



*SISTEMAS REGULATORIOS*  
*Cumplimento com las*  
*conventiones*

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# TOPICS

Who we are:  
The Brazilian Nuclear Area

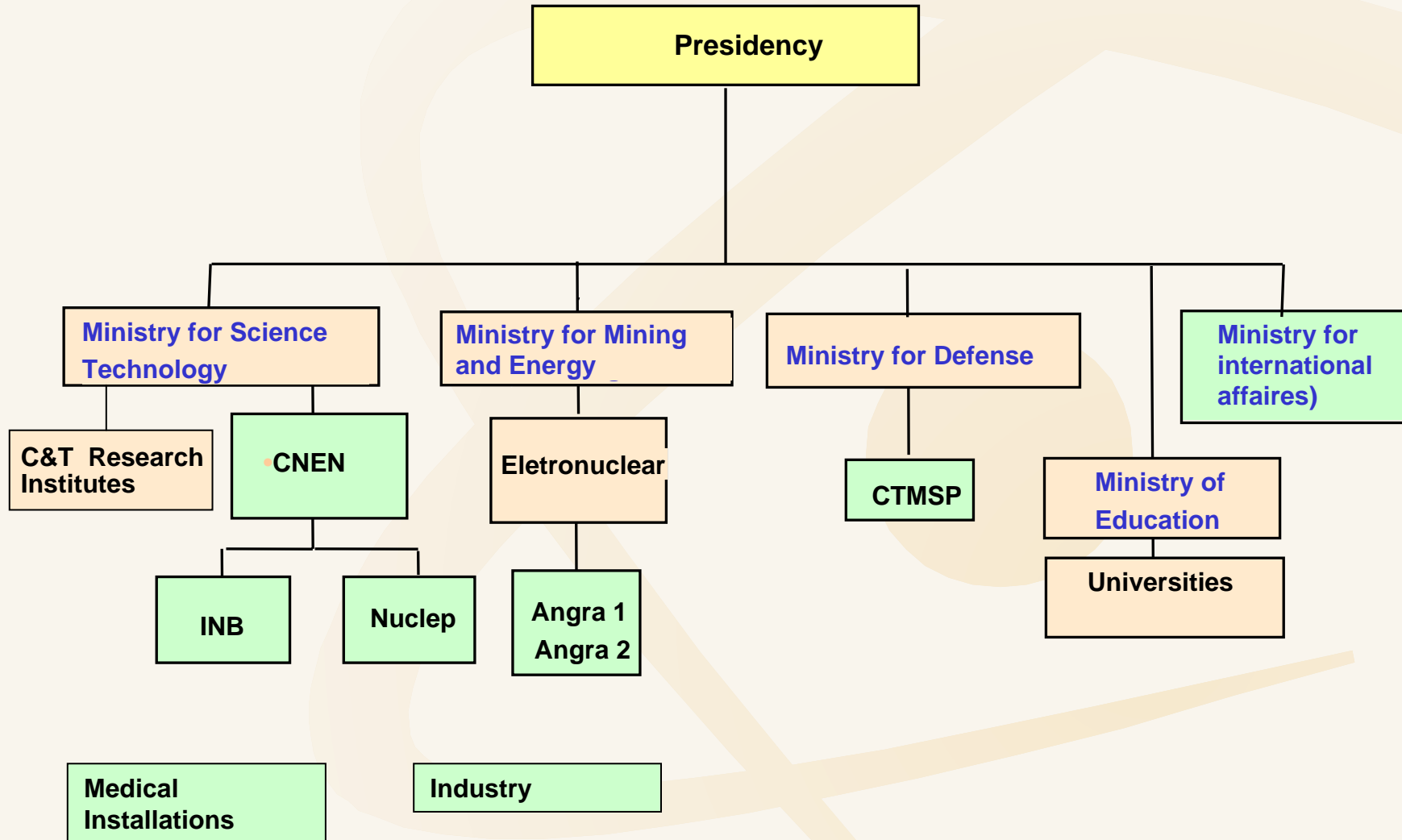


# BRAZIL

- Population (2004): 180.000.000
- Area: 8,514,215 km<sup>2</sup>
- 12th economy in the world
- Electricity sector
  - Installed capacity: 75 GW
  - Hydro: 92,7%
  - Oil/gas(others): 4,8%
  - Nuclear: 3%



