WPS8721

Policy Research Working Paper 8721

Learning from Developing Country Power Market Experiences

The Case of the Philippines

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WORLD BANK GROUP
Energy and Extractives Global Practice
January 2019

Policy Research Working Paper 8721

Abstract

Deep reforms of the Philippine power sector began in 2001, aiming at competitive wholesale and retail markets. This case study analyzes the Philippine experience with wholesale electricity markets at the generation level, including design, implementation, and outcomes. The spot market began operation in 2006, amidst adequate generation capacity albeit highly concentrated among few players. The reforms have successfully introduced market-driven forces to system operation and spot price signals for investments. Investment in new generation has recently been commissioned; generation concentration has plunged since the market's inception (mainly due to privatization of generation assets); and generation supply has been generally secure (barring natural disasters). However, serious conflicts due to market power abuse occurred in the past; the market remains concentrated in four major players; and new competitors have slowly entered through the opaque and largely regulated market of bilateral contracts. Moreover, following aggressive capacity additions, baseload coal generation soared over the past decade, reaching 50 percent of total output in 2017, thus raising concerns about environmental sustainability, the optimal capacity mix (due to lack of investments in flexible mid-merit and peaking power plants), and long-term supply security of the Philippine power sector (since coal is imported). The case of the Philippines' power market highlights the importance of adequate ownership structure supportive of competition, the need of effective monitoring and oversight, especially during initial phases of the market, and the benefits and challenges that open and competitive wholesale markets can provide over time, especially in interaction with vertical integration (whether through cross-ownership or through bilateral contracts).

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Learning from Developing Country Power Market Experiences: The Case of the Philippines[1]

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Keywords: Electricity markets; Competition; Developing countries; Emerging markets

JEL codes: L13, L94, L98, Q4, K21

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[1] This paper is a product of the "Rethinking Power Sector Reform" knowledge program of the Energy & Extractives Global Practice of the World Bank. Any views presented here are the authors alone and should not be attributed to the World Bank or any other person or institution. The authors are very grateful for financial support from the Energy Sector Management Assistance Program (ESMAP) and the Public Private Infrastructure Advisory Facility (PPIAF). Special thanks to Rauf Tan, who provided most of the source information, data and analysis used to develop this paper. Thanks are also due to Vivien Foster, Debabrata Chattophadyay, Kamleshwar Khelawan, Yuriy Myroshnychenko and Rowaldo del Mundo who acted as peer reviewers. Any shortcomings are the sole responsibility of the authors.

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Abbreviations

DOE	Department of Energy

DU	Distribution Utility
ECO	Enforcement and Compliance Office (within PEMC)
EPIRA	Electric Power Industry Reform Act of 2001
ERC	Energy Regulatory Commission
FIT	Feed-In-Tariff
IMEM	Interim Mindanao Electricity Market
IPP	Independent Power Producer
LTSO	Legally unbundled Transmission System Operator
NGCP	National Grid Corporation of the Philippines
NPC	National Power Corporation
PEM Board	Philippine Electricity Market Board
PEMC	Philippine Electricity Market Corporation
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PSALM	Power Sector Asset and Liability Management Corporation
RCOA	Retail Competition and Open Access
RPS	Renewable Portfolio Standards
WESM	Wholesale Energy Market

1 Introduction

The World Bank is seeking to update its understanding on power sector reforms in developing countries, accounting for emerging challenges and new reform directions over the past decade. Implementation of power sector reforms in developing countries has been varied, especially when it comes to power markets, with widely different outcomes. This work forms a part of the World Bank's project "Rethinking Power Sector Reform", which was commissioned to analyze the recent experience of developing countries, including a series of case studies on wholesale power markets. These case studies, including the incumbent one for the Philippines, were developed based on both qualitative and quantitative inputs from experienced consultants of each studied country.

The Philippine power sector underwent a serious supply crisis in the early 1990s. Many Philippine regions experienced brownouts averaging 7 hours per day in 1992-93, with brownouts up to 12 hours a day. The government pursued private participation through IPPs by enacting law RA No. 6947 in 1990. The Philippine IPP model considered sovereign guarantees, which were contracted by a negotiated process. IPPs increased to 46% of total generation in 1997, successfully ending the power crisis. Although the IPP program successfully solved the crisis, chronically weak financial positions were further distressed by stranded costs due to high-priced IPP contracts, the regional economic crisis of 1997 and the parallel surge of oil prices (Toba, 2007).

Attempting to address the deep challenges facing its power sector, the Philippines undertook major reform of the electric power industry in the early 2000s, which was directed by and implemented in accordance with the Electric Power Industry Reform Act of 2001, or EPIRA. EPIRA envisioned competitiveness in the power generation and supply segment, under a restructured power sector, based on private investment, and with an independent regulator. The short-term wholesale power market (WESM) was designed as an energy-only gross power-pool running in parallel to bilateral supply contracts. The pool enables hourly bid-based security-constrained merit-order dispatch, which clears market-based nodal electricity prices.

The pool was established after extensive preparation in 2006, under the administration of a non-stock, non-profit market operator led by the Department of Energy; while system operation is conferred to the sole national Transco. Transmission was unbundled from generation and distribution, but cross-ownership between generation and distribution businesses is allowed up to a limit stipulated by the regulator. On the supply side, 84% of electricity needs continue to be covered by contracts, some of which include rigidities and clauses from the 1990s IPP program aimed at solving the deep power crisis faced by the Philippines at the time. Key figures for the Philippines power sector are summarized in Table 1-1.

Table 1-1 Philippines power sector summary.

Population (2016)	103 million
Electricity sales (2017)	78 TWh
Electricity sales CAGR (2005-2017)	4.6%
Major generation technologies[1]	Coal: 50% Natural gas: 22% Geothermal: 11% Hydropower: 10%

Spot electricity price (2005-2017)[2]	5,549 PhP/kWh (114 USD/MWh)

Source: Worldbank, Department of Energy.

[1] As share of 2017 energy generation.

[2] Average spot electricity prices from 2006 to 2017, expressed in 2015 currency.

The objective of this paper is to document and analyze the experience of the Philippines with power markets, regarding design, implementation and outcomes of the market. Ultimately, the analysis in this paper is expected to be useful for developing countries which are currently developing or considering the development of a power market. However, the paper does not aim at providing policy or market recommendations for improving the performance of the Philippines power market. Furthermore, the scope of this paper is limited to assessing competitive power markets, with an emphasis on the generation and supply segment. Hence, retail competition, as well as the transmission and distribution segments, are not the primary focus of this paper. Moreover, the paper does not directly address several power sector reform issues, such as regulation, privatization, and political economy. These and other subjects are addressed elsewhere for each country, as part of the wider project.

This case study is structured as follows. First, section 2 describes the basic pre-conditions for power markets, referring to both power system infrastructure and ownership (section 2.1), and to fuel supply (section 2.2). Section 3 describes the power market design. Section 4 describes the implementation of the power market, referring to both the governance of the market (section 4.1) and the transitional process towards a power market (section 4.2). Section 5 assesses the performance of the power market, from the perspective of prices and efficiency (section 5.1), investment and security of supply (section 5.2), and sustainability (section 5.3). Section 6 concludes this case study.

2 Context and conditions for power markets

2.1 Power System

As the 12th-largest nation in the world, the Philippines has a population of more than 100 million people spread over 7,000 islands, presenting several electricity infrastructure challenges. Luzon (which includes Manila), Visayas and Mindanao are the three main Philippine islands, of which Luzon and Visayas are currently interconnected. The transmission grid in these three major islands is operated by the National Grid Corporation of the Philippines (NGCP). The island of Luzon accounts for 75% of Philippine's energy demand and 73% of installed capacity, with Visayas and Mindanao accounting for 13% and 12% of power demand, respectively (see Figure 2-1). It is worth noting that about 70% of Luzon's demand is concentrated in the franchise area of the major Disco Meralco.

The major transmission grid addressed in this case study comprises Luzon and Visayas, which are interconnected via a submarine HVDC link since 1997. The Visayas grid is in turn composed of five sub-grids in different islands, interconnected via submarine AC lines (NGCP, 2015). Besides the three major islands, there are more than 120 small island and isolated power grids. These smaller systems are not addressed in this case study, since the focus is on wholesale markets and therefore focus on the main power grids.

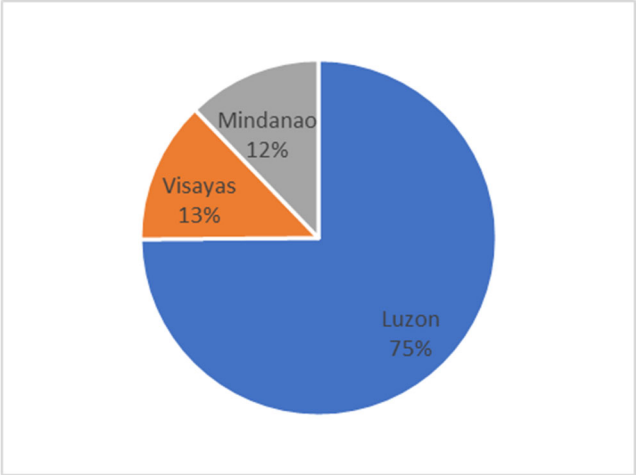


Figure 2-1 Share of electricity demand in Philippine's major islands during 2017.

Source: Department of Energy.

Electricity consumption in Philippines reached 78 TWh in 2017, growing at a CAGR of 4.6% from 2005 (see Figure 2-2**Error! Reference source not found.**). Residential, industrial and commercial consumptions account for most of Philippines electricity consumption in similar amounts (35%, 27% and 35% respectively during 2005, with little changes until 2017**Error! Reference source not found.**).

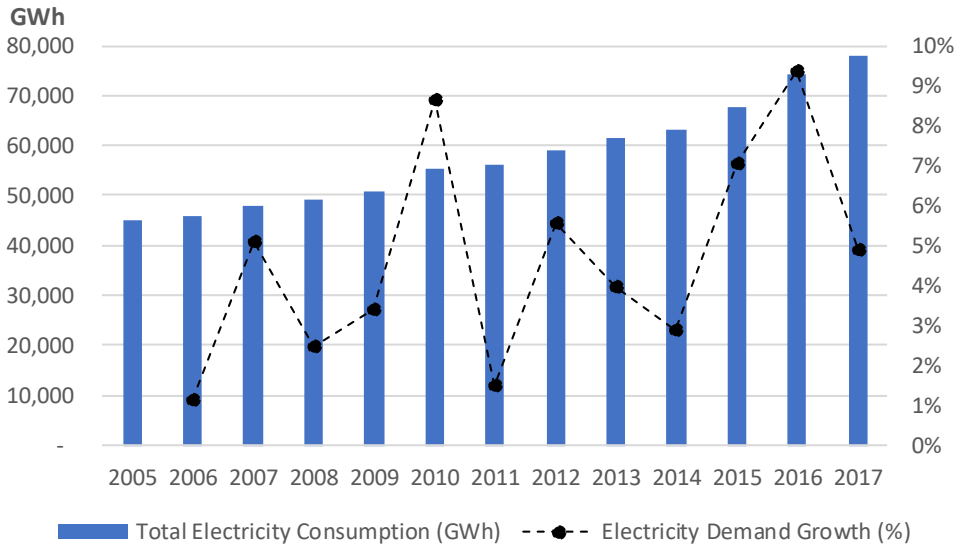


Figure 2-2 Evolution of electricity consumption in Philippines from 2005 to 2015.

Source: Department of Energy.

In 1998 (two years before power sector reform in Philippines), 47% of electricity was generated by oil-fired power plants; 19% from imported coal-fired plants; 4% from local coal-fired plants; 10% from

hydropower; and 20% from geothermal (see Figure 2-3). Philippines is a major geothermal electricity producer. Indeed, Philippines is the second country by geothermal installed capacity with 14% of the world's installed capacity, only surpassed by the USA (BP, 2016).

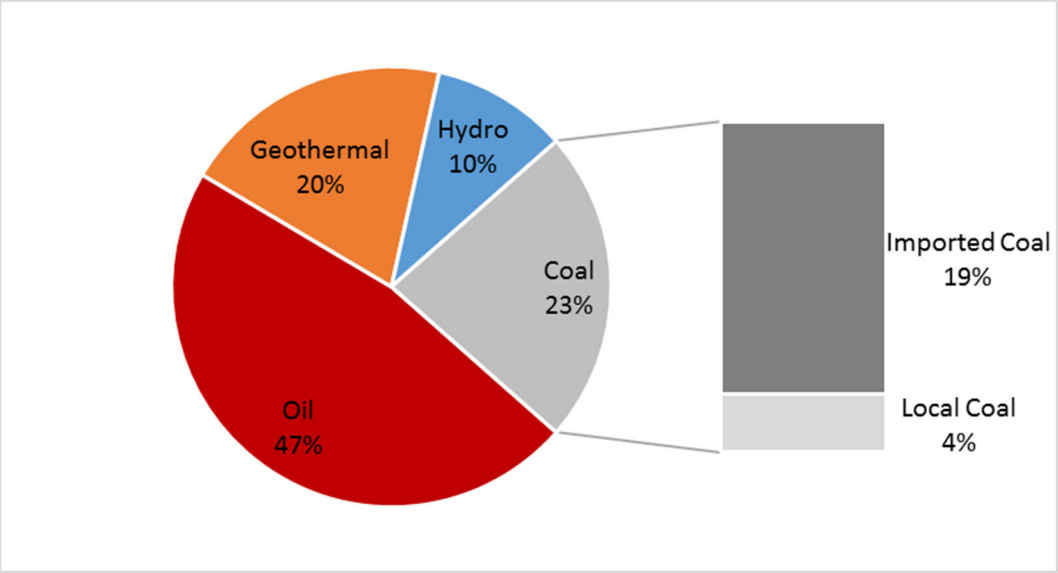


Figure 2-3 Technology-wise share of electricity generation (in GWh) during 1998 in Philippines.

Source: (Toba, 2007)

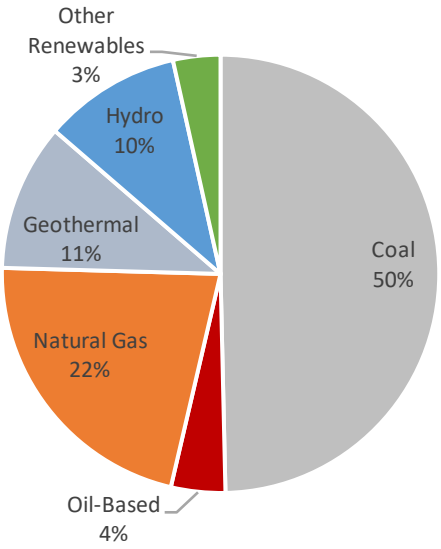


Figure 2-4 Technology-wise share of electricity generation (in GWh) during 2017 in Philippines.

Source: Department of Energy

As of 2017, electricity generation in Philippines was dominated by coal, natural gas, geothermal and hydro (see Figure 2-4). The three main island regions of Luzon, Visayas, and Mindanao each have historically distinct generation profiles (EIA, 2015). In the northern part of the country, Luzon's capacity is mainly powered by fossil fuels. On the other hand, Visayas, in central Philippines, historically relied heavily on its geothermal resources which accounted for 57% of the Visayas' grid dependable generation capacity in 2005; and in the south, Mindanao historically relied on its hydropower resources, which accounted for 60% of dependable generation capacity in 2005. However, coal-based generation has become more important in recent years in both Visayas and Mindanao, accounting for 35% and 40% of dependable generation capacity in 2017, respectively in each grid.

