BHUTAN POWER CORPORATION LIMITED

(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)

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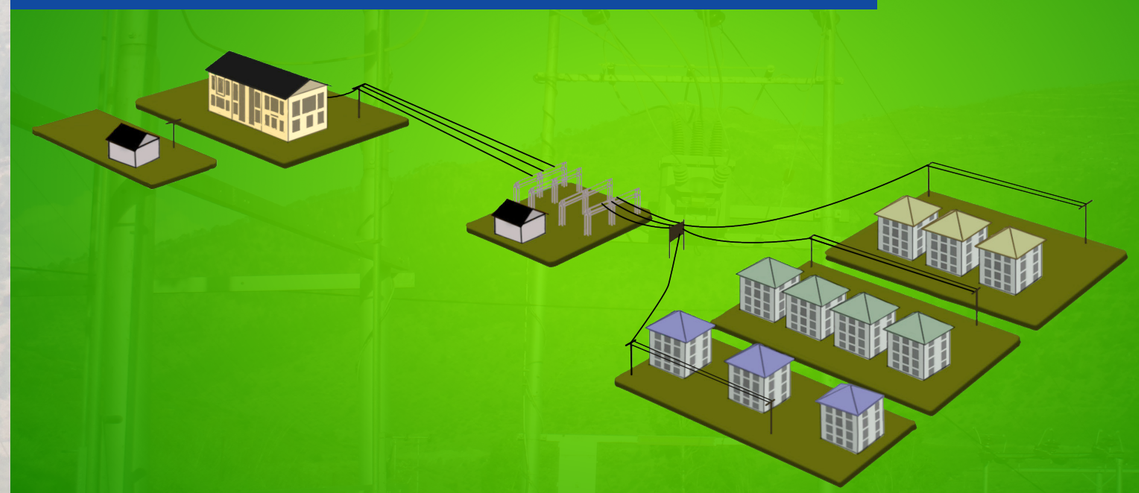
DISTRIBUTION SYSTEM MASTER PLAN (2020-2030)

SAMTSE DZONGKHAG



Distribution and Customer Services Department
Distribution Services
Bhutan Power Corporation Limited

2020

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FOREWORD

The Distribution System Master Plan (DSMP) identifies, prioritizes and opts for adequate and optimal distribution system expansion and augmentation programs to meet the expected electricity growth and demand development in the Country. This timely formulation of DSMP is in line with the stated corporate strategic objective of providing affordable, reliable and quality services to customers and will enable to traverse the changing technological, regulatory and social constraints for the time horizons considered.

The DSMP has been finalized after a series of consultative discussions with all the relevant stakeholders to obtain a shared outcome. In particular, adequate efforts have been taken to ensure that the DSMP aligns and integrates with the stated plans and programs of the Royal Government of Bhutan (RGoB) for the energy sector.

Based on the expected demand development for the time horizons considered, the DSMP outlines the road map for the implementation of optimized distribution network expansion programs and projects in stages with the expected investment required and financial commitments. The DSMP will be updated on a regular basis to incorporate changing business imperatives and contexts to ensure its relevance.

Appreciation goes to all the officials of the Distribution Services for formulating and coming out a comprehensive document that is timely which will serve as a blueprint for the Distribution Services to build a robust distribution system that will go a long way in contributing towards realization of BPC's objectives of providing a reliable electricity supply to its valued customers.

(Sonam Tobjey)
Chief Executive Officer

Preparation, Review & Approval of the Document

Prepared by:	Distribution & Customer Services Department, Distribution Services, Bhutan Power Corporation Limited, Thimphu.	**GM, DCSD**
Reviewed& Vetted by:	Management, Bhutan Power Corporation Limited, Thimphu. (22nd December 2019 – Meeting No. 557)	**CEO, BPC**
Approved by:	Board Tender & Technical Committee (BTTC), Bhutan Power Corporation Limited, Thimphu. (26th December, 2019 - 15th BTTC Meeting)	**Chairman, BTCC**

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Abbreviations

BPC: Bhutan Power Corporation Limited

ESD: Electricity Services Division

DSMP: Distribution System Master Plan

GIS: Geographical Information System

SLD: Single Line Diagram

ETAP: Electrical Transient and Analysis Program

IS: Indian Standard on Transformers

IEC: International Electrotechnical Commission

DT: Distribution Transformer

TSA: Time Series Analysis

LRM: Linear Regression Method

MV: Medium voltage (33kV, 11kV and 6.6kV (if it exists))

DDCS: Distribution Design and Construction Standards

kVA: Kilo Volt Ampere

W: Watt

kWh: Kilo Watt Hour

RMU: Ring Main Unit

PHCB: Population and Housing and Census of Bhutan

BDBL: Bhutan Development Bank Limited

BNB: Bhutan National Bank

RSTA: Road Safety and Transport Authority

RICB: Royal Insurance Corporation Limited

BoB: Bank of Bhutan Limited

USS: Unitized Substation

DMS: Distribution Management System

ADMS: Advanced DMS

SCADA: Supervisory Control and Data Acquisition

DSCADA: Distribution SCAD

Asset Life: The period of time (or total amount of activity) for which the asset will be economically feasible for use in a business.

Balanced system: A system is said to be balanced when all phase conductors carry approximately the same current. For delta systems, this applies to two-phase conductors, and for three-phase wye systems, this applies to three-phase conductors.

Contingency plan: Power that is needed when regularly used electric generating units are not in service, such as during short-term emergencies or longer unplanned outages, and during periods of scheduled maintenance when the units must be shut sown. Short-term backup power is generally called emergency power. Long-range backup power is often provided for in reserve sharing agreements.

Capacity: Also known as the power or capability of an electric generating plant. Facilities and place to serve electric customers. 2) The total amount of electrical energy a power line is able to transport at any given time (Measured in kVA).

Clearance: The clear distance between two objects measured surface to surface. For safety reasons, proper clearance must be maintained between power lines and the ground, buildings, trees, etc.

Critical Value: The value of the random variable at the boundary between the acceptance region and the rejection region in the testing of a hypothesis.

Distribution line: That part of the electrical supply system that distributes electricity at medium voltage (33kV, 11kV & 6.6kV) from a transformer substation to transformers or other step-down devices service customer premises, which finally supply power at the voltage required for customer use.

Distribution loss: Energy losses in the process of supplying electricity to the consumers due to commercial and technical losses.

Distribution system: The portion of the transmission and facilities of an electric system that is dedicated to delivering electric energy to an end-user.

Energy: Delivered power measured in kilowatt-hours (kWh).

Generating station: A plant wherein electric energy is produced by conversion from some other forms of energy.

Grid: A system of high-voltage transmission and power-generating facilities that is interconnected with a number of other bulk power supply agencies on a regional basis. A grid enables power to be transmitted from areas having a surplus to areas experiencing a shortage. A grid also eliminates some duplication of costly facilities in a given region.

Investment: the action or process of investing money for certain activities with return and profit.

Lines (electrical supply) - Those conductors used to transmit or deliver electric energy and their necessary support or containing structures.

Linear Regression Method: In **statistical modeling**, regression analysis is a set of statistical processes for **estimating** the relationships between a **dependent variable** (often called the 'outcome variable') and one or more **independent variables.**

Load: 1) A device, or resistance of a device, to which power is delivered in a circuit. 2) The measure of electrical demand placed on an electric system at any given time.

Load forecasting: The methods used in determining a system's short and long-term growth in peak load and kilowatt-hour sales by consumers.

Load Growth: The increase in the demand of power required over time.

Marginal Value: Just barely adequate or within a lower Limit.

On line - Term generally used to indicate when a generating plant and transmission line is scheduled to be in operation. When an operational plant and line is not on line, it is said to be "down."

Outage - Interruption of service to an electric consumer.

Overload - Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated ampacity that, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload.

Optimization: the action of making the best or most effective use of a situation or resource.

Pad-mounted equipment- General term describing enclosed equipment, the exterior of which enclosure is at ground potential, positioned on a surface-mounted pad. Example: underground transformers and junction boxes.

Peak demand - The maximum amounts of electricity used by a utility customer at any given time during the year. The peak is used to measure the amount of electric transmission, distribution, and generating capacity required to meet that maximum demand, even if it occurs infrequently and only for very short durations.

Peak load - The greatest amount of electricity used during a time period by the consumers in a utility's system.

Power - The time rate of electric energy in a device or circuit, measured in watts.

Power factor - A measurement of efficiency in the use of electricity. For example: a 100% power factor would be like a horse pulling a wagon on rails directly forward with no resistance. If the horse turns and pulls at a right angle to the rails, he may pull just as hard, but his efforts will not move the car. This would be a zero percent power factor. Now, if he pulls at a 45-degree angle to the rails, he will pull the car, but not with as high efficiency as if he were pulling straight down the rails. In the use of electricity, not every kilowatt generated translates into equivalent horsepower efficiency.

Power grid - A network of generation, transmission and distribution system that are interconnected

Power quality - The extent to which a utility system is able to maintain its delivery of electric energy within the tolerable limits of voltage and without outages or other problems with affect a customer's equipment use.

Power supply - Source of current and voltage.

Reliability - A measure of a utility's ability to deliver uninterrupted electric service to its customers.

Substation - An electrical facility containing switches, circuit breakers, buses, and transformers for switching power circuits and transforming power from one voltage to another, or from one system to another.

Time Series Analysis: The statistical techniques used when several years' data are available to forecast the load growth.

1. Executive Summary

Bhutan Power Corporation Limited is mandated to provide affordable, adequate, reliable and quality electricity services to the customers through transmission and distribution network established across the country. Towards realizing the mission, vision and destination statement of BPC as outlined in the Corporate Strategic Plan (2020-2030), there is a need to carry out comprehensive studies of the distribution system to address the system deficiencies as the ground realities are different triggered by technological advancement and economic growth.

The existing distribution networks are modeled and accordingly, the technical evaluation is carried out adopting the generally accepted load forecasting framework i.e. Time Series Analysis in conjunction to Linear Regression Method, the power requirement for next ten (10) years are forecasted. Subsequently, the network capability and the system gaps are identified with proposed distribution system planning. The investments are proposed (based on the priority matrix) to address the system inadequacies with the intent to improve the Customer Services Excellence, Operational and Resource Optimization Excellence, Innovation and Technology Excellence and Business Growth Excellence.

The single to three-phase distribution network conversion across the country is reproduced in this report based on the studies carried out by BPC "Technical and Financial Proposal on Converting Single Phase to Three-Phase Power Supply in Rural Areas".

The details on the distribution grid modernization are outlined in Smart Grid Master Plan 2019 including the investment (2020-20230). The identification of the system deficiencies and qualitative remedial measures which would require system automation and remote control as per the existing and projected load are only outlined in this report.

Similarly, the system study beyond the Distribution Transformers had to be captured during the annual rolling investment and budget approval.

The ETAP tool is used to carry out the technical evaluation and validate the system performances. Finally, necessary contingency plans, up gradation and reinforcement plans are proposed as annual investment plans based on the outcome of the simulation result.

2. Introduction

The system study is intended to improve the power distribution system in Bhutan by formulating a comprehensive, national level and district wise DSMP (2020-2030) till 2030 that provides measures for renewing and reinforcing power distribution facilities. BPC's distribution system has grown in size and complexities over the years. While many network additions and alterations carried out so far were as per the recommendations of the Druk Care Consultancy Study Report (2006), the ground realities are evermore different now than anticipated during the study. There is a need to explore opportunities for optimizing the available resources and develop a master plan for future investments.

Some of the prominent driving factors required for the development of the master plan includes but not limited to reliable power supply to the customers, reduction of distribution losses, network capability with the anticipated load growth, optimization of the resources and to develop annual investment plan.

BPC has never carried out comprehensive system studies to improve the distribution system and optimize the available resources. The recurring investment plans (annual) is based on the on-site and field proposals without any technical evaluation being carried out which could have resulted in preventable and excessive investments. Therefore, proper planning is necessary to improve the system for optimal usage of resources.

It is also intended that this master plan is to provide general guidance in preparing long-range system planning. The analysis indicates where up-grades are most likely to be economical and provides insight into the development of a practical transition from the existing system to the proposed long-range system. Based on this analysis, recommendations are made for improving system performance and increasing system capacity for expansion. Periodic reviews of the master plan will be required to examine the applicability of the preferred plan considering actual system developments.

3. Objectives of the Master Plan

The objective(s) of the DSMP (are):

3.1 To carry out the system study of the existing distribution network, forecast and come out with the comprehensive ten (10) years strategic distribution plan;

3.2 To provide affordable and adequate electricity, reduce losses, improve power quality, reliability, optimize the resources and gear towards excellent customer services; and

3.3 To come out with annual investment plans.

4. Scope of the Distribution System Master Plan

Formulation of detailed DSMP (2020-2030) of the Dzongkhag for renewal, reinforcement, and extension of the power distribution system up to DT.

5. Methodology and Approach

In order to better understand the existing distribution system and postulate the credible investment plans; standard framework and procedures had been adopted. However, in the absence of any standardized procedures in BPC for planning of distribution system, the following customized procedures detailed in **Section 5.1** through **Section 5.5**and as shown in **Figure 1** are considered to suit BPC's requirement for developing the DSMP.

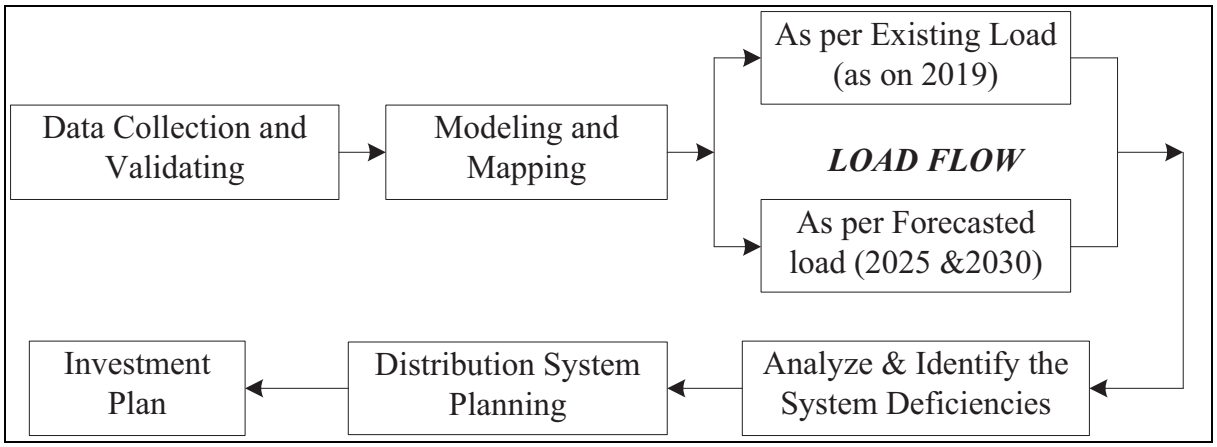


Figure 1: Block diagram for distribution system planning for thematic studies

5.1 Data Collection and Validation

In order to carry out the detailed studies with greater accuracy, complete and reliable data for the existing distribution infrastructure is required. Therefore, intensive field investigation was carried out during the months of April and May (2020) to validate the information that was collected. The information required for the studies does not confine to the BPC's internal distribution network but also the developmental activities of the cross-governmental sectors. The power arrangement requirements from these developmental activities were also used to forecast the power demand. The data validation on the distribution system includes the review of all the power sources, medium voltage lines and transformers with that of GIS data of Environment and GIS Division and SLD submitted by respective ESDs which is attached as **Annexure-1.**

5.2 Modeling and Mapping

The feeder wise distribution lines and transformers were modeled and mapped in ETAP tool and the base case was developed for the existing distribution network. The technical parameters for the lines and transformers were considered based on IS 2026, IEC 60076 (Details attached as **Annexure-2**) to develop the base model. Modeling and Mapping detail is attached as **Annexure-1.**

5.3 Analysis and Identification of System Deficiencies

The existing distribution system model was analyzed in the ETAP involving balanced load flow to figure out the network capabilities against the set distribution standards. The load growth was projected using the commonly adopted methodology that is LRM in conjunction to TSA which is based on the historical data and accordingly the behavior of the distribution system was analyzed, and the system deficiencies were identified. The details on load forecast methodology is attached as **Annexure-3.**

5.4 Distribution System Planning

Necessary deterministic and probable distribution system planning methods are proposed to address the system gaps focusing on reduction of losses, improving the reliability and power

quality. Accordingly, any contingency plans, up gradation and reinforcement plans are proposed along with the investment plans incorporating best fit technology.

5.5 Investment Plan

The approved investment plans (from 2020 to 2023) have been validated based on the outcome of the system studies and accordingly, the yearly investment plans are outlined as per the priority matrix as detailed in **Section 9.**

6. Existing Electricity Distribution Network

6.1 Overview of the Power Supply Sources of Samtse Dzongkhag

The power supply to fifteen (15) Gewogs of Samtse Dzongkhag and industries based in Samtse and Gomtu is fed from 220/66/33kV Dhamdum substation (220/66kV, 2x50/63MVA & 66/33kV, 2x5MVA). The basic electricity distribution network model as seen from the source at Dhamdum is illustrated in the schematic diagram is predominantly redial as shown in **Figure 2.** The primary electricity supply to Samtse Dzongkhag is from Dhamdum Substation.

The above HV substations are further stepped down to 33/11kV substations. There are two 33/11kV substations at Samtse, Sipsu and a 66/11kV Gomtu substation and twenty-three feeders (for HV, MV and domestic customers) operated and maintained by ESD, Samtse including the station feeders.

6.2 Electricity Distribution Lines

The quantity of MV and LV lines operated and maintained by ESD, Samtse is summarized in **Table 1.**

Table 1: MV and LV Line Details

Sl. No.	33 kV		11 kV			Total MV line			LV lines*			Total line length
	OH	UG	OH	UG	HV ABC	OH	UG	HV ABC	OH	UG	LV ABC	
1	157.27	2.62	402.42	1.77	2.12	559.69	4.39	2.12	110.23	1.45	928.39	1,606.27

**LV line length is as per Power Data Book 2018.*

The total MV line length is 566.20 km and the total LV line length is 1,040.07km. The ratio of LV to MV line length is 1.84 which reflects a high proportion of power distribution through LV network. While the ratio of LV to MV line length would vary according to the site conditions, as a general thumb rule, network ratio of 1.2:1 (LV to MV) should be maintained for optimum initial capex and the running and maintenance costs. The majority of the MV distribution network is through 33 kV and 11 kV overhead lines with some network in the town areas being through underground cables.

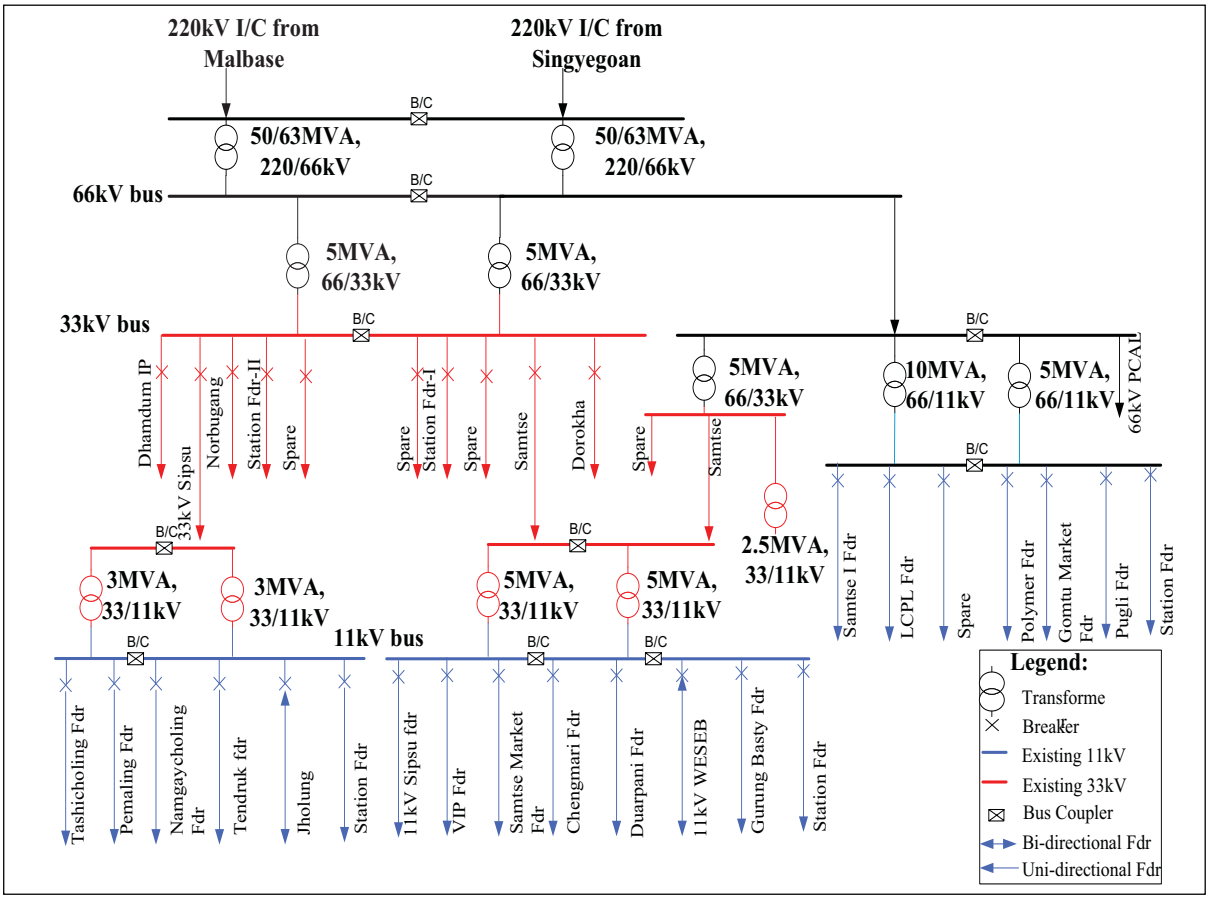


Figure 2: Electricity Distribution Schematic Diagram of Samtse Dzongkhag

6.3 Distribution Transformers

The quantity of distribution transformers operated and maintained by the Dzongkhag is tabulated in **Table 2**.

As of June 2019, there were 575 (528 BPC & 47 Private) transformers with a total installed capacity of 57,002.00.00kVA. As evidenced from **Table 2,** the installed capacity of transformer per customer is 3.91kVA as on June 2019. The installed transformers are generally large in capacity and few in number rather than generally small in capacity and more in numbers.

The 11kV Tading feeder with a connected installed capacity of 1,158.00 kVA (for 53 transformers) is currently being operated and maintained by ESSD, Dorokha although the source of supply is from 66/11kV Phuentsholing substation. Therefore, the system study for 11kV Tading Feeder is incorporated in the DSMP studies of Chukha Dzongkhag.

Table 2: Total Number of Transformers, Installed Capacity& Customers

Sl.No.	Name of Feeder	Voltage Ratio	Number of Transformers	Installed capacity (kVA)	Total customers
1	11kV Sipsu Feeder VI	11/0.415kV	3	750	3
2	11kV VIIP Feeder I	11/0.415kV	6	1488	1156
3	11kV Samtse Market Feeder II	11/0.415kV	5	3500	695
4	11kV Chengmari Feeder III	11/0.240kV	4	64	2969
		11/0.415kV	84	5168	
5	11kV Duarpani Feeder V	11/0.240kV	2	32	285
		11/0.415kV	15	2806	
6	11kV Gurung Basty Feeder IV	11/0.415kV	14	2493	245
7	Samtse station feeder	11/0.415kV	1	63	1
8	11kV Samtse Feeder I	11/0.240kV	12	138	335
		11/0.415kV	26	777	
9	11kV Lhaki Feeder II	11/0.415kV	3	4200	1
10	11kV Polymer Feeder III	11/0.415kV	2	2250	2
11	11kV Gomtu Market Feeder IV	11/0.415kV	2	375	491
12	11kV Pugli Feeder V	11/0.240kV	4	52	449
		11/0.415kV	25	5463	
13	Gomtu station feeder	11/0.415kV	1	125	1
14	33kV Norbugang Feeder III	33/0.415kV	3	3750	3

Sl.No.	Name of Feeder	Voltage Ratio	Number of Transformers	Installed capacity (kVA)	Total customers
15	Dhamdum station feeder-II	33/0.415kV	1	250	1
16	11kV Pemaling Feeder II	11/0.240kV	5	80	462
		11/0.415kV	22	702	
17	11kV Tashichholing Feeder I	11/0.415kV	21	2961	1375
18	11kV Namgaychholing Feeder III	11/0.240kV	5	80	840
		11/0.415kV	41	1549	
19	11kV Tendruk Feeder	11/0.240kV	15	234	2029
		11/0.415kV	93	3304	
20	11kV Station Feeder	11/0.415kV	1	125	1
21	33kV Dorokha Feeder IV	33/0.240kV	38	578	3224*
		33/0.415kV	119	3395	
22	Dhamdum station feeder-I	33/0.415kV	1	250	1
23	PCAL	66kV	1	10000	1
	Total		**575**	**57,002.00**	**14,570.00**

**Customers under Haa Dzongkhag not included*

7. Analysis of Existing System

Based on the model developed in ETAP for the existing feeder wise distribution network, analysis of the system was carried out by considering the forecasted load growth from 2020-2030. The quality of power, reliability and energy loss of the existing network were assessed and accordingly the augmentation and reinforcement works are proposed which shall be the integral part of the investment plan. The assessment of MV lines, DTs, power sources, reliability of the power supply and energy & power consumption pattern are presented from **Section 7.1** through **Section 7.4**.

7.1 Assessment of Power Sources

The assessments of the capabilities of the power sources were exclusively done based on the existing (as on 2019) and forecasted load. The source capability assessment had been carried out bifurcating HV and MV substations as detailed below.

7.1.1 HV Substation

The assessment of 66kV and above substations had to be carried out to ascertain the adequacy of the installed capacity against the existing load and the forecasted load.

Table 3: HV Power Sources

Sl.No.	Name of Source	Source Capacity		Forecasted Peak Load (MW)		
		MVA	MW*	2019	2025	2030
1	66/11kV, 10MVA Gomtu SS	10	8.50	4.70	6.50	8.02
2	66/11kV, 5MVA Gomtu SS	5	4.25	3.70	10.10	12.01
3	66/33kV, 5MVA Dhamdu SS(T1)	5	4.25	3.34	8.31	11.84
4	66/33kV, 5MVA Dhamdum SS (T2)	5	4.25	4.78	12.04	15.95
	66/33kV, 5MVA Gomtu SS					
5	**220/66kV, 50/63MVA Dhamdum SS (T2)**	**63**	**53.55**	**4.78**	**12.04**	**15.95**
a	66/33kV, 5MVA Dhamdum SS (T1)	5	4.25	3.34	8.31	11.84
b	66kV PCAL (HV Customers)	0.00	0.00	7.69	8.00	8.00
c	66/11kV, 10MVA Gomtu SS	10	8.5	4.70	6.50	8.02
d	66/11kV, 5MVA Samtse SS	5	4.25	3.70	10.10	12.01
e	66/33kV, 5MVA Gomtu SS	5	4.25	3.64	5.08	7.04
6	**220/66kV, 50/63MVA, Dhamdum SS (T1)**	**63**	**53.55**	**23.07**	**38.00**	**46.92**
a	33/11kV, 2.5MVA SS			0.00	0.00	0.00
b	33/11kV, 5MVA SS			3.64	5.08	7.04
7	**66/33kV, 5MVA Dhamdum SS (T1)**	**7.50**	**6.38**	**3.64**	**5.08**	**7.04**

**pf of 0.85 was considered to for study purpose only.*

From the above table it is conclusive that the existing installed capacity will not be adequate for the forecasted load. The power demand from this substation is expected to grow drastically over the years due to developmental activities in the designated LAPs and when Dhamdum IPs get operationalized. Therefore, HV substation would have to be up-graded to meet the increasing power demand and it is also anticipated to improve the power quality (voltage profile) of the 11kV outgoing feeders of the MV substations.

The existing peak load of 66/33kV, 2x5MVA Dhamdum substations is 8.12MW (96% loaded) and is expected to reach 20.36MW & 27.79MW by 2025 & 2030 respectively against the

installed capacity of 8.5MW (10MVA). Therefore, to meet the increasing demand of power, it is proposed to up-grade the transformer to 40MVA. By 2025, it is recommended to up-grade the total installed capacity to 20MVA.

Gomtu has 66/33kV, 1x5 MVA transformer with peak load of 3.64MW as on 2019 and is expected to reach 5.08MW & 7.04MW by 2025 & 2030 respectively surpassing the installed capacity. As there is no other 33kV feeder to relieve the load and to meet the increasing power demand, it is proposed to up-grade the capacity to 10MVA post 2025.

The 66/11kV, 1x10MVA & 1x5MVA Gomtu substations had experienced a peak load of 4.7MW & 3.7MW respectively as on 2019. The 66/11kV transformers are operating in islanding mode due to different capacities and impedance mismatch. In addition to the existing load of 3.7MW for 5MVA transformer, four MV industries would be connected and is forecasted to increase the peak load to 10.10 MW and 12.01MW by 2025 and 2030 respectively. Therefore, to meet the increasing power demand, it is proposed to install additional 10MVA transformer within 2025.

7.1.2 MV Substation

The assessment of 33kV and below substations had to be also carried out to ascertain the adequacy of the installed capacity against the existing load and the forecasted load.

Table 4: MV Power Sources

Sl. No.	Name of Source	Source Capacity		Feeder Load (MW)		
		MVA	MW*	2019	2025	2030
1	33/11kV, 3MVA Sipsu SS (T1)	3	5.10	3.15	4.70	5.99
2	33/11kV, 3MVA Sipsu SS (T2)	3				
3	33/11kV, 5MVA Samtse SS (T1)	5	4.25	1.93	5.99	8.64
4	33/11kV, 5MVA Samtse SS (T2)	5	4.25	3.64	5.08	7.04
5	33/11kV, 2.5MVA Samtse (T3**)	5	4.25	0.00	0.00	0.00

**pf of 0.85 is considered to compute the real power for study purpose only*

***Removed from the system recently.*

Single out assessment of MV substations are carried as follows:

a) 33/11kV, 2x5MVA Samtse substation

The FWPL for Samtse substation as on 2019 is 5.57MW and is expected to reach 11.07 & 15.68MW by 2025 & 2030 respectively. As can be inferred from **Table 4,** the installed capacity will not be adequate and therefore, it is proposed to up-grade the substation capacity to 20MVA by 2025.

b) 33/11kV, 2x3MVA Tendruk Substation

One of the 11kV outgoing feeders (Tendruk-Bara) has circuit length of 85.57 km and the voltage profile clearly violates the allowable range which could be due to longer circuit line length. Therefore, in order to improve the reliability and quality of power supply, the total circuit length has to be reduced. Therefore, it is proposed to extend 8.67km of 33kV line on Dog from 33/11kV, 2x3MVA Sipsu substation and to proposed to install additional 33/11kV, 2.5MVA ICT with 11kV, 4 ways RMU. The sensitiveness of the Doklam area has resulted in VVIPs visiting the area frequently thereby demanding quality and reliable power. Further, the Off-Grid to On-Grid electrification works would be extended from this feeder. Therefore, to meet the increasing power demand and to improve the power quality and reliability of the feeder, it is proposed to install the ICT transformer.

c) 33/11kV, 2.5MVA Yoeseltse Substation

The 33kV Norbugang feeder has been extended to Yoeseltse where there was proposal to construct 33/11kV, 2.5MVA substation in the leased one-acre land at Yoeseltse. However, due to lower power requirement, the proposal was turned down to later years. Further, 33kV line was extended from Ice Beverage to Yoeseltse and was charged at 11kV which has immensely improved the reliability. However, due to longer line length (81.41km), customer at the end of the feeder received the voltage lower than the permissible range. The dedicated 33kV line constructed (11.62km & 6.99km) for the proposed construction of 33/11kV, 2.5MVA Yoeseltse is terminated at four-pole structure in Ugyentse. The 11kV Chengmari feeder also converge at this four-pole structure. The down-stream customers of this feeder are fed from Chengmari feeder there by increasing the trunk and circuit line length. With the proposal to construct the Yoeseltse substation, not only the trunk like will be reduced from 81.41km to 42.45km, reliability and quality of power would be also improved. All the

customers of Yoeseltse and Ugyentse Gewogs (1,619.00) could be catered from this feeder. Therefore, in order to improve the reliability, quality of power, and to meet the increasing power requirement, it is proposed to construct 2.5MVA Yoeseltse substation.

7.2 Assessment of MV Feeders

Feeder wise planning is necessary to ensure that the power delivery capacity, power quality and reliability requirements of the customers are met. In distribution system, capacity assessment of existing MV feeders is important to ensure that feeders are adequate to transmit the peak demand of the load connected to the feeders. Particularly, the capacity assessment of the feeders enables identification of feeders that require reinforcement and reconfiguration works.

The behavior of the MV feeders are assessed based on the existing and forecasted load, feeder wise energy loss, reliability, and single to three-phase line conversions which are outlined vividly in **Section 7.2.1** through **Section 7.2.4**. Further, recognizing that the asset life of the distribution system is thirty years (30), our system should be able to handle the load growth (peak demand) for next 30 years. Therefore, it is equally important to consider the asset life of the system in addition to the assessment of the system in different time horizons.

7.2.1 Assessment of MV Feeder with Forecasted Load

The feeder wise peak power consumption was compiled based on the historical data. The array of daily and monthly peak demand was sorted to obtain the annual peak demand. The feeder-wise historical peak demand recorded at the source is presented in **Table 5** and the corresponding feeder-wise annual load curve is presented in **Figure 3.**

Further, recognizing that the asset life of the distribution system is thirty years (30), our system should be able to handle the load growth (peak demand) for next 30 years. Therefore, it is equally important to consider the asset life of the system in addition to the DSMP time horizon.

As the peak load records of 33/11kV outgoing feeders were not available (in the absence of the feeder meter), the peak load data recorded at the HV substations were used for the study. However, in order to carry out the system studies for the outgoing feeders of the MV substations,

the peak loads of the feeder were prorated and redistributed according to the peak load of the transformers (as of 2019) and accordingly the simulations were carried out.

Table 5: Feeder Wise Peak Power Demand (2015-2019)

Sl.No.	Feeder Name	Peak Load Consumption Pattern (MW)				
		2015	2016	2017	2018	2019
1	11kV Daurpani Feeder	0.70	0.78	0.86	0.94	0.98
2	11kV VIP Feeder	0.49	0.63	0.53	0.61	0.68
3	11kV Samtse Market Feeder	0.46	0.51	1.04	0.84	0.74
4	11kV Chengmari Feeder	0.82	0.90	1.38	1.42	1.47
5	11kV Gurung Basty Feeder	0.24	0.30	0.61	0.92	1.19
6	11kV Sipsu Feeder	0.20	0.23	0.39	0.40	0.51
7	11kV Samtse Station feeder	0.00	0.00	0.04	0.00	0.00
8	11kV Samtse -I	0.20	0.18	0.26	0.28	0.39
9	11kV LCPL	3.30	3.46	3.93	4.00	4.31
10	11kV Bhutan Polymer	0.66	0.67	0.49	0.67	0.85
11	11kV Gomtu Market Feeder	0.00	0.25	0.27	0.29	0.38
12	11kV Pugli feeder	1.56	1.64	2.25	2.36	2.47
13	11kV Gomtu Station feeder	0.00	0.00	0.00	0.01	0.01
14	33 kV Dhamdhum- Norbugang II	0.74	0.75	0.82	1.39	1.63
15	33 kV Dhamdhum- Sipsu Feeder	1.90	2.43	2.54	2.95	3.15
16	33 kV Dhamdhum- Dorokha Feeder		0.81	0.90	0.93	1.40
17	33kV Dhamdum Station feeder-I	0.00	0.00	0.00	0.01	0.01
18	33kV Dhamdum Station feeder-II	0.00	0.00	0.00	0.01	0.01
19	33kV Dhamdum Industrial Park	0.00	0.00	0.00	0.00	0.00
20	66kV PCAL (HV Customers)	8.00	8.00	7.79	7.71	7.69
	Total	**19.27**	**21.55**	**24.11**	**25.72**	**27.86**

As evident from **Table 5**, compared to 33kV, Samtse has more 11kV system and accordingly the 11kV network is more loaded than 33kV system. Dhamdum-Dorokha feeder has the longest circuit length which is distributed as far as Sombaykha and Gakidling Gewogs under Gakidling Drungkhag, Haa Dzongkhag. Apart from the LV customers, Samtse has also MV and HV customers.

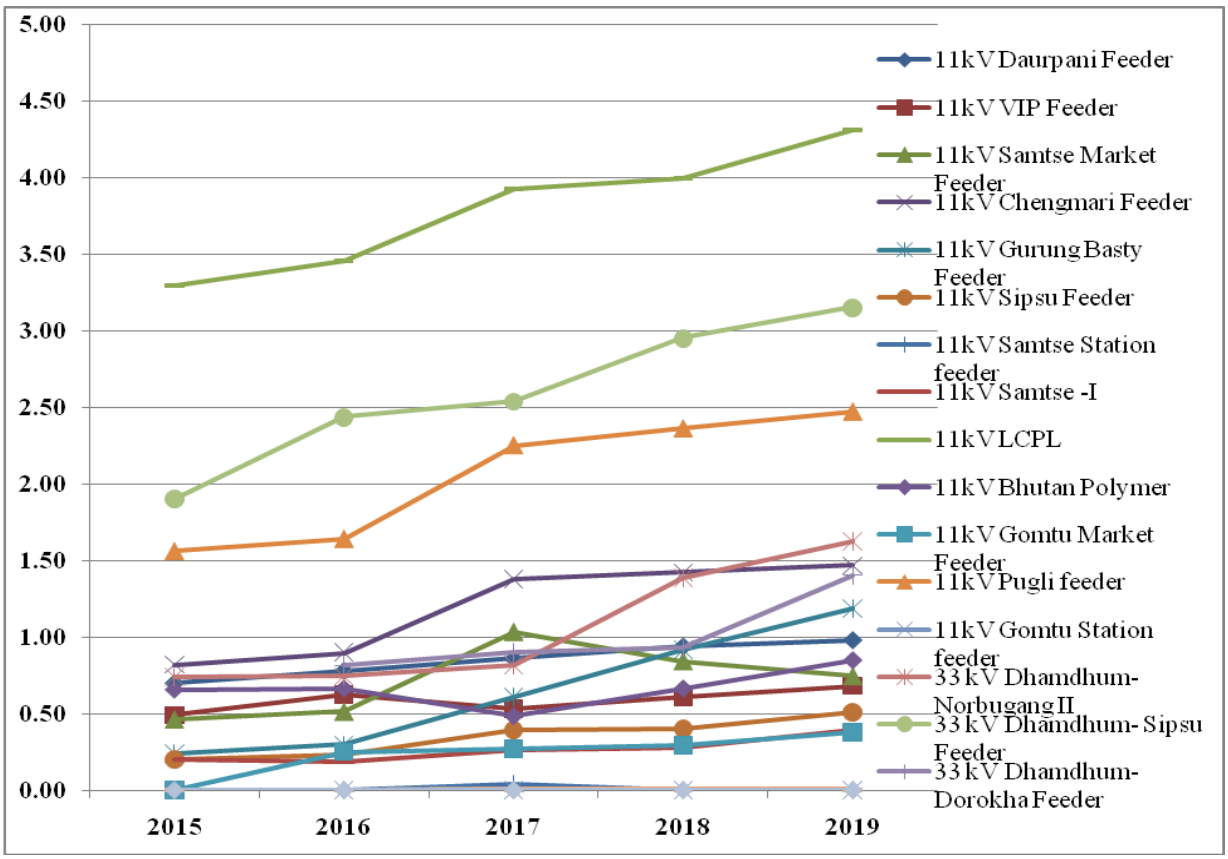


Figure 3: Plot of Feeder Wise Peak Power Demand Forecast

The assessment of the feeder is carried out based on the following aspects:

a) System study: Existing load

b) System study based on forecasted load: 2025 & 2030 scenario

a) System Study (Existing Load)

Based on the peak load (2019-2020) and the thermal capacity of the line, the load flow and accordingly the assessment of the feeder was carried out. The simulation result shows no abnormality and the ampacity capability of the feeders will be within the range with the existing load. The thermal capacity of the different conductor sizes is as shown in **Table 6.**

Table 6: Thermal loading of ACSR conductor at different voltage levels.

Sl. No.	ACSR Conductor Type	Ampacity of Conductor	MVA rating corresponding to the Ampacity
33 kV Voltage Level			
1	RABBIT	193	11.031
2	DOG	300	17.146
3	WOLF	398	22.748
11 kV Voltage Level			
1	RABBIT	193	3.677
2	DOG	300	5.715
3	WOLF	398	7.582

Ampacity (thermal loading) of the lines have been calculated based on IS 398 (Part-II): 1996 for maximum conductor temperature 85°C for ACSR conductors considering an ambient temperature of 40°C.

The ampacity of all the feeders would be within the permissible range with the existing load however, the 11kV Samtse Market, LCPL and Pugli feeders would exceed the thermal limit of the conductor as it is forecasted to reach 3.99MW, 7.13MW and 6.71MW respectively. However, degree of the feeder loading has to be closely monitored as the accuracy of the forecasted load would deviate more in the distant future.

b) System Study with Forecasted Load (2025 and 2030)

The peak power demand from 2014-2019 has been considered to forecast the peak power demand for the next 10 years (2020-2030) as shown in **Table 7** and **Figure 4** adopting the commonly practiced methodology of LRM and TSA with the help of ETAP. The detailed load simulation result is attached as **Annexure-4.**

Table 7: Summary of Feeder Wise Loading Pattern of ESD, Samtse

Sl. No.	Feeder Name	Circuit Length (km)	Total Transformer	Installed Capacity (kVA)	Feeder Load (MW)		
					2019	2025	2030
1	11kV Sipsu Feeder	3.12	3	750	0.51	0.88	1.17
2	11kV VIP Feeder	1.34	6	1488	0.68	2.36	3.47
3	11kV Samtse Market Feeder	3.11	5	3500	0.74	2.76	3.99
4	11kV Chengmari Feeder	81.41	88	5232	1.47	1.74	1.96
5	11kV Daurpani Feeder	14.67	17	2838	0.98	1.35	1.66
6	11kV Gurung Basty Feeder	12.60	14	2493	1.19	1.97	3.41
7	11kV Samtse Station Feeder	0.05	1	63	0.00	0.01	0.02
8	11kV West Bengal	0.42	Power is imported from this feeder from India				
9	11kV Samtse -I	43.36	38	915	0.39	0.65	0.89
10	11kV LCPL	0.64	3	4200	4.31	5.85	7.13
11	11kV Bhutan Polymer	0.72	2	2250	0.85	2.96	3.87
12	11kV Gomtu Market Feeder	0.53	2	375	0.38	0.97	1.41
13	11kV Pugli feeder	23.10	29	5515	2.47	6.16	6.71
14	11kV Gomtu Station feeder	0.05	1	125	0.01	0.01	0.02
15	33 kV Dhamdhum- Norbugang II	19.29	3	3750	1.63	3.56	5.17
16	33kV Dhamdum Station feeder-II	0.05	1	250	0.01	0.01	0.02
17	33 kV Dhamdhum- Sipsu Feeder	4.99			3.15	4.70	5.99
a	11kV Pemaling Feeder	21.62	27	782	0.32	0.48	0.61
b	11kV Tashicholing Feeder	58.15	21	2961	0.91	1.35	1.72
a	11kV Namgaycholing Feeder	39.25	46	1629	0.58	0.87	1.11
b	11kV Tendruk Feeder	85.57	108	3538	1.34	1.99	2.54
c	11kV Jholung Feeder	0.52			0.00	0.01	0.01
d	11kV Station Feeder	0.05	1	125	0.00	0.00	0.00
18	33kV Dhamdum Industrial Park	0.00	0	0	0.00	3.77	4.77
19	33 kV Dhamdhum- Dorokha Feeder	132.63	157	3973	1.40	2.31	3.19
20	33kV Dhamdum Station feeder-I	0.05	1	250	0.01	0.01	0.02
21	33kV Samtse Feeder	3.43					
22	66kV PCAL (HV Customers)	0.06	1	10000	7.69	8.00	8.00
23	33kV Gomtu-Samtse Feeder-II	15.46					
	Overall Total	**566**	**575**	**57002**	**27.86**	**50.04**	**62.87**

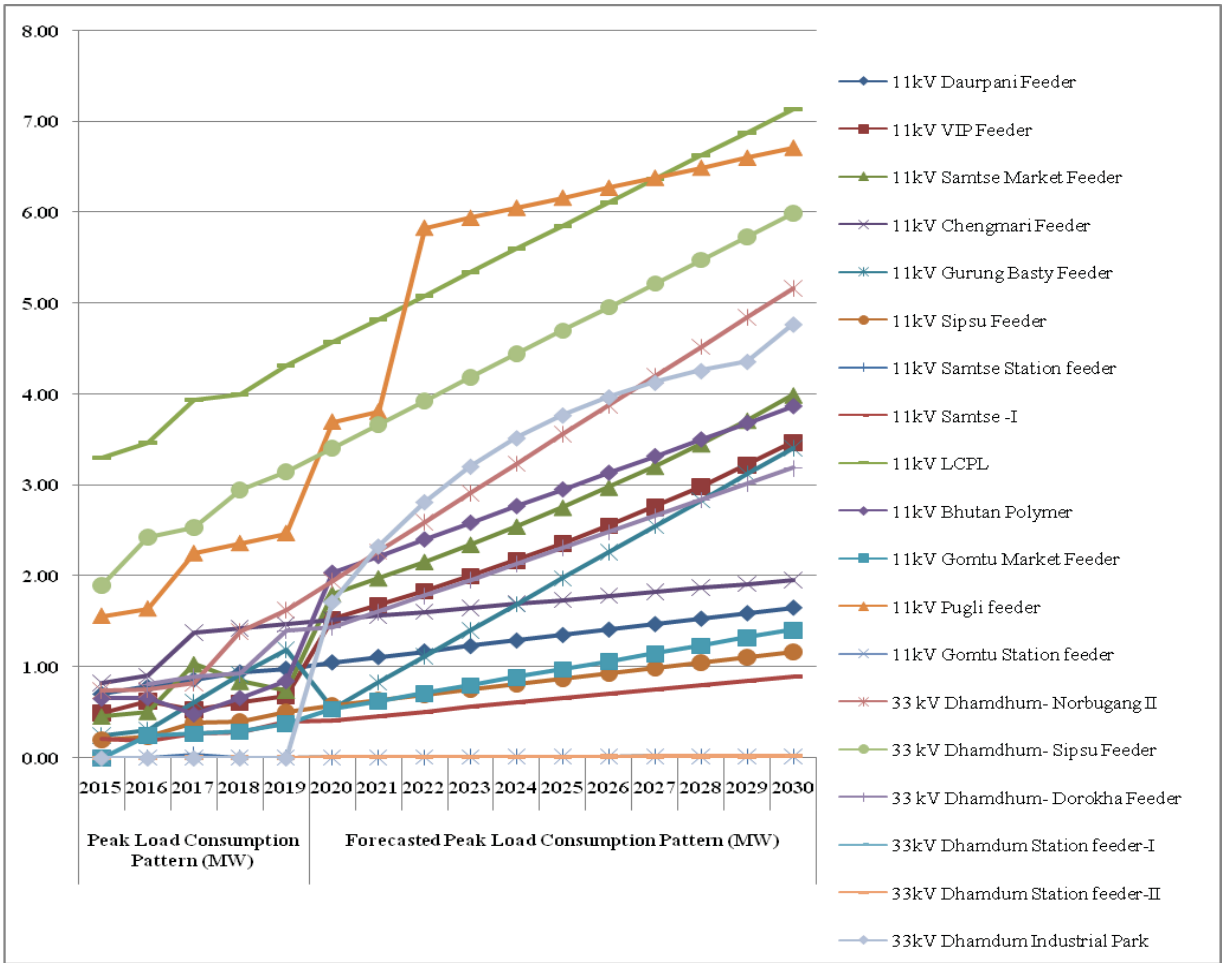


Figure 4: Plot of Feeder Wise Peak Power Demand Forecast of ESD, Samtse

From the above table, it is observed that the highest peak load (as on 2019) is 3.15MW for 33kV Feeder (Dhamdum-Sipsu) which is expected to grow up to 4.7MW & 5.99MW by 2025 and 2030 respectively. Similarly, the highest 11kV feeder is 2.47MW as on 2019 for Pugli Feeder and is expected to reach 6.16MW & 6.71MW by 2025 and 2030 respectively.

Although it is conclusive that the existing MV lines are adequate to evacuate the power if assessed independently, the voltage profile would go below the standard accepted range of (±) 10% should the existing network supply the forecasted load as tabulated in **Table 8**. The load carrying capacity of a feeder is determined by the line length and degree of load connected in addition to other parameters (e.g., ampacity).

Table 8: Feeders with Poor Voltage Profile (2019, 2025 & 2030)

Sl. No.	Name of Feeder	Conductor	Circuit Length (km)	End Voltage (kV)	% Variation	Load (MW)		
						2019	2025	2030
A	**2019**							
1	11kV Tendruk-Bara Feeder	D/R	85.57	9.52	13%	1.34	1.99	2.54
2	11kV Chengmari Feeder	D/R	84.11	8.92	19%	1.47	1.74	1.96
5	11kV Daurpani Feeder	R	14.67	8.30	25%	0.98	1.35	1.66
B	**2025**							
1	11kV Chengmari Feeder	D/R	84.11	9.06	18%	1.47	1.74	1.96
2	11kV Samtse Feeder	R	43.36	9.56	13%	0.39	0.65	0.89
3	11kV Pugli Feeder	D/R	23.10	9.1	17%	2.47	6.16	6.71
4	11kV Tendruk-Bara Feeder	D/R	85.57	9.48	14%	1.34	1.99	2.54
C	**2030**							
1	11kV Chengmari Feeder	D/R	84.11	9.17	17%	1.47	1.74	1.96
2	11kV Pugli Feeder	D/R	23.10	8.83	20%	2.47	6.16	6.71
3	11kV Samtse Feeder	D/R	43.36	9.22	16%	0.39	0.65	0.89

The 11kV feeders which are reflected in the table above would violate the voltage profile with the current loading (as of 2019) and the forecasted load till 2030. Details on each of the feeder with proposal for improving the voltage profile is as follows:

a) 11kV Tendruk-Bara Feeder

The Tendruk-Bara feeder has 85.57km constructed on Dog and Rabbit conductors. Most of the loads connected to this feeder are rural customer and therefore, the connected loads are static/impedance load (90%) in nature. Further, as the load considered for carrying out the technical evaluation is based on the peak not on the normal load, actual voltage profile would be within the permissible range that is less than 13% as worked out. Similarly, in the span of five years, the feeder will experience only 1% increase from 13% voltage profile violation.

Nevertheless, it is proposed to construct 8.67km on DOG conductor from 33/11kV, 2x3MVA Sipsu substation and 2.5MVA 33/11kV ICT transformer with 11kV RMU (4 ways) to curb the voltage violation issues, improve the reliability and reduce the loss. This feeder currently

caters the power supply to Tendruk-RBA and there are 2029 customers connected to this feeder.

b) 11kV Chengmari Feeder

The Chengmari feeder has MV and LV bulk industries in addition to rural and urban customers. Therefore, technical evaluation was carried out with 70% as static and 30% as motor load. The simulation result doesn't indicate any significant improvement in the voltage profile after proposing to upgrade the trunk line from Rabbit to Dog conductor due to longer line length and many industries connected to this feeder. The forecasted load is almost 2MW in this feeder and as per the DDCS, the effective load that the feeder can evacuate is less than 1MW with 85.57km of feeder circuit length. Therefore, it is proposed to construct 33/11kV, 2.5MVA substation which is expected to reduce the circuit length and accordingly the voltage profile. The simulation result clearly indicates that not only the voltage profile will improve; it is also anticipated to significantly improve the reliability and reduce the power loss. There are 2,969.00 customers connected to this feeder.

c) 11kV Samtse Feeder

The analysis shows that the voltage at the furthest end of the customer in this feeder will be 9.56kV (13%) violating the voltage profile as the circuit length is 43.36km with Rabbit conductor. As per the DDCS, with the circuit length of 43.36km, the line can deliver a quality power if the load is less than 1MW. The peak load of this feeder is 0.39MW and is expected to reach 0.65 & 0.89 MW by 2025 and 2030 respectively. Considering the nature of load (rural customers), the feeder would be adequate to deliver the quality power though violates the voltage profile as the peak load was considered while evaluating the technicalities. The feeder can be also interconnected with the Tading feeder in case either of Phuentsholing or Dhamdum sources gets interrupted.

d) 11kV Daurpani Feeder

The Daurpani feeder has both MV and LV bulk industries in addition to rural and urban customers. Therefore, technical evaluation was carried out with 70% as static and 30% as motor load. The peak load as of 2019 is 0.98MW and is expected to reach 1.35MW &

1.66MW by 2025 and 2030 respectively. The simulation result shows that the voltage at the end of the feeder is 8.30kV (25%) violating the voltage profile. Although the line length is only 14.67km, due to significant number of motor loads (industries) connected to this feeder, the voltage drop is substantial. However, the feeder saw decreasing trend in the load (due to reduction in the production sector), the voltage profile is expected to improve in the coming years. Nevertheless, in order to improve the voltage profile of the feeder, it is proposed to upgrade the conductor from Rabbit to Wolf. The simulation result shows that the voltage at the end of the feeder would be increased from 8.30kV (25%) to 10.16kV (8%) by changing the conductor size. However, it is recommended to explore best fit technologies to improve the quality of power as re-sizing of the conductor would result in power interruptions and inconveniences to the customers.

e) 11kV Pugli Feeder

In order to improve the voltage profile, either some section (preferably from source) of the line needs to re-sized, to realign and tap from the nearest alternate sources or to proposed additional substation.

Knowing the degree of significance of quality of power (voltage profile), it is inevitable that voltage regulation be maintained within the permissible range which is required as per the distribution code and the requirement of the end user appliances. Therefore, the feeders whose voltage regulation aren't within the permissible range due to existing or forecasted load would be corrected as detailed in table **Table 9**.

f) 33kV Dorokha Feeder

The Dhamdum-Dorokha feeder is the longest feeder with circuit length of 132.63km with 157DTs connected to this feeder for 3224 customers and the total line length for this feeder is 178km (including 42.452km of Haa Dzongkhag). Additionally, there are 35DTs catering power requirement for customers of Sombaykha and Gakidling Gewogs under Haa Dzongkhag from this feeder. The simulation result shows that the voltage profile will be lower than the permissible range should the feeder continues to cater the power sourcing from Dhamdum substation.

Therefore, it is necessary that alternative arrangements be made; that is from Haa for improving the voltage profile and reliability as well. The details on the reliability aspect is reflected in **Section 7.2.3.** The power requirement is forecasted to reach 2.31MW & 3.19MW by 2025 and 2030 respectively from 1.40MW in 2019 (excluding the power requirement of Haa Dzongkhag).

Table 9: Feeder Wise Voltage Improvement

Sl.No.	Name of Feeder	Before		After		Remarks
		Voltage (kV)	% Variation	Voltage (kV)	% Variation	
A	**2019**					
1	11kV Tendruk-Bara Feeder	9.52	13%			
2	11kV Chengmari Feeder	8.92	19%		8.31%	Tap used
5	11kV Daurpani Feeder	8.30	25%			
B	**2025**					
1	11kV Chengmari Feeder	9.06	18%	10.09	8.31%	Source (10MVA) & Tap used
2	11kV Samtse Feeder	9.56	13%			
3	11kV Pugli Feeder	9.1	17%	10.18	7.38%	
4	11kV Tendruk-Bara Feeder	9.48	14%	10.94	0.55%	Construction of 2.5MV SS & 8.67km of Line of DOG
C	**2030**					
1	11kV Chengmari Feeder	9.17	17%	10.04	8.70%	Source (20MVA) & Tap used
2	11kV Pugli Feeder	8.83	20%	9.90	10.00%	Re-sizing of the conductor
3	11kV Samtse Feeder	9.22	16%	10.47	4.79%	Re-sizing of the conductor
4	11kV Daurpani Feeder					Re-sizing of the conductor

It is also important for BPC to explore the best fit technology (e.g. installing AVR/voltage boosters) to improve the voltage profile rather than proposing to up-grade the entire conductor size which would be inconvenient to implement as it will involve frequent power interruptions.

7.2.2 Energy Loss Assessment of MV Feeders

Energy losses in the distribution network are inherent as the power transmission and distribution system are associated with the transformers and lines. However, it is crucial to maintain the energy loss at an optimal level by engaging in timely improvement of the distribution infrastructures and not reacting to the localized system deficiencies. The objective of the energy loss assessment is to single out the feeder (s) with maximum loss (es) and put in additional corrective measures to minimize to the acceptable range.

To carry out the assessment, the energy sales, purchase and loss is as tabulated in **Table 10** and as shown in **Figure 5.**

Table 10: Summary of Total Energy Loss (MU) of ESD, Samtse

Sl. No.	Energy requirement, sales and loss (MU)	2014	2015	2016	2017	2018	Average
1	Total Energy Requirement (MU)	97.81	93.50	98.66	97.36	99.71	**97.41**
2	Total Energy Sales (MU)	96.24	94.36	99.79	93.87	96.07	**96.07**
3	Total energy loss (MU)	1.57	-0.86	-1.12	3.49	3.63	**1.34**
	Total Loss (%)	**1.60%**	**-0.92%**	**-1.14%**	**3.59%**	**3.64%**	**1.35%**

Generally, the technical loss is 10% for distribution network and any loss more than this range is due to commercial loss. An independent case study carried out by 19 ESDs for 38 feeders in 2017 (two feeders each in ESD) with more loss showed that average of 6.84% is due to technical loss. The study also showed that loss pattern was never consistent because of variant characteristics of distribution network and loading pattern. The loss index of Samtse for 2019 is 1.35% and is comparatively less. This low energy loss may be due to high proportion of energy consumption by the HV customers.

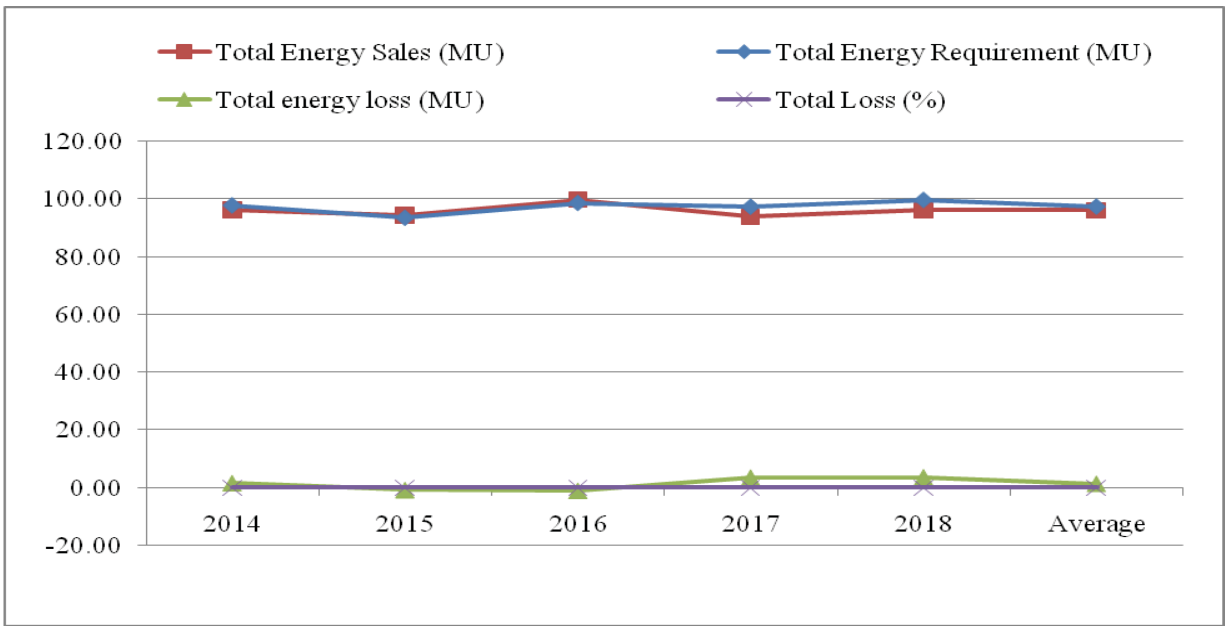


Figure 5: Plot of Total Energy Loss (MU)

As the feeder wise energy details were not available, the energy loss was redistributed to the feeders based on number of customers connected and circuit line length and accordingly the feeder wise energy loss was computed as tabulated in **Table 11** and **Figure 6.** It indicates that 11kV Chengmari, 11kV, Samtse Market, 11kV Tendruk, 11kV VIP and 11kV Sipsu feeders had contributed the major portion of the energy loss of ESD, Samtse. More or less, these feeders have more circuit length than the other feeders. On the other hand, 33kV Dorokha, 11kV Pugli and 11kV Tendruk feeders have negative energy loss which could have resulted from anomalous energy accounting or could be due to energy accounting during the transition of seasons.

The energy losses are expected to reduce with the augmentation of substations, shortening of line length, improving the voltage profile and re-sizing of the conductors.

Table 11: Feeder Wise Energy Loss (in MU)

Sl. No.	Name of Feeder	Length (km)	2014	2015	2016	2017	2018	Average	Loss %
1	11kV Sipsu Feeder VI	3.12	0.79	0.28	0.00	0.00	0.00	0.21	0.19%
2	11kV VIP Feeder I	1.34	0.32	0.11	0.25	0.29	0.35	0.26	0.23%

Sl. No.	Name of Feeder	Length (km)	2014	2015	2016	2017	2018	Average	Loss %
3	11kV Samtse Market Feeder II	3.11	0.30	0.11	0.21	0.24	0.28	0.23	0.20%
a	33kV Samtse Feeder	3.43							0.00%
4	11kV Chengmari Feeder III	84.11	0.82	0.28	0.64	0.71	0.86	0.66	0.58%
5	11kV Duarpani Feeder V	14.67	0.10	0.03	0.08	0.085	0.10	0.08	0.07%
6	11kV Gurung Basty Feeder IV	12.60	0.09	0.03	0.06	0.07	0.08	0.07	0.06%
7	11kV Samtse station feeder	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
8	11kV Samtse Feeder I	43.36	0.03	0.04	0.04	0.04	0.05	0.04	0.03%
a	33kV Gomtu-Samtse Feeder-II	15.46							0.00%
9	11kV Lhaki Feeder II	0.64	0.17	0.01	0.09	0.08	0.00	0.03	-0.03%
10	11kV Polymer Feeder III	0.72	0.03	0.11	0.24	0.09	0.03	0.01	-0.01%
11	11kV Gomtu Market Feeder IV	0.53	0.01	0.00	0.02	0.01	0.01	0.01	0.01%
12	11kV Pugli Feeder V	23.10	0.36	0.88	0.82	0.02	0.02	0.26	-0.23%
13	Gomtu station Feeder	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
14	33kVNorbugang	19.29			0.03	0.33	0.25	0.21	0.18%
15	Dhamdum station feeder-II	0.05			0.00	0.01	0.02	0.01	0.01%
a	33 kV Dhamdhum- Sipsu Feeder	4.99							0.00%
16	11kV Pemaling Feeder II	21.62			0.02	0.07	0.10	0.05	0.05%
17	11kV Tashichholing Feeder I	58.15			0.05	0.21	0.30	0.15	0.13%
18	11kV Namgaychholing Feeder III	39.25			0.03	0.12	0.18	0.09	0.08%
19	11kV Tendruk Feeder	85.57	0.13	0.50	0.08	0.31	0.46	0.27	0.23%
20	Sipsu station feeder	0.05			0.00	0.00	0.00	0.00	0.00%
21	33kV Dorokha Feeder IV	132.63	1.19	1.47	1.16	0.80	0.53	0.50	-0.43%
22	Dhamdum station feeder-I	0.05			0.00	0.00	0.00	0.00	0.00%
23	PCAL	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
	Total loss %								**1.35%**

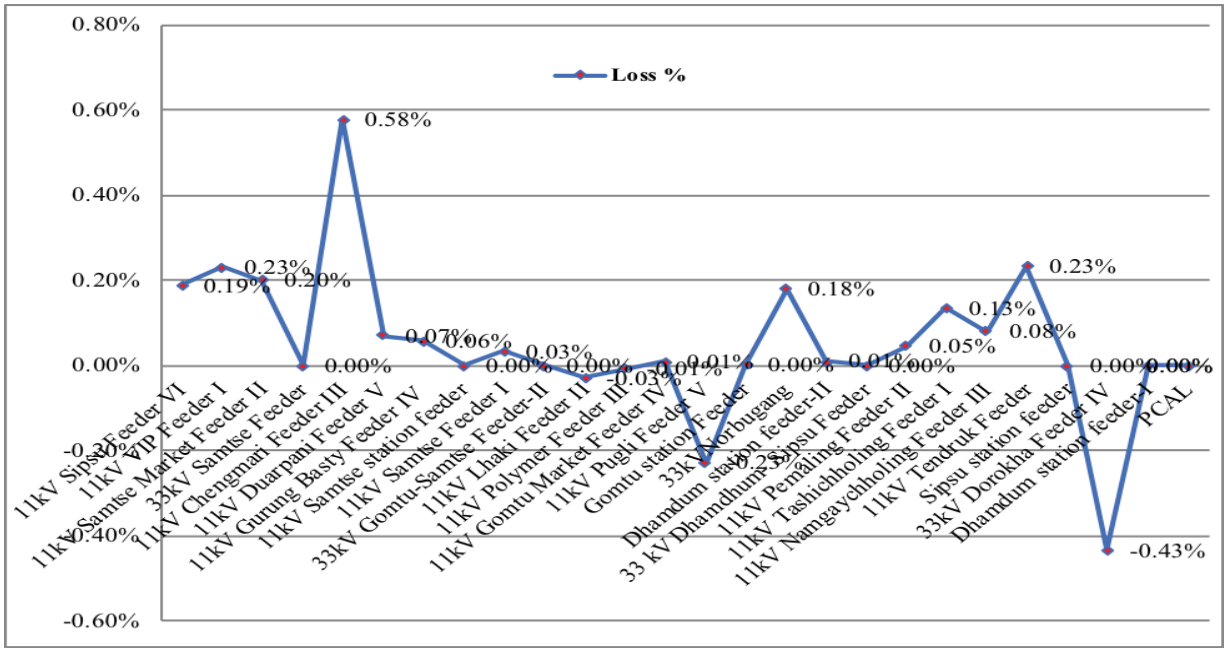


Figure 6: Feeder Wise Energy Losses (MU) of ESD, Samtse

7.2.3 Reliability Assessment of the MV Feeders

Today's emphasis in the power sector has shifted to providing reliable power supply as electricity itself is positioned as one of the essential needs. However, improving reliability comes with its inherent costs as it involves embracing additional preventive and corrective measures leading to substantial up-front capital investment. Any major reliability improvement strategies need to be adopted only after carefully understanding the costs involved and the benefits that will be accrued from implementing such strategies. Failure rate, repair time and restoration time are some important parameters defining reliability. Reducing the values of one or more of the above parameters can improve reliability considerably.

In addition to ensuring that the MV feeders have the required capacity, it is also very important to ensure that the MV feeders are reliable. In order to assess the reliability of the distribution system, the historical data was referred. The yearly (2017-2019) feeder reliability indices summary is compiled as tabulated in **Table 11** and details used to derive such summary is attached as **Annexure-5**. The interruptions with less than five minutes were omitted from the computation. The actual records (both within and beyond ESDs control) were considered for

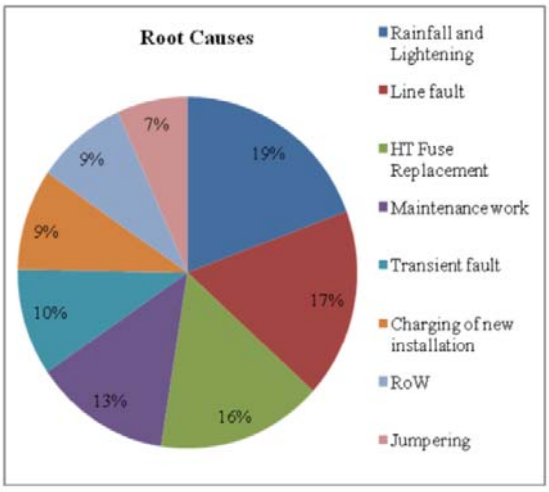
actual representation to compute the reliability indices. The average reliability indices viz. SAIFI & SAIDI compiled from 2016-2019 are 22.08 & 32.23 respectively which is exceptionally high.

Table 12: Feeder Wise Reliability Indices of ESD, Samtse

Sl. No.	Name of Feeders	11kV Sipsu Feeder VI	11kV VIP Feeder I	11kV Samtse Market	11kV Chengmari Feeder III	11kV Duarpani Feeder V	11kV Gurung Basty Feeder IV	Samtse station feeder	11kV Samtse Feeder I	11kV Lhaki Feeder II	11kV Polymer Feeder III
1	**SAIFI**	0.00	0.22	0.05	6.95	0.40	0.41	-	0.65	0.00	0.00
2	**SAIDI**	0.00	0.41	0.08	11.25	0.59	0.70	-	2.04	0.01	0.03
Sl. No.	**Name of Feeders**	**11kV Gomtu Market Feeder IV**	**11kV Pugli Feeder V**	**Gomtu station feeder**	**33kV Norbugang Feeder III**	**Dhamdum station feeder-II**	**33kV Sipsu Feeder**	**33kV Dorokha Fdr**	**Dhamdum station feeder-I**	**PCAL**	**Total ***
1	**SAIFI**	0.21	0.74	-	0.00	-	2.00	10.44	-	0.00	**22.08**
2	**SAIDI**	0.46	1.62	-	0.00	-	1.00	15.03	-	0.00	**32.23**

**Reliability indices for last 3.5 years.*

Sl. No.	Root Causes	Frequency	% Distribution
5	Rainfall and Lightening	42.70	19%
3	Line fault	38.38	17%
8	HT Fuse Replacement	34.86	16%
4	Maintenance work	28.65	13%
6	Transient fault	21.62	10%
2	Charging of new installation	20.54	9%
7	RoW	19.19	9%
1	Jumpering	14.86	7%
	Total	**220.81**	**100%**



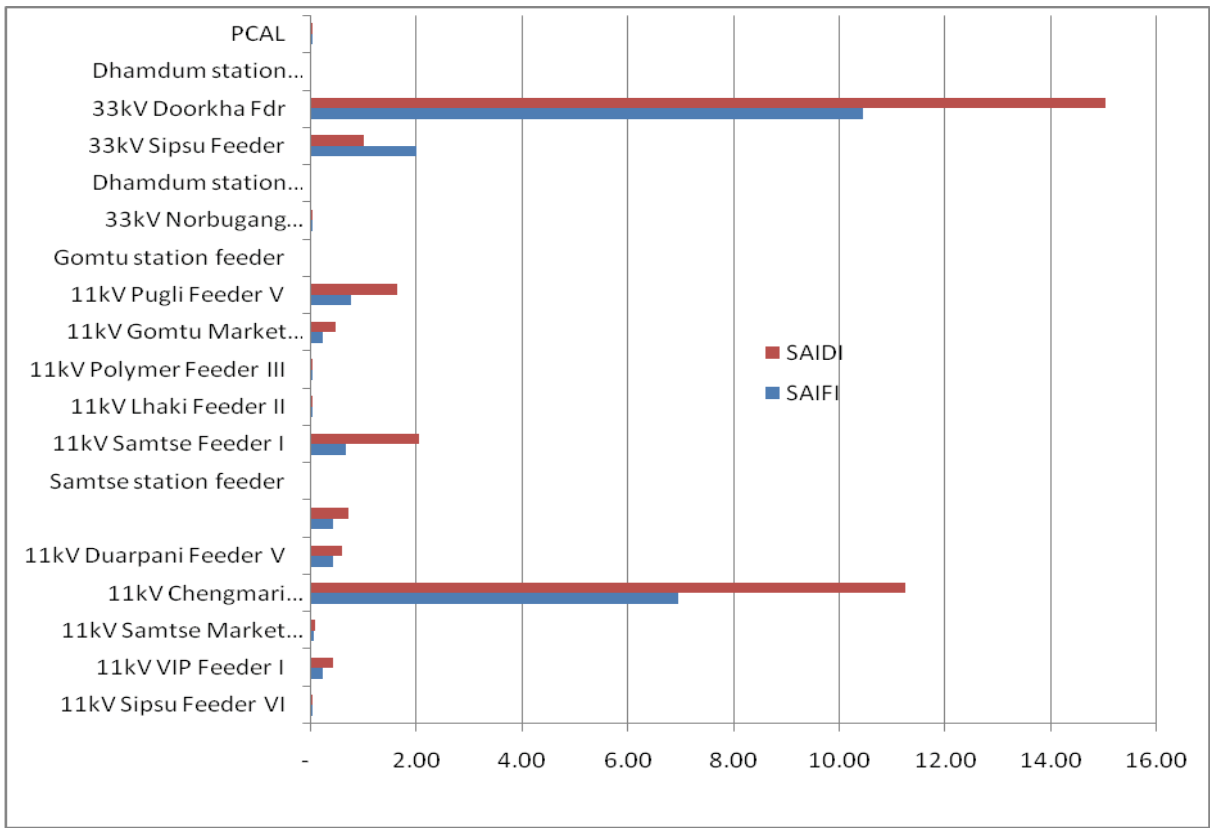


Figure 7: Feeder Wise Plot of SAIFI & SAIDI of ESD, Samtse

The above summary (compiled from 2016-2019) indicates that the 11kV Chengmari, 11kV Samtse Feeder-I, 11kV Pugli, 33kV Sipsu and 33kV Dhamdum-Dorokha feeders sustained more interruptions compared to the other feeders.

The causes of the power interruptions are attributed to rainfall & lightning, line faults, HT fuse replacement, maintenance work, transient faults (temporary faults), followed by charging of new installation, RoW and jumpering.

There are switching devices (ARCBs and LBS) installed in these feeders for better operation and maintenance flexibility. In order to address the reliability issue of the feeders, following remedial and corrective measures are proposed:

a) Chengmari Feeder

The circuit length of this feeder is 84.11km and passes through thick vegetation and rugged terrain. The feeder recorded 6.95 & 11.25 as SAIFI & SAIDI indices respectively. The industrial and commercial load constitutes the major portion of the load connected to this feeder requiring reliable power supply at all times. The dedicated 33kV line constructed (11.62km & 6.99km) for the proposed construction of 33/11kV, 2.5MVA Yoeseltse is terminated at four-pole structure in Ugyentse. The 11kV Chengmari feeder also converge at this four-pole structure and the down-stream customers of this feeder are fed from Chegmari feeder. With the proposal to construct the Yoeseltse substation, not only the trunk like will be reduced from 84.11 to 42.45km, reliability and quality of power would be also improved.

- **Installation of more and smart switching devices**

Due to many spur lines protruding from the main feeder, fault finding is the key. Therefore, to locate the fault instantly and to isolate the faulty from healthy network it is proposed to install more and smart switching devices like ARCBs (1 no. in Drapper), Sectionalizers (1 no.) and FPIs (3 nos in Diana and other areas).

b) Dhamdum-Dorokha Feeder

The circuit length of this feeder is 132.63km and passes through thick vegetation and rugged terrain. The feeder recorded 10.44 & 15.03 as SAIFI & SAIDI indices respectively and therefore, is the most susceptible feeder of all the feeders under Samtse Dzongkhag. The poor reliability indices for this feeder in comparison to rest of the feeders may be due to but not limited to following empirical reasons:

- **Terrain and vegetation**

The feeder originates from Dhamdum substation to Dorokha Dungkhag (all the Gewogs under Dungkhag) and even caters power supply to the customers of Sombaykha and Gakidling Gewogs under Haa Dzongkhag. Most of the landscape is rugged in nature with thick vegetation which are prone to landslides during monsoon seasons. The causes of interruptions are mainly due to HT fuse replacement and maintenance works followed by

lines and transient faults as conclusive from **Table 13** and **Figure 7**. These are all rooted down to the lines being stretched through thick vegetation and rugged terrain.

The stretch between Dhamdum and Sebichang (Yabala) is prone to frequent landslides and to make matter worst, the line also traverses the meandering Dhamdum River when swollen during monsoon season becomes inaccessible for any maintenance works. Therefore, should there be any faults in this stretch; it takes minimum one week to restore the supply.

- **Circuit length**

  The total circuit line length is 132.63km covering two Dzongkhags and is passing through dense forest and rugged terrain. It is certain that the feeder would experience more interruptions proportionate to the line length and total number of customers connected to it. Therefore, it is recommended to re-align the portion of the line and to arrange alternative sources.

- **Road accessibility**

  The interconnecting through road from Samtse and Haa Dzongkhags was completed recently and is yet to stabilize. The newly connected road frequently gets cut off during the rainy seasons and accordingly it takes more time to restore the power supply.

- **Rainfall and lightning**

  Since Samtse is situated in the southern belt of the country, it is prone to lightning strikes damaging the protective equipment and other important distribution equipment thus interrupting the power supply.

- **LBS/GO**

  Dorokha feeder has 27 major spur lines tapped from the trunk line with further tapings from the spur line. None the distribution transformers connected to the feeder have transformer LBS/ GO to isolate the feeder (spur/main line, transformer) in the case of fault caused by equipment failures and even to replace a simple HT fuse of a transformer would lead to disruption of customers connected to spur/main line. Currently, there are four ARCBs and ten LBS installed at various strategic locations to isolate the healthy lines from interrupted ones during faults. However, none of the ARCBs functions as intended and the one installed

at Sengten operates irrespective of type of fault and doesn't reclose even if the fault is transient in nature due to damaged parts.

Therefore, in order to improve the reliability of the feeder, it is not only proposed to revive the existing ARCBs, but also proposed to install additional ARCBs, FPIs and LBS in the identified locations, realign some sections of the line, reduce the line by arranging the supply from other sources.

c) Pugli Feeder

11kV Pugli feeder is feeding both Industrial and rural customers. Currently, LBS(s) are installed to isolate the faulty section. During monsoon, Pugli River swells and becomes inaccessible to operate the LBS. Therefore, ARCB is proposed to isolate the fault beyond industrial area and minimize the interruption to industries. Further, FPI is proposed at rural tap off to ease while locating the of faults of feeder.

d) Samtse I Feeder

Samtse I feeder is currently catering the power supply to rural customers. The line passes through dense forest and LBS are installed far away from the motorable road taking longer period to locate and carry out O&M works. Therefore, ARCBs and FPIs are proposed to address the issues.

e) Gurung Basty Feeder

11kV Gurung Basty is currently catering the power to customers of urban (50%), industries (30%) and to rural (20%). Majority of the power interruption in this feeder is due to fault in the rural areas and even the source gets tripped occasionally. Therefore, the ARCB is proposed to minimize the interruption to urban and industrial customers during transient and other faults.

f) Tendruk Feeder

With the proposal to construct 33/11kV ICT, 2.5MVA substation at Tendruk, it is obvious that reliability and quality of power is expected to improve for the customers of Tendruk and Norgaygang Gewogs. However, it is proposed to install FPI at Kamari for easy location of the faults and to reduce to lead time in restoring the power supply.

g) Namgaycholing feeder

Feeder is catering power supply to the rural customers of Namgaychholing Gewog. Considering the longer circuit length of the spur lines, FPIs are proposed to be installed at Malbasey for easy fault finding.

h) Pemaling Feeder

Considering the category of connected customers and tapings from the feeder, the existing isolation device, LBS has served the purpose. However, to isolate any faulty from healthy network, it is proposed to install sectionalizer.

Although, some of the feeders which have better reliability indices, it is also proposed to be installed with additional switching devices to improve the reliability as detailed in **Section 8** of this report.

7.2.4 Single-Phase to Three-Phase Conversion

BPC during the RE expansion programs considered for low-load remote and rural homes with two of the three-phases of the MV designed with single phase transformers. However, with the adoption of mechanized agricultural machinery, the requirement of three-phase power to cater these loads is gaining an importance even in the rural areas. Therefore, R&DD, BPC in 2017 has carried out the "Technical and Financial Proposal on Converting Single Phase to Three-phase Supply" to come out with the alternatives for providing three-phase power supply where there are single phase power supplies. It was reported that while all the alternatives required the third conductor of the MV system to be extended on the existing poles following three proposals along with the financial impact were proposed:

a) Alternative -I

It was proposed to replace all the single-phase with three-phase transformers and this option as contemplated as not feasible as a replacement by three-phase transformers and distribution boards will lead to idle storage of single phase transformers of BPC.

b) Alternative -II

It was proposed to utilize the existing single-phase transformers to form three-phase transformations along with the additional purchase of three-phase transformers and additional pole structures. Further, single phase transformers of identical make, type, and rating can be only used to make three-phase power available.

c) Alternative -III

Option 3 is found to be a techno-commercially viable alternative as the lines can be easily upgraded to three-phase by constructing third conductor on existing pole structures. The transformer can be upgraded from single phase to three-phase as and when the demand for 3-phase supply comes. The line up-gradation across the country would amount to Nu. 96.67 million (Detail in **Annexure-6**) excluding the cost of three-phase transformers which have to be procured on need-basis, rather than one-time conversion in general.

The total single-phase line length required to be converted to three-phase in the Dzongkhag is 38.81 km and the estimate for such conversion would require Nu. 4.27 Million.

As the single phase to three network conversions is a demand-driven planning, conversions works shall be carried out based on the demand from the customers which would be more techno-commercially viable alternatives. Therefore, considering the anticipatory conversion requirement, the conversion of networks is proposed in the later stage of the DSMP.

7.3 Assessment of the Existing Distribution Transformers

The number of distribution transformers operated and maintained by the ESD is tabulated in **Table 2.**

7.3.1 Distribution Transformer Loading

The DTs are one of the most critical equipment of the distribution network and assessment of loading pattern along with the remaining asset life are crucial to ascertain the adequacy and performance of the transformer. The capability evaluation is based on historical peak load loading pattern and forecasted peak load growth of the feeder.

As per the peak loading pattern, some of the existing transformer capacities would not be adequate to cater the forecasted load growth for next ten (10) years. Accordingly, the capacities of the transformers need to be up-graded and such proposal is tabulated in **Table 13**. The individual DT loading details used to derive the summary is attached as **Annexure-7**.

Table 13: Forecasted Transformer Loading

Sl. No.	Name	Capacity (kVA)	Peak load(kVA)	% Loading	Peak Load (kVA)	% Loading	Peak Load(kV)	% Loading
			2019		2025		2030	
1	11kV Samtse I	25	5.06	18%	21.54	75%	29.49	103%
2	LCPL	4200	3661.00	87%	5850.00	139%	7132.00	170%
3	11kV Polymer	1125	435.50	40%	1735.29	160%	2235.29	206%
4	11kV Gomtu Market	188	85.42	43%	573.53	291%	823.53	418%
5	11kV Pugli	281	83.31	31%	219.60	53%	239.21	61%
6	11kV Gomtu Station Feeder	125	5.88	5%	14.12	11%	20.00	%
7	11kV Daurpani	167	74.27	36%	93.63	46%	114.53	56%
8	11kV VIP Feeder	570	83.58	36%	396.20	94%	583.74	126%
9	11kV Samtse Market	1000	109.95	16%	540.66	55%	782.99	75%
10	11kV Chengmari Feeder	59	18.95	26%	23.26	32%	26.20	36%
11	11kV Gurung Basty Feeder	178	66.29	27%	165.97	67%	286.55	116%
12	11kV Sipsu Feeder	250	200.00	80%	343.14	137%	458.82	184%
13	11kV Station Feeder	63	4.71	7%	12.94	21%	18.82	%
14	33kV Norbugang Feeder	1250	476.00	51%	1396.08	149%	2027.45	216%
15	33kV Dhamdu Station Feeder	250	5.88	2%	14.12	6%	20.00	%
16	33kV Sipsu Feeder	33	9.15	26%	22.69	65%	28.48	82%
17	Namgaychholing Feeder	35	6.92	15%	17.16	37%	21.55	50%
18	Tashicholing Feeder	141	37.29	30%	92.44	74%	116.05	93%
19	Pemaling Feeder	32	6.09	16%	15.09	40%	18.94	51%
20	33kV Dorokha Feeder	25	5.36	21%	17.31	68%	23.90	94%
21	33kV Dhamdum IP	6000	0.00	0%	4435.29	74%	5611.76	94%
22	33kV Dhamdum Station Feeder	250	5.88	2%	14.12	6%	20.00	%

Sl. No.	Name	Capacity (kVA)	Peak load(kVA)	% Loading	Peak Load (kVA)	% Loading	Peak Load(kV)	% Loading
			2019		2025		2030	
23	11kV PCAL	10000	9048	90%	9412	94%	9412	94%

Assuming that the load growth of the rural homes is not expected to grow similar to that of urban dwellings, it is strongly recommended to closely monitor the actual load growth and accordingly plan remedial measures for those transformers. Nevertheless, considering the actual site-specific growth rate and judgment of the field offices, it is recommended that arrangements be made for the up-gradation of ten (10) out of twenty-three (23) transformers as tabulated in **Table 14**. However, cross-swapping the existing transformers prior to procurement of new transformers would mean that only 8 transformers have to procured. However, the existing transformers of the urban areas would be required to be up-graded as forecasted.

Table 14: Proposed lists of DTs Requiring Up-Grading

Sl.No.	Name of substation location	Capacity (kVA)	Proposed kVA	Adjustment/New
	List of Transformers for 2019			
1	Phendegang	16	25	Adjustment-Daragoan
2	Devithan	500	1000	New
3	Rangtse B	16	63	New
4	Dogap F	16	63	New
5	Daragoan	25	125	New
6	AWP	500	1000	New
7	Jigme Sawmill	250	1000	New
	List of Transformers for 2025			
1	Garigoan	250	1000	New
2	Bhutan Telecom	500	1000	New
3	BFPL	250	500	Adjustment-Devithan
	Total Transformers required to up-grade		**10**	
	Extra Transformers	16	3	**Cross check with the nearest ESDs for adjustment**
		250	3	
		500	2	

Sl.No.	Name of substation location	Capacity (kVA)	Proposed kVA	Adjustment/New
	Total extra		**8**	

7.3.2 Asset life of Distribution Transformers

The DTs are one of the most critical equipment of the distribution network. Therefore, assessment of existing loading pattern together with the remaining asset life is crucial to ascertain its capabilities to cater the projected load growth. The life cycle of transformer and its mapping provides the clear information for its optimal utilization and development of an asset replacement framework.

As listed in **Table 15,** for the DTs that outlived its asset life expectancy, proper evaluation and testing should be prerequisite for their continued utilization.

Table 15: List of Outlived Transformers

Sl.No.	Name of Location	Unit	Qty	Cap. Date	No. of Years put to Use	Serial Number
1	250KVA, Gomtu Market"	NO	1	7/1/1993	26.43	S/4143
2	125KVA, Chargari 185	NO	1	7/1/1990	29.44	8200-060/1
3	125KVA, Haathikhola	NO	1	7/1/1989	30.44	S/4164
4	125KVA, 82DD-060/2	NO	1	7/1/1978	41.44	82DD-060/2
5	63KVA, Lower Peljorling	NO	1	7/1/1985	34.44	29003
6	63KVA, 18403, BP, Ku	NO	1	7/1/1990	29.44	184-03
7	63KVA, BP, Jiti	NO	1	7/1/1989	30.44	14046
9	63KVA, S/3444	NO	1	7/1/1988	31.44	S/3444
10	25KVA, Pel.Pr	NO	1	7/1/1979	40.44	16853
	Total		**9**			

7.3.3 Replacement of Single-phase Transformers

As discussed in the “Single Phase to Three-phase Conversion” of the distribution network it will be more economical and technically feasible to convert the single to three-phase transformers on

need basis. Total of Nu. 283.00 million is estimated for replacing all single-phase transformers including the distribution board. The detailed work out is produced as **Annexure-8.**

There are 105 single phase transformers in the Dzongkhag and the estimate for up-grading all the single to three-phase transformers would require Nu. 19.40Million. As the conversion from single to three-phase transformer is demand base, the plan has been distributed in ten year-span.

7.4 Power Requirement for Urban Areas by 2030

Samtse town has an area approximately 1200 acres of land (LAP-I & LAP-II) and the office of the Census Commissioner's preliminary report places approximately 62,590.00 (8.6%) of the total population is in Samtse Dzongkhag. The formal development of Samtse Town commenced only in 2017 under the Local Area Plan, LAP I. The areas under the LAP -I are Samtse Core area, AWP, Garigoan, Leechbari and Devithan with total of 321 plots allocated.

Similarly, as informed the planning for LAP II has been completed and the plot allocation had begun (from November 2019). The areas under LAP-II are Gurung Basty, Daragoan, Dhamdum area and Zero Point. Therefore, it is anticipated that there will be construction boom due to the presence of Dhamdum Industrial Estate or IP increasing the power demand in addition to normal growth. The Samtse town network is as shown in **Figure 8.**

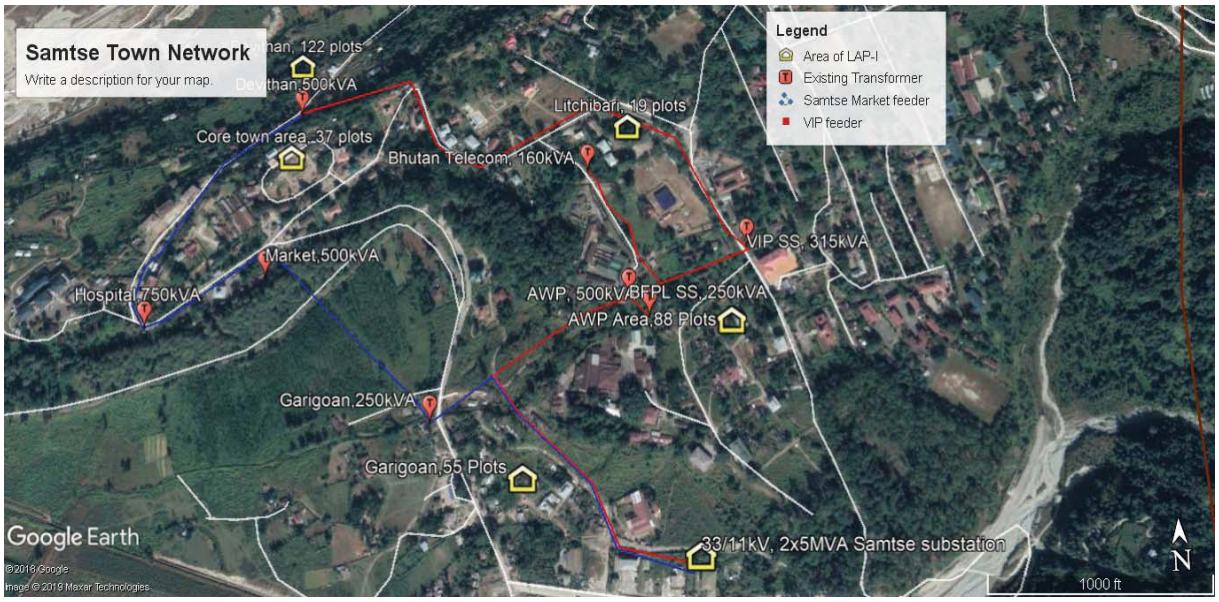


Figure 8: Samtse Town with Distribution Network

The LAP boundary extends Dhamdum IP in the west, Indo-Bhutan boundary in the south, Scruty Khola in the east and Gurung Basty in the north as shown in **Figure 9**.

