	0.00	307.33	-47.14	-26.95	103.23	336.47	336.47
13	1998			44.78	33.67	760.53	16.34	38.94				1067.86	14.91	45.66	0.00	307.33	-46.21	-26.95	103.23	337.40	337.40
14	1999			43.69	33.67	760.53	14.99	38.94				1067.86	13.40	45.66	0.00	307.33	-45.28	-26.95	103.23	338.33	338.33
15	2000			42.59	33.67	760.53	13.64	38.94				1067.86	11.88	45.66	0.00	307.33	-44.35	-26.95	103.23	339.26	339.26
16	2001			41.50	33.67	760.53	12.29	38.94				1067.86	10.37	45.66	0.00	307.33	-43.42	-26.95	103.23	340.19	340.19
17	2002			40.41	33.67	760.53	10.94	38.94				1067.86	8.86	45.66	0.00	307.33	-42.49	-26.95	103.23	341.12	341.12
18	2003			39.32	33.67	760.53	9.59	38.94				1067.86	7.35	45.66	0.00	307.33	-41.56	-26.95	103.23	342.05	342.05
19	2004			38.23	33.67	760.53	8.24	38.94				1067.86	5.84	45.66	0.00	307.33	-40.63	-26.95	103.23	342.98	342.98
20	2005			37.13	33.67	760.53	6.89	38.94	1134.00			1067.86	4.33	45.66	-1134.00	307.33	-39.69	-26.95	103.23	343.92	1477.92
21	2006			36.04	33.67	760.53	5.53	38.94				1067.86	28.50	45.66	0.00	307.33	-13.07	-26.95	103.23	370.54	370.54
22	2007		1134.00	34.95	33.67	760.53	4.18	38.94				1067.86	26.99	45.66	1134.00	307.33	-12.14	-26.95	103.23	371.47	-762.53
23	2008			33.86	33.67	760.53	28.50	38.94				1067.86	25.48	45.66	0.00	307.33	-36.88	-26.95	103.23	346.73	346.73
24	2009			32.77	33.67	760.53	27.15	38.94				1067.86	23.97	45.66	0.00	307.33	-35.95	-26.95	103.23	347.66	347.66
25	2010			31.67	33.67	760.53	25.80	38.94				1067.86	22.46	45.66	0.00	307.33	-35.01	-26.95	103.23	348.60	348.60
26	2011			30.58	33.67	760.53	24.45	38.94				1067.86	20.95	45.66	0.00	307.33	-34.08	-26.95	103.23	349.53	349.53
27	2012			29.49	33.67	760.53	23.10	38.94				1067.86	19.44	45.66	0.00	307.33	-33.15	-26.95	103.23	350.46	350.46
28	2013			28.40	33.67	760.53	21.75	38.94				1067.86	17.93	45.66	0.00	307.33	-32.22	-26.95	103.23	351.39	351.39
29	2014			27.30	33.67	760.53	20.39	38.94				1067.86	16.42	45.66	0.00	307.33	-31.27	-26.95	103.23	352.34	352.34
30	2015			26.21	33.67	760.53	19.04	38.94				1067.86	14.91	45.66	0.00	307.33	-30.34	-26.95	103.23	353.27	353.27
31	2016			25.12	33.67	760.53	17.69	38.94				1067.86	13.40	45.66	0.00	307.33	-29.41	-26.95	103.23	354.20	354.20
32	2017			24.03	33.67	760.53	16.34	38.94				1067.86	11.88	45.66	0.00	307.33	-28.49	-26.95	103.23	355.12	355.12
33	2018			22.94	33.67	760.53	14.99	38.94				1067.86	10.37	45.66	0.00	307.33	-27.56	-26.95	103.23	356.05	356.05
34	2019			21.84	33.67	760.53	13.64	38.94				1067.86	8.86	45.66	0.00	307.33	-26.62	-26.95	103.23	356.99	356.99
35	2020			20.75	33.67	760.53	12.29	38.94				1067.86	7.35	45.66	0.00	307.33	-25.69	-26.95	103.23	357.92	357.92
36	2021			19.66	33.67	760.53	10.94	38.94				1067.86	5.84	45.66	0.00	307.33	-24.76	-26.95	103.23	358.85	358.85
37	2022			18.57	33.67	760.53	9.59	38.94	1134.00			1067.86	4.33	45.66	-1134.00	307.33	-23.83	-26.95	103.23	359.78	1493.78
38	2023			17.47	33.67	760.53	8.24	38.94				1067.86	28.50	45.66	0.00	307.33	2.79	-26.95	103.23	386.40	386.40
39	2024			16.38	33.67	760.53	6.89	38.94				1067.86	26.99	45.66	0.00	307.33	3.72	-26.95	103.23	387.33	387.33
40	2025			15.29	33.67	760.53	5.53	38.94				1067.86	25.48	45.66	0.00	307.33	4.66	-26.95	103.23	388.27	388.27
41	2026		1134.00	14.20	33.67	760.53	4.18	38.94				1067.86	23.97	45.66	1134.00	307.33	5.59	-26.95	103.23	389.20	-744.80
42	2027			13.11	33.67	760.53	28.50	38.94				1067.86	22.46	45.66	0.00	307.33	-19.15	-26.95	103.23	364.46	364.46
43	2028			12.01	33.67	760.53	27.15	38.94				1067.86	20.95	45.66	0.00	307.33	-18.21	-26.95	103.23	365.40	365.40
44	2029			10.92	33.67	760.53	25.80	38.94				1067.86	19.44	45.66	0.00	307.33	-17.28	-26.95	103.23	366.33	366.33
45	2030			9.83	33.67	760.53	24.45	38.94				1067.86	17.93	45.66	0.00	307.33	-16.35	-26.95	103.23	367.26	367.26
46	2031			8.74	33.67	760.53	23.10	38.94				1067.86	16.42	45.66	0.00	307.33	-15.42	-26.95	103.23	368.19	368.19
47	2032			7.65	33.67	760.53	21.75	38.94				1067.86	14.91	45.66	0.00	307.33	-14.49	-26.95	103.23	369.12	369.12
48	2033	-387.45	-716.23	6.55	33.67	760.53	20.39	38.94	-400.24			1067.86	13.40	45.66	-703.44	307.33	-13.54	-26.95	103.23	370.07	1073.51





