COMPARISION OF DIFFERENT TECHNIQUES FOR MITIGATION OF UNDER VOLTAGE PROBLEM OF BANGLADESH POWER SYSTEM AND THEIR EFFECT ON STABILITY

A thesis submitted in partial fulfillment of the requirement for the degree of Bachelor in Electrical, Electronic and Communication Engineering

by

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CERTIFICATION OF APPROVAL

The thesis titled "Comparison of different techniques for mitigation of under voltage problem of Bangladesh power system and their effect on stability" submitted by Manobendro Sarker Utsha (201416014), Shadman Shakib Nabil (201416029) and Md. Mahmudur Rahman (201416031), has been accepted as satisfactory in partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN ELECTRICAL, ELECTRONIC AND COMMUNICATION ENGINEERING on 23rd December, 2017.

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DECLARATION

We hereby declare that this thesis is our original work and it has been written by us in its entity. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

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ABSTRACT

Power quality has become a major concern because of increasing number of loads being connected to the power system. Abnormal conditions in a power system create fluctuations to electrical quantities such as voltage, frequency and current. An important factor in the normal and healthy operation of the power system is to maintain security in power generation, transmission and distribution. System security can be assessed by solving under-voltage problem. In this thesis power flow analysis of Bangladesh Power System is performed by PSAF (Power System Analysis Framework) and three different solution method of under-voltage problem is shown along with cost calculation for each of the methods. Afterward, transient stability analysis is done for each of the methods considering four different abnormal events taking one at a time. A comparative conclusion is shown on the basis of cost effectiveness and stability for the adopted solution methods.

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List of Abbreviations

BPS	Bangladesh Power System
PFS	Power Flow System
PFA	Power Flow Analysis
DC	Direct Current
AC	Alternating Current
IEEE	Institute of Electrical and Electronic Engineers
RMS	Root Means Square
KV	Kilo Volt
MVA	Mega Volt Ampere
HVDC	High Voltage Direct Current
SCB	Shunt Capacitor Bank
VAR	Volt-Ampere Reactive
VCB	Vacuum Circuit Breaker
G-S	Gauss-Seidel
N-R	Newton Raphson
EPS	Electrical Power System

List of Symbols

V	Voltage
I	Current
Z	Impedance
Y_{BUS}	Bus Admittance
Z_{BUS}	Bus Impedance
C	Capacitance
X_c	Capacitive Reactance
P	Real Power
Q	Reactive Power
S	Apparent Power
δ	Angle
$\|V\|$	Magnitude of Voltage

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CHAPTER 1

INTRODUCTION

1.1 Power Flow Study

Power flow analysis is the most important and essential approach to investigating problems in power system operating and planning. Based on a specified generating state and transmission network structure, power flow analysis solves the steady operation state with node voltage and branch power flow in the power system. Power flow analysis can provide a balanced steady operation state of the power system without considering system transient process [1].

The power flow calculations provide power flows and voltages for a specified power system subject to the regulating capability of generators, condensers, and tap changing under load transformers as well as specified net interchange between individual operating systems. This information is essential for the continuous evaluation of the current performance of a power system and for analyzing the effectiveness of alternative plans for system expansion to meet increased load demand [2].

Power flow studies are of great importance in planning and designing the future expansion of power systems as well as in determining the best operation of existing system. The principal information obtained from a power flow study is the magnitude and phase angle of the voltage at each bus and the real and reactive power flowing in each line. Unlike in traditional circuit analysis, where voltages and currents through branches of direct current (DC) circuits, the power study uses simplified notation such as the one line diagram, per unit representation and focuses on various forms of AC power (Real and Reactive), rather than voltage. It is normally assumed that the system is balanced and the common use of the term implies a positive sequence solution only [3].

1.2 Necessity of Power Flow Study and Analysis

- Bus voltage and system voltage profile.
- Effect of change in configuration and incorporating new circuits on system loading.
- Effect of temporary loss of transmission capacity and (or) generation on the system loading and accompanied effects.
- Effect of in phase and quadrated boost voltages on system loading.
- Economic system operation.
- System loss minimization.
- Transformer tap setting for economic operation.
- Possible improvements to an existing system by change of the conductor sizes and system voltages.
- Transmission, distribution expansion planning and operation planning.
- Network and grid interconnection studies.
- Evaluation of energy transaction.
- Energy audits to accuracy.
- System security assessment via static contingency studies.
- Decision making tool in operation planning.
- Motor starting studies using load flow type analysis.
- Evaluation of the static voltage.
- Optimizing components and circuit loading.
- Developing practical bus voltage profiles [4].

The following general criteria of acceptability if designs are used in power flow studies:

- Voltage drop at all buses should be within +/- 5% of the normal rating for all operating conditions considered.
- No overload conditions of any electrical circuit for all operating conditions considered.
- Ensuring quality power supply to all loads, under specific contingency conditions, as per design philosophy adopted [9].

1.3 Under Voltage Problem Solution

Under-voltage is described by IEEE 1159 as the decrease in the AC voltage (RMS), typically to 80%-90% of nominal, at the power frequency for a period of time greater than 1 minute. Under-voltage generally results from low distribution voltage because of heavy loaded circuits that lead to considerable voltage drop, switching on a large load or group of loads, or a capacitor bank switching off [5].

Synopsis:

Magnitude: 0.8 to 0.9 pu (typical)

Duration: More than 1 minute

Source: Utility or facility

Occurrence: Medium to high

Symptoms: Malfunction or premature equipment failure and overheating of motors [6].

Effects of under-voltage:

- Voltage fluctuation in households and industries.
- Memory loss or data errors
- Premature shutdown of circuit.
- Overheating specially for motors.
- Batteries fail to recharge properly
- Miss operation or sometimes-full operation stoppage.
- Dim or bright lights
- Shrinking display screens [7] [8].

1.4 Graphical Representation of Under-voltage

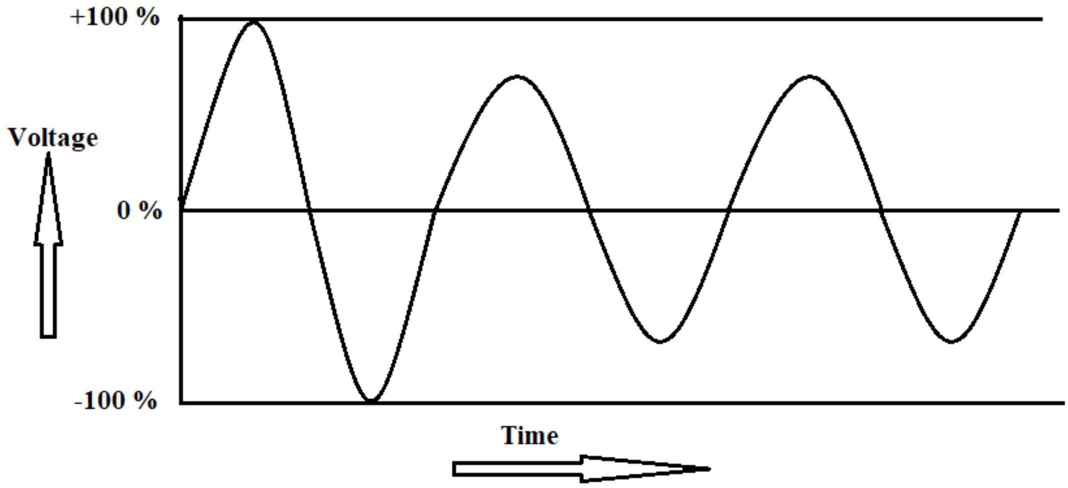

Fig 1.1: Graphical representation of under-voltage problem

- From the figure, Nominal voltage is seen in the first cycle.
- After first cycle the voltage is suddenly decreased from the nominal or rated voltage and continued to more than 1 minute.
- Under-voltages are the result of long term problems that create sags.

1.5 Power System Stability

Successful operation of a power system depends largely on the ability to provide reliable and uninterrupted service to the loads. Ideally, the loads must be fed at constant voltage and frequency at all times. In practical terms, this means that both voltage and frequency must be held within close tolerances so that the consumer's equipment may operate satisfactory. The stability problem is concerned with the behavior of the synchronous machines after they have been perturbed. If the perturbation does not involve any net change in power, the machines should return to their original state [10].

If any unbalance between the supply and demand is created by a change in load, in generation, or in network conditions, a new operating state is necessary. In any case, all interconnected synchronous machines should remain in synchronism if the system is stable, i.e., they should all remain operating in parallel and at the same speed. If the oscillatory response of a power system during the transient period following a disturbance is damped and the system settles in a finite time to a new operating condition, we say the system is stable. If the system is not stable, it is considered unstable [10].

Power system stability is the ability of an electric power system for a given initial operating condition, to regain a state of operating equilibrium after being subjected to a physical disturbance, with most system variables bounded so that practically the system remains intact [11].

1.6 Objectives of the Thesis

This thesis aims at developing the most economic and stable solution of under-voltage problem of Bangladesh power system and their effect on stability. Our purpose is to make a comparative study of different methods for solving the under-voltage problem of complicated power system of Bangladesh. The specific objectives of the thesis are as follows:

- To study the load flow analysis of Bangladesh power system.
- To find the under-voltage problem, Newton Raphson Method of load flow analysis is chosen in PSAF.
- To solve this problem in three different methods namely by adding (i) shunt capacitor, (ii) parallel transmission lines and (iii) generators.
- To compare the cost of the three different methods.
- To find their relative effect on stability for a fixed transient event.

CHAPTER 2

POWER FLOW STUDY

2.1 What is Power Flow Study?

Power flow study is probably the most important of all network calculations since it concerns the network performance in its abnormal operating conditions. It is performed to investigate the magnitude and phase angle of the voltage at each bus and the real and reactive power flows in the system components [3].

The goal of power flow study is to obtain complete voltage angle and magnitude information for each bus in a power system for special load and generator real power and voltage conditions. Once this information is known, real and reactive power flow on each branch as well as generator reactive power input can be analytically determined. Due to the nonlinear nature of this problem, numerical methods are employed to obtain a solution that is within an acceptable tolerance [3].

The great importance of power flow or load flow studies is in the planning the future expansion of power systems as well as in determining the best operation of existing systems. The principal information obtained from the power flow is the magnitude and phase angle of the voltage at each bus and the real and reactive power at each line [3].

2.2 Necessity of Power Flow Study

Power flow study is required when

- There is a significant plant expansion.
- New local generation is (or is proposed to be) added.
- New utility feed has been installed.
- New large motors have been added to the system.
- New transformers have been installed.
- Addition of significant loads [3].

2.3 Data Needed for Power Flow Study

- One-line diagram.
- Either Y_{BUS} or Z_{BUS} (Value of series impedance and shunt admittance of transmission line are necessary to form Z_{BUS}).
- Power input from generator and from interconnection.
- Power angle.

2.4 Bus Classification

Each bus in the system has 4 variables: voltage magnitude (V), voltage angle (δ), real power (P), reactive power (Q). During the operation of power system, each bus has two known variables and two unknown variables. Generally, the bus can be classified as one of the following bus types:

1. Load Bus (P-Q Bus): A bus at which the real and reactive power are specified, and for which the bus voltage will be calculated. All buses having no generators are load buses. In here, V and δ are unknown.
2. Generator Bus (P-V Bus): A bus at which the magnitude of the voltage is defined and is kept constant by adjusting the field current of a synchronous generator. We also assign real power generation for each generator according to the economic dispatch. In here, Q and δ are unknown.
3. Slack Bus (Swing Bus): A special generator bus serving as the reference bus. Its voltage is assumed to be fixed in both magnitude and phase (for instance $1\angle 0°$ pu). In here, P and Q are unknown [3].

2.5 Variables for Power Flow

At each bus two of four quantities P, Q, |V|, δ are specified and the remaining two are calculated.

Table 2.1 Variables for power flow

Bus Type	Known Variables	Unknown Variables
Load Bus/PQ Bus	P & Q	V & δ
Voltage Bus/PV Bus	P & V	Q & δ
Swing/Reference Bus	V & δ	P & Q

2.6 Techniques of Solution

Because of the nonlinearity and difficulty involved in the analytical expressions for the power flow study, numerical iterative techniques must be used such as:

- Gauss-Seidel method (G-S)
- Newton-Raphson method (N-R)

The first method (G-S) is simpler but the second (N-R) is reported to have better convergence characteristics and is faster than (G-S) method.

2.7 Newton-Raphson Method

2.7.1 Definition

In numerical analysis, Newton's method (also known as Newton-Raphson method) named after Isaac Newton and Joseph Raphson, is perhaps the best known method for finding successively better approximations to the zeroes (or roots) of a real valued function. The Newton-Raphson (N-R) method is widely used for solving nonlinear set of equations. It transforms the original nonlinear problem into a sequence of linear problems whose solutions approach the solution of the original problem. This method begins with initial gausses of all unknown variables (voltage magnitude and angles at load buses and voltage angle at generator buses). Next, a Taylor series is written, with the higher order terms ignored, for each of the power balance equations included in the system equations.

Taylor's series of expansion is used

$y = b_0 + b_1 X + b_2X^2 + b_3X^3 + b_4X^4$

$y = f(x)$

Let, solution of X is,

$x = x^0 + \Delta x$

$\Delta x = x - x^0$

According to Taylor's series

$$y = f(x) = f(x^0) + \frac{\Delta x}{1!} f'(x) + \frac{\Delta x^2}{2!} f''(x) + \cdots\cdots + \frac{\Delta x^n}{n!} f^n(x)$$

Where $f'(x) = \frac{df(x)}{dx}$

If $\Delta x << 1$

$y = f(x) \approx f(x^0) + \frac{\Delta x}{1!} f'(x)$

or, $y - f(x^0) = f'(x)\, \Delta x$

$[k] = [J]\, \Delta x$

$\Delta x = [J]^{-1}\, [k]$

If $\Delta x = \varepsilon$

Then $x^0 = x^0 + \Delta x$

Otherwise continue iteration assuming

$x^{i+1} = x^i + \Delta x$ (That is new value of x = previous value + difference)

$S_i^* = P_i - j\, Q_i = V^*\, I$

$I = \sum_{k=1}^{N} Y_{ik}\, V_k$

$S^* = P_i - j\, Q_i = \sum_{k=1}^{N} V_i^*\, Y_{ik}\, V_k$

$V_i = |V|\, e^{jS(i)} = D_i + jF_i$

$Y_{ik} = |Y_{ik}|\, e^{-jQ(ik)} = G_{ik} - j\, B_{ik}$

$\therefore S = P_i - j\, Q_i = (D_i - j\, F_i)\, (G_{ik} - j\, B_{ik})\, (D_i + j\, F_i)$

Equating real and imaginary terms,

$P_k = \sum_{m=1}^{N} (D_k\, G_{km}\, D_m + D_k\, B_{km}\, F_m - F_k\, B_{km}\, D_m + F_k\, G_{km}\, F_m)$

$Q = \sum_{m=1}^{N} (D_k\, B_{km}\, D_m + D_k\, G_{km}\, F_m - F_k\, G_{km}\, D_m + F_k\, B_{km}\, F_m)$

$P = f\,(D, F)$

$Q = f\,(D, F)$

2.7.2 Information regarding variables

Known:

$V_1 = V_1\angle 0$ for swing bus

V_k, P_k $k = 2\ldots\ldots G$ (Gen. Bus)

P_k, Q_k $k = G + 1\ldots\ldots\ldots N$ (Local Bus)

Unknown:

P_1, Q_1

Q_k, S_k $k = 2\ldots\ldots G$

V_k, S_k $k = G + \ldots\ldots N$

2.7.3 Procedure

1. Form Y_{BUS} p.u
2. Assume initial values:

   $D_k^0 = V_{ks}$ $F_k{}^0 = 0$ $k = 2,3, \ldots\ldots G$

   $D_k^0 = 1$ $F_k^0 = 0$ $k = G + 1\ldots\ldots N$

3. Calculate P_k^i, Q_k^i
4. Calculate

   $\Delta P_k^i = P_{ks} - P_k^i$ $k = 2, \ldots\ldots N$ (For both Generator and load buses)
   $\Delta Q_k^i = Q_{ks} - Q_k^i$ $k = G + 1, \ldots\ldots N$ (Only for Load buses)
   $\Delta V_k^{i\wedge 2} = V_{ks} - V_k^{i\wedge 2}$ $k = 2,3, \ldots\ldots G$ (Only for generator buses)

   Where P_{ks}, Q_{ks} and V_{ks} are scheduled (known) quantities and

   $V_k^{i\wedge 2} = (D_k^i)^2 + (F_k^i)^2$

   Set, $\Delta x_{max} = \text{Max } \{\Delta P^i_{kmax}, Q^i_{kmax}, \Delta V^{i\wedge 2}_{kmax}\}$

5. Calculate the bus currents using
   $I_k^i = \frac{P(k,i) - jQ\,(k,i)}{(V*)*} = A_k^i + j\,C_k^i$ $k = 2,3, \ldots\ldots N$

6. Calculate the Jacobian matrix.
7. Obtain by matrix inversion the correction

   ΔD_k^i, ΔF_k^i $k = 2,3, \ldots\ldots N$ (For all Generator and Load buses)

8. Calculate the new bus voltages
   a) At generator buses (Voltage controlled bus = PU bus)
      $D_k^{i+1} = V_{ks} \text{ Cos } \delta_k^{i''}$
      $F_k^{i+1} = V_{ks} \text{ Cos } \delta_k^{i''}$
      Where $k = 2, 3, \ldots\ldots G$
      And $\delta_k^i = \tan^{-1} F(k,i) / D(k,i)$

   b) At the remaining buses (load buses)
      $D_k^{i+1} = D_k^i + \Delta D_k^i$
      $F_k^{i+1} = F_k^i + \Delta F_k^i$ where $k = G + 1, G + 2, \ldots\ldots N$

9. Replace D_k^i and F_k^i by D_k^{i+1} and F_k^{i+1}, for $k = 2, 3, \ldots\ldots N$

10. This is the end of the current iteration, check $\Delta x_{max} \leq \varepsilon$

If all corrections are within the tolerance specified, then the solution has been reached. Otherwise, repeat steps 3-10 until the solution is reached.

11. Calculate

$P_i = \sum_{k=1}^{N} (V_i G_{ik} V_k \text{Cos}\, \delta_{ik} - V_i B_{ik} V_k \text{Sin}\, \delta_{ik})$

$Q_i = \sum_{k=1}^{N} (V_i B_{ik} V_k \text{Cos}\, \delta_{ik} - V_i G_{ik} V_k \text{Sin}\, \delta_{ik})$

Where $\delta_{ik} = \delta_i - \delta_k$ [12]

CHAPTER 3

UNDERVOLTAGE PROBLEM SOLUTION

3.1 What is Under Voltage Problem?

An electric transmission system must provide power transmission within voltage limits at safe and high-quality conditions. By industrial development, demand of electrical energy has become harder to provide acceptable voltage profile in power system. Therefore, voltage stability and voltage collapse studies have become increasingly important [12].

Voltage collapses usually occur on power system which are heavily loaded or faulted or have shortage of reactive power. Voltage collapse is a system instability involving many power system components. In fact, a voltage collapse may involve an entire power system [13]. Main reason of voltage instability is an insufficient injection of reactive power to the system. Consequently, sufficient amount of reactive power reserve must be placed at suitable points. The load flow analysis involves the calculation of load flows and voltage of network for specified terminal and bus conditions [12].

3.2 Methods of Under-voltage Problem Solution

3.2.1 Shunt capacitor method

Shunt capacitor banks (SCB) are mainly installed to provide capacitive reactive compensation power factor correction. The use of SCBs has increased because they are relatively inexpensive, easy and quick to install and can be deployed virtually anywhere in the network. Its installation has other beneficial effects on the system such as: improvement of the voltage at the load, better voltage regulation (if they were adequately designed), reduction of losses and reduction or postponement of investments in transmission [12]. Shunt compensating is applied to electric power transmission system to confirm transmission effectively [14].

In order to solve the faulty conditions found in our network, we use a technique called "Shunt Capacitance Technique". Using capacitor banks in a system ideally performs the following functions:

- It helps produce a substantially flat voltage profile at all levels of power transmission.
- It improves stability by increasing the maximum transmissible power.
- It provides an economical means for meeting the reactive power requirements of transmission.
- It improves power factor of the source current.
- It reduces line current of the system.
- It reduces the system losses.

It is well known that shunt capacitance is both socially and economically beneficial to power system network. These devices reduce the apparent power (S) which is produced by generators allowing more customers to be served and increasing the income of electrical companies.

To solve the abnormal conditions in our network, we used Single Bus Technique. In this technique the computer program places a capacitor on each bus of the system separately. The capacitance is then increased until the highest compensation of reactive power on that bus is achieved, provided that the generators are not converted to capacitive power generation [14].

Implementing shunt capacitance technique:

To maintain least possible losses, our required per unit voltage solution for a certain bus ranges from 0.9 to 1.1. When any bus doesn't meet these criteria, the bus is beyond our expected voltage limit. To get the voltage within the range, we include capacitor as a shunt to the specific bus using shunt capacitance technique.

In our case, we have collected the apparent power (Q) and voltage rating (KV) from the database for those under loaded buses. Then we did the following calculations:

We know, $Q = V^2/X_c$
Therefore, $X_c = V^2/Q$
We also know that, $C = 1/ (2\pi f X_c)$
This way, we get the exact value of the shunt capacitor needed for a specific bus [14].

3.2.2 Parallel line method

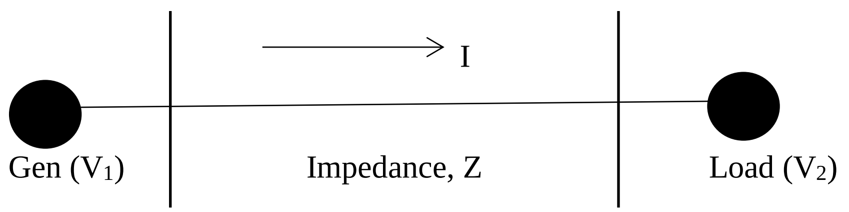

Fig 3.1: Single line diagram for parallel line method with a generator (V_1) and a load (V_2)

Here, considering a single line diagram with a generator and a load and a transmission line having impedance Z. The sending end voltage is V_1 and receiving end voltage V_2.

$V_2 = V_1 - IZ$ **… … …** (1)

Now, in case of parallel line, the receiving end voltage V_3.

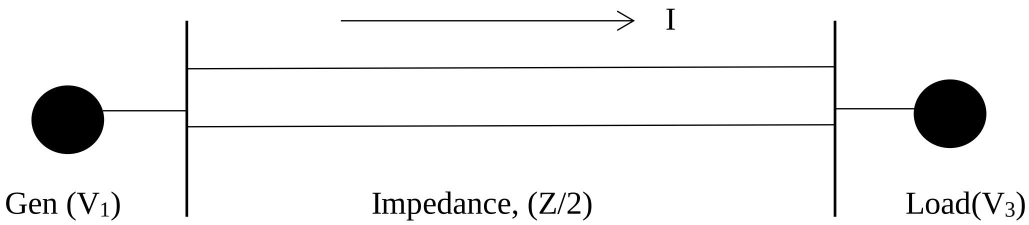

Fig 3.2: Single line diagram for parallel line method with a generator (V_1) and a load (V_3)

$V_3 = V_1 – I (Z/2)$ **… … …** (2)

So, comparing between two equations we get,

$V_3 > V_2$

3.2.3 VAR injection method

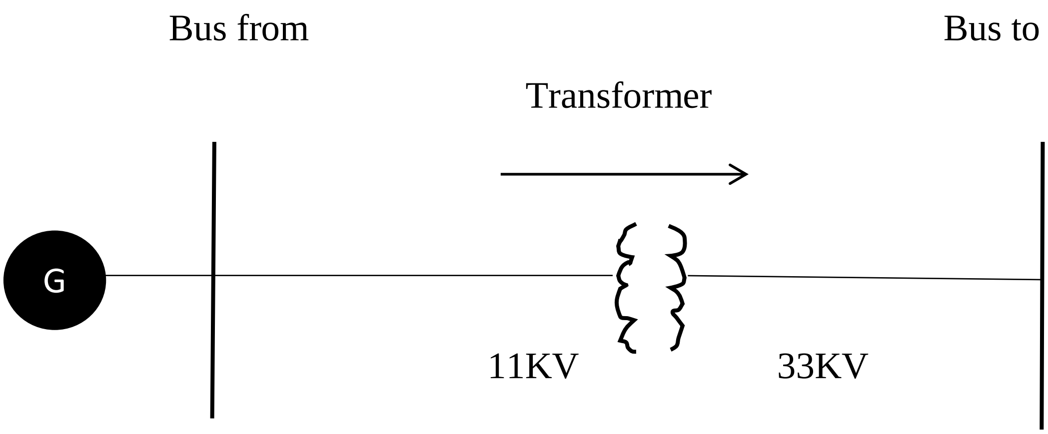

Fig 3.3: Single line diagram for VAR injection method

VAR Injection Method is a simply described method but it is considered as a very effective one. The whole arrangement is shown above. For simulation, a virtual bus is created and a generator is connected to that bus having a rating 11KV, 6.25 MVA and 5 MW. The destination bus is 33 KV which has voltage under 0.9 pu. So, we have to introduce a step-up transformer of 10 MVA with turn ratio 3:1 along with two VCB at both sides [12].

CHAPTER 4

POWER SYSTEM STABILITY

4.1 Power System Stability

According to Kimbark, "Power system stability is term applied to alternating current electric power systems, denoting a condition in which the various synchronous machines of the system remain in synchronism or 'in step' with each other. Conversely, instability denotes a condition involving loss of synchronism of falling 'out of step' [15].

Therefore, the system is said to remain stable when the forces tending to hold the machines in synchronism with one another are enough to overcome the disturbances. The system stability that is of most concern is the characteristic and the behavior of the power system after a disturbance [16].

4.2 Classification of Power System

The classification of power system stability is essential for the better understanding of EPS stability analysis. The classification of stability is based on the nature of resulting system instability (voltage instability, frequency instability and rotor angle instability), the size of the disturbance (small disturbance, large disturbance) and time frame instability (short term, long term) [17]. In other terms, stability broadly maybe classified as steady state stability, dynamic and transient stability [18].

4.2.1 Steady state stability

It is the ability of the power system to maintain transfer of power without loss of synchronism as the amount of power transferred is changed gradually. The change in power level must occur slowly enough so that regulating devices are able to respond. It is also assumed that inertia is negligible [19].

4.2.2 Transient stability

It is the ability of power system to maintain stability in the event of a sudden large change in load occasioned by system switching or by faults. Usually the regulating devices are not fast enough to respond during this transient period and nonlinear modes of system operation may be encountered. In this case system is likely to lose stability unless an effective counter measure is taken, e.g. dynamic resistance braking or fast valving /load shedding [20].

4.2.3 Dynamic stability

It is the ability of the power system to maintain stability for relatively small disturbance and to prevent oscillations. Dynamic instability generally occurs due to lack of damping torque. A typical example would be the low frequency oscillations that may occur in the large interconnected power systems [20].

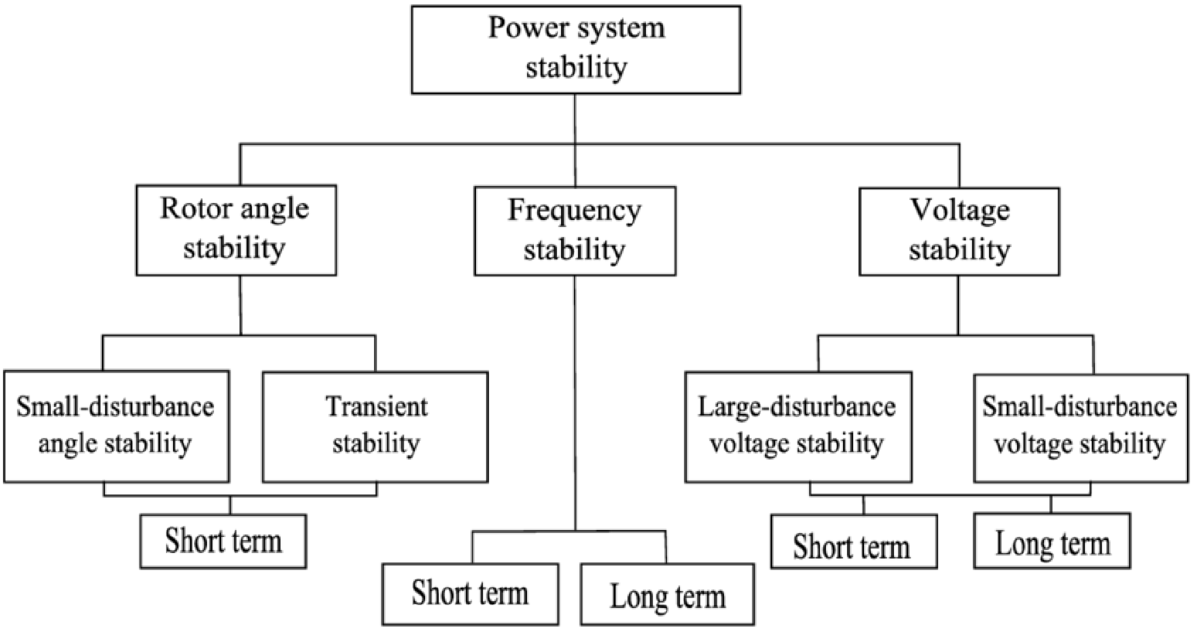

Fig 4.1: Classification of stability based on IEEE/CIGRE joint task force on stability [21].

4.3 Stability Studies

Transient stability studies are much more commonly undertaken thereby reflecting their greater importance in practice. Such problems involve large disturbances which do not allow the linearization process to be used and the nonlinear differential and algebraic equations must be solved. Transient stability problem can be subdivided into first swing and multi-swing stability problems. First swing stability study is based on a reasonably simple generator model without representation of the control systems. Usually the time period under consideration is one second under the system fault. Multi-swing stability problems extend over a longer period and therefore must consider effects of generator control systems which affect machine performance during that time period [20].

4.3.1 Rotor angle stability

Rotor angle stability refers to the ability of synchronous machines of an interconnected power system to remain in synchronism after being subjected to a disturbance. It depends on the ability to maintain/restore equilibrium between electromagnetic torque and mechanical torque of each synchronous machine in the system. Instability that may result occurs in the form of increasing angular swings of some generators leading to their loss of synchronism with other generators [22]. Basic phenomenon associated with angle stability are:

- Imbalance between accelerating and decelerating generator torque.
- Temporary surplus energy is stored in the rotating masses.
- Capture range of synchronizing torque is limited by pull-out torque or power.
- If the limits exceed, stability may be lost [10]

4.3.2 Voltage stability

Voltage stability refers to the ability of a power system to maintain steady voltages at all buses in the system after being subjected to a disturbance from a given initial operating condition. It depends on the ability to maintain/restore equilibrium between load demand and load supply from the power system. Instability that may result occurs in the form of progressive fall or rise of voltage of some buses. A possible outcome of voltage instability is loss of load in an area, or tripping of transmission lines and other elements by their protective systems leading to cascading outages. Basic phenomenon associated with voltage stability is:

- High (reactive) loading reduces the voltage in an area.
- Temporary load reduction.
- Transfer capacity to the area is reduced.
- Load demand recovers.
- Voltage is further reduced.
- If there is no solution to load flow, the voltage collapses [10].

4.3.3 Frequency stability

Frequency stability refers to the ability to a power system to maintain steady frequency following a severe system upset resulting in significant imbalance between generation and load. It depends on the ability to maintain/restore equilibrium between system generation and load, with minimum unintentional loss of load. Instability that may result occurs in the form of sustained frequency swings leading to tripping of generating units and/or loads [10].

Severe system upsets generally result in large excursions of frequency, power flows, voltage and other system variables, thereby invoking the actions of process, controls and protections that are not modeled in transient stability or voltage stability studies. Generally, frequency stability problems are associated with inadequacies in equipment response, poor coordination of control and protection equipment or insufficient generation reserve [10].

4.4 Necessity of Stability Study

The variables of power system change continually and the power industries are structured to cater to more uses at lower prices with better efficiency. The demand of electricity is increasing regularly with the increase of users and power systems are becoming more complex as they are inter-connected. Since stability phenomena limit the transfer capability of the system, there is a need to ensure stability and reliability of the power system due to economic reasons [4].

The performance of a power system is affected when any type of disturbances occurs in the system which result insufficient power to the users or loss of power. In order to compensate for the fault and to resume normal operation, corrective measures must be taken to bring the system back to its stable operating conditions [4].

4.5 Factors Affecting Power System Stability

The power system is a highly nonlinear system that operates in a constantly changing environment; loads, generators, outputs, topology, and key operating parameters change continually [23]. Stability of a nonlinear system depends on the type and magnitude of inputs, and the initial states. Behaviors and characteristics of system equipment, system control and protection schemes etc. are the factors those affect the stability of an electric power system. The following discussions summarized the most important factors:

- Synchronous machine parameters such as the inertia constant H (stored kinetic energy at rated speed per rated power) and the generator terminal voltage affect the system stability. The increase of generators inertia constant tends to reduce the swings of rotor angle and hence improve system stability [4].

- The stability is influenced by the dynamics of generator rotor angles and power-angle relationships. Instability may also be encountered without the loss of synchronism. In this instance, it is the stability and control of voltage that is the issue, rather than the maintenance of synchronism. This type of instability can also occur in the case of loads covering an extensive area in a large system [4].

- System stability is affected by a significant load/generation mismatch, generator and prime mover controls become important, as well as system controls and special protections. If not properly coordinated, it is possible for the system frequency to become unstable, and generating units and/or loads may ultimately be tripped possibly leading to a system blackout. This is another case where units may remain in synchronism (until tripped by such protections as under-frequency) but the system becomes unstable [4].

- The duration, location and type of the fault determine the amount of kinetic energy will be gained. Longer fault duration allows generator rotors to gain more kinetic energy during the fault. At certain limit, the gained energy may not be dissipated after the fault clearance. This gained energy may lead to instability [4].

- Pre-and-post-disturbance system state such as the generators loading before the fault and the generator outputs during the fault. The higher the loading before the fault is the more likely to be less stable during faults [4].

- Transmission reliability margin greatly affect the system stability where a transmission outage may take place due to overloading during system abnormal conditions, which may lead to uncontrolled loss of a sequence of additional network elements [4].

- Excitation system and governor characteristics of synchronous machines have important role in damping of power oscillations. The automatic voltage regulator (AVR) senses the terminal voltage and helps to control it by acting within the excitation system. Fast valving for rapidly opening and closing steam valves of the turbine used to control the generators accelerating power during faults [4].

- System relaying and protection have a great importance in system stability. The power system has a finite capacity to absorb such energy and as majority of fault are transient in nature, rapid switching and isolation of unhealthy lines followed by rapid reclosing improves the stability margins. Special protection schemes can be used to split the grid at predetermined points in the network to quickly avoid cascading actions [4].

CHAPTER 5

SIMULATION RESULTS

5.1 Data Collection

One of the primary objectives of our thesis is to analyze the eventuality of the power system network (2016) of Bangladesh. To do that we need to get the complete database first. So, we collected detailed database from the Power Generation Company Bangladesh (PGCB). The following major components are found from the database:

- Bus: 533
- Fixed Tap Transformer: 350
- Generator: 158
- Transmission Line: 341
- Shunt Capacitor: 120
- Static Load: 204

5.2 Computer Program Selection

In this thesis for numerical evaluation computer programs are developed in PSAF (Power System Application Framework). It is a software package that offers both graphical and tabular data entry modes, single-line diagram drawing options and many other sophisticated facilities for reporting, plotting and customizing the simulation reports. It is developed by CYME International TD Inc. We have found the software user friendly for analyzing the contingency of Bangladesh power system using the data we have collected. We have used the PSAF version 2.81 (Revision 2.8) for our thesis purpose.

5.3 Network Construction

After collecting the database and selecting the suitable software, we constructed the whole simulated network of Bangladesh power system in PSAF. We have given some screenshots of the simulated network in Appendix ‘A’ and the data and summary of power flow analysis of Bangladesh power system in Appendix ‘B’

5.4 Exploring the Abnormal Conditions

There are total 533 buses in Bangladesh power system. It is divided into 9 zones. Power flow analysis is applied in PSAF using Newton-Raphson method without any compensator at first and 65 buses are found those have voltage under 0.9 p.u.