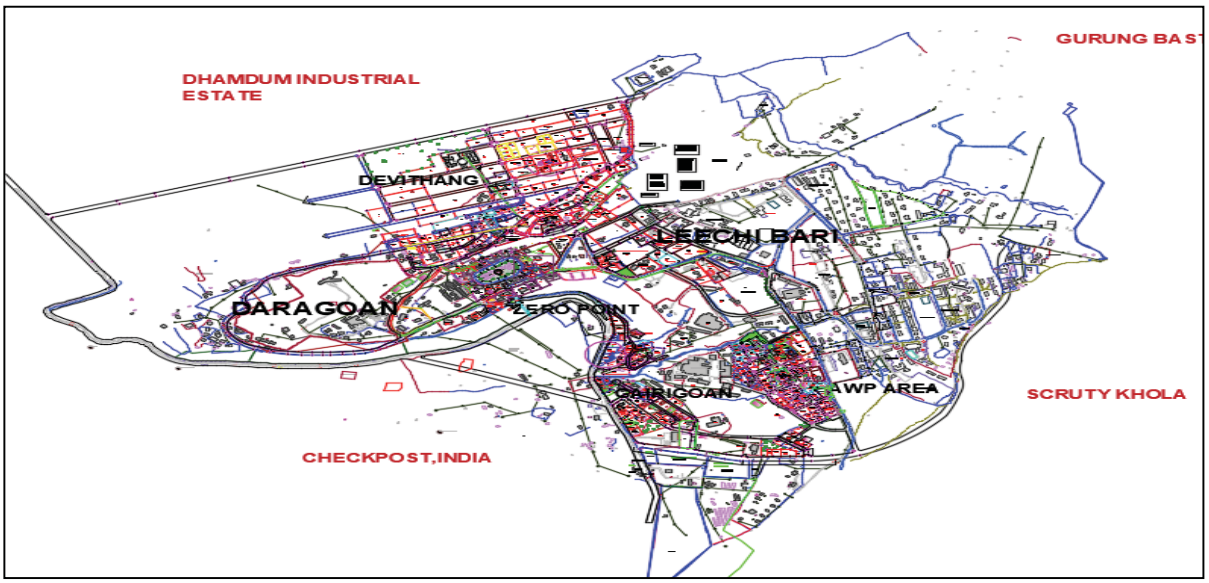


Figure 9: Administrative Boundary Map of LAP-I & LAP-II

i. Existing Distribution Network and Scenario

a) Existing Infrastructure

The construction works specifically in the core area is under full swing. Out of 321 plots allocated under LAP-I, eighteen buildings have been already mushroomed and seven buildings are under construction. The basic amenities such as access road, drainage and sewerage system and footpath have also initiated in some of the areas.

b) Existing Distribution Network

Currently, the Samtse town is fed from outgoing 11kV VIP and 11kV Samtse Market feeders of 33/11kV, 2x5MVA Samtse substation. The feeders are constructed with overhead bare conductor (Rabbit) and are interconnected through HV ABC, 3x95sq.mm. There are eight transformers with installed capacity of 3225kVA for 1851 customers as shown in **Table 16**. The peak load of the Samtse town recorded as on 2019 is 1.567MW.

Table 16: Total Number of Transformers and its Installed Capacity in Samtse Town

Sl. No.	Name of Transformer Location	Installed Capacity (kVA)	Location	Customer
1	AWP Premises	500	AWP area	1851
2	VIP	315		
3	BFPL	250	AWP area & Lechibari	
4	BTL SS	160	Lechibari area	
5	Garigoan	250	Garigoan area	
6	Market substation	500	Core town area	
7	Devithan	500		
8	Hospital	750	Daragoan area	
	Total	**3225**		**1851**

The installed capacity works out to be 4.25MW (5MVA @0.85 pf) each and would be adequate to meet the power requirement when both are operating. However, under single out condition, one feeder/transformer won't be able to meet the forecasted load of 15.68MW (8.64MW+7.04MW) in 2030 for the circuit length of 4.45km. Therefore, it is proposed to install additional 2x5MVA to meet the increasing demand as detailed in **Section 7.3.2**.

Both the feeders supplying power to Samtse town are constructed along the periphery of the town and it doesn't necessitate overhead to UG conversion. However, sections of the feeders which passes through the private and service plots in the Garigoan had to be realigned after formalizing the demarcation by the Dzongkhag municipal. Further, some sections of 11kV Chengmari, 11kV Sipsu and 11kV Gurung Bsaty feeders also passé through the private plots which has to be realigned.

Figure 10: Existing LT Distribution Network in Samtse Town

As shown in Figure 4.10 LT network is represented by a red line distributed under LAP-I. There is a plan to develop park in the core area and it would be necessary to convert the existing LT overhead lines to UG due to RoW issues, safety of the general public and more importantly from aesthetic point of view.

ii. Augmentation of Transformer Capacities

The total power requirement for 321 plots under LAP-I is works out to be 14.7MW considering the power data from 2015-2019 and load factor of 60%. Within span of three years, construction of twenty five (25) buildings had commenced under LAP-I. Based on the trend of civil infrastructure growth of the town and feeder peak load of the area, the power requirement is forecasted for 10 years with annual growth of 10.22%.

As per load forecast, the peak load of Samtse town will be 5.11MW and 7.47MW in 2025 and 2030 respectively. Therefore, up gradation of existing substations to higher capacity would be required to meet the increasing power demand whose details are as follows:

- Up gradation of 11/0.415kV, 250kVA to 1000KVA at Jigme Sawmill
- Up gradation of 11/0.415kV, 250kVA to 1000KVA at Garigoan

- Up gradation of 11/0.415kV, 500kVA to 1000KVA at Devithan
- Up gradation of 11/0.415kV, 500kVA to 1000KVA at AWP
- Up gradation of 11/0.415kV, 160kVA to 500KVA at Bhutan telecom
- Up gradation of 11/0.415kV, 250kVA to 500KVA at BFPL
- Construction of 11/0.415kV, 1750kVA package substation at Town area.

iii. Augmentation of conductor size and Conversion

a) Change of conductor size

With the increase in power requirement in the town areas, 11kV VIP & 11kV Market feeders have to upgrade to wolf conductor to cater the forecasted load of 8.64MW even with the single out condition.

b) Construction of UG network for core town area

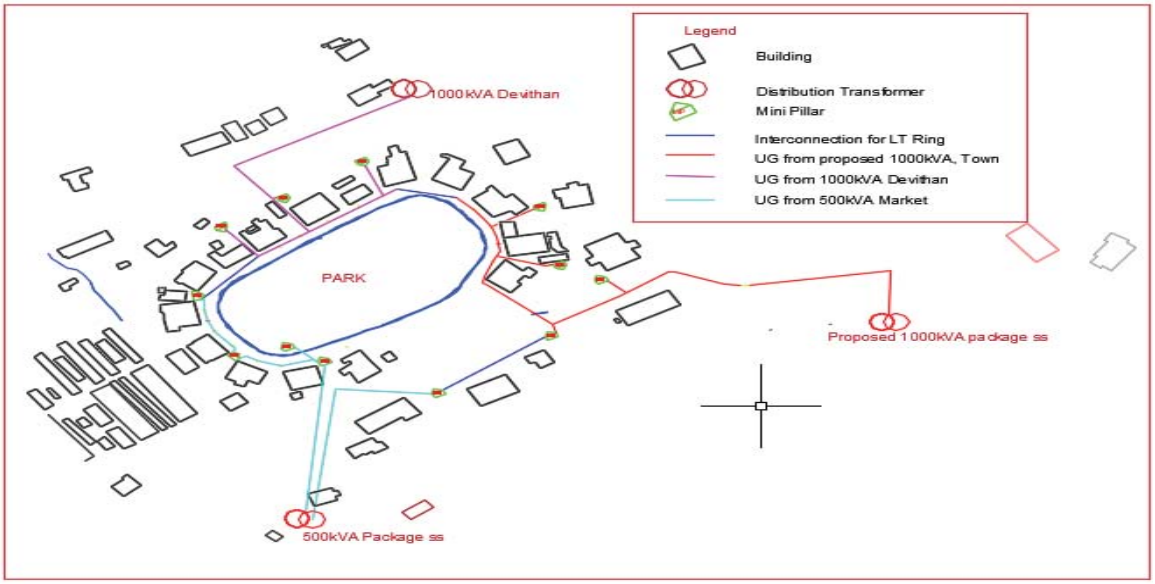


Figure 11:Locations of Proposed Transformer Up-Gradation Capacities

For 37 plots in the core town area, the power supply will be fed from 500kVA Market substation, 1000kVA Devithan and 1000kVA new substation of town. There shall be provision for LT interconnection arrangement to have adequate contingency plan should any of the transformer fails.

c) Conversion of HT bare conductor to UG cable for line passing through the town area

11kV Chengmari feeder is on bare conductor which passes through the town area. Further, sections of the feeders also pass through the private and service plots in the Garigoan area. Therefore, from the RoW issues, safety of the general public and to aesthetic point of view, it is proposed to convert the overhead bare conductor to the UG cable.

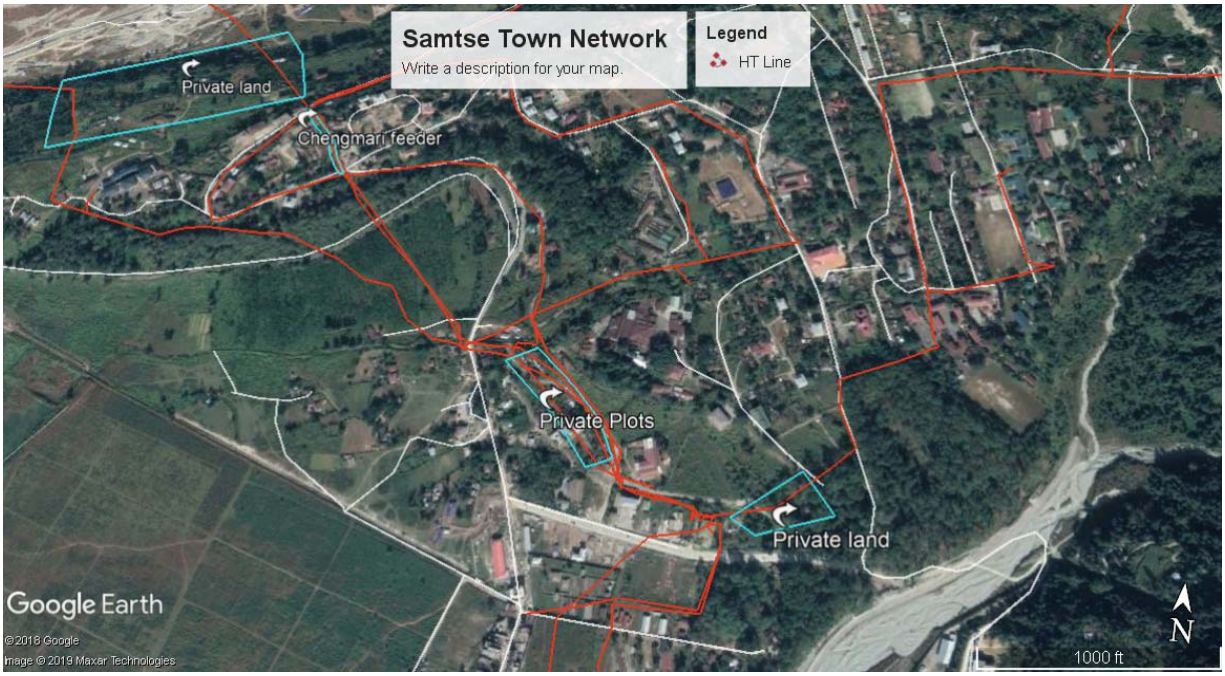


Figure 12: Locations of Distribution Network Passing Through the Private Properties

8. Distribution System Planning

The distribution network of the Dzongkhag has a radial topology with significant risk of high interruptions (fault in one location would mean that the entire customer in the network would experience the outage). Having alternate routes, sources or any contingency plan would significantly improve the reliability and power quality. In order to have robust and hard-lined distribution network, there is a need for good contingency plans with adequate sources to reduce the downtime. However, any provision to improve the power system would incur additional capital cost in addition to recurring additional preventive and corrective costs.

Therefore, to meet the system shortfalls against the set standard and to keep abreast with the forecasted load growth, proper distribution system planning is required which are detailed from **Section 8.1** through **Section 8.4.**

8.1 Power Supply Sources

8.1.1 HV Substations

As detailed in **Section 7.1.1**, it is proposed to up-grade the HV substations capacities as tabulated in **Table 17.**

Table 17: Proposed Up-Grading of HV substations

Sl.No.	Name of Substation	Capacity (MVA)		Forecasted Peak Load (MW)		
		Existing	Proposed	2019	2025	2030
1	66/33kV, 5MVA Dhamdum SS(T1)	5	20	3.34	8.31	11.84
2	66/33kV, 5MVA Dhamdum SS (T2)	5	20	4.78	12.04	15.95
3	66/11kV, 5MVA Samtse SS	5	10	3.7	10.1	12.01
4	66/33kV, 5MVA Gomtu SS	5	10	3.64	5.08	7.04

However, the proposal on the up-gradation of the substation has to be coordinated with Transmission services for the anticipatory load growth and requirement of HV & MV substation based on the type of load.

8.1.2 MV Substations

As detailed in **Section 7.1.2,** it is proposed to up-grade the MV substations not only to meet the increasing power demand, but also to improve the quality of power and reliability which are tabulated in **Table 18.**

Table 18: Proposed Up-Grading of MV substations

Sl.No.	Name of Source	Source Capacity (MVA)		Feeder Load (MW)		
		Existing	Proposed	2019	2025	2030
1	33/11kV, 5MVA Samtse SS (T1)	5	10	1.93	5.99	8.64
2	33/11kV, 5MVA Samtse SS (T2)	5	10	3.64	5.08	7.04

Sl.No.	Name of Source	Source Capacity (MVA)		Feeder Load (MW)		
		Existing	Proposed	2019	2025	2030
3	33/11kV, 2.5 MVA Yoeseltse SS	0	2.5	To improve the reliability, quality of power by reducing the line length.		
4	33/11kV, 2.5MVA Tendruk SS	0	2.5	To improve the reliability, quality of power and Tendruk RBA is an important load.		

8.2 MV and LV Lines

i. In line with the proposal to construct 33/11kV, 2.5MVA substation at Tendruk to improve the reliability and quality of power to the Tendruk RBA and other customers, it has to be extended from 33/11kV, 2x3MVA Sipsu substation. Therefore, it is proposed to construct 8.67km on Dog;

ii. The 11kV VIP and 11kV Market feeders have to evacuate more power requiring large sized conductors. Therefore, it proposed to up-grade the existing line to Wolf conductor;

iii. Section of Dhamdum-Dorokha line "Dhamdum to Yabala 33kV line" experiences the maximum fault and there was proposal to realign the line and same has been approved in the investment plan (2019-2023). Therefore, it is proposed to re-route 16.00 km of line to improve reliable power supply to Dorokha, Dumtoe, Denchukha under Samtse Dzongkhag and Gakidling and Sangbay Gewogs under Haa Dzongkhag; and

iv. Conversion of overhead to UG cables.

a) HT bare to UG cable

As proposed, the 11kV bare conductor has to be converted to UG system of both the LAPs to enhance safety, to ease the RoW issues and aesthetic of Samtse town. Similarly, some sections of 11kV Chengmari, 11kV Sipsu and 11kV Gurung Basty feeders need to be converted to UG system.

b) LV to UG cable

The LV network of LAP-I which falls in the designated park area has to be converted to UG system due to RoW issues, safety of the general public and more importantly from aesthetic point of view.

The proposed distribution network inclusive of construction and up-gradations of substations and lines and substations including the realignment of the feeders is shown in **Figure 13.**

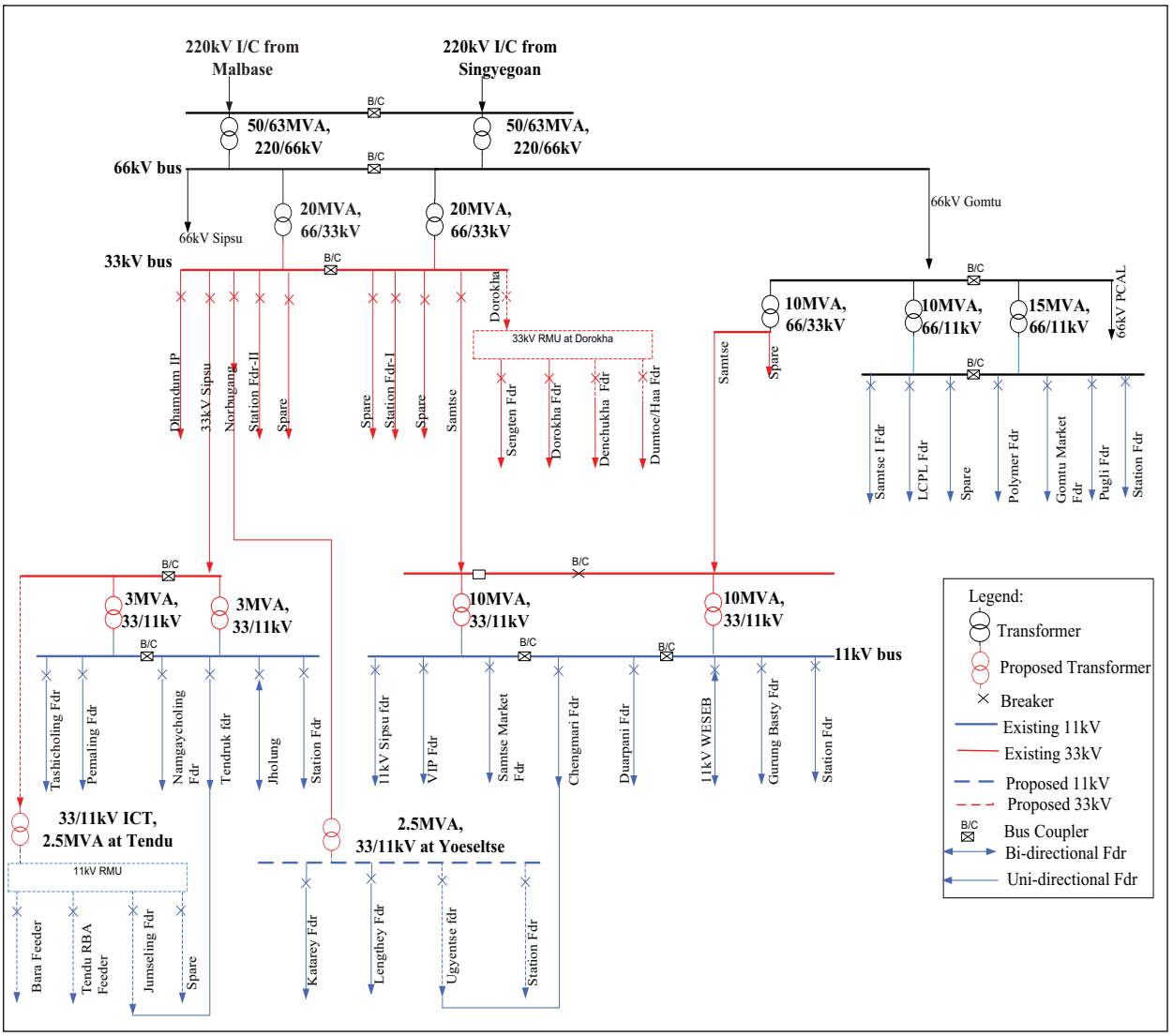


Figure 13: Proposed Distribution Network

8.3 Distribution Transformers

As listed in **Section 7.3.1,** these transformers need to be up-graded either by procuring or by cross-swapping the required capacities. Out of 23 listed transformers, procurement of only 8 DTs would be required which has been worked out based on the likelihood of load growth of the areas and inculcating the fair judgment of the field offices.

Table 19: List of Distribution Transformers which needs to be Up-Graded

Sl.No.	Name of substation location	Capacity (kVA)	Proposed kVA	Adjustment/New
	List of Transformers for 2019			
1	Phendegang	16	25	Adjustment-Daragoan
2	Devithan	500	1000	New
3	Rangtse B	16	63	New
4	Dogap F	16	63	New
5	Daragoan	25	125	New
6	AWP	500	1000	New
7	Jigme Sawmill	250	1000	New
	List of Transformers for 2025			
1	Garigoan	250	1000	New
2	Bhutan Telecom	500	1000	New
3	BFPL	250	500	Adjustment-Devithan
	Total Transformers required to up-grade		**10**	
	Extra Transformers	16	3	**Cross check with the nearest ESDs for adjustment**
		250	3	
		500	2	
	Total extra		**8**	

8.4 Switching and Control

Switching and control system is required to take care of the system during faulty situations which ultimately is going to take care of the failure rate, repair and restoration time. This in turn would improve the reliability, safety of the equipment and online staff, optimizes the resource usage and more importantly the revenue generation will be enhanced. Similarly, in order to

capture the real time data and information, it is inevitable to have automated and smart distribution system. The feeders which are more susceptible to faults are identified with proposed restorative measures through the studies. With the exception of tripping of breakers in the sending end substations, existing distribution network is neither automated nor smart to detect the faults and respond in real-time manner. The automation and smart grid components are detailed in Smart Grid Master Plan 2019.

8.4.1 Intelligent Switching Devices

As reflected in **Section 7.2.3,** some of the feeders are the more susceptible. Therefore, additional preventive and corrective measure for these feeders need to be put in place. In order to improve reliability and power quality of these feeders, it is proposed to have technology in place to respond to fault and clear it accordingly rather than through ex post facto approach. Therefore, it is proposed to enhance the existing switching and control system by having latest suitable and user-friendly technology (automatic). The coordinated arrangement of Intelligent Switching Devices (ISD) like ARCBs, Sectionalizers and FPIs would significantly improve the control and operation mechanism of the network. **Figure 14** shows the existing installed breakers, isolators, RMUs and proposed plan is as shown in **Figure 15** and **Table 20.**

Table 20: Existing and Proposed Switching Equipment

Sl. No.	Feeder Name	ARCBs		Sectionalizers		FPIs		LBS	
		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
1	11kV Pemaling Feeder				1		1	1	
2	11kV Namgaycholing Feeder				1		2	1	
3	11kV Tendruk Feeder				1		1	1	
4	11kV Chengmari Feeder		1		1		3	1	
5	11kV Daurpani Feeder		1					1	
6	11kV Gurung Basty Feeder		1					1	
7	33 kV Dhamdhum- Dorokha Feeder	4	1				5	3	3
8	11kV Samtse -I		2		2		2	1	
9	11kV Pugli feeder		1				1	1	

Sl. No.	Feeder Name	ARCBs		Sectionalizers		FPIs		LBS	
		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
	Total	**4**	**7**	**0**	**6**	**0**	**15**	**11**	

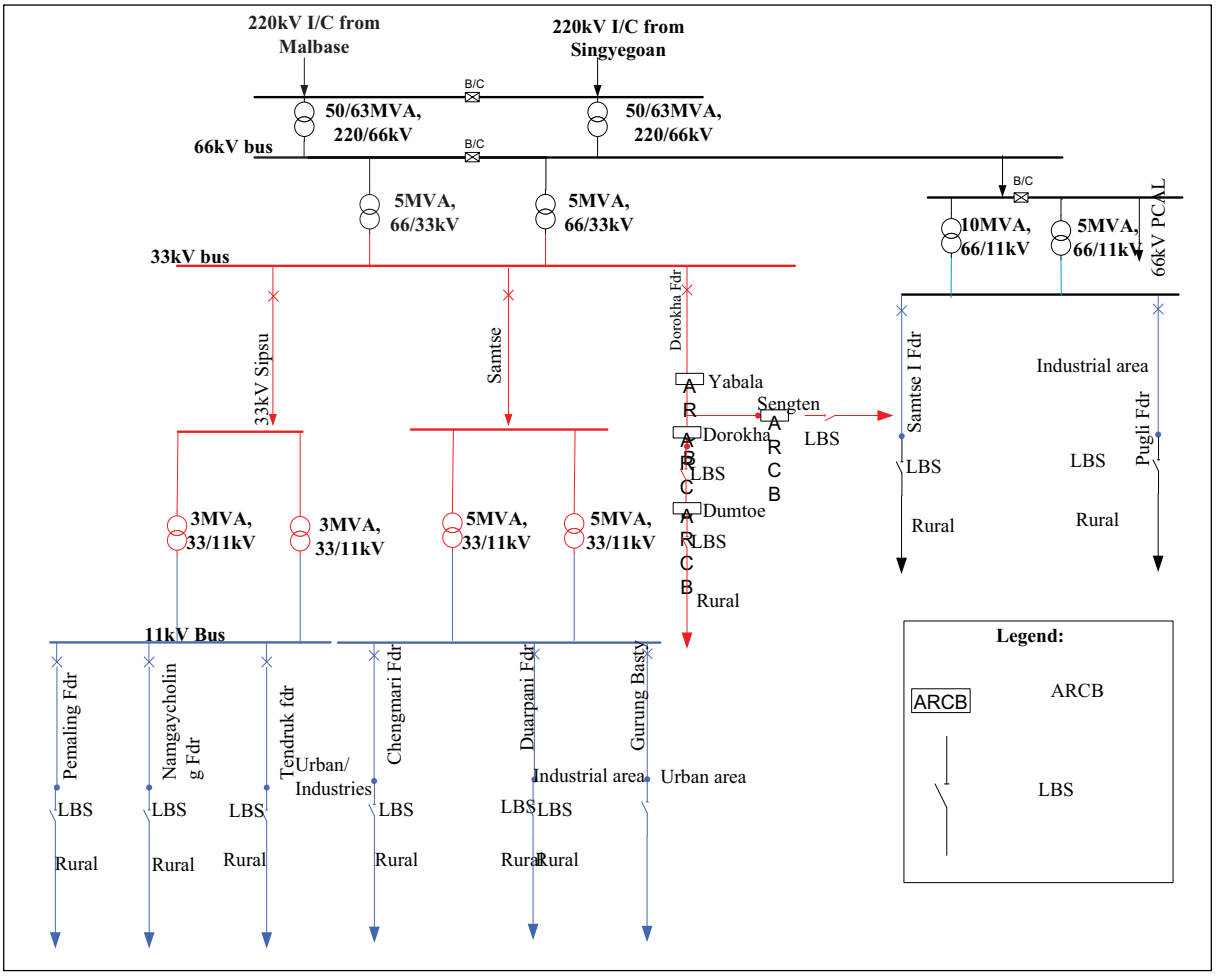


Figure 14: Existing Switching Equipment Installed in Distribution Network of ESD, Samtse

Reliability of the lines and substations can also be enhanced through training of line staff. They need to be equipped with the knowledge, skills, and the confidence to operate and maintain the distribution infrastructure. For instance, the linemen of the ESDs need to develop the confidence to change DO fuses online using hot sticks instead of the usual practice of taking shut down of the whole feeder. However, having the right tools, equipment, and especially spares (of appropriate specifications) is a prerequisite. Although it is not possible to quantify the reliability

indices that can be achieved with preventive and corrective measures in place, the proposed contingency plans would significantly improve the power quality.

However, the quantum and location of the devices to be installed shall be based on the Smart Grid Master Plan 2019.

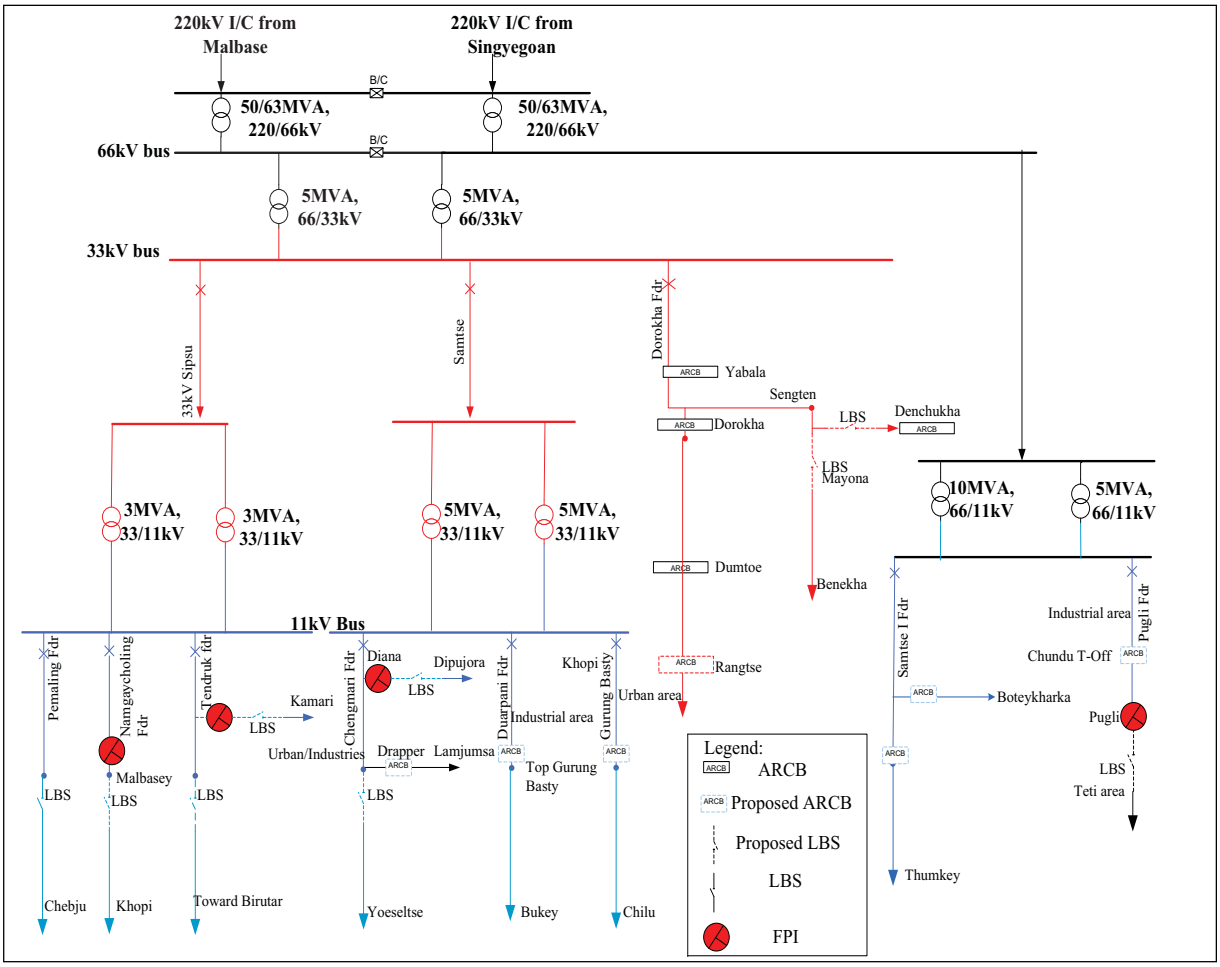


Figure 15: Proposed Switching Equipment for Distribution Network of ESD, Samtse

8.4.2 Distribution System Smart Grid

The distribution grid modernization is outlined in Smart Grid Road Map 2019 including the investment (2020-2027). The DMS, ADMS, DSCADA features along with their components and functionalities, the timeline for the programs and the cost estimates of the smart grid are lucidly reflected. Therefore, this report exclusively entails the identification of the system deficiencies

and qualitative remedial measures which would require system augmentation and reinforcement as per the existing and projected load.

9. Investment Plan

In accordance to the above mentioned contingency plans targeted to improve the power quality, reduce losses and improve reliability indices of the Dzongkhag, investment proposal is developed. The investment plan has been confined to power supply sources, MV lines, DTs, switching and control equipment and RoW. The proposed/approved (2020-2024) investment plan and any new investment plans have been validated and synced with the system studies carried out. The annual investment plan (2020-2030) has been worked out based on the priority parameters set out as shown in **Figure 16.**

The matrix gives us the basis on the prioritization of the investments to be made in the ten-year schedule as every activity cannot be carried out at a time. The activities which have to be carried out due to load growth, developmental activities and retrofitting of obsolete/defective switchgears and equipment will have the highest level of importance and urgency. These activities have to be prioritized and invested in the initial years which are grouped in the first quadrant (Do First).

How important is the task?			
	Highly Important	Action: Do First **I**	Action: Do Next **II**
	Important	**Action: Do Later** **III**	No Action: Don't Do **IV**
		More Urgent	**Urgent**
How urgent is the task?			

Figure 16: Priority Matrix

Similarly, there are certain activities although might be very important but not so urgent can be planned in the later stage of the year (Do Next). These activities can be but not limited to improving the reliability, reducing losses and reconfiguration of lines and substations to reduce the losses and improving the power quality. The activities which are not so important but are highly urgent have to be also planned in later stage of the period.

According to the investment prioritization matrix framework, the yearly investment plan along with the cost estimation is derived and is consolidated in **Table 21** as an investment plan. The

cost estimates have been worked out based on the BPC ESR-2015 and annual inflation is cumulatively applied to arrive the actual investment cost for the following years.

In the span of next 10 years (2020-2030), the total projected investment required to adequately deliver the power to the customers of Samtse Dzongkhag is Nu. 281.03 million (Nu. 28.10 million per year).

Table 21: Yearly Investment Plans (2020-2030)

Sl. No.	Activities	Investment Plan (Nu. In Million)											Total
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
1	Conversion of ACSR bare conductor with ABC insulated cables	1.37	1.98	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	**16.76**
2	Reconductoring of 11kV line (Chengmari) feeder from Samtse to Jiti boarder (ACSR Rabbit to ACSR Dog)			3.28									**3.28**
3	Reconductoring of 2c x50sq.mm LV ABC to 4cx50sq.mm LV ABC at Dogap			1.00									**1.00**
4	Underground cable works for Samtse core town area			4.00									**4.00**
5	Upgradation 1phase 16kVA Transformer with 3phase 25kVA, 11/0.415kV Transformer and Upgradation of single phase LV ABC lines at Phendegang under Norgaygang Gewog (Investment work Name: Up-gradation and construction of new substations in rural areas including MV lines extension under ESSD Sipsu)	0.35											**0.35**
6	Up-gradation of Middle Daragoan (Dumtoe Gewog area) substation (25kVA to 125kVA)			0.31									**0.31**
7	Construction of 11/0.415kV, 1000 kVA Substation near existing Dzong	1.67											**1.67**
8	Upgradation of single phase LV lines to three-phase under ESSD Sipsu.			0.20	0.20	0.15							**0.55**
9	Up-gradation of Rangtse-B substation (16kVA to		0.67										**0.67**

Sl. No.	Activities	Investment Plan (Nu. In Million)											Total
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
	63kVA)												
10	Up-gradation of Dogap-F substation (16kVA to 63kVA)		0.74										**0.74**
11	Up gradation of 11/0.415kV, 500kVA to 1000KVA at Devithan		1.51										**1.51**
12	Up gradation of 11/0.415kV, 250kVA to 1000KVA at Garigoan								4.41				**4.41**
13	Construction of 11/0.415kV, 1500kVA package substation at Town area			6.34									**6.34**
14	Rural Electrification (Refill In)	3.80	3.69	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	**41.69**
15	Construction of 8.67km of 33kV, Dog conductor from 33/11kV Sipsu substation to Tendu			17.86									**17.86**
16	Conversion of 33kV single phase line to three-phase line from Pungthra till Benakha under Denchukha Gewog	0.40											**0.40**
17	Interconnection of Tading feeder and Samtse I feeder from Gomtu SS.	1.26											**1.26**
18	Construction of 33/11kV, 2.5 MVA Yoeseltse SS					30.07							**30.07**
19	Construction of 33/11kV, 2.5MVA at Tendu			7.05									**7.05**
20	Upgradation of 33/11kV, 2X5MVA to 2x10 MVA Samtse SS											39.25	**39.25**
21	Upgradation of 11kV Market and 11kV VIP to Wolf conductor						3.33						**3.33**

Sl. No.	Activities	Investment Plan (Nu. In Million)											Total
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
22	Conversion of HT bare conductor to UG at Tendu Town area			3.28									**3.28**
23	Up gradation of 11/0.415kV, 250kVA to 1000KVA at Jigme Sawmill					3.17							**3.17**
24	Up gradation of 11/0.415kV, 500kVA to 1000KVA at AWP				1.89								**1.89**
25	Up gradation of 11/0.415kV, 160kVA to 500KVA at Bhutan Telecom									2.07			**2.07**
26	Up gradation of 11/0.415kV, 250kVA to 500KVA at BFPL										3.24		**3.24**
27	Conversion of bare conductor to UG cable in LAP I & LAP II				27.79								**27.79**
28	Realignment of 33kV Dorokha feeder from Dhamdum to Dorokha			26.98									**26.98**
29	Construction of 33kV RMU at Dorokha					5.19							**5.19**
30	Construction power supply to eleven (11) industries whose potential is 395kW in Dhamdum to be tapped from existing 11kV line		1.25										**1.25**
31	Conversion of single to three-phase line			0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	**4.23**
32	Replacement of single phase by three phase transformers			2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	**19.44**
	Total	**8.85**	**9.84**	**78.22**	**37.80**	**46.50**	**11.25**	**7.92**	**12.33**	**9.99**	**11.16**	**47.17**	**281.03**

10. Conclusion

Based on the inputs from ESD Samtse, validated data, assessment of the existing distribution network, and the reliability analysis, recommendations are made for system modifications and improvements. Costs associated with each recommendation and presented in several phases so that work may continue at a pace that is determined by fund availability and the capacity of the office to execute the work. An attempt is made to prioritize the recommendations; however, there will undoubtedly be adjustments in the order and priority by which the investments will be actually implemented.

The third option which would be the least-cost alternatives for converting the single to three-phase distribution network where all the MV lines will have to be converted to three-phase and replacing the single phase to three-phase transformers on need basis.

Although the report entails the identification of system deficiencies and reinforcement required, for automation and smart operation of the distribution network, the smart grid infrastructure development with functionalities are detailed in "Smart Grid Master Plan 2019". Therefore, the DSMP-Smart Grid Master Plan-Hybrid is necessary which can be amalgamated during the rolling out of annual investment and budget approvals.

Proportion of LV is higher in comparison to MV line length, accordingly the independent study carried out by BPC in 2017 showed that large portion of loss is due to LV and DT. Therefore, similar system study beyond DT (including DT) has to be carried out in order to capture the entire network and strategize to develop the master plan blue print.

11. Recommendations

Sl. No.	Parameters	Recommendations
A. Power Supply Sources		
1	HV Substations	**1) Substations 66/33kV Dhamdum SS** To meet the increasing power demand as per the forecasted load and to improve the voltage profile, it is proposed to upgrade to 40MVA. **2) 66/11kV, 5MVA Gomtu SS** The 66/11kV Gomtu transformers are operating in islanding mode due to different capacities and impedance mismatch. In addition to the existing load of 3.7MW for 5MVA transformer, four MV industries would be connected and is forecasted to increase the peak load to 10.10 MW by 2025 and 12.01MW by 2030. Therefore, to meet the increasing power demand, it is proposed to install 10MVA transformer within 2025.
2	MV Substations	**1) 33/11kV, 2.5 MVA Yoeseltse SS** In order to improve the reliability and quality of power, the feeder circuit length has to be reduced from 84.11km. Further, BPC has already leased one-acre of land at Yoeseltse. In 2015. Therefore, it is proposed to construct 33/11kV, 2.5MVA substation. **2) 33/11kV, 2.5MVA Tendruk SS** The 11kV Tendruk-Bara feeder has circuit length of 85.57km and the important customer of this feeder is Tendruk-RBA where VVIPs frequent the area. Therefore, in order to improve the reliability, quality of power supply and to reduce the circuit length, it is proposed to construct 33/11kV, 2.5MVA Tendruk substation. **3) 33/11kV, 2X5MVA Samtse SS** Samtse has 33/11kV, 2x5 MVA transformers with peak load of 5.57MW as on 2019. This is the main source of power supply to core (LAP-I) and other parts of the Samtse town. The average electrical power requirement growth from 2015-2019 was 10.22% and is forecasted to reach 11.07MW

Sl. No.	Parameters	Recommendations
		& 15.68 MW by 2025 & 2030 respectively. Therefore, to meet the increasing power demand as forecasted, it is proposed to upgrade the existing transformer capacity by installing 2x5MVA in addition to existing capacity.
B. MV Lines		
1	Sipsu to Tendruk-RBA line extension	In line with the proposal to construct 33/11kV, 2.5MVA substation at Tendruk to improve the reliability and quality of power to the Tendruk RBA and other customers, it has to be extended from 33/11kV, 2x3MVA Sipsu substation. Therefore, it is proposed to construct 8.67km on Dog.
	11kV VIP & 11kV Market feeders	These feeders have to evacuate more power requiring large sized conductors. Therefore, it is proposed to re-size the existing to Wolf conductor.
2	Re-alignment (Dhamdum to Yabala)	Section of Dhamdum-Dorokha line "Dhamdum to Yabala 33kV line" experiences the maximum fault and there was proposal to realign the line and same has been approved in the investment plan (2019-2023). Therefore, it is proposed to re-route of 16.00 km of line and installation of 33kV RMU to improve the reliability of power supply to Dorokha, Dumtoe, Denchukha under Samtse Dzongkhag and Gakidling and Sombaykha Gewogs under Haa Dzongkhag.
3	Conversion Works	**1) HT overhead to UG cable** It is proposed to convert sections of overhead 11kV Chengmari, 11kV Sipsu and 11kV Gurung Basty feeders to UG system to enhance safety, to ease the RoW issues and to enhance the aesthetic view of Samtse town. Similarly, some sections of 11kV Chengmari, 11kV Sipsu and 11kV Gurung Basty feeders need to be converted to UG system. **2) LT overhead to UG cable** The LV network of LAP-I which falls in the designated park area has to be converted to UG system due to RoW issues, safety of the general public and more importantly from aesthetic point of view.
C. Distribution Transformers		

Sl. No.	Parameters	Recommendations
1	Distribution Transformer	As reflected in **Section 7.3.1** of this report, it is proposed to regularly monitor the loading pattern especially of the urban transformers. It is desired to load the transformers less than 85% so as to ensure that transformer is operated at maximum efficiency. The system study is restricted to DTs, the loads needs to be uniformly distributed amongst the LV feeders to balance the load.
2	Single to Three Phase Transformers	As reported in the "Technical and Financial Proposal on Converting Single-phase Power Supply to Three Phase in Rural Areas", it is recommended to replace the single to three phase transformers on need basis.
D. Switching and Control Equipment		
1	Switching and Control Equipment	It is recommended to install Intelligent Switching Devices (ISD) like ARCBs, Sectionalizers and FPIs as proposed which would reduce the downtime for clearing faults. 1) Install FPI, Sectionalizes and ARCBs at various identified locations. 2) Installation of 11kV& 33kV RMUs at various identified locations.
E. others		
1	Investment Plan	As reflected in Section 9 of this report, overall investment plan as proposed is recommended.
2	Review of the DSMP	Practically the projections will hold only true in the nearest future therefor, it is strongly recommended to review the DSMP in 2025 (after five years) or if need be as and when situation demands.
3	System Studies beyond DT	& HV and the scope of DSMP terminates at DT. However, it is equally important to carry out similar system studies for LV networks till meter point. Due to time constraint and non-availability of required LV data, it is recommended that ESD Samtse should carry out the studies on LV network including the DTs. Nevertheless, with the entire distribution network captured in the GIS and ISU, the system studies should be carried out including the LV network in the future.
4	Customer Mapping	One of the important parameters required especially for reaffirming the capability of the DTs is by examining customer growth patterns. Therefore, it is recommended to consistently update the customers via customer mapping

Sl. No.	Parameters	Recommendations
		process carried out annually.
5	Right of Way	RoW should be maintained as per the DDCS 2016. However, increased frequency of RoW clearing in the problematic sections of the line and in fast growth sub-tropical forest is recommended.
6	Asset life of DTs	The asset life of DTs need to be gathered to enable development of asset replacement framework. However, it is recommended to regularly monitor the health of the transformers which have already outlived their lives.
7	Overloading of DTs	As per the load forecast, some of the rural DTs might overload. While the probability of realizing such an event is quite low. It is, however, recommended that the DTs that have already exhausted its statutory life (25 years and above) be regularly monitored.
8	New extension through 33kV network	The power carrying capacity of 33kV system is almost 3-fold compared to that of 11kV system. Therefore, any new extension of lines may be done through 33kV system (based on fund availability and practical convenience).
9	Reliability	In order to improve the reliability of the feeder/network, it is recommended that fault should be located within short period of time there by reducing the restoration time and the number of customers affected. In this regard, the following initiatives are recommended: 1) To install ISDs (communicable FPIs, Sectionalizers & ARCBs); 2) To explore with construction of feeders with customized 11kV & 33kV towers; and 3) To increase the frequency of Row clearing in a year.
10	Lightning Protection	The top root cause of the power interruption is due lightning and storm. Therefore, more focus should on how to control and safeguard the equipment from lightning and storm (especially for the southern foothills).
11	Conversion Works	As the joint survey for laying the UG had not be done, the investment has been worked based on assumptions of likely scenarios. Therefore, ESD Samtse should incorporate the actual activities during the rolling out of the investment plans.

12. Annexure

Annexure-1: MV Line Details and Single Line Diagram

Annexure-2: IS 2026, IEC 60076 (Technical parameters for Distribution Lines and Transformers)

Annexure-3: The details on load forecast methodology

Annexure-4: Detailed Simulation Results

Annexure 5: Feeder Wise Reliability Indices

Annexure-6: Material Cost for Upgrading single phase (11 kV and 33 kV) Lines to three-phase

Annexure 7: Distribution Transformer loading

Annexure-8: Material Cost of three phase (3Φ) Transformers

13. References

1. The FWPL and CPL from TD, BPC as of 2018.
2. BPC Power Data Book 2018.
3. BPC Distribution Design and Construction Standards (DDCS)-2016.
4. BPC Smart Grid Master Plan (2019-2027).
5. BPC National Transmission Grid Master Plan (2020 & 2030).
6. BPC Operation and Maintenance Manual for Distribution System (2012).
7. BPC Corporate Strategic Plan (2019-2030).
8. Population and Housing Census of Bhutan 2019.
9. The Structural Plan (2004-2027) for every Dzongkhag.
10. Industrial Parks (Department of Industry).
11. BPC Electrical Schedule of Rates 2015.

14. Assumptions

1. All the distribution network was considered as Balanced System (Restriction with the existing ETAP Key);

2. All DTs considered as lump load and depending upon the type of load connected to the feeder, ratio of 80% (static load) to 20% (industrial feeders) were assumed;

3. The voltage level of ±10% is given as critical value which is indicated by red color while simulating and voltage level of ±5% is given as marginal value which is indicated by pink color while simulating.

4. The typical inbuilt value of X/R ratio of ETAP tool was considered for all the transformers;

5. Dimensions and parameters of some cables/UG cables are customized in the library as per the requirement;

6. The technical parameters which are required for analysis of the distribution network have been considered as per the set standard of DDCS.

15. Challenges

Sl. No.	Parameters	Challenges	Opportunities/Proposals
1	Software Tool (ETAP)	a) Only one key & offline Key	a) Can opt for on line key with fewer more modules specially to carry out the technical evaluation of un-balanced load flow system. This would be more applicable and accrue good result for LV networks.
		a) Balanced Load Flow	
		b) Limitations of No. of buses (1000)	
2	Data	a) No recorded data (reliability & energy) on the out-going feeders of MV SS	a) Feeder Meters could be install for outgoing feeders of MV substations to record actual data (reliability & energy)
		b) Peak Load data of DTs which were recorded manually may be inaccurate due to timing and number of DTs.	b) In order to get the accurate Transformer Load Management (TLM)/loading, it is proposed to install DT meters which could also have additional features to capture other required information.
		c) No proper feeder and DT	c) Customer Information System (CIS)

Sl. No.	Parameters	Challenges	Opportunities/Proposals
		wise Customer Mapping recorded	of the feeder/DT would enable to have proper TLM and replacement framework.
3	Manpower	a) Resource gap in terms of trained (ETAP) and adequate engineers (numbers)	a) Due to lesser number of trained engineers in the relevant fields (software), engineers from other areas were involved.

12. Annexures

Annexure-1: MV Line Details and Single Line Diagram

MV line details of Samtse Dzongkhag

Source	Feeder details		Voltage (kV)	Section			Type & Line Length of the Conductor						Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
66/33kV, 5MVA Gomtu SS	33KV Samtse I feeder	L10	33	Gomtu SS to L10H001	45.75					0.05	0.05	3			
				L10H001 to L10H192				15377.00		15.38	15.42	3			
				L10H192 to samtse SS	32.75					0.03	**15.46**	3			
66/33/11kV Gomtu substation,66/11kV, 10MVA	11kV Samtse I feeder	L20	11	Gomtu SS to L20H012					877.00	0.88	0.88	3			
				L20H012 to Alay substation					1064.00	1.06	1.94	3	25	3	L20T28
				L20H012 to L20H019					718.00	0.72	2.66	3			
				L20H019 to Andhari SS					20.00	0.02	2.68	3	63	3	L20T1
				L20H019 to L20H046					2366.00	2.37	5.05	3			
				L20H046 to Lower Dumsidara B SS					140.00	0.14	5.19	3	10	1	L20T31
				L20H046 to L20H056					962.00	0.96	6.15	3			
				L20H056 to Tendari B SS					161.00	0.16	6.31	3	25	3	L20T4
				L20H056 to L20H060					311.00	0.31	6.62	3			
				L20H060 to Dumsidara SS					193.00	0.19	6.81	3	63	3	L20T2
				L20H060 to Tendhari A SS					1066.00	1.07	7.88	3	16	3	L20T3
				Tendhari SS to L20H060					1554.00	1.55	9.43	3			
				L20H107 to Kalapani SS(L20H102)					249.00	0.25	9.68	3	25	3	L20T5
				L20H107 to Singkaulay SS (L20H126)					1920.00	1.92	11.60	3	16	1	L20T6
				L20H126 to L20H127					323.00	0.32	11.92				
				L20H127 to Banstar SS (L20H155)					3400.00	3.40	15.32	3	63	3	L20T14
				L20H155 to L20H157					178.00	0.18	15.50				
				L20H157 to Uttaray I SS (H20H382)					1695.00	1.70	17.20	3	63	3	L20T29
				Uttaray I SS (H20H382) to Uttaray IISS (H20H386)					400.00	0.40	17.60	3	25	3	L20T30
				L20H157 to L20H159					172.00	0.17	17.77	3			
				L20H159 to Lamatar SS(L20H187)					1498.00	1.50	19.27	3	63	3	L20T16
				Lamatar SS(L20H187) to Phajaydang SS(L20H192)					591.00	0.59	19.86	3	25	3	L20T17
				Lamatar SS(L20H187) to Changay Sangla(L20H542)					1754.00	1.75	21.61	1	10	1	L20T57
				L20H159 toSangla SS(L20H174)					1471.00	1.47	23.08	3	25	3	L20T15
				Sangla SS(L20H174) to L20H400					928.00	0.93	24.01	3			
				L20H400 to L20H403 (L.Dolomthang SS)					276.00	0.28	24.29	3	25	3	L20T32
				L20H403 (L.Dolomthang SS) To L20H406 (u. Dolomthang)					276.00	0.28	24.56	3	25	3	L20T33
				L20H406 (u. Dolomthang) to Numlakha (L20H421)					2018.00	2.02	26.58	1	10	1	L20T34
				L20H400 to L20H425					676.00	0.68	27.26	3			
				L20H425 to M Dolomthang (L20H427)					196.00	0.20	27.45	3	16	3	L20T35
				L20H25 to Litchi ss(L20H432)					443.00	0.44	27.90	3	25	3	L20T36
				Litchi ss(L20H432) to Kamidara SS (L20H438)					1104.00	1.10	29.00	3	16	3	L20T37
				Kamidara SS (L20H438) to L20H441					585.00	0.59	29.59	3			
				L20H441 to L20H443					298.00	0.30	29.88	3			
				L20H443 to L20H444(M. Gashinggoan)					104.18	0.10	29.99	3	25	3	L20T38
				L20H444(M. Gashinggoan ss) to (L20H448)					340.00	0.34	30.33	3			
				L20H443 to U Gashingoan					97.00	0.10	30.42	3			
				L20H441 to L20H453					429.00	0.43	30.85	3			
				L20H453 to L20H459(U Gumbadara)					668.00	0.67	31.52	3	25	3	L20T41
				L20H459(U Gumbadara) to L20H463(Ratey A)					785.00	0.79	32.31	3	16	3	L20T42
				L20H463(Ratey A)ss to Ratey B ss (L20H469)					874.00	0.87	33.18	3	25	3	L20T43
				L20H453 to M Gumbadara SS(L20H472)					168.00	0.17	33.35	3	25	3	L20T44
				M Gumbadara SS(L20H472) to L Gumbadara SS(L20H475)					415.00	0.42	33.76	3	16	3	L20T45
				L Gumbadara SS(L20H475) to L20H481					1185.00	1.19	34.95	3			
				L20H481 to M Thumkey SS (L20H483)					477.00	0.48	35.43	3	16	3	L20T46
				M Thumkey SS (L20H483) to L20H491					1124.00	1.12	36.55	3			
				L20H491 to L. Thodney C (L20H492)					132.35	0.13	36.68	1	10	1	L20T47
				L. Thodney C SS (L20H492) to M. Thodney C SS(L20496)					525.00	0.53	37.21	1	10	1	L20T48
				M. Thodney C SS(L20496) to Thodney B (Top)					587.00	0.59	37.79	1	16	1	L20T49
				L20H491 to Raigoan SS (L20H504)					549.00	0.55	38.34	1	10	1	L20T50
				Raigoan SS (L20H504) to Thodney A SS(L20H510)					767.00	0.77	39.11	1	10	1	L20T51
				L20H481 to L20H513					513.00	0.51	39.62	3			
				L20H513 to U Thumkey SS(L20H514)					317.00	0.32	39.94	3	25	3	L20T52
				L20H513 to L Thumkay SS (L20H518)					615.00	0.62	40.55	3	16	3	L20T53

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L Thumkay SS (L20H518) to Suktey SS (L20H527)					1579.00	1.58	42.13	1	16	1	L20T54
				Suktey SS (L20H527) to L20H529					375.00	0.38	42.51	3			
				L20H529 to Suktey Thumkay SS (L20H531)					339.00	0.34	42.85	3	10	1	L20T55
				L20H529 to Suktey Dagaydara SS (L20H534)					514.00	0.51	43.36	3	10	1	L20T56
			TOTAL								**43.36**				
66/33/11kV Gomtu substation,66/33kV, 5MVA & 66/11kV, 1x5MVA & 10MVA	Pugli Feeder	L30	11	Gomtu SS to L30H000	69					0.07	0.07	3			
				L30H000 to L30H003				140.00		0.14	0.21	3			
				L30H003 to L30H108(Kenpa Pvt)					33.00	0.03	0.24	3	500	3	L30T11
				L30H003 to L30H014				511.00		0.51		3			
				L30H014 to New Lahatar (L30H112)					340.00	0.34	0.34	3	63	3	L30T12
				New Lahatar (L30H112) to Lahatar(L30233)					431.00	0.43	0.77	3	63	3	L30T27
				Lahatar(L30233) to Suktey Village (L30159)					1571.00	1.57	2.34	3	25	3	L30T17
				L30H014 to kothidara SS(L30H021)				521.00		0.52	2.86	3	63	3	L30T1
				L30H020 to Druk Emulsion (L30H026)				510.00		0.51	3.37	3	250	3	
				L30H026 to G2 crusher (L30H225)					77.66	0.08	3.45	3	125	3	
				L30H026 to Tashi Dagay (L30H031)				375.00		0.38	3.83		63	3	
				L30H031 to Serkikhola SS(L30H034)					217.00	0.22	4.04	3	25	3	L30T2
				L30H031 to BCU SS (L30H227)					62.00	0.06	4.10	3	750	3	L30T26
				L30H031 to L30H150				263.00		0.26	4.37	3			
				L30H150 to Bphermaceutical SS (L30H160)					84.00	0.08	4.45	3	500	3	L30T18
				L30H150 to L30H058				2179.00		2.18	6.63	3			
				L30H058 to Chundu Dolomite SS(L30H057)					144.00	0.14	6.77	3	500	3	L30T3
				L30H058 to L30H059				88.00		0.09	6.86	3			
				L30H059 to L30H064					67.00	0.07	6.93	3			
				L30H064 to Samden Dolomite (L30H066)					130.00	0.13	7.06	3	250	3	L30T4
				L30H064 to Pugli SS(L30H068)					128.60	0.13	7.19	3	250	3	L30T5
				Pugli SS(L30H068) to Jigme Industries(L30H073)					215.00	0.22	7.40	3	750	3	L30T6
				L30H059 to JIPL SS (L30H077)				313.00		0.31	7.72	3	200	3	L30T7
				JIPL SS (L30H077) to L30H183					177.00	0.18	7.89	3			
				L30H183 to Dhamdara SS(L30H205)					2072.00	2.07	9.97	3	25	3	L30T20
				Dhamdara SS(L30H205) to Teti A ss(L30H213)					1540.00	1.54	11.51	3	10	1	L30T21
				Teti A ss(L30H213) to L30H214					13.45	0.01	11.52	3			
				L30H214 to L. Teti A SS (L30H224)					191.78	0.19	11.71	3	16	1	L30T24
				L30H214 to Teti A (Bichgoan)(L30H218)					562.27	0.56	12.27	3	16	1	L30T22
				Teti A (Bichgoan)(L30H218) to Teti A Top(L30H223)					638.64	0.64	12.91	3	10	1	L30T23
				L30H183 to L30H085					436.73	0.44	13.35	3			
				L30H085 to Pakhagoan SS(L30H088)					417.70	0.42	13.77	3	16	3	L30T8
				L30H085 to L30H102					1383.00	1.38	15.15	3			
				L30H102 to JIPL SS(screening plant)(L30H104)					116.00	0.12	15.26	3	400	3	L30T9
				L30H102 to L30H113					281.67	0.28	15.55	3			
				L30H113 toBS&M (L30H107)					230.00	0.23	15.78	3	500	3	L30T10
				L30H113 to L30H124					1084.00	1.08	16.86	3			
				L30H124 to Khanigoan SS (L30H126)					99.26	0.10	16.96	3	63	3	L30T13
				L30H124 to Gokuldara SS(L30H182)					2239.00	2.24	19.20	3	16	3	L30T19
				L30H113 to L30H130					408.62	0.41	19.61	3			
				L30H130 to L30H132					157.93	0.16	19.77	3			
				L30H132 to Boteykharka I SS (L30H144)					36.89	0.04	19.80	3	25	3	L30T15
				L30H132 to Boteykharka II SS (L30H142)					983.00	0.98	20.79	3	25	3	L30T14
				L30H130 to Boteykharka III SS(L30H149)					537.15	0.54	21.32	3	16	3	L30T16
				Boteykharka III SS(L30H149) to L30H248					1774.38	1.77	23.10	3			
											23.10				
66/33/11kV Gomtu substation,66/33kV,	Polymer Feeder	L40	11	Gomtu SS to Lhaki Office SS (L40H013)					644.26	0.64	0.64	3	1500	3	L40T1
				Lhaki Office SS (L40H013) to Plymer SS (L40H014)					75.53	0.08	0.72	3	750	3	L40T2
											0.72				
66/33/11kV Gomtu substation,66/33kV, 5MVA & 66/11kV,	Market Feeder	L50	11	Gomtu SS to L50H000	41.3					0.04	0.04	3			
				L50H000 to Gomtu market SS (L50H001)					42.92	0.04	0.08	3	250	3	L50T1
				Gomtu market SS (L50H001) to BHU SS (L50H002)					447.71	0.45	0.53	3	125	3	L50T2

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
											0.53				
66/33/11kV Gomtu substation,66/33kV, 5MVA & 66/11kV, 1x5MVA & 10MVA	Lhaki Feeder	L60	11	Gomtu SS to L60H0P4	170.66					0.17	0.17	3			
				L60H0P4 to Lhaki Cement SS (L60H013)				465.95		0.47	0.64	3	4200	3	L60T1
											0.64				
66/11kV , 5MVA Gomtu SS	Gomtu Station feeder	L110	11		50					0.05	**0.05**	3	125	3	L110T1
33/11kV,2x5MVA Samtse SS	VIP feeder	L70	11	Samtse SS (Gantry) to L70P3	75					0.08	0.08	3			
				Samtse SS (Gantry) to L70H019	12					0.01	0.09	3	63	3	
				Samtse SS (Gantry) to L70H000	79					0.08	0.17				
				L70H000 to Cardboard SS (L70H020)	60					0.06	0.23	3	200	3	L70T5
				L70H000 to BFPL SS (L70H010)					510.00	0.51	0.74	3	250	3	L70T1
				L70H010 to L70H021					80.00	0.08	0.82	3			
				L70H021 to AWP SS (L70H022)					40.00	0.04	0.86	3	500	3	L70T6
				L70H021 to L70H011					60.00	0.06	0.92	3			
				L70H011 to BT SS(L70H016)					260.00	0.26	1.18	3	160	3	L70T2
				L70H011 to VIP SS (L70H018)					160.00	0.16	1.34	3	315	3	L70T3
											1.34				
33/11kV,2x5MVA Samtse SS	Market feeder	L80	11	Samtse SS (Gantry) to L80H000	150					0.15	0.15				
				L80H000 to Garigoan SS (L80H008)					450.00	0.45	0.60	3	250	3	L80T5
				Garigoan SS (L80H008) to Market SS (L80H013)					390.00	0.39	0.99	3	500	3	L80T1
				Market SS (L80H013)to Hospital SS (L80H021)		270				0.27	1.26	3	750	3	L80T2
				Hospital SS (L80H021) to New Hospital SS		300				0.30	1.56	3	1500	3	
				Hospital SS (L80H021) to Devithan SS (L80H035)		520				0.52	2.08	3	500	3	L80T3
				Devithan SS (L80H035) to L80H064		1030				1.03	3.11	3			
											3.11				
				Samtse SS (Gantry) to L90H000	150					0.15	0.15				
				L90H000 to Trade office SS (L90H028)				2119.00		2.12	2.27	3	125	3	
				L90H028 to Bhudiney SS(L90H043)				1428.00		1.43	3.70	3	63	3	L90T1
				Bhudiney SS(L90H043) to L90H1877				40.00		0.04	3.74	3			
				L90H1877 to Lamatar SS (L90H940)					1374.00	1.37	5.11	3	63	3	L90T65
				Lamatar SS (L90H940)to L90H971					160.00	0.16	5.27	3			
				L90H971 to L90H982					120.00	0.12	5.39	3			
				L90H982 to Lamatar I (L90H987)					250.00	0.25	5.64	3	25	3	L90T71
				L90H982 to Lamatar II (L90H992)					552.00	0.55	6.19	3	25	3	L90T72
				L90H971 to Mandrini I SS (L90H1858)					1590.00	1.59	7.78	3	25	3	L90T172
				L90H1858 to (L90H1859)					70.00	0.07	7.85	3			
				L90H1859 to Mandrini II SS (L90H1862)					360.00	0.36	8.21	3	25	3	L90T173
				L90H1859 to L90H1871					2000.00	2.00	10.21	3			
				L90H1871 to Tashim I SS (L90H1872)					100.00	0.10	10.31	3	25	3	L90T174
				L90H1871 to Tashim II SS (L90H1876)					570.00	0.57	10.88	3	63	3	L90T175
				L90H1877 to Mechater SS (L90H052)				1060.00		1.06	11.94	3	250	3	L90T2
				Mechater SS (L90H052) to L90H062				750.00		0.75	12.69	3			
				L90H062 to Choligop SS (L90H079)					1310.00	1.31	14.00	3	63	3	L90T3
				L90H062 to Ahalay SS (L90H084)				350.00		0.35	14.35	3	63	3	L90T4
				Ahalay SS (L90H084) to L90H097				1090.00		1.09	15.44	3			
				L90H097 to Diana SS (L90H100)					140.00	0.14	15.58	3	63	3	L90T5
				L90H097 to L90H103				190.00		0.19	15.77	3			
				L90H103 to L90H112					610.00	0.61	16.38	3			
				L90H112 to L90H169					840.00	0.84	17.22	3			
				L90H169 to U Kirney SS (L90H176)					490.00	0.49	17.71	3	63	3	L90T9
				L90H169 to L Kirney SS (L90H181)					310.00	0.31	18.02	3	63	3	L90T10
				L90H112 to L90H129					1295.00	1.30	19.32	3			
				L90H129 to T Dipujora (L90H161)					700.00	0.70	20.02	3	63	3	L90T8
				L90H129 to L Dipujora SS (L90H137)					661.00	0.66	20.68	3	63	3	L90T6
				L Dipujora SS (L90H137) to L90H142					610.00	0.61	21.29	3			

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
33/11kV,2x5MVA Samtse SS	Chengmari feeder	L90	11	L90H142 to Ambakey SS (L90H1177)					602.00	0.60	21.89	1	16	1	L90T73
				L90H142 to L90H147					350.00	0.35	22.24	3			
				L90H147 to U Dipujora (L90H150)					290.00	0.29	22.53	3	63	3	L90T7
				L90H147 to Thumkey (L90H969)					1438.00	1.44	23.97	3	16	3	L90T70
				L90H103 to RBP Chengmari(L90H195)				938.00		0.94	24.91	3	63	3	L90T11
				RBP Chengmari(L90H195) to Hathkhola SS (L90H200)				455.00		0.46	25.36	3	315	3	L90T12
				Hathkhola SS (L90H200) to L90H208				672.00		0.67	26.03	3			
				L90H208 to Garigoan SS (L90H223)					940.00	0.94	26.97	3	63	3	L90T13
				Garigoan SS (L90H223) to L90H234					880.00	0.88	27.85	3			
				L90H234 to L Drapper (L90H235)					60.00	0.06	27.91	3	63	3	L90T14
				L90H234 to U Drapper (L90H244)					570.00	0.57	28.48	3	63	3	L90T15
				U Drapper (L90H244) to Lhazey Preform (L90H1017)					1780.00	1.78	30.26	3	500	3	
				L90H1017 to L90H1053					114.00	0.11	30.38	3			
				L90H1053 to (Kopchay A) L90H1056					370.00	0.37	30.75	3	25	3	L90T84
				L90H1053 to (Kopchay **B**) L90H1065					460.00	0.46	31.21	3	25	3	L90T85
				L90H1064 to Kopchay C (L90H1070)					370.00	0.37	31.58	3	25	3	L90T86
				L90H1017 to L90H1021					410.00	0.41	31.99	3			
				L90H1021 to L90H1112					260.00	0.26	32.25	3			
				L90H1112 to Bombaley I ss (L90H1113)					35.00	0.04	32.28	3	16	3	L90T91
				L90H1112 to L90H1118					560.00	0.56	32.84	3			
				L90H1118 to Bombaley II SS (L90H1119)					38.00	0.04	32.88	3	16	1	L90T92
				L90H1118 to L90H1124					520.00	0.52	33.40	3			
				L90H1124 to Tinterey I ss (L90H1125)					130.00	0.13	33.53	3	25	3	L90T93
				Tinterey I ss (L90H1125) to Tinterey II ss (L90H1129)					430.00	0.43	33.96	3	25	3	L90T94
				L90H1124 to L90H1136					840.00	0.84	34.80	3			
				L90H1136 to L90H1137					60.00	0.06	34.86	3			
				L90H1137 to majuwa I SS (L90H1143)					140.00	0.14	35.00	3	25	3	L90T96
				L90H1137 to majuwa II SS (L90H1141)					280.00	0.28	35.28	3	25	3	L90T95
				L90H1136 to L90H1152					890.00	0.89	36.17	3			
				L90H1152 to Boteykharka IV (L90H1155)					250.00	0.25	36.42	3	16	3	L90T100
				L90H1021 to L90H1025					340.00	0.34	36.76	3			
				L90H1025 to Nangladang I (L90H1027)					120.00	0.12	36.88	3	25	3	L90T82
				L90H1025 to L90H1032					360.00	0.36	37.24	3			
				L90H1032 to Nangladang II (L90H1034)					130.00	0.13	37.37	3	25	3	L90T83
				L90H1032 to L90H1038					240.00	0.24	37.61	3			
				L90H1038 to Nangladang III (L90H1040)					220.00	0.22	37.83	3	16	1	L90T84
				L90H1038 to L90H1073					530.00	0.53	38.36	3			
				L90H1073 to Mirik SS (L90H1081)					890.00	0.89	39.25	3	25	3	L90T88
				L90H1073 to L90H1085					370.00	0.37	39.62	3			
				L90H1085 to Lamjumsa ss (L90H1086)					30.00	0.03	39.65	3	25	3	L90T89
				L90H1085 to L90H1101					1230.00	1.23	40.88	3			
				L90H1101 to Thungjee SS (L90H1102)					30.00	0.03	40.91	3	25	3	L90T90
				L90H1101 to Bimberey SS (L90H1108)					460.00	0.46	41.37	3	16	1	L90T91
				L90H1152 to L90H1158					150.00	0.15	41.52	3			
				L90H1158 to Boteykharka III (L90H1159)					50.00	0.05	41.57	3	25	3	L90T99
				L90H1158 to L90H1162					320.00	0.32	41.89	3			
				L90H1162 to Boteykharka II (L90H1164)					200.00	0.20	42.09	3	25	3	L90T98
				L90H1162 to Boteykharka I(L90H1167)					280.00	0.28	42.37	3	25	3	L90T97
				L90H208 to Kothidara SS (L90H245)				80.00		0.08	42.45	3	125	3	L90T16
				Kothidara SS (L90H245) to Chengmari Tea garden (L90H258)				1250.00		1.25	43.70	3	125	3	L90T17
				Chengmari Tea garden (L90H258) to L90H262				450.00		0.45	44.15	3			
				L90H262 to L90H278					1390.00	1.39	45.54	3			
				L90H278 Raigoan SS (L90H287)					350.00	0.35	45.89	3	63	3	L90T18
				L90H278Thakhurigoan SS (L90H283)					370.00	0.37	46.26	3	63	3	L90T19
				L90H262 to Ura SS (L90H294)				490.00		0.49	46.75	3	63	3	L90T20
				Ura SS (L90H294) to L90H298				430.00		0.43	47.18	3			

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer			
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L90H298 to Jarib SS (L90H1179)					130.00	0.13	47.31	3	25	3	L90T74
				L90H298 to Ngatsang SS (L90H307)				1010.00		1.01	48.32	3	63	3	L90T21
				Ngatsang SS (L90H307) to L90H309				250.00		0.25	48.57	3			
				L90H309 to L90H331					1550.00	1.55	50.12	3			
				L90H331 to L Kado SS (L90H332)					90.00	0.09	50.21	3	63	3	L90T22
				L90H331 to U Kado SS (L90H342)					710.00	0.71	50.92	3	63	3	L90T23
				L90H309 to L90H348				1040.00		1.04	51.96	3			
				L90H348 to Kharbandi A (L90H350)					150.00	0.15	52.11	3	125	3	L90T24
				L90H348 to L90H354				310.00		0.31	52.42	3			
				L90H354 to Kharbandi B (L90H358)					300.00	0.30	52.72	3	63	3	L90T25
				L90H354 to L90H364				660.00		0.66	53.38	3			
				L90H364 to L90H376					860.00	0.86	54.24	3			
				L90H376 to Kuchidiana (L90H377)					50.00	0.05	54.29	3	63	3	L90T26
				L90H376 to Jarib (Gaumaney)(L90H948)					570.00	0.57	54.86	3	63	3	L90T67
				L90H364 to L90H381				380.00		0.38	55.24	3			
				L90H381 to Gaumaney school (L90H956)					180.00	0.18	55.42	3	160	3	L90T69
				L90H381 to Dungkar A SS (L90H383)					120.00	0.12	55.54	3	125	3	L90T27
				Dungkar A SS (L90H383) to Dungkar B SS (L90H391)					500.00	0.50	56.04	3	250	3	L90T28
				Dungkar B SS (L90H391) to L90H395					330.00	0.33	56.37	3			
				L90H395 to Kolagari SS (L90H1846)					1590.00	1.59	57.96	3	25	3	L90T171
				L90H395 to Tsakaling SS (L90H400)				580.00		0.58	58.54	3	63	3	L90T29
				Tsakaling SS (L90H400) to L90H416				580.00		0.58	59.12	3			
				L90H416 to L90H428					880.00	0.88	60.00	3			
				L90H428 to L90H429(L Labourbot)					110.00	0.11	60.11	3	63	3	L90T31
				L90H428 to L90H433(U Labourbot)					330.00	0.33	60.44	3	63	3	L90T32
				L90H433 to L90H435					70.00	0.07	60.51	3			
				L90H435 to L Katarey(L90H455)					1040.00	1.04	61.55	3	25	3	L90T33
				L Katarey(L90H455) to U Katarey (L90H460)					360.00	0.36	61.91	3	63	3	L90T34
				L90H435 to L90H443					810.00	0.81	62.72	3			
				L90H443 to Lamitar (Gaumaney)(L90H444)					90.00	0.09	62.81	3	63	3	L90T32
				L90H443 to L90H1195					1220.00	1.22	64.03	3			
				L90H1195 to U Singyedara (L90H1201)					510.00	0.51	64.54	3	25	3	L90T75
				U Singyedara (L90H1201) to L. Singyedara (L90H1211)					1080.00	1.08	65.62	3	16	3	L90T76
				L90H1195 to L90H1217					510.00	0.51	66.13	3			
				L90H1217 to sakthipakha (L90H1225)					580.00	0.58	66.71	3	25	3	L90T77
				L90H1217 to L90H1228					270.00	0.27	66.98	3			
				L90H1228 to Bichgoan(L90H1230), Ghalleygoan B					150.00	0.15	67.13	3	25	3	L90T78
				L90H1228 to L90H1242					1000.00	1.00	68.13	3			
				L90H1242 to L Ghalleygoan(L90H1244)					120.00	0.12	68.25	3	25	3	L90T79
				L90H1242 to U Ghalleygoan(L90H1250), A					510.00	0.51	68.76	3	25	3	L90T80
				L90H416 to Lengthy SS (L90H464)				140.00		0.14	68.90	3	25	3	L90T66
				Lengthy SS (L90H464) to L Gathia SS (L90H478)				1290.00		1.29	70.19	3	63	3	L90T35
				L Gathia SS (L90H478) to L90H483				280.00		0.28	70.47	3			
				L90H483 to L90H495					740.00	0.74	71.21	3			
				L90H495 to M Gathia(L90H1879)					110.00	0.11	71.32	3	63	3	L90T176
				L90H495 to U Gathia (L90H513)					1190.00	1.19	72.51	3	63	3	L90T36
				U Gathia (L90H513) to L 90H517					290.00	0.29	72.80	3			
				L 90H517 to Top Gathia (L90H520)					250.00	0.25	73.05	3	63	3	L90T37
				L 90H517 to L90H1270					1520.00	1.52	74.57	3			
				L90H1270 Sombektar(L90H1275)					520.00	0.52	75.09	3	25	3	L90T101
				L90H1270 to Namselling I SS (L90H1280)					330.00	0.33	75.42	3	25	3	L90T102
				Namselling I SS (L90H1280) to L90H1286					720.00	0.72	76.14	3			
				L90H1286 to Namseling II SS (L90H1292)					400.00	0.40	76.54	3	25	3	L90T103
				L90H1286 to Sombek III SS (L90H1297)					340.00	0.34	76.88	3	25	3	L90T104
				L90H1286 to Sombek I SS (L90H1301)					460.00	0.46	77.34	3	25	3	L90T105
				Sombek I SS (L90H1301) to L90H1304					320.00	0.32	77.66	3			
				L90H1304 to Sombek II (L90H1310)					530.00	0.53	78.19	3	25	3	L90T106

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L90H1304 to Shidadara (L90H1312)					230.00	0.23	78.42	3	25	3	L90T107
				Shidadara (L90H1312) to Chapa SS (L90H1326)					1160.00	1.16	79.58	3	25	3	L90T108
				L90H483 to L90H545				1830.00		1.83	81.41	3			
											81.41				
33/11kV,2x5MVA Samtse SS	Gurung Basty feeder	L100	11	Samtse SS (Gantry) to L100H000	22.2					0.02	0.02	3			
				L100H000 to Samtse HS (L90H008)					530.00	0.53	0.55	3	160	3	L100T1
				Samtse HS (L90H008) to L100H011		100				0.10	0.65	3			
				L100H011 to SCE (L90H013)					220.00	0.22	0.87	3	315	3	L100T2
				SCE (L90H013) to L100H0P6	250					0.25	1.12	3	500	3	
				L100H011 to Gurung Basty SS (L90H019)		340				0.34	1.46	3	500	3	L100T3
				Gurung Basty SS (L90H019) to BMML (L100H026)					580.00	0.58	2.04	3	500	3	
				L100H026 to WTP SS (L100H056)					570.00	0.57	2.61	3	125	3	L100T8
				L100H056 to Water plant SS (L100H072)					1370.00	1.37	3.98	3	63		L100T9
				L100H026 to L100H028					160.00	0.16	4.14	3			
				L100H028 to Gurung Basty (L100H048)					110.00	0.11	4.25	3	160	3	L100T7
				Gurung Basty (L100H048) to L Saurini(L100H034)					680.00	0.68	4.93	3	25	3	L100T4
				L Saurini(L100H034) to M Saurini SS (L100H042)					880.00	0.88	5.81	3	63	3	L100T5
				M Saurini SS (L100H042) to L100H046					450.00	0.45	6.26	3			
				L100H046 to T Saurini					60.00	0.06	6.32	3	25	3	L100T6
				L100H046 to L100H083					1070.00	1.07	7.39	3			
				L100H083 to L100H085(Uttray)					430.00	0.43	7.82	3	16	3	L100T10
				L100H083 to L100H104 (Thumkey)					1970.00	1.97	9.79	3	25	3	L100T11
				L100H104 (Thumkey) to Chilu(L100H124)					2810.00	2.81	12.60	3	16	3	L100T12
											12.60				
33/11kV,2x5MVA Samtse SS	Samtse station feeder	L110	11		50					0.05	**0.05**	3	63	3	
WBSED	11kV West Bengal Fdr		11						415.00	0.42	**0.42**	3			
33/11kV,2x5MVA Samtse SS	Duarpani feeder	L20	11	Samtse SS to Gantry	63.51					0.06	0.06	3			
				L20H295 to BFRA SS (L20H291)					260.00	0.26	0.32	3	125	3	L20T13
				BFRA SS (L20H291) to L20H280					440.00	0.44	0.76	3			
				L20H280 to Sukruti (L20H284)					380.00	0.38	1.14	3	63	3	L20T12
				L20H280 to L20H263					960.00	0.96	2.10	3			
				L20H263 to U Sukreti (L20H271)					480.00	0.48	2.58	3	63	3	L20T20
				U Sukreti (L20H271) to M Malbasey (L20H305)					1460.00	1.46	4.04	3	25	3	L20T21
				M Malbasey (L20H305) to L Malbasey (L20H312)					610.00	0.61	4.65	3	16	3	L20T22
				L Malbasey (L20H312) to L20H314					90.00	0.09	4.74	3			
				L20H314 to L20H331					730.00	0.73	5.47	3			
				L20H331 to Malbasey IV (L20H333)					150.00	0.15	5.62	3	25	3	L20T24
				L20H331 to L20H339					560.00	0.56	6.18	3			
				L20H339 to Bukey I SS (L90H341)					150.00	0.15	6.33	3	16	1	L20T25
				L20H339 to Bukey II SS (L90H343)					110.00	0.11	6.44	3	25	3	L20T26
				L20H314 to Top Malbasey SS (L20H321)					980.00	0.98	7.42	3	16	1	L20T23
				L20H263 to L20H248					730.00	0.73	8.15	3			
				L20H248 to YCI SS (L20H255)					610.00	0.61	8.76	3	750	3	L20T11
				L20H248 to L20H245					180.00	0.18	8.94	3			
				L20H245 to L Sukruti SS (L20H246)					110.00	0.11	9.05	3	63	3	L20T19
				L20H245 to L20H223					800.00	0.80	9.85	3			
				L20H223 to L20H224					50.00	0.05	9.90	3			
				L20H224 to L20H227					32.00	0.03	9.94	3			
				L20H227 to Nob Minerals (L20H228)					120.00	0.12	10.06	3	500	3	L20T9
				L20H227 to Lhachen Minerals (L20H230)					220.00	0.22	10.28	3	500	3	L20T10
				L20H224 to Lhaki Dolomite (L20H234)					560.00	0.56	10.84	3	500	3	L20T7
				L20H223 to L20H198					1353.00	1.35	12.19	3			
				L20H198 to Tenzin G CU					1000.00	1.00	13.19	3	63	3	
				L20H198 to L20H208					838.00	0.84	14.03	3			
				L20H208 to Bukey SS (L20H209)					80.00	0.08	14.11	3	63	3	L20T18
				L20H208 to Khalingtar(L20H347)					560.00	0.56	14.67	3	25	3	L20T27

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
											14.67				
33/11kV,2x5MVA Samtse SS	11kV Sipsu feeder	L180	11	Samtse SS (Gantry) to L180H000	150					0.15	0.15	3			
				L180H000 to Tsheten D CU (L180H041)					2457.00	2.46	2.61	3	250	3	
				L180H041 to Tshering CU (L180H047)					270.00	0.27	2.88	3	250	3	L180T2
				L180H041 to Tshamgar CU					240.00	0.24	3.12	3	250	3	
											3.12				
				Control room to L120H000	80					0.08	0.08	3			
				L120H000 to Deorali SS (L120H012)					770.00	0.77	0.85	3	63	3	L120T1
				Deorali SS (L120H012) to L120H022					500.00	0.50	1.35				
				L120H022 to Khamari SS (L120H303)					425.00	0.43	1.78	3	16	1	L120T15
				Khamari SS (L120H303) to L120H319					1030.00	1.03	2.81	3			
				L120H319 to L120H322					140.00	0.14	2.95	3			
				L120H322 to Scholay SS (L120H323)					30.00	0.03	2.98	3	25	3	L120T16
				L120H322 to Panidara SS (L120H327)					460.00	0.46	3.44	3	25	3	L120T17
				L120H319 to L120H331					330.00	0.33	3.77	3			
				L120H331 to Kamigoan SS(L120H334)					130.00	0.13	3.90	3	25	3	L120T18
				L120H331 to Sersesey SS(L120H340)					530.00	0.53	4.43	3	25	3	L120T19
				Sersesey SS(L120H340) to L120H342					70.00	0.07	4.50	3			
				L120H342 to U Seresey (L120H344)					170.00	0.17	4.67	3	10	1	L120T20
				L120H342 to L120H350					420.00	0.42	5.09	3			
				L120H350 to Hathikharka BI SS (L120H361)					800.00	0.80	5.89	3	25	3	L120T21
				Hathikharka BI SS (L120H361)to Hathikharka BIISS (L120H365)					410.00	0.41	6.30	3	25	3	L120T22
				L120H350 to L Chisopani (L120369)					370.00	0.37	6.67	3	25	3	L120T23
				L Chisopani (L120369) to U Chisopani(L120H372)					350.00	0.35	7.02	3	25	3	L120T24
				U Chisopani(L120H372) to L120H376					420.00	0.42	7.44	3			
				L120H376 to Daurigoan (L120H378)					140.00	0.14	7.58	3	25	3	L120T25
				L120H376 to Jurbutey SS (L120H385)					610.00	0.61	8.19	3	16	1	L120T26
				Jurbutey SS (L120H385) to Chisop SS (L120H387)					310.00	0.31	8.50	3	16	1	L120T27
				Chisop SS (L120H387) to L120H390					320.00	0.32	8.82	3			
				L120H390 to Molotenev SS (L120H395)					250.00	0.25	9.07	3	25	3	L120T28
				L120H390 to L120H399					370.00	0.37	9.44	3			
				L120H390 to Hathikarka AI(L120H402)					220.00	0.22	9.66	3	25	3	L120T29
				L120H390 to Hathikarka AII(L120H407)					240.00	0.24	9.90	3	16	1	L120T30
				Hathikarka AII(L120H407) to Birukhola SS (L120H415)					600.00	0.60	10.50	3	25	3	L120T31
				L120H022 to Birutar SS (L120H050)					1950.00	1.95	12.45	3	63	3	L120T2
				Birutar SS (L120H050) to L120H062					880.00	0.88	13.33	3			
				L120H062 to Toribari SS (L120H297)					370.00	0.37	13.70	3	25	3	L120T14
				L120H062 to L120H416					760.00	0.76	14.46	3			
				L120H416 to lamatar SS (L120H418)					90.00	0.09	14.55	3	25	3	L120T32
				lamatar SS (L120H418) to L120H427					530.00	0.53	15.08	3			
				L120H427 to Javatar SS (L120H428)					70.00	0.07	15.15	3	25	3	L120T33
				L120H427 to L120H435					490.00	0.49	15.64	3			
				L120H435 to Ahalay (L120H439)					270.00	0.27	15.91	3	25	3	L120T34
				L120H435 to Gondaytar SS(L120H457)					1390.00	1.39	17.30	3	16	1	L120T35
				L120H416 to Pakpay SS (L120H089)					1300.00	1.30	18.60	3	63	3	L120T3
				Pakpay SS (L120H089) to L120H107					1240.00	1.24	19.84	3			
				L120H107 to L120H463					570.00	0.57	20.41	3			
				L120H463 to Saurini SS (L120H464)					80.00	0.08	20.49	3	25	3	L120T36
				L120H463 to Jhatey SS (L120H474)					890.00	0.89	21.38	3	25	3	L120T37
				L120H458 to Jumsa SS(L120H115)					580.00	0.58	21.96	3	63		L120T4
				Jumsa SS(L120H115) to L120H120					280.00	0.28	22.24	3			
				L120H120 to Bakvakay SS (L120H515)					1240.00	1.24	23.48	3	63	3	L12042
				L120H120 to L120H121					60.00	0.06	23.54	3			
				L120H121 to L120H482					560.00	0.56	24.10	3			
				L120H482 to Raigoan SS(L120H483)					40.00	0.04	24.14	3	25	3	L120T38
				Raigoan SS(L120H483) to Tshogpagoan SS (L120H488)					380.00	0.38	24.52	3	16	1	L120T39

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer			
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
33/11kV,2x3MVA Tashichholing SS	Tendu Bara feeder	L120	11	Tshogpagoan SS (L120H488) to Baunbari SS (L120H490)					140.00	0.14	24.66	3	16	1	L120T40
				Baunbari SS (L120H490) to Bichgoan SS (L120H499)					730.00	0.73	25.39	3	25	3	L120T41
				L120H121 to L120H125					230.00	0.23	25.62	3			
				L120H125 to L Kuchin (L120H145)					1400.00	1.40	27.02	3	63	3	L120T5
				L Kuchin (L120H145) to L120H151					290.00	0.29	27.31	3			
				L120H151 to Jumseling SS (L120H161)					850.00	0.85	28.16	3	63	3	L120T6
				L120H151 to U Kuchin SS (L120H173)					920.00	0.92	29.08	3	63	3	L120T7
				L120H125 to L120H191					1110.00	1.11	30.19	3			
				L120H191 to L120H632					170.00	0.17	30.36	3			
				L120H632 to Barleyni SS (L120H635)					145.00	0.15	30.50	3	25	3	L120T56
				L120H632 to L120H645					890.00	0.89	31.39	3			
				L120H645 to L Bara I L120H649					313.00	0.31	31.70	3	25	3	L120T57
				L120H645 to L120H655					330.00	0.33	32.03	3			
				L120H655 to Dhakalgoan I (L120H665)					578.00	0.58	32.61	3	25	3	L120T58
				L120H655 to L120H673					570.00	0.57	33.18	3			
				L120H673 to Dhalkalgoan II(L120H677)					352.00	0.35	33.53	3	25	3	L120T59
				L120H673 to L Bara II SS (L120H680)					130.00	0.13	33.66	3	25	3	L120T60
				Bara II SS (L120H680) to L120H685)					200.00	0.20	33.86	3			
				L120H685 to L Bara III (L120H695)					750.00	0.75	34.61	3	25	3	L120T61
				L120H685 to L120H698					270.00	0.27	34.88	3			
				L120H698 to Lepchagoan II (L120H701)					340.00	0.34	35.22	3	25	3	L120T62
				Lepchagoan II (L120H701) to Lepchagoan III(L120H703)					220.00	0.22	35.44	3	25	3	L120T63
				L120H698 to L120H705					160.00	0.16	35.60	3			
				L120H705 to lapchagoan I (L120H707)					180.00	0.18	35.78	3	25	3	L120T64
				Lapchagoan I (L120H707) to kamigoan I (L120H712)					340.00	0.34	36.12	3	25	3	L120T65
				kamigoan I (L120H712) to L120H713					42.00	0.04	36.17	3			
				L120H713 to Kamigoan II (L120H719)					440.00	0.44	36.61	3	25	3	L120T66
				L120H713 to Mukhenigoan I (L120H724)					510.00	0.51	37.12	3	16	1	L120T67
				Mukhenigoan I (L120H724) to L120H725					30.00	0.03	37.15	3			
				L120H725 to Mukhenigoan II (L120H728)					200.00	0.20	37.35	3	25	3	L120T68
				L120H725 to Mukthenigoan III (L120H737)					600.00	0.60	37.95	3	16	1	L120T69
				Mukthenigoan III (L120H737) to Mukhenigoan IV (L120H738)					160.00	0.16	38.11	3	16	1	L120T70
				L120H705 to L120H740					230.00	0.23	38.34	3			
				L120H740 to Bara School (L120H741)					40.00	0.04	38.38	3	63	3	L120T71
				L120H740 to L120H744					190.00	0.19	38.57	3			
				L120H744 to Bichgoan I (L120H746)					130.00	0.13	38.70	3	25	3	L120T72
				L120H744 to L120H754					460.00	0.46	39.16	3			
				L120H754 to Bichgoan II (L120H755)					30.00	0.03	39.19	3	25	3	L120T73
				L120H754 to L120H757					110.00	0.11	39.30	3			
				L120H757 to Bichgoan III (L120H760)					170.00	0.17	39.47	3	25	3	L120T74
				L120H757 to L120H768					710.00	0.71	40.18	3			
				L120H768 to L120H776					620.00	0.62	40.80	3			
				L120H776 to Dubay A(L120H779)					290.00	0.29	41.09	3	16	3	L120T75
				Dubay A(L120H779) to Dubay B (L120H791)					1040.00	1.04	42.13	3	25	3	L120T76
				L120H776 to Lingtam A SS (L120H800)					355.00	0.36	42.48	3	16	1	L120T77
				Lingtam A SS (L120H800) to L120H806					1320.00	1.32	43.80	3			
				L120H806 to Lingtam B (L120H809)					350.00	0.35	44.15	3	25	3	L120T78
				Lingtam B (L120H809) to Lingtam C (L120H815)					420.00	0.42	44.57	3	25	3	L120T79
				L120H806 to Majuwa A (L120H837)					1990.00	1.99	46.56	3	25	3	L120T80
				Majuwa A (L120H837) to Majuwa B (L120H849)					1000.00	1.00	47.56	3	25	3	L120T81
				Majuwa B (L120H849) to L120H857					570.00	0.57	48.13	3			
				L120H857 to Gempang A (L120H858)					20.00	0.02	48.15	3	16	1	L120T82
				L120H857 to Gempang B (L120H864)					520.00	0.52	48.67	3	25	3	L120T83
				Gempang B (L120H864) to L120H870					460.00	0.46	49.13	3			
				L120H870 to Gempang C (L120H871)					80.00	0.08	49.21	3	25	3	L120T84
				L120H870 to Gempang Chungju (L120H879)					690.00	0.69	49.90	3	25	3	L120T85

