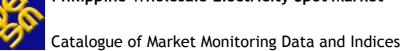PUBLIC

Catalogue of Market Monitoring Data and Indices
Issue 1.0

Abstract	This document covers the list of market monitoring indices to be used in assessing the development of the wholesale electricity spot market.

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0.0	0.0	MAG	2 March 2006	Market monitoring indices are based on the Report prepared for the Department of Energy and Asian Development Bank under the Implementation Plan for WESM Institution-Building (TA 4073-PHI)

Related Document

Document ID	Document Title
	WESM Rules
WESM-MSCEM-001	Market Surveillance, Compliance and Enforcement Market Manual

Distribution List

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1. INTRODUCTION

1.1   Purpose

This document was developed in accordance with Section 7.2.2 of the Market Surveillance, Compliance and Enforcement Market Manual ("Manual") which states that the Market Surveillance Committee (MSC) will develop and adopt a list of monitoring indices to analyze the monitoring data or other information collected in connection with market surveillance.

This document provides a catalogue of market monitoring indices that will be used as an assessment tool to measure or assess competition and to facilitate identifying when a market design, or market rule or sector structure impedes competition, or produces or promotes inefficient or anti competitive behavior or outcomes, or leads to distortions.

Specifically, the monitoring indices will be used for the following purposes:

a) For the MSC to identify anomalous circumstances, conducts or outcomes of the WESM, Trading Participants, the Market Operator, or the System Operator that require further assessment or an investigation;

b) For the MSC to identify and recommend amendments to the WESM Rules that could:

- Cause distorted outcomes in the WESM even if Participants behave competitively;

- Cause unintended costs or risks that lead to inefficient conduct by Participants; or

- Create opportunities for gaming and incentives for Participants to behave not competitively.

c) For the Market Assessment Group (MAG) to prepare and submit periodic Market Assessment Reports to MSC.

1.2   Scope

This document covers a catalogue of market monitoring data and indices, which include:

a) Catalogue of monitoring data that shall be routinely provided by the Market Operator and System Operator;

b) Catalogue of the additional monitoring data that may be collected from WESM Members to complement the data from the Market Operator and System Operator; and

c) Catalogue of the monitoring indices that will be used to process and analyze the monitoring data collected.

This Catalogue includes at least two types of monitoring indices:

- Market monitoring indices to monitor the overall competitiveness and efficiency of the WESM; and

- Monitoring indices of Trading Participants to monitor their behavior and relative performance and to assess bidding strategies.

1.3   Review and Update

Over time, one or more of the types of monitoring indices described in this document may be eliminated, due to unavailability of the necessary data or if market surveillance experience shows that the indices do not provide useful information for the conditions in the WESM.

Consistent with Section 7.2.2.4 of the Manual, the MSC will continue to elaborate and improve on the list of monitoring indices based on experience with actual application, the results and developments of the WESM, and developments in international practices. New indices may be added or some of the type of indices contained in this document may be modified to facilitate the identification of the following:

- Conditions that may correspond to market power or its exercise or other anti-competitive behavior; or

- Conditions or circumstances that may correspond to a behavior or outcome that can undermine the efficiency and effective competition in the WESM or produce undesired results contrary to the WESM objectives; or

- Anomalous results (e.g. prices) or behaviors.

The MSC has the authority to eliminate, add or otherwise modify monitoring indices as it deems necessary and to select the monitoring indices it considers appropriate and useful. In updating the monitoring indices, the MSC may receive recommendations from the PEM Board and other interested parties.

2. DEFINITIONS OF TERMS

Administered Price. A price imposed by the Market Operator to the Trading Participants during market suspension and intervention to be used for settlement which price is determined in accordance with the methodology developed and published by the Market Operator and approved by the Energy Regulatory Commission.

Anti-Competitive Behavior. Refers to a behavior contrary to competition as defined in the Act, IRR, the Competition Rules, and other rules and regulations that the ERC may promulgate regarding competition.

