

33rd IAEE INTERNATIONAL CONFERENCE

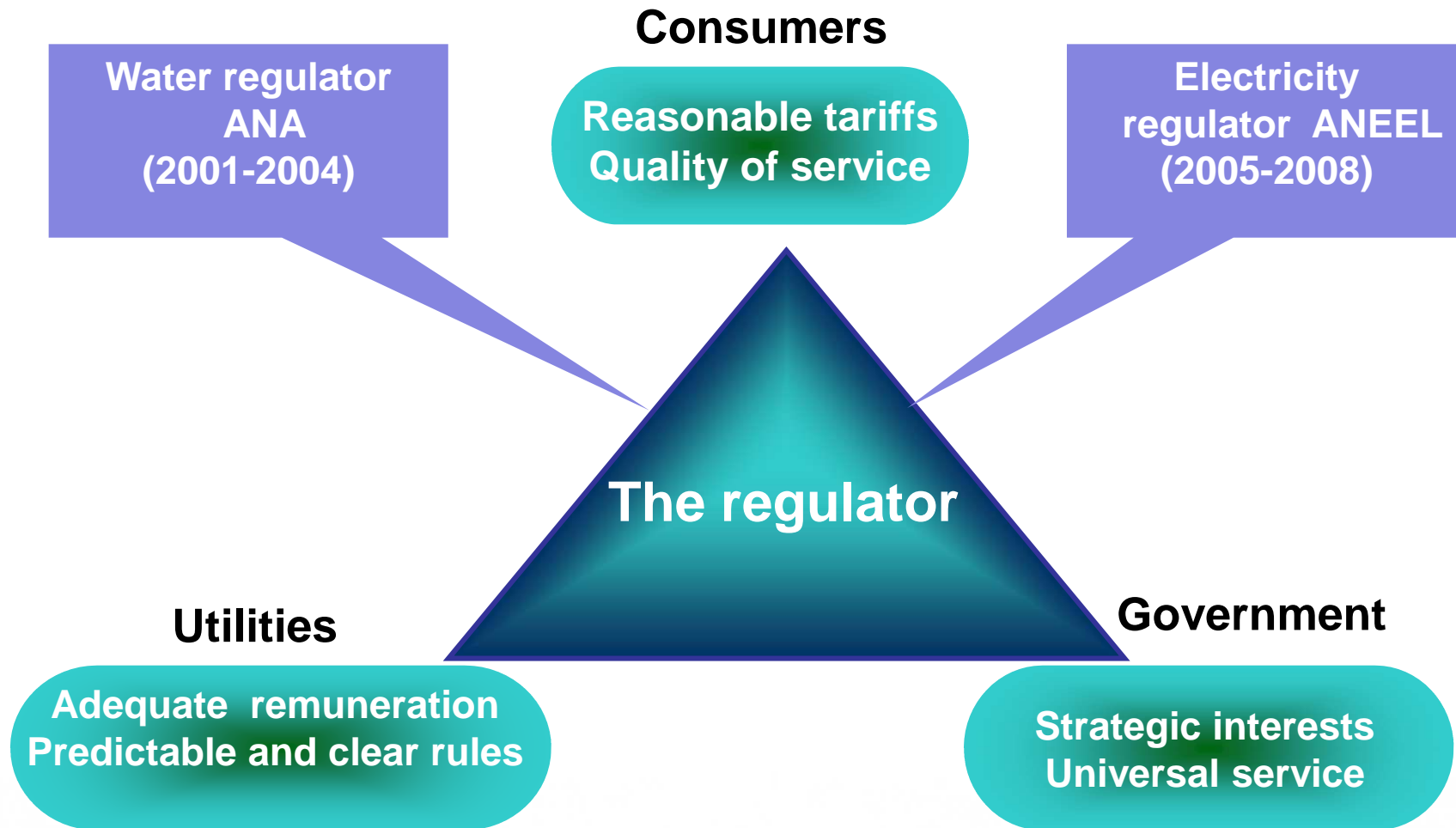
**Energy theft
From the regulator and the regulated viewpoints**

Jerson Kelman
President of Light

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June 2010

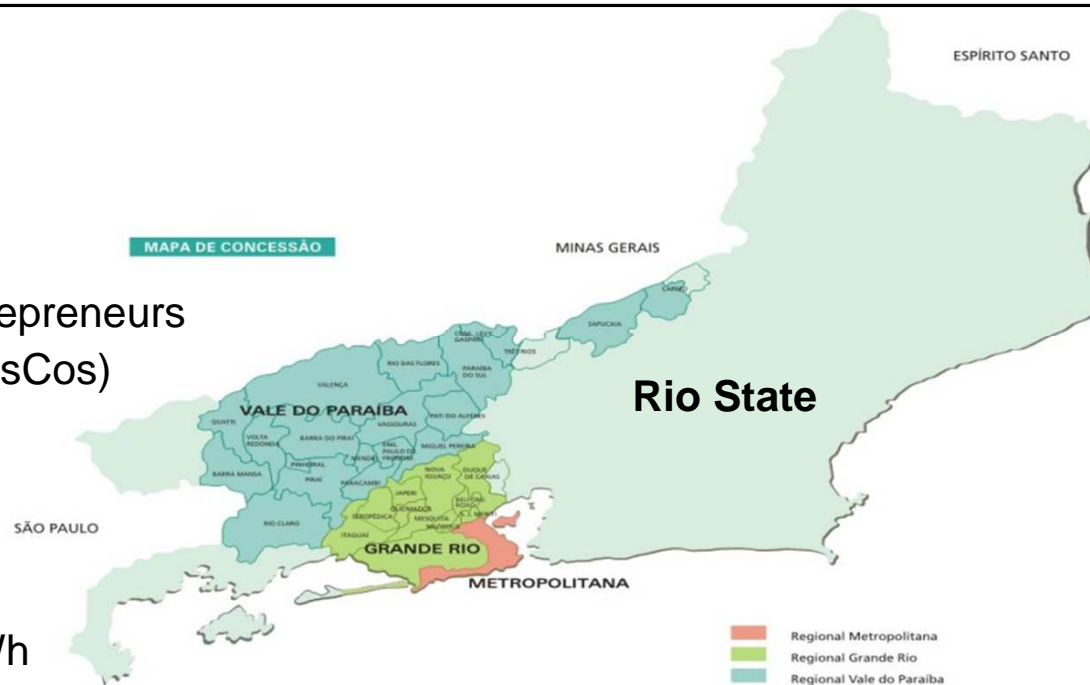
Energy Theft: The view of the regulator



Energy Theft: The view of the regulated Light Company at a glance (2009)

Light : 5 TWh lost due to theft in 2009

- Founded in 1904 by Canadian entrepreneurs
- Fourth DisCo of Brazil (out of 64 DisCos)
- Distribution grid: 60 thousand km
- Concession area: 11 thousand km²
- 11 million inhabitants
- 4 million consumers
- Energy regularly distributed: 22 TWh



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Challenges of Energy Regulation in Rio de Janeiro – Energy Theft

