

Distribution Value Added

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CONTENTS

1. Introduction
2. How to calculate DVA
3. Costs by Voltage Levels
4. Required Revenue
5. NRV Optimization
6. Grid Operation Costs

1.- INTRODUCTION

Rates paid by users for electricity service should reflect electric energy **efficient** production, transmission, and **distribution** costs. Hence, regulated rates have 2 basic components: **the node price**, related to generation and transmission cost,

INTRODUCTION

and the **Distribution Value Added**, which is the **cost** of **taking** electric energy from transmission or subtransmission **networks** and **carrying** it to industries, homes, businesses, etc.

2.- HOW TO CALCULATE DVA

The criterion followed consists of using demand-adapted **efficient model businesses** to determine distribution costs by voltage levels

2.- HOW TO CALCULATE DVA

REFERENCE NETWORK MODEL

Parameters

•CUSTOMERS

- Location
- Power

•QUALITY Slogans

•Unit COSTS

- Investment
- O&M

Scope

•MINIMIZATION

- Investment
- Losses

•CONSTRAINTS

- Quality

Results

•THEORETICAL GRID

- Substations
- TC's
- Lines

•FIXED INVESTMENTS

•O&M COSTS

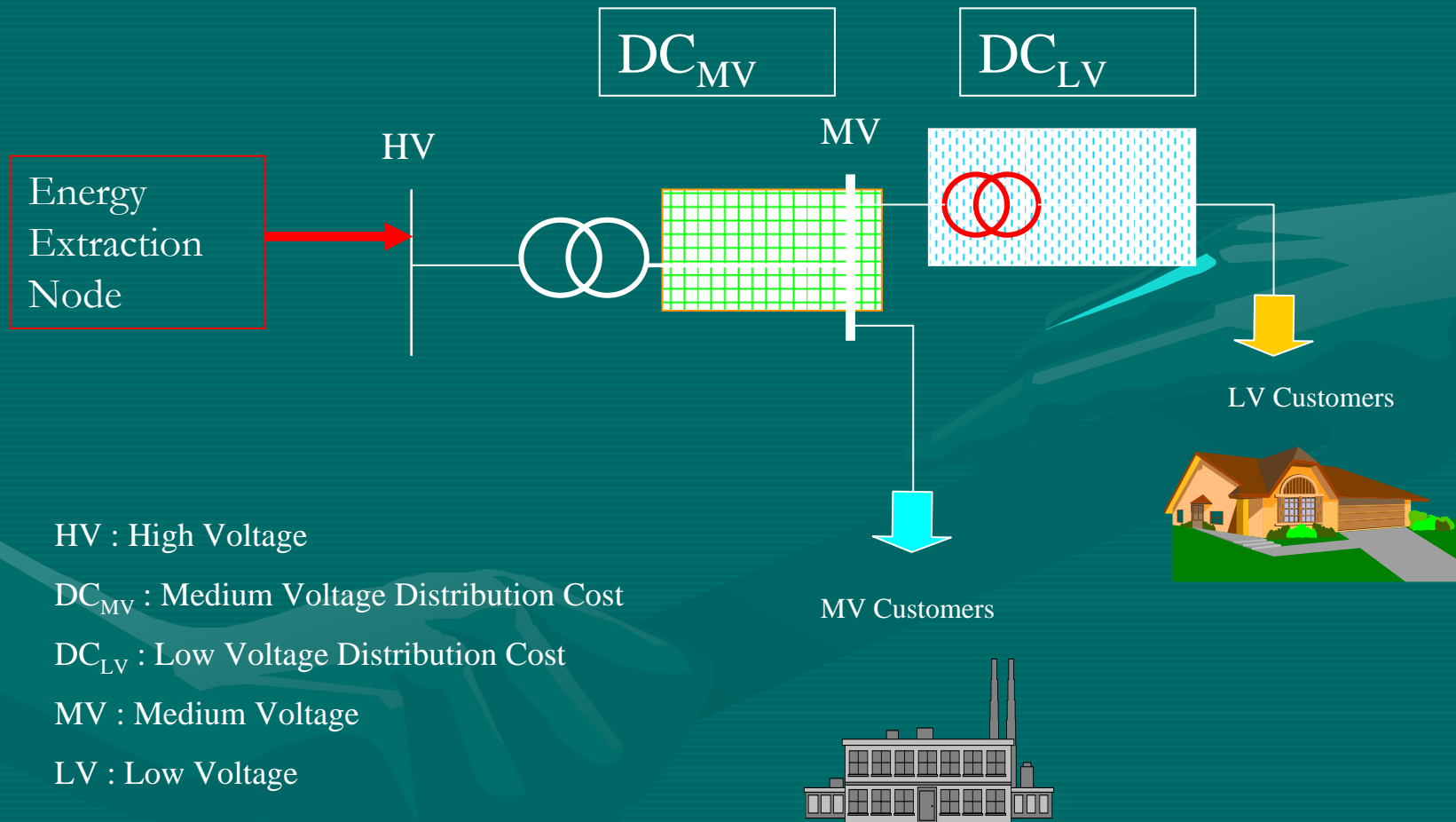
2.- HOW TO CALCULATE DVA

MODEL USE

The reference network model is used by the regulator to:

- Assist in **SETTING INITIAL DISTRIBUTION** of compensation pool
- Measure the company's **TECHNICAL EFFICIENCY EVOLUTION** with time
 - *Starting with the reference grid for Year 0, demand is increased by the value expected in the next few years to get the needed grid increase and, hence, the required costs.*

2.- HOW TO CALCULATE DVA



2.- HOW TO CALCULATE DVA

DVA includes:

Distribution costs, or DC (MV, LV, and HP facility grid)

Marketing expenses, or ME (Customer Service and Metering Equipment)

DVA is calculated for an electrical distribution service provider that operates in an efficient and wise manner:

Investing in and managing a minimum cost network;

Designing and managing a business structure geared to service quality and safety, valued at market prices, and adequately marketing its services

