



# EXECUTIVE SUMMARY

*As a region continuously challenged with security issues, cultural diversities and political conflicts, **Mindanao** remains a special focus of government intervention. The DOE, in particular has always been on the look out for long-term solutions to ensure the region's energy supply.*

*It is in this context that the DOE has rallied its efforts to come up with region-specific goals and strategies pursuant to the Energy Reform Agenda – ensuring energy security, achieving optimal energy pricing and developing a sustainable energy system. Laid out within the pages of this Plan are the initiatives of the Department in addressing the energy challenges of the Mindanao Region.*

## **ENERGY RESOURCE DEVELOPMENT**

### **A. Fossil Fuels**

Mindanao hosts three (3) of the country's largest oil and gas basins, namely: Cotabato, Agusan-Davao & Sulu Sea and four (4) major coal basins that are located in Zamboanga, Davao, Cotabato-Sarangani and Surigao.

Of the 15 areas offered for oil and gas exploration under PECR4, Area 15 over Sulu Seas considered as one of the most promising. The area is an offshore block lying at the southwestern portion of the Sulu Sea Basin covering around 482,000 hectares with water depths ranging from 1,500 – 5,000 meters and sedimentary thickness of 3,000 to 10,000 meters. The block has an adequate number of good quality seismic and well data. Currently, a total of eight (8) wells have been drilled within the

area and five (5) of these have showed significant oil and gas finds (PEC 409-1, Dockan-1, Hippo-1, Wildebeest-1, and Lumba Lumba-1A).

The DOE will improve the quality of information and data on petroleum exploration to promote the prospectivity of underexplored sedimentary basins among industry players. The Cotabato Basin and Agusan-Davao Basins in Mindanao remain underexplored.

On the other hand, 26 prospective coal blocks in Mindanao were offered under PECR 4 located in Agusan del Norte, Agusan del Sur, Misamis Oriental, Surigao del Sur, Compostela Valley, Lanao del Sur, Lanao del Norte, South Cotabato, Sultan Kudarat, Sarangani, Zamboanga del Norte and Zamboanga Sibugay. The awarding of new Coal Operating Contracts (COCs) is expected to raise local coal production in Mindanao to about 3,532 thousand metric tons (MMT) by 2030. Almost half of these will come from South Cotabato and Sultan Kudarat (Region XII). The 15 coal areas offered during the launching of PECR 5<sup>1</sup> are mostly found in Mindanao.

<sup>1</sup> Seven (7) COCs were awarded in December 2014 for the exploration of coal areas in the provinces of Surigao Del Sur (COC No. 193), Agusan del Norte and Agusan Del Sur (COC Nos. 194, 195, 196,197), Zamboanga del Norte and Zamboanga Sibugay (COC Nos. 198 and 199).

To address issues on health, environment and social acceptability, the government in collaboration with the private sector will strengthen its effort in the promotion and adoption of clean coal technologies (CCT). A policy will also be formulated and implemented to intensify the use of indigenous low-rank coal whose quality will be continuously enhanced to comply with environmental standards.

## **B. Renewable Energy**

The production and development of renewable energy is at the forefront of the Mindanao Energy Plan. In the context of this goal are the following plans and programs:

### **Hydro**

Blessed with the bounty of water resources, more than half of Mindanao's power supply comes from hydropower. Region X or Northern Mindanao has almost 680 MW of potential hydropower capacity, followed by CARAGA at 280 MW. To boost the development of these resources, there are six (6) hydropower projects in construction and are expected to be on-line by 2017. This will add about 90.8 MW rated capacity to the Mindanao Grid. On the other hand, another 90.8 MW of prospective resource potential can be generated from six (6) indicative projects located in Bukidnon, Zamboanga and Agusan Del Norte.

### **Geothermal**

It is the country's pride to be the world's second biggest producer of geothermal energy. The Mindanao Region, for its part, can boast of the 50-MW Mindanao III Geothermal Expansion Project located within Mt. Apo, the country's highest mountain peak. Said expansion project will be constructed in the northwest summit of Mt. Apo and will be operational by 2017. To further promote geothermal production in the region, about 290 MW of potential capacity will be explored within the planning period. Region XII (General Santos, Cotabato and South Cotabato) will contribute 100 MW while Region X has the second largest potential at 80 MW located in Misamis Occidental, Misamis Oriental and Lanao del Norte.

