



# **THE SUPERVISION OF QUALITY IN THE ELECTRICITY SECTOR**

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Chairman of OSINERGMIN

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# Institutional Structure of the Peruvian Electric Sector



- Regulator and inspector
- Establish Tariffs
- Resolves Disputes between participants

**Osinergmin**  
ORGANISMO SUPERVISOR DE LA INVERSIÓN EN ENERGÍA Y MINERÍA



- Conformed by generation, transmission and distribution representatory
- Responsible for the operation of the system at minimum cost



**Ministerio de Energía y Minas**  
República del Perú



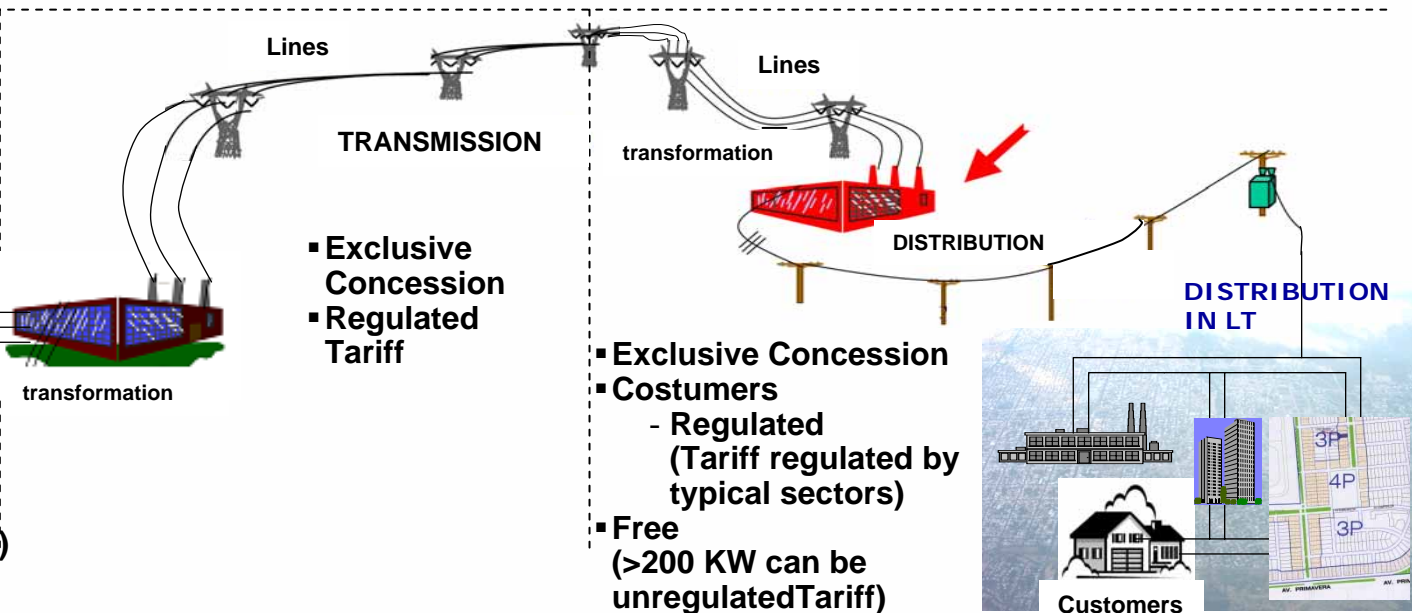
- Normative organ and licensor

**GENERATION**



**MARKETS**

- Distributors (Regulated Tariff)
- Free (>200 KW can be unregulatedTariff)



