Annex "A"

Regulatory Asset Base (RAB) Roll Forward Handbook for Privately Owned Electricity Distribution Utilities (DUs)

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Prepared for:

TABLE OF CONTENTS

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1. INTRODUCTION

1.1 OVERVIEW

The Energy Regulatory Commission (ERC/Commission) has promulgated the "Rules for Setting Distribution Wheeling Rates (RDWR) for Privately Owned Electricity Distribution Utilities (DUs) Operating under Performance Based Regulation (PBR)"[1]. Clause 4.8 of the RDWR describes the requirements for the determination of the Regulatory Asset Base (RAB) value for each DU which shall either be through (a) the revaluation of a DU's RAB or (b) the roll forward of the DU's previous RAB value.

This Roll Forward Handbook (Handbook) details the ERC's roll forward process which would apply to all DUs operating under PBR for the subsequent Regulatory Period. Consistent with the requirements in the RDWR, DUs are required to submit a proposed RAB value as part of their rate applications. This Handbook will be used to determine the Closing RAB for each DU. This Closing RAB value then becomes the Opening RAB to be used as an input parameter for the building block model used by the ERC to calculate the annual revenue requirement (ARR) for each DU for the next Regulatory Period.

1.2 ERC POSITION ON THE ROLL FORWARD PROCESS

At the time of writing of this Handbook, the position of the ERC is that there are strong economic arguments and support in the submissions for the roll forward approach. Considering that the DUs have already undergone the Optimized Depreciated Replacement Cost (ODRC) valuation during the previous Regulatory Period, hence it was concluded that subsequently it will be appropriate to update the RAB using the roll forward approach[2].

The basic steps involved in the roll forward process as envisioned by the ERC are summarized in the table below as extracted from the Position Paper[3] of the Commission. The detailed methodology in the application of the roll forward approach is described in more detail in the other sections of this Handbook.

Table 1: ERC's Steps in Determining the Roll Forward Asset Values[4]

Opening RAB	Adopt the latest approved Opening RAB
Add: Actual Capital Expenditure (CAPEX)	Actual cost of new assets or investment that has been added
Less: Regulatory Depreciation	Actual return of capital allowed under the RDWR (based on the standard asset lives set by the ERC)

[1] Resolution No. 25, Series of 2016, "Resolution Modifying the Rules for Setting Distribution Wheeling Rates for Privately Owned Electricity Distribution Utilities Operating Under Performance Based Regulation", Energy Regulatory Commission, July 2016.

[2] "Commission Resolution on the Issues on the Implementation of Performance Based Regulation (PBR) for Privately Owned Distribution Utilities under the Rules for Setting Distribution Wheeling Rates (RDWR)", Energy Regulatory Commission, July 2016.

[3] "Position Paper: Regulatory Reset for the July 2015 to June 2019 Fourth Regulatory Period for the First Entry Group of Privately Owned Distribution Utilities subject to Performance Based Regulation", Energy Regulatory Commission, July 2016.

[4] It is noted that the Commission excludes the addition of inflationary factors at the time of roll forward RAB calculation which is subsequently excluded from Section 4.

Less: Asset Disposal/Retirement (net income from disposal)	Actual cost of disposed/retired assets less net income from disposal
Closing RAB	Closing value of the RAB to be carried forward at the start of the next Regulatory Period

1.3 AMENDMENT

This Handbook may be amended by the ERC, with the assistance of a Regulatory Reset Expert, if necessary, from time to time. A revised version will be published by the ERC when required.

1.4 EFFECTIVITY

This Handbook supersedes the "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)"[5], and will take effect following its publication or posting.

1.5 DEFINITIONS

TERM	DEFINITION
Asset Additions	Refers to the actual or forecast Capital Expenditure of a Distribution Utility on assets in the different Asset Categories for the period from the date of the valuation of the Distribution Utility to the date of the commencement of the subsequent Regulatory Period.
Asset Category	A grouping of assets in the asset base that perform a similar function. The different Asset Categories are identified in Section 3.2.1.
Asset Class	Refers to the asset breakdown within an asset category. The different Asset Classes are identified in Section 3.5.1.
Asset Disposals	Refers to the actual or forecast net receipts from the disposal of assets, for the period from the date of the valuation of the Distribution Utility to the date of the commencement of the subsequent Regulatory Period.
Asset Type	Refers to a sub-category of assets within an asset class.
Auditor	Means a person(s) who: a. Is a certified public accountant qualified to be appointed as an auditor, or is a company that is a registered audit firm, or is a company that is recognized as being eligible to act as an auditor; b. Has the necessary expertise to properly provide an Independent Auditor's Report as required in this document; c. Is preferably not the same person as the person who audits the financial accounts of the Distribution Utility for any other purpose; d. Has no relationship with, or interest in the Distribution Utility to be audited that may involve

[5] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

TERM	DEFINITION
	the person in a conflict of interest between his, her or its duties to the Distribution Utility and his, her its duties to the Energy Regulatory Commission.; and Has not assisted with the preparation of the Independent Expert's Report, or with the preparation of the rate application of the Distribution Utility, or provided advice or opinions on the methodologies or processes used in preparing any information required for the rate application of the Distribution Utility.
Closing RAB	Closing value of the Regulatory Asset Base of the DU to be carried forward at the start of the next regulatory year or the next Regulatory Period.
Distribution Connection Services	In respect of a regulated Distribution System: a. the provision of capability at a distribution connection point in respect of that regulated Distribution System to deliver electricity to or take electricity from that distribution connection point; b. the conveyance of electricity: i. to a distribution connection point in respect of that regulated Distribution System from any user system or equipment which is directly connected to that regulated Distribution System at that distribution connection point; or ii. from a distribution connection point in respect of that regulated Distribution System to any user system or equipment which is directly connected to that regulated Distribution System at that distribution connection point; or iii. from an embedded generator to a regulated Distribution System, also where the generation plant is installed outside the franchise area of the Distribution Utility operating the regulated Distribution System. c. the planning, installation, maintenance, augmentation, testing and operation of distribution connection assets in respect of that regulated Distribution System; and the provision of services that support any of the services referred to in paragraphs a to c.
Distribution System	In respect of a Distribution Utility, a system of wires and associated facilities extending between the delivery points on the grid and sub-transmission system operated by a person other than the Distribution Utility, on the one hand, and the points of connection of user systems and equipment of end-users, on the other hand.
Distribution Utility	In respect of this Handbook, a private corporation that has an exclusive franchise to operate a Distribution System in accordance with the EPIRA.
Energy Regulatory Commission	The Energy Regulatory Commission created by Section 38 of the EPIRA.
EPIRA	Republic Act No. 9136, otherwise known as the Electric Power Industry Reform Act of 2001.
Expert	Means a person(s) who: a. Is a recognized engineer qualified to be appointed as an expert in regulatory valuation, or is an engineering/consultancy/appraisal company recognized as being qualified to act as an expert and represented by a recognized engineer(s) qualified to be an expert in regulatory valuation; b. Is acting in the professional capacity as specified above;

TERM	DEFINITION
	c. Has the necessary track record and expertise in regulatory valuation or in the regulatory sector in the Philippine electric power industry to properly provide an Independent Expert's Report as required in this document; and Has no relationship with, or interest in the Distribution Utility to be reviewed that may involve the person in a conflict of interest between his, her or its duties to the Distribution Utility and his, her or its duties to the Energy Regulatory Commission.
Independent Auditor's Report	Means a report prepared and issued by a person or firm that is qualified to be an auditor, details of the report are specified in Section 2.4 of this document.
Independent Expert's Report	Means a report prepared and issued by a person or firm that is qualified to be an Expert, details of the report are specified in Section 2.3 of this document.
Modern Equivalent Asset	Electrical equipment that would be installed at the current date, replacing older assets that are already in place and would fulfill the same function of those being replaced. Modern Equivalent Asset would be those widely accepted by efficient Distribution Utilities to be the most technically and economically effective assets currently available to fulfill a particular function that can be practically installed in the field by Distribution Utilities.
Network Assets	Refers to assets forming part of the Regulatory Asset Base that are required to provide Regulated Distribution Services; Distribution Connection Services; and Regulated Retail Services but are not Non-Network Assets.
Non-Network Assets	Those assets forming part of a Regulatory Asset Base that are required to provide Regulated Distribution Services, but are not Distribution System assets or Distribution Connection assets. Examples include construction vehicles and equipment, office buildings, depots, warehouses, furniture and computers used for non-network related applications.
Opening RAB	Opening value of the Regulatory Asset Base of the DU for the regulatory year or for the Regulatory Period.
Regulated Distribution Services	In respect of a regulated Distribution System: a. the conveyance of electricity through the regulated Distribution System and the control and monitoring of electricity as it is conveyed through the regulated Distribution System (including any services that support such conveyance, control or monitoring or the safe operation of the regulated Distribution System); b. the planning, maintenance, augmentation and operation of the regulated Distribution System; c. the provision, installation, commissioning, testing, repair, maintenance and reading both of meters that are used to measure the delivery of electricity to persons whose user systems or equipment is directly connected to the regulated Distribution System and of other meters that are used (for the purposes of the Wholesale Electricity Spot Market) to measure the flow of electricity into or through the regulated Distribution System; d. Distribution Connection Services in respect of the regulated Distribution System except to the extent that such Distribution Connection Services have been determined by the Energy Regulatory Commission to be excluded services;

TERM	DEFINITION
	e. the provision of ancillary services that are provided using assets which form part of the regulated Distribution System (excluding any such ancillary services to the extent they are provided to the system operator under contract, or through a spot market established under the Wholesale Electricity Spot Market Rules); and billing, collection and customer services that are directly related to the delivery of electricity through the regulated Distribution System to distribution connection points in respect of the regulated Distribution System and billing, collection and customer services for persons purchasing or receiving (or seeking to purchase or receive) any Distribution Connection Services in respect of the regulated Distribution System, but do not include such of these services as are determined by the Energy Regulatory Commission to be contestable.
Regulated Retail Services	The distribution business segment defined in the Business Separation Guidelines[6] that relates to the provision of retail services pertaining to the sale of electricity to end users who are included in the captive market.
Regulatory Asset Base	Those assets employed by a Distribution Utility to provide efficient regulated distribution services. It covers the regulated distribution network assets as well as the non-network assets required to support the delivery of regulated distribution services.
Regulatory Period	The First Regulatory Period, the Second Regulatory Period or a subsequent Regulatory Period (as the case may be).
Regulatory Reset Expert	Consistent with the "Rules for Setting Distribution Wheeling Rates for Privately Owned Electricity Distribution Utilities Operating Under Performance Based Regulation", the Regulatory Reset Expert must be an expert who: a. Has expertise in regulatory asset valuation or such other areas as the ERC considers appropriate; b. In respect of its relevant area of expertise, satisfies the applicable criteria that are specified in Appendix C of the "Rules for Setting Distribution Wheeling Rates for Privately Owned Electricity Distribution Utilities Operating Under Performance Based Regulation" or that are otherwise notified in writing by the Energy Regulatory Commission to each Distribution Utility from time to time; and Has no commercial or pecuniary relationship with a Distribution Utility at a financial, management or board level.
Roll Forward Information	Refers to all information provided by the Distribution Utility for purposes of the roll forward.
Roll Forward Template	Refers to the excel spreadsheet template that will be used by each Distribution Utility in its roll forward calculation. The template has two (2) main worksheets, the Opening RAB template and the Closing RAB template.

