2012 LAS-ANS SYMPISIUM
Rio de Janeiro - Brazil

Scientific Education and Capacity Building Programs for Nuclear Power Projects

Prof. José V. Lolich, PhD
Instituto Balseiro
Argentina

CAPACITY BUILDING FOR NUCLEAR PROJECTS

ARGENTINA APPROACH

CAPACITY BUILDING THROUGH EDUCATION AND TRAINING

Human Resources for Nuclear Power Projects

Two main stages during a Nuclear Project:
1. Design and construction (procurement)
2. Operation and Maintenance

Two type of Professionals:
1. "Highly Skilled" Nuclear Engineers
2. Engineers (Chemical, Electrical, Mechanical, etc.)

but…. "Highly Skilled" Nuclear Workforce demand are required only during procurement, design, and construction.

Human resources is one of the key elements for a successful implementation of the various types of nuclear application

HUMAN RESOURCES ARGENTINA APPROACH

- **Highly Skilled Professionals that never had difficulties securing jobs in the nuclear or technological fields*.**
- **Training Centers (Institutes) associated to R&D Centers.**
  - **Joint project between a National University and a R&D State Organization**

Nucleoeléctrica Argentina, the country's sole constructor and operator of nuclear power plants, also has its own nuclear training centres close to nuclear power plant sites.
Training for non-graduate technical staff as well as for new engineering graduates and other technical staff is provided through these centres.

*even during two decades of almost no activity in the nuclear sector, graduates of Argentina's principal nuclear training institute, the Balseiro Institute, never had difficulties securing jobs in the nuclear field.

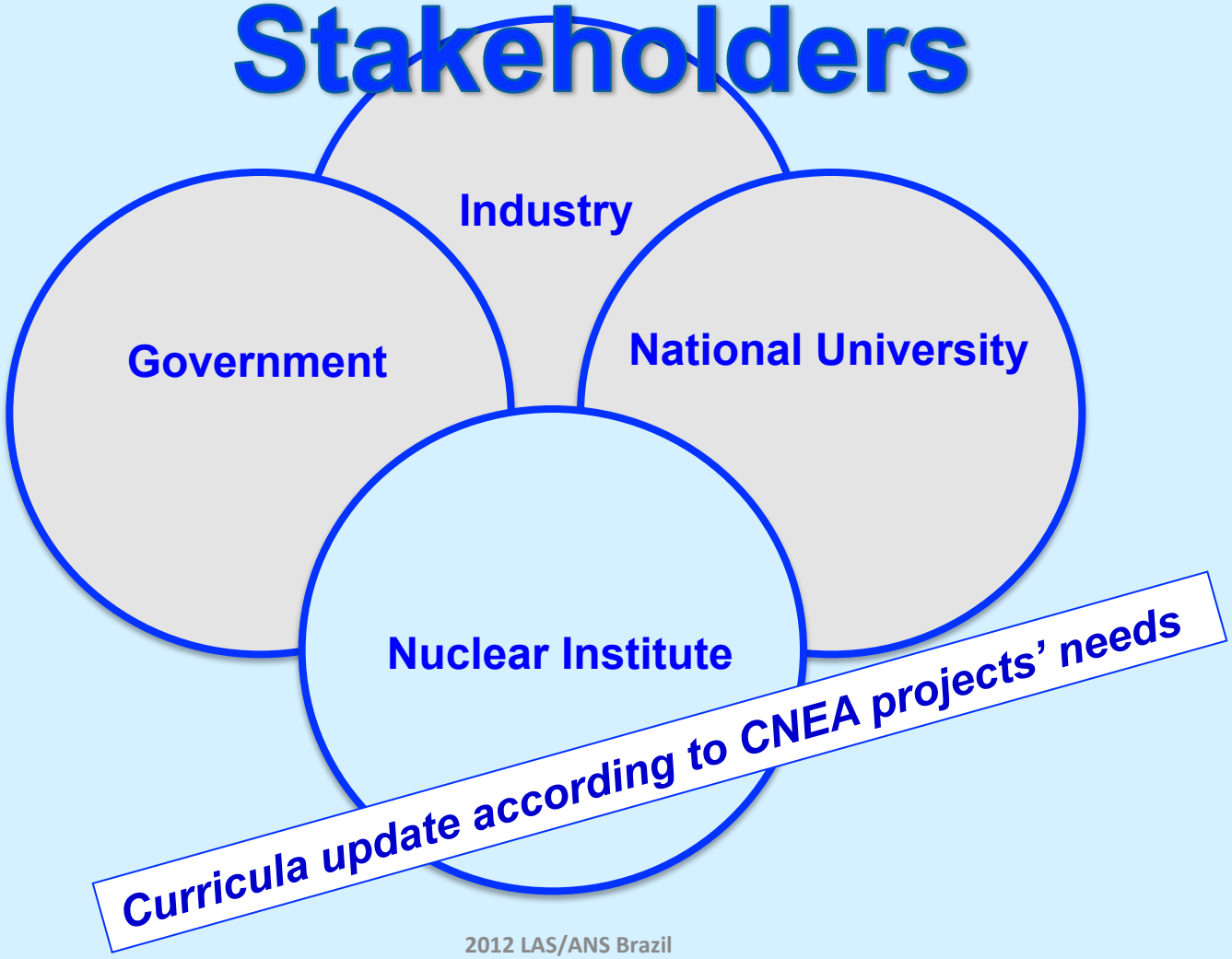
CNEA's INSTITUTES

Institute	Main Activity Area
Dan Beninson	Nuclear Courses
Sabato	Materials Science (Nuclear)*
Medicine School	Nuclear Medicine**
Balseiro	Nuclear + Science + R&D*