The Problem in Brazil

Brazil: 22 TWh lost per year - 8% of Captive Consumption

- **21%** of Brazil's Energy Theft
- **23%** of region's captive consumption

- **14%** of Brazil's Energy Theft
- **7%** of region's captive consumption

- **4%** of Brazil's Energy Theft
- **5%** of region's captive consumption

- **9%** of Brazil's Energy Theft
- **3%** of region's captive consumption

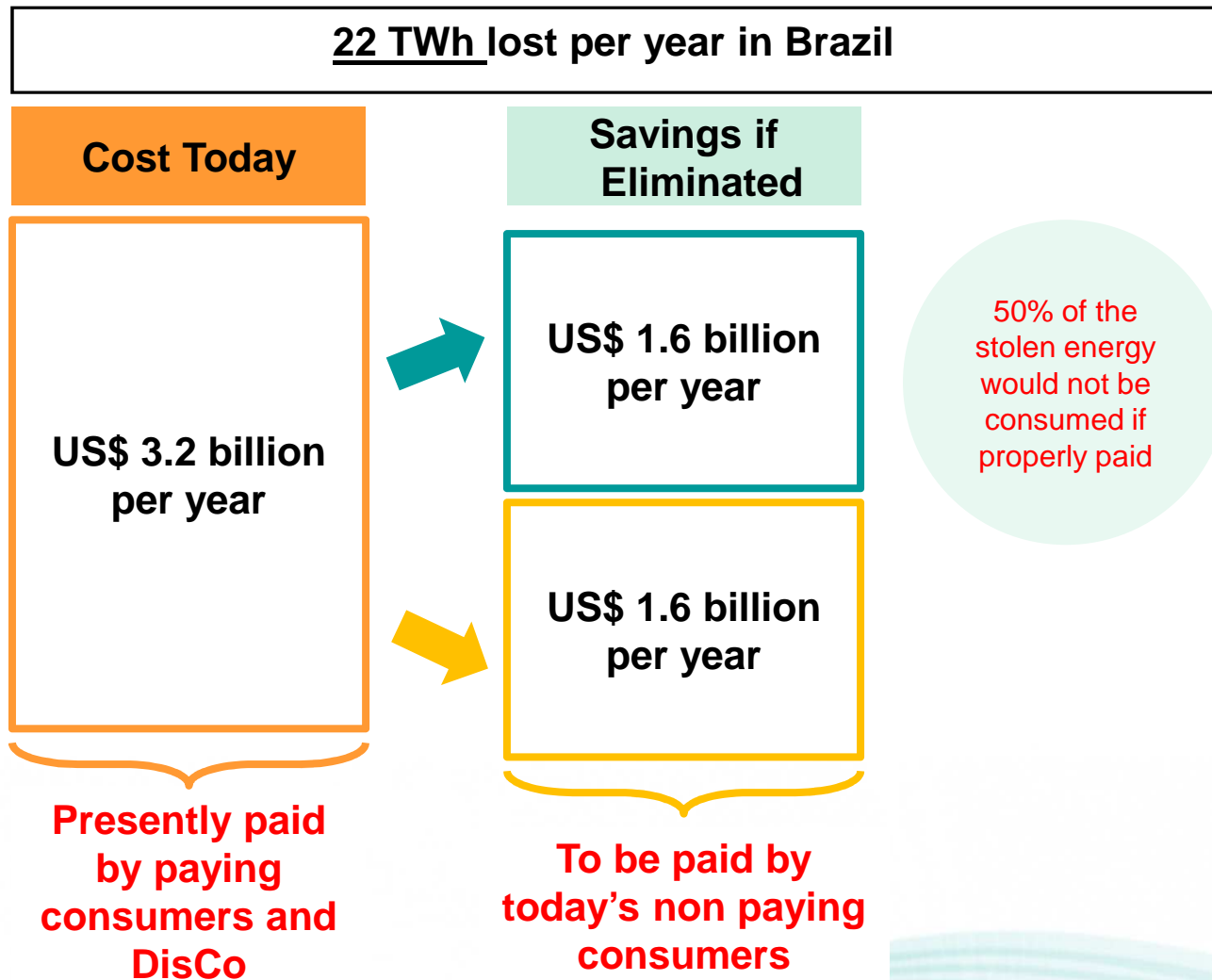
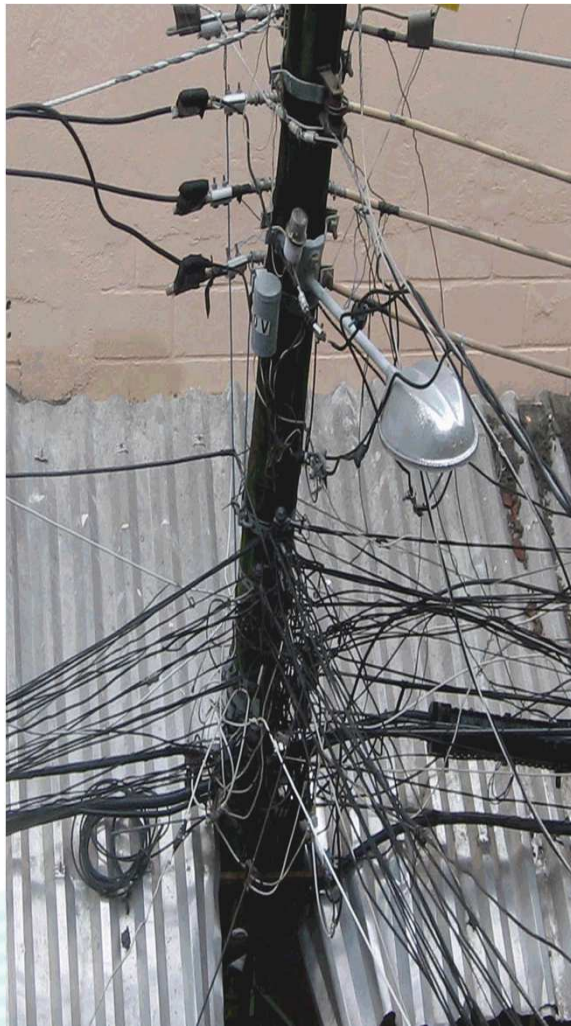
- **52%** of Brazil's Energy Theft
- **3%** of region's captive consumption