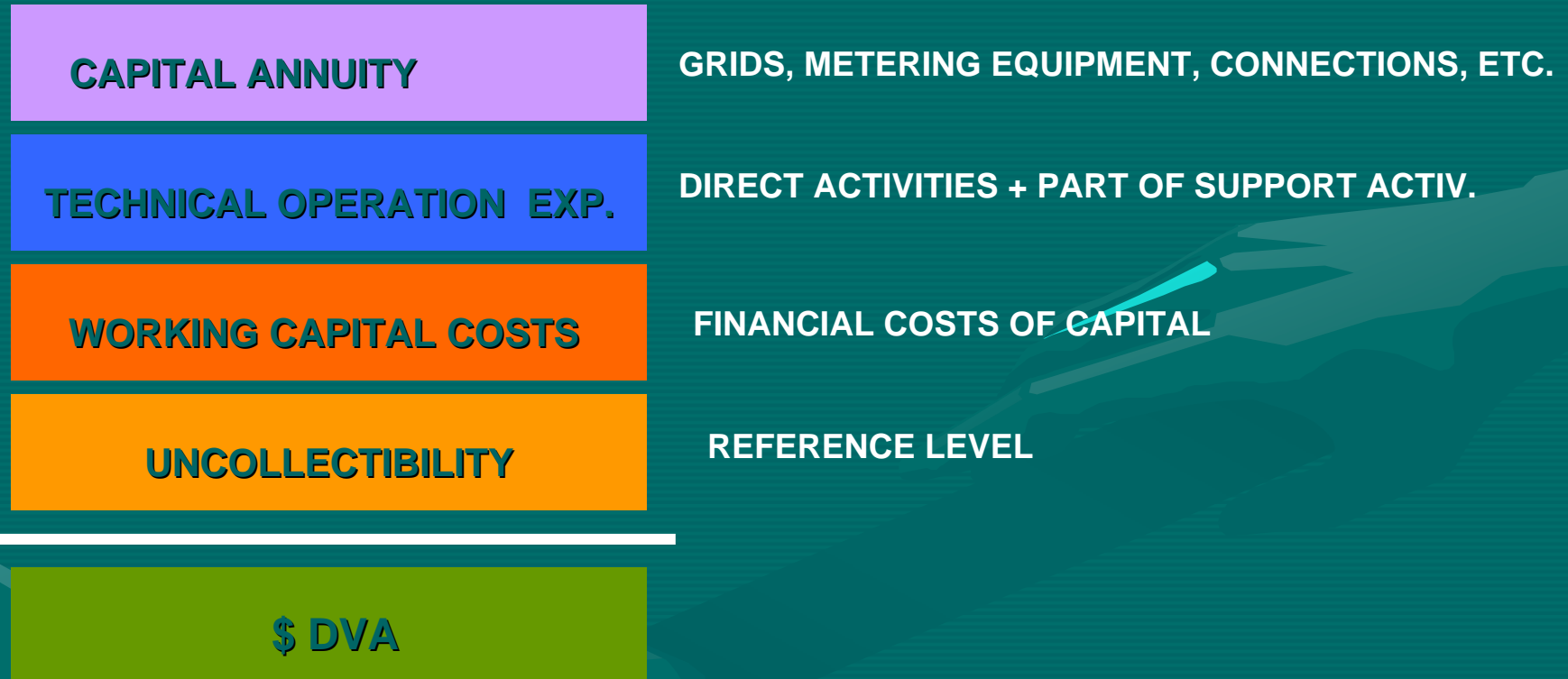
2.- HOW TO CALCULATE DVA

Parameters taken into account are:

- Geographic characteristics of the area
- Demand
- Technical and policy constraints

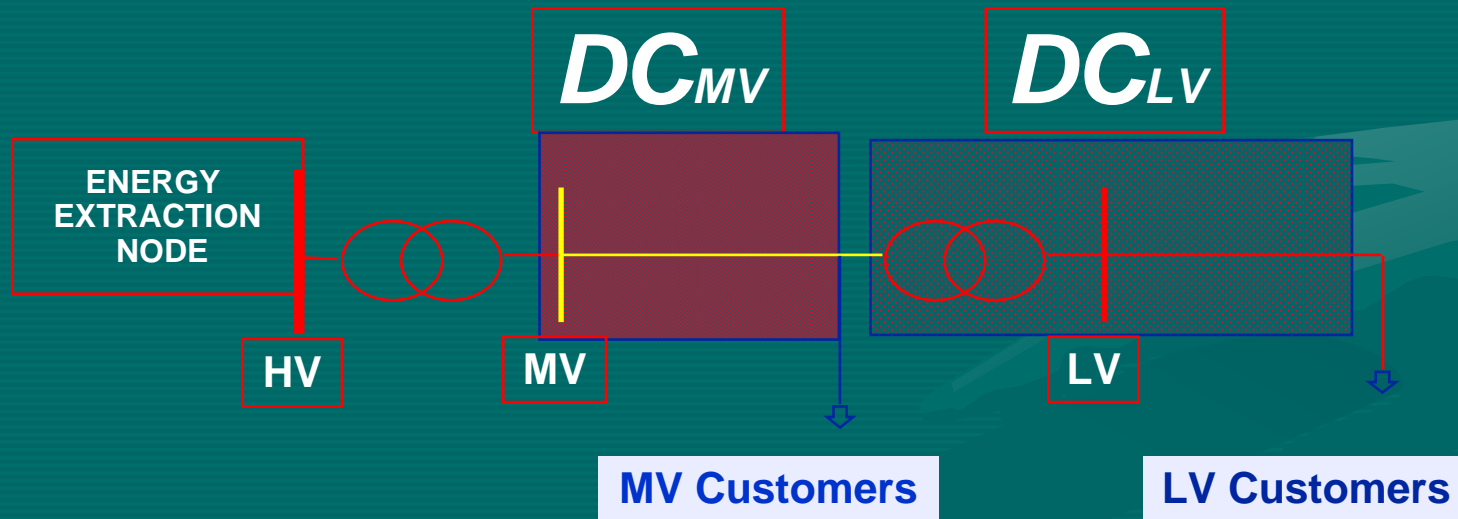
2.- HOW TO CALCULATE DVA

What is taken into consideration?