The diverse generation fleet provides enough scope for a competitive wholesale market on the supply side. Almost 60 power plants (mostly privately-owned) are marginal resources during baseload, shoulder and peak hours, providing enough scope for a competitive wholesale market. Baseload and shoulder hours are supplied primarily by coal, while peak-load hours are supplied by both coal and oil. Furthermore, at least 41 power plants are partly dispatched often (i.e. plants with less than or equal to 50% scheduled capacity on average during peak-load hours), providing scope for competition among such generators under the wholesale market. However, the ownership structure of these resources matters and, in the case of Philippines, horizontal and vertical integration has worked to the detriment of competition, as discussed later.

Inadequate transmission capacity is a persistent issue in the Philippine power industry. The Philippine transmission grid has many weaknesses and bottlenecks which in some cases result in power plants being declared as must-run to preserve security of system operation (Roxas & Santiago, 2010). Power sector reforms were undertaken in the 2000s amidst a mismatch of generation and transmission capacity. Two major bottlenecks currently persist in the Philippine power market, namely at the HVDC link between the Luzon and Visayas islands (which transports power mostly from Visayas to Luzon); and at the Zapote substation in Luzon due to frequent N-1 radial congestion (PEMC, 2016c).

2.2 Fuel Supply

Philippines is a net importer of energy, with the Philippine power system being highly dependent on imported coal and oil. The country produces small volumes of oil (nearly all locally produced crude oil is exported), natural gas (used for domestic power generation), and coal.[3] The Philippines has tried to reduce its dependence on fuel imports, increasing its self-supply of total energy mix from 8% in 1973 to over 40% by 1997 (Toba, 2007).

Coal-based generation capacity in Philippines has grown over the past decade and particularly over the past few years (accounting for 50% of power generation in 2017), driving up coal consumption and imports. Coal in Philippines is primarily used for baseload power generation,[4] which accounted for 77% of total coal consumption. The recent increase in coal importation and usage results from the commissioning of 5 new coal power plants with total capacity of about 1 GW. Almost 99% of imported coal was sourced

[3] EIA, Philippines. Available online at https://www.eia.gov/beta/international/country.cfm?iso=PHL [accessed on June 21, 2017.

[4] Coal-fired power plants reached an average capacity factor of 63% (with respect to registered capacity) during 2016 (Market Assessment Group, 2017).

from Indonesia while the remaining was coming from Australia, Vietnam and the Russian Federation (DoE, 2017).[5]

The mid-term outlook for Philippines remains reliant on coal-fired generation to match demand growth. As of December 2017, the Department of Energy (DOE) reports that committed coal-fired power plants for a total of 6.3 GW are planned to be commissioned between 2018 and 2022 in Philippines, equal to 73% of on-grid committed generation projects.[6] It is worth noting that a tax hike on coal was passed in late 2017 in the Philippines. Nevertheless, figures on planned capacity additions refer to power generation projects in advanced development or construction stages.

Natural gas has also become important for power supply (accounting for 22% of power generation during 2017), especially in the Luzon island where the 3 GW of gas-fired generating capacity of the Philippines is located. Three gas-fired power plants were commissioned in the early 2000s in Luzon for a total of 2,700 MW, and two more power plants during 2016 for a total of 520 MW, reaching 16% of dependable generation capacity of Philippines in 2017, and 23% in the Luzon Island. These gas-fired power plants have rather inflexible supply arrangements to access natural gas from the Malampaya deepwater gas-to-power field, compelling those plants to run as baseload resources, especially the 1.5 GW of Santa Rita and San Lorenzo power plants with high take-or-pay quantities.[7] Maintenance shutdown of the Malampaya gas field had, among other factors, led to tight power supply conditions and high spot prices in Philippines in 2010 and 2013, as further discussed later. However, inflexible gas-supply has been at least partially alleviated recently due to the 2010 IPP administration contract of the 1.2 GW Ilijan plant, and the commissioning of two new power plants in 2016 (The Lantau Group, 2011, 2013).

Hydrological conditions also affect the power sector due to the significant share of run-of-river and dam hydro power plants, which account for 16% of dependable generation capacity in 2017. Hydrological conditions are especially important during El Niño meteorological phenomena which result in unusually hot and dry weather in Philippines. Such an event coincided with maintenance shutdown of the Malampaya gas field during 2010, leading to high spot prices and tight supply conditions, as further discussed later.

3 Market design

The Philippine power market is composed of bilateral contracts, and an energy-only bid-based power pool (the Wholesale Electricity Spot Market, or WESM). The market operator (PEMC) develops a least-cost generation schedule and determines the market-clearing spot price considering all power injections and withdrawals from the grid, based on generation offers. However, the spot price is used to settle traded quantities net of bilateral contracts (that is, quantities not covered by contracts). In turn, contracts are settled privately by the parties.

[5] Department of Energy, "2016 Coal Statistics". Available online: https://www.doe.gov.ph/energy-resources/2016-coal-statistics

[6] Department of Energy, "Private Sector Initiated Projects" as of December 2017. Available online: https://www.doe.gov.ph/private-sector-initiated-power-projects

[7] Natural gas-fired power plants reached an average capacity factor of 70% (with respect to registered capacity) during 2016 (Market Assessment Group, 2017).

This section further describes the power market design adopted in Philippines, focusing on the technical and economic dimensions of the reform. Section 3.1 provides an overview followed by a description of each of the following elements of the market: market participants and governance of the market; generation scheduling and dispatch (section 3.2); price formation (section 3.3); demand participation (section 3.4); contracts and bilateral markets (section 3.5); market settlement (section 3.6); and renewable resources (section 3.7).

3.1 Overview

Market participants and their roles in the Philippine power market are the following:

- **Gencos**: own and operate power plants and compete in both the pool market and the market for financial contracts. Private Gencos coexist along government-owned power plants, which have been progressively privatized. There are IPPs with long-term contracts awarded during the 1990s, besides privatized power plants and new entrants after the market reform.
- **Retail Electricity Suppliers (RES)**: engage in the supply of electricity to end-users in the Contestable Market after securing an RES license from the regulator (ERC). Retail Competition and Open Access (RCOA) allows contestable customers in the Luzon and Visayas grids to choose their supplier of electricity under agreed terms and rates.
- **Discos (Distribution Utilities)**: own and operate distribution networks as a regulated natural monopoly. Open access to the distribution network is established under RCOA. Discos also own and operate sub-transmission assets and can be integrated with generation / retailing businesses within regulatory limits.
- **Transmission**: all transmission assets in Philippines are owned by the government company National Transmission Corp. (TRANSCO) as a regulated natural monopoly. The transmission systems are operated by the National Grid Corporation of the Philippines (NGCP) through a 25-year O&M concession agreement. Open access to the transmission network is established.
- **Final customers**:
    - **Directly Connected Customers (DCCs or Bulk customers** connected to the transmission grid): participate in the pool (can opt for demand bidding in the pool or a rather passive participation) and can voluntarily engage in bilateral contracting.
    - **Contestable customers** (large customers can opt for the liberalized supply regime): customers with at least 750 kW, connected to the distribution grid (down from the original threshold of 1 MW), which can choose their retail supplier under agreed terms and prices.
    - **Captive customers**: electricity end-users who do not have choice of a supplier of electricity (mostly households and small businesses connected to distribution networks), as may be determined by the ERC in accordance with the EPIRA.

Entities governing the Philippine power market are the following (further details in section 4.1.2.2):

- **Department of Energy (DOE)**: government agency in charge of planning and policy making for the electricity sector. In addition to its existing powers and functions, EPIRA mandated DOE to supervise the restructuring of the electricity industry. In particular, DOE is mandated by EPIRA to "organize and establish the appropriate market design and governance structure of the WESM".
- **Energy Regulatory Commission** (ERC): regulatory agency created by the EPIRA as an independent, quasi-judicial regulatory body. ERC regulates natural monopolies (distribution and transmission

wires business), issues generation and supply licenses, oversees competition in the power market (including penalization of market power abuse), and enforces the implementing rules (IRR) and regulations of the EPIRA. Specific ERC's tasks related to power markets include the following:

- Approve the Price Determination Methodology for the WESM
- Promulgate and enforce the Grid Code & Distribution Code
- Promulgate and implement Rules for Setting Transmission Wheeling Rates and Distribution Wheeling Rates
- Promulgate the following rules:
  - Open Access Transmission Service Rules
  - Distribution Services and Open Access Rules
  - Rules for the Issuance of Licenses to Retail Electricity Suppliers
  - Code of Conduct for Competitive Retail Market Participants
  - Rules for Contestability
  - Rules for Customer Switching
  - Rules for the Supplier of Last Resort (SOLR)
  - Competition Rules and Complaint Procedures

- **System operator (SO)** under NGCP.
- **Market operator (MO)** currently the Philippine Electricity Market Corp. (PEMC), expected to be transferred to an Independent Market Operator (IMO); governed by the Philippine Electricity Market Board.

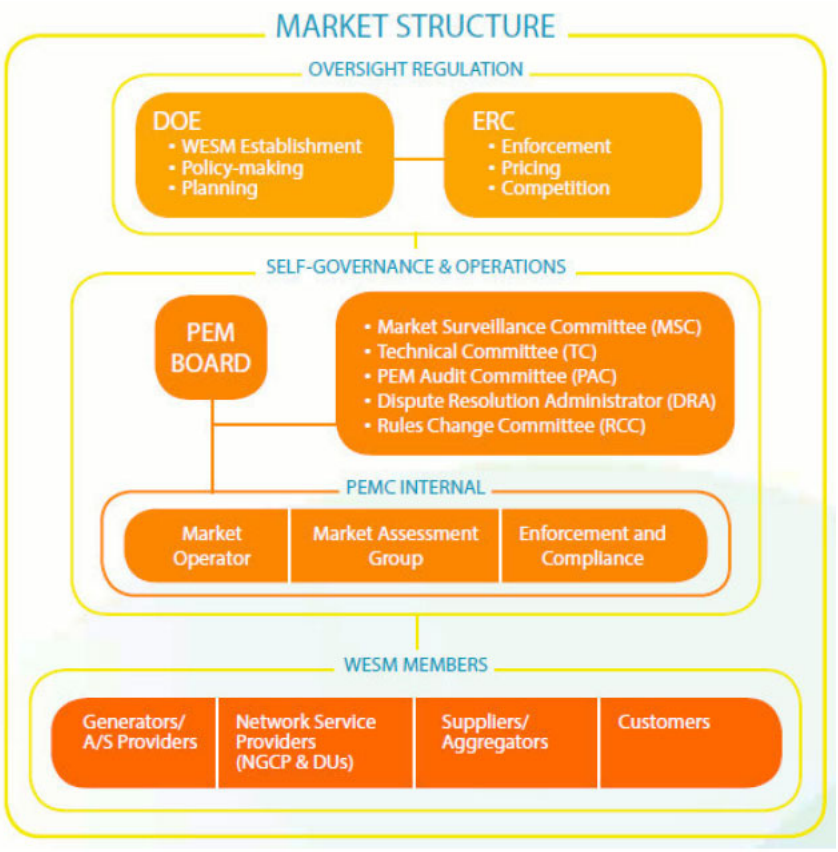


Figure 3-1 Entities governing Philippine's power market.

Source: (ADB, 2016)

A broad overview of power market design in Philippines is summarized in Table 3-1.

Table 3-1 Power market design overview, Philippines.

Power Market Element	Philippines Design Choice
Overall Market Organization	Centralized and mandatory energy-only bid-based power pool; with privately-agreed bilateral contracts. The spot market and price is cleared considering all physical injections and withdrawals, but the spot price is only used to settle quantities not covered by bilateral contracts.
Demand Participation	Discos and bulk customers (Directly Connected Customers, DCCs) can engage in voluntary bilateral contracting (i.e. there is no contracting nor forward procurement obligations on Discos). Inelastic consumption forecasts must be provided by demand. To this date, demand has been passive in the pool. Customer choice enabled since 2013 for small consumers.
Coordination of Operations	Least-cost hourly schedule developed by the market operator under PEMC, based on generation bids, and considering transmission and security constraints. Schedule and dispatch implemented by the system operator NGCP, based on generator capabilities and the real-time state of the system.

Congestion management	Financial transmission rights allowed in the market rules but not yet implemented.
Reserves and ancillary services	Reserve prices are based on the approved rates under the Ancillary Services Procurement Agreement of NGCP with various reserve providers. The cost is currently paid by all electricity consumers. Co-optimization of reserves and energy scheduling is envisioned but yet to be implemented in practice.
Contracts and Bilateral Markets	Gencos and demand can voluntarily engage in financial bilateral contracts, with confidential terms, and regulated prices / approval in the case of Discos. Bilateral Contract Quantities are netted out of the spot market for the purpose of settlement.
Price Formation	Hourly nodal prices cleared by bid-based, centralized optimization of the market operator. Gencos bid price-quantity pairs in 1 MW blocks, but must offer their entire available generating capacity. Genco offers are capped at 62,000 PhP/MWh (cap lowered in 2014 following price spikes in November -December 2013).
Capacity Markets	No specific capacity market currently exists, besides privately agreed provisions in bilateral contracts.
Settlement	The Market Operator administers a two-settlement system (ex-ante and ex-post) to settle physical transactions of electricity in the gross pool, based on ex-ante / ex-post system locational marginal prices; and pool quantities net of bilateral contracted quantities. Bilateral Contract Quantities are settled privately by the parties, outside the power pool, at regulated prices for Discos, and agreed prices in the case of DCCs and Contestable Customers.
Non-Conventional Renewable Generation	Renewable power plants are paid at the approved Feed-in-Tariff regardless of market prices. RE plants enjoy priority dispatch and access status. Recently, Renewable Portfolio Standards (RPS) impose obligations on Discos to source an agreed-upon portion of its energy supply from eligible renewable suppliers.

3.2 Generation scheduling and dispatch

The WESM uses a Market Dispatch Optimization Model (MDOM) which performs market clearing computations. It receives information on system conditions and requirements from the System Operator, and market offers from trading participants. It then processes the submitted information to come up with an optimal scheduling of energy that will maximize economic gains for the trading participants, considering the physical limitations of the transmission network and of the facilities of the trading participants.

The optimization process produces the following outputs:

- system marginal price
- generation output levels for each generating resource
- transmission line flows
- transmission losses
- energy prices at each market trading node (considering transmission losses and congestions)

All generators submit price and quantity offers to the market for all the energy they intend to produce, irrespective of their contracts with customers. The Market Operator then schedules all available generation to meet the forecasted load, considering technical constraints in order to maintain power balance in the grid.

Submission of price and quantity offers and bids is done through the market interface provided by the market operator. Through the MDOM, the offers submitted by the generators are ranked from lowest to highest price offer. Generating facilities that are scheduled to run are stacked based on their price offers until the total generation matches the total load requirement for a particular trading interval. The Market Operator maintains and publishes a Market Network Model, used for central scheduling and dispatch, pricing and settlement. The Market Network Model is an approximate physical representation of the power system elements, including minimum stable load levels and ramping capabilities of power plants.

Prices differ across nodes in the network due to the presence of both physical losses and network constraints (congestion). Under an unconstrained system, the market clearing price (MCP) is set by the system marginal price. If the system is constrained, different plants will be setting the MCPs in different nodes in the system due to line constraints. Although most transmission and system constraints are considered during market scheduling, local issues (e.g. voltage, local emergency) are handled by the SO.