表 8-11

投資收益率 (CASE 11)

RR= 0.095941

NPV=0.000145

		Million Yen																				
Project Year	Year	Generation by Hydro and Diesel Power Plants						Diesel Power Generation(w/o Hydro)				Cost	Benefit				Benefit - Cost					
		Investment		Operation and Maintenance				Invest- ment	Operation & Maintenance				Total	Benefit - Cost								
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant			Fuel	Tax	Repair /Others			Fuel	Tax	Repair /Others		Fuel Saving	Tax Saving	Repair /Others Saving	Turn-over from Energy Sold	
				Tax	Repair /Others	Fuel	Tax															Repair /Others
1	1986	139.79															0.00	-139.79				
2	1987	865.58															0.00	-865.58				
3	1988	1715.03	1270.80							1270.80							0.00	-1715.03				
4	1989	1398.71		49.15	33.67	911.86	25.65	38.94				1124.48	25.65	45.66		1398.71	212.62	-49.15	-26.95	25.19	161.71	-1237.00
5	1990			48.16	33.67	773.52	24.43	38.94				1139.10	24.29	45.66		0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94				1153.91	22.93	45.66		0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94				1168.91	23.97	45.66		0.00	336.41	-51.81	-26.95	101.66	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94				1184.10	22.46	45.66		0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94				1199.50	20.95	45.66		0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94				1215.09	19.44	45.66		0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94				1230.89	17.93	45.66		0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94				1246.89	16.42	45.66		0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94				1263.10	14.91	45.66		0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94				1279.52	13.40	45.66		0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94				1296.15	11.88	45.66		0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94				1313.00	10.37	45.66		0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94				1330.07	8.86	45.66		0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94				1347.36	7.35	45.66		0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94				1364.88	5.84	45.66		0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94				1382.62	4.33	45.66		-1143.72	397.91	-39.69	-26.95	114.70	445.97	1589.69
21	2006			36.04	33.67	997.51	5.53	38.94				1400.59	28.50	45.66		0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1143.72	34.95	33.67	1010.48	4.18	38.94				1418.80	26.99	45.66		1143.72	408.33	-12.14	-26.95	114.70	483.94	-659.78
23	2008			33.86	33.67	1023.61	28.50	38.94				1437.25	25.48	45.66		0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94				1455.93	23.97	45.66		0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94				1474.86	22.46	45.66		0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94				1494.03	20.95	45.66		0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94				1513.45	19.44	45.66		0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94				1533.13	17.93	45.66		0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94				1553.06	16.42	45.66		0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94				1573.25	14.91	45.66		0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94				1593.70	13.40	45.66		0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94				1614.42	11.88	45.66		0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94				1635.41	10.37	45.66		0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94				1656.67	8.86	45.66		0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94				1678.20	7.35	45.66		0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94				1700.02	5.84	45.66		0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94				1722.12	4.33	45.66		-1143.72	495.62	-23.83	-26.95	114.70	559.54	1703.26
38	2023			17.47	33.67	1242.44	8.24	38.94				1744.51	28.50	45.66		0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94				1767.19	26.99	45.66		0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94				1790.16	25.48	45.66		0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1143.72	14.20	33.67	1291.53	4.18	38.94				1813.43	23.97	45.66		1143.72	521.90	5.59	-26.95	114.70	615.24	-528.48
42	2027			13.11	33.67	1308.32	28.50	38.94				1837.01	22.46	45.66		0.00	528.68	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94				1860.89	20.95	45.66		0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94				1885.08	19.44	45.66		0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94				1909.59	17.93	45.66		0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94				1934.41	16.42	45.66		0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94				1959.56	14.91	45.66		0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-411.91	-722.37	6.55	33.67	1413.75	20.39	38.94			-403.67	1985.03	13.40	45.66		-730.61	571.28	-13.54	-26.95	114.70	645.49	1376.10

