WELCOME TO

ANGAT HYDROELECTRIC POWER PLANT

LOCATION

Angat Hydroelectric Power Plant, the biggest plant of its kind in the Philippines with an installed capacity of 246 MW, is located in Norzagaray, Bulacan about 58 kilometers northeast of Manila.

The Angat River originates from the Sierra Madre Mountain Ranges, flows down across the towns of Bulacan, then joins the Pampanga River at the town of Calumpit and finally discharges to the Manila Bay at Hagonoy, Bulacan.





PRESIDENT MARCOS PUSHING THE BUTTON



BLESSING OF THE POWERHOUSE



THE INAUGURAL CROWD



PRESIDENT MARCOS DELIVERING A SPEECH

BACKGROUND

ANGAT HEP is a multipurpose project commissioned on September 9, 1967 with a rated output of 218 MW. It was built along Angat River whose average inflow of 60 cms is allocated as follows:

 Irrigation (NIA) – 	36 cms
Water Supply (MWSS)	– <u>22 cms</u>
 Power Generation – 	58 cms
River maintenance –	<u>2 cms</u>
	60 cms

ANGAT DAM COMPLEX

ANGAT HEP – ORIGINAL SCHEME



ANGAT HEP – MWSS AWSOP / UMIRAY PROJECT



EFFECT OF AWSOP AND UMIRAY TO ANGAT POWER GENERATION



REVENUE LOSS DUE TO RE-ALLOCATION OF WATER TO MWSS Annual Estimated Generation Loss: 445.80 - 412.0 = 33.80 GWH per year Annual Revenue Loss: (@ Php 4.3835 per kWh) ~ Php 148.1623 M per year Action by NPC: – Send Debit MEMO to MWSS: Php 3.796 B

Recommendation

• To recover the losses per provision of the Philippine Water Code and MOU between NPC and MWSS dated February 9, 1990 as follows: "6. MWSS shall compensate NAPOCOR the energy and capacity losses, if any, which the latter may incur as a result of the operation of the former's Auxiliary Unit No. 5 in such manner and amount as shall be agreed by the Parties..."

Angat Project Cost

- Estimated Cost: Php476.344 million in construction (9 Generating Units)
- Peso requirements came from bond issues, earnings and reserves of the National Power Corporation
- NWSA contributed PhP 21.5 M in return for an allocation of 500 M gallons of water daily (22 CMS)
- Foreign requirements were financed from the proceeds of a \$34 M loan from IBRD
- As of June 30, 2004, the total Equipment Plant in Service: PhP 9.049 B





The Powerhouse & Switchyard





AHEPP OPERATING CONTEXT

 Angat Hydroelectric Power Plant is the first project to integrate in its design several functional activities such as power, irrigation, water supply, and flood control.

It is composed of two sets of generating stations, the main power station (4 x 50MW) and the auxiliary power station (3 x 6MW, 10MW, 18MW) with a total of 246MW rated capacity. Electric Power is conveyed to the Luzon Grid thru the San Jose Substation via three (3) 115KV transmission lines.

The AHEPP is a "must run" power station intended to provide not only large block of power but water requirements for potable water supply of Metro manila and irrigation supply for the province of Bulacan. The five (5) Auxiliary Units with a combined capacity of 46MW operates 24 hours a day for 365 days a year to deliver the required outflow of 46cu.m./sec of water for Metro Manila.

The four (4) Main Units (200MW) usually operates during peak hours (Peaking/Load Following) to augment the power requirement of Luzon Grid while delivering water for Bustos Dam irrigating 30,000 hectares of land in Bulacan. During the rainy season when the inflow of water to the reservoir is high causing a rapid increase in water elevation, all the generating units are operated as Base Load in order to maintain the water elevation within its normal level without necessarily spilling excess water. During Blackouts, the plant serves as the system catalyst that provides much needed power to the grid.

 At reservoir elevation of 180 masl, AHEPP is mandated by the NWRB to stop the operation of the four (4) main units.

