PHILIPPINE POWER SITUATION

January-December 2015

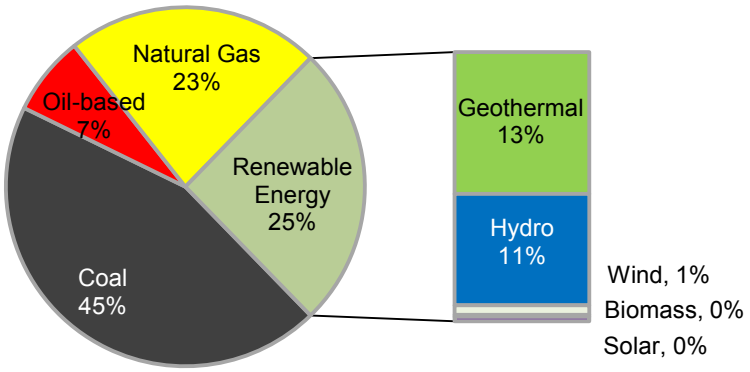
TABLE OF CONTENTS

SUMMARY

- Peak demand growth rate in the Visayas Grid was recorded the highest at 8.1% compared to 2.4% and 3.3% growth for Luzon and Mindanao from 2014-2015.
- Coal maintained its largest share to the total installed capacity at 32%, dependable and available capacity at 34% and power generation mix at 45%.
- Due to Feed-in-Tariff (FIT) race, wind and solar grew in terms of total installed capacity at 50.9% (144 MW increase) and 616% (142 MW increase) respectively from 2014 to 2015.
- Electricity sales and consumption increased remarkably by 6.7% from 77,261 GWh in 2014 to 82,413 GWh in 2015.
- A total of 633 circuit-km of overhead transmission lines were completed and a total of 1,025 MVA additional capacities and 600 MVAR of reactive power support were installed from January to December 2015 Majority of these completed transmission projects are in the Luzon Grid.

Grid	Installed Capacity	Dependable Capacity	Available Capacity	Peak Demand	Net Available Capacity
Luzon	13,668	12,179	9,624	8,928	696
Visayas	2,683	2,228	2,001	1,768	233
Mindanao	2,414	2,025	1,563	1,517	46
Total	**18,765**	**16,432**	**13,188**	**12,213**	**975**

Gross Generation = 82,413 GWh



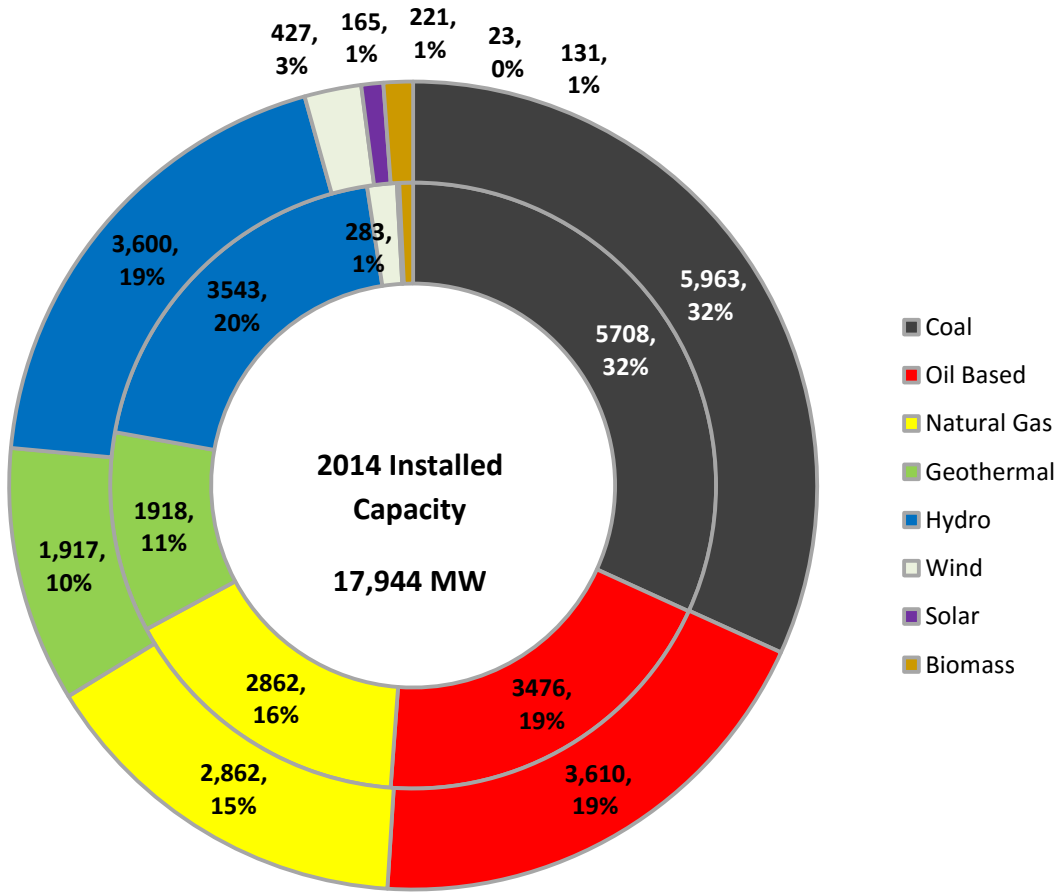
SIGNIFICANT INCIDENTS

- 19 February 2015 – Visayas Partial Blackout
- 15 March to 13 April 2015 – 2015 Malampaya Turnaround and the Projected Power Shortage
- El Niño Phenomenon starting March 2015
- 5 April 2015 – Mindanao Blackout
- June 2015 – Fire incident that affected the operations of KSPC
- October 2015 – Typhoon Lando
-
- Bombed and Toppled Transmission Towers in Mindanao in January, October, November and December 2015

A. INSTALLED, DEPENDABLE AND AVAILABLE CAPACITY

The Philippines' total installed generating capacity continued to grow by 4.6% from 17,944 MW in 2014 to 18,765 MW in 2015 equivalent to 821 MW increase. Coal-fired power plants constitute the largest share in the installed and dependable capacity in 2015 at 32% and 34% respectively. Among renewable energy, hydro sources' share remained the highest at 19% majority of which comes from the Mindanao Grid. With the FIT incentives and continued support of the DOE and energy agencies and stakeholders, Variable Renewable Energy (VRE) such as wind and solar grew remarkably by 50.9% (144 MW increase) and 616.0% (142 MW increase) respectively from 2014 to 2015 as shown in Figure 1.

Figure 1. 2015 vs. 2014 Installed Capacity, Philippines (in MW)



2015 Installed Capacity
18,765 MW

Source: DOE List of Existing Power Plants as of December 2015, released March 2016

The percent share on a per Grid basis remained unchanged over the years. In 2015, almost 75% of the total capacities was in Luzon, while Visayas and Mindanao, with at par shares, comprised the remaining 25%. The commercial operation of power plants from different technologies provided the needed additional capacities for the Luzon Grid in 2015.

On the average, the actual available capacity during peak hours in Luzon, Visayas in Mindanao was 70% of the total installed capacity in the Philippines in 2015. Among other plant technologies, natural gas in Luzon provided the highest percentage of available capacity over installed capacity at 95%, followed by coal at 85% and geothermal at 70%. Whereas, wind and solar, due to variability and intermittency, provided the lowest available capacity in 2015 at only 22% and 33% of the total installed capacity.

For Visayas and Mindanao, coal-fired power plants delivered the highest available capacity at 91% and 89% respectively. The actual available capacity over installed capacity provided by wind and solar was the highest in Visayas at 89% and 72%. However, due to El Niño, the available capacity of hydro in Mindanao was limited to only 58% of the total hydro capacity.

