Compliance to ERC Directives on the Re-filing of the WESM Price Determination Methodology

Compliances to the directives of the Commission contained in its Order of 15 March 2004 were prepared by the WESM Market Operations (the "MO") and presented to the WESM Technical Working Group for further deliberation and thereafter to the Philippine Electricity Market Corporation Board (the "PEM Board") for approval. All compliances discussed herein have been so deliberated and approved.

1. Customer Pricing Zones

The WESM Rules provide generator pricing based on nodal prices while customers are priced on zonal prices which are load weighted average nodal prices for a particular customer pricing zone. As such, some customers whose nodal prices are lower than the zonal price would in effect pay a higher price while customers with nodal prices higher than the zonal price would pay lower prices. In that case, customers whose nodal prices are lower are deemed to subsdize customers with high nodal prices. This is perceived as counter to the EPIRA mandate of removing cross-subsidies.

However, implementing full nodal pricing for customers, Distribution Utilities with large franchise areas having multiple nodes would have the potential problem of having different prices for contiguous customers. As such, Distribution Utilities with multiple nodes within its franchise area should seek the approval of the Energy Regulatory Commission (the "ERC") to group their nodes into zones.

WESM Rules Change

The issue on nodal and zonal pricing for Customers was deliberated upon by the WESM Technical Working Group (WESM-TWG) and it was concluded that to minimize potential cross-subsidy, while considering the dilemma of large distributors of having multiple prices in their franchise area, nodal pricing for customers will be adopted while making customer zonal pricing optional and not mandatory.

Rules 3.2.2.3(A), 3.2.3.1 and 3.2.3.2 of the WESM Rules were amended by the Department of Energy (the "DOE") through DOE Circular DO-2004-07-008 (Attachment 1). The amendments enable nodal pricing for customers and make zonal pricing for customers optional and not mandatory.

Market Simulation

To quantify possible level of market subsidy resulting from application of customer pricing zone, MO submits Market Simulation results attached as Attachment “2”.

2. Ex-Ante Market

The ERC has has directed a further study be made on the advantages and benefits of a one sided mandatory ex-ante/ex-post regime in comparison to a two sided ex-ante/ex-post regime. Should the propensity for gaming and anticompetitive behavior outweigh the benefits, the ERC further directed that recommendation to mitigate the situation be made.

WESM Rules Change

The WESM-TWG recommended that two-sided Ex-ante market be considered for WESM, wherein, customers may provide load forecast for the Ex-ante market. To effect the optional ability of the Customers to provide forecasts for the Ex-ante market and make the WESM Ex-ante market two-sided, Rule 3.5.4.1 of the WESM Rules was amended enabling optional customer forecast to be used in the Ex-ante market subject to a validation procedure (Attachment 1).

A summary of study by the MO and discussions of the WESM-TWG are presented below:

Benefits of Ex-Ante and Ex-Post Regime in General

The Ex-Ante and Ex-Post regime provides:

- price certainty through the Ex-Ante pricing; and
- accurate pricing by accurate representation of the complexicity of the electricity networks and associated systems in Ex-Post reality, through the Ex-Post pricing.

However, neither the Ex-Ante nor Ex-Post pricing could provide certainty and accuracy in pricing simultaneously. A regime that comprises an Ex-Ante component and an Ex-Post component is structurally more efficient than either an Ex-Ante regime or an Ex-Post regime.

The Ex-Ante component allows market participants to secure hour-ahead prices which reduce participant vulnerability to price fluctuations that can occur within a trading interval. The mandatory Ex-Ante price signals influence correct, economic real-time behavior as it produces greater certainty of generator performance and provide an incentive for customers to manage their energy consumption. The participants are provided with a broader range of options in the sense that the hourly transaction provides a short time for participants to react to market price signals which tend to make the market more liquid, competitive, and economically efficient.

Another key benefit of Ex-Ante pricing is that it provides verification on the economic consistency of the dispatch solution prior to actual physical dispatch. This tends to reduce the risk of inferior dispatch decisions while providing direct economic signals within a time fame that allows for participant response.

While the intention of Ex-Post pricing is to mirror reality as close as possible, various reasons may account for the real time behaviour of load and generation patterns to differ from that determined in Ex-Ante calculations. This might be due to deviations from dispatch instructions or unexpected changes in load and modelling deficiencies. The Ex-Post regime ensures that the final prices reflect the correct economic and grid conditions in real time. For example, to the extent that load responds to the high Ex-Ante prices by reducing consumption, the Ex-Post pricing would reflect the benefit of the response in real time.

Generators and customer reactions (ex-post) to price signals tend to make them equal participant in the determination of prices and provides a market based means of balancing the supply and demand. For generators, however, risks are also reduced due to price certainty prior to actual dispatch.

One-Sided and Two Sided Ex-Ante Market

One sided Ex-Ante markets pertain to the ability of generators to make offers while customers take on what generators offer and react to the price signals on an ex-post basis. On the other hand, two sided Ex-ante market enable the simulataneous reaction of both generators and customers prior to gate closure. Generators can make offers based on their strategy while customers can react by providing their demand requirements for the relevant trading interval (this is aside from customers making demand bids).

Although the risks in a two-sided Ex-Ante market are not symetrical, generally tending to favour generators over customers as they tend to have greater flexibility in their ability to vary supply than customers can vary load in real time. This slight bias towards generators is exacerbated if the market is one sided, e.g., If the MO, in applying the the industry agreed forecasting method, has no incentive to improve accuracy or respond to generator gaming strategies. Although this generalisation is physically true (in the absence of fully developed demand-side (demand bidding) participation) the actual degree of freedom in real time will depend on the compliance of Trading Participants to the agreed dispatch tolerances and other significant variations in the market.

One sided Ex-ante market as an option during transition

Many, smaller, customers might regard the transaction cost of having to hourly produce a forecast as being overly burdensome for the level of energy they are transacting in the market. They may well prefer to hedge most of their energy purchases and simply be a price taker in both the Ex-Ante and Ex-Post markets. Thus the MO provides a default, neutral forecasting service for all customers.

One sided Ex-Ante markets also provide a soft entry option for customers of all sizes as they learn about the market. Transitioning to the market will be a steep learning curve for all parties. Customers will have many issues to consider in developing systems and procedures for participating in the market. Developing load forecasting tools may not be top of their list. Allowing the MO to carry out this function, initially, on their behalf will assist in easing their transition.

Gaming Opportunities

Gaming and anti-competitive behaviour in a one-sided market would appropriately be addressed by the Market Surveillance Committee under the PEMC Board pursuant to Sec. 1.6 of the WESM Rules.