In Rio de Janeiro

- **26%** of Brazil's Energy Theft
- **22%** of state's captive consumption

Energy Theft: The Problem in Brazil

Waste and Unfair Cost Allocation



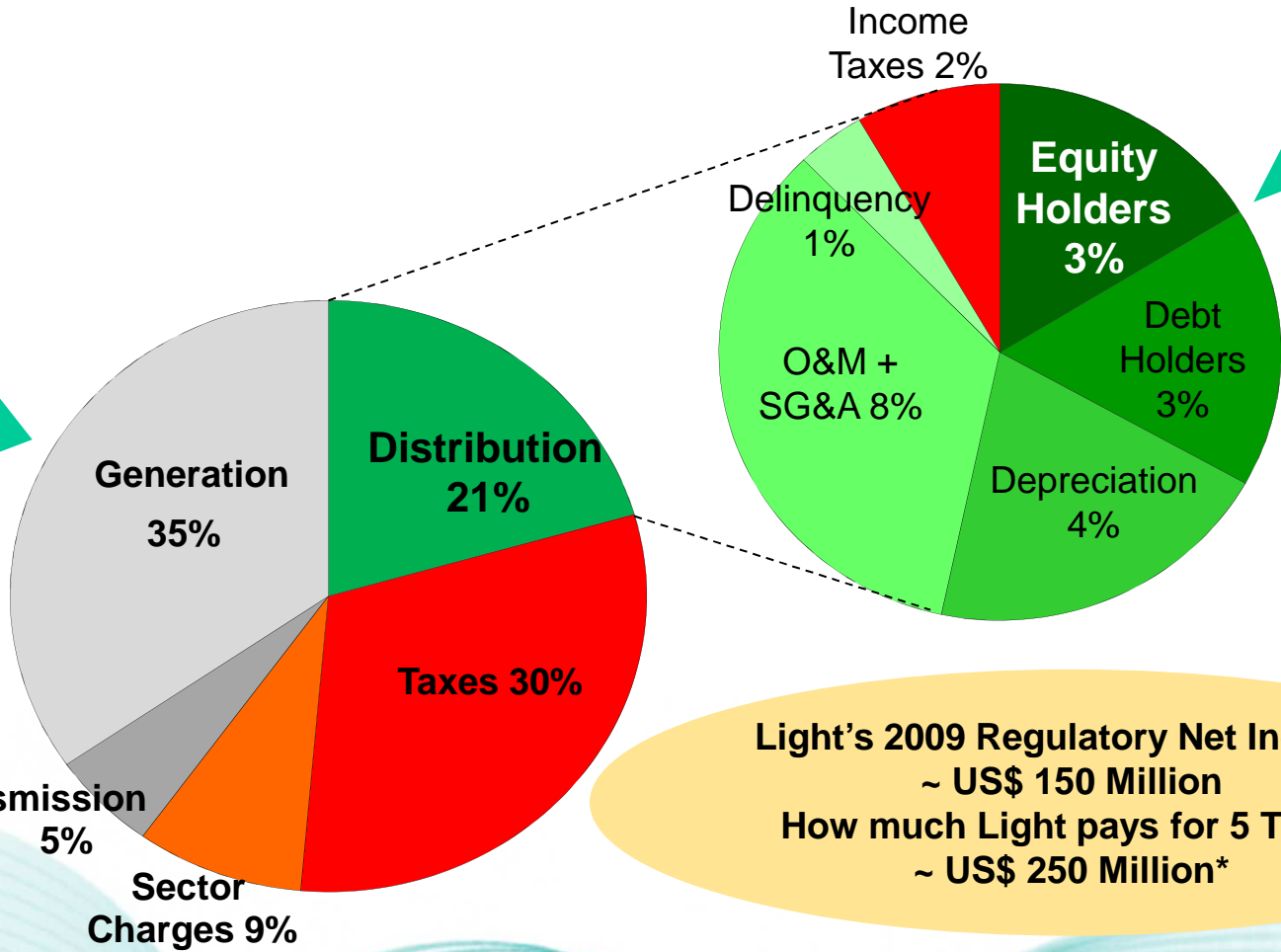
The Regulated DisCo's Perspective

Light's Challenges



Light's Regulatory Gross Revenues: only 3% goes to Equity Holders

Only 21% of Light's gross revenues is used to pay the distribution service



Regulatory WACC:
 • 15,05% Before Taxes
 • 9,95% After Taxes

Light's 2009 Regulatory Net Income: ~ US\$ 150 Million
How much Light pays for 5 TWh? ~ US\$ 250 Million*



* Considering only Generation Costs

Energy Theft: The Regulator's Perspective

What should the Regulator do?

Let DisCo pay for everything

DisCo's lack of financial sustainability would cause the return of the concession to Federal Government: Taxpayers would pay the bill!

Let honest consumers pay for everything

DisCo would not have incentives to reduce energy theft, that would increase over time: Paying consumers would pay an ever increasing bill!

Find a solution consistent with Price-cap Regulation

Understand causes, compare companies' performances, provide strong incentives to reduce energy theft: In the long run, paying consumers pay a smaller bill!

Energy Theft: The Regulator's Perspective

A Solution Consistent with Price-cap Regulation

ANEEL's Methodology to Determine Regulatory Levels

Understand the causes of energy theft:

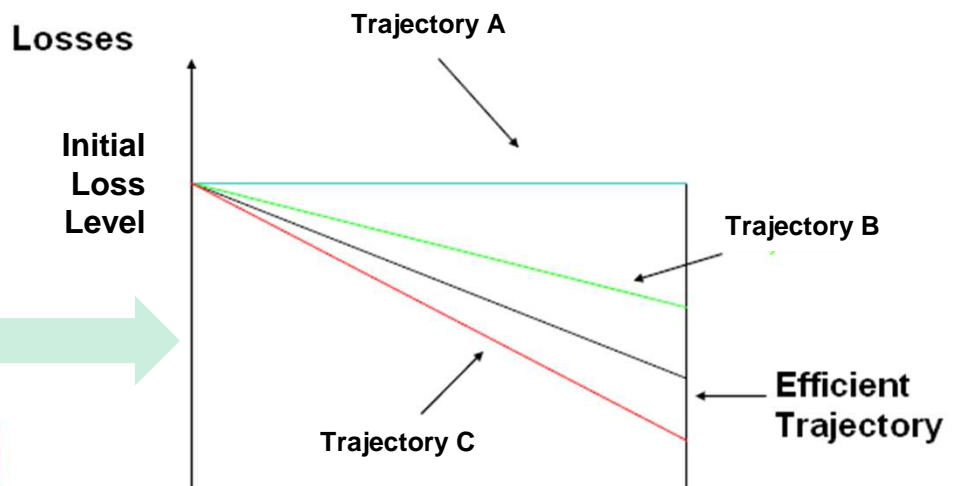
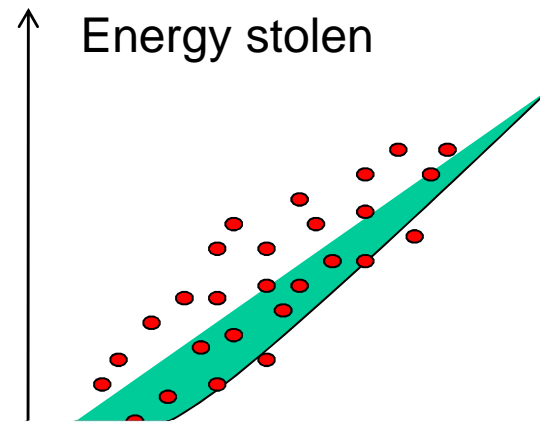
- Econometric model to capture social complexity of concessions

Compare Companies' performances:

- Yardstick Competition
- Clusters

Strong incentives to reduce energy theft:

- Trajectory for regulatory energy theft levels
- Cost-benefit analysis



Energy Theft: The Regulator's Perspective

The Social Complexity of the Concessions

Included in ANEEL's Model

Excluded from ANEEL's Model

Anomie

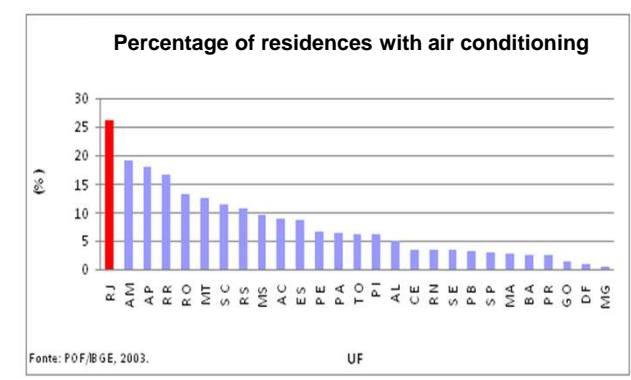
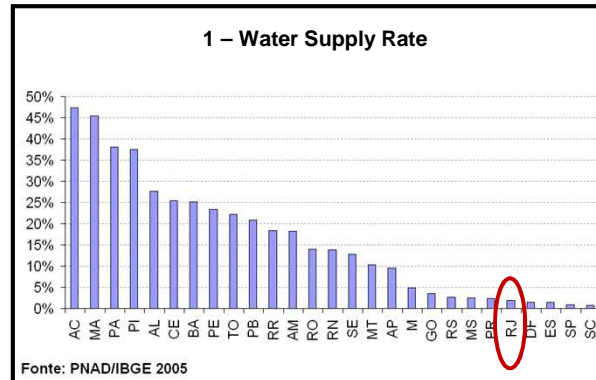
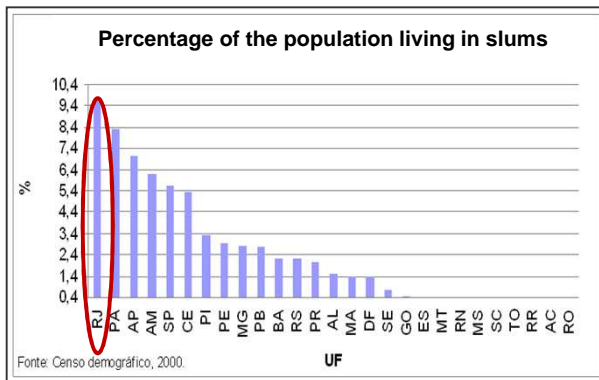
Development

Energy Usage

Urban Informality

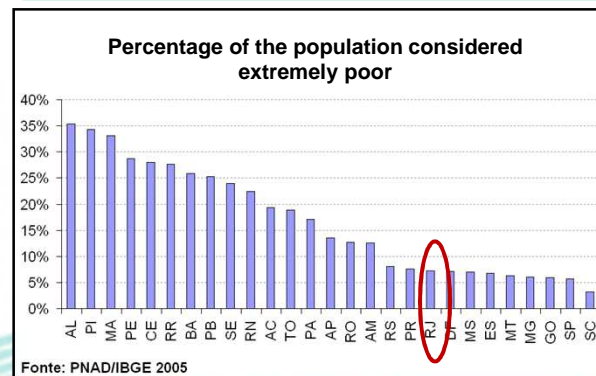
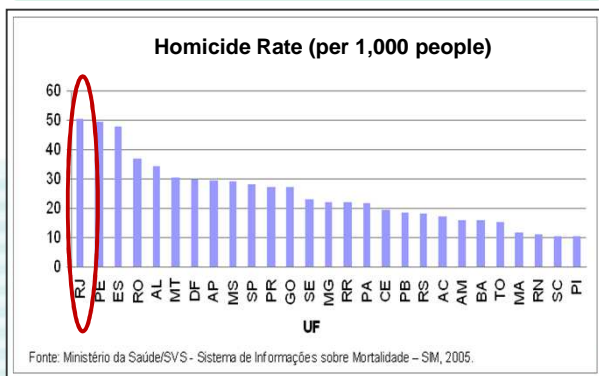
Infrastructure

Air Conditioning



Violence

Income



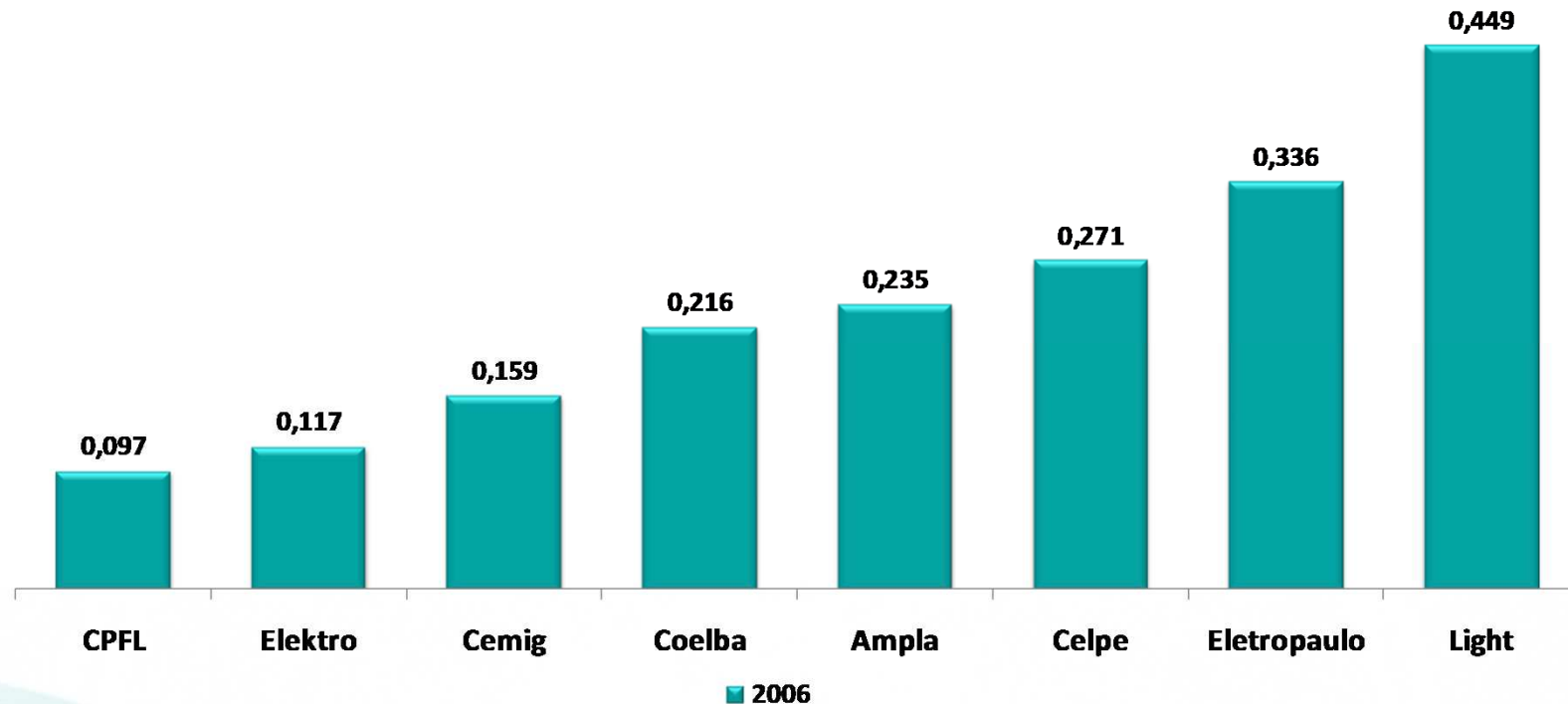
Air conditioning usage statistically significant

