



Overcoming the new Challenges in Safety after Fukushima



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IAEA Experts Meeting
H&O Factors in Nuclear Safety in the light of Fukushima

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Topics

- . **Brazil & Eletronuclear**
- . **Actions after Fukushima**
- . **Challenges**

The Company

(Brazil & Eletronuclear)



THE COMPANY



MINISTRY OF MINES AND ENERGY



Eletrobras



Eletrobras
Eletronuclear





ANGRA 2

1.350 MW

Siemens/KWU

Operation: Jan/2001

ANGRA 1

640 MW

Westinghouse

Operation: Jan/1985

Central Nuclear Almirante Álvaro Alberto – CNAANA
(Admiral Álvaro Alberto Nuclear Power Station)

ANGRA 3

2016 - OPERATION

TODAY



~30%
RJ

2016



~60%
RJ



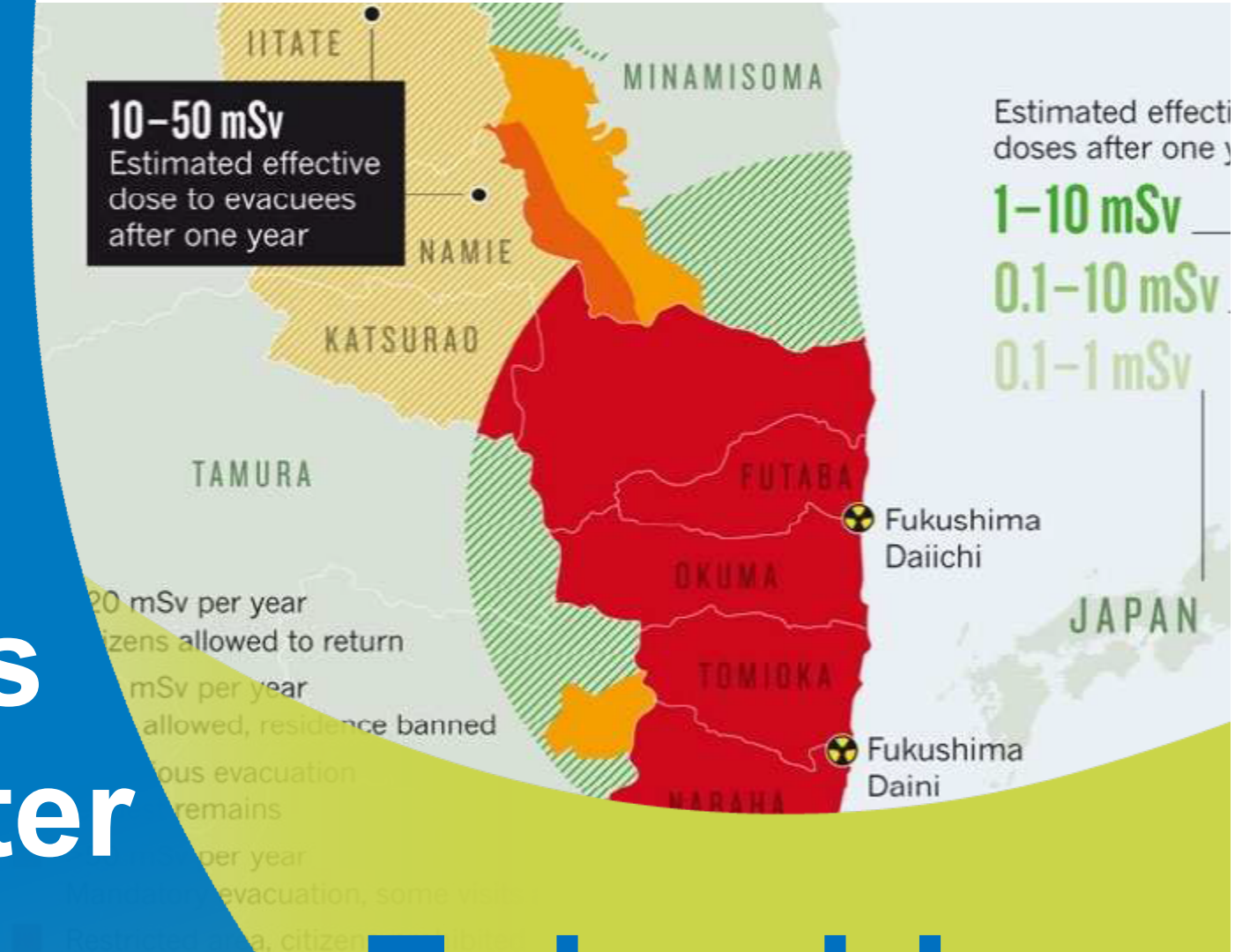
Nuclear Power Plants after Angra 3

Reference Case : + 4.000 MW

Alternative 1: + 6.000 MW

Alternative 2: + 8.000 MW

Actions after



Fukushima

Eletronuclear Actions

Three days after the accident, a Working Group was created to monitor, collect and analyze information about the event.