[6] The Guideline promulgated by the Energy Regulatory Commission under Rule 10, Section 1 of the Implementing Rules and Regulations as promulgated by the Energy Regulatory Commission on September 2003 under ERC Case No. 2003-46, Resolution No. 49, Series of 2006 as amended, to provide the framework and rules for the structural unbundling of the business activities of electric power industry participants.

2. ROLL FORWARD PROCESS REQUIREMENTS

2.1 TIMEFRAME OF SUBMISSION

Unless otherwise specified by the ERC, the determination of the roll forward RAB value must be undertaken for each DU, which will commence with the submission of the following:

a. Independent Expert's Report complying with requirements set out in this Handbook;

b. Independent Auditor's Report to be completed by an Auditor; and

c. Directors' Certificate to be completed and signed by a minimum of two directors of the DU.

The Independent Expert's Report and Independent Auditor's Report are to be completed at least fifteen (15) months before the start of the next Regulatory Period or as otherwise specified by the ERC. The Directors' Certificate is to be submitted together with the Independent Expert's Report and Independent Auditor's Report. In the absence of the Directors' Certificate, the ERC may decide to reject the submission of the DU.

2.2 REQUIRED EXPERT OPINIONS

It will be each DU's responsibility to appoint the required experts i.e. Expert and Auditor as defined in this document.

In the event that a DU fails to submit either the Independent Expert's Report or the Independent Auditor's Report in the timeframe prescribed by the ERC, the ERC shall use its own Regulatory Reset Expert to perform the roll forward RAB (at the cost of the DU).

2.3 INDEPENDENT EXPERT'S REPORT REQUIREMENTS

The Independent Expert's Report must be completed by an Expert as defined in this document. The report at a minimum must:

a. Include a copy of the appointment of the Expert by the DU detailing the scope of work of the Expert;

b. Present the results of the optimization process undertaken in accordance with the requirements of this Handbook;

c. Include a copy of the DU's quality of supply criteria;

d. Include a section detailing the adjusted Asset Additions, Asset Disposals and depreciation for the previous Regulatory Period, if relevant.[7] The section shall be accompanied by the following:

    i. Review of the DU's records in relation to the timing of assets added or removed over the period under review;

    ii. Assessment and verification of construction dates of Asset Additions over the period under review;

[7] Refer to Section 4.2.1.

iii. Detail regarding the variables used in the prescribed formula including the source of information and level of confidence in the accuracy of the variables used;

iv. An excel spreadsheet clearly identifying the calculation from which the updated previous Regulatory Period Closing RAB is calculated; and

v. Completed Roll Forward Template as prescribed by the Commission specifically the template for the Opening RAB.

e. Include a section detailing the development of the Closing RAB of the current Regulatory Period.[8] The section shall be accompanied by the following:

i. Review of the DU's records in relation to the timing of assets being added or removed;

ii. Assessment and verification of construction dates of Asset Additions;

iii. Detail regarding the variables used in the prescribed formula including the source of information and level of confidence in the accuracy of the variables used;

iv. An excel spreadsheet clearly identifying the calculation from which the updated current Regulatory Period Closing RAB is calculated; and

v. Completed Roll Forward Template as prescribed by the Commission specifically the template for the Closing RAB.

f. (For DUs with refurbished assets) Present the Expert's review of the engineering reports prepared by the DU in relation to the refurbishment undertaken on the assets, and provide an expert opinion on the reasonableness of the new standard life assigned to an asset after the refurbishment; and

g. Include a certification stating that:

i. The accuracy of the asset registers have been verified to the stated level of statistical accuracy, relevant for DUs with approved ODRC valuation during the previous Regulatory Period;

i. The Expert was responsible for preparing the report;

ii. That the report was prepared in accordance with the Handbook;

iii. That the review was undertaken independently and there exists no conflict of interest;

iv. That the network was optimized correctly in accordance with the Handbook; and

v. That the report represents a fair and accurate reflection of the value of the RAB, based on the methodology described in this Handbook.

All sections of the report should include adequate information to allow a reader of the report to:

a. Understand all the data and information presented in the report;

[8] Refer Section 4.2.2.

b. Understand the calculations and verify the accuracy of the calculations;

c. Understand all the assumptions used by the Expert; and

d. Understand the extent to which professional judgment was exercised and the effect of that judgment in deriving the prosed results.

2.4 REQUIRED INFORMATION FOR THE INDEPENDENT AUDITOR'S REPORT

Given that the submitted Roll Forward Information will be a critical source of the decisions made by the Commission, the purpose of the Independent Auditor's Report is for the Commission to obtain assurance that the Roll Forward Information submitted by the DU has been properly verified/audited by an independent body.

The Independent Auditor's Report must be completed by an Auditor as defined in this document. The report at a minimum must:

a. Clearly define the Auditor's responsibilities;

b. Clearly state the qualifications of the Auditor;

c. Clearly state the purpose and define the limitations of use of the report;

d. Include a statement that the Auditor has no relationship with, or interests in the DU and no conflict of interest exists;

e. Provide a detailed basis of their opinion on the review conducted including:

   i. The standards followed to obtain reasonable assurance about whether the information as provided is free from material misstatement;

   ii. Their understanding of materiality and that the results of their evidence-gathering procedures might influence the decisions of the users of the information submitted by the DU; and

   iii. Details of the procedures followed by the Auditor: in reviewing the methodologies used in preparing all the required information as indicated in this Handbook; in obtaining appropriate evidence in respect of the Roll Forward Information and the overall compliance with this Handbook; in examining, on a test basis, of evidence relevant to each item of Roll Forward Information; in examining, on a test basis, evidence to support the Roll Forward information; in examining internally and externally generated documents and records relevant to the Roll Forward Information, interviewing selected personnel, and other procedures deemed relevant by the Auditor for this review; in assessing the risks of material misstatement whether due to fraud, error or other reasons.

f. Present the Auditor's opinion on the review conducted including:

   i. A statement that all the evidence and explanations obtained by the Auditor during the course of its review of the DU are sufficient and appropriate to provide a basis for their independent opinion of the DU's compliance with the requirements set out in this Handbook;

ii. A statement confirming that the methodologies used in preparing the Roll Forward Information are in accordance with the methodologies set out in this Handbook and providing assurance that all the assumptions used are reasonable;

iii. A statement confirming that all the relevant information used in the preparation of the Roll Forward Information has been properly extracted from the DU's relevant system(s) with the most accurate asset information;

iv. Include a statement confirming that all calculations are mathematically correct and calculated in all material respects, in accordance with this Handbook;

v. Include a statement presenting all the key inputs to the Roll Forward Information submitted and confirming that these inputs have been reconciled by the Auditor to the different source documents and systems of the DU;

g. Present the Auditor's qualifications on each opinion. Qualifications shall include:

i. The nature of and reason(s) for the qualification; and

ii. Estimated impact from the Roll Forward Information submitted to the ERC.

2.5 REQUIRED INFORMATION FOR THE DIRECTORS' CERTIFICATE

The purpose of the Directors' Certificate is to impose obligations on the DUs to ensure that they produce accurate and reliable information. This will also encourage DUs to implement proper internal systems and controls.

The Directors' Certificate must be completed and signed by a minimum of two directors of the DU and shall include the following:

a. A statement accepting the Independent Expert's Report and Independent Auditor's Report and the validity of the Expert's certificate;

b. A statement certifying that the directors have made all reasonable enquiry, and to the best of their knowledge and belief, that the Roll Forward Information and the independent reports comply with the Commission's requirements as presented in this Handbook;

c. In the case of non-compliance to specific requirements, a detailed description of the non-compliance; and

d. A statement that the Roll Forward Information was prepared in accordance with necessary internal controls to ensure that all the information provided is free from material misstatement.

2.6 REVIEW OF DU SUBMITTED INFORMATION AND REPORTS

The ERC, with the assistance of a Regulatory Reset Expert, will review the independent reports submitted by the DUs. The DU shall ensure that the reports include sufficient information to enable the reviewer of the reports to independently assess the accuracy, validity and robustness of the Roll Forward Information in accordance with the methodologies prescribed in this Handbook.

In the review of the information submitted by the DUs, some or all of the following will be undertaken:

a. A compliance review of the submitted independent reports and the Directors' Certificate with additional detailed reviews as listed below;

b. A detailed review of the Independent Expert's Report and making necessary adjustments to the proposed roll forward values if required, including in situations where insufficient supporting information has been provided to substantiate the roll forward results;

c. A reasonability test: It is recognized that for most network components modern equivalent asset (MEA) values will already be reflected in the standard replacement costs as used in the previous RAB valuations. Even so, and due to the fact that DUs are not implementing a revaluation or roll forward at similar times, the ERC retains the right to revisit replacement costs used in the previously approved valuations as well as consider any Asset Additions to ensure cost efficiency;

d. A detailed review of the models developed by the Expert, as required in 2.3 (c) used to recalculate the Opening RAB (if applicable), for the previous Regulatory Period which includes a detailed review of all inputs to the models;

e. A detailed review of the models developed by the Expert, as required in 2.3 (d) used to calculate the Closing RAB for the current Regulatory Period which includes a detailed review of all inputs to the models;

f. A detailed review of the optimization performed including:

    i. The optimization process undertaken; and

    ii. proposed optimization adjustments including all calculations, assumptions used, and the bases of the proposed adjustments.

g. A review of the DU's quality of supply criteria as it applies to optimization;

h. A detailed review of the age profiles of the assets, including detailed review of the calculation of the remaining lives of the assets, with particular focus on assets where the remaining lives cannot be accurately determined because of the absence of actual installation dates. Such review will include, assessing the method and all assumptions used to determine such asset ages and the subsequent calculation of the remaining lives;

i. A review of the DU's database system and the process being undertaken by the DUs to accurately update and maintain the system, including its capability to generate the required asset registers and other relevant reports;

j. A detailed review of the accuracy of the DU's asset register. This will include (but not limited to) field inspections of randomly selected assets[9]; examination of system diagrams and single-line diagrams and the comparison of this with the information included in the asset register; analysis of evidences supporting the asset register; and verification of the asset age information provided; and

k. Efficiency assessment of the level of asset values through benchmarking for example asset value levels associated with Non-Network Assets.