* *Undergraduate & Postgraduate*
** *Postgraduate*

Human Resources for the Nuclear Technology (Argentina case)

Argentina Nuclear Institutes Stakeholders



ARGENTINA APPROACH

INSTITUTO BALSEIRO

"Instituto Balseiro" established in 1955

Agreement between:

- ✓ Argentina Atomic Energy Commission
- ✓ Cuyo National University

1. 1955: School of Physics started
2. 1977: School of Nuclear Engineering (Design and Construction)
3. 1996: Specialization in Technological Applications of Nuclear Energy (Operation and Maintenance)

> 30 years old!

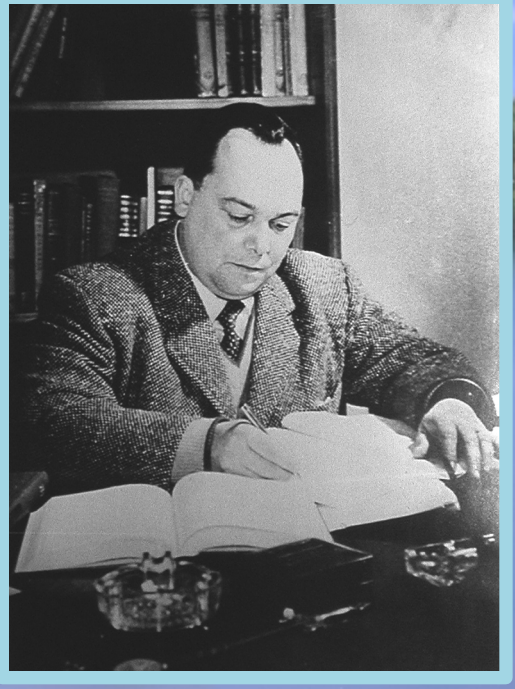
Agreement

CNEA (Comision Nacional de Energia Atomica)

- ✓ Student scholarships*
- ✓ Infrastructure (buildings, labs, equipment, utilities)
- ✓ Budget

UNCu (Universidad Nacional de Cuyo)

- ✓ Academic degrees
- ✓ Teachers salaries
- ✓ Administrative staff salaries
- ✓ Budget



Our founder
Dr. J. Balseiro

* Plus private companies

UNIVERSIDAD NACIONAL DE CUYO

- Created 1939
- 13 Faculties
- at the end of 2012:
  - 4038 Academic Staff
  - 30996 Undergraduate Students
  - 3748 Postgraduate Students
  - 147 Academic Degrees
  - 67 Postgraduate Degrees