Table 1. 2015 vs. 2014 Installed, Dependable and Available Capacity, Philippines (in MW)

FUEL TYPE	PHILIPPINES						2015 Available Capacity
	Installed Capacity			Dependable Capacity			
	2015	2014	Difference	2015	2014	Difference	
Coal	5,963	5,709	254	5,613	5,378	235	5,051
Oil Based	3,610	3,476	134	2,734	2,705	29	1,787
Natural Gas	2,862	2,862	0	2,759	2,760	(1)	2,730
Geothermal	1,917	1,917	0	1,602	1,607	(5)	1,340
Hydro	3,600	3,543	57	3,072	2,982	90	2,062
Wind	427	283	144	379	103	276	96
Biomass	220	130	90	147	81	66	70
Solar	165	23	142	125	17	108	54
TOTAL	**18,765**	**17,944**	**821**	**16,432**	**15,633**	**799**	**13,188**

Source: DOE List of Existing Power Plants as of December 2015, released March 2016

As shown in Table 2, new power plants were commissioned in 2015 from different technologies such as the 135 MW South Luzon Thermal Energy Corporation (SLTEC) Coal-Fired Power Plant Unit 1 in Batangas, 13.2 MW Sabangan Hydroelectric Power Plant (HEPP) in Mt. Province and 6 MW Sinoma Waste Heat Recovery System in Rizal. In addition, the 100 MW Gas Turbine Power Plant in Navotas was rehabilitated by Millennium Energy Inc. (MEI) and is currently embedded under the MERALCO franchise area.

On the second half of 2015, more RE-based plants from wind, biomass and solar went online totaling to 265 MW such as the 54 MW Alternergy Wind Farm in Pililia, Rizal, 20 MW Isabela Biomass Energy Corporation (IBEC) Bagasse-Fired Power Plant, and 13 MW Bataan 2020 Rice Husk-Fired Power Plant. There were also solar photovoltaic (PV) farms which have been operational such as the 10 MW Phase 1 and 13.1 MW Phase 2 of Raslag Corporation Solar Farm in Pampanga, 41.3 MW Majestic Solar Rooftop in Cavite, 4 MW Burgos Solar Farm in Ilocos Norte, and the 1.5 MW rooftop-installed solar panels of Solar Philippines which is located at SM North EDSA.

Table 2. 2015 vs. 2014 Installed, Dependable and Available Capacity, Luzon (in MW)

FUEL TYPE	LUZON						2015 Available Capacity[1]
	Installed Capacity			Dependable Capacity			
	2015	2014	Difference	2015	2014	Difference	
Coal	4,812	4,671	141	4,512	4,391	121	4,010
Oil Based	2,133	2,033	100	1,585	1,507	78	916
Natural Gas	2,861	2,861	0	2,759	2,759	0	2,730
Geothermal	844	844	0	691	692	(1)	504
Hydro	2,528	2,471	57	2,224	2,131	93	1,439
Wind	337	283	54	293	103	190	16
Biomass	83	50	33	60	39	21	10
Solar	70	0	70	54	**0**	54	0
TOTAL	**13,668**	**13,213**	**455**	**12,179**	**11,622**	**557**	**9,624**

Source: DOE List of Existing Power Plants as of December 2015, released March 2016

On the other hand, Visayas' net increase in capacity was the smallest compared to the two Grids. Based on Table 3, newly operational RE plants coming from biomass, wind, and solar provided additional 200 MW in the installed capacity and 170 MW in the dependable capacity. However, due to the decommissioning of Salcon's Cebu Thermal Power Plant (TPP), the total installed and dependable capacity of coal declined in 2015. The units of Cebu Land-Based Gas Turbine of SPC Island Power Corporation is currently under preservation and have not provided power to the grid during the past years which contributed to the 80 MW drop in dependable capacity coming from oil-based sources in 2015. On the same manner, the non-operation of DESCO Inc.'s Natural Gas Power Plant due to non-availability of fuel and the adjustments in capacities of Unified Leyte Geothermal Power Plants also decreased the dependable capacity of the Visayas Grid.

[1] Available Capacity during the occurrence of non-coincident 8,928 MW Peak Demand in Luzon on 21 May 2015

Table 3. 2015 vs. 2014 Installed, Dependable and Available Capacity, Visayas (in MW)

FUEL TYPE	VISAYAS						2015 Available Capacity[2]
	Installed Capacity			Dependable Capacity			
	2015	2014	Difference	2015	2014	Difference	
Coal	769	806	(37)	761	777	(16)	701
Oil Based	670	670	0	425	505	(80)	364
Natural Gas	1	1	0	0	1	(1)	0
Geothermal	965	965	0	813	817	(4)	738
Hydro	11	11	0	11	11	0	4
Wind	90	0	90	86	0	86	80
Biomass	101	44	57	77	32	45	60
Solar	75	22	53	56	17	39	54
TOTAL	**2,683**	**2,520**	**163**	**2,228**	**2,160**	**68**	**2,001**

Source: DOE List of Existing Power Plants as of December 2015, released March 2016

As shown in Table 4, in 2015, the capacities in Mindanao inched up significantly compared to previous years after the entry of new power plants coming from base-load coal (150 MW Therma South Coal Unit 1), oil (20.9 MW Peak Power Soccsargen, 5.9 MW Peak Power ASELCO, and 7.8 MW King Energy - Maramag) and solar (12.5 MW Kirahon Solar Farm and 6.2 MW Centralla Solar Farm). On the other hand, the dependable capacity of hydro declined by 3 MW due to deratings.

Table 4. 2015 vs. 2014 Installed, Dependable and Capacity, Mindanao (in MW)

FUEL TYPE	MINDANAO						2015 Available Capacity[3]
	Installed Capacity			Dependable Capacity			
	2015	2014	Difference	2015	2014	Difference	
Coal	382	232	150	340	210	130	340
Oil Based	807	773	34	724	693	31	507
Natural Gas	0	0	0	0	0	0	0
Geothermal	108	108	0	98	98	0	98
Hydro	1,061	1,061	0	837	840	(3)	619
Wind	0	0	0	0	0	0	0
Biomass	36	36	0	10	10	0	0
Solar	20	1	19	15	0	15	0
TOTAL	**2,414**	**2,211**	**203**	**2,025**	**1,851**	**174**	**1,563**

Source: DOE List of Existing Power Plants as of December 2015, released March 2016

[2] Available Capacity during the occurrence of non-coincident 1,768 MW Peak Demand in Visayas on 18 November 2015

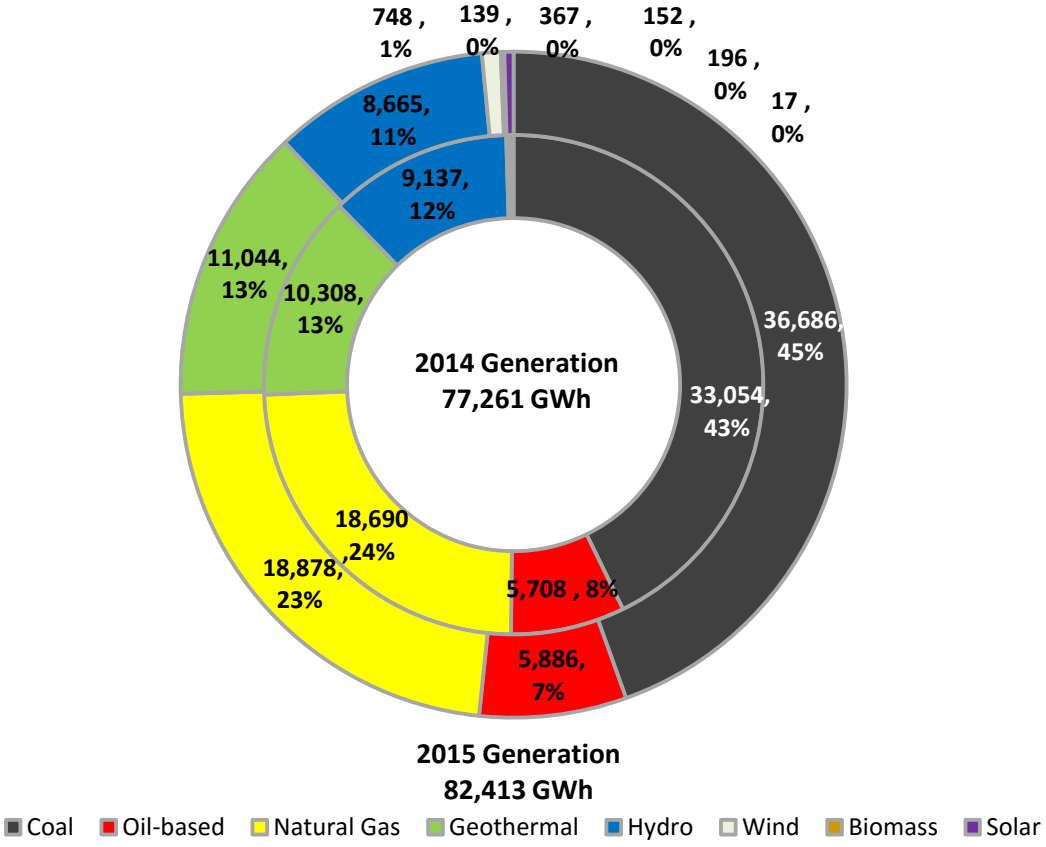
[3] Available Capacity during the occurrence of non-coincident 1,517 MW Peak Demand in Mindanao on 12 November 2015

B. POWER GENERATION

The power generation of the country grew by 6.7% equivalent to 5,152 GWh increase in 2015 due to the significant increase in coal-fired power generation at 3,632 MW. This covers the generation of grid-connected plants from the three main grids as well as embedded and off-grid generations as shown in Figure 2.