### **Solar**

Solar energy is identified as one of the solutions to the current power supply deficiency in Mindanao. Government is looking into the establishment of massive solar farms to contribute to the power supply reliability of the Region. Aiming to surpass the 1 MW solar facility in Cagayan de Oro City, two (2) indicative solar power projects are expected to be online within the planning period. Specifically, these are the 10-MW Digas Solar Power Project in Davao del Sur and the 6.25-MW Centralia Solar Power Project in South Cotabato. Likewise, 17 indicative solar projects with potential capacity totaling 201 MW are targeted to be commissioned within the planning period.

### **Ocean**

Mindanao is also an ideal site for ocean energy as it is surrounded by bodies of deep waters. Technologies such as the Ocean Thermal Energy Conversion (OTEC) may be employed.

Initial resource assessment shows that there are eight (8) potential projects with estimated capacity of 24 MW. Surigao de Norte has the highest potential capacity at 15 MW. Being an innovative technology, harnessing energy from the ocean faces several challenges such as high investment cost and the need for more R&D and capacity development.

### **Biomass**

With its vast agricultural lands, Mindanao can produce large amount of agricultural waste which can serve as biomass energy resources. Based on the Plan, there are two (2) committed biomass projects in Maguindanao, with 11.6 MW of potential capacity, that are now under construction and will be commissioned by 2015. Furthermore, Region X has four (4) indicative projects with total capacity of 37.8 MW that can be harnessed in Misamis Oriental and Bukidnon.

In October 2013, the DOE issued Department Order (DO) 2013-10-0018 "*Adopting the Revised Evaluation Process Flow and Timelines of Renewable Energy Service Contracts (RESC) and Mandating the Adoption of the Milestone Approach*" effectively accelerating the evaluation process of RESC which should not exceed 45 working days. A milestone approach has also been adopted for pre-development and development stages to monitor progress of RESC holders. A One-Stop Processing and Facilitation Center (OSPFC) will be established in the island to fast-track the approval process of RE power projects on securing permits and licenses.

## **C. Alternative Fuels**

The DOE has formulated the Alternative Fuels Roadmap to serve as policy framework on diversifying fuels for transport use in the country. The Roadmap sets out specific timelines and targets for the use of alternative fuels. The DOE aims to convert diesel and gasoline-fed private and public vehicles to compressed natural gas, liquefied petroleum gas and electric power. The use of alternative fuels is an option to reduce dependence on imported fuels and reduce the carbon footprints of the country.

### **Biofuels**

Pursuant to the Biofuels Act of 2006, the mandated biofuels blend is targeted to increase to 20 percent for both biodiesel and bioethanol by 2030. This translates to fuel displacements of 278.6 and 103.5 million liters of fuel, respectively. However, said target is dependent on sustainable supply of alternative fuels during the planning period. Mindanao is seen as a viable location for biofuel feedstock production.

### **Auto-LPG**

Liquefied petroleum gas is one of the most common alternative fuels used globally. For the planning period, government will continue to encourage wider usage of the fuel in taxis. By 2030, a total of 23,000 taxi units will be on the roads and 3,450 units of which will be fielded in Mindanao. Relative infrastructure support will also be on hand in the region to support this government initiative. The number of refilling stations will increase from 37 in 2013 to 44 by

2030. This will eventually increase the consumption of LPG for transport use from 21.34 million liters of LPG in 2013 to 23.63 million liters by 2020 and 25.04 million liters by the end of the planning period.

### **Compressed Natural Gas (CNG)**

Natural gas for transport use has now come of age. Under the DOE's Natural Gas Vehicle Program for Public Transport (NGVPPT), there are now 34 buses plying the route of Metro Manila and South Luzon. The establishment of CNG supply infrastructure nationwide will bring the project into commercial phase. It is envisioned that Mindanao will have 1,000 CNG buses by 2025 increasing to 2,100 by 2030. The use of CNG will extend to taxis with about 100 CNG taxis targeted to be on Mindanao routes by 2020 and reaching 1,600 taxis by 2030. Said target will displace 15.02 million liters of gasoline by end of the planning period.

### **E-Vehicle (EVs)**

There are now 200 units of EVs that are being demonstrated in Makati, Taguig, Mandaluyong, Quezon, Puerto Princesa, Davao and Surigao del Norte. More EVs are expected to hit the streets of the country with the targeted deployment of 3,000 out of the total 100,000 EVs under the loan assistance of the Asian Development Bank. And with the support of the private sector, about 150,000 more will be deployed by 2025, further increasing to 200,000 by 2030. Gasoline displacement from the use of EVs will reach 313 million liters by 2030.

## **D. Energy Efficiency and Conservation**

The DOE has intensified its campaign on the National Energy Efficiency and Conservation Program (NEECP) which aims to promote energy efficiency and conservation as a way of life.