Mendoza

Bariloche

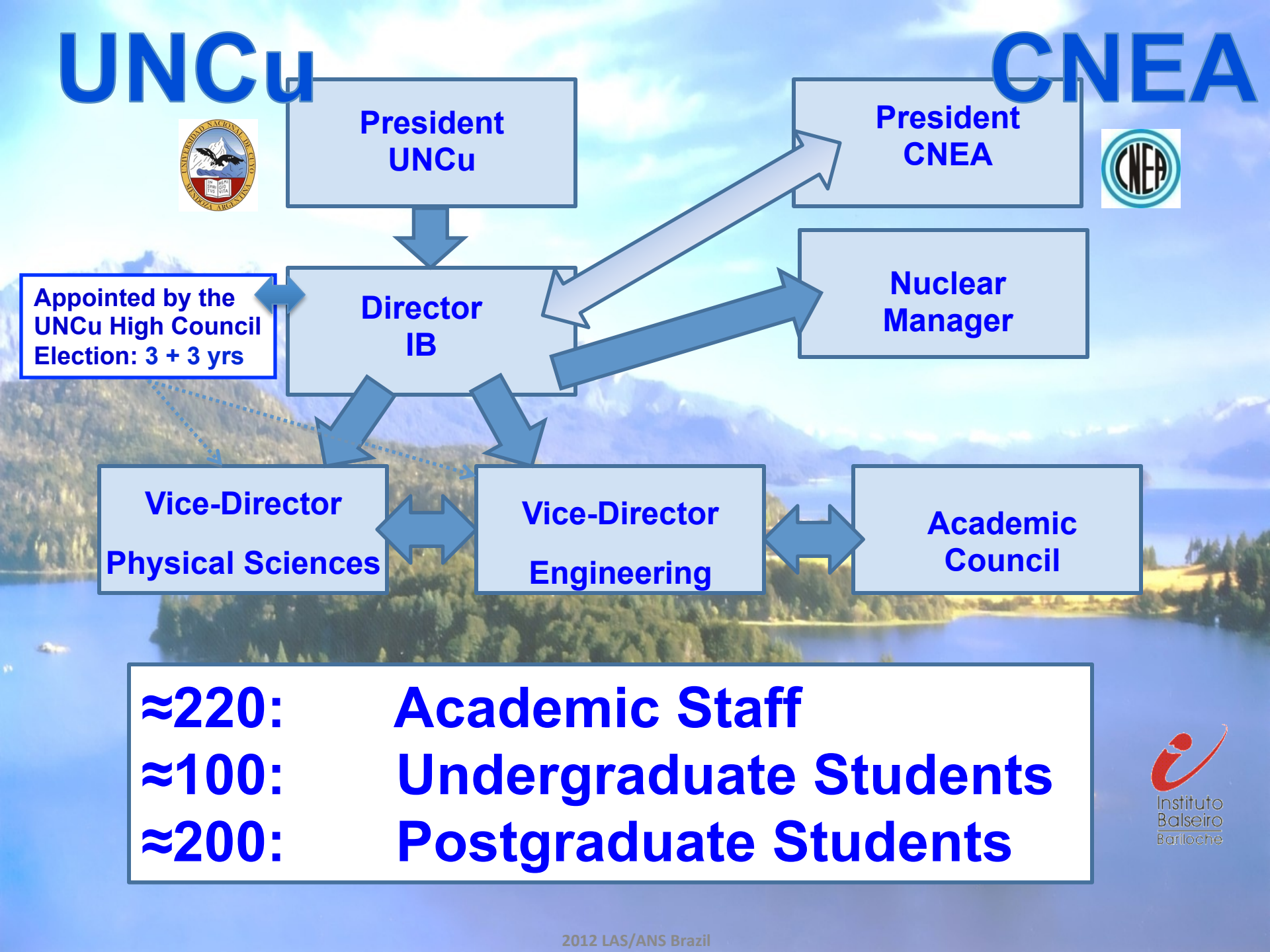
COMISION NACIONAL DE ENERGIA ATOMICA

- Created 1950
- 3 Atomic Centers
  - Ezeiza Atomic Center
  - Constituyentes Atomic Center } *Buenos Aires*
  - Bariloche Atomic Center ← Instituto Balseiro