[9] The sampling method to be applied by the Expert shall be based on a statistically valid sampling methodology, resulting in a confidence level not lower than 95% with a margin of error below the materiality threshold of 5%. The sampling will be applied to Asset Additions as well as the most material (materiality threshold is 5%) asset categories.

3. ROLL FORWARD VARIABLES

3.1 INTRODUCTION

This section defines the key inputs to the calculation of the RAB which includes the following:

a. Opening RAB[10];

b. Asset Additions;

c. Depreciation; and

d. Asset Disposals.

The above key inputs will be used to calculate the closing value of the RAB to be carried forward at the start of the next Regulatory Period. The calculation of the Closing RAB is presented in more detail in the next Section.

3.1.1 Allowed Assets in the RAB

Assets that are allowed to be included in the RAB of a DU are assets that are used for the efficient provision of the following services:

- Regulated Distribution Services;
- Distribution Connection Services; and
- Regulated Retail Services.

Below a table exploring the assets associated with the above services which would therefore constitute typical assets that could be owned and/or managed by a DU and therefore allowed to form part of the RAB.

Table 2: Breakdown of RAB[11]

REGULATED DISTRIBUTION ASSETS	DISTRIBUTION CONNECTION ASSETS	REGULATED RETAIL SERVICES ASSETS
Assets for providing: • Electricity conveyance from bulk or embedded generation connection points to end-user connection points • Administration and	Assets for providing: • Capability at a connection point • Conveyance of electricity • Planning, installation, maintenance, augmentation and	Assets for providing: • Billing and collection • Customer support • Collection of bad debt • Energy trading • Electricity sales (excluding

[10] The Opening RAB may be based on an adjusted Closing RAB for the previous Regulatory Period as discussed in the next section.

[11] "Position Paper: Regulatory Reset for the July 2015 to June 2019 Fourth Regulatory Period for the First Entry Group of Privately Owned Distribution Utilities subject to Performance Based Regulation", Energy Regulatory Commission, July 12, 2016.

REGULATED DISTRIBUTION ASSETS	DISTRIBUTION CONNECTION ASSETS	REGULATED RETAIL SERVICES ASSETS
general management of the regulated distribution services part of the business of a DU • Distribution information technology • Street and area lighting • Regulated distribution system control, metering and telecommunications • Transferred sub-transmission assets	operation of distribution connection assets	generation and transmission costs) • Consumer metering installation

Materials and supplies, including spares, may be included in the RAB provided that the quantities are reasonable considering the historical reliability of the equipment and the quantity of items installed in the Distribution System.

3.1.2 RAB Asset Register

The Commission expects that the DU shall be responsible to maintain an accurate asset register broken down into asset types and shall include all relevant information about the assets such as but not limited to:

- the different asset properties relevant to determining the value of an asset e.g. material type, size, capacity, key ratings, installation and configuration details, etc.;
- location of the asset and environment in which they are installed;
- date of initial installation;
- initial historical cost of the installed and commission asset, including all costs capitalized against the asset;
- all costs capitalized against the asset after installation, such as for refurbishment;
- unique asset identifier (to allow an asset to be identified in the field); and
- asset utilization information[12].

[12] Asset utilization information is additional data required in a DU's asset register as per the ERC's Position Paper dated July 12, 2016.

DUs are encouraged to have a reliable and secure database system to store and maintain relevant and accurate asset information, and where an asset register and other necessary reports can be generated from.

Information in the asset registers shall be comprehensive enough to allow the verification of these assets whenever required by the ERC. While this is the case, for the purpose of simplifying the calculation of the RAB through the roll forward approach, the different asset types in the DU's asset registers shall be aggregated into Asset Categories. The Roll Forward Template is presented in Appendix A of this Handbook.

3.2 OPENING RAB FOR REGULATORY YEAR 1

The Opening RAB would be the latest approved Opening RAB of the DU.[13] That is, in the case of the DUs who have undergone the ODRC valuation in the previous Regulatory Period , the last approved Opening RAB would be the Opening Value to be rolled forward.

The Opening RAB shall be broken down into Asset Categories as described below.

3.2.1 Asset Categories

Consistent with the RDWR, the following is the required asset categorization:

Regulated Distribution Services Assets

i. Distribution services

   a. Land and Land Rights (dedicated to distribution purposes)

   b. Structures and Improvements (dedicated to distribution purposes)

   c. Substation Equipment

      - Power transformers
      - Switchgear
      - Protective equipment
      - Metering and control equipment
      - Communications equipment
      - Other station equipment

   d. Poles, Towers and Fixtures

   e. Overhead Conductors and Devices

   f. Underground Conduits

   g. Underground Conductors and Devices

   h. Distribution Transformers

[13] Please refer to Section 4.2.1 whereby the approved Opening RAB could be required to be adjusted due to the actual additions, disposals and depreciation during the latter part of the previous Regulatory Period and/or the reasonableness test adjustments of the ERC.

i. Power Conditioning Equipment

j. Meters, Metering Instruments & Metering Transformers (dedicated to distribution purposes)

k. Information technology equipment (dedicated to distribution purposes)

l. Regulated Entity property on Consumers' Premises (not forming part of Distribution Connection Assets)

m. Street Lights and Signal Systems

n. Submarine Cables

ii. General Plant (Non-network Assets)

a. Land and Land Rights (non-network related)

b. Structures and Improvements (non-network related)

c. Office Furniture and Equipment

d. Transportation Equipment

e. Stores Equipment

f. Tools, Shop and Garage Equipment

g. Laboratory Equipment

h. Information systems equipment (non-network related)

i. Power-operated Equipment

j. Communication Plant and Equipment

k. Miscellaneous Equipment

iii. Materials and Supplies, including spares

iv. Transferred Sub-transmission Assets

Distribution Connection Services Assets

i. Distribution services

a. Poles, Towers and Fixtures

b. Overhead Conductors and Devices

c. Underground Conduits

d. Underground Conductors and Devices

e. Distribution Transformers

f. Information technology equipment (dedicated to Distribution Connection Services)

ii. General Plant (Non-network Assets)

a. Land and Land Rights (non-network related)

b. Structures and Improvements (non-network related)

c. Office Furniture and Equipment

d. Transportation Equipment

e. Stores Equipment

f. Tools, Shop and Garage Equipment

g. Laboratory Equipment

h. Information systems equipment (non-network related)

i. Power-operated Equipment

j. Communication Plant and Equipment

k. Miscellaneous Equipment

iii. Materials and Supplies, including spares

Regulated Retail Services Assets

a. Meters, Metering Instruments & Metering Transformers – Consumer consumption metering

b. Land and Land Rights

c. Structures and Improvements

d. Office Furniture and Equipment

e. Transportation Equipment

f. Stores Equipment

g. Tools, Shop and Garage Equipment

h. Laboratory Equipment

i. Information systems equipment

j. Communication Plant and Equipment

k. Miscellaneous Equipment

Any other Asset Categories specified by the ERC.

3.2.2 Description of Asset Categories and Asset Classes

The definition[14] of each network Asset Category and the network Asset Classes that shall fall under each Asset Category are presented below.

[14] Reference: "Asset Valuation Policy Guidelines for Privately Owned Distribution Utilities Subject to Performance Based Regulation", Energy Regulatory Commission, August 2006.

Asset Category: Substation Equipment		
	Asset Class	**Description**
	Power Transformer	Grouped by voltage level and power ratings. Shall include foundations, conductors between high voltage line and the transformer terminals, high voltage, low voltage and control cable terminations at the transformer, and transformer earthing.
	Switchgear	Broken down into circuit breakers and disconnectors. Circuit breakers shall be grouped by type, voltage and size and shall include foundations, control cable terminations and control, metering and protections tests. Disconnectors shall be grouped based on voltage and rating.
	Protective Equipment	Shall be divided into current transformers, potential transformers, lightning arresters and protection schemes. Shall include all foundation, stands, conductor to the main circuit and all cable and conductor terminations. Shall also include metering potential transformers and current transformers.
	Metering and Control Equipment	Shall include all substation metering equipment that is used for power quality and revenue metering. Metering boxes and control panels shall be included. Control panels shall include all equipment for the operation of circuit breakers from the control room and shall include IED devices for monitoring circuit loads and voltages.
	Communications Equipment	Shall include all supervisory control and data acquisition (SCADA) and communications equipment.
	Other Station Equipment	Shall be divided into batteries and chargers, structures and busbars, and miscellaneous substation equipment which consists of any substation item that cannot be associated with any particular piece of equipment, such as substation earthing. Batteries and chargers shall be sub-categorized based on capacity and ratings

		while structures and busbars shall be based on voltage and configuration.
Asset Category: Poles, Towers and Fixtures		
	Asset Class	**Definition**
	Pole	Shall be sub-divided based on construction material and height. Shall include all line hardware required for installing the pole (e.g. foundations, guys, etc.).
	Pole Top	Shall include cross-arms, insulators, braces, clamps, nuts and bolts for securing the cross-arms and insulators to the pole. Shall also include any material required to secure the conductors to the insulators
Asset Category: Overhead Conductors and Devices		
	Asset Class	**Definition**
	Overhead Conductor	Shall be further divided based on conductor material and cross sectional area.
	Overhead Line Devices	Shall include fuse cut-outs, surge arresters, line switches, line sectionalizers and reclosers.
Asset Category: Underground Conduits		
Asset Category: Underground Conductors and Devices		
	Asset Class	**Definition**
	Underground Conductor	Shall be based on conductor type. Shall include cable joints and terminations along with all trenching and reinstatement.
	Underground Devices	Shall include ground mounted switching devices, further sub-divided based on voltage rating. Shall include foundations, cable terminations and earthing.
Asset Category: Distribution Transformer		
	Shall be sub-categorized based on voltage and rating. Shall include the brackets for mounting on poles (or foundations if ground mounted), the conductor between the fuse unit and the transformer terminals, all connectors and terminations and the transformer earthing.	
Asset Category: Power Conditioning Equipment		