Under the NEECP, several programs are being implemented on a nationwide scale, to include Information, Education and Communication (IEC) Campaign, Standards and Labeling Program, Fuel Economy Runs, Government Energy Management Program (GEMP), Energy Management Services/Energy Audit and Recognition Awards (Don Emilio Abello Energy Efficiency Awards).

A major project on EE&C was the implementation of the Philippine Energy Efficiency Project which called for the phasing out of inefficient lighting technologies. A major component of the project is the replacement of incandescent bulbs with compact fluorescent lamps (CFLs) in the residential sector, lighting retrofit of government buildings, installation of Lamp Waste Management Facility, and replacement of energy efficient lamps used in traffic lights with light-emitting diode (LED).

## **E. Downstream Oil Industry Deregulation**

In line with the Downstream Oil Industry Deregulation Act of 1998, the DOE is continuously monitoring compliance of the industry to the law. This includes checking the industry compliance to fuel quality and quantity standards and monitoring of domestic and international oil prices to determine its reasonableness.

On the policy side, the DOE targets the formulation and updating of the Oil Contingency Plan during the planning period. The Plan would include measures to cushion the impact of oil price increases, establish a strategic oil stockpile, and provide for more infrastructures on oil distribution and refineries.

One of the sector's major initiatives is the implementation of the Gasoline Station Lending and Financial Assistance Program which provides financial assistance/loans to prospective industry participants. Said loans can be used for the establishment/construction of new gasoline stations/auto-LPG stations and improvement/maintenance of existing stations.

## **F. Natural Gas Industry**

To provide additional sources of energy for Mindanao, the DOE is looking at the development of natural gas resources and related infrastructures in the region. According to the World Bank (WB) study on potential LNG terminal sites in Luzon and Mindanao, the Macajalar Bay near Phividec Industrial Estate in Misamis Oriental is a promising site for the proposed Floating Storage Regasification Facility (FSRU) in Mindanao due to its marine characteristics, lowest cost terminal option, its concentrated industrial load, availability of government-owned land and access to transmission lines. The FSRU, which is vital for LNG transfer, will include pipeline systems that will traverse the industrial zones in Mindanao.

For Mindanao, the supply source will come from importation in the form of liquefied natural gas since reserves from Malampaya gas field is limited and has already been contracted to supply the requirement of the three gas-fired power plants in Luzon.

Another WB study, the Mindanao Natural Gas Market Development Strategy consisted of market demand assessment and options for distributing the resource in Mindanao, including the policy and regulatory framework requirements to realize the use of natural gas. The market demand assessment focused on the Phividec Industrial Complex, Cagayan de Oro, Iligan, Davao and General Santos City where 22 potential customers showed interest to convert into using natural gas.

As part of infrastructure development, a two-phased approach for the introduction of natural gas has been identified during the planning period: Phase I will involve the putting up of an FSRU Facility in Macajalar Bay, Misamis Oriental and two (2) satellite supply terminals in the north and south of Iligan City. On the other hand, Phase II will focus on the expansion of natural gas use in General Santos and Davao with the construction of three (3) satellite LNG terminals and Liquefied Compressed Natural Gas (LCNG) refueling stations. This would address the natural gas requirements of the industrial, commercial and transport sectors.

## **G. Power Development**

The recurring power crisis in Mindanao has sparked calls for specific short-and-long-term measures to address the issue. Following are the immediate measures that have been pursued and undertaken:

1. *Interruptible Load Program (ILP)* is a mechanism allowing the ILP customer to de-load itself from the grid during peak hours and operate its own generating facility to supply its own needs;
2. *Interim Mindanao Electricity Market (IMEM)* aims to provide real-time correction on energy imbalances and is a venue for transparent and efficient utilization of all available capacities in the Mindanao Grid to meet supply deficiency;
3. *Mindanao Modular Generator Sets Program* provides loan facility for Mindanao ECs to be used for the acquisition of modular generator sets at low interest rates with an option to return said gensets to the national government once the EC supply requirements are met by new capacities;
4. *Upgrading of Agus VI Hydropower Plant (Units 1 & 2) in Lanao del Sur* will not only extend the economic life of the power plant, but will also increase its power output from 50 MW to 69 MW;
5. *Implementation of the Balo-I Flood Control Project* is expected to fully utilize the generating capability of Agus I and II hydropower plant and address the flooding in Balo-I plain; and,
6. *Dredging of Pulangui IV* will augment the dependability and reliability of the hydropower plant.