Available Capacity. The registered maximum capacity, minus outage capacity (reductions in capacity due to maintenance outages coordinated with the System Operator and forced outages informed to the System Operator), minus other reductions on maximum output due to constraints informed by the Generator to the System Operator (transitory derating, ramps, etc.)

Constraint. A limitation on the capability of any combination of network elements, loads, generating units or Ancillary Service Providers such that it is, or is deemed by the System Operator to be, unacceptable to adopt the pattern of transfer, consumption, generation or production of electrical power or other services that would be most desirable if the limitation were removed.

Day-Ahead Projections. Projections of market conditions for the day ahead determined and published by the Market Operator.

Ex-ante Dispatch. The dispatch targets set for the end of a trading interval, immediately preceding the beginning of that trading interval.

Ex-post. A matter determined in relation to a trading interval after that trading interval concludes.

Generating Plant. A facility, consisting of one or more generating units, where electric energy is produced from some other form of energy by means of a suitable apparatus.

Generation. The production of electrical power by converting one form of energy to another in a generating unit.

Generation Offer. A standing offer, or market offer to supply electricity, submitted or revised by a Generation Company in accordance with clauses 3.5.5, 3.5.9, 3.5.10 or 3.5.11 of the WESM Rules.

Load. The amount of energy consumed in a defined period via a node.

Market Assessment Group (MAG). Refers to the market assessment group of the Philippine Electricity Market Corporation established pursuant to the WESM Rules tasked to support the PEM Committee and regularly prepare assessments reports on the overall market performance and competitiveness.

Market Price. A generic term covering prices for energy and reserve, ex-ante or ex-post, nodal or zonal, as appropriate.

Market Suspension. An event wherein the ERC declares the operation of the spot market to be suspended in cases of natural calamities or national and international securities emergencies. During such event, the administered price cap shall be used for settlement.

Market Intervention. A measure taken by the System Operator when the grid is in extreme state condition as established in the Grid Code, arising from (1) a threat to system security; (2) force majeure; or (3) emergency, and during which administered prices shall be used by the Market Operator for settlements of energy transactions in the WESM.

Market Surveillance Committee (MSC). The Committee appointed by the PEM Board pursuant to clause 1.6 of the WESM Rules tasked to monitor and report on activities in the WESM.

Maximum Capacity. Refers to the gross capacity that a unit can sustain over a specified period of time as established during formal demonstration through testing based on manufacturers approved procedures or any internationally-accepted testing such as, but not limited to, the American Society of Mechanical Engineers(ASME) and American National Standards Institute(ANSI): Provided, that for generation facilities that have not conducted such testing during the 12 months immediately prior to its initial submission of its maximum capacity, the initial submission thereof shall be the highest nominated capacity over the period of twelve(12) months as provided in the capacity nomination submission for dispatch scheduling.

Settlement. The activity of producing bills and credit notes for WESM Members in accordance with clause 3.13 of the WESM Rules, and with the processes defined in clause 3.14 of the WESM Rules.

Trading Participant. A person or entity registered with the Market Operator in accordance with WESM Rule 2.3.3 as either a customer or a generation company.

Week-Ahead Projections. The projections performed for the week-ahead market horizon by the Market Operator in accordance with clause 3.7.1 of the WESM Rules.

3. MARKET MONITORING INDICES

3.1 Type of Indices

The indices provide indication of market trends, performance, and possible drivers, and signals which require more in-depth analysis. The types of indices are summarized as follows:

a) Market Performance Indices

b) Supply (Generation) Indices

c) Spot Market Price Indices

d) Transmission Constraints Indices

e) Structural Indices

Depending on the type of index, the indices may be calculated for the whole market, by generating plant or by Trading Participant.
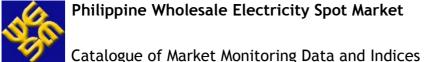
3.2 Study Points

Following the timeline of market operation processes, the monitoring indices are calculated for specific study points, which include, among others:

- Week-Ahead Projection
- Day-Ahead Projection
- Ex-Ante Dispatch
- Ex-post
- Settlement

3.3 Frequency

The monitoring indices are calculated on an hourly, daily, weekly, monthly, quarterly, and annual basis. Each index can also be calculated for cases such as:

- Working days and non working days
- Peak and off peak hours

Indices may be static (do not change for a significant period, such as market concentration in the installed capacity market) or dynamic (change within a relative short time, such as reserve margin and the pivotal indices). Static indices are calculated annually or, at the most, monthly. Dynamic indices need to be calculated for shorter periods, because in a long period the information on dynamic changes in behavior or results is lost.