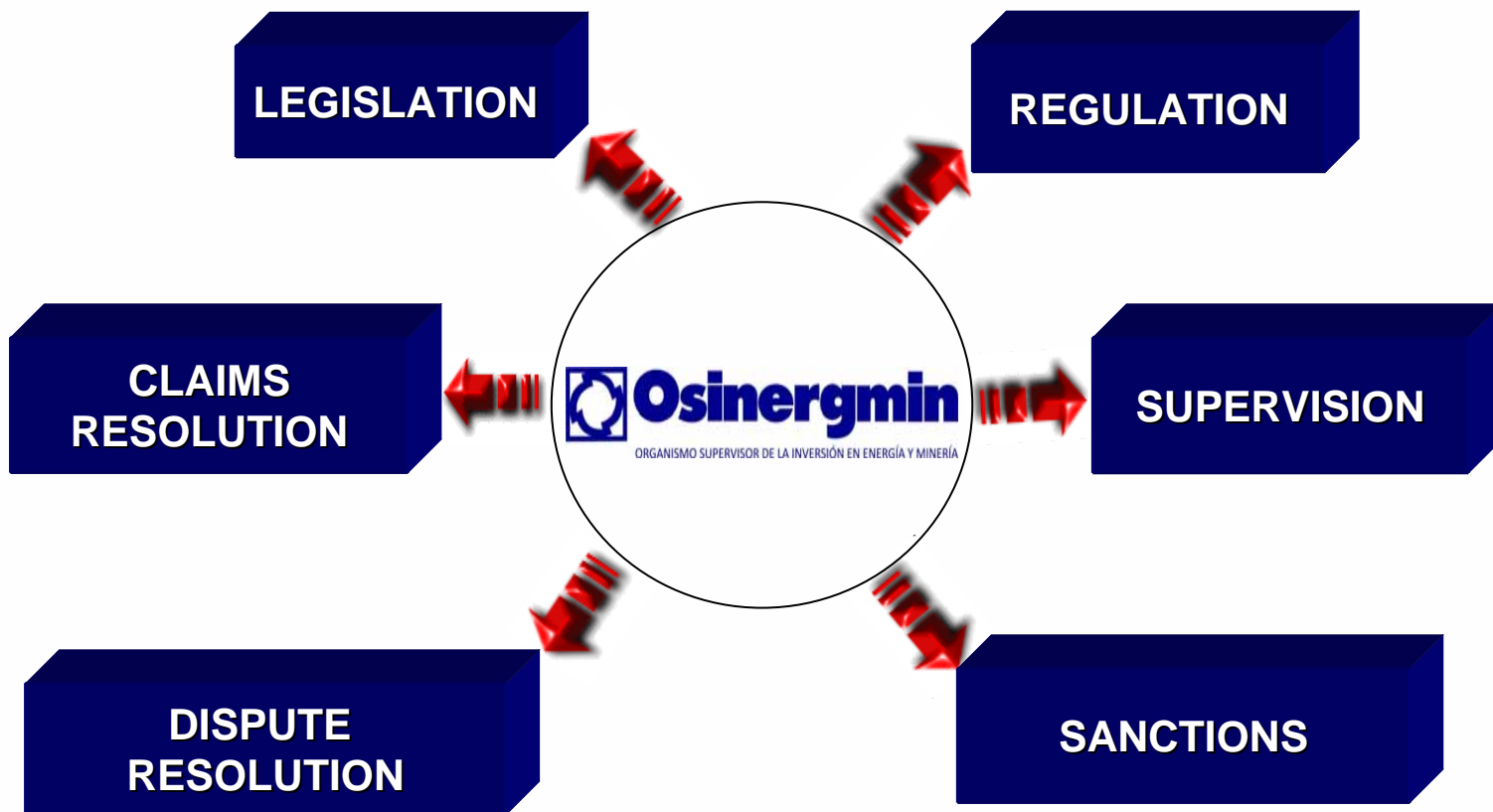


## OSINERGMIN

- Regulator and supervisor of the power sector.
- Decentralized public institution, attached to the office of the prime minister.
- Directorial council comprised by 5 members:  
Duration: 5 years (annual renovation of 1 member).