The Action Plan:

- Approved in Nov/2011**
- Submitted to the National Regulatory Body, CNEN.**

The Action Plan

58 studies and projects to be accomplished by 2016.

Areas of evaluation:

- **Protection against risk events,**
- **Cooling capacity, and**
- **Limitation of radiological consequences.**

Some actions were already in progress.

Estimated investment: US\$ 150 million.

- **US\$ 15 million already invested**
- **End 2013: US\$ 25 million**

Plan General Structure

Main Evaluation Areas of FUKUSHIMA RESPONSE PLAN

PROTECTION FROM RISK EVENTS **PE**

15 initiatives

Focus:

Protection from events with the potential to induce multiple failures in safety systems

Objective:

Assure that safety systems are preserved in case of extreme conditions associated with external or internal events, beyond the design basis.

COOLING CAPACITY **RF**

32 initiatives

Focus:

Reactor and Spent Fuel Pool cooling capacity in case of beyond design basis accidents

Objective:

Provide alternative possibilities for reactor and fuel pool cooling, for conditions beyond design basis

MITIGATION OF RADIOLOGICAL CONSEQUENCES **CR**

9 initiatives

Focus:

Mitigation of radiological consequences in case of severe accidents

Objective:

Provide means to minimize the risk of losing containment integrity and releases of radioactivity materials to the environment

Time evolution of accidents – Defense in Depth

Strong exchange of information



Eletrobras
Eletronuclear

- **National organizations: government, regulator, technical support, vendors, service providers and others.**
- **Invited international organizations: GDFSuez, AREVA, Westinghouse, Rosatom and others.**
- **Participated and led discussions with media and public through seminars and open meetings.**



159 Member States have already made significant progress in upgrading nuclear safety

The IAEA Action Plan on Nuclear Safety was endorsed by the Member States (Sep. 2011)

Member States with NPPs have completed stress tests and taken practical steps towards safety

The IAEA is making efforts to expand the expert peer reviews to Member States

IAEA Safety Standards being revised

Challenges

Actions

Challenge

Safety Culture -
A continuous move!

Different cultures
Different definitions
Review missions
Mixed messages

Governamental attention

IAEA

Regulatory demands

Quality of Regulators and
review missions

Communication

Improve communication
in general & openness to
the media
Respect to the public

Interaction with WANO,
IAEA, LA Forum, etc.

Exchange of information
& meetings

Actions

Challenge

Improvement of design and practices

OPEX

Report on events – increase the number of reports to international organizations

Reaching Low Level Events & Near Misses

Safe Long Term Operation (SALTO)

Knowledge Mngt - Plants getting older & older

SC interaction with other organizations/industries

(e.g., L A Forum) and this will continue to progress!

Etc.

Example of a Safety Benchmarking Forum in Brazil:

- oil, gas & energy (Petrobras, Shell, ExxonMobil, Statoil, Chevron, BP),
- nuclear (Eletronuclear)
- mining & metallurgy (Vale, Samarco, ArcelorMittal)
- health (Hospital A. Einstein),
- chemistry (Braskem, DuPont),
- eng & equipment (GE),
- paper (Klabin), etc.

and this will continue to progress!

Is Safety Culture the highest priority of the nuclear agenda?

Indications exist that for many other industries it is a hot topic deserving continuously increasing attention.

A specific research has demonstrated that in the non-nuclear journals there is a growing and consistent corpus of knowledge upon which researchers and practitioners of safety culture keep on accessing, using and improving.

Is Safety Culture the highest priority of the nuclear agenda? (cont.)

As an inevitable consequence of the Fukushima accident, the nuclear organizations are putting more attention to this discussion, but in addition to that we have to make sure that this subject is included in nuclear education everywhere as well to foster research in this subject.

Is Safety Culture the highest priority of the nuclear agenda? (cont.)

It is essential to create an active and sustainable worldwide community of practice of academia, researchers and practitioners of safety culture.

There are several initiatives in how to gain insight and assess safety culture of organizations, but consensus is still to come. It is important to maintain this focus, or complacency will come (again?) and another important event may come (again?).

Other events will happen in nuclear
and in other industries and they will
be
more and more visible!

Where?

- Prevention
- Avoid
Complacency

How?



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IAEA
Atoms For Peace

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Thank you