# THE BRAZILIAN NUCLEAR AREA



# NUCLEAR POWER ACTIVITIES

- **ELECTRICITY PRODUCTION**
  - **URANIUM MINING AND MILLING**
  - **URANIUM ENRICHMENT**
  - **RECONVERSION AND PELLET FABRICATION**
  - **FUEL ELEMENT ASSEMBLAGE**
- \* **Nuclear represented 3% of installed electrical energy production capacity and 5% of the delivered electrical energy in 2004.**

# *FACILITIES*

*(Published in the Brazilian Report for the Safety and Waste IAEA Conventions)*

- 2 Nuclear Reactors
- 2 pools for temporary deposition of used nuclear fuel
- 3 temporary waste deposits for medium and low activity
- 4 High Intensity industrial irradiators
- 4 Research Reactors
- 5 Cyclotrons for radiopharmaceutical production (+ 2 in construction)
- 1 Synchrotron
- 5 Research Linear Accelerators
- ~ 25,000 sources in medical facilities for nuclear medicine
- ~ 30,000 sources used in industries

# TOPICS

Who we are:

CNEN, the Brazilian regulatory  
body and R&D institution

- The National Nuclear Energy Commission was created in 1956 and became the responsible for the monopoly of nuclear energy issues.
- As in other countries, soon CNEN became the Brazilian Regulatory body



