ANCILLARY SERVICES PROCUREMENT PLAN

Rules, Terms and Conditions for the provision of

OPEN ACCESS TRANSMISSION SERVICE

Energy Regulatory Commission

(ERC Case No. 2002 – 253)

CORPORATE PLANNING
NATIONAL TRANSMISSION CORPORATION
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1.0 Introduction

1.1 Historical Background

The Philippine Government has embarked on a reform process for its electricity industry that involves, among other things, the unbundling of the functions of the state-owned, primary electricity organization, the National Power Corporation (NPC), into separate transmission and generation companies. As part of this process, the new industry regulator, the Electricity Regulatory Commission (ERC) must approve open access arrangements to transmission before the transmission and generation arms can be privatized.

1.2 Original OATS Filing of NPC

1.2.1 1997 OATS

In 1997, the Energy Regulatory Board (ERB) approved NPC's Open Access Transmission Tariff (OATT) and the Tariff for Ancillary Services (TAS). Power delivery service and ancillary services are the transmission services that NPC provides to privately owned generators under its Open Access Transmission Service of 1997 (1997 OATS). The 1997 OATS was in support of Executive Order 215 allowing private sector's participation in electricity generation.

1.2.2 2002 OATS Filing

In August 2002, TransCo, the new transmission company, submitted its proposed Rules, Terms, and Conditions for the Provision of Open Access Transmission Service Rules (OATS Rules) to the ERC but the ERC found these to be non-compliant with the relevant legislation, the Electricity Power Industry Reform Act of 2001 (EPIRA). In compliance with an ERC order, TransCo in February 2003 submitted a revised draft of the OATS Rules to satisfy the said order.

After conducting series of public consultations (May and September 2003), the ERC issued an order in February 2004 approving the OATS Rules.

1.3 Industry Restructuring (EPIRA)

The Philippine Grid Code defines Ancillary Service as "support services such as Frequency Regulating and Contingency Reserves, Reactive Power support, and Black Start capability which are necessary to support the transmission capacity and Energy that are essential in maintaining Power Quality and the Reliability and Security of the Grid." Prior to the enactment of the EPIRA, NPC, as a vertically integrated public utility, planned for and deployed generation, transmission and system operations resources to produce ancillary services as part of its normal operations.

Historically, no one other than NPC needed to understand the definitions and applications of these ancillary services. In 1997 however, ancillary services first came into the industry's consciousness when the OATT and the TAS were approved by the ERB. Power delivery service and ancillary services, are the transmission services that NPC provides to privately owned generators under the 1997 OATS, which was in support of Executive Order 215 allowing private sector's participation in electricity generation.

While the OATS Rules defines the obligations and responsibilities of TransCo in the procurement of ancillary services, it fell short in establishing a detailed and comprehensive Ancillary Services Procurement Plan. The said plan is supposed to outline the processes that TransCo, as the System Operator, shall use in procuring each ancillary service.

1.4 NPC Re-Organization (TRANSCO/GENCO Spin-off)

The enactment of Republic Act No. 9136 paved the way for the creation of a new electric industry structure. The law defines the organization of the industry, the transition into the envisioned competitive structure, and the responsibilities of every industry player during and after the restructuring process. Among the major changes was the unbundling of the NPC functions into separate generation and transmission companies.

Under the law, NPC will be privatized and divested of its generation facilities resulting in the formation of new generation companies (GENCOs). With the creation of new transmission company, TransCo has now taken over NPC's transmission and sub-transmission functions.

The spun-off GENCOs are expected to compete in a deregulated and highly competitive generation sub-sector. These GENCOs will undertake the bulk supply of electricity to distributors and suppliers, and could participate in the bidding process under the WESM.

On the other hand, TransCo will be a regulated transmission business monopoly, providing open and non-discriminatory access to its power transmission system for all users. Among the responsibilities of TransCo are planning, construction, and centralized operation and maintenance of the high voltage transmission system, grid interconnections, dispatch system and operations, and securing ancillary services on behalf of all users of the transmission system.

1.5 Transition from OATS to WESM (Reserve Markets)

In its initial implementation in 1997, the OATS was intended primarily to allow IPPs access to the NPC-owned transmission system. What was before a "bundled" generation service that NPC provided to its customers, "new" services such as power delivery and ancillary services were introduced for a new set of customers – the IPPs. The OATS simply unbundled the services specific for the needs of the generation customers of the monolith NPC.

The OATS Rules serve as the framework of TransCo's open access mandate. As such, it must adapt to the changes in the industry, particularly the shift to wholesale electricity

spot market. The OATS must distinguish between services that TransCo needs to provide only under the old structure, for the transition period prior to establishment of the spot market, and those that it will continue to provide once the spot market and the restructuring are in place.

Under the OATS regime, ancillary services are deemed provided by the dominant generator, i.e., the NPC. TransCo, on the other hand, is responsible for ensuring that appropriate amounts of these ancillary services are available for reliability. At the same time, TransCo is responsible for collecting from transmission customers the payment for the ancillary services in accordance with the ERC-approved rates.

Prior to the commencement of spot market, TransCo, as the system operator, in consultation with the Market Operator, is tasked to develop procedures in relation to any competitive tendering process for ancillary services. This is intended for ancillary services where competition is possible. In addition, TransCo shall develop ancillary service arrangements, interim market contract requirements, and cost recovery formula, all of which are contained in this Procurement Plan.

2.0 Effectivity

The ASPP shall take effect upon the approval of the ERC.

3.0 System Operations Ancillary Service Requirements

3.1 Specification of Ancillary Services

The following Ancillary Services will be procured by Transco from various power plants in the Philippine Grid. These Ancillary Services are essential in maintaining Power Quality, Reliability and Security of the Philippine Grid.

3.1.1 ***Frequency Reserve or Load Following and Frequency Regulation (LFFR)*** Ancillary Services provides generating capacity necessary to adjust total system generation over short periods of time (e.g. minute by minute) to match system load changes that result from random fluctuations in total Transmission System Load. This is to address the temporary variation in load and unintended fluctuation in generation. System Operations is mandated to maintain the System Frequency within 59.7 and 60.3Hz. The key distinction between Load Following and Frequency Regulation is the time period over which these fluctuations occur. The Frequency Regulation responds to rapid load/generation fluctuations on the order of few seconds to one minute while Load Following responds to slower changes on the order of five (5) to thirty (30) minutes. The LFFR is still classified into two as specified hereunder to wit:

3.1.1.1 **Primary Response –** Generating units that operate in an automatic frequency sensitive mode or Free Governor mode with deadband of

±0.15Hz with maximum response time of five (5) seconds and sustainable for twenty five (25) seconds.

3.1.1.2 **Secondary Response –** Generating units that operate in an Automatic Generation Control (AGC) of the SCADA/EMS of the National Control Center (NCC) or manual adjustment of load with specific dispatch instructions from system operator. The maximum response time of a generator should be twenty-five (25) seconds and its load can be sustained for at least thirty (30) minutes.

3.1.2 ***Contingency Reserve-*** Generating capacity that is intended to take care of sudden and unexpected loss of the large synchronized Generating unit or the power import from a single Grid interconnection. These plants are quick enough to maintain system reliability and restore the system to generation/load balance and the system frequency. Contingency reserves are divided into two components; spinning reserve and back-up power supply.

3.1.3 ***Spinning Reserve Ancillary Service*** is the ability of a Generating unit, to provide generating capacity necessary to respond immediately to infrequent, but usually large, failures of generating units and/or transmission tie lines. The generating units providing spinning reserve shall be on-line and synchronized to the Grid, operating below its maximum capability, and can automatically respond to change in frequency caused by a loss of large generating unit. The difference between the level at which a unit is operating, and the level of output it could reach within ten (10) minutes is the spinning reserve. The dead band setting of these units should be between –0.15Hz and –0.30Hz.

3.1.3.1 **Primary Response –** Generating units that operate in an automatic frequency sensitive mode or Free Governor mode with deadband setting of between –0.15Hz and -0.30Hz.

3.1.2.2 **Secondary Response –** Generating units that operate in an automatic generation control (AGC) of the SCADA/EMS of the National Control Center (NCC) or manual adjustment of load with specific dispatch instructions from system operator with maximum time to full capacity of ten (10) minutes and is sustainable for at least thirty (30) minutes.

3.1.4 ***Back-up Power Supply*** is sometime called Cold Reserve or Supplemental Reserve. These are generating units that have fast start capability, it can synchronize within fifteen (15) minutes upon advise of the Control Center and can provide additional energy to the system rapidly. Its capacity shall be sustainable for a minimum period of eight (8) hours.

3.1.5 ***Reactive Power Support Ancillary Service*** is the capability of a Generating unit to supply reactive power to, or absorb reactive power from, the Transmission Network in order to maintain the bus voltage within five percent (5%) of its nominal voltage. Plants are considered providing this type of Ancillary Service if

they operate above 0.85 lagging and below 0.90 leading power factor but within its capability curve.

3.1.6 ***Black Start Service*** - The need for this Ancillary Service arises when event or significant incident will result in a Partial or Total System Blackout. This is the ability of a generating unit, without assistance from the Grid or other external power supply, to recover from a Shutdown condition to an operating condition in order to energize the Grid and assists other generating units to start. Black Start plants must be put on-line and ready to extend power within thirty (30) minutes upon receipt of dispatch instruction and can sustain the operation for at least 12 hours.

3.2 Technical Requirements

This section of the Plan sets out the arrangements the System Operator will follow for contracting each category of Ancillary Services. On the other hand, the Service Provider shall use reasonable efforts, in accordance with Good Industry Practice, to ensure that the plant and equipment meet the technical specification as per Grid Code requirement.

A tabulated summary of Performance Measures and Criteria with its monitoring scheme was developed by the System Operator and is included as part of this plan.

3.2.1 *Frequency Regulation*

The objective of purchasing Frequency-keeping ancillary service is to control the frequency and time error to within specified limits of 59.7Hz to 60.3Hz as per Grid code requirement.

Operating characteristics and technical capabilities of Generating units:

3.2.1.1 The Generating units shall be capable of contributing to Frequency Control by continuous regulation of the Active Power supplied to the Grid or to the User System in the case of an Embedded Generating Unit.

3.2.1.2 The Generating units shall be fitted with a fast-acting speed-governing system to provide Frequency Control under normal operating conditions. The speed-governing System shall have an overall speed-droop characteristic of (5) five percent or better. For thermal plants 5% speed-droop setting is required while hydro 3% speed-droop setting is required.

3.2.1.3. A Generating unit's speed governing system shall have a Ramp rate of at least 5MW/min.

3.2.1.4 A Generating unit providing Primary Response for Frequency Regulation shall have its speed-governing System capable of a maximum response time of five (5) seconds (one time constant) sustainable for (25) twenty five seconds.

3.2.1.5 Frequency Control using Secondary Response of the Generating Unit shall be accomplished through Automatic Generation Control (AGC) or manual adjustment of generation with specific Dispatch Instructions from the System Operator. The maximum response time for the change in the Unit's power output shall be twenty-five (25) seconds and which shall be sustainable for at least 30 minutes.

3.2.1.6 The Generator shall not override the free-governor mode or Automatic Generation Control mode of a Generating unit, which is providing Primary or Secondary Response unless Control Center is properly informed due to valid reason.

3.2.1.7 The speed governing System shall be capable of accepting raise and lower signals from the Control Center of the System Operator or normally termed as AGC-Automatic Generation Control.

3.2.1.8 Provides generating capacity necessary to adjust total system generation over short periods of time to match system load changes that result from random fluctuations in total transmission system load.

3.2.1.9 A Generating plant that is designated as load following capacity must, during at all times that is so designated, be dedicated to the grid Load Following and Frequency Regulation Service capacity pool under the control of the System Control Operator.

3.2.2 ***Spinning Reserve***

The purpose of this ancillary service is to avoid the cascade failure assets leading to a partial or total failure of the power system. Ensure that the rate of occurrence of frequency fluctuation does not exceed the level set out in the Grid Code.

Operating characteristics and technical capabilities of Generating units:

3.2.2.1 Provides Generating capacity necessary to respond immediate to infrequent, but usually large, failures of Generating units or transmission lines. A Generating unit providing Spinning Reserve as an Ancillary Service shall be synchronized with the Grid and be available to automatically respond to any sudden loss or significant reduction in Generating capacity.

3.2.2.2 A Generating plant that is designated as spinning reserve capacity must, during at all times that is so designated, be dedicated to the Grid Spinning Reserve Service capacity pool under the control of the System Control Operator.

3.2.2.3 Spinning Reserve Service shall be sustainable for a period of at least 30 minutes. Continued supply service in excess of 30 minutes shall be provided under the terms of Backup Service.

3.2.3 ***Backup Reserve***

The objective is to replenish the spinning reserve.

Operating characteristics and technical capabilities of Generating units:

3.2.3.1 A generating unit providing Backup Reserve shall have a Fast Start capability and its capacity shall be sustainable for a minimum period of eight (8) hours.

3.2.3.2 The Fast Start capability test shall demonstrate that the Generating unit has the capability to automatically Start-up, synchronize with the Grid within 15 minutes and be loaded up to its offered capability, as specified in the Grid Code Section 5.4.8. The Generating Unit shall pass the test if it meets the Fast Start capability requirements.

3.2.4 ***Reactive Supply and Voltage Control Service***

The purpose is to supplement Reactive Power resources of the static and dynamic type, depending on the location and network loading conditions, and to contribute to network voltage control when dispatched.

Operating characteristics and technical capabilities of Generating units:

3.2.4.1 The Generating units shall be capable of supplying its Active Power output, as specified in the Generator's Declared Data, within the limits of 0.85 Power Factor lagging and 0.90 Power Factor Leading at the Generating unit's terminals, in accordance with its Reactive Capability Curve.

3.2.4.2 Beyond the required limits of Lagging and Leading Power Factor the generating unit can supply to the system if the system so requires normally through MVAR dispatch as a good utility practice or opt to offer such an ancillary service.

3.2.4.3 Reactive power generation shall be limited only to the boundaries of the Capability curve of the generating units.

3.2.5 ***Black Start Service***

The objective is to energize a section of the network without the use of external power sources, allowing further connection of transmission circuits, and demand to be progressively connected, until the network is re-integrated.

Operating characteristics and technical capabilities of Generating units:

3.2.5.1 The Grid shall have Black start capability at a number of strategically located generating plants.

3.2.5.2 Sufficient Black start and fast start capacity shall be available at strategic locations to facilitate the restoration of the Grid to the normal state following a total System blackout.

3.2.5.3 Sufficient Black start generation shall be available at all times to facilitate the goal of a complete system restoration in twelve (12) hours.

3.2.5.4 Redundancy of Black start generation shall be taken into consideration due to possibility of unit failure to start or transmission facility failures preventing units from serving their intended loads.

3.2.5.5 No more than one unit at a Black start plant with multiple black start units maybe on planned maintenance at any one time.

3.2.5.6 When Generating unit becomes isolated from the Grid, the speed-governing System shall provide Frequency Control to the resulting island Grid (asynchronous control). Exemption from this requirement shall be specified in the Connection Agreement or Amendments to existing.

There shall be at least 50 MW of black start capability available per restoration highway in Luzon, 20 MW for Visayas and 25 MW for Mindanao.

3.3 Required Levels of Ancillary Services

3.3.1 *Load Following and Frequency Regulation*

The System Operations allocates 4% of hourly system demand as the minimum requirement for Luzon, Visayas and Mindanao grids.

The level of regulating reserve on the hourly basis can be computed as follows;

$$LFFR^{h} = F^{h}_{D} \times 4\%$$

Where:

$LFFR^{h}$ = Regulating reserve for the hour "h"

F^{h}_{D} = Forecast Demand for the hour "h"

3.3.2 *Spinning Reserve Service*

The Spinning Reserve level shall be computed on an hourly basis and shall be the maximum of the load of the largest generator unit of the grid and the scheduled reserve level of that generator for the hour.

$$SR^{h}_{i} = Max(LG^{h}_{i} + GR^{h}_{i})$$

Where: $SR^{h}i$ - Spinning Reserve for the hour "h"
$LG^{h}i$ - Scheduled unit load of Generator "i" at hour "h"
GR_H - Scheduled Reserve level Generator "i" at hour "h"

3.3.3 ***Back-up Reserve Service***

To meet the grid requirement, there must be enough Backup reserve at any given time, thus using the method established by the System Operator. The minimum amount of this service shall be equal to the amount allocated to the spinning reserve service in order to arm/bring back the spinning reserve in its required minimum level after fifteen (15) minutes.