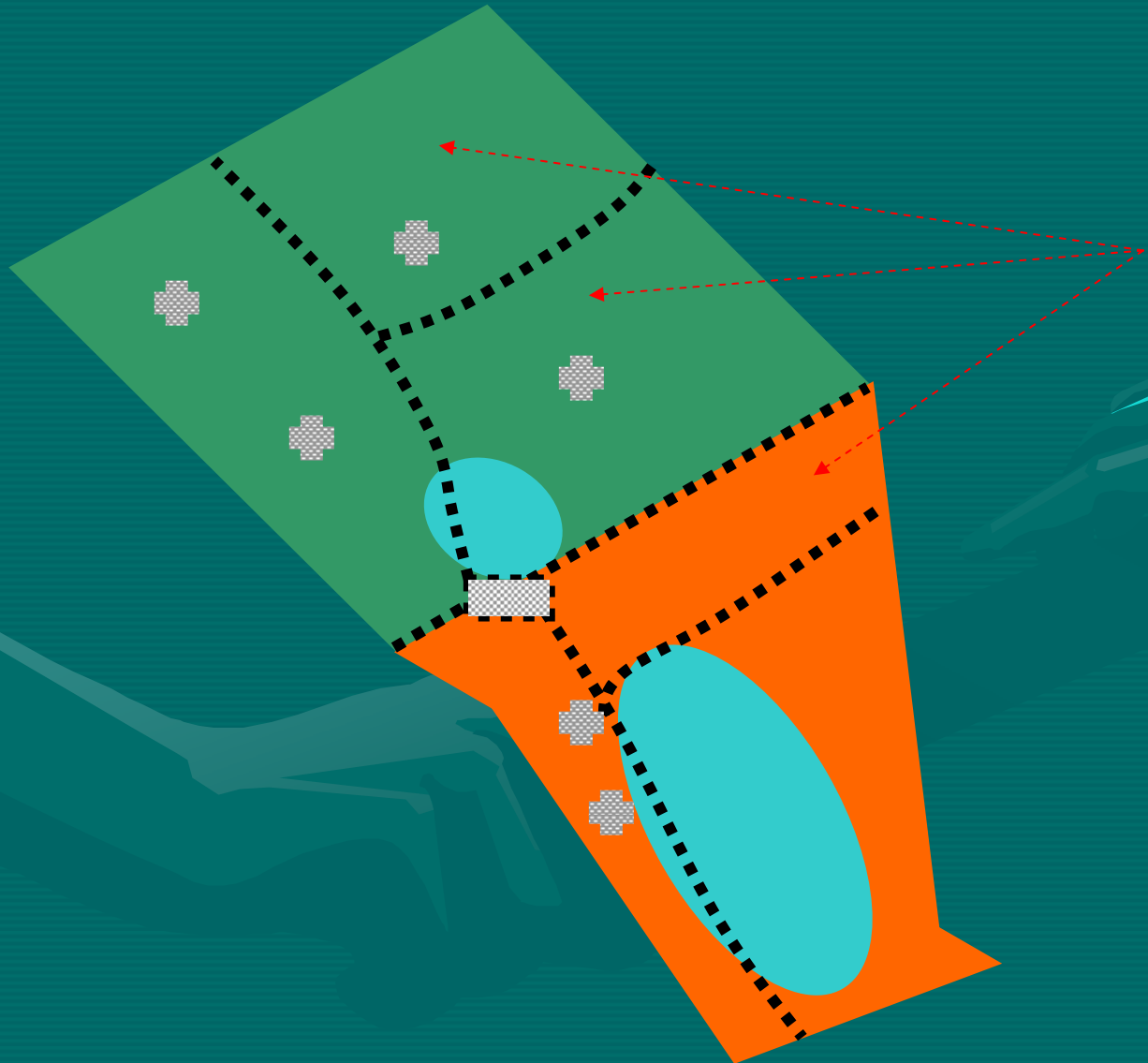
2.- HOW TO CALCULATE DVA

What is being compensated?



$$DC_{MV/LV} = \left(\frac{CapitalAnnuityC + OperationC}{PeakPower / 12} \right)$$

3.- DETERMINING COSTS BY VOLTAGE LEVELS.



-Demand study and projection by typical (urban and rural) area.

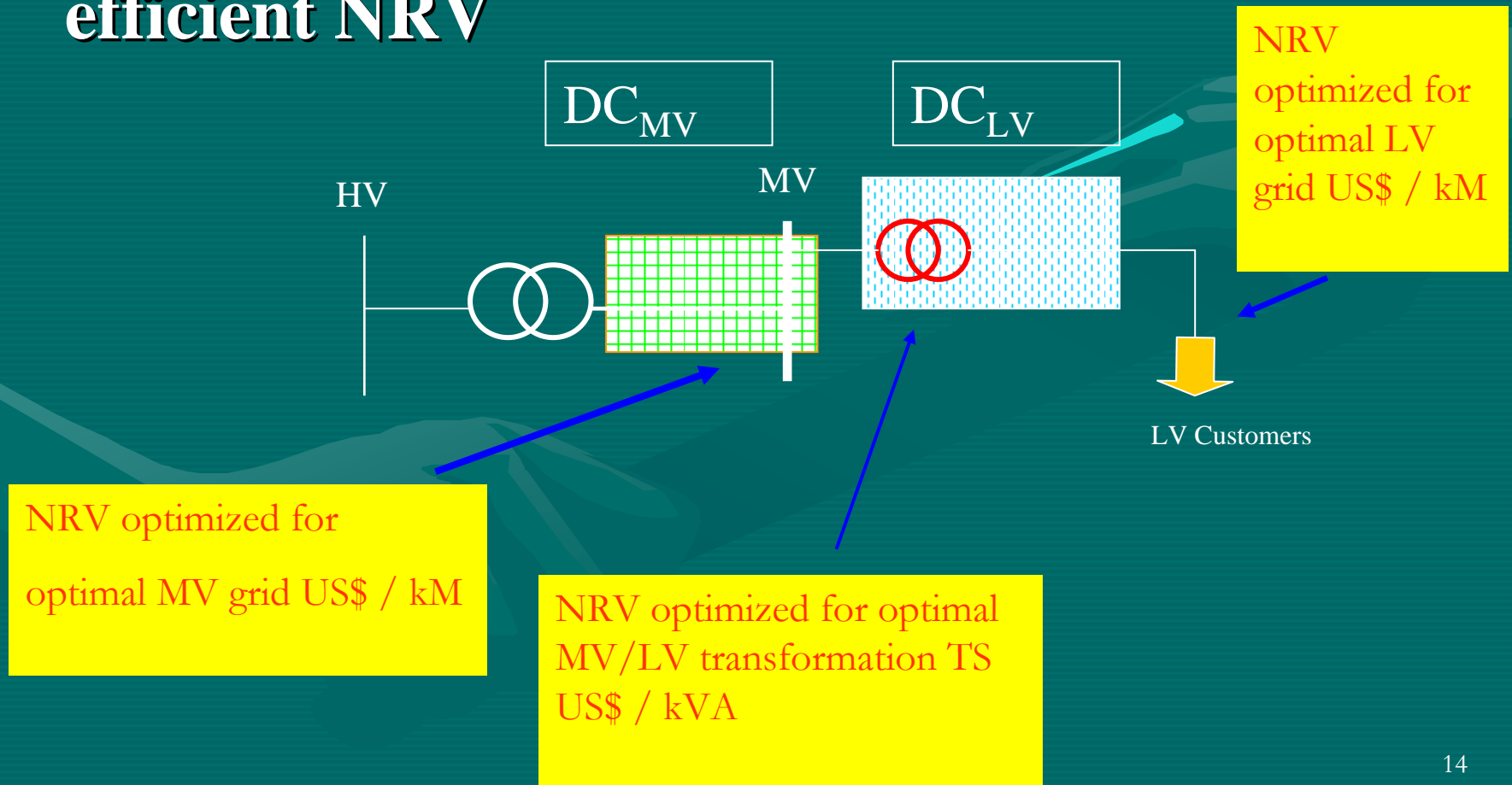
-Determining facilities New Replacement Value (NRV).