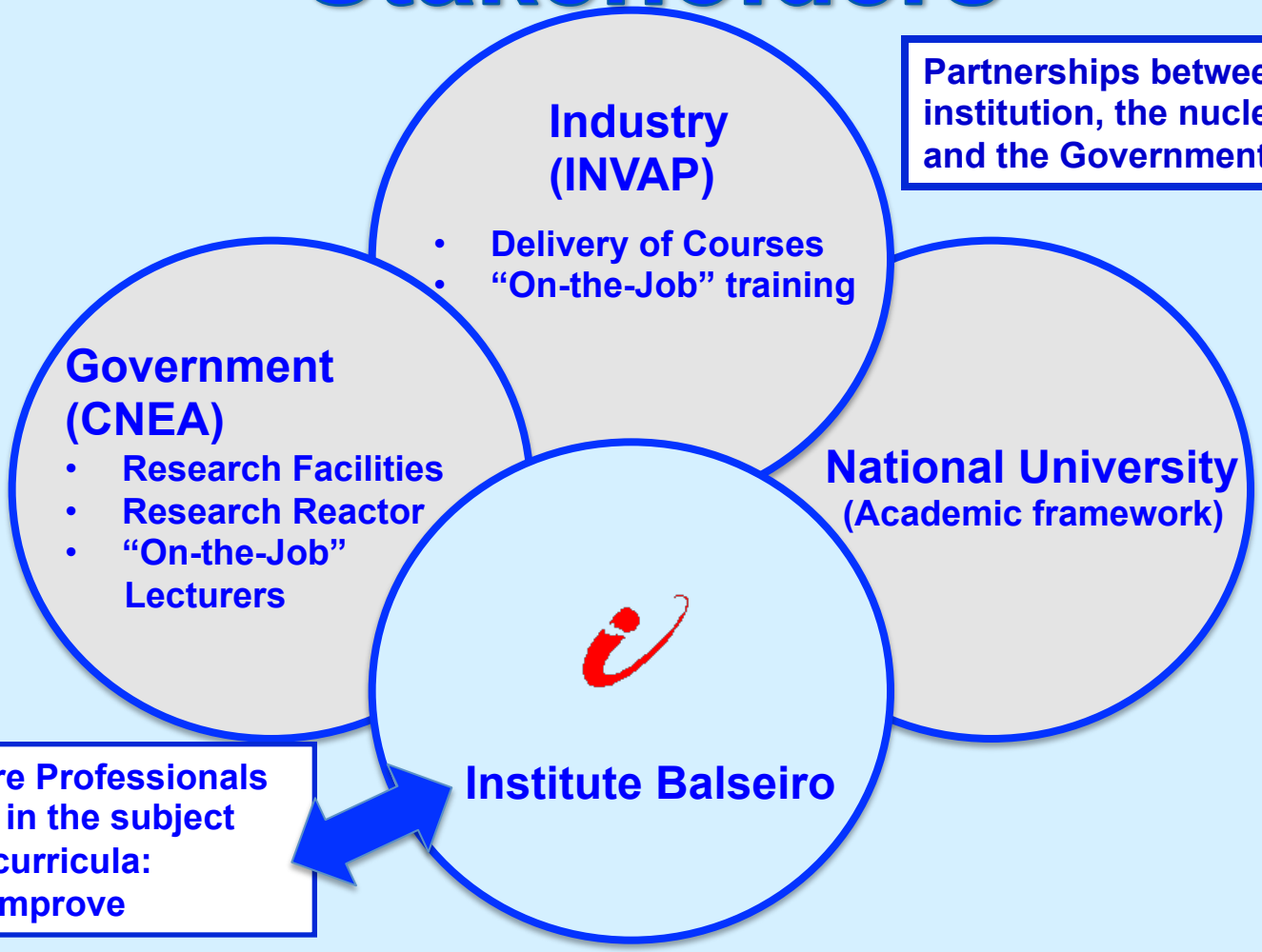
CAE

CAC

CAB


UNCu
CNEA
President UNCu
President CNEA
Appointed by the UNCu High Council Election: 3 + 3 yrs
Director IB
Nuclear Manager
Vice-Director Physical Sciences
Vice-Director Engineering
Academic Council
≈220: Academic Staff
≈100: Undergraduate Students
≈200: Postgraduate Students
Instituto Balseiro Bariloche

Instituto Balseiro Stakeholders



Partnerships between educational institution, the nuclear industry and the Government

All lecturers are Professionals that are active in the subject they teach ➔ curricula: continuously improve

Admission requirements for Graduate Studies

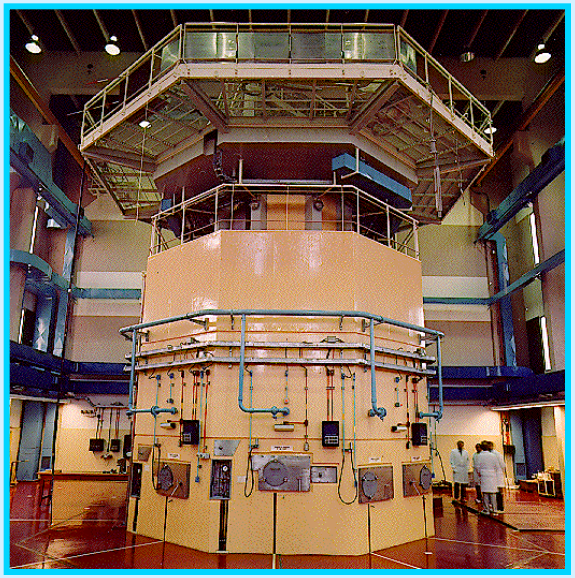
Applicants must have successfully completed **two years** study in Science or Engineering at any other university.

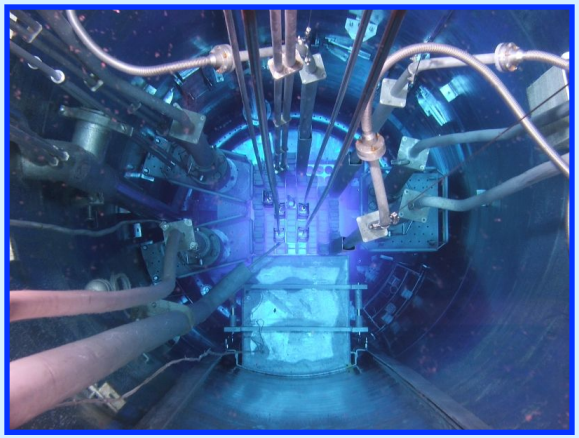
Degree	duration
Physics	2 ½ years
Nuclear Engineering	3 years
Mechanical Engineering	3 years

unique in Latin America

Admission requirements for Postgraduate Studies

Candidates must have a Graduate Degree in related university studies.





Postgraduate Degrees

DEGREE	duration
Specialization in Technological Applications of Nuclear Energy	1 year
Master in Physical Sciences	1 ½ year
Master in Medical Physics	1 ½ year
Master in Engineering	1 ½ year
Ph. D. in Physical Sciences	4 years
Ph. D. in Nuclear Engineering	4 years
Ph. D. in Engineering Sciences	4 years

Calendar

One term (6 months)

Lectures		Lectures	Exams	Holidays

One week break

- Student participation in class and laboratory team work is actively encouraged and regarded as an important aspect of their future professional activities.
- Equal importance is given from the very beginning to both theoretical and experimental work in well equipped laboratories. The curricula are periodically updated.
- No pending exams are allowed from one term to the next.

ENGLISH IS A MANDATORY SUBJECT

Strong emphasis on experimental teaching

The Institute is well-known for the intense laboratory practice in the teaching of experimental subjects. All students – from Physics, Nuclear or Mechanical Engineering – have access from the very beginning to the type of equipment they will be using throughout their professional career.

Since it was founded in 1955, this system has proved to be effective in the development of professional scientists and technicians.

General Characteristics

- ❑annual selection of candidates
- ❑full-time commitment to studies
- ❑full scholarships for students
- ❑faculty members involved in Research and Development
- ❑close working relationship between teachers and students
- ❑emphasis on experimental teaching/ learning
- ❑Master students join fully active working groups
- ❑high graduation rate

Student dorms

- on-campus housing for degree students
- on-campus housing for graduate students according to an allocation process

The scholarship covers all students living expenses to guarantee full-time commitment to study.