- NWRB mandates the order of priority on water usage:
 - 1. Potable Water Supply
 - 2. Irrigation Supply
 - 3. Domestic Supply
 - 4. Power Generation



Angat Dam Reservoir Daily Water Elevation, @ 0000H For the Year 1998 - July 15, 2005



ANGAT TABLE OF ORGANIZATION



Historical Performance Statistics of Angat Hydroelectric Power Plant For the Year 2002-2004

Gross Generation, GWH
Net Generation, GWH
Equiv. Availability Factor, %
Forced Outage Rate, %
Plant Capacity Factor, %
Station Used, MWH

Plant Performance 1st Sem CY 2005

GROSS GENERATION, GWH

(Actual vs target)

	Jan	Feb	Mar	Apr	May	Jun	1 st Sem	Jul	Aug	Sep	Oct	Nov	Dec	2 nd Sem	Total
Actual	33.7	35.6	27.5	14.9	6.34	5.45	123.5								
Target	53.0	50.0	41.0	35.0	19.0	16.0	214.0	25.0	24.0	25.0	36.0	19.0	29.0	158.0	372.0



EQUIVALENT AVAILABILITY FACTOR, %

(Actual vs target)

	Jan	Feb	Mar	Apr	May	Jun	1 st Sem	Jul	Aug	Sep	Oct	Nov	Dec	2 nd Sem	Total
Actual	68.3	66.1	67.7	60.4	54.6	48.7	57.97								
Target	66.9	62.9	45.9	52.1	44.7	39.3	44.59	38.5	42.9	53.6	73.0	83.9	89.9	59.8	50.02



FORCED OUTAGE RATE, % (Actual vs target)

	Jan	Feb	Mar	Apr	May	Jun	1 st Sem	Jul	Aug	Sep	Oct	Nov	Dec	2 nd Sem	Total
Actual	0.00	0.00	0.00	0.00	0.00	0.00	0.00								0.00
Target	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04



PLANT CAPACITY FACTOR, % (Actual vs target)

	Jan	Feb	Mar	Apr	May	Jun	1 st Sem	Jul	Aug	Sep	Oct	Nov	Dec	2 nd Sem	Total
Actual	18.4	19.4	16.6	8.16	3.58	2.99	11.50								11.5
Target	28.9	27.3	24.8	19.1	10.7	8.74	19.92	14.1	13.1	13.7	20.3	10.4	16.4	14.62	17.26



STATION SERVICE, MWH

(Actual vs target)

	Jan/ Jul	Feb/ Aug	Mar/ Sep	Apr/ Oct	May/ Nov	Jun/ Dec	1 st Sem/ 2 nd Sem	Total
Actual	204.65	212.29	210.55	200.24	235.76	229.51	1,315.35	1,315.35
Target	219.6/ 220.5	190.3/ 221.5	210.5/ 221.2	209.5/ 223.09	231.8/ 249.36	211.9/ 228.57	1,273.82/ 1,364.20	2,638.02



National Power Corporation Angat HE Power Plant Financial Information for CY 2000 – 2004 (in Million P)

	2000	2001	2002	2003	2004
Gross Gen. (GwH)	736.489	525.998	440.843	379.952	247.54
Net Utility Revenue	1,177.00	850.00	1,171.90	1,172.10	1,119.36
Gen. Fixed Costs:	372.21	361.70	376.10	390.60	425.40
Depreciation	282.31	282.20	283.70	294.40	307.50
Total Plant OPEX	89.90	79.50	92.40	96.20	117.90
Gen. Margin	804.79	488.30	795.80	781.50	693.96
Rate Base	2,382.90	2,110.50	1,828.50	1,642.30	1,341.40
RORB (%)	32.60	21.83	39.57	44.89	48.71
Gen. Cost/Kwh ¹	0.1221	0.1511	0.2096	0.2532	0.4763
Gen. Cost/Kwh ²	0.5054	0.6876	0.8531	1.0280	1.7185

1/ Generation Cost/Kwh = Generation Fixed Costs (excluding Depreciation) / Gross Generation in Kwh
2/ Generation Cost/Kwh = Generation Fixed Costs (including Depreciation) / Gross Generation in Kwh

Angat HE Power Plant Results of Operation For the Month Ended June 30,

	<u>2005</u>	<u>2004</u>	<u>Inc. / (Dec)</u>
Gross Gen., KWH	123,476,100.00	121,242,220.00	2,233,880.00
Net Gen., KWH	122,010,270.00	119,942,390.00	2,067,880.00
Net Operating Revenue	545, 264,604.13	392,642,118.00	152,622,486.13
Less: Variable Costs:			
Gross Contribution Margin	545, 264,604.13	392,642,118.00	152,622,486.13
Less: Generation Fixed Costs:	208,511,384.40	215,868,735.08	(7,357,350.68)
Depreciation	153,728,000.04	153,728,000.04	-
Other Operating Expenses:			
Generation	30,621,267.64	30,288,985.85	332,281.79
Bad Debts			
Corporate Support	11,829,384.71	19,500,000.00	(7,670,615.29)