	Shall include capacitors and voltage regulators. Capacitors shall be further subcategorized as substation capacitors and line capacitors. Substation capacitors are installed in sub-transmission and distribution substations and generally of a larger capacitor. Capacitors shall include all foundations, structures, earthing, switching reactors and potential transformers. Line capacitors are installed on distribution circuits and includes all control equipment (if switched), brackets for installation on the poles, and conductors required shall be included in this subcategory.
Asset Category: Meters, Instruments and Metering Transformers	
	Shall include meter, instrument transformers (if any), metering cabinets, sockets and seals.
Asset Category: Street Light and Signal System	
	Shall be further sub-divided according to voltage for cables and wattage for street lights. Each standalone streetlight pole shall consist of a pole, an outreach arm and fitting complete with luminaire. Each street light installed on existing power poles shall consist only of an outreach arm and fitting with luminaire.
Asset Category: Submarine Cables	
Asset Category: Overhead Conductors and Devices (distribution connection services) – Service Drops	
	Shall be grouped based on cross sectional area. Shall include termination for the cable at the transformer and the customer premises.

3.3 ASSET ADDITIONS FOR CURRENT REGULATORY PERIOD

Asset Additions are defined as the nominal value of Asset Additions for each year of the current Regulatory Period. The actual (not forecast) Asset Additions shall be from the date of the latest approved Opening RAB up to the date of the commencement of the subsequent Regulatory Period. Forecast Asset Additions will be required as inputs for the final year(s) of the current Regulatory Period in the event that the Closing RAB value is assessed prior to the end of the current Regulatory Period.

Categories of Asset Additions should match the Asset Categories in the Opening RAB in order to allow for consistent depreciation across asset classifications.

3.4 ASSET DISPOSALS FOR CURRENT REGULATORY PERIOD

Asset Disposals are defined as the actual nominal Asset Disposals that have taken place in each regulatory year of the current Regulatory Period. Forecast Asset Disposals will be required as inputs for the final year(s) of the current Regulatory Period.

The value of Asset Disposals shall be the actual cost of the disposed/retired assets less the net income from disposal.

Categories of Asset Disposals should match the Asset Categories in the Opening RAB.

3.5 DEPRECIATION

For the purpose of calculating the actual nominal depreciation, the straight line method of depreciation shall be adopted, consistent with the method used for previous Regulatory Periods. Depreciation shall be applied where an existing asset's remaining life is less than the standard asset life of such asset.

Yearly depreciation shall be calculated for the Opening RAB as well as for the Asset Additions.

In order to calculate the depreciation, the standard asset lives and remaining lives for all assets (except land and land rights) need to be established as can be viewed below.

3.5.1 Standard Asset Lives[15]

The standard asset lives for each network Asset Class is as follows:

Table 3: Standard Asset Lives for each Network Asset Class[16]

Asset Category: Substation Equipment			
	Asset Class		**Standard Asset Life**
	Power Transformer		30
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Switchgear	Circuit Breakers	30
		Disconnectors	30
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Protective Equipment	Current Transformers	30
		Potential Transformers	30
		Lightning Arresters	15
		Protection Schemes	30 (Mechanical), 15 (Electronic)
	Asset Class		**Standard Asset Life**
	Metering and Control Equipment		30
	Asset Class		**Standard Asset Life**

[15] For purposes of the roll forward, and due to the aggregated nature of asset categories in the roll forward process and in the Roll Forward Template, the standard asset lives per Asset Category shall be calculated as the weighted average asset lives of the standard asset lives as depicted in this section.

[16] References: "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010; and "Asset Valuation Policy Guidelines for Privately Owned Distribution Utilities Subject to Performance Based Regulation", Energy Regulatory Commission, August 2006.

	Communications Equipment		10
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Other Station Equipment	Batteries and Chargers	10
		Structures and Busbars	The asset life of structures and busbars shall be a weighted life (by value) of the major components in the module i.e. circuit breaker, disconnectors and structures, excluding power transformers
		Miscellaneous Substation Equipment	The asset life of miscellaneous substation equipment shall be a weighted life (by value) of the major components in the module i.e. circuit breaker, disconnectors and structures, excluding power transformers
Asset Category: Poles, Towers and Fixtures			
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Pole	Wood	20
		Concrete	30
		Steel	40
		Steel Tower (Sub-transmission)	50
		Galvanized Iron	30
	Asset Class		**Standard Asset Life**
	Pole Top		30
Asset Category: Overhead Conductors and Devices			
	Asset Class		**Standard Asset Life**
	Overhead Conductor		30
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Overhead Line Devices	Fuse Cut-out	**30**
		Surge Arresters	30
		Line Switches, Circuit Breakers and Disconnectors (Sectionalizers and	30

		Disconnectors)	
		Reclosers	30
Asset Category: Underground Conduits **Asset Category: Underground Conductors and Devices**			
	Asset Class		**Standard Asset Life**
	Underground Conductor		35
	Underground Devices		35
Asset Category: Distribution Transformer			
	Asset Category		**Standard Asset Life**
	Distribution Transformer		30
Asset Category: Power Conditioning Equipment			
	Asset Class	**Asset Sub-Class**	**Standard Asset Life**
	Capacitor	Substation Capacitor	35
		Line Capacitor	30
	Asset Class		**Standard Asset Life**
	Voltage Regulator		35
Asset Category: Meters, Instruments and Metering Transformers			
	Asset Class		**Standard Asset Life**
	Meters		25 (ElectroMechanical), 15 (Electronic)
	Current Transformers		25
	Potential Transformers		25
Asset Category: Street Light and Signal System			
	Asset Category		**Standard Asset Life**
	Street Light and Signal System		30
Asset Category: Submarine Cables **Asset Category: Overhead Conductors and Devices (distribution connection services) – Service Drops**			

Asset Category	Standard Asset Life
Service Drops	30

Standard asset lives of Network Assets not provided in Table 3 above shall be established on a comparable basis with the standard asset lives provided in the aforementioned table, but shall not exceed such standard asset lives for comparable assets. Furthermore, the assessment of the standard asset lives of Network Assets not provided in Table 3 shall include the examination of service records, physical inspection of the assets, and discussion with maintenance personnel.

Standard asset lives for Non-Network assets shall be based on Philippine Accounting Standard (PAS) 16, which corresponds to International Accounting Standard (IAS) 16 – Property, Plant and Equipment. PAS shall also be the primary accounting standard governing the valuation of non-network assets.

3.5.2 Asset Lives for Refurbished Assets

The DU shall be responsible to assign an asset life to a refurbished asset. The asset life shall be effective from the time of refurbishment and shall be for a period not greater than the standard asset life of such asset. The DU shall be required to prepare an engineering report presenting the details of the refurbishment work undertaken and justifying the basis of the new assigned asset life. These reports, if any, should form part of the Independent Expert's Report.[17]

3.5.3 Remaining Lives[18]

The life of an asset commences when it is first installed/commissioned/refurbished. Remaining lives of assets are then determined by subtracting the age of the assets from their standard asset lives. The age of an asset shall be determined from the DUs records of installation dates establishing the age.

For assets with no record of installation/commissioning dates, the DU shall provide sufficient evidence for the basis of the assigned remaining life of the asset, which shall be consequently reviewed in detail by the Commission as provided for in Section 2.6.

3.5.4 Residual Values[19]

The residual value of an asset must be estimated to perform a depreciation calculation. This residual value reflects the fact that the asset may no longer be an economic proposition in its present role, however, it may remain in use but with profitability impaired due to increased maintenance costs and lack of efficiency compared with more modern assets. Alternatively it may be possible to sell the assets to a secondary user or for salvage value.

[17] Please refer to Section 2.

[18] For purposes of the roll forward, and due to the aggregated nature of asset categories in the roll forward process and in the Roll Forward Template, the remaining lives per Asset Category shall be calculated as the weighted average remaining asset lives of all assets in the relevant Asset Category.

[19] As described in the "Asset Valuation Policy Guidelines for Privately Owned Distribution Utilities Subject to Performance Based Regulation", Energy Regulatory Commission, August 2006.

In principle when an asset reaches the end of its standard asset life, it has zero value under the straight line depreciation method. Assets however remain in service beyond this period. It is reasonable to allocate a value to these assets in order to recognize their value to the network and to provide an incentive for DUs to extend the useful lives of assets.

In the past, the approach that was adopted was to allocate a residual value of 5% of the optimized replacement cost of assets used beyond their standard asset lives.

Note that while the residual value will be included in the RAB for the purposes of calculating the return on assets building block, there will be no further depreciation of the asset once it reaches the end of its standard asset life.

3.6 EXCLUDED VARIABLES

Consistent with previous Regulatory Periods, value added tax (VAT) shall be excluded from the RAB calculation. Inflationary factors shall also be excluded from the RAB calculation at the stage of applying the roll forward as stipulated in this Handbook.

4. ROLL FORWARD PROCEDURES

4.1 INTRODUCTION

The objective of the roll forward procedure described in this section is to determine the Closing RAB for each DU for each Regulatory Period. This Closing RAB value becomes the Opening RAB value to be used for the purposes of making a regulatory determination for the next Regulatory Period.

The roll forward procedure consists of three main steps of which the first is the removal of any penalty or benefit on returns associated with differences between the actual and forecast Asset Additions, Asset Disposals and depreciation associated with the end period of the previous Regulatory Period[20].

Secondly, the final Closing RAB is determined by calculating the nominal Closing RAB for each regulatory year of the current Regulatory Period. This yearly calculation will utilize actual Asset Additions, Asset Disposals and depreciation during the current Regulatory Period.

Lastly, the procedure also consists of the application of network optimization.

