

# III. ENERGY INDEPENDENCE

## A. ACCELERATE DEVELOPMENT OF INDIGENOUS FOSSIL FUEL RESOURCES

### OIL AND GAS

To accelerate the implementation of the government's energy independence package, the oil and gas sector is working towards increasing the country's oil and gas reserves by about 20.0 percent in ten years. Thus, reserves are targeted to increase from 481.0 MMBFOE (69.5 MTOE) in 2004 to 579 MMBFOE (83.6 MTOE) by 2014.

### PERFORMANCE ASSESSMENT

The 2004 level of petroleum reserves stood at 481 MMBFOE (69.5 MTOE), broken down into 25 MMB of oil, 2,243 BCF of gas and 59.1 MMB of condensates. Actual oil production in 2004 from the Nido and Matinloc fields reached 0.14 MMB, while gas produced from the Malampaya field reached 87.6 billion cubic feet during the same period.

To meet the target the DOE pursued an aggressive promotion of the country's indigenous oil and gas resources and adopted a competitive

contracting schemes. As of December 2005, the country has 21 active service contracts (SC) and one geophysical service exploration contract (GSEC) in the petroleum sector. Work programs under these service contracts include the conduct of geological and geophysical studies, seismic acquisition and drilling of wells.

To continue the gains from PCR-1, the DOE conducted the PECR 2005 wherein four oil and gas areas were offered. These areas include prospective blocks in East Palawan (two areas), Southwest Palawan (one area), and Sulu Sea regions (one area). The DOE expects more contract applications with the increased investor confidence following the Supreme Court reversal of its ruling on the Mining Act of 1995 which now allows 100 percent foreign ownership in the mining sector.

### DEVELOPMENT CHALLENGES

- Development of marginal fields such as those found in offshore Mindoro and offshore Palawan. The development of these fields, even with a modest production rate, would help accelerate the country's move towards energy independence.
- Re-evaluation and possible rehabilitation of West Linapacan, Cadlao and Galoc fields will lessen crude petroleum imports, as well as increase the country's self-sufficiency level.

Table 3.1. ACTIVE SERVICE EXPLORATION CONTRACTS, as of December 2005

Operator	Contract Number	Location	Area (has.)	Effective Date
Sterling Energy Ltd	GSEC 101	Reed Bank	1,036,000	June 13, 2002
Philodrill/Alcorn	SC 6A/B	Northwest Palawan	164,837.72	Sept. 1, 1973
Philodrill	SC 14	Northwest Palawan	70,887.56	Dec. 17, 1975
PNOC-EC	SC 37	Cagayan	36,000	July 18, 1990
Shell Philippines	SC 38	Northwest Palawan	158,526	Feb. 23, 1989
Forum Exploration	SC 40	Northern Cebu	458,000	Feb. 19, 1994
Basic Consolidated	SC 41	Sulu Sea	832,386	May 10, 1996
Premiere Oil	SC 43	Ragay Gulf	1,088,000	Jan. 14, 2004
Gas2Grid	SC 44	Central Cebu	100,000	Jan. 28, 2004
South Sea Petroleum	SC 45	Agusan-Davao	748,000	Dec. 15, 2004
JAPEX	SC 46	Offshore Tanon Strait	328,000	Dec. 21, 2004
PNOC-EC/Petronas	SC 47	Offshore Mindoro	1,466,700	Jan. 10, 2005
Aragorn Power Corp	SC 48	Cagayan	748,000	Feb. 22, 2005
Phil-Malaysia Petroenergy	SC 49	South Cebu	265,000	Mar. 1, 2005
NorAsian Energy Ltd.	SC 50	NW Palawan	172,000	Mar. 11, 2005
NorAsian Energy Ltd.	SC 51	Visayan Basin	444,000	Jul. 8, 2005
EF Durkee and Associates	SC 52	Cagayan Valley	96,000	Jul. 8, 2005
Laxmi Organic Industries	SC 53	Mindoro-Cuyo Basin	660,000	Jul. 8, 2005
Nido Petroleum Phil	SC 54	NW Palawan	537,616	Aug. 5, 2005
NorAsian Energy Ltd.	SC 55	West Palawan	900,000	Aug. 5, 2005
Mitra Energy Ltd.	SC 56	Sulu Sea	862,000	Aug. 5, 2005
PNOC-EC	SC 57	North Calamian	720,000	Sept. 15, 2005

### MEASURABLE SECTORAL TARGETS

#### EXPLORATION

On exploration drilling, 61 new petroleum wells are projected. This shows an increase in drilling commitments by about eight wells over the set targets of the Reference Plan. The increase in drilling targets is attributable to the increase in the number of active service contracts.

#### FIELDS

The discovery of new oil fields as well as the programmed reactivation of the West Linapacan oil field is anticipated by 2008-2010.

## PRODUCTION

About 120.8 MMB of oil and 43.6 MMB of condensates are expected to be produced during the planning period.

Table 3.2. OIL AND GAS MEASURABLE TARGETS

Field	2005	2006	2010	2014
<b>Oil and Gas Reserves</b>				
<b>in MMBFOE</b>	<b>456</b>	<b>436</b>	<b>796</b>	<b>579</b>
<b>in MTOE</b>	<b>65.8</b>	<b>63.0</b>	<b>114.9</b>	<b>83.6</b>
<b>Exploration Well Drilling</b>	<b>3</b>	<b>3</b>	<b>7</b>	<b>12</b>
<b>Production</b>				
<b>Oil (MMB)</b>	<b>0.152</b>	<b>0.165</b>	<b>19.0</b>	<b>11.86</b>
- Nido	.083	.091	-	-
- Matinloc	.067	.074	-	-
- Galoc*	-	-	.750	-
- Malampaya*	-	-	4.38	-
- West Linapacan	-	-	6.57	8.21
- New oilfield	-	-	7.30	3.65
<b>Gas (BCF)</b>	<b>108.2</b>	<b>88.3</b>	<b>182.6</b>	<b>184.9</b>
- San Martin	-	-	36.5	36.5
- Malampaya	108.2	88.2	146.0	146.0
- Libertad	-	0.112	0.123	-
- Sultan sa Barongis	-	-	-	2.4
<b>Condensate (MMB)</b>				
-Malampaya	5.21	5.20	4.93	3.65
<b>Total Imported Fuel Oil Displacement</b>				
<b>in MMBFOE</b>	<b>24.51</b>	<b>20.94</b>	<b>55.35</b>	<b>47.86</b>
<b>in MTOE</b>	<b>3.54</b>	<b>3.02</b>	<b>7.99</b>	<b>6.90</b>

\* Oil production from Malampaya and Galoc fields is expected to commence in 2007.

## ACTION PLAN

- Pursue the implementation of the PECR. Under this activity, investors are assured of a transparent contracting round and provided with an updated database on the country's prospective Palawan and Sulu Sea Basins.
- Encourage service contractors and prospective investors to undertake improved and new technologies to address the development of marginal fields and rehabilitation of previously-producing fields
- Pursue institutional strengthening activities to improve DOE's in-house capacity and strengthen its capability in planning and monitoring the upstream activities of the oil and gas sector, as well as on the optimal exploration, development and production of indigenous energy resources
- Interact actively with the downstream energy sector through gas-to-market projects



Signing of the Framework Agreement for Upstream Opportunities in the Calamian Area in Offshore Northwest Palawan in Malacañang on April 26, 2005. Photo shows (left to right) CNOOC Chairman of Directors Mr. Fu Chengyu, Chinese President Mr. Hu Jintao, President Gloria Macapagal-Arroyo and PNOC President Eduardo V. Mañalac.

## BEYOND 2014

The DOE expects the introduction of a new and advanced petroleum resource assessment program to assist the DOE in increasing the country's proven reserve estimates, identify under-explored sedimentary basins and, in the long-run, address the projected increase in oil demand.

Likewise, advanced technology for the discovery of petroleum deposits in deep water areas (depth of more than 200 meters) will enable explorers to discover and develop oil and gas in deep waters to increase proven reserves while minimizing exploration risks.

Furthermore, the DOE seeks to duplicate the success of the Malampaya oil and gas field with the discovery of a new gas field for the 2015-2025 planning period. The development and production of the new gas field is expected for another 20 years as marketability of gas is expected to be enhanced due to the implementation of various programs to expand its use in both power and non-power activities.

## COAL

***As the use of indigenous coal is promoted, the energy sector aims to reduce coal imports by 20.0 percent in ten years.***

## PERFORMANCE ASSESSMENT

As of end-2004, coal importation was recorded at 6,410.1 KMT. The 2004 coal production was recorded at 2.5 MMT, translating to a fuel oil displacement of about 8.7 MMBFOE (1.3 MTOE).

Indigenous coal is largely sourced from the operations of Semirara Mining Corporation (Antique) and the output from its open cast operations represented about 92.3 percent of the country's total coal production for 2004. The balance was provided by the small- and medium-scale mining operations in the coal-rich provinces of Zamboanga Sibugay, Cebu, Negros and Albay.