The frequency and study points may be modified, depending on the analysis that would be undertaken. Appendix A contains the market monitoring indices and the corresponding formulas in Appendix B.

3.4   Reporting

The MAG will regularly monitor and collect all relevant data that will be used for the calculation of the market monitoring indices. Appendix C contains the catalogue of Market Monitoring Data that will be routinely provided by the Market Operator, System Operator and the WESM Members.

Prior to each periodic monitoring meeting of the MSC, the MAG will prepare and submit periodic Market Assessment Reports to the MSC, containing an analysis of the market monitoring indices.

APPENDIX A. MARKET MONITORING INDICES

Type	Purpose	Study Points
I. Market Performance Indices		

1. Load Characteristics
    a. Load profile
        i. Average Load;
        ii. Maximum Load; and
        iii. Minimum Load
 	
    b. Load Factor (LF)
    c. Load distribution by nodes
	Indicators on load characteristics may be used to assess load profile, maximum demand and location of load in the grid. The purpose is to:
	• Identify typical load profiles;
	• Identify nodes were load is more concentrated;
	• Calculate correlation between loads and prices; and
	• Calculate correlation between typical loads and Trading Participant bidding behavior.
		Week-Ahead,
		Day-Ahead,
		Ex-ante,
		Ex-post

2. Load Forecast Variation
    a. Comparison of day-ahead load forecast and ex-ante load
    b. Comparison of ex-ante load and actual metered quantity
	To assess the quality of the pre-dispatch process in estimating and informing expected load requirement.
	
	Comparison of the day-ahead (or four-hour ahead) load forecasts and real-time actual demand (as metered) will indicate the degree of accuracy of the day -ahead (or four-hour ahead) generation scheduling in relation to load forecast.
		Day-ahead,
		Ex-ante,
		Ex-post

3. Reserve Margin Index (RMI)	Measures the generation – demand balance, including the operating reserve requirement as demand. The purpose is to measure whether the energy balance in the market is tight, because the tighter the supply the greater the opportunities to exercise market power.	Ex-ante, Ex-post

Type	Purpose	Study Points

4. Market Intervention or Suspension
   a. Frequency (number of interventions or suspensions in a period)
   b. Duration (percentage of hours in a period)
   c. Default Dispatch Offer
	To assess the development of the WESM in relation to special conditions.	Ex-post

5. Spot Market Exposure
   a. For each Generator
      i. Percentage of energy injected not covered by bilateral contracts
   b. For each Customer
      i. Percentage of energy withdrawn not covered by bilateral contracts
      ii. Percentage of peak demand not covered by contracts
	To assess the behavior of the trading participants in the contract market measured as the resulting exposure to the spot market.	Ex-ante,
		Ex-post

6. Dispatch Constraints
   a. Percentage of generation scheduled by merit compared to total generation offered
   b. Generation scheduled out of merit (due to system constraints)
	To assess the effect of system constraints in the economic use of offered generation.	Ex-ante,
		Ex-post

II. Supply (Generation) Indices		
1. General Characteristics a. Distribution of generation by nodes		Ex-ante, Ex-post

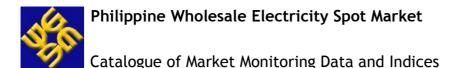| Type	Purpose	Study Points

2. Capacity factor for each generating plant
   a. Registered Capacity
   b. Available Capacity
	To identify trends, such as whether the load factor is decreasing or increasing. Decreasing load factor may show a generation that is becoming non-competitive in the market, or being constrained by transmission.	

