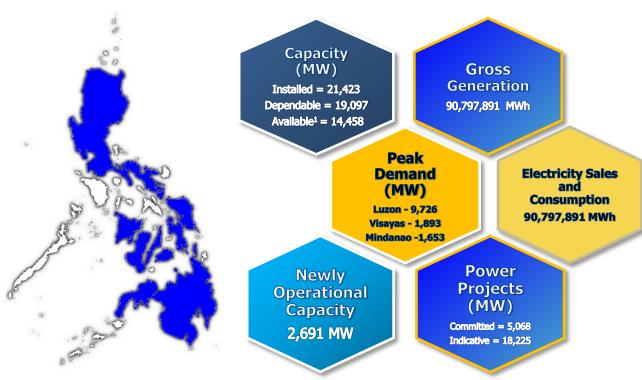


DEPARTMENT OF ENERGY

Electric Power Industry Management Bureau

2016 PHILIPPINE ELECTRICITY DEMAND-SUPPLY SNAPSHOT



¹Total Average Available Capacity

Notes: Shaded blue and white portions of the Philippine map correspond to on-grid and off-grid areas, respectively Totals may not correspond to the sum of all figures due to rounding

The year 2016 is characterized by a significant increase in electricity consumption at 10% and peak demand at 8.7% attributed to several factors such as the increase in temperature and utilization of cooling equipment aggravated by the strong El Niño, the conduct of National and Local elections during the first half of the year, increase in economic growth, and entry of large power generating plants. The residential and industrial sectors remained the major drivers of electricity consumption in the country while Luzon remained the largest on a per grid basis.

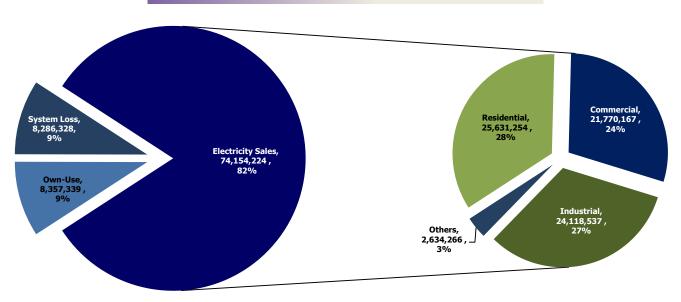
Notably, the growth of the country's supply base supplemented the increase in demand with the growth of total installed capacity at 14% from 18,765 MWh (2015) to 21,423 MWh (2016) majority coming from coal-fired power plants. Among the three grids, Mindanao has the highest recorded growth in terms of capacity at 31% from 2015-2016. From 2017-2025 a total of 5,068 MW committed projects are expected to come online. The DOE is continuously encouraging investments in power generation in view of the increasing peak demand which is expected to grow by more than triple* in 2040.

Along with supply security, the DOE also embarks on increasing the reliability and resiliency of the system. In 2016, several yellow and red alerts were declared by the system operator in Luzon and Visayas in addition to the major grid disturbances and load dropping incidents. Among the three major grids, Mindanao was adversely affected by El Niño which caused the decline in hydro power generation and curtailment of supply during the first half of 2016. The entry of large coal-fired power plants in Mindanao on the latter part of 2016 has addressed these supply shortfalls.

^{*} Based from the Power Demand and Supply Outlook of the Power Development Plan, 2016-2040

Electricity Sales and Consumption

Electricity Consumption = 90, 797,891 MWh



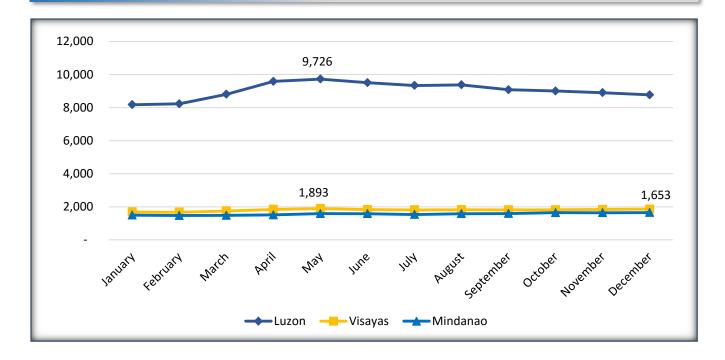
Electricity Sales and Consumption, per Grid (MWh)