Gaming opportunities exist for both generators and customers in both an Ex-Ante and Ex-Post market. Customers can game the market if they forecast their own load for the Ex-Ante market. They can financially gain from under forecasting in the Ex-ante market because the same generator offers are used in both markets. Under forecasting will lead to a lower Ex-Ante prices and the higher (real) price in the Ex-Post market only applies to the difference between the Ex-Ante and Ex-Post volumes.

Potential gaming opportunities for generation companies also exist after the gate closure time, e.g., by using forced outages strategically to withdraw capacity after gate closure. For example a generator with multiple units could suffer an outage after gate closure that withdraws cleared unit from the supply stack. This would force the use of higher priced generation in real time to replace the tripped unit, thus, forcing up the overall price such that the generator benefits from the higher price on the remaining units it has in the market. Gaming opportunities will always be sought by trading participants within the market rules and can provide highly volatile prices. Table 3 provides a simple example wherein generators and customers alike may game the market.

Recommended Mitigating Measures

The following summarizes the measures to provide equal level playing field for all participants and mitigate any possible gaming by both generators and customers alike.

1. Rule amendments allowing voluntary customer participation in the Ex-Ante market subject to validation procedures and an ex-post validation procedure to ensure that the customer complies with the forecasted demand. Customer forecasts can be validated through the setting of a tolerance level agreed upon by Trading Participants.
2. A load forecasting methodology to be applied in the Ex-Ante market developed and agreed upon by Trading Participants.
3. A regular review of the Ex-ante load forecasting process.
4. A robust gate closure regime which provide for the identification and classification of bona fide significant variation in and in-between trading intervals.
5. Building-up of demand-side participation capability and reducing gate closure time, as long term development options.
6. A clear concept of measures to sustain the market, including a robust dispatch compliance regime, agreed upon by the Trading Participants.
7. Development of procedures to be applied by a market monitoring body agreed upon by Trading Participants.

MO Liability for Forecast Errors

Voluntary customer participation in the Ex-ante market subject to validation procedures raises the question of whether the Market Operator (MO) should have any liability for forecasting errors. However, it is noted that the MO will employ a forecasting methodology that is based on the process/procedures set out in its operation manuals and which have been endorsed by the WESM participants through the industry consultation process. Provided the MO follow the process, it should not be liable for the forecasting errors. It is therefore construed that the WESM participants has to take ownership of the forecasting methodology as they suffer direct financial consequences of any forecasting errors. They need to be involved and have responsibility for approving the forecasting methodology. The MO should then be responsible for implementing the agreed methodology and its liability should be limited to failure to apply the methodology agreed to by the industry.

Detailed Procedures and Concepts to be applied on the WESM.

Several procedures and or regimes are necessary and are inter-related in their development. These include, the identification of significant variations and gate closure regime, dispatch tolerance level, load forecasting methodology and market sustainability measures. As per direction from the WESM-TWG, the detailed concepts and procedures need to further studied with due consideration on all aspects the aspects of WESM. It this regard, it is manifests that the details regarding these procedures and regimes shall be presented to the ERC for information purposes upon deliberation and approval by the PEM Board.

Table 3. Example of Possible Generator and Customer Gaming Opportunities

Ex-ante Market Generator Gaming Example										
Over Forecast										
Offer Stack		Load		Ex-ante			Ex-post			Total
MW	Pesos	Forecast (MO)	Actual	Price	Quatity	Settlement	Price	Quantity	Settlement	
3001-4000	100,000	3010	2998	100,000	3,010	301,000,000	3,000	- 12	-36000	300,964,000
2501-3000	3,000									
0-2500	1,000									
Under Forecast										
Offer Stack		Load		Ex-ante			Ex-post			Total
MW	Pesos	Forecast (MO)	Actual	Price	Quatity	Settlement	Price	Quantity	Settlement	
3001-4000	100,000	2986	2998	3,000	2,986	8,958,000	3,000	12	36000	8,994,000
2501-3000	3,000									
0-2500	1,000									
Average						154,979,000			-	154,979,000
Accurate Forecast										
Offer Stack		Load		Ex-ante			Ex-post			Total
MW	Pesos	Forecast (MO)	Actual	Price	Quatity	Settlement	Price	Quantity	Settlement	
3001-4000	100,000	2998	2998	3,000	2,998	8,994,000	3,000	-	0	8,994,000
2501-3000	3,000									
0-2500	1,000									
Net Generator Gain (assuming no bias in forecast errors)										**145,985,000**
Customer Gaming Example										
Accurate Forecast										
Offer Stack		Load		Ex-ante			Ex-post			Total
MW	Pesos	Forecast (Customer)	Actual	Price	Quatity	Settlement	Price	Quantity	Settlement	
3001-4000	100,000	2998	2998	3,000	2,998	8,994,000	3,000	-	0	8,994,000
2501-3000	3,000									
0-2500	1,000									
Under Forecast										
Offer Stack		Load		Ex-ante			Ex-post			Total
MW	Pesos	Forecast (Customer)	Actual	Price	Quatity	Settlement	Price	Quantity	Settlement	
3001-4000	100,000	2498	2998	1,000	2,498	2,498,000	3,000	500	1500000	3,998,000
2501-3000	3,000									
0-2500	1,000									
Net Customer Gain										**4,996,000**

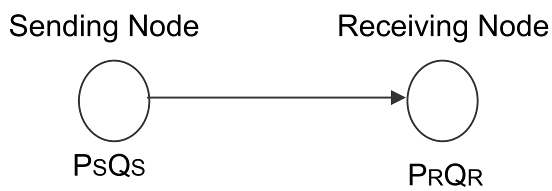
Disclaimer: The above figures are presented for illustration only and the Applicant takes no responsibility for any inaccuracies that may be contained in this paper.