3. Outages
   a. Frequency of outages
   b. Unavailability factors
	To measure the reliability of generation, and to assess the impact of outages on the spot market.	Ex-post

4. Capacity Gap Indices
   a. Registered Capacity
   b. Available Capacity
	To determine capacity withholding or if the generator is offering to the market less capacity than its maximum output available and that can be generated.	Ex-post

5. Price Setting Indices
   a. Price Setter Index
   b. Price Setting Frequency Index (PSFI)
	To identify generation units or Generators that are "price setters," and therefore require more in-depth monitoring. A Generator that frequently sets the price may have greater opportunities to design bidding strategies to manipulate prices.	Ex-ante, Ex-post

6. Generation Offer Indices
   a. Offer curves and segments
   b. Reference offers
   c. Offer correlation analysis
   d. Frequency and quantity of offer changes
	To determine trends or strategy in the offer behavior of Generators, in particular those who may have or abuse market power.	Ex-ante

III. Spot Price Indices		

1. General Characteristics
   a. Average energy weighted spot prices (moving averages)
   b. Maximum spot price
	To assess spot price evolution, trends and volatility.	Week-Ahead, Day-Ahead, Ex-ante, Ex-post

Type	Purpose	Study Points
c. Minimum spot price d. Frequency and Distribution		

2. Price Forecast Variation
   a. Week-ahead price forecast compared to day-ahead price forecasts
   b. Day-ahead price forecast compared to actual ex post spot prices
   c. Differences between ex-post price and ex-ante price
	To assess the quality of the day-ahead process in estimating and informing expected spot prices. If the error is significant or persistent or there is an unexpected or difficult to explain difference, it would be necessary to assess the reasons and the need for improvements in the day-ahead or ex ante calculations.	Day-Ahead,
		Ex-ante,
		Ex-post

3. Spot Price Node Variation Index (SPNVI)	To assess the difference of spot prices in the different nodes in the market.	Day-Ahead, Ex-ante, Ex-post
4. Maximum Spot Price Index (MSPI)	To assess the margin range (or cost mark up) for marginal/ peaking generation.	
IV. Transmission Indices		

1. Transmission Congestion Frequency Indices
   a. Frequency of active constraints (number)
   b. Duration of active constraints (percentage of time in a period)
   c. Correlation between unexpected constraints and nodal prices or level of congestion
		Ex-post

Type	Purpose	Study Points
2. Transmission Congestion Cost Index (TCI)	To compare the impact of congestion in different periods and/or regions. When there is no transmission congestion, TCI will be zero. When TCI becomes high, transmission congestion has become more severe, showing the need for further assessment on transmission expansion plans.	Ex-post
3. Percentage of Transmission Congestion Index (TCIP)		
V. Structural: Market Concentration Indices	These indices measure the concentration of a market, to assess if existing conditions facilitate or impede the development of competition. The less concentrated the market, the greater the possibility of effective competition.	
1. Market Share (by Generator and by Customer)	Measures the percentage of capacity or energy that a Trading Participant controls in the monitored market.	

a. Concentration by Generator (by Generating Plant and by Trading Participants)
  i. Nameplate Capacity
  ii. Available (Offered) Capacity
  iii. Energy Injected
		Ex-ante for available (offered) capacity; Ex-post for energy injected

b. Concentration by Customer
  i. Peak Demand
  ii. Energy withdrawn
		Ex-ante, Ex-post

2. Herfindahl-Hirschman Index (HHI) (by Generating Plant and by Trading	Measures the degree of concentration. Defined as the sum of squares of the Participants' market shares. It is generally	Ex-ante for available

