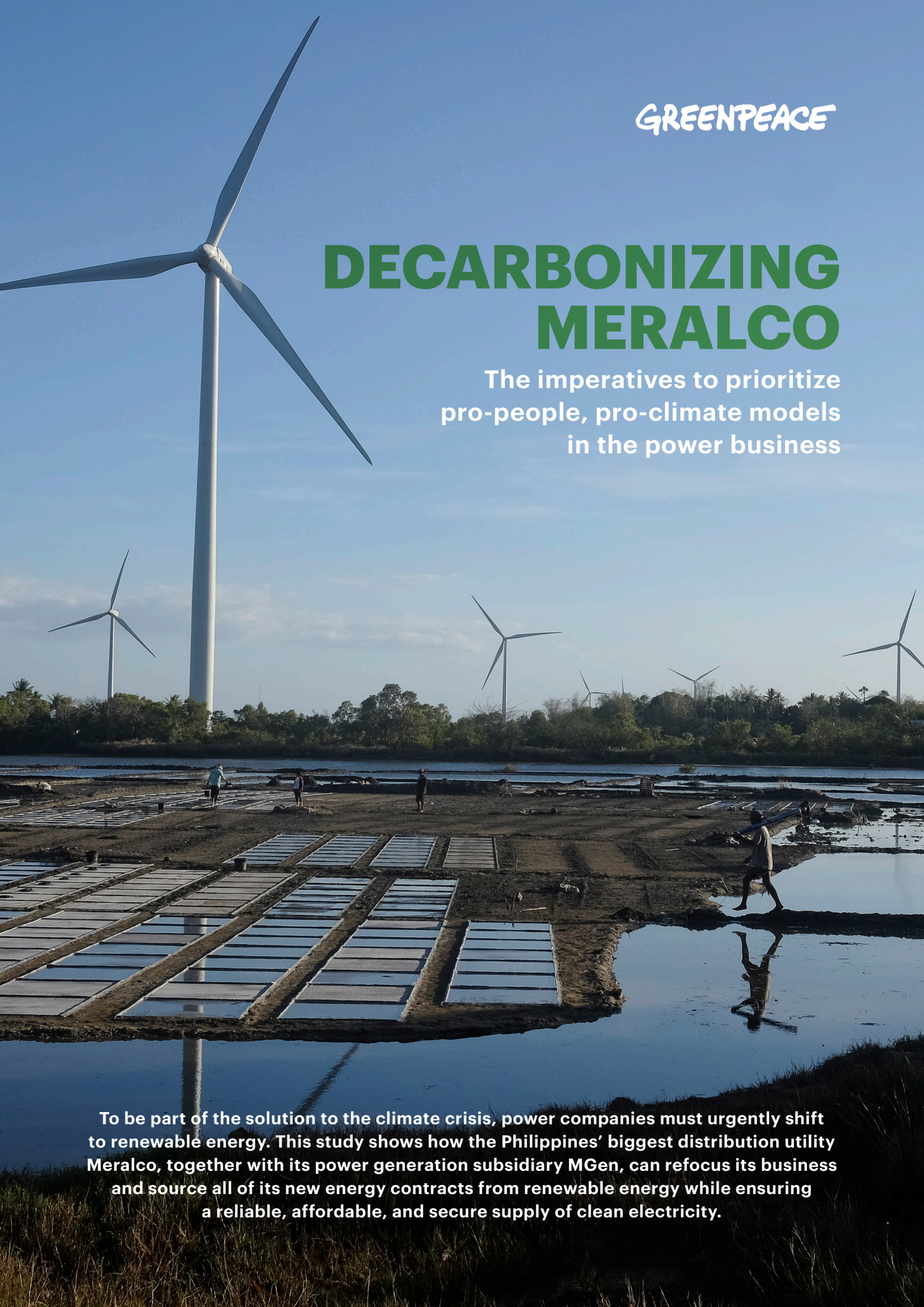


GREENPEACE

DECARBONIZING MERALCO

The imperatives to prioritize pro-people, pro-climate models in the power business

To be part of the solution to the climate crisis, power companies must urgently shift to renewable energy. This study shows how the Philippines' biggest distribution utility Meralco, together with its power generation subsidiary MGen, can refocus its business and source all of its new energy contracts from renewable energy while ensuring a reliable, affordable, and secure supply of clean electricity.

DECARBONIZING MERALCO
The imperative to prioritize pro-people, pro-climate models in the power business

Greenpeace is a global, independent campaigning organization that uses peaceful protest and creative communication to expose global environmental problems and promote solutions that are essential to a green and peaceful future.
Greenpeace has been present in the Philippines since 2000, working to safeguard the constitutional rights of Filipinos to a balanced and healthful ecology.

Greenpeace Southeast Asia - Philippines
30 Scout Tuason Street Room 201 JGS
Building, Quezon City, 1103
Metro Manila, Philippines
www.greenpeace.org.ph

The Center for Renewable Energy and Sustainable Technology (CREST) is the lead author of this report.
CREST is a non-government organization that promotes the use of renewable energy systems and climate technologies by providing technical support and capacity-building to cities and communities.
Decarbonizing Meralco is dedicated to the memory of the late Roberto S. Verzola, who was the lead researcher for this project.

DECARBONIZING MERALCO

The imperatives to prioritize pro-people, pro-climate models in the power business

Table of Contents

PART 5: Limitations of the Study
Annexes

I: Philippine Energy Laws and Frameworks

II: Meralco's Historical Consumption Data

III: GHG Emissions and the Power Sector

Abbreviations

List of Figures

List of Tables

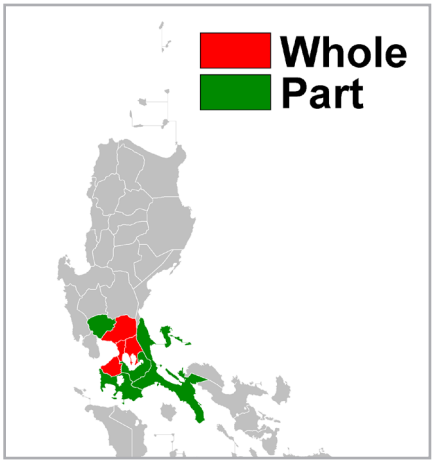
References

PART 1

Meralco, the Company

A. Energy Mix

Meralco is the largest private electric distribution utility (DU) company in the country, covering 36 cities and 75 municipalities in the island of Luzon. Its franchise area of over 9,685 km2 (Meralco, 2018) includes the country's industrial, commercial, and population centers, and it serves over 6.8 million customers. In 2019, Meralco purchased 41,207 GWh of electricity, representing 38.86% of all electricity generated within the country.



Like most DUs, Meralco procures electricity through both bilateral contracts and wholesale electricity spot market (WESM) purchases.

Table A: Meralco Power Suppliers. (Meralco, 2020b)

Power Plants	Energy Sources
AC Energy	coal & solar
Bacavalley Energy Inc. (BEI)	biomass***
FGP Corp. (FGP) – San Lorenzo	fossil gas
First Gas Power Corp. (FGPC) – Sta. Rita	fossil gas
First Gen Hydro Power Corp. (FGHPC)	hydropower
First NatGas Power Corp. (FNPC) - San Gabriel	fossil gas
Masinloc Power Partners Co. Ltd. (MPPCL)	coal
Millennium Energy Inc. (MEI)	fossil gas
Montalban Methane Power Corporation (MMPC)	biomass***
Net Metering Customer	solar*
NPC†	mixed
Panay Energy Development Corp. (PEDC)	coal
Pangea Green Energy Philippines	biomass***
Philippine Power & Development, Co. (PPDC)	hydropower
Philippine Power & Development Co. (Philpodeco)	hydropower
Quezon Power Phils Ltd. Co. (QPPL)	coal
San Buenaventura Power Ltd. Co. (SBPL)	coal
San Miguel Energy Corp. (SMEC)	coal
SEM-Calaca Power Corp. (SCPC)	coal
South Premiere Power Corp. (SPPC)	fossil gas (oil-based)**
Therma Luzon Inc. (TLI)	coal
Therma Mobile Inc. (TMO)	oil-based
Toledo Power Co. (TPC)	oil-based
WESM††	mixed

** Net metering customers are assumed to operate solar PV installations.*
*** SPPC runs primarily on gas but can be powered with diesel. This analysis assumes gas power for SPPC.*
**** All biomass plants supplying electricity to Meralco rely on waste-to-energy technologies or utilize landfill gas.*
† NPC purchases are not unbundled in the source documents. NPC assets include plants under Transition Supply Contracts such as Masinloc, Makban, Pagbilao, Sual, and Calaca, as well as residual from NPC special projects.
†† WESM purchases are not unbundled in the source documents.

Based on the company's electricity purchase data for the past seven years, Meralco's purchases were dominated by fossil fuels, covering 70 to 100% of the total purchased electricity. Roughly half of these purchases come from fossil gas, which typically covers 41 to 65%. Coal has a 12 to 31% share, while oil-based sources cover up to 15% of the energy mix. Most of the remaining generation is covered through WESM purchases, contributing up to 26% of the overall supply.

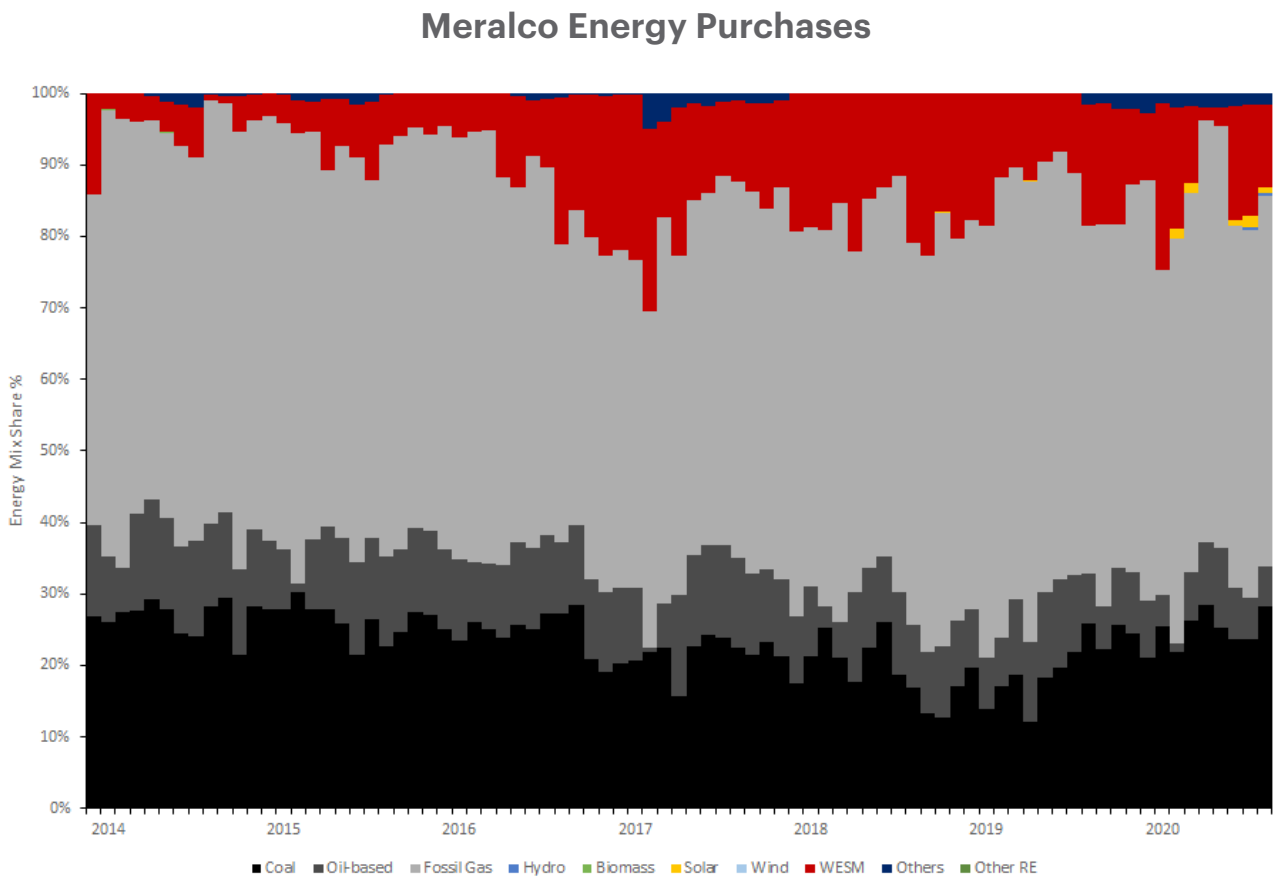


Figure 1. Historical Meralco energy purchases by source from December 2013 to August 2020, based on Meralco documents (Meralco, 2020b). WESM electricity purchases include both RE and non-RE purchases. Note that RE purchases are sometimes bundled under "Others" and "Other RE" categories in the source documents. Regardless, the overall renewables share did not exceed 10% at any given month.

Renewables from power supply agreements (PSAs) contribute a very negligible share of the energy mix at 1 to 2%. These small contributions mostly come from Meralco's power purchases from renewable plants of AC Energy, which includes the solar power plants of Negros Island Solar Power, Inc. and First Gen Hydro Power Corporation. WESM purchases introduce more variety into the energy mix, particularly for geothermal and wind. Nevertheless, fossil fuels still dominate the WESM generation mix.

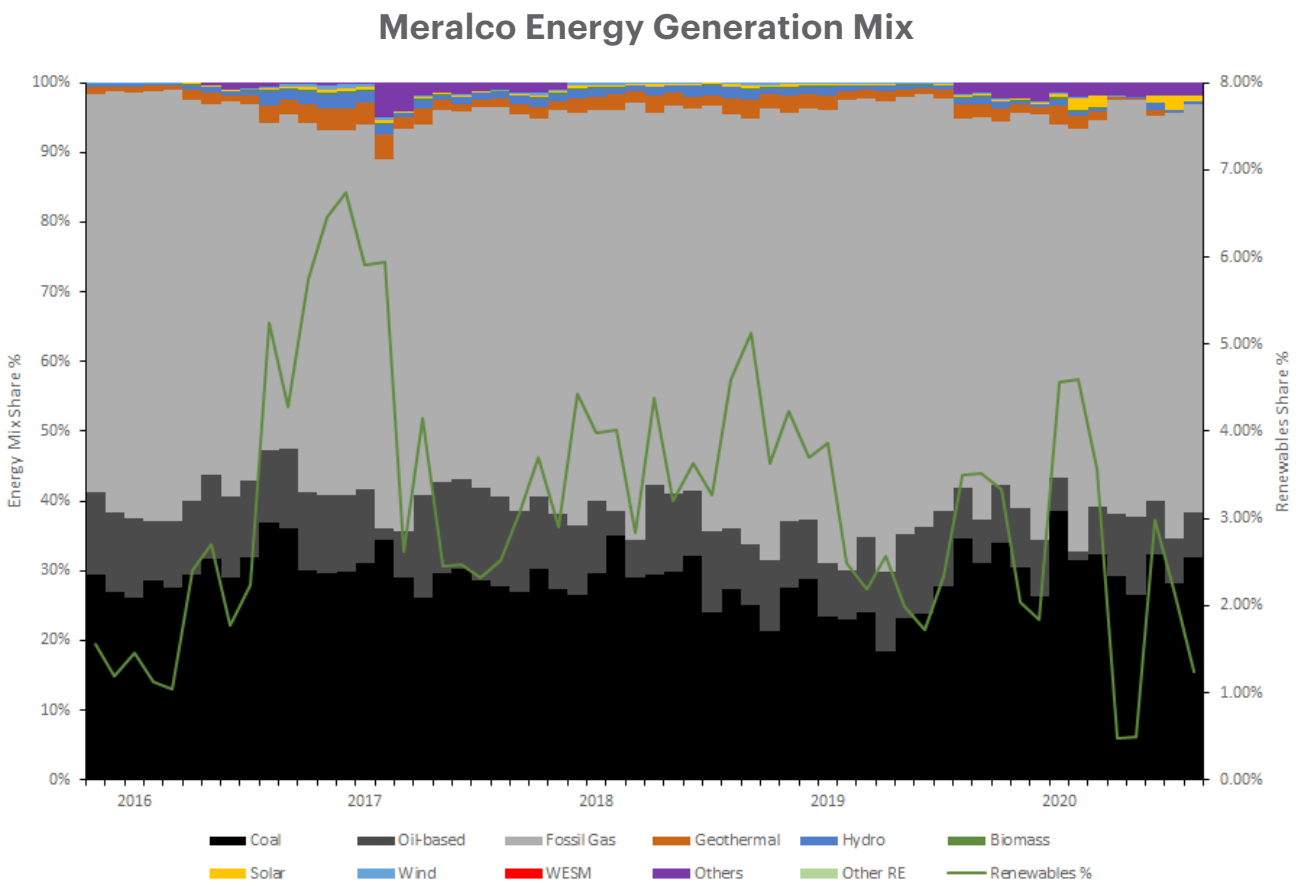


Figure 2. Approximate Meralco generation mix from November 2015 to August 2020, based on Meralco and WESM documents (Independent Electricity Market Operator of the Philippines, 2020b; Meralco, 2020b; Wholesale Electricity Spot Market, 2020). Meralco's WESM purchases are unbundled. Note that WESM data for 2019 and until June 2020 is approximate, as the relevant source documents present generation data on a seasonal or yearly, not monthly, basis.

Fossil fuels made up nearly 97% of the Meralco energy mix in 2019, including energy sourced through PSAs and WESM. Fossil gas took up 61% of the company's energy mix with 20354.47 GWh total electricity purchases. This was followed by coal purchases amounting to 8971.10 GWh, resulting in a 27% coal share. Renewable energy accounts for a meager 2.60% of the total share.