The level of back-up reserve on the hourly basis can be computed as follows:

$$BR^{h} = SR^{h}$$

Where: SR^{h} = Spinning Reserve for the hour "h"

3.3.4 ***Reactive Supply and Voltage Control Service***

With a system Power Factor assumption of 0.92, the maximum amount of reactive power to be supplied by generators shall be 2800 MVAR at a projected system peak of 6500MW with the assumption that the installed capacitors are just enough to compensate transmission reactive power loss. The maximum amount of reactive power to be absorbed by the generators shall be 1500 MVAR at a projected off peak of 3500 MW with the assumption that all capacitors are switch off and all shunt reactors are switched on and are just enough to compensate line capacitance. However, system reactive requirement can only be determined during the preparation of the day a head dispatch scheduled of the generators.

3.3.5 ***Black Start Service***

Black Start Service shall be contracted annually to qualified generators considering there should be at least two (2) plants contracted per blackout restoration highway and one (1) should always be available at any given time.

In Luzon, there are eight (8) Restoration Highways consisting of nine (9) Generating plants. There are five Area Control Centers in Mindanao, and each Control centers is equipped with one restoration highway. Moreover, In the Visayas Grid, at least one (1) Restoration Highway is allocated.

3.4 Scheduling and Dispatch of Ancillary Services

3.4.1 Pre-WESM and Non-Tradable Ancillary Services

The Ancillary service providers must use reasonable endeavours to ensure that the contracted plants are available to be dispatched to provide the ancillary services. An ancillary service Dispatch Protocol is developed to guide the ancillary service providers and the System Operator in scheduling and dispatching of ancillary services. This protocol shall remain in effect even in the WESM regime but only applicable to non-market tradable ancillary service such as Black Start and Reactive Support.

3.4.1.1 ANCILLARY SERVICES DISPATCH PROTOCOL

Responsibilities of the Parties (TRANSCO AND A/S PROVIDERS)

- The ancillary service providers shall submit daily to the System Operator on before 1400H of the day preceding the dispatch day the following data:
    - Hourly day a head capacity nomination.
    - Status of Black Start equipment (for Black start providers)
    - Hourly day a head capacity nominations for LFFR, SR, RS and BU for LFFR, SR, RS and BU providers)
- TRANSCO-PNPD/SO shall prepare the Hourly Reserve Profile requirement based on the load forecast for the following day.
- TRANSCO-PNPD/SO shall prepare and issue to the ancillary service providers on or before 1600H the hourly day a head schedule for LFFR, SR, BU, SR and BS for each ancillary service providers. The ancillary service schedule will be based on the following:
    - Hourly reserve requirement
    - Ancillary capacity nomination
    - Merit order table of each ancillary service
    - Available Black Start units
    - Reactive Support Requirement of the System
- TRANSCO-SO NCC/RCC dispatches all plants according to approved Daily Generation Schedule and Ancillary Services Providers Day Ahead Schedule. In the event of the following conditions, TRANSCO-SO may undertake re-dispatch procedures:
    - Outage of Transmission Lines or Substation Facilities
    - Violation of System Security Limits
    - Total System Failure
    - Unexpected Reduction of Generation Availability

- Force Majeure Events
- Emergency Security Measures

- Ancillary service providers shall implement TRANSCO-SO NCC/RCC dispatch instructions and ensure to provide their required ancillary services.

- TRANSCO-PNPD/SO shall monitor the compliance of Ancillary Services Providers based on the approved Ancillary Services Provider schedule using the SCADA system and available meter data. Penalties for non-compliance will be included in the statement of accounts at the end of the billing period.

- The ancillary service providers receive, evaluate and validate the submitted statement of account prepared by TRANSCO-PNPD/SO and return it for billing settlement.

3.4.2 Tradable Ancillary Services at WESM Regime

In the WESM regime, tradable ancillary service shall be dispatched in accordance with the WESM Rules. This is discussed in Section 4.2.

4.0 Procurement of Required Ancillary Services

4.1 Long-Term Service Contract

Accredited A/S providers shall conclude a long term service contract with Transco consistent with the ASPP.

4.2 Spot Market Trading

When traded in the WESM, reserves and interruptible loads are offered and scheduled for dispatch on an hourly basis. To do this, qualified service providers must submit generation reserve offers and demand bids for each trading interval within their designated reserve regions (i.e., Luzon, Vizayas or Mindanao). The MMS is designed to accept different types of bids and offers other than energy. As per WESM Rules, each reserve offer shall have a maximum of three (3) blocks per category (i.e., regulating or contingency).

The MO shall accept and validate reserve offers in accordance with the accreditation and registration information of the concerned participants as well as the current status of its generating facilities.

All valid demand bids and reserve offers, are scheduled and cleared to meet the reliability requirements of SO and that of the forecasted demand. The reliability requirements state the amount and types of reserves or interruptible load needed for each trading interval to meet the operating standards mandated by the Grid Code. The forecasted demand which are derived from customer load projections serves as confirmation for the load-following and frequency regulating requirements of SO. The optimal scheduling is performed to

simultaneously minimize the overall cost of energy and reserve in the WESM as the energy and reserve requirements are met.

The reserve allocations are submitted to SO within the hourly schedules for actual dispatch implementation. Reserve prices and quantities which were cleared in the market are published through the WESM website for the information of the market participants, DOE, ERC and the public in general.

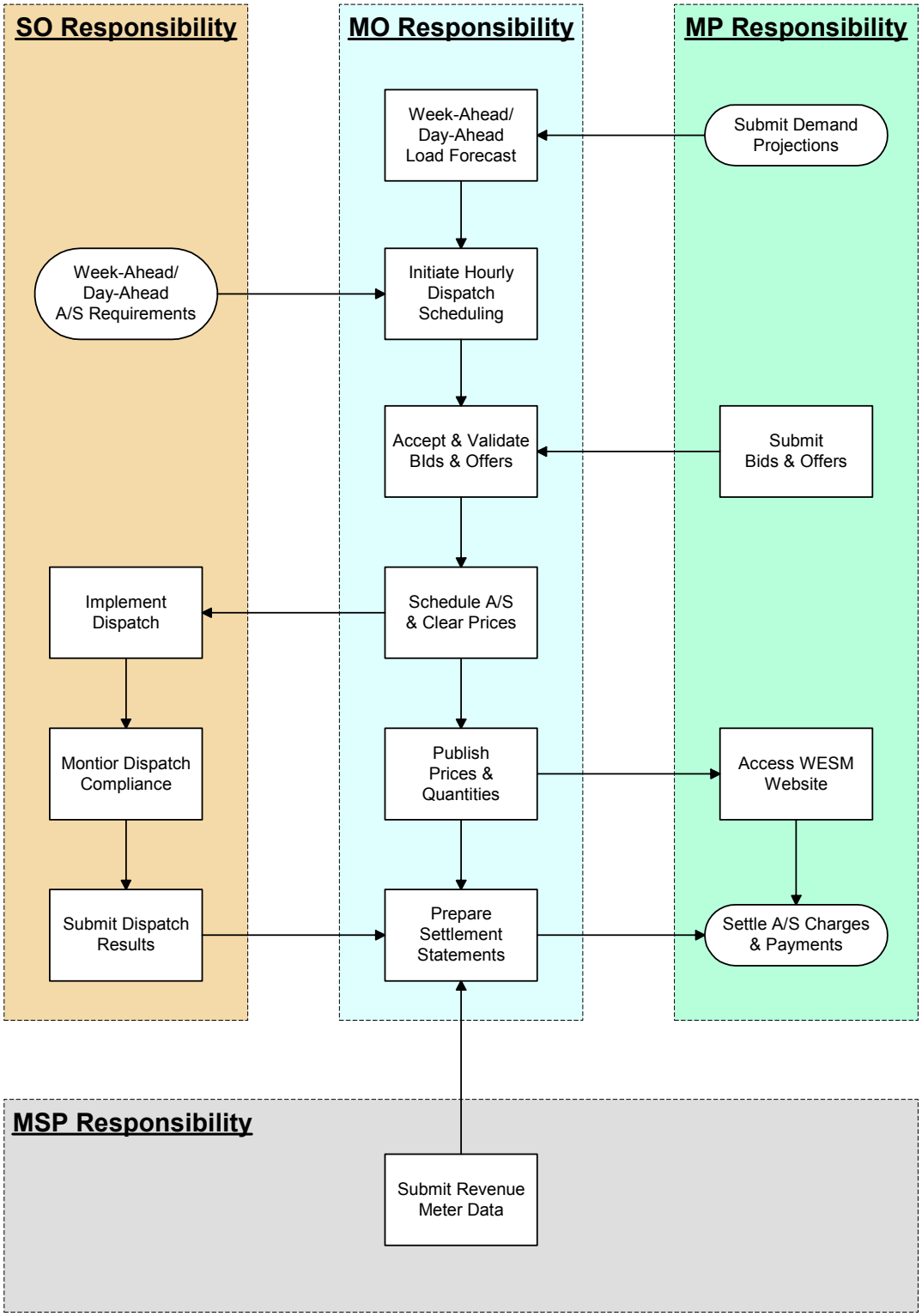
During dispatch implementation SO monitors the facilities of market participants providing ancillary services to ensure compliance with the standards and measure of service. The result of the actual dispatch is reported back to MO and then compared with the scheduled reserve allocation.

The MO then prepares settlement statements for the payment and charging of ancillary services traded through the market on the basis of the scheduled and actual dispatch. These statements are provided to the concerned market participants for their review, correction and final settlement. Note that even prior to the issuance of settlement statements the participants can access the WESM websites to immediately obtain information on the market clearing prices and quantities. This information is useful for reviewing the statement of accounts for possible correction.

Note that the revenue meter data are used only for the allocation of Ancillary Service charges which, as proposed, will be based on the scheduled energy transaction of the participant for the trading interval. This is to correct some misconceptions that revenue meters will be used to measure Ancillary Services such as reserves and interruptible loads.

Figure 1 shows the process flow for the trading of Ancillary Services within the WESM as described in this section.

Figure 1. Ancillary Service Trading Process Flow



4.3 Qualification of Ancillary Service Providers

TRANSCO, as the System Operator, may use reasonable endeavors to procure and enter into "Ancillary Services Procurement Agreement" with qualified generation companies to provide sufficient ancillary services to the Grid. The procurement shall conform to the procurement principles. Compliance Monitoring will be done through the TransCo's SCADA system.

4.3 1 ***Load Following and Frequency Regulation***

4.3.1.1 Provider must be certified by TransCo as LFFR Provider after undergoing accreditation process.

4.3.1.2 Will be contracted annually.

4.3.1.3 Provider will nominate daily quantity of LFFR it can provide to TransCo.

4.3.1.4 TransCo will choose the nomination to be included in the day-ahead schedule of LFFR using the following criteria:

a. Least costs offered by the provider.
b. Total LFFR forecasted requirement.

4.3.1.5 TransCo will schedule the day-ahead LFFR requirement based on the nomination of the providers. If TransCo did not schedule the nomination of a certain provider, no payment will be made.

4.3.2 ***Spinning Reserve***

4.3.2.1 Provider must be certified by TransCo as Spinning Reserve Provider after undergoing accreditation process.

4.3.2.2 Will be contracted annually.

4.3.2.3 Provider will nominate daily quantity of SR it can provide to TransCo.

4.3.2.4 TransCo will choose the nomination to be included in the day-ahead schedule of SR using the following criteria:

a. Least costs offered by the provider.
b. Total SR forecasted requirement

4.3.2.5 TransCo will schedule the day-ahead SR requirement based on the nomination of the providers. If TransCo did not schedule the nomination of a certain provider, no payment will be made.

4.3.3 ***Backup Reserve***

4.3.3.1 Provider must be certified by TransCo as BUR Provider after undergoing accreditation process.

4.3.3.2 Will be contracted annually.

4.3.3.3 Provider will nominate daily quantity of BUR it can provide to TransCo.

4.3.3.4 TransCo will choose the nomination to be included in the day-ahead schedule of BUR using the following criteria:

a. Least costs offered by the provider.
b. Total BUR forecasted requirement

4.3.3.5 TransCo will schedule the day-ahead BUR requirement based on the nomination of the providers. If TransCo did not schedule the nomination of a certain provider, no payment will be made.

4.3.4 ***Reactive Support***

4.3.4.1 Provider must be certified by TransCo as RS Provider after undergoing accreditation process.

4.3.4.2 Will be contracted annually.

4.3.4.3 Provider will nominate daily quantity of RS it can provide to TransCo.

4.3.4.4 TransCo will choose the nomination to be included in the day-ahead schedule of RS using the following criteria:

a. Least costs offered by the provider.
b. Total RS forecasted requirement

4.3.4.5 TransCo will schedule the day-ahead MVar requirement based on the nomination of the providers. If TransCo did not schedule the nomination of a certain provider, no payment will be made.

4.3.5 ***Black Start Services***

4.3.5.1 Provider must be certified by TransCo as BSS Provider after undergoing accreditation process.

4.3.5.2 Will be acquired through long-term contract.

4.3.5.3 Yearly availability payment will be applied through equal monthly payment

4.4 Monitoring and Testing of Ancillary Service

4.4.1. Monitoring

The system operator will regularly monitor the performance of the ancillary service providers. The data from Transco's SCADA/EMS and available meter data will be used in monitoring the ancillary service compliance.

Ancillary Services providers for LFFR and spinning reserve operating under the Automatic Generation Control will be monitored using the Alarm/Event subsystem of the SCADA/EMS. Occurrence of the "Unit not tracking" event will be interpreted as failure to provide such services.

In monitoring for Ancillary Service providers of LFFR and spinning reserve operating in governor control mode, data from SCADA/EMS, particularly; System Frequency and Unit MW output will be analyzed regularly and compared with the scheduled values for the particular services. Similarly, the actual MVAR output and Substation voltages data from SCADA/EMS will be analyzed and compared with the scheduled values.

The actual synchronization time of back-up and black start providers are also monitored using the Alarm/Event subsystem of the SCADA/EMS.

4.4.2 Testing of Ancillary Service Providers

Scheduled tests shall be conducted to confirm the compliance of Generating units' capability and availability to deliver the Ancillary Services that the Generator had agreed to provide. All tests shall be recorded and witnessed by the authorized representatives of TransCo and the Ancillary Service Providers. The test procedures in Attachment 5 will be used in these tests.

4.5 Payment to Ancillary Service Providers

Ancillary Services are treated differently to Power Delivery Service Charges and other transmission-related charges to the extent that they represent payment to generators.

The AS that will be paid for are: Load Following & Frequency Regulation (LFFR); Spinning Reserve (SR); Back-up Reserve (BR); Reactive Support (RS) and Black Start (BS). *Note: WESM may consider other forms of AS that may be traded and settled in the market)*

The following formulas on the payment and settlement to Ancillary Service Providers shall be the same for pre-WESM and WESM Regimes. For pre-WESM Regime AS providers shall be paid based on the contract price agreed upon, while under the WESM Regime, rates shall be based on the market clearing price or the highest-priced provider.

Ancillary Service Providers shall be paid on a monthly basis. This will be the aggregate of the hourly computed cost of providing the service for a billing period.