	Luzon	Visayas	Mindanao
Residential	18,650,032 27.7%	3,508,238 28.7%	3,472,984 30.6%
Commercial	18,726,890 27.9%	1,554,845 12.7%	1,488,432 13.1%
Industrial	17,094,048 25.4%	3,470,390 28.4%	3,554,098 31.3%
Others	942,178 1.4%	1,065,378 8.7%	626,710 5.5%
Own-Use	6,517,149 9.7%	1,188,570 9.7%	651,156 5.7%
Systems Loss	5,289,833 7.9%	1,444,418 11.8%	1,552,077 13.7%
TOTAL 2016 TOTAL 2015	67,220,596 61,099,345	12,231,839 11,184,002	11,345,457 10,129,866

Electricity Sales and Consumption Highlights

- Electricity consumption grew significantly from 82,413,213 MWh (2015) to 90,797,891 MWh (2016). This year's growth level increased to 10.2% compared to the 6.7% growth from 2014-2015. The substantial increase is due to the strong El Niño which affected the entire country during the 1st half of 2016.
- This increase is primarily driven by the growth of residential consumption at 12.7% from 22,747,049 MWh (2015) to 25,631,254 MWh (2016) due to high requirements for cooling system.
- On a per grid basis, Mindanao's electricity consumption grew the highest at 12% boosted by the own-use consumption of newly operational and large coal-fired power plants. Own-use consumption in Mindanao massively increased from 395,268 MWh to 651,156 MWh which is equivalent to a 64.7% growth rate in 2016.
- In terms of share, Luzon, Visayas and Mindanao contributed 74%, 13.5% and 12.5% shares, respectively. The residential sector, together with the industrial sector, comprised more than half of the total Philippine electricity consumption. Own-use and systems loss have at par shares at 9%.

Peak Demand



Luzon reached new all-time high system peak demand at 9,726 MW which occurred on 03 May 2016, 1:52 PM with corresponding 11,137 MW available capacity. This is 9% higher than the 2015 peak demand at 8,928 MW.

Highest system peak demand in Visayas at 1,893 MW occurred on 05 May 2016, 1:28 PM with corresponding 2,242 MW available capacity. This is 7% higher than the 2015 peak demand at 1,768 MW.

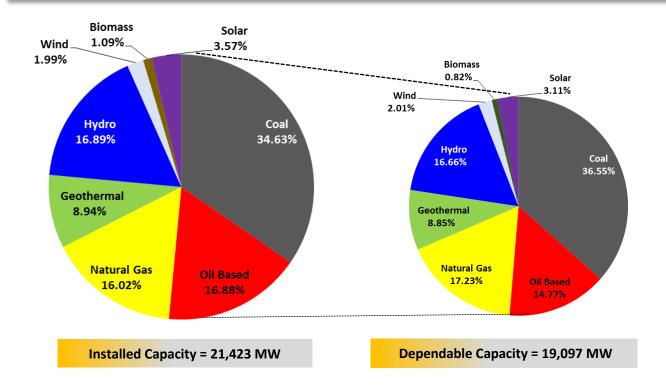
Highest system peak demand in Mindanao at 1,653 MW occurred on 1 December 2016, 5:53 PM with corresponding 1,931 MW Available Capacity. This is 9% higher than the 2015 peak demand at 1,517 MW.

Comparative Peak Demand, Actual 2015-2016 vs. Forecast

Grid	2015 Actual (MW)	2016 Actual (MW)	Difference (MW)	2015- 2016 Growth Rate	PDP 2016 High GDP Forecast (MW)	Difference of 2016 Forecast vs. Actual (MW)	2016 Forecast vs. Actual Deviation
Luzon	8,928	9,726	798	8.94%	9,726*	0	0
Visayas	1,768	1,893	125	7.07%	1,878	(15)	(0.8)%
Mindanao	1,517	1,653	136	8.97%	1,786	133	8.0%