Data are based on the submitted Monthly Operations Report (MOR) from the generation facilities operators. Almost seventy-five percent of the country's power generation in 2015 came from fossil-based power plants which include coal, oil-based, and natural gas. Meanwhile, renewable energy from geothermal and hydro sources remained the major source of power generation for the Visayas and Mindanao grids.

Figure 2. 2015 and 2014 Comparative Power Generation, Philippines



Source: DOE Power Statistics 2015, released June 2016

Luzon grid recorded an increased generation of 5.9 % in 2015. Based on Table 5, Coal generation still dominated the generation mix in the grid at 49.4% or an increment of 2,333 GWh due to the operation of new coal-fired power plants. Oil-based generation in Luzon fell significantly by 21.2% due to less utilization of oil-based plants and giving priority to RE-based plants as must-dispatch. RE generation

from wind, biomass, and solar remained aggressive by reaching more than a hundred percent increase in power generation due to the upsurge of RE projects.

Table 5: 2015 and 2014 Comparative Gross Generation, Luzon

LUZON GRID						
PLANT TYPE	2015		2014		Difference	
	GWh	%Share	GWh	%Share	GWh	% Growth Rate
Coal	29,680	49.4	27,346	47.0	2,333	8.5
Oil-based	1,845	3.1	2,342	2.9	(498)	(21.2)
Natural Gas	18,878	31.4	18,686	34.3	192	1.0
Geothermal	4,096	6.8	3,817	6.2	279	7.3
Hydro	4,769	7.9	4,357	9.4	412	9.5
Wind	592	1.0	152	0.1	440	289.2
Biomass	187	0.3	65	0.1	122	186.8
Solar	66	0.1	0	0.0	66	-
Total Generation	**60,113**	**100.0**	**56,766**	**100.0**	**3,346**	**5.9**

Source: DOE Power Statistics 2015, released June 2016

Despite having the smallest capacity addition among the three Grids and decline in output of other plant types in 2015, power generation in the Visayas still managed to grow by 10.5% driven by the increase in renewable energy generation as shown in Table 6. Solar power generation in Visayas posted a notable 369% growth from 2014-2015.

Table 6. 2015 and 2014 Comparative Gross Generation, Visayas

VISAYAS GRID						
PLANT TYPE	2015		2014		Difference	
	GWh	%Share	GWh	%Share	GWh	% Growth Rate
Coal	4,968	40.8	4,449	40.4	519	11.7
Oil-based	672	5.5	765	7.0	(94)	(12.2)
Natural Gas	0	0.0	4	0.0	(4)	(100.0)
Geothermal	6,105	50.2	5,627	51.1	478	(8.5)
Hydro	38	0.3	35	0.3	3	(8.2)
Wind	157	1.3	0	0.0	157	-
Biomass	159	1.3	117	1.1	42	36.3
Solar	71	0.6	15	0.1	56	369.1
Total Generation	**12,170**	**100.0**	**11,014**	**100.0**	**1,157**	**10.5**

Source: DOE Power Statistics 2015, released June 2016

The effect of the El Niño phenomenon which started in the last quarter of 2015 was mostly pronounced in Mindanao that caused hydro generation to fall by 887 MWh or 18.7% as shown in Table 7. This caused rotating blackouts in distribution utilities which are dependent on the Agus and Pulangi Hydro power plants of the National Power Corporation – Power Sector Assets and Liabilities Management Corporation (NPC-PSALM) for their power supply. However, this decline was neutralized by the increase in generation output from other new sources such as large coal and oil-based power plants. There is also a noted decrease in the generation of geothermal due to the extended maintenance of Mt Apo Geothermal Power Plant during last August 2015.

Table 7. 2015 and 2014 Comparative Gross Generation, Mindanao

MINDANAO GRID						
PLANT TYPE	2015		2014		Difference	
	GWh	%Share	GWh	%Share	GWh	% Growth Rate
Coal	2,038	20.1	1,258	13.3	780	62.0
Oil-based	3,369	33.3	2,599	27.4	770	29.6
Geothermal	842	8.3	864	9.1	(22)	(2.5)
Hydro	3,858	38.1	4,745	50.1	(887)	(18.7)
Biomass	21.4	0.2	13.9	0.2	7.5	54.0
Solar	1.55	0.0	1.48	0.0	0.07	4.8
Total Generation	**10,130**	**100.0**	**9,481**	**100.0**	**649**	**7.6**

Source: DOE Power Statistics 2015, released June 2016

C. SYSTEM PEAK DEMAND

The system peak demand for the grids increased significantly as shown in Table 8. For Luzon grid in 2015, the peak demand was recorded at 8,928 MW which occurred on 21 May 2015. This was 2.4 % or 211 MW higher than the recorded demand of 8,717 MW which happened in the same month last year. This was attributed to the high electricity consumption due to high temperature and increased utilization of air conditioning and other cooling equipment of the residential and commercial sector especially during summer period.

System peak demand continued to increase in 2015 especially in the Visayas with 8.1% growth rate. Its highest recorded coincident peak demand occurred on 18 November 2015 at 1,768 MW. From Table 8, the highest demand for Visayas came from Cebu sub-grid with 48.1 percent share followed by Panay and Negros both with 17.5 percent share. The remaining 17 percent came from the Leyte-Samar and Bohol sub-grids with 13 percent and 4 percent respectively.

In Mindanao, the recorded highest demand, including embedded loads, was at 1,517 MW which occurred on 12 November 2015. Despite having demand curtailment, this 2015 peak demand was higher by 3.3% from 1,469 MW in 2014. Mindanao's peak demand usually occurs during the latter part of the year where hydro capacity and supply is high.

Table 8. Comparison of 2015 and 2014 Peak Demand, per Grid

GRID	Peak Demand (MW)		Deviation	
	2015	2014	MW	%
LUZON	8,928	8,717	211	2.4%
VISAYAS	1,768	1,636	132	8.1%
MINDANAO	1,517	1,469	48	3.3%
TOTAL	**12,213**	**11,822**	**391**	**3.3%**

Source: DOE Power Statistics 2015, released June 2016

Table 9. Breakdown of the 2015 highest demand of Visayas at 1,768 MW

Visayas Sub-grid	2015 Peak Demand Breakdown (MW)	% Share
Cebu	850	48.1
Negros	309	17.5
Panay	309	17.5
Leyte – Samar	230	13.0
Bohol	70	4.0
Total Visayas Demand	**1,768**	**100.0**

Source: DOE Power Statistics 2015, released June 2016

D. ELECTRICITY SALES AND CONSUMPTION

Electricity consumption remarkably grew by 6.7% in 2014-2015 compared to the 2.7% growth level in 2013-2014 as shown in Table 10. Power consumption in the Philippines remained driven by the residential and industrial sectors comprising more than 50% combined shares. A notable increase in residential consumption was observed for Visayas and Mindanao attributed to the increase in connectivity of households at the distribution level. The continued line restoration, reconnection, and rehabilitation of natural disaster affected areas in the Visayas revived the electricity consumption at the household level. On the other hand, the rise in residential

consumption in Mindanao was due to the reduced rotating blackouts in 2015 and improved power supply situation brought by new capacities.

Despite having the lowest share in the total consumption, the "Others" sector which include public buildings, street lights, irrigation, energy recovered, and others not elsewhere classified remained aggressive by having the highest growth rate from 2014 to 2015 at 12.6% uplifted by the growth in the Visayas at 34.2%. This was boosted by the increase in government spending at 9.4% and the accelerated performance of public construction which grew by 20.6% in 2015[4].