4.5.1 **Load Following and Frequency Regulation (LFFR)**

TransCo proposes monthly payment to LFFR providers that are *scheduled* to provide the service based on scheduled quantity of reserve they are holding. Failure to provide the service shall mean no payment.

$$\textbf{LFFR Payment}_{i} = \sum_{h}^{n} (SQ^{h}_{i} \times \textbf{Rate}^{h}_{\textbf{LFFR}})$$

where: $SQ^{h}_{i} \times \text{Rate}^{h}_{LFFR}$ - payment for Scheduled Quantity of LFFR at hour "h"
SQ^{h}_{i} – Scheduled Quantity of LFFR in MW for Generator "i" at hour "h"
Rate^{h}_{LFFR} – rate of LFFR in Peso per MW at hour "h"
n = one (1) month

4.5.2 **Spinning Reserve (SR)**

TransCo proposes monthly payments to SR providers that are *scheduled* to provide the service based on scheduled quantity of reserve they are holding. Failure to provide the service shall mean no payment.

$$\textbf{SR Payment}_{i} = \sum_{h}^{n} (SQ^{h}_{i} \times \textbf{Rate}^{h}_{\textbf{SR}})$$

where: $SQ^{h}_{i} \times \text{Rate}^{h}_{SR}$ - payment for Scheduled Quantity of SR at hour "h"
SQ^{h}_{i} – Scheduled Quantity of SR in MW for Generator "i" at hour "h"
Rate^{h}_{SR} – rate of SR in Peso per MW at hour "h"
n = one (1) month

4.5.3 **Back-up Reserve (BUR)**

TransCo proposes monthly payments to BUR providers that are *scheduled* to provide the service based on scheduled quantity of reserve they are holding. Failure to satisfy synchronization requirement shall be subjected to adjustment.

$$\textbf{BUR Payment}_{i} = \sum_{h}^{n} (SQ^{h}_{i} \times \textbf{Rate}^{h}_{\textbf{BUR}} - \textbf{BUR Adj}^{h}_{i})$$

where: $SQ^{h}_{i} \times \text{Rate}^{h}_{BUR}$ - payment for Scheduled Quantity of BUR at hour "h"
SQ^{h}_{i} – Scheduled Quantity of BUR in MW for Generator "i" at hour "h"
Rate^{h}_{BUR} – rate of BUR in Peso per MW at hour "h"
BUR Adj^{h}_{i} – Adjustment for Generator "i" at hour "h"
n = one (1) month

4.5.4 **Reactive Support Service (RS)**

TransCo proposes monthly payments to RS providers that are *scheduled* to provide the service based on scheduled quantity of reserve they are holding. Failure to satisfy technical requirements shall mean no payment or shall be subjected to adjustment.

.

$$\textbf{RS Payment}_{i} = \sum_{h}^{n} (\textbf{SQ}^{h}_{i} \times \textbf{Rate}^{h}_{RS} - \textbf{RS Adj}^{h}_{i})$$

where: SQ^{h}_{i} x $Rate^{h}_{RS}$ - payment for Scheduled Quantity of RS at hour "h"
SQ^{h}_{i} – Scheduled Quantity of RS in MVAr for Generator "i" at hour "h"
$Rate_{RS}$ – rate of RS in Peso per MVAr at hour "h"
RS Adj^{h}_{i} – Adjustment for Generator "i" at hour "h"
n = one (1) month

4.5.5 **Black Start Service (BS)**

TransCo proposes monthly payments to BS providers based on annual cost of providing BS over twelve (12) months.
Failure to provide the service shall mean no payment or shall be subjected to adjustment.

$$\textbf{BS Payment}_{i} = \frac{\textbf{Annual Cost of Providing BS}}{\textbf{12 months}} - \textbf{BS Adj}_{i}$$

where: BS Adj_{i} - Adjustment for Generator "i"

4.6 Adjustments for Non-Performance of Service

4.6.1 **Back-Up Reserve (BUR)**

Adjustment due to failure to synchronize within 15-minute time requirement, **BUR** $\textbf{Adj}^{h}_{i}$**,** shall be:

$$\textbf{BUR Adj}^{h}_{i} = \textbf{SQ}^{h}_{i} \times \textbf{d}^{h} \times \textbf{Rate}^{h}_{BUR}$$

where: SQ^{h}_{i} – Scheduled Quantity of BUR in MW for Generator "i" at hour "h"
d^{h} = (t–15)/60; t – time duration, in minutes, at which the provider has synchronized with the Grid from dispatch instruction at hour "h"
$Rate^{h}_{BUR}$ – rate of BUR in Peso per MW at hour "h"

4.6.2 **Reactive Support Service (RS)**

Adjustment due to failure to supply or absorb scheduled quantity of MVar, **RS Adj $^{h}_{i}$,** shall be:

$$\textbf{RS Adj } ^{h}_{i} = (\textbf{SQ } ^{h}_{i} - \textbf{AMSA } ^{h}_{i}) \textbf{ x Rate } ^{h}_{RS}$$

where: SQ $^{h}_{i}$ – Scheduled Quantity of RS in MVAr for Generator "i" at hour "h"
AMSA $^{h}_{i}$ – Actual MVAr Supplied or Absorbed by Generator "i" at hour "h"
Rate $^{h}_{RS}$ – rate of RS in Peso per MW at hour "h"

4.6.3 **Black Start Service (BS)**

Adjustment due to failure to synchronize within 30-minute time requirement or failure to pass the annual start-up test, **BS Adj $_{i}$** , shall be:

$$\textbf{BS Adj}_{i} = \textbf{d x Monthly Rate}_{BS}$$

where: d = 0.75 when t: $30 < t < 40$
= 0.50 when t: $40 < t < 50$
= 0.25 when t: $50 < t < 60$
= 0 when t: $t \geq 60$

t - time duration, in minutes, at which the provider has synchronized with the Grid from dispatch instruction

Monthly Rate_{BS} – BS rate in Peso per month

5.0 Ancillary Services Cost Recovery Mechanism

There are two regimes being considered in the formulation of Ancillary Service Cost Recovery. The current regime is that of the Open Access Transmission Service (OATS) where all forms of Ancillary Services are contracted by TRANSCO and recovered through rates and charges approved by the Energy Regulatory Commission. A new regime, which is under development, is the Wholesale Electricity Spot Market (WESM) which allows certain types of Ancillary Services to be traded in the market for a more transparent and efficient method of procurement and cost recovery.

To manage the transition from the OATS to the WESM regime, efforts to reconcile the applicable provisions of the Rules, Terms and Conditions for the Provision of Open Access Transmission Service to that of the WESM Rules were done by the Task Force on Ancillary Services. The Task Force is composed of personnel from the System Operations, Market Operations and the Corporate Planning groups of TRANSCO.

The Task Force agreed that the reconciliation effort should consider all relevant requirements in system operations such that reliability and quality of service in the grid will not be

compromised in the process. Following this principle, an equivalence matrix shown in **Table 5.1** was developed by the Task Force.

Table 5.1 Equivalence Matrix for Ancillary Services

OATS Filing	SO Requirement	WESM Rules
Load Following and Frequency Regulation	Load Following and Frequency Regulation	Regulating Reserve
Spinning Reserve	Contingency Reserve – Spinning Reserve	Contingency Reserve
Back-Up Reserve	Contingency Reserve – Back-Up Power Supply	Dispatchable Reserve
Black-Start Capacity	Black Start Service	(Not Traded in WESM)
Energy Imbalance	Energy component of Back-Up Power Supply	Ex-Post Price within Trading Interval
		Spot Energy Purchase beyond Trading Interval
(Not included in filing)	Reactive Supply and Voltage Control	(Not Traded in WESM)
(Not Included in filing)	Customer Load Dropping	Interruptible Loads in Lieu of Reserve

Ancillary Service cost recovery is closely related to the manner by which they are procured or contracted. It is in the procurement methods of some Ancillary Services where the distinction between the OATS and WESM regimes is apparent as discussed in Section 4 of this report.

Table 5.2 shows the summary of procurement and cost recovery schemes applicable for each type of Ancillary Services in the OATS and WESM regimes. The columns under cost recovery specify method of charging which could either be to a specific user or beneficiary of the Ancillary Service or to all Customers or Generators. When the cost of Ancillary Service is charged to all Customers or Generators, it is divided by a certain allocator, such as system demand or consumption. Effectively, this results into the system average rate for that service. The system averaging approach in cost recovery is adopted in both the OATS and WESM regimes. The only difference is mainly in the timeframe of cost allocation (or charging) as will be clarified in the succeeding sections.

Table 5.2 Ancillary Service Procurement & Cost Recovery

Ancillary Service Types	Procurement		Cost Recovery	
	WESM	OATS	User Specific	System Average
Load Following and Frequency Regulation = Regulating Reserve	Spot offers	Transition contracts	None	Customer (capacity)
Spinning Reserve = Contingency Reserve	Spot offers	Transition contracts	None	Generator (capacity)
Back-Up Power =	Spot offers	Transition	None	Generator

Ancillary Service Types	Procurement		Cost Recovery	
	WESM	OATS	User Specific	System Average
Dispatchable Reserve		contracts		(capacity)
Black Start Capacity	(Not traded)	Long-term contracts	User (energy)	All (capacity)
Energy Imbalance ≈ Ex Ante and Ex Post Pricing	Spot offers	Back-Up Power (energy)	User (energy)	None
Reactive Supply and Voltage Control	(Not traded)	(Not included)	Users (reactive energy)	None
Customer Load Dropping = Interruptible Loads	Spot offers	(Not included)	None	Generator (capacity)

The following were the general guidelines that were observed in the formulation of the cost recovery mechanisms for Ancillary Services:

- The formula should be revenue neutral to both System Operator and Market Operator. There should be no under- and over-recovery of the cost of service and no profit margin will be allowed. That is, the charges should be complete passed-on from the user of beneficiary of the service to the service provider.

- The principle of "causers pay" should apply whenever practical. This means that if the necessity of a certain Ancillary Service can be attributed to a particular user or beneficiary the cost of that service should be charged accordingly. Otherwise the cost should be allocated in proportion to the level of transaction in the grid.

- However, charging the cost of Ancillary Services the "causers pay" principle based on Generator vs. Customer cost allocation may be immaterial considering that Generators will always impute all these cost when they charge the Customers or bid into the WESM.

- When allocating cost for Ancillary Services, the timeframe for system averaging should be as close as practicable (i.e., coincident) to the time the services are being provided or made available to the system. For example, the cost allocation of reserve should be based on the hourly energy schedules of instead of using monthly peak demands.

- Ancillary Services that are allowed to be traded in the WESM will have cost recovery formulations for both the OATS and WESM regimes to provide a transition while the latter is still under development. Other types of services not covered by the WESM will adopt the rates and charges as stipulated in the OATS although this does not preclude TRANSCO from using the WESM formulation.

5.1 Ancillary Services Contracted Under OATS

Under the OATS regime, all Ancillary Services will be contracted by TRANSCO from Generators and will be recovered through rates and charges all Generation Customers, Embedded Generation and Load Customers, where applicable.

The following formulae on Ancillary Service Charges were taken from Annex VI-Module F of the Rules, Terms and Conditions for the Provision of Open Access Transmission Service. The document was filed by TRANSCO last June 2003 to the Energy Regulatory Commission.

5.1.1 Load Following and Frequency Regulation Service Charges

The rates and charges for Load Following and Frequency Regulation are determined by the following formula:

$$\text{Charge}_{\text{LFFR}} = \text{Rate}_{\text{LFFR}} \times \text{LBD}_{\text{j}}$$

$$\text{Rate}_{\text{LFFR}} = \frac{\text{Cost}_{\text{LFFR}}}{\sum_{\text{j}} \text{LBD}_{\text{j}}}$$

Where:

$\text{Charge}_{\text{LFFR}}$ - The Load Following and Frequency Regulation Service Charge payable by the Load Customer in a Billing Period.

$\text{Rate}_{\text{LFFR}}$ - The Load Following and Frequency Regulation rate

LBD_{j} - Load Billing Determinant for customer " j ". The Load Billing Determinant for each Point of Delivery shall be the average of the highest 12 demand peaks, measured in kW aggregated over a 30 minute period, at that Point of Delivery, over the past 12 months.

$\text{Cost}_{\text{LFFR}}$ - The expected or contracted cost to the Transmission Provider/System Operator for Load Following and Frequency Regulation Services specified in the Ancillary Services Procurement Plan

5.1.2 Spinning Reserve Service Charges

The rates and charges for Spinning Reserve Service are determined by the following formula:

$$\text{Charge}_{\text{SR}} = \text{Rate}_{\text{SR}} \times \text{GBD}_{\text{i}}$$

$$\text{Rate}_{\text{SR}} = \frac{\text{Cost}_{\text{SR}}}{\sum_{\text{i}} \text{GBD}_{\text{i}}}$$

Where:

$\text{Charge}_{\text{SR}}$ - The Spinning Reserve Service Charge payable by the Generation Customer and Embedded Generator in a Billing Period

$Rate_{SR}$ - The Spinning Reserve rate

GBD_i - The Generator Billing Determinant for Generation Customer or Embedded Generator " i ". The Generator Billing Determinant for each Point of Receipt or Embedded Generator facility shall be the average of the highest 12 injection peaks, measured in kW aggregated over a 30 minute period, over the past 12 months.

$Cost_{SR}$ - The expected or contracted cost to the Transmission Provider/System Operator for Spinning Reserve Services in the Ancillary Services Procurement Plan

5.1.3 Back-Up Reserve Service Charges

The rates and charges for Back-Up Reserve Service are determined by the following formula:

$$Charge_{BUR} = Rate_{BUR} \times GBD_i$$

$$Rate_{BUR} = \frac{Cost_{BUR}}{\sum_i GBD_i}$$

Where:

$Charge_{BUR}$ - The Back Up Reserve (Cold Standby) Service Charge payable by the Generation Customer and Embedded Generator in a Billing Period

$Rate_{BUR}$ - The Backup Reserve (Cold Standby) Service rate

GBD_i - The Generator Billing Determinant for Generation Customer or Embedded Generator " i ". The Generator Billing Determinant for each Point of Receipt or Embedded Generator facility shall be the average of the highest 12 injection peaks, measured in kW aggregated over a 30 minute period, over the past 12 months.

$Cost_{BUR}$ - The expected or contracted cost to the Transmission Provider/System Operator for Back-up Reserve (Cold Standby) Services in the Ancillary Services Procurement Plan

5.1.4 Black-Start Capacity Service Charges

The rates and charges for Black-Start Capacity Service are determined by the following formula:

$$Charge_{BSC} = Rate_{BSC} \times ABD_k$$

$$Rate_{BSC} = \frac{Cost_{BSC}}{\sum_k ABD_k}$$

Where:

$Charge_{BSC}$ - The Black Start Service Charge payable by the Load Customer, Generation Customer and Embedded Generator in a Billing Period

$Rate_{BSC}$ - The Black Start Service rate.

ABD_k - Applicable Billing Determinant which shall either be the Billing Determinant for the Load Customer, Generation Customer or Embedded Generator facility " k ", shall be the average of the highest 12 injection or demand peaks, measured in kW aggregated over a 30 minute period, over the past 12 months.

$Cost_{BSC}$ - Expected or contracted cost to the Transmission Provider/System operator for Black Start Services in the Ancillary Services Procurement Plan

5.1.5 Energy Imbalance Service Charges

The rates and charges for Energy Imbalance Service are determined by the following formula:

$$Charge_{EI} = \sum_{h} Rate^{h}_{Energy} \times Imbalance^{h}_{i}$$

Where:

$Charge_{EI}$ - The Energy Imbalance for each Generation Facility of each Generation Customer and of each Embedded Generator recorded in whole kWh for each hour of the Billing Period.

$Rate^{h}_{Energy}$ - Applicable ERC-approved percentage to the hourly marginal cost or the prevailing Electricity rates, whichever is higher.

$Imbalance^{h}_{i}$ - The Energy Imbalance for each Generation Facility of each Generation Customer and of each Embedded Generator " i ", recorded in whole kWh for each hour " h " of the Billing Period. Energy Imbalance is determined with respect to scheduled dispatch in the following manner:

If $$\frac{Energy^{h}_{sched} - Energy^{h}_{actual}}{Energy^{h}_{sched}} > 1.5\%$$

then,

$$Imbalance^{h}_{i} = 98.5\% \times Energy^{h}_{sched} - Energy^{h}_{actual}$$

else, $$Imbalance^{h}_{i} = 0$$

5.1.6 Reactive Power and Voltage Control Service Charge

There are rate and no charge formula for Ancillary Service Charges for Reactive Power and Voltage Control in the Rules, Terms and Conditions for the Provision of Open Access Transmission Service filed by TRANSCO last June 2003 to the Energy Regulatory Commission. However the System Operations have included this in their Ancillary Service requirement.