The Philippine Electricity Market Corporation (PEMC), which serves as the Market Operator of the Philippine WESM, provides NGCP with the generation schedule, but the actual dispatch is implemented by the System Operator (NGCP) taking into consideration the congestion and state of the system. The generators are scheduled and dispatched based on their capabilities as determined during NGCPs accreditation and evaluation process.

3.2.1 Physical provisions of contracts: Maintenance, off-take and dispatch

Bilateral contracts normally provide for the number of days that the plant will undertake its preventive maintenance and the allowed number of days for forced outage. However, the schedule as to when this maintenance is going to be undertaken is within the generation company's discretion in coordination with the System Operator (NGCP) . The agreed maintenance schedule forms part of the Grid Operating and Management Program (GOMP).

Some contracts include provisions for minimum energy off-take and/or minimum guaranteed demand. There are also contracts which provide for the preferential dispatch over other suppliers of the Discos for economic and technical considerations.

3.2.2 Ancillary Services

The System Operator (NGCP) has the obligation to identify and arrange for a provision of adequate ancillary services for each region either:

- By competitive tendering process administered by the System Operator;
- By negotiating contracts directly with an Ancillary Services Provider who is a direct WESM member

Payments for ancillary services are made by the Market Operator via the settlements system. The Market Operator in coordination with the System Operator, shall establish and administer a spot market for the purchase of certain reserve categories. While reserves are co-optimized with energy the scheduling and dispatch still remains with the NGCP and the prices are based on the approved rates under the approved

Ancillary Services Procurement Agreement (ASPA) of NGCP with various reserve providers. The cost of these Ancillary Services is currently paid by all electricity consumers.

3.3 Price formation

Hourly nodal prices are cleared by centralized optimization of the market operator, based on bidding by Gencos and inelastic demand. Gencos bid price-quantity pairs in 1 MW blocks, monotonically increasing in price. It is worth noting that DOE has recently mandated the reduction of the trading interval to 5-minutes to determine dispatch and spot prices.[8]

It is important to note that the Philippine spot market is a hybrid between a gross pool for generation scheduling, with bilateral contracts which often include minimum off-take requirements (Abrenica, 2014). Unlike bilateral power markets where generators can self-dispatch based on physical contracted quantities (and can offer excess capacities in the spot market), scheduling in Philippines is based on economic dispatch of all the offered generation capacities. Hence, many power plants offer zero or negative prices to ensure dispatch in order to fulfill minimum off-take requirements of bilateral contracts.[9] On the other hand, a must-offer rule requires Gencos to offer their entire available generation capacity, in order to prevent capacity withholding from the market. Furthermore, the regulator established offer and price caps in 2013-2014 following sharp spot price spikes (see section 4.1.3).

Market-clearing nodal prices are determined by the Market Operator's optimization model, considering transmission losses and congestions (although a price-substitution methodology is in place to avoid extreme nodal price separation). Gencos are paid at the nodal price for produced quantities net of Bilateral Contract Quantities (BCQs), while buyers pay a zonal price (weighted average of nodal prices at all off-take nodes within the pricing zone) for consumed quantities net of quantities traded in bilateral contracts.

Retail tariffs are regulated for captive customers, and the generation charge is passed-through by Discos to final customers (mostly households and small businesses). The energy charge to final customers covers both payments for bilateral contracts and purchases from the spot market (WESM).

3.4 Demand participation in the wholesale market

Demand participates directly in the financial bilateral contracts market; while retail customers can choose their retail supplier. Discos and bulk customers (i.e. connected to the transmission grid) can engage in contracting directly with suppliers. Discos and bulk customers are also forced to participate in the gross power pool for settling physical energy transactions not covered by bilateral contracts.

Direct demand participation in the wholesale market is envisioned in the market rules but is not yet implemented in practice. It is noteworthy that Discos tend to be passive buyers due to the pass-through of the generation charge to captive customers (PEMC, 2014). Moreover, cross-ownership between

[8] DoE circular No. 2015-10-0015. Available online: https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc_2015-10-0015.pdf

[9] For example, PEMC's 2016 Annual Market Assessment Report indicates that all geothermal power plants in Luzon priced their capacity offers at zero or negative prices during the year; while Luzon coal plants priced 45% of its capacity offers between 0 and 5,000 PhP/MWh, and 53% were priced at zero or negative (2% bid higher than 5,000 PhP/MWh).

generation and distribution businesses is allowed up to limits established by the electricity reform law (Republic Act No. 9136 – Electric Power Industry Reform Act of 2001 or EPIRA Law).

3.5 Contracts and bilateral trading

Bilateral contracts cover most of electricity demand in Philippines (84% during 2017). Bilateral contracts in Philippines power market are mostly Power Supply Agreements (i.e. physical contracts) at the wholesale level. However, bilateral contract accounting in the WESM is financial since it allows customers to sell generating capacities in excess of contract quantities (or buy electricity not covered by contracts).

The contract terms are privately agreed upon by the parties and remain confidential, although contracts for the supply of captive customers (mostly households and commercial customers) are subject to regulatory reviews and approval. Regulated contracts are priced based on actual costs of generation (variable and fixed) with allowable return on capital. Actual generation costs are indexed to their fuel costs (e.g. coal, diesel), inflation and foreign exchange rates. Generation costs are passed-through by Discos to final customers.

3.6 Market settlement

Settlement in the spot market is undertaken by the market operator, while payment for ancillary services is settled by the market operator according to the rate contracted by the system operator. Bilateral contracts are settled outside of the market, based on the agreement between sellers (the generators) and buyers (distribution utilities, bulk customers or retailers).

The settlement process involves determining ex-ante and ex-post prices and quantities (net of bilateral contract quantities). Ex-ante billing is based on the ex-ante price determined by expected system conditions on an hourly basis, and is commonly positive for generators and negative for customers. Ex-post billing is based on realized system operation (particularly actual demand levels) and may be either positive or negative for generators and demand alike. It is worth noting that WESM enhancements ruled by DOE in 2017 establish ex-ante pricing only, in 5-minute intervals, although such enhancements are not yet implemented.

Total trading amounts arising in the spot market (including ex-ante and ex-post energy trading amounts, among others) are administered by the market operator. WESM members with a negative settlement amount must pay that amount to the market operator on a monthly basis. Likewise, WESM members with a positive settlement amount receive a payment for that amount from the market operator.

Generic instruments to ensure timely payment in the wholesale market include insurances, penalties, suspension from the market and disconnection from the grid.

3.7 Renewable resources

The energy generated by Feed-In-Tariff (FIT) eligible renewable power plants (i.e. wind, solar, run-of-river hydro and biomass) is paid at the approved FIT rate for the respective Renewable Energy (RE) plants regardless of the market prices. The difference between the spot price and the FIT rate is paid by TRANSCO through the FIT-ALL Fund which comes from collection from all electricity users as universal charge (i.e., users tax), thus making the RE developers whole.

The level of FIT approved by the regulator (ERC) on 2012 (updated downwards for solar and wind in 2015, see Table 3-2) is well above average generation costs in Philippines (USAID, 2013). Approved FIT levels

apply for a period of at least 12 years. However, the DOE Secretary decided to suspend the allocation of new FIT contracts.

Table 3-2 Feed-In-Tariff levels approved for renewable power plants in 2012.

Renewable Technology	Approved FIT in 2012 (P/kWh)	FIT update in 2015 (P/kWh)	Approved FIT (2015 USD/MWh)
Run-of-river hydro	5.90	-	130
Biomass	6.63	-	146
Wind	8.53	7.40	163
Solar	**9.68**	**8.69**	**191**

Source: ERC Resolutions

RE plants must register with the WESM and must comply with NGCP and/or the Host Disco's interconnection requirements (in the case of embedded RE plants). RE plants enjoy priority dispatch status since May 2015 (PEMC, 2017a). Registered capacity of preferential dispatch resources in the WESM totals about 1.2 GW as of June 2017.

The DOE issued in December 2017 the Renewable Portfolio Standards (RPS) rules for On-Grid areas (circular DC2017-12-0015), mandating suppliers to source or produce a certain percentage share of their total energy sales from eligible renewable energy sources. The RE percentage grows at a minimum of 1% annually in order meet an "aspirational target" of 35% by the year 2035. The rules also envision a market for trading Renewable Energy Certificates (REC). RPS shall be enforced beginning in 2020, with a transition phase during 2018-2019.

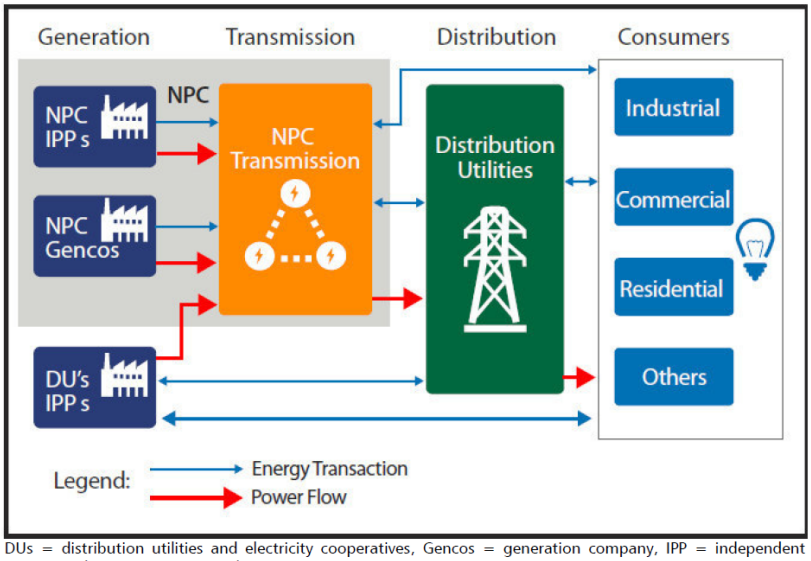
4 Power market implementation

This section describes the implementation of the power market design in Philippines. First, governance and structure of the power market are described in section 4.1. Then, the process of transition towards the envisioned power market is described in section 4.2. Indicators of the Philippines' power market and a summary of its implementation are then presented in section 4.3.

4.1 Power market governance and structure

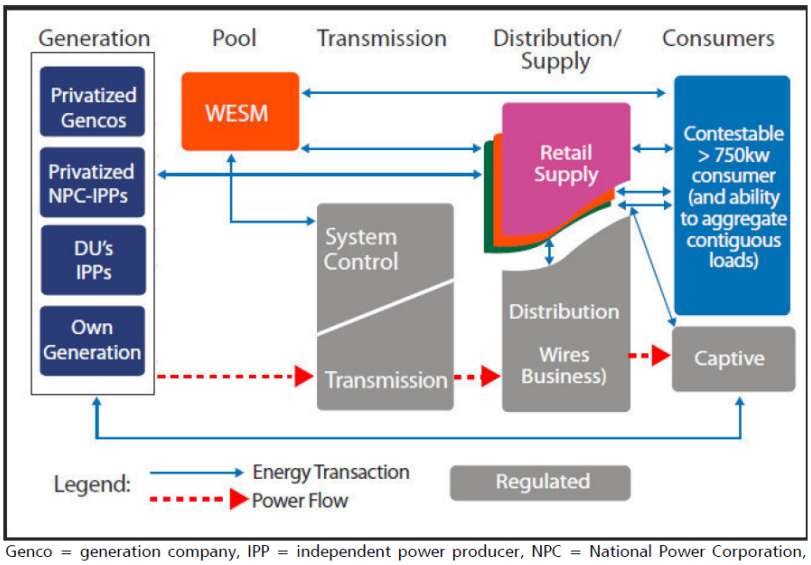
The Philippine power sector evolved from a vertically integrated industry to a partially unbundled industry, after the introduction of IPPs in the 1990s to solve the deep power supply crisis, by means of the major reform undertaken in 2001 by enactment of EPIRA (as further described in section 4.2). After the power sector reform, generation was deregulated and a wholesale market (WESM) was established in 2006, with open access to the transmission grid (see Figure 4-1 and Figure 4-2). Transmission ownership was unbundled from generation and distribution. Generation and distribution companies are allowed to remain (vertically) integrated, within limits imposed to trading between related companies (see section 4.2.2).

Wholesale market operation was separated from transmission ownership and system operation (which remain integrated). Customer choice was eventually enabled for large customers in distribution grids; while bulk customers connected to the transmission grid have directly participated in the power market since its inception (although only through bilateral contracting). Transmission and distribution are treated as natural monopolies regulated by the ERC.



DUs = distribution utilities and electricity cooperatives, Gencos = generation company, IPP = independent power producer, NPC = National Power Corporation,
Source: KPMG. 2013. *The Energy Report Philippines, 2013–2014.* Manila

Figure 4-1 Pre-EPIRA power sector organization.



Genco = generation company, IPP = independent power producer, NPC = National Power Corporation, WESM = wholesale electricity spot market.
Note: TransCo is the public sector asset owner and the National Grid Corporation of the Philippines the private operator and concessionaire for the transmission system.
Source: KPMG. 2013. *The Energy Report* Philippines, 2013–2014. Manila

Figure 4-2 Post-EPIRA power sector organization.

EPIRA establishes open access for the use of the transmission and distribution systems and associated facilities, subject to the payment of wheeling rates duly approved by the ERC. Indeed, transmission is a regulated common carrier business that provides open and non-discriminatory access to all electric power industry participants. Distribution to end-users is a regulated common carrier business requiring a national franchise and provides open and non-discriminatory access to all users. Open access at the distribution level, however, was designed as a phased transition after required preconditions are met in the power sector, as further described in section 4.2.

The WESM is a self-governing institution, governed by the PEMC which is in turn chaired by the government through the Department of Energy. PEMC is composed by WESM members (including generators, distributors, etc.) who participate in the PEMC board and also in committees which govern specific aspects of the market. Market operation is performed by PEMC and is expected to be transferred to an Independent Market Operator in the near future. The regulator oversees the market.

The ownership structure of the Philippine electricity industry is further described in section 4.1.1. The system and market operators, and the governance of the market, are further described in section 24.1.2. Market oversight, enforcement, intervention and conflicts due to market power exercise are further described in section 4.1.3.

4.1.1 Ownership structure of market participants

Ownership limitations. EPIRA forbids government investment in new generation or the underwriting of new capacity with take-or-pay contracts or operating/financial guarantees. Furthermore, EPIRA forbids cross-ownership of transmission and generation. However, EPIRA allowed for limited generation and distribution integration, by allowing Discos to source a maximum of 50% of its total demand from bilateral contracts with associated Gencos. Taking advantage of such provision, the controlling shareholders of the

dominant Disco Meralco also own significant generation capacity, a strategy that has been argued to lead to a conflict of interest for competition and open access to distribution networks (i.e. by curbing the practical extent of retail customer choice) (Toba, 2007).

ERC established in 2007 limits on the maximum market share in the generation segment in terms of generating capacity, at 30% for each of the three major islands, and 25% for the country as a whole. Later on, a limit of about 600 MW of installed capacity was imposed for new generation facilities in Luzon and 150 MW for facilities in Visayas and Mindanao, for security of supply reasons.