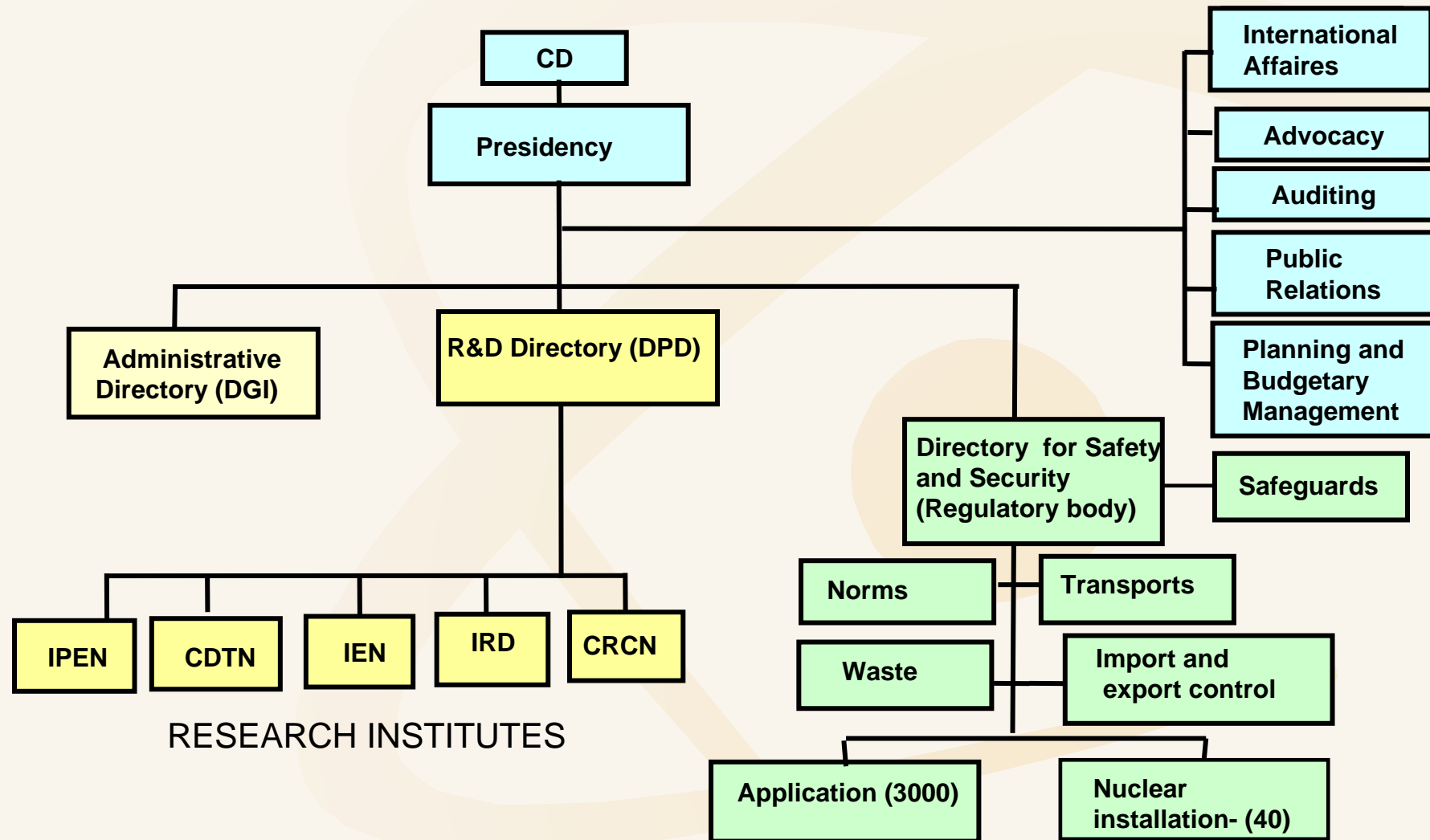


# *CNEN*

## *RESPONSIBILITIES*

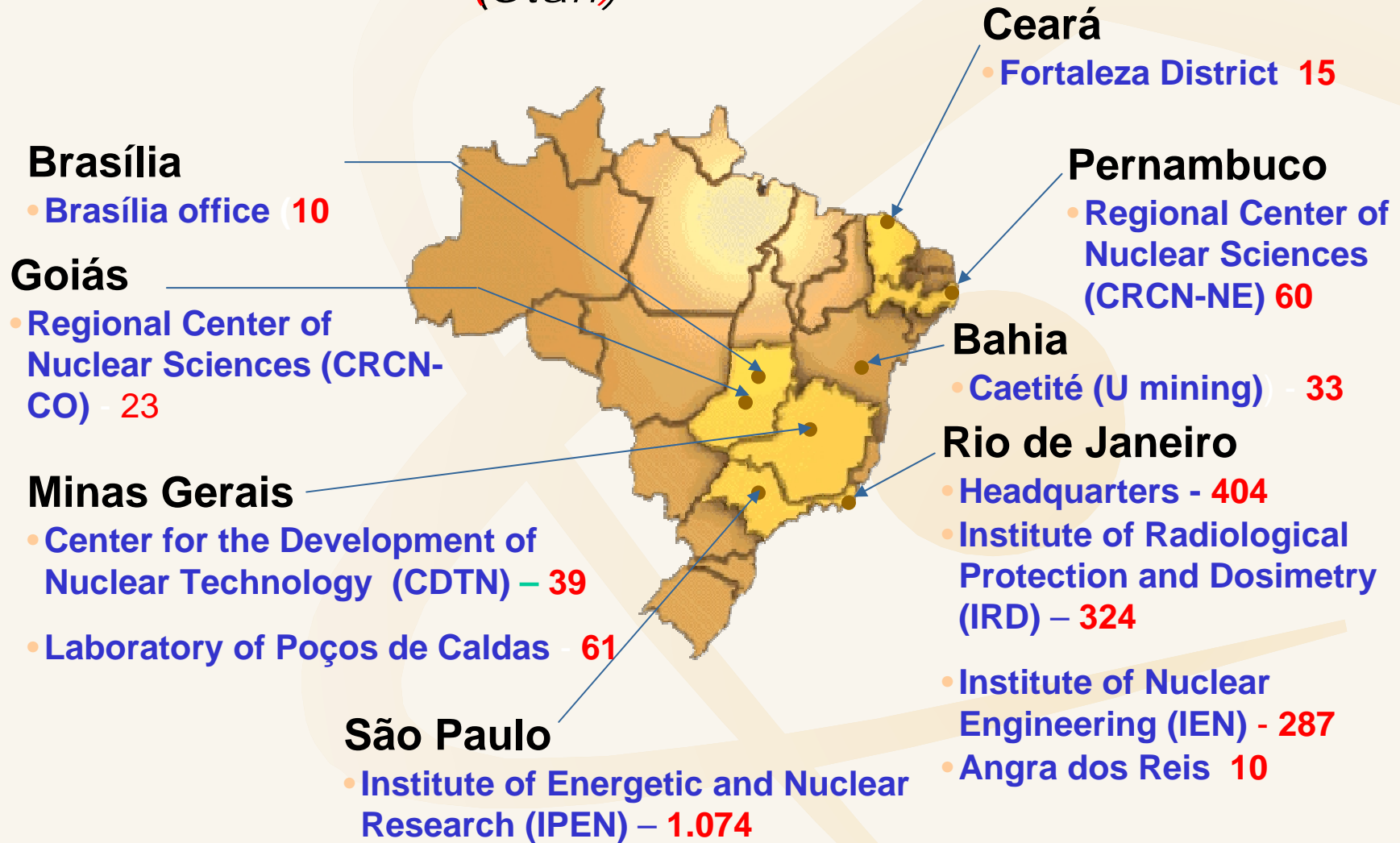
- **REGULATORY BODY, RESPONSIBLE FOR SAFETY, SECURITY AND SAFEGUARDS IN NUCLEAR AND APPLICATION AREAS**
- **RESEARCH, APPLICATIONS AND INNOVATION**
- **RADIO PHARMACEUTICALS PRODUCTION**
- **EDUCATION**
- **INTERNATIONAL ADVISORY TO THE MINISTRY OF INTERNATIONAL AFFAIRES**