5.2 Ancillary Services Traded in the WESM

Ancillary Services which are to be traded in the WESM mostly deal with operating reserve requirements in system operations. In addition, the WESM Rules allows Customers to offer Interruptible Loads as Ancillary Service in lieu of operating reserves, a condition that was not considered in the Rules, Terms and Conditions for the Provision of Open Access Transmission Service of TRANSCO.

In the following sections, only formulations for the equivalent Ancillary Services in the WESM are presented. No cost allocation formula will be presented for Ancillary Service types not traded in the WESM.

5.2.1 Regulating Reserve Cost Allocation

As previously pointed out, the WESM equivalent of Load Following and Frequency Regulation is Regulating Reserve. The cost allocation and recovery formula are shown below:

$$\text{Charge}_{\text{REG}}^{\text{Gen}} = \sum_{h} \text{Cost}_{\text{REG}}^{h} \times \left[\frac{\text{Energy}_{i}^{\text{ex ante}}}{\sum_{i} \text{Energy}_{i}^{\text{ex ante}}} \right]^{h} \times G_{\text{REG}}$$

$$\text{Charge}_{\text{REG}}^{\text{Load}} = \sum_{h} \text{Cost}_{\text{REG}}^{h} \times \left[\frac{\text{Energy}_{j}^{\text{ex ante}}}{\sum_{j} \text{Energy}_{j}^{\text{ex ante}}} \right]^{h} \times \left(1 - G_{\text{REG}}\right)$$

$$\text{Cost}_{\text{REG}}^{h} = \text{MCP}_{\text{REG}}^{h} \times \sum_{i} \text{REG}_{i}^{h}$$

$$0\% \le G_{\text{REG}} \le 100\%$$

Where:

$\text{Charge}_{\text{REG}}^{\text{Gen}}$ - Total hourly cost allocation of Regulating Reserve for the Generator " i "

$\text{Energy}_{i}^{\text{ex ante}}$ - Hourly energy schedule of Generator " i " for the Trading Interval " h "

$Charge_{REG}^{Load}$ - Total hourly cost allocation of Regulating Reserve for the Customer " j "

$Energy_{j}^{ex\ ante}$ - Hourly energy schedule of Customer " j " for the Trading Interval " h "

G_{REG} - Percentage cost allocation of Regulating Reserve to all Generators

$Cost_{REG}^{h}$ - Total cost of Regulating Reserve for the Trading Interval " h "

MCP_{REG}^{h} - Market Clearing Price for Regulating Reserve for Trading Interval " h "

REG_{i}^{h} - Regulating Reserve capacity allocation for Generator " i " for the Trading Interval " h "

5.2.2 Contingency Reserve Cost Allocation

Contingency Reserve is the equivalent of Spinning Reserve in the latest OATS filing for Ancillary Service rates and charges. The WESM cost recovery formula is given by the following equations:

$$Charge_{CON}^{Gen} = \sum_{h} Cost_{CON}^{h} \times \left[\frac{Energy_{i}^{ex\ ante}}{\sum_{i} Energy_{i}^{ex\ ante}} \right]^{h} \times G_{CON}$$

$$Charge_{CON}^{Load} = \sum_{h} Cost_{CON}^{h} \times \left[\frac{Energy_{j}^{ex\ ante}}{\sum_{j} Energy_{j}^{ex\ ante}} \right]^{h} \times \left(1 - G_{CON}\right)$$

$$Cost_{CON}^{h} = MCP_{CON}^{h} \times \sum_{i} CON_{i}^{h}$$

$$0\% \le G_{CON} \le 100\%$$

Where:

$Charge_{CON}^{Gen}$ - Total hourly cost allocation of Contingency Reserve for the Generator " I "

$Energy_{i}^{ex\ ante}$ - Hourly energy schedule of Generator " i " for the Trading Interval " h "

$Charge_{CON}^{Load}$ - Total hourly cost allocation of Contingency Reserve for the Customer " j "

$Energy_{j}^{ex\ ante}$ - Hourly energy schedule of Customer " j " for the Trading Interval " h "

G_{CON} - Percentage cost allocation of Contingency Reserve to all Generators

$Cost_{CON}^{h}$ - Total cost of Contingency Reserve for the Trading Interval " h "

MCP_{CON}^{h} - Market Clearing Price for Contingency Reserve for Trading Interval " h "

CON_i^h - Contingency Reserve capacity allocation for Generator " i " for the Trading Interval " h "

5.2.3 Dispatchable Reserve Cost Allocation

Back-Up Reserve Service is represented as Dispatchable Reserve under the WESM Rules. Allocation of cost is determined by the following formula:

$$Charge_{DIS}^{Gen} = \sum_h Cost_{DIS}^h \times \left[\frac{Energy_i^{ex\ ante}}{\sum_i Energy_i^{ex\ ante}} \right]^h \times G_{DIS}$$

$$Charge_{DIS}^{Load} = \sum_h Cost_{DIS}^h \times \left[\frac{Energy_j^{ex\ ante}}{\sum_j Energy_j^{ex\ ante}} \right]^h \times (1 - G_{DIS})$$

$$Cost_{DIS}^h = MCP_{DIS}^h \times \sum_i DIS_i^h$$

$$0\% \le G_{DIS} \le 100\%$$

Where:

$Charge_{DIS}^{Gen}$ - Total hourly cost allocation of Dispatchable Reserve for the Generator " I "

$Energy_i^{ex\ ante}$ - Hourly energy schedule of Generator " i " for the Trading Interval " h "

$Charge_{DIS}^{Load}$ - Total hourly cost allocation of Dispatchable Reserve for the Customer " j "

$Energy_j^{ex\ ante}$ - Hourly energy schedule of Customer " j " for the Trading Interval " h "

G_{DIS} - Percentage cost allocation of Dispatchable Reserve to all Generators

$Cost_{DIS}^h$ - Total cost of Dispatchable Reserve for the Trading Interval " h "

MCP_{DIS}^h - Market Clearing Price for Dispatchable Reserve for Trading Interval " h "

DIS_i^h - Contingency Reserve capacity allocation for Generator " i " for the Trading Interval " h "

5.2.4 Interruptible Load Cost Allocation

Interruptible Loads have always been used by System Operations when of operating reserves are insufficient. However, this is not included in the current OATS filing as a type of Ancillary Service.

TRANSCO must firs provide the terms and conditions in the provision for Interruptible Loads before this could be considered as another type of Ancillary Service by ERC. The applicable cost recovery formula will also similar to those used for operating reserves;

$$\text{Charge}_{\text{ILD}}^{\text{Gen}} = \sum_{h} \text{Cost}_{\text{ILD}}^{h} \times \left[\frac{\text{Energy}_{i}^{\text{ex ante}}}{\sum_{i} \text{Energy}_{i}^{\text{ex ante}}} \right]^{h} \times G_{\text{ILD}}$$

$$\text{Charge}_{\text{ILD}}^{\text{Load}} = \sum_{h} \text{Cost}_{\text{ILD}}^{h} \times \left[\frac{\text{Energy}_{j}^{\text{ex ante}}}{\sum_{j} \text{Energy}_{j}^{\text{ex ante}}} \right]^{h} \times (1 - G_{\text{ILD}})$$

$$\text{Cost}_{\text{ILD}}^{h} = \text{MCP}_{\text{ILD}}^{h} \times \sum_{i} \text{ILD}_{i}^{h}$$

$$0\% \le G_{\text{ILD}} \le 100\%$$

Where:

$\text{Charge}_{\text{ILD}}^{\text{Gen}}$	- Total hourly cost allocation of Interruptible Loads for the Generator " i "
$\text{Energy}_{i}^{\text{ex ante}}$	- Hourly energy schedule of Generator " i " for the Trading Interval " h "
$\text{Charge}_{\text{DIS}}^{\text{Load}}$	- Total hourly cost allocation of Interruptible Loads for the Customer " j "
$\text{Energy}_{j}^{\text{ex ante}}$	- Hourly energy schedule of Customer " j " for the Trading Interval " h "
G_{ILD}	- Percentage cost allocation of Interruptible Loads to all Generators
$\text{Cost}_{\text{ILD}}^{h}$	- Total cost of Interruptible Loads for the Trading Interval " h "
$\text{MCP}_{\text{ILD}}^{h}$	- Market Clearing Price for Interruptible Loads for Trading Interval " h "
ILD_{i}^{h}	- Interruptible Loads capacity allocation for Generator " i " for the Trading Interval " h "

5.2.5 Ex Ante and Ex Post Energy Pricing

Strictly speaking, Ex Ante and Ex Post Energy Pricing are not defined as a type of Ancillary Service in the WESM. This energy pricing scheme is presented in this report to explain how energy imbalance is treated in the real-time market to ensure cost recovery.

Ex Post Energy Pricing, as seen in the formula below, accounts for imbalances within the Trading Interval of one hour.

$$\text{Charge}_{\text{Energy}}^{\text{ex post}} = \sum_{h} \left[\left(\text{Energy}_{k}^{\text{ex post}} - \text{Energy}_{k}^{\text{ex ante}} \right) \times \text{MCP}_{\text{Energy}}^{\text{ex post}} \right]^{h}$$

Where:

$\text{Charge}_{\text{Energy}}^{\text{ex post}}$	- Total hourly Ex-Post energy charges to Market Participant " k ". The Market Participant can either be a Customer or a Generator.
$\text{Energy}_{k}^{\text{ex ante}}$	- Hourly energy schedule of Market Participant " k " for the Trading Interval " h "
$\text{Energy}_{j}^{\text{ex post}}$	- Actual energy delivered or drawn by Market Participant " k " for the Trading Interval " h "
$\text{MCP}_{\text{Energy}}^{\text{ex post}}$	- Market Clearing Price for energy based on actual dispatch applied to Market Participant " k " for Trading Interval " h "

The above formula indicates that any deviation from the scheduled energy within the hourly trading interval is settled using the resulting spot market price during actual dispatch.

If the energy imbalance continues beyond the hourly trading interval, Ex Ante Energy Pricing will account for the energy prices for the succeeding hours after the energy imbalance has started. The Ex Ante energy pricing formula is shown as follows:

$$\text{Charge}_{\text{Energy}}^{\text{ex ante}} = \sum_{h+1} \left[\left(\text{Energy}_{k}^{\text{ex ante}} - \text{Energy}_{k}^{\text{bilateral}} \right) \times \text{MCP}_{\text{Energy}}^{\text{ex ante}} \right]^{h+1}$$

Where:

$\text{Charge}_{\text{Energy}}^{\text{ex ante}}$	- Total hourly Ex Ante energy charges to Market Participant " k ". The Market Participant can either be a Customer or a Generator.
$\text{Energy}_{k}^{\text{ex ante}}$	- Hourly energy schedule of Market Participant " k " for the Trading Interval " h + 1 "
$\text{Energy}_{k}^{\text{bilateral}}$	- Actual energy delivered or drawn by Market Participant " k " for the Trading Interval " h + 1 "
$\text{MCP}_{\text{Energy}}^{\text{ex post}}$	- Market Clearing Price for energy based on scheduled dispatch applied to Market Participant " k " for Trading Interval " h + 1 "

Note that since the WESM has the ability to update dispatch schedule and pricing every Trading Interval (i.e., Ex Ante - before the hour and Ex Post – after the hour), energy imbalances due to schedule deviation is automatically charged in the settlement of energy transactions. Thus it is not necessary to treat energy imbalance as another type of Ancillary Service in the WESM.

5.3 Further Action Required

The following courses of actions should be considered in the formulation of Ancillary Service Cost Recovery mechanism to be filed with the ERC:

- The inclusion of the terms of condition for provision of Reactive Power and Voltage Control as another type of Ancillary Service under the OATS filing and the corresponding cost recovery formula

- The inclusion of terms and condition for provision of Interruptible Loads as another type of Ancillary service which corresponds to the WESM Rules and cost allocation scheme

- Exploit the use of advanced metering system in the WESM for a more accurate and equitable formulation of rates and charges for cost recovery

- Exploit the use of advanced settlement system in the WESM for a more efficient and transparent collection of Ancillary Service charges

6.0 Development of Other Forms of Ancillary Services

In addition to what has already been filed with the ERC, other forms of Ancillary Service are being considered for development in recognition of certain operational requirements of SO and MO. Among the new forms of Ancillary Services currently being studied are the following:

- Interruptible Load - defined in the WESM rules as the ability of a Customer to disconnect loads from the Grid within a very short notice in response to a frequency deviation or a request of the System Operator.

- Must-Run Capacity – this refer to certain generating resources which are being required by the SO to run at certain generations levels for technical, commercial or other reasons.

- Constrained-Off Capacity – this refers to the ability of certain generating resources to reduce their power output for system security reasons as determined by SO.

- Reactive Power Compensation – this refers to the ability of certain network service providers to provide reactive power support to the Grid beyond what is required by their customer demand.

Like all forms of Ancillary Services, commercial and technical terms have to be established for each new category before they could be filed with the ERC for approval. Among the necessary preparation are metrics, qualifying test and monitoring procedures, payment and cost recovery methods for ERC approval

7.0 References

1. EPIRA
2. Grid Code
3. Distribution Code
4. WESM Rules
5. OATS Rules

Attachments

Attachment 1

Accreditation of Ancillary Service Providers

1.0 Purpose

1.1. This procedure establishes guidelines to be followed in the Issuance of Certification/Accreditation for Ancillary Service Provider who would like to provide Ancillary Services to ensure quality of power in the Grid.

2.0 Scope

2.1. This procedure covers only the Accreditation Process including Contracting for Ancillary Service Provider.

3.0 Definition of Terms/Acronyms

3.1 Definition of Terms

3.1.1 **A/S Provider**- a person or an entity-providing ancillary services and registered with the Market Operator.

3.1.2 **Ancillary Services**- Support services such as Frequency Regulating and Contingency Reserves, Reactive Power Support, and Black start capability, which are necessary to support the transmission capacity and Energy that are essential in maintaining Power Quality and the Reliability and Security of the Grid.

3.1.3 **Generator**- any person or entity authorized by the ERC to operate a facility used in the Generation of Electricity.

3.1.4 **TransCo/SO**- the party responsible for generation Dispatch, the provision of Ancillary Service, and operation & control to ensure safety, power quality, stability, reliability, and the security of the Grid.