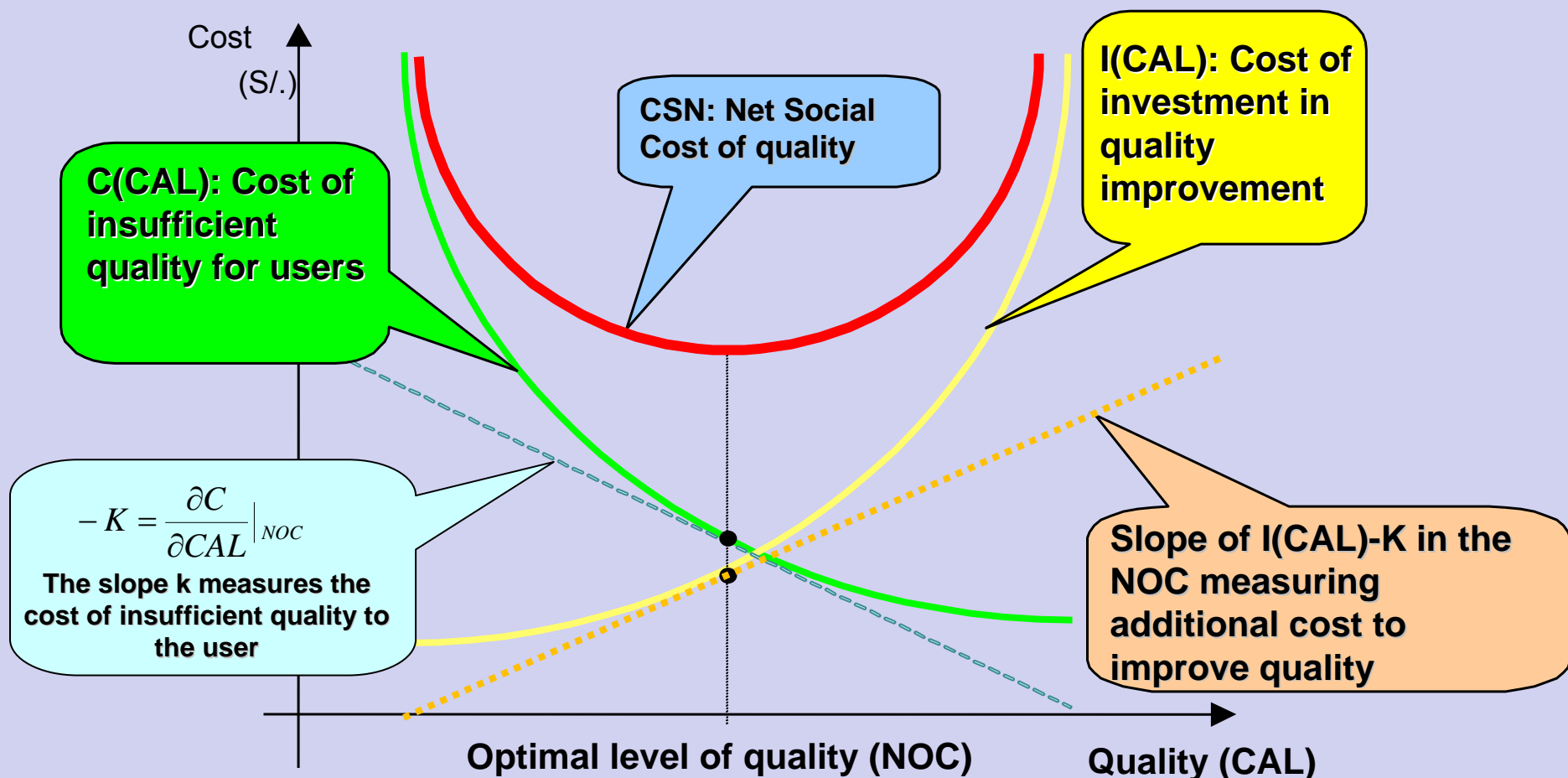


## FUNCTIONS





# QUALITY REGULATION Scheme – Avoided Cost







## Supervision of electricity services

Aspect	Indicator	Tolerance
Quality of product	Voltage variation	+/- 5% Vn
Quality of supply	Frequency and duration of interruptions	According to typical sector
Commercial quality	Waiting time Billing Meters verification	According to requirement
Quality of Public Lighting	Deficiencies	10% quality, 2% deficiencies
Public Safety	Transmission and distribution lines's deficiencies	According to voltage level