# CNEN's ORGANIZACIONAL ESTRUTURA



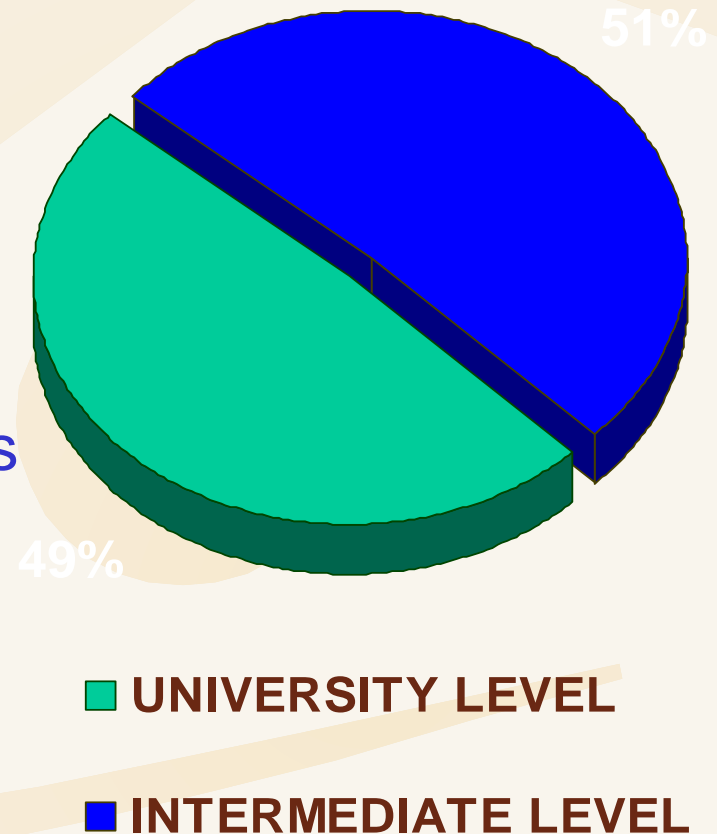
# CNEN'S UNITS

(Staff)



# STAFF

- 2.665 employees
  - 49 % university level
    - 12 % PhD's
    - 17% master in sciences
    - 16% specialization
    - 4 % undergraduate
  - 51% intermediate level



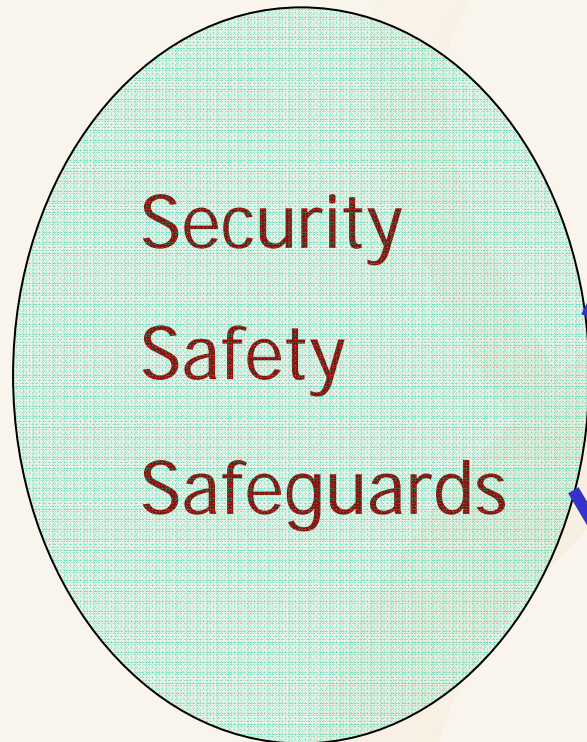
## International agreements

Aiming the peaceful use of nuclear energy, Brazil maintains technical cooperation agreements with more than thirty (30) countries such as Argentine, Germany, Spain, United States, France and Russia.