3. Congestion Revenues

Locational marginal pricing (LMP) provides the cost of supplying next MW of load at a specific location considering the marginal costs of generation, transmission losses and congestion. The marginal loss and congestion component vary locational marginal prices throughout the power system and may cause settlement surpluses wherein the Market Operator collects more revenue from customers than it will pay to generators. This over-collection is called line rentals revenue. In certain circumstances congestion may also cause negative rentals due to loop flow conditions given the combination of power system condition and generator offers. In algebraic form, LMP is shown below:

$$\text{LMP} = \text{Marginal Generator Cost} + \text{Marginal Transmission Loss} + \text{Marginal Cogestion Cost}$$

Line rentals are composed of two interrelated types of costs: the cost of marginal losses (i.e. loss rentals) and the marginal costs of any power system constraints (i.e. congestion rentals). It should therefore be concluded that congestions rents only exist when there are congestion in the transmission system; however, in reality congestion affect losses and that losses can also cause constraints if the flow on a line plus the line loss itself reaches the line capacity limits. Hence, distinction between loss and constraint rentals is blurred when constraints occur. The line rental concept is shown below:



Line Rental = $P_R Q_R - P_S Q_S$

Where:
P_R – Price at Receiving node
P_S – Price at Sending node
Q_R – Quantity at Receiving node
Q_R – Quantity at Sending node

The ERC agrees that the Market Operator requires the loss rentals to properly settle the market and is considered insignificant and easily managed by the Market Operator using the procedures outlined in the WESM Rules. On the other hand, congestion line rentals on the transmission system could be a significant amount of revenue. To effectively manage the congestion line rentals, it should also be retained by the Market Operator and re-allocated or returned to trading participants in a manner agreed upon by trading participants.

WESM Rules Change

Deliberations were made vefore the WESM-TWG on who should retain the line rentals. Upon due deliberation, the WESM–TWG concurred and with the approval of the PEM Board, that as a matter facilitating the management of the market surplus or line rentals, it should be the MO who shall retain the line rentals. Further, clarifications included the treatment line rentals in a bilateral contract and the manner of treating line rentals in the WESM. A WESM Rules change was therefore promulgated by the DOE, based on the recommendation of the WESM-TWG. The rules change harmonizes and provides for the clarification of the different provisions on the rules regarding the market surplus. The rules changes were on: Rule 3.13.1.1 (b), Rule 3.13.15, Rule 3.13.16.2, Rule 3.13.16.3, Rule 3.13.17, Rule 3.13.17.1, Rule 3.13.17.2 and Rule

3.15.2.2 (c). Attachment 1 (DOE Circular DO-2004-07-008) provides the promulgated amendment to the WESM Rules.

Congestion Surplus Allocation

Congestion revenues need to be returned to the Trading Participants either directly through an allocation formula or funding for a Financial Transmission Right contract or indirectly through the reduction of other Market Participant fees or charges. This is in line with EPIRA and WESM goal of fair and equitable playing field for all Trading Participants. The WESM Rules amendments (Rule 3.13.16.2, Rule 3.13.16.3) provide the basic mechanisms for the treatment and development of detailed procedures for the allocation of congestion surplus. It is construed, however, that detailed procedures should be developed during market trials to enable the trading participants to fully quantify its impact on the industry and the WESM, including the development of financial transmission rights.

Market Surplus Simulation[1]

In order to provide information to the ERC as to the likely magnitude of congestion rents, the MO utilized the results of the market simulations conducted in determining possible cross-subsidy amounts (Nodal and Zonal Pricing Comparison) . The following are the results of the market simulation:

Table 4. Line Rental Simulation Result (In Million Pesos)

Month	September (Wet Season)	May (Dry Season)
Total Energy Transacted, GWh	3,310	3,574
Customer Collection	8,688	9,199
Generator Payment	7,457	7,935
Net Settlement Surplus	1,231	1,264
Monthly Line Loss Rental (MLR)	263	336

1 It should be noted that the figures shown in the table are highly indicative and dependent on the assumptions and simulation data utilized.

Monthly Constraint Rental (MCR)	968	928
Annual Line Loss Rental	3,451	
Annual Constraint Rental	11,425	
Annual Customer Payment	106,299	
Annual Payment to Generator	91,395	

Likewise , the simulation utilized the Luzon Demonstration Market System in the calculation of dispatch schedule and nodal prices based on the System Operator daily operations report for the months of May 2004 and September 2003. Generator offers were maintained based on variable costs (fuel costs) for each type of plant in the Luzon Grid. The monthly line rental results were then translated to an annual basis by considering the months of March, April, May and June as dry season while the rest of the months as wet season.

The market simulation considered two scenarios, normal and worst case scenario. Normal scenario considered no line outages while worst case scenario considered single and double line outage contingencies. A complete documentation on the data and assumptions used and corresponding simulation methodology for the Market Simulation conducted is shown in Attachment 2. Market Simulations – Luzon Grid.

Table 5. Line Rental Simulation Result (Worst Case)

Month	**September (Wet Season)**	**May (Dry Season)**
% Loss Rental = MLR/TCCl	3%	4%
% Congestion Rental = MCR/TCC	11%	10%
% Surplus = Surplus/Total Customer Collection	14%	14%

Where:
MLR = Monthly Line Loss Rental
MCR = Monthly Constraint Rental
TCC= Total Customer Collection

Table 6. Estimated Monthly Surplus Range

% Constrained Period (Worst Case)	65% (of time)
% Constrained Period (Normal Condition)	38% (of time)
% Surplus Range (Max) (Worst Case)	14%
% Surplus Range (Min) (Normal Case)	5.8%

The results indicate that with or without physical line outages, congestion can still be present due to line limitation, demand level and generator offer optimization. Typical constrained transmission lines include dasmarinas-binan, duhat-balintawak, and concepcion-mexico while typical marginal plants include Ilijan, Malaya, Duracom, Sta. Rita, and Limay generating plants.

The results also indicate that around 3-4% of the total monthly customer payments can be allocated to line rentals due to losses while around 10-11% are line rentals due to congestion, for a total surplus percentage of around 14%. This translates to about the P 11,425 Billion annual line rents due to congestion. It was also observed that during worst case condition, congestion is present 65% of the time while for normal condition; congestion is present about 38% of the time. Estimating the range of surplus considering the worst and normal condition indicates that the surplus can range from 5.8 % to 14% with respect to total customer collection.

Disclaimer: The above simulations are based on historical data. As such, the Applicant takes no responsibility for any inaccuracies that may be contained in this paper. Any reliance on the information herein shall be for reader's sole account.

4. Financial Transmission Rights (FTRs)

The approval of a methodology for developing, allocating, issuing and/or auctioning FTRs shall be subject of a future separate filing with the Commission.

5. Must-Run Plants

The WESM Rules has no provision for must run plants. In some cases, however, a plant has to run (i.e., not in accordance with the merit order) because it is needed for system reliability and/or to support system security. The System Operator has the responsibility to define system security requirements and nominate which plants are classified as must-run during specific trading intervals.

The criteria for determining which plant should operate as must run will depend on the requirement of the power system. Must run plants are designated to correct localized problems in the system operation. The ideal criteria therefore for designating must run plants should be based on its solution effectiveness in improving system problems. Possible reasons for designating generators as must run could be for testing and commissioning purpose, local voltage support, system security and stability improvement.