Source	Feeder details		Voltage (kV)	Section					Type & Line Length of the Conductor				Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L120H768 to Gondaygoan I (L120H881)					100.00	0.10	50.00	3	25	3	L120T86
				Gondaygoan I (L120H881) to Gondaygoan II (L120H889)					550.00	0.55	50.55	3	25	3	L120T87
				Gondaygoan II (L120H889) to L120H896					940.00	0.94	51.49	3			
				L120H896 to Betini SS (L120H898)					220.00	0.22	51.71	3	25	3	L120T88
				Betini SS (L120H898) to Halhaney (L120H906)					890.00	0.89	52.60	3	16	1	L120T89
				Halhaney (L120H906) to Thika SS (L120H911)					710.00	0.71	53.31	3	25	3	L120T90
				L120H896 to M Betini SS (L120H918)					530.00	0.53	53.84	3	25	3	L120T91
				M Betini SS (L120H918) to L120H926					760.00	0.76	54.60	3			
				L120H926 to L Betini Ss (L120H927)					70.00	0.07	54.67	3	25	3	L120T92
				L120H926 to L120H937					780.00	0.78	55.45	3			
				L120H937 to Thika B (L120H945)					930.00	0.93	56.38	3	25	3	L120T93
				L120H937 to Thika A (L120H947)					200.00	0.20	56.58	3	25	3	L120T94
				Thika A (L120H947) to L120H959					1130.00	1.13	57.71	3			
				L120H959 to Nayak SS (L120H961)					130.00	0.13	57.84	3	25	3	L120T95
				L120H959 to Fenchigoan (L120H981)					2520.00	2.52	60.36	3	25	3	L120T96
				Fenchigoan (L120H981) to L120H982					50.00	0.05	60.41	3			
				L120H982 to Daragoan SS (L120H987)					530.00	0.53	60.94	3	25	3	L120T97
				L120H982 to Harkatey Ss (L120H989)					440.00	0.44	61.38	3	25	3	L120T98
				Harkatey Ss (L120H989) to Lakshay SS (L120H996)					560.00	0.56	61.94	3	16	3	L120T99
				L120H959 to Nayak B (L120H1001)					260.00	0.26	62.20	3	25	3	L120T100
				Nayak B (L120H1001) to Changju Nuuleygoan (L120H1014)					1010.00	1.01	63.21	3	25	3	L120T101
				Changju (L120H1014) to L120H1017					360.00	0.36	63.57	3			
				L120H1017 to Chunju RBA (L120H1022)					560.00	0.56	64.13	3	16	3	L120T102
				Chunju RBA (L120H1022) to Dukpagoan (L120H1025)					290.00	0.29	64.42	3	25	3	L120T103
				L120H1017 to L120H1028					430.00	0.43	64.85	3			
				L120H1028 to Gondaygoan, Changju (L120H1030)					660.00	0.66	65.51	3	25	3	L120T104
				Gondaygoan, Changju (L120H1030) to Autarigoan A SS (L120H1037)					780.00	0.78	66.29	3	25	3	L120T105
				Autarigoan A SS (L120H1037) to Autarigoan B SS (L120H1039)					90.00	0.09	66.38	3	16	1	L120T106
				L120H1028 to Bardara A SS (L120H1045)					830.00	0.83	67.21	3	25	3	L120T107
				Bardara(L120H1045) to Bardara B (L120H1049)					220.00	0.22	67.43	3	25	3	L120T108
				L120H191 toTendu RBA SS (L120H206)					780.00	0.78	68.21	3	250	3	L120T8
				L120H205 to L120H210					220.00	0.22	68.43	3			
				L120H210 to Tendu MS SS (L120H292)					40.00	0.04	68.47	3	125	3	L120T13
				L120H210 to Tendu Bazar (L120H214)					210.00	0.21	68.68	3	250	3	L120T9
				Tendu Bazar (L120H214) to L120H223					650.00	0.65	69.33	3			
				L120H223 to L120H582					750.00	0.75	70.08	3			
				L120H582 to Jaldhakha SS (L120H628)					890.00	0.89	70.97	3	25	3	L120T55
				L120H582 to L120H590					740.00	0.74	71.71	3			
				L120H590 to Khentong I SS (L120H616)					370.00	0.37	72.08	3	25	3	L120T56
				L120H590 to Khentong II SS (L120H596)					530.00	0.53	72.61	3	25	3	L120T50
				Khentong II SS (L120H596) to L120H601					600.00	0.60	73.21	3			
				L120H601 to Fita (L120H603)					300.00	0.30	73.51	3	25	3	L120T51
				L120H601 to Okharbotey I (L120H609)					960.00	0.96	74.47	3	25	3	L120T52
				Okharbotey I (L120H609) to Okharbotey II (L120H611)					420.00	0.42	74.89	3	25	3	
				L120H223 to L120H244					1550.00	1.55	76.44	3			
				L120H244to Doraney SS (L120H248)					210.00	0.21	76.65	3	63	3	L120T10
				L120H244 to L120H263					1220.00	1.22	77.87	3			
				L120H263 to L120H267					310.00	0.31	78.18	3			
				L120H267 to N Bindu (L120H279)					910.00	0.91	79.09	3	63	3	L120T11
				L120H267 to D Bindu (L120H290)					900.00	0.90	79.99	3	63	3	L120T12
				L120H263 to Kachintar (L120H534)					1560.00	1.56	81.55	3	25	3	L120T43
				Kachintar (L120H534) to L120H541					540.00	0.54	82.09	3			
				L120H541 to L120H549					810.00	0.81	82.90	3			
				L120H549 to Thulokharka (L120H550)					70.00	0.07	82.97	3	25	3	L120T44

Source	Feeder details		Voltage (kV)	Section			Type & Line Length of the Conductor						Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L120H549 to Gandukay SS(L120H552)					330.00	0.33	83.30	3	25	3	L120T45
				L120H541 to NFE kachin (L120H553)					50.00	0.05	83.35	3	25	3	L120T46
				NFE kachin (L120H553) to L120H559					540.00	0.54	83.89	3			
				L120H559 to Garigoan (L120H560)					20.00	0.02	83.91	3	25	3	L120T47
				L120H559 to Dhamigoan SS (L120H563)					310.00	0.31	84.22	3	25	3	L120T48
				Dhamigoan SS (L120H563) to Balukhop SS (L120H574)					1350.00	1.35	85.57	3	25	3	L120T49
											85.57				
33/11kV,2x3MVA Tashichholing SS	Tashicholing feeder	L240	11	Control room to L240H000	117					0.12	0.12	3			
				L240H000 to Sipsu Hospital (L240H009)					653.00	0.65	0.77	3	250	3	L240T1
				L240H009 to Gola Town SS (L240H016)					430.00	0.43	1.20	3	750	3	L240T2
				L240H009 to Shivalaya SS (L240H065)					2221.00	2.22	3.42	3	125	3	L240T3
				Shivalaya SS (L240H065) to Boepoteng SS (L240H083)					1269.00	1.27	4.69	3	160	3	L240T4
				Boepoteng SS (L240H083) to L240H084					58.00	0.06	4.75	3			
				L240H084 to RBA Boelbotey (L240H087)					152.00	0.15	4.90	3	315	3	L240T5
				L240H084 to L240H093					281.00	0.28	5.18	3			
				L240H093 to Jogimara SS (L240H0104)					722.00	0.72	5.90	3	63	3	L240T6
				L240H093 to L240H122					1142.00	1.14	7.05	3			
				L240H122 to Peljorling HSS (L1240H123)					80.00	0.08	7.13	3	125	3	L240T7
				L240H122 to L240H131					684.00	0.68	7.81	3			
				L240H131 to L240H143					897.00	0.90	8.71	3			
				L240H143 to L Peljorling SS (L240H145)					105.00	0.11	8.81	3	63	3	L240T8
				L240H143 to B Peljorling SS (L240H154)					629.00	0.63	9.44	3	25	3	L240T9
				L240H131 to L240H164					897.00	0.90	10.34	3			
				L240H164 to Kalamati Ss (L240H176)					751.00	0.75	11.09	3	250	3	L240T10
				L240H164 to L240H180					310.00	0.31	11.40	3			
				L240H180 to L Namgaychholing (L240H186)					384.00	0.38	11.78	3	63	3	L240T11
				L Namgaychholing (L240H186) to U Namgaychholing (L240H197)					702.00	0.70	12.48	3	63	3	L240T12
				L240H180 to Jiti Bridge SS (L240H214)					1469.00	1.47	13.95	3	160	3	L240T13
				Jiti Bridge SS (L240H214) to L240H223					972.00	0.97	14.93	3			
				L240H223 to Jiti Border Ss(L240H230)					400.00	0.40	15.33	3	63	3	L240T14
				L240H223 to L240H232					86.00	0.09	15.41	3			
				L240H232 to Jiti A (L240H252)					1420.00	1.42	16.83	3	63	3	L240T15
				Jiti A (L240H252) to Sakpipakha (L240H265)					1000.00	1.00	17.83	3	25	3	L240T16
				L240H232 to L240H270					622.00	0.62	18.45	3			
				L240H270 to Tharpo SS (L240H274)					300.00	0.30	18.75	3	25	3	L240T17
				L240H270 to Sengyegang CU(L240H283)					965.00	0.97	19.72	3	160	3	
				L240H283 to Mongargoan (L240H302)					285.00	0.29	20.00	3	25	3	L240T18
				L240H283 to Pakhudara (L240H298)					1000.00	1.00	21.00	3	63	3	L240T19
				L240H283 to Chargarey (L240H307)					620.00	0.62	21.62	3	125	3	L240T20
											21.62			3	L240T21
				Control room to L230H000	117					0.12	0.12	3			
				L230H000 to Gangatey SS (L230H048)					3470.00	3.47	3.59	3	25	3	L230T1
				Gangatey SS (L230H048) to Maneydara(L230H052)					242.00	0.24	3.83	3	25	3	L230T2
				Maneydara(L230H052) to L230H056					287.00	0.29	4.12	3			
				L230H056 to Sadudara(L230H058)					157.00	0.16	4.27	3	25	3	L230T3
				L230H056 to L230H066					550.00	0.55	4.82	3			
				L230H066 to L230H067					32.00	0.03	4.86	3			
				L230H067 to Yamadara (L230H068)					14.00	0.01	4.87	3	16	1	L230T4
				L230H067 to Kausey (L230H076)					543.00	0.54	5.41	3	25	3	L230T5
				L230H066 to Jandey II (L230H084)					743.00	0.74	6.16	3	25	3	L230T6
				Jandey II (L230H084) to Jandey I(L230H095)					736.00	0.74	6.89	3	25	3	L230T7
				Jandey I(L230H095) to L230H108					962.00	0.96	7.85	3			
				L230H108 to M Namgaychholing SS (L230H121)					830.00	0.83	8.68	3	63	3	L230T8
				L230H108 to M Malbasey SS (L230H126)					224.00	0.22	8.91	3	25	3	L230T9
				M Malbasey SS (L230H126) to L230H132					480.00	0.48	9.39	3			
				L230H132 to T Malbasey (L230H135)					280.00	0.28	9.67	3	25	3	L230T10

Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
33/11kV,2x3MVA Tashichholing SS	Namgaychholing	L230	11	L230H132 to U Malbasey (L230H140)					646.00	0.65	10.31	3	63	3	L230T11
				U Malbasey (L230H140) to L230H152					959.00	0.96	11.27	3			
				L230H152 to L230H155					135.00	0.14	11.41	3			
				L230H155 to L Noonpani A (L230H156)					25.00	0.03	11.43	3	25	3	L230T11
				L230H155 to L230H161					462.00	0.46	11.89	3			
				L230H161 to L Noonpani B(L230H162)					88.00	0.09	11.98	3	16	1	L230T12
				L230H161 to L230H167					563.00	0.56	12.55	3			
				L230H167 to Tintalay A					394.00	0.39	12.94	3	25	3	L230T13
				L230H167 to Tintalay B					304.00	0.30	13.24	3	25	3	L230T14
				L230H152 to Tintalay Crushing Unit (L230H182)					1022.00	1.02	14.27	3	500	3	
				L230H182 to M Noonpani A (L230H183)					73.00	0.07	14.34	3	16	1	L230T16
				L230H182 to L230H185					319.00	0.32	14.66	3			
				L230H185 to M Noonpani B(L230H186)					122.00	0.12	14.78	3	16	1	L230T17
				L230H185 to L230H192					498.00	0.50	15.28	3			
				L230H192 to M Noonpani C (L230H195)					373.00	0.37	15.65	3	25	3	L230T18
				L230H192 to L230H197					126.00	0.13	15.78	3			
				L230H197 to L230H202					602.00	0.60	16.38	3			
				L230H202 to Rangaydara A (L230H205)					280.00	0.28	16.66	3	25	3	L230T19
				L230H202 to Rangaydara B (L230H209)					221.00	0.22	16.88	3	25	3	L230T20
				L230H197 to L230H210					84.00	0.08	16.96	3			
				L230H210 to Top Noonpani A(L230H213)					272.00	0.27	17.24	3	25	3	L230T21
				Top Noonpani A(L230H213) to L230H217					385.00	0.39	17.62	3			
				L230H217 to Kholakharka IIB (L230H225)					690.00	0.69	18.31	3	25	3	L230T22
				L230H217 to L230H234					990.00	0.99	19.30	3			
				L230H234 to Choksa IB (L230H235)					33.00	0.03	19.33	3	25	3	L230T23
				L230H234 to L230H245					1000.00	1.00	20.33	3			
				L230H245 to L230H255					310.00	0.31	20.64	3			
				L230H255 to Choksa IA (L230H256)					30.00	0.03	20.67	3	25	3	L230T24
				L230H255 to Kalikhola SS (L230H265)					824.00	0.82	21.50	3	25	3	L230T25
				L230H245 to Choksa II (L230H251)					810.00	0.81	22.31	3	25	3	L230T26
				L230H210 to L230H271					610.00	0.61	22.92	3			
				L230H271 to Kareydara SS (L230H273)					110.00	0.11	23.03	3	16	3	L230T27
				L230H271 to L230H279					860.00	0.86	23.89	3			
				L230H279 to Maneydara SS (L230H281)					225.00	0.23	24.11	3	25	3	L230T28
				L230H279 to Lamaykhoti SS (L230H289)					890.00	0.89	25.00	3	25	3	L230T29
				Lamaykhoti SS (L230H289) to L230H295					720.00	0.72	25.72	3			
				L230H295 to Daragoan (L230H296)					25.00	0.03	25.75	3	16	3	L230T30
				Daragoan (L230H296) to L230H300					450.00	0.45	26.20	3			
				L230H300 to Kholakharka IC (L230H302)					230.00	0.23	26.43	3	25	3	L230T31
				L230H300 to L230H307					650.00	0.65	27.08	3			
				L230H307 to L230H311					410.00	0.41	27.49	3			
				L230H311 to Pokharidara A(L230H315)					250.00	0.25	27.74	3	25	3	L230T32
				L230H311 to Pokharidara B(L230H318)					244.00	0.24	27.98	3	25	3	L230T33
				L230H307 to Pokharidara C(L230H323)					610.00	0.61	28.59	3	16	3	L230T34
				L230H295 to L230H332					830.00	0.83	29.42	3			
				L230H332 to Bijwater (L230H333)					70.00	0.07	29.49	3	25	3	L230T35
				L230H332 to L230H338					440.00	0.44	29.93	3			
				L230H338 Suntolay IIA SS (L120H343)					584.00	0.58	30.52	3	25	3	L230T36
				L230H338 to L230H348					765.00	0.77	31.28	3			
				L230H348 to Suntolay IIB(L230H350)					134.00	0.13	31.41	3	25	3	L230T37
				L230H348 to L230H353					410.00	0.41	31.82	3			
				L230H353 to Suntolay IB(L230H355)					165.00	0.17	31.99	3	25	3	L230T38
				L230H353 to L230H357					232.00	0.23	32.22	3			
				L230H357 to Suntolay IA (L230H363)					640.00	0.64	32.86	3	25	3	L230T39
				L230H357 to L230H380					2384.00	2.38	35.25	3			
				L230H380 to majuwa II (L230H381)					62.00	0.06	35.31	3	16	1	L230T40
				L230H380 to L230H408					1000.00	1.00	36.31	3			

Source	Feeder details		Voltage (kV)	Section			Type & Line Length of the Conductor						Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L230H408 to Rajaruk B (L230H410)					152.00	0.15	36.46	3	25	3	L230T41
				Rajaruk B (L230H410) to Rajarukh C (L230H412)					261.00	0.26	36.72	3	25	3	L230T42
				L230H408 to Rajaruk A (L230H417)					440.00	0.44	37.16	3	25	3	L230T43
				L230H380 to L230H388					816.00	0.82	37.98	3			
				L230H388 to Majuwa IB (L230H392)					400.00	0.40	38.38	3	25	3	L230T44
				L230H388 to Majuwa IA (L230H399)					870.00	0.87	39.25	3	25	3	L230T45
											39.25				
33/11kV,2x3MVA Tashichholing SS	**Pemaling feeder**	**L250**	**11**	Control room to L250H000	117					0.12	39.36	3			
				L250H000 to L250H001					185.00	0.19	39.55	3			
				L250H001 to Pakhagoan SS (L250H002)					171.00	0.17	39.72	3	63	3	L250T1
				L250H001 to U Pakhagoan SS (L250H008)					866.00	0.87	40.59	3	63	3	L250T2
				U Pakhagoan SS (L250H008) to L250H021					1050.00	1.05	41.64	3			
				L250H021 to Kamari (L250H022)					30.00	0.03	41.67	3	25	3	L250T3
				L250H021 to L250H025					340.00	0.34	42.01	3			
				L250H025 to L250H031					530.00	0.53	42.54	3			
				L250H031 to Talay SS (L250H32)					460.00	0.46	43.00	3	25	3	L250T4
				L250H031 to Sowaranee SS (L250H37)					60.00	0.06	43.06	3	25	3	L250T5
				L250H025 to Katlay I SS (L250H043)					560.00	0.56	43.62	3	25	3	L250T6
				Katlay I SS (L250H043) to Katlay II (L250H049)					420.00	0.42	44.04	3	25	3	L250T7
				Katlay II (L250H049) to L250H050					140.00	0.14	44.18	3			
				L250H050 to Samatar (L250H054)					310.00	0.31	44.49	3	25	3	L250T8
				L250H050 to L250H058					350.00	0.35	44.84	3			
				L250H058 to Talay I(L250H062)					190.00	0.19	45.03	3	16	1	L250T9
				L250H058 to L250H063					80.00	0.08	45.11	3			
				L250H063 to Talay II (L250H065)					60.00	0.06	45.17	3	16	1	L250T10
				L250H063 to Niguray I (L250H076)					790.00	0.79	45.96	3	16	1	L250T11
				Niguray I (L250H076) to Niguray II (L250H085)					830.00	0.83	46.79	3	25	3	L250T12
				Niguray II (L250H085) to L250H094					640.00	0.64	47.43	3			
				L250H094 to Patalbashay (L250H100)					490.00	0.49	47.92	3	16	1	L250T13
				L250H094 to Barchey SS (L250H106)					470.00	0.47	48.39	3	16	1	L250T14
				Barchey SS (L250H106) to L250H118					1337.00	1.34	49.72	3			
				L250H118 to Kopi II (L250H120)					133.00	0.13	49.86	3	25	3	L250T15
				L250H118 to Kopi I (L250H122)					82.00	0.08	49.94	3	25	3	L250T16
				Kopi I (L250H122) to Rokotar SS (L250H127)					620.00	0.62	50.56	3	25	3	L250T17
				Rokotar SS (L250H127) to L250H134					607.00	0.61	51.16	3			
				L250H134 to L250H135					80.00	0.08	51.24	3			
				L250H135 to Damigoan I SS (L250H136)					110.00	0.11	51.35	3	25	3	L250T18
				L250H135 to Damigoan I SS (L250H139)					396.00	0.40	51.75	3	25	3	L250T19
				L250H134 to Tachay Ss(L250H147)					717.00	0.72	52.47	3	25	3	L250T20
				Tachay Ss(L250H147) to U Daraygoan SS (L250H157)					674.00	0.67	53.14	3	25	3	L250T21
				U Daraygoan SS (L250H157) to L Daraygoan (L250H164)					429.00	0.43	53.57	3	25	3	L250T22
				L Daraygoan (L250H164) to L250H169					264.00	0.26	53.83	3			
				L250H169 to Puridara (L250H174)					377.00	0.38	54.21	3	25	3	L250T23
				L250H169 to L250H187					1020.00	1.02	55.23	3			
				L250H187 to Baraney SS (L250H188)					60.00	0.06	55.29	3	63	3	L250T24
				L250H187 to L250H191					228.00	0.23	55.52	3			
				L250H191 to Jamirkot SS (L250H206)					1449.00	1.45	56.97	3	63	3	L250T25
				L250H191 to U Chebju (L240H214)					472.00	0.47	57.44	3	25	3	L250T26
				U Chebju (L240H214) to L Chebju (L250H233)					713.00	0.71	58.15	3	25	3	L250T27
											58.15				
Jaldakha Power House	11kV Jholung Feeder	L130	11	L130H001 to L130H014					517.00	0.52	**0.52**	3			
33/11kV,2x3MVA Tashichholing SS	11kV Sipsu station feeder		11		50					0.05	**0.05**	3	125		
		L220	33	Dhamdum SS to L220P5 (Gantry)	136.3					0.14	0.14	3			
				L220P5 (Gantry) to L220H089(Sebichang SS)				8746.00		8.75	8.88	3			
										0.00	8.88				

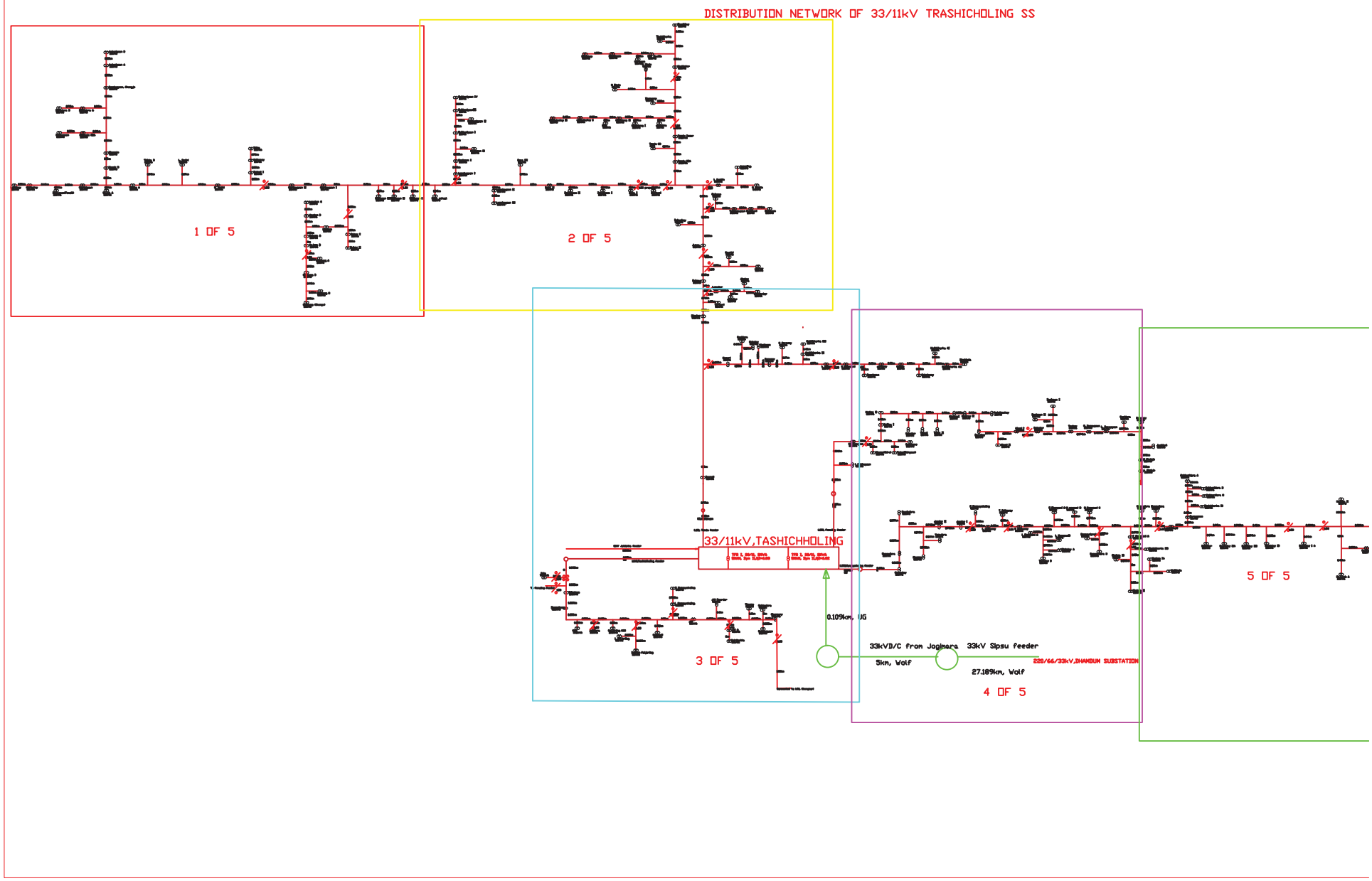
Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L140H1 to L140H4 (Thunwa Ranitaar SS)				767.13		0.77	0.77	3	25	3	L140T1
				L140H5 to L140H6 T off to Thumwa Bjigoan				287.49		0.29	1.05	3			
				L140H7 to L140H19 (Thumwa Bjigoan SS)					1379.25	1.38	2.43	3	25	3	L140T2
				L140H20 T off to Thumwa Neulagoan & Thunwa Daragoan					81.78	0.08	2.52	3			
				L140H21 to L140H25 (Thunwa Neulaygoan SS)					588.67	0.59	3.10	3	25	3	L140T3
				L140H25 to L140H31 (Thunwa Daragoan SS)					577.64	0.58	3.68	3	25	3	L140T4
				L140H32 to L140H39 T_off to Lower & Upper Thunwa Herantaar					682.58	0.68	4.36	3			
				L140H39 to L140H43 (Thunwa Lower Herantaar SS)					519.36	0.52	4.88	3	25	3	L140T5
				L140H44 to L140H47 (Thunwa Upper Herantaar SS)					311.11	0.31	5.20	3	25	3	L140T6
				L140H48 to L140H74 T_off to Wangchuk-B Lower & Wangchuk-A Upper				2823.88		2.82	8.02	3			
				L140H75 to L140H76 (Wangchuk-A Upper SS)					89.95	0.09	8.11	3	25	3	L140T7
				L140H77 to L140H79 (Wangchuk-B Lower SS)					286.86	0.29	8.40	3	25	3	L140T8
				L140H80 to L140H98 T off to Singye-A				1693.34		1.69	10.09	3			
				L140H99 to L140H101 T off to Jigme-B & Jigme-A				172.58		0.17	10.26	3			
				L140H102 to L140H103 (Jigme-A SS)					154.90	0.15	10.42	3	25	3	L140T9
				L140H104 Jigme-B SS					83.34	0.08	10.50	3	25	3	L140T10
				L140H105 to L140H109 (Jigme-C SS)				337.90		0.34	10.84	3	25	3	L140T11
				L140H110 to L140H112 (Jigme-D SS)				198.96		0.20	11.04	3	25	3	L140T12
				L140H113 to L140H115 (Singye -A SS)					104.96	0.10	11.14	3	25	3	L140T13
				L140H116 to L140H118 T off to Singye-B				275.60		0.28	11.42	3			
				L140H119 to L140H120 (Singye-B SS)					177.86	0.18	11.60	3	25	3	L140T14
				L140H121 to L140H122 (Singye-C SS)					113.37	0.11	11.71	3	25	3	L140T15
				L140H123 to L140H124 T off to Singye-D				170.95		0.17	11.88				
				L140H125 to L140H126 (Singye-D SS)					162.13	0.16	12.04	3	16	1	L140T16
				L140H127 to L140H130 T off to Sengten-I Raigoan				449.56		0.45	12.49	3			
				L140H131 T off to Sengten-I Raigoan					116.08	0.12	12.61	3			
				L140H132 (Sengten-I Raigoan SS)					82.37	0.08	12.69	3	16	1	L140T17
				L140H133 to L140H137 T off to Sanglung Labey					662.57	0.66	13.35	3			
				L140H138 to L140H142 (Sanglung Labey SS)					203.96	0.20	13.56	3	25	3	L140T18
				L140H143 to L140H150 T off to Sanglung School					791.65	0.79	14.35	3			
				L140H151 (Sanglung School SS)					5.44	0.01	14.35	3	25	3	L140T19
				L140H152 to L140H157 (Sanglung Kadoding SS)					549.90	0.55	14.90	3	16	1	L140T20
				L140H158 (Sanglung ORC SS)					79.63	0.08	14.98	3	25	3	L140T21
				L140H159 T off to Lower Sanglung					58.74	0.06	15.04	3			
				L140H160 to L140H162 (Lower Sanglung SS)					246.81	0.25	15.29	3	25	3	L140T22
				L140H163 to L140H169 (Sanglung Daragoan SS)					940.93	0.94	16.23	3	25	3	L140T23
				L140H170 to L140H180 T off to Middle Lumbey ORC					997.16	1.00	17.23	3			
				L140H181 to L140H184 T off to Upper Lumbey					513.57	0.51	17.74				
				L140H185 to L140H186 (Middle Lumbey ORC SS)					249.88	0.25	17.99	3	25	3	L140T24
				L140H187 to L140H189(Upper Lumbey SS)					102.46	0.10	18.09	3	16	1	L140T25
				L140H190 to L140H194 (Lower Lumbey SS)					849.13	0.85	18.94	3	25	3	L140T26
				L140H195 to L140H197 T off to Lower Lapchagoan B					305.84	0.31	19.25	3			
				L140H198 (Lower LapchagoanB SS)					95.88	0.10	19.34	3	25	3	L140T27
				L140H199 to L140H204 (Upper LapchagoanA SS)					415.27	0.42	19.76	3	25	3	L140T28
				L140H205 to L140H210 T off to Sengten II BHU				750.04		0.75	20.51	3			
				L140H211 to L140H112 T off to Sengten III School					750.04	0.75	21.26	3			
				L140H213 to L140H214 (Sengten II BHU SS)					187.22	0.19	21.45	3	25	3	L140T29
				L140H215 to L140H216 (Sengten III School SS)					137.77	0.14	21.58	3	25	3	L140T30
				L140H217 to L140H220 T off to Sengten IV				346.93		0.35	21.93				
				L140H221 (Sengten IV SS)				223.24		0.22	22.15	3	16	1	L140T31
				L140H222 to L140H252 T off to Upper Satakha				2732.05		2.73	24.89				
				L140H253 (Upper Satakha SS)				21.93		0.02	24.91	3	25	3	L140T32
				L140H254 to L140H260 T off to Lower Satakha				615.28		0.62	25.52				
				L140H261 (Lower Satakha SS)				64.19		0.06	25.59	3	25	3	L140T33
				L140H262 to L140H277 T off to Timburau I Yabal				1008.92		1.01	26.60	3			

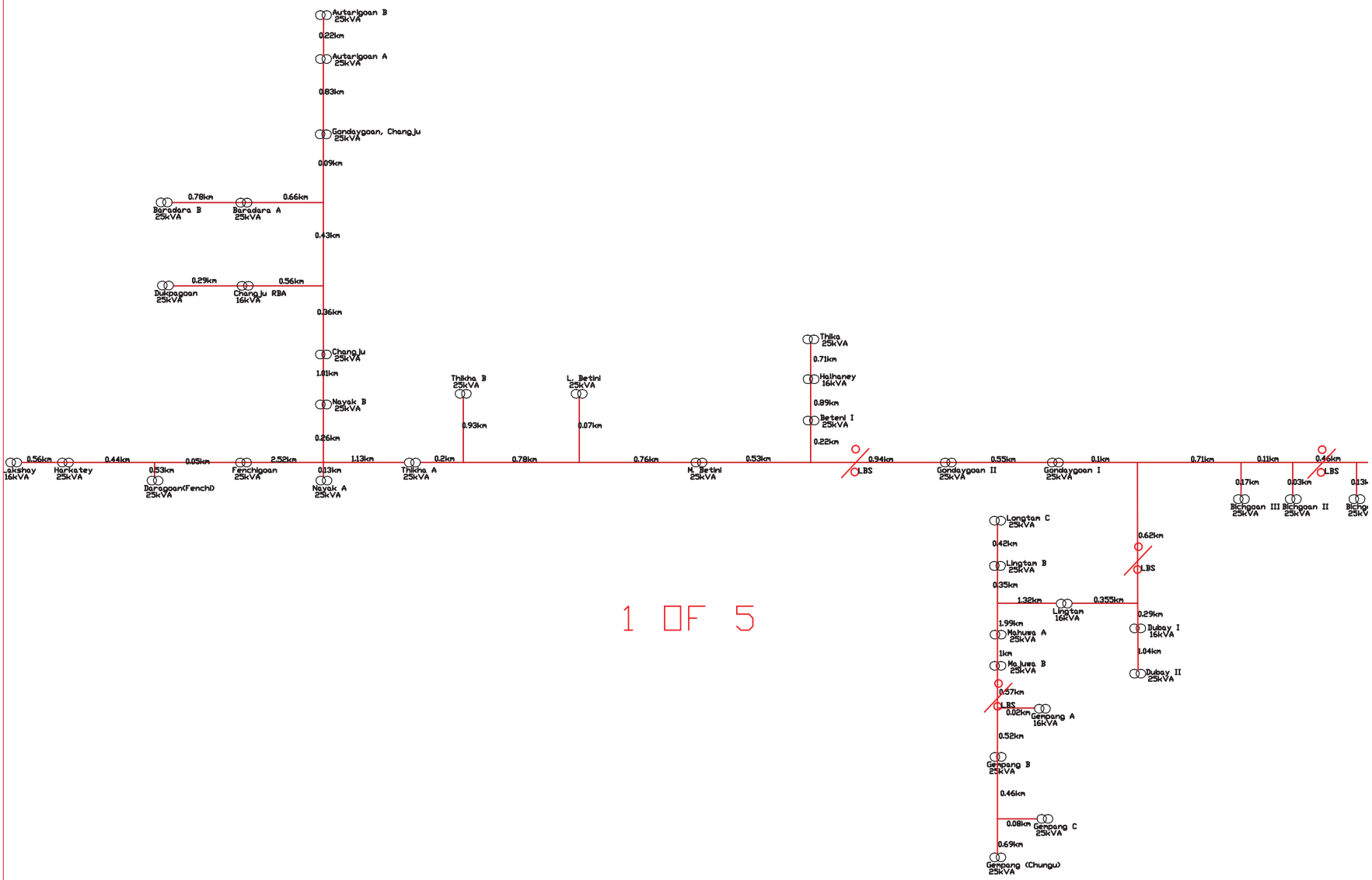
Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L140H278 to L140H287 (Timburau I Yabal SS)					1069.64	1.07	27.67	3	16	1	L140T34
				L140H288 to L140H309 (Sebichang SS)					3095.54	3.10	30.76	3	25	3	L140T35
				L140H310 to L140323 T_off to Timburay Sukey					1155.64	1.16	31.92				
				L140H324 (Timburay Sukey SS)					14.19	0.01	31.93	3	16	1	L140T36
				L140H325 to L140H 329 T_off to Timburay II					587.21	0.59	32.52	3			
				L140H330 to L140H332 (Timburay II SS)					335.03	0.34	32.85	3	25	3	L140T37
				L140H333 to L140H335 T_off to Lower Basentay					190.39	0.19	33.04	3			
				L140H336 to L140H346 (Lower Basentay SS)					764.43	0.76	33.81	3	25	3	L140T38
				L140H347 (Upper Basentay SS)					103.83	0.10	33.91	3	25	3	L140T39
				L140H348 to L140H362 T_off to Manigoan BPC Complex					1437.84	1.44	35.35	3			
				L140H363 to L140H366 (Manigoan BPC Complex SS)					366.93	0.37	35.72	3	25	3	L140T40
				L140H367 to L140H377					996.13	1.00	36.71	3	63	3	
				L140H378 to L140H379 (Manigoan Tshampa SS)					138.57	0.14	36.85	3	25	3	L140T41
				L140H380 to L140H381 (Manigoan Gurung SS)					166.55	0.17	37.02	3	16	1	L140T42
				L140H382 to L140H385 T_off to Manigoan Dungkha					399.58	0.40	37.42	3			
				L140H386 to L140H388 T_off to Manigoan Dungkha & Manigoan Police					183.06	0.18	37.60	3			
				L140H389 to L140H390 (Manigoan Dungkha SS)					166.45	0.17	37.77	3	125	3	L140T43
				L140H391T_off to Manigoan Police & Manigoan Gewog					89.69	0.09	37.86				
				L140H392 to L140H394 (Manigoan Police SS)					95.07	0.10	37.95	3	25	3	L140T44
				L140H395 (Manigoan Gewog SS)					116.50	0.12	38.07	3	25	3	L140T45
				L140H396 to L140H400 (Manigoan Bazardara SS)				509.29		0.51	38.58	3	25	3	L140T46
				L140H401 T_off to Damphuchen I				37.79		0.04	38.62	3			
				L140H402 to L140H407 T_off to Damphuchen I					328.29	0.33	38.94	3			
				L140H408 to L140H411 T_off to Damphuchen I					223.38	0.22	39.17	3			
				L140H412 (Damphuchen I SS)					128.20	0.13	39.30	3	25	3	L140T47
				L140H413 to L140H415 (Damphuchen I/Chelunchen I SS)					283.46	0.28	39.58	3	25	3	L140T48
				L140H416 to L140H418 T_off to Damphuchen II					222.77	0.22	39.80	3			
				L140H419 to L140H422 (Damphuchen II SS)					427.03	0.43	40.23	3	25	3	L140T49
				L140H423 T_off to Damphuchen III					112.39	0.11	40.34	3			
				L140H424 (Damphuchen III SS)					89.69	0.09	40.43	3	25	3	L140T50
				L140H425 to L140H430 (Chelumchen II SS)					599.29	0.60	41.03	3	25	3	L140T51
				L140H431 to L140H434 T_off to Namchu II				327.82		0.33	41.36	3			
				L140H435 to L140H440 T_off to Namchu II					398.76	0.40	41.76	3			
				L140H441 to L140H447 (Namchu IIISS)					500.94	0.50	42.26	3	25	3	L140T52
				L140H448 to L140H456 (Namchu IV SS)					682.71	0.68	42.94	3	25	3	L140T53
				L140H457 to L140H458 T_off to Namchu I					156.36	0.16	43.10				
				L140H459 (Namchu I SS)					58.84	0.06	43.16	3	25	3	L140T54
				L140H460 to L140H467 (Namchu II SS)					762.73	0.76	43.92	3	25	3	L140T55
				L140H468 to L140H469 T_off to Beachgoan/Army A4					147.07	0.15	44.07	3			
				L140H470 to L140H472 (Beachgoan/Army A4 SS)					198.57	0.20	44.26	3	25	3	L140T56
				L140H473 to L140H476 (Beachgoan/Rangger/Army A3 SS)					230.86	0.23	44.49	3	16	1	L140T57
				L140H477 to L140H478 T_off to Manigoan Dubjey					108.21	0.11	44.60	3			
				L140H479 to L140H481 T_off to Manigoan Dubjey					189.12	0.19	44.79	3			
				L140H482 (Manigoan Dubjey SS)					24.71	0.02	44.82	3	16	1	L140T58
				L140H483 (Manigoan DMSS Upper SS)					33.66	0.03	44.85	3	25	3	L140T59
				L140H484 to L140H485 (Manigoan DMSS Lower SS)					109.19	0.11	44.96	3	25	3	L140T60
				L140H486 (Beachgoan/Doya A2 SS)					92.11	0.09	45.05	3	16	1	L140T61
				L140H487 to L140H493 (Beachgoan A1 SS)					577.30	0.58	45.63	3	16	1	L140T62
				L140H494 to L140H499(Dorokha BHU)					590.87	0.59	46.22	3			
				L140H500 to L140H503 (Middle Bjigoan SS)					450.29	0.45	46.67	3	25	1	L140T63
				L140H504 to L140H506 (Lower Bjigoan SS)					414.37	0.41	47.08	3	16	1	L140T64
				L140H505 to L140H509 (Upper Bjigoan SS)					310.77	0.31	47.40	3	25	3	L140T65
				L140H510 to L140H512 (Dorokha CS)					293.05	0.29	47.69	3	250	3	
				L140H513 to L140H516 (Middle Tarigoan SS)					269.34	0.27	47.96	3	25	3	L140T66
				L140H517 to L140H520 (Upper Tarigoan SS)					396.59	0.40	48.35	3	25	3	L140T67
				L140H521 to L140H523 T_off Lower Tarigoan					228.90	0.23	48.58	3			

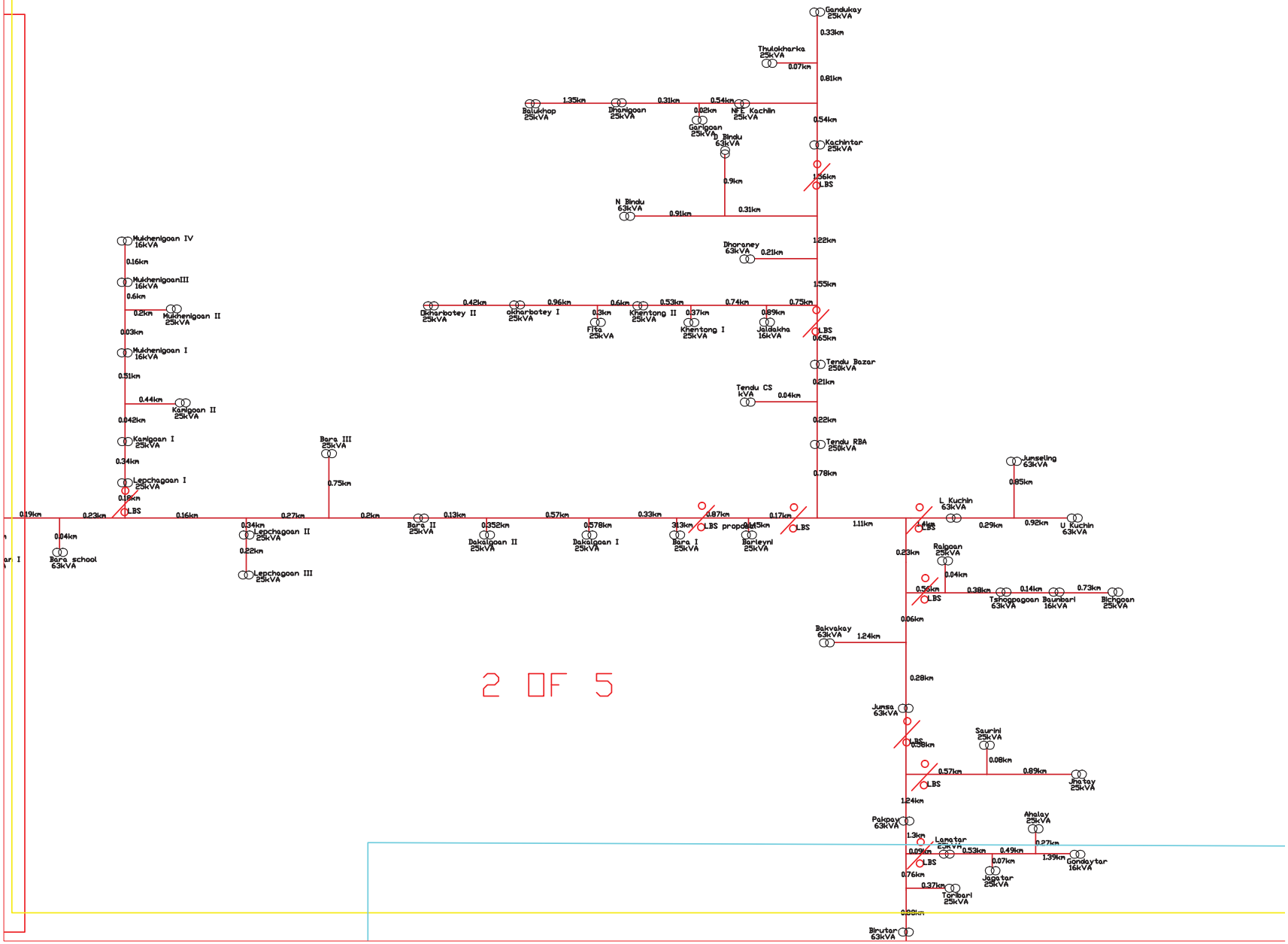
Source	Feeder details		Voltage (kV)	Section			Type & Line Length of the Conductor						Distribution Transformer			
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
66/33kV,2x5MVA Dhamdum SS	33 kV Dorokha feeder	L140	**33**	L140H524 to L140H528 (Lower Tarigoan SS)					448.98	0.45	49.03	3	25	3	L140T68
				L140H529 to L140H535 T_off to Middle Daragoan					555.20	0.56	49.59	3			
				L140H536 to L140H537 (Middle Daragoan SS)					180.90	0.18	49.77	3	25	3	L140T69
				L140H538 to L140H541 T_off to Upper Daragoan					273.09	0.27	50.04	3			
				L140H542 (Upper Daragoan SS)					85.25	0.09	50.13	3	25	3	L140T70
				L140H543 to L140H548 (Dogap-G SS)					529.10	0.53	50.66	3	25	3	L140T71
				L140H549 to L140H551 T_off to Dogap-C					388.73	0.39	51.04	3			
				L140H552 (Dogap-C SS)					166.51	0.17	51.21	3	25	3	L140T72
				L140H553 to L140H555 (Dogap-D SS)					319.90	0.32	51.53	3	25	3	L140T73
				L140H556 to L140H558 (Dogap-A SS)					144.65	0.14	51.68	3	16	1	L140T74
				L140H559 (Dogap-B SS)					103.31	0.10	51.78	3	25	3	L140T75
				L140H560 to L140H561 (Dogap-F SS)					313.50	0.31	52.09	3	16	1	L140T76
				L140H563 to L140H566 (Dogap-E SS)					586.69	0.59	52.68	3	16	1	L140T77
				L140H567 to L140H575 T_off to Lower Somlachen					987.56	0.99	53.67	3			
				L140H576 to L140H578 (Lower Somlachen SS)					143.66	0.14	53.81	3	25	3	L140T78
				L140H579 to L140H580 T_off to Upper Somlachen					220.69	0.22	54.03	3			
				L140H581 to L140H585 (Upper Somlachen SS)					373.48	0.37	54.40	3	25	3	L140T79
				L140H586 to L140H602 T_off to Sangay					1494.38	1.49	55.90	3			
				L140H603 to L140H604 (Sangay SS)					140.08	0.14	56.04	3	16	1	L140T80
				L140H605 to L140H632 (Lower Mithun SS)					3309.52	3.31	59.35	3	25	3	L140T81
				L140H633 to L140H634 (Upper Mithun SS)					222.62	0.22	59.57	3	25	3	L140T82
				L140H635 to L140H637 T_off to Lower Daragoan				311.43		0.31	59.88	3			
				L140H638 (Lower Daragoan SS)					38.75	0.04	59.92	3	25	3	L140T83
				L140H639 to L140H6661 T_off to Lower Sanu Dumtoe				2457.41		2.46	62.38	3			
				L140H6662 T_off to Lower Sanu Dumtoe					82.06	0.08	62.46	3			
				L140H6663 (Lower Sanu Dumtoe SS)					46.02	0.05	62.51	3	25	3	L140T84
				L140H664 to L140H666 T_ off Upper Sanu Dumtoe					436.42	0.44	62.94	3			
				L140H667 to L140H670 (Upper Sanu Dumtoe SS)					301.25	0.30	63.24	3	25	3	L140T85
				L140H671 to L140H674 (Jaringay A SS)					724.11	0.72	63.97	3	25	3	L140T86
				L140H675 to L140H676 (Jaringay B SS)					262.06	0.26	64.23	3	25	3	L140T87
				L140H677 to L140H682 (Jaringay C SS)					501.15	0.50	64.73	3	25	3	L140T88
				L140H683 to L140H687 (Salmay SS)					800.29	0.80	65.53	3	16	1	L140T89
				L140H688 to L140H715 T_off to Gairigoan A				2137.32		2.14	67.67				
				L140H716 to L140H719 (Gairigoan A SS)					211.19	0.21	67.88	3	25	3	L140T90
				L140H720 to L140H727 T_off to Thrulu Dumtoe A					554.21	0.55	68.43	3			
				L140H728 to L140H729 (Thrulu Dumtoe A SS)					86.19	0.09	68.52	3	16	1	L140T91
				L140H730 to L140H731 T_of to Thrulu Dumtoe C					114.15	0.11	68.63	3			
				L140H732 to L140H739 (Thrulu Dumtoe C SS)					624.27	0.62	69.26	3	25	3	L140T92
				L140H740 to L140H742 (Thrulu Dumtoe B SS)					177.53	0.18	69.44	3	16	1	L140T93
				L140H743 to L140H752 T_off to Gairigoan B				799.22		0.80	70.24	3			
				L140H753 to L140H756 (Gairigoan B SS)					349.87	0.35	70.59	3	25	3	L140T94
				L140H757 to L140H761 T_off to Gairigoan D				302.80		0.30	70.89	3			
				L140H762 to L140H763 (Gairigoan D SS)					123.14	0.12	71.01	3	25	3	L140T95
				L140H764 to L140H766 T_off to Gairigoan E					272.91	0.27	71.28	3			
				L140H767 to L140H768 (Gairigoan E SS)					103.61	0.10	71.39	3	25	3	L140T96
				L140H769 to L140H772 (Gairigoan F SS)					510.06	0.51	71.90	3	16	1	L140T97
				L140H773 to L140H778 (Gairigoan C SS)					397.97	0.40	72.30	3	16	1	L140T98
				L140H779 to L140H791 T_off to Khalingoan A				907.22		0.91	73.20	3			
				L140H792 to L140H794 (Khalingoan A SS)					219.20	0.22	73.42	3	25	1	L140T99
				L140H795 to L140H801 (Khalingoan B SS)					574.75	0.57	74.00	3	16	1	L140T100
				L140H802 to L140H805 (Khalingoan C SS)					301.09	0.30	74.30	3	25	3	L140T101
				L140H806 to L140H812 T_off to Upper Daragoan				773.54		0.77	75.07	3			
				L140H813 to L140H815 (Upper Daragoan SS)					171.12	0.17	75.24	3	16	1	L140T102
				L140H816 to L140H818 (Middle Daragoan SS)					215.73	0.22	75.46	3	25	3	L140T103
				L140H819 to L140H835 (Kuchey A SS)					2287.46	2.29	77.75	3	25	3	L140T104
				L140H836 to L140H840 (Kuchey B SS)					689.06	0.69	78.44	3	25	3	L140T105
				L140H841 to L140H846 T_off to Lower Daragoan				494.18		0.49	78.93	3			

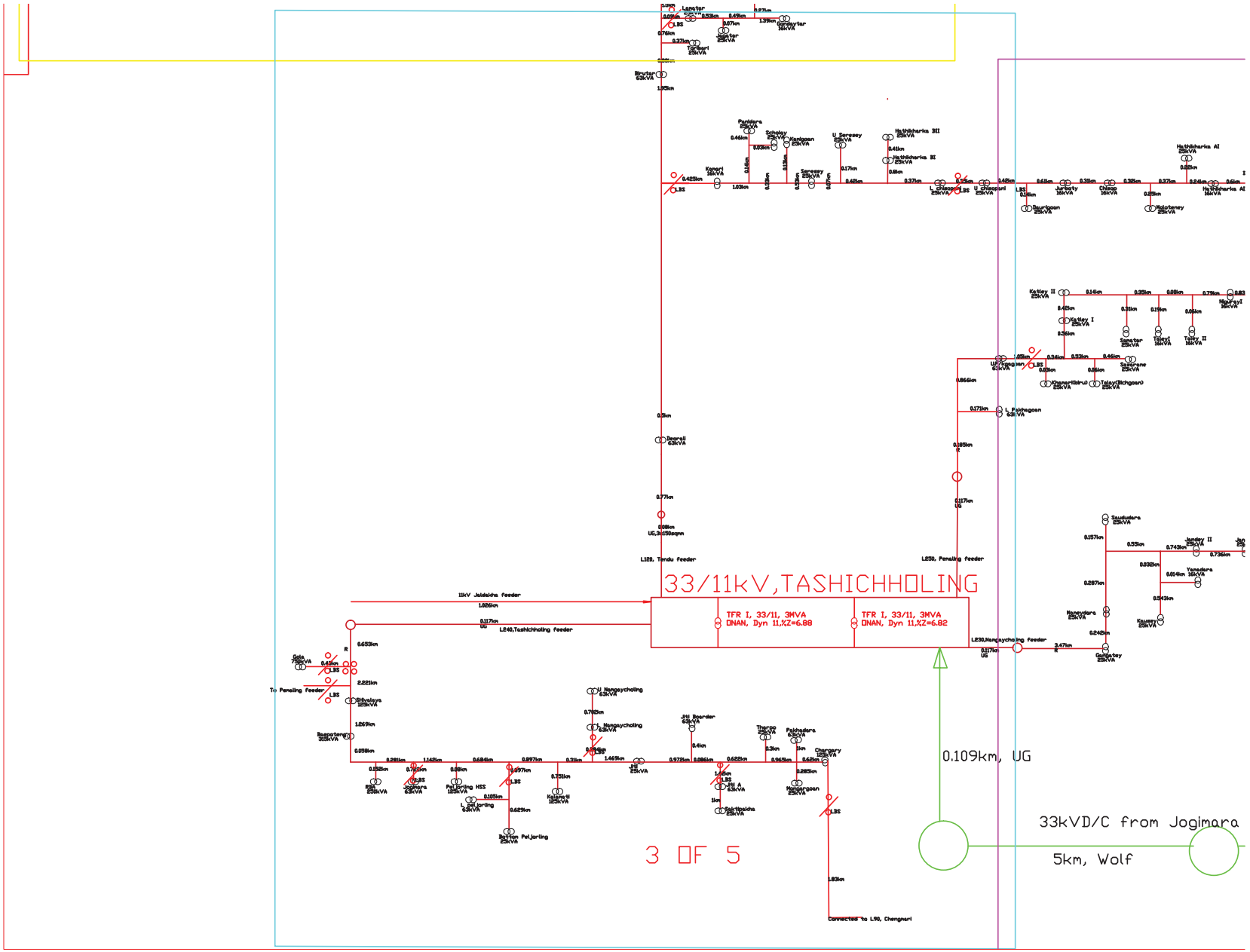
Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer			
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L140H847 (Lower Daragoan SS)					137.48	0.14	79.07	3	25	3	L140T106
				E70H000 to E70H019 (Damikha)				2685.00		2.69	81.75	3	25	1	E70T1
				E70H019 (Damikha) to E70H023(Naychana)				531.00		0.53	82.28	3	25	3	E70T2
				E70H024 to E70H029				686.00		0.69	82.97	3			
				E70H029 to E70H076 (Chego)				2429.00		2.43	85.40	3	16	1	E70T8
				E70H029 to E70H032				482.00		0.48	85.88	3			
				E70H032 to E70H034(Tanga A)				151.00		0.15	86.03	3	16	1	E70T3
				E70H032 to E70H038				698.00		0.70	86.73	3			
				E70H038 to E70H039 (Tanga B)				20.00		0.02	86.75	3	16	1	E70T4
				E70H038 to E70H052				1961.00		1.96	88.71	3			
				E70H052 to E70H054 (Yokha)				230.00		0.23	88.94	3	25	3	E70T5
				E70H052 to E70H060 (Rangtse A)				1228.00		1.23	90.17	3	16	1	E70T6
				E70H060 (Rangtse A) to E70H062 (Rangtse B)				317.00		0.32	90.49	3	25	3	E70T7
				L140H848 to L140H861 T off to Puchena A				1241.45		1.24	91.73	3			
				L140H862 to L140H863 (Puchena A SS)				307.46		0.31	92.03	3	25	3	L140T107
				L140H864 to L140H866 (Puchena B SS)				445.48		0.45	92.48	3	16	1	L140T108
				L140H867 to L140H880 T off to Gabji S/S				1290.91		1.29	93.77	3			
				L140H881 to L140H883 (Gabji S/S SS)				325.39		0.33	94.10	3	25	3	L140T109
				L140H884 to L140H904 T off to Damjee				2862.21		2.86	96.96	3			
				L140H905 to L140H906 (Damjee SS)				188.13		0.19	97.15	3	25	3	L140T110
				L140H907 to L140H919 T off to Lower Khenpagoan					1438.42	1.44	98.58	3			
				L140H920 (Lower Khenpagoan SS)				120.49		0.12	98.70	3	25	3	L140T111
				L140H921 to L140H926 (Upper Khenpagoan SS)				46.89		0.05	98.75	3	25	3	L140T112
				L140H927 to L140H929 T off to Lower Bangalay				483.81		0.48	99.24	3			
				L140H930 to L140H931 T off to Lower Bangalay				265.41		0.27	99.50	3			
				L140H932 (Lower Bangalay SS)				68.98		0.07	99.57	3	25	3	L140T113
				L140H933 to L140H936 (Upper Bangalay SS)					523.94	0.52	100.09	3	25	3	L140T114
				L140H937 to L140H946 T off to Basiney				1047.18		1.05	101.14	3			
				L140H947 to L140H948 (Basiney SS)				211.52		0.21	101.35	3	25	3	L140T115
				L140H949 to L140H951 T off to Bethini					367.50	0.37	101.72	3			
				L140H952 to L140H959 (Bethini SS)					702.85	0.70	102.42	3	25	3	L140T116
				L140H960 to L140H965 T off to Upper Kadorey					872.05	0.87	103.30	3			
				L140H966 to L140H968 (Upper Kadorey SS)					373.78	0.37	103.67	1	25	1	L140T117
				L140H969 to L140H971 (Lower Kadorey SS)					239.21	0.24	103.91	3	25	3	L140T118
				L140H972 to L140H980 T off to Upper Balukhola					1051.21	1.05	104.96	3			
				L140H981 to L140H982 (Upper Balukhola SS)					272.16	0.27	105.23	1	16	1	L140T119
				L140H983 to L140H984 (Lower Balukhola SS)				252.51		0.25	105.48	3	25	3	L140T120
				L140H985 to L140H988 T off to Lower Shetekha				664.15		0.66	106.15				
				L140H989 (Lower Shetekha SS)					34.89	0.03	106.18	3	25	3	L140T121
				L140H990 to L140H991 Upper Shetekha SS)					323.27	0.32	106.51	3	25	3	L140T122
				L140H992 to L140H995 T off to Relukha 1				627.77		0.63	107.13	3			
				L140H996 T off to Relukha 1					150.00	0.15	107.28	3			
				L140H996 Relukha 1 SS)					127.44	0.13	107.41	3	25	3	L140T123
				L140H998 to L140H999 T off to Relukha 2					273.91	0.27	107.69	3			
				L140H1000 to L140H1002 (Relukha 2 SS)					491.24	0.49	108.18	3	25	3	L140T124
				L140H1003 to L140H1004 (Dechukha 1 SS)					289.49	0.29	108.47	3	25	3	L140T125
				L140H1004 to L140H1007 (Dechukha 2 SS)					359.82	0.36	108.83	3	25	3	L140T126
				L140H1008 to L140H1010 (Dechukha 3 SS)					395.92	0.40	109.22	3	16	1	L140T127
				L140H1011 to L140H1015 T off to Dechukha BHU				773.82		0.77	110.00	3			
				L140H1016 to L140H1017 (Dechukha BHU SS)				167.69		0.17	110.16	3	25	3	L140T128
				L140H1018 to L140H1019 T off to Gabjee 2B				174.28		0.17	110.34	3			
				L140H1020 to L140H1025 (Gabjee 2B SS)					644.28	0.64	110.98	3	25	3	L140T129
				L140H1026 to L140H1028 (Boribotey 1 SS)					461.21	0.46	111.44	3	25	3	L140T130
				L140H1029 to L140H1030 T off to Boribotey 2					276.03	0.28	111.72	3			
				L140H1031 to L140H1032 (Boribotey 2 SS)					240.57	0.24	111.96	3	25	3	L140T131
				L140H1033 to L140H1034 T off to Boribotey 3					168.95	0.17	112.13	3			
				L140H1035 to L140H1036 (Boribotey 3 SS)					124.43	0.12	112.25	3	25	3	L140T132

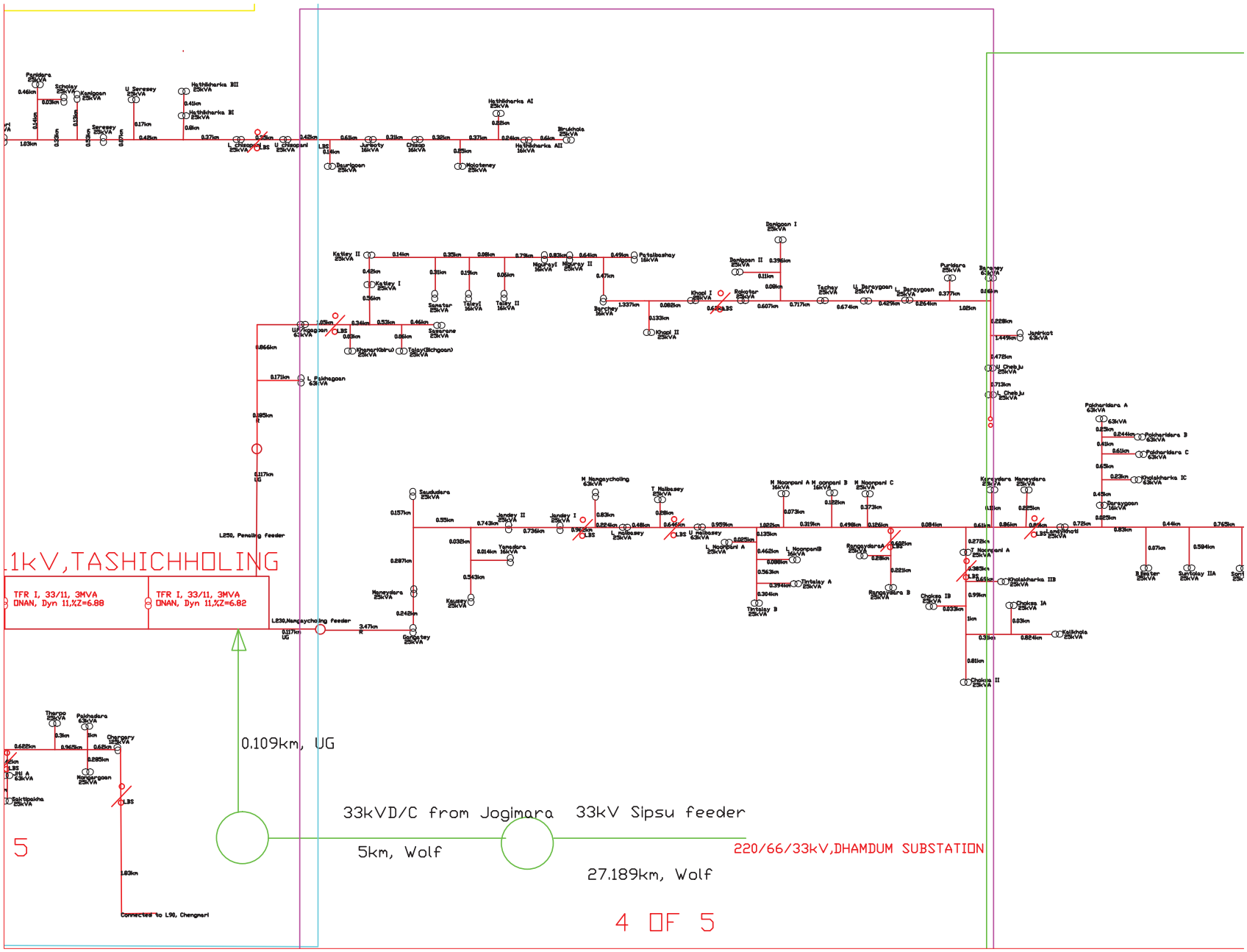
Source	Feeder details		Voltage (kV)	Section	Type & Line Length of the Conductor								Distribution Transformer		
	Name	ID			UG	HV ABC	WOLF	DOG	RABBIT	Section Length (km)	Cumulative Length (km)	3/1-Phase	Capacity (kVA)	3/1-Phase	ID
				L140H1037 to L140H1038 (Denchukha 4 SS)					362.22	0.36	112.62	3	25	3	L140T133
				L140H1039 T_off to Denchukha School				203.15		0.20	112.82	3			
				L140H1040 (Denchukha School SS)					98.55	0.10	112.92	3	25	3	L140T134
				L140H1041 to L140H1043 T_off to Gabjee 1B				372.10		0.37	113.29	3			
				L140H1044 (Gabjee 1B SS)					174.93	0.17	113.46	3	25	3	L140T135
				L140H1045 to L140H1049 T_off to Meyona A				692.01		0.69	114.16	3			
				L140H1050 to L140H1051 (Meyona A SS)					250.41	0.25	114.41	3	25	3	L140T136
				L140H1052 T_off to Meyona B				223.07		0.22	114.63	3			
				L140H1053 to L140H1055 (Meyona B SS)					456.15	0.46	115.09	3	25	3	L140T137
				L140H1056 to L140H1057 (Meyona C SS)					175.14	0.18	115.26	3	25	3	L140T138
				L140H1058 to L140H1061 T_off to Damilay				379.92		0.38	115.64	3			
				L140H1062 to L140H1064 (Damilay SS)				780.05		0.78	116.42	3	25	3	L140T139
				L140H1065 to L140H1069 T_off to Navarey					142.66	0.14	116.56	3			
				L140H1070 to L140H1071 (Navarey SS)					350.40	0.35	116.91	3	16	1	L140T140
				L140H1072 to L140H1085 (Pungthra A SS)				1683.90		1.68	118.60	3	25	3	L140T141
				L140H1086 to L140H1089 T_off to Pungthra B				487.17		0.49	119.08	3			
				L140H1090 (Pungthra B SS)					242.55	0.24	119.33	3	25	3	L140T142
				L140H1091 to L140H1093 T_off to Pungthra C					413.14	0.41	119.74	3			
				L140H1094 (Pungthra C SS)					157.09	0.16	119.90	3	25	3	L140T143
				L140H1095 to L140H1097 (Pungthra D SS)					482.07	0.48	120.38	3	16	1	L140T144
				L140H1098 to L140H1105 T_off to Belung				1230.65		1.23	121.61	3			
				L140H1106 to L140H1110 (Belung SS)					597.24	0.60	122.21	3	16	1	L140T145
				L140H1111 to L140H1116 T_off to Tafekha				489.17		0.49	122.70	3			
				L140H1117 (Tafekha SS)					157.09	0.16	122.85	3	25	3	L140T146
				L140H1118 to L140H1121 (Benekha SS)					896.95	0.90	123.75	1	16	1	L140T147
											132.63				
66/33kV, 2x5MVA Dhamdum SS	Dhamdum station feeder-I		**33**		50					0.05	**0.05**	3	250	3	
66/33kV, 2x5MVA Dhamdum SS	33kV Samtse feeder	L150	**33**	Dhamdum Control room to L150P7	148.42					0.15	0.15	3			
				L150H000 to L150H019				1030.00		1.03	1.18	3			
				L150H019 to Samtse ss (Control room)	2249					2.25	3.43	3			
											3.43				
66/33kV, 2x5MVA Dhamdum SS	Norbugang feeder	L170	**33**	Dhamdum SS to L170P7	145					0.15	0.15	3			
				L170P7 to L170H002				42.00		0.04	0.19	3			
				L170H002 to BMML SS					500.00	0.50	0.69	3	1000	3	
				L170H002 to Printing press (L170H066)				4000.00		4.00	4.69	3	250	3	
				L170H002 to L170H156				7619.00		7.62	12.31	3	2500	3	
				L170H156 to L170H261				6985.00		6.99	19.29	3			
											19.29				
220/66kV, 2x50MVA Dhamdum SS	Dhamdum station feeder-II		**33**		50					0.05	**0.05**	3	250	3	
220/66kV, 2x50MVA Dhamdum SS	33kV Sipsu	L200/L210	**33**	L200H001 to L200H082				4990.00		4.99	**4.99**	3			
220/66kV, 2x50MVA Dhamdum SS	66kV PCAL		66				60			0.06	**0.06**	3	10000	3	
Total circuit length (km)											**566.22**		**57002**		

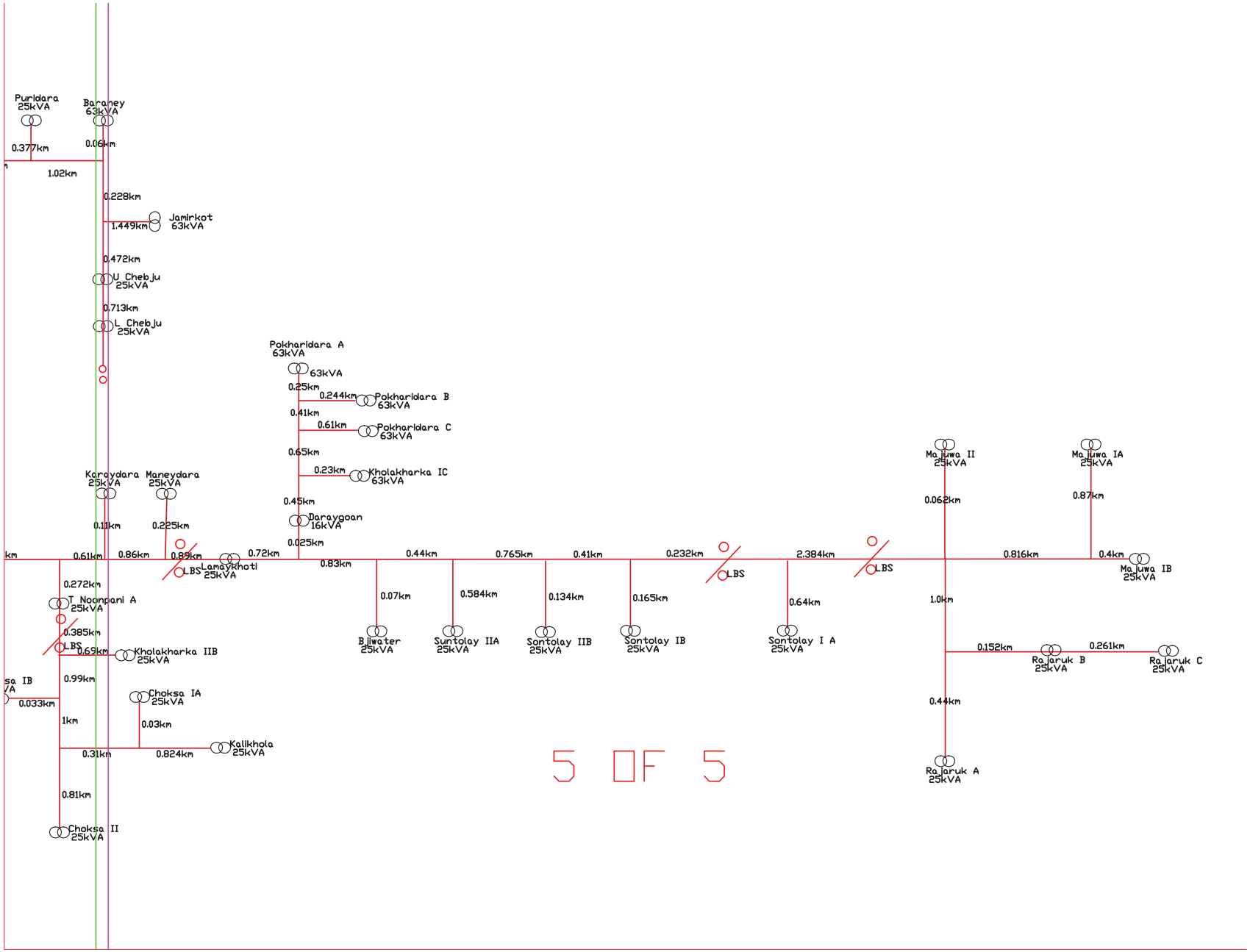

DISTRIBUTION NETWORK OF 33/11kV TRASHICHOLING SS
1 OF 5
2 OF 5
33/11kV,TASHICHHOLING
3 OF 5
4 OF 5
5 OF 5
0.109km, UG
33kVD/C from Jogimara 33kV Sipsu feeder
5km, Wolf
27.189km, Wolf
220/66/33kV,DHANDUN SUBSTATION

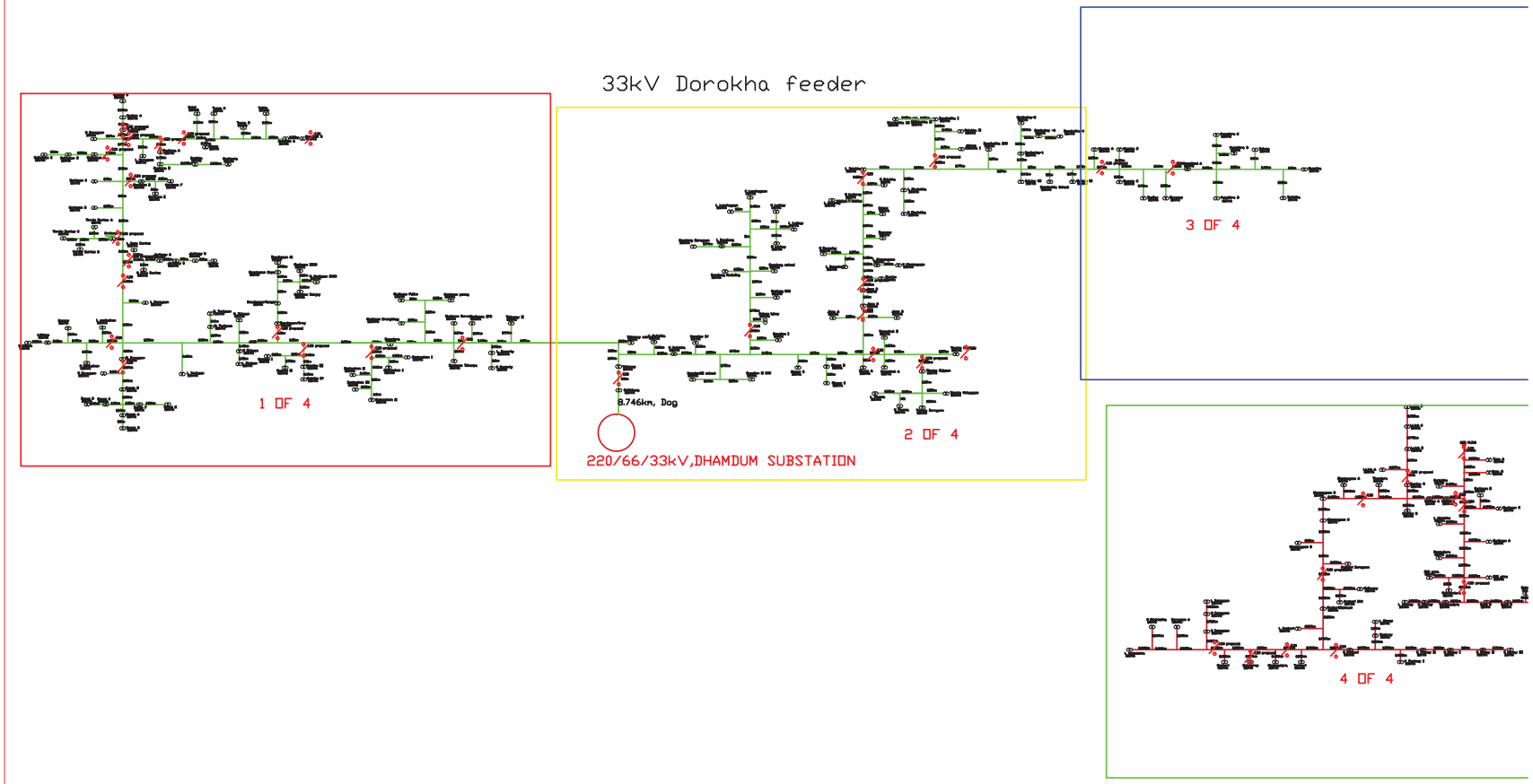

Autarigaon B
25kVA
0.22km
Autarigaon A
25kVA
0.83km
Gandaygaon, Changlu
25kVA
0.09km
0.78km
0.66km
Baradara B
25kVA
Baradara A
25kVA
0.43km
0.29km
0.56km
Dukpagaon
25kVA
Changlu RBA
16kVA
0.36km
Changlu
25kVA
1.01km
Nayak B
25kVA
0.26km
Thikha B
25kVA
0.93km
L. Betini
25kVA
0.07km
Thika
25kVA
0.71km
Halhaney
16kVA
0.89km
Beteni I
25kVA
0.22km
0.56km
0.44km
0.53km
0.05km
2.52km
0.13km
1.13km
0.2km
0.78km
0.76km
0.53km
0.94km
LBS
0.55km
0.1km
0.71km
0.11km
0.46km
LBS
0.17km
0.03km
0.13k
akshay
16kVA
Harkatey
25kVA
Daragaon(Fenchi)
25kVA
Fenchigaon
25kVA
Nayak A
25kVA
Thikha A
25kVA
M. Betini
25kVA
Gandaygaon II
25kVA
Gandaygaon I
25kVA
Bichgaon III
25kVA
Bichgaon II
25kVA
Bichgu
25kV
Langtan C
25kVA
0.42km
Langtan B
25kVA
0.35km
1.32km
0.355km
Langtan
16kVA
1.99km
Mahuwa A
25kVA
1km
Ma.luwa B
25kVA
0.57km
LBS
0.02km
Gempang A
16kVA
0.52km
Gempang B
25kVA
0.46km
0.08km
Gempang C
25kVA
0.69km
Gempang (Chungu)
25kVA
0.62km
LBS
0.29km
Dubay I
16kVA
1.04km
Dubay II
25kVA
1 OF 5

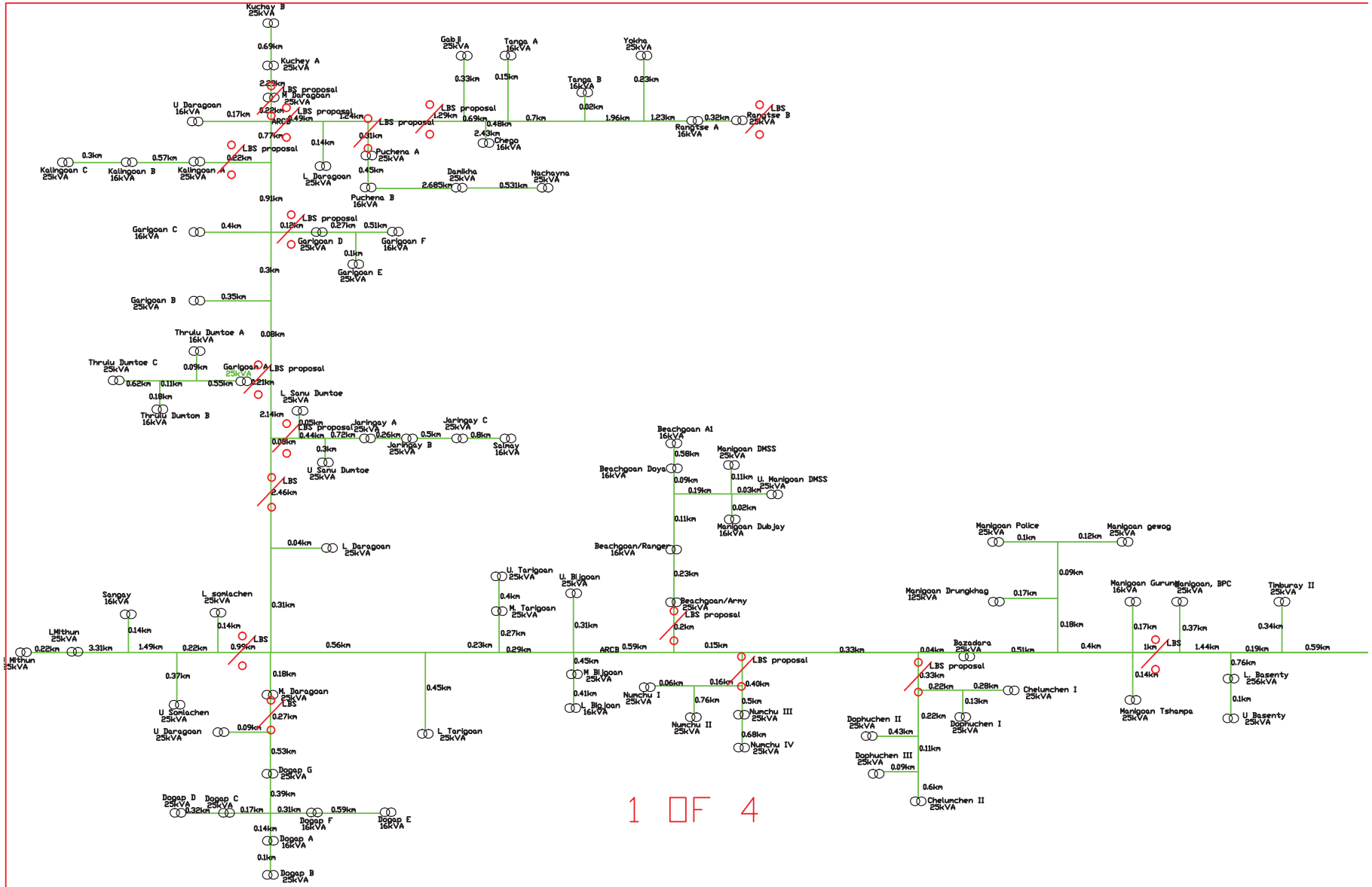

DISTRIBUTION NETWORK
Gandukay 25kVA
0.33km
Thulokharka 25kVA
0.07km
0.81km
Balukhop 25kVA
1.35km
Dharigaon 25kVA
0.31km
0.02km
0.54km
NPE Kachilin 25kVA
Ganigaon 25kVA
0.54km
Bindu 63kVA
Kachintar 25kVA
0.9km
1.56km
LBS
N Bindu 63kVA
0.91km
0.31km
Dharaney 63kVA
0.21km
1.22km
1.55km
Mudhenigaon IV 16kVA
0.16km
Mudhenigaon III 16kVA
0.6km
0.2km
Mudhenigaon II 25kVA
0.03km
Mudhenigaon I 16kVA
0.51km
0.44km
Kanigaon II 25kVA
0.042km
Kanigaon I 25kVA
0.34km
Lepchagaon I 25kVA
0.18km
LBS
0.19km
0.23km
0.16km
0.04km
Bara school 63kVA
0.34km
Lepchagaon II 25kVA
0.27km
0.22km
Lepchagaon III 25kVA
Bara III 25kVA
0.75km
0.2km
Bara II 25kVA
0.13km
0.352km
Dakalgaon II 25kVA
0.57km
0.578km
Dakalgaon I 25kVA
0.33km
3.3km
Bara I 25kVA
0.87km
LBS proposed
0.45km
Barleyni 25kVA
0.17km
LBS
1.11km
0.42km
Dkharbotey II 25kVA
0.96km
okharbotey I 25kVA
0.6km
0.3km
Fibs 25kVA
Khamtong II 25kVA
0.53km
0.37km
Khamtong I 25kVA
0.74km
0.89km
Jalakaha 16kVA
0.75km
LBS
0.65km
Tendu Bazar 250kVA
0.21km
Tendu CS kVA
0.04km
0.22km
Tendu RBA 250kVA
0.78km
L Kuchin 63kVA
1.46km
LBS
0.29km
Junseling 63kVA
0.85km
0.92km
U Kuchin 63kVA
0.23km
Raigaon 25kVA
0.04km
0.56km
LBS
0.38km
Tshogpagaon 63kVA
0.14km
Baumbari 16kVA
0.73km
Bichagaon 25kVA
0.06km
Bakvakay 63kVA
1.24km
0.28km
Jumsa 63kVA
LBS
0.38km
Saurini 25kVA
0.08km
0.57km
0.89km
Jhatay 25kVA
LBS
1.24km
Pakpay 63kVA
Ahalay 25kVA
1.3km
Lamatar 25kVA
0.27km
0.09km
0.53km
0.49km
1.39km
Gandaytar 16kVA
LBS
0.07km
Jagatar 25kVA
0.76km
0.37km
Tarkari 25kVA
Birutar 63kVA
2 OF 5

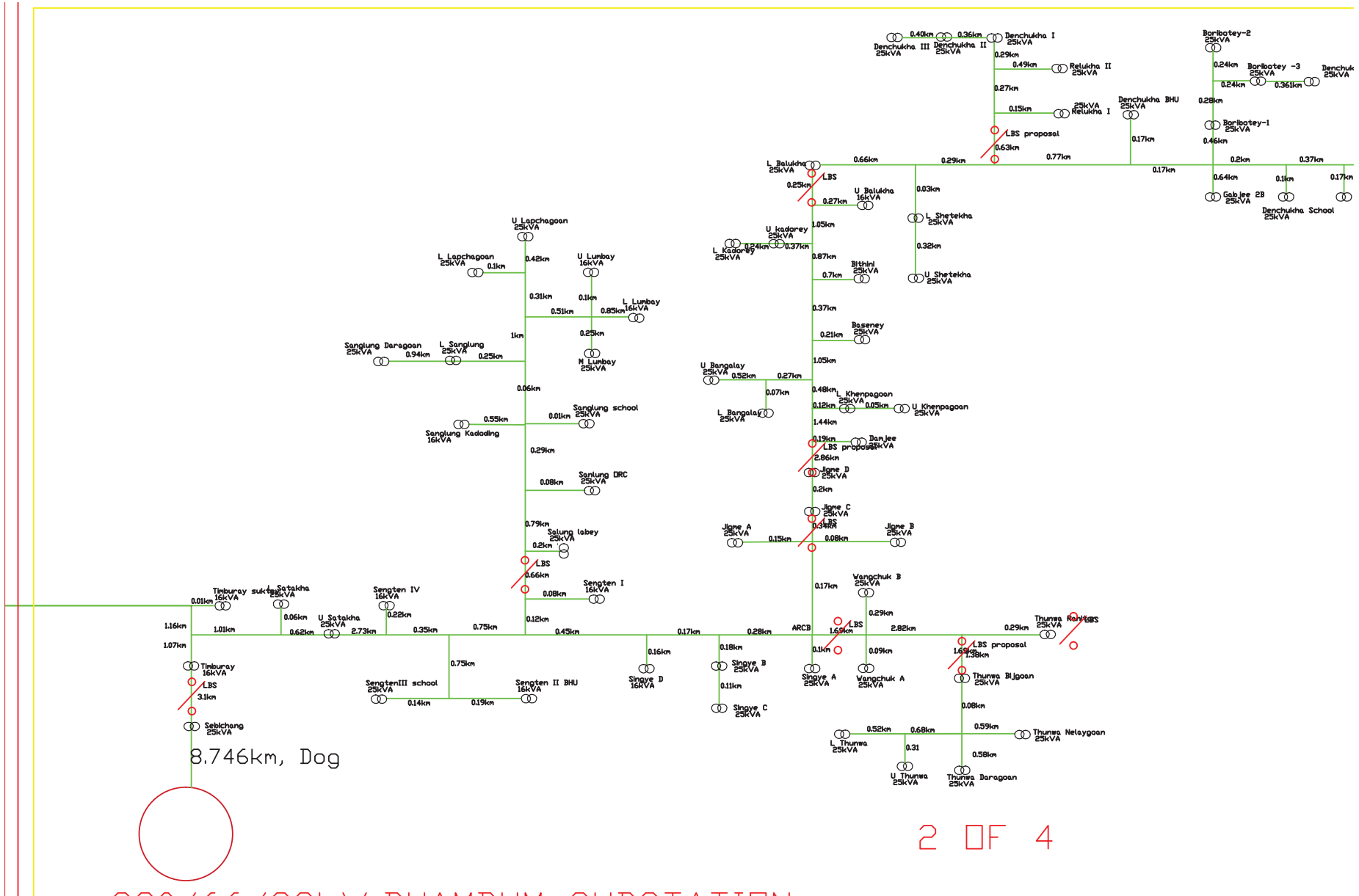

33/11kV,TASHICHHOLING
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.88
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.82
L128, Tondu Feeder
L250, Penaling Feeder
11kV Jaldakha Feeder
L240,Tashichholing Feeder
L230,Nangaycholing Feeder
To Penaling Feeder
0.109km, UG
33kVD/C from Jogimara
5km, Wolf
3 OF 5
Connected to L90, Chengmari


.1kV,TASHICHHOLING
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.88
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.82
L230, Penalling Feeder
L230,Nangaycholing Feeder
0.109km, UG
33kVD/C from Jogimara 33kV Sipsu feeder
5km, Wolf
27.189km, Wolf
220/66/33kV,DHAMDUM SUBSTATION
Connected to L90, Chengmari
5
4 OF 5


Puridara
25kVA
Baraney
63kVA
0.377km
0.06km
1.02km
0.228km
Jamirkot
63kVA
1.449km
0.472km
U_Chebju
25kVA
0.713km
L_Chebju
25kVA
Pokharidara A
63kVA
63kVA
0.25km
0.244km
Pokharidara B
63kVA
0.41km
0.61km
Pokharidara C
63kVA
0.65km
0.23km
Kholakharka IC
63kVA
0.45km
Daraygoan
16kVA
0.025km
Karaydara
25kVA
Maneydara
25kVA
0.11km
0.225km
km
0.61km
0.86km
0.89km
LBS
Lamaykhotl
25kVA
0.72km
0.83km
0.44km
0.765km
0.41km
0.232km
LBS
2.384km
LBS
Majuwa II
25kVA
0.062km
Majuwa IA
25kVA
0.87km
0.816km
0.4km
Majuwa IB
25kVA
0.272km
T Noonpani A
25kVA
0.385km
LBS
0.69km
Kholakharka IIB
25kVA
0.07km
Bjwater
25kVA
0.584km
Suntolay IIA
25kVA
0.134km
Santolay IIB
25kVA
0.165km
Santolay IB
25kVA
0.64km
Santolay I A
25kVA
1.0km
0.152km
Rajaruk B
25kVA
0.261km
Rajaruk C
25kVA
sa IB
/A
0.033km
0.99km
Chaksa IA
25kVA
0.03km
1km
0.31km
0.824km
Kalikhola
25kVA
0.44km
Rajaruk A
25kVA
0.81km
Chaksa II
25kVA
5 OF 5

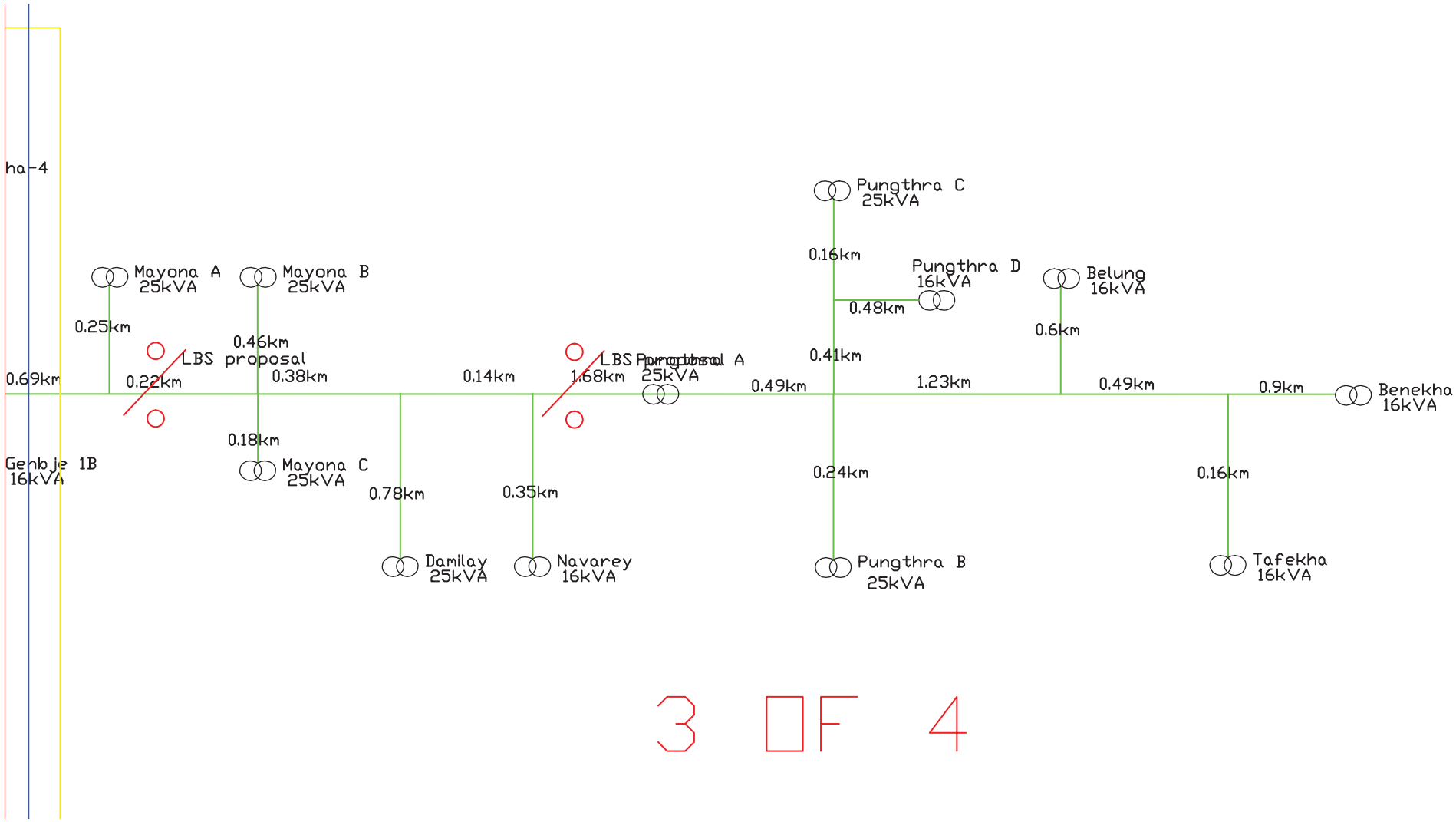

33kV Dorokha feeder
1 OF 4
2 OF 4
3 OF 4
4 OF 4
8.746km, Dog
220/66/33kV,DHAMDUM SUBSTATION