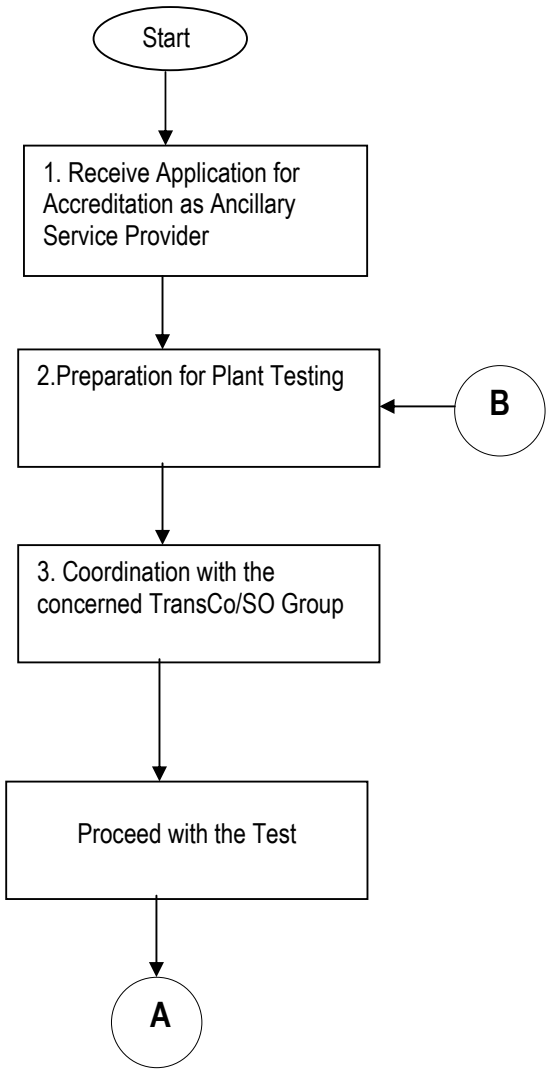
3.2 Acronyms

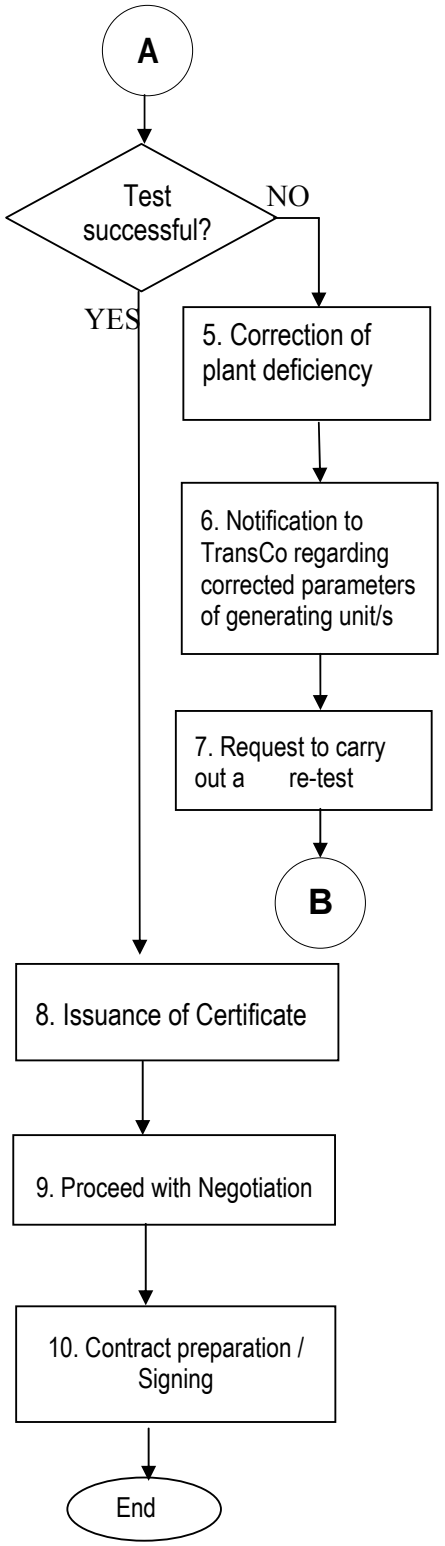
3.2.1	**ACC**	-	Area Control Center
3.2.2	**ASP**	-	Ancillary Service Provider
3.2.3	**A/S**	-	Ancillary Service
3.2.4	**NCC**	-	National Control Center
3.2.5	**OPD**	-	Operations Planning Division
3.2.6	**SCADA**	-	Supervisory Control and Data Acquisition
3.2.7	**SO**	-	System Operations
3.2.8	**TransCo**	-	National Transmission Corporation

4.0 References

4.1 Grid Code

5.0 Procedure

FLOWCHART	RESPONSIBILITY	DETAILS
	Transco/SO Transco/SO Transco/SO Generator	1 TransCo/SO upon receipt of application for accreditation and required documents will perform initial evaluation based on the Standard Technical Requirements. 2. Notify and coordinate with the plant regarding the test to be performed. Check the availability of test equipment and tools for testing. 3. Coordinate with NCC/ACC and OPD for the schedule of testing. 4. Conduct the test to be witnessed by the authorized representative of TransCo/SO.

FLOWCHART	RESPONSIBILITY	DETAILS
	Generator Generator Transco/SO Transco/SO Transco/SO Transco/Generator	5. Generator shall correct the deficiency of its generating unit/s within an agreed period to attain the relevant registered parameters for that unit/s. 6. The Plant shall immediately notify TransCo once the generating unit/s achieves the registered parameters. 7. Transco shall require the plant to conduct a retest in order to demonstrate that the appropriate parameter has already been restored to its registered value. 8. Issue Certification to Ancillary Service Provider/s. 9. Negotiate with Ancillary Service Provider/s regarding the details of the contract/agreement. 10. Prepare Memorandum of Agreement/Contract for signature of both parties concern.

Attachment 2

Method of Determination of Ancillary Service Levels

4.1 Load Following and Frequency Regulation

Several factors contribute to the fluctuations of system frequency over a short period of time. These are load forecast errors, load fluctuations, inability of some generators to maintain steady output, and the mismatch between the rate of load change and the average ramp rates of the generators.

In order to maintain the system frequency within the range of 59.85-60.15 Hz, there should be enough LFFR in the system. Load forecast errors and the rate of load change are the biggest contributors of frequency fluctuations. Based on the 2003 data (Please see attached Tables 4.1A to 4.1E), the average load forecast error is about 3.5% of the hourly system demand and the rate of load change is about 13.52 MW/min. The effect of load fluctuations in the Luzon and Visayas grids are minimal. The biggest load in Luzon is the Kalayaan pump storage, which at normal operation; a single unit consumes steadily 165MW of power. Cyclic loads (e.g. Steel Mills) in Luzon and Visayas grid have minimal effect in the system frequency as shown in the table. It is only in Mindanao grid that cyclic loads have significant effect in the system frequency.

With the above premise, the minimum amount of LFFR can then be set at 4% of the hourly system demand. This figure will provide enough load following and regulating reserve in an hourly basis. The generators that will provide LFFR should have enough ramp rate in order to address the rate of load change and load and generator fluctuations. Generators with Automatic Generator Control (AGC) are the preferable providers of LFFR.

4. 2 Contingency Reserve

4.2.1. Spinning Reserve

In order to ensure reliability, adequacy, and security of the system, there must be enough Spinning Reserve and Backup Reserve at any given time. Reliability can be described in terms of adequacy and security. Historically, utilities determine adequacy by means of probabilistic analysis and security by deterministic method. Adequacy implies that there is sufficient generation and transmission resources available to meet projected needs plus reserves for contingency. While security implies that the system will remain intact even after outages or other equipment failures occur. In general, however, the required level of spinning reserve is currently based primarily on the magnitude of the largest single contingency (N-1 security criterion). The thinking behind this approach is that the system must be able to withstand such a contingency regardless of the probability of its occurrence. In other words, even if the largest generator has an excellent reliability record (e.g., less than one forced outage a year), the consequences of such an outage are so severe that the system must be protected against its occurrence.

4.2.2 **Backup Reserve**

Prior to the deregulation of the electric industry, system planning engineers ensured that the system had ample system reserve to cover a certain level of lost of load probability (LOLP). NPC then had set this level as 1 day LOLP or an equivalent of 30% of the peak demand as system planning reserve. Backup reserve was determined as the difference between system planning reserve and spinning reserve (30% less10.4% or 19.6% of the system peak).

With the onset of deregulation, market forces now signal for additional investment for capacity and reserve. Hence, the backup reserve margin should be set at the optimum.

The optimum level of Backup reserve at any given hour must be set equal to the minimum level of Spinning reserve. The rationale of this is that not all reserve generators are capable for fast start and there should be enough backup reserve to replace the used up Spinning reserve. It is also assumed that there is enough non-backup (cold or replacement) reserve within the 8-hour period to put back the Backup reserve to its minimum level.

Non-backup (cold or replacement) reserves are not considered as ancillary reserves as these generators are the excess capacity that are not dispatched and are given ample time to start-up whenever needed in the system.

4.3 **Reactive Support**

The system voltage throughout the Grid shall be maintained within the ±5% of nominal value as required by the Grid Code. Transco shall control Transmission voltage with the timely use of reactive power control devices (switch reactors and capacitors) and purchase of additional MVAR (supply or absorption) from identified generators.

This type of service varies according to the system load and condition. The minimum absorption and generation can only be determined based on the day-ahead scheduling of dispatch. Generators are the biggest suppliers/absorbers of reactive power. In order to encourage generators to provide this service, they will be paid on the actual MVAR generation and/or absorption in accordance with the scheduled MVAR as determined by the System Operator.

4.4 **Black start**

Transco is required to immediately restart the grid after a total or partial system blackout. A number of power restoration highways are established to attain this mandate. The availability of fast start capacity at strategic locations and redundancy of black start generation were taken into consideration in the design of the restoration highways. Hydro power plants and diesel power plants are typically used as black start plants.

TABLE 4.1A

YEAR 2003 Percentage of Error between Actual and Forecast Demand in (%)

	DAILY AVERAGE																													Mo. Ave
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jan	11.71	9.00	3.97	2.34	4.19	3.46	2.77	2.02	1.96	1.41	4.17	3.20	2.63	1.91	2.90	4.63	4.59	3.44	1.17	4.61	3.65	3.16	2.52	NDA	3.03	3.01	1.92	1.73	1.78	NDA	NDA	3.46
Feb	4.36	2.99	3.31	3.41	NDA	2.82	1.03	4.39	6.39	3.25	3.89	1.86	2.04	2.46	2.93	0.90	1.28	2.01	2.05	1.95	1.86	2.30	2.04	3.40	NDA	3.53	NDA	1.37	--	--	--	2.71
Mar	4.14	1.79	3.27	2.70	1.92	1.54	1.63	10.01	4.98	5.94	4.35	4.46	1.39	1.81	5.47	0.90	2.29	0.94	2.39	1.04	2.42	4.62	2.47	1.12	1.36	3.03	0.68	0.86	3.05	1.35	1.19	2.74
Apr	1.36	1.54	1.71	2.35	2.38	3.09	3.59	4.08	2.19	1.60	1.20	2.63	###	3.38	3.16	2.47	5.74	4.23	3.56	3.62	3.24	1.40	1.45	2.32	2.60	2.28	2.72	3.90	1.78	1.69	1.81	3.02
May	###	###	9.07	3.58	1.51	6.01	###	2.83	3.86	1.28	2.38	1.87	NDA	1.96	2.25	9.67	2.37	2.28	1.39	###	9.40	1.80	3.10	4.04	4.27	###	11.94	13.51	###	10.91	3.92	7.38
Jun	6.00	3.53	4.43	5.02	4.00	2.80	1.13	2.69	2.83	2.74	2.68	2.50	2.82	2.84	2.48	4.62	3.47	2.41	3.08	3.78	1.13	3.15	2.55	4.12	2.85	3.48	4.06	2.21	3.65	NDA	--	3.21
	1st sem Ave.																															3.76
Jul	4.53	4.72	3.02	6.73	2.21	6.73	1.82	NDA	3.03	NDA	3.77	3.81	1.50	2.14	5.37	2.56	2.99	2.59	2.33	1.32	1.12	16.47	6.58	3.44	2.17	3.40	5.74	3.90	2.80	1.86	2.05	3.82
Aug	2.39	2.69	2.35	2.03	2.18	2.61	2.33	2.01	2.87	4.04	3.28	1.16	1.43	1.83	2.78	3.63	1.45	2.69	NDA	3.58	5.63	4.22	2.62	2.04	2.13	3.31	2.36	3.16	1.62	2.79	4.53	2.72
Sep	2.23	5.58	5.11	1.24	1.42	3.35	1.98	1.21	3.12	3.83	2.30	1.85	4.52	2.11	1.42	3.42	2.03	3.37	2.37	4.85	1.13	2.08	3.05	1.59	2.87	1.82	4.06	5.00	2.98	2.06	--	2.80
Oct	1.33	1.33	1.60	1.85	1.19	1.62	3.03	0.95	1.71	NDA	3.43	5.50	4.11	1.65	2.05	1.79	3.63	2.32	2.89	NDA	1.64	1.25	2.61	5.45	1.44	2.33	3.97	2.36	0.72	1.31	5.18	2.42
Nov	6.69	2.92	1.96	3.07	1.34	2.14	1.95	2.03	1.75	2.34	1.87	3.45	2.74	7.00	3.17	5.17	1.96	2.07	0.99	0.92	1.36	3.06	3.19	0.92	1.45	4.06	1.95	1.62	3.79	7.90	--	2.83
Dec	6.87	3.06	4.45	1.12	1.90	9.56	NDA	NDA	NDA	4.22	NDA	2.15	3.26	4.83	2.82	2.61	1.47	1.17	1.94	4.69	6.32	5.56	4.33	5.33	4.66	5.31	5.50	2.47	4.21	3.81	11.91	4.28
	2nd sem Ave.																															3.14
	Annual Ave.																															3.45

Note: NDA - No data available

TABLE 4.1B

Summary of Rate of Load Change, MW/min												
	MONTH											
	Jan 10 Fri	Feb 10 Mon	Mar 28 Fri	Apr 24 Thu	May 07 Wed	Jun 10 Tue	Jul 15 Tue	Aug 07 Thu	Sept 26 Fri	Oct 07 Tue	Nov 25 Tue	Dec 18 Thu
Time												
1:00AM	-2.70	-1.28	-3.12	-3.03	-5.68	-2.32	-2.08	-2.73	-4.65	-3.90	-4.57	-1.40
2:00AM	-1.40	-1.25	-2.05	-2.98	-2.73	-1.32	-1.95	-1.37	-1.00	-1.85	-2.52	-1.83
3:00AM	-1.45	-1.40	-2.10	-2.00	-2.82	-1.93	-0.77	-2.55	-1.23	-1.70	-1.43	-0.33
4:00AM	-0.92	-0.77	-0.87	-1.58	-0.98	-2.13	-2.88	3.12	-0.23	-0.45	-0.47	0.67
5:00AM	1.50	2.73	1.47	0.35	-1.53	-0.77	-0.33	3.73	1.63	2.10	1.92	1.25
6:00AM	3.37	4.88	0.85	-1.55	0.15	2.47	1.37	1.67	0.32	-0.20	0.98	2.67
7:00AM	0.45	0.43	1.07	2.77	1.03	0.07	0.20	2.10	1.97	1.73	0.78	0.27
8:00AM	7.35	7.43	11.33	11.05	10.68	12.18	12.60	8.53	9.40	9.17	8.78	6.70
9:00AM	8.27	9.87	7.70	8.57	9.88	8.33	8.32	8.87	9.40	9.57	10.68	9.53
10:00AM	6.20	7.08	5.98	5.62	6.02	6.92	7.03	5.98	6.88	6.58	7.05	5.32
11:00AM	3.87	3.27	3.42	4.22	3.05	2.97	3.08	5.22	3.05	3.05	2.62	2.25
12:00NN	-2.73	-0.73	-1.08	-2.00	0.02	-0.07	0.47	-6.32	-1.32	-0.17	-2.90	-1.78
1:00PM	1.32	0.70	0.95	1.05	0.17	-0.67	-0.55	-1.53	0.20	0.32	1.43	1.83
2:00PM	1.62	2.17	2.65	1.43	2.98	2.90	2.80	1.23	3.07	2.23	1.53	0.68
3:00PM	-1.68	-0.62	-2.52	-3.48	-0.18	-0.73	-0.53	-1.70	-2.42	-3.23	-1.62	-1.43
4:00PM	-1.90	-1.77	-1.93	-0.45	-1.88	-2.08	-2.27	-1.77	-1.75	-1.75	-18.27	-1.55
5:00PM	-2.00	-3.68	-4.45	-11.52	-1.32	-1.78	-2.48	-2.17	-3.35	-3.03	13.52	-1.10
6:00PM	3.97	0.05	-2.78	3.80	-6.27	-4.72	-2.72	0.52	2.88	5.60	11.25	11.32
7:00PM	2.82	6.30	8.77	8.62	4.52	4.63	2.15	4.47	3.42	0.53	-1.35	1.42
8:00PM	-3.33	-2.62	-1.60	-1.75	0.53	0.65	1.23	-1.97	-2.72	-2.78	-3.17	-3.12
9:00PM	-5.23	-4.13	-4.82	-2.73	-1.72	-0.67	0.55	-3.65	-4.80	-4.10	-5.97	-5.88
10:00PM	-5.98	-7.92	-5.72	-4.68	-2.07	-4.42	-3.08	-7.38	-6.10	-7.25	-6.97	-7.27
11:00PM	-4.87	-5.72	-4.25	-4.32	-5.82	-5.48	-9.40	-4.73	-5.25	-5.25	-6.53	-11.92
12:00PM	-5.53	-4.68	-6.80	-1.95	-5.42	-8.85	-9.30	-6.48	-4.32	-5.17	-4.35	-2.98
Max ramp-up	8.27	9.87	11.33	11.05	10.68	12.18	12.60	8.87	9.40	9.57	13.52	11.32
Max ramp-down	-5.98	-7.92	-6.80	-11.52	-6.27	-8.85	-9.40	-7.38	-6.10	-7.25	-18.27	-11.92