Table 5.1: Under voltage data

Sl. No	Bus Id	Extra Id	Rated Voltage (KV)	Zone	Voltage Before Compensation (P.U.)
1	3L06_2	Comilla South	33	3	0.872
2	1L19_2	Kabirpur	33	1	0.882
3	1L19_1	Kabirpur	33	1	0.872
4	1L29_1	Mirpur	33	1	0.897
5	3L06_1	Comilla South	33	3	0.873
6	1L38	Sitalakhya	33	1	0.894
7	1L39	Shyampur	33	1	0.854
8	1L27	Manikganj	33	1	0.879
9	1L32	Narinda	33	1	0.862
10	1L36	Satmasjid	33	1	0.861
11	1L41	Ullyan	33	1	0.873
12	1L42	Uttara	33	1	0.869
13	1L43	Gulshan	33	1	0.870
14	1L17	Dhanmondi	33	1	0.890
15	1L20	Kallyanpur	33	1	0.856

Sl. No	Bus Id	Extra Id	Rated Voltage (KV)	Zone	Voltage Before Compensation (P.U.)
16	1L26	Madartek	33	1	0.871
17	1L28	Matuail	33	1	0.858
18	1L30	Moghbazar	33	1	0.853
19	1L31	Munshiganj	33	1	0.869
20	1L23	Kodda PP	33	1	0.885
21	1L21	Kamrangirchar	33	1	0.895
22	1L24	Lalbagh	33	1	0.871
23	1L15	Bhasantek (Cant)	33	1	0.899
24	1L14	Basundhara	33	1	0.900
25	1L13	Bangabhaban	11	1	0.861
26	1L08	Hasnabad	33	1	0.887
27	2201	AKSPL	230	2	0.897
28	2L02	BSRM	33	2	0.856
29	2L12	KSRM	33	2	0.883
30	2L14	Khagrachari	33	2	0.882
31	2L22	KYCR	33	2	0.882
32	2L07	Chandraghona	33	2	0.882

Sl. No	Bus Id	Extra Id	Rated Voltage (KV)	Zone	Voltage Before Compensation (P.U.)
33	2L18	Rangamati	33	2	0.899
34	2L16	Madunaghat	33	2	0.882
35	2L03	Hathazari	33	2	0.870
36	2L15	Khulsi	33	2	0.880
37	3105	Chowmuhani	132	3	0.877
38	3L08	Feni	33	3	0.893
39	3L04	Chandpur	33	3	0.861
40	3L07	Daudkandi SS	33	3	0.879
41	3L02	Comilla North	33	3	0.900
42	3L05	Choumuhoni	33	3	0.852
43	4107	Tangail	132	4	0.868
44	4G07	Doreen Tangail	11	4	0.872
45	4L07	Tangail	33	4	0.844
46	4L06	Sherpur	33	4	0.874
47	2L01_2	AKSPL	33	2	0.853
48	4L03	Mymensing	33	4	0.873
49	2L01_3	AKSPL (11KV LOAD BUS)	11	2	0.853

Sl. No	Bus Id	Extra Id	Rated Voltage (KV)	Zone	Voltage Before Compensation (P.U.)
50	6105	Chuadanga	132	6	0.900
51	6L16	Mongla	33	6	0.873
52	6L13	Khulna C	33	6	0.895
53	6L03	Bagerhat	33	6	0.868
54	6L05	Chuadanga	33	6	0.882
55	2L01_1	AKSPL	33	2	0.888
56	2L10_1	Halishahar	33	2	0.870
57	2L06_1	Baraulia	33	2	0.897
58	4L01_1	Jamalpur	33	4	0.896
59	4L02_1	Kisoreganj	33	4	0.899
60	8L04_1	Naogaon	33	8	0.896
61	6L11_1	Jessore	33	6	0.879
62	8L11	Joupurhat	33	8	0.892
63	8L13	Niyamatpur	33	8	0.890
64	9L03	Panchagarh	33	9	0.898
65	9L07	Thakurgaon	33	9	0.897

5.5 Eliminating the Abnormal Conditions

5.5.1 Shunt capacitor method

Table 5.2: Shunt capacitor method

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)	Capaci-tance (MVAR)
			Initial	Final			
1	3L06_2	Comilla South	12.5	13.9	0.872	0.980	13.9
2	1L19_2	Kabirpur	5	12.5	0.882	0.942	12.5
3	1L19_1	Kabirpur	12.5	15	0.872	0.929	15
4	1L29_1	Mirpur	10	15	0.897	0.935	15
5	3L06_1	Comilla South	12.5	13.9	0.873	0.920	13.9
6	1L39	Shyampur	10	20	0.854	0.910	20
7	1L32	Narinda	0	10	0.862	0.910	10
8	1L36	Satmasjid	0	10	0.861	0.909	10
9	1L41	Ullyan	0	10	0.873	0.909	10
10	1L42	Uttara	0	10	0.869	0.904	10
11	1L43	Gulshan	10	20	0.87	0.917	20
12	1L17	Dhanmondi	10	10	0.89	0.927	10
13	1L20	Kallyanpur	10	25	0.856	0.923	20
14	1L26	Madartek	0	10	0.871	0.927	10
15	1L28	Matuail	0	10	0.858	0.903	10
16	1L30	Moghbazar	10	20	0.853	0.922	20

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)	Capaci-tance (MVAR)
			Initial	Final			
17	1L31	Munshi-ganj	10	20	0.859	0.908	20
18	1L24	Lalbagh	10	13.9	0.871	0.923	13.9
19	1L15	Bhasantek (Cant)	10	10	0.899	0.926	10
20	1L14	Basundhara	10	10	0.90	0.928	10
21	1L13	Bangabhaban	12.5	25	0.861	0.900	25
22	1L08	Hasnabad	5	12.5	0.887	0.920	12.5
23	2L02	BSRM	0	25	0.856	0.916	25
24	2L12	KSRM	0	5	0.883	0.904	5
25	2L14	Khagrachari	0	5	0.882	0.908	5
26	2L22	KYCR	0	5	0.882	0.919	5
27	2L07	Chandra-ghona	0	5	0.882	0.914	5
28	2L16	Madunaghat	10	12.5	0.882	0.904	12.5
29	2L03	Hathazari	10	12.5	0.87	0.910	12.5
30	2L15	Khulsi	10	22	0.88	0.901	22
31	3L04	Chandpur	10	25	0.861	0.911	13.9
32	3L05	Choumuhoni	12.5	12.5	0.852	0.904	12.5

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)	Capaci-tance (MVAR)
			Initial	Final			
33	2L01_2	AKSPL	25	25	0.853	0.920	25
34	4L03	Mymen-singh	10	10	0.873	0.903	10
35	2L01_3	AKSPL (11KV LOAD BUS)	25	25	0.853	0.903	25
36	6L13	Khulna C	25	25	0.895	0.943	25
37	6L05	Chuadanga	10	13.9	0.882	0.929	13.9
38	2L10_1	Halishahar	0	25	0.87	0.900	25
39	4L01_1	Jamalpur	12.5	12.5	0.896	0.918	12.5
40	8L04_1	Naogaon	12.5	12.5	0.896	0.906	12.5
41	8L11	Joupurhat	10	12.5	0.892	0.916	12.5
42	8L13	Niyamatpur	12.5	12.5	0.89	0.902	12.5
43	9L03	Panchagarh	10	10	0.898	1.0	10
44	9L07	Thakurgaon	5	5	0.897	0.937	5

Table 5.3: Automatically solved buses

Sl. No	Bus Id	Extra Id	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
45	1L38	Sitalakhya	0.894	0.909
46	1L27	Manikganj	0.879	0.926
47	1L23	Kodda PP	0.885	0.916
48	1L21	Kamrangirchar	0.895	0.923
49	2201	AKSPL	0.897	0.933
50	2L18	Rangamati	0.899	0.915
51	3105	Chowmuhani	0.877	0.919
52	3L08	Feni	0.893	0.929
53	3L07	Daudkandi SS	0.879	0.901

Sl. No	Bus Id	Extra Id	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
54	3L02	Comilla North	0.900	0.931
55	4107	Tangail	0.868	0.915
56	4G07	Doreen Tangail	0.872	0.928
57	4L07	Tangaill	0.844	0.901
58	4L06	Sherpur	0.874	0.923
59	6105	Chuadanga	0.900	0.932
60	6L16	Mongla	0.873	0.904
61	6L03	Bagerhat	0.868	0.900
62	2L01_1	AKSPL	0.888	0.906
63	2L06_1	Baraulia	0.897	0.917
64	4L02_1	Kisoreganj	0.899	0.910
65	6L11_1	Jessore	0.879	0.909

5.5.2 Parallel line method

It is checked and decided from the simulation that under-voltage problem found in the 65 buses can't be solved by only using parallel line. In order to solve under-voltage problem, shunt capacitor is used in few some buses along with parallel line. We have taken maximum line duplicity 3

Table 5.4: Parallel line method

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)
		From	To				
1	1L14	1105	1116	6.99	3	0.899	0.901
2	3L02					0.899	0.901
3	1L29_1	2101	2106	4	3	0.897	0.900
4	1L15					0.899	0.915
5	1L21	1201 3202 1207_1	1202	125.5	3	0.895	0.926
6	2L18					0.899	0.915
7	3L08					0.893	0.933
8	6105					0.899	0.936
9	4L02_1					0.899	0.911
10	2201	2106	2112	4	3	0.897	0.934
11	8L11	8102	8104	44	2	0.892	0.920
12	8L13					0.890	0.921
13	8L04_1	7104 6109_1	6103	85	3	0.896	0.921

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)
		From	To				
14	2L06_1	2107	2116	27	3	0.897	0.918
15	3105	3104	3105	68	2	0.877	0.926
16	2L03	3202	2202	98.2	3	0.870	0.905
17	2L02					0.856	0.904
18	3L07	3102	3107_1	55	3	0.879	0.903
19	3L06_2	3102	3106	18	3	0.872	0.920
20	3L06_1					0.873	0.919
21	3L04	3106	3104	62	3	0.861	0.900
22	1L38	6109_1 6109_2	6113	3.9	2	0.894	0.920
23	1L39	1107	1109	62	3	0.854	0.950
24	1L20	1108 1120 1121	1124	31.6	3	0.856	0.912
25	4L03	4101	4106	20	3	0.873	0.902
26	4L01_1	6112	6105	39.3	3	0.896	0.915

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)
		From	To				
27	6L13	1119	1127	32	3	0.895	0.916
28	6L05					0.882	0.922
29	1L19_2	1119	4107	51	3	0.882	0.921
30	1L17					0.890	0.926
31	1L23					0.885	0.917
32	1L08					0.887	0.924
33	4107					0.868	0.930
34	4G07					0.872	1.00
35	2L10_1	2115	2105	15	3	0.870	0.915
36	2L15					0.880	0.906
37	2L01_1	2115	2106	15	2	0.888	0.918
38	2L16	2116	2121	8.5	3	0.882	0.905
39	1L27	1202	1208	24.5	3	0.879	0.918

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)
		From	To				
40	1L30	1110	1143	3.3	3	0.853	0.902
41	1L26					0.871	0.903
42	1L19_1	1110	2126	4.5	3	0.872	0.911
43	2L12	2118	2114	57	2	0.883	0.906
44	4L07					0.844	0.910
45	2L14	1111_1	1111_4	2.4	3	0.882	0.908
46	1L13	1111_1	1109	10	3	0.861	0.915
47	1L24	1111_1	1141	16	3	0.871	0.910
48	2L22	2120	2119	9	3	0.882	0.906
49	1L31	9104	9107	45	2	0.869	0.901
50	2L01_2					0.853	0.909
51	2L01_3					0.853	0.900
52	9L03					0.898	0.981
53	9L07					0.897	0.983

Table5.5: Additional capacitor to solve remain unsolved buses

Sl. No	Solved Buses	Shunt Capacitor Id	Capaci-tance (MVAR)	Duplicity	Voltage Before Compen-sation (P.U.)	Voltage After Compen-sation (P.U.)
54	1L28	newC1	10	2	0.858	0.913
55	1L42				0.869	0.917
56	1L43				0.870	0.908
57	3L05				0.852	0.905
58	1L32	newC2	10	2	0.862	0.921
59	1L36				0.861	0.906
60	1L41				0.873	0.907
61	2L07	newC3	5	1	0.882	0.913
62	4L06	newC4	10	1	0.874	0.912
63	6L03	newC5	5	1	0.868	0.915
64	6L11_1				0.879	0.907
65	6L16				0.873	0.919

5.5.3 VAR injection method

Table 5.6: VAR injection method

Sl. No	Generator Id	Solved Buses	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
1	1newG13	1L13	0.861	1
2	1newG19_1	1L19_1	0.872	0.924
3		1L19_2	0.882	0.923
4		1L27	0.879	0.928
5	1newG20	1L20	0.856	0.914
6	1newG23	1L23	0.885	0.922
7	1newG24	1L08	0.887	0.910
8		1L21	0.895	0.922
9		1L24	0.871	0.914
10		1L29_1	0.897	0.928
11	1newG28	1L28	0.858	0.912
12	1newG30	1L26	0.871	0.900
13		1L30	0.853	0.948
14		1L43	0.870	0.902
15	1newG31	1L31	0.869	0.905
16		1L38	0.894	0.910

Sl. No	Generator Id	Solved Buses	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
17	1newG32	1L32	0.862	0.912
18	1newG36	1L15	0.899	0.923
19		1L36	0.861	0.908
20	1newG39	1L39	0.854	0.907
21	1newG41	1L17	0.890	0.919
22		1L41	0.873	0.914
23	1newG42	1L14	0.900	0.929
24		1L42	0.869	0.903
25	2newG01	2L01_2	0.853	0.921
26	2newG01_3	2L01_3	0.853	0.925
27		2201	0.897	0.939
28	2newG02	2L02	0.856	0.920
29	2newG03	2L03	0.87	0.909

Sl. No	Generator Id	Solved Buses	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
30	2newG10_1	2L01_1	0.888	0.909
31		2L06_1	0.897	0.919
32		2L10_1	0.870	0.937
33		2L12	0.883	0.905
34		2L15	0.880	0.901
35		2L16	0.882	0.903
36		2L22	0.882	0.904
37	2newG14	2L07	0.882	0.901
38		2L14	0.882	0.936
39		2L18	0.899	0.922
40	3newG04	3L04	0.861	0.909
41	3newG05	3105	0.877	0.918
42		3L02	0.900	0.928
43		3L05	0.852	0.902
44		3L08	0.893	0.927

Sl. No	Generator Id	Solved Buses	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
45	3newG06_1	3L06_1	0.873	0.916
46	3newG06_2	3L06_2	0.872	0.948
47	3newG07	3L07	0.879	0.908
48	4newG03	4L03	0.873	0.904
49	4newG06	4L01_1	0.896	0.917
50		4L02_1	0.899	0.913
51		4L06	0.874	0.906
52	4newG07	4107	0.868	0.926
53		4G07	0.872	0.944
54		4L07	0.844	0.917
55	6newG03	6L03	0.868	0.915
56		6L13	0.895	0.905

Sl. No	Generator Id	Solved Buses	Voltage Before Compensation (P.U.)	Voltage After Compensation (P.U.)
57	6newG11_1	6105	0.900	0.917
58		6L05	0.882	0.902
59		6L11_1	0.879	0.907
60	6newG16	6L16	0.873	0.910
61	8newG13	8L04_1	0.896	0.906
62		8L11	0.892	0.903
63		8L13	0.890	0.912
64	9newG07	9L03	0.897	0.914
65		9L07	0.891	1

CHAPTER 6

STABILITY ANALYSIS

6.1 Transient Stability

Transient stability analysis is carried out for three different methods (Shunt capacitor, Parallel line and VAR injection) after solving under voltage problem found in 65 buses. For stability analysis, four different abnormal events (Generator removal, Line removal, Load addition, Load rejection) have been taken into consideration taking single event at a time. From the analysis it is clear that stability is not hampered after solving under-voltage problem by our estimated values used in solving under-voltage.

Table 6.1: Abnormal events

Removed generator	IG6_GT
Removed line	BSRM1_AKSPL, 230 KV
Added load	ULLON (1L41) P = 50 MW & Q = 30 MVAR
Rejected load	ULLON (1L41) P = 50 MW & Q = 30 MVAR

6.2 Shunt Capacitor Method

6.2.1 Generator removal (IG6_GT)

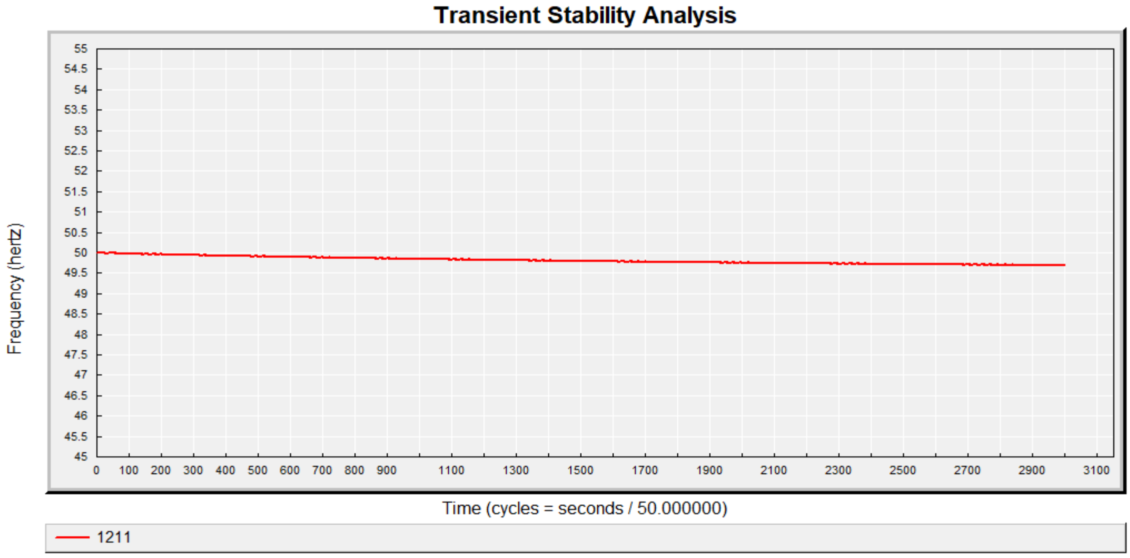

Fig 6.1: Transient stability analysis before adding shunt capacitor.

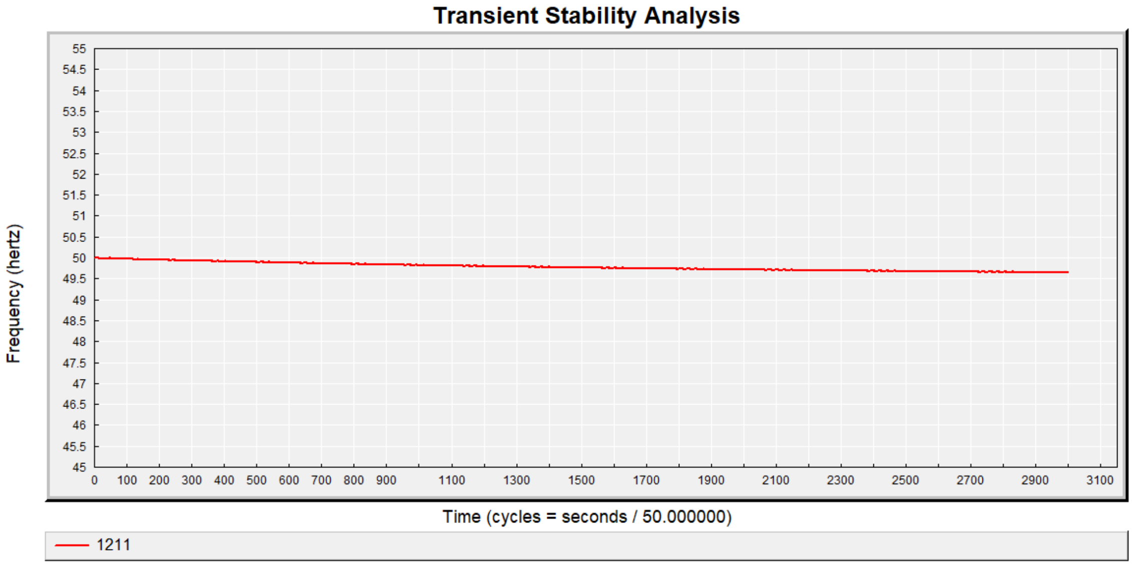

Fig 6.2: Transient stability analysis after adding shunt capacitor.

6.2.2 Line removal (BSRM1_AKSPL, 230KV)

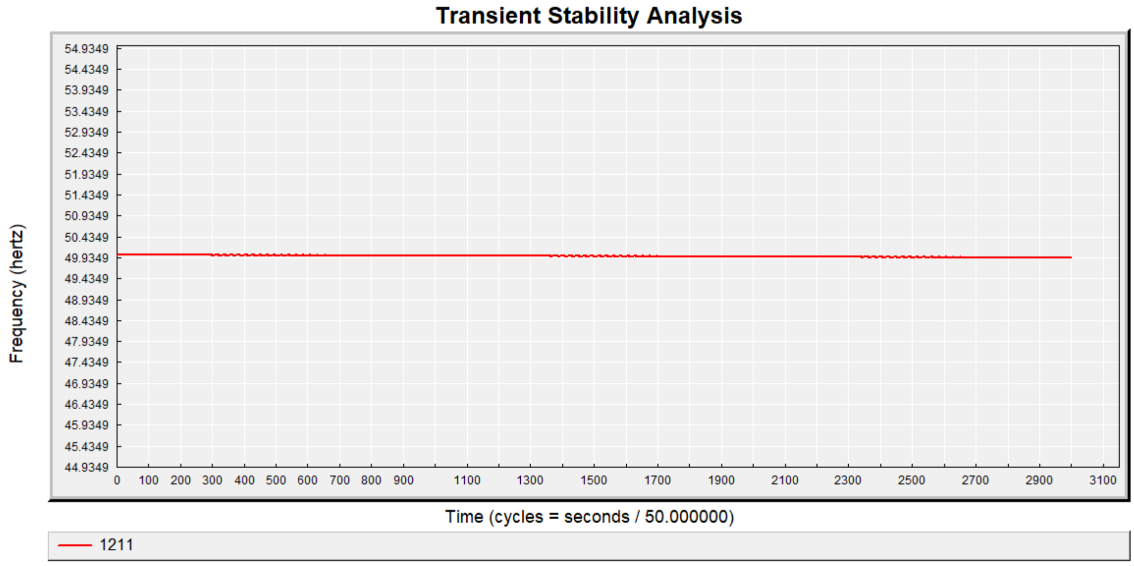

Fig 6.3: Transient stability analysis before adding shunt capacitor.

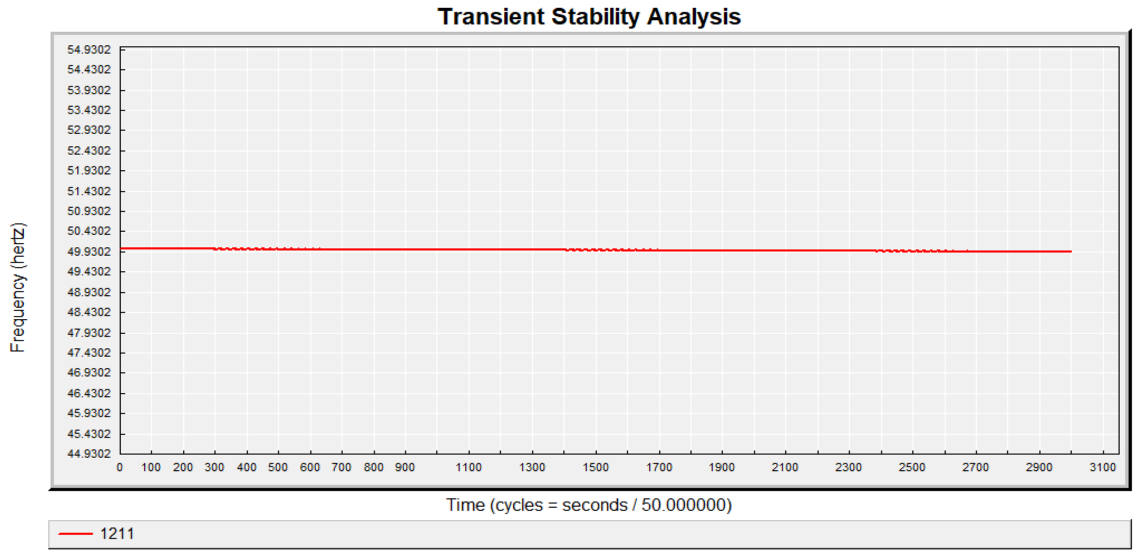

Fig 6.4: Transient stability analysis after adding shunt capacitor.

6.2.3 Load addition (ULLON, 1L41)

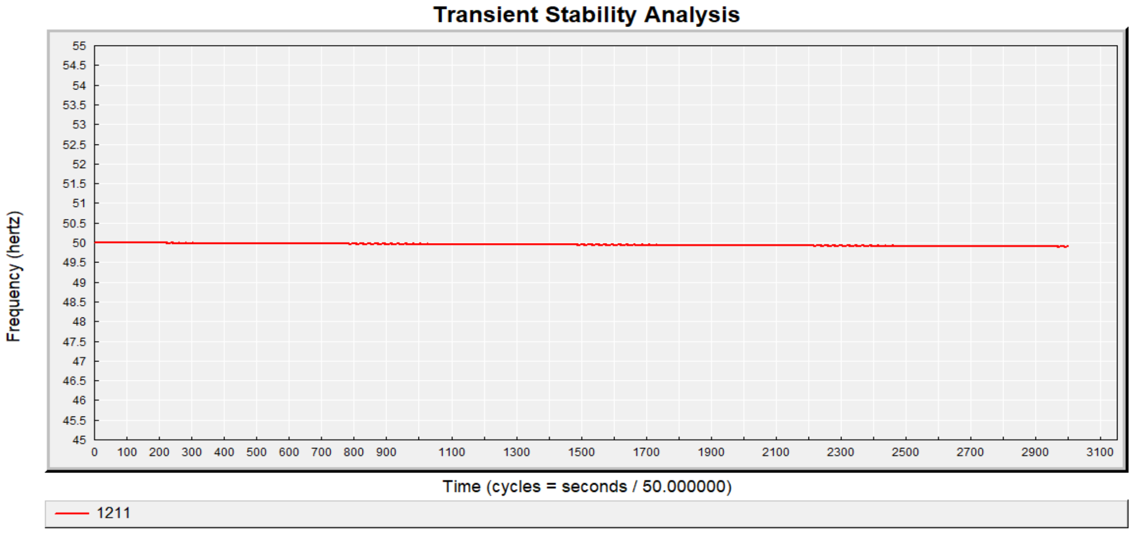

Fig 6.5: Transient stability analysis before adding shunt capacitor.

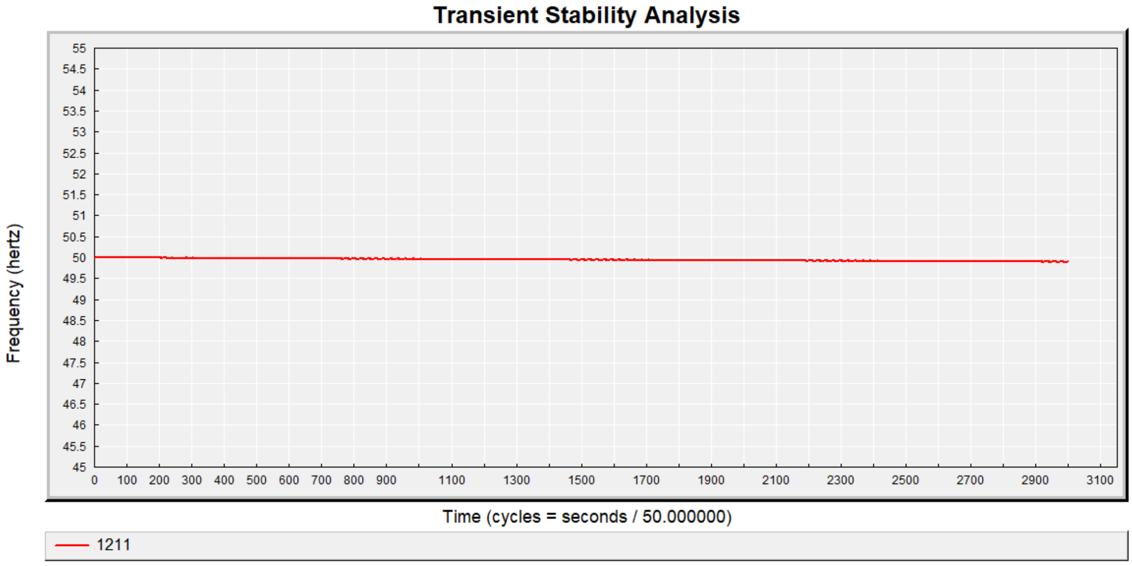

Fig 6.6: Transient stability analysis after adding shunt capacitor.

6.2.4 Load rejection (ULLON, 1L41)

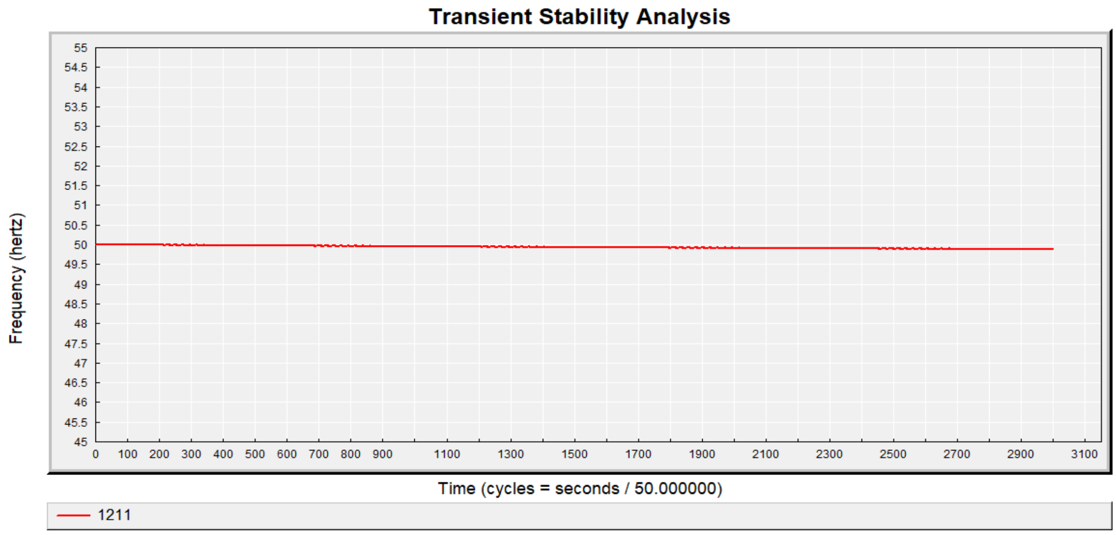

Fig 6.7: Transient stability analysis before adding shunt capacitor.

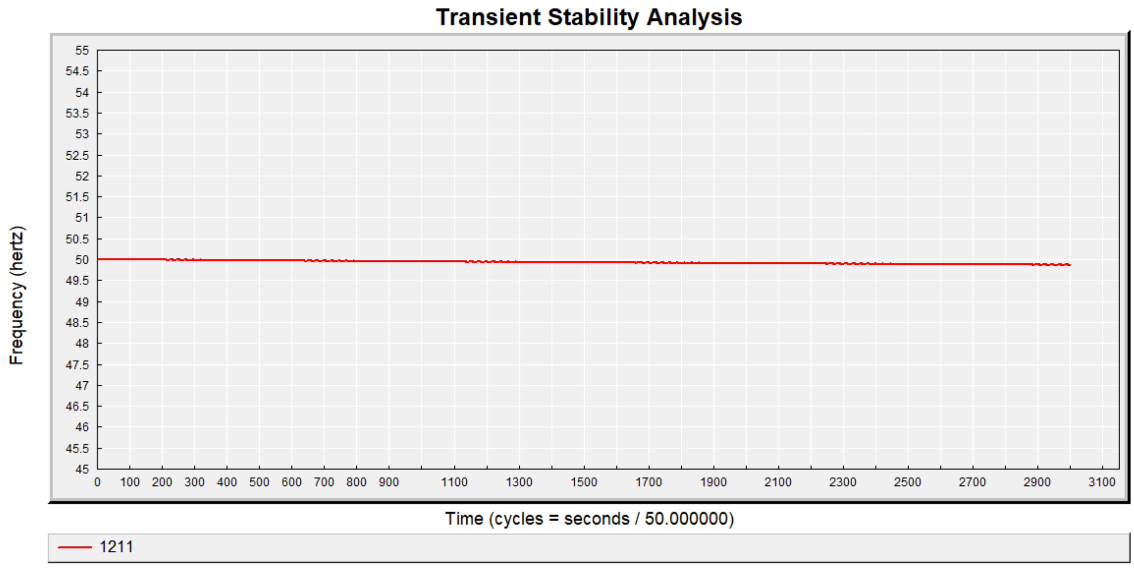

Fig 6.8: Transient stability analysis after adding shunt capacitor.

6.3 Parallel Line Method

6.3.1 Generator removal (IG6_GT)

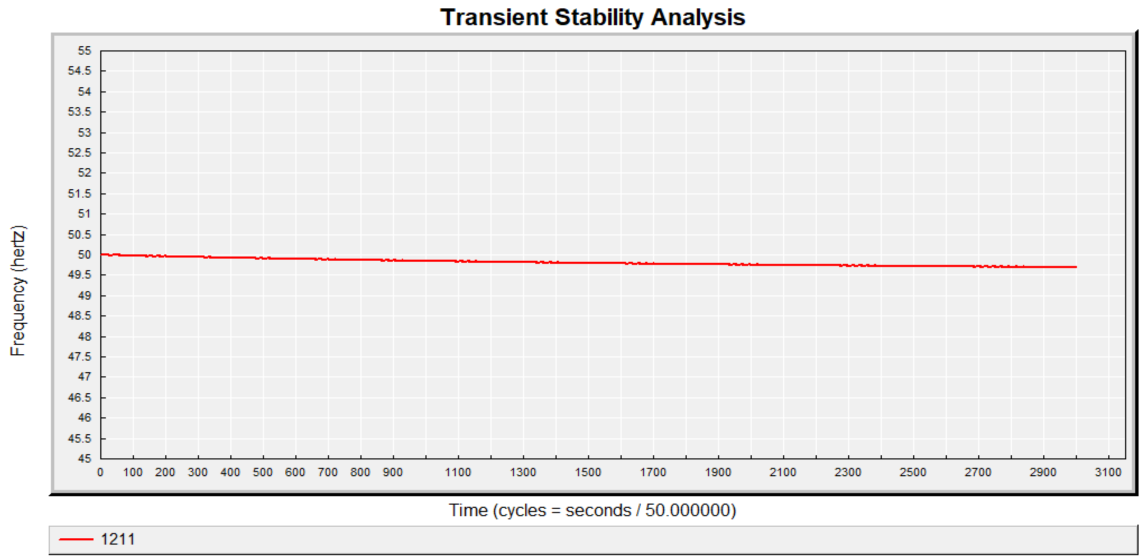

Fig 6.9: Transient stability analysis before adding parallel line.

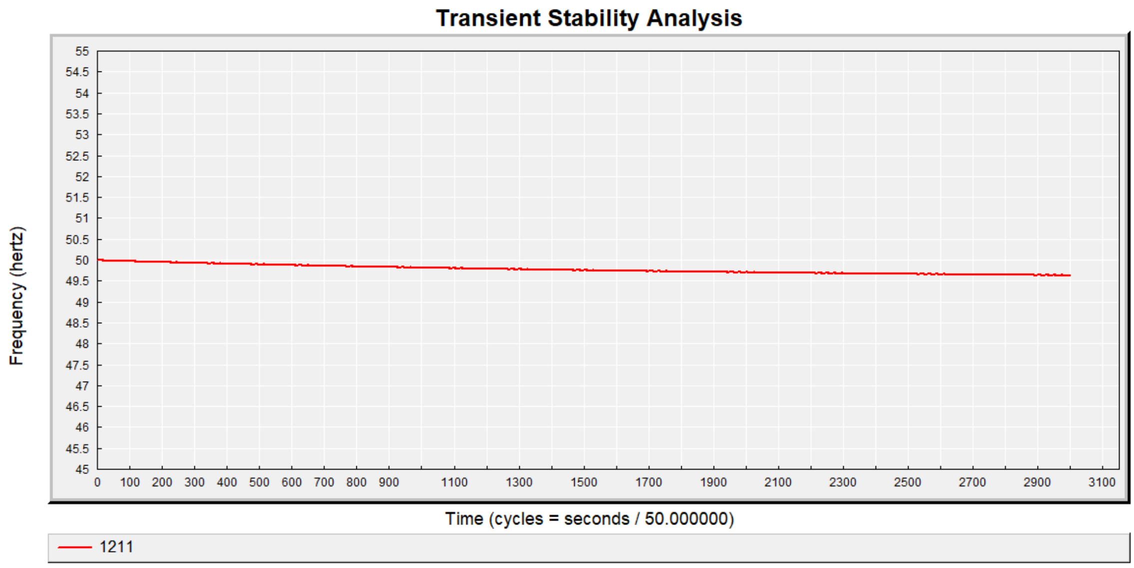

Fig 6.10: Transient stability analysis after adding parallel line.

6.3.2 Line removal (BSRM1_AKSPL, 230KV)

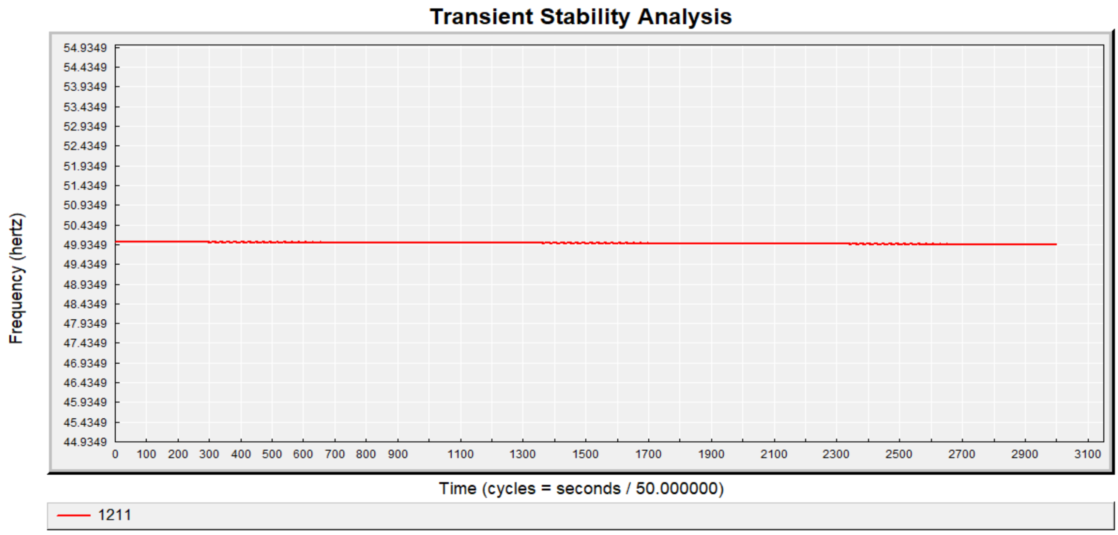

Fig 6.11: Transient stability analysis before adding parallel line.