Energy Theft: The Regulator's Perspective

A Solution Consistent with Price-cap Regulation



Social Complexity Index of concession areas similar to Light's

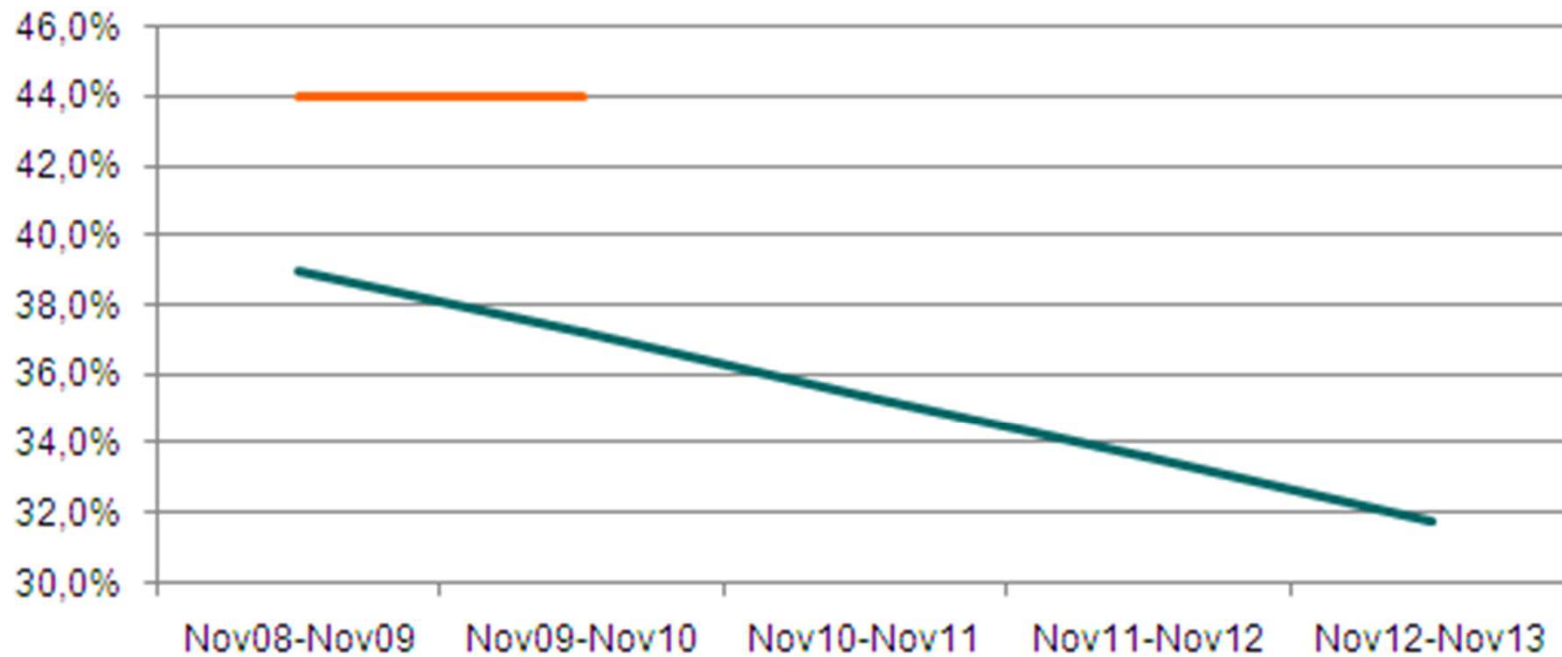


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The Regulated DisCo's Perspective

Light's Challenge to Reach the Regulatory Loss Levels

Light's total expenditure in energy theft control: ~ US\$ 80 Million per year*



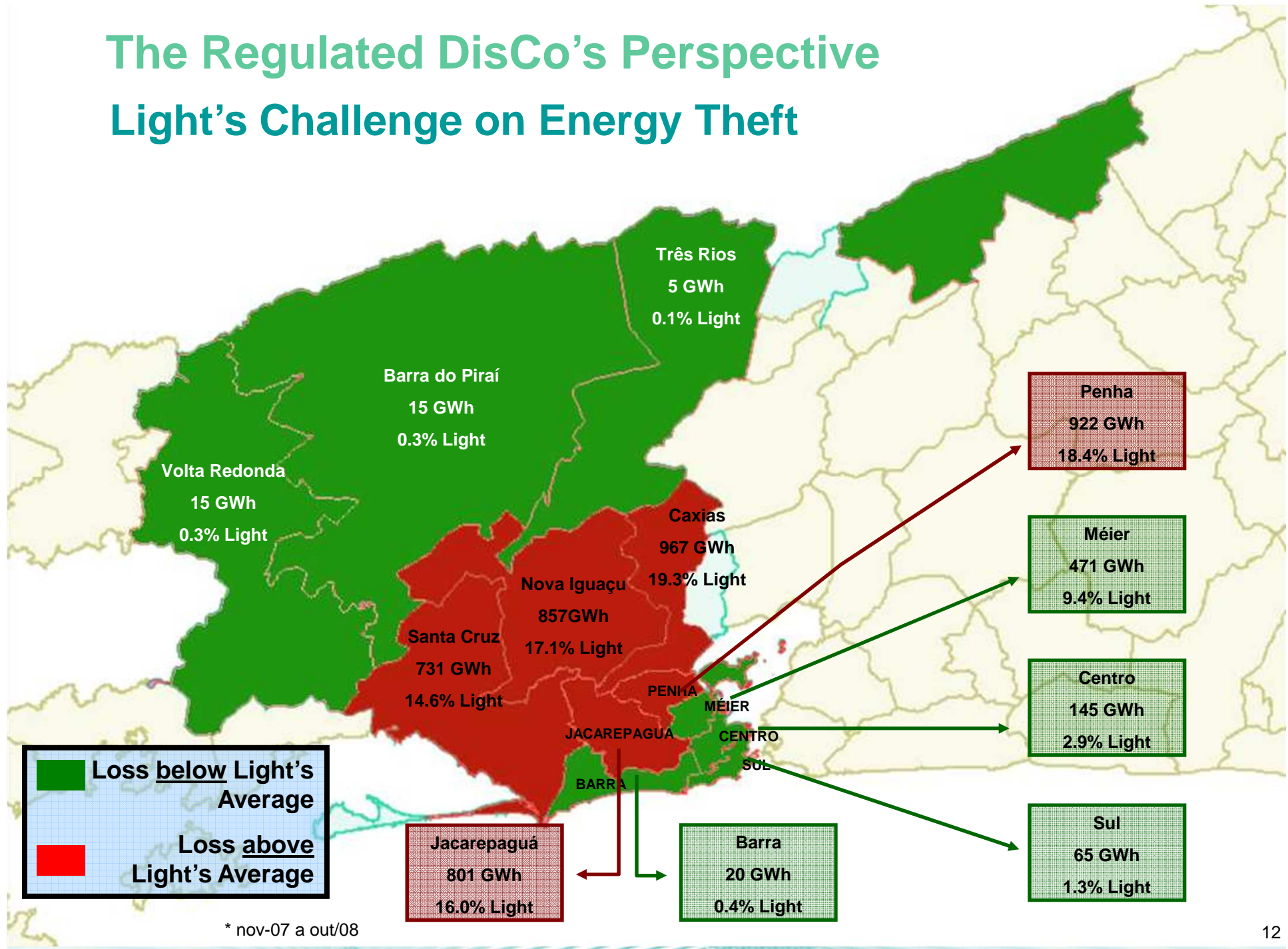
— Regulatory Energy Theft (% of Low Voltage Market)