New Student dorms

Degree Careers: Students from different Argentinean States

National

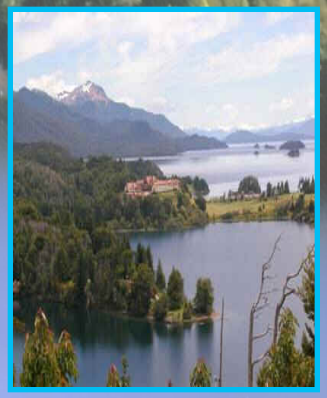
Master/Doctoral – students from:

- Argentina
- Chile
- Uruguay
- Colombia
- Peru
- Venezuela

International

Student life at the Institute

Campus life takes place in the beautiful surroundings offered by the mountain, forest and lakes of Patagonia.
Students are free to organize their time between study and outdoor activities, such as skiing, fishing, rafting, hiking, trecking, canoeing, etc.



Bariloche Atomic Center & Instituto Balseiro Campus

our added value

Nuclear Physic Labs

Radiation Protection

Research Reactor

Materials Science

Nuclear Safety

Library

Classrooms

Reactor I&C

Reactor Calculations

Fuel Cycle

Engineering Labs

Physics Labs

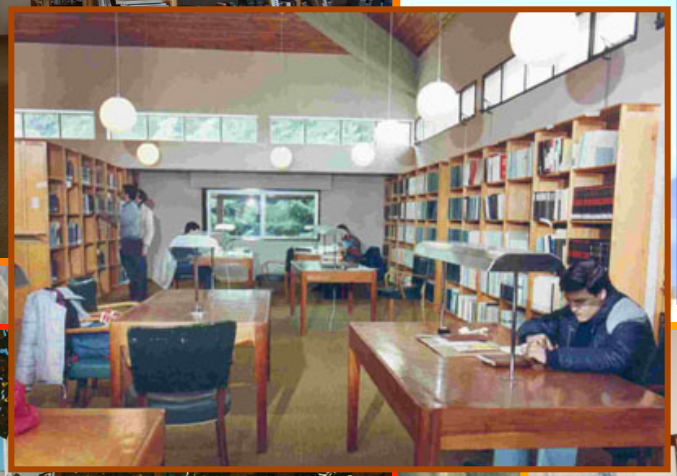
Student dorms

Auditorium

Reactor Physics

Thermohydraulics

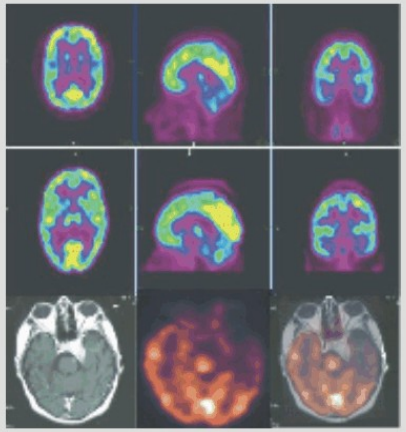
Library



- 20.000 books
- 700 journal titles
- electronic web access to 3.000 journal titles
- digital library of thesis & dissertations
- wi-fi

Master Degree in Medical Physics

Postgraduate



Duration:

1 ½ years

The Master Degree in Medical Physics is run jointly by the Institute and the Mendoza Medicine School (FUESMEN).
The main objective is to train professionals who have already obtained an undergraduate degree in a related field to work as medical physicists in clinical or academic settings.

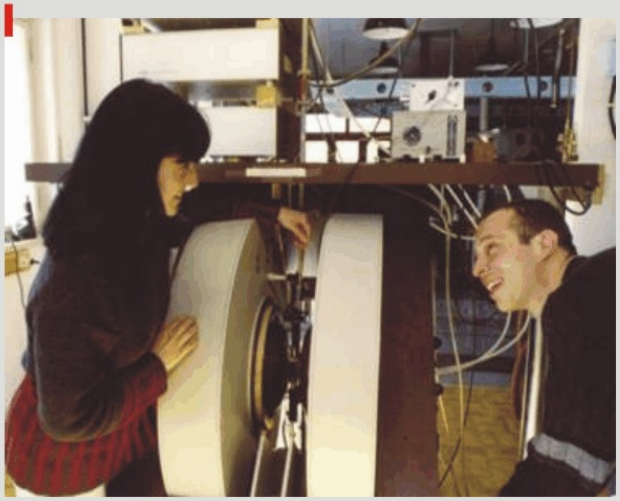
For further inquires:
Instituto Balseiro
tel : +54-2944- 445296
Maestria.Fisica.Medica@ib.edu.ar
www.ib.edu.ar

Instituto Balseiro Bariloche

Fundación Escuela Medicina Nuclear

Master Degree in Physical Sciences

Postgraduate



Objectives

-To provide sound knowledge of a specialized area in physics
-To give students experience in scientific and technological research
-To provide opportunities for independent work and continuing education
-To prepare students both for individual and teamwork
-To form versatile innovation-oriented professionals

For further inquires:

Instituto Balseiro
tel : +54-2944- 445296
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Specialization In Technological Applications Of Nuclear Energy

(CEATEN)

Postgraduate

1 YEAR

Oriented Towards
Engineers Physicists Chemists Biologists Biochemists Geologists others.