On the other hand, the country's in-situ reserves reached 360.2 MMT in 2004 with the resurgence of heightened coal exploration activity in the country's sedimentary basins. This is expected to increase as COC holders undertake more exploration activities.

As of December 2005, the country has 35 COCs with development, production and exploration commitments. The improved price for domestic coal triggered the influx of applications for coal concessions.

The sites are located in Polillo (Quezon), Tagkawayan (Quezon), Calatrava (Negros Occidental), Candoni/Bayawan (Negros Oriental), Gigaquit (Surigao del Norte), Tandag-Tago-Lianga-Bislig (Surigao del Sur) and Malangas (Zamboanga Sibugay).

On the other hand, adoption of clean coal technologies (CCTs) will maximize the use of coal for power generation. To date, several coal-fired thermal power plants have initiated the use of the said technology. These are:

- ❖ 500-MW Mauban Coal-fired Thermal Power Plant
- ❖ 728-MW Pagbilao Coal-fired Thermal Power Plant (Units 1 and 2)
- ❖ 1,152-MW Sual Coal-fired Thermal Power Plant
- ❖ 326-MW Calaca Coal-fired Thermal Power Plant
- ❖ 40-MW Toledo Coal-fired Thermal Power Plant
- ❖ 105-MW Salcon Coal-fired Thermal Power Plant (Cebu TPP 1 and 2)
- ❖ 580-MW Masinloc Coal-fired Thermal Power Plant (Units 1 and 2)

Likewise, agreements were finalized with developed countries to demonstrate projects on clean coal technology. These include the country's technical cooperation project with the Federal Republic of Germany on *Environment-friendly Production of Carbon Enriched Lignite Project*. This initiative will process low-ranked indigenous coal to produce household briquettes using the rotary kiln carbonization technology. The construction of the 300-kilogram (kg) per hour carbonization plant at the Semirara Mining Corporation (SMC) plant in Antique, as well as the stabilization of plant operation and training of SMC personnel were completed in 2005. By 2006, a dedusting system will be instituted in the facility.

On the other hand, the *Demonstration Project for Coal Briquette (Carbonized) Production Plant (RP-Japan)* will

**Table 3.3. COAL OPERATING CONTRACT HOLDERS, as of December 2005**

Operator	COC Number	Location	Effective Date
Semirara Mining Corp	5	Semirara Island, Caluya, Antique	Jul. 11, 1977
Adlaon Energy Dev't Corp	9	Badian and Argao, Cebu	Mar. 14, 1978
Ibalong Resources Dev't Corp.	13	Dalaguete, Cebu	June 27, 1978
PNOC-EC	41	Malangas and Diplahan, Zamboanga Sibugay	Aug. 14, 1980
Filsystems Incorporated	68	Bulalacao, Oriental Mindoro	Jul. 11, 1984
Filsystems Incorporated	77	Imelda, Zamboanga Sibugay	Mar. 6, 1987
Filsystems Incorporated	78	Payao, Zamboanga Sibugay	Mar. 27, 1992
Benguet Corp	83	San Miguel, Surigao del Sur	June 10, 1988
Adlaon Energy Dev't Corp	89	Compostela and Consolacion, Cebu	Aug. 31, 1993
Industrial Entreprises	92	Giporlos, Eastern Samar	Oct. 14, 1988
Filsystems Incorporated	93	Kabasalan, Zamboanga del Sur	Feb. 2, 1989
Rock Energy International Corp.	104	Liguan, Batan Island, Rapu-rapu, Albay	May 14, 1991
MG Mining and Energy Corp	106	Bislig and Lingig, Surigao del Sur	June 28, 1991
D. M. Wenceslao, Inc	116	Iguig, Cagayan Province	June 24, 2004
PNOC-EC	122	Cauayan, Isabela	July 23, 1998
D. M. Wenceslao, Inc	123	Gattaran and Baculud, Cagayan Prov.	June 24, 2004
Lima Coal Development Corp	125	Sagrada, Batan Is., Rapu-rapu, Albay	May 29, 2001
Daguma Agro-Minerals Inc	126	South Cotabato and Sultan Kudarat	Nov. 19, 2002
MG Mining and Energy Corp	127	Bislig, Surigao del Sur	May 5, 2003
Ibalong Resources and Dev't Corp	128	Calanaga, Batan Is., Rapu-rapu, Albay	Sept. 2, 2003
Samaju Corporation	129	San Ramon, Batan Is., Rapu-rapu, Albay	Feb. 4, 2005
Philex Mining Corp.	130	Diplahan, Zamboanga Sibugay	Feb. 23, 2005
Forum Exploration Inc	131	Dalaguete, Cebu	Feb. 23, 2005
Forum Exploration Inc	132	Balamban and Naga, Cebu	Feb. 23, 2005
MG Mining & Energy Corp	133	Argao, Cebu	Feb. 23, 2005
MG Mining & Energy Corp	134	South Cotabato	Feb. 23, 2005
SKI Construction Group	135	Danao City, Cebu	May 26, 2005
SKI Construction Group	136	Naga, Cebu	May 26, 2005
Rock Energy International Corp	137	Dapdap, Batan Is., Rapu-rapu, Albay	May 26, 2005
Bonanza Energy Resources	138	Sultan Kudarat, South Cotabato and Sarangani Provinces	May 26, 2005
Ulysis Mining Corp	139	Siocon, Zamboanga del Norte	May 26, 2005
PNOC-EC	140	Surigao del Sur	July 5, 2005
PNOC-EC	141	Isabela Province	July 5, 2005
Visayas Multi-Minerals Mining and Trading Corp.	142	Toledo City, Cebu	July 5, 2005
Monte Oro Resources and Energy, Inc.	143	Caramuran, Catanduanes	Nov. 8, 2005

Moreover, seven coal prospect areas were offered to potential investors during the PECR 2005.

produce briquettes for distribution among households and small to medium-scale industries in Cebu. Modification activities are being conducted to ensure the plant's compliance to Philippine environmental regulations.

Moreover, a U.S. technology firm recently completed a study on the conversion of indigenous coal to specification transportation fuels such as diesel and gasoline. The study, which revealed encouraging results, paved the way for the signing of an MOU between the DOE and Hydrocarbon Technology Innovations Group (HTIG) for the establishment of a 50,000 barrels per day coal-to-fuels conversion facility in the country. HTIG will utilize its 25-kg per day pilot plant to establish the design basis for converting the country's indigenous coal to liquid fuel. The project will drastically cut the country's dependence on expensive imported fuel, as well as boost the utilization of indigenous coal.

The DOE is likewise looking at the possibility of developing the country's coalbed methane resources, an emerging natural gas resource that has evolved worldwide as an alternative clean-burning fossil fuel. In 2005, the United States Geological Survey (USGS) submitted a report entitled "Assessment of Philippine Coalbed Methane (CBM)" which identified available coal resources of the country (from lignite to semi-anthracite) that has good potential for gas storage capacity compared with coals found in U.S coal fields. With encouraging results of the laboratory tests, a detailed study has been proposed to be conducted to determine the volume and prove the recoverable reserve potential of CBM resources.



The Semirara Coal Mine Pit located in Antique is the largest coal mine in the country.

## DEVELOPMENT CHALLENGES

- Social acceptability factors arising from the apprehensions that coal projects are hazardous to the environment
- Obtaining prior and informed consent of indigenous people
- Extracting resources from National Integrated Protected Areas System (NIPAS)
- Peace and order situation in remote coal areas such as those found in Surigao, Mindoro and Isabela Province.

## MEASURABLE SECTORAL TARGETS

### RESERVES

With the recent awarding of new COCs for exploration, it is projected that the country's coal reserves will stand at 420.8 MMT by the end of the planning period (Table 3.4). This shows a 16.8 percent increase over the target set by the Reference Plan which posted in-situ reserves target at 360.3 MMT by 2014.

Table 3.4. COAL MEASURABLE SECTORAL TARGETS

	2005	2006	2010	2014
<b>In-Situ Reserves (MMMT)</b>	<b>307.56</b>	<b>313.19</b>	<b>318.82</b>	<b>420.81</b>
<b>Production (@10,000 BTU/lb MMT)</b>	<b>2.81</b>	<b>3.33</b>	<b>4.77</b>	<b>6.60</b>
Luzon	0.04	0.046	0.37	0.73
Visayas	2.55	3.00	3.73	4.87
Mindanao	0.22	0.28	0.68	1.01
<b>Imported Fuel Oil Displacement</b>				
<b>In MMBFOE</b>	<b>9.94</b>	<b>11.75</b>	<b>16.85</b>	<b>23.30</b>
<b>In MTOE</b>	<b>1.43</b>	<b>1.70</b>	<b>2.44</b>	<b>3.36</b>

### PRODUCTION

Production statistics of the 2006 Plan Update show that the coal sector will be able to hit the 3-million mark in production level by 2006. This would gradually reach the 4-million mark by 2009 brought about by additional production from coal-producing areas in Cauayan, Isabela and Sultan Kudarat. This trend will continue up to the end of the planning period as coal production is expected to reach 6.6 MMT in 2014. The country's coal resources are envisioned to fuel mine-mouth coal-fired power plants located in Isabela, Cagayan, Antique, Surigao and Sultan Kudarat (Table 3.5). The use of indigenous coal is expected to displace about 11.8 MMBFOE (1.7 MTOE) in 2006 and will double its level by 2014 as it reaches 23.3 MMBFOE (3.4 MTOE) (Table 3.4).