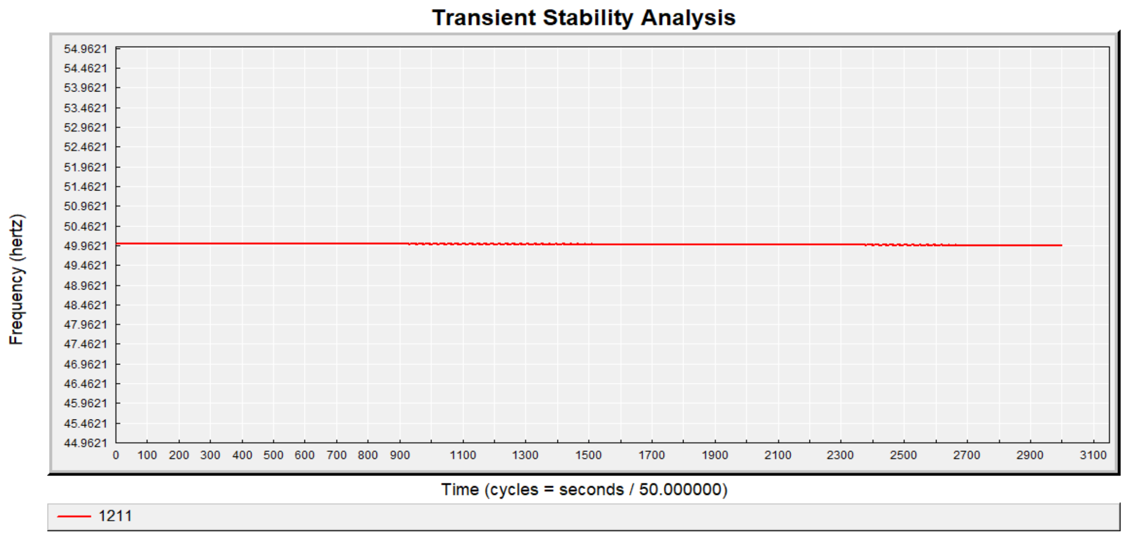

Fig 6.12: Transient stability analysis after adding parallel line.

6.3.3 Load addition (ULLON, 1L41)

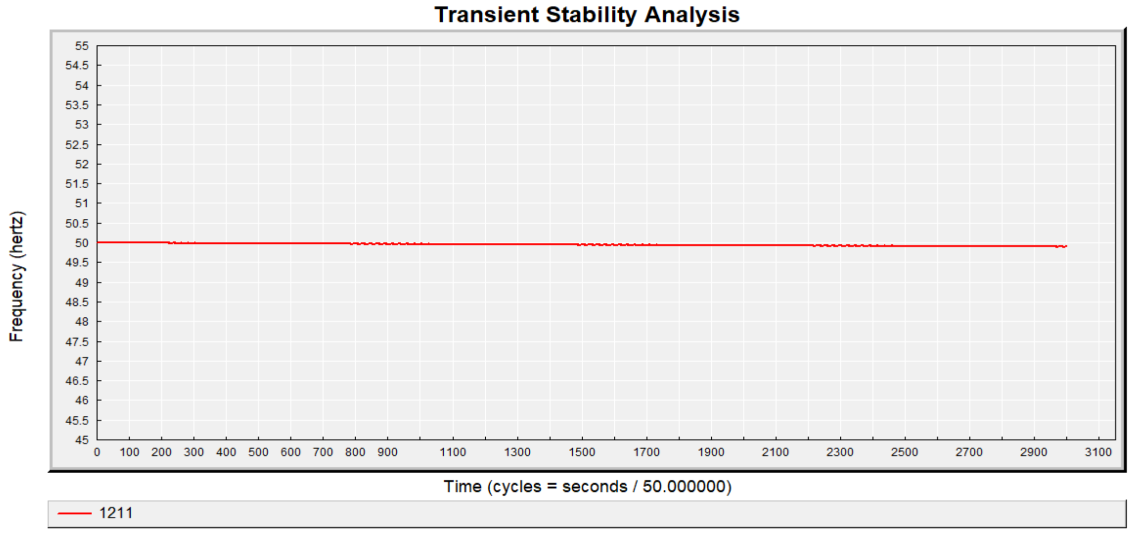

Fig 6.13: Transient stability analysis before adding parallel line.

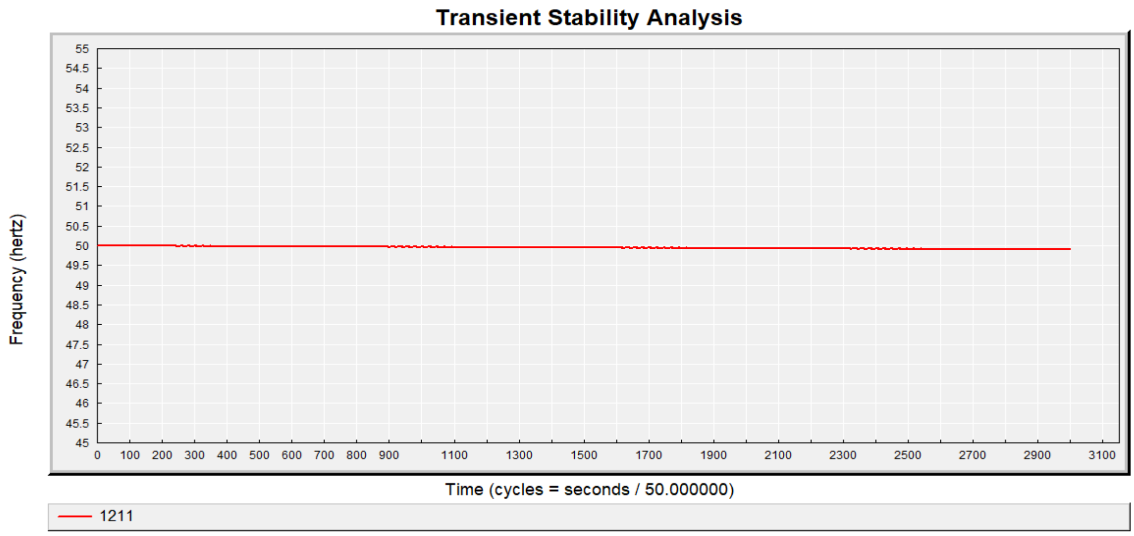

Fig 6.14: Transient stability analysis after adding parallel line.

6.3.4 Load rejection (ULLON, 1L41)

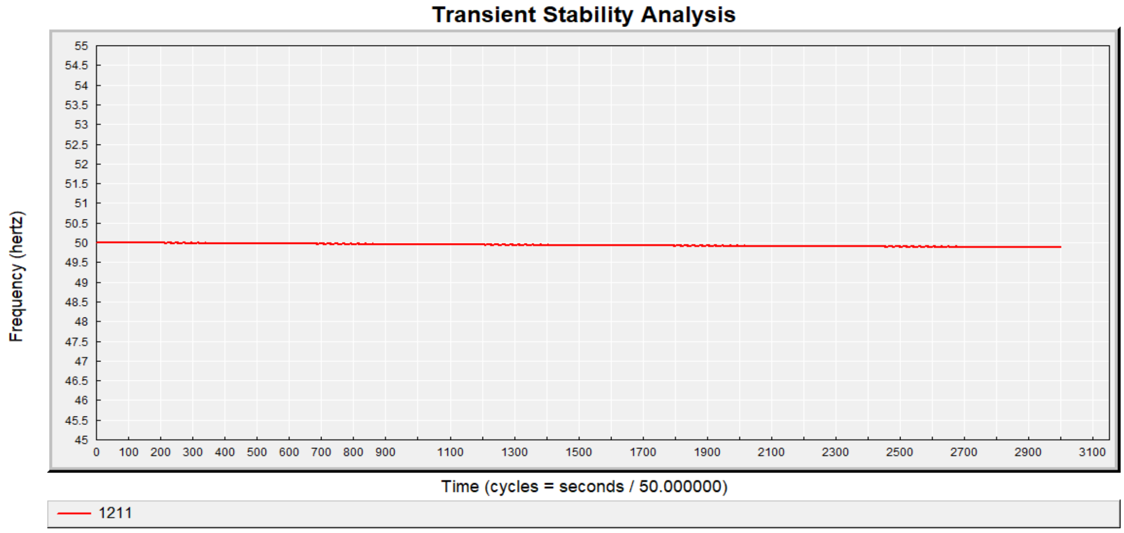

Fig 6.15: Transient stability analysis before adding parallel line.

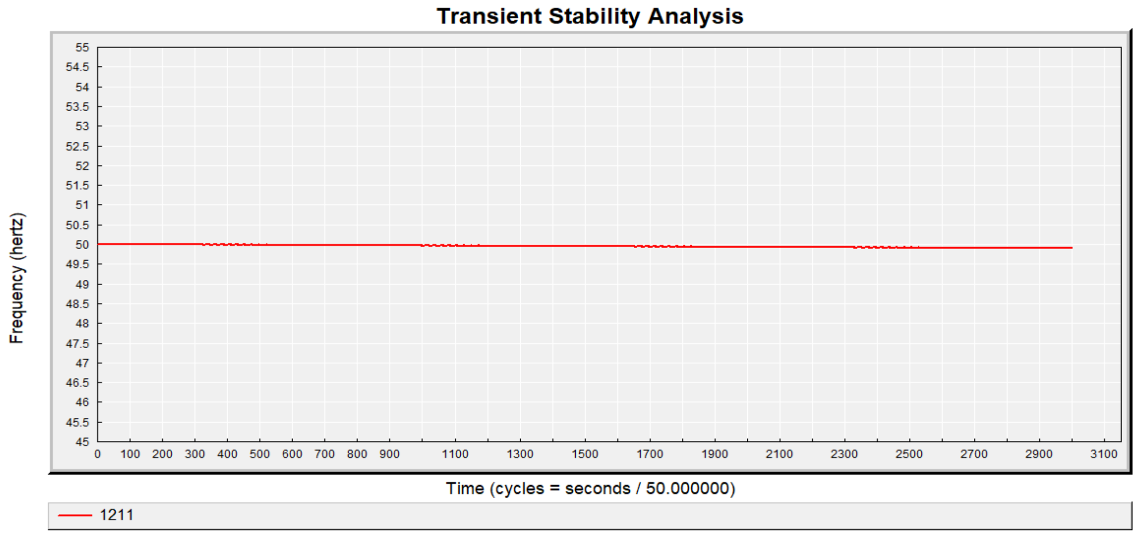

Fig 6.16: Transient stability analysis after adding parallel line.

6.4 VAR Injection Method

6.4.1 Generator removal (IG6_GT)

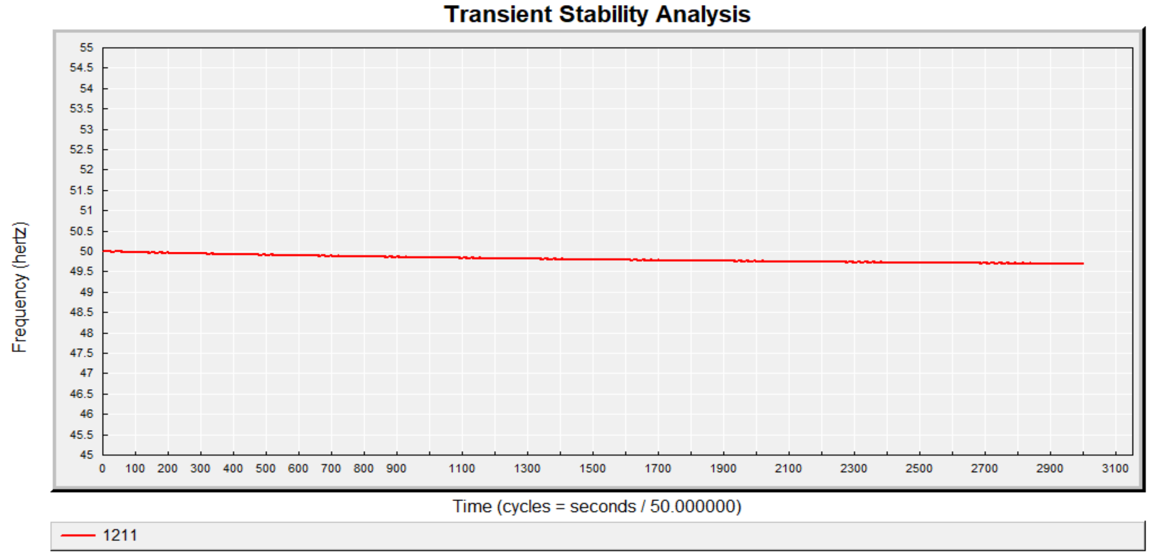

Fig 6.17: Transient stability analysis before VAR injection.

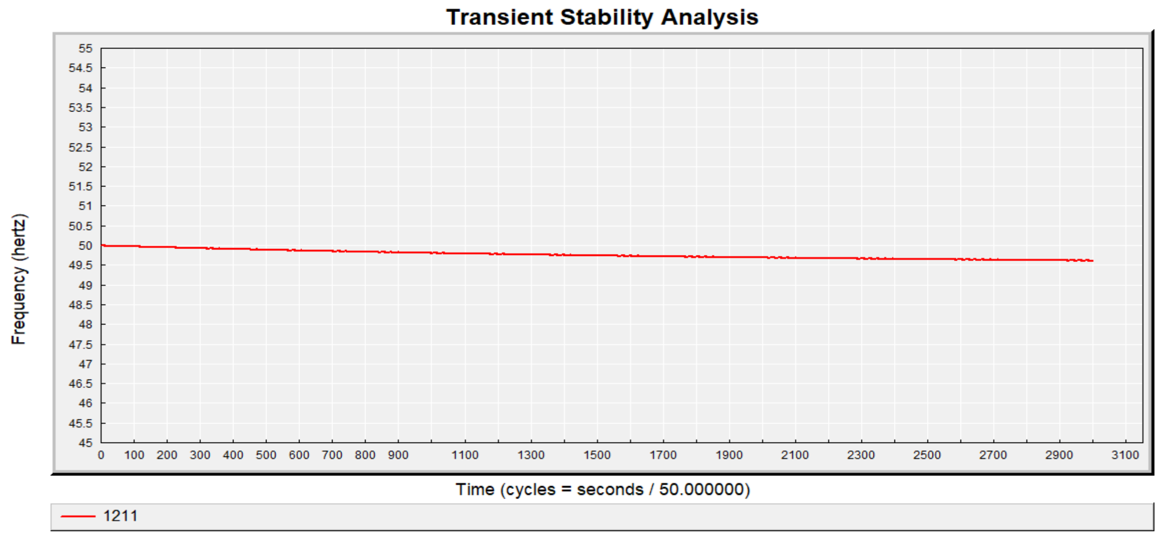

Fig 6.18: Transient stability analysis after VAR injection.

6.4.2 Line removal (BSRM1_AKSPL, 230KV)

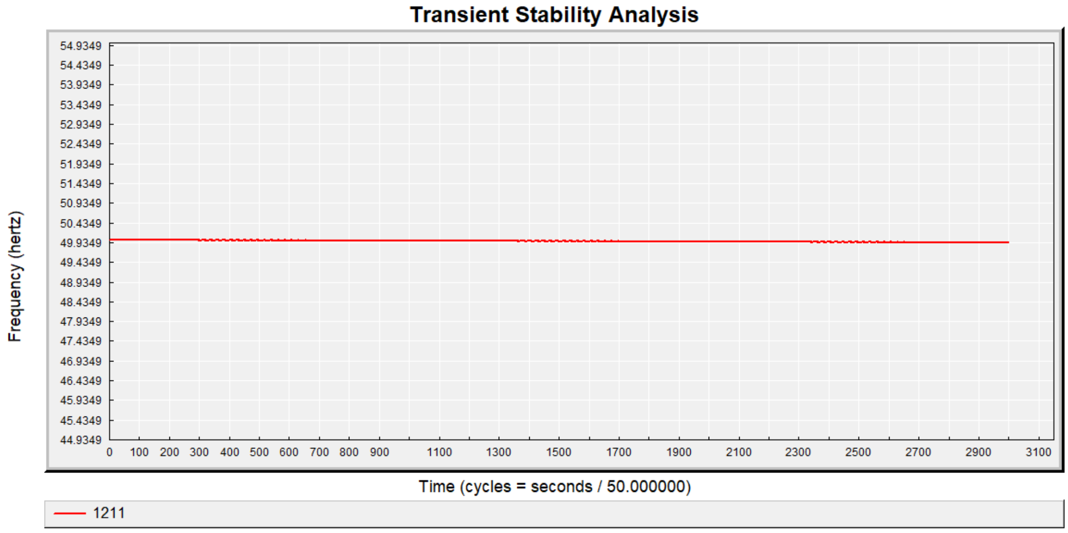

Fig 6.19: Transient stability analysis before VAR injection.

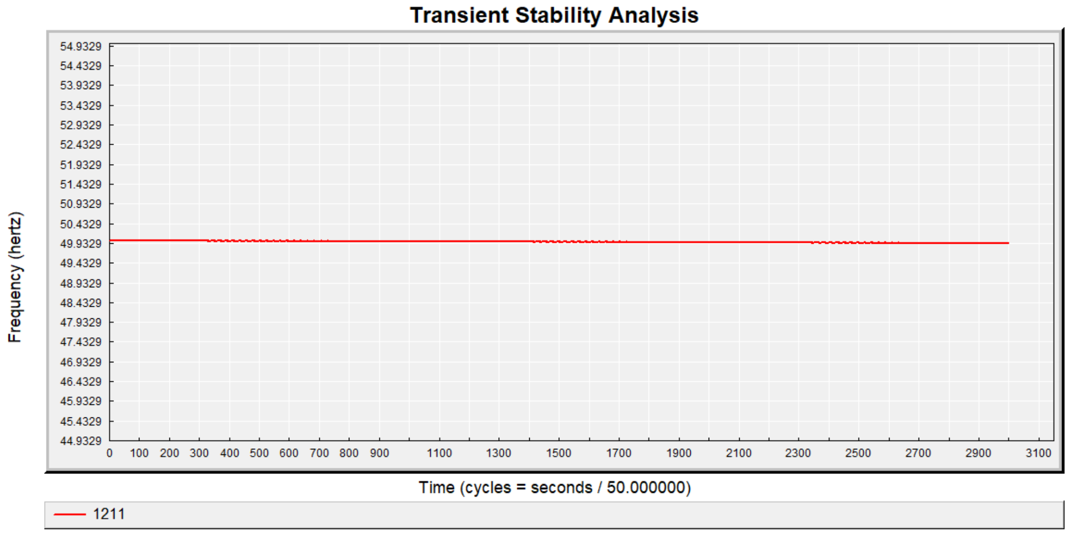

Fig 6.20: Transient stability analysis after VAR injection.

6.4.3 Load addition (ULLON, 1L41)

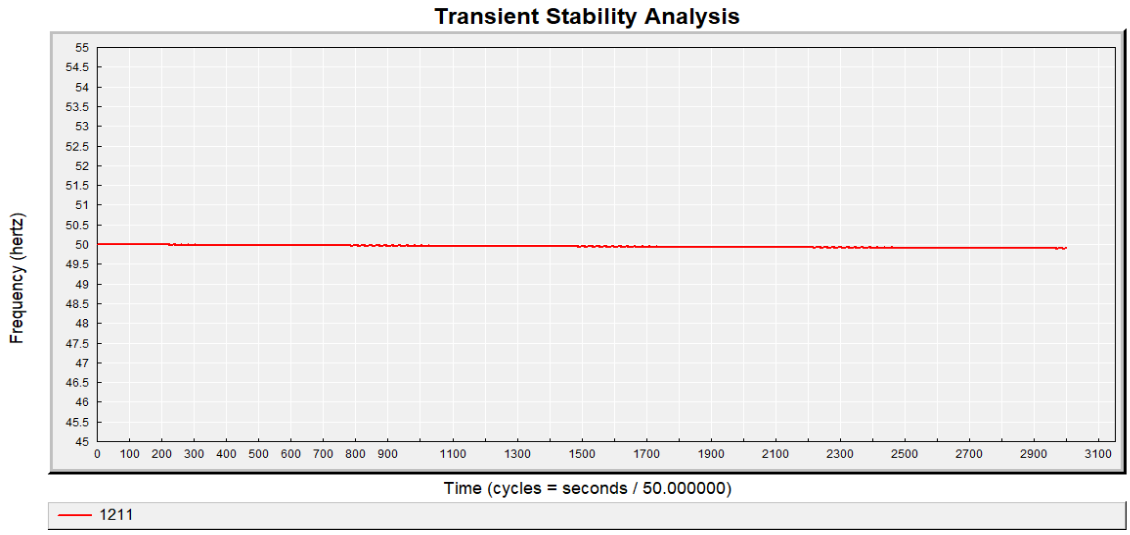

Fig 6.21: Transient stability analysis before VAR injection.

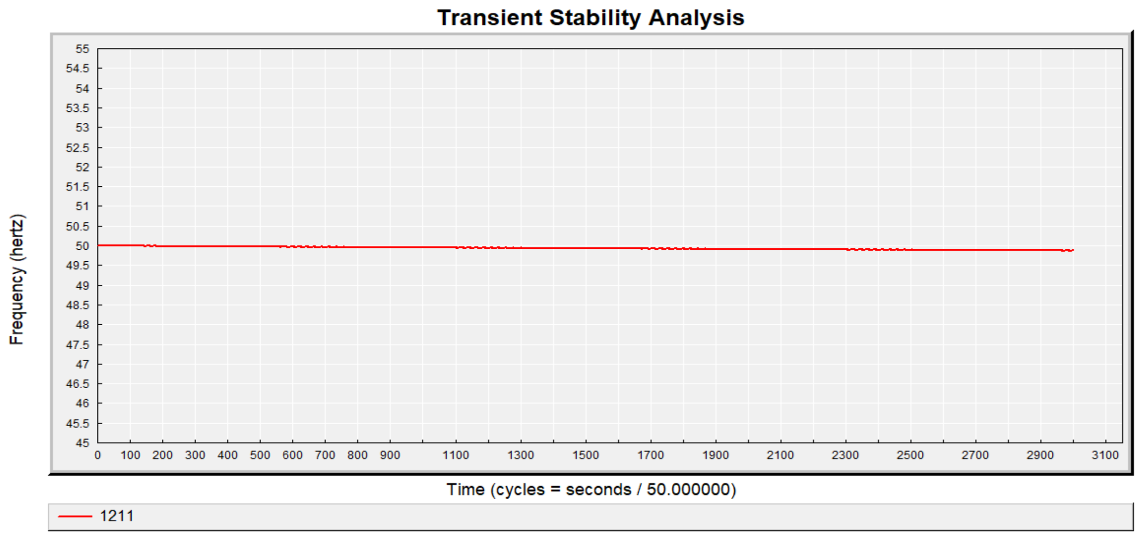

Fig 6.22: Transient stability analysis after VAR injection.

6.4.4 Load rejection (ULLON, 1L41)

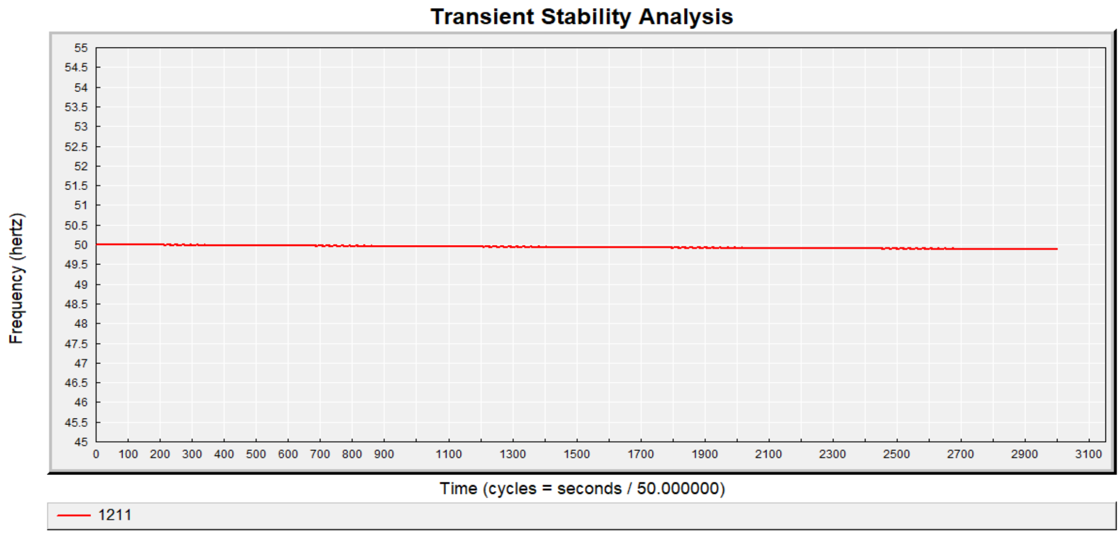

Fig 6.23: Transient stability analysis before VAR injection.

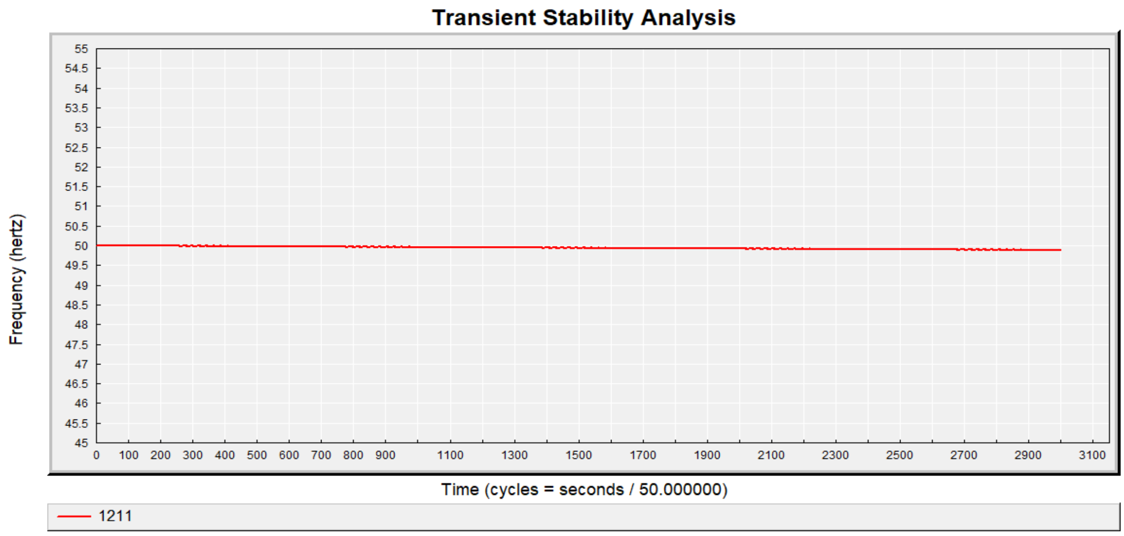

Fig 6.24: Transient stability analysis after VAR injection.

CHAPTER 7

COST ANALYSIS

7.1 Cost Data

Table 7.1: Cost data

Plant Type	Capacity (MW)	Fuel	Capital Cost ($/KW)	Fixed O&M ($/KW/yr.)	Variable O&M ($/KWh)	Fuel Cost ($/KWh)	Plant Factor (%)	Levelized Cost (tk/KWh)
100 MW HFO Engine (RE)	100	HFO	1100	30	0.002	0.17	HFO	18.00
100 MW Duel Fuel Engine (RE)	100	Duel Fuel (HSD/ Gas)	1300	40	0.002	0.21	HSD	21.50
						0.009	Gas	3.80

Cost of 12.5 MVAR 33 KV Capacitor Bank	1,28,01,353.71 BDT
Line cost per km	74,50,000 BDT
Transformer (11 KV – 33 KV)	1,20,00,000 BDT

- 1 USD = 82.16 BDT

7.2 Cost Calculation

7.2.1 Line cost

Line cost = Per km cost × Length × Total number of lines

For 2106 – 2112:

Line cost = 74,50,000 × 4 × 3 = 8,94,00,000 BDT

For 3104 – 3105:

Line cost = 74,50,000 × 68 × 2 = 101,32,00,000 BDT

7.2.2 Capacitor bank cost

Cost of 12.5 MVAR 33 KV capacitor bank = 1,28,01,353.71 BDT

So, cost of 1 MVAR 33 KV capacitor bank = 10,24,108.3 BDT

For 1L29_1 (Mirpur):

Initial = 10 MVAR & Final = 15 MVAR

So, net injected power (Q) = (15 – 10) MVAR = 5 MVAR

Corresponding cost = 5 × 10,24,108.3 = 51,20,541.5 BDT

7.2.3 Generator cost

All calculations are done for 5 MW output considering average lifetime is 25 yrs.

Total annual cost is calculated by:

(Capital cost + per yr. cost × 25 + per hr. cost × 24 × 365 × 25)/25

A. HFO (Heavy Fuel Oil):

Capital cost: 5500000 $ = 45,18,80,000 BDT

Fixed O & M/yr.: 150000 $ = 1,23,24,000 BDT/yr

Variable O & M: 10 $/hr = 821.60 BDT/hr

Fuel Cost: 850 $/hr = 69,836 BDT/hr

Levelized cost: 90,000 BDT/hr

Total annual cost: 143,77,59,776 BDT

B. HSD (High Speed Diesel):

Capital cost:6500000 $ = 53,40,40,000 BDT

Fixed O & M/yr.: 200000 $ = 1,64,32,000 BDT/yr

Variable O & M: 10 $/hr = 821.6 BDT/hr

Fuel Cost: 1050 $/hr = 86,268 BDT/hr

Levelized cost: 1,07,000 BDT/hr

Total annual cost: 173,80,18,496 BDT

C. Gas:

Capital cost: 6500000 $ = 53,40,40,000 BDT

Fixed O & M/yr.: 200000 $ = 1,64,32,000 BDT/yr

Variable O & M: 10 $/hr = 821.60 BDT/hr

Fuel Cost: 45 $/hr = 3,697.20 BDT/hr

Levelized cost: 19,000 BDT/hr

Total annual cost: 24,38,18,288 BDT

Table 7.2: Equipment wise cost

EQUIPMENT		COST
Generator	HFO	143,77,59,776 BDT/yr.
	HSD	173,80,18,496 BDT/yr.
	GAS	24,38,18,288 BDT/yr.
Transformer	11KV – 33KV	1,20,00,000 BDT

7.3 Method Wise Cost Table

7.3.1 Shunt capacitor method

Table 7.3: Shunt capacitor method

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Net Injected Power Q (MVAR)	Cost (BDT)
			Initial	Final		
1	3L06_2	Comilla South	12.5	13.9	1.4	14,33,751.62
2	1L19_2	Kabirpur	5	12.5	7.5	76,80,812.25
3	1L19_1	Kabirpur	12.5	15	2.5	25,60,270.75
4	1L29_1	Mirpur	10	15	5	51,20,541.5
5	3L06_1	Comilla South	12.5	13.9	1.4	14,33,751.62
6	1L39	Shyampur	10	20	10	1,02,41,083
7	1L32	Narinda	0	10	10	1,02,41,083
8	1L36	Satmasjid	0	10	10	1,02,41,083
9	1L41	Ullyan	0	10	10	1,02,41,083
10	1L42	Uttara	0	10	10	1,02,41,083
11	1L43	Gulshan	10	20	10	1,02,41,083
12	1L17	Dhanmondi	10	12.5	2.5	25,60,270.75
13	1L20	Kallyanpur	10	25	15	1,53,61,624.5
14	1L26	Madartek	0	10	10	1,02,41,083
15	1L28	Matuail	0	10	10	1,02,41,083
16	1L30	Moghbazar	10	20	10	1,02,41,083

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Net Injected Power Q (MVAR)	Cost (BDT)
			Initial	Final		
17	1L31	Munshiganj	10	20	10	1,02,41,083
18	1L24	Lalbagh	10	13.9	3.9	39,94,022.37
19	1L15	Bhasantek (Cant)	10	12.5	2.5	25,60,270.75
20	1L14	Basundhara	10	12.5	2.5	25,60,270.75
21	1L13	Bangabhaban	12.5	25	12.5	1,28,01,353.75
22	1L08	Hasnabad	5	12.5	7.5	76,80,812.25
23	2L02	BSRM	0	25	25	2,56,02,707.5
24	2L12	KSRM	0	5	5	51,20,541.5
25	2L14	Khagrachari	0	5	5	51,20,541.5
26	2L22	KYCR	0	5	5	51,20,541.5
27	2L07	Chandraghona	0	5	5	51,20,541.5
28	2L16	Madunaghat	10	12.5	2.5	25,60,270.75
29	2L03	Hathazari	10	12.5	2.5	25,60,270.75
30	2L15	Khulsi	10	22	12	1,22,89,299.6
31	3L04	Chandpur	10	25	15	1,53,61,624.5
32	3L05	Choumuhoni	12.5	13.9	1.4	14,33,751.62

Sl. No	Bus Id	Extra Id	Injected Reactive Power Q (MVAR)		Net Injected Power Q (MVAR)	Cost (BDT)
			Initial	Final		
33	2L01_2	AKSPL	25	30	5	51,20,541.5
34	4L03	Mymensingh	10	12.5	2.5	25,60,270.75
35	2L01_3	AKSPL (11KV LOAD BUS)	25	30	5	51,20,541.5
36	6L13	Khulna C	25	30	5	51,20,541.5
37	6L05	Chuadanga	10	13.9	3.9	39,94,022.37
38	2L10_1	Halishahar	0	25	25	2,56,02,707.5
39	4L01_1	Jamalpur	12.5	13.9	1.4	14,33,751.62
40	8L04_1	Naogaon	12.5	13.9	1.4	14,33,751.62
41	8L11	Joupurhat	10	12.5	2.5	25,60,270.75
42	8L13	Niyamatpur	12.5	13.9	1.4	14,33,751.62
43	9L03	Panchagarh	10	12.5	2.5	25,60,270.75
44	9L07	Thakurgaon	5	10	5	51,20,541.5
TOTAL						31,05,09,636.6 BDT

7.3.2 Parallel line method

Table 7.4: Parallel line method

Sl. No	Solved Buses	Bus Id From	Bus Id To	Length	Parallel Line Duplicity	Cost (BDT)
1	1L14	1105	1116	6.99	3	15,62,26,400
2	3L02					
3	1L29_1	2101	2106	4	3	8,94,00,000
4	1L15					
5	1L21	1201 3202 1207_1	1202	125.5	3	280,49,25,000
6	2L18					
7	3L08					
8	6105					
9	4L02_1					
10	2201	2106	2112	4	3	8,94,00,000
11	8L11	8102	8104	44	2	65,56,00,000
12	8L13					
13	8L04_1	7104 6109_1	6103	85	3	189,97,50,000

<table>
<tr><th rowspan="2">Sl. No</th><th rowspan="2">Solved Buses</th><th colspan="2">Bus Id</th><th rowspan="2">Length</th><th rowspan="2">Parallel Line Duplicity</th><th rowspan="2">Cost (BDT)</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>14</td><td>2L06_1</td><td>2107</td><td>2116</td><td>27</td><td>3</td><td>60,34,50,000</td></tr>
<tr><td>15</td><td>3105</td><td>3104</td><td>3105</td><td>68</td><td>2</td><td>101,32,00,000</td></tr>
<tr><td>16</td><td>2L03</td><td rowspan="2">3202</td><td rowspan="2">2202</td><td rowspan="2">98.2</td><td rowspan="2">3</td><td rowspan="2">219,47,70,000</td></tr>
<tr><td>17</td><td>2L02</td></tr>
<tr><td>18</td><td>3L07</td><td>3102</td><td>3107_1</td><td>55</td><td>3</td><td>122,92,50,000</td></tr>
<tr><td>19</td><td>3L06_2</td><td rowspan="2">3102</td><td rowspan="2">3106</td><td rowspan="2">18</td><td rowspan="2">3</td><td rowspan="2">40,23,00,000</td></tr>
<tr><td>20</td><td>3L06_1</td></tr>
<tr><td>21</td><td>3L04</td><td>3106</td><td>3104</td><td>62</td><td>3</td><td>138,57,00,000</td></tr>
<tr><td>22</td><td>1L38</td><td>6109_1
6109_2</td><td>6113</td><td>3.9</td><td>2</td><td>5,81,10,000</td></tr>
<tr><td>23</td><td>1L39</td><td>1107</td><td>1109</td><td>62</td><td>3</td><td>138,57,00,000</td></tr>
<tr><td>24</td><td>1L20</td><td>1108
1120
1121</td><td>1124</td><td>31.6</td><td>3</td><td>70,62,60,000</td></tr>
<tr><td>25</td><td>4L03</td><td>4101</td><td>4106</td><td>20</td><td>3</td><td>44,70,00,000</td></tr>
<tr><td>26</td><td>4L01_1</td><td>6112</td><td>6105</td><td>39.3</td><td>3</td><td>87,83,55,000</td></tr>
</table>