WESM liquidity-enhancing provisions. The EPIRA law required all DUs to source from WESM at least 10% of their demand in the first 5 years of the WESM. After 5 years, there is no requirement on the quantities procured by DUs from the WESM, allowing DUs to purchase 100% from bilateral contracts or 100% from the WESM. Bilateral contracts between Gencos and Discos are subject to ERC's Individual review of bilateral contracts or Power Supply Agreements (PSAs). However, there is a dichotomy in generation which is supposed to be competitive. Although in the WESM, generation is competitive, PSAs (about 90% of the generation output) entered into by distribution utilities are subject to review by ERC on the basis of costs, for reasons indicated in EPIRA as: "A distribution utility shall have the obligation to supply electricity in the least cost manner to its captive market, subject to the collection of retail rate duly approved by the ERC".

4.1.2 System and market operators

Per the EPIRA, the Market Operator (the Autonomous Group of Market Operator or AGMO, prior to establishment of the Independent Market Operator or IMO) is currently the Philippine Electricity Market Corporation (PEMC), a non-stock, non-profit organization, which governs and administers the operation of the WESM in accordance with the WESM Rules enacted by the DOE in 2002. All Gencos, Suppliers, Discos and bulk customers (i.e. withdrawing power from the transmission system) have to register as WESM members. PEMC is the governing entity of the WESM, whereas the market operation function currently performed by PEMC is expected to be transferred to an Independent Market Operator in the near future. The system operator of Philippines is the National Grid Corporation of the Philippines (NGCP), a different entity than PEMC.

4.1.2.1 Functional description

Under the WESM Rules, the System Operator (under the National Grid Corporation of the Philippines, or NGCP) shall:

- Be responsible for and **operate the power system** in accordance with the WESM Rules, the Grid Code and any instruction issued by the Market Operator or the ERC.
- Provide **central dispatch to all generation facilities and loads connected**, directly or indirectly, to the transmission system in accordance with the dispatch schedule submitted by the Market Operator.
- **Contribute towards the development of procedures**, processes or systems, or to assist with any aspect of the operation of the spot market, in coordination with the Market Operator.

In other words, the system operator performs the following functions:

- Maintaining short-term reliability
- Least-cost dispatch and system operation

- Congestion management
- Coordinate the operation of ancillary services
- Accountability of system operations

Under the WESM Rules, the Market Operator shall, generally and non-restrictively:

- Administer the operation of the WESM in accordance with the WESM Rules;
- Allocate resources to enable it to operate and administer the WESM on a non-profit basis;
- Determine the dispatch schedule of all facilities in accordance with the WESM Rules. Such schedule shall be submitted to the System Operator;
- Monitor daily trading activities in the market;
- Oversee transaction billing and settlement procedures; and
- Maintain and publish a register of all WESM Participants and update and publish the register.

4.1.2.2 Governance of the wholesale market

The governance of the Philippines wholesale market is illustrated in Figure 4-3.

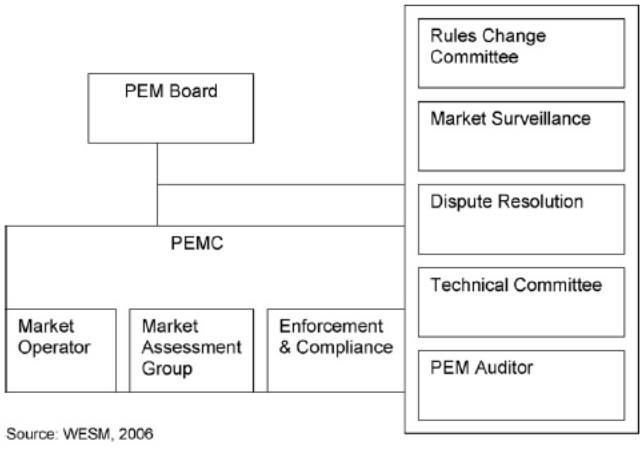


Figure 4-3 Governance structure of the Philippine power market.

Source: (Fe Villamejor-Mendoza, 2008)

The Philippine Electricity Market Board (PEM Board) governs the PEMC. The PEM Board is chaired by the Secretary of Energy, and is a 15-member body consisting of an equitable representation from the different segments of the power supply chain (generation, distribution and electric cooperatives, supply, transmission, and the market operator) and independent members (independent of the power sector and the government). The PEM Board provides the policies and guidelines of the WESM contained in the Implementing Rules and Regulations of the Act, WESM Rules, and such other relevant laws, rules and regulations.

Looking at the composition of the PEM Board, there would still be that question of independence which is quite a important issue to ensure power market competition. Indeed, the PEM Board, being chaired by the Secretary of Energy, is open to government intervention. This vulnerability should be addressed if operation of the WESM is turned over to the independent market operator (IMO). Unfortunately, as reported by the DOE, there have been some delays in achieving the goals of the EPIRA, which concern the

transition of PEMC to an Independent Market Operator (IMO, see section 4.2). Only very recently, in February 2018, did the PEM Board approve the creation of the Independent Market Operator.[10]

The WESM Rules provide for the creation of committees with specific responsibilities to support the PEM Board in the exercise of its governance functions. Governance committees oversee the varied activities of the electricity market (PEMC, 2017b). More precisely, the PEM Board shall form working groups and appoint qualified personnel who shall act as the following (Adviento, 2015):

- **PEM Auditor**
  - Supervised the conduct of audits of the operation of the spot market and of the Market Operator in order to reinforce trading participants' confidence in the transparency and adequacy of WESM operations
  - Conducts Metering Arrangement Review in the WESM and the Retail Market
- **Market Surveillance Committee** (MSC), whose members must be independent from both market participants and the government
  - Monitors activities conducted by WESM Participants in the spot market
  - Monitors possible breaches of the WESM Rules
  - Defines and reviews market monitoring data and indices
- **Technical Committee** (TC)
  - Monitors and reviews technical matters of the Spot Market to ensure attainment of WESM objectives
  - Assists the PEM Board by providing expertise in relation to IT, metering technology and metering data and other technical matters
- **Rules Change Committee** (RCC): assists the PEM Board and DOE in relation to the revision and amendment of the WESM Rules, market manuals, procedures and guidelines
- **Dispute Resolution Administrator** (DRA)
  - Administers the dispute resolution process as provided for in the Dispute Resolution Market Manual and the WESM Rules
  - Facilitates the mediation and arbitration of disputes between WESM participants to reach resolution in accordance with the market objectives

The Market Assessment Group (MAG) within the PEMC serves as the primary support unit of the PEM Committees and the PEM Board, and it is responsible of the following tasks:

- Conduct market research and studies;
- Provision of data processing capability;
- Drafting of Technical Reports and Studies for the Committees;
- Advisory and secretariat support during Committee meetings;
- Assist the PEM Board or the Market Surveillance Committee to establish the procedures for monitoring and assessing the performance of the WESM and the activities conducted by the WESM members with the goal of ensuring the effective functioning or overall efficiency of the WESM;

[10] http://www.manilatimes.net/new-wesm-operator-approved-pemc-board/377989/

- Regularly collect and process market monitoring data and indices; and
- Prepare periodic assessment reports on overall market performance and competitiveness.

The MAG issues monthly and annual reports assessing the market. The market assessment reports comprise figures and analyses of outages, spot prices and traded quantities, concentration and structural indices (such as HHI, Price-Setting Frequency, Pivotal Supply and Residual Supply Index), among others. However, the reports fall short of analyzing bidding behavior (beyond identifying generation offer patterns) and assessing market outcomes, particularly whether or not these outcomes are deemed to be competitive.[11] The Market Surveillance Committee does analyze events of unusual spot prices detected by the MAG, but again their annual reports fall short of more in-depth and comprehensive analyses of market outcomes.

4.1.3 Oversight, market intervention and dispute resolution

4.1.3.1 Rule-based market intervention

There have been interventions of the market during natural calamities or international / national security emergencies, based on explicit provisions laid out in market rules. There are no publicly known instances of distortion of the system or market operation by political pressures or other criteria unrelated to reliability standards and economic efficiency. Market rules establish the conditions for market intervention and suspension, during which market-based prices are replaced by an administered price cap set by the Market Operator, to be used as basis for settlements.

4.1.3.2 Regulatory oversight

The regulator (Energy Regulatory Commission, ERC) is responsible for the oversight of the Philippine wholesale market. The ERC has the primary jurisdiction to impose the rules and regulations of the electricity spot market and to investigate and act against any participant or player in the electricity industry for violations of any law, rule or regulation governing the same, including the rules on cross-ownership, anti-competitive behavior, abuse of market positions, must-offer rule of the pool, and other similar or related acts. In compliance with its responsibility under the EPIRA, the ERC promulgated in August 2006 competition rules and complaint procedures (ADB, 2016). The Philippine Competition Commission, a new anti-trust agency, was created by law in 2017. The Commission oversees mergers and acquisitions and has primary responsibility to investigate and rule on market competition, including uncompetitive behavior.

Enforcement is targeted towards two types of breach that are believed to have the most impact on efficiency of the market and its ability to achieve its objectives, namely compliance with offer rule and with dispatch schedules, and dispatch tolerance by scheduled generating units. Deterrence of breach is anticipated to be achieved through regular monitoring of compliance and immediate initiation of investigations for probable breach; and imposition of stiff financial penalties (ADB, 2016). ERC has

[11] See for example market monitoring reports for PJM (http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018/2018q1-som-pjm.pdf) and CAISO (http://www.caiso.com/Documents/2017FourthQuarterReport-MarketIssues-PerformanceFebruary2018.pdf), which focus on the performance and competitiveness of the markets (energy, capacity, etc.).

conducted two major investigations on market power allegations, first in 2007 and then in 2013, following steep spot price hikes (see section 4.2.4).

4.1.3.3 Dispute resolution

Decisions by the market or system operator can be appealed to the regulator (ERC) and the Department of Energy. This shall first undergo the Dispute Resolution Process under the WESM Rules before filing a formal complaint to the ERC. There are dispute resolution procedures set out in the WESM Rules which apply to all disputes relating to or in connection with transactions in the WESM which may arise between or among market / system operators, WESM members. However, several disputes have escalated to the Supreme Court, such as those regarding allegations of market power abuse.

4.2 Transitional process

The Philippine power market was established with the ultimate goal of attaining open access and retail competition in the electric power industry. Wholesale competition commenced in 2006 with the commercial operation of WESM (managed by PEMC), while retail competition was opened in 2013. The evolution of the Philippine power market is summarized in Table 4-1 by highlighting reform milestones and other major events.

Table 4-1 Milestones and other relevant events of Philippine power market evolution.

Year	Milestone (or major event related to power markets)
1986	Introduced IPP Program which allowed private sector participation in the generation sector, which was previously a monopoly of NPC.
1990	Power supply crisis, with brownouts averaging 7 hours per day in 1992-93 in many Philippine regions.
1993	Electric Power Crisis Act (R.A. 7648) granted the Philippine President an emergency power which allowed NPC to negotiate PPAs with IPPs.
1997	IPP increased to 46% of total generation, successfully ending the power crisis (Toba, 2007).
2001	Electric Power Industry Reform Act of 2001 (EPIRA)
July 2001	The Power Sector Assets and Liabilities Management Corporation (PSALM) began operations after being formally established on June 26, 2001
December 2001	Grid Code & the Distribution Code was promulgated by the Energy Regulatory Commission (ERC)
2002	WESM operations planned to start in 2002. WESM rules promulgated by DOE on June 2002.
March 2003	The National Transmission Corporation started its operation as monopoly transmission company
May 2003	Transmission Wheeling Rate Guidelines was promulgated by the ERC
October 2003	Start of implementation of the unbundled retail tariff of the distribution utilities as well as the removal of intra-grid and inter-class cross subsidy
November 2003	The Philippine Electricity Market Corporation was incorporated.
October 2004	Open Access Transmission Service Rules was promulgated by the ERC
December 2004	Distribution Wheeling Rate Guidelines was promulgated by the ERC
June 2006	Wholesale Electricity Spot Market commences commercial operation in Luzon
2007	ERC rules out PEMC's allegation of market power abuse by PSALM.
2007	ERC sets limits on market share per grid (Resolution 20).
December 2007	Transco NGCP privatized through a 25-year O&M concession after four failed bidding rounds.
2008	Enactment of Renewable Energy Act (R.A. 9513), mandating Feed-In-Tariff and priority connection / dispatch for renewables; besides other fiscal incentives.
2008	Meralco controversy due to high retail prices allegedly for using its own expensive power plants instead of cheaper available generation (Fe Villamejor-Mendoza, 2008).
January 2009	National Grid Corporation of the Philippines (NGCP) takes over power transmission function from Transco, as Transmission Service Provider and at the same time System Operator.
June 2010	Requirement for DUs to source from WESM at least 10% of their power supply was lifted in accordance with RA 9136.

December 2010	The island of Visayas is integrated to the Luzon WESM administered by PEMC.
2011	Price substitution methodology established in the WESM.
December 2012	Commencement of a 6-month transition period to the Retail Competition and Open Access (RCOA) on June, 2013.
June 2013	• Commercial Operation of Retail Competition and Open Access (RCOA), after the said 6-month transition period. • Optional Contestability. Mandatory contestability under RCOA still has to be declared by the ERC.
November 2013	Mindanao wholesale market (Interim Mindanao Electricity Market or IMEM) commenced operation (separated from the Luzon-Visayas market).
November through December 2013	Sharp pool price spikes prompted market intervention by the regulator and an investigation which finally ruled 12 market participants to have engaged in anti-competitive behavior, to the detriment of final customers.
December 2013	Offer Price Ceiling lowered from 62,000 PhP/MWh to 32,000 PhP/MWh
February 2014	Mindanao wholesale market suspended after three months of operation, following a grid-wide power interruption in the region, as well as problems with settling the market.
May 2014	ERC issued an urgent resolution establishing an interim secondary price cap of 6,245 PhP/MWh
December 2014	ERC adopted a permanent pre-emptive mitigation measure, where the price cap of 6,245 PhP/MWh would be imposed if the average WESM spot price exceeds 9,000 PhP/MWh over a rolling seven-day period.
2015	ERC ruled on the FIT Rates for the second round of the FIT program
June 2015	DOE issued Circular No. DC2015-06-0008, "Mandating All Distribution Utilities to Undergo Competitive Selection Process (CSP) in Securing Power Supply Agreements (PSA)" after several groups of small electric cooperatives successfully bidded-out their aggregated demand (150 to 300 MW) resulting in a reduction in generation contract prices
July 2015	Wholesale Aggregation Scheme is discontinued (ERC Resolution No. 12 Series of 2015).
October 2015	DOE issues circular on Enhancement of the WESM, establishing 5-minute intervals, ex-ante pricing only, and economic scheduling of Pmin, among other enhancements which, however, are not yet implemented in WESM.
December 2015	DOE issued WESM rules on Central scheduling of energy and reserves. Co-optimization of reserve with energy has not been implemented yet.
June 2017	DOE declares launch of trial operations of the wholesale spot market in Mindanao
December 2017	DOE issues resolution on Renewable Portfolio Standards
July 2018	The DOE Secretary turned over the chairmanship of PEM Board to a representative of the private sector to start the shift from AGMO to IMO.

To achieve open access and retail competition, the electric power industry had to be restructured and the assets of the National Power Corporation (NPC) privatized. Stranded debt and contract costs resulted from power market reforms due to both sunk costs by the incumbent utility and contracts awarded to IPPs.

Significant preparations were necessary for putting up the systems and the appropriate infrastructure, including:

- the establishment of WESM Rules (2002) and Procedures, among others,

- establishing the merit order dispatch instructions for each time period;
- determining the market-clearing price for each time period; and
- administering the market.