-Calculation of efficient technical losses.

-Efficient commercial costs.

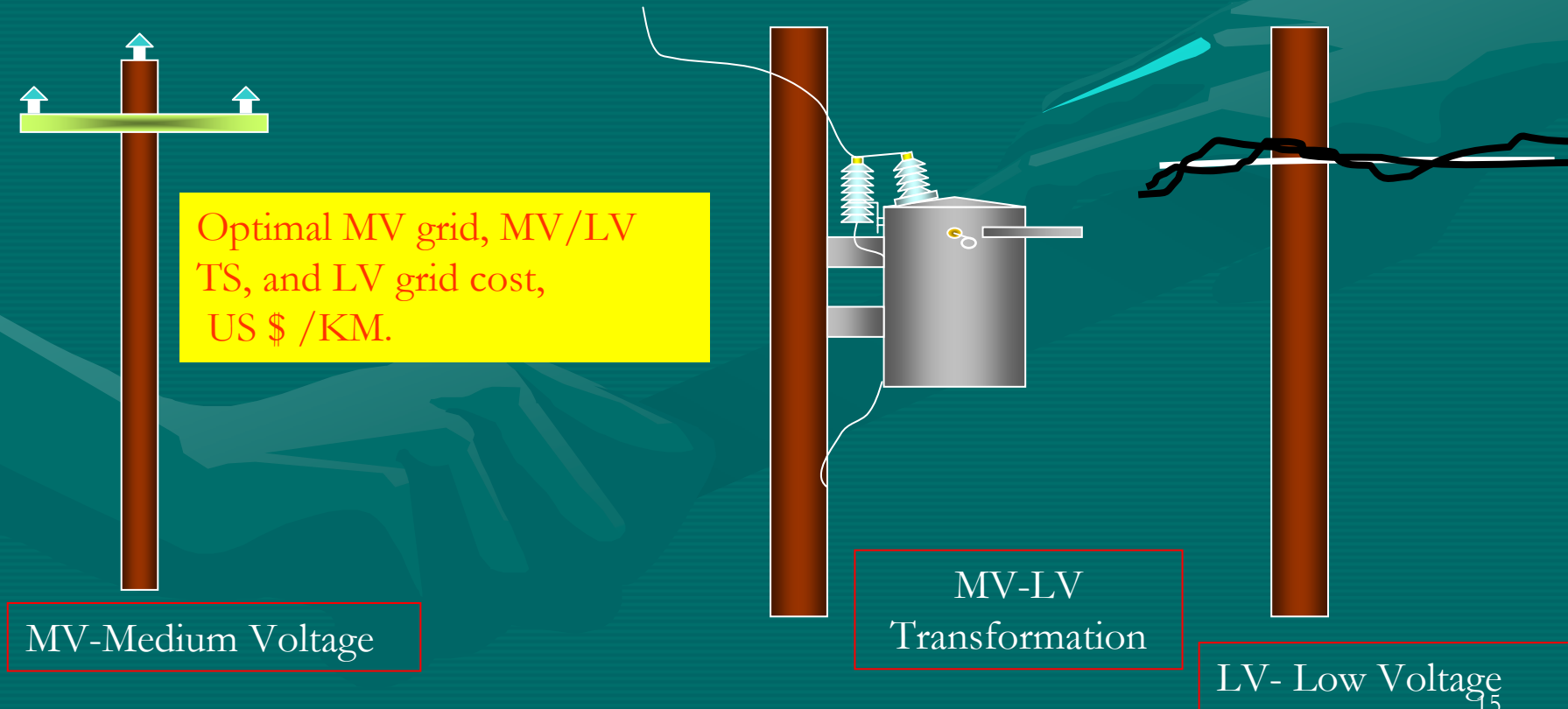
4. REQUIRED REVENUE CALCULATION

Grid replacement value cost study---Cost-efficient NRV



4. REQUIRED REVENUE CALCULATION

Study on optimal Operation &
Maintenance costs by voltage level.



4. REQUIRED REVENUE CALCULATION

Study on commercial operation costs for efficient model company.

- Commercial Office and Store Requirements. Efficient Company.
- Provision of staff, equipment, and work means. Efficient Company.
- Electric material requirements and others.
- Administrative expenses. Efficient.

REQUIRED REVENUE CALCULATION

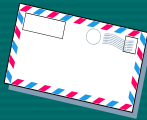
What is compensated?