4.2 ROLL FORWARD PROCEDURE

4.2.1 Adjusting Asset Additions, Asset Disposals and Depreciation for the Previous Regulatory Period

This subsection is only relevant in the instance where the Closing RAB of the previous Regulatory Period was established by utilizing forecast Asset Additions, forecast Asset Disposals and/or forecast depreciation values for part or all of the previous Regulatory Period. This utilization of forecast values at the end of the Regulatory Period is common due to the fact that the Closing RAB for a Regulatory Period is generally calculated prior to the end of the said period. In the event where the Closing RAB for the previous Regulatory Period was based on actual Asset Additions, actual Asset Disposals and actual depreciation, the procedure described in this subsection will not be required.

In the event that the Closing RAB of the previous period was based on forecast values, the following procedure should be followed to adjust such values which will be applied during the procedure for calculating the Closing RAB for the Regulatory Period under review.

For this procedure, work in progress will not form part of Asset Additions and such assets will only appear in the year of commissioning (energization).

The formula for calculating the Opening RAB for the current Regulatory Period:

Opening RAB for the final year of the previous Regulatory Period

+ actual nominal Asset Additions

– actual nominal Disposals

– actual nominal regulatory depreciation

[20] As an example, for DUs in the Third Regulatory Period, the Previous Regulatory Period refers to the Second Regulatory Period.

= Opening RAB for the first regulatory year of the current Regulatory Period

Where:

Actual disposals are defined as the Asset Disposal value minus the value obtained from the disposal of the asset.

4.2.2 Roll Forward Procedure

This subsection provides the procedure to establish the nominal Closing RAB for each year of the current Regulatory Period. The Closing RAB of the final year of the current Regulatory Period will also be the Opening RAB value for the upcoming Regulatory Period.

For this procedure, work in progress will not form part of Asset Additions and will only appear in the year of commissioning (energization).

This procedure assumes the availability of actual Asset Additions and Asset Disposals during the current Regulatory Period. Where the procedure is applied prior to the end of the current Regulatory period it is allowed that the Asset Additions and Asset Disposals be based on forecast values for the final year(s) of the Regulatory Period. The forecast used and any aggregated compounded returns associated with the use of such forecast values will be adjusted in future as per the procedure described in Section 4.2.1.

It is understandable that DUs may overspend or underspend on CAPEX as allowed at the start of the current Regulatory Period. These variances from the allowed CAPEX may be caused by unforeseen increases or decreases in demand, actual costs or even errors in forecasting at the onset. These potential variances do not affect the outcome of the roll forward procedure as it is based on actual Asset Additions with adjustment as described in the following section.

The formula for calculating the Closing RAB for each year of the current Regulatory Period:

Opening RAB for regulatory year 1

+ Actual nominal Asset Additions for regulatory year 1

– Actual nominal regulatory depreciation for regulatory year 1

– Actual nominal Asset Disposals for regulatory year 1

= Closing RAB for regulatory year 1 = Opening RAB for regulatory year 2

+ Actual nominal Asset Additions for regulatory year 2

– Actual nominal regulatory depreciation for regulatory year 2

– Actual nominal Asset Disposals for regulatory year 2

= Closing RAB for regulatory year 2 = Opening RAB for regulatory year 3

(Additional Years)

= Closing RAB for regulatory year X[21]

+ - Optimization

= Closing RAB for the current Regulatory Period

Where:

Opening RAB for regulatory year 1 = closing RAB for the final regulatory year of the previous Regulatory Period, which was calculated in accordance with Section 4.2.1.

Actual nominal Asset Additions and Asset Disposals are assumed to be spread evenly over a regulatory year and therefore the reported values are assumed to be in mid-year terms.

For clarity, nominal actual regulatory depreciation includes depreciation on the new Opening RAB as well as depreciation on the previous year's Actual Additions.

4.3 OPTIMIZATION

4.3.1 Introduction

The purpose of optimization is to ensure that the RAB reflects an efficient set of assets that would be able to achieve the required level of service. An "incremental optimization" approach is to be followed in which the existing network is examined and changes made to ratings, configurations, designs or materials to optimize the network configuration and its component asset having regard to such issues as excess capacity, redundancy and over-design. DUs shall adopt standard sizes/ratings on the basis of least cost considerations and optimization also takes this practice into account. The optimization to be undertaken will not be concerned with improving the system from its current state as optimization cannot result in an increased network system asset replacement cost.[22]

Optimization consists of five stages:

i. removal of stranded assets in the RAB;

ii. optimization of the DU's network configuration;

iii. optimization of the capacity/voltage of elements in the DU's network;

iv. optimization of network engineering; and

v. optimization of materials and supplies, including spares.

4.3.2 Optimization Principles

The optimization shall be based on a reasonable expected level of use of the asset, which is determined by reference to the required level of service potential or output consistent with both the reasonably foreseeable future demand and the objective of minimizing the whole of life costs.

[21] X depicts the final year of the current Regulatory Period.

[22] "Asset Valuation Policy Guidelines for Privately Owned Distribution Utilities Subject to Performance Based Regulation", Energy Regulatory Commission, August 2006.

The optimization process shall be carried out subject to the following constraints[23]:

i. the potential level of service of the optimized network shall not exceed that of the existing network, and the performance of any part of the optimized network shall not exceed the DU's standard quality of supply criteria, as disclosed in the Independent Expert's Report. If non-standard contracts with individual customers exist that require the DU to provide an enhanced quality of supply, these assets[24], shall be optimized out of the RAB on the basis that these assets are required by the individual customer rather than the DU and that customer-specific rates (falling outside normal distribution wheeling rates) will apply to such installations;

ii. the location of points of connection to other networks or transmission grid exit points shall be assumed to be fixed. However, where a fixed point of connection can be readily bypassed and replaced with a more cost-efficient network arrangement, then that fixed point of connection shall be deleted for valuation purposes and the more cost-efficient network included;

iii. the location and number of connection points to consumers shall be assumed fixed;

iv. the optimized network should only use the voltage levels used on the existing network. This does not preclude existing equipment being optimized down to a lower standard network voltage, but there is no requirement to optimize down to a non-standard voltage level; and

v. the optimized network shall use standard equipment/fitting ratings/sizes to optimize construction/maintenance practices. This does not preclude oversized existing equipment being optimized down to standard sizes used by other DU's, but there is no requirement to optimize equipment sizes down to non-standard equipment that is not readily available in the Philippines.

4.3.3 Quality of Supply[25]

The optimized network shall be designed to supply the allowed future load growth. The quality of supply of the optimized network shall match the level that currently exists, except where this is greater than the disclosed quality of supply criteria.

The DU's quality of supply criteria that it currently uses as a basis for network design shall be disclosed in the Independent's Expert's Report. The Quality of Supply criteria shall be based on:

i. the DU's analysis of customer requirements;

ii. the DU's assessment of network maintenance requirements and costs;

iii. the standards and practices that have historically been used to develop the existing sub-transmission and distribution networks; and

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[23] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

[24] Refers to assets used to enhance the quality of supply.

[25] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

iv. the DUs assessment of widely accepted best practice followed by other effective DUs in the Philippines and internationally, for similar distribution networks and customer types.

Relevant quality of supply criteria include:

i. the degree of security (redundancy) in different circumstances or localities;

ii. target reliability indices for different areas of the network. For example, central business, urban and rural districts;

iii. voltage regulation criteria; and

iv. levels of electrical losses.

The degree of security may be disclosed either in probabilistic or deterministic terms. A deterministic approach could reference the level of in-built redundancy, for example, as (n) or (n-1) or (n-2) component redundancy. An (n) security level implies no component redundancy so that if a component fails, then consumer supply is lost. An (n-1) security level implies that consumer supply is not interrupted in the event of any single component outage[26]. A less reliable (n-1 switched) security level involves the loss of consumer supply subsequent to a single component outage, but with subsequent consumer supply restoration via network switching. Irrespective of whether probabilistic or deterministic criteria are used, it is necessary for a DU to express its degree of security criteria in such a way that the optimization process is transparent and can be shown to have been applied consistently across all sections of the network.

Existing Distribution System assets that provide a quality of supply greater than that disclosed by the DU shall be optimized out. As mentioned earlier, improved levels of quality of supply are allowed as part of non-standard contracts but are not to be included in the RAB.

4.3.4 Future Load Growth[27]

The maximum capacity of any part of a DUs optimized network shall be determined by considering the projected future load growth for the relevant planning period in tandem with the DU's quality of supply criteria. However, in no case shall the optimized network capacity exceed the existing capacity.

In order to ensure compliance, the DU's existing peak demand and forecast electrical demand levels that are used as a basis for optimization shall be disclosed in the Independent Expert's Report. The forecast electrical demand values should account for any potential to reduce peak demand through the application of cost-effective demand-side management practices. As a minimum, the existing and forecast electrical demand levels shall be provided for each (i) point of supply, (ii) distribution substation, (iii) sub-transmission feeder and (iv) primary distribution feeder. Clear justification and a detailed derivation of the load growth forecasts are required. Both the existing maximum demand and the highest forecast maximum demand during the planning period shall be provided. Allowances should be made, where possible, for different growth rates in different parts of the network. Existing electrical demands, power factors or

[26] A completely uninterrupted supply in the event of a component failure is mostly not feasible and, depending on the definition adopted, supply restoration within 1 minute, 3 minutes or 5 minutes are usually considered to be no-break.

[27] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

diversity factors may be estimated where metering or SCADA data is not available. Estimated quantities should be clearly identified in the DU's disclosed forecast electrical demand[28].

The network demand forecast should:

i. be based on peak kilo-volt-ampere (kVA) values and include an indication of the relevant electrical power factors;

ii. clearly outline any diversity factors that may exist in relation to the peak loads on (i) the entire network, (ii) the zone substations and (iii) the primary distribution feeders;

iii. be based on "system normal conditions" and only consider the peak electrical demand on each of the relevant network components without load transfer due to network contingencies; and

iv. include only future electrical loads that can reasonably be expected to be supplied from the DU's network. Any loads that are forecast to emerge outside of a DU's franchise area should be specifically noted in Independent Expert's Report.

The Independent Expert's Report shall also present any separately identifiable new load or load increment that is forecasted to be (i) 5% of the DU's existing maximum demand or (ii) 5 megawatts (MW) (whichever is the lower).