Objective
To provide basic knowledge on the technological applications of nuclear energy for professionals working in fields related to nuclear energy, or for professionals who want to learn more about nuclear energy by means of a postgraduate course of excellence.

REACTOR OPERATORS

For further inquires:

Instituto Bal[illegible]ro
tel : +54 [illegible]44-[illegible]45[illegible]3
[illegible]b.edu.ar
www.ib.edu.ar

Instituto Balseiro Bariloche

UNIVERSIDAD DE BUENOS AIRES

Specialization on Technological Applications of Nuclear Energy CEATEN

- **STUDENTS: All fields Engineers, Physicists, Chemists, etc. from our country and from abroad.**

- **Objective: To provide basic knowledge on technological applications of nuclear energy to those professionals who will operate nuclear facilities or perform related activities in the peaceful uses of nuclear technology.**

- **Postgraduate Diploma: "*Specialist on Technological Applications of Nuclear Energy*"**, granted by the Universidad Nacional de Cuyo (UNCu) and the Universidad Nacional de Buenos Aires (UBA).
  - **Duration:** One year
  - **Dedication:** Full Time

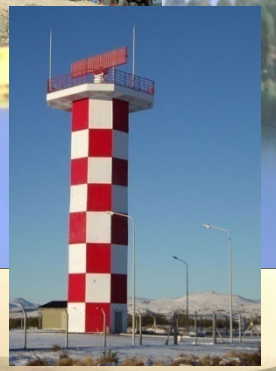
Close relationship with the Industry

NA S.A.
INVAP
Techint
IMPSA
CONUAR
Y.P.F.
etc.



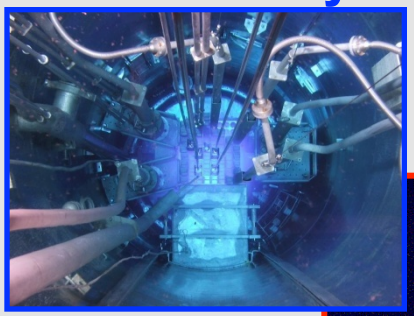


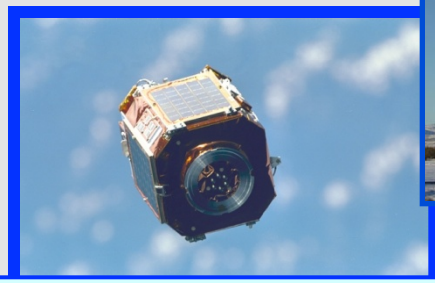




From our Nuclear Engineering students:

- ❑ Uranium Enrichment
- ❑ Scientific Satellites
- ❑ Research Reactors
- ❑ Nuclear Power Plants
- ❑ Nuclear Medicine equipments
- ❑ Radar Systems





Since its foundation in 1955, the Institute has proved to be an efficient way of training highly qualified scientists and technologists.

"The largest single investment ever in science and technology in Australia´s History"