	<u>2005</u>	<u>2004</u>	<u>Inc. / (Dec)</u>
Fixed O&M:			
Financial Assistance	1,159,098.34	1,138,121.14	20,977.20
Share in National Wealth	4,820,956.00	5,281,436.00	(460,480.00)
Real Property Tax	155,279.69	155,279.69	-
Franchise Tax	2,410,476.00	2,835,953.75	(425,477.75)
Taxes & Duties	773,496.00	175,072.00	598,424.00
Insurance	3,013,425.98	2,765,886.61	247,539.37
NOI Before Financial Charges	336,753,219.73	176,773,382.92	159,979,836.81
Less: Interest Expense	2,052,995.37	4,400,000.00	(2,347,004.63)
NOI After Financial Charges	334,700,224.36	172,373,382.92	162,326,841.44
Add Interest Income	4,012.45	3,600,000.00	(3,595,987.55)
Other Income	485,303.97	3,100,000.00	(2,614,696.03)
Allocated Other Income	15,321,037.81		15,321,037.81
Less: Depreciation-Others	-		
Other Expenses	16,156.10	19,100,000.00	(19,083,843.90)
Allocated Other Expenses	1,170,612.01		1,170,612.01
<u>NET INCOME</u>	<u>349,323,810.48</u>	<u>159,973,382.92</u>	<u>189,350,427.56</u>

Cy 2005 APMT/Maintenance Schedule

UNIT	DAYS/						<u>PE</u>	<u>RIOD</u>							
	HRS	<u>JAN</u>	<u>FEB</u>	MAR	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUN</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	NOV	DEC		
MN1	59/ 1416			Jan 1-	Feb 2	8 Rep	oair of [Damage	ed Stato	or Wind	ing Pha	se "B"			
MN2	15/ 360				APMT_Nov 15, 24										
AN1	10/ 240				APMT Nov 15-24 Retrofitting of Excitation System Nov 15-Dec 8										
MN3	15/ 360								AI	PMT	Sep 2	21-Oct	5		
MN4	15/ 360								Oc	t 12-26		APMT			
AN X′R A	5/ 120					Oct 15-20 APMT									
AN2	10/ 240				Re	trofittir	ng of Ex	citation	م n Syste	NPMT N m Nov	lov 28-l 15-De	Dec 8 c 8			

UNIT	DAYS						PEI	RIOD					
STIT -	/HRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
MN X'R A	5/ 120								(Dct 3-7	APN	ЛТ	
AN3	10/ 240									AP	MT Dec	: 12-21	
MN X'R B	5/ 120								APMT	Oct 24	-29		
AN5	273/ 6552									Repair	Jan /Reasse	1-Sep embly o	30 f AN 5
AN4	212/ 5088									Jan 1- Repair/	Jul 31 'Reasse	mbly of	AN 4
AN X'R B	5/ 120									ļ	ΑΡΜΤ [Dec 16-	21
Spill way	61/ 1464	Replac	ement	of Spill	lway G	ate Nos	s. 1, 2 <u>,</u>	May 1 & 3 bot	Jun 30) al and s	side sea	l (Gate	No. 3)
Power Intake	61/ 1464					Pov	ver Inta	ike Con	trol and	Nov 1-I d Protec	Dec 31 ction Sy	rstem	

Cy 2005 APMT/Maintenance Schedule Actual Vs. Target (As of June 30, 2005)

UNIT	DAYS/						<u>PEI</u>	RIOD							
	HRS	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUN</u>	<u>AUG</u>	<u>SEP</u>	<u>ост</u>	<u>NOV</u>	<u>DEC</u>		
MN1	59/ 1416			Jan 1-	- Feb 2	8 Rep	oair of [Damage	ed Stato	br Wind	ing Pha	se "B″			
MN2	15/ 360									Se	p 1-15	APMT			
AN1	10/ 240			APMT Nov 15-24 Retrofitting of Excitation System Nov 15-Dec 8											
MN3	15/ 360			APMT Sep 21-Oct 5											
MN4	15/ 360								Oc	t 12-26		APMT			
AN X'r A	5/ 120								0	ct 15-2	0	APMT			
AN2	10/ 240		APMT Nov 28-Dec 8 Retrofitting of Excitation System Nov 15-Dec 8												
Logond			Taraat	Date_			Actual	Date							