The development of must-run plants and conditions by which the SO may alter the dispatch schedule require thorough assessment of the transmission system and generating plants together, including the finalization of dispatch protocols to be agreed upon by the SO, Trading Participants and the MO. We therefore manifest that the criteria for must run shall be submitted to the ERC for information purposes upon formulation of the procedures on dispatch protocols and ancillary services by the WESM-TWG and thePEM Board.

6. Market Network Model

In compliance to the WESM Rules and ERC directives, the WESM–TWG market operations subcommittee drafted detailed criteria and procedures for the development, maintenance, publication and alteration of the Market Network Model (MNM) to be used in the determination of dispatch schedule and nodal prices in the WESM. The MNM document was presented to and reviewed by the WESM – TWG. Consequently, the document was endorsed to and approved by the PEM Board. As per the MNM document procedure, the market network model (bus oriented single diagram) to be used in the market trials and corresponding market trading nodes will be published based on the standing network data of MO. Prior to commercial operation of the WESM, a refined network model based on participant input shall be published. Complete details of the criteria, procedures and other provisions adopted by WESM for the MNM are shown in Attachment 3 - WESM Market Network Model.

7. Ancillary Services

The procedures and related cost recovery mechanisms are currently being developed by the MO-SO Ancillary Servies Task Force to gether with the WESM-TWG SO Subcommittee. Transco-MO takes note of the ERC directive on Ancillary Services. However, these are set as a matter of a future separate filing with the ERC.

8. Prudential Requirements

Upon due deliberation by the WESM-TWG, it is concurred that

"Rule 3.15.2.2 (c) pertaining to the exemption of a distribution utility from prudential requirements if it demonstrates the financial capability by complying with agreed upon financial covenants and that such exemption is subject to the approval of the *PEM Board*,"

is counter to the objectives of a fair and level playing field for all trading participants.

Hence, its deletion in the WESM Rules was recommended by the WESM–TWG and, thereafter, approved and promulgated by the DOE. Attachment 1 (DOE Circular DO-2004-07-008) provides the promulgated amendment (deletion of Rule 3.15.2.2 (c)) to the WESM Rules.

9. Market Sustainability

Market sustainability measures aims to achieve the policies and goals of the EPIRA and the WESM Rules with minimal additional need for government direction, and allowing the market to evolve in a manner that is fair and equitable to all parties. These measures must be established and agreed upon by all Trading Participants.

As it is encompassing the different aspect of the WESM, from the Rules to the different operational procedures that must be adhered to by the MO, SO and the Trading Participants, it is the contention of the WESM – TWG that detailed provisions on these measures should be finalized during the market trials.

Market Sustainability Issues

Three main issues may arise in the WESM that could undermine its sustainability. These include unrealistic and highly volatile market prices, market power abuses by generation companies and the lack of demand side participation.

Unrealistic and highly volatile market prices arise due to gaps in the market rules and abuse of market power. It is a fact that no market design or rules is ever perfect as can be noted from the experiences of the California, UK and other markets. Circumstances also change and inevitably, the WESM Rules will contain gaps or errors that allow one trading party to gain an unintended commercial advantage over others.

On the other hand, market power will always exist in electricity markets, due mainly to the physical condition or location of the power system and the Trading Participant. Also, locational marginal pricing may create temporary islands of potential generator market power in any region where a transmission constraint binds and there is limited local generation competition. However, market power in these conditions becomes an issue when it is abused in a way that makes the market un-sustainable and leads to further intervention by the government. Although, it maybe construed that temporary market power may also lead to new investment as these maybe seen by Trading Participants as an incentive to locate and develop in a particular region.

Another issue that can possibly undermine market sustainability is the lack of demand side participation. At present, demand side participation is relatively limited as WESM and Trading Participants are only at the beginning of a long evolutionary process. Although WESM inherently provides demand side participation through demand bidding, infrastructure requirements (switching controls) may limit demand side participation to large customers who are able to provide the required infrastructure and load requirements. Hence, market sustainability must also ensure that barriers to effective demand side management are removed as soon as they are identified.

It is noted that one particular barrier that has been removed to provide an effective demand side management is the provision of an optional customer load forecast in the Ex-Ante market, which effectively makes the WESM as a two-sided Ex-ante market. Please refer to Item 2. Ex-Ante Market.

In this regard, the following market sustainability measures are proposed:

1. Well defined objectives of the market sustainability regime.

   Market sustainability objectives must be well defined as the rules will not be perfect and Trading Participants will seek to find any gaps in the rules that give them a competitive advantage.

2. An effective pre-emptive market power mitigating regime.

   Pre-emptive market power mitigating measures ensures that market power is not exercised where conditions for competition are lacking. A pre-emptive market power mitigating regime sends a strong signal to Trading Participants that WESM would not tolerate abuse of market power.

3. Specific rules set out to curb abuse of market power and anti-competitive behaviours.

   Unchecked abuse of market power will lead to undesirable prices, undue price volatility and government intervention. However, differentiating between prices that fairly represent desirable investment signals and abuse of market power is difficult. Hence, the market sustainability measures must be robust within the face of changes in industry structure or environment.

4. An effective demand side participation regime.

   Barriers on any entry to effective demand side management shall be removed as soon as they are identified. Participation to the market by an aggregator who aggregates the load of a number of end consumers can reduce the transaction costs of end consumers.

5. An effective rule change process.

   A flexible, robust, efficient and timely rule change process shall be implemented to withstand changes in industry structure and environment and retain the desired balance and representation of Trading Participants.

6. An effective rule compliance regime.

   To provide for an effective rule compliance regime, an expanded investigative powers of the Market Surveillance Committee (MSC) and the PEM Board concerning alleged rule breaches under rule 1.6.2 (d) (2) can include:

   - The ability to appoint an investigator to investigate any allegations.
   - Requirements on all parties to co-operate with the investigator.
   - Expansion of the confidential information regime to include the right of the investigator to access, but not disclose, confidential information where this is relevant to the investigation.
   - Clarification of the relative roles of the MSC and the PEM Board.
   - The ability to reach negotiated settlements separate from any sanctions

7. A robust regime for investigating “undesirable trading situations”

   To provide for a robust regime for investigating undesirable trading situations, an expanded role of the MSC and PEM Board to investigate under rule 1.6.2.(d) (3) shall be provided, including:

   - A widening of the scope of the investigation beyond “anti-competitive behaviour” to include any “undesirable trading situations”
   - A well defined “undesirable trading situation” - defined and agreed to by all Trading Participants.