Prof. Helen Garnet/ANSTO Chief Executive/July 2000

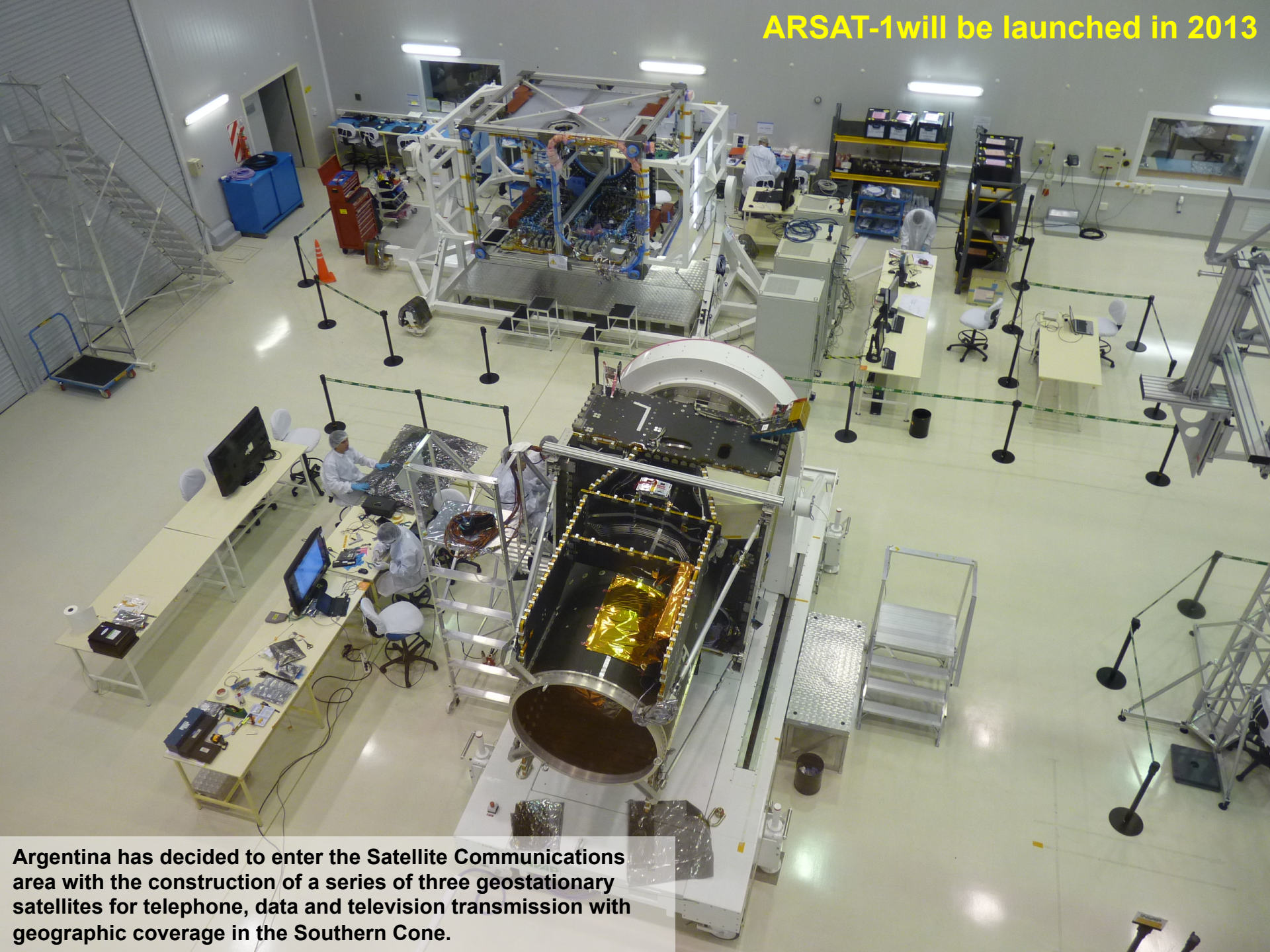
AUGER OBSERVATORY

A new Astrophysics Facility

Correlation of the highest-Energy Cosmic Rays with Nearby Extragalactic Objects November 2007

Important participation from our alumni!

Aquarius/SAC-D
Sea Surface Salinity from Space
Launched 2011



Argentina has decided to enter the Satellite Communications area with the construction of a series of three geostationary satellites for telephone, data and television transmission with geographic coverage in the Southern Cone.

Our alumni:

- *General Manager,* Argentina Atomic Energy Commission
  - Dr. Rubén Calabrese

- *General Manager & CEO, Technological Company*
  - Lic. Héctor Otheguy

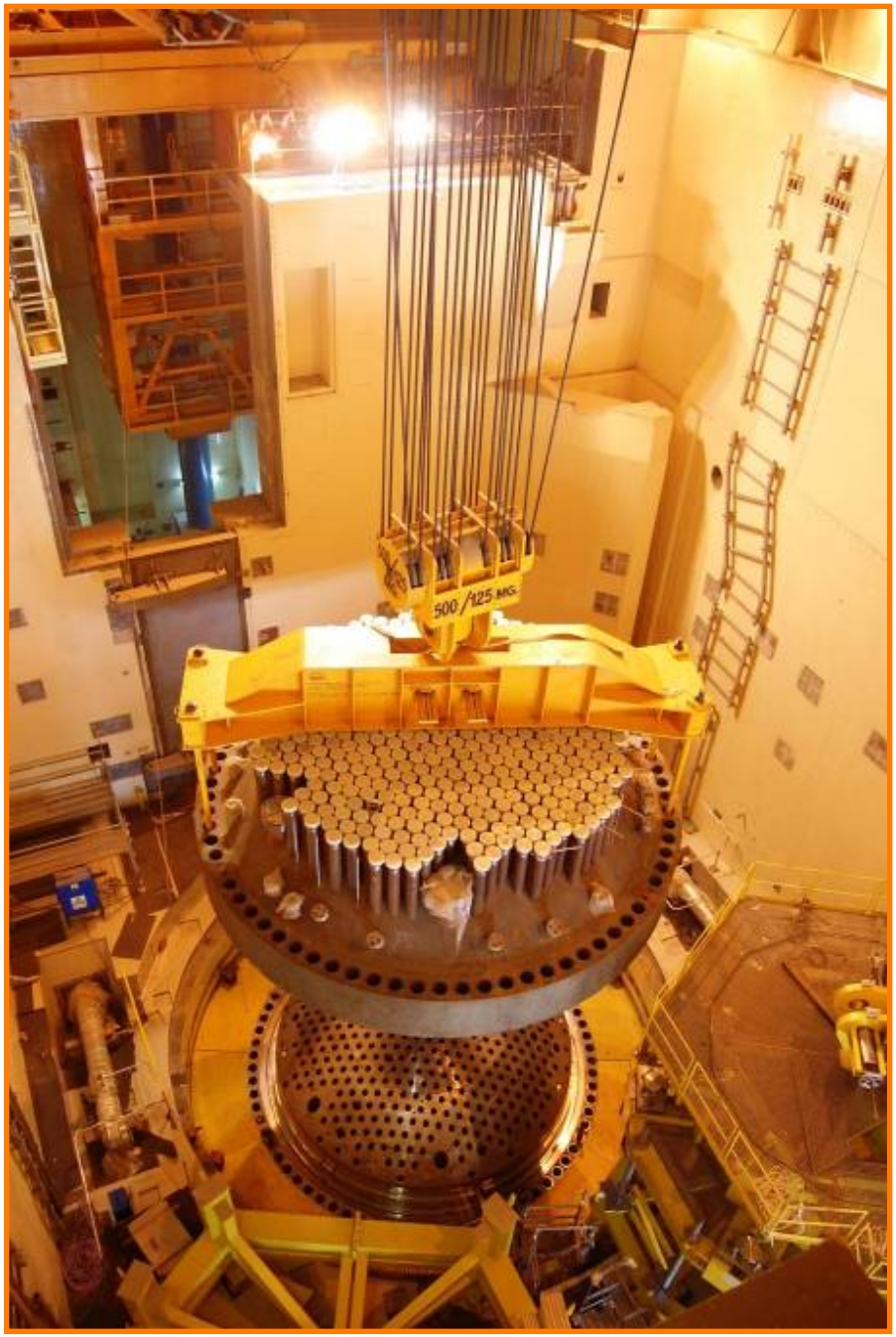
- *General Manager and CEO*, CONAE, Argentina Aerospace Agency
  - Dr. Conrado Varotto