Table 3.5. INDICATIVE MINE-MOUTH COAL-FIRED POWER PROJECTS

Location	Potential Capacity (MW)	Year Available
Sultan Kudarat	100	2009
Cauayan, Isabela	50	2009
	50	2012
Iguig, Cagayan	50	2010
	50	2013
Antique	100	2010
Antique	200	2012
Antique	200	2014
Surigao	100	2011

In addition, feasibility studies for the coal power projects in Cauayan (Isabela), Sta. Ana (Cagayan), Concepcion (Iloilo) and Maitum (Sarangani) have been undertaken and presented by NPC to investors interested in the development of new coal-fired power plants in the said areas.

## ACTION PLAN

- Conduct information campaign on CCTs for power generating companies, LGUs and other stakeholders, as well as training and seminars on safety, health and environment. This is expected to generate social acceptability of CCT projects.
- Pursue environmental programs and new technologies such as low-rank coal upgrading, flue gas desulfurization for the reduction of emissions and effluents from coal-fired power plants, conversion of indigenous coal to liquid fuels technology and CBM resource potential inventory.
- Review policy guidelines on small-scale coal mining operations
- Pursue small-scale coal mining projects to provide livelihood in certain coal mining areas, thereby uplifting the standard of living among local residents

## BEYOND 2014

The DOE will continue to focus on sustaining a steady 5.0 percent annual growth in domestic coal production for the planning period 2015-2025 to meet the projected demand for indigenous coal.

## B. AGGRESSIVELY DEVELOP RENEWABLE ENERGY POTENTIALS

Consistent with the target of increasing renewable energy-based capacity by 100 percent in 2013, a total of 721 MW was installed during the period 2003 to 2005. This includes 695 MW of hydropower capacity, 25 MW of wind power and 1 MW of solar power.

### GEOTHERMAL

*The country seeks to be the world's largest producer of geothermal energy with the provision of 1,200 MW<sup>3</sup> of maximum capacity in the next ten years.*

### PERFORMANCE ASSESSMENT

In 2004, power generation from geothermal resources reached 10,282 GWh, displacing about 17.7 MMBFOE (2.56 MTOE). The year saw the conduct of rehabilitation/maintenance works on several geothermal plants such as Makban, Tiwi and Bacman.

Geothermal fields offered in the 2005 PECR could add about 330 MW in additional capacity. This includes the development of new fields in Daklan (Benguet), Natib (Bataan), Mabini (Batangas), Montelago (Oriental Mindoro), Biliran (Biliran Province) and Amacan (Compostela Valley). Proposals for the exploration and

development of prospective sites in Biliran and Amacan by PNOC-EDC are currently being reviewed and evaluated. The PECR 2005 was launched in August 2005 to offer 11 geothermal prospects for power and non-power utilization. Submission of bid proposals ended in November 2005 and awarding of contracts is expected to be completed by June 2006.

Another major investment promotion activity was the country's participation in the World Geothermal Congress (WGC) in Antalya, Turkey in April 2005. The event which was attended by participants from 83 different countries served as an opportunity for the Philippine energy sector to showcase the country's achievements as a "World Leader in Geothermal Energy" and an investment haven in geothermal as well as other energy resources.

## DEVELOPMENT CHALLENGE

- Issues on the preservation of the environment through the NIPAS Act and the protection of cultural minorities hosting geothermal projects highlight the need to enhance public acceptability of geothermal energy projects.

## MEASURABLE SECTORAL TARGETS

### GENERATION

Additional capacity of 828 MW (original target is 1,200 MW) within the planning period will bring installed capacity to 2,172.89 MW which could generate a maximum of 15,218 GWh of electricity by 2014.

Table 3.6. GEOTHERMAL MEASURABLE TARGETS

	2005	2006	2010	2014
<b>No. of Wells to be drilled</b>	<b>7</b>	<b>15</b>	<b>46</b>	<b>13</b>
- Luzon	2	12	22	7
- Visayas	5	2	12	4
- Mindanao	0	1	12	2
<b>Steam Availability (Cum. MW)</b>	<b>1,902.62</b>	<b>1,944.50</b>	<b>2,652.42</b>	<b>2,854.86</b>
- Luzon	721.26	775.23	1,239.57	1,321.02
- Visayas	1,072.58	1,055.86	1,164.08	1,175.21
- Mindanao	108.78	113.40	248.77	358.63
<b>Installed Generating Capacity (Cum. MW)</b>	<b>1,930.89</b>	<b>1,930.89</b>	<b>2,010.89</b>	<b>2,172.89</b>
- Luzon	907.23	907.23	907.23	907.23
- Visayas	915.18	915.18	975.18	975.18
- Mindanao	108.48	108.48	128.48	290.48
<b>Gross Generation (GWh)</b>	<b>9,978.00</b>	<b>10,449.00</b>	<b>12,303.00</b>	<b>15,218.00</b>
- Luzon	3,753.00	3,970.00	4,569.00	5,553.00
- Visayas	5,327.00	5,581.00	6,673.00	7,287.00
- Mindanao	898.0	898.00	1,061.00	2,378.00
<b>Imported Fuel Oil Displacement</b>				
<b>In MMBFOE</b>	<b>17.20</b>	<b>18.02</b>	<b>21.21</b>	<b>26.24</b>
<b>In MTOE</b>	<b>2.48</b>	<b>2.60</b>	<b>3.06</b>	<b>3.79</b>

<sup>3</sup> Based on REPF targets

## DRILLING

A total of 302 wells is envisioned to be drilled by PNOC-EDC and the private sector to meet the steam requirement by 2014.

## INDICATIVE PROJECTS

Two committed projects of PNOC-EDC, namely: the 53.8-MW Northern Negros Geothermal Project and the 20-MW Nasulo Geothermal Power Project (formerly known as the Palinpinon Optimization Project) are scheduled for commissioning by 2007 and 2008, respectively. Construction of the Northern Negros Project is currently ongoing to meet its targeted commissioning date by January 2007, while the awarding of bids for the construction of the Nasulo Geothermal Power Project is scheduled in June 2006.

In addition, three major geothermal projects are most likely to be commissioned during the planning period. These are the Batong-Buhay (Kalinga), Buguias-Tinoc (Benguet-Ifugao) and Southern Leyte (Cabalian, Southern Leyte) Geothermal Projects. The 2006 Plan Update includes the 50-MW Mindanao Greenfield Project in North Cotabato under its list of indicative projects for the planning period bringing the total indicative capacity addition to 750 MW. However, only 170 MW was accommodated in the simulations considering future power capacity requirements of the country.

## ACTION PLAN

- Continue to place on the auction block contracts for the exploration and development of highly prospective geothermal areas in the country through the PECR. Consistent with the Geothermal-1 bid round, areas to be offered in the auction block will be based on technical, environmental and legal merits. The contracting round in 2005 offered the following geothermal areas for exploration, development, optimization and direct utilization: a) Luzon: Daklan in Benguet, Natib in Bataan, Mabini in Batangas, Tiwi in Albay, Montelago in Oriental Mindoro and Sta. Lucia-Iwahig in Palawan b) Visayas: Biliran in Biliran Province, Mambucal in Negros Occidental, Malabuyoc in Cebu and c) Mindanao: Camiguin in Camiguin Island and Amacan in Compostela Valley (Table 3.7).
- Optimize plant capacity in areas of existing geothermal fields that have the potential to produce additional steam

- Promote geothermal sites particularly the low enthalpy areas in the country which are being offered for direct-use applications. The DOE, in partnership with the Department of Tourism (DOT) and the Department of Health (DOH), is laying the groundwork for the development of these areas for direct use, health and spa purposes. Geothermal areas for non-power utilization include Laguna, Albay, Palawan, Negros Occidental, Cebu and Camiguin.
- Establish guidelines on small-scale and non-power application of geothermal resources
- Optimize utilization of geothermal energy using the cascading scheme<sup>4</sup> of geothermal development

Table 3.7. INDICATIVE GEOTHERMAL CAPACITY ADDITIONS

Region	Project	Location	Potential Capacity (MW)	Year Available
CAR	Batong Buhay	Kalinga	60	2011
	Buguias-Tinoc	Benguet-Ifugao	60	2012
	Daklan	Benguet	20	2012
II	Baua	Cagayan	20	2012
III	Natib	Natib, Bataan	40	2010
IV-A	Mabini	Mabini, Batangas	20	2010
IV-B	Montelago	Mindoro Oriental	40	2010
V	Tanawon	Albay and Sorsogon	40	2009
	Manito-Kayabon	Albay and Sorsogon	40	2011
	Rangas	Albay and Sorsogon	40	2012
VI	Mandalagan	Negros Occidental	20	2014
VII	Dauin	Negros Oriental	40	2011
VIII	Biliran	Biliran, Leyte	20	2009
	Cabalian	Cabalian, Southern Leyte	100	2011
IX	Lakewood	Zamboanga del Sur	40	2012
XI	Amacan	North Davao	20	2013
	SE Apo	Davao del Sur	40	2014
XII	Mindanao Geothermal Optimization	North Cotabato	20	2009
	Mindanao Greenfield*	North Cotabato	50	2011
	NW Apo	North Cotabato	20	2011
<b>Total</b>			<b>750</b>	

\* Not included in the indicative projects list of the Reference Plan

## BEYOND 2014

For the next ten years, technologies utilizing acidic reservoir and low enthalpy type of fluids are expected to be available in the market to allow areas like Mt. Labo in Camarines Norte and others in the Bicol Region to provide additional capacities.