Type	Purpose	Study Points
Participants) a. Capacity (Name Plate Rating, Available or Offered Capacity) b. Energy Injected	considered that HHI above 1,800 indicate a high degree of concentration.	(offered) capacity; Ex-post for energy injected
VI. Structural: Pivotal Dynamic Indices	Measures market power (and potential benefit of exercising market power) taking into consideration the variables that change dynamically, mainly demand (energy withdrawn), required spinning (or operational) reserve and generation availability.	
1. Pivotal Supply Index (PSI)	The PSI index is a binary variable (1 for pivotal and 0 not pivotal) which measures for a Generator in a particular period of time whether, given the market conditions of demand and generation, the demand can be supplied without that Generator.	Day-ahead, Ex-post
2. Pivotal Supplier Frequency Index	measures the frequency that a generating plant is pivotal in a particular study period	
3. Residual Supply Index (RSI) a. RSI of a Generating Plant	The RSI is a dynamic continuous index that provides additional information to the concept of pivotal Generator (PSI), by measuring the ratio of the available generation without a Generator to the total generation (including operational reserve) required to supply the demand. The RSI is measured on a continuous scale rather than binary, as in the case of PSI	
b. RSI of the whole market	RSI of the Whole Market is the lowest RSI among all generating plants in the market	

APPENDIX B. MARKET MONITORING INDICES FORMULAS

I. Market Performance Indices

1. Load Factor (for the period "t")

$$LF^t = \frac{Total\ Energy\ Withdrawn^t}{Peak\ Load^t\ x\ Total\ Hours^t}$$

2. Load Distribution in Node "n" for the period "t"

$$LoadDist_n^t = \frac{Load\ per\ Node_n^t}{Total\ Load^t}$$

3. Load Forecast Variation (for the hour "h")

$$LoadVar^h = \frac{Actual\ Load^h - Forecast\ Load^h}{Forecast\ Load^h}$$

4. Reserve Margin Index

$$RMI^h = \frac{\sum GenCap^h - (GenTot^h + Res^h)}{(GenTot^h + Res^h)}$$

Where:

- $GenTot^h$ = total generation required in hour "h" to supply the load (energy withdrawn plus transmission losses)

- Res^h = the operating reserve in hour "h"

- $\sum GenCap^h$ = total offered capacity of all generators in hour "h"

5. Spot Market Exposure

a. Percentage of energy injected not covered by bilateral contracts (for the period "t")

$$\frac{Total\ Energy\ Injected^t - Total\ Bilateral\ Contract^t}{Total\ Energy\ Injected^t}$$

b. Percentage of energy withdrawn not covered by bilateral contracts (for the period "t")

$$\frac{Total\ Energy\ Withdrawn^t - Total\ Bilateral\ Contract^t}{Total\ Energy\ Withdrawn^t}$$

c. Percentage of peak demand not covered by bilateral contracts (for the period "t")

$$\frac{Peak\ Load^t - Total\ Bilateral\ Contract^t}{Peak\ Load^t}$$

6. Dispatch Constraints

a. Percentage of generation scheduled by merit to the total generation offered (for the period "t")

$$\frac{Generation\ Scheduled\ by\ Merit^t}{Total\ Generation\ Offered^t}$$

b. Generation scheduled out of merit (for the period "t")

$$\frac{Generation\ Scheduled\ Out\ of\ Merit^t}{Total\ Generation\ Scheduled^t}$$

II. Supply (Generation) Indices

1. Generation Distribution in Node "n" for the period "t"

$$GenDist_n^t = \frac{Generation\ per\ Node_n^t}{Total\ Generation^t}$$

2. Capacity Ratio of Generator "i" for the period "t"

$$CapRatio_i^t = \frac{Total\ Generation_i^t + Total\ Operating\ Reserve_i^t}{Total\ Offered\ Capacity_i^t}$$

3. Capacity Gap (for the hour "h")

$$CapGap_i^h = \frac{Registered\ Capacity_i^h - Offered\ Capacity_i^h}{Registered\ Capacity_i^h}$$
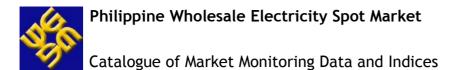
4. Price Setting Indices

a. Price Setting Index

$PriceSetter_i^h = 0$,   if Last Accepted Offer Price$_i^h$

is below 95% of Nodal Price$_i^h$

$PriceSetter_i^h = 1$,   if Last Accepted Offer Price$_i^h$

is between 95% to 100% of Nodal Price$_i^h$

Where:

- PriceSetter$_i^h$ is the price setting index for generator "i" in hour "h"

b. Price Setting Frequency Index

$$PSFI_i^t = \frac{\sum PriceSetter_i^h}{(\text{No. of hours in period "t"})}$$

Where:

- $PSFI_i^t$ = the percentage of time that generator "i" qualified as price setter in the period "t"

III. Spot Price Indices

1. Price Forecast Variation (for the hour "h"), %

$$PriceVar^h = \frac{Actual\ AvgSP^h - Forecast\ AvgSP^h}{Forecast\ AvgSP^h}$$

Where:

- $AvgSP^h$ = energy weighted average spot price in hour "h", PhP/MWH

2. Spot Price Node Variation Index (SPNVI) (for the hour "h")

$$SPD^h = \sqrt{\frac{\sum (Spot\ Price_n^h - AvgSP^h)^2}{N}}$$

$$\text{If } AvgSP^h > 0, \quad SPNVI^h = \frac{SPD^h}{AvgSP^h} \ ;$$

Where:

- SPD^h = spot price deviation in hour "h", %
- $Spot\ Price_n^h$ = spot price at node "n" in hour "h" , PhP/MWH
- $AvgSP^h$ = energy weighted average spot price in hour "h" , PhP/MWH
- N = number of nodes in the market

IV. Transmission Indices

1. Transmission Congestion Cost Index (for the period "t")

$$TCI^t = \frac{Total\ Congestion\ Cost^t}{Total\ Generation^t}$$

2. Percentage of Transmission Congestion Index (for the period "t")

$$TCIP^t = \frac{TCI^t}{AvgSP^t}$$

Where:

- $AvgSP^t$ = energy weighted average spot price in period "t"

V. Structural: Market Concentration Indices

1. Market Share

    a. Concentration by Generating Plant or Trading Participant (Based on Offered Capacity)

    $$SAvCap_i^t = \frac{MW\_Av_i^t}{\Sigma MW\_Av^t}$$

    Where:

    - $MW\_Av_i^t$ = offered capacity of a generating plant/trading participant "i" in the period "t"

    - ΣMW_Av^t = total offered capacity of all generating plants/trading participants in the period "t"

    b. Concentration by Generating Plant or Trading Participant (Based on Energy Injected)

    $$SGen_i^t = \frac{Gen\_MWh_i^t}{\Sigma Gen\_MWh^t}$$

    Where:

    - $Gen\_MWh_i^t$ = energy injected by generating plant/trading participant "i" in the period "t"

    - ΣGen_MWh^t = total energy injected by all generating plants/trading participants in the period "t"

    c. Concentration by Customer or Trading Participant (Based on Energy Withdrawn)

    $$SCust_i^t = \frac{Cust\_MWh_i^t}{\Sigma Cust\_MWh^t}$$

    Where:

    - $Cust\_MWh_i^t$ = energy withdrawn by customer/trading participant "i" in the period "t"

    - $\Sigma Cust\_MWh^t$ = total energy withdrawn by customers/trading participants in the period "t"

2. Herfindahl-Hirschman Index

$$HHI^t = \Sigma\,(S_k^t)^2$$

Where:

- S_k^t = generating plant/customer/trading participant "k" market share in the period "t", where $\Sigma\,S_k^t = 100\%$

- "k" = all generating plants/customer/trading participants

VI. Structural: Pivotal Dynamic Indices

1. Pivotal Supply Index

$$RDem_i^h = GenTot^h + Res^h - (\Sigma GenCap^h - GenCap_i^h) - IntCap^h$$

$$PSI_i^h = 1,\ \ if\ RDem_i^h > 0$$

$$PSI_i^h = 0,\ \ if\ RDem_i^h <= 0$$

Where:

- $RDem_i^h$ = residual demand of generator "i" in hour "h"

- PSI_i^h = the pivotal supplier index for generator "i" in hour "h"

- $GenTot^h$ = total generation required in hour "h" to supply the load (energy withdrawn plus transmission losses)

- Res^h = the operating reserve in hour "h"

- $\Sigma GenCap^h$ = total offered capacity of all generators in the hour "h'