- *OPAL* Reactor Project Manager
  - Ing. Pablo Ordoñez

- *General Manager & CEO*, ARSAT, Argentina Satellite Communication Enterprise
  - Dr. Pablo Tognetti

Dr. ElBaradei – Doctor Honoris Causa
Instituto Balseiro – November 2007

IAEA Director General Dr. Mohamed ElBaradei delivers a speech at Instituto Balseiro (University of Cuyo), Bariloche, Argentina



Atucha II Project
- PHWR
- 745 MW_e

- ✓ 1980 - Project started (KWU PHWR NPP)
- ✓ 1984 - Construction stop (the engineering design continue on)
- ✓ 1992 - Project re-started*
- ✓ 1994 - Project Stop
- ✓ 2007 - Executive Order 1082/07 - Project re-started**
- ✓ 2012 - Full Power

Note: * KWU does not exist
** Siemens Nuclear does not exist

PROJECT: INTERNET REACTOR LABORATORY PROJECT FOR LATIN AMERICA

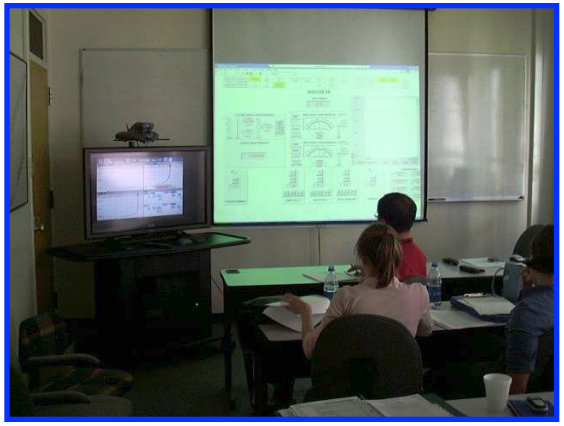
CNEA will provide access, via the internet, to data and video signals sent from the RA-6 Reactor to educational institutions in Latin America taking part in this Project.

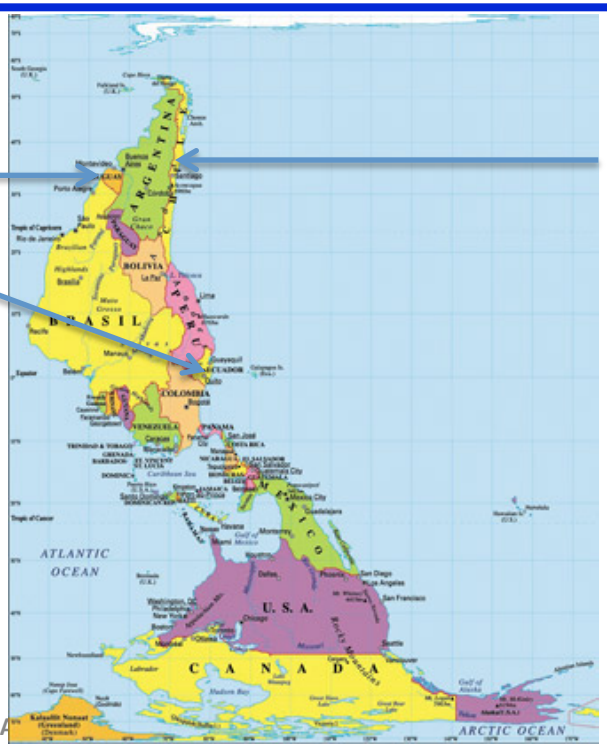
Initial experiments:

1. Critical approach;
2. Control rod calibration;
3. Control rod reactivity measurement (rod drop);
4. Temperature reactivity coefficient; and
5. Void coefficient calculation.

New Project

Reactor Parameters
- **Power**
- **Rod Positions**
- **Temperature**
- **Alarms**
- **more**





RA-6 Research Reactor
Bariloche, Argentina

IAEA COLLABORATION CENTRE
2009/2012

AREA: HUMAN RESOURCES FOR THE NUCLEAR TECHNOLOGY

IAEA
Atoms for Peace: The First Half Century
1957–2007

THANK YOU!

Knowledge management is the key factor in the long-term success of any technological project