- Concerning Nuclear Safety Area, Brazil has signed six conventions:
  - Physical Protection on Nuclear Materials;
  - Prompt Notification on Nuclear Accident;
  - Assistance in case of Nuclear Accident and Radiological Emergency;
  - Civil Responsibility for Nuclear Hazards;
  - Nuclear Safety
  - Safe Management of Irradiated Fuels and Radioactive Wastes;
- Regarding Safeguards and Non proliferation, Brazil has signed three treaties:
  - Tlateloco – Nuclear Weapons Non-Proliferation Treaty in Latin America and Caribbean;
  - TNP – Nuclear Weapons Non-Proliferation Treaty;
  - CTBT - Comprehensive Test Ban Treaty.

# Overview of the Brazilian Regulatory Process

# REGULATION



Nuclear Installations

Nuclear Materials

Medical and Industrial  
Installations

Transportation

Waste

Personnel accreditation

# LICENSING PROCESS

- **NUCLEAR and RADIOACTIVE: BY CNEN**
  - SITE APPROVAL
  - CONSTRUCTION LICENCE
  - AUTHORIZATION FOR OPERATION
    - Initial
    - Permanent
- **ENVIRONMENTAL: BY OTHER AGENCIES**
  - IBAMA - BASED ON ENVIRONMENTAL IMPACT STUDY(EIA/RIMA)



# EMERGENCY ASSESSMENT AND RESPONSE

## Nuclear Accident Coordination Board

- Emergency Planning
- Emergency Response
- Development of dose projections.
- On line tracking of event development..

# Regulation: lessons learned

# Lessons learned

## **Human capacities: the first and main condition**

- Necessities: engineers, physicists, geologists, chemists, and others...
- Training could take from months to one decade
- Way of thinking different from the traditional researcher or scientist: efficiency, efficacy, routine, schedule and hierarchy, are important
- Important to plan: how many and for what?

## Lessons learned

### **Avoid the repressive police behaviour**

- Be proactive
- If they don't know, teach them
- Have in mind national and public interests

# Lessons learned

## Have a consistent legislation

- Account for responsibilities
- Provide different sanction grades
- Have space to deal differently with the different
- Consider the public interests

## Lessons learned

**Consult the operators to learn about the quality, efficiency and propriety of your service**

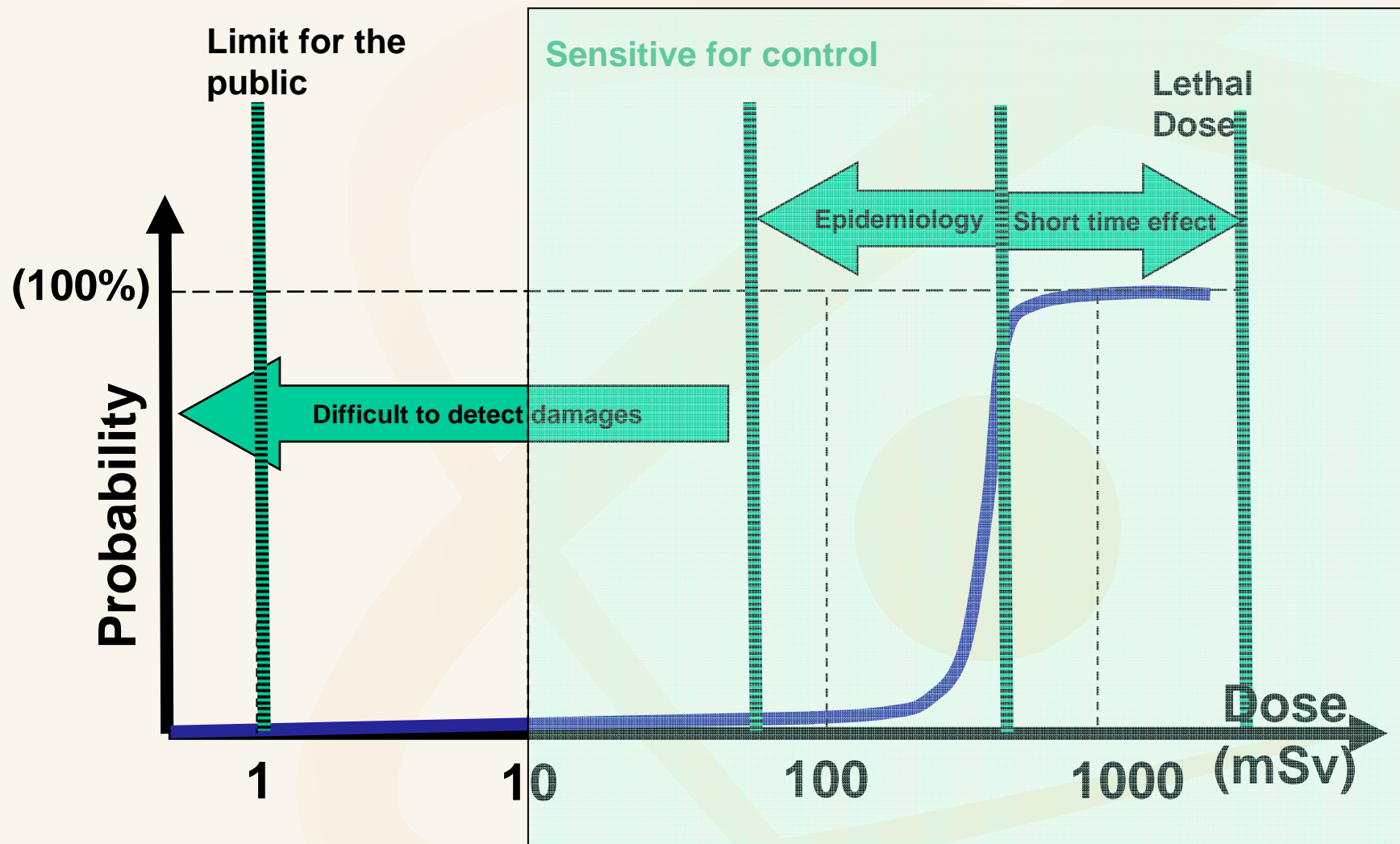
- Promote joint events with the operators
- Establish good and effective communication channels with the operators
- Reflect about suggestions