TABLE 4.1C

MIC and SKK Cyclic Load Profile
August 9, 2004 (2:50:00PM - 3:02:00PM)

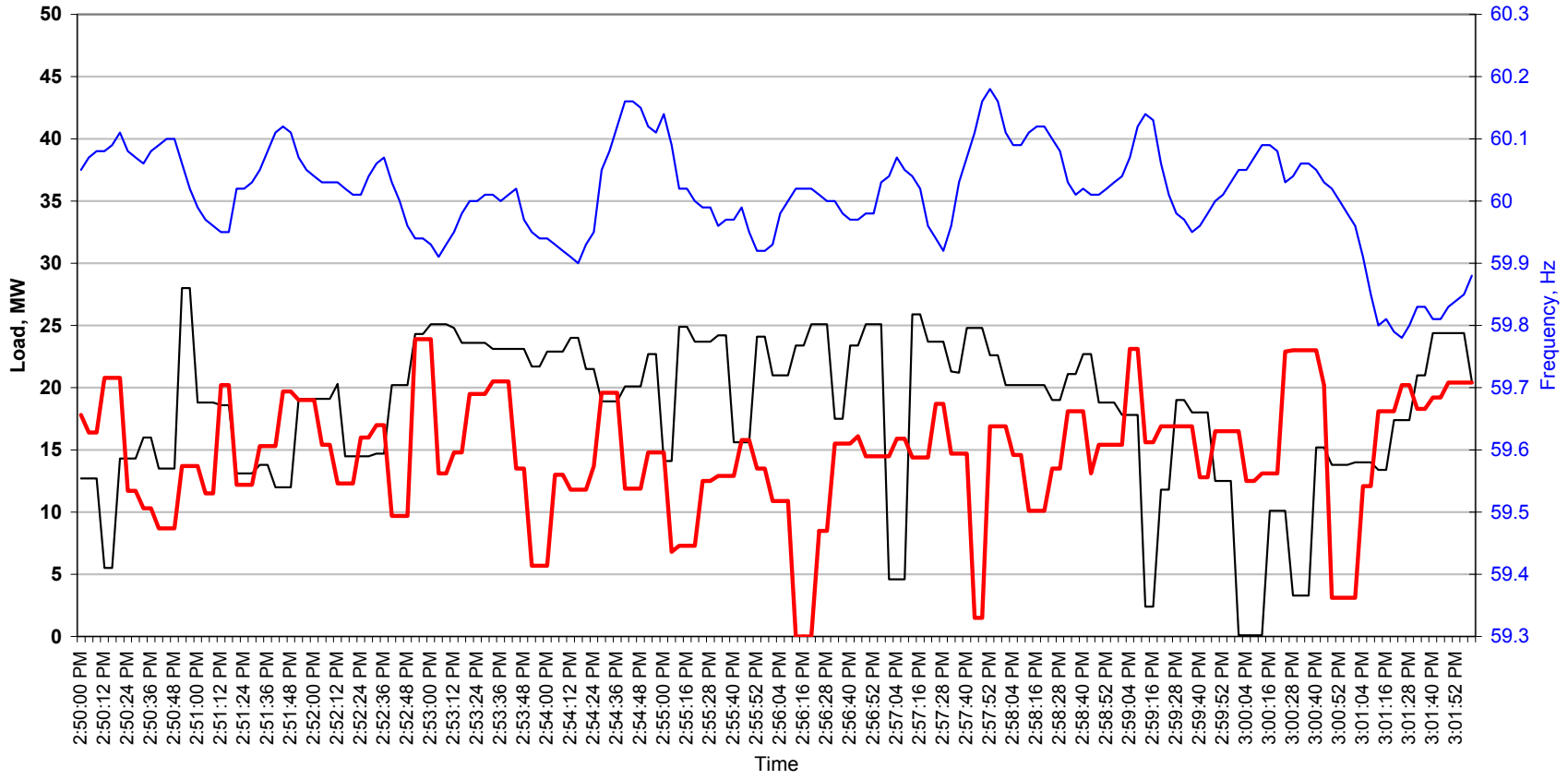


TABLE 4.1D

MIC and SKK Cyclic Load Profile
August 9, 2004 (2:50:00PM - 2:56:00PM)

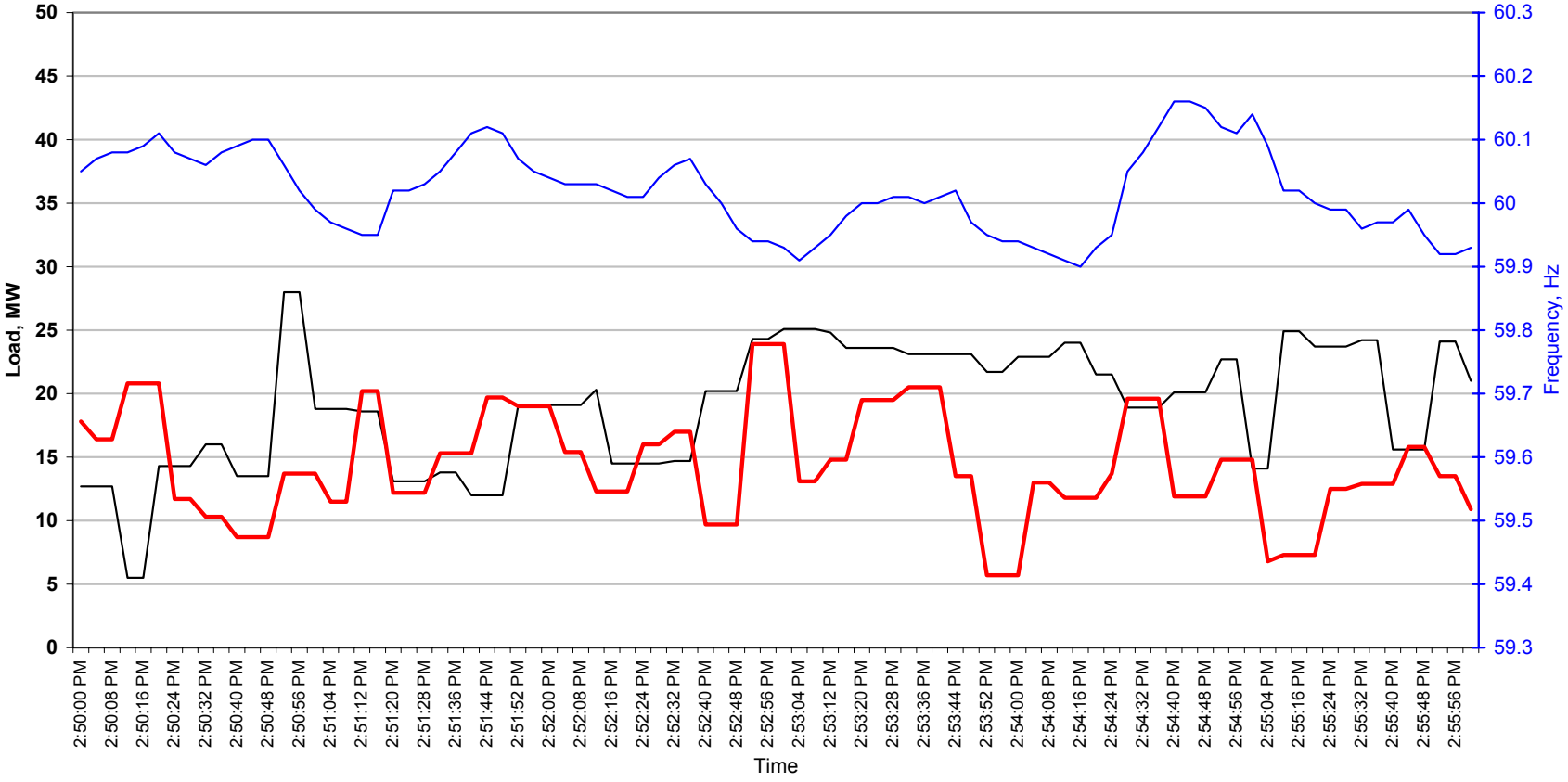
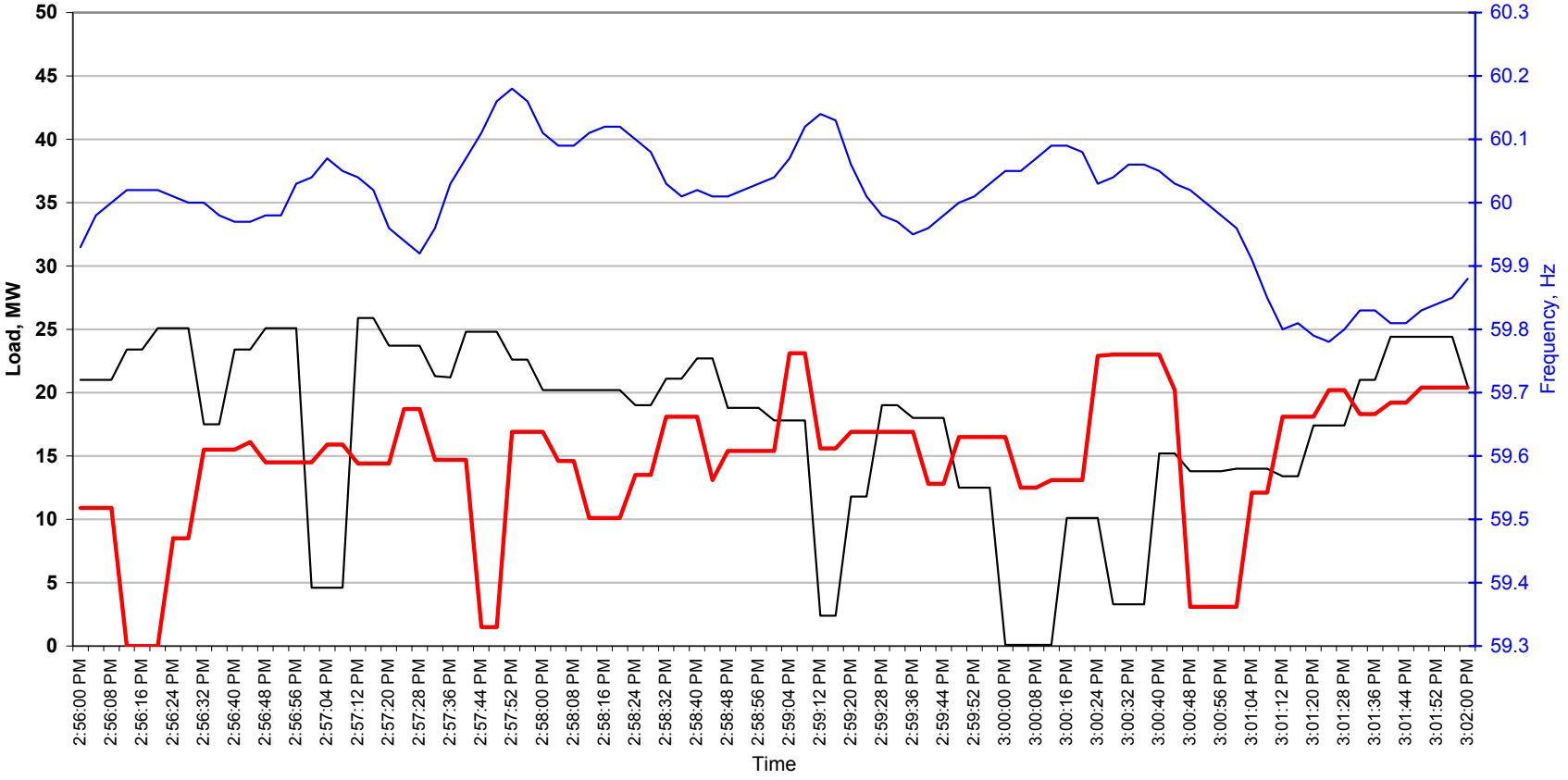


TABLE 4.1E

MIC and SKK Cyclic Load Profile
August 9, 2004 (2:56:00PM - 3:02:00PM)



Attachment 3

Ancillary Service Test and Measurement Procedures

1.0 Load Following and Frequency Regulation

1.1 Purpose

To establish the guidelines that TRANSCO shall use to test plant/generator to be contracted for Load Following and Frequency Regulation (LFFR).

1.2 Scope

This procedure covers the Load Following and Frequency Regulation type of Ancillary Service that qualified generation companies can provide to ensure the provision of regulating capacity necessary to adjust total system generation to match system load changes.

1.3 Definition of Terms/Acronyms

1.3.1 Definition of Terms

- Frequency is the number of complete cycles of alternating current or voltage per unit time, usually measured in cycle per second or Hertz.
- Frequency Control is a strategy used by the System Operator to maintain the frequency of the Grid within the limits prescribed by the Grid Code by the timely use of Frequency Regulating Reserve, Contingency Reserve, and Demand Control.
- Frequency Regulating Reserve refers to a generating unit that assists in Frequency Control by providing automatic Primary and/or Secondary frequency response. *[Grid Code]*
- Frequency Regulation addresses the temporal variations in load and unintended fluctuations in Generation. FR responds to rapid load/generation fluctuations on the order of few seconds to one minute.
- Load Following and Frequency Regulation Service is a service that provides Generation Capacity necessary to adjust total system generation over short periods of time to match system load changes that result from random fluctuations in total transmission system load.
- Load Following Reserve Margin is the required reserve margin expressed as a percentage of average monthly maximum system peak demand (net of plant station use). *[OATS Rules]*
- Primary Response is the automatic response of a Generating Unit to Frequency changes, released increasingly from zero to five seconds

from the time of Frequency change, and which is fully available for the next 25 minutes.

- Secondary Response is the automatic response to Frequency which is fully available 25 seconds from the time of Frequency change to take over from the Primary Response, and which is sustainable for at least 30 minutes.

1.3.2 Acronyms

- LF – Load Following
- FR – Frequency Regulation
- MW- Mega Watt
- PF- Power Factor
- NCC – National Control Center

1.4 Precautions

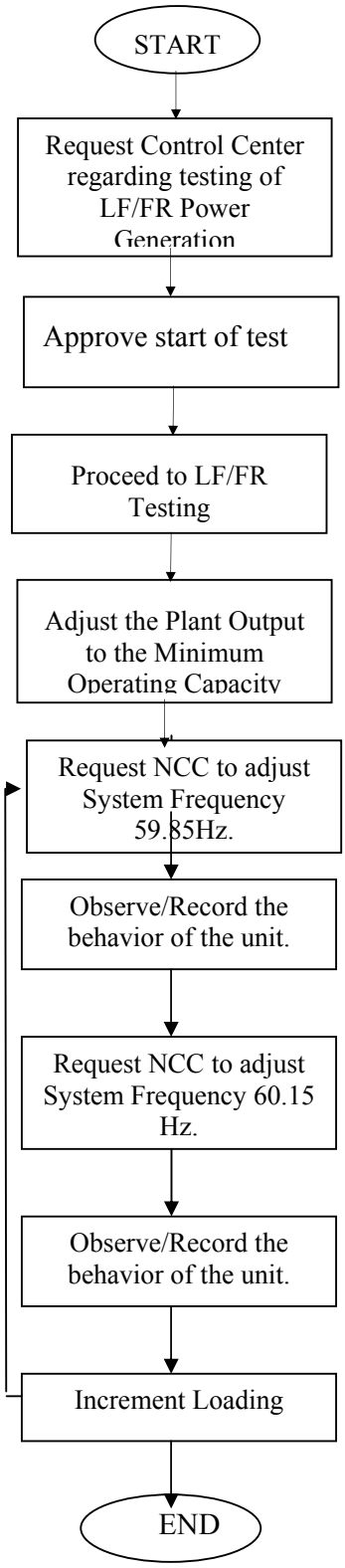
- The unit is online and at least 10% of its rated capacity is allocated for free governor operation mode.
- The test equipment is installed to monitor the unit output MW and the system frequency.
- NCC is informed of the scheduled test.
- For thermal plants, the following parameters should also be monitored:
    - Steam temperature.
    - Governor valve position.