The privatization of the Agus-Pulangi Hydropower Complex will still be subject to further studies and discussion by the Joint Congressional Power Commission (JCPC). Meanwhile, the Visayas-Mindanao Interconnection Project which is targeted for completion by 2018 will enable the realization of a unified Philippine National Grid.

Among the long-term measures being considered include the implementation of Demand Aggregation and Supply Auctioning, establishment of a Reserve Market and a One-Stop-Shop for Energy Investments, creation of a Task Force on Electricity and support of legislation on the Declaration of Energy Projects as Projects of National Significance.

### **Small Island Grids**

Planning for the small island and isolated grids is a major component of the Missionary Electrification Development Plan (MEDP). Under the MEDP, system peak demand of missionary areas in the region is projected to grow from 23.43 MW in 2013, increasing to 29.86 MW in 2015 and 97.74 MW by 2030. The increase in system peak demand is also attributed to the expansion of operating hours in the missionary areas. It is targeted that by the end of the planning period, all missionary areas in the region will have 24-hour electricity supply. And to meet the expected load requirement, a total of 101.55 MW of additional capacities will be put in place bringing the total installed capacity to 163.95 MW by 2030. Potential capacity addition from renewable energy sources with an aggregate capacity of 454.9 MW has also been identified.

## **H. Transmission Development Plan (TDP)**

The TDP, prepared and implemented by the National Grid Corporation of the Philippines (NGCP) outlines the expansion projects, as well as enforcement and improvement of existing transmission system in the three (3) major island grids of the country.

The TDP particular for the region highlights the putting up of transmission infrastructure projects to expand the coverage and improve the quality and reliability of the system. These transmission projects include ERC-approved projects, load growth-driven projects, reliability and power quality projects, indicative projects for the period 2011 to 2015 as well as future projects for 2016 to 2020 that also cover the Visayas-Mindanao interconnection.

## **I. Electrification**

The Household Electrification Development Plan, which serves as the electrification roadmap of the country, is now in place to meet the 90.0 percent household electrification level nationwide. For Mindanao, household electrification level has reached 56.3 percent as of December 2013, equivalent to the provision of electricity access to 2.7 million households in the region.

The government also aimed at attaining 100.0 percent sitio electrification level by 2015. Spearheaded by the National Electrification Administration (NEA), the Sitio Electrification Program targets the electrification of 32,441 unenergized sitios nationwide (based on NEA's June 2011 planning base year). In Mindanao alone, this entails the energization of 14,387 sitios.

## **ENERGY OUTLOOK**

The Mindanao 2020 Peace and Development (2011-2030) sets the economic outlook for the region, which aims to achieve a 7.0-8.0 percent average real GDP growth in 2016 to reach 10.0 percent in 2020 and beyond. The conclusion of the Bangsamoro peace agreement will usher an economic boom that will support the said economic targets. As energy is key to every economic activity, energy requirements are seen to pick up in pace with the region's economic improvement.

Two (2) demand scenarios were used to formulate the energy outlook for the region – the Low Growth Scenario (LGS) and High Growth Scenario (HGS). The LGS considered the region's share to the national economic growth rate target, while HGS adopted the economic target of the Mindanao 2020. The national energy policies and programs of the government were likewise taken into consideration in the energy outlook.

For the planning horizon, the region's total final energy consumption (TFEC) is expected to increase at 2.7 percent average annual rate under the LGS and 4.5 percent per annum in the HGS. Historically, TFEC of the region grew only by 0.8 percent annually. For LGS, TFEC will reach 4,842 KTOE in 2015, 5,492 KTOE in 2020, and 6,251 KTOE in 2030. In the HGS, TFEC will register 4,913 KTOE in 2015, 5,836 KTOE in 2020 and 9,630 KTOE in 2030, which more than

double the 2013 level of 4,608 KTOE. The region's share to the national energy consumption pie is seen to improve from 20.1 percent share in 2013 to 24.6 percent in HGS by the end of the planning period.

Among the sectors, the residential and transport sectors will account for more than half of the TFEC. However, the share of the residential sector is projected to decelerate from historical average of 39.7 percent to 26.0 percent in the planning horizon, and will post average annual growth rate of 0.8 percent in LGS and 2.7 percent in HGS. More households are expected to have greater access to efficient fuel and energy sources (electricity and LPG) as the region's economy move toward rapid urbanization. On the other hand, the transport sector will exhibit an increasing share from historical average of 29.4 percent to 36.5 percent in LGS and 34.0 percent in HGS. The sector's energy consumption will grow slower at 2.5 annual average rate in LGS and 3.1 percent in HGS from its 3.7 percent historical average growth.