The growth rate of own-use consumption of power plants and distribution utilities remained sluggish for Mindanao compared to the two grids in 2015. However, own-use consumption is expected to increase in the coming years considering the entry of large generating units which started in 2015 and other additional capacities coming in the pipeline.

On the other hand, the net minimal increase in the overall systems loss of 26.3 MW resulted from the 296 MW reduction in systems loss for Luzon which was offset by the 322 MW increase in Visayas and Mindanao.

Table 10. 2015 and 2014 Sectoral Electricity Sales and Consumption

Sector	PHILIPPINES					
	2015		2014		Difference	
	GWh	% Share	GWh	% Share	GWh	% Growth Rate
Residential	22,747	27.6	**20,969**	27.1	1,778.18	8.5
Commercial	20,085	24.4	**18,761**	24.3	1,324	7.1
Industrial	22,514	27.3	**21,429**	27.7	1,085.21	5.2
Others	2,462	3.0	**2,186**	2.8	275.57	12.6
Total Sales	**67,807**	**82.3**	**63,345**	**82.0**	**4,462.96**	**7.1**
Own-Use	7,124	8.6	**6,461**	8.3	663	10.3
System Loss	7,481	9.1	**7,455**	9.7	26.25	0.4
Total Consumption	**82,413**	**100.0**	**77,261**	**100.0**	**5,152**	**6.7**

Source: DOE Power Statistics 2015, released June 2016

[4] NEDA, *Statement of Secretary Balisacan on the 2015 Fourth Quarter and Full-Year Performance of the Philippine Economy* published at the NEDA website

The comparative sectoral electricity sales and consumption by the three grids for 2015 and 2014 was presented in Table 10. The Luzon grid grew by 6.3% or 3,611 MWh while Visayas, with the highest growth among the three grids, grew by 8.7% at 892 MWh. Mindanao continued to grow by 6.9% or 649 MWh in 2015.

Table 11. 2015 and 2014 Comparative Sectoral Electricity Sales and Consumption, by Grid

Luzon	2015 (MWh)	2014 (MWh)	Difference (MWh)	% Growth Rate
Residential	16,528	15,304	1,224	8.0
Commercial	17,272	16,103	1,170	7.3
Industrial	15,876	14,939	937	6.3
Others	913	895	19	2.1
Total Sales	**50,589**	**47.241**	**3,349**	**7.1**
Own-Use	5,598	5,040	558	11.1
System Loss	4,912	5,208	(296)	(5.7)
Total Consumption	***61,099***	***57,489***	***3,611***	***6.3***
Visayas	**2015 (MWh)**	**2014 (MWh)**	**Difference (MWh)**	**% Growth Rate**
Residential	3,068	2,770	298	10.8
Commercial	1,418	1,302	117	9.0
Industrial	3,268	3,214	54	1.7
Others	1,011	753	257	34.2
Total Sales	***8,765***	***8,039***	***726***	***9.0***
Own-Use	1,131	1,049	82	7.8
System Loss	1,288	1,204	84	7.0
Total Consumption	***11,184***	***10,292***	***892***	***8.7***
Mindanao	**2015 (MWh)**	**2014 (MWh)**	**Difference (MWh)**	**% Growth Rate**
Residential	3,151	2,895	257	8.9
Commercial	1,394	1,357	37	2.8
Industrial	3,370	3,275	94	2.9
Others	538	538	(0)	(0.1)
Total Sales	***8,453***	***8,065***	***388***	***4.8***
Own-Use	395	372	24	6.3
System Loss	1,281	1,044	238	22.8
Total Consumption	***10,130***	***9,481***	***649***	***6.9***

**Includes Off-Grid Sales*
Source: DOE Power Statistics 2015, released June 2016

❖ Industrial Sector

The industrial sector's growth observed in 2015 at 5.1% was lower than the residential and commercial sector which was attributed to its increased exposure and vulnerability to the dynamics of domestic demand and external economic uncertainties. Electricity consumption in Visayas and Mindanao improved slowly compared to the boosting 6.3% growth observed for Luzon.

Among others, the manufacturing sub-sector bolstered the growth of the industry level with the upsurge of demand for tobacco, transport equipment, non-metallic products, and construction-related manufactured goods. However, the onset of El Niño adversely hit the food manufacturing subsector. The sluggish export performance brought by domestic uncertainties and global economic slowdown of importing countries like China led to the decline in demand for metals (iron and steel), petroleum and export-oriented products among others.[5]

❖ Residential Sector

The countrywide electricity consumption of residential customers continued to expand posting a remarkable turnaround growth of 8.5% in 2015 from 1.7% growth rate from 2013-2014.

This significant growth in the residential electricity sales can be partly attributed to base effects, as year–ago levels reflected lower-than-normal consumption among the residential customers specifically in the Visayas Grid due to the huge numbers of destroyed and damaged residential houses after the onslaught of Bohol Earthquake and typhoon Yolanda in the southern areas of the Visayas in the latter part of 2013.

The increase in electricity sales of residential customers can also be traced to the increased utilization of cooling system due to higher temperatures caused by El Niño. Moreover, the growth in electricity sales was also driven by robust household utilization of electronic appliances for food preparation and recreation. At the same time, the favorable business, positive consumer sentiments provided further boost to the residential electricity sales in the country, supported by stable inflation and stable stream of overseas Filipinos' (OFs) remittances.

[5] NEDA, *Statement of Secretary Balisacan on the 2015 Fourth Quarter and Full-Year Performance of the Philippine Economy* published at the NEDA website

❖ Commercial Sector

As the services sector continues to fuel the country's economic growth, the commercial sector's electricity consumption reaffirmed its growth level in 2015 at 7.1%. Contrary to manufactured goods, service exports remained strong primarily due to the BPO subsector's firm performance. Similar to the previous years, commercial sector's power consumption was strengthened by the emergence of new businesses and rising employment led by the active performance of the real estate activities, renting and business activities engaged in transport, storage and communication, trade and repair of motor vehicles, personal and household goods, and the recovery of the trading activities towards the end of the year. Further, the rising demand for services such as laundry, medical, health and education-related services, hotels, restaurants, spas and beauty parlors contributed to the growth of electricity sales in the commercial sector.

As expected in 2015, Visayas grid investments rebounded due to the opening of new businesses, commercial establishments, and other infrastructure expansions. Likewise, the potential of Mindanao for both the industrial and commercial sector has been upraised. Mindanao's economy continue to grow with the unrelenting coordination and collaboration of the government investment promotion agencies, which provides support for the active involvement of Mindanao investors, prospective entrepreneurs, and stakeholders through involvements in the organization of trade fairs and exhibits, investment forums, summits, and conferences.

❖ Others

"Others" refer to public buildings, street lights, irrigation, agriculture and "others not elsewhere classified". This sector continued to post double-digit growth over the previous years.

The consistent performance of the "others" sector was fueled by the massive improvements in government spending coupled with the remarkable performance of both public and private infrastructure in 2015. Despite the adverse effects of weather-related natural occurrences, the agriculture, hunting, forestry, and fishing sector maintained its stable performance.

❖ Own-Use and System Loss

With the increase in total capacity brought by newly operational power generation projects, station use of power plants and utilities' own-use for office and other equipment continued to increase in 2015 at 10.3% growth rate.

In 2015, total systems loss' share to total consumption at 9.1% was lowered compared to 2014 at 9.7% consistent with the thrust of energy agencies to reduce the national level of systems loss by increasing network efficiency, improving pilferage management, adopting appropriate standards and technology, implementing technical and management reforms and promoting energy efficiency relative to demand side management among others. Technical losses which are the residuals of day-to-day systems operation comprised the bulk of Distribution Utilities' (DUs) systems loss while non-technical losses include electricity pilferages mainly from Electric Cooperatives (ECs).