- And including, but not be limited to, examination of any offer price that might lead to “undue price volatility or unrealistic prices”; and

- The definition of a test for “undue price volatility or unrealistic prices” developed and defined in consultation with the Trading participants.

It should also be noted that in considering market sustainability, prevention maybe better than cure as starting off with a relatively restrictive regime and allowing this to relax over time is a “safer” approach than starting open and tightening up over time.

10. Line Rental Charge for bilaterals

The line rental amount is simply the difference in the settlement amount (Quantity x Nodal Price) between the receiving node and the sending node. The difference in the amount is due to the cost of transmission loss and transmission congestion. These cost components are already reflected in the nodal prices as a result of the optimization process and are collected from customers and disbursed to the generators.

For bilateral contracts settled outside the market, the line rental amount incurred in the price differential between the sending and receiving nodes stipulated in the bilateral contract remain unsettled. This should be collected to balance the settlements in the market and if not collected, a market settlement deficit will be incurred and will accumulate continuously.

WESM Rules Change

The WESM Rules provide no clear guideline on the treatment of line rent for bilateral contracts. Hence, after due deliberation, WESM - TWG endorsed the necessary amendments to the WESM Rules to the PEM Board for approval, which, in turn, endorsed the same to the DOE. A WESM Rules change was therefore promulgated by the DOE, based on the recommendation of the WESM-TWG, to clearly provide for the charging of bilateral contracts and the details of charging line rental amounts to the Trading Participants. Attachment 1 (DOE Circular DO-2004-07-008) provides the promulgated amendment (Rule 3.13.17) to the WESM Rules.

11. Other Issues

a. Marginal Pricing Concept

The ERC has directed the Applicant to submit a paper clarifying the definition of marginal pricing as used in the PDM submission. This is in view of the discussion on whether the Market Operator has indeed adopted the economic principle of marginal pricing or some other form of pricing.

In this regard, the petitioner submits the document on the Marginal Pricing Concept, prepared by the WESM Project Management Consultant (Attachment 4 – Marginal Pricing) in compliance to the ERC Directive.

b. Treatment of Loss Factor, Value of Lost load, Constraint Violation Coefficient and Dispatch Tolerance

Treatment of Loss Factor

The loss factors to be used in PDM are dynamic loss factors since these are dependent on the power flows in the system (and referenced on the corresponding marginal plant node) that varies depending on the offer of the generators and power system condition. The power flows in the system changes with the variation of load demand, generation, and transmission configuration. The reader is referred to the revised WESM Price Determination Methodology (PDM).

Value of Lost Load (VoLL) and Constraint Violation Coefficient (CVC)

Even as the ERC directed the MO to provide details on value of lost load and the constraint violation coefficient to be used in the WESM, the WESM Rules also require the development and publication of Constraint Violation Coefficient including Value of Lost Load (WESM Rules 10.4.11 and 3.6.2). The main purpose of a VoLL and constraint violation coefficient is to provide certainty in relation to dispatch, pricing and settlement under extreme circumstances when normal trading conditions do not apply.

The Value of Lost Load (VoLL) can be defined as the value an average consumer puts on an unsupplied unit of energy. It depends on many factors, including, among other factors, the time of day and the type, nature, size and mix of customers, and duration of supply interruption.

Rationale for VoLL[2]

Shedding load is an expensive way to curb demand. It makes no distinction between those who need the power most and those who need it least. Because most customers' usage is not metered in real time, and because most do not know the price, contemporary markets have little ability to ration demand with

[2] Ref. Stoft, Power System Economics

price. Instead, when it is necessary, the system operator must ration demand by shedding load. In this case, the value of another megawatt of power equals the cost imposed by involuntary load curtailment. This value is called the value of lost load, VoLL.

Because economic theory says it is efficient to pay suppliers the value of supplying another unit of output, VoLL is very high. This implies a very high price whenever load must be shed. Implementing this policy causes extreme price spikes, but these will be brief and lead to optimal investment in generating capacity and optimal reliability. Although basic theory ignores risk and market power, it provides valuable insights and a basis for discussing more subtle theories of setting energy prices.

VoLL Application and Criteria

VoLL is commonly used for specifying the price bounds and constraint violation coefficients. Therefore, to apply VoLL pricing, the value of lost load must be determined. In determining an appropriate value for VoLL, two conditions must be met:

- The value of VoLL must not be so low to discourage investment in capacity.
- The value of VoLL must not be so high that customers would prefer to be curtailed rather than pay for the VoLL price.

VoLL pricing provides two very different types of signals. In the short run it encourages customers to reduce their demand and generators to increase their output. In the long run it encourages customers to invest in demand management measures and suppliers to investment in generation capacity. All these signals are useful but do not all require huge price spikes.

VoLL pricing is difficult because of lack of market-based information. However, in the absence of full demand side response, it is an effective method for maintaining system reliability in extreme circumstances. Price risk and the exacerbation of market power are both significant problems with VoLL pricing.

As stated earlier, the key challenge of determining VoLL is the lack of market transaction based information. Therefore, an alternative approach must be developed for determining how much value customers place on unsupplied unit of energy, or maintaining their electricity supply. A non-market based regulatory process is applied to determine the specific value used for VoLL.

There are two basic approaches to determining VoLL:

- Economic estimate: A rule of thumb approach is to divide the gross domestic product by total energy consumed.

- Customer surveys: The simplest form of survey is to directly ask consumers to estimate the costs they incur during blackout situations.

The WESM-TWG has agreed to initially consider the economic estimate in determining VoLL subject to finalization during the WESM market trials. Considering the economic estimate approach, the Voll for WESM will be:

GDP (2003 level): 4,399 billion pesos
Electricity consumption (2002 level): 42.04 billion kWh

VoLL = GDP/Electricity Consumption

VoLL = 104,600 pesos/MWh (104.6 pesos/kWh)

Constraint Violation Coefficient (CVC)

Under WESM Rules 10.4.11.1. the Market Operator is mandated to develop and publish constraint violation coefficients. In certain circumstances the Market Dispatch Optimization Model (MDOM) maybe unable to find a feasible solution due to either model limitation or constraint limitation. In these situations, applying CVCs ensure that MDOM does find a solution which provides guidance to the System Operator to issue dispatch instructions and coordinate the actions. The resulting solution may remain not dispatchable (although sometimes it may be dispatchable, for example, if the system operator chooses to overload a line temporarily). As provided in the WESM Rules, the purpose of the constraint violation coefficient regime is to ensure that if constraints shall be violated, such violation will occur in appropriate priority order.