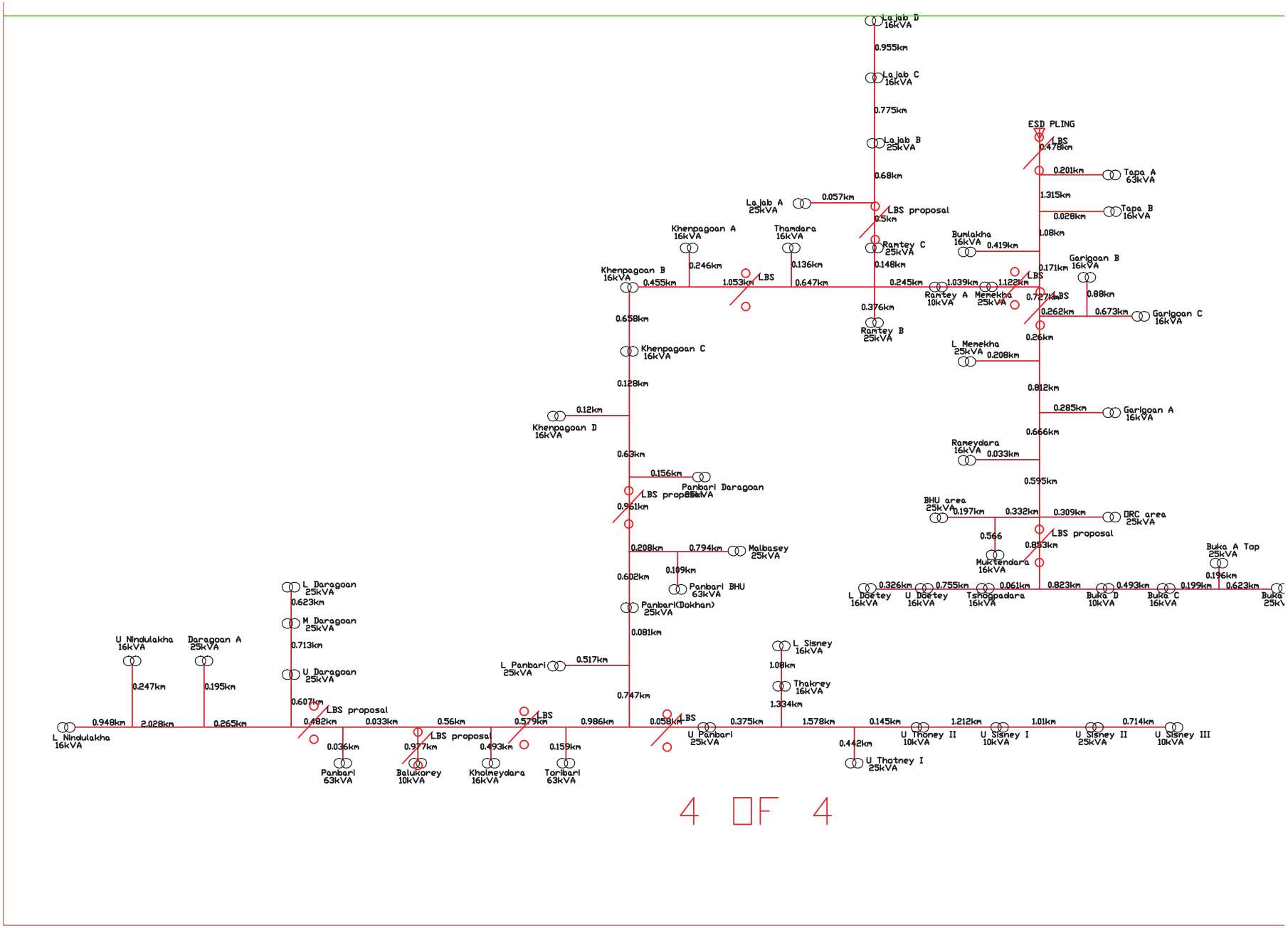

Kuchey B 25kVA
0.69km
Kuchey A 25kVA
2.23km
LBS proposal
M Daragoan 25kVA
U Daragoan 16kVA
0.17km
0.22km
0.49km
1.24km
ARCB
LBS proposal
0.77km
LBS proposal
0.22km
Kalingaon C 25kVA
0.3km
Kalingaon B 16kVA
0.57km
Kalingaon A 25kVA
0.14km
L Daragoan 25kVA
0.31km
Puchena A 25kVA
0.45km
Puchena B 16kVA
0.91km
Gab II 25kVA
0.33km
Tenga A 16kVA
0.15km
LBS proposal
1.29km
0.69km
0.48km
2.43km
Chega 16kVA
Tenga B 16kVA
0.02km
0.7km
1.96km
Yakha 25kVA
0.23km
1.23km
0.32km
Ranatse A 16kVA
LBS
Ranatse B 25kVA
Danikha 25kVA
2.685km
0.531km
Nacheyna 25kVA
Garigaon C 16kVA
0.4km
LBS proposal
0.12km
0.27km
0.51km
Garigaon D 25kVA
Garigaon F 16kVA
0.1km
Garigaon E 25kVA
0.3km
Garigaon B 25kVA
0.35km
Thrulu Dumtoe A 16kVA
0.08km
Thrulu Dumtoe C 25kVA
0.09km
Garigaon A 25kVA
LBS proposal
0.62km
0.11km
0.55km
0.21km
L Sanu Dumtoe 25kVA
0.18km
Thrulu Dumtoe B 16kVA
2.14km
0.05km
LBS proposal
Jaringay A 25kVA
0.44km
0.72km
0.26km
Jaringay C 25kVA
0.5km
0.8km
Jaringay B 25kVA
Salney 16kVA
0.08km
0.3km
U Sanu Dumtoe 25kVA
LBS
2.46km
0.04km
L Daragoan 25kVA
Beachgoan A1 16kVA
0.58km
Manigaon DMSS 25kVA
Beachgoan Doya 16kVA
0.09km
0.11km
U Manigaon DMSS 25kVA
0.19km
0.03km
0.02km
Manigaon Dubjay 16kVA
0.11km
Beachgoan/Ranger 16kVA
0.23km
Beachgoan/Army 25kVA
LBS proposal
0.2km
U Tarigaon 25kVA
0.4km
M Tarigaon 25kVA
0.27km
0.23km
0.29km
U Bigaon 25kVA
0.31km
0.45km
M Bigaon 25kVA
0.41km
L Bigaon 16kVA
ARCB
0.59km
0.15km
LBS proposal
0.06km
0.16km
0.40km
Nunchu I 25kVA
0.76km
0.5km
Nunchu III 25kVA
Nunchu II 25kVA
0.68km
Nunchu IV 25kVA
0.33km
0.04km
Bazadara 25kVA
0.51km
LBS proposal
0.33km
0.22km
0.28km
Chelumchen I 25kVA
0.13km
Dophuchen II 25kVA
0.43km
Dophuchen I 25kVA
0.22km
Dophuchen III 25kVA
0.09km
0.11km
0.6km
Chelumchen II 25kVA
Manigaon Police 25kVA
0.1km
0.12km
Manigaon gewog 25kVA
0.09km
Manigaon Drungkhag 125kVA
0.17km
0.18km
0.4km
Manigaon Gurung 16kVA
Manigaon, BPC 25kVA
0.17km
0.37km
1km
LBS
1.44km
0.14km
Manigaon Tsharpa 25kVA
Timburay II 25kVA
0.34km
0.19km
0.59km
0.76km
L. Basenty 256kVA
0.1km
U Basenty 25kVA
Sangay 16kVA
0.14km
L Mithun 25kVA
0.22km
3.31km
1.49km
L samlachen 25kVA
0.14km
0.22km
LBS
0.99km
0.56km
0.31km
L Mithun 25kVA
0.37km
U Samlachen 25kVA
U Daragoan 25kVA
0.09km
0.18km
M. Daragoan 25kVA
LBS
0.27km
0.53km
Dagap G 25kVA
0.39km
Dagap D 25kVA
Dagap C 25kVA
0.32km
0.17km
0.31km
Dagap F 16kVA
0.59km
Dagap E 16kVA
0.14km
Dagap A 16kVA
0.1km
Dagap B 25kVA
0.45km
L Tarigaon 25kVA
1 OF 4



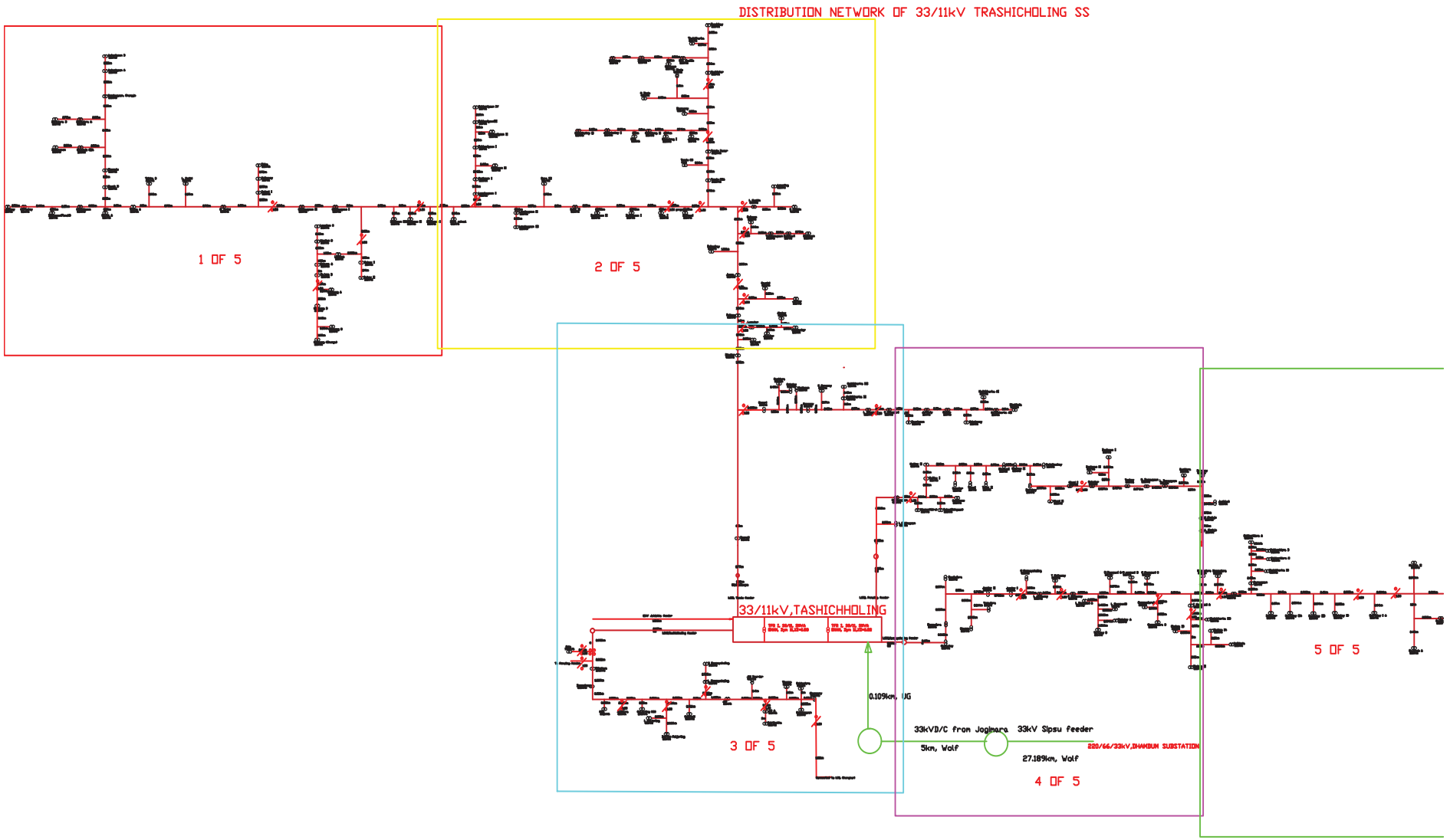
2 OF 4

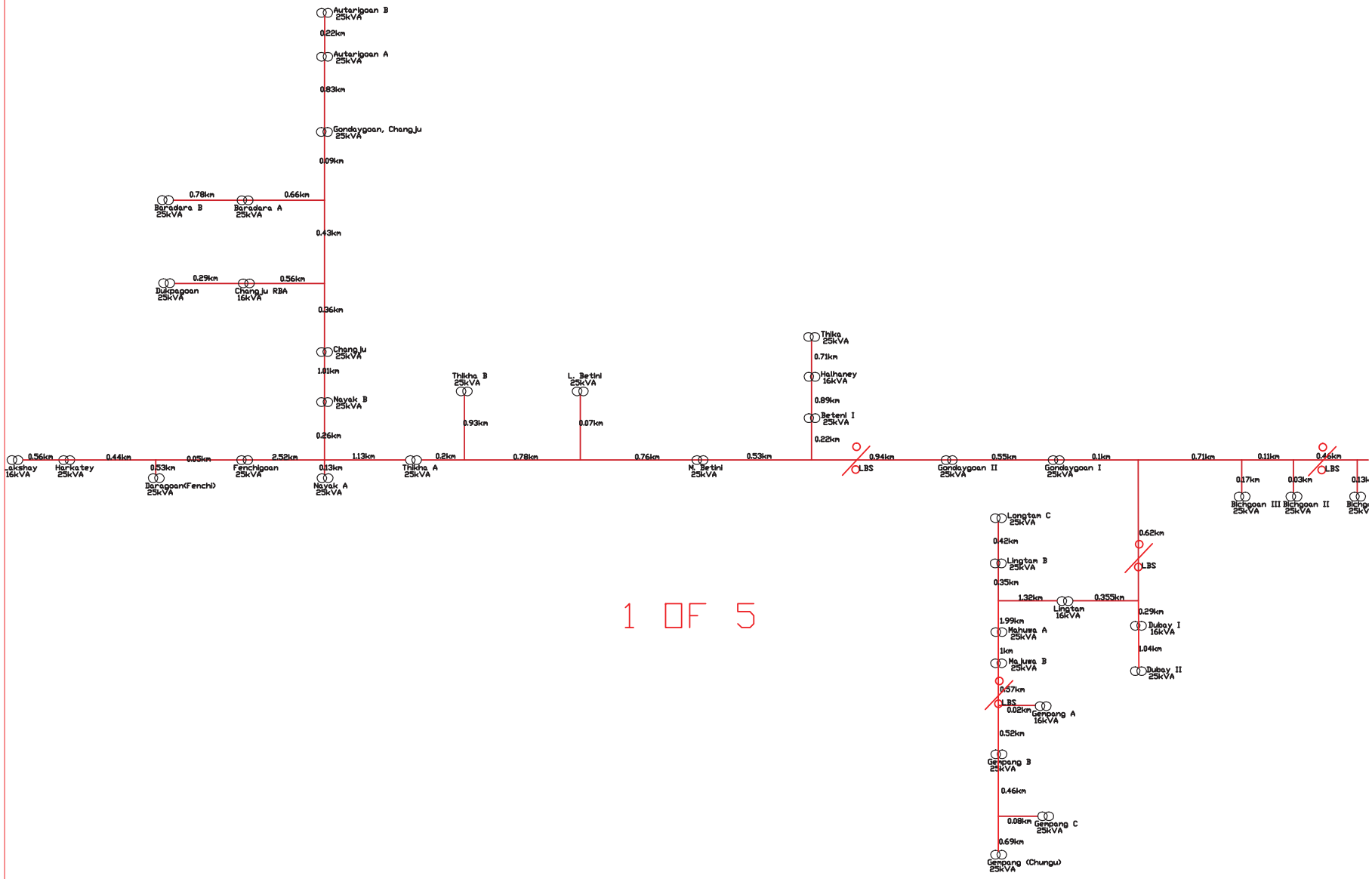
220/66/33kV,DHAMDUM SUBSTATION


ha-4
Mayona A
25kVA
Mayona B
25kVA
Pungthra C
25kVA
Pungthra D
16kVA
Belung
16kVA
0.25km
0.46km
0.16km
0.48km
0.6km
0.69km
0.22km
LBS proposal
0.38km
0.14km
1.68km
LBS Pungthra A
25kVA
0.41km
0.49km
1.23km
0.49km
0.9km
Benekha
16kVA
0.18km
Genbje 1B
16kVA
Mayona C
25kVA
0.78km
0.35km
0.24km
0.16km
Damilay
25kVA
Navarey
16kVA
Pungthra B
25kVA
Tafekha
16kVA

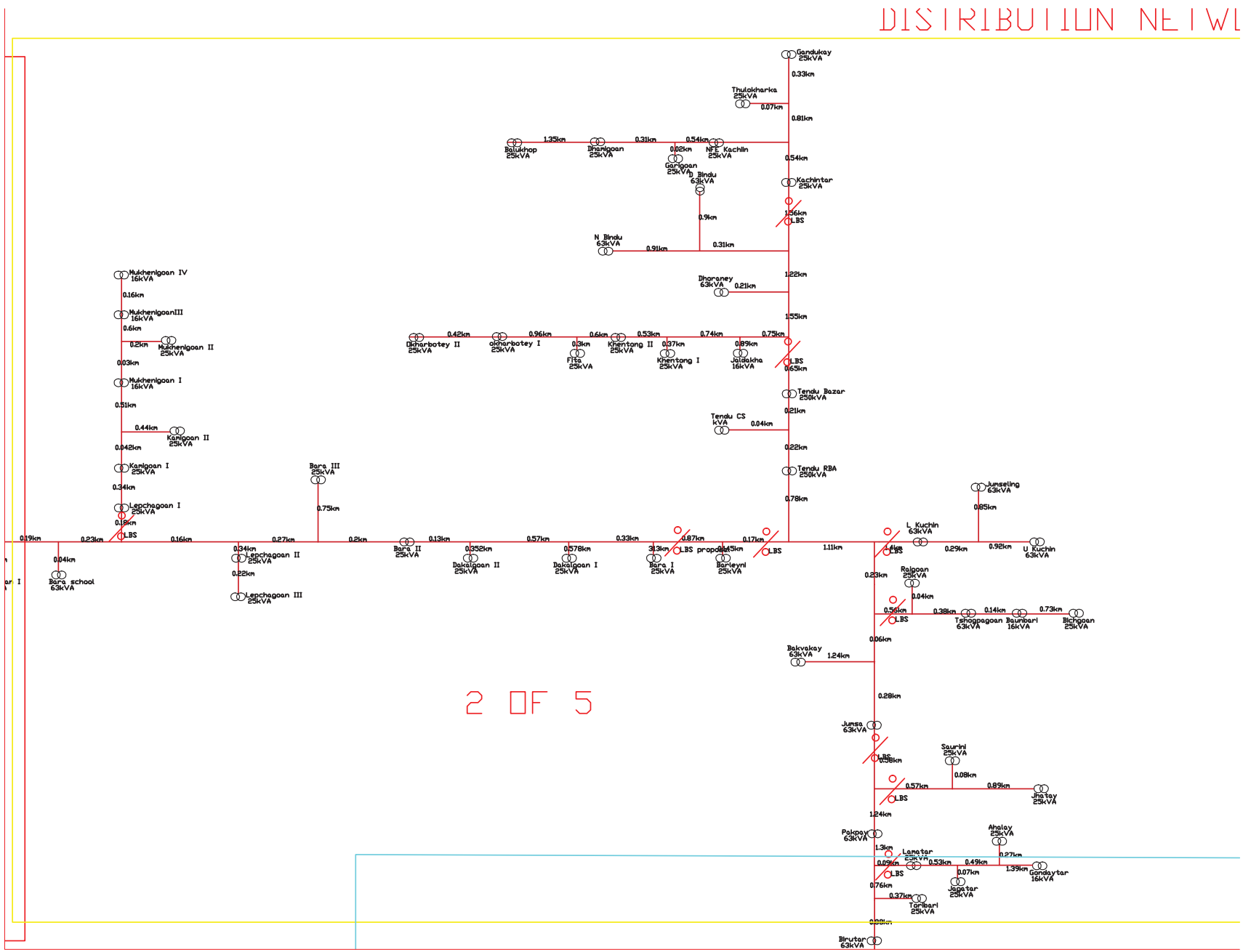

Lajab D
16kVA
0.955km
Lajab C
16kVA
0.775km
Lajab B
25kVA
0.68km
Lajab A
25kVA
0.057km
LBS proposal
0.5km
Ramtey C
25kVA
0.148km
Ramtey B
25kVA
0.376km
Khenpagoan A
16kVA
0.246km
Thamdara
16kVA
0.136km
Khenpagoan B
16kVA
0.455km
1.053km
LBS
0.647km
Ramtey A
10kVA
0.245km
1.039km
Menekha
25kVA
1.122km
LBS
0.727km
LBS
0.478km
ESD PLING
0.201km
Tapa A
63kVA
1.315km
0.028km
Tapa B
16kVA
1.08km
Bumlakha
16kVA
0.419km
Garigaon B
16kVA
0.171km
0.88km
0.262km
0.673km
Garigaon C
16kVA
0.26km
L Menekha
25kVA
0.208km
0.812km
0.285km
Garigaon A
16kVA
0.666km
Rameydara
16kVA
0.033km
0.595km
BHU area
25kVA
0.197km
0.332km
0.309km
ORC area
25kVA
0.566
LBS proposal
0.853km
Muktendara
16kVA
Buka A Top
25kVA
0.196km
0.326km
0.755km
0.061km
0.823km
0.493km
0.199km
0.623km
L Daetey
16kVA
U Daetey
16kVA
Tshappadara
16kVA
Buka D
10kVA
Buka C
16kVA
Buka
25kV
0.658km
Khenpagoan C
16kVA
0.128km
0.12km
Khenpagoan D
16kVA
0.63km
0.156km
Panbari Daragaon
25kVA
LBS proposal
0.961km
0.208km
0.794km
Malbasey
25kVA
0.109km
0.602km
Panbari BHU
63kVA
Panbari(Dakhan)
25kVA
0.081km
0.747km
L Panbari
25kVA
0.517km
L Sisney
16kVA
1.08km
Thakrey
16kVA
1.334km
U Nindulakha
16kVA
Daragaon A
25kVA
0.247km
0.195km
L Daragaon
25kVA
0.623km
M Daragaon
25kVA
0.713km
U Daragaon
25kVA
0.607km
LBS proposal
0.948km
2.028km
0.265km
0.482km
0.033km
0.56km
0.579km
LBS
0.986km
0.058km
LBS
0.375km
1.578km
0.145km
1.212km
1.01km
0.714km
L Nindulakha
16kVA
0.036km
Panbari
63kVA
0.977km
LBS proposal
Balukorey
10kVA
0.493km
Kholmeydara
16kVA
0.159km
Toribari
63kVA
U Panbari
25kVA
0.442km
U Thotney I
25kVA
U Thoney II
10kVA
U Sisney I
10kVA
U Sisney II
25kVA
U Sisney III
10kVA

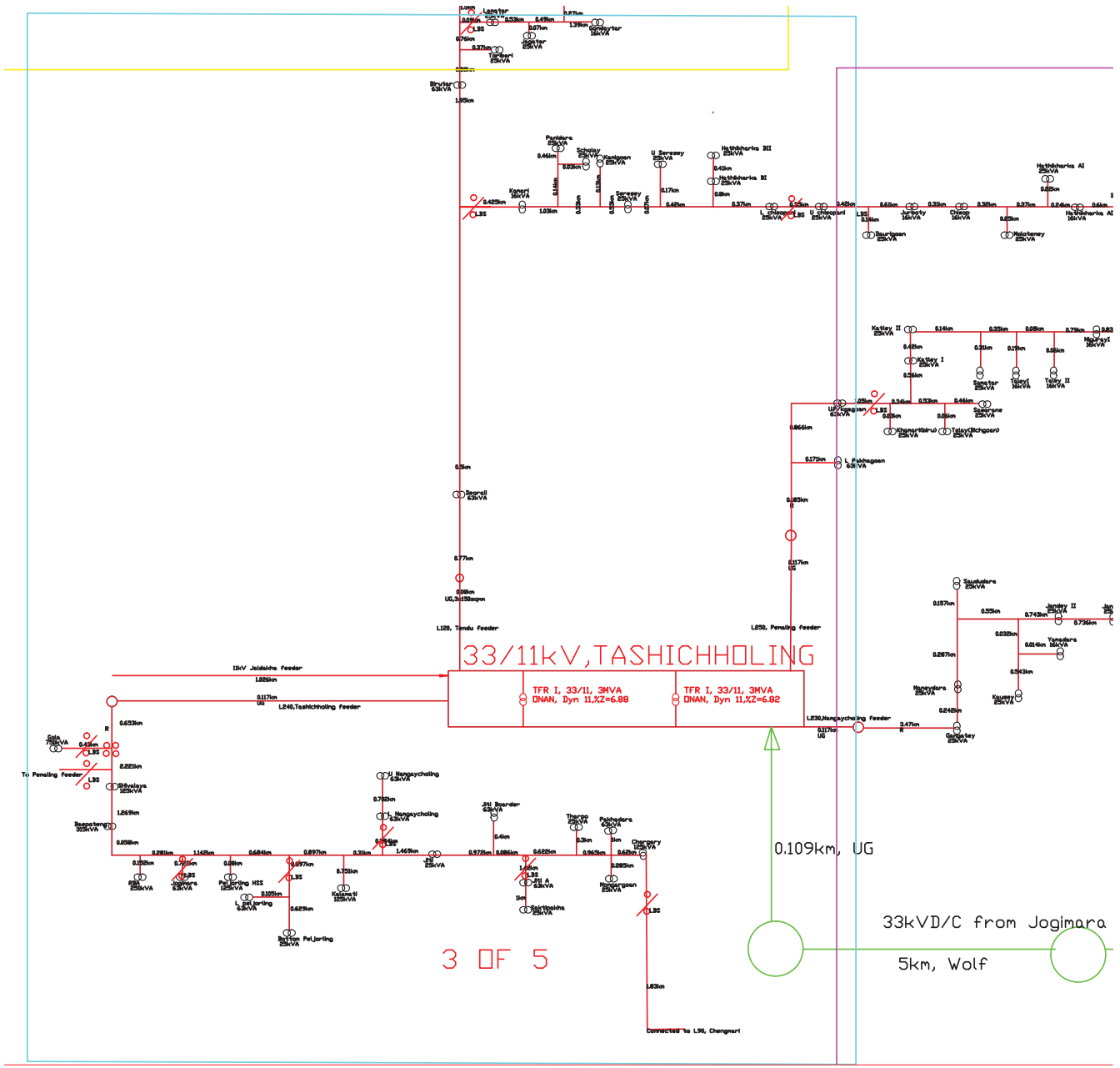
4 OF 4

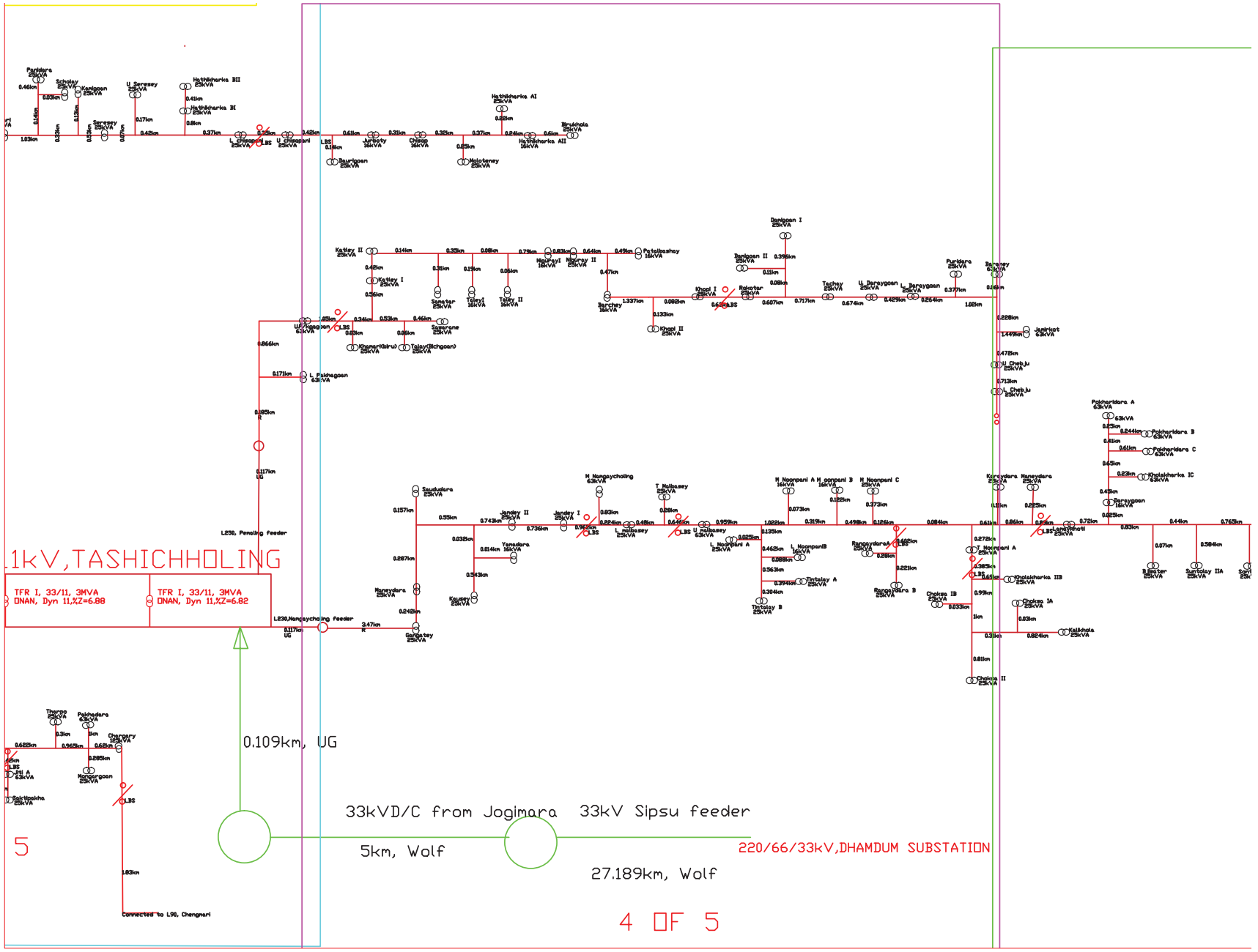

DISTRIBUTION NETWORK OF 33/11kV TRASHICHOLING SS
1 OF 5
2 OF 5
33/11kV,TASHICHHOLING
3 OF 5
0.109km, UG
33kVD/C from Jogmara 33kV Sipsu feeder
5km, Wolf
27.189km, Wolf
220/66/33kV,DHAMDUM SUBSTATION
4 OF 5
5 OF 5

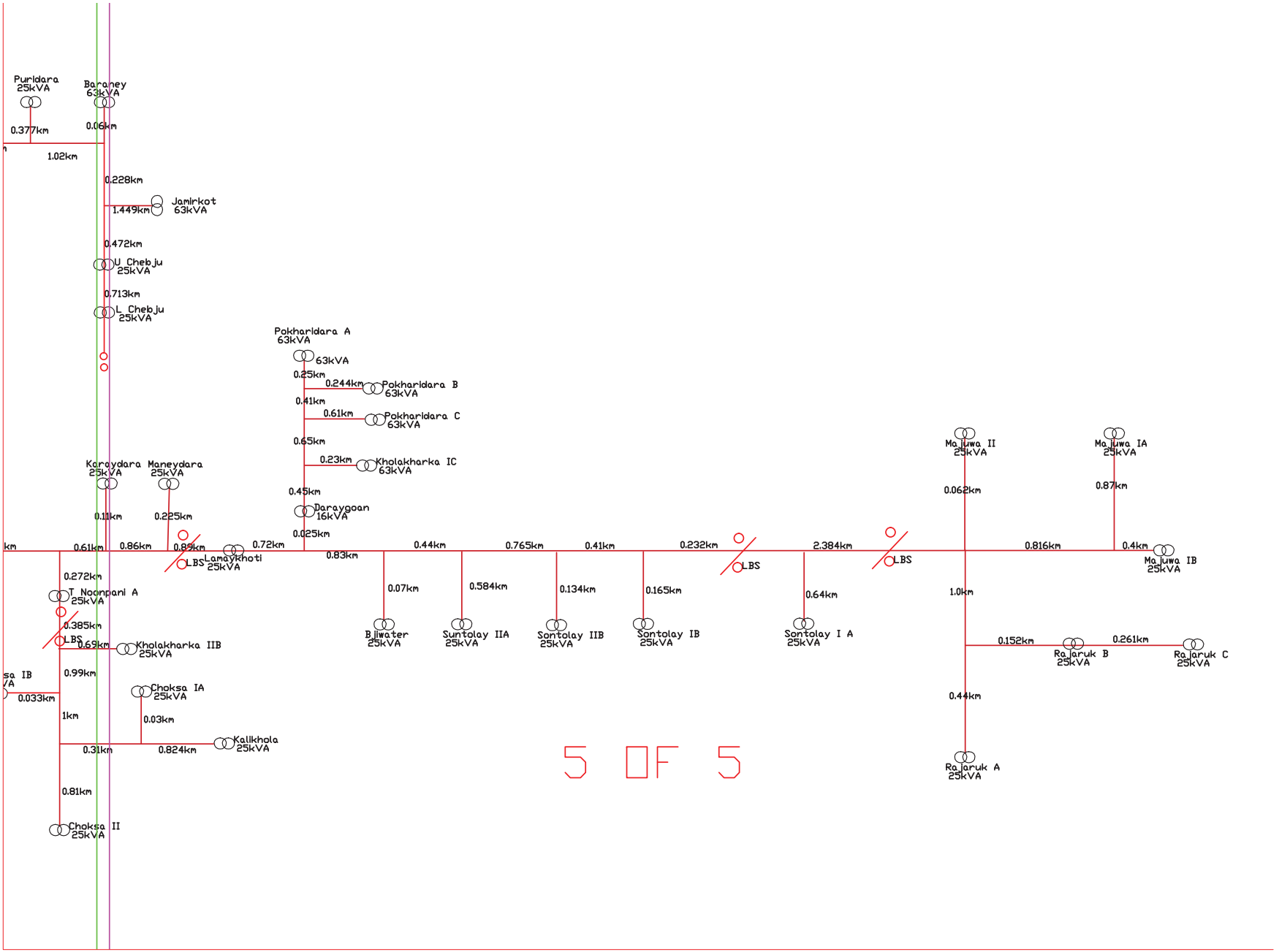

Autarigaan B
25kVA
0.22km
Autarigaan A
25kVA
0.83km
Gandaygaan, Changju
25kVA
0.09km
0.78km
0.66km
Baradara B
25kVA
Baradara A
25kVA
0.43km
0.29km
0.56km
Dukpagaan
25kVA
Changju RBA
16kVA
0.36km
Changju
25kVA
1.01km
Nayak B
25kVA
0.26km
Thikha B
25kVA
0.93km
L. Betini
25kVA
0.07km
Thika
25kVA
0.71km
Halhaney
16kVA
0.89km
Betani I
25kVA
0.22km
0.56km
Lakshay
16kVA
0.44km
Harkatey
25kVA
0.53km
Daragaan(Fenchi)
25kVA
0.05km
Fenchigaan
25kVA
2.52km
0.13km
Nayak A
25kVA
1.13km
Thikha A
25kVA
0.2km
0.78km
0.76km
M. Betini
25kVA
0.53km
0.94km
LBS
Gandaygaan II
25kVA
0.55km
Gandaygaan I
25kVA
0.1km
0.71km
0.17km
Bichgaan III
25kVA
0.11km
0.03km
Bichgaan II
25kVA
0.46km
LBS
0.13k
Bichg
25kV
Langtam C
25kVA
0.42km
Langtam B
25kVA
0.35km
1.32km
Langtam
16kVA
0.355km
0.62km
LBS
0.29km
Dubay I
16kVA
1.04km
Dubay II
25kVA
1.99km
Mahuwa A
25kVA
1km
Mahuwa B
25kVA
0.57km
LBS
0.02km
Gempang A
16kVA
0.52km
Gempang B
25kVA
0.46km
0.08km
Gempang C
25kVA
0.69km
Gempang (Chungu)
25kVA

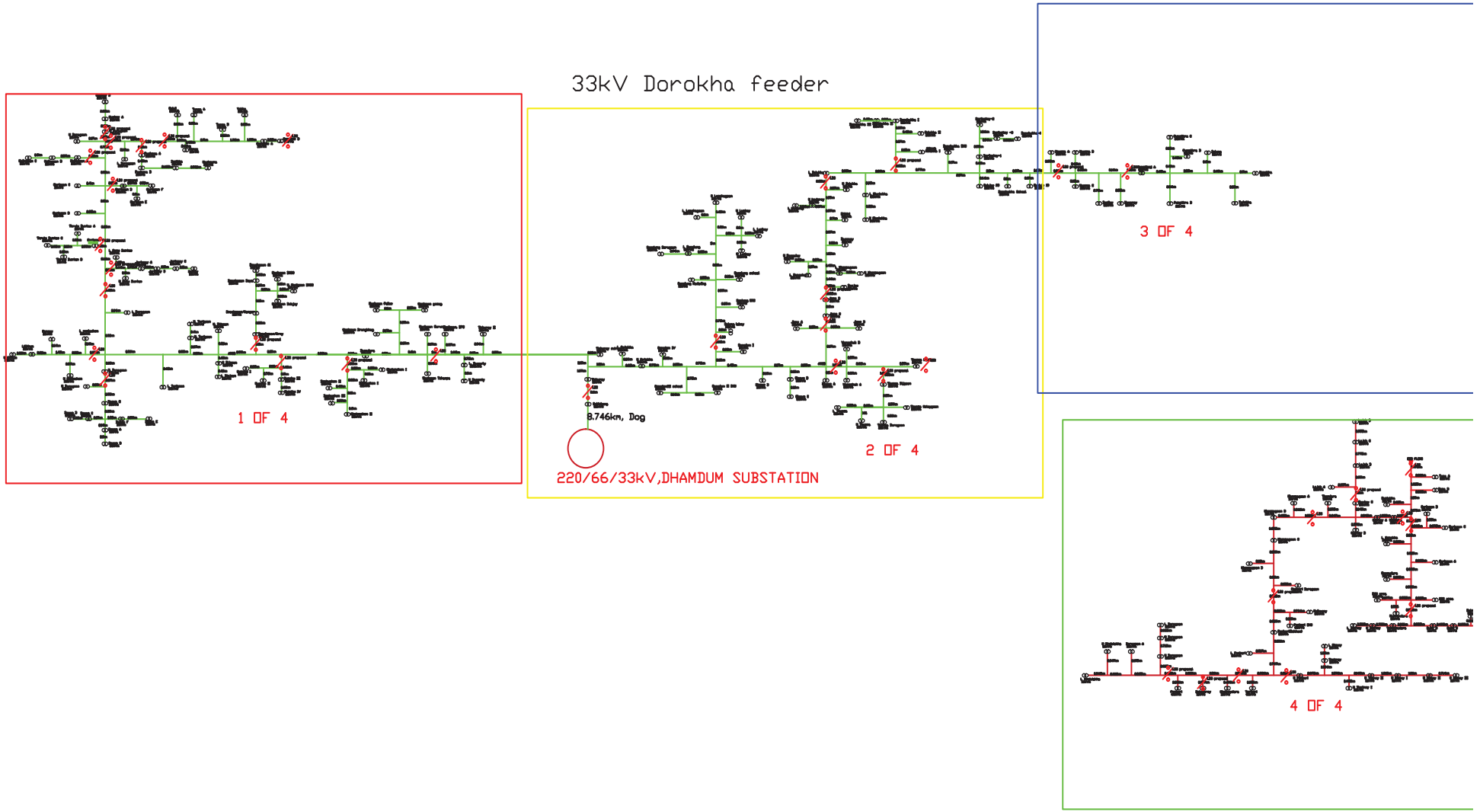
1 OF 5

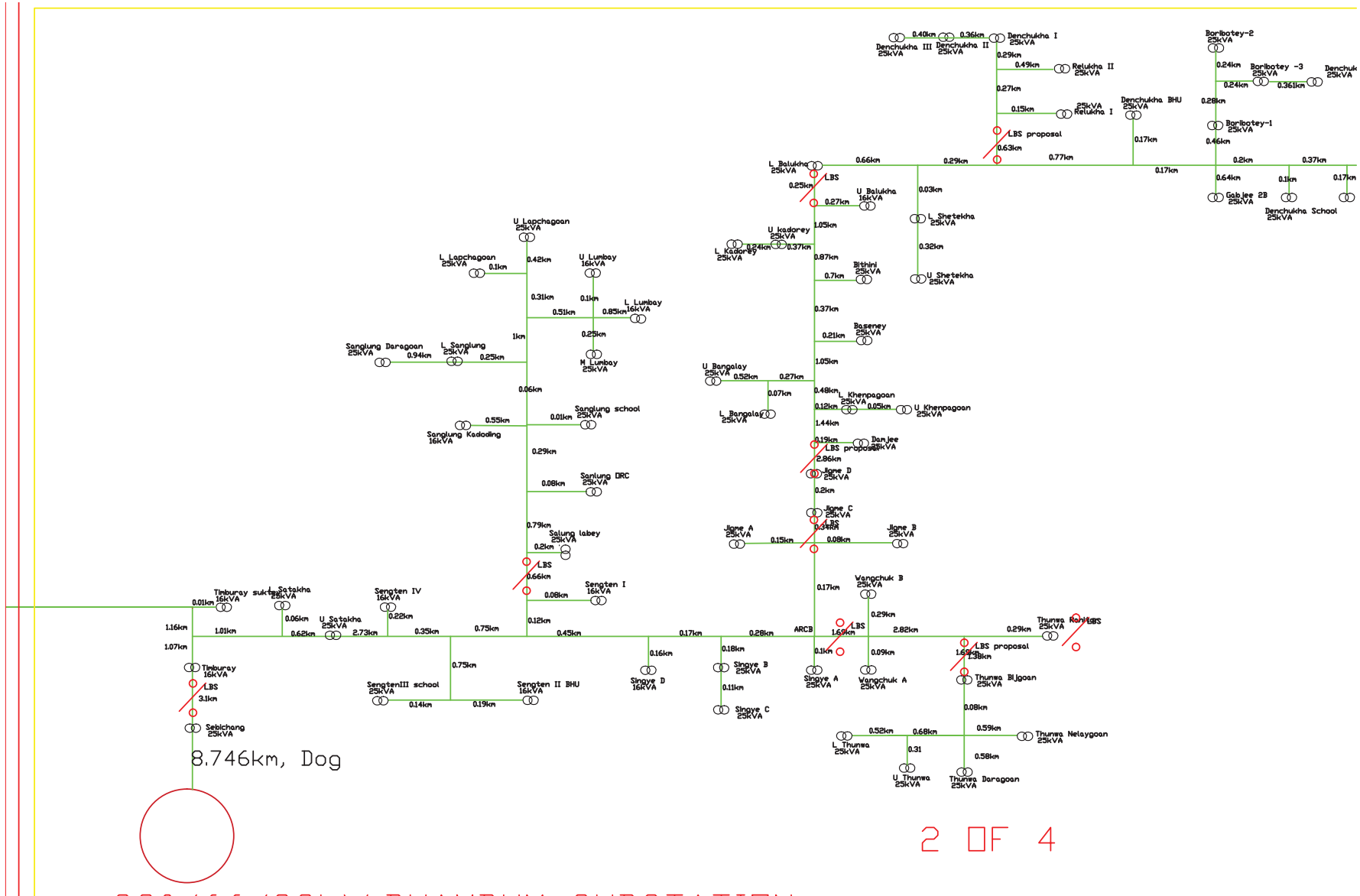

DISTRIBUTION NETWORK
Gandukay 25kVA
0.33km
Thulokharka 25kVA
0.07km
0.81km
Balukhop 25kVA
1.35km
Dharnigaon 25kVA
0.31km
0.54km
NFE Kachlin 25kVA
0.02km
Garigaon 25kVA
0.54km
Kachintar 25kVA
N Bindu 63kVA
0.9km
1.56km
LBS
N Bindu 63kVA
0.91km
0.31km
1.22km
Dharaney 63kVA
0.21km
1.55km
Mukhenigaon IV 16kVA
0.16km
MukhenigaonIII 16kVA
0.6km
0.2km
Mukhenigaon II 25kVA
0.03km
Mukhenigaon I 16kVA
0.51km
0.44km
Kanigaon II 25kVA
0.042km
Kanigaon I 25kVA
0.34km
Lepchagaon I 25kVA
0.18km
LBS
0.19km
0.23km
0.04km
Bara school 63kVA
0.16km
0.34km
Lepchagaon II 25kVA
0.22km
Lepchagaon III 25kVA
0.27km
Bara III 25kVA
0.75km
0.2km
Bara II 25kVA
0.13km
0.352km
Dakalgaon II 25kVA
0.57km
0.578km
Dakalgaon I 25kVA
0.33km
0.87km
LBS
Bara I 25kVA
propakat
0.45km
Barleyni 25kVA
0.17km
LBS
1.11km
0.42km
Okharbotey II 25kVA
0.96km
okharbotey I 25kVA
0.6km
0.3km
Fita 25kVA
0.53km
Khentong II 25kVA
0.37km
Khentong I 25kVA
0.74km
0.89km
Jalakakha 16kVA
0.75km
LBS
0.65km
Tendu Bazar 250kVA
0.21km
Tendu CS kVA
0.04km
0.22km
Tendu RBA 250kVA
0.78km
L Kuchin 63kVA
LBS
Jumseling 63kVA
0.85km
0.29km
0.92km
U Kuchin 63kVA
Raigaon 25kVA
0.23km
0.04km
0.56km
LBS
0.38km
Tshogpagaon 63kVA
0.14km
Baunbari 16kVA
0.73km
Bichagaon 25kVA
0.06km
Bakvskay 63kVA
1.24km
0.28km
Jumsa 63kVA
LBS
0.098km
Saurini 25kVA
0.08km
0.57km
LBS
0.89km
Jhatay 25kVA
1.24km
Pakpay 63kVA
1.3km
Ahalay 25kVA
0.27km
Lanatar 25kVA
0.09km
0.53km
0.49km
1.39km
Gandaytar 16kVA
LBS
0.07km
Jagatar 25kVA
0.76km
0.37km
Tarlbari 25kVA
Birutar 63kVA
2 OF 5

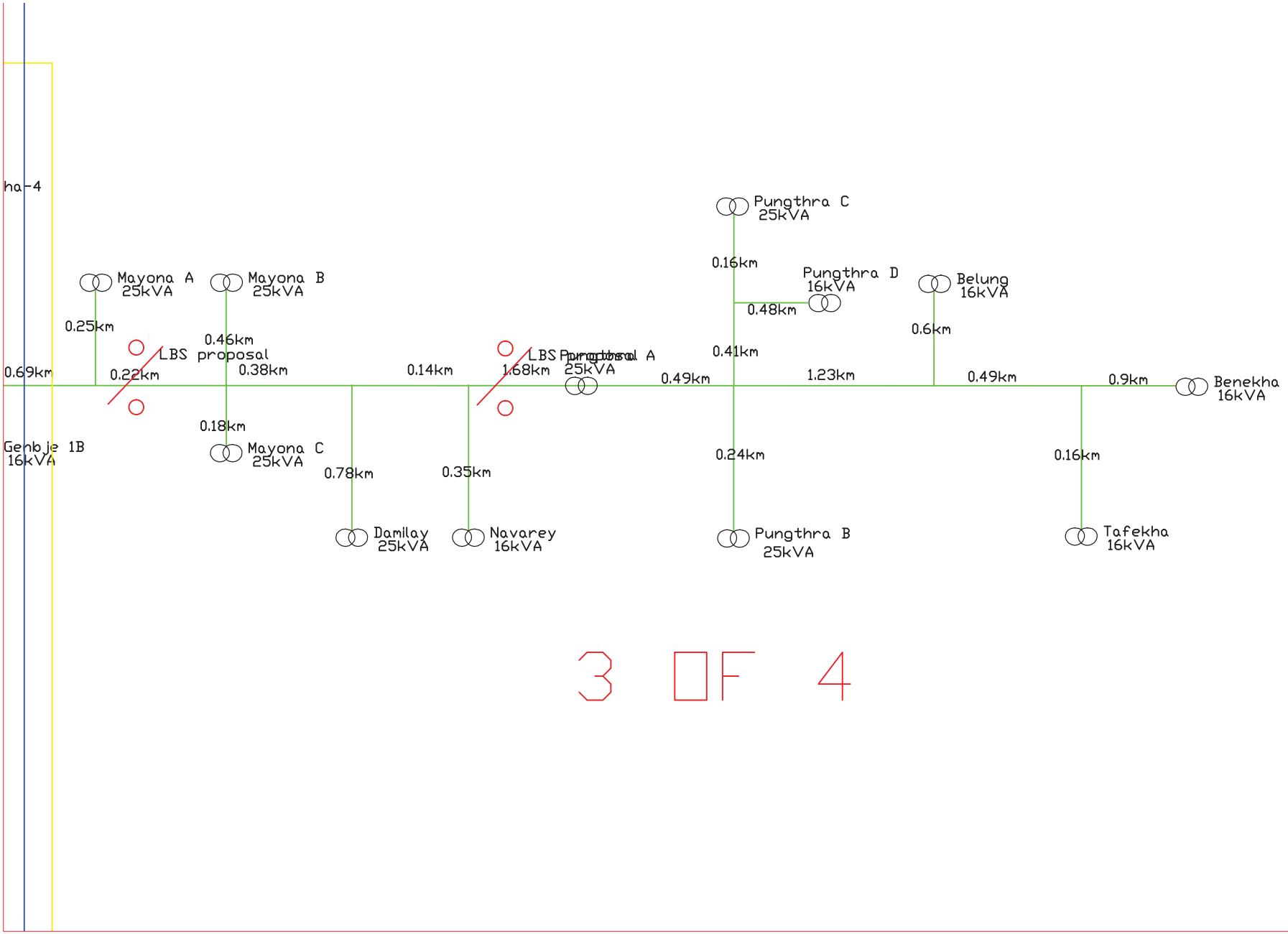

33/11kV,TASHICHHOLING
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.88
TFR I, 33/11, 3MVA
DNAN, Dyn 11,%Z=6.82
11kV Jaldakha feeder
L240,Tashichholing Feeder
L230,Mangaychoing Feeder
L126, Tsmdu Feeder
L250, Penaling Feeder
To Penaling Feeder
0.109km, UG
33kVD/C from Jogimara
5km, Wolf
3 OF 5


1kV,TASHICHHOLING
TFR I, 33/11, 3MVA
ONAN, Dyn 11,%Z=6.88
TFR I, 33/11, 3MVA
ONAN, Dyn 11,%Z=6.82
L230, Penaling Feeder
L230,Nangaycholing Feeder
0.109km, UG
33kVD/C from Jogimara 33kV Sipsu feeder
5km, Wolf
27.189km, Wolf
220/66/33kV,DHAMDUM SUBSTATION
Connected to L90, Chengmari
5
4 OF 5

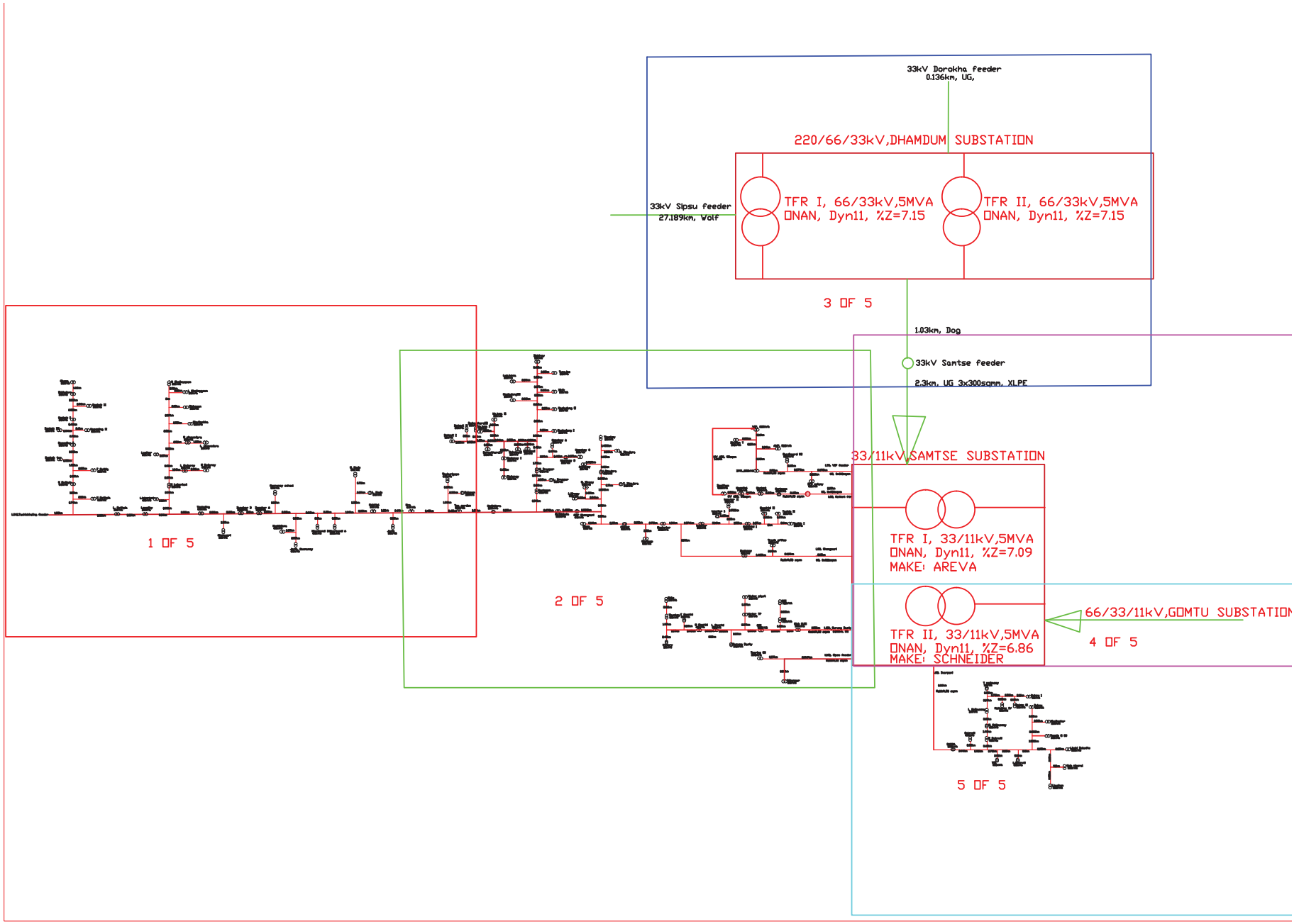

Puridara
25kVA
Baraney
63kVA
0.377km
0.06km
1.02km
0.228km
Jamirkot
63kVA
1.449km
0.472km
U_Chebju
25kVA
0.713km
L_Chebju
25kVA
Pokharidara A
63kVA
63kVA
0.25km
0.244km
Pokharidara B
63kVA
0.41km
0.61km
Pokharidara C
63kVA
0.65km
0.23km
Kholakharka IC
63kVA
0.45km
Paraygoan
16kVA
0.025km
Karaydara
25kVA
Maneydara
25kVA
0.11km
0.225km
km
0.61km
0.86km
0.89km
LBS
Lamaykhoti
25kVA
0.72km
0.83km
0.44km
0.765km
0.41km
0.232km
LBS
2.384km
LBS
Majuwa II
25kVA
Majuwa IA
25kVA
0.062km
0.87km
0.816km
0.4km
Majuwa IB
25kVA
0.272km
T_Noonpani A
25kVA
0.385km
LBS
0.69km
Kholakharka IIB
25kVA
0.07km
Bijwater
25kVA
0.584km
Suntolay IIA
25kVA
0.134km
Santolay IIB
25kVA
0.165km
Santolay IB
25kVA
0.64km
Santolay I A
25kVA
1.0km
0.152km
Rajaruk B
25kVA
0.261km
Rajaruk C
25kVA
sa IB
/A
0.033km
0.99km
Chaksa IA
25kVA
0.03km
1km
0.31km
0.824km
Kalikhola
25kVA
0.44km
Rajaruk A
25kVA
0.81km
Chaksa II
25kVA
5 OF 5

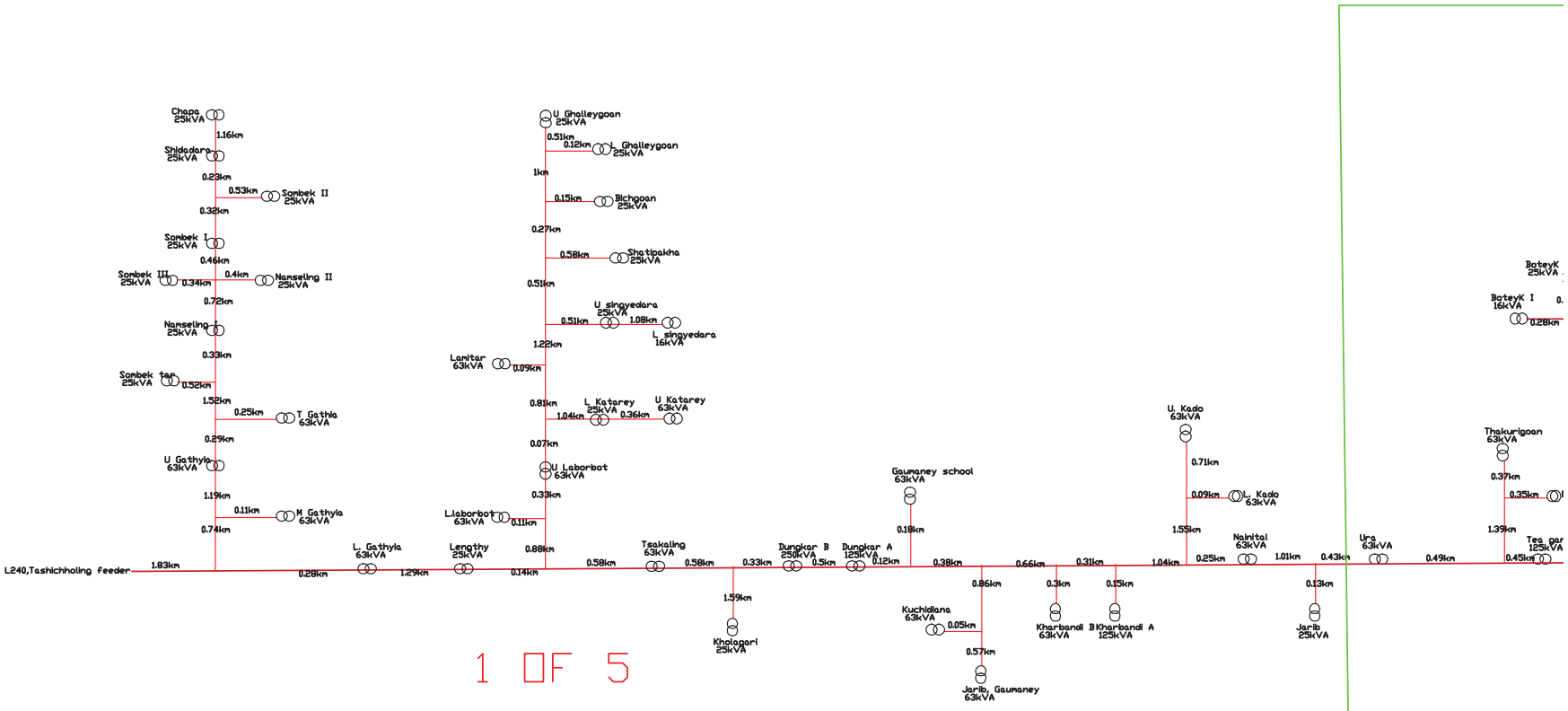

33kV Dorokha feeder
1 OF 4
2 OF 4
3 OF 4
4 OF 4
8.746km, Dog
220/66/33kV,DHAMDUM SUBSTATION

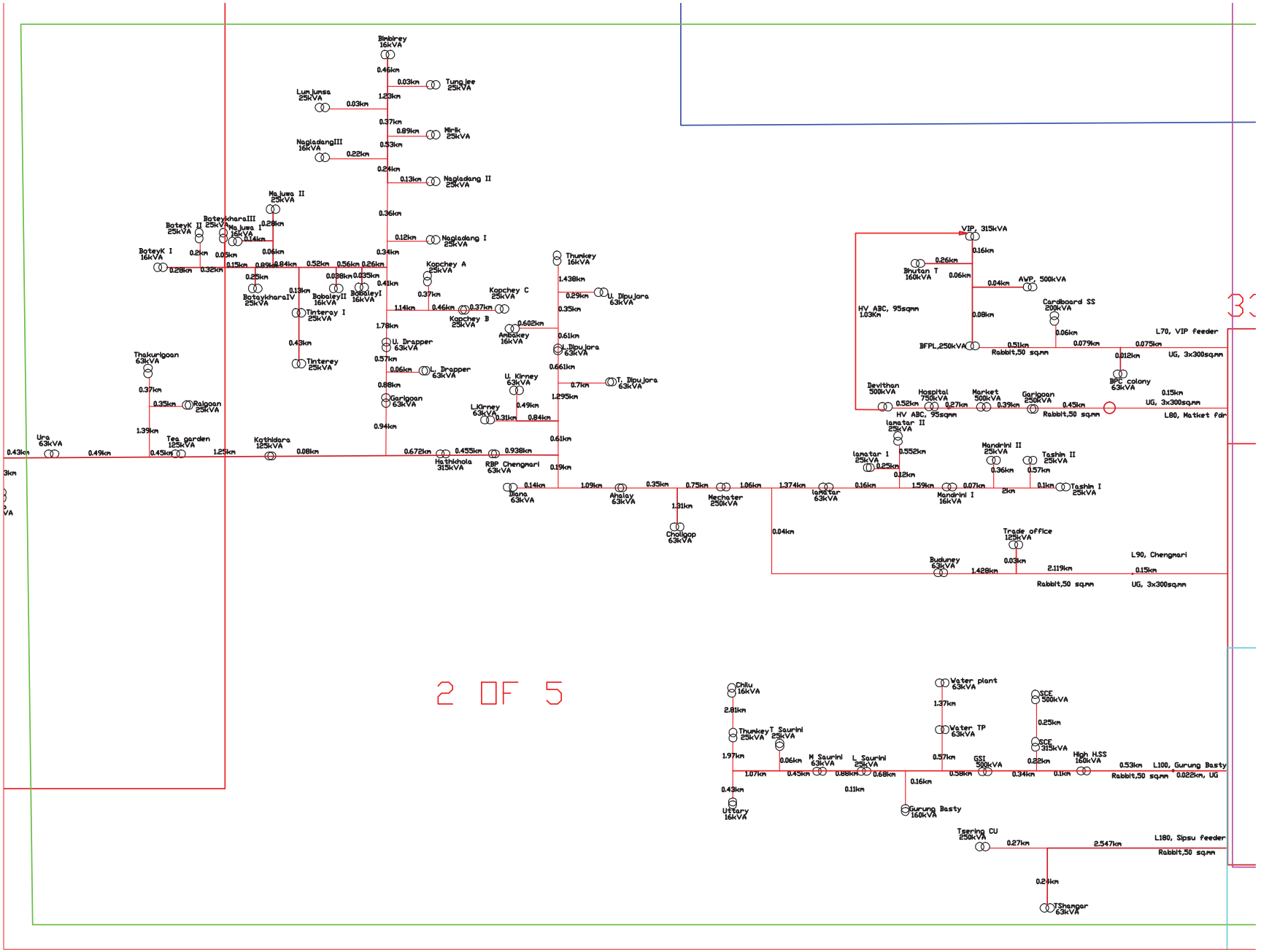

Denchukha III 25kVA
0.40km
Denchukha II 25kVA
0.36km
Denchukha I 25kVA
0.29km
0.49km
Relukha II 25kVA
0.27km
0.15km
25kVA Relukha I
Denchukha BHU 25kVA
0.17km
LBS proposal
0.63km
0.77km
Baribatey-2 25kVA
0.24km
Baribatey -3 25kVA
0.24km
0.361km
Denchuk 25kVA
0.28km
Baribatey-1 25kVA
0.46km
0.64km
Gabjee 2B 25kVA
0.1km
0.17km
Denchukha School 25kVA
0.2km
0.37km
L_Balukha 25kVA
0.66km
0.29km
LBS
0.25km
U_Balukha 16kVA
0.27km
0.03km
L_Shetekha 25kVA
0.32km
U_Shetekha 25kVA
1.05km
U_kadorey 25kVA
L_Kadorey 25kVA
0.24km
0.37km
0.87km
0.7km
Bithini 25kVA
0.37km
Baseney 25kVA
0.21km
1.05km
U_Bangalay 25kVA
0.52km
0.27km
0.07km
L_Bangalay 25kVA
0.48km
L_Khenpagoan 25kVA
0.12km
0.05km
U_Khenpagoan 25kVA
1.44km
0.19km
Danjee 25kVA
LBS proposal
2.86km
Jigme D 25kVA
0.2km
Jigme C 25kVA
LBS
0.34km
Jigme A 25kVA
0.15km
Jigme B 25kVA
0.08km
0.17km
Wangchuk B 25kVA
0.29km
LBS
1.69km
2.82km
0.29km
Thunwa 25kVA
Rahtse
LBS
LBS proposal
1.69km
1.38km
Thunwa Bijgoan 25kVA
0.08km
0.18km
Singye B 25kVA
0.11km
Singye C 25kVA
0.1km
Singye A 25kVA
Wangchuk A 25kVA
0.52km
0.68km
0.59km
Thunwa Nelaygoan 25kVA
L_Thunwa 25kVA
0.31
0.58km
U_Thunwa 25kVA
Thunwa Daragoan 25kVA
U_Lapchagoan 25kVA
L_Lapchagoan 25kVA
0.1km
0.42km
U_Lumbay 16kVA
0.31km
0.51km
0.1km
L_Lumbay 16kVA
0.85km
1km
0.25km
M_Lumbay 25kVA
Sanglung Daragoan 25kVA
0.94km
L_Sanglung 25kVA
0.25km
0.06km
Sanglung school 25kVA
0.01km
0.55km
Sanglung Kadoding 16kVA
0.29km
Santung DRC 25kVA
0.08km
0.79km
Salung labey 25kVA
0.2km
LBS
0.66km
Sengten I 16kVA
0.08km
0.12km
0.45km
0.17km
0.28km
ARCB
0.1km
0.16km
Singye D 16kVA
Timburay sukteng 16kVA
0.01km
L_Satakha 25kVA
0.06km
0.62km
U_Satakha 25kVA
2.73km
Sengten IV 16kVA
0.22km
0.35km
0.75km
1.16km
1.01km
1.07km
Timburay 16kVA
LBS
3.1km
Sebicheng 25kVA
SengtenIII school 25kVA
0.14km
0.75km
0.19km
Sengten II BHU 16kVA
8.746km, Dog
2 OF 4
220/66/33kV,DHAMDUM SUBSTATION

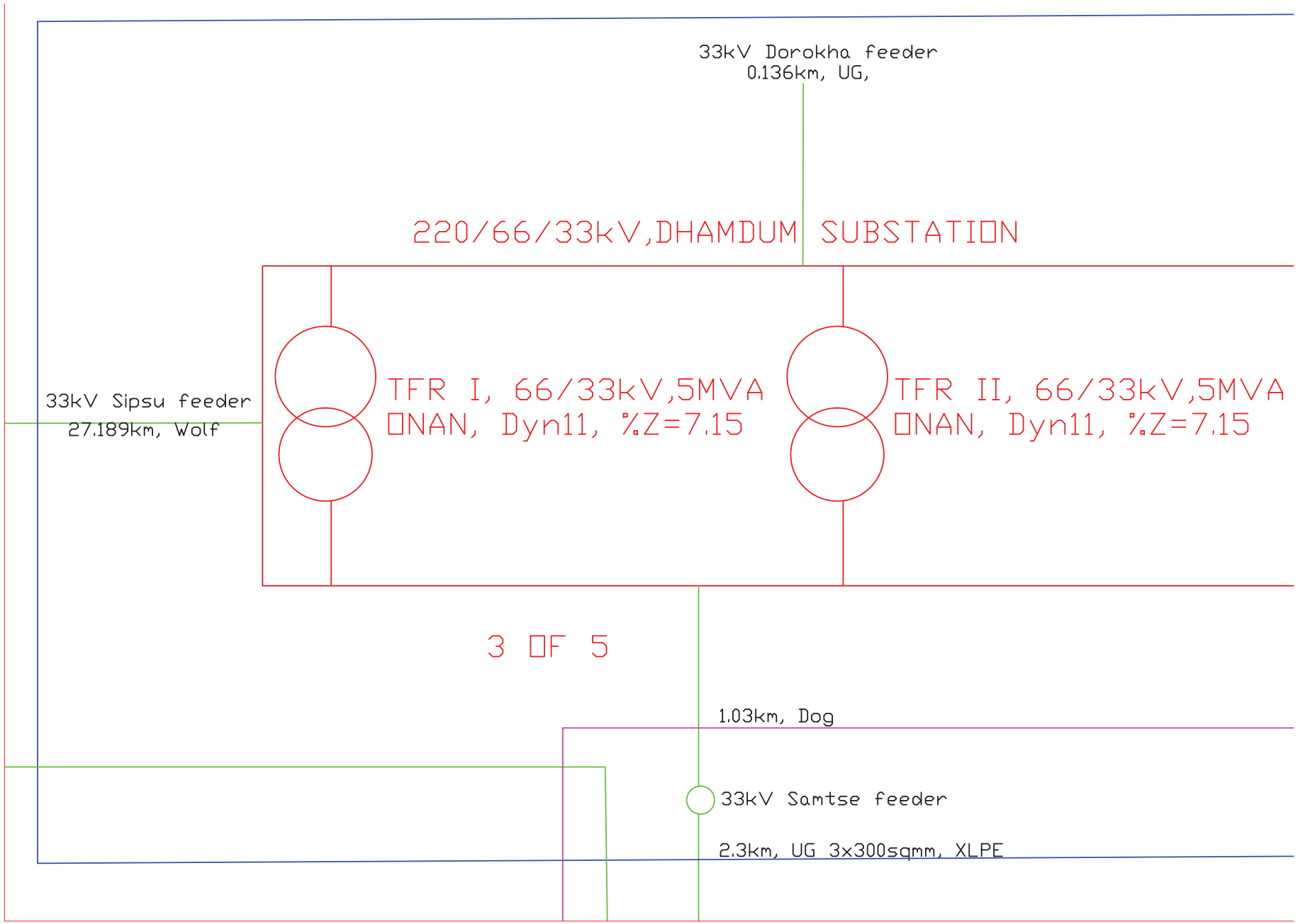

ha-4
Mayona A
25kVA
Mayona B
25kVA
Pungthra C
25kVA
Pungthra D
16kVA
Belung
16kVA
0.25km
0.46km
0.16km
0.48km
0.6km
LBS proposal
0.41km
0.69km
0.22km
0.38km
0.14km
1.68km
0.49km
1.23km
0.49km
0.9km
Benekha
16kVA
0.18km
Genbje 1B
16kVA
Mayona C
25kVA
0.78km
0.35km
0.24km
0.16km
Damilay
25kVA
Navarey
16kVA
Pungthra B
25kVA
Tafekha
16kVA

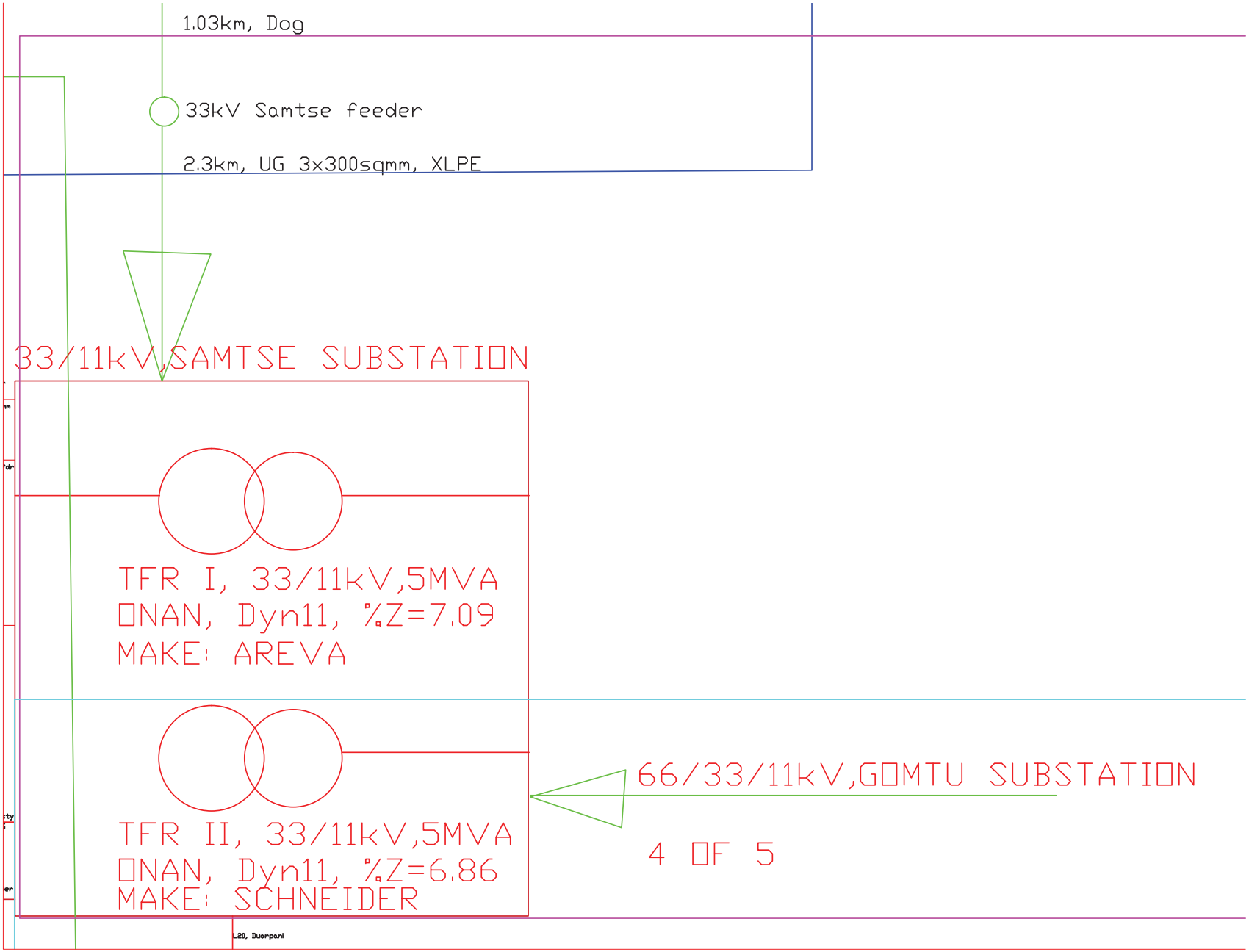
3 OF 4


33kV Dorokha feeder
0.136km, UG,
220/66/33kV,DHAMDUM SUBSTATION
33kV Sipsu feeder
27.189km, Wolf
TFR I, 66/33kV,5MVA
ONAN, Dyn11, %Z=7.15
TFR II, 66/33kV,5MVA
ONAN, Dyn11, %Z=7.15
3 OF 5
1.03km, Dog
33kV Samtse feeder
2.3km, UG 3x300sqmm, XLPE
33/11kV,SAMTSE SUBSTATION
TFR I, 33/11kV,5MVA
ONAN, Dyn11, %Z=7.09
MAKE: AREVA
TFR II, 33/11kV,5MVA
ONAN, Dyn11, %Z=6.86
MAKE: SCHNEIDER
66/33/11kV,GOMTU SUBSTATION
4 OF 5
1 OF 5
2 OF 5
5 OF 5


L240,Tashichholing feeder
1.83km
Chapa 25kVA
1.16km
Shidadara 25kVA
0.23km
0.53km
Sonbek II 25kVA
0.32km
Sonbek I 25kVA
0.46km
Sonbek III 25kVA
0.34km
0.4km
Namseling II 25kVA
0.72km
Namseling I 25kVA
0.33km
Sonbek tap 25kVA
0.52km
1.52km
0.25km
T Gathla 63kVA
0.29km
U Gathyla 63kVA
1.19km
0.11km
M Gathyla 63kVA
0.74km
0.28km
L Gathyla 63kVA
1.29km
Lengthy 25kVA
0.14km
U Ghalleygoan 25kVA
0.51km
0.12km
L Ghalleygoan 25kVA
1km
0.15km
Bichoogan 25kVA
0.27km
0.58km
Shatipakha 25kVA
0.51km
U singyedara 25kVA
0.51km
1.08km
L singyedara 16kVA
1.22km
Lamitar 63kVA
0.09km
0.81km
L Katarey 25kVA
1.04km
0.36km
U Katarey 63kVA
0.07km
U Laborbot 63kVA
0.33km
Llaborbot 63kVA
0.11km
0.88km
Tsakaling 63kVA
0.58km
0.58km
0.33km
1.59km
Khologari 25kVA
Dungkar B 250kVA
0.5km
Dungkar A 125kVA
0.12km
Gaumaney school 63kVA
0.18km
0.38km
0.66km
0.86km
Kuchidlana 63kVA
0.05km
0.57km
Jarib Gaumaney 63kVA
0.3km
Kharbandi B 63kVA
0.15km
Kharbandi A 125kVA
0.31km
U Kado 63kVA
0.71km
0.09km
L Kado 63kVA
1.55km
1.04km
0.25km
Nainital 63kVA
1.01km
0.13km
Jarib 25kVA
0.43km
Ura 63kVA
0.49km
Thakurigoan 63kVA
0.37km
0.35km
1.39km
0.45km
BateyK 25kVA
BateyK I 16kVA
0.28km
1 OF 5


Binbirey
16kVA
0.46km
0.03km
Tungjee
25kVA
Lumjunsa
25kVA
0.03km
1.23km
0.37km
0.89km
Mirik
25kVA
NagladangIII
16kVA
0.22km
0.53km
0.24km
0.13km
Nagladang II
25kVA
Majuwa II
25kVA
0.36km
BoteyKharaIII
25kVA
0.28km
BoteyK II
25kVA
Majuwa I
16kVA
0.14km
0.12km
Nagladang I
25kVA
BoteyK I
16kVA
0.2km
0.05km
0.06km
0.34km
0.28km
0.32km
0.15km
0.89km
0.84km
0.52km
0.56km
0.26km
0.25km
0.038km
0.035km
0.41km
Kopchey A
25kVA
0.13km
BoteyKharaIV
25kVA
BabaleyII
16kVA
BabaleyI
16kVA
0.37km
Kopchey C
25kVA
Thunkey
16kVA
1.438km
0.29km
U. Dipujara
63kVA
Tinteray I
25kVA
1.14km
0.46km
0.37km
0.35km
Kopchey B
25kVA
1.78km
0.602km
Ambakey
16kVA
0.61km
L.Dipujara
63kVA
0.43km
U. Dropper
63kVA
0.57km
Tinterey
25kVA
0.06km
L. Dropper
63kVA
0.661km
0.7km
T. Dipujara
63kVA
Thakurigaon
63kVA
U. Kirney
63kVA
0.88km
Garigaon
63kVA
1.295km
L.Kirney
63kVA
0.49km
0.37km
0.31km
0.84km
0.35km
Ralgoon
25kVA
0.94km
0.61km
1.39km
Ura
63kVA
0.43km
0.49km
Tea garden
125kVA
0.45km
1.25km
Kothidara
125kVA
0.08km
0.672km
0.455km
Hathikhola
315kVA
0.938km
RBP Chengmari
63kVA
0.19km
Dhana
63kVA
0.14km
1.09km
Ahalay
63kVA
0.35km
0.75km
Mechater
250kVA
1.06km
1.374km
Iamatar
63kVA
0.16km
1.31km
Challaap
63kVA
0.04km
VIP, 315kVA
0.16km
0.26km
Bhutan T
160kVA
0.06km
0.04km
AVP, 500kVA
HV ABC, 95sqmm
1.03km
Cardboard SS
200kVA
0.08km
0.06km
L70, VIP feeder
BFPL,250kVA
0.51km
Rabbit,50 sq.mm
0.079km
0.075km
UG, 3x300sq.mm
0.012km
BPC colony
63kVA
Devithan
500kVA
Haspital
750kVA
Market
500kVA
Garigaon
250kVA
0.15km
UG, 3x300sq.mm
0.52km
0.27km
0.39km
0.45km
Rabbit,50 sq.mm
L80, Matket fdr
HV ABC, 95sqmm
Iamatar II
25kVA
Iamatar I
25kVA
0.552km
0.25km
0.12km
Mandrini II
25kVA
Tashin II
25kVA
0.36km
0.57km
1.59km
0.07km
2km
0.1km
Tashin I
25kVA
Mandrini I
16kVA
Trade office
125kVA
Bukuney
63kVA
0.03km
1.428km
2.119km
Rabbit,50 sq.mm
L90, Chengmari
0.15km
UG, 3x300sq.mm
2 OF 5
Chilu
16kVA
2.81km
Water plant
63kVA
1.37km
SCE
500kVA
0.25km
Water TP
63kVA
ThunkeyT Saurini
25kVA
1.97km
0.06km
M Saurini
63kVA
L Saurini
25kVA
0.57km
GSI
500kVA
SCE
315kVA
0.22km
High H.SS
160kVA
0.53km
L100, Gurung Basty
Rabbit,50 sq.mm
0.022km, UG
1.07km
0.45km
0.88km
0.68km
0.34km
0.1km
0.58km
0.16km
0.43km
0.11km
Uttary
16kVA
Gurung Basty
160kVA
Tsering CU
250kVA
0.27km
2.547km
L180, Sipsu feeder
Rabbit,50 sq.mm
0.24km
TShangar
63kVA


33kV Dorokha feeder
0.136km, UG,
220/66/33kV,DHAMDUM SUBSTATION
33kV Sipsu feeder
27.189km, Wolf
TFR I, 66/33kV,5MVA
ONAN, Dyn11, %Z=7.15
TFR II, 66/33kV,5MVA
ONAN, Dyn11, %Z=7.15
3 OF 5
1.03km, Dog
33kV Samtse feeder
2.3km, UG 3x300sqmm, XLPE


1.03km, Dog
33kV Samtse feeder
2.3km, UG 3x300sqmm, XLPE
33/11kV,SAMTSE SUBSTATION
TFR I, 33/11kV,5MVA
ONAN, Dyn11, %Z=7.09
MAKE: AREVA
TFR II, 33/11kV,5MVA
ONAN, Dyn11, %Z=6.86
MAKE: SCHNEIDER
66/33/11kV,GOMTU SUBSTATION
4 OF 5

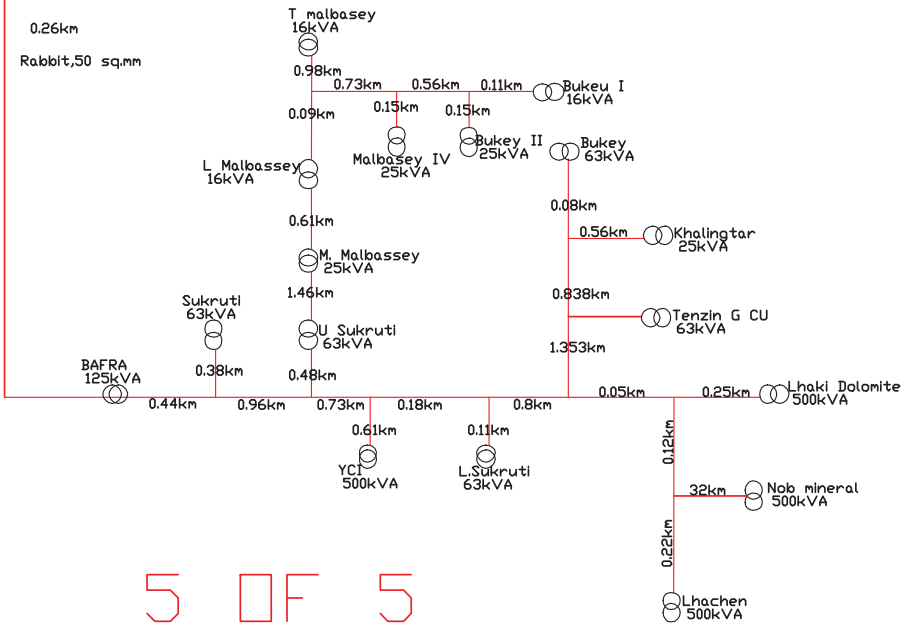
Basty
UG

eeder
mm

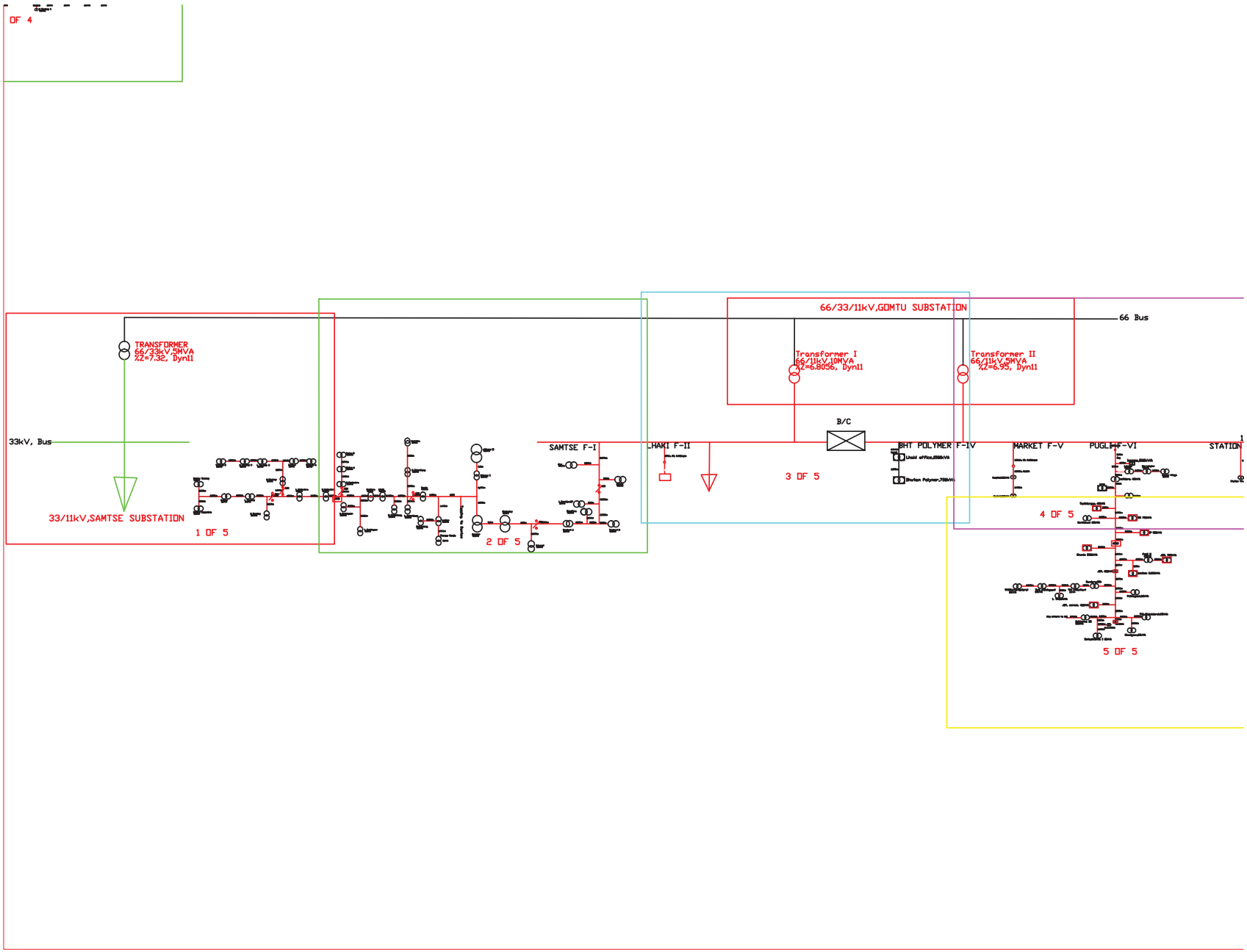
TFR II, 33/11kV,5MVA
ONAN, Dyn11, %Z=6.86
MAKE: SCHNEIDER

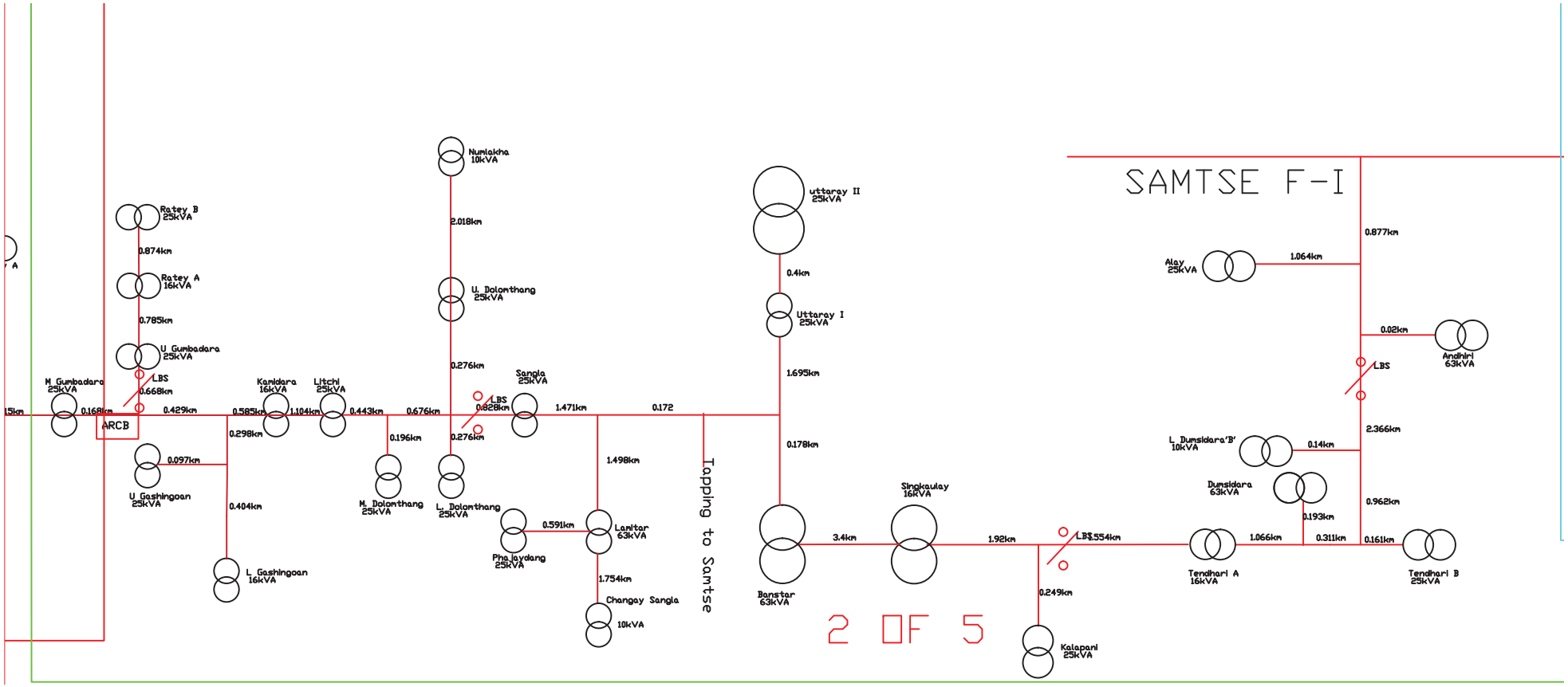
4 OF 5

L20, Duarpani



5 OF 5

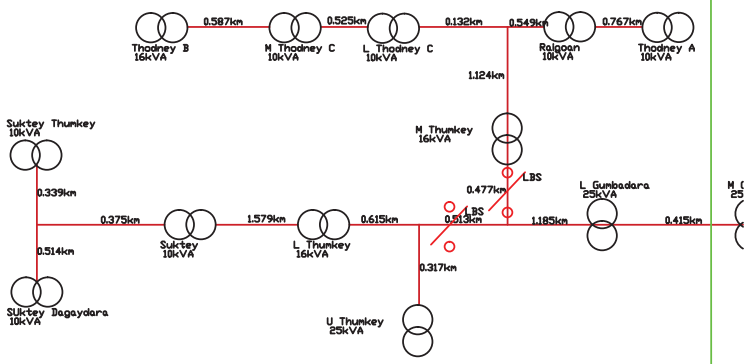

OF 4
66/33/11kV,GOMTU SUBSTATION
66 Bus
TRANSFORMER
66/33kV,5MVA
%Z=7.32, Dyn11
Transformer I
66/11kV,10MVA
%Z=6.8056, Dyn11
Transformer II
66/11kV,5MVA
%Z=6.95, Dyn11
33kV, Bus
B/C
SAMTSE F-I
HAKI F-II
BHT POLYMER F-IV
MARKET F-V
PUGLI F-VI
STATION
33/11kV,SAMTSE SUBSTATION
1 OF 5
2 OF 5
3 OF 5
4 OF 5
5 OF 5