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Cost (BDT)
		From	To			
27	6L13	1119	1127	32	3	71,52,00,000
28	6L05					
29	1L19_2	1119	4107	51	3	113,98,50,000
30	1L17					
31	1L23					
32	1L08					
33	4107					
34	4G07					
35	2L10_1	2115	2105	15	3	33,52,50,000
36	2L15					
37	2L01_1	2115	2106	15	2	22,35,00,000
38	2L16	2116	2121	8.5	3	18,99,75,000
39	1L27	1202	1208	24.5	3	54,75,75,000

Sl. No	Solved Buses	Bus Id		Length	Parallel Line Duplicity	Cost (BDT)
		From	To			
40	1L30	1110	1143	3.3	3	7,37,55,000
41	1L26					
42	1L19_1	1110	2126	4.5	3	10,05,75,000
43	2L12	2118	2114	57	2	84,93,00,000
44	4L07					
45	2L14	1111_1	1111_4	2.4	3	5,36,40,000
46	1L13	1111_1	1109	10	3	22,35,00,000
47	1L24	1111_1	1141	16	3	35,76,00,000
48	2L22	2120	2119	9	3	20,11,50,000
49	1L31	9104	9107	45	2	67,05,00,000
50	2L01_2					
51	2L01_3					
52	9L03					
53	9L07					
TOTAL COST						2103,60,86,400 BDT

Table 7.5: Cost for solving remaining buses

<table>
<tr><th>Sl. No</th><th>Solved Buses</th><th>Shunt Capacitor Id</th><th>Capacitance (MVAR)</th><th>Cost (BDT)</th></tr>
<tr><td>54</td><td>1L28</td><td rowspan="4">newC1</td><td rowspan="4">10</td><td rowspan="4">1,02,41,083</td></tr>
<tr><td>55</td><td>1L42</td></tr>
<tr><td>56</td><td>1L43</td></tr>
<tr><td>57</td><td>3L05</td></tr>
<tr><td>58</td><td>1L32</td><td rowspan="3">newC2</td><td rowspan="3">10</td><td rowspan="3">1,02,41,083</td></tr>
<tr><td>59</td><td>1L36</td></tr>
<tr><td>60</td><td>1L41</td></tr>
<tr><td>61</td><td>2L07</td><td>newC3</td><td>5</td><td>51,20,541.5</td></tr>
<tr><td>62</td><td>4L06</td><td>newC4</td><td>10</td><td>1,02,41,083</td></tr>
<tr><td>63</td><td>6L03</td><td rowspan="3">newC5</td><td rowspan="3">5</td><td rowspan="3">51,20,541.5</td></tr>
<tr><td>64</td><td>6L11_1</td></tr>
<tr><td>65</td><td>6L16</td></tr>
<tr><td colspan="4">TOTAL</td><td>4,09,64,332 BDT</td></tr>
</table>

Parallel Line Cost	2103,60,86,400 BDT
Capacitor bank Cost	4,09,64,332 BDT
Total Cost	2107,70,50,730 BDT

7.3.3 VAR injection method

Table 7.6: VAR injection method

Sl. No	Generator Id	Solved Buses	No of Generator
1	1newG13	1L13	1
2	1newG19_1	1L19_1	1
3		1L19_2	
4		1L27	
5	1newG20	1L20	1
6	1newG23	1L23	1
7	1newG24	1L08	1
8		1L21	
9		1L24	
10		1L29_1	
11	1newG28	1L28	1
12	1newG30	1L26	1
13		1L30	
14		1L43	
15	1newG31	1L31	1
16		1L38	

Sl. No	Generator Id	Solved Buses	No of Generator
17	1newG32	1L32	1
18	1newG36	1L15	1
19		1L36	
20	1newG39	1L39	1
21	1newG41	1L17	1
22		1L41	
23	1newG42	1L14	1
24		1L42	
25	2newG01	2L01_2	1
26	2newG01_3	2L01_3	1
27		2201	
28	2newG02	2L02	1
29	2newG03	2L03	1

Sl. No	Generator Id	Solved Buses	No of Generator
30	2newG10_1	2L01_1	1
31		2L06_1	
32		2L10_1	
33		2L12	
34		2L15	
35		2L16	
36		2L22	
37	2newG14	2L07	1
38		2L14	
39		2L18	
40	3newG04	3L04	1
41	3newG05	3105	1
42		3L02	
43		3L05	
44		3L08	

Sl. No	Generator Id	Solved Buses	No of Generator
45	3newG06_1	3L06_1	1
46	3newG06_2	3L06_2	1
47	3newG07	3L07	1
48	4newG03	4L03	1
49	4newG06	4L01_1	1
50		4L02_1	
51		4L06	
52	4newG07	4107	1
53		4G07	
54		4L07	
55	6newG03	6L03	1
56		6L13	

Sl. No	Generator Id	Solved Buses	No of Generator
57	6newG11_1	6105	1
58		6L05	
59		6L11_1	
60	6newG16	6L16	1
61	8newG13	8L04_1	1
62		8L11	
63		8L13	
64	9newG07	9L03	1
65		9L07	
TOTAL			32

Table 7.7: Total cost for generator method

EQUIPMENT		COST
32 × Generator	HFO	32 × (143,77,59,776 BDT/yr.) = 4600,83,12,030 BDT/yr.
	HSD	32 × (173,80,18,496 BDT/yr.) = 5561,65,91,870 BDT/yr.
	GAS	32 × (24,38,18,288 BDT/yr.) = 780,21,85,216 BDT/yr.
32 × Transformer	11KV – 33KV	32 × (1,20,00,000 BDT) = 38,40,00,000 BDT

7.4 Preference

The preference table on the basis of cost effectiveness is shown below:

Table 7.8: Preferred method on the basis of cost

Preference serial	Method
I	Shunt Capacitor Method
II	GAS Generator Method
III	Parallel Line plus Shunt Capacitor
IV	HFO Generator Method
V	HSD Generator Method

CHAPTER 8

CONCLUSION

8.1 Concluding Remarks

Abnormal conditions or disturbances to power system create fluctuations to electrical quantities such as voltage, frequency and current. Most of the abnormal conditions to a power system lead to fall of frequency and sometimes extreme abnormality leads to the blackout of an integrated system.

In this thesis, an entire load flow analysis of Bangladesh power system is implemented. This thesis evaluates the analysis of Bangladesh power system using iterative Newton-Raphson Method which approximates the set of non-linear simultaneous equations of a set of linear simultaneous equations using Taylor's series expansion and the terms are limited to restored approximation. We have shown power flow from one bus to another, generation of real and reactive power, total losses in the system under the analysis of Newton-Raphson method. The cost calculations are also obtained. The result obtained in this thesis will help Bangladesh power system to operate more quickly and effectively as well as to improve the stability of power system.

Under-voltage is usually obtainable to reduced voltage levels on the utility's transmission and distribution system. Distribution system characteristics can also contribute to relatively low voltage situations. The three methods are used for solving this problem. It is found that "Shunt capacitance compensation technique" is more preferable from engineering point of view and from economic point of view.

In case of stability purpose, the parallel line method is considerable but not cost effective. As reactance of the lines decrease, maximum power will increase and reach to stability limit quickly. So, the power system will become stable with improved power quality and security.

This thesis will help to estimate better service quality and security of Bangladesh power system. It will also create awareness among the utility and the consumers of the system and will assist in future planning and operation process of Bangladesh power system.

Finally it will have a great power savings from national grid. In Bangladesh, our power is very less, we have very little resources, bearing with that limitation, we need to walk forward. If we can avoid wasting the power, more industries can run with that power.

8.2 Suggestions for Future Work

Here, we are capable of finding out the total cost of the entire power system of Bangladesh. We have gone through load flow analysis by Newton-Raphson model and further gone through Shunt capacitance, Parallel line and VAR injection technique to solve under-voltage problem separately. But we are unable to find out the combinational solution of these three techniques for under-voltage problem by Newton-Raphson model.

One proposal for future work in this area of study is to explore the combinational solution for under-voltage problem by Newton-Raphson model. The Fast-decoupled model is faster computational technique than Newton-Raphson model. So, another proposal is to evaluate the load flow analysis and total cost calculation of the system by Fast-decoupled model. Therefore, it will be possible to make a good comparison between both of the load flow analysis model.

Finally, rapidly growing electric power industries develop many reasons for system instability and blackouts. Therefore, the assessment and the enhancement of power system stability still is an active research area.

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APPENDIX ‘A’

SOME SCREENSHOTS OF THE SIMULATED NETWORK

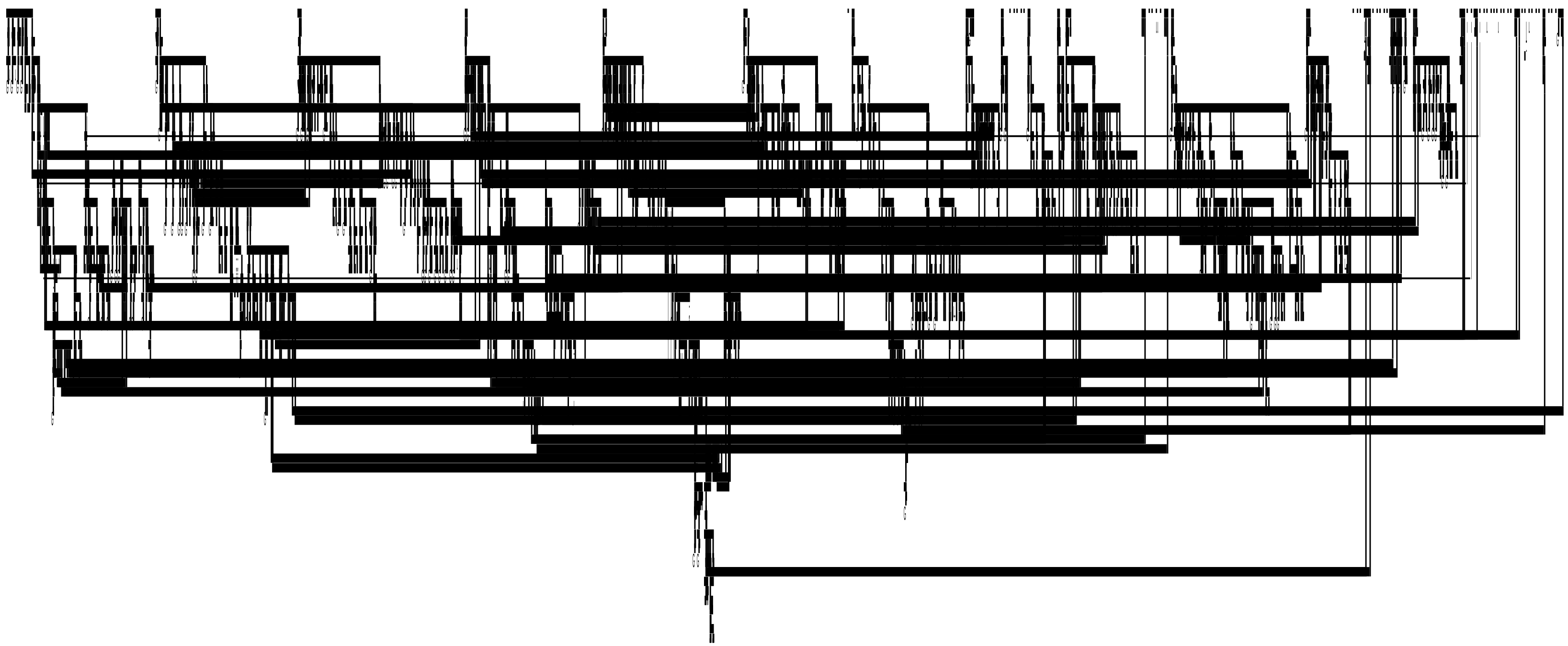
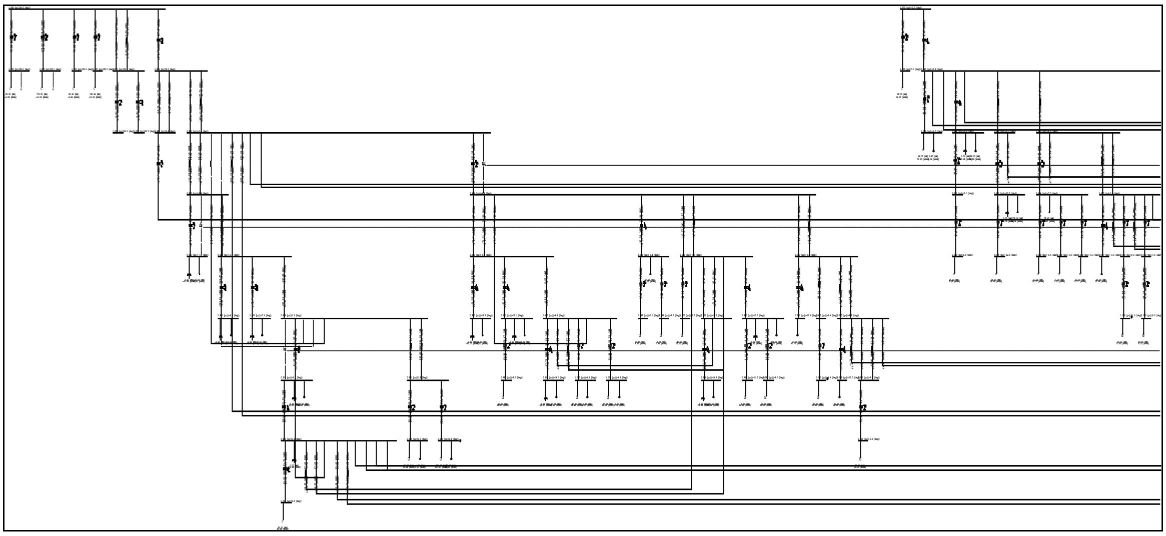
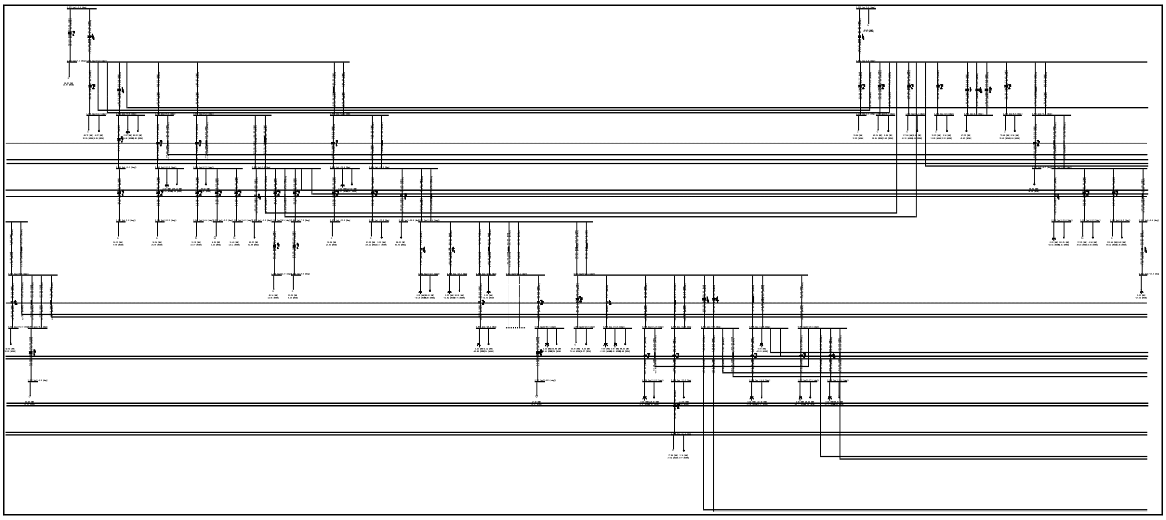
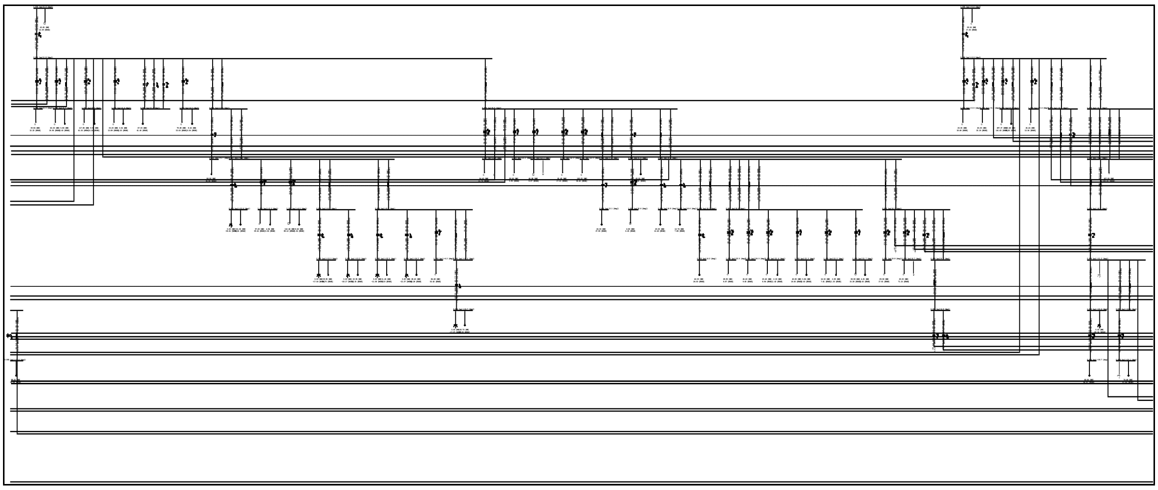
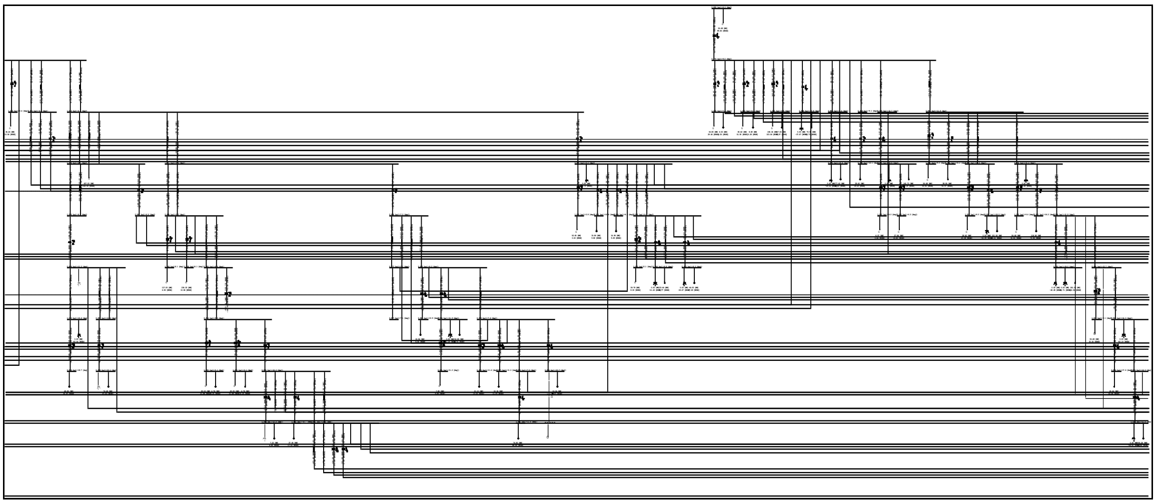


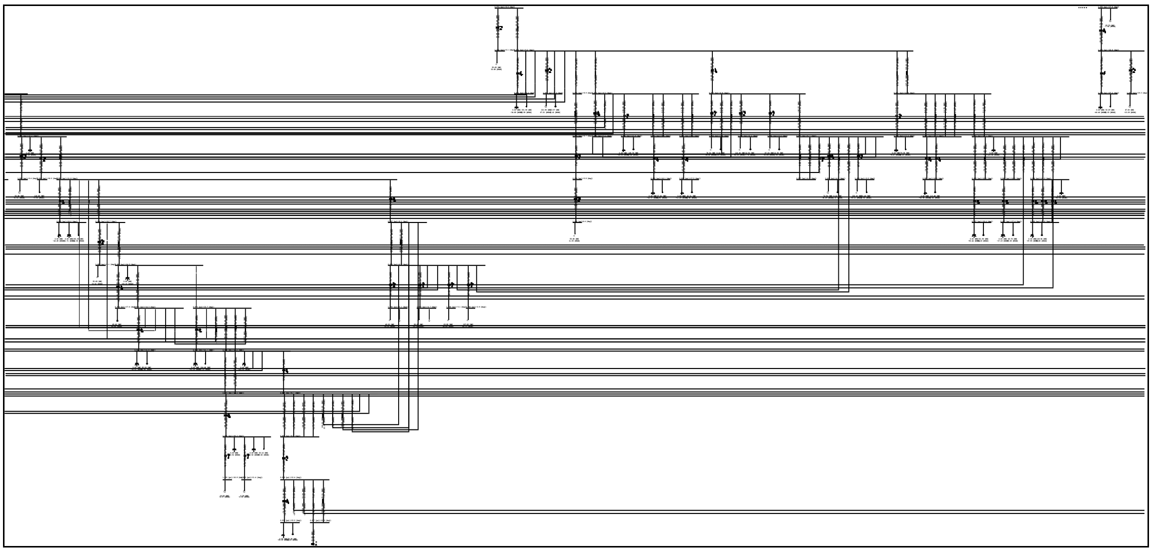
FIGURE: SIMULATED NETWORK OF BANGLADESH POWER SYSTEM

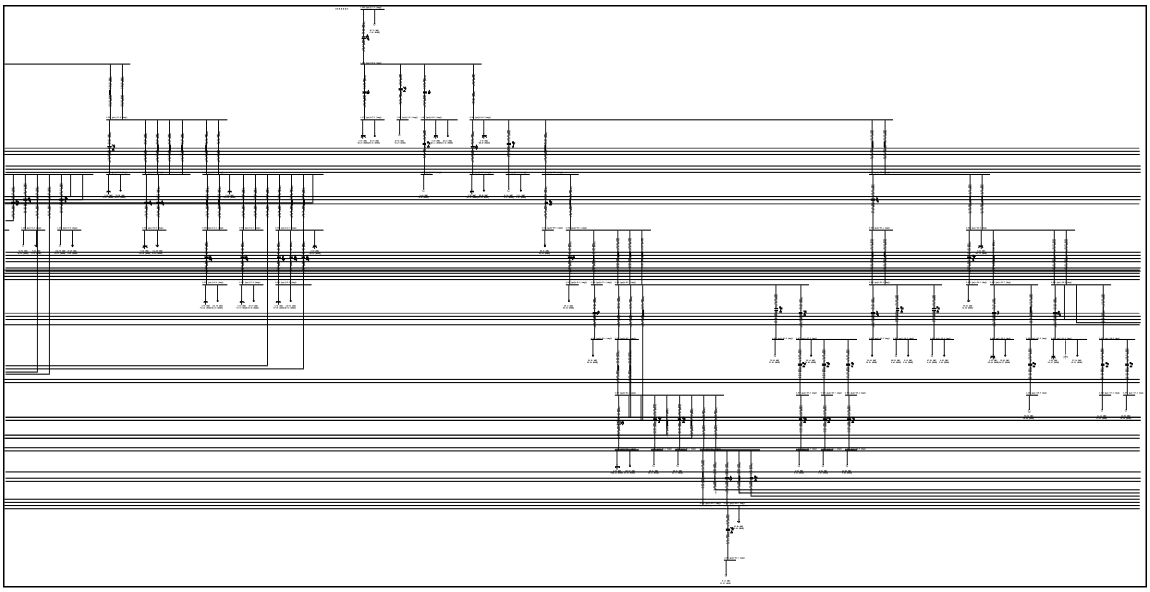


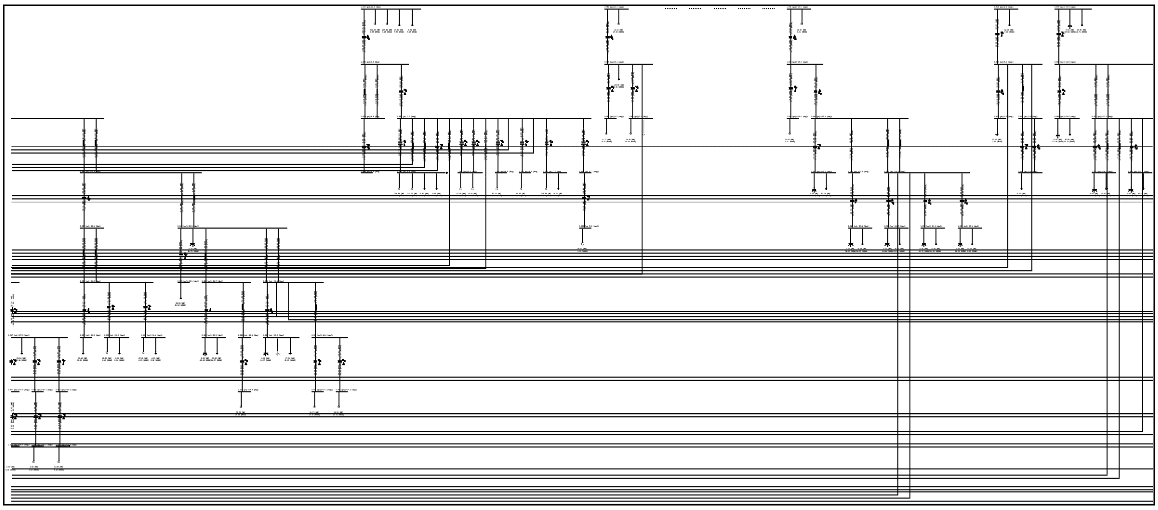


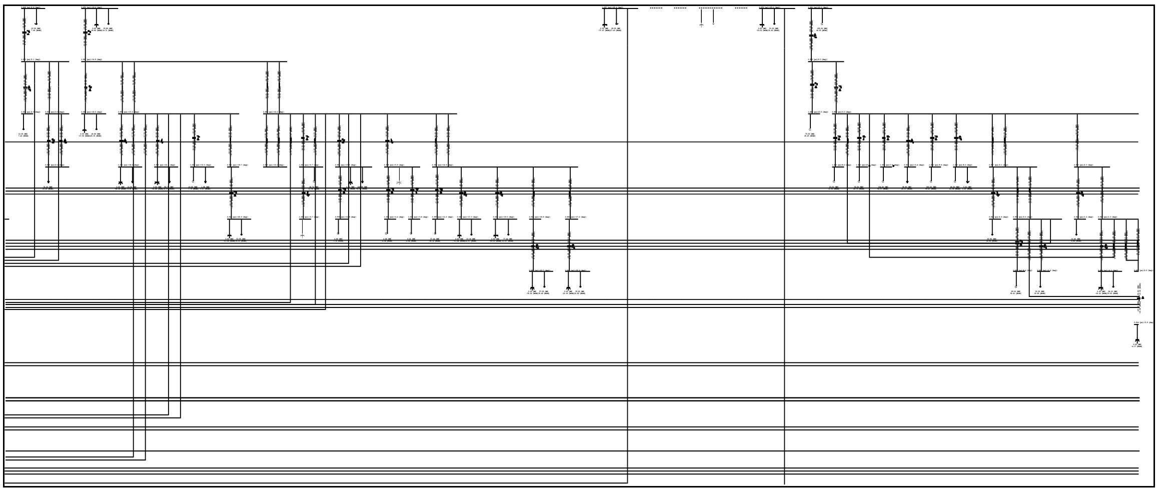


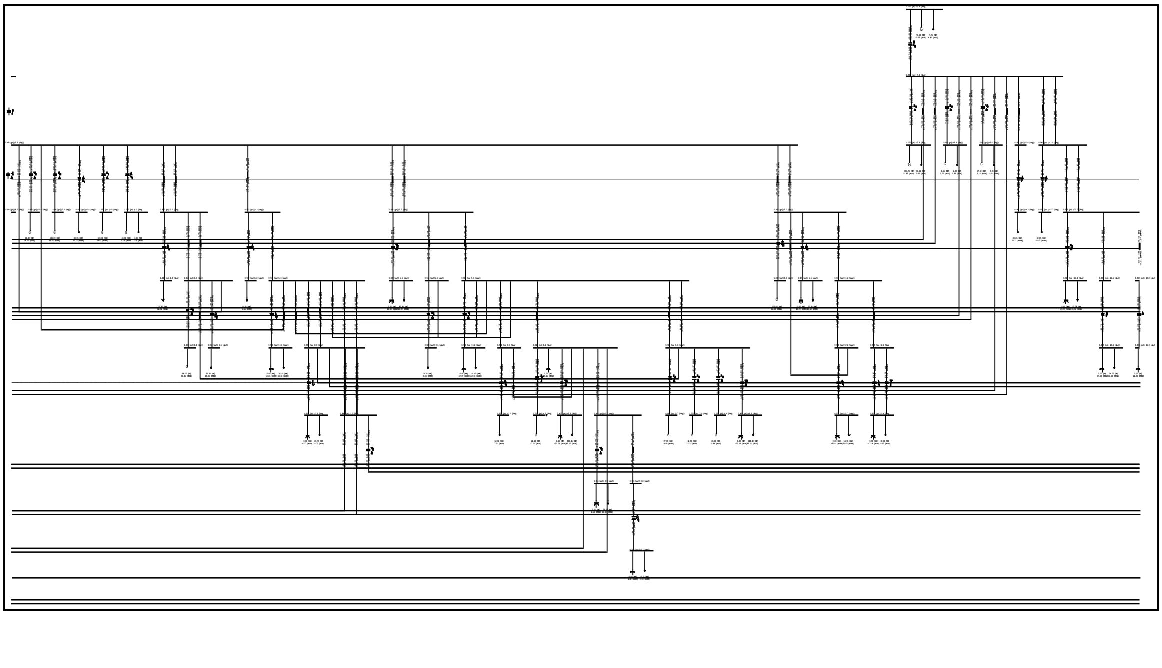


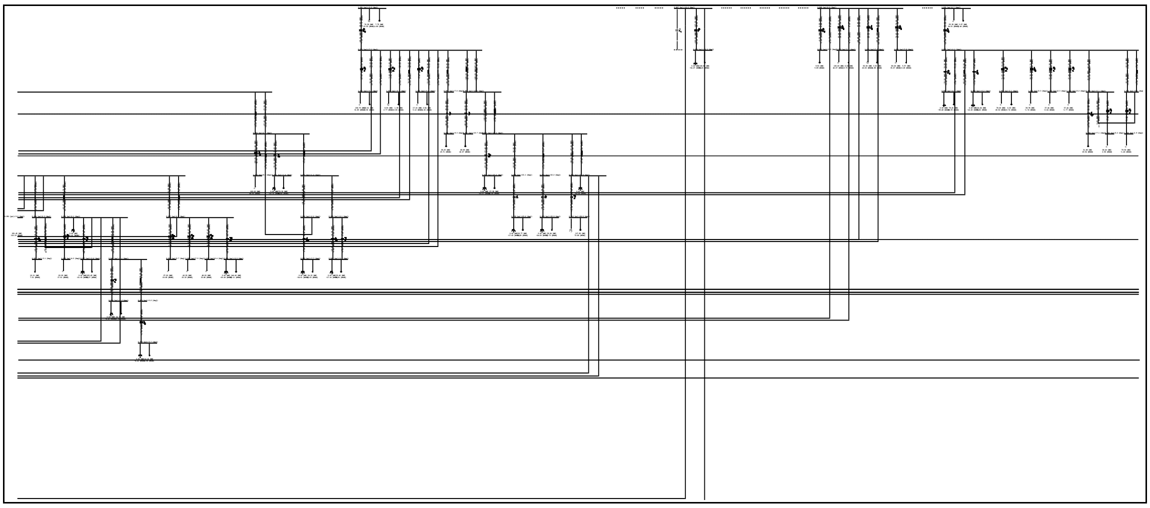


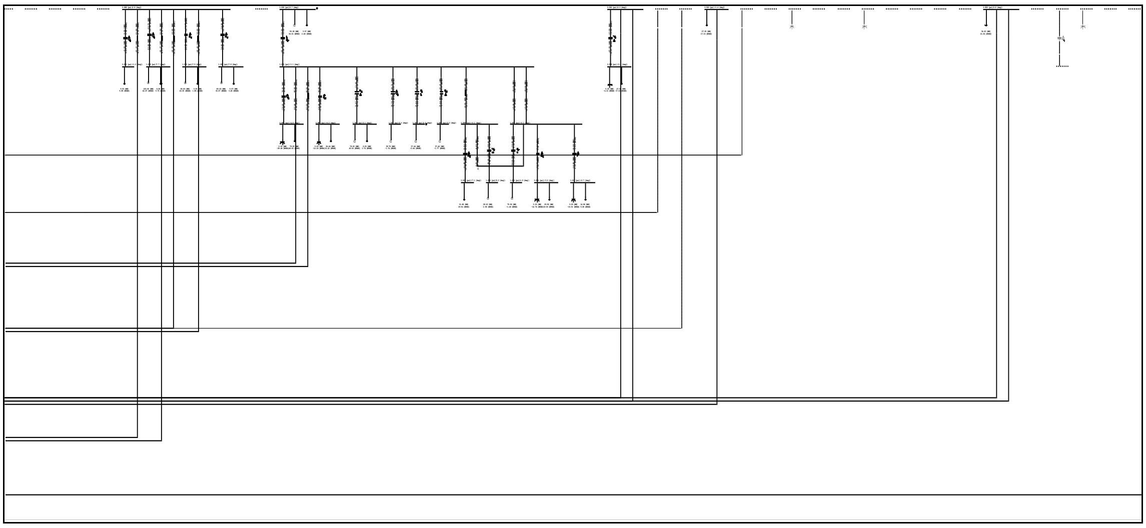


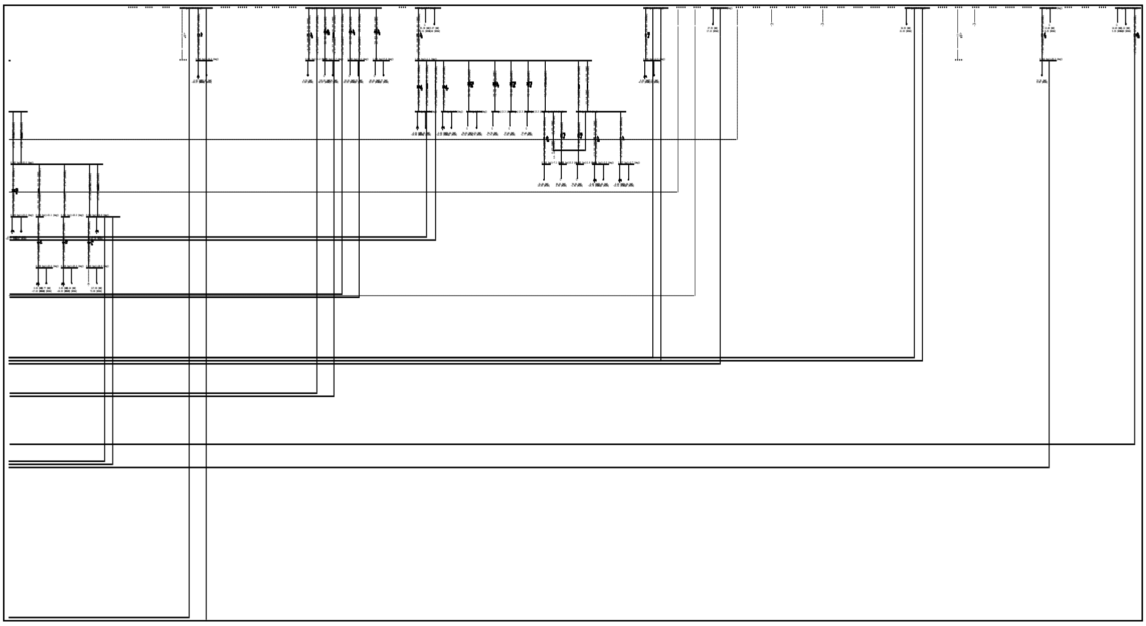












APPENDIX ‘B’