IEC campaign to educate the people on geothermal development in areas where there is high

<sup>4</sup> series of geothermal energy utilization at different levels of temperature (e.g. pulp/paper processing, food processing, lumber drying, spa purposes)

opposition to the development of the said resource. Thus, it is expected that communities hosting geothermal prospect areas (such as Mainit-Sadanga in Mt. Province and Maibarara in Laguna) will be more receptive to geothermal energy projects. Other areas like Mt. Malindang in Misamis Occidental, Mainit in Surigao del Norte and Mt. Parker in South Cotabato will also be included among the possible projects for the succeeding ten-year planning period.

### HYDROPOWER

*The country seeks to double its hydropower capacity from 2,518 MW in 2002 to 5,468 MW in 2013<sup>5</sup> through indicative capacity addition of 2,950 MW.*

### PERFORMANCE ASSESSMENT

The country's hydropower resources contributed 15.9 percent to the country's total power generation mix in 2004 with the commissioning of the 345-MW San Roque Hydropower plant in Pangasinan and 350-MW Kalayaan 3 and 4 in Laguna. Fuel oil displacement of the sector reached 14.8 MMBFOE (2.1 MTOE) in 2004.

The country currently has 134 hydropower plants in operation, broken down into 21 large hydropower plants (HEP), 52 mini-hydropower plants (MHP) and 61 micro-hydropower plants.

The DOE is currently supervising five ongoing MHP projects:

- ❖ 0.96-MW Cantingas MHP Project in San Fernando, Sibuyan Island, Romblon
- ❖ 0.50-MW Hinubasan MHP Project in Loreto, Dinagat Island, Surigao del Norte
- ❖ 2.5-MW Sevilla MHP Project in Sevilla, Bohol
- ❖ 0.75-MW San Luis MHP Project in San Luis, Aurora
- ❖ 1.0-MW Sipangpang MHP in Surigao Sur

The state-owned PNOC is currently working on the evaluation/conduct of feasibility studies on the following hydropower projects:

- ❖ 29.0-MW Timbaban HEP Project in Barangay Maria Cristina, Madalag, Aklan
- ❖ 16.5-MW Villasiga HEP Project in Antique
- ❖ 17.8-MW Sicopong HEP Project in Sta. Catalina, Negros Oriental
- ❖ 24-MW Catuiran HEP Project in Calapan, Oriental Mindoro
- ❖ 5.6-MW Langogan and 6.8-MW Babuyan HEP Project in Puerto Princesa
- ❖ 22-MW Pasil HEP Project in Kalinga

On the other hand, the feasibility studies of the following projects by private proponents are under evaluation by the DOE:

- ❖ 16-MW Sibulan A HEP Project in Davao del Sur
- ❖ 24-MW Sibulan B HEP Project Davao del Sur
- ❖ 10-MW Magpet HEP Project in Cotabato
- ❖ 9-MW Talaingod MHP Project in Davao del Norte
- ❖ 40-MW Suwawan HEP Project in Davao City
- ❖ 60-MW Tamogan HEP Project in Davao City
- ❖ 3.5-MW Cabulig HEP Project in Misamis Oriental
- ❖ 3-MW Dugui HEP Project in Catanduanes
- ❖ 0.96-MW Colasi HEP Project in Camarines Norte
- ❖ 0.2-MW Balutakay MHP Project in Davao del Sur
- ❖ 0.6-MW Taytayan MHP Project in Compostela Valley

### DEVELOPMENT CHALLENGE

- Securing financing support in the form of loan guarantee, project preparation and micro-financing funds for hydropower projects
- High cost of development resulting in marginal financial viability of projects

Table 3.8. HYDROPOWER MEASURABLE TARGETS

	2005	2006	2010	2014
<b>Installed Capacity (MW)</b>	<b>3,219.1</b>	<b>3,219.1</b>	<b>3,219.1</b>	<b>3,999.1</b>
Luzon	2,209.8	2,209.8	2,209.8	2,509.8
Visayas	11.61	11.61	11.61	61.61
Mindanao	997.65	997.65	997.65	1,427.65
<b>Gross Generation (GWh)</b>	<b>8,374</b>	<b>8,563</b>	<b>12,996</b>	<b>14,741</b>
Luzon	4,422	4,611	8,896	8,819
Visayas	35	35	35	188
Mindanao	3,917	3,917	4,065	5,734
<b>Total Imported Fuel Oil Displacement</b>				
<b>in MMBFOE</b>	<b>14.44</b>	<b>14.76</b>	<b>22.41</b>	<b>25.42</b>
<b>in MTOE</b>	<b>2.08</b>	<b>2.13</b>	<b>3.24</b>	<b>3.67</b>

### MEASURABLE SECTORAL TARGETS

#### INSTALLED CAPACITY

By 2014, the hydropower sector targets a cumulative installed capacity of 3,999.1 MW from hydropower resources. This corresponds to about 780.0 MW of additional capacity from the current capacity of 3,219.1 MW. Generation of electricity will reach 14,741 GWh by 2014 displacing 25.4 MMBFOE (3.7 MTOE).

#### INDICATIVE PROJECTS

The 2006 Plan Update identifies 70 hydropower projects with a total potential capacity of 2,603.5 MW (Table 3.9). This is composed of 34 large hydropower projects, 27 mini-hydropower projects and nine micro-hydropower projects. About 37 of these indicative projects have existing feasibility

<sup>5</sup> Based on REPF targets

studies. This 2006 Plan Update includes eight hydropower projects with an aggregate capacity of 68.6 MW not listed in the Reference Plan, namely the Debutunan and Dinalugan MHP in Aurora, Siguil B in Sarangani, Taytayan MHP in Compostela Valley, Sibulan A and B HEP in Davao del Sur, Talubin MHP and Caneo MHP in the Mountain Province. The last two projects are considered as potential projects under the CDM provided for under the Kyoto Protocol.

Of the total potential capacity set to come onstream within the planning period, only 780 MW was accommodated in the simulations considering the future capacity requirements of the country.

### ACTION PLAN

- Establish a Market Service Center as identified under the *Capacity Building to Remove Barriers to Renewable Energy in the Philippines (CBRED) Project*. The Center aims to assist renewable energy producers to obtain legal papers and permits required for renewable energy projects. Likewise, the project has provisions for various financing assistance options available to developers of renewable energy projects.
- Enhance DOE's technical capabilities on the development of micro-hydro and solar projects through the implementation of the Japan International Cooperation Agency (JICA)-assisted project on *Sustainable Improvement of Renewable Energy Development in Village Electrification*.
- Develop micro-hydro sites in off-grid areas through the implementation of Asian Development Bank (ADB)-assisted projects on *Renewable Energy and Livelihood Development Project in Negros Occidental (RENEW Negros)* and the *Rehabilitation of Renewable Energy Projects for Rural Electrification and Livelihood Development*. The former has initially identified the development of eight micro hydro sites in Negros Occidental, while the latter aims to develop two micro-hydro systems in the province of Kalinga.

### BEYOND 2014

The formulation of a modified REPF will serve as the continuing policy for renewable energy development program in the country. Specific programs and activities will include project packaging of renewable energy resources for capacity addition, supervision of government and private institutions on renewable energy