Considerable efforts also went in looking for the appropriate software for the market bidding procedures and the price determination algorithm.

Thus, actual start of the WESM took place only on June 26, 2006, five years after the enactment of the EPIRA and not one year as indicated therein. It is understandable that the WESM will continually be improved on, revised, and expanded. In fact, a separate wholesale market for the Mindanao Island was set up by PEMC in 2013, but the market was suspended after three months of operation following a grid-wide power interruption in the region. The target launch date for the Mindanao market was set for June 2017 (PEMC, 2017a). The trial market eventually started on June 30, 2017, but the actual market start has been delayed and is yet to start.

Philippines is yet to establish a fully Independent Market Operator (IMO) as envisioned in EPIRA. For the first year, the Market Operator's functions shall be provided by the Autonomous Group Market Operator (AGMO) under the administrative supervision of the National Transmission Corporation (Transco). After the first year, the Market Operator shall be an independent entity (the Independent Market Operator). Thereafter, the administrative supervision of the Transco over such entity ceased.

PEMC, which has been governing and operating the market since 2006, is currently not an independent entity (as previously discussed), although such lack of independence does not seem to have had adverse effects. But under EPIRA, WESM operation must be transferred to an independent entity or IMO one year after its establishment. The IMO structure will come out to instill true independence without any structural or political constraints to power market competition in the country. However, the ADB has argued that a *"reassessment and careful choice of the independent marker operator is needed, since the lack of independence of PEMC has had no obvious adverse repercussions to date, suggesting that it could be counterproductive to force the pace of change to establish the IMO that the EPIRA and project design called for, and the government undertook to create but did not"* (ADB, 2016). The DOE Secretary has in July 2018 taken the first step towards establishing the IMO by turning over the chairmanship of the PEM Board to a representative of the private sector.

Regarding retail competition and customer choice, EPIRA established five specific pre-conditions to be met before commencing the competitive supply regime for customers connected to distribution networks down to 750 kW (see section 4.2.3). The ERC declared the commercial commencement of RCOA on 2013, but the regime was later postponed. In the meantime, customers with demand above 750 kW are free to choose their preferred supplier.

The evolution of market coverage, industry structure and retail competition is further discussed under sections 4.2.1, 4.2.2, and 4.2.3, respectively. Market power concerns in Philippine's electricity market are presented in section 4.2.4.

4.2.1 Evolution of market coverage

PEMC currently operates the country's electricity spot market in the Luzon and Visayas Regions. The WESM in Luzon started in June 2006, while Visayas was incorporated in the Luzon wholesale market administered by PEMC in 2010.

Mindanao is not part of the WESM and its power grid is not currently connected to the national grid. Instead, an Interim Mindanao Electricity Market (IMEM) was set up on September 26, 2013 and started full commercial operations on November 26, 2013 as a trading floor for electricity in the region, similar to WESM in Luzon and Visayas. However, WESM was introduced in spite of deficiency in power generating capacity in the Mindanao Grid. IMEM was suspended in February 2014 following a grid-wide power interruption in the region, preventing power companies with excess generating capacity to offer their output to distribution utilities. Difficulties also occurred with settlements in IMEM.

Mindanao recently entered a period of supply adequacy following investments in coal-fired generation power plants since 2015 as a result of bilateral forward contracts of DUs with Gencos, thus enhancing the conditions for the wholesale market. The Philippine Electricity Market Corp. (PEMC) is awaiting the directive from the Department of Energy to start operating the WESM in Mindanao. The DOE confirmed that it will be June 2017, but as noted before, the market start has been delayed and is not yet implemented.

4.2.2 Evolution of industry structure

The industry structure and ownership prior to the EPIRA was dominated by the state-owned NPC (supervised by DOE), a vertically integrated utility (transmission and generation) that was responsible for central management and control of both generation and transmission of electricity in the whole country. Supply of electricity came from NPC's own power plants and from Independent Power Producers (IPPs). NPC had exclusive ownership of the transmission grid and was also responsible for central systems planning and systems operations.

Under EPIRA, power generation is not considered a public utility operation and is not required to secure a national franchise. The ERC regulates electricity prices for the captive market; while electricity prices for the competitive market are liberalized. However, bilateral contracts between Discos and suppliers are subject to regulatory approval as mentioned earlier. The distribution utilities' obligation to supply electricity is carved out for the contestable market (customers), which shall be open and competitive to distribution utilities with respect to their franchise area and retail electricity suppliers (RES) which are licensed by the ERC.

NPC's generation and transmission functions had to be unbundled to enable competition in both the generation and supply segments. The Power Sector Assets and Liabilities Management Corporation (PSALM) was created to take ownership of NPC's assets and to manage its privatization with the objective of liquidating all NPC financial obligations and stranded contract costs in an optimal manner. The prospect was that the privatization proceeds would at least cover NPC's financial obligations. PSALM has sold 4,601.43 MW of NPC Plants as of June 30, 2016 and has awarded 3,607.52 MW of contracted IPP capacity to Independent Power Producer Administrators (IPPA) as of December 31, 2015.

The transmission function of the NPC was assumed by the National Transmission Corporation (Transco), created under the EPIRA. The corresponding liabilities in the transmission assets were assumed by PSALM. A concession contract for the transmission function was later awarded to the National Grid Corporation of the Philippines, after an open competitive bidding process.

The central scheduling and dispatch function of the NPC was likewise unbundled into physical and systems operation dispatch and merit order dispatch. The former was included in the transmission function, while

the Wholesale Electricity Spot Market (WESM) was created for the latter. The Philippine Electricity Market Corporation (PEMC), composed of the WESM participants, was formed to govern and operate the WESM.

To facilitate initial implementation of the WESM, transitional measures were put in place. To encourage participation in the WESM, Discos were barred from sourcing over 90% of their power purchases from bilateral contracts during the first five years of operation (section 6, IRR of EPIRA). Besides, power plants administered by PSALM were allocated to four independent trading teams within PSALM, in an effort to reduce the scope of market power. However, following spot price spikes during the first months of WESM operation there were allegations of collusion and anti-competitive behavior by these four independent PSALM trading teams (further discussed in section 4.2.4).

Some degrees of vertical integration persist in the Philippines power market. Privately-owned Discos have retained or acquired ownership of generation assets, since cross-ownership of Discos and Gencos businesses is allowed in the EPIRA (besides vertical integration through bilateral contracts). One example is the major Disco Meralco, whose wholly owned subsidiary, Meralco PowerGen Corp. (MGen), is targeting a portfolio of 3,000 MW by 2020. Furthermore, the Luzon contestable market has been dominated by Meralco's retail supplier Mpower, with a share of 47% of contestable customers during 2016 (PEMC, 2016b). Other examples of integration between generation and distribution are the Aboitiz Power -- Visayan Electric Co., Subic Enerzone Lima Enerzone, and Davao Light.[12] However, the regulator has established limits on integration of generation and distribution (see section 4.1.1).

4.2.3 Retail competition and open access

The reform brought about by EPIRA envisioned Retail Competition and Open Access (RCOA) for the supply of contestable customers (i.e. customers above a certain threshold consumption level), who would be able to choose their supplier. EPIRA established the following levels for mandatory contestable customers (i.e. forcing contestable customers to choose their supplier, instead of allowing them to stay with their current distribution utility):

- Initial phase: Average monthly peak demand of at least 1 MW over the past 12 months.
- Two years thereafter: 750 kW.
- Annual review by the regulator to lower the threshold until the contestable market reaches household demand levels.

The EPIRA established that the implementation of retail competition shall be declared by the ERC once the following five pre-conditions have been met:

- Establishment of the Wholesale Electricity Spot Market (WESM);
- Approval of unbundled transmission and distribution wheeling charges;
- Initial implementation of the Cross-Subsidy Removal Scheme;
- Privatization of at least seventy percent (70%) of the total capacity of generating assets of NPC in Luzon and Visayas; and

[12] Source: http://www.bworldonline.com/content.php?section=Weekender&title=the-philippine-electricity-market-monopoly-and-competition&id=113411#sthash.59hhyC4c.dpuf

- Transfer of the management and control of at least 70 percent (70%) of the total energy output of power plants under contract with NPC to the IPP Administrators.

Retail competition is yet to become fully operational, following postponements and an amendment which changed mandatory to voluntary customer switching. Originally, the ERC declared the commercial commencement of RCOA on June 26, 2013, following a 6-month transition period that started on December 26, 2012. ERC later postponed mandatory contestability, which was supposed to come into force during the first semester of 2017. However, the Supreme Court issued a Temporary Restraining Order putting on hold the switching of customers with consumption between 750 kW and 1 MW, while allowing voluntary switching of customers with consumption at or above 1 MW. Following the restraining order, ERC repealed mandatory contestability in November 2017 and changed it to voluntary participation for customers with consumption above 750 kW.

It is worth noting that the retail market is highly concentrated, with the major Disco Meralco accounting for a 47% market share of contestable customers during 2016, and Aboitiz Energy Solutions accounting for an 18% market share (PEMC, 2016b). It also worth noting recent regulations are targeting the efficiency of supply for captive customers. Captive customers have been historically supplied by a mix of bilateral contracts between Discos and Gencos (approved by ERC in the basis of reasonable costs), and a relatively small portion of WESM purchases.[13] Recent resolutions by DOE and ERC have mandated Discos to award contracts by conducting a Competitive Selection Procedure (CSP) through an independent, five-person third-party bids and awards committee, or through an accredited third-party auctioneer. However, rules and regulation are yet to be reconciled between ERC and DOE.

4.2.4 Market power concerns

Philippines' power market has had two major conflicts due to spot price spikes which may have been provoked or exacerbated by market power exercise, first in 2006 and later in 2013. The first conflict stemmed from a surge of spot prices in initial stages of WESM's operation in Luzon, when generation was highly concentrated under PSALM. Market settlements were adjusted after determining spot prices were altered by market power exercise; but a related case on the matter is still pending resolution by the Supreme Court. The second conflict occurred in late 2013 due to spot price spikes which fed-through to regulated customers. Price caps were imposed in the market, the Supreme Court issued a restraining order on the price increase to final customers, and the regulator finally determined that market power had been exercised.

The first dispute related to market power concerns occurred due to high spot prices during the third and fourth months of the market's commercial operation (September and October 2006). Average hourly spot prices surged by 75% during September 2006, and frequently hovered at about 10,000 PhP/MWh during peak hours. Meralco raised concerns regarding these prices surges and requested PEMC to do an investigation on whether WESM rules were breached or anti-competitive behavior had occurred.

[13] Discos were barred from sourcing over 90% of their power purchases from bilateral contracts during the first 5 years of WESM's operation. The major Disco Meralco sourced about 11% of power purchases from the WESM during 2017, up from 4% during 2014.

PEMC's investigation of the events (first through the Market Surveillance Committee, and then by the Enforcement and Compliance Office) determined that PSALM had exercised market power. Philippines established an energy-only bid-based power market in a highly concentrated generation segment. With privatization of NPC's assets and contracts still in early stages, PSALM had high market shares and enjoyed significant market power in the first years of the market.

In an effort to avoid market power exercise, power plants were allocated to four independent trading teams within PSALM. However, PEMC determined that PSALM drove a surge of spot prices in peak hours, in an attempt to recover variable costs of running during the off-peak hours when prices were zero or negative. Indeed, three power plants traded by different teams within PSALM were frequent price setters, and bids submitted to the WESM by these power plants changed radically and in a coordinated fashion during the third month, driving the surge of spot prices (Abrenica, 2009; Roxas & Santiago, 2010).

After establishing that PSALM had indeed exercised its market power (i.e. profitably altering spot prices away from the competitive equilibrium), PEMC ruled settlements adjustments. These adjustments were determined by applying the regulated rate for NPC's power plant (based on average generation costs), which was lower than the spot price in the said months.

However, after analyzing the matter, the ERC's conclusion was that there was no prima facie case against PSALM for anti-competitive behavior and/or market power abuse.[14] A series of exchanges and appeals took place involving ERC, Meralco and PSALM, and a case is still pending resolution by the Supreme Court as of 2018.[15] It has been argued that the case illustrates the challenges of monitoring and oversight of power markets especially in transitioning stages and under highly concentrated structures (Abrenica, 2009), and that in any case the outcome was good for consumers since high price spikes were not passed-through to final customers (Roxas & Santiago, 2010). Furthermore, the concerns regarding market power is consistent with the high degrees of horizontal concentration in the generation segment, despite high generation reserve margins at the time that WESM came into operation.

Shortly thereafter, concerns were raised regarding Philippines' dominant Disco Meralco and its integration with the generation segment (Fe Villamejor-Mendoza, 2008). The generation and distribution segments have tended towards vertical reintegration, since EPIRA allows cross-ownership between generation and distribution but limits Discos' supply contracts from affiliate Gencos to a maximum of 50%. Most of the winning buyers of NPC power plants are owners of distribution utilities, such as Aboitiz and First Holding. In this context, Meralco blamed NPC and other Gencos for high electricity bills, but concerns have been raised on whether Meralco respected the 50% cap of supply from affiliate Gencos. Furthermore, Meralco's IPPs often bid zero or negative to ensure being dispatched, since incomes are determined by a pricing formula approved before enactment of EPIRA (Roxas & Santiago, 2010).

The second major conflict relating to market power in the Philippines electricity market occurred by the end of 2013, when spot price spikes fed through to Meralco's retail tariffs.[16] Maintenance of the

[14] ERC Order 421 MC, 2007. Available online: http://www.erc.gov.ph/Files/Render/issuance/2188
[15] Meralco, "2017 Annual Report". Available online: https://meralcomain.s3.ap-southeast-1.amazonaws.com/2018-06/2017_meralco_omf_annual_reports.pdf?null
[16] http://www.manilatimes.net/meralco-blames-high-rate-hike-on-wesm-violations/73732/

Malampaya gas-field and outage of several other gas and coal-fired power plants led to tight supply during November and December 2013. The average WESM price ballooned to 33.22 PhP/kWh in November 2013 and 36.08 PhP/kWh in December, against only 13.74 PhP/kWh in October. Therefore, the rate of Meralco, which comprises almost 70% of demand in Luzon, in December spiked on account of a higher generation charge for power purchased from WESM (DOE, 2014).

In December 2013 the WESM tripartite committee (consisting of DOE, ERC and PEMC) issued a resolution setting a reduced price cap of 32,000 PhP/MWh, down from previous levels of 62,000 PhP/MWh. A second price cap was also implemented to avoid sustained periods of high spot prices, by capping prices to 6,245 PhP/MWh when the previous 72-hour rolling average hits or surpasses 8,168 PhP/MWh. In late 2014, the secondary price cap was made permanent with a threshold of 9,000 PhP/MWh over a 168-hour rolling average.

The Supreme Court (SC) issued a Temporary Restraining Order (TRO) on Meralco's record high price increase in its December generation charge of 3.44 PhP/kWh to 9.10 PhP/kWh. Furthermore, ERC conducted a probe into the situation concluding that Meralco, PSALM and other 10 different Gencos engaged in anti-competitive behavior. ERC concluded that market power was exercised by Gencos by withholding capacity from the market (either declaring low available capacity or bidding extremely high prices), thus violating the must-offer rule by which all available capacity must be offered in the spot market.[17] Based on these arguments, ERC intervened the spot market by replacing market-clearing prices with regulated rates. The probe conducted by the Investigation Unit of the ERC concluded in 2015 that 12 market participants were liable for the 2013 spot price spike by engaging in anti-competitive behavior. This case is still pending at the Supreme Court.