POWER FLOW ANALYSIS DATA
&
SUMMARY

BUS INFORMATION

ID	Extra ID	Zone	Volt Sol [pu]	Angle Sol [deg]	kV Base	V_{min} [pu]	V_{max} [pu]
1101	Aminbazar_132	1	0.968	-13.2	132	0.9	1.1
1102_1	Meghnaghat Rental PP	1	0.970	-8.7	132	0.9	1.1
1102_2	New Meghnaghat (Sonargaon)	1	0.000	0.0	132	0.9	1.1
1103	Bhulta_132	1	0.955	-9.5	132	0.9	1.1
1104	Kaliakoir_132	1	1.025	24.5	132	0.9	1.1
1105	Agargaon(Old Airport)	1	0.948	-12.4	132	0.9	1.1
1106	Ghorashal_132	1	0.963	-5.8	132	0.9	1.1
1107	Haripur_132	1	0.972	-9.0	132	0.9	1.1
1108	Hasnabad_132	1	0.954	-11.9	132	0.9	1.1
1109	Maniknagar	1	0.963	-9.3	132	0.9	1.1
1110	Rampura(Aftabnagar)_132	1	0.964	-12.1	132	0.9	1.1
1111_1	Siddhirganj	1	0.972	-9.0	132	0.9	1.1
1111_2	Siddhirganj Desh Energy PP	1	0.973	-8.7	132	0.9	1.1
1111_3	Siddhirganj SS	1	0.972	-8.9	132	0.9	1.1
1111_4	Siddhirganj Dutch Bangla - 1	1	0.974	-8.9	132	0.9	1.1
1112	Tongi	1	0.959	-12.4	132	0.9	1.1
1113	Bangabhaban	1	0.962	-9.4	132	0.9	1.1
1114	Bashundhara	1	0.959	-12.8	132	0.9	1.1
1115	Bhasantek	1	0.000	0.0	132	0.9	1.1
1116	Cantonment (Bhashantek)	1	0.947	-12.6	132	0.9	1.1
1117	Dhanmondi	1	0.960	-11.9	132	0.9	1.1
1118	Joydevpur	1	0.945	-12.0	132	0.9	1.1
1119	Kabirpur	1	0.943	-14.6	132	0.9	1.1
1120	Kallyanpur	1	0.963	-13.7	132	0.9	1.1
1121	Kamrangirchar	1	0.961	-14.3	132	0.9	1.1
1122	Keraniganj	1	0.964	-12.7	132	0.9	1.1
1123	Kodda PP	1	0.945	-13.3	132	0.9	1.1
1124	Lalbagh	1	0.960	-14.3	132	0.9	1.1
1125	Madanganj	1	0.954	-11.8	132	0.9	1.1
1126	Madartek	1	0.963	-12.1	132	0.9	1.1
1127	Manikganj	1	0.954	-17.0	132	0.9	1.1
1128	Matuail	1	0.963	-9.4	132	0.9	1.1
1129	MIrpur	1	0.960	-13.6	132	0.9	1.1
1130	Moghbazar	1	0.964	-12.5	132	0.9	1.1
1131	Munshiganj	1	0.952	-12.0	132	0.9	1.1

1132	Narinda	1	0.960	-9.5	132	0.9	1.1
1133	Narsingdi	1	0.960	-4.9	132	0.9	1.1
1134	New Tongi	1	0.959	-12.5	132	0.9	1.1
1135	Rahim Steel	1	0.968	-9.1	132	0.9	1.1
1136	Satmasjid	1	0.947	-12.6	132	0.9	1.1
1137	Savar	1	0.970	-14.0	132	0.9	1.1
1138	Shitalakhya	1	0.956	-12.2	132	0.9	1.1
1139	Shyampur	1	0.939	-12.7	132	0.9	1.1
1140_1	Sonargaon	1	0.967	-8.8	132	0.9	1.1
1140_2	Sonargaon S/S	1	0.000	0.0	132	0.9	1.1
1141	Ullon	1	0.961	-11.8	132	0.9	1.1
1142	Uttara	1	0.946	-13.9	132	0.9	1.1
1143	Gulshan	1	0.963	-12.1	132	0.9	1.1
1201	Aminbazar 230	1	0.965	-8.7	230	0.9	1.1
1202	Meghnaghat 230	1	0.976	-6.5	230	0.9	1.1
1203	Bhulta 230	1	1.009	6.4	230	0.9	1.1
1204	Kaliakoir_230	1	1.025	24.5	230	0.9	1.1
1205	Agargaon(Old Airport)	1	0.965	-8.8	230	0.9	1.1
1206	Ghorashal_230	1	0.986	-3.3	230	0.9	1.1
1207_1	Haripur_230	1	0.977	-6.7	230	0.9	1.1
1207_2	Haripur	1	0.977	-6.8	230	0.9	1.1
1208	Hasnabad_230	1	0.967	-8.1	230	0.9	1.1
1209	Maniknagar	1	0.975	-7.1	230	0.9	1.1
1210	Rampura(Aftabnagar)_230	1	0.975	-6.8	230	0.9	1.1
1211	Siddhirganj	1	0.977	-6.8	230	0.9	1.1
1212	Tongi	1	0.965	-7.7	230	0.9	1.1
1401	Aminbazar 400	1	1.000	0.0	400	0.9	1.1
1402	Meghnaghat 400	1	1.000	0.0	400	0.9	1.1
1403	Bhulta 400	1	1.009	6.4	400	0.9	1.1
1404	Kaliakoir_400	1	1.025	24.5	400	0.9	1.1
1G01_1	Keranganj Powerpac	1	1.000	-9.1	11	0.9	1.1
1G02_1	Meghnaghat summit GT_305	1	1.000	-2.9	14.5	0.9	1.1
1G02_2	Meghnaghat summit ST_305	1	1.000	-3.1	13.8	0.9	1.1
1G02_3	Meghnaghat CCPP GT	1	1.000	-4.7	14.7	0.9	1.1
1G02_4	Meghnaghat CCPP ST	1	1.000	-5.1	14.7	0.9	1.1
1G03	Summit Rupganj	1	0.974	-12.0	11	0.9	1.1
1G04	Munshiganj Sinha	1	1.000	-8.0	11	0.9	1.1
1G05	Gazipur RPCL	1	0.994	-13.0	11	0.9	1.1
1G06_1	Ghorashal MAX	1	1.000	-0.4	11.1	0.9	1.1
1G06_2	Ghorashal unit 1_2	1	1.000	-2.7	10.5	0.9	1.1

1G06_3	Ghorashal unit 3 to 6	1	1.000	0.0	15.75	0.9	1.1
1G06_4	Ghorashal Agreko 100	1	1.000	7.1	0.44	0.9	1.1
1G06_4int	Ghorashal Agreko 100	1	0.972	-0.5	11	0.9	1.1
1G06_5	Ghorashal Agreko 45	1	1.000	1.8	0.44	0.9	1.1
1G06_5int	Ghorashal Agreko 45	1	0.961	-5.1	11	0.9	1.1
1G06_6	Ghorashal Regent	1	1.000	-0.6	11	0.9	1.1
1G06_7	Ghorashal CCPP GT	1	1.000	-2.2	13.8	0.9	1.1
1G06_8	Ghorashal CCPP ST	1	1.000	-2.5	13.8	0.9	1.1
1G07_1	Haripur EGCB GT	1	1.000	-6.5	19	0.9	1.1
1G07_2	Haripur EGCB ST	1	1.000	-6.5	13.8	0.9	1.1
1G07_3	Haripur CCPP_GT	1	1.000	-3.5	16	0.9	1.1
1G07_4	Haripur CCPP_ST	1	1.000	-4.0	11	0.9	1.1
1G07_5	Haripur GT1_2_3	1	1.000	-7.2	11	0.9	1.1
1G07_6	Haripur NEPC	1	0.990	-8.3	15	0.9	1.1
1G08	Tongi PDB	1	1.000	-10.9	11	0.9	1.1
1G11	Shiddirganj desh	1	1.000	4.4	0.6	0.9	1.1
1G11_1	Siddhirganj Peaking PP	1	1.000	-6.0	11	0.9	1.1
1G11_2	Shidhirganj ST PDB	1	1.000	-4.6	15.75	0.9	1.1
1G11_3	Sidhirganj DuchB	1	1.000	-6.1	11	0.9	1.1
1G11_4	Siddirganj 335MW CCPP GT	1	1.000	-4.2	14.5	0.9	1.1
1G11_5	Siddirganj 335MW CCPP ST	1	1.000	-3.8	14.5	0.9	1.1
1G11_int	Shiddirganj desh int	1	0.974	-5.8	11	0.9	1.1
1G18	Summit Maona	1	0.973	-13.9	11	0.9	1.1
1G23	Kodda PP	1	1.000	-10.9	11	0.9	1.1
1G25	Madanganj Summit	1	1.000	-9.0	11	0.9	1.1
1G33	Narshigdi Doreen	1	1.000	-4.3	11	0.9	1.1
1G33_1	Summit Narsighdi1	1	1.000	0.0	11	0.9	1.1
1G33_2	Summit Narsighdi2	1	0.964	-6.4	11	0.9	1.1
1G37_1	Summit Ashulia1	1	1.000	-11.4	11	0.9	1.1
1G37_2	Summit Ashulia2	1	1.000	-16.8	11	0.9	1.1
1G38	Sitalakhya Orion	1	1.000	-9.4	11	0.9	1.1
1G39_1	DPA Pagla1	1	1.000	-4.3	11	0.9	1.1
1G39_2	DPA Pagla2	1	1.000	-6.0	11	0.9	1.1
1G40	Meghnahgat IEL	1	1.000	-5.9	11	0.9	1.1
1L01	Aminbazar	1	1.000	0.0	33	0.9	1.1
1L02	New Meghnaghat Sonargaon	1	0.000	0.0	33	0.9	1.1
1L02_1	Meghnaghat Rental PP	1	1.000	0.0	33	0.9	1.1
1L03	Bhulta	1	0.940	-13.5	33	0.9	1.1
1L04	Kaliakoir	1	1.000	0.0	33	0.9	1.1
1L05	Agargaon	1	0.938	-15.2	33	0.9	1.1

1L06	Ghoashal	1	0.944	-9.6	33	0.9	1.1
1L07	Haripur	1	0.968	-10.8	33	0.9	1.1
1L08	Hasnabad	1	0.920	-19.0	33	0.9	1.1
1L09	Maniknagar	1	0.942	-12.9	33	0.9	1.1
1L10	Rampura	1	1.000	0.0	33	0.9	1.1
1L11	Siddhirganj	1	0.931	-14.2	33	0.9	1.1
1L11_2	Siddhirganj Desh Energy PP	1	1.000	0.0	33	0.9	1.1
1L11_3	Siddhirganj SS	1	1.000	0.0	33	0.9	1.1
1L11_4	Siddhirganj Dutch Bangla	1	1.000	0.0	33	0.9	1.1
1L12	Tongi	1	0.959	-16.5	33	0.9	1.1
1L13	Bangabhaban	1	0.900	-17.5	11	0.9	1.1
1L14	Basundhara	1	0.928	-16.6	33	0.9	1.1
1L15	Bhasantek (Cant)	1	0.926	-16.2	33	0.9	1.1
1L16	Cantonment (Bhashantek)	1	1.000	0.0	33	0.9	1.1
1L17	Dhanmondi	1	0.927	-18.0	33	0.9	1.1
1L18_1	Joydevpur	1	0.938	-15.4	33	0.9	1.1
1L18_2	Joydevpur	1	0.000	0.0	33	0.9	1.1
1L19_1	Kabirpur	1	0.929	-19.7	33	0.9	1.1
1L19_2	Kabirpur	1	0.942	-19.7	33	0.9	1.1
1L20	Kallyanpur	1	0.923	-21.7	33	0.9	1.1
1L21	Kamrangirchar	1	0.924	-17.6	33	0.9	1.1
1L22	Keraniganj	1	1.000	0.0	33	0.9	1.1
1L23	Kodda PP	1	0.916	-15.8	33	0.9	1.1
1L24	Lalbagh	1	0.923	-21.8	33	0.9	1.1
1L25	Madanganj	1	0.916	-15.2	33	0.9	1.1
1L26	Madartek	1	0.927	-17.4	33	0.9	1.1
1L27	Manikganj	1	0.926	-24.1	33	0.9	1.1
1L28	Matuail	1	0.903	-16.6	33	0.9	1.1
1L29_1	Mirpur	1	0.935	-19.6	33	0.9	1.1
1L29_2	Mirpur	1	1.070	-17.5	33	0.9	1.1
1L30	Moghbazar	1	0.922	-21.8	33	0.9	1.1
1L31	Munshiganj	1	0.908	-18.9	33	0.9	1.1
1L32	Narinda	1	0.910	-16.1	33	0.9	1.1
1L33	Narshingdi	1	0.944	-7.3	33	0.9	1.1
1L34	New Tongi	1	0.935	-15.5	33	0.9	1.1
1L35	Rahim Steel	1	0.935	-12.1	33	0.9	1.1
1L36	Satmasjid	1	0.909	-17.6	33	0.9	1.1
1L37	Savar	1	1.005	-18.2	33	0.9	1.1
1L38	Sitalakhya	1	0.910	-16.2	33	0.9	1.1
1L39	Shyampur	1	0.910	-18.9	33	0.9	1.1
1L40_1	Sonargaon	1	0.928	-12.3	33	0.9	1.1
1L40_2	Sonargaon SS	1	1.000	0.0	33	0.9	1.1

1L41	Ullon	1	0.909	-17.0	33	0.9	1.1
1L42	Uttara	1	0.904	-18.0	33	0.9	1.1
1L43	Gulshan	1	0.917	-19.4	33	0.9	1.1
2101	AKSPL	2	0.944	0.3	132	0.9	1.1
2103	Hathhazari_132	2	0.952	0.4	132	0.9	1.1
2105	Bakulia	2	0.954	2.7	132	0.9	1.1
2106	Baraulia	2	0.946	0.1	132	0.9	1.1
2107	Chandraghona	2	0.957	2.0	132	0.9	1.1
2108	Cox's Bazar	2	0.928	-2.2	132	0.9	1.1
2109	Dohazari	2	0.952	2.1	132	0.9	1.1
2110	Halishahar	2	0.947	1.8	132	0.9	1.1
2111	Julda	2	0.956	3.0	132	0.9	1.1
2112	KSRM	2	0.944	-0.1	132	0.9	1.1
2113	Kaptai	2	0.968	2.9	132	0.9	1.1
2114	Khagrachari	2	0.932	0.3	132	0.9	1.1
2115	Khulshi	2	0.942	1.1	132	0.9	1.1
2116	Madunaghat	2	0.949	1.3	132	0.9	1.1
2117	Modern Steel	2	0.944	1.4	132	0.9	1.1
2118	Rangamati	2	0.945	1.3	132	0.9	1.1
2119	Shahmirpur	2	0.957	3.1	132	0.9	1.1
2120	Shikalbaha	2	0.960	3.3	132	0.9	1.1
2121	TK Chemicals	2	0.953	2.3	132	0.9	1.1
2122	KYCR	2	0.943	-0.2	132	0.9	1.1
2123_1	Matarbari_T	2	0.933	-1.2	132	0.9	1.1
2123_2	Matarbari	2	0.929	-2.1	132	0.9	1.1
2201	AKSPL	2	0.933	-2.9	230	0.9	1.1
2202	BSRM	2	0.945	-2.6	230	0.9	1.1
2203	Hathazari_230	2	0.958	0.3	230	0.9	1.1
2204	Raozan	2	0.971	1.8	230	0.9	1.1
2220	Sikalbaha 230	2	0.976	9.3	230	0.9	1.1
2G03_1	Hathazari Peaking	2	0.000	0.0	11	0.9	1.1
2G03_2	Hathazari	2	1.000	6.8	11	0.9	1.1
2G04_1	Raozan RPCL PP	2	1.000	5.1	11	0.9	1.1
2G04_2	Raozan 210 MW PP	2	1.000	6.4	15.75	0.9	1.1
2G06	Baraulia_Barabkunda Regent PP	2	1.000	4.2	11	0.9	1.1
2G09	Dohazari PS	2	1.000	9.0	11	0.9	1.1
2G10	Halishar_Potenga PP	2	1.000	6.4	11	0.9	1.1
2G11	Julda RPP	2	1.000	8.4	11	0.9	1.1
2G13_1	kaptai hydro PP U1_2	2	1.000	7.8	11	0.9	1.1
2G13_2	kaptai hydro PP U3	2	1.000	7.5	11	0.9	1.1
2G13_3	kaptai hydro PP U4_5	2	1.000	7.7	11	0.9	1.1
2G20_1	Shikalbaha 150 MW PPP	2	1.000	9.9	15.75	0.9	1.1

2G20_2	SHikalbaha TPS	2	1.000	8.0	11	0.9	1.1
2G20_3	Shikalbaha ECPV	2	1.000	7.8	11	0.9	1.1
2G20_4	Sikalbaha Energis U1_4	2	1.000	10.4	11	0.9	1.1
2G20_5	Sikalbaha Energis U5_6	2	1.000	8.2	11	0.9	1.1
2G20_6	Sikalbaha CCPP GT	2	1.000	15.0	14.75	0.9	1.1
2G20_7	Sikalbaha CCPP ST	2	1.000	13.5	13.8	0.9	1.1
2G22_1	Malancha Ctg EPZ	2	1.000	7.9	11	0.9	1.1
2G22_2	Malancha Ctg EPZ	2	0.994	5.7	11	0.9	1.1
2L01_1	AKSPL	2	0.907	-3.1	33	0.9	1.1
2L01_2	AKSPL	2	0.920	-9.5	33	0.9	1.1
2L01_3	AKSPL (11 KV LOAD BUS)	2	0.903	-7.3	11	0.9	1.1
2L02	BSRM	2	0.916	-7.3	33	0.9	1.1
2L03	Hathazari	2	0.910	-6.2	33	0.9	1.1
2L05_1	Bakulia	2	0.929	-1.5	33	0.9	1.1
2L05_2	Bakulia	2	0.000	0.0	33	0.9	1.1
2L06_1	Baraulia	2	0.917	-3.6	33	0.9	1.1
2L06_2	Baraulia	2	0.000	0.0	33	0.9	1.1
2L07	Chandraghona	2	0.914	-2.9	33	0.9	1.1
2L08	Cox's Bazar	2	0.922	-7.7	33	0.9	1.1
2L09	Dohazari	2	0.921	-1.6	33	0.9	1.1
2L10_1	Halishahar	2	0.900	-3.3	33	0.9	1.1
2L10_2	Halishahar	2	0.000	0.0	33	0.9	1.1
2L11	Julda	2	0.915	-0.6	33	0.9	1.1
2L12	KSRM	2	0.914	-3.7	33	0.9	1.1
2L13	Kaptai	2	0.921	-1.2	11	0.9	1.1
2L14	Khagrachari	2	0.908	-2.5	33	0.9	1.1
2L15	Khulsi	2	0.901	-3.2	33	0.9	1.1
2L16	Madunaghat	2	0.904	-4.1	33	0.9	1.1
2L17	Modern Steel (11 KV LOAD BUS)	2	0.928	-0.1	33	0.9	1.1
2L18	Rangamati	2	0.915	-1.4	33	0.9	1.1
2L19	Shahmirpur	2	0.943	1.9	33	0.9	1.1
2L20	Sikalbaha	2	0.918	-0.4	33	0.9	1.1
2L21	TKChemical (20 KV LOAD BUS)	2	0.942	1.2	20	0.9	1.1
2L22	KYCR	2	0.919	-3.7	33	0.9	1.1
2L23	Matarbari	2	0.926	-3.6	33	0.9	1.1
2W02	BSRM Tertiary W	2	1.000	0.0	11	0.9	1.1
2W03	Hathazari Tertiary winding	2	1.000	0.0	33	0.9	1.1
3101	Ashuganj	3	0.981	1.8	132	0.9	1.1
3102	Comilla North_132	3	0.954	-6.9	132	0.9	1.1
3103	B.Baria	3	0.970	1.8	132	0.9	1.1

3104	Chandpur	3	0.950	-8.9	132	0.9	1.1
3105	Chowmuhani	3	0.920	-10.6	132	0.9	1.1
3106	Comilla South	3	0.945	-8.7	132	0.9	1.1
3107_1	Daudkandi (SS)	3	0.949	-8.4	132	0.9	1.1
3107_2	Daudkandi PP	3	0.950	-8.4	132	0.9	1.1
3108	Feni	3	0.936	-7.9	132	0.9	1.1
3201	Ashuganj 230	3	0.999	3.1	230	0.9	1.1
3202	Comilla North_230	3	0.970	-2.1	230	0.9	1.1
3401	Ashuganj 400	3	1.006	6.5	400	0.9	1.1
3G01_1	Ashuganj U1_2	3	1.000	4.5	11	0.9	1.1
3G01_10	Ashuganj Aggreko	3	1.000	8.0	0.415	0.9	1.1
3G01_10int	Ashuganj Aggreko	3	0.999	6.7	11	0.9	1.1
3G01_11	Ashuganj Modula Engines	3	1.000	5.0	11	0.9	1.1
3G01_13	AshuganjN CCPP 450 MW GT_ST	3	1.000	8.6	22	0.9	1.1
3G01_14	AshuganjS 450 MW CCPP	3	1.000	11.6	22	0.9	1.1
3G01_3	Ashuganj GT2	3	1.000	4.6	13.8	0.9	1.1
3G01_4	Ashuganj CCPP GT	3	1.000	5.2	15.75	0.9	1.1
3G01_5	Ashuganj CCPP ST	3	1.000	5.7	11	0.9	1.1
3G01_6	Ashuganj Precision	3	1.000	5.8	11	0.9	1.1
3G01_7	Ashuganj engines	3	1.000	5.5	11	0.9	1.1
3G01_8	Ashuganj Midland	3	1.022	6.5	11	0.9	1.1
3G01_9	Ashuganj United	3	1.000	6.8	11	0.9	1.1
3G02_1	Comilla chandina (kutumbpur)	3	0.948	-8.3	11	0.9	1.1
3G02_2	Comilla chandina (kutumbpur)	3	0.966	-7.1	11	0.9	1.1
3G03	B. Baria Aggreko	3	1.000	11.0	0.415	0.9	1.1
3G03_int	B. Baria Aggreko int	3	0.993	9.5	11	0.9	1.1
3G04	B. Baria Aggreko	3	1.000	9.0	0.415	0.9	1.1
3G04_1	Chandpur CCPP_GT	3	1.000	-4.6	15	0.9	1.1
3G04_2	Chandpur CCPP ST	3	1.000	-4.8	11	0.9	1.1
3G04_int	B. Baria Aggreko	3	0.992	7.5	11	0.9	1.1
3G06	Comilla S(Jangalia)	3	0.986	-8.6	11	0.9	1.1
3G07	Daudkandi Peaking	3	1.000	-4.4	11	0.9	1.1
3G08_1	Doreen Feni	3	0.983	-8.0	11	0.9	1.1
3G08_2	Doreen Mohipal	3	0.980	-11.5	11	0.9	1.1
3G09	Lakdamvi	3	1.000	-2.5	11	0.9	1.1
3GG01_2	Ashuganj U345	3	1.000	7.3	15.75	0.9	1.1
3L01	Ashuganj	3	0.963	0.2	33	0.9	1.1
3L02	Comilla North	3	0.932	-9.4	33	0.9	1.1
3L03	B.Baria	3	0.907	-3.5	33	0.9	1.1

3L04	Chandpur	3	0.911	-14.0	33	0.9	1.1
3L05	Choumuhoni	3	0.904	-14.9	33	0.9	1.1
3L06_1	Comilla South	3	0.920	-13.1	33	0.9	1.1
3L06_2	Comilla South	3	0.980	-13.8	33	0.9	1.1
3L07	Daudkandi SS	3	0.901	-12.6	33	0.9	1.1
3L08	Feni	3	0.930	-12.2	33	0.9	1.1
3W02	Comilla North Twinding	3	1.000	0.0	33	0.9	1.1
4101	Jamalpur	4	0.946	-9.6	132	0.9	1.1
4102	Kishoreganj	4	0.945	-3.6	132	0.9	1.1
4103	Mymensingh	4	0.947	-8.0	132	0.9	1.1
4104	Netrakona	4	0.939	-9.4	132	0.9	1.1
4105	RPCL	4	0.883	-18.1	132	0.9	1.1
4106	Sherpur	4	0.941	-10.2	132	0.9	1.1
4107	Tangail	4	0.915	-17.5	132	0.9	1.1
4G01	Jamalpur 95MW PP	4	1.000	-4.2	11	0.9	1.1
4G03_1	Mymensingh RPCL_1	4	1.000	-3.3	10.5	0.9	1.1
4G03_2	Mymensingh RPCL_2	4	1.000	-4.0	11	0.9	1.1
4G03_3	Mymensingh RPCL_3	4	1.000	0.0	11	0.9	1.1
4G07	Doreen Tangail	4	0.929	-18.5	11	0.9	1.1
4L01_1	Jamalpur	4	0.918	-14.2	33	0.9	1.1
4L01_2	Jamalpur	4	0.962	-12.5	33	0.9	1.1
4L02_1	Kisoreganj	4	0.910	-6.7	33	0.9	1.1
4L02_2	Kisoreganj	4	0.000	0.0	33	0.9	1.1
4L03	Mymensing	4	0.903	-13.6	33	0.9	1.1
4L04_1	Netrakona	4	0.953	-13.2	33	0.9	1.1
4L04_2	Netrakona	4	0.923	-13.3	33	0.9	1.1
4L06	Sherpur	4	0.924	-13.7	33	0.9	1.1
4L07	Tangail	4	0.902	-20.7	33	0.9	1.1
5102_1	Fenchuganj_132	5	0.980	8.7	132	0.9	1.1
5102_2	Fenchuganj P/S	5	0.982	8.9	132	0.9	1.1
5103	Bianibazar(2017)	5	0.938	4.8	132	0.9	1.1
5104	Chatak	5	0.943	5.1	132	0.9	1.1
5105	Kulaura	5	0.968	8.1	132	0.9	1.1
5106	Shahjibazar	5	0.988	8.6	132	0.9	1.1
5107	Srimongal	5	0.970	7.7	132	0.9	1.1
5108	Sunamganj	5	0.923	3.9	132	0.9	1.1
5109	Sylhet	5	0.962	6.1	132	0.9	1.1
5110	Sylhet South(2017)	5	0.958	5.9	132	0.9	1.1
5201	Bibiyana 230	5	0.983	9.5	230	0.9	1.1
5202	Fenchuganj_230	5	0.982	9.4	230	0.9	1.1
5401	Bibiyana 400	5	1.008	24.6	400	0.9	1.1
5G01_1	Bibiyana summit GT	5	1.000	28.5	15	0.9	1.1
5G01_2	BIbiyana summit ST	5	1.000	28.0	13.8	0.9	1.1

5G01_3	Bibiyana south 383 CCPP GT	5	1.000	29.1	13.8	0.9	1.1
5G01_4	Bibiyana south 383 CCPP ST	5	1.000	28.0	13.8	0.9	1.1
5G02_1	Fenchuganj CCPP1 GT	5	1.000	11.7	11.5	0.9	1.1
5G02_2	Fenchuganj CCPP1 ST	5	1.000	11.2	11.5	0.9	1.1
5G02_3	Fenchuganj CCPP2 GT	5	1.000	11.3	11	0.9	1.1
5G02_4	Fenchuganj CCPP2 ST	5	1.000	11.4	11	0.9	1.1
5G02_5	Fenchuganj BARAKAT	5	1.000	14.5	11	0.9	1.1
5G02_6	Fenchuganj EPRIMA	5	1.000	12.5	11	0.9	1.1
5G06_1	Shahjibazar CCPP GT	5	1.000	12.0	14.5	0.9	1.1
5G06_2	Shahjibazar CCPP ST	5	1.000	12.0	14.5	0.9	1.1
5G06_3	Shahjibazar U8_9 GT	5	1.000	12.3	11.12	0.9	1.1
5G06_4	Shahjibazar Eprima	5	1.000	12.2	11	0.9	1.1
5G06_5	Shahjibazar 86 MW	5	1.000	11.9	11	0.9	1.1
5G06_6	Habiganj Confidence	5	1.000	8.6	11	0.9	1.1
5G09_1	Sylhet desh energy	5	0.989	5.5	11	0.9	1.1
5G09_2	Sylhet 150 MW	5	1.000	6.7	15.75	0.9	1.1
5G09_3	Sylhet 20 MW GT	5	1.000	7.5	11	0.9	1.1
5G09_4	Sylhet Eprima	5	1.000	9.8	11	0.9	1.1
5G09_5	Sylhet Shajanullah	5	0.984	5.6	11	0.9	1.1
5L02_1	Fenchuganj	5	0.932	4.6	33	0.9	1.1
5L02_2	Fenchuganj	5	0.936	4.9	33	0.9	1.1
5L03	Bianibazar	5	0.925	3.6	33	0.9	1.1
5L04_1	Chatak	5	0.915	2.5	33	0.9	1.1
5L04_2	Chatak	5	0.918	2.8	33	0.9	1.1
5L05	Kulaura	5	0.923	4.2	33	0.9	1.1
5L06	Shahjibazar	5	0.958	5.9	33	0.9	1.1
5L07	Srimongol	5	0.916	3.1	33	0.9	1.1
5L08	Sunamganj	5	0.906	2.4	33	0.9	1.1
5L09	Sylhet	5	0.939	3.4	33	0.9	1.1
6101_1	Bheramara 132	6	0.992	-7.0	132	0.9	1.1
6101_2	Bheramara PGCB (GK)	6	0.991	-7.0	132	0.9	1.1
6101_3	Bheramara 132 HVDC	6	0.996	-6.5	132	0.9	1.1
6102	Khulna South_132	6	0.996	-11.2	132	0.9	1.1
6103	Bagerhat	6	0.960	-26.4	132	0.9	1.1
6104	Bottail	6	0.000	0.0	132	0.9	1.1
6105	Chuadanga	6	0.932	-22.2	132	0.9	1.1
6106_1	Faridpur	6	0.950	-18.4	132	0.9	1.1
6106_2	Faridpur PP	6	0.951	-18.4	132	0.9	1.1
6107	Gallamari	6	0.992	-11.4	132	0.9	1.1
6108	GK Project	6	0.000	0.0	132	0.9	1.1
6109_1	Goalpara	6	0.986	-25.1	132	0.9	1.1

6109_2	Goalpara SS (NWPGCL)	6	0.986	-25.1	132	0.9	1.1
6110_1	Gopalganj (SS)	6	0.980	-21.7	132	0.9	1.1
6110_2	Gopalganj PP	6	0.981	-21.6	132	0.9	1.1
6111	Jessore	6	0.956	-24.8	132	0.9	1.1
6112	Jhenidah	6	0.943	-20.0	132	0.9	1.1
6113	Khulna Central	6	0.987	-25.1	132	0.9	1.1
6114	Kustia	6	0.960	-12.0	132	0.9	1.1
6115	Magura	6	0.939	-21.1	132	0.9	1.1
6116	Mongla	6	0.938	-27.4	132	0.9	1.1
6117_1	Noapara (SS)	6	0.970	-25.2	132	0.9	1.1
6117_2	Noapara PP	6	0.970	-25.2	132	0.9	1.1
6118	Satkhira	6	1.022	-15.6	132	0.9	1.1
6119	Madaripur	6	0.963	-22.8	132	0.9	1.1
6201	Bheramara_230 HVDC	10	1.016	-4.1	230	0.9	1.1
6202	Khulna South_230	6	1.005	-8.6	230	0.9	1.1
6401	Bheramara HVDC (400)	6	0.000	0.0	400	0.9	1.1
6G01_1	Bheramara PDB_1	6	1.000	-5.0	10.5	0.9	1.1
6G01_2	Bheramara PDB_2	6	1.000	-5.3	11.5	0.9	1.1
6G01_4	Bheramara OTOBI RPP	6	0.000	0.0	11	0.9	1.1
6G01_5	Bheramara 414 CCPP GT	6	1.000	-3.9	18	0.9	1.1
6G01_6	Bheramara 414 CCPP ST	6	1.000	-3.9	14.5	0.9	1.1
6G06_1	Faridpur	6	0.975	-17.3	11	0.9	1.1
6G06_2	Faridpur	6	0.974	-17.3	11	0.9	1.1
6G09_1	Goalpara KPCL-110	6	1.000	-21.8	15	0.9	1.1
6G09_2	Goalpara Aggreko	6	1.000	-24.9	0.415	0.9	1.1
6G09_2int	Goalpara Aggreko	6	0.992	-25.4	11	0.9	1.1
6G09_3	Goalpara 30	6	0.000	0.0	11	0.9	1.1
6G09_4	Goalpara Aggreko	6	1.000	-25.1	0.415	0.9	1.1
6G09_4int	Goalpara Aggreko	6	0.992	-25.7	11	0.9	1.1
6G09_5	Goalpara Aggreko	6	1.000	-26.5	0.415	0.9	1.1
6G09_5int	Goalpara Aggreko	6	0.977	-27.0	11	0.9	1.1
6G10	Gopalganj PEAK	6	1.000	-18.9	11	0.9	1.1
6G13_1	Khulna KPCL-2	6	1.000	-22.3	11	0.9	1.1
6G13_2	Khulna NWPGCL	6	1.000	-22.4	15	0.9	1.1
6G17_1	Noapara	6	1.000	-22.0	11	0.9	1.1
6G17_2	Noapara	6	1.000	-25.3	11	0.9	1.1
6L01	Bheramara PGCB (GK)	6	0.964	-9.3	33	0.9	1.1
6L03	Bagerhat	6	0.900	-31.5	33	0.9	1.1
6L04	Bottail	6	0.000	0.0	33	0.9	1.1
6L05	Chuadanga	6	0.929	-25.9	33	0.9	1.1
6L06	Faridpur	6	0.921	-21.9	33	0.9	1.1
6L07	Gallamari	6	0.948	-15.1	33	0.9	1.1
6L08	GK Project	6	0.000	0.0	33	0.9	1.1

6L09	Goalpara	6	0.967	-27.3	33	0.9	1.1
6L10	Gopalganj	6	0.966	-25.5	33	0.9	1.1
6L11_1	Jessore	6	0.910	-28.8	33	0.9	1.1
6L11_2	Jessore	6	0.000	0.0	33	0.9	1.1
6L12_1	Jhenaidah	6	0.929	-23.0	33	0.9	1.1
6L12_2	Jhenaidah	6	0.000	0.0	33	0.9	1.1
6L13	Khulna C	6	1.048	-29.4	33	0.9	1.1
6L14	Kustia	6	0.917	-15.7	33	0.9	1.1
6L15	Magura	6	0.939	-23.6	33	0.9	1.1
6L16	Mongla	6	0.904	-30.4	33	0.9	1.1
6L17_1	Noapara	6	0.966	-25.3	33	0.9	1.1
6L17_2	Noapara	6	0.938	-28.6	33	0.9	1.1
6L18	Satkhira	6	0.984	-18.7	33	0.9	1.1
6L19	Madaripur	6	0.925	-26.1	33	0.9	1.1
7101	Barisal North_132	7	0.996	-23.4	132	0.9	1.1
7103	Barisal	7	0.999	-24.0	132	0.9	1.1
7104	Bhandaria	7	0.960	-26.1	132	0.9	1.1
7105	Patuakhali	7	1.020	-22.8	132	0.9	1.1
7201	Barisal North	7	0.998	-22.1	230	0.9	1.1
7202	Bhola	7	0.998	-21.2	230	0.9	1.1
7G02_1	Bhola CCPP_ST	7	1.000	-19.4	11.5	0.9	1.1
7G02_2	Bhola CCPP_GT	7	1.000	-19.5	11.5	0.9	1.1
7G03_1	Barisal PDB_1	7	1.000	-21.5	11	0.9	1.1
7G03_3	Barishal summit	7	1.000	-19.3	11	0.9	1.1
7G03_4	Barishal summit	7	1.000	-17.9	11	0.9	1.1
7G05	Bhola Venture	7	1.083	-24.5	11	0.9	1.1
7L01	Barisal North	7	0.000	0.0	33	0.9	1.1
7L02	Bhola	7	0.950	-25.2	33	0.9	1.1
7L03	Barisal	7	1.010	-28.7	33	0.9	1.1
7L04	Bhandaria	7	0.921	-29.5	33	0.9	1.1
7L05_1	Patuakhali	7	1.097	-26.2	33	0.9	1.1
7L05_2	Patuakhali	7	1.078	-27.2	33	0.9	1.1
8101	Baghabari_132	8	0.974	-7.3	132	0.9	1.1
8102	Bogra (old)_132	8	0.963	-10.2	132	0.9	1.1
8103	Ishwardi_132	8	0.997	-6.0	132	0.9	1.1
8104	Naogaon	8	0.934	-14.9	132	0.9	1.1
8105	Sirajganj	8	0.960	-9.2	132	0.9	1.1
8106	Amnura (SS+PP)	8	0.995	-0.1	132	0.9	1.1
8107_1	BERA PP	8	0.977	-7.1	132	0.9	1.1
8107_2	BeraPP_T	8	0.977	-7.1	132	0.9	1.1
8108	Bogra New_132	8	0.963	-10.2	132	0.9	1.1
8110	Chapai Nawabganj	8	1.000	-0.1	132	0.9	1.1
8111	Joypurhat	8	0.921	-17.2	132	0.9	1.1