Table 12. 2015 Electricity Sales and Consumption of Distribution Utilities, by Grid

Electric Cooperatives (ECs)*	LUZON (MWh)	VISAYAS (MWh)	MINDANAO (MWh)	PHILIPPINES (MWh)
Residential	4,472	2,016	2,120	8,608
Commercial	1,804	864	872	3,540
Industrial	1,209	588	1,313	3,110
Others	582	461	427	1,470
Total Sales	***8,067***	***3,929***	***4,732***	***16,728***
Own-Use	19	13	11	43
System Loss	1,169	500	739	2,408
Total	***9,255***	***4,443***	***5,482***	***19,180***
Private Investors Owned Utilities (PIOU's)	**LUZON (MWh)**	**VISAYAS (MWh)**	**MINDANAO (MWh)**	**PHILIPPINES (MWh)**
Residential	12,056	1,052	1,031	14,139
Commercial	15,468	554	522	16,544
Industrial	12,113	2,131	1,698	15,942
Others	180	81	54	315
Total Sales	***39,817***	***3,818***	***3,305***	***46,941***
Own-Use	141	9	2	152
System Loss	2,693	318	231	3,243
Total	***42,651***	***4,146***	***3,538***	***50,336***
Non-Utilities/Directly Connected	2,554	559	367	3,481
Other Services	151	458	49	658
Plant Station Used	5,438	1,108	383	6,929
Transmission Losses	1,051	469	311	1,830
Total	***61,099***	***11,184***	***10,130***	***82,413***

**Includes Off-Grid Sales*
Source: DOE Power Statistics 2015, released June 2016

As presented in Table 12, about 60% of electricity consumed in the country in 2015 was delivered by Private Investors Owned Utilities (PIOUs), mostly from Luzon under MERALCO, while the share of ECs, mainly from Visayas and Mindanao constitute about 23% of the total electricity consumption. Based on Table 12, the majority of the customers of PIOUs include the industrial and commercial sectors while majority of electricity sales of ECs came from residential consumers. The remaining 15 % of electricity consumption came from non-utilities, directly-connected customers, other services, plant station-used, and transmission losses.

E. UPDATES ON TRANSMISSION PROJECTS

The table below provides the summary of the existing transmission facilities in the country in 2015 consist of transmission lines, sub-transmission lines and submarine cables in Ckt-km with corresponding substation capacity (MVA) and reactive/capacitive compensation (MVAR).

Table 13. Total Existing Transmission Facilities, as of 2015

Voltage Level	Transmission Lines (Ckt-km)	Sub-Transmission Lines (Ckt-km)	Submarine Cable (Ckt-km)	Substation Capacity (MVA)	Reactive/ Capacitive Compensation (MVAR)
500-kV	981.34	0.00	0.00	10,800.00	450.00
350-kV	904.99	0.00	42.59	1032.00	0.00
230-kV	5,542.90	0.00	64.00	12,256.00	1,620.00
138kV	5,420.29	45.72	72.10	5,560.00	177.50
115-kV	165.13	26.18	0.00	570.00	107.50
69-kV & below	1,655.85	4,808.11	0.00	388.00	1,986.21
Total	**14,671.46**	**4,880.01**	**178.69**	**30,606.00**	**4,341.21**

Source: 2014-2015 NGCP Transmission Development Plan (Draft)

Meanwhile, summarized below are the projects completed and/or energized from 01 January 2015 to 31 December 2015. In this period, a total of 633 circuit-km of overhead transmission lines were completed and a total of 1,025 MVA additional capacities and 600 MVAR of reactive power support were installed.

Table 14. List of Completed/Energized Transmission Projects in 2015

Project Name	Purpose	MVA	MVAR	CKT -KM	Date of Completion/ Energization
Luzon					
Lumban-Bay 230kV T/L Project - Lumban-Kalayaan Line 1 - Lumban-Bay Line 2 - Lumban-Calauan Line 2 - Lumban-Bay Line 1 - Lumban-Malaya Line 1	To increase the capacity of this corridor in order to accommodate any generation dispatch scenarios.			40	 Jan 2015 Mar 2015 Mar 2015 Mar 2015 May 2015
Luzon Voltage Improvement Project II - Biñan S/S - Dasmariñas S/S - Mexico S/S	To improve voltage regulation and keep the voltages in the area within the Grid Code prescribed limits both during normal and N-1 contingency conditions.		 200 200 200		 Jul 2015 Oct 2015 Sep 2015
Luzon S/S Expansion Project II - Mexico S/S	To meet load growth and to provide N-1 contingency to various substations in North Luzon.	400			Jun 2015
Luzon S/S Expansion Project IV - Bayombong S/S - Muntinlupa S/S - Tuguegarao S/S	To add substation capacity to accommodate load growth.	 75 300			 Aug 2015 Mar 2015
Binga-San Manuel 230kV T/L (Stage 1) - Binga S/S Upgrade	To provide N-1 contingency during maximum dispatch of the generating plants, particularly HEPPs, in north Luzon.	50			Dec 2015
San Esteban - Laoag 230kV T/L Project, Stage 2 - Line 1 & 2	To strengthen the existing corridor to provide N-1 contingency and to support the wind farm connections.			240	Dec 2015

Project Name	Purpose	MVA	MVAR	CKT -KM	Date of Completion/ Energization
Visayas					
Southern Panay Backbone 138kV T/L - Sta. Barbara - San Jose T/L - San Jose S/S (New)	To accommodate load growth in Southern Panay by extending the 138 kV backbone.			99	Dec 2015
Visayas S/S Reliability Project I - Babatngon S/S - Cadiz S/S	To add substation capacity to provide N-1 contingency	50			July 2015
Visayas S/S Reliability Project II - Babatngon S/S	To add substation capacity to provide N-1 contingency	50			Nov 2015
Mindanao					
Baloi-Villanueva 230 kV T/L Project	To provide new transmission corridor to Agus Hydro for higher reliability.			240	Jan 2015
Mindanao S/S Reliability Project I - Jasaan S/S	To provide N-1 contingency transformers at various substations	100			Dec 2015
Opol S/S Project - Transmission Line	To address the increase in demand and improve power quality in the area			14	Nov 2015
Total		**1,025**	**600**	**633**	

Source: 2014-2015 NGCP Transmission Development Plan (Draft) and NGCP's Monthly Transmission Status Report, as of December 2015

Also, provided below are the summary of updates on the status, in percent completion, of other ERC approved transmission projects and with the indicated expected time of completion (ETC). This includes the previously completed projects but still with some remaining components yet for completion in 2016.

Table 15. Ongoing Transmission Projects for Completion in 2016

Project Name	Project Driver	Purpose & Remaining Major Components	Percent (%) Completion	ETC
LUZON				
Luzon Substation Expansion III	Load Growth	To add substation capacity to accommodate load growth. Bay: 1-100 MVA 230/69 kV transformer	98.6%	Mar 2016
Luzon Substation Reliability I	System Reliability	To add substation capacity to provide N-1 contingency Botolan: 1-50 MVA 230/69 kV transformer Labo: 1-50 MVA 230/69 kV transformer	94.5%	Mar 2016
Luzon PCB Replacement	System Reliability	To replace old PCBs to improve substation reliability at San Jose, Labo, Malaya and Gumaca.	71.6%	Mar 2016
Luzon Substation Expansion IV	Load Growth	To add substation capacity to accommodate load growth. Daraga: 1-100 MVA 230/69 kV transformer Gumaca: 1-50 MVA 230/69 kV transformer Santiago: 2-100 MVA 230/69 kV transformer Tuguegarao: 1-100 MVA 230/69 kV transformer Nagsaag EHV: 1-100 MVA 230/69 kV transformer	92.0% 93.4% 98.0%	Mar 2016 Sep 2016 Sep 2016
Santiago – Tuguegarao 230kV Line	System Reliability	To provide N-1 contingency for the existing transmission corridor serving Isabela and Cagayan Santiago-Tuguegarao: 1-795 MCM ACSR, 118 km	99.1%	Jun 2016
Dasmariñas EHV Substation	System Reliability	The installation of new 1-600 MVA 500/230 kV transformer has been completed already.	99.3%	Mar 2016

Project Name	Project Driver	Purpose & Remaining Major Components	Percent (%) Completion	ETC
		The remaining project component is the replacement of some 230 kV PCBs to increase the fault interrupting capability of the substation.		
Bacnotan Tap-Bacnotan 230 kV T/L	System Reliability	To improve the reliability of the Bauang-Bacnotan-San Esteban Line by replacing the wood pole structures with steel tower structures in the segment immediate to Bacnotan Substation. This is an ERC approved project originally under O&M capex.	74.7%	Mar 2016
Balingueo (Sta. Barbara) 230 kV S/S	Load Growth	To provide a new substation to adequately and reliably serve the load centers in the province of Pangasinan Balingueo: 1-100 MVA 230/69 kV transformer	74.1%	Mar 2016
Eastern Albay 69 kV T/L Stage 1	Load Growth & System Reliability	To provide reliable power service delivery in eastern Albay by developing new 69 kV supply line and a new 69 kV substation in Sto. Domingo. Sto. Domingo Load-end S/S: 1-69 kV PCB and associated equipment; Daraga S/S Expansion: 1-69 kV PCB and associated equipment.	98.1%	Aug 2016
Las Piñas (Zapote) S/S Expansion	Load Growth & System Reliability	Installation of the 4th transformer unit for N-1 contingency for the 230/115 kV transformers Las Piñas: 1-300 MVA 230/115 kV transformer	82.4%	Dec 2016
VISAYAS				
Negros V T/L	Load Growth	To accommodate load growth in Northeastern Negros and to provide operational flexibility San Carlos-Guihulngan: 69	79.7%	Sep 2016