4.3 Summary and Institutional indicators for the Philippine Power Market

Philippines has adopted an advanced power market design with strong governance, according to the institutional indicators developed and calculated in this study. The high score on power market design reflects the bid-based market design with retail competition, following the text-book design of power markets. The high score on governance is related to the adoption of best practices regarding decision making autonomy, transparency, and accountability. It is worth noting that aforementioned institutional indicators do not capture particularities of the Philippine case. Further details are available in Annex A: Institutional indicators for the Philippines.

Table 4-2 Institutional indicators for Philippines' power market, per level

	Level	Philippines score
1	**Wholesale Market Design**	**54%**
1.1	Market Architecture	50%
1.2	Market Rules	57%
2	**Market Governance**	**72%**
2.1	Decision Making Autonomy	71%
2.2	Transparency	88%

[17] http://www.bworldonline.com/content.php?section=TopStory&title=power-pricing-probe-finds-12-liable&id=109023

2.3 Accountability and Monitoring 57%

Table 4-3 summarizes the Philippine approach to implementing the envisioned power market.

Table 4-3 Overview of power market implementation in Philippines.

Power Market Implementation Element	Philippines
Key market participants and actors	• PSALM: government-owned corporation created by EPIRA to manage the orderly sale, disposition, and privatization of NPC generation and other disposable assets, and its IPP contracts; as well as liquidate all the NPC's financial obligations and stranded contract costs in an optimal manner. • Gencos: IPPs, privatized Gencos, newer Gencos. • Discos: Meralco is the dominant buyer in the market, is integrated with generation assets, and a dominant licensed retail electricity supplier as well. 18 more private but small DUs and 121 non-profit small electric cooperatives owned by consumers. • Open access bulk customers • Retail suppliers • Open access retail customers • Market operator – PEMC • System operator NGCP (ownership unbundled from Gencos and Discos) • Regulator (ERC) • Planning and policy-maker (DOE)
Governance of system and market operation	**Legally-Unbundled Transmission System Operator (LTSO)** Market operation by PEMC (non-stock, non-profit organization, although not fully independent since it is chaired by the DOE); System operation by NGCP.
Investment responsibility and risk allocation	Investment in new generation assets left entirely to private participants after power industry reform.
Barriers to investment and entry	• Country-wide risks • Regulatory uncertainty • Complicated and lengthy processes for permits and license • Public opposition
Open access in practice	System and market operators have no conflicts of interest with respect to grid access, operation and expansion. Open access to distribution networks may be conflicted for Discos which have cross-ownership of generation assets (e.g. Meralco).
Market transparency	System and market operation; dispatch quantities and schedules; pool bid data; and pool prices; are all publicly available.
Approach to market monitoring and oversight	• Market Operator PEMC is governed by a not-independent board (chaired by the DOE) to which an independent market surveillance committee reports, regarding anti-competitive behavior and other related issues. A unit within PEMC aids the surveillance committee and the board. • Market oversight by the regulator (ERC). ERC may (and has) conduct investigations on anti-competitive behavior and market power abuse.

Power Market Implementation Element	Philippines
Provisions for market intervention and related events	Regulator (ERC) may (and has) substitute spot prices for regulated prices in case of error or excessive prices spikes; emergency and force-majeur events. Suspension of the spot market is also allowed.
Year the market was introduced	2006, wholesale market (WESM) introduced 2013, customer choice allowed down to 1 MW distribution customers
Major reform adaptations and milestones	• 2001, enactment of EPIRA laid the foundations of power sector reform • 2006, commencement of wholesale market (WESM) operations • 2008, enactment of Renewable Energy Act, mandating Feed-In-Tariff and priority connection / dispatch for renewables; besides other fiscal incentives • 2010, Visayas grid integrated in the WESM • 2013, commencement of retail competition down to 1 MW customers

5 Power market performance

Performance of the Philippine power market is assessed in this section, in terms of prices and competition (section 5.1), investment and security of supply (section 5.2), and sustainability (section 5.3). Table 5-1 summarizes the performance assessment of the Philippine power market.

Table 5-1 Overview of power market outcomes in Philippines.

Power Market Outcome Element	Philippines outcome
Most relevant markets	1. Bilateral contract transactions amounted to 61 TWh in 2017 (84%), growing at a CAGR of 20% between 2006-2017. 2. Spot market transactions amounted to 11 TWh in 2017 (16%), growing at a CAGR of 6% between 2006-2017.
Evolution of prices and competition	• Spot electricity prices in Philippines fell by 55% in real terms since the inception of the power market (from 7,154 PhP/MWh in 2006, to 3,205 PhP/MWh in 2017; or 116 USD/MWh in 2006 to 65 USD/MWh in 2017). However, spot prices have been volatile over the past decade, with price spikes in 2010 and 2013. • Market concentration measured by the capacity HHI dropped from over 3,700 in 2006 (highly concentrated) to 1,120 in 2017 (moderately concentrated). However, the WESM remains dominated by four major players who account for 62% of total registered capacity. • Allegations of market power abuse prompted market intervention in 2013, and it was later ruled that market players engaged in anti-competitive behavior provoking a sharp price hike. Allegations of market power abuse were also raised against PSALM in 2007.

Power Market Outcome Element	Philippines outcome
Stressful events for power markets	• May 2013: Blackout in Luzon (main Philippine island) due to the outage of five power plants[18] • November 2013: Visayas blackout and serious damage to electricity facilities following Super Typhoon Yolanda (Haiyan). • November and December 2013: Spot price spikes in 2013 were later determined to be the result of anti-competitive behavior by 12 market participants. • February 2014: grid-wide blackout in Mindanao due to forced outage of power plants and insufficient Automatic Load Drop at off-peak scenario. • July 2014: Luzon is hit by Typhoon Glenda (Rammasun), leaving around 90% of Meralco's franchise area experiencing power outages.[19]
Evolution of investment and supply reliability	• Electricity demand has outpaced installed generating capacity in Philippines over the past decade, thus dipping Philippine's system reserve margin to 17% in 2017, down from 31% in 2006. • System peak power demand has grown at a CAGR of 4.0% from 2005 to 2017 (14 GW in 2017), whilst generation capacity has grown at a CAGR of 3.5% (21 GW in 2017). • Capacity margins have increased recently in all three islands and especially in Mindanao, reaching 75% in 2017. • Capacity additions are driven by baseload coal-fired power plants (CAGR of 6.9% over years 2005-2017) backed primarily by bilateral contracts (70%-80%).
Evolution of sustainability	• The power sector has become more reliant on fossil fuels and coal over the past decade. Following capacity additions, coal-based generation grew at a CAGR of 10%, reaching 50% of total power output in 2017 (with 47 TWh), up from 27% in 2005 (with 15 TWh). • Power generation from renewable resources in Philippines has fallen from 33% of total output in 2005 to 25% in 2017 (23 TWh). Renewable energy generation continues to be dominated by hydro and geothermal, amounting to 11% and 10% in 2017, respectively; while wind, solar and biomass each contributed about 1% to total power generation in Philippines during 2017. • Rapid penetration of other renewable sources over the past few years, with wind, solar and biomass totaling 1,243 MW in 2017, up from 93 MW in 2013.

5.1 Wholesale Prices and Market Efficiency

The most relevant power submarkets in Philippines are the following (see Figure 5-1 and Figure 5-2 also):

1. Bilateral contract transactions amounted to 60,712 GWh in 2017, up from 8,307 GWh in 2006, growing at a CAGR of 20% per annum between 2006 and 2017.
2. Spot market transactions amounted to 11,220 GWh in 2017 (or 16% of total transactions), up from 5,625 GWh in 2006 (or 40% of total transactions), growing at a CAGR of 6% per annum.

[18] http://www.philstar.com/headlines/2013/05/09/939972/luzon-wide-blackout http://www.gmanetwork.com/news/news/nation/307335/widespread-blackout-hits-luzon-due-to-outage-in-five-power-plants/story/

[19] http://www.latimes.com/world/worldnow/la-fg-thousands-flee-typhoon-rammasun-philippines-20140715-story.html

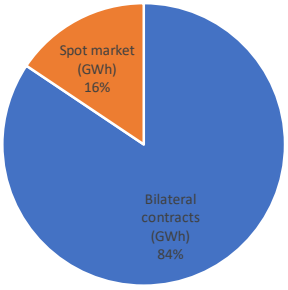


Figure 5-1 Relative size of power submarkets in Philippines during 2017, as percentage of total traded energy.

Source: Own elaboration based on data collected by the World Bank.

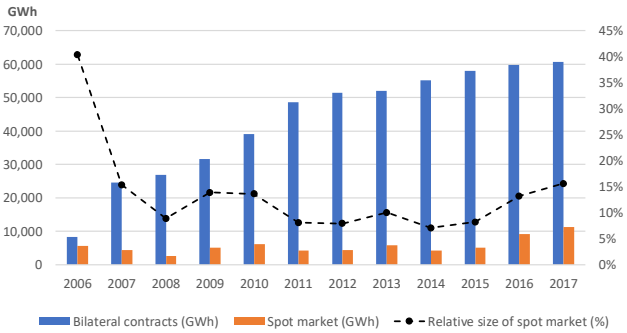


Figure 5-2 Evolution of traded energy volumes in contracts and spot market in Philippines.

Source: Own elaboration based on data collected by the World Bank.

Contracted electricity volumes are driven by load growth (around 85-95% of customer loads are permanently contracted by most Discos). Maturity is usually long-term (typically 20 yrs.) for coal-fired power plants, and short to medium-term (e.g. 5-10 yrs.) for peaking plants and also for other existing plants (e.g. coal, geothermal and hydro). On the other hand, absent a spot market, peaking plants in Mindanao are bilaterally contracted with a typical maturity of 20 years. Regulated contract prices are based on actual generation costs.

Energy traded in the Philippine spot market (hour-ahead) stood at 16% of total traded energy in 2017. The spot market shrank over the past decade, partly due to abuse of market power and the tendency to vertical integration of Gencos and Retailers. As a result, retailers and market participants in general have relied in bilateral contracts outside the spot power market. Hence, the spot market has been relegated to a bare minimal existence with inadequate power to influence investment and operational decisions. Bilateral contract prices dominated by generation tend to be high and have more influence than spot prices on retail tariffs. However, bilateral contract prices are not publicly available since these contracts are privately agreed by the parties (and approved by the regulator in the case of contracts for supplying captive customers).

Spot electricity prices in Philippines have been rather volatile over the past decade. Spot prices have fallen by 55% in real terms since the inception of the power market (from 7,154 PhP/MWh in 2006, to 3,205 PhP/MWh in 2017; or 116 USD/MWh in 2006 to 65 USD/MWh in 2017, a 44% decrease when expressed in 2015 USD). However, the annual spot price evolution highlights price hikes in 2010 and 2013, and a price slump in 2009 to 45 USD/MWh (see Figure 5-3 and Table 5-2). Average spot prices reached 190 USD/MWh during 2013, and peak spot prices reached 618 USD/MWh in the same year, due to what was later determined to be the result of anti-competitive behavior by market participants who withheld capacity from the market.

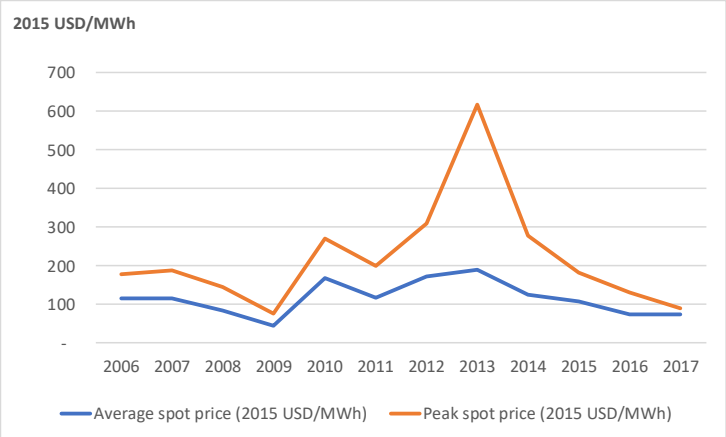


Figure 5-3 Evolution of yearly average and peak spot price (i.e. in the hour-ahead market) in Philippines (in real terms).

Source: Own elaboration based on data collected by the World Bank.

Table 5-2 Evolution of yearly average and peak spot real price (i.e. in the hour-ahead market) in Philippines.

Year	Average spot price (2015 P/MWh)	Average spot price (2015 USD/MWh)	Peak spot price (2015 USD/MWh)
2006	7,154	116	179
2007	6,451	116	189
2008	4,292	84	145
2009	2,372	45	76
2010	8,250	169	269
2011	5,417	117	200
2012	7,684	173	311
2013	8,357	190	618
2014	5,669	126	278
2015	4,465	98	168
2016	3,278	69	121
2017	3,205	65	78

Source: Own elaboration based on data collected by the World Bank.

Spot electricity prices are largely driven by supply-demand conditions. Investment in baseload coal-fired generation and entry of variable renewable energy resources have also caused prices in the market to go down in recent years. In general terms, spot prices have been driven by:

- Increased wholesale competition (due to both new entry and horizontal unbundling in the generation segment)
- More efficient use of generation and transmission resources
- Increased investment in power infrastructure (generation or transmission)
- Increasing generation by renewable resources with Feed-in-Tariffs (FIT) and priority dispatch

- Ageing and outages of generation and transmission infrastructure
- Tariff reform
- Contractual positions of market players

Positive price spikes in the Philippines power market have been driven primarily by tight supply due to forced and scheduled outage of power generation facilities (for example, due to natural disasters, forced outage, or due to planned periodical maintenance), and slow investment with electricity demand growth outpacing capacity additions until recent years. Natural calamities result in particularly high spot prices as expected, although most of those intervals are subjected to administered pricing.

Zero or negative prices have occurred in Philippines as a result of bidding behavior by market participants who submit zero or negative offers to the pool in order to ensure their power plants are dispatched during low load conditions. Many bilateral contracts have minimum offtake requirements (MW and/or MWh). This results in the submission of very low offer prices (0 to negative 10 PHP/kWh) in the market by generators serving their minimum offtake. Even if there are plants with cheaper marginal costs in the market, they are displaced by contracted capacities. Indeed, spot prices fell to a record low of -594 PhP/MWh on average during January 2009, by the combined effect of low demand and high supply, as fewer plants went on outage (PEMC, 2014).

Due to limited intra-island transmission capacity and transfer capacity in inter-island connections, price separation has been a common occurrence in the market. A robust transmission grid would reduce the occurrence of price separation resulting in the optimal utilization of available capacities in the grid.

Although concentration in the Philippine power market plummeted over the past decade, the market remains relatively concentrated. As of 2017, the WESM remains dominated by four major players who account for 62% of total registered capacity (i.e. First Gen Corporation – FGC; PSALM; Aboitiz Power – AP; and San Miguel Corporation – SMC); while other generators account for 38% of registered capacity (see Figure 5-4). Market concentration measured by the registered capacity HHI dropped from over 3,700 in 2006 (highly concentrated) to nearly 1,120 in 2017 (moderately concentrated) (PEMC, 2016a, 2017b). Other indices are also calculated by PEMC to reflect market outcomes. For example, the market Residual Supply Index exceeded 100% during an average of 62% of the hours of 2016. Hence, during 38% of the hours there was a pivotal supplier who can modify the market-clearing price either by physically withholding capacity or offering its capacity at a high price (Market Assessment Group, 2017).