8112	Natore	8	0.982	-5.4	132	0.9	1.1
8113	Niyamatpur	8	0.914	-18.8	132	0.9	1.1
8114	Pabna	8	0.968	-7.5	132	0.9	1.1
8116	Shahjadpur	8	0.969	-7.6	132	0.9	1.1
8117	Rajshahi	8	1.005	-1.1	132	0.9	1.1
8201	Baghabari_230	8	1.001	-3.4	230	0.9	1.1
8202	Bogra(New)_230	8	0.983	-6.5	230	0.9	1.1
8203	Ishwardi_230	8	1.013	-4.1	230	0.9	1.1
8205	Sirajganj_230(SW)	8	0.998	-2.2	230	0.9	1.1
8G01_1	Baghabari WMONT_1	8	0.000	0.0	11	0.9	1.1
8G01_2	Baghabari WMONT_2	8	0.000	0.0	11	0.9	1.1
8G01_3	Baghabari PEK	8	1.000	3.3	11	0.9	1.1
8G01_4	Baghabari SBU PDB_1	8	1.000	2.7	11.5	0.9	1.1
8G01_5	Baghabari SBU PDB_2	8	1.000	3.1	11.5	0.9	1.1
8G02_1	Bogra Old RPP	8	1.000	-6.7	11	0.9	1.1
8G02_2	Bogra Old prima UJ	8	1.000	-3.8	11	0.9	1.1
8G02_3	Bogra Old Prima UW	8	1.000	-4.4	0.4	0.9	1.1
8G02_4	Bogra Old Prima UD	8	0.976	-11.9	0.66	0.9	1.1
8G04	Santahar Peaking	8	0.997	-11.0	11	0.9	1.1
8G05_1	Sirajganj NWPGCL	8	1.000	6.1	15.75	0.9	1.1
8G05_2	Sirajganj NWPGCL ST	8	1.000	6.1	10.5	0.9	1.1
8G05_3	Summit Ullapara	8	0.961	-11.2	11	0.9	1.1
8G06	Amnura RPP	8	1.000	5.2	11	0.9	1.1
8G07	BERA PEAK	8	1.000	-2.8	11	0.9	1.1
8G07_1	Rajshahi NPS	8	1.000	2.3	11	0.9	1.1
8G07_2	Rajshahi PEAK	8	1.000	3.2	11	0.9	1.1
8G10	Chapainawabganj	8	1.000	1.9	11	0.9	1.1
8G12	Natore RAJ	8	1.000	0.1	11	0.9	1.1
8G13	Shajadpur	8	0.000	0.0	11	0.9	1.1
8L01	Baghabari	8	0.000	0.0	33	0.9	1.1
8L02_1	Bogra Old	8	0.931	-13.5	33	0.9	1.1
8L02_2	Bogra Old	8	0.988	-5.9	33	0.9	1.1
8L02_3	Bogra Old	8	1.000	-6.7	33	0.9	1.1
8L03_1	Ishwardi	8	0.966	-8.6	33	0.9	1.1
8L03_2	Ishwardi	8	0.941	-10.6	33	0.9	1.1
8L04_1	Naogaon	8	0.906	-19.0	33	0.9	1.1
8L04_2	Naogaon	8	0.944	-17.3	33	0.9	1.1
8L05_1	Sirajganj	8	0.941	-10.9	33	0.9	1.1
8L05_2	Sirajganj	8	0.946	-11.9	33	0.9	1.1
8L06	Amnura	8	0.908	-7.1	33	0.9	1.1
8L08	Bogra New	8	1.000	0.0	33	0.9	1.1
8L10_1	C. Nawabganj	8	1.017	-2.7	33	0.9	1.1
8L10_2	C. Nawabganj	8	0.991	-3.0	33	0.9	1.1

8L11	Joupurhat	8	0.916	-20.9	33	0.9	1.1
8L12_1	Natore	8	0.973	-9.3	33	0.9	1.1
8L12_2	Natore	8	0.956	-9.9	33	0.9	1.1
8L13	Niyamatpur	8	0.902	-23.7	33	0.9	1.1
8L14	Pabna	8	0.922	-11.4	33	0.9	1.1
8L16_1	Shahjadpur	8	0.934	-10.7	33	0.9	1.1
8L16_2	Shahjadpur	8	0.927	-11.3	33	0.9	1.1
8L16_3	Shahjadpur	8	0.923	-11.6	33	0.9	1.1
8L17_1	Rajshahi	8	0.988	-6.2	33	0.9	1.1
8L17_2	Rajshahi	8	0.993	-4.8	33	0.9	1.1
9101	Barapukuria_132	9	0.982	-14.2	132	0.9	1.1
9102	Lalmonirhat	9	0.941	-19.7	132	0.9	1.1
9103	Panchagar	9	1.014	-23.8	132	0.9	1.1
9104	Purbasadipur	9	0.990	-20.5	132	0.9	1.1
9105	Rangpur	9	0.970	-17.2	132	0.9	1.1
9106	Saidpur	9	0.981	-18.3	132	0.9	1.1
9107	Thakurgaon	9	1.000	-22.4	132	0.9	1.1
9115	Palashbari	9	0.961	-14.8	132	0.9	1.1
9201	Barapukuria_230	9	0.984	-9.3	230	0.9	1.1
9G01_1	Barapukuria	9	1.000	-5.1	13.8	0.9	1.1
9G01_2	Barapukuria	9	1.000	-5.1	13.8	0.9	1.1
9G05	Rangpur	9	1.000	-13.3	11	0.9	1.1
9G06	Saidpur	9	1.000	-14.4	11	0.9	1.1
9G07_1	Thakurgaon	9	1.000	-18.5	0.44	0.9	1.1
9G07_2	Thakurgaon	9	1.000	-18.5	0.44	0.9	1.1
9G07_int	Thakurgaon	9	1.000	-19.3	11	0.9	1.1
9L01_1	Barapukuria	9	0.953	-16.7	33	0.9	1.1
9L01_2	Barapukuria	9	0.965	-15.8	33	0.9	1.1
9L02_1	Lalmonirhat	9	0.924	-22.6	33	0.9	1.1
9L02_2	Lalmonirhat	9	0.000	0.0	33	0.9	1.1
9L02_3	Lalmonirhat	9	0.000	0.0	33	0.9	1.1
9L03	Panchagarh	9	1.042	-25.4	33	0.9	1.1
9L04_1	Purbasadipur	9	1.056	-23.1	33	0.9	1.1
9L04_2	Purbasadipur	9	1.034	-23.6	33	0.9	1.1
9L04_3	Purbasadipur	9	0.985	-24.3	33	0.9	1.1
9L05_1	Rangpur	9	0.955	-21.2	33	0.9	1.1
9L05_2	Rangpur	9	1.001	-18.0	33	0.9	1.1
9L06_1	Saidpur	9	0.979	-23.0	33	0.9	1.1
9L06_2	Saidpur	9	1.037	-23.4	33	0.9	1.1
9L07	Thakurgaon	9	1.004	-25.5	33	0.9	1.1
9L15_1	Palashbari	9	0.946	-18.6	33	0.9	1.1
9L15_2	Palashbari	9	0.970	-19.6	33	0.9	1.1

TRANSFORMER INFORMATION

ID	Bus From	Bus To	DBase ID	Duplic	Min Tap	Max Tap	Number of Tap
1T1	9103	9L03	PANCHAGARH 2X25/41	2	90	110	99
1T10	9115	9L15_2	PALASHBARI 2X15/20	2	90	110	99
1T100	1129	1L29_1	MIRPUR 2X50/75	2	90	110	99
1T101	1129	1L29_2	MIRPUR 1X35/50	1	90	110	99
1T102	1137	1L37	SAVAR 2X50/75	2	90	110	99
1T103	1134	1L34	NEW TONGI 2X80/120	2	90	110	99
1T104	1112	1L12	TONGI 3X50/75	3	90	110	99
1T105	1140_1	1L40_1	SONARGAON 2X50/75	2	90	110	99
1T106	1107	1L07	HARIPUR 2X80/120	2	90	110	99
1T107_1	1103	1L03	BHULTA 3X50/75	3	90	110	99
1T108	1133	1L33	NARSHINGDI 2X 50/75	2	90	110	99
1T109	1111_1	1L11	SIDDHIRGANJ 2X80/120	2	90	110	99
1T11	9102	9L02_1	LALMONIRHAT 2X50/75	2	90	110	99
1T110	1139	1L39	SHYAMPUR 4X50/75	4	90	110	99
1T111	1108	1L08	HASNABAD 3X66/100	3	90	110	99
1T112	1131	1L31	MUNSHIGANJ 2X50/75	2	90	110	99
1T113	1109	1L09	MANIKNAGAR 2X80/120	2	90	110	99
1T114	1141	1L41	ULLON 3X35/50	3	90	110	99
1T115	2103	2L03	HATHAZARI 2X50/75	2	90	110	99
1T116	2115	2L15	KHULSHI 3X80/120	3	90	110	99
1T117	2110	2L10_1	HALISHAHAR 3X50/75	3	90	110	99
1T119	2106	2L06_1	BARAULIA 3X50/75	3	90	110	99
1T121	2119	2L19	SHAHMIRPUR 2X48/64	2	90	110	99
1T122	2111	2L11	JULDA 1X48/64	1	90	110	99
1T124	2105	2L05_1	BAKULIA 2X50/75	2	90	110	99
1T125	2116	2L16	MADUNAGHAT 2X25/41	2	90	110	99

1T126	2109	2L09	DOHAZARI 2X 50/75	2	90	110	99
1T127	2108	2L08	COXSBAZAR 2X25/41	2	90	110	99
1T128	2107	2L07	CHANDRAGHONA 2X15/20	2	90	110	99
1T129	2101	2L01_1	ABUL KHAIR 1X25/30	1	90	110	99
1T130	2112	2L12	KSRM 1X30/50	1	90	110	99
1T133	2121	2L21	TK PAPER 1X50/75	1	90	110	99
1T134	2117	2L17	MODERN STEEL 1X50/75	1	90	110	99
1T135	1124	1L24	LALBAGH 2X50/75	2	90	110	99
1T136	1126	1L26	MADARTEK 2X50/75	2	90	110	99
1T137_1	1117	1L17	DHANMONDI 50/75	1	90	110	99
1T137_2	1117	1L17	DHANMONDI 2X50/75	2	90	110	99
1T138_1	1130	1L30	MOGHBAZAR 50/75_1	1	90	110	99
1T138_2	1130	1L30	MOGHBAZAR 50/75_2	1	90	110	99
1T138_3	1130	1L30	MOGHBAZAR 50/75_3	1	90	110	99
1T139	1113	1L13	BANGABHABAN 2X 28/35	2	90	110	99
1T14	8113	8L13	NIYAMOTPUR 2X35/50	2	90	110	99
1T140	1125	1L25	MADANGANJ 2X80/120	2	90	110	99
1T141	1128	1L28	MATUAIL 2X50/75	2	90	110	99
1T142	1132	1L32	NARINDA 2X50/75	2	90	110	99
1T143	1138	1L38	SITALAKHYA 2X80/120	2	90	110	99
1T144	1142	1L42	UTTARA 2X80/120	2	90	110	99
1T145	1114	1L14	BASHUNDHARA 3X80/120	3	90	110	99
1T146	1106	1L06	GHORASHAL 2X 41/63	2	90	110	99
1T147	1135	1L35	RAHIM STEEL 1X50/75	1	90	110	99
1T148	2120	2L20	SHIKALBAHA 2X 25/41.6	2	90	110	99
1T149	2113	2L13	KAPTAI 1X 15/20	1	90	110	99
1T15	8111	8L11	JOYPURHAT 2X25/41	2	90	110	99
1T150	2122	2L22	KYCR 1X 35/50	1	90	110	99

1T151	5103	5L03	BIYANIBAZAR 2X 50/75	2	90	110	99
1T152	5108	5L08	SUBAMGANJ 2X 25/41	2	90	110	99
1T153	3101	3L01	ASHUGANJ 2X50/75	2	90	110	99
1T154	1116	1L15	BHASHANTEK 2X 80/120	2	90	110	99
1T155	1121	1L21	KAMRANGIRCHAR 2X 50/75	2	90	110	99
1T156	1123	1L23	KODDA 4X50/75	4	90	110	99
1T157	2123_2	2L23	MATARBARI 2X 25/41	2	90	110	99
1T158	8102	8L02_2	BOGRA EPRIMA2 1X30	1	90	110	99
1T16	8102	8L02_1	BOGRA OLD 2X80/120	2	90	110	99
1T19	8112	8L12_1	NATORE 2X25/41	2	90	110	99
1T2	9107	9L07	THAKURGOAN 2X 50/75	2	90	110	99
1T20	8112	8L12_2	NATORE 1X35/50	1	90	110	99
1T21	8117	8L17_1	RAJSHAHI 1X35/50	1	90	110	99
1T22	8117	8L17_2	RAJSHAHI 2X50/75	2	90	110	99
1T23	8106	8L06	AMNURA 1X35/50	1	90	110	99
1T24	8110	8L10_1	CHAPAI 1X25/41	1	90	110	99
1T25	8110	8L10_2	CHAPAI 3X15/20	3	90	110	99
1T26	8104	8L04_1	NAOGAON 2X50/75	2	90	110	99
1T27	8104	8L04_2	NAOGAON 1X25/41	1	90	110	99
1T28	9104	9L04_1	PURBASADIPUR 1X15/20	1	90	110	99
1T29	9104	9L04_2	PURBASADIPUR 1X25/41	1	90	110	99
1T30	9104	9L04_3	PURBASADIPUR 1X50/75	1	90	110	99
1T31	9101	9L01_1	BARAPUKURIA 2X25/41	2	90	110	99
1T32	9101	9L01_2	BARAPUKURIA 1X12.5/16.66	1	90	110	99
1T33	8105	8L05_1	SIRAJGONJ 1X 15/20	2	90	110	99
1T34	8105	8L05_2	SIRAJGANJ 2X25/41	2	90	110	99
1T35	8114	8L14	PABNA 2X 50/75	2	90	110	99
1T36	8116	8L16_1	SHAJADPUR 2X15/20	2	90	110	99
1T37	8116	8L16_2	SHAJADPUR 1X25/41	1	90	110	99

1T38	8116	8L16_3	SHAJADPUR 1X35/50	1	90	110	99
1T39	8103	8L03_1	ISHWARDI 1X25/41	1	90	110	99
1T4	9106	9L06_1	SAIDPUR 2X25/41	2	90	110	99
1T40	8103	8L03_2	ISHWARDI 2X10/13.3	2	90	110	99
1T41	4106	4L06	SHERPUR 2X35/50	2	90	110	99
1T42	4101	4L01_1	JAMALPUR 3X25/41	3	90	110	99
1T43	4101	4L01_2	JAMALPUR 1X15/20	1	90	110	99
1T44	4104	4L04_1	NETROKONA 1X25/33	1	90	110	99
1T45	4104	4L04_2	NETROKONA 2X25/41	2	90	110	99
1T46	4103	4L03	MYMENSHINGH 3X50/75	3	90	110	99
1T47	4102	4L02_1	KISHOREGANJ 2X50/75	2	90	110	99
1T49	4107	4L07	TANGAIL 3X50/75	3	90	110	99
1T5	9106	9L06_2	SAIDPUR 1X35/50	1	90	110	99
1T50	1127	1L27	MANIKGANJ 3X35/50	3	90	110	99
1T51	1119	1L19_1	KABIRPUR 2X50/75	2	90	110	99
1T52	1119	1L19_2	KABIRPUR 1X50/83	1	90	110	99
1T53	1118	1L18_1	JOYDEVPUR 3X50/75	3	90	110	99
1T55	3104	3L04	CHADPUR 2X50/75	2	90	110	99
1T56	3105	3L05	CHOWMUHUNI 4X50/75	4	90	110	99
1T57	3108	3L08	FENI 2X 50/75	2	90	110	99
1T58	3102	3L02	COMILLA_N 2X 50/75	2	90	110	99
1T59	3106	3L06_1	COMILLA_S 2X 50/75	2	90	110	99
1T6	9105	9L05_1	RANGPUR 2X50/75	2	90	110	99
1T60	3106	3L06_2	COMILLA_S 2X 25/41	2	90	110	99
1T61	3107_1	3L07	DAUDKANDI 2X 50/75	2	90	110	99
1T62	3103	3L03	B.BARIA 3X 25/41	3	90	110	99
1T63	7103	7L03	BARISHAL 2X 50/75	2	90	110	99
1T64	7105	7L05_1	PATUAKHALI 1X 25/41	1	90	110	99
1T65	7105	7L05_2	PATUAKHALI 2X 15/20	2	90	110	99

1T66	7104	7L04	BHANDARIA 1X50/75	1	90	110	99
1T67	5105	5L05	KULAURA 2X 25/41	2	90	110	99
1T68	5106	5L06	SHAHJIBAZAR 2X50/75	2	90	110	99
1T69	5107	5L07	SREEMONGAL 1X50/75	1	90	110	99
1T7	9105	9L05_2	RANGPUR 2X10/13.3	2	90	110	99
1T70	5102_1	5L02_1	FENCHGANJ 1X 15/20	1	90	110	99
1T71	5102_1	5L02_2	FENCHGANJ 1X 25/41	1	90	110	99
1T73	5109	5L09	SYLHET 2X80/120	2	90	110	99
1T74	5104	5L04_1	CHHATAK 2X 15/20	2	90	110	99
1T75	5104	5L04_2	CHHATAK 1X 25/41	1	90	110	99
1T76	6114	6L14	KUSTIA 2X 50/75	2	90	110	99
1T77	6115	6L15	MAGURA 2X 25/41	2	90	110	99
1T78	6105	6L05	CHUADANGA 2X 25/41	2	90	110	99
1T79_1	6112	6L12_1	JHENAIDAH 2X50/75	2	90	110	99
1T80	6117_1	6L17_1	NOAPARA 2X25/41	2	90	110	99
1T81	6117_1	6L17_2	NOAPARA 1X 44.1/63	1	90	110	99
1T82	6111	6L11_1	JESSORE 2X80/120	2	90	110	99
1T84	6107	6L07	GALLAMRI 2X50/75	2	90	110	99
1T85	6116	6L16	MONGLA 2X 25/41	2	90	110	99
1T86	6103	6L03	BAGERHAT 2X 25/41	2	90	110	99
1T87	6113	6L13	KHULNA_C 3X 48/64	3	90	110	99
1T88	6109_1	6L09	GOALPARA 1X80/120	1	90	110	99
1T89	6118	6L18	SATKHIRA 2X50/75	2	90	110	99
1T9	9115	9L15_1	PALASHBARI 2X25/41	2	90	110	99
1T90	6119	6L19	MADARIPUR 3X50/75	3	90	110	99
1T91	6110_1	6L10	GOPALGANJ 2X25/41	2	90	110	99
1T92	6106_1	6L06	FARIDPUR 2X50/75	3	90	110	99
1T93	6101_2	6L01	BHERAMARA PGCB-GKI 3X25/41	3	90	110	99
1T94	6108	6L08	BHERAMA GK 1X15/20	1	90	110	99

1T95	1105	1L05	AGARGAON 2X80/120	2	90	110	99
1T96	1116	1L16	CANTONMENT 2X80/120	2	90	110	99
1T97	1136	1L36	SATMASJID 1X80/120	1	90	110	99
1T98	1143	1L43	GULSHAN 2X80/120	2	90	110	99
1T99	1120	1L20	KALLYANPUR 3X50/75	3	90	110	99
1U1	1G23	1123	KODDA 4X80/80	4	90	110	99
1U10	1G07_5	1107	HARIPUR 3X50	3	90	110	99
1U11	1G06_1	1206	GHORASHAL MAX 1X 133	1	90	110	99
1U12	1G25	1125	MADANGANJ SUMMIT 3X 40/50	3	90	110	99
1U13	1G11	1G11_int	SHIDDIRGANJ DESH 32X 4.5	32	90	110	99
1U14	1G11_int	1111_2	SHIDDIRGANJ DESH 5X 35	5	90	110	99
1U15	1G06_2	1106	GHORASHAL U1_2 2X 70	2	90	110	99
1U16	1G06_3	1206	GHORASHAL U3_6 8 X 125	8	90	110	99
1U17	1G06_4	1G06_4int	GHORASHAL AGG 100MW 32X 6.3	32	90	110	99
1U18	1G06_4int	1106	GHORASHAL AGG 100MW 4X25	4	90	110	99
1U19	1G06_5	1G06_5int	GHORASHAL AGG 45MW 16X 6.3	16	90	110	99
1U2	1G07_3	1207_1	HARIPUR 360MW 320	1	90	110	99
1U20	1G06_5int	1L06	GHORASHAL AGG 45 MW 2X 25	2	90	110	99
1U21	1G06_6	1206	GHORASHAL REGNT 2X75/80	2	90	110	99
1U22	1G08	1112	TONGI PDB 4X55/75	4	90	110	99
1U23	1G07_6	1107	HARIPUR NEPC 8X80	8	90	110	99
1U24	1G02_3	1202	MEGHNAGHAT CCPP GT 2X180	2	90	110	99
1U25	1G02_4	1202	MEGHNAGHAT CCPP ST 1X240	1	90	110	99
1U26	1G01_1	1122	KERANIGANJ POWERPAC 3X55	3	90	110	99
1U27	1G33	1L33	NARSINGDI 1X30/35	1	90	110	99

1U28	1G04	1131	MUNSHIGANJ SINHA 1X55/75	1	90	110	99
1U29	1G05	1L34	GAZIPUR RPCL 3X23.5/27	3	90	110	99
1U3	1G07_4	1207_1	HARIPUR 360MW 160	1	90	110	99
1U30	1G38	1138	SITALAKHYA ORION 3X40/50	3	90	110	99
1U31	1G40	1102_1	MEGHNAGHAT ORION 3X40/50	3	90	110	99
1U32	1G11_3	1111_4	SIDDIRGANJ DUCHB 3X40/50	3	90	110	99
1U33	1G39_1	1L39	DPA PAGLA 0.44/33 15X 3.6	15	90	110	99
1U34	1G39_2	1L39	DPA PAGLA 0.44/33 4X 3.6	4	90	110	99
1U35	1G37_1	1L37	SUMMIT ASHULIA 3 X 12.5/15	3	90	110	99
1U36	1G37_2	1L37	SUMMIT ASHULIA 4 X 20/25	4	90	110	99
1U37	1G33_1	1L33	SUMMIT NARSIGHDI 3 X 12.5/15	3	90	110	99
1U38	1G33_2	1L33	SUMMIT NARSIGHDI 3X28/34	3	90	110	99
1U39	1G18	1L18_1	SUMMIT MAONA 4 X 20/25	4	90	110	99
1U4	1G11_1	1111_1	SIDHIRGANJ EGCB 2X150	2	90	110	99
1U40	1G03	1L03	SUMMIT RUPGANJ 4 X 20/25	4	90	110	99
1U41	1G11_4	1211	SIDDIRGANJ 335MW 2X150	2	90	110	99
1U42	1G11_5	1211	SIDDIRGANJ 335MW 1X150/200	1	90	110	99
1U43	1G06_7	1206	GHORASHAL 365 CCPP GT 1X380	1	90	110	99
1U44	1G06_8	1206	GHORASHAL CCPP 365 ST 1X200	1	90	110	99
1U5	1G07_1	1107	HARIPUR EGCB 6X75	6	90	110	99
1U6	1G07_2	1107	HARIPUR EGCB 3X75	3	90	110	99
1U7	1G02_1	1202	MEGHNAGHAT SUMMIT 2X200	2	90	110	99
1U8	1G02_2	1202	MEGHNAGHAT SUMMIT ST 1X200	1	90	110	99

1U9	1G11_2	1211	SHIDDHIRGANJ 210 STEPUP	2	90	110	99
2T10	2114	2L14	KHAGRACHARI 2X25/41	2	90	110	99
2T10_1	1206	1106	GHORASHAL	2	90	110	99
2T11	1207_1	1107	HARIPUR	3	90	110	99
2T12	1208	1108	HASNABAD	3	90	110	99
2T13	2203	2103	HATHHAZARI	4	90	110	99
2T131	2201	2L01_2	ABUL KHAIR 2X130/150	2	90	110	99
2T132	2201	2L01_3	ABUL KHAIR 1X63/80	2	90	110	99
2T133	2202	2L02	BSRM 2X125/140	2	90	110	99
2T14	2118	2L18	RANGAMATI 2X25/41	2	90	110	99
2T14_1	8203	8103	ISHWARDI	3	90	110	99
2T15	6202	6102	KHULNA SOUTH	2	90	110	99
2T16	1209	1109	MANIKNAGAR	2	90	110	99
2T17	1210	1110	RAMPURA	3	90	110	99
2T18	1211	1111_1	SIDDHIRGANJ	2	90	110	99
2T19_1	1212	1112	TONGI	2	90	110	99
2T19_2	1212	1112	TONGI 2	1	90	110	99
2T1_1	1205	1105	AGARGAON	2	90	110	99
2T20	7202	7L02	BHOLA 1X 60	1	90	110	99
2T21	2123_2	2L23	MATARBARI 2X25/41	2	90	110	99
2T2_1	1201	1101	AMINBAZAR	3	90	110	99
2T3	3201	3101	ASHUGANJ	2	90	110	99
2T4	8201	8101	BAGHABARI	1	90	110	99
2T5_1	9201	9101	BARAPUKURIA	2	90	110	99
2T6	2220	2120	SIKALBAHA 2X150	2	90	110	99
2T7	8202	8102	BOGRA	2	90	110	99
2T8_1	3202	3102	COMILLA NORTH	2	90	110	99
2T9	5202	5102_1	FENCHUGANJ	1	90	110	99
2U1	2G04_2	2204	RAOZAN 210 MW 4X150	4	90	110	99
2U10	2G06	2106	BARABKUNDA REGENT 1X40	1	90	110	99
2U11	2G10	2110	POTENGA 2X40	2	90	110	99
2U12	2G04_1	2204	RAOZAN RPCL 1X35/50	1	90	110	99
2U13	2G20_3	2120	SIKALBAHA ECPV 1X150/200	1	90	110	99
2U14	2G22_1	2110	MALANCHA EPZ U1_5 1X50/75	1	90	110	99

2U15	2G22_2	2110	MALANCHA EPZ U6_8 1X50/75	1	90	110	99
2U16	2G20_4	2120	SIKALBAHA ENERGIS U1_4 1X50/75	1	90	110	99
2U17	2G20_5	2120	SIKALBAHA ENERGIS U4_6 1X35/40	1	90	110	99
2U18	2G20_6	2220	SIKALBAHA CCPP GT 1X225	1	90	110	99
2U19	2G20_7	2220	SIKALBAHA CCPP ST 1X150	1	90	110	99
2U2	2G20_2	2120	SIKALBAHA 60MW 38.5/70	1	90	110	99
2U3	2G20_1	2120	SIKALBAHA 150MW 3X75	1	90	110	99
2U4	2G11	2111	JULDAH 100MW 2X75	2	90	110	99
2U5	2G09	2109	DOHAZARI 100 MW 2X76	2	90	110	99
2U6	2G13_1	2113	KAPATAI 1&2 6X14.4/19.2	6	90	110	99
2U7	2G13_2	2113	KAPTAI 3 3X18/24	3	90	110	99
2U8	2G13_3	2113	KAPTAI 4&5 2X62.5	2	90	110	99
2U9	2G03_2	2103	HATHAZAR 100MW 2X 76	2	90	110	99
3T1	3101	3L01	APSCL 2X25/41	2	90	110	99
3T2	3101	3L01	APSCL 3X15/20	3	90	110	99
3U1	3G01_1	3101	APSCL U1&2 2X54/90	2	90	110	99
3U10	3G01_7	3101	APSCL ENGINES 50MW 1X80	1	90	110	99
3U11	3G01_8	3201	ASHUGANJ MIDLAND 2X 40/45	2	90	110	99
3U12	3G01_9	3201	ASHUGANJ UNITED 1X 80	1	90	110	99
3U13	3G07	3107_2	DAUDKANDI PEAKING 1X80	1	90	110	99
3U14	3G08_1	3L08	DOREEN FENI 1X30/35	1	90	110	99
3U15	3G09	3108	LAKDAMVI 1X70	1	90	110	99
3U16	3G01_10	3G01_10int	ASHUGANJ AGGREKO 96X 1.3	96	90	110	99
3U17	3G01_10int	3201	ASHUGANJ AGGREKO 2X60	2	90	110	99
3U18	3G01_11	3201	ASHUGANJ MODULAR 4X70/80	4	90	110	99

3U19	3G01_11	3201	ASHUGANJ MODULAR 4X70/80	4	90	110	99
3U2	3GG01_2	3201	APSCL U3_4_5 3X150/200	3	90	110	99
3U20	3G01_13	3201	ASHUGANJN 450MW CCPP 460/515	1	90	110	99
3U21	3G01_14	3401	ASHUGANJS 450MW CCPP 352/547	1	90	110	99
3U22	3G03	3G03_int	B BARIA AGGREKO 87X1.4	52	90	110	99
3U23	3G04_int	3103	B BARIA AGGREKO 1X50	1	90	110	99
3U24	3G03_int	3103	B BARIA AGGREKO 1X60	1	90	110	99
3U25	3G08_2	3L08	DOREEN MOHIPAL 4X12.5/15	4	90	110	99
3U26	3G04	3G04_int	B BARIA AGGREKO 87X1.4	35	90	110	99
3U27	3G02_1	3L02	COMILLA CHANDINA 3 X 12.5/15	3	90	110	99
3U28	3G02_2	3L02	COMILLA CHANDINA 2X16/20	2	90	110	99
3U3	3G01_3	3101	APSCL GT2 58.7/78.5	1	90	110	99
3U4	3G01_4	3101	APSCL 225 MW GT 117/195	1	90	110	99
3U5	3G06	3L06_1	SUMMIT JANGALIA 20/25	2	90	110	99
3U6	3G04_1	3104	CHADPUR CCPP 1X160	1	90	110	99
3U7	3G04_2	3104	CHADPUR CCPP 1X 80	1	90	110	99
3U8	3G01_5	3101	ASPCL 225 MW ST 2X75	2	90	110	99
3U9	3G01_6	3101	APSCL PRE 55 MW 1X80	1	90	110	99
4T1	3401	3201	ASHUGANJ 400/230 2X 244/325	2	90	110	99
4T2	1404	1204	KALIAKOIR 400/230	1	90	110	99
4T3	5401	5201	BIBIYANA 400/230	1	90	110	99
4T4	1403	1203	BHULTA 400/230	1	90	110	99
4T5	1404	1104	KALIAKOIR 400/132	1	90	110	99

4U1	4G03_2	4103	MYMENSIGH RPCL 4X35/50	4	90	110	99
4U2	4G03_1	4103	MYMENSIGH RPCL 70/100	1	90	110	99
4U3	4G07	4L07	DOREEN TANGAIL 1X30/35	1	90	110	99
4U4	4G01	4101	JAMALPUR 2X60	2	90	110	99
5T1	5103	5L03	BIANIBAZAR 2X50/75	2	90	110	99
5T2	5108	5L08	SUNAMGANJ 2X25/41	2	90	110	99
5U1	5G06_1	5106	SHAJIBAJAR GT 2X150/200	2	90	110	99
5U10	5G01_2	5401	BIBIYANA SUMMIT ST 1X200	1	90	110	99
5U11	5G09_2	5109	SYLHET 150MW 3X80	3	90	110	99
5U12	5G09_3	5L09	SYLHET 20 MW 1X 26.6	1	90	110	99
5U13	5G06_3	5106	SHAJIBAZAR U89 GT 1X90	1	90	110	99
5U14	5G06_4	5106	SHAJIBAZAR EPRIMA 2X35	2	90	110	99
5U15	5G09_4	5109	SYLHET EPRIMA 2X35	2	90	110	99
5U16	5G06_5	5106	SHAZAIBAZAR 86MW 4X30/35	4	90	110	99
5U17	5G06_6	5L06	HABIGNAJ CONFIDENCE 1X16/20	1	90	110	99
5U18	5G09_5	5L09	SYLHET SHAJANULLAH 3X 16/20	3	90	110	99
5U19	5G01_3	5401	BIBIANA SOUTH 383 CCPP GT 1X380	1	90	110	99
5U2	5G06_2	5106	SHAJIBAJAR ST 1X150/200	1	90	110	99
5U20	5G01_4	5401	BIBIANA SOUTH 383 CCPP ST 1X200	1	90	110	99
5U21	5G09_1	5L09	SYLHET DESH 1X15	1	90	110	99
5U3	5G02_1	5102_2	FENCHUGANJ CCPP1 GT 2X 35/45	2	90	110	99
5U4	5G02_2	5102_2	FENCHUGANJ CCPP1 ST 1X 35/45	1	90	110	99
5U5	5G02_3	5102_2	FENCHUGANJ CCPP2 GT 2X55/75	2	90	110	99
5U6	5G02_4	5102_2	FENCHUGANJ CCPP2 ST 1X55/75	1	90	110	99

5U7	5G02_5	5102_2	FENCHUGANJ BARAKAT 2X30/35	2	90	110	99
5U8	5G02_6	5102_2	FENCHUGANJ EPRIMA 2X30/35	2	90	110	99
5U9	5G01_1	5401	BIBIYANA SUMMIT GT 1X380	1	90	110	99
6T1	6201	6101_3	BHERAMARA 230/132 HVDC 2X135/225	2	90	110	99
6U1	6G13_2	6113	KHULNA NWPGCL 1X211/281	1	90	110	99
6U10	6G10	6110_2	GOPALGANJ 2X80	2	90	110	99
6U11	6G09_2	6G09_2int	GOALPARA AGGREKO 62X1.4	41	90	110	99
6U12	6G09_2int	6L09	GOALPARA AGGREKO 2X25	2	90	110	99
6U13	6G09_4	6G09_4int	GOALPARA AGGREKO 62X1.4	14	90	110	99
6U14	6G09_4int	6L09	GOALPARA AGGREKO 1X20	1	90	110	99
6U15	6G09_5	6G09_5int	GOALPARA AGGREKO 62X1.4	7	90	110	99
6U16	6G09_5int	6L09	GOALPARA AGGREKO 1X10	7	90	110	99
6U17	6G01_5	6101_1	BHERAMARA CCPP GT 1X297/396	1	90	110	99
6U18	6G01_6	6101_1	BHERAMARA CCPP ST 1X145/194	1	90	110	99
6U2	6G01_1	6101_1	BHERAMARA PDB 1X55/75	1	90	110	99
6U3	6G01_2	6101_1	BHERAMARA PDB 1X35	1	90	110	99
6U4	6G17_1	6L17_1	NOAPARA KJAPCL 1X35	1	90	110	99
6U5	6G17_2	6L17_2	NOAPARA KJAPCL 1X25	1	90	110	99
6U6	6G09_1	6109_1	GOALPARA KPCL 2X80	2	90	110	99
6U7	6G13_1	6113	KHULNA KPCL2 3X80/80	3	90	110	99
6U8	6G06_1	6106_2	FARIDPUR PARKING 2X65	2	90	110	99
6U9	6G06_2	6106_2	FARIDPUR PEAKING 3X 25	3	90	110	99
7T1	7201	7101	BARISAL 230_132 NORTH	2	90	110	99
7U1	7G02_1	7202	BHOLA CCPP ST 1X150/200	1	90	110	99

7U2	7G02_2	7202	BHOLA CCPP GT 2X150/200	2	90	110	99
7U3	7G03_1	7103	BARISAL GT PDB 1X55/75	1	90	110	99
7U4	7G05	7L05_1	BHOLA VENTURE 1X 30/35	1	90	110	99
7U5	7G03_3	7105	BARISHAL SUMMIT 2X 40/50	2	90	110	99
7U6	7G03_4	7105	BARISHAL SUMMIT 1X 60/75	1	90	110	99
8U1	8G07_2	8117	KATAKHALI 3X25	3	90	110	99
8U10	8G02_1	8102	BOGRA RPP 1X40	1	90	110	99
8U11	8G02_3	8L02_2	BOGRA EPRIMA2 12.5/15	1	90	110	99
8U12	8G05_1	8205	SIRAJGANJ CCPP GT 2X187.5/240	1	90	110	99
8U13	8G05_2	8205	SIRAJGANJ CCPP ST 2X84/120	1	90	110	99
8U14	8G13	8L16_1	ULLAPARA SUMMIT 1X12.5/15	1	90	110	99
8U15	8G07	8103	BERA PEAK 1X80/120	1	90	110	99
8U16	8G12	8112	RAJLANKA NATORE 1X55/75	1	90	110	99
8U17	8G04	8104	SANTAHAR PEAKING 3X25	3	90	110	99
8U18	8G05_3	8L05_2	SUMMIT ULLAPARA 4X12.5/15	4	90	110	99
8U19	8G10	8110	CNAWABGANJ 104MW 1X150	2	90	110	99
8U2	8G07_1	8117	KATAKHALI 2X40	2	90	110	99
8U3	8G01_3	8117	BAGHABARI 3X26.67	3	90	110	99
8U4	8G01_4	8117	BAGHABARI 3X35	3	90	110	99
8U5	8G01_5	8117	BAGHABARI 3X50	3	90	110	99
8U6	8G02_4	8L02_1	BOGRA EPRIMA 12.5/15	1	90	110	99
8U7	8G02_2	8L02_2	BOGRA EPRIMA 12.5/15_2	1	90	110	99
8U8	8G02_1	8L02_3	BOGRA GBB PPP 35/35	1	90	110	99
8U9	8G06	8106	AMNURA PP 55/75	1	90	110	99
9U1	9G01_1	9201	BARAPUKURIA 156.3	1	90	110	99
9U2	9G01_2	9201	BARAPUKURIA 156.3	1	90	110	99

9U3	9G07_int	9107	THAKURGAON RZPL 2X 30/35	2	90	110	99
9U4	9G06	9106	SAIDPUR 1X30/35	1	90	110	99
9U5	9G05	9105	RANGPUR PDB GT 1X30/35	1	90	110	99
9U6	9G07_1	9G07_int	THAKURGAON 0.44/11 18 X 4.5	9	90	110	99
9U7	9G07_2	9G07_int	THAKURGAON 0.44/11 18 X 4.5	9	90	110	99

GENERATOR INFORMATION

ID	Bus ID	DBase ID	Duplic	Generator Type	P Gen
1G10	1G23	KODDA 150MW RPCL	9	Voltage Controlled	9.28
1G11_GT	1G06_1	GHORASHAL MAX 78 MW	2	Voltage Controlled	22.62
1G12_HFO	1G25	MADANGANJ SUMMIT 100MW	6	Voltage Controlled	9.28
1G13_HFO	1G11	SHIDDIRGANJ DESH 100MW	96	Voltage Controlled	0.58
1G14_ST	1G06_2	GHORASHAL ST U1_2	2	Voltage Controlled	24.36
1G15_ST	1G06_3	GHORASHAL ST U 3 TO 6	4	Swing	0
1G16_GE	1G06_4	GHORASHAL AGREKO 100MW	100	Voltage Controlled	0.58
1G17_GE	1G06_5	GHORASHAL AGGREKO 45 MW	45	Voltage Controlled	0.58
1G18_GE	1G06_6	GHORASHAL REGNT 108MW	34	Voltage Controlled	1.74
1G19_GT	1G08	TONGI PDB 105 MW GT	1	Voltage Controlled	52.2
1G1_GT	1G11_1	SIDDIRGANJ 2X120 MW	2	Voltage Controlled	60.9
1G20_HFO	1G07_6	HARIPUR NEPC 110MW GE	8	Voltage Controlled	6.96
1G21_GT	1G02_3	MEGHNAGHAT CCPP GT	2	Voltage Controlled	40
1G22_ST	1G02_4	MEGHNAGHAT CCPP ST	1	Voltage Controlled	40