— Actual Energy Theft (% of Low Voltage Market)

* OPEX + CAPEX

The Regulated DisCo's Perspective

Light's Challenge on Energy Theft



The Regulated DisCo's Perspective Light's Challenge on Energy Theft

Different Solutions for Different Areas



Higher Income Areas: Conventional control

**Lower Income Areas:
Electronic Meters + Anti-theft
cables**



**Risk Areas: To follow the effort of Rio's State
Government to regain territorial control and to
improve general living conditions in these areas**



The Regulated DisCo's Perspective

Risk Areas: Where Energy Theft Control is Virtually Impossible

40% of Light's energy losses due to theft

- 600 communities; **650,000 consumers** (17% of total)

Rio's effort to regain territorial control

Comunidades que serão mapeadas pela polícia



- 1 policeman per 40 people

- So far, 10 slums, 25,000 families (4% of total)

- Before pacification:

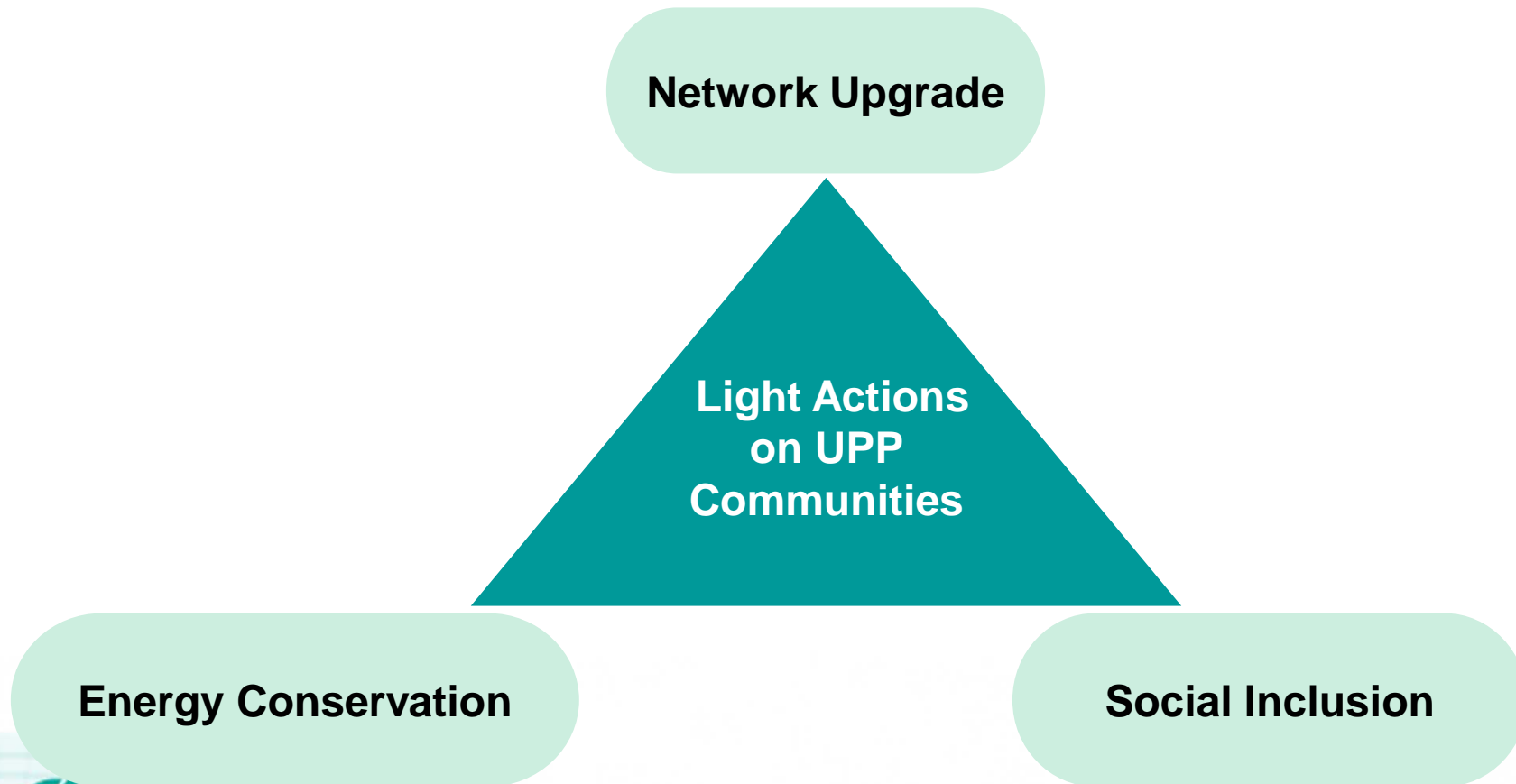
above 80% of delivered energy is stolen



- State Territorial Control: a necessary condition for adequate public services

The Regulated DisCo's Perspective

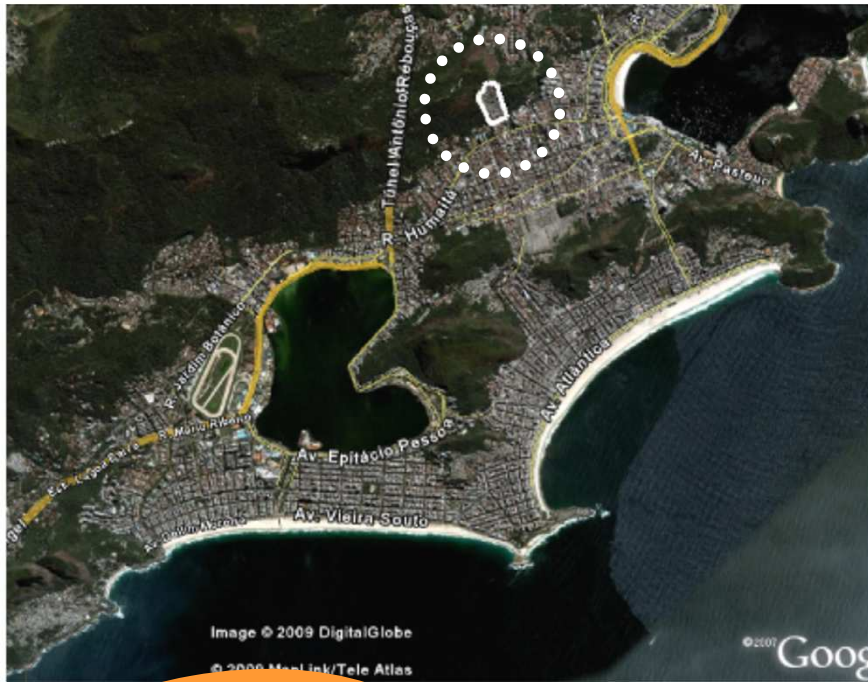
Risk Areas: Where Energy Theft Control is Virtually Impossible