It is worth noting that the Visayas grid was incorporated in the WESM in 2010, thus expanding the scope of the wholesale market and the number of players. Privatization of publicly-owned generation assets has also contributed to horizontal disintegration in the generation segment. Furthermore, new competitors have entered the market during recent years.

Both market power and vertical integration (through bilateral contracts and cross-ownership of generation and retail / distribution) have lowered liquidity in the spot market. Indeed, vertical integration has been apparent with most Gencos establishing retail arms, and even customers having their own retail companies. Discos have also been allowed to establish retail affiliates, and the retail market is currently dominated by Meralco (the Genco/Disco/Retailer which accounts for about 70% of demand in Luzon) with a 47% market share of contestable customers.

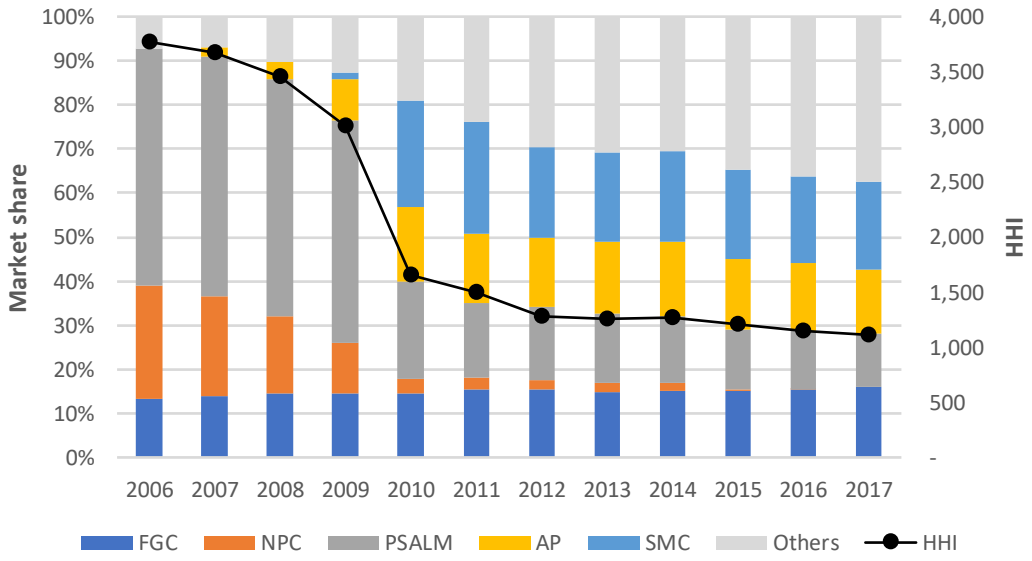


Figure 5-4 Market share and Herfindahl-Hirschman Index, in terms of registered generation capacity.

Source: (PEMC, 2017b)

Some Gencos have also raised concerns on regulatory uncertainty affecting their investment appetite in the Philippine power market. Spot prices have been previously capped by the ERC after-the-fact (Nov-Dec 2013) and caps have been lowered (from 62 PhP/kWh to 32 PhP/kWh). Delays and the overall shortage of available Power Supply Agreements approved by the ERC has also been cited as an obstacle for investment.[20] Moreover, high capital requirements and restrictions on foreign ownership have probably resulted in only a number of major players.

5.2 Investment and Security of Supply

Electricity demand has outpaced installed generating capacity in Philippines over the past decade (see Table 5-3). Demand for electricity has grown at a CAGR of 4.6% from 2005 to 2017 (from 45 TWh in 2005 to 78 TWh in 2017), whilst system peak power demand has grown at a CAGR of 4.0% (from 9 GW in 2005 to 14 GW in 2017). On the other hand, generation capacity has grown at a CAGR of 3.5% (from 14 GW in 2005 to 21 GW in 2017). Given the sluggish growth of generation capacity, the system reserve margin in the Luzon and Visayas grid dipped to 17% in 2017, down from 31% in 2006 (see Figure 5-5).[21]

[20] BPI, 2015, "Financing Energy Projects". Available online: https://www.doe.gov.ph/sites/default/files/pdf/e_ipo/04_bank_of_the_philippine_islands_financing_facility_for_energy_projects.pdf

[21] The reserve margin was calculated as dependable generation capacity divided by peak demand plus reserves. A reserve requirement of 23.4% was considered. Luzon is considered over all the horizon, and Visayas is included since 2010 due to its integration to the WESM. Mindanao is excluded over all the horizon.

Table 5-3 Evolution of energy demand, peak power demand and generation capacity in Philippines (including Luzon, Visayas and Mindanao).

Year	System peak demand (GW)	Dependable generation capacity (GW)	Total Electricity Consumption (TWh)
2005	8.6	13.6	45.2
2006	8.8	13.6	45.7
2007	9.0	13.5	48.0
2008	9.1	13.0	49.2
2009	9.5	13.3	50.9
2010	10.4	13.9	55.3
2011	10.4	14.5	56.1
2012	10.8	15.1	59.2
2013	11.3	15.4	61.6
2014	11.8	15.6	63.3
2015	12.2	16.4	67.8
2016	13.3	19.1	74.2
2017	13.8	20.5	77.8
CAGR 2005-17	**4.0%**	**3.5%**	**4.6%**

Source: Department of Energy.

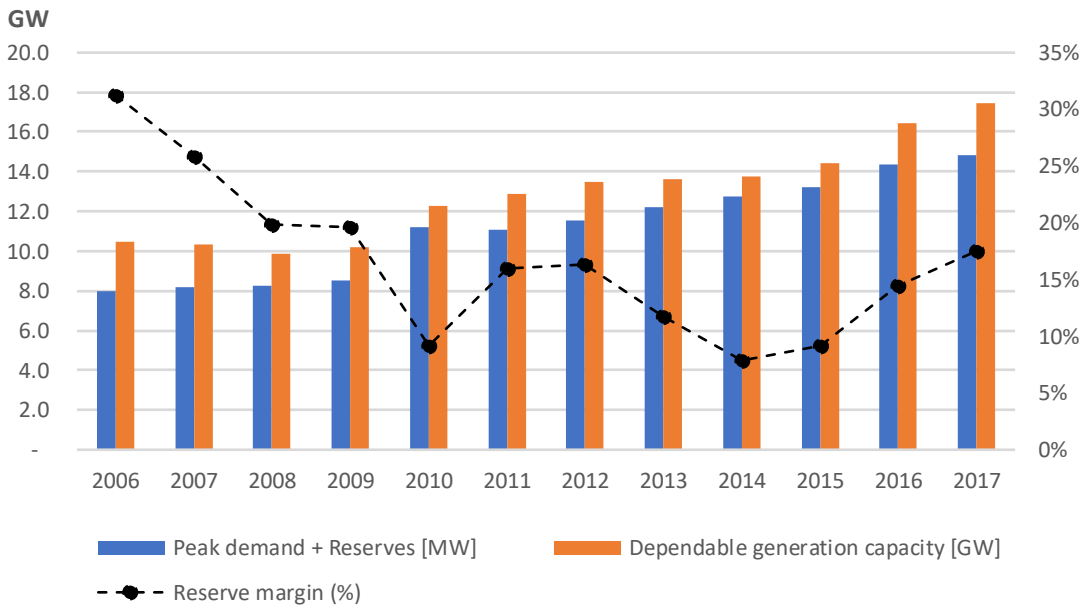


Figure 5-5 Evolution of peak power demand, generation capacity and system reserve margin in the WESM*.
* Visayas included since 2010 due to its integration to WESM; Mindanao excluded. A reserve requirement of 23.4% was considered.
Source: Department of Energy.

Supply has been secure for Luzon and Visayas in recent years bar occurrence of force majeure events (e.g. major typhoons and earthquakes). Mindanao has entered a period of supply security starting 2017 with the influx of new generating capacities in the region. Indeed, the breakdown of the capacity margin (dependable generation capacity divided by peak demand) for each of the major Philippine power grids highlights the downward trend in Luzon and Visayas until 2014, down from a situation of high margins inherited from the IPPs program of the 1990s. From 2015 to 2017 the reserve margin rose, particularly in Mindanao reaching 75% in 2017, following aggressive investments in (mostly coal-fired) generation capacity (see Figure 5-6**Error! Reference source not found.**).

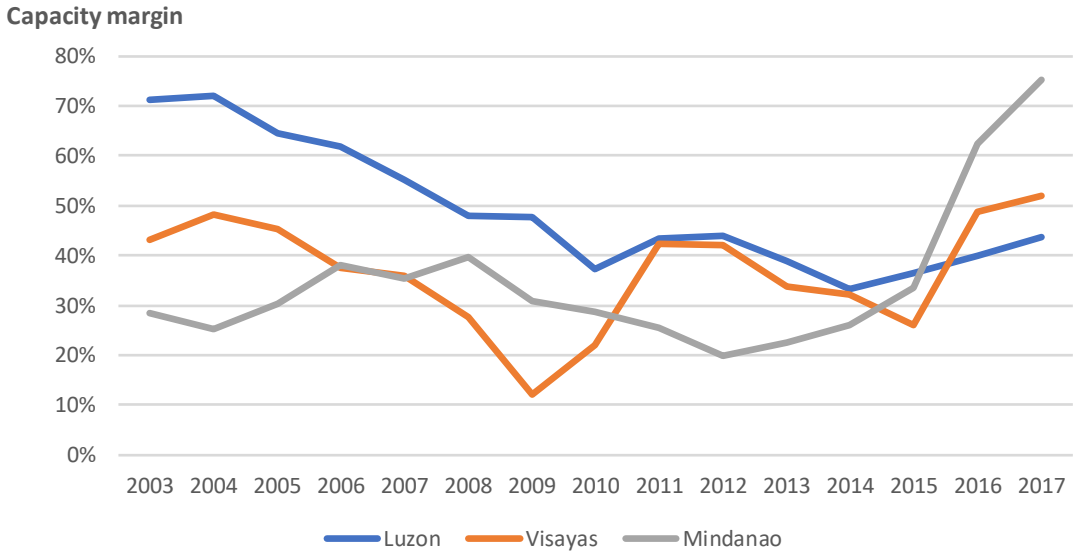


Figure 5-6 Evolution of capacity margin in Philippine's grids.

Source: Department of Energy.

However, tight supply conditions have been reflected in episodes of price hikes (EIA, 2015). Tight supply conditions are common in Philippines in particular when Malampaya gas-fired power plant is scheduled for maintenance or faces gas shortage; as well as due to facilities outage (planned and unscheduled), and hydro availability as an effect of El Niño meteorological phenomena (PEMC, 2016b).

Capacity expansion of generation in Philippines has been driven by coal over the past decade (see Figure 5-7**Error! Reference source not found.**). Indeed, coal operational capacity grew by 64%, from 3.4 GW in 2005 to 7.7 GW in 2017 (CAGR of 6.9%), largely surpassing capacity additions from every other technology. Moreover, the pipeline of committed generation investments is dominated by 6.3 GW of coal-fired projects (about 73% of on-grid committed generation projects) to be commissioned over the next four years. The trend is consistent with an outlook of low coal prices, and the regulatory review of contracts for regulated customers (focused on costs rather than economic efficiency).

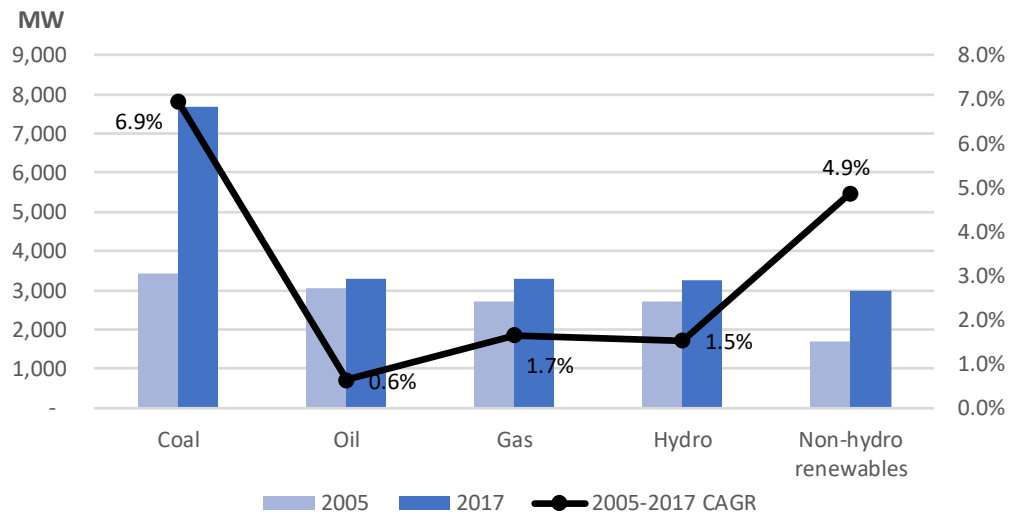


Figure 5-7 Evolution of technology-wise generation operational capacity in Philippines.

Source: Department of Energy.

Investments in new generation capacity are primarily backed by bilateral contracts (about 70%-80%) to provide revenue stability and bankability. Given the crucial impact of bilateral contracts in generation investment decisions, key elements for power market outcomes include (1) the incentives and structure of the distribution and retailing market (including horizontal and vertical integration); and (2) the role of the regulator (ERC) in reviewing and approving Power Supply Agreements. Neither of these issues was extensively analyzed in this case study, since the focus of the paper is on wholesale markets at the generation level. In this regard, it is worth noting that market-driven spot prices in the Philippine's WESM largely reflect supply and demand conditions, thus providing complementary signals for generation investments (despite not being the primary signal for investment decisions). Indeed, a few merchant power plants have been recently commissioned, and these projects are thus fully exposed to the volatility and uncertainty of spot prices.[22]

Despite the recent trends of investment in new generation capacity, it is worth noting that supply security and the overall market performance hinge on the adequacy of both transmission and distribution infrastructure. However, these issues are out of the scope of this case study.

5.3 Sustainability

Philippine's generation fleet is largely dominated by fossil-fueled power plants, accounting for 69% of installed capacity in 2017 (see Figure 5-8). Renewables in turn accounted for 31% of installed capacity in 2017, down from 33% in 2006. Such trend of renewable capacity is a mix of the slow decline of large hydro

[22] BPI, 2015, "Financing Energy Projects". Available online: https://www.doe.gov.ph/sites/default/files/pdf/e_ipo/04_bank_of_the_philippine_islands_financing_facility_for_energy_projects.pdf

and geothermal generation over the past decade, and the rapid penetration of other renewable sources in recent years (wind, biomass and solar).

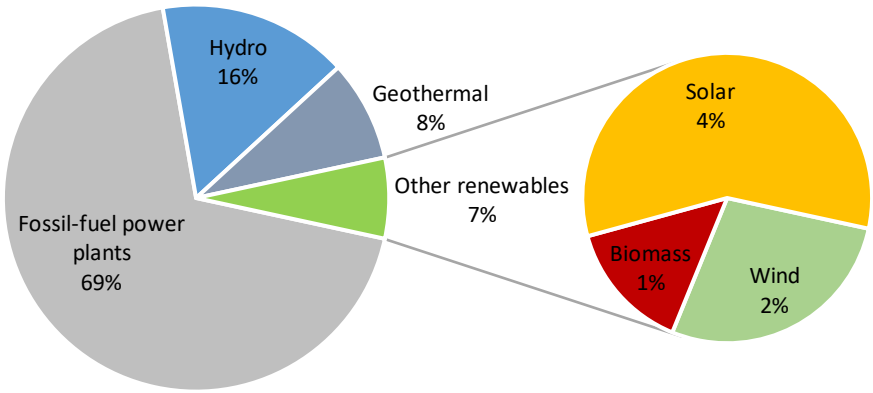


Figure 5-8 Share of renewable generation capacity by technology in Philippines, 2017.