Project Name	Project Driver	Purpose & Remaining Major Components	Percent (%) Completion	ETC
		kV 1-336.4 MCM ACSR, ST-SC, 58 km		
Ormoc-Maasin 138kV T/L	System Reliability	To provide N-1 contingency for the existing corridor Ormoc-Maasin: 138 kV 1-795 MCM ACSR, ST-DC2, 113.97 km	94.6%	Jun 2016
Colon-Cebu T/L	Capacity Addition	To provide additional capacity to meet load growth and to accommodate the full dispatch of coal plants Colon-Cebu: 138 kV 1-795 MCM ACSR, ST-DC, 25 km	96.1%	Apr 2016
Calong-Calong-Toledo-Colon 138 kV T/L	Generation Entry	To accommodate the full generation capacity of the 246 MW CEDC Coal and the 82 MW TPC Coal Calong-calong-Colon: 1-795 MCM ACSR, ST-DC, 28 km	96.9%	Apr 2016
Ormoc-Babatngon 138 kV T/L	System Reliability	To provide N-1 contingency for the existing corridor by installing the second circuit Ormoc-Babatngon: 1-795 MCM ACSR, ST-DC1, 78.54 km	92.0%	Jun 2016
Visayas Substation Reliability I	System Reliability	To add substation capacity to provide N-1 contingency Ormoc: 1-150 MVA 230/138 kV transformer	96.7%	Sep 2016
Culasi-San Jose 69 kV T/L	System Reliability	To provide N-1 contingency for the existing corridor Culasi-San Jose: 1-336.4 MCM ACSR, ST-SC, 86 km	83.6%	Dec 2016
MINDANAO				
Mindanao Substation Reliability I	System Reliability	To provide N-1 contingency transformers at various substations Lugait: 1-75MVA 138/69 kV transformer intended for this	90.5%	Jun 2016

Project Name	Project Driver	Purpose & Remaining Major Components	Percent (%) Completion	ETC
		substation was installed in Opol Substation instead.		
Agus 6 Switchyard Upgrading / Rehabilitation	System Reliability	To ensure the operational reliability of the plant's switchyard	57.7%	Oct 2016
Malita-Matanao 230 kV T/L	Generation Entry	To accommodate the grid connection of SMCPC's CFPP Malita-Matanao: 230 kV 2-410mm2 TACSR, ST-DC, 67 km transmission line Malita (New): 1-50 MVA 138/69 kV transformer	73.9% 77.8%	Mar 2016
Matanao-Gen. Santos 138 kV T/L	System Reliability	To provide N-1 contingency capability to the transmission corridor Matanao-Gen.Santos: 138 kV 1-795 MCM ACSR, ST-SC, 72.60 km transmission line	98.4%	Jun 2016
Opol 138 kV S/S	Load Growth, System Reliability & Power Quality	To address the increase in demand and improve power quality in the area Opol: 1-75 MVA 138/69 kV transformer. This transformer was originally planned for Lugait Substation.	84.2%	Apr 2016
Butuan-Placer 138 kV T/L	System Reliability	To provide N-1 contingency to the existing line Placer (Expansion), 2-138 kV PCB + Accessories Butuan (Expansion), 2-138 kV PCB + Accessories	93.7%	Dec 2016
Mindanao Substation Expansion	Load Growth	To add substation capacity to meet load growth Gen. Santos SS: 1-100 MVA	89.4%	Jun 2016

Project Name	Project Driver	Purpose & Remaining Major Components	Percent (%) Completion	ETC
Project II		138/69 kV transformer Kidapawan SS: Transfer of 1-50 MVA 138/69 kV transformer from General Santos Substation.		

Source: NGCP's Monthly Transmission Status Report

Visayas-Mindanao Interconnection Project

With regard to the Visayas-Mindanao interconnection to complete the nationwide grid connection, the ERC, under ERC Case No. 2015-201RC, issued on 21 January 2016, a Provisional Authority to NGCP for the conduct of a desktop study and hydrographic survey for the western route of the **Visayas-Mindanao Interconnection Project** (Cebu-Negros to Zamboanga del Norte). Said project will replace the initially identified eastern route connecting Leyte to Surigao as the feasibility study commissioned by NGCP showed that there are geophysical hazards such as underwater volcano, faultlines, and unstable rock slabs; strong seabed currents; and significant quantity of unexploded ordnance along the intended route.

F. SIGNIFICANT OUTAGES

LUZON

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
Angat Unit 1	50	50	Planned Outage	To conduct maintenance activity	20 May to 9 June 2015
			Planned Outage	To conduct maintenance activity	10 to 13 June 2015
			Unplanned Outage	Extended maintenance activity	14 June to 10 September 2015
Angat Unit 2	50	50	Planned Outage	To conduct maintenance activity	20 May to 9 June 2015
			Planned Outage	To conduct maintenance activity	10 to 13 June 2015
			Unplanned Outage	Extended maintenance activity	14 June to 1 August 2015
Angat Unit 3	50	50	Planned Outage	To conduct maintenance activity	10 to 30 June 2015
			Unplanned Outage	Extended maintenance activity	1 July to 1 August 2015
Angat Unit 4	50	50	Planned Outage	To conduct maintenance activity	1 June 2015 to 1 February 2016
Binga Units 1 - 4			Forced Outage	Tail race spur dikes repair	24-26 April 2015
Calaca Unit 2	300	300	Planned Outage	To conduct maintenance activity	20 November 2015 to 25 January 2016
GNPower Mariveles Unit 1	326	302	Forced Outage	Actuation of generator fault protection	26 October 2014 to 15 March 2015
			Unplanned Outage	Condenser tube leak	19 to 30 September 2016
Ilijan GT 1	200	200	Forced Outage	Actuation of overspeed trip relay	23 December 2014 to 26 February 2015
Ilijan B	600	600	Planned Outage	To conduct maintenance activity	14 March to 16 April 2015
			Forced Outage	Malampaya Gas	17 to 22 June

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
				Restriction	2015
			Forced Outage	Malampaya Gas Restriction	26 to 27 June 2015
			Forced Outage	Malampaya Gas Restriction	31 August to 1 September 2015
Kalayaan Unit 1	180	180	Planned Outage	To conduct maintenance activity	16 to 20 June 2015
			Planned Outage	To conduct maintenance activity	10 to 14 November 2015
Kalayaan Unit 2	180	180	Planned Outage	To conduct maintenance activity	23 to 27 June 2015
			Planned Outage	To conduct maintenance activity	17 to 21 November 2015
Kalayaan Unit 3	180	180	Planned Outage	To conduct maintenance activity	2 to 6 June 2015
			Planned Outage	To conduct maintenance activity	25 to 30 November 2015
Kalayaan Unit 4	180	180	Planned Outage	To conduct maintenance activity	8 to 12 June 2015
			Planned Outage	To conduct maintenance activity	28 November to 3 December 2015
Magat Unit 1	90	90	Planned Outage	To conduct maintenance activity	6 April to 13 May 2015
Magat Unit 2	90	90	Planned Outage	To conduct maintenance activity	6 April to 13 May 2015
Magat Unit 3	90	90	Planned Outage	To conduct maintenance activity	5 January to 13 February 2015
			Planned Outage	To conduct maintenance activity	26 February to 28 March 2015
Magat Unit 3	90	90	Planned Outage	To conduct maintenance activity	30 April to 7 May 2015
			Planned Outage	Common system upgrading	14 May to 3 June 2015
Magat Unit 4	90	90	Planned Outage	To conduct	20 February to 9