1G23_HFO	1G01_1	KERANIGANJ POWERPAC	8	Voltage Controlled	6.96
1G24_NG	1G33	NARSINGDI DOREEN	8	Voltage Controlled	1.45
1G25_HFO	1G04	MUNSHIGANJ SINHA 7X7.79MW	7	Voltage Controlled	4.06
1G26_HFO	1G05	GAZIPUR RPCL 52MW	6	Voltage Controlled	4.64
1G27_HFO	1G38	SITALAKHYA ORION 102MW	12	Voltage Controlled	4.64
1G28_HFO	1G40	MEGHNAGHAT ORION 102MW	12	Voltage Controlled	4.64
1G29_HFO	1G11_3	SIDHIRGANJ DUCHB 102MW	12	Voltage Controlled	4.64
1G2_GT	1G07_1	HARIPUR 412 MW CCPP GT	1	Voltage Controlled	158.34
1G30_HSD	1G39_1	DPA PAGLA 32X1.5MW	32	Voltage Controlled	0.87
1G31_HSD	1G39_2	DPA PAGLA 9 X1.25MW	9	Voltage Controlled	0.73
1G32_NG	1G37_1	SUMMIT ASHULIA 11MW	3	Voltage Controlled	2.13
1G33_NG	1G37_2	SUMMIT ASHULIA 33.75MW	4	Voltage Controlled	4.64
1G34_NG	1G33_1	SUMMIT NARSIGHDI 11MW	3	Voltage Controlled	2.13
1G35_NG	1G33_2	SUMMIT NARSIGHDI 24.3MW	3	Voltage Controlled	4.64
1G36_NG	1G18	SUMMIT MAONA 33MW	4	Voltage Controlled	4.64
1G37_NG	1G03	SUMMIT RUPGANJ 33MW	4	Voltage Controlled	4.64
1G38_GT	1G11_4	SIDDIRGANJ 335MW CCPP GT	1	Voltage Controlled	116
1G39_ST	1G11_5	SIDDIRGANJ 335MW CCPP ST	1	Voltage Controlled	78.3
1G3_ST	1G07_2	HARIPUR 412 CCPP ST	1	Voltage Controlled	80.62
1G40_GT	1G06_7	GHORASHAL CCPP 365MW GT	1	Voltage Controlled	45
1G41_ST	1G06_8	GHORASHAL CCPP 365 ST	1	Voltage Controlled	20

1G4_GT	1G02_1	MEGHNAGHAT SUMMIT 305MW CCPP GT	2	Voltage Controlled	63.8
1G5_ST	1G02_2	MEGHNAGHAT 305MW CCPP ST	1	Voltage Controlled	63.8
1G6_GT	1G07_3	HARIPUR 360MW CCPP GT	1	Voltage Controlled	136.3
1G7_ST	1G07_4	HARIPUR 360MW CCPP ST	1	Voltage Controlled	72.5
1G8_ST	1G11_2	SHIDHIRGANJ ST 210MW PDB	1	Voltage Controlled	87
1G9_GT	1G07_5	HARIPUR 3X20 MW	3	Voltage Controlled	11.6
2G10	2G09	DOHARAZI 100MW	6	Voltage Controlled	17
2G10_GE	2G06	BARABKUNDA REGENT 22MW	8	Voltage Controlled	2.75
2G11_HFO	2G10	POTENGA 50 MW	8	Voltage Controlled	6
2G12_HFO	2G03_2	HATHAZARI 100MW	6	Voltage Controlled	16
2G13_GE	2G22_1	MALANCHA EPZ 45 MW U1_5	5	Voltage Controlled	8.5
2G14_GE	2G22_2	MALANCHA EPZ 28 MW U6_8	3	Voltage Controlled	9
2G15_HFO	2G20_4	SIKALBAHA ENERGIS 43MW U1_4	4	Voltage Controlled	12.5
2G16_HFO	2G20_5	SIKALBAHA ENERGIS 43MW U5_6	2	Voltage Controlled	11.5
2G17_GT	2G20_6	SIKALBAHA 225MW CCPP GT	1	Voltage Controlled	150
2G18_ST	2G20_7	SIKALBAHA 225 MW CCPP ST	1	Voltage Controlled	75
2G1_PPP_GT	2G20_1	SHIKALBAHA 150MW PPP_GT	1	Voltage Controlled	150
2G2_RPCL_E	2G04_1	RPCL RAOZAN 25MW	3	Voltage Controlled	8
2G3_TPS	2G20_2	SHIKALBAHA 60MW TPS	1	Voltage Controlled	40
2G4_HFO	2G20_3	SHIKALBAHA ECPV 100MW	16	Voltage Controlled	6.5

2G5_TPS	2G04_2	RAOZAN 2X 210 MW	2	Voltage Controlled	197
2G6_Hydro	2G13_1	KAPTAI HYDRO UNIT 1&2	2	Voltage Controlled	40
2G7_Hydro	2G13_2	KAPTAI HYDRO UNIT 3	1	Voltage Controlled	50
2G8_Hydro	2G13_3	KAPTAI HYDRO UNIT 4&5	2	Voltage Controlled	50
2G9_FUEL	2G11	JULDA 100MW RPP	6	Voltage Controlled	16.5
3G08_GE	3G08_2	DOREEN MOHIPAL 4X11.7MW	4	Voltage Controlled	2.08
3G10_GE	3G01_8	ASHUGANJ MIDLAND	6	Voltage Controlled	7.06
3G11_GE	3G01_9	ASHUGANJ UNITED 53 MW	14	Voltage Controlled	2.91
3G12_GE	3G01_10	ASHUGANJ AGGREKO 95 MW	96	Voltage Controlled	0.62
3G12_HFO	3G07	DAUDKANDI PEAKING 52 MW	6	Voltage Controlled	7.06
3G13_GE	3G01_11	ASHUGANJ MODULAR 200MW GE	20	Voltage Controlled	7.89
3G14_ST	3G01_11	ASHUGANJ MODULAR 200MW ST	1	Voltage Controlled	13.28
3G15_GE	3G08_1	DOREEN FENI	8	Voltage Controlled	2.08
3G16_HFO	3G09	LAKDAMVI 52 MW	6	Voltage Controlled	7.06
3G17_GT	3G01_13	ASHUGANJN 450MW CCPP GT	1	Voltage Controlled	205.84
3G18_ST	3G01_13	ASHUGNAJN 450MW CCPP ST	1	Voltage Controlled	111.22
3G19_GT	3G01_14	ASHUGANJS 450MW CCPP GT	1	Voltage Controlled	205.84
3G1_CCPP_GT	3G04_1	CHANDPUR 150 CCPP_GT	1	Voltage Controlled	87.98
3G1_CCPP_ST	3G04_2	CHANDPUR 150 CCPP_ST	1	Voltage Controlled	47.31
3G20_GE	3G03	B BARIA AGGREKO 87X1.12MW	52	Voltage Controlled	0.83

3G20_ST	3G01_14	ASHUGANJS 450MW CCPP ST	1	Voltage Controlled	111.22
3G21_GE	3G04	B BARIA AGGREKO 87X1.12MW	35	Voltage Controlled	0.83
3G22_NG	3G02_1	COMILLA CHANDINA 11MW	3	Voltage Controlled	2.91
3G23_NG	3G02_2	COMILLA CHANDINA 13.5MW	2	Voltage Controlled	5.4
3G2_XT	3G01_1	ASHUGANJ U1&2 97MW	2	Voltage Controlled	39.84
3G3_XT	3GG01_2	ASHUGANJ 3X 150 MW	3	Voltage Controlled	109.98
3G4_GT	3G01_3	ASHUGANJ 40MW GT2	1	Voltage Controlled	33.2
3G5_CCPP_GT	3G01_4	ASHUGANJ 225 CCPP GT	1	Voltage Controlled	117.86
3G6_CCPP_ST	3G01_5	ASHUGANJ 225 CCPP ST	1	Voltage Controlled	62.25
3G7_GE	3G01_6	ASHUGANJ PRE 55MW	15	Voltage Controlled	2.91
3G8_GE	3G01_7	ASHUGANJ ENGINES 50MW	16	Voltage Controlled	2.49
3G9	3G06	SUMMIT JUNGALIA 33 MW	4	Voltage Controlled	6.64
4G1_ST	4G03_1	MYMENSINGH RPCL ST 70MW	1	Voltage Controlled	57.2
4G2_GT	4G03_2	MYMENSINGH RPCL GT 4X35MW	4	Voltage Controlled	28.16
4G3_NG	4G07	DOREEN TANGAIL	8	Voltage Controlled	2.2
4G4_FO	4G01	JAMALPUR 95 MW	96	Voltage Controlled	0.88
5G10_GE	5G02_6	FENCHUGANJ EPRIMA 44MW	17	Voltage Controlled	1.7
5G11_GT	5G01_1	BIBIYANA SUMMIT CCPP341 GT	1	Voltage Controlled	150.96
5G12_GT	5G09_2	SYLHET 150 MW	1	Voltage Controlled	20
5G12_ST	5G01_2	BIBIYANA SUMMIT CCPP341 ST	1	Voltage Controlled	80.92
5G13_GT	5G09_3	SYLHET 20 MW GT	1	Voltage Controlled	13.6

5G14_GE	5G06_4	SHAJIBAZAR 50MW EPRIMA	29	Voltage Controlled	1.02
5G14_GT	5G06_3	SHAJIBAZAR U89 GT	2	Voltage Controlled	22.44
5G15_GE	5G09_4	SYLHET EPRIMA 50 MW	29	Voltage Controlled	1.02
5G16_GE	5G06_5	SHAHJIBAZAR 86 MW	32	Voltage Controlled	1.7
5G17_GE	5G06_5	SHAHJIBAZAR 86 MW	32	Voltage Controlled	0
5G18_GE	5G06_6	HABIGANJ CONFIDENCE 11	4	Voltage Controlled	1.7
5G19_NG	5G09_5	SHYLHET SHAJANULLAH 28 MW	3	Voltage Controlled	5.44
5G20_GT	5G01_3	BIBIANA SOUTH 383 CCPP GT	1	Voltage Controlled	175
5G21_ST	5G01_4	BIBIANA SOUTH 383 CCPP ST	1	Voltage Controlled	80
5G2_GT	5G09_1	10 MW SYLHET DESH ENERGY	6	Voltage Controlled	1.02
5G3_GT	5G06_1	SHAHJIBAZAR 330 MW PEAK PP	2	Voltage Controlled	81.6
5G4_ST	5G06_2	SHAHJIBAZAR 330 MW PEAK PP ST	1	Voltage Controlled	81.6
5G5_GT	5G02_1	FENCHGANJ CCPP1 GT 2X 32 MW	2	Voltage Controlled	19.04
5G6_ST	5G02_2	FENCHUGANJ CCPP1 ST 32 MW	1	Voltage Controlled	16.32
5G7_GT	5G02_3	FENCHUGANJ CCPP2 GT 45.9MW	2	Voltage Controlled	20.4
5G8_ST	5G02_4	FENCHUGANJ CCPP2 ST 36MW	1	Voltage Controlled	20.4
5G9_GE	5G02_5	FENCHUGANJ BARAKAT 51MW	19	Voltage Controlled	2.38
6G10_DE	6G09_2	GOALPARA AGGEREKO 55MW	41	Voltage Controlled	0.29
6G11_DE	6G09_4	GOALPARA AGGEREKO 55MW	14	Voltage Controlled	0.29

6G12_DE	6G09_5	GOALPARA AGGEREKO 55MW	7	Voltage Controlled	0.29
6G13_GT	6G01_5	BHERAMARA 414MW CCPP GT	1	Voltage Controlled	156.75
6G14_ST	6G01_6	BHERAMARA 414MW CCPP ST	1	Voltage Controlled	76.38
6G1_NWPGCL	6G13_2	KHULNA_150MW NWPGCL GT	1	Voltage Controlled	88.35
6G2_GT	6G01_1	BHERAMARA GT1&2 PDB	2	Voltage Controlled	8.55
6G3_GT	6G01_2	BHERAMARA GT3 PDB	1	Voltage Controlled	8.55
6G4_HFO1	6G17_1	NOAPARA KJAPCL 40 MW U123	3	Voltage Controlled	4.56
6G4_HFO2	6G17_2	NOAPARA KJAPCL 40 MW U45	2	Voltage Controlled	4.56
6G5_HFO	6G09_1	GOALPARA KPCL_1 110MW	19	Voltage Controlled	3.71
6G6_HFO	6G13_1	KHULNA KPCL_2 115MW	7	Voltage Controlled	9.12
6G7_HFO	6G06_1	FARIDPUR PEAKING 54MW	5	Voltage Controlled	3.71
6G8_HFO	6G06_2	FARIDPUR PEAKING 54MW	3	Voltage Controlled	3.71
6G9_HFO	6G10	GOPALGANJ PEAKING 109MW	16	Voltage Controlled	3.71
7G1_CCPP-ST	7G02_1	BHOLA 225 MW CCPP_ST	1	Voltage Controlled	47.6
7G2_CCPP-GT	7G02_2	BHOLA 225 MW CCPP_GT	2	Voltage Controlled	44.1
7G3_GT	7G03_1	BARISAL 2X20MW GT PDB	2	Voltage Controlled	10.5
7G4_GE	7G05	BHOLA VENTURE	2	Voltage Controlled	4.2
7G5_GE_1	7G03_3	BARISHAL SUMMIT110MW GE1_4	4	Voltage Controlled	11.9
7G5_GE_2	7G03_4	BARISHAL SUMMIT 110MW GE5_7	3	Voltage Controlled	11.9
8G10_GT	8G05_1	SIRAJGANJ NWPGCL 150 MW	2	Voltage Controlled	117

8G10_ST	8G05_2	SIRAJGANJ NWPGCL ST	2	Voltage Controlled	58.5
8G11_GE	8G13	ULLAPARA SUMMIT 11MW	4	Voltage Controlled	1.95
8G12_GE	8G07	BERA PEAK 71	9	Voltage Controlled	5.85
8G13_GE	8G06	AMNURA 50MW	7	Voltage Controlled	5.46
8G14_HFO	8G12	RAJLANKA NATORE 52MW	6	Voltage Controlled	6.63
8G15_HFO	8G04	SANTAHAR PEAKING 50MW	6	Voltage Controlled	6.24
8G16_NG	8G05_3	SUMMIT ULLAPARA 4X2.9MW	4	Voltage Controlled	1.95
8G17_FO	8G10	CNAWABGANJ 104 MW	12	Voltage Controlled	6.63
8G2_FUEL	8G07_2	RAJSAHI 50MW PEAK PP	6	Voltage Controlled	6.24
8G3_FUEL	8G02_1	BOGRA RPP 21 MW	6	Voltage Controlled	3.12
8G4_FUEL	8G02_2	BOGRA EPRIMA 1	4	Voltage Controlled	1.56
8G5_FUEL	8G02_3	BOGRA EPRIMA 2	3	Voltage Controlled	1.56
8G6_Fuel	8G02_4	BOGRA EPRIMA 3	3	Voltage Controlled	1.56
8G7_GT	8G01_4	BAGHABARI 71MW	1	Voltage Controlled	55.38
8G8_GT	8G01_5	BAGHABARI 100MW	1	Voltage Controlled	78
8G9_E	8G01_3	BAGHABARI PEAK 50MW	6	Voltage Controlled	6.63
9G1_GT	9G06	SAIDPUR 20MW GTPS	1	Voltage Controlled	16.6
9G2_ST1	9G01_1	BARAPUKURIA 125 MW ST1	1	Voltage Controlled	83
9G3_ST2	9G01_2	BARAPUKURIA 125 MW ST2	1	Voltage Controlled	83
9G4_GT	9G05	RANGPUR PDB 20 MW	1	Voltage Controlled	16.6
9G5_GE	9G07_1	THAKURGAON 20 X 1.5MW	20	Voltage Controlled	0.62
9G6_GE	9G07_2	THAKURGAON 21 X 1.1 MW	21	Voltage Controlled	0.62
g10	8G07_1	RAJSAHI 50MW NPS KATAKALI	6	Voltage Controlled	6.24

LINE INFORMATION

ID	Bus From	Bus To	DBase ID	Duplic	Length
AES_Hari1	1207_2	1207_1	FINCH 1113 MCM	1	2.4
AES_Hari2	1207_2	1207_1	FINCH 1113 MCM	1	2.4
AKSPL_Bara	2101	2106	GROSBEAK 636 MCM	1	4
AKSPL_HatH	2201	2203	ACCC-DOVE 713 KCMIL	1	22.87
Agar_Cant1	1105	1116	XLPE 800 MM SQ.	1	6.99
Agar_Cant2	1105	1116	XLPE 800 MM SQ.	1	6.99
Agar_Satmas1	1105	1136	XLPE 800 MM SQ.	1	8.294
Agar_Satmas2	1105	1136	XLPE 800 MM SQ.	1	8.294
Amin_Agar1	1201	1205	TWIN MALLARD 2X795MCM	1	3.58
Amin_Agar2	1201	1205	XLPE 2000 MM SQ.	1	4.01
Amin_Agar3	1201	1205	TWIN MALLARD 2X795MCM	1	3.58
Amin_Agar4	1201	1205	XLPE 2000 MM SQ.	1	4.01
Amin_Hasna1	1201	1208	TWIN AAAC 37/4.176 MM	1	21.5
Amin_Hasna2	1201	1208	TWIN AAAC 37/4.176 MM	1	21.5
Amin_Kalyan1	1101	1120	ACCC HAWK 611 KCMIL	1	4
Amin_Kalyan2	1101	1120	ACCC HAWK 611 KCMIL	1	4
Amin_Megna1	1201	1202	QUAD EGRET 336 MCM	1	55
Amin_Megna2	1201	1202	QUAD EGRET 336 MCM	1	55

Amin_Savar1	1101	1137	GROSBEAK 636 MCM	1	15.8
Amin_Savar2	1101	1137	GROSBEAK 636 MCM	1	15.8
Amnur_Cnwab	8106	8110	GROSBEAK 636 MCM	1	16
Amnur_Raj	8106	8117	GROSBEAK 636 MCM	1	62
Ashu_Bhulta1	3401	1403	TWIN FINCH 1113 MCM	1	70
Ashu_Bhulta2	3401	1403	TWIN FINCH 1113 MCM	1	70
Ashu_ComN1	3201	3202	FINCH 1113 MCM	1	79
Ashu_ComN2	3201	3202	FINCH 1113 MCM	1	79
Ashu_Ghora1	3101	1106	GROSBEAK 636 MCM	1	45.32
Ashu_Ghora2	3101	1106	GROSBEAK 636 MCM	1	45.32
Ashu_Kisor1	3101	4102	GROSBEAK 636 MCM	1	52
Ashu_Kisor2	3101	4102	GROSBEAK 636 MCM	1	52
Ashu_SajiBz	3101	5106	GROSBEAK 636 MCM	1	53
Ashu_Siraj1	3201	8205	TWIN AAAC 37/4.176 MM	1	144
Ashu_Siraj2	3201	8205	TWIN AAAC 37/4.176 MM	1	144
BBari_Ashu1	3103	3101	GROSBEAK 636 MCM	1	16.5
BBari_Ashu2	3103	3101	GROSBEAK 636 MCM	1	16.5
BSRM1_AKSPL	2202	2201	ACCC-DOVE 713 KCMIL	1	66.47
BSRM2_HatH	2202	2203	ACCC-DOVE 713 KCMIL	1	53
Bagha_Sjdpr1	8101	8116	HAWK 477 MCM	1	5
Bagha_Sjdpr2	8101	8116	GROSBEAK 636 MCM	1	5.5

Bagha_siraj1	8201	8205	TWIN AAAC 37/4.176 MM	1	38
Bagha_siraj2	8201	8205	TWIN AAAC 37/4.176 MM	1	38
BagrH_Mongla	6103	6116	HAWK 477 MCM	1	28
Bara_KSRM	2106	2112	GROSBEAK 636 MCM	1	4
Basun_Tongi1	1114	1112	GROSBEAK 636 MCM	1	11
Basun_Tongi2	1114	1112	GROSBEAK 636 MCM	1	11
Bbari_NarS1	3103	1133	GROSBEAK 636 MCM	1	55
Bbari_NarS2	3103	1133	GROSBEAK 636 MCM	1	55
BeraPP_T	8107_1	8107_2	GROSBEAK 636 MCM	1	4.5
BeraT_Bagha	8107_2	8101	HAWK 477 MCM	1	6.66
Bgra O_N1	8102	8108	TWIN AAAC 37/4.176 MM_132	1	1.5
Bgra O_N2	8102	8108	TWIN AAAC 37/4.176 MM_132	1	1.5
BgraO_Pbari1	8102	9115	GROSBEAK 804 SQ MM	1	50
BgraO_Pbari2	8102	9115	GROSBEAK 804 SQ MM	1	50
BgraO_Siraj1	8102	8105	GROSBEAK 636 MCM	1	66
BgraO_Siraj2	8102	8105	GROSBEAK 636 MCM	1	66
Bgra_BPuk1	8202	9201	TWIN AAAC 37/4.176 MM	1	106
Bgra_BPuk2	8202	9201	TWIN AAAC 37/4.176 MM	1	106
Bgra_Ngao1	8102	8104	GROSBEAK 636 MCM	1	44
Bgra_Ngao2	8102	8104	GROSBEAK 636 MCM	1	44

BherH_Ishw1	6201	8203	TWIN AAAC 37/4.176 MM	1	10.1
BherH_Ishw2	6201	8203	TWIN AAAC 37/4.176 MM	1	10.1
BherH_Ishw3	6201	8203	TWIN AAAC 37/4.176 MM	1	10.1
BherH_Ishw4	6201	8203	TWIN AAAC 37/4.176 MM	1	10.1
Bhera132_B-0	6101_1	6101_3	GROSBEAK 804 SQ MM	1	5
Bhera132_B-1	6101_1	6101_3	GROSBEAK 804 SQ MM	1	5
Bhera_Bher-0	6101_1	6101_2	HAWK 477 MCM	1	1
Bhera_Farid1	6101_1	6106_1	HAWK 477 MCM	1	105
Bhera_Farid2	6101_1	6106_1	HAWK 477 MCM	1	105
Bhera_Ishw1	6101_1	8103	GROSBEAK 804 SQ MM	1	10
Bhera_Ishw2	6101_1	8103	GROSBEAK 804 SQ MM	1	10
Bhndr_BagrH	7104	6103	HAWK 477 MCM	1	40
Bhola_BshlN1	7202	7201	TWIN MALLARD 2X795MCM	1	62.5
Bhola_BshlN2	7202	7201	TWIN MALLARD 2X795MCM	1	62.5
Bhulta_Hari1	1103	1107	GROSBEAK 636 MCM	1	15.25
Bibi_ComN1	5201	3202	TWIN MALLARD 2X795MCM	1	153.55
Bibi_ComN2	5201	3202	TWIN MALLARD 2X795MCM	1	153.55
Bibi_kalia1	5401	1404	TWIN FINCH 1113 MCM	1	168.64
Bibi_kalia2	5401	1404	TWIN FINCH 1113 MCM	1	168.64

Bpuk_Rang1	9101	9105	GROSBEAK 636 MCM	1	42
Bpuk_Rang2	9101	9105	GROSBEAK 636 MCM	1	42
Bpuk_SaidP1	9101	9106	GROSBEAK 636 MCM	1	36
Bpuk_SaidP2	9101	9106	GROSBEAK 636 MCM	1	36
BshalN_Bsh-0	7101	7103	HAWK 477 MCM	1	9.2
BshalN_Bsh-1	7101	7103	HAWK 477 MCM	1	9.2
Bshal_Bhndr	7103	7104	HAWK 477 MCM	1	49
Bshal_Patua	7103	7105	GROSBEAK 636 MCM	1	38.2
Byani_SylS	5103	5110	GROSBEAK 636 MCM	1	28
Cgona_Madun1	2107	2116	GROSBEAK 636 MCM	1	27
Cgona_Madun2	2107	2116	GROSBEAK 636 MCM	1	27
Cgona_Rmati1	2107	2118	GROSBEAK 636 MCM	1	23
Cgona_Rmati2	2107	2118	GROSBEAK 636 MCM	1	23
Chad_Chaum1	3104	3105	GROSBEAK 636 MCM	1	68
Chad_Chaum2	3104	3105	GROSBEAK 636 MCM	1	68
ComN_BSRM1	3202	2202	ACCC-DOVE 713 KCMIL	1	98.2
ComN_BSRM2	3202	2202	ACCC-DOVE 713 KCMIL	1	98.2
ComN_Chand	3102	3104	LINNET 636 MCM	1	77.5
ComN_Daud1	3102	3107_1	GROSBEAK 636 MCM	1	55
ComN_Daud2	3102	3107_1	GROSBEAK 636 MCM	1	55
ComN_HatH1	3202	2203	FINCH 1113 MCM	1	151
ComN_HatH2	3202	2203	FINCH 1113 MCM	1	151
ComN_Megna1	3202	1202	TWIN MALLARD 2X795MCM	1	58

ComN_Megna2	3202	1202	TWIN MALLARD 2X795MCM	1	58
ComN_S1	3102	3106	GROSBEAK 636 MCM	1	18
ComN_S2	3102	3106	GROSBEAK 636 MCM	1	18
ComS_Chad	3106	3104	ACSR 600 SQ. MM	1	62
Cox_MataT	2108	2123_1	GROSBEAK 636 MCM	1	39
DHazri_Cox	2109	2108	GROSBEAK 636 MCM	1	87
DaudPP_SS	3107_2	3107_1	GROSBEAK 636 MCM	1	1.3
Daud_Sgao1	3107_1	1140_1	GROSBEAK 636 MCM	1	61.7
Daud_Sgao2	3107_1	1140_1	GROSBEAK 636 MCM	1	61.7
Farid_Mdari1	6106_1	6119	HAWK 477 MCM	1	65.5
Farid_Mdari2	6106_1	6119	HAWK 477 MCM	1	65.5
Farid_PP	6106_2	6106_1	GROSBEAK 636 MCM	1	1
Fench_Bibi1	5202	5201	TWIN MALLARD 2X795MCM	1	33.19
Fench_Bibi2	5202	5201	TWIN MALLARD 2X795MCM	1	33.19
Fench_Kula1	5102_1	5105	GROSBEAK 636 MCM	1	25
Fench_Kula2	5102_1	5105	GROSBEAK 636 MCM	1	25
Fench_PS1	5102_1	5102_2	GROSBEAK 636 MCM	1	3.66
Fench_PS2	5102_1	5102_2	GROSBEAK 636 MCM	1	3.66
Fench_PS3	5102_1	5102_2	GROSBEAK 636 MCM	1	3.66
Fench_PS4	5102_1	5102_2	GROSBEAK 636 MCM	1	3.66
Fench_Syl1	5102_1	5109	GROSBEAK 636 MCM	1	31.7
Fench_Syl2	5102_1	5109	GROSBEAK 636 MCM	1	31.7
Feni_Chaum1	3108	3105	GROSBEAK 636 MCM	1	32

Feni_Chaum2	3108	3105	GROSBEAK 636 MCM	1	32
Feni_ComN1	3108	3102	GROSBEAK 636 MCM	1	66
Feni_ComN2	3108	3102	GROSBEAK 636 MCM	1	66
Ghora_Ashu1	1206	3201	ACCC-DOVE 713 KCMIL	1	44
Ghora_Ashu2	1206	3201	ACCC-DOVE 713 KCMIL	1	44
Ghora_Bhulta	1106	1103	GROSBEAK 636 MCM	1	29.1
Ghora_Ishw1	1206	8203	MALLARD 795 MCM	1	175
Ghora_Ishw2	1206	8203	MALLARD 795 MCM	1	175
Ghora_Joy1	1106	1118	ACCC HAWK 611 KCMIL	1	28
Ghora_Joy2	1106	1118	ACCC HAWK 611 KCMIL	1	28
Ghora_NarS	1106	1133	GROSBEAK 636 MCM	1	13.35
Ghora_Rampu1	1206	1210	TWIN MALLARD 2X795MCM	1	50
Ghora_Rampu2	1206	1210	TWIN MALLARD 2X795MCM	1	50
GoalP_NWPG	6109_1	6109_2	XLPE 800 MM SQ.	1	0.5
Goalp_BagrH1	6109_1	6103	GROSBEAK 636 MCM	1	45
Goalp_BagrH2	6109_1	6103	GROSBEAK 636 MCM	1	45
Goalp_BagrH3	6109_1	6103	GROSBEAK 804 SQ MM	1	45
Goalp_KhulC1	6109_1	6113	GROSBEAK 804 SQ MM	1	1.5
Goalp_KhulC2	6109_1	6113	GROSBEAK 804 SQ MM	1	1.5
GopalSS_PP	6110_2	6110_1	GROSBEAK 636 MCM	1	1.2
Hari_Manik	1107	1109	GROSBEAK 636 MCM	1	13

Hari_Matu	1107	1128	GROSBEAK 636 MCM	1	5.65
Hari_Megna1	1207_1	1202	TWIN MALLARD 2X795MCM	1	12.5
Hari_Megna2	1207_1	1202	TWIN MALLARD 2X795MCM	1	12.5
Hari_RahimS	1107	1135	HAWK 477 MCM	1	5
Hari_Sidd1	1107	1111_1	GROSBEAK 636 MCM	1	2
Hari_Sidd2	1107	1111_1	GROSBEAK 636 MCM	1	2
Hari_Sidd3	1107	1111_1	GROSBEAK 636 MCM	1	2.25
Hari_Sidd4	1107	1111_1	GROSBEAK 636 MCM	1	2.25
Hasna_Kera	1108	1122	GROSBEAK 636 MCM	1	13.5
Hasna_Lal	1108	1124	GROSBEAK 636 MCM	1	15
Hasna_LalX	1108	1124	GROSBEAK 636 MCM	1	30
Hasna_Shym	1108	1139	GROSBEAK 636 MCM	1	21
Hasna_Sital	1108	1138	GROSBEAK 636 MCM	1	12.6
HatH_Bara1	2103	2106	GROSBEAK 636 MCM	1	11
HatH_Bara2	2103	2106	GROSBEAK 636 MCM	1	11
HatH_Feni1	2103	3108	GROSBEAK 636 MCM	1	85.4
HatH_Feni2	2103	3108	GROSBEAK 636 MCM	1	85.4
Ishw_Bagha1	8203	8201	TWIN AAAC 37/4.176 MM	1	55
Ishw_Bagha2	8203	8201	TWIN AAAC 37/4.176 MM	1	55
Ishw_BeraT	8103	8107_2	HAWK 477 MCM	1	56.34
Ishw_Nator1	8103	8112	GROSBEAK 804 SQ MM	1	42
Ishw_Nator2	8103	8112	GROSBEAK 804 SQ MM	1	42

Ishw_Pabna	8103	8114	GROSBEAK 636 MCM	1	18
Jamal_Sher1	4101	4106	GROSBEAK 636 MCM	1	20
Jamal_Sher2	4101	4106	GROSBEAK 636 MCM	1	20
Jess_Jnidh1	6111	6112	GROSBEAK 804 SQ MM	1	47.5
Jess_Jnidh2	6111	6112	GROSBEAK 804 SQ MM	1	47.5
Jnidh_Chwad	6112	6105	GROSBEAK 636 MCM	1	39.3
Jnidh_Mgura	6112	6115	GROSBEAK 636 MCM	1	26.5
Jnidh_kusta1	6112	6114	GROSBEAK 804 SQ MM	1	43
Jnidh_kusta2	6112	6114	GROSBEAK 804 SQ MM	1	43
Joy_Kodda1	1118	1123	GROSBEAK 636 MCM	1	8
Joy_kodda2	1118	1123	GROSBEAK 636 MCM	1	8
Julda_HaliS	2111	2110	GROSBEAK 804 SQ MM	1	8
Julda_Shmir1	2111	2119	GROSBEAK 636 MCM	1	6
Julda_Shmir2	2111	2119	GROSBEAK 636 MCM	1	6
KChar_LalB	1121	1124	GROSBEAK 636 MCM	1	2.6
KSRM_KYCR	2112	2122	GROSBEAK 636 MCM	1	0.5
Kabir_Manik1	1119	1127	GROSBEAK 636 MCM	1	32
Kabir_Manik2	1119	1127	GROSBEAK 636 MCM	1	32
Kabir_Tanga1	1119	4107	GROSBEAK 636 MCM	1	51
Kabir_Tanga2	1119	4107	GROSBEAK 636 MCM	1	51
Kalyan_KChar	1120	1121	GROSBEAK 636 MCM	1	11
Kalyan_Kera	1120	1122	GROSBEAK 636 MCM	1	20
Kalyan_Lal1	1120	1124	GROSBEAK 636 MCM	1	14
Kalyan_Lal2	1120	1124	GROSBEAK 636 MCM	1	14

Kapta_Cgona1	2113	2107	GROSBEAK 636 MCM	1	11.5
Kapta_Cgona2	2113	2107	GROSBEAK 636 MCM	1	11.5
Kapta_HatH1	2113	2103	GROSBEAK 636 MCM	1	45
Kapta_HatH2	2113	2103	GROSBEAK 636 MCM	1	45
Kera_KChar	1122	1121	GROSBEAK 636 MCM	1	13
KhulC_NoaP1	6113	6117_1	GROSBEAK 804 SQ MM	1	22.8
KhulC_NoaP2	6113	6117_1	GROSBEAK 804 SQ MM	1	22.8
KhulC_S1	6113	6102	TWIN AAAC 37/4.176 MM_132	1	9
KhulC_S2	6113	6102	TWIN AAAC 37/4.176 MM_132	1	9
KhulS_Bhera1	6202	6201	TWIN AAAC 37/4.176 MM	1	176.5
KhulS_Bhera2	6202	6201	TWIN AAAC 37/4.176 MM	1	176.5
KhulS_Galla1	6102	6107	GROSBEAK 636 MCM	1	4.2
KhulS_Galla2	6102	6107	GROSBEAK 636 MCM	1	4.2
KhulS_SatKi	6102	6118	GROSBEAK 804 SQ MM	1	47
Kisor_Msing1	4102	4103	GROSBEAK 636 MCM	1	59
Kisor_Msing2	4102	4103	GROSBEAK 636 MCM	1	59
Kodda_Kabir1	1123	1119	GROSBEAK 636 MCM	1	10
Kodda_Kabir2	1123	1119	GROSBEAK 636 MCM	1	10
Kulsi_AKSPL	2115	2101	GROSBEAK 636 MCM	1	11
Kulsi_Baku	2115	2105	GROSBEAK 636 MCM	1	15
Kulsi_HaliS1	2115	2110	GROSBEAK 636 MCM	1	13

Kulsi_HaliS2	2115	2110	GROSBEAK 636 MCM	1	13
Kulsi_ModS	2115	2117	GROSBEAK 636 MCM	1	3.45
Kulsi_bara	2115	2106	GROSBEAK 636 MCM	1	15
Madan_Hari	1125	1107	ACCC HAWK 611 KCMIL	1	12.4
Madan_Munsi1	1125	1131	GROSBEAK 636 MCM	1	4
Madan_Munsi2	1125	1131	GROSBEAK 636 MCM	1	4
Madan_Sital	1125	1138	GROSBEAK 636 MCM	1	4
Madun_HatH1	2116	2103	GROSBEAK 636 MCM	1	10.2
Madun_HatH2	2116	2103	GROSBEAK 636 MCM	1	10.2
Madun_Kulsi1	2116	2115	GROSBEAK 636 MCM	1	13
Madun_Kulsi2	2116	2115	GROSBEAK 636 MCM	1	13
Madun_Sikal	2116	2120	GROSBEAK 636 MCM	1	16.5
Madun_TKC	2116	2121	GROSBEAK 636 MCM	1	8.5
Manik_Banga1	1109	1113	COPPER CABLE 240 SQ MM	1	3
Manik_Banga2	1109	1113	COPPER CABLE 240 SQ MM	1	3
Manik_Matu	1109	1128	GROSBEAK 636 MCM	1	5.5
Manik_Narin1	1109	1132	COPPER CABLE 240 SQ MM	1	5
Manik_Narin2	1109	1132	COPPER CABLE 240 SQ MM	1	5
MataT_Dhazri	2123_1	2109	GROSBEAK 636 MCM	1	48
MataT_Mata	2123_1	2123_2	GROSBEAK 636 MCM	1	20
Mdari_Bsha-0	6119	7101	HAWK 477 MCM	1	49.79
Mdari_Bsha-1	6119	7101	HAWK 477 MCM	1	49.79