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants										Diesel Power Generation(w/o Hydro)			Benefit					Benefit - Cost	
		Investment		Operation and Maintenance						Investment	Operation & Maintenance			Cost	Benefit				Total		
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant					Fuel	Tax	Repair /Others		Fuel Saving	Tax Saving	Repair /Others Saving	Turn-over from Energy Sold			
				Tax	Repair /Others	Fuel	Tax	Repair /Others													
1	1986	142.56																0.00	-142.56		
2	1987	885.36																0.00	-885.36		
3	1988	1767.72	1296.00															0.00	-1767.72		
4	1989	1476.20		49.15	33.67	911.86	25.65	38.94				1124.48	25.65	45.66	1476.20	212.62	-49.15	-26.95	25.19	161.71	-1314.49
5	1990			48.16	33.67	773.52	24.43	38.94				1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94				1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94				1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	101.66	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94				1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94				1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94				1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94				1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94				1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94				1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94				1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94				1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94				1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94				1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94				1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94				1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94	1166.40			1382.62	4.33	45.66	-1166.40	397.91	-39.69	-26.95	114.70	445.97	1612.37
21	2006			36.04	33.67	997.51	5.53	38.94				1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1166.40	34.95	33.67	1010.48	4.18	38.94				1418.80	26.99	45.66	1166.40	408.33	-12.14	-20.95	114.70	483.94	-682.46
23	2008			33.86	33.67	1023.61	28.50	38.94				1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94				1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94				1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94				1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94				1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94				1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94				1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94				1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94				1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94				1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94				1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94				1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94				1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94				1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94	1166.40			1722.12	4.33	45.66	-1166.40	495.62	-23.83	-26.95	114.70	559.54	1725.94
38	2023			17.47	33.67	1242.44	8.24	38.94				1744.51	28.50	45.66	0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94				1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94				1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1166.40	14.20	33.67	1291.53	4.18	38.94				1813.43	23.97	45.66	1166.40	521.90	5.59	-26.95	114.70	615.24	-551.16
42	2027			13.11	33.67	1308.32	28.50	38.94				1837.01	22.46	45.66	0.00	528.88	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94				1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94				1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94				1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94				1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94				1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-427.18	-736.69	6.55	33.67	1413.75	20.39	38.94	-411.67			1985.03	13.40	45.66	-752.20	571.28	-13.54	-26.95	114.70	645.49	1397.69

表 8-13

投資收益率 (CASE 13)