Other sectors (industry, commercial and agriculture) will share the remaining TFEC with industry obtaining 26.0-27.0 percent share (LGS and HGS) to TFEC. The commercial sector will display the fastest growth at an average annual rate of 4.8 percent in LGS and 7.8 percent in HGS, while the agriculture sector will demonstrate annual growth rates of 4.0 percent (LGS) and 5.8 percent (HGS). The foreseen increase in tourism and business process outsourcing in key cities in the region, and the improvement in agro-industrial activity will trigger the energy demand growth of these sectors.

In terms of fuel analysis, oil will still be the major fuel –similar to the national TFEC – having a stable share of about 40.0 percent in both historical and planning period. Despite oil displacement from alternative fuels and the foreseen increases in oil prices, demand for oil in the region will grow by 1.8 percent and 3.0 percent average annual rates under LGS and HGS, respectively. LPG consumption will have the highest increase with 8.7 percent average annual growth rate in the LGS and 9.8 percent in the HGS. The increase is a result of a shift to more efficient fuel for cooking, from previously used biomass. Kerosene demand is on the decreasing trend as more households will have greater access to electricity. Demand for both gasoline and diesel fuels will register lower growth rates compared with their historical levels due to increased utilization of alternative fuels (biofuels, CNG and e-trike). However, the shares of these fuels to total petroleum demand are somewhat stable – gasoline with about 25.0 percent share and diesel with 50.0 percent.

With the target increase in biofuels blend during the planning period, the demand for biofuels is expected to pick up in both scenarios by 11.5-12.5 percent average annual growth rate. Biodiesel demand will be growing at an average annual rate of 8.0 percent (LGS) and 20.0 percent (HGS), respectively, and bioethanol at 6.0 percent (for both scenarios). On the other hand, demand for biomass (particularly used for cooking) will gradually decline as socio-economic structure of the households is seen to improve with better income and expanding urbanization. Such reduction can be translated to average shares of 20.4 percent in LGS and 18.1 percent in HGS, lower than the historical share of 37.0 percent.

Coal consumption will also rise with projected increase in its demand by the industry sector (i.e. cement, steel, and food processing, among others). From historical growth rate of 3.8 percent annually, coal demand will grow at 3.9 percent average rate in LGS and 5.2 percent in HGS. Coal consumption will more than double its 2013 level of 382 KTOE to reach 729 KTOE



(LGS) and 906 KTOE (HGS) by 2030. Meanwhile, the introduction of CNG for transport, if supply infrastructures were in place, will result in changes in the energy profile of the region. With target CNG buses and taxis running by 2017 and 2020, respectively, demand for natural gas will reach 162 KTOE in 2030 and will contribute about 1.0 percent share to TFEC.

With better economic outlook for the region, electricity demand will be in upward trend in both scenarios – growing at average annual rates of 5.4 percent in LGS and 9.1 percent in HGS from historical average rate of 3.2 percent. As such, electricity contribution to TFEC will increase to 22.6 percent (LGS) and 27.5 percent (HGS) from historical share of 15.5 percent, thus making it as the second most consumed energy next to oil.

## **POWER OUTLOOK**

Under the LGS (the basecase scenario), peak demand will increase at an average rate of 5.5 percent annually from 1,416 MW in 2013 to 2,147 MW in 2020 and 3,550 MW by the end of the planning period. On the other hand, peak demand under the HGS will increase to 6,592 MW in 2030 with average annual growth rate of 9.1 percent.

To meet the growing peak demand under LGS, the region needs a total of 1,420 MW of additional capacity on top of committed power projects with an aggregate capacity of 1,065.3 MW. As more committed projects will be operational by 2015 to 2017, the region will have enough supply capacity. However, tight supply will occur in 2023 requiring additional capacity. The 1,420 MW needed capacity should consist of 600 MW baseload, 320 MW of midrange and 500 MW of peaking load capacity.

As for HGS supply requirement with only committed power projects coming in, critical period will be earlier in 2020. The region will have to provide additional capacity of 4,930 MW on top of committed projects to ensure enough supply capacity, which should be composed of 3,600 MW baseload, 480 MW midrange and 850 MW of peaking load plants. And if the proposed LNG power plants will be operational and included in the supply mix, the capacity requirement will only be 3,150 MW baseload and 800 MW peaking load capacity. Also as another supply option or scenario, when indicative power projects will be realized instead of the proposed LNG together with committed project, tight supply will be experienced in 2026 and will only require 2,880 MW of new capacities for private sector investment.