The WESM-TWG has agreed to initially consider the following types and values of CVCs subject to finalization during the WESM market trials: It should be noted that VoLL and CVCs setting are configurable in the Market Management System MDOM.

Types of CVCs

Below is a list of the constraint violations that are incorporated in the MDOM.

- **Deficit generation** to signal the risk of load shedding (reducing or disconnecting from power system) at a node when the generation that may be scheduled and injected to that node falls below the nodal load requirements. The WESM Rules set out the constraint violation coefficient for the nodal energy balance equation as the nodal VoLL (WESM Rule Clause 3.6.2.3 (b)).

- **Excess generation** to signal the risk of shutting down generator(s). WESM defines excess generation as generation which may be scheduled to occur in excess of load requirements, even though market energy prices have fallen to the market price floor, and shall be dealt with in accordance with clause 2.9.8. In theory, shutting down or withdrawing 1 MW of generating capacity from the market has the same value as VoLL. In practical terms, it is considered highly unlikely that generators would seek to offer their energy capacity into the market at less than negative VoLL, and so that negative VoLL serves as the reasonable constraint violation coefficient for excess generation.

- **Deficit regulation reserve** to signal insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower than that for deficit generation, or VoLL.

- **Deficit contingency reserve** to signal insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. Similar to the deficient regulation reserve, the constraint violation coefficient for deficit contingency should be lower than that for deficit generation.

- **Facility capacity violation** to signal risks to the plant generation capability. These constraints relate to the standing capability data provided by trading participants. Facility constraints should be the most expensive (hence the last) to violate. They comprise constraints on ramping, reserve capability at low loading, total generation plus reserve plus reserve capability etc. Trading participants have the best knowledge of the capability of their plant, not the market operator or the system operator. Violation of these constraints may expose the Market Operator and System Operator to financial liability.

- **Security violation** to signal risks to the security constraints that are imposed by the System Operator. As such, the constraint violation coefficient for the security constraints should be variable, depending on how important the system operator and market operator consider the constraint to be.

Recommended Value for Constraint Violation Coefficients

Table 5 below sets out the recommended values of constraint violation coefficients, based on experiences in other jurisdictions, including the priority for violation of the constraints in the optimization models.

Table 5. Recommended CVC Values

Constraint violation coefficient	Value
1. Deficit regulation reserve	0.6 VoLL
2. Deficit contingency reserve	0.8 VoLL
3. Deficit generation	VoLL
4. Excess generation	-VoLL
5. Excess line flow	2.1 VoLL
6. Facility capability violation	10 VoLL
7. Security violation for security constraint imposed by System Operator	Variable

As previously noted, the WESM-TWG has directed that the above initial values for the the CVCs shall be taken into consideration subject to finalization during the WESM market trials.

Voll and CVC Relation in other Jurisdictions

Table 6 below shows the use of constraint violation coefficients in selected jurisdictions, including their role in setting the settlement prices. In these markets, the constraint violation coefficients do not set the settlement prices for energy when load is not shed.

It is noted that in the early days of the Singapore market, the constraint violation coefficients did set the settlement prices for energy when the load was not shed (violation mostly likely due to imperfect modelling). This anomaly was subsequently rectified.

Table 6. VoLL and CVC in Other Jurisdictions

Market	Pricing type	Nodal/ Market type	Infeasibility solution	Violation Coefficient Value	Settlement prices When no load shed
NZEM	Ex-post	Full Nodal, real time market, co-optimized.	Use violation coefficients to flag infeasibility.	$100,000 to $160,000 (NZ$)	First try to remove coefficients using established processes. If not, then use Administered prices.

Singapore	Ex-Ante	Full nodal on supply side, single price for loads,	Use violation coefficients to flag infeasibility	0.6VoLL to 20 VoLL (VoLL = SIN$5000)	First try to remove coefficients using established processes. If not, then use Administered prices.
NEMMCO	Ex-ante	Zonal pricing, real time market, co-optimized.	Use violation coefficients	2 VoLL to 440 VoLL (VoLL = AUS$10000)	Relax constraints to get true prices.
PJM	Ex-post	Full nodal, day-ahead and real time balancing market, co-optimized.	Use violation coefficients	Minimum US$ 5000	Relax constraints to get true prices.
IMO	Ex-post	System marginal pricing, real time market, co-optimized.	Use violation coefficients	$2000 to $60000 (CAN$)	Based on last bid and offer
New England ISO	Ex-post	Full nodal on supply side and zonal on load side, day ahead and real time markets.	Adjustment of bids in both markets, when violation is flagged.	$1000-$85000 (US$)	Violation coefficients are removed by relaxing the constraint.

Source: Energy Market Company, Singapore

Setting of Dispatch Tolerance

Dispatch Tolerances are the limits on the extent to which Trading Participants may deviate from dispatch schedules. To limit energy imbalances that may occur when participants' deviate from their dispatch schedules. As provided in the WESM Rules, dispatch tolerances standards shall be developed by the System Operator for each type of plant, and location, in accordance with the Grid Code and Distribution Code and the Market Operator shall maintain and publish such dispatch tolerances standards.

Energy imbalances resulting from the participants' deviation from their dispatch schedules are measured and settled in the ex-post run. Large deviations will result to large imbalances in generation targets and resulting nodal prices.

Detailed criteria and procedures has been drafted by the WESM-TWG SO Subcommittee, however, pending approval by WESM – TWG and the PEM board, the TRANSCO-MO manifests its intention to provide detailed procedures on management of excess generations as a matter of a future submission with the Commission.

c. Reference Bus

Coupled with the loss factors, the determination of the reference bus is incorporated in the PDM algorithm and dynamically computed based on the interaction of the different inputs to the MDOM. The reference bus corresponds to the marginal plant(s) on which the dynamically computed loss factors are referenced into. The reader is referred to the revised PDM document.