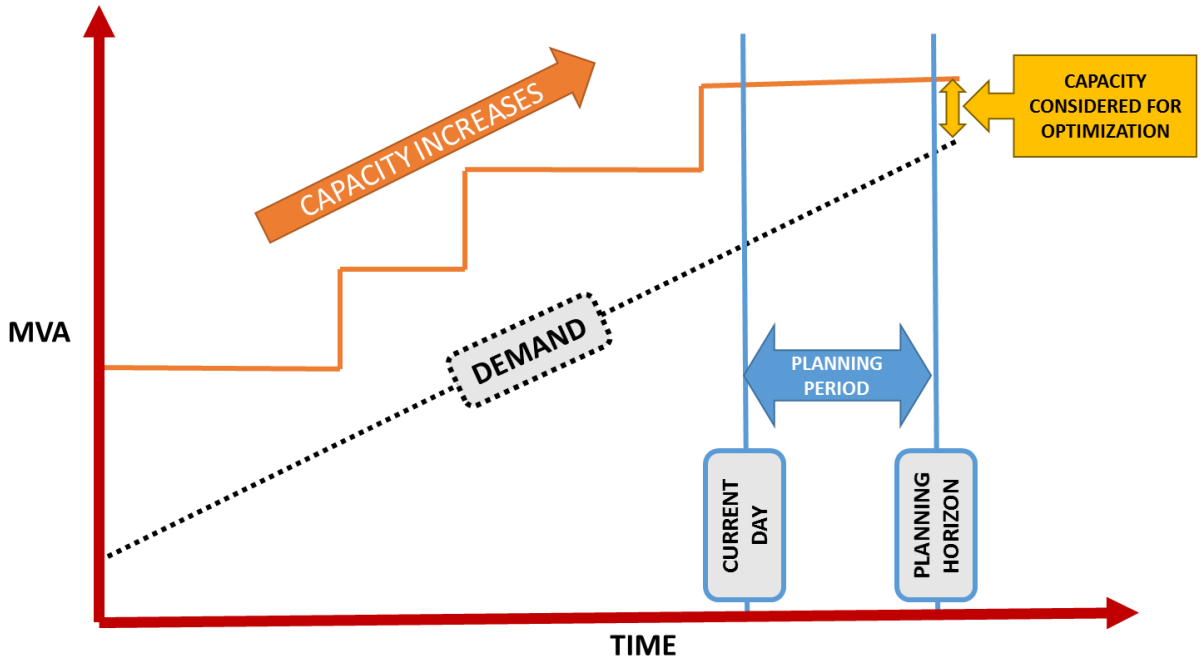
The planning periods over which future load growth can be allowed for shall not exceed those outlined in the following table:

Table 4: Optimization Planning Horizon

NETWORK COMPONENTS	PLANNING HORIZON
Points of connection to the transmission network Delivery Point Substation Sub-transmission (HV) lines/cables Distribution Substations (excluding transformers)	15 years
Distribution Substation Transformers Primary Distribution (MV) lines/cables	10 years
Distribution/Line Transformers Secondary Distribution (LV) lines/cables Other Distribution Assets	5 years

The following figure illustrates graphically the progression of a network asset's capacity and electrical demand. It also shows that the extent of the spare capacity at the end of the planning period and which would be subject to potential optimization under this Handbook's optimization methodology.

[28] The demand forecast figures presented by DUs should be consistent with those used to forecast the basis of its capital expenditure on network growth, for the upcoming Regulatory Period.



4.3.5 The Process of Optimization[29]

Optimization of the network shall be undertaken on a systematic basis. The optimization process must examine the existing network and determine whether a more cost-efficient design could meet the DU's quality of supply criteria throughout the allowed planning period. Optimization shall be undertaken systematically across the network and shall include, in particular, the following network components: i. points of supply; ii. delivery point substations; iii. sub-transmission lines and distribution substations; iv. primary distribution switching stations; v. the primary distribution circuits/feeders (including distribution transformers); and vi. the secondary (low voltage) distribution system.

Removal of Stranded Assets in the RAB

Any asset not required to supply distribution services to the DU's existing customers, and which could therefore be disconnected, shall be identified and excluded from the optimized network.

Optimization of the DU's Network Configuration

Optimization of the system configuration shall be carried out by considering alternative configurations subject to the constraints on optimization and in accordance with the relevant quality of supply criteria. The optimized configuration is the one that supplies the forecast load at the end of the allowed planning period and meets the disclosed quality of supply requirements in the most cost efficient manner.

In the process of optimizing the system configuration, certain assets or groups of assets may become excess to requirements and should be assigned a zero value, while other new assets

[29] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

may need to be notionally brought in. The minimum optimization tests to be carried out by DUs in optimizing the system configuration are set out in Appendix B.

Optimization of the Capacity/Voltage of Elements in the DU's Network

After the configuration of the system has been optimized, the elements within that system shall be optimized by considering whether lower capacity/voltage, more cost-efficient elements would be adequate. The minimum tests to be carried out by DUs in optimizing the network capacity are set out in Appendix B.

Civil engineering works such as spare ducts, control buildings, cable tunnels and switchyard bays not currently used shall be optimized out unless they will be required to meet the allowed future load growth within a reasonable growth period, coupled with meeting the disclosed quality of supply criteria.

Optimization of Network Engineering

As part of the process of optimizing the network, the engineering of the network shall be examined to confirm that the optimized asset base is not over-engineered, given the disclosed quality of supply criteria. Over-engineering may occur if parts of the existing asset base are engineered to a standard that exceeds the DU's current practice or if a more cost-efficient engineering arrangement or configuration would be used if the existing assets were replaced. The DU's design and construction standards, and the standard of engineering applied to its most recent projects should be used as the benchmark for this test.

Where a more cost-efficient arrangement would result if the required level of service were provided by applying the DU's existing engineering standards, the relevant assets shall be replaced by a notional asset arrangement that reflects current best practice. The minimum tests to be carried out by DUs in optimizing the network engineering are set out in Appendix B.

Optimization of Materials and Supplies, Including Spares

Network materials and supplies, including spares may be included in the RAB as long as the spares are suitable replacements for the assets installed in the network. However, the quantity of spares in the RAB shall not exceed the reasonable quantity of spares required to meet the DU's disclosed quality of supply criteria.

Stranded assets may be valued as network spares, subject to the criteria above. Stranded assets not required as network spares shall be assigned a zero value for the purposes of calculating the RAB.

Determining the Optimized Replacement Cost

Once the optimized system has been determined, those parts of the optimized network that are different from the existing network shall be revalued. This entails applying the replacement costs of MEAs to the optimized notional network. A schedule of all network optimizations and details of the valuation impact of each optimization, including details of the assets removed as stranded assets, shall be included in the Independent Expert's Report.

When assets are notionally brought into the network as a result of the optimization process, they should be valued at the replacement costs of MEA to determine the total replacement cost.

5. LIST OF ACRONYMS AND SHORTCUTS

ACRONYM AND SHORTCUT	TERM
ARR	Annual Revenue Requirement
CAPEX	Capital Expenditure
DRC	Depreciated Replacement Cost
DU	Privately Owned Electricity Distribution Utility
ERC/Commission	Energy Regulatory Commission
Handbook	Roll Forward Handbook
HV	High Voltage
kV	Kilovolt
kVA	Kilo-volt-ampere
LV	Low Voltage
MEA	Modern Equivalent Asset
MV	Medium Voltage
MVA	Mega-volt-ampere
MW	Megawatt
ODRC	Optimized Depreciated Replacement Cost
OLTC	Off Load Tap Changer
PBR	Performance Based Regulation
POS	Points of Supply
RAB	Regulatory Asset Base
RDWR	Rules for Setting Distribution Wheeling Rates
SCADA	Supervisory Control and Data Acquisition
VAT	Value Added Tax

APPENDIX A: ROLL FORWARD TEMPLATE SAMPLES

All values must be provided as Please complete areas identified as	*Thousands*				
Asset Categories	**Opening Asset Value (Approved Closing RAB for previous Regulatory Period)**	**Weighted Average Remaining Life**	**Weighted Average Standard Asset Life**	**Actual Nominal Capex Final Year**	**Forecast Nominal Capex Final Year**
Regulated Distribution Services Assets					
1. Distribution Services					
a. Land and Land Rights (dedicated to distribution purposes)					
b. Structures and Improvements (dedicated to distribution purposes)					
c. Substation Equipment					
- Power Transformers					
- Switchgear					
- Protective Equipment					
- Metering and Control Equipment					
- Communications Equipment					
- Other Station Equipment					
d. Poles, Towers and Fixtures					
e. Overhead Conductors and Devices					
f. Underground Conduits					
g. Underground Conductors and Devices					
h. Distribution Transformers					
i. Power Conditioning Equipment					
j. Meters, Metering Instruments & Metering Transformers (dedicated to distribution purposes)					
k. Information Technology Equipment (dedicated to distribution purposes)					
l. Regulated Entity Property on Consumers' Premises (not forming part of Distribution Connection Assets)					
m. Street Lights and Signal Systems					
n. Submarine Cables					
2. General Plant (Non-network Assets)					
a. Land and Land Rights (non-network related)					
b. Structures and Improvements (non-network related)					
c. Office Furniture and Equipment					
d. Transportation Equipment					
e. Stores Equipment					
f. Tools, Shop and Garage Equipment					
g. Laboratory Equipment					
h. Information Systems Equipment (non-network related)					
i. Power-operated Equipment					
j. Communication Plant and Equipment					
k. Miscellaneous Equipment					
3. Materials and Supplines, including spares					
4. Transferred Sub-transmission Assets					
Distribution Connection Services Assets					
1. Distribution Services					
a. Poles, Towers and Fixtures					
b. Overhead Conductors and Devices					
c. Underground Conduits					
d. Underground Conductors and Devices					
e. Distribution Transformers					

All values must be provided as *Thousands*
Please complete areas identified as
Year 1 refers to the first year after the previous Regulatory Period