SAMTSE F-I
Ratey B
25kVA
0.874km
Ratey A
16kVA
0.785km
U Gumbadara
25kVA
LBS
0.668km
M Gumbadara
25kVA
0.168km
ARCB
0.429km
0.585km
Kamidara
16kVA
1.104km
Litchi
25kVA
0.443km
0.676km
0.298km
0.097km
U Gashingoan
25kVA
0.404km
L Gashingoan
16kVA
0.196km
M Dolamthang
25kVA
Numlakha
10kVA
2.018km
U Dolamthang
25kVA
0.276km
LBS
0.828km
0.276km
L Dolamthang
25kVA
Sangla
25kVA
1.471km
0.172
1.498km
0.591km
Phajaydang
25kVA
Lamitar
63kVA
1.754km
Changay Sangla
10kVA
Tapping to Samtse
uttaray II
25kVA
0.4km
Uttaray I
25kVA
1.695km
0.178km
Banstar
63kVA
3.4km
Singkaulay
16kVA
1.92km
LBS.554km
0.249km
Kalapani
25kVA
2 OF 5
Alay
25kVA
1.064km
0.877km
0.02km
Andhiri
63kVA
LBS
2.366km
L Dumsidara'B'
10kVA
0.14km
Dumsidara
63kVA
0.193km
0.962km
1.066km
0.311km
0.161km
Tendhari A
16kVA
Tendhari B
25kVA

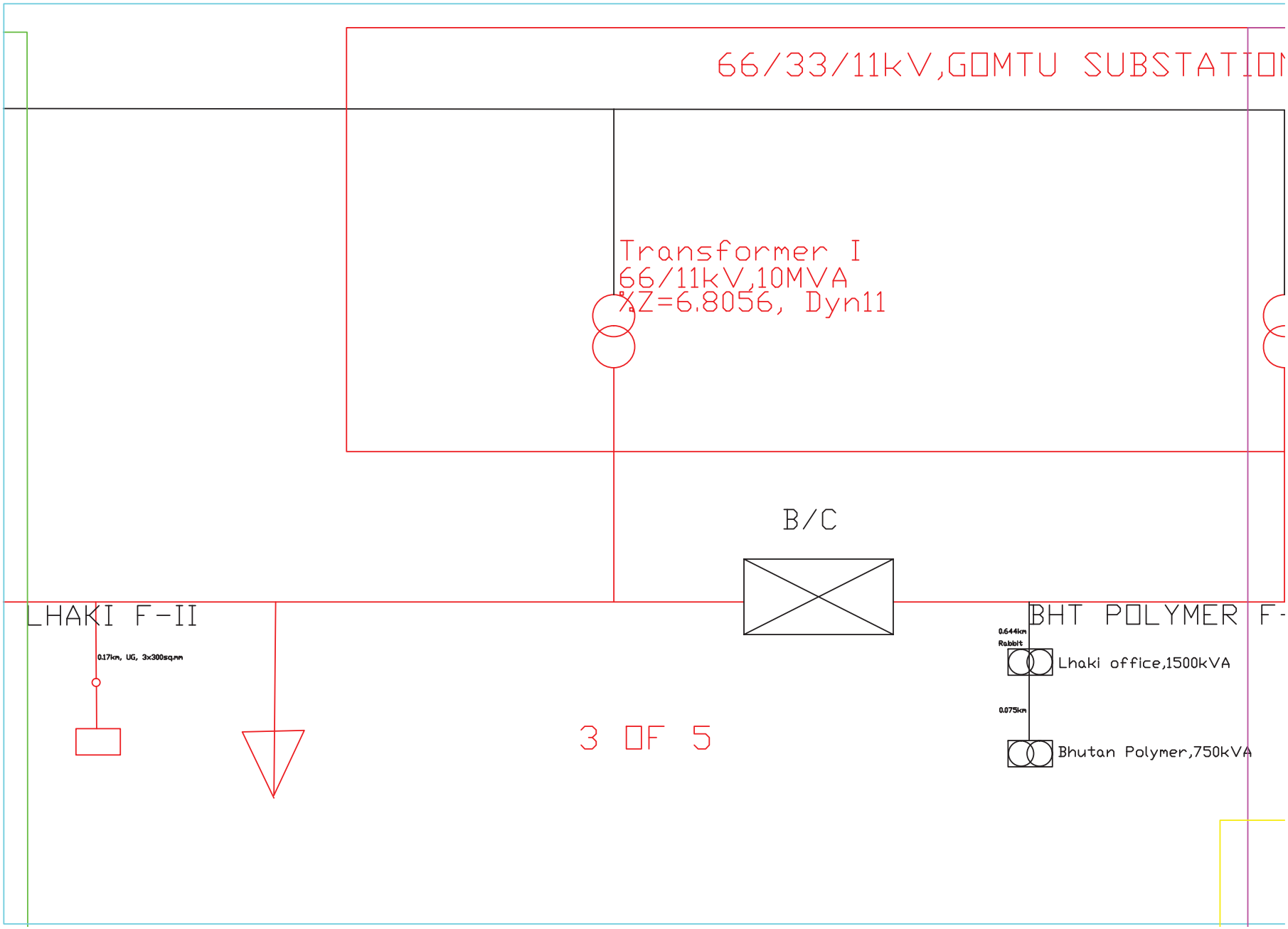
TRANSFORMER
66/33kV,5MVA
%Z=7.32, Dyn11

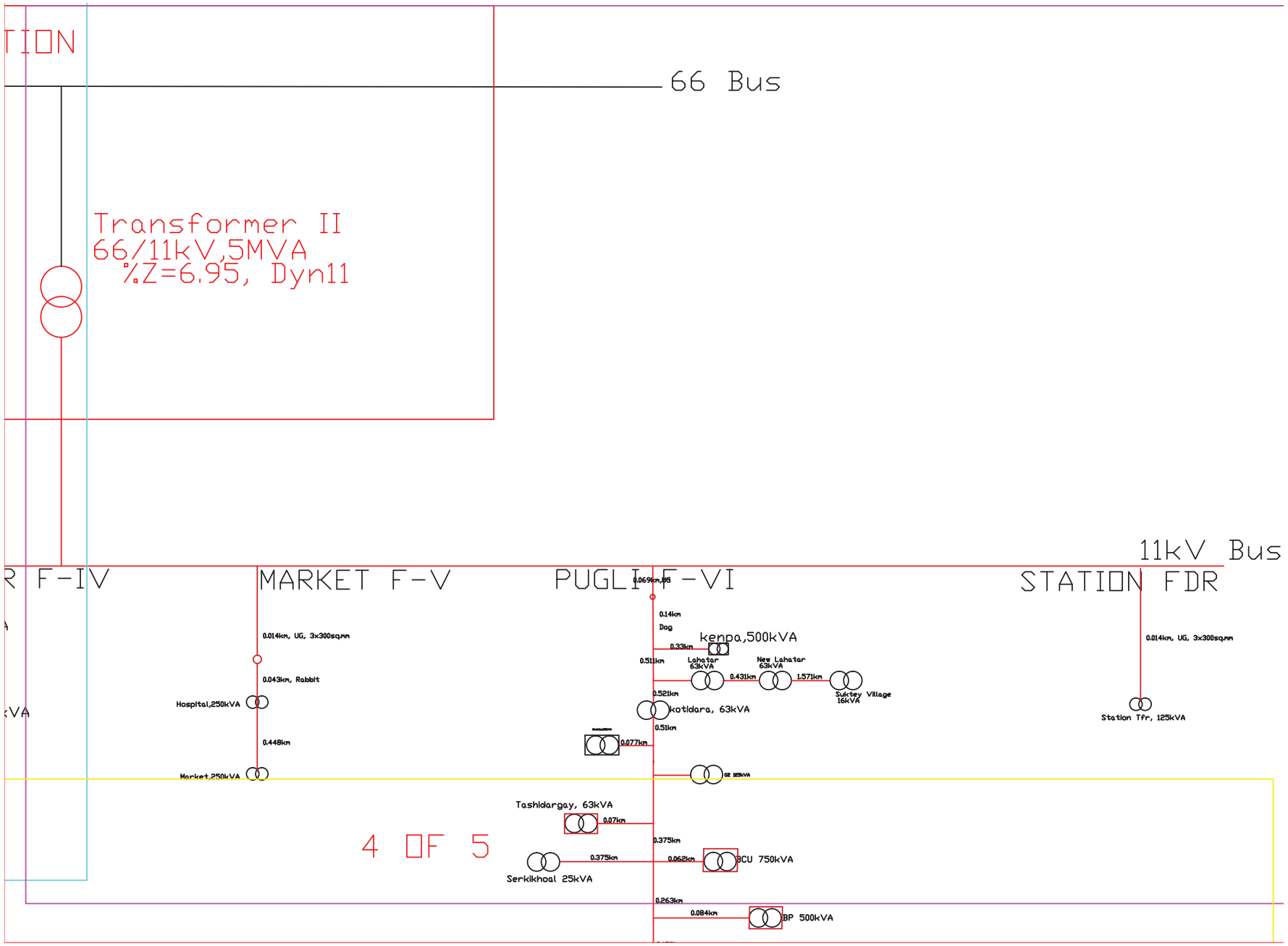
33kV, Bus

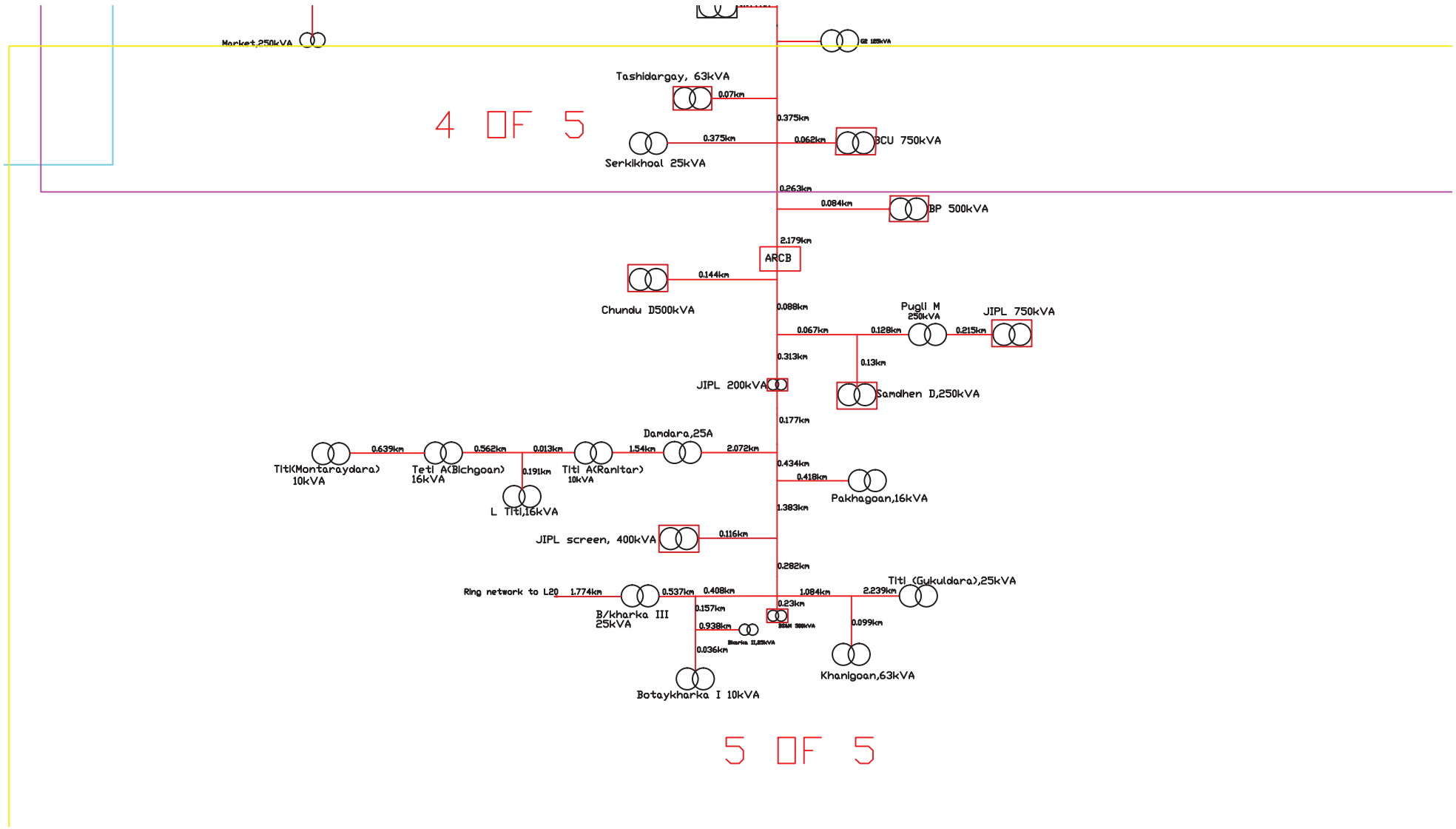
33/11kV,SAMTSE SUBSTATION



1 OF 5


66/33/11kV,GOMTU SUBSTATION
Transformer I
66/11kV,10MVA
%Z=6.8056, Dyn11
B/C
LHAKI F-II
0.17km, UG, 3x300sq.mm
BHT POLYMER F-
0.644km
Rabbit
Lhaki office,1500kVA
0.075km
Bhutan Polymer,750kVA
3 OF 5


TION
66 Bus
Transformer II
66/11kV,5MVA
%Z=6.95, Dyn11
11kV Bus
R F-IV
MARKET F-V
PUGLI F-VI
STATION FDR
0.014km, UG, 3x300sq.mm
0.043km, Rabbit
Hospital,250kVA
0.448km
Market,250kVA
0.069km,UG
0.14km
Dog
kenpa,500kVA
0.33km
0.511km
Lahatar
63kVA
New Lahatar
63kVA
0.431km
1.571km
Suktey Village
16kVA
0.521km
kotidara, 63kVA
0.511km
0.077km
Tashidargay, 63kVA
0.07km
0.375km
0.375km
0.062km
BCU 750kVA
Serkikhoal 25kVA
0.263km
0.084km
BP 500kVA
0.014km, UG, 3x300sq.mm
Station Tfr, 125kVA
4 OF 5


Market,250kVA
GE 125kVA
Tashidargay, 63kVA
0.07km
4 OF 5
0.375km
0.375km
0.062km
BCU 750kVA
Serkikhoal 25kVA
0.263km
0.084km
BP 500kVA
2.179km
ARCB
0.144km
Chundu D500kVA
0.088km
Pugli M
250kVA
JIPL 750kVA
0.067km
0.128km
0.215km
0.313km
0.13km
JIPL 200kVA
Samdhen D,250kVA
0.177km
Damdara,25A
0.639km
0.562km
0.013km
1.54km
2.072km
TItl(Montaraydara)
10kVA
Teti A(Bichgoan)
16kVA
0.191km
TItl A(Ranitar)
10kVA
0.434km
0.418km
Pakhagoan,16kVA
L TItl,16kVA
1.383km
JIPL screen, 400kVA
0.116km
0.282km
Ring network to L20
1.774km
0.537km
0.408km
1.084km
2.239km
TItl (Gukuldara),25kVA
B/kharka III
25kVA
0.23km
0.157km
0.938km
0.099km
0.036km
Khanigoan,63kVA
Botaykharka I 10kVA
5 OF 5

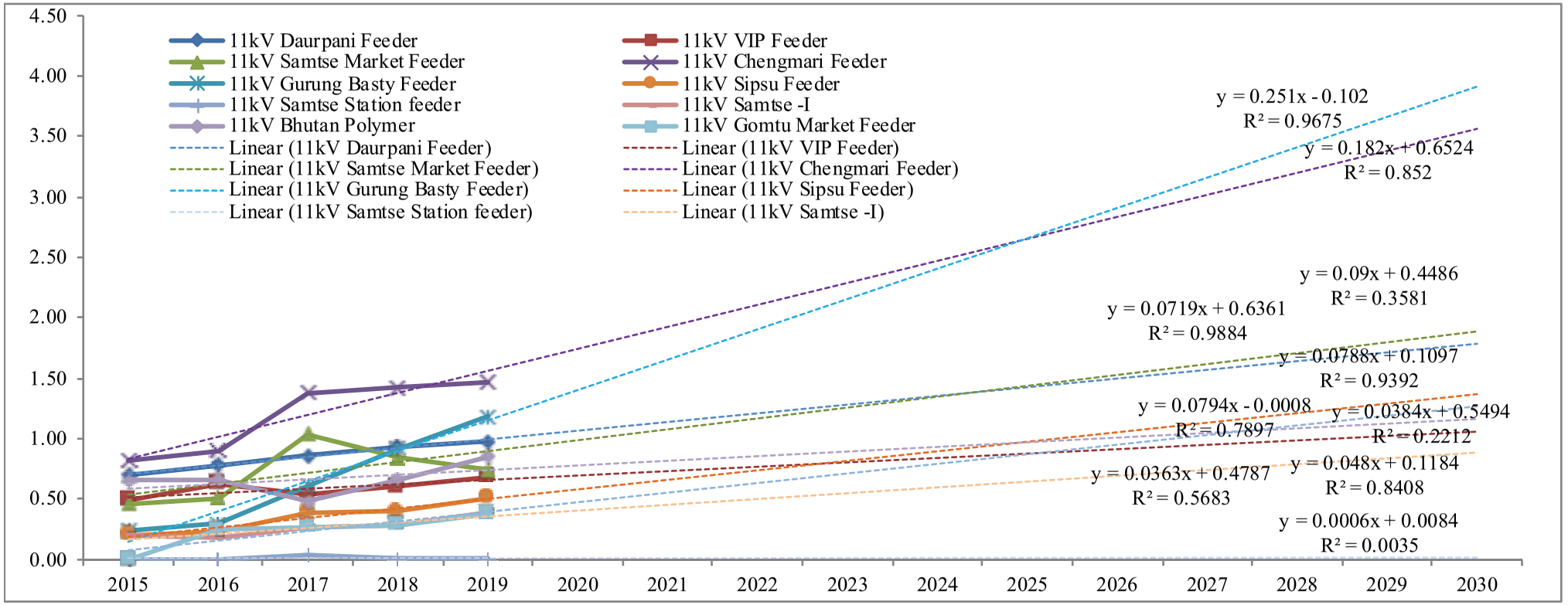
Annexure-2: IS 2026, IEC 60076 (Technical parameters for Distribution Lines and Transformers)

Sl. No.	Parameter	Requirement
1	Applicable standard	IS 2026, IEC 60076
2	Type	Oil filled[1] / two winding
3	Winding material	Copper
4	Core Material	CRGO silicon steel/Amorphous Metal
5	Cooling	Oil natural air natural (ONAN)
6	Terminations	
	· Primary	Outdoor Bushing or cable box[2]
	· Secondary	Outdoor Bushing or Cable box
7	Rated no load voltage	
	· Primary	33 kV or 11 kV
	· Secondary	415/240 V
8	% Impedance	
	10 kVA-24 kVA (1phase/3phase)	3%
	25 kVA-630 kVA	4%
	631 kVA-1250 kVA	5%
9	Vector group	Dyn11
10	Tap changer	
	· Type	Off load
	· Range	+5% to -5%
	· Step value	2.50%
11	Insulation Class (IEC-76)	A
12	Permissible Temperature rise	
	· Maximum winding temperature	55°C
	· Max. Top oil temperature	50°C
13	Insulation levels	
	· Primary	170 kVp-70 kV/75 kVp-28 kV
	· Secondary	7500 Vp-3000 V

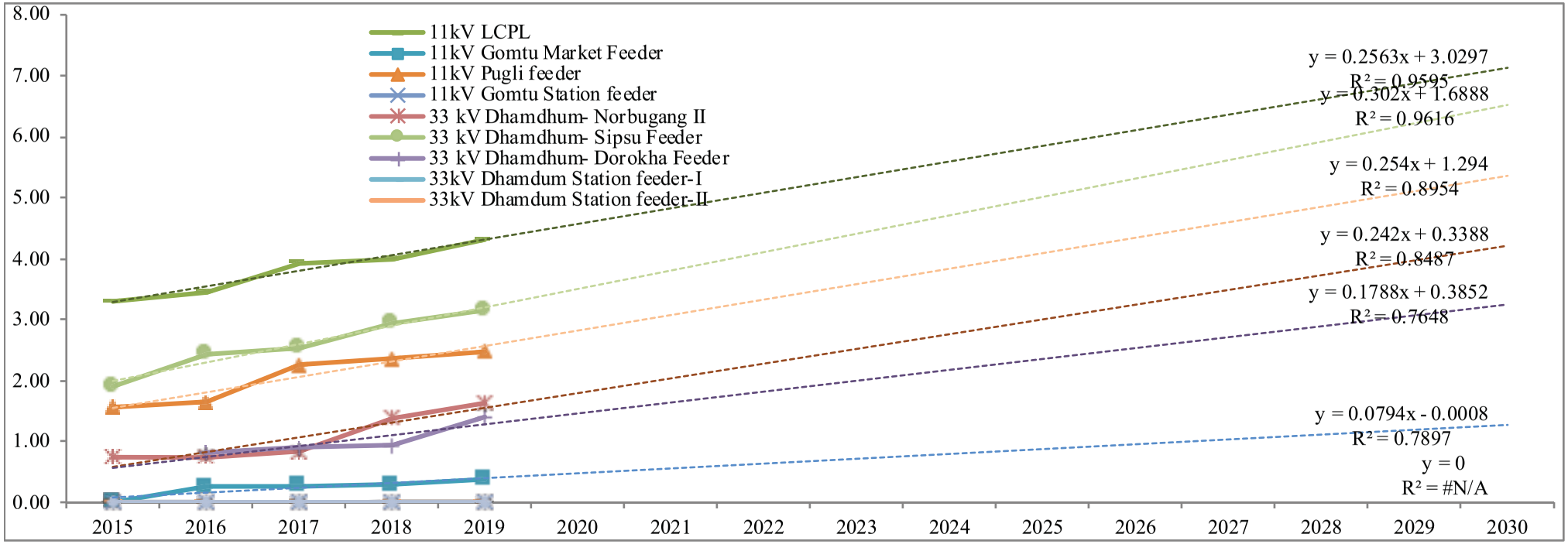
Annexure-3: Load Forecast adopting LRM & TSA

Load forecast for Samtse Dzongkhag

SL. No.	Feeder Name	Peak Load Consumption Pattern					Forecasted Peak Load Consumption Pattern (MW)										
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	11kV Daurpani Feeder	0.70	0.78	0.86	0.94	0.98	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.66
2	11kV VIP Feeder	0.49	0.63	0.53	0.61	0.68	1.53	1.68	1.83	2.00	2.17	2.36	2.55	2.76	2.98	3.22	3.47
3	11kV Samtse Market Feeder	0.46	0.51	1.04	0.84	0.74	1.81	1.98	2.16	2.35	2.55	2.76	2.98	3.21	3.46	3.72	3.99
4	11kV Chengmari Feeder	0.82	0.90	1.38	1.42	1.47	1.52	1.56	1.61	1.65	1.70	1.74	1.78	1.83	1.87	1.92	1.96
5	11kV Gurung Basty Feeder	0.24	0.30	0.61	0.92	1.19	0.54	0.83	1.11	1.40	1.69	1.97	2.26	2.55	2.84	3.12	3.41
6	11kV Sipsu Feeder	0.20	0.23	0.39	0.40	0.51	0.58	0.64	0.70	0.76	0.82	0.88	0.93	0.99	1.05	1.11	1.17
7	11kV Samtse Station feeder	0.00	0.00	0.04	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
8	11kV Samtse -I	0.20	0.18	0.26	0.28	0.39	0.41	0.46	0.51	0.55	0.60	0.65	0.70	0.75	0.79	0.84	0.89
9	11kV Bhutan Polymer	0.66	0.67	0.49	0.67	0.85	2.04	2.23	2.41	2.59	2.77	2.96	3.14	3.32	3.51	3.69	3.87
10	11kV Gomtu Market Feeder	0.00	0.25	0.27	0.29	0.38	0.54	0.63	0.71	0.80	0.89	0.97	1.06	1.15	1.24	1.32	1.41
	Total	**3.77**	**4.45**	**5.86**	**6.37**	**7.19**	**10.02**	**11.11**	**12.22**	**13.35**	**14.49**	**15.65**	**16.84**	**18.05**	**19.28**	**20.55**	**21.85**



SL. No.	Feeder Name	Peak Load Consumption Pattern					Forecasted Peak Load Consumption Pattern (MW)										
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	11kV LCPL	3.30	3.46	3.93	4.00	4.31	4.57	4.82	5.08	5.34	5.59	5.85	6.11	6.36	6.62	6.88	7.13
2	11kV Pugli feeder	1.56	1.64	2.25	2.36	2.47	3.70	3.81	5.83	5.94	6.05	6.16	6.27	6.38	6.49	6.60	6.71
3	11kV Gomtu Station feeder	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
4	33 kV Dhamdhum- Norbugang II	0.74	0.75	0.82	1.39	1.63	1.95	2.27	2.59	2.92	3.24	3.56	3.88	4.20	4.53	4.85	5.17
5	33 kV Dhamdhum- Sipsu Feeder	1.90	2.43	2.54	2.95	3.15	3.41	3.67	3.93	4.18	4.44	4.70	4.96	5.22	5.47	5.73	5.99
6	33 kV Dhamdhum- Dorokha Feeder		0.81	0.90	0.93	1.40	1.43	1.61	1.79	1.96	2.14	2.31	2.49	2.66	2.84	3.02	3.19
7	33kV Dhamdum Station feeder-I	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
8	33kV Dhamdum Station feeder-II	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
9	33kV Dhamdum Industrial Park	0.00	0.00	0.00	0.00	0.00	1.72	2.33	2.82	3.21	3.52	3.77	3.97	4.13	4.26	4.36	4.77
10	66kV PCAL (HV Customers)	8.00	8.00	7.79	7.71	7.69	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
	Total	**15.50**	**17.10**	**18.24**	**19.35**	**20.67**	**24.80**	**26.54**	**30.06**	**31.58**	**33.01**	**34.39**	**35.71**	**37.00**	**38.25**	**39.48**	**41.02**
	Overall Total	**19.27**	**21.55**	**24.11**	**25.72**	**27.86**	**34.82**	**37.65**	**42.28**	**44.92**	**47.50**	**50.04**	**52.55**	**55.05**	**57.54**	**60.03**	**62.87**



Load forecast methodology

1. Load Forecast

1.1 Type of Load Forecast and Power System Planning

One of the power system planning element is the load forecast. Although, there are no documented standards specifying the type of planning however, the power system planning can be short-term planning (STP) (less than one year), medium-term planning (MTP) (1-3 years) and long-term planning (LTP) (3-10 years and even higher). It is necessary to predict the power requirement for a specified time-horizon which is referred to as load (power) forecasting based on the historical consumption pattern for better planning and optimizing the available resources. Analogy to power system planning, the load forecast can be also short-term load forecasting (STLF), medium-term load forecasting (MTLF) and long-term load forecasting (LTLF) and accordingly the distribution network expansion programs are proposed[1] for distributing the electricity.

There are number of driving factors which are listed below affecting the forecasted load.

a) Time
   - Hours of the day (day or night)
   - Day of the week (weekdays or weekend)
   - Time of the year (winter or summer season)
b) Weather conditions (temperature and humidity)
c) Type of customers (residential, commercial, industries etc.)
d) Population
e) Economic indicators (per capita income, Gross Domestic Product (GDP) etc.)
f) Prices of the electricity

As the DSMP is being developed for 10-year period, the load forecast has to be done for same time horizon. Therefore, some of the driving factors as listed above which affects the LTLF may not impact the accuracy as daily, weekly and monthly time factors and weather conditions will have minimum contribution to the load variance.

1.2 Methods of Load (LTLF) Forecast

The LTLF methods are generally the trend analysis or time series analysis, economic modelling, end-use analysis and hybrid analysis. As the DSMP is for 10-year period, the methods of LTFL is being outlined for forecasting the load[1].

1.2.1 Trend Analysis

In the trend analysis, the historical data (power) is used to forecast the load. The details on load forecast adopting power consumption trend is reflected in **Section 1.3.** Typical load forecast is as shown in **Figure 1.**

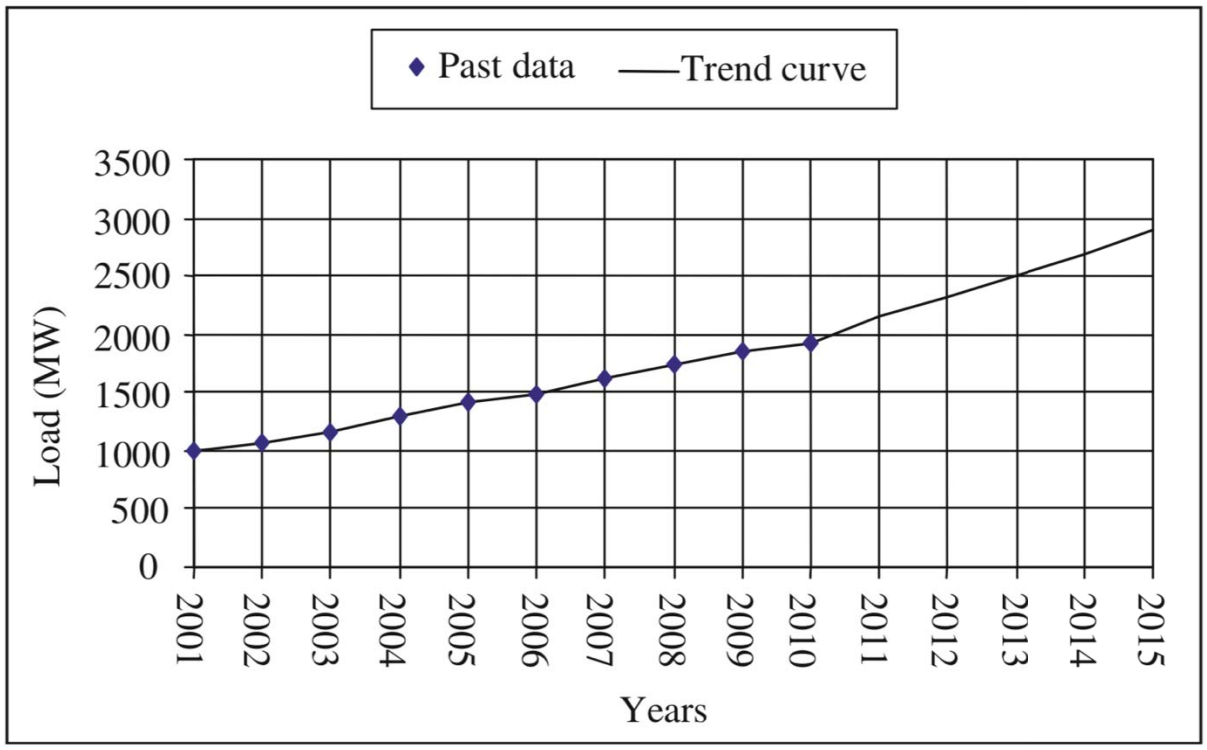


Figure 1: Typical trend curve[1]

1.2.2 Economic Modelling

In this method, the relationship between the load and the driving parameters are established and accordingly the future values of the driving factors are projected. Although, this approach is widely being used, as most of the data for driving factors are not available and for simplicity the trend analysis is adopted to forecast the load.

1.2.3 End-use Analysis

This approach is exclusively used for residential loads which is forecasted in terms of energy and therefore, it requires some methods to convert the predicted energy consumption to load (power demand). There is uncertainty in the accuracy of the predicted load and is also confined to residential customers. Therefore, end-use analysis approach is not adopted to predict the load.

1.2.4 Hybrid Analysis

Although, the end-use and econometric methods may be simultaneously used to forecast the load, it is not widely used as it has advantages and disadvantages of both the approaches.

1.3 Trend Line Analysis

The LTLF is carried out using the trend analysis approach and accordingly for planning the distribution system network. In order to forecast the load, the peak power demand prior to 2020 was considered and the power requirement trend is obtained. Load requirement is then predicted for next ten-year period (2020-2030) by extrapolating the trend line considering the load of 2019 as a base data. The case study of Punakha Dzongkhag is chosen to get insight of actual load forecast.

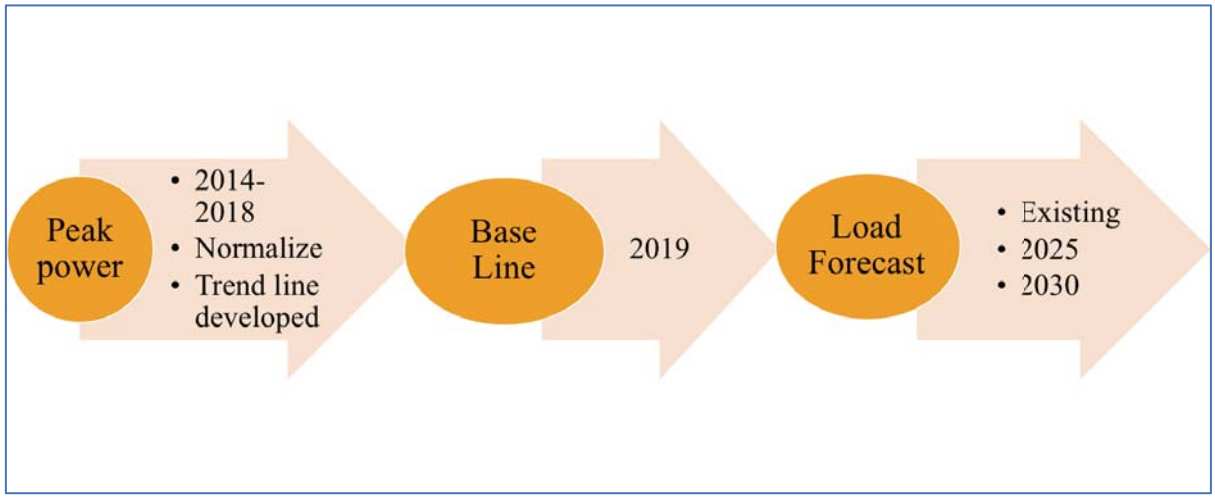


Figure 2: Flow diagram for load forecast

1.3.1 Normalizing the Data

Some of the distribution network do have ring feeders and multiple sources for better reliability and contingency. This in turn has resulted in abnormality in the power consumption data (recordings). Further, in the absence of meters or malfunctioning of the reading equipment or

recorded data, some of the feeders have unreliable data for some of the years. Therefore, data is normalized by omitting the outliers or by taking the average of the past data (or average of preceding and future load if a year's data is missing). Such exercise is carried out for all the feeders and substation loads.

Table 1: Actual power data of Punakha Dzongkhag

Sl.No.	Name of Feeder	Consumption Pattern (MW)						
		2013	2014	2015	2016	2017	2018	2019
1	Feeder A	1.85	2.01	0.90	0.22	2.45	2.64	2.63
2	Feeder B	0.48	0.51	4.86	0.50	0.49	0.74	0.72
3	Feeder C	1.35	1.60	1.60	1.80	2.10	1.76	2.40
4	Feeder D	0.96	1.02	1.47	1.48	1.80	2.24	1.89
	Total	**4.64**	**5.14**	**8.83**	**4.00**	**6.84**	**7.37**	**7.64**

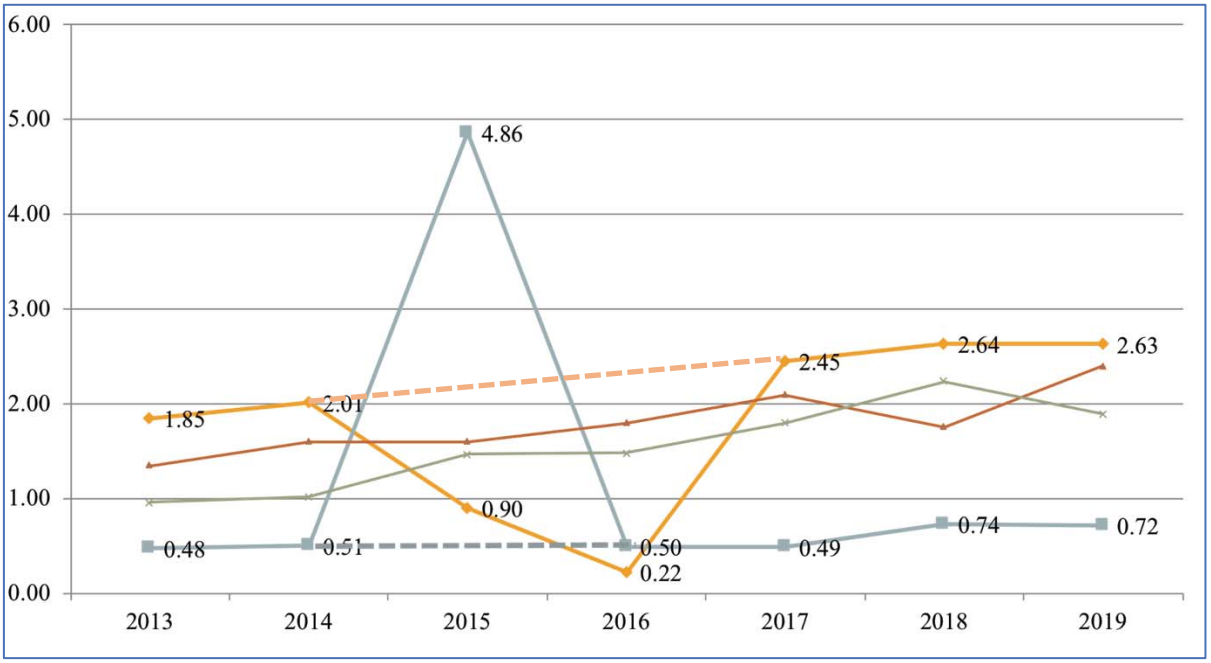


Figure 3: Actual data of Punakha Dzongkhag

$$x = \left(\frac{x_1 + x_2}{2}\right)$$

Where:
x *is the normalized data*

$x_1 and\ x_2 is\ the\ data\ for\ two\ years$

Table 2: Normalized power data of Punakha Dzongkhag

Sl.No.	Name of Feeder	Consumption Pattern (MW)						
		2013	2014	2015	2016	2017	2018	2019
1	Feeder A	1.85	2.01	1.93	1.97	2.45	2.64	2.63
2	Feeder B	0.48	0.51	0.49	0.50	0.49	0.74	0.72
3	Feeder C	1.35	1.60	1.60	1.80	2.10	1.76	2.40
4	Feeder D	0.96	1.02	1.47	1.48	1.80	2.24	1.89
	Total	**4.64**	**5.14**	**8.83**	**4.00**	**6.84**	**7.37**	**7.64**

1.3.2 Trend Line and Load Forecast

Based on the power data, the trend line is added to portray the power consumption pattern which gets generated as per the linear regression equation[1]. The trend line added is then extrapolated to forecast the load for next ten years which is as shown in **Figure 4.**

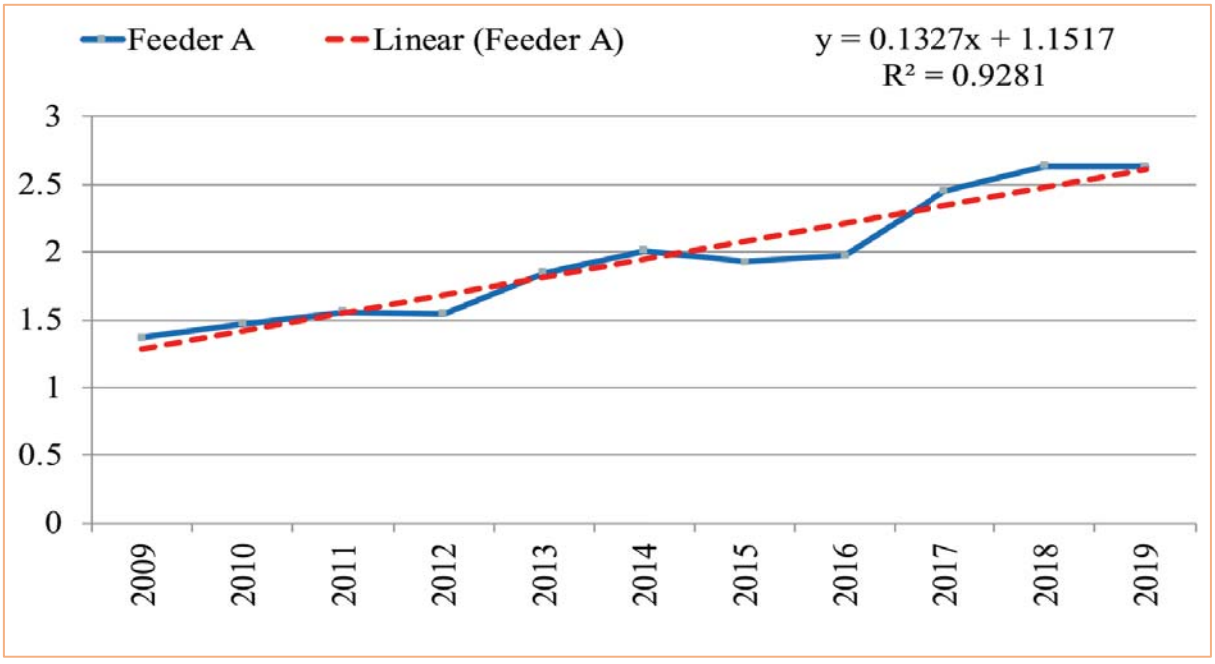


Figure 4: Trend line and load forecast for Punakha Dzongkhag

The trend line equation is given by[2]:

$$y = ax + b$$

$Where$:

y is the dependent variable or forecasted load
a is the slope which is the average change in y for every increment of x (increase in year).
It also gives x is the independent variable or time in year
b is the intercept which is the predicted value of y when x is zero (time is zero)

The Pearson correlation coefficient *'r'*, which can take values between -1 & 1 corresponds to the linear relationship between variables *x & y*. If the *r* value is either -1 or 1, dependent variable can be perfectly explained by a linear function of the other.

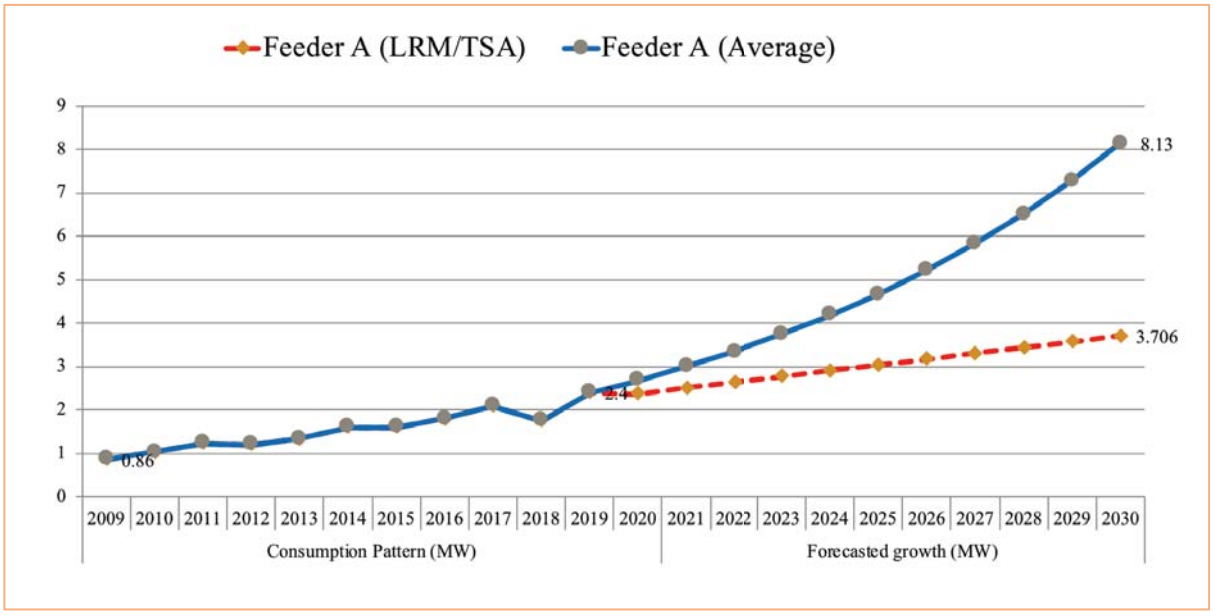


Figure 5: Forecasted load (trend line with red shows the linear regression and one with blue shows the forecast with average method)

2. Electrical Transient Analyser Program (ETAP) –Modelling and Load Flow Analysis

2.1 ETAP Software

"**ETAP** is an analytical engineering solution tool specializing in the simulation, design, monitoring, control, operator training, optimizing, and automating power systems[3]. ETAP's integrated digital platform offers the best comprehensive suite of enterprise solutions."
ETAP software is used in DSMP for modelling/designing, network simulation and to carry out the technical evaluation for distribution power system. The modelled network is fed with the essential data (such as specifications, constraints and parameters for network components) and the simulation results are assessed and analysed. Conclusively, different measures are considered and performed in ETAP for improving the efficiency of a system.

2.2 Load Flow Analysis (ETAP)

Load Flow Analysis (LFA) is a major tool to study and analyse the operation of a power system and determines voltage drops and power flow throughout the electrical system. Using network parameters (Input) for power sources, lines, transformers and connected loads, LFA provides voltages magnitude, real/reactive power, currents, and power losses as a result from the load flow simulation. The study also allows for swing, voltage regulated, and unregulated power sources with multiple power grids and generator connections and the analysis can be performed on both radial and loop systems.

Numerical analysis method such as Adaptive Newton-Raphson, Newton-Raphson, Fast Decoupled, & Accelerated Gauss Seidel methods are accessible in ETAP and can be used for solving the load flow analysis problems.

In this analysis, Adaptive Newton-Raphson method is used for load flow study of distribution networks and the study is carried out under 3-time horizon: present (2019), 2025 and 2030 (forecast load). The results (total generation, loading, system losses, and critical report of load flow) obtained under the scenarios are analysed and corresponding corrective measures are proposed.

2.2.1 Creating the Library

Although, the electrical parameters and specifications are inbuilt, to suit the requirements of the study, the missing electrical parameters are customized by creating a library. The units are

set to metric system and accordingly the network is modelled and the relative data for network components such as transformers, line types, power sources and load details are fed in which are detailed as follows:

a) Transmission Cable

- Library-Transmission Line-Phase Conductor-Add-Transmission line library
- In transmission line library: change unit system into Metric, conductor type into ACSR and frequency into 50HZ, and Source name as BPC.
- Click BPC and click edit properties.
- In edit properties add the required conductor parameter by referring the Excel sheet (technical parameters.)
- For AAAC use the source name "Pirelli" and select the required size.

b) UG cable (Since 33kV Al UG Cable is not available):

- Library- Cable- Add-change the source name to BPC and make the necessary changes especially type of conductor to Aluminium and installation into non-magnetic.
- Change insulation type to XLPE.
- Select BPC from the Cable library table and click edit properties
- In edit properties add the required UG cable parameters referring the Excel sheet as shown in Pictures below.

c) Set Loading and Generation Categories.

- Go to Project- Settings- Loading and generation categories
- In Generation Category, set 3 categories as Maximum, Normal and Minimum.
- In AC Load, set 3 categories as 2019, 2025 and 2030.
- Keep the DC Load Empty.

2.2.2 Network Modelling and Load Flow Analysis

a) Draw Distribution Network (SLD).
b) Enter the height=8 and spacing =1.25 in the Transmission line table.
c) Enter the electrical parameters (kW, kVA, kV, etc.) ratings for power sources, transformers, line type, bus kV and loading details.

d) Under the Lump Load, in “Nameplate” edit and enter DT % loading and forecasted % loading details for 2019,2025,2030. Set the load type (80% as constant impedance and 20% as constant KVA) as most of the loads are impedance load.
e) Make sure to run the load flow for each composite network before you continue with other network. This is to avoid numerous errors at the end.
f) After completing the SLD, study case for different load scenarios needs to be created.
g) Switch to “Load Flow Analysis” mode in Mode Toolbar. Go to “Study Case,” select present Case 1 as 2019 and select “Prompt” in “Output Report”
h) Edit the “Load Flow Study Case [Brief Case Symbol].” Go to “Loading” and set to “2019” under Loading Category and set “Normal” under Generation Category. Check the Margins set under Alerts and set “Marginal (±5% for Over and Under Voltage Category)” and set “Critical (±10% for Over and Under Voltage Category)”
i) Close “Load Flow Study Case” and run “Run Load Flow” and save the result as 2019.
j) Similarly, follow step b), c) and d) for 2025 and 2030.
k) To generate the report (SLD drawings) in PDF, go to print preview- set up- change the printer name “Microsoft print to PDF”.

2.3 Consideration/Assumptions made while simulating in ETAP software

a) All Network is considered as balanced system as there is limitation of unbalanced system in ETAP Key.
b) The voltage level of ±10% is given as critical value which is indicated by red colour while simulating and voltage level of ±5% is given as marginal value which is indicated by pink colour while simulating.
c) The typical value of X/R ratio from ETAP inbuilt system is taken for all the power transformers for the simulation.
d) Some of the types of transmission cables /underground cables used in BPC are not available in ETAP library therefore, a new source is created in ETAP library by inserting all the parameters of those unavailable cables/transmission lines.
e) There are three cases created in ETAP simulation depending on the load forecast namely the 2019, 2025 and 2030 where the forecasted loads are given respectively and simulated/analysed accordingly.

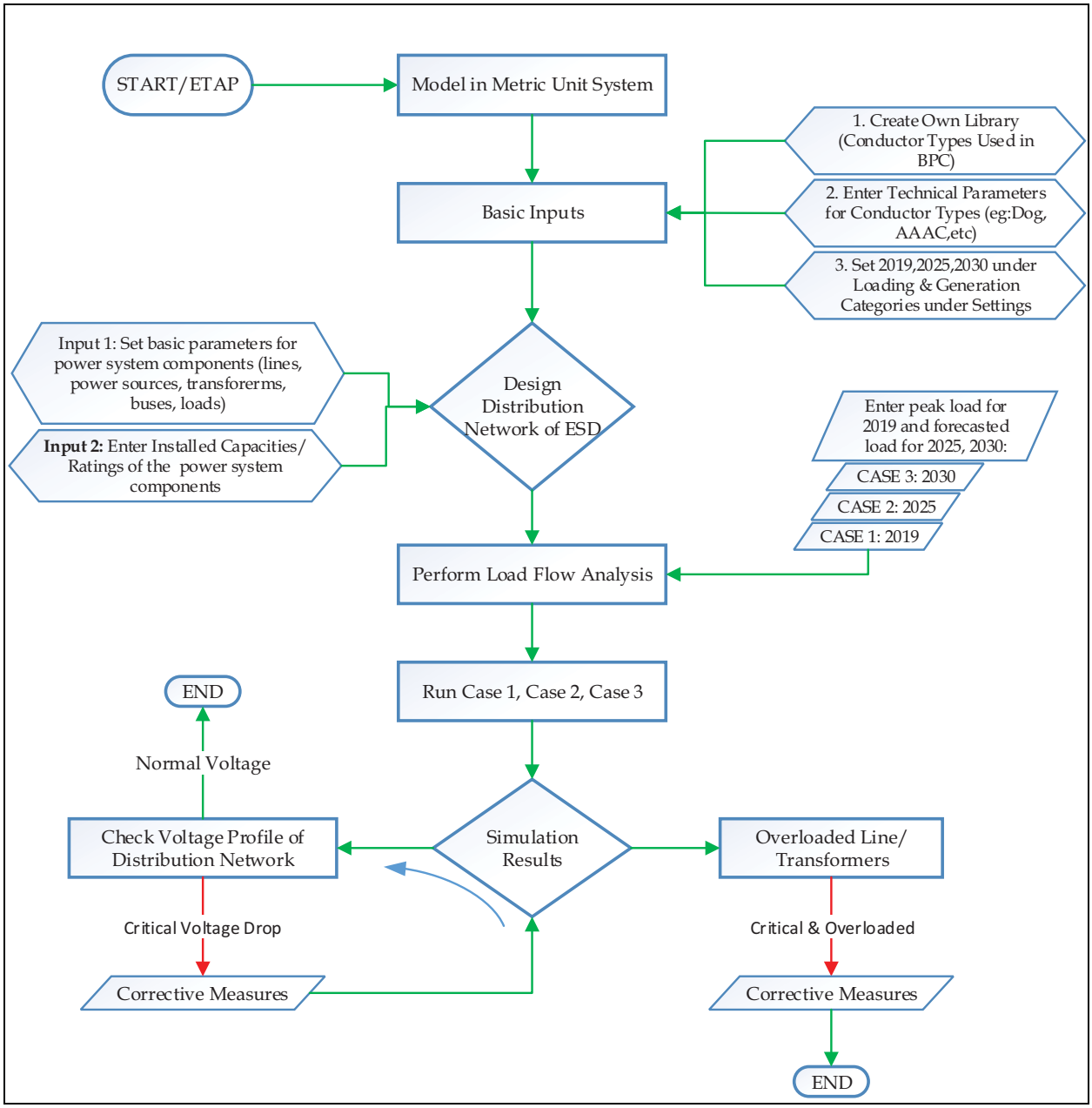


Figure 6: Flow Chart for Network Modelling & Load Flow Analysis (ETAP)

[1]Electric Power System Planning Issues, Algorithms and Solutions by Hossein Seifi Mohammad Sadegh Sepasian

[2]http://sites.utexas.edu/sos/guided/inferential/numeric/bivariate/cor/: dated September 29, 2020

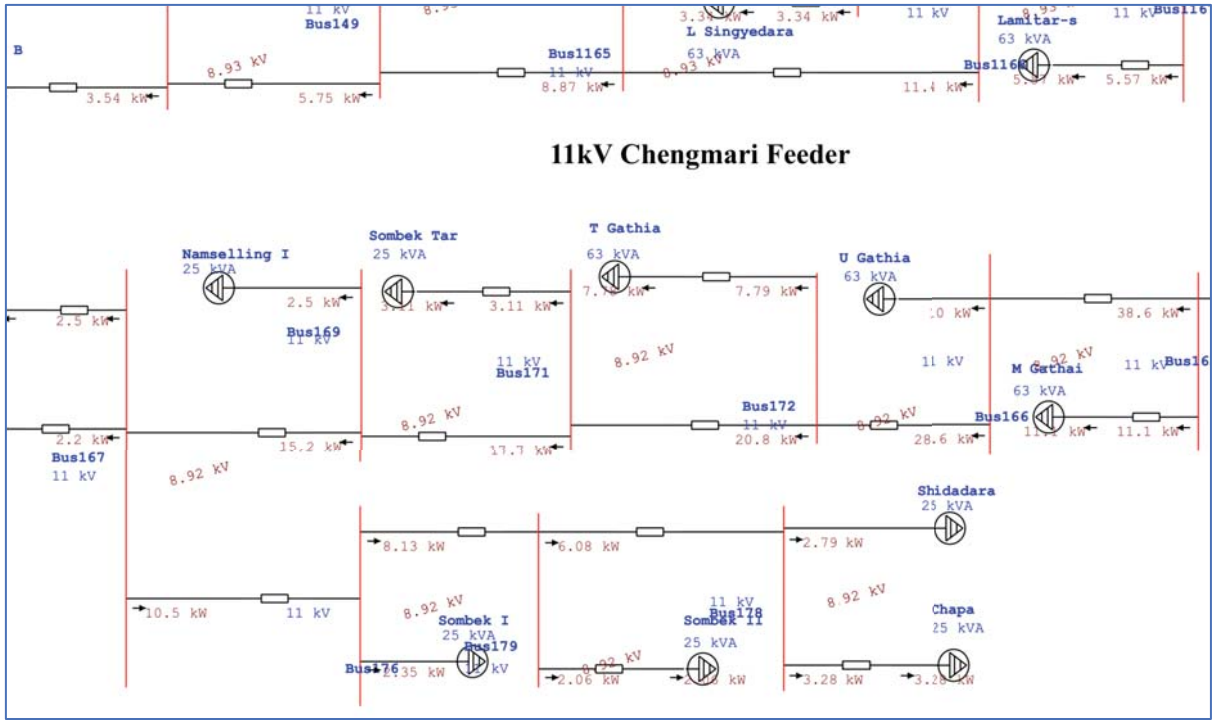
[3]http://www.powerqualityworld.com/2011/05/etap-tutorials-load-flow-analysis.html dated September 30, 2020

Annexure 4: The Simulation Results

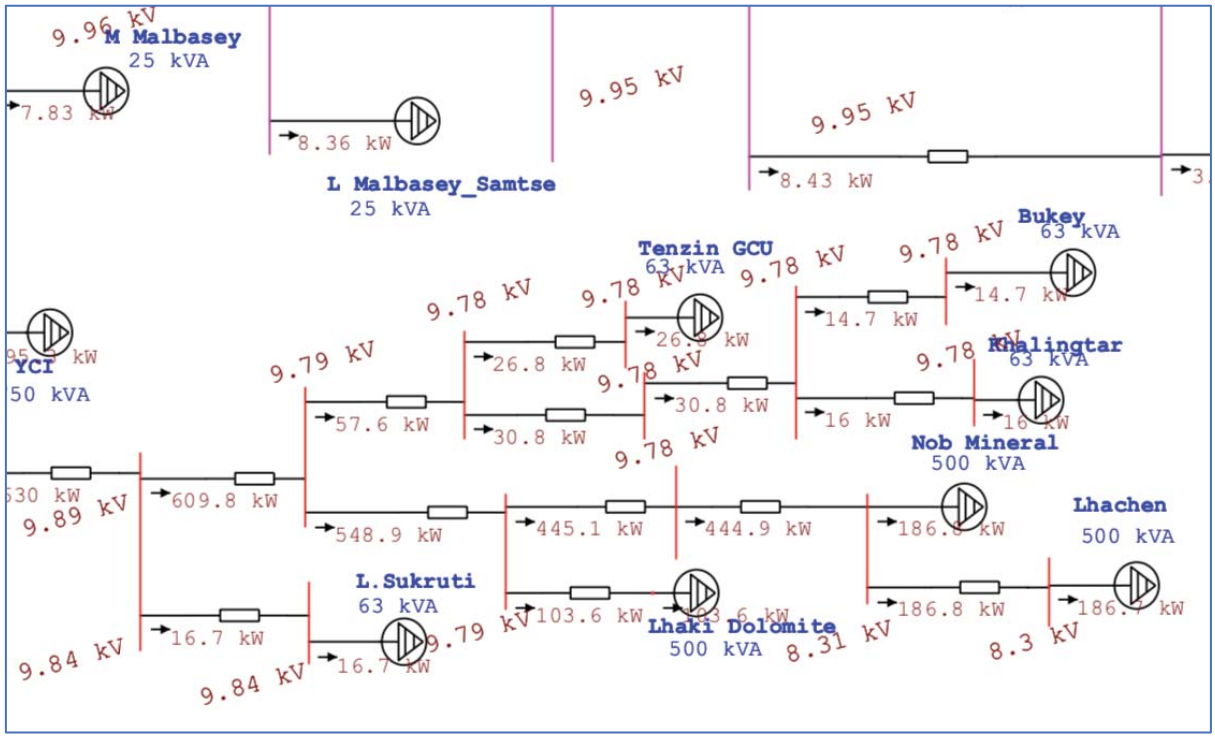
Simulation results for low voltage profile feeders

Time Horizon 2019

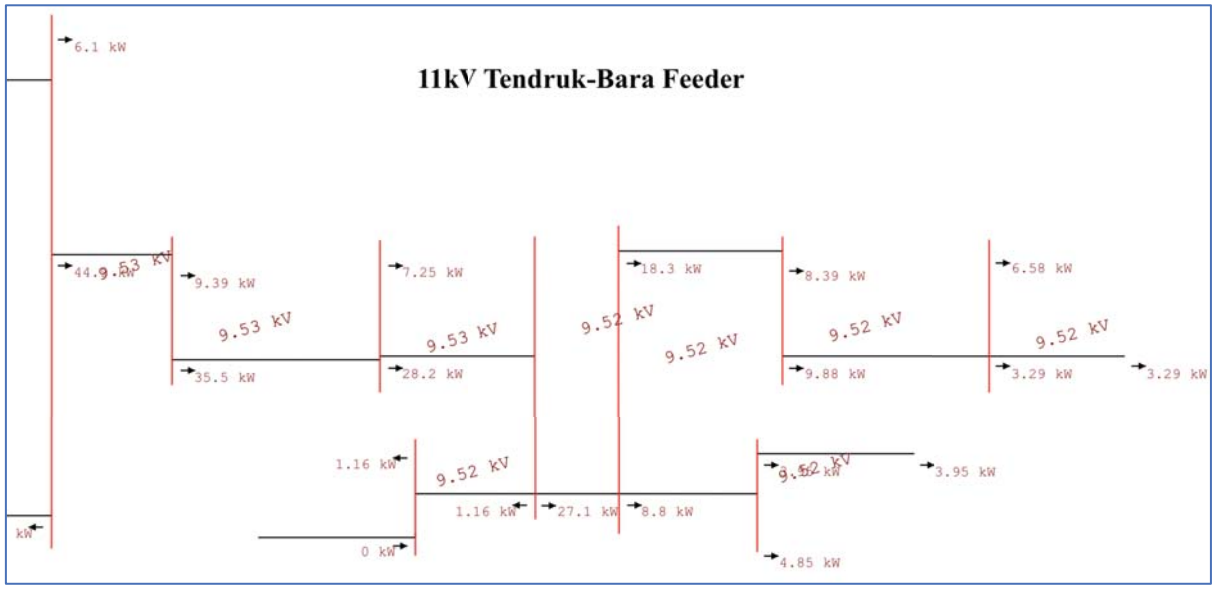
11kV Chengmari Feeder



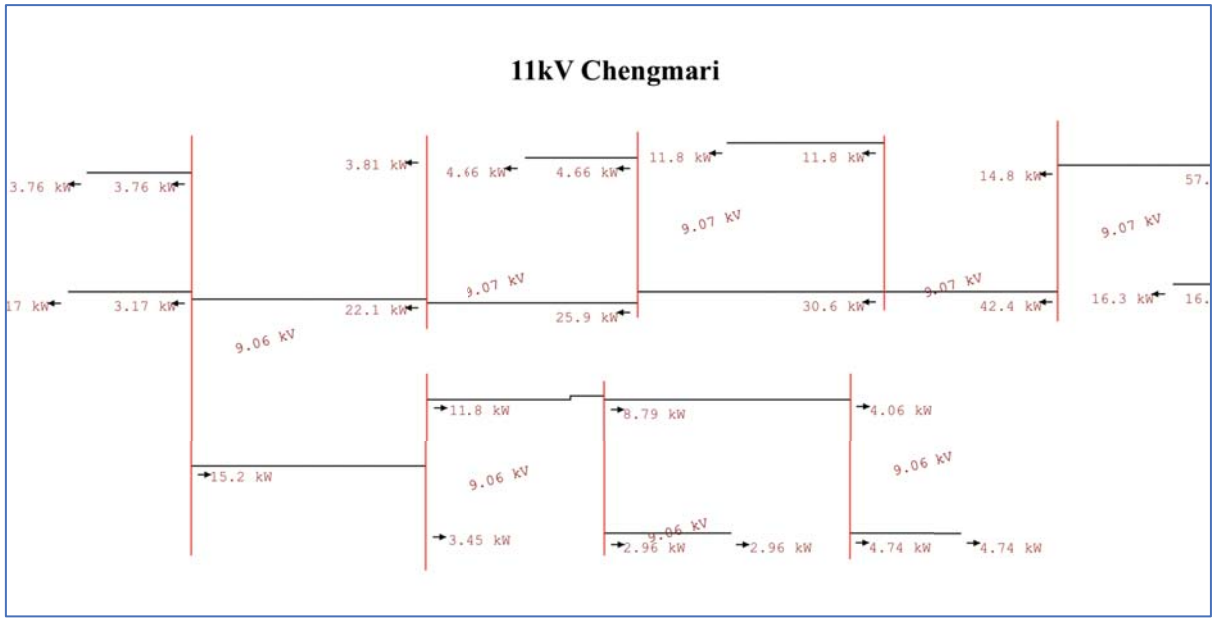
11kV Daurpani Feeder



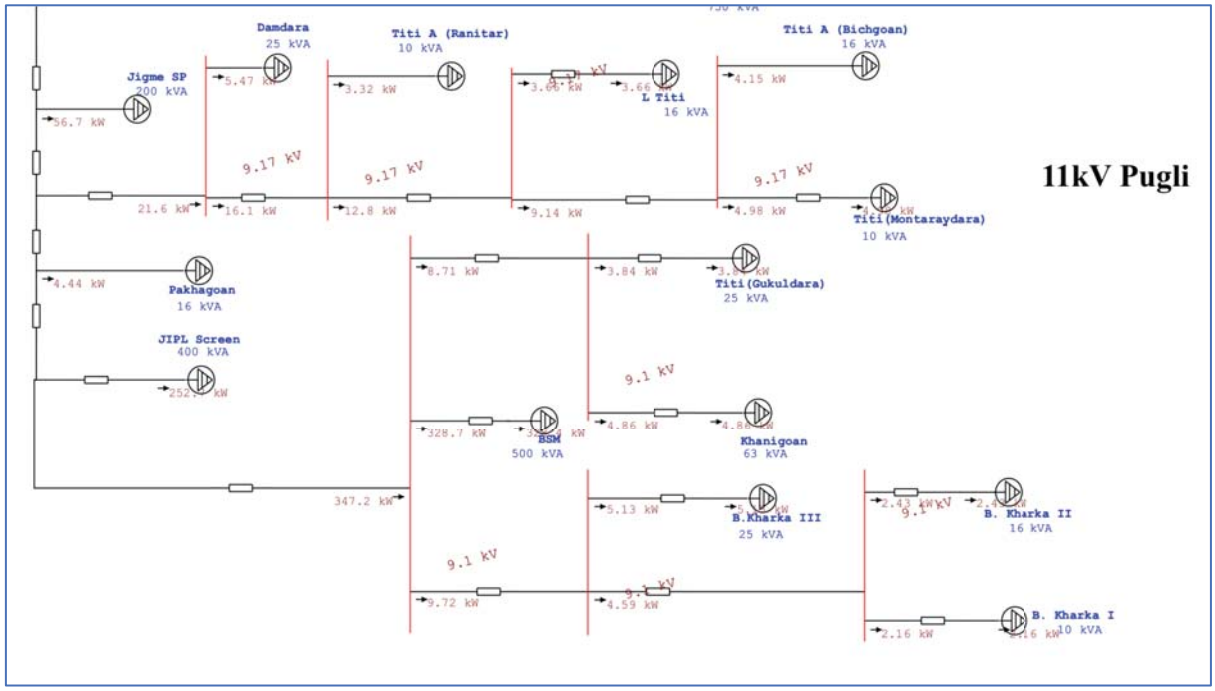
11kV Tendruk-Bara Feeder



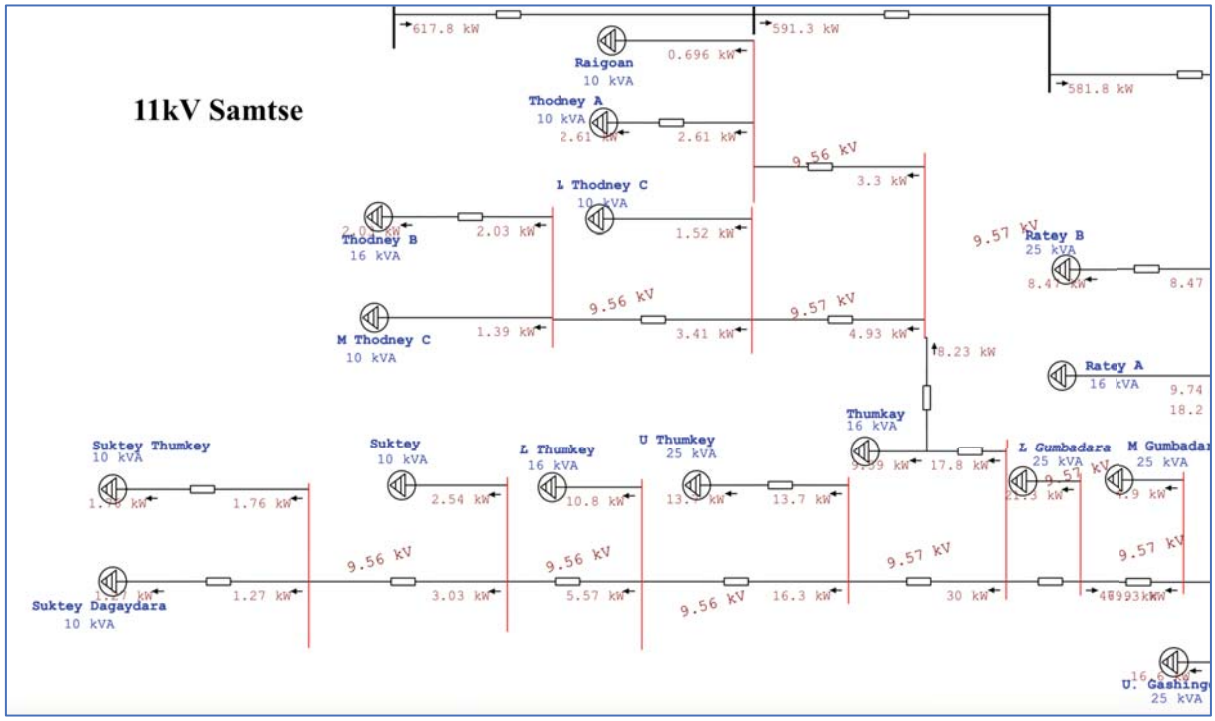
Time Horizon 2025



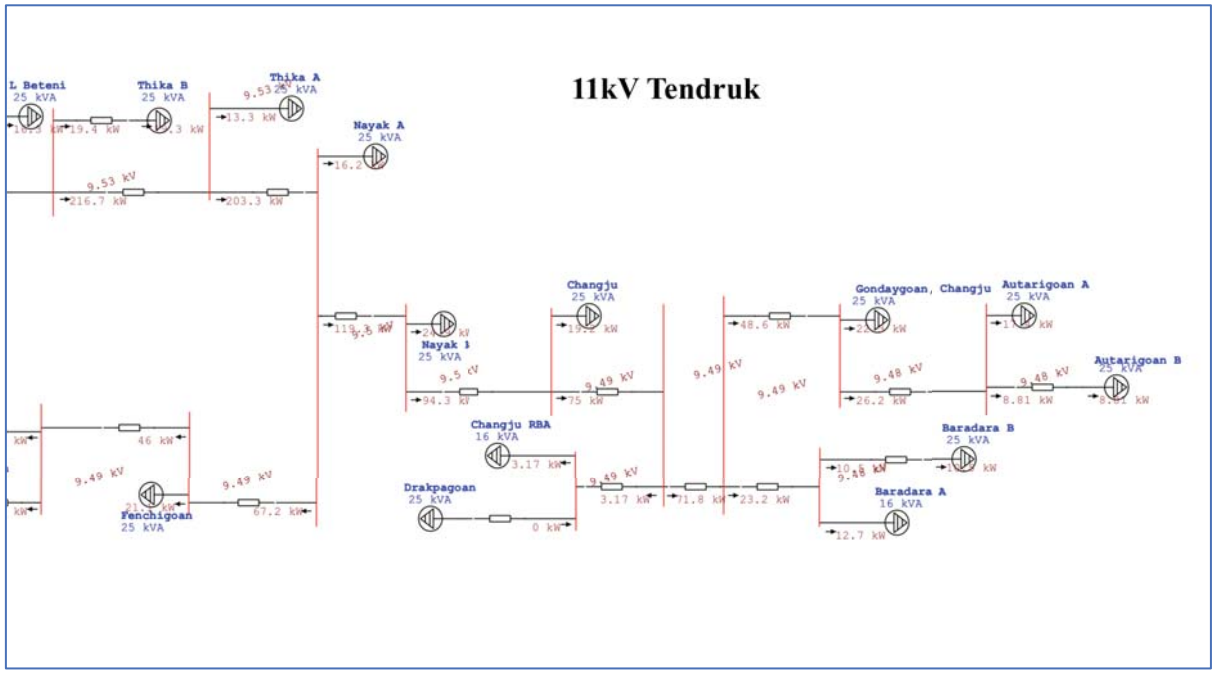
11kV Pugli Feeder



11kV Samtse Feeder

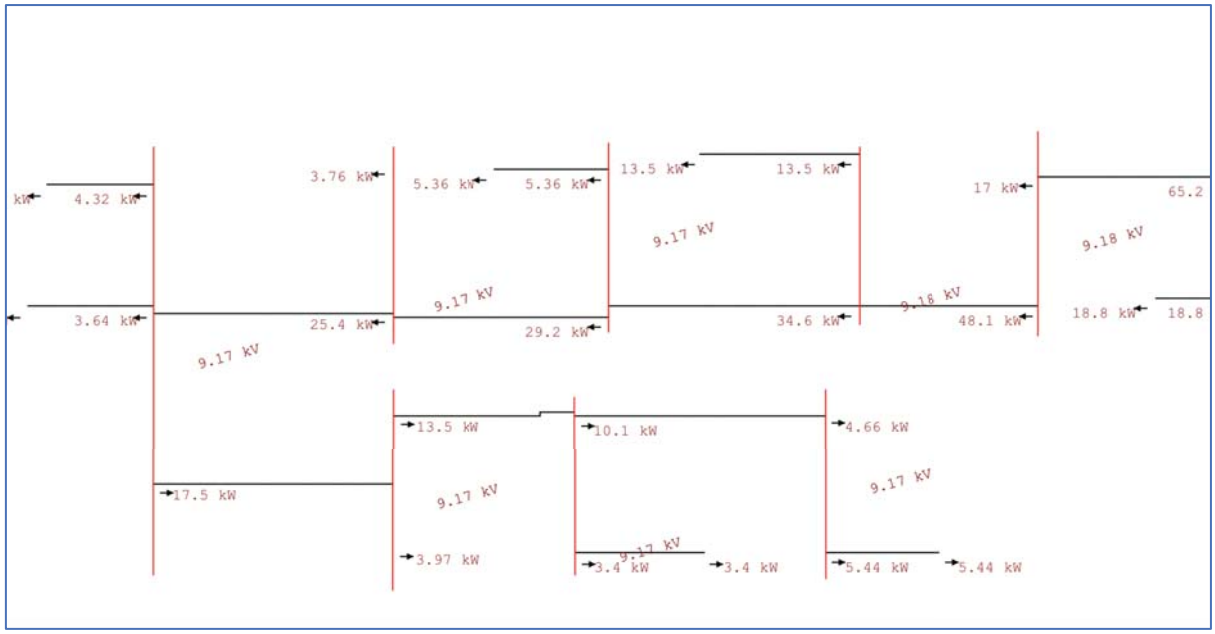


11kV Tendruk Feeder

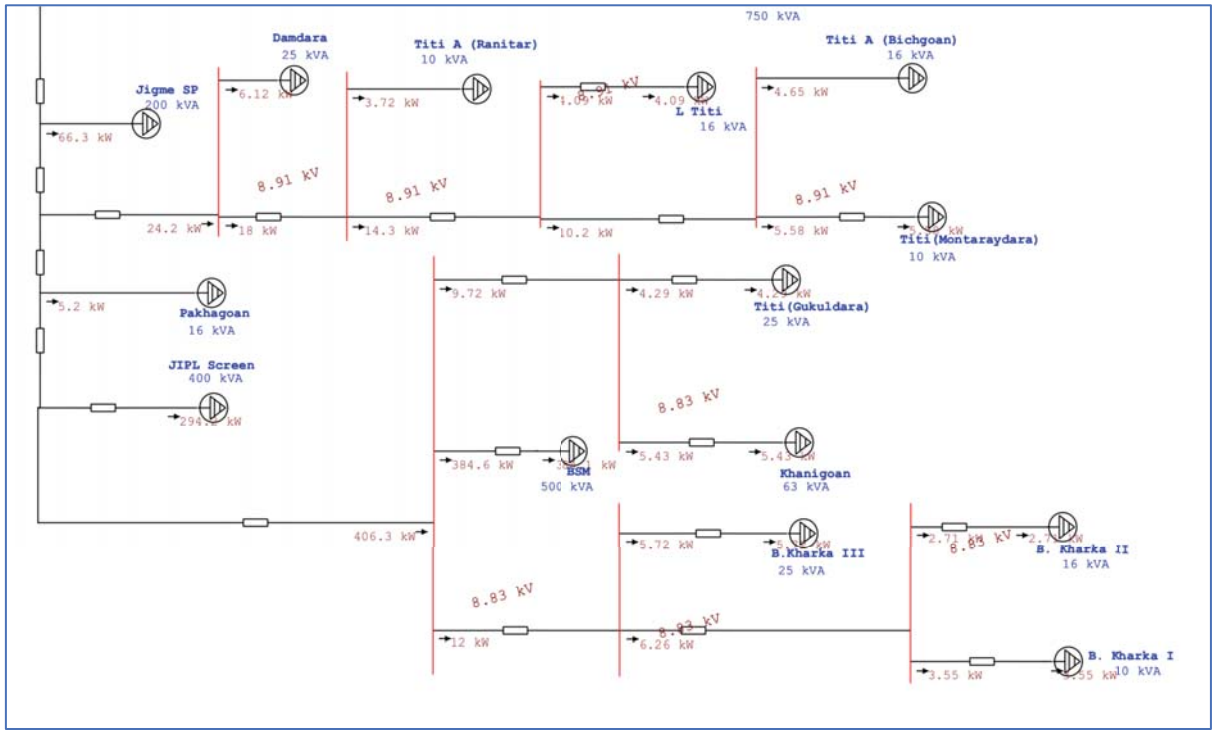


Time Horizon 2030

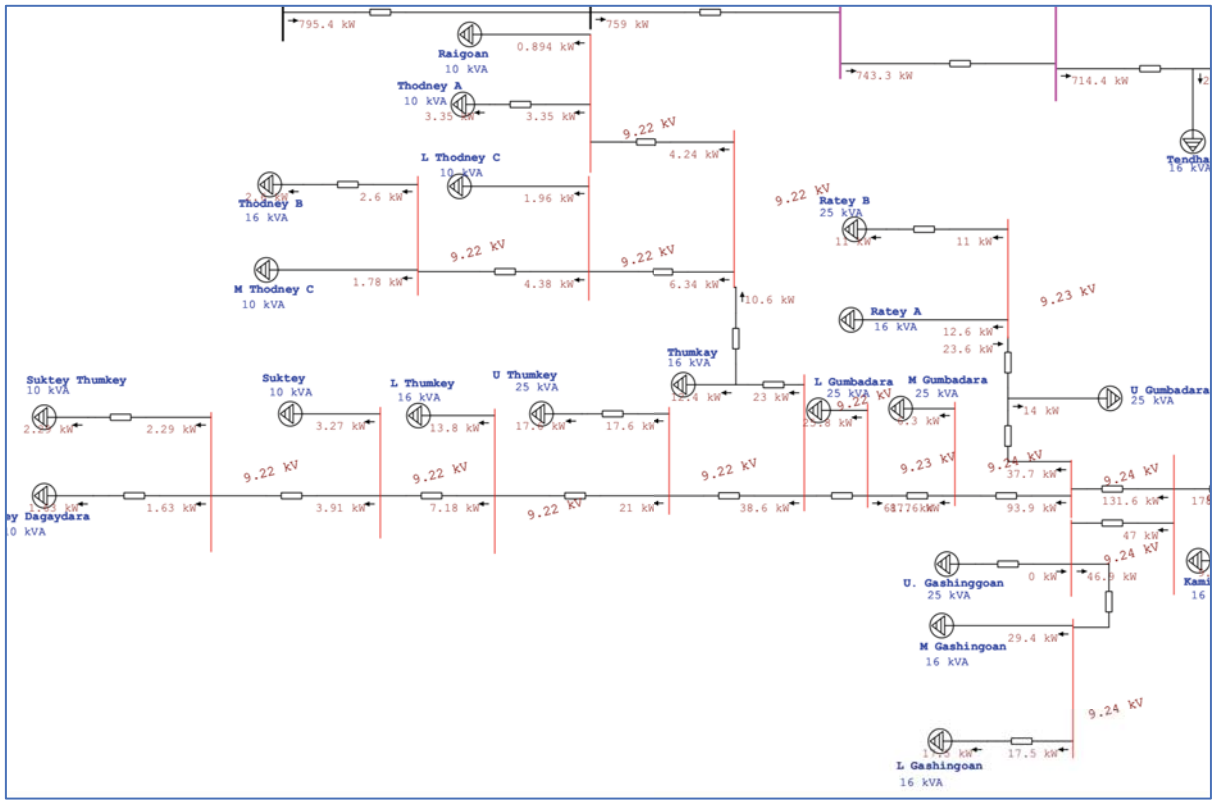
11kV Chengmari Feeder



11kV Pugli Feeder



11kV Samtse Feeder



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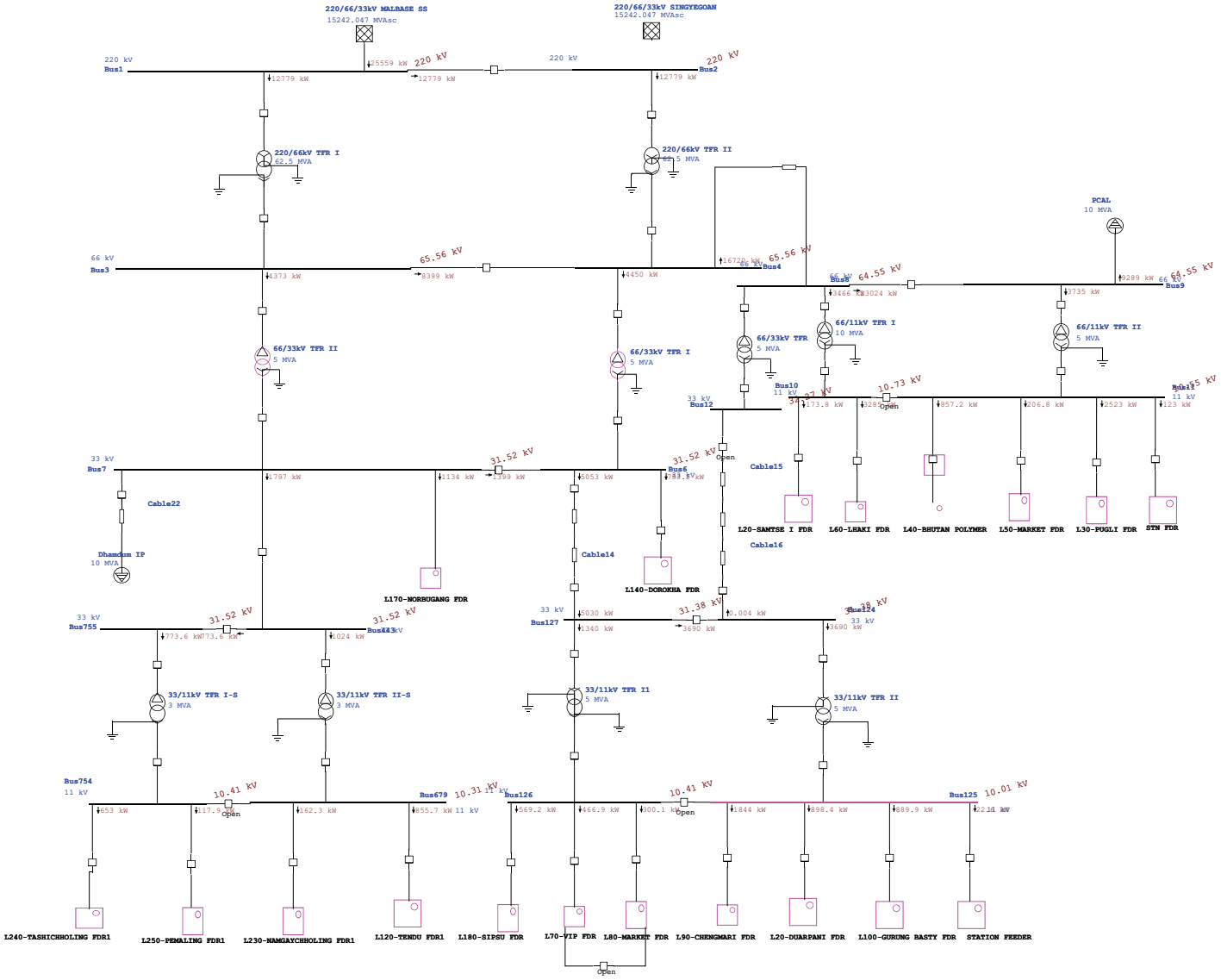