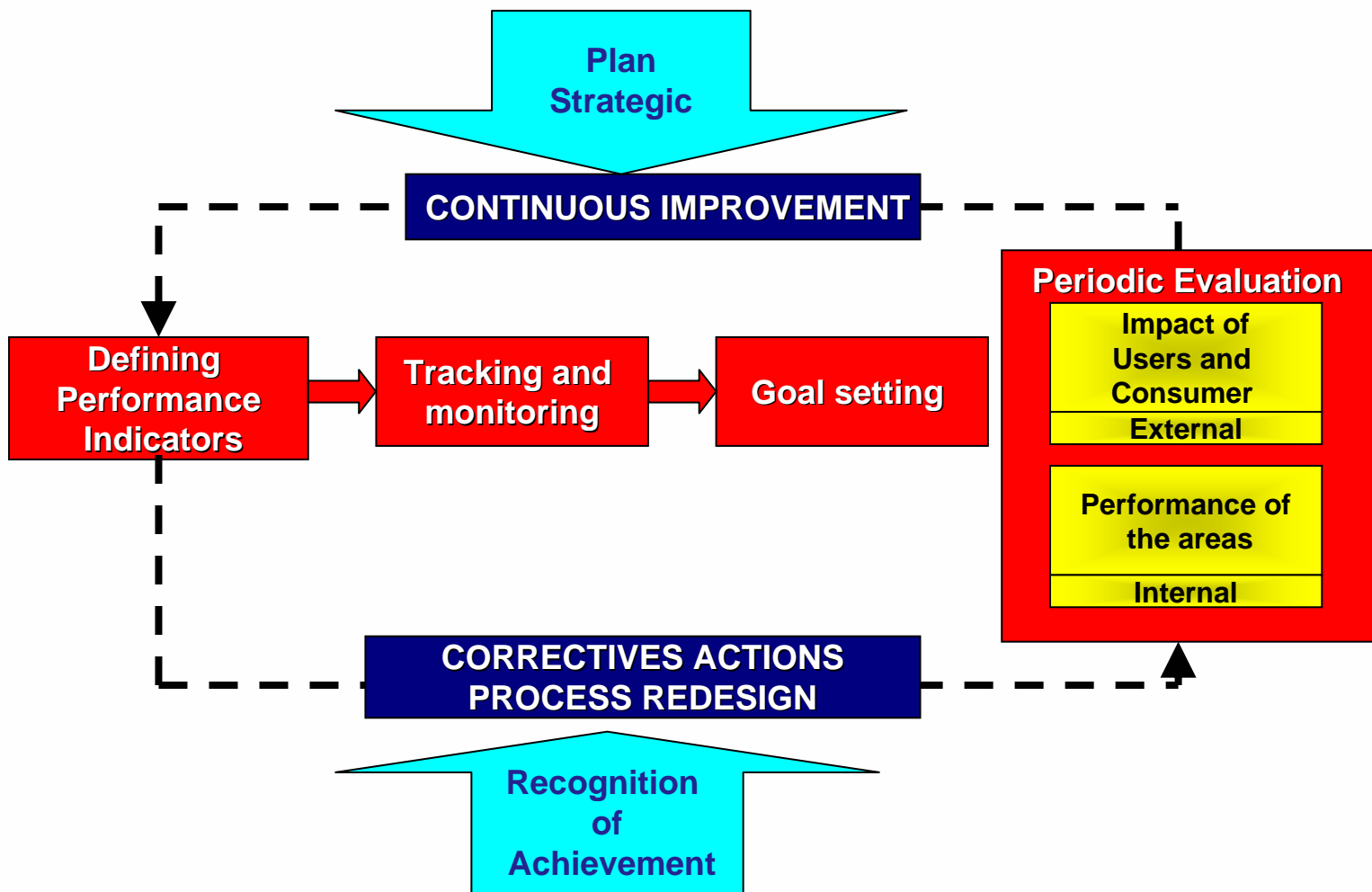


## **Supervision Procedures**

**The new supervision procedures began in 2003, these are based on statistical sampling and reports by the supervised companies with objective performance indicators.**



# General Scheme of Supervision model







# Existing supervision procedures by 2009

## SPECIFIC PROCEDURES

### GENERATION

- |  |   |
|--|---|
| 1. Availability and operating status of the units of SEIN (Peruvian Electric system) | 2. Maintenance approved by the COES (system operator) |
|--|---|

### TRANSMISSION

- |  |  |
|--|--|
| 3. Safety deficiencies in transmission lines and easements | 4. Performance of transmission systems |
|--|--|

### DISTRIBUTION

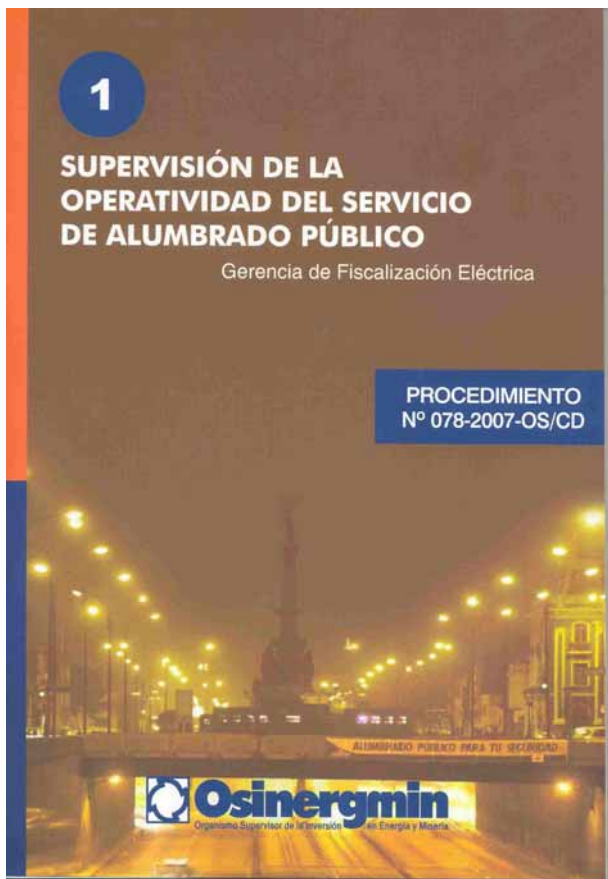
- |  |   |
|--|---|
| 5. Operation of public Lighting services   | 11. Generation in isolated electrical systems                               |
| 6. Contrasting and / or verification of meters   | 12. Disconnections and reconnection   |
| 7. Public safety in medium voltage lines   | 13. Safety in public establishments   |
| 8. Operation of electrical systems   | 14. Public safety in low voltage lines and electrical household connections |
| 9. Billing, collection and customer service  | 15. Procedure for requesting stoppage of activities due to high risks       |
| 10. Supervision of reimbursements for power failures in the public electricity service |   |