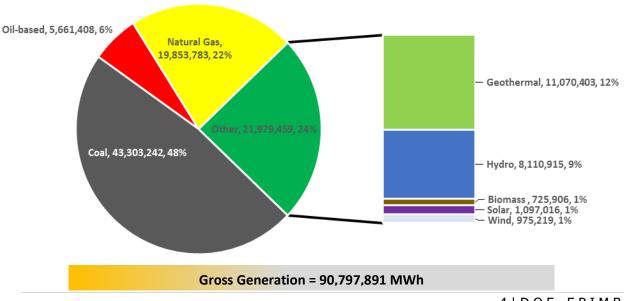
^{*} Actual 2016 Peak Demand was already adopted in the PDP, 2016-2040 since the peak demand already occurred prior to the finalization of the PDP, 2016-2040

Electricity Supply



The country's total installed capacity for 2016 grew to 21,423 MW compared to 18,765 MW from 2015. This increase in capacity is associated with the commercial operation of new power plants in Luzon such as the 2x150 MW SLPGC Coal Power Plant, 450 MW San Gabriel Natural Gas Power Plant; Visayas the 135 MW Palm Concepcion Coal Power Plant Unit 1, 132.5 MW HELIOS Solar Farm; and Mindanao the 2 x 135 MW FDC Misamis Coal Power Plant, and 150 MW SMC Malita Coal Power Plant. On the other hand, the country has a total of 19,097 MW dependable capacity or about 89% of the total installed capacity which has been delivered to the grid.

The Philippines also displayed a significant growth in power generation at 10% from 82,413,213 MW in 2015 to 90,797,891 MW in 2016. Of this total generation, 48% comes from coal, 22% comes from natural gas and 6% comes from oil-based generation. The remaining 24% or about one-fourth of the total power generation comes from renewable energy (RE) – based generating facilities.

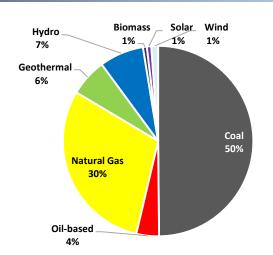


LUZON

Luzon Installed, Dependable and Available Capacity from January-December 2016 (in MW)

	Inst	alled	Depe	ndable		Available	
Fuel Type	MW	Percent Share (%)	MW	Percent Share (%)	Min	Max	Average
Coal	5,294	35.35	4,970	36.54	2,601	4,859	3,977
Oil Based	2,133	14.24	1,655	12.17	593	1,606	1,216
Natural Gas	3,430	22.90	3,291	24.20	1,864	3,272	2,729
Renewable Energy	4,120	27.51	3,684	27.09	1,319	3,648	2,586
Geothermal	843	5.63	777	5.71	239	740	500
Hydro	2,537	16.94	2,323	17.08	1,058	2,314	1,826
Wind	337	2.25	293	2.15	1	298	95
Biomass	95	0.63	71	0.52	20	61	48
Solar	307	2.05	220	1.62	1	235	117
TOTAL	14,977	100.00	13,600	100.00	6,377	13,385	10,508

Gross Power Generation (January-December 2016)66,497,549 MWh





LUZON HIGHLIGHTS AND SIGNIFICANT INCIDENTS

- Fire incident on an oil depot nearby the SLTEC Unit 2 in Calaca, Batangas deferred its commercial operation which is scheduled on 20 March 2016 to 21 March 2016.
- Yellow Alert occurred once in April 2016 due to tight supply caused by forced outages, planned outages of power plants and limited dispatch of hydro as an effect of El Niño. It is then followed by a Red Alert the next day for the same reason.
- On 03 May 2016, the all-time high peak demand of Luzon grid occurred at 9,726 MW, an increase of 9% from the previous year.
- For the month of June 2016, Luzon grid experienced five (5) Yellow Alert occurrences due to tripping and maintenance of power plants with large capacities.