Mdari_Gopal	6119	6110_1	GROSBEAK 804 SQ MM	1	45
Megna_Hasna1	1202	1208	TWIN MALLARD 2X795MCM	1	24.5
Megna_Hasna2	1202	1208	TWIN MALLARD 2X795MCM	1	24.5
Mirpur_Amin1	1129	1101	GROSBEAK 636 MCM	1	7
Mirpur_Amin2	1129	1101	GROSBEAK 636 MCM	1	7
ModS_Baku	2117	2105	GROSBEAK 636 MCM	1	12
Msing-Nkona1	4103	4104	GROSBEAK 636 MCM	1	34
Msing-Nkona2	4103	4104	GROSBEAK 636 MCM	1	34
Msing_Jamal1	4103	4101	GROSBEAK 636 MCM	1	55
Msing_Jamal2	4103	4101	GROSBEAK 636 MCM	1	55
NWPG_KhulC1	6109_2	6113	XLPE 800 MM SQ.	1	2.4
NWPG_KhulC2	6109_2	6113	XLPE 800 MM SQ.	1	2.4
NarS_Hari	1133	1107	GROSBEAK 636 MCM	1	34.33
Nator_Bgra1	8112	8102	GROSBEAK 804 SQ MM	1	61
Nator_Bgra2	8112	8102	GROSBEAK 804 SQ MM	1	61
Ngao_JPhat	8104	8111	GROSBEAK 636 MCM	1	46.2
Ngao_Niamt	8104	8113	GROSBEAK 804 SQ MM	1	46
NoaPP_SS	6117_2	6117_1	GROSBEAK 636 MCM	1	1.6
NoaPSS_Jess1	6117_1	6111	GROSBEAK 804 SQ MM	1	27.9
NoaPSS_Jess2	6117_1	6111	GROSBEAK 804 SQ MM	1	27.9
Pabna_SjadP	8114	8116	GROSBEAK 636 MCM	1	41
Pbari_Rang1	9115	9105	GROSBEAK 804 SQ MM	1	52
Pbari_Rang2	9115	9105	GROSBEAK 804 SQ MM	1	52

Psadi_Takur1	9104	9107	GROSBEAK 804 SQ MM	1	45
Psadi_Takur2	9104	9107	GROSBEAK 804 SQ MM	1	45
RPCL_Tangl1	4105	4107	GROSBEAK 636 MCM	1	100
RPCL_Tangl2	4105	4107	GROSBEAK 636 MCM	1	100
Raj_Cnwab1	8117	8110	GROSBEAK 636 MCM	1	48
Raj_Cnwab2	8117	8110	GROSBEAK 636 MCM	1	48
Raj_Nator1	8117	8112	HAWK 477 MCM	1	37
Raj_Nator2	8117	8112	GROSBEAK 636 MCM	1	40
Rampu_Basun1	1110	1114	GROSBEAK 636 MCM	1	8
Rampu_Basun2	1110	1114	GROSBEAK 636 MCM	1	8
Rampu_Gul1	1110	1143	XLPE 800 MM SQ.	1	3.3
Rampu_Gul2	1110	1143	XLPE 800 MM SQ.	1	3.3
Rampu_Hari1	1210	1207_1	TWIN MALLARD 2X795MCM	1	22
Rampu_Hari2	1210	1207_1	TWIN MALLARD 2X795MCM	1	22
Rampu_Madar1	1110	1126	XLPE 800 MM SQ.	1	4.5
Rampu_Madar2	1110	1126	XLPE 800 MM SQ.	1	4.5
Rampu_Mogh1	1110	1130	GROSBEAK 636 MCM	1	4.5
Rampu_Mogh2	1110	1130	GROSBEAK 636 MCM	1	4.5
Rang_LMonir	9105	9102	GROSBEAK 636 MCM	1	38
Rang_SaidP1	9105	9106	GROSBEAK 804 SQ MM	1	41.5
Rang_SaidP2	9105	9106	GROSBEAK 804 SQ MM	1	41.5
Raozn_HatH1	2204	2203	TWIN 300 SQ MM	1	22.5
Raozn_HatH2	2204	2203	TWIN 300 SQ MM	1	22.5

Rmati_Khag1	2118	2114	GROSBEAK 636 MCM	1	57
Rmati_Khag2	2118	2114	GROSBEAK 636 MCM	1	57
SaidP_Psadi1	9106	9104	GROSBEAK 804 SQ MM	1	24.5
SaidP_Psadi2	9106	9104	GROSBEAK 804 SQ MM	1	24.5
SajiB_BBari1	5106	3103	GROSBEAK 636 MCM	1	57
SajiB_BBari2	5106	3103	GROSBEAK 636 MCM	1	57
SajiB_SreeM1	5106	5107	GROSBEAK 636 MCM	1	36.2
SajiB_SreeM2	5106	5107	GROSBEAK 636 MCM	1	36.2
Sgao_Hari2	1140_1	1107	GROSBEAK 636 MCM	1	15
Sgaon_Hari1	1140_1	1107	GROSBEAK 636 MCM	1	15
Sgaon_MegR1	1140_1	1102_1	GROSBEAK 636 MCM	1	5
Sgaon_MegR2	1140_1	1102_1	GROSBEAK 636 MCM	1	5
Shym_Hari	1139	1107	GROSBEAK 636 MCM	1	30
SiddD_SiddSS	1111_2	1111_3	GROSBEAK 636 MCM	1	2.5
Sidd_DPP	1111_1	1111_4	GROSBEAK 636 MCM	1	2.4
Sidd_Hari	1211	1207_1	ACSR 600 SQ. MM	1	1.5
Sidd_Manik	1111_1	1109	GROSBEAK 636 MCM	1	10
Sidd_Manik1	1211	1209	TWIN MALLARD 2X795MCM	1	11
Sidd_Manik2	1211	1209	TWIN MALLARD 2X795MCM	1	11
Sidd_SiddSS	1111_1	1111_3	GROSBEAK 804 SQ MM	1	2
Sidd_Ulon1	1111_1	1141	ACCC HAWK 611 KCMIL	1	16
Sidd_Ulon2	1111_1	1141	ACCC HAWK 611 KCMIL	1	16

Sikal_Baku1	2120	2105	GROSBEAK 636 MCM	1	4
Sikal_Baku2	2120	2105	GROSBEAK 636 MCM	1	4
Sikal_DHazr1	2120	2109	GROSBEAK 636 MCM	1	32
Sikal_DHazr2	2120	2109	GROSBEAK 636 MCM	1	32
Sikal_Julda	2120	2111	GROSBEAK 804 SQ MM	1	7.5
Sikal_Shmir1	2120	2119	GROSBEAK 636 MCM	1	9
Sikal_Shmir2	2120	2119	GROSBEAK 636 MCM	1	9
Siraj_Bagha	8105	8101	GROSBEAK 636 MCM	1	39.7
Siraj_BgraO1	8205	8202	TWIN AAAC 37/4.176 MM	1	72.5
Siraj_BgraO2	8205	8202	TWIN AAAC 37/4.176 MM	1	72.5
Siraj_SjadP	8105	8116	GROSBEAK 636 MCM	1	34
SreeM_Fench1	5106	5102_1	GROSBEAK 636 MCM	1	49
SreeM_Fench2	5106	5102_1	GROSBEAK 636 MCM	1	49
Sunam_chtak	5108	5104	GROSBEAK 636 MCM	1	30
Syl_Chtk1	5109	5104	GROSBEAK 636 MCM	1	32.9
Syl_Chtk2	5109	5104	GROSBEAK 636 MCM	1	32.9
Syl_SylS1	5109	5110	GROSBEAK 636 MCM	1	13
Syl_SylS2	5109	5110	GROSBEAK 636 MCM	1	13
TKC_Sikal1	2121	2120	GROSBEAK 636 MCM	1	8.5
Takur_Panch	9107	9103	GROSBEAK 636 MCM	1	45
Tongi_Amin1	1212	1201	TWIN AAAC 37/4.176 MM	1	25.2
Tongi_Amin2	1212	1201	TWIN AAAC 37/4.176 MM	1	25.2

Tongi_Ghora1	1212	1206	ACCC-DOVE 713 KCMIL	1	27
Tongi_Ghora2	1212	1206	ACCC-DOVE 713 KCMIL	1	27
Tongi_Kabir1	1112	1119	GROSBEAK 636 MCM	1	22.5
Tongi_Kabir2	1112	1119	GROSBEAK 636 MCM	1	22.5
Tongi_Mirpur	1112	1129	GROSBEAK 636 MCM	1	17
Tongi_Nton1	1112	1134	GROSBEAK 636 MCM	1	0.5
Tongi_Nton2	1112	1134	GROSBEAK 636 MCM	1	0.5
Tongi_Uttara	1112	1142	GROSBEAK 636 MCM	1	14.5
Ulon_Dhan1	1141	1117	XLPE 800 MM SQ.	1	5.5
Ulon_Dhan2	1141	1117	COPPER CABLE 240 SQ MM	1	5.5
Ulon_Dhan3	1141	1117	COPPER CABLE 240 SQ MM	1	5.5
Ulon_Dhan4	1141	1117	XLPE 800 MM SQ.	1	5.5
Ulon_Rampu1	1141	1110	GROSBEAK 636 MCM	1	4
Ulon_Rampu2	1141	1110	GROSBEAK 636 MCM	1	4
Uttar_Mirpu	1142	1129	GROSBEAK 636 MCM	1	8.5
kusta_Bhera1	6114	6101_1	GROSBEAK 804 SQ MM	1	23
kusta_Bhera2	6114	6101_1	GROSBEAK 804 SQ MM	1	23

SHUNT CAPACITOR INFORMATION

ID	Bus ID	DBase ID	Duplic	MVAR	kV Nominal	Capacitance
1C1	1L08	HASNABAD 12.5	4	12.5	33	36.537
1C10	1L29_2	MIRPUR 10	4	10	33	29.23
1C11	1L18_1	JAYDEVPUR 12.5	4	12.5	33	36.537
1C12	1L18_2	JAYDEVPUR 12.5	3	12.5	33	36.537
1C13	1101	AMINBAZAR 45	3	45	132	8.221
1C14	1L12	TONGI 5	3	5	33	14.615
1C15	1L12	TONGI 10	5	10	33	29.23
1C16	1L05	CAP_GEN	4	10	33	29.23
1C17	1L06	CAP_GEN	4	10	33	29.23
1C18	1L07	CAP_GEN	4	10	33	29.23
1C19	1L09	CAP_GEN	4	10	33	29.23
1C2	1L08	HASNABAD 5	3	12.5	33	36.537
1C20	1L11	CAP_GEN	4	10	33	29.23
1C21	1L13	CAP_GEN	5	25	33	73.074
1C22	1L14	CAP_GEN	4	10	33	29.23
1C23	1L15	CAP_GEN	4	10	33	29.23
1C24	1L17	CAP_GEN	5	10	33	29.23
1C25	1L27	CAP_GEN	5	10	33	29.23
1C26	1L30	CAP_GEN	4	20	33	58.459
1C27	1L24	CAP_GEN	3	13.9	33	40.629
1C28	1L20	CAP_GEN	3	20	33	58.459
1C29	1L39	CAP_GEN	4	20	33	58.459
1C3	1L03	BHULTA 12.5	4	12.5	33	36.537
1C30	1L43	CAP_GEN	3	20	33	58.459
1C31	1L31	CAP_GEN	2	20	33	58.459
1C32	1114	CAP_GEN_45MVAR	2	45	132	8.221
1C33	1121	CAP_GEN_45MVAR	2	45	132	8.221
1C34	1138	CAP_GEN_45MVAR	2	45	132	8.221
1C35	1127	CAP_GEN_45MVAR	2	45	132	8.221
1C36	1130	CAP_GEN_45MVAR	2	45	132	8.221
1C4	1110	RAMPURA 45	3	45	132	8.221
1C5	1L19_1	KABIRPUR 12.5	4	15	33	43.844
1C6	1L19_2	KABIRPUR 5	3	12.5	33	36.537
1C7	1L37	SAVAR 12.5	4	12.5	33	36.537
1C8	1L37	SAVAR 12.5	4	12.5	33	36.537
1C9	1L29_1	MIRPUR 10	3	15	33	43.844
1new26	1L26	CAP_GEN	2	10	33	29.23
1new28	1L28	CAP_GEN	2	10	33	29.23

1new32	1L32	CAP_GEN	2	10	33	29.23
1new36	1L36	CAP_GEN	2	10	33	29.23
1new41	1L41	CAP_GEN	1	10	33	29.23
1new42	1L42	CAP_GEN	1	10	33	29.23
2C1	2103	HATHAZARI 22/45	1	22	132	4.019
2C10	2L01_2	CAP_GEN_25MVAR	6	25	33	73.074
2C11	2L01_3	CAP_GEN_25MVAR	9	25	33	73.074
1C1	1L09	HASNABAD 12.6	2.78687	22.4669	61.1	35.8894
1C10	1L29_3	MIRPUR 11	2.76118	22.6409	61.5565	35.9955
1C11	1L18_3	JAYDEVPUR 12.5	2.73549	22.8149	62.013	36.1016
1C12	1L18_4	JAYDEVPUR 12.5	2.70979	22.9889	62.4696	36.2077
1C13	1102	AMINBAZAR 46	2.6841	23.1629	62.9261	36.3138
1C14	1L12	TONGI 15	2.65841	23.337	63.3826	36.4199
1C15	1L12	TONGI 20	2.63272	23.511	63.8391	36.5259
1C16	1L05	CAP_GEN	2.60703	23.685	64.2957	36.632
1C17	1L06	CAP_GEN	2.58134	23.859	64.7522	36.7381
1C18	1L07	CAP_GEN	2.55564	24.033	65.2087	36.8442
1C19	1L09	CAP_GEN	2.52995	24.2071	65.6652	36.9503
1C2	1L08	HASNABAD 6	2.50426	24.3811	66.1217	37.0564
1C20	1L11	CAP_GEN	2.47857	24.5551	66.5783	37.1625
1C21	1L13	CAP_GEN	2.45288	24.7291	67.0348	37.2686
1C22	1L14	CAP_GEN	2.42718	24.9031	67.4913	37.3747
1C23	1L15	CAP_GEN	2.40149	25.0771	67.9478	37.4808
1C24	1L17	CAP_GEN	2.3758	25.2512	68.4043	37.5868
1C25	1L27	CAP_GEN	2.35011	25.4252	68.8609	37.6929
1C26	1L30	CAP_GEN	2.32442	25.5992	69.3174	37.799
1C27	1L24	CAP_GEN	2.29873	25.7732	69.7739	37.9051
1C28	1L20	CAP_GEN	2.27303	25.9472	70.2304	38.0112
1C29	1L39	CAP_GEN	2.24734	26.1213	70.687	38.1173
1C3	1L03	BHULTA 12.6	2.22165	26.2953	71.1435	38.2234
1C30	1L43	CAP_GEN	2.19596	26.4693	71.6	38.3295
1C31	1L31	CAP_GEN	2.17027	26.6433	72.0565	38.4356
1C32	1122.93	CAP_GEN_45MVAR	2.14458	26.8173	72.513	38.5416
1C33	1122.82	CAP_GEN_45MVAR	2.11888	26.9913	72.9696	38.6477
1C34	1122.7	CAP_GEN_45MVAR	2.09319	27.1654	73.4261	38.7538
1C35	1122.59	CAP_GEN_45MVAR	2.0675	27.3394	73.8826	38.8599
1C36	1122.48	CAP_GEN_45MVAR	2.04181	27.5134	74.3391	38.966
1C4	1122.36	RAMPURA 46	2.01612	27.6874	74.7957	39.0721
1C5	1L19_3	KABIRPUR 12.6	1.99043	27.8614	75.2522	39.1782
1C6	1L19_4	KABIRPUR 6	1.96473	28.0355	75.7087	39.2843
1C7	1L37	SAVAR 12.5	1.93904	28.2095	76.1652	39.3904
1C8	1L37	SAVAR 12.5	1.91335	28.3835	76.6217	39.4964
1C9	1L29_2	MIRPUR 11	1.88766	28.5575	77.0783	39.6025

1new26	1L26	CAP_GEN	1.86197	28.7315	77.5348	39.7086
1new28	1L28	CAP_GEN	1.83628	28.9056	77.9913	39.8147
1new32	1L32	CAP_GEN	1.81058	29.0796	78.4478	39.9208
1new36	1L36	CAP_GEN	1.78489	29.2536	78.9043	40.0269
1new41	1L41	CAP_GEN	1.7592	29.4276	79.3609	40.133
1new42	1L42	CAP_GEN	1.73351	29.6016	79.8174	40.2391
2C1	2104	HATHAZARI 22/46	1.70782	29.7756	80.2739	40.3452
2C10	2L01_4	CAP_GEN_25MVAR	1.68213	29.9497	80.7304	40.4513
2C11	2L01_5	CAP_GEN_25MVAR	1.65643	30.1237	81.187	40.5573
1C1	1L10	HASNABAD 12.7	1.63074	30.2977	81.6435	40.6634
1C10	1L29_4	MIRPUR 12	1.60505	30.4717	82.1	40.7695
1C11	1L18_5	JAYDEVPUR 12.5	1.57936	30.6457	82.5565	40.8756
1C12	1L18_6	JAYDEVPUR 12.5	1.55367	30.8198	83.013	40.9817
1C13	1103	AMINBAZAR 47	1.52798	30.9938	83.4696	41.0878
1C14	1L12	TONGI 25	1.50228	31.1678	83.9261	41.1939
1C15	1L12	TONGI 30	1.47659	31.3418	84.3826	41.3
1C16	1L05	CAP_GEN	1.4509	31.5158	84.8391	41.4061
1C17	1L06	CAP_GEN	1.42521	31.6898	85.2957	41.5121
1C18	1L07	CAP_GEN	1.39952	31.8639	85.7522	41.6182
1C19	1L09	CAP_GEN	1.37383	32.0379	86.2087	41.7243
1C2	1L08	HASNABAD 7	1.34813	32.2119	86.6652	41.8304
1C20	1L11	CAP_GEN	1.32244	32.3859	87.1217	41.9365
1C21	1L13	CAP_GEN	1.29675	32.5599	87.5783	42.0426
1C22	1L14	CAP_GEN	1.27106	32.734	88.0348	42.1487
1C23	1L15	CAP_GEN	1.24537	32.908	88.4913	42.2548
1C24	1L17	CAP_GEN	1.21968	33.082	88.9478	42.3609
1C25	1L27	CAP_GEN	1.19398	33.256	89.4043	42.4669
1C26	1L30	CAP_GEN	1.16829	33.43	89.8609	42.573
1C27	1L24	CAP_GEN	1.1426	33.604	90.3174	42.6791
1C28	1L20	CAP_GEN	1.11691	33.7781	90.7739	42.7852
1C29	1L39	CAP_GEN	1.09122	33.9521	91.2304	42.8913
1C3	1L03	BHULTA 12.7	1.06552	34.1261	91.687	42.9974
1C30	1L43	CAP_GEN	1.03983	34.3001	92.1435	43.1035
1C31	1L31	CAP_GEN	1.01414	34.4741	92.6	43.2096
1C32	1122.25	CAP_GEN_45MVAR	0.98845	34.6482	93.0565	43.3157
1C33	1122.13	CAP_GEN_45MVAR	0.96276	34.8222	93.513	43.4218
1C34	1122.02	CAP_GEN_45MVAR	0.93707	34.9962	93.9696	43.5278
1C35	1121.9	CAP_GEN_45MVAR	0.91137	35.1702	94.4261	43.6339
1C36	1121.79	CAP_GEN_45MVAR	0.88568	35.3442	94.8826	43.74

STATIC LOAD INFORMATION

ID	Bus ID	DBase ID	P Load	Q Load	MVA	P.Factor
AL01	1G23	KODDA 150 AL	9.92	6.17	11.6823	0.8492
AL02	1G06_2	GHORASHAL ST U1_2	6.87	4.26	8.0836	0.8499
AL03	1G06_3	GHORASHAL ST U3_6	52.48	32.52	61.739	0.85
AL04	1G11_1	SIDDHIRGANJ 2X120	13.57	8.41	15.9647	0.85
AL05	1G02_3	MEGHNAGHAT CCPP GT	17.49	10.84	20.5768	0.85
AL06	1G02_4	MEGHNAGHAT CCPP ST	11.88	7.36	13.9751	0.8501
AL07	1G05	GAZIPUR RPCL	3.34	2.07	3.9294	0.85
AL08	1G07_1	HARIPUR CCPP GT	17.06	10.57	20.0691	0.8501
AL09	1G07_2	HARIPUR CCPP ST	8.69	5.38	10.2206	0.8502
AL10	1G07_3	HARIPUR 360 MW CCPP GT	15.49	9.6	18.2236	0.85
AL11	1G07_4	HARIPUR 360 MW CCPP ST	8.22	5.1	9.6736	0.8497
AL12	1G11_2	SIDDHIRGANJ ST 210 MW	12.35	7.65	14.5274	0.8501
AL13	2G20_2	SIKALBAHA 60 MW TPS	3.63	2.25	4.2708	0.85
AL14	2G13_1	KAPTAI HYDRO U1&2	5.57	3.45	6.5519	0.8501
AL15	2G13_2	KAPTAI HYDRO U3	3.03	1.88	3.5659	0.8497
AL16	2G13_3	KAPTAI HYDRO U4&5	6.06	3.75	7.1264	0.8504
AL17	3G01_1	ASHUGANJ 97 MW U1&2	8.16	5.06	9.6015	0.8499
AL18	3GG01_2	ASHUGANJ 3X150 MW	29.07	18.016	34.2	0.85
AL19	3G01_3	ASHUGANJ 40 MW GT2	3.5445	2.2	4.1717	0.8496
AL20	3G01_4	ASHUGANJ 225 CCPP GT	9.945	6.16	11.6982	0.8501
AL21	3G01_5	ASHUGANJ 225 CCPP ST	5.865	3.63	6.8975	0.8503
AL22	1G11_4	SIDDHIRGANJ 335 MW CCPP GT	12.5	7.74	14.7023	0.8502
AL23	1G11_5	SIDDHIRGANJ 335 MW CCPP ST	8.44	5.23	9.9291	0.85

AL24	2G04_2	RAOZAN 2X 210 MW	23.93	14.83	28.1527	0.85
AL25	1G07_5	HARIPUR 3X 20 MW	6.53	4.05	7.684	0.8498
AL26	3G01_14	ASHUGANJ S 450 MW CCPP GT	15.81	9.8	18.601	0.85
AL27	3G01_14	ASHUGANJ S 450 MW CCPP ST	8.5425	5.29	10.0478	0.8502
AL28	4G03_1	MYMENSINGH RPCL ST 70 MW	4.94	3.06	5.811	0.8501
AL29	4G03_2	MYMENSINGH RPCL GT 4X35 MW	8.62	5.34	10.14	0.8501
AL30	7G02_1	BHOLA 225 MW CCPP ST	4.55	2.82	5.353	0.85
AL31	7G02_2	BHOLA 225 MW CCPP GT	8.16	5.06	9.6015	0.8499
AL32	2G04_1	RPCL RAOZAN 25 MW	1.62	1.01	1.9091	0.8486
AL33	3G01_13	ASHUGANJ N 450 MW CCPP GT	15.81	9.8	18.601	0.85
AL34	3G01_13	ASHUGANJ N 450 MW CCPP ST	8.5425	5.29	10.0478	0.8502
AL35	3G04_1	CHANDPUR 150 MW CCPP GT	6.018	3.73	7.0802	0.85
AL36	5G09_2	SYLHET 150 MW	10.2	6.3214	12	0.85
AL37	5G09_3	SYLHET 20 MW GT	1.3515	0.8376	1.59	0.85
AL38	5G06_3	SHAHJIBAZAR U 89 GT	4.386	2.7182	5.16	0.85
AL39	5G01_3	BIBIANA S 383 MW CCPP GT	16.07	9.9562	18.9042	0.8501
AL40	5G01_4	BIBIANA S 383 MW CCPP ST	8.3555	5.1783	9.83	0.85
AL41	5G02_1	FENCHUGANJ CCPP 1 GT	4.25	2.6339	5	0.85
AL42	5G02_2	FENCHUGANJ CCPP 1 ST	2.091	1.2959	2.46	0.85
AL43	5G02_3	FENCHUGANJ CCPP 2 GT	5.8565	3.6295	6.89	0.85
AL44	5G02_4	FENCHUGANJ CCPP 2 ST	2.295	1.4223	2.7	0.85
AL45	6G01_1	BHERAMARA GT 1&2	2.94	1.82	3.4577	0.8503
AL46	6G01_2	BHERAMARA GT 3	1.39	0.86	1.6345	0.8504
AL47	7G03_1	BARISHAL 2X20 MW GT PDB	2.51	1.56	2.9553	0.8493

AL48	8G01_4	BAGHABARI 71 MW	3.97	2.46	4.6704	0.85
AL49	8G01_5	BAGHABARI 100 MW	6.03	3.74	7.0957	0.8498
AL50	1G08	TONGI PDB 105 MW GT	6.56	4.07	7.72	0.8497
AL51	3G04_2	CHANDPUR 150 MW CCPP ST	3.825	2.37	4.4997	0.8501
AL52	9G06	SYEDPUR 20 MW GTPS	1.12	0.69	1.3155	0.8514
AL53	9G01_1	BARAPUKURIA 125 MW ST 1	6.78	4.2	7.9755	0.8501
AL54	9G01_2	BARAPUKURIA 125 MW ST 2	6.78	4.2	7.9755	0.8501
AL55	9G05	RANGPUR PDB 20 MW	1.08	0.67	1.2709	0.8498
AL56	6G01_5	BHERAMARA 414 CCPP GT	16.01	9.92	18.8342	0.8501
AL57	6G01_6	BHERAMARA 414 CCPP GT	7.75	4.8	9.1161	0.8501
L0	3L01	ASHUGANJ 67	67	41.4	78.7589	0.8507
L1	1L19_1	KABIRPUR 100	98	60.76	115.307	0.8499
L10	1L31	MUNSHIGANJ 104	101.92	63.21	119.93	0.8498
L100	8L05_1	SIRAJGANJ 12	10.56	6.55	12.4264	0.8498
L101	8L05_2	SIRAJGANJ 60	52.8	32.74	62.1269	0.8499
L102	8L12_1	NATORE 50	44	27.28	51.7706	0.8499
L103	8L12_2	NATORE 38	33.44	20.77	39.3653	0.8495
L104	8L16_1	SHAHJADPUR 22	19.36	11.97	22.7616	0.8506
L105	8L16_2	SHAHJADPUR 22	19.36	11.97	22.7616	0.8506
L106	8L16_3	SHAHJADPUR 24	21.12	13.02	24.8108	0.8512
L107	8L14	PABNA 85	74.8	46.38	88.0122	0.8499
L108	8L03_1	ISHWARDI 17	14.96	9.28	17.6045	0.8498
L109	8L03_2	ISHWARDI 18	15.84	9.82	18.637	0.8499
L11	1L08	HASNABAD 185	181.3	112.36	213.294	0.85
L110	8L17_1	RAJSHAHI 28	24.64	15.22	28.9617	0.8508
L111	8L17_2	RAJSHAHI 90	79.2	48.93	93.0956	0.8507
L112	8L10_1	CHAPAI 17	14.96	9.28	17.6045	0.8498
L113	8L10_2	CHAPAI 34	29.92	18.55	35.2038	0.8499
L114	8L06	AMNURA 36	31.68	19.54	37.2214	0.8511
L115	6L19	MADARIPUR 110	99	61.36	116.473	0.85
L116	6L06	FARIDPUR 107	97.16	60.21	114.304	0.85
L117	6L10	GOPALGANJ 44	39.6	24.57	46.6031	0.8497
L118	6L14	KUSHTIA 87	68.85	42.67	81.0003	0.85
L119	6L01	BHERAMARA PGCB-GKI 45	38.25	23.71	45.0025	0.85

L12	1L41	ULLON 81	79.38	49.2	93.3907	0.85
L120	6L05	CHUADANGA 49	38.24	23.73	45.0046	0.8497
L121	6L12_1	JHENAIDAH 77	57.38	35.56	67.5054	0.85
L122	6L15	MAGURA 35	26.77	16.6	31.4991	0.8499
L123	6L11_1	JESSORE 131	117.9	73.08	138.712	0.85
L125	6L17_1	NOAPARA 17	15.3	9.49	18.0042	0.8498
L126	6L17_2	NOAPARA 42	37.8	23.4	44.4567	0.8503
L127	6L18	SATKHIRA 60	68.85	42.67	81.0003	0.85
L128	6L13	KHULNA CENTRAL 121	108.9	67.5	128.123	0.85
L129	6L09	GOALPARA 59	53.1	32.94	62.4872	0.8498
L13	1L26	MADARTEK 62	60.76	37.65	71.4794	0.85
L130	6L07	GALLAMARI 50	76.49	47.42	89.9965	0.8499
L131	6L03	BAGERHAT 59	53.1	32.94	62.4872	0.8498
L132	6L16	MONGLA 34	30.6	18.99	36.0136	0.8497
L133	7L05_1	PATUAKHALI 18	28.2592	17.5209	33.25	0.8499
L134	7L05_2	PATUAKHALI 24	32.2924	20.03	38	0.8498
L135	1L29_1	MIRPUR 90	88.2	54.68	103.775	0.8499
L136	1L29_2	MIRPUR 19	18.62	11.56	21.9166	0.8496
L137	2L02	BSRM 140	133	82.43	156.473	0.85
L138	2L01_1	AKSPL 25	12.11	7.51	14.2496	0.8498
L139	2L01_2	AKSPL 255	219.66	136	258.354	0.8502
L14	1L30	MOGHBAZAR 162	149.94	92.92	176.398	0.85
L140	2L01_3	AKSPL 60	77.51	48	91.1691	0.8502
L141	5L03	BEANIBAZAR 34	34	21	39.9625	0.8508
L142	7L02	BHOLA 32	30.4	18.81	35.7488	0.8504
L143_1	3L06_1	COMILLA_S 110	110	68	129.321	0.8506
L143_2	3L06_2	COMILLA_S 54	54	33.5	63.5472	0.8498
L144	1L06	GHORASHAL 90	88.2	54.88	103.88	0.8491
L145	1L35	RAHIM STEEL 30	29.4	18.23	34.5933	0.8499
L146	2L18	RANGAMATI 29	27.55	17.1	32.4255	0.8496
L147	2L20	SIKALBAHA 41	38.95	24.13	45.8188	0.8501
L148	1L40_1	SONARGAON 54	52.92	32.83	62.2763	0.8498
L149	5L08	SUNAMGANJ 31	31	19.2	36.4642	0.8501
L15	1L09	MANIKNAGAR 111	108.78	67.42	127.979	0.85
L150	2L13	KAPTAI 10	9.5	5.89	11.1778	0.8499
L151	1L23	KODDA 100	98	60.76	115.307	0.8499
L152	2L22	KYCR 17	16.15	9.98	18.9848	0.8507
L153	2L23	MATARBARI 32	30.4	18.81	35.7488	0.8504
L154	2L14	KHAGRACHARI 29	27.55	17.1	32.4255	0.8496

L16	1L13	BANGABHABAN 49	43.3058	26.8613	50.96	0.8498
L17	1L17	DHANMONDI 116	113.68	70.46	133.745	0.85
L18	1L32	NARINDA 69	67.62	41.9	79.5492	0.85
L19	1L21	KAMRANGIRCH AR 67	65.66	40.69	77.2458	0.85
L2	1L19_2	KABIRPUR 50	49	30.38	57.6537	0.8499
L20	1L24	LALBAGH 87	85.26	52.84	100.306	0.85
L21	1L36	SATMASJID 80	70.7967	43.8944	83.3	0.8499
L22	1L39	SHYAMPUR 165	161.7	100.25	190.255	0.8499
L23	1L38	SHITALAKHYA 121	118.58	73.5	139.512	0.85
L24	1L25	MADANGANJ 100	99.95	61.97	117.602	0.8499
L25	1L28	MATUAIL 79	77.42	48.02	91.1031	0.8498
L26	1L20	KALLYANPUR 127	124.46	77.13	146.422	0.85
L27	1L05	AGARGAON 81	79.38	49.2	93.3907	0.85
L28	1L15	BHASANTEK 109	106.82	66.2	125.67	0.85
L29	1L43	GULSHAN 155	151.9	94.18	178.727	0.8499
L3	1L37	SAVAR 95	93.1	57.82	109.594	0.8495
L30	1L14	BASUNDHARA 176	172.48	106.92	202.932	0.8499
L31	1L42	UTTARA 121	118.58	73.5	139.512	0.85
L32	1L34	NEW TONGI 117	114.66	71.06	134.894	0.85
L33	4L07	TANGAIL 115	100.938	62.5554	118.75	0.85
L34	4L06	SHERPUR 46	43.7	27.08	51.4103	0.85
L35	4L03	MYMENSINGH 159	151.05	93.61	177.705	0.85
L36	3L03	B. BARIA 85	85	52.68	100.001	0.85
L37	3L02	COMILLA N 57	57	35.33	67.0612	0.85
L38	3L07	DAUDKANDI 77	77	47.72	90.5881	0.85
L39	3L04	CHADPUR 105	97.7385	60.5986	115	0.8499
L4	1L27	MANIKGANJ 94	92.12	57.04	108.35	0.8502
L40	3L05	CHOWMUHANI 165	157.232	97.4846	185	0.8499
L41	3L08	FENI 106	106	65.7	124.71	0.85
L42	7L03	BARISAL 104	98.8	61.28	116.261	0.8498
L43	7L04	BHANDARIA 35	33.25	20.62	39.1248	0.8498
L44	4L01_1	JAMALPUR 72	68.4	42.28	80.4124	0.8506
L45	4L01_2	JAMALPUR 12	11.4	7.03	13.3933	0.8512
L46	4L04_1	NETROKONA 21	19.95	12.35	23.4633	0.8503
L47	4L04_2	NETROKONA 42	39.9	24.7	46.9265	0.8503
L48	4L02_1	KISHORGANJ 38	58.9	36.58	69.3347	0.8495
L5	1L18_1	JOYDEVPUR 60	117.6	72.91	138.368	0.8499

L50	1L07	HARIPUR 73	70.91	43.71	83.2994	0.8513
L51	2L03	HATHAZARI 103	97.85	60.52	115.053	0.8505
L52	2L21	TKC 11	10.45	6.46	12.2855	0.8506
L53	2L17	MODERN STEEL 15	14.25	8.84	16.7693	0.8498
L54	2L12	KSRM 26	24.7	15.3	29.0548	0.8501
L55	2L06_1	BAROAULIA 111	105.45	65.17	123.963	0.8507
L57	2L15	KHULSHI 191	181.45	112.1	213.285	0.8507
L58	2L10_1	HALISHAHAR 152	144.4	89.11	169.682	0.851
L6	1L18_2	JOYDEVPUR 60	58.8	36.46	69.1865	0.8499
L61	2L05_1	BAKULIA 103	80.8	49.97	95.0034	0.8505
L62	2L16	MADUNAGHAT 57	54.15	33.63	63.7432	0.8495
L63	2L07	CHANDRAGHONA 25	23.75	14.73	27.947	0.8498
L64	2L19	SHAHMIRPUR 22	20.9	12.92	24.571	0.8506
L65	2L11	JULDAH 34	32.3	19.95	37.9644	0.8508
L66	2L09	DOHAZARI 74	70.3	43.42	82.628	0.8508
L67	2L08	COX'S BAZAR 57	54.15	33.63	63.7432	0.8495
L68	5L09	SYLHET 60	120	74	140.982	0.8512
L7	1L12	TONGI 90	88.2	54.68	103.775	0.8499
L70	5L04_1	CHATAK 12	12	7.4	14.0982	0.8512
L71	5L04_2	CHATAK 12	12	7.4	14.0982	0.8512
L72	5L02_1	FENCHUGANJ 17	12.762	7.8823	15	0.8508
L73	5L02_2	FENCHUGANJ 20	20	12.4	23.5321	0.8499
L74	5L05	KULAURA 42	42	26	49.3964	0.8503
L75	5L07	SREEMONGAL 45	45	27.9	52.9472	0.8499
L76	5L06	SHAHJIBAZAR 63	63	38.8	73.9895	0.8515
L77	9L03	PANCHAGARH 23	19.55	12.07	22.9758	0.8509
L78	9L07	THAKURGAON 79	67.15	41.65	79.018	0.8498
L79	9L04_1	PURBASADIPUR 12	10.2	6.29	11.9835	0.8512
L8	1L33	NARSINGDI 80	78.4	48.61	92.2469	0.8499
L80	9L04_2	PURBASADIPUR 21	17.85	11.05	20.9935	0.8503
L81	9L04_3	PURBASADIPUR 48	40.8	25.33	48.0234	0.8496
L82	9L06_1	SAIDPUR 60	51	31.45	59.9175	0.8512
L83	9L06_2	SAIDPUR 33	28.05	17.43	33.0243	0.8494
L84	9L01_2	BARAPUKURIA 18	7.22	4.49	8.5023	0.8492
L85	9L01_1	BARAPUKURIA 30	27.45	17.02	32.2983	0.8499

L86	9L05_1	RANGPUR 95	80.75	50.07	95.0135	0.8499
L87	9L05_2	RANGPUR 15	13	8.06	15.2959	0.8499
L88	9L15_1	PALASHBARI 48	40.8	25.33	48.0234	0.8496
L89	9L15_2	PALASHBARI 28	23.8	14.71	27.979	0.8506
L9	1L11	SIDDHIRGANJ 155	151.9	93.59	178.417	0.8514
L90	9L02_1	LALMONIRHAT 63	53.55	33.15	62.9804	0.8503
L93	8L02_1	BOGRA 168	104.89	64.62	123.198	0.8514
L96	8L04_1	NAOGAON 88	77.44	47.87	91.0411	0.8506
L97	8L04_2	NAOGAON 22	19.36	11.97	22.7616	0.8506
L98	8L11	JOYPURHAT 40	35.2	21.82	41.4144	0.8499
L99	8L13	NIYAMOTPUR 65	57.2	35.46	67.2997	0.8499
L9_1	1L03	BHULTA 142	139.16	86.24	163.716	0.85