The Regulated DisCo's Perspective

The Santa Marta Experience

1,500 families, US\$ 2.5 million in investments



Before
Theft: 89%
Delinquency: 76%



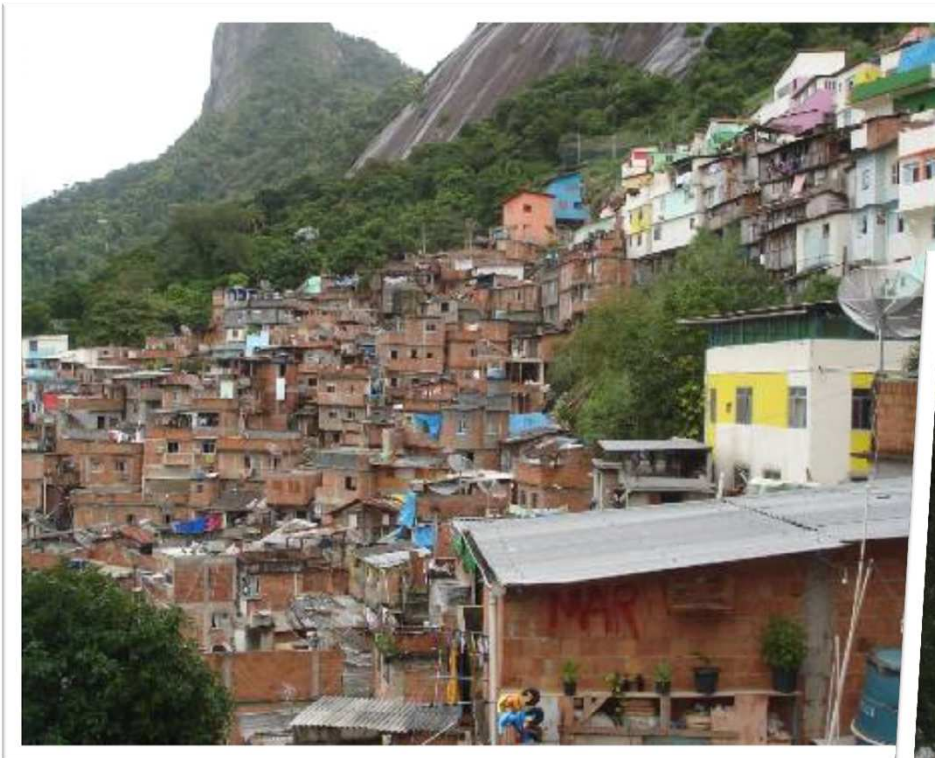
After
Theft: 0%
Delinquency: 5%



The Regulated DisCo's Perspective

The Santa Marta Community Experience

Before Pacification



- Number of families: 1,500
- Billed consumers: 80
- Total Revenues: US\$360/month

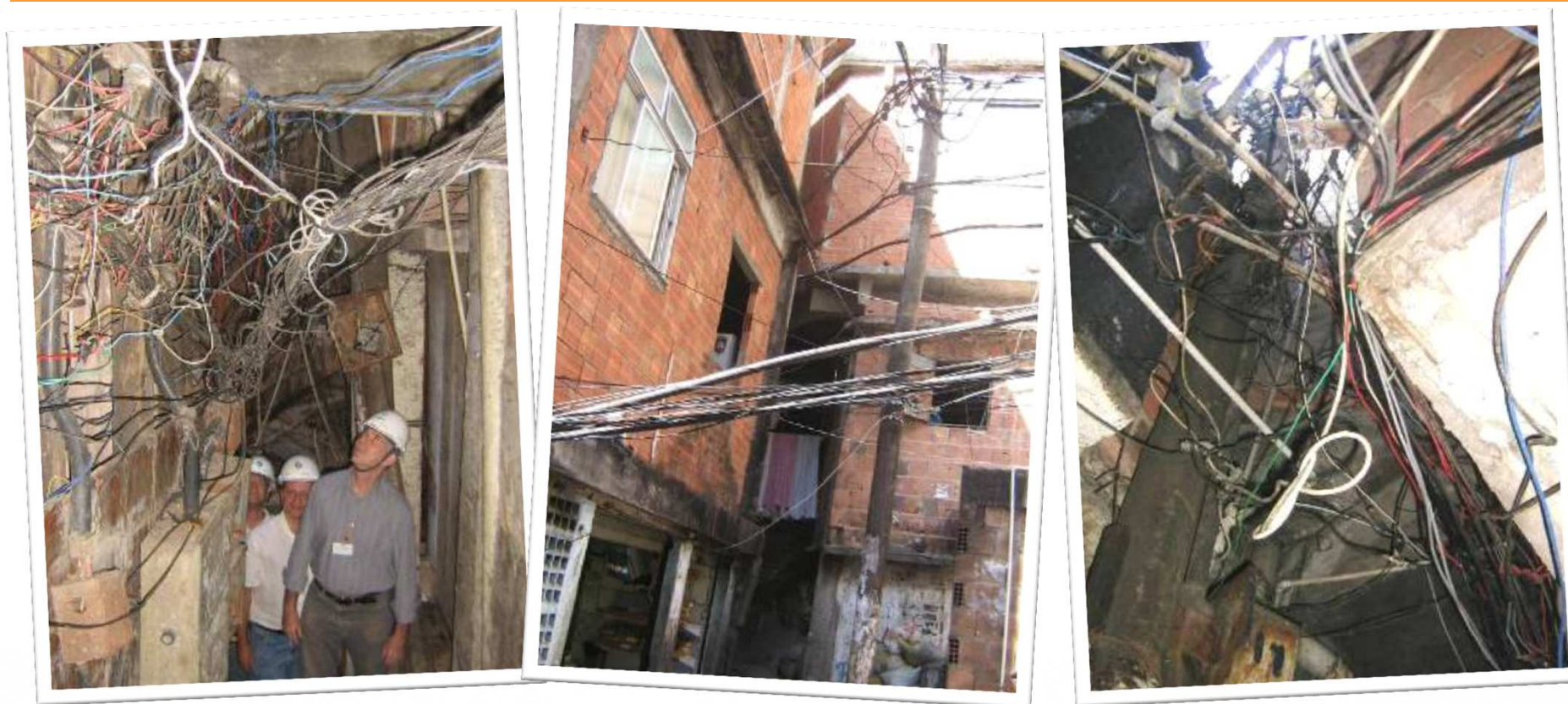


The Regulated DisCo's Perspective

The Santa Marta Community Experience



Before Pacification



- Transformers overcharged
- Precarious low voltage grid

The Regulated DisCo's Perspective

The Santa Marta Community Experience



Interaction with local community



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The Regulated DisCo's Perspective