d. Handling Equivalent Offers

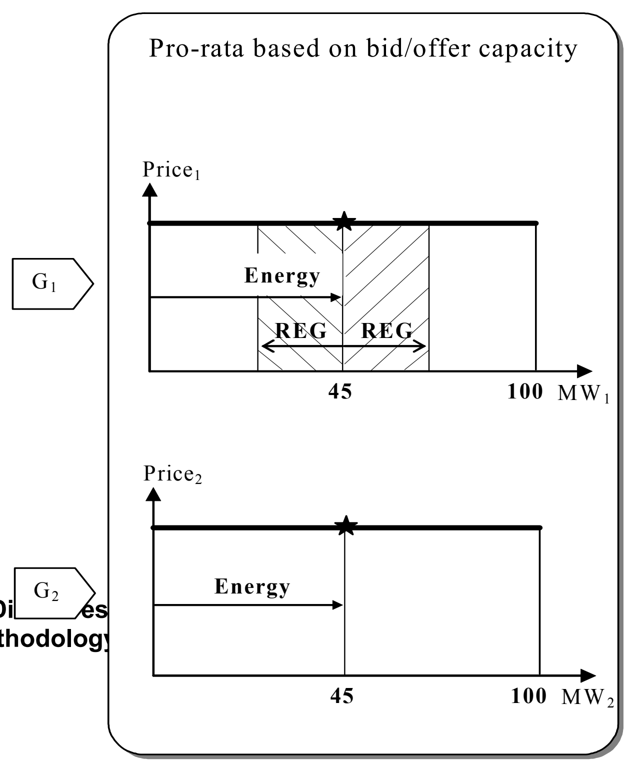
The WESM policy on handling equivalent offers is to consider the Trading Participants with equal offers in the dispatch optimization on a pro-rata basis.

In the event that there are two or more equivalent offers providing two or more optimal schedules, the dispatch requirements shall be pro-rated. The prorating rules will be based on the size of the *MW Block* of the price curves containing the non-unique schedules. Only that part of the price curve within the bid/offer's availability region will be used. This policy is simple, fair, and cost-effective to implement.

Consider the following illustrative scenarios incorporating energy and reserve:

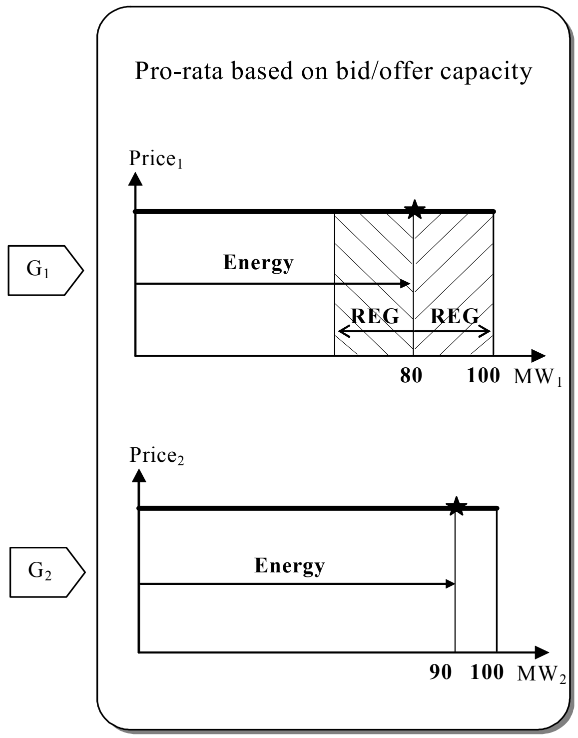
- Both generators ("G1" and "G2") have the same offer prices and offer capacity. Both generators also have the same transmission loss factors.
- "G1" is allocated with regulation reserve (REG) of 20 MW, while "G2" does not have regulation reserve allocated.
- The two generators are to provide a total energy of 90 MW in Scenario 1 and 170 MW in Scenario 2.

Scenario 1



For Scenario 1, the pro-rata rule is based on the amount of energy offers. In the example, both G1 and G2 have energy offers of 100MW. Thus, both G1 and G2 are dispatched to 45 MW to meet the total load demand of 90 MW.

Scenario 2



For Scenario 2, while G1 and G2 go proportionally, G1 stops at 80 MW due to reserve tail-room constraints, and G2 continues to be the marginal unit and arrives at 90 MW.

The above pro-rating approach provides a valid basis that G1 and G2, which have equal offer prices, shall get equal chance of being dispatched in the energy market.

e. Others

a. Significant Variation In and In-between Trading Intervals

As deemed by the WESM-TWG, significant variations in and in-between trading intervals should be finalized during the market trials to provide actual operational information ad thorough analysis as basis for considering significant variations in a market based operation of the market, as these may impact on other aspects of the WESM, including the setting of dispatch tolerances, setting of Voll and CVC and market sustainability measures.

However, for purposes of providing initial information, presented below are the basic concepts of the significant variations in and in-between trading intervals:

A significant variation is defined as a variation between the offer quantity or price which occurs after gate closure. It does not include variations in offer quantity or price prior to gate closure. A significant variation regime aims to set out the conditions under which variations are permitted for the pre-gate closure period, post-gate closure (but before real time) period, and during real time trading period or to allow differentiation between necessary changes to offers to accommodate real system changes and changes due to anti-competitive behaviour.

As mentioned there are two types of variations: Variations before gate closure and variations after gate closure. Variations prior to gate closure provide an equal opportunity to Trading Participants to respond to changes in conditions, or the competitive behaviour of other players. For customers, this provides them the ability to react to the supply side offer situation. It is therefore construed that variations between trading periods (prior to gate closure) are not an anti-competitive issue and are not an issue prior to real time dispatch.

On the other hand, variations after gate closure may occur and become necessary to account for changes in bona fide physical conditions and to allow participants to voluntarily respond to an emergency. Hence, variations should only be allowed either in response to a bona-fide physical change (e.g. a forced outage) or when the System Operator calls a grid emergency. In both cases, it is argued that such changes should be accepted by the WESM without question, but subject to investigation afterwards. It is construed that defining bona-fide physical change is subject to determination of technical issues pertaining to the operation of the grid and dispatch protocols to be agreed by the MO, SO and Trading Participants. As such, the WESM-TWG has directed that further development and identification of significant variations be concluded during the conduct of market trials and subject to adoption of a Significant Variation Regime.

Significant Variation Regime

Bona fide variations after gate closure should be accepted by the market without question, but subject to investigation afterwards. In this case, trading Participants must prove to an independent body that the change was due to a bona-fide physical reason or was in response to a grid emergency notice issued by the System Operator. The grid emergency response is by definition not anti-competitive as all parties are equally able to respond. It is effectively a waiving of the gate closure rules by the System Operator in order to deal with an emergency.

It is construed that an independent body with relevant experience will be needed to assess such post gate closure changes to offers. The Market Surveillance Committee would do the monitoring function while the Dispute Resolution Panel and the PEM Board should make these assessments.