LUZON HIGHLIGHTS AND SIGNIFICANT INCIDENTS (continued)

- At the last week of July 2016 to first week of August 2016, Luzon Grid experienced ten (10) Yellow Alert Notices and four (4) Red Alert Notices due to the forced outage and planned outage of some major power plants. The maximum capacity outage was 3,146 MW which occurred on 05 August 2016. To alleviate Red Alert Notices, the Interruptible Load Program (ILP) was implemented within the MERALCO franchise area.
- On September 2016, Luzon experienced one (1) Yellow Alert Notice and one (1) Red Alert Notice while another Yellow Alert Notice on November 2016 was experienced.
- On 15 November 2016, 7:31 PM, a major grid disturbance occurred which was caused by the fault at the NGCP San Jose substation wherein a total of 2,407 MW generator tripped simultaneously in Batangas, Bataan, Bicol, Pangasinan and Quezon. The maximum load which was dropped due to this major grid disturbance is equivalent to 672 MW with a maximum unserved energy of 484.16 MWh. Customers in the MERALCO franchise experienced automatic load dropping (ALD) wherein 672 MW was dropped for a duration of 45 minutes. 407 MW of NGCP customers were also automatically dropped for 72 minutes. The ALD on the MERALCO franchise was followed by a manual load dropping (MLD) resulting to 383 MW load dropping for 72 minutes.
- Luzon grid experienced 34 ALD and three (3) MLD for 2016. Most of ALDs occurred in the month of June with seven (7) ALDs due to the tripping of power plants with large capacities. On the average, most of the outages caused by the load dropping were not sustained for more than 15 minutes.
- At the end of 2016, a total of 1,318.8 MW increase in the installed capacity was recorded with the entry of the power plants listed on the table below.

Luzon Additional Capacities (01 January to 31 December 2016)

Newly-Operating Power Plants	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Commercial Operation Date
COAL				
SLTEC Puting Bato Coal Fired Power Plant Unit 2	Calaca, Batangas	135.0	122.0	February 2016
SLPGC Coal-Fired Power Plant Units 1 & 2	Calaca, Batangas	300.0	280.0	July 2016
Anda Coal Fired Power Plant	Mabalacat, Pampanga	83.7	72.0	September 2016
SUBTOTAL		518.7	474.0	
NATURAL GAS				
Avion Open Cycle Power Plant	Batangas City	100.0	97.0	August 2016
San Gabriel Combined Cycle Power Plant	Batangas City	450.0	414.0	November 2016
SUBTOTAL		550.0	511.0	
BIOMASS				
GIFT Biomass Project	Talavera, Nueva Ecija	12.0	10.8	March 2016
SUBTOTAL		12.0	10.8	
HYDRO				
Bulanao HEPP	Tabuk, Kalinga	1.0	1.0	March 2016
SUBTOTAL		1.0	1.0	

LUZON

Newly-Operating Power Plants	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Commercial Operation Date
SOLAR				
Burgos Solar Phase 2 Project	Burgos, Ilocos Norte	2.7	1.9	January 2016
Petrosolar - Tarlac Project	Tarlac City, Tarlac	50.1	35.0	February 2016
YH Green Solar	Hermosa, Bataan	14.5	10.2	February 2016
Cabanatuan Solar Project	Cabanatuan City, Nueva Ecija	10.3	7.2	April 2016
Calatagan Solar Project	Calatagan and Balayan, Batangas	63.3	44.3	March 2016
Mirae Currimao Solar Project	Currimao, Ilocos Norte	20.0	14.0	February 2016
Valenzuela Solar Project	Brgy. Isla, Valenzuela City	8.5	6.0	March 2016
Absolute Distiller Lian Solar Project	Lian, Batangas	2.0	1.4	March 2016
MSPI Clark Solar Project	Clark Freeport Zone, Pampanga	22.3	15.6	March 2016
SPARC Palauig Solar Project	Morong, Bataan	5.0	3.5	March 2016
BSEC San Ildefonso Solar Project	San Ildefonso, Bulacan	15.0	10.5	March 2016
Sta. Rita Solar	Morong and Hermosa, Bataan	7.1	5.0	November 2016
Dalayap Solar	Tarlac City, Tarlac	7.5	5.2	December 2016
Armenia Solar	Tarlac City, Tarlac	8.8	6.2	December 2016
SUBTOTAL		237.1	166.0	
TOTAL 2016		1,318.8	1,162.8	
TOTAL 2015		412.0	332.5	