**Table 3.9. INDICATIVE HYDROPOWER CAPACITY ADDITION**

Region	Project	Location	Potential Capacity (MW)	Year Available
CAR	Pasil HEP	Kalinga	22.0	2011
	Talubin MHP	Mt. Province	5.6	2012
	Can-ao MHP	Mt. Province	5.9	2012
	Agbulu HEP*	Apayao	360.0	2012
	Nalatang HEP*	Benguet	75.0	2014
	Binongan HEP*	Abra	175.0	2014
I	Upper Agno MHP*	Pangasinan	5.0	2008
II	Adalam HEP	Quirino	46.0	2010
	Diduyon HEP*	Quirino	345.0	2011
	Abuan HEP*	Isabela	60.0	2013
	Ilaguen HEP*	Isabela	88.0	2014
III	Dinalugan MHP	Aurora	0.5	2007
	Debutunan MHP	Aurora	0.5	2010
IV-A	Kanan HEP*	Infanta, Quezon	113.0	2008
IV-B	Batang-Batang MHP	Palawan	3.5	2006
	Langogan MHP*	Palawan	6.8	2010
	Babuyan Island MHP*	Palawan	5.6	2010
	Catuiran HEP*	Mindoro Oriental	18.0	2011
	Aglubang HEP*	Mindoro Oriental	13.6	2011
V	Cabinbin MHP*	Palawan	0.8	2013
	Kapipian MHP	Catanduanes	3.0	2006
	Colasi MHP*	Camarines	0.96	2008
	Dugui MHP*	Catanduanes	3.5	2009
VI	Cawayan II MHP*	Sorsogon	2.5	2012
	Hitoma MHP*	Catanduanes	3.0	2012
	Igbolo MHP*	Iloilo	4.0	2010
VII	Timbaban HEP*	Aklan	23.5	2011
	Villasiga HEP*	Antique	16.5	2012
	Pacuan HEP	Negros Oriental	33.0	2007
	Siaton MHP*	Negros Oriental	5.4	2011
VIII	Okoy HEP*	Negros Oriental	12.0	2012
	Sicopong HEP*	Negros Oriental	17.8	2012
	Bugtong MHP*	Samar	1.0	2009
IX	Amandaraga MHP*	Eastern Samar	4.0	2012
	Lower Dapitan MHP	Zamboanga Norte	3.8	2006
	Salug Daku 1 MHP*	Zamboanga Sur	2.5	2008
	Salug Daku 2 MHP	Zamboanga Sur	2.5	2008
	Middle Dapitan MHP	Zamboanga Norte	4.4	2008
	Salug Daku 3 MHP	Zamboanga Sur	6.0	2010
	Salug Daku 4 MHP	Zamboanga Sur	6.0	2010
	Upper Dapitan MHP	Zamboanga Norte	3.6	2011
	Ingin MHP*	Zamboanga Norte	3.0	2012
X	Tuasan MHP	Camiguin	0.5	2008
	Larangan MHP	Misamis Occidental	8.5	2008
	Culaman MHP	Bukidnon	10.0	2008
	Odiongan 3 MHP*	Misamis Oriental	10.0	2008
	Cabulig MHP*	Misamis Oriental	3.5	2009
	Tagoloan HEP*	Bukidnon	68.0	2010
	Impasugong HEP	Bukidnon	68.0	2010
	Odiongan 2 MHP*	Misamis Oriental	5.0	2012
	Liangang HEP	Lanao Norte	11.9	2012
	Bulanog Batang HEP*	Bukidnon	132.0	2012
	Agus III HEP*	Lanao Norte/Sur	225.0	2014

\* With feasibility study

development, monitoring of renewable energy facilities and provision of technical assistance to industry stakeholders.

### BIOMASS, SOLAR, WIND AND OCEAN

*To further promote the wide-scale use of renewable energy sources, about 548 MW of indicative capacities from biomass, solar, wind and ocean energy sources were identified for possible development. About 417 MW will come from wind power projects and the balance of 131 MW will be from biomass, solar and ocean.*

### PERFORMANCE ASSESSMENT

#### BIOMASS

Based on the study "Power Switch and Strategies for Clean Power Development in the Philippines", the country has a potential installed capacity of 235.7 MW from bagasse resources. The study indicates the existence of abundant supply in Western Visayas, Eastern Visayas and Southern Tagalog.

Meanwhile, the PNOC has entered into a MOA with BP and TBI for PNOC's equity participation in the development and operation of the 30-MW Bagasse Cogeneration Project. This will cover the construction of the cogeneration power plant powered by bagasse or sugar cane residue. A Development Agreement was signed in 2004 for PNOC's 30.0 percent equity participation in the project.

#### SOLAR

*The country aims to become the solar technology manufacturing export hub of the ASEAN region.*

The inauguration of the Sunpower Solar Wafer Fabrication Plant in April 2004 boosted the country's bid to be the solar manufacturing export hub in the ASEAN region. The USD 300-million investment located in Sta. Rosa, Laguna is expected to supply about 6.0 percent of the demand in the world market for photovoltaic (PV) cells. It aims to sell 20.0 percent of its production to local market at a discount to encourage the establishment of a downstream solar industry in the country.

The use of solar energy is seen as a viable alternative to fossil fuel for the electrification of off-grid far-flung communities.

PNOC's *Solar Home Systems (SHS) Distribution Project (the Environmental Improvement for Economic Sustainability Project)* aims to install 15,100 solar PV systems in remote areas in Regions I to VII, CAR and Mindanao for the period 2002 to 2007. A solar system package consists of a solar

Table 3.9. INDICATIVE HYDROPOWER CAPACITY ADDITION (Continued)

Region	Project	Location	Potential Capacity (MW)	Year Available
XI	Sibulan A	Davao del Sur	16.5	2008
	Sibulan B	Davao del Sur	24.0	2008
	Taytayan MHP	Compostela Valley	0.6	2009
	Tandik MHP*	Compostela Valley	5.0	2010
	Siguil B	Sarangani	15.0	2010
	Talaingod MHP	Davao del Norte	10.0	2010
	Suwawan HEP	Davao City	40.0	2011
	Tamogan HEP	Davao City	60.0	2011
	Camanlangan MHP	Compostela Valley	1.0	2012
	Balutakay MHP	Davao del Sur	0.2	2012
XII	Magpet MHP*	Cotabato	10.0	2007
	Libungan MHP	North Cotabato	10.0	2010
	Pulangi V HEP*	North Cotabato	300.0	2012
XIII	Taguibo MHP	Agusan Norte	7.0	2008
	Lake Mainit HEP	Agusan Norte	22.0	2009
	Pugo HEP*	Agusan Norte	18.0	2010
ARMM	Kanapnapan Fall MHP	Lanao Sur	10.0	2008
<b>Total</b>			<b>2,603.5</b>	

\* With feasibility study

panel, deep cycle battery, wiring, lights and other fixtures. A solar panel can have a lifespan of 20 years and can generate enough electricity to run small appliances like small electric fans, radios and television sets, in addition to light bulbs. The PNOC Solar Project, which earned the prestigious Energy Globe Award in 2003 was also a recipient of a Congressional Medal of Achievement awarded by the Philippine House of Representatives in 2004. This is in recognition of PNOC Solar Project's contribution in providing outstanding services to the rural households and giving international recognition to the Philippines through the Energy Globe Award. As of December 2005, a total of 8,944 SHS has been installed in the target areas. Of this figure, 3,967 SHS were installed from August 2002 to December 2004, while the balance of 4,977 SHS were installed from January to December 2005, mostly in Palawan and Maguindanao.



The 28-kW peak centralized PV system in Pangan-an Island was installed through Belgian assistance (photo courtesy of IICA)

The *Solar Power Technology Support (SPOTS)* Project was launched by the Department of

Land Reform (DLR) to improve the socio-economic conditions of Agrarian Reform Beneficiaries (ARBs) in the unenergized and off-grid Agrarian Reform Communities (ARCs) in Mindanao. The project involves the installation of solar-powered facilities such as water pumps for irrigation, incubators and hatcheries for agri-business activities, community lighting in schools and barangay halls, and vaccine refrigerators for rural health clinics. Phase I of the project covers 40 ARCs and 110 barangays in 16 provinces of Mindanao. For Phase II, the project is expected to benefit 40 ARCs, 114 unenergized barangays and 40,000 poor households in 16 provinces in Mindanao.

In 2004, the ceremonial switch-on of the country's first and largest on-grid solar power facility was held in Cagayan de Oro. The 1-MW solar power plant with an investment capital of about USD 5.3 million utilizes 6,480 units of poly-crystalline silicon solar cells.

Two solar hybrid projects in Palawan have received Official Development Assistance (ODA) funds, namely: the *Renewable Energy-based Village Power System* in New Ibajay, El Nido which is now providing electricity to 200 households, and the *Multi-purpose Pilot PV-Wind Turbines Hybrid System Electrification in the Philippines* which supplied electricity to the fishing village of Sitio Sicud, Brgy. Candawara, Rizal starting third quarter of 2005.

In Cebu, a Belgian ODA project helped the communities in Pangan-an island install a 28-kW peak centralized PV plant for 200 households through the Mini-Grid Solar Electrification Project in Remote Areas which was commissioned in February 2005.

Likewise, the *United States Agency for International Development (USAID)-Alliance for Mindanao Off-grid Renewable Energy (AMORE) Project* in Mindanao has energized 227 barangays in the Autonomous Region in Muslim Mindanao (ARMM) region for the period 2002 to 2005 using PV battery charging stations (112 barangays), PV SHS (112 barangays) and micro-hydro (3 barangays). The first phase of AMORE has energized about 86 barangays in 2004, with the addition of another 20 barangays in March 2005. On the other hand, the second phase of the project has energized 27 barangays using PV SHS for the period May to December 2005.

## WIND

***With its good wind potential, the country aims to become the leading producer of wind energy in Southeast Asia within the next ten years.***

The country has taken a major step in its goal of being the leading wind energy producer in Southeast Asia with the commissioning of Northwind's 25-MW wind power project along the Bangui Bay Area in Ilocos Norte. The project has commenced the supply of electricity to about 40.0 percent of the province with the construction of a substation and

transmission line system which deliver electricity to the province's local power cooperative.