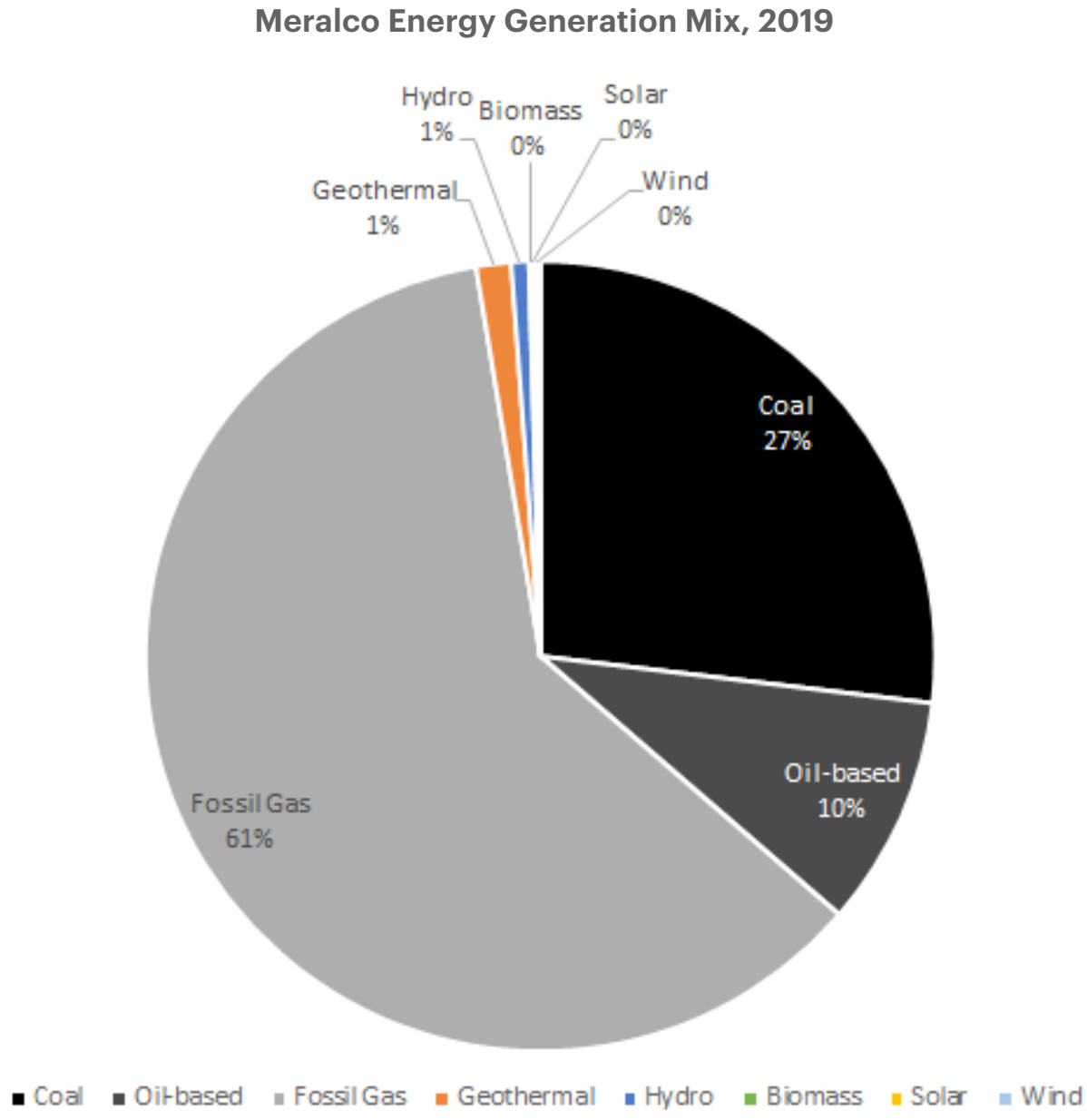


Figure 3. Approximate Meralco energy generation mix in 2019, based on purchased electricity (Independent Electricity Market Operator of the Philippines, 2020b; Meralco, 2020b; Wholesale Electricity Spot Market, 2020). The WESM generation mix was used to unbundle the WESM purchases made by Meralco.

An increasing trend can be seen in net metering purchases under Meralco. This trend demonstrates the growing number of end-users who prefer to generate their own power. Net metering is a non-fiscal incentive provided under the Renewable Energy Act that allows end-users to produce their own electricity through renewable energy and to pass the excess power to the distribution utility to earn "credits."

From 2018 to 2019, net metering purchases have grown at a compound annual growth rate (CAGR) of 71.15%. This corroborated the observations that recent growth in local renewable energy adoption came from the increased installation of solar PV rooftop systems (International Renewable Energy Agency, 2017). As of December 2019, Meralco had 2,502 customers participating in the net metering program with a total capacity of 16.92 MWp (Meralco, 2020a).

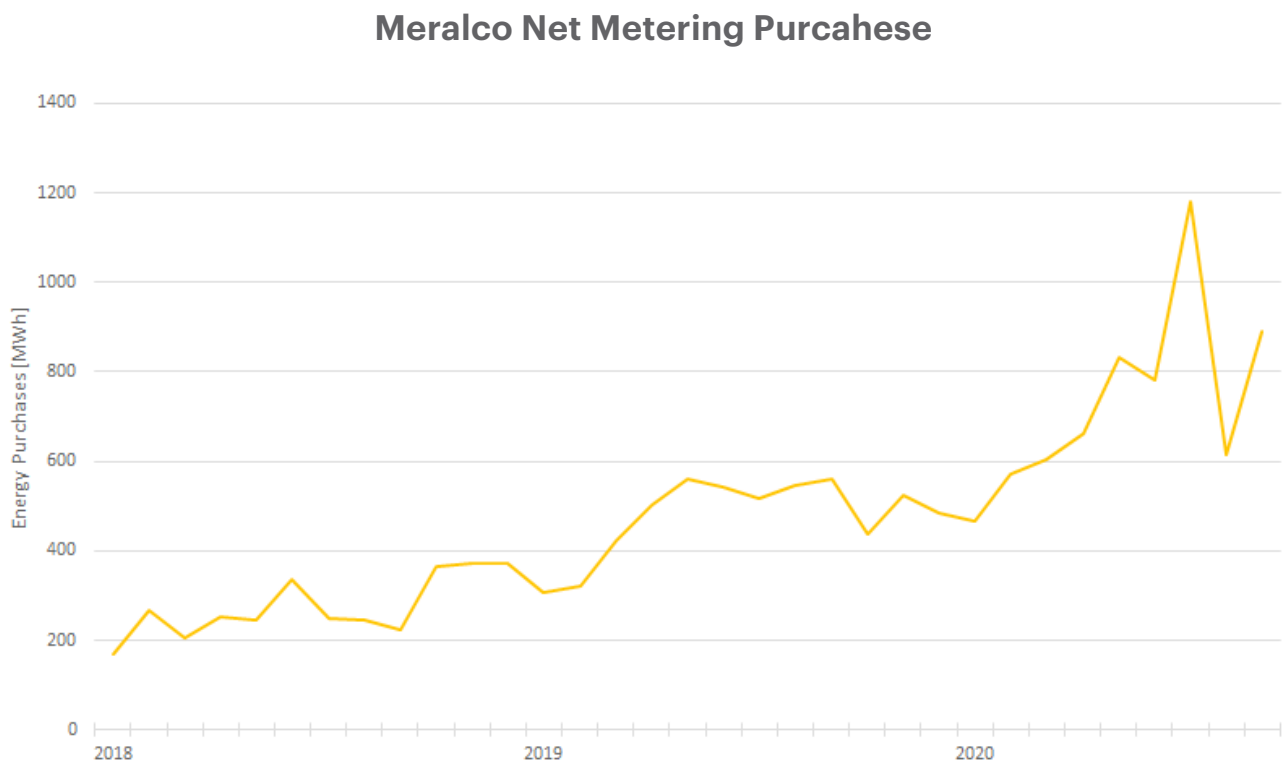


Figure 4. Meralco monthly net metering purchases from December 2017 to August 2020 (Meralco, 2020b).

B. Supply Profile

Meralco's monthly supply has an overall average of 2,604.14 GWh with a standard deviation of 147.53 GWh from 2010 to 2019. While monthly demand is relatively stable, June has the highest average supply of 2,864.26 GWh, higher than the average by 9.99%. Meanwhile, April has the lowest average supply of 2,405.01 GWh, a figure that is 7.65% lower than the average.

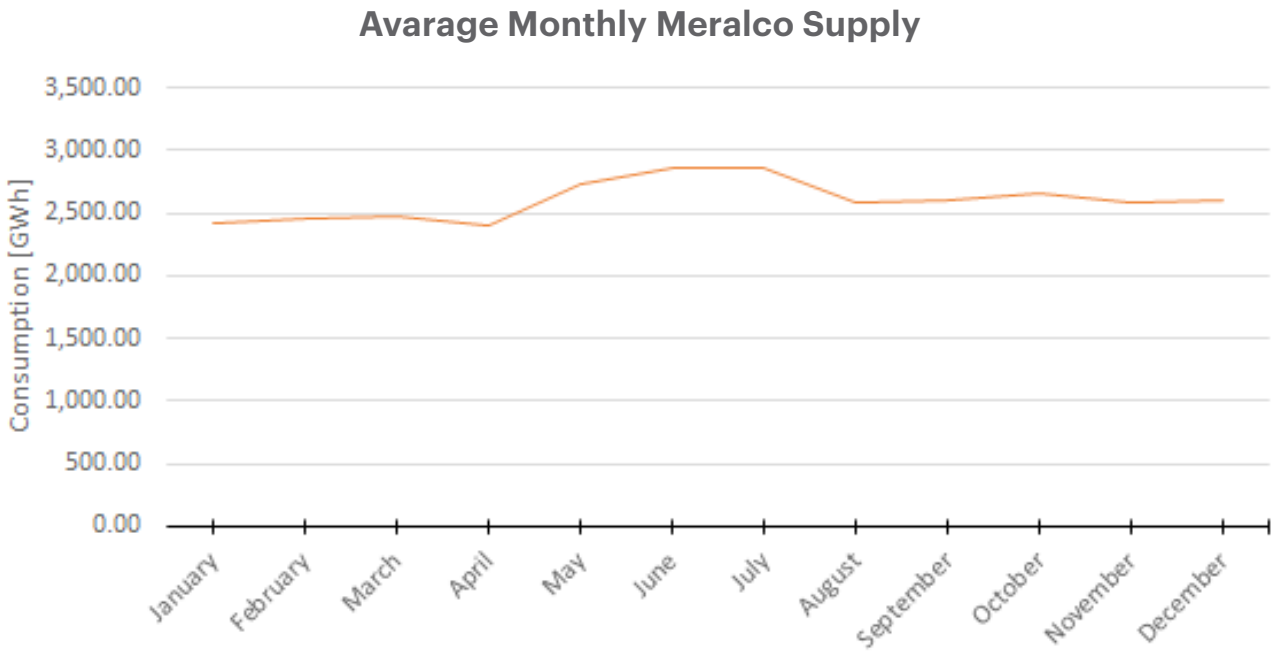


Figure 5. Average monthly Meralco consumption, based on purchased electricity. (Meralco, 2020b)

Meralco's Power Supply Procurement Plan also gives typical hourly load profiles for the customers of the DU (Meralco, 2020a). All typical loads show a general peak during noontime and early afternoons, given that higher ambient temperatures lead to increased cooling loads for operating electric fans and air conditioners. A slight drop occurs at 1:00 PM, possibly due to lunch breaks. Demand is lowest during early mornings.

Weekday loads show greater variability, as evidenced by higher standard deviation. The variability can be attributed to the typical workday schedule which assumes that more people will be simultaneously engaged in similar activities, such as turning on office lighting and cooling.

Meanwhile, weekend and holiday loads show a secondary peak from 6 PM to 12 NN. This increase in demand may be due to people going to malls, eating at restaurants, and other leisure activities.

Table B: Statistics for Meralco hourly load profiles. (Meralco, 2020a)

	Weekday Load [MW]	Weekend Load [MW]	Holiday Load [MW]
Average	6,491	6,109	5,609
Standard Deviation	821.73	571.72	463.48

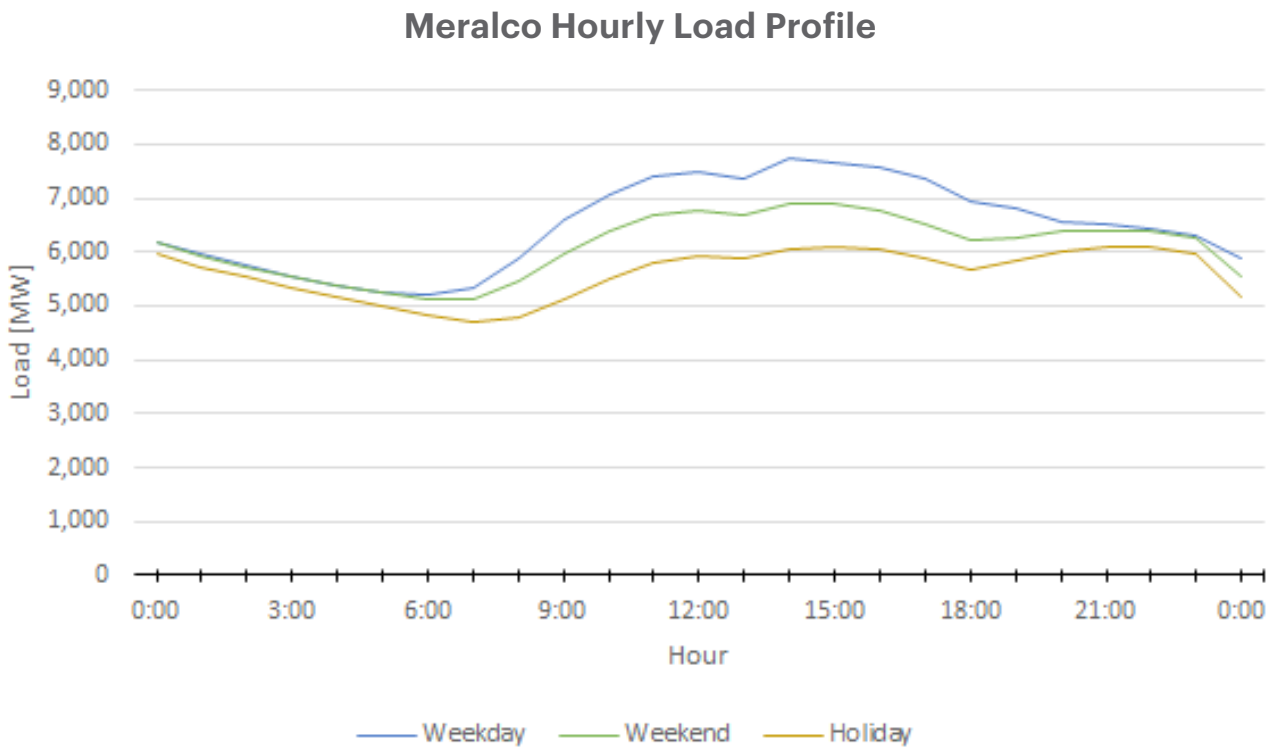


Figure 6. Typical Meralco hourly load profiles, based on purchased electricity. (Meralco, 2020a)

C. Price Trends

Meralco's electricity rates for residential customers have followed a slightly increasing trend from 2015 to 2020. Based on a linear fit, prices have risen each complete year by an average of 18.6 centavos per kWh. This trend agrees with the generation cost trend for the same period, which saw costs rise by an average of 11.97 centavos per kWh annually. Notably, the seasonal rise in Meralco rates for the first half of each year is not apparent in 2020, possibly due to lower electricity demands from the COVID-19 pandemic.

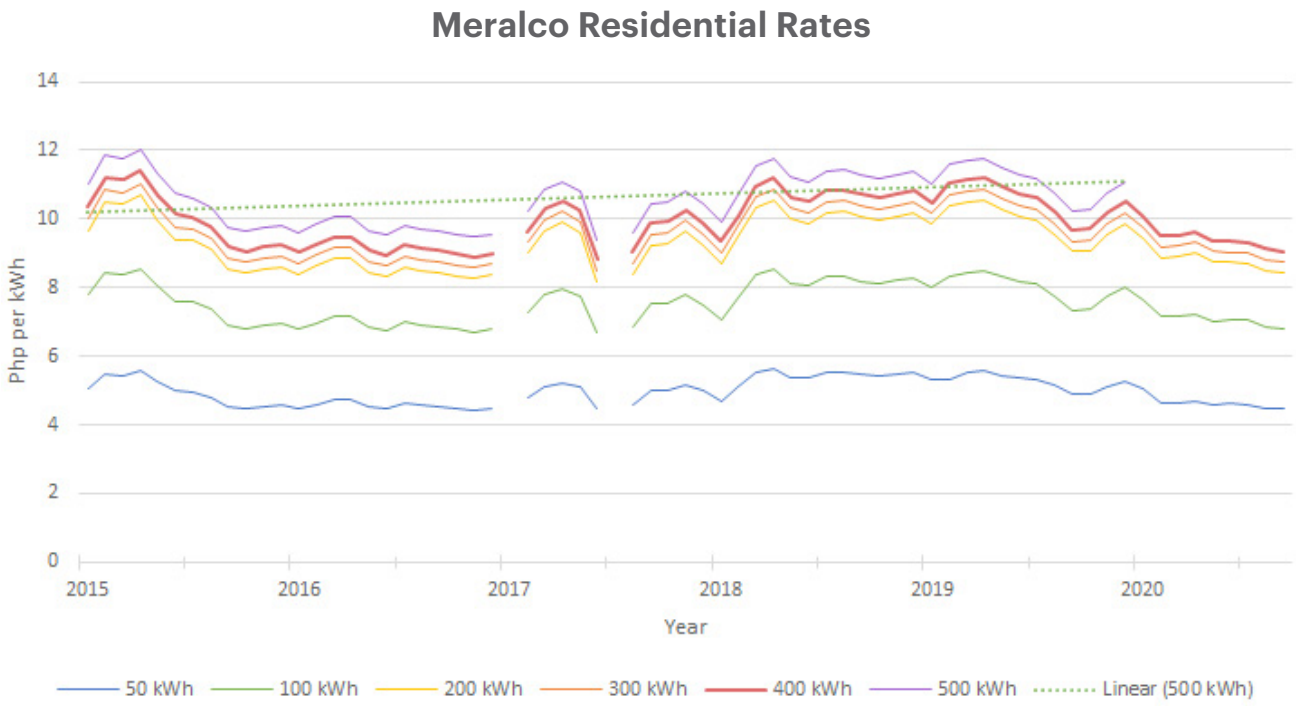


Figure 7. Historical Meralco rates for residential customers from January 2015 to September 2020. Nominal rates are used and values come from Meralco rates archives (Meralco, 2020b). Gaps indicate unavailable data.

In 2012, Meralco retail rates ranked 9th out of 44 global markets and were the 2nd highest in Asia (International Energy Consultants, 2012). In a similar study made by the same research group in 2018, Meralco rates ranked 24th out of 46 surveyed markets and 3rd in Asia (International Energy Consultants, 2018). Thus, while Meralco rates have improved relative to its international ranking and have not risen above inflation, they remain among the most expensive electricity prices in Asia.