- Utmost safety of the plant is a priority. Abort the test if conditions will lead to plant tripping.

1.5 Reference

- Grid Code

1.6 Flowchart

FLOWCHART	RESPONSIBILITY	DETAILS
	Plant Control Engineer NCC/ACC Personnel Test Coordinator / Witness Plant Control Engineer Plant Control Engineer / Test Coordinator Plant Control Engineer / Witness Plant Control Engineer / Test Coordinator Plant Control Engineer / Witness Plant Control Engineer	Request NCC/ACC Personnel regarding the test to be done. Approve the request taking into consideration the security of the system. To start the test, record the status and operating parameters ,e.g., load and system frequency for the start of the test. Adjust the plant output to the minimum operating capacity. Take note of the unit's frequency deadband. Request NCC to adjust the System Frequency to 59.85Hz, if possible request NCC to maintain the system frequency for 10 minutes to determine the maximum regulating capacity of the plant. Observe/Record the data to be obtained. Request NCC to adjust the System Frequency to 60.15Hz, if possible request NCC to maintain the system frequency for 10 minutes to determine the regulating capacity of the plant. Observe/Record the data to be obtained. Repeat the testing until the load increment reached the maximum operating capacity of the unit for free governor.

1.7 Test Report of Load Following and Frequency Regulation

National Transmission Corporation

SYSTEM OPERATIONS

LOAD FOLLOWING AND FREQUENCY REGULATION

TEST REPORT

Date: _____

Generating Unit: _____
Nameplate Rating: _____ Plant Type: _____
Test Authorized By: _____
Test Supervised By: _____
NCC/RCC Clearance Given By: _____
Date of Testing: _____
Governor Deadband Setting: _____ Hz Rated Power Factor _____
Droop Setting: _____% Load Clipping (MW) _____
☐ Governor Control Operation Mode ☐ With AGC capability

DECLARED CAPABILITY

Ramp-up Rate (MW/min) _____

Ramp-down Rate (MW/min) _____

Required Governor Deadband = ± 0.0 to 0.15 Hz (LF/FR)

☐ High Limit _____ MW ☐ Low Limit _____ MW
☐ Availability Status ☐ Rate Limit _____ MW/min
☐ Monitor AGC Status

Time Started: _____ Time Finished: _____

Time	***Load***	**System Frequency**

Plant Representative	**NPC Representative**	**TransCo Representative**

2.0 Spinning Reserve

2.1 Purpose

To establish the guidelines that TRANSCO shall use to test plant/generator to be contracted for Spinning Reserve (SR).

2.2 Scope

This procedure covers the Spinning Reserve type of Ancillary Service that qualified generation companies can provide to ensure the provision of generating capacity necessary to respond immediately to sudden and unexpected loss of large synchronized Generating unit.

2.3 Definition of Terms/Acronyms

2.3.1 Definition of Terms

- Frequency Control is a strategy used by the System Operator to maintain the frequency of the Grid within the limits prescribed by the Grid Code by the timely use of Frequency Regulating Reserve, Contingency Reserve, and Demand Control.

- Spinning Reserve is a component of Contingency Reserve which is synchronized to the Grid and ready to take on load. *[Grid Code]*

- Spinning Reserve Service is a service that provides Generation Capacity necessary to respond immediately to infrequent, but usually large, failures of generating units and/or transmission tie lines.

- Primary Response Generating units that operate in an automatic frequency sensitive mode or Free Governor mode with deadband setting of between –0.15Hz and 0.30Hz..

- Secondary Response Generating units that operate in an automatic generation control (AGC) of the SCADA/EMS of the National Control Center (NCC) or manual adjustment of load with specific dispatch instructions from system operator with maximum time to full capacity of ten (10) minutes and is sustainable for at least thirty (30) minutes.

2.3.2 Acronyms

- SR – Spinning Reserve
- AGC – Frequency Regulation
- DSM – Dynamic System Monitor
- NCC – National Control Center

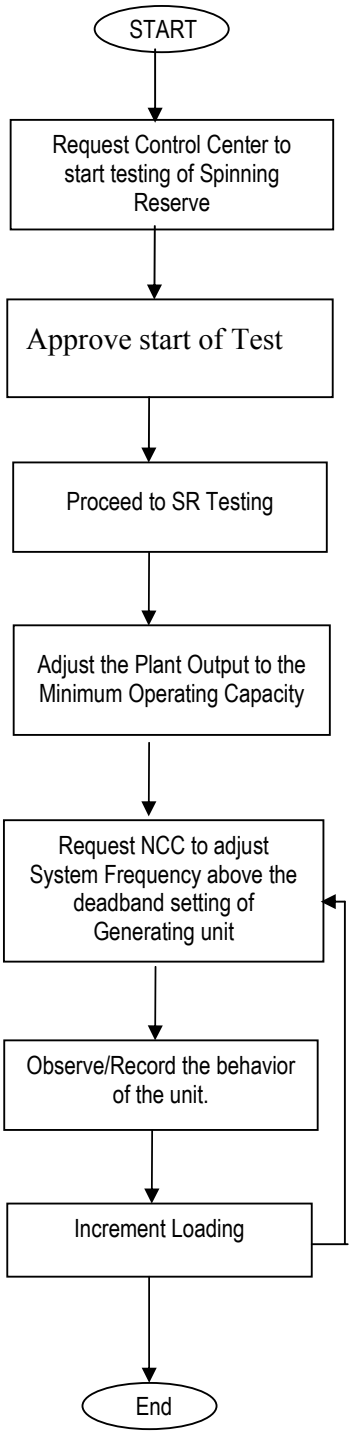
2.4 Precautions

- The unit is online/synchronized.
- The test equipment is installed to monitor the unit output MW and the system frequency.
- NCC is informed of the scheduled test.
- For thermal plants, the following parameters should also be monitored:
- Steam temperature.
- Governor valve position.
- Utmost safety of the plant is a priority. Abort the test if conditions will lead to plant tripping.

2.5 Reference

- Grid Code

2.6 Flowchart

FLOWCHART	DETAILS	RESPONSIBILITY
	Plant Control Engineer NCC/ACC Personnel Test Coordinator / Witness Plant Control Engineer Plant Control Engineer / Test Coordinator Plant Control Engineer / Witness Plant Control Engineer	Request NCC/ACC Personnel regarding the test to be done. Approve the request taking into consideration the security of the system Record the status and operating parameters ,e.g., load and system frequency for the start of the test. To start the test, adjust the plant output to the minimum operating capacity. Take note of the unit's frequency deadband. Request NCC to adjust the System Frequency above the deadband setting of the Generating unit. Observe/Record the data to be obtained. Repeat the testing with a load increment halfway its minimum & maximum generating capacity, and then, with a load equal to its maximum generating capacity.

2.7 Spinning Reserve Test Report

National Transmission Corporation

SYSTEM OPERATIONS

SPINNING RESERVE

TEST REPORT

Date: _____

Generating Unit: _____
Nameplate Rating: _____ Plant Type: _____
Test Authorized By: _____
Test Supervised By: _____
NCC/RCC Clearance Given By: _____
Date of Testing: _____
Governor Deadband Setting: _____ Hz Rated Power Factor _____
Droop Setting: _____ % Load Clipping (MW) _____

☐ Governor Control Operation Mode ☐ With AGC capability

DECLARED CAPABILITY

Ramp-up Rate (MW/min) _____
Ramp-down Rate (MW/min) _____

Required Governor Deadband (-)Hz = Greater than 0.15 but less than 0.30 (SR)

☐ High Limit _____ MW ☐ Low Limit _____ MW
☐ Availability Status ☐ Rate Limit _____ MW/min
☐ Monitor AGC Status

Time Started: _____ Time Finished: _____

Time	**Load**	**System Frequency**

Plant Representative **NPC Representative** **TransCo Representative**

3.0 Reactive Power Generation/Absorption

3.1 Purpose

To establish the guidelines that TRANSCO shall use to test plant/generator to be contracted for Reactive Power Ancillary Service.

3.2. Scope

This procedure covers the Reactive Support type of Ancillary Service that qualified generation companies can provide to ensure the safe operating level of the Grid voltage in consideration with the generating unit's capability curve.

3.3 Definition of Terms/Acronyms

3.3.1 Definition of Terms

- Voltage- the electromotive force or electric potential difference between two points, which causes the flow of electric current in an electric circuit.

- Reactive Power Capability Curve- A diagram which shows the Reactive Power Capability limit versus the Real Power within which a Generating Unit is expected to operate under normal condition.

- Reactive Power- the component of electrical power representing the alternating exchange of stored Energy (inductive or capacitive) between sources and loads or between systems, measured in VAR or multiples thereof. For AC circuits or systems it is the product of the RMS value of the voltage and the RMS value of the quadrature component of the alternating current. In a three phase system, it is the sum of the reactive power of the individual phases.

- Power Factor- the ratio of Active Power to Apparent Power.

3.3.2 Acronyms

- MVAR- Mega Volt-Ampere Reactive
- MW- Mega Watt
- MEX- Maximum Excitation Level
- PF- Power Factor

3.4 Precautions

System at Normal condition

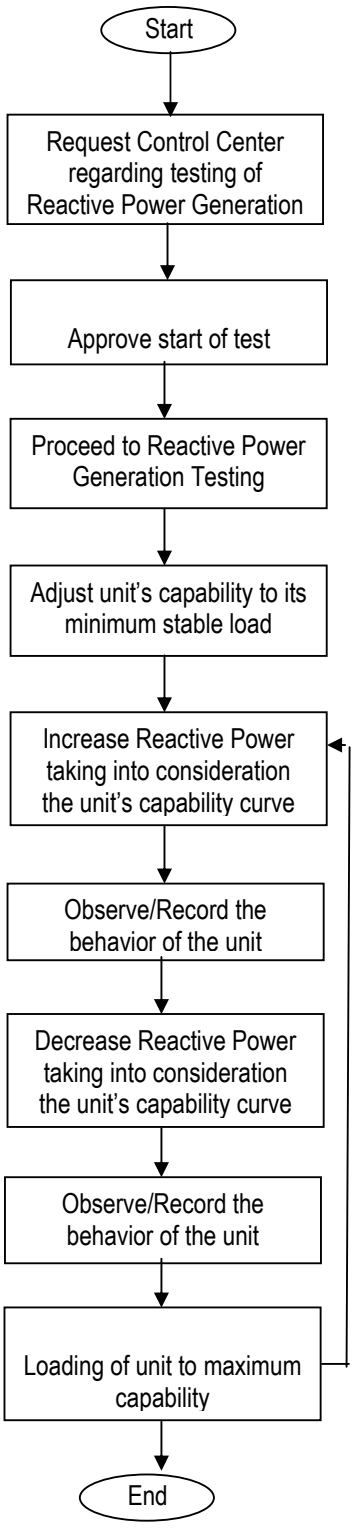
- Test will not place the security of the system and generating units at risk. Abort testing if damage or risk of tripping the generating units exists during the progress of testing.

- Voltage variation to the system will not exceed the ±5% at the connecting point.
- Approval from the Control Center
- Readily available compensation from other generating units to limit voltage within the prescribe limits.

3.5 Reference

- Grid Code

3.6 Flowchart

FLOWCHART	RESPONSIBILITY	DETAILS
	Plant Control Engineer NCC/ACC Personnel Test Coordinator / Witness Plant Control Engineer Plant Control Engineer Plant Control Engineer/Witness Plant Control Engineer Plant Control Engineer/Witness Plant Control Engineer	Request NCC/ACC Personnel regarding the test to be done. Approve the request taking into consideration the security of the system. To start the test, record the status and operating parameters ,e.g., load and system frequency for the start of the test. Unit load set at minimum stable load Using the Capability Curve of the unit, increase the Reactive Power Generation (over excitation or lagging power factor) until maximum value is achieved. Record the MW, MVAR, pf, Rotor and Stator Temperature, of each increment and maintain value for 5 to 15 minutes, taking consideration of ±5% terminal voltage. Observe/Record the data to be obtained Using the Capability Curve of the unit, decrease the Reactive Power Generation (under excitation or leading power factor) until maximum value is achieved. Record the MW, MVAR, pf, Rotor and Stator Temperature, of each increment and maintain value for 5 to 15 minutes, taking consideration of ±5% terminal voltage. Observe/Record the data to be obtained Unit load set at maximum capability and repeat the procedure from increasing the Reactive Power Generation.

3.7 Reactive Support Capability Test Report

National Transmission Corporation

SYSTEM OPERATIONS

REACTIVE SUPPORT CAPABILITY

TEST REPORT

Date: _____

Generating Unit: _____

Plant Type: _____

Nameplate Rating: _____ MW _____ MVAR _____ MVA

Test Authorized By: _____
Test Supervised By: _____
NCC/RCC Clearance Given By: _____
Date of Testing: _____
Governor Deadband Setting: _____ Hz Rated Power Factor: _____
Droop Setting: _____ % Gen. Terminal Voltage (kV) _____
☐ Governor Control Operation Mode ☐ With AGC capability

(Please attach copy of the Generator Reactive Power Capability Curve)

Time Started: _____ Time Finished: _____

Time	MW	MVAR	Power Factor	Terminal Voltage (kV)	Temperature (degC)	
					Rotor	Stator

Plant Representative **NPC Representative** **TransCo Representative**

4.0 Black Start Capability

4.1 Purpose

To establish the guidelines that TRANSCO shall use to test plant/generator to be contracted for Black Start Ancillary Service.

4.2 Scope

This procedure covers the Black Start type of Ancillary Service to be able to determine the ability of Generating units to recover from a shutdown condition to an operating condition, without assistance from the Grid or other external power supply, in order to energize the Grid and assists other generating units to start.

4.3 Definition of Terms/Acronyms

4.3.1 Definition of Terms

- Dispatch Instruction- refers to the instruction issued by the System Operator to the Generators with scheduled Generating units and the generating units providing ancillary services to implement the final generation schedule in real time.
- Central Dispatch- the process of issuing direct instructions to the electric power industry participants by the System Operator to achieve an economic operation while maintaining Power Quality, Stability, Reliability and Security of the Grid.
- NCC Specialist- System Operator personnel responsible for generation Dispatch, the provision of Ancillary Services and operation and control to ensure safety of the Grid.
- Control Center- a facility used for monitoring and controlling the operation of the Grid, Distribution System, or a User System.