Another notable project is the 180-kW wind-diesel hybrid plant in Basco, Batanes consisting of three Vergnet 60-kW wind turbines and two 500-kW diesel generators designed to provide uninterrupted power supply to the area.

Likewise, PNOC-EDC has committed the commissioning of the 40-MW Northern Luzon Wind Power Project (Phase 1) in 2010. This project, with financing assistance from the Japan Bank for International Cooperation (JBIC), will be located in Burgos, Ilocos Norte.

**Table 3.10. INDICATIVE WIND POWER PROJECTS**

Region	Potential Site	Capacity (MW)	Year Available
I	Pagudpud, Ilocos Norte	40	2008
	Burgos, Ilocos Norte	15	2009
	Sual, Pangasinan	25	2010
III	Carranglan, Nueva Ecija	50	2008
IV-A	Mauban, Quezon	50	2008
	Caliraya, Laguna	25	2008
IV-B	Mt. Payong-payong, Marinduque	5	2008
	Occidental Mindoro	10	2010
	Bulalakaw, Oriental Mindoro	20	2010
	Tablas Island	5	2012
V	Masbate	5	2012
VI	San Carlos, Negros Occidental	30	2007
	Pandan, Antique	20	2010
	San Remigio, Antique	20	2010
	Caticlan, Aklan	10	2012
CARAGA	Surigao del Sur	15	2008
<b>Total</b>		<b>345</b>	

Meanwhile, the DOE has identified 16 wind power sites with a potential of 345 MW for private sector participation. Under the Philippine Wind Energy Investment Kit, sites open for investments are as follows: Pagudpud and Bayog in Ilocos Norte, Sual in Pangasinan, Mauban in Quezon, Abra de Ilog and Bulalakaw in Mindoro Oriental, Manoc-Manoc in Aklan, Pandan and San Remigio in Antique, Carranglan in Nueva Ecija, Caliraya in Laguna, Marinduque, Tablas Island in Romblon, Masbate, Nuventa in Surigao del Sur and San Carlos in Negros Oriental. Based on the study conducted by the United States Department of Energy (US-DOE) - National Renewable Energy Laboratory (NREL), the country being situated in the fringes of the Asia Pacific monsoon belt, has a full wind potential of 76,000 MW, with 47 provinces having at least 50-MW wind potential and 25 provinces with about 1,000 MW each. Another study by the World Wildlife Fund (WWF) Philippines showed that the country has 1,038 wind sites that could generate about 7,404 MW of electricity.

During the Wind Power Summit held in December 2004, PCCs were signed between DOE

and the private sector to further explore and develop potential wind power sites in the country with a combined capacity of 140 MW. Contracts were awarded to Trans-Asia Renewable Energy Corporation and San Carlos Wind Power Corporation to develop wind potential in Sual, Pangasinan and San Carlos City, Negros Occidental. These projects are expected to generate 25 MW and 30 MW of power, respectively. On the other hand, the Philippine Hybrid Energy Systems Inc. (PHESI) was awarded PCCs to develop the potential sites in Masbate, Oriental Mindoro and Marinduque. Potential generating capacity of these projects varies from 5 to 20 MW each. Other companies are in the process of securing PCCs from the DOE for the remaining wind power sites.

As a follow-through activity, the remaining 11 wind sites were re-offered to investors during the first quarter of 2005. As a result, Coastal Power Development Corporation was recently awarded a PCC to develop the wind power project in Carranglan, Nueva Ecija with an estimated capacity of about 50 MW. Likewise, a bilateral agreement between the Philippines and Spain was signed to develop the wind resources of Abra de Ilog in Occidental Mindoro.

### Ocean

The Philippines lies in an area where temperature difference between surface and depth of 1,000 meters of its ocean ranges from 22–24°C. Thus, the country is considered a potential site for ocean thermal energy conversion (OTEC). The country's ocean resource area of about 1,000 sq. kms. has a potential capacity of about 265 million MW. Although there is limited information available on the potential of ocean energy, navigational experience hypothesizes that these systems are significant resource options. Initial ocean energy potential sites identified are Hinatuan Passage, Camarines Sur, Northeastern Samar, Surigao, Batan Island, Catanduanes, Tacloban, San Bernardino Strait, Babuyan Island, Ilocos Norte, Siargao Island and Davao Oriental.

### DEVELOPMENT CHALLENGES

- As identified in the CBRED project, the challenges discussed in the hydropower section are similar to those for biomass, solar and wind.
- On ocean energy, its capital-intensive development, as well as limited working models/prototypes are major challenges toward the full development of this resource.

### MEASURABLE SECTORAL TARGETS

#### INDICATIVE PROJECTS

The country's aggregate biomass supply potential comes from woodwastes, bagasse, coconut and rice residues, animal wastes and municipal solid waste. For the planning period, the entry of six biomass projects could contribute a total potential capacity of 136 MW. These are the 50-MW Victorias

Bagasse Project (Negros), 30-MW Talisay Bioenergy Bagasse-fired Cogeneration Project (Negros), the 25-MW Bais Project (Negros), the 25-MW Panay Project, the 5-MW Rice Husk-Fired Power Plant (Bulacan) and the 1-MW La Suerte Rice Hull Project (Isabela).

On the other hand, the country can look forward to the development of indicative wind power projects to come onstream within the period 2008-2012. This would include the three PCCs awarded to the PHESI in December 2004, as well as one PCC each for Trans-Asia Renewable Energy Corporation and San Carlos Wind Power Corporation.

### ACTION PLAN

- ❖ Pursue the conduct of the Investment Promotion Round in 2006 wherein 22 new wind farm sites will be offered to the private sector
- ❖ Pursue the passage of the Renewable Energy Bill

### BEYOND 2014

The formulation of a modified REPF will serve as the continuing blueprint for the accelerated development of renewable energy in the country.

## C. INCREASE USE OF ALTERNATIVE FUELS

*The alternative fuels for transport program is targeted to yield an average annual savings of 2.1 MMBFOE (0.3 MTOE) within the planning period.*

The introduction of alternative fuels in the country provides a feasible solution in minimizing the effects of continuous increases in the prices of crude oil in the world market and the worsening condition of our environment. Hence, the government is bent on pursuing the programs and projects that will further increase and enhance the utilization of indigenous, clean and efficient alternative fuels that include CME, fuel ethanol, CNG, autogas and jatropha (*tubang bakod*).

### BIOFUELS

*The government is keen on implementing a 1.0 to 5.0 percent CME blend with diesel fuel for vehicles in 2010 and a 5.0 percent ethanol blend with gasoline fuel for vehicles by 2007 to reach 10.0 percent in 2010.*

### PERFORMANCE ASSESSMENT

#### BIOFUELS

##### *Coco-biodiesel or Coconut Methyl Ester (CME)*

President Arroyo issued M.C. 55 in February 2004 and its Implementing Rules and Regulations (IRR) in March 2004 mandating government vehicles

to use 1.0 percent CME blend in their diesel requirements. As of December 2005, at least 59 government agencies with 1,100 diesel vehicles are currently complying with M.C. 55. The initial respondents of the program experienced a favorable result in their engine performance in terms of increased mileage and improved vehicular emissions. The DOE will push for the passage of the Biofuels Act of 2005 (Senate Bill No. 2007) which is due for plenary deliberation in the Senate in 2006.

To make coco-biodiesel readily available in the local market, the DOE approved the application for accreditation of two manufacturing companies in June 2004, namely: Senbel Fine Chemicals, Inc. which has 54 retailer outlets nationwide and Chemrez, Inc. which also has 56 retailer outlets nationwide. Likewise, there are already some prospective coco-biodiesel manufacturers, namely:

- ❖ Romtron Incorporated in Odiongan, Romblon inaugurated on May 13, 2005
- ❖ Small-scale CME demonstration plant by PNOC-Energy Development Corporation's (PNOC-EDC) Energy Research and Development Group launched in October 2004



Launching ceremonies of E10 headed by DOE Secretary Lotilla and Seaoil CEO Mr. Glenn Yu in August 2005.

On the other hand, one of the relatively new industry players, Flying V, recently introduced the first CME pre-blended diesel in the country under the name *B1 diesel* or the *Envirotek bio-diesel premium*. The product launching which was led by President G.M. Arroyo was held in Flying V's service station in Cainta, Rizal on August 11, 2005. As of December 2005, *Envirotek bio-diesel premium blend* is sold in 34 Flying V stations nationwide and was granted with accreditation to repack and sell coco-biodiesel.

Meanwhile, various information, education and communication (IEC) campaign in key cities of the country are being undertaken in cooperation with the Technological University of the Philippines (TUP), Philippine Coconut Authority (PCA), coco-biodiesel manufacturers and US-DOE/USAID to promote public awareness and understanding of the coco-biodiesel program.

The DOE, through USAID, tapped the US-NREL to conduct confirmatory tests on the quality of

local coco-biodiesel. Initial results showed that the country's biodiesel is superior to other biodiesel.

### *Jatropha Curcas*

The potential of *jatropha curcas* (locally known as "tubang bakod") as a feedstock for alternative fuel is being studied by DOST in coordination with DOE.