Based on the generation costs for Meralco energy purchases, much of the historical variability comes from WESM purchases and the bundled category of other PSAs. The composition of the latter group varies for each report, but it generally contains small purchases from various conventional and renewable power plants.

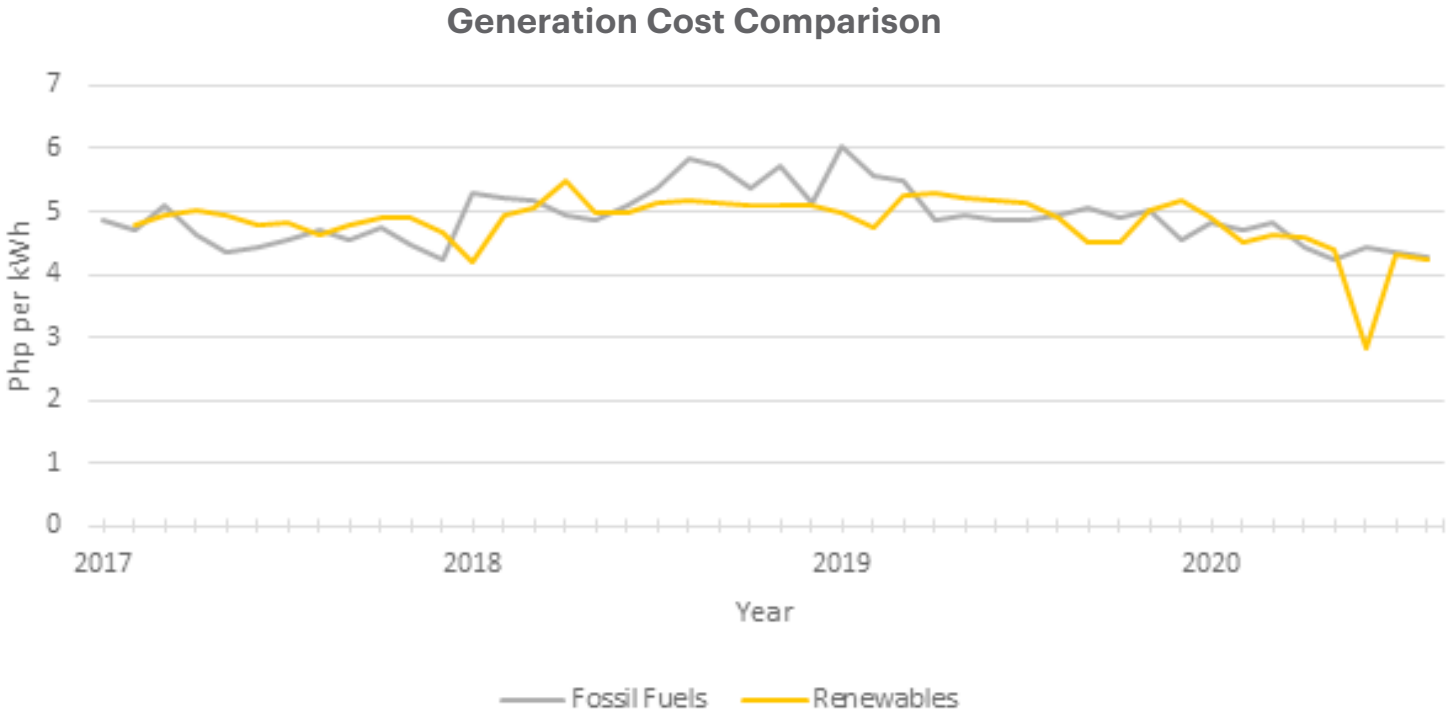


Figure 8. Meralco generation cost comparison for conventional vs renewable power purchases through PSAs, from January 2017 to August 2020. Values were nominal and taken from Meralco rates archives. (Meralco, 2020b).

Average generation costs from renewable power plants are comparable to those from conventional power plants. Purchased renewable energy has an average generation cost of 4.6087 Php/kWh, lower than the 4.6481 Php/kWh average for fossil fuel energy.

The proximity of the average costs for conventional and renewable energy was due to the low share of renewable energy in the Meralco energy mix. These resulted in higher variability for RE-powered generators than those from fossil fuel-powered generators. Nevertheless, this is evidence that renewable energy can already compete with fossil fuels as the least-cost source of electricity in the Philippines.

Globally, many renewable energy generation costs have plummeted for the last decade. The main drivers of this trend are technological improvements, economies of scale, more efficient supply chains, and increasing developer experience, according to a report by the International Renewable Energy Agency (IRENA) in 2019. In turn, falling costs are a major factor in increasing renewable energy installations, with 72% of all new capacity additions coming from renewables.

Based on the Levelized Cost of Energy (LCOE) analysis by Lazard, many RE technologies, such as utility-scale solar, wind, and geothermal, are already competitive with conventional sources of power, such as coal, gas, and nuclear (Lazard, 2019). LCOE is a ratio of net adjusted lifetime costs over lifetime electricity generation, and it is a standard metric used for comparing different power generation technologies.

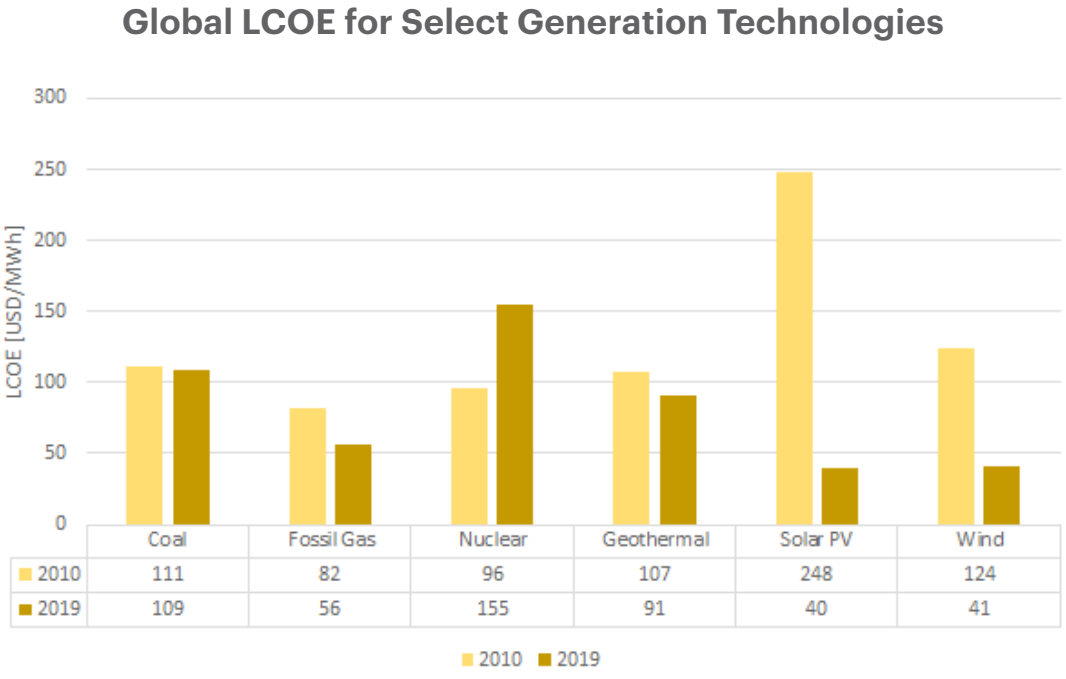


Figure 9. Global LCOE for select generation technologies (Lazard, 2019). LCOE values are adjusted for inflation (Aldersey-Williams & Rubert, 2019).

As of 2019, geothermal, solar PV, and wind technologies have lower LCOEs than coal technology. Solar PV and wind LCOEs are even cheaper than the LCOEs for fossil gas, which was the cheapest fossil fuel.

D. Demand Projections

Meralco forecasts that its electricity output will rise from 41,207 GWh in 2020 to 60,979 GWh in 2029, resulting in an Average Annual Growth Rate (AAGR) of 5.33% (Meralco, 2020a). This value may be conservative, given that the DOE projects electricity consumption to rise from 82,602 GWh in 2018 to 343,516 GWh in 2040, with an AAGR of 14.36% (DOE, 2020b).

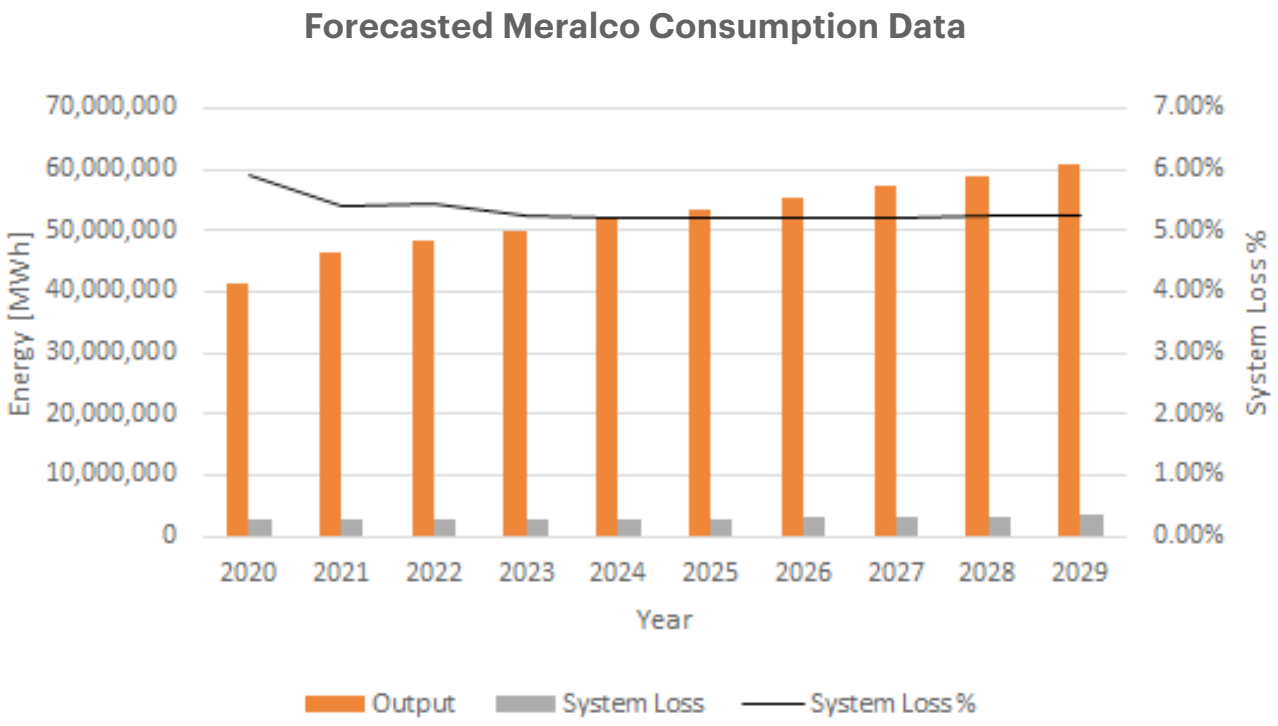


Figure 10. Forecasted electricity consumption for Meralco. (Meralco, 2020a)

Meralco will need to account for the additional 19,771 GWh demand in the next nine years. This offers an opportunity for Meralco to become a leader in climate action and environmental sustainability by opting for clean energy sources to break away from high dependence on fossil fuels. By shifting away from coal during this period, Meralco will help the country better fulfill its obligations under the Paris Agreement.

PART 2

Meralco's Prospects for Energy Transition

A. Energy Trilemma

The power development objectives of Meralco can be analyzed through three dimensions, as provided by the energy trilemma: accessibility, security, and sustainability (Austin, 2016).

Energy Equity: End-users in Meralco service areas must continue to gain better access and sufficient supply for their needs. Currently, Meralco service areas have an electrification rate of 99.6% as of 2019, with plans to achieve full electrification by the first half of 2021 (Meralco, 2020c). Hence, the discussion on energy access through Meralco should focus on affordability.

Imported fossil fuels are prone to price volatility and shocks. Instead of continuously passing through fuel costs and other expenses to consumers, Meralco should mandate generation companies to provide straight energy pricing. This way, the burden of fluctuation risks from fuel costs, currency exchange, and other factors will be shouldered by the power generators instead of the consumers.

In its report titled Preventing Another 20 Years of Coal, non-profit group Center for Energy, Ecology and Development (CEED) analyzed that by employing straight pricing, Meralco was able to secure a PSA with generation rate between 3.8913-4.1496 PhP/kWh San Miguel Corporation's Sual Coal Plant for 2019-2029 PSA. This is lower compared to its previous 2012-2019 PSA with the same plant with a generation rate as high as 7.4203 PhP/kW (De Torres, 2020).

Meralco's recent power tenders already mandated a straight energy price, with an escalation cap of up to 60% of the contract price at a rate not greater than 3.5% annually. However, Meralco's new auctioned 1800MW greenfield baseload power starting 2024 still allowed a pass-through of fuel costs to consumers. The winners of the new 1800MW supply contract are two subsidiary firms of San Miguel Corporation.

Meralco's electricity rates are one of the highest in Asia. With high electrification rates, equitable access to energy will only occur if every household can afford the electricity it needs. The prolonged economic lockdown due to the COVID-19 pandemic resulted in massive unemployment, and high electricity rates will compete with other basic commodities needed by households.

Energy Security: Several metrics can be used to quantify the energy stability of electricity services. For instance, the System Average Interruption Frequency Index (SAIFI) measures the frequency of interruptions. This metric can be analyzed in parallel with the System Average Interruption Duration Index (SAIDI), which measures the average duration of power interruptions.

As of 2019, Meralco has a SAIFI value of 1.77 sustained interruptions per customer and a SAIDI value of 188.36 minutes of supply interruption per customer (Meralco, 2020c). These values represent a 4.84%-SAIFI drop and a 2.23%-SAIDI rise relative to 2017 levels, implying that the frequency of disturbances has decreased but that the duration of supply interruptions has increased.

Meralco should fully commit to harnessing indigenous energy sources and stop locking itself in long-term agreements with power generators dependent on coal and other imported energy sources. Given the rapid cost decreases for solar and wind energy technologies, the development of smart grids would enable Meralco to maximize the benefits of variable renewables and improve its energy security.

Environmental Sustainability: The last component of the energy trilemma involves environmental sustainability. For businesses operating within the power industry, GHG emissions are the main determinant of environmental sustainability. Meralco uses the GHG Protocol international standard to assess its GHG emissions (Meralco, 2020c). Under this standard, emissions are classified based on source.

Scope 1 emissions:	direct GHG emissions from sources owned or controlled by Meralco
Scope 2 emissions:	GHG emissions from the electricity consumed by Meralco
Scope 3 emissions:	all indirect GHG emissions, including those coming from the generation of electricity that Meralco supplies to end-users

Meralco has been able to reduce its Scope 1 emissions due to better fuel efficiency and maintenance of substation equipment. This is reflected by an AAGR of -36.68% for Scope 1 emissions from 2017 to 2019

However, Scope 2 emissions have increased at an AAGR of 1.57% due to system loss increases; despite the lower percentage of electricity not utilized due to system losses, the absolute quantity of electricity losses has increased.

Scope 3 emissions form the bulk of Meralco GHG emissions. Most GHG emissions in this category come from energy sales. Scope 3 emissions have risen with an AAGR of 5.65%.

Meralco's continued high reliance on fossil fuels for its purchases contradicts the recommendations set under the IPCC Special Report, which called for urgent action to cut back on GHG emissions by shifting away from coal starting in 2020 (Parra et al., 2019). Transitioning to lower carbon energy sources should remove a significant portion of Meralco's environmental impact.

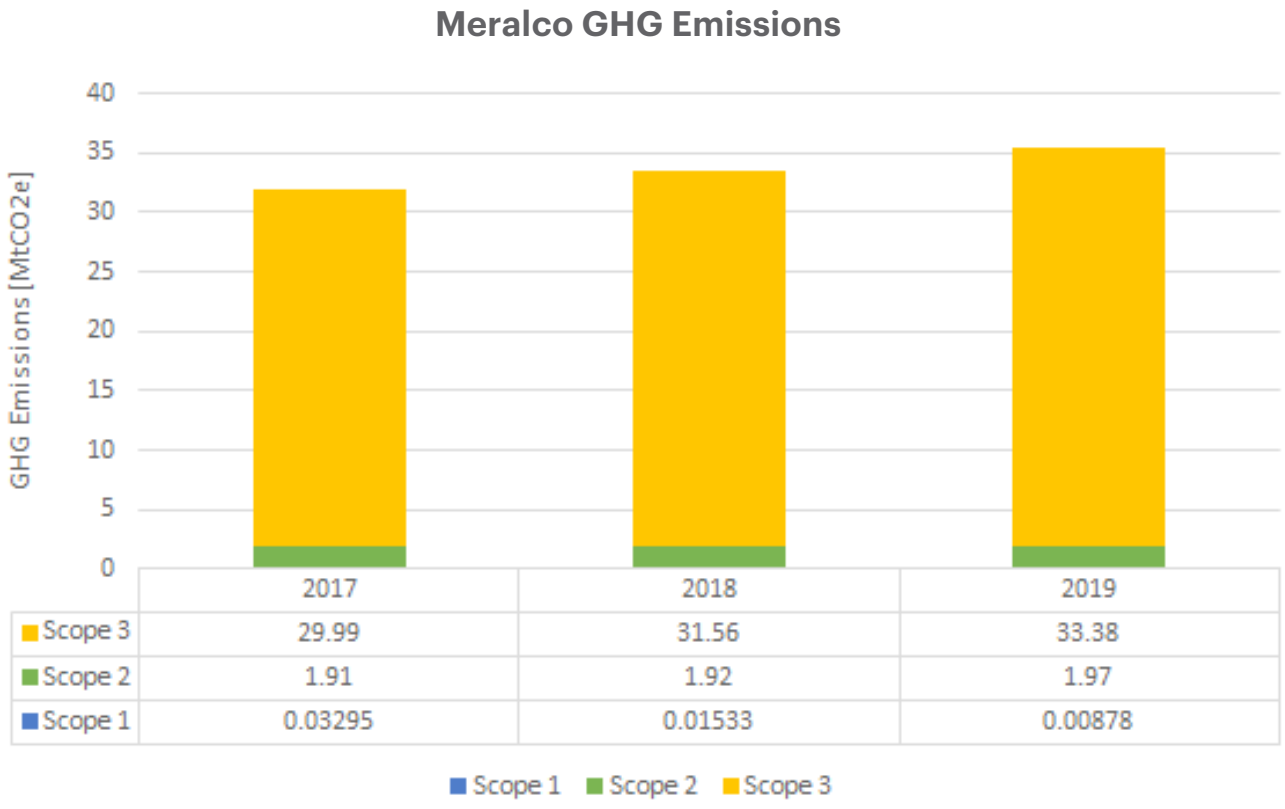


Figure 11. Meralco GHG emissions by category (Meralco, 2020c).

