FUTURE CHALLENGES FOR IPEN/MB-01 NUCLEAR RESEARCH REACTOR

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Summary

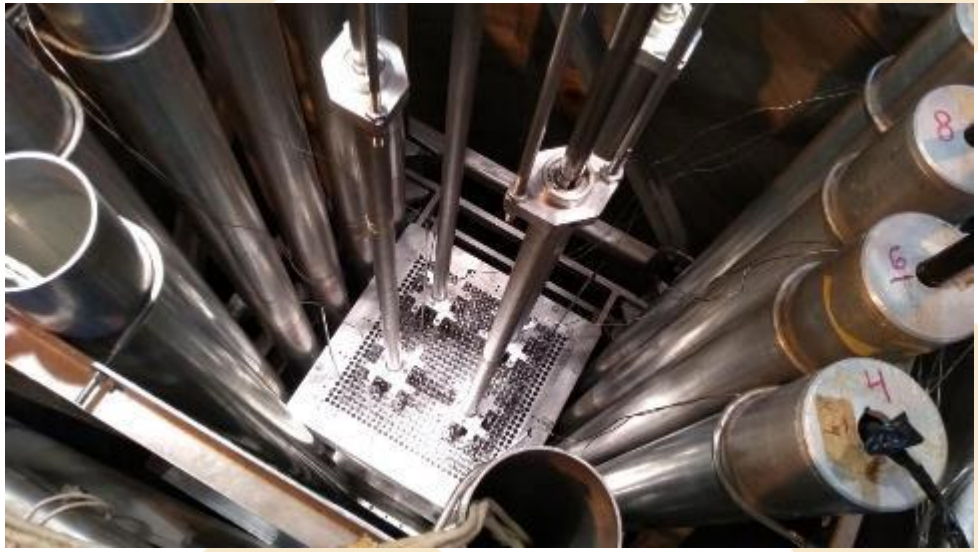
1. Facility description
2. The last 30 years
3. Challenges for the next 30 years
4. Actions for the future challenges
5. Conclusions
6. Acknowledgments

1. Facility description

IPEN/MB-01

- **Conception, project and construction performed in Brazil**
- **First criticality:** 09/11/1988
- **Type:** Critical facility (tank)
- **Power:** 100W
- **Flexible core:** No need of a heat removal system
- **Applications:**
  - Validation of reactor physics methodology and nuclear data associated for PWR core analysis (NEA/OECD database)
  - Teaching and training in reactor physics
  - Training Brazilian NPP operators
- **Status:** Core replacement ongoing

1. Facility description



2. The last 30 years

Played a key role in the BNP development

Sessions: 3663

Students: 20 a year (average)

Experiments:

~15 different a year

Validation of reactor physics methodology and nuclear data associated – NEA/OECD benchmark experiments

2. The last 30 years

Training:

More than 40 new operators for RR

- 2 years training course

About 50 new operators for NPP

- 3 weeks training course

Dozens of nuclear professionals (undergraduate / graduate)

2. The last 30 years

Educational Activities Levels: Undergraduate (1), Graduate (MSc and PhD, 2)

Experiments:

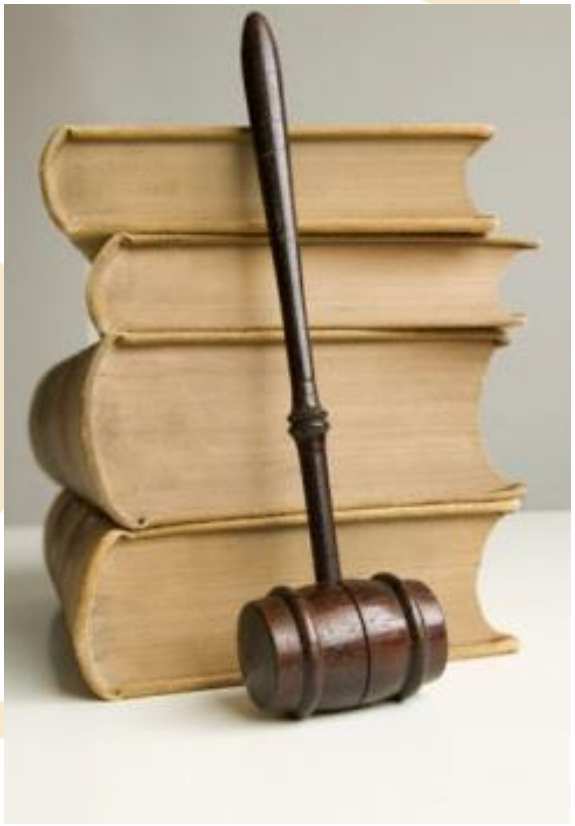
Gamma spectrometry (2)
Flux measurement (NAA) (2)
Power measurement (NAA) (2)
Reactor tour and criticalization (1/2)
Criticality prediction (1/2)
Control rod calibration (1/2)
Temperature coefficient measurement (1/2)
Void coefficient measurement (1/2)
Power measurement through neutron noise (2)

2. The last 30 years

Outcome:

Experience acquisition regarding:

- Management of nuclear facilities
- Safety operation
- Proper maintenance
- Nuclear material accounting and control
- Physical and radiological protection



Nuclear knowledge preservation*

3. Challenges for the next 30 years

Commissioning process of the new core

Part of the knowledge / experience has been lost

Aging of the workforce

Just 2 senior operators / they can retire at any moment

1 operator with great experience / 1 operator waiting the new core to finish the training course

Retirement of the researches (2019)

Retirement of the staff (up to 2022)

3. Challenges for the next 30 years

Reactor utilization

- Reestablish the connection with some stakeholders
- Brazilian universities are facing aging issues
- Activities performed together are not in place anymore
- Number of students in the facility decreased

Reactor maintenance

- Use of original equipment and elements
- Storage of spare electronic parts
- Process instrumentation upgrade – necessity of refurbishment

3. Challenges for the next 30 years

3 major areas identified

Replenishment the workforce

Improve reactor utilization

Facility upgrade

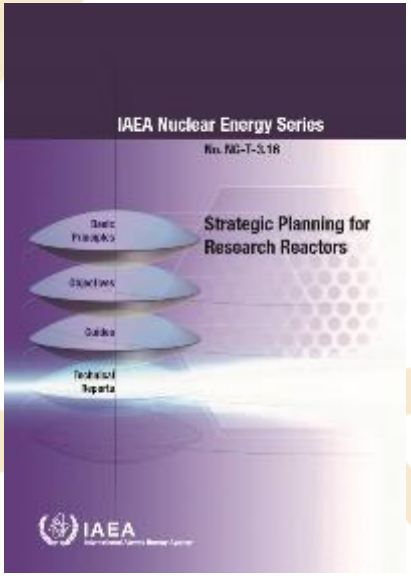
4. Actions for the future challenges

Development a Strategic Plan (SP)

Efficient and well managed utilization of the RR

Sustainable operation

Investment justification (refurbishment / expansion)