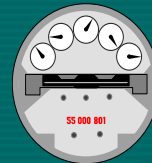
Meter Reading



Customer Service



Billing and Mailing



Metering Equipment



Collection Management

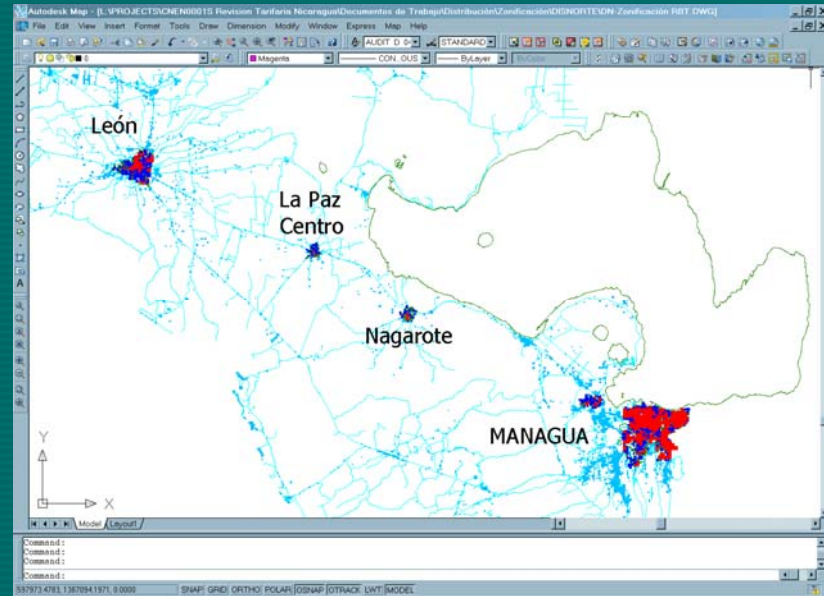
Costs

$$CommercC_{CATEGORY} = \frac{ReadingC + BillingC + ServiceC}{Numb_Customers / 12} + \frac{MeterC_{ANNUITY}}{12}$$

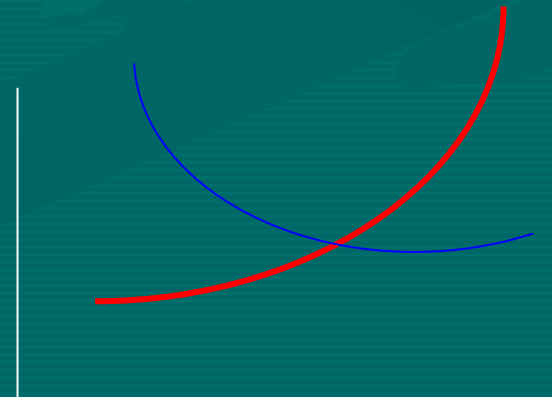
5. NRV OPTIMIZATION

MV Grid

- Load flow run
 - Feeder load state and technical loss calculation
 - Feeder selection by technology
 - Lowest cost feeder determination.
- Investment vs Losses



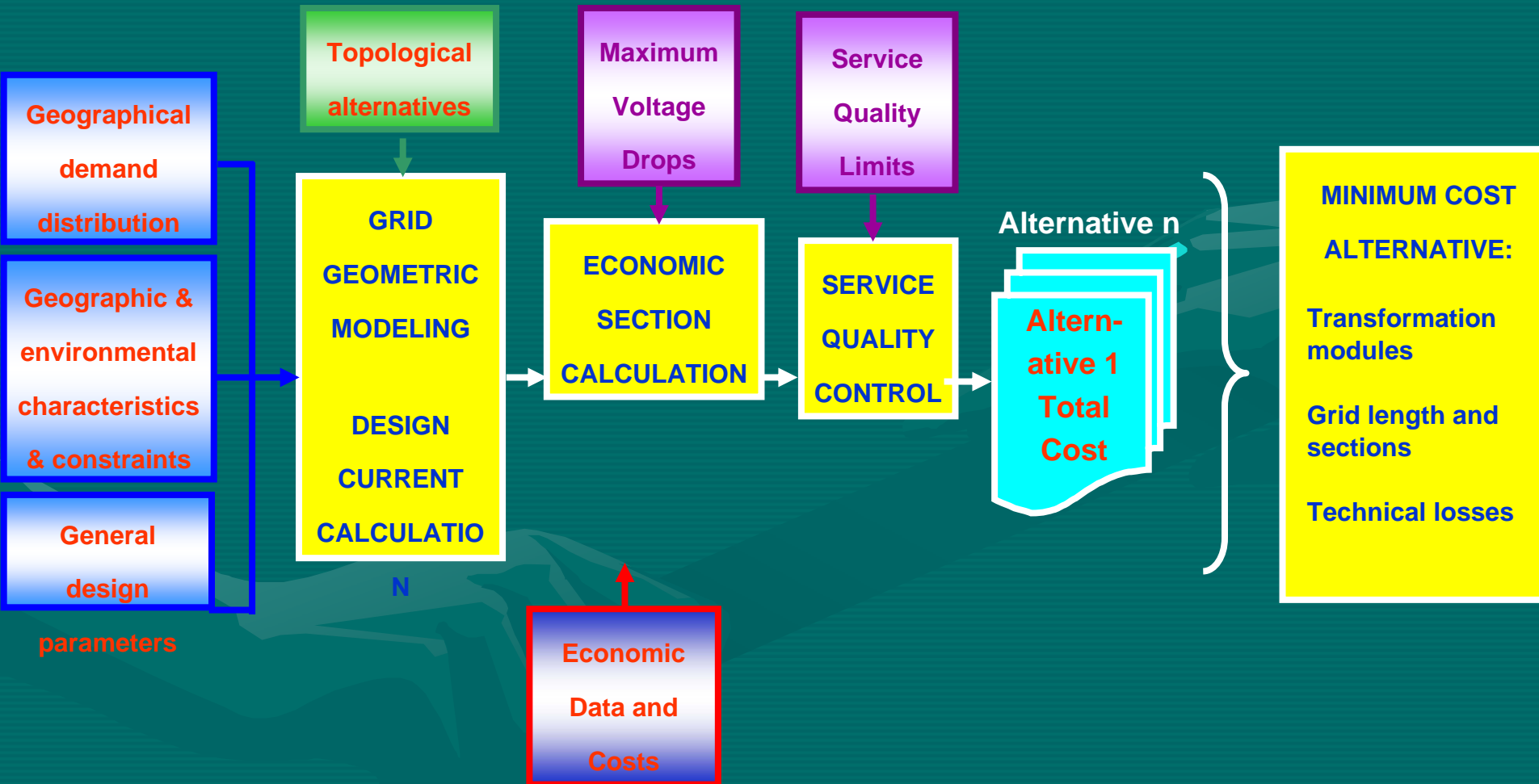
Investments US \$



Demand

5. NRV OPTIMIZATION

LV grid optimization



6. GRID OPERATING COSTS

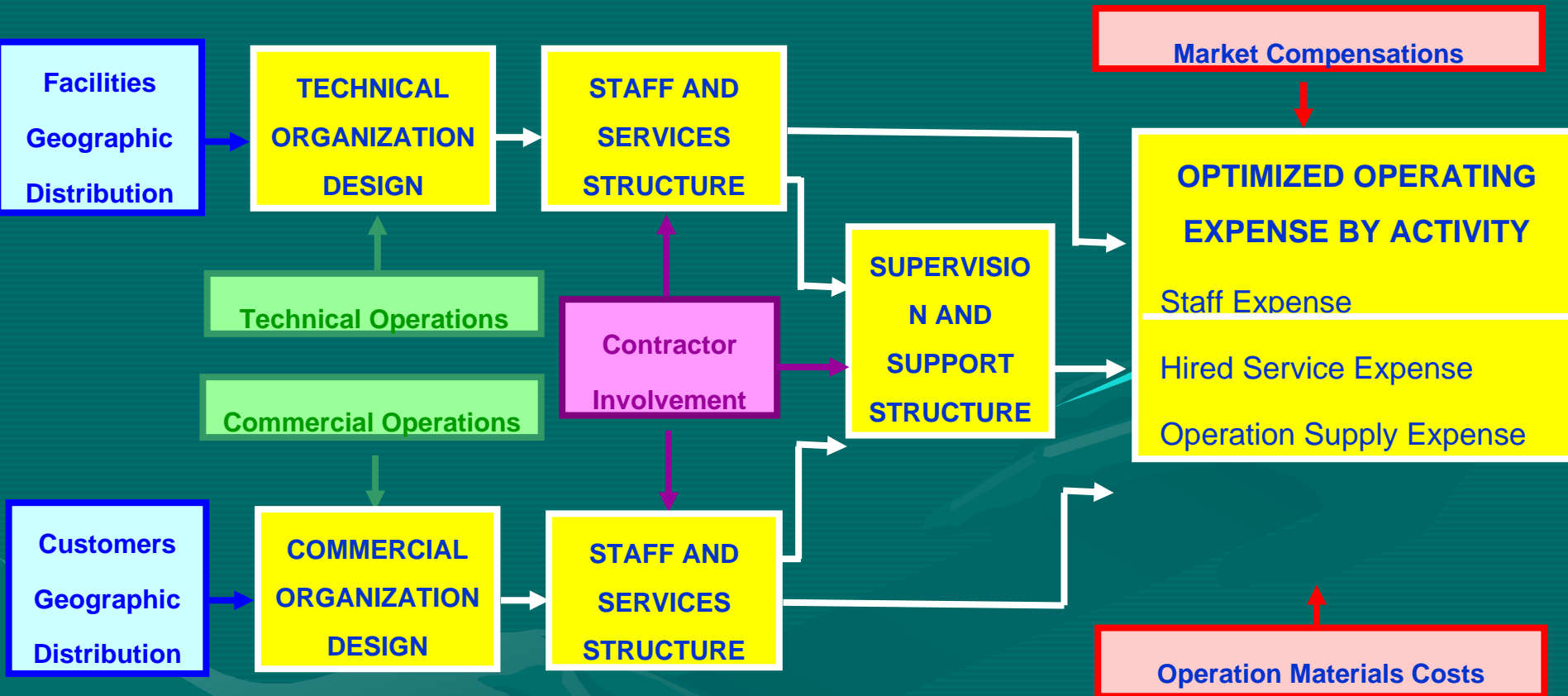
Distribution company costs related to grid operation, maintenance, and expansion components may be grouped into:

- Investment Costs associated to Grid expansion
- Capital costs related to interests and asset depreciations
- Operating costs, including grid losses and maintenance.

6. GRID OPERATING COSTS

- General administrative and fixed costs
- New supply connection costs
- Reading and billing costs related to grid use.

Operating Expense Calculation Chart



Results

Annual Requirements in US\$

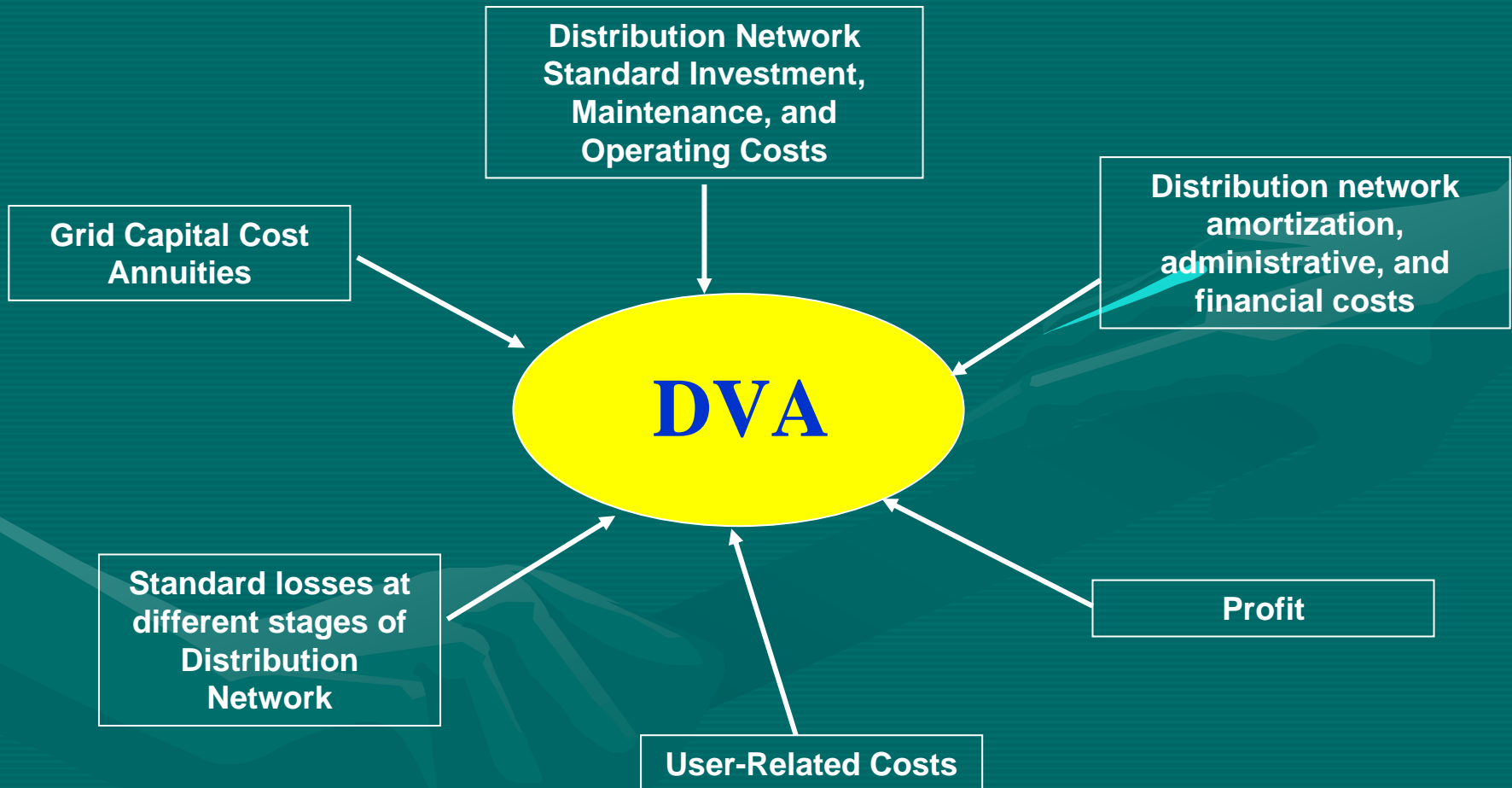
Item	DISNORTE & DISSUR
Capital Annuity	54.63
Technical Operating Costs	14.83
Commercial Operating Costs	10.71
Support Activity Operating Costs	7.25
Working Capital Cost & Uncollectibles	7.14
Total Distributor DVA	94.57

Note: Year 2003 costs

DVA Unit Value:

US\$44.2 /MWh

DVA CALCULATION PROCEDURE



MEAN TRANSMISSION COST-MTC

It is based on annual compensation to the national transmission company and has three basic components:

- 1) General Annual Compensation (GAC): made up of recognized investment (RIn) annuity, considering a 30-year useful life and the discount rate, plus recognized O&M costs (ROMC).
- 2) Particular Annual Compensation (PAC): consisting of NTS expansions made through agent initiatives and secondary system expansions.
- 3) Annual NLDC Operating Cost (ADC).

MEAN TRANSMISSION COST-MTC

It is computed through a Demand Economically Adapted System –EAS: electric energy transportation at the lowest installation and operation cost for transmission and transformation facilities in the system.

Typical load states with different TS use condition situations

Maximum and minimum demand

Maximum and minimum power plant production

Load states including contingencies with higher occurrence probability

M
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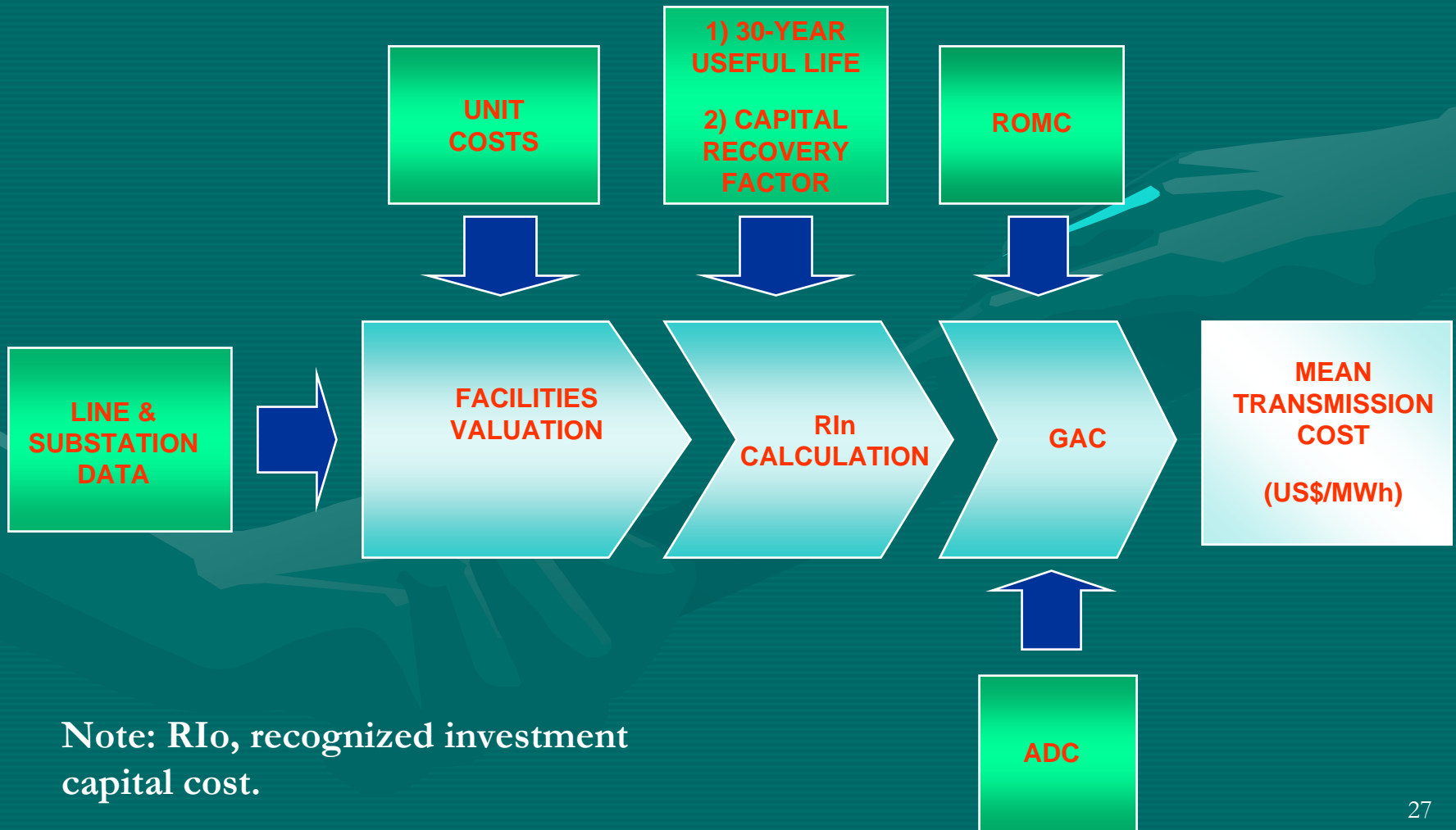
Load flows to determine Pmax. Transmitted on lines or transformer (Max. Load)

Max. Load vs Nominal Load Comparison

Nominal line capacity w/o max. transportation limit is determined as minimum value of conductor thermal limit, transient & dynamic stability limit

MEAN TRANSMISSION COST-MTC

Calculation Chart:



Note: RIo, recognized investment capital cost.

Substation NRV

230-138-69 kV SUBSTATIONS
SWITCHGEAR AREA

**HV
Equipment &
Accessories**

**UNIT COSTS +
ASSEMBLY**

**HV/MV
Transform.**

**UNIT COSTS +
ASSEMBLY**

**Command,
signalling,
alarm, and
protection
equipment**

**UNIT COSTS +
ASSEMBLY**

**Building
& Land**

LINE FIELD

**TRANSFORMER
FIELD**

COUPLING FIELD

CONTROL BUILDING

COMMAND PANEL

PROTECTION PANEL

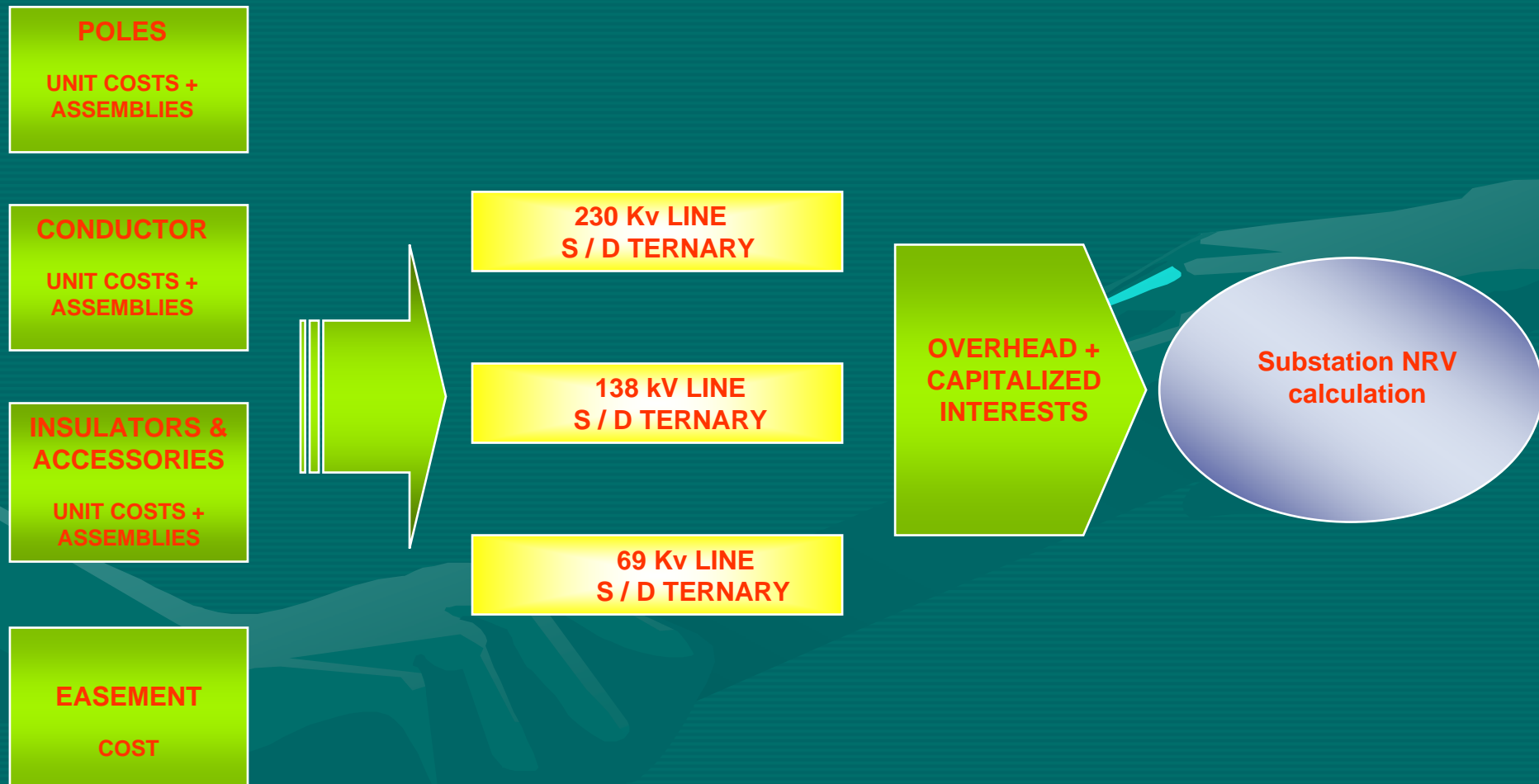
**SIGNALLING & ALARM
PANEL**

**AC/DC ANCILLARY
SERVICE PANEL**

**OVERHEAD +
CAPITALIZED
INTERESTS**

**Substation NRV
calculation**

HV Line NRV



MTC Value

MTC, based on transportation system toll, is determined as a summation of capital, operation and maintenance, NLDC operation cost, divided by projected base energy demand.

$$MTC = \frac{\sum (CC + ROMC + ADC)}{Demand} \times 10^3 \text{ \$ / year}$$

$$MTC_{\text{(For 2003)}} = \text{US \$4.6654 / MWh}$$