B. Meralco Energy Outlook

Meralco should focus on renewable energy to greatly reduce its GHG emissions. Unfortunately, Meralco continues to pursue a high-carbon energy mix as evident in its current and pending PSAs.

Table C: Current and Pending Meralco PSAs. (Meralco, 2020a).

PSA	Source	Contracted Capacity [MW]	Start Date	End Date
Quezon Power Phils Ltd. Co. (QPPL)	coal	460.00	May 2000	May 2025
First Gas Power Corp. (FGPC) – Sta. Rita	fossil gas	720.00	August 2000	August 2025
First Gas Power Corp. (FGPC) – Sta. Rita	fossil gas	359.75	August 2000	August 2025
FGP Corp. (FGP) – San Lorenzo	fossil gas	360.00	October 2002	October 2027
FGP Corp. (FGP) – San Lorenzo	fossil gas	197.95	October 2002	October 2027
Panay Energy Development Corp. (PEDC)	coal	70.00	January 2017	August 2020
First NatGas Power Corp. (FNPC) – San Gabriel	fossil gas	210.00	June 2018	February 2024
First NatGas Power Corp. (FNPC) – San Gabriel	fossil gas	218.00	June 2018	February 2024
Therma Mobile Inc. (TMO)	oil-based	165.00	April 2019	April 2020
Millennium Energy Inc. (MEI)	fossil gas	73.00	April 2019	April 2020
Solar Philippines Tarlac Corporation (Phase 1)	solar	75.00	July 2019	July 2039
San Buenaventura Power Ltd. Co. (SBPL)	coal	455.00	September 2019	September 2039
AC Energy Philippines, Inc. – SLTEC	coal	200.00	December 2019	December 2029
San Miguel Energy Corp. (SMEC) – Sual Plant	coal	330.00	December 2019	December 2029
South Premiere Power Corp. (SPPC) – Ilijan Plant	fossil gas (oil-based)*	670.00	December 2019	December 2029
Therma Luzon Inc. (TLI) – Pagbilao Plant	coal	250.00	December 2019	December 2020
AC Energy Philippines, Inc.	coal**	110.00	January 2020	December 2024
South Premiere Power Corp. (SPPC) – Ilijan Plant	fossil gas (oil-based)*	290.00	February 2020	December 2024
First Gen Hydro Power Corp. (FGHPC)	hydropower	100.00	June 2020	December 2024
Masinloc Power Partners Co. Ltd. (MPPCL)	coal	260.00	June 2020	June 2021
PowerSource First Bulacan Solar, Inc.	solar	50.00	December 2020	December 2040
Solar Philippines Tanauan Corporation	solar	50.00	December 2020	December 2040
Solar Philippines Tarlac Corporation (Phase 2)	solar	50.00	December 2020	December 2040

** Net metering customers are assumed to operate solar PV installations.*
** SPPC runs primarily on gas but can be powered with diesel. This analysis assumes gas power for SPPC.*
*** AC Energy manages coal-fired and solar power plants. Given that this PSA is supplying intermediate power, coal is prioritized over solar.*

Collectively, these PSAs represent 5398.70 MW of fossil fuel power, including 2135 MW of coal. Fossil fuel will remain dominant at 94% with renewable energy shares only at 6%. Renewable energy only comprises 325 MW of capacity and most were only sourced recently.

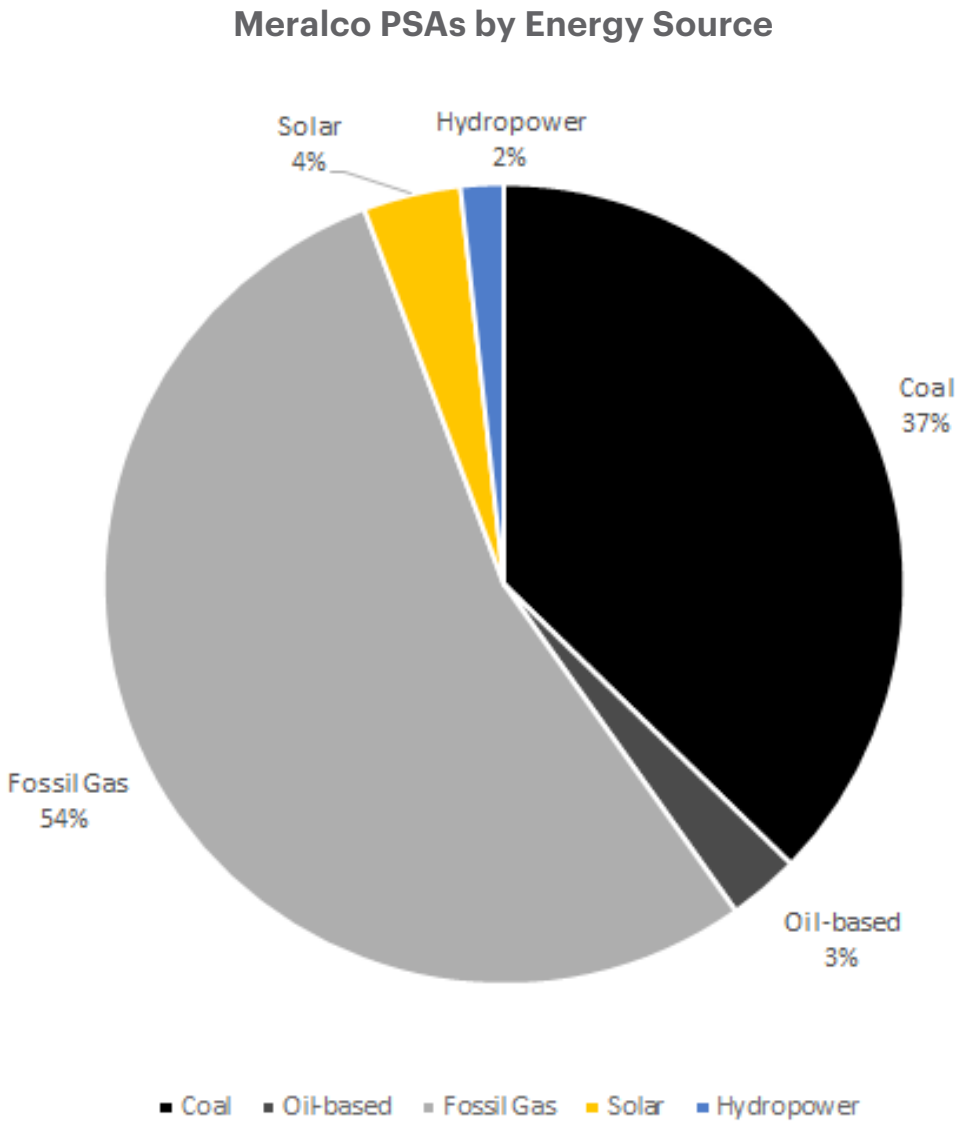


Figure 12. Meralco PSAs by energy source (Meralco, 2020a). Percentages are based on contracted capacity.

Meralco's most recent tender for a 1,800 MW greenfield baseload with a 20-year contract term mandates a minimum capacity offer of 150 MW per bidder. According to CEED, this cap limited the participation of renewable energy generators since only 12.5% of the proposed RE plants have an installed capacity of at least 150 MW. Meanwhile, 67% of the proposed coal and fossil-fuel plants have more than 150 MW installed capacity (De Torres, 2020).

C. Power Generation

Meralco's power generation arm, Meralco PowerGen Corporation, contributes directly to the national energy mix through the power plants that it operates. The MGen energy mix influences how Meralco would achieve its power development and sustainability objectives. Meralco, mainly through MGen, aims to build a portfolio of 3,000 MW in capacity for the next five years (Lectura, 2020a), including 1,000 MW of renewable energy capacity (Meralco PowerGen Corporation, 2019a).

The power generation subsidiary is currently involved in one operational project, the San Buenaventura Power Ltd. Co. (SBPL) power plant (Meralco PowerGen Corporation, 2019e). SBPL is a 455-MW coal-fired power plant that uses supercritical boiler technology (San Buenaventura Power Ltd. Co., 2016).

MGen also has three coal projects in development. Atimonan One Energy, Inc. (A1E) will be a 2x600 MW coal-fired power plant in Atimonan, Quezon that will employ "ultra-supercritical" technology. However, stakeholders such as the Power for People Coalition and the Diocese of Lucena are calling for the cancellation of the A1E project and other coal projects in favor of cleaner and more affordable energy sources (Cordero, 2020).

Another upcoming MGen coal project involves Redondo Peninsula Energy, Inc. (RPE) in Barangay Cawag, Subic (Meralco PowerGen Corporation, 2019d). The 2x300 MW coal-fired power plant has been beset by construction and PSA issues (Flores, 2019). A Writ of Kalikasan case was filed against the project in 2013 on the grounds of issuance of Environmental Compliance Certificate (ECC) without prior from the approval from LGUs and other stakeholders; the petition was denied in 2015 (Requejo, 2015).

The third MGen project in development is the St. Raphael Power Generation, Inc. (SRPGC) coal-fired power plant in Calaca, Batangas (Meralco PowerGen Corporation, 2019f). The plant will provide 2x350 MW of capacity, with commercial operations pegged to commence in 2025 (Department of Energy, 2020c).

Notably, all three MGen coal projects in development were involved in the 90 PSAs that were required by the Supreme Court to undergo the competitive selection process, given that the coal contracts were allegedly penned without proper bidding (Navallo, 2019).

In addition, Meralco also invests in Global Business Power Corporation (GBPC) with a 14% equity interest (Meralco PowerGen Corporation, 2019c). GBPC has an energy portfolio consisting of 939 MW coal capacity and 152 MW oil-based capacity (Global Business Power Corporation, 2020).

Collectively, MGen projects will provide 2,955 MW of coal capacity, a value nearly encompassing its capacity target for the next five years. If the GBCP investment is included, MGen's upcoming coal portfolio rises to 3,894 MW.

Meralco also seeks to expand its ventures into renewable energy through MGen Renewable Energy, Inc., or MGREEN. The MGen subsidiary aims to build up to establish 1000 MW of renewable energy capacity for the next 5-7 years. The company also started delving into energy storage. It led its pilot project in battery storage through a 2 MW lithium-based BESS in San Rafael, Bulacan that was inaugurated in 2019 (Meralco, 2020c).

MSpectrum, Inc. is Meralco's unit that provides solar PV systems for residential, commercial, and industrial customers. It also provides microgrid technology for off-grid customers, with plans to delve into wind and battery energy storage systems.

Meralco looks to diversify its energy portfolio by venturing into renewable energy and energy storage. However, Meralco's continuing moves to build more coal-fired power plants seems to be an indication that the company does not see any urgency in investing more aggressively in renewables as a way of helping keep the country's commitments under the Paris Agreement.

D. COVID-19 Impacts on Electricity Sector

Electricity demand dropped quickly during the first month of the Enhanced Community Quarantine (ECQ), which was first implemented in mid-March 2020. The average demand drop for the Luzon-Visayas grid was at 2,350 MW, representing a 19.8% drop compared to pre-ECQ levels (Independent Electricity Market Operator of the Philippines, 2020b).

The drop in electricity supply was less pronounced. Most of the supply reductions came from coal-fired power plants that were essentially used as marginal plants (Independent Electricity Market Operator of the Philippines, 2020b), running counter to their traditional role as baseload power sources. Generally, renewables have priority dispatch while fossil gas plants are mostly under take-or-pay contracts, limiting their potential as flexible power sources (Ravago & Roumasset, 2020). Hence, coal power plants took most of the burden of adjusting to lower demand.

Power supply from coal dropped by 1,569 MW during the ECQ period, representing nearly 88% of the overall WESM supply reduction. This caused the share of coal in the WESM energy mix to drop from 56% to 50%. However, the energy mix during the early months of the COVID pandemic remained dominated by coal and other fossil fuels.

Table D: 2020 WESM Generation Energy Mix. (Independent Electricity Market Operator of the Philippines, 2020c).

Source	Hourly Average Supply [MW]		
	Pre-ECQ	ECQ	Change
Coal	5,870	4,301	-1,569
Oil-based	130	95	-35
Fossil gas	2,379	2,348	-31
Geothermal	1,180	1,146	-34
Hydropower	396	298	-98
Biomass	154	165	11
Solar	164	162	-2
Wind	122	105	-17

** Pre-ECQ period covers February 26 to March 15 while assessed ECQ period covers March 16 to May 15.*

Changes in consumption patterns, such as the drop in electricity demand, naturally increase the use of mid-merit and other flexible generators at the expense of inflexible baseload plants (Ahmed, 2020a). This phenomenon highlights the advantages of flexible generation in ensuring power stability during abrupt changes in demand.

The impact of COVID-19 on energy supply for Meralco was less apparent, with 2020 data showing similar purchase patterns relative to the previous year. Generation charges and residential electricity prices continued their gradual drop during 2020. However, Meralco did experience a nearly 40% drop in peak demand to 4,516 MW in March, which was followed by another drop to 4,289 MW in April (Calonzo, 2020).

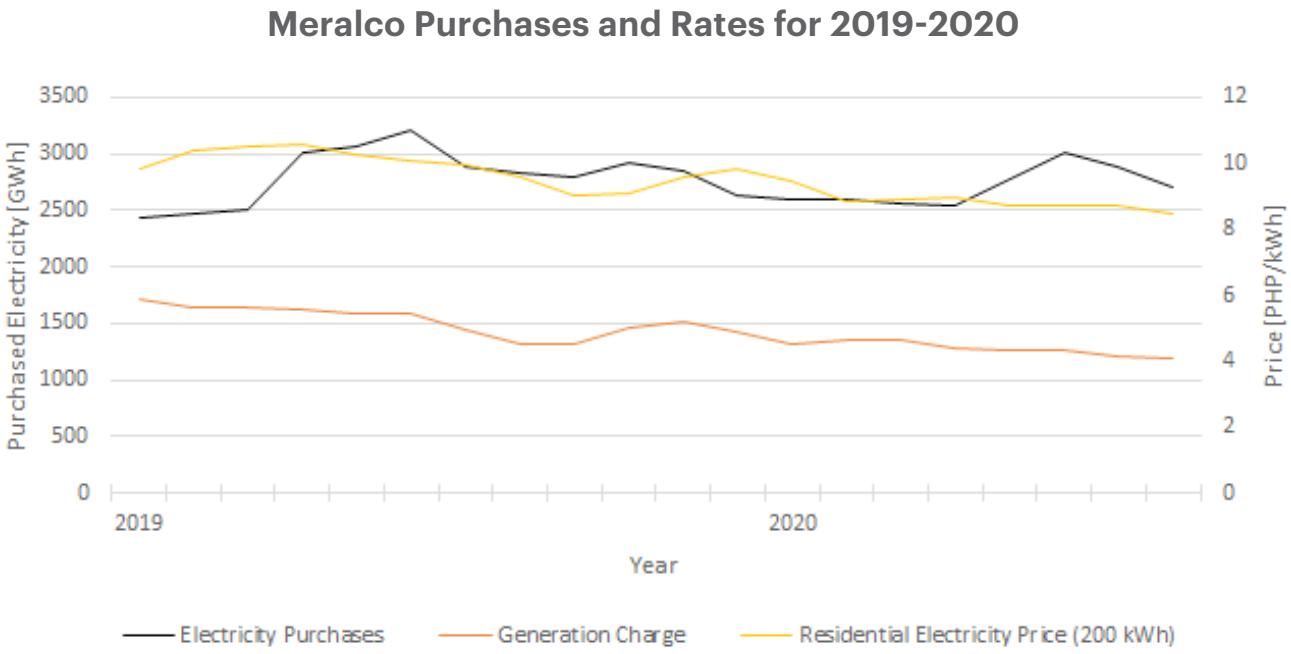


Figure 13. Meralco purchases and rates from January 2019 to August 2020. (Meralco, 2020b).

Meralco energy purchases during the ECQ period describe a different situation, given the take-or-pay provisions and minimum purchases for PSAs. WESM purchases were thus impacted the most by the decrease in energy demand.

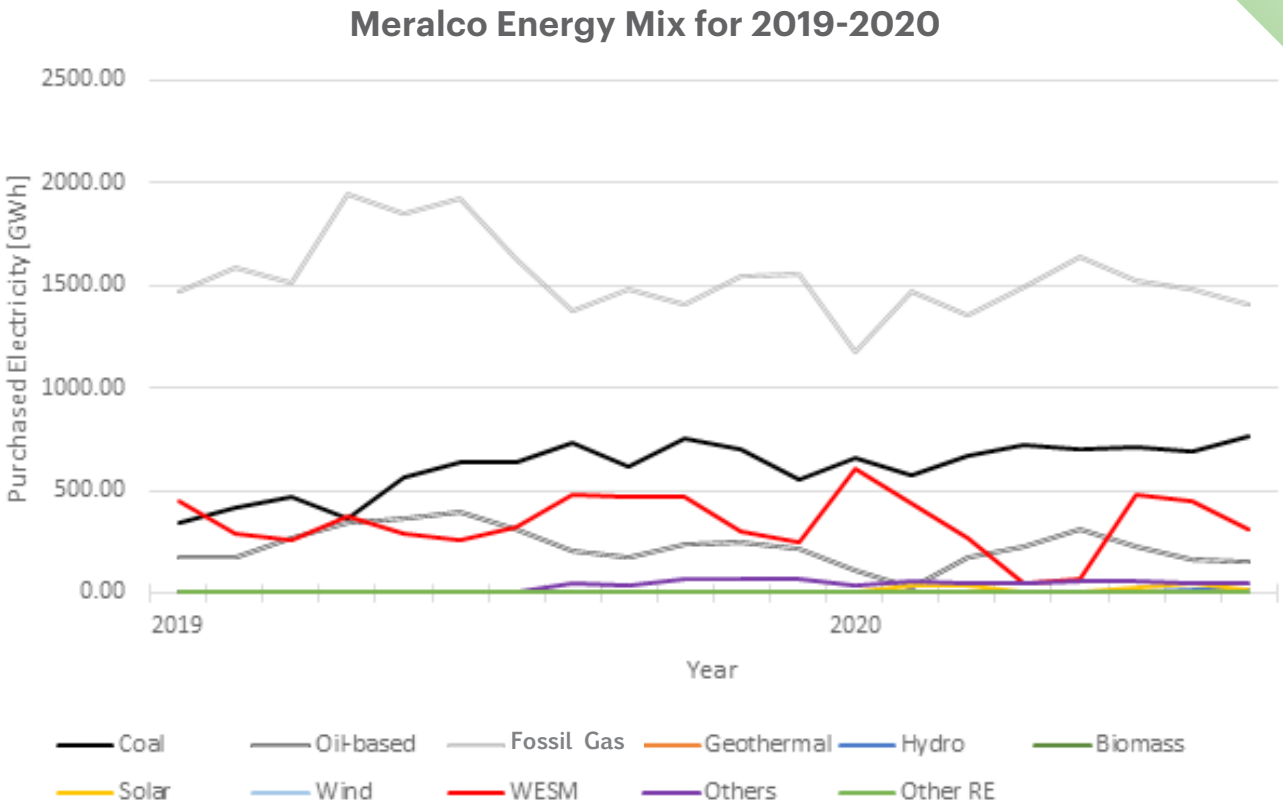


Figure 14. Meralco energy purchases for January 2019 to August 2020. (Meralco, 2020b)

Coal plants have limited flexibility in ramping down production, as operation outside design conditions can increase equipment wear. Their inherent inflexibility introduces operational inefficiencies that translate to more costs, which are either shouldered by the generation company or eventually passed to end-users through take-or-pay provisions. Additionally, fuel supply shocks and supply chain interruptions can interrupt normal operations.