Detailed Simulation Results

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus1	220.000										74.922	79.3	196.6	
Bus2	220.000										37.461	79.3	98.3	
Bus3	66.000										35.795	82.8	327.7	
Bus4	66.000										50.001	87.0	457.7	
Bus5	11.000										0.004	87.2	0.3	
Bus6	33.000										18.830	85.0	461.5	
Bus7	33.000										16.608	89.5	407.0	
Bus8	66.000										27.565	96.2	261.7	
Bus9	66.000		6.588		2.397						23.070	95.4	219.0	
Bus10	11.000										4.509	99.4	258.7	
Bus11	11.000										13.119	96.3	839.6	
Bus12	33.000													
Bus13	11.000										3.692	100.0	212.0	
Bus14	11.000		3.040		0.626						3.666	100.0	212.0	
Bus15	11.000										0.909	86.1	52.5	
Bus16	11.000				0.010	0.006					0.012	85.0	0.7	
Bus17	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.2	
Bus19	11.000										0.892	86.1	51.9	
Bus20	11.000				0.030	0.019					0.035	85.0	2.1	
Bus21	11.000										0.842	86.0	49.8	
Bus22	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus23	11.000										0.834	85.9	49.7	
Bus24	11.000		0.010	0.006	0.002	0.001					0.014	85.0	0.8	
Bus25	11.000		0.009	0.006	0.002	0.001					0.013	85.0	0.8	
Bus26	11.000		0.021	0.013	0.004	0.002					0.801	85.9	48.1	
Bus28	11.000										0.763	85.8	46.4	
Bus29	11.000				0.007	0.004					0.008	85.0	0.5	
Bus30	11.000				0.002	0.001					0.744	85.7	45.9	
Bus31	11.000		0.033	0.021	0.053	0.033					0.724	85.5	45.8	
Bus32	11.000										0.621	85.6	39.3	
Bus33	11.000		0.011	0.007	0.002	0.001					0.084	85.1	5.3	
Bus34	11.000		0.050	0.031	0.009	0.005					0.069	85.0	4.4	
Bus35	11.000										0.536	85.6	34.0	
Bus36	11.000		0.123	0.076	0.021	0.013					0.258	85.1	16.4	
Bus37	11.000		0.006	0.004	0.037	0.023					0.051	85.0	3.2	
Bus38	11.000		0.009	0.005	0.024	0.015					0.038	85.0	2.4	
Bus39	11.000		0.002	0.001	0.015	0.009					0.276	85.9	17.6	
Bus40	11.000										0.256	85.9	16.3	
Bus41	11.000		0.002	0.001	0.005	0.003					0.009	87.4	0.6	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus42	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus43	11.000		0.001	0.001	0.007	0.004					0.009	85.0	0.6	
Bus44	11.000		0.001	0.001	0.006	0.004					0.008	85.0	0.5	
Bus45	11.000										0.237	85.8	15.1	
Bus46	11.000		0.002	0.001	0.013	0.008					0.228	85.8	14.6	
Bus47	11.000										0.199	85.8	12.8	
Bus48	11.000		0.001	0.001	0.008	0.005					0.210	85.8	13.5	
Bus49	11.000												-	
Bus50	11.000										0.052	85.3	3.4	
Bus51	11.000		0.002	0.001	0.026	0.016					0.053	85.1	3.4	
Bus52	11.000		0.005	0.003	0.012	0.008					0.020	85.0	1.3	
Bus53	11.000										0.146	86.0	9.4	
Bus54	11.000		0.003	0.002	0.009	0.005					0.027	85.4	1.7	
Bus55	11.000		0.004	0.002	0.010	0.006					0.042	85.4	2.7	
Bus56	11.000		0.003	0.002	0.008	0.005					0.012	85.0	0.8	
Bus57	11.000		0.004	0.002	0.021	0.013					0.097	86.1	6.2	
Bus58	11.000		0.001	0.001	0.005	0.003					0.104	86.1	6.7	
Bus59	11.000										0.068	86.4	4.4	
Bus60	11.000		0.003	0.002	0.009	0.005					0.025	86.6	1.6	
Bus61	11.000										0.012	87.4	0.7	
Bus62	11.000										7.117	88.5	470.6	
Bus63	11.000		0.000	0.000	0.001	-					0.005	86.8	0.3	
Bus64	11.000		0.000	0.000	0.003	0.002					0.004	85.0	0.2	
Bus65	11.000		2.217		0.363						4.162	100.0	270.1	
Bus66	11.000		0.000	0.000	0.002	0.001					0.003	85.0	0.2	
Bus67	11.000		0.000	0.000	0.001	0.001					0.005	86.3	0.3	
Bus68	11.000		0.000	0.000	0.002	0.001					0.007	86.8	0.4	
Bus69	11.000		0.000	0.000	0.003	0.002					0.008	86.7	0.5	
Bus70	11.000		0.002	0.001	0.011	0.007					0.023	86.3	1.5	
Bus71	11.000		0.002	0.001	0.014	0.009					0.020	85.0	1.3	
Bus72	11.000										0.043	86.0	2.8	
Bus73	11.000										1.205	100.0	77.1	
Bus74	11.000										0.009	87.1	0.7	
Bus75	11.000										7.870	89.8	504.2	
Bus76	11.000		0.502		0.083						7.815	89.9	504.2	
Bus77	11.000		0.002		0.005						0.008	100.0	0.8	
Bus78	33.000										2.144	99.9	52.6	
Bus79	11.000		1.359		0.222						1.581	100.0	102.7	
Bus80	11.000		0.225		0.352						0.577	100.0	37.0	
Bus81	11.000		0.375		0.252						1.204	100.0	77.1	
Bus82	11.000		0.001	0.000	0.003	0.002					0.004	85.0	0.3	
Bus83	11.000		0.003	0.002	0.017	0.010					0.037	85.6	2.5	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus84	11.000		0.001	0.001	0.005	0.003					0.015	86.1	1.0	
Bus85	11.000		0.001	0.001	0.006	0.004					0.008	85.0	0.5	
Bus86	11.000		0.001	0.001	0.005	0.003					6.902	88.8	468.1	
Bus87	11.000										6.718	89.1	467.6	
Bus88	11.000		0.160		0.023						0.182	100.0	12.7	
Bus89	11.000		0.055	0.034	0.003	0.002					6.549	88.5	456.3	
Bus90	11.000		0.037		0.005						0.042	100.0	2.9	
Bus91	11.000										6.475	88.6	451.6	
Bus92	11.000										6.320	88.6	449.0	
Bus93	11.000										1.145	89.9	86.2	
Bus94	11.000		0.003		0.000						0.003	100.0	0.2	
Bus95	11.000		0.411	0.254	0.025	0.015					0.512	85.0	36.4	
Bus96	11.000										5.737	89.0	412.5	
Bus97	11.000		0.321	0.199	0.019	0.012					0.400	85.0	28.8	
Bus98	11.000		0.384		0.047						0.431	100.0	32.4	
Bus99	11.000										2.383	94.1	178.9	
Bus100	11.000		0.739	0.458	0.038	0.023					0.914	85.0	70.7	
Bus101	11.000		0.003	0.002	0.013	0.008					0.952	85.2	72.1	
Bus102	11.000										1.980	91.3	148.9	
Bus103	11.000		0.190		0.023						0.213	100.0	16.0	
Bus104	11.000		0.062	0.038	0.003	0.002					0.834	93.1	62.8	
Bus105	11.000		0.001	0.001	0.004	0.002					0.022	86.1	1.6	
Bus106	11.000		0.001	0.000	0.002	0.001					0.016	85.7	1.2	
Bus107	11.000										0.013	85.9	1.0	
Bus108	11.000		0.005	0.003	0.000	-					0.733	94.0	55.6	
Bus109	11.000										0.758	93.8	57.2	
Bus110	11.000		0.001	0.000	0.003	0.002					0.004	85.0	0.3	
Bus111	11.000		0.001	0.000	0.003	0.002					0.009	85.6	0.7	
Bus112	11.000		0.001	0.001	0.004	0.002					0.005	85.0	0.4	
Bus113	11.000		0.253		0.030						0.283	100.0	21.7	
Bus114	11.000										0.721	94.1	55.1	
Bus115	11.000		0.001	0.000	0.003	0.002					0.005	85.0	0.4	
Bus116	11.000										0.463	85.1	35.5	
Bus117	11.000		0.359	0.222	0.019	0.012					0.444	85.0	34.0	
Bus118	11.000		0.001	0.001	0.004	0.002					0.005	85.0	0.4	
Bus119	11.000										0.011	86.3	0.8	
Bus120	11.000										0.006	86.5	0.4	
Bus121	11.000		0.000	0.000	0.002	0.001					0.002	85.0	0.2	
Bus122	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.2	
Bus123	11.000		0.120		0.020						0.140	100.0	9.0	
Bus124	33.000										5.158	79.3	129.5	
Bus125	11.000										4.665	85.8	388.6	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus126	11.000										9.347	95.6	866.2	
Bus127	33.000										16.637	81.1	417.8	
Bus128	11.000		0.016	0.010	0.057	0.035					2.153	85.2	179.4	
Bus129	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.3	
Bus130	11.000		0.486	0.301	0.429	0.266					2.019	85.1	172.3	
Bus131	11.000		0.041	0.026	0.139	0.086					0.936	85.2	80.4	
Bus132	11.000										0.719	85.1	62.2	
Bus133	11.000		0.029	0.018	0.001	0.001					0.607	85.0	52.9	
Bus134	11.000		0.134	0.083	0.005	0.003					0.164	85.0	14.3	
Bus135	33.000		0.011		0.005						2.088	99.9	52.1	
Bus136	11.000		0.003	0.002	0.007	0.004					0.044	87.5	4.4	
Bus137	11.000										0.108	85.5	9.3	
Bus138	11.000		0.002	0.002	0.008	0.005					0.037	86.3	3.2	
Bus139	11.000		0.002	0.001	0.004	0.003					0.007	85.0	0.7	
Bus140	11.000		0.002	0.001	0.005	0.003					0.025	86.7	2.2	
Bus141	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.3	
Bus142	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.4	
Bus143	11.000										0.017	87.2	1.5	
Bus144	11.000		0.000	0.000	0.001	0.001					0.005	86.0	0.5	
Bus145	11.000										0.017	87.4	1.5	
Bus146	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus147	11.000										0.012	87.5	1.1	
Bus148	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.5	
Bus149	11.000										0.008	93.5	0.8	
Bus150	11.000		0.001	0.000	0.003	0.002					0.007	87.5	0.6	
Bus151	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.2	
Bus152	11.000		0.001		0.002						0.002	100.0	0.2	
Bus153	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus154	11.000										0.005	85.5	0.5	
Bus155	11.000		0.001	0.001	0.002	0.001					0.003	85.0	0.3	
Bus156	11.000		0.003	0.002	0.006	0.004					0.011	85.0	1.1	
Bus157	33.000		0.003		0.014						2.115	99.9	52.5	
Bus158	33.000		0.020		0.085						0.104	100.0	2.6	
Bus159	33.000		0.013		0.007						0.780	100.0	19.5	
Bus160	11.000		0.001		0.002						0.062	89.3	6.2	
Bus161	11.000		0.003	0.002	0.009	0.005					0.059	88.2	5.9	
Bus162	11.000										0.045	88.9	4.5	
Bus163	11.000										0.045	88.8	4.5	
Bus164	33.000										0.759	100.0	19.0	
Bus165	33.000		0.007		0.004						0.791	100.0	19.8	
Bus166	11.000		0.002	0.001	0.006	0.004					0.035	89.7	3.5	
Bus167	11.000										0.013	90.9	1.3	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus168	11.000		0.004	0.002	0.010	0.006					0.016	85.0	1.5	
Bus169	11.000		0.001	0.000	0.001	0.001					0.015	90.4	1.5	
Bus170	11.000		0.001		0.002						0.003	100.0	0.3	
Bus171	11.000										0.018	92.9	1.8	
Bus172	11.000										0.025	91.2	2.5	
Bus173	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.8	
Bus174	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus175	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus176	11.000		0.001	0.000	0.001	0.001					0.009	92.9	0.9	
Bus177	11.000		0.001		0.002						0.003	100.0	0.3	
Bus178	11.000		0.001	0.000	0.002	0.001					0.005	96.1	0.5	
Bus179	11.000										0.007	94.7	0.7	
Bus180	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus181	33.000		0.001		0.007						0.008	100.0	0.2	
Bus182	33.000		0.003	0.002	0.014	0.009					0.021	85.0	0.5	
Bus183	33.000		0.005	0.003	0.020	0.013					0.029	85.0	0.7	
Bus184	33.000										0.050	85.5	1.3	
Bus185	33.000										0.751	99.9	18.8	
Bus186	33.000		0.001		0.005						0.104	99.3	2.6	
Bus187	33.000		0.001		0.004						0.005	100.0	0.1	
Bus188	33.000										0.098	99.3	2.5	
Bus189	11.000		0.333	0.206	0.013	0.008					0.407	85.0	35.5	
Bus190	33.000		0.002		0.007						0.093	99.5	2.3	
Bus191	33.000		0.001		0.005						0.085	99.5	2.1	
Bus192	33.000		0.001		0.007						0.017	99.6	0.4	
Bus193	33.000										0.073	99.4	1.8	
Bus194	33.000										0.056	99.7	1.4	
Bus195	11.000		0.003	0.002	0.010	0.006					0.014	85.0	1.2	
Bus196	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus197	33.000		0.001		0.005						0.006	100.0	0.1	
Bus198	33.000		0.002		0.007						0.009	100.0	0.2	
Bus199	33.000		0.007		0.003						0.010	100.0	0.3	
Bus200	33.000		0.001		0.005						0.006	100.0	0.1	
Bus201	33.000		0.002		0.009						0.011	100.0	0.3	
Bus202	33.000										0.026	99.7	0.7	
Bus203	33.000		0.001		0.005						0.006	100.0	0.1	
Bus204	33.000		0.003		0.012						0.015	100.0	0.4	
Bus205	11.000		2.288	1.418	0.133	0.082					2.848	85.0	206.8	
Bus206	33.000		0.003		0.012						0.029	100.0	0.7	
Bus207	33.000		0.001		0.004						0.005	100.0	0.1	
Bus208	33.000		0.002		0.010						0.013	100.0	0.3	
Bus209	33.000		0.004		0.015						0.032	100.0	0.8	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus210	33.000										0.725	99.5	18.3	
Bus211	33.000		0.003		0.012						0.014	100.0	0.4	
Bus212	33.000		0.007		0.029						0.035	100.0	0.9	
Bus213	33.000										0.072	99.9	1.8	
Bus214	33.000										0.170	98.1	4.3	
Bus215	33.000		0.001		0.004						0.005	100.0	0.1	
Bus216	33.000		0.002		0.007						0.532	99.5	13.5	
Bus217	33.000										0.045	100.0	1.1	
Bus218	33.000										0.084	99.9	2.1	
Bus219	33.000										0.604	100.0	15.1	
Bus220	33.000		0.001		0.005						0.007	100.0	0.2	
Bus221	33.000		0.001		0.006						0.014	100.0	0.3	
Bus222	33.000										0.599	100.0	15.0	
Bus223	33.000										0.087	99.9	2.2	
Bus224	33.000		0.003		0.012						0.015	100.0	0.4	
Bus225	33.000										0.395	99.1	9.9	
Bus226	33.000		0.001		0.006						0.008	100.0	0.2	
Bus227	33.000										0.588	99.6	14.7	
Bus228	33.000		0.001		0.004						0.364	99.0	9.1	
Bus229	33.000		0.001		0.006						0.372	99.1	9.3	
Bus230	33.000										0.359	99.2	9.0	
Bus231	33.000		0.002		0.009						0.011	100.0	0.3	
Bus232	33.000		0.001		0.005						0.006	100.0	0.2	
Bus233	33.000		0.002		0.010						0.018	100.0	0.5	
Bus234	33.000										0.348	99.2	8.7	
Bus235	33.000		0.002		0.008						0.010	100.0	0.2	
Bus236	33.000		0.002		0.009						0.020	99.9	0.5	
Bus237	33.000										0.330	99.2	8.3	
Bus238	33.000		0.002		0.007						0.009	100.0	0.2	
Bus239	33.000		0.001		0.005						0.093	99.8	2.4	
Bus240	33.000										0.177	99.2	4.4	
Bus241	33.000		0.002		0.011						0.013	100.0	0.3	
Bus242	33.000										0.165	99.1	4.2	
Bus243	33.000										0.679	99.4	17.2	
Bus244	33.000										0.108	98.6	2.7	
Bus245	33.000		0.008		0.032						0.040	100.0	1.0	
Bus246	33.000										0.023	99.9	0.6	
Bus247	33.000		0.001		0.006						0.031	99.9	0.8	
Bus248	33.000										0.309	99.2	7.8	
Bus249	33.000		0.009		0.004						0.014	100.0	0.3	
Bus250	33.000										0.295	99.2	7.4	
Bus251	33.000		0.001		0.002						0.003	100.0	0.1	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus252	33.000		0.002		0.008						0.252	99.3	6.3	
Bus253	33.000										0.259	99.3	6.5	
Bus254	33.000		0.002		0.007						0.022	100.0	0.6	
Bus255	33.000										0.281	99.2	7.1	
Bus256	33.000		0.006		0.007						0.014	100.0	0.3	
Bus257	33.000		0.009		0.005						0.014	100.0	0.3	
Bus258	33.000		0.005		0.002						0.007	100.0	0.2	
Bus259	33.000		0.002		0.007						0.009	100.0	0.2	
Bus260	33.000		0.002	0.001	0.008	0.005					0.011	85.0	0.3	
Bus261	33.000		0.009		0.005						0.243	99.3	6.1	
Bus262	33.000		0.005		0.005						0.010	100.0	0.2	
Bus263	33.000										0.043	99.7	1.1	
Bus264	33.000		0.002		0.008						0.009	100.0	0.2	
Bus265	33.000										0.033	99.7	0.8	
Bus266	33.000		0.002		0.009						0.011	100.0	0.3	
Bus267	33.000		0.002		0.007						0.023	99.9	0.6	
Bus268	11.000										3.726	100.0	345.6	
Bus269	33.000										0.180	97.3	4.5	
Bus270	33.000		0.002		0.008						0.015	100.0	0.4	
Bus271	33.000		0.002		0.009						0.010	100.0	0.3	
Bus272	33.000										0.121	98.8	3.1	
Bus273	33.000										0.220	99.2	5.5	
Bus274	33.000		0.001		0.004						0.005	100.0	0.1	
Bus275	33.000		0.005		0.006						0.011	100.0	0.3	
Bus276	33.000		0.007		0.003						0.010	100.0	0.2	
Bus277	33.000		0.009		0.004						0.013	100.0	0.3	
Bus278	33.000		0.002		0.011						0.013	100.0	0.3	
Bus279	33.000		0.001		0.004						0.005	100.0	0.1	
Bus280	33.000										0.103	98.7	2.6	
Bus281	33.000		0.005		0.006						0.012	100.0	0.3	
Bus282	33.000		0.002		0.008						0.010	100.0	0.3	
Bus283	33.000										0.091	98.6	2.3	
Bus284	33.000		0.001		0.004						0.005	100.0	0.1	
Bus285	33.000										0.061	97.9	1.5	
Bus286	33.000										0.073	98.0	1.8	
Bus287	33.000		0.002		0.009						0.011	100.0	0.3	
Bus288	33.000		0.002		0.007						0.008	100.0	0.2	
Bus289	33.000		0.012		0.006						0.019	100.0	0.5	
Bus290	11.000										1.525	85.9	127.1	
Bus291	11.000		0.024		0.020						1.431	86.3	126.8	
Bus292	11.000										1.471	86.2	127.1	
Bus293	11.000		0.017	0.010	0.052	0.032					0.081	85.0	7.1	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus294	11.000										1.180	85.9	108.6	
Bus295	11.000		0.002	0.001	0.007	0.004					1.230	85.7	111.1	
Bus296	11.000										1.264	85.6	113.5	
Bus297	11.000										1.392	85.5	123.5	
Bus298	11.000		0.003	0.002	0.010	0.006					0.015	85.0	1.4	
Bus299	11.000										1.199	85.8	110.1	
Bus300	33.000										0.046	98.5	1.2	
Bus301	11.000										0.401	100.0	37.2	
Bus302	33.000		0.005		0.005						0.056	98.7	1.4	
Bus303	11.000		0.008	0.005	0.023	0.014					1.052	86.0	98.3	
Bus304	11.000										0.948	86.2	89.9	
Bus305	11.000		0.012	0.007	0.033	0.021					1.010	86.1	94.9	
Bus306	11.000										3.262	100.0	317.6	
Bus307	11.000		0.114		0.078						3.474	100.0	336.2	
Bus308	33.000		0.004		0.016						0.030	100.0	0.8	
Bus309	33.000										0.016	99.8	0.4	
Bus310	33.000		0.001		0.004						0.004	100.0	0.1	
Bus311	11.000		0.007	0.004	0.018	0.011					0.336	87.8	32.2	
Bus312	11.000		0.006	0.004	0.016	0.010					0.366	87.6	34.7	
Bus313	33.000		0.002		0.010						0.012	100.0	0.3	
Bus314	33.000		0.000		0.002						0.003	100.0	0.1	
Bus315	33.000										0.007	96.5	0.2	
Bus316	11.000										0.018	85.2	1.7	
Bus317	11.000										3.669	100.0	341.3	
Bus318	11.000		0.002	0.002	0.006	0.004					0.010	85.0	1.0	
Bus319	11.000		0.002	0.001	0.005	0.003					0.007	85.0	0.7	
Bus320	33.000										0.011	94.7	0.3	
Bus321	11.000										0.236	88.5	23.2	
Bus322	33.000		0.001		0.004						0.004	100.0	0.1	
Bus323	11.000		0.001	0.001	0.003	0.002					0.004	85.0	0.4	
Bus324	11.000		0.032		0.024						0.055	100.0	5.2	
Bus325	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus326	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus327	11.000										0.213	88.8	21.0	
Bus328	11.000										0.227	88.6	22.4	
Bus329	11.000		0.011	0.007	0.028	0.017					0.168	89.7	16.6	
Bus330	11.000										0.234	88.5	23.0	
Bus331	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.6	
Bus332	11.000		0.010	0.006	0.026	0.016					0.210	88.8	20.8	
Bus333	33.000		0.001		0.003						0.004	100.0	0.1	
Bus334	11.000		0.003	0.002	0.007	0.004					0.267	88.2	26.0	
Bus335	33.000		0.001		0.002						0.003	100.0	0.1	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus336	11.000										0.255	88.4	24.9	
Bus337	33.000										2.068	99.9	51.7	
Bus338	33.000		0.001		0.005						1.275	99.7	31.9	
Bus339	33.000										0.190	97.4	4.8	
Bus340	33.000		0.001		0.004						0.005	100.0	0.1	
Bus341	11.000		0.122	0.075	0.319	0.198					0.518	85.0	50.4	
Bus342	11.000										0.554	85.1	53.8	
Bus343	33.000										1.267	99.7	31.8	
Bus344	11.000		0.001	0.001	0.004	0.002					0.035	86.9	3.4	
Bus345	11.000										0.030	87.0	2.9	
Bus346	11.000		0.003	0.002	0.009	0.006					0.575	85.2	55.2	
Bus347	11.000										0.010	85.6	1.0	
Bus348	33.000		0.003		0.012						0.015	100.0	0.4	
Bus349	11.000		0.006	0.004	0.017	0.010					0.027	85.0	2.5	
Bus350	11.000										0.113	85.4	10.4	
Bus351	11.000										0.069	85.4	6.4	
Bus352	33.000		0.001		0.003						0.019	100.0	0.5	
Bus353	11.000		0.003	0.002	0.009	0.006					0.043	85.4	3.9	
Bus354	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus355	11.000										0.028	85.5	2.6	
Bus356	11.000										0.027	85.4	2.5	
Bus357	33.000										1.262	99.7	31.6	
Bus358	11.000		0.006	0.004	0.016	0.010					0.026	85.0	2.4	
Bus359	11.000		0.005	0.003	0.014	0.008					0.022	85.0	2.0	
Bus360	11.000										0.044	85.1	4.0	
Bus361	33.000		0.001		0.003						0.003	100.0	0.1	
Bus362	33.000										1.191	99.7	30.0	
Bus363	11.000		0.005	0.003	0.014	0.009					0.022	85.0	2.0	
Bus364	33.000										1.213	99.7	30.5	
Bus365	11.000										0.014	85.1	1.4	
Bus366	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.8	
Bus367	11.000		0.001	0.001	0.003	0.002					0.006	85.0	0.6	
Bus368	11.000										5.468	87.7	508.3	
Bus369	33.000		0.005	0.003	0.021	0.013					0.031	85.0	0.8	
Bus370	33.000		0.005		0.023						0.152	98.2	3.8	
Bus371	11.000										4.511	85.6	485.0	
Bus372	11.000		0.095		0.057						4.807	86.8	498.6	
Bus373	11.000		0.068		0.045						5.161	87.5	508.3	
Bus374	33.000		0.005	0.003	0.022	0.014					0.032	85.0	0.8	
Bus375	11.000		0.113		0.076						0.189	100.0	18.5	
Bus376	33.000										1.239	99.7	31.2	
Bus377	11.000		1.650		1.110						3.031	100.0	296.3	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus378	33.000		0.005		0.020						0.024	100.0	0.6	
Bus379	33.000		0.003		0.014						0.018	100.0	0.4	
Bus380	33.000		0.007		0.030						0.037	100.0	0.9	
Bus381	33.000										0.125	96.8	3.1	
Bus382	33.000		0.012		0.053						0.065	100.0	1.6	
Bus383	33.000										0.120	100.0	3.0	
Bus385	33.000		0.005	0.003	0.022	0.014					0.032	85.0	0.8	
Bus386	33.000		0.013		0.055						0.067	100.0	1.7	
Bus387	33.000										1.031	99.6	26.0	
Bus388	33.000													
Bus389	33.000		0.003		0.014						0.017	100.0	0.4	
Bus390	33.000										0.013	99.5	0.3	
Bus391	33.000										0.030	100.0	0.8	
Bus392	33.000										0.062	99.9	1.6	
Bus393	33.000		0.003		0.014						0.017	100.0	0.4	
Bus394	33.000		0.003		0.011						0.013	100.0	0.3	
Bus395	11.000		0.049		0.033						0.082	100.0	8.0	
Bus396	33.000		0.010		0.005						0.015	99.8	0.4	
Bus397	11.000										0.392	100.0	37.2	
Bus398	33.000		0.003		0.014						0.017	100.0	0.4	
Bus399	33.000										0.032	99.8	0.8	
Bus400	11.000		0.100		0.031						0.131	100.0	12.4	
Bus401	11.000		0.006		0.005						0.967	86.9	80.9	
Bus402	33.000										0.006	99.3	0.1	
Bus403	33.000										0.835	99.6	21.1	
Bus404	33.000										0.936	99.6	23.6	
Bus405	33.000		0.001		0.004						0.005	100.0	0.1	
Bus406	33.000										0.968	99.6	24.4	
Bus407	33.000		0.001		0.006						0.007	100.0	0.2	
Bus408	33.000										0.032	99.4	0.8	
Bus409	33.000		0.001		0.003						0.004	100.0	0.1	
Bus410	33.000		0.003		0.013						0.019	99.8	0.5	
Bus411	11.000										0.950	86.6	80.1	
Bus412	33.000		0.004		0.015						0.100	100.0	2.5	
Bus413	11.000		0.037	0.023	0.124	0.077					0.189	85.0	16.2	
Bus414	33.000		0.001		0.005						0.081	100.0	2.1	
Bus415	33.000										0.075	100.0	1.9	
Bus416	11.000										0.888	86.6	75.9	
Bus417	11.000		0.002	0.001	0.005	0.003					0.034	85.3	2.9	
Bus418	33.000		0.012		0.053						0.066	100.0	1.7	
Bus419	11.000		0.001	0.001	0.005	0.003					0.041	85.5	3.5	
Bus420	33.000		0.002		0.008						0.009	100.0	0.2	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus421	33.000										0.694	99.4	17.5	
Bus422	11.000		0.000	0.000	0.001	0.001					0.043	85.7	3.6	
Bus423	33.000		0.001		0.003						0.007	99.0	0.2	
Bus424	33.000		0.001		0.006						0.007	100.0	0.2	
Bus425	33.000		0.002		0.008						0.017	100.0	0.4	
Bus426	33.000										0.020	94.9	0.5	
Bus427	33.000										0.036	96.5	0.9	
Bus428	33.000										0.053	98.2	1.3	
Bus429	33.000		0.003		0.014						0.018	100.0	0.4	
Bus430	33.000		0.003		0.012						0.015	100.0	0.4	
Bus431	33.000		0.000		0.002						0.002	100.0	0.1	
Bus432	11.000										0.026	85.2	2.2	
Bus433	33.000		0.002		0.011						0.022	99.8	0.6	
Bus434	33.000		0.006		0.027						0.055	99.9	1.4	
Bus435	33.000		0.007		0.032						0.095	100.0	2.4	
Bus436	33.000										0.129	99.9	3.3	
Bus437	33.000		0.006		0.028						0.163	100.0	4.1	
Bus438	33.000										5.351	85.0	131.2	
Bus439	33.000										5.350	85.0	131.2	
Bus440	33.000										0.523	99.5	13.2	
Bus441	33.000		1.468	0.909	0.186	0.116					1.946	85.0	47.8	
Bus442	33.000		2.456	1.522	0.276	0.171					3.214	85.0	83.9	
Bus443	33.000										5.426	88.5	133.0	
Bus444	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.5	
Bus445	11.000		0.006	0.003	0.016	0.010					0.025	85.0	2.3	
Bus446	11.000		0.023	0.014	0.071	0.044					0.110	85.0	10.0	
Bus447	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.6	
Bus448	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus449	11.000		0.002	0.001	0.007	0.004					0.011	85.0	1.0	
Bus450	11.000		0.003	0.002	0.009	0.006					0.014	85.0	1.3	
Bus451	11.000		0.002	0.001	0.006	0.004					0.010	85.0	0.9	
Bus452	11.000										0.024	85.4	2.2	
Bus453	11.000										0.035	85.4	3.2	
Bus454	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.5	
Bus455	11.000										0.040	85.6	3.6	
Bus456	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.6	
Bus457	11.000										0.046	85.8	4.2	
Bus458	11.000		0.003	0.002	0.009	0.006					0.014	85.0	1.3	
Bus459	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.7	
Bus460	11.000										0.022	85.1	2.0	
Bus461	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.3	
Bus462	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.7	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus463	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus464	11.000										0.546	87.8	45.0	
Bus465	11.000		0.002		0.007						0.528	87.6	45.0	
Bus466	11.000		0.001		0.003						0.518	87.2	44.3	
Bus467	11.000										0.513	87.0	44.0	
Bus468	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus469	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.5	
Bus470	11.000										0.008	85.4	0.7	
Bus471	11.000										0.509	86.9	43.8	
Bus472	11.000		0.012		0.011						0.498	86.9	43.2	
Bus473	11.000		0.004	0.002	0.013	0.008					0.474	85.7	41.4	
Bus474	11.000										0.451	85.6	39.7	
Bus475	11.000		0.002	0.001	0.007	0.004					0.442	85.6	39.0	
Bus476	11.000		0.004	0.003	0.014	0.008					0.021	85.0	1.9	
Bus477	11.000										0.430	85.6	38.1	
Bus478	11.000		0.005	0.003	0.017	0.010					0.407	85.6	36.3	
Bus479	11.000										0.378	85.6	34.0	
Bus480	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus481	11.000										0.263	85.7	23.7	
Bus482	11.000										0.260	85.7	23.6	
Bus483	11.000		0.000	0.000	0.001	0.001					0.260	85.6	23.6	
Bus484	11.000										0.258	85.6	23.4	
Bus485	11.000										0.235	85.7	21.4	
Bus486	11.000										0.187	85.6	17.0	
Bus487	11.000		0.001	0.001	0.003	0.002					0.004	85.0	0.4	
Bus488	11.000										0.180	85.5	16.5	
Bus489	11.000		0.004	0.002	0.011	0.007					0.175	85.5	16.1	
Bus490	11.000		0.004	0.003	0.012	0.008					0.019	85.0	1.8	
Bus491	11.000		0.002	0.001	0.006	0.004					0.010	85.0	0.9	
Bus492	11.000		0.003	0.002	0.008	0.005					0.012	85.0	1.1	
Bus493	11.000										0.022	85.1	2.0	
Bus494	11.000		0.002	0.002	0.007	0.004					0.011	85.0	1.0	
Bus495	11.000										0.033	85.3	3.1	
Bus496	11.000										0.053	85.3	4.8	
Bus497	11.000		0.001	0.000	0.002	0.001					0.055	85.3	5.1	
Bus498	11.000										0.158	85.5	14.5	
Bus499	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.7	
Bus500	11.000										0.103	85.6	9.5	
Bus501	11.000										0.095	85.6	8.8	
Bus502	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.8	
Bus503	11.000										0.069	85.7	6.4	
Bus504	11.000		0.004	0.003	0.012	0.007					0.019	85.0	1.7	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus505	11.000										0.061	85.7	5.6	
Bus506	11.000		0.001	0.001	0.003	0.002					0.004	85.0	0.4	
Bus507	11.000										0.042	86.0	3.9	
Bus508	11.000		0.001	0.001	0.004	0.003					0.007	85.0	0.6	
Bus509	11.000		0.002	0.001	0.005	0.003					0.008	85.0	0.7	
Bus510	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.5	
Bus511	11.000										0.020	85.2	1.8	
Bus512	11.000										0.038	85.6	3.5	
Bus513	11.000		0.001	0.001	0.004	0.003					0.007	85.0	0.6	
Bus514	11.000										0.013	85.5	1.2	
Bus515	11.000		0.001	0.001	0.004	0.003					0.006	85.0	0.6	
Bus516	11.000		0.003	0.002	0.005	0.003					0.009	85.0	1.2	
Bus517	11.000		0.004	0.002	0.006	0.004					0.020	85.1	2.5	
Bus518	11.000												-	
Bus519	11.000		0.001	0.001	0.001	0.001					0.003	85.0	0.3	
Bus520	11.000		0.005	0.003	0.009	0.006					0.017	85.0	2.0	
Bus521	11.000		0.003	0.002	0.005	0.003					0.009	85.0	1.0	
Bus522	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.6	
Bus523	11.000		0.002	0.001	0.004	0.002					0.006	85.0	0.7	
Bus524	11.000		0.005	0.003	0.008	0.005					0.015	85.0	1.7	
Bus525	11.000		0.005	0.003	0.010	0.006					0.017	85.0	2.0	
Bus526	11.000		0.006	0.003	0.010	0.006					0.018	85.0	2.1	
Bus527	11.000		0.006	0.003	0.010	0.006					0.036	85.0	4.3	
Bus528	11.000										0.054	85.1	6.3	
Bus529	11.000		0.005	0.003	0.008	0.005					0.069	85.1	8.0	
Bus530	11.000										0.084	85.1	9.8	
Bus531	11.000										0.090	85.2	10.5	
Bus532	11.000		0.015	0.009	0.026	0.016					0.048	85.0	5.7	
Bus533	11.000		0.015	0.009	0.027	0.016					0.049	85.0	5.9	
Bus534	11.000		0.016	0.010	0.028	0.017					0.052	85.0	6.2	
Bus535	11.000										0.101	85.1	12.1	
Bus536	11.000		0.005	0.003	0.008	0.005					0.015	85.0	1.8	
Bus537	11.000		0.006	0.004	0.011	0.007					0.020	85.0	2.4	
Bus538	11.000										0.035	85.0	4.3	
Bus539	11.000		0.005	0.003	0.008	0.005					0.015	85.0	1.8	
Bus540	11.000		0.006	0.004	0.011	0.007					0.020	85.0	2.4	
Bus541	11.000		0.004	0.002	0.007	0.004					0.033	85.1	4.0	
Bus542	11.000										0.048	85.1	5.8	
Bus543	11.000		0.004	0.002	0.007	0.004					0.061	85.1	7.3	
Bus544	11.000										0.097	85.1	11.6	
Bus545	11.000		0.005	0.003	0.008	0.005					0.112	85.1	13.4	
Bus546	11.000										0.214	85.2	25.5	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus547	11.000										0.264	85.2	31.2	
Bus548	11.000										0.358	85.3	41.7	
Bus549	11.000		0.064	0.040	0.119	0.074					0.576	85.2	66.5	
Bus550	11.000										0.589	85.3	67.0	
Bus551	11.000		0.064	0.040	0.123	0.076					0.812	85.3	91.9	
Bus552	11.000		0.005	0.003	0.011	0.007					0.019	85.0	2.0	
Bus553	11.000		0.003	0.002	0.007	0.004					0.012	85.0	1.2	
Bus554	11.000		0.002	0.001	0.004	0.002					0.018	85.2	1.9	
Bus555	11.000		0.009	0.006	0.020	0.012					0.052	85.1	5.5	
Bus556	11.000										0.072	85.1	7.5	
Bus557	11.000		0.004	0.002	0.010	0.006					0.016	85.0	1.5	
Bus558	11.000		0.003	0.002	0.008	0.005					0.012	85.0	1.2	
Bus559	11.000		0.002	0.001	0.006	0.004					0.010	85.0	0.9	
Bus560	11.000										0.022	85.4	2.1	
Bus561	11.000										0.038	85.3	3.6	
Bus562	11.000		0.004	0.002	0.010	0.006					0.054	85.3	5.1	
Bus563	11.000		0.002	0.002	0.007	0.004					0.011	85.0	1.0	
Bus564	11.000										2.606	86.8	214.7	
Bus565	11.000		0.005	0.003	0.018	0.011					2.512	86.6	214.7	
Bus566	11.000		0.002	0.001	0.006	0.004					0.009	85.0	0.8	
Bus567	11.000		0.002	0.001	0.006	0.004					0.010	85.0	0.9	
Bus568	11.000										0.019	85.1	1.7	
Bus569	11.000		0.006	0.004	0.019	0.012					0.029	85.0	2.6	
Bus570	11.000		0.002	0.001	0.008	0.005					0.012	85.0	1.0	
Bus571	11.000		0.003	0.002	0.009	0.005					0.013	85.0	1.2	
Bus572	11.000		0.002	0.001	0.006	0.004					0.023	85.1	2.0	
Bus573	11.000		0.003	0.002	0.009	0.005					0.014	85.0	1.2	
Bus574	11.000		0.002	0.001	0.005	0.003					0.007	85.0	0.7	
Bus575	11.000		0.002	0.001	0.006	0.004					0.009	85.0	0.8	
Bus576	11.000												-	
Bus577	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.3	
Bus578	11.000										0.012	85.5	1.0	
Bus579	11.000										0.019	85.5	1.7	
Bus580	11.000		0.000	0.000	0.001	0.001					0.021	85.5	1.8	
Bus581	11.000		0.001	0.000	0.002	0.001					0.024	85.5	2.1	
Bus582	11.000		0.002	0.001	0.007	0.004					0.049	85.3	4.3	
Bus583	11.000		0.002	0.002	0.008	0.005					0.061	85.3	5.4	
Bus584	11.000										0.084	85.3	7.4	
Bus585	11.000										0.096	85.3	8.4	
Bus586	11.000		0.002	0.001	0.006	0.004					0.104	85.3	9.2	
Bus587	11.000										0.134	85.3	11.8	
Bus588	11.000										0.153	85.3	13.4	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus589	11.000		0.000	0.000	0.000	-					0.153	85.4	13.4	
Bus590	11.000		0.007	0.004	0.022	0.013					2.426	86.5	212.3	
Bus591	11.000										2.150	86.4	196.0	
Bus592	11.000		0.008	0.005	0.022	0.013					0.034	85.0	3.3	
Bus593	11.000										2.063	86.2	195.0	
Bus594	11.000		0.004	0.002	0.010	0.006					0.016	85.0	1.6	
Bus595	11.000		0.005	0.003	0.012	0.007					0.019	85.0	1.9	
Bus596	11.000										0.036	85.1	3.6	
Bus597	11.000										1.861	86.0	186.6	
Bus598	11.000		0.016	0.010	0.038	0.023					1.778	85.8	183.0	
Bus599	11.000		0.005	0.003	0.010	0.006					0.017	85.0	1.8	
Bus600	11.000										1.692	85.8	176.5	
Bus601	11.000										1.670	85.8	174.7	
Bus602	11.000		0.016	0.010	0.035	0.022					0.060	85.0	6.4	
Bus603	11.000		0.010	0.006	0.022	0.014					0.038	85.0	4.1	
Bus604	11.000										0.098	85.1	10.5	
Bus605	11.000		0.016	0.010	0.035	0.022					0.159	85.1	16.9	
Bus606	11.000										1.582	85.7	167.2	
Bus607	11.000										1.356	85.5	150.4	
Bus608	11.000		0.004	0.002	0.008	0.005					0.014	85.0	1.6	
Bus609	11.000										0.526	85.7	58.4	
Bus610	11.000		0.003	0.002	0.005	0.003					0.009	85.0	1.0	
Bus611	11.000										0.504	85.7	56.9	
Bus612	11.000		0.001	0.001	0.002	0.002					0.004	85.0	0.5	
Bus613	11.000										0.492	85.6	55.9	
Bus614	11.000		0.003	0.002	0.005	0.003					0.009	85.0	1.0	
Bus615	11.000										0.483	85.6	55.4	
Bus616	11.000										0.473	85.6	54.3	
Bus617	11.000		0.004	0.003	0.008	0.005					0.472	85.5	54.3	
Bus618	11.000		0.002	0.001	0.004	0.003					0.008	85.0	0.9	
Bus619	11.000		0.003	0.002	0.005	0.003					0.017	85.0	2.0	
Bus620	11.000										0.455	85.5	52.6	
Bus621	11.000		0.001	0.001	0.002	0.001					0.003	85.0	0.4	
Bus622	11.000		0.001	0.001	0.002	0.001					0.003	85.0	0.4	
Bus623	11.000		0.000	0.000	0.001	0.001					0.005	85.1	0.5	
Bus624	11.000										0.008	85.4	0.9	
Bus625	11.000		0.001	0.001	0.002	0.002					0.004	85.0	0.5	
Bus626	11.000										0.013	85.4	1.4	
Bus627	11.000		0.002	0.001	0.003	0.002					0.019	85.3	2.2	
Bus628	11.000		0.003	0.002	0.005	0.003					0.028	85.2	3.3	
Bus629	11.000										0.437	85.5	50.6	
Bus630	11.000		0.003	0.002	0.005	0.003					0.009	85.0	1.1	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus631	11.000										0.407	85.5	47.4	
Bus632	11.000		0.006	0.004	0.011	0.007					0.020	85.0	2.4	
Bus633	11.000										0.397	85.5	46.3	
Bus634	11.000										0.374	85.5	43.9	
Bus635	11.000										0.365	85.5	42.9	
Bus636	11.000		0.002	0.001	0.003	0.002					0.005	85.0	0.6	
Bus637	11.000		0.002	0.001	0.003	0.002					0.011	85.3	1.3	
Bus638	11.000		0.001	0.001	0.002	0.001					0.004	85.0	0.4	
Bus639	11.000		0.002	0.001	0.003	0.002					0.006	85.0	0.7	
Bus640	11.000		0.002	0.001	0.003	0.002					0.006	85.0	0.7	
Bus641	11.000										0.012	85.2	1.4	
Bus642	11.000		0.003	0.002	0.005	0.003					0.021	85.2	2.5	
Bus643	11.000										0.024	85.2	2.9	
Bus644	11.000		0.002	0.001	0.004	0.002					0.031	85.2	3.7	
Bus645	11.000		0.002	0.001	0.003	0.002					0.037	85.3	4.4	
Bus646	11.000		0.002	0.001	0.003	0.002					0.006	85.0	0.8	
Bus647	11.000		0.002	0.001	0.004	0.003					0.014	85.1	1.7	
Bus648	11.000										0.051	85.4	6.0	
Bus649	11.000		0.001	0.001	0.002	0.001					0.055	85.5	6.5	
Bus650	11.000										0.066	85.5	7.8	
Bus651	11.000										0.345	85.5	40.9	
Bus652	11.000		0.002	0.001	0.003	0.002					0.279	85.4	33.1	
Bus653	11.000		0.003	0.002	0.005	0.003					0.272	85.4	32.5	
Bus654	11.000										0.008	85.2	0.7	
Bus655	11.000										0.026	85.4	2.2	
Bus656	11.000		0.006	0.004	0.010	0.006					0.020	85.1	2.4	
Bus657	11.000										0.261	85.3	31.4	
Bus658	11.000		0.005	0.003	0.008	0.005					0.239	85.3	29.0	
Bus659	11.000		0.005	0.003	0.008	0.005					0.015	85.0	1.8	
Bus660	11.000										0.223	85.3	27.2	
Bus661	11.000		0.006	0.003	0.009	0.006					0.017	85.0	2.1	
Bus662	11.000										0.207	85.3	25.4	
Bus663	11.000		0.004	0.002	0.006	0.004					0.190	85.3	23.3	
Bus664	11.000		0.006	0.003	0.009	0.006					0.017	85.0	2.1	
Bus665	11.000		0.003	0.002	0.005	0.003					0.010	85.0	1.2	
Bus666	11.000		0.004	0.003	0.007	0.004					0.023	85.1	2.9	
Bus667	11.000										0.041	85.1	5.1	
Bus668	11.000		0.006	0.004	0.010	0.006					0.059	85.1	7.4	
Bus669	11.000		0.005	0.003	0.008	0.005					0.176	85.2	21.8	
Bus670	11.000		0.006	0.004	0.010	0.006					0.103	85.2	12.7	
Bus671	11.000		0.006	0.003	0.009	0.006					0.083	85.2	10.3	
Bus672	11.000										0.066	85.2	8.2	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus673	11.000										0.063	85.1	7.8	
Bus674	11.000		0.006	0.004	0.010	0.006					0.043	85.1	5.3	
Bus675	11.000		0.005	0.003	0.008	0.005					0.023	85.0	2.9	
Bus676	11.000		0.003	0.002	0.004	0.003					0.008	85.0	1.0	
Bus679	11.000										3.155	87.0	259.7	
Bus680	11.000		0.007		0.007						0.014	100.0	1.1	
Bus681	11.000		0.026		0.025						0.051	100.0	4.2	
Bus682	11.000		0.038		0.038						0.075	100.0	6.1	
Bus683	11.000		0.006	0.004	0.024	0.015					0.036	85.0	2.9	
Bus684	11.000		0.057		0.056						0.113	100.0	9.1	
Bus685	11.000										0.145	99.1	11.7	
Bus686	11.000		0.124		0.127						0.251	100.0	19.8	
Bus687	11.000										1.516	99.5	114.9	
Bus688	11.000		0.088		0.176						0.264	100.0	20.1	
Bus689	11.000										1.505	99.6	114.9	
Bus690	11.000		0.101		0.107						1.216	99.5	94.9	
Bus691	11.000										0.999	99.4	78.7	
Bus692	11.000										0.998	99.4	78.7	
Bus693	11.000		0.005		0.005						0.011	100.0	0.9	
Bus694	11.000										0.748	98.9	59.1	
Bus695	11.000													
Bus696	11.000										0.732	98.9	58.3	
Bus697	11.000										0.726	99.0	58.3	
Bus698	11.000										0.578	99.0	46.6	
Bus699	11.000		0.047		0.046						0.094	100.0	7.6	
Bus700	11.000		0.013		0.013						0.120	100.0	9.7	
Bus701	11.000										0.503	98.6	40.6	
Bus702	11.000		0.002	0.001	0.008	0.005					0.383	97.7	31.1	
Bus703	11.000										0.371	97.9	30.2	
Bus704	11.000		0.008		0.008						0.016	100.0	1.3	
Bus705	11.000		0.024	0.015	0.090	0.056					0.148	87.9	12.1	
Bus706	11.000										0.321	97.2	26.1	
Bus707	11.000		0.007		0.007						0.014	100.0	1.1	
Bus708	11.000										0.182	100.0	14.8	
Bus709	11.000		0.074		0.071						0.146	100.0	11.9	
Bus710	11.000										0.167	100.0	13.7	
Bus711	11.000		0.002	0.001	0.006	0.004					0.009	85.0	0.7	
Bus712	11.000		0.002	0.001	0.007	0.004					0.010	85.0	0.8	
Bus713	11.000		0.001	0.001	0.006	0.004					0.008	85.0	0.6	
Bus714	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus715	11.000		0.006	0.004	0.025	0.015					0.036	85.0	2.8	
Bus716	11.000										0.436	97.4	33.0	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus717	11.000		0.036		0.040						0.075	100.0	5.7	
Bus718	11.000										0.435	97.4	33.0	
Bus719	11.000		0.022		0.025						0.361	96.2	27.5	
Bus720	11.000										0.314	95.1	24.1	
Bus721	11.000		0.002	0.001	0.008	0.005					0.011	85.0	0.8	
Bus722	11.000		0.005	0.003	0.022	0.014					0.032	85.0	2.5	
Bus723	11.000										0.043	85.1	3.3	
Bus724	11.000										0.278	96.0	21.4	
Bus725	11.000		0.008		0.009						0.237	97.2	18.2	
Bus726	11.000		0.006	0.004	0.026	0.016					0.221	96.8	17.0	
Bus727	11.000		0.006		0.006						0.012	100.0	0.9	
Bus728	11.000										0.185	98.1	14.3	
Bus729	11.000		0.000		0.000						0.001	100.0	0.1	
Bus730	11.000										0.174	97.8	13.4	
Bus731	11.000										0.173	97.8	13.4	
Bus732	11.000		0.001		0.001						0.171	97.8	13.2	
Bus733	11.000		0.000	0.000	0.001	-					0.169	97.8	13.1	
Bus734	11.000		0.001		0.001						0.002	100.0	0.1	
Bus735	11.000										0.168	97.8	13.0	
Bus736	11.000		0.002		0.003						0.166	97.8	12.9	
Bus737	11.000										0.161	97.6	12.5	
Bus738	11.000		0.001	0.001	0.003	0.002					0.153	98.0	11.9	
Bus739	11.000		0.010		0.011						0.148	98.2	11.6	
Bus740	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.4	
Bus741	11.000		0.007		0.008						0.015	100.0	1.2	
Bus742	11.000										0.020	99.1	1.5	
Bus743	11.000										0.127	97.6	9.9	
Bus744	11.000		0.003	0.002	0.013	0.008					0.107	97.1	8.4	
Bus745	11.000		0.006		0.007						0.090	98.4	7.0	
Bus746	11.000		0.001	0.001	0.003	0.002					0.077	97.8	6.0	
Bus747	11.000		0.005		0.005						0.010	100.0	0.8	
Bus748	11.000										0.072	98.3	5.7	
Bus749	11.000		0.018		0.019						0.038	100.0	3.0	
Bus750	11.000										0.062	97.6	4.9	
Bus751	11.000										0.026	85.7	2.1	
Bus752	11.000		0.003	0.002	0.011	0.007					0.017	85.0	1.3	
Bus753	11.000													
Bus754	11.000										1.949	99.2	147.7	
Bus755	33.000										2.009	97.7	49.2	
Bus756	33.000										16.761	81.4	417.8	
Bus757	33.000										0.027	-	0.7	
Bus758	33.000													

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus759	11.000		0.003	0.002	0.011	0.007					0.017	85.0	1.5	
Bus760	33.000		0.002		0.007						0.009	100.0	0.2	
Bus761	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.4	
Bus762	33.000		0.006		0.028						0.034	100.0	0.9	
Bus763	33.000										0.359	99.3	9.1	
Bus764	33.000		0.002		0.010						0.013	100.0	0.3	
Bus765	33.000										0.058	100.0	1.5	
Bus766	33.000		0.002		0.008						0.068	99.9	1.7	
Bus767	11.000		0.001	0.001	0.002	0.001					0.004	85.0	0.3	
Bus768	33.000		0.002		0.007						0.009	100.0	0.2	
Bus769	33.000										0.292	99.1	7.4	
Bus770	33.000		0.002		0.009						0.011	100.0	0.3	
Bus771	33.000										0.283	99.1	7.2	
Bus772	33.000		0.005		0.021						0.025	100.0	0.6	
Bus773	33.000										0.040	100.0	1.0	
Bus774	33.000		0.001		0.006						0.047	100.0	1.2	
Bus775	33.000		0.003		0.012						0.014	100.0	0.4	
Bus776	33.000		0.007		0.031						0.055	100.0	1.4	
Bus777	33.000										0.116	97.9	2.9	
Bus778	33.000		0.002		0.008						0.017	100.0	0.4	
Bus779	33.000		0.001		0.006						0.007	100.0	0.2	
Bus780	33.000										0.225	98.7	5.7	
Bus781	33.000		0.001		0.004						0.005	100.0	0.1	
Bus782	33.000		0.004		0.019						0.040	99.2	1.0	
Bus785	11.000										0.697	86.9	59.7	
Bus786	33.000		0.001		0.006						0.017	99.7	0.4	
Bus787	33.000		0.002		0.008						0.009	100.0	0.2	
Bus788	33.000		0.002		0.010						0.012	100.0	0.3	
Bus789	33.000										0.085	98.5	2.2	
Bus790	33.000										0.125	97.8	3.2	
Bus791	33.000		0.002		0.007						0.009	100.0	0.2	
Bus792	33.000		0.001		0.006						0.030	97.8	0.8	
Bus793	33.000		0.002		0.007						0.023	97.0	0.6	
Bus794	33.000		0.001		0.004						0.005	100.0	0.1	
Bus795	33.000		0.002		0.007						0.014	99.8	0.4	
Bus796	33.000		0.000		0.001						0.001	100.0	-	
Bus797	33.000										0.073	98.4	1.9	
Bus798	33.000		0.001		0.005						0.006	100.0	0.1	
Bus799	33.000										0.067	99.5	1.7	
Bus800	33.000		0.001		0.004						0.005	100.0	0.1	
Bus801	33.000										0.072	99.4	1.8	
Bus802	33.000		0.004		0.015						0.019	100.0	0.5	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus803	33.000										0.061	99.9	1.5	
Bus804	33.000		0.003		0.014						0.042	100.0	1.1	
Bus805	33.000		0.005		0.020						0.024	100.0	0.6	
Bus806	33.000		0.008		0.032						1.071	99.6	27.0	
Bus808	11.000		0.001	0.001	0.005	0.003					0.008	85.0	0.7	
Bus809	11.000										0.690	86.9	59.7	
Bus810	11.000		0.003	0.002	0.010	0.006					0.016	85.0	1.4	
Bus811	11.000										0.666	86.9	58.3	
Bus812	11.000										0.061	85.4	5.4	
Bus813	11.000										0.605	87.0	53.0	
Bus814	11.000										0.507	87.4	44.4	
Bus815	11.000		0.020	0.012	0.064	0.039					0.098	85.0	8.6	
Bus816	11.000		0.088	0.055	0.057	0.035					0.342	85.0	44.6	
Bus817	11.000		0.088	0.055	0.057	0.035					0.171	85.0	22.3	
Bus818	11.000										0.033	85.4	2.9	
Bus819	11.000		0.010	0.006	0.014	0.009					0.029	85.0	2.5	
Bus820	11.000										0.033	85.3	2.9	
Bus821	11.000		0.006	0.003	0.008	0.005					0.016	85.0	1.4	
Bus822	11.000		0.006	0.004	0.009	0.005					0.017	85.0	1.5	
Bus823	33.000		3.920		0.856						4.776	100.0	117.1	
Bus1085	11.000		0.200		0.061						0.261	100.0	24.8	
Bus1087	11.000		0.014	0.009	0.046	0.028					0.070	85.0	6.1	
Bus1088	11.000		0.026		0.020						0.046	100.0	4.2	
Bus1089	11.000		0.130		0.088						0.218	100.0	21.2	
Bus1090	11.000		1.250	0.774	2.312	1.433					4.190	85.0	485.0	
Bus1091	11.000		0.003		0.001						0.005	100.0	0.4	
Bus1093	11.000										0.011	85.4	0.9	
Bus1094	11.000		0.001	0.000	0.002	0.001					0.032	86.1	2.9	
Bus1095	11.000										0.030	86.1	2.6	
Bus1098	11.000		0.001	0.000	0.003	0.002					0.004	85.0	0.3	
Bus1099	11.000										0.011	86.6	1.0	
Bus1100	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1101	11.000										0.007	85.6	0.6	
Bus1102	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.5	
Bus1107	11.000		0.001	0.001	0.004	0.002					0.006	85.0	0.5	
Bus1108	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.4	
Bus1109	11.000		0.002	0.001	0.005	0.003					0.019	85.9	1.7	
Bus1110	11.000		0.006	0.003	0.017	0.011					0.027	85.0	2.4	
Bus1111	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1112	11.000		0.001	0.000	0.002	0.001					0.003	85.0	0.3	
Bus1113	11.000		0.001	0.000	0.002	0.001					0.007	85.3	0.7	
Bus1114	11.000		0.001	0.001	0.003	0.002					0.004	85.0	0.4	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus1115	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1116	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1117	11.000										0.009	86.8	0.8	
Bus1118	11.000										0.010	86.7	1.0	
Bus1119	11.000										0.020	87.3	1.9	
Bus1120	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1121	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1122	11.000										0.004	87.4	0.4	
Bus1123	11.000										0.006	87.2	0.6	
Bus1124	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1125	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1127	11.000										0.002	86.3	0.2	
Bus1128	11.000										0.003	86.3	0.3	
Bus1129	11.000		0.000	0.000	0.000	-					0.000	85.0	-	
Bus1130	11.000		0.000	0.000	0.000	-					0.000	85.0	-	
Bus1131	11.000										0.010	87.7	0.9	
Bus1132	11.000		0.000	0.000	0.000	-					0.000	85.0	-	
Bus1133	11.000										0.009	87.4	0.9	
Bus1134	11.000		0.000	0.000	0.001	-					0.002	85.9	0.2	
Bus1135	11.000										0.009	87.2	0.9	
Bus1136	11.000										0.002	86.2	0.2	
Bus1137	11.000										0.007	87.0	0.6	
Bus1138	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.1	
Bus1139	11.000										0.005	86.2	0.5	
Bus1140	11.000										0.003	86.0	0.2	
Bus1141	11.000										0.003	86.2	0.3	
Bus1142	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1143	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1144	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1145	11.000		0.000	0.000	0.000	-					0.001	85.0	0.1	
Bus1146	11.000		0.000	0.000	0.001	-					0.001	85.0	0.1	
Bus1147	11.000		0.000	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1151	11.000		0.004	0.002	0.010	0.006					0.290	88.1	28.0	
Bus1152	11.000										0.273	88.2	26.4	
Bus1153	11.000										0.307	88.0	29.5	
Bus1156	11.000		0.001	0.000	0.001	0.001					0.002	85.0	0.2	
Bus1157	11.000										0.122	91.2	12.1	
Bus1158	11.000		0.001	0.001	0.004	0.002					0.013	85.5	1.3	
Bus1159	11.000		0.005		0.003						0.120	91.2	11.9	
Bus1161	11.000										0.113	90.0	11.2	
Bus1162	11.000										0.051	90.8	5.1	
Bus1163	11.000										0.033	88.3	3.3	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Loading
Bus1165	11.000										0.010	92.2	1.0	
Bus1166	11.000										0.015	90.6	1.5	
Bus1167	11.000										0.020	89.5	2.0	
Bus1168	11.000		0.001	0.001	0.003	0.002					0.005	85.0	0.5	

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
						Loading (input)		Loading (output)	
ID	Type	Ampacity (Amp)	Loading Amp	%	Capability (MVA)	MVA	%	MVA	%
Cable1	Cable	378.60	211.98	55.99					
Cable2	Cable	338.03	179.43	53.08					
Cable3	Cable	338.03	77.13	22.82					
* Cable4	Cable	338.03	504.18	149.15					
Cable5	Cable	338.03	8.97	2.65					
Cable6	Cable	338.03	127.11	37.60					
* Cable7	Cable	338.03	508.30	150.37					
* Cable8	Cable	338.03	345.58	102.23					
Cable9	Cable	310.24	131.17	42.28					
Cable10	Cable	338.03	44.97	13.30					
Cable11	Cable	229.86	214.72	93.41					
Cable12	Cable	338.03	114.92	34.00					
Cable13	Cable	338.03	33.03	9.77					
* Cable14	Cable	274.79	417.80	152.04					
Cable16	Cable	310.24	0.68	0.22					
Cable18	Cable	178.41	1.20	0.67					
Cable19	Cable	338.03	37.16	10.99					
Cable21	Cable	310.24	52.56	16.94					
Cable22	Cable	930.73	117.05	12.58					
L70-C1	Cable	338.03	5.16	1.53					
33/11kV TFR I-S	Transformer				3.000	2.009	67.0	1.949	65.0
* 33/11kV TFR I1	Transformer				5.000	11.497	229.9	9.347	186.9
* 33/11kV TFR II	Transformer				5.000	5.158	103.2	4.665	93.3
* 33/11kV TFR II-S	Transformer				3.000	3.532	117.7	3.155	105.2
66/11kV TFR I	Transformer				10.000	4.542	45.4	4.509	45.1
* 66/11kV TFR II	Transformer				5.000	14.739	294.8	13.119	262.4
66/33kV TFR	Transformer				5.000				
* 66/33kV TFR I	Transformer				5.000	22.926	458.5	17.128	342.6
* 66/33kV TFR II	Transformer				5.000	22.093	441.9	16.608	332.2
220/66kV TFR I	Transformer				62.500	37.461	59.9	35.795	57.3
220/66kV TFR II	Transformer				62.500	37.461	59.9	35.795	57.3

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
220/66kV TFR I	29.709	22.819	-29.648	-20.058	61.4	2761.1	100.0	95.6	4.45
220/66kV TFR II	29.709	22.819	-29.648	-20.058	61.4	2761.1	100.0	95.6	4.45
66/33kV TFR II	15.817	15.425	-14.872	-7.393	944.9	8031.4	95.6	71.4	24.17
66kV line	27.236	8.511	-26.515	-7.535	721.4	976.2	95.6	92.1	3.41
66/33kV TFR I	16.243	16.180	-15.255	-7.787	987.4	8392.9	95.6	71.4	24.17
Line19	-0.004	-0.002	0.004	0.002	0.0	-0.1	81.5	81.5	0.00
Line57	0.002	0.001	-0.002	-0.001	0.0	-0.1	81.5	81.5	0.00
Line58	0.002	0.001	-0.002	-0.001	0.0	-0.1	81.5	81.5	0.00
Cable21	2.142	-0.094	-2.142	0.094	0.1	0.0	71.4	71.4	0.00
Line714	13.861	9.921	-13.643	-9.737	218.6	184.3	71.4	70.2	1.20
Cable9	4.548	2.822	-4.547	-2.822	0.7	0.0	71.4	71.4	0.01
Cable22	4.776	0.000	-4.776	0.000	0.0	0.0	71.4	71.4	0.00
66/11kV TFR I	4.495	0.653	-4.482	-0.488	12.7	164.9	92.1	91.5	0.68
66/33kV TFR	0.000	0.000	0.000	0.000			92.1	92.1	
66/11kV TFR II	13.034	6.882	-12.639	-3.517	395.9	3364.9	92.1	82.0	10.13
Cable1	3.694	0.023	-3.692	-0.022	2.2	2.0	91.5	91.4	0.06
Line3	0.788	0.465	-0.783	-0.462	5.8	2.4	91.5	90.8	0.64
Cable3	1.205	0.001	-1.205	-0.001	0.0	0.0	82.0	82.0	0.00
Cable4	7.074	3.467	-7.067	-3.462	6.5	4.6	82.0	81.9	0.08
Cable5	0.140	0.000	-0.140	0.000	0.0	0.0	82.0	82.0	0.00
Line59	4.219	0.049	-4.162	-0.001	57.1	48.5	82.0	80.9	1.12
Line2	3.692	0.022	-3.666	0.000	25.5	21.5	91.4	90.8	0.63
Line4	0.010	0.006	-0.010	-0.006	0.0	-0.3	90.8	90.8	0.01
Line5	0.773	0.456	-0.768	-0.455	4.6	1.9	90.8	90.3	0.51
Line6	0.030	0.019	-0.030	-0.019	0.0	0.0	90.3	90.3	0.00
Line7	0.738	0.436	-0.724	-0.430	14.1	5.7	90.3	88.7	1.63
Line8	0.001	0.001	-0.001	-0.001	0.0	0.0	88.7	88.7	0.00
Line9	0.722	0.429	-0.717	-0.427	5.7	2.3	88.7	88.0	0.66
Line10	0.012	0.007	-0.012	-0.007	0.0	0.0	88.0	88.0	0.00
Line11	0.011	0.007	-0.011	-0.007	0.0	-0.1	88.0	88.0	0.00
Line12	0.694	0.413	-0.688	-0.410	5.9	2.4	88.0	87.3	0.71
Line13	0.663	0.395	-0.655	-0.392	8.0	3.2	87.3	86.3	0.99
Line14	0.007	0.004	-0.007	-0.004	0.0	-0.1	86.3	86.3	0.00
Line15	0.648	0.387	-0.638	-0.383	9.7	3.9	86.3	85.1	1.22

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line16	0.636	0.382	-0.619	-0.375	17.1	6.9	85.1	83.0	2.15
Line17	0.532	0.322	-0.531	-0.321	0.7	0.3	83.0	82.9	0.10
Line18	0.072	0.044	-0.072	-0.044	0.1	-0.4	82.9	82.7	0.12
Line21	0.460	0.277	-0.459	-0.277	0.5	0.2	82.9	82.8	0.08
Line20	0.059	0.036	-0.059	-0.036	0.0	-0.1	82.7	82.7	0.02
Line22	0.221	0.136	-0.220	-0.136	1.0	0.1	82.8	82.4	0.34
Line25	0.238	0.142	-0.237	-0.141	1.1	0.1	82.8	82.4	0.36
Line23	0.043	0.026	-0.043	-0.027	0.0	-0.4	82.4	82.4	0.08
Line24	0.032	0.020	-0.032	-0.020	0.0	-0.1	82.4	82.4	0.02
Line26	0.220	0.131	-0.220	-0.131	0.5	0.0	82.4	82.2	0.19
Line27	0.008	0.004	-0.008	-0.005	0.0	-0.1	82.2	82.2	0.00
Line29	0.008	0.005	-0.008	-0.005	0.0	-0.1	82.2	82.2	0.00
Line30	0.204	0.121	-0.203	-0.121	0.4	0.0	82.2	82.1	0.14
Line28	0.001	0.000	-0.001	-0.001	0.0	-0.5	82.2	82.2	0.00
Line31	-0.007	-0.004	0.007	0.004	0.0	-0.1	82.1	82.1	0.00
Line33	0.196	0.117	-0.196	-0.117	0.2	0.0	82.1	82.0	0.09
Line32	0.181	0.108	-0.180	-0.108	0.5	-0.1	82.0	81.8	0.21
Line34	-0.171	-0.102	0.171	0.102	0.2	0.0	81.7	81.8	0.10
Line35	0.045	0.027	-0.045	-0.027	0.0	-0.1	81.7	81.7	0.01
Line39	0.126	0.075	-0.126	-0.075	0.1	-0.1	81.7	81.6	0.06
Line36	0.000	0.000	0.000	0.000	0.0	0.0	81.7	81.7	0.00
Line37	0.045	0.027	-0.045	-0.028	0.0	-0.1	81.7	81.7	0.03
Line38	0.017	0.010	-0.017	-0.010	0.0	-0.1	81.7	81.7	0.01
Line40	0.036	0.022	-0.036	-0.022	0.0	-0.2	81.6	81.6	0.03
Line44	0.090	0.053	-0.090	-0.053	0.0	0.0	81.6	81.6	0.02
Line41	-0.023	-0.014	0.023	0.014	0.0	-0.2	81.6	81.6	0.02
Line42	0.011	0.006	-0.011	-0.007	0.0	-0.2	81.6	81.6	0.01
Line43	-0.083	-0.049	0.084	0.049	0.0	-0.1	81.6	81.6	0.04
Line45	0.059	0.034	-0.059	-0.034	0.1	-0.3	81.6	81.5	0.07
Line46	0.022	0.013	-0.022	-0.013	0.0	-0.1	81.5	81.5	0.01
Line50	0.037	0.022	-0.037	-0.022	0.0	-0.1	81.5	81.5	0.02
Line47	0.010	0.005	-0.010	-0.006	0.0	-0.3	81.5	81.5	0.01
Line48	0.004	0.002	-0.004	-0.002	0.0	-0.1	81.5	81.5	0.00
Line51	0.006	0.003	-0.006	-0.003	0.0	0.0	81.5	81.5	0.00
Line63	-6.302	-3.308	6.439	3.425	137.6	117.1	79.4	81.4	1.97
Line67	0.032	0.019	-0.032	-0.019	0.0	-0.1	79.4	79.4	0.01
Line70	6.270	3.289	-6.131	-3.171	138.8	118.1	79.4	77.4	1.99

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line49	0.003	0.002	-0.003	-0.002	0.0	-0.2	81.5	81.5	0.00
Line64	1.582	0.001	-1.581	0.000	1.0	0.8	80.9	80.8	0.05
Line52	-0.002	-0.002	0.002	0.001	0.0	-0.1	81.5	81.5	0.00
Line53	-0.004	-0.002	0.004	0.002	0.0	-0.1	81.5	81.5	0.00
Line54	-0.007	-0.004	0.007	0.004	0.0	-0.4	81.5	81.5	0.01
Line55	-0.020	-0.012	0.020	0.012	0.0	-0.2	81.5	81.5	0.01
Line56	-0.017	-0.010	0.017	0.010	0.0	-0.1	81.5	81.5	0.01
Line60	1.205	0.001	-1.204	-0.001	0.6	0.3	82.0	82.0	0.04
Line66	-0.007	-0.004	0.007	0.004	0.0	-0.2	68.5	68.5	0.01
Line98	0.003	0.002	-0.003	-0.002	0.0	-0.4	68.5	68.5	0.01
Line101	0.004	0.003	-0.004	-0.003	0.0	0.0	68.5	68.5	0.00
Line61	7.067	3.462	-7.024	-3.425	43.3	36.8	81.9	81.4	0.57
Line62	-0.008	0.000	0.008	0.000	0.0	0.0	52.7	52.7	0.00
Line96	2.142	-0.094	-2.113	0.103	29.4	9.0	71.4	70.4	0.94
Line65	-0.577	0.000	0.578	0.001	0.7	0.5	81.9	82.0	0.11
Line68	0.013	0.007	-0.013	-0.007	0.0	-0.1	79.4	79.4	0.01
Line69	0.007	0.004	-0.007	-0.004	0.0	-0.4	79.4	79.4	0.01
Line71	6.125	3.167	-5.986	-3.049	138.6	117.9	77.4	75.4	1.99
Line72	0.182	0.000	-0.182	0.000	0.1	0.0	75.4	75.4	0.04
Line73	5.804	3.049	-5.799	-3.045	5.1	4.3	75.4	75.3	0.07
Line74	5.741	3.009	-5.736	-3.005	5.0	4.2	75.3	75.3	0.07
Line75	-0.042	0.000	0.042	0.000	0.0	0.0	75.3	75.3	0.00
Line76	5.694	3.005	-5.602	-2.926	92.0	78.2	75.3	73.9	1.38
Line78	0.003	0.000	-0.003	0.000	0.0	0.0	73.9	73.9	0.00
Line79	0.436	0.270	-0.436	-0.270	0.2	0.1	73.9	73.8	0.03
Line80	5.163	2.657	-5.109	-2.610	54.4	46.3	73.9	73.0	0.89
Line77	-1.030	-0.502	1.030	0.502	0.6	0.5	69.8	69.8	0.05
Line85	0.816	0.502	-0.811	-0.499	5.4	2.4	69.8	69.3	0.43
Line87	0.213	0.000	-0.213	0.000	0.0	0.0	69.8	69.8	0.01
Line81	0.340	0.211	-0.340	-0.211	0.1	0.0	73.0	73.0	0.02
Line83	2.326	0.881	-2.242	-0.809	84.8	71.8	73.0	69.9	3.07
Line174	2.442	1.518	-2.421	-1.500	20.8	17.6	73.0	72.3	0.69
Line82	-0.431	0.000	0.431	0.000	0.4	0.1	69.9	69.9	0.06
Line84	1.811	0.809	-1.808	-0.807	2.4	2.0	69.9	69.8	0.11
Line86	-0.777	-0.481	0.795	0.490	18.9	8.4	67.8	69.3	1.53
Line88	0.778	0.305	-0.777	-0.304	1.5	1.2	69.8	69.7	0.16
Line92	0.711	0.264	-0.711	-0.263	0.7	0.6	69.7	69.6	0.08

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line89	-0.019	-0.011	0.019	0.011	0.0	-0.4	69.5	69.6	0.05
Line90	0.014	0.008	-0.014	-0.008	0.0	-0.3	69.5	69.5	0.03
Line91	0.011	0.007	-0.011	-0.007	0.0	0.0	69.5	69.5	0.00
Line93	0.003	0.002	-0.003	-0.002	0.0	0.0	69.5	69.5	0.00
Line94	0.008	0.005	-0.008	-0.005	0.0	-0.1	69.5	69.5	0.01
Line97	-0.689	-0.251	0.692	0.252	3.2	1.4	69.2	69.6	0.33
Line99	0.684	0.248	-0.679	-0.244	5.1	4.1	69.2	68.7	0.60
Line95	0.004	0.003	-0.004	-0.003	0.0	-0.1	69.5	69.5	0.00
0.116	-0.283	0.000	0.283	0.000	0.2	0.0	68.6	68.7	0.04
Line100	0.395	0.244	-0.394	-0.243	0.9	0.3	68.7	68.5	0.14
Line102	0.378	0.234	-0.377	-0.234	0.6	0.3	68.5	68.4	0.11
Line105	0.009	0.005	-0.009	-0.005	0.0	-0.1	68.5	68.5	0.00
Line103	-0.004	-0.003	0.004	0.003	0.0	-0.1	68.5	68.5	0.00
Line104	0.005	0.003	-0.005	-0.003	0.0	0.0	68.5	68.5	0.00
Line106	0.002	0.001	-0.002	-0.001	0.0	-0.2	68.5	68.5	0.00
Line107	0.003	0.002	-0.003	-0.002	0.0	0.0	68.5	68.5	0.00
Cable16	0.000	-0.027	0.000	0.027	0.0	0.0	69.7	69.7	0.00
33/11kV TFR II	4.091	3.142	-4.003	-2.395	87.9	747.0	69.7	63.0	6.67
Cable2	1.836	1.126	-1.836	-1.126	0.3	0.2	63.0	63.0	0.01
Cable6	1.311	0.781	-1.310	-0.781	0.9	0.6	63.0	63.0	0.05
Cable18	0.012	0.008	-0.012	-0.008	0.0	0.0	63.0	63.0	0.00
Line361	0.844	0.480	-0.840	-0.478	4.1	1.8	63.0	62.7	0.29
Cable7	4.811	2.634	-4.797	-2.624	14.4	10.2	56.6	56.5	0.18
Cable8	3.728	0.089	-3.725	-0.087	3.3	2.3	56.6	56.6	0.05
Cable19	0.401	0.004	-0.401	-0.004	0.1	0.0	56.6	56.6	0.01
33/11kV TFR I1	-8.940	-2.727	9.399	6.622	458.2	3895.0	56.6	69.7	13.03
Cable14	-13.490	-9.737	13.643	9.737	153.2	0.0	69.7	70.2	0.52
Line108	1.763	1.081	-1.718	-1.061	45.0	20.5	63.0	61.5	1.50
Line621	-0.002	-0.001	0.002	0.001	0.0	-0.1	43.6	43.6	0.00
Line110	0.803	0.493	-0.797	-0.491	5.3	2.4	61.5	61.1	0.38
Line111	0.617	0.379	-0.612	-0.377	5.4	2.4	61.1	60.6	0.50
Line112	0.520	0.321	-0.516	-0.319	3.8	1.7	60.6	60.2	0.42
Line115	0.092	0.056	-0.092	-0.056	0.0	0.0	60.6	60.6	0.02
Line113	0.140	0.086	-0.139	-0.086	0.6	0.1	60.2	60.0	0.25
Line155	0.346	0.215	-0.346	-0.215	0.2	0.1	60.2	60.2	0.03
Line133	2.069	-0.106	-2.065	0.107	3.5	0.7	70.1	70.0	0.11
Line136	-2.085	0.106	2.095	-0.103	10.2	3.1	70.1	70.4	0.33

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line114	0.029	0.015	-0.029	-0.016	0.0	0.0	52.6	52.6	0.00
Line1100	-0.038	-0.021	0.038	0.021	0.0	0.0	52.6	52.7	0.02
Line117	0.032	0.019	-0.032	-0.019	0.0	-0.1	60.6	60.6	0.03
Line137	0.060	0.037	-0.060	-0.037	0.0	0.0	60.6	60.6	0.01
Line119	0.022	0.012	-0.022	-0.013	0.0	-0.1	60.6	60.5	0.03
Line116	-0.006	-0.004	0.006	0.004	0.0	-0.1	52.6	52.6	0.01
Line120	0.015	0.008	-0.015	-0.008	0.0	-0.1	60.5	60.5	0.01
Line123	-0.003	-0.002	0.003	0.002	0.0	-0.1	52.6	52.6	0.00
Line121	-0.004	-0.003	0.004	0.003	0.0	0.0	60.5	60.5	0.00
Line122	-0.015	-0.008	0.015	0.008	0.0	-0.1	60.5	60.5	0.01
Line125	0.011	0.006	-0.011	-0.006	0.0	-0.1	60.5	60.5	0.02
Line118	-0.004	-0.003	0.004	0.003	0.0	-0.1	52.6	52.6	0.00
Line1103	-0.002	-0.001	0.002	0.001	0.0	-0.1	52.6	52.6	0.00
Line126	0.005	0.003	-0.005	-0.003	0.0	-0.1	60.5	60.5	0.00
Line127	0.006	0.003	-0.006	-0.003	0.0	-0.3	60.5	60.5	0.02
Line124	0.005	0.003	-0.005	-0.003	0.0	-0.1	52.6	52.6	0.01
Line129	0.002	0.000	-0.002	0.000	0.0	0.0	52.6	52.6	0.00
Line1102	-0.007	-0.003	0.007	0.003	0.0	0.0	52.6	52.6	0.00
Line128	0.002	0.001	-0.002	-0.001	0.0	-0.4	60.5	60.5	0.01
Line130	-0.002	-0.001	0.002	0.001	0.0	0.0	52.6	52.6	0.00
Line131	0.003	0.002	-0.003	-0.002	0.0	-0.1	52.6	52.6	0.00
Line132	-0.009	-0.006	0.009	0.006	0.0	0.0	52.5	52.5	0.00
Line142	-0.104	0.000	0.104	-0.001	0.0	-0.5	69.3	69.3	0.00
Line143	-0.780	0.007	0.780	-0.008	0.3	-0.9	69.9	70.0	0.03
Line146	0.760	-0.007	-0.759	0.003	1.2	-3.8	69.9	69.8	0.11
Line135	-0.055	-0.028	0.055	0.028	0.0	0.0	52.7	52.7	0.01
Line138	0.052	0.028	-0.052	-0.028	0.1	-0.1	52.7	52.6	0.10
Line139	0.040	0.021	-0.040	-0.021	0.0	0.0	52.6	52.6	0.02
Line140	0.040	0.021	-0.040	-0.021	0.0	-0.1	52.6	52.5	0.05
Line134	0.000	0.000	0.000	0.000	0.0	-0.2	52.6	52.6	0.00
Line141	0.031	0.015	-0.031	-0.015	0.0	-0.1	52.5	52.5	0.06
Line159	0.008	0.000	-0.008	0.000	0.0	-0.4	69.8	69.8	0.00
Line160	0.751	-0.003	-0.750	0.002	0.2	-0.5	69.8	69.8	0.01
Line244	-0.791	0.008	0.791	-0.009	0.5	-1.5	70.0	70.0	0.04
Line144	0.023	0.010	-0.023	-0.010	0.0	0.0	52.5	52.5	0.01
Line145	-0.012	-0.006	0.012	0.005	0.0	-0.1	52.4	52.4	0.01
Line151	0.002	0.001	-0.002	-0.001	0.0	0.0	52.4	52.4	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line152	0.002	0.001	-0.002	-0.001	0.0	0.0	52.4	52.4	0.00
Line153	0.008	0.003	-0.008	-0.003	0.0	0.0	52.4	52.4	0.01
Line109	-0.013	-0.008	0.013	0.008	0.0	-0.2	54.6	54.6	0.04
Line147	-0.014	-0.007	0.014	0.007	0.0	0.0	52.4	52.4	0.01
Line148	-0.003	0.000	0.003	0.000	0.0	-0.1	52.4	52.4	0.00
Line149	-0.017	-0.007	0.017	0.006	0.0	-0.2	52.4	52.5	0.04
Line150	0.006	0.004	-0.006	-0.004	0.0	0.0	52.5	52.5	0.00
Line154	0.006	0.002	-0.006	-0.002	0.0	0.0	52.4	52.4	0.00
Line156	-0.003	0.000	0.003	0.000	0.0	-0.1	52.4	52.4	0.00
Line157	-0.005	-0.001	0.005	0.001	0.0	0.0	52.4	52.4	0.00
Line158	0.002	0.001	-0.002	-0.001	0.0	-0.1	52.4	52.4	0.00
Line162	-0.018	-0.011	0.018	0.011	0.0	-0.3	69.8	69.8	0.00
Line163	-0.025	-0.015	0.025	0.015	0.0	-0.2	69.8	69.8	0.00
Line161	-0.043	-0.026	0.043	0.025	0.0	-1.2	69.8	69.8	0.00
Line164	0.104	-0.013	-0.103	0.012	0.0	-0.3	69.8	69.8	0.00
Line180	0.604	-0.014	-0.604	0.014	0.1	-0.7	69.8	69.8	0.01
Line165	0.097	-0.012	-0.097	0.011	0.0	-1.1	69.8	69.8	0.01
Line166	-0.005	0.000	0.005	0.000	0.0	-0.3	69.8	69.8	0.00
Line167	0.093	-0.011	-0.093	0.009	0.0	-1.5	69.8	69.8	0.01
Line169	0.084	-0.009	-0.084	0.009	0.0	-0.5	69.8	69.8	0.00
Line170	0.072	-0.008	-0.072	0.008	0.0	-0.1	69.8	69.8	0.00
Line176	0.006	-0.001	-0.006	0.000	0.0	-0.9	69.8	69.8	0.00
Line171	-0.017	0.002	0.017	-0.002	0.0	-0.4	69.8	69.8	0.00
Line177	0.009	-0.002	-0.009	0.000	0.0	-1.6	69.8	69.8	0.00
Line172	0.055	-0.006	-0.055	0.004	0.0	-1.7	69.8	69.8	0.01
Line173	0.026	-0.003	-0.026	0.002	0.0	-0.8	69.8	69.8	0.00
Line185	0.029	-0.001	-0.029	0.001	0.0	-0.7	69.8	69.8	0.00
Line178	-0.010	0.000	0.010	-0.001	0.0	-1.4	69.8	69.8	0.00
Line188	-0.006	0.000	0.006	-0.001	0.0	-0.7	69.3	69.3	0.00
Line181	-0.011	0.000	0.011	0.000	0.0	-0.4	69.8	69.8	0.00
Line182	0.006	0.000	-0.006	0.000	0.0	-0.2	69.8	69.8	0.00
Line183	-0.015	0.000	0.015	-0.001	0.0	-0.7	69.8	69.8	0.00
Line186	-0.005	0.000	0.005	0.000	0.0	-0.3	69.8	69.8	0.00
Line189	-0.013	0.000	0.013	-0.001	0.0	-0.7	69.2	69.2	0.00
Line374	-0.032	0.001	0.032	-0.001	0.0	-0.3	69.2	69.2	0.00
Line375	-0.721	0.076	0.722	-0.076	0.2	-0.4	69.2	69.3	0.02
Line380	0.690	-0.075	-0.690	0.075	0.2	-0.3	69.2	69.2	0.02

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line378	-0.014	0.000	0.014	-0.001	0.0	-0.7	69.2	69.2	0.00
Line192	-0.035	0.000	0.035	0.000	0.0	-0.4	69.2	69.2	0.00
Line193	-0.072	0.003	0.072	-0.003	0.0	-0.6	69.2	69.2	0.00
Line392	0.030	-0.001	-0.030	0.001	0.0	-0.3	69.2	69.2	0.00
Line394	0.007	-0.001	-0.007	0.001	0.0	-0.5	69.2	69.2	0.00
Line742	-0.167	0.033	0.167	-0.034	0.0	-1.2	69.0	69.1	0.01
Line743	0.005	-0.001	-0.005	0.000	0.0	-0.7	69.0	69.0	0.00
Line744	0.039	-0.005	-0.039	0.005	0.0	-0.4	69.0	69.0	0.00
Line748	0.123	-0.027	-0.123	0.026	0.0	-0.8	69.0	69.0	0.01
Line195	-0.005	0.000	0.005	0.000	0.0	-0.3	69.1	69.1	0.00
Line404	-0.529	0.055	0.529	-0.056	0.1	-0.5	69.2	69.2	0.01
Line406	0.521	-0.055	-0.520	0.052	0.5	-3.8	69.2	69.1	0.06
Line196	0.040	-0.001	-0.040	0.000	0.0	-1.0	69.1	69.1	0.00
Line724	-0.045	0.001	0.045	-0.001	0.0	-0.2	69.1	69.1	0.00
Line197	0.011	0.000	-0.011	0.000	0.0	-0.3	69.2	69.2	0.00
Line242	-0.084	0.004	0.084	-0.005	0.0	-0.9	69.2	69.2	0.00
Line187	0.599	-0.013	-0.599	0.013	0.1	-0.2	69.8	69.8	0.01
Line200	-0.007	0.000	0.007	0.000	0.0	-0.2	69.8	69.8	0.00
Line199	-0.014	0.000	0.014	0.000	0.0	-0.3	69.8	69.8	0.00
Line201	0.585	-0.013	-0.585	0.012	0.1	-0.4	69.8	69.8	0.02
Line389	-0.086	0.005	0.086	-0.005	0.0	-0.4	69.2	69.2	0.00
Line390	0.003	0.000	-0.003	0.000	0.0	-0.2	69.2	69.2	0.00
Line202	-0.015	0.000	0.015	0.000	0.0	-0.1	69.8	69.8	0.00
Line198	-0.391	0.052	0.391	-0.052	0.0	-0.3	69.8	69.8	0.00
Line203	0.008	0.000	-0.008	0.000	0.0	-0.2	69.8	69.8	0.00
Line204	0.368	-0.051	-0.368	0.051	0.0	-0.6	69.8	69.8	0.01
Line175	0.009	0.000	-0.009	0.000	0.0	-0.2	69.8	69.8	0.00
Line363	0.185	0.040	-0.185	-0.043	0.1	-2.8	69.8	69.7	0.04
Line205	-0.361	0.050	0.361	-0.051	0.0	-0.3	69.8	69.8	0.00
Line206	0.356	-0.050	-0.356	0.046	0.3	-4.8	69.8	69.7	0.05
Line207	0.011	0.000	-0.011	0.000	0.0	-0.3	69.7	69.7	0.00
Line210	0.345	-0.045	-0.345	0.043	0.1	-2.4	69.7	69.7	0.02
Line209	-0.006	0.000	0.006	0.000	0.0	-0.2	69.7	69.7	0.00
Line208	-0.018	0.000	0.018	0.000	0.0	-0.2	69.7	69.7	0.00
Line211	0.327	-0.042	-0.327	0.042	0.0	-0.8	69.7	69.7	0.01
Line213	-0.010	0.000	0.010	-0.001	0.0	-0.9	69.7	69.7	0.00
Line212	-0.020	0.001	0.020	-0.001	0.0	-0.6	69.7	69.7	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line224	0.307	-0.040	-0.307	0.038	0.1	-1.8	69.7	69.7	0.02
Line191	-0.093	0.005	0.093	-0.005	0.0	-0.3	69.2	69.2	0.00
Line215	-0.175	0.023	0.175	-0.024	0.0	-1.3	69.6	69.6	0.01
Line216	0.164	-0.023	-0.164	0.022	0.0	-0.3	69.6	69.6	0.00
Line246	0.011	0.000	-0.011	0.000	0.0	-0.3	69.6	69.6	0.00
Line217	-0.013	0.000	0.013	-0.001	0.0	-1.1	69.6	69.6	0.00
Line218	0.031	-0.002	-0.031	0.001	0.0	-0.8	69.6	69.6	0.00
Line247	0.120	-0.019	-0.120	0.019	0.0	-0.3	69.6	69.6	0.00
Line190	-0.675	0.073	0.675	-0.074	0.4	-0.7	69.2	69.2	0.04
Line396	0.052	-0.012	-0.052	0.010	0.0	-1.6	69.2	69.2	0.00
Line219	0.102	-0.018	-0.102	0.016	0.0	-1.2	69.6	69.6	0.00
Line220	0.005	0.000	-0.005	0.000	0.0	-0.3	69.6	69.6	0.00
Line221	-0.107	0.018	0.107	-0.018	0.0	-0.6	69.6	69.6	0.00
Line222	0.010	0.000	-0.010	0.000	0.0	-0.5	69.6	69.6	0.00
Line223	-0.023	0.001	0.023	-0.001	0.0	-0.5	69.6	69.6	0.00
Line248	0.013	0.000	-0.013	0.000	0.0	-0.4	69.6	69.6	0.00
Line179	0.014	0.000	-0.014	0.000	0.0	-0.4	69.7	69.7	0.00
Line225	0.293	-0.038	-0.293	0.037	0.0	-0.6	69.7	69.7	0.01
Line226	-0.014	0.000	0.014	-0.001	0.0	-1.2	69.7	69.7	0.00
Line227	0.279	-0.036	-0.279	0.035	0.1	-1.6	69.7	69.6	0.01
Line229	0.241	-0.031	-0.241	0.030	0.0	-1.2	69.6	69.6	0.01
Line230	-0.251	0.031	0.251	-0.031	0.0	-0.4	69.6	69.6	0.00
Line231	-0.257	0.032	0.257	-0.033	0.1	-1.8	69.6	69.6	0.01
Line233	0.007	0.000	-0.007	0.000	0.0	-0.5	69.6	69.6	0.00
1	0.014	0.000	-0.014	0.000	0.0	-0.4	69.6	69.6	0.00
Line232	-0.022	0.000	0.022	-0.001	0.0	-0.7	69.6	69.6	0.00
Line235	-0.009	0.000	0.009	-0.001	0.0	-0.6	69.6	69.6	0.00
Line184	-0.009	-0.006	0.009	0.005	0.0	-0.6	69.7	69.7	0.00
Line228	0.218	-0.029	-0.218	0.029	0.0	-0.5	69.6	69.6	0.00
Line238	-0.010	0.000	0.010	0.000	0.0	-0.3	69.6	69.6	0.00
Line237	-0.043	0.003	0.043	-0.004	0.0	-1.1	69.6	69.6	0.00
Line239	0.033	-0.003	-0.033	0.002	0.0	-0.5	69.6	69.6	0.00
Line240	-0.009	0.000	0.009	-0.001	0.0	-0.9	69.6	69.6	0.00
Line241	0.023	-0.002	-0.023	0.001	0.0	-0.5	69.6	69.6	0.00
Line243	0.014	-0.001	-0.014	0.000	0.0	-0.6	69.6	69.6	0.00
L70-L1	0.046	0.000	-0.046	0.000	0.0	0.0	56.6	56.6	0.00
L70-L2	3.679	0.087	-3.668	-0.078	11.2	9.5	56.6	56.4	0.18

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line168	0.149	0.026	-0.149	-0.029	0.1	-2.8	69.7	69.6	0.03
Line214	-0.175	-0.042	0.176	0.037	0.1	-4.6	69.7	69.7	0.06
Line234	0.026	0.016	-0.026	-0.016	0.0	-0.5	69.7	69.7	0.00
Line245	0.005	0.000	-0.005	0.000	0.0	-0.4	69.6	69.6	0.00
Line393	-0.010	0.000	0.010	-0.001	0.0	-0.5	69.2	69.2	0.00
Line236	0.013	0.000	-0.013	0.000	0.0	-0.2	69.6	69.6	0.00
Line249	0.012	0.000	-0.012	0.000	0.0	-0.4	69.6	69.6	0.00
Line251	0.090	-0.016	-0.090	0.016	0.0	-0.4	69.6	69.6	0.00
Line250	-0.010	0.000	0.010	0.000	0.0	-0.2	69.6	69.6	0.00
Line252	0.071	-0.015	-0.071	0.015	0.0	-0.7	69.6	69.6	0.00
Line256	0.008	0.000	-0.008	0.000	0.0	-0.2	69.6	69.6	0.00
Line253	-0.005	0.000	0.005	-0.001	0.0	-0.6	69.6	69.6	0.00
Line254	-0.060	0.012	0.060	-0.013	0.0	-0.7	69.6	69.6	0.00
Line261	0.055	-0.012	-0.055	0.009	0.0	-3.0	69.6	69.6	0.00
Line255	0.011	-0.001	-0.011	0.000	0.0	-1.4	69.6	69.6	0.00
Line259	-0.019	0.000	0.019	0.000	0.0	-0.4	69.6	69.6	0.00
Line267	1.310	0.781	-1.268	-0.746	41.6	35.1	63.0	60.7	2.23
Line268	-1.235	-0.722	1.263	0.746	27.9	23.6	59.2	60.7	1.49
Line270	1.192	0.722	-1.190	-0.721	1.5	0.6	59.2	59.2	0.07
Line1040	0.005	0.000	-0.005	0.000	0.0	0.0	60.7	60.7	0.00
Line269	-0.068	-0.042	0.068	0.042	0.1	-0.1	59.1	59.2	0.06
Line277	-1.013	-0.605	1.015	0.607	2.7	2.2	57.0	57.2	0.17
Line278	0.916	0.546	-0.905	-0.537	11.0	9.3	57.0	56.2	0.76
Line320	0.096	0.059	-0.096	-0.059	0.0	0.0	57.0	57.0	0.02
Line272	-1.054	-0.635	1.059	0.639	5.3	4.4	58.1	58.5	0.32
Line274	1.045	0.629	-1.029	-0.615	16.1	13.5	58.1	57.2	0.99
Line271	0.023	0.014	-0.023	-0.014	0.0	-0.2	58.5	58.4	0.04
Line273	-1.082	-0.653	1.094	0.663	11.7	9.9	58.5	59.2	0.70
Line1043	0.028	0.016	-0.028	-0.016	0.0	-0.2	59.2	59.1	0.05
Line257	-0.013	-0.008	0.013	0.008	0.0	0.0	57.1	57.2	0.00
Line258	0.011	-0.006	-0.011	0.004	0.0	-2.3	69.6	69.6	0.00
Line260	-0.046	0.008	0.046	-0.009	0.0	-0.9	69.6	69.6	0.00
Line263	0.016	-0.002	-0.016	0.001	0.0	-0.7	69.6	69.6	0.00
Line310	0.401	0.004	-0.392	0.000	8.5	3.6	56.6	55.4	1.20
Line279	0.874	0.518	-0.869	-0.514	5.0	4.2	56.2	55.9	0.36
0	0.497	0.303	-0.490	-0.301	6.9	2.9	55.4	54.7	0.71
Line280	-0.818	-0.480	0.824	0.486	6.6	5.5	55.4	55.9	0.50

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line282	0.321	0.177	-0.321	-0.176	0.1	0.1	55.4	55.3	0.02
L70-L4	-3.262	-0.006	3.281	0.014	19.4	8.4	53.9	54.2	0.32
L70-L5	0.218	0.000	-0.218	0.000	0.0	0.0	53.9	53.9	0.01
L70-L6	3.044	0.006	-3.031	0.000	12.7	5.8	53.9	53.7	0.22
L70-L3	-3.474	-0.014	3.612	0.078	138.6	63.4	54.2	56.4	2.18
Line262	0.012	0.000	-0.012	0.000	0.0	-0.3	69.6	69.6	0.00
Line264	0.004	-0.001	-0.004	0.000	0.0	-0.7	69.6	69.6	0.00
Line285	0.271	0.146	-0.270	-0.146	0.9	0.4	54.8	54.6	0.18
Line286	-0.295	-0.161	0.298	0.163	3.1	1.3	54.8	55.3	0.56
Line275	-0.003	0.000	0.003	0.000	0.0	-0.3	69.6	69.6	0.00
Line265	-0.006	0.002	0.006	-0.003	0.0	-0.9	69.6	69.6	0.00
Line266	0.004	-0.001	-0.004	0.000	0.0	-1.5	69.6	69.6	0.00
Line287	0.006	0.004	-0.006	-0.004	0.0	0.0	53.8	53.8	0.00
Line288	-0.015	-0.009	0.015	0.009	0.0	-0.2	53.8	53.8	0.04
Line289	0.009	0.005	-0.009	-0.005	0.0	-0.1	53.8	53.8	0.01
L70-C1	0.055	0.000	-0.055	0.000	0.0	0.0	56.4	56.4	0.00
Line276	0.004	-0.001	-0.004	0.000	0.0	-1.1	69.6	69.6	0.00
Line291	0.207	0.109	-0.207	-0.109	0.4	0.1	53.5	53.4	0.10
Line295	0.002	0.001	-0.002	-0.001	0.0	0.0	53.5	53.5	0.00
Line306	-0.209	-0.110	0.210	0.110	1.3	0.5	53.5	53.8	0.33
Line293	-0.004	-0.002	0.004	0.002	0.0	0.0	54.3	54.3	0.00
Line297	-0.002	-0.001	0.002	0.001	0.0	0.0	53.1	53.1	0.00
Line296	0.187	0.097	-0.187	-0.097	0.1	0.0	53.1	53.0	0.03
Line298	-0.189	-0.098	0.189	0.098	0.4	0.1	53.1	53.2	0.11
Line299	-0.201	-0.105	0.202	0.105	0.8	0.3	53.2	53.4	0.20
Line334	0.012	0.007	-0.012	-0.007	0.0	-0.1	53.2	53.2	0.02
Line300	-0.150	-0.074	0.151	0.074	0.3	0.1	52.9	53.0	0.12
Line307	0.111	0.050	-0.111	-0.050	0.1	0.0	52.9	52.9	0.06
Line301	0.005	0.003	-0.005	-0.003	0.0	0.0	53.4	53.4	0.00
Line303	-0.235	-0.126	0.237	0.126	1.6	0.6	53.9	54.3	0.36
Line304	0.226	0.120	-0.225	-0.119	0.4	0.1	53.9	53.8	0.09
Line395	-0.003	0.000	0.003	-0.001	0.0	-1.0	69.2	69.2	0.00
Line283	1.274	-0.098	-1.271	0.097	2.8	-0.6	70.0	69.9	0.15
Line290	1.265	-0.097	-1.264	0.097	1.4	-0.3	69.9	69.8	0.08
Line292	-0.005	0.000	0.005	-0.001	0.0	-0.6	69.8	69.8	0.00
Line311	-0.440	-0.273	0.441	0.273	0.4	0.2	54.0	54.0	0.04
Line313	0.031	0.017	-0.031	-0.018	0.0	-0.1	54.0	54.0	0.03