RR= 0.087376

NPV=0.019297

Million Yen

Project Year	Year	Generation by Hydro and Diesel Power Plants							Diesel Power Generation(w/o Hydro)			Cost	Benefit				Benefit - Cost				
		Investment		Operation and Maintenance					Investment	Operation & Maintenance			Total								
		Hydro	Diesel	Hydropower Plant		Diesel Power Plant				Fuel	Tax			Repair /Others							
				Tax	Repair /Others	Fuel	Tax	Repair /Others							Fuel Saving	Tax Saving		Repair /Others Saving	Turn-over from Energy Sold		
1	1986	144.68									144.68					0.00	-144.68				
2	1987	927.23									927.23					0.00	-927.23				
3	1988	1901.48	1408.96								1408.96					0.00	-1901.48				
4	1989	1605.05		49.15	33.67	911.86	25.65	38.94				1124.48	25.65	45.66	1605.05	212.62	-49.15	-26.95	25.19	161.71	-1443.34
5	1990			48.16	33.67	773.52	24.43	38.94				1139.10	24.29	45.66	0.00	365.58	-48.30	-26.95	72.89	363.22	363.22
6	1991			47.18	33.67	810.00	23.22	38.94				1153.91	22.93	45.66	0.00	343.91	-47.47	-26.95	86.65	356.14	356.14
7	1992			51.33	33.67	832.50	24.45	38.94				1168.91	23.97	45.66	0.00	336.41	-51.81	-26.95	101.66	359.31	359.31
8	1993			50.24	33.67	843.32	23.10	38.94				1184.10	22.46	45.66	0.00	340.78	-50.88	-26.95	114.70	377.65	377.65
9	1994			49.15	33.67	854.29	21.75	38.94				1199.50	20.95	45.66	0.00	345.21	-49.95	-26.95	114.70	383.01	383.01
10	1995			48.06	33.67	865.39	20.39	38.94				1215.09	19.44	45.66	0.00	349.70	-49.01	-26.95	114.70	388.44	388.44
11	1996			46.96	33.67	876.64	19.04	38.94				1230.89	17.93	45.66	0.00	354.24	-48.07	-26.95	114.70	393.92	393.92
12	1997			45.87	33.67	888.04	17.69	38.94				1246.89	16.42	45.66	0.00	358.85	-47.14	-26.95	114.70	399.46	399.46
13	1998			44.78	33.67	899.58	16.34	38.94				1263.10	14.91	45.66	0.00	363.51	-46.21	-26.95	114.70	405.05	405.05
14	1999			43.69	33.67	911.28	14.99	38.94				1279.52	13.40	45.66	0.00	368.24	-45.28	-26.95	114.70	410.71	410.71
15	2000			42.59	33.67	923.12	13.64	38.94				1296.15	11.88	45.66	0.00	373.03	-44.35	-26.95	114.70	416.43	416.43
16	2001			41.50	33.67	935.12	12.29	38.94				1313.00	10.37	45.66	0.00	377.88	-43.42	-26.95	114.70	422.21	422.21
17	2002			40.41	33.67	947.28	10.94	38.94				1330.07	8.86	45.66	0.00	382.79	-42.49	-26.95	114.70	428.05	428.05
18	2003			39.32	33.67	959.60	9.59	38.94				1347.36	7.35	45.66	0.00	387.77	-41.56	-26.95	114.70	433.96	433.96
19	2004			38.23	33.67	972.07	8.24	38.94				1364.88	5.84	45.66	0.00	392.81	-40.63	-26.95	114.70	439.93	439.93
20	2005			37.13	33.67	984.71	6.89	38.94			1268.06	1382.62	4.33	45.66	-1268.06	397.91	-39.69	-26.95	114.70	445.97	1714.04
21	2006			36.04	33.67	997.51	5.53	38.94				1400.59	28.50	45.66	0.00	403.09	-13.07	-26.95	114.70	477.77	477.77
22	2007		1268.06	34.95	33.67	1010.48	4.18	38.94				1418.80	26.99	45.66	1268.06	408.33	-12.14	-26.95	114.70	483.94	-784.13
23	2008			33.86	33.67	1023.61	28.50	38.94				1437.25	25.48	45.66	0.00	413.63	-36.88	-26.95	114.70	464.50	464.50