In the case of Meralco, reliance on inflexible power sources makes it harder for the DU to respond to sudden changes in demand. To keep electricity rates from rising, Meralco had to invoke force majeure claims to avoid mandatory payments for minimum contracted electricity volumes (Domingo, 2020b). Otherwise, rates would have risen by 5-15% (Ahmed, Dalusung, Logarta, & Maniego, 2020). Indeed, force majeure claims reduced rates from April to September 2020 by PHP 0.14 per kWh and has so far led to total savings of PHP 2.4B (Lectura, 2020b).

The COVID-19 pandemic underscores the importance of flexibility in the power sector. By decreasing purchases from inflexible power producers and incorporating provisions in PSAs to allow for greater flexibility, Meralco can reduce the need for more active interventions such as negotiating force majeure claims with generation companies. With an increased share of renewable energy plants, Meralco will have a more robust electricity portfolio and reduce its exposure to supply volatility.

PART 3

Generation Cost Projections by 2025 and 2030

Approximate generation projections can be generated based on current and forecasted Meralco energy statistics. This paper considers three projected scenarios by 2025 and 2030:

Table E: 2025 and 2030 Scenarios for Generation Cost Projections.

Scenario	Description
Scenario 1: Current Energy Mix (Base scenario)	The 2019 generation energy mix remains constant until 2025, but generation costs by energy source change based on recent global LCOE trends.
Scenario 2: Proposed Energy Mix	All current PSAs are renewed until 2025 and all proposed PSAs are approved. Additional demand is supplied by PSAs yet to be proposed. Generation costs by energy source change based on recent global LCOE trends.
Scenario 3: 100% of new energy contracts are sourced from RE	Only currently approved PSAs still active by 2025 are retained. Additional demand is met by renewable energy sources with generation costs pegged at projected PSA prices. The 2025 energy mix is interpolated from the 50% RE case by 2030 as presented in the USAID-DOE study (Barrows et al., 2018). Generation costs by energy source change based on recent global LCOE trends.

In particular, Scenario 3 assumes that fossil fuel share will drop at 46.82% while variable renewable energy sources, such as wind and solar, will take up 25.33% of the energy mix by 2025. The scenario also further calculated that fossil fuel share will continue to decrease to 41.32% by 2030, a situation that is technically feasible given the implementation of planned transmission and distribution system upgrades for the next few years (Barrows et al., 2018). The allocated share for variable renewables is split in a 6:4 ratio between solar and wind as used in the USAID-DOE study, while the allocation for flexible renewables is divided equally among geothermal, hydropower, and biomass resources for simplicity.

The average CAGR values from the IRENA and Lazard studies were used to project recent PSA and WESM prices up to 2025. Baseline generation cost prices from PSAs were obtained from Meralco generation documents (Meralco, 2020b).

As Meralco PSAs in 2019 did not cover geothermal and biomass power plants, WESM generation prices were used to calculate approximate prices for hypothetical PSAs utilizing geothermal and biomass. This method accounts for the tendency of PSAs to reduce generation costs relative to WESM purchases.

The ratios among the average WESM prices and the average PSA prices were used to calculate the hypothetical PSA prices for geothermal, biomass, and wind. As an example, suppose that the average WESM prices for hydropower and geothermal were at PHP 5.00 per kWh and PHP 6.00 per kWh, respectively. If the average Meralco PSA price for hydropower was at PHP 4.00 per kWh, then the hypothetical PSA price for geothermal would be four-fifths of 6.00, or 4.80, pesos per kWh.

Given the availability of several energy sources for both WESM and PSA purchases, ratios were also taken with other energy types represented by MERALCO PSAs, such as coal, fossil gas, diesel, and solar. Due to their use as multiplicative factors, these ratios were averaged geometrically to obtain the overall representative factor, which was used to obtain the hypothetical PSA price.

Table F: PSA Price Forecasts for 2025.

Type	2019 Generation Cost [PHP/kWh]	CAGR	2025 Generation Cost [PHP/kWh]	2030 Generation Cost [PHP/kWh]
Coal	4.887389008	-0.20%	4.828503907*	4.77997531*
Oil-based	6.341724563	-4.15%	4.918018507††	3.979017152††
Fossil gas	4.995370193	-4.15%	3.873918335*	3.134267893*
Geothermal	4.625624308†	1.37%	5.019904113***	5.374024506***
Hydropower	2.852568533	2.69%	3.345801538**	3.821380216**
Biomass	4.773228191†	-1.56%	4.344759676**	4.017233364**
Solar	5.20803559	-17.85%	1.600529452***	0.598763211***
Wind	4.816526626	-8.40%	2.844499623***	1.833999205***

† Hypothetical PSA price was calculated based on the relative cost ratios of various energy sources represented by WESM generation plants, as described above.
†† Due to the unavailability of cost trends, the AAGR for oil-based plants was pegged on the AAGR for fossil gas plants, given that both use petroleum products.
** AAGR obtained from Lazard LCOE study (Lazard, 2019). The assumed compounded rate for coal does not include any anticipated external levies such as carbon tax.*
*** AAGR obtained from IRENA LCOE study (International Renewable Energy Agency, 2019).*
**** AAGR obtained by averaging values from the Lazard and IRENA studies (International Renewable Energy Agency, 2019; Lazard, 2019).*

As of writing, the available data only contained WESM prices for each generator type from August 5 to November 4, 2020. These prices were scaled to obtain an approximate breakdown of WESM prices by energy source for the 2019 reference year, given that the average WESM price is known for that year.

Based on the scenario results, Scenario 1, representing the status quo, would result in a generation cost of 4.4807 PHP per kWh by 2025. Scenario 2, which accounts for proposed Meralco PSAs, would lead to 4.3080 PHP per kWh. This value represents a 3.85% drop versus the base case.

Meanwhile, Scenario 3 would lead to a generation cost of 3.6928 PHP per kWh, which is 17.58% lower than the base case. The main driver of the cost reduction is the higher share of solar and wind energy in the mix, given that these two generation technologies experienced the largest drop in costs for the last decade (International Renewable Energy Agency, 2019; Lazard, 2019).

The cost decline for Scenario 3 is also visible in 2030. By then, generation cost would be 3.9275 PHP per kWh under Scenario 1, while Scenario 2 would lead to 3.9854 PHP per kWh, a 1.47% increase from the base case. Scenario 3 would still have the cheapest generation cost at 3.5858 PHP per kWh, which is 8.70% lower than the base case.

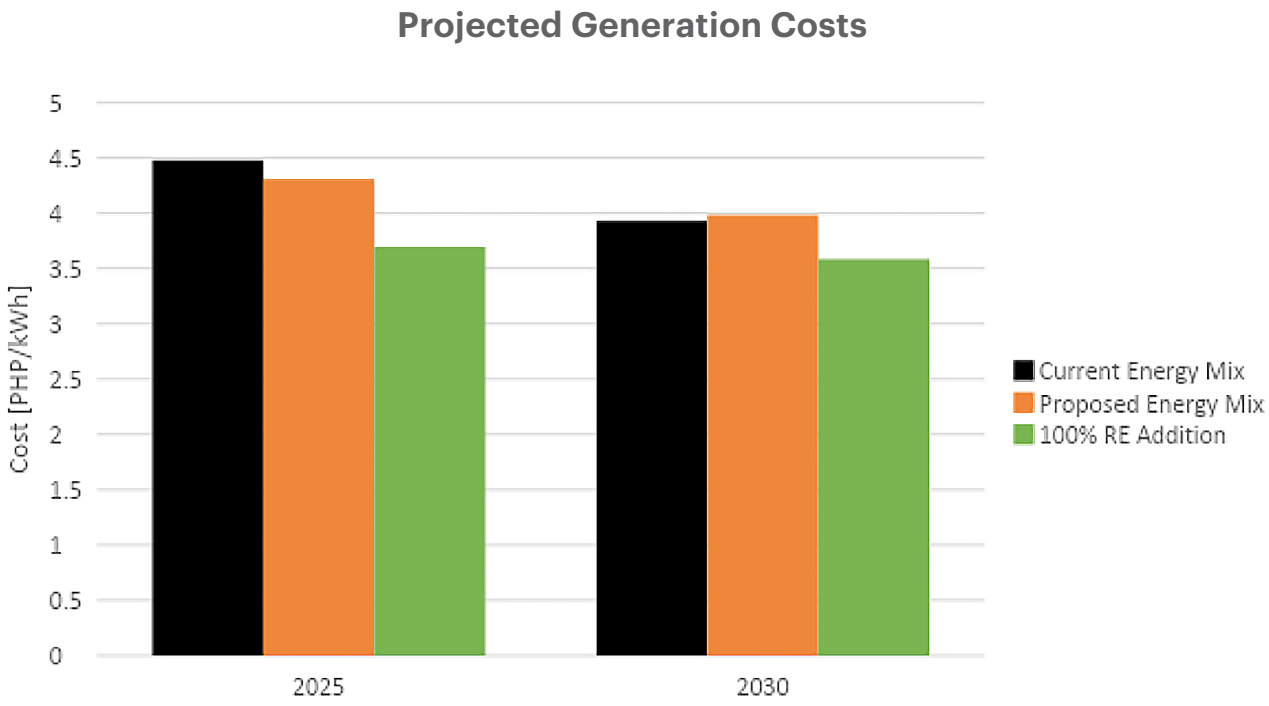


Figure 15. Approximate projected Meralco generation costs for 2025 and 2030. As the LCOE values account for inflation, the projected values are approximately based on the 2019 value of the Philippine peso.

The results of the projections show that increasing the share of renewable energy, particularly solar and wind, will lead to substantial reductions in generation costs.

The USAID-DOE report only considers power sector development plans in mid-2016 and does not account for increases in storage capacity beyond 2014 (Barrows et al., 2018). Hence, greater utilization of flexible generators, as well as additional improvements in energy storage and distribution infrastructure, can further drive down generation costs.

Under Scenario 1, 97.38% of the Meralco electricity supply will be sourced from fossil fuels. Scenario 2 improves the energy mix by reducing the share of fossil fuels to 91.15%. However, some fossil gas and nearly all oil-based generation are displaced by coal. Scenario 3 further reduces fossil fuel shares to 46.82%, with wind and solar taking up 25.33% of the energy mix, by 2025.

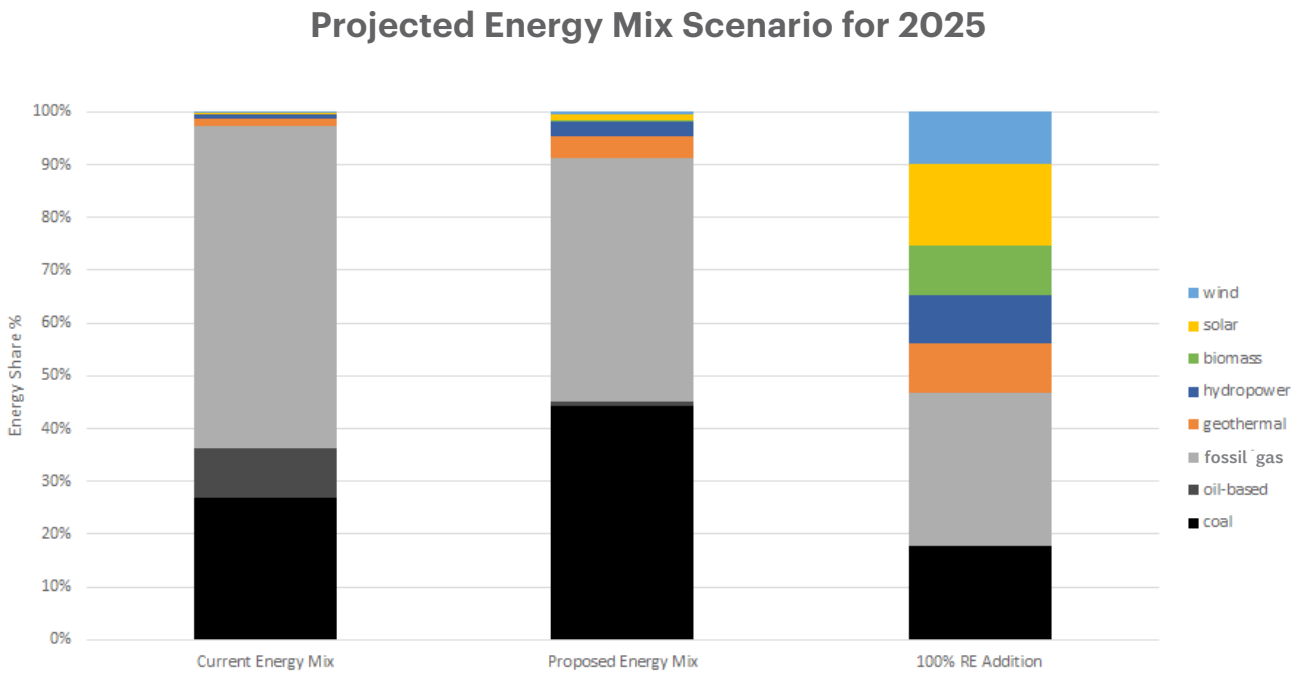


Figure 16. Projected Meralco generation mix (in M based on 2025 scenarios.

PART 4

MERALCO's Transition to Renewable Energy

Further investments in variable renewable energy technologies such as solar and wind are paramount for Meralco to continue its pursuit of least-cost electricity, given that solar and wind LCOEs dropped with CAGRs of -17.85% and -8.40%, respectively. Based on these trends, costs for solar power will halve every three years while wind power costs will halve every seven years.

However, Meralco should also balance increased procurements of solar and wind power with flexible renewable energy technologies to maintain energy diversity. A varied energy mix based on indigenous renewables will shield the DU and its end-users from fuel price fluctuations and other international risks. At the same time, additional storage capacity and improvements in the distribution system will allow Meralco to further increase its utilization of solar and wind power, leading to even more cost reductions.

Meralco will require ample financial resources for transitioning into renewables. The scale of the investments required is underscored by the size of green finance in the Philippines. So far, domestic banks have issued nearly USD 1.8B of green bonds (Lucas, 2020) and green investments this year by the Bangko Sentral ng Pilipinas have increased to USD 200 million (Villanueva, 2020). However, these figures are dwarfed by the projected cost of stranded coal asset risks, pegged at USD 10B (Institute for Climate and Sustainable Cities, 2020). To hedge itself against stranded asset risks, Meralco should invest now in spearheading the Philippine energy transition towards renewable energy.

A. Trailblazing the Philippine Energy Transition

The rise of renewable energy comes from technological innovations that are dramatically reducing the cost of electricity from solar and wind. At the same time, the increasing urgency of the climate crisis is pushing power industry stakeholders at all levels, from electricity end-users to policymakers, to decarbonize. Technological change and increased preference for clean energy are driving the transition of the Philippine power sector (Ahmed, 2019).

As the largest private electric distribution utility company, Meralco is a significant player in the Philippine power sector. Its actions will impact significant portions of society and its decisions will influence how other power companies will respond to the changing power market. By embracing clean and affordable power, Meralco can become a local leader for the Philippines' just transition towards renewable energy.

Renewable energy is vital for achieving the energy trilemma of secure, accessible, and sustainable electricity. With its declared sustainability framework, Meralco is poised to lead the way for other companies towards achieving their own power development objectives.

Meralco already formally recognizes the importance of integrating sustainability into their business models, as seen by the release of their first-ever sustainability report in 2020. The next step is to translate these objectives into behavioral shifts and continuous action.

B. Securing Energy Supply

A relevant risk when it comes to energy security comes from the importation of fossil fuels. With the country's energy self-sufficiency at 46.85% as of 2019, nearly half of our energy sources come from overseas.

Continued high reliance on imported fuels introduces complexities that may compromise energy security. Any international event that influences the supply and pricing of coal and petroleum products can lead to price fluctuations. Even currency fluctuations can potentially lead to unfavorable electricity prices.

In fact, the tendency of fossil fuel prices to fluctuate is readily seen in WESM plants. Based on electricity generation prices, dividing the standard deviation with the average price yields the relative standard deviation (RSD), a standardized measurement of variability suitable for assessing energy types with varying average prices.