Luzon Summary of Committed and Indicative Power Projects As of December 2016

		Committed		Indicative			
Type of Power Plant	No. of Proponents	Capacity (MW)	% Share	No. of Proponents	Capacity (MW)	% Share	
Coal	5	2,720.0	77.1	10	6,570.0	54.4	
Oil-Based	0	0.0	0.0	2	196.0	1.6	
Natural Gas	1	650.0	18.4	3	2,050.0	17.0	
Renewable Energy	13	157.9	4.5	57	3,259.5	27.0	
Geothermal	2	43.0	1.2	1	80.0	0.7	
Hydro	3	62.5	1.8	32	1070.6	8.9	
Biomass	4	22.9	0.7	4	<i>58.2</i>	0.5	
Solar	4	29.5	0.8	15	<i>1053.7</i>	8.7	
Wind	0	0.0	0.0	5	997.0	8.2	
TOTAL	19	3,527.9	100.0	72	12,075.5	100.0	
Battery Storage*	1	10.0		2	230.0		

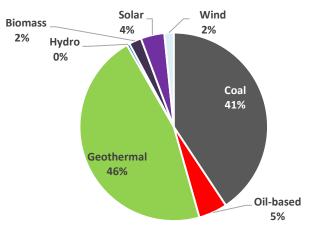
^{*} for accounting purposes; declared capacity for Ancillary Services (AS) to the system



Visayas Installed, Dependable and Available Capacity from January-December 2016 (in MW)

	Ins	talled	Depe	endable		Available	
Fuel Type	MW Percent MW Percent Share (%)		Min	Max	Average		
Coal	1,054	32.10	1,050	37.33	320	1,048	805
Oil Based	655	19.95	434	15.43	202	445	390
Natural Gas	1	0.03	0	0.00	0	0	0
Renewable Energy	1,574	47.93	1,329	47.24	535	1,346	1,113
Geothermal	965	29.38	813	28.90	384	798	702
Hydro	20	0.61	18	0.64	6	18	12
Wind	90	2.74	90	3.20	1	90	45
Biomass	101	3.08	<i>77</i>	2.74	18	67	59
Solar	399	12.15	331	11.77	126	373	295
TOTAL	3,284	100.00	2,813	100.00	1,057	2,839	2,308







VISAYAS HIGHLIGHTS AND SIGNIFICANT INCIDENTS

- From the months of April until November 2016, the Visayas grid has experienced frequent issuances of Yellow Alert Status and few issuances of Red Alert Status especially in the evening peak period. This can be attributed to the following: (1) increase in electricity demand, (2) decrease in or zero output of solar power plants in the evening, and (3) the simultaneous outages (planned and/or forced) of large coal and geothermal power plants.
- A few load dropping incidents occurred within the months of January, March, August, October, and November 2016. It can be noted that the first level of ALD scheme was activated during those instances where (1) there were sudden load reduction in the output of solar power plants, (2) tripping of large generating units, and (3) occurrence of high-voltage direct current (HVDC) telecom fault.



VISAYAS HIGHLIGHTS AND SIGNIFICANT INCIDENTS (continued)

- On 5 September 2016, the all-time high peak demand of Visayas grid occurred at 1,893 MW, an increase of 7% from the previous year (1,768 MW).
- At the end of 2016, a total of 623.9 MW of installed capacity was added into the Visayas grid primarily composed of solar power plants and a few coal-fired and diesel power generation facilities.

Visayas Additional Capacities (01 January to 31 December 2016)

Newly-Operating Power Plants	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Commercial Operation Date
COAL				
Palm Concepcion U1	Concepcion, Iloilo	135.00	135.00	August 2016
PEDC U3	Iloilo City, Iloilo	150.00	150.00	December 2016*
SUB-TOTAL		285.00	285.00	
OIL-BASED				
Calumangan DPP U2	Bago City, Negros Occidental	5.00	4.20	April 2016
Calumangan DPP U1	Bago City, Negros Occidental	5.00	4.20	June 2016
Calumangan DPP U3	Bago City, Negros Occidental	5.00	4.20	June 2016
SUB-TOTAL		15.00	12.60	
SOLAR				
MONTESOL Solar Power Project	Cadiz City, Negros Occidental	18.00	14.00	March 2016
HELIOS Solar Power Project	Cadiz City, Negros Occidental	132.50	108.00	Mar-2016
SACASUN Solar Power Project	San Carlos City, Negros Occidental	23.40	23.40	Mar-2016
ISLASOL II Solar Power Project	La Carlota City, Negros Occidental	32.00	27.00	Mar-2016
ISLASOL III Solar Power Project	Manapla, Negros Occidental	48.00	42.00	Mar-2016
SILAY Solar Power Project	Silay City, Negros Occidental	25.00	20.00	April 2016
SEPALCO Solar Power Project	Palo, Leyte	45.00	35.00	October 2016*
SUB-TOTAL		323.90	269.40	
TOTAL 2016		623.90	567.00	
TOTAL 2015		227.0	173.4	