24	2009			32.77	33.67	1036.92	27.15	38.94				1455.93	23.97	45.66	0.00	419.01	-35.95	-26.95	114.70	470.81	470.81
25	2010			31.67	33.67	1050.40	25.80	38.94				1474.86	22.46	45.66	0.00	424.46	-35.01	-26.95	114.70	477.20	477.20
26	2011			30.58	33.67	1064.05	24.45	38.94				1494.03	20.95	45.66	0.00	429.98	-34.08	-26.95	114.70	483.65	483.65
27	2012			29.49	33.67	1077.89	23.10	38.94				1513.45	19.44	45.66	0.00	435.57	-33.15	-26.95	114.70	490.17	490.17
28	2013			28.40	33.67	1091.90	21.75	38.94				1533.13	17.93	45.66	0.00	441.23	-32.22	-26.95	114.70	496.76	496.76
29	2014			27.30	33.67	1106.09	20.39	38.94				1553.06	16.42	45.66	0.00	446.96	-31.27	-26.95	114.70	503.44	503.44
30	2015			26.21	33.67	1120.47	19.04	38.94				1573.25	14.91	45.66	0.00	452.78	-30.34	-26.95	114.70	510.19	510.19
31	2016			25.12	33.67	1135.04	17.69	38.94				1593.70	13.40	45.66	0.00	458.66	-29.41	-26.95	114.70	517.00	517.00
32	2017			24.03	33.67	1149.79	16.34	38.94				1614.42	11.88	45.66	0.00	464.62	-28.49	-26.95	114.70	523.88	523.88
33	2018			22.94	33.67	1164.74	14.99	38.94				1635.41	10.37	45.66	0.00	470.66	-27.56	-26.95	114.70	530.85	530.85
34	2019			21.84	33.67	1179.88	13.64	38.94				1656.67	8.86	45.66	0.00	476.78	-26.62	-26.95	114.70	537.91	537.91
35	2020			20.75	33.67	1195.22	12.29	38.94				1678.20	7.35	45.66	0.00	482.98	-25.69	-26.95	114.70	545.04	545.04
36	2021			19.66	33.67	1210.76	10.94	38.94				1700.02	5.84	45.66	0.00	489.26	-24.76	-26.95	114.70	552.25	552.25
37	2022			18.57	33.67	1226.50	9.59	38.94			1268.06	1722.12	4.33	45.66	-1268.06	495.62	-23.83	-26.95	114.70	559.54	1827.60
38	2023			17.47	33.67	1242.44	8.24	38.94				1744.51	28.50	45.66	0.00	502.06	2.79	-26.95	114.70	592.60	592.60
39	2024			16.38	33.67	1258.60	6.89	38.94				1767.19	26.99	45.66	0.00	508.59	3.72	-26.95	114.70	600.06	600.06
40	2025			15.29	33.67	1274.96	5.53	38.94				1790.16	25.48	45.66	0.00	515.20	4.66	-26.95	114.70	607.61	607.61
41	2026		1268.06	14.20	33.67	1291.53	4.18	38.94				1813.43	23.97	45.66	1268.06	521.90	5.59	-26.95	114.70	615.24	-652.82
42	2027			13.11	33.67	1308.32	28.50	38.94				1837.01	22.46	45.66	0.00	528.68	-19.15	-26.95	114.70	597.28	597.28
43	2028			12.01	33.67	1325.33	27.15	38.94				1860.89	20.95	45.66	0.00	535.56	-18.21	-26.95	114.70	605.10	605.10
44	2029			10.92	33.67	1342.56	25.80	38.94				1885.08	19.44	45.66	0.00	542.52	-17.28	-26.95	114.70	612.99	612.99
45	2030			9.83	33.67	1360.01	24.45	38.94				1909.59	17.93	45.66	0.00	549.57	-16.35	-26.95	114.70	620.97	620.97
46	2031			8.74	33.67	1377.69	23.10	38.94				1934.41	16.42	45.66	0.00	556.72	-15.42	-26.95	114.70	629.05	629.05
47	2032			7.65	33.67	1395.60	21.75	38.94				1959.56	14.91	45.66	0.00	563.95	-14.49	-26.95	114.70	637.21	637.21
48	2033	-457.84	-800.90	6.55	33.67	1413.75	20.39	38.94			-447.56	1985.03	13.40	45.66	-811.18	571.28	-13.54	-26.95	114.70	645.49	1456.66



