

# Performance Based Regulation of Philippines Electricity Distribution Companies

## REGULATORY TRAINING COURSE

Cebu – November 5 & 6, 2007  
Baguio – November 8 & 9, 2007

### SESSION 3B – PERFORMANCE INCENTIVE SCHEME



# Overview of the session

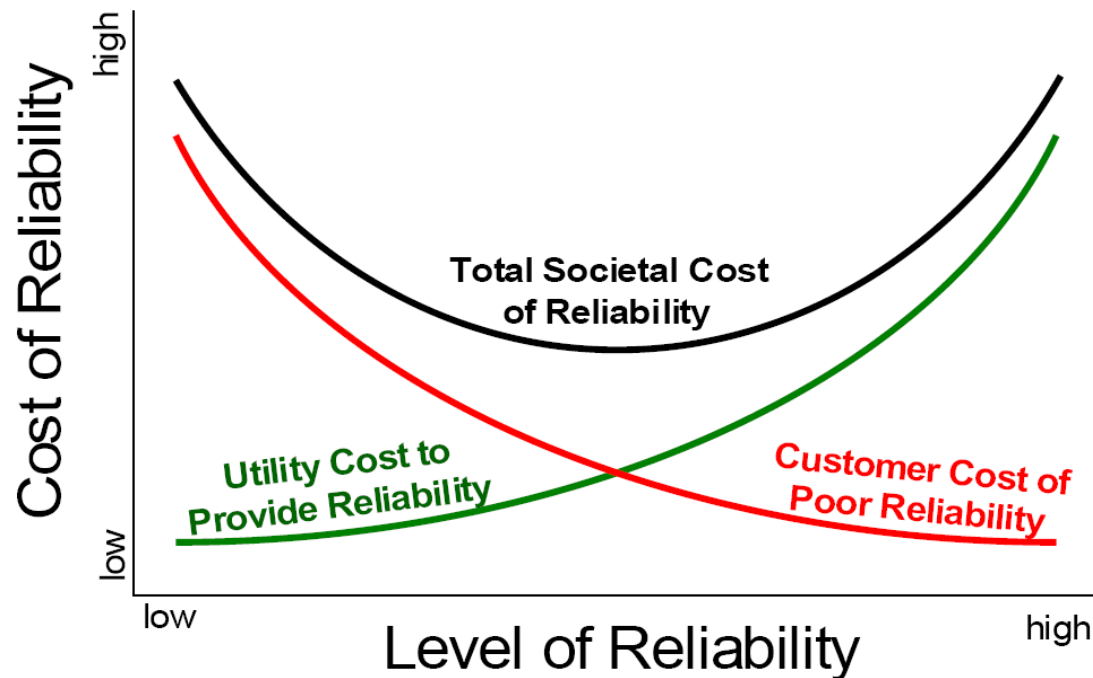
- This session will cover:
  - Principles behind the performance incentive scheme
  - The price-linked performance incentive scheme
  - The guaranteed service level scheme
  - Information disclosure
  - Excluded events

# Why regulate service quality?

- To ensure customers receive an acceptable quality of supply

BUT...

- Mainly because of the trade-off between technical supply quality and the cost to consumers to provide the service



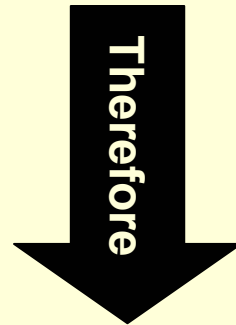
# Why regulate service quality?

In a regulatory environment, where

- revenue or prices are capped, or
- ex-ante (advance) approval of expenditure paths is granted

there is an incentive for utilities to reduce costs (maximising profit).

An obvious means to cut costs is to compromise quality.



Regulator controlling costs only, risks quality reduction

# What is quality in electricity distribution?

- General definition of quality:
  - Six sigma – “Anticipate and honour the need of an intending user”
  - ISO 9000 definition- “Quality is about meeting the needs and expectations of customers”
- Therefore – providing an electricity supply at service and reliability levels commensurate with customers’ requirements and their willingness to pay for this.
- Electricity supply quality however often defined in three dimensions:
  - Continuity of supply (reliability)
  - Commercial quality of supply
  - Technical, or signal quality of supply

# Continuity of supply

- Related to number and duration of supply interruptions
- Should reflect customer expectation of
  - Reliability (extent to which supply is continuously available)
  - Quick restoration after a supply interruption
  - Timely and reliable information when there is a problem
- Continuous supply not technically or economically feasible, so need quantitative measures of performance
- Quantitative measures of supply continuity include:
  - SAIDI : How long (on average per customer) power is not supplied
  - SAIFI : Number of extended power interruptions per year
  - CAIDI : Average duration of each sustained customer interruption
  - MAIFI : Number of momentary power interruptions per year
  - ENS, or un-served energy : Energy not supplied due to interruptions
  - CIT : Cumulative interruption time

# Commercial quality of supply

- Related to nature and quality of customer service provided
- Performance related to conditions of distribution & supply e.g. :
  - On-time provision of connection
  - Time to process connection application
  - Time to construct new connection, after approval
- Performance during period of contract eg. :
  - Billing & paying arrangements
  - Time of restoration of supply after minor fault
  - Response to queries & complaints
  - Response of call-centre or helpline
  - Keeping scheduled appointments

# Voltage or signal quality

- Related to disturbances in the power system or signal provided
- Typically technical of nature, but of great importance to customers
- Typical measures include:
  - Supply voltage fluctuations
  - Rapid voltage changes
  - Voltage “spikes”
  - Voltage dips
  - Voltage unbalance
  - Frequency distortion
  - Harmonic distortion
  - Flicker severity
- Generally voltage quality is governed by technical codes – not primary function of regulator

# ERC's purpose with quality regulation

- The purpose of quality regulation under PBR is:
  - Ensure existing quality levels do not deteriorate under price caps
  - Create incentives to improve service levels
  - Assist utilities to improve service performance management capacity
  - Support worst-served customers
  - Measure and compare service quality of utilities
- In future resets, regulation may also be used to ensure service level improvements

# Price-linked incentive scheme

- Recall the price-cap formula :

$$MAP_t = [MAP_{t-1} \times \{1 + CWI_t - X\}] - K_t + ITA_t + S_t$$

Price-linked  
incentive scheme  
factor.  
The focus of this  
session.

- The S-factor will allow:
  - average prices to increase (by up to 2.5%) if actual service performance exceeds target levels
  - average prices to decrease (by up to 2.5%) if actual service performance falls below target level

# Price-linked incentive scheme

- Quality measured under the price-linked scheme is based on a mix of continuity and customer service indices
- The eventual scheme will include:

| <b>Component</b>                    | <b>Weighting</b> |
|-------------------------------------|------------------|
| <b>SAIFI</b>                        | <b>0.20</b>      |
| <b>CAIDI</b>                        | <b>0.20</b>      |
| <b>Planned SAIDI</b>                | <b>0.15</b>      |
| <b>Voltage regulation</b>           | <b>0.10</b>      |
| <b>System losses</b>                | <b>0.05</b>      |
| <b>Time to process applications</b> | <b>0.10</b>      |
| <b>Time to connect premises</b>     | <b>0.10</b>      |
| <b>Call-center performance</b>      | <b>0.10</b>      |

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System average interruption frequency index (as per Distribution Code)

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Customer average interruption duration index

System average interruption duration index (as per Distribution Code) (for planned, or pre-arranged outages)

Measure of the probability of measured voltage levels falling outside the  $\pm 10\%$  regulation (specified in the Distribution Code)

SAIFI

CAIDI

Planned SAIDI

Voltage regulation

System losses

Technical & non-technical losses falling below 9.5% (positive incentive to further reduce losses only, as this is covered in other programmes already)

Time to process applications

Average time to process applications for regulatory services (standard connections)

Time to connect premises

Call-center performance

Average time to provide connection, after all administrative requirements have been met

Average time for call-centre to respond to calls

0.20

0.05

0.10

# Price-linked incentive scheme

- All these indices are included in the calculation of the S-factor:

$$S_t = \frac{[S_{SAIFI,t} + S_{CAIDI,t} + S_{SAIDI,t} + S_{VoltViol,t} + S_{Sysloss,t} + S_{Proc,t} + S_{Con,t} + S_{Call,t}] \times 0.025ARR_t}{FQ_t}$$

Where

$0.025ARR_t$  = 2.5% of the allowed revenue requirement for year  $t$

$FQ_t$  = The energy units sold (kWh) in year  $t$

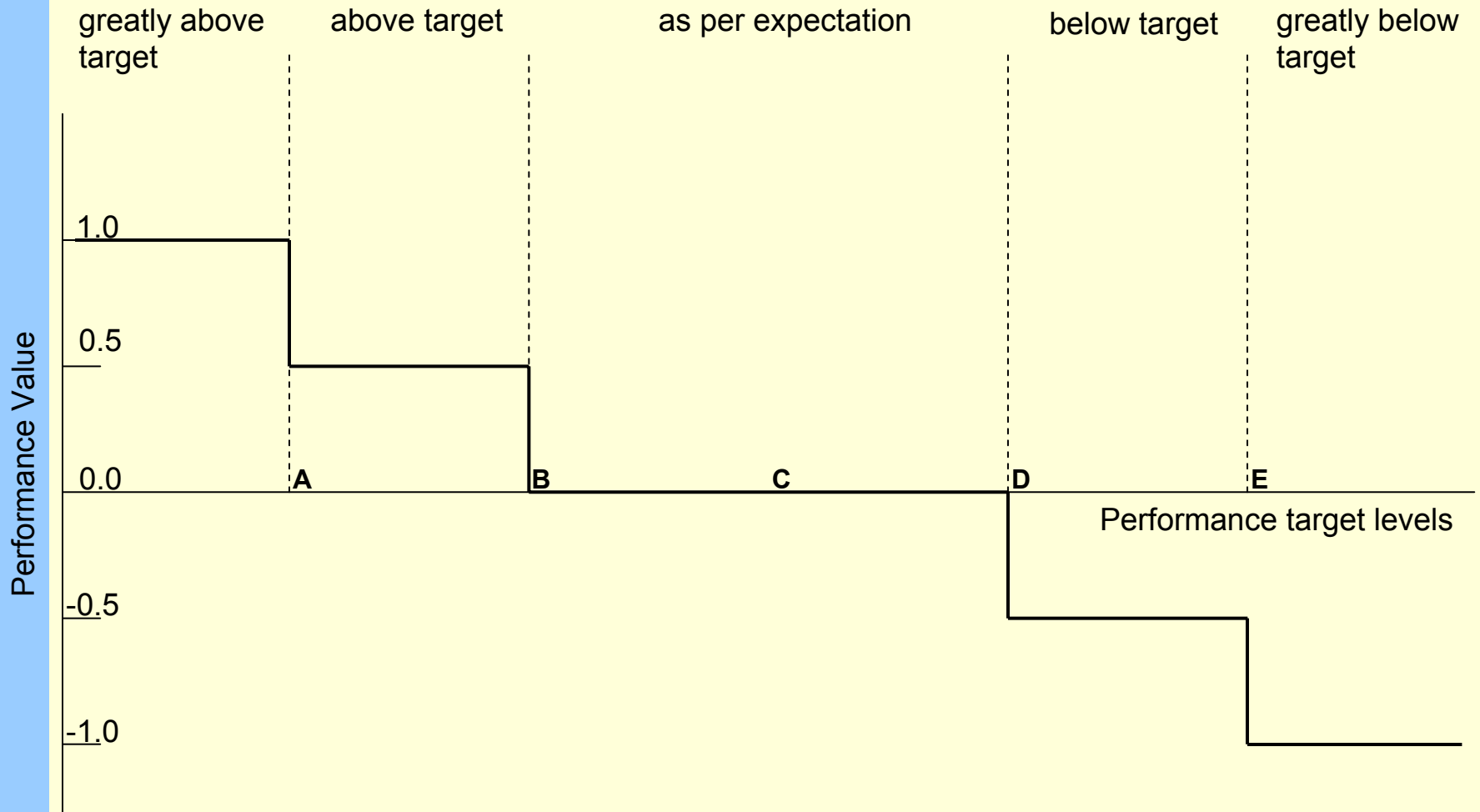
- The individual S-values for each index takes into account:
  - Weighting given to index
  - Performance against target
  - For example:

$$S_{SAIFI,t} = W_{SAIFI} \times Perf_{SAIFI,t-1}$$

$$S_{Call,t} = W_{Call} \times Perf_{Call,t-1}$$

# Price-linked incentive scheme

- The performance against target will be measured in discrete steps:



# Price-linked incentive scheme

- For each index the performance thresholds will typically be set as per the following example:

| SAIFI                            |   |
|----------------------------------|---|
| Average SAIFI value              | Average annual SAIFI for a Regulated Distribution System for the Second Regulatory Period   |
| Standard deviation               | Standard deviation of the annual SAIFI values for a Regulated Distribution System for the 10 calendar years leading up to the regulatory period |
| Performance greatly below target | Annual SAIFI more than 2 standard deviations above the SAIFI average  |
| Target not achieved              | Annual SAIFI more than or equal to 1 standard deviation, but less than 2 standard deviations, above the SAIFI average                           |
| Performance as per expectation   | Annual SAIFI between or equal to 1 standard deviation above and 1 standard deviation below the average value                                    |
| Target exceeded                  | Annual SAIFI more than 1 standard deviation, but less than or equal to 2 standard deviations, below the SAIFI average                           |
| Target greatly exceeded          | Annual SAIFI more than 2 standard deviations below the SAIFI average  |

# Price-linked incentive scheme

- During consultation to date, it was found that the utilities:
  - Do not have the capability to measure performance against all of these network performance indices
  - Do not have sufficient historical data trends for these indices
- Therefore decided to adopt interim performance incentive scheme
- Utilities each to design their own scheme, based on their capabilities
- ERC will adopt the full suggested scheme at the third regulatory period
- Utilities therefore have a five-year period over which to develop their performance measurement capability and to collect historical data

# Price-linked incentive scheme

- ERC will :
  - Consult with all utilities during their reset process regarding the incentive scheme and what can realistically be adopted
  - Cooperate with utilities to design their interim schemes
- Utilities are encouraged to a.s.a.p.
  - Commence building capacity for performance measurement
  - Start measuring performance against the indices

# Guaranteed service level scheme

- In terms of this scheme:
  - Utilities have to provide minimum service standards to consumers
  - If the standards are breached, compensation will be paid to consumers
  - On some indices payments can be made repeatedly
  - Other indices measures cumulative performance
- Scheme intended to give worst-served customers some recognition
- GSL payment based on 0.5% of the ARR
  - An additional allowance will be made of this amount to keep utilities revenue neutral
- Utilities to decide whether to spend this on :
  - Improving service (avoiding GSL payments)
  - Paying the penalties

# Guaranteed service level scheme

- The following scheme will be adopted (target levels indicative only):

| <b>Guaranteed Service Level (GSLs)</b> |  |
|--|--|
| <b>Indices</b>                         | <b>Definition</b>  |
| GSL 1                                  | Customers experiencing interruption periods greater than 30 hours per year                                   |
| GSL 2                                  | Customers experiencing more than 20 sustained interruptions per year   |
| GSL 3                                  | Customers experiencing outages as a result of secondary system faults, that are not restored within 12 hours |
| GSL 4                                  | Failure to provide connection on the day previously agreed with the customer.                                |

# Guaranteed service level scheme

- The value of the GSL payments will be based on:
  - Performance target level adopted
  - Number of customer who have historically breached the target every year (and would therefore receive a GSL payment)
  - The total ARR allowed
  - Weighting allowed for each index

Example of GSL penalty (customers with outages exceeding 30 hours). If:

ARR = PhP3,200,000,000                      0.005xARR = 16,000,000

Historical average number of customers affected per year : 10,000

Weighting of index                      :                      0.25

Revenue allocated to index = 0.25 x 16,000,000 = PhP 4,000,000

GSL payment per event = (4,000,000/10,000) = PhP 400

- Note, no cap on GSL payments
- Accurate performance measurement on individual level required

# Information disclosure

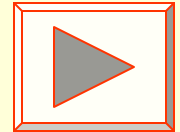
- Utilities to disclose performance against the following on a monthly basis :
  - momentary average interruption frequency index (MAIFI);
  - frequency of tripping events per 100 circuit-km;
  - average time to respond to queries and complaints; and
  - average time to reconnect a service after payment of all dues.
- ERC will collect data (as soon as capacity exists at utility), and publish annual comparative report

# Excluded events

- ERC recognises that
  - Some events occur on other part of electricity chain
  - Some events are so extreme that the capacity of an efficient utility to deal with these are exceeded
- There is therefore allowance for events to be excluded from reliability measurements, for example:
  - supply interruptions made at the request of a customer;
  - load shedding due to a shortfall in generation;
  - supply interruptions caused by a failure of the transmission network;
  - supply interruptions caused by a failure of a transmission connection asset, but only to the extent that the interruptions were not due to inadequate planning of transmission connections; and
  - widespread supply interruptions due to rare and extreme events.

# Excluded events

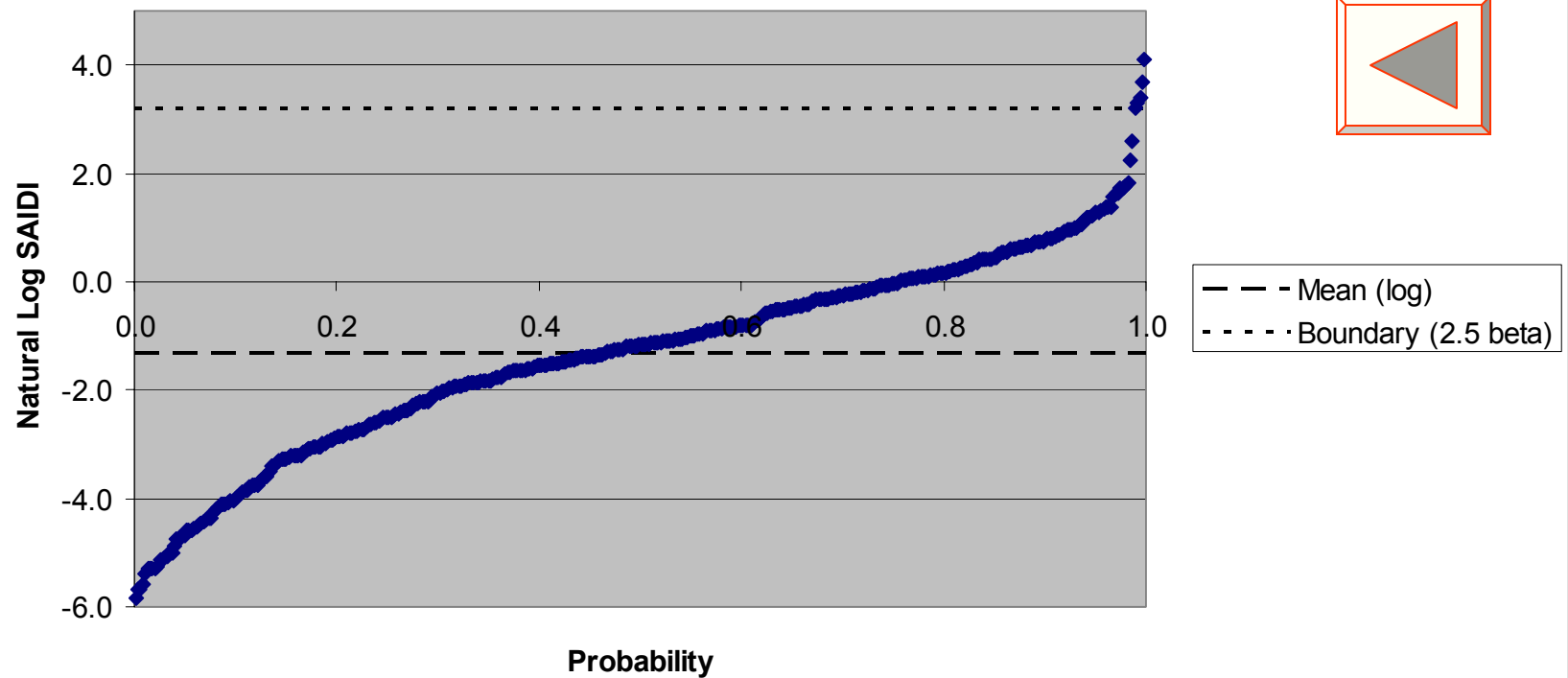
- Rare and extreme events will be identified using the Institute for Electric and Electronic Engineers (IEEE) 2.5 Beta method
- This method:
  - Looks at the daily SAIDI outages of a utility
  - Determines the natural logarithm of the daily SAIDI values over previous 5 years
    - Research has proved that daily SAIDI approximates a lognormal distribution
  - Finds the mean and standard deviation of the daily (log) values
  - Sets a boundary value at :
$$T_{MED} = e^{\alpha + 2.5\beta}$$
  - A day where  $SAIDI > T_{MED}$  is considered a *major event day* (MED)
  - The SAIDI and SAIFI for MED's are excluded from the statistics



# QUESTIONS



Probability plot for lognormal distribution of SAIDI values



- Same plot on logarithmic basis
- Shows the (log) mean and the boundary value (2.5 standard deviations above)
- Note the small number of events classed as extreme