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line317	-0.471	-0.290	0.478	0.293	6.1	2.5	54.0	54.7	0.64
Line294	1.258	-0.096	-1.258	0.096	0.2	-0.1	69.8	69.8	0.01
Line315	0.026	0.014	-0.026	-0.015	0.0	-0.2	54.0	53.9	0.07
Line318	0.008	0.005	-0.008	-0.005	0.0	-0.1	53.9	53.9	0.02
Line1045	0.017	0.010	-0.017	-0.010	0.0	0.0	53.9	53.9	0.01
Line1058	0.002	0.002	-0.002	-0.002	0.0	0.0	53.9	53.9	0.00
Line1059	0.006	0.004	-0.006	-0.004	0.0	-0.1	53.9	53.9	0.00
Line302	-0.015	0.000	0.015	0.000	0.0	-0.2	69.8	69.8	0.00
Line319	-0.023	-0.014	0.023	0.014	0.0	-0.1	56.8	56.8	0.02
Line321	0.059	0.036	-0.059	-0.036	0.1	-0.1	57.0	56.8	0.11
Line331	0.037	0.023	-0.037	-0.023	0.0	-0.1	57.0	56.9	0.05
Line322	0.036	0.022	-0.036	-0.022	0.0	-0.1	56.8	56.8	0.04
Line305	-0.019	0.000	0.019	-0.001	0.0	-1.3	69.8	69.8	0.00
Line324	0.024	0.015	-0.024	-0.015	0.0	-0.1	56.8	56.8	0.02
Line325	-0.001	-0.001	0.001	0.001	0.0	-0.1	56.8	56.8	0.00
Line326	0.023	0.014	-0.023	-0.014	0.0	0.0	56.8	56.8	0.01
Line328	0.022	0.014	-0.022	-0.014	0.0	0.0	56.8	56.8	0.01
Line332	0.001	0.000	-0.001	-0.001	0.0	-0.2	56.8	56.8	0.00
Line308	1.239	-0.094	-1.235	0.094	3.4	-0.8	69.8	69.6	0.18
Line330	-0.018	-0.011	0.018	0.011	0.0	0.0	56.9	56.9	0.01
Line329	0.019	0.012	-0.019	-0.012	0.0	-0.1	56.9	56.9	0.01
Line309	-0.003	0.000	0.003	0.000	0.0	-0.3	69.5	69.5	0.00
Line314	-1.187	0.092	1.188	-0.092	0.9	-0.3	69.4	69.5	0.05
Line335	1.068	-0.091	-1.067	0.090	0.9	-0.4	69.4	69.4	0.06
Line346	0.120	-0.001	-0.120	0.001	0.0	-0.3	69.4	69.4	0.00
Line316	-1.209	0.092	1.211	-0.093	2.2	-0.6	69.5	69.6	0.12
Line340	0.018	0.000	-0.018	0.000	0.0	-0.2	69.5	69.5	0.00
Line336	0.007	0.004	-0.007	-0.004	0.0	0.0	53.2	53.2	0.00
Line337	0.005	0.003	-0.005	-0.003	0.0	0.0	53.2	53.2	0.00
Line338	4.797	2.624	-4.517	-2.496	279.6	127.9	56.5	53.3	3.17
Line323	0.121	0.029	-0.121	-0.029	0.0	-0.1	69.6	69.6	0.00
Line342	3.863	2.329	-3.561	-2.207	301.6	122.5	48.8	45.3	3.48
Line343	-3.863	-2.329	4.019	2.389	156.6	59.6	48.8	50.6	1.79
Line344	-4.171	-2.389	4.404	2.496	233.2	106.6	50.6	53.3	2.69
Line284	-0.027	-0.017	0.027	0.016	0.0	-1.0	69.6	69.6	0.00
L70-L8	-0.189	0.000	0.189	0.000	0.1	0.0	53.7	53.7	0.02
Line339	0.024	-0.001	-0.024	0.000	0.0	-0.6	69.6	69.6	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
L70-L7	0.082	0.000	-0.082	0.000	0.0	0.0	53.7	53.7	0.02
Line341	-0.037	0.000	0.037	0.000	0.0	-0.2	69.4	69.4	0.00
Line333	0.067	-0.002	-0.067	0.000	0.0	-2.5	69.6	69.6	0.01
Line350	0.027	0.016	-0.027	-0.017	0.0	-1.0	69.6	69.6	0.00
Line347	-0.065	0.000	0.065	0.000	0.0	-0.3	69.4	69.4	0.00
Line345	0.017	0.000	-0.017	0.000	0.0	-0.3	69.4	69.4	0.00
Line349	-1.027	0.090	1.027	-0.090	0.1	0.0	69.4	69.4	0.01
Line351	0.062	-0.004	-0.062	0.003	0.0	-0.5	69.4	69.3	0.00
Line358	0.964	-0.086	-0.964	0.086	0.2	-0.4	69.4	69.3	0.02
Line352	0.000	0.000	0.000	-0.001	0.0	-1.0	69.3	69.3	0.00
Line353	-0.017	0.000	0.017	0.000	0.0	-0.2	69.3	69.3	0.00
Line367	0.005	-0.001	-0.005	0.000	0.0	-1.2	69.3	69.3	0.00
Line368	0.007	0.000	-0.007	0.000	0.0	-0.1	69.3	69.3	0.00
Line371	-0.013	0.001	0.013	-0.002	0.0	-0.3	69.3	69.3	0.00
Line354	0.013	0.000	-0.013	0.000	0.0	-0.5	69.3	69.3	0.00
Line357	-0.030	0.001	0.030	-0.001	0.0	-0.4	69.3	69.3	0.00
Line355	0.032	-0.002	-0.032	0.002	0.0	-0.4	69.3	69.3	0.00
Line359	-0.015	0.001	0.015	-0.001	0.0	-0.3	69.3	69.3	0.00
Line370	0.262	0.000	-0.261	0.000	0.4	0.2	55.4	55.3	0.08
Line1036	0.131	0.000	-0.131	0.000	0.1	0.0	55.4	55.4	0.04
Line360	-0.017	0.000	0.017	-0.001	0.0	-0.7	69.3	69.3	0.00
Line381	0.829	0.478	-0.822	-0.475	6.8	3.0	62.7	62.2	0.49
Line362	-0.006	0.001	0.006	-0.001	0.0	-0.8	69.3	69.3	0.00
Line365	-0.831	0.078	0.832	-0.079	0.6	-0.7	69.3	69.3	0.05
Line366	-0.932	0.081	0.932	-0.082	0.2	-0.2	69.3	69.3	0.01
Line376	0.100	-0.003	-0.100	0.002	0.0	-0.3	69.3	69.3	0.00
Line369	0.032	-0.004	-0.032	0.004	0.0	-0.7	69.3	69.3	0.00
Line372	0.019	-0.002	-0.019	0.001	0.0	-0.8	69.3	69.3	0.00
Line373	-0.004	0.000	0.004	-0.001	0.0	-1.1	69.3	69.3	0.00
Line382	0.037	0.022	-0.037	-0.022	0.0	-0.1	62.2	62.2	0.05
Line764	0.007	0.004	-0.007	-0.004	0.0	-0.1	62.2	62.2	0.00
Line767	0.779	0.449	-0.769	-0.445	10.1	4.5	62.2	61.5	0.77
Line377	0.081	-0.002	-0.081	0.002	0.0	-0.4	69.3	69.3	0.00
Line768	-0.161	-0.100	0.161	0.100	0.4	0.1	61.3	61.5	0.14
Line379	0.075	-0.002	-0.075	0.002	0.0	-0.2	69.3	69.3	0.00
Line383	0.066	-0.001	-0.066	0.000	0.0	-0.6	69.3	69.3	0.00
Line385	0.009	-0.001	-0.009	0.000	0.0	-1.1	69.3	69.3	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line769	0.608	0.345	-0.606	-0.344	1.5	0.7	61.5	61.3	0.15
Line405	0.022	0.013	-0.022	-0.013	0.0	0.0	62.1	62.1	0.00
Line415	-0.029	-0.018	0.029	0.017	0.0	-0.2	62.1	62.1	0.05
Line620	-0.035	-0.021	0.035	0.021	0.0	-0.2	62.1	62.2	0.07
Line397	-0.007	0.000	0.007	0.000	0.0	-0.4	69.2	69.2	0.00
Line398	-0.017	0.000	0.017	-0.006	0.0	-5.4	69.2	69.2	0.01
Line399	-0.019	0.006	0.019	-0.009	0.0	-2.6	69.2	69.2	0.00
Line403	0.002	-0.001	-0.002	0.000	0.0	-0.7	69.2	69.2	0.00
Line400	-0.035	0.009	0.035	-0.010	0.0	-0.4	69.2	69.2	0.00
Line402	0.015	0.000	-0.015	0.000	0.0	-0.4	69.2	69.2	0.00
Line401	0.018	0.000	-0.018	0.000	0.0	-0.2	69.2	69.2	0.00
Line391	0.015	0.009	-0.015	-0.009	0.0	0.0	62.0	62.0	0.00
Line720	-0.022	-0.013	0.022	0.013	0.0	-0.1	62.0	62.1	0.02
Line735	0.007	0.004	-0.007	-0.004	0.0	-0.1	62.0	62.0	0.01
Line408	-0.022	0.001	0.022	-0.002	0.0	-0.8	69.1	69.1	0.00
Line717	0.009	-0.001	-0.009	0.000	0.0	-1.3	69.1	69.1	0.00
Line716	-0.055	0.002	0.055	-0.003	0.0	-0.4	69.1	69.1	0.00
Line718	-0.095	0.003	0.095	-0.004	0.0	-1.2	69.1	69.1	0.00
Line719	-0.129	0.004	0.129	-0.005	0.0	-0.7	69.1	69.1	0.01
Line721	0.034	0.000	-0.034	0.000	0.0	-0.5	69.1	69.1	0.00
Line407	-0.163	0.005	0.163	-0.005	0.0	-0.2	69.1	69.1	0.00
Line409	4.547	2.822	-4.546	-2.821	0.9	0.7	71.4	71.4	0.02
Line410	2.891	1.796	-2.732	-1.693	158.3	102.4	71.4	67.1	4.30
Line411	1.655	1.025	-1.654	-1.025	1.4	0.3	71.4	71.3	0.07
Line722	0.357	-0.046	-0.357	0.043	0.2	-3.5	69.1	69.1	0.04
33/11kV TFR II-S	2.836	2.105	-2.745	-1.556	91.5	548.9	71.4	63.8	7.62
Line412	-0.005	-0.003	0.005	0.003	0.0	0.0	56.7	56.7	0.00
Line413	-0.022	-0.013	0.022	0.013	0.0	-0.1	56.9	56.9	0.02
Line414	-0.094	-0.058	0.094	0.058	0.4	0.0	58.2	58.4	0.25
Line416	-0.005	-0.003	0.005	0.003	0.0	0.0	57.6	57.6	0.00
Line417	-0.002	-0.001	0.002	0.001	0.0	0.0	57.7	57.7	0.00
Line418	-0.009	-0.006	0.009	0.006	0.0	-0.1	57.6	57.6	0.01
Line419	-0.012	-0.008	0.012	0.007	0.0	-0.1	57.6	57.6	0.01
Line420	-0.008	-0.005	0.008	0.005	0.0	-0.1	57.6	57.6	0.01
Line421	-0.020	-0.012	0.020	0.012	0.0	0.0	57.6	57.6	0.01
Line422	-0.030	-0.018	0.030	0.018	0.0	-0.1	57.6	57.7	0.04
Line423	-0.004	-0.003	0.004	0.003	0.0	-0.1	57.7	57.7	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line424	-0.034	-0.020	0.034	0.020	0.0	-0.1	57.7	57.7	0.05
Line425	-0.005	-0.003	0.005	0.003	0.0	-0.1	57.7	57.7	0.01
Line426	-0.039	-0.023	0.039	0.023	0.0	0.0	57.7	57.7	0.02
Line427	-0.012	-0.008	0.012	0.007	0.0	0.0	57.7	57.7	0.01
Line428	-0.007	-0.004	0.007	0.004	0.0	0.0	57.7	57.7	0.00
Line429	-0.019	-0.012	0.019	0.012	0.0	-0.1	57.7	57.8	0.02
Line430	-0.003	-0.002	0.003	0.002	0.0	0.0	58.4	58.4	0.00
Line431	-0.006	-0.004	0.006	0.004	0.0	-0.1	59.5	59.6	0.01
Line432	-0.001	-0.001	0.001	0.001	0.0	0.0	61.3	61.3	0.00
Cable10	-0.480	-0.262	0.480	0.262	0.1	0.1	63.8	63.8	0.01
Line433	0.480	0.262	-0.463	-0.254	16.9	7.2	63.8	61.6	2.16
Line434	0.453	0.254	-0.452	-0.254	1.1	0.5	61.6	61.4	0.15
Line435	0.448	0.254	-0.446	-0.253	1.3	0.5	61.4	61.3	0.17
Line436	0.445	0.253	-0.442	-0.251	2.5	1.1	61.3	60.9	0.33
Line437	-0.002	-0.001	0.002	0.001	0.0	-0.1	60.9	60.9	0.00
Line438	-0.005	-0.003	0.005	0.003	0.0	0.0	60.9	60.9	0.00
Line439	-0.007	-0.004	0.007	0.004	0.0	0.0	60.9	60.9	0.00
Line440	0.436	0.247	-0.432	-0.246	3.3	1.4	60.9	60.5	0.44
Line441	0.409	0.246	-0.406	-0.245	3.0	1.2	60.5	60.1	0.42
Line442	0.389	0.234	-0.386	-0.233	3.6	1.5	60.1	59.6	0.53
Line443	0.379	0.229	-0.378	-0.228	0.8	0.3	59.6	59.4	0.12
Line444	0.370	0.223	-0.368	-0.222	1.7	0.7	59.4	59.2	0.25
Line445	-0.018	-0.011	0.018	0.011	0.0	0.0	59.2	59.2	0.01
Line446	0.350	0.211	-0.348	-0.211	2.0	0.8	59.2	58.9	0.32
Line447	0.326	0.197	-0.324	-0.196	2.7	1.1	58.9	58.4	0.45
Line448	0.226	0.136	-0.225	-0.135	1.4	0.5	58.4	58.1	0.33
M Noonpani B2	-0.001	-0.001	0.001	0.001	0.0	0.0	58.1	58.1	0.00
Line449	0.224	0.135	-0.223	-0.134	0.7	0.2	58.1	57.9	0.16
M Noonpani B3	0.223	0.134	-0.222	-0.134	0.5	0.2	57.9	57.8	0.12
Line450	0.221	0.133	-0.221	-0.133	0.2	0.1	57.8	57.8	0.04
Line451	0.202	0.121	-0.201	-0.121	0.1	0.0	57.8	57.7	0.02
Line452	0.160	0.097	-0.160	-0.097	0.4	0.1	57.7	57.6	0.14
Line453	0.155	0.093	-0.154	-0.093	0.6	0.1	57.6	57.4	0.19
Line454	-0.004	-0.002	0.004	0.002	0.0	0.0	57.4	57.4	0.00
Line455	0.150	0.091	-0.150	-0.091	0.6	0.1	57.4	57.2	0.20
Line456	0.136	0.082	-0.135	-0.082	0.4	0.1	57.2	57.1	0.14
Line457	-0.017	-0.010	0.017	0.010	0.0	0.0	57.0	57.0	0.01

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line458	-0.008	-0.005	0.008	0.005	0.0	0.0	57.0	57.0	0.00
Line459	-0.010	-0.006	0.010	0.006	0.0	0.0	57.0	57.0	0.00
Line460	-0.019	-0.011	0.019	0.011	0.0	0.0	57.0	57.0	0.01
Line461	-0.010	-0.006	0.010	0.006	0.0	-0.1	57.0	57.0	0.01
Line462	-0.028	-0.017	0.028	0.017	0.0	-0.1	57.0	57.0	0.03
Line463	-0.045	-0.027	0.045	0.027	0.0	0.0	57.0	57.1	0.03
Line464	-0.047	-0.029	0.047	0.029	0.0	0.0	57.1	57.1	0.00
Line465	0.088	0.053	-0.088	-0.053	0.2	0.0	57.1	56.9	0.11
Line466	-0.007	-0.004	0.007	0.004	0.0	0.0	56.9	56.9	0.00
Line467	0.081	0.049	-0.081	-0.049	0.1	0.0	56.9	56.9	0.05
Line468	0.060	0.036	-0.059	-0.036	0.1	-0.1	56.9	56.8	0.07
Line469	-0.007	-0.004	0.007	0.004	0.0	0.0	56.8	56.8	0.00
Line470	0.052	0.031	-0.052	-0.031	0.0	0.0	56.8	56.8	0.03
Line471	-0.016	-0.010	0.016	0.010	0.0	0.0	56.8	56.8	0.00
Line472	0.036	0.022	-0.036	-0.022	0.0	0.0	56.8	56.8	0.01
Line473	-0.004	-0.002	0.004	0.002	0.0	-0.1	56.8	56.8	0.00
Line474	0.033	0.019	-0.033	-0.020	0.1	-0.3	56.8	56.7	0.11
Line475	-0.006	-0.003	0.006	0.003	0.0	0.0	56.6	56.6	0.00
Line476	-0.007	-0.004	0.007	0.004	0.0	0.0	56.6	56.6	0.00
Line477	-0.005	-0.003	0.005	0.003	0.0	-0.1	56.6	56.6	0.00
Line478	-0.017	-0.010	0.017	0.010	0.0	-0.1	56.6	56.7	0.03
Line479	0.011	0.007	-0.011	-0.007	0.0	-0.1	56.7	56.7	0.01
Line480	-0.006	-0.003	0.006	0.003	0.0	-0.1	56.7	56.7	0.01
Line481	0.005	0.003	-0.005	-0.003	0.0	0.0	56.7	56.7	0.00
Line482	-0.008	-0.005	0.008	0.005	0.0	-0.1	42.1	42.1	0.01
Line483	-0.017	-0.011	0.017	0.011	0.0	0.0	42.1	42.1	0.02
Line484	0.000	0.000	0.000	0.000	0.0	0.0	42.2	42.2	0.00
Line485	-0.002	-0.001	0.002	0.001	0.0	0.0	42.2	42.2	0.00
Line486	-0.014	-0.009	0.014	0.009	0.0	0.0	44.7	44.7	0.00
Line487	-0.007	-0.004	0.007	0.004	0.0	0.0	44.7	44.7	0.00
Line488	-0.004	-0.003	0.004	0.003	0.0	0.0	46.1	46.1	0.00
Line489	-0.005	-0.003	0.005	0.003	0.0	-0.1	45.0	45.0	0.01
Line490	-0.013	-0.008	0.013	0.008	0.0	0.0	44.9	44.9	0.01
Line491	-0.015	-0.009	0.015	0.009	0.0	0.0	44.8	44.8	0.01
Line492	-0.015	-0.010	0.015	0.010	0.0	0.0	44.7	44.7	0.01
Line493	-0.031	-0.019	0.031	0.019	0.0	-0.1	44.7	44.8	0.06
Line494	-0.046	-0.028	0.046	0.028	0.1	0.0	44.8	44.8	0.05

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line495	-0.058	-0.036	0.059	0.036	0.1	0.0	44.8	44.9	0.06
Line496	-0.071	-0.044	0.071	0.044	0.2	0.0	44.9	45.0	0.10
Line497	-0.077	-0.047	0.077	0.047	0.2	0.0	45.0	45.1	0.11
Line498	-0.041	-0.025	0.041	0.025	0.1	-0.1	44.3	44.4	0.12
Line499	-0.042	-0.026	0.042	0.026	0.1	0.0	43.9	44.0	0.07
Line500	-0.044	-0.027	0.044	0.027	0.1	0.0	43.9	44.0	0.08
Line501	-0.086	-0.053	0.086	0.053	0.1	0.0	44.0	44.0	0.05
Line502	-0.013	-0.008	0.013	0.008	0.0	0.0	43.6	43.6	0.00
Line503	-0.017	-0.011	0.017	0.011	0.0	0.0	43.6	43.6	0.01
Line504	-0.030	-0.019	0.030	0.019	0.0	0.0	43.6	43.6	0.05
Line505	-0.013	-0.008	0.013	0.008	0.0	0.0	43.6	43.6	0.00
Line506	-0.017	-0.011	0.017	0.011	0.0	-0.1	43.5	43.6	0.05
Line507	-0.028	-0.017	0.028	0.017	0.0	0.0	43.6	43.6	0.02
Line508	-0.041	-0.025	0.041	0.025	0.0	0.0	43.6	43.6	0.04
Line509	-0.052	-0.032	0.052	0.032	0.0	0.0	43.6	43.6	0.01
Line510	-0.082	-0.051	0.082	0.051	0.2	0.0	43.6	43.7	0.09
Line511	-0.095	-0.059	0.096	0.059	0.7	0.2	43.7	44.0	0.29
Line512	-0.182	-0.112	0.184	0.113	1.9	0.8	44.0	44.4	0.43
Line513	-0.225	-0.138	0.229	0.140	3.6	1.5	44.4	45.1	0.67
Line514	-0.306	-0.187	0.308	0.188	2.7	1.2	45.1	45.5	0.37
Line515	-0.491	-0.301	0.499	0.305	7.8	3.5	45.5	46.1	0.67
Line516	-0.503	-0.307	0.505	0.308	2.4	1.1	46.1	46.4	0.20
Line517	-0.692	-0.424	0.708	0.431	15.9	7.2	46.4	47.3	0.99
Line518	-0.016	-0.010	0.016	0.010	0.0	0.0	50.1	50.1	0.00
Line519	-0.010	-0.006	0.010	0.006	0.0	-0.1	50.1	50.1	0.01
Line520	-0.016	-0.010	0.016	0.010	0.0	0.0	50.1	50.1	0.00
Line521	-0.044	-0.027	0.044	0.027	0.0	0.0	50.1	50.1	0.03
Line522	-0.061	-0.038	0.061	0.038	0.1	0.0	50.1	50.2	0.06
Line523	-0.013	-0.008	0.013	0.008	0.0	0.0	55.5	55.5	0.00
Line524	-0.010	-0.006	0.010	0.006	0.0	0.0	55.5	55.5	0.00
Line525	-0.009	-0.005	0.009	0.005	0.0	-0.2	55.5	55.5	0.02
Line526	-0.019	-0.012	0.019	0.011	0.0	-0.1	55.5	55.5	0.01
Line527	-0.032	-0.020	0.032	0.020	0.0	-0.1	55.5	55.5	0.03
Line528	-0.046	-0.028	0.046	0.028	0.0	0.0	55.5	55.5	0.01
Line529	-0.010	-0.006	0.010	0.006	0.0	0.0	57.6	57.6	0.01
Cable11	-2.262	-1.293	2.265	1.294	2.8	1.1	63.7	63.8	0.07
Line530	2.262	1.293	-2.177	-1.254	85.4	38.9	63.7	61.4	2.29

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line531	2.153	1.240	-2.099	-1.216	54.2	23.3	61.4	60.0	1.45
Line532	-0.008	-0.005	0.008	0.005	0.0	-0.1	59.7	59.7	0.00
Line533	-0.008	-0.005	0.008	0.005	0.0	0.0	59.7	59.7	0.00
Line534	-0.016	-0.010	0.016	0.010	0.0	-0.1	59.7	59.7	0.01
Line535	-0.025	-0.015	0.025	0.015	0.0	0.0	59.6	59.6	0.00
Line536	-0.010	-0.006	0.010	0.006	0.0	0.0	59.6	59.6	0.00
Line537	-0.011	-0.007	0.011	0.007	0.0	-0.1	59.5	59.5	0.01
Line538	-0.020	-0.012	0.020	0.012	0.0	-0.1	59.5	59.5	0.02
Line539	-0.012	-0.007	0.012	0.007	0.0	0.0	59.5	59.5	0.00
Line540	-0.006	-0.004	0.006	0.004	0.0	0.0	59.4	59.4	0.00
Line541	-0.008	-0.005	0.008	0.005	0.0	0.0	59.4	59.4	0.00
Line542	0.000	0.000	0.000	0.000	0.0	-0.1	59.4	59.4	0.00
Line543	-0.002	-0.001	0.002	0.001	0.0	0.0	59.4	59.4	0.00
Line544	-0.010	-0.006	0.010	0.006	0.0	0.0	59.4	59.4	0.01
Line545	-0.016	-0.010	0.016	0.010	0.0	0.0	59.4	59.4	0.00
Line546	-0.018	-0.011	0.018	0.011	0.0	0.0	59.4	59.5	0.01
Line547	-0.021	-0.013	0.021	0.013	0.0	-0.1	59.5	59.5	0.02
Line548	-0.042	-0.025	0.042	0.025	0.0	0.0	59.5	59.5	0.02
Line549	-0.052	-0.032	0.052	0.032	0.0	0.0	59.5	59.5	0.03
Line550	-0.072	-0.044	0.072	0.044	0.1	0.0	59.5	59.6	0.04
Line551	-0.082	-0.050	0.082	0.050	0.0	0.0	59.6	59.6	0.01
Line552	-0.089	-0.054	0.089	0.054	0.1	0.0	59.6	59.6	0.07
Line553	-0.114	-0.070	0.114	0.070	0.1	0.0	59.6	59.7	0.05
Line554	-0.130	-0.080	0.131	0.080	0.4	0.1	59.7	59.9	0.19
Line555	-0.131	-0.080	0.131	0.080	0.2	0.0	59.9	60.0	0.08
Line556	1.940	1.119	-1.858	-1.082	81.3	37.1	60.0	57.6	2.38
Line557	1.849	1.076	-1.779	-1.044	69.5	31.7	57.6	55.5	2.05
Line558	-0.029	-0.018	0.029	0.018	0.0	-0.1	55.5	55.5	0.06
Line559	1.703	0.998	-1.600	-0.951	103.8	47.4	55.5	52.3	3.19
Line560	-0.014	-0.009	0.014	0.009	0.0	0.0	52.3	52.3	0.00
Line561	-0.016	-0.010	0.016	0.010	0.0	-0.1	52.3	52.3	0.02
Line562	-0.030	-0.019	0.030	0.019	0.0	-0.1	52.3	52.3	0.03
Line563	1.569	0.932	-1.527	-0.912	42.7	19.5	52.3	51.0	1.34
Line564	1.473	0.879	-1.452	-0.870	21.0	9.6	51.0	50.3	0.68
Line565	-0.015	-0.009	0.015	0.009	0.0	-0.1	50.3	50.3	0.03
Line566	1.437	0.860	-1.433	-0.858	4.4	2.0	50.3	50.2	0.14
Line567	1.372	0.821	-1.356	-0.814	15.5	7.1	50.2	49.6	0.53

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line568	-0.051	-0.032	0.051	0.032	0.1	0.0	49.2	49.3	0.08
Line569	-0.033	-0.020	0.033	0.020	0.0	-0.1	49.2	49.3	0.05
Line570	-0.084	-0.052	0.084	0.052	0.1	0.0	49.3	49.3	0.04
Line571	-0.135	-0.083	0.136	0.084	1.0	0.3	49.3	49.6	0.33
Line572	1.220	0.730	-1.160	-0.703	60.4	27.5	49.6	47.3	2.30
Line573	0.452	0.271	-0.451	-0.271	1.4	0.6	47.3	47.2	0.14
Line574	-0.012	-0.007	0.012	0.007	0.0	0.0	47.2	47.2	0.00
Line575	0.439	0.263	-0.432	-0.260	6.8	3.0	47.2	46.5	0.68
Line576	-0.008	-0.005	0.008	0.005	0.0	-0.3	46.5	46.5	0.04
Line577	0.424	0.255	-0.422	-0.254	2.5	1.1	46.5	46.3	0.25
Line578	-0.004	-0.002	0.004	0.002	0.0	0.0	46.3	46.3	0.00
Line579	0.418	0.252	-0.414	-0.250	4.2	1.9	46.3	45.8	0.44
Line580	-0.008	-0.005	0.008	0.005	0.0	0.0	45.8	45.8	0.01
Line581	0.406	0.245	-0.405	-0.245	0.9	0.4	45.8	45.7	0.10
Line582	0.405	0.245	-0.404	-0.244	1.4	0.6	45.7	45.6	0.15
Line583	0.391	0.237	-0.389	-0.236	1.8	0.8	45.6	45.4	0.20
Line584	-0.007	-0.004	0.007	0.004	0.0	0.0	45.4	45.4	0.00
Line585	-0.015	-0.009	0.015	0.009	0.0	0.0	45.4	45.4	0.01
Line586	0.374	0.227	-0.373	-0.226	1.0	0.4	45.4	45.3	0.11
Line587	-0.003	-0.002	0.003	0.002	0.0	0.0	45.3	45.3	0.00
Line588	-0.003	-0.002	0.003	0.002	0.0	0.0	45.3	45.3	0.00
Line589	-0.004	-0.002	0.004	0.002	0.0	0.0	45.3	45.3	0.00
Line590	-0.007	-0.004	0.007	0.004	0.0	0.0	45.3	45.3	0.00
Line591	-0.004	-0.002	0.004	0.002	0.0	0.0	45.3	45.3	0.00
Line592	-0.011	-0.007	0.011	0.006	0.0	0.0	45.3	45.3	0.00
Line593	-0.016	-0.010	0.016	0.010	0.0	0.0	45.3	45.3	0.01
Line594	-0.024	-0.015	0.024	0.015	0.0	0.0	45.3	45.3	0.01
Line595	0.349	0.212	-0.348	-0.211	1.2	0.5	45.3	45.1	0.15
Line596	-0.008	-0.005	0.008	0.005	0.0	0.0	45.1	45.1	0.00
Line597	0.340	0.206	-0.339	-0.206	1.0	0.4	45.1	45.0	0.12
Line598	-0.017	-0.011	0.017	0.011	0.0	0.0	45.0	45.0	0.00
Line599	0.322	0.195	-0.320	-0.194	2.1	0.9	45.0	44.7	0.28
Line600	0.313	0.190	-0.312	-0.189	0.5	0.2	44.7	44.7	0.07
Line601	0.298	0.180	-0.295	-0.179	2.9	1.3	44.7	44.3	0.40
Line602	-0.005	-0.003	0.005	0.003	0.0	-0.1	44.2	44.2	0.01
Line603	-0.009	-0.006	0.009	0.006	0.0	0.0	44.2	44.2	0.01
Line604	-0.003	-0.002	0.003	0.002	0.0	0.0	43.9	43.9	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line605	-0.005	-0.003	0.005	0.003	0.0	0.0	43.8	43.8	0.00
Line606	-0.005	-0.003	0.005	0.003	0.0	0.0	43.8	43.8	0.01
Line607	-0.010	-0.006	0.010	0.006	0.0	0.0	43.8	43.8	0.01
Line608	-0.018	-0.011	0.018	0.011	0.0	0.0	43.8	43.9	0.02
Line609	-0.021	-0.013	0.021	0.013	0.0	0.0	43.9	43.9	0.02
Line610	-0.027	-0.016	0.027	0.016	0.0	-0.1	43.9	43.9	0.05
Line611	-0.031	-0.019	0.031	0.019	0.1	-0.1	43.9	44.1	0.12
Line612	-0.005	-0.003	0.005	0.003	0.0	0.0	44.0	44.0	0.00
Line613	-0.012	-0.007	0.012	0.007	0.0	0.0	44.0	44.1	0.01
Line614	-0.043	-0.026	0.043	0.026	0.1	0.0	44.1	44.2	0.11
Line615	-0.047	-0.029	0.047	0.029	0.0	0.0	44.2	44.2	0.03
Line616	-0.056	-0.034	0.056	0.034	0.1	0.0	44.2	44.3	0.07
Line617	0.239	0.145	-0.238	-0.145	0.3	0.1	44.3	44.2	0.05
Line618	0.234	0.142	-0.232	-0.141	1.4	0.6	44.2	44.0	0.25
Line619	0.225	0.137	-0.223	-0.136	2.2	1.0	44.0	43.6	0.41
Line386	0.003	0.002	-0.003	-0.002	0.0	0.0	62.0	62.0	0.00
Line746	0.004	0.003	-0.004	-0.003	0.0	0.0	62.0	62.0	0.00
Line622	-0.017	-0.011	0.017	0.011	0.0	0.0	43.6	43.6	0.01
Line623	0.205	0.125	-0.204	-0.125	1.1	0.5	43.6	43.4	0.21
Line624	0.192	0.117	-0.190	-0.116	1.3	0.6	43.4	43.1	0.28
Line625	-0.012	-0.008	0.012	0.008	0.0	0.0	43.1	43.1	0.00
Line626	0.178	0.109	-0.177	-0.108	1.2	0.5	43.1	42.8	0.27
Line627	-0.015	-0.009	0.015	0.009	0.0	-0.1	42.8	42.8	0.03
Line628	0.162	0.099	-0.162	-0.099	0.3	0.1	42.8	42.7	0.06
Line629	0.152	0.093	-0.150	-0.092	1.3	0.5	42.7	42.4	0.34
Line630	-0.015	-0.009	0.015	0.009	0.0	0.0	42.1	42.1	0.02
Line631	-0.008	-0.005	0.008	0.005	0.0	0.0	42.1	42.1	0.01
Line632	-0.020	-0.012	0.020	0.012	0.0	0.0	42.1	42.1	0.02
Line633	-0.035	-0.021	0.035	0.021	0.0	0.0	42.1	42.1	0.00
Line634	-0.050	-0.031	0.051	0.031	0.3	0.0	42.1	42.4	0.26
Line635	0.088	0.054	-0.087	-0.054	0.1	0.0	42.4	42.3	0.05
Line636	0.071	0.043	-0.071	-0.043	0.3	0.0	42.3	42.2	0.14
Line637	0.056	0.034	-0.056	-0.034	0.1	0.0	42.2	42.2	0.04
Line638	0.054	0.033	-0.054	-0.033	0.1	0.0	42.2	42.1	0.05
Line639	0.036	0.022	-0.036	-0.022	0.0	0.0	42.1	42.1	0.01
Line640	0.020	0.012	-0.020	-0.012	0.0	0.0	42.1	42.1	0.03
Line641	0.007	0.004	-0.007	-0.004	0.0	0.0	42.1	42.1	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line642	-0.014	0.000	0.014	0.000	0.0	0.0	64.3	64.3	0.00
Line643	-0.051	0.000	0.051	0.000	0.0	-0.1	64.5	64.5	0.01
Line644	-0.075	0.000	0.076	0.000	0.0	-0.1	65.1	65.1	0.03
Line645	-0.031	-0.019	0.031	0.019	0.0	-0.1	65.3	65.3	0.02
Line646	-0.113	0.000	0.113	0.000	0.0	0.0	65.3	65.3	0.01
Line647	-0.144	-0.019	0.144	0.019	0.1	0.0	65.3	65.4	0.07
Line648	-0.251	0.000	0.251	0.000	0.1	0.0	66.5	66.5	0.02
Cable12	-1.509	-0.148	1.509	0.148	0.6	0.4	69.2	69.3	0.03
Line649	1.509	0.148	-1.498	-0.139	10.5	8.8	69.2	68.7	0.52
Line650	-0.264	0.000	0.264	0.000	0.2	0.1	68.7	68.7	0.06
Line651	1.234	0.139	-1.210	-0.119	24.3	20.3	68.7	67.3	1.46
Line652	1.002	0.119	-0.992	-0.111	9.6	7.4	67.3	66.6	0.69
Line653	0.992	0.111	-0.992	-0.111	0.4	0.4	66.6	66.5	0.03
Line654	0.741	0.111	-0.740	-0.110	1.2	1.0	66.5	66.4	0.12
Line655	-0.011	0.000	0.011	0.000	0.0	-0.1	66.4	66.4	0.00
Line656	0.729	0.110	-0.724	-0.107	4.7	3.6	66.4	65.9	0.47
Line657	0.000	0.000	0.000	0.000	0.0	0.0	65.9	65.9	0.00
Line658	0.724	0.107	-0.719	-0.104	5.6	2.4	65.9	65.4	0.53
Line659	0.574	0.085	-0.572	-0.083	2.4	1.9	65.4	65.1	0.30
Line660	0.497	0.083	-0.496	-0.083	0.6	0.5	65.1	65.0	0.09
Line661	-0.094	0.000	0.094	0.000	0.1	-0.1	64.9	65.0	0.07
Line662	-0.120	0.000	0.120	0.000	0.1	0.0	65.0	65.0	0.05
Line663	0.376	0.083	-0.374	-0.082	1.7	1.1	65.0	64.7	0.33
Line664	0.364	0.076	-0.363	-0.075	1.1	0.8	64.7	64.5	0.22
Line665	0.312	0.075	-0.312	-0.075	0.1	0.0	64.5	64.5	0.02
Line666	-0.016	0.000	0.016	0.000	0.0	-0.2	64.3	64.3	0.01
Line667	-0.130	-0.070	0.130	0.070	0.3	-0.1	64.3	64.5	0.14
Line668	0.182	0.005	-0.182	-0.005	0.2	0.0	64.5	64.4	0.06
Line669	-0.014	0.000	0.014	0.000	0.0	0.0	64.4	64.4	0.00
Line670	0.168	0.005	-0.167	-0.005	0.2	0.0	64.4	64.3	0.09
Line671	-0.146	0.000	0.146	0.000	0.2	0.0	64.2	64.3	0.08
Line672	0.008	0.005	-0.008	-0.005	0.0	0.0	64.3	64.3	0.00
Line673	-0.008	-0.005	0.008	0.005	0.0	-0.2	66.9	66.9	0.02
Line674	-0.007	-0.004	0.007	0.004	0.0	0.0	67.3	67.3	0.00
Line675	-0.001	-0.001	0.001	0.001	0.0	0.0	68.0	68.0	0.00
Line676	-0.031	-0.019	0.031	0.019	0.0	0.0	68.5	68.5	0.00
Cable13	-0.425	-0.099	0.425	0.099	0.0	0.0	69.2	69.3	0.01

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line677	0.425	0.099	-0.424	-0.098	0.5	0.2	69.2	69.2	0.08
Line678	-0.075	0.000	0.076	0.000	0.0	0.0	69.2	69.2	0.01
Line679	0.349	0.099	-0.347	-0.098	1.6	0.6	69.2	68.8	0.33
Line680	0.300	0.098	-0.298	-0.098	1.5	0.4	68.8	68.5	0.35
Line681	0.268	0.078	-0.267	-0.078	0.4	0.1	68.5	68.4	0.10
Line682	-0.009	-0.006	0.009	0.006	0.0	0.0	68.4	68.4	0.00
Line683	-0.027	-0.017	0.027	0.017	0.0	-0.1	68.4	68.4	0.02
Line684	-0.036	-0.023	0.036	0.022	0.0	-0.1	68.4	68.4	0.02
Line685	0.231	0.056	-0.230	-0.056	0.4	0.1	68.4	68.3	0.14
Line686	0.214	0.056	-0.214	-0.056	0.3	0.1	68.3	68.1	0.11
Line687	0.182	0.036	-0.182	-0.036	0.1	0.0	68.1	68.1	0.03
Line688	-0.012	0.000	0.012	0.000	0.0	-0.1	68.1	68.1	0.00
Line689	0.170	0.036	-0.170	-0.036	0.2	0.0	68.1	68.1	0.06
Line690	-0.001	0.000	0.001	0.000	0.0	0.0	68.1	68.1	0.00
Line691	0.169	0.036	-0.169	-0.036	0.0	0.0	68.1	68.0	0.01
Line692	0.168	0.035	-0.168	-0.035	0.3	0.0	68.0	67.9	0.14
Line693	0.166	0.035	-0.166	-0.035	0.3	0.0	67.9	67.8	0.15
Line694	0.165	0.035	-0.164	-0.035	0.3	0.0	67.8	67.6	0.11
Line695	-0.002	0.000	0.002	0.000	0.0	-0.1	67.6	67.6	0.00
Line696	0.163	0.035	-0.162	-0.035	0.2	0.0	67.6	67.6	0.08
Line697	0.158	0.035	-0.157	-0.035	0.5	0.0	67.6	67.3	0.23
Line698	0.150	0.031	-0.150	-0.031	0.0	0.0	67.3	67.3	0.01
Line699	0.146	0.028	-0.145	-0.028	0.2	0.0	67.3	67.2	0.10
Line700	0.124	0.028	-0.124	-0.028	0.1	0.0	67.2	67.1	0.08
Line701	-0.004	-0.003	0.004	0.003	0.0	0.0	67.1	67.1	0.00
Line702	-0.015	0.000	0.015	0.000	0.0	-0.1	67.1	67.1	0.01
Line703	-0.020	-0.003	0.020	0.002	0.0	0.0	67.1	67.1	0.00
Line704	0.104	0.025	-0.104	-0.025	0.1	-0.1	67.1	67.1	0.08
Line705	0.088	0.016	-0.088	-0.016	0.1	-0.1	67.1	67.0	0.06
Line706	0.075	0.016	-0.075	-0.016	0.0	-0.1	67.0	67.0	0.03
Line707	0.071	0.013	-0.071	-0.013	0.0	0.0	67.0	66.9	0.02
Line708	-0.010	0.000	0.010	0.000	0.0	-0.1	66.9	66.9	0.00
Line709	0.060	0.013	-0.060	-0.014	0.1	-0.1	66.9	66.9	0.07
Line710	-0.038	0.000	0.038	0.000	0.0	0.0	66.9	66.9	0.00
Line711	0.023	0.014	-0.023	-0.014	0.0	0.0	66.9	66.9	0.01
Line712	0.014	0.009	-0.014	-0.009	0.0	-0.1	66.9	66.9	0.01
Line713	0.000	0.000	0.000	0.000	0.0	-0.1	66.9	66.9	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
33/11kV TFR I-S	-1.934	-0.247	1.964	0.426	29.9	179.2	69.3	71.4	2.13
Line715	0.000	-0.027	0.000	0.000	0.0	-27.1	69.7	69.7	0.01
Line723	0.068	-0.003	-0.068	0.003	0.0	-0.3	69.1	69.1	0.00
Line727	0.289	-0.040	-0.289	0.040	0.0	-0.1	69.1	69.1	0.00
Line725	-0.013	0.000	0.013	0.000	0.0	-0.1	69.1	69.1	0.00
Line726	-0.058	0.002	0.058	-0.003	0.0	-0.9	69.1	69.1	0.00
Line728	-0.009	0.000	0.009	-0.001	0.0	-0.6	69.1	69.1	0.00
Line729	0.280	-0.039	-0.280	0.039	0.0	-0.5	69.1	69.1	0.01
Line730	-0.011	0.000	0.011	-0.001	0.0	-0.7	69.1	69.1	0.00
Line194	0.222	-0.037	-0.222	0.036	0.1	-1.4	69.1	69.1	0.02
Line731	0.047	-0.001	-0.047	0.001	0.0	-0.2	69.1	69.1	0.00
Line733	-0.025	0.000	0.025	0.000	0.0	-0.2	69.1	69.1	0.00
Line732	0.014	0.000	-0.014	0.000	0.0	-0.2	69.1	69.1	0.00
Line734	-0.040	0.000	0.040	-0.001	0.0	-0.4	69.1	69.1	0.00
Line736	-0.055	0.001	0.055	-0.002	0.0	-0.4	69.1	69.1	0.00
Line737	0.017	-0.001	-0.017	0.001	0.0	-0.9	69.1	69.1	0.00
Line738	-0.113	0.024	0.113	-0.026	0.0	-2.0	69.0	69.0	0.01
Line749	0.084	-0.017	-0.084	0.015	0.0	-2.2	69.0	69.0	0.00
Line753	0.030	-0.007	-0.030	0.006	0.0	-0.5	69.0	69.0	0.00
Line739	0.007	-0.001	-0.007	0.000	0.0	-0.5	69.1	69.1	0.00
Line745	0.017	-0.005	-0.017	0.001	0.0	-3.7	69.0	69.0	0.00
Line770	0.606	0.344	-0.599	-0.341	6.8	3.0	61.3	60.6	0.66
Line747	0.009	-0.001	-0.009	0.000	0.0	-1.2	69.0	69.0	0.00
Line750	-0.012	0.000	0.012	-0.001	0.0	-0.6	69.0	69.0	0.00
Line751	0.072	-0.014	-0.072	0.013	0.0	-1.2	69.0	69.0	0.00
Line752	0.009	0.000	-0.009	0.000	0.0	-0.2	69.0	69.0	0.00
Line754	0.022	-0.006	-0.022	0.006	0.0	-0.7	69.0	69.0	0.00
Line755	0.014	-0.006	-0.014	0.001	0.0	-4.7	69.0	69.0	0.00
Line756	-0.005	0.000	0.005	-0.001	0.0	-0.9	69.0	69.0	0.00
Line757	-0.001	0.000	0.001	-0.004	0.0	-4.2	69.0	69.0	0.00
Line760	0.071	-0.009	-0.071	0.008	0.0	-0.8	69.0	69.0	0.00
Line758	-0.006	0.000	0.006	0.000	0.0	0.0	69.0	69.0	0.00
Line759	-0.066	0.007	0.066	-0.008	0.0	-1.2	69.0	69.0	0.00
Line763	0.060	-0.006	-0.060	0.003	0.0	-3.4	69.0	69.0	0.01
Line761	-0.005	0.000	0.005	0.000	0.0	-0.3	69.0	69.0	0.00
Line765	-0.019	0.000	0.019	0.000	0.0	-0.4	69.0	69.0	0.00
Line762	0.042	-0.003	-0.042	0.001	0.0	-2.1	69.0	69.0	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Line766	0.024	-0.001	-0.024	0.000	0.0	-0.6	69.0	69.0	0.00
Line771	0.586	0.333	-0.579	-0.330	6.5	2.9	60.6	60.0	0.64
Line772	0.014	0.008	-0.014	-0.008	0.0	0.0	60.6	60.6	0.00
Line773	0.052	0.032	-0.052	-0.032	0.1	-0.1	60.0	59.9	0.10
Line774	0.527	0.298	-0.526	-0.298	0.3	0.1	60.0	60.0	0.04
Line779	0.028	0.017	-0.028	-0.017	0.0	-0.1	59.9	59.9	0.03
Line780	0.024	0.015	-0.024	-0.015	0.0	-0.1	59.9	59.9	0.03
Line775	0.083	0.052	-0.083	-0.052	0.0	0.0	60.0	59.9	0.03
Line776	0.443	0.247	-0.443	-0.246	0.6	0.2	60.0	59.9	0.07
Line777	0.443	0.246	-0.290	-0.180	152.3	66.5	59.9	40.2	19.66
Line778	0.145	0.090	-0.145	-0.090	0.3	0.1	40.2	40.2	0.07
Line781	0.028	0.017	-0.028	-0.017	0.0	-0.1	59.9	59.8	0.03
Line782	0.013	0.008	-0.013	-0.008	0.0	-0.1	59.8	59.8	0.02
Line783	0.014	0.009	-0.014	-0.009	0.0	-0.1	59.8	59.8	0.01
Line1039	0.000	0.000	0.000	0.000	0.0	-0.1	45.3	45.3	0.00
Line1042	-0.009	-0.006	0.009	0.006	0.0	0.0	59.1	59.1	0.00
Line1055	0.005	0.003	-0.005	-0.003	0.0	0.0	59.1	59.1	0.00
Line1056	0.004	0.003	-0.004	-0.003	0.0	-0.1	59.1	59.1	0.00
Line1044	0.026	0.015	-0.026	-0.015	0.0	0.0	59.1	59.1	0.01
Line1057	0.017	0.010	-0.017	-0.010	0.0	-0.2	59.1	59.1	0.04
Line1048	-0.003	-0.002	0.003	0.002	0.0	0.0	59.1	59.1	0.00
Line1049	0.006	0.003	-0.006	-0.004	0.0	-0.3	59.1	59.1	0.02
Line1052	-0.010	-0.006	0.010	0.006	0.0	0.0	59.1	59.1	0.00
Line1050	-0.002	-0.001	0.002	0.001	0.0	-0.1	59.1	59.1	0.00
Line1051	0.005	0.003	-0.005	-0.003	0.0	0.0	59.1	59.1	0.00
Line1060	0.004	0.002	-0.004	-0.002	0.0	0.0	53.9	53.9	0.00
Line1062	-0.001	-0.001	0.001	0.001	0.0	0.0	53.9	53.9	0.00
Line1063	-0.002	-0.001	0.002	0.001	0.0	0.0	53.9	53.9	0.00
Line1064	-0.007	-0.004	0.007	0.004	0.0	0.0	53.9	53.9	0.00
Line1065	0.005	0.003	-0.005	-0.003	0.0	0.0	53.9	53.9	0.00
Line1061	-0.009	-0.005	0.009	0.005	0.0	0.0	53.9	53.9	0.00
Line1074	0.008	0.005	-0.008	-0.005	0.0	0.0	53.9	53.9	0.00
Line1066	-0.002	-0.001	0.002	0.001	0.0	0.0	53.9	53.9	0.00
Line1067	-0.001	-0.001	0.001	0.001	0.0	-0.1	53.9	53.9	0.00
Line1068	-0.004	-0.002	0.004	0.002	0.0	-0.1	53.9	53.9	0.00
Line1069	0.003	0.001	-0.003	-0.001	0.0	0.0	53.9	53.9	0.00
Line1070	-0.001	-0.001	0.001	0.001	0.0	0.0	53.9	53.9	0.00

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
Line1071	-0.001	-0.001	0.001	0.001	0.0	0.0	53.9	53.9	0.00
Line1072	0.000	0.000	0.000	0.000	0.0	-0.1	53.9	53.9	0.00
Line1073	-0.002	-0.001	0.002	0.001	0.0	0.0	53.9	53.9	0.00
Line1075	0.000	0.000	0.000	0.000	0.0	0.0	53.9	53.9	0.00
Line1076	0.008	0.004	-0.008	-0.004	0.0	-0.1	53.9	53.9	0.01
Line1077	0.000	0.000	0.000	0.000	0.0	0.0	53.9	53.9	0.00
Line1078	0.008	0.004	-0.008	-0.004	0.0	-0.1	53.9	53.9	0.01
Line1079	-0.002	-0.001	0.002	0.001	0.0	0.0	53.9	53.9	0.00
Line1087	0.001	0.001	-0.001	-0.001	0.0	0.0	53.9	53.9	0.00
Line1080	0.006	0.003	-0.006	-0.003	0.0	-0.1	53.9	53.9	0.01
Line1041	0.001	0.000	-0.001	0.000	0.0	0.0	53.9	53.9	0.00
Line1081	-0.001	-0.001	0.001	0.001	0.0	0.0	53.9	53.9	0.00
Line1088	0.001	0.001	-0.001	-0.001	0.0	0.0	53.9	53.9	0.00
Line1082	0.004	0.002	-0.004	-0.003	0.0	-0.1	53.9	53.9	0.01
Line1083	-0.001	-0.001	0.001	0.001	0.0	0.0	53.9	53.9	0.00
Line1084	0.003	0.002	-0.003	-0.002	0.0	0.0	53.9	53.9	0.00
Line327	0.001	0.001	-0.001	-0.001	0.0	0.0	53.9	53.9	0.00
Line1085	-0.002	-0.001	0.002	0.001	0.0	0.0	53.9	53.9	0.00
Line1089	0.001	0.000	-0.001	0.000	0.0	0.0	53.9	53.9	0.00
Line1086	0.001	0.001	-0.001	-0.001	0.0	0.0	53.9	53.9	0.00
Line1093	0.242	0.129	-0.241	-0.128	0.7	0.3	54.4	54.3	0.16
Line1094	-0.255	-0.137	0.256	0.138	0.9	0.3	54.4	54.6	0.19
Line1097	-0.002	-0.001	0.002	0.001	0.0	-0.2	52.9	52.9	0.00
Line1107	0.109	0.049	-0.109	-0.049	0.1	0.0	52.9	52.8	0.06
Line1096	-0.011	-0.007	0.011	0.007	0.0	-0.1	52.6	52.6	0.02
Line1095	0.102	0.049	-0.101	-0.049	0.2	0.0	52.8	52.7	0.09
Line1099	0.046	0.021	-0.046	-0.021	0.1	-0.1	52.7	52.7	0.06
Line1101	0.018	0.009	-0.018	-0.009	0.0	-0.1	52.6	52.6	0.02
Line1104	-0.009	-0.004	0.009	0.004	0.0	-0.1	52.6	52.6	0.01
Line1105	-0.014	-0.006	0.014	0.006	0.0	-0.1	52.6	52.6	0.03
Line1106	0.005	0.003	-0.005	-0.003	0.0	0.0	52.6	52.6	0.00
					7698.9	33715.5			

Alert Summary Report

	% Alert Settings
	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	100.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	100.0
UnderExcited (Q Min.)	100.0

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
33/11kV TFR I1	Transformer	Overload	5.000	MVA	11.497	229.9	3-Phase
33/11kV TFR II	Transformer	Overload	5.000	MVA	5.16	103.2	3-Phase
33/11kV TFR II-S	Transformer	Overload	3.000	MVA	3.53	117.7	3-Phase
66/11kV TFR II	Transformer	Overload	5.000	MVA	14.74	294.8	3-Phase
66/33kV TFR I	Transformer	Overload	5.000	MVA	22.93	458.5	3-Phase
66/33kV TFR II	Transformer	Overload	5.000	MVA	22.09	441.9	3-Phase
Bus10	Bus	Under Voltage	11.000	kV	10.06	91.5	3-Phase
Bus100	Bus	Under Voltage	11.000	kV	7.46	67.8	3-Phase
Bus101	Bus	Under Voltage	11.000	kV	7.63	69.3	3-Phase
Bus102	Bus	Under Voltage	11.000	kV	7.68	69.8	3-Phase
Bus103	Bus	Under Voltage	11.000	kV	7.67	69.8	3-Phase
Bus104	Bus	Under Voltage	11.000	kV	7.66	69.7	3-Phase
Bus105	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase
Bus106	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase
Bus107	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus108	Bus	Under Voltage	11.000	kV	7.617	69.2	3-Phase
Bus1085	Bus	Under Voltage	11.000	kV	6.09	55.3	3-Phase
Bus1087	Bus	Under Voltage	11.000	kV	6.67	60.6	3-Phase
Bus1088	Bus	Under Voltage	11.000	kV	6.22	56.6	3-Phase
Bus1089	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus109	Bus	Under Voltage	11.000	kV	7.65	69.6	3-Phase
Bus1090	Bus	Under Voltage	11.000	kV	4.99	45.3	3-Phase
Bus1091	Bus	Under Voltage	11.000	kV	6.68	60.7	3-Phase
Bus1093	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1094	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1095	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1098	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1099	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus11	Bus	Under Voltage	11.000	kV	9.02	82.0	3-Phase
Bus110	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase
Bus1100	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1101	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1102	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1107	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1108	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus1109	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus111	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase
Bus1110	Bus	Under Voltage	11.000	kV	6.43	58.4	3-Phase
Bus1111	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus1112	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1113	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1114	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1115	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1116	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1117	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1118	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1119	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus112	Bus	Under Voltage	11.000	kV	7.65	69.5	3-Phase
Bus1120	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1121	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1122	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus1123	Bus	Under Voltage	11.000	kV	5.929	53.9	3-Phase
Bus1124	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1125	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1127	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1128	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1129	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus113	Bus	Under Voltage	11.000	kV	7.55	68.6	3-Phase
Bus1130	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1131	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1132	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1133	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1134	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1135	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1136	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1137	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1138	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1139	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus114	Bus	Under Voltage	11.000	kV	7.55	68.7	3-Phase
Bus1140	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1141	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1142	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1143	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1144	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1145	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1146	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus1147	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus115	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus1151	Bus	Under Voltage	11.000	kV	5.99	54.4	3-Phase
Bus1152	Bus	Under Voltage	11.000	kV	5.97	54.3	3-Phase
Bus1153	Bus	Under Voltage	11.000	kV	6.01	54.6	3-Phase
Bus1156	Bus	Under Voltage	11.000	kV	5.81	52.9	3-Phase
Bus1157	Bus	Under Voltage	11.000	kV	5.81	52.9	3-Phase
Bus1158	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus1159	Bus	Under Voltage	11.000	kV	5.81	52.8	3-Phase
Bus116	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus1161	Bus	Under Voltage	11.000	kV	5.80	52.7	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus1162	Bus	Under Voltage	11.000	kV	5.792	52.7	3-Phase
Bus1163	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus1165	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus1166	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus1167	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus1168	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus117	Bus	Under Voltage	11.000	kV	7.52	68.4	3-Phase
Bus118	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus119	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus12	Bus	Under Voltage	33.000	kV	30.41	92.1	3-Phase
Bus120	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus121	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus122	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus123	Bus	Under Voltage	11.000	kV	9.02	82.0	3-Phase
Bus124	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus125	Bus	Under Voltage	11.000	kV	6.93	63.0	3-Phase
Bus126	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus127	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus128	Bus	Under Voltage	11.000	kV	6.93	63.0	3-Phase
Bus129	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus13	Bus	Under Voltage	11.000	kV	10.05	91.4	3-Phase
Bus130	Bus	Under Voltage	11.000	kV	6.76	61.5	3-Phase
Bus131	Bus	Under Voltage	11.000	kV	6.72	61.1	3-Phase
Bus132	Bus	Under Voltage	11.000	kV	6.67	60.6	3-Phase
Bus133	Bus	Under Voltage	11.000	kV	6.62	60.2	3-Phase
Bus134	Bus	Under Voltage	11.000	kV	6.60	60.0	3-Phase
Bus135	Bus	Under Voltage	33.000	kV	23.14	70.1	3-Phase
Bus136	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus137	Bus	Under Voltage	11.000	kV	6.67	60.6	3-Phase
Bus138	Bus	Under Voltage	11.000	kV	6.66	60.6	3-Phase
Bus139	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus14	Bus	Under Voltage	11.000	kV	9.99	90.8	3-Phase
Bus140	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase
Bus141	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus142	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase
Bus143	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus144	Bus	Under Voltage	11.000	kV	5.784	52.6	3-Phase
Bus145	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase
Bus146	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus147	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase
Bus148	Bus	Under Voltage	11.000	kV	6.66	60.5	3-Phase
Bus149	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus15	Bus	Under Voltage	11.000	kV	9.99	90.8	3-Phase
Bus150	Bus	Under Voltage	11.000	kV	6.65	60.5	3-Phase
Bus151	Bus	Under Voltage	11.000	kV	6.65	60.5	3-Phase
Bus152	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus153	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus154	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus155	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus156	Bus	Under Voltage	11.000	kV	5.78	52.5	3-Phase
Bus157	Bus	Under Voltage	33.000	kV	23.25	70.4	3-Phase
Bus158	Bus	Under Voltage	33.000	kV	22.86	69.3	3-Phase
Bus159	Bus	Under Voltage	33.000	kV	23.08	69.9	3-Phase
Bus16	Bus	Under Voltage	11.000	kV	9.99	90.8	3-Phase
Bus160	Bus	Under Voltage	11.000	kV	5.80	52.7	3-Phase
Bus161	Bus	Under Voltage	11.000	kV	5.79	52.6	3-Phase
Bus162	Bus	Under Voltage	11.000	kV	5.78	52.6	3-Phase
Bus163	Bus	Under Voltage	11.000	kV	5.78	52.5	3-Phase
Bus164	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus165	Bus	Under Voltage	33.000	kV	23.09	70.0	3-Phase
Bus166	Bus	Under Voltage	11.000	kV	5.77	52.5	3-Phase
Bus167	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus168	Bus	Under Voltage	11.000	kV	6.00	54.6	3-Phase
Bus169	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus17	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus170	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus171	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus172	Bus	Under Voltage	11.000	kV	5.77	52.5	3-Phase
Bus173	Bus	Under Voltage	11.000	kV	5.77	52.5	3-Phase
Bus174	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus175	Bus	Under Voltage	11.000	kV	5.77	52.4	3-Phase
Bus176	Bus	Under Voltage	11.000	kV	5.76	52.4	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus177	Bus	Under Voltage	11.000	kV	5.764	52.4	3-Phase
Bus178	Bus	Under Voltage	11.000	kV	5.76	52.4	3-Phase
Bus179	Bus	Under Voltage	11.000	kV	5.76	52.4	3-Phase
Bus180	Bus	Under Voltage	11.000	kV	5.76	52.4	3-Phase
Bus181	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus182	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus183	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus184	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus185	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus186	Bus	Under Voltage	33.000	kV	23.04	69.8	3-Phase
Bus187	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus188	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus189	Bus	Under Voltage	11.000	kV	6.62	60.2	3-Phase
Bus19	Bus	Under Voltage	11.000	kV	9.93	90.3	3-Phase
Bus190	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus191	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus192	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus193	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus194	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus195	Bus	Under Voltage	11.000	kV	6.93	63.0	3-Phase
Bus196	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus197	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus198	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus199	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus20	Bus	Under Voltage	11.000	kV	9.93	90.3	3-Phase
Bus200	Bus	Under Voltage	33.000	kV	22.86	69.3	3-Phase
Bus201	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus202	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus203	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus204	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus205	Bus	Under Voltage	11.000	kV	7.95	72.3	3-Phase
Bus206	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus207	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus208	Bus	Under Voltage	33.000	kV	22.85	69.2	3-Phase
Bus209	Bus	Under Voltage	33.000	kV	22.85	69.2	3-Phase
Bus21	Bus	Under Voltage	11.000	kV	9.76	88.7	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus210	Bus	Under Voltage	33.000	kV	22.852	69.2	3-Phase
Bus211	Bus	Under Voltage	33.000	kV	22.85	69.2	3-Phase
Bus212	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus213	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus214	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus215	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus216	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus217	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus218	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus219	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus22	Bus	Under Voltage	11.000	kV	9.76	88.7	3-Phase
Bus220	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus221	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus222	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus223	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus224	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus225	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus226	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus227	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus228	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus229	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus23	Bus	Under Voltage	11.000	kV	9.68	88.0	3-Phase
Bus230	Bus	Under Voltage	33.000	kV	23.00	69.7	3-Phase
Bus231	Bus	Under Voltage	33.000	kV	23.00	69.7	3-Phase
Bus232	Bus	Under Voltage	33.000	kV	23.00	69.7	3-Phase
Bus233	Bus	Under Voltage	33.000	kV	23.00	69.7	3-Phase
Bus234	Bus	Under Voltage	33.000	kV	23.00	69.7	3-Phase
Bus235	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus236	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus237	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus238	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus239	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus24	Bus	Under Voltage	11.000	kV	9.68	88.0	3-Phase
Bus240	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus241	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus242	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus243	Bus	Under Voltage	33.000	kV	22.834	69.2	3-Phase
Bus244	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus245	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus246	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus247	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus248	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus249	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus25	Bus	Under Voltage	11.000	kV	9.68	88.0	3-Phase
Bus250	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus251	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus252	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus253	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus254	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus255	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus256	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus257	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus258	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus259	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus26	Bus	Under Voltage	11.000	kV	9.61	87.3	3-Phase
Bus260	Bus	Under Voltage	33.000	kV	23.01	69.7	3-Phase
Bus261	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus262	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus263	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus264	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus265	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus266	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus267	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus268	Bus	Under Voltage	11.000	kV	6.22	56.6	3-Phase
Bus269	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus270	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus271	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus272	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus273	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus274	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus275	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus276	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus277	Bus	Under Voltage	33.000	kV	22.970	69.6	3-Phase
Bus278	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus279	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus28	Bus	Under Voltage	11.000	kV	9.50	86.3	3-Phase
Bus280	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus281	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus282	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus283	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus284	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus285	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus286	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus287	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus288	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus289	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus29	Bus	Under Voltage	11.000	kV	9.50	86.3	3-Phase
Bus290	Bus	Under Voltage	11.000	kV	6.93	63.0	3-Phase
Bus291	Bus	Under Voltage	11.000	kV	6.52	59.2	3-Phase
Bus292	Bus	Under Voltage	11.000	kV	6.68	60.7	3-Phase
Bus293	Bus	Under Voltage	11.000	kV	6.50	59.1	3-Phase
Bus294	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus295	Bus	Under Voltage	11.000	kV	6.40	58.1	3-Phase
Bus296	Bus	Under Voltage	11.000	kV	6.43	58.5	3-Phase
Bus297	Bus	Under Voltage	11.000	kV	6.51	59.2	3-Phase
Bus298	Bus	Under Voltage	11.000	kV	6.29	57.1	3-Phase
Bus299	Bus	Under Voltage	11.000	kV	6.29	57.2	3-Phase
Bus30	Bus	Under Voltage	11.000	kV	9.36	85.1	3-Phase
Bus300	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus301	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus302	Bus	Under Voltage	33.000	kV	22.97	69.6	3-Phase
Bus303	Bus	Under Voltage	11.000	kV	6.18	56.2	3-Phase
Bus304	Bus	Under Voltage	11.000	kV	6.09	55.4	3-Phase
Bus305	Bus	Under Voltage	11.000	kV	6.15	55.9	3-Phase
Bus306	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus307	Bus	Under Voltage	11.000	kV	5.97	54.2	3-Phase
Bus308	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus309	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus31	Bus	Under Voltage	11.000	kV	9.126	83.0	3-Phase
Bus310	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus311	Bus	Under Voltage	11.000	kV	6.03	54.8	3-Phase
Bus312	Bus	Under Voltage	11.000	kV	6.09	55.3	3-Phase
Bus313	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus314	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus315	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus316	Bus	Under Voltage	11.000	kV	5.92	53.8	3-Phase
Bus317	Bus	Under Voltage	11.000	kV	6.21	56.4	3-Phase
Bus318	Bus	Under Voltage	11.000	kV	5.91	53.8	3-Phase
Bus319	Bus	Under Voltage	11.000	kV	5.92	53.8	3-Phase
Bus32	Bus	Under Voltage	11.000	kV	9.12	82.9	3-Phase
Bus320	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus321	Bus	Under Voltage	11.000	kV	5.88	53.5	3-Phase
Bus322	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus323	Bus	Under Voltage	11.000	kV	5.97	54.3	3-Phase
Bus324	Bus	Under Voltage	11.000	kV	6.21	56.4	3-Phase
Bus325	Bus	Under Voltage	11.000	kV	5.88	53.5	3-Phase
Bus326	Bus	Under Voltage	11.000	kV	5.84	53.1	3-Phase
Bus327	Bus	Under Voltage	11.000	kV	5.84	53.1	3-Phase
Bus328	Bus	Under Voltage	11.000	kV	5.85	53.2	3-Phase
Bus329	Bus	Under Voltage	11.000	kV	5.82	52.9	3-Phase
Bus33	Bus	Under Voltage	11.000	kV	9.10	82.7	3-Phase
Bus330	Bus	Under Voltage	11.000	kV	5.87	53.4	3-Phase
Bus331	Bus	Under Voltage	11.000	kV	5.87	53.4	3-Phase
Bus332	Bus	Under Voltage	11.000	kV	5.83	53.0	3-Phase
Bus333	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus334	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus335	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus336	Bus	Under Voltage	11.000	kV	5.92	53.8	3-Phase
Bus337	Bus	Under Voltage	33.000	kV	23.10	70.0	3-Phase
Bus338	Bus	Under Voltage	33.000	kV	23.05	69.9	3-Phase
Bus339	Bus	Under Voltage	33.000	kV	23.01	69.7	3-Phase
Bus34	Bus	Under Voltage	11.000	kV	9.10	82.7	3-Phase
Bus340	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus341	Bus	Under Voltage	11.000	kV	5.94	54.0	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus342	Bus	Under Voltage	11.000	kV	5.942	54.0	3-Phase
Bus343	Bus	Under Voltage	33.000	kV	23.03	69.8	3-Phase
Bus344	Bus	Under Voltage	11.000	kV	5.94	54.0	3-Phase
Bus345	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus346	Bus	Under Voltage	11.000	kV	6.01	54.7	3-Phase
Bus347	Bus	Under Voltage	11.000	kV	5.93	53.9	3-Phase
Bus348	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus349	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus35	Bus	Under Voltage	11.000	kV	9.11	82.8	3-Phase
Bus350	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus351	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus352	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus353	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus354	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus355	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus356	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus357	Bus	Under Voltage	33.000	kV	23.02	69.8	3-Phase
Bus358	Bus	Under Voltage	11.000	kV	6.24	56.8	3-Phase
Bus359	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus36	Bus	Under Voltage	11.000	kV	9.07	82.4	3-Phase
Bus360	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus361	Bus	Under Voltage	33.000	kV	22.92	69.5	3-Phase
Bus362	Bus	Under Voltage	33.000	kV	22.91	69.4	3-Phase
Bus363	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus364	Bus	Under Voltage	33.000	kV	22.92	69.5	3-Phase
Bus365	Bus	Under Voltage	11.000	kV	5.85	53.2	3-Phase
Bus366	Bus	Under Voltage	11.000	kV	5.85	53.2	3-Phase
Bus367	Bus	Under Voltage	11.000	kV	5.85	53.2	3-Phase
Bus368	Bus	Under Voltage	11.000	kV	6.21	56.5	3-Phase
Bus369	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus37	Bus	Under Voltage	11.000	kV	9.06	82.4	3-Phase
Bus370	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus371	Bus	Under Voltage	11.000	kV	5.37	48.8	3-Phase
Bus372	Bus	Under Voltage	11.000	kV	5.57	50.6	3-Phase
Bus373	Bus	Under Voltage	11.000	kV	5.86	53.3	3-Phase
Bus374	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus375	Bus	Under Voltage	11.000	kV	5.904	53.7	3-Phase
Bus376	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus377	Bus	Under Voltage	11.000	kV	5.91	53.7	3-Phase
Bus378	Bus	Under Voltage	33.000	kV	22.96	69.6	3-Phase
Bus379	Bus	Under Voltage	33.000	kV	22.92	69.5	3-Phase
Bus38	Bus	Under Voltage	11.000	kV	9.07	82.4	3-Phase
Bus380	Bus	Under Voltage	33.000	kV	22.90	69.4	3-Phase
Bus381	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus382	Bus	Under Voltage	33.000	kV	22.90	69.4	3-Phase
Bus383	Bus	Under Voltage	33.000	kV	22.90	69.4	3-Phase
Bus385	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus386	Bus	Under Voltage	33.000	kV	22.98	69.6	3-Phase
Bus387	Bus	Under Voltage	33.000	kV	22.89	69.4	3-Phase
Bus388	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus389	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus39	Bus	Under Voltage	11.000	kV	9.07	82.4	3-Phase
Bus390	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus391	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus392	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus393	Bus	Under Voltage	33.000	kV	22.90	69.4	3-Phase
Bus394	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus395	Bus	Under Voltage	11.000	kV	5.90	53.7	3-Phase
Bus396	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus397	Bus	Under Voltage	11.000	kV	6.10	55.4	3-Phase
Bus398	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus399	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus40	Bus	Under Voltage	11.000	kV	9.05	82.2	3-Phase
Bus400	Bus	Under Voltage	11.000	kV	6.09	55.4	3-Phase
Bus401	Bus	Under Voltage	11.000	kV	6.90	62.7	3-Phase
Bus402	Bus	Under Voltage	33.000	kV	22.86	69.3	3-Phase
Bus403	Bus	Under Voltage	33.000	kV	22.86	69.3	3-Phase
Bus404	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus405	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus406	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus407	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus408	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus409	Bus	Under Voltage	33.000	kV	22.880	69.3	3-Phase
Bus41	Bus	Under Voltage	11.000	kV	9.05	82.2	3-Phase
Bus410	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus411	Bus	Under Voltage	11.000	kV	6.84	62.2	3-Phase
Bus412	Bus	Under Voltage	33.000	kV	22.88	69.3	3-Phase
Bus413	Bus	Under Voltage	11.000	kV	6.75	61.3	3-Phase
Bus414	Bus	Under Voltage	33.000	kV	22.87	69.3	3-Phase
Bus415	Bus	Under Voltage	33.000	kV	22.87	69.3	3-Phase
Bus416	Bus	Under Voltage	11.000	kV	6.76	61.5	3-Phase
Bus417	Bus	Under Voltage	11.000	kV	6.83	62.1	3-Phase
Bus418	Bus	Under Voltage	33.000	kV	22.87	69.3	3-Phase
Bus419	Bus	Under Voltage	11.000	kV	6.83	62.1	3-Phase
Bus42	Bus	Under Voltage	11.000	kV	9.05	82.2	3-Phase
Bus420	Bus	Under Voltage	33.000	kV	22.87	69.3	3-Phase
Bus421	Bus	Under Voltage	33.000	kV	22.85	69.2	3-Phase
Bus422	Bus	Under Voltage	11.000	kV	6.84	62.2	3-Phase
Bus423	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus424	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus425	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus426	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus427	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus428	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus429	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus43	Bus	Under Voltage	11.000	kV	9.05	82.2	3-Phase
Bus430	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus431	Bus	Under Voltage	33.000	kV	22.83	69.2	3-Phase
Bus432	Bus	Under Voltage	11.000	kV	6.82	62.0	3-Phase
Bus433	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus434	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus435	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus436	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus437	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus438	Bus	Under Voltage	33.000	kV	23.55	71.4	3-Phase
Bus439	Bus	Under Voltage	33.000	kV	23.55	71.4	3-Phase
Bus44	Bus	Under Voltage	11.000	kV	9.03	82.1	3-Phase
Bus440	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus441	Bus	Under Voltage	33.000	kV	23.528	71.3	3-Phase
Bus442	Bus	Under Voltage	33.000	kV	22.13	67.1	3-Phase
Bus443	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus444	Bus	Under Voltage	11.000	kV	6.23	56.7	3-Phase
Bus445	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus446	Bus	Under Voltage	11.000	kV	6.40	58.2	3-Phase
Bus447	Bus	Under Voltage	11.000	kV	6.33	57.6	3-Phase
Bus448	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus449	Bus	Under Voltage	11.000	kV	6.34	57.6	3-Phase
Bus45	Bus	Under Voltage	11.000	kV	9.03	82.1	3-Phase
Bus450	Bus	Under Voltage	11.000	kV	6.34	57.6	3-Phase
Bus451	Bus	Under Voltage	11.000	kV	6.34	57.6	3-Phase
Bus452	Bus	Under Voltage	11.000	kV	6.34	57.6	3-Phase
Bus453	Bus	Under Voltage	11.000	kV	6.34	57.6	3-Phase
Bus454	Bus	Under Voltage	11.000	kV	6.34	57.7	3-Phase
Bus455	Bus	Under Voltage	11.000	kV	6.34	57.7	3-Phase
Bus456	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus457	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus458	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus459	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus46	Bus	Under Voltage	11.000	kV	9.02	82.0	3-Phase
Bus460	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus461	Bus	Under Voltage	11.000	kV	6.43	58.4	3-Phase
Bus462	Bus	Under Voltage	11.000	kV	6.55	59.5	3-Phase
Bus463	Bus	Under Voltage	11.000	kV	6.74	61.3	3-Phase
Bus464	Bus	Under Voltage	11.000	kV	7.01	63.8	3-Phase
Bus465	Bus	Under Voltage	11.000	kV	6.78	61.6	3-Phase
Bus466	Bus	Under Voltage	11.000	kV	6.76	61.4	3-Phase
Bus467	Bus	Under Voltage	11.000	kV	6.74	61.3	3-Phase
Bus468	Bus	Under Voltage	11.000	kV	6.70	60.9	3-Phase
Bus469	Bus	Under Voltage	11.000	kV	6.70	60.9	3-Phase
Bus47	Bus	Under Voltage	11.000	kV	8.99	81.7	3-Phase
Bus470	Bus	Under Voltage	11.000	kV	6.70	60.9	3-Phase
Bus471	Bus	Under Voltage	11.000	kV	6.70	60.9	3-Phase
Bus472	Bus	Under Voltage	11.000	kV	6.65	60.5	3-Phase
Bus473	Bus	Under Voltage	11.000	kV	6.61	60.1	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus474	Bus	Under Voltage	11.000	kV	6.551	59.6	3-Phase
Bus475	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus476	Bus	Under Voltage	11.000	kV	6.51	59.2	3-Phase
Bus477	Bus	Under Voltage	11.000	kV	6.51	59.2	3-Phase
Bus478	Bus	Under Voltage	11.000	kV	6.47	58.9	3-Phase
Bus479	Bus	Under Voltage	11.000	kV	6.43	58.4	3-Phase
Bus48	Bus	Under Voltage	11.000	kV	9.00	81.8	3-Phase
Bus480	Bus	Under Voltage	11.000	kV	6.39	58.1	3-Phase
Bus481	Bus	Under Voltage	11.000	kV	6.39	58.1	3-Phase
Bus482	Bus	Under Voltage	11.000	kV	6.37	57.9	3-Phase
Bus483	Bus	Under Voltage	11.000	kV	6.36	57.8	3-Phase
Bus484	Bus	Under Voltage	11.000	kV	6.35	57.8	3-Phase
Bus485	Bus	Under Voltage	11.000	kV	6.35	57.7	3-Phase
Bus486	Bus	Under Voltage	11.000	kV	6.33	57.6	3-Phase
Bus487	Bus	Under Voltage	11.000	kV	6.31	57.4	3-Phase
Bus488	Bus	Under Voltage	11.000	kV	6.31	57.4	3-Phase
Bus489	Bus	Under Voltage	11.000	kV	6.29	57.2	3-Phase
Bus49	Bus	Under Voltage	11.000	kV	8.99	81.7	3-Phase
Bus490	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus491	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus492	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus493	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus494	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus495	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus496	Bus	Under Voltage	11.000	kV	6.27	57.0	3-Phase
Bus497	Bus	Under Voltage	11.000	kV	6.28	57.1	3-Phase
Bus498	Bus	Under Voltage	11.000	kV	6.28	57.1	3-Phase
Bus499	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus5	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus50	Bus	Under Voltage	11.000	kV	8.99	81.7	3-Phase
Bus500	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus501	Bus	Under Voltage	11.000	kV	6.26	56.9	3-Phase
Bus502	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus503	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus504	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus505	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus506	Bus	Under Voltage	11.000	kV	6.246	56.8	3-Phase
Bus507	Bus	Under Voltage	11.000	kV	6.25	56.8	3-Phase
Bus508	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus509	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus51	Bus	Under Voltage	11.000	kV	8.98	81.7	3-Phase
Bus510	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus511	Bus	Under Voltage	11.000	kV	6.23	56.6	3-Phase
Bus512	Bus	Under Voltage	11.000	kV	6.23	56.7	3-Phase
Bus513	Bus	Under Voltage	11.000	kV	6.23	56.7	3-Phase
Bus514	Bus	Under Voltage	11.000	kV	6.23	56.7	3-Phase
Bus515	Bus	Under Voltage	11.000	kV	6.23	56.7	3-Phase
Bus516	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus517	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus518	Bus	Under Voltage	11.000	kV	4.64	42.2	3-Phase
Bus519	Bus	Under Voltage	11.000	kV	4.64	42.2	3-Phase
Bus52	Bus	Under Voltage	11.000	kV	8.98	81.7	3-Phase
Bus520	Bus	Under Voltage	11.000	kV	4.91	44.7	3-Phase
Bus521	Bus	Under Voltage	11.000	kV	4.92	44.7	3-Phase
Bus522	Bus	Under Voltage	11.000	kV	5.08	46.1	3-Phase
Bus523	Bus	Under Voltage	11.000	kV	4.95	45.0	3-Phase
Bus524	Bus	Under Voltage	11.000	kV	4.94	44.9	3-Phase
Bus525	Bus	Under Voltage	11.000	kV	4.93	44.8	3-Phase
Bus526	Bus	Under Voltage	11.000	kV	4.92	44.7	3-Phase
Bus527	Bus	Under Voltage	11.000	kV	4.92	44.7	3-Phase
Bus528	Bus	Under Voltage	11.000	kV	4.93	44.8	3-Phase
Bus529	Bus	Under Voltage	11.000	kV	4.93	44.8	3-Phase
Bus53	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus530	Bus	Under Voltage	11.000	kV	4.94	44.9	3-Phase
Bus531	Bus	Under Voltage	11.000	kV	4.95	45.0	3-Phase
Bus532	Bus	Under Voltage	11.000	kV	4.87	44.3	3-Phase
Bus533	Bus	Under Voltage	11.000	kV	4.83	43.9	3-Phase
Bus534	Bus	Under Voltage	11.000	kV	4.83	43.9	3-Phase
Bus535	Bus	Under Voltage	11.000	kV	4.84	44.0	3-Phase
Bus536	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus537	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus538	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus539	Bus	Under Voltage	11.000	kV	4.795	43.6	3-Phase
Bus54	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus540	Bus	Under Voltage	11.000	kV	4.79	43.5	3-Phase
Bus541	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus542	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus543	Bus	Under Voltage	11.000	kV	4.80	43.6	3-Phase
Bus544	Bus	Under Voltage	11.000	kV	4.80	43.6	3-Phase
Bus545	Bus	Under Voltage	11.000	kV	4.81	43.7	3-Phase
Bus546	Bus	Under Voltage	11.000	kV	4.84	44.0	3-Phase
Bus547	Bus	Under Voltage	11.000	kV	4.89	44.4	3-Phase
Bus548	Bus	Under Voltage	11.000	kV	4.96	45.1	3-Phase
Bus549	Bus	Under Voltage	11.000	kV	5.00	45.5	3-Phase
Bus55	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus550	Bus	Under Voltage	11.000	kV	5.08	46.1	3-Phase
Bus551	Bus	Under Voltage	11.000	kV	5.10	46.4	3-Phase
Bus552	Bus	Under Voltage	11.000	kV	5.51	50.1	3-Phase
Bus553	Bus	Under Voltage	11.000	kV	5.51	50.1	3-Phase
Bus554	Bus	Under Voltage	11.000	kV	5.51	50.1	3-Phase
Bus555	Bus	Under Voltage	11.000	kV	5.51	50.1	3-Phase
Bus556	Bus	Under Voltage	11.000	kV	5.51	50.1	3-Phase
Bus557	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus558	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus559	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus56	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus560	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus561	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus562	Bus	Under Voltage	11.000	kV	6.11	55.5	3-Phase
Bus563	Bus	Under Voltage	11.000	kV	6.33	57.6	3-Phase
Bus564	Bus	Under Voltage	11.000	kV	7.01	63.7	3-Phase
Bus565	Bus	Under Voltage	11.000	kV	6.76	61.4	3-Phase
Bus566	Bus	Under Voltage	11.000	kV	6.56	59.7	3-Phase
Bus567	Bus	Under Voltage	11.000	kV	6.57	59.7	3-Phase
Bus568	Bus	Under Voltage	11.000	kV	6.57	59.7	3-Phase
Bus569	Bus	Under Voltage	11.000	kV	6.56	59.6	3-Phase
Bus57	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus570	Bus	Under Voltage	11.000	kV	6.55	59.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus571	Bus	Under Voltage	11.000	kV	6.544	59.5	3-Phase
Bus572	Bus	Under Voltage	11.000	kV	6.54	59.5	3-Phase
Bus573	Bus	Under Voltage	11.000	kV	6.54	59.5	3-Phase
Bus574	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus575	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus576	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus577	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus578	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus579	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus58	Bus	Under Voltage	11.000	kV	8.98	81.6	3-Phase
Bus580	Bus	Under Voltage	11.000	kV	6.54	59.4	3-Phase
Bus581	Bus	Under Voltage	11.000	kV	6.54	59.5	3-Phase
Bus582	Bus	Under Voltage	11.000	kV	6.54	59.5	3-Phase
Bus583	Bus	Under Voltage	11.000	kV	6.54	59.5	3-Phase
Bus584	Bus	Under Voltage	11.000	kV	6.55	59.5	3-Phase
Bus585	Bus	Under Voltage	11.000	kV	6.55	59.6	3-Phase
Bus586	Bus	Under Voltage	11.000	kV	6.55	59.6	3-Phase
Bus587	Bus	Under Voltage	11.000	kV	6.56	59.6	3-Phase
Bus588	Bus	Under Voltage	11.000	kV	6.57	59.7	3-Phase
Bus589	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus59	Bus	Under Voltage	11.000	kV	8.97	81.5	3-Phase
Bus590	Bus	Under Voltage	11.000	kV	6.60	60.0	3-Phase
Bus591	Bus	Under Voltage	11.000	kV	6.33	57.6	3-Phase
Bus592	Bus	Under Voltage	11.000	kV	6.10	55.5	3-Phase
Bus593	Bus	Under Voltage	11.000	kV	6.11	55.5	3-Phase
Bus594	Bus	Under Voltage	11.000	kV	5.75	52.3	3-Phase
Bus595	Bus	Under Voltage	11.000	kV	5.75	52.3	3-Phase
Bus596	Bus	Under Voltage	11.000	kV	5.75	52.3	3-Phase
Bus597	Bus	Under Voltage	11.000	kV	5.76	52.3	3-Phase
Bus598	Bus	Under Voltage	11.000	kV	5.61	51.0	3-Phase
Bus599	Bus	Under Voltage	11.000	kV	5.53	50.3	3-Phase
Bus6	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus60	Bus	Under Voltage	11.000	kV	8.97	81.5	3-Phase
Bus600	Bus	Under Voltage	11.000	kV	5.53	50.3	3-Phase
Bus601	Bus	Under Voltage	11.000	kV	5.52	50.2	3-Phase
Bus602	Bus	Under Voltage	11.000	kV	5.41	49.2	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus603	Bus	Under Voltage	11.000	kV	5.415	49.2	3-Phase
Bus604	Bus	Under Voltage	11.000	kV	5.42	49.3	3-Phase
Bus605	Bus	Under Voltage	11.000	kV	5.42	49.3	3-Phase
Bus606	Bus	Under Voltage	11.000	kV	5.46	49.6	3-Phase
Bus607	Bus	Under Voltage	11.000	kV	5.21	47.3	3-Phase
Bus608	Bus	Under Voltage	11.000	kV	5.19	47.2	3-Phase
Bus609	Bus	Under Voltage	11.000	kV	5.19	47.2	3-Phase
Bus61	Bus	Under Voltage	11.000	kV	8.97	81.5	3-Phase
Bus610	Bus	Under Voltage	11.000	kV	5.11	46.5	3-Phase
Bus611	Bus	Under Voltage	11.000	kV	5.12	46.5	3-Phase
Bus612	Bus	Under Voltage	11.000	kV	5.09	46.3	3-Phase
Bus613	Bus	Under Voltage	11.000	kV	5.09	46.3	3-Phase
Bus614	Bus	Under Voltage	11.000	kV	5.04	45.8	3-Phase
Bus615	Bus	Under Voltage	11.000	kV	5.04	45.8	3-Phase
Bus616	Bus	Under Voltage	11.000	kV	5.03	45.7	3-Phase
Bus617	Bus	Under Voltage	11.000	kV	5.01	45.6	3-Phase
Bus618	Bus	Under Voltage	11.000	kV	4.99	45.4	3-Phase
Bus619	Bus	Under Voltage	11.000	kV	4.99	45.4	3-Phase
Bus62	Bus	Under Voltage	11.000	kV	8.73	79.4	3-Phase
Bus620	Bus	Under Voltage	11.000	kV	4.99	45.4	3-Phase
Bus621	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus622	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus623	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus624	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus625	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus626	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus627	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus628	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus629	Bus	Under Voltage	11.000	kV	4.98	45.3	3-Phase
Bus63	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus630	Bus	Under Voltage	11.000	kV	4.96	45.1	3-Phase
Bus631	Bus	Under Voltage	11.000	kV	4.96	45.1	3-Phase
Bus632	Bus	Under Voltage	11.000	kV	4.95	45.0	3-Phase
Bus633	Bus	Under Voltage	11.000	kV	4.95	45.0	3-Phase
Bus634	Bus	Under Voltage	11.000	kV	4.92	44.7	3-Phase
Bus635	Bus	Under Voltage	11.000	kV	4.91	44.7	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus636	Bus	Under Voltage	11.000	kV	4.860	44.2	3-Phase
Bus637	Bus	Under Voltage	11.000	kV	4.86	44.2	3-Phase
Bus638	Bus	Under Voltage	11.000	kV	4.82	43.9	3-Phase
Bus639	Bus	Under Voltage	11.000	kV	4.82	43.8	3-Phase
Bus64	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus640	Bus	Under Voltage	11.000	kV	4.82	43.8	3-Phase
Bus641	Bus	Under Voltage	11.000	kV	4.82	43.8	3-Phase
Bus642	Bus	Under Voltage	11.000	kV	4.82	43.8	3-Phase
Bus643	Bus	Under Voltage	11.000	kV	4.82	43.9	3-Phase
Bus644	Bus	Under Voltage	11.000	kV	4.83	43.9	3-Phase
Bus645	Bus	Under Voltage	11.000	kV	4.83	43.9	3-Phase
Bus646	Bus	Under Voltage	11.000	kV	4.84	44.0	3-Phase
Bus647	Bus	Under Voltage	11.000	kV	4.84	44.0	3-Phase
Bus648	Bus	Under Voltage	11.000	kV	4.85	44.1	3-Phase
Bus649	Bus	Under Voltage	11.000	kV	4.86	44.2	3-Phase
Bus65	Bus	Under Voltage	11.000	kV	8.90	80.9	3-Phase
Bus650	Bus	Under Voltage	11.000	kV	4.86	44.2	3-Phase
Bus651	Bus	Under Voltage	11.000	kV	4.87	44.3	3-Phase
Bus652	Bus	Under Voltage	11.000	kV	4.86	44.2	3-Phase
Bus653	Bus	Under Voltage	11.000	kV	4.84	44.0	3-Phase
Bus654	Bus	Under Voltage	11.000	kV	6.82	62.0	3-Phase
Bus655	Bus	Under Voltage	11.000	kV	6.83	62.1	3-Phase
Bus656	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus657	Bus	Under Voltage	11.000	kV	4.79	43.6	3-Phase
Bus658	Bus	Under Voltage	11.000	kV	4.77	43.4	3-Phase
Bus659	Bus	Under Voltage	11.000	kV	4.74	43.1	3-Phase
Bus66	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus660	Bus	Under Voltage	11.000	kV	4.74	43.1	3-Phase
Bus661	Bus	Under Voltage	11.000	kV	4.70	42.8	3-Phase
Bus662	Bus	Under Voltage	11.000	kV	4.71	42.8	3-Phase
Bus663	Bus	Under Voltage	11.000	kV	4.70	42.7	3-Phase
Bus664	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus665	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus666	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus667	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus668	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus669	Bus	Under Voltage	11.000	kV	4.663	42.4	3-Phase
Bus67	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus670	Bus	Under Voltage	11.000	kV	4.66	42.3	3-Phase
Bus671	Bus	Under Voltage	11.000	kV	4.64	42.2	3-Phase
Bus672	Bus	Under Voltage	11.000	kV	4.64	42.2	3-Phase
Bus673	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus674	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus675	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus676	Bus	Under Voltage	11.000	kV	4.63	42.1	3-Phase
Bus679	Bus	Under Voltage	11.000	kV	7.01	63.8	3-Phase
Bus68	Bus	Under Voltage	11.000	kV	8.97	81.5	3-Phase
Bus680	Bus	Under Voltage	11.000	kV	7.07	64.3	3-Phase
Bus681	Bus	Under Voltage	11.000	kV	7.09	64.5	3-Phase
Bus682	Bus	Under Voltage	11.000	kV	7.16	65.1	3-Phase
Bus683	Bus	Under Voltage	11.000	kV	7.19	65.3	3-Phase
Bus684	Bus	Under Voltage	11.000	kV	7.19	65.3	3-Phase
Bus685	Bus	Under Voltage	11.000	kV	7.19	65.3	3-Phase
Bus686	Bus	Under Voltage	11.000	kV	7.32	66.5	3-Phase
Bus687	Bus	Under Voltage	11.000	kV	7.62	69.2	3-Phase
Bus688	Bus	Under Voltage	11.000	kV	7.55	68.7	3-Phase
Bus689	Bus	Under Voltage	11.000	kV	7.56	68.7	3-Phase
Bus69	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus690	Bus	Under Voltage	11.000	kV	7.40	67.3	3-Phase
Bus691	Bus	Under Voltage	11.000	kV	7.32	66.6	3-Phase
Bus692	Bus	Under Voltage	11.000	kV	7.32	66.5	3-Phase
Bus693	Bus	Under Voltage	11.000	kV	7.31	66.4	3-Phase
Bus694	Bus	Under Voltage	11.000	kV	7.31	66.4	3-Phase
Bus695	Bus	Under Voltage	11.000	kV	7.25	65.9	3-Phase
Bus696	Bus	Under Voltage	11.000	kV	7.25	65.9	3-Phase
Bus697	Bus	Under Voltage	11.000	kV	7.20	65.4	3-Phase
Bus698	Bus	Under Voltage	11.000	kV	7.16	65.1	3-Phase
Bus699	Bus	Under Voltage	11.000	kV	7.14	64.9	3-Phase
Bus7	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus70	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus700	Bus	Under Voltage	11.000	kV	7.15	65.0	3-Phase
Bus701	Bus	Under Voltage	11.000	kV	7.15	65.0	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus702	Bus	Under Voltage	11.000	kV	7.116	64.7	3-Phase
Bus703	Bus	Under Voltage	11.000	kV	7.09	64.5	3-Phase
Bus704	Bus	Under Voltage	11.000	kV	7.07	64.3	3-Phase
Bus705	Bus	Under Voltage	11.000	kV	7.08	64.3	3-Phase
Bus706	Bus	Under Voltage	11.000	kV	7.09	64.5	3-Phase
Bus707	Bus	Under Voltage	11.000	kV	7.08	64.4	3-Phase
Bus708	Bus	Under Voltage	11.000	kV	7.08	64.4	3-Phase
Bus709	Bus	Under Voltage	11.000	kV	7.07	64.2	3-Phase
Bus71	Bus	Under Voltage	11.000	kV	8.96	81.5	3-Phase
Bus710	Bus	Under Voltage	11.000	kV	7.07	64.3	3-Phase
Bus711	Bus	Under Voltage	11.000	kV	7.07	64.3	3-Phase
Bus712	Bus	Under Voltage	11.000	kV	7.35	66.9	3-Phase
Bus713	Bus	Under Voltage	11.000	kV	7.41	67.3	3-Phase
Bus714	Bus	Under Voltage	11.000	kV	7.48	68.0	3-Phase
Bus715	Bus	Under Voltage	11.000	kV	7.53	68.5	3-Phase
Bus716	Bus	Under Voltage	11.000	kV	7.62	69.2	3-Phase
Bus717	Bus	Under Voltage	11.000	kV	7.61	69.2	3-Phase
Bus718	Bus	Under Voltage	11.000	kV	7.61	69.2	3-Phase
Bus719	Bus	Under Voltage	11.000	kV	7.57	68.8	3-Phase
Bus72	Bus	Under Voltage	11.000	kV	8.97	81.5	3-Phase
Bus720	Bus	Under Voltage	11.000	kV	7.53	68.5	3-Phase
Bus721	Bus	Under Voltage	11.000	kV	7.52	68.4	3-Phase
Bus722	Bus	Under Voltage	11.000	kV	7.52	68.4	3-Phase
Bus723	Bus	Under Voltage	11.000	kV	7.52	68.4	3-Phase
Bus724	Bus	Under Voltage	11.000	kV	7.52	68.4	3-Phase
Bus725	Bus	Under Voltage	11.000	kV	7.51	68.3	3-Phase
Bus726	Bus	Under Voltage	11.000	kV	7.50	68.1	3-Phase
Bus727	Bus	Under Voltage	11.000	kV	7.49	68.1	3-Phase
Bus728	Bus	Under Voltage	11.000	kV	7.49	68.1	3-Phase
Bus729	Bus	Under Voltage	11.000	kV	7.49	68.1	3-Phase
Bus73	Bus	Under Voltage	11.000	kV	9.02	82.0	3-Phase
Bus730	Bus	Under Voltage	11.000	kV	7.49	68.1	3-Phase
Bus731	Bus	Under Voltage	11.000	kV	7.48	68.0	3-Phase
Bus732	Bus	Under Voltage	11.000	kV	7.47	67.9	3-Phase
Bus733	Bus	Under Voltage	11.000	kV	7.45	67.8	3-Phase
Bus734	Bus	Under Voltage	11.000	kV	7.44	67.6	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus735	Bus	Under Voltage	11.000	kV	7.441	67.6	3-Phase
Bus736	Bus	Under Voltage	11.000	kV	7.43	67.6	3-Phase
Bus737	Bus	Under Voltage	11.000	kV	7.41	67.3	3-Phase
Bus738	Bus	Under Voltage	11.000	kV	7.41	67.3	3-Phase
Bus739	Bus	Under Voltage	11.000	kV	7.39	67.2	3-Phase
Bus74	Bus	Under Voltage	11.000	kV	7.54	68.5	3-Phase
Bus740	Bus	Under Voltage	11.000	kV	7.39	67.1	3-Phase
Bus741	Bus	Under Voltage	11.000	kV	7.38	67.1	3-Phase
Bus742	Bus	Under Voltage	11.000	kV	7.39	67.1	3-Phase
Bus743	Bus	Under Voltage	11.000	kV	7.39	67.1	3-Phase
Bus744	Bus	Under Voltage	11.000	kV	7.38	67.1	3-Phase
Bus745	Bus	Under Voltage	11.000	kV	7.37	67.0	3-Phase
Bus746	Bus	Under Voltage	11.000	kV	7.37	67.0	3-Phase
Bus747	Bus	Under Voltage	11.000	kV	7.36	66.9	3-Phase
Bus748	Bus	Under Voltage	11.000	kV	7.36	66.9	3-Phase
Bus749	Bus	Under Voltage	11.000	kV	7.36	66.9	3-Phase
Bus75	Bus	Under Voltage	11.000	kV	9.01	81.9	3-Phase
Bus750	Bus	Under Voltage	11.000	kV	7.36	66.9	3-Phase
Bus751	Bus	Under Voltage	11.000	kV	7.36	66.9	3-Phase
Bus752	Bus	Under Voltage	11.000	kV	7.35	66.9	3-Phase
Bus753	Bus	Under Voltage	11.000	kV	7.35	66.9	3-Phase
Bus754	Bus	Under Voltage	11.000	kV	7.62	69.3	3-Phase
Bus755	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus756	Bus	Under Voltage	33.000	kV	23.16	70.2	3-Phase
Bus757	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus758	Bus	Under Voltage	33.000	kV	22.99	69.7	3-Phase
Bus759	Bus	Under Voltage	11.000	kV	6.82	62.0	3-Phase
Bus76	Bus	Under Voltage	11.000	kV	8.95	81.4	3-Phase
Bus760	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus761	Bus	Under Voltage	11.000	kV	6.82	62.0	3-Phase
Bus762	Bus	Under Voltage	33.000	kV	22.81	69.1	3-Phase
Bus763	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus764	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus765	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus766	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus767	Bus	Under Voltage	11.000	kV	6.82	62.0	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus768	Bus	Under Voltage	33.000	kV	22.798	69.1	3-Phase
Bus769	Bus	Under Voltage	33.000	kV	22.80	69.1	3-Phase
Bus77	Bus	Under Voltage	11.000	kV	5.79	52.7	3-Phase
Bus770	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus771	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus772	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus773	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus774	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus775	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus776	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus777	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus778	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus779	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus78	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus780	Bus	Under Voltage	33.000	kV	22.79	69.1	3-Phase
Bus781	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus782	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus785	Bus	Under Voltage	11.000	kV	6.74	61.3	3-Phase
Bus786	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus787	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus788	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus789	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus79	Bus	Under Voltage	11.000	kV	8.89	80.8	3-Phase
Bus790	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus791	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus792	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus793	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus794	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus795	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus796	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus797	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase
Bus798	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus799	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus8	Bus	Under Voltage	66.000	kV	60.81	92.1	3-Phase
Bus80	Bus	Under Voltage	11.000	kV	9.00	81.9	3-Phase
Bus800	Bus	Under Voltage	33.000	kV	22.78	69.0	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus801	Bus	Under Voltage	33.000	kV	22.775	69.0	3-Phase
Bus802	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus803	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus804	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus805	Bus	Under Voltage	33.000	kV	22.77	69.0	3-Phase
Bus806	Bus	Under Voltage	33.000	kV	22.89	69.4	3-Phase
Bus808	Bus	Under Voltage	11.000	kV	6.84	62.2	3-Phase
Bus809	Bus	Under Voltage	11.000	kV	6.67	60.6	3-Phase
Bus81	Bus	Under Voltage	11.000	kV	9.02	82.0	3-Phase
Bus810	Bus	Under Voltage	11.000	kV	6.67	60.6	3-Phase
Bus811	Bus	Under Voltage	11.000	kV	6.60	60.0	3-Phase
Bus812	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus813	Bus	Under Voltage	11.000	kV	6.60	60.0	3-Phase
Bus814	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus815	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus816	Bus	Under Voltage	11.000	kV	4.43	40.2	3-Phase
Bus817	Bus	Under Voltage	11.000	kV	4.42	40.2	3-Phase
Bus818	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus819	Bus	Under Voltage	11.000	kV	6.59	59.9	3-Phase
Bus82	Bus	Under Voltage	11.000	kV	7.53	68.5	3-Phase
Bus820	Bus	Under Voltage	11.000	kV	6.58	59.8	3-Phase
Bus821	Bus	Under Voltage	11.000	kV	6.58	59.8	3-Phase
Bus822	Bus	Under Voltage	11.000	kV	6.58	59.8	3-Phase
Bus823	Bus	Under Voltage	33.000	kV	23.56	71.4	3-Phase
Bus83	Bus	Under Voltage	11.000	kV	8.73	79.4	3-Phase
Bus84	Bus	Under Voltage	11.000	kV	8.73	79.4	3-Phase
Bus85	Bus	Under Voltage	11.000	kV	8.73	79.4	3-Phase
Bus86	Bus	Under Voltage	11.000	kV	8.51	77.4	3-Phase
Bus87	Bus	Under Voltage	11.000	kV	8.29	75.4	3-Phase
Bus88	Bus	Under Voltage	11.000	kV	8.29	75.4	3-Phase
Bus89	Bus	Under Voltage	11.000	kV	8.29	75.3	3-Phase
Bus9	Bus	Under Voltage	66.000	kV	60.81	92.1	3-Phase
Bus90	Bus	Under Voltage	11.000	kV	8.28	75.3	3-Phase
Bus91	Bus	Under Voltage	11.000	kV	8.28	75.3	3-Phase
Bus92	Bus	Under Voltage	11.000	kV	8.13	73.9	3-Phase
Bus93	Bus	Under Voltage	11.000	kV	7.67	69.8	3-Phase