## CROSS SECTION PROCEDURES

- |  |
|--|
| 17. Terms of use and free access to the electrical transmission and distribution services        |
| 18. Applications for qualification of force majeure for transmission and distribution facilities |
| 19. Environmental supervision of the electricity companies                                       |



## EXAMPLE : Supervision of Quality of Public Lighting

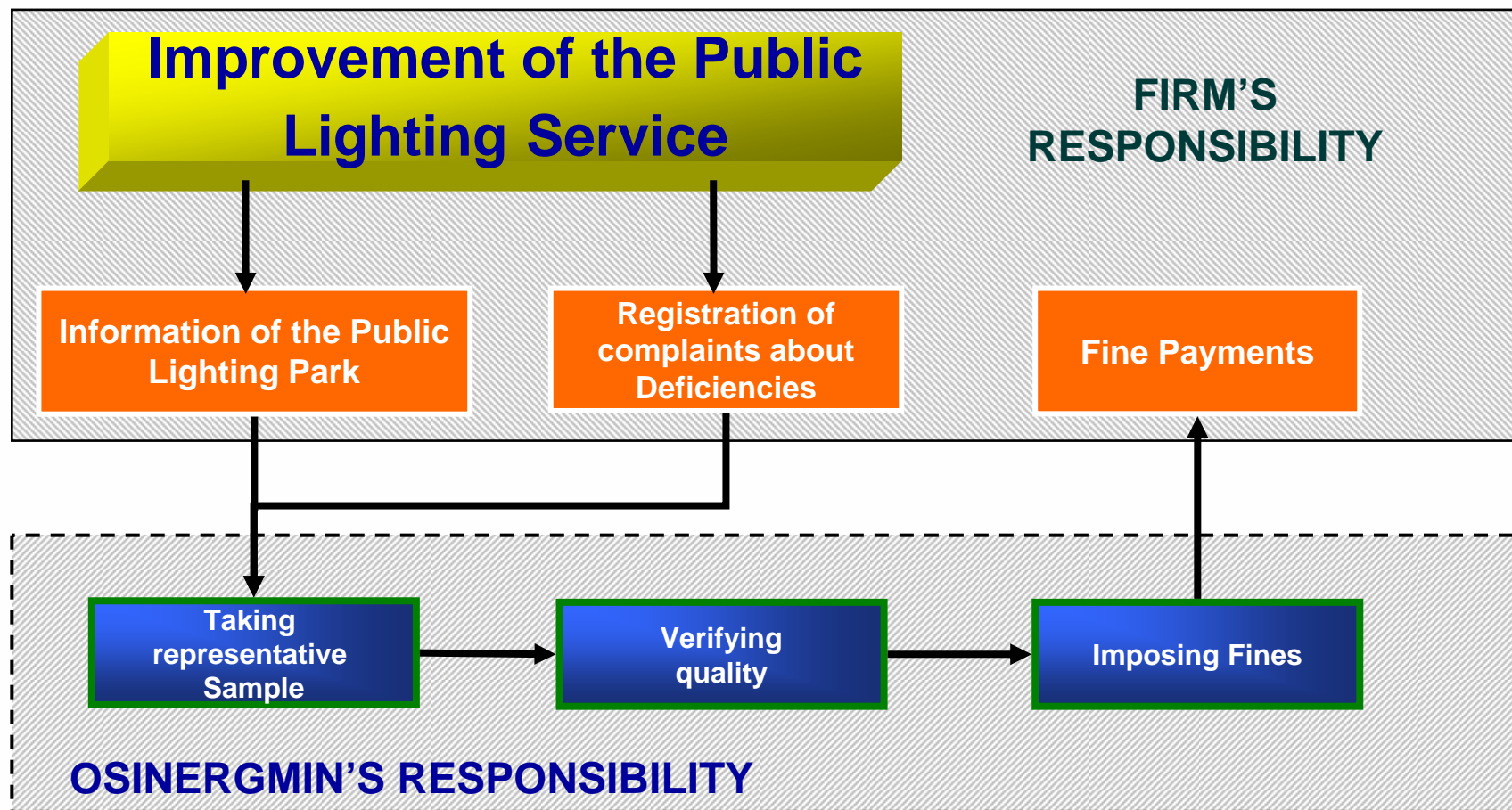


### OSINERGMIN's Resolution N° 078-2007-OS/CD

This procedure establishes the maximum tolerances of defective Units of Public Lighting (**UAP** for their initials in Spanish: Unidades de Alumbrado Público), and the time to solve the public's complaints on deficiencies, with the objective of achieving a better and more effective control of quality of service.