^{*} PEDC U3 and SEPALCO with Provisional Authority (PA) to Operate from ERC



Visayas Summary of Committed and Indicative Power Projects As of December 2016

- (5		Committed			Indicative			
Type of Power Plant	No. of Proponents	Capacity (MW)	% Share	No. of Proponents	Capacity (MW)	% Share		
Coal	1	135.0	49.7	3	900.0	26.9		
Oil-Based	1	8.0	2.9	1	10.0	0.3		
Natural Gas	0	0.0	0.0	0	0.0	0.0		
Renewable Energy	5	128.8	47.4	29	2,432.9	72.8		
Geothermal	1	50.0	18.4	1	40.0	1.2		
Hydro	2	13.1	4.8	12	701.7	21.0		
Biomass	0	0.0	0.0	2	78	2.3		
Solar	2	65.7	24.2	10	464.6	13.9		
Wind	0	0.0	0.0	4	1,148.6	34.4		
TOTAL	7	271.8	100.0	33	3,342.9	100.0		
Battery Storage*	0	0.0		3	100.0			

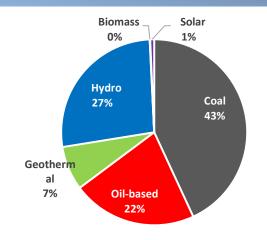
^{*} for accounting purposes; declared capacity for Ancillary Services (AS) to the system



Mindanao Installed, Dependable and Available Capacity from January-December 2016 (in MW)

	Ins	talled	Depe	endable		Available	
Fuel Type	MW	Percent Share (%)	MW	Percent Share (%)	Min	Max	Average
Coal	1,070	33.84	959	35.73	333	959	609
Oil Based	828	26.19	733	27.31	51	656	435
Natural Gas	0	0.00	0	0.00	0	0	0
Renewable Energy	1,264	39.97	993	37.00	215	923	598
Geothermal	108	3.42	100	3.73	<i>50</i>	104	98
Hydro	1,061	33.55	840	31.30	165	770	476
Wind	0	0.00	0	0.00	0	0	0
Biomass	36	1.14	10	0.37	0	8	5
Solar	59	1.87	43	1.60	0	41	19
TOTAL	3,162	100.00	2,684	100.00	599	2,539	1,642

Mindanao Gross Power Generation (January-Dec 2016) 11,345,457 MWh





MINDANAO HIGHLIGHTS AND SIGNIFICANT INCIDENTS

- In the previous years prior to 2016, Mindanao has been dependent on the available capacities, such as diesel and hydro power plants to supply the electricity demand in the region. For 2016, the generation of coal-fired power plants increased by 2,852 GWh or 139.9% compared to 2038 GWh in 2015 because of the commercial operations of the 688 MW coal- fired power plants. Consequently, the generation for diesel power plants decreased by 907 GWh or 26.9% since the distribution utilities in Mindanao shifted to the new coal- fired power plants as their power supply instead of diesel due to commercial reasons. The occurrence of El Nino from January to May 2016 resulted to decrease in generation of hydro plants due to low water level in Lake Lanao. On the other hand, the generation from solar plants significantly increased from 2 GWh in 2015 to 77 GWh in 2016 due to commercial operation of the 39.1 MW solar power plants in Mindanao.
- The occurrence of El Niño affected the operation of the Hydro Power Plants in Mindanao which caused curtailments to some Distribution Utilities which do not have enough supply contracts to cover the deficiency of NPC-PSALM through the Agus and Pulangi Hydroelectric Power Plants:
 - Average Available Capacity of Agus and Pulangi from January to May 2016 was at 253.1 MW, with the lowest available capacity occurringon 4 April 2016 at 129.4 MW.