4. Actions for the future challenges

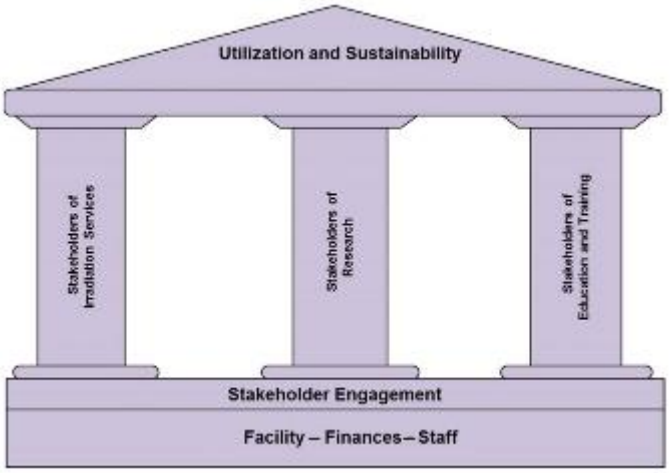
IEAE TECDOC + SOP + experience acquired

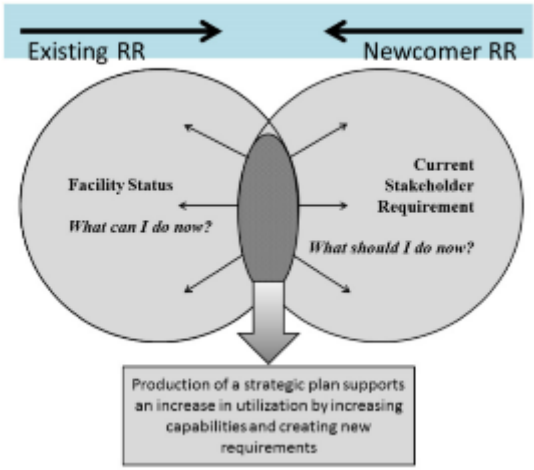
Present and potential capabilities of RR

Existing and potential stakeholders (and their needs)

Scenario – staff / budget

Major objectives has been defined (SMART criteria)





Source: "Strategic Planning for Research Reactors – No. NG-T-3.16", IAEA Nuclear Energy Series, Vienna (2017)

4. Actions for the future challenges

4 main areas / Major objectives


Education


Training


Research


Managerial

4. Actions for the future challenges

Education

- Technical information tours
  - Include the RR in the Institutional system (~1200 visitors a year)
  - Weekly basis
  - Guide preparation
  - Expand the social rule of the RR
- Internet Reactor Laboratory (IRL)
  - Link a host reactor with a classroom in any other place
  - Live reactor experiments
  - Bring professional to the facility
  - Increase the utilization of the RR

4. Actions for the future challenges

Training

- New RR operators training course
  - Form new 3 senior operators asap
  - Transfer the knowledge
- New NPP operators training course
  - Continue offering a proper training course
  - Update all the available material to the new core

4. Actions for the future challenges

Research

- Provide access to researches from outside
  - POLI/USP / UFABC / UFPE / others
  - Development of new projects
  - Offer a multidisciplinary nuclear laboratory
- Provide access to researches from inside
  - Great retirement expected for the next 5 years
  - Attract those who are not going to retire
  - Create strategies to facilitate their entrance in the facility
  - Technical tours / presentation of nuclear and auxiliary systems

4. Actions for the future challenges

Research

- Experimental validation of RMB core
  - Experimental support and validate the calculation methods
  - It is imperative to form new operators
- Expand the number of experiments performed
  - IAEA/RRDB
  - IAEA - Hands-on Training Courses using research reactors and accelerators
  - IAEA Compendium*
  - Analyze the experiments around the world
  - Development and deployment can bring new professionals and students

4. Actions for the future challenges

Management of the facility

- Improve the communication with other RRs
  - Exchange experience (operation, maintenance, management)
  - Different constraints, clients, experiments and staff
- General upgrade
  - Overcome the obsolescence challenge
  - Stablish cooperation with IS/IEN/CNEN
  - Alignment with CNEN`s SOP
  - Opportunity to put professionals together again

4. Actions for the future challenges

Management of the facility

- Specific web portal
  - Increase the facility visibility
  - Can support the finding process for new researches, students and visitors
  - Increase reactor utilization

5. Conclusions

Challenges are already in place

It is imperative to develop a comprehensive SP

Main threats – workforce aging / absence of well trained staff – jeopardize the facility development

Very first action – new operators / new professionals / new students

6. Acknowledgments

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Questions!?

Thanks for the attention

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