# Supervision of the Public Lighting Service





# Deficiencies in the Public Illumination

## LACK OF PUBLIC LIGHTING



## TREE'S INTERFERENCE



## BROKEN OR NOT WELL GUIDED POST



## NON OPERATIVE LAMPS







## Sample Size

- The sample size  $n_0$  for each company is defined as:

$$n_0 = \frac{p \times q \times Z^2}{d^2}$$

where:

- $n_0$  : The sample size of UAP to verify.
- $p, q$  : Portions of the universe, with and without Deficiencies.
- $Z$ : Abscissa of the normal curve that cuts an area of  $\alpha$  in the tail of the normal distribution.
- $d$ : The level of precision wanted for the estimate.





## Sample Size

- Correction for finite population :

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

- $n$ : Constitutes the final sample size to evaluate (UAP).
- $N$ : Population of UAP of the public illumination's park of the concessionaire that is evaluated in biannual periods.



## Theory of Sanctions and Dissuasive Fines

The company evaluates its expected benefit, of not meeting the targets fixed by the regulator:

$$E(B) = p(e) \cdot (B - M) + (1 - p(e)) \cdot (B)$$

Where:

- B: avoided cost and / or illicit earnings.
- M: Amount of fine.
- E(B): Expected benefit of the company when being avoided the monetary cost or to be generated illicit earnings.
- P(e): Probability of detection of the infraction.



The dissuasive fines should be set to an amount equal or greater than the expected benefit:

$$E(B) = p(e) \cdot (B - M) + (1 - p(e)) \cdot (B) = 0$$

Then the dissuasive fine is:

$$M^* = \frac{B}{p(e)}$$

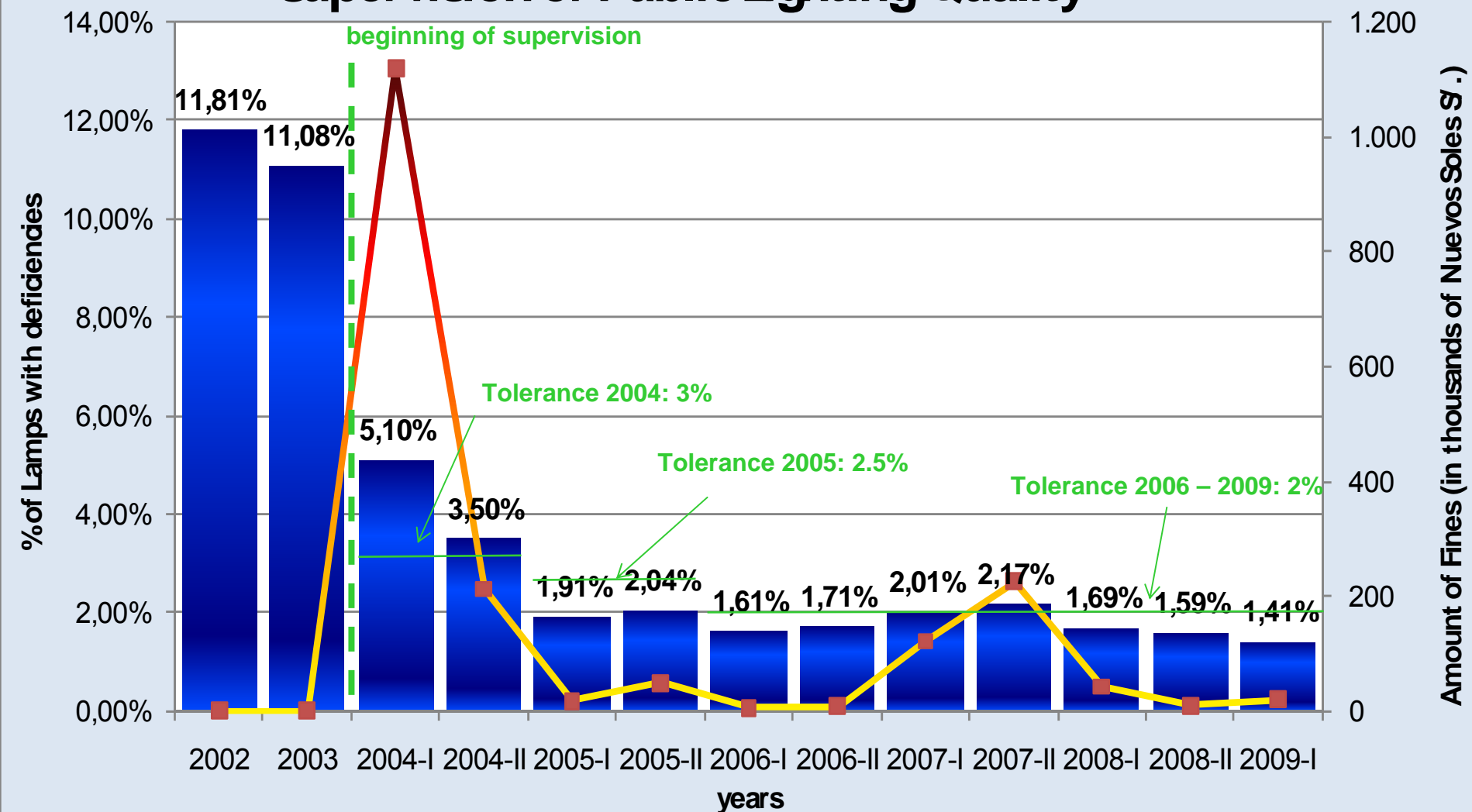
**The benefit is calculated starting from the savings that the company obtains for not keeping the lights in operation at the target fixed by the regulator**