UNIT	DAYS /HRS	PERIOD												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
MN X'r A	5/ 120					May 4	-20		C	Oct 3-7 APMT				
AN3	10/ 240									API	MT Dec	: 12-21		
MN X′r B	5/ 120					■ May 23-27 APN			APMT	Oct 24	-29			
AN5	273/ 6552		Balancing of rotor					Feb 17	Jan 1-Sep 30 -Jun 30 Repair/Reassembly of AN 5					
AN4	212/ 5088	Jan 1-F	b 7 Mar 4 - Present						Jan 1-Jul 31 Repair/Reassembly of AN 4					
AN X'r B	5/ 120				May Jun	23- 10		Jun 14- 17		Æ	APMT [Dec 16-	21	
Spill Way	61/ 1464	Replacement of Spillway Gate Nos. 1, 2, & 3 bottom seal and side seal (Gate No. 3												
Power Intake	61/ 1464					Nov 1-Dec 31 Power Intake Control and Protection System								

DATE OF MAJOR OVERHAULING

UNIT	Date Commissioned	Date of Major Overhaul
Main Unit 1	October 16, 1967	July 1987
Main Unit 2	October 16, 1967	October 1985
Main Unit 3	August 6, 1968	July 1989
Main Unit 4	June 6, 1968	July 1988
Aux. Unit 1	July 2, 1967	December 1989
Aux. Unit 2	July 2, 1967	December 1990
Aux. Unit 3	October 16, 1978	_
Aux. Unit 4	June 16, 1986	Mar 2004-Present
Aux. Unit 5	January 14, 1993	Nov 2004 -
		Present

ISSUES AND CONCERNS

Proliferation of Squatter Families within the Angat Watershed. Latest AWAT survey showed that the illegal occupants within the watershed reservation is about 300 families and still increasing. Majority of these people have no immediate source of living but would largely depend on the forest for sustenance. They would engage on illegal activities like rattan gathering, kaingin making and worse, timber poaching and possibly result to a severe destruction of forest in the years to come. Furthermore, threatens Angat's hydrologic capability, consequently, affecting the water supply for MWSS, NIA and NPC.

Creation of Barangay San Lorenzo. In November 13, 1985, the Sangguniang Panlalawigan of Bulacan passed Ordinance Number 4-RE-655 which separated the illegally occupied timberland portion of Barangay San Mateo and created it into a barangay named San Lorenzo. However, the subject area, which includes the Angat HEPP compound is a proclaimed forest reserve by virtue of Proclamation No. 71 Series of 1927, Proclamation No. 505 dated December 5, 1965 and Proclamation No. 599 date june 23, 1959. The current barangay status of San Lorenzo has attracted and continues to attract migrant illegal occupants.

Clogging of the Low Level Outlet (LLO)

Purpose:

1. It was used as discharge outlet for water requirement of NIA & MWSS during the impounding time of water at the reservoir.

2. It is used as outlet for the much needed water for NIA & MWSS when the power tunnel is shutdown for inspection or maintenance or there is shortage of water brought about by low inflow like "El Nino"

<u>Clogging Incidents</u>

1. In 1991 while the LLO was opened to deliver the water requirements of MWSS, suddenly it was clogged with silt and logs. It was unclogged and rehabilitated in 1998.

2. In November 2004, the regulating value of the LLO was found damaged while augmenting the requirement of MWSS. During the testing on the first week of July this year after partially completing the repair works, it was found out that the LLO is again clogged with silt and logs.

On-going Actions

1. NPC, MWSS and the Concessionaires are working together for the immediate declogging of the upstream portion of the tunnel. The group is now negotiating with the former contractor and consultant who rehabilitated the LLO in 1998.



-_____

In Low and All

PROFILE

1:90

SCALE

Thank You and Good Day!

- June 6, 1968 50 MW Main Unit #3.
 August 6, 1968 50 MW Main Unit #4.
- October 16, 1978 6 MW Auxiliary Unit #3.
- June 16, 1986 10 MW Auxiliary Unit #4.
- January 14, 1993 18 MW Auxiliary Unit #5