# Lessons learned

## **Be transparent**

- Inform the public about rules, risks and benefits of ionizing radiation and about the operators status
- Develop a friendly user home page with all kinds of information
- Establish good and effective communication channels with the public
- Don't try to hide or delay deliver of information concerning public interests.

# Don't ever forget: risk of damage





## Lessons learned

### **Don't try to control everything**

- Take into account risks, benefits and costs .
- Consider the IAEA source classification
- Establish a prioritization for the installations aiming different scope of controls
- But... Try to keep track of ALL radioactive sources and equipment in the country

## Lessons learned

**The IAEA standards are the state of art. Fit them to your facilities and capacities.**

- Sometimes it is better to do less but with more effectiveness, always considering risks and benefits
- Look at the different alternatives, for example American and European regulatory guides. You will be surprised.
- Somewhere another country has already dealt with similar problems and situations. Contact them.

## Lessons learned

### **Think carefully about the independence principle**

- How really independent can an institution be?
- Separation of promotion (R&D) and regulation is a guarantee of independence? TSOs
- Does the institutional independency (and even the economical assurance) guarantee the effectiveness of control?
- Or is the record of the accident number and the public transparency that allow to evaluate the effectiveness and efficiency of the control

## Lessons learned

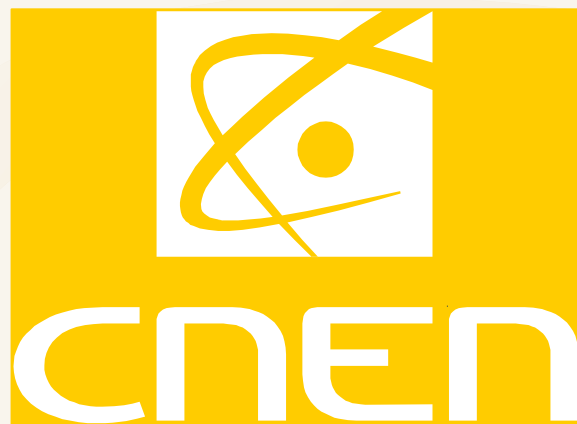
### **Think carefully about the independence principle**

- For Brazil, it was important to wait for the proper time to create a Nuclear Regulatory body separated from the Nuclear Energy Commission, in order to guarantee the sustainability of both institutions.

# Lessons learned

**Easy to say...Hard to do**

We do our best...



Thank you

[www.cnem.gov.br](http://www.cnem.gov.br)