The DOE has commenced consultations with various stakeholders from both government and private sectors on the use of *jatropha* as biodiesel feedstock. Samples of various *jatropha* oil from the Philippine Agro-Forestry Corporation have also been analyzed by the DOE to test its compliance with the prevailing PNS for coco-biodiesel. Preparatory meetings have also been initiated by the TCPPA to look at various *jatropha* biodiesel standards from India and South Africa that may be used as reference standard in forthcoming deliberations scheduled for 2006.

### *Fuel Ethanol*

On May 30, 2005, President Arroyo led the groundbreaking ceremony of San Carlos Bioenergy, Inc. to ensure the supply security of the fuel. To date, it is the first bioethanol manufacturing plant and power co-generation complex in the country. Located in San Carlos City, Negros Occidental, the plant has a production capacity of 100,000 liters per day. It is a pioneering project of the National Development Company (NDC) in partnership with BP, Gamboa y Ledesma Hermanos Inc. and Valmayor Group of Companies.

Another major development of this program is the launching of Seaoil first 10.0 percent ethanol-blended gasoline on August 29, 2005 under the name "E10". It is now available in all Seaoil stations and four Flying V outlets in Metro Manila and possibly expanding its availability nationwide.

On October 26, 2005, a MOA was signed between the DOE, Automotive Association of the Philippines (AAP) and Seaoil Philippines, Inc. to support the alternative fuels program of the government through the utilization of bioethanol in the motorsports industry.

The DOE also developed an implementation plan for the fuel ethanol program in cooperation with concerned government agencies. The said plan includes policy development, supply infrastructure requirements, technology and market development and IEC program. Executive Order (E.O.) 449 reduced import duties on bioethanol products to be used in the program from 10.0 percent to 1.0 percent.

The DOE initiated the drafting of ethanol fuel standards for approval by the Technical Committee for Petroleum Products and Additives (TCPA). By first quarter of 2006, the standards are expected to be adopted and promulgated by the Department of Trade and Industry (DTI)-Bureau of Product Standards (BPS).

## COMPRESSED NATURAL GAS (CNG)

***The government targets that all of Metro Manila buses will be running on CNG by 2010.***



Thus, the DOE commits to ensure the availability of CNG and the development of its related infrastructure facilities to make the industry commercially feasible. Through its CNG carrier program which is the NGVPPT, the DOE plans to accelerate incentives and support for its stakeholders to encourage other transport firms to shift to CNG.

### **Policy Initiatives**

To accelerate the implementation of the NGVPPT and its medium-term expansion, D.C. 2005-07-006 was issued on July 5, 2005 *“Directing the Enhanced Implementation of the NGVPPT and the Development of CNG Supply and Infrastructure”*. The policy directive aims to provide the public transport sector with meaningful access to CNG supply and encourage the participation of the private sector in the establishment of the necessary supply infrastructure e.g., CNG refilling stations.

### **Supply Infrastructure Development**

The country's first-ever CNG mother-daughter refueling stations have been constructed. The mother station is located in Tabangao, Batangas while the daughter station is situated along South Luzon Tollway near Mamplasan Exit, Barangay Sto. Tomas, Biñan, Laguna. These mother-daughter stations were completed under the supervision of Shell Philippines Exploration B.V. (SPEX) and Pilipinas Shell Petroleum Corporation (PSPC), respectively and will serve the first batch of commercial CNG buses that will ply along the Manila-Laguna-Batangas routes. The commercial operation of both mother-daughter stations will commence upon their compliance with technical and safety standards.

### **Market Development**

E.O. 290<sup>6</sup> issued on February 24, 2004 provided the institutional framework for the effective implementation of the CNG program. The said E.O. laid down various incentives that may be availed by the program's stakeholders and participants. As of 2005, the program has offered incentives such as the negotiated CNG price of PhP 14.52 per diesel liter equivalent (subject to foreign exchange fluctuation) for the first 200 CNG-fed buses (set to arrive in 2006) for a period of seven years and zero-rated import duty on the acquisition of the 200 completely-built-unit CNG buses, NGVs and CNG-NGV industry-related facilities, equipment, parts and components through the approved E.O. 396.

In addition, 17 China-made CNG buses<sup>7</sup> of HM Transport, Inc. (4), KL CNG Bus Transport

Corporation (12) and CNG Vehicles, Inc. (1) were delivered. The first of the 17, which is a prototype CNG bus of HM Transport, Inc. was test run by no less than President G. M. Arroyo on July 1, 2005. The said bus was equipped with 230-HP Cummins Westport engine and 8-80 liter cylinder fuel storage. Apart from the three bus companies cited, the other bus companies accredited were RRCG Transport System Co., Inc., Paradise Transport Corp., Biñan Bus Line Trans-System Inc., and Greenstar Express, Inc.

### **Standards**

There are 48 Philippine National Standards (PNS) promulgated since June 2003 under the NGVPPT. Additional standards are being deliberated by concerned Technical Committees on natural gas utilization for transport to ensure the complete safety operation of CNG-NGV systems.

### **AUTOGAS**

The Board of Investments (BOI) offers a new package of incentives for the program stakeholders through the inclusion of autogas assembly facilities, conversion shops, refueling stations, and taxi fleet operations in the 2005 Investment Priorities Plan. The DBP, on the other hand, opened a new financial window in the acquisition of autogas vehicles under the *“Clean Alternative Transport Fuel Financing Program”*.

### **Supply Infrastructure Development**

In terms of supply infrastructure as of 2005, Petron Corporation has established two dispensing pumps for public use in the cities of Pasig and Makati, and two garage-based in Valenzuela (1) and Cebu (1). Five garage-based pumps have been put up by Shell for taxi fleet operators in Cebu City (4) and Cagayan de Oro (1). Ongoing construction of additional eight dispensing stations for public use located in different areas in Metropolitan Manila are expected to be operational by third quarter of 2006.

To date, there is a total of 800 autogas units being operated in the different parts of Metropolitan Manila, Cebu and Cagayan de Oro City.

### **Standards**

Deliberations of the LPG for transport utilization (autogas) standards are being undertaken by the Technical Committees on Cylinders, Road Vehicles and Dispensing Stations.

### **IEC Activities**

In July 2005, an Autogas Stakeholder Consultation was held at the Holiday Plaza Hotel, Cebu City which was participated in by 67 representatives from Region VII government agencies, LGUs, taxi operators and associations, LPG suppliers and other stakeholders. The consultation aimed to gather issues and information necessary for the formulation of policies and regulatory framework in the implementation of the autogas program.

<sup>6</sup> Implementing the NGVPPT

<sup>7</sup> As of December 2005

## DEVELOPMENT CHALLENGES

### BIOFUELS

- Sustainability of feedstock supply of biofuels and *Jatropha curcas*
- Encouraging investments for small-scale biofuel production in the different regions of the country

### CNG

- Compliance with technical standards and at the same time financial viability of re-powering/conversion of used vehicles into CNG-fed vehicles
- Supply infrastructure

### AUTOGAS

- The increasing demand of the transport sector in addition to the demand of the residential sector may influence LPG prices

## MEASURABLE SECTORAL TARGETS

### CNG

The NGVPPT will continue to be the carrier program for CNG until 2014. The first 200 CNG buses, under the pilot phase stage, will ply along the major routes of Batangas, Laguna and Metro Manila by 2006. In anticipation of greater supply infrastructure requirements, ten additional CNG refilling stations using the mother-daughter system shall be put up starting 2007. With the program's full implementation, the number of CNG buses is expected to increase to 3,000 by 2010.

### AUTOGAS

In order to support and monitor this growing industry, the DOE aims to intensify the implementation of the Autogas Program in the country. Hence, for infrastructure and market development, 20 to 70 refilling stations will be needed to serve an estimated 1,500 OEM / converted autogas vehicles by 2008 to 2012.

## ACTION PLAN

### BIOFUELS

- Support the proposed Biofuels Bill and participate in the deliberation of the Bill

### *Coco-biodiesel or CME*

- Monitor compliance to M.C. 55
- Accredite prospective CME manufacturing plants to increase overall national coco-biodiesel production capacity
- Coordinate with Philippine Coconut Authority for the intensification of coconut plantation

- Study the possibility of expanding biodiesel utilization in the area of power generation and marine transport

### *Jatropha Curcas*

- Coordinate with Philippine Forest Corporation to intensify the nationwide plantation of *Jatropha*
- Conduct consultations with multi-sectoral and inter-agency focus group
- Conduct technology assessment to establish fuel properties and engine performance, as well as to evaluate its effects on vehicular emissions
- Establish product standards
- Conduct engine durability tests
- Conduct IEC to further promote the use of *Jatropha* in the country

### *Fuel Ethanol*

- IEC thru tri-media campaign/workshops and seminars
- Develop an accreditation scheme for ethanol producers

### *Other Feedstocks*

- Encourage development of other feedstock oils for biodiesel and bio-ethanol through research and development on potential feedstocks such as used vegetable cooking oil, corn and cassava

### CNG

- Review policy incentives to further encourage other transport firms to shift to CNG
- Establish a certification body composed of representatives from concerned government agencies to inspect, register, and certify CNG-NGV vehicles and related facilities thereby ensuring the safety and compliance of CNG-fed converted or re-powered vehicle on the NGV-CNG standards
- Develop a training curriculum on re-powering/conversion to CNG-NGV vehicles to facilitate the smooth expansion of the NGVPPT in terms of technology transfer
- To help resolve the technical and safety standard concerns on the CNG mother station

### AUTOGAS

- Conduct stakeholder consultation in Metro Manila and other major cities of the country in order to determine issues and gather sufficient information necessary in the formulation of policy framework in implementing the use of LPG in transport

## D. STRENGTHEN AND ENHANCE ENERGY EFFICIENCY AND CONSERVATION PROGRAM

*The government's continuous implementation of its energy efficiency and conservation program will generate average annual energy savings of 17.7 MMBFOE (2.9 MTOE) across the planning period.*

Seen as an essential strategy in rationalizing the country's demand for petroleum products and eventually lessening the impact of escalating prices to the economy, the NEECP shall continue to provide the framework in the government's efforts to promote efficient and judicious utilization of energy. The program which is being popularized through a campaign dubbed as "EC Way of Life" was officially launched by the President on August 28, 2004.