4.3.2 Acronyms

- NCC- National Control Center
- S/S- Substation
- PRH- Power Restoration Highway

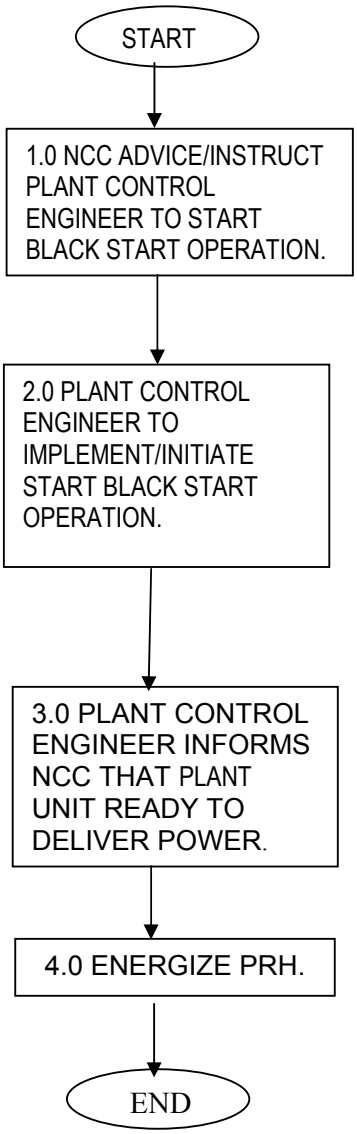
4.4 References

- Grid Code

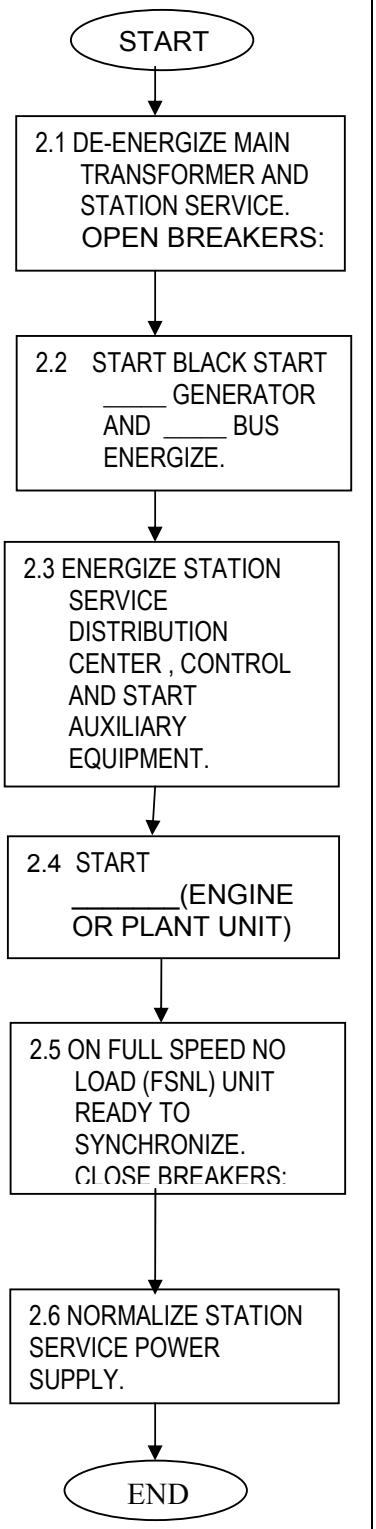
4.5 Appendices

- QF 266A – Record of Time
- QF 266B – Black Start Test Report

4.6 Flowchart (NCC)

FLOWCHART	RESPONSIBILITY	DETAILS
	NCC Specialist Plant Control Engr Plant Control Engr NCC Specialist	1.1 NCC Specialist to activate/ issued Plant Unit Black Start @ XA 21 (display 6.500). Fill-up form QF 266B 2.1Refer to individual Power Plant testing procedures. To record the actual time for each completed activity. Fill-up form QF 266A 3.1 Inform NCC that Plant Unit is dispatchable and ready to extend power thru PRH.Fill-up form QF266B. 4.1 Coordinate with S/S operator and Plant Control Engineers to accept & extend power to adjacent S/S. Refer to individual PRH.

4.7 Flowchart (Plant)

FLOWCHART	RESPONSIBILITY	TIME
	Plant Control Engr Plant Control Engr Plant Control Engr Plant Control Engr Plant Control Engr Plant Control Engr	_____ _____ _____ _____ _____ _____

Compliance Monitoring

Load Following and Frequency Regulation Service Providers

1.0 Responsible Person

Principal Engineer

2.0 Instructions

2.1 Get the list of all Ancillary Service Providers scheduled to provide the service from the Daily Generation Schedule (DGS) and its respective LFFR quantity from the Reserve profile. Evaluate each Provider based on the Actual MW Generation obtained from SCADA.

2.2 For every dispatch period, evaluate and analyze the data through the following:

2.2.1 For every two (2) seconds compare the generator MW output with the Generator schedule operating limits.

2.2.1.1 Frequency at 60Hz

2.2.1.1.1 Delivered LFFR equals zero (0) MW:

Scheduled Generation = Actual Generation

2.2.1.1.2 For undesired operation:

Scheduled Generation ≠ Actual Generation

Allowable Load Variation = ±1MW or ±1.5% of Scheduled Generation, whichever is higher

2.2.1.2 Frequency between 59.85Hz and 60Hz

2.2.1.2.1 Delivered LFFR = Actual Generation - Scheduled Generation

2.2.1.2.2 For Undesired operation:

Actual Generation - Scheduled Generation < zero (0)

2.2.1.2.3 For failure to deliver LFFR:

Actual Generation - Scheduled Generation = zero (0)

2.2.1.3 Frequency between 60Hz and 60.15Hz

2.2.1.3.1 Delivered LFFR = Scheduled Generation – Actual Generation

2.2.1.3.2 For Undesired operation:

Scheduled Generation - Actual Generation < zero (0)

2.2.1.3.3 For failure to deliver LFFR:

Scheduled Generation - Actual Generation = zero (0)

Spinning Reserve Service Providers

1.0 Responsible Person

Principal Engineer

2.0 Instructions

2.1 Get the list of all Ancillary Service Providers scheduled to provide the service from the Daily Generation Schedule (DGS) and its respective SR quantity from the Reserve profile. Evaluate each Provider based on the Actual MW Generation obtained from SCADA.

2.2. For every dispatch period, evaluate and analyze the data through the following:

2.2.1 Every time the frequency is below 59.85Hz

2.2.1.1 Delivered SR = Actual Generation - Scheduled Generation

2.2.1.2 For Undesired operation:

Actual Generation - Scheduled Generation < zero (0)

2.2.1.3 For failure to deliver SR:

Actual Generation - Scheduled Generation = zero (0)

Reactive Support Service Providers

1.0 Responsible Person

Principal Engineer C

2.0 Instruction

2.1 Get the list of all Ancillary Service Providers scheduled to provide the service from the Daily MVar Generation Schedule. Evaluate each Provider based on the Actual MVar Generation obtained from SCADA.

2.2 For every dispatch period compare Scheduled Reactive Power with Actual Reactive Power

2.2.1 If bus voltage is within 5% of nominal

2.2.1.1 For delivered Reactive Power Support:

Scheduled Reactive Power = Actual Reactive Power

2.2.1.2 For Non-delivered Reactive Power Support:

Scheduled Reactive Power ≠ Actual Reactive Power

Black Start Service Providers

1.0 Responsible Person

Principal Engineer C

2.0 Instruction

2.1 in from SCADA the Alarm Event data and the Dispatch Instruction from NCC. Use the existing Restoration Highways as reference, to get the list of Generating plants with Black start capability.

2.2 During Actual Black out and test scenario

2.2.1 Provider delivered Black start when ready to pick-up load within thirty (30) minutes from dispatch instruction for Black start and it can extend its power and sustain it for twelve (12) hours.

Back-up Reserve Service Providers

1.0 Responsible Person

Principal Engineer

2.0 Instruction

2.1 Get the list of all Ancillary Service Providers scheduled to provide the service from the Daily Generation Schedule (DGS) and its respective BUR quantity from the Reserve profile. Evaluate each Provider based on the Actual MW Generation obtained from SCADA.

2.2 From the Dispatch Instruction and Alarm Event data, evaluate the provider base on the requirement stated below:

2.2.1 Back-up Reserve is delivered on time if the unit is synchronized within 15 minutes from
dispatch instruction to start-up for Back-up power and can sustain up to eight (8) hours continuous.

Attachment 6
Ancillary Services Standard Technical Requirements

	Performance Measures	Performance Criteria	Monitoring Scheme
Load Following & Frequency Regulation	Primary Response (Speed Governor)		**Monitored from EMS/SCADA**
	Regulating Capacity, ±MW	Within ±1% declared	1. Continuous monitoring
	Static Gain, MW/Hz	Within ±5% declared	
	Speed droop setting	5% or less	
	Response time	5 seconds maximum	
	Dead band setting (±) Hz	Within 0.15	
	Secondary Response (AGC or Manual)		
	Regulating Capacity, ±MW	Within ±1% declared	
	Ramping Rate, ±MW/min	Less than ±10% declared	
	Response time	25 seconds maximum	
	Dead band setting (±) Hz	Within 0.15	
Spinning Reserve	Primary Response (Speed Governor)		Monitored from EMS/SCADA triggered by:
	Reserve Capacity, MW	Within ±1% declared	1. Actual restoration of spinning reserve
	Speed droop setting	5% or less	
	Static Gain, MW/Hz	Within ±5% declared	2. Spot check
	Maximum time to full reserve capacity	10 minutes	
	Dead band setting (-) Hz	Greater than 0.15 but less than 0.30	
	Secondary Response (AGC or Manual)		
	Reserve Capacity, MW	Within ±1% declared	
	Maximum time to full reserve capacity	10 minutes	
	Dead band setting (-) Hz	Greater than 0.15 but less than 0.30	
	Ramping Rate, ±MW/min	Less than ±10% declared	
	Sustainable time	At least 30 minutes	

Attachment 6
Ancillary Services Standard Technical Requirements

	Performance Measures	Performance Criteria	Monitoring Scheme
Back-up Power	Back-up Capacity, MW	Within ±1% declared	Monitored from EMS/SCADA triggered by: 1. Actual restoration of spinning reserve 2. Spot check
	Synchronizing time	Within 15 minutes	
	Ramping Rate, ±MW/min	Within ±10% declared	
	Sustainable time	Minimum of 8 hours	
Black-Start Capability	Black start Capacity, MW	Within ±1% declared	Monitored from EMS/SCADA triggered by: 1. Actual system restoration 2. Simulated emergency exercises 3. Spot check
	Maximum time to Synchronize	Within 30 minutes	
	Maximum time at no load, min	Within 10% declared	
	Load Pick-up Rate, MW/min	Within ±10% declared	
	Overload Capacity, MW	Within ±1% declared	
	Sustainable time	At least 12 hours	
	Reactive Power Range, ±MVAr	Within ±5% declared	
Reactive Power	Reactive Power Capability	Within ±5% declared	***Monitored from EMS/SCADA***
	Power Factor within Capability Curve	Less than 0.85 lagging and less than 0.90 leading	

Attachment 4

Accreditation of Ancillary Service Providers

1.0 Purpose

1.1 This procedure establishes guidelines to be followed in the Issuance of Certification/Accreditation for Ancillary Service Provider who would like to provide Ancillary Services to ensure quality of power in the Grid.

2.0 Scope

2.1 This procedure covers only the Accreditation Process including Contracting for Ancillary Service Provider.

3.0 Definition of Terms/Acronyms

3.1 Definition of Terms

3.1.1 **A/S Provider**- a person or an entity-providing ancillary services and registered with the Market Operator.

3.1.2 **Ancillary Services**- Support services such as Frequency Regulating and Contingency Reserves, Reactive Power Support, and Black start capability, which are necessary to support the transmission capacity and Energy that are essential in maintaining Power Quality and the Reliability and Security of the Grid.

3.1.3 **Generator**- any person or entity authorized by the ERC to operate a facility used in the Generation of Electricity.

3.1.4 **TransCo/SO**- the party responsible for generation Dispatch, the provision of Ancillary Service, and operation & control to ensure safety, power quality, stability, reliability, and the security of the Grid.

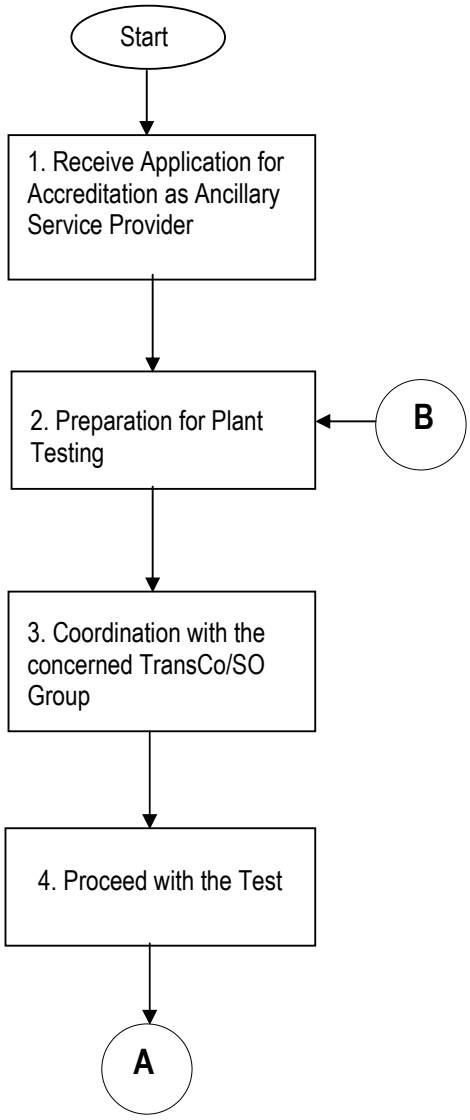
3.2 Acronyms

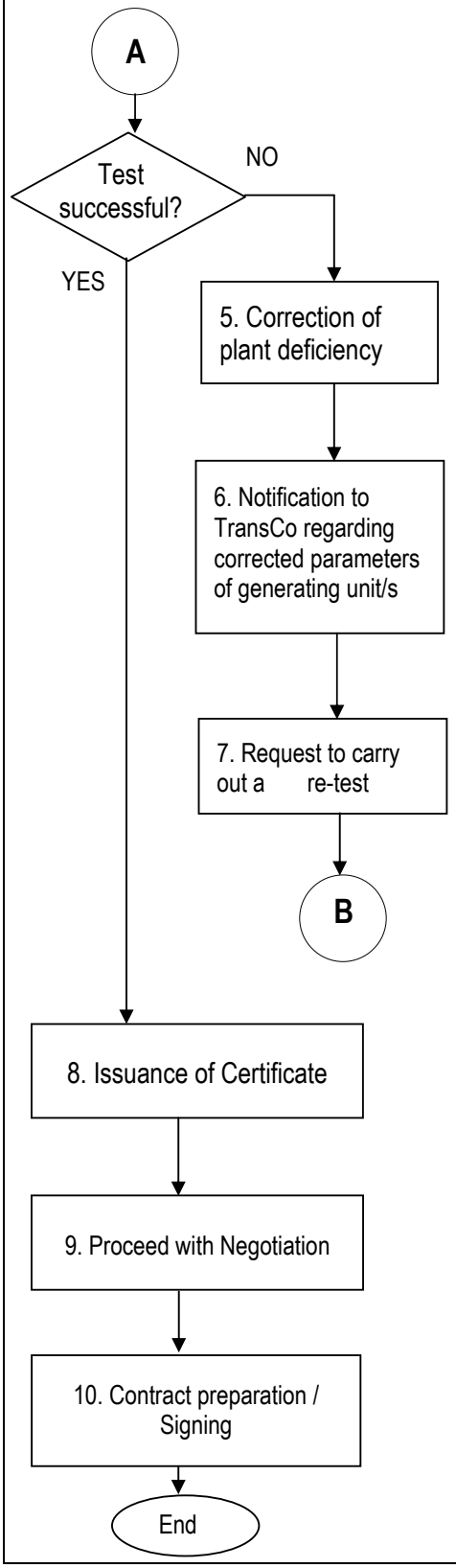
3.2.1 **ACC** - Area Control Center
3.2.2 **ASP** - Ancillary Service Provider
3.2.3 **A/S** - Ancillary Service
3.2.4 **NCC** - National Control Center
3.2.5 **OPD** - Operations Planning Division
3.2.6 **SCADA** - Supervisory Control and Data Acquisition
3.2.7 **SO** - System Operations
3.2.8 **TransCo** - National Transmission Corporation

4.0 References

4.1 Grid Code

4.0 Procedure

FLOWCHART	RESPONSIBILITY	DETAILS
	Transco/SO Transco/SO Transco/SO Generator	1 TransCo/SO upon receipt of application for accreditation and required documents will perform initial evaluation based on the Standard Technical Requirements. 2. Notify and coordinate with the plant regarding the test to be performed. Check the availability of test equipment and tools for testing. 3. Coordinate with NCC/ACC and OPD for the schedule of testing. 4. Conduct the test to be witnessed by the authorized representative of TransCo/SO.

FLOWCHART	RESPONSIBILITY	DETAILS
	Generator Generator Transco/SO Transco/SO Transco/SO Transco/Generator	5. Generator shall correct the deficiency of its generating unit/s within an agreed period to attain the relevant registered parameters for that unit/s. 6. The Plant shall immediately notify TransCo once the generating unit/s achieves the registered parameters 7. Transco shall require the plant to conduct a retest in order to demonstrate that the appropriate parameter has already been restored to its registered value. 8. Issue Certification to Ancillary Service Provider/s. 9. Negotiate with Ancillary Service Provider/s regarding the details of the contract/agreement. 10. Prepare Memorandum of Agreement/Contract for signature of both parties concern.