MINDANAO HIGHLIGHTS AND SIGNIFICANT INCIDENTS (continued)

- Water level of Lanao Lake breached the minimum operating level of 899.15 meters above sea level (masl) and reached the lowest level for this year at 699.0 masl on23 April 2016.
- o Compared to the occurrence in 2010, the 2015-2016 El Niño had lesser impact because of the commercial operation of coal power plants such as the 2x150 MW TSI Coal and 118 MW SEC Coal.
- Upon the directive of President Benigno S. Aquino III to ensure sufficient and uninterrupted power supply and at the same time secure the transmission facilities during the conduct of the 2016 Elections, the Inter-Agency Task Force on Securing Facilities (IATFSEF) was created on 27 January 2016. However, the IATFSEF is yet to address two remaining issues:
 - Repair of Tower No. 25 located along the Agus 2 Kibawe 138 kV Line, which was bombed last 24 December 2015.
 - o Clearing of tall trees under the transmission facilities, specifically along the Agus 2- Baloi 138 kV Line.
- The highest demand for 2016 was recorded at 1,653 which occurred on 1 December 2016. This was higher by 9% compared to the 1,519 MW peak demand of Mindanao for 2015 which occurred on 12 November 2015.
- The power situation in the Mindanao Grid has shifted from supply deficiency to generation adequacy due to the commercial operation of a total of 748.2 MW of installed capacity from the following power plants in 2016.

Mindanao Additional Capacities (01 January to 31 December 2016)

Newly-Operating Power Plants	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Commercial Operation Date
COAL				
Therma South Inc. Coal Fired Power Plant U2	Sta. Cruz, Davao del Sur	150	130	February 2016
SEC Coal Fired Power Station U1	Brgy. Kamanga, Maasim, Sarangani	118	105	April 2016
FDC Misamis Coal Unit 1 & 2	PHIVIDEC, Misamis Oriental	270	240	October 2016
SMC Davao Power Plant Project Phase I Unit 1	Brgy. Culaman, Malita, Davao del Sur	150	135	December 2016
SUB-TOTAL		688.0	610.0	
OIL-BASED				
KEGI Camiguin	Brgy. Maubog, Balbagon, Mambajao, Camiguin	4.4	4.4	February 2016
BPC Fuel Power Plant Project	Barangay Barandias, Municipality of Pangantucan, Province of Bukidnon	4.8	4.7	February 2016
SPC Koronadal	Purok Garfin, Brgy. Paraiso, Koronadal, South Cotabato	11.9	11.9	May 2016
SUB-TOTAL		21.1	21.0	_
SOLAR				
Kibawe Solar	Brgy. Labuagon, Kibawe, Bukidnon	10.5	7.3	March 2016



Newly-Operating Power Plants	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Commercial Operation Date
Digos Solar	Brgy. San Roque, DigosCity, Davao del Sur	28.6	20	March 2016
SUB-TOTAL		39.1	27.3	
TOTAL 2016		748.2	658.3	
TOTAL 2015		203.3	1699.7	

Mindanao Summary of Committed and Indicative Power Projects As of December 2016

Type of Power Plant	Committed			Indicative		
	No. of Proponents	Capacity (MW)	% Share	No. of Proponents	Capacity (MW)	% Share
Coal	5	1,090.0	86.0	6	1,733.0	61.8
Oil-Based	4	29.5	2.3	3	36.8	1.3
Natural Gas	0	0.0	0.0	0	0.0	0.0
Renewable Energy	8	148.4	11.7	30	1,036.6	36.9
Geothermal	0	0.0	0.0	1	40.0	1.4
Hydro	5	134.2	10.6	18	673.4	24.0
Biomass	3	14.2	1.1	6	85.2	3.0
Solar	0	0.0	0.0	5	238.0	8.5
Wind	0	0.0	0.0	0	0.0	0.0
TOTAL	17	1,267.9	100.0	39	2,806.4	100.0