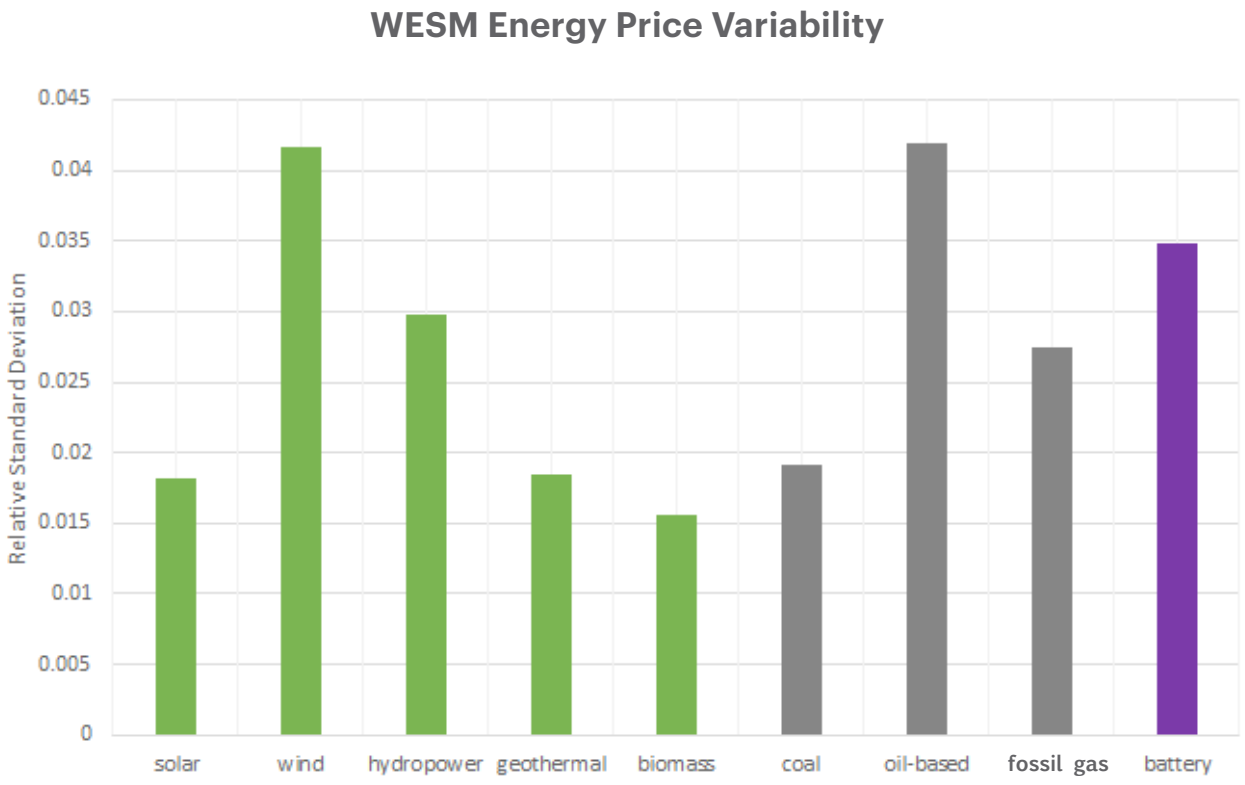


Figure 17. Price variability by energy source, based on final prices for WESM generators from August 5 to November 4, 2020. (Independent Electricity Market Operator of the Philippines, 2020a).

Several forms of renewable energy have lower RSDs in price than coal, which has an RSD of 1.92%. Solar, geothermal, and biomass have price RSDs of 1.82%, 1.85%, and 1.57%, respectively. Note that the high price variability of wind and battery in Figure 29 was a result of the low number of WESM plants utilizing these energy sources; WESM has 7 wind plants and 2 battery facilities. Meanwhile, the significant price variability of hydropower may come from the contribution of mini hydropower plants into the WESM energy mix.

The Department of Energy must stop the practice of DUs to allow pass-through provisions within their PSAs. The implementation of mandatory straight energy pricing represents a step towards greater energy security by ensuring that players in the distribution sector bear the risks and rewards of their power supply decisions.

Another risk to energy security comes from abrupt changes in energy supply and demand, such as the drop in demand during the ECQ period. The drawbacks of heavy reliance on inflexible generators became apparent from the drop in coal utilization, as coal plants were forced to operate as marginal plants (Independent Electricity Market Operator of the Philippines, 2020b). Operating inflexible generators below their optimal operating points increases equipment wear and reduces efficiency, ultimately resulting in higher costs.

As an example of the inflexibility of coal power, the Luzon grid was placed under yellow alert in June, signifying limitations in electricity supply. Most outages came from 2,243 MW worth of coal, dwarfing the contributions of oil-based capacity (150 MW) and geothermal (115 MW) to the yellow alert (Ahmed, 2020a). In fact, the contribution of coal plants to power grid inflexibility is one factor behind the public pronouncement of DOE Secretary Alfonso G. Cusi to impose a moratorium on new coal power plants (DOE, 2020d)

Meralco might encounter another form of inflexibility due to the expected depletion of Malampaya in 2027 (Cervantes, 2020). Take-or-pay provisions severely limit the potential of fossil gas to act as flexible power sources. Future procurement of coal power can also threaten the potential flexibility already inherent in the Meralco energy mix.

To improve the flexibility of its grid, Meralco should divest from coal and other fossil fuels. It should also review its PSAs to alter provisions that would otherwise curtail the flexibility of corresponding generators.

Meralco should continue its initiatives in establishing smart grids and energy storage systems, preparing it to thrive in a future power sector dominated by variable and flexible renewable energy sources. Its thrusts into next-generation distribution systems and energy storage facilities will help promote local innovation, paving the way for other entities to follow suit.

C. Clean and Affordable Electricity

The rapid pace of technological innovation for solar and wind energy has led to dramatic reductions in LCOE, and the trend of decreasing costs is expected to continue post-2020. In fact, we may see the cost of solar and battery storage halve within the next decade (Ahmed, 2020a), and renewables can reduce electricity costs by as much as 30% (Institute for Energy Economics and Financial Analysis, 2019). Favorable economics, alongside the intensifying need to decarbonize, point towards renewables as the dominant energy source of the future.

Any DU seeking a least-cost approach would benefit from increasing their utilization of solar and wind energy. However, as shown in the previous section, renewables comprise a very small fraction of Meralco's portfolio.

Cost trends should also be considered in parallel with health and environmental considerations. In 2018, Meralco Scope 3 emissions were at 31.56 MtCO2e (Meralco, 2020c), representing 49.50% of all GHG emissions attributed to Philippine power generation. Given that Meralco purchased 38.86% of all generated power, there is room for the DU to reduce the carbon footprint of its energy mix.

Meralco Scope 3 emissions grew at an AAGR of 5.35% from 2017 to 2019, despite energy purchases only growing by 1.16% for the same period. This implies that Meralco electricity is becoming more carbon-intensive.

The need for decarbonization is underscored by the vulnerability of the Philippines to the impacts of climate change, especially since the Philippines is the 2nd country most impacted by climate risks, including extreme weather events (Eckstein, Künzel, Schäfer, & Winges, 2019).

Meralco must start to divest from coal and other fossil fuels to help the Philippines align with the goal of the Paris Agreement in limiting global warming to 1.5°C. The company needs to increase the share of renewable energy in its energy mix. In particular, massive reductions in GHG emissions can come from solar, wind, and hydropower sources, given that they have less than 5% of the lifecycle emissions of coal plants (Bruckner et al., 2014).

By increasing its utilization of renewable energy, Meralco can increase domestic demand for clean and affordable power and stimulate further investments. In turn, this would encourage the entry of new players into the clean energy sector, increasing competition and further driving down costs. By increasing procurements of renewable energy, Meralco can take the lead in jumpstarting the renewable energy transition.

At the same time, the traditional dominance of coal power is being challenged by decreases in renewable energy costs, the introduction of retail competition, and ongoing plans to establish LNG importation infrastructure (Ahmed & Logarta, 2017). The introduction of additional coal taxes through the TRAIN Law will also lead to higher costs (MindaNews, 2018). Increased coal taxation and the effects of both RCOA and RPS will further dampen future investments into coal and increase stranded asset risks for existing coal generators.

Greater awareness of the health impacts of coal is also increasing pressure on the power sector to transition away from coal. With an estimated 960 premature deaths coming annually from coal-fired power plants in the Philippines (Greenpeace Philippines, 2016) and growing resistance against coal power across several provinces (Chavez, 2019), coal investments are a risky proposition for players in the power sector.

Meralco should continue its receptiveness to introduce carve-out provisions that allow for the curtailment of coal power purchases (Asian Power, 2020), protecting the company and its customers from stranded asset risks. In fact, generation cost projections in this report show that if all additional energy purchases can decrease costs in 2025 by 17.58% versus the base case.

Meralco should also continue its development of a power grid that can better accommodate flexible sources of power. With the establishment of smart grids, Meralco may be able to incorporate even more electricity from variable renewables, further decreasing prices and reducing its carbon footprint.

D. The Rise of Prosumers

Prosumers are end-users that both consume and produce electricity (Office of Energy Efficiency & Renewable Energy, 2017). They represent the next evolution of the power sector as they challenge the traditional distinction between power generators and electricity end-users.

Due to large economies of scale, energy generation used to be limited to large industry players able to commission and operate large-scale power plants. Decreasing capacity for these plants meant prohibitively expensive electricity.

However, dramatic reductions in renewable energy cost have made it more feasible for end-users to install their own electricity generators. Based on electricity purchase data (Meralco, 2020b), Meralco started recording net metering transactions in December 2017. With a CAGR of 71.15%, net metering generation is projected to reach 2173.11 GWh annually and to comprise 3.39% of the generation energy mix by 2030.

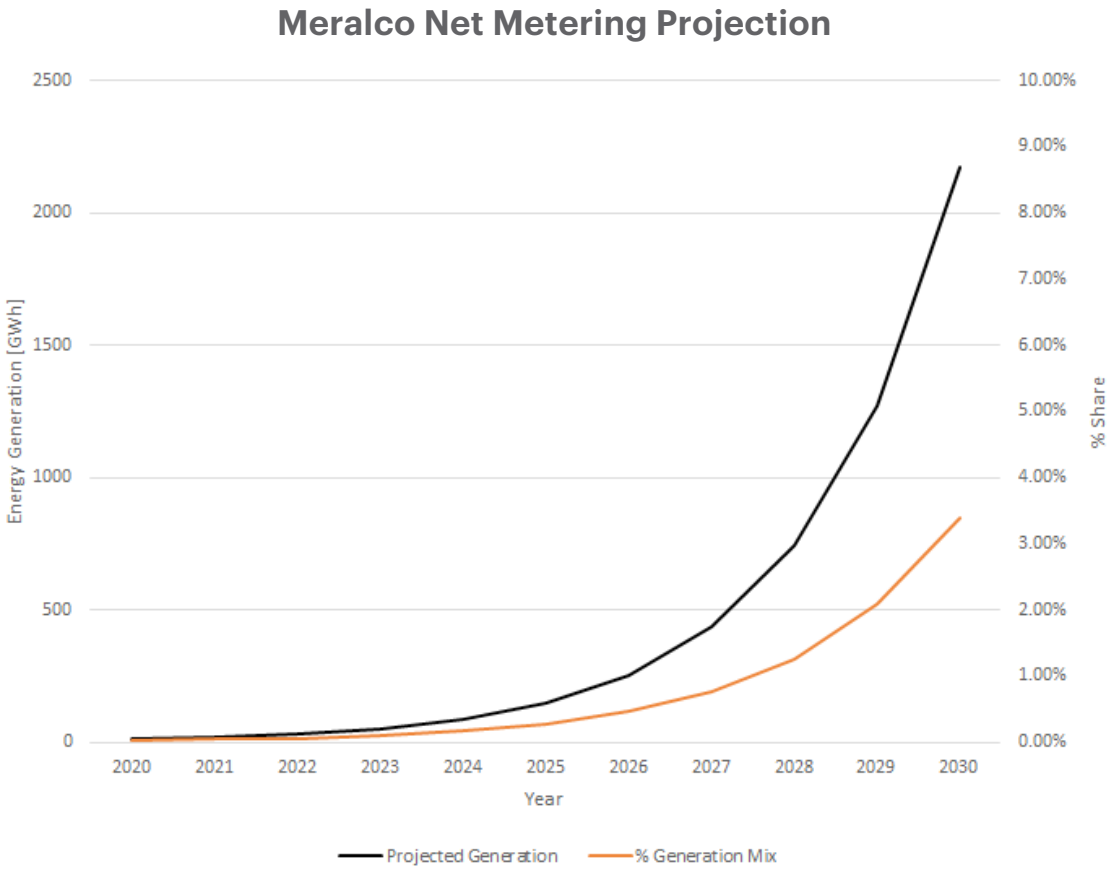


Figure 18. Meralco's Net Metering Projection

Given that the distribution power grid was originally intended solely for consumers, regulations had to be updated to better support consumer-based energy generation. For instance, the Energy Regulatory Commission released a 2013 resolution that set initial guidelines on net metering. This was followed by amendments through resolutions passed in 2019 and 2020 to remove participation barriers such as distribution impact study (DIS) fees and long application processing times.

However, Philippine net metering can be improved by adopting true net metering policies that compensate participants based on retail prices. Removing pass-through charges and rationalizing requirements can reduce the initial costs associated with setting up and registering small-scale electricity generators. Finally, increasing public awareness of net metering will allow more end-users to reap the benefits of consumer-based energy generation.

E. Prosumers Towards Energy Sustainability

Under EPIRA, DUs have the responsibility to choose energy generators that will supply them with specific quantities of electricity. The energy purchases are passed on to the customers within the franchise area of each DU.

Notably, all power purchase decisions are made by the DU, with each DU following set criteria for evaluating which PSAs to make. For instance, Meralco aims to minimize electricity prices through a least-cost, technology-agnostic approach (Meralco, 2020c). While the ERC has the power to approve or decline PSAs, DUs like Meralco still exert massive control over where they obtain electricity, while end-users have little to no influence over this process.

Traditionally, the transmission and distribution sectors are natural monopolies due to extremely high barriers to entry and large economies of scale (Roberts, 2015). Even without considering legal hurdles, would-be DUs trying to infringe upon the franchise area of an established DU will have to spend large amounts of resources to establish their own distribution infrastructure. They would also have to negotiate PSAs with generation companies, many of which would avoid transacting with a newly-established company that has no solid track record.

Given the difficulties of establishing new participants in the distribution sector and the small amount of influence that end-users have over the decisions of DU management, it is very difficult for consumers to choose their sources of electricity.

However, these natural monopolies are now being challenged in a different manner by technological developments. For instance, regulatory developments such as the development of retail competition and open access (RCOA) are also promoting the evolution of the power sector. Through RCOA, contestable customers can choose their electricity supplier and are not limited by the energy mix of their respective DUs.

The rapidly declining costs and increasing efficiencies of photovoltaic systems are making it possible for end-users to afford small-scale solar PV systems, paving the way towards consumer-based energy generation. Not all end-users can access net metering, but those that can are able to control how much of their electricity comes from renewable energy.

To reiterate, technological progress and increasing preference for clean energy sources are becoming the main drivers in the evolution of the power sector (Ahmed, 2020b). Amid rapid changes to how the Philippine power industry operates, DUs such as Meralco should act as enablers of positive change. By embracing the inevitable rise of consumer-based energy generation and retail competition, Meralco can better achieve its power development goals and thrive in the evolving energy landscape of the Philippines.

PART 5

Conclusion and Recommendations

The heavy reliance of power companies on fossil fuel energy generation comes at a great price: the climate crisis and serious health and environmental problems for host communities. The case of Meralco is no different: with 97% of its energy mix sourced from fossil fuels, and with further coal expansion planned out, its outdated business model aggravates rather than helps solve the climate emergency. Its plans to harness only around 1,000MW of renewable energy in the next five years is markedly unambitious and does not rise to the challenge of the Philippine government's policy declarations calling for flexible energy sources and a moratorium on new coal power plants.

The good news is that, as this report has laid out, energy companies such as Meralco are poised to reap benefits should they transition to RE now. Such a transition is not only desirable but also technically feasible.

As the largest distribution utility in the country, Meralco is in a position to contribute significantly to accelerating the transition to renewables and end the reliance on fossil fuels. Decarbonizing Meralco is a win-win solution for both the company and electricity consumers as it will lower costs, increase potential profit and address the climate emergency.

This report aims to compel Meralco and MGen officials, as well as their stockholders, to take a critical look at their fossil fuel-centric business strategies and assess these against the benefits of an early transition to RE and the imperatives to prioritize pro-people, pro-climate business models. The following recommendations serve as a challenge to Meralco and other energy companies to put focus on responding proactively to environmental and social concerns beyond mere profit.

Meralco's executives should:

- **Source all of their new future power supply agreements (PSAs) and other future energy demands from renewable energy.** Existing coal contracts should not be renewed and should be retired as soon as possible, while ensuring a just and managed transition for coal plant workers. Fossil gas projects should be reviewed and deprioritized as these are still fossil fuels that emit greenhouse gas emissions.

  Meralco should instead prioritize PSAs for solar and wind energy, given the historical and forecasted rapid drop in levelized cost of energy (LCOE) from variable renewables. Given that Meralco has the strategic expertise to seek out low-cost PSAs, it is well-poised to reap the benefits of cheaper electricity through solar and wind energy.

  A 35.9% share of variable renewable energy is technically feasible by 2030 and even higher penetration of solar and wind can become possible through further investments in flexible power generators, energy storage, and grid modernization.

- **Lessen reliance on inflexible baseload and invest more in hybrid RE plants.** A substantial decrease in the cost of variable renewables will increase demands for flexible power, subsequently reducing demand for inflexible baseload power, such as coal plants. And in a future power grid where flexibility is crucial, coal plants will only serve as stranded assets. To prevent these risks from being passed to end-users or shouldered by Meralco, it is paramount to start reductions in power purchases from coal-fired power plants and other inflexible power generators. Doing so will be both beneficial for the management and shareholders of Meralco as it provides dependable power sources and is less exposed to volatility in supply as experienced when using coal and other fossil fuels.

- **Mandate straight energy pricing for future power contracts.** A straight pricing structure is more favorable for consumers since it removes the burden of absorbing coal's financial risks such as price fluctuations, currency exchanges, and others. An analysis by the Center for Energy, Ecology and Development (CEED) showed that because of favorable tariff structure, MERALCO's 2019-2029 PSA with San Miguel Corp's Sual Coal Plant has a lower generation charge compared to its older 2012-2019 PSA with the same plant that implemented a two-part tariff structure (De Torres, 2020). Meralco's past practice of allowing power generation companies to pass through these risks to their electric customers must be stopped.

- **Include carve-out clauses for any future baseload PSAs.** To mitigate stranded asset risks, future PSAs with inflexible baseload generators should have carve-out provisions, permitting Meralco to purchase less electricity according to changes in demand. These carve-out clauses might be an easier way to adjust electricity purchases compared to force majeure negotiations.

  By pioneering carve-out clauses, Meralco can regain adaptability during pandemics and other events that impact energy supply and demand, given that many distribution utilities (DUs) and energy companies (ECs) do not have the same negotiating power as Meralco for invoking force majeure.