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
				maintenance activity	April 2015
			Planned Outage	To conduct maintenance activity	30 April to 7 May 2015
			Planned Outage	Common system upgrading	14 to 30 May 2015
Masinloc Unit 2	315	315	Unplanned Outage	Extended maintenance activity	1 January to 4 March 2015
Pagbilao Unit 1	382	382	Unplanned Outage	Extended maintenance activity	30 May to 6 July 2015
Pantabangan Unit 1	60	60	Forced Outage	Cooling system repair	25 May to 1 July 2015
Pantabangan Unit 2	60	60	Forced Outage	Cooling system repair	25 May to 1 July 2015
San Lorenzo Module 50	270	270	Planned Outage	To conduct maintenance activity	31 October to 12 November 2015
San Lorenzo Module 60	270	270	Planned Outage	To conduct maintenance activity	29 October to 4 November 2015
San Roque Units 1 to 3	411	411	Planned Outage	To conduct maintenance activity	26 May to 1 June 2015
SLTEC Unit 1	135	122	Forced Outage	Steam leak trouble at the turbine side	11 to 21 May 2015
			Forced Outage	Governor trouble	27 July to 26 August 2015
Sual Unit 1	647	647	Planned Outage	To conduct maintenance activity	7 August to 4 September 2015
Sual Unit 2	647	647	Planned Outage	To conduct maintenance activity	16 September to 15 November 2015
			Unplanned Outage	Extended maintenance activity	16 November to 17 December 2015

VISAYAS

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
Cebu Energy Development Corporation (CEDC) Unit 1	82	82	Planned outage	To conduct maintenance activities	21 February to 07 March 2015
			Forced outage	Due to boiler tube leak	17 to 21 May 2015
			Forced outage	Due to conduct of boiler air nozzle replacement	06 to 15 November 2015
Cebu Energy Development Corporation (CEDC) Unit 2	82	82	Forced outage	On outage	26 May to 06 June 2015
Cebu Energy Development Corporation (CEDC) Unit 3	82	82	Planned outage	To conduct maintenance activities	14 to 28 January 2015
			Forced outage	Due to boiler tube leak	28 February to 08 March 2015
			Forced outage	Due to boiler problem	13 to 20 May 2015
			Forced outage	On outage	16 to 20 August 2015
KEPCO-Salcon Power Corporation (KSPC) Unit 1	103	103	Forced outage	Due to coal conveyor affected by fire	31 May to 03 June 2015
			Planned outage	To conduct maintenance activities	27 October to 11 November 2015
KEPCO-Salcon Power Corporation (KSPC) Unit 2	103	103	Unplanned outage	Due to unit maintenance	31 May to 14 June 2015
Palinpinon Geothermal Power Plant 1 (PGPP1) Unit 3	37.5	37	Planned outage	To conduct maintenance activities	07 August to 09 September 2015
Panay Energy Development Corporation (PEDC) Unit 1	83.7	82	Forced outage	Due to boiler tube leak	10 February to 05 March 2015
			Forced outage	Due to auto-tripping	20 to 26 April 2015
Panay Energy Development Corporation (PEDC) Unit 2	83.7	82	Forced outage	Due to boiler tube leak	20 to 22 January 2015
			Forced outage	Due to boiler problem	24 to 28 May 2015
Panay Energy Development Corporation (PEDC) Unit 2	83.7	82	Forced outage	On outage	10 to 24 August 2015
			Forced outage	On outage	03 to 05 November 2015
			Forced outage	Due to boiler tube	07 to 09

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
				leak	November 2015
Tongonan Geothermal Power Plant (TGPP) Unit 2	37.5	36	Planned outage	To conduct maintenance activities	07 to 12 November 2015
Upper Mahiao Geothermal Power Plant (UMGPP) Unit 3	32.3	27	Forced outage	Due to rectification of generator ground detection system	09 January to 19 February 2015

MINDANAO

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
Agus 1 HEPP Unit 1	40	25	Planned outage	To conduct maintenance activities	17 to 30 March 2015
			Planned outage	To conduct maintenance activities	2 to 14 September 2015
Agus 1 HEPP Unit 2	40	25	Planned outage	To conduct maintenance activities	8 to 27 August 2015
Agus 2 HEPP Unit 1	60	50	Planned outage	To conduct maintenance activities	7 to 15 April 2015
Agus 2 HEPP Unit 2	60	50	Planned outage	To conduct maintenance activities	27 Feb to 9 March 2015
			Planned outage	To conduct maintenance activities	1 to 12 October 2015
			Planned outage	To conduct maintenance activities	16 to 30 December 2015
Agus 2 HEPP Unit 3	60	50	Planned outage	To conduct maintenance activities	31 January to 23 February 2015
			Planned outage	To conduct maintenance activities	1 to 15 September 2015
Agus 4 HEPP Unit 1	52.7	45.3	Planned outage	To conduct maintenance activities	23 January 2015 to 20 February 2015
			Planned outage	To conduct maintenance	14 to 24 December 2015

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
				activities	
Agus 4 HEPP Unit 2	52.7	45.3	Planned outage	To conduct maintenance activities	1 2016 to 10 July 2016
			Planned outage	To conduct maintenance activities	24 to 30 November 2015
Agus 4 HEPP Unit 3	52.7	45.3	Planned outage	To conduct maintenance activities	22 April 2015 to 5 May 2015
			Planned outage	To conduct maintenance activities	21 to 30 August 2015
Agus 5 HEPP Unit 1	27.5	25.5	Planned outage	To conduct maintenance activities	16 to 22 October 2015
Agus 5 HEPP Unit 2	27.5	25.5	Unplanned outage	Extended maintenance	13 to 21 April 2015
Agus 6 HEPP Unit 1	25	20	Planned outage	To conduct maintenance activities	8 to 20 April 2015
			Planned outage	(UPRATING PROJECT)	10 November to present
Agus 6 HEPP Unit 2	25	20	Forced outage	deactivated shutdown due to generator problems (UPRATING PROJECT)	23 HEPP October 2014 until present
Agus 6 HEPP Unit 3	50	40	Planned outage	To conduct maintenance activities	18 May to 15 August 2015
Agus 6 HEPP Unit 4	50	40	Unplanned outage	Extended maintenance	4 May to 9 September 2015
Agus 6 HEPP Unit 4	50	40	Unplanned outage	Extended maintenance	3 November to 9 December 2015
Agus 7 HEPP Unit 1	27	20	Unplanned outage	Extended maintenance	18 March to 2 April 2015
Pulangi 4 HEPP Unit 1	85	75	Forced outage	thrust bearing oil leak	22 March to 22 May 2015
Pulangi 4 HEPP Unit 2	75	75	Planned outage	To conduct maintenance activities	15 June until 14 July 2015
Pulangi 4 HEPP Unit 3	75	75	Forced outage	earth fault indication	15 January 2015 to 27 March 2015
			Forced outage	high turbine guide bearing oil level	19 to 29 April 2015
			Forced outage	On emergency shut down due to strong generator vibration	30 September to 20 October 2015

Plant	Installed Capacity (MW)	Dependable Capacity (MW)	Outage Classification	Reason	Period Covered
Mt. Apo Geothermal Power Plant (MAGPP) Unit 1	54.2	52	Planned outage	To conduct maintenance activities	13 July to 13 August 2015
Mt. Apo Geothermal Power Plant (MAGPP) Unit 2	54.2	52	Planned outage	To conduct maintenance activities	18 to 28 October 2015
STEAG Coal Unit 1	116	105	Planned outage	To conduct maintenance activities	21 February 2015 to 12 March 2015
			Unplanned outage	Extended maintenance	6 to 14 May 2015
			Planned outage	To conduct maintenance activities	20 to 23 November 2015
STEAG Coal Unit 2	116	105	Planned outage	To conduct maintenance activities	19 February 2015 to 2 March 2015
			Planned outage	To conduct maintenance activities	18 July to 16 August 2015
			Planned outage	To conduct maintenance activities	31 October to 2 November 2015
Therma Marine Inc. (TMI) 1 Diesel Unit 1 and Unit 2	100	99	Planned outage	To conduct maintenance activities	4 to 8 July 2015
Therma Marine Inc. (TMI) 1 Diesel Unit 2	50	49.5	Planned outage	To conduct maintenance activities	21 to 24 March 2015
			Planned outage	To conduct maintenance activities	17 to 22 August 2015
Therma Marine Inc. (TMI) 2 Diesel Unit 1	50	49.5	Planned outage	To conduct maintenance activities	24 to 27 January 2015
			Planned outage	To conduct maintenance activities	6 to 14 June 2015
			Planned outage	To conduct maintenance activities	9 to 12 November 2015
Therma Marine Inc. (TMI) 2 Diesel Unit 2	50	49.5	Unplanned outage	Extended maintenance	16 to 14 June 2015
Therma South Inc. (TSI) Coal U1	150	130	Forced outage	Boiler problems	22 November to 7 December 2015

G. 2015 SIGNIFICANT INCIDENTS IN THE POWER SYSTEM

- **19 February 2015 – Visayas Partial Blackout**

  There was a widespread system disturbance in Visayas grid which occurred last 19 February 2016 at around 1:45 AM due to a fault caused by the explosion of Potential Transformer (PT) at the 138 kV side of Cebu Diesel Power Plant 1 (CDPP1) Generator Transformer No. 2 connected to the NGCP Old Naga substation.