Asset Categories	Newly Adjusted Opening RAB for the first regulatory year of the current Regulatory Period *(refer Opening RAB sheet)*	Optimization Adjustment for current Regulatory Period	Year 1 Actual Nominal Asset Additions	Year 2 Actual Nominal Asset Additions	Year 3 Actual Nominal Asset Additions	Year 4 Actual Nominal Asset Additions
Regulated Distribution Services Assets						
1. Distribution Services						
a. Land and Land Rights (dedicated to distribution purposes)						
b. Structures and Improvements (dedicated to distribution purposes)						
c. Substation Equipment						
- Power Transformers						
- Switchgear						
- Protective Equipment						
- Metering and Control Equipment						
- Communications Equipment						
- Other Station Equipment						
d. Poles, Towers and Fixtures						
e. Overhead Conductors and Devices						
f. Underground Conduits						
g. Underground Conductors and Devices						
h. Distribution Transformers						
i. Power Conditioning Equipment						
j. Meters, Metering Instruments & Metering Transformers (dedicated to distribution purposes)						
k. Information Technology Equipment (dedicated to distribution purposes)						
l. Regulated Entity Property on Consumers' Premises (not forming part of Distribution Connection Assets)						
m. Street Lights and Signal Systems						
n. Submarine Cables						
2. General Plant (Non-network Assets)						
a. Land and Land Rights (non-network related)						
b. Structures and Improvements (non-network related)						
c. Office Furniture and Equipment						
d. Transportation Equipment						
e. Stores Equipment						
f. Tools, Shop and Garage Equipment						
g. Laboratory Equipment						
h. Information Systems Equipment (non-network related)						
i. Power-operated Equipment						
j. Communication Plant and Equipment						
k. Miscellaneous Equipment						
3. Materials and Supplines, including spares						
4. Transferred Sub-transmission Assets						
Distribution Connection Services Assets						
1. Distribution Services						
a. Poles, Towers and Fixtures						
b. Overhead Conductors and Devices						
c. Underground Conduits						
d. Underground Conductors and Devices						
e. Distribution Transformers						
f. Information Technology Equipment (dedicated to Distribution Connection Services)						
2. General Plant (Non-network Assets)						

APPENDIX B: OPTIMIZATION[30]

B.1 Introduction

The optimization of a DU's assets shall be undertaken in accordance with the requirements of Section 4. The general approach is to systematically test (i) the network configuration, (ii) the network capacity/voltage and (iii) the network engineering against the DU's disclosed quality of supply criteria. The network is adjusted in an incremental fashion in situations where it is found that a more cost-efficient design will meet the pre-determined criteria. This section describes the **minimum tests** that shall be applied in all cases in order to optimize a DU's network in accordance with the requirements of this Handbook.

Note that the intent is to arrive at the most cost effective DU supply network that meets with (i) the DUs quality of supply and (ii) the forecast electrical demand for the allowed planning period, within the boundaries of the optimization method.

Optimization of the DU's Network Configuration

B.2 Points of Supply and Delivery Point Substations

Issue (a): Whether all the existing points of supply (POS) and delivery point substations are required, given the allowed quality of supply criteria.

Approach: The location and supply voltage for the existing POS and delivery point substations may be considered fixed. All POS shall be tested to determine whether a more cost-efficient DU network would result if the POS were eliminated and the load supplied from adjacent POS. If possible, the POS shall be optimized out and replaced with a notional and more cost-efficient DU network. For example, an existing DU network is supplied via 4 x 69kV lines emanating from two POS. The network loading levels are light and there is little prospect of significant future load growth within the allowed planning periods outlined in Section 4.3.4. The existing and future electrical load can be comfortably supplied using a more economic arrangement, involving only 2 x 69kV lines emanating from one POS, which still meets with the DU's disclosed quality of supply criteria. The other 2 x 69kV lines (and any associated Delivery Point Substation termination equipment, land and easements owned by the DU) should be optimized out.

B.3 Sub-transmission (HV) Circuits

Issue (a): Whether the number of sub-transmission lines/cables exceeds the number required given the DU's quality of supply criteria and the forecast future load growth within the allowed planning period.

Approach: The route of each line/cable may be considered fixed. Assess the required number of sub-transmission lines/cables in relation to the allowed quality of supply criteria and future load growth within the allowed planning period. Optimize out those lines/cables that are not required. For example, an existing DU's sub-transmission network is supplied from a single delivery point substation via 3 x 69kV lines. Given the projected loading levels (over the entire planning period) the existing DU network is afforded with (N-2) security, whilst the DU's quality of supply criteria indicates only (N-1) security

[30] "Valuation Handbook for Optimized Depreciated Replacement Cost Valuation of System Fixed Assets of Privately Owned Distribution Utilities Operating Under Performance-Based Regulation (Third Regulatory Period)", Energy Regulatory Commission, July 2010.

is required. One of the 69kV lines, together with any associated delivery point substation termination equipment, land and easements owned by the DU should be optimized out and the other two 69kV lines should be considered for optimization down to a lower conductor size. In extreme cases it may be necessary to consider supplying consumer demand at a lower operating voltage whilst still meeting with the DU's quality of supply criteria. The notional/optimized network should be based on an achievable and acceptable network design.

B.4 Distribution Substations

Issue (a): Whether the number of distribution substations exceeds that which is required to meet the DU's quality of supply criteria and projected future load growth within the allowed planning period.

Approach: The location of all distribution substations may be considered fixed. Each substation shall be tested to determine whether a more cost-efficient network would result if distribution substations (and their associated supply/tie-lines) were eliminated whilst still meeting with the DU's quality of supply criteria. Network Assets that are not required should be optimized out. For example, a DU's network includes a 69/23kV substation that was built to supply a factory that has closed down. With the loss of the factory the substation has been reconfigured to supply the surrounding 23kV distribution network, but is still lightly loaded. If the 69/23kV substation is removed from service and the 23kV network reconfigured the adjacent 69/23kV substations can comfortably supply the network demand whilst still meeting with the DU's allowed quality of supply criteria. The 69/23kV substation should be optimized out. Again the notional/optimized network should be based on an achievable and acceptable network design. In this situation it may also be necessary to optimize out the sub-transmission circuits supplying the substation in accordance with B.3 above.

Issue (a): Whether the busbar/switchboard arrangements and configurations are required to meet the DU's quality of supply criteria and projected future load growth within the allowed planning period.

Approach: Consider whether double bus and/or double breaker arrangements should be optimized to breaker-and-a-half or single-bus arrangements. In those locations where the redundancy associated with dual busbar/switchboard arrangement is not required optimize out the duplication.

B.5 Primary (MV) Distribution Circuits

Issue (a): Whether the number of primary distribution lines/cables exceeds the number required given the DU's quality of supply criteria and the forecast future load growth within the allowed planning period.

Approach: The route of each line/cable may be considered fixed. Assess the number of primary distribution lines/cables in relation to the allowed quality of supply criteria and future load growth within the allowed planning period. Optimize out those lines/cables that are not required. For example, a DU's network contains a 13.8kV feeder that consists of a lightly loaded line that traverses from one distribution substation to another distribution substation. The feeder/line follows a path that contains other 13.8kV lines and it would be possible to transfer the distribution/line transformers (loads) from the lightly loaded feeder to other lines without exceeding the DU's security criteria (given the load forecast for the allowed planning period). The lightly loaded feeder should be optimized out based on an achievable and acceptable network design.

Another example would be a primary distribution feeder built to supply a large industrial load that has been shut down and over subsequent years a small number of distribution transformers have been connected to the feeder. If

these distribution transformers could be more cost-effectively supplied by short spurs connected to a neighbouring feeder then the feeder in question (and its associated circuit breaker) should be optimized out and the affected line transformers assumed to be connected to the neighbouring feeder. The value of the short notional spur lines to the Distribution Transformers should be included in the optimized RAB.

Issue (b): Whether three-phase primary distribution lines are required.

Approach: Where an existing distribution line or a part of it is less than three-phase construction, the line shall be valued accordingly. Three phase primary distribution lateral lines that are in remote/rural areas where consumers have no requirement for three-phase supply shall be optimized to single-phase two wire lines provided the optimization meets with the DU's quality of supply criteria with a two wire arrangement. If significant numbers of three-phase laterals exist which could be optimized to single-phase the optimization can be undertaken by sample (i.e. examining a typical network section and determining the percentage of lines for optimization from three-phase to single-phase). This optimization percentage would then be applied across all the relevant part of the network.

Optimization of the Capacity/Voltage of Elements in the DU's Network

B.6 Delivery Point Substations

Issue (a): Whether all the equipment located at the delivery point substations is required, given the allowed quality of supply criteria.

Approach: Optimize the size of the equipment used, including transformers, to the lowest standard rating that meets the accepted quality of supply criteria coupled with the projected future load growth for the relevant planning period.

B.7 Sub-transmission (HV) Lines and Cables

Issue (a): Conductor and cable size and voltage.

Approach: Determine the required capacity and/or voltage of the line/cable given the allowed quality of supply criteria and the predicted load growth within the allowed planning period. Optimize down the size/voltage of the conductor or cable to the most cost-efficient standard size/voltage whilst still meeting with the allowed quality of supply criteria. If possible use the short-term line/cable ratings as appropriate. For example, a remote urban area is supplied via a 138/23kV substation which in turn is supplied via a single circuit 138kV line from a Delivery Point Substation that has both 138kV and 69kV assets. The 138kV supply line well exceeds that required to supply the projected urban area load within the planning period. It would be possible to supply the projected load whilst still meeting the allowed quality of supply criteria using a more economic 69kV single circuit line and associated 69/23kV substation. For valuation purposes the existing supply network should be optimized down to a notional 69kV line coupled with a 69/23kV substation.

Issue (b): Whether underground cables are justified.

Approach: Review the existing underground sub-transmission to determine whether underground reticulation is justified.

Possible justifications for undergrounding include:

i. local authority planning criteria prohibit the construction of new overhead circuits;

ii. the use of underground cable is the most cost-efficient means of achieving the disclosed quality of supply criteria;
iii. economic analysis shows that underground cable is the most cost-efficient method of providing the required network service;
iv. consultation with customers affected (including those affected by having to pay higher electricity distribution prices) has demonstrated a willingness to pay the additional cost of the underground service; or
v. the existing underground cable was funded by a capital contribution equal to, as a minimum, the difference in the capital cost of overhead and underground circuits.

If suitable justification for the existing underground cables cannot be provided then optimize the underground circuits to overhead. The justification for retaining underground cable in the optimized network shall be described in general terms in the Independent Expert's Report.

B.8 Distribution Substations

Issue (a): Under-utilized equipment installed at substations.