- **Rationalize requirements for net metering.** Cost decreases in solar panels and other small-scale renewable energy technologies are prompting more users to participate in consumer-based energy generation. Meralco should implement measures to increase the accessibility of its net metering application process, to further develop the potential of distributed energy generation. For instance, Meralco can streamline applications to shorten processing times or consider reducing fees associated with net metering applications.

- **Pursue investments in energy storage and smart grids.** Flexibility will be foundational for the energy grid of the future, and Meralco needs to start developing the infrastructure to enable greater grid flexibility. It must thoroughly analyze the outcomes of its initial ventures into smart grids and energy storage systems, with subsequent insights shaping further thrusts into these fields.

  Given the learning curve of novel technologies, Meralco should see lowered costs as it continues to expand its smart grid technologies and commission new storage facilities. These improvements in the distribution system will enable greater participation of variable renewables, paving the way for the Philippine energy transition.

Following the discussions laid out in this report, we likewise urge **Meralco shareholders and other energy investors to consider the economic disadvantages of continuing their investments in dirty energy, and to pressure company executives to start the process of shifting Meralco's business from fossil fuels to RE.**

Investors have direct influence on decision-making within Meralco and the energy industry. With the understanding that not only would these recommendations benefit the people and our environment, but also the economic prospects of the company they invested in, these shareholders could use their influence to call for recommended changes from within.

Moreover, shareholders must understand that investments in fossil fuels locks society into carbon pollution and severely lessen the chances of averting the worst impacts of climate change. The Department of Energy recommends green investments that promote reliable, affordable, and sustainable energy. Continued exposure of Meralco to fossil fuel projects will also carry financial risks, particularly at a time when climate policies are impacting businesses and financial institutions are letting go of climate-damaging investments.

Lastly, the **Philippine government, especially energy regulators, must fully commit to their pronouncements to accelerate the shift to renewable energy, and must prioritize the energy transition as part of the COVID pandemic recovery plan towards a Better Normal.**

The DOE has an important role in paving the energy transition pathway of the country. Following their strong pronouncements calling for a shift from inflexible energy sources primarily from fossil fuels, and for a moratorium on new coal-fired power plants, the next important step is to ensure the Philippine Energy Plan (PEP), as well as the National Renewable Energy Plan (NREP) prioritizes the massive uptake of RE, and the phase out of fossil fuel power generation. Under the current plans, RE is seen to have a meager 37% share in the energy mix by 2030. This low target will fail to get the Philippines on track in helping keep global temperatures below 1.5 degrees Celsius under the Paris climate targets. The DOE must aim for a minimum of 50% renewable energy by 2030 and immediately start creating exclusion policies for new coal and fossil gas, and improve grid development for RE connectivity to hasten the energy transition.

It is also important for the government to exclude nuclear energy, and so-called waste-to-energy incinerators. These technologies are dangerous and pose serious health and environmental threats, aside from being among the most costly sources of electricity.

The imperative for power companies like Meralco to transition to RE is now more pronounced with the onset of the COVID pandemic crisis. The need for a green and just recovery to ensure that society is able to cope with ongoing and future crises, including the much bigger climate crisis, is pushing the agenda for rapid decarbonization. As with other fossil fuel-driven energy companies, Meralco must heed the call of the times, adopt and change, and put people and planet before profit.

PART 6

Limitations of the Research

While every effort was made to optimize for accuracy, there are several limitations to this research that can be addressed in future reports.

Most notably, global cost trends were used to forecast LCOE trends, with the assumption that these patterns will translate into local trends. Actual reflection of these trends locally will depend on many factors, including the implementation of various policies that can impact the energy sector.

Historical cost trends from the last decade are assumed to continue, dictating the cost of future generation cost projects. Historical AAGR and CAGR values are used to project future costs.

All global LCOE values rely on discounting and are adjusted for global inflation. While the application of these values into local generation cost projections can introduce errors, the costs of each energy source relative to each other remain unchanged, facilitating comparisons among different generation technologies in the same period.

The generation costs projections do not consider the impact of increases in energy storage, given that the USAID-DOE report states that 47.9% renewable energy in the national energy mix by 2030 is feasible without additional storage capacity (Barrows et al., 2018). However, renewable energy penetration beyond this level should be possible through greater development of energy storage capacity and distribution facilities.

For cost projections, the analysis also assumes that Meralco can employ additional PSAs for any energy source to satisfy excess demand not met by currently active PSAs.

WESM generation data, not dispatched electricity, was used to unbundle Meralco WESM purchases, while WESM pricing data was only available for a recent three-month period from August 5 to November 4. The same dataset was used to determine price variability for each energy source. A larger dataset spanning a longer period would make the variability analysis more accurate.

Some Meralco electricity purchases, particularly purchases of renewable energy, were bundled with other relatively small purchases during certain periods, complicating data analysis. Some data points, such as Meralco residential rates for certain months, are also unavailable in the source documents. Hence, some graphs display different ranges depending on data availability.

ANNEX I

Philippine Energy Laws and Frameworks

Various laws and regulatory frameworks governed the Philippine power sector. Some of these important laws are:

A. Electric Power Industry Reform Act

The Electric Power Industry Reform Act of 2001, known as EPIRA, restructured the Philippine electric power industry. Its approach to introduce reforms was to provide a regulatory framework to manage privatization of key functions of the National Power Corporation. It also defines the four sectors of the Philippine power industry: generation, transmission, distribution, and supply.

Salient features of the law:

- Power generation is no longer a 100% public utility operation, allowing private sector participation through establishing private generation companies.
- Transmission assets, which consist of the grid infrastructure that distributed high-voltage power across the country, were placed under the mandate of the National Transmission Corporation (TRANSCO).
- Operation, development, and management of the transmission grid were then placed under the National Grid Corporation of the Philippines (NGCP), a privately-owned corporation (National Grid Corporation of the Philippines, 2020).
- Distribution of electricity to end-users was opened to participation from privatized distribution utilities, cooperatives, and other authorized entities. The distribution utility (DU) is obligated to provide open and non-discriminatory distribution services to any end-user within its prescribed franchise area. DUs are also entitled to collect distribution charges and other fees from end-users in exchange for the services they provide.
- All other suppliers of electricity not covered by the distribution sector fall under the supply sector.
- General regulatory oversight for the Philippine power industry now falls under the mandate of the Energy Regulatory Commission (ERC), an agency created and rationalized by EPIRA.
- DUs are provided two methods for procuring electricity. DUs can enter into bilateral contracts, called the Power Supply Agreement (PSA), with registered power producers. PSAs prescribe how much electricity is to be supplied and how much each unit of electricity will cost. Alternately, DUs can trade electricity within the Wholesale Electricity Spot Market.
- The Philippine Electricity Market Corporation (PEMC) is the autonomous group market operator and governing body for WESM (Philippine Electricity Market Corporation, 2019), while the Independent Electricity Market Operator of the Philippines (IEMOP) is its independent market operator (Independent Electricity Market Operator of the Philippines, 2020d).

- DUs are permitted to undergo cost recovery for any incurred standard costs as subject to ERC review. The law also allows for reduction of royalties, returns, and taxes for the utilization of indigenous sources of energy to encourage parity with imported energy sources.

B. Retail Competition and Open Access

EPIRA establishes the framework for the Retail Competition and Open Access (RCOA) program. Among the provisions of RCOA is the inclusion of end-users satisfying a minimum average peak demand into the contestable market. Qualified end-users can choose their own retail electricity suppliers (RES). The threshold for qualifying as part of the contestable market was initially set at 1 MW, with the threshold level to be gradually lowered until it reaches the household demand level. According to DOE Department Circular No. 2017-12-0013, end-users in contiguous areas who want to qualify for retail competition may also aggregate to meet the average peak demand cutoff.

As of 2019, the threshold for qualifying as a contestable customer was at 750 kW average peak demand (Wholesale Electricity Spot Market, 2019). Implementation has encountered some setbacks, such as the issuance by the Supreme Court of a Temporary Restraining Order blocking RCOA implementation due to an ongoing lawsuit, with proponents saying that the program limits accredited suppliers for large consumers of power (Rivera, 2019).

However, there is a push to make RCOA more accessible to consumers (Flores, 2019). One example is the release of DOE Department Circular No. 2019-07-0011, which removes the mandatory requirement of WESM registration for contestable customers.

The growth of the RCOA program continues, with the ERC granting 42 RES licenses and authorizing 25 local RES entities during the second quarter of 2020 (The Philippine Star, 2020). Participation of contestable customers in the RCOA is at 70%, with 1460 qualified end-users sourcing electricity from a RES. Participation grew by 2% from May to June 2020, even during the imposition of community quarantine. One benefit of the greater competition from RCOA is a reduction in electricity prices, with weighted average prices dropping from Php 4.12 per kWh to Php 3.97 per kWh in the same two-month period.

RCOA should also increase competition among competitive retailers, many of which are affiliated with existing DUs. As a result, WESM spot prices are predicted to converge more closely with PSA-derived electricity prices (Fairhurst, 2016).

C. Renewable Energy Law

The Renewable Energy Law establishes the framework for the development and advancement of renewable energy programs, and it provides fiscal and non-fiscal incentives to encourage investment in and deployment of renewable energy projects. It was passed in 2008 although not all incentives were immediately implemented affecting the full expansion of renewable energy in the country.

Fiscal Incentives	Non-Fiscal Incentives
7-year income tax holiday	Renewable Portfolio Standards (on-grid and off-grid)
Duty-free impotation of machinery, equipment and materials	Net Metering
Special reality tax rate	Feed-in Tariff System
Zero VAT rate	RE Market
Cash incentives for missionary electrification	Green Energy Option Program

Fiscal incentives include:

- Renewable energy developers are exempted from income tax for the first seven years of operation. After this period, they will enjoy a corporate tax rate of 10% if savings are passed on to end-users through lower power rates.
- The importation of equipment and materials to be directly used for renewable energy operations will also be subject to duty-free importation, upon endorsement to DOE.
- Zero percent value-added tax for sales of fuel or power from renewable energy sources and for purchases of goods, products, and services required for plant facilities.
- Tax exemption on carbon credits, tax credit on domestic capital equipment and services, accelerated depreciation, net operation loss carry-over, cash incentives for missionary electrification, and special reality tax rates for equipment and machinery.

Non-fiscal incentives:

- Renewable Portfolio Standards (RPS): The RPS mandates that a minimum portion of electricity generation within the grid should come from eligible renewable energy resources.
- Feed-In Tariff System (FiT): Electricity generated from emerging renewables can receive priority connections to the grid. Qualifying generators receive preferred tariffs, incentivizing the entry of players that can utilize the indicated renewable energy technology.

- Renewable Energy Market (REM): In cooperation with the RPS, the REM establishes a market for the trade of Renewable Energy Certificates. These RECs are used to show compliance with the RPS.

- Green Energy Option Program (GEOP): Under GEOP, electricity end-users have the option to source their energy from RE resources. End-users will coordinate with their respective EC or DU to source their electricity from renewables, with the EC or DU contracting directly with renewable energy generators. Alternately, contestable customers under RCOA can transact directly with renewable energy suppliers. An initial target of 2000 MW will be included for GEOP (Domingo, 2020a).

- Net Metering: Qualified end-users can enter into net metering agreements with their respective distribution utilities. Under the net metering program, participants can install their own renewable energy systems, such as rooftop solar photovoltaic (PV) systems. The corresponding DU will also receive RECs that they can use to satisfy the RPS requirement. DUs are mandated to provide non-discriminatory service to all consumers within its franchise area, regardless of participation in net metering. Currently, there is a limit of 100 kW capacity for RE systems installed under net metering.

The Renewable Energy Act of 2008 establishes the framework for the development and advancement of renewable energy programs, and it provides fiscal and non-fiscal incentives to encourage investment in and deployment of renewable energy projects. However, the delay in the implementation of many of the law's fiscal and non-fiscal incentive mechanisms contributed to the slow growth of the renewable energy industry in the country. The impending implementation of various mechanisms such as the Renewable Portfolio Standard, Green Energy Option, RE market will boost the adoption of renewable energy systems across the country

ANNEX II

Meralco's Historical Consumption Data

Historical Meralco Consumption Data. (Meralco, 2020a).

Year	Peak Demand [MW]	Output [MWh]	System Loss [MWh]	System Loss %
2000	3,999.31	21,941,952	2,486,048	10.18%
2001	4,139.88	22,770,071	2,639,929	10.39%
2002	4,201.93	22,924,619	2,790,381	10.85%
2003	4,420.00	23,922,003	2,911,881	10.85%
2004	4,487.60	24,744,690	3,090,786	11.10%
2005	4,588.00	24,939,797	2,835,195	10.21%
2006	4,567.04	25,159,217	2,827,766	10.10%
2007	4,774.29	26,296,099	2,808,249	9.65%
2008	4,789.54	26,873,155	2,748,581	9.28%
2009	4,910.19	27,346,292	2,575,671	8.61%
2010	5,374.37	30,050,680	2,592,492	7.94%
2011	5,283.41	30,380,008	2,410,674	7.35%
2012	5,632.90	32,528,644	2,463,681	7.04%
2013	5,927.72	33,761,691	2,508,944	6.92%
2014	6,121.26	34,706,133	2,407,812	6.49%
2015	6,298.44	36,619,770	2,534,635	6.47%
2016	6,747.94	39,590,456	2,686,507	6.35%
2017	6,973.36	41,448,752	2,601,313	5.91%
2018	7,398.82	43,570,228	2,619,039	5.67%
2019	7,740.31	45,958,473	2,694,326	5.54%

ANNEX III
GHG Emission and the Power sector

GHG Inventory for the Energy Sector. (Department of Energy, 2020b).

	Total GHG Emissions [MTCO2e]		% Change in GHG Emissions	% Share in Energy GHG Emissions	
	2017	2018		2017	2018
Power Generation	58.24	63.76	9.48%	49.15%	51.71%
Transportation	33.2	34.36	3.49%	28.02%	27.86%
Industry	16.36	13.99	-14.47%	13.81%	11.35%
Other*	10.01	10.47	4.61%	8.45%	8.49%
Energy**	0.68	0.74	8.56%	0.57%	0.6%
Total	**118.48**	**123.32**	**4.08%**	**100%**	**100%**

** includes non-transport emissions from services, households, and agriculture sectors*
*** includes losses from oil refining*

GHG Avoidance for the 2018 Energy Sector (Department of Energy, 2020b).

GHG Reduction Measures	GHG Emission Avoidance [ktCO2e]	% Reduction
Demand Side Interventions		
Efficiency in Electricity Consumption	3120.95	2.24%
Efficiency in Fossil Fuel Consumption	6,182.36	4.44%
Biofuel Utilization	1,728.07	1.24%
CNG Utilization	0.00	0.00%
Subtotal	11,031.39	7.93%
Supply Side Interventions		
Fuel Diversification for Power Generation	4,815.72	3.46%
Subtotal	4,815.72	3.46%
Total GHG Avoidance	**15,847.10**	**11.39%**

Abbreviations

Acronym	Definition
AAGR	Average Annual Growth Rate
BAU	Business-As-Usual
BESS	Battery Energy Storage System
CAIDI	Customer Average Interruption Duration Index
CCGT	Closed-Cycle Gas Turbine
CCS	Carbon Capture and Sequestration
CES	Clean Energy Scenario
CNG	Compressed Natural Gas
CO 2 e	Carbon Dioxide Equivalent
CREAS	Customer Renewable Energy Asset Study
CSP	Competitive Selection Process
DIS	Distribution Impact Study
DOE	Department of Energy
DU	Distribution Utility
ECC	Environmental Compliance Certificate
ECQ	Enhanced Community Quarantine
EICC	Energy Investment Coordinating Council
EPNS	Energy Projects of National Significance
ERC	Energy Regulatory Commission
FiT	Feed-in Tariff
GEOP	Green Energy Option Program
GHG	Greenhouse gas
IEMOP	Independent Electricity Market Operator of the Philippines
INDC	Intended Nationally Determined Contribution
LCOE	Levelized Cost of Electricity
LCOS	Levelized Cost of Storage
LRMC	Long-Run Marginal Cost
MGen	Meralco PowerGen Corporation
MGreen	MGen Renewable Energy, Inc.
MWa	Megawatt (alternating current)

Acronym	Definition
MWp	Megawatt peak
NDC	Nationally Determined Contribution
NGCP	National Grid Corporation of the Philippines
NPC	National Power Corporation
NREP	National Renewable Energy Program
OCGT	Open-Cycle Gas Turbine
PPA	Power Purchasing Agreement
PSA	Power Supply Agreement
PV	Photovoltaic
RCOA	Retail Competition and Open Access
REC	Renewable Energy Certificates
REF	Reference Scenario (synonymous with business-as-usual)
REM	Renewable Energy Market
RES	Retail Electricity Suppliers
RES	Retail Electricity Supply
RPS	Renewable Portfolio Standards
RSD	Relative Standard Deviation
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
TRANSCO	National Transmission Corporation
WESM	Wholesale Electricity Spot Market

List of Figures

List of Tables

References

Ahmed, S. J. (2019). Prospects Improve for Energy Transition in the Philippines. Retrieved from https://ieefa.org/wp-content/uploads/2019/09/Prospects-Improve-for-Energy-Transition-in-the-Philippines_September-2019.pdf

Ahmed, S. J. (2020a). IEEFA Philippines: Reshaping the power market by moving towards renewables and energy resilience by 2021. Retrieved October 29, 2020, from https://ieefa.org/ieefa-philippines-reshaping-power-market-by-moving-towards-renewables-and-energy-resilience-by-2021/%0A

Ahmed, S. J. (2020b). Philippines Power Sector Can Reach Resilience by 2021. Retrieved from https://ieefa.org/wp-content/uploads/2020/06/Philippines-Power-Sector-Can-Reach-Resilience-by-2021_June-2020.pdf

Ahmed, S. J., & Brown, M. (2020). Philippines Moratorium on Greenfield Coal Projects Will Attract USD 30 Billion in Renewable Energy Investment. Retrieved from https://ieefa.org/wp-content/uploads/2020/10/Philippines-Greenfield-Coal-Project-Moratorium-Will-Attract-Billions-in-RE-Investment_November-2020.pdf

Ahmed, S. J., Dalusung, A. I., Logarta, J. J., & Maniego, P. J. (2020). Covid-19: Lessons for the Philippine power sector. Retrieved October 29, 2020, from https://icsc.ngo/covid-19-lessons-for-the-philippine-power-sector/%0A

Ahmed, S. J., & Logarta, J. J. (2017). Carving out Coal in the Philippines: Stranded Coal Plant Assets and the Energy Transition. Retrieved from https://ieefa.org/wp-content/uploads/2017/10/Carving-out-Coal-in-the-Philippines_IEEFAICSC_ONLINE_12Oct2017.pdf

Asian Power. (2020, August 27). Meralco open to buying less power from coal plants. Asian Power. Retrieved from https://asian-power.com/power-utility/news/meralco-open-buying-less-power-coal-plants

Atimonan One Energy. (2017). About the Project. Retrieved October 27, 2020, from https://atimonan1energy.ph/

Austin, F. (2016). The World Energy Trilemma: Progress Toward Balanced, Sustainable Energy Remains Slow. Retrieved from https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/mar/Energy-Journal/Energy Trilemma-online.pdf

Barrows, C. P., Katz, J. R., Cochran, J. M., Maclaurin, G. J., Marollano, M. C., Gabis, M. G., … Leisch, J. (2018). Greening the Grid: Solar and Wind Grid Integration Study for the Luzon-Visayas System of the Philippines. https://doi.org/10.2172/1418740

Bellini, E. (2018, November 27). Philippine regulator opposes net metering expansion. Pv Magazine. Retrieved from https://www.pv-magazine.com/2018/11/27/philippines-regulator-opposes-net-metering-expansion/

Bruckner, T., Bashmakov, I. A., Mulugetta, Y., Chum, H., Navarro, A. D. la V., Edmonds, J., … Zhang, X. (2014). Energy Systems. In Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 511–597). Retrieved from https://www.ipcc.ch/report/ar5/wg3/energy-systems/

Calonzo, A. (2020, April 27). Manila Electric Halves Spending as Lockdown Weakens Power Demand. Bloomberg.Com. Retrieved from https://www.bloomberg.com/news/articles/2020-04-27/manila-electric-halves-spending-as-lockdown-weakens-power-demand

Chavez, L. (2019, October 28). Coal power plants flourish in the Philippines despite 'climate emergency.' Mongabay.