  Power restoration was completed at 9:09 AM of the same date.

- **15 March to 13 April 2015 – 2015 Malampaya Turnaround and the Projected Power Shortage**

  In the advent of a projected power shortage in the Luzon grid in Summer 2015, Shell Philippines Exploration B.V. conducted their 30-day maintenance of the Malamapaya turnaround to give way for the coupling of the newly-built Malampaya Phase 3 platform to the existing platform in order to increase the capability to retrieve the indigenous gas supply in SC-38. With this maintenance, gas supply for natural gas has been cut out. Contingency plan during this event is the operation of 1,500 MW Sta. Rita and San Lorenzo Natural gas-fired power plant in Batangas using condensate, which is more expensive compared to the natural gas from Malampaya. For the 1,200 MW Ilijan plant,also in Batangas, Block A (600 MW) was operated using biodiesel at a limited capacity of 420 MW while Block B was scheduled for maintenance.

  The anticipated power shortage in Luzon during summer did not occur due to the following reasons:

  - Cooler temperature that was extended in March 2015 where temperature was expected to be high. This lead to a lower actual demand in March compared to the projection;
  - High hydro capacity during the period of Malampaya turnaround due to the series of coordination meetings among hydro power plant operators to conduct water management;
  - Additional capacity from the operation of expected committed power projects such as 135 MW SLTEC coal-fired power plant Unit 1 in Batangas, 41.3 MW Majestic Solar Rooftop project in Cavite, and 10 MW Raslag Solar Farm project in Pampanga; and
  - Lower actual Forced Outage in the summer of 2015 from power plants compared to the actual 2014 Forced Outage where there were frequent outage of large power plants in the summer of 2014.

- **5 April 2015 – Mindanao Blackout**

  At 1:01 AM of 5 April 2015, Mindanao grid experienced a system blackout. A fault occurred on Line 2 of Agus 7 138 KV which was caused by the failure of the insulator of Agus 7 138 kV double circuit line 2 Phase A due to severe corrosion of the suspension insulator shank. The sequence of events led to the tripping of the transmission lines and power plants followed by the splitting of the Mindanao grid into two sub-grids - the Northern and Southern part, then ultimately resulted in total system collapse. The system collapse was due to the lack of supply during that time to support the demand.

  All Area Control Centers (ACC) sub-grids were interconnected and all NGCP substations were fully energized at 7:52 AM of 5 April 2015.

- **June 2015 – Fire incident that affected the operations of KSPC**

  A fire incident happened last 31 May 2015 within the compound of the coal plant of KSPC which affected the coal conveyors of the generating facilities. Both units were out from 31 May to 03 June 2015 that put the Visayas grid on Red Alert status. KSPC Unit 1 (103 MW) went online on 4 June 2015 while KSPC Unit 2 (103 MW) was on unplanned maintenance from 31 May to 14 June 2015.

- **October 2015 – Typhoon Lando**

  On 12 October 2015, a typhoon was detected in the Pacific Ocean named “Lando” with an international name “Koppu”. It entered the Philippine Area of Responsibility (PAR) on 14 October 2016 and made its landfall on 18 October 2016 over Casiguran, Aurora with a maximum speed of 185 kph and gustiness of 220 kph. There were four (4) 500 kV lines, twelve (12) 230 kV lines, and forty-two (42) 69 kV lines that were affected during the passage of the said typhoon. Typhoon Lando dissipated on 21 October 2015 as it entered from Aurora, crossed Nueva Ecija, Nueva Viscaya, Benguet, Ilocos Sur, and exited Ilocos Norte leaving 13 provinces with full or partially province-wide power outages due to the affected transmission lines.

- **2015 El Niño Phenomenon**[6]

  Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) declared the state of El Niño in 2015 characterized by unusually warm ocean surface temperatures in the central and eastern equatorial Pacific. This results to period of long dry spell to drought characterized by below to way below normal rainfall conditions. From weak to moderate conditions in the early months of 2015, Strong El Niño has evolved starting fourth quarter of 2015 affecting most parts of the country. This phenomenon persisted until June 2016 which resulted to high system demand and low water level of reservoirs and weirs especially in Mindanao.

- **Bombed and Toppled Transmission Towers in Mindanao for 2015**

  In 2015, there were occurrences of transmission tower bombings in Mindanao which caused interruption in the power delivery of power plants. Series of investigations and coordination meetings in Congress, under the House Committee on Energy, were held to seek resolutions on the issue as well as to resolve any peace and security concerns to prevent future bombings of the power industry assets such as transmission towers, substations, and others. Following are the towers bombed in 2015:

AFFECTED TRANSMISSION LINE	TOWER NO.	DATE OF BOMBING	DATE OF TEMPORARY RESTORATION	DATE OF PERMANENT RESTORATION
Kabacan-Sultan Kudarat 138kV Line	26	13 January 2015		13 October 2015
Kabacan-Sultan Kudarat 138kV Line	41	18 January 2015		03 October 2015
Kibawe - Tacurong 138kV Line	155	26 January 2015		21 December 2015
Kabacan-Sultan Kudarat 138kV Line	25 (IED unexploded)	27 January 2015		
Kibawe – Sultan Kudarat 138kV Line	44, 45	09 October 2015	17 October 2015	
Kabacan-Sultan Kudarat 138 kV Line	110 (IED unexploded)	18 October 2015		
Agus 2 – Kibawe 138 kV Line	20	29 October 2015		16 December 2015
Agus 2 – Kibawe 138 kV Line	19	29 October 2015		09 November 2015

[6] PAGASA El Niño Advisories

AFFECTED TRANSMISSION LINE	TOWER NO.	DATE OF BOMBING	DATE OF TEMPORARY RESTORATION	DATE OF PERMANENT RESTORATION
Agus 2 – Kibawe 138 kV Line	21 (not toppled)	29 October 2015		01 November 2015
Agus 2 – Kibawe 138 kV Line	13 (not toppled)	06 November 2015		09 November 2015
Kibawe-Tacurong 138 kV Line	69 (IED unexploded)	13 November 2015		
Kibawe – Sultan Kudarat 138kV	68	10 December 2015	16 December 2015	
Kibawe – Sultan Kudarat 138kV	168 (not toppled)	18 December 2015		20 December 2015
Kibawe – Tacurong 138kV Line	153 (not toppled)	23 December 2015		28 December 2015
Agus 2-Kibawe 138 kV Lines 1 and 2	25	24 December 2015		Restoration works were suspended since 29 December 2015
Kibawe-Sultan Kudarat 138 kV Line	95 (not toppled)	24 December 2015		27 December 2015
Balo-i-Agus 2 138 kV Lines 1 and 2	4 (not toppled)	28 December 2015		29 December 2015

Source: NGCP

H. REFERENCES

- DOE List of Existing Power Plants, as of December 2015
- DOE Power Statistics 2015
- NGCP Daily Operations Report (DOR)
- NGCP 2015 Grid Operating Program (GOP) revision 4, dated January 2016
- National Economic Development Authority (NEDA)
- Monitoring of Typhoon Lando - National Disaster Risk Reduction and Management Council (NDRRMC); www.ndrrmc.gov.ph/index...ndrrmc.../2607-preparedness-measures-for-ts-lando-i-n-koppu

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Images used are as follows:

1. **GNPower Mariveles Coal Plant, Bataan**
2. **Pililia Wind Farm, Rizal**
3. **Burgos Solar farm, Ilocos Norte**
4. **Sinoma Waste-to-Energy plant, Rizal**
5. **Therma South Inc. Coal plant, Davao del Sur**

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