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus94	Bus	Under Voltage	11.000	kV	8.127	73.9	3-Phase
Bus95	Bus	Under Voltage	11.000	kV	8.12	73.8	3-Phase
Bus96	Bus	Under Voltage	11.000	kV	8.03	73.0	3-Phase
Bus97	Bus	Under Voltage	11.000	kV	8.03	73.0	3-Phase
Bus98	Bus	Under Voltage	11.000	kV	7.69	69.9	3-Phase
Bus99	Bus	Under Voltage	11.000	kV	7.69	69.9	3-Phase
Cable14	Cable	Overload	274.786	Amp	417.80	152.0	3-Phase
Cable4	Cable	Overload	338.032	Amp	504.18	149.2	3-Phase
Cable7	Cable	Overload	338.032	Amp	508.30	150.4	3-Phase
Cable8	Cable	Overload	338.032	Amp	345.58	102.2	3-Phase

SUMMARY OF TOTAL GENERATION , LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	59.419	45.638	74.922	79.31 Lagging
Source (Non-Swing Buses):	0.000	0.000	0.000	
Total Demand:	59.419	45.638	74.922	79.31 Lagging
Total Motor Load:	35.286	7.498	36.074	97.82 Lagging
Total Static Load:	16.434	4.424	17.019	96.56 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	7.699	33.716		
System Mismatch:	0.000	0.000		

Number of Iterations: 6

Annexure 5: Feeder Wise Reliability Indices

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
33kV Sipsu feeder (L180).							
1	Charging of new installation	5.00	8.33	10	0.00	0.00	0.24
2	Jumpering	5.00	4.99	10	0.00	0.00	0.24
3	Line fault	4.00	14.33	8	0.00	0.00	0.19
4	Maintenance work	1.00	1.25	2	0.00	0.00	0.05
5	Rainfall and Lightening	1.00	0.50	2	0.00	0.00	0.05
6	Transient fault	4.00	2.66	8	0.00	0.00	0.19
8	RoW	1.00	3.00	2	0.00	0.00	0.05
Total		**21**	**35**	**42.00**	**0.00**	**0.00**	
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average11kV Sipsu feeder	**3.00**	**5.01**	**6.00**			
	Total number of years		**3.7**				
	Total customers in a feeder		**3**				
	Total number of customers served		**14575**				
11kV VIP feeder (L70).							
1	Charging of new installation	2.00	8.75	1060	25.48	0.21	2.00
2	Line fault	7.00	7.67	3505	84.25	0.18	7.00
3	Animal	1.00	0.42	323	7.76	0.01	1.00
4	Maintenance work	2.00	2.83	573	13.77	0.07	2.00
5	Rainfall and Lightening	12.00	13.47	5536	133.08	0.32	12.00
6	Transient fault	4.00	2.66	8	0.19	0.06	4.00
7	RoW	1.00	3.00	2	0.05	0.07	1.00
8	Replacemnet of equipment	3.00	2.80	896	21.54	0.07	3.00
0		**32**	**42**	**11903.00**	**286.13**	**1.00**	32.00
	2016	365	1	year			
	2017	365	1	year			

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV VIP feeder	**4.00**	**5.20**	**1487.88**	**35.77**	**0.13**	
	Total number of years		**3.7**				
	Total customers in a feeder		**530**				
	Total number of customers served		**14575**				
Feeder Name Station: Market feeder (L80).							
1	Charging of new installation	2.00	8.75	2080	0.04	0.17	0.09
2	Line fault	7.00	10.83	6858	0.13	0.21	0.32
3	Animal	1.00	0.42	323	0.01	0.01	0.05
4	Maintenance work	3.00	7.50	2236	0.04	0.15	0.14
5	Rainfall and Lightening	4.00	1.72	3318	0.06	0.03	0.18
6	Transient fault	1.00	0.25	1040	0.02	0.00	0.05
7	RoW	2.00	2.83	1870	0.04	0.06	0.09
8	Replacemnet of equipment	2.00	0.97	1532	0.03	0.02	0.09
0		**22**	**33**	**19257.00**	**0.36**	**0.65**	1.00
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV Samtse market f	**2.75**	**4.16**	**2407.13**	**0.05**	**0.08**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1040**				
	Total number of customers served		**14575**				
Changmari feeder (L90).							
1	Charging of new installation	9.00	22.83	30927	0.58	1.00	0.06
2	Line fault	30.00	45.75	64444	1.21	2.01	0.20
3	HT fuse replacement	7.00	3.05	24731	0.46	0.13	0.05
4	Maintenance work	19.00	58.33	49824	0.94	2.56	0.13

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
5	Rainfall and Lightening	39.00	53.16	92305	1.74	2.33	0.26
6	Transient fault	11.00	4.92	30551	0.57	0.22	0.07
7	RoW	14.00	40.42	34083	0.64	1.77	0.09
8	Replacemnet of equipment	17.00	22.51	39989	0.75	0.99	0.11
9	Jumpering	2.00	5.58	2744	0.05	0.24	0.01
		148	**257**	**369598**	**6.95**	**11.25**	1.00
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV Chengmari feede	**16.44**	**28.51**	**41066.44**	**0.77**	**1.25**	
	Total number of years		**3.7**				
	Total customers in a feeder		**2333**				
	Total number of customers served		**14575**				
11kV Duarpani back feeder (L20).							
1	Charging of new installation	7.00	14.17	1717	0.03	0.09	0.09
2	Line fault	21.00	26.25	4912	0.09	0.17	0.27
3	Maintenance work	6.00	11.83	1568	0.03	0.08	0.08
4	Rainfall and Lightening	17.00	21.38	5065	0.10	0.14	0.22
5	Transient fault	6.00	2.00	2034	0.04	0.01	0.08
6	RoW	4.00	4.75	1308	0.02	0.03	0.05
7	Replacemnet of equipment	8.00	7.97	2295	0.04	0.05	0.10
8	Jumpering	8.00	4.83	2488	0.05	0.03	0.10
		77	**93**	**21387**	0.40	0.59	1.00
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV Duarpani feeder	**9.63**	**11.65**	**2673.38**	0.40	0.59	

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	Total number of years		**3.7**				
	Total customers in a feeder		**339**				
	Total number of customers served		**14575**				
11kV Gurung Basti feeder (L100).							
1	Charging of new installation	4.00	6.33	2140	0.04	0.06	0.08
2	HT fuse replacemnet	1.00	0.17	326	0.01	0.00	0.02
3	Line fault	11.00	7.75	5467	0.10	0.08	0.21
4	Maintenance work	4.00	3.58	1537	0.03	0.04	0.08
5	Rainfall and Lightening	9.00	8.55	2865	0.05	0.09	0.17
6	Transient fault	15.00	5.70	7158	0.13	0.06	0.28
7	Realignment work	2.00	3.33	150	0.00	0.03	0.04
8	RoW	7.00	33.97	2192	0.04	0.34	0.13
	Total	**53**	**69**	**21835**	**0.41**	**0.70**	**1.00**
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kv Gurung Basty fe	**6.63**	**8.67**	**2729.38**	**0.05**	**0.09**	
	Total number of years		**3.7**				
	Total customers in a feeder		**535**				
	Total number of customers served		**14575**				
Samtse Station Feeder							
1	Charging of new installation	0.00	0.00	0.00	0.00	0.00	#DIV/0!
2	Maintenance Works	0.00	0.00	0.00	0.00	0.00	#DIV/0!
3	RoW	0.00	0.00	0.00	0.00	0.00	#DIV/0!
4	Line Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
5	Transient Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
8	Rainfall and Lightening	0.00	0.00	0.00	0.00	0.00	#DIV/0!
Total		**0**	**-**	**-**	**0.00**	**0.00**	**#DIV/0!**

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average Samtse station Feeder	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1**				
	Total number of customers served		**14575**				
11kV Samtse Feeder I							
1	HT Fuse Replacement	29.00	20.14	9683	0.18	0.13	0.27
2	Maintenance Works	22.00	66.41	7810	0.15	0.42	0.21
3	RoW	8.00	17.22	2590	0.05	0.11	0.08
4	Line Fault	8.00	84.05	1920	0.04	0.53	0.08
5	Transient Fault	3.00	2.25	975	0.02	0.01	0.03
6	Jumpering of line	10.00	11.87	3192	0.06	0.07	0.09
7	Grid Faiure	1.00	5.52	305	0.01	0.03	0.01
8	Rainfall and Lightening	17.00	83.78	5347	0.10	0.53	0.16
9	Replacemnet of LA, Pin & Disc	6.00	28.27	1934	0.04	0.18	0.06
10	Fire	2.00	4.46	610	0.01	0.03	0.02
Total		**106**	**323.97**	**34,366.00**	**0.65**	**2.04**	**1.00**
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV Samtse Feeder N	**10.60**	**32.40**	**3436.60**	**0.06**	**0.20**	
	Total number of years		**3.7**				
	Total customers in a feeder		**335**				
	Total number of customers served		**14575**				
11kV Lhaki Feeder II							

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
Sl No.	**Causes**	**Total interruption**	**Total interruption duration (Hr)**	**Total Customers Interrupted**	SAIFI	SAIDI	% Distribution
1	Planned shutdown	6.00	125.95	6	0.00	0.01	0.16
2	Nuisance tripping (Due to tripping of Samtse feeder-I)	25.00	40.95	25	0.00	0.00	0.68
3	Tripping of the feeder due to bad weather	3.00	2.48	3	0.00	0.00	0.08
4	Fault from Lhaki plant	3.00	3.12	3	0.00	0.00	0.08
Total		**37**	**172.50**	**37.00**	0.00	0.01	
	2018	365	1	year			
	2019	120	0.3	years			
	Average 11kV Lhaki Fdr	**9.25**	**43.13**	**9.25**	0.00	0.00	
	Total number of years		**1.3**				
	Total customers in a feeder		**1**				
	Total number of customers served		**14575**				
	11kV Polymer Feeder III						
1	RoW	4	15.63	8	0.00	0.03	0.22
		4	**16**	**8**			1.00
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV PolymerFeeder	**4.00**	**15.63**	**8.00**	**0.00**	**0.03**	0.22
	Total number of years		**3.7**				
	Total customers in a feeder		**2**				
	Total number of customers served		**14575**				
11kV Pugli Feeder V							

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	HT fuse replacement	**7**	**3.83**	**2509**	0.05	0.03	0.06
1	Charging of new installation	5.00	4.87	1816	0.03	0.03	0.05
2	Maintenance Works	21.00	24.67	7517	0.14	0.17	0.19
3	RoW	11.00	19.46	3969	0.07	0.13	0.10
4	Replacement of equipment	9.00	42.82	3242	0.06	0.29	0.08
5	Rainfall and Lightening	10.00	37.51	3640	0.07	0.26	0.09
6	Fire	1.00	2.28	364	0.01	0.02	0.01
7	Jumpering of line	6.00	7.80	2182	0.04	0.05	0.05
8	Line fault	21.00	65.55	6920.25	0.13	0.45	0.19
9	Man made fault	5.00	4.30	1856	0.03	0.03	0.05
10	Realignment works	10.00	22.58	3707	0.07	0.15	0.09
11	Transient fault	5.00	1.28	1768	0.03	0.01	0.05
		111	**237**	**39490**	0.74	1.62	1.00
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 11kV Pugli Feeder	**9.25**	**19.75**	**3290.85**	0.06	0.14	
	Total number of years		**3.7**				
	Total customers in a feeder		**364**				
	Total number of customers served		**14575**				
11kV Gomtu Station Feeder							
1	Charging of new installation	0.00	0.00	0.00	0.00	0.00	#DIV/0!
2	Maintenance Works	0.00	0.00	0.00	0.00	0.00	#DIV/0!
3	RoW	0.00	0.00	0.00	0.00	0.00	#DIV/0!
4	Line Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
5	Transient Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
8	Rainfall and Lightening	0.00	0.00	0.00	0.00	0.00	#DIV/0!
Total		**0**	**-**	**-**	**0.00**	**0.00**	**#DIV/0!**

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average Gomtu station feeder	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1**				
	Total number of customers served		**14575**				
33kV Norbugang Feeder III							
1	Line Fault	1.00	0.15	2.00	0.00	0.00	0.25
2	Transient Fault	3.00	0.15	6.00	0.00	0.00	0.75
Total		**4**	**0**	**8**	0.00	0.00	1.00
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 33Kv Norbugang feeder	**2.00**	**0.15**	**4.00**	0.00	0.00	
	Total number of years		**2.7**				
	Total customers in a feeder		**2**				
	Total number of customers served		**14575**				
33kV Dhamdum Station Feeder							
1	Charging of new installation	0.00	0.00	0.00	0.00	0.00	#DIV/0!
2	Maintenance Works	0.00	0.00	0.00	0.00	0.00	#DIV/0!
3	RoW	0.00	0.00	0.00	0.00	0.00	#DIV/0!
4	Line Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
5	Transient Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
8	Rainfall and Lightening	0.00	0.00	0.00	0.00	0.00	#DIV/0!
Total		**0**	**-**	**-**	**0.00**	0.00	**#DIV/0!**
	2016	365	1	year			

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	AverageDhamdum station feed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1**				
	Total number of customers served		**14575**				
33kV Sipsu Feeder							
1	Maintenance Works	1.00	4.70	4997	0.09	0.44	0.05
2	RoW	5.00	6.76	24985	0.47	0.63	0.24
3	Rainfall and Lightening	15.00	9.84	64398	1.21	0.92	0.71
	Total	**21**	**21.30**	**94,380.00**	**1.77**	**2.00**	**1.00**
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 33kV Sipsu feeder	**7.00**	**7.10**	**31460.00**	**0.59**	**0.67**	
	Total number of years		**3.7**				
	Total customers in a feeder		**4997**				
	Total number of customers served		**14575**				
33kV Dorokha Feeder							
1	HT Fuse Replacement	78.00	55.60	238260	4.48	3.27	0.43
2	Maintenance Works	18.00	19.96	55840	1.05	1.17	0.10
3	RoW	13.00	35.07	39072	0.73	2.06	0.07
4	Line Fault	29.00	66.59	89030	1.67	3.92	0.16
5	Transient Fault	2.00	0.35	5764	0.11	0.02	0.01
6	Jumpering of line	9.00	6.91	28170	0.53	0.41	0.05
8	Rainfall and Lightening	25.00	57.20	74997	1.41	3.37	0.14
9	Replacement of equipment	7.00	10.13	21164	0.40	0.60	0.04

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
10	Man made	1.00	3.63	3130	0.06	0.21	0.01
Total		**182**	**255.44**	**555,427.00**	**10.44**	**15.03**	**1.00**
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 33kV Dorokha feeder	**20.22**	**28.38**	**61714.11**	**1.16**	**1.67**	
	Total number of years		**3.7**				
	Total customers in a feeder		**3130**				
	Total number of customers served		**14575**				
33kV Station Feeder I							
1	Charging of new installation	0.00	0.00	0.00	0.00	0.00	#DIV/0!
2	Maintenance Works	0.00	0.00	0.00	0.00	0.00	#DIV/0!
3	RoW	0.00	0.00	0.00	0.00	0.00	#DIV/0!
4	Line Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
5	Transient Fault	0.00	0.00	0.00	0.00	0.00	#DIV/0!
8	Rainfall and Lightening	0.00	0.00	0.00	0.00	0.00	#DIV/0!
Total		**0**	**-**	**-**	**0.00**	**0.00**	**#DIV/0!**
	2016	365	1	year			
	2017	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average Dhamdum station feed	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1**				
	Total number of customers served		**14575**				
PCLA Feeder							
1	Planned shutdown	10.00	33.37	10	0.00	0.00	0.14
2	Grid failure	11.00	4.03	11	0.00	0.00	0.15

Sl No.	Causes of the Interruptions	Total Interruption	Total Interruption Duration	Total Customers Interrupted	SAIFI	SAIDI	% Distribution
3	Transient Fault	26.00	4.50	26	0.00	0.00	0.37
4	Emmergency shutdown	3.00	2.78	3	0.00	0.00	0.04
5	RoW	1.00	1.47	1	0.00	0.00	0.01
6	Line Fault	14.00	6.40	12	0.00	0.00	0.20
7	Rainfall and Lightening	6.00	0.95	6	0.00	0.00	0.08
Total		**71**	**54**	**69**	**0.00**	**0.00**	**1.00**
	2016	365	1	year			
	2017.00	365	1	year			
	2018	365	1	year			
	2019	240	0.7	years			
	Average 66kV PCAL feeder	**10.14**	**7.64**	**9.86**	**0.00**	**0.00**	
	Total number of years		**3.7**				
	Total customers in a feeder		**1**				
Total number of customers served			**14575**				

Annexure 6: Material Cost for Upgrading single phase (11 kV and 33 kV) Lines to three-phase

Sl. No	Name of ESDs	Total Cost in Nu. For upgradation of Line to 3Φ from 1Φ		Total cost in Nu.
		11 kV Line in Km	33 kV Line in Km	
		Cost in Nu.	Cost in Nu.	
1	Bumthang	604,083.80	626,364.17	1,230,447.97
2	Chukhha	1,372,746.06	6,450,371.80	7,823,117.86
3	Dagana	–	2,495,645.61	2,495,645.61
4	Haa	–	341,755.04	341,755.04
5	Lhuntse	1,648,680.77	6,292,698.01	7,941,378.78
6	Mongar	–	–	–
7	Paro	1,576,599.08	1,663,407.47	3,240,006.55
8	Pemagatshel	–	2,467,625.51	2,467,625.51
9	Punakha	612,259.13	8,183,731.48	8,795,990.60
10	S/Jongkhar	–	7,593,301.40	7,593,301.40
11	Samtse	2,031,083.74	536,799.03	2,567,882.76
12	Sarpang	756,490.07	1,112,902.61	1,869,392.68
13	Trashi Gang	251,649.96	626,304.45	877,954.41
14	Trashiyangtse		2,207,281.49	2,207,281.49
15	Thimphu	5,228,316.74	-	5,228,316.74
16	Trongsa	–	651,860.25	651,860.25
17	Tsirang	–	1,693,286.88	1,693,286.88
18	Wangdue	98,146.90	3,133,078.14	3,231,225.04
19	Zhemgang	–	5,303,863.16	5,303,863.16
	TOTAL	**14,180,056.24**	**51,380,276.50**	**65,560,332.75**

The cost of extending one phase in case of ACSR conductor and AAAC covered conductor were considered and incase of HV ABC, the cost of constructing three core cable has been considered in estimation. Above estimation indicates the total material cost involved in upgrading the existing single-phase line to three phase under each ESD.

The total cost including material cost (Nu. 65 million), transportation cost (Nu. 3.47 million) and labor cost (Nu. 28 million) will amount to Nu. 97 million.

11 kV and 33 kV Single-phase Line Length in km under each ESD

Sl. No	Name of ESDs	11kV 1Φ Line (km)	33kV 1Φ Line (km)	Total 1Φ Line (km)
1	Bumthang	6.96276	5.6246	12.58736
2	Chukhha	21.569	78.274	99.843

Sl. No	Name of ESDs	11kV 1Φ Line (km)	33kV 1Φ Line (km)	Total 1Φ Line (km)
3	Dagana	0	30.527	30.527
4	Haa	0	4.391	4.391
5	Lhuntse	18.7075	80.851	99.5585
6	Mongar	0	0	0
7	Paro	24.772	14.937	39.709
8	Pemagatshel	0	31.705	31.705
9	Punakha	9.62	58.4	68.02
10	S/Jongkhar	0	93.672	93.672
11	Samtse	31.913	6.897	38.81
12	Sarpang	11.8862	14.299	26.1852
13	Trashigang	3.954	8.047	12.001
14	Trashiyangtse	0	28.36	28.36
15	Thimphu	5.93	0	5.93
16	Trongsa	0	5.383	5.383
17	Tsirang	0	21.756	21.756
18	Wangdue	1.01	29.7	30.71
19	Zhemgang	0	66.785	66.785
TOTAL		**136.32446**	**579.6086**	**715.93306**

Annexure 7: Distribution Transformer Loading

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
	11kV Samtse I								
1	Ahalay	25	2.49	0.10	10.57	0.42	14.47	0.58	Rural
2	Andheri	63	7.66	0.12	32.57	0.52	44.59	0.71	Rural
3	L Dumsidara 'B'	10	0.37	0.04	1.55	0.16	2.13	0.21	Rural
4	Tindaray 'B'	25	2.57	0.10	10.92	0.44	14.95	0.60	Rural
5	Dumsidara 'A'	63	3.21	0.05	13.64	0.22	18.67	0.30	Rural
6	Tindaray 'A'	16	5.43	0.34	23.08	1.44	31.60	1.98	Rural
7	Kalapani	25	1.98	0.08	8.42	0.34	11.53	0.46	Rural
8	Singkauley	16	0.54	0.03	2.31	0.14	3.16	0.20	Rural
9	Banstar	63	23.00	0.37	97.82	1.55	133.94	2.13	Rural
10	Uttary I	63	7.32	0.12	31.13	0.49	42.62	0.68	Rural
11	Uttary II	25	13.00	0.52	55.29	2.21	75.70	3.03	Rural
12	Lamitar	63	32.00	0.51	136.10	2.16	186.35	2.96	Rural
13	Phajaydang	25	9.00	0.36	38.28	1.53	52.41	2.10	Rural
14	Changay Sangla	10	2.00	0.20	8.51	0.85	11.65	1.16	Rural
15	Sangla	25	5.00	0.20	21.27	0.85	29.12	1.16	Rural
16	Lower Dolomthang	25	2.30	0.09	9.78	0.39	13.40	0.54	Rural
17	Upper Dolomthang	25	2.00	0.08	8.52	0.34	11.66	0.47	Rural
18	Numlakha	10	0.29	0.03	1.24	0.12	1.70	0.17	Rural
19	Mid Dolomthang	16	1.29	0.08	5.49	0.34	7.52	0.47	Rural
20	Litchi	25	4.50	0.18	19.14	0.77	26.21	1.05	Rural
21	Kamidara	16	2.80	0.18	11.92	0.75	16.33	1.02	Rural
22	Mid Gaysinggaon	25	16.55	0.66	70.39	2.82	96.37	3.85	Rural
23	Upper Gumbadara	25	3.80	0.15	16.17	0.65	22.14	0.89	Rural
24	Ratay A	16	3.43	0.21	14.59	0.91	19.98	1.25	Rural
25	Ratay B	25	2.98	0.12	12.69	0.51	17.38	0.70	Rural
26	MidGumbadara	25	1.78	0.07	7.56	0.30	10.35	0.41	Rural
27	Lower Gumbadara	16	4.67	0.29	19.85	1.24	27.18	1.70	Rural
28	Middle Thumkey	16	3.38	0.21	14.38	0.90	19.69	1.23	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
29	Thodney C (T2) Raigaon	10	0.25	0.03	1.08	0.11	1.47	0.15	Rural
30	Thodney A	10	0.95	0.09	4.03	0.40	5.52	0.55	Rural
31	Thodney C (T1)	10	0.55	0.06	2.36	0.24	3.23	0.32	Rural
32	Thodney C (T3)	10	0.50	0.05	2.14	0.21	2.93	0.29	Rural
33	Thodney B	16	0.74	0.05	3.14	0.20	4.29	0.27	Rural
34	Upper Thumkey	25	4.99	0.20	21.23	0.85	29.07	1.16	Rural
35	Lower Thumkey	16	3.91	0.24	16.64	1.04	22.78	1.42	Rural
	LCPL								
1	11kV Lhaki Cement	4200	3661.00	0.87	5850.00	1.39	7132.00	1.70	Pvt
	11kV Polymer								
1	Lhaki Office	1500	540.00	0.36	2151.69	1.43	2771.66	1.85	Pvt
2	Bhutan Polymer	750	331.00	0.44	1318.90	1.76	1698.93	2.27	Pvt
	11kV Gomtu Market								
1	Gomtu Market	250	125.00	0.50	839.24	3.36	1205.06	4.82	Urban
2	BHU	125	45.85	0.37	307.82	2.46	442.00	3.54	Urban
	11kV Pugli								
1	Kenpa	500	396.00	0.79	533.78	1.07	626.99	1.25	Pvt
2	Lhatar	63	21.70	0.34	29.25	0.46	34.36	0.55	Rural
3	New Lhatar S/Station	63	6.26	0.10	8.44	0.13	9.91	0.16	Rural
4	Suktey Village	25	12.00	0.48	16.18	0.65	19.00	0.76	Rural
5	Kothidara	63	7.37	0.12	9.93	0.16	11.67	0.19	Rural
6	Druk Emulsion	250	126.00	0.50	169.84	0.68	199.50	0.80	Pvt
7	G2 Crusher	125	45.00	0.36	60.66	0.49	71.25	0.57	Pvt
8	Tashidargay	63	29.00	0.46	39.09	0.62	45.92	0.73	Pvt
9	Serki Khola	25	2.11	0.08	2.84	0.11	3.33	0.13	Rural
10	Bhutan Crushing Unit	750	339.00	0.45	456.95	0.61	536.74	0.72	Pvt
11	Bhutan Phermaceutical	500	79.00	0.16	106.49	0.21	125.08	0.25	Pvt
12	Chundu Dolomite	500	303.00	0.61	408.43	0.82	479.74	0.96	Pvt
13	Samdhen	250	150.00	0.60	202.19	0.81	237.49	0.95	Pvt

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
14	Pugli Market	250	21.73	0.09	29.30	0.12	34.41	0.14	Urban
15	Jigme Industries	750	610.00	0.81	822.24	1.10	965.81	1.29	Pvt
16	JIPL	200	51.00	0.26	68.75	0.34	80.75	0.40	Pvt
17	Damdara	25	6.58	0.26	8.87	0.35	10.42	0.42	Rural
18	Titi A (Ranitar)	10	4.00	0.40	5.39	0.54	6.33	0.63	Rural
19	Titi A (Lowergoan)	16	4.40	0.28	5.93	0.37	6.97	0.44	Rural
20	Titi A (Beechgaon)	16	5.00	0.31	6.74	0.42	7.92	0.49	Rural
21	Titi A (Montaraydara)	10	6.00	0.60	8.09	0.81	9.50	0.95	Rural
22	Pakhagoan	16	4.00	0.25	5.39	0.34	6.33	0.40	Rural
23	JIPL Screen Plant	400	200.00	0.50	269.59	0.67	316.66	0.79	Pvt
24	BS&M	500	296.00	0.59	398.99	0.80	468.66	0.94	Pvt
25	Upper Khanigoan	63	5.93	0.09	8.00	0.13	9.39	0.15	Rural
26	Titi B (Gokuldara)	16	3.00	0.19	4.04	0.25	4.75	0.30	Rural
27	Botaykharka II	25	4.63	0.19	6.24	0.25	7.33	0.29	Rural
28	Botaykharka I	25	6.58	0.26	8.86	0.35	10.41	0.42	Rural
29	Botaykharka III	16	4.00	0.25	5.39	0.34	6.33	0.40	Rural
30	Bhutan Flux and Refractories	1000	0.00	0.00	941.00	0.94	941.00	0.94	
31	Jigme Polytex	500	0.00	0.00	350.00	0.70	350.00	0.70	
32	Bhutan Polymer	1500	0.00	0.00	1500.00	1.00	1500.00	1.00	
33	Glass manufactoring unit	750	0.00	0.00	750.00	1.00	750.00	1.00	
	11kV Gomtu Station Feeder								
1	Station Tfr	125	5.88	0.05	14.12	0.11	20.00	%	Urban
	11kV Daurpani								
1	RBA, checkpost SS	125	12.84	0.10	16.18	0.13	19.80	0.16	Urban
2	Scruti	63	11.18	0.18	14.09	0.22	17.24	0.27	Rural
3	U Scruty	63	2.03	0.03	2.56	0.04	3.13	0.05	Rural
4	M Malbasey	25	11.00	0.44	13.87	0.55	16.96	0.68	Rural
5	**L Malbasey**	16	7.50	0.47	9.46	0.59	11.57	0.72	Rural
6	T Malbasey	16	6.00	0.38	7.56	0.47	9.25	0.58	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
7	Malbasey IV	25	10.00	0.40	12.61	0.50	15.42	0.62	Rural
8	Bukey I	16	3.00	0.19	3.78	0.24	4.63	0.29	Rural
9	Bukey II	25	7.00	0.28	8.83	0.35	10.80	0.43	Rural
10	YCI	750	280.00	0.37	353.01	0.47	431.81	0.58	Pvt
11	L Scruty	63	24.00	0.38	30.26	0.48	37.01	0.59	Rural
12	Tenzin GCU	63	38.00	0.60	47.91	0.76	58.60	0.93	Pvt
13	Kalingtar	25	9.00	0.36	11.35	0.45	13.88	0.56	Rural
14	Bukey	63	21.00	0.33	26.48	0.42	32.39	0.51	Rural
15	Lhaki Dolomite	500	150.00	0.30	189.11	0.38	231.33	0.46	Pvt
16	Nob Mineral	500	336.00	0.67	423.61	0.85	518.17	1.04	Pvt
17	Lhachen	500	334.00	0.67	421.09	0.84	515.08	1.03	Pvt
	11kV VIP Feeder								
1	BPC Colony	63	24.00	0.38	66.16	1.05	87.27	1.39	Urban
2	Cardboard factory	200	105.00	0.53	289.43	1.45	381.80	1.91	Pvt
3	BFPL	250	104.62	0.42	288.39	1.15	380.44	1.52	Urban
4	AWP Factory	500	119.13	0.24	328.37	0.66	433.16	0.87	Urban
4	BTL SS	160	45.10	0.28	124.33	0.78	164.01	1.03	Urban
5	VIP	315	103.64	0.33	285.68	0.91	376.85	1.20	Urban
6	LAP-I	2500			1391.03	0.56	2262.66	0.91	
	11kV Samtse Market								
1	Garigoan	250	61.36	0.25	172.33	0.69	226.49	0.91	Urban
2	Market substation	500	87.15	0.17	244.78	0.49	321.71	0.64	Urban
3	Hospital	750	113.03	0.15	317.47	0.42	417.25	0.56	Urban
4	Devithan	500	98.18	0.20	275.75	0.55	362.41	0.72	Urban
5	New Hospital	1500	300.00	0.20	842.61	0.56	1107.43	0.74	Pvt
6	LAP-I	2500	0.00	0.00	1391.03	0.56	2262.66	0.91	
	11kV Chengmari Feeder								
1	Trade office	125	20.00	0.16	24.56	0.20	27.66	0.22	Pvt
1	Buduni	63	46.50	0.74	57.09	0.91	64.31	1.02	Urban

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
3	Lamater	63	3.50	0.06	4.30	0.07	4.84	0.08	Rural
4	Lamater I	25	8.00	0.32	9.82	0.39	11.06	0.44	Rural
5	Lamater II	25	7.00	0.28	8.59	0.34	9.68	0.39	Rural
6	Mandrini I	25	18.00	0.72	22.10	0.88	24.89	1.00	Rural
7	Mandrini II	25	5.50	0.22	6.75	0.27	7.61	0.30	Rural
8	Tashim I	25	7.50	0.30	9.21	0.37	10.37	0.41	Rural
9	Tashim II	63	7.00	0.11	8.59	0.14	9.68	0.15	Rural
10	Mechater	250	121.00	0.48	148.56	0.59	167.35	0.67	Urban
11	Choligop	63	41.00	0.65	50.34	0.80	56.70	0.90	Rural
12	Alay	63	17.03	0.27	20.92	0.33	23.56	0.37	Rural
13	Diana	63	24.50	0.39	30.08	0.48	33.88	0.54	Rural
14	L Kirney	63	34.00	0.54	41.75	0.66	47.02	0.75	Rural
15	U Kirney	63	35.00	0.56	42.97	0.68	48.41	0.77	Rural
16	T Dipujora	63	42.00	0.67	51.57	0.82	58.09	0.92	Rural
17	L Dipujora	63	22.50	0.36	27.63	0.44	31.12	0.49	Rural
18	Ambakey	16	2.50	0.16	3.07	0.19	3.46	0.22	Rural
19	U Dipujora	63	41.00	0.65	50.34	0.80	56.70	0.90	Rural
20	Thumkey	16	1.50	0.09	1.84	0.12	2.07	0.13	Rural
21	RBP Chengmari	63	58.00	0.92	71.21	1.13	80.22	1.27	Urban
22	Hathkhola	315	86.23	0.27	105.87	0.34	119.26	0.38	Urban
23	Garigoan	63	24.00	0.38	29.47	0.47	33.19	0.53	Rural
24	Lower Drapper	63	5.60	0.09	6.88	0.11	7.75	0.12	Rural
25	Lhazey preform	500	246.00	0.49	302.04	0.60	340.23	0.68	Pvt
26	Upper Drapper	63	9.88	0.16	12.14	0.19	13.67	0.22	Rural
27	Kopchey A	25	5.00	0.20	6.14	0.25	6.92	0.28	Rural
28	Kopchey B	25	4.50	0.18	5.53	0.22	6.22	0.25	Rural
29	Kopchey C	25	7.50	0.30	9.21	0.37	10.37	0.41	Rural
30	Bombalay I	16	0.70	0.04	0.86	0.05	0.97	0.06	Rural
31	Bombalay II	16	0.66	0.04	0.81	0.05	0.91	0.06	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
32	Tenterey I	25	1.88	0.08	2.31	0.09	2.60	0.10	Rural
33	Tenterey II	25	2.06	0.08	2.52	0.10	2.84	0.11	Rural
34	Majuwa I	25	1.76	0.07	2.17	0.09	2.44	0.10	Rural
35	Majuwa II	25	1.78	0.07	2.19	0.09	2.46	0.10	Rural
36	Boteykharka I	25	4.38	0.18	5.37	0.21	6.05	0.24	Rural
37	Boteykharka II	25	1.70	0.07	2.09	0.08	2.35	0.09	Rural
38	Boteykharka III	25	1.84	0.07	2.26	0.09	2.55	0.10	Rural
39	Boteykharka IV	16	1.65	0.10	2.03	0.13	2.28	0.14	Rural
40	Nangladang I	25	3.00	0.12	3.68	0.15	4.15	0.17	Rural
41	Nangladang II	25	4.00	0.16	4.91	0.20	5.53	0.22	Rural
42	Nangladang III	16	4.00	0.25	4.91	0.31	5.53	0.35	Rural
43	Mirik	25	2.00	0.08	2.46	0.10	2.77	0.11	Rural
44	Lamjumsa	25	1.65	0.07	2.03	0.08	2.28	0.09	Rural
45	Tungi	25	2.12	0.08	2.60	0.10	2.93	0.12	Rural
46	Bimberey	16	0.65	0.04	0.80	0.05	0.90	0.06	Rural
47	Khothidara	125	43.30	0.35	53.17	0.43	59.89	0.48	Rural
48	Tea Garden	125	48.00	0.38	58.93	0.47	66.39	0.53	Rural
49	Raigoan	63	12.50	0.20	15.35	0.24	17.29	0.27	Rural
50	Thakhurigoan	63	60.00	0.95	73.67	1.17	82.98	1.32	Rural
51	Ura	63	27.50	0.44	33.76	0.54	38.03	0.60	Rural
52	Jarib	25	7.50	0.30	9.21	0.37	10.37	0.41	Rural
53	Nainital	63	19.50	0.31	23.94	0.38	26.97	0.43	Rural
54	Lower Kado	63	12.54	0.20	15.40	0.24	17.35	0.28	Rural
55	Upper Kado	63	17.69	0.28	21.72	0.34	24.47	0.39	Rural
56	Kharbandi A	125	17.92	0.14	22.00	0.18	24.79	0.20	Rural
57	Kharbandi B	63	10.50	0.17	12.89	0.20	14.52	0.23	Rural
58	Kuchi Diana	63	9.83	0.16	12.07	0.19	13.60	0.22	Rural
59	Jarib	63	14.14	0.22	17.36	0.28	19.56	0.31	Rural
60	Yeoseltse Middle secondary School	160	10.00	0.06	12.27	0.08	13.82	0.09	Pvt

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
61	Dungkhar A	125	74.22	0.59	91.13	0.73	102.65	0.82	Urban
62	Yeoseltse	250	79.93	0.32	98.14	0.39	110.54	0.44	Urban
63	Kholagari	25	4.04	0.16	4.96	0.20	5.58	0.22	Rural
64	Tsakaling	63	9.45	0.15	11.61	0.18	13.07	0.21	Rural
65	Lower Laborboat	63	13.50	0.21	16.58	0.26	18.67	0.30	Rural
66	Upper Laborboat	63	19.30	0.31	23.69	0.38	26.69	0.42	Rural
67	Lower Kataray	25	10.46	0.42	12.85	0.51	14.47	0.58	Rural
68	Upper Kataray	63	12.22	0.19	15.01	0.24	16.91	0.27	Rural
69	Lamatar	63	9.63	0.15	11.82	0.19	13.32	0.21	Rural
70	U Singeydara	25	3.33	0.13	4.08	0.16	4.60	0.18	Rural
71	L Singeydara(Atsaray)	16	1.43	0.09	1.75	0.11	1.98	0.12	Rural
72	Sathipakha	25	4.26	0.17	5.23	0.21	5.89	0.24	Rural
73	Lower Ghalleygaon	25	4.41	0.18	5.41	0.22	6.09	0.24	Rural
74	Ghalleygaon B	25	5.92	0.24	7.27	0.29	8.19	0.33	Rural
75	Ghalleygaon A	25	3.77	0.15	4.63	0.19	5.22	0.21	Rural
76	Langthey	25	5.18	0.21	6.35	0.25	7.16	0.29	Rural
77	Upper Gathia	63	16.95	0.27	20.81	0.33	23.44	0.37	Rural
78	M Gathia	63	18.71	0.30	22.97	0.36	25.88	0.41	Rural
79	Lower Gathia	63	25.02	0.40	30.72	0.49	34.61	0.55	Rural
80	T Gathia	63	13.50	0.21	16.58	0.26	18.67	0.30	Rural
81	Sombek IV (Sombek Tar)	25	4.55	0.18	5.58	0.22	6.29	0.25	Rural
82	Namseling I	25	4.37	0.17	5.37	0.21	6.05	0.24	Rural
83	Namseling II (Bidangtar)	25	4.32	0.17	5.30	0.21	5.97	0.24	Rural
84	Sombek I (Beachgaon)	25	3.96	0.16	4.87	0.19	5.48	0.22	Rural
85	Sombek II (Sherpatar)	25	3.40	0.14	4.18	0.17	4.70	0.19	Rural
86	Sombek III (Baundara)	25	3.64	0.15	4.47	0.18	5.04	0.20	Rural
87	Shidadara	25	4.66	0.19	5.73	0.23	6.45	0.26	Rural
88	Chapa (Namgaychholing)	25	4.63	0.19	5.68	0.23	6.40	0.26	Rural
	11kV Gurung Basty Feeder								

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
1	Samtse HSS	160	43.29	0.27	108.38	0.68	187.12	1.17	Pvt
2	SCE T1	315	85.24	0.27	213.40	0.68	368.45	1.17	Pvt
3	SCE T2	500	135.29	0.27	338.70	0.68	584.80	1.17	Pvt
4	GSI Substation	500	112.48	0.22	281.59	0.56	486.18	0.97	Urban
4	BMML I	500	436.00	0.87	1091.54	2.18	1884.63	3.77	Pvt
6	Water Treatment Plant	125	17.18	0.14	43.00	0.34	74.25	0.59	Pvt
5	Water plant	63	40.46	0.64	101.29	1.61	174.89	2.78	Pvt
6	Gurung Basti	160	37.69	0.24	94.36	0.59	162.91	1.02	Urban
7	L Saurini	25	6.67	0.27	16.70	0.67	28.83	1.15	Rural
8	M Saurini	63	4.33	0.07	10.84	0.17	18.72	0.30	Rural
9	T Saurini	25	2.71	0.11	6.78	0.27	11.71	0.47	Rural
10	Uttary	16	3.10	0.19	7.76	0.49	13.40	0.84	Rural
11	Thumkey	25	2.17	0.09	5.43	0.22	9.38	0.38	Rural
12	Chilu	16	1.50	0.09	3.76	0.23	6.48	0.41	Rural
	11kV Sipsu Feeder								
1	Tshering CU	250	200.00	0.80	343.14	1.37	458.82	1.84	Pvt
2	Tsheten D CU	250	200.00	0.80	343.14	1.37	458.82	1.84	Pvt
3	Tshamgar CU	250	200.00	0.80	343.14	1.37	458.82	1.84	Pvt
	11kV Station Feeder								
1	Station Tfr	63	4.71	0.07	12.94	0.21	18.82	%	Urban
	33kV Norbugang Feeder								
1	BMML II	1000	380.00	0.38	1114.52	1.11	1618.55	1.62	Pvt
2	Pelber printing press	250	200.00	0.80	586.59	2.35	851.87	3.41	Pvt
3	IBPL	2500	848.00	0.34	2487.13	0.99	3611.93	1.44	Pvt
	33kV Dhamdu Station Feeder								
1	Station Tfr	250	5.88	0.02	14.12	0.06	20.00	%	Urban
	33kV Sipsu Feeder								
1	Deurali, Sipsu	63	10.83	0.17	26.84	0.43	33.70	0.53	Rural
2	Khamaray	16	0.04	0.00	0.10	0.01	0.12	0.01	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
3	Schoolay	25	3.91	0.16	9.70	0.39	12.17	0.49	Rural
4	Panidara	25	3.67	0.15	9.09	0.36	11.41	0.46	Rural
5	Kamigoan	25	11.77	0.47	29.18	1.17	36.64	1.47	Rural
6	Seresey	25	3.58	0.14	8.88	0.36	11.14	0.45	Rural
7	U Seresey/Farashay	10	1.90	0.19	4.71	0.47	5.91	0.59	Rural
8	Hathikharka B-I	25	3.96	0.16	9.81	0.39	12.32	0.49	Rural
9	Hathikharka B-II	25	5.40	0.22	13.39	0.54	16.81	0.67	Rural
10	Upper Chisopani	25	4.41	0.18	10.92	0.44	13.71	0.55	Rural
11	Lower Chisopani	25	4.92	0.20	12.19	0.49	15.30	0.61	Rural
12	Daurigaon	25	5.48	0.22	13.59	0.54	17.07	0.68	Rural
13	Jaribotey	16	1.45	0.09	3.59	0.22	4.51	0.28	Rural
14	Chisopani	16	0.64	0.04	1.59	0.10	2.00	0.12	Rural
15	Molateni	25	3.03	0.12	7.51	0.30	9.43	0.38	Rural
16	Hatikharka A-I	25	3.62	0.14	8.98	0.36	11.27	0.45	Rural
17	Hatikharka A-II	16	0.74	0.05	1.85	0.12	2.32	0.14	Rural
18	Birukhola	25	13.25	0.53	32.84	1.31	41.22	1.65	Rural
19	Birutar	63	13.29	0.21	32.95	0.52	41.36	0.66	Rural
20	Toribari	25	4.84	0.19	12.00	0.48	15.06	0.60	Rural
21	Lamatar (Biru)	25	7.50	0.30	18.59	0.74	23.34	0.93	Rural
22	Jagatar (Biru)	25	7.00	0.28	17.35	0.69	21.78	0.87	Rural
23	Ahalay (Biru)	25	5.50	0.22	13.63	0.55	17.12	0.68	Rural
24	Gondaytar (Biru)	16	4.50	0.28	11.16	0.70	14.00	0.88	Rural
25	Pakpay	63	15.50	0.25	38.42	0.61	48.24	0.77	Rural
26	Saureni (Tendu)	25	8.00	0.32	19.83	0.79	24.90	1.00	Rural
27	Jhatey (Tendu)	25	9.50	0.38	23.55	0.94	29.56	1.18	Rural
28	Jumsa	63	38.50	0.61	95.44	1.51	119.81	1.90	Rural
29	Bakvakay (Tendu)	63	9.00	0.14	22.31	0.35	28.01	0.44	Rural
30	Raigaon Chargharey (Tendu)	25	5.00	0.20	12.40	0.50	15.56	0.62	Rural
31	Tshopagaon Chargharey (Tendu)	16	4.50	0.28	11.16	0.70	14.00	0.88	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
32	Baunbari Chargharey (Tendu)	16	3.50	0.22	8.68	0.54	10.89	0.68	Rural
33	Bichgaon Chargharey (Tendu)	25	6.00	0.24	14.87	0.59	18.67	0.75	Rural
34	Lower Kuchin	63	34.00	0.54	84.29	1.34	105.81	1.68	Rural
35	Upper Kuchin	63	18.00	0.29	44.62	0.71	56.02	0.89	Rural
36	Jumseling	63	20.38	0.32	50.52	0.80	63.42	1.01	Rural
37	Tendu RBA complex	250	21.00	0.08	52.06	0.21	65.35	0.26	Urban
38	Tendu C.S. School	125	32.25	0.26	79.95	0.64	100.36	0.80	Pvt
39	Tendu Bazar/Village	250	135.74	0.54	336.49	1.35	422.41	1.69	Urban
40	Jaldhaka, Tendu	25	6.00	0.24	14.87	0.59	18.67	0.75	Rural
41	Khentong I (Tendu)	25	9.00	0.36	22.31	0.89	28.01	1.12	Rural
42	Khentong II (Tendu)	25	9.50	0.38	23.55	0.94	29.56	1.18	Rural
43	Fita, Tendu	25	10.50	0.42	26.03	1.04	32.68	1.31	Rural
44	Okharbotey I, Tendu	25	11.00	0.44	27.27	1.09	34.23	1.37	Rural
45	Okharbotey II	25	6.28	0.25	15.56	0.62	19.53	0.78	Rural
46	Dhoraney (Ningaley)	63	29.50	0.47	73.13	1.16	91.80	1.46	Rural
47	N/Bindu	63	15.25	0.24	37.80	0.60	47.46	0.75	Rural
48	D/Bindu	63	15.25	0.24	37.80	0.60	47.46	0.75	Rural
49	Kachintar	25	9.50	0.38	23.55	0.94	29.56	1.18	Rural
50	NFE (Kachin)	25	8.00	0.32	19.83	0.79	24.90	1.00	Rural
51	Gairigaon (Kachin)	25	9.50	0.38	23.55	0.94	29.56	1.18	Rural
52	Dhamigaon (Kachin)	25	4.00	0.16	9.92	0.40	12.45	0.50	Rural
53	Balukhop	25	4.00	0.16	9.92	0.40	12.45	0.50	Rural
54	Tholokharka (Kachin)	25	9.50	0.38	23.55	0.94	29.56	1.18	Rural
55	Gandukay (Kachin)	25	16.11	0.64	39.93	1.60	50.12	2.00	Rural
56	Barleni (Tendu)	25	8.00	0.32	19.83	0.79	24.90	1.00	Rural
57	Lower Bara I	25	5.25	0.21	13.01	0.52	16.33	0.65	Rural
58	Dhakalgaon I (Bara)	25	2.55	0.10	6.32	0.25	7.93	0.32	Rural
59	Dhakalgaon II (Bara)	25	5.31	0.21	13.17	0.53	16.53	0.66	Rural
60	Lower Bara II	25	4.26	0.17	10.57	0.42	13.26	0.53	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
61	Lower Bara III	25	3.45	0.14	8.56	0.34	10.74	0.43	Rural
62	Lepchagaon I (Bara)	25	4.82	0.19	11.95	0.48	15.00	0.60	Rural
63	Lepchagaon II (Bara)	25	5.48	0.22	13.59	0.54	17.06	0.68	Rural
64	Lepchagaon III (Bara)	25	3.05	0.12	7.57	0.30	9.50	0.38	Rural
65	Kamigaon I (Bara)	25	4.72	0.19	11.71	0.47	14.70	0.59	Rural
66	Kamigaon II (Bara)	25	3.72	0.15	9.23	0.37	11.58	0.46	Rural
67	Mukhenigaon I (Bara)	16	2.67	0.17	6.63	0.41	8.32	0.52	Rural
68	Mukhenigaon II (Bara)	25	2.07	0.08	5.12	0.20	6.43	0.26	Rural
69	Mukhenigaon III (Bara)	16	0.91	0.06	2.25	0.14	2.83	0.18	Rural
70	Mukhenigaon IV (Bara)	16	1.84	0.12	4.57	0.29	5.73	0.36	Rural
71	Bara School	63	5.63	0.09	13.96	0.22	17.52	0.28	Rural
72	Bichgaon I (Bara)	25	18.43	0.74	45.68	1.83	57.34	2.29	Rural
73	Bichgaon II (Bara)	25	5.17	0.21	12.82	0.51	16.09	0.64	Rural
74	Bichgaon III (Bara)	25	10.34	0.41	25.64	1.03	32.19	1.29	Rural
75	Dubay-I	16	3.21	0.20	7.95	0.50	9.98	0.62	Rural
76	Dubay-II	25	3.36	0.13	8.33	0.33	10.45	0.42	Rural
77	Lingtam-I	16	2.54	0.16	6.30	0.39	7.91	0.49	Rural
78	Lingtam-II	25	4.79	0.19	11.88	0.48	14.91	0.60	Rural
79	Lingtam-III	25	3.94	0.16	9.77	0.39	12.27	0.49	Rural
80	Majuwa-I	25	3.35	0.13	8.30	0.33	10.41	0.42	Rural
81	Majuwa-II	25	4.19	0.17	10.39	0.42	13.04	0.52	Rural
82	Gempang-I	16	2.28	0.14	5.65	0.35	7.10	0.44	Rural
83	Gempang-II	25	5.40	0.22	13.39	0.54	16.80	0.67	Rural
84	Gempang-III	25	3.75	0.15	9.30	0.37	11.68	0.47	Rural
85	Gempang-IV	25	3.78	0.15	9.38	0.38	11.77	0.47	Rural
86	Gondaygaon I (Bara)	25	3.34	0.13	8.27	0.33	10.38	0.42	Rural
87	Gondaygaon II (Bara)	25	5.47	0.22	13.56	0.54	17.02	0.68	Rural
88	Betini Top	25	11.32	0.45	28.06	1.12	35.23	1.41	Rural
89	Halhaley	16	1.37	0.09	3.39	0.21	4.26	0.27	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
90	Thika Top	25	8.75	0.35	21.70	0.87	27.24	1.09	Rural
91	Middle Betini	25	9.40	0.38	23.31	0.93	29.26	1.17	Rural
92	Lower Betini	25	9.25	0.37	22.92	0.92	28.78	1.15	Rural
93	Thika A	25	7.59	0.30	18.81	0.75	23.62	0.94	Rural
94	Thika B	25	11.04	0.44	27.37	1.09	34.36	1.37	Rural
95	Nayak A	25	9.28	0.37	23.00	0.92	28.87	1.15	Rural
96	Nayak B	25	14.31	0.57	35.48	1.42	44.54	1.78	Rural
97	Chongzhu Nauleygaon (Bara)	25	11.05	0.44	27.39	1.10	34.38	1.38	Rural
98	Chongzhu RBA (Bara)	16	1.82	0.11	4.52	0.28	5.68	0.35	Rural
99	Drakpagoan	25	5.00	0.20	12.40	0.50	15.56	0.62	Rural
100	Chongzhu Bardara - A (Bara)	25	11.42	0.46	28.30	1.13	35.53	1.42	Rural
101	Chongzhu Bardara - B (Bara)	25	6.04	0.24	14.98	0.60	18.81	0.75	Rural
102	Chongzhu Gondaygaon (Bara)	25	12.86	0.51	31.88	1.28	40.02	1.60	Rural
103	Chongzhu Autarigaon - A (Bara)	25	10.04	0.40	24.88	1.00	31.23	1.25	Rural
104	Chongzhu Autarigaon - B (Bara)	16	3.25	0.20	8.05	0.50	10.11	0.63	Rural
105	Fenchigoan (Tshogpagaon, Bara)	25	12.12	0.48	30.03	1.20	37.70	1.51	Rural
106	Fenchi Daragaon	25	11.15	0.45	27.65	1.11	34.70	1.39	Rural
107	Fenchi (Harkatey, Bara)	25	8.84	0.35	21.90	0.88	27.50	1.10	Rural
108	Fenchi (Laksey, Bara)	16	6.51	0.41	16.13	1.01	20.25	1.27	Rural
	Namgaychholing Feeder								
1	Gangatey	25	3.66	0.15	9.06	0.36	11.38	0.49	Rural
2	Pelunga Maneydara	25	1.67	0.07	4.14	0.17	5.20	0.22	Rural
3	Sadudara	25	0.61	0.02	1.52	0.06	1.90	0.08	Rural
4	Yamadara	16	2.29	0.14	5.67	0.35	7.12	0.48	Rural
5	Kausay	25	1.23	0.05	3.05	0.12	3.82	0.16	Rural
6	Jandey II	25	7.00	0.28	17.35	0.69	21.78	0.93	Rural
7	Jandey I	25	8.00	0.32	19.83	0.79	24.90	1.07	Rural
8	Mid Namgaycholing	63	3.06	0.05	7.59	0.12	9.53	0.16	Rural
9	Lower Malbassy	25	4.18	0.17	10.36	0.41	13.00	0.56	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
10	Malbassy Top	25	8.56	0.34	21.21	0.85	26.62	1.14	Rural
11	Upper Malbassy	63	10.64	0.17	26.37	0.42	33.10	0.56	Rural
12	Lower Noonpani A	25	2.42	0.10	6.01	0.24	7.54	0.32	Rural
13	Lower Noonpani B (Tirsulay)	16	0.47	0.03	1.16	0.07	1.45	0.10	Rural
14	Tintalay A	25	3.94	0.16	9.76	0.39	12.26	0.53	Rural
15	Tintalay B	25	6.76	0.27	16.76	0.67	21.03	0.90	Rural
16	Middle Noonpani A	16	1.42	0.09	3.53	0.22	4.43	0.30	Rural
17	Middle Noonpani B	16	0.70	0.04	1.73	0.11	2.18	0.15	Rural
18	Middle Noonpani C	25	1.30	0.05	3.21	0.13	4.03	0.17	Rural
19	Rangaydara A	25	6.05	0.24	14.99	0.60	18.82	0.81	Rural
20	Rangaydara B	25	3.44	0.14	8.53	0.34	10.71	0.46	Rural
21	Top Noonpani A	25	0.90	0.04	2.22	0.09	2.79	0.12	Rural
22	Kholakharka IIB Namgaycholing	25	3.33	0.13	8.26	0.33	10.37	0.44	Rural
23	Choksa I A, Namgaycholing	25	4.09	0.16	10.14	0.41	12.73	0.55	Rural
24	Choksa I B (Arubotey)	25	2.14	0.09	5.31	0.21	6.66	0.29	Rural
25	Kalikhola	25	6.11	0.24	15.15	0.61	19.02	0.82	Rural
26	Choksa II (Padeygaon) Namgaycholing	25	4.57	0.18	11.33	0.45	14.23	0.61	Rural
27	Kholakharka (Karaeydara) Namgaycholing	16	1.69	0.11	4.18	0.26	5.25	0.35	Rural
28	Kholakharka II A (Maneydara), Namgaycholing	25	1.89	0.08	4.70	0.19	5.89	0.25	Rural
29	Kholakharka I A (Lamaykoti), Namgaycholing	25	7.23	0.29	17.92	0.72	22.50	0.96	Rural
30	Daraygoan	16	1.23	0.08	3.05	0.19	3.82	0.26	Rural
31	Kholakharka IC, Namgaycholing	25	3.33	0.13	8.26	0.33	10.37	0.44	Rural
32	Pokharidara A	25	4.30	0.17	10.66	0.43	13.38	0.57	Rural
33	Pokharidara B	25	5.16	0.21	12.80	0.51	16.07	0.69	Rural
34	Pokharidara C	16	1.24	0.08	3.08	0.19	3.87	0.26	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
35	Pokharidara/ Bijwatar	25	3.32	0.13	8.22	0.33	10.32	0.44	Rural
36	Gyanthok/ Suntolay II A	25	11.03	0.44	27.33	1.09	34.31	1.47	Rural
37	Gyanthok/ Suntolay II B	25	3.60	0.14	8.91	0.36	11.19	0.48	Rural
38	Gyanthok/ Suntolay I A	25	1.95	0.08	4.83	0.19	6.07	0.26	Rural
39	Gyanthok/ Suntolay I B	25	8.14	0.33	20.18	0.81	25.33	1.09	Rural
40	Majuwa I A	25	2.84	0.11	7.05	0.28	8.85	0.38	Rural
41	Majuwa I B	25	2.81	0.11	6.97	0.28	8.75	0.38	Rural
42	Majuwa II/ Sathgarey	16	1.49	0.09	3.69	0.23	4.64	0.29	Rural
43	Rajarukh A	25	2.35	0.09	5.84	0.23	7.33	0.31	Rural
44	Rajarukh B	25	2.84	0.11	7.05	0.28	8.85	0.38	Rural
45	Rajarukh C	25	3.51	0.14	8.69	0.35	10.91	0.47	Rural
46	Crushing Unit	500	150.00	0.14	371.85	0.74	466.79	0.93	Pvt
	Tashicholing Feeder								
1	Gola Bazar	750	78.12	0.10	193.65	0.26	243.09	0.32	Urban
2	Tashicholing Hospital	250	58.00	0.23	143.78	0.58	180.49	0.72	Pvt
3	Shivalaya	125	57.17	0.46	141.72	1.13	177.90	1.42	Urban
4	Belbotey Village	160	57.00	0.36	141.30	0.88	177.38	1.11	Urban
5	RBA camp Wing-V, Belbotey	315	87.92	0.28	217.95	0.69	273.59	0.87	Pvt
6	Jogimara	63	3.00	0.05	7.44	0.12	9.34	0.15	Urban
7	Peljorling School	125	123.52	0.99	306.21	2.45	384.39	3.08	Urban
8	Lower Peljorling	63	35.04	0.56	86.86	1.38	109.03	1.73	Urban
9	Peljorling bottom	25	13.14	0.53	32.58	1.30	40.90	1.64	Urban
10	Kalamati	250	42.90	0.17	106.34	0.43	133.49	0.53	Rural
11	Lower Namgaycholing	63	7.43	0.12	18.42	0.29	23.12	0.37	Rural
12	Upper Namgaycholing	63	26.69	0.42	66.15	1.05	83.05	1.32	Rural
13	Jitti Bridge	160	47.96	0.30	118.90	0.74	149.26	0.93	Rural
14	Jitti Border	63	14.66	0.23	36.35	0.58	45.62	0.72	Rural
15	Jitti A	63	10.69	0.17	26.50	0.42	33.26	0.53	Rural
16	Setipakha	25	4.65	0.19	11.54	0.46	14.48	0.58	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
17	Therpo	25	4.04	0.16	10.01	0.40	12.56	0.50	Rural
18	Mongargaon (Chargharey)	25	3.99	0.16	9.90	0.40	12.42	0.50	Rural
19	Pakhadura	63	8.05	0.13	19.95	0.32	25.04	0.40	Rural
20	Charghary	125	41.94	0.34	103.98	0.83	130.53	1.04	Rural
21	Sengyegang Stone Crushing Plant	160	57.20	0.36	141.79	0.89	177.99	1.11	Pvt
	Pemaling Feeder								
1	Lower Pakhagaon	63	20.16	0.32	49.97	0.79	62.73	1.00	Rural
2	Upper Pakhagaon	63	12.63	0.20	31.31	0.50	39.30	0.62	Rural
3	Kopchey, Khamari	25	11.77	0.47	29.18	1.17	36.64	1.47	Rural
4	Talay,Bichgoan	25	3.58	0.14	8.87	0.35	11.14	0.45	Rural
5	Sowaranee	25	4.12	0.16	10.22	0.41	12.83	0.51	Rural
6	Katlay I	25	4.43	0.18	10.99	0.44	13.80	0.55	Rural
7	Katlay II	25	4.83	0.19	11.97	0.48	15.03	0.60	Rural
8	Samatar	25	3.13	0.13	7.75	0.31	9.73	0.39	Rural
9	Upper Talay I	16	0.24	0.02	0.60	0.04	0.76	0.05	Rural
10	Upper Talay II	16	0.55	0.03	1.37	0.09	1.72	0.11	Rural
11	Nigurey I	16	0.42	0.03	1.05	0.07	1.32	0.08	Rural
12	Nigurey II	25	0.52	0.02	1.29	0.05	1.61	0.06	Rural
13	Bharkhay	16	1.33	0.08	3.31	0.21	4.15	0.26	Rural
14	Patalbashay	16	0.51	0.03	1.26	0.08	1.58	0.10	Rural
15	Khopi II	25	2.77	0.11	6.87	0.27	8.62	0.34	Rural
16	Khopi I	25	2.83	0.11	7.00	0.28	8.79	0.35	Rural
17	Rokotar	25	5.92	0.24	14.68	0.59	18.43	0.74	Rural
18	Damigoan II	25	2.92	0.12	7.25	0.29	9.10	0.36	Rural
19	Damigoan I	25	4.22	0.17	10.47	0.42	13.14	0.53	Rural
20	Tachey	25	6.22	0.25	15.41	0.62	19.35	0.77	Rural
21	Dharaygoan (Upper)	25	3.64	0.15	9.03	0.36	11.34	0.45	Rural
22	Dharaygoan (Lower)	25	1.63	0.07	4.03	0.16	5.06	0.20	Rural
23	Puridara	25	2.89	0.12	7.16	0.29	8.98	0.36	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
24	Baraney	63	10.44	0.17	25.87	0.41	32.48	0.52	Rural
25	Jamirkot	63	13.06	0.21	32.38	0.51	40.64	0.65	Rural
26	Upper Chebju (Laptaney)	25	5.68	0.23	14.09	0.56	17.69	0.71	Rural
27	L Chebju	25	10.00	0.40	24.79	0.99	31.12	1.24	Rural
28	Sipsu station feeder	125	30.00	0.24	74.37	0.59	93.36	0.75	Urban
	33kV Dorokha Feeder								
1	Sebichang	25	6.78	0.27	21.88	0.88	30.21	1.21	Rural
2	Timburau I/Yabala S/S	16	4.60	0.29	14.87	0.93	20.53	1.28	Rural
3	Lower Satakha	25	2.83	0.11	9.13	0.37	12.61	0.50	Rural
4	Upper Satakha	25	5.61	0.22	18.10	0.72	25.00	1.00	Rural
3	Sengten-III School	25	11.46	0.46	37.00	1.48	51.10	2.04	Urban
6	Sengten-IV	16	2.01	0.13	6.51	0.41	8.98	0.56	Rural
4	Sengten-II BHU	25	8.14	0.33	26.28	1.05	36.30	1.45	Urban
8	Sengten-I Raigoan	16	2.35	0.15	7.58	0.47	10.46	0.65	Rural
9	Sanglung Labay	25	1.88	0.08	6.08	0.24	8.39	0.34	Rural
10	Sanglung ORC	25	3.20	0.13	10.34	0.41	14.28	0.57	Rural
11	Sang lung School Area	25	2.52	0.10	8.13	0.33	11.23	0.45	Rural
12	Sanglung Kadoding	16	2.18	0.14	7.03	0.44	9.71	0.61	Rural
13	Lower Sanglung	25	3.14	0.13	10.14	0.41	14.00	0.56	Rural
14	Sanglung Daragoan	25	3.46	0.14	11.18	0.45	15.43	0.62	Rural
15	Lower Lapchagoan	25	5.82	0.23	18.79	0.75	25.95	1.04	Rural
16	Upper Lapchagoan	25	5.56	0.22	17.94	0.72	24.77	0.99	Rural
17	Lumbey (Middle)	25	6.51	0.26	21.01	0.84	29.01	1.16	Rural
18	Lumbey (Upper)	16	2.16	0.13	6.96	0.44	9.62	0.60	Rural
19	Lumbey (Lower)	25	2.86	0.11	9.23	0.37	12.74	0.51	Rural
20	Singye-A	25	3.53	0.14	11.41	0.46	15.76	0.63	Rural
21	Singye-D	16	1.85	0.12	5.97	0.37	8.24	0.52	Rural
22	singye-B	25	2.80	0.11	9.03	0.36	12.46	0.50	Rural
23	Singye-C	25	2.58	0.10	8.32	0.33	11.49	0.46	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
24	Jigme-A	25	3.08	0.12	9.94	0.40	13.73	0.55	Rural
25	Jigme-B	25	5.92	0.24	19.11	0.76	26.39	1.06	Rural
26	Jigme C	25	2.88	0.12	9.31	0.37	12.85	0.51	Rural
27	Jigme-D	25	1.77	0.07	5.72	0.23	7.91	0.32	Rural
28	Damjee	25	4.17	0.17	13.48	0.54	18.61	0.74	Rural
29	Khenpagoan A	25	4.58	0.18	14.80	0.59	20.44	0.82	Rural
30	Khenpagoan B	25	2.50	0.10	8.08	0.32	11.16	0.45	Rural
31	Lower Bangalay	25	4.11	0.16	13.28	0.53	18.33	0.73	Rural
32	Upper Bangalay	25	3.87	0.15	12.51	0.50	17.27	0.69	Rural
33	Baseni	25	4.44	0.18	14.34	0.57	19.80	0.79	Rural
34	Betini	25	3.86	0.15	12.45	0.50	17.19	0.69	Rural
35	Upper Kadori	25	3.18	0.13	10.26	0.41	14.17	0.57	Rural
36	Lower Kadori	25	3.90	0.16	12.60	0.50	17.40	0.70	Rural
37	Upper Balukhola	16	1.22	0.08	3.94	0.25	5.44	0.34	Rural
38	Lower Balukhola	25	3.79	0.15	12.24	0.49	16.90	0.68	Rural
39	Lower Shetekha	25	3.92	0.16	12.67	0.51	17.50	0.70	Rural
40	Upper Shetekha	25	3.58	0.14	11.56	0.46	15.97	0.64	Rural
41	Relukha-1	25	3.25	0.13	10.51	0.42	14.51	0.58	Rural
42	Relukha-2	25	3.67	0.15	11.86	0.47	16.38	0.66	Rural
43	Denchukha -1(Upper part)	25	3.51	0.14	11.34	0.45	15.66	0.63	Rural
44	Denchukha -2(middle part)	25	3.89	0.16	12.57	0.50	17.36	0.69	Rural
45	Denchukha-3(Lower part)	16	1.14	0.07	3.69	0.23	5.09	0.32	Rural
46	Denchukha -(BHU area)	25	3.70	0.15	11.94	0.48	16.48	0.66	Rural
47	Boribotey-1(Upper part)	25	0.14	0.01	0.45	0.02	0.63	0.03	Rural
48	Boribotey -2(Middle Part)	25	3.69	0.15	11.91	0.48	16.44	0.66	Rural
49	Boribotey -3(Lower Part)	25	4.35	0.17	14.06	0.56	19.42	0.78	Rural
50	Denchukha-4(Boribotey side)	25	4.31	0.17	13.92	0.56	19.23	0.77	Rural
51	Gabjee-2B(Upper Gabjee)	25	5.12	0.20	16.52	0.66	22.81	0.91	Rural
52	Denchukha -(School area)	25	5.19	0.21	16.74	0.67	23.12	0.92	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
53	Gabjee-1B(Lower Gabjee)	25	3.06	0.12	9.87	0.39	13.64	0.55	Rural
54	Meyona-A	25	3.85	0.15	12.42	0.50	17.15	0.69	Rural
55	Meyona-B	25	4.09	0.16	13.20	0.53	18.23	0.73	Rural
56	Meyona-C	25	3.20	0.13	10.33	0.41	14.26	0.57	Rural
57	Dhamilay	25	4.50	0.18	14.54	0.58	20.08	0.80	Rural
58	Navaray	16	1.86	0.12	6.02	0.38	8.32	0.52	Rural
59	Pungthra-A	25	3.20	0.13	10.34	0.41	14.28	0.57	Rural
60	Pungthra-B	25	4.82	0.19	15.56	0.62	21.49	0.86	Rural
61	Pungthra-C	25	4.64	0.19	14.98	0.60	20.69	0.83	Rural
62	Pungthra-D	16	1.71	0.11	5.53	0.35	7.63	0.48	Rural
63	Belung	16	1.71	0.11	5.53	0.35	7.63	0.48	Rural
64	Tafekha	25	1.64	0.07	5.29	0.21	7.31	0.29	Rural
65	Benekha	16	1.47	0.09	4.73	0.30	6.54	0.41	Rural
66	Wangchuk-A (Upper)	25	1.43	0.06	4.61	0.18	6.37	0.25	Rural
67	Wangchuk-B (Lower)	25	0.91	0.04	2.92	0.12	4.04	0.16	Rural
68	Thunwa Ranitaar	25	12.11	0.48	39.09	1.56	53.98	2.16	Rural
69	Thumwa Bijgoan	25	10.93	0.44	35.31	1.41	48.76	1.95	Rural
70	Thunwa Neulaygoan	25	6.24	0.25	20.13	0.81	27.80	1.11	Rural
71	Thunwa Daragoan	25	13.16	0.53	42.48	1.70	58.66	2.35	Rural
72	Thunwa Lower Herantaar	25	7.70	0.31	24.87	0.99	34.35	1.37	Rural
73	Thunwa Upper Herantaar	25	5.45	0.22	17.59	0.70	24.29	0.97	Rural
74	Timburay-II Sukey	16	1.48	0.09	4.76	0.30	6.58	0.41	Rural
75	Timburay-III	25	2.13	0.09	6.89	0.28	9.52	0.38	Rural
76	Lower Basentay	25	1.54	0.06	4.97	0.20	6.86	0.27	Rural
77	Upper Basentay	25	6.40	0.26	20.65	0.83	28.52	1.14	Rural
78	Manigoan BPC Complex	25	9.48	0.38	30.60	1.22	42.26	1.69	Urban
79	Manigoan Tshampa	25	6.90	0.28	22.27	0.89	30.75	1.23	Urban
80	Manigoan Gurung	16	1.32	0.08	4.25	0.27	5.87	0.37	Urban
81	Manigoan Dungkhag	125	25.44	0.20	82.15	0.66	113.44	0.91	Urban

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
82	Manigoan Police	25	6.85	0.27	22.14	0.89	30.57	1.22	Urban
83	Manigoan Gewog	25	14.51	0.58	46.85	1.87	64.69	2.59	Urban
74	Manigoan Bazardara	25	20.57	0.82	66.41	2.66	91.71	3.67	Urban
85	Damphuchen-I	25	6.58	0.26	21.24	0.85	29.32	1.17	Rural
86	Damphuchen/Chelumchen-I	25	5.25	0.21	16.96	0.68	23.42	0.94	Rural
87	Damphuchen-II	25	6.64	0.27	21.43	0.86	29.60	1.18	Rural
88	Damphuchen-III	25	3.62	0.14	11.70	0.47	16.16	0.65	Rural
89	Chelumchen-II	25	4.38	0.18	14.14	0.57	19.53	0.78	Rural
90	Namchu-III	25	6.12	0.24	19.77	0.79	27.30	1.09	Rural
91	Namchu-IV	25	1.43	0.06	4.62	0.18	6.38	0.26	Rural
92	Namchu-I	25	2.92	0.12	9.44	0.38	13.04	0.52	Rural
93	Namchu-II	25	2.15	0.09	6.95	0.28	9.60	0.38	Rural
94	Bijgoan/Armey	25	7.37	0.29	23.81	0.95	32.88	1.32	Rural
95	Bijgoan/Ranger	16	2.41	0.15	7.77	0.49	10.73	0.67	Rural
96	Manigoan Drugeydara	16	6.51	0.41	21.04	1.31	29.05	1.82	Rural
97	Manigoan DMSS Upper	25	7.71	0.31	24.89	1.00	34.37	1.37	Rural
98	Manigoan DMSS Lower	25	8.06	0.32	26.03	1.04	35.94	1.44	Rural
99	Bijgoan Doya	16	3.70	0.23	11.95	0.75	16.50	1.03	Rural
100	Beachgoan Top	16	5.84	0.36	18.85	1.18	26.03	1.63	Rural
101	Lower Bijgoan	16	2.25	0.14	7.26	0.45	10.03	0.63	Rural
102	Middle Bijgoan	25	2.25	0.09	7.26	0.29	10.03	0.40	Rural
103	Upper Bijgoan	25	8.23	0.33	26.57	1.06	36.69	1.47	Rural
104	Middle Tarigoan	25	7.36	0.29	23.78	0.95	32.84	1.31	Rural
105	Upper Tarigoan	25	5.08	0.20	16.41	0.66	22.66	0.91	Rural
106	Lower Tarigoan	25	5.70	0.23	18.41	0.74	25.43	1.02	Rural
107	Upper Daragoan	25	1.71	0.07	5.52	0.22	7.63	0.31	Rural
108	Middle Daragoan	25	2.67	0.11	8.62	0.34	11.90	0.48	Rural
109	Dogap-G	25	4.51	0.18	14.56	0.58	20.11	0.80	Rural
110	Dogap-C	25	7.77	0.31	25.10	1.00	34.66	1.39	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
111	Dogap-D	25	4.15	0.17	13.39	0.54	18.50	0.74	Rural
112	Dogap-A	16	4.06	0.25	13.10	0.82	18.09	1.13	Rural
113	Dogap-B	25	9.99	0.40	32.26	1.29	44.54	1.78	Rural
114	Dogap-F	16	6.00	0.38	19.38	1.21	26.76	1.67	Rural
115	Dogap-E	16	1.21	0.08	3.90	0.24	5.38	0.34	Rural
116	Lower Somlachen	25	6.93	0.28	22.36	0.89	30.88	1.24	Rural
117	Upper Somlachen	25	6.02	0.24	19.43	0.78	26.83	1.07	Rural
118	Sangay	16	0.86	0.05	2.77	0.17	3.83	0.24	Rural
119	Lower Mithun	25	4.05	0.16	13.08	0.52	18.07	0.72	Rural
120	Upper Mithun	25	2.77	0.11	8.96	0.36	12.37	0.49	Rural
121	Lower Daragoan	25	3.47	0.14	11.20	0.45	15.46	0.62	Rural
122	Lower Sano Dumtoe	25	13.50	0.54	43.59	1.74	60.20	2.41	Rural
123	Upper Sano Dumtoe	25	12.42	0.50	40.12	1.60	55.40	2.22	Rural
124	Jharingay A	25	15.74	0.63	50.84	2.03	70.20	2.81	Rural
125	Jharingay-B	25	13.02	0.52	42.04	1.68	58.05	2.32	Rural
126	Jharingay-C	25	5.22	0.21	16.87	0.67	23.30	0.93	Rural
127	Salmay	16	3.59	0.22	11.59	0.72	16.00	1.00	Rural
128	Gairigoan A	25	3.97	0.16	12.82	0.51	17.70	0.71	Rural
129	Thulo Dumtoe A	16	5.08	0.32	16.39	1.02	22.64	1.41	Rural
130	Thauo Dumtoe B	16	2.02	0.13	6.53	0.41	9.01	0.56	Rural
131	Thulo Dumtoe C	25	17.72	0.71	57.21	2.29	79.00	3.16	Rural
132	Gairigoan B	25	3.59	0.14	11.60	0.46	16.02	0.64	Rural
133	Gairigoan C	16	4.30	0.27	13.89	0.87	19.18	1.20	Rural
134	Gairigoan D	25	2.90	0.12	9.37	0.37	12.94	0.52	Rural
135	Garirgoan E	25	17.54	0.70	56.66	2.27	78.24	3.13	Rural
136	Gairigoan F	16	5.66	0.35	18.27	1.14	25.23	1.58	Rural
137	Khalinggoan A	25	7.56	0.30	24.40	0.98	33.69	1.35	Rural
138	Khalinggoan B	16	3.88	0.24	12.52	0.78	17.29	1.08	Rural
139	Khalinggoan C	25	2.91	0.12	9.39	0.38	12.97	0.52	Rural

Sl. No.	Name	Capacity (kVA)	Peak load (kVA)	% Loading	Peak Load(kVA)	% Loading	Peak Load(kVA)	% Loading	Remarks
			2019		2025		2030		
140	Upper Daragoan	16	2.00	0.13	6.46	0.40	8.92	0.56	Rural
141	Middle Daragoan	25	14.18	0.57	45.79	1.83	63.23	2.53	Rural
142	Kuchey A	25	2.85	0.11	9.19	0.37	12.70	0.51	Rural
143	Kuchey B	25	3.72	0.15	12.02	0.48	16.60	0.66	Rural
144	Lower Daragoan	25	3.61	0.14	11.66	0.47	16.10	0.64	Rural
145	Phuchena A	25	2.93	0.12	9.47	0.38	13.08	0.52	Rural
146	Phuchena B	16	3.37	0.21	10.88	0.68	15.03	0.94	Rural
147	Dramey	25	3.53	0.14	11.41	0.46	15.76	0.63	Rural
148	Ngacheyna	25	1.96	0.08	6.31	0.25	8.72	0.35	Rural
149	Gebji	25	4.72	0.19	15.23	0.61	21.03	0.84	Rural
150	Chego	16	0.28	0.02	0.90	0.06	1.24	0.08	Rural
151	Tangana A	16	1.23	0.08	3.97	0.25	5.48	0.34	Rural
152	Tangana B	16	1.49	0.09	4.81	0.30	6.64	0.41	Rural
153	Youkha	25	7.49	0.30	24.19	0.97	33.40	1.34	Rural
154	Rangtse A	16	4.37	0.27	14.10	0.88	19.47	1.22	Rural
155	Rangtse B	25	9.72	0.39	31.40	1.26	43.36	1.73	Rural
156	Dorokha BHU	63	20.00	0.32	64.58	1.03	89.19	1.42	Urban
157	Dorokha Central School	250	45.00	0.18	145.31	0.58	200.67	0.80	Pvt
	33kV Dhamdum IP								
1	Dhamdum IP	6000	0.00	0.00	4435.29	0.74	5611.76	0.94	Urban
	33kV Dhamdum Station Feeder								
1	Station Tfr	250	5.88	0.02	14.12	0.06	20.00	%	Urban
	11kV PCAL								
1	PCAL	10000	9048.00	0.90	9412.00	0.94	9412.00	0.94	

Annexure-8: Material Cost of three phase (3Φ) Transformers

Sl. No	Name of ESDs	Cost for replacement of single-phase transformers and distribution boards with three-phase		Total cost in Nu.
		11 kV transformers	33 kV transformers	
		Cost in Nu.	Cost in Nu.	
1	Bumthang	421,565.09	132,535.04	554,100.14
2	Chukhha	956,241.73	9,144,917.99	10,101,159.72
3	Dagana	–	6,361,682.08	6,361,682.08
4	Haa	–	3,048,306.00	3,048,306.00
5	Lhuntse	731,506.19	8,747,312.86	9,478,819.05
6	Mongar	182,876.55	4,108,586.34	4,291,462.89
7	Paro	836,897.46	1,060,280.35	1,897,177.81
8	Pemagatshel	91,438.27	6,759,287.21	6,850,725.48
9	Punakha	274,314.82	4,771,261.56	5,045,576.38
10	S/Jongkhar	–	15,506,600.07	15,506,600.07
11	Samtse	6,674,993.95	4,241,121.39	10,916,115.34
12	Sarpang	2,053,501.01	3,445,911.13	5,499,412.14
13	Trashi Gang	906,662.46	4,903,796.60	5,810,459.06
14	Trashiyangtse	–	4,638,726.52	4,638,726.52
15	Thimphu	723,785.91	–	723,785.91
16	Trongsa	91,438.27	3,445,911.13	3,537,349.40
17	Tsirang	–	5,168,866.69	5,168,866.69
18	Wangdue	182,876.55	1,457,885.48	1,640,762.02
19	Zhemgang	105,391.27	11,928,153.90	12,033,545.17
	TOTAL	**14,233,489.55**	**98,871,142.33**	**113,104,631.87**

Here the existing single-phase transformers and distribution boards were replaced by three phase system, therefore the estimation includes the cost of three phase transformers and distribution boards. In line with Distribution Design and Construction Standard (DDCS) 2015, the transformer capacities according to voltage level are standardized as shown below:

33 kV System		11 kV System	
3 Φ	**1Φ**	**3 Φ**	**1Φ**
25 kVA	25 kVA, 16 kVA	25 kVA, 16 kVA	25 kVA,16 kVA, 10 kVA

Therefore, during the estimation, on 33 kV system, the cost of 25 kVA transformers was taken for 10 kVA and 16 kVA transformers and for 11 kV system, the cost of 16 kVA transformers was taken for 10 kVA ratings. The total cost for replacing the 1-phase transformers under whole ESD including transportation cost (Nu. 2.6 million) and labor cost (Nu. 70 million) is Nu. 186 million. Therefore, the total cost under this option will amount to Nu. 283 million.

11 kV & 33 kV Single-phase Transformers used under each ESD

Sl. No	Name of ESDs	TRANSFORMERS (Nos.)					
		11/0.240 kV			33/0.240 kV		
		10 kVA	16kVA	25kVA	10 kVA	16kVA	25kVA
1	Bumthang	–	–	4	–	1	–
2	Chukhha	2	5	3	19	31	19
3	Dagana	–	–	–	4	43	1
4	Haa	–	–	–	8	13	2
5	Lhuntse	3	5	–	3	19	44
6	Mongar		2	–	12	17	2
7	Paro	5	3	1	6	2	–
8	Pemagatshel	–	1	–	4	8	39
9	Punakha	1	2	–	2	5	29
10	S/Jongkhar	–	–	–	18	24	75
11	Samtse	15	58	–	–	32	–
12	Sarpang	10	9	3	9	8	9
13	Trashi Gang	3	–	6	–	–	37
14	Trashiyangtse	–	–	–	16	19	–
15	Thimphu*	–	1	6	–	–	–
16	Trongsa	1	–	–	9	17	–
17	Tsirang	–	–	–	7	32	–
18	Wangdue	1	1	–	–	2	9
19	Zhemgang	–	–	1	27	36	27
	TOTAL	**41**	**87**	**24**	**144**	**309**	**293**