The Santa Marta Community Experience



New grid, new technical solutions



The Regulated DisCo's Perspective

The Santa Marta Community Experience



Telemetric electronic gauging



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The Regulated DisCo's Perspective

The Santa Marta Community Experience



Energetic Efficiency

- Replacement of 7,000 incandescent bulb lamps
- Replacement of 700 inefficient refrigerators
- Substitution of internal wiring of 500 households

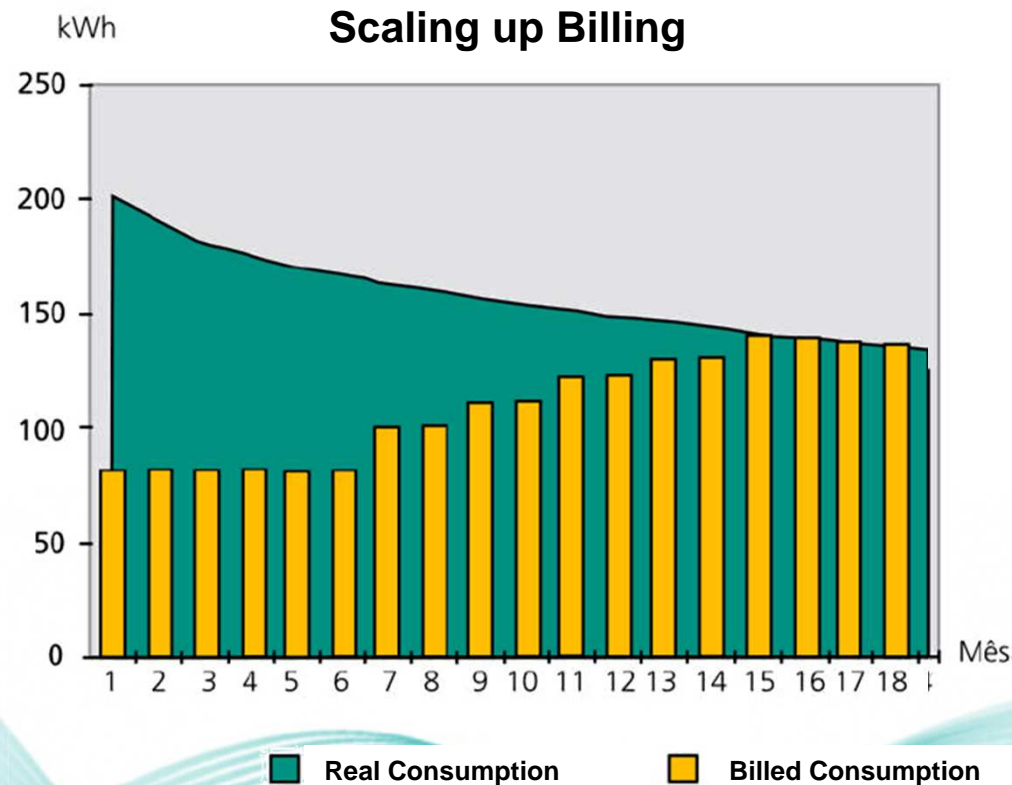


The Regulated DisCo's Perspective

The Santa Marta Community Experience

Santa Marta Billing

- Cancelling of old debts
- Electricity bill limited to 80 kWh per month during first 6 months
- Gradual stepping up of 20kWh per month each two months



The Regulated DisCo's Perspective

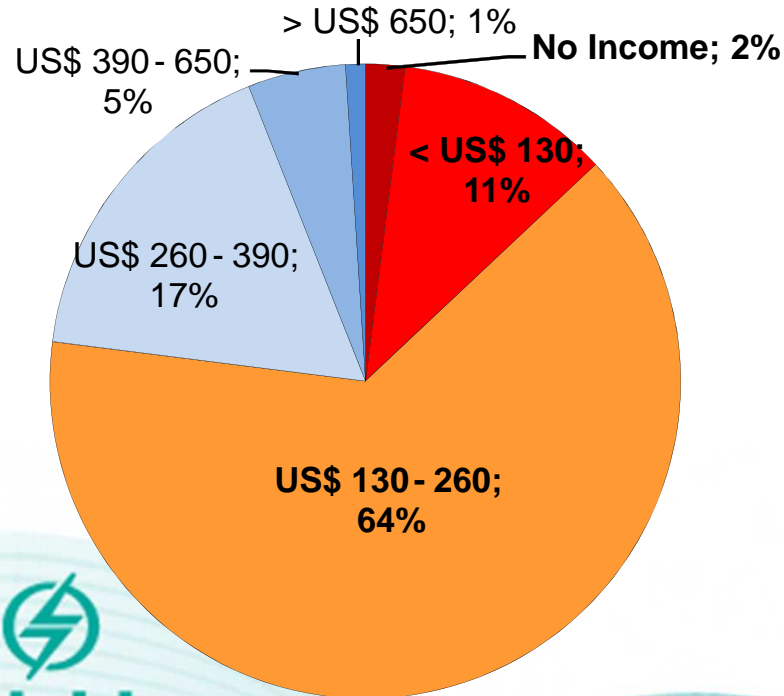
The Santa Marta Community Experience

Santa Marta: 1,500 Families

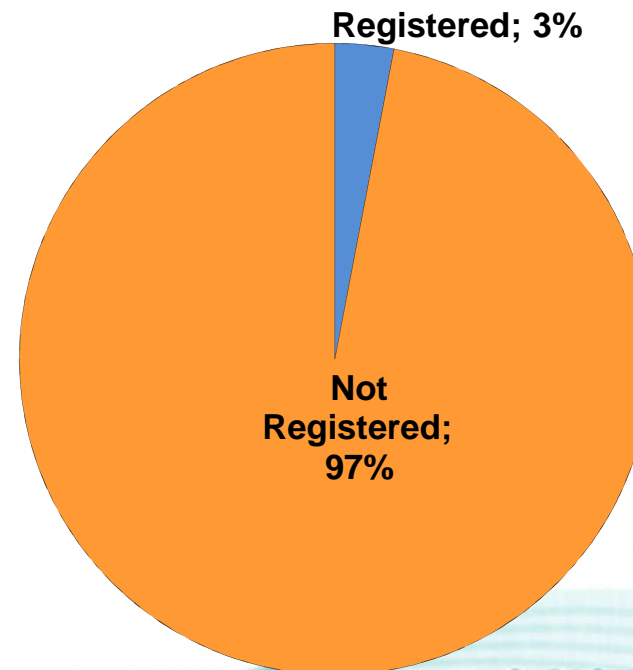
More than 70%: Per capita income below 50% of minimum salary

Only 3%: Billed with Social Tariffs

Per Capita Monthly Income



Registration in the Federal Government's Social Programs



Chapéu Mangueira e Babilônia



Cidade de Deus