The significant variation regime is also closely linked with the dispatch tolerances regime. The significant variation regime monitors changes in offers after gate closure. Some of these will be necessary to accommodate changes in bona fide physical circumstances. By allowing these changes in offers the dispatch process can be updated to more accurately reflect the actual final physical situation.

The dispatch tolerance regime monitors changes between dispatched quantities and the actual generation or load (for dispatchable load). If the dispatch more accurately reflects the final physical situation due to the significant variation regime allowing such bona fide physical changes, then there will be less variation between the dispatched outcome and the actual generation or load. Hence the dispatch tolerance monitoring regime will not be falsely reporting bona fide physical changes.

Proposed Approach in Developing Guidelines as to what constitutes a Significant Variation in and between Trading Intervals.

1. Allowing variations pre gate closure.
2. Post gate closure changes allowed subject to investigation.
3. Allow bona fide changes within period but again subject to review afterwards and cost allocation for any costs arising.
4. Week ahead and day ahead project process allows customers to monitor significant variations pre gate closure.
5. Publication of offers allows customers to monitor offer strategy.
6. Surveillance and Compliance process allows investigation of market manipulation.
7. An efficient process for reviewing whether post gate closure changes were within the rules.

8. The clear role of the surveillance and compliance body in overseeing this process.

b. Procedure on Net Load Forecasting

The provision of load demand is necessary to provide for the calculation of nodal prices and dispatch. It is an integral requirement of the market dispatch optimization model. Each *net load forecast* shall be prepared in such a way as to represent the *net load* to be met by *scheduled generation*, including losses occurring outside the system represented by the *market network model*, but excluding any *scheduled load*, and less:

(a) *Non-scheduled generation*, and
(b) Generation from *NRE generating units with intermittent energy resource.*

Further, amendments to the WESM Rule 3.5.4.1 (as per DOE Circular No. 2004-07-008) stipulates that "each customer may submit a forecast in respect of each trading interval for each of its registered load facilities for each trading day of the week in accordance with the timetable. The forecast submitted by the customer shall be used by the Market Operator in preparation of net load forecast. If the Customer fails to submit a forecast of his load facilities in accordance with the timetable, the forecast prepared by the Market Operator at the node where the customer is located shall be used."

Two methodologies shall be utilized for the WESM net load forecasts. These are the Similar Day Load Forecasting methodology (SDLF) and the Load Predictor Methodology (LDP). Although the methodologies are similar in nature, they differ in the information utilized and the time frames to which they are applied.

The *Similar Day Load Forecast* (SDLF) produces forecasted nodal hourly loads for each forecast area. The forecast period covers the current day and future seven days. The load forecast values are used in pre-dispatch processes performed by *Security-Constrained Economic Dispatch* (SCED) particularly for the Day-Ahead and Week-Ahead dispatch. Using daily forecasted weather data, SDLF calculates forecasted load based on historical load and weather data. The load profile consist of the values of actual *Hourly Average Loads*, type of day (normal day and/or holiday) and actual weather data for the day, which has been previously saved in the MMS database. SDLF extracts from the historical data the best curve candidate and then applies customer provided factors to produce the load forecast.

Load Predictor (LDP) forecasts total system load for next two hours at five-minutes intervals. The forecasted total system loads are used for the calculation of real-time nodal prices and dispatch schedules. The LDP utilizes the latest historical load profile and telemetering data provided by the Energy Management System (EMS) of SO to the Market Management System (MMS) every 5 minutes (system snapshot) for the estimation of loads. The latest snapshot prior to a real-time dispatch is therefore utilized.

Table 7 below summarizes the methodologies used in the net load forecasting while detailed procedures is provided in Attachment 5 - WESM Net Load Forecasting Methodology.

Table 7. SDLF and LDP Forecasting Methodologies

Forecast	Similar Day Load Forecasting (SDLF)	Load Predictor (LDP)
1. Application	Market Projections for Forecast Area ■ Day-Ahead ■ Week-Ahead	Real-Time Dispatch
2. Forecast Horizon and Resolution	Current Day + future 7 Days (hourly)	120 Minutes (every 5 minutes)
3. Parameters	■ Latest Hourly Load from EMS ■ Historical Load Profile ▪ Latest Historical and Forecast Weather Data ▪ Historical Load Data ▪ Holiday Data ▪ Historical Load Growth ▪ Peak-Off-Peak Load	Current Load Telemetry Latest Load Profile from System Snap Shot
4. System Forecast Area	Luzon, Visayas and Mindanao	
5. Customer Forecast	Day-Ahead & Week Ahead Hourly interval	Hourly

Customer Forecast Submission

Customers have been provided the option of providing their own demand to be used in the Ex-Ante Market. This aims to enable Customers or Buyers to have an opportunity to respond to the price signal by adjusting the level of load requirements input to the ex-ante market, counter possible generator gaming practices and minimize impact of possible forecasting error.

However, to counter possible gaming of customers and minimize potential forecast errors which can create inefficient pricing in the market, the WESM-TWG has concluded that it is appropriate to provide a validation process for the submitted forecast which consequently is included in the MMS functionality.

Submitted forecasts by Customers will be used in the MDOM if the forecast submitted is within a tolerance range to be set the PEM Board. If the forecast submitted is not within the tolerance range, then the MO forecast shall be used for the relevant trading interval.

Due to lack of actual market based information, the tolerance range to be applied in the validation process shall be determined during the market trials.

c. Load Shedding Management

Detailed criteria and procedures has been drafted by the WESM-TWG SO Subcommittee, however, pending approval by WESM – TWG and the PEM board, the MO manifests its intention to provide detailed procedures on load sheddingmanagment as a matter of a future submission with the Commission.

d. Management of Excess Generation

Detailed criteria and procedures has been drafted by the WESM-TWG SO Subcommittee, however, pending approval by WESM – TWG and the PEM board, the MO manifests its intention to provide detailed procedures on management of excess generations as a matter of a future submission with the Commission.

Attachments

Attachment 1 – WESM Rules Change (DOE Circular DO-2004-07-008)
Attachment 2 – Market Simulations – Luzon Grid
Attachmetn 3 – Market Network Model (WESM-MNM-000)
Attachment 4 – Marginal Pricing
Attachment 5 – Load Forecasting Methodology (WESM-LFM-000)

Attachment 1
WESM Rules Change
DOE Circular DO-2004-07-008

Attachment 2
Market Simulations – Luzon Grid

Attachment 3
Market Network Model Criteria and Procedures
WESM-MNM-000

Attachment 4
Marginal Pricing

Attachment 5
Load Forecasting Methodology
WESM-LFM-000