# Results of the Supervision of Public Lighting Quality



## Supervision of Public Lighting Quality

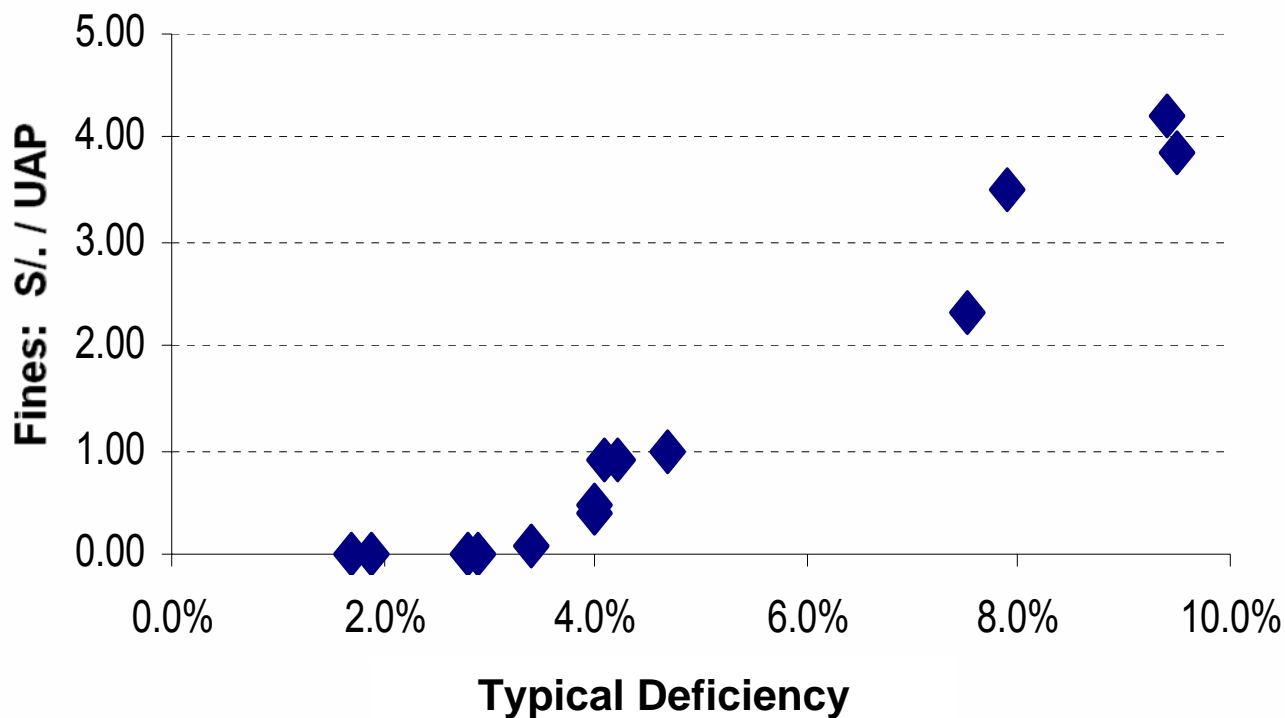






# Deficiencias vs Fines in Public Lighting

2004-I

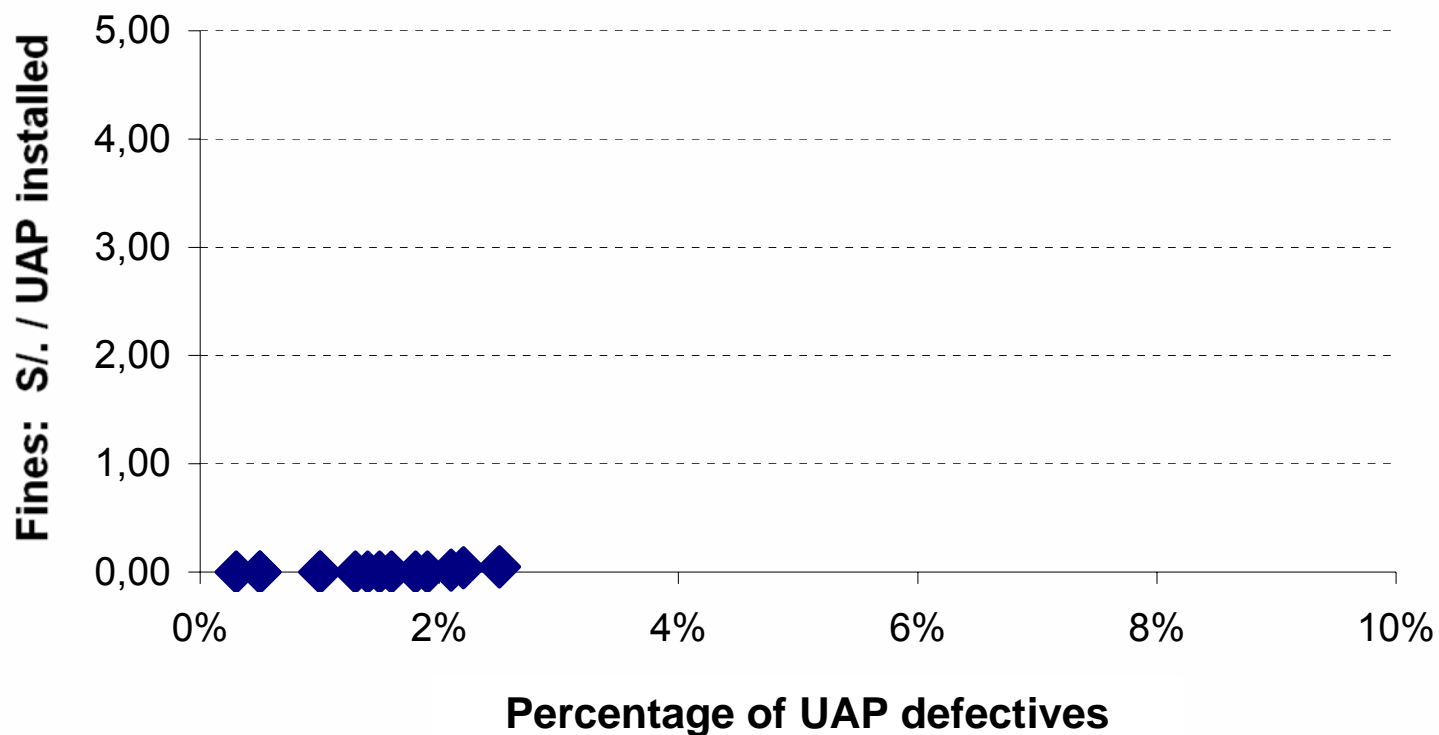


◆ Companies



# Deficiencias vs Fines in Public Lighting

2008-II



◆ Companies



## Some Performance Indicators

Area	Concept	2004	2005	2006	2007	2008	2009
Public Lighting <sup>1</sup>	% of UAP defectives	4.30	1.98	1.66	2.09	1.64	1.41*
	Fines <sup>2</sup>	1 330.7	66.1	12.9.	346.1	50.8	19.5*
Meters Verification (% of total)	Number of Verifications <sup>3</sup>	7	18	28	40	51	56*
Quality of power supply	Hours of Interruption <sup>4</sup>	—	9.24	11.41	9.97	9.93	9.34
	Frecuency of Interruption <sup>4</sup>	—	9.23	10.72	9.87	9.55	9.24
Customer Service	Average Waitins per Customer (minutes)	—	19	18	15.5	15.31	15.56*
	Billing Errors (%)	—	0.0688	0.0520	0.0062	0.0334	0.0241*

\* First semester

1 Averages of the biannual data

2Thousands of S/. (Nuevos Soles)

3Average anual



# Thank You



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