Clean Energy Solutions Center. (n.d.). Net Metering and Net Billing. Retrieved October 1, 2020, from https://cleanenergysolutions.org/instruments/net-metering-net-billing

Cordero, T. (2020, September 1). Consumer group, church leaders call for cancellation of 3 coal-fired power plants in Quezon.

GMA News Online. Retrieved from https://www.gmanetwork.com/news/news/regions/753748/consumer-group-church-leaders-call-for-cancellation-of-3-coal-fired-power-plants-in-quezon/story/

Department of Energy. (2017). What is Green Energy Option Program (GEOP)? (p. 1). p. 1. Retrieved from doe.gov.ph/sites/default/files/pdf/consumer_connect/2017_green_energy_option_flyer.pdf

Department of Energy. (2018). Key Energy Statistics 1990-2018. Retrieved October 5, 2020, from https://www.doe.gov.ph/energy-statistics/key-energy-statistics-1990-2018

Department of Energy. (2019). 34th Electric Power Industry Reform Act (EPIRA) Implementation Status Report. Retrieved from https://www.doe.gov.ph/electric-power/34th-electric-power-industry-reform-act-epira-implementation-status-report

Department of Energy. (2020a). List of Existing Power Plants. Retrieved November 7, 2020, from https://www.doe.gov.ph/list-existing-power-plants

Department of Energy. (2020b). Philippine Energy Plan (2018-2040). Retrieved from https://www.doe.gov.ph/pep

Department of Energy. (2020c). Private Sector Initiated Power Projects (Luzon): Committed. Retrieved from https://www.doe.gov.ph/private-sector-initiated-power-projects

Department of Energy. (2020d). Private Sector Initiated Power Projects (Luzon): Indicative. Retrieved from https://www.doe.gov.ph/private-sector-initiated-power-projects

Domingo, R. W. (2020a, July 4). Gov't pushes renewable energy program. Inquirer.Net. Retrieved from https://business.inquirer.net/301651/govt-pushes-renewable-energy-program

Domingo, R. W. (2020b, July 11). 'Force majeure' sets off another drop in Meralco rates. Inquirer.Net. Retrieved from https://business.inquirer.net/302362/force-majeure-sets-off-another-drop-in-meralco-rates

Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2019). Global Climate Risk Index 2020. Retrieved from https://www.germanwatch.org/en/17307

Fairhurst, S. (2016). Wholesale power prices for fossil fuel and renewable energy power projects in Philippines, Thailand and Indonesia. Retrieved from https://www.lantaugroup.com/publications/display/Wholesale-power-prices-for-fossil-fuel-and-renewable-energy-power-projects-in-Philippines--Thailand-and-Indonesia

Federigan, L. O. (2020, October 24). Why the Nationally Determined Contribution is key to PH development. Manila Times. Retrieved from https://www.manilatimes.net/2020/10/24/business/green-business/why-the-nationally-determined-contribution-is-key-to-ph-development/785030/

Flores, A. M. S. (2019, April 5). DoE order to refine retail competition and open access. Philstar.Com. Retrieved from https://manilastandard.net/business/power-technology/291892/doe-order-to-refine-retail-competition-and-open-access.html

Global Business Power Corporation. (2020). Power Generation. Retrieved October 27, 2020, from https://gbp.com.ph/power-generation/

Greenpeace Philippines. (2016). Coal: A Public Health Crisis. Retrieved from https://www.greenpeace.org/philippines/publication/1252/coal-a-public-health-crisis/

Independent Electricity Market Operator of the Philippines. (2020a). Final Prices. Retrieved November 6, 2020, from http://180.232.125.102/inner.php/downloads/final_prices

Independent Electricity Market Operator of the Philippines. (2020b). Market Operations Report: First 30 Days of WESM Operations under the COVID-19 Enhanced Community Quarantine. Retrieved from https://www.iemop.ph/home-media/publications/

Independent Electricity Market Operator of the Philippines. (2020c). Market Operations Report: WESM Operations During the

COVID-19 Enhanced Community Quarantine Period. Retrieved from https://www.iemop.ph/home-media/publications/

Independent Electricity Market Operator of the Philippines. (2020d). Who We Are. Retrieved September 29, 2020, from http://www.iemop.ph/about/about-us/

Institute for Climate and Sustainable Cities. (2020). Experts back DOE, Meralco lead in energy transition. Retrieved November 18, 2020, from https://icsc.ngo/experts-back-doe-meralco-lead-in-energy-transition/

Institute for Energy Economics and Financial Analysis. (2019). Philippines: Renewables could cut electricity rates by 30 percent. Retrieved October 21, 2020, from https://ieefa.org/philippines-renewables-could-cut-electricity-rates-by-30-percent/

International Energy Consultants. (2012). Regional Comparison of Retail Electricity Tariffs: Executive Summary. Retrieved from https://meralcomain.s3-ap-southeast-1.amazonaws.com/images/ckeditor-documents/2012 IEC Study.pdf

International Energy Consultants. (2018). Regional Comparison of Retail Electricity Tariffs: Executive Summary. Retrieved from https://meralcomain.s3.ap-southeast-1.amazonaws.com/images/ckeditor-documents/2018_IEC_Study_Updated.pdf

International Renewable Energy Agency. (2017a). Electricity Storage and Renewables: Costs and Markets to 2030. Retrieved from https://www.irena.org/publications/2017/Oct/Electricity-storage-and-renewables-costs-and-markets

International Renewable Energy Agency. (2017b). Renewables Readiness Assessment: The Philippines. In International Renewable Energy Agency. Retrieved from https://irena.org/publications/2017/Mar/Renewables-Readiness-Assessment-The-Philippines

International Renewable Energy Agency. (2019). Renewable Power Generation Costs in 2019. Abu Dhabi, United Arab Emirates.

Lagare, J. B. (2020, September 7). Many power distributors unfamiliar with net metering. The Manila Times. Retrieved from https://www.manilatimes.net/2020/09/07/business/at-a-glance-business/many-power-distributors-unfamiliar-with-net-metering

Lazard. (2019a). Lazard's Levelized Cost of Energy Analysis—Version 13.0. Retrieved from https://www.lazard.com/perspective/lcoe2019

Lazard. (2019b). Lazard's Levelized Cost of Storage Analysis—Version 5.0. Retrieved from https://www.lazard.com/perspective/lcoe2019

Lectura, L. (2020a, May 16). MGen to build diversified power portfolio in 5 years. BusinessMirror. Retrieved from https://businessmirror.com.ph/2020/05/26/mgen-to-build-diversified-power-portfolio-in-5-years/

Lectura, L. (2020b, September 9). Meralco: Force majeure claims bring down electricity rates in September. BusinessMirror. Retrieved from http://businessmirror.com.ph/2020/09/09/meralco-force-majeure-claims-bring-down-electricity-rates-in-september/

Lee, N., Flores-Espino, F., Oliveira, R., Roberts, B., Bowen, T., & Katz, J. (2020). Exploring Renewable Energy Opportunities in select Southeast Asian Countries: A Geospatial Analysis of the Levelized Cost of Energy of Utility-Scale Wind and Solar Photovoltaics. Retrieved from www.nrel.gov/publications.

Lucas, D. L. (2020, August 28). More PH banks subscribing to BSP's 'green' finance principles. Inquirer.Net. Retrieved from https://business.inquirer.net/306082/more-ph-banks-subscribing-to-bsps-green-finance-principles

Meralco. (2018a). Corporate Profile. Retrieved October 7, 2020, from https://company.meralco.com.ph/corporate-profile

Meralco. (2018b). Solar & Net Metering. Retrieved October 2, 2020, from https://residential.meralco.com.ph/products-services-and-programs/solar-net-metering

Meralco. (2020a). Power Supply Procurement Plan 2020. Retrieved from https://www.doe.gov.ph/sites/default/files/pdf/du_csp/2020-2029_MERALCO_PSPP.pdf

Meralco. (2020b). Rates Archives. Retrieved October 4, 2020, from https://company.meralco.com.ph/news-and-advisories/rates-archives

Meralco. (2020c). Sustaining the Future: 2019 Meralco Sustainability Report. Retrieved from https://company.meralco.com.ph/investor-relations/annual-reports

Meralco PowerGen Corporation. (2019a). About. Retrieved October 27, 2020, from https://meralcopowergen.com.ph/about/

Meralco PowerGen Corporation. (2019b). Atimonan One Energy, Inc. (A1E). Retrieved October 27, 2020, from https://meralcopowergen.com.ph/development-project-atimonan-one-energy-inc/

Meralco PowerGen Corporation. (2019c). Global Business Power Corporation (GBPC). Retrieved October 27, 2020, from https://meralcopowergen.com.ph/investments-global-business-power-corporation/

Meralco PowerGen Corporation. (2019d). Redondo Peninsula Energy, Inc. (RPE). Retrieved October 27, 2020, from https://meralcopowergen.com.ph/development-project-redondo-peninsula-energy-inc/

Meralco PowerGen Corporation. (2019e). San Buenaventura Power Ltd. Co. (SBPL). Retrieved October 27, 2020, from https://meralcopowergen.com.ph/development-project-san-buenaventura-power-ltd-co/

Meralco PowerGen Corporation. (2019f). St. Raphael Power Generation, Inc. (SRPGC). Retrieved October 27, 2020, from https://meralcopowergen.com.ph/st-raphael-power-generation-inc-srpgc/

Metro Pacific Investments Corporation. (2019). Meralco. Retrieved October 7, 2020, from https://www.mpic.com.ph/investor-relations/investments/power/meralco/

MindaNews. (2018, January 9). Coal tax under TRAIN will mean higher electricity costs, group warns. MindaNews. Retrieved from https://www.mindanews.com/top-stories/2018/01/coal-tax-under-train-will-mean-higher-electricity-costs-group-warns/

National Grid Corporation of the Philippines. (2020). Corporate Profile. Retrieved September 29, 2020, from https://www.ngcp.ph/profile

Navallo, M. (2019, August 8). SC affirms with finality ruling requiring power supply deals to undergo bidding. ABS-CBN. Retrieved from https://news.abs-cbn.com/business/08/08/19/sc-affirms-with-finality-ruling-requiring-power-supply-deals-to-undergo-bidding

O'Neil, C. (2020). Renewables Rescue Stability as the Grid Loses Spin. Retrieved November 20, 2020, from https://www.nrel.gov/news/features/2020/renewables-rescue-stability-as-the-grid-loses-spin.html

Ocampo, R. (n.d.). 1. How Net-Metering works: understanding the basics of policy, regulation and standards. Retrieved October 1, 2020, from https://www.doe.gov.ph/1-how-net-metering-works-understanding-basics-policy-regulation-and-standards

Office of Energy Efficiency & Renewable Energy. (2017). Consumer vs Prosumer: What's the Difference? Retrieved November 13, 2020, from https://www.energy.gov/eere/articles/consumer-vs-prosumer-whats-difference

Ofreneo, R. E. (2019, May 2). After 18 years, Epira failed to give PHL energy security. BusinessMirror. Retrieved from https://businessmirror.com.ph/2019/05/02/after-18-years-epira-failed-to-give-phl-energy-security/

Oplas, B. S. J. (2018, June 4). The EPIRA is working. BusinessWorld. Retrieved from https://www.bworldonline.com/the-epira-is-working/

Pacudan, R. (2018). The Economics of Net-metering Policy in the Philippines. International Energy Journal, 18(3), 283–296. Retrieved from http://www.rericjournal.ait.ac.th/index.php/reric/article/view/1813

Philippine Electricity Market Corporation. (2019). About Us. Retrieved September 29, 2020, from https://www.wesm.ph/about-us/about-pemc

Ram, M., Child, M., Aghahosseini, A., Bogdanov, D., Lohrmann, A., & Breyer, C. (2018). A comparative analysis of electricity generation costs from renewable, fossil fuel and nuclear sources in G20 countries for the period 2015-2030. Journal of Cleaner Production, 199, 687–704. https://doi.org/10.1016/j.jclepro.2018.07.159

Ravago, M.-L. V., & Roumasset, J. A. (2020, June 11). Can COVID-19 spark an energy transition

in the Philippines? Sun-Connect News. Retrieved from https://www.sun-connect-news.org/de/news/details/can-covid-19-spark-an-energy-transition-in-the-philippines/

Republic of the Philippines. (2015). Republic of the Philippines Intended Nationally Determined Contributions. Retrieved from http://www4.unfccc.int/submissions/INDC/Published Documents/Philippines/1/Philippines - Final INDC submission.pdf

Requejo, R. E. (2015, February 4). SC junks kalikasan writ vs Subic firm. Manila Standard. Retrieved from https://www.manilastandard.net/news/-main-stories/169827/sc-junks-kalikasan-writ-vs-subic-firm.html

Rey, A. (2020, October 27). No more new coal plant applications under latest PH energy policy. Rappler.Com. Retrieved from https://www.rappler.com/business/moratorium-endorsement-new-coal-power-plants-philippine-energy-policy-2020%0A

Rivera, D. (2018). Malampaya supply seen declining by 2022. Retrieved from Philstar.com website: https://www.philstar.com/business/2018/04/28/1810042/malampaya-supply-seen-declining-2022

Rivera, D. (2019, May 14). ERC explores options on retail competition, open access. Philstar.Com. Retrieved from https://www.philstar.com/business/2019/05/14/1917522/erc-explores-options-retail-competition-open-access

Roberts, D. (2015, September 9). Power utilities are built for the 20th century. That's why they're flailing in the 21st. Vox.Com. Retrieved from /www.vox.com/2015/9/9/9287719/utilities-monopoly

San Buenaventura Power Ltd. Co. (2016). Asset. Retrieved October 27, 2020, from http://www.sbpl.com.ph/asset/

Schmidt, O., Melchior, S., Hawkes, A., & Staffell, I. (2019). Projecting the Future Levelized Cost of Electricity Storage Technologies. Joule, 3(1), 81–100. https://doi.org/10.1016/j.joule.2018.12.008

The Philippine Star. (2020, August 20). More retail electricity suppliers accredited. Philstar.Com. Retrieved from https://www.philstar.com/business/2020/08/20/2036481/more-retail-electricity-suppliers-accredited

Tongsopit, S., Saelim, S., Keereepart, T., Darghouth, N., Aznar, A., O'Shaughnessy, E., & Chaitusaney, S. (2019). Distributed Photovoltaic Economic and Technical Impact Analysis in the Distributed Photovoltaic Economic and Technical Impact. Retrieved

from https://usaidcleanpowerasia.aseanenergy.org/resource/distributed-photovoltaic-economic-and-technical-impact-analysis-in-the-philippines/

Verzola, R. (2016). Philippine Pseudo-Net-Metering Scheme Results In The Double-Charging Of Consumers. Retrieved from https://rverzola.files.wordpress.com/2016/01/philippine-pseudo-net-metering-results-in-the-double-charging-of-customers-by-rverzola.pdf

Villanueva, J. (2020, August 27). BSP eyes incentives for banks' sustainable finance compliance. Philippine News Agency. Retrieved from https://www.pna.gov.ph/articles/1113648

Wholesale Electricity Spot Market. (2019). Retail. Retrieved September 17, 2020, from https://www.wesm.ph/market-development/retail

Wholesale Electricity Spot Market. (2020). Annual Market Assessment Report. Retrieved November 2, 2020, from https://www.wesm.ph/market-outcomes/market-assessment-reports/annual-market-assessment-report

Photo Credits

Cover	Veejay Villafranca
P 04-05	Veejay Villafranca
P 06	Veejay Villafranca
P08	Veejay Villafranca
P 14	Veejay Villafranca
P 11	Greenpeace
P 12	Basilio Sepe
P 14	Jimmy Domingo
P 15	Veejay Villafranca
P17	Veejay Villafranca
P18	Veejay Villafranca
P 19	Jed Delano
P 23-24	Veejay Villafranca
P 32	Veejay Villafranca
P 33	Greenpeace
P 36	Basilio Sepe
P 37	Noel Guevarra
P 40	Veejay Villafranca
P 42	Kate Davidson
P 46-47	Veejay Villafranca
P 49-50	Veejay Villafranca
P 58-59	Veejay Villafranca

GREENPEACE

Greenpeace is a global, independent campaigning organization that uses peaceful protest and creative communication to expose global environmental problems and promote solutions that are essential to a green and peaceful future.Greenpeace has been present in the Philippines since 2000, working to safeguard the constitutional rights of Filipinos to a balanced and healthful ecology.

30 Scout Tuason Street Room 201 JGS Building,
Quezon City, 1103 Metro Manila, Philippines

www.greenpeace.org.ph