- $GenCap_i^h$ = offered capacity of generator "i" in hour "h"

- $IntCap^h$ = available import capacity from interconnection in hour "h"

2. Pivotal Supplier Frequency Index

$$PSI_i^t = \frac{\Sigma\,PSI_i^h}{(No.\ of\ hours\ in\ period\ "t")}$$

Where

- PSI_i^t refers to the percentage of time that generator "i" is pivotal in the period "t"

3. Residual Supply Index

a. Residual Supply Index by Generating Plant

$$RSI_i^h = \frac{(\Sigma GenCap^h - GenCap_i^h) + IntCap^h}{GenTot^h + Res^h}$$

Where:

- $GenTot^h$ = total generation required in hour "h" to supply the load (energy withdrawn plus transmission losses)

- Res^h = the operating reserve in hour "h"

- $GenCap_i^h$ = offered capacity of generator "i" in hour "h"

- $\Sigma GenCap^h$ = total offered capacity of all generators in hour "h'

- $IntCap^h$ = available import capacity from interconnection in hour "h"

b. Residual Supply Index of the Whole Market

$$RSI\_Market^h = min\ (RSI_k^h)$$

Where "k" refers to all generating plants in the market

APPENDIX C. MARKET MONITORING DATA

Type of Data		Description	Frequency of Collection	Source	Means of Obtaining
1. Generating Facilities Information	1.	Nameplate capacity of each registered generating plant/unit	Once	MO	Electronic copy of registration form
	2.	Maximum generation capacity of each registered generating plant/unit	Once and the next business day upon change		
	3.	Minimum generation capacity of each registered generating plant/unit	Once and the next business day upon change		
	4.	Maximum reserve capacity (regulating, contingency, dispatchable, interruptible) of each registered generating plant/unit	Once and the next business day upon change		
	5.	Maximum ramp-up rate of each registered generating plant/unit	Once and the next business day upon change		
	6.	Maximum ramp-down rate of each registered generating plant/unit	Once and the next business day upon change		
	7.	Category of each registered generating plant/unit (Scheduled, Non-scheduled, NRE)	Once and the next business day upon change		
	8.	Bid type of each registered generating plant/unit (Scheduled, Non-scheduled)	Once and the next business day upon change		
	9.	Facility type of each registered generating plant/unit	Once and the next business day upon change		
	10.	Year each registered generating plant/unit was first commissioned	Once	Generation Company	By e-mail or fax
	11.	Historical data on planned and forced outages (minimum three years) of each registered generating plant/unit (number, hours and volume)	Once and to be updated annually	Generation Company	By e-mail
	12.	Historical overhaul hours (minimum three years) of each registered generating plant/unit (number,	Once and to be updated annually	Generation Company	By e-mail

Type of Data		Description	Frequency of Collection	Source	Means of Obtaining
		hours and volume)			
2. Network Data	13.	Maps and diagrams showing the location of each registered generating plant/unit and loads, and ratings of transmission lines	Once and the next business day upon change	SO	Electronic copy
	14.	Market Network Model	Once and the next business day upon change	MO	
	15.	Transmission line constraints	Hourly	MO	
	16.	Transmission Line Loss	Daily		
	17.	Transmission line limit advice	Daily, upon occurrence		Automatic file transfer of flat files
	18.	Transmission line maintenance outage program	Daily or Weekly		
	19.	Transmission line forced outage	Daily upon occurrence	MO or SO	Electronic copy, Notice Report
	20.	Distribution line maintenance outage program	Daily or Weekly	DUs	
	21.	Distribution line forced outage	Daily upon occurrence	DUs	
	22.	Historical data on transmission line planned and forced outages (minimum three years) (number, hours and volume)	Once and to be updated annually	SO	By e-mail
	23.	Historical data on distribution line planned and forced outages (minimum three years) (number, hours and volume)	Once and to be updated annually	DUs	By e-mail
3. Demand Data	24.	Pre-dispatch load forecast	Every 4 hours for Day-Ahead Projection; Daily for Week Ahead Projection	MO	Automatic file transfer of flat files
	25.	Real-time nodal load data (Ex-ante and Ex-post)	Hourly		
	26.	Settlement ready metered load data	Daily, within 2 days after the trading day		