### PERFORMANCE ASSESSMENT

Seminars and workshops promoting fuel and power conservation and the Voluntary Agreements Program were held for transport operators and drivers, commercial establishments, elementary and high school students and teachers, barangay officials and the general public. Tri-media campaigns were likewise strengthened with the increase in television, radio and print ads in 2004 that reached wider consumer base in the residential sector.

The coverage of the energy labeling and efficiency standards program was extended to luminaire installations, linear fluorescent lamps, household electric fans and televisions.

Compliance with the following executive issuances to government offices were monitored:

- ❖ Administrative Order (A.O.) 126 "Strengthening Measures to Address the Extraordinary Increase in World Oil Prices, Directing the Enhanced Implementation of the Government's Energy Conservation Program" dated August 13, 2005;
- ❖ A.O. 117 "Providing for Adjusted Official Hours in Departments, Bureaus, Offices and Other Agencies in the Executive Branch, including Government-Owned and Controlled Corporations, for the Months of April and May 2005";
- ❖ A.O. 110 "Directing the Institutionalization of a Government Energy Management Program (GEMP)" dated October 25, 2004; and,
- ❖ A.O. 103 "Directing the Continued Adoption of Austerity Measures in the Government" dated 31 August 2004.

In 2005, the DOE implemented the *Philippine Efficient Lighting Market Transformation Project* (PELMATP), a five-year project co-funded by the

Global Environmental Facility (GEF) through the United Nations Development Programme (UNDP). PELMATP aims to address the barriers to widespread utilization of energy efficient lighting systems in the Philippines. It will cover energy efficient versions of linear fluorescent lamps (standard versus the slim tubes), compact fluorescent lamps (CFLs), high intensity discharge (HID) lamps, ballasts (low loss electromagnetic and electronic), and luminaires.



*DOE Sec. Lotilla led the Palit-Ilaw sa Palengke Program in New Dagonoy Market in San Andres, Manila on August 31, 2005.*

### DEVELOPMENT CHALLENGES

- Increase support from the private sector to complement government resources in its IEC campaign in the different parts of the country
- Formulation of monitoring mechanisms to determine the actual savings from the energy efficiency and conservation programs
- Review of DOE policies on DSM

### MEASURABLE SECTORAL TARGETS

The NEECP will yield an estimated aggregate energy savings of 178.0 MMBFOE (25.7 MTOE) within the planning period, which will come primarily from the intensified energy utilization management programs of the commercial and industrial sectors, power plants, distribution utilities, as well as the continuous use of alternative fuels and technology, among others.

### ACTION PLAN

- Strengthen the implementation and monitoring of new and existing energy efficiency programs with government agencies taking the lead in energy efficiency and conservation
- Review and formulate policies and guidelines on energy-efficient lighting and lamp waste management in coordination with concerned agencies

- Propose executive issuances on: (1) Adoption and implementation of the "Guidelines for Energy-Conserving Design of Buildings and Utilities"; (2) Ban on the importation of inefficient second-hand vehicles; (3) Establishment of an energy efficiency and conservation testing center to include testing of vehicle engine

performance, energy saving gadget, among others; (4) Energy efficiency fuel mileage labeling of all brand new vehicles; and, (5) Inclusion of energy efficiency projects costing at least PhP 50.0 million in the Omnibus Incentives Bill.

Table 3.11. POTENTIAL CUMULATIVE ENERGY SAVINGS (MMBFOE)

Programs	2004	2005	2006	2010	2014
<b>ENERGY EFFICIENCY PROGRAM</b>					
<b>I. INFORMATION, EDUCATION AND COMMUNICATION CAMPAIGN</b>	<b>2.26<sup>a</sup></b>	<b>2.42</b>	<b>4.99</b>	<b>16.55</b>	<b>30.02</b>
A. Road Transport Patrol	0.33	0.33	0.67	2.17	3.95
B. Fuel Economy Run and Seminars	0.76	0.18	0.38	1.21	2.20
C. Infomercials/Publications/Collaterals for Fuel Efficiency and Conservation	0.85	1.42	2.86	8.86	15.28
D. Power Patrol	0.31	0.49	1.09	4.30	8.59
<b>II. VOLUNTARY AGREEMENT</b>	<b>-</b>	<b>1.04</b>	<b>2.12</b>	<b>6.87</b>	<b>12.39</b>
A. Carless Day Program	-	0.33	0.68	2.22	4.03
B. Carpooling Program	-	0.33	0.68	2.22	4.03
C. Park and Wait Program	-	0.27	0.54	1.77	3.21
D. Park and Ride Program	-	0.11	0.22	0.67	1.11
<b>III. ENERGY LABELING AND EFFICIENCY STANDARDS</b>	<b>0.63<sup>b</sup></b>	<b>0.98</b>	<b>2.47</b>	<b>14.93</b>	<b>39.09</b>
A. Fuel Economy Guide for Vehicles	0.21	0.34	0.68	2.60	5.15
B. Energy Labeling Program for Refrigerators and Freezers	0.09	0.12	0.28	1.36	2.95
C. Labeling for Compact Fluorescent Lamps	-	0.39	1.18	8.42	23.27
D. Ballast loss std. and Labeling for Fluorescent Lamp Ballast	-	0.09	0.18	0.71	1.86
E. Luminaire Installation	-	0.01	0.02	0.14	0.42
F. Linear Fluorescent Lamp	-	0.03	0.09	0.57	1.86
G. Household Electric Fans	-	-	0.05	0.25	0.50
H. Television Stand-by Power Reduction	-	-	-	0.49	2.21
I. Performance Certification of Fans and Blowers	-	-	-	0.26	0.55
J. Labeling of Electric Motors	-	-	-	0.12	0.32
<b>IV. GOVERNMENT ENERCON PROGRAM</b>	<b>0.42<sup>b</sup></b>	<b>0.17</b>	<b>0.35</b>	<b>1.04</b>	<b>1.73</b>
A. Fuel Conservation	0.26	0.07	0.13	0.40	0.66
B. Electricity Conservation	0.16	0.11	0.21	0.64	1.07
<b>V. ENERGY MANAGEMENT PROGRAM</b>	<b>4.78<sup>b</sup></b>	<b>7.03</b>	<b>14.36</b>	<b>47.47</b>	<b>87.69</b>
A. Energy Audits/Recognition Programs	3.04	3.23	6.76	24.20	48.24
B. Heat Rate Improvement of Power Plants	0.39	3.16	6.30	18.86	31.42
C. System Loss Reduction Program	0.88	0.43	0.88	3.02	5.78
D. DSM	0.49 <sup>a</sup>	0.20	0.42	1.39	2.25
<b>Total Savings</b>	<b>8.10</b>	<b>11.64</b>	<b>24.29</b>	<b>86.87</b>	<b>170.92</b>
<b>EQUIVALENT MW DEFERRED CAPACITY</b>		<b>430.57</b>	<b>915.30</b>	<b>3,487.40</b>	<b>7,160.94</b>
<b>ALTERNATIVE FUELS AND TECHNOLOGY PROGRAM</b>	<b>-</b>	<b>1.67</b>	<b>3.42</b>	<b>11.22</b>	<b>20.34</b>
A. CME Program (Blending of 1% CME for diesel-fed vehicles)	nil <sup>c</sup>	0.34	0.70	2.33	4.25
B. Natural Gas Vehicles for Public Transport Program	-	0.34	0.17	0.50	0.84
C. Ethanol	nil <sup>d</sup>	0.08	2.55	8.39	15.25
<b>Total Savings</b>	<b>-</b>	<b>1.67</b>	<b>3.42</b>	<b>11.22</b>	<b>20.34</b>
<b>GRAND TOTAL SAVINGS</b>	<b>8.10</b>	<b>13.31</b>	<b>27.71</b>	<b>98.09</b>	<b>191.27</b>

<sup>a</sup> Based on estimates only

<sup>b</sup> Based on actual figures (except for DSM)

<sup>c</sup> 190,226 liters

<sup>d</sup> 1.21 million liters