Source: Department of Energy.

Generation capacity additions in Philippines have been primarily in coal-based power plants. Modest additions of wind, solar and biomass power plants have been completed in the recent years in Philippines, reaching 6% of total dependable generation capacity with 1,243 MW in 2017, primarily driven by Feed-in-Tariffs. Non-hydro renewable installed capacity is dominated by 1,752 MW of geothermal power plants (see Table 5-4). Investment in renewable energy generating assets are incentivized by the Feed-in-Tariff scheme and other measures adopted by Philippines by enactment of 2008 Renewable Energy Act. As a result, Philippines has seen rapid penetration of other renewable sources over the past few years, with wind, solar and biomass totaling 1,243 MW in 2017, up from 93 MW in 2013.

Table 5-4 Evolution of renewable installed capacity in Philippines.

Year	Hydro	Geothermal	Solar	Wind	Biomass
2005	2,725	1,683	1	9	0
2010	3,021	1,351	1	20	20
2017	2,369	1,752	700	383	160

Source: Department of Energy

Power generation from renewable resources in Philippines has fallen from 32% of total output in 2005 (18 TWh) to 25% in 2017 (23 TWh, see Table 5-5). Most of renewable energy generation continues to be produced by hydro and geothermal power plants, amounting to 11% and 10% in 2017, respectively; while wind, solar and biomass each contributed about 1% to total power generation in Philippines during 2017 (see Table 5-5**Error! Reference source not found.**).

Table 5-5 Technology-wise gross power generation in Philippines (in GWh).

Technology	2005	2010	2017
Coal	15,257	23,301	46,847
Oil-based	6,141	7,101	3,793
Natural Gas	16,861	19,518	20,547
Renewable Energy (RE)	18,308	17,823	23,183
Geothermal	9,902	9,929	10,270
Hydro	8,387	7,803	9,605
Biomass	0	27	1,335
Solar	2	1	1,283
Wind Generation	17	62	690
Total	**56,568**	**67,743**	**94,370**

Source: Department of Energy

In contrast with the low contribution of renewable generation, coal-based generation soared over the past decade (see Figure 5-9). Coal-fired power generation grew at a CAGR of 10%, reaching 50% of total power output in 2017 (with 47 TWh), up from 27% in 2005 (with 15 TWh). The power sector has thus become more reliant on imported fossil fuels (especially coal imported primarily from Indonesia).

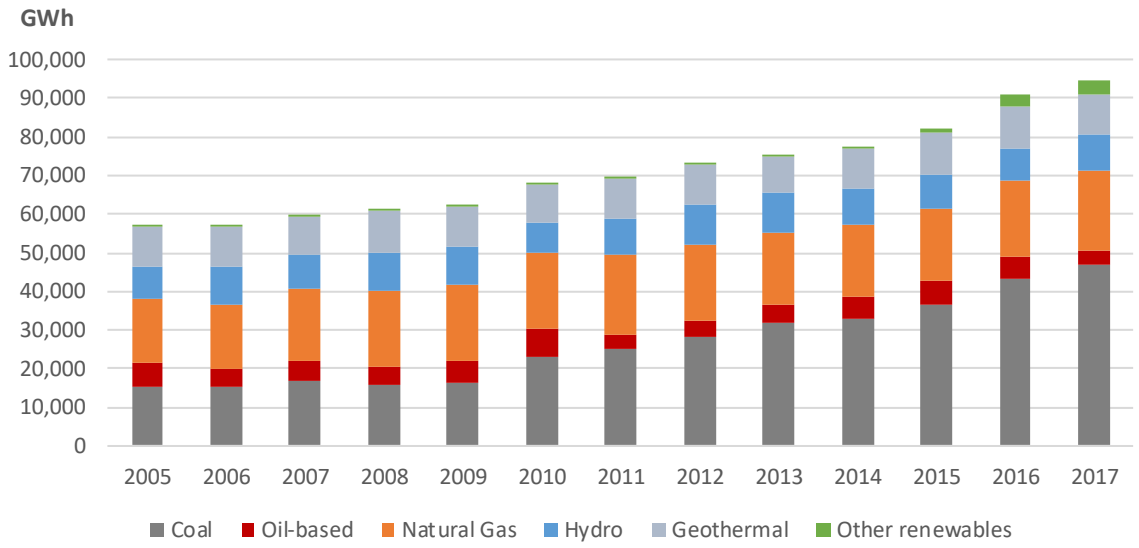


Figure 5-9 Evolution of technology-wise power generation in Philippines.

Source: Department of Energy

6 Conclusions on the Philippine Experience with Power Market Reforms

Overall, the Philippine power market has partially delivered the objectives of competitive outcomes and sustainability. On the other hand, supply has been secure at the generation level, but generation adequacy

risks remain since demand growth has outpaced capacity additions, which in turn are primarily based on imported coal. Industry reform brought about by EPIRA in 2001 was very slowly implemented, with the wholesale spot market beginning operations in 2006, that is, with a 4-year delay with respect to plans; and retail competition established only partially in 2013, and yet to become fully operational. Privatization of government-owned generation assets has not yet completed.

Security of supply. The 1990s IPP program successfully addressed the deep Philippine power supply crisis, albeit at high costs and introducing rigidities in power supply. Supply at the generation level has been generally secure for Luzon and Visayas in recent years bar occurrence of force majeure events (e.g. major typhoon, earthquake), while Mindanao has recently entered a period of supply adequacy with the influx of new generating capacities in the region. However, the Philippine power system is stressed during peak-power demand months in the summer, experiencing tight supply conditions and spiking spot power prices. Several widespread blackouts have occurred over the past five years during tight periods, for example due to low fuel or hydro generation availability, maintenance of major power plants (e.g. Malampaya gas-to-power plant) and forced facilities outage (due to failure and / or poor maintenance).

Commissioned and committed investment in new generation power plants has improved the Philippine's security of supply. Investments in new power plants are largely backed by bilateral contracts to enable bankability, and contracts with Discos are subject to cost-based review and approval by the regulator. Generation investments have been primarily driven by low-cost coal-fired plants based on imported coal. Thus, concerns have been raised regarding dependency on imported coal, the optimal capacity mix (due to the lack of investment in flexible mid-merit and peaking power plants), and environmental sustainability.

Competition. The Philippine wholesale spot market has been successful in introducing market driven forces to power system operation, providing spot prices which largely reflect demand and supply conditions. Spot electricity prices have fallen by 38% in real terms since the inception of the power market (from 7,154 PhP/MWh in 2006, to 4,465 PhP/MWh in 2015; or a 15% decrease when expressed in 2015 USD, from 116 USD/MWh in 2006 to 98 USD/MWh in 2016), following aggressive coal-fired capacity additions and intensifying competition. However, the spot market has a secondary function for investment decisions due to the dominance of contracts, which also feed-through to the spot market (for example, contracted generators submit low or negative bids to ensure dispatch and cover physical requirements of contracts).

Competition has increased significantly in the Philippine power market over the past decade. Indeed, market concentration measured by the capacity of HHI dropped from over 3,700 in 2006 (highly concentrated) to nearly 1,120 in 2017 (moderately concentrated). However, the dominance of few major players across the power supply chain and the possibility of market power abuse are still troubling. Four major players account for 64% of total registered generation capacity, and PSALM's dominant seller position due to slow privatization of its generation assets was reason for concern in the early years of the market. Furthermore, many of PSALM's privatized power plants were purchased by incumbent Gencos, or Gencos-Discos such as the dominant buyer Meralco (with a franchise over the majority of the demand of Luzon), leading to further concerns regarding the scope for market power abuse. In fact, the market was intervened by the regulator in 2013 following a sharp price spike, and it was later ruled that market players engaged in anti-competitive behavior to the detriment of final customers.

New competitors have entered the market albeit slowly, probably due to deterrence by regulatory uncertainty (particularly ex-post interventions in spot prices), complicated and lengthy processes for permits and licenses, high capital requirements, and restrictions on foreign ownership.

Sustainability. The Philippine power sector has become more reliant on fossil fuels and particularly imported coal over the past decade. Capacity additions have been primarily in coal power plants, with coal-based generation growing at a CAGR of 10% over 2005-2017, reaching 50% of total power output in 2017 (with 47 TWh). In contrast, power generation from renewable resources in Philippines fell from 32% of total output in 2005, to 25% in 2017. Most of the renewable energy generating capacity and output continues to be dominated by hydro and geothermal, amounting to 11% and 10% of energy generation in 2017, respectively; while wind, solar and biomass each contributed less than about 1% to total power generation in the Philippines during 2017, despite Feed-in-Tariffs and other incentives for renewables set forth in the Renewable Energy Act 2008. Such evolution raises concerns regarding the environmental sustainability of the power sector.

Future challenges. The Philippines needs to continue to expand its power generation capacity to meet fast growing electricity demand needs. The bulk of expected capacity additions in the mid-term are in coal-based power plants. It is therefore important for the Philippines to continue to diversify its power generation mix and harness the potential for renewable generation, to improve both security of supply and sustainability. Increasing competition in the power generation segment is also crucially important, by attracting new competitors to the market, improving short-term trading arrangements, and finally tackling the competitiveness of the contracts market.

Lessons. The case of the Philippines illustrates the benefits and challenges that open and competitive wholesale markets can provide over time, highlighting several structural and institutional issues which are key for reaping the benefits of competitive power markets in developing countries. First, the ownership structure of the power sector should support competition through vertical and horizontal unbundling. Vertically, the transmission system (both in terms of ownership and operations) should be unbundled from the rest of the power supply chain. In the generation segment, power plants (baseload, shoulder and peaking) should be dispersed among as many sizable competitors as possible, especially during periods of tight supply due to planned maintenance outage. Moreover, vertical integration of generation, distribution and retailing (whether through cross-ownership or through bilateral contracts) can be problematic and raise concerns over market power exercise in relatively concentrated markets. The underpinning problem in the Philippines is related to the bilateral contracts market, which covers most of the supply of final customers, and may not adequately reap the benefits of competition (for example, due to regulation of contract costs for Distribution Utilities). In turn, the highly contracted and vertically integrated structure of the Philippine power market relegates the spot market to a role of imbalances adjustment.

Monitoring, oversight, and effective market assessment and adjustment processes are also important for enhancing market performance, especially during the initial phases of the market. The Philippine power market commenced operations in Luzon under a highly concentrated generation segment and has since suffered episodes of sharp price spikes and conflicts over market power exercise. Although market oversight in the Philippines has evolved since its inception, there is still room for improvement by periodically assessing market performance in terms of outcomes (e.g. how far from perfectly competitive has been the actual market clearing), and then adjusting the market design and its institutions accordingly.

Market intervention may be warranted in some situations, such as the sharp spot price spikes which feed through to final customers in the Philippines. However, such intervention should follow a clear and predefined process in terms of acceptable market outcomes and intervention measures. Following unacceptable market outcomes and the respective assessment, market adaptations should not only address the immediate problems (e.g. by imposing price caps on the spot price as the regulator did in 2013), but also aim at enhancing performance by encouraging competition (e.g. lowering entry barriers and encouraging competition in the contracts market).

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8 Annex A: Institutional indicators for the Philippines

Based on information gathered and provided by the local consultant for this project, institutional indicators were developed and calculated in this study. Questions are aggregated in two levels (see Table 8-1). Level 2 indicators aggregate responses to individual questions by dividing the number of positive answers by the total number of questions. Level 1 indicators are the simple average of level 2 indicators.

Detailed results for the Philippines' power market institutional indicators are provided in Table 8-2 and Table 8-3.

Table 8-1 Structure of power market institutional indicators

Level 1	**Level 2**
Wholesale Market Design	Market Architecture
	Market Rules
Market Governance	Decision making Autonomy
	Transparency
	Accountability and Monitoring

Table 8-2 Detail of wholesale market design indicators for Philippines

Level	**Philippines score**
Wholesale Market Design	**54%**
Market Architecture	**50%**
Is there a real-time or balancing market currently operational?	1
Is there a market for reserves currently operational?	1
Is there a market for ancillary services (other than balancing and reserves) currently operational?	0
Is there a market for transmission rights currently operational?	0
Is there a market for CO2 emissions permits currently operational?	0
Has retail competition been introduced?	1
Are there hedging instruments available to different market participants in order to manage risks?	1
Is there a demand response and load control program in place?	0
Market Rules	**57%**
Is there open access to distribution networks?	1
Do wholesale energy market prices have nodal spatial resolution?	1
Are there take-or-pay PPAs or other arrangements that distort reliable and efficient dispatch (e.g. compulsory dispatch of particular generators)?	0
Are reserves co-optimized with energy during the scheduling and dispatch process?	0
Is separate contracting for energy and network services allowed with transmission revenues separated from energy and other revenues?	1
Can the regulator review the details of bilateral contracts (which are often confidential)?	0
Are there mechanisms to enforce payments throughout the electric supply chain?	1

Table 8-3 Detail of wholesale market governance indicators for Philippines

Level	Philippines score
Market Governance	**72%**
Decision Making Autonomy	**71%**
Is there an Independent System Operator (ISO), or Independent Transmission System Operator (ITSO)?	0
Does the system operator hold ultimate authority on real-time system operation (i.e. above market operator instructions or generator self-schedules)?	1
Does the board of the market (or system) operator allow one class vetoes (e.g. allowing a class of market participants to veto rule changes sought by other classes, thus producing deadlocks and impede changes to the system operator and its procedures)?	NAV
Is regulatory backstop allowed, whereby the regulator (or minister) can review, revoke or modify decisions taken by the board of the market (or system) operator?	NAV
Is the market (or system) operator legally independent from market participants and government?	1
Can the market (or system) operator decisions be appealed?	1
Are there regulatory requirements for the board members of the market (or system) operator to be independent from market participants and the government to prevent conflicts of interest?	0
Is there a formally established mechanism for dispute resolution among market participants?	1
Does the board of the market (or system) operator have real decision-making authority?	1
Transparency	**88%**
Are operation procedures publicly available?	1
Is bid data publicly available?	1
Are market prices publicly available?	1
Are dispatch quantities and schedules publicly available?	1
Is settlement information publicly available?	0
Are the grid code and all the operating procedures (including market clearing processes) publicly available to all interested parties?	1
Are there well-defined boundaries on acceptable market outcomes?	1
Is the form of regulatory intervention clarified in advance?	1
Accountability and Monitoring	**57%**
Is there an external overseeing or monitoring entity?	0
Can the external monitoring entity access information from system and market operation, including commercially sensitive and confidential information?	NAV
Does the external monitoring entity report to the board of directors of the operator?	0
Does the external monitoring entity report to the regulator?	0
Does the system operator report regularly to the regulator, and policy makers?	1
Was sufficient time (> 3 years) allowed for fully phasing in the operation of the wholesale power market?	1
During the transition to a wholesale power market were any measures taken to reduce market power in the generation segment?	1
Was any transition mechanism put in place to ensure a minimum degree revenue certainty for generators and acceptable degree of price risks for retailers?	1