Type of Data		Description	Frequency of Collection	Source	Means of Obtaining
	27.	Historical system demand including maximum and minimum hourly demand (minimum three years)	Once		Electronic copy
	28.	Historical load profile including maximum and minimum hourly demand of each DU (minimum three years)	Once	DUs	Electronic copy
4. Market Offer/ Bid Data	29.	Standing Generation offer (Price and Quantity) submitted by Generation Companies	Once and the next business day upon change	MO	Automatic file transfer of flat files
	30.	Standing Reserve offer (Price and Quantity) submitted by Generation Companies	Once and the next business day upon change		
	31.	Standing Demand Bid (Price and Quantity) submitted by Customers	Once and the next business day upon change		
	32.	Generation offer (Price and Quantity) submitted by Generation Companies	Hourly		
	33.	Reserve offer (Price and Quantity) submitted by Generation Companies	Hourly		
	34.	Demand Bid (Price and Quantity) submitted by Customers	Hourly		
	35.	Default dispatch offer (Price and Quantity)	Once and the next business day upon change		
5. Scheduling and Dispatch	36.	Pre-dispatch scheduled quantity of energy and reserve by generating plant/unit	Every 4 hours for Day-Ahead Projection; Daily for Week Ahead Projection		
	37.	Real-time scheduled quantity of energy and reserve by generating plant/unit (Ex-ante and Ex-post)	Hourly		
	38.	Pre-dispatch nodal prices for energy and reserve	Every 4 hours for Day-Ahead Projection; Daily for Week Ahead Projection		

Type of Data		Description	Frequency of Collection	Source	Means of Obtaining
	39.	Real-time nodal prices for energy and reserve (Ex-ante and Ex-post)	Hourly		
	40.	Pricing Error Notice	Within the trading day upon occurrence		
	41.	Generating plant/unit under maintenance (planned outages and annual overhaul)	Daily, the next business day		
	42.	Forced outage by generating plant/unit	Upon occurrence, the next business day	MO or SO	
	43.	Data on constrained generation	Daily	SO	
6. System Operations Data	44.	Security limit advice	Daily, the next business day	MO	Automatic file transfer of flat files
	45.	5-minute system snapshot	Daily, the next business day		
	46.	HVDC Line Flow	Daily, the next business day		Electronic copy
	47.	Overriding constraints	Immediately upon occurrence	SO	Notice Report
7. Settlement Data	48.	Settlement amount for each Trading Participant	Daily, within 2 days after the trading day	MO	
	49.	Settlement amount for must-run units	Daily, within 2 days after the trading day		
	50.	Settlement ready metered generation quantity by generating plant/unit	Daily, within 2 days after the trading day		Notice Report
	51.	Settlement ready metered load data	Daily, within 2 days after the trading day		
	52.	Bilateral contract quantity	Daily, within 2 days after the trading day	MO	Electronic copy
8. Must-Run Units (MRUs)	53.	List of designated MRUs	Once	SO	Electronic copy
	54.	Actual dispatch quantity for MRUs	Next business day	SO	

Type of Data		Description	Frequency of Collection	Source	Means of Obtaining
9. Ancillary Services (A/S)	55.	List of contracted A/S Providers	Once	SO	Electronic copy
	56.	Hourly reserve requirement	Daily	SO	
	57.	Hourly day-ahead schedule for A/S	Daily	SO	
	58.	Actual dispatched quantity for each A/S Provider	Daily	SO	
10. Administered Price Information	59.	Actual dispatch quantity for each generating plant/unit	Next business day	SO	
	60.	Settlement Amount for each Trading Participant	Daily, within 2 days after the trading day	MO	
	61.	Event of Market Suspension	Immediately upon occurrence	MO	Notice Report
	62.	Event of Market Intervention	Immediately upon occurrence	MO	Notice Report
11. Hydro Generation	63.	Hydro generation data (e.g. reservoir level status reports and limits).			