Approach: Optimize the size of the equipment used, including transformers, to the lowest standard rating that meets the accepted quality of supply criteria coupled with the projected future load growth for the accepted planning period. For example, a Distribution Substation is equipped with a single 40MVA transformer, whilst the peak projected demand over the planning period is 18MVA. The use of a 20MVA unit would meet with the DU's quality of supply criteria, and the DU has 20MVA units installed in other substations. The 40MVA transformer should be optimized down to 20MVA.

Issue (b): Over-rated equipment installed at substations.

Approach: Optimize the nominal and fault ratings of the equipment used in substations to the lowest standard rating that meets the accepted quality of supply criteria coupled with the projected future load growth and network developments over the accepted planning period. For example, a substation is equipped with 40kA fault rated equipment and the fault level is projected to increase only marginally within the accepted planning period. The DU widely uses 18kA fault rated equipment and it would be adequate for the planning period. The relevant substation should be optimized down to 18kA fault rated MEA.

B.9 Primary Distribution (MV) Lines and Cables

Issue (a): Conductor and cable size and voltage.

Approach: Determine the required capacity and/or voltage of the primary distribution lines/cables given the allowed quality of supply criteria and the predicted load growth within the allowed planning period. Optimize down the size/voltage of the conductor or cable to the most cost-efficient standard size/voltage whilst still meeting with the allowed quality of supply criteria. If possible use the short-term line/cable ratings as appropriate. For example, the primary distribution feeders associated with a distribution substation are lightly loaded. The distribution lines can be optimized to a lower conductor size (i.e. from 336MCM to 4/0) without breaching the DU's primary distribution line quality of supply criteria (given the forecast demand for the allowed primary distribution line planning period). The primary distribution lines should be optimized down unless the higher capacity can be justified on the basis that it is required to backup an adjacent Distribution Substation or primary distribution feeder in the event of a contingency situation arising.

Issue (b): Whether underground cables are justified.

Approach: Review the existing underground primary distribution cables to determine whether underground reticulation is justified.

Possible justifications for undergrounding include:

i. local authority planning criteria prohibit the construction of new overhead circuits;
ii. the use of underground cable is the most cost-efficient means of achieving the disclosed quality of supply criteria;
iii. economic analysis shows that underground cable is the most cost-efficient method of providing the required network service;
iv. consultation with customers affected (including those affected by having to pay higher electricity distribution prices) has demonstrated a willingness to pay the additional cost of the underground service; or
v. health and safety reasons.

If there is clear evidence that underground cables cannot be justified then optimize them to overhead lines.

Issue (c): Underground cable trenching.

Approach: Optimize the trenching arrangement of existing underground cables. Cables running close together, or on the same side of any road or street shall be optimized to a single trench except where this would not meet the quality of supply criteria. Derating factors applicable to cables run in a single trench should be considered when making this assessment. If more than one underground cable is laid in a trench, only the incremental cost of the additional cable(s) may be included in the valuation.

Issue (d): Overhead lines constructed along the same street.

Approach: Optimize the overhead arrangement of existing overhead lines. Overhead lines running close together, or on the same side of any road or street shall be optimized to a double circuit or under-built line except where this would meet with the quality of supply criteria. For under-built lines only the incremental cost of the additional conductor and pole-top hardware may be included in the valuation. For example, due to different construction timings a new 23kV overhead line has been installed adjacent to an existing 23kV overhead distribution line. The most economic configuration is a single pole line supporting both 23kV circuits. The two existing lines should be optimized to a notional double circuit 23kV line.

B.10 Distribution Transformers (pole, kiosk, ground types)

Issue: Utilization of transformer capacity.

Approach: Optimize out excess distribution transformer capacity so that the capacity utilization is at a level judged to be efficient for the DU, given its load and supply characteristics. If maximum demand information is available for individual distribution transformers they should be individually optimized to the lowest possible standard size, whilst considering the transformer's projected demand for the allowed planning period. This approach should be applied to all DU owned transformers supplying individual customers.

For those distribution transformers where individual maximum demands are not available the optimization should be based on transformer capacity utilization which is defined as follows:

Utilization (%) = Peak Demand (MVA) x 100
Total Distribution Transformer Capacity (MVA)

If a DU's transformer utilization level is less than 30%, then distribution transformer capacity should be optimized out such that the optimized network has a distribution utilization level that is greater than 30%. Any distribution transformer capacity adjustments that are made shall be disclosed and the methodology used clearly explained in the Independent Expert's Report. Transformer capacity that is optimized out shall be valued at the average depreciated replacement cost (DRC) per kVA of the DU's transformer equipment.

DUs may separate out segments of the network and apply the above formula (i.e. distribution (MV) feeders). Again, if this approach is taken, details shall be included in the optimization description included in the Independent Expert's Report.

When using the above formula care should be taken to:

i. separate out the capacity associated with privately owned distribution transformers;
ii. ensure that the peak demand value used includes only the electrical load which passes through the distribution transformers being analyzed. The need to remove load that does not pass through the distribution transformers may mean that the peak load used in the analysis has to be estimated and details of the analysis used to arrive at the peak load estimate should be included in the Independent Expert's Report; and
iii. account for embedded generation that would reduce peak network demand levels.

B.11 Secondary (LV) Distribution

Issue (a): Whether secondary distribution underground cables are justified.

Approach: Review existing underground secondary distribution (LV) cables to determine whether undergrounding is justified. Possible justifications for undergrounding include:

i. local authority planning criteria prohibit the construction of new overhead circuits;
ii. the use of underground cable is the most cost-efficient means of achieving the accepted quality of supply criteria;
iii. economic analysis shows that underground cable is the most cost-efficient method of providing the required network service;
iv. consultation with customers affected (including those affected by having to pay higher electricity distribution prices) has demonstrated a willingness to pay the additional cost of the underground service; or
v. health and safety reasons.

If there is clear evidence that underground cables cannot be justified then optimize them to overhead lines.

Issue (b): Underground primary distribution trenching.

Approach: Optimize the trenching arrangement of existing underground cables. Cables running close together, or on the same side of any road or street shall be optimized to a single trench except where this would not meet the accepted quality of supply criteria. Derating factors applicable to cables run in a single trench should be considered when making this assessment. If more than one underground cable is laid in a trench only the incremental cost of the additional cable(s) may be included in the valuation.

Optimization of Network Engineering

B.12 System Control And Communication

Issue (a): Degree of sophistication of SCADA equipment.

Approach: Determine whether the equipment is appropriate on the basis of disclosed Quality of Supply criteria. Reduce replacement cost to that of a MEA of the required sophistication. Consideration should also be made regarding the optimization of control centres. For example, a DU consists of the amalgamation of six historical networks that include the associated original six control centres. The MEA would be a notional single control centre with an associated notional emergency backup control centre. There may be reasons to maintain multiple active control centres (i.e. for security reasons) and if this is the case the reasons should be clearly outlined in the Independent Expert's Report. The use of fibre/communication networks for system control should be limited to the amount required to control/operate the electrical network. Underutilized fibre should be optimized out.

B.13 Distribution Substations

Issue (a): Land and buildings.

Approach: Optimize indoor substations to outdoor where land is available and where this will result in a more cost-efficient design unless there are clear technical or security reasons or local authority requirements that prevent this. Optimize out any unutilized or under-utilized land so that the value of the land allowed reflects only the area of land required to meet the accepted quality of supply criteria and projected future load growth for the accepted planning period. Reduce the replacement cost of buildings to that of a simple standard modern structure cost effective design. A higher standard of construction is allowed only where the DU can provide evidence to show that a lower cost design will not meet local authority planning requirements, given the location of the substation. The size of the optimized design should not exceed that required to meet the essential functionality of the building.

Issue (b): Whether substation engineering exceeds DU requirements.

Approach: Review the standard of engineering of each substation. If possible, recent projects undertaken by the DU should be used as a benchmark for this test. If it is found that a more cost-efficient standard of engineering would meet the accepted quality of supply criteria, the existing assets should be notionally re-engineered and the replacement costs reduced accordingly. Compliance with territorial local authority conditions for the substation location should be retained in any notional redesign.

Issue (c): Fire protection and oil retention facilities.

Approach: Include equipment currently installed unless not required for MEA. Again recent projects undertaken by the DU should be used as a benchmark for this test.

B.14 Secondary (LV) Distribution Lines/Cables

Issue (a): Whether the engineering of the secondary distribution network exceeds the standard required to meet the accepted quality of supply criteria.

Approach: Review the standard of engineering of the secondary/LV distribution network, using recent projects undertaken by the DU as a benchmark for this test. If it is found that a more cost-effective standard of engineering would meet the accepted quality of supply criteria, those parts of the low voltage network containing excess asset value should be notionally reconfigured so that they do not exceed the required standard. Assets that are not required should be optimized out. In applying this test, it is not required that DUs examine each individual primary/LV circuit. It is acceptable to estimate the proportion of the DU's low voltage distribution network that is over-engineered and apply an appropriate optimization factor. However details of the approach taken shall be included in the optimization description included in the Independent Expert's Report.

B.15 Voltage Control Devices

Issues: (i) Degree of voltage control, (ii) Manual and on-load tap changes, (iii) Line regulators and line drop compensation (iv) Reactive compensation.

Approach: Test requirements for all existing voltage control devices and optimize out where there is no clear justification for the equipment. For example, a DU's distribution substation is equipped with a single 40MVA transformer bank with an Off Load Tap Changer (OLTC). The 13.8kV feeders are all equipped with line regulators adjacent to the substation. A more cost effective design involves the use of 40MVA transformer bank equipped with OLTC and the DU has recently installed a Distribution Substation Transformer with OLTC. If cost effective the line regulators should be optimized out and replaced with a notional 40MVA bank with OLTC capability.

B.16 Network Spares

Issue: The extent/quantity of network related spares.

Approach: An assessment should be made of network spares. Those spares which are of inappropriate type, or which for whatever reason are unlikely to be used by the DU within the relevant planning horizon, should be optimized out. Spares would likely be classified as (i) critical contingency spares (for N-1 security), (ii) emergency spares and (ii) routine spares (for maintenance). The extent of the spares will be dictated by (i) equipment procurement lead times and (ii) asset failure rates and (iii) network reliability requirements. Network spares should not be dictated by the DU's inventory associated with capital works. The stores history pertaining to spares shall be taken into account when assessing reasonable levels of spares.