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# Monitoring of Electricity Utility Performance - An example

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## Quality of Service Monitoring

**Economic justification:** prevent excessive prices and unsatisfactory quality of service – exercise of market power by monopolies

**Goal:** Ensure economic quality of service

**Target:** Regulated monopoly services

Must take into account price of **service and users' preferences.**

**Poor quality of service:** a mismatch between levels of service and prices relative to consumers' demand/expectations



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## Incentives for Quality of Service

Regulator monitors and analyzes quality, then establishes **incentives** for service providers.

### Incentives:

Under a price-service compact, regulated firm required to maintain service quality at a specified target level of quality, or above a minimum.

Public reporting of quality performance: public pressure



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## Regulation and Quality

Allowed expenditure has impact on

Level of congestion

Service delays

Reliability

Safety

User convenience: e.g. ease of payment

Billing accuracy

Responsiveness to customer complaints

Provision of information to customers



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## Attributes of Monitoring Program

Monitoring should focus on service items that have significant impact on costs and/or consumer value

Analysis of quality performance should take into account levels and trends in expenditure on service provision

Where services are provided using long-lived assets such as in electricity and gas, special attention should be paid to long-term impacts of investment patterns

Assess also the quality of asset management practices: will they provide economic service in the long term?



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## What to cover in the Monitoring program

Approach should be as broad as possible:

- Enables coverage of services that are economically significant
- Ensures that information is placed in proper context when assessing performance

Constraints to broad coverage:

- Need to focus on key indicators of service provider's performance
- Cost of monitoring: to regulator and to service provider



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## Information Sources and Frequency of Reporting

Periodic reporting of defined quality of service indicators (including explanations by service provider)

Analysis of other performance reports, e.g. annual reports and financial audits

Reporting should take into account:

- Significance of the indicator to different customer segments
- The frequency of with which data should be reported: e.g. in electricity – supply reliability (monthly); billing performance (quarterly); reliability of feeders (annually); asset management audits (every five years)

**Costs, Economic Significance, Measurability**



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## Analyzing the Information

### Efficiency and Outcomes

Compare outputs to inputs: is the provider meeting regulatory quality targets efficiently?

What is the outcome of the measures? Trends in customer complaints, customer surveys

### How good is the information ?

Comparable: to other providers

Verifiable: measurability

Reliable: may need expert validation of data

**Regulator should engage service provider to develop the monitoring program**





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## Cost of reporting and Processing

**Regulator  
should be  
mindful  
of**

the cost of the monitoring program

The lead time in significantly changing reporting systems (from the already existing)

Frequency of reporting

Expertise, size of staff and tools needed to store and analyze data



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## Reliability Indices

Description	Index	Definition
<b>Total number of minutes on average that a customer is without electricity in a year</b>	<b>SAIDI</b> System Average Interruption Duration Index	The sum of the duration of each sustained interruption (in minutes) divided by the total number of customers. SAIDI excludes momentary interruptions of one minute or less duration
<b>Average number of times a customer's supply is interrupted per year</b>	<b>SAIFI</b> System Average Interruption Frequency	The total number of sustained customer interruptions divided by the total number of customers. SAIFI excludes momentary interruptions of one minute or less duration
<b>Average duration of each interruption</b>	<b>CAIDI</b> Customer Average Interruption Duration Index	The sum of the duration of each sustained customer interruption (in minutes), divided by the total number of sustained customer interruptions (SAIDI divided by SAIFI). CAIDI excludes momentary interruptions of one minute or less duration
<b>Average number of momentary interruptions per customer per year</b>	<b>MAIFI</b> Momentary Average Interruption Frequency Index	The total number of customer interruptions of one minute or less duration, divided by the total number of customers



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## Data on Reliability of Supply



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Sustained Interruptions		Feeder Category			
	Data set	CBD	Urban 1	Urban 2	Rural
SAIDI	Overall				
	Distribution network – planned				
	Distribution network - unplanned				
SAIFI	Overall				
	Distribution network – planned				
	Distribution network - unplanned				
CAIDI	Overall				
	Distribution network – planned				
	Distribution network - unplanned				
Momentary Interruptions					
MAIFI	Distribution network				



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## Data on Technical Quality of Supply

Complaints		#
	Total QoS complaints	
Complaints by category		%
	Low supply voltage	
	Voltage dips	
	High voltage	
	Voltage spike	
	Voltage distortion	
	Other	
Likely cause of problem		%
	Network equipment faulty	
	Network Limitation	
	Customer internal problem	
	No problem identified	
	Environmental	
	Other	



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# Statistics on Customer Service



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<b>Timely Provision of Services</b>	<b>Unit</b>
Total number of connections provided	#
Overdue connections	#
<b>Call Centre Performance</b>	
Total number of calls	#
Number of calls not answered within 30 seconds (e.g.)	#
Average waiting time before a call is answered	(sec)
Percentage of calls abandoned	(%)
Number of overload events	#
<b>Customer Complaints</b>	
Reliability of Supply	#
Technical Quality of supply	#
Administrative process or customer service	#
Other	#
<b>Repair of street lights</b>	
Ave. number of street lights 'out' in each month	#
Faulty street lights not repaired within agreed times	#
Average number of days to repair faulty street light	#
Total number of street lights	#



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## Business Descriptors

Number of metered supply points			By type of customer		By supply voltage			
	Total		Residential	Non-res	ST	HV	LV	
Feeder Category	CBD							
	Urban 1							
	Urban 2							
Energy delivered (GWh)								
Feeder Category	CBD							
	Urban 1							
	Urban 2							
Line length (km)			U/ground	O/head	ST	HV	LV	
	Total km							
Feeder Category	CBD							
	Urban 1							
	Urban 2							
Number and capacity of transformers						Distribution losses		(%)
	Number	Capacity				Network service area		(km <sup>2</sup> )
Sub T	(#)	(MVA)				Number of poles		(#)
Distribution	(#)	(MVA)				Peak demand		(MW)



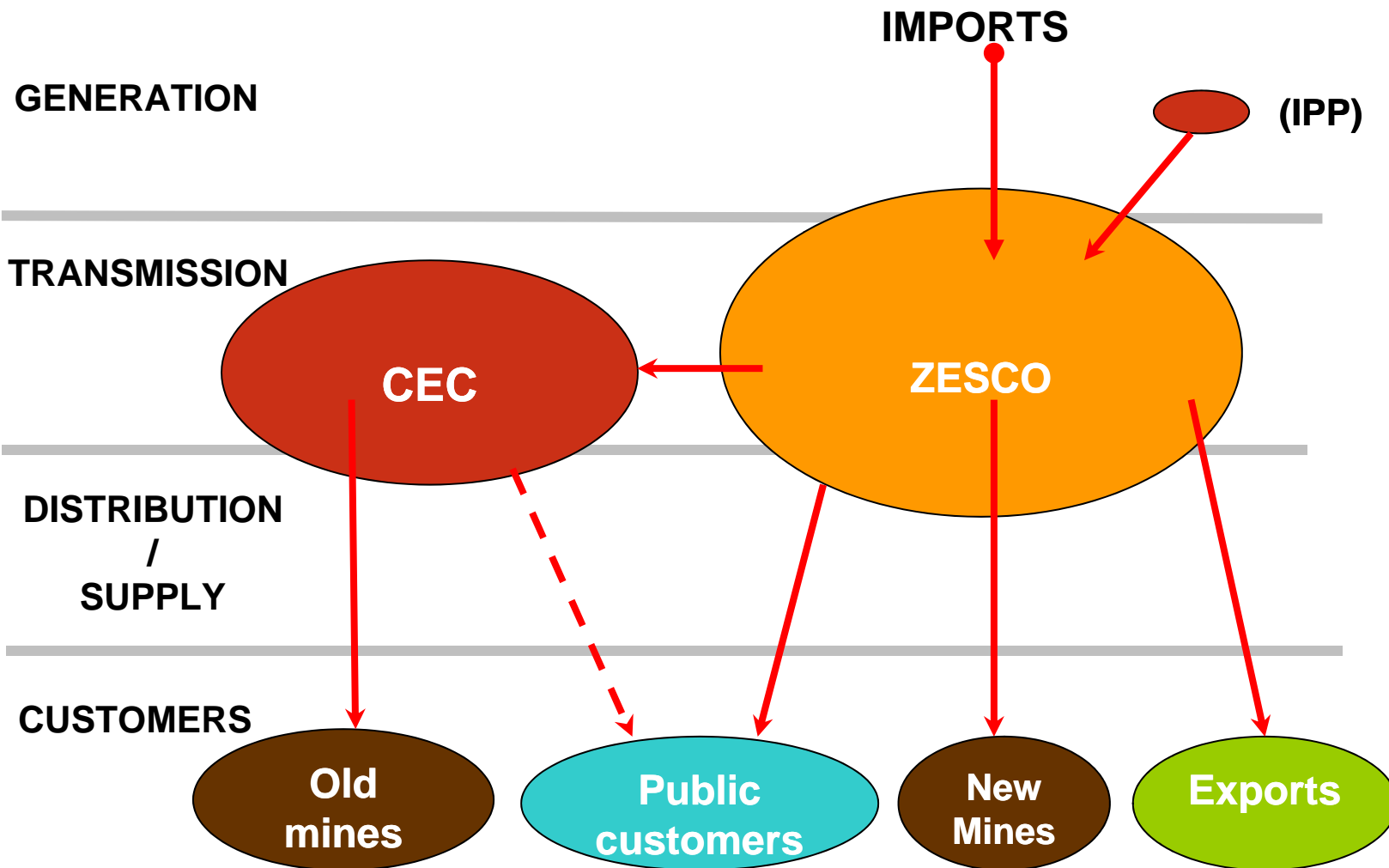


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## Zambia Industry Structure (2011)





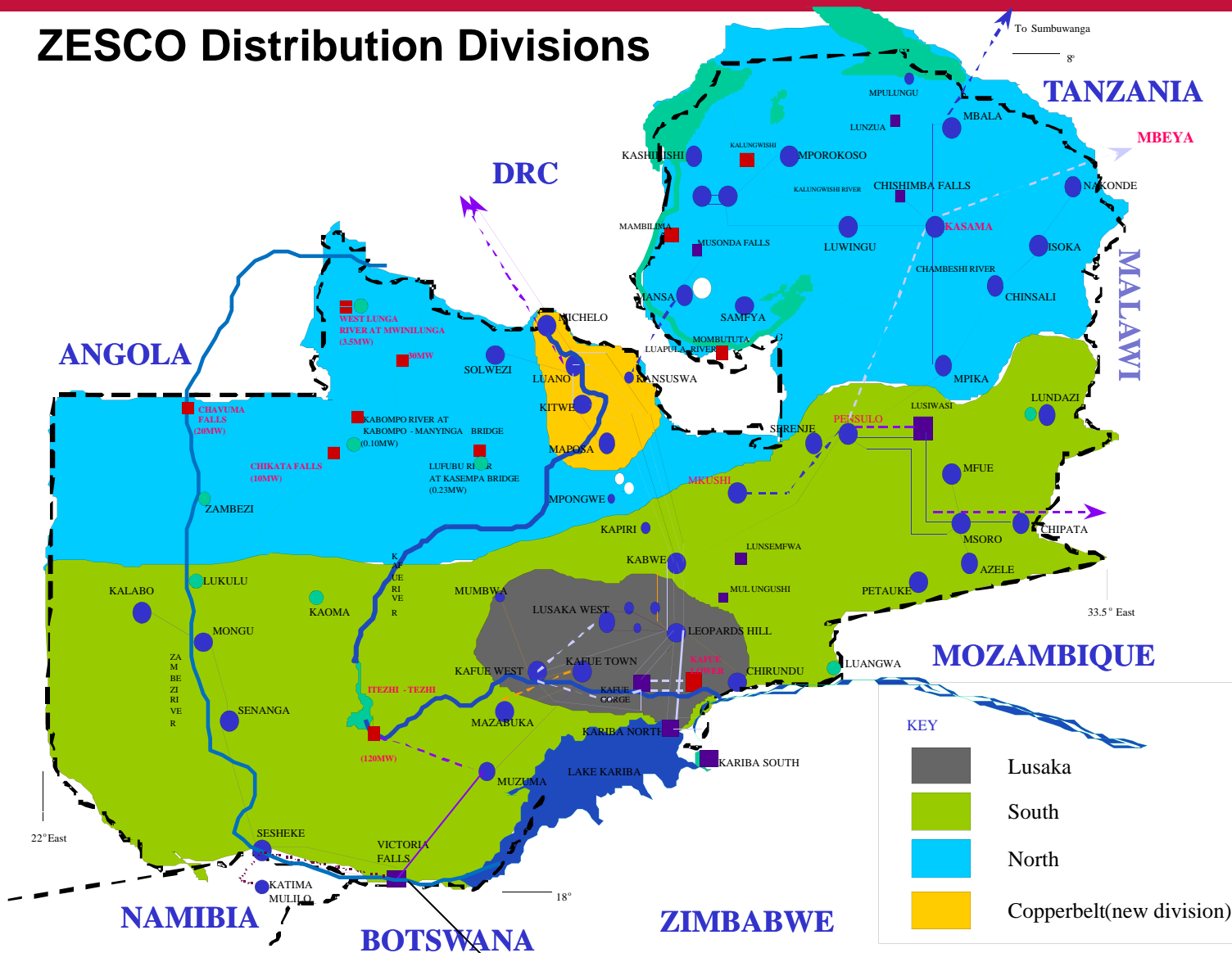


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## ZESCO Distribution Divisions





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## Zesco KPIs 2006 - 2008

**Regulatory Objective:** Migrate tariffs to cost reflective level over three years

**Concern:** Ensure that tariff increases address key areas of performance

**Approach:** Link increases to incentives and sanctions

**Implementation:** Close oversight; quarterly publication of utility performance against targets of Key Performance Indicators



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## ZESCO KPIs



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Performance indicator	Targets set in 2006	Assessment 2008 to Q2 2010
<b>Metering of Customers</b>	Meter all new customers	for 2008 and 2009: 18% new connections metered
	BY 2010: All customers metered; Dismantle backlog	2 <sup>nd</sup> Quarter 2010: 33% new customers metered;
<b>New connections</b>	New residential customers connected within 30 days after payment	More than 85 days at end 2010
<b>Cash management</b>	Bill all customers every month	85 – 100% per quarter (2008 – 2009)
	Reduce debtor days to not more than 60 days by March 2010	118 days at June 2010 (179 days at June 2008)
	Total trade receivables not to exceed 17% of turnover by March 2010	121% at Dec 2009 (54% at June 2008)
<b>Staff Productivity</b>	100 employees per by March 2010	94 employees for each customer at June 2010
<b>Staff Costs</b>	30% of O&M from 49%	<i>Data not available, still around 50%</i>
<b>Quality of Service</b>	Reduce annual unplanned outages to five (5) hours per consumer by March 2010	23.9 hours at June 2010 (57.6 hrs at Dec 2008)
<b>System Losses</b>	Maintain transmission losses at $\leq 3\%$	2.9% at Dec. 2009 (3.3% at Dec 2007)
	Reduce distribution losses to $\leq 14\%$ by March 2010	15% at June 2010 (27% June 2008)



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## Implementation Issues

### Utility

Assessment method: If a target is only partially met, how should it be scored?

Publication of assessments: should regulator publish without prior discussion with utility?

For a state-owned utility, if government does not pay, how does this reflect on effectiveness of management?

For reliability assessments, should there not be discrimination among customer classes?

Dynamism of targets: e.g. Zesco change from credit to pre-paid meters affects measurements

### Regulator:

How effective are financial